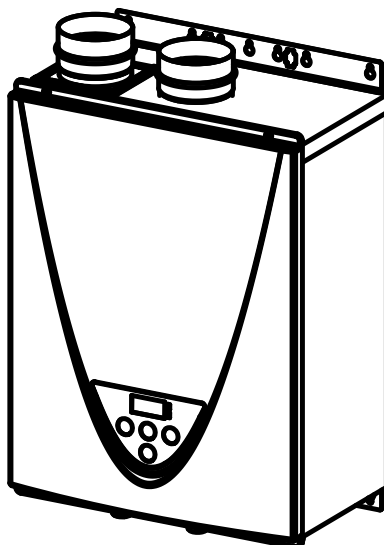


Condensing Models

On-Demand Water Heater Service Handbook



MODELS:

240 Indoor (T-H3J-DV)

240 Outdoor (T-H3J-OS)

340 Indoor (T-H3S-DV)

340 Outdoor (T-H3S-OS)

540 Indoor (T-H3-DV)

540 Outdoor (T-H3-OS)

Series 100/101

**THIS SERVICE HANDBOOK IS FOR USE BY QUALIFIED SERVICE PROFESSIONALS ONLY.
IF YOU NEED ASSISTANCE, CALL TECHNICAL SUPPORT.**

IN USA, CALL AT 877-737-2840. IN CANADA, CALL 888-479-8324.

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SPECIFICATIONS

Table 1:									
Model			240 Indoor (T-H3J-DV)	240 Outdoor (T-H3J-OS)	340 Indoor (T-H3S-DV)	340 Outdoor (T-H3S-OS)	540 Indoor (T-H3-DV)	540 Outdoor (T-H3-OS)	
Natural Gas Input (Operating Range)	BTU/h		Min.: 15,000 Max.: 160,000		Min.: 15,000 Max.: 180,000		Min.: 15,000 Max.: 199,000		
Propane Input (Operating Range)	BTU/h		Min.: 13,000 Max.: 160,000		Min.: 13,000 Max.: 180,000		Min.: 13,000 Max.: 199,000		
Gas Connection			3/4" NPT						
Water Connections			3/4" NPT						
Water Pressure*	psi (MPa)		15 - 150 (0.1 - 1)						
Natural gas Inlet Pressure	inch W.C. (kPa)		Min. 4.0 (1.0) Max. 10.5 (2.61)						
Propane Inlet Pressure	inch W.C. (kPa)		Min. 8.0 (1.99) Max. 14.0 (3.48)						
Manifold Pressure**	Max.	inch W.C. (kPa)	LP: 2.2 (0.55) NAT: 1.9 (0.47)	LP: 2.2 (0.55) NAT: 2.0 (0.50)	LP: 2.6 (0.65) NAT: 2.4 (0.60)	LP: 2.7 (0.67) NAT: 2.4 (0.60)	LP: 3.2 (0.80) NAT: 2.8 (0.70)	LP: 3.2 (0.80) NAT: 2.9 (0.72)	
	Min.	inch W.C. (kPa)	LP: 0.6 (0.15) NAT: 0.7 (0.17)	LP: 0.7 (0.17) NAT: 0.7 (0.17)	LP: 0.6 (0.15) NAT: 0.7 (0.17)	LP: 0.7 (0.17) NAT: 0.7 (0.17)	LP: 0.6 (0.15) NAT: 0.7 (0.17)	LP: 0.7 (0.17) NAT: 0.7 (0.17)	
Weight	lbs. (kg)		58 (26.3)	58 (26.2)	58 (26.3)	58 (26.2)	59 (26.8)	59 (26.9)	
Dimension	inches		H 22.4 x W 17.7 x D 10.7						
	mm		H 570 x W 450 x D 272						
Ignition			Electric Ignition						
Electric	Supply		VAC/ Hz	120 / 60					
	Consumption	Operation	W/A	72.7 / 0.61		78.2 / 0.65		89.0 / 0.74	
		Standby	W/A	3.1 / 0.03		3.1 / 0.03		4.2 / 0.04	
		Freeze-Protection	W/A	174 / 1.5		174 / 1.5		175 / 1.5	

* 40 psi (0.27 MPa) or above is recommended for maximum flow.

** The Manifold Pressure is the factory setting and should not need adjustment. NOTE: Manifold Pressure readings are taken with the front cover removed.

NOTE:

- Check the rating plate to ensure this product matches your specifications.
- The manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligation.

INTRODUCTION

Read and follow all safety messages and instructions in this handbook and on the product labeling.



This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible property damage, serious injury or death. Do not remove any permanent instructions, labels, or the rating plate from either the outside of the water heater or the inside of the access panels.

⚠ DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.
⚠ WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.
⚠ CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
⚠ NOTICE indicates practices not related to physical injury.

⚠ WARNING

- Installation and service must be performed by a qualified installer (such as a licensed plumber or gas fitter).
- The installer/service agent (licensed professional) is responsible for correctly installing or servicing your water heater and for compliance with all national, state/provincial, and local codes.
- Failure to comply with these warnings could result in death, explosion, fire, or carbon monoxide poisoning.

⚠ CAUTION

Wear eye protection during water heater assembly or disassembly. Failure to do so could lead to personal injury.

This handbook provides the necessary information for troubleshooting the 240/T-H3J, 340/T-H3S, and 540/T-H3 tankless water heaters. It will be effective in helping your troubleshooting needs as long as the instructions are followed in the intended order. Here is how to use this manual:

- First, refer to the Installation Manual as the primary source of information. Refer to it along side this manual throughout the troubleshooting process.
- Before troubleshooting, if you are unfamiliar with how a tankless unit operates, read “Normal Operation” on page 6.
- Before troubleshooting a new installation, use the installation manual.
- Before troubleshooting, first go through the “Preliminary Checklist” on page 7. It will identify the most common and frequent problems and provide you with general knowledge to help narrow down the information you need.
- If the water heater is in fault and is displaying an error code, refer to “Error Codes” on page 11. If you have not received an error code, refer to “General Issues” on page 8.
- The following sections can be removed from this manual for easy reference as you work:

- “Component Diagrams/Item Numbers” (starting on page 71).
- The following graphics, which show the location of basic components.
 - Indoor model: page 49.
 - Outdoor model: page 50.

If you have any problems or questions regarding this equipment, consult the technical service department or the local service agent.

General Installation Guidelines

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 (Natural Gas and Propane Installation Code) in Canada.
2. Properly ground the unit in accordance with all local codes or, in the absence of local codes, with the National Electrical Codes: ANSI/NFPA 70 in the USA or CSA standard C22.1, Canada Electrical Code, Part 1 in Canada.
3. Carefully plan where you intend to install your water heater.
4. Check the rating plate for the correct GAS TYPE, GAS PRESSURE, WATER PRESSURE and ELECTRIC RATING. (See the left-hand and right-hand sides of the water heater.) **NOTE:** If this unit does not match your requirements, do not install.

NORMAL OPERATION

If any problem occurs, turn off all hot water taps and turn off the gas. Then call a trained technician or the gas company.

Becoming familiar with how a tankless water heater normally operates may help to troubleshoot it. Assuming it is properly installed with appropriate gas, water, and electrical connections, it should operate as follows:

Activation

5. A hot water fixture is opened. The flow sensor must detect a flow rate through the heater that is greater than the 0.5 GPM before the heater will begin operation. The temperature rise must be great enough to meet the minimum input requirement which is 15,000 BTUH for natural gas models or 13,000 BTUH for propane models. Otherwise, the heater will remain in standby.
6. The fan activates to purge the system.
7. The Igniter generates a spark between the spark electrode and the burner to ignite the gas.
8. The gas valve will open. You will hear a deep “clunk clunk” noise.
9. Once a flame is detected, the green “In Use” LED will activate. (This green LED is located on the temperature controller or remote controller.)

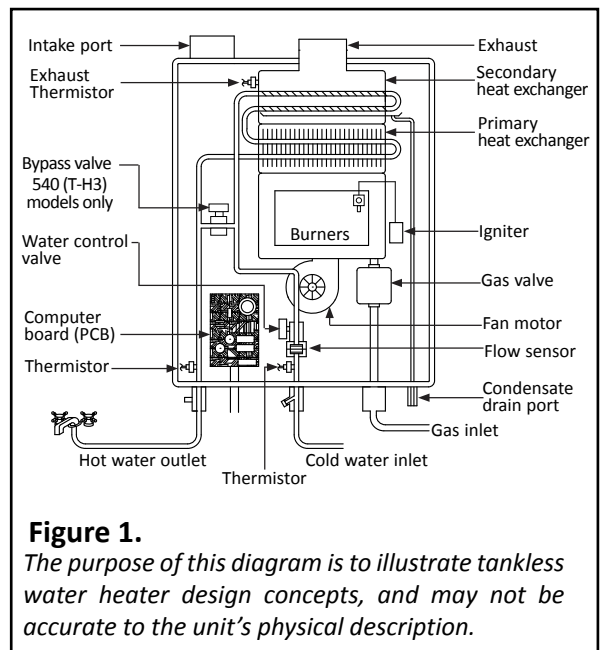
Operation

10. The proportional gas valve and fan will modulate based on the amount of hot water demanded and the temperature rise needed.
11. You may notice that only partial sections of the burner will be lit. This is normal operation. There are three sections on the burner assembly, and the computer controls the number of sections needed based on the flow rate and temperature rise required.
12. If the water flow exceeds the water heater’s capabilities to heat to the desired temperature, the flow control valve will restrict the flow to ensure delivery of water at the desired temperature. This will result in a loss of pressure at hot water fixtures whenever flow is restricted through the water heater.

NOTICE: 540 (T-H3) models include a bypass valve. This component acts like a mixing valve. It helps to reduce the risk of flue gases condensing on the copper heat exchanger which could lead to corrosion, damage, and water leaks. The bypass valve is also used when multiple heaters are linked together.

Shutdown

1. The heater will stop heating when the water flow rate drops below the deactivation point of 0.4 GPM.
2. The heater will close the main gas valve and solenoid gas valves, extinguishing the flame.
3. When the flame sensor no longer detects a flame, the green “In Use” LED will turn off.
4. The fan will increase in speed to purge any remaining exhaust gases. The length of post-purge can last up to 1-½ minutes.
5. The heater will enter standby mode.



Preliminary Checklist

To get started, review the following topics. You may also refer to “General Issues,” if necessary.

Gas/Water/Electric:

- Verify that the correct gas type is being used. Check the supply gas, the gas type dip switch, and the gas type shown on the rating plate. All three must agree in terms of gas type, and your water heater model must be designed for use with that type of gas (natural gas or LP).
- The gas supply valve should be fully open and the gas line purged.
- The water supply valve should be fully open.
- The unit must be connected to a 120 VAC 60 Hz power supply.
- There is a power switch inside the heater, located directly above the control board, that must be turned on before the heater can operate.

Remote Controller:

If you are using a remote controller, the remote’s power button must be turned on. Press the power button on the remote until the amber Stand-By LED is lit.

High Altitude:

If the heater is installed at an altitude of over 2,000 feet, it may cause a lack of air and incomplete combustion. See Dip Switch Settings, page 23.

Long Vent Run

The length of your vent run may require changes to your DIP switch settings. See Dip Switch Settings, page 23. Also, see the installation manual for venting requirements.

Hard Water:

What is the hardness of the water? A means for reducing scale is always recommended, but one must be installed if water hardness levels exceed 7 grains per gallon (120 ppm) for single family domestic applications or 4 grains per gallon (70 ppm) for all other applications. If a means for conditioning hard water is not installed, existing installations may gradually accumulate scale buildup on the heat exchanger and a leak could result. (Descaling instructions are listed on page 38.) Heat exchanger leaks due to hard water scale are not covered under the warranty.

Water with higher concentrations of dissolved minerals like calcium or magnesium is considered to be “hard” water. The higher the “hardness” of the water, the more frequently the water heater will need regular maintenance to ensure trouble free operation at the best possible efficiency.

New Installations:

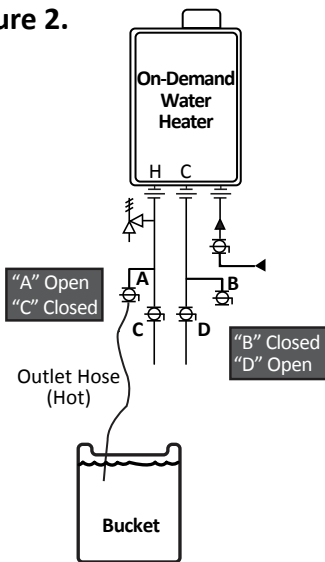
If a newly installed water heater won’t operate at all or operates erratically, check for the following:

- Reversed hot and cold plumbing connections. The water heater must sense water flow to initialize operations. Water flowing through the heater backwards will not activate the flow sensor.
- A dirty inlet filter. A dirty inlet filter can either prevent water from flowing through the water heater entirely, or create turbulence that can prevent the flow sensor from measuring the water flow.
- Misconfiguration of the Easy-Link system (if applicable).
- Gas line that has not been purged correctly.

External Problem:

1. Test whether the problem is within the unit or external to the unit (i.e., in the plumbing system) by attempting to run hot water locally through the isolation valve. Ensure that the hot water shutoff is closed while running water through the hot isolation valve drain port. See Figure 2, page 8.
2. Does the heater ignite and continue to run properly? If it runs properly through the hot isolation valve, the plumbing system is at fault. If the heater shuts down with an error code or no operation occurs, the problem is with the water heater. **NOTICE:** If no error code is displayed, you can use Diagnostic Mode to review stored error codes. See page 45.

Figure 2.

**Next Step:**

Finally, check to see if the unit has an error code. The error code will be displayed on the temperature controller (or remote controller) and by flash codes on the green LED on the computer board. See Figure 3, page 11. See also the error code chart on page 11.

- If it is displaying an error code, proceed to Error Codes, p. 11.
- If there is no error code, proceed to “General Issues.”

General Issues

Proceed to the “Error Codes” section if an error code is identified. For other common problems that do not involve error codes, see if the following items help:

Water is not hot enough.

- What is the set temperature of the heater? Temperature can be adjusted using the temperature or remote controller.
 - Isolate the heater by closing the hot isolation valve. Open the hot drain valve and test the heater. A hose may need to be connected to the hot drain prior to opening it in order to drain the water properly.
 - If the temperature and flow rate are correct through the drain, then the problem resides in the plumbing line, not in the tankless unit.
- Check for crossed plumbing between cold water lines and hot water lines. See the “Service Procedures” section for instructions.
- Unit may be hard water scaled. The scale acts as an insulator preventing the heat exchanger from transferring heat to the water. Refer to “Descaling the Unit” on page 38.
- The unit may not be receiving enough gas.
 - The gas supply valve may not be fully open.
 - The gas line may be sized improperly.
 - The gas supply pressure may be too low. This may be caused by a malfunctioning gas supply regulator, so check to see if the regulator is working properly. See “Check gas supply” later in this section.
- If a recirculation system is installed, ensure that a check valve is installed between

the pump discharge and the connection to the cold water supply. Inspect the check valve for proper operation. If there isn’t one installed, or if it is malfunctioning, cold water may be back-feeding into the system.

- If a mixing valve is installed, check to see if it is operating properly and not allowing water to cross over.
- Output temperature will be affected if air flow is impeded.
 - Check for construction dust and debris in venting, such as dry wall dust.
 - If there is dust inside the cabinet, there will also be dust inside the burner and heat exchanger. Refer to “Cleaning the Combustion Components,” page 39.

Water is too hot.

- The temperature setting may be set too high. Adjust the temperature using the temperature controller or the remote controller.
- The output thermistor could be compromised. This component may be checked by entering the Diagnostics Mode on the remote controller or temperature controller. Turn power off to the unit and run cold water through it; check to see if the inlet and outlet temperatures read the same on the remote. Press the INFO button once on the temp/remote controller. The inlet water temperature will be displayed. Press the INFO button again to show the outlet temperature. If the readings are not similar, then one of the thermistors may not be

reading correctly. Refer to error codes 311 and 321 in Table 2: Error and Flash Codes, page 11.

- The flow adjustment valve could be obstructed due to hard water scale or debris, causing lower than expected water flow. Verify water flow with a graduated container or with the temperature controller.
NOTE: Indoor models have a built-in temperature controller. However, outdoor models require a remote temperature controller in order to view the flow rate.

Temperature fluctuates when a fixture is opened.

Make sure that the unit is installed properly.

- Test whether the problem is within the unit or external to the unit (i.e., plumbing system).
- Plumbing connections:
 1. Check for a crossed connection. See “Checking for a Crossed Connection,” page 33.
 2. Problems with the recirculation system:
 - Make sure that a check valve is installed between the pump discharge and the connection to the cold water supply.
 - Check to see if the pump is operating properly.
 - Check for air cavitation. If present, the pump will be very hot or chattering.
 - Check the directional indicator on the pump flange.

- Check the sizing of the pump. A minimum flow of 2 gpm is required.

3. If the unit is installed in a multi-unit system, verify that the Easy-Link system or Multi-Link system is set up correctly. Refer to the installation manual.

- Check gas supply:
 - Verify that the gas meter is capable of supplying sufficient gas supply to all gas appliances. Determine the sum of all gas appliances’ maximum energy input (in cubic feet per hour). This number must be less than the maximum ratings shown on the gas meter’s rating plate. If the maximum energy input of all appliances exceeds the maximum rating of the gas meter, consult your local gas utility.
 - For LP models, there may not be enough propane left in the tank.
 - Verify that the supply gas pressure is within specification, not only when the heater is in standby, but also while the heater is running on maximum fire. (See “Checking the Inlet Gas Pressure and Pressure Drop,” page 33.)
 - The gas supply pressure may be too low. This may be caused by a malfunctioning gas supply regulator or incorrect gas line sizing.
 - Check the pressure difference between static and maximum operating pressure. If the

drop is more than 1 inch W.C., there may be insufficient gas supply. **NOTE:** In Canada, do not exceed the maximum allowable pressure drop permitted by B149.1.

- Venting:
 - Verify that the venting is installed to manufacturer’s specifications.
 - Verify that the vent run does not exceed the allowable limit. Refer to the installation manual.
 - Verify that the DIP switch settings for vent length match the installation’s equivalent vent length and diameter.
- The filter on the cold water inlet should be clean. Look for signs of hard water scaling. See “Unit Draining and Filter Cleaning,” page 32.
- If the clear tube from the proportional gas valve to the bottom of the combustion chamber is disconnected, fluctuations in temperature and/or very low flow to the fixtures may occur.
- On well systems or even on some city water systems, water pressure fluctuations (especially on low flow) of 8 to 10 psi will result in flow rate fluctuations. This may result in minor temperature fluctuations.
- Flow sensor or water control valve may be compromised. Inspect both parts for blockages or debris.

Unit does not ignite when water goes through it.

- If you have an indoor model, is the power button on the built-in controller turned on?
- If you use a remote controller, is the remote power button turned on?
- Check to see if the Computer board is receiving power. This can be verified by observing the green LED on the computer board or the amber LED on the temperature/remote controller.

If it is not lit, the computer board is not being powered. Check to see if the ON/OFF switch below the fuse box is set to the on position, or if the fuse in the fuse box assembly is blown.

- Is the flow rate over 0.5 gpm? See if the unit initiates when you increase demand of water being drawn through the unit (e.g., opening up more hot fixtures). You can verify the flow rate by pressing the info button on the front of the unit until the arrow lights up beside “flow.”
- Check that the filter on the cold water inlet is clean (page 32).
- If the unit is in a recirculation system, the return water temperature may be too close to the set point temperature to activate the water heater. You can verify the incoming water temperature by using the INFO button on the front of the unit. Simply press the INFO button until the arrow on the display points toward IN. Refer to “error code indicator” in Figure 3 (p. 11).
- Check that the gas line is open and is purged of air (page 33).

- Are the hot and cold water connections to the water heater reversed (hooked up backwards)? Water flowing in reverse through the heater will not be detected by the flow sensor and the water heater will not operate. See page 33 for details on checking for a reversed connection.
- Check both ends of the clear hose that runs between the proportional gas valve and the combustion chamber. If this hose is disconnected, the unit may fail to light.
- Check for problems with the recirculation system.

Make sure that a check valve is installed between the pump discharge and the connection to the cold water supply. A malfunctioning or missing check valve will cause a cross connection, allowing cold water to back-feed into the system.

- If the fan does not initiate at all and it is verified that there is power to the unit, the flow sensor may not be working properly. Check the flow sensor for proper impeller functionality. See “Checking the Flow Sensor,” page 36.

Abnormal sounds come from the unit.

- Check the fan for debris.
- Check for blockages in the exhaust vent and intake air line.
- Check for proper gas supply pressure.

- Check the rating plate to ensure that the correct gas type is applied to the unit.
- Check the DIP switch settings.
- Check flame quality.
- Check vent termination clearances.
- If you cannot identify the source of this issue, contact the technical service department.

Error Codes

All units have self-diagnostics. If there is a problem with the unit, a numerical error code will display on the temperature controller of indoor models or on the TM-RE42 Remote Controller (if installed). Installation related problems may also produce an error code. If the remote/temperature controllers are not working, the green LED on the computer board will flash a code pattern. (The green LED is located beside the DIP switches as shown in Figure 3)

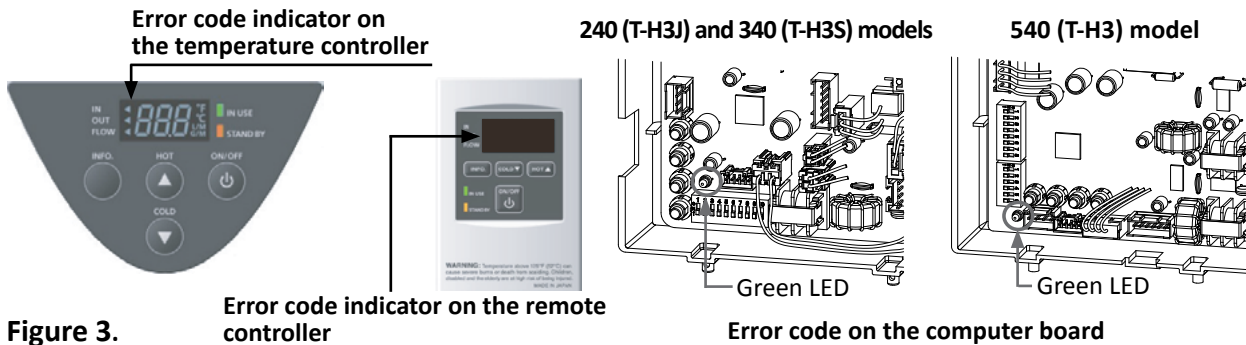


Figure 3.

NOTE:
 If you are working with a water heater that is part of an Easy-Link or multi-unit system, we recommend that you troubleshoot the unit as an individual unit and not as part of the system. Follow these steps prior to troubleshooting a child unit: 1. Shut off power to the heater. 2. Close the isolation valves to the heater. 3. Disconnect both linking wires from the bottom of the heater. 4. If the unit is not an end unit, take the ends of both linking wires which you unplugged and connect them together. One end is male and the other is female; they will connect together. 5. Turn power to the heater back on, then troubleshoot as necessary.

Table 2: Error and Flash Codes

ERROR CODE	GREEN LED ON COMPUTER BOARD	SYMPTOM OR ISSUE	TROUBLESHOOTING PROCEDURE (PAGE NUMBER)
031	One Flash	Incorrect DIP switch setting	<i>Code 031: Incorrect DIP Switch Settings, p. 14.</i>
101	Five Flashes	Abnormal Combustion (lockout is imminent)	<i>Code 101: Abnormal Combustion, p. 14.</i>
111 or 121	Three Flashes	Ignition failure / Loss of flame	<i>Code 111 or 121: Ignition Failure / Flame Loss, p. 14.</i>
311	Two Flashes	Outlet thermistor failure (240/340 models) Heat Exchanger Thermistor Failure (540 models)	<i>Code 311, 321, 331 or 341: Thermistor Failure, p. 16.</i>

ERROR CODE	GREEN LED ON COMPUTER BOARD	SYMPTOM OR ISSUE	TROUBLESHOOTING PROCEDURE (PAGE NUMBER)
321	Two Flashes	Inlet thermistor failure	<i>Code 311, 321, 331 or 341: Thermistor Failure, p. 16.</i>
331	Two Flashes	Outlet thermistor failure (540 model only)	<i>Code 311, 321, 331 or 341: Thermistor Failure, p. 16.</i>
341	Two Flashes	Exhaust thermistor failure (indoor models only)	<i>Code 311, 321, 331 or 341: Thermistor Failure, p. 16.</i>
391	Two Flashes	Air-fuel ratio rod failure	<i>Code 391: Air-Fuel Ratio Rod Failure, p. 17.</i>
441	Two Flashes	Flow Sensor Failure (Easy-Link or Multi-Link System)	<i>Code 441: Flow Sensor Failure (Easy-Link or Multi-Link System Only), p. 17.</i>
510	Six Flashes	Abnormal main gas solenoid valve (MV)	<i>Code 510: Abnormal Main Gas Solenoid Valve (MV), p. 17.</i>
551	Six Flashes	Abnormal gas solenoid valve (SV1, SV2, and/or SV3)	<i>Code 551: Abnormal Solenoid Gas Valve (SV1, SV2, and/or SV3), p. 18.</i>
611	Four Flashes	Fan motor fault	<i>Code 611: Abnormal Fan Motor, p. 18.</i>
651	Four Flashes	Flow adjustment valve fault (Easy-Link or Multi-Link System)	<i>Code 651: Flow Adjustment Valve Fault (Easy-Link or Multi-Link System only), p. 18.</i>
661	Four Flashes	Bypass valve fault	<i>Code 661: Bypass valve fault (540 (T-H3) model only), p. 19.</i>
701	One Flash	Computer board fault	<i>Code 701: Computer Board Fault / Proportional Gas Valve Fault, p. 19.</i>
711	One Flash	Gas solenoid valve drive circuit failure	<i>Code 711: High Limit Switch / Overheat Cutoff Fuse Circuit is Compromised, p. 19.</i>
721	Six Flashes	False flame detection	<i>Code 721: False Flame Detection, p. 20.</i>
741	N/A	Miscommunication between water heater and remote controller	<i>Code 741: Remote Control Problem, p. 20.</i>
751	N/A	Miscommunication between water heater and temperature controller (Indoor model only)	<i>Code 751: Temperature Controller Problem, p. 20.</i>
761	N/A	Miscommunication between units in an Easy-Link or Multi-Link system. (540/T-H3 Only)	<i>Code 761: Communication Error in Easy-Link or Multi-Link System, p. 20.</i>

ERROR CODE	GREEN LED ON COMPUTER BOARD	SYMPTOM OR ISSUE	TROUBLESHOOTING PROCEDURE (PAGE NUMBER)
941	Five Flashes	Abnormal exhaust temperature (Indoor model only)	<i>Code 941: Abnormal Exhaust Temperature, p. 21.</i>
991	Five Flashes	Imperfect Combustion	<i>Code 991: Abnormal Combustion, p. 21.</i>

Code 031: Incorrect DIP Switch Settings

The system displays this code when an incorrect DIP switch setting is detected.

1. Turn off the power supply.
2. Remove front cover and locate the DIP switches at the bottom of the computer board.

Refer to “Dip Switch Settings” on page 23. The correct DIP switch positions are illustrated in that section.

For specific DIP switch settings related to vent length or high-altitude installations, refer to the tables that start on page 23. Additional information is provided in the Installation Manual/Owner’s Guide.

3. After setting the DIP switches, turn power to the water heater back on.

Code 101: Abnormal Combustion

This code is a warning that the air-fuel ratio for combustion is gas rich. Undersized gas lines can lead to a 101 or 991 error code as well.

The heater will continue to operate with a 101 error code, but a shutdown is imminent if the problem is not resolved. The next step is a 991 error code which will force the water heater to shut down.

Refer to “Error Code: 991,” page 21.

Code 111 or 121: Ignition Failure / Flame Loss

Either the water heater will not fire after three failed ignition attempts (code 111) or it lost the flame signal

during a heating cycle and was not able to establish a flame after three failed ignition attempts (code 121).

These codes can appear due to a component in the heater or due to an external cause, such as no gas supply.

Also, these codes will automatically reset when water flow through the heater stops, or when the power is interrupted.

1. Verify that the gas supply pressure is within specifications when the heater is in standby, and verify the gas pressure does not drop below the minimum specified pressure when the heater is trying to light. Also, verify that the gas line is cleared of debris.

- It is possible that there is a faulty pressure regulator at the gas meter.
- For propane units, colder periods of the day result in a cold regulator and may cause this problem. An inlet gas pressure drop of more than 1” to 1.5” of water column when the water heater operates under a maximum demand (all hot water fixtures open) indicates not enough fuel is being supplied to the water heater. See “Checking the Inlet Gas Pressure and Pressure Drop” on page 33.

2. Check the High Limit Switch and Overheat Cutoff Fuse (OHCF) as follows:

- 2.1 Turn off power to the water heater, then turn it back on. (Use the switch above the computer board.) Listen for the “clunking” noises of the gas solenoid valves. If you DO hear them, go directly to step 3.

- 2.2 Turn off power to the heater by disconnecting the power cord or external switch.

- 2.3 Locate the high limit switch (item 412, p. 74). See also Figure 41 (p. 49) and Figure 42 (p. 50).

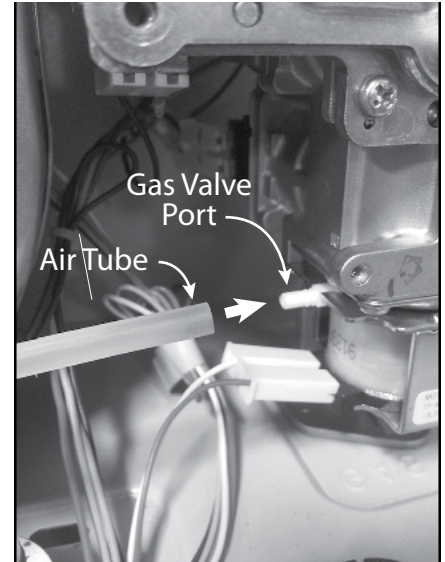


Figure 4.

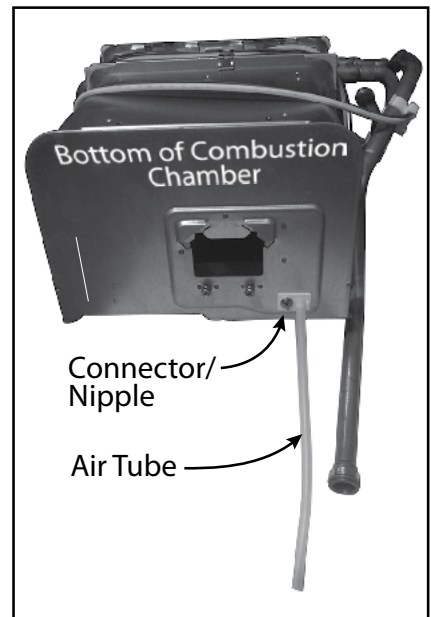


Figure 5.

- 2.3.1 Push the button in the middle of it. The switch was reset if you heard and felt the button click.
- 2.3.2 Turn the power back on and test the heater. If the burner lights, the cause of the high limit trip must be determined. Continue with the troubleshooting process.
- 2.3.3 If the high limit switch trips again, the water heater may need to be descaled. See “Descaling the Unit” on page 38.
- Also, be sure to check the temperature of the incoming water supply. If the unit is supplied with pre-heated water, such as from a solar system, the incoming water temperature may be too high.
- If descaling and limiting the incoming water temperature and did not solve the issue, replace the high limit switch. (See page 74 for the appropriate part number.)
- 2.4 If the high limit switch is operating properly and you don’t hear the “clunking” noises of the gas valves, then check the overheat cutoff fuse (OHCF) for continuity. If there is no continuity, or for instructions on how to test the OHCF for continuity, refer to “Checking the Overheat Cutoff Fuse (OHCF)” on page 35.
3. Check for blockages in venting, such as bird nests, animals, or trash. An air blockage of the exhaust, burner, or heat exchanger will over-pressurize the burner chamber and force the diaphragm in the proportional valve to close. This will prevent gas flow through the gas valve.
4. Make sure that the clear plastic tube connecting the proportional gas valve to the combustion chamber is attached. See Figure 4 and Figure 5. If necessary, see also Figure 41 (p. 49) or Figure 42 (p. 50).
5. Check for a spark inside the burner chamber between the spark electrode and the burner. The spark may be viewed through the sight glass located next to the igniter and flame sensor. A strong blue spark will remain steady and in place, while a weak spark will jump around.
- 5.1 If no spark or a weak spark is observed, check the purple igniter wire connections at both the igniter and at the computer board. Unplug and reconnect them to clean the electrical connections.
- 5.2 Check the igniter rod to make sure the black wire is properly attached and that the rod doesn’t move. If the rod moves, replace the igniter rod, part number 100074222. You will also need a rod holder gasket, part number 100074219.
- 5.3 When the igniter is sparking, check the voltage across the purple wires coming to the igniter. Normal voltage is 108-132 VAC. If voltage is outside of this range, then replace the computer board. (See item 701 on page 78 for the correct part number.)
- 5.4 If the previous steps still don’t result in a spark being generated, replace the igniter (part number 100074640).
6. If flame comes on for only 1-2 seconds before going out, verify that the green IN USE LED on the built-in controller or remote controller did not turn on. If the LED stayed off, then inspect the flame sensor. Clean it if necessary. Replace it if any damage (chips or cracks in the ceramic) is seen or if the metal rod can move freely in the ceramic insulator. See “Cleaning the Rod Assembly (Flame Sensor and Air/ Fuel Ratio Rod)” on page 36.
- Unplug both ends of the wiring harness from the igniter assembly and control board, then reconnect them to ensure good connection. Also, verify that the green wire that is part of the circuit is attached to one of the screw connections around the manifold.
7. Verify proper operation of the main gas valve (MV). To do so, turn the power off, then check the resistance of the MV. A normal resistance is 1.35-1.65 kΩ. If the resistance is out of range, replace the gas valve/manifold assembly.
8. Verify proper operation of the gas solenoid valves. To do so, turn the power off, then check the resistance of the valves. A normal resistance reading for SV1 and SV2 is 1.35-1.65 kΩ. Normal resistance for SV3 is 2.07-2.53 kΩ. If the resistance is out of range, replace the gas valve.

**Code 311, 321, 331 or 341:
Thermistor Failure**

The system displays this code when it detects a thermistor failure.

1. Turn off power to the water heater.
2. Identify the row in Table 3 that applies to you, then follow its instructions.

Table 3:

Error Code	Indoor or Outdoor Model?	Model Type	Locate the thermistor by its callout:
311	Indoor or Outdoor	240 340	See "Outlet Thermistor," page 49 or 50.

Error Code	Indoor or Outdoor Model?	Model Type	Locate the thermistor by its callout:
311	Indoor or Outdoor	540	See "Heat Exchanger Thermistor" page 49.
321	Indoor or Outdoor	240 340 540	See "Inlet Thermistor," page 49 or 50.
331	Indoor Or Outdoor	540	See "Outlet Thermistor," page 49 or 50.
341	Indoor Only	240 340 540	See "Exhaust Thermistor," page 49.

3. After you have located the correct thermistor, verify that the wire connections are secure and free of burns or cuts.
4. Check the thermistor's resistance value. See Table 4 for a list of normal resistance values.
5. Clean the thermistor as follows:
 - a. Drain the unit of water. (See "Unit Draining and Filter Cleaning" on page 32.)
 - b. IF you are testing the outlet thermistor, remove the screw that secures the computer board. Move the computer board out of the way without disconnecting any of its wires. This will

Table 4: Thermistor Resistance Values

TEMPERATURE:		°F	32	41	50	59	68	77	86	95	104	113
		°C	0	5	10	15	20	25	30	35	40	45
RESISTANCE:	TEMPERATURE THERMISTORS (INDOOR & OUTDOOR)	kΩ	23.76	19.08	15.43	12.56	10.28	8.47	7.02	5.85	4.90	4.12
RESISTANCE:	TEMPERATURE EXHAUST THERMISTOR (INDOOR ONLY)	kΩ	30.04	24.12	19.50	15.87	13.00	10.71	8.87	7.39	6.19	5.21

TEMPERATURE:		°F	122	131	140	149	158	167	176	185	194	203	212
		°C	50	55	60	65	70	75	80	85	90	95	100
RESISTANCE:	TEMPERATURE THERMISTORS (INDOOR & OUTDOOR)	kΩ	3.49	2.96	2.53	2.16	1.86	1.60	1.39	1.21	1.05	0.92	0.81
RESISTANCE:	TEMPERATURE EXHAUST THERMISTOR (INDOOR ONLY)	kΩ	4.41	3.74	3.19	2.73	2.35	2.03	1.76	1.53	1.33	1.16	1.02

allow you to access the outlet thermistor.

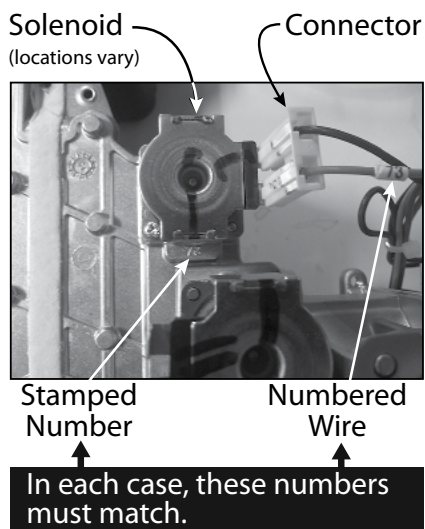
- c. Remove the screw or clip that secures the thermistor, then pull the sensor probe out.
 - d. Clean the probe to a silver finish. Do not lose the red rubber o-ring that wraps around this sensor.
 - e. Reinstall the thermistor. IF you cleaned the outlet thermistor, reinstall the computer board.
6. Return the water heater to service.
 7. If the error code persists, replace the thermistor.

Code 391: Air-Fuel Ratio Rod Failure

The system displays this code if no flame is detected by the Air-Fuel Ratio (AFR) rod.

1. Ensure that the unit is plugged into a socket that is properly grounded.

Figure 6. Gas Valve Wiring



A floating ground can cause this error.

2. Check that the wire connections are secure and free of burns or cuts. Verify that the green ground wire is installed properly and is making an electrical connection. This ground wire is part of the AFR and Flame Rod circuit. See “Wiring Diagrams” on page 30.
3. Check that the clear plastic tube connecting the proportional gas valve to the combustion chamber is attached. (See page 49 or 50.)
4. Clean the air-fuel ratio rod (flame rod). See “Cleaning the Rod Assembly (Flame Sensor and Air/Fuel Ratio Rod)” on page 36.

Code 441: Flow Sensor Failure (Easy-Link or Multi-Link System Only)

The system displays this code when it detects a flow sensor failure.

1. Disconnect the water heater from the linked system before you advance to step 2. The water heater must be tested as an individual unit.
2. Ensure that the water supply is turned on.
3. Check the flow sensor/control valve wires to see if they are broken or disconnected. Refer to Figure 41 (p. 49) or Figure 42 (p. 50).
4. Verify the flow rate using the water heater’s controller. To do so, select Flow Rate by pushing the INFO button until the arrow on the left side of the display points toward “Flow.” Ensure that the controller displays a flow rate during operation. If a flow rate is

not indicated, proceed to the next step.

5. Check the inline water filter for debris.
6. Turn off the gas supply and electrical power to the heater, then remove the flow sensor/control valve (p. 51). Check the flow sensor as described in “Checking the Flow Sensor,” page 36. Clean or replace as necessary.

Code 510: Abnormal Main Gas Solenoid Valve (MV)

This code indicates a fault in the main solenoid gas valve (MV) circuit.

1. If the hot water is shut off, but flames are still visible through the burner sight window, immediately shut off gas and power to the unit and contact the technical service department.
2. Check the wire connections to the main gas solenoid valve for burns or cuts.
3. If the unit was serviced recently and the gas valve had to be removed, make sure that each gas valve wire is plugged into the proper place. (For each connector, the number stamped on the metal must match the number that is printed on the wire’s label. See Figure 6.)
4. Verify that the gas supply pressure is within the specified limits. An inlet gas pressure that is too high can jam or damage the main gas valve.
5. With the power off, check the resistance of the valve. Normal resistance reading is 1.35-1.65 kΩ. If the resistance is out of range,

replace the gas valve.

6. Check the voltage across the main gas valve wires (blue - light blue #3) during operation. The voltage reading should be 93-120 VDC. If the voltage is not within normal range, replace the computer board.

Code 551: Abnormal Solenoid Gas Valve (SV1, SV2, and/or SV3)

This code indicates a driving circuit fault for one or more of the solenoid gas valves (SV1, SV2, or SV3).

1. Check the wire connections to the gas solenoid valves for burns or cuts.
2. If the unit was serviced recently and the gas valve had to be removed, make sure that each gas valve wire is plugged into the proper place. (For each connector, the number stamped on the metal must match the number that is printed on the wire's label. See Figure 6, page 17.)
3. Verify that the supply gas pressure is within the specified limits. Too high of an inlet gas pressure may cause the main gas valve to jam or could be damaged.
4. With the power off, check the resistance of each valve. Normal resistance reading for SV1 and SV2 is 1.35-1.65 k Ω . Normal resistance reading for SV3 is 2.07-2.53 k Ω . If the resistance is out of range, replace the gas valve.
5. Check the voltage across these solenoid gas valve wires during operation. (The dark blue wire is common.)
 - SV1: Green (#9) & Blue
 - SV2: Orange (#53) & Blue

- SV3: Red (#73) & Blue

In each case, the voltage reading should be 93-120 VDC. If the voltage is not within normal range, replace the computer board.

Code 611: Abnormal Fan Motor

This code indicates a fan motor fault.

1. Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker.
2. Check venting for blockages or for the presence of contaminants in the water heater area (e.g., lint, dust). Make sure that there are no contaminants inside the water heater cabinet. Correct any issues that are found.
3. Visually check for breakages in the fan motor wiring or burn marks on the computer board (PCB). Repair/replace as needed.
4. Check for leaks at the heat exchanger.
5. Check the fan housing for water.
6. If you found water in the fan housing, clean and dry the fan. To remove the fan, **make sure that power to the water heater is still turned off**, then follow steps 8.1 through 8.1.2 on page 41. Reassemble in reverse order.
7. Turn on power to the water heater, then test the heater.
8. Complete this step only if the previous steps did not solve the issue.

During operation, check the voltage between the fan motor wires listed below. The blue wire is common. (See "FM" in the wiring diagram, page 30 or 31.)

- Red & Blue
Normal: 132 to 192 VDC (during operation)
- Yellow & Blue
Normal: 13 to 17 VDC (during operation)
- Orange & Blue
Normal: 2 to 6.5 VDC (during operation)

If the voltage readings fall within the normal range, replace the fan motor. If the voltage readings are not within normal range, replace the computer board.

Code 651: Flow Adjustment Valve Fault (Easy-Link or Multi-Link System only)

This code indicates a flow adjustment valve fault.

1. Inspect the flow adjustment valve (item number 402, p. 74) for the following:
 - Broken or disconnected wires
 - Debris or scale buildup inside the valve assembly that would prevent the valve from opening or closing
 - Water leakage at the flow adjustment valve (Replace the seals/component.)
2. Check the resistance of the flow adjustment valve. To check it, **a.)** turn off electrical power to the water heater, then **b.)** unplug the flow adjustment valve's connector from the computer board. (See schematic on page 30 or 31.) **c.)** Check the resistance between the red and black wires. Normal resistance (black-red): 90 to 200 Ω . If the resistance is out of range, replace the flow adjustment valve.
3. Check the voltage of the flow adjustment valve where its connector plugs into the PCB. Measure between

the black and red wires. (See page 30 or 31.) Normal voltage range (black-red): 7 VDC - 16 VDC. If the voltage is out of range, replace the computer board. (See page 49 or 50.)

Code 661: Bypass valve fault (540 (T-H3) model only)

This code indicates a bypass valve fault.

1. Inspect the bypass valve (item number 403) for the following:
 - Broken or disconnected wires (Be sure to look behind the fuse box and check the wire assembly from the bypass valve. Wire colors: red, yellow, white, blue, brown.)
 - Locked motor drive due to debris or scale build up inside the valve assembly
 - Water leakage at the bypass valve

Check the resistance of the bypass valve. To check it, **a.)** turn off electrical power to the water heater, then **b.)** unplug the bypass valve's harness. There is a connector in the middle of the harness which you can access by removing the computer board. (See Figure 41, page 49. The harness' wire colors are red, yellow, white, blue, brown). **c.)** Check the resistance between the brown and red wires. (You can use the pins in the female connector.) Normal resistance (brown-red): 50 to 85 Ω . If the resistance is out of range, replace the bypass valve.

2. Check the voltage of the bypass valve. To check it, measure between the brown and red wires. (See page 31.) Normal voltage range (brown-red): 3 VDC - 11 VDC. If the voltage is out of range, replace the computer board. (See page 50.)

Code 701: Computer Board Fault / Proportional Gas Valve Fault

This code indicates a computer board or proportional gas valve fault.

1. Verify that the red/white harness is connected at both the proportional valve solenoid and the computer board (PCB).
2. Inspect the computer board (PCB) for connection/breakage of wires and/or burn marks.
3. Check the operation of the outlet thermistor as follows:
 - 3.1 Push the on/off button on the temperature controller or remote controller so the orange STAND BY LED turns off.
 - 3.2 Run water through the heater.
 - 3.3 Check the reading of the outlet thermistor by pushing the INFO button on the temperature/remote controller two times. Compare it to the inlet thermistor. The readings should be similar and it should be reading the temperature of the supply water. If there is a difference of more than five degrees, refer to "Code 311, 321, 331 or 341: Thermistor Failure" on page 16.

When you are finished, retest the water heater.

4. Check the proportional gas valve as described in the following sub-steps. The proportional valve is located at the bottom of the gas valve assembly and has red and white wires connected to it.

- 4.1 Turn off the power supply.
- 4.2 Check the wire connections at both the gas valve and on the control board. Make sure that they are secure and free of burns or cuts.
- 4.3 Check the resistance across the proportional valve (red, white wires). Normal value is 20-40 Ω . If the resistance is outside of this range, replace the gas valve. If you do replace the gas valve, verify that the gas supply pressure is within specifications.

Code 711: High Limit Switch / Overheat Cutoff Fuse Circuit is Compromised

When power is turned on to the heater, the computer performs a diagnostic check of the gas valve, high limit, and Overheat Cutoff Fuse (OHCF) circuits. If any of these are compromised, this code will appear.

1. Inspect the dark blue common wire to the high limit switch, the OHCF, and the gas valves for any breaks or cuts.
2. Verify proper wiring harness connections to the gas valve solenoids. (For each connector, the number stamped on the metal must match the number that is printed on the wire's label. See Figure 6, page 17.)
3. Check the High Limit switch. Refer to "Code 111 or 121: Ignition Failure / Flame Loss," page 14.
4. The Overheat Cutoff switch may be compromised. Refer to "Checking the Overheat Cutoff Fuse (OHCF),"

page 35.

5. There may be a computer board (PCB) and/or gas valve fault. Refer to error codes 510 and 551.

Code 721: False Flame Detection

A false flame was detected by the system during start up. No flames should have been present, so the system stopped the ignition process.

1. **WARNING! Shut off all gas and power to the unit. Failure to do so could lead to fire, explosion, personal injury or death.**
2. Inspect the flame sensor to see if it is dirty. Also, check the ceramic housing for cracks. Clean the assembly, if necessary. See "Cleaning the Rod Assembly (Flame Sensor and Air/ Fuel Ratio Rod)" on page 36.
3. Contact the technical service department for further assistance.

Code 741: Remote Control Problem

Error Code: 741

This code indicates a miscommunication between the temperature remote controller and the water heater. This code is **not** associated with the built-in controller for indoor models.

NOTICE:

- If you disconnect the remote from the heater with the power supply on, this error code will result. Turn off power before disconnecting the remote from the heater.
- Remote controllers for outdoor models will vary in the field.

Outdoor models manufactured prior to April 2015 were equipped with remote controller TM-RE40/100112572; current outdoor models are equipped with TM-RE42/100209924.

1. Verify that the remote is compatible with the water heater. Refer to the remote's instruction sheet and the heater's installation manual.
2. Verify that only a single remote is installed. With indoor models, only one remote may be used in addition to the built-in temperature controller. An incorrect remote or multiple remotes will result in this error code.
3. Make sure that all wiring is connected to the remote controller properly.
4. Power surges can cause this fault. If frequent power surges occur, install adequate surge protection to prevent nuisance faults.
5. Check the voltage across the wires coming to the remote. Normal voltage should be 10-25 VDC. If within normal range, replace the remote, part 100209924. If the voltage is out of range, replace the computer board (PCB).

Code 751: Temperature Controller Problem

This code indicates a miscommunication between the water heater and the **built-in** temperature controller (indoor models only).

NOTE: This code is **not** associated with the remote controller.

1. Check that all wiring is properly connected to the built-in temperature controller.
2. Power surges can cause this fault. If

frequent power surges occur, install adequate surge protection to prevent nuisance faults.

3. Check the voltage across the wires that are connected to the remote. Normal voltage should be 11 VDC and 25 VDC. If within normal range, replace the built-in temperature controller. If the voltage is out of range, replace the computer board (PCB).

Code 761: Communication Error in Easy-Link or Multi-Link System

A 761 error code means that the parent unit (Easy-Link system) or multi-unit controller (Multi-Link system) has lost communication with at least one heater.

This code will display on the parent heater in an Easy-Link system **or** on the multi-unit controller of a Multi-Link system.

To address this error, do the following:

1. Inspect the wiring between the Parent heater/Multi-Unit Controller and the heater identified by the code.
2. Verify that the heater in question has power to the computer board.
 - Make sure the switch above the computer board is on.
 - Make sure that a fuse or surge absorber in the fuse box has not blown.
 - Verify proper supply power to the water heater in question.

If the error appeared while troubleshooting the water heater, do the following:

- Easy-Link System: Cycle the power of the parent unit off, then back on again.

- Multi-Link System:
Push the Alarm Reset button on the multi-unit controller to clear the code.

Code 941: Abnormal Exhaust Temperature

(Indoor models only.) This code indicates that the exhaust temperature exceeded limits and that the heater was not able to reduce the exhaust temperature, forcing the exhaust high limit switch to trip and shutdown the burners.

1. Check for excessive vent length and for any blockage in the intake air and/or exhaust.
2. Check for dust or lint in the burner and heat exchanger in contaminated installation areas.
3. Check the incoming water temperature. If it is above 140°F, the exhaust temperature may be too high. Reduce the supply water temperature.
4. Check the resistance of the thermistor. Refer to “Code 311, 321, 331 or 341: Thermistor Failure,” page 16.
5. Check the manifold pressure. See “Checking and Adjusting the Manifold Gas Pressure,” page 34.

Code 991: Abnormal Combustion

This code indicates imperfect combustion. This can be caused by insufficient intake air or exhaust obstructions.

See also “Error Code: 101.”

WARNING! Familiarize yourself with the components before attempting these procedures. Use the Installation Manual

and reference the component schematic on the last few pages of the manual.

Safety first! These procedures must be performed by licensed, qualified service professionals only. Failure to observe this warning could lead to personal injury or death.

A.O. Smith is not liable for the actions of the technician if he/she fails to adhere to any or all safety procedures, specifically in regards to electrical and gas safety.

1. Check the rating plate to verify that the gas type of the water heater matches the gas type applied to the unit. Next, make sure that the gas-type DIP switch setting is correct. (See page 23.)
2. Verify that the venting meets the requirements specified in the installation manual (e.g., vent diameter and length).
3. Verify the DIP switch settings.
 - 3.1 Are the DIP switches set for the correct vent size and length? Refer to Dip Switch Settings, p. 23 for the correct settings. Each 90-degree elbow is equal to 5 feet of straight pipe. Refer to the installation manual for vent requirements.
 - 3.2 Is the heater set to the correct elevation? The default setting for your water heater is 2,000

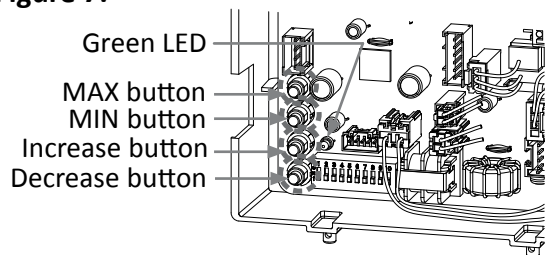
ft. above sea level. A DIP switch change is required for installations that are higher than 2,000 feet above sea level. Refer to “Dip Switch Settings” on page 23. One of its tables lists the correct DIP switch settings for each elevation range.

4. Check the following:

Is the gas supply pressure within specified limits when the heater is in standby and when it is running?

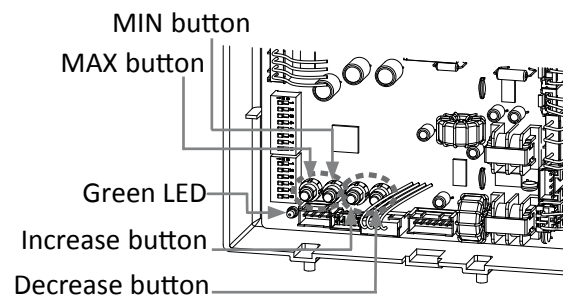
If the pressure difference between standby and maximum firing is greater than 1 inch W.C., the supply line, gas meter, and/or regulator may be undersized. NOTE: In Canada, do not exceed the maximum allowable pressure drop permitted by B149.1. Verify that the gas lines are sized

Figure 7.



240 (T-H3J) / 340 (T-H3S) model

Figure 8.



540 (T-H3) model

for the correct volume of gas. Refer to the installation manual or the current edition of the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 (U.S.) or Natural Gas and Propane Code, B149.1 (Canada).

5. Check for obstructions in the vent or intake air lines. Clear them if any are found.
6. Verify that the terminations meet the minimum clearances that are outlined in the installation manual and local codes. (Doing so will minimize the risk of flue gas recirculation.) Also, ensure that no other appliance's exhaust gasses can be pulled into the intake.
7. Check for signs of contaminated air inside the water heater's cabinet and inside the fan on the fan blades. Clean the fan and cabinet if any debris is present. It may also be necessary to inspect for debris or a partial blockage of the burners that could affect the flame quality.

Also, check for any partial air obstructions in the exhaust venting or finned air passage through the heat exchanger. If the fan is unable to push sufficient air, then the burners will become gas rich and trigger the 101 or 991 code.

- To check and clean the fan, see "Cleaning the Combustion Components," page 39.
- To check and clean the burner, refer to "Cleaning the Combustion Components," page 39.

NOTE: Do not proceed to the next step until this one has been completed and these causes have been ruled out. Improperly installed venting, incorrect dip switch settings,

and obstructions in the venting or heater will affect manifold pressure readings.

8. Contact Technical Support regarding the manifold pressure. (See "," page 34.) With approval from Technical Support, adjust the manifold pressure to the correct values, if necessary.
9. Complete the following procedure to clear the 101/991 error code:
 - 9.1 Make sure that the water heater is powered on.
 - 9.2 Press the on/off button on the remote/temperature controller so the amber standby light is off.
 - 9.3 On the computer board, simultaneously press and hold the INCREASE and DECREASE buttons for five seconds. (See Figure 7 or Figure 8, as appropriate.)
 - 9.4 Release the buttons when the green LED on the computer board turns off. (Figure 7 or Figure 8.)

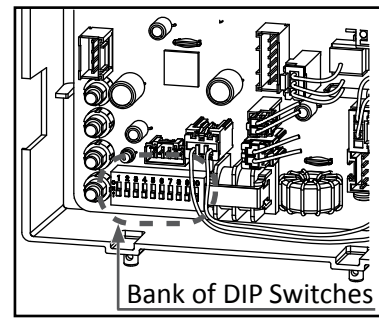
The green LED will then turn back on.
 - 9.5 Shut off power to the heater using the on/off switch above the computer board.
 - 9.6 After 5 seconds, turn the power on. The heater will be in standby and ready for operation.

DIP SWITCH SETTINGS

The computer board layout for all 240 and 340 models is identical. See “Wiring Diagrams,” page 30. The DIP switches have certain special functions as shown on the following table and generally should not need adjustment.

Verify the functions of each DIP switch carefully before changing any settings. If you have questions, contact the technical service department.

Figure 9: 240 (T-H3J) and 340 (T-H3S)



TROUBLESHOOTING

Table 5: 240 (T-H3J) / 340 (T-H3S) models

NOTE: Dark squares represents DIP switches

NO.	FUNCTIONS	ON POSITION	OFF POSITION																				
1	Gas type	Propane	Disable																				
2	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Propane ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: center;"> Natural Gas ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> </div>	Natural gas	Disable																				
3 4 5	FM+, FM- and Input- (Fan motor speed is increased automatically.) For correct settings, see pages 26 and 27.	DEFAULT ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No.3: OFF No.4: OFF No.5: OFF																					
6 7	Installation settings Set DIP switches shown in the table below depending on the vent length.	Set DIP switches shown in the table below. Outdoor models ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 6 : OFF No. 7 : ON																					
Vent settings (Indoor models only)																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 25%;">5 to 20 ft (DEFAULT)</th> <th style="width: 25%;">21 to 40 ft</th> <th style="width: 35%;">41 to 70 ft</th> </tr> </thead> <tbody> <tr> <td>3" ventings</td> <td>5 to 20 ft (DEFAULT)</td> <td>21 to 40 ft</td> <td>41 to 70 ft</td> </tr> <tr> <td>4" ventings</td> <td>5 to 50 ft (DEFAULT)</td> <td>51 to 100 ft</td> <td>N/A</td> </tr> <tr> <td></td> <td> ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </td> <td> ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </td> <td> ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </td> </tr> <tr> <td></td> <td>No. 6 : ON No. 7 : OFF</td> <td>No. 6 : OFF No. 7 : OFF</td> <td>No. 6 : ON No. 7 : ON</td> </tr> </tbody> </table>					5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft	3" ventings	5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft	4" ventings	5 to 50 ft (DEFAULT)	51 to 100 ft	N/A		ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		No. 6 : ON No. 7 : OFF	No. 6 : OFF No. 7 : OFF	No. 6 : ON No. 7 : ON
	5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft																				
3" ventings	5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft																				
4" ventings	5 to 50 ft (DEFAULT)	51 to 100 ft	N/A																				
	ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	ON <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																				
	No. 6 : ON No. 7 : OFF	No. 6 : OFF No. 7 : OFF	No. 6 : ON No. 7 : ON																				
8	N/A (Do not change switch position.)	N/A	N/A (Default)																				
9	Output temperature settings (Default 120°F / 49°C)	140 °F (60 °C)	120 °F (49 °C) (Default)																				
10*	Deactivation of the exhaust temperature control	Enable	Disable (Default)																				

* **WARNING:** Do not adjust DIP switch No. 10 without guidance from the technical service department. The only time DIP switch 10 should be set to ON is when your unit is being hooked up to CAT III/IV metal vent with a maximum temp. rating of 480° F. The No. 10 DIP switch deactivates the exhaust temperature control when set to the ON position. Failure to follow this warning can lead to personal injury, carbon monoxide poisoning, or death.

DIP SWITCH SETTINGS (CONTINUED)

The 540 Indoor (T-H3-DV) model uses the same computer board as the 540 Outdoor (T-H3-OS) model. There are two banks of DIP switches (upper and lower bank) on the computer board. The upper bank has certain special functions as shown on the following table and generally should not need adjustment.

Verify the functions of each DIP switch carefully before changing any settings. If you have questions, contact the technical service department.

Figure 10: 540 (T-H3) Model

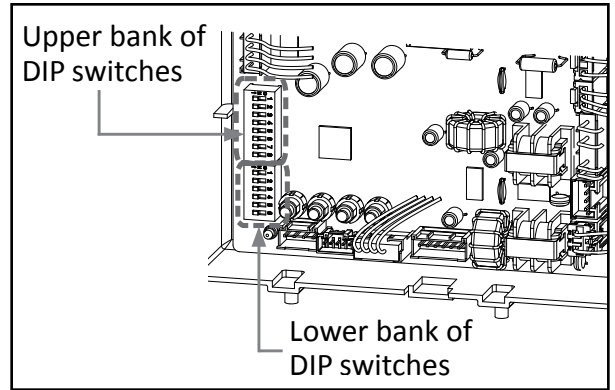


Table 6: 540 (T-H3) model
Upper bank of DIP switches (Figure 10)
NOTE: Dark squares represents DIP switches

No.	Functions	ON position	OFF position																																																																	
1	Gas type	Propane	Disable																																																																	
2	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Propane ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: center;"> Natural Gas ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> </div>	Natural gas	Disable																																																																	
3	Installation settings	<div style="display: flex; justify-content: space-between;"> <div> <p>Set DIP switches shown in the table above depending on the vent length.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="4">Vent settings (Indoor model only)</th> </tr> <tr> <th>3" ventings</th> <th>5 to 20 ft (DEFAULT)</th> <th>21 to 40 ft</th> <th>41 to 70 ft</th> </tr> </thead> <tbody> <tr> <td>4" ventings</td> <td>5 to 50 ft (DEFAULT)</td> <td>51 to 100 ft</td> <td>N/A</td> </tr> <tr> <td></td> <td> ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : OFF </td> <td> ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : OFF No. 4 : OFF </td> <td> ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : ON </td> </tr> </tbody> </table> </div> <div> <p>Set DIP switches shown in the table below.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="4">Outdoor models</th> </tr> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>ON</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>OFF</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td colspan="2"></td> <td colspan="2">No. 3 : OFF</td> <td colspan="5"></td> </tr> <tr> <td colspan="2"></td> <td colspan="2">No. 4 : ON</td> <td colspan="5"></td> </tr> </tbody> </table> </div> </div>		Vent settings (Indoor model only)				3" ventings	5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft	4" ventings	5 to 50 ft (DEFAULT)	51 to 100 ft	N/A		ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : OFF	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : OFF No. 4 : OFF	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : ON	Outdoor models					1	2	3	4	5	6	7	8	ON	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OFF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			No. 3 : OFF									No. 4 : ON						
Vent settings (Indoor model only)																																																																				
3" ventings	5 to 20 ft (DEFAULT)	21 to 40 ft	41 to 70 ft																																																																	
4" ventings	5 to 50 ft (DEFAULT)	51 to 100 ft	N/A																																																																	
	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : OFF	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : OFF No. 4 : OFF	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No. 3 : ON No. 4 : ON																																																																	
Outdoor models																																																																				
	1	2	3	4	5	6	7	8																																																												
ON	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																												
OFF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																												
		No. 3 : OFF																																																																		
		No. 4 : ON																																																																		
5	N/A (Do not change switch position.)	N/A	N/A (Default)																																																																	
6*	Deactivation of the exhaust temperature control (This switch is for a specialized purpose only)	Enable	Disable (Default)																																																																	
7	N/A (Do not change switch position.)	N/A	N/A (Default)																																																																	
8	Deactivation of the freeze protection firing system	Enable	Disable (Default)																																																																	

* **⚠ WARNING:** Do not adjust DIP switch No. 6 without guidance from the technical service department. The only time DIP switch 6 should be set to ON is when your unit is being hooked up to CAT III/IV metal vent with a maximum temp. rating of 480° F. The No. 6 DIP switch deactivates the exhaust temperature control when set to the ON position. Failure to follow this warning can lead to personal injury, carbon monoxide poisoning, or death.

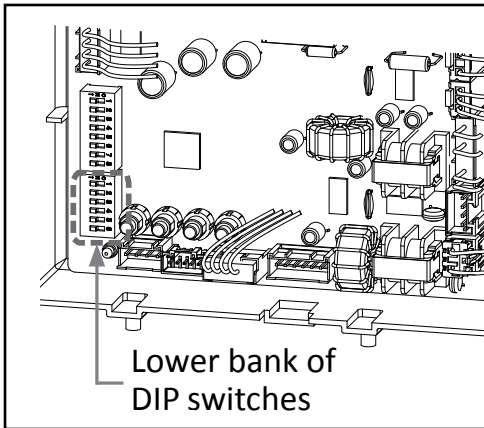
Continued on the next page.

DIP SWITCH SETTINGS (CONTINUED)

Table 7: 540 (T-H3) model
Lower bank of DIP switches (Figure 11)
NOTE: Dark squares represents DIP switches

No.	Functions	ON position	OFF position														
1	Parent/Child setting for Easy-Link Systems	Parent	Child (Default)														
2 3 4	FM+, FM- and Input- (Fan motor speed is increased automatically.) For correct settings, see pages 28 and 29.		<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p style="text-align: center; margin: 0;">DEFAULT</p> <table style="margin: 0 auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">ON</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">2</td> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">5</td> <td style="padding: 2px 5px;">6</td> </tr> <tr> <td style="padding: 2px 5px;">OFF</td> <td style="text-align: center;">□</td> <td style="text-align: center;">■</td> <td style="text-align: center;">■</td> <td style="text-align: center;">■</td> <td style="text-align: center;">□</td> <td style="text-align: center;">□</td> </tr> </table> <p style="margin: 5px 0 0 20px;">No.2: OFF NO.3: OFF No.4: OFF</p> </div>	ON	1	2	3	4	5	6	OFF	□	■	■	■	□	□
ON	1	2	3	4	5	6											
OFF	□	■	■	■	□	□											
5	Output temperature settings (Default 120 °F)	140 °F (60 °C)	120 °F (49 °C) (Default)														
6	Easy-Link connections with previous models (See page 43.)	Enable	Disable (Default)														

Figure 11: 540 (T-H3) Model Computer Board



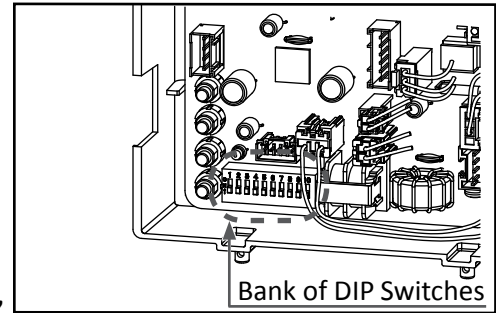
HIGH ALTITUDE SETTINGS

By default, all models are set to operate at altitudes of up to 2,000 feet. However, the altitude settings can be adjusted as described in the following pages.

⚠ WARNING

Failure to properly set the DIP switches could cause carbon monoxide poisoning, resulting in severe personal injury or death.

Figure 12: 240 (T-H3J) and 340 (T-H3S)



TROUBLESHOOTING

Table 8: Indoor model, 240 (T-H3J) / 340 (T-H3S) - Propane
Apply the altitude setting by adjusting DIP switches 3, 4, and 5 as described below.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.3	No.4	No.5		
0 to 2,000 ft.	0(DEFAULT)	OFF	OFF	OFF	N/A	N/A
2,000 to 3,000 ft.	1	OFF	ON	OFF	N/A	3 %
3,000 to 5,000 ft.	2*	ON	ON	OFF	-8 %	5 %
	3	OFF	OFF	ON	-11 %	7 %
5,000 to 7,500 ft.	4*	ON	OFF	ON	-14 %	9 %
	5	OFF	ON	ON	-18 %	12 %
7,500 to 10,100 ft.	6	ON	ON	ON	-22 %	15 %
Special function*		ON	OFF	OFF	N/A	-7%

Table 9: Indoor model, 240 (T-H3J) / 340 (T-H3S) - Natural Gas
Apply the altitude setting by adjusting DIP switches 3, 4, and 5 as described below.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.3	No.4	No.5		
0 to 2,000 ft.	0(DEFAULT)	OFF	OFF	OFF	N/A	N/A
2,000 to 3,000 ft.	1	OFF	ON	OFF	N/A	6%
3,000 to 5,000 ft.	2*	ON	ON	OFF	-6 %	10 %
	3	OFF	OFF	ON	-9 %	14 %
5,000 to 7,500 ft.	4*	ON	OFF	ON	-12 %	18 %
	5	OFF	ON	ON	-15 %	22 %
7,500 to 10,100 ft.	6	ON	ON	ON	-18 %	26 %
Special function*		ON	OFF	OFF	N/A	-7 %

*The settings are not listed in the Installation Manual of 240(T-H3J),340(T-H3S), and 540(T-H3) models.

HIGH ALTITUDE SETTINGS (CONTINUED)

⚠ WARNING

Failure to properly set the DIP switches could cause carbon monoxide poisoning, resulting in severe personal injury or death.

Figure 13: 240 (T-H3J) and 340 (T-H3S)

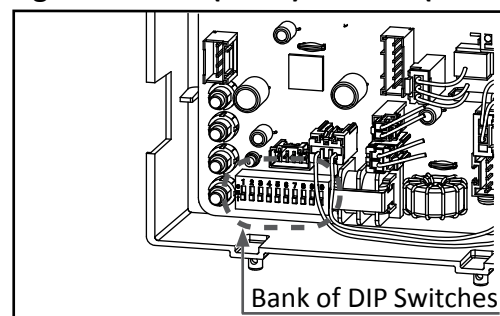


Table 10: Outdoor model, 240 (T-H3J) / 340 (T-H3S) - Propane

Apply the altitude setting by adjusting DIP switches 3, 4, and 5 as described below.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.3	No.4	No.5		
0 to 2,000 ft.	0 (DEFAULT)	OFF	OFF	OFF	N/A	N/A
	1**	OFF	ON	OFF	N/A	3 %
2,000 to 4,000 ft.	2	OFF	OFF	ON	-11 %	7 %
4,000 to 6,000 ft.	3*	ON	OFF	ON	-14 %	9 %
Special function**		ON	OFF	OFF	N/A	-7 %

Table 11: Outdoor model, 240 (T-H3J) / 340 (T-H3S) - Natural Gas

Apply the altitude setting by adjusting DIP switches 3, 4, and 5 as described below.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.3	No.4	No.5		
0 to 2,000 ft.	0 (DEFAULT)	OFF	OFF	OFF	N/A	N/A
	1**	OFF	ON	OFF	N/A	6 %
2,000 to 4,000 ft.	2	OFF	OFF	ON	-9 %	14 %
4,000 to 6,000 ft.	3*	ON	OFF	ON	-12 %	18 %
Special function**		ON	OFF	OFF	N/A	-7 %

* If the abnormal sound problem persists even with “Level 3” setting, please contact our Technical Service Department for advice.

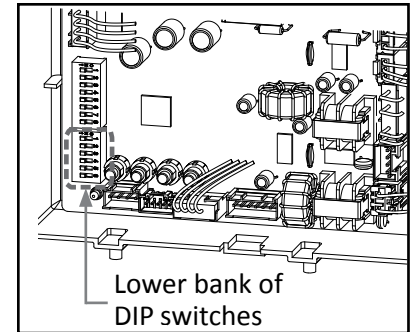
**These settings are not listed in the 240(T-H3J),340(T-H3S), and 540(T-H3) installation manual.

HIGH ALTITUDE SETTINGS (CONTINUED)

⚠ WARNING

Failure to properly set the DIP switches could cause carbon monoxide poisoning, resulting in severe personal injury or death.

Figure 14: 540 (T-H3)



TROUBLESHOOTING

Table 12: Indoor model, 540 (T-H3) - Propane

Apply the altitude setting by adjusting DIP switches 2, 3, and 4 on the lower bank. See Figure 14.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.2	No.3	No.4		
0 to 2,000 ft.	0(DEFAULT)	OFF	OFF	OFF	N/A	N/A
2,000 to 3,000 ft.	1	OFF	ON	OFF	N/A	3 %
3,000 to 5,000 ft.	2*	ON	ON	OFF	-8 %	5 %
	3	OFF	OFF	ON	-11 %	7 %
5,000 to 7,500 ft.	4*	ON	OFF	ON	-14 %	9 %
	5	OFF	ON	ON	-18 %	12 %
7,500 to 10,100 ft.	6	ON	ON	ON	-22 %	15 %
Special function*		ON	OFF	OFF	N/A	-7%

Table 13: Indoor model, 540 (T-H3) - Natural Gas

Apply the altitude setting by adjusting DIP switches 2, 3, and 4 on the lower bank. See Figure 14.

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.2	No.3	No.4		
0 to 2,000 ft.	0(DEFAULT)	OFF	OFF	OFF	N/A	N/A
2,000 to 3,000 ft.	1	OFF	ON	OFF	N/A	6%
3,000 to 5,000 ft.	2*	ON	ON	OFF	-6 %	10 %
	3	OFF	OFF	ON	-9 %	14 %
5,000 to 7,500 ft.	4*	ON	OFF	ON	-12 %	18 %
	5	OFF	ON	ON	-15 %	22 %
7,500 to 10,100 ft.	6	ON	ON	ON	-18 %	26 %
Special function*		ON	OFF	OFF	N/A	-7 %

* **These settings are not listed in the 240(T-H3J),340(T-H3S), and 540(T-H3) installation manual.

HIGH ALTITUDE SETTINGS (CONTINUED)

⚠ WARNING

Failure to properly set the DIP switches could cause carbon monoxide poisoning, resulting in severe personal injury or death.

Table 14: Outdoor model, 540 (T-H3) - Propane

**Apply the altitude setting by adjusting DIP switches 2, 3, and 4 on the lower bank.
See Figure 14, page 28.**

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.2	No.3	No.4		
0 to 2,000 ft.	0 (DEFAULT)	OFF	OFF	OFF	N/A	N/A
	1**	OFF	ON	OFF	N/A	3 %
2,000 to 4,000 ft.	2	OFF	OFF	ON	-11 %	7 %
4,000 to 6,000 ft.	3*	ON	OFF	ON	-14 %	9 %
Special function**		ON	OFF	OFF	N/A	-7 %

TROUBLESHOOTING

Table 15: Outdoor model, 540 (T-H3) - Natural Gas

**Apply the altitude setting by adjusting DIP switches 2, 3, and 4 on the lower bank.
See Figure 14, page 28.**

Elevation	Level	DIP switch settings			Output reduction	Fan motor speed change
		No.2	No.3	No.4		
0 to 2,000 ft.	0 (DEFAULT)	OFF	OFF	OFF	N/A	N/A
	1**	OFF	ON	OFF	N/A	6 %
2,000 to 4,000 ft.	2	OFF	OFF	ON	-9 %	14 %
4,000 to 6,000 ft.	3*	ON	OFF	ON	-12 %	18 %
Special function**		ON	OFF	OFF	N/A	-7 %

* If the abnormal sound problem persists even with “Level 3” setting, please contact our Technical Service Department for advice. Note that there are many high risks associated with manually changing manifold pressure.

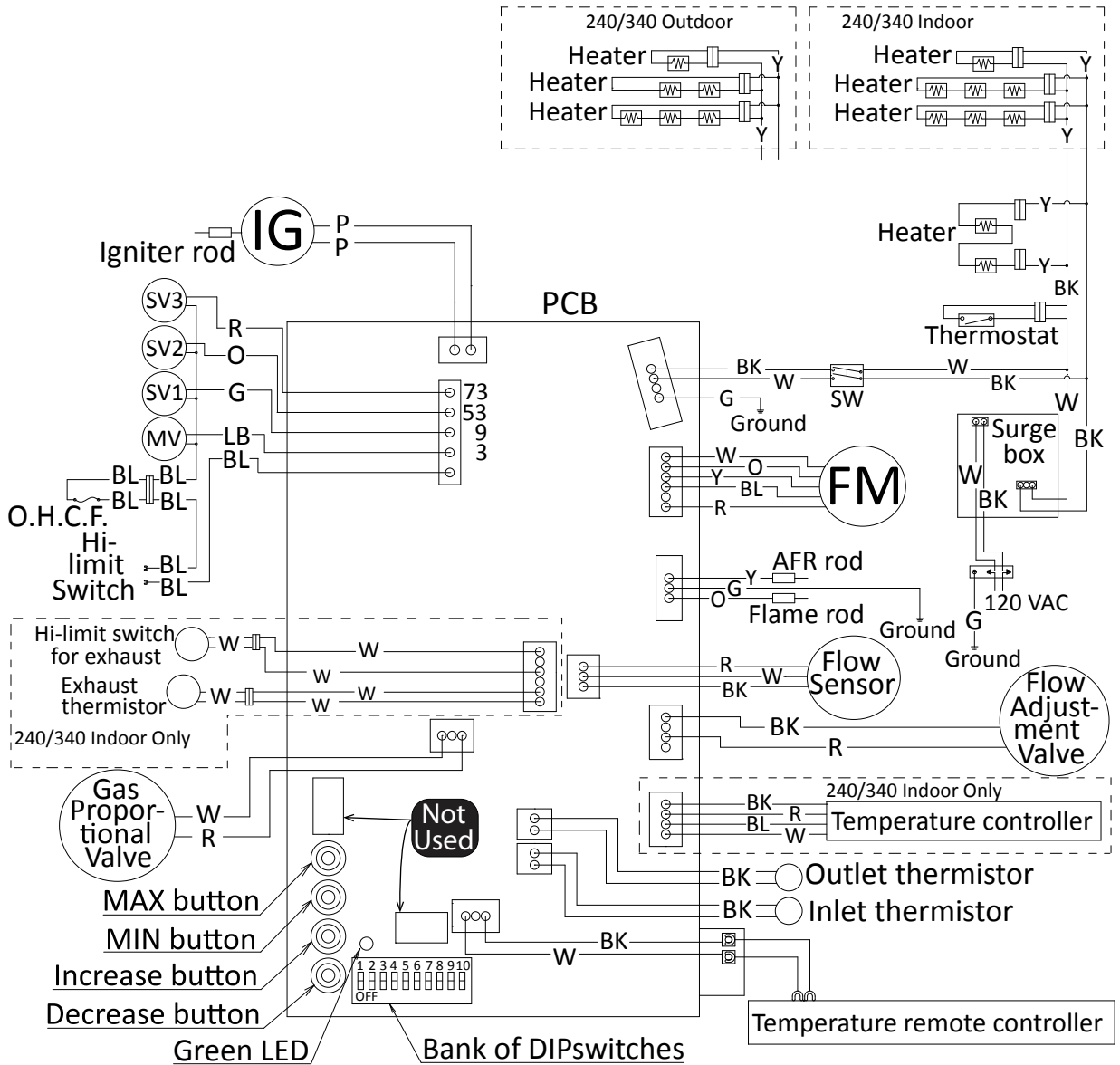
**These settings are not listed in the 240(T-H3J),340(T-H3S), and 540(T-H3) installation manual.

WIRING DIAGRAMS

Figure 15: Wiring Schematic for 240 (T-H3J) and 340 (T-H3S) Models

W: WHITE BK: BLACK LB: LIGHT BLUE
 R: RED BL: BLUE Y: YELLOW
 G: GREEN O: ORANGE BR: BROWN P: PURPLE

TROUBLESHOOTING



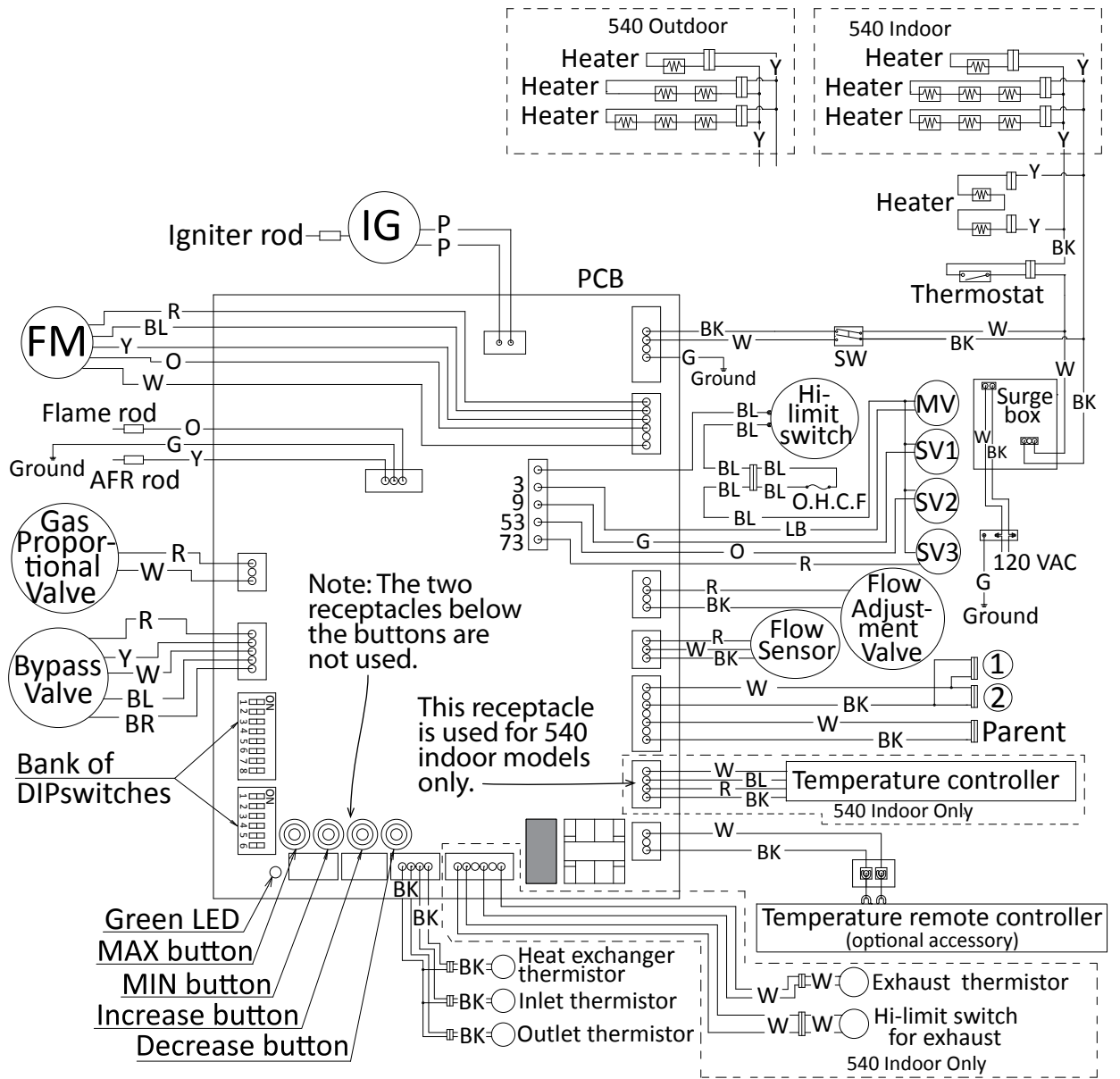
For instructions on how to use checkpoints during troubleshooting, refer to the water heater’s maintenance sheet. The maintenance sheet is stored in a pouch on the inside of the water heater’s front cover.

Continued on the next page.

WIRING DIAGRAMS (CONTINUED)

Figure 16: Wiring Schematic for 540 (T-H3) Models

W: WHITE BK: BLACK LB: LIGHT BLUE
 R: RED BL: BLUE Y: YELLOW
 G: GREEN O: ORANGE BR: BROWN P: PURPLE



TROUBLESHOOTING

For instructions on how to use checkpoints during troubleshooting, refer to the water heater's maintenance sheet. The maintenance sheet is stored in a pouch on the inside of the water heater's front cover.

SERVICE PROCEDURES

Unit Draining and Filter Cleaning

⚠ WARNING

Water drained from the water heater may be hot and could cause severe burns. Failure to observe proper safety practices could lead to serious personal injury.

1. Close the manual gas shut off valve.
2. Turn OFF power to the unit, then turn it ON again.
3. Wait 30 seconds, then turn OFF power to the unit again.
4. Close the cold water shutoff valve (Figure 17).
5. Open nearby hot water faucets. When the water flow stops, close all hot water faucets.

6. **IF** the installation includes isolation valves, follow these sub-steps:

- 6.1 Place a bucket or pan underneath each isolation valve drain port. (There are two: one on the COLD line and one on the HOT line.) See Figure 17.

If you connect hoses to the isolation valve service ports, only one bucket is needed.

- 6.2 Remove the plugs from each isolation valve drain port, then open their valves to drain the water.
- 6.3 Go to step 8.
7. Place a bucket or pan under the water filter/drain plug to catch the water when it drains (Figure 17). You may also drain the water to the outdoors.
8. Open the drain port by turning it

counter-clockwise for two turns. (The drain port is shown at the far left-hand side of Figure 17.) There is no need to remove the drain port plug.

9. Remove the water filter drain plug and the water filter.
10. **Clean the filter.** With a small brush, clean the water filter of any debris which may have accumulated. (See Figure 18). When the filter is clean, reinstall it.
11. Replace all plugs and close all drain valves.

NOTICE: Drain plugs must be hand tightened only.

Figure 17. Drain Plugs

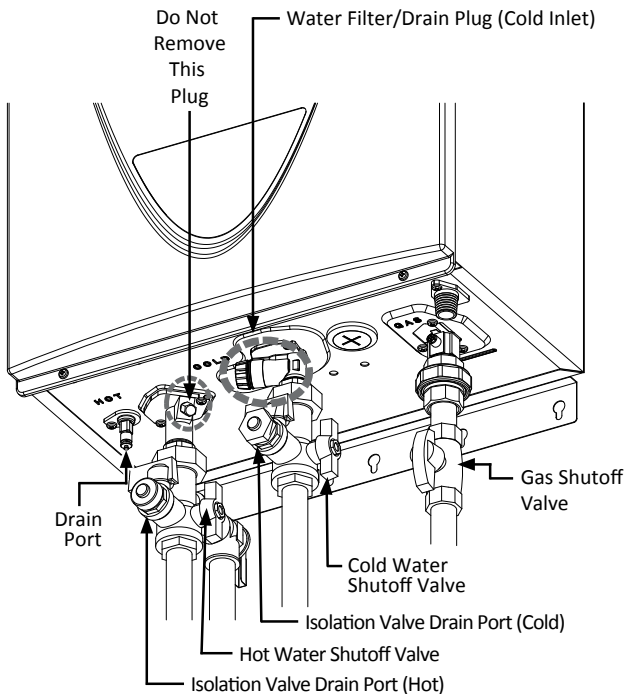
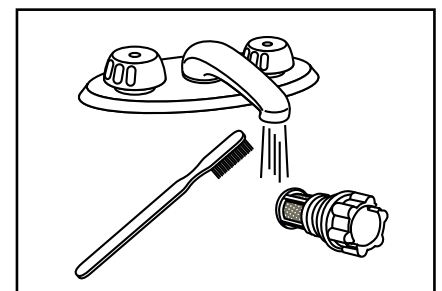


Figure 18. Clean the water filter with a brush.



Checking for a Crossed Connection

1. Turn off cold water supply valve to the water heater. If there are pumps installed in the system for recirculation, ensure that they are turned off.
2. Turn on hot water at **one** fixture in the structure. Make sure that it is located at the highest point possible. If possible, use the hot side of a two-handle fixture. If you must use a single-handle fixture, make sure that it is open to the hot side only.
 - After a brief time, the water should drain completely.
 - If water continues to run, the fixtures and plumbing system need to be checked.
 - Cold water cross-connections may be related to a recirculation pump application, a defective mixing valve, a bad check valve, a missing check valve in the application, or a cartridge in a single-handle faucet that needs to be replaced.

Checking for a Reversed Connection

1. Close cold water supply at the inlet.
2. Open the pressure-relief valve. It should be installed on the hot outlet side of the unit.
3. If water continues to run through

the pressure-relief valve, the system has a reversed connection.

Checking the Inlet Gas Pressure and Pressure Drop

This test is most effective when all gas appliances on the supply line are operating.

1. Close the manual shut off valve at the gas supply line inlet.
2. Open a hot water fixture. The unit should turn on and the remaining gas in the pipe line should purge out. Close the water fixture when the flame in the heater extinguishes.
3. Turn power to the heater off by unplugging it or closing the external shutoff switch.
4. Remove the screw from the pressure port located on the gas inlet. See Figure 19.
5. Connect a manometer to the pressure port and zero the manometer.
6. Slowly re-open the manual gas valve. Confirm that there are no gas leaks.
7. Turn power to the water heater on.
8. Open some of the hot water fixtures that use the highest flow rate to turn on the unit. Once the heater has reached a steady firing rate, **press and hold the "MAX" button on the computer board.** (See

Figure 20 or Figure 21.)

9. Record your gas supply pressure (dynamic).
10. Release the "MAX" button and close all of the water fixtures.
11. Record your gas supply pressure (static).

Figure 19.

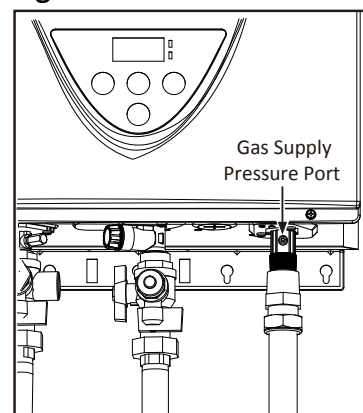
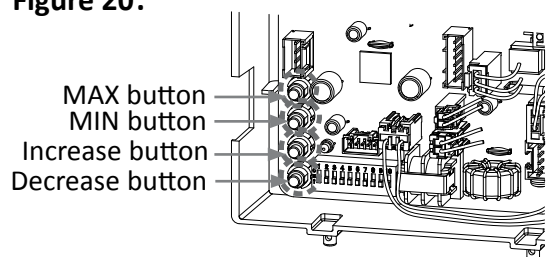
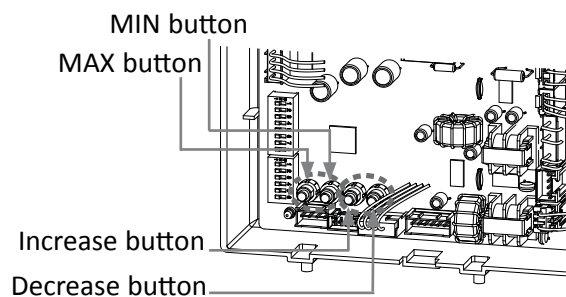


Figure 20.



240 (T-H3J) / 340 (T-H3S) model

Figure 21.



540 (T-H3) model

12. The gas supply pressures should be within the following ranges:
 - Natural Gas: 4 to 10.5 inches W.C.
 - Propane: 8 to 14.0 inches W.C.
13. Subtract your static supply gas pressure (step 11) from your dynamic supply gas pressure (step 9). This will be your pressure drop.
14. If the pressure drop is more than 1 inch W.C., there may be insufficient gas supply, incorrectly sized gas line, or incorrectly sized gas regulator. **NOTICE:** In Canada, do not exceed the maximum allowable pressure drop permitted by B149.1.
15. Remove the manometer.
16. Install the screw into the gas pressure port on the gas inlet (hand tight).

WARNING! Ensure that there are no gas leaks. Failure to prevent gas leaks can result in an explosion, severe injury, or death.
17. Turn power to the water heater on.

Checking and Adjusting the Manifold Gas Pressure

⚠ WARNING

Complete the following procedures ONLY if you have been instructed to do so by the Technical Service Department. Incorrect adjustment may result in carbon monoxide poisoning.

NOTICE:
Incorrect adjustment may damage the water heater and/or shorten its lifespan. Therefore, changing the manifold pressure is not recommended unless there are very strong reasons to do so (e.g., high elevation installations).

Checking the Manifold Gas Pressure

1. Verify that the gas supply pressure is within the correct operating range when the heater fires at maximum combustion. (Incorrect gas supply pressure will affect the

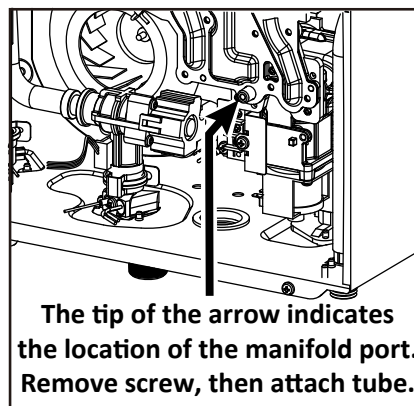


Figure 22.

- gas manifold pressure.)
2. Ensure that the unit is not in operation.
 3. Remove the screw from the manifold port (Figure 22).
 4. Connect a manometer to the manifold port using a tube. Ensure that this connection is secure enough to prevent a gas leak.
 5. Run water (preferably 3.5 GPM or more) to activate operation. It is suggested that you draw a large amount of flow to prevent overheating during maximum burn. If presence of a gas leak is detected, immediately shut off the unit and inspect the tube/manifold connection. Otherwise, proceed to the next step.
 6. Check the manifold gas pressures:
 - To check the manifold gas pressure during maximum combustion, press and hold the "MAX" button on the computer board (Figure 20 or Figure 21, page 33).
 - To check the manifold pressure during minimum combustion, press and hold the "MIN" button on the computer board (Figure 20 or Figure 21, page 33).
 - The desired pressures are listed in the "Specifications" section. (See page 4).
 7. When you are finished, turn off water flow or turn power to the water heater off.
 8. Remove the manometer tube, then replace the port screw.

Complete the next step ONLY if you have been instructed to do so by the Technical Service Department.
 9. If the manifold pressures do not

match up with those listed on the rating plate, adjust the manifold pressure. To do so, refer to the following procedures.

Adjusting Maximum Manifold Pressure

WARNING! Complete the following procedure ONLY if you have been instructed to do so by the Technical Service Department. See WARNING text at the beginning of this section.

1. Ensure that the water heater is not in operation.
2. Remove the screw from the manifold port (Figure 22).
3. Connect a manometer to the manifold port using a tube. Ensure that this connection is secure enough to prevent gas leak.
4. Run water through the water heater to activate its operation. If presence of a gas leak is detected, immediately shut off the water heater and inspect the tube/manifold connection. Otherwise, proceed to the next step.

During this step, DO NOT press the “Increase” or “Decrease” button for more than two seconds at a time.

Press and hold down the “MAX” button on the computer board. (Figure 20 or Figure 21, page 33.)

While holding down the “MAX” button, press either the “Increase” or “Decrease” button to increase or decrease the manifold gas pressure, respectively. (See Figure 20 or Figure 21 on page 33.) Use the manometer to verify that pressure has been set to the desired value.

5. After the gas pressure has been

set, deactivate the water heater, remove the manometer tube, and replace the port screw.

6. Verify proper operation.

Adjusting Minimum Manifold Pressure

WARNING! Complete the following procedure ONLY if you have been instructed to do so by the Technical Service Department. See WARNING text at the beginning of this section.

1. Ensure that the water heater is not in operation.
2. Remove the screw from the manifold test port (Figure 22, page 34). See also page 49 or page 50.
3. Connect a manometer to the manifold port using a tube. Ensure that this connection is secure enough to prevent gas leak.

Left Side of Interior

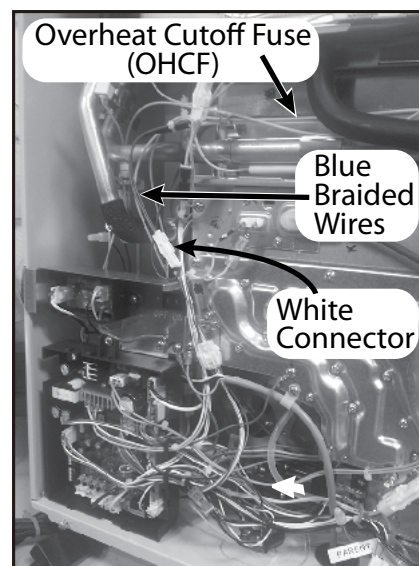


Figure 23.

4. Run water through the water heater to activate its operation. If presence of a gas leak is detected, immediately shut off the water heater and inspect the tube/manifold connection. Otherwise, proceed to the next step.

During the next step, DO NOT press the “Increase” or “Decrease” button for more than two seconds at a time.

5. Press and hold down the “MIN” button on the computer board. While holding down the “MIN” button, press either the “Increase” or “Decrease” button to increase or decrease the manifold gas pressure, respectively. (See Figure 20 or Figure 21 on page 33.)

Refer to the manometer to verify that pressure has been set to the desired value.

6. After the gas pressure has been set, deactivate the water heater, remove the manometer tube, and replace the port screw.
7. Verify proper operation.

Checking the Overheat Cutoff Fuse (OHCF)

1. **WARNING** Disconnect electrical power from the water heater before servicing. Failure to do so can result in electrical shock.
2. Locate the white OHCF which wraps around the heat exchanger (Figure 23). See also Figure 41, p.

49 or Figure 42, p. 50.

3. Find the white clip at the end of the two blue braided wires coming from the OHCF. (Refer to Figure 23 on page 35.)
4. Unplug the connection.
5. Test resistance at the end of the OHCF with a digital volt/ohm meter (Figure 23). Resistance should measure 1 ohm or less. Reconnect the plug.

If the resistance exceeds 1 ohm, replace the OHCF (part 319143-149). Replacing this part will require you to remove the heat exchanger. Follow the "Replacing the Heat Exchanger" instructions which are found in the "Service Procedures" section. Inspect the heat exchanger for any burn marks, hot spots, cracks, etc.

6. Restore power and test the unit.

Checking the Flow Sensor

If the water heater is connected to the water, gas, and power supplies correctly, but the fan motor does not initiate when water flows, then the flow sensor may not be able to detect water flow. Water flow must be detected for the water heater to initiate operation.

Tools and Materials:

- Flashlight
- Towels

The flow sensor (item 402, p. 74) is located below the water control valve at the cold inlet. (See also Figure 41,

p. 49 or Figure 42, p. 50.) Its flow rate is determined by an impeller that spins as water runs through it.

To check the flow sensor,

1. If you have a remote, you can check for flow rate by turning on power to the water heater. Push the "Info" button three times. This will display flow if the flow sensor is working properly.
 2. Remove the flow sensor as described in "Flow Sensor/Control Valve Removal and Installation," page 51.
 3. Blow into the inlet of the flow sensor. Watch to see if the impeller spins. It should spin freely for a few seconds. If it comes to rest abruptly or doesn't spin at all, it should be inspected for blockage.
- NOTICE:** Do not try to disassemble the flow sensor. If there is debris that cannot be removed, or if the impeller does not move freely, replace the flow sensor/flow control valve.
4. If you have an outdoor model without a remote, test the flow sensor as follows:
 - 4.1 Reattach the flow sensor wires.
 - 4.2 Turn power to the unit back on. (GAS MUST STILL BE OFF.)

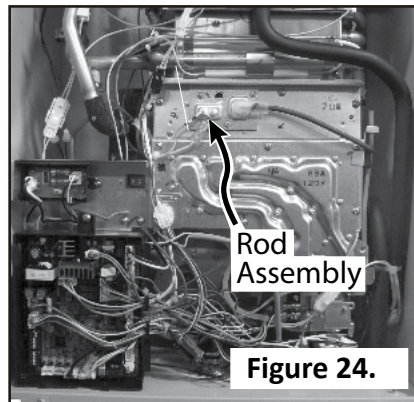


Figure 24.

- 4.3 Blow into the flow sensor. If the fan initiates, the flow sensor successfully read the airflow and should now work properly.
5. Reinstall the flow sensor as described in "Installation" on page 51.

Cleaning the Rod Assembly (Flame Sensor and Air/Fuel Ratio Rod)

Tools:

- Sheet of 100 Grit Sandpaper or other suitable abrasive
 - #2 Philips Screw Driver
 - Replacement gasket, part 100074219.
1. Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate. Verify that power is off using a volt meter or similar device.
 2. Remove the front cover. It is held on by two screws on the top and two screws on the bottom.
 3. Remove the rod assembly as described below. (See Figure 24.)
 - 3.1 Locate the yellow and orange wires located in the center of the unit (beside the sight glass).
 - 3.2 Disconnect these wires.

NOTICE: The yellow wire is locked onto the rod's

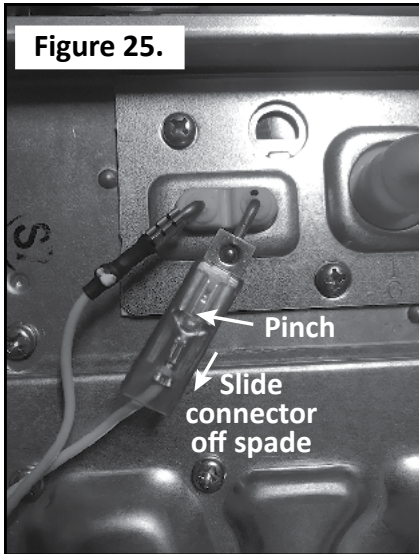


Figure 25.

To remove the AFR rod connector, pinch at the location shown by the arrow, then slide the connector off the spade.

conductive spade. To release the AFR rod connector, follow the instructions in Figure 25.

- 3.3 Remove the three Phillips-head screws holding the panel in place.
- 3.4 Pull the assembly out.

NOTICE:

- All pieces are separate.
- Be careful to not drop or lose the sight glass.

4. Inspect the ceramic insulator for chips or cracks. (This ceramic insulator holds the flame sensor and air/fuel ratio rods in place.)

Replace it if any chips or cracks are visible or if either rod moves freely inside the ceramic.

5. Clean the flame sensor and air/fuel ratio rod as described below. (See Figure 26.)

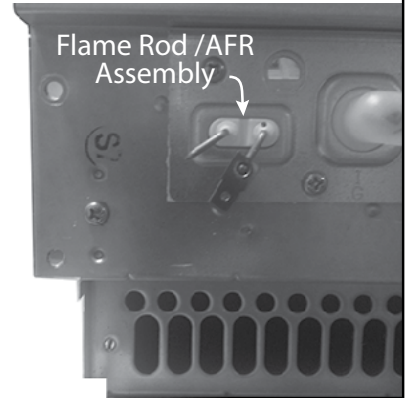
- 5.1 Clean the portion of the **flame sensor** that extends to the inside of the burner. Use 100 grit sandpaper or other suitable abrasive. Be sure to remove any oxidation or contaminants.
- 5.2 Clean the portion of the **air/fuel ratio rod** that extends to the inside of the burner. Use 100 grit sandpaper or other suitable abrasive. Be sure to remove any oxidation or contaminants.

6. Reassemble the unit in reverse order: gasket, rods, and metal cover. Be sure to connect all 3 wires on the front of the burner. Also, inspect all gaskets to make sure that they are free of debris and are not ripped or torn. If the gaskets are ripped or torn, replace them BEFORE reassembly.

7. Verify proper operation.

Figure 26.

Front of burner:



- Do not clean the extensions on the outside (shown above).
- Clean the metal extensions on the inside of the burner.

Descaling the Unit

During operation, a tankless water heater accumulates hard water deposits on the interior surfaces of the heat exchanger. These deposits make it difficult to transfer heat into the water, lowering the water heater's efficiency and causing excessive wear to the components. Removing any deposits is essential to the proper operation and longevity of the water heater.

Tools and Materials:

- Submersible transfer pump
- 3 gallons of 5% acidity white vinegar (food grade), available from most grocery stores
- Washing machine hoses (2)
- Five gallon bucket
- Water heater isolation valve kits, installed on both the cold water inlet and hot water outlet of the water heater (See Figure 27.)

1. Press the **UP ARROW** on the temperature controller or remote temperature controller to increase the set temperature to 140°F.

To increase the temperature above the 120- and 140-degree safety stops, press and hold the **INFO** and **UP ARROW** buttons simultaneously until the display starts flashing. You can now increase the temperature by releasing the buttons and pressing the **UP ARROW** button until the desired setting is reached.

2. Open any hot water fixture to begin heating water.
 - 2.1 Allow the water heater to operate for 60 seconds.
 - 2.2 Turn off power with the power switch at the water heater's fuse box, by unplugging the heater (indoor models), or

by turning off the associated circuit breaker (outdoor models).

3. Once power to the water heater has been disconnected, close the hot water fixture.
4. Close the isolation valves (C & D).
5. Pour the white vinegar (3 gallons) into the five gallon bucket.
6. Connect one hose to the transfer pump's discharge outlet. Connect its opposite end to the service connection at the cold water inlet's isolation valve (B).
7. Place the pump in the bucket of vinegar.
8. Connect the second hose to the service connection at the hot water outlet (A). Place its loose end into the bucket with the vinegar.
9. Open the hot and cold service valves (A & B).
10. Turn power to the pump on and let it run.
11. Turn the pump's power off after 45 minutes.
12. Ensure that the bucket is placed underneath the drain port. (See Figure 17, page 32; see also item 469, page 74.)
13. Remove the drain plug from the drain port by turning it counter-clockwise. See Figure 17, page 32.
NOTICE: Do not lose the O-ring.
14. Reinstall the drain port plug after all of the vinegar has drained out.
15. Close both service valves (A & B) and remove the hoses.
16. Open the isolation valves (C & D).
17. Open the hot water fixture nearest to the water heater and let the water run for several minutes to remove any remaining

vinegar from the water heater.

18. Close valve D.
19. Remove the drain port's plug again (Figure 17, p. 32), making sure that the bucket is placed underneath it.
20. Open valve D for about 10 seconds, allowing water to flow through the drain port.
21. Close valve D.
22. Reinstall the drain port's plug.
NOTICE: Be sure that the O-ring is still attached at the end of the plug.
23. Open valve D again.
24. Turn power to the water heater back on, then lower the set temperature to where it was before you began the descaling procedure.
25. Wait until all air is pushed out of the water line, then close the open hot water fixture.

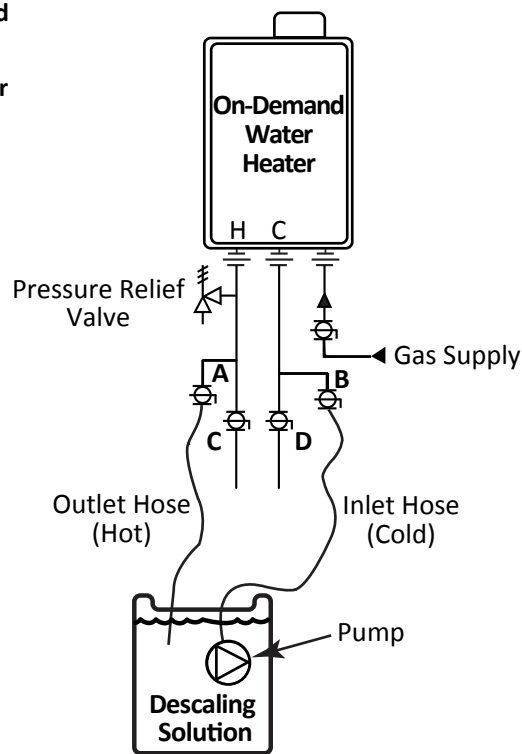


Figure 27.
Descaling the Water Heater

Cleaning the Combustion Components

Follow these procedures to clean the fan, burner, flame sensor and air/fuel ratio rod (AFR).

Tools and Materials

- Degreaser in a pump action bottle
- 100 Grit Sandpaper or other suitable abrasive
- #2 Phillips Screwdriver, 8-in long
- Needle-Nosed Pliers
- Duct Tape
- Flashlight
- Air Compressor
- Shop Vacuum
- Towels

NOTICE: As you complete the following steps, reinstall the screws after removing each component. Doing so will keep the fasteners organized and will expedite reassembly.

WARNING

- Before servicing, disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.
- Use a non-contact circuit tester to confirm that power is off before working on or near any electrical parts.
- Ensure that the gas supply is shut off at the manual gas shutoff valve.
- Replace the front cover after servicing.
- Failure to follow these warnings can lead to personal injury or death.

1. Prepare the water heater for service as follows:

- 1.1 Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.
- 1.2 Shut off the gas supply at the gas supply line's manual shutoff valve.
- 1.3 Once the power and gas have been turned off, remove the front panel from the water heater. **INDOOR MODELS:** Remove the Temperature Controller (item 722, page 71) by disconnecting its white connector from the computer board.

2. Remove the computer board from the water heater according to the following steps. (See also Figure 41, p. 49 or Figure 42, p. 50.)

- 2.1 **INDOOR MODELS ONLY:** Unplug the wire connectors for the exhaust high limit switch (item 472, p. 74) and the exhaust thermistor (item 718, p. 74). See also Figure 41, page 49.
- 2.2 Disconnect these wires from the front of the burner:
 - Flame rod wire (orange). See Figure 41, p. 49 OR Figure 42, p. 50 (center of picture).
 - Air-fuel ratio rod/AFR wire (yellow). **NOTICE:** The connector is locked onto the spade. To release the AFR rod connector, follow the instructions in Figure 25, page 37.

- Igniter rod wire (black). See Figure 41, p. 49 OR Figure 42, p. 50 (center of picture).

- 2.3 Remove the screw that secures the computer board assembly. See Figure 41 (p. 49) OR Figure 42 (p. 50).

Do not remove connectors from the circuit board. Now that the computer board is unsecured, you can move it around as you work with the other components.

3. Remove both screws which secure the fuse box to the manifold plate. Move the fuse box away from the work area. See Figure 41 (p. 49) OR Figure 42 (p. 50). Disconnect wire connectors as needed.

INDOOR MODELS: When you are finished, allow the fuse box to hang from the wire which is attached to the air intake vent at the top, left-hand side of the cabinet.

4. Unplug the white connector above the main gas valve (yellow wires). This connector is shown just above the "Main Gas Valve" in Figure 41 (p. 49) and Figure 42 (p. 50).

5. Remove the Gas Valve and Manifold Plate Assembly:

- 5.1 Remove the screw that secures the remaining ground wire (green) to the manifold plate.
- 5.2 Remove the screws that secure the manifold plate; doing so will remove the igniter assembly as well.

NOTICE: Remove only the screws along the outside edges of the manifold plate. See Figure 28.

- **DO NOT** remove the screws securing the manifold plate to the gas valve.
- **NOTICE: DO NOT** remove the screws along the interior of the manifold plate.

- 5.3 INDOOR MODELS: Remove the power cord mounting tab. (Figure 41, page 49.)
- 5.4 Disconnect the clear air tube off the left side of the gas valve. (Figure 29.)
- 5.5 Remove the brass-colored screw securing the gas valve to the gas inlet connection.

The screw is located at the bottom, right-hand side of the gas valve. See Figure 41 (p. 49) OR Figure 42 (p. 50).

Manifold Screws:

- **DO NOT** remove the screws indicated by the white, crossed-out circles.
- Remove the screws indicated by the white arrows.

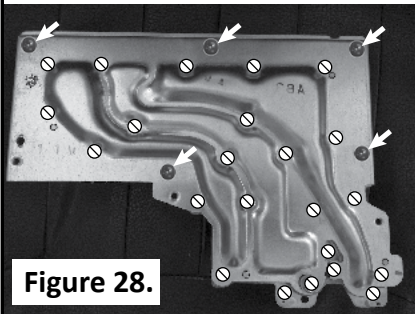


Figure 28.

- 5.6 Lift the manifold plate/ gas valve assembly upward to remove it from the gas inlet connection. (The gas valve and manifold are still connected together.)
You may need to twist the gas valve/manifold assembly slightly.
- 5.7 If necessary, unplug the wire connectors from the solenoid valves, main gas valve, and proportional gas valve. (These valves are connected to the back side of the gas valve.) There are five connectors that can be unplugged from the manifold plate assembly.
- 5.8 Inspect the gaskets on the manifold plate for any tears. If compromised, replace with part number 100074229 (item 113) and/or 100074230 (item 114). See p. 73.
- 5.9 Inspect the o-ring (item 151, p. 73) and gas inlet ring (item 119, p. 73) at the gas connection for cuts or breaks.

If damaged, replace with

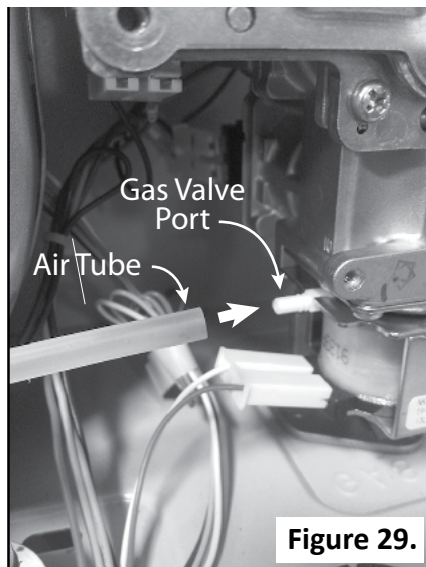


Figure 29.

part number 100074242 (item 151) and/or 100074526 (item 119).

6. Remove the burner assembly according to the following steps.

- 6.1 Remove the five (5) pan-head Phillips screws that secure the burner to the combustion chamber. There are three at the top of the burner and two more at the bottom (toward back of combustion chamber). If the screws at the bottom are difficult to remove, lift the burner while turning the screws. (See Figure 30.)
- 6.2 Remove the burner assembly as described below:
- 6.2.1 Grasp an oval air vent on either side of the burner with a pair of pliers. (See "Air Vents" in Figure 30.)
- 6.2.2 Pull firmly to loosen the burner while bracing it at the bottom to provide leverage.
- 6.2.3 Repeat on the opposite side to loosen the assembly.

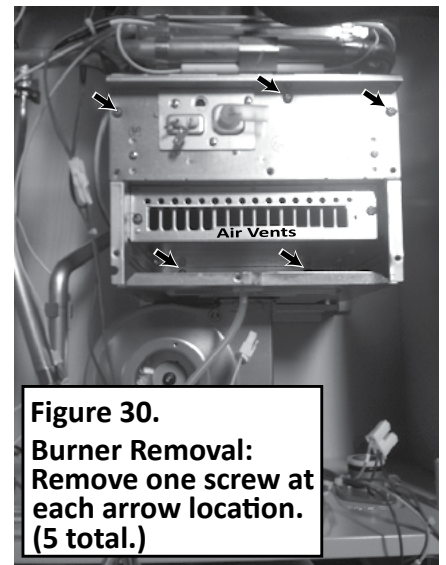


Figure 30.
Burner Removal:
Remove one screw at each arrow location. (5 total.)

- 6.2.4 Once loosened, grasp an oval air vent in the center and pull the burner out. Brace the bottom of the combustion chamber to provide leverage.
- 6.3 Inspect the gasket. Minor surface tears are acceptable. If the gasket shows major separations, replace the gasket before the unit is returned to service. (The parts list starts on page 75; burner assembly components are identified on page 73.)

7. Clean the burner with compressed air and a wire brush.

If necessary, continue according to these instructions:

- Use a safe degreaser.
- Protect the burner gasket from direct water pressure. If the gasket is damaged in any way, contact technical service for further assistance.

- 7.1 Saturate the burner with the cleaning solution (from top, down through slots, and openings in front of burner). Continue until burner is completely wet.
- 7.2 Wait for five minutes.
- 7.3 Set the burner in a sink in its normal, upright position and wash the burner with a high flow of water. Ensure that the water flows down into the slots, starting at the back and moving forward. **Make sure that no contact is made with the gasket; protect it from direct water pressure.** Rinse thoroughly.

- 7.4 Clear excessive water from the burner with compressed air.
- 7.5 Inspect the gasket. Minor surface tears are acceptable. If the gasket shows major separations, replace the gasket before the unit is returned to service.

8. Clean the fan:

- 8.1 Remove the fan from the bottom of the combustion chamber as follows:
 - 8.1.1 Remove the two Phillips/hex head screws pointing down from the fan using an 8" long, #2 Phillips head screw driver. There are 2 holes in the case directly below the screws to put the screw driver through (Figure 31).

NOTICE: During the next step, remove the fan cautiously. Do not allow it to strike the flow sensor/control valve during removal. See Figure 41 (p. 49) or Figure 42 (p. 50).

- 8.1.2 Slide the fan toward you to remove it from the rear slots that hold it in place. Remove the fan.
- 8.2 Hold the fan away from the water heater cabinet.
- 8.3 Blow compressed air into the fan. The fan will rotate and dust will fly out of the fan housing.

NOTE: You will reassemble these items in reverse order at the end of this procedure.

9. Clean the heat exchanger:

- 9.1 Place a towel at the bottom of the combustion chamber so that it covers the fan discharge opening (fan port).

CAUTION: Wear eye protection during the following steps. We also recommend that you wear a face mask which covers your mouth and nose. Failure to do so could result in personal injury.

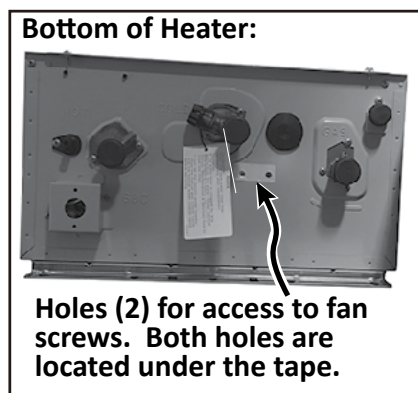


Figure 31.

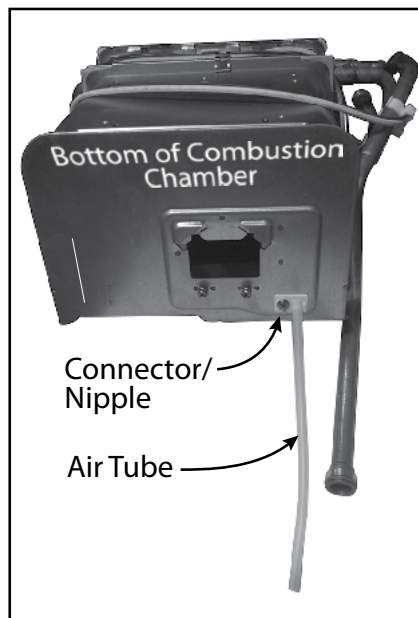


Figure 32.

- 9.2 Insert an air compressor's air hose into the opening from which the burner was removed.
- Blow air up into the heat exchanger to remove soot and debris.
 - At the same time, vacuum the combustion chamber with a shop vac.
 - Continue until all dirt has been removed.

10. Clean the parts of the flame rod and air/fuel ratio rod (AFR) that are on the inside of the burner. (Use sand paper or other appropriate abrasive.) See "Cleaning the Rod Assembly (Flame Sensor and Air/ Fuel Ratio Rod)," page 36.

NOTICE: Do not clean the metal extensions on the outside of the burner. See Figure 33.

11. Reassemble all items in reverse order.

WARNING! Ensure that you reinstall the brass-colored screw that secures the gas valve to the gas inlet connection. Failure to do so can lead to a gas leak which can result in severe personal injury or death.

Things to remember:

- Reinstall the solenoid connectors to the gas valve before you reinstall the gas valve/manifold plate assembly. See Figure 34.
- Only four solenoid circuits have numbers labeled on their wires: 3, 9, 53, and 73. (See Figure 34. See also schematics on pages 30 or 31.)
- The connector which connects to the gas proportional valve is not labeled with a number. It has two wires: red and white. (See schematics on pages 30 or 31.)

NOTICE:

- If necessary, refer to the exploded assembly views which start on page 71.
- Inspect all gaskets.
- Ensure that the black O-rings and mesh filter on the gas valve inlet are not pinched or otherwise damaged during reinstallation.
- ALL screws must be hand tightened only, especially around the gas valve inlet.
- Reconnect the plastic tube that runs from the gas valve to the bottom of the combustion chamber.
- Reinstall the fan.
- Reinstall the igniter assembly.
- Verify that all components are reattached and are secure.
- Ensure that all wire connectors have been reconnected.

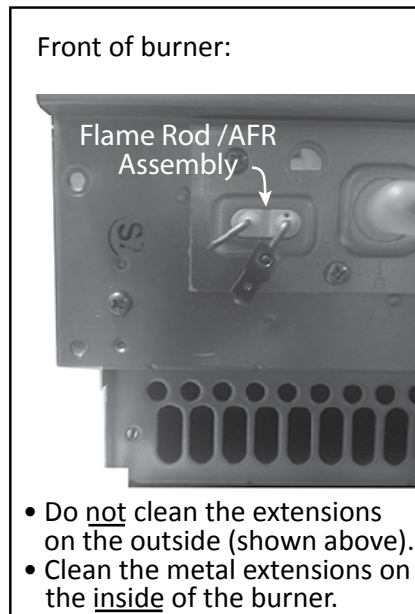


Figure 33.

- Ensure that the solenoid connectors are reinstalled in the correct locations.

To do so, match the printed number on the wire to the corresponding number that is stamped on the solenoid body. See Figure 34.

For example, if "73" is printed on a wire, its pin should plug into the side of the connector that has the number "73" stamped closest to it.

- All connectors with **yellow** wire go to the same circuit. They may be reconnected in any order.

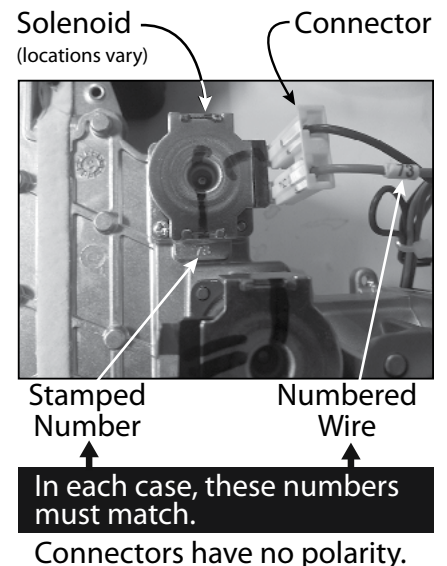


Figure 34.

Easy-Link Connections with Previous Models (540 [T-H3] Only)

DIP Switch Setting on the 540 (T-H3) Computer Board

The 540 (T-H3) model can be connected to 520 (T-H2) or 710 (T-M32) models using the Easy-Link system. However, you must change one DIP switch setting first. **On each 540 (T-H3) computer board, change DIP switch no. 6 on the lower bank of switches to the "ON" position.** See Figure 35 and Figure 36.

Figure 35.

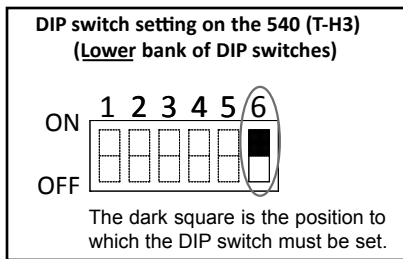


Figure 36: 540 (T-H3)

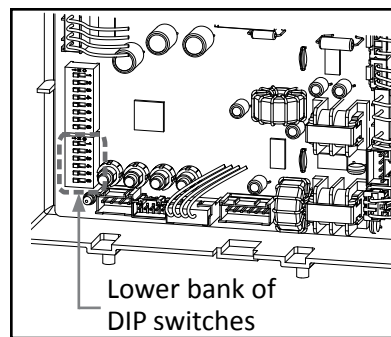
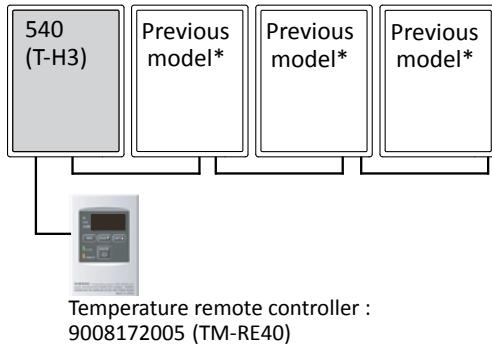


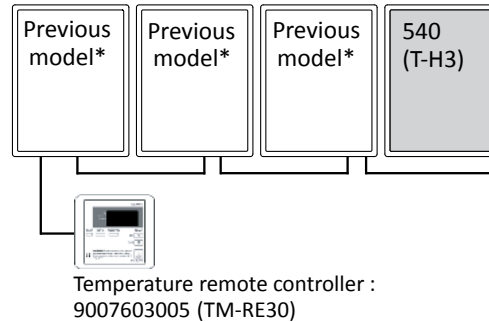
Figure 37.

Examples of correct Easy-Link connections

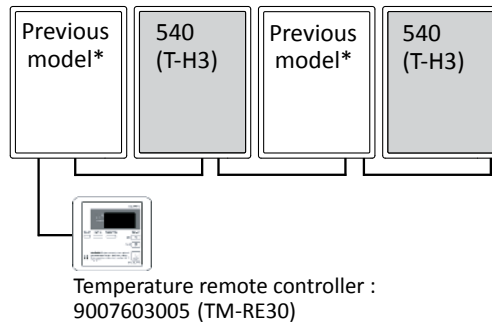
Case 1



Case 2



Case 3



* In each case, "Previous model" indicates a 520 (T-H2) unit or a 710 (T-M32) unit.

520 (T-H2) units and 710 (T-M32) units cannot be linked in the same system.

Temperature Settings

When the 540 (T-H3) is connected with 520 (T-H2) models as part of an Easy-Link System, the available set temperatures will default to what is available on the 520 (T-H2). These temperatures range from 100°F to 175°F or from 100°F to 185°F. See the tables below.

NOTE:

- The 540 (T-H3) can be connected with temperature remote controller 100209924 (TM-RE42), but it cannot be connected with temperature remote controller 100112155(TM-RE30). See Figure 37, page 43.
- The 520 (T-H2) or 710 (T-M32) can be connected with temperature remote controller 9007603005 (TM-RE30), but they cannot be connected with temperature remote controller 9009069005 (TM-RE42). See Figure 37, page 43.

Table 16: Temperatures available under the Normal Temperature Mode*

°F	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175
°C	38	40	43	45	50	52	55	57	60	63	65	68	70	75	77	80

*Factory setting (Default): 120 °F

Table 17: Temperatures available under the High Temperature Mode*

°F	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
°C	43	45	50	52	55	57	60	63	65	68	70	75	77	80	82	85

*Factory setting (Default): 120 °F

Diagnostic Mode

Diagnostic mode allows you to discover various pieces of information about one or more water heaters, even if they are linked together through an Easy-Link or Multi-Unit system.

Individual Unit

1. To enter diagnostic mode, complete this step on the parent heater or on the remote that

is attached to the multi-unit controller:

Press the HOT button and the COLD button simultaneously for at least five seconds. See Figure 38.

2. Use the HOT or COLD buttons to scroll through the mode numbers. Continue until you reach the desired mode number. (Figure 39.) See Table 18, page 47 for a list of mode numbers and their meanings.
3. Press the INFO button to select the mode number. The information will display on the controller. (Figure 39.)
4. To exit diagnostic mode, press and

hold the HOT and COLD buttons simultaneously for at least five seconds.

NOTE: You may exit diagnostic mode by pressing the ON/OFF button. Also, if left alone, the display will exit diagnostic mode automatically after 30 minutes.

Multiple Units in a Linked System (540 [T-H3] Models Only)

1. To enter diagnostic mode, press the HOT button and the COLD button simultaneously for at least five seconds. See Figure 38.

Figure 38.

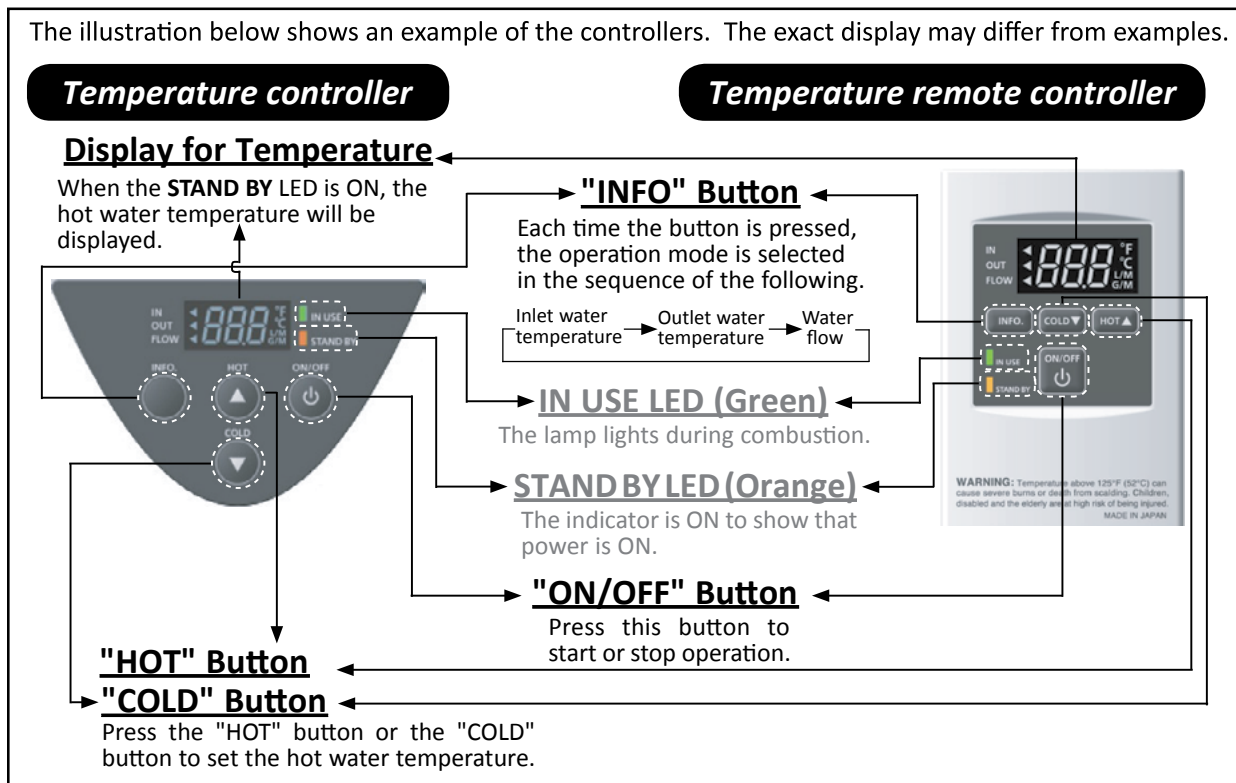
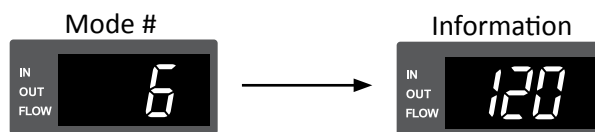


Figure 39.



2. "0" will display on the controller. (Figure 40.)
3. Scroll to the desired 540 (T-H3) unit number in the linked system by pressing the HOT or COLD button to scroll up or down. (Figure 40 shows that unit no. 2 is selected.)

NOTE: "0" will yield information about the linked system as a whole. "1" will yield information about the parent unit in a Easy-Link system. "2", "3", & "4" will yield information about each of the 540 (T-H3) models that are installed in

the Easy-Link system. A maximum of four 540 (T-H3) units can be linked together in an Easy-Link System. (A multi-unit controller can link up to 20 heaters. Refer to the multi-unit controller manual for more information.)

4. Press the INFO button to select the desired unit number.
5. When the desired unit number is selected, press the HOT or COLD button to scroll to the desired information (mode number). Figure 40 shows that mode number 6 is selected. See Table 18, page 47 for a list of mode numbers and their meanings.

6. Press the INFO button to select the mode number. The data will be displayed on the controller. (Figure 40 shows that the outlet water temperature of this heater is 120 degrees.)
7. To exit diagnostic mode, press and hold the HOT and COLD buttons simultaneously for at least five seconds.

NOTE: You may exit diagnostic mode by pressing the ON/OFF button. Also, if left alone, the display will exit diagnostic mode automatically after 30 minutes.

Figure 40. This example shows the steps for displaying the outlet temperature for unit 2 in a linked system.



NOTE:

- Although the controller of the parent unit will display the set temperature in an Easy-Link System, the controller of the child unit will not display the set temperature.
- In an Easy-Link system, the parent heater will always be heater number 1.
- In a Multi-Link system, any heater can be heater number 1. Number assignments can be random. The parent unit is the Multi-Unit controller itself.

Continued on the next page.

Table 18.

Mode Number Descriptions

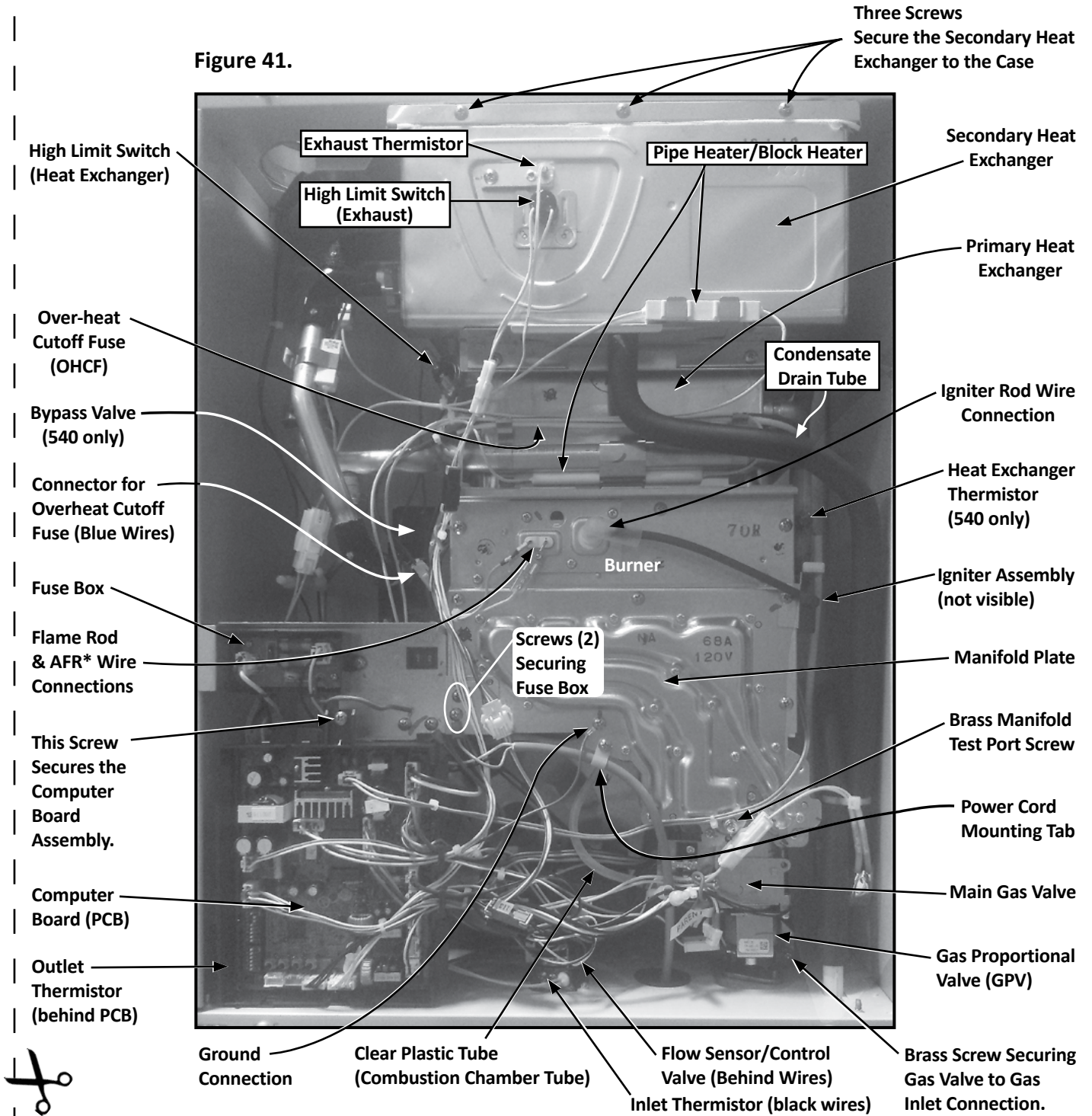
Mode #	Whole Multi-Unit System information (#0)		Unit information (#1 to #4)	
1	Total system flow rate	0 to 999 (GPM)	Total operation time	0 to 999 (x 100 hours)
2	BTU requirement for the Multi-System	0 to 999 (xkBTU/h)	ON/OFF cycles	0 to 999 (x 1,000 cycles)
3	Quantity of connected water heaters	1 to 4 (units)	Fan motor speed	0 to 999 (x 10 rpm)
4	Priority water heater unit	1 to 4 (unit #)	Inlet temperature	32 to 212 (°F) Over 212 °F = E5, Under 32 °F = E0
5	Quantity of operational water heaters	0 to 4 (units)	Heat exchanger temperature (540 (T-H3) model only)	
6	Set temperature	100 to 185 °F	Outlet temperature	
7	Operation time during current rotation	0 to 720 (minutes) After 720, the next rotation occurs	Air-Fuel ratio rod current	0 to 999 (µA)
8	ON/OFF cycles during current rotation	0 to 100 (cycles) After 100, the next rotation occurs	Flow rate	0 to 999 (x 0.1 GPM)
9	N/A		Energization time of the unit	0 to 999 (x 100 hours)
10			Integrating flow of the unit	0 to 999 (x 10,000 gallons)
11			Error code history: displays the most recent error code	
12	Inlet temperature of the priority unit	32 to 212 (°F) Over 212 °F = E5, Under 32 °F = E0	Error code history: displays the 2nd most recent error code	
13	Outlet temperature of the priority unit		Error code history: displays the 3rd most recent error code	
14	N/A		Clears the memory in error code history*	
15			Integrating output of the unit	0 to 999 MBTU/h
16			Air-fuel ratio stage	0 to 16, normal condition=6
17			Exhaust temperature (Indoor models only)	32 to 212 (°F) Over 212 °F = E5, Under 32 °F = E0
18			N/A	

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MAINTENANCE

Indoor Model (Front View/Cabinet Interior):

Figure 41.



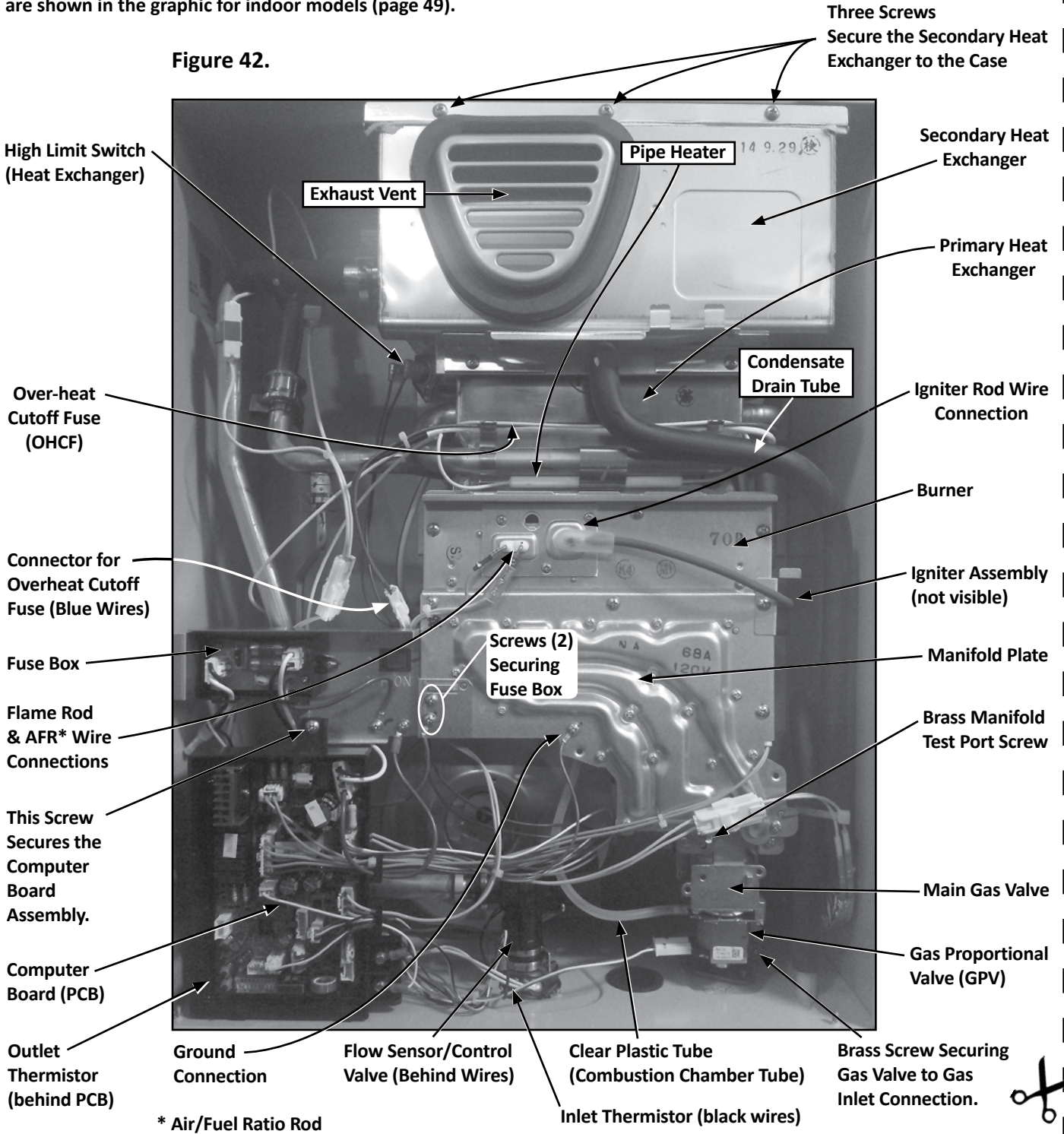
* Air/Fuel Ratio Rod

See also "Component Diagrams/Item Numbers" which starts on page 71.

Outdoor Model (Front View/Cabinet Interior):

NOTE: 540 outdoor models include a heat exchanger thermistor and a bypass valve which are not shown in this graphic. However, their locations are shown in the graphic for indoor models (page 49).

Figure 42.



Flow Sensor/ Control Valve Removal and Installation

Tools:

#2 Phillips Screw Driver

See also "Checking the Flow Sensor," page 36.

Removal

1. Shut off power by disconnecting the power cord or shutting off the power disconnect.
2. Shut off the gas supply to the water heater.
3. Drain the water from the water heater.
 - 3.1 Close the shutoff valves on the hot and cold side of the heater.
 - 3.2 If isolation valves are installed, open the drain ports.
 - 3.3 If isolation valves are not installed, remove the filter (item 406, p. 74) and open the pressure relief valve.
4. FOR INDOOR MODEL ONLY: Remove the Temperature Controller (item 722, p. 71) by disconnecting it at the white connectors that go to the computer board (PCB).

5. Disconnect the flow sensor/control valve's wires from the computer board as described below. See Figure 41 (p. 49) or Figure 42 (p. 50).
 - There are two plugs to remove from the computer board: one with three wires (red, white, black) and one with two wires (red, black).
 - If necessary, refer to the appropriate schematic on page 30 or 31.

6. Remove the flow sensor/control valve (item 402, p. 74) as follows:

- 6.1 Remove fasteners 16A and 14-22 (items 460 & 461, page 74).
- 6.2 Pull the cold connection tube (item 466, page 74) from the outlet of the flow sensor/control valve, then lift the valve off the inlet connection. You may have to twist the valve off inlet connection.

7. Inspect the o-rings on the inlet water connection and the cold connection tube for cuts or wear. Replace as needed.

- O-ring on inlet water connection: part no. 100076308.
- O-ring on cold connection tube: part no. 100076306.
- These O-rings are shown as items 456 and 458 on page 74.

Installation

1. Install the flow sensor/control valve (item 402, p. 74) onto the inlet water connection.

2. Connect the cold water connection tube (item 466, p. 74) to the outlet of the flow sensor/control valve.
3. Reinstall both fasteners.
4. Plug the flow sensor/control valve's wires into the computer board.

Install both plugs as shown in the appropriate schematic (page 30 or 31).

5. Turn on the water and verify that there are no leaks at the connections. If there are leaks, shut off the water, drain the water heater, and fix the leak.
6. Restore power to the water heater.
7. Open the gas valve.
8. Turn on water to the heater and test for proper operation.
9. Verify that there are no leaks. Correct any leaks that are found.
10. Reinstall the front cover. (If yours is an indoor model, install the front cover *after* inserting the temperature controller into its opening first.)

If you have any questions, please contact technical support.

Burner Removal and Installation

Tools:

- #2 Phillips Screw Driver

NOTICE: As you complete the following steps, reinstall the screws after removing each component. Doing so will keep the fasteners organized and will expedite reassembly.

⚠ WARNING

- Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.
- Use a non-contact circuit tester to confirm that power is off before working on or near any electrical parts.
- Ensure that the gas supply is shut off at the manual gas shutoff valve.
- Replace the front cover after servicing.
- Failure to follow these warnings can lead to personal injury or death.

Burner Removal

1. Prepare the water heater for service as follows:

- 1.1 Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.

- 1.2 Shut off the gas supply at the gas supply line's manual shutoff valve.
- 1.3 Once the power and gas have been turned off, remove the front panel from the water heater.

INDOOR MODELS: Remove the Temperature Controller (item 722, page 71) by disconnecting its white connector from the computer board.

2. Remove the computer board from the water heater according to the following steps. (See also Figure 41, p. 49 or Figure 42, p. 50.)

- 2.1 INDOOR MODELS ONLY: Unplug the wire connectors for the exhaust high limit switch (item 472, p. 74) and the exhaust thermistor (item 718, p. 74). See also Figure 41, page 49.
- 2.2 Disconnect these wires from the front of the burner:
 - Flame rod wire (orange). See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).
 - Air-fuel ratio rod/AFR wire (yellow).

NOTICE: The connector is locked onto the spade. To remove, pinch the flat surfaces of the connector while pulling. Do not pinch the edges or use a tool.

See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).

- Igniter rod wire (black). See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).
- 2.3 Remove the screw that secures the computer board assembly. See Figure 41 (p. 49) OR Figure 42 (p. 50). Do not remove connectors from the circuit board.
 - 2.4 Remove the computer board assembly.

3. Remove both screws which secure the fuse box to the manifold plate. Move the fuse box away from the work area. See Figure 41 (p. 49) OR Figure 42 (p. 50).

4. Unplug the white connector above the main gas valve (yellow wires). This connector is shown just above the "Main Gas Valve" in Figure 41 (p. 49) and Figure 42 (p. 50).

5. Remove the Gas Valve and Manifold Plate Assembly:

- 5.1 Remove the screw that secures the remaining ground wire (green) to the manifold plate.
- 5.2 Remove the screws that secure the manifold plate; doing so will remove the igniter assembly as well.

NOTICE: Remove only the screws along the outside edges of the manifold plate. See Figure 43.

- DO NOT remove the screws securing the manifold plate to the gas valve.

- **NOTICE: DO NOT remove the screws along the interior of the manifold plate.**

- 5.3 INDOOR MODELS: Remove the power cord mounting tab. (Figure 41, page 49.)
- 5.4 Disconnect the clear air tube off the left side of the gas valve. (Figure 44.)
- 5.5 Remove the screw securing the gas valve to the gas inlet connection.
 - The screw is located at the bottom, right-hand side of the gas valve. See **Figure 41 (p. 49) OR Figure 42 (p. 50).**
 - **If necessary, disconnect the condensate tube from the bottom, right-hand side of the cabinet first.**
- 5.6 Lift the manifold plate/gas valve assembly upward to remove it from the gas

Manifold Screws:

- **DO NOT remove the screws indicated by the white, crossed-out circles.**
- **Remove the screws indicated by the white arrows.**

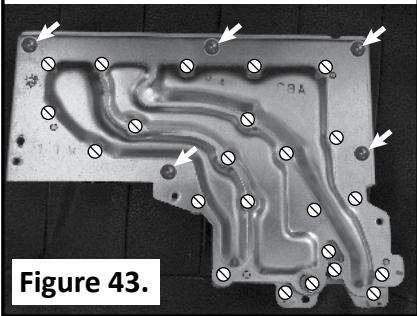


Figure 43.

inlet connection. (The gas valve and manifold are still connected together.)

You may need to twist the gas valve/manifold assembly slightly.

- 5.7 If necessary, unplug the wire connectors from the solenoid valves, main gas valve, and proportional gas valve. (These valves are connected to the back corner of the manifold plate.) There are five connectors that can be unplugged from the manifold plate assembly.
- 5.8 Inspect the gaskets on the manifold plate for any tears. If compromised, replace with part number 100074229 (item 113) and/or 100074230 (item 114). See p. 73.
- 5.9 Inspect the o-ring (item 151, p. 73) and gas inlet ring (item 119, p. 73) at the gas connection for cuts or breaks.

If damaged, replace with part number 100074242 (item 151) and/or 100074526 (item 119).

6. Remove the burner assembly according to the following steps.

- 6.1 Remove the five (5) pan-head Phillips screws that secure the burner to the combustion chamber. There are three at the top of the burner and two more at the bottom (toward back of combustion chamber). If the screws at the bottom

are difficult to remove, lift the burner while turning the screws. (See Figure 45.)

- 6.2 Complete this sub-step **IF** you are replacing the burner with a new one: Note the orientation of the damper, then remove the damper (item 112, p. 73).
- 6.3 Remove the burner assembly as described below:
 - 6.3.1 Grasp an oval air vent on either side of the burner with a pair of pliers. (See “Air Vents” in Figure 45.)
 - 6.3.2 Pull firmly to loosen the burner while bracing it at the bottom to provide leverage.
 - 6.3.3 Repeat on the opposite side to loosen the assembly.
 - 6.3.4 Once loosened, grasp an oval air vent in the center and pull the burner out. Brace the bottom of the combustion chamber to provide leverage.

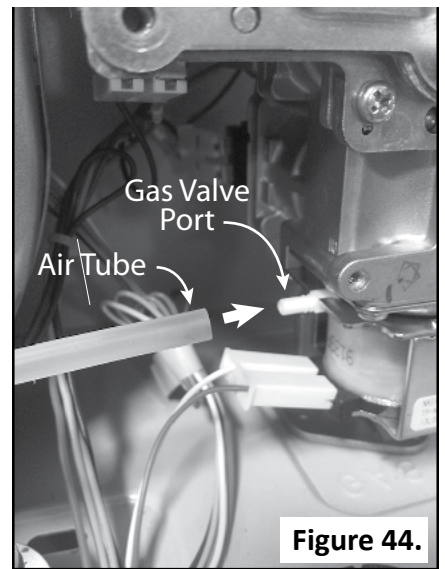


Figure 44.

- 6.4 Inspect the gasket. Minor surface tears are acceptable. If the gasket shows major separations, replace the gasket before the unit is returned to service. (The parts list starts on page 75; burner assembly components are identified on page 73.)

Burner Installation

- 1. **WARNING!** Natural Gas and LP models use different dampers. Failure to install the correct damper for your model can cause carbon monoxide poisoning. Failure to observe this warning could lead to carbon monoxide poisoning.

Transfer the burner damper (item 112, p. 73) from the original burner to the new burner.

-OR-

Install a new burner damper if one is needed (item 112, p. 73).

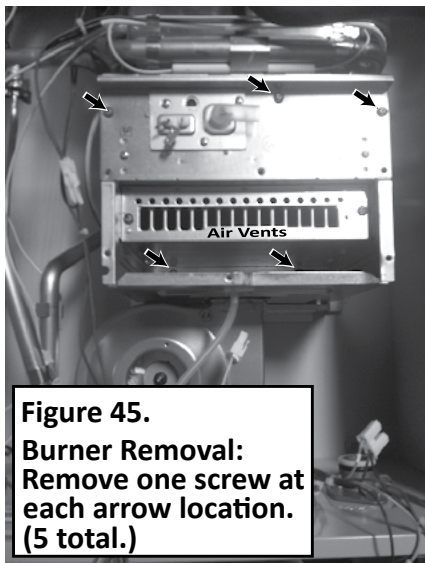


Figure 45.
Burner Removal:
 Remove one screw at each arrow location. (5 total.)

2. Install the burner into the combustion chamber.

There are grooves on the sides of the combustion chamber to slide the bottom of the burner in between.

- 2.1 Insert and hand tighten two screws below the burner, at the back (Figure 45). These screws will secure to the back of the cabinet. You may need to push the assembly up some in order to line up the holes.
- 2.2 Insert three screws along the top portion of the burner, then hand tighten them. See Figure 45.

3. Install the manifold plate/gas valve assembly (item 102, p. 73) to the combustion chamber as follows:

- 3.1 If you removed the white connectors from the solenoids, reconnect them.
 - Match the printed number on the wire to the corresponding number that is stamped on the solenoid body. See Figure 46.
 - For example, if “73” is printed on a wire, its pin should plug into the side of the connector that has the number “73” stamped closest to it.
- 3.2 Slide the gas valve/manifold plate onto the gas inlet connection. (The gas inlet is located at the bottom, right-hand corner of cabinet.)

You may need to rotate

the gas valve while sliding it down for an easier fit. The tab on the gas valve connection should line up behind the tab on the gas inlet connection.

- 3.3 Secure the gas valve to the gas inlet by installing the brass screw through both tabs at the connection (hand-tight only). See Figure 41 (p. 49) or Figure 42 (p. 50).
 - 3.4 Line up the manifold plate with the holes on the burner and combustion box.
 - 3.5 Insert and hand tighten the top center screw on the manifold plate. **Do not overtighten.**
 - 3.6 Secure the manifold plate by hand tightening the remaining screws around the outside edge of the plate. **Do not overtighten.**
- If necessary, see Figure 43, p. 53.
- NOTICE:** Be sure to reinstall the igniter assembly at the top, right-hand corner of the manifold plate.
- 3.7 Attach the clear air tube from the bottom of the combustion chamber to the port on the left side of the gas valve. (See Figure 47.)

4. Reconnect the plug and receptacle that you disconnected earlier (i.e., the ones with the yellow wires). This connector is shown just above the “Main Gas Valve” in Figure 41 (p. 49) and Figure 42 (p. 50).

5. Install the fuse box assembly to the left side of the manifold plate. (See Figure 41 (p. 49) or Figure 42 (p. 50).)

Hand tighten two screws to secure it to the manifold plate.

6. Install the computer board (PCB):

6.1 Position the PCB in place: Small feet at the bottom must fit into the corresponding holes in the case.

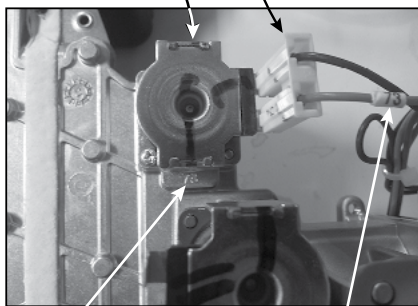
6.2 Insert and hand tighten the screw at the top of the PCB to secure it to the fuse box.

7. Verify that all manifold screws have been reinstalled and hand tightened.

8. Complete the wiring:

Refer to Figure 41 (p. 49) or Figure 42 (p. 50) as you complete these steps.

Solenoid (locations vary) Connector



In each case, these numbers must match.

Connectors have no polarity.

Figure 46.

- Install the green ground wire onto the manifold plate. (See "Ground Connection" in the figure noted above.)
- Insert the connector from the power supply cable to its port on the fuse box. (See "Fuse Box" in the figure noted above.)
- Reinstall the flame rod/AFR wires. (See "Flame Rod & AFR Wire Connections" in the figure noted above.)

9. INDOOR MODELS: Connect the wires from the temperature controller (item 722, page 71) to the computer board.

The correct receptacle is shown in one of these schematics:

- 240 (T-H3J) and 340 (T-H3s) Models. Page 30. See "Temperature Controller"
- 540 (T-H3) Models. Page 31. See "Temperature Controller."

10. Verify that all water connections are tight and that there are no

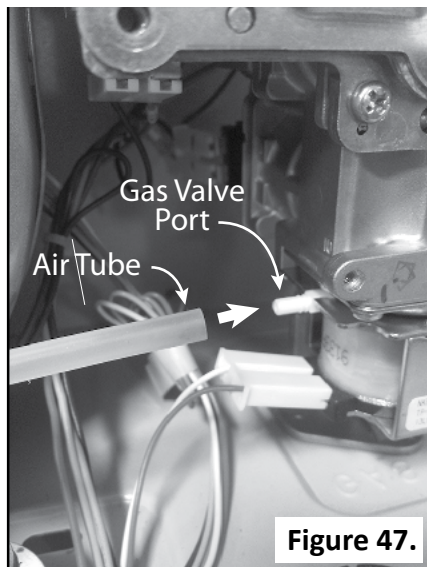


Figure 47.

parts left over.

Be sure that you reconnected the condensate tube at the bottom, right-hand corner of the cabinet.

11. Slowly open the gas valve and check for leaks. If any gas leaks appear, shut off the gas and turn off power to the heater.

WARNING! Failure to prevent gas leaks can result in an explosion, severe injury, or death.

12. Turn on water to the heater and test for proper operation.

13. Verify that there are no water or gas leaks.

14. Outdoor models: Reinstall the front cover.

Indoor Models: Insert the temperature controller into the opening of the front cover, then reinstall the front cover.

If there are any questions, please contact technical support.

Gas Valve/ Manifold Plate: Removal and Installation

Tools:

- Phillips Screw Driver
- Gas Manometer

NOTICE: As you complete the following steps, reinstall the screws after removing each component. Doing so will keep the

fasteners organized and will expedite reassembly.

⚠ WARNING

- ❑ Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.
- ❑ Use a non-contact circuit tester to confirm that power is off before working on or near any electrical parts.
- ❑ Ensure that the gas supply is shut off at the manual gas shutoff valve.
- ❑ Replace the front cover after servicing.
- ❑ Failure to follow these warnings can lead to personal injury or death.

Gas Valve/Manifold Plate Removal

1. Prepare the water heater for service as follows:

- 1.1 Disconnect power to the water heater by unplugging it from the wall outlet or turning it off at the circuit breaker, as appropriate.
- 1.2 Shut off the gas supply at the gas supply line's manual shutoff valve.
- 1.3 Once the power and gas have been turned off, remove the front panel from the water heater.

INDOOR MODELS: Remove the Temperature Controller (item 722, page 71) by

disconnecting its white connector from the computer board.

2. Remove the computer board from the water heater according to the following steps. (See also Figure 41, p. 49 or Figure 42, p. 50.)

NOTICE:

Do not remove connectors from the circuit board during the following steps.

- 2.1 **INDOOR MODELS ONLY:** Unplug the wire connectors for the exhaust high limit switch (item 472, p. 74) and the exhaust thermistor (item 718, p. 74). See also Figure 41, page 49.
- 2.2 Disconnect these wires from the front of the burner:
 - Flame rod wire (orange). See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).
 - Air-fuel ratio rod/AFR wire (yellow). See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).

NOTICE: The yellow wire is locked onto the rod's conductive spade. To release the flame rod connector, follow the instructions in Figure 25, page 37.

 - Igniter rod wire (black). See Figure 41, p. 49 or Figure 42, p. 50 (center of picture).
- 2.3 Remove the screw that secures the computer board assembly. See Figure 41

(p. 49) OR Figure 42 (p. 50).

Do not remove connectors from the circuit board.

- 2.4 Remove the computer board assembly.

3. Remove both screws which secure the fuse box to the manifold plate. Move the fuse box away from the work area. See Figure 41 (p. 49) OR Figure 42 (p. 50).

4. Unplug the white connector above the main gas valve (yellow wires). This connector is shown just above the "Main Gas Valve" in Figure 41 (p. 49) and Figure 42 (p. 50).

5. Remove the Gas Valve and Manifold Plate Assembly:

- 5.1 Remove the screw that secures the remaining ground wire (green) to the manifold plate.
- 5.2 Remove the screws that secure the manifold plate; doing so will remove the igniter assembly as well.

NOTICE: Remove only the screws along the outside edges of the manifold plate. See Figure 48, p. 57.

- **DO NOT** remove the screws securing the manifold plate to the gas valve.
- **DO NOT** remove the screws along the interior of the manifold plate.

- 5.3 **INDOOR MODELS:** Remove the power cord mounting tab. (Figure 41, page 49.)

- 5.4 Disconnect the clear air tube off the left side of the gas valve. (Figure 49.)
- 5.5 Remove the screw securing the gas valve to the gas inlet connection.
- The screw is located at the bottom, right-hand side of the gas valve. See **Figure 41 (p. 49) OR Figure 42 (p. 50).**
 - **If necessary, disconnect the condensate tube from the bottom, right-hand side of the cabinet first.**
- 5.6 Lift the manifold plate/gas valve assembly upward to remove it from the gas inlet connection. (The gas valve and manifold are still connected together.)
- You may need to twist the gas valve/manifold assembly slightly.**
- 5.7 Unplug the wire connectors from the solenoid valves, main gas valve, and proportional gas valve. (These valves are connected to the back corner of the manifold plate.) There are five connectors that can be unplugged from the manifold plate assembly.
- 5.8 Inspect the gaskets on the manifold plate for any tears. If compromised, replace with part number 100074229 (item 113) and/or 100074230 (item 114). See p. 73.
- 5.9 Inspect the o-ring (item 151, p. 73) and gas inlet ring (item 119, p. 73) at the gas

connection for cuts or breaks.

If damaged, replace with part number 100074242 (item 151) and/or 100074526 (item 119).

Gas Valve/Manifold Plate Installation

6. Install the gas valve/manifold assembly. (See item 102, p. 73)

- 6.1 Attach a wire connector to each of the solenoid valves as described:
- There are a total of five connectors to be reinstalled.
 - Each connector has a dark blue wire, except for the proportional valve. The other wire colors will vary.
 - Each set of wires has a tag with a number on it, and each solenoid valve has a number stamped next to it. During installation, each wire number must match its solenoid valve number. **See Figure 50.**
 - Install each connector to the solenoid valve with the matching number except as noted below.
 - The proportional valve does not have a number and is located at the bottom of the assembly. **It has red and white wires.**
- 6.2 Make sure that the screen inside the gas valve inlet is still in place.

- 6.3 Slide the gas valve/manifold plate onto the gas inlet connection. (The gas inlet is located at the bottom, right-hand corner of cabinet.)

You may need to rotate the gas valve while sliding it downward. The tab on the gas valve connection should line up behind the tab on the gas inlet connection.

Manifold Screws:

- **DO NOT remove the screws indicated by the white, crossed-out circles.**
- **Remove the screws indicated by the white arrows.**

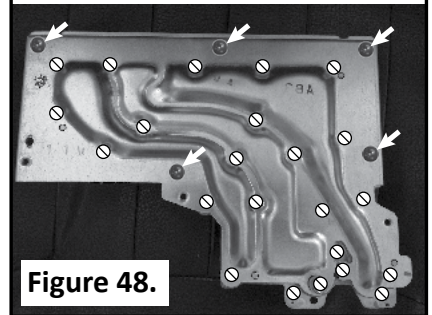


Figure 48.

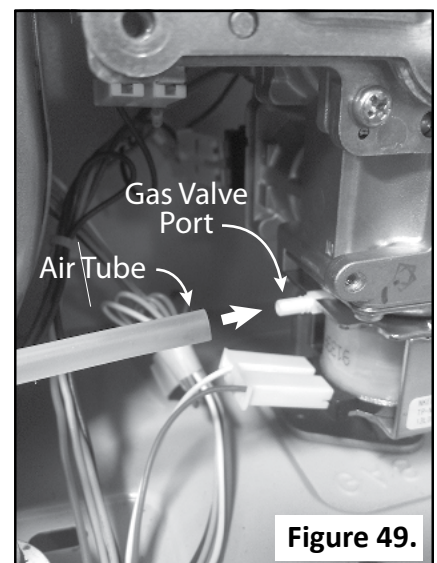


Figure 49.

6.4 Secure the gas valve to the inlet by installing the brass screw through both tabs at the connection (hand-tight only).

See Figure 41 (p. 49) or Figure 42 (p. 50).

6.5 Attach the air tube from the bottom of the combustion chamber to the port on the left side of the gas valve. (See Figure 49, page 57.)

7. **Reconnect the plug and receptacle that you disconnected earlier (i.e., the ones with the yellow wires). This connector is shown just above the “Main Gas Valve” in Figure 41 (p. 49) and Figure 42 (p. 50).**

8. **Install the fuse box assembly to the left side of the manifold plate. (See Figure 41 (p. 49) or Figure 42 (p. 50).)**

Hand tighten two screws to secure it to the manifold plate.

9. **Install the computer board (PCB):**

9.1 Position the PCB in place: Small feet at the bottom must fit into the corresponding holes in the case.

9.2 Insert and hand tighten the screw at the top of the PCB to secure it to the fuse box.

10. **Verify that all manifold screws have been reinstalled and hand tightened.**

11. Complete the wiring:

Refer to Figure 41 (p. 49) or Figure 42 (p. 50) as you complete these steps.

- Install the green ground wire onto the manifold plate. (See “Ground Connection” in the figure noted above.)
- Insert the connector from the power supply cable to its port on the fuse box. (See “Fuse Box” in the figure noted above.)
- Reinstall the flame rod/AFR wires. (See “Flame Rod & AFR Wire Connections” in the figure noted above.)

12. INDOOR MODELS: Connect the wires from the temperature controller (item 722, page 71) to the computer board.

The correct receptacle for your model is shown in one of these schematics:

- 240 (T-H3J) and 340 (T-H3s) Models. Page 30.

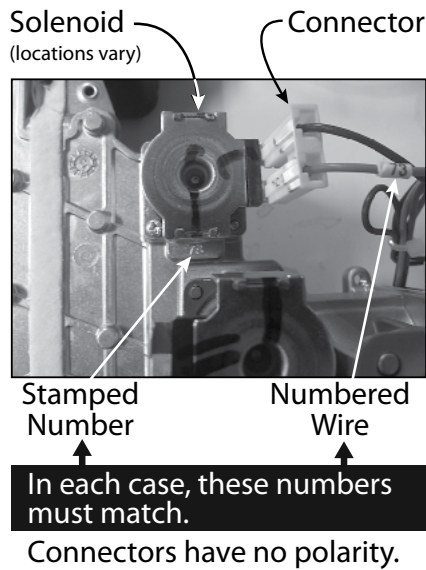


Figure 50.

See “Temperature Controller”

- 540 (T-H3) Models. Page 31. See “Temperature Controller.”

13. Verify that all gas and water connections are tight and that there are no parts left over.

Be sure that you reconnected the condensate tube at the bottom, right-hand corner of the cabinet.

14. Slowly open the gas valve and check for leaks. If any gas leaks appear, shut off the gas and turn off power to the heater.

WARNING! Failure to prevent gas leaks can result in an explosion, severe injury, or death.

15. Turn on water to the heater and test for proper operation.

16. Verify that there are no water or gas leaks.

17. Outdoor models: Reinstall the front cover.

INDOOR MODELS: Insert the temperature controller into the opening of the front cover, then reinstall the front cover.

If there are any questions, please contact technical support.

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Replacing the Heat Exchanger

Tools:

- #2 Phillips Screw Driver, 8" long (a magnetic tip is helpful)
- Pliers

⚠ WARNING

- **Disconnect power by opening the circuit breaker or removing the fuses before installing or servicing.**
- **Use a non-contact circuit tester to confirm that power is off before working on or near any electrical parts.**
- **Ensure that the gas supply is shut off at the manual gas shutoff valve.**
- **Replace the front cover after servicing.**
- **Failure to follow these warnings can lead to personal injury or death.**

Consider removing the following sections from this manual for easy reference:

- "Component Diagrams/Item Numbers" (starting on page 71).
- Figure 41 (p. 49) or Figure 42 (p. 50) which shows the location of basic components.

This will allow you to lay the loose pages beside this manual for easier reference.

Also, screw sizes vary. We recommend bagging and labeling screws as you remove them, or reinstall them in their proper places as you proceed

with disassembly. This will make reassembly easier.

1. Shut the unit down as follows:

- 1.1 Shut Off power and gas supply as follows:
 - 1.1.1 Shut off Power by disconnecting the power cord or shutting off the power disconnect.
 - 1.1.2 Shut off the gas supply to the water heater at the manual gas shutoff valve.
- 1.2 Drain the water from the heater as follows:
 - 1.2.1 Close the shutoff valves on the hot and cold side of the heater.
 - 1.2.2 IF isolation valves are installed: open up the drain ports.
 - 1.2.3 IF isolation valves are not installed: remove the filter (item 406, page 74) and open the pressure relief valve.

2. INDOOR MODELS: Remove the Temperature Controller (item 722, page 71) by disconnecting its white connector that goes to the computer board.

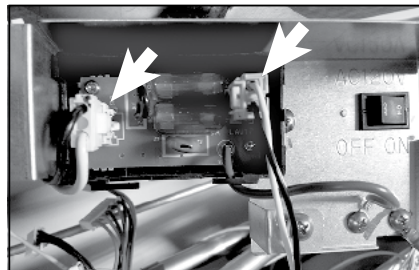


Figure 51.

3. Remove the computer board as follows (item 701, page 72; see also page 49 or 50):

NOTICE:

- During the next step, consider taking a digital photo to aid in reassembly.
- Do not touch the circuit board components. Doing so may cause damage by electrostatic discharge.

- 3.1 Disconnect all wire connectors from the computer board.
- 3.2 Remove the screw at the top of the computer board assembly, then remove the board. See page 49 or 50, as appropriate.

4. Remove the fuse box assembly (item 703, page 72):

- 4.1 Disconnect both wire connectors from the fuse box ports (Figure 51).

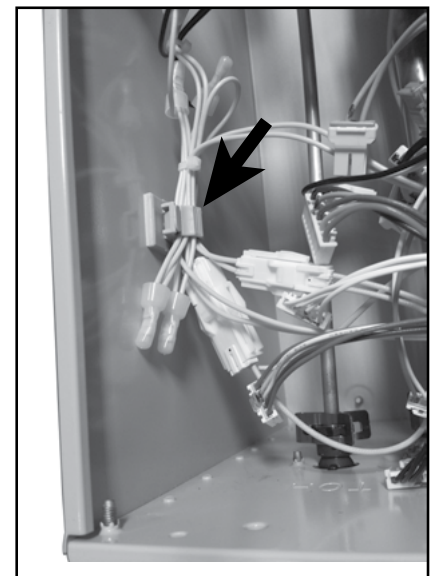


Figure 52.

- 4.1 Open the clip that secures the yellow wires to the bottom, left-hand side of the cabinet. Remove the wires. See Figure 52.
- 4.2 Remove both screws that secure the fuse box and lift the fuse box away. (It will still be connected to wires.)
- 4.3 Unlatch the connectors on the freeze protection heater wires. There are 5 sets of these white connectors with yellow wires (one above the fuse box assembly, three below the fuse box assembly, and one near the bottom, right-hand side of the cabinet).

INDOOR MODELS ONLY:
The plug on the back of the fuse box connects it to the freeze protection thermostat. This thermostat hangs off of the intake vent

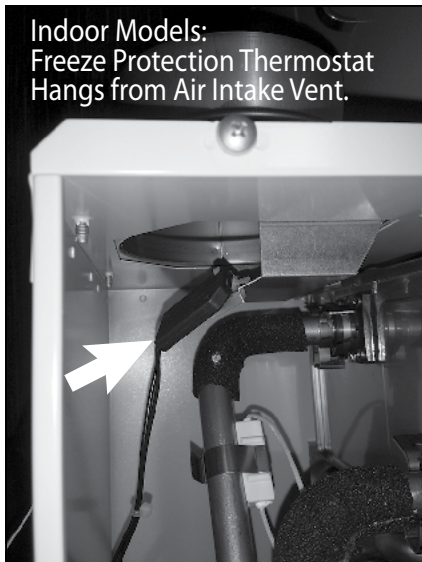


Figure 53.

(top, left of cabinet). Leave that thermostat in place. (See Figure 53.)

When you are finished, the plug, wire, and fuse box will hang from the intake vent.)

5. Remove the flow sensor/control valve (item 402, page 74) as described in the following steps. See also page 49 or 50.

- 5.1 Remove fasteners 16A and 14-22 (items 460 and 461, page 74).

NOTICE: If you have a 540 model with a bypass valve, you must remove an additional fastener. See item 458 at connection point **A** (two places), page 74.

- 5.2 Pull the cold connection tube (item 466, page 74) from the outlet of the flow sensor/control valve.

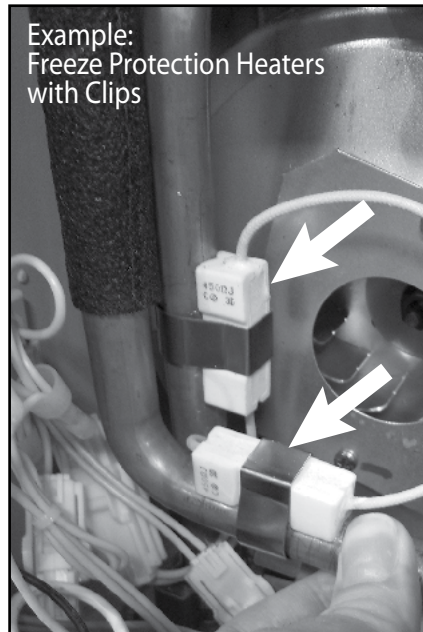


Figure 54.

NOTICE: If you have a 540 model, you must pull a portion of the tube out of the bypass valve as well.

- 5.3 Turn the flow sensor/control valve gently and lift it off of the inlet.

6. Remove the cold connection tube (item 466, page 74) as follows:

- 6.1 Disconnect fastener 16-25 (item 462, page 74) from the top of the cold connection tube.
- 6.2 Remove two heaters and clips (located at the top and bottom of the cold connection tube):
 - Items 414 & 451, p. 74.
 - Items 415 & 451, p. 74.

See also Figure 54.

- 6.3 Remove the cold connection tube from the heat exchanger.
- 6.4 Remove the cold connection tube from the cabinet.

7. Remove the igniter assembly:

See page 49 or 50 during the following sub-steps.

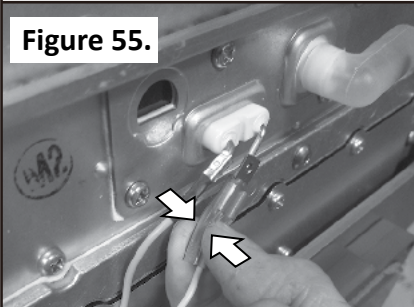
- 7.1 Remove the screw that secures the igniter assembly.
- 7.2 Disconnect the igniter wire at the igniter rod wire connection.

8. Disconnect the blue wires from the high limit switch. See “High Limit Switch (Heat Exchanger),” page 49 or 50.

Flame Rod Wire Connector:

To remove, pinch flat sides at end with your finger nails, then slide connector off the spade.

Figure 55.



Manifold Screws:

- **DO NOT** remove the screws indicated by the white, crossed-out circles.
- **Remove** the screws indicated by the white arrows.

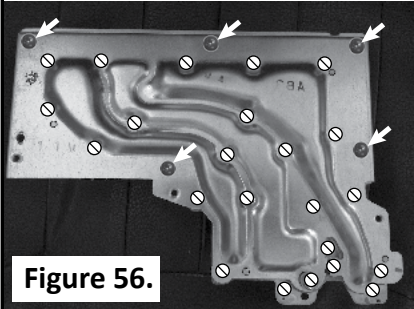


Figure 56.

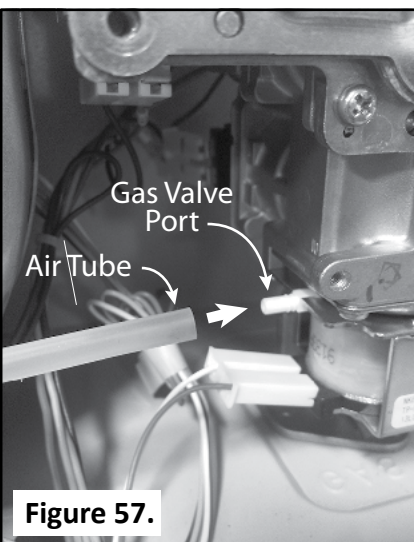


Figure 57.

The wires are locked onto the connectors. Pinch the flat sides on each connector to release it.

9. Remove the Gas Valve and Manifold Plate Assembly:

- 9.1 Unplug wire connectors from the air/fuel ratio rod (AFR), flame rod, and igniter. See Figure 55.
- 9.2 Remove the screws that secure the green ground wires to the manifold plate. (You may have completed this step already.)
- 9.3 Remove the screws that secure the manifold plate. (See page 49 or 50).

NOTICE: Remove only the screws along the outside edges of the manifold plate. See Figure 56.

- **DO NOT** remove the screws securing the manifold plate to the gas valve.
- **DO NOT** remove the screws along the interior of the manifold plate.
- You will not be able to pull the manifold plate away from the assembly yet. That will happen during gas valve removal.

- 9.4 **INDOOR MODELS:** Remove the clip that secures the power cord. See “Power Cord Mounting Tab” in Figure 41, p. 49.
- 9.5 Disconnect the air tube off the left side of the gas valve (**Figure 57.**) See also “Clear Plastic Tube” in Figure 41, p. 49.

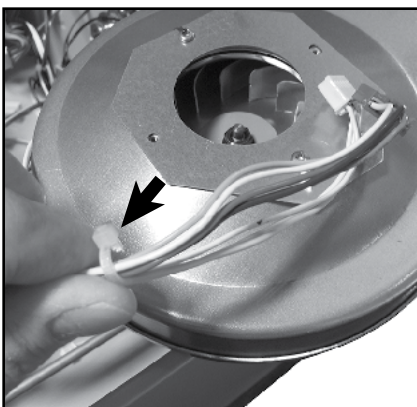
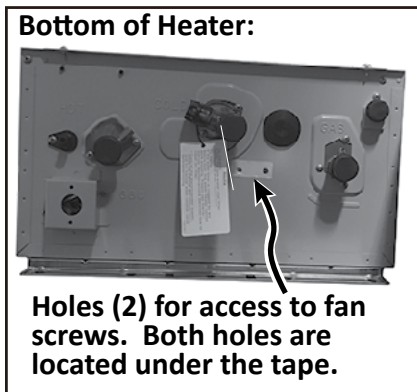
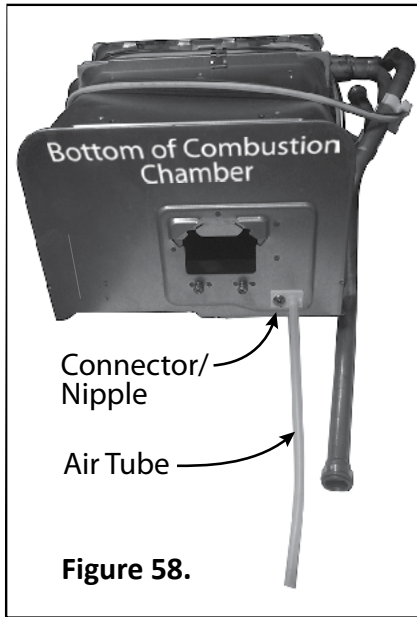
- 9.6 Disconnect the connector on the left side (blue wires) which goes to the overheat cutoff fuse. See “Connector for Overheat Cutoff Fuse (Blue Wires)” in Figure 41, p. 49.)

- 9.7 Remove the brass screw securing the gas valve to the gas connection. The screw is located at the bottom, right-hand side of the gas valve. **See “Brass Screw Securing Gas Valve...” on page 49 or 50.**

- 9.8 Lift the manifold plate/gas valve assembly upward to remove it from the gas inlet connection. (The gas valve and manifold are still connected together.)

You may need to twist the gas valve/manifold assembly slightly.

- 9.9 Unplug the wire connectors from the solenoid valves, main gas valve, and proportional gas valve. (These valves are connected to the back corner of the manifold plate.) There are five connectors that can be unplugged from the manifold plate assembly.
- 9.10 Inspect the gaskets on the manifold plate for any tears. If compromised, replace with part number 100074229 (item 113) and/or 100074230 (item 114). See p. 73.



9.11 Inspect the o-ring (item 151, p. 73) and gas inlet ring (item 119, p. 73) at the gas inlet for cuts or breaks.

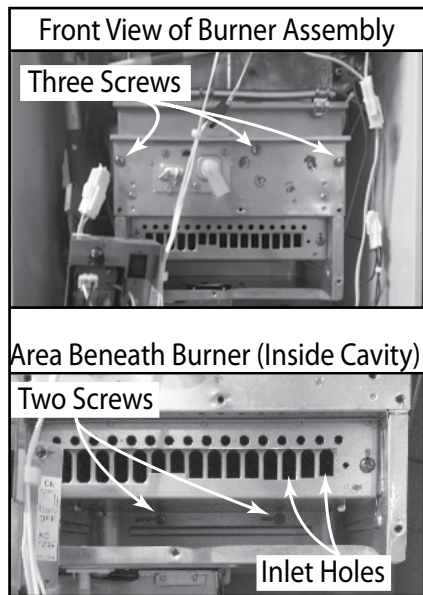
If damaged, replace with part number 100074242 (item 151) and/or 100074526 (item 119).

10. Disconnect and remove the fan from the combustion chamber as follows:

10.1 Remove the clear air tube from the bottom of the combustion chamber (Figure 58).

10.1 Remove the 2 Phillips/hex head screws pointing down from the fan using an 8" long, #2 Phillips head screw driver.

There are 2 holes in the case directly below the screws to put the screw driver through (Figure 59).



10.2 Slide the fan toward you to remove it from the rear slots that hold it in place. Remove the fan.

10.3 IF the fan wires are zip-tied to the white Exhaust Thermistor/High Limit Switch wires, clip the zip tie to separate them (Figure 60).

NOTICE: Do not cut, nick, or damage the wires when clipping the zip tie.

11. Remove the burner from the combustion chamber:

11.1 Remove two screws below the burner, at the back (Figure 61).

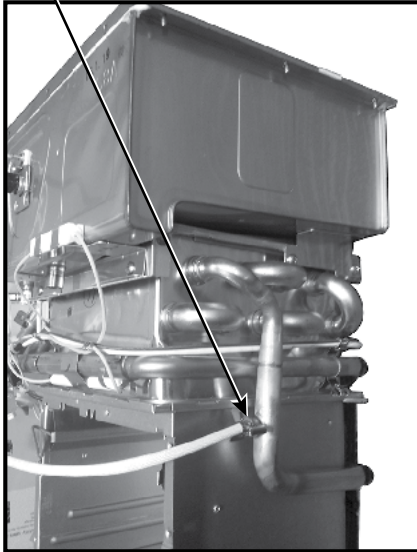
11.2 Remove three screws across the front of the burner. See Figure 61. Do not remove the screws around the flame sensor/AFR and igniter rods.

11.3 Remove the burner as follows:

- Using pliers, grip the burner on one side and pull. (Grip at an inlet hole; see Figure 61.)
- Repeat on the opposite side.
- Continue to pull on each side in an alternating fashion until the burner begins to loosen. When the burner loosens, pull from the middle portion until the burner slides out toward you.

11.4 Check the gaskets on the burner for any tears. If there are, replace the gasket with part number 100074217.

Heat Exchanger Thermistor
(540 Models Only)



View: Right Side of
Heat Exchangers

Figure 62.

Three Screws Securing the
Secondary Heat Exchanger

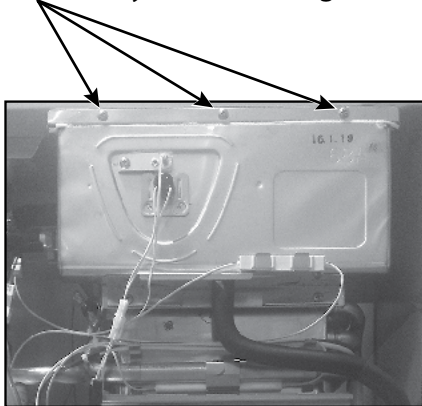


Figure 63.

12. Disconnect and remove the following items:

- 12.1 Disconnect the condensate drain line (item 416, page 74) from the secondary heat exchanger assembly by pulling down. Do not remove the drain line from the outlet connection at the bottom of the cabinet.
- 12.2 Remove fastener 16-25 (item 462, page 74) from the outlet tubing and outlet water connection.
- 12.3 Slide the outlet tube up and out of the outlet water connection.
- 12.4 Remove the drain pipe as follows:
 - 12.4.1 Remove the clips at the top and bottom of the drain pipe. **See page 74, items 465 and 463. (There are two instances of item 463.)**
 - 12.4.2 Remove the drain pipe.
- 12.5 IF you have a 540 model, remove the heat exchanger thermistor as described below:
 - 12.5.1 Remove the clip that secures the thermistor. See Figure 62; see also “Heat Exchanger Thermistor” in Figure 41, p. 49.
 - 12.5.2 Pull the thermistor out of the copper pipe.
- 12.6 **INDOOR MODELS:** Disconnect the venting from the exhaust flue.
- 12.7 IF you have a 540 model, disconnect the bypass valve wiring as follows:

- 12.7.1 Locate the bypass valve wires on the left side of the heat exchangers.

Wire colors:
Red, Yellow, White, Blue,
Brown.

- 12.7.2 Disconnect the white connector in the middle of that wire run.

- 12.8 Remove the three screws at the top of the secondary heat exchanger that are securing it to the case. Refer to Figure 63. Save for future use.

13. Follow these steps to remove the heat exchangers:

- 13.1 Slide the heat exchangers down while gradually angling the bottom toward you.
- 13.2 Separate the primary and secondary heat exchangers as follows:
 - 13.2.1 Remove fastener 16-25 (connection point **E**; item 462, page 74;).

Location: Copper tube at top of left-hand side. (This tube connects the primary heat exchanger to the secondary heat exchanger.)
 - 13.2.2 Remove two (2) ceramic heaters that are clipped onto the copper pipes on the left-hand side of the cabinet. (One heater is on the heat exchanger out pipe, item 467. The other is just above connection point **C**. See page 74.

13.2.3 Remove the eight screws that hold the primary and secondary heat exchangers together. (There are two screws on each of the four sides. Save them for future use.)

NOTICE: The primary and secondary heat exchangers are identified on page 49 or 50.

13.3 IF you are replacing the primary heat exchanger assembly, go to “Preparing the New PRIMARY Heat Exchanger for Installation.”

IF you are replacing the secondary heat exchanger assembly, go to “Preparing the New SECONDARY Heat Exchanger for Installation.”

Preparing the New PRIMARY Heat Exchanger for Installation

- The primary heat exchanger is the same assembly for both indoor and outdoor models.
- 240 and 340 models use primary heat exchanger 100074698.
- 540 models use primary heat exchanger 100074699.
- The new primary heat exchanger comes with:
 - A combustion chamber attached to the bottom of the heat exchanger. (See “Combustion Chamber,” page 73.)

- A plate attached at the top with a gasket surrounding the flue gas connection to the secondary heat exchanger. See item 401, page 74.

1. Make sure the gasket on top of the primary heat exchanger is not compromised. If it is, contact technical support.

2. Remove the following items from the primary heat exchanger and **INSTALL THEM IN THE SAME LOCATIONS ON THE NEW PRIMARY HEAT EXCHANGER:**

- High limit switch on the left side (item 412, page 74).
- Over-heat Cutoff Fuse (OHCF) and its six clips. See Figure 64, Figure 65, and item 413 on page 74. See also “Over-heat Cutoff Fuse” in Figure 41, page 49.
- Air tube and its connector/nipple on the bottom of the combustion chamber. (See Figure 58, p. 63.)
- Pipe heater at the front of the primary heat exchanger. See Figure 64. See also page 74.
- O-Rings on the connection tubes:
 - See item 458, page 74, at connection point “E.” This O-ring is attached to the connection tube that travels to the secondary heat exchanger.
 - See item 458, page 74, at connection point “C.” This O-ring is attached where the outlet water tube connects to the outlet water connection.

3. Complete the steps in the next section: “Preparing the New SECONDARY Heat Exchanger for Installation.”

Preparing the New SECONDARY Heat Exchanger for Installation

1. INDOOR MODELS ONLY:

Remove the following items from the secondary heat exchanger, then **INSTALL THEM IN THE SAME LOCATIONS ON THE NEW SECONDARY HEAT EXCHANGER:**

- Silicon ring (item 154, page 74) which is located around the

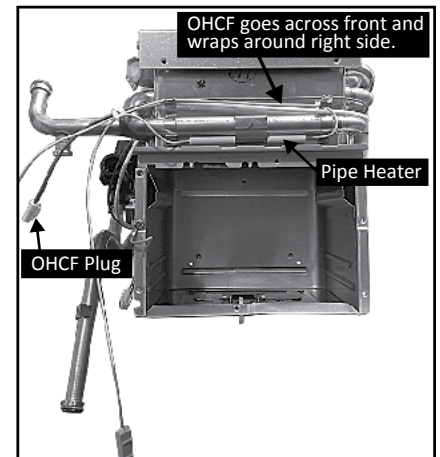
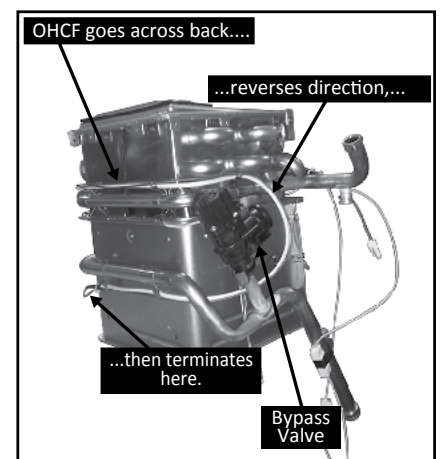


Figure 64.



NOTE: The bypass valve shown above is included with 540 models only.

Figure 65.

exhaust flue.

- Exhaust thermistor, gasket, bracket, and screw. (See items 471, 718, 470, and 053 on page 74.)
- Exhaust high limit switch (item 472, page 74): it can be removed and installed by sliding it through the bracket.
- Freeze protection heater, which is shaped as a long rectangle (item 415, page 74) and located on the front, right-hand side of the secondary.

2. Complete the steps in “Installing the Heat Exchanger Assembly.”

Installing the Heat Exchanger Assembly

- 1. Fit the secondary heat exchanger on top of the primary heat exchanger.**

WARNING! Make sure that the flange on top of the primary heat exchanger fits into the female opening on the bottom of the secondary heat exchanger. Failure to do so could allow flue gasses to escape, resulting in carbon monoxide poisoning.

NOTICE: The copper pipes bend easily. Do not allow them to bend during assembly.

- 2. Make sure that all eight mounting holes line up. See Figure 66.**
- 3. Secure the primary and secondary heat exchangers together with eight screws (two on each of the four sides).**

- 4. Insert the heat exchanger assembly into the case with its exhaust outlet fitting through the hole in the top of the case. (The assembly should rest on a flange on the inside of the case.)**

INDOOR MODELS: Make sure that the flue gasket (item 154, page 74) is on the inside of the case.

- 5. Insert and hand tighten three (3) screws as shown in Figure 63, page 64. This will secure the heat exchanger assembly to the heater case.**

- 6. Reconnect the cold pipe as follows:**

6.3.1 Install the cold pipe as shown on page 74. (See item 466.)

NOTICE:

- 240/340 MODELS: Reconnect the top termination. The bottom termination will be connected during later steps.

- 540 MODELS: Reconnect the top and middle terminations. The bottom termination will be connected during later steps.

- 6.3.2 Secure the connection(s) with clip(s).

NOTICE: “16-25” is marked on the end of the clip(s). All such clips are marked on the end in the same manner.

- 6.3.3 Reattach **two** ceramic heaters to the cold pipe, one at the top and one at the bottom. See items 466, 414, and 415 on page 74.

- 7. Reconnect the heat exchanger out pipe (item 467, page 74) as shown at connection point E.**

- The top connection should be connected already. If it is not, reconnect it as shown on page 74.
- The out pipe must be connected at each end with a 16-25 clip.

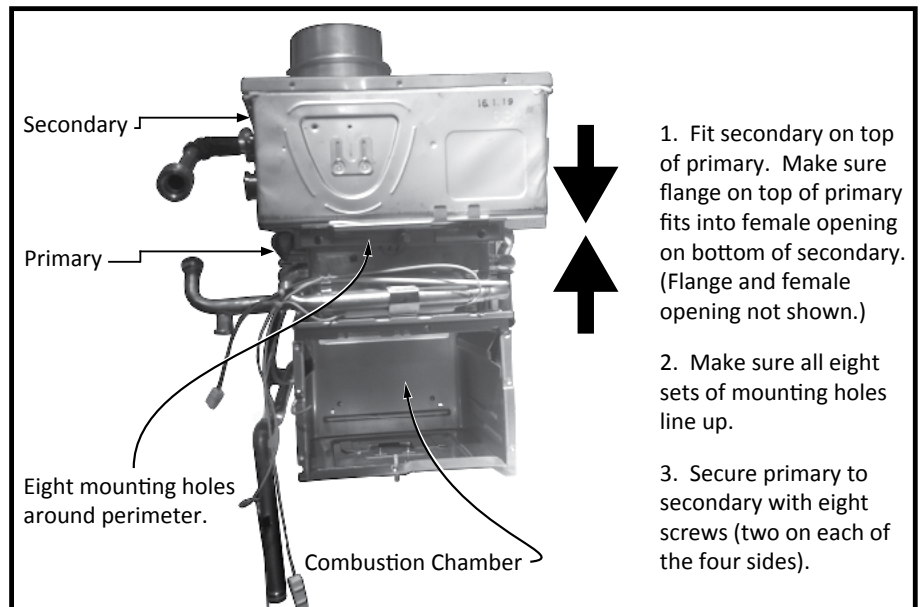


Figure 66.

8. Reconnect the drain pipe (item 465) as shown in the diagram on page 74.

Secure both ends with 6-15 clips.

9. Slide the burner into the combustion chamber. (See Figure 66.) There are grooves on the sides of the combustion chamber; the top and bottom of the burner has flanges and spacers that will slide along the grooves.

NOTICE: Install with caution. The flanges along the bottom of the burner are rigid, but the spacers along the top of the burner are fragile and can be damaged easily. Ensure that the flanges /spacers are in alignment with the grooves before sliding the burner into place.

9.3.1 Insert and hand tighten two (2) screws below the burner, at the back. (See Figure 61, page 63.) These screws will secure the burner to the back of the cabinet. You may need to push the assembly up some in order to line up the holes.

9.3.2 Insert and hand tighten three (3) screws along the top, front portion of the burner (Figure 61, p. 63).

10. Insert the outlet tubing into the water outlet connection, making sure that the brass ring on the tube goes all the way in and is flush with the top of the outlet connection (Figure 67).

Secure it with a 16-25 clip. See item 462 on page 74.

11. Attach the top of the condensate

drain tube to the port on the bottom of the secondary heat exchanger. (See Item 416 on page 74.)

12. Install the fan with the air inlet facing toward the front as follows:

12.1 Slide the fan's flanges into the slots on the bottom of the combustion chamber. (The fan's air inlet must face outward.)

12.2 Line up the holes, then insert and hand-tighten two (2) hex head screws with washers (item 54). See page 73.

NOTICE: There are two holes on the bottom of the case through which you can reach both screws with an 8-inch long phillips screw driver (#2). See Figure 59 on page 63.

13. Install the gas valve/manifold assembly as described below. (See also item 102, p. 73)

13.1 Attach a wire connector to each of the solenoid valves as described:

- There are a total of five connectors to be reinstalled.
- Each connector has a dark blue wire, except for the proportional valve. The other wire colors will vary.
- Each set of wires has a tag with a number on it, and each solenoid valve has a number stamped next to it. During installation, each wire number must match its solenoid valve number. See Figure 68.

- Install each connector to

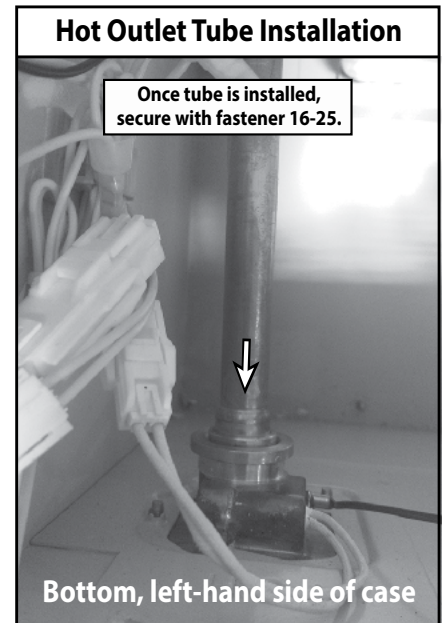


Figure 67.

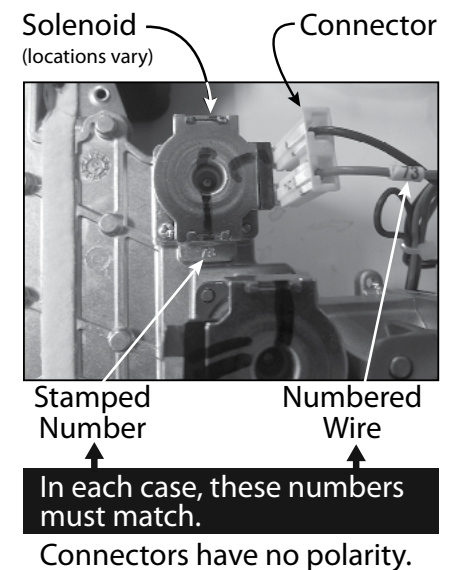


Figure 68.

the solenoid valve with the matching number except as noted below.

- The proportional valve does not have a number and is located at the bottom of the assembly. **Connect the wire assembly with red and white wires to its fork terminals.**

- 13.2 Make sure that the screen inside the gas valve inlet is still in place.
- 13.3 Slide the gas valve/manifold plate assembly onto the gas inlet connection. (The gas inlet is located at the bottom, right-hand corner of cabinet.)

You may need to rotate the gas valve while sliding it down for an easier fit. The tab on the gas valve connection should line up behind the tab on the gas inlet connection.

- 13.4 Secure the gas valve to the gas inlet by installing the brass screw (with washer) through both tabs at the connection. **Hand-tighten only.**

See “Brass Screw Securing Gas Valve...” in Figure 41, p. 49.

- 13.5 Attach the air tube from the bottom of the combustion chamber to the port on the left side of the gas valve. (See Figure 69.)

NOTICE: If the air tube is not connected to the bottom of

the combustion chamber, connect it now as shown in Figure 58 (p. 63).

- 14. INDOOR MODELS ONLY:**
Secure the power cord to the manifold plate as shown in Figure 41, page 49. (See the “Power Cord Mounting Tab” callout.)
Hand-tighten only.

Use the mounting tab and its M4X10 screw.

15. Secure the manifold plate:

- 15.1 Line up the manifold plate with the holes on the burner, then hand tighten the top center screw on the manifold plate. (See “Manifold Plate,” page 49.)

- 15.2 Hand tighten the remaining manifold plate screws. **Do not overtighten.**

NOTICE: Leave the following mounting holes open:

- Fuse box mounting holes (left side of plate)
- Igniter assembly mounting hole (top, right-hand side of plate)
- Ground wire mounting location (bottom, center of plate).

- 16. Install the igniter assembly to the top, right-hand corner of the manifold plate. (See “Igniter Assembly” and “Igniter Rod Wire Connection” in Figure 41, p. 49)**

- 16.1 Insert and hand tighten the screw.

- 16.2 Slide the black igniter wire onto the igniter rod. See “Igniter Rod Wire Connection” in Figure 41, page 49.

- 17. Install the flow sensor/control valve (item 402, p. 74) and cold pipe (item 466, p. 74) as follows:**

- 17.1 Install the flow sensor/control valve onto the water inlet connection (bottom, center of cabinet).

Figure 69.

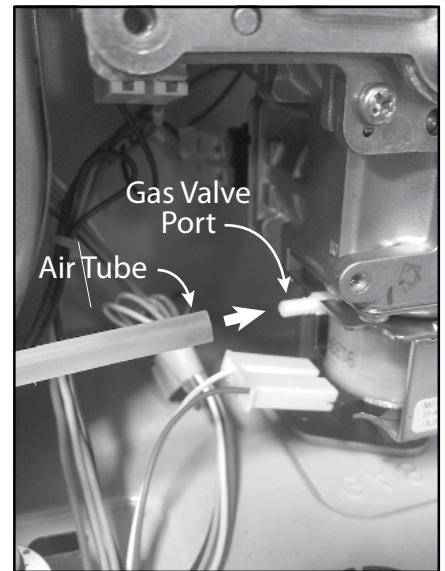
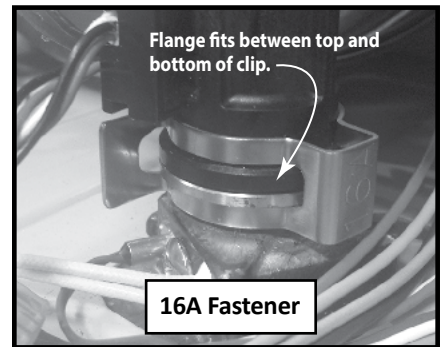


Figure 70.



17.2 Insert the end of the cold pipe into the outlet of the flow sensor/control valve. See connection point “D” on page 74 (shown in two places).

17.3 Install these fasteners:

- One 16A fastener, which secures the inlet of the flow sensor/control valve to the inlet water connection.

See Figure 70. See also item 461 on page 74.

(“16A” is marked on the end of this clip.)

- One 14-22 fastener, which secures the cold pipe to the flow sensor/control valve. See item 460 on page 74. (“14-22” is marked on the end of the clip.)

NOTICE: The cold pipe’s brass ring must be fully inserted into the flow sensor/control valve.

17.4 Verify that all of the fasteners on the water tubing are installed properly.

17.5 Install the cold water inlet filter. Refer to the water heater’s manual, if needed.

17.6 Test for leaks by slightly opening the water supply to the water heater. Check the water tube connections for any drips or leaks. If any appear, turn off the water, drain the water heater, dry the components that got wet, and fix the leak.

18. Reattach all ceramic pipe heaters as shown on page 74. (Each is identified as item 414 or 415.)

19. Install the fuse box at the location shown in Figure 41, page 49. Secure it by hand-tightening both mounting screws.

20. Reconnect the freeze protection heater wiring:

- Connect each male/female pair of connectors that have YELLOW wires.
- When you finish, you will have reconnected five (5) pair of connectors with YELLOW wires.
- Location of each connection:
 - One near the cold water inlet
 - Two near the hot water outlet
 - One on the right side, above the gas valve
 - One at the top, left-hand side, along the cold pipe (item 466, page 74)

NOTICE: All connectors with yellow wires are connected to the same circuit, so the order in which you connect them does not matter.

21. Install the computer board (PCB):

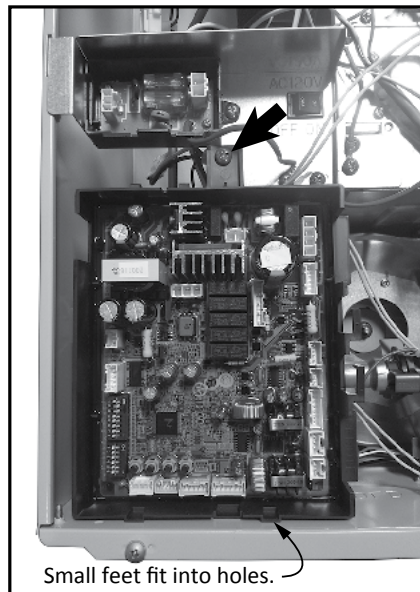
- Small feet at the bottom must fit into the corresponding holes in the case (Figure 71).
- Insert the screw at the top of the computer board, then hand-tighten it to secure the board to the fuse box assembly. See Figure 71.

21.1 Connect all of the wires to the computer board. All of the wire connectors are uniquely sized and shaped to fit only in the correct connector on the board. **If necessary, refer to one of the schematics on page 30 or page 31.**

NOTICE:

- There are two (2) receptacles on the computer board that will be open (not used).
- The AFR rod, flame rod, and ground connections use a separate wiring assembly, and that assembly includes three wires: yellow, green, and orange. Install it as shown in the schematic. (See page 30 or 31).
- Be sure to plug the igniter wires (**purple**) into the receptacle at the top of the PCB.

Figure 71.



- **INDOOR MODELS:**
Install the connector with four white wires into the computer board as described below.
 - If you have a 240 or 340 model, see “Hi-limit switch for exhaust/ Exhaust thermistor” on page 30.
 - If you have a 540 model, see “Exhaust thermistor/Hi-limit switch for exhaust” on page 31.
- **540 MODELS:**
Be sure to reconnect the wiring harness to the bypass valve, then plug it into the PCB. Wire colors: Red, Yellow, White, Blue, Brown.

22. Complete the wiring connections inside the cabinet:

- Locate the two unsecured ground wires (green). Secure them with screws as shown in Figure 72.
- Locate the plug and receptacle with **blue** wires. Plug them together at the left-hand side of the cabinet. See “Over-heat Cutoff Fuse (OHCF)” in Figure 41 (p. 49) or Figure 42 (p. 50).

(This blue wire assembly has male and female plugs that you must plug together. There are also two separate wires on this assembly that have spade connectors on each end. You will connect the spade connectors during the next step.)

- Plug both spade connectors (**blue** wires) onto the heat exchanger’s high limit switch. See “High Limit Switch (Heat Exchanger)” in Figure 41 (p. 49) or Figure 42 (p. 50).
- Reconnect the flame rod and AFR wiring. See “Flame Rod & AFR Wire Connections” on page 49 or 50.
- Install both power plugs at the fuse box. See “Fuse Box” on page 49 or 50.
- **INDOOR MODELS:**
 - Plug in the high limit switch and exhaust thermistor connectors. See the top of Figure 41, page 49.
 - Plug the wires from the temperature controller into the computer board (PCB). These wires are black, red, blue, white.

If needed, refer to one of the

schematics on page 30 or page 31.

- **540 MODELS ONLY:**
Install the heat exchanger thermistor as shown on page 74. **See items 411, 454, and 459 on page 74.**

NOTICE: Be sure that the thermistor is fully inserted into the opening and that it is secured by the 4-11 clip.

Restarting the Unit

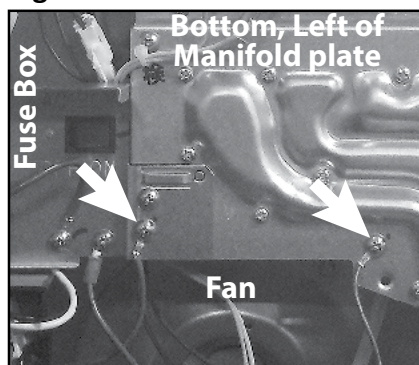
1. **Verify that all water connections are tight, all components are installed, and no parts are left over.**
2. **Restore power to the water heater.**
3. **Open the gas valve slowly and check for leaks.**

WARNING! If any gas leaks appear, shut off the gas supply and disconnect power to the water heater. Failure to do so could lead to fire, explosion, personal injury or death.

4. **Turn on water to the heater and test for proper operation.**
5. **Confirm that there are no water or gas leaks.**
6. **Insert the temperature controller into the opening of the front cover, then reinstall the front cover.**

If you have any questions, please contact technical support.

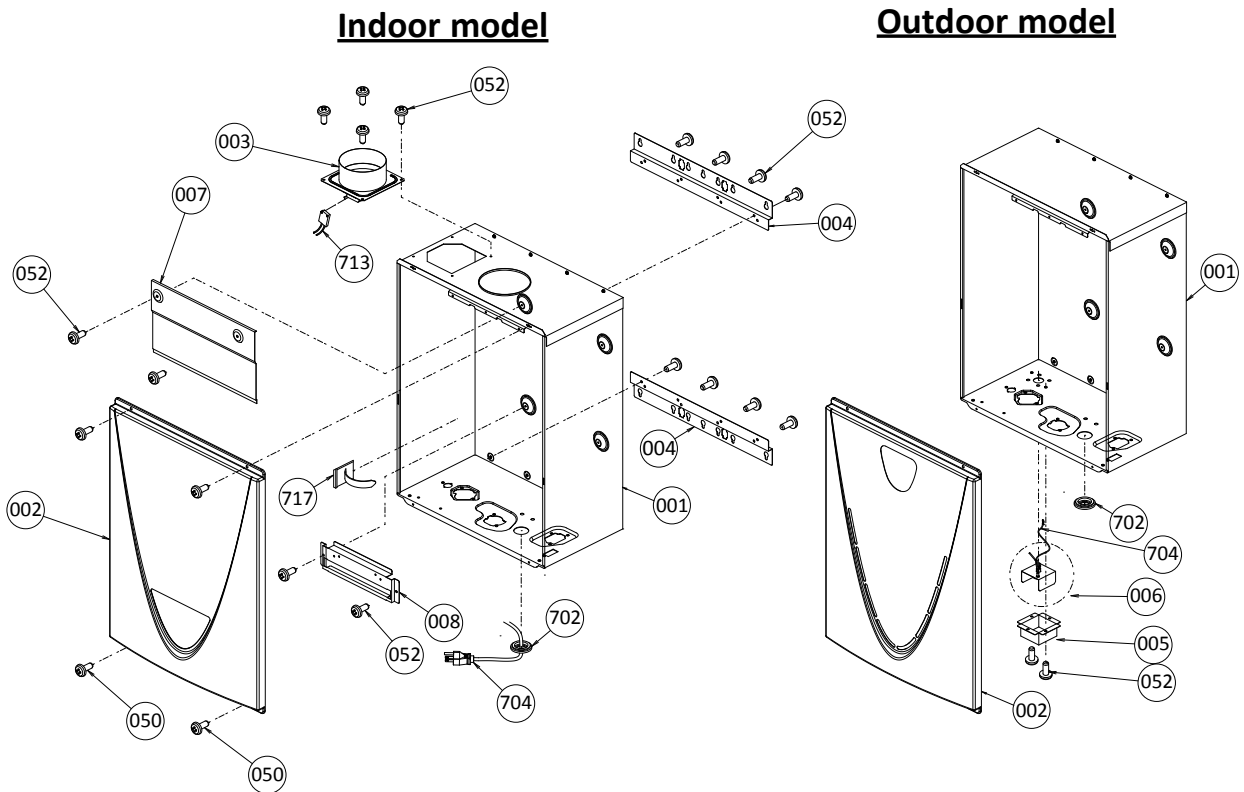
Figure 72.



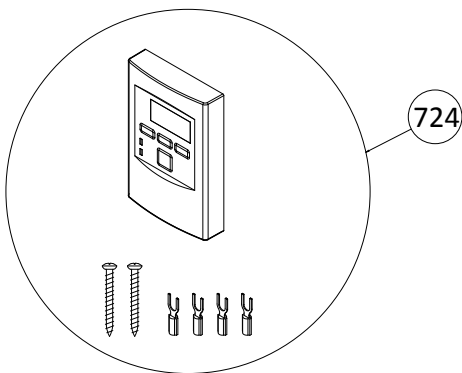
Install ground wires at these two locations.

COMPONENT DIAGRAMS/ITEM NUMBERS

Case assembly

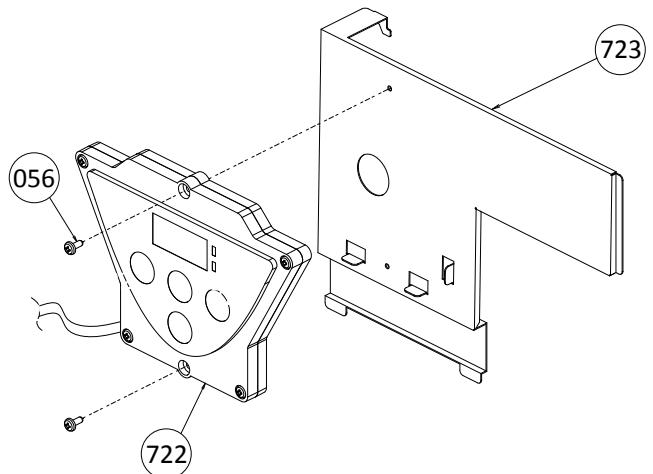


Temperature remote controller



Temperature controller

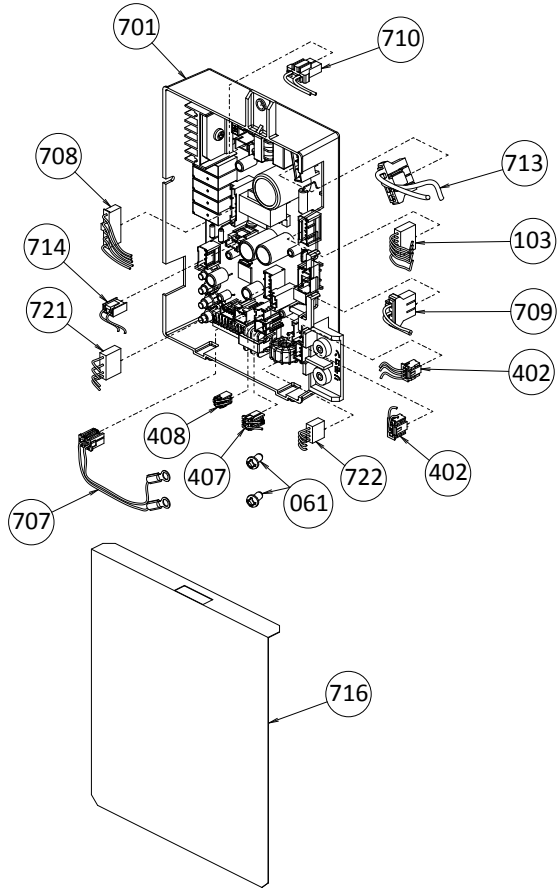
Indoor model



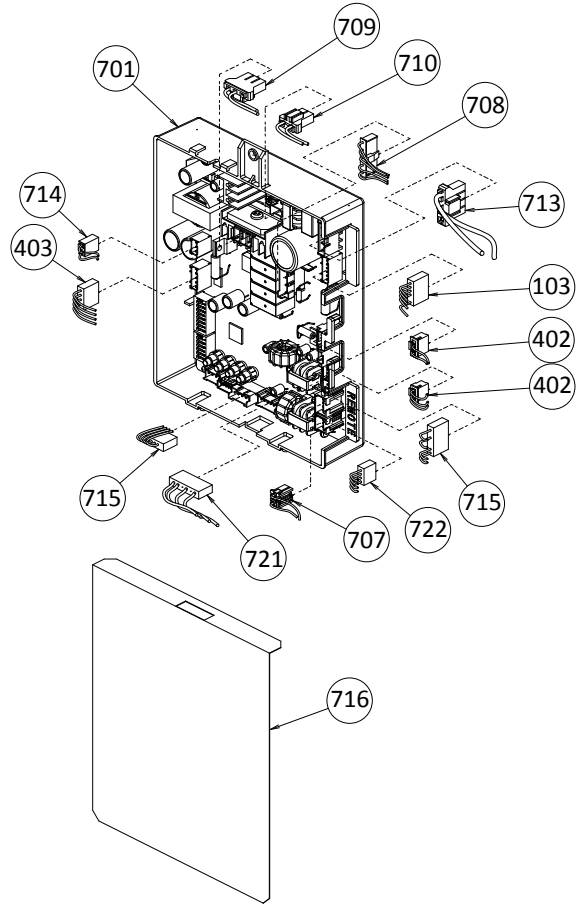
COMPONENT DIAGRAMS/ITEM NUMBERS (CONT.)

Computer board assembly

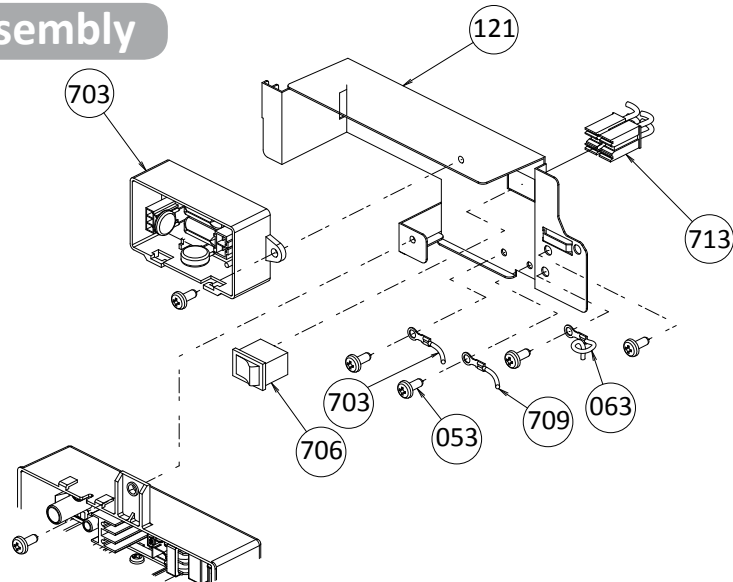
**240 (T-H3J) and
340 (T-H3S) model**



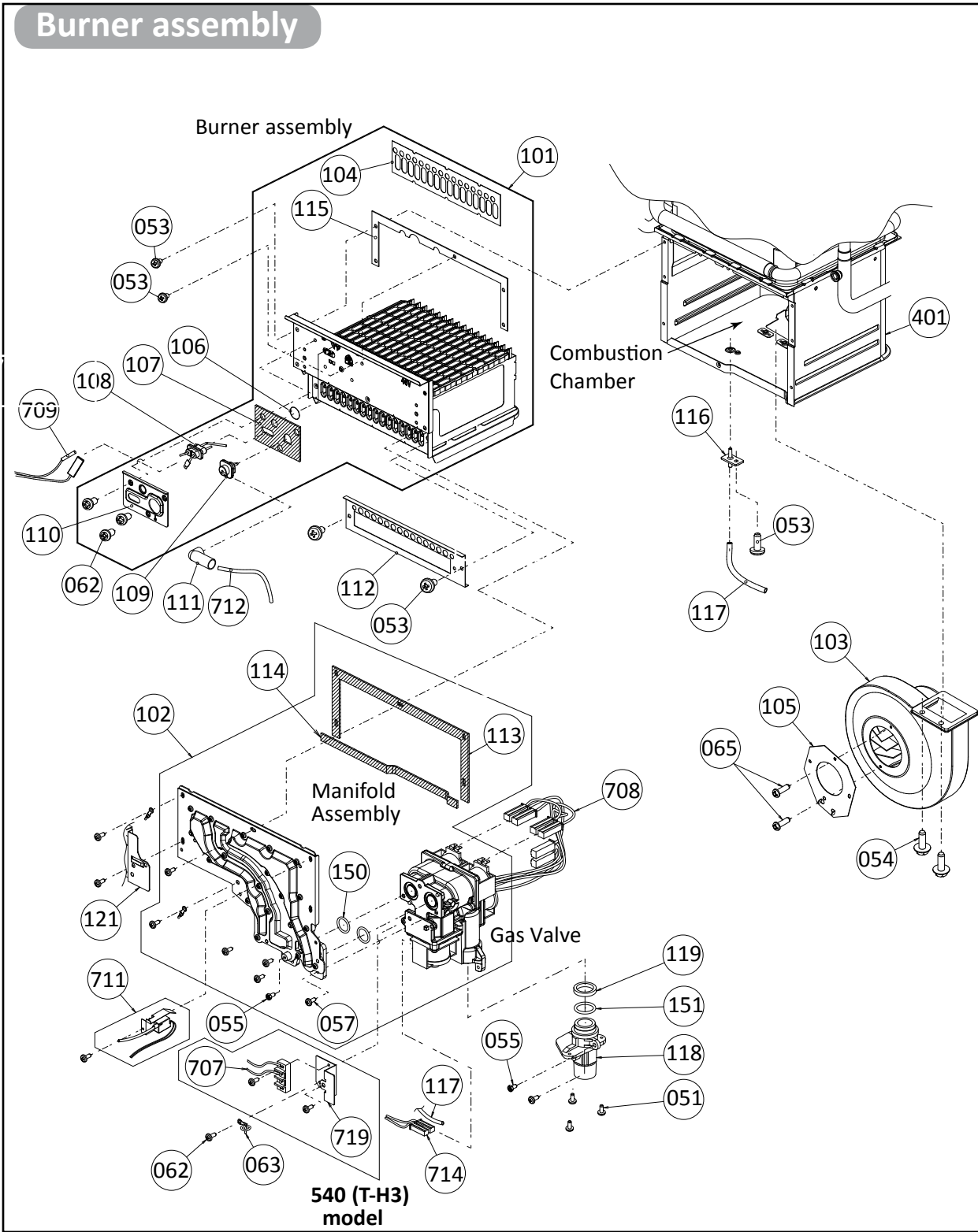
540 (T-H3) model



Surge box assembly



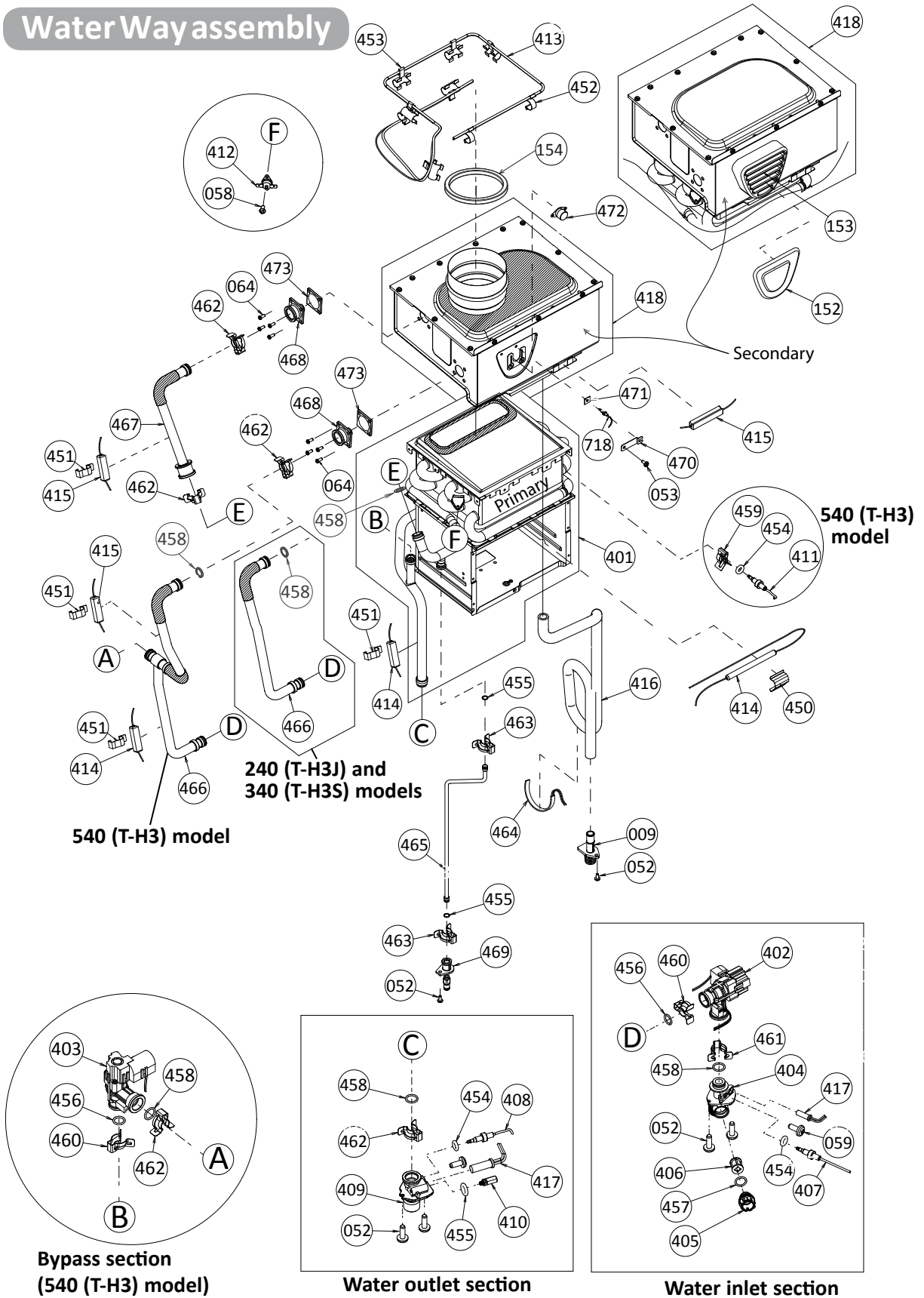
COMPONENT DIAGRAMS/ITEM NUMBERS (CONT.)



COMPONENTS

COMPONENT DIAGRAMS/ITEM NUMBERS (CONT.)

Water Way assembly



COMPONENTS



COMPONENT ITEM NUMBERS

Item #	Part #		Description
	240, 340, and 540 models	T-H3J, T-H3S and T-H3 models	
001	N/A	EK159	Case assembly for Indoor model
	N/A	EK164	Case assembly for Outdoor model
002	100074663	EK187	Front cover for 240 and 340 Indoor (T-H3J-DV and T-H3S-DV)
	100074664	EK188	Front cover for 240 and 340 Outdoor (T-H3J-DV and T-H3S-OS)
	100074665	EK158	Front cover for 540 Indoor (T-H3-DV)
	100074666	EK174	Front cover for 540 Outdoor (T-H3-OS)
003	100074667	EK170	Intake air port assembly
004	N/A	EK162	Bracket
005	100074668	EK190	Junction box for Outdoor model
006	100074669	EK171	Power supply cord assembly
007	N/A	EK161	Back guard panel
008	N/A	EK160	Chamber fixing plate
009	100074203	EKH23	Condensate drain port
050	N/A	EW000	Truss screw M4x12 (w/ washer) SUS410
051	N/A	EW001	Truss screw M4x10 (w/ washer) SUS410
052	N/A	EW002	Truss screw M4x10 (Coated) SUS3
053	N/A	EW003	Truss screw M4x10 SUS
054	N/A	EW004	Hex head screw M4x12 (W/Washer) SUS3
055	N/A	EW005	Hex Head screw M4x8 FeZn
056	N/A	EW018	Pan screw M4x20 SUS410
057	N/A	EKK31	Tap tight screw M4x12 FeZn
058	N/A	EW00A	Tapping screw M3x6 SUS3 Binding head
059	N/A	EW009	Tapping screw M4x6 SUS3 Truss head
060	N/A	EKK37	Screw M4x12
061	N/A	EK191	Screw M3x6
062	N/A	EW00D	Pan screw M4x8 MFZN
063	N/A	EM167	Wire clamp 60
064	N/A	EK230	Screw M4x10
065	N/A	EW00B	Screw M3x6 SUS3 binding head
101	100074670	EK192	Burner assembly
102	100074671	EK181	Manifold with gas valve assembly LP
	100074672	EK182	Manifold with gas valve assembly NA

COMPONENT ITEM NUMBERS (CONT.)

COMPONENTS

Item #	Part #		Description
	240, 340, and 540 models	T-H3J, T-H3S and T-H3 models	
103	100074606	EK109	Fan motor for Indoor models
	100074228	EKK25	Fan motor for Outdoor models
104	100074216	EKK2X	Burner gasket
105	100074466	EM381	Fan damper for Indoor model
106	100074218	EKK2V	Burner window
107	100074219	EKK2W	Rod holder gasket
108	100074673	EK193	Flame rod
109	100074222	EKK0F	Igniter rod
110	100074221	EKK32	Rod holder
111	100074223	EKN61	Rod cap
112	100074674	EK183	Burner damper LP
	100074675	EK169	Burner damper NA
113	100074229	EKK2Y	Manifold gasket A
114	100074230	EKK2K	Manifold gasket B
115	100074217	EKK0G	Burner holder gasket
116	100074227	EKK2D	Pressure port
117	N/A	EX019	Combustion chamber tube
118	100074616	EK117	Gas inlet
119	100074526	EX00D	Gas inlet ring
121	100074677	EK163	Surge box plate
150	100074533	EZP18	O-ring P18 NBR (Black)
151	100074242	EK042	O-ring P20 NBR (Black)
152	100074678	EK157	Silicon ring for Outdoor model
153	100074679	EK177	Exhaust port for Outdoor model
154	100074250	EKN50	Silicon ring (at top of secondary heat exchanger; indoor models)
401	100074698	EK252	Primary heat exchanger assembly for 240 (T-H3J) and 340 (T-H3S) models
	100074699	EK250	Primary heat exchanger assembly for 540 (T-H3) model
402	100074624	EK129	Flow adjustment valve / Flow sensor
403	100074625	EKD58	Bypass valve for 540 (T-H3) model
404	100074377	EKK1U	Water inlet
405	100074381	EKK2B	Inlet drain plug
406	100074382	EKK2C	Inlet water filter

COMPONENT ITEM NUMBERS (CONT.)

Item #	Part #		Description
	240, 340, and 540 models	T-H3J, T-H3S and T-H3 models	
407	100074398	EKK4J	Inlet thermistor for 240 (T-H3J) and 340 (T-H3S) models
	100074626	EK137	Inlet thermistor for 540 (T-H3) model
408	100074680	EK207	Outlet thermistor for 240 (T-H3J) and 340 (T-H3S) models
	100074374	EKK1A	Outlet thermistor for 540 (T-H3) model
409	100074681	EK208	Water outlet
410	100074383	EKK2E	Outlet drain plug
411	100074281	EKK2T	Heat exchanger thermistor for 540 (T-H3) model
412	100074412	EM212	High Limit switch for 240 (T-H3J) and 340 (T-H3S) models
	100074280	EKN34	High Limit switch for 540 (T-H3) model
413	100074334	EK333	Overheat-cut-off fuse
414	100074682	EK209	Pipe heater
415	100074683	EK210	Inlet heater for Indoor model
	100074684	EK211	Inlet heater for Outdoor model
416	100074685	EK231	Drain tube
417	100074629	EK105	Inlet heater
418	100074700	EK251	Secondary heat exchanger for Indoor model
	100074701	EK256	Secondary heat exchanger for Outdoor model
450	100074273	EKK27	Pipe heater fixing plate
451	100074310	EK031	Heater fixing plate 16
452	100074251	EKK26	Fuse fixing plate 18
453	100074331	EK029	Fuse fixing plate 14
454	100076303	EZM04	O-ring P4 FKM
455	100076305	EZM06	O-ring P6 FKM
456	100076306	EZM14	O-ring P14 FKM
457	100076307	EZM15	O-ring P15 FKM
458	100076308	EZM16	O-ring P16 FKM
459	100074282	EKH30	Fastener "4-11"
460	100074290	EKK24	Fastener "14-22"
461	100074410	EM192	Fastener "16A"
462	100074389	EKK39	Fastener "16-25A"
463	100074297	EX12K	Fastener "6-15"
464	100074686	EK217	Flat heater
465	100074687	EK218	Drain pipe

COMPONENT ITEM NUMBERS (CONT.)

COMPONENTS

Item #	Part #		Description
	240, 340, and 540 models	T-H3J, T-H3S and T-H3 models	
466	100074688	EK219	Cold pipe for 240 (T-H3J) and 340 (T-H3S) models
	100074689	EK220	Cold pipe for 540 (T-H3) model
467	100074690	EK222	Stainless heat exchanger out pipe
468	100074691	EK226	Header connection
469	100074692	EK228	Drain port
470	100074291	EX13H	Thermistor fixing plate
471	100074296	EK13L	Exhaust thermistor gasket
472	100074289	EKH6G	High limit switch for exhaust
473	100074693	EK229	Gasket
701	100074694	EK186	Computer board for 240 (T-H3J) model
	100074695	EK175	Computer board for 340 (T-H3S) model
	100074696	EK176	Computer board for 540 (T-H3) model
702	100074518	EX00B	Rubber grommet
703	100076100	EK280	Surge box
704	100074601	EK146	120 VAC wire for Indoor model
	100074697	EK143	120 VAC wire for Outdoor model
706	100074326	EKK4V	120 VAC Power ON-OFF switch
707	100074649	EK189	Remote controller wire for 240 (T-H3J) and 340 (T-H3S) models
	100074650	EK165	Remote controller wire for 540 (T-H3) model
708	100074651	EK168	Gas valve wire
709	100074652	EK166	Flame rod wire
710	100074653	EK172	EH-IG wire
711	100074640	EK153	Igniter assembly
713	100074655	EK184	Switch wire with thermostat for Indoor model
	100074656	EK185	Switch wire with thermostat for Outdoor model
714	100074657	EK167	Proportional gas valve wire
715	100074658	EK179	24V cables for 540 (T-H3) model
716	100074375	EKK1M	Computer board cover
717	N/A	EX13C	Cable clamp for Indoor model
718	100074316	EKH6E	Exhaust thermistor assembly for indoor model
719	100074644	EK152	Remote fixing plate for 540 (T-H3) model
721	100074659	EK180	Exhaust Hi-limit switch wire
722	100074660	EK173	Temperature controller for Indoor model

COMPONENT ITEM NUMBERS (CONT.)

Item #	Part #		Description
	240, 340, and 540 models	T-H3J, T-H3S and T-H3 models	
723	N/A	EK178	Fixing plate
724	100112572	TM-RE40	Temperature remote controller
	100209924	TM-RE42	Temperature remote controller

