

- Place the "Literature Bag" containing the Limited Warranty, this booklet, the venting manual, and any control or optional information in an accessible location near the heater.

DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of indirect-fired gas burning equipment requires a properly operating vent system that vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.

Always comply with the combustion air requirements in the installation codes and in Paragraph 6.2. Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. Model UDAP units installed in a confined space must be supplied with air for combustion as required by Code and in Paragraph 6.2 of this heater installation manual. MAINTAIN THE VENT OR VENT/COMBUSTION AIR SYSTEM IN STRUCTURALLY SOUND AND PROPER OPERATING CONDITION.

10. Maintenance and Service

WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

The material contained in the MAINTENANCE AND SERVICE Section of this manual is designed to aid a qualified service person in maintaining and servicing this equipment. This heater will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

When any service is completed, be careful to reassemble correctly to ensure that no unsafe conditions are created. When re-lighting, always follow the lighting instructions on the heater.

Maintenance Schedule - The following procedures should be carried out at least annually (See **FIGURE 18** and Paragraphs 10.2.1 - 10.2.14.):

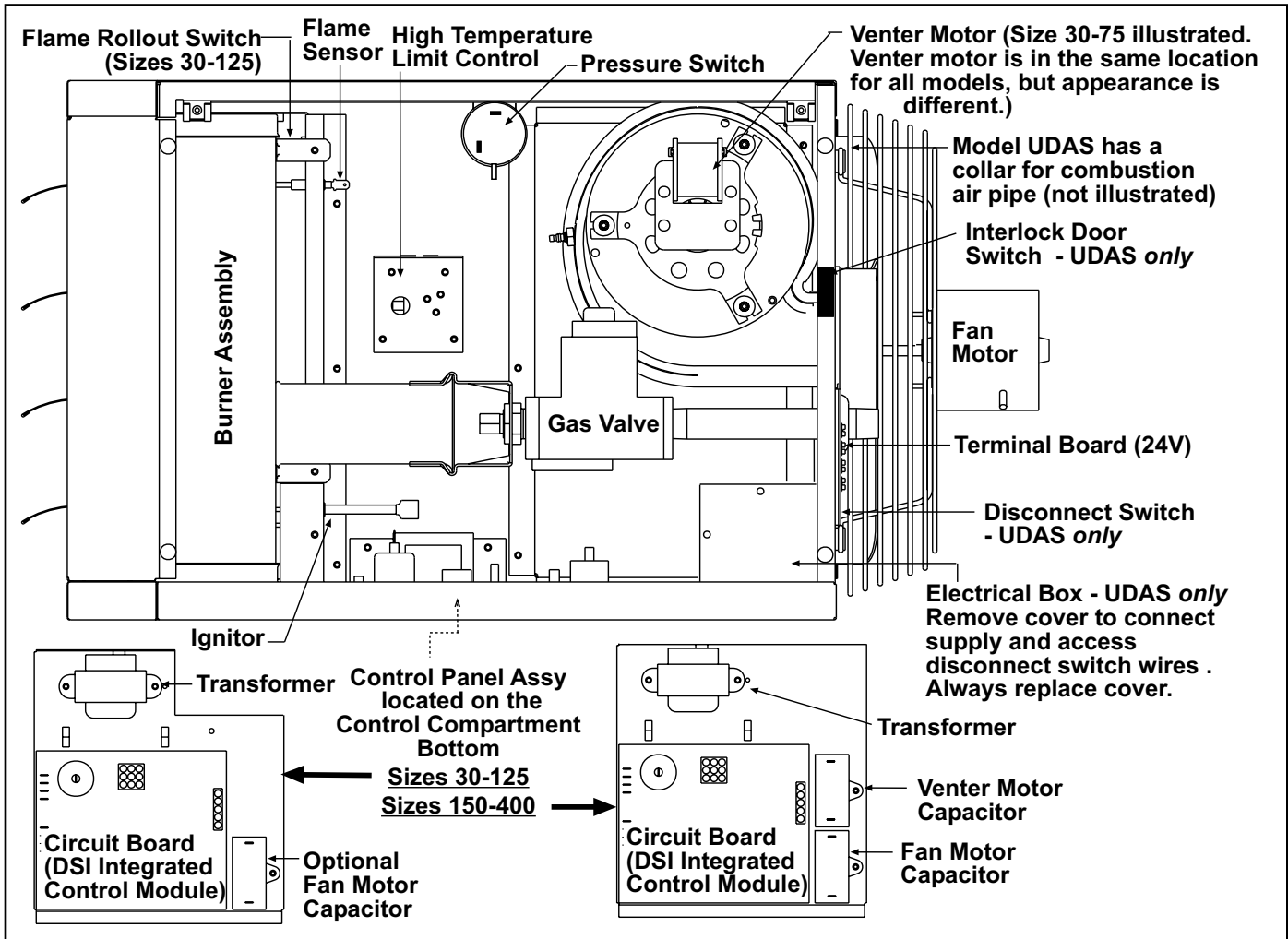
- Clean all dirt, lint, and grease from the combustion air opening (UDAP) and venter assembly.
- Clean all dirt, lint, and grease from the fan blade, fan guard, and motor.
- Check the heat exchanger both internally and externally.
- Check the burner for scale, dust, or lint accumulation. Clean if needed.
- Check gas valve to ensure that gas flow is being shutoff completely.
- Check the vent or vent/combustion air system for soundness. Clean openings. Replace any parts that do not appear sound.
- Check the wiring for any damaged wire. Replace damaged wiring. (See Paragraph 7 for replacement wiring requirements.)

10.1 Maintenance Schedule

NOTE: If replacement parts are required, use only factory-authorized parts.

10. Maintenance and Service (cont'd)

FIGURE 18 - Location of Controls



10.2 Maintenance Procedures

10.2.1 Heat Exchanger Maintenance

This heater has a T_{CORE}²® heat exchanger.

Remove any external dirt or dust accumulation. Visually check the heat exchanger for cracks and holes. If a crack or hole is observed, replace the heat exchanger.

NOTE: Inspection of the lower portion of the heat exchanger is done with the burner removed. See the Burner Service section below for information on inspecting the lower portion of the heat exchanger.

10.2.2 Burner Maintenance

This heater is equipped with a T_{CORE}²® burner.

Inspect the burner/control compartment annually to determine if cleaning is necessary. If there is an accumulation of dirt, dust, and/or lint, clean the compartment and follow the instructions below to remove and clean the burner.

Burner Removal Instructions (Refer to FIGURE 19.)

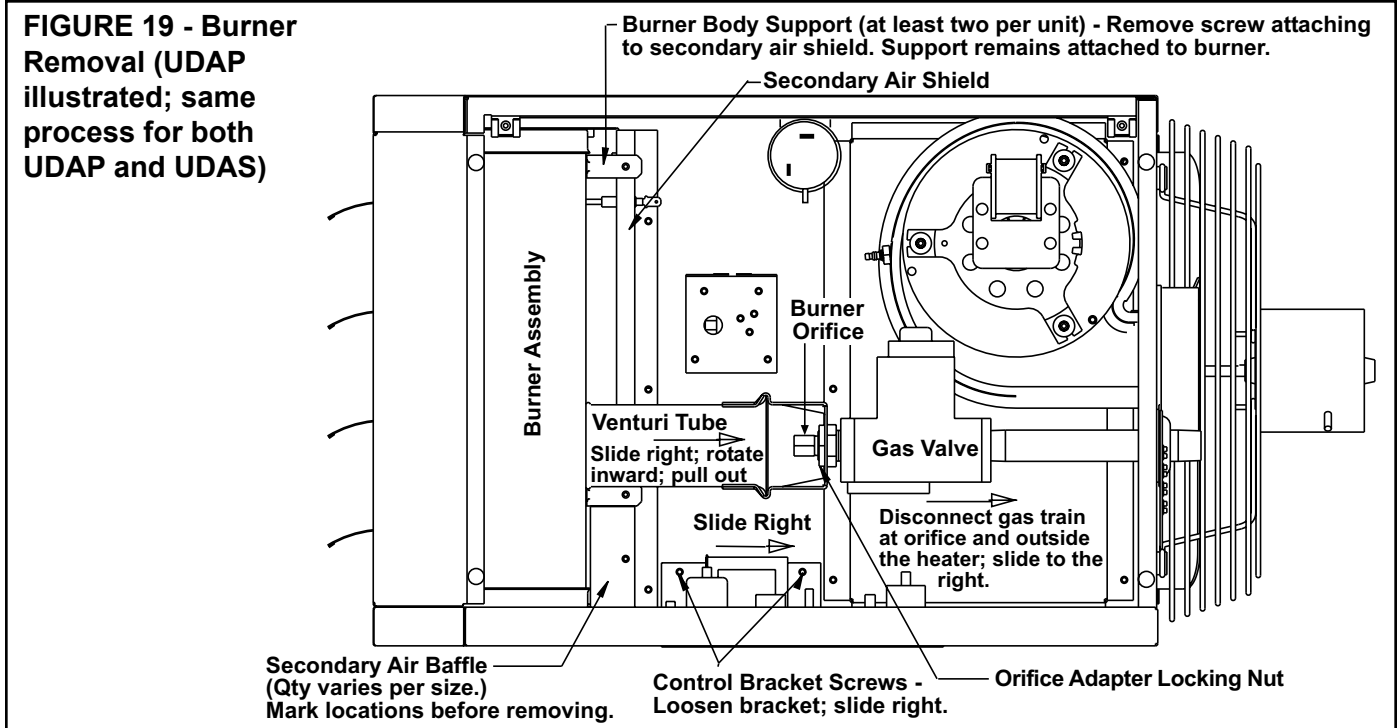
1. Outside the cabinet, shut the gas supply off at the manual valve ahead of the union.
2. Turn off electric supply.
3. Disconnect the gas supply at the union outside of the cabinet.
4. Remove the access panel.
5. **Disconnect and Move the Gas Train** - At the gas valve, mark and disconnect the wires. Carefully remove the burner orifice and orifice adapter locking nut. Slide the orifice adapter out through the bracket on the burner pushing the gas train to the right. This will move the gas train out of the way.
6. **Move the Control Assembly** - Remove the two screws holding the control assembly bracket. Being careful not to disconnect any wires, slide the control assembly to the right.

CAUTION: Use of eye protection is recommended.

7. Remove Secondary Air Baffles (Sizes 60-400 only) - Vertical along the right side of the burner, locate the flat plate(s) identified as the secondary air baffle(s). The quantity of baffles could be one to four depending on heater size. Each baffle is held in place by one screw. **For re-assembly, on the secondary air shield, mark the location (top and bottom) of each baffle.** Remove all baffles.

8. Remove Burner Assembly

- a) Locate the burner body supports. Depending on the size, the burner will have two or more supports. At each support, remove the one screw that attaches it to the secondary air shield
- b) Holding the venturi tube, slide the entire burner assembly slightly to the right to disengage the burner from the supports on the left. Then rotate the open end of the venturi tube inward toward the heater. Carefully pull the burner assembly out of the cabinet.



Inspect and Clean the Burner

With the burner assembly removed, shine a flashlight on the burner ribbons. Look for carbon buildup, scale, dust, lint, and/or anything that might restrict flow through the spaces between the burner ribbons. Holding the burner assembly so that any foreign material will fall away from the burner, use a stiff bristle brush to loosen and remove any foreign material(s). If the burner is excessively dirty, remove one of the burner end caps. Remove the four screws that hold the end cap to the burner housing. Lightly tap the end cap to remove it.

Clean all foreign material from the burner and venturi. After the burner is thoroughly clean, replace the end cap making certain that it is tight against the burner housing. **NOTE:** If any of the burner components are damaged or deteriorated, replace the burner assembly.

Inspect the Lower Portion of the Heat Exchanger (with burner assembly removed)

At the burner flame entrance of each tube, shine a bright light into each heat exchanger section. With the light shining into the heat exchanger, observe the outside for visible light. Repeat this procedure with each heat exchanger section. If any light is observed, replace the heat exchanger.

Re-Install the Burner

Instructions to Re-Install the Burner (Refer to FIGURE 19)

- 1. Attach the Burner Assembly** - Holding the venturi tube, slide the entire burner assembly into position. Align the supports on the left side with the slots in the

10. Maintenance and Service (cont'd)

10.2 Maintenance Procedures (cont'd)

10.2.2 Burner Maintenance (cont'd)

Re-Install the Burner (cont'd)

- burner shield; sliding the supports into the slots. On the right, re-attach each burner body support to the secondary air shield.
2. **Attach the Secondary Air Baffles (Sizes 60-400 only)** - Re-attach the secondary air baffles as marked. Baffles may be different sizes and each **must** be attached in the correct location.
 3. **Attach the Control Assembly** - Carefully slide the control assembly into position. Re-attach with the same screws. Check to be sure all wire connections are secure.
 4. **Attach the Gas Train** - Slide the gas train so that the orifice adapter is through the bracket. Fasten the gas train to the bracket with the locking nut. Install the gas orifice. Re-connect the wires to the gas valve.
 5. Close the access panel.
 6. Reconnect the gas supply at the union outside of the cabinet. Leak test the connection with leak detecting solution.
 7. Turn on the electric and the gas. Check for proper operation.

10.2.3 Burner Orifice

Burner orifice usually only needs to be replaced when installing a gas conversion kit. If ordering a replacement orifice only, give BTUH content and specific gravity of gas, as well as the model and serial number of the unit. When removing or replacing the burner orifice, be careful not to damage the venturi tube and/or the bracket.

10.2.4 Ignition System

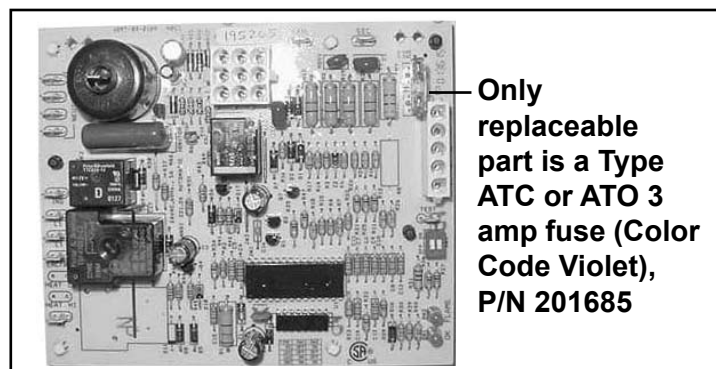
DSI Integrated Control Module (circuit board) - See **FIGURE 20**. The module monitors the operation of the heater including ignition. The only replaceable component is the 3 amp Type ATC or ATO fuse. If the fuse is blown, the problem is most likely an external overload. Correct the problem and replace the fuse.

Do not attempt to disassemble the control module. However, each heating season check the lead wires for insulation deterioration and good connections.

Proper operation of the direct spark ignition system requires a minimum flame signal of 1.0 microamps as measured by a microammeter.

FIGURE 20 - DSI Integrated Control Module (Circuit Board)

CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized. See Hazard Levels, page 2.



For further information and check out procedure on the direct spark ignition system, refer to Paragraph 8.3 and the Troubleshooting Flow Chart in Paragraph 10.3.

Ignitor - Refer to **FIGURE 18** and locate the ignitor. Disconnect the wire; remove the screw and the ignitor. Clean the ignitor assembly with an emery cloth.

Spark gap must be maintained to 1/8". See **FIGURE 21**.

IMPORTANT: When re-assembling, the brown ground wire must remain attached to the ignitor.

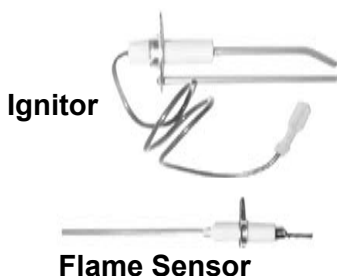
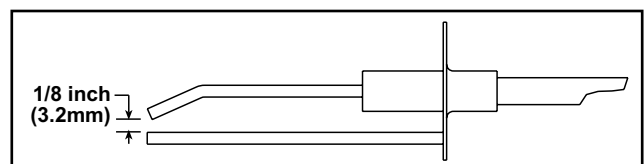


FIGURE 21 - Ignitor showing required Spark Gap measurement

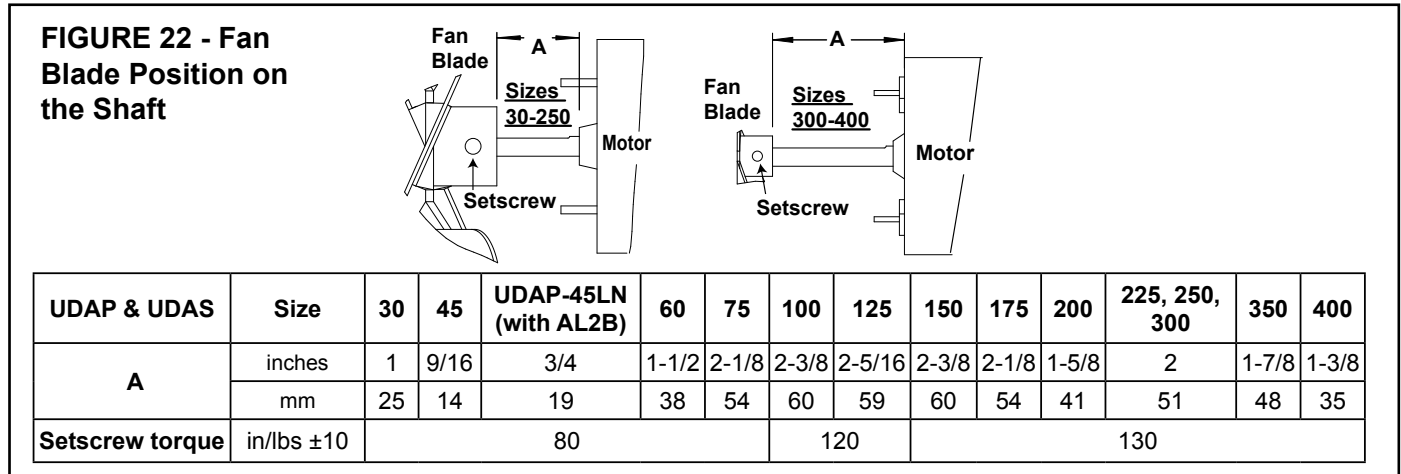


Flame Sensor - Refer to **FIGURE 18** and locate the flame sensor. Disconnect the wire; remove the screw and the flame sensor. Clean with an emery cloth.

10.2.5 Fan Motor, Fan Blades, and Guard

Remove dirt and grease from the motor, the fan guard, and blades. Use care when cleaning the fan blades to prevent causing misalignment or imbalance. Check that the hub of the fan blades is secure to the shaft.

Follow these instructions for replacement of the fan guard, fan motor and/or fan blades.



1. If the heater is installed, turn off the gas and disconnect the electric power.
2. Open the access door and disconnect the fan motor wires, capacitor wires at the capacitor, and ground screw.
3. Remove the assembled parts (the fan guard, the motor and the fan blade).
4. Disassemble and replace whatever parts are needed and reassemble using whatever part(s) are being replaced and the original parts.

Be sure the fan blade is in the proper position on the shaft; refer to the illustration and table in **FIGURE 22**.

Position the assembly on the heater. Attach the fan guard.

Rotate the fan blade to check for adequate clearance. If adjustment is required, loosen the mounting screws, re-position the fan guard, and tighten the screws. Rotate the fan blade and re-check for adequate clearance. Repeat this procedure until the assembly is positioned properly.

5. Reconnect the fan motor wires according to the wiring diagram and close the access panel.
6. Restore power to the heater and turn on the gas. Light, following the instructions on the lighting instruction plate. Check for proper operation.

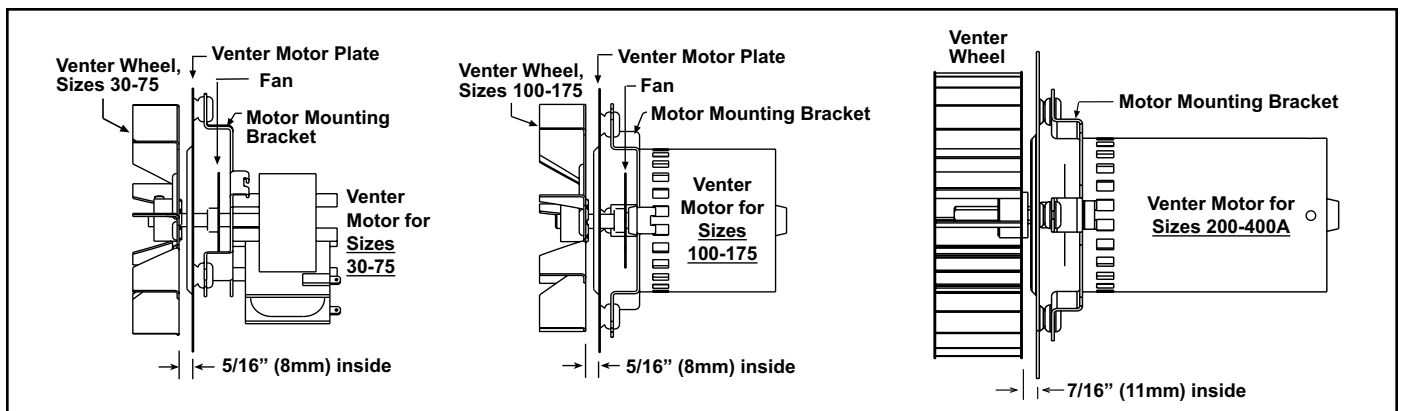
10.2.6 Venter Motor and Wheel

Replacement Instructions

Remove dirt and grease from the motor casing, the venter housing, and the venter wheel. Venter motor bearings are permanently lubricated. Follow these instructions for replacement of the venter motor and wheel assembly. Keep all hardware removed to be used in re-assembling and installing the replacement parts.

1. Turn off the gas and disconnect the electric power.
2. Open the burner/control compartment access panel.

FIGURE 23 - Venter Wheel Position on Shaft



10. Maintenance and Service (cont'd)

10.2 Maintenance Procedures (cont'd)

3. Disconnect the three venter motor wires at the DSI control, capacitor wires at the capacitor (if applicable), and ground screw (located on the control panel).
4. Sizes 30 and 45 - Disconnect the gas train and move it out of the way. Disconnect the gas supply at the union outside of the cabinet. At the gas valve, mark and disconnect the wires. Carefully remove the burner orifice and orifice adapter locking nut. Slide the orifice adapter out through the bracket on the burner pushing the gas train to the right. This will move the gas train out of the way.
5. Holding the venter motor, remove the three or four screws that attach the venter motor mounting plate to the venter housing. Remove the motor and wheel assembly from the heater.
6. Re-assemble with the replacement venter motor and wheel assembly. See **FIGURE 23**.
7. Follow the wiring diagram to connect the venter wires.
8. Sizes 30 and 45 - Reconnect the gas supply at the union outside of the cabinet. Leak test the connection with leak detecting solution.
9. Replace the access panel. Restore power to the heater and turn on the gas. Light, following the instructions on the lighting instruction plate. Check for proper operation.

10.2.7 Operating Gas Valve

WARNING: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting to the unit to ensure positive closure. See Hazard Levels, page 2.

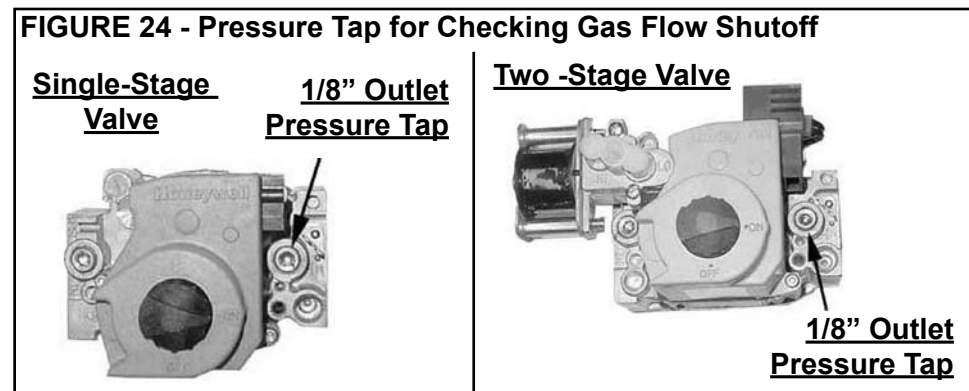
NOTE: Operational pressure settings and instructions for checking pressure settings are in Paragraph 6.1.

Carefully remove external dirt accumulation and check wiring connections.

The combination gas valve must be checked annually to ensure that the valve is shutting off gas flow completely.

Instructions:

- 1) Locate the 1/8" NPT pressure tap on the combination valve.



- 2) With the manual valve turned off to prevent flow to the gas valve, connect a manometer to the 1/8" outlet pressure tap in the valve. **NOTE:** A manometer (fluid-filled gauge) is recommended.
- 3) Turn the manual valve to the ON position and the heater OFF. Use your finger to fully block the main burner orifice for several seconds. Observe the manometer with the orifice blocked, and if any pressure is indicated, the gas valve is leaking. **A leaking gas valve must be replaced before the heater is put back in operation.**

10.2.8 Combustion Air Pressure Switch



See **FIGURE 18**, page 30, for location. (**NOTE:** Depending on date of manufacture and size, pressure switch may not be in the location indicated. Check the control bracket on the bottom of the compartment or further down on the compartment wall.) If it is determined that the pressure switch needs replacing, use only the factory-authorized replacement part that is designed for the model and size of heater being serviced.

NOTE: A unit operating above 6000 ft (1830M) elevation requires a high altitude pressure switch. See Paragraph 3.2.

10.2.9 Limit Control



If it is determined that the limit control needs replacing, use only a factory-authorized replacement part that is designed for the size of heater. For approximate limit location, see **FIGURE 18**, page 30.

10.2.10 Flame Rollout Switch - Sizes 30-125 only



For location, see **FIGURE 18**, page 30.

The cause of a flame rollout switch activating must be determined. Activation of the manually reset flame rollout switch could be caused by one or more of the following:

- Restricted or plugged heat exchanger
- Too much building exhaust
- Manifold gas pressure too high
- Restricted combustion air inlet or exhaust outlet in combination with a defective pressure switch
- Electrical power interruption during operation
- Unit being operated with a line voltage disconnect (a 24-volt thermostat is required)

If a flame rollout switch trips, inspect the burner/control compartment for signs of excessive heat and burned wiring.

If the compartment appears normal, reset by depressing the red button on the switch. 15 to 20 minutes are required for the switch to cool sufficiently for resetting. A distinct click will be felt when the switch resets. Operate the furnace. If the flame rollout switch trips again, determine and correct the cause before resetting the switch.

If there is damage to the control compartment, repairs must be made before resetting the switch.

If it is determined that the flame rollout switch needs replacing, use only the factory-authorized replacement part that is designed for that size of heater.

The disconnect switch is located in the sealed electrical box inside the control compartment with the toggle on the rear of the heater.

10.2.11. Door Switch - UDAS only



If it is determined that the door switch needs replacing, use only a factory-authorized replacement part that is designed for the heater.

For approximate switch location, see **FIGURE 18**, page 30.

10.2.12 Transformer



See **FIGURE 18**, page 30, for location. Use a voltmeter to verify that there are 24 volts output from the transformer. If the transformer is not functioning, it must be replaced. Use a replacement transformer identical to the factory-installed model.

10.2.13 Disconnect Switch - UDAS only



If it is determined that the disconnect switch needs replacing, use only the factory-authorized replacement part that is designed for the heater. Always replace electrical box cover.

10.2.14 Vent or Vent/Combustion Air System

Check the complete system at least once a year. Inspection should include all joints, seams, concentric adapter box (UDAS), inlet air guard or inlet air cap (UDAS), and the vent terminal cap. Clean openings. Replace any defective parts.

10.3 Troubleshooting

Check the Lights on the DSI Integrated Control Module (Circuit Board)

The integrated circuit board monitors the operation of the heater and includes two LED signal lights that indicate normal operation and various abnormal conditions. If the heater fails to operate properly, check this signal to determine the cause and/or to eliminate certain causes. LED is visible through viewport on Model UDAS. Remove access panel on Model UDAP. See operating sequence in Paragraph 9.

Do not attempt to repair the DSI integrated control module (circuit board); the only field replaceable component is the fuse.

10.3 Troubleshooting (cont'd)

IMPORTANT: When using a multimeter to troubleshoot the 24 volt circuit, place the meter's test leads into the 5 or 9 pin connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings due to the ignition control board's fault mode monitoring circuits.

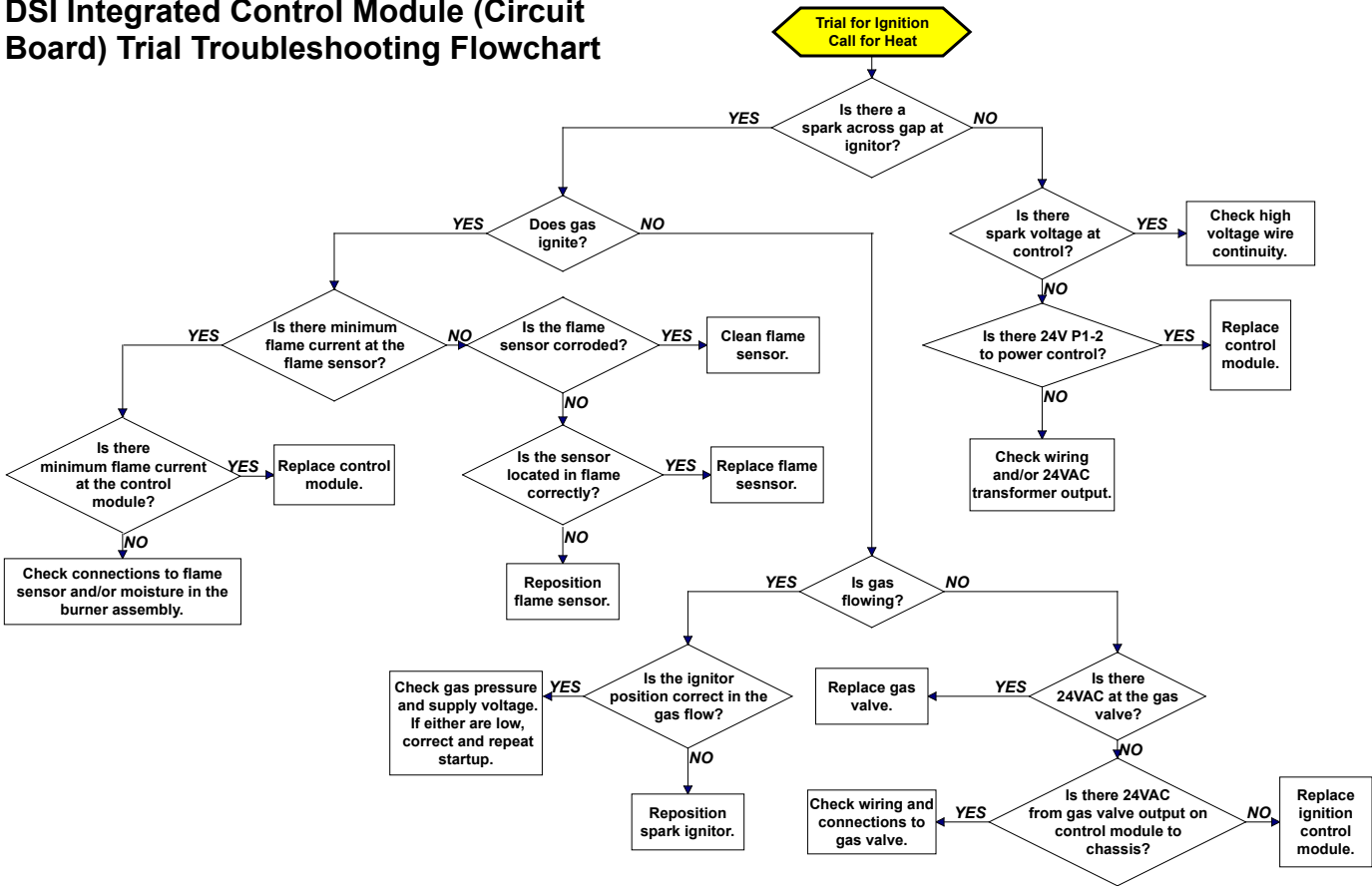
Control Status - Green LED Codes

- Steady ON Normal Operation, No call for heat
- Fast Flash . Normal Operation, Call for heat
- 1 Flash System Lockout, Failed to detect or sustain flame
- 2 Flashes .. Pressure Switch Did Not Close within 30 Seconds of Venter Motor
- 3 Flashes .. High Limit or Flame Rollout Switch Open
- 4 Flashes Pressure Switch is Closed Before Venter Motor is Energized
- Steady OFF Blown fuse, No Power, or Defective Board

Flame Status - Yellow LED Codes

- Steady ON .. Flame is sensed
- Slow Flash .. Weak flame (current below 1.0 microamps ± 50%)
- Fast Flash ... Undesired Flame (valve open and no call for heat)

DSI Integrated Control Module (Circuit Board) Trial Troubleshooting Flowchart



General Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
Venter motor will not start	1. No power to unit.	1. Turn on power, check supply fuses or circuit breaker.
	2. No 24 volt power to integrated circuit board.	2. Turn up thermostat; check control transformer output.
	3. Integrated circuit board fuse blown.	3. Correct cause. Replace fuse (type ATC or ATO, 32VDC, 3A).
	4. No power to venter motor.	4. Tighten connections at circuit board and/or motor terminals.
	5. Integrated circuit board defective.	5. Replace integrated circuit board.
	6. Defective venter motor.	6. Replace venter motor. See Paragraph 29.
Burner will not light	1. Manual valve not open.	1. Open manual valve.
	2. Air in the gas line.	2. Bleed gas line (initial startup only).
	3. Gas pressure too high or too low.	3. Supply pressure should be 5" - 14" w.c. for natural gas or 11" - 14" w.c. for propane gas.
	4. No Spark: a) Loose wire connections. b) Transformer failure.	4. a) Be certain all wire connections are solid. b) Be sure 24 volts is available.

PROBLEM (cont'd)	PROBABLE CAUSE (cont'd)	REMEDY (cont'd)
Burner will not light (cont'd)	4. No Spark (cont'd): c) Incorrect spark gap. d) Spark cable shorted to ground. e) Spark electrode shorted to ground. f) Burner not grounded. g) Circuit board not grounded. h) Unit not properly grounded. i) Integrated circuit board fuse blown. j) Faulty integrated circuit board.	4. (cont'd) c) Maintain spark gap at 1/8". d) Replace worn or grounded spark cable. e) Replace if ceramic spark electrode is cracked or grounded. f) Make certain integrated circuit board is grounded to ignitor. g) Make certain integrated circuit board is grounded to furnace chassis. h) Make certain unit is properly field grounded to earth ground and properly phased (L1 to hot lead L2 to neutral). i) Correct cause. Replace fuse (type ATC or ATO, 32VDC, 3A). j) If 24 volt is available to the integrated circuit board and all other causes have been eliminated, replace board.
	5. Lockout device interrupting control circuit by above causes.	5. Reset lockout by interrupting control at the thermostat or main power.
	6. Combustion air proving switch not closing.	6. a) Make sure unit is properly vented . b) Remove obstructions from vent. c) Replace faulty tubing to pressure switch.
	7. Faulty combustion air proving switch.	7. Replace combustion air proving switch.
	8. Main valve not operating. a) Defective valve. b) Loose wire connections	8. a) If 24 volt is measured at the valve connections and valve remains closed, replace valve. b) Check and tighten all wiring connections.
	9. Integrated circuit board does not power main valve. a) Loose wire connections. b) Flame sensor grounded. c) Incorrect gas pressure. d) Cracked ceramic at sensor.	9. a) Check and tighten all wiring connections. b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required. c) Supply pressure should be 5" - 14" w.c. for natural gas or 11" - 14" w.c. for propane gas. d) Replace sensor.
Burner cycle on and off	1. Gas pressure too high or too low.	1. Supply pressure should be 5" - 14" w.c. for natural gas or 11" - 14" w.c. for propane gas.
	2. Burner not grounded	2. Make certain integrated circuit board is grounded to ignitor.
	3. Circuit board not grounded.	3. Make certain integrated circuit board is grounded to furnace chassis.
	4. Faulty integrated circuit board	4. If 24 volt is available to the integrated circuit board and all other causes have been eliminated, replace board.
	5. Combustion air proving switch not closing.	5. a) Make sure unit is properly vented. b) Remove obstructions from vent. c) Replace faulty tubing to pressure switch.
	6. Faulty combustion air proving switch.	6. Replace combustion air proving switch.
	7. Flame sensor grounded.	7. Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.
	8. Cracked ceramic at sensor.	8. Replace sensor.
	9. Incorrect polarity.	9. Reverse line volt leads to integrated circuit board.
	10. Pin terminal loose on 9 pin plug.	10. Replace wire harness.
No heat (Heater Operating)	1. Incorrect valve outlet pressure or orifice.	1. Check valve outlet pressure. See Rating plate for manifold pressure.
	2. Cycling on limit control.	2. Check air throughput.
	3. Improper thermostat location or adjustment.	3. See thermostat manufacturer's instructions.
Fan or venter motor will not run	1. Circuit open.	1. Check wiring and connections.
	2. Defective integrated circuit board.	2. Replace board.
	3. Defective motor or starter.	3. Replace motor or starter.
Fan or venter motor turns on and off while burner is operating	1. Motor overload device cycling on and off.	1. Check motor load against motor rating plate. Replace motor if needed.
Fan or venter motor cuts out on overload	1. Low or high voltage supply.	1. Correct electric supply.
	2. Defective motor.	2. Replace motor.
	3. Poor airflow.	3. Clean motor, fan, fan guard, filter, and coils