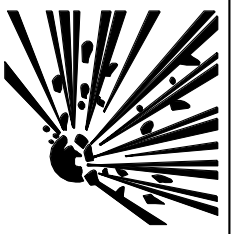
14.0) INSTRUCTIONS FOR PRESSURE TEST GAUGE CONNECTION

⚠WARNING

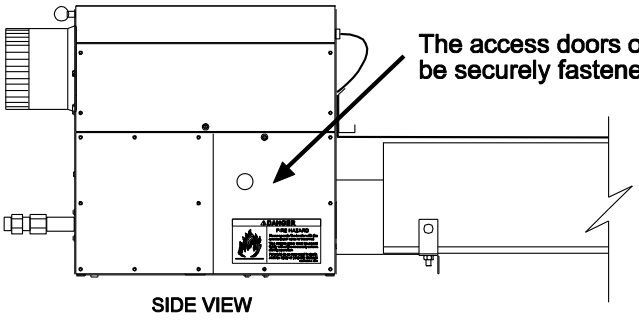


FIRE AND EXPLOSION HAZARD

Never operate the heater with the access panel open or removed.

The access panels must be closed tightly with all the necessary screws during operation.

Failure to do so may result in death, serious injury or property damage.



The access doors on either side of the burner must be securely fastened before operating the heater.

SIDE VIEW

SUPPLY PRESSURE

1. The installer will provide a 1/8" N.P.T. tapped plug, accessible for test gauge connection immediately upstream of the gas supply connection to the heater.

OUTLET GAS PRESSURE CHECK AND ADJUSTMENTS

Gauges that measure pressure in pounds per square inch are not accurate enough to measure or set the manifold pressure. All measurements **MUST BE** made when the heater and all other gas burning equipment that are connectied to the gas supply system are operating at maximum capacity. The combination gas valve is factory set and should not need adjustment. If gas pressure adjustment is required, follow the instructions:

1. Turn off all electrical power to the system to connect manometer hoses.
2. Turn the pressure test screw (3/32" Hex) in the center of the boss **not more than one turn counterclockwise.** Attach a 5/16" hose and manometer over the tapered outlet pressure boss on the valve (see **Figures 1** and **2** below). If regulator needs to be adjusted, see instructions below.

TO ADJUST REGULATOR (single stage gas valves):

1. Turn on power and energize the main gas valve. Remove regulator cover screw (see **Figure 1** below). Turn regulator adjustment screw **clockwise** ↻ **to increase presure**, or **counterclockwise** ↺ to decrease pressure. Replace regulator cover screw and tighten securely.

DO NOT EXCEED THE PRESSURES SHOWN IN THE GAS PRESSURE TABLE.

2. After testing pressure and adjusting the regulator, turn off all electrical power to the system, remove manometer hoses, turn outlet test screw (3/32" Hex) clockwise to seal pressure port. Tighten to 7 in lb minimum. Turn on system power.

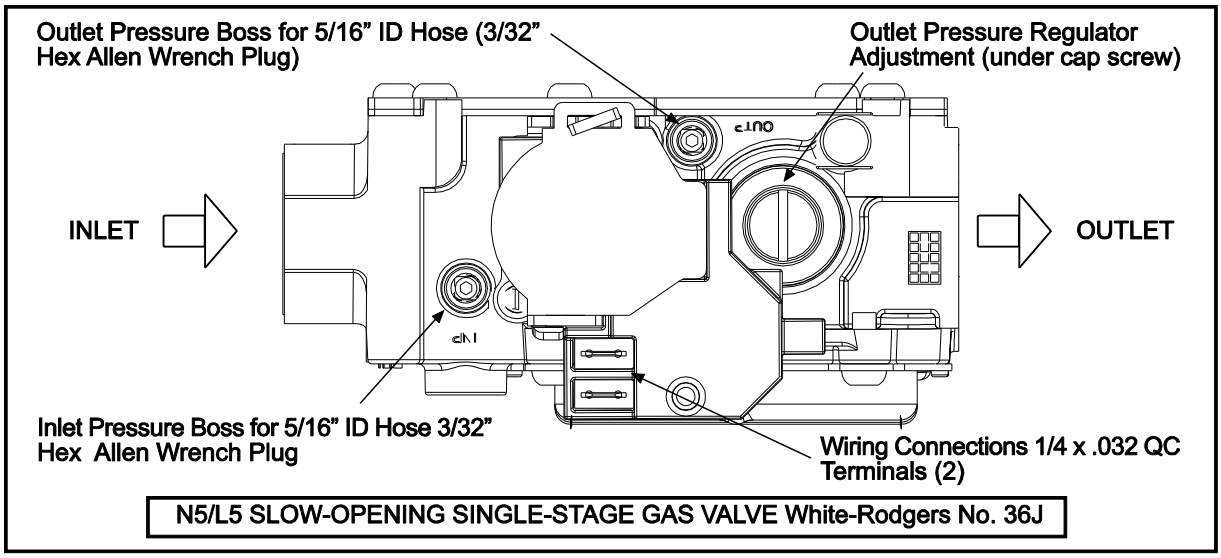


Figure 1

TO ADJUST REGULATOR (two stage gas valves):

1. Turn on power and energize main gas valve solenoid. Do not energize the **HI** solenoid.
2. Remove regulator cover screw from the **low** outlet pressure regulator (see **Figure 2** below) and turn screw clockwise ↻ to increase pressure, or counterclockwise ↺ to decrease pressure. Replace regulator cover screw and tighten securely.
3. Energize main gas valve solenoid as well as the **HI** terminal.
4. Remove regulator cover screw from the **high** outlet pressure regulator (see **Figure 2** below) and turn screw clockwise ↻ to increase pressure, or counterclockwise ↺ to decrease pressure. Replace regulator cover screw and tighten securely.

DO NOT EXCEED THE PRESSURES SHOWN IN THE GAS PRESSURE TABLE.

5. After testing pressure and adjusting the regulator, turn off all electrical power to the system, remove manometer hoses, turn outlet test screw (3/32" Hex) clockwise to seal pressure port. Tighten to 7 in-lb minimum. Turn on system power.

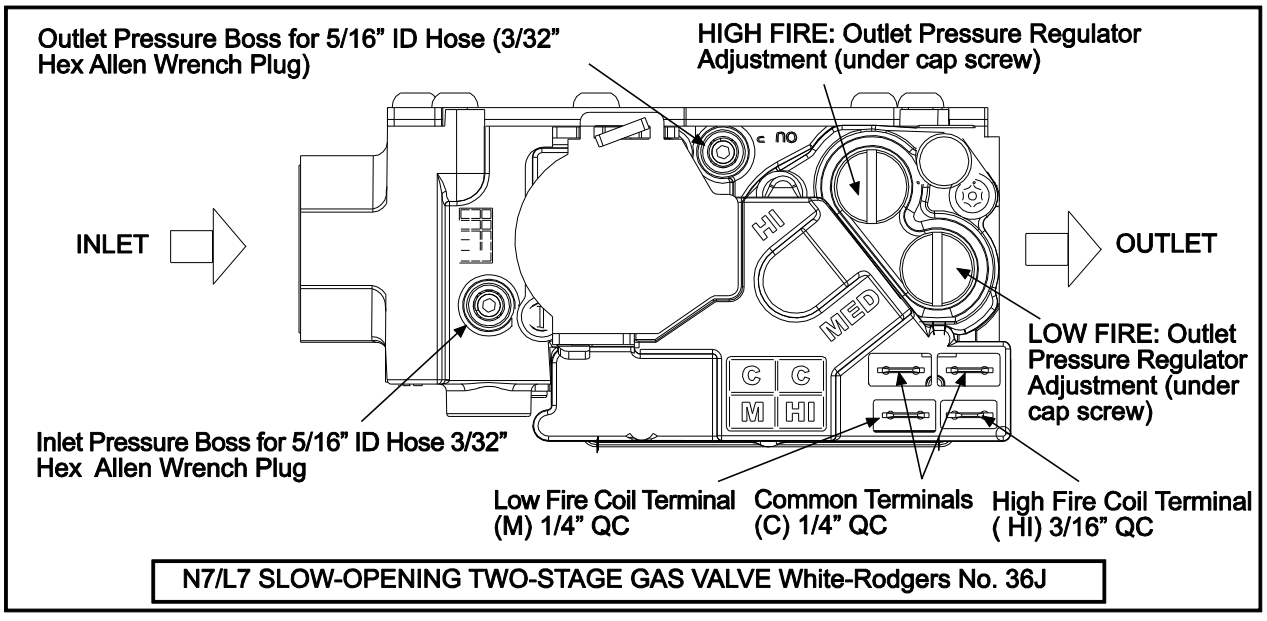


Figure 2

GAS PRESSURE TABLE				
GAS TYPE	MANIFOLD PRESSURE *High*	*Low (2-stage only)*	SUPPLY PRESSURE *Minimum**	*Maximum*
Natural Gas	3.5" W.C.	1.4" W.C.	5" W.C.[1]	14" W.C.
Propane Gas	10.0" W.C.	4.0" W.C.	11" W.C.[2]	14" W.C.

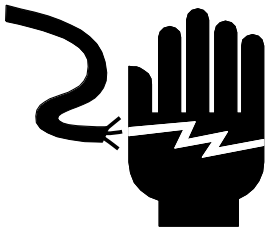
* Minimum permissible gas supply pressure for purpose of input adjustment.

[1] 7" W.C. for Models 150-200

[2] 12" W.C. for Model 200

15.0) ELECTRICAL CONNECTIONS

⚠ WARNING



ELECTRIC SHOCK HAZARD

Disconnect electrical power and gas supply before servicing.

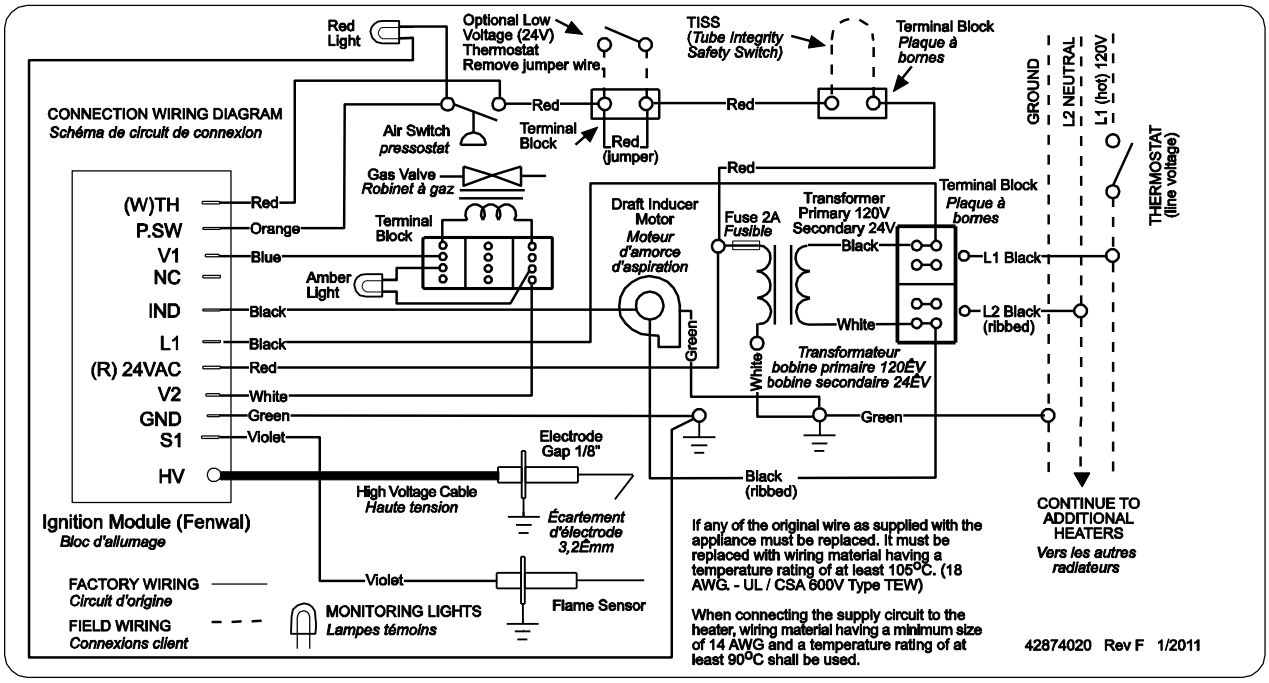
This appliance must be connected to a properly grounded electrical source.

Failure to do so may result in death or serious injury.

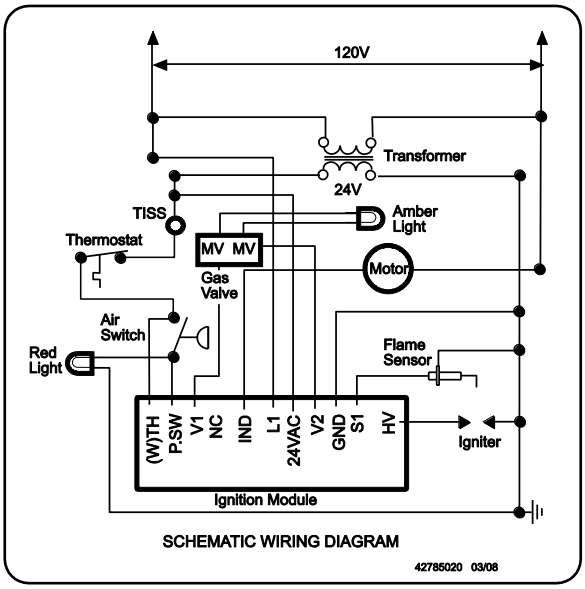
1. All electric wiring shall conform to the latest edition of the National Electrical Code (ANSI/NFPA No. 70), or the code legally authorized in the locality where the installation is made.
2. The unit must be electrically grounded in accordance with the National Electrical Code (ANSI/NFPA No. 70-latest edition). In Canada, refer to current standard C22.1 Canadian Electrical Code Part 1.
3. The wiring providing power to the heater shall be connected to a permanently live electrical circuit, one that is not controlled by a light switch.
4. The power supply to the unit should be protected with a fused disconnect switch or circuit breaker. A service switch, as required by local codes, shall be located in the vicinity of the heater (check local codes for allowable distances) and should be identified as Heater Service Switch. All electrical wiring must be located in accordance with the required Clearances to Combustibles from the heater as listed on the nameplate on the heater.
5. Connection to the power supply is provided by an 18/3 gauge x 72" long cord with grounded 3 prong plug.
6. The post purge function of the burner (fan on for 30 seconds after the call for heat) will only be enabled when using a 24 Volt thermostat. With the line Voltage thermostat post purge operation is disabled.
7. If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105ºC. (18 Ga. CSA 600V Type TEW)
8. When connecting the supply circuit to the heater, wiring material having a minimum size of 14 AWG and a temperature rating of at least 90ºC shall be used.

15.3) SINGLE STAGE (N5/L5) INTERNAL AND THERMOSTAT CONNECTIONS

SINGLE STAGE CONTROLS - INTERNAL CONNECTION WIRING DIAGRAM



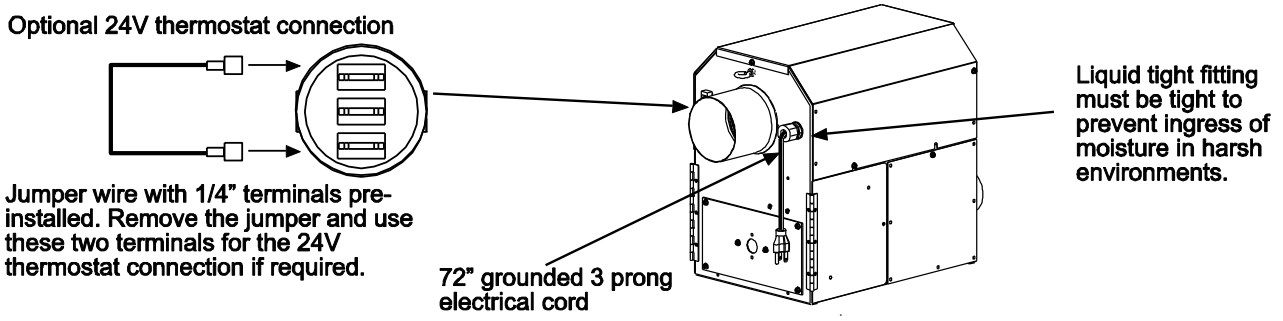
SINGLE STAGE CONTROLS - SCHEMATIC WIRING DIAGRAM



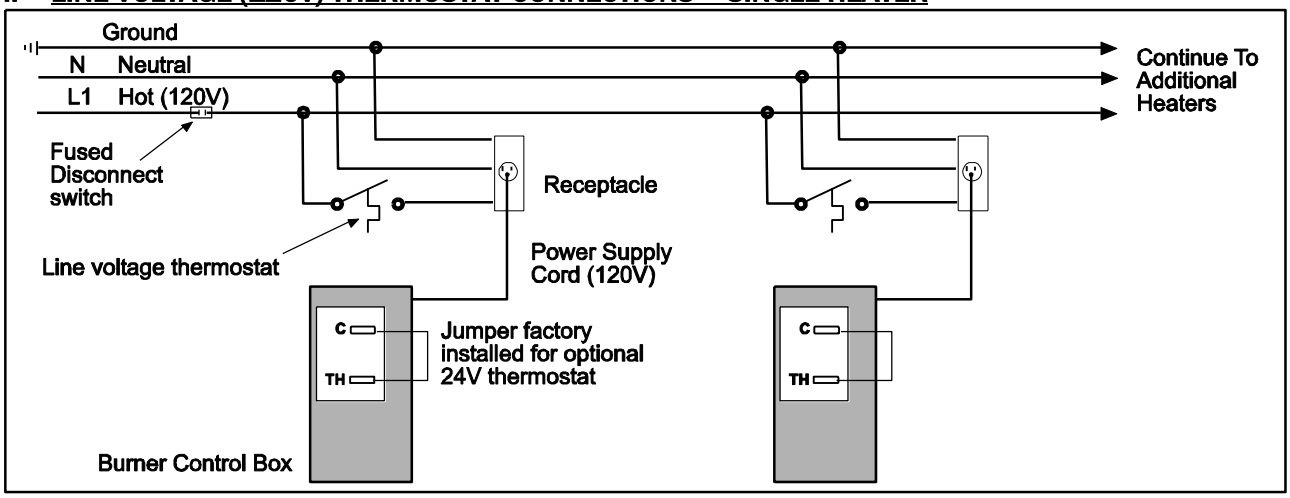
IGNITION MODULE TERMINAL DESIGNATIONS	
24VAC/R	24 VAC Supply to Module
TH/W	Thermostat Input
PS/W	Pressure Switch Input
GND	System Ground
V1	Valve Power
V2	Valve Ground
L1	120/240 VAC Input (Hot)
IND	Blower Output

SINGLE STAGE CONTROLS - THERMOSTAT WIRING DIAGRAMS

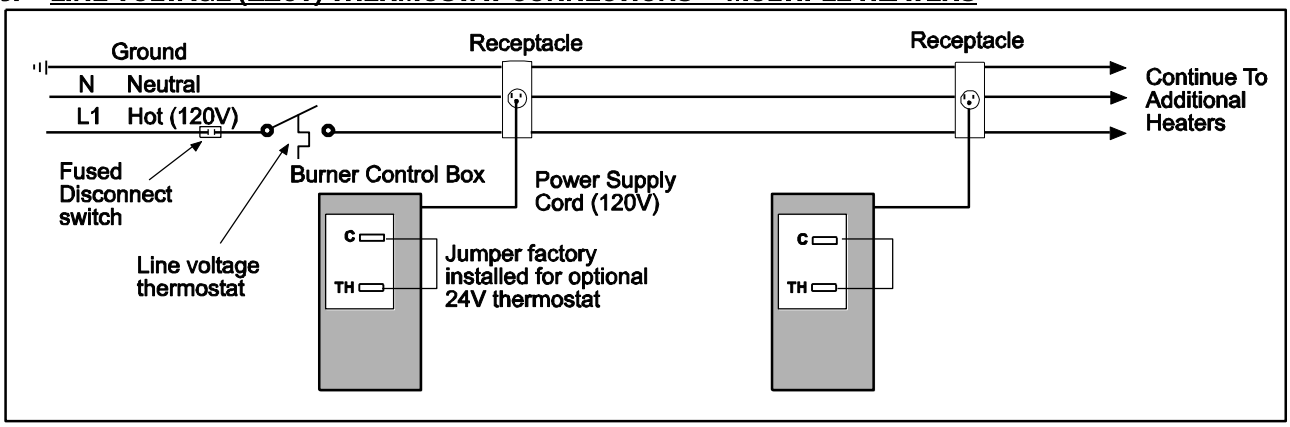
SINGLE STAGE CONTROLS



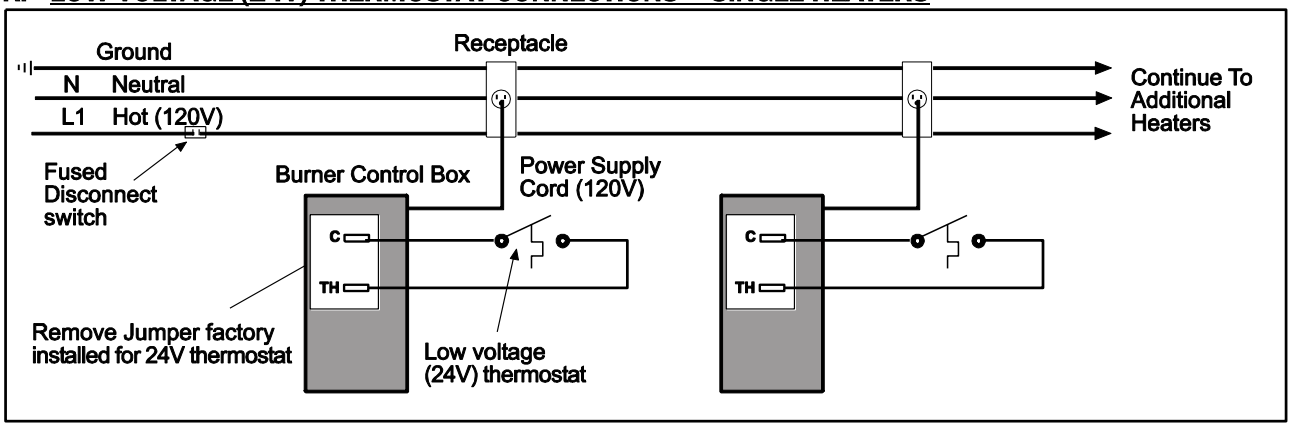
I. LINE VOLTAGE (120V) THERMOSTAT CONNECTIONS – SINGLE HEATER



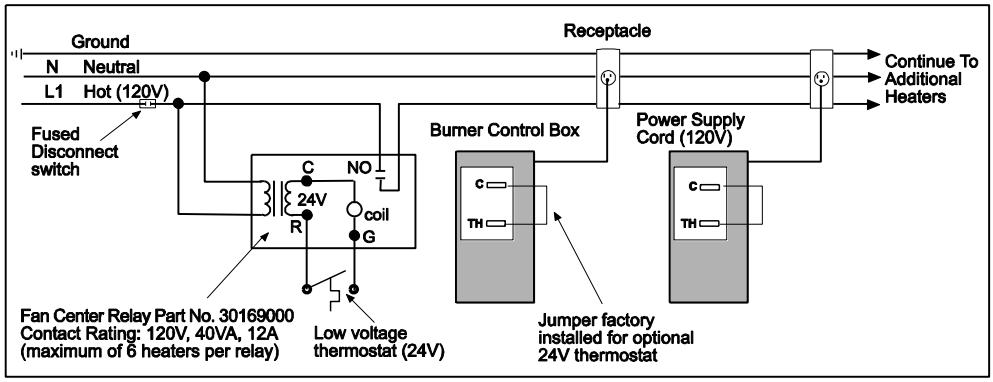
J. LINE VOLTAGE (120V) THERMOSTAT CONNECTIONS – MULTIPLE HEATERS



K. LOW VOLTAGE (24V) THERMOSTAT CONNECTIONS – SINGLE HEATERS

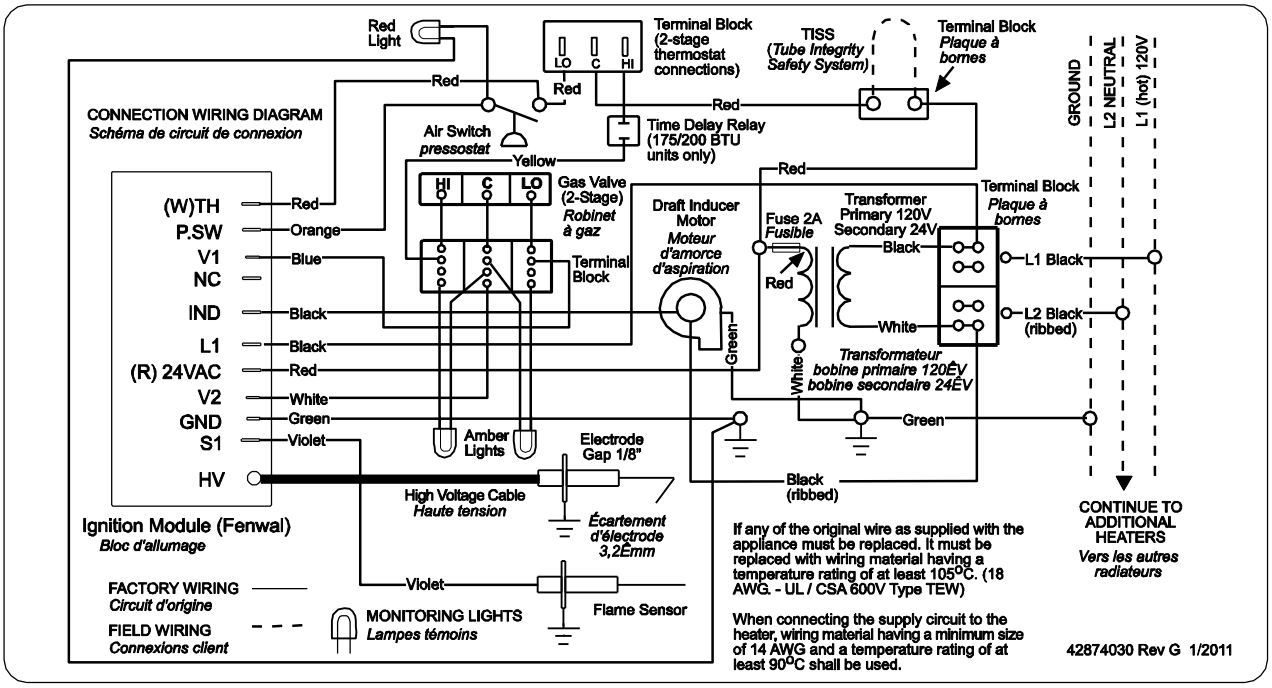


L. LOW VOLTAGE (24V) THERMOSTAT CONNECTIONS – MULTIPLE HEATERS (utilizing a fan center relay)

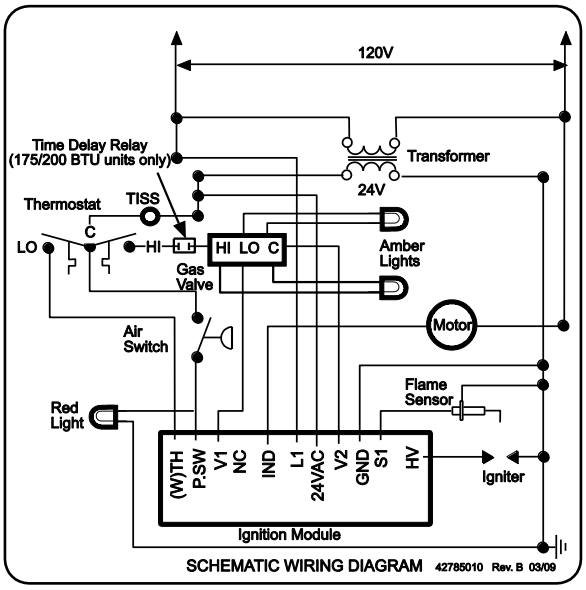


15.4) TWO STAGE (N7/L7) INTERNAL AND THERMOSTAT CONNECTIONS

TWO STAGE CONTROLS - INTERNAL CONNECTION WIRING DIAGRAM



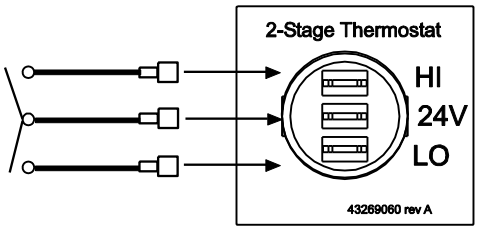
TWO STAGE CONTROLS - SCHEMATIC WIRING DIAGRAM



IGNITION MODULE TERMINAL DESIGNATIONS	
24VAC/R	24 VAC Supply to Module
TH/W	Thermostat Input
PS/W	Pressure Switch Input
GND	System Ground
V1	Valve Power
V2	Valve Ground
L1	120/240 VAC Input (Hot)
IND	Blower Output

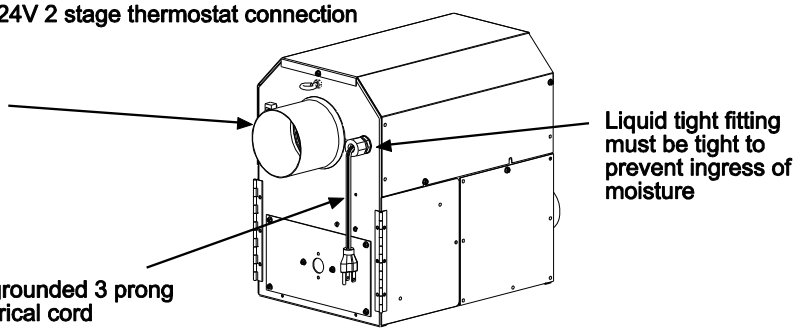
TWO STAGE CONTROLS - THERMOSTAT WIRING DIAGRAMS

TWO STAGE CONTROLS



Use these three terminals for the 24V thermostat connection.

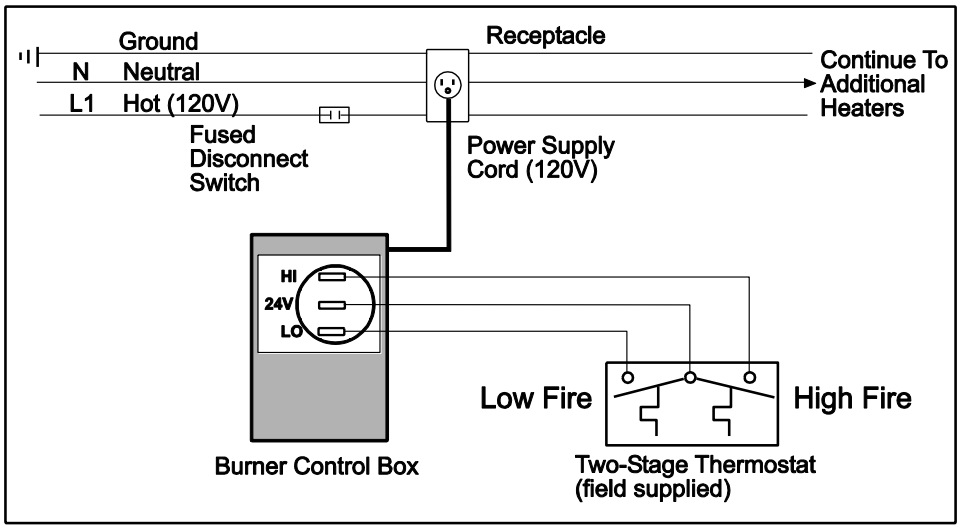
24V 2 stage thermostat connection



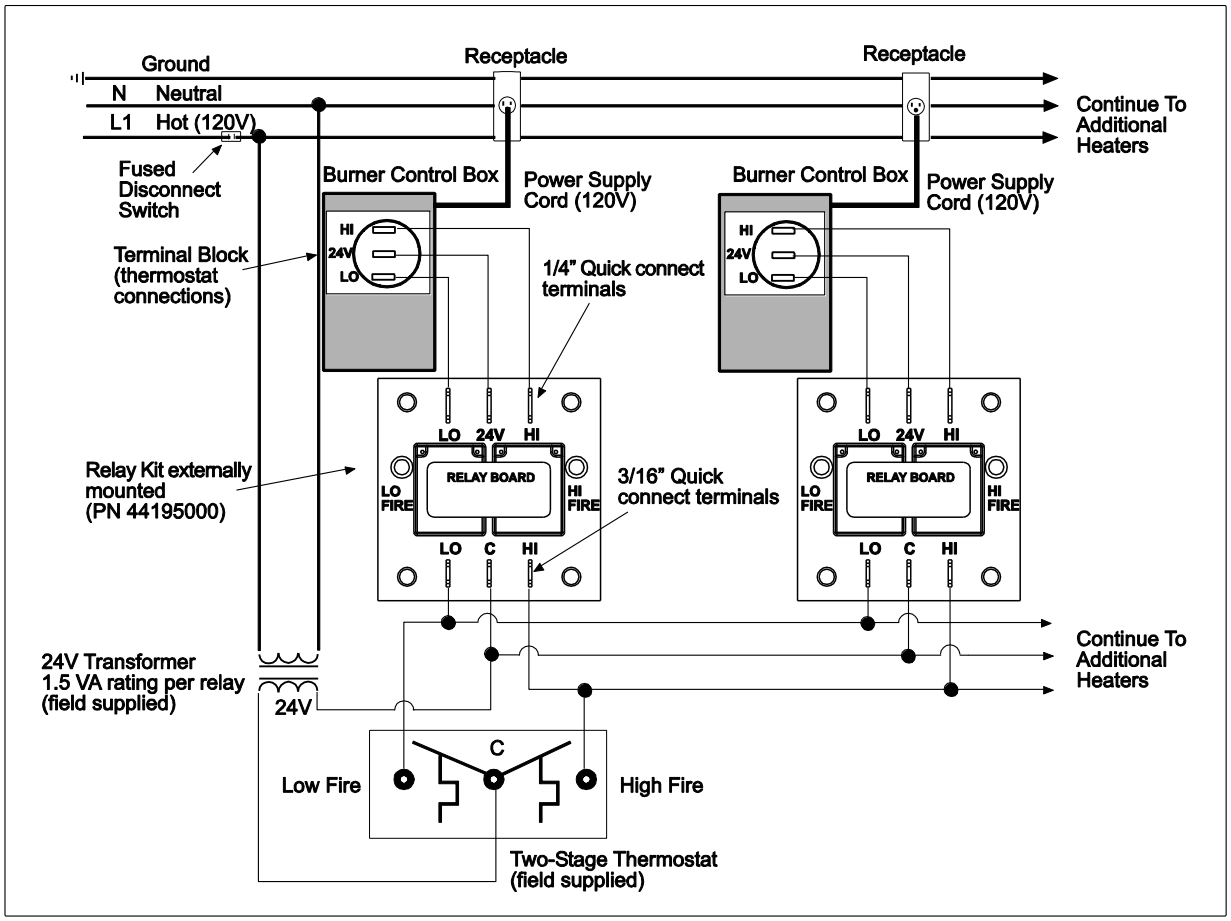
Liquid tight fitting must be tight to prevent ingress of moisture

72" grounded 3 prong electrical cord

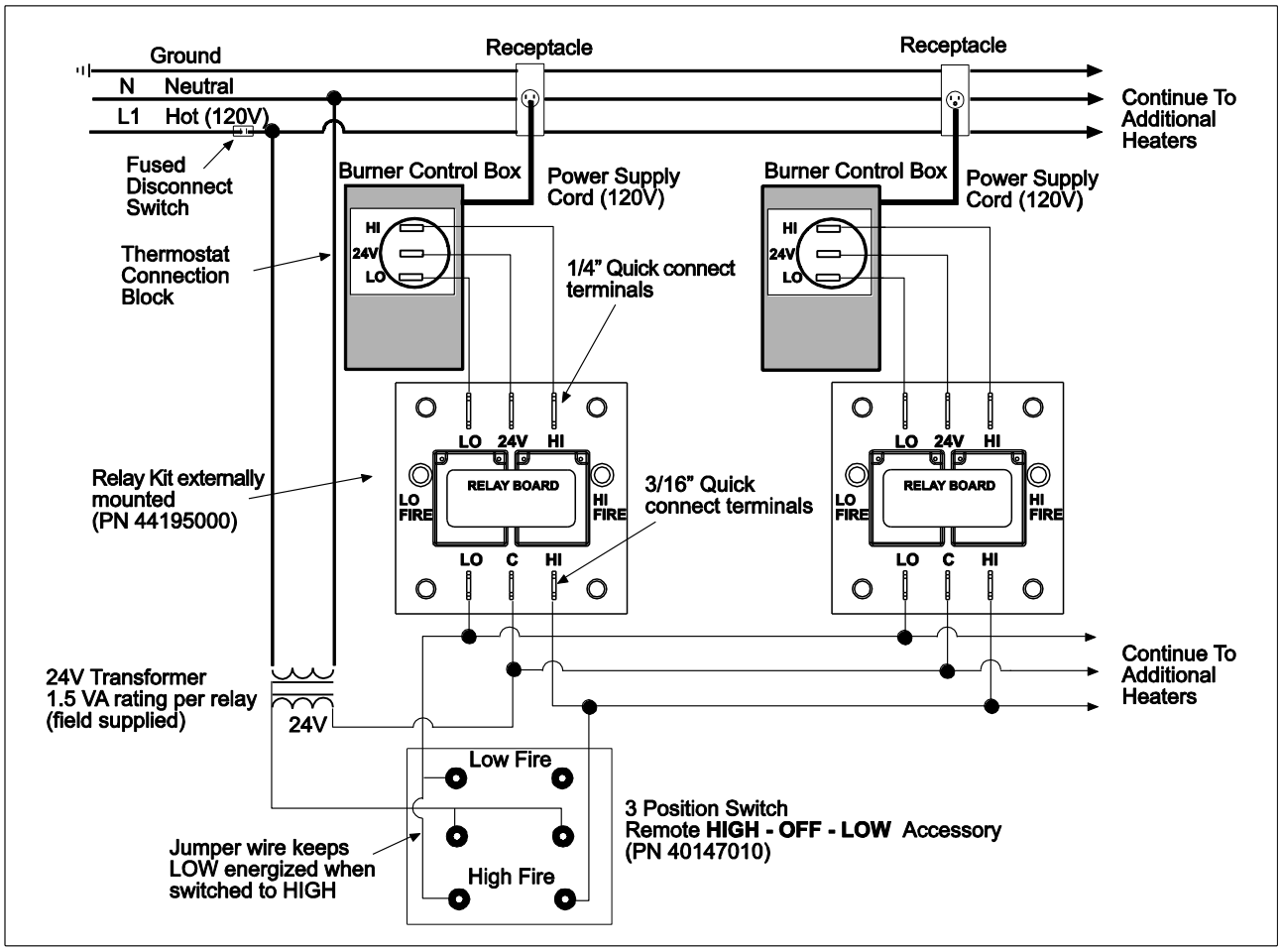
A. LOW VOLTAGE (24V) THERMOSTAT CONNECTIONS – SINGLE HEATERS



B. LOW VOLTAGE (24V) THERMOSTAT CONNECTIONS – MULTIPLE HEATERS

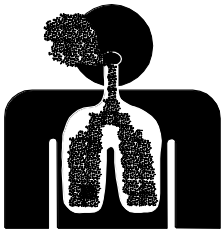


C. LOW VOLTAGE (24V) 3 WAY MANUAL SWITCH CONNECTIONS – MULTIPLE HEATERS



16.0) VENTING

⚠ WARNING



CARBON MONOXIDE HAZARD

Heaters installed in an unvented mode require a minimum ventilation flow of 4 CFM per 1,000 Btu/hr of total installed capacity.

In buildings with airborne contamination the heater must be installed with fresh air for combustion.

Failure to do so may result in death, serious injury, property damage or illness from Carbon Monoxide poisoning.

This is a category III appliance.

A. BASIC FLUE VENTING — Venting must comply with the latest edition of the National Fuel Gas Code (ANSI Z223.1-latest edition) or the authority having jurisdiction. Other venting references are in the equipment volume of the ASHRAE Handbook.

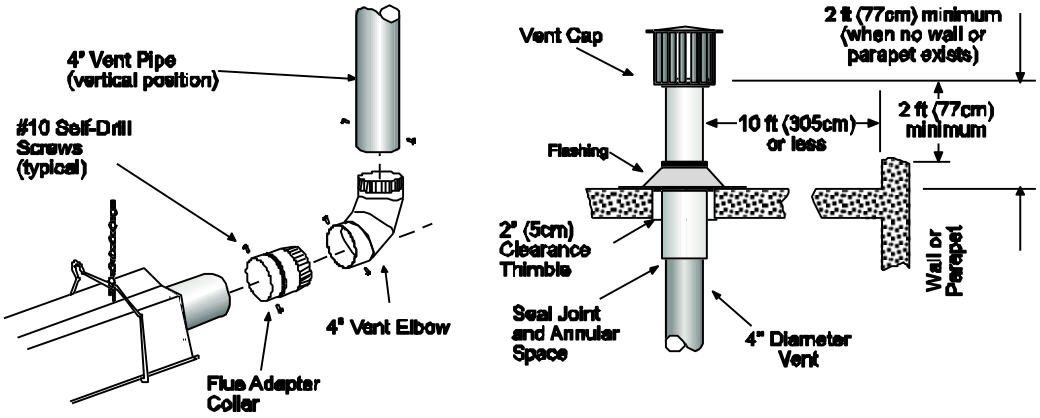
Model	Heat exchanger length ft	Maximum vent length ft. (4" diameter)	Maximum Fresh air intake length ft (4" diameter)	Max. combination of fresh air and vent ft. (4" diameter)
SPS/U 40	10	45	50	75
SPS/U 40	20	45	50	75
SPS/U 50,60	20	45	50	75
SPS/U 50,60	30	35	40	65
SPS/U 50,60	40	25	30	55
SPS/U 75	20	45	50	75
SPS/U 75	30	35	40	65
SPS/U 75	40	25	30	55
SPS/U 100	30	45	50	75
SPS/U 100	40	35	40	65
SPS/U 100	50	25	30	55
SPS/U 125	30	60	50	75
SPS/U 125	40	50	40	65
SPS/U 125	50	40	30	55
SPS/U 125	60	30	20	45
SPS/U 150	40	60	50	75
SPS/U 150	50	50	40	65
SPS/U 150	60	40	30	55
SPS/U 175	50	60	50	75
SPS/U 175	60	50	40	65
SPS/U 175	70	40	30	55
SPS/U 200	50	60	40	65
SPS/U 200	60	50	30	55
SPS/U 200	70	40	30	45

Vent lengths shown in the table are for horizontal and vertical venting. If a longer length of vertical or horizontal venting is required contact the manufacturer for assistance with vent sizing.

SINGLE HEATER VENTING (VERTICAL THROUGH THE ROOF)

1. When venting the heater to outside of building through a roof, use single-wall metal pipe. This is to be constructed of galvanized sheet metal or other approved noncombustible corrosion-resistant material as allowed by state or local codes.
2. A vent passing through a combustible roof shall extend through an approved clearance roof thimble. Double-wall, Type B vent must be used for the portion of the vent system which passes through the combustible roof. An approved vent cap must be attached to end of the flue.
3. The maximum equivalent length of vent pipe should be carefully observed. A safety switch in the heater is designed to shut the heater off before excessive flue restriction causes bad combustion. Refer to the Vent Sizing Table for maximum vent lengths and vent pipe diameter.
4. Joints between sections of piping shall be fastened by sheet metal screws or other approved means and should be sealed to prevent leakage of flue gas into building. Aluminum tape rated for 550ºF (3M Company tapes 433 or 363) or silicone sealant is recommended.
5. All portions of the vent pipe shall be supported to prevent from sagging (6' spacing is recommended).
6. When the vent pipe passes through areas where the ambient temperature is likely to induce condensation of the flue gases, the vent pipe should be insulated and a condensation drain should be provided.
7. Minimum clearance for single-wall flue pipe to combustible material shall be 6 inches. This may be reduced when the combustible material is protected as specified in the National Fuel Gas Code or the authority having jurisdiction.

8. Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall or concealed space, or through any floor. For the installation of a single-wall metal pipe through an exterior combustible wall, refer to latest edition of the National Fuel Gas Code or the authority having jurisdiction.
9. A venting system shall terminate at least 3 ft. above any forced air inlet located within 10 ft.



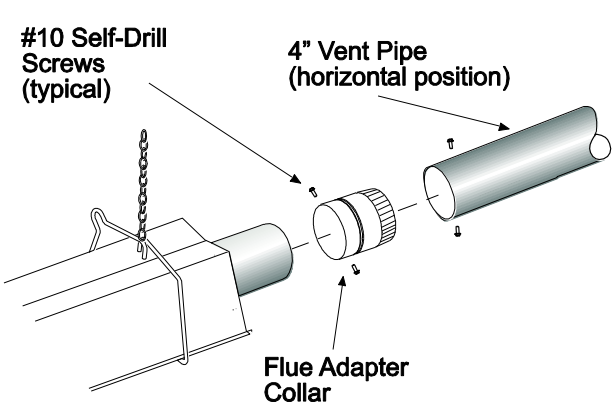
SINGLE HEATER VENTING (HORIZONTAL THROUGH SIDEWALL)

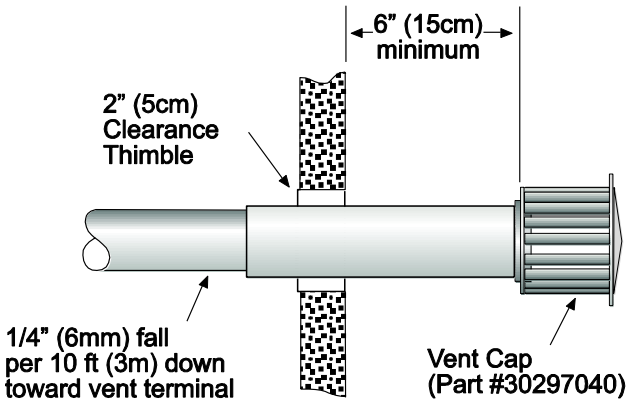
When venting the heater horizontally through a combustible outside sidewall, the same requirements listed previously for venting **Vertical Through The Roof** apply except as follows:

1. A vent passing through a combustible wall must pass through an approved clearance thimble (Air-Jet #4VT or Ameri-Vent #4EWT or other thimbles) that are listed by a nationally recognized testing agency; double wall Type B vent must be used for the portion of the vent system which passes through the combustible sidewall.
2. An approved vent cap (Breidert or equal) must be attached to the end of the vent pipe.

NOTE: To minimize problems associated with condensation in long horizontal runs, vent pipe can be insulated.

3. Use the following correction factors to obtain the equivalent length when elbows are used:
   - Subtract 10 ft. for each elbow beyond 15 ft. from the heater.
   - Subtract 15 ft. for each elbow within 15 ft. of the heater.
4. Limit to (2) 90º elbows in the vent system.
5. When venting through a sidewall, the horizontal vent pipe shall fall 1/4 inch per 10 feet down from the start of the vent system to the vent terminal. All portions of the vent pipe shall be supported to prevent sagging. (6' spacing is recommended)
6. A minimum clearance of 6 inches must be maintained between the outside wall and vent cap (18" clearance will provide stability under high wind conditions).
7. The horizontal venting system shall not terminate:
   - Less than 4 ft. (1.2m) below, 4 ft. (1.2m) horizontally from or 1 ft. (30cm) above any door, operable window or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 7 ft. (2.1m) above grade or above snow accumulation level as determined by local codes.
   - Less than 3 ft. (0.9m) from a combustion air inlet.
   - Less than 3 ft. (0.9m) from any other building opening or any gas service regulator.
   - Less than 7 ft. (2.1m) above public walkways.
   - Directly over areas where condensate or vapor could create a nuisance or hazard or be harmful to the operation of gas utility meters, regulators, relief valves, or other equipment. Building materials should be protected from flue gases and condensate.
   - Less than 18" (0.45m) when directly below a combustible overhang.
8. In regions of the country where prevailing winds are consistently higher than 40 mph, it may be necessary to terminate the vent system above the roof level.





MULTIPLE HEATER VENTING (CONNECTIONS INTO A COMMON VENT OR MANIFOLD)

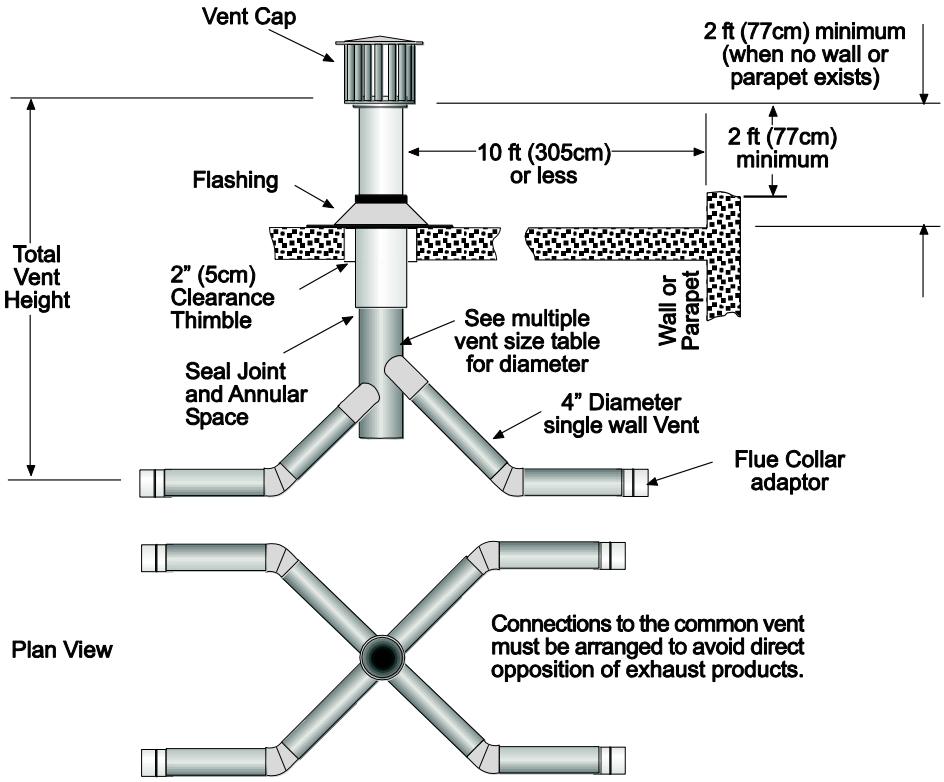
Requirements for venting of multiple heaters are the same as described for **SINGLE HEATER VENTING** except as follows:

1. The common vent size and total vent height is normally determined by the number of heaters per common vent, length of horizontal connector runs, and connector fall. Connector lengths should be as short as possible and have a minimum 1/4 inch per foot rise. Without regard to connector fall and total vent height due to many possible venting configurations, the following should be observed:
   - Common vent pipe & vent connector diameter should be no less than that shown in the following Vent Sizing Table.
   - A Y-connector must be used to the common vent.
2. Material for connectors and Y-connectors should be constructed of galvanized sheet metal or other approved noncombustible corrosion resistant material as allowed by state or local codes. All common vent pipe should be insulated flue pipe or double wall, Type B vent.
3. Avoid unnecessary bends. Limit to two (2) 90° elbows.
4. The entire length of vent connector shall be readily accessible for inspection, cleaning and replacement.
5. Groups of heaters with a common vent must be controlled by a common thermostat.

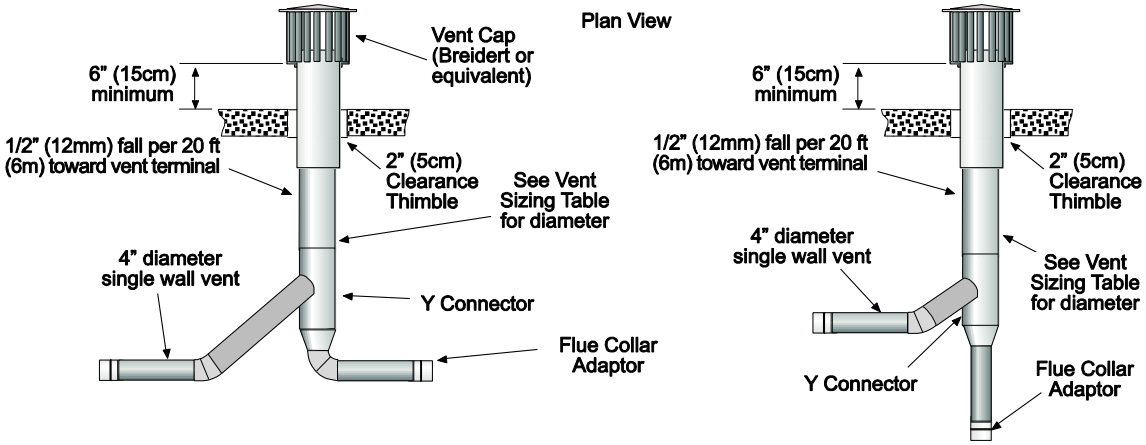
⚠ WARNING

If any heater connected to a common vent system for multiple heaters is found inoperative, the heater should be disconnected from the vent system and its entrance into the vent system capped.

Multiple Heater Vertical Venting Arrangement

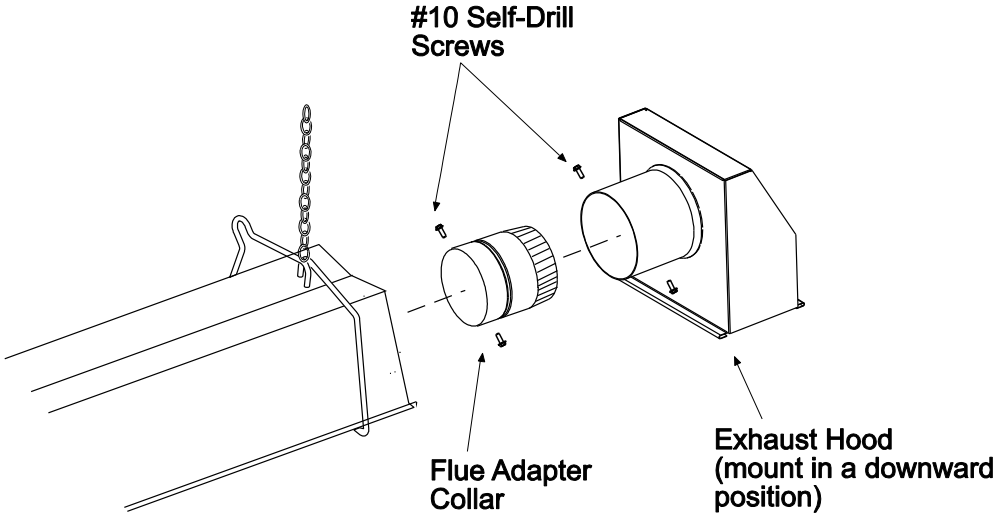


Multiple Heater Horizontal Venting Arrangement



VENT SIZING TABLE — Multiple Heater Venting				
	Number of Heaters			
	Horizontal and vertical		Vertical Only	
	1	2	3	4
SPS/SPU 40	4"	4"	4"	4"
SPS/SPU 50	4"	4"	4"	5"
SPS/SPU 60	4"	4"	4"	5"
SPS/SPU 75	4"	4"	5"	6"
SPS/SPU 100	4"	5"	6"	6"
SPS/SPU 125	4"	5"	6"	7"
SPS/SPU 150	4"	6"	7"	7"
SPS/SPU 175	4"	6"	7"	8"
SPS/SPU 200	4"	6"	7"	8"
	COMMON VENT DIAMETER (If a size is not available use the next larger size.)			

B. **INDIRECT VENTING (UNVENTED HEATERS)** — This heater requires ventilation in the building to dilute the products of combustion and provide fresh air for efficient combustion. Where unvented heaters are used, gravity or mechanical means shall be provided to supply and exhaust at least 4 CFM per 1,000 Btu/hr input of installed heaters. Exhaust vents must be located at the highest point above and in the vicinity of the heaters, and the inlet vents must be located below the level of the heaters. An exhaust hood (Part #42924000) must be placed on the flue adapter collar located on the end of the last body section when used unvented and **must be mounted only in a downward position as shown.**



Exhaust Hood Attachment
(for UNVENTED use)

17.0) AIR FOR COMBUSTION

If indoor combustion air is to be supplied for a tightly enclosed area, one square inch of free area opening shall be provided below the heater for each 1,000 Btu/hr of heater input. When outside air is used, the opening below the heater shall be one square inch of free area for each 4,000 Btu/hr of heater input. In contaminated atmospheres or high humidity areas, optional outside air for combustion is recommended. Adequate clearances around the air inlet screen must be maintained at all times. In larger open areas of buildings, infiltration normally is adequate to provide air for combustion.

17.1) DIRECT OUTSIDE AIR FOR COMBUSTION

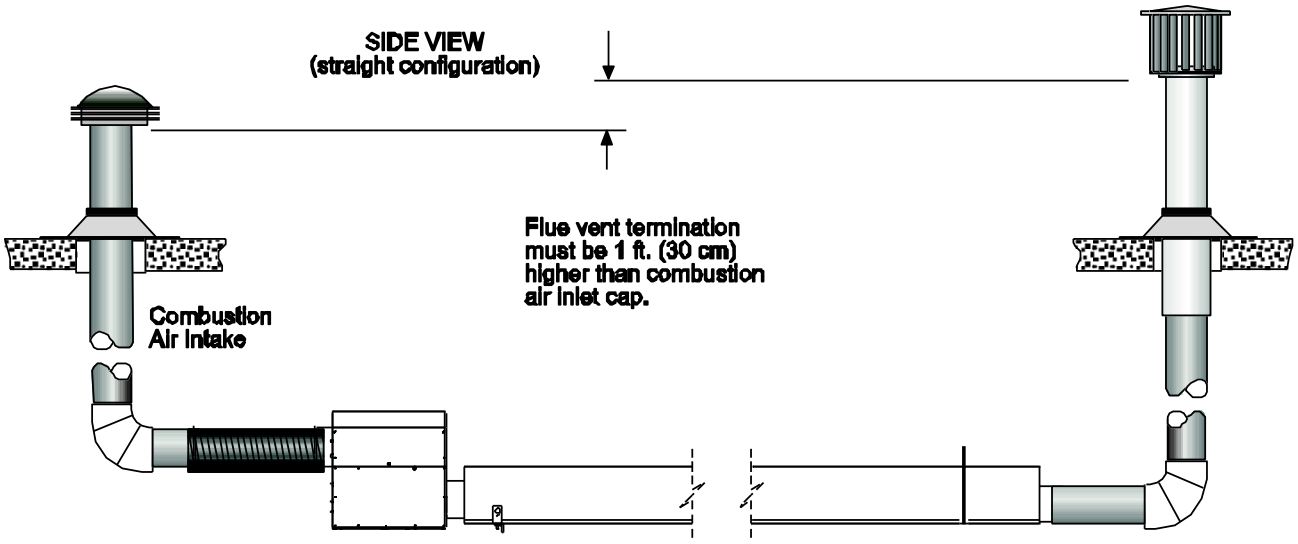
Outside combustion air should be supplied directly to the heater when the building is subject to negative pressure, or when contaminants or high humidity are present in the building air. These contaminants include paints, solvents, corrosive vapors or any other foreign particles that may cause damage to the heater or result in poor combustion.

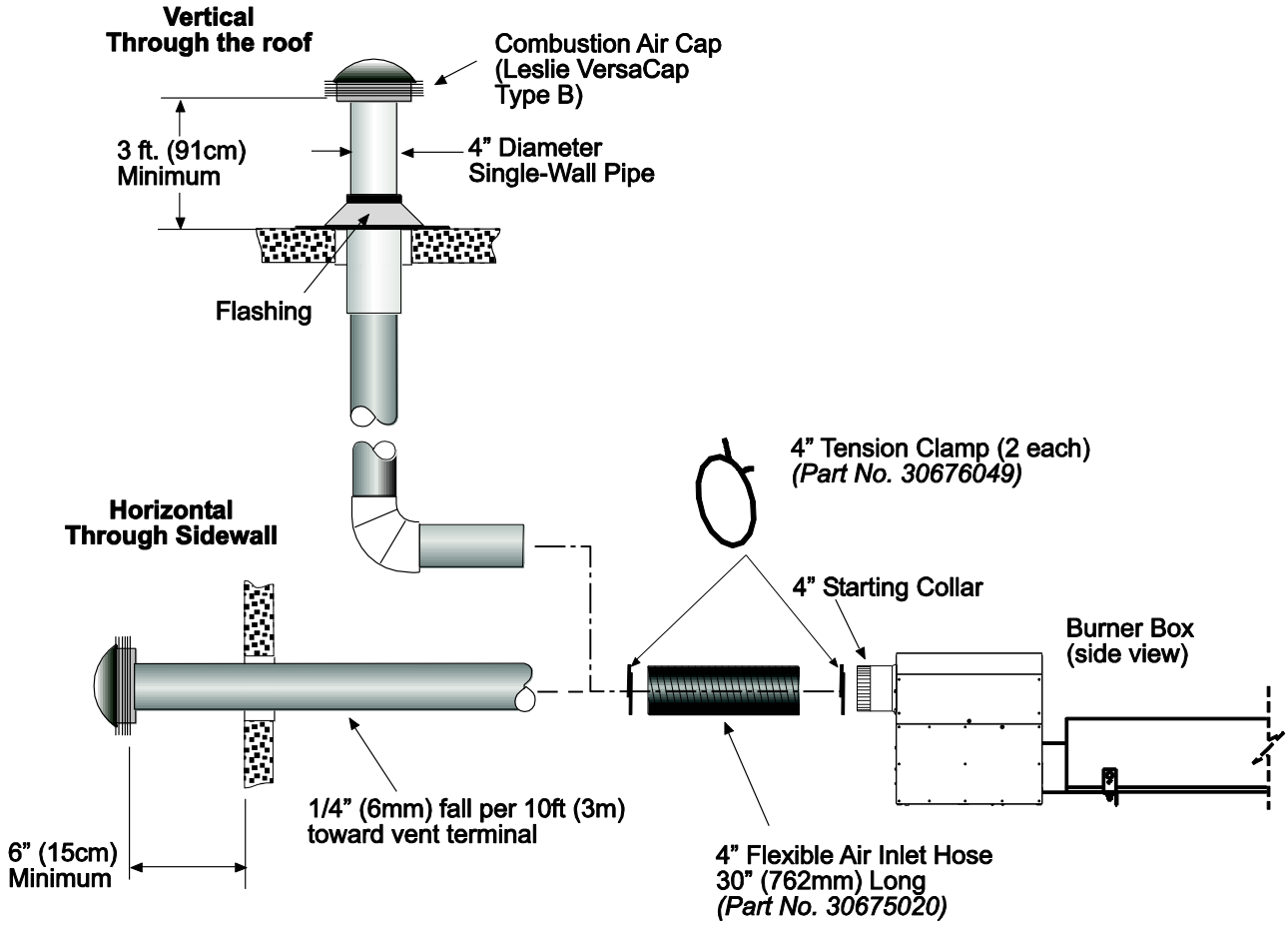
Outside combustion air can be brought directly to the heater by a 4" diameter duct less than 50 ft. long or equivalent (see table in Section 16.0) based on selected model and heat exchanger lengths). This is attached to the 4" diameter starting collar (supplied with heater). The starting collar is fitted to the rear of the burner box cabinet as shown below. An approved vent cap must be placed directly on the end of the outside combustion air inlet pipe. The combustion air inlet should be not less than 3 ft. (0.9m), either vertically or horizontally, from the flue vent termination. The air intake terminal must be located not less than 1 ft. (30cm) above grade. It is good installation practice to supply combustion air from the same pressure zone as the vent outlet. Avoid bringing combustion air to the heater from an attic space. There is no guarantee that adequate combustion air will be supplied.

If the heater is installed less than 2 ft. from the ceiling, a combustion air inlet kit PN 44129510 must be provided to allow for expansion/contraction of straight tube heaters (SPS series).

In colder climates, where necessary, insulate the outside combustion air duct.

In **multiple heater applications**, the combustion air intake may be ducted individually or common ducted in the same configuration as shown for venting in Section 16.0). For combustion air intake duct sizing, please refer to the **Vent Sizing Table** and use the diameter indicated, based on the number of heaters per duct.

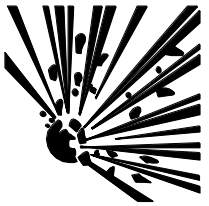




⚠ WARNING **All vent terminations and Combustion Air Intake Terminations must be at least 6" higher than anticipated snow depth.**

18.0) LIGHTING AND SHUTDOWN INSTRUCTIONS

⚠ WARNING

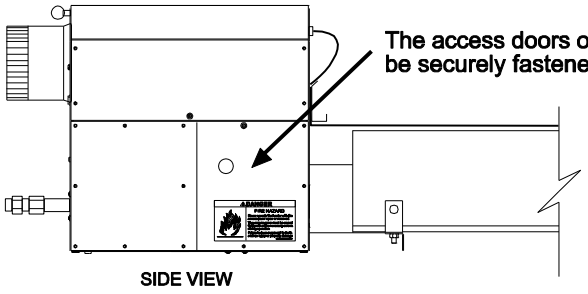


FIRE AND EXPLOSION HAZARD

Never operate the heater with the access panel open or removed.

The access panels must be closed tightly with all the necessary screws during operation.

Failure to do so may result in death, serious injury or property damage.



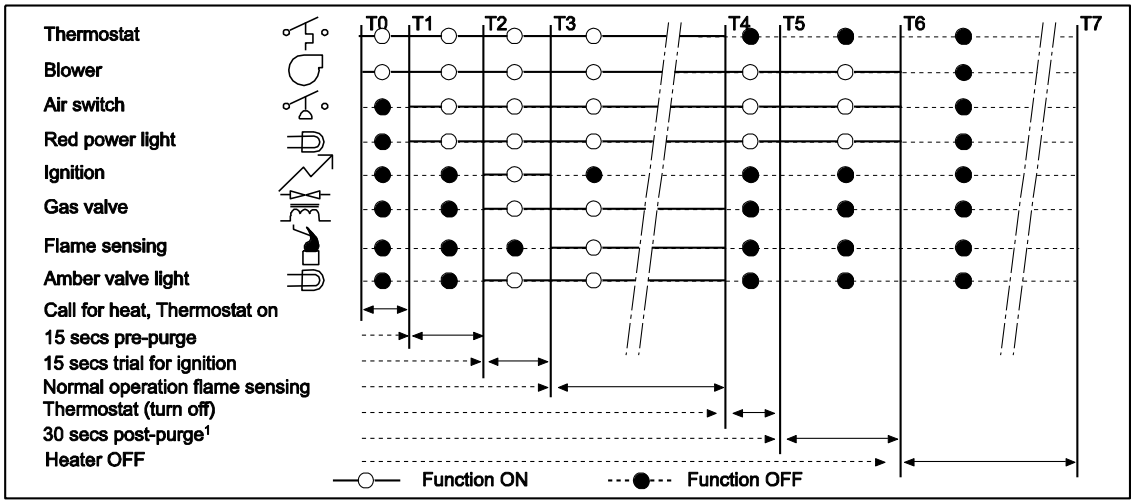
SIDE VIEW

1. Turn on the gas and electrical supply.
2. Set the thermostat to call for heat. The blower motor will energize.
3. Ignition should occur after the 15-second pre-purge.
4. If the burner fails to light, or flame is not detected during the first trial for ignition (a period of approximately 15 seconds) the gas valve is de-energized and the control goes through an inter-purge delay of approximately 60 seconds before another ignition attempt. The control will attempt two additional ignition trials before going into lockout, and the valve relay will be de-energized immediately. The blower will be turned off following a post-purge period of approximately 30 seconds.
5. If the heater does not light, manually reset the thermostat or shut off power completely for 5 minutes before attempting to relight.
6. To permanently shut down the heater, turn off the gas and electrical supply.

NOTE: The lighting and shutdown instructions are also shown on the permanent nameplate label attached to the heater control box.

19.0) SEQUENCE OF OPERATION – SINGLE STAGE (N5/L5)

The chart below shows the sequence of operation for the normal operating cycle of the SPS/SPU when connected to a permanent 120V power supply and the heater is turned on and off by a remote 24V thermostat. (Electrical connection diagram C).

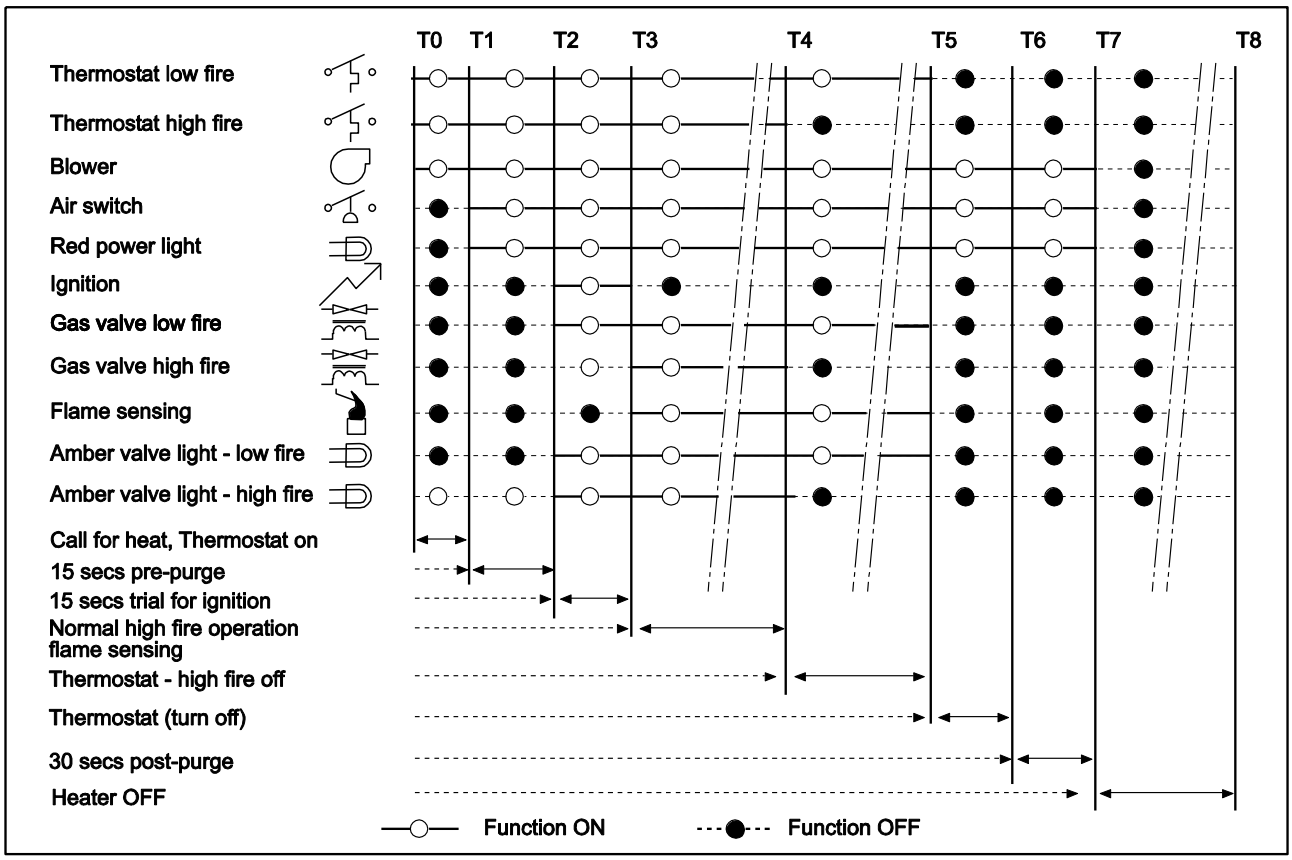


Note: When the SPS / SPU is operated by a thermostat interrupting the line voltage (120V) to the heater then the post purge function is disabled.

If the flame is not sensed during sequence T3 then the burner will automatically begin re-ignition sequence T2. The ignition sequence will be repeated three times with a 60 second inter-purge. If the flame is not re-established the heater will go to lockout.

19.1) SEQUENCE OF OPERATION – TWO STAGE (N7/L7)

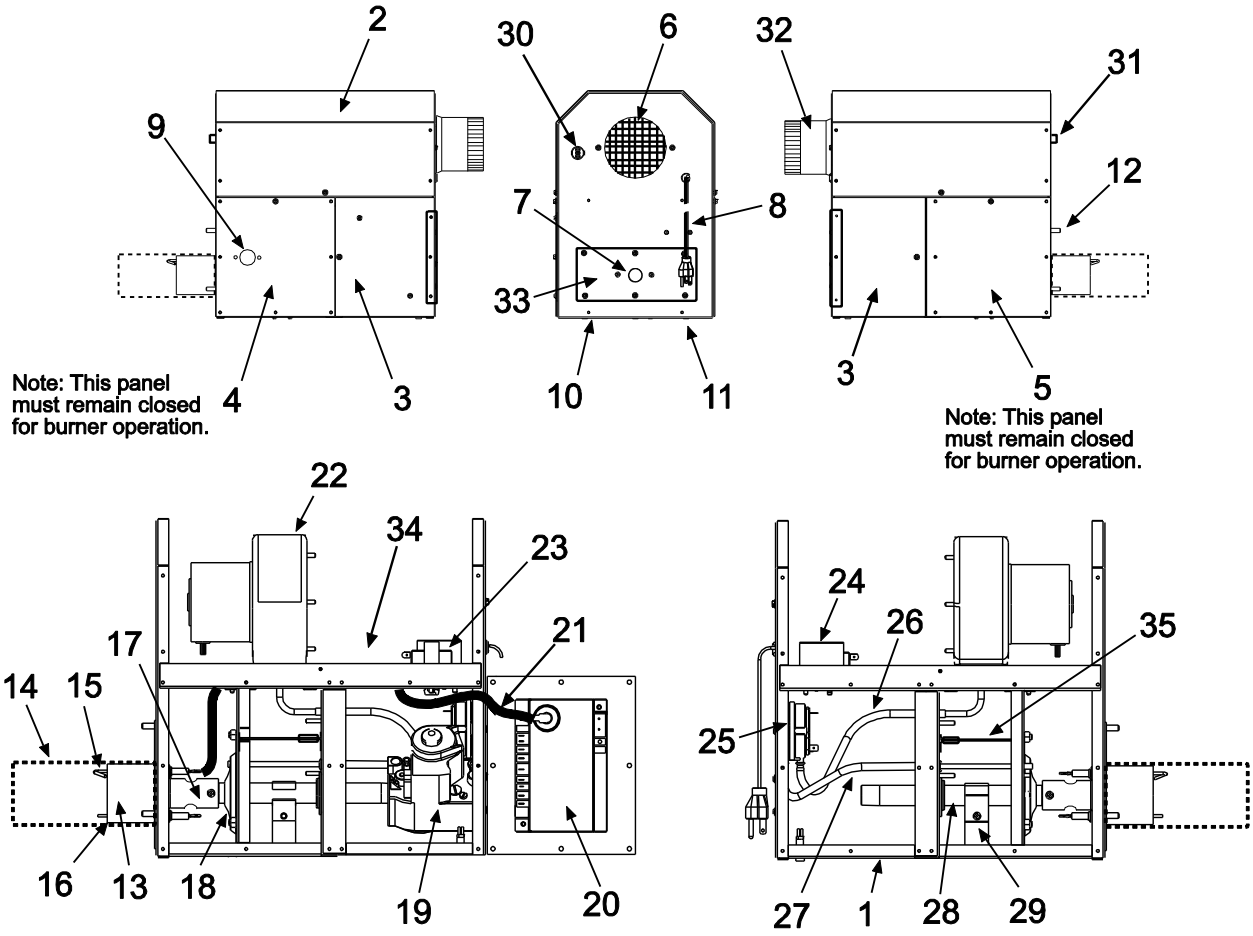
The chart below shows the sequence of operation for the normal operating cycle of the SPS/SPU (N7/L7) when connected to a permanent 120V power supply and the heater is turned on and off by a remote 24V thermostat.



Note:

If the flame is not sensed during sequence T3 then the burner will automatically begin re-ignition sequence T2. The ignition sequence will be repeated three times with a 60 second inter-purge. If the flame is not re-established the heater will go to lockout.

20.0) CONTROL COMPONENT LOCATION

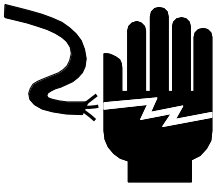


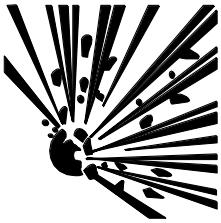
Legend:

1	Cabinet Assembly	19	Gas Control Valve
2	Access Panel - Top	20	Ignition Module
3	Access Panel - Hinged (2 ea)	21	Ignition Cable
4	Access Panel - LH Burner	22	Blower Assembly
5	Access Panel - RH Burner	23	Transformer - 120/24 VAC
6	Air Inlet Screen	24	Terminal Block/Fishpaper Shield
7	Gas Inlet Connection - 1/2"NPT	25	Air Switch
8	Power Supply Cord - 120V	26	Air Sensing Tube (P1+)
9	Burner Sight Glass	27	Air Sensing Tube (P2-)
10	Indicator Light - Amber (Gas Valve)	28	Manifold Pipe
11	Indicator Light - Red (Air Switch)	29	Manifold Support Bracket/Clamp
12	Tube Flange Connection	30	Thermostat Connection Block
13	Main Burner	31	Terminal Bushing (TISS connection)
14	Flame Screen **(200m/BTU units only)**	32	Starting Collar
15	Electrode	33	Valve Holder Plate
16	Flame Sensor	34	Fuseholder/Fuse (2 amp)
17	Main Burner Orifice	35	Combustion Air Restrictor Plate
18	Inlet Air Plate - Stamped		

21.0) CLEANING AND ANNUAL MAINTENANCE

⚠ WARNING





ELECTRIC SHOCK & EXPLOSION HAZARD

Disconnect electrical power and gas supply before servicing.

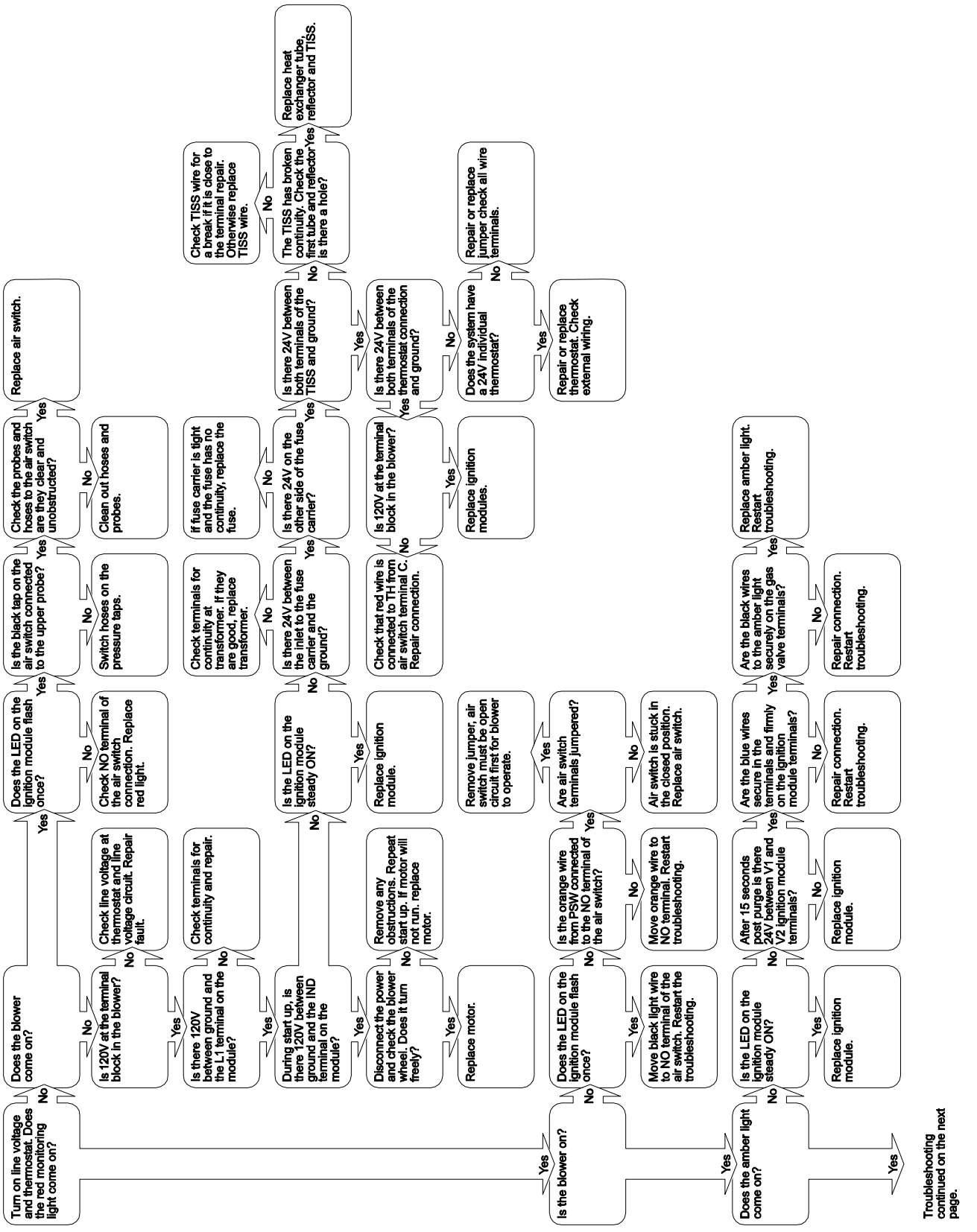
Failure to do so may result in death or serious injury.

This heater must be cleaned and serviced annually by a qualified contractor before the start of each heating season and at any time excessive accumulation of dust and dirt is observed. Maximum heating efficiency and clean combustion will be maintained by keeping the heater clean.

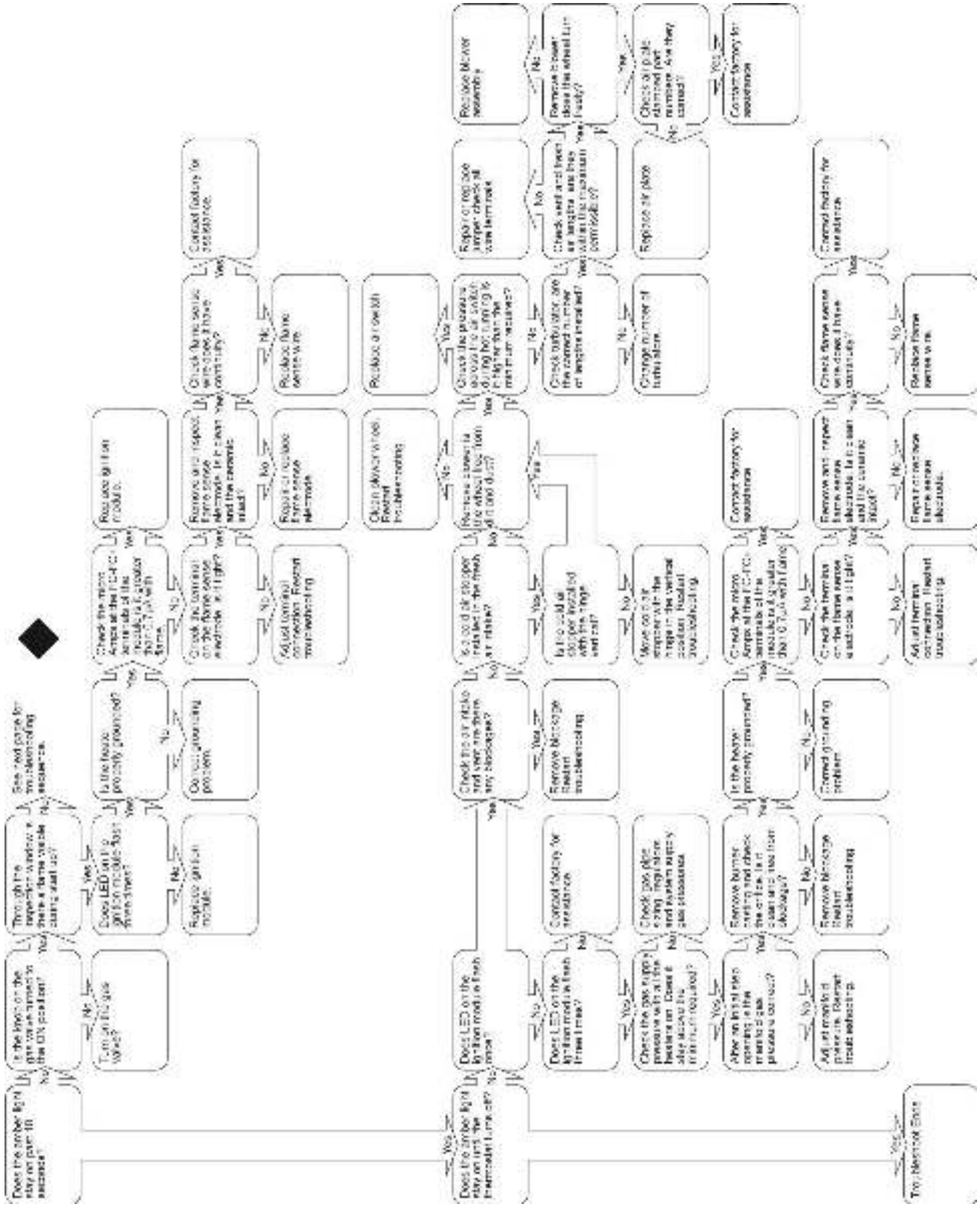
The contractor shall check the following during periodic maintenance.

- **Clearances to combustibles:** Check that clearances are being maintained. Make sure there are no flammable objects, liquids or vapors near the heater. See also Section 4.0).
- **Reflectors:** Reflectors should be kept clean, at a minimum blow off the reflectors. (Dirty reflectors will reduce heat output).
- **Heat exchanger tubes:** Inspect the heat exchanger tubes to make sure they are not cracked, sagging or showing signs of fatigue.
- **Combustion air intake:** Disconnect combustion air intake from the burner box and inspect internally using a flashlight to make sure no foreign material has collected in the tubes and that there is no obstruction around the air intake openings. Clean any foreign materials. Inspect any joints to make sure they are completely sealed. See also Section 17.0).
- **Venting System:** Disconnect vent pipe and inspect internally using a flashlight to make sure no foreign material has collected in the pipes. Check the external vent cap and make sure that there is no obstruction around the exhaust openings. Clean any foreign materials. Inspect any joints to make sure they are completely sealed. See also Section 16.0).
- **Gas lines:** Make sure that the gas lines are not leaking. Check the gas connection to the heater for any signs of damage, fatigue or corrosion. If there are any signs of damage to the gas connection or leaks found in the gas piping, immediately stop using the heater until the gas pipe and connections have been repaired or replaced. Check that the gas lines are not bearing the weight of the heater. See also Section 13.0).
- **Burner Box:** In order to extend the longevity of the heater, the heat exchanger tube and the burner must be level. Check that the burner box is level; use the turnbuckle on the burner suspension eyebolt to adjust the level of the burner. See also Section 9.0).
- **Burner sight glass:** Check that the burner sight glass is clean and that the glass is sealed against the housing door. If there any signs of distortion, the sight glass must be replaced. See Section 20.0) for sight glass location.
- **Blower wheel and housing:** Check that the blower wheel spins freely, blow out any dust or dirt with compressed air. See Section 20.0) for blower location.
- **Electrode condition:** Visually check that the electrode gap is maintained at 1/8" and that the tips of the flame sensor and spark electrode are free from deposits. Clean off any deposits. Check that the electrode ceramic is free from cracks. See Section 23.1).
- **Suspension system:** Check that the suspension system is holding the heater level. Make sure that the heater is hanging securely, look for any evidence where the heater may have been hit accidentally and tighten any loose hanging points. Check that S hooks are closed. Check that there is no evidence of wear on the chain at the connection to the heater and at the ceiling.
- **Tube Integrity Safety System:** Check that the tension of the tube integrity safety system is maintained at 11". Adjust tension if necessary. See Section 0.
- **Main Burner and Orifice:** Check the Main burner and orifice; remove any dirt or debris including spider webs. See Section 23.1).

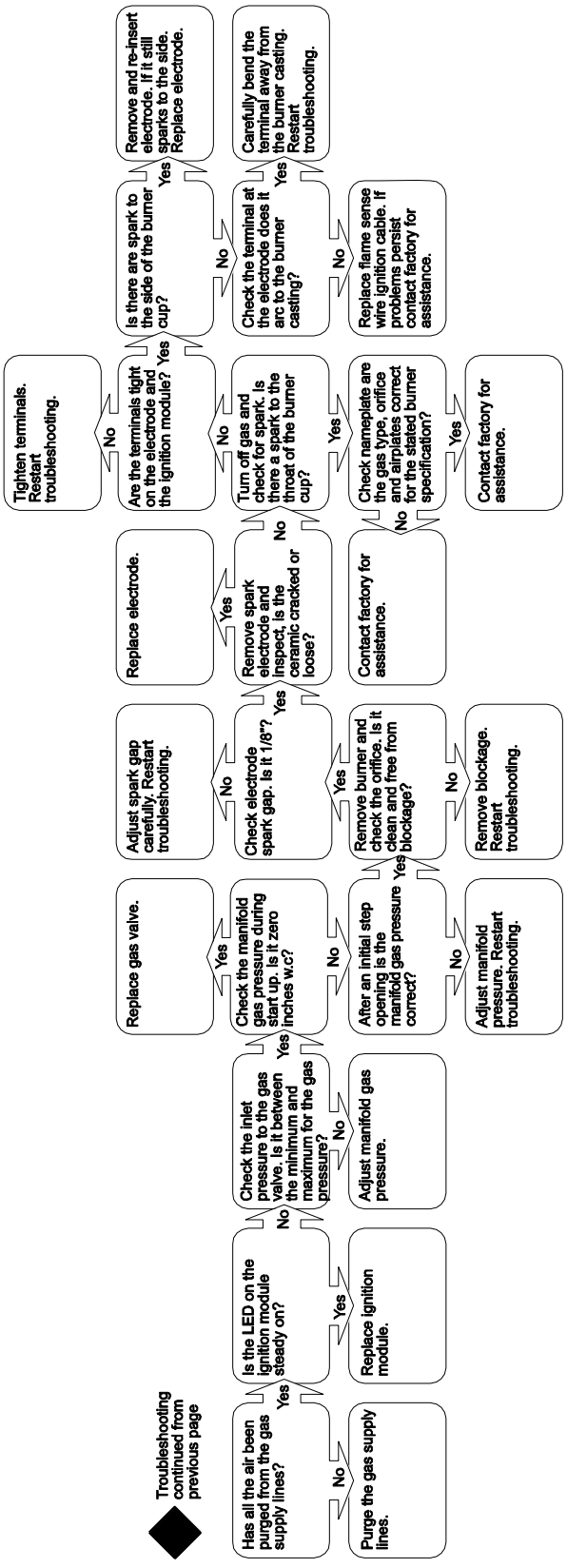
22.0) TROUBLESHOOTING GUIDE – SINGLE STAGE (N5/L5)



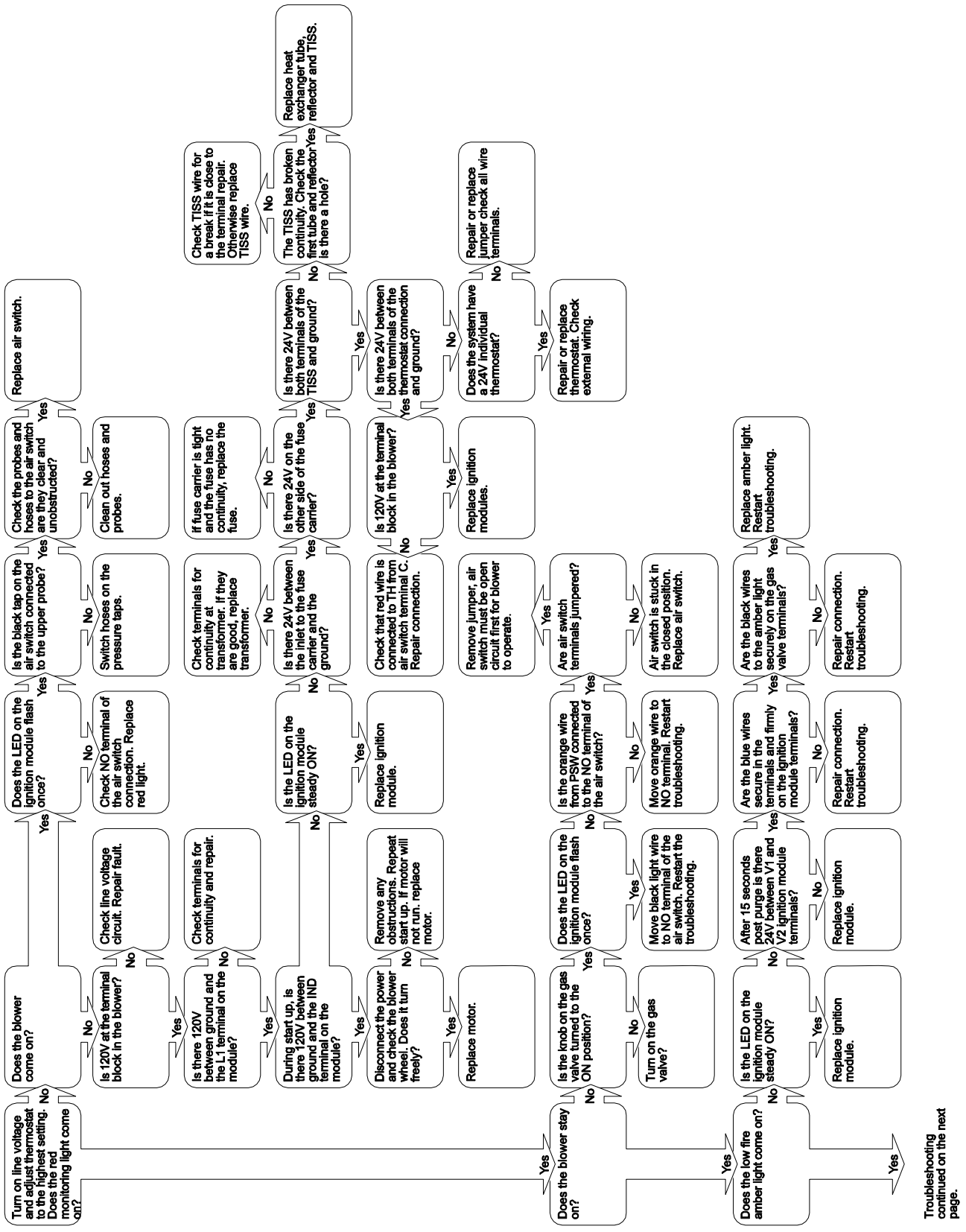
TROUBLESHOOTING GUIDE – SINGLE STAGE (CONTINUED)



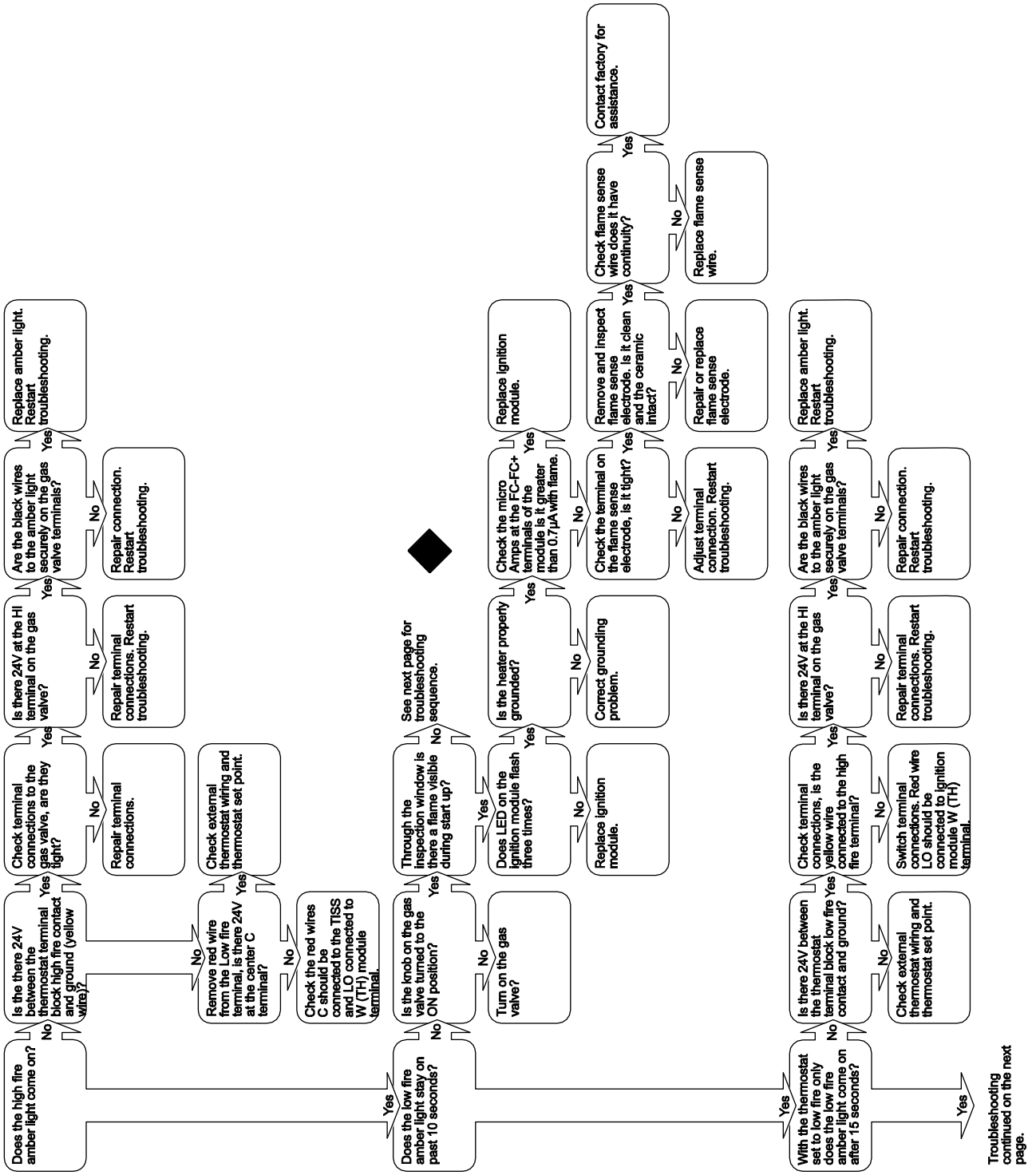
TROUBLESHOOTING GUIDE – SINGLE STAGE (CONTINUED)



22.2) TROUBLESHOOTING GUIDE – TWO STAGE (N7/L7)



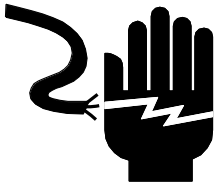
TROUBLESHOOTING GUIDE – TWO STAGE (CONTINUED)

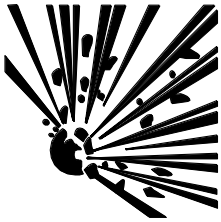


TROUBLESHOOTING GUIDE – TWO STAGE (CONTINUED)

23.0) REPLACING PARTS

⚠ WARNING





ELECTRIC SHOCK & EXPLOSION HAZARD

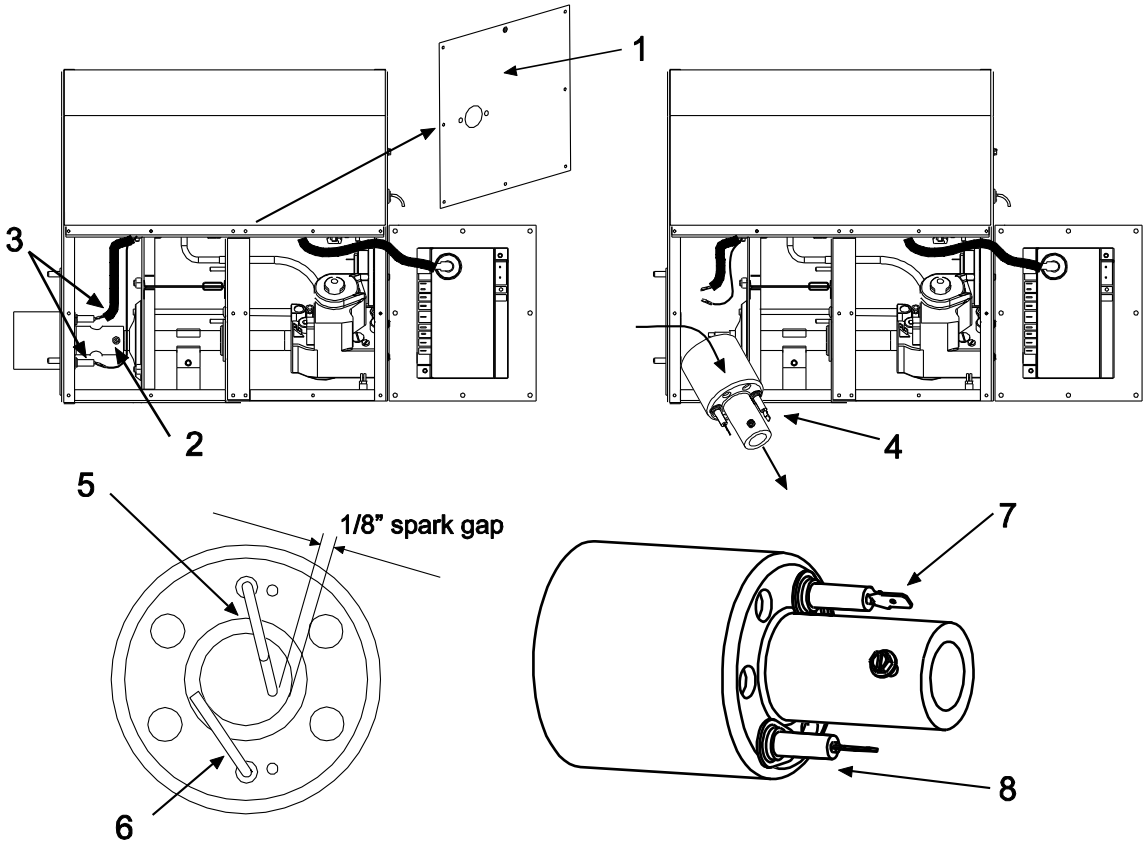
Disconnect electrical power and gas supply before servicing.

Failure to do so may result in death or serious injury.

Only use genuine SunStar replacement parts. Parts are available from the factory for replacement by a licensed person. Refer to the Replacement Parts Guide in Section 25.0) for all replacement parts.

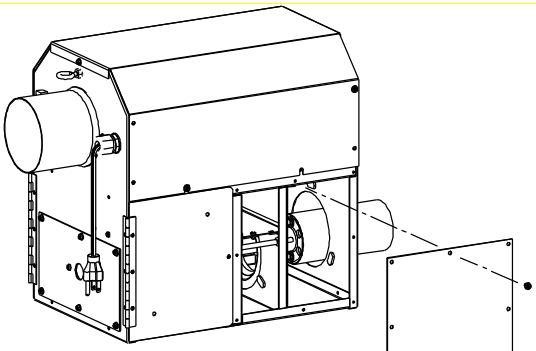
23.1) REMOVAL OF MAIN BURNER AND ELECTRODES

The main burner can be inspected without removing the burner housing from the heat exchanger tube.

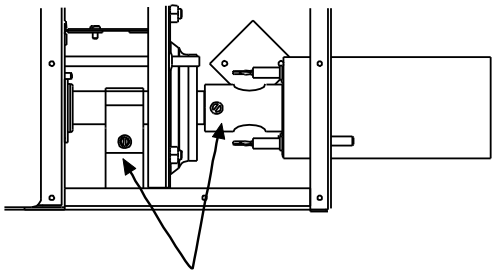


1. Disconnect electrical supply and Remove cover 1.
2. Remove screw securing burner casting to the gas manifold.
3. Disconnect Spark lead and sensing wire.
4. Pull burner forward from the gas manifold and then out through the side of the box as shown.
5. Check that the spark gap is 1/8" between the electrode and the burner casting as shown. Spark electrode should be clean and free from debris.
6. Flame sensor should be clean and free from debris.
7. Check ceramic on the spark electrode, for replacement into the box the spark electrode is the ¼" terminal which connects to the spark lead.
8. Check ceramic on flame sense electrode, for replacement into the box the flame sense electrode is the 3/16" terminal which connects to the violet wire. (in some models the terminal is ¼" painted violet)

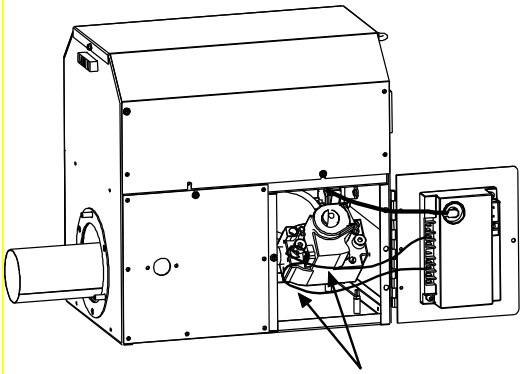
23.2) REMOVING GAS VALVE AND MANIFOLD ASSEMBLY



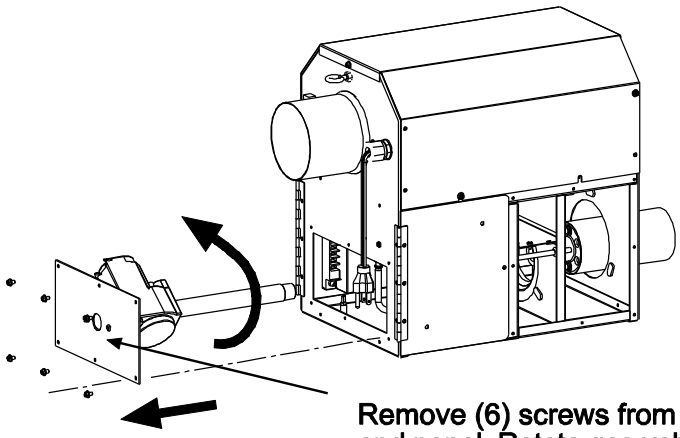
Step 1 Remove side access panel.



Step 2 Loosen screws from manifold clamp and burner assembly.

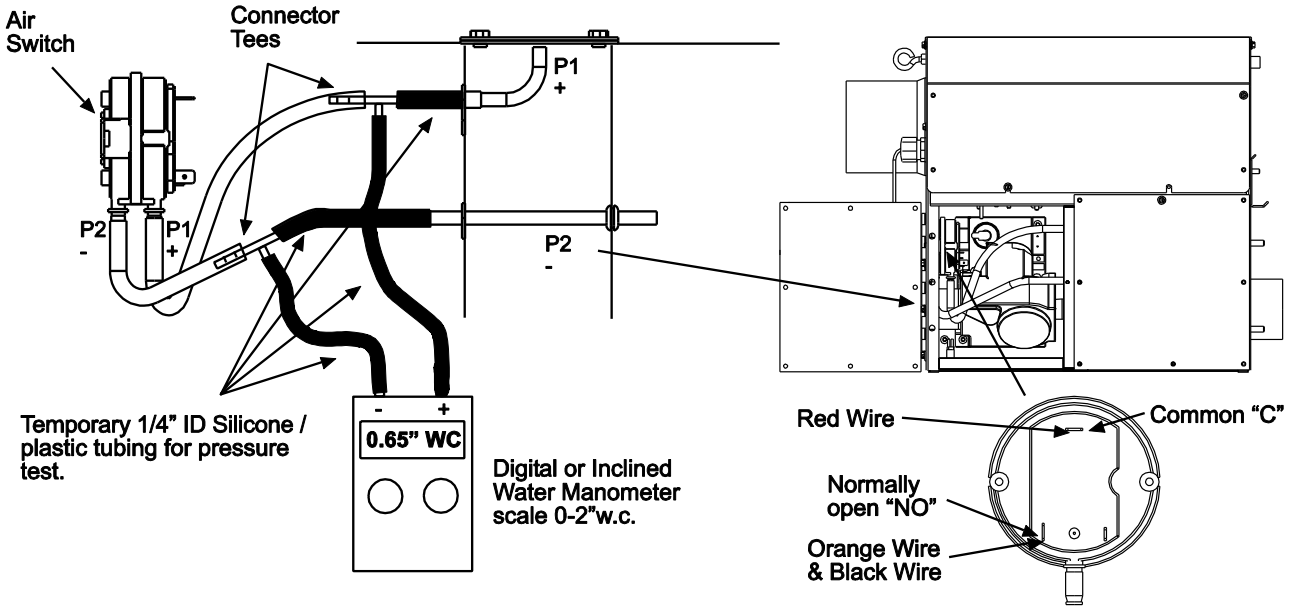


Step 3 Open hinged access panel and disconnect wires from gas valve.



Step 4 Remove (6) screws from end panel. Rotate gas valve and manifold assembly slightly counter-clockwise and slide out from housing.

23.3) AIR SWITCH PRESSURE CHECK



1. Open hinged access panel.
2. Add tubing to connect the air switch tubing P1 + and P2 - with the connector tees and the probes P1+ and P2+.
3. Connect plastic tubing of a digital or inclined water manometer with a 0-2" scale onto the connector tees.
4. Turn heater on and wait until blower motor is activated.
5. Observe air pressure from manometer. This should be higher than the set point indicated below for correct operation.

Model	Operating Pressure
SPS/U 40	0.98" W.C. Hot
SPS/U 50	0.98" W.C. Hot
SPS/U 60	0.98" W.C. Hot
SPS/U 75	0.70" W.C. Hot
SPS/U 100	0.80" W.C. Hot
SPS/U 125	0.39" W.C. Hot
SPS/U 150	0.39" W.C. Hot
SPS/U 175	0.39" W.C. Hot
SPS/U 200	0.39" W.C. Hot

All pressures are with the heater in operation for at least 15 minutes.

23.4) IGNITION SYSTEM CHECKS

TO CHECK FLAME SENSOR CIRCUIT.

Flame current is the current which passes through the flame from the sensor to ground. The minimum flame current necessary to keep the system from lockout is 0.7 microamps.

a. Turn off heater at thermostat.

b. Connect a meter (dc microammeter scale) in series with the ground lead as shown in the diagram. Connect the meter as follows:
   - Connect the black (negative) meter lead to the electronic control FC- terminal.
   - Connect the red (positive) meter lead to the electronic control FC+ terminal.

c. Restart the system and read the meter. The flame sensor current must be steady and measure at least 0.7 microamps.

d. If the meter reads less than the minimum or if reading is unsteady:
   - Make sure burner flame is capable of providing a good rectification signal.
   - Make sure fasteners securing igniter/sensor are tightened to assure correct positions. **DO NOT** relocate igniter/sensor.
   - Check for excessive (over 1000°F) temperature at ceramic insulator on flame sensor. Excessive temperature can cause short to ground. **DO NOT** relocate igniter/sensor.
   - Check for cracked ceramic insulator, which can cause short to ground, and replace sensor if necessary.
   - Make sure that electrical connections are clean and tight. Replace damaged wire.

e. If the meter reads below "0" on the scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

f. Remove microammeter. Return system to normal operation.

IGNITION MODULE DIAGNOSTICS

Flame Fault

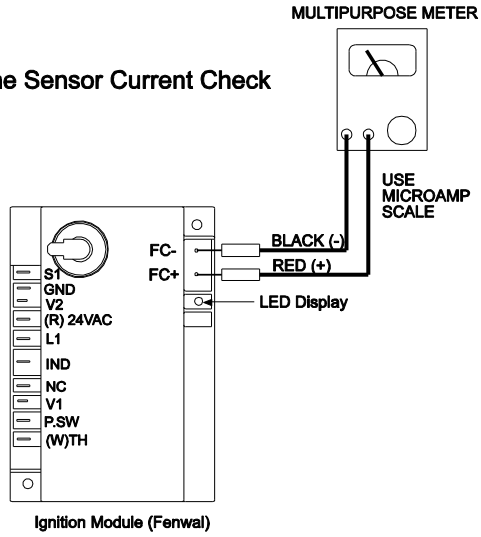
If at any time the main valve fails to close completely and maintains a flame, the full time flame sense circuit will detect it and energize the combustion blower. Should the main valve later close completely removing the flame signal, the combustion blower will power off following the post purge period.

Fault Conditions

Error Mode	LED Indication
Internal Control Failure	Steady On
Air Flow Fault	1 Flash
Gas valve failure (stuck open)	2 Flashes
Ignition Lockout	3 Flashes

The LED located on the ignition module will flash ON for ¼ second, then OFF for ¼ second during a fault condition. The pause between fault codes is 3 seconds.

Flame Sensor Current Check



24.0) INSTALLATION DATA

Date of Installation: _____ # of Heaters in System: _____

Serial No. _____

Model: **SPS or SPU** _____ N = Natural Gas L = Propane Gas

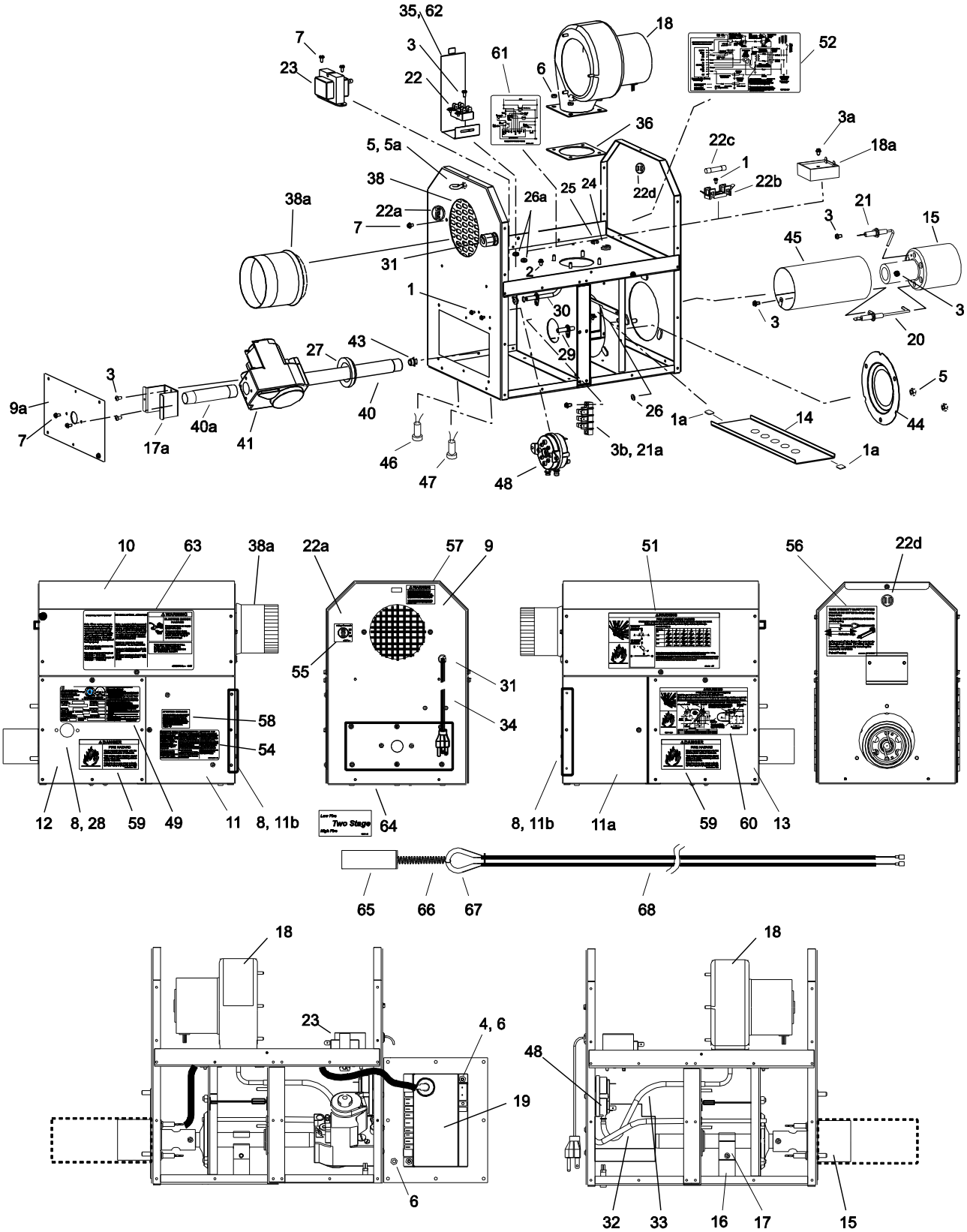
25.0) REPLACEMENT PARTS GUIDE

BURNER BOX			
Item No.	**Part No.**	**Description**	**Qty.**
		Fasteners	
1	02295040	PHTCS #6-32 x 3/8"	3
1a	02266010	Speed Clips (for air inlet plate)	2
2	02261030	HHTCS #8-32 x 3/8" (green coated)	1
3	02242050	PHTCS #8-32 x 3/8"	7
3b	02242070	PHTCS #8-32 x 1/2"	2
4	02123170	RHMS #8-32 x 3/4"	2
5	02167010	Locknut 1/4-20 Keps	8
5a	02309000	Eyebolt 1/4-20 x 2"	1
6	02167040	Locknut #8-32 Keps	7
7	02212020	HWHSMS #8 x 1/2" "B" Point (typical all access panels)	45
8	02132020	Rivet 1/8"	32
		Housing Components	
9	44139050	Housing Assembly (painted)	1
9a	44140119	Valve Holder Plate (painted)	1
10	44140009	Access Panel – Top (painted)	1
11	44140040	Access Panel - Hinged (with module holes)	1
11a	44140041	Access Panel – Hinged	1
11b	02201080	Hinge 1-1/2" x 6"	2
12	44140057	Access Panel - LH burner end –with sight glass (painted)	1
13	44140099	Access Panel - RH burner end (painted)	1
14	4414006x	Combustion Air Plate (see size requirements in Section 5.0)	1
		Burner Components	
15	42700500	Burner, Investment Casting - Machined	1
16	44146090	Manifold Support Bracket (painted)	1
17	44146060	Manifold Support Clamp	1
17a	44146058	Manifold Extension Bracket (with set screw)	1
18	30703000	Blower Assembly	1
19	30632510	Spark Module – Fenwal-24V #35-615950-197	1
20	30702010	Flame Sensor #PSE-GF24	1
21	30702020	Electrode #PSE-GF25	1
21a	30743000	Terminal Block #EL-3008	1
22	30281000	Terminal Block #EK-204	1
22a	30738030	Terminal Bushing (3 x 1/4" tabs)	1
22b	30713000	Fuse Holder	1
22c	30202000	Fuse 1/4 x 1-1/4" (2 amp)	1
22d	30738020	Terminal Bushing (2 x 1/4" tabs)	1
23	30279000	Transformer 120v-24V 20VA	1
24	02175020	Strain Relief #SR-6P3-4 (ignition cable)	1
25	02175060	Strain Relief #SR-2M-1 (flame sensor wire)	1
26	30514020	Grommet .250ID #739 (air sensing tube)	1
26a	30512020	Split Bushing #2871 (misc. wiring, ignition cable, sensor wire)	2
27	30700040	Grommet, Pipe Sealing 1/2" #63595K34	1
28	30623010	Sight Glass #1295	1
29	42744079	Air Sensing Tube Asm. (straight) 1/4"od	1
30	42744069	Air Sensing Tube Asm. (90 deg bend) 1/4"	1
31	30635050	Cord Connector 1/2" #M4521 (Gray)	1
31a	30635049	Nut ½" #8463 (Black)	1
32	03988100	Plastic Vacuum Air Tube 10" (P2- to static pressure point)	1
33	03988100	Plastic Vacuum Air Tube 10" (P1+ to total pressure point)	1

34	43563040	Supply Cord Set (SVT-1 18/3 x 72" long) – includes connector & nut	1
35	42709000	Shield, Terminal Block	1
36	42395010	Gasket, Blower	1
37	03946010	Sealing Strip 1/8" x 3/8" wide (access panels) -not shown-	Ft.
38	42752250	Air Inlet Screen	1
38a	30504040	Starting Collar (combustion air inlet)	1
39	30701240	Ignition Cable - Female (2) 1/4" QC x 24"lg #PSE-GF23 -not shown-	1
40	44145060	Manifold Pipe – 6-1/4"lg	1
40a	03333140	Pipe Nipple – 4"lg	1
41a	44010370	Kit, Gas Valve – WR #36J23-203B1 Single Stage (natural gas)	1
41b	44010380	Kit, Gas Valve – WR #36J23-204B1 Single Stage (propane gas)	1
41c	44010390	Kit, Gas Valve – WR #36J58-201B1 Two Stage (natural gas)	1
41d	44010400	Kit, Gas Valve – WR #36J58-202B1 Two Stage (propane gas)	1
43	03259xxx	Main Burner Orifice #7/16-27 (see size requirements in Section5.0)	1
44	42741150	Air Restrictor Plate 2-3/4" (earlier models only)	1
45	44151010	Burner Screen Sub-Assembly (200 BTU units only)	1
46	42398030	Monitoring Light – Amber (gas valve operation) – 2 each for Two Stage	1
47	42398150	Monitoring Light – Red (air switch operation)	1
48	30186250	Air Switch (set point @ .93"WC, RED LABEL) SPS/SPU40, 50 & 60	1
48a	30186260	Air Switch (set point @ .65"WC, BLUE LABEL) SPS/SPU75	1
48b	30186240	Air Switch (set point @ .75"WC, PINK LABEL) SPS/SPU 100	1
48c	30186270	Air Switch (set point @ .34"WC, GREEN LABEL) SPS/SPU125,150,175 & 200	1

		Labels/Manual	
49	42848010	Label, Nameplate – Single Stage	1
49a	42848120	Label, Nameplate – Two Stage	1
50	42013010	Label, Logo (SunStar) (Not Shown)	1
51	43344060	Label, Clearances to Combustibles	1
52	42874020	Label, Wire Connection Diagram – Single Stage	1
52a	42874030	Label, Wire Connection Diagram – Two Stage	1
54	42875000	Label, Warning (installation/configuration/chemical)	1
55	43269010	Label, 24V Thermostat Connection – Single Stage	1
55a	43269060	Label, 24V Thermostat Connection – Two Stage	1
56	43269020	Label, TISS Connection	1
57	43269030	Label, Eyebolt Suspension Warning	1
58	43269040	Label, Gas Valve in "OFF" Position	1
59	43269050	Label, Burner Warning (access panel must remain closed)	2
60	43344110	Label, Flex Gas Connector	1
61	42785020	Label, Ladder Wiring Connection – Single Stage	1
61a	42785010	Label, Ladder Wiring Connection – Two Stage	1
62	42834000	Label, 120V Caution	1
63	42922030	Label, Sidewall Venting	1
64	43269070	Label, Low/High Fire – Two Stage	1
64a	43343320	Installation & Operation Manual (Not Shown)	1

		Tube Integrity Safety Switch (TISS) Components	
65	44175000	Retainer clamp	1
66	30519020	Spring	1
67	30736000	Thimble	1
68	44176510	TISS replacement assembly **(does not include retainer clamp or spring)**	1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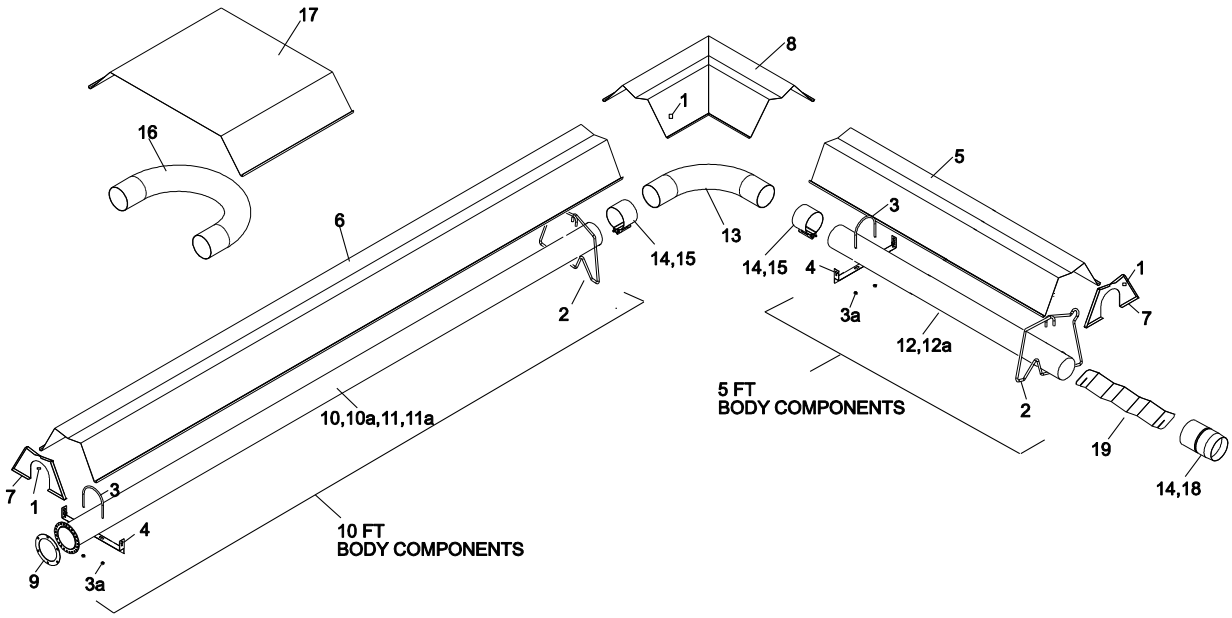
BODY COMPONENTS			
Item No.	**Part No.**	**Description**	
1	02266010	Reflector Speed Clip	
2	43980010	Wire Hanger	
3	42873000	"U" Bolt Clamp, 4" OD Tube	
3a	02127110	5/16-18 Hex Nut (2 per "U" Bolt)	
4	43318000	Tube Support/Hanger Bracket, 13"	
5	43319050	Reflector, 4'-11½" long (5' section only; 1 per 5 ft. body section)	
6	43319100	Reflector, 9'-11½" long (10' section only; 1 per 10 ft. body section)	
7	43320000	End Reflector (optional)	
8	43342000	Corner Reflector Package (optional)	
9	42921000	Tube Flange Gasket	
10*	44028170	10' Tube Assembly Kit, 4" OD, ATC steel with one 6-hole flange (start tube)	
10a**	44028030	10' Tube Assembly Kit, 4" OD, ALC steel with one 12-radial hole flange (start tube)	
11	44028100	10' Tube Assembly Kit, 4" OD, HRS steel without flanges (extension tube & exhaust tube)	
11a	44028060	10' Tube Assembly Kit, 4" OD, ALC steel without flanges (extension tube & exhaust tube)	
12	44028120	5' Tube Assembly Kit, 4" OD, HRS steel without flanges (extension tube & exhaust tube)	
12a	44028010	5' Tube Assembly Kit, 4" OD, ALC steel without flanges (extension tube & exhaust tube)	
13	43208010	4" O.D. Elbow Package	
14	02189020	#10 x ½" Self-Drilling Screw	
15	30462980	4" OD Tube Compression Coupling w/bolts	
16	43208020	4" OD U-Bend (Required for SPU Only)	
17	43488000	U-Bend Reflector (SPU Option)	**ALC = Heat Treated, Aluminized Steel**
18	30504500	Flue Adapter Collar	**HRS = Hot Rolled Steel**
19	44152240	Turbulator (See Section 5.0) for quantities)	**ATC = Heat Treated, Alumi-Therm Steel**

*** Required on 40ft, 50ft, 60ft and 70ft systems for mounting of burner box.**

**** Required on 10ft, 20ft and 30ft systems for mounting of burner box.**



Note:

1) Screws, Nuts and Washers are standard hardware items and can be purchased at any local hardware store.
2) Please order by PART NUMBER – not by Item Number.
3) Replacement Part Prices are available when ordering.
4) Please refer to complete Model Number when ordering.

ALL ILLUSTRATIONS ARE INTENDED TO GIVE THE GENERAL IMPRESSION OF UNITS ONLY. OTHER COMBINATIONS OF 5 FT. AND 10 FT. SECTIONS, AND ONES WITH OR WITHOUT THE ELBOW PACKAGE ARE POSSIBLE. PLEASE CONSULT WITH YOUR SUNSTAR SALES REPRESENTATIVE. WE RESERVE THE RIGHT TO ALTER ANY SPECIFICATION WITHOUT NOTICE.

26.0) WARNINGS CARD

Copies of this card may be ordered at no charge under part no. 43344980 for installation near the heater.

Attach this information card adjacent to the thermostat which controls the SunStar heater(s).

SunStar
Infrared Gas Heaters

Read the Installation and Operating Instructions thoroughly before installation, operation or service.

INSTALLER: Write the clearance distance for the highest BTU model in the building in the blank spaces below using permanent ink. The clearances to combustible materials are based on each individual heater model number. Locate the heater model number on the nameplate affixed to the heater. The clearances to combustibles distances can be located adjacent to the nameplate or in the Installation & Operating (I & O) Instructions.I & O's can also be located on www.sunstarheaters.com.

⚠ WARNING

FIRE HAZARD

Combustible material must be located outside the clearance distance listed from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

Maintain Clearances to Combustibles to Prevent the Risk of Fire.

Clearance to combustibles must be maintained at all times in order to prevent the ignition of combustible materials. In locations used for the storage of combustible materials signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Signs must either be posted adjacent to the heater's thermostats or in the absence of such thermostats, in a conspicuous location.

Maintain the following clearances: _____ to the side, _____ above and _____below the heater from combustible materials.

IF YOU SMELL GAS: **FOR YOUR SAFETY**

! **DO NOT** try to light any appliance.
! **DO NOT** touch any electrical switch; **DO NOT** use any telephone in your building.
! **IMMEDIATELY** call your gas supplier from a neighbor's telephone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

Installation Code and Annual Inspections:
Installation and Service of SunStar equipment must be performed by a qualified contractor and conform with all requirements set forth in the SunStar Installation and Operating Instructions and any National and Local codes pertaining to the installation, service and operation of the equipment. Annual inspection is recommended prior to the heating season to ensure proper operation of the heating equipment.

SUNSTAR HEATING PRODUCTS, INC.
Post Office Box 36271 (28236) * 1700 Parker Drive (28208) * Charlotte, North Carolina
Phone (704) 372-3480 * Fax (704) 332-6943 www.sunstarheaters.com * email: info@sunstarheaters.com

43344980
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Scan warranty QR code on the right to register your product.