SPACE-RAY®
INFRARED GAS HEATERS

INSTALLATION AND OPERATION INSTRUCTIONS

OWNER / INSTALLER: For your safety this manual must be carefully and thoroughly read and understood before installing, operating or servicing this heater.

INFRARED RADIANT TUBE HEATER

Single Stage Pull Through System (Negative Pressure)

Models:

LTU SERIES: (80, 90, 100, 110, 120, 125, 130, 140, 150, 160, 175, 180, 200, 225, 250) – N5/L5

LTS SERIES: (40, 50, 60, 75, 80, 90, 100, 110, 120, 125, 130, 140, 150, 160, 175, 180, 200, 225, 250) – N5/L5

!INSTALLER: This manual is the property of the owner. Please present this manual to the owner when you leave the job site.

▲WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury or death. Read the installation, operation and maintenance instructions thoroughly before installing or servicing this equipment.

IF YOU SMELL GAS:

- **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.

FOR YOUR SAFETY

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

!IMPORTANT: SAVE THIS MANUAL FOR FUTURE REFERENCE.

SPACE-RAY
Post Office Box 36485 (28236) • 305 Doggett Street (28203) • Charlotte, North Carolina
Phone (704) 372-6391 • Fax (704) 332-5843 • www.spaceray.com • email: info@spaceray.com

Form #43155010
Dec 09

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
1.0)	Safety	2
2.0)	Installer Responsibility	2
3.0)	General Information	2
4.0)	Minimum Clearances to Combustibles	4
5.0)	Typical Suspension Methods	5
6.0)	LTU Series Specifications	6
7.0)	LTU Series Packing List	6
8.0)	LTU Series Typical Layouts	8
8.1)	LTU Series Dimensions	8
8.2)	LTU 80-175 Series Heater Assembly Overview	10
8.3)	LTU 180-250 Series Heater Assembly Overview	11
8.4)	LTU Series 15' Body Package Opening	11
8.5)	LTU 80-130 Series Heater Assembly	12
8.6)	LTU 125-250 Series – Joining of 5' and 10' Body Sections	15
9.0)	LTS Series Specifications	16
10.0)	LTS Series Packing List	16
11.0)	LTS Series Typical Layouts	19
11.1)	LTS Series Dimensions	20
11.2)	LTS 40-175 Series Heater Assembly Overview	21
11.3)	LTS 180-250 Series Heater Assembly Overview	22
11.4)	LTS Series Heater Assembly	22
11.5)	LTS Series - Adding Optional 90º Elbow	24
11.6)	LTS Series - Adding Optional Corner Reflector	25
11.7)	LTS Series - Attaching Control Box Assembly	25
11.8)	LTS Series - Attaching Draft Inducer Assembly	26
11.9)	LTS Series - Inclined Mounting Instructions	27
12.0)	Accessory Packages	29
13.0)	Multiple Hanging & Draft Inducer Positions	29
14.0)	Gas Connections and Regulations	31
15.0)	Instructions for Pressure Test Gauge Connection	33
16.0)	Electrical Connections	34
17.0)	Venting	37
18.0)	Air for Combustion	41
18.1)	Direct Outside Air for Combustion	41
19.0)	Lighting and Shutdown Instructions	43
20.0)	Sequence of Operation	43
21.0)	Control Component Location	44
22.0)	Cleaning and Annual Maintenance	45
23.0)	Troubleshooting Guide	46
24.0)	Replacing Parts	49
24.1)	Removing Spark Electrode	49
24.2)	Removing Main Burner and Gas Valve	50
24.3)	Air Switch Pressure Check	51
24.4)	Ignition System Checks	51
24.5)	Motor and Blower Wheel Check	52
25.0)	Installation Data	52
26.0)	Replacement Parts Guide	53

This heater complies with ANSI Z83.20 (current standard) and CSA 2.34. Copies of the National Fuel Gas Code (ANSI Z223.1-latest edition) are available from the CSA at 8501 East Pleasant Valley Road, Cleveland, Ohio 44131 or 55 Scarsdale Road, Don Mills, Ontario M3B 2R3. All NFPA codes are available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

1.0) SAFETY

This heater is a self-contained infrared radiant tube heater. Safety information required during installation and operation of this heater is provided in this manual and the labels on the product. The installation, service and maintenance of this heater must be performed by a contractor qualified in the installation and service of gas fired heating equipment.

All personnel in contact with the heater must read and understand all safety information, instructions and labels before operation. The following symbols will be used in this manual to indicate important safety information.

⚠ WARNING **Warning** instructions must be followed to prevent or avoid hazards which may cause serious injury, property damage or death.

⚠ CAUTION **Caution** instructions must be followed to prevent incorrect operation or installation of the heater which may cause minor injury or property damage.

2.0) INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- The heater and venting, as well as electrical and gas supplies must be installed in accordance with these installation instructions and any applicable codes and regulations.
- Every heater shall be located with respect to building construction and other equipment so as to permit access to the heater.
- Each installer must follow the clearances to combustible materials for the heaters.
- Install the heater so that the supports and hangers are correctly spaced in accordance with these instructions. The heater must be supported by materials having a working load limit of at least 115lbs.
- Supply the owner with a copy of these Installation and Operation Instructions.
- 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.
- Never use the heater as a support for a ladder or other access equipment. Do not hang anything from the heater.
- Supply all installation materials necessary that are not included with the heater.
- Check the nameplate to make sure that the burner is correct for the gas type in the building and the installation altitude.

3.0) GENERAL INFORMATION

This heater is a self-contained infrared radiant tube heater for use in locations where flammable gases or vapors are not generally present (as defined by OSHA acceptable limits) and is intended for the heating of **nonresidential** spaces.

INSTALLATION REQUIREMENTS

The installation must conform to local building codes or in the absence of local codes, with the National Fuel Gas Code ANSI Z223.1/NFPA54 or the Natural Gas and Propane Installation Code CSA B149.1. Heaters shall be installed by a licensed contractor or licensed installer. Clearances to combustibles as outlined in this manual should always be observed. In areas used for storage of combustible materials where they may be stacked below the heater, NFPA54 requires that the installer must post signs that will "specify the maximum permissible stacking height to maintain the required clearances from the heater to combustibles."

The higher capacity LTS/LTU 180–250 models generate intense radiant heat. Therefore, the minimum recommended mounting height is 18 ft. above floor level for the LTS/LTU 180-200 models and 20 ft. above floor level for the LTS/LTU 225-250 models. Heaters may be mounted at various heights and angles depending on the application. If you have any questions, please consult your local Space-Ray representative.

Every heater shall be located with respect to building construction and other equipment so as to permit access to the heater. Each installer shall use quality installation practices when locating the heater and must give consideration to clearances to combustible materials, vehicles parked below, lights, overhead doors, storage areas with stacked materials, sprinkler heads, gas and electrical lines and any other possible obstructions or hazards. Consideration also must be given to service accessibility.

The heater, when installed in aircraft hangars and public garages, must be installed in accordance with ANSI/NFPA 409-latest edition (Standard for Aircraft Hangars), ANSI/NFPA 88a-latest edition (Standard for Parking Structures), and ANSI/NFPA 88b-latest edition (Standard for Repair Garages) with the following clearances:

a. At least 10 feet above the upper surfaces of wings or engine enclosures of the highest aircraft that may be housed in the hangar and at least 8 feet above the floor in shops, offices, and other sections of hangars communicating with aircraft storage or service areas.

b. At least 8 feet above the floor in public garages. ▲**WARNING:** Minimum clearances marked on the heater must be maintained from vehicles parked below the heater.

(FOR CANADA ONLY)

a. Installation of this appliance is to be in accordance with latest edition of CSA B149.1 (Natural Gas and Propane Installation Code).

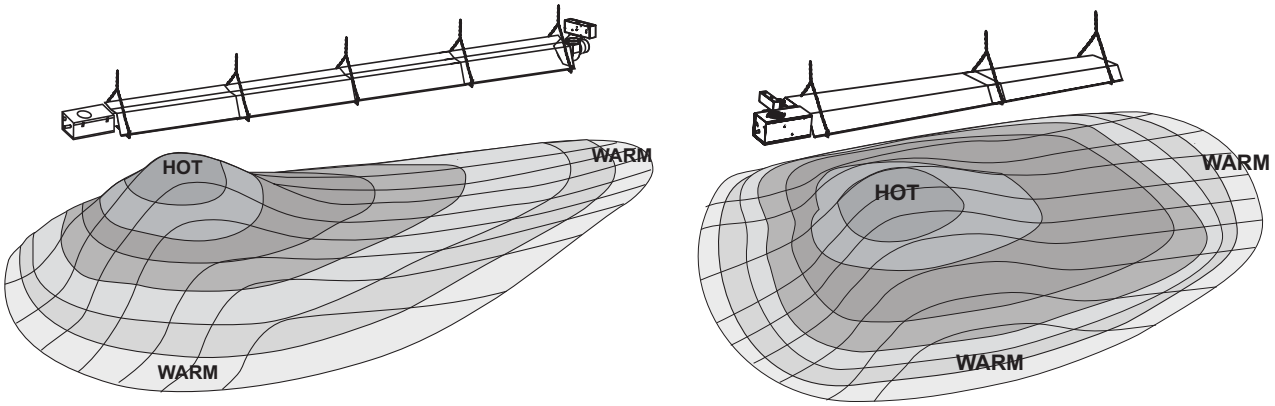
b. For installation in public garages or aircraft hangars, the minimum clearances from the bottom of the infrared heater to the upper surface of the highest aircraft or vehicle shall be 50 percent greater than the certified minimum clearance, but the clearance shall not be less than 8 feet.

Although these heaters may be used in many applications other than space heating (e.g., process heating), Space-Ray will not recognize the warranty for any use other than space heating.

This heater is for Indoor Installation and Covered Patio Installation only and can be used in either Vented or Unvented mode. The term Unvented actually means Indirect Vented. While the products of combustion are expelled into the building, national codes require ventilation in the building to dilute these products of combustion. This ventilation may be provided by gravity or mechanical means.

This heater is not an explosion proof heater. Where the possibility of exposure to volatile and low flash point materials exists, it could result in property damage or death. This heater must not be installed in a spray booth where the heater can operate during the spraying process. Consult your local fire marshal or insurance company.

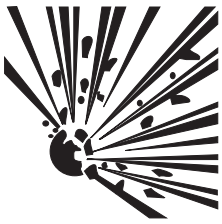
LTS Series Only: Since straight tube heaters are always hotter at the control end than at the flue terminal end, always observe the minimum recommended mounting heights shown on the specification sheets in Section 9.0) of this manual. Use U-tube configuration instead of straight tubes for spot or area heating (e.g., where a single heater is utilized for space heating).



High Altitude:
Appliances are supplied as standard for altitudes of 0 to 2,000 feet (0-610 m). High-altitude ratings are obtained by a change in the orifice size. When ordered for high altitude installations, burners are supplied by the factory ready for high altitude installation. Check the nameplate for altitude before proceeding with the installation. In Canada the adjustment for altitude is made in accordance with Standard CGA 2.17, Gas-Fired Appliances for Use at High Altitudes.

4.0) MINIMUM CLEARANCES TO COMBUSTIBLES

⚠WARNING



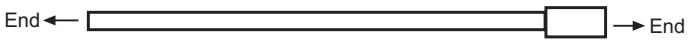


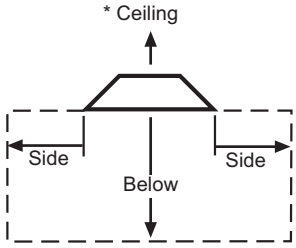
FIRE AND EXPLOSION HAZARD

Combustible material must be located outside the clearance dimensions listed.

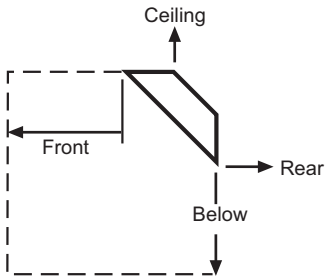
Failure to do so may result in death, serious injury or property damage.

Minimum clearances to combustibles shall be measured from the outer surfaces as shown in the following diagram:





Horizontal



45° Angle (Maximum)

MINIMUM CLEARANCES TO COMBUSTIBLES						
	Mounted Horizontally				Angle Mounted at 45°	
Model No.	Sides	Ceiling*	Below	Ends	45° Front	45° Rear
LTS 40, 50	27”	6”	40”	30”	48”	12”
LTS 60, 75	27”	6”	60”	30”	48”	12”
LTS/LTU 80, 90	52”	6”	84”	30”	52”	12”
LTS/LTU 100	66”	6”	88” **	40”	66”	20”
LTS/LTU 110, 120, 125, 130	66”	6”	101” **	40”	66”	20”
LTS/LTU 140, 150, 160, 175	84”	6”	106” **	48”	84”	24”
LTS/LTU 180, 200, 225, 250	84”	6”	132” **	48”	84”	24”

* When used indirect vented, minimum clearance for CEILING must be: 12” for LTS 40-75 and 18” for LTS/LTU 80-250. If optional corner and U-bend reflectors are not used, the clearance must be 18”.

** Maximum clearance below reduces to 72” once you are 20 ft. downstream from the control box.

▲WARNING: Certain materials or objects, when stored under the heater, will be subjected to radiant heat and could be seriously damaged. Observe the Minimum Clearances to Combustibles listed in the manual and on the heater at all times.

NOTE:

1. The clearances specified above must be maintained to combustibles and other materials that may be damaged by temperatures 90°F above ambient temperature. Clearances to combustibles are posted on the control box. In areas used for storage of combustible materials where they may be stacked below the heater, NFPA54 requires that the installer must post signs that will “specify the maximum permissible stacking height to maintain the required clearances from the heater to combustibles.” Space-Ray recommends posting these signs adjacent to the heater thermostat or other suitable location that will provide enhanced visibility.

2. The stated clearance to combustibles represents a surface temperature of 90 °F (32 °C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyle siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer’s responsibility to assure that adjacent materials are protected from degradation.

5.0) TYPICAL SUSPENSION METHODS

⚠ WARNING



SUSPENSION HAZARD

Burner must be secured to the mounting flange with nuts.

All materials used to suspend the heater must have a minimum working load of 115 lbs.
All "S" Hooks must be crimped closed.

Never use the heater to support a ladder or other access equipment.

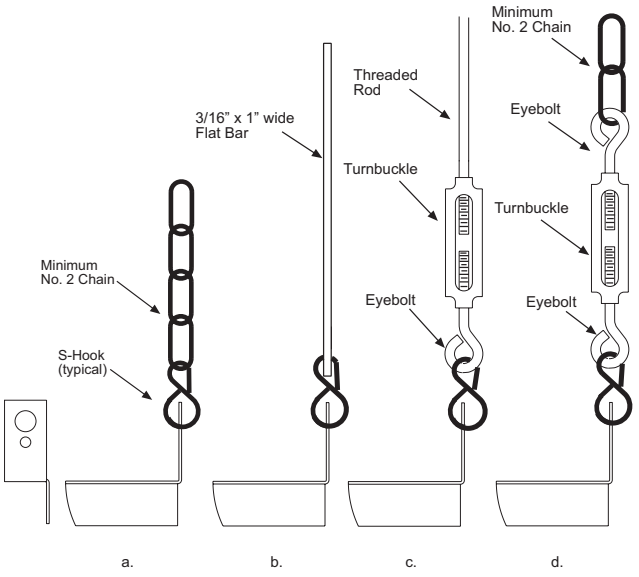
Failure to do so may result in death, serious injury or property damage.

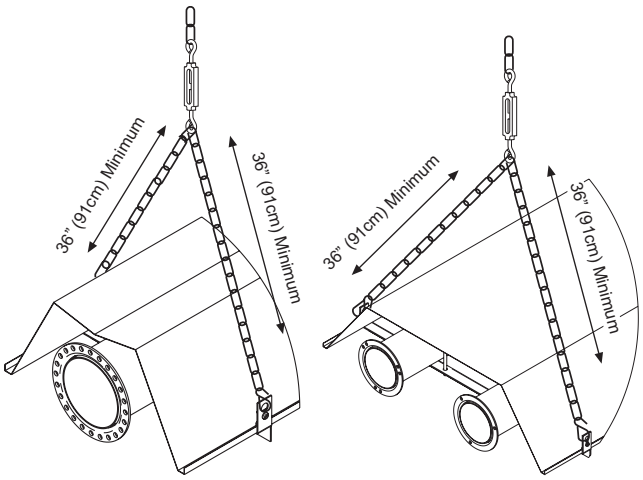
Various means of suspending the heater can be used. See the following drawings for typical examples.

1. **Use only noncombustible materials for suspending hangers and brackets.**
2. **A minimum No. 2 chain with a working load limit of 115 lbs. is required.**
3. **Turnbuckles can be used with chains to allow leveling of the heater. All "S" hooks and eye bolts must be manually crimped closed by the installer.**
4. **When using rigid means for heater suspension (rod, flat bar, etc.) provide sufficient lengths or swing joints to compensate for expansion. See Figures b and c.**
5. **Heaters subject to vibration must be provided with vibration isolating hangers.**
6. **Heaters must not be supported by gas or electric supply lines and must be suspended from a permanent structure with adequate load capacity.**

Space-Ray recommends that the body sections be suspended using chains with turnbuckles. This will allow slight adjustments after assembly and heater expansion/ contraction during operation.

If a "trapeze" method is used for tube support/hanger brackets (shown below), the minimum chain length for the two connecting chains is 36" to minimize any vibration that might be generated by the draft inducer assembly. If these chains must be less than 36", then do not use the trapeze method and, instead, use individual chains on each tube support/hanger bracket.





6.0) LTU SERIES SPECIFICATIONS

Model No.	Btu/hr Input	Flue Restrictor Plate I.D. & Part #		Orifice Size				Minimum * Mounting Height	
				Natural Gas		Propane Gas		@ Horizontal	@ 45° Angle
LTU 80	80,000	1-1/2"	#42741050	#19	(0.166)	#38	(0.102)	13 ft.	12 ft.
LTU 90	90,000	1-1/2"	#42741050	#16	(0.177)	#36	(0.106)	13 ft.	12 ft.
LTU 100	100,000	1-5/8"	#42741060	#14	(0.182)	#33	(0.113)	13 ft.	12 ft.
LTU 110	110,000	1-3/4"	#42741070	#10	(0.194)	#31	(0.120)	14 ft.	13 ft.
LTU 120	120,000	1-3/4"	#42741070	13/64	(0.203)	1/8	(0.125)	14 ft.	13 ft.
LTU 125	125,000	1-7/8"	#42741080	#5	(0.206)	#30	(0.129)	14 ft.	13 ft.
LTU 130	130,000	1-7/8"	#42741080	#4	(0.209)	3.3mm	(0.130)	14 ft.	13 ft.
LTU 140	140,000	2-1/32"	#42741090	5.5mm	(0.216)	#29	(0.136)	15 ft.	14 ft.
LTU 150	150,000	2-1/32"	#42741090	5.7mm	(0.224)	#28	(0.140)	15 ft.	14 ft.
LTU 160	160,000	2-1/4"	#42741100	5.8mm	(0.228)	#27	(0.144)	15 ft.	14 ft.
LTU 175	175,000	2-1/4"	#42741100	"C"	(0.242)	3.8mm	(0.150)	15 ft.	14 ft.
LTU 180	180,000	2-1/4"	#42741100	"C"	(0.242)	#24	(0.152)	18 ft.	17 ft.
LTU 200	200,000	2-3/8"	#42741130	"F"	(0.257)	#21	(0.159)	18 ft.	17 ft.
LTU 225	225,000	2-1/2"	#42741140	6.9mm	(0.272)	#18	(0.170)	20 ft.	19 ft.
LTU 250	250,000	2-3/4"	#42741150	"K"	(0.281)	4.5mm	(0.177)	20 ft.	19 ft.

* MOUNT HEATERS AS HIGH AS POSSIBLE. Minimums are shown as a guideline for human comfort and uniform energy distribution for complete building heating applications. Consult your Space-Ray representative for the particulars of your installation requirements.

Type Gas	Gas Pipe Connection[1]	Tube Diameter	Flue Connection[2]	Fresh Air Connection	Electrical Supply	Current Rating
Natural or Propane	½" MPT (Male)	4"	4" Round	6" Round	120 Volt, 60Hz, 1 Phase	2.6 Amp

[1] LTU 225 and 250 require a minimum 3/4" nominal ID flexible gas connector.

[2] LTU 180-250: 6" round. See Section 17.0) for vent sizes and limitations.

Fuse Rating:		Ignition System (direct spark):
In-line: 2 Amp 250V (for 24V Circuit)	Spark Module: 3 Amp 250V (for 24V Circuit)	30 second pre-purge period

7.0) LTU SERIES PACKING LIST

A. Control/Draft Inducer Package

Part Description	QTY
Control Box Assembly	1
Draft Inducer & Junction Box Assembly	1
Flue Restrictor Plate (See Section 6.0) for plate I.D. and part no.)	1
4" x 6" Starting Collar[1] (#42892009) Supplied with LTU 180-250	1
Control Fastener Kit (#42907010)	1
Containing: #8-32 Screws & Nuts (#02166010 & #02127030)	2
¼ - 20 Locknuts (#02167010)	6
Tube Flange Gasket (#42921000)	2
Installation & Operation Instructions (#43155010)	1
Gas connector, 5/8" OD x 36" (#30302360) [2]	1

[1] 4-inch Starting Collar (#40504020) supplied with LTU 80-175 models.

[2] LTU 225 and 250 models using Gas Connector, 1" OD x 36" (#30302361)

LTU 80-250 CONTROL/DRAFT INDUCER PACKAGE NUMBERS

NATURAL GAS			
MODEL NO.	**PART NO.**	**MODEL NO.**	**PART NO.**
LTU 80-N5	#42883010	LTU 150-N5	#42883210
LTU 90-N5	#42883030	LTU 160-N5	#42883230
LTU 100-N5	#42883050	LTU 175-N5	#42883250
LTU 110-N5	#42883070	LTU 180-N5	#42883270
LTU 120-N5	#42883090	LTU 200-N5	#42883290
LTU 125-N5	#42883110	LTU 225-N5	#42883310
LTU 130-N5	#42883130	LTU 250-N5	#42883330
LTU 140-N5	#42883190		

PROPANE GAS			
MODEL NO.	**PART NO.**	**MODEL NO.**	**PART NO.**
LTU 80-L5	#42883020	LTU 150-L5	#42883220
LTU 90-L5	#42883040	LTU 160-L5	#42883240
LTU 100-L5	#42883060	LTU 175-L5	#42883260
LTU 110-L5	#42883080	LTU 180-L5	#42883280
LTU 120-L5	#42883100	LTU 200-L5	#42883300
LTU 125-L5	#42883120	LTU 225-L5	#42883320
LTU 130-L5	#42883140	LTU 250-L5	#42883340
LTU 140-L5	#42883200		

B. LTU 80-250 Body Package Descriptions

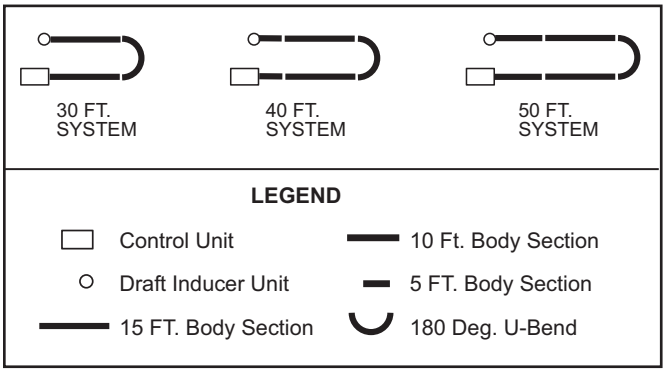
(Package Part Number is indicated on the outside of each corresponding carton.)

System Lengths Ft.	15' Body Pkg. 42881000	5' Body Pkg. 42882000	10' Body Pkg. 42882020	10' Body Pkg. 42882030
	Qty.	Qty.	Qty.	Qty.
30'	1	-	-	-
40'	1	1	-	-
50' *	1	-	1	-
50' **	1	-	-	1

* for LTU 180-200 Models Only; ** for LTU 225-250 Models Only

LTU Body Package Components		15' Pkg. 42881000	5' Pkg. 42882000	10' Pkg. 42882020	10' Pkg. 42882030
Part #	**Component Description**	**Qty.**	**Qty.**	**Qty.**	**Qty.**
42914000	Pre-assembled 15' ALC Steel U-Tube (two 24-hole flanges) with reflector	1	-	-	-
42915000	Pre-assembled 5' ALC Steel Tube (two 24-hole flanges) with reflector	-	1	-	-
42915020	Pre-assembled 10' ALC Steel Tube (24-hole flanges) with reflector	-	-	1	-
42915030	Pre-assembled with reflector, one 10' ATC Steel Tube (6-hole flanges) and one 10' ALC Steel Tube (24-hole flanges)	-	-	-	1
42895000	Control End Reflector	1	-	-	-
42896000	Foot End Reflector	1	-	-	-
42907020	Body Fastener Kit, Containing: #02167010, ¼-20 Locknuts (QTY = 12) #02259000, ¼-20 Machine Screws (QTY = 12) #02125130, #10-24x1/2" Screws (QTY = 4 #02189020, #10-16x1/2" Screws (QTY = 2) #02266010, Speed Clips (QTY = 2) #42769010, Sliding Clamps (QTY = 4) #42921000, Tube Flange Gaskets (QTY = 2)	-	1	1	1
42907030	Body Fastener Kit, Containing: #02125130, #10-24x1/2" Screws (QTY = 6 #02189020, #10-16x1/2" Screws (QTY = 2) #02266010, Speed Clips (QTY = 20) #42769010, Sliding Clamps (QTY = 6)	1	-	-	-

8.0) LTU SERIES TYPICAL LAYOUTS

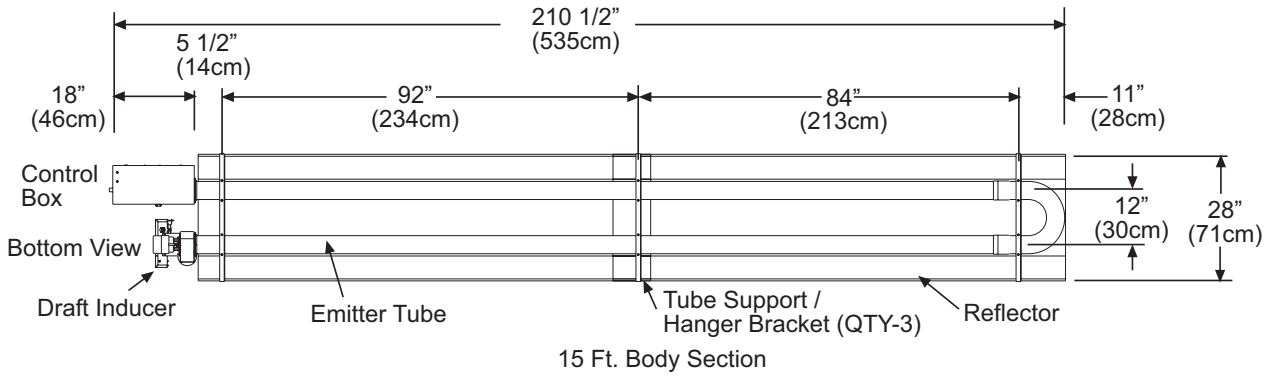


EMITTER LENGTH	MODEL
30'	LTU 80, 90, 100, 110, 120, 125, 130
40'	LTU 125, 130, 140, 150, 160, 175
50'	LTU 180, 200, 225, 250

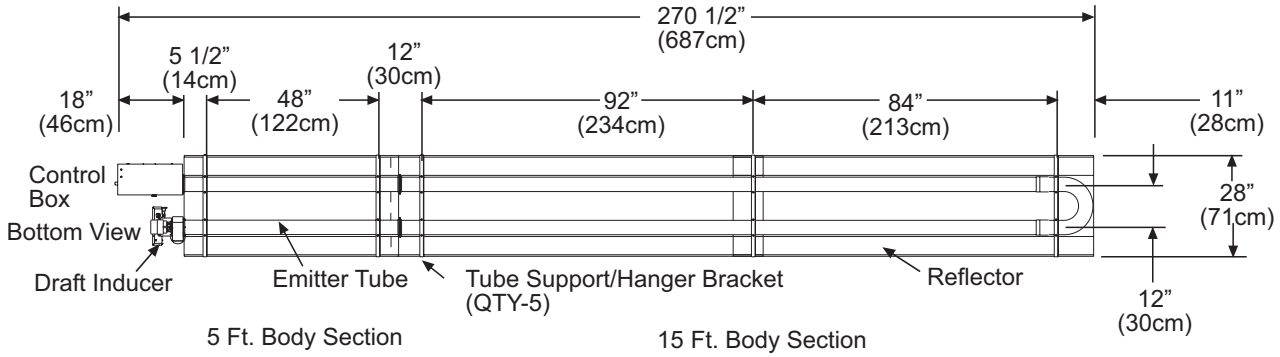
NOTES:

1. In all configurations, the control unit must be connected directly to either a) the 24-hole flange of the aluminized steel body section (for LTU 80-200 models) or b) the 6-hole flange of the 10 ft. alumi-therm steel body section (for LTU 225 and 250 models).
2. **Failure to attach the control box to the 6-hole flange for LTU 225-250 as indicated above will void the manufacturer's warranty.**

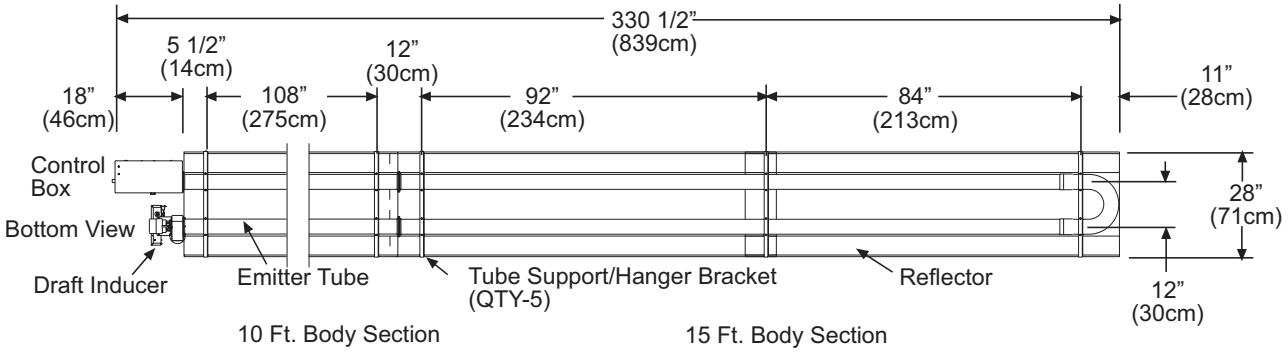
8.1) LTU SERIES DIMENSIONS



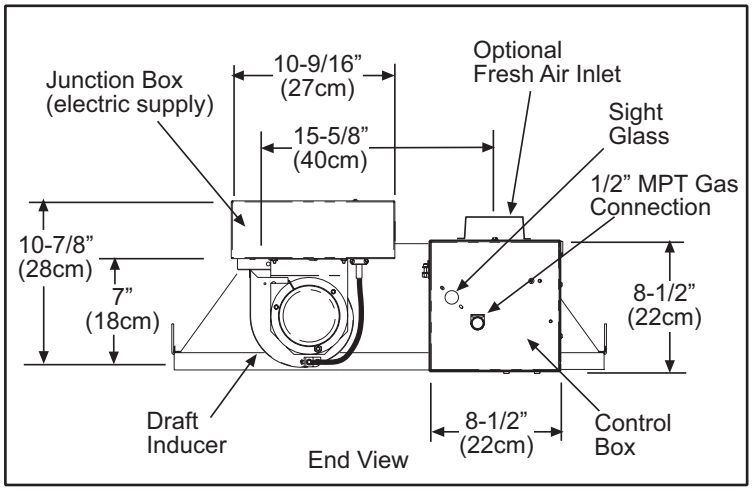
Models: LTU 80-130



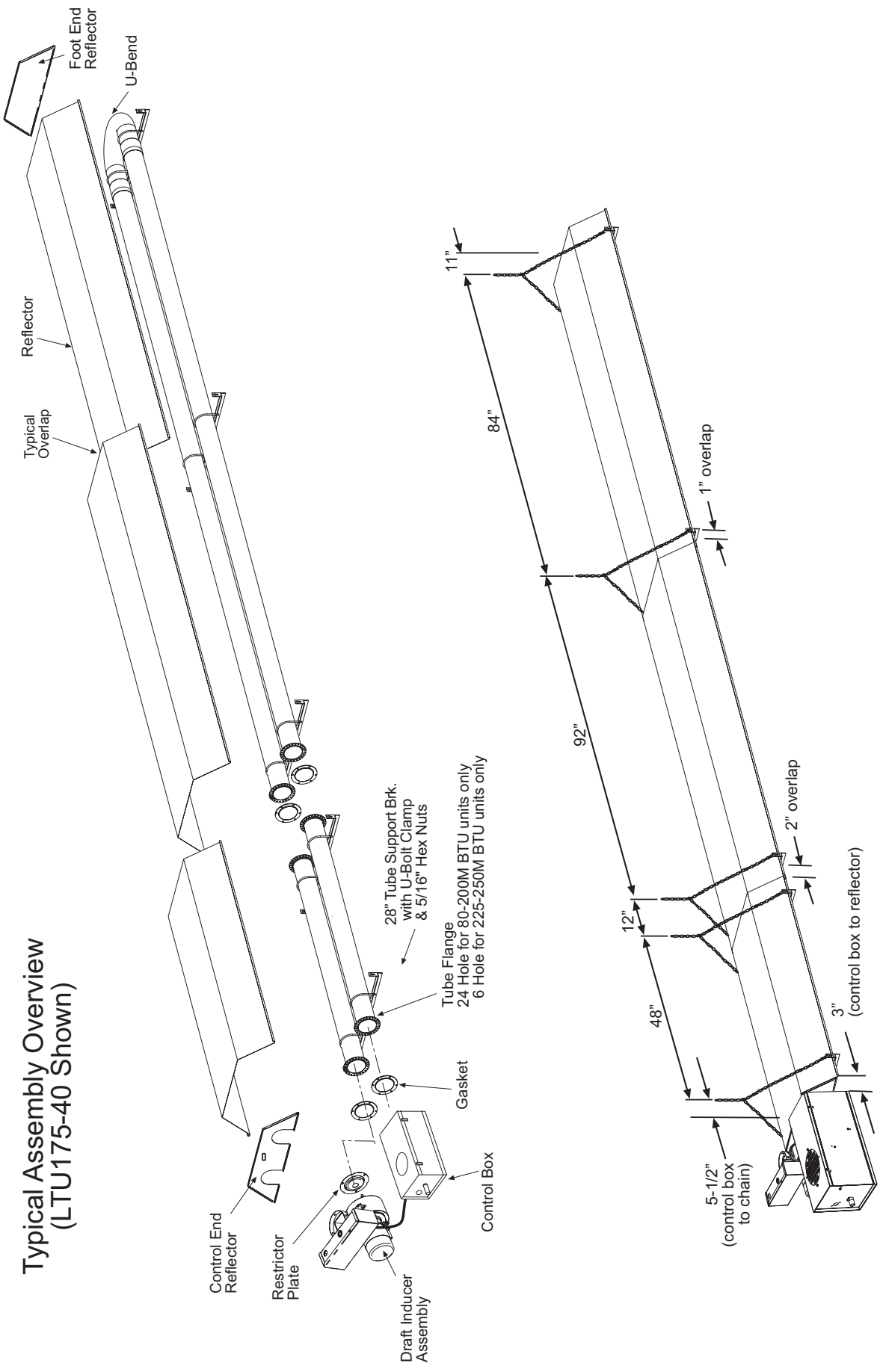
Models: LTU 125-175



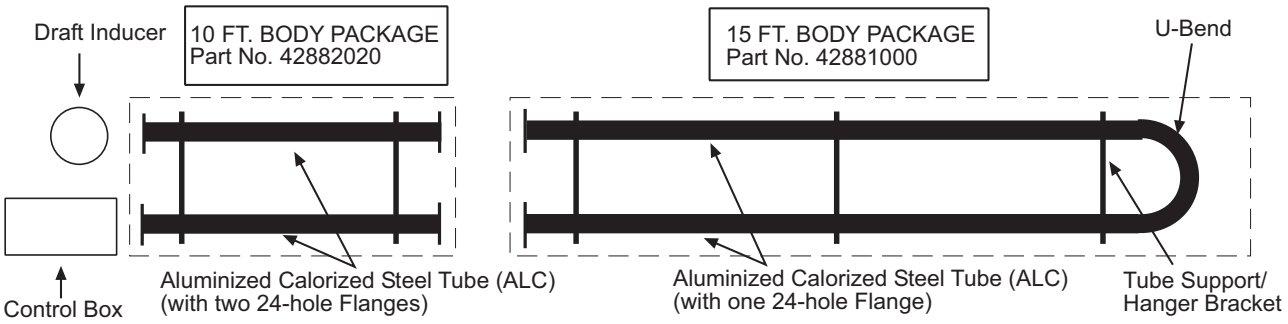
Models: LTU 180-250



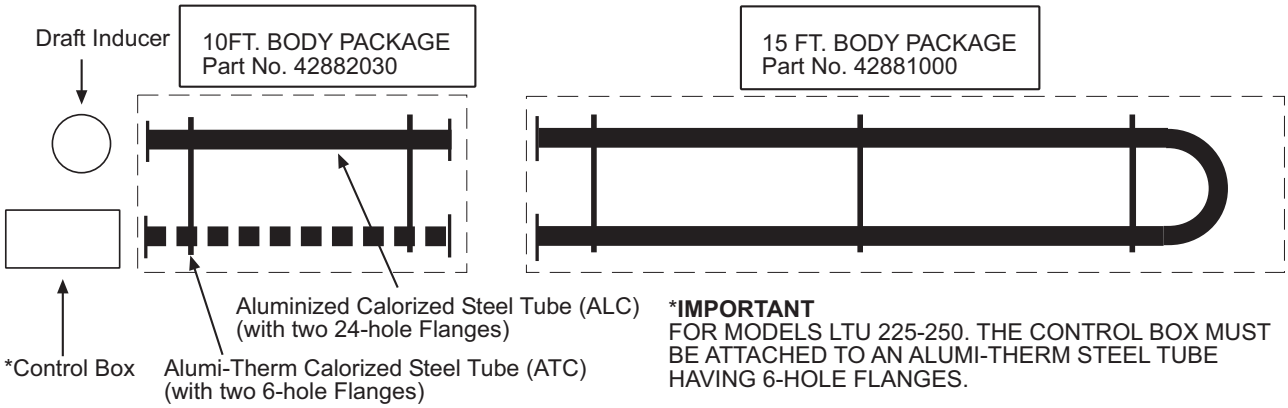
8.2) LTU 80-175 SERIES HEATER ASSEMBLY 0VERVIEW



8.3) LTU 180-250 SERIES HEATER ASSEMBLY OVERVIEW



Models: LTU 180-200



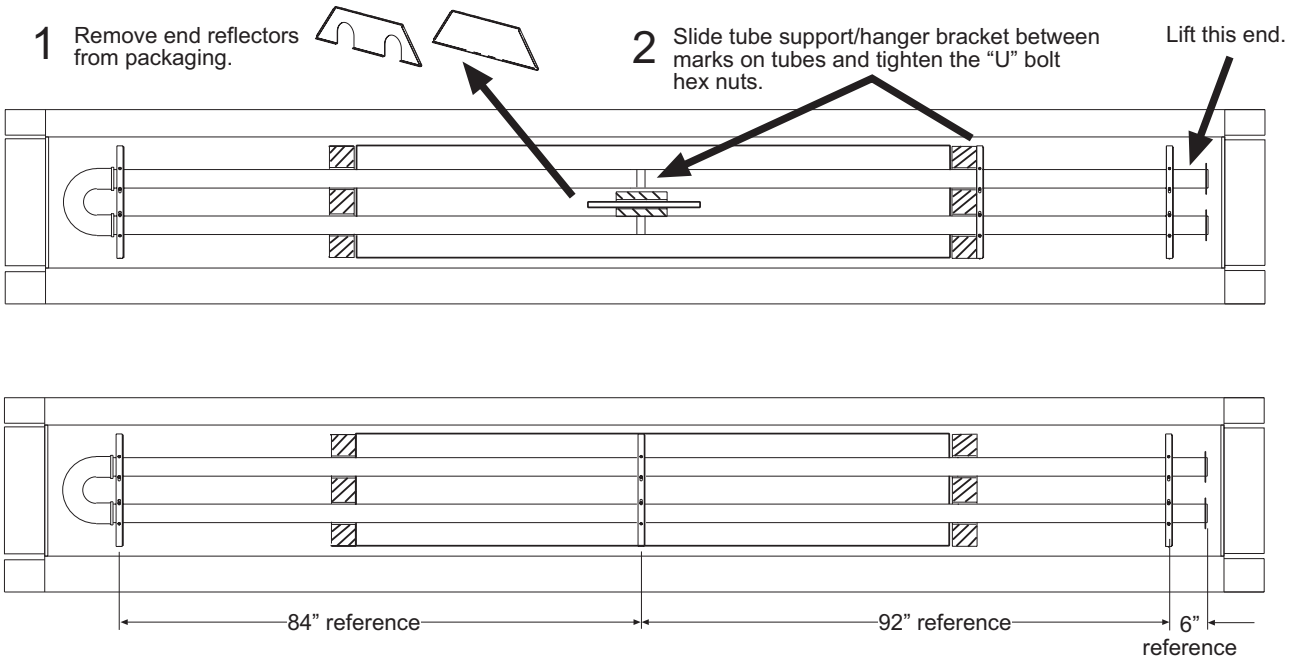
***IMPORTANT**
FOR MODELS LTU 225-250. THE CONTROL BOX MUST BE ATTACHED TO AN ALUMI-THERM STEEL TUBE HAVING 6-HOLE FLANGES.

Models: LTU 225-250

8.4) LTU SERIES 15' BODY PACKAGE OPENING

Follow the procedure below to open the 15' body package.

1. **Remove end reflectors from packaging.**
2. **Lift the tube at the flange end, then slide tube support/hanger bracket between marks on tubes and tighten the "U" bolt hex nuts. Follow instructions in Sections 8.5) and 8.6) for the field assembly of the heater.**



8.5) LTU 80-130 SERIES HEATER ASSEMBLY

⚠ CAUTION



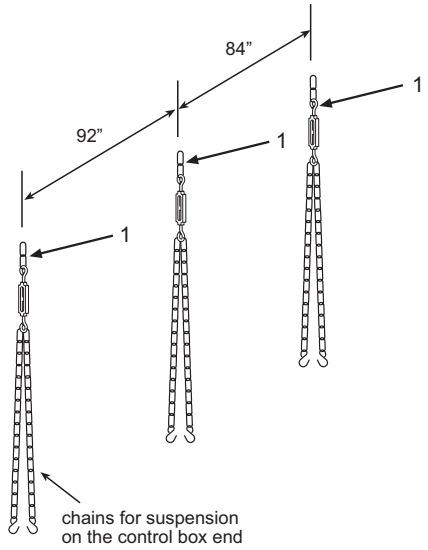
CUT HAZARD

Sheet metal parts, particularly reflectors and vent have sharp edges. Always use gloves when handling.

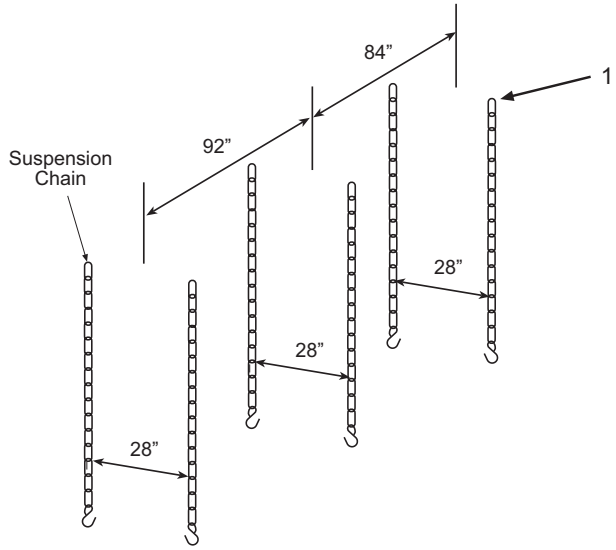
Failure to do so may result in death, serious injury or property damage.

During field assembly of the heater, the recommended procedure is as follows:

1. **Install the suspension (according to Section 8.1) using proper suspension method (see Section 5.0).**

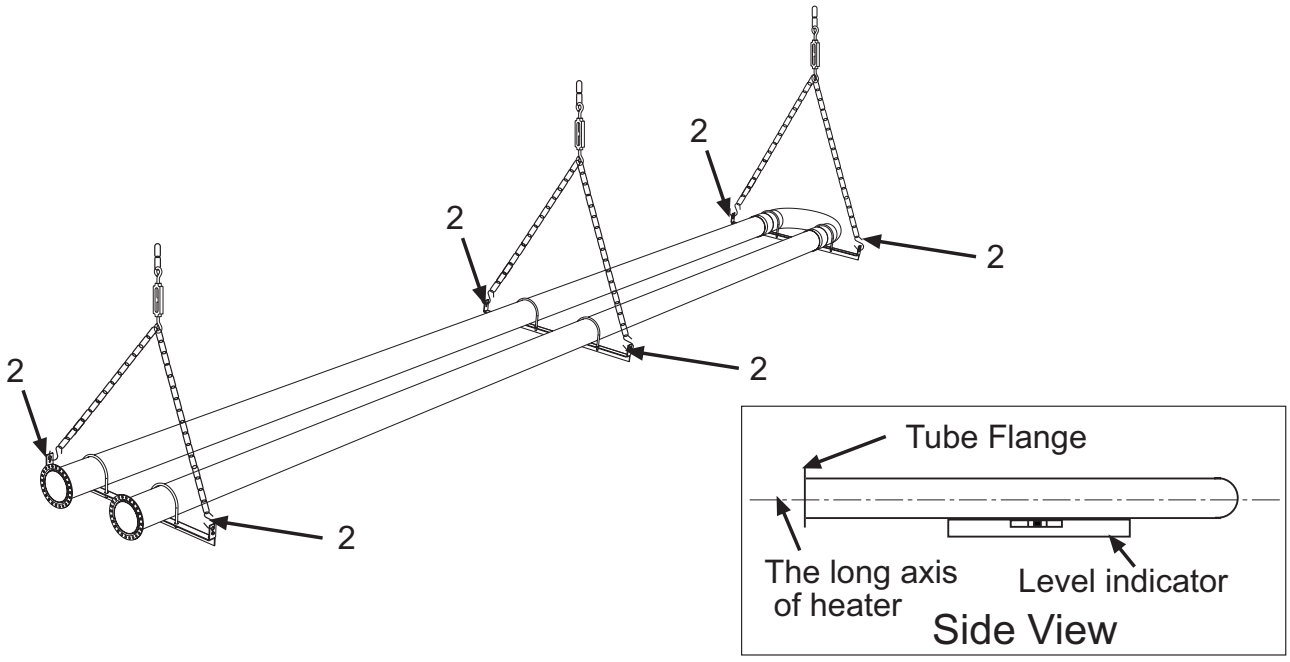


Trapeze Method

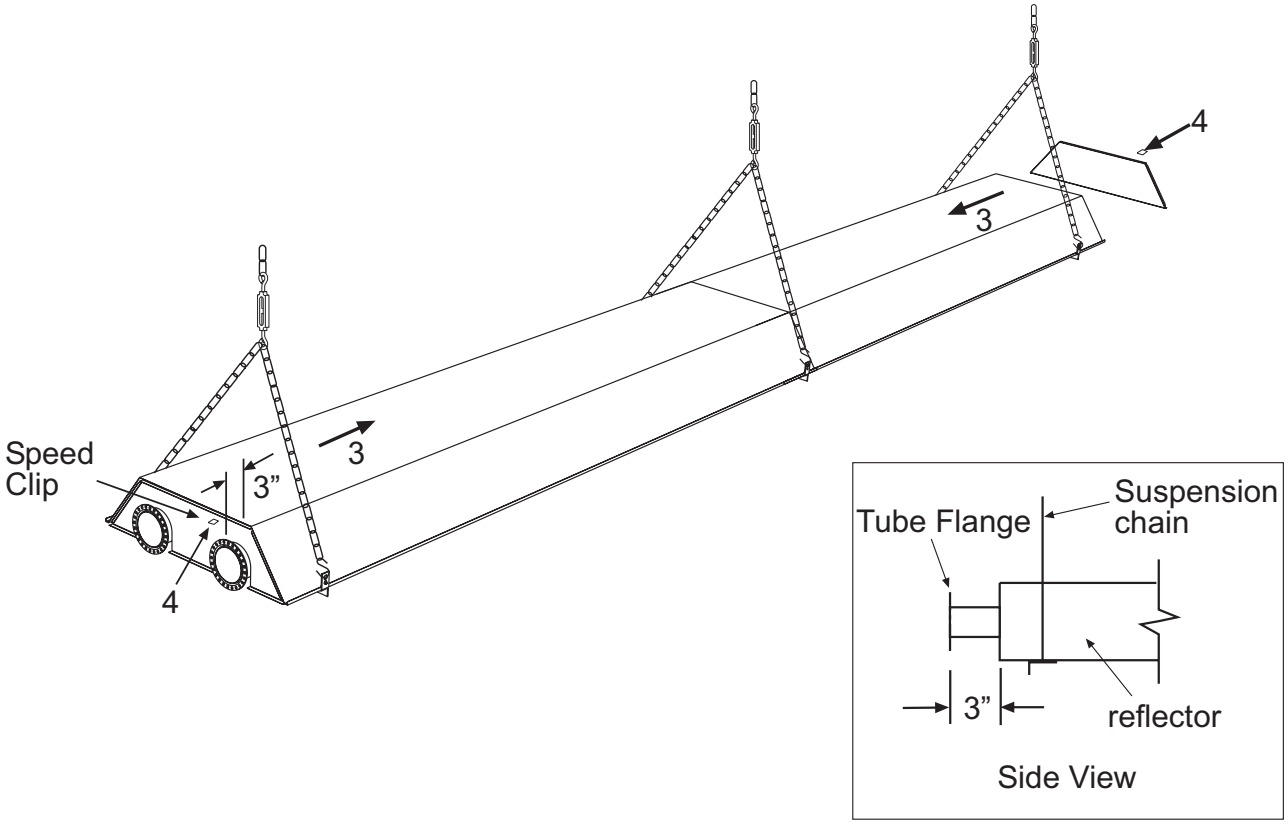


Individual Suspension Method

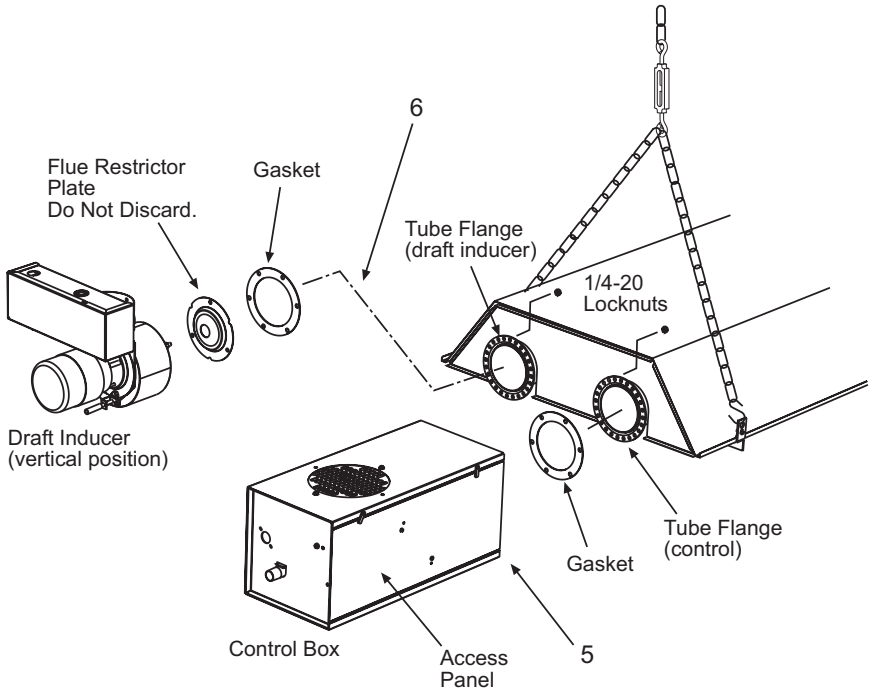
2. **Lift the body section and suspend it into place. When lifting, caution should be used to avoid damaging the assembly. Make sure that the long axis of heater is level.**



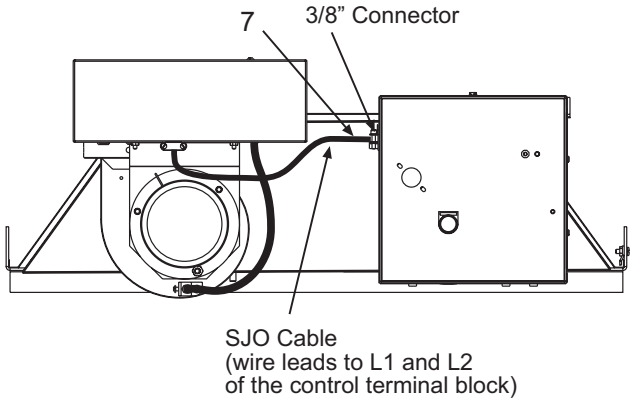
3. Assembly the reflectors onto the body section. Leave 3" space between the tube flange and the first reflector for later mounting of control box and draft inducer.
4. Place the flanges of the control end reflector flush with the end of the first reflector. Secure by sliding speed clips onto reflector edges. Evenly space 6 speed clips on sides and top of reflectors to provide a snug fit. Place foot end reflector on the opposite end of the reflector and secure as above.



5. Attach the control box to the right-hand control tube flange and secure with 1/4-20 locknuts. The control box must be mounted with the perforated fresh air plate on top, facing the ceiling.
6. Attach the draft inducer assembly to the left-hand draft inducer tube flange and secure with 1/4-20 locknuts. A flue restrictor plate is attached to the draft inducer weld studs. Make sure this remains in place while the draft inducer is being attached to the heater body.

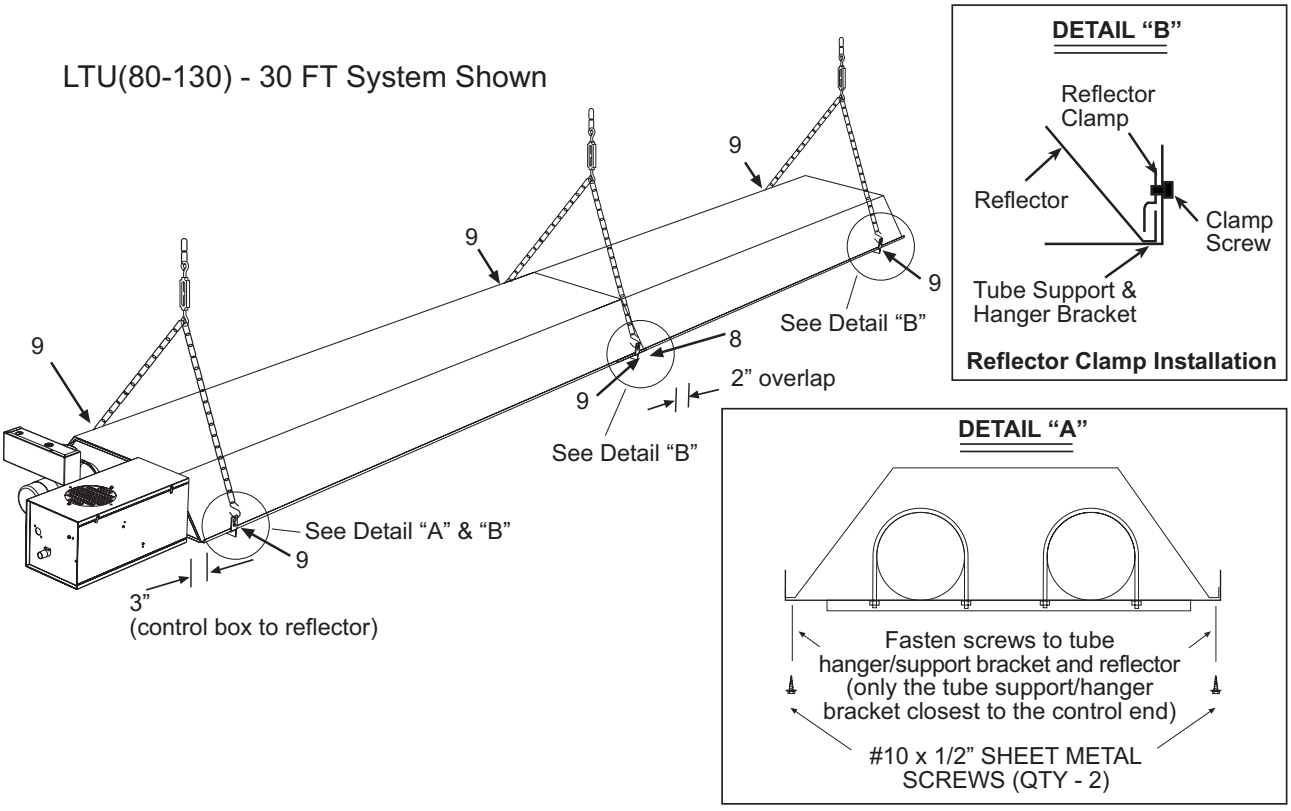


7. Insert SJO cable through the strain relief bushing of the control box and connect to L1 and L2 of terminal block. Refer also to the wiring diagram in Section16.0).



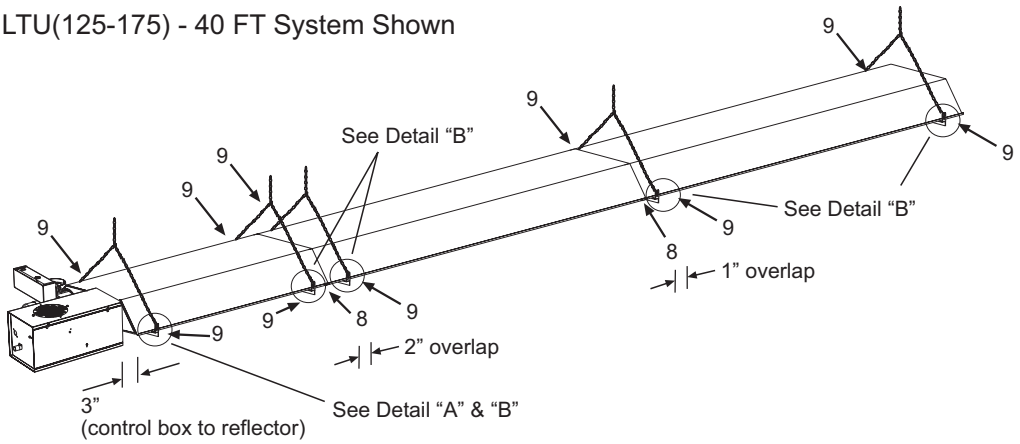
8. Reflectors should overlap 1" to 3" and must be secured by sliding speed clips on the reflector edges. One speed clip is required for each side of the reflector.
9. Fasten the first reflector to the tube support/hanger bracket with (2) #10 sheet metal screws according to Detail "A". Mount the sliding reflector clamps (#42769010) per Reflector Clamp Installation (Detail "B") on all tube support/hanger brackets. Make sure the reflector can slide under the clamp during heater operation.

⚠ WARNING **The reflector clamps MUST be installed per reflector clamp installation detail which allows the reflector to slide under the clamp during heater operation.**

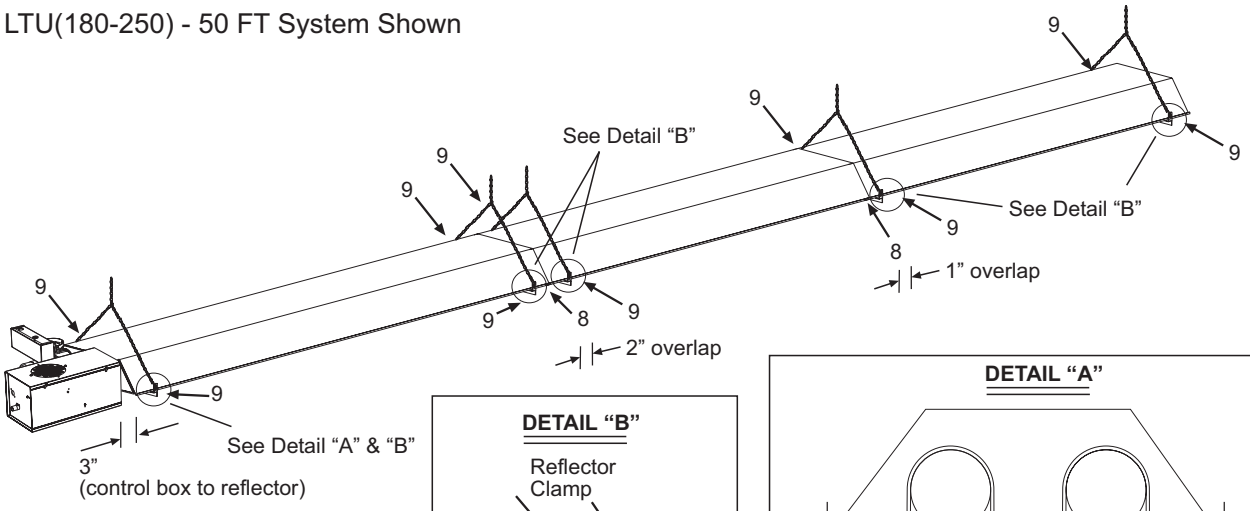


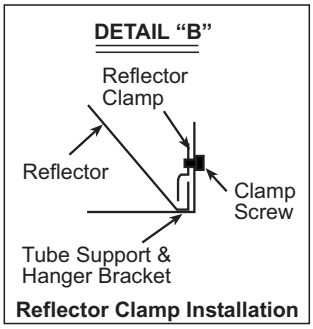
⚠ CAUTION **Do not relocate the tube support/hanger bracket at the control box end of the heater. This will increase the weight on the emitter tube and can result in premature tube failure.**

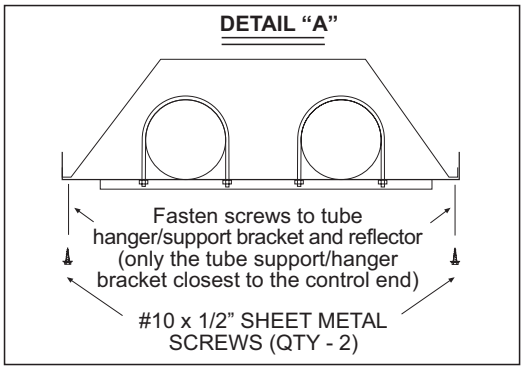
LTU(125-175) - 40 FT System Shown



LTU(180-250) - 50 FT System Shown



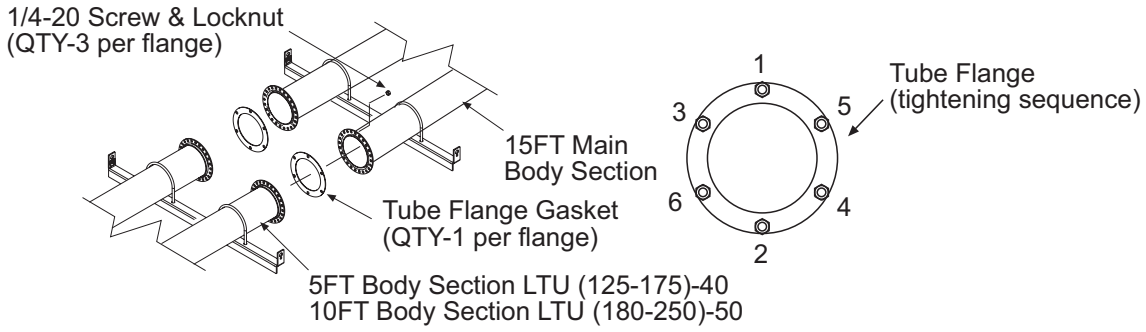




8.6) LTU 125-250 SERIES – JOINING OF 5' AND 10' BODY SECTIONS

These models require the use of an additional 5' body section for LTU 125-175 and 10' body section for LTU 180-250, as shown in Section 8.1). Follow the instruction below for joining these sections.

1. **Join the tube flanges of the body sections together with gaskets in between. Secure the flanges with the ¼-20 screws and locknuts provided.**
2. **Assemble the control box, draft inducer, and other components as previously described in the heater assembly instructions.**



9.0) LTS SERIES SPECIFICATIONS

Model No.	Btu/hr Input	Flue Restrictor Plate I.D. & Part #		Orifice Size				Minimum * Mounting Height	
				Natural Gas		Propane Gas		@ Horizontal	@ 45° Angle
LTS 40	40,000	1"	#42741040	#31	(0.120)	#49	(0.073)	10 ft.	9 ft.
LTS 50	50,000	1-1/8"	#42741030	3.3mm	(0.130)	#46	(0.081)	11 ft.	10 ft.
LTS 60	60,000	1-7/32"	#42741020	#27	(0.144)	#43	(0.089)	12 ft.	11 ft.
LTS 75	75,000	1-7/16"	#42741010	#20	(0.161)	#39	(0.099)	13 ft.	12 ft.
LTS 80	80,000	1-1/2"	#42741050	#19	(0.166)	#38	(0.102)	13 ft.	12 ft.
LTS 90	90,000	1-1/2"	#42741050	#16	(0.177)	#36	(0.106)	13 ft.	12 ft.
LTS 100	100,000	1-5/8"	#42741060	#14	(0.182)	#33	(0.113)	13 ft.	12 ft.
LTS 110	110,000	1-3/4"	#42741070	#10	(0.194)	#31	(0.120)	14 ft.	13 ft.
LTS 120	120,000	1-3/4"	#42741070	13/64	(0.203)	1/8	(0.125)	14 ft.	13 ft.
LTS 125	125,000	1-7/8"	#42741080	#5	(0.206)	#30	(0.129)	14 ft.	13 ft.
LTS 130	130,000	1-7/8"	#42741080	#4	(0.209)	3.3mm	(0.130)	14 ft.	13 ft.
LTS 140	140,000	2-1/32"	#42741090	5.5mm	(0.216)	#29	(0.136)	15 ft.	14 ft.
LTS 150	150,000	2-1/32"	#42741090	5.7mm	(0.224)	#28	(0.140)	15 ft.	14 ft.
LTS 160	160,000	2-1/4"	#42741100	5.8mm	(0.228)	#27	(0.144)	15 ft.	14 ft.
LTS 175	175,000	2-1/4"	#42741100	"C"	(0.242)	3.8mm	(0.150)	15 ft.	14 ft.
LTS 180	180,000	2-1/4"	#42741100	"C"	(0.242)	#24	(0.152)	18 ft.	17 ft.
LTS 200	200,000	2-3/8"	#42741130	"F"	(0.257)	#21	(0.159)	18 ft.	17 ft.
LTS 225	225,000	2-1/2"	#42741140	6.9mm	(0.272)	#18	(0.170)	20 ft.	19 ft.
LTS 250	250,000	2-3/4"	#42741150	"K"	(0.281)	4.5mm	(0.177)	20 ft.	19 ft.

* MOUNT HEATERS AS HIGH AS POSSIBLE. Minimums are shown as a guideline for human comfort and uniform energy distribution for complete building heating applications. Consult your Space-Ray representative for the particulars of your installation requirements.

Type Gas	Gas Pipe Connection[1]	Tube Diameter	Flue Connection[2]	Fresh Air Connection	Electrical Supply	Current Rating
Natural or Propane	½" MPT (Male)	4"	4" Round	6" Round	120 Volt, 60Hz, 1 Phase	2.6 Amp

[1] LTS 225 and 250 require a minimum 3/4" nominal ID flexible gas connector.

[2] LTS 180-250: 6" round. See Section 17.0) for vent sizes and limitations.

Fuse Rating:		Ignition System (direct spark):
In-line: 2 Amp 250V (for 24V Circuit)	Spark Module: 3 Amp 250V (for 24V Circuit)	30 second pre-purge period

10.0) LTS SERIES PACKING LIST

A. Control/Draft Inducer Package

Part Description	QTY
Control Box Assembly	1
Draft Inducer & Junction Box Assembly	1
Flue Restrictor Plate (See Section 9.0) for plate I.D. and part no.)	1
4" x 6" Starting Collar[1] (#42892009) Supplied with LTS 180-250	1
Control Fastener Kit (#42907010)	1
Containing: #8-32 Screws & Nuts (#02166010 & #02127030)	2
¼ - 20 Locknuts (#02167010)	6
Tube Flange Gasket (#42921000)	2
Installation & Operation Instructions (#43155010)	1
Gas connector, 5/8" OD x 36" (#30302360) [2]	1

[1] 4-inch Starting Collar (#40504020) supplied with LTS 40-175 models.

[2] LTS 225 and 250 models using Gas Connector, 1" OD x 36" (#30302361)

LTS SERIES CONTROL/DRAFT INDUCER PACKAGE NUMBERS

NATURAL GAS				PROPANE GAS			
MODEL NO.	PART NO.	MODEL NO.	PART NO.	MODEL NO.	PART NO.	MODEL NO.	PART NO.
LTS 40-N5	#43187010	LTS 130-N5	#42883130	LTS 40-L5	#43187020	LTS 130-L5	#42883140
LTS 50-N5	#43187030	LTS 140-N5	#42883190	LTS 50-L5	#43187040	LTS 140-L5	#42883200
LTS 60-N5	#43187050	LTS 150-N5	#42883210	LTS 60-L5	#43187060	LTS 150-L5	#42883220
LTS 75-N5	#43187070	LTS 160-N5	#42883230	LTS 75-L5	#43187080	LTS 160-L5	#42883240
LTS 80-N5	#42883010	LTS 175-N5	#42883250	LTS 80-L5	#42883020	LTS 175-L5	#42883260
LTS 90-N5	#42883030	LTS 180-N5	#42883270	LTS 90-L5	#42883040	LTS 180-L5	#42883280
LTS 100-N5	#42883050	LTS 200-N5	#42883290	LTS 100-L5	#42883060	LTS 200-L5	#42883300
LTS 110-N5	#42883070	LTS 225-N5	#42883310	LTS 110-L5	#42883080	LTS 225-L5	#42883320
LTS 120-N5	#42883090	LTS 250-N5	#42883330	LTS 120-L5	#42883100	LTS 250-L5	#42883340
LTS 125-N5	#42883110			LTS 125-L5	#42883120		

B. LTS 40-200 Body Package Descriptions

(Package Part Number is indicated on the outside of each corresponding carton.)

	10' Body Pkg. 43337040	10' Extension Body Pkg. 43337010	5' Ending Body Pkg. 43336030
System Lengths	Qty.	Qty.	Qty.
15'	1	-	1
20'	2	-	-
25'	1	1	1
30'	2	1	-
35'	1	2	1
40'	2	2	-
45'	1	3	1
50'	2	3	-
55'	1	4	1
60'	2	4	-
65'	1	5	1
70'	2	5	-
75'	1	6	1
80'	2	6	-

C. LTS 225-250 Body Package Descriptions

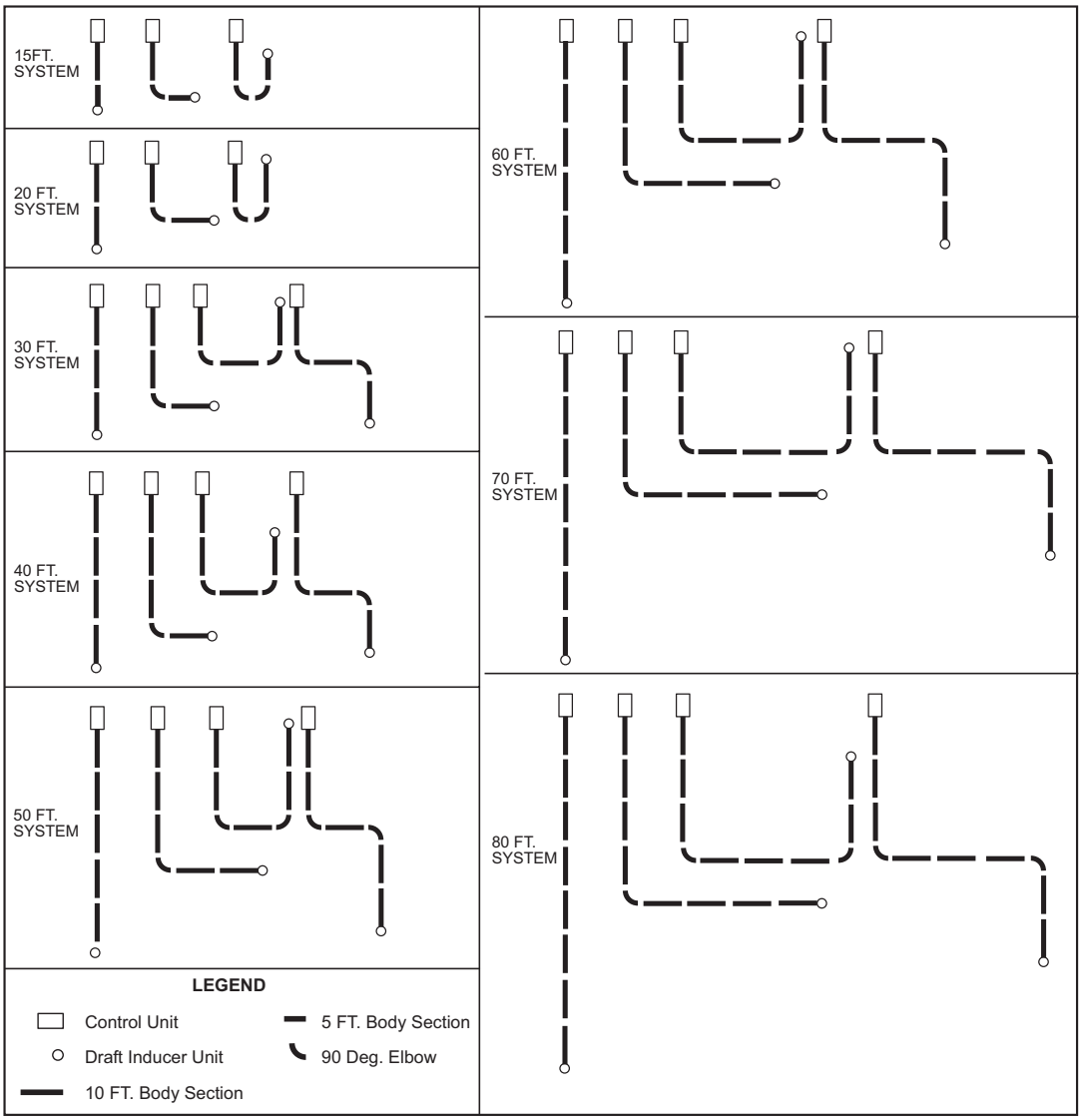
(Package Part Number is indicated on the outside of each corresponding carton.)

System Lengths	10' Starting Body Pkg. 43337050	10' Start/End Body Pkg. 43337040	10' Extension Body Pkg. 43337010	5' Ending Body Pkg. 43336030
	Qty.	Qty.	Qty.	Qty.
50'	1	2	2	-
55'	1	1	3	1
60'	1	2	3	-
65'	1	1	4	1
70'	1	2	4	-
75'	1	1	5	1
80'	1	2	5	-

Components of LTS body packages are listed as follows.

LTS Body Package Components		10' Pkg. 43337040	10' Pkg. 43337010	5' Pkg. 43336030	10' Pkg. 43337050
Part #	Component Description	Qty.	Qty.	Qty.	Qty.
43182060	Pre-assembled 10' ALC Steel Tube (one 24-hole flange) with reflector	1	-	-	-
43182040	Pre-assembled 10' ALC Steel Tube (no flange) with reflector	-	1	-	-
43181050	Pre-assembled 5' ALC Steel Tube (one 24-hole flange) with reflector	-	-	1	-
43182023	Pre-assembled 10' ATC Steel Tube (two 6-hole flanges) with reflector	-	-	-	1
30462980	Tube Coupling	1	1	1	-
43320000	End Reflector	1	-	1	1
42907140	Reflector/Coupling Fastener Kit, Containing: #02189020, #10-16x1/2" Screws (QTY = 4) #02266010, Speed Clips (QTY = 6) #02125130, #10-24x1/2" Screws (QTY = 4) #42769010, Sliding Clamps (QTY = 4)	1	1	1	-
42907180	Body Fastener Kit, Containing: #02189020, #10-16x1/2" Screws (QTY = 2) #02266010, Speed Clips (QTY = 4) #02125130, #10-24x1/2" Screws (QTY = 4) #42769010, Sliding Clamps (QTY = 4) #02167010, ¼-20 Locknut (QTY = 6) #02259000, ¼-20x5/8" Screws (QTY = 6) #42921000, Tube Flange Gasket (QTY = 1)	-	-	-	1

11.0) LTS SERIES TYPICAL LAYOUTS



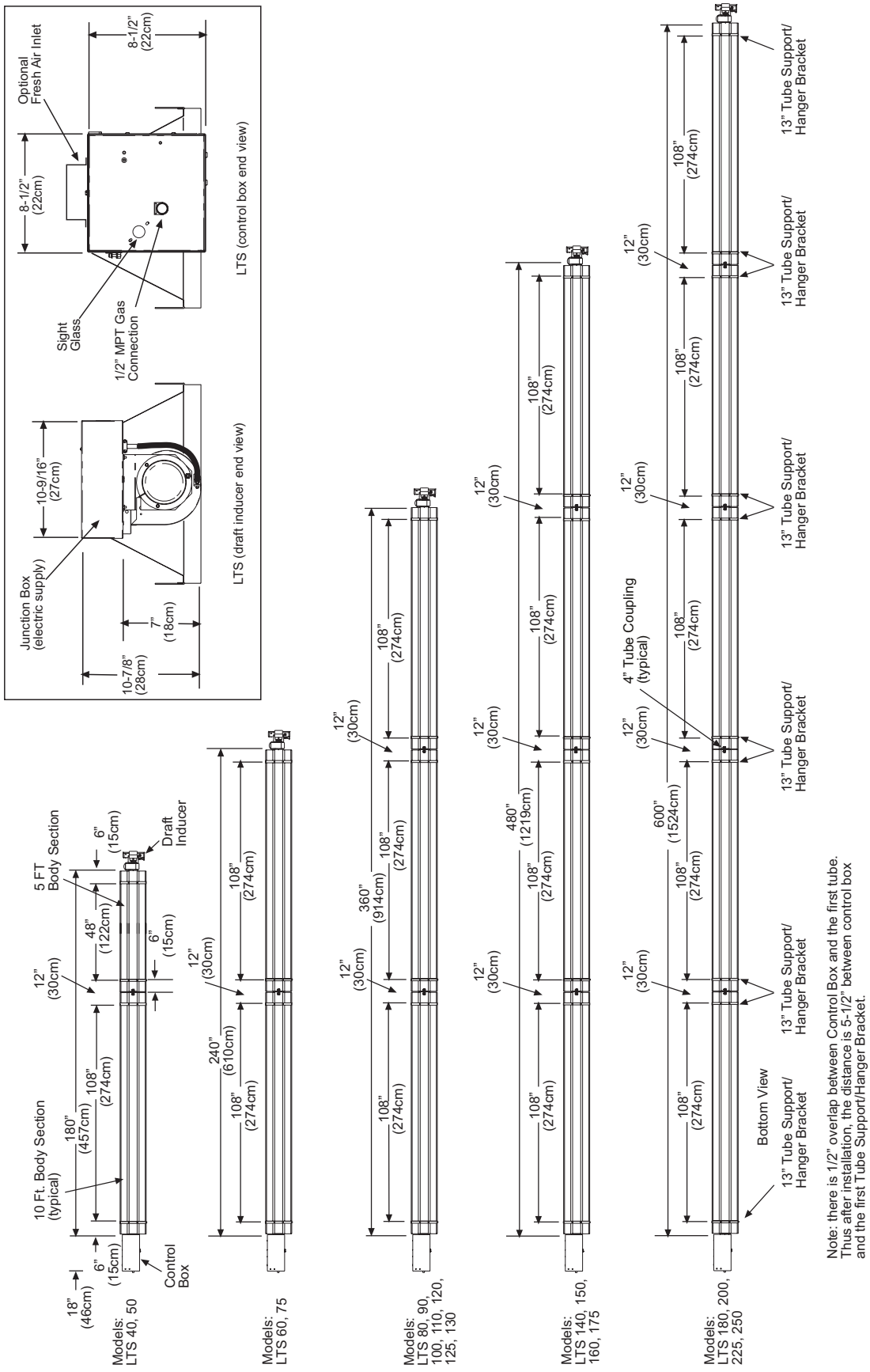
NOTES:

1. In all configurations, the control unit must be connected directly to either a) the 24-hole flange of the 10 ft. aluminized steel start/end body section (for LTS 40-200 models) or b) the 6-hole flange of the 10 ft. aluminitherm steel starting body section (for LTS 225 and 250 models). **Failure to attach the control box to the 6-hole flange for LTS 225-250 as indicated above will void the manufacturer's warranty.**
2. Joining of two 90º elbows directly together to form a "Z" shape **IS NOT** permitted.
3. 5 Ft. Body Packages may be utilized on any of these heaters to yield heater lengths from 15 ft. to 80 ft.
4. Any configuration of components not shown in the illustrations may be used except as noted in 1 and 2 above.

MODEL	EMITTER LENGTH		MODEL	EMITTER LENGTH	
	Min.	Max.		Min.	Max.
LTS 40	15 Ft.	20 Ft.	LTS 130	30 Ft.	50 Ft.
LTS 50	15 Ft.	30 Ft.	LTS 140	40 Ft.	50 Ft.
LTS 60	20 Ft.	30 Ft.	LTS 150	40 Ft.	50 Ft.
LTS 75	20 Ft.	30 Ft.	LTS 160	40 Ft.	50 Ft.
LTS 80	30 Ft.	40 Ft.	LTS 175	40 Ft.	50 Ft.
LTS 90	30 Ft.	40 Ft.	LTS 180	50 Ft.	80 Ft.
LTS 100	30 Ft.	40 Ft.	LTS 200	50 Ft.	80 Ft.
LTS 110	30 Ft.	40 Ft.	LTS 225	50 Ft.	80 Ft.
LTS 120	30 Ft.	40 Ft.	LTS 250	50 Ft.	80 Ft.
LTS 125	30 Ft.	50 Ft.			

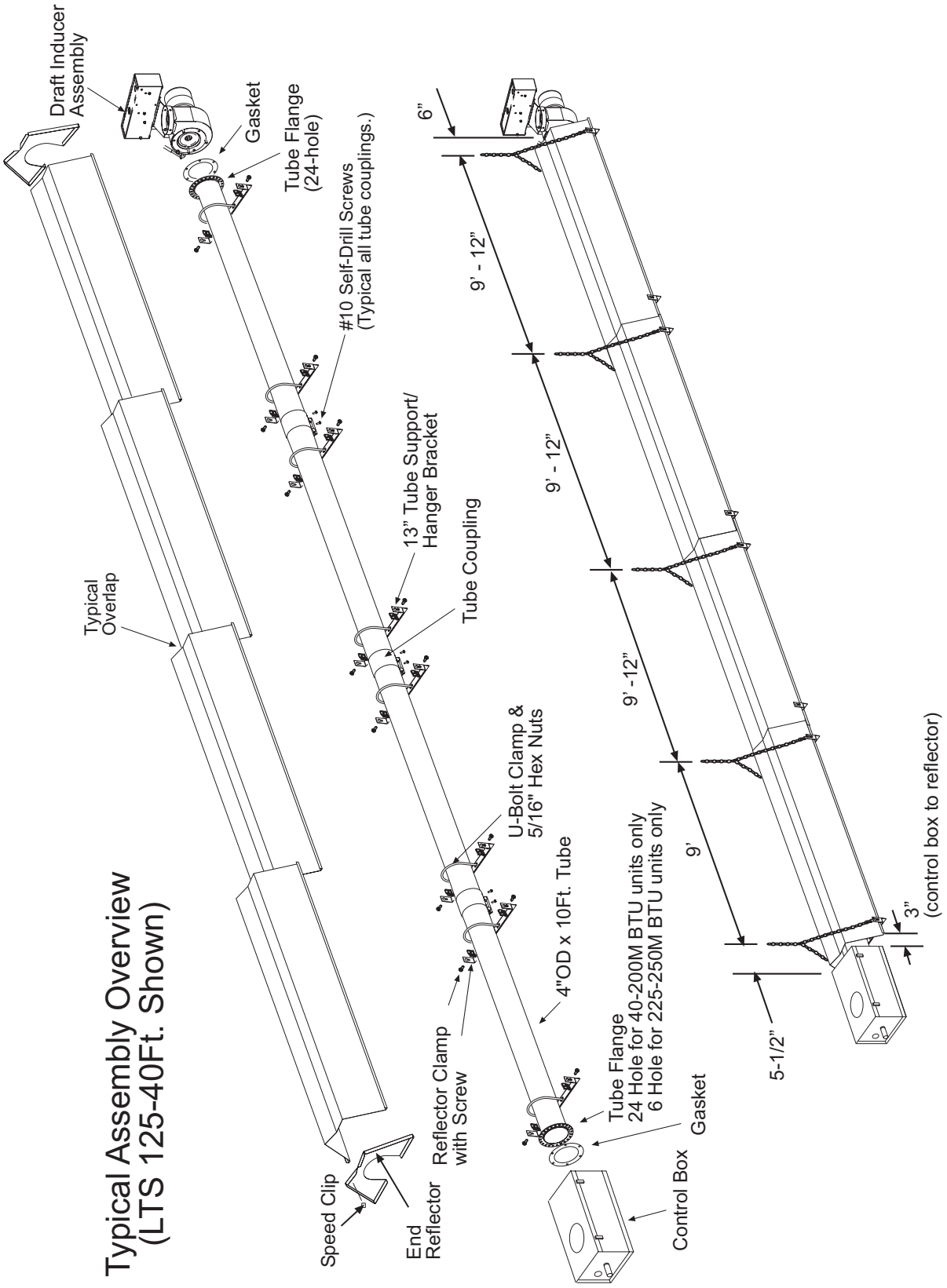
11.1) LTS SERIES DIMENSIONS

Typical Dimensions Up to 50 Ft. Shown

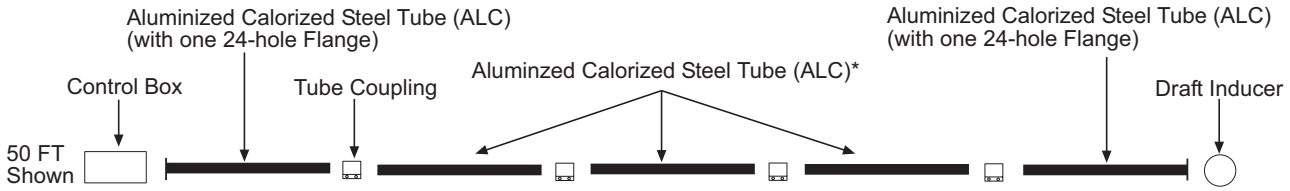


Note: there is 1/2" overlap between Control Box and the first tube. Thus after installation, the distance is 5-1/2" between control box and the first Tube Support/Hanger Bracket.

11.2) LTS 40-175 SERIES HEATER ASSEMBLY OVERVIEW

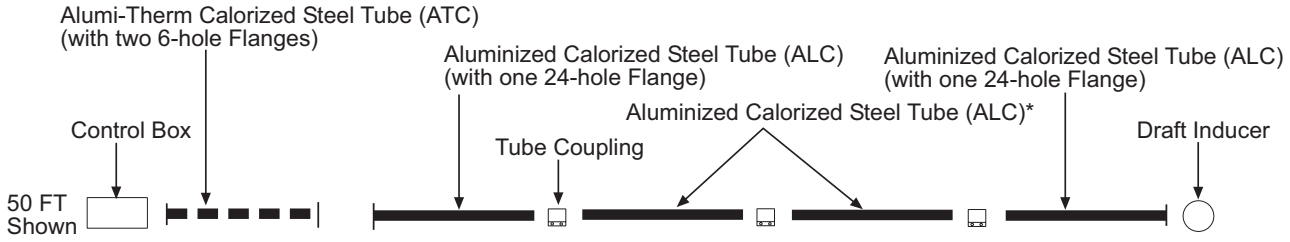


11.3) LTS 180-250 SERIES HEATER ASSEMBLY OVERVIEW



* Additional tubes of this type are added to increase the heater length up to a maximum of 80 ft.

Models: LTS 180-200



* Additional tubes of this type are added to increase the heater length up to a maximum of 80 ft.

Models: LTS 225-250

11.4) LTS SERIES HEATER ASSEMBLY

⚠ CAUTION



CUT HAZARD

Sheet metal parts, particularly reflectors and vent have sharp edges. Always use gloves when handling.

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

During field assembly of the LTS series heater body sections, the recommended procedure is as follows:

1. Before hanging heater sections, first determine the actual layout of the system (see Sections 11.0) & 11.1) for details). Consideration must also be taken for flue pipe, fresh air ducting, gas piping, clearances to combustibles, etc. before hanging heater.
2. Put the suspension in place using proper suspension method (see Section 5.0).
3. Hang each tube section individually. Observe the following requirements.
   a) **DO NOT** attach the heater tube sections together on the ground and attempt to hang the entire system. **The weight of the individual heater body sections can cause misalignment and damage to the heater.**
   b) **DO NOT relocate the tube support/hanger brackets, especially at the control end of the heater.**
   c) For LTS40-200 Models, the first tube section **MUST** be a 10 ft. tube with one 24-hole flange which is to mount control box.
   d) For LTS225-250 Models, the first tube section **MUST** be a 10 ft. tube with two 6-hole flanges.
   e) For all LTS models, the last tube section **MUST** be an either 10 ft. or 5 ft. tube with one 24-hole flange which is to mount draft inducer.
   f) **Failure to attach the control box to the flange end as indicated above will void the manufacturer's warranty.**
   g) Any S hook used in suspension should be crimped close.

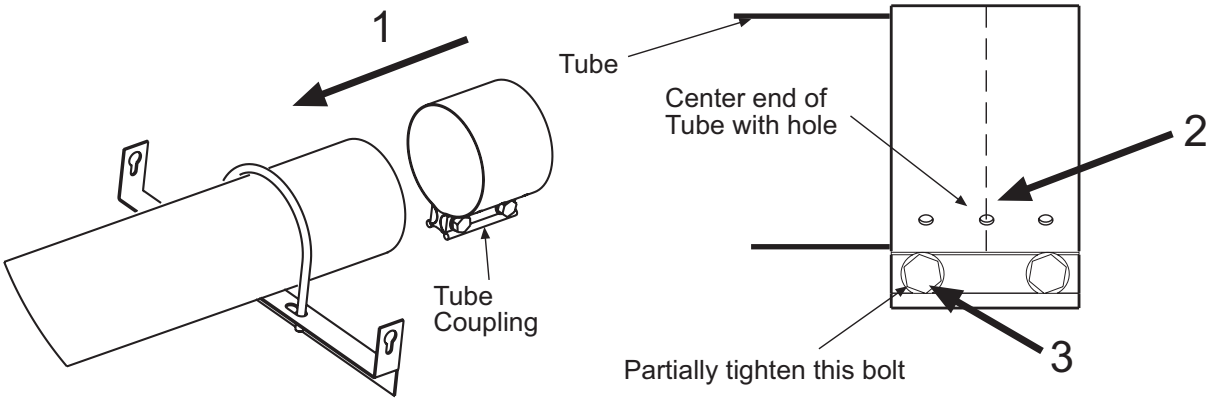
4. Join the body sections together and secure with tube couplings as follows:

⚠ WARNING **The following coupling tightening instructions MUST be followed properly to ensure the integrity of the tube connections. Two #10 self-drilling screws MUST be installed at every coupling as shown in the instructions below. Failure to do so may result in serious injury or property damage.**

a) Place the compression coupling over the end of the tube.

b) Use the small hole at the centerline of the coupling to check that the coupling is inserted correctly.

c) Partially tighten the bolt nearest the end of the tube (approximately half closed).

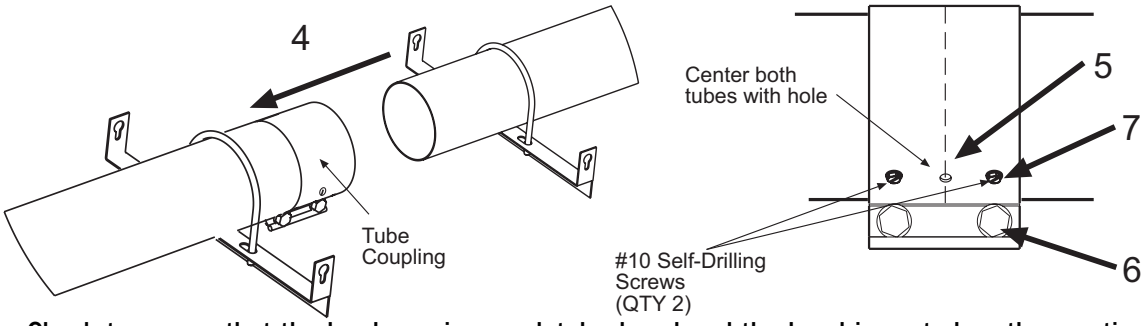


d) Slide the next tube into the coupling.

e) Make sure both tube ends are butted together.

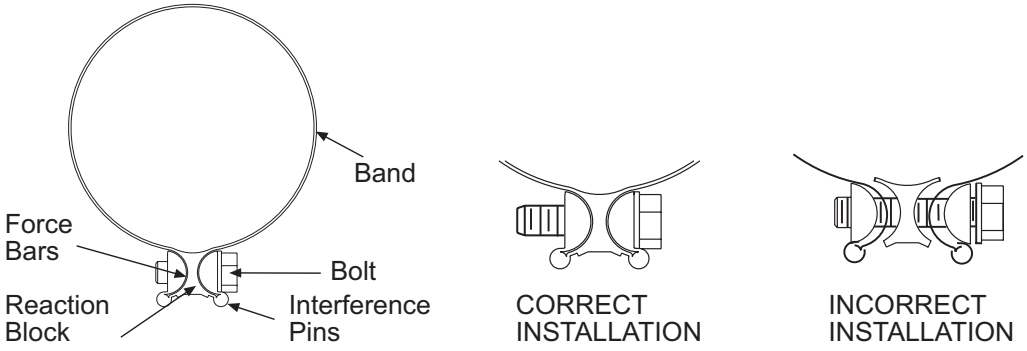
f) Finish tightening both bolts to 40-60 ft. lbs. torque to ensure a complete seal.

g) Use the two Self-drilling screws through the pre-punched holes to secure the tubes in the coupling.



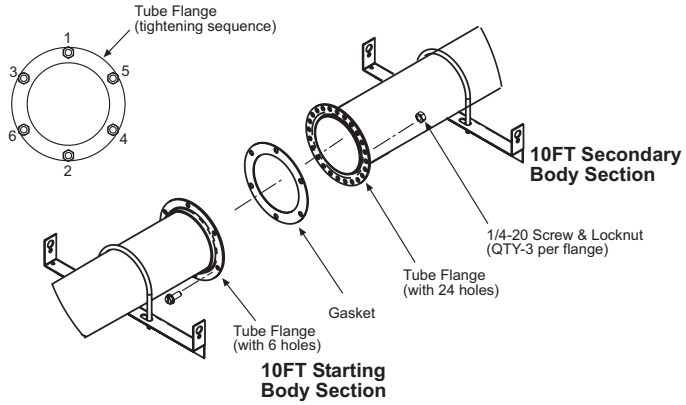
h) Check to ensure that the hardware is completely closed and the band is seated on the reaction block and interference pins as illustrated above.

i) Once all the heater body sections are attached, make sure that the heater system is level. If it is not, slight adjustments can be made using the turnbuckles. (See Section 5.0)



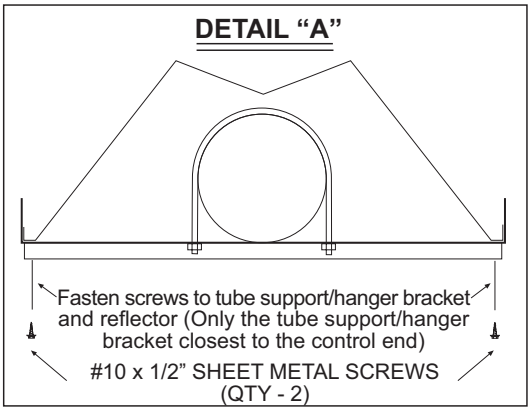
⚠ CAUTION **Important: NEVER reuse a coupling. Always install a new coupling only and torque as per instructions above and the diagrams above.**

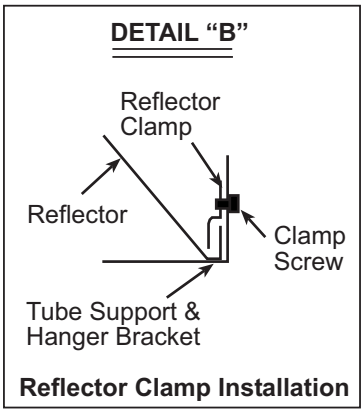
5. **For LTS225-250 Models**, join the first two body sections as illustrated below.
   a) Join the tube flanges of the body sections together with the gasket in between. Loosely attach the heater body sections together with the ¼-20 screws and locknuts provided. **DO NOT** fully tighten the screws and locknuts yet!
   b) Tighten the screws and locknuts using the sequence shown. The screws and locknuts should be tightened a little bit at a time (the same way you would secure the lug nuts to a car wheel).



6. Assemble reflectors onto the body section. Refer to the instructions described in Sections 8.5) and 11.2).

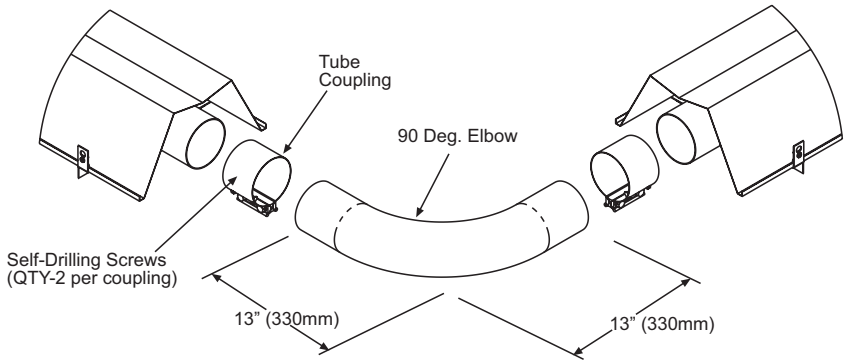
⚠ WARNING **The reflector clamps MUST be installed per reflector clamp installation detail which allows the reflector to slide under the clamp during heater operation.**





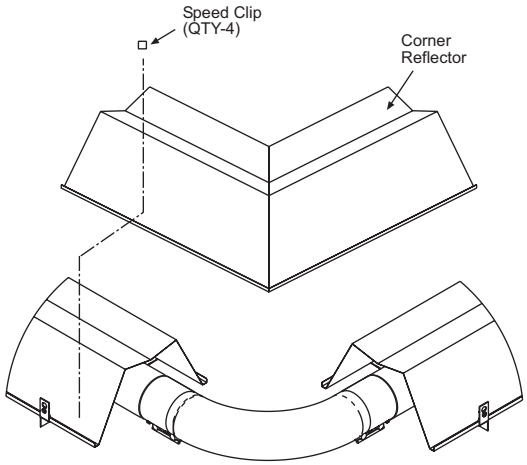
11.5) LTS SERIES - ADDING OPTIONAL 90º ELBOW

1. The optional 90º elbow must be located a minimum of 10 ft. after the control box.
2. Hang the body sections in a 90º ("L") shaped pattern. Allow spacing for the elbow. The distance from one end of the elbow to the centerline of the opposite leg is 13" as shown.
3. Join the tube ends of the body sections and the elbow together and secure with tube couplings as described in Section 11.4).



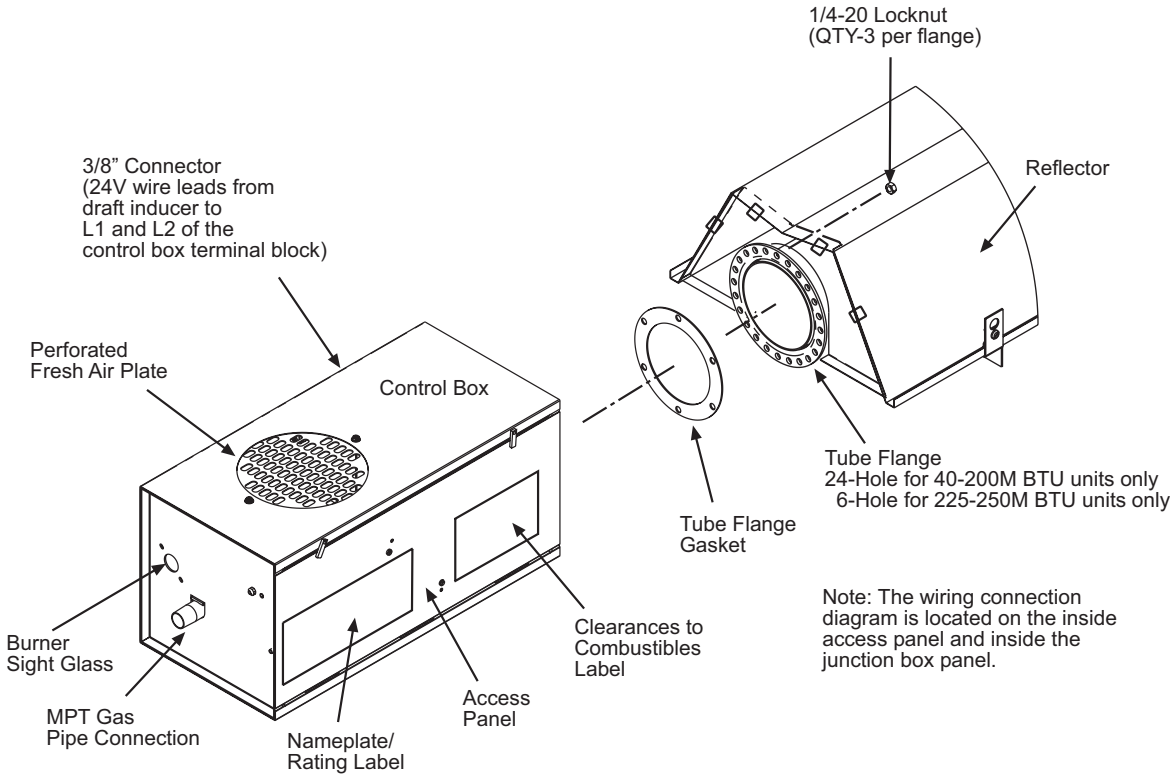
11.6) LTS SERIES - ADDING OPTIONAL CORNER REFLECTOR

1. Place the corner reflector over the reflectors of both body sections.
2. Secure by sliding speed clips on the reflector edges. One speed clip is required for each side of reflector.
3. The corner reflector can be used only when the long axis of the heater is level and mounted in a horizontal position.



11.7) LTS SERIES - ATTACHING CONTROL BOX ASSEMBLY

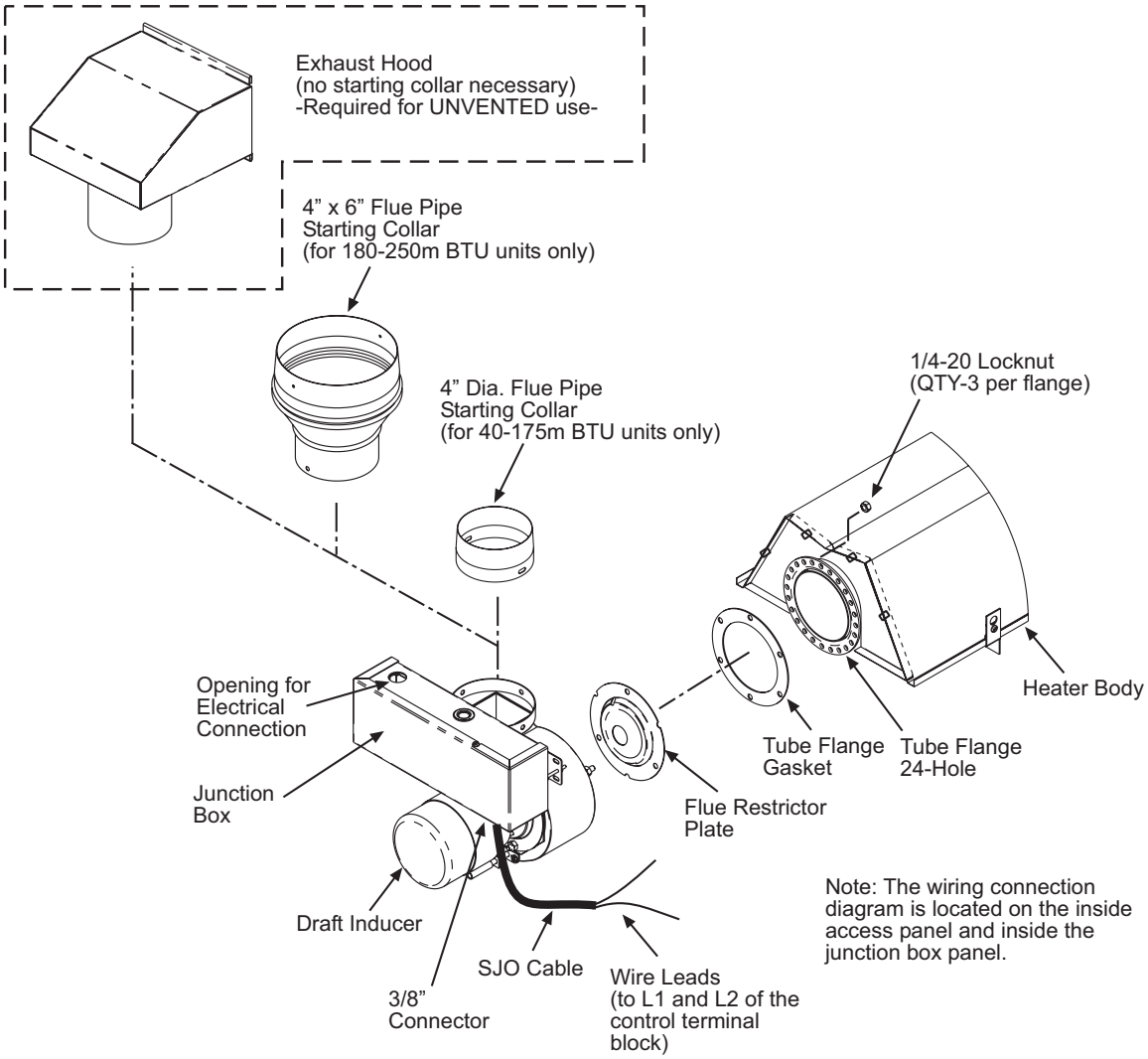
1. Attach the control box and gasket to end of tube flange and secure with 1/4-20 locknuts. **NOTE: The control box must be mounted to an aluminized steel body section (24-hole flange) for 40-200 MBtu/hr models, or to a 10 ft. Alumi-Therm steel body section (6-hole flange) for 225-250 MBtu/hr models, regardless of configuration used. Failure to attach the control box to the flange end as indicated above will void the manufacturer's warranty.**
2. A 3/8" connector is located on the left side of the control cabinet to provide strain relief for field wiring to the draft inducer junction box (refer to Section 16.0) on Electrical Connections and Connection Wiring Diagram for wiring between the control box and the draft inducer.)
3. The control box must be mounted with the perforated fresh air plate on top, facing the ceiling.



4. The heater can be mounted **horizontally** or at an angle of up to **45 degrees** maximum from horizontal. When angle mounting, the **control box** must be positioned **upright**. **Failure to install the control box in an upright position will VOID the manufacturer's warranty.** For additional instructions see Section 13.0) for multiple hanging and draft inducer positions.

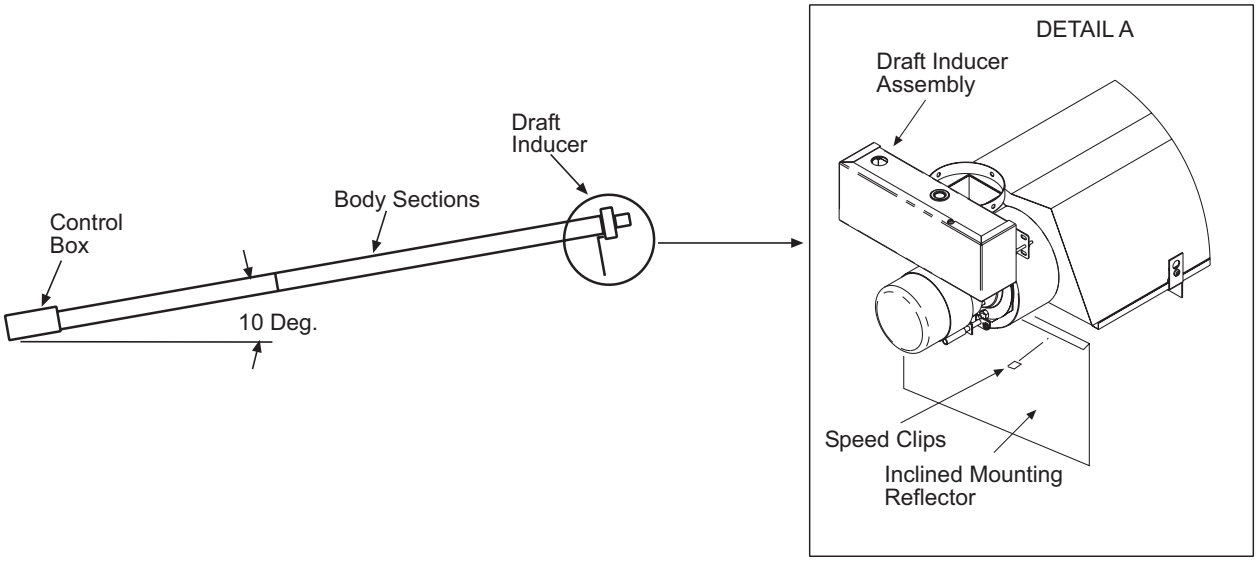
11.8) LTS SERIES - ATTACHING DRAFT INDUCER ASSEMBLY

1. Attach the draft inducer assembly and gasket to end of the draft inducer flange and secure with 1/4-20 locknuts. A flue restrictor plate is attached to the draft inducer weld studs. Make sure this remains in place while the draft inducer is being attached to the heater body. **NOTE:** The draft inducer can be mounted in a vertical, a 45º, or a horizontal position. Refer to the diagram on Multiple Hanging and Draft Inducer Positions (Section 13.0).
2. Disconnect the piece of SJO cable (if equipped) from the junction box and discard. This is used only on LTU series heaters.
3. The 3/8" connector used to hold the SJO cable will remain to provide strain relief for field wiring of the control box and the draft inducer (refer to the Electrical Connections and Connection Wiring Diagram for wiring between the control box and the draft inducer in Section 16.0).
4. If the heater is to be VENTED to the outside of the building, place the starting collar on the outlet of the draft inducer and secure with the #8-32 screws and nuts. Place the flue pipe directly onto the starting collar, secure with the #8 sheet metal screws, and terminate with an approved vent cap.
5. If the heater is for UNVENTED use, place the exhaust hood (supplied as an accessory) directly onto the outlet of the draft inducer (starting collar is not necessary for unvented use). Secure with the #8 sheet metal screws. **The exhaust hood must be mounted only in an upright position and directed toward the reflector body.**



11.9) LTS SERIES - INCLINED MOUNTING INSTRUCTIONS

These inclined mounting instructions relate to LTS series heaters (straight tubes) that do not utilize the elbow accessory. These heaters have been tested and design certified by the CSA for 2"/12" pitch (10º) inclined mounting of the heater from the control box to the draft inducer assembly as shown in the following diagram.



These parts are included in the inclined mounting kit.

The purpose of this type mounting is to allow the heater to be mounted in the plane of the roof (particularly in modern "Butler" type buildings frequently used today). This will typically put the heater out of the way while still providing the warmth and comfort. The heater can be inclined upwards from the control box to the draft inducer at a distance of 2 inches up for every linear foot of the heater length. The total rise for each draft inducer is tabulated in the table below:

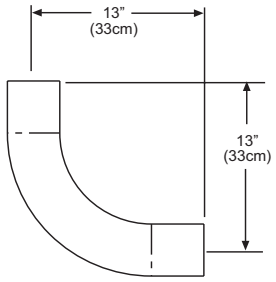
TOTAL DRAFT INDUCER HEIGHT ABOVE HORIZONTAL FOR 2"/12" PITCH INSTALLATIONS								
MODEL	Tube Length							
	15 Ft.	20 Ft.	25 Ft.	30 Ft.	35 Ft.	40 Ft.	45 Ft.	50 Ft.
LTS 40-75	30"	40"	50"	60"				
LTS 80-120				60"	70"			
LTS 125-130				60"	70"	80"	90"	100"
LTS 140-175						80"	90"	100"
MODEL	Tube Length							
	50 Ft.	55 Ft.	60 Ft.	65 Ft.	70 Ft.	75 Ft.	80 Ft.	
LTS 180-250	100"	110"	120"	130"	140"	150"	160"	

The heater is subject to all other requirements presented in these Installations Instructions, particularly the Clearances to Combustibles. If you plan to use this type of installation, order the **Space Ray Inclined Mounting Kit, Part #43238000**.

12.0) ACCESSORY PACKAGES

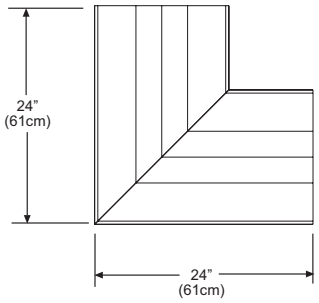
A. Elbow Accessory Package, Part #43208010
(Option for LTS Series Only)

Contains:
Elbow, #43175000.....QTY–1
#10-16 x ½ Self-Drilling Screws, #02189020.....QTY–2
Tube Coupling, #30462980.....QTY–1



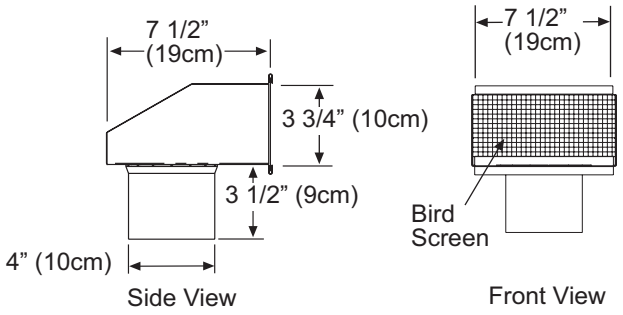
B. Corner Reflector Accessory Package, Part #43342000
(Option for LTS Series Only)

Contains:
Corner Reflector Assembly, #43345000.....QTY–1
Speed Clips, #02266010.....QTY–4



C. Exhaust Hood Package, Part #42924000

Contains:
Exhaust Hood Assembly, #42925540.....QTY–1
#8-18 x ½ Self-Drilling Screws, #02189030.....QTY–2



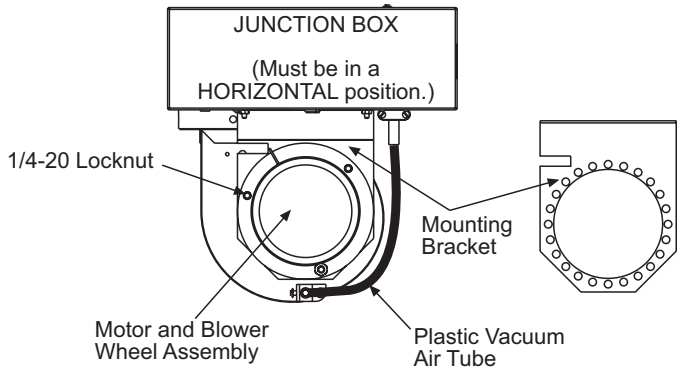
13.0) MULTIPLE HANGING & DRAFT INDUCER POSITIONS

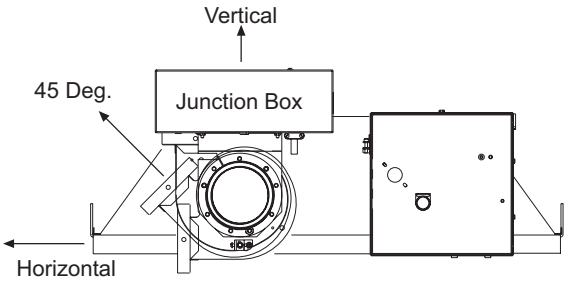
The heater can be mounted horizontally or at an angle of 45º maximum from horizontal. Make sure the long axis of heater is level.

Multiple draft inducer positions can also be used as shown in the diagrams. This allows for the desired configuration of flue venting. Regardless of the position chosen, the junction box must remain horizontal as shown. This may be achieved as follows:

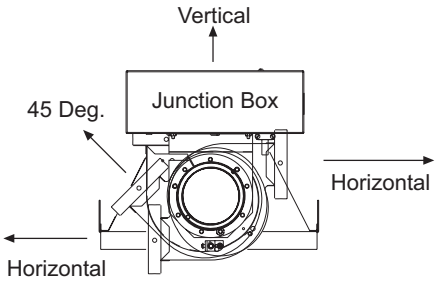
1. Remove the three (3) ¼-20 locknuts securing the motor and blower wheel assembly.
2. Pull the motor and blower wheel assembly with the motor plate slightly from the end of the housing studs. Use care not to damage the motor leads.
3. Rotate the junction box assembly to the upright position using the multi-hole mounting bracket.

4. **Replace the motor and blower assembly. Tighten the locknuts.**
5. **Horizontal and 45º draft inducer positions can allow the plastic vacuum air tube to sag. The air tube should be shortened to prevent a downward sag that could allow condensation build-up in the tube.**

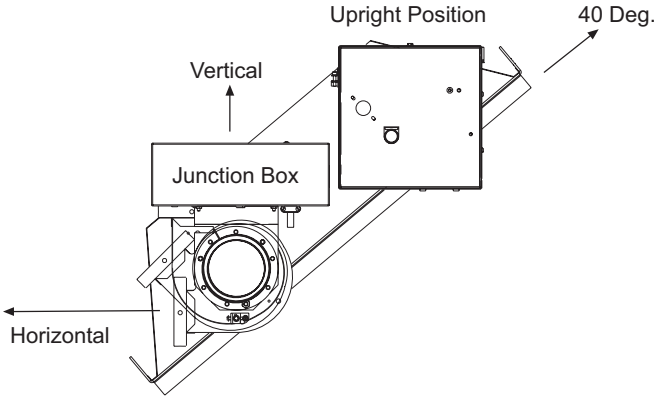




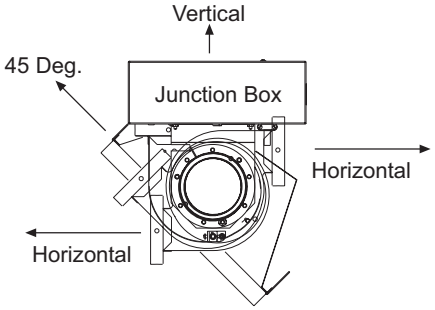
Hoizontal Mounting
LTU Series



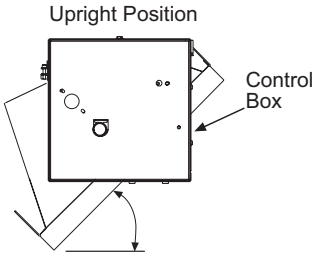
Horizontal Mounting
LTS Series



40 Deg. Angle Mounting
LTU Series

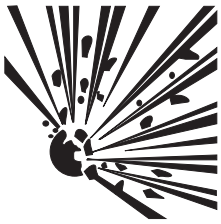


45 Deg. Angle Mounting
LTS Series



14.0) GAS CONNECTIONS AND REGULATIONS

⚠ WARNING





FIRE AND EXPLOSION HAZARD

Tighten flexible gas hose and components securely.

Flexible metal gas hoses must be installed without any twists or kinks in them. The hose will move during operation of the heater and it can crack if it is twisted.

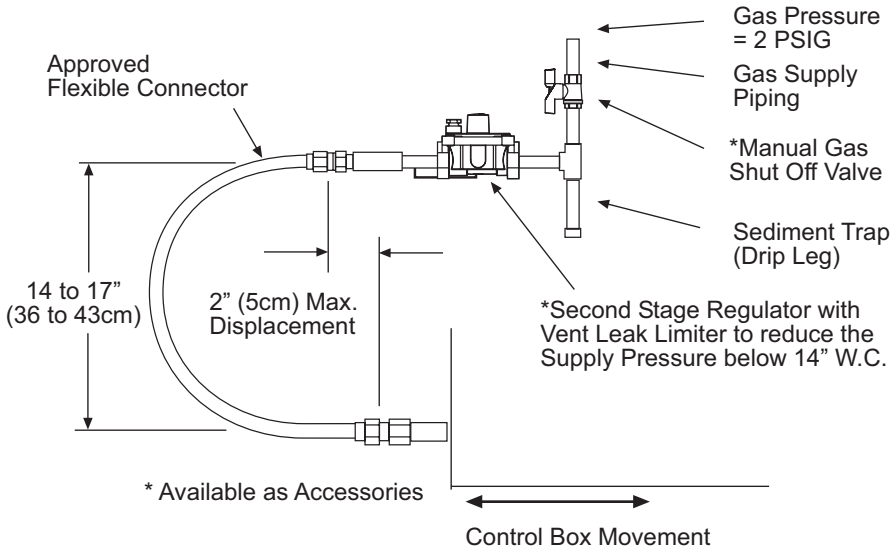
Failure to do so may result in death, serious injury or property damage.

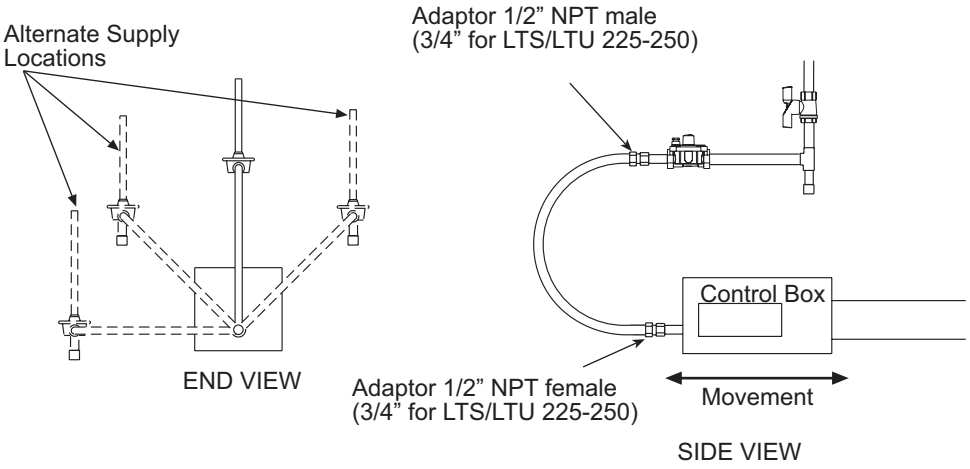
IMPORTANT BEFORE CONNECTING THE GAS TO THE HEATER

1. Connect to the supply tank or manifold in accordance with the latest edition of National Fuel Gas Code (ANSI Z223.1), and local building codes. Authorities having jurisdiction should be consulted before the installation is made. (In Canada, refer to the latest edition of CSA B149.1, Natural Gas and Propane Installation Code.)
2. Check that the gas fuel on the burner rating plate matches the fuel for the application.
3. Check that the gas supply piping has the capacity for the total gas consumption of the heaters and any other equipment connected to the line.
4. Check that the calculated supply pressure with all gas appliances and heaters operating will not drop below the minimum supply pressure required for these heaters. Check inlet supply pressures on Section 15.0).
5. All gas supply lines must be located in accordance with the required clearances to combustibles from the heater as listed on the clearances label of the heater and Section 4.0) of this manual.
6. Pipe joint compounds must be resistant to the action of liquefied petroleum gases.
7. Tube heaters will expand/contract during operation. Where local codes do not prohibit, a CSA or U.L. approved flexible connector supplied with this heater is required for connections between the rigid piping and the heater. A union should be installed before the control box inlet. An approved shut off valve should be installed within 6 feet of the union.
8. The gas pipe, flexible hose and connections must be self supporting. The gas pipe work must not bear any of the weight of the heater or any other suspended assembly.
9. This appliance is equipped with a step-opening, combination gas valve. **The maximum supply pressure to the appliance is 14" W.C. or 1/2 P.S.I.** If the line pressure is more than the maximum supply pressure, then a second stage regulator which corresponds to the supply pressure must be used.
10. After all gas connections have been made, make sure the heater and all gas outlets are turned off before the main gas supply is turned on slowly. Turn the gas supply pressure on and check for leaks. To check for leaks, check by one of the methods listed in Appendix D of the National Fuel Gas Code.
11. If a 2nd stage regulator is used, the ball valve down stream in the supply line must be closed when purging the gas lines to prevent gas seeping through it. If initial gas pressure is higher than 14" w.c. the redundant combination gas valve is designed to lock out. Pressure build-up in the supply lines prior to the heater must be released before proper heater operation.

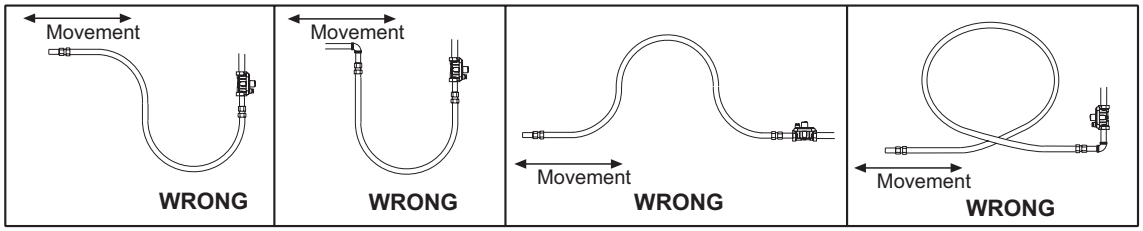
⚠ WARNING **DO not use an open flame of any kind to test for leaks.**

KEY DIMENSIONS AND COMPONENTS OF THE GAS CONNECTIONS





INCORRECT POSITIONS



⚠ WARNING **US ONLY: Connector MUST be installed in "⊃" configuration. Use only the 36" long connector that was furnished with this heater.**

US ONLY: A gas connector certified for use on a tubular type infrared heater per the standard for Connectors for Gas Appliances, ANSI Z21.24/CSA 6.10 is supplied for installation in US only. The gas connector is 36" long and 1/2" nominal ID, and must be installed as shown above, in one plane, and without sharp bends, kinks or twists. Note: The gas connector supplied with LTS/LTU 225 and 250 is 36" long and 3/4" nominal ID.

CANADA ONLY: A Type I hose connector should be used that is certified as being in compliance with the Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas (CAN/CGA 8.1) and is of length of 36+/- 6 in (90+/- 15 cm). The gas connector must be installed as shown above, in one plane, and without sharp bends, kinks or twists.

15.0) INSTRUCTIONS FOR PRESSURE TEST GAUGE CONNECTION

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.

MANIFOLD PRESSURE – COMBINATION GAS VALVE IS FACTORY SET

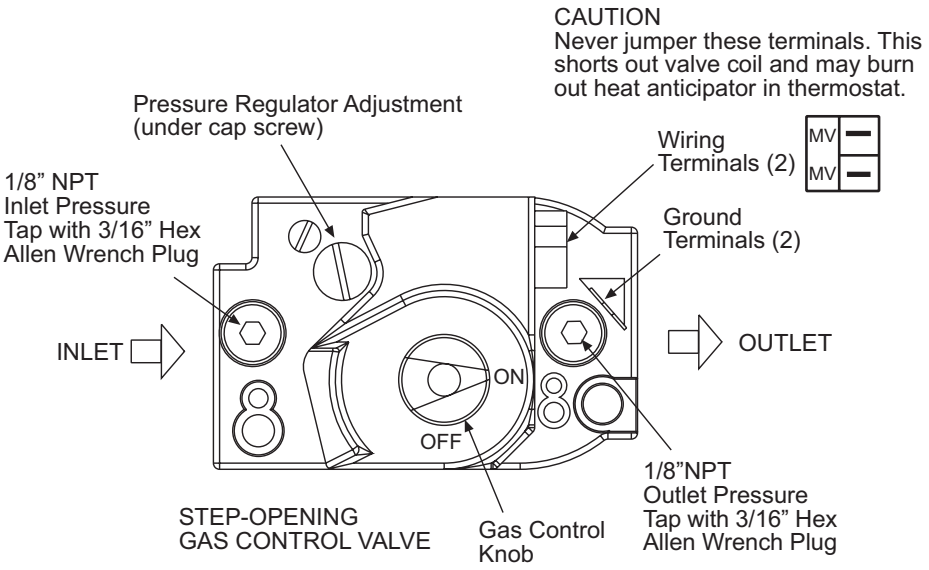
1. Turn the gas valve to the "OFF" position. Remove the 1/8" plug from the combination gas valve at the outlet pressure tap and connect a 1/8" nipple to the tapped hole. Connect the test gauge to the nipple. Turn on the gas supply.
2. With the main burner operating, check the burner manifold pressure using a water column manometer. 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 this heater and all other gas burning equipment that is connected to the gas supply system are operating at maximum capacity.
3. **The combination gas valve is factory set and should not require adjustment.** If full rate adjustment is required, remove the cover screw. Using a small screwdriver, turn the adjustment screw clockwise ↻ to increase or counterclockwise ↺ to decrease the gas pressure to the burner. Replace the cover screw. **NOTE: The step opening pressure of this gas valve is not adjustable.**
4. Check the burner at step pressure, observing burner ignition and flame characteristics. The burner should ignite properly and without flashback to the orifice, and should remain lit.

GAS PRESSURE TABLE			
		SUPPLY PRESSURE	
GAS TYPE	MANIFOLD PRESSURE	Minimum*	Maximum
Natural Gas	3.5" W.C.	5" W.C.[1]	14" W.C.
Propane Gas	10.0" W.C.	11" W.C.[2]	14" W.C.

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

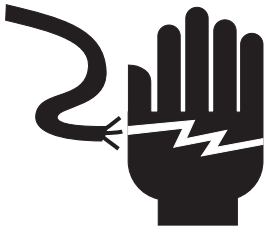
[1] 7" W.C. for LTS/U 150-250

[2] 12" W.C. for LTS/U 180-250



16.0) ELECTRICAL CONNECTIONS

⚠ WARNING



ELECTRIC SHOCK HAZARD

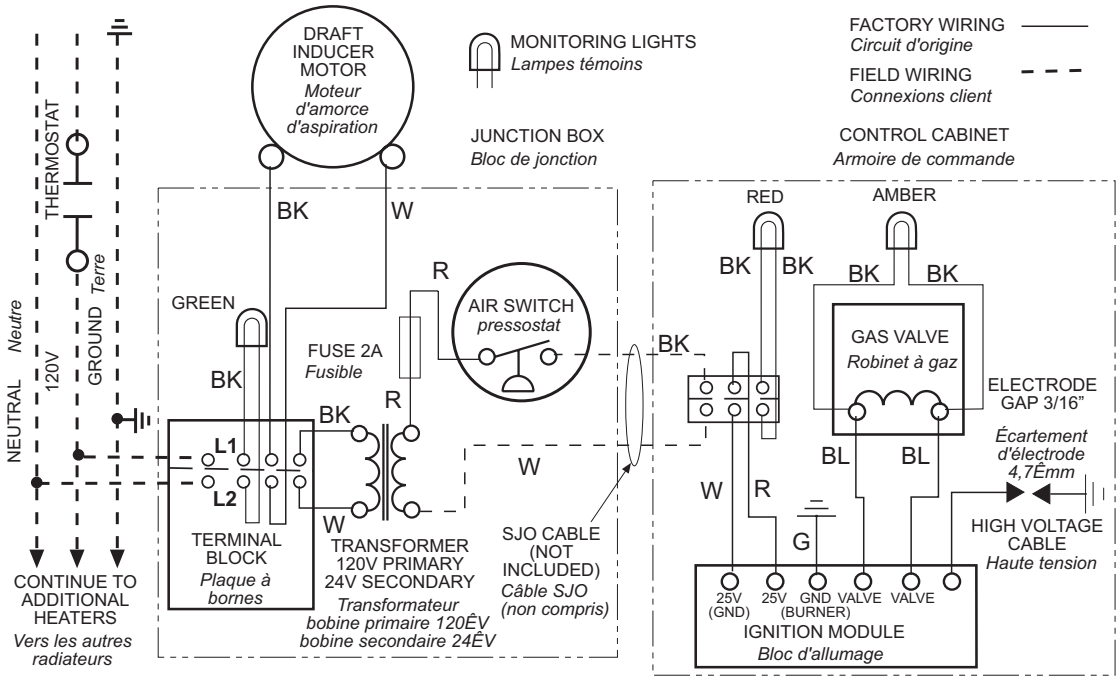
Disconnect electrical power and gas supply before servicing.

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. When connecting the **supply circuit** to the heater, wiring material having a minimum size of 14 AWG and a temperature rating of at least 90°C shall be used.
6. **LTS SERIES ONLY:** The installer will provide type SJO wire cable having minimum size of 18 AWG and connect the ends to the draft inducer junction box and the control box. Secure with 3/8" connectors as previously described in the attachment of the control box and draft inducer. Connect wire leads as shown in the Connection Wiring Diagram. The SJO cable should be located and secured to protect it from mechanical damage.

INTERNAL CONNECTION WIRING DIAGRAM — Direct Spark Ignition

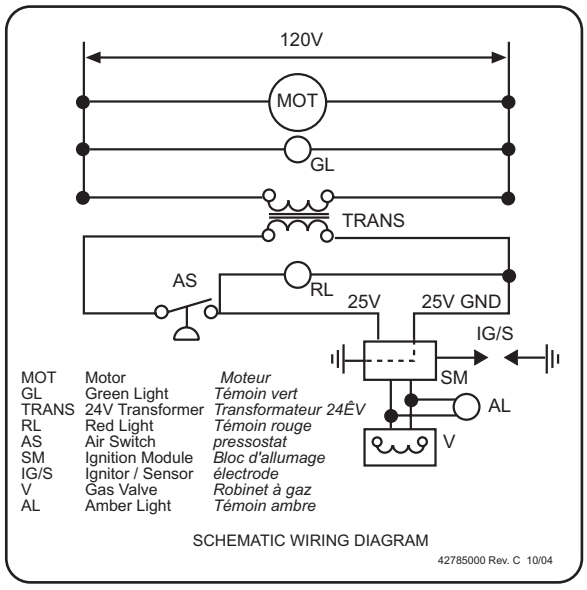


NOTES:

1. 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)

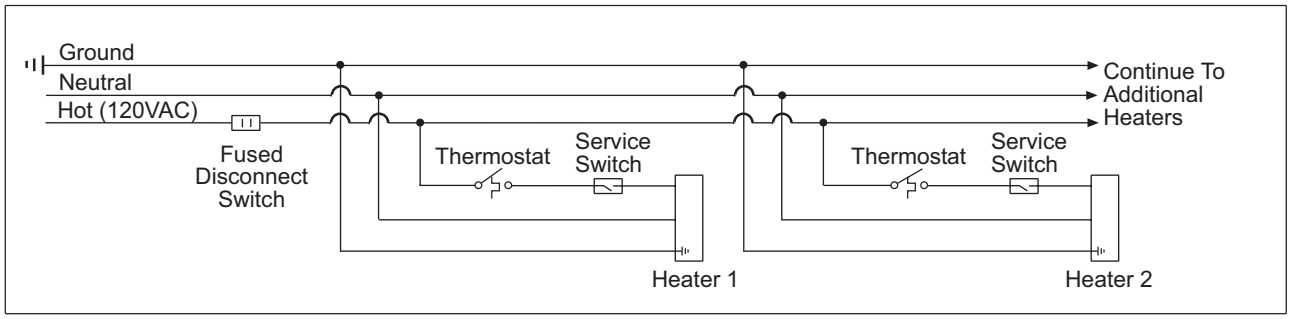
2. When connecting the supply circuit to the heater, wiring material having a minimum size of 14 AWG and a temperature rating of at least 90ºC shall be used.
3. A replaceable 3-amp fuse (1-1/4" long) is fitted to the Ignition Control Module.

SCHEMATIC WIRING DIAGRAM — Direct Spark Ignition

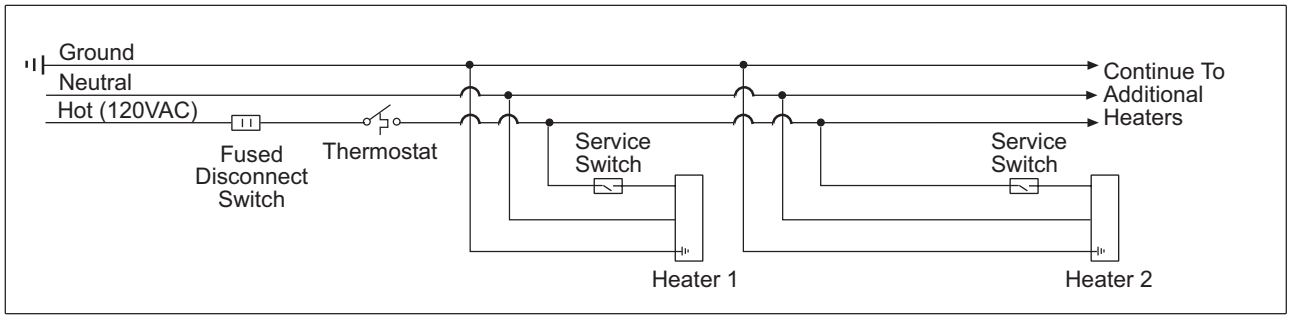


FIELD CONNECTION AND THERMOSTAT WIRING DIAGRAMS

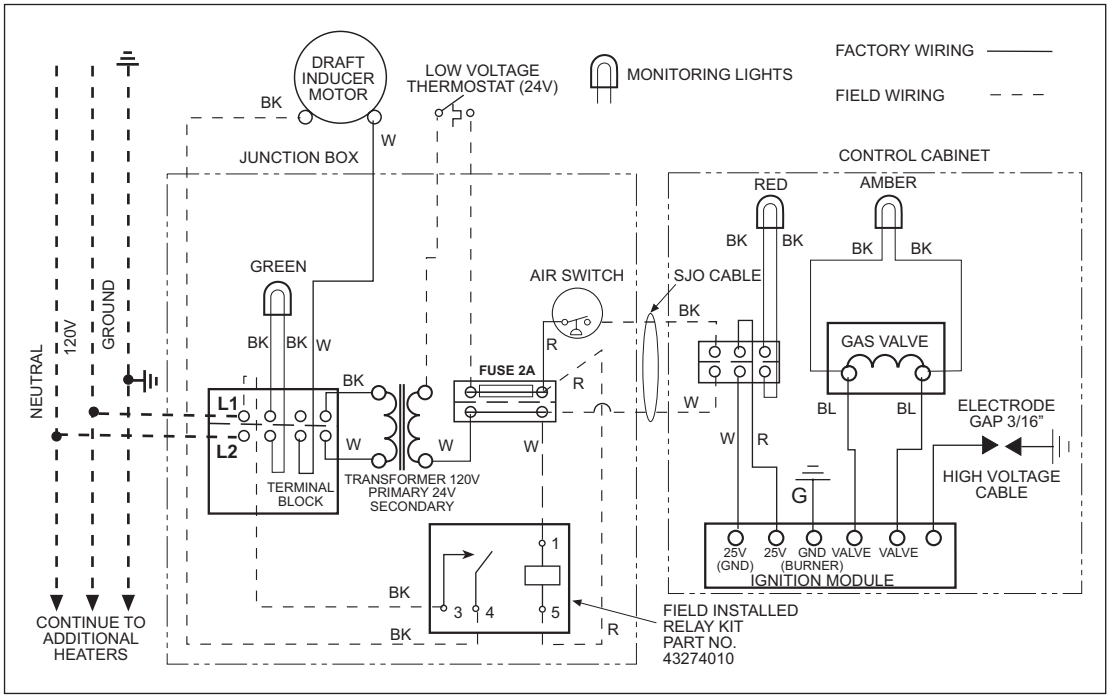
A. LINE VOLTAGE (120V) THERMOSTAT CONNECTIONS – SINGLE HEATER PER THERMOSTAT



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



C. LOW VOLTAGE (24V) THERMOSTAT CONNECTIONS – SINGLE HEATER PER THERMOSTAT

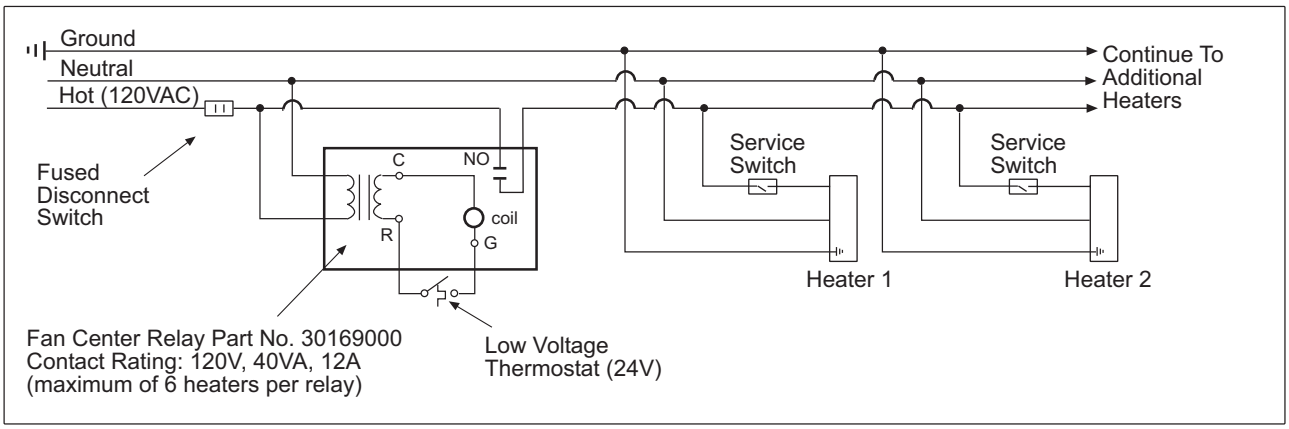


Order 24V Relay Kit (Part No. 43274010) for Low Voltage (24V) thermostat connection.

NOTES:

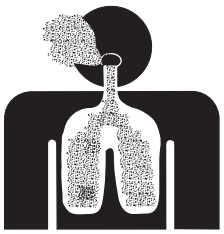
1. If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105ºC. (18 Ga. CSA 600V Type TEW)
2. When connecting the supply circuit to the heater, wiring material having a minimum size of 14 AWG and a temperature rating of at least 90ºC shall be used.
3. A replaceable 3-amp fuse (1-1/4" long) is fitted to the Ignition Control Module.

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



17.0) 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.

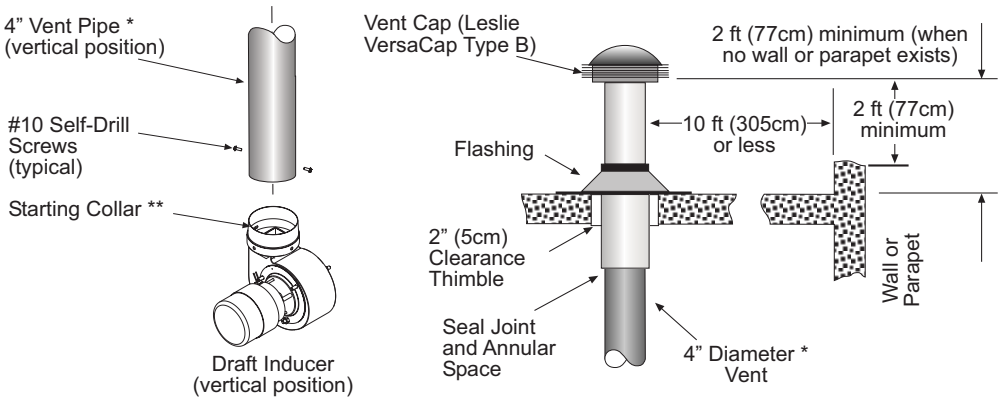
Failure to do so may result in death, serious injury, property damage or illness from Carbon Monoxide poisoning.

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.

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 (Leslie "VersaCap"-Type B or equal) 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 vent pipe diameter.
   - Minimum Equivalent Length = 5 ft. of pipe
   - Maximum Equivalent Length = 100 ft. of 4" pipe for 40-175 Models and 6" pipe for 180-250 Models

   Use the following correction factors to obtain the equivalent length:
   - Subtract 15 ft. if the run is horizontal. (maximum horizontal length for 4" pipe is 25 ft.)
   - Subtract 10 ft. for an approved vent cap.
   - 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. 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 or Teflon tape suitable for 550ºF (3M Company tapes 433 or 363) or silicone sealant is recommended.
5. Avoid locating elbows in the first 5' of vent pipe whenever possible. Limit to (2) 90° elbows. When vent pipe is in a horizontal run, it must have 1/4 inch per foot rise.
6. All portions of the vent pipe shall be supported to prevent from sagging (6' spacing is recommended).
7. 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.
8. 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.
9. 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.
10. A venting system shall terminate at least 3 ft. above any forced air inlet located within 10 ft.



* 6" for LTS/U 180-250 Models
** 4"x6" Adaptor included for LTS/U 180-250 Models

Note: Junction Box is not shown.

SINGLE HEATER VENTING (HORIZONTAL THROUGH SIDEWALL)

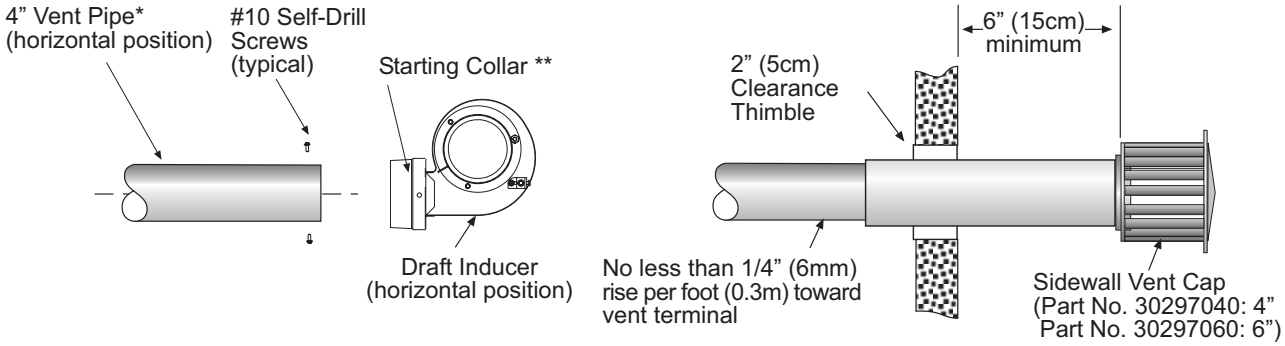
When venting the heater horizontally through a combustible outside sidewall, the same requirements listed previously for venting **Vertical Through The Roof** apply except as follows:

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-Type L or equal) must be attached to the end of the vent pipe.
   - 4" vent – 25 ft. maximum with one 90° elbow and vent cap for 40-175 Models
   - 6" vent – 75 ft. maximum with maximum two 90° elbows and vent cap for all Models

If other horizontal vent configurations are required, consult the manufacturer.

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

3. When venting through a sidewall, the horizontal vent pipe shall rise not less than 1/4 inch per foot 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)
4. A minimum clearance of 6 inches must be maintained between the outside wall and vent cap.
5. 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 12" (0.30m) when directly below a combustible overhang.
6. 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.



* 6" for LTS/U 180-250 Models
** 4"x6" Adaptor included for LTS/U 180-250 Models

Note: Junction Box is not shown.

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

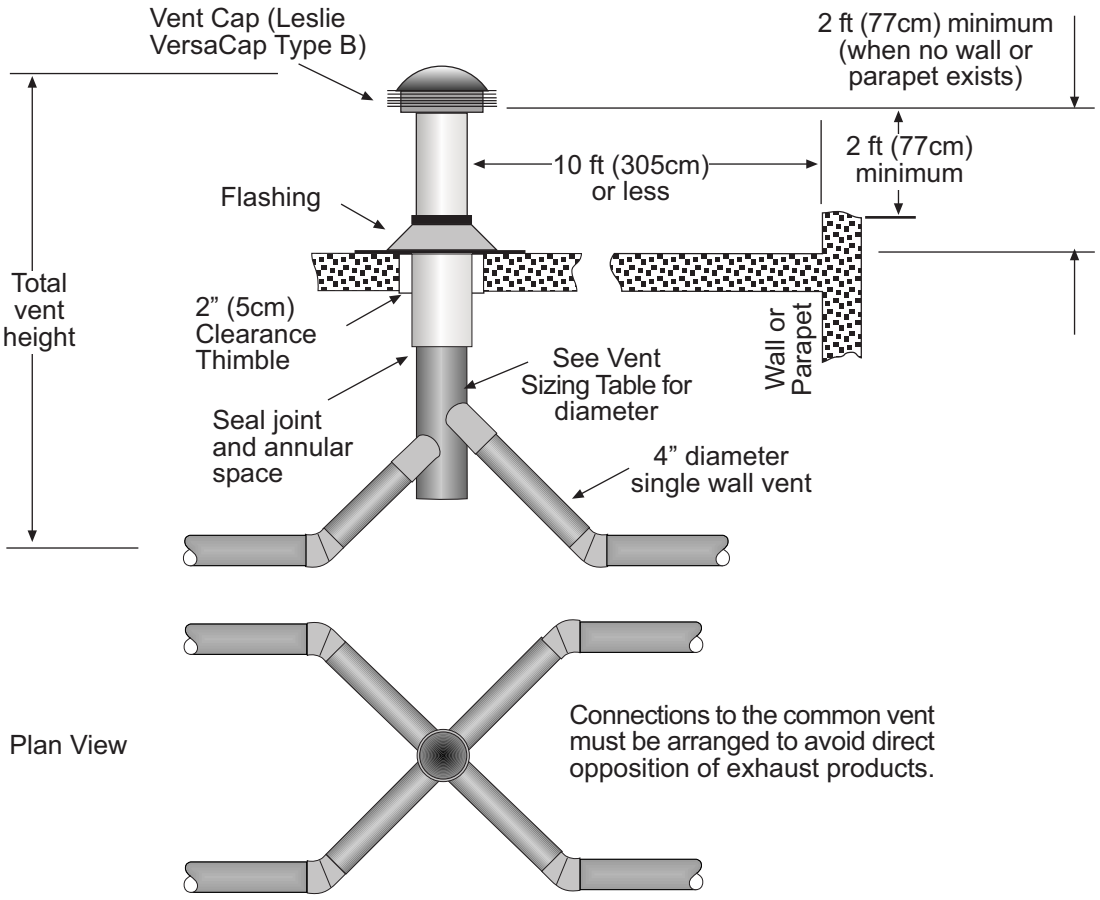
Requirements for venting of multiple heaters are the same as described for **SINGLE HEATER VENTING** except as follows:

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 rise. Connector lengths should be as short as possible and have a minimum 1/4 inch per foot rise. Without regard to connector rise 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.
   - The connector length should be no more than 75% of the vertical portion of vent above the connector.
   - Where possible, use a Y-connector to the common vent.
2. Material for 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 double-wall, Type B vent.
3. Avoid unnecessary bends. Limit to two (2) 90º 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.

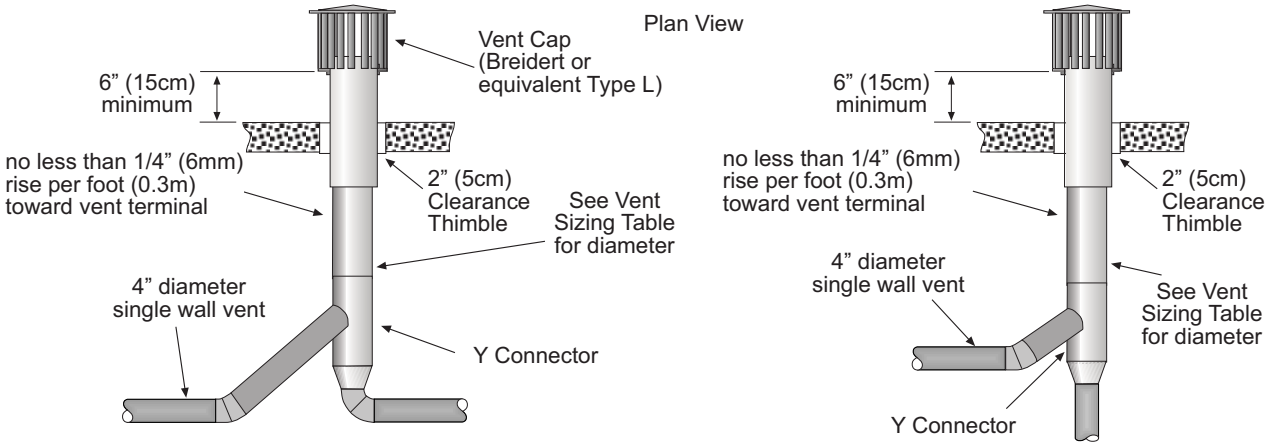
⚠ WARNING

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.

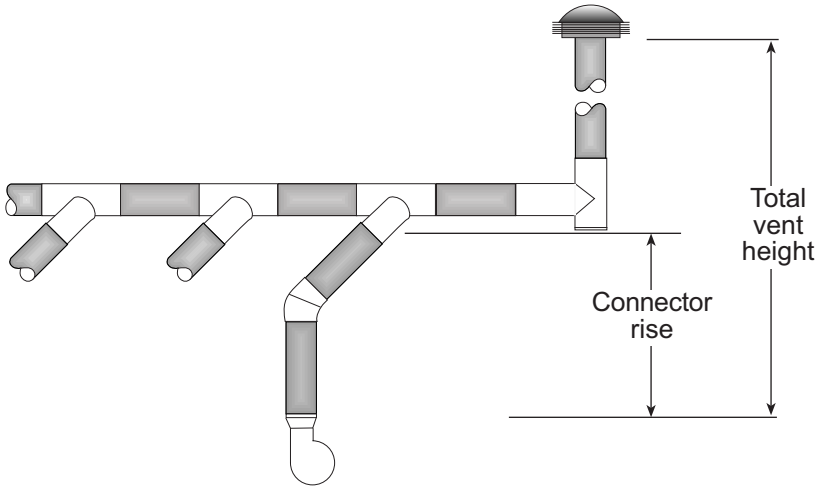
Multiple Heater Vertical Venting Arrangement



Multiple Heater Horizontal Venting Arrangement



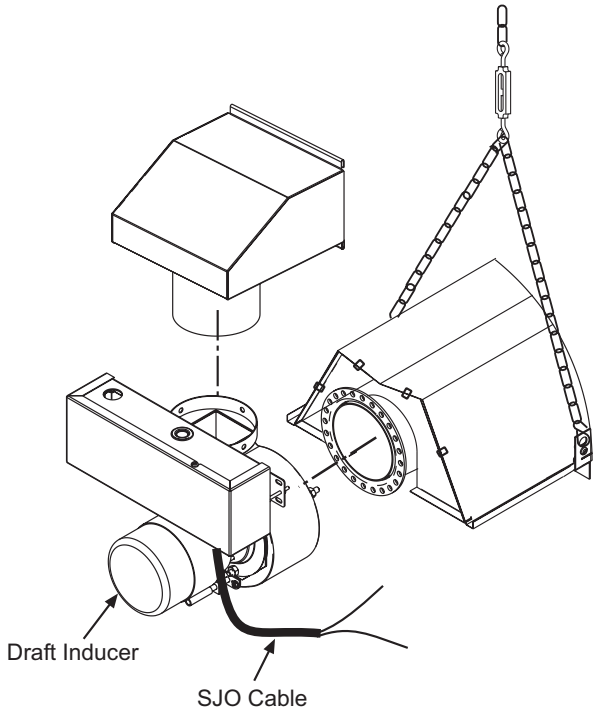
Multiple Heater Venting (Connections into a Manifold)



VENT SIZING TABLE — Multiple Heater Venting					
	Number of Heaters				
	1	2	3	4	5
LTU40-50	4"	4"	5"	5"	6"
LTU60-75	4"	5"	6"	6"	7"
LTS/U80-100	4"	6"	6"	7"	8"
LTS/U110-130	4"	6"	7"	8"	9"
LTS/U140-175	4"	8"	8"	9"	10"
LTS/U180-200	6"	8"	9"	10"	11"
LTS/U225-250	6"	9"	10"	11"	12"
	COMMON VENT DIAMETER (If a size is not available use the next larger size.)				

THE ABOVE ILLUSTRATIONS AND TABLE OF VENT SIZES FOR COMMON VENTING OF MULTIPLE HEATERS ARE IN ACCORDANCE WITH THE NATIONAL FUEL GAS CODE ANSI Z223.1-LATEST EDITION, NFPA 54-LATEST EDITION, EQUIPMENT VOLUME OF 1988 ASHRAE HANDBOOK, CURRENT CAN/CGA-B149.1/2-M86 INSTALLATION CODE, AND AGA PUBLICATION NO. 10M5.85 2.5-2 ON FUNDAMENTALS OF GAS APPLIANCE VENTING AND VENTILATION-REVISED BUT ARE NOT A PART OF THE CSA CERTIFICATION.

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 outlet collar of the draft inducer or on the existing 4" starting collar when used unvented and **must be mounted only in an upright position and directed towards the reflector body as shown.**



18.0) 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 per hour 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 perforated fresh air plate must be maintained at all times. In larger open areas of buildings, infiltration normally is adequate to provide air for combustion.

18.1) DIRECT OUTSIDE AIR FOR COMBUSTION

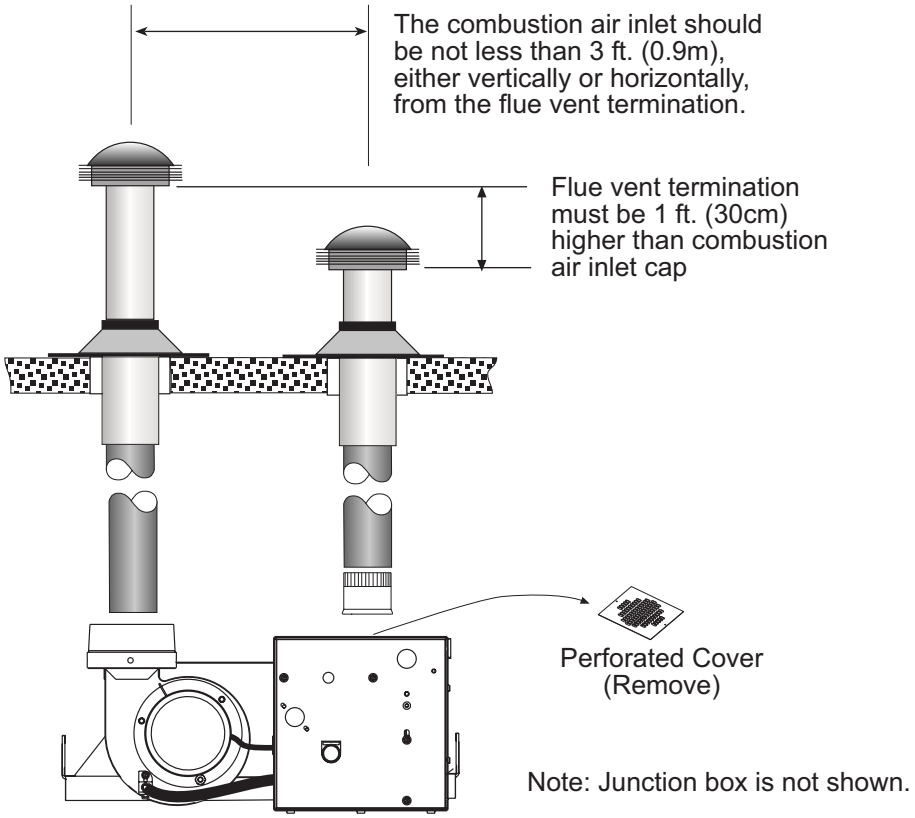
Outside combustion air should be supplied directly to the heater when the building is subject to negative pressure, or when contaminants or high humidity are present in the building air. These contaminants include paints, solvents, corrosive vapors or any other foreign particles that may cause damage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

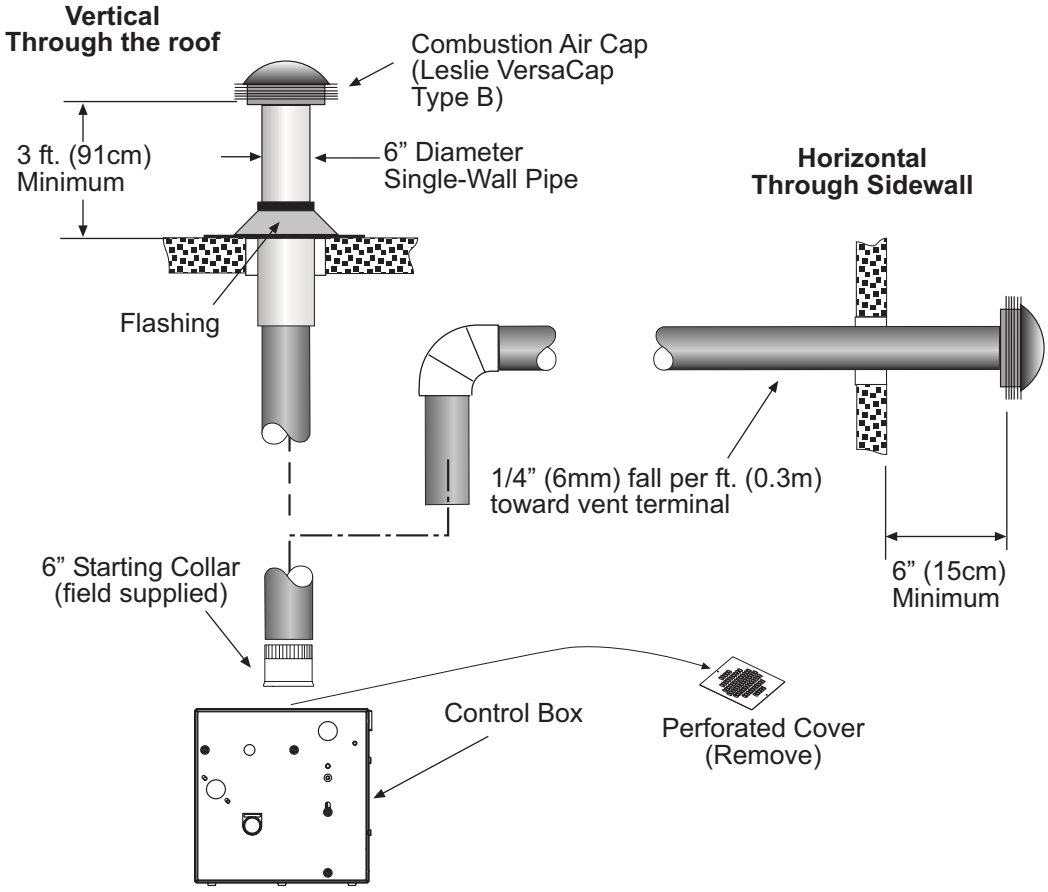
Outside combustion air can be brought directly to the heater by a 6" diameter duct less than 50 ft. long or equivalent. This is attached to the 6" diameter starting collar. The starting collar is fitted to the top of the control box cabinet **after first removing and discarding the perforated cover**. 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 flexible transition section (e.g., flexible aluminum duct) must be provided to allow for expansion/contraction of straight tube heaters (LTS Series).

In colder climates, where necessary, insulate the outside combustion air duct. Avoid locating the outside combustion air duct directly above the control box. Provide a capped cleanout T as necessary. In high humidity applications, the control box should be sealed with silicone sealer.

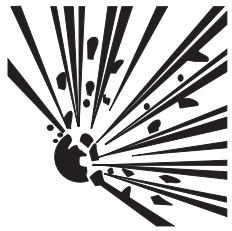
In **multiple heater applications**, the combustion air intake may be ducted individually or common ducted in the same configuration as shown for venting in Section 17.0). For combustion air intake duct sizing, please refer to the **Vent Sizing Table** and use the diameter indicated, based on the number of heaters per duct.





19.0) LIGHTING AND SHUTDOWN INSTRUCTIONS

⚠ WARNING





FIRE AND EXPLOSION HAZARD

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

The access panel must be closed tightly during operation.

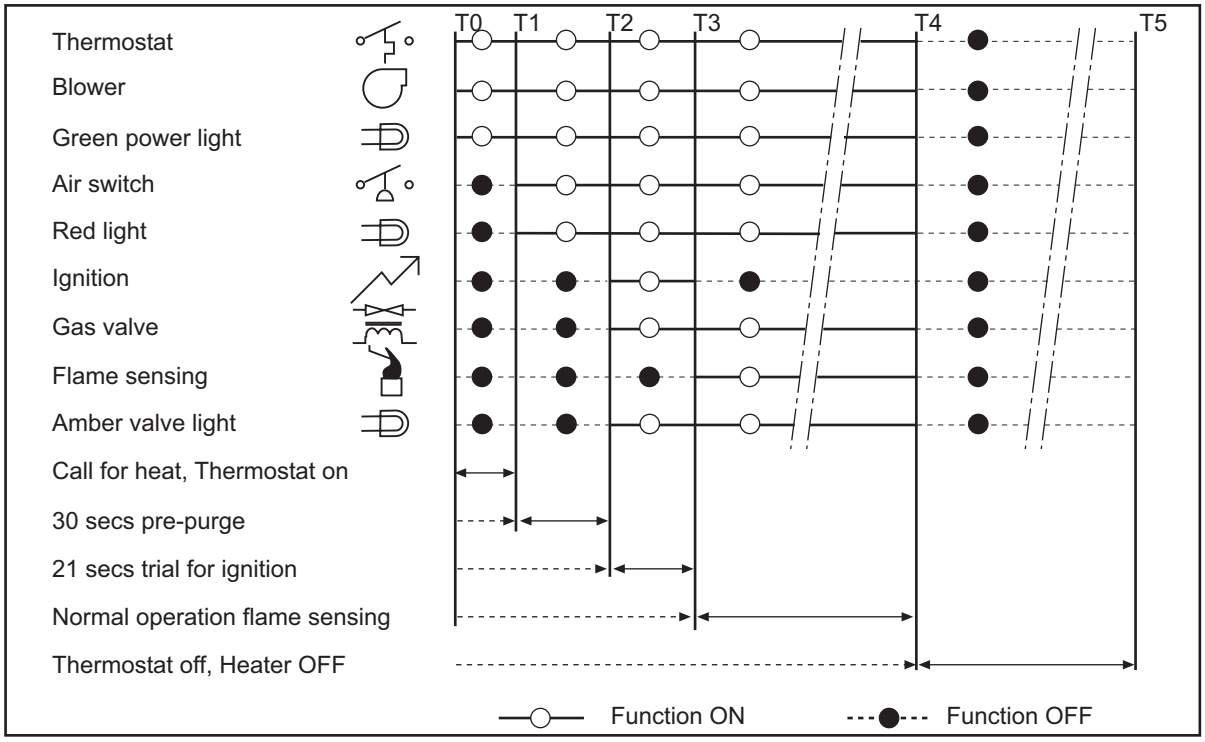
Failure to do so may result in death, serious injury or property damage.

1. Turn on the gas and electrical supply. Rotate the gas valve knob counter-clockwise ↺ to the "ON" position.
2. Set the thermostat to call for heat. The blower motor will energize.
3. Ignition should occur after the 30-second air pre-purge.
4. If ignition fails, the unit will spark for approximately 21 seconds and go into safety lockout. Turn the thermostat (power) off for 60 seconds to take the system out of lockout.
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, rotate the gas valve knob clockwise ↻ to the "OFF" position and 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.

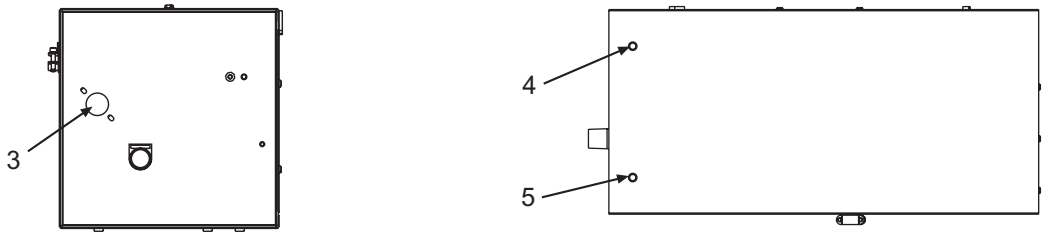
20.0) SEQUENCE OF OPERATION

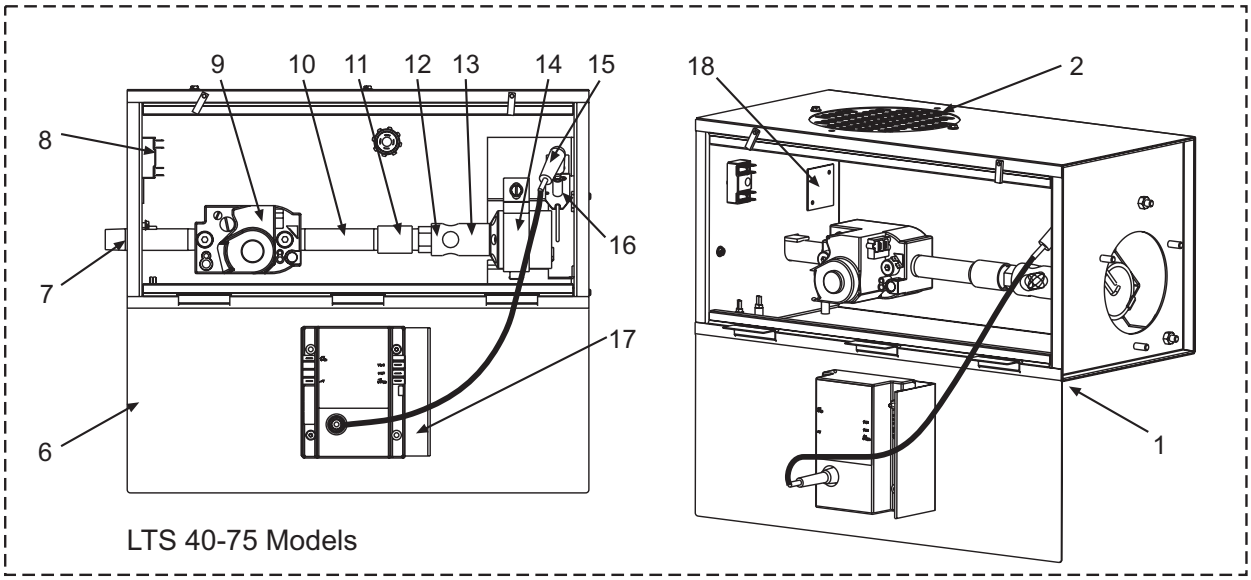
The chart below shows the sequence of operation for the normal operating cycle.



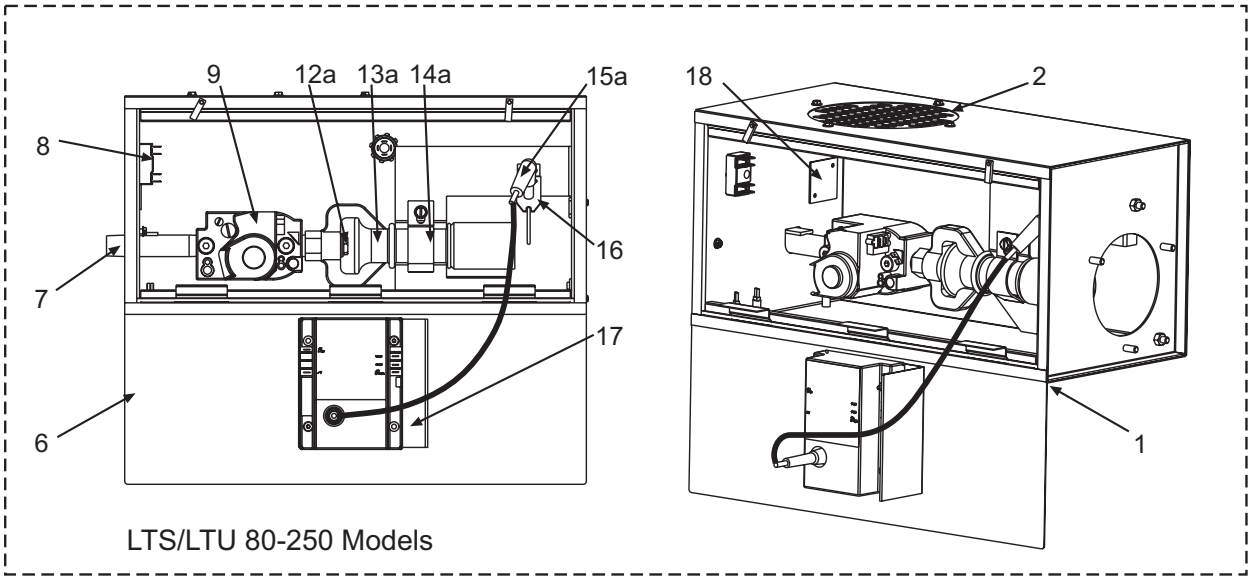
If the flame is not sensed during sequence T3 then the burner will automatically begin ignition sequence T2. If the flame is not re-established the heater will go to lockout.

21.0) CONTROL COMPONENT LOCATION





LTS 40-75 Models



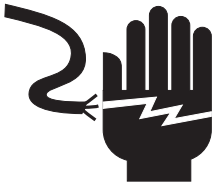
LTS/LTU 80-250 Models

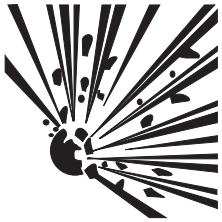
1	Cabinet Assembly	7	Restrainter Nipple	13, 13a	Main Burner
2	Air Inlet Plate	8	Terminal Block	14, 14a	Burner Clamp
3	Sight Glass	9	Gas Valve	15, 15a	Ignition Cable
4	Monitoring Light, Red	10	Nipple	16	Spark Electrode
5	Monitoring Light, Amber	11	Coupling	17	Spark Ignition Module
6	Access Panel	12, 12a	Orifice	18	Sight Glass

NOTE: Access panel only opens to 90°.

22.0) CLEANING AND ANNUAL MAINTENANCE

⚠ WARNING





ELECTRIC SHOCK & EXPLOSION HAZARD

Disconnect electrical power and gas supply before servicing.

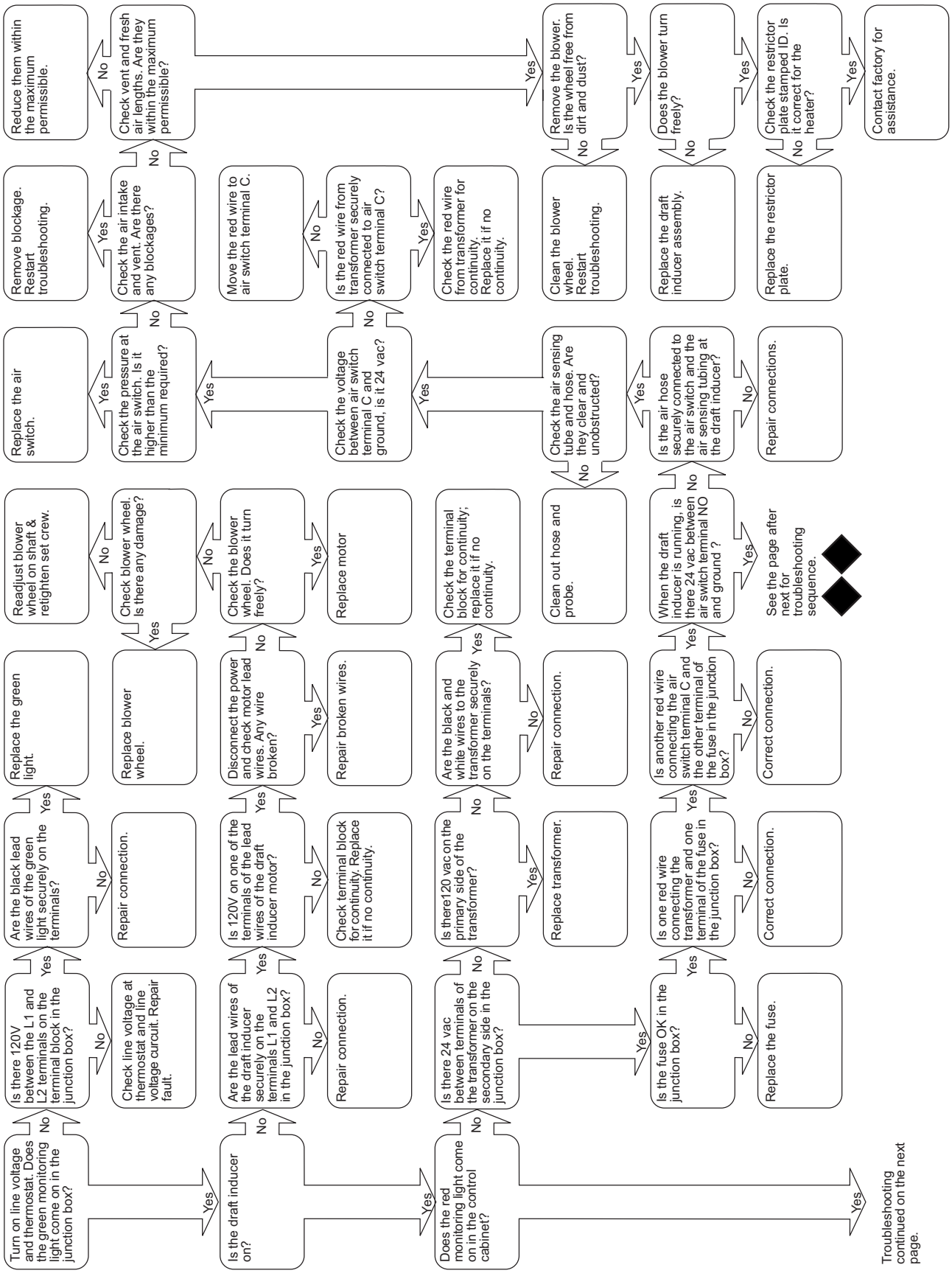
Failure to do so may result in death or serious injury.

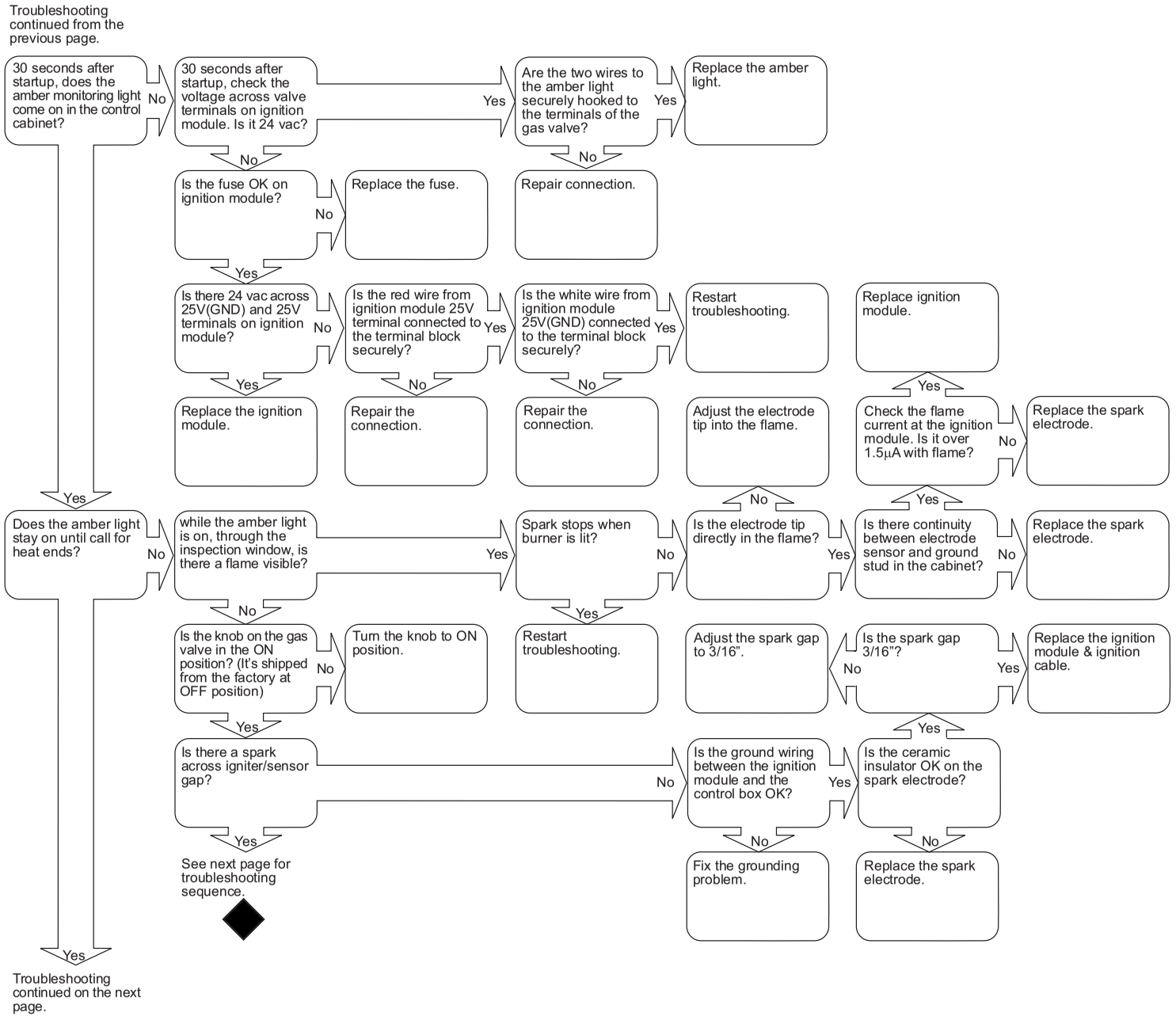
This heater must be cleaned and serviced annually by a qualified contractor before the start of each heating season and at any time excessive accumulation of dust and dirt is observed. Maximum heating efficiency and clean combustion will be maintained by keeping the heater clean.

The contractor shall check the following during periodic maintenance.

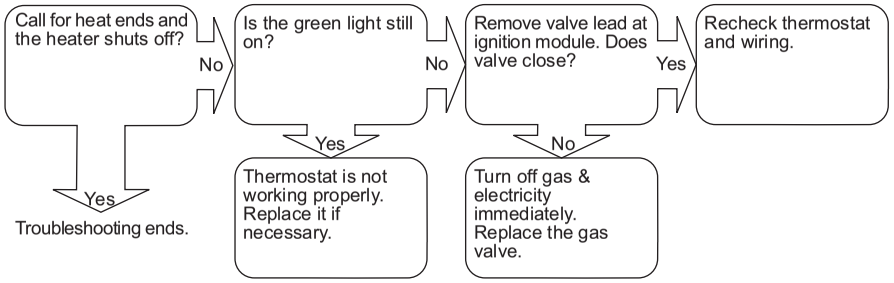
- **Clearances to combustibles:** Check that clearances are being maintained. Make sure there are no flammable objects, liquids or vapors near the heater. See also Section 4.0).
- **Reflectors:** Reflectors should be kept clean, at a minimum blow off the reflectors. (Dirty reflectors may reduce heat 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 control 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 18.0).
- **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 17.0).
- **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 14.0).
- **Control Box:** In order to extend the longevity of the heater, the heat exchanger tube and the burner must be level. Check that the control box is level; use the turnbuckle on the burner suspension eyebolt to adjust the level of the burner. See also Section 5.0).
- **Blower wheel and housing:** Check that the blower wheel spins freely, blow out any dust or dirt with compressed air.
- **Electrode condition:** Visually check that the electrode gap is maintained at 3/16" and that the tips of the spark electrode are free from deposits. Clean off any deposits. Check that the electrode ceramic is free from cracks. See Section 24.1).
- **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.
- **Main Burner and Orifice:** Check the Main burner and orifice; remove any dirt or debris including spider webs. See Section 24.1).

23.0) TROUBLESHOOTING GUIDE

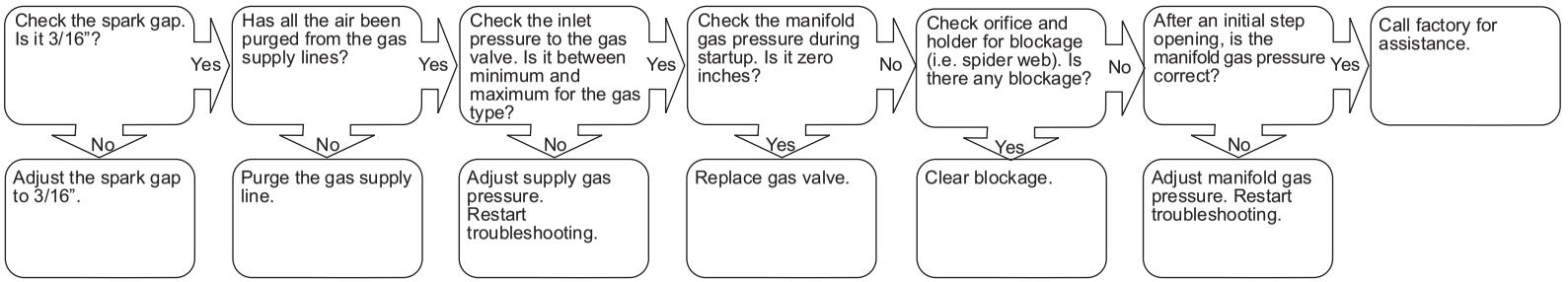



Troubleshooting continued from the previous page.
30 seconds after startup, does the amber monitoring light come on in the control cabinet?
No
30 seconds after startup, check the voltage across valve terminals on ignition module. Is it 24 vac?
Yes
Are the two wires to the amber light securely hooked to the terminals of the gas valve?
Yes
Replace the amber light.
No
Is the fuse OK on ignition module?
No
Replace the fuse.
No
Repair connection.
Yes
Is there 24 vac across 25V(GND) and 25V terminals on ignition module?
No
Is the red wire from ignition module 25V terminal connected to the terminal block securely?
Yes
Is the white wire from ignition module 25V(GND) connected to the terminal block securely?
Yes
Restart troubleshooting.
Replace ignition module.
Yes
Replace the ignition module.
No
Repair the connection.
No
Repair the connection.
Adjust the electrode tip into the flame.
Check the flame current at the ignition module. Is it over 1.5μA with flame?
No
Replace the spark electrode.
Yes
Does the amber light stay on until call for heat ends?
No
while the amber light is on, through the inspection window, is there a flame visible?
Yes
Spark stops when burner is lit?
No
Is the electrode tip directly in the flame?
Yes
Is there continuity between electrode sensor and ground stud in the cabinet?
No
Replace the spark electrode.
No
Is the knob on the gas valve in the ON position? (It's shipped from the factory at OFF position)
No
Turn the knob to ON position.
Yes
Restart troubleshooting.
Adjust the spark gap to 3/16".
Is the spark gap 3/16"?
No
Yes
Replace the ignition module & ignition cable.
Yes
Is there a spark across igniter/sensor gap?
No
Is the ground wiring between the ignition module and the control box OK?
Yes
Is the ceramic insulator OK on the spark electrode?
Yes
No
Fix the grounding problem.
No
Replace the spark electrode.
Yes
See next page for troubleshooting sequence.
Yes
Troubleshooting continued on the next page.

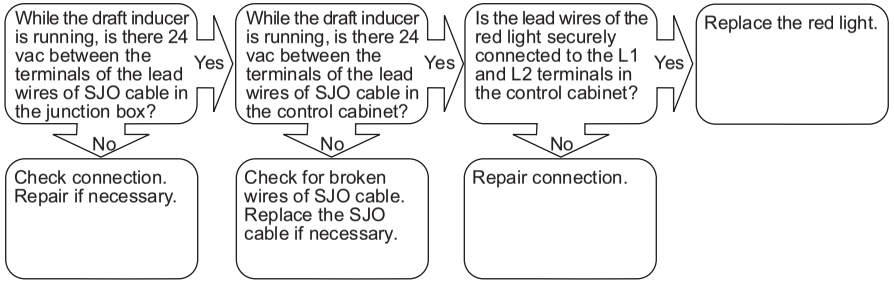
Troubleshooting continued from the previous page.



Troubleshooting continued from the previous page. ◆



Troubleshooting continued from the page before last. ◆◆

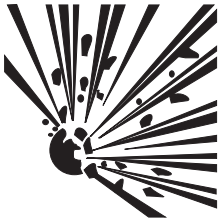


Form #43155010
Dec 09

24.0) REPLACING PARTS

⚠ WARNING





ELECTRIC SHOCK & EXPLOSION HAZARD

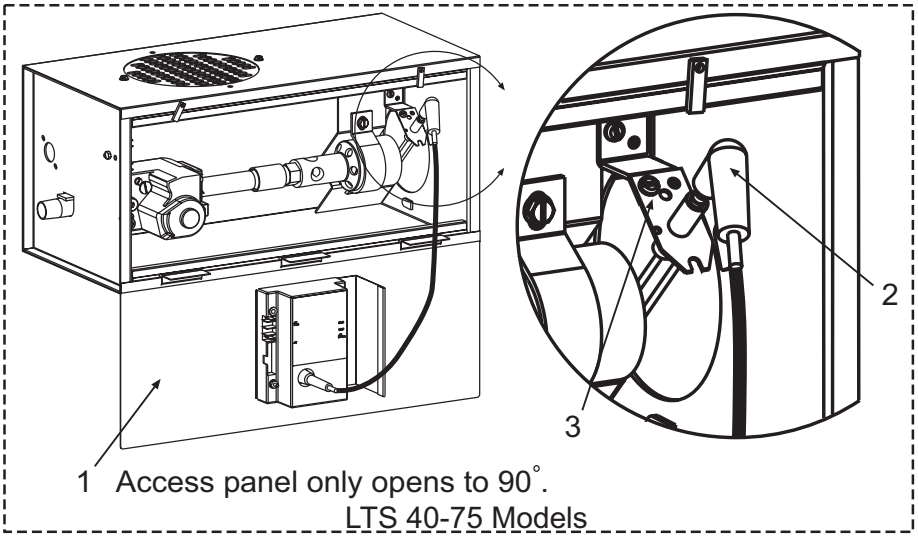
Disconnect electrical power and gas supply before servicing.

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

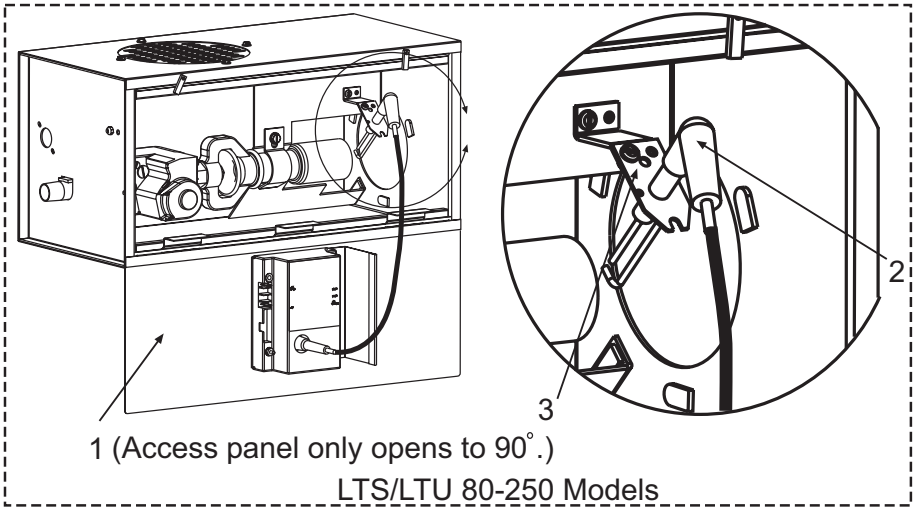
Only use genuine Space-Ray replacement parts. Parts are available from the factory for replacement by a licensed person. Refer to the Replacement Parts Guide in Section 26.0) for all replacement parts.

24.1) REMOVING SPARK ELECTRODE

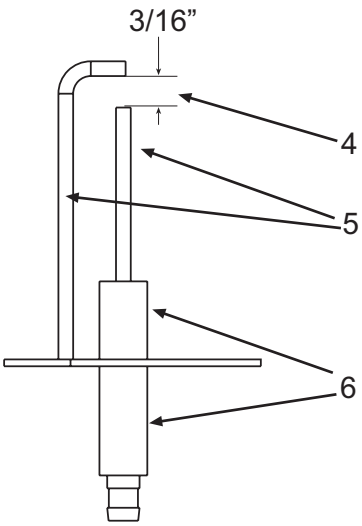
The main burner can be inspected without removing the burner housing from the heat exchanger tube.



LTS 40-75 Models

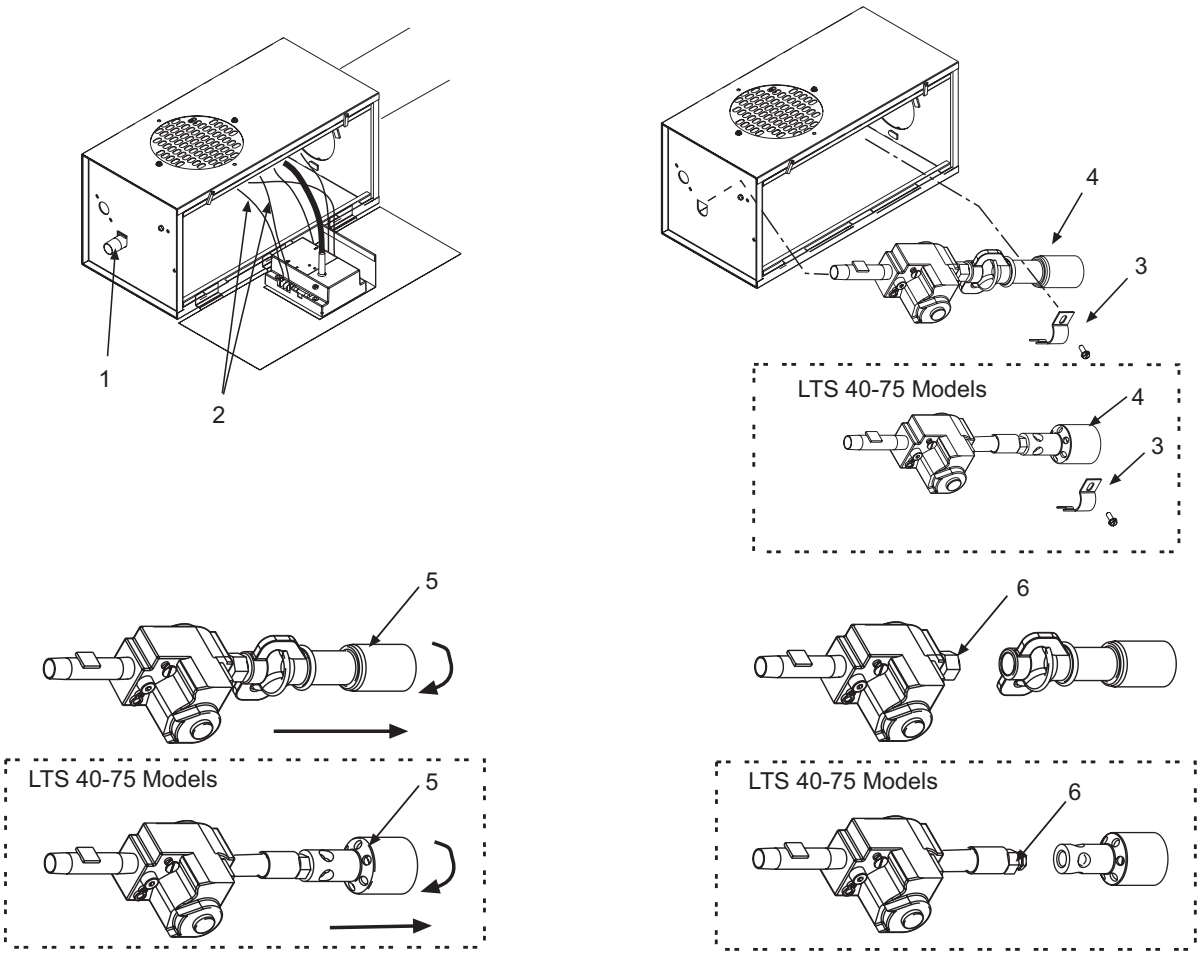


LTS/LTU 80-250 Models



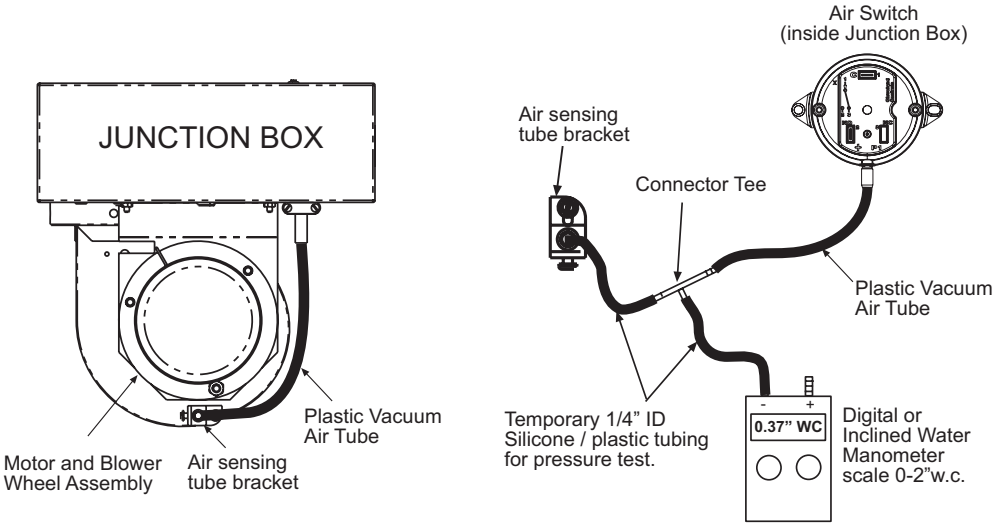
1. **Disconnect electrical supply and open access panel.**
2. **Pull out the ignition cable hooked to spark electrode.**
3. **Remove two mounting screws.**
4. **Take out the spark electrode. Check that the spark gap is 3/16”.**
5. **Check spark electrode. Spark electrode should be clean and free from debris.**
6. **Check ceramic on the spark electrode. It should be free from cracks.**

24.2) REMOVING MAIN BURNER AND GAS VALVE



1. Disconnect electrical supply and gas connection at the restrainer nipple.
2. Open the access panel and disconnect the wires from gas valve.
3. Remove the burner clamp and screws.
4. Remove the burner and gas valve assembly from the cabinet.
5. Unscrew the burner from the manifold.
6. Check the orifice. If the gas valve is to be replaced, the pipe joint compounds must be resistant to the action of liquefied petroleum gases.

24.3) AIR SWITCH PRESSURE CHECK



1. Open hinged access panel.
2. Add tubing to connect the air switch with the connector tee and the existing tubing.
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
LTS40-175, LTU80-175	0.42" W.C. Hot
LTS/U 180 - 250	0.57" W.C. Hot

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

24.4) IGNITION SYSTEM CHECKS

TO CHECK IGNITION CABLE.

a. Make sure that the ignition cable does not touch any metal surface.

b. Make sure that connections to the stud terminal and the igniter/sensor are clean and tight.

c. Make sure that the ignition cable provides good electrical continuity.

TO CHECK IGNITION SYSTEM GROUNDING.

(Nuisance shutdowns are often caused by a poor or erratic ground.) A common ground is required for the module, igniter, flame sensor and main burner.

a. Check for good metal-to-metal contact between the igniter bracket and the main burner.

b. Check the ground lead from the GND (BURNER) terminal on the module to the igniter bracket. Make sure connections are clean and tight. If the wire is damaged or deteriorated, replace it.

c. Replace igniter/sensor with factory replacement part if insulator is cracked.

TO CHECK SPARK IGNITION CIRCUIT.

▲**WARNING:** The ignition circuit generates a 20,000 Volt open circuit and electrical shock can result.

a. Check ignition cable.

b. Check external fuse on the module.

c. Verify power (24V) at module input terminals and output terminal to gas valve.

d. Replace spark module if fuse and power are OK.

TO CHECK FLAME SENSOR CIRCUIT.

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:

- Disconnect the ground lead at the electronic control.
- Connect the black (negative) meter lead to the electronic control GND terminal.
- Connect the red (positive) meter lead to the free end of the ground lead.

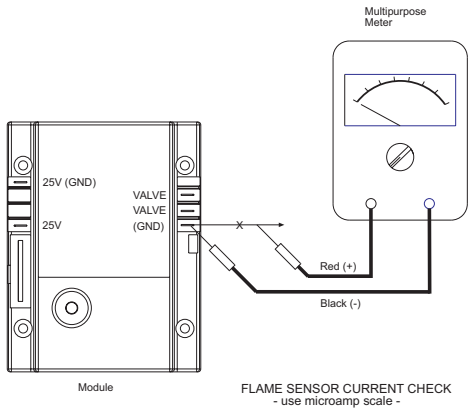
c. Restart the system and read the meter. The flame sensor current must be steady and measure at least 1.5 microamps.

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 1000ºF) 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.



24.5) MOTOR AND BLOWER WHEEL CHECK

If draft inducer motor fails to run:

a. Check power supply to junction box.

b. Check for loose or broken motor lead wire.

c. Check to see that blower wheel turns freely and is not rubbing housing. Blower wheel may have worked loose from shaft and jammed against housing.

d. Check for blower wheel damage; replace if necessary. If no damage, readjust blower wheel on shaft & retighten set screw.

e. If all above does not correct, replace motor.

25.0) INSTALLATION DATA

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

Serial No. _____

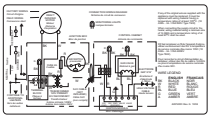
Model: **LTS or LTU** _____ N = Natural Gas L = Propane Gas

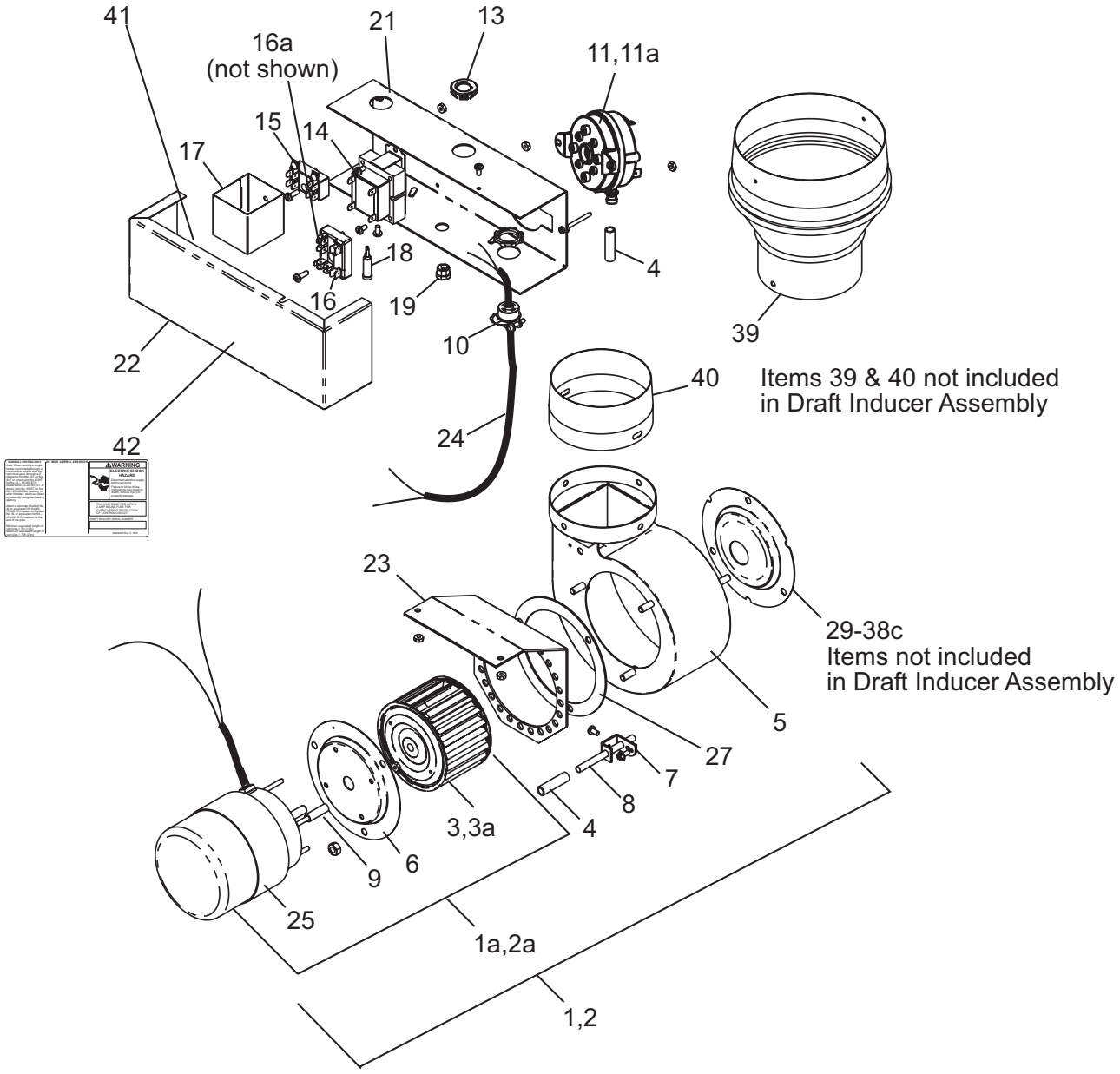
26.0) REPLACEMENT PARTS GUIDE

DRAFT INDUCER COMPONENTS		
Item No.	**Part No.**	**Description**
1	42917000	Draft Inducer Assembly, 40M–175M Btu/hr models
1a	42928000	Motor Replacement Kit, 40M–175M Btu/hr models
2	42917010	Draft Inducer Assembly, 180M–250M Btu/hr models
2a	42928010	Motor Replacement Kit, 180M–250M Btu/hr models
3	03723020	Blower Wheel, Beckett (180M–250M Btu/hr models)
3a	03723000	Blower Wheel, Revcor (40M–175M Btu/hr models)
4	03988120	Plastic Vacuum Air Tube, 12" long
5	42739010	Blower Housing Sub-Assembly
6	42740000	Motor Plate
7	42742000	Sensing Tube Bracket
8	42744000	Sensing Tube, Draft Inducer
9	30347000	Motor Spacer (4 per motor)
10	03868010	3/8" Connector
11	30186200	Air Switch, set @0.37" W.C., #NS2-0306-00 (40-175M Btu/hr models)
11a	30186202	Air Switch, set @0.52" W.C., #NS2-0308-00 (180-250M Btu/hr models)
13	30267000	½" Knockout Plug
14	30279000	Transformer
15	30281000	Terminal Block, EK-204
16	30330000	Terminal Block, TFB-323
16a	30202000	Fuse, 2A 250V
17	42709000	Terminal Block Shield
18	30220010	Monitoring Light, Green
19	02175050	Strain Relief
21	42909000	Junction Box
22	42910000	Junction Box Cover
23	42911000	Junction Box Support Bracket
24	42923000	SJO Cable Assembly
25	03721000	Motor
27	43221000	Draft Inducer Gasket
29	42741040	Restrictor Plate, 1" I.D. (40M Btu/hr)
30	42741030	Restrictor Plate, 1-1/8" I.D. (50M Btu/hr)
31	42741020	Restrictor Plate, 1-7/32" I.D. (60M Btu/hr)
32	42741010	Restrictor Plate, 1-7/16" I.D. (75M Btu/hr)
33	42741050	Restrictor Plate, 1-1/2" I.D. (80M & 90M Btu/hr)
34	42741060	Restrictor Plate, 1-5/8" I.D. (100M Btu/hr)
35	42741070	Restrictor Plate, 1-3/4" I.D. (110M & 120M Btu/hr)
36	42741080	Restrictor Plate, 1-7/8" I.D. (125M & 130M Btu/hr)
37	42741090	Restrictor Plate, 2-1/32" I.D. (140M & 150M Btu/hr)
38	42741100	Restrictor Plate, 2-1/4" I.D. (160M, 175M, 180M Btu/hr)
38a	42741130	Restrictor Plate, 2-3/8" I.D. (200M Btu/hr)
38b	42741140	Restrictor Plate, 2-1/2" I.D. (225M Btu/hr)
38c	42741150	Restrictor Plate, 2-3/4" I.D. (250M Btu/hr)
39	42892000	Starting Collar, 4" x 6" (180–250M Btu/hr)
40	40504020	Starting Collar, 4" (40–175M Btu/hr)

Labels / Manual			
Item No.	**Part No.**	**Description**	**Qty.**
41	42874000	Label, Wire Diagram	1
42	42922020	Label, Sidewall Venting	1

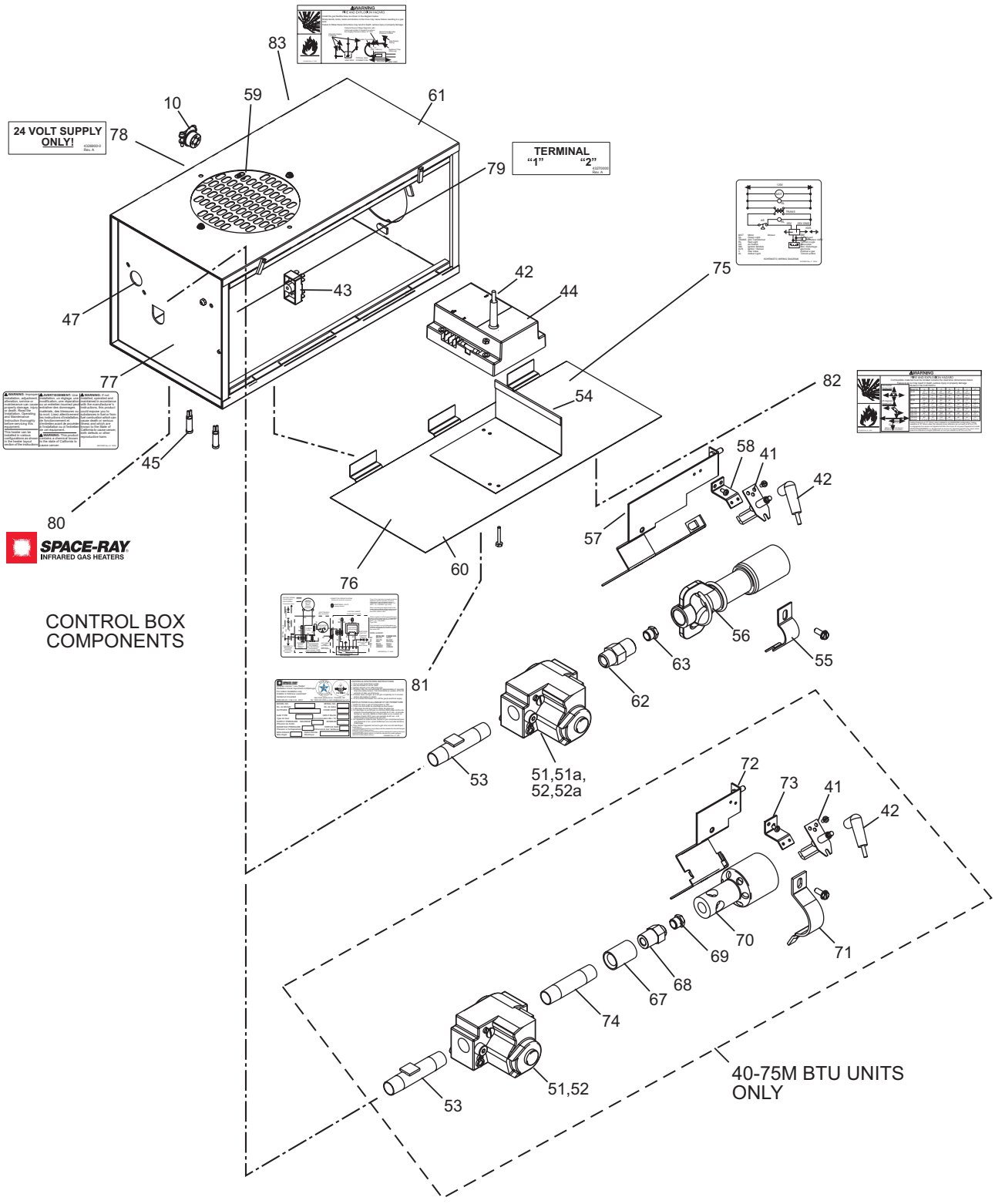
DRAFT INDUCER COMPONENTS



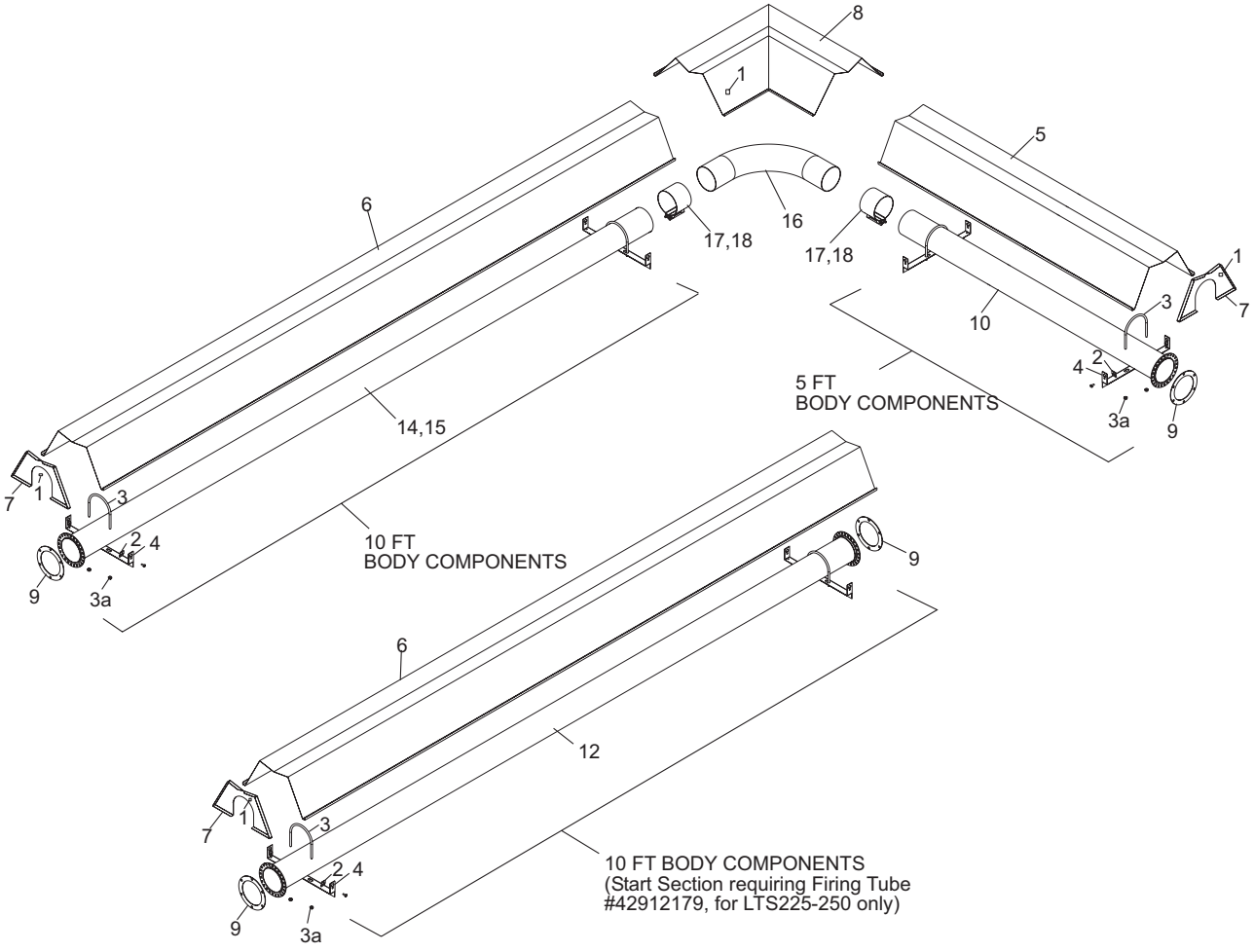


CONTROL COMPONENTS		
Item No.	**Part No.**	**Description**
10	03868010	3/8" Connector
28	42874000	Connection Wire Diagram (not shown)
41	30295000	Electrode PSE-GF1 (Igniter/Sensor)
42	30314120	Ignition Cable, 14" long
43	30324000	Terminal Block, EK-104
44	30331040	Spark Module, S87J-1034
45	42398060	Monitoring Light, Red
46	42398050	Monitoring Light, Amber
47	42447000	Sight Glass
51	30333070	Valve, VR8205P-2408 @3.5" W.C. (Natural Gas, 40–200M Btu/hr Models)
52	30333080	Valve, VR8205P-2416 @10" W.C. (Propane Gas, 40–200M Btu/hr Models)
51a	30475069	Valve Kit, VR8305P-3206 @3.5" W.C. (Natural Gas, 225–250M Btu/hr Models)
52a	30475039	Valve Kit, VR8305P-3214 @10" W.C. (Propane Gas, 225–250M Btu/hr Models)
53	42757010	Restrainer Nipple, 4" long
54	42885000	Spark Module Shield
55	42887100	Burner Clamp
56	42890010	Burner Assembly
57	42899100	Burner Bracket Sub-Assembly
58	42888000	Electrode Bracket
59	42893000	Air Inlet Plate (Perforated)
60	42905000	Access Panel
61	42906100	Cabinet Assembly (for offset burner)
62	42889000	Orifice Fitting & Test Gauge Connection
63	03258xxx	Orifice for 80M–250M Btu/hr (State Model & Gas Type for Size)
67	03540090	Coupling, ½"
68	42701000	Orifice Fitting & Test Gauge Connection
69	03259xxx	Orifice for 40M-75M Btu/hr (State Model & Gas Type for Size)
70	42700000	Burner
71	43169000	Burner Clamp
72	43172100	Burner Bracket Sub-assembly
73	43170000	Electrode Bracket
74	03333140	Nipple, ½"x4" long

Labels / Manual			
Item No.	**Part No.**	**Description**	**Qty.**
64	43155010	Installation and Operation Instructions (not shown)	1
75	42785000	Label, Wire Diagram (ladder)	1
76	42874000	Label, Wire Diagram	1
77	42875000	Label, Warning	1
78	43269000	Label, 24V Supply	1
79	43270000	Label, Terminal ID	1
80	42013000	Label, "Space-Ray" Logo	1
81	42848000	Label, "Space-Ray" Nameplate	1
82	43344000	Label, Clearance to Combustibles	1
83	43344050	Label, Gas Connector Warning	1

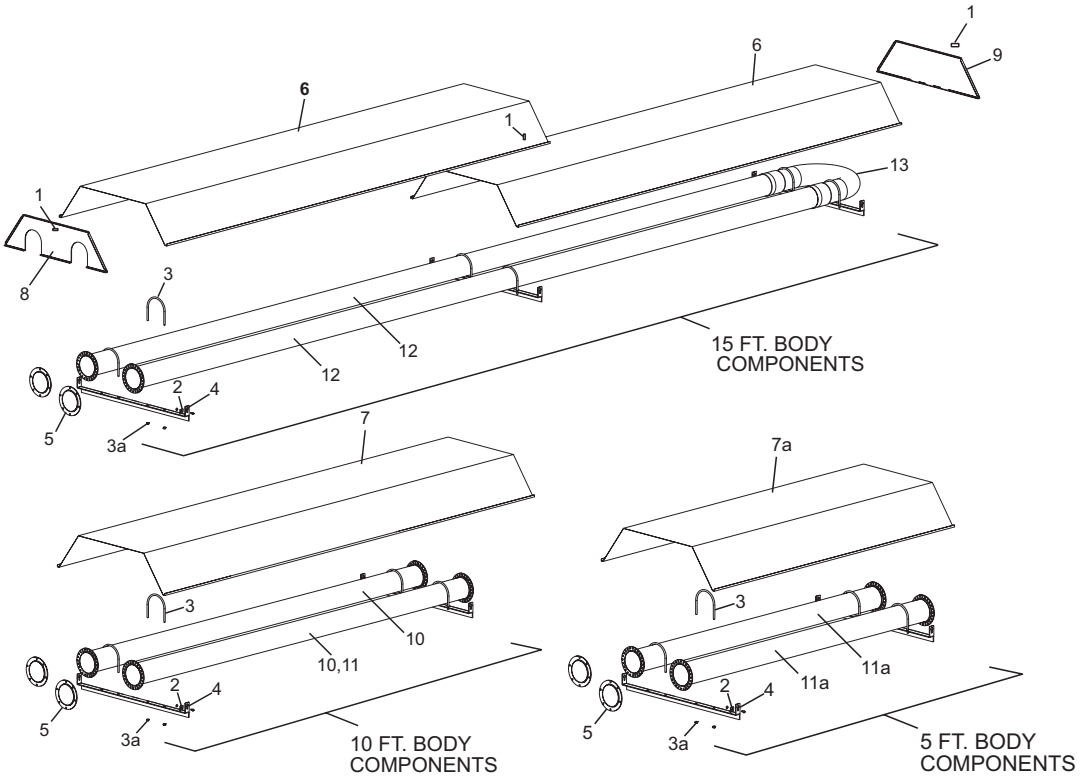

24 VOLT SUPPLY ONLY!
TERMINAL "1" "2"
SPACE-RAY INFRARED GAS HEATERS
CONTROL BOX COMPONENTS
40-75M BTU UNITS ONLY
10
42
43
44
45
47
51,51a, 52,52a
51,52
53
54
55
56
57
58
59
60
61
62
63
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83

BODY COMPONENTS: LTS 40-250			
Item No.	Part No.	Description	
1	02266010	Reflector Speed Clip	
2	42769011	Reflector Clamp with Screw	
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" (2 per 5 ft. or 10 ft. body section)	
5	43319050	Reflector, 4'-11½" long (5 ft. section only; 1 per 5 ft. body section)	
6	43319100	Reflector, 9'-11½" long (10 ft. section only; 1 per 10 ft. body section)	
7	43320000	End Reflector (2 per heater)	
8	43342000	Corner Reflector Package	
9	42921000	Tube Flange Gasket	
10	42912100	5' Tube Assembly Kit, 4" OD, ALC steel with one 24-hole flange (exhaust tube)	
12	42912179	10' Tube Assembly Kit, 4" OD, ATC w/ two 6-hole flanges (firing tube) – for LTS225-250	
14	42912080	10' Tube Assembly Kit, 4" OD, ALC w/ one 24-hole flange (start/end tube)	
15	41932100	10' Tube Assembly Kit, 4" OD, ALC w/o flange (extension tube)	
16	43208010	4" O.D. Elbow Package	
17	02189020	#10 x ½" Self-Drilling Screw (2 per coupling)	ALC = Calorized, Aluminized Steel
18	30462980	4" OD Tube Compression Coupling w/bolts	ATC = Calorized, Alumi-Therm Steel



LTS40-250
BODY COMPONENTS

BODY COMPONENTS: LTU 80-250			
Item No.	Part No.	Description	
1	02266010	Reflector Speed Clip	
2	42769011	Reflector Clamp with Screw	
3	42873000	"U" Bolt Clamp, 4" OD Tube	
3a	02127110	5/16-18 Hex Nut (2 per "U" Bolt)	
4	42898000	Tube Support/Hanger Bracket, 28"	
5	42921000	Tube Flange Gasket	
6	42894080	Reflector, 8'-4" long (15 ft. section only; 2 per 15 ft. body section)	
7	42894100	Reflector, 9'-11½" long (10 ft. section only; 1 per 10 ft. body section)	
7a	42894050	Reflector, 4'-11½" long (5 ft. section only; 1 per 5 ft. body section)	
8	42895000	Reflector, Control End	
9	42896000	Reflector, Foot End	
10	42912070	10' Tube Assembly Kit, 4" OD, ALC w/ two 24-hole flanges (firing tube) – for LTU180-200	
11	42912179	10' Tube Assembly Kit, 4" OD, ATC w/ two 6-hole flanges (firing tube) – for LTU225-250	
11a	42912130	5' Tube Assembly Kit, 4" OD, ALC w/ two 24-hole flanges (firing tube) – for LTU125-175	
12	42912010	15' Tube Assembly Kit, 4" OD, ALC w/ one 24-hole flange	ALC = Calorized, Aluminized Steel
13	42913000	U Bend, 4" OD x 6" centerline radius	ATC = Calorized, Alum-Therm Steel



LTU80-250
BODY COMPONENTS

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 SPACE-RAY SALES REPRESENTATIVE. WE RESERVE THE RIGHT TO ALTER ANY SPECIFICATION WITHOUT NOTICE.