SPACE-RAY

INSTALLATION AND OPERATION INSTRUCTIONS
INFRARED RADIANT TUBE HEATER

Single Stage (On/Off) Push Through System (Positive Pressure)
Two Stage (Hi/Lo) Push Through System (Positive Pressure)

Models: EPA 12, EPA 15, EPA 20, EPA 25, EPA 30, EPA 38, EPA 45, EPA 55

0086

ICOM Energy Association

OWNER / INSTALLER: For your safety this manual must be carefully and thoroughly read and understood before installing, operating or servicing this heater. This heater is intended for use with either Natural Gas or Propane Gas. It must be installed by a qualified service person or a licensed contractor in accordance with state and local codes.

▲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. For assistance or additional information, consult a qualified installer, service agency or the gas supplier.

INSPECT all combustion air openings into the building and, if necessary, clear if they become blocked.

FOR YOUR SAFETY: If the heater is installed without a flue, exhaust fans **MUST** be operating on an appropriate cycle when heaters are operating to avoid a high concentration of carbon monoxide. When used without fresh air, this heater may give off carbon monoxide, an odorless and poisonous gas. **CARBON MONOXIDE POISONING MAY LEAD TO DEATH**. Early signs of carbon monoxide poisoning resemble the flue with headaches, dizziness and nausea. If you experience these signs, **GET FRESH AIR IMMEDIATELY!** Have the heaters serviced as soon as possible and check the ventilation into the building.

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

IF YOU SMELL GAS:

FOR YOUR SAFETY

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

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.

Gas Fired Products (UK) Ltd.
Chapel Lane, Claydon, Ipswich, Suffolk IP6 0JL, England
Phone 01473 830551 Fax: 01473 832055 E-mail: info@spaceray.co.uk www.spaceray.com.uk

Form 44201320
Jan 2017

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)	Specifications	5
6.0)	Packing List	9
6.1)	U-Models	10
6.2)	Linear Models	12
6.3)	Accessory Packages	13
7.0)	Typical Layouts – EPA Series	15
7.1)	Typical Assembly Layout – (EPA – Linear Models Shown)	16
8.0)	Dimensions – EPA Linear models	17
8.1)	Dimensions – EPA U-Models	18
8.2)	Heater Assembly / Joining of Tube Sections	19
9.0)	Typical Suspension Methods	21
9.1)	Angle Mounting of Heaters	22
10.0)	Assembly of Tube Sections	22
10.1)	Assembly of Extension Section	24
10.2)	Inserting Turbulators	26
10.3)	Adding Body Reflectors	26
11.0)	Adding Optional 90° Elbow (Linear Models Only)	27
11.1)	Adding Optional Corner Reflector (Linear Models Only)	28
11.2)	Adding 180° U-Bend (U-Models Only)	28
11.3)	Adding Optional U-Bend Reflector (U-Models Only)	29
12.0)	ATTACHING BURNER BOX ASSEMBLY	29
12.4)	Connecting the TISS System	31
13.0)	Gas Connections and Regulations	34
14.0)	Instructions for Pressure Test Gauge Connection	36
15.0)	Electrical Connections	38
15.1)	SINGLE STAGE (N5/L5) INTERNAL AND THERMOSTAT CONNECTIONS	39
15.2)	TWO STAGE (N7/L7) INTERNAL AND THERMOSTAT CONNECTIONS	40
16.0)	Venting and Fresh Air for Combustion	42
17.0)	Lighting and Shutdown Instructions	45
18.0)	Sequence of Operation – SINGLE STAGE (N5/L5)	45
19.0)	Cleaning and Annual Maintenance	46
20.0)	Troubleshooting Guide – SINGLE STAGE (N5/L5)	48
21.0)	Troubleshooting Guide – TWO STAGE (N7/L7)	50
22.0)	Replacing Parts	51
22.1)	Removal of Main Burner and Electrodes	51
22.2)	Removing Gas Valve and Manifold Assembly	52
22.3)	Air Switch Pressure Check	52
23.0)	Conversion Instructions	53
24.0)	Installation Data	54
25.0)	Replacement Parts Guide	54

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 52kg.
- Ensure that the tube integrity safety system TISS™ supplied is installed in accordance with these instructions and that the tension is correct.
- Supply the owner with a copy of these Installation and Operation Instructions.
- 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 designed for use where flammable gases or vapors are not generally present.

Installation of this heater must be in accordance with all applicable codes shown in the instructions and/or the local codes and authorities having jurisdiction. In the UK all equipment must be installed and maintained in accordance with the relevant provisions of the Gas Safety (Installations and Use) Regulations 1998 for gas fired products. Installation practices must take into account the Health and Safety at Works Act 1974 or relevant codes of practice. In addition the installation must be carried out in accordance with the current IEE wiring regulations BS 7671-latest revision, BS 6896-latest revision (Industrial & Commercial) and any other relevant British Standards and Codes of Practice by a qualified installer. All external wiring MUST comply with the current IEE wiring regulations.

Clearances to combustibles as outlined in the manual should always be observed. In areas used for storage of combustible materials where they may be stacked below the heater, the installer must post signs that will "specify the maximum permissible stacking height to maintain the required clearances from the heater to combustibles."

Every heater shall be located with respect to building construction and other equipment so as to permit access to the control housing. Each installer shall use skillful and reliable installation practices when locating the heaters and must give consideration to service accessibility.

This heater is for **INDOOR INSTALLATION ONLY** and is used in **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 must be provided by gravity or mechanical means. Ventilation requirements are addressed further in these instructions.

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 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.

Linear Configuration Series Only: Since linear configuration tube heaters are always hotter at the control end than at the flue terminal end, always observe the minimum recommended mounting heights.

Before installation, check that the local distribution conditions, nature of gas and pressure, and adjustment of the appliance are compatible.

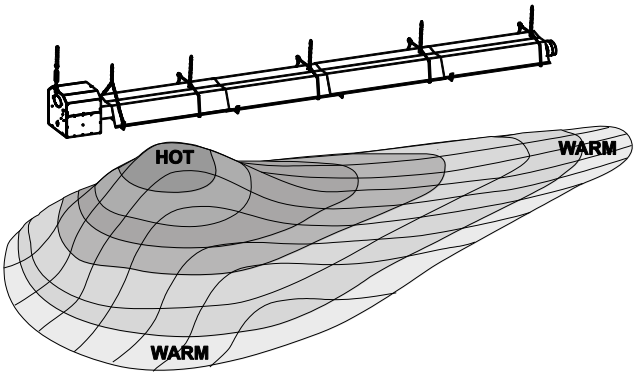
This heater must be applied and operated under the general concepts of reasonable use and installed using best building practices.

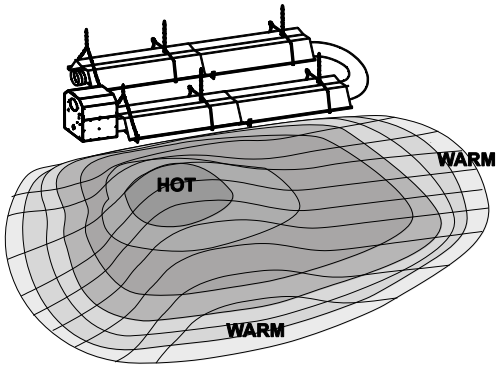
It is the responsibility of the qualified installer to supply the appropriate lifting equipment to safely installer the radiant tube heater. Tools required for the safe installation, startup and maintenance are various screwdrivers, wrenches, pipe wrenches, volt and multimeter, air and gas manometer and required tools to safely install the chosen hanging materials.

These instructions refer to appliances designed to operate in the European Union.
Appliances designed for other countries (Non-European Union) are available on request.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

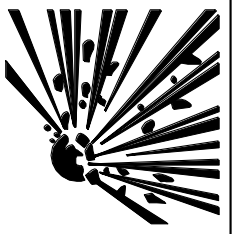
Children must be supervised not to play with the appliance.





4.0) MINIMUM CLEARANCES TO COMBUSTIBLES

⚠WARNING



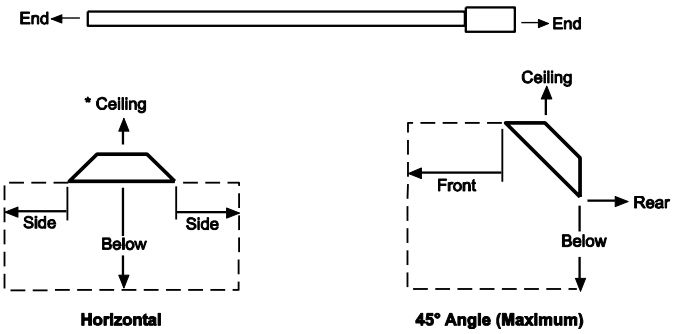


FIRE AND EXPLOSION HAZARD

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:



MINIMUM CLEARANCES TO COMBUSTIBLES						
	Mounted Horizontally				Angle Mounted at 45°	
Model No.	Sides	Ceiling*	Below	Ends	45° Front	45° Rear
EPA 12	56cm	15cm	132cm	38cm	102cm	30cm
EPA 15	56cm	15cm	142cm	38cm	122cm	30cm
EPA 20	56cm	15cm	152cm	38cm	132cm	30cm
EPA 25	71cm	15cm	152cm	38cm	132cm	30cm
EPA 30	71cm	15cm	178cm	38cm	147cm	30cm
EPA 38	86cm	15cm	193cm	51cm	168cm	30cm
EPA 45	86cm	15cm	206cm	51cm	178cm	30cm
EPA 55	106cm	15cm	218cm	51cm	191cm	30cm

* Ceiling clearance is 30cm when installed in an UNVENTED configuration. Ceiling clearance is 46cm when the optional corner reflectors are not used on linear models.

** Maximum clearance below reduces by 50% once you are 8m downstream from the burner 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 50°C 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 50 °C above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl 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) SPECIFICATIONS

Model Identification:

Control Option Suffix	Gas Type	Description
N5	Natural	Single Stage SIT 840 Gas Valve – Single Stage Input – On/Off
L5	Propane	Single Stage SIT 840Gas Valve – Single Stage Input – On/Off
N7	Natural	Two Stage SIT 843 Gas Valve – Modulating Input – High/Low Fire
L7	Propane	Two Stage SIT 843 Gas Valve – Modulating Input – High/Low Fire

Weights:

Control Package : 20kg

Body Packages per System Lengths :						
4.5m : 32kg	6m : 41kg	9m : 57kg	12m : 73kg	15m : 90kg	18m : 106kg	21m : 122kg

MODEL	EPA 12-N	EPA 12-L
Heat Input	11.5 kW Hs / 10.35 kW Hi (minimum 7.3 kW Hs / 6.57 kW Hi two stage only)	11.5 kW Hs / 10.35 kW Hi (minimum 8.4 kW Hs / 7.56 kW Hi two stage only)
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	No. 32	No. 50
Air Plate	PN 44140064	
Turbulator Qty.	2	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	2	

MODEL	EPA 15-N	EPA 15-L
Heat Input	14.0 kW Hs / 12.6 kW Hi (minimum 9.7 kW Hs / 8.7 kW Hi two stage only)	
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	Ø3.3mm	2.0mm
Air Plate	PN 4414006G	
Turbulator Qty.	2	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	2	

MODEL	EPA 20-N	EPA 20-L
Heat Input	20.0 kW Hs / 18.0 kW Hi (minimum 14.0 kW Hs / 12.6 kW Hi two stage only)	20.0 kW Hs / 18.0 kW Hi (minimum 14.4 kW Hs / 13.0 kW Hi two stage only)
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	No. 23	No. 42
Air Plate	PN 44140063	
Turbulator Qty.	4	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	3	

MODEL	EPA 25-N	EPA 25-L
Heat Input	25.0 kW Hs / 22.5 kW Hi (minimum 17.0 kW Hs / 15.3 kW Hi two stage only)	
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	4.3mm	2.6mm
Air Plate	PN 44140062	
Turbulator Qty.	4	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	3	

MODEL	EPA 30-N	EPA 30-L
Heat Input	30.0 kW Hs / 27.0kW Hi (minimum 20.5 kW Hs / 18.5 kW Hi two stage only)	
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	4.8mm	No. 35
Air Plate	PN 4414006B	
Turbulator Qty.	8	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	3	

MODEL	EPA 38-N	EPA 38-L
Heat Input	36.6 kW Hs / 33.0 kW Hi (minimum 25.6 kW Hs / 23.0 kW Hi two stage only)	
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	No. 4	No. 30
Air Plate	PN 44140067	
Turbulator Qty.	4	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	1	

MODEL	EPA 45-N	EPA 45-L
Heat Input	45.0 kW Hs / 40.5 kW Hi (minimum 30.8 kW Hs / 27.7 kW Hi two stage only)	
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	A	Ø 3.5mm
Air Plate	PN 4414006F	
Turbulator Qty.	6	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	3	

MODEL	EPA 55-N	EPA 55-L
Heat Input	53.0 kW Hs / 47.7 kW Hi (minimum 37.1 kW Hs / 33.4 kW Hi two stage only)	53.0 kW Hs / 47.7 kW Hi (minimum 36.5 kW Hs / 32.9 kW Hi two stage only)
Appliance Type (II_{2H3P})	A_3, $B_{23,53}$ $C_{13,33,53,63}$	
Appliance Category	II_{2H3P}	
Adjusted for	2H G20 20mbar	3P G31 37mbar
Setting Pressure	8.7mbar (minimum 4.9mbar two stage)	24.9mbar (minimum 13.2mbar two stage)
Injector (1 piece)	6.4mm	No. 23
Air Plate	PN 4414006E	
Turbulator Qty.	2	
Electrical Supply	230V~50Hz 90W	
Fuse Externally	3A	
Gas Connection	R - ½	
Flue Size	Ø100mm	
NOx class	2	

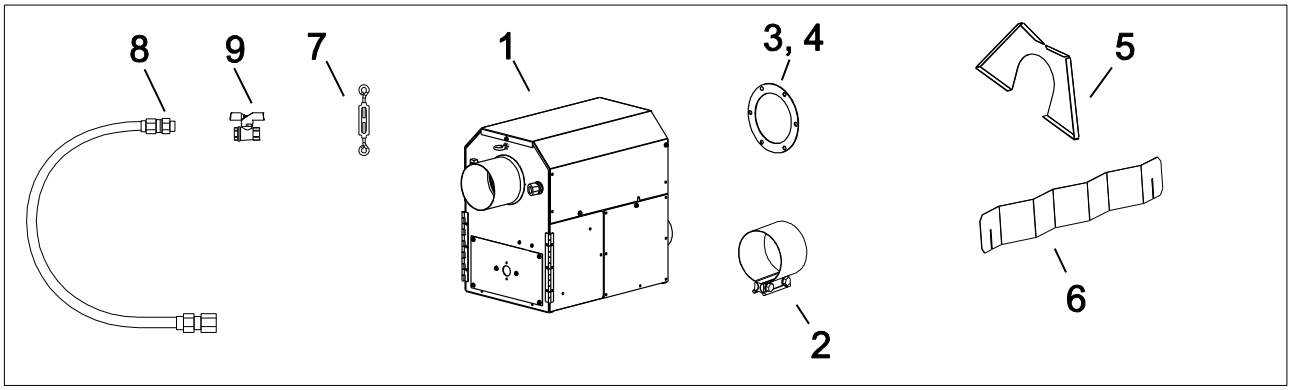
Flue Data

Model			Flue Gas Mass Flow Rate (kg/s)	Flue Pressure (Pa)	Flue Gas Temperature (°C)
EPA	12	N	0.0066	18-22	120-135
EPA	12	L	0.0066	18-22	120-135
EPA	15	N	0.0086	18-22	125-140
EPA	15	L	0.0086	18-22	125-140
EPA	20	N	0.0114	18-22	165-180
EPA	20	L	0.0114	18-22	165-180
EPA	25	N	0.0143	20-24	195-210
EPA	25	L	0.0143	20-24	195-210
EPA	30	N	0.0171	25-29	185-200
EPA	30	L	0.0171	25-29	185-200
EPA	38	N	0.0211	38-42	150-165
EPA	38	L	0.0211	38-42	150-165
EPA	45	N	0.0257	45-49	235-250
EPA	45	L	0.0257	45-49	235-250
EPA	55	N	0.0303	60-64	220-235
EPA	55	L	0.0302	60-64	220-235

6.0) PACKING LIST

A. EPA Burner Package

Ref.	Part #	Each Burner Package Includes:	Qty.
1	See chart.	Burner Box Assembly (Refer to the following chart for Package Part Numbers)	1
2	30462980	Tube Coupling (for flue terminal connection)	1
3	**42907040**	**Control Fastener Kit - comprising of:**	1
-	02189020	Screw, #10-16 x ½" (4.8 x 13mm) Self-Drill (TEKS)	2
-	02167010	1/4-20 Locknuts	3
4	42921000	Tube Flange Gasket	1
5	43341000	Head End Reflector Kit (includes 2 reflectors and clips)	1
6	44152240	Turbulator – 610mm Long (See chart for quantities)	-
7	30545040	Turnbuckle	1
8	4262504	Gas connector, 16mm OD x 914mm (SEPERATLY ORDERED ANCILLERY)	1
9	2160	Manual Gas Cut Off Valve (SEPERATLY ORDERED ANCILLERY)	1
10	44201320	Installation and Operation Manual -not shown-	1



BURNER PACKAGE NUMBERS

SINGLE STAGE CONTROLS		
MODEL NO.	**PART NO.**	**GAS TYPE**
EPA 12-N5	44580010	NATURAL
EPA 15-N5	44580020	NATURAL
EPA 20-N5	44580030	NATURAL
EPA 25-N5	44580040	NATURAL
EPA 30-N5	44580050	NATURAL
EPA 38-N5	44580060	NATURAL
EPA 45-N5	44580070	NATURAL
EPA 55-N5	44580080	NATURAL
EPA 12-L5	44580090	PROPANE
EPA 15-L5	44580100	PROPANE
EPA 20-L5	44580110	PROPANE
EPA 25-L5	44580120	PROPANE
EPA 30-L5	44580130	PROPANE
EPA 38-L5	44580140	PROPANE
EPA 45-L5	44580150	PROPANE
EPA 55-L5	44580160	PROPANE

TWO STAGE CONTROLS		
MODEL NO.	**PART NO.**	**GAS TYPE**
EPA 12-N7	44580170	NATURAL
EPA 15-N7	44580180	NATURAL
EPA 20-N7	44580190	NATURAL
EPA 25-N7	44580200	NATURAL
EPA 30-N7	44580210	NATURAL
EPA 38-N7	44580220	NATURAL
EPA 45-N7	44580230	NATURAL
EPA 55-N7	44580240	NATURAL
EPA 12-L7	44580250	PROPANE
EPA 15-L7	44580260	PROPANE
EPA 20-L7	44580270	PROPANE
EPA 25-L7	44580280	PROPANE
EPA 30-L7	44580290	PROPANE
EPA 38-L7	44580300	PROPANE
EPA 45-L7	44580310	PROPANE
EPA 55-L7	44580320	PROPANE

6.1) U-MODELS

B. EPA Body Fastener Kits – U Models (included in body packages)

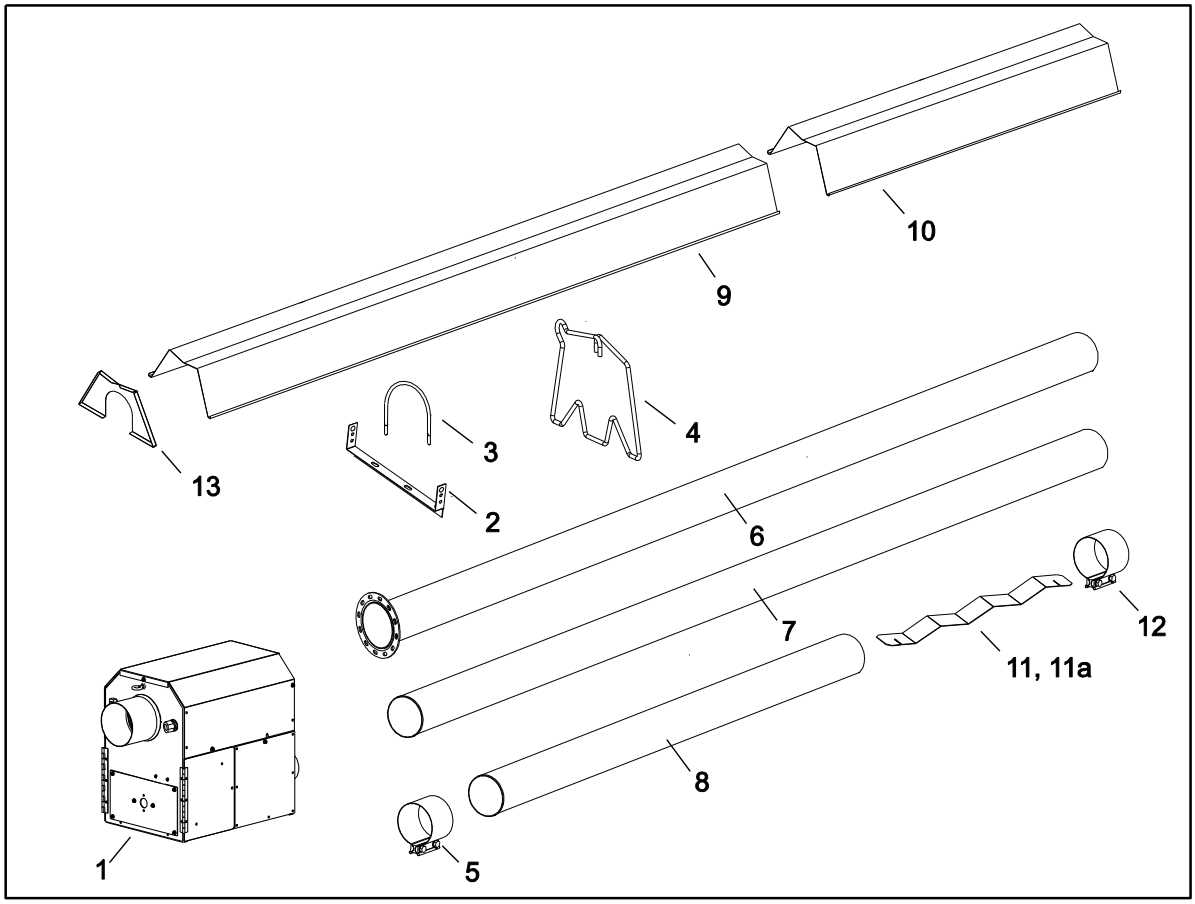
Part No.	Part Description	System Lengths – U Model					
		4.5m, 6m, 18m	21m	9m, 12m, 18m	21m	15m	3m
		42907190	42907200	42907210	42907220	42907221	42907280
42873000	U-Bolt	2	3	4	5	6	1
02127110	Hex Nut, 5/16-18	5	6	8	10	13	3
02189020	HWHSM Screw, #10-16 x ½" TEKS (4.8 x 13mm)	8	10	14	18	24	4

C. EPA Main Heater Components – U Models

The appliances are supplied as follows:

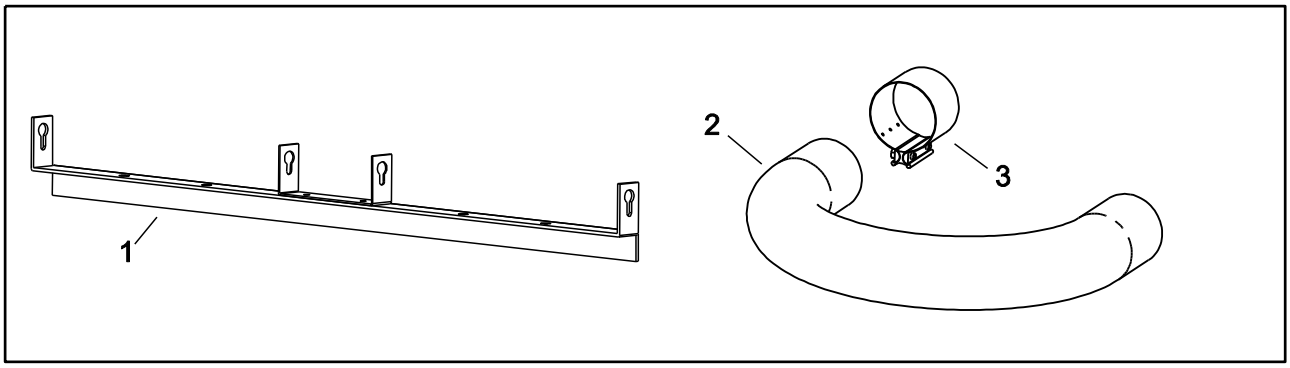
			U Models Used On						
			12kW, 15kW, 20kW	12kW, 15kW, 20kW 25kW	15kW, 20kW, 25kW 30kW, 38kW	15kW, 20kW, 25kW 30kW, 38kW, 45kW	38kW, 45kW, 55kW	38kW, 45kW 55kW	55kW
			System Lengths						
Ref. No.	Part No.	Part Description	4.5m	6m	9m	12m	15m	18m	21m
			Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.
1	See list A	Burner Package	1	1	1	1	1	1	1
not shown	See list B	Body Fastener Kits	1	1	1	1	1	1	1
not shown	See list D	U-Bend Package	1	1	1	1	1	1	1
2	43318000	Tube Hanger/Support Bracket, 33cm	2	2	4	4	6	6	8
3	42873000	U-Bolt (included in fastener kits)	2	2	4	4	6	6	8
4	43980010	Wire Hanger	2	2	4	4	6	6	8
5	30462980	Tube Coupling	1	1	3	3	5	5	7
6	42912180	Radiant Tube W/12 Hole Flange-3M	1	1	1	1	1	1	1
7	41932100	Radiant Tube L/Flanges-3m	-	1	1	3	3	5	5
8	41932050	Radiant Tube L/Flanges-1.5m	1	-	2	-	2	-	2
9	43319100	Reflector Panel – 3035mm	1	2	2	4	4	6	6
10	43319050	Reflector Panel – 1511mm	1	-	2	-	2	-	2
11	44152240	Turbulator – (included with control)	-See specifications section for quantity-						
12	30462980	Tube Coupling – (included with control)	1	1	1	1	1	1	1
13	43341000	Reflector Kit – (included with control)	1	1	1	1	1	1	1

NOTE: These models require an additional U-Bend package no. 43208020



D. EPA U-Bend Package (required for U Series)

			Kit Part No.
Item No.	Part No.	Description	43208020
1	43318500	Tube Support/Hanger Bracket – 79cm	1
2	42913020	U-Bend	1
3	30462980	Tube Coupling	1
not shown	02189020	HWHSM Screw, #10-16 x ½" TEKS (4.8 x 13mm)	2



6.2) LINEAR MODELS

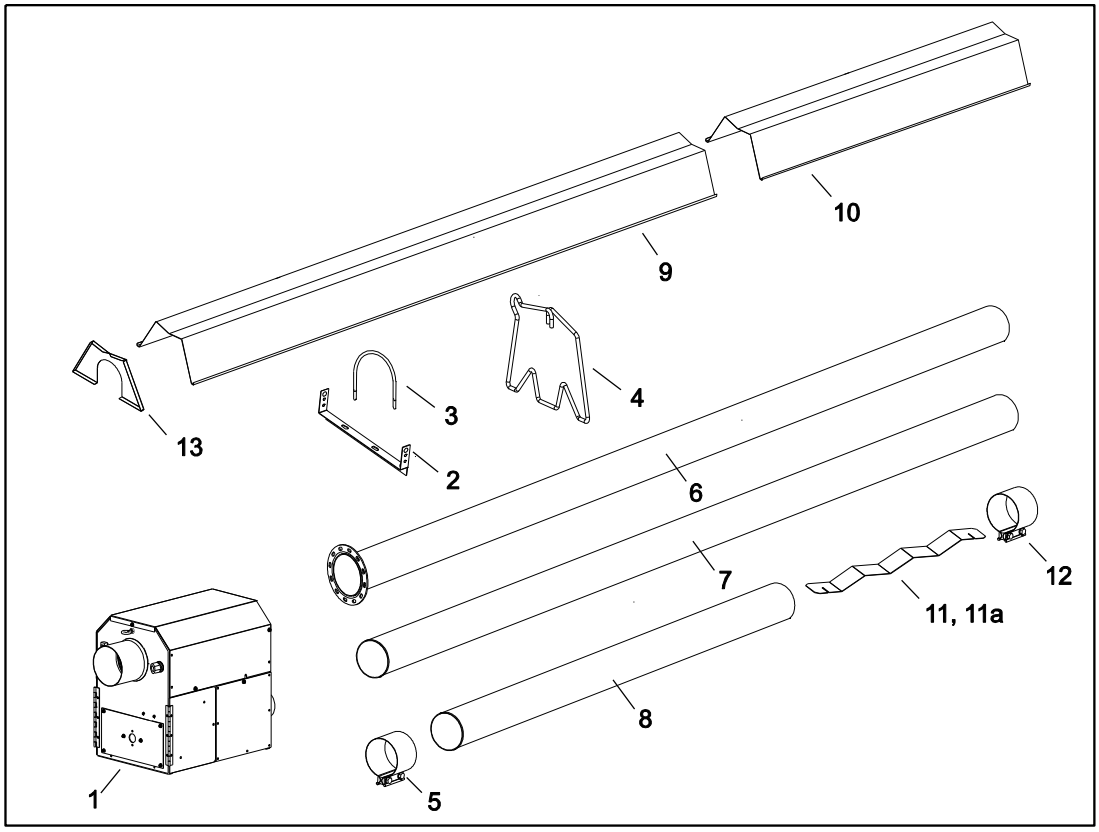
E. EPA Body Fastener Kits - Linear Models (included in body packages)

Part No.	Part Description	System Lengths – Linear Model			
		4.5m, 6m, 18m	9m, 21m	12m, 18m, 21m	15m
		42907190	42907200	42907210	42907220
42873000	U-Bolt	2	3	4	5
02127110	Hex Nut, 5/16-18	5	6	8	10
02189020	HWHSM Screw, #10-16 x ½" TEKS (4.8 x 13mm)	8	10	14	18

F. EPA Main Heater Components – Linear Models

The appliances are supplied as follows:

			Linear Models Used On						
			12kW	12kW, 15kW, 20kW	15kW, 20kW 25kW, 30kW,	15kW, 20kW, 25kW 30kW, 38kW, 45kW	38kW, 45kW, 55kW	38kW, 45kW 55kW	55kW
			System Lengths						
Ref. No.	Part No.	Part Description	4.5m	6m	9m	12m	15m	18m	21m
			Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.
1	See list A	Burner Package	1	1	1	1	1	1	1
not shown	See list E	Body Fastener Kits	1	1	1	1	1	1	1
2	43318000	Tube Hanger/Support Bracket, 33cm	2	2	3	4	5	6	7
3	42873000	U-Bolt (included in fastener kits)	2	2	3	4	5	6	7
4	43980010	Wire Hanger	2	2	3	4	5	6	7
5	30462980	Tube Coupling	1	1	2	3	4	5	6
6	42912180	Radiant Tube W/12 Hole Flange-3M	1	1	1	1	1	1	1
7	41932100	Radiant Tube L/Flanges-3m	-	1	2	3	4	5	6
8	41932050	Radiant Tube L/Flanges-1.5m	1	-	-	-	-	-	-
9	43319100	Reflector Panel – 3035mm	1	2	3	4	5	6	7
10	43319050	Reflector Panel – 1511mm	1	-	-	-	-	-	-
11	44152240	Turbulator – (included with control)	-See specifications section for quantity-						
12	30462980	Tube Coupling – (included with control)	1	1	1	1	1	1	1
13	43341000	Reflector Kit – (included with control)	1	1	1	1	1	1	1

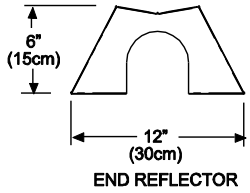


6.3) ACCESSORY PACKAGES

A. <u>End Reflector Accessory Package, Part #43341000</u>

(1 pkg. per Linear Series or 2 pkgs. per U- Series)

Contains:
End Reflector, #43320000.....QTY–2
Speed Clips, #02266010.....QTY–8

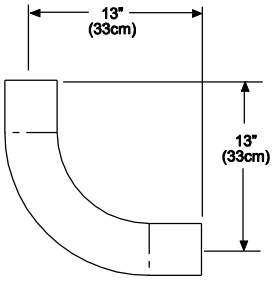


END REFLECTOR

B. <u>Elbow Accessory Package, Part #43208010</u>

(Option for Linear Series Only)

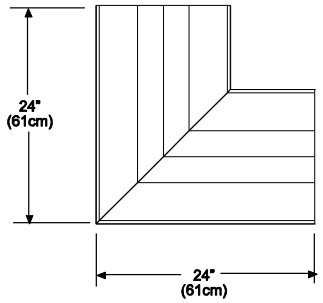
Contains:
Elbow, #43175000.....QTY–1
#10-16 x ½" (4.8 x 13mm) Self-Drilling Screws, #02189020.....QTY–2
Tube Coupling, #30462980.....QTY–1



C. Corner Reflector Accessory Package, Part #43342000

(Option for Linear Series Only)

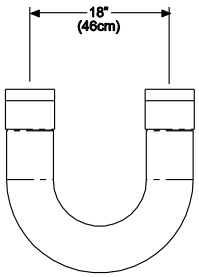
Contains:
Corner Reflector Assembly, #43345000.....QTY–1
Speed Clips, #02266010.....QTY–4



D. U-Bend Package, Part #43208020

(Option for U-Series Only)

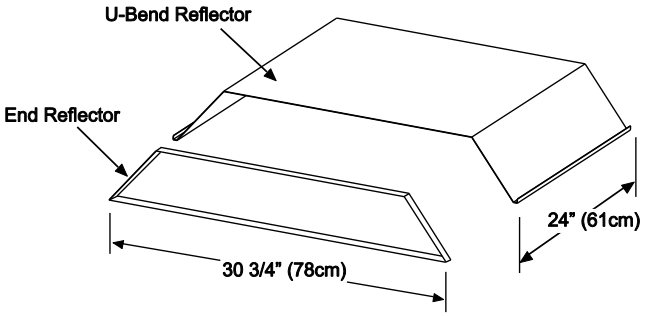
Contains:
U-Bend, #42913020.....QTY–1
#10-16 x ½" (4.8 x 13mm) Self-Drilling Screws, #02189020.....QTY–2
Tube Coupling, #30462980.....QTY–1
79cm Tube Support/Hanger Bracket, #43318500.....QTY–1



E. U-Bend Reflector Package, Part #43488000

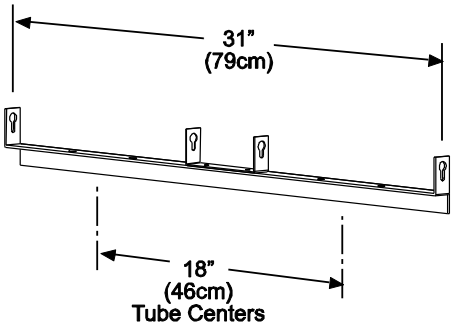
(Option for U-Series Only)

Contains:
U-Bend Reflector, #43490000.....QTY–1
U-Bend End Reflector, #43490050.....QTY–1
Speed Clips, #02266010.....QTY–11
#10-16 x ½" (4.8 x 13mm) Self-Drilling Screws, #02189020.....QTY–4
Installation Form, #43489000.....QTY-1



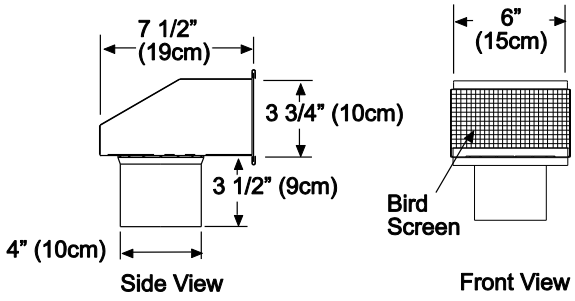
F. 79cm Hanger/Tube Support, Part #43318500

(Option for Angle Mounting of U-Series)

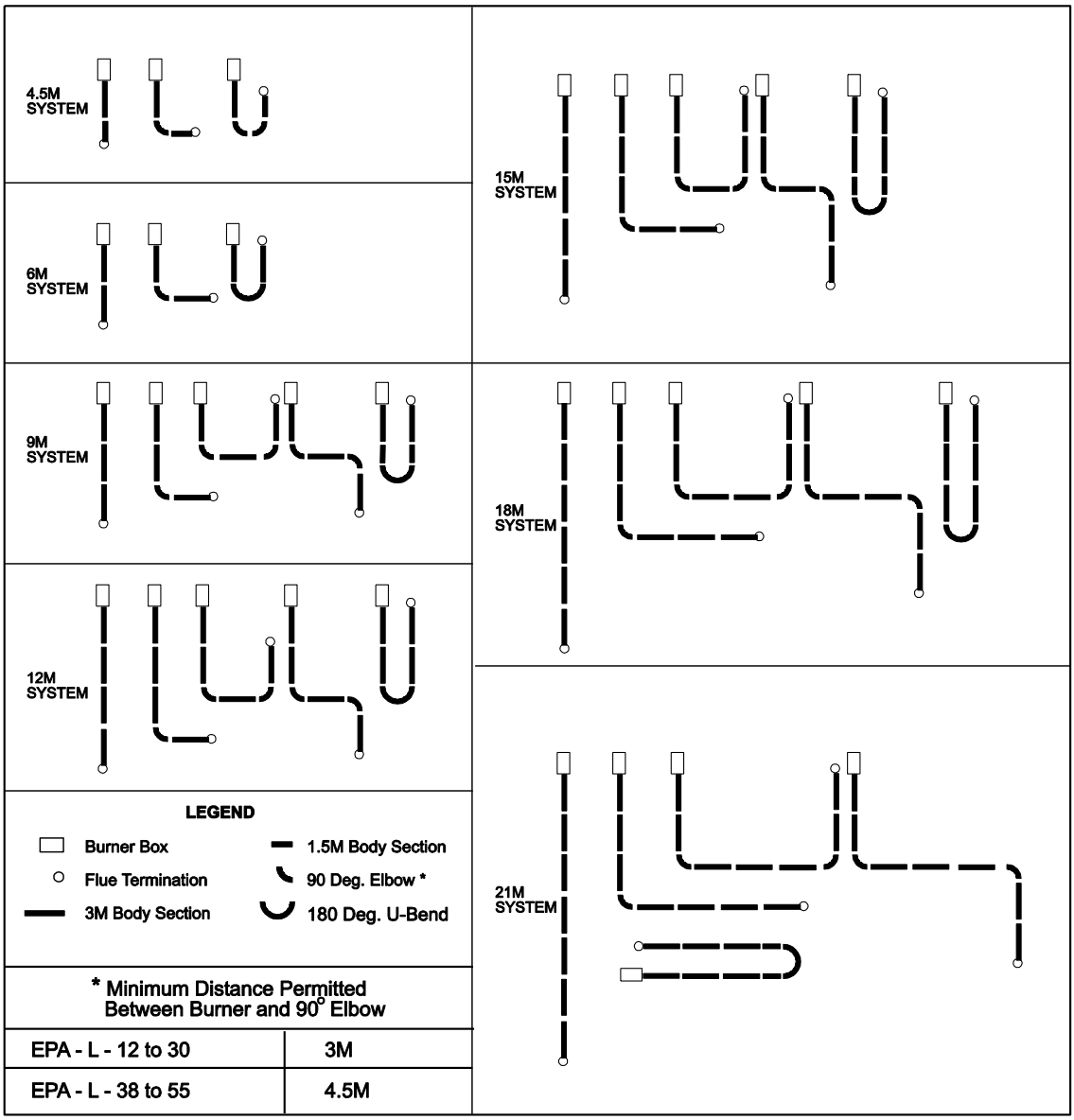


G. Exhaust Hood Package, Part #42924000

Contains:
Exhaust Hood Assembly, #42925540.....QTY–1
#8-18 x ½" (4.2 x 13mm) Self-Drilling Screws, #02189030 QTY–2



7.0) TYPICAL LAYOUTS – EPA SERIES



LINEAR MODEL	EMITTER LENGTH		U-MODEL	BODY LENGTH	
	Min.	Max.		Min.	Max.
EPA 12	4.5m	6m	EPA 12	3m	3m
EPA 15	6m	12m	EPA 15	3m	6m
EPA 20	6m	12m	EPA 20	3m	6m
EPA 25	9m	12m	EPA 25	3m	6m
EPA 30	9m	12m	EPA 30	4.5m	6m
EPA 38	12m	18m	EPA 38	4.5m	9m
EPA 45	12m	18m	EPA 45	6m	9m
EPA 55	15m	21m	EPA 55	8m	11m

NOTES:

In all configurations, the control unit must be connected directly to the tube flange assembly,

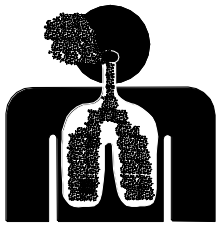
Joining of two 90° elbows directly together to form a "Z" shape IS NOT permitted.

1.5m Body Packages may be utilized on any of these heaters to yield heater lengths from 4.5m to 21m.

Any configuration of components not shown in the illustrations may be used except as noted in 1 and 2 above.

7.1) TYPICAL ASSEMBLY LAYOUT – (EPA – LINEAR MODELS SHOWN)

⚠ WARNING



POISONOUS GAS AND SOOT HAZARD

The heater must be assembled with the correct number of turbulator sections and tube length for the rated heat input.

The turbulator must be installed in the last tube section as shown.

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

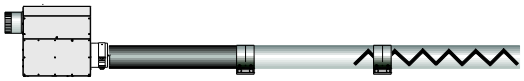
4.5m SYSTEM



6m SYSTEM



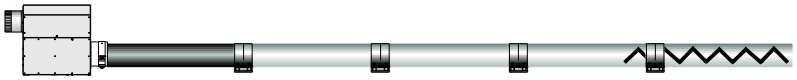
9m SYSTEM



12m SYSTEM



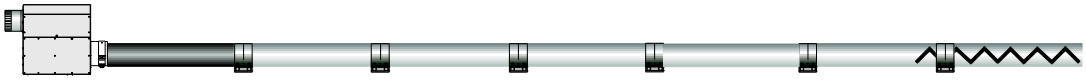
15m SYSTEM



18m SYSTEM



21m SYSTEM



Model	610mm Turbulator Sections
EPA (L,U) 12	2
EPA (L,U) 15	2
EPA (L,U) 20	4
EPA (L,U) 25	4
EPA (L,U) 30	8
EPA (L,U) 38	4
EPA (L,U) 45	6
EPA (L,U) 55	2

LEGEND



Burner Box



3m Aluminized Tube
12 Radial Hole Flange



Coupling



3m or 1.5m
Aluminized Tube

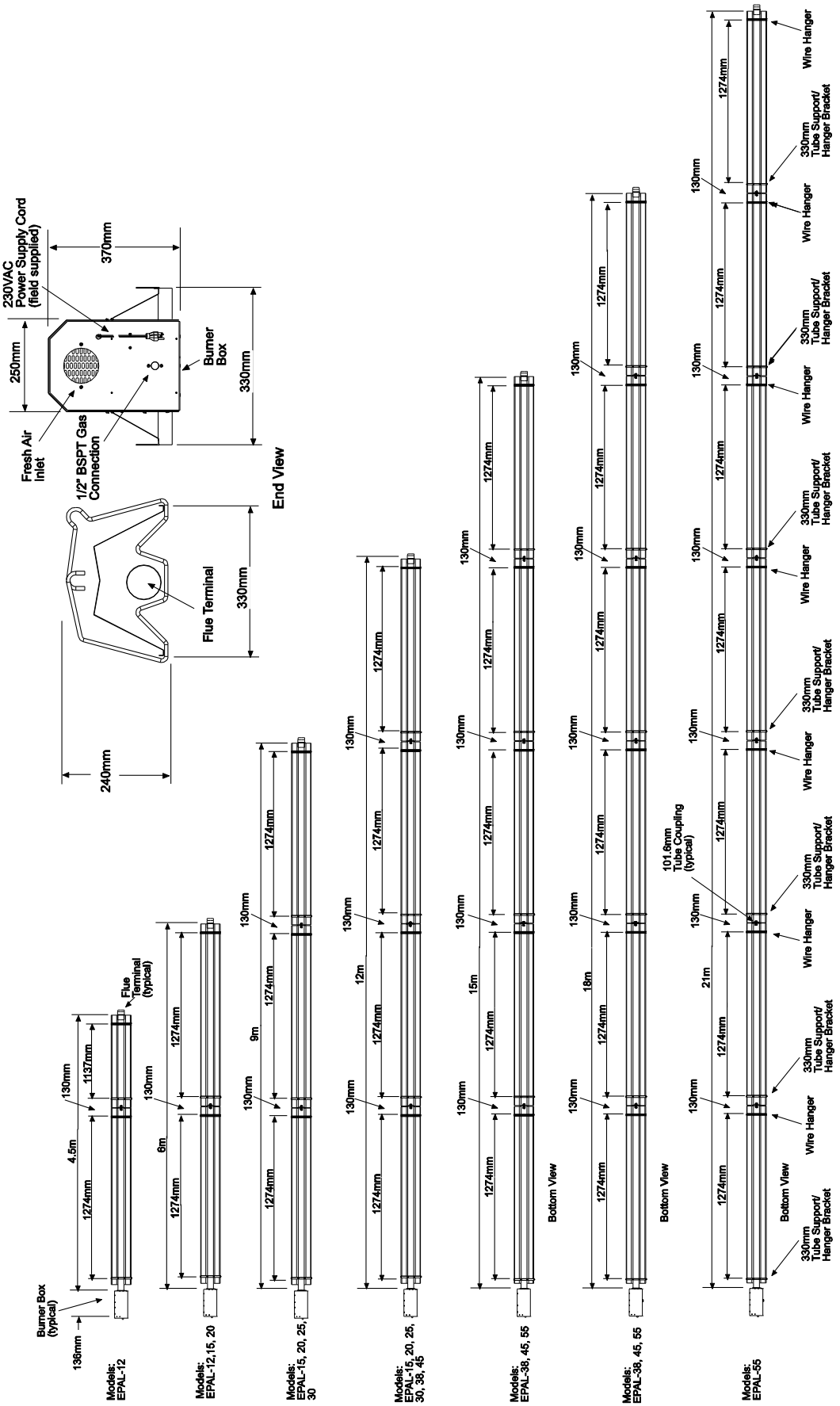


610mm Aluminized Steel
Turbulator sections
(see chart above
for required quantities)

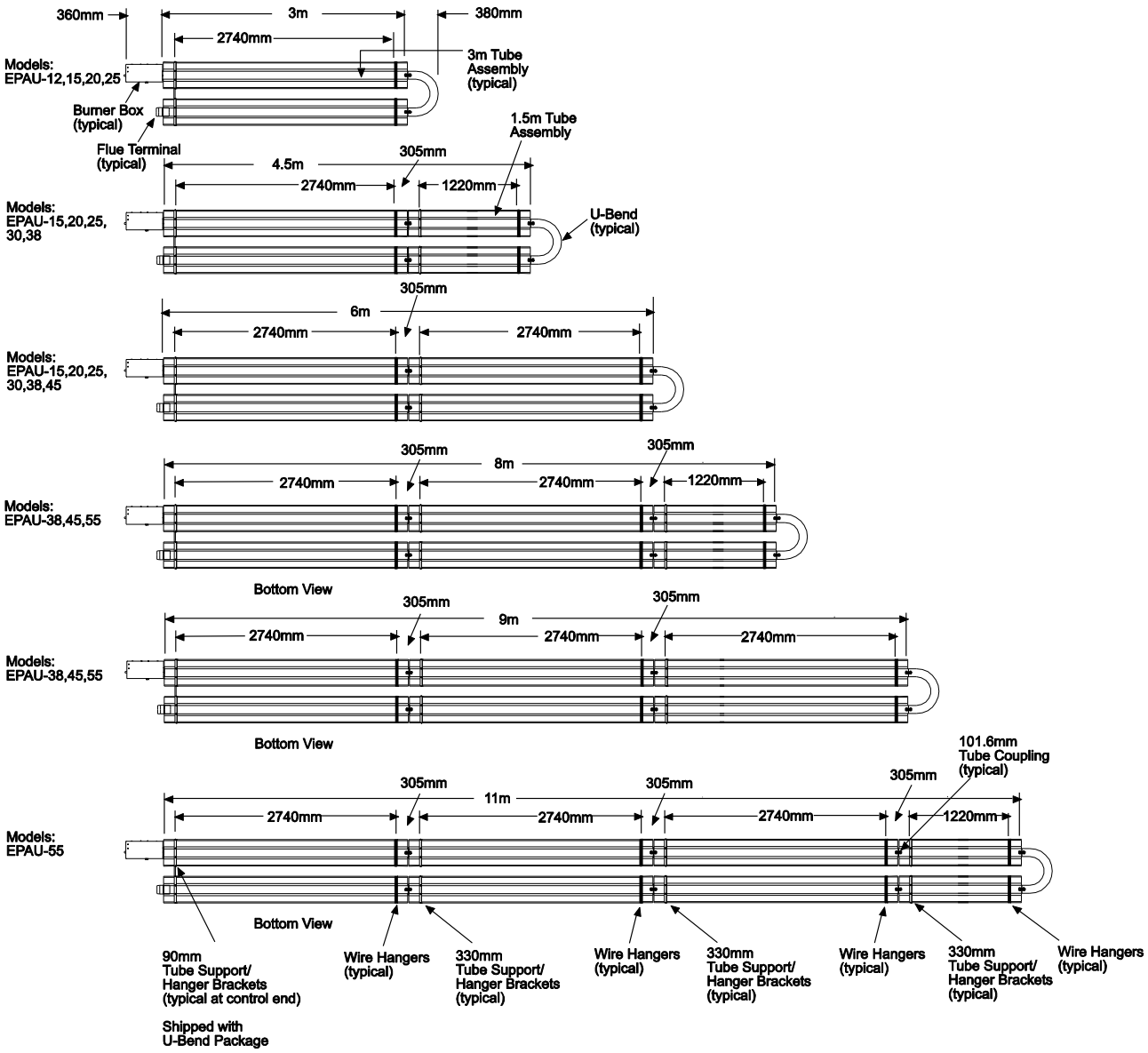


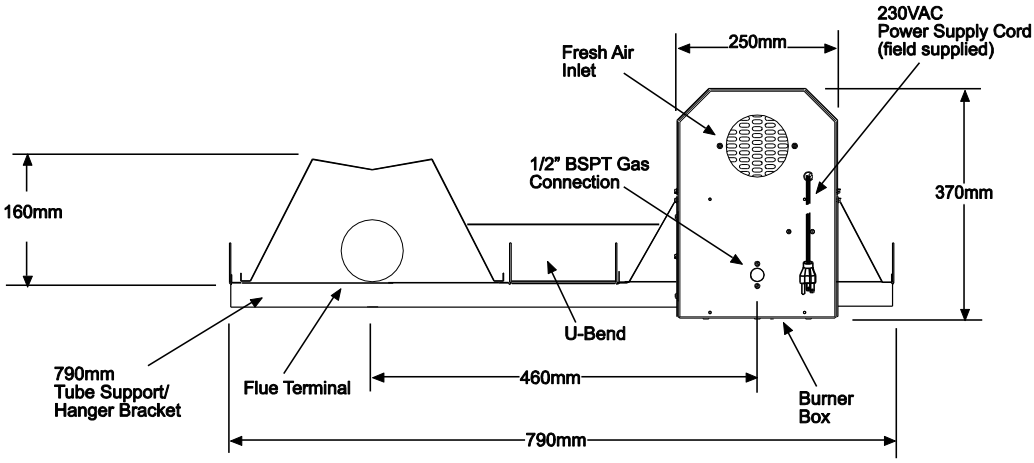
Coupling
(for flue outlet
connection)

8.0) DIMENSIONS – EPA LINEAR MODELS



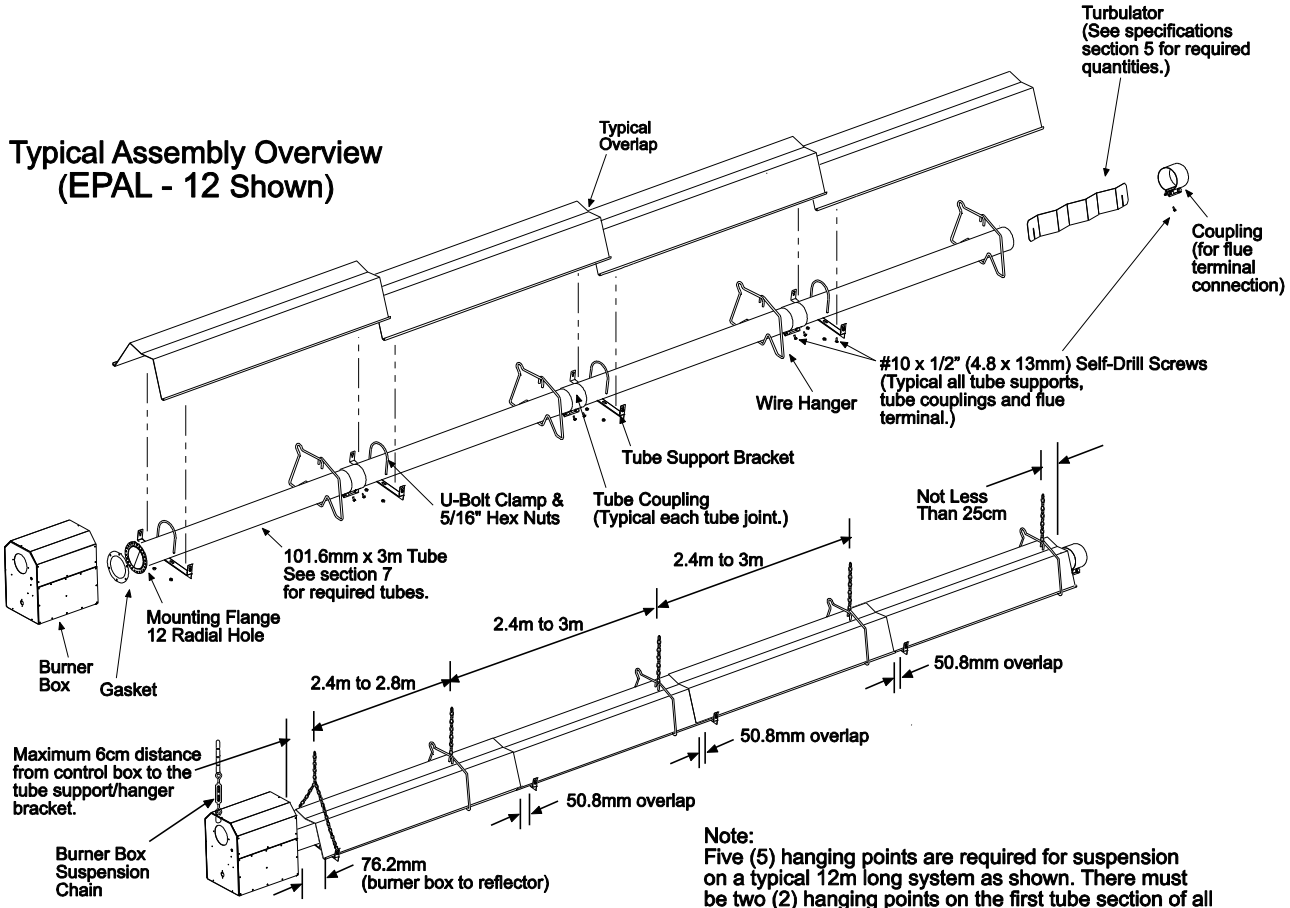
8.1) DIMENSIONS – EPA U-MODELS





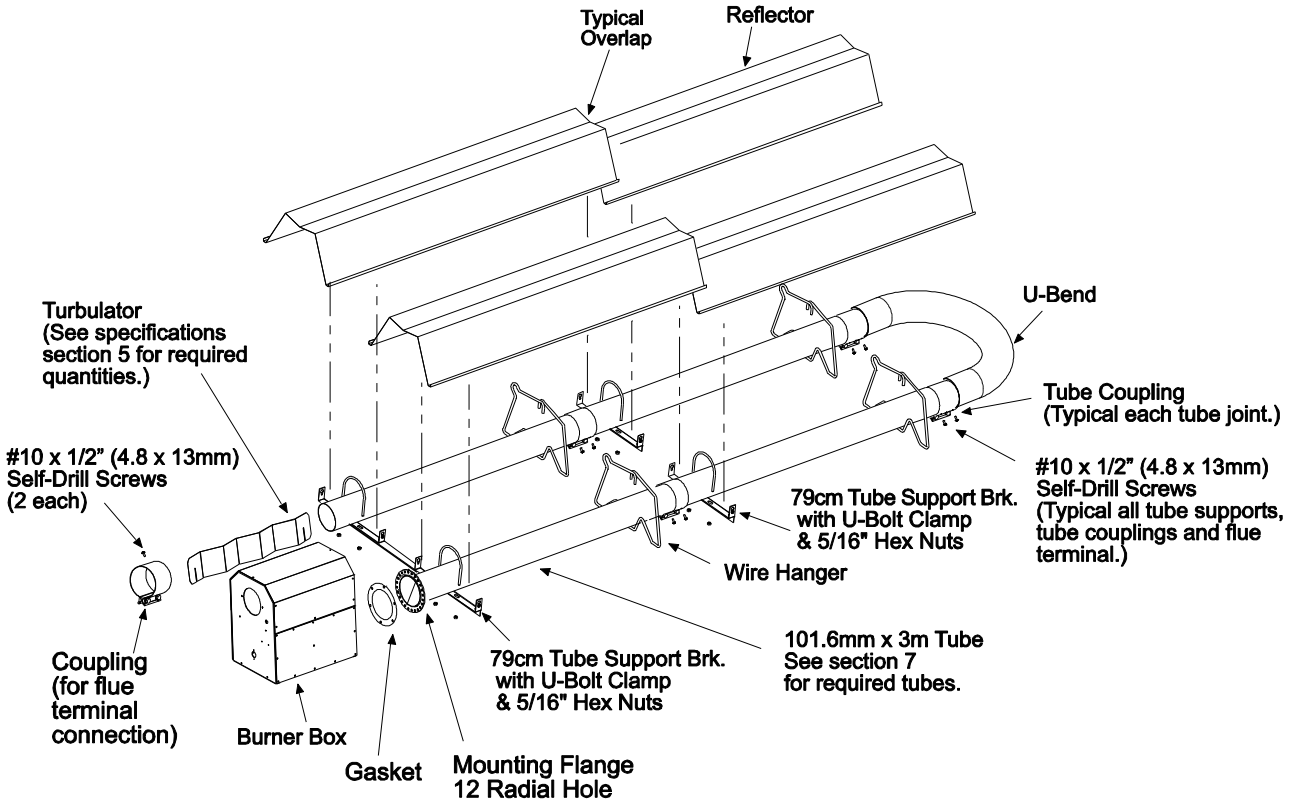
End View

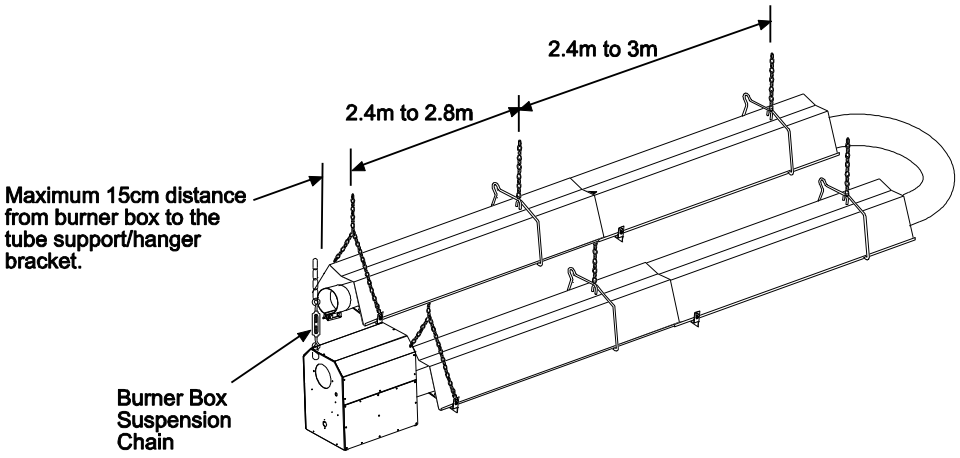
8.2) HEATER ASSEMBLY / JOINING OF TUBE SECTIONS



Note:
Five (5) hanging points are required for suspension on a typical 12m long system as shown. There must be two (2) hanging points on the first tube section of all heater system lengths and one (1) each on the remaining tube sections.

Typical Assembly Overview
(EPAU - 12 Shown)



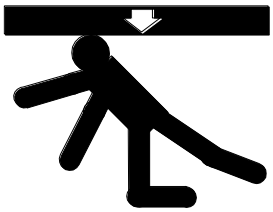


6 hanging points to be used for suspension for a typical 12m long system. There must be two hanging points on the first tube and one on each of the other tubes

9.0) TYPICAL SUSPENSION METHODS

Not with standing their limited scope, the appliance should be installed in accordance with the relevant provisions of any National Gas Safety (Installation and Use) Regulations. Due account should also be taken of any obligations arising from any National Health and Safety at Work Regulations, National and Local Building Regulations and National Electrical Wiring Regulations. The appliance must be installed, and where necessary, converted for use on other gases, by a qualified installer.

⚠ 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 52kg.

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.

a) Use only noncombustible materials for suspending hangers and brackets.

b) **Linear Tube Heaters** should be suspended to provide a slope of 0.25 degree **up** to the end (25 to 50mm). The appliance should be located with respect to building construction and other equipment to permit access to the appliance for servicing etc.

c) **U-Tube Heaters** should be suspended horizontally along the length.

d) 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.

e) For suspending the appliance it is recommended that suitable protected welded chain (Ø 3mm x 65 links per m) or Ø 8mm min mild steel drop rods and suitable brackets are used. Attach the chains or drop rods to the hanger brackets where shown providing at least Ø 5mm closed link hooks are used chains may be attached directly to the hanger brackets.

f) Heaters subject to vibration must be provided with vibration isolating hangers.

g) Heaters must not be supported by gas or electric supply lines and must be suspended from a permanent structure with adequate load capacity.

h) Hanging points are fixed along the length of heater to accommodate trim pieces. Secondary steel work may be required to span between supporting beams.

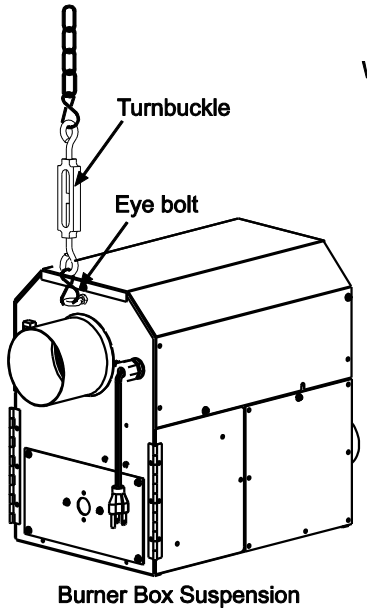
i) The appliance should be located with respect to building construction and other equipment to permit access to the appliance for servicing etc.

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.

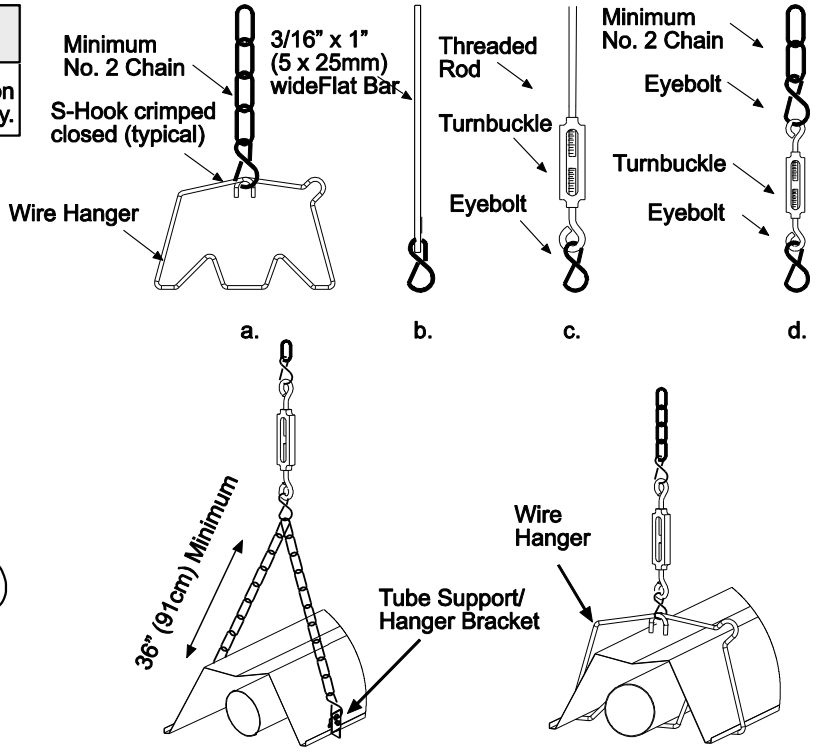
If a "trapeze" method is used for tube support/hanger brackets (shown below), the minimum chain length for the two connecting chains is 914 mm to minimize any vibration that might be generated by the draft inducer assembly. If these chains must be less than 914 mm, then do not use the trapeze method and, instead, use individual chains on each tube support/hanger bracket.

⚠ CAUTION

Failure to install the burner box suspension chain will void the manufacturers warranty.



Burner Box Suspension



9.1) ANGLE MOUNTING OF HEATERS

a) Angle mounting can be accomplished by shortening one length of the chain to achieve the desired angle or using notched section of the wire hanger for angle mounting.

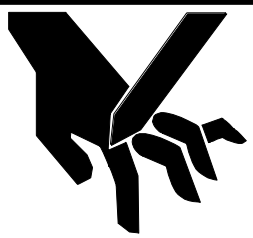
⚠ CAUTION

Angle mounting can result in up to 30 % lower radiant output on the floor level and result in lower tube temperatures when compared to horizontal mounting. Angle mounting of straight tubes for spot or area heating (e.g. where a single heater is used for space heating) is not recommended unless you have additional capacity or larger heaters specified/installed. If you are using straight tube heaters, you might have to install two smaller size tube heaters with burners located at opposite ends, to provide more uniform energy distribution and improved comfort level on the floor. Consult your Space-Ray Representative if you have any questions prior to the installation concerning particulars of your application.

2. Based on the location of the wire hangers and spacing between the suspension points, it might be necessary to use additional tube support brackets to support the reflector system. Please order additional Tube Hanger Support Bracket (#43318000), U-bolt (#42873000), and 2 pieces of Hex Nut (#02127110) for each 3m length of emitter tube.

10.0) ASSEMBLY OF TUBE SECTIONS

⚠ WARNING



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 body sections, the recommended procedure is as follows:

a) Before hanging heater sections, first determine the actual layout of the system (see Sections 7.0) & 8.0) for details). Consideration must also be taken for flue pipe, fresh air ducting, gas piping, clearances to combustibles, etc. before hanging heater. Typical suspension methods are shown in Section 9.0).

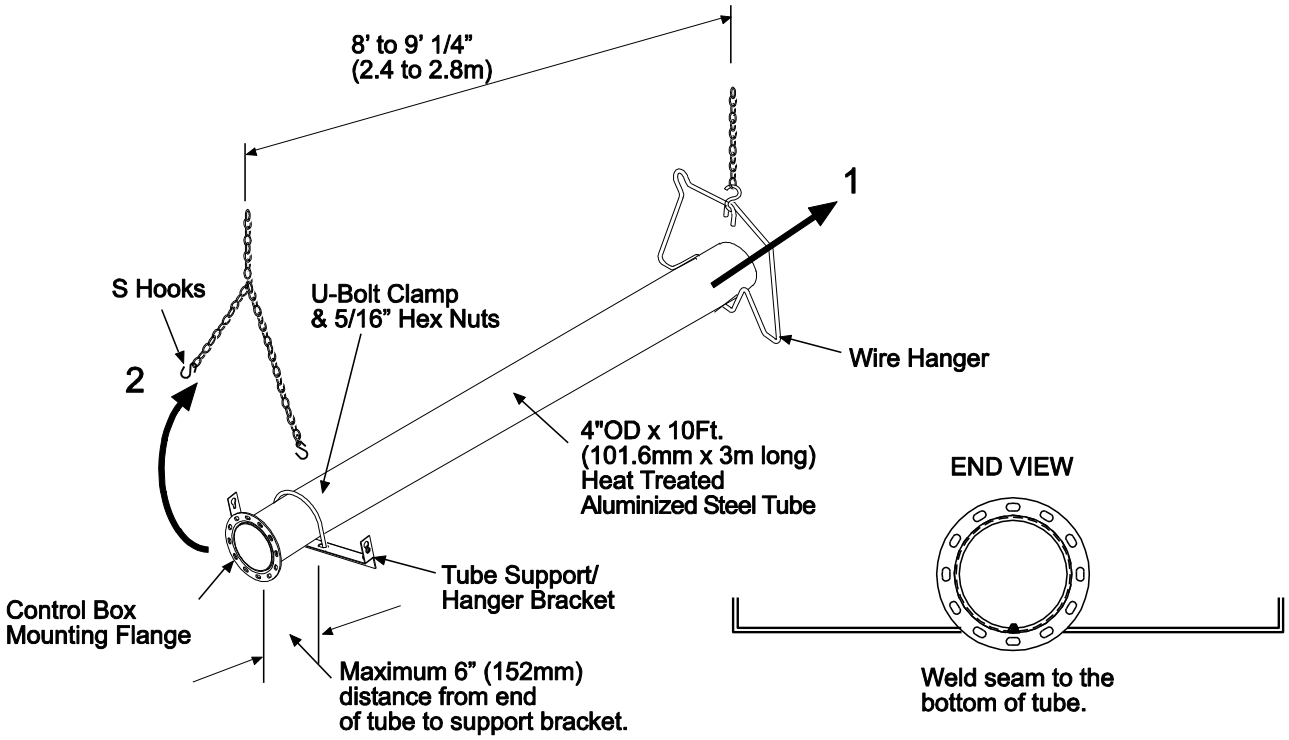
Hang each tube section individually. DO NOT attach the heater tube sections together on the ground and attempt to hang the entire system.

In all configurations, the burner box must be connected directly to mounting flange assembly.

Assemble a tube support/hanger bracket 4" from the end of the heat exchanger tube having the mounting flange. Align the tube such that the welded seam is facing down toward the ground.

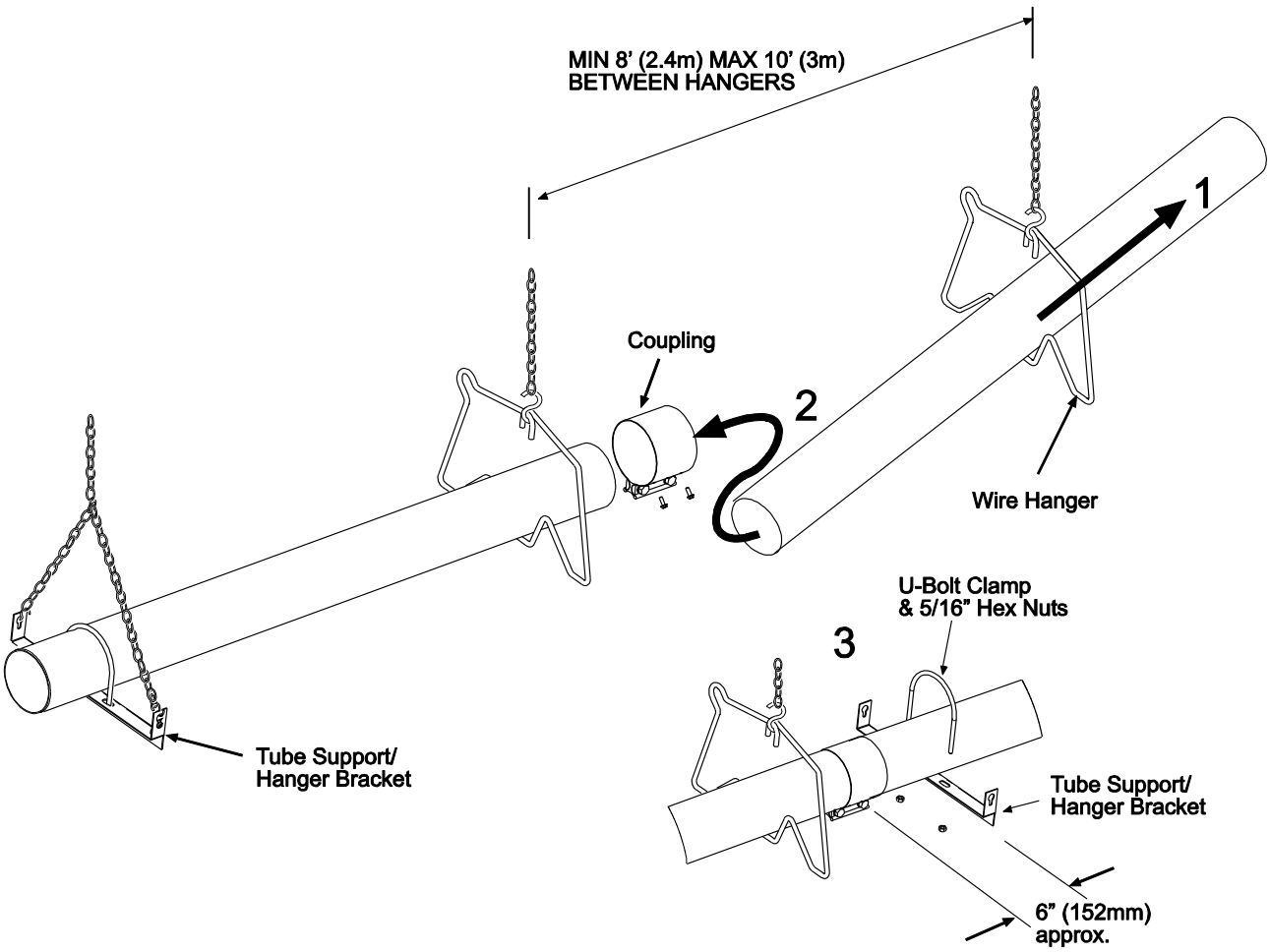
⚠ CAUTION

Failure to assemble the tube with the seam facing down and installing the first tube support/hanger bracket more than 152mm from the burner box will VOID the manufacturer' warranty.



Suspend the chain to attach the wire hanger and the tube support bracket. Insert the tube into the wire hanger and then raise the tube support bracket end up to the suspension chain, use "S" hooks to attach the wire hanger and tube support bracket to the chain.

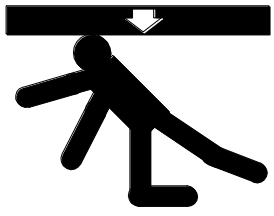
10.1) ASSEMBLY OF EXTENSION SECTION



See typical assembly overview (Section 8.0) for typical complete assembly. Assemble additional extension sections as required for all systems. (See Sections 7.0), and 8.0) for typical layout details.)

Join the tube sections together and secure with tube couplings as described below:

⚠ WARNING



CRUSH HAZARD

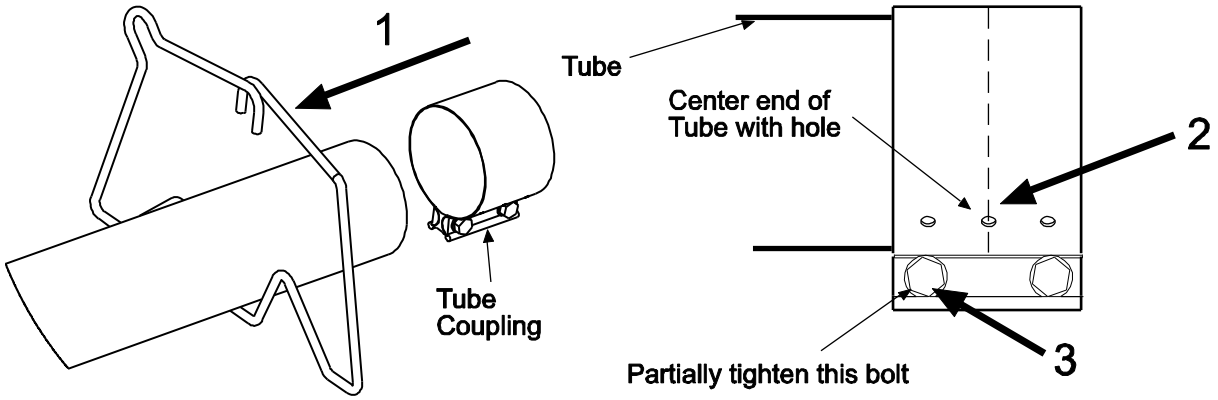
The following coupling tightening instructions **MUST** be followed properly to ensure the integrity of the tube connections. Two #10 x 1/2" (4.8 x 13mm) self-drilling screws **MUST** be installed at every coupling as shown in the instructions below.

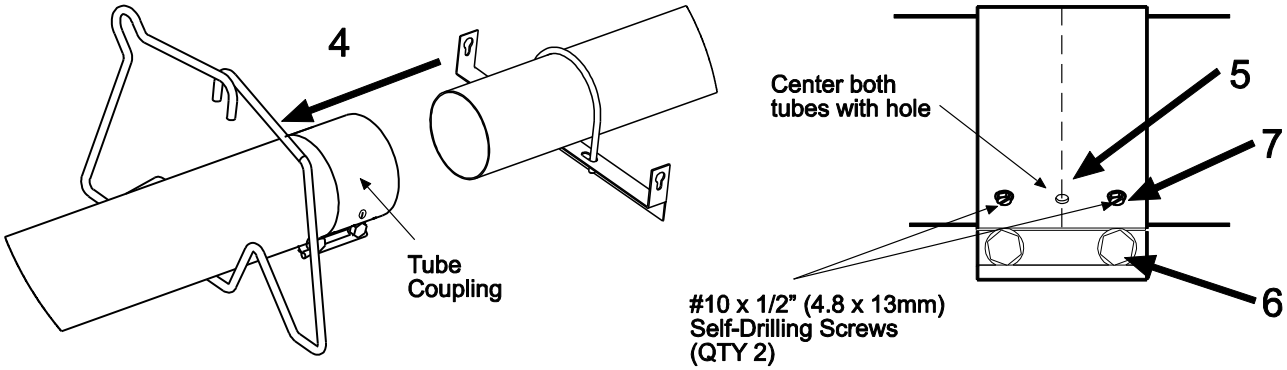
Failure to do so may result in death, serious injury or property damage.

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

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

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



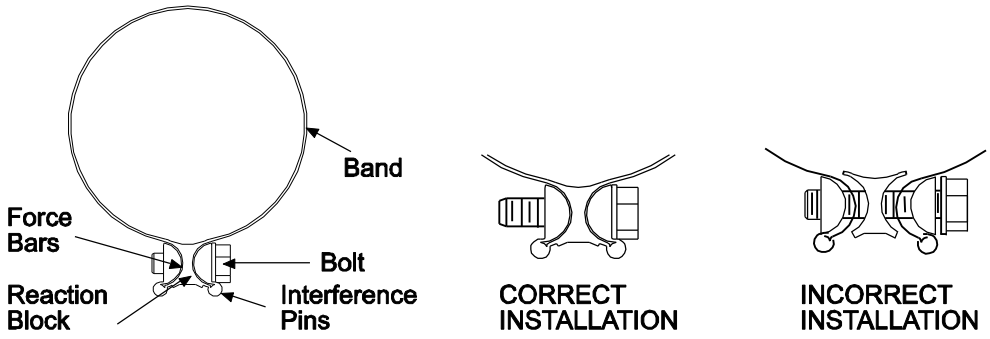


Slide the next tube into the coupling.

Make sure both tube ends are butted together.

Finish tightening both bolts to 40-60 ft.lbs. (54.5-81.0 Nm) torque to ensure a complete seal.

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



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

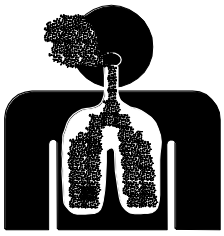
Once all the heater body sections are attached, make sure that the heater system is level. If it is not, slight adjustments can be made using the turnbuckles. (See Section 9.0)

⚠ CAUTION

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

10.2) INSERTING TURBULATORS

⚠ WARNING



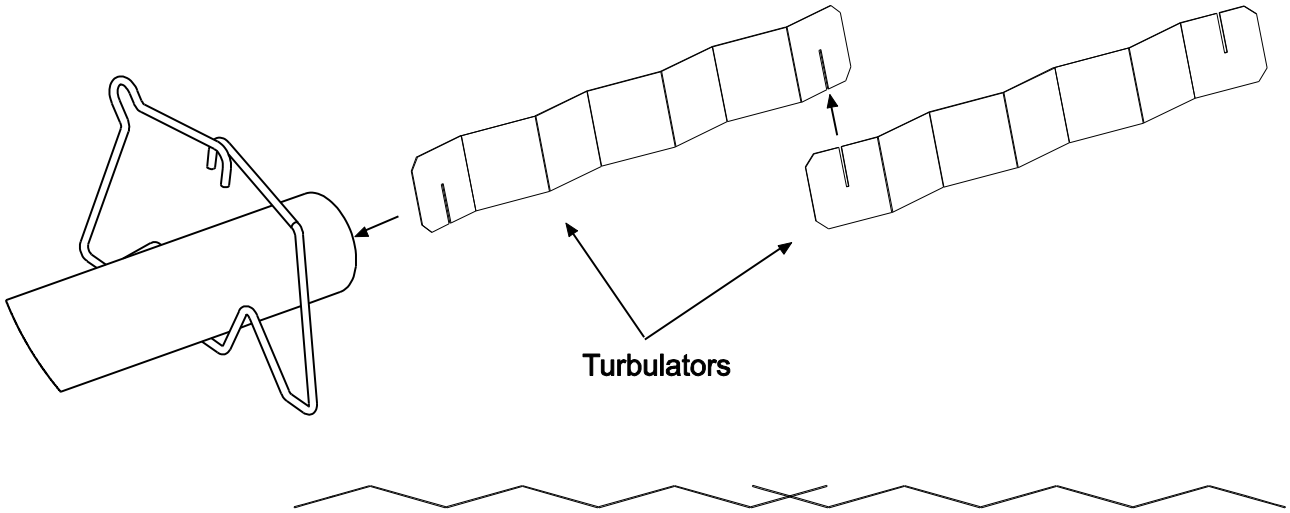
CARBON MONOXIDE AND SOOT HAZARD

The heater must be assembled with the correct number of turbulator sections and tube length for the rated heat input.

The turbulator must be installed in the last tube section as shown.

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

a) Assemble the turbulators together by interlocking the slotted end portions. Slide these into the last tube section until they are flush with the tube end. Note: Refer to the table below for quantities of turbulators required for each heater model.



Assembled View

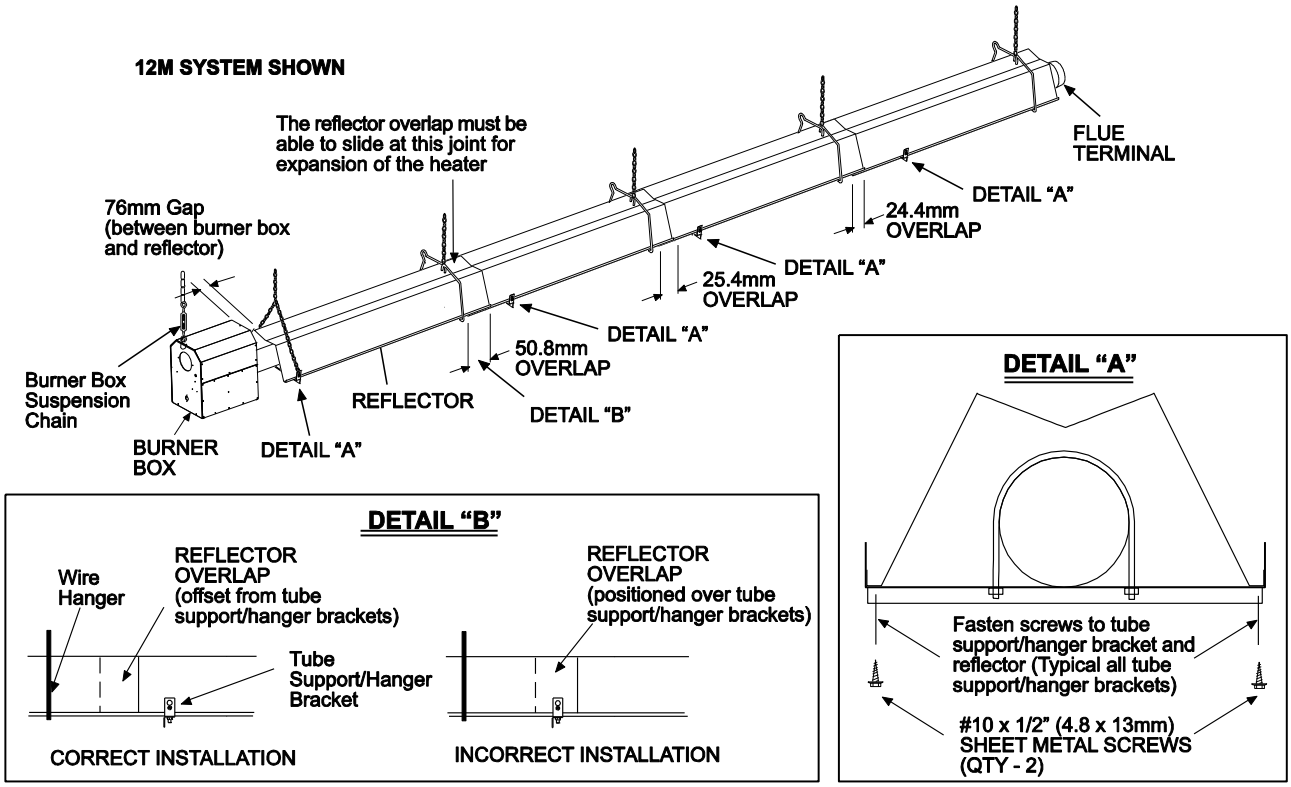
MODEL	2 Ft. Turbulator Sections
EPA 12	2
EPA 15	2
EPA 20	4
EPA 25	4
EPA 30	8
EPA 38	4
EPA 45	6
EPA 55	2

10.3) ADDING BODY REFLECTORS

a) Slide the reflectors on the tube support/hanger brackets and through the wire hangers.

The tube at the coupling joints must be covered. Slide the reflectors together and provide an overlap of two (51mm) inches for the first reflector overlap after the control unit. All remaining reflector overlaps will be approximately one (25.4mm) inch. This will allow for the natural expansion and contraction of the heater when in operation. **Note: The heaters can expand and contract up to 1.75 inches (44.5mm).**

Secure the reflectors as shown in Detail "A" #10 x ½ (4.8 x 13mm) self-drilling sheet metal screws at each tube support/hanger bracket.

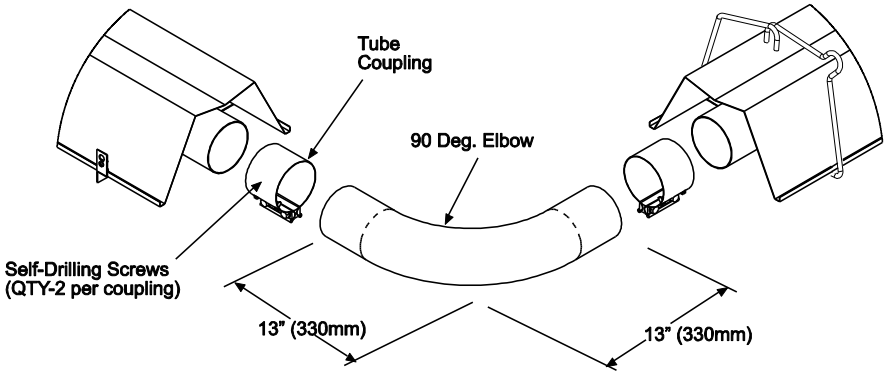


11.0) ADDING OPTIONAL 90° ELBOW (LINEAR MODELS ONLY)

a) The optional 90° elbow must be located a minimum of 3m after the burner box.

Hang the body sections in a 90° ("L") shaped pattern. Allow spacing for the elbow. The distance from one end of the elbow to the centerline of the opposite leg is 330mm as shown.

Join the tube ends of the body sections and the elbow together and secure with tube couplings as described in Section 10.1).

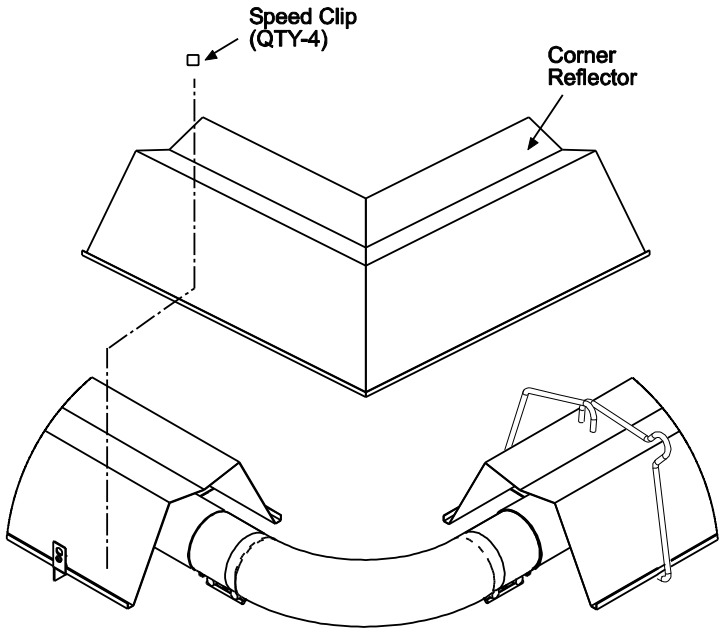


11.1) ADDING OPTIONAL CORNER REFLECTOR (LINEAR MODELS ONLY)

a) Place the corner reflector over the reflectors of both body sections.

Secure by sliding speed clips on the reflector edges. One speed clip is required for each side of reflector.

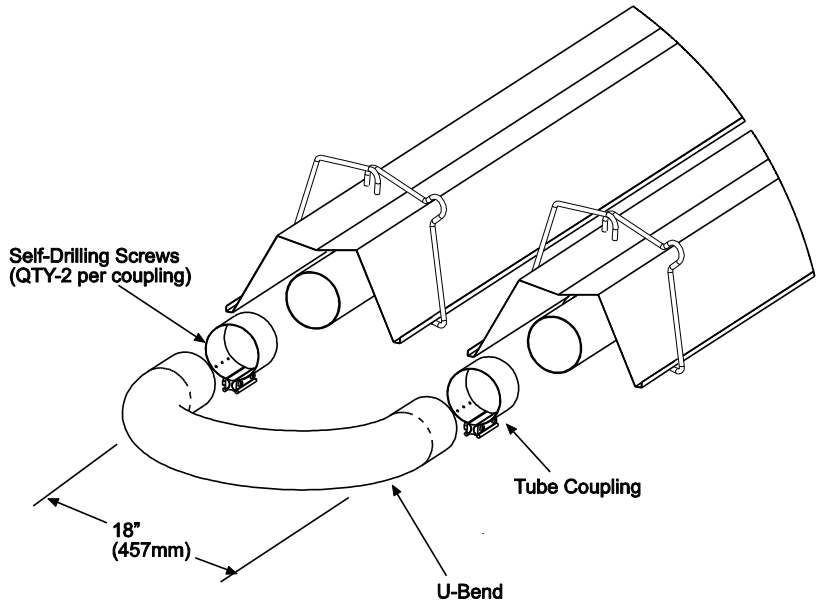
The corner reflector can be used only when the long axis of the heater is level and mounted in a horizontal position.



11.2) ADDING 180º U-BEND (U-MODELS ONLY)

a) Hang body sections parallel with each other. The centerline distance from tube at each body section should be 457mm as shown.

Join tube ends of body sections and the U-Bend together and secure with tube couplings as described in Section 10.1).

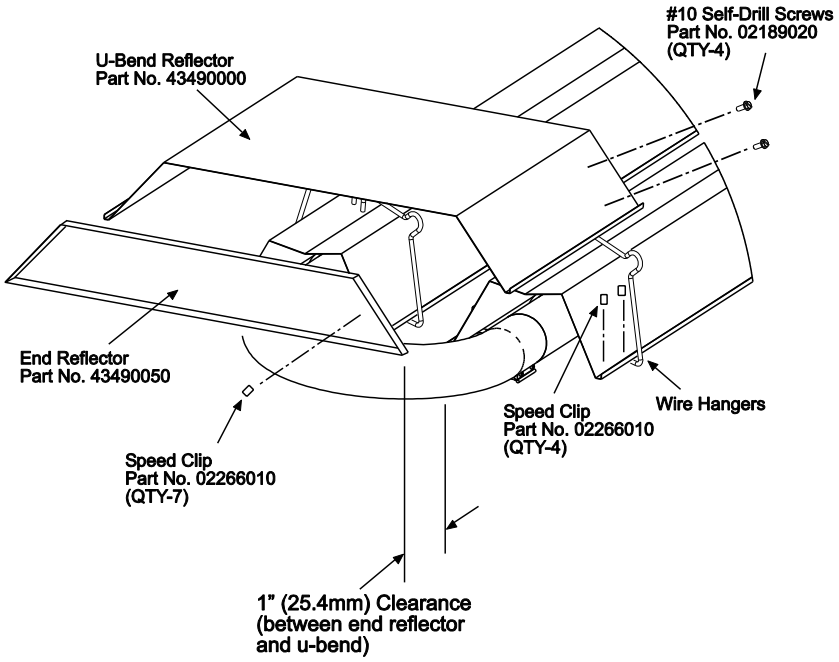


11.3) ADDING OPTIONAL U-BEND REFLECTOR (U-MODELS ONLY)

a) Place the **U-Bend Reflector** over the reflectors of each body section with the end resting next to the tube wire hangers as shown.

Slide the speed clips on the reflector edges towards the end of the body section reflectors. Two speed clips are required for each side of the **U-Bend Reflector**. Make sure that the speed clips fit tightly over both the **U-Bend Reflector** and the reflector on each body section. Use two self-drilling screws to permanently secure both sides to the reflectors.

Place the **End Reflector** flush with the **U-Bend Reflector** as shown. **Note:** Clearance between end of **the U-Bend Reflector** and the **U-Bend** must be a minimum of **25.4mm**. Secure by sliding speed clips onto the end reflector edges. Evenly space the speed clips on the sides (two each side) and top (three each) of the reflectors to provide a snug fit.



12.0) ATTACHING BURNER BOX ASSEMBLY

a) Attach the burner box and gasket to end of tube flange and secure with 1/4-20 locknuts.

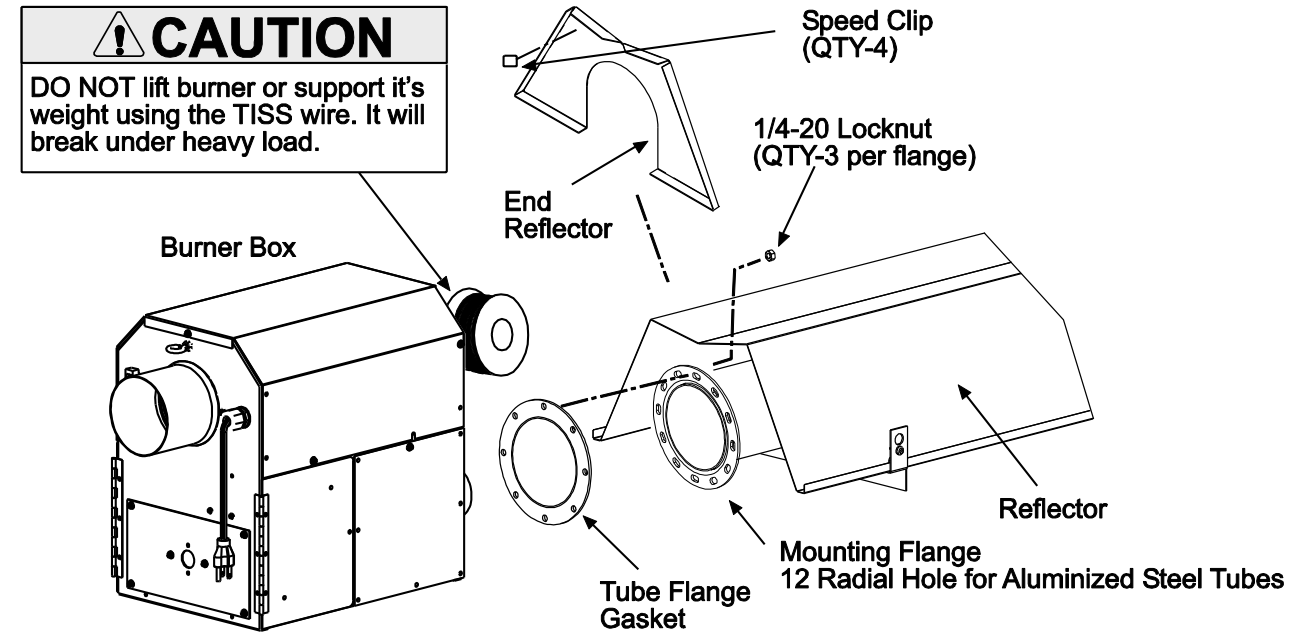
Assemble the optional end reflector flush with the end of the main body reflector. Secure by sliding speed clips onto the reflector edges. Evenly space the speed clips on the sides (one each side) and top (two required) of the reflectors to provide a snug fit. Leave a 76.2mm space between the end reflector and the burner box assembly.

The heater can be mounted **horizontally** or at an angle of up to **45 degrees** maximum from horizontal.

When angle mounting, the **burner** box unit **must** be positioned **upright** as shown below. **Failure to install the burner box in an UPRIGHT position will VOID the manufacturer's warranty.**

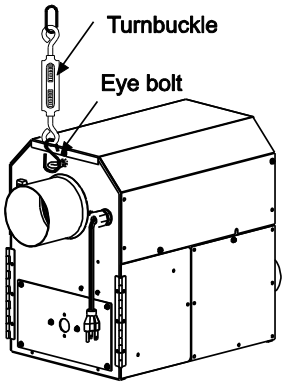
⚠ CAUTION

DO NOT lift burner or support it's weight using the TISS wire. It will break under heavy load.

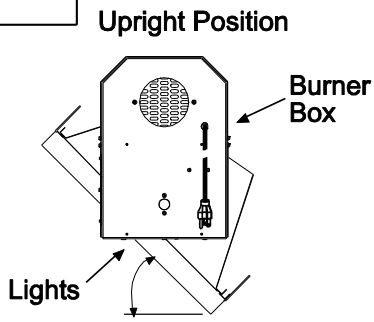


⚠ CAUTION

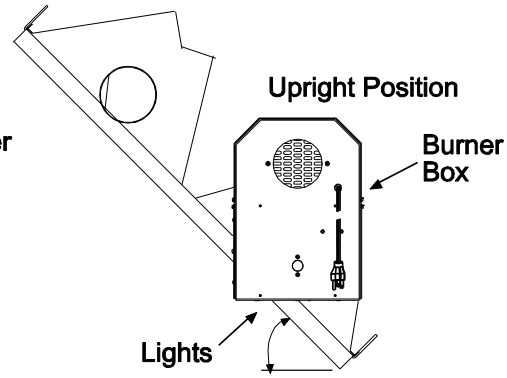
Failure to install the burner box suspension chain will void manufacturers warranty.



Burner Box Suspension



Angle Mounting
Linear Tube Heaters



Angle Mounting
U-Tube Heaters

⚠ CAUTION

The burner box weighs 38 lbs. (17kg) Use caution when handling it.

⚠ CAUTION

The burner box weights 38 lbs. (17kg) Use caution when handling it.

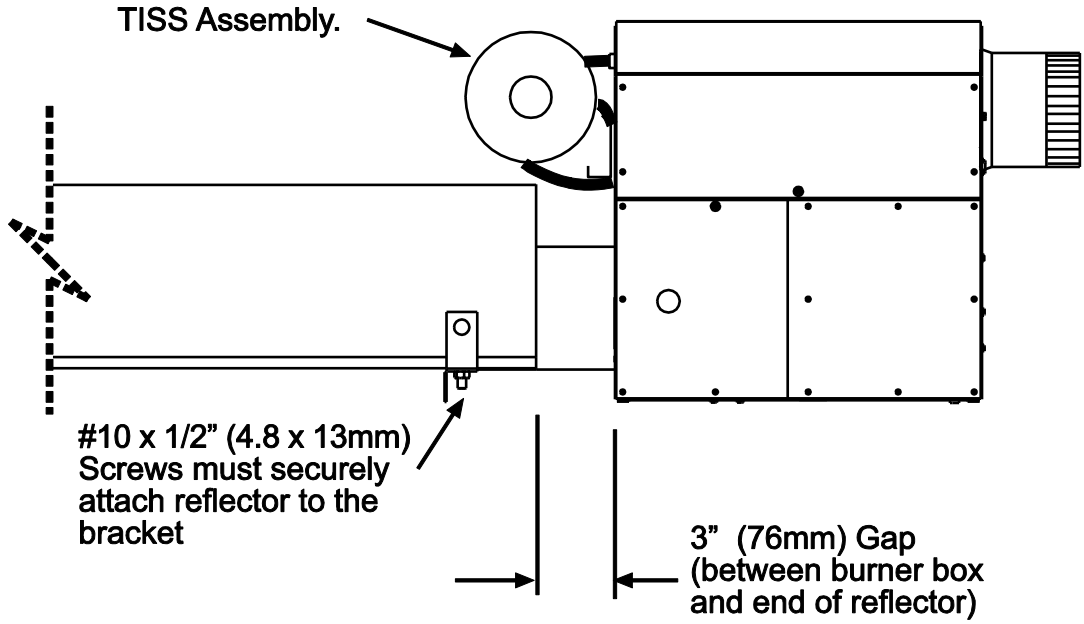
Failure to install the burner box in an upright position and lights facing the floor will void the manufacturer's warranty.

12.4) CONNECTING THE TISS SYSTEM

Description: The **TISS (Tube Integrity Safety System)** is designed to shut the main burner off in the event that a burnout occurs in the first 3m section of firing tube. **Note:** When replacing the firing tube a new **TISS** wire assembly PN 44176510 **(spring and spring retainer clamp not included)** must also be installed.

Instructions:

a) Make sure that the gap between the burner box and end of reflector is 76mm and the reflector is securely attached to the reflector support bracket. Make adjustments if necessary.

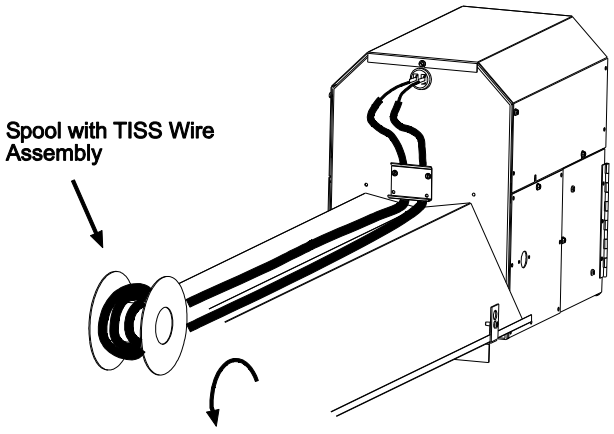


Step 1

⚠ CAUTION

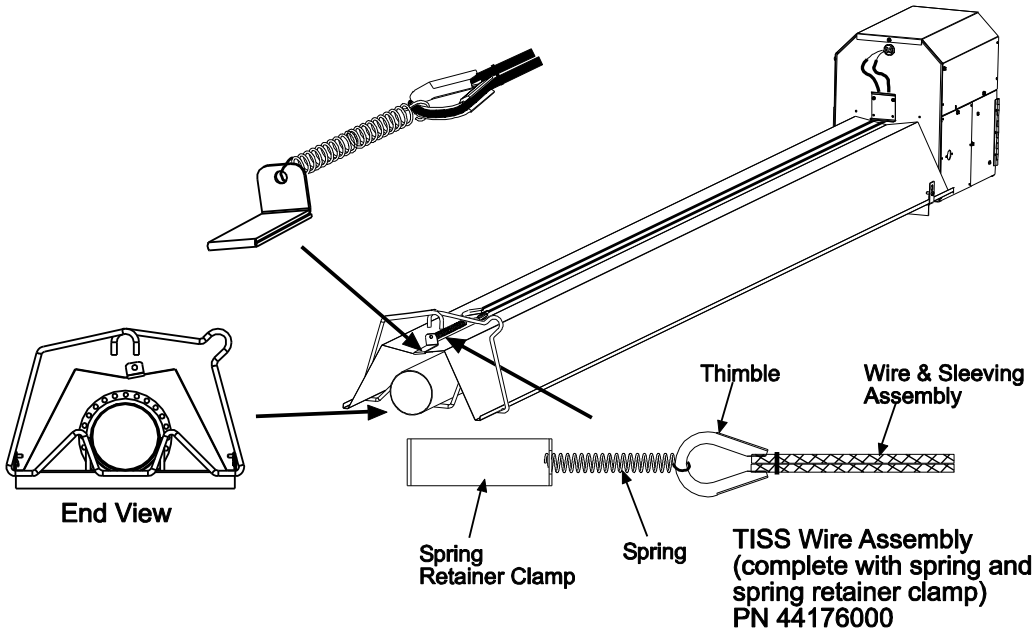
Failure to maintain 3" (76mm) gap as shown will result in pre-mature TISS wire failure.

Un-roll the **TISS** wire assembly from the spool. Be careful not to kink the wires.



Step 2

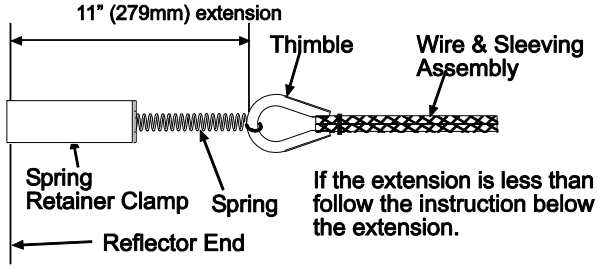
Hold the spring retainer clamp and pull the **TISS** wire assembly to end of reflector at overlap joint. Slide spring retainer clamp over end of reflector as shown.



Step 3

After attachment of the **TISS**, check to make sure that there is sufficient tension on the wire. **Follow the diagram below to increase or decrease the tension as necessary.**

1. Measure the extension of the spring from the end of the reflector to the thimble as shown below.

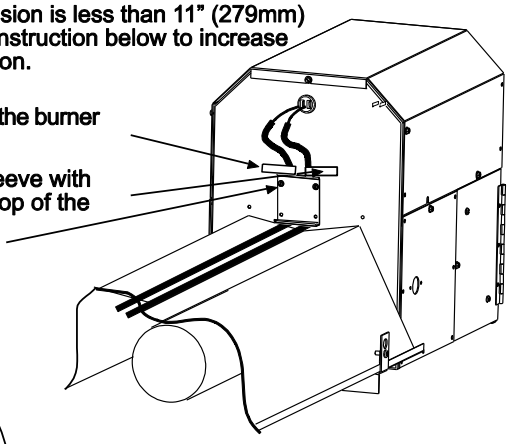


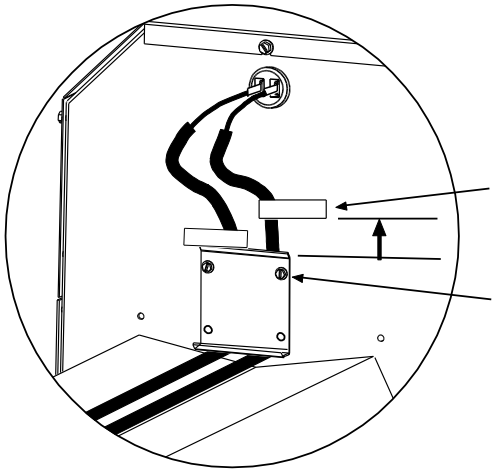
If the extension is less than 11" (279mm) follow the instruction below to increase the extension.

2. Tape one end of the sleeve to the burner box or use a marker.

3. Mark the other end of the sleeve with tape or other marker. Use the top of the retainer as a reference.

4. Loosen screws.





5. Pull one end of the sleeve and wire inside until the marker is raised by the total adjusment length. ie. if the extension is 10" (254mm) then pull through 1" (25mm) to increase the exension to 11" (279mm).

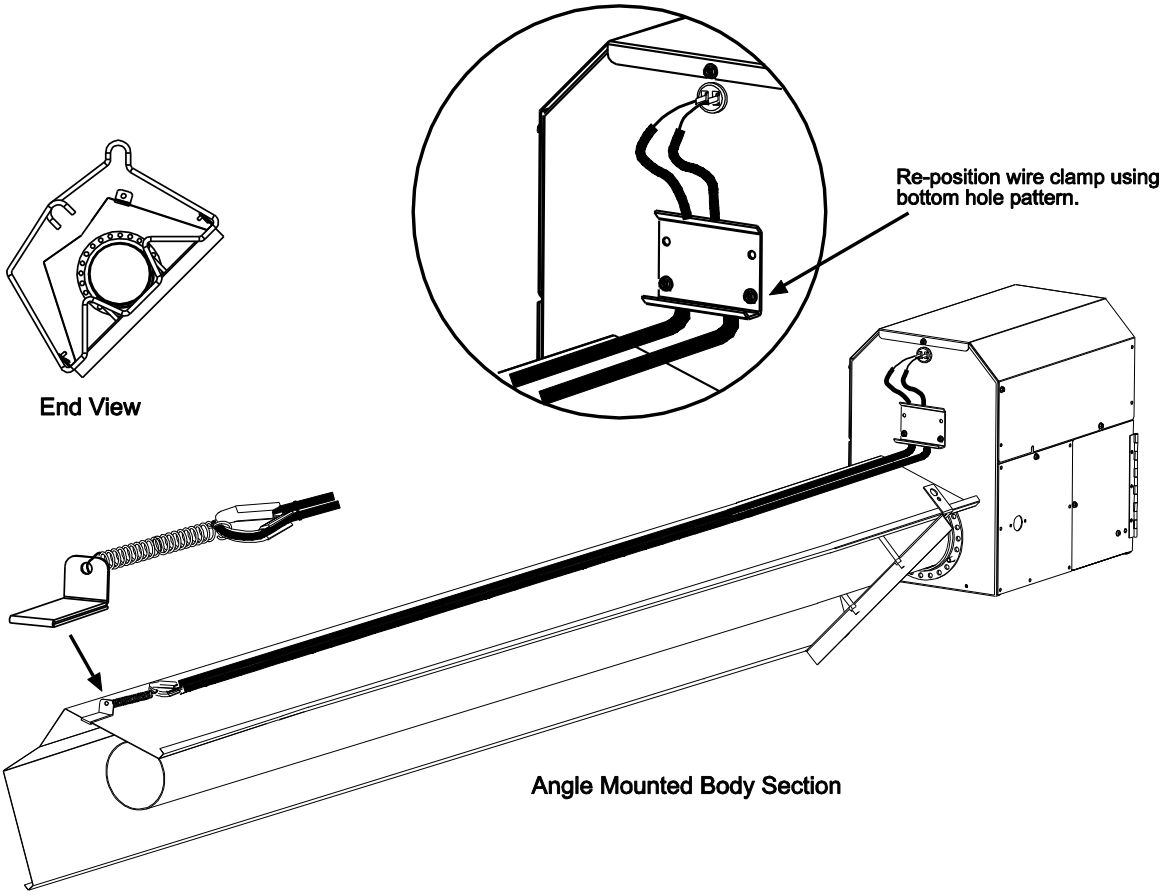
6. Tighten screws.

7. Check extension using the method in step 1.

Step 4

ANGLE MOUNTED HEATERS ONLY

If heaters are to be angle mounted, the TISS wire holder clamp must first be re-positioned as shown **using the bottom hole pattern** of the clamp. Follow procedures described earlier for all other adjustments.



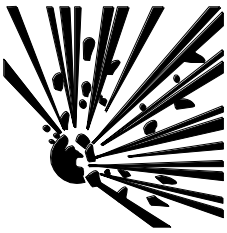
Step 5

⚠ CAUTION

Failure to re-position the wire clamp at the bottom hole pattern will shorten the life expectancy of the TISS wire assembly.

13.0) 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.

DO NOT use an open flame of any kind to test for leaks.

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

IMPORTANT BEFORE CONNECTING THE GAS TO THE HEATER

a) Connect to the supply tank or manifold in accordance with state or local building codes. Authorities having jurisdiction should be consulted before the installation is made.

b) Check that the gas fuel on the burner rating plate matches the fuel for the application.

c) 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.

d) 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. See table below.

Gas type	Nominal Supply Pressure	Maximum Supply Pressure	Minimum Supply Pressure
Natural Gas (G20)	20 mbar	60 mbar	17 mbar
Propane (G31)	37 mbar	60 mbar	30 mbar

e) 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.

f) Pipe joint compounds must be resistant to the action of liquefied petroleum gases.

g) Tube heaters will expand/contract during operation. Use an approved flexible connector 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 1.8m of the union.

h) 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.

i) This appliance is equipped with a step-opening, combination gas valve. **The maximum supply pressure to the appliance is 60 mbar.** 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.

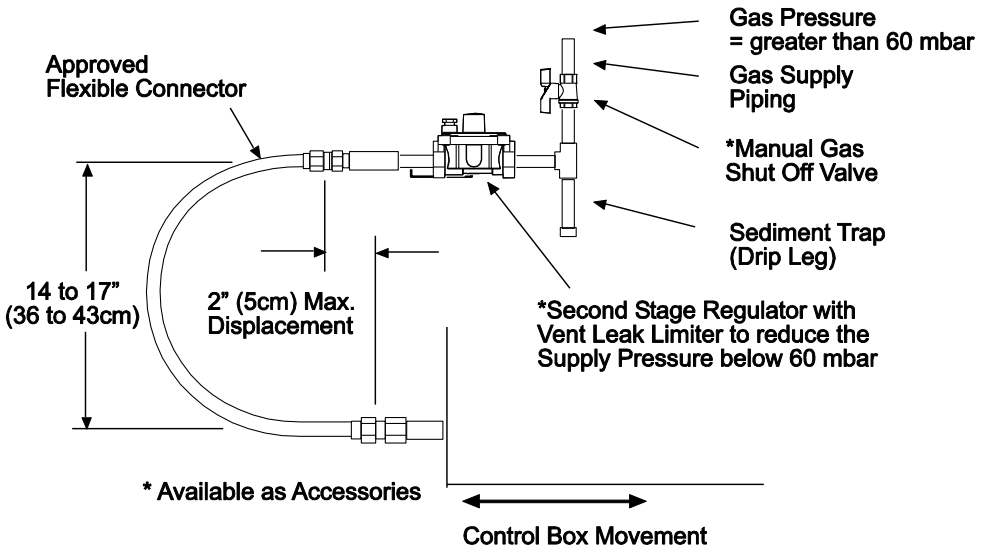
j) After all gas connections have been made, make sure the heater and all gas outlets are turned off before the main gas supply is turned on slowly. Turn the gas supply pressure on and check for leaks.

k) 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 60 mbar 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.

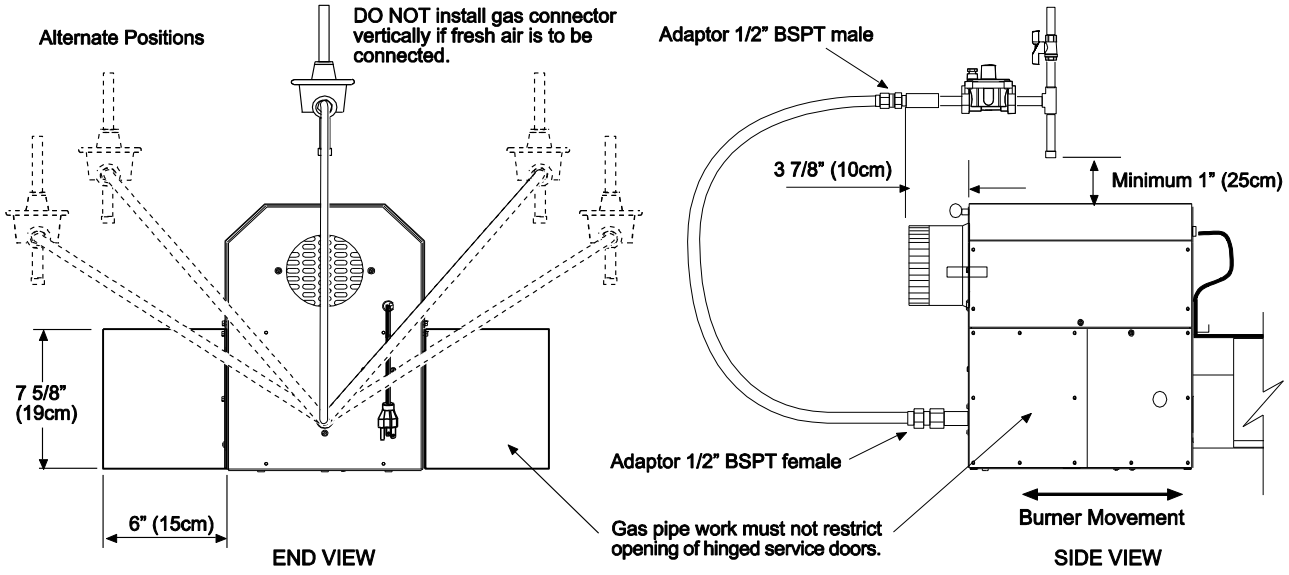
l) High gas pressure regulators need to be installed upstream of flexible gas lines.

m) The entire gas supply system must be checked for leaks prior to heater operation.

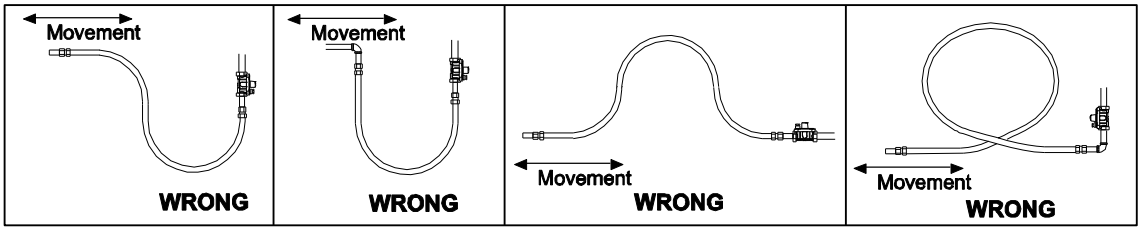
KEY DIMENSIONS AND COMPONENTS OF THE GAS CONNECTIONS



RECOMMENDED GAS CONNECTION POSITIONS WITH 36" (91cm) FLEXIBLE GAS HOSE



INCORRECT POSITIONS

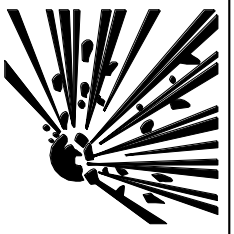


Radiant tube heaters will expand and contract during operation. Therefore it is essential to provide a flexible metallic hose, which must conform, to national or Local Regulations, to connect the appliance to the gas supply. Minimum size to be ½" diameter x 1m long.

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.

14.0) INSTRUCTIONS FOR PRESSURE TEST GAUGE CONNECTION

⚠WARNING



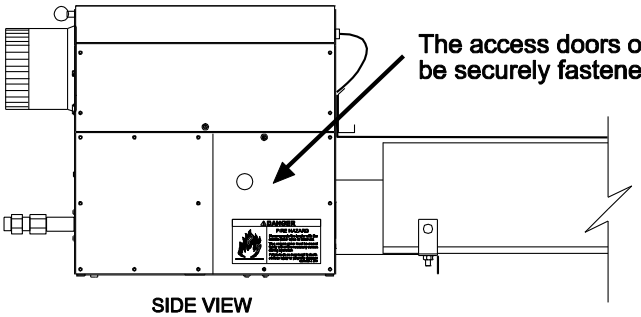


FIRE AND EXPLOSION HAZARD

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

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

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



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

SIDE VIEW

INLET GAS PRESSURE CHECK

1. Turn off all electrical power and manual gas shutoff valve to the system to connect manometer hoses.
2. Turn the pressure test screw in the center of the gas valve test boss (see **Figure 1** below) not more than one turn **counterclockwise.** Attach a 9 mm hose and manometer over the inlet pressure boss on the valve.
3. Ignite the appliance burner by switching on the electricity supply to the appliance and check that the manometer reading is as shown in the chart below (see also the Data Label affixed to the Burner Control Box).
4. Switch off the electricity supply to the appliance and remove the manometer tube from the gas valve test boss. After testing, carefully seal test point with the provided screw. Recommended torque = 1.0 Nm.

OUTLET GAS PRESSURE CHECK AND ADJUSTMENTS

All adjustments must be made on the basis of the specific characteristics of the appliance. Check inlet and outlet pressure using the pressure test points provided. After testing, carefully seal test points with the provided screws. Recommended torque = 1.0 Nm.

1. Turn off all electrical power to the system to connect manometer hoses.
2. Turn the pressure test screw in the center of the gas valve test boss not more than one turn **counterclockwise.** Attach a 9 mm hose and manometer over the outlet pressure test boss on the valve (see **Figure 1** below). If regulator needs to be adjusted, see instructions below.

TO ADJUST REGULATOR (single stage gas valves):

1. Disconnect pressure regulator connection "VENT" (if used). Remove the protective plug **A** (see **Figure 1** below). Turn regulator adjustment screw **B clockwise** ↻ **to increase presure**, or **counterclockwise** ↺ to decrease pressure. After setting put back the protective plug.

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

2. After testing pressure and adjusting the regulator, turn off all electrical power to the system, remove manometer hoses, turn outlet test screw clockwise to seal pressure port. Tighten to 1.0 Nm torque minimum. Turn on system power.

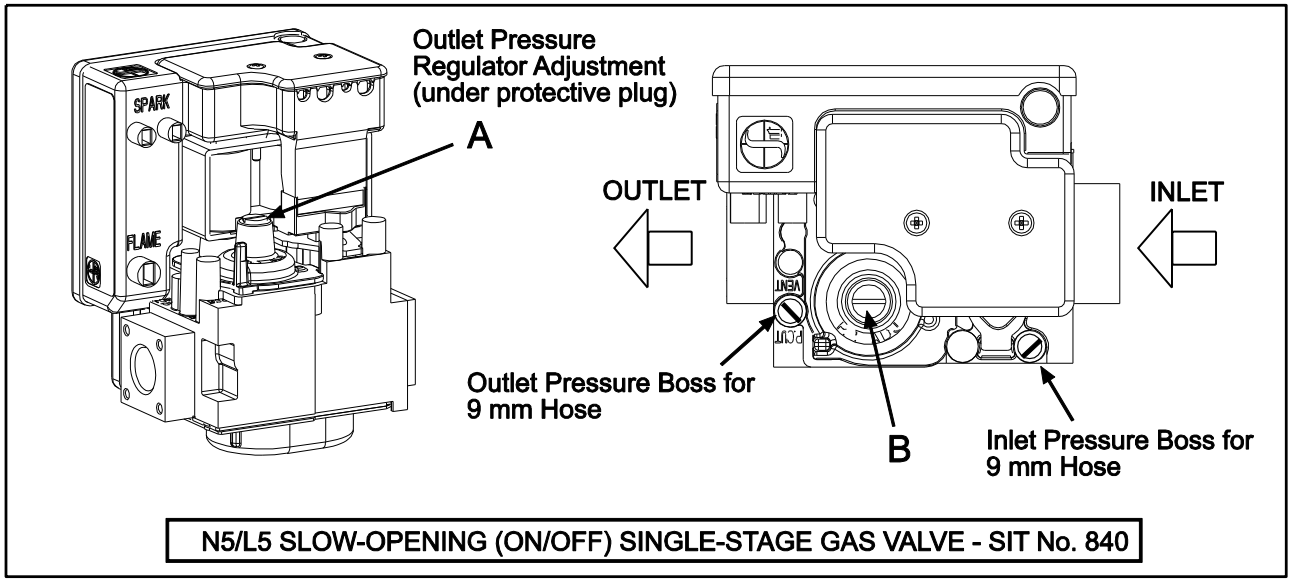


Figure 1

TO ADJUST REGULATOR (two stage gas valves):

b) Disconnect pressure regulator connection "VENT" (if used). Remove the modulator plastic cap **A** (see **Figure 2** below).

c) **MAXIMUM PRESSURE:** Power the modulator in the maximum condition. Turn regulator adjustment hex nut **B** **clockwise** ↻ to increase presure, or **counterclockwise** ↺ to decrease pressure. Use a 10 mm spanner. After setting put back the modulator plastic cap.

d) **MINIMUM PRESSURE:** Turn off the power supply to the modulator and, keeping the hex nut **B** stationary, turn the screw **C clockwise** ↻ to increase presure, or **counterclockwise** ↺ to decrease pressure. Use a 6 x 1 blade. After setting put back the modulator plastic cap. Reconnect pressure regulator connection (if used). **WARNING:** To ensure the correct operation of the modulator it is necessary that the plastic cap **A** is returned to its original location.

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

e) After testing pressure and adjusting the regulator, turn off all electrical power to the system, remove manometer hoses, turn outlet test screw clockwise to seal pressure port. Tighten to 1.0 Nm torque minimum. Turn on system power.

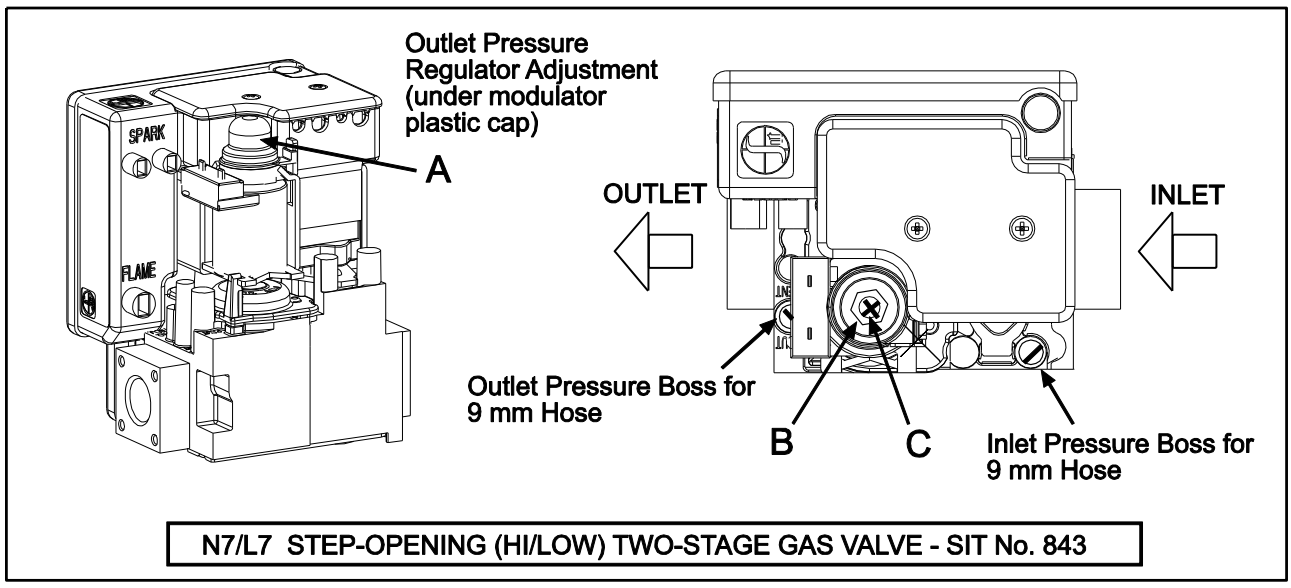
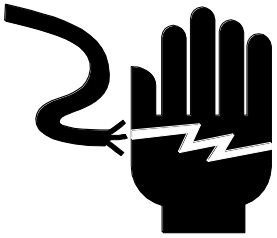


Figure 2

15.0) ELECTRICAL CONNECTIONS

⚠ WARNING



ELECTRIC SHOCK HAZARD

Disconnect electrical power and gas supply before servicing.

This appliance must be connected to earth.

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

a) The electrical wiring to this heater must be installed in accordance with the latest or current National Regulations and any Local Regulations, which apply.

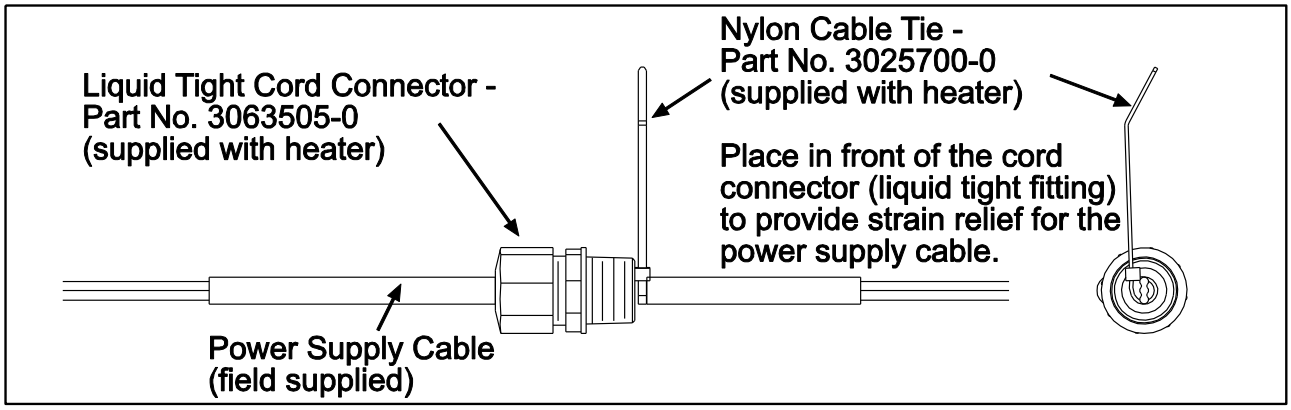
Electrical supply	230V~50Hz 125W
Current rating	0.55
Fuse externally	3A

1. Using flexible international harmonized 3-wire PVC (thermoplastic jacket) supply cable with earth (0.75 mm^2 to National or Local standard specifications) connect the power supply leads to the terminal block and earth connection located inside the control housing as follows:

Brown (red)	-	to terminal marked L
Blue (Black)	-	to terminal marked N
Green/Yellow	-	to terminal marked ⏚

Refer to the internal connection wiring diagram shown below.

2. Provide strain relief for the power supply cable as shown in the illustration below.



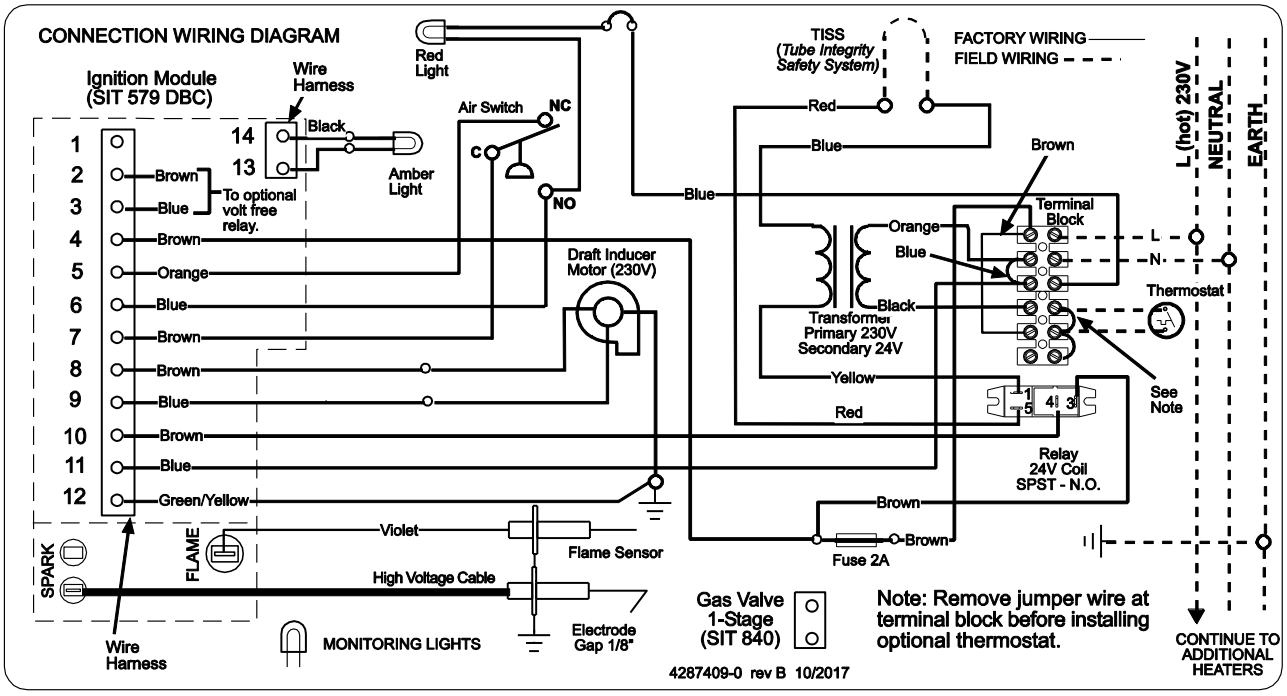
3. Connect an electric 3 pin plug (marked 230V~50Hz) to the end of the power supply cable.
   External fuse rating required - 3A.

4. Make thermostat connections as shown in the single and multiple heaters per thermostat connection diagrams shown below.
   Thermostats must be located outside the direct sight of the heat exchanger tubes (outside the direct radiation) and/or be located a minimum of 3m from either end of the heater. The thermostat can also be shielded from direct radiation. An installation height of 1.5m is recommended. Above rules do not apply to non-temperature sensing controls.

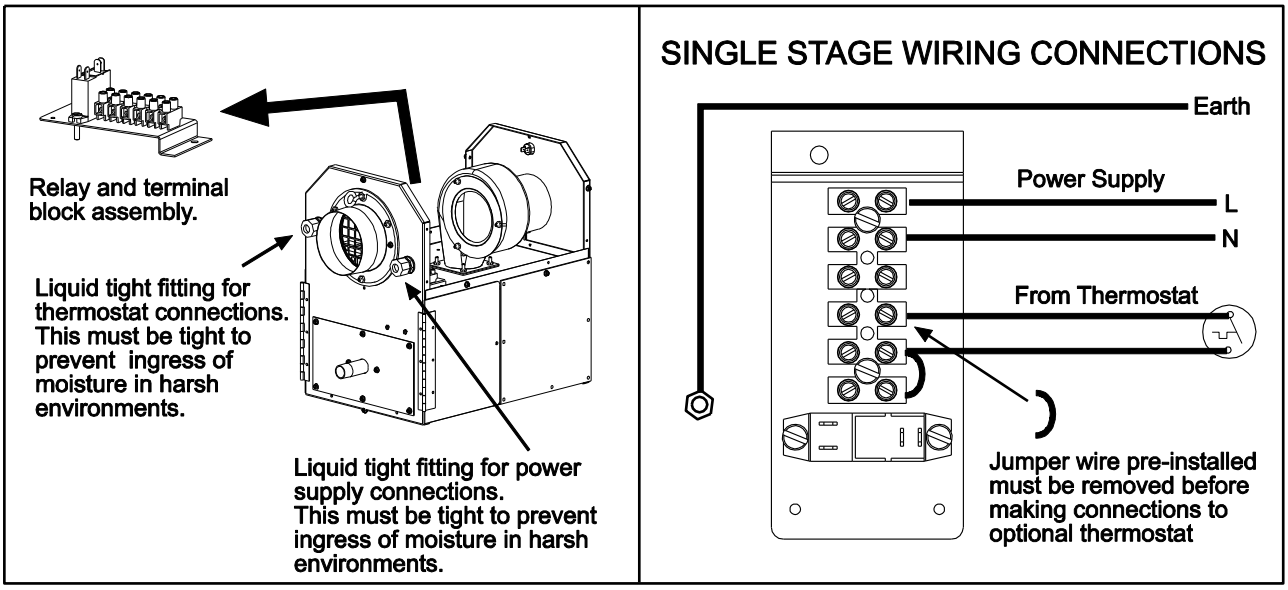
   NOTE: It is important for the correct function of the appliance for the polarity of the electrical supply to be correct.

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

SINGLE STAGE CONTROLS - INTERNAL CONNECTION WIRING DIAGRAM

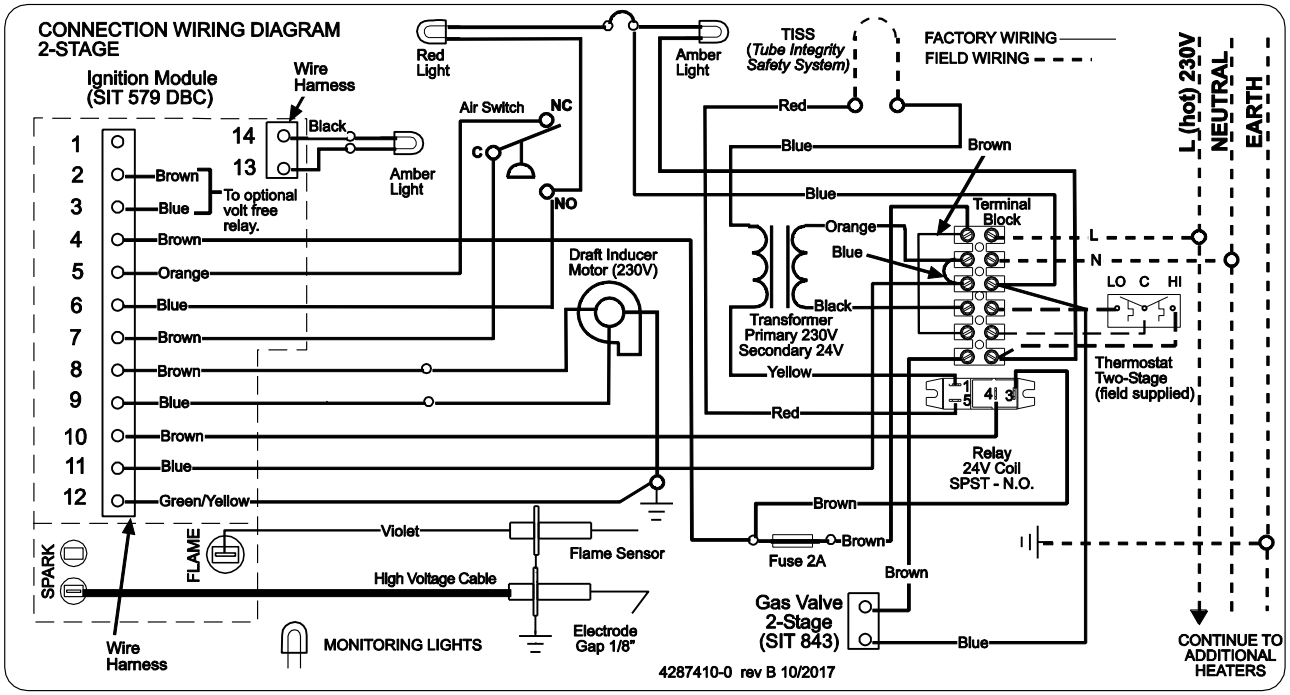


SINGLE STAGE CONTROLS – POWER SUPPLY AND THERMOSTAT CONNECTIONS

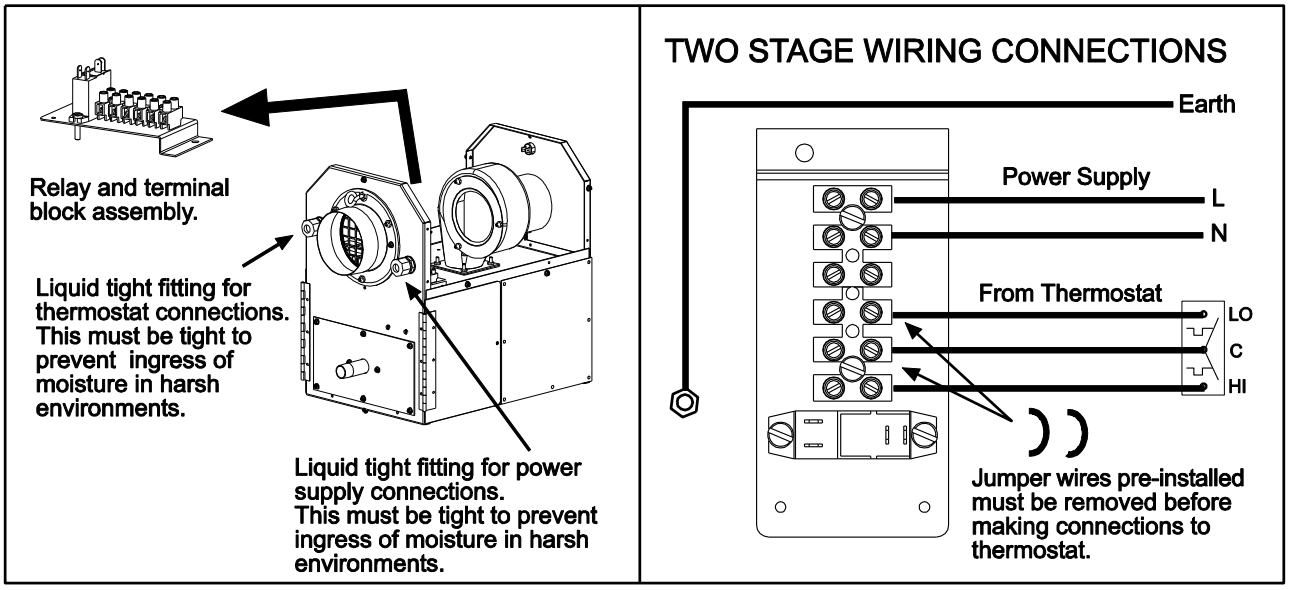


15.2) TWO STAGE (N7/L7) INTERNAL AND THERMOSTAT CONNECTIONS

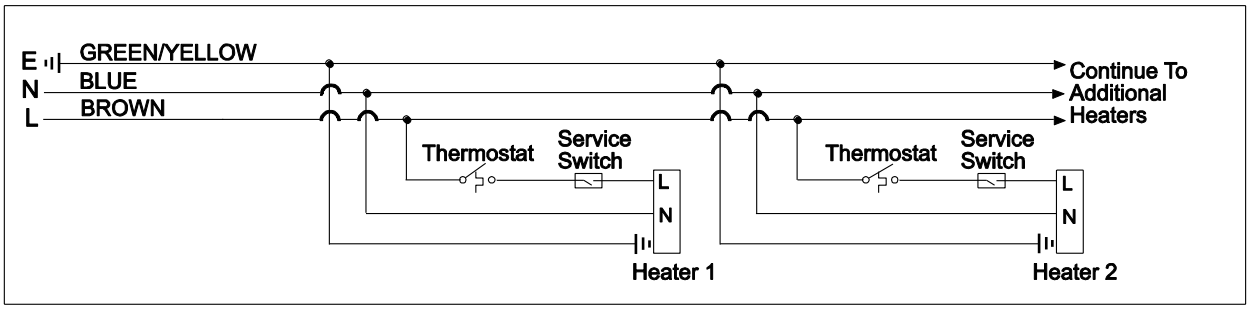
TWO STAGE CONTROLS - INTERNAL CONNECTION WIRING DIAGRAM



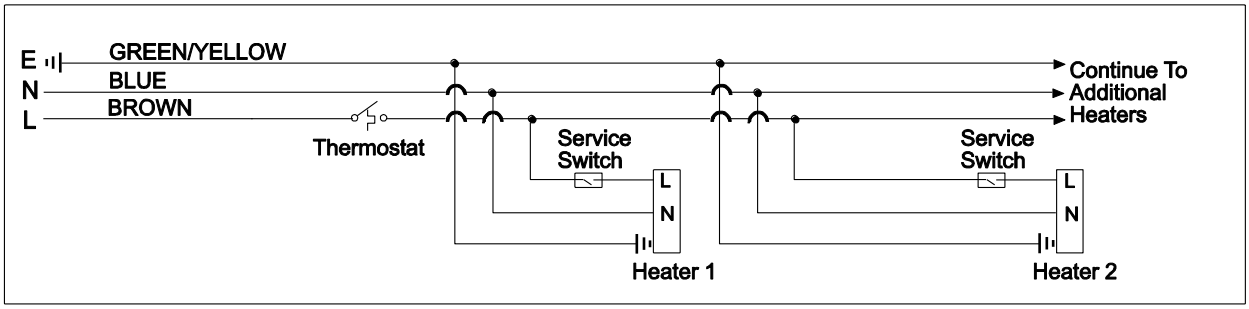
TWO STAGE CONTROLS – POWER SUPPLY AND THERMOSTAT CONNECTIONS



A. LINE VOLTAGE (230V) THERMOSTAT CONNECTIONS – SINGLE HEATER



B. LINE VOLTAGE (230V) THERMOSTAT CONNECTIONS – MULTIPLE HEATERS

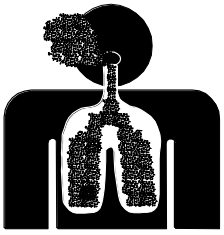


Notes: The method of connection to the electrical supply must facilitate complete isolation and should preferably be via a fused double pole isolator having a constant separation of at least 3mm in all poles and supplying the appliance ONLY.

Alternatively, connection may be made via a fused 3 pin plug and un-switched, shuttered socket, both complying with the requirements of National or Local Regulations. Neither thermostat nor switch are supplied as standard equipment. NOTE: In the event of an electrical fault after installation of the appliance, preliminary system checks are required to be carried out i.e. earth continuity, polarity and resistance to earth.

16.0) VENTING AND FRESH AIR FOR COMBUSTION

⚠ WARNING



CARBON MONOXIDE HAZARD

Heaters installed unvented must be installed in an area with at least $10m^3$/hr per KW heat input of outside air ventilation.

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.

These appliances may be installed with an exhaust flue fitted **or** without an exhaust flue fitted.

A. FLUELESS (UNFLUED)

The installation room should have a volume of at least $10m^3$/kW of installed nominal heat input of the radiant heater.

The ventilation requirements and calculation methods for unflued appliances are set out in the European Standards **EN 13410 (latest edition)** and must be applied. The following is guidance to the standard:

Ventilation may be achieved by any of the three following different means:

a) Thermal evacuation of the products of combustion/air mixture
b) Mechanical evacuation of the products of combustion/air mixture
c) Natural air change

VENTILATION BY THERMAL EVACUATION

a) Ventilation by thermal evacuation is sufficient if $10m^3$/h of exhaust air per kW of operating heat input are ventilated out of the installation room.
b) The air/products of combustion mixture must be evacuated above the radiant heaters, if possible near the ridge, by means of exhaust mixture opening(s), (vents).
c) Where the exhaust mixture opening(s) can be closed, it shall only possible to operate the radiant heaters when they are open.
d) The maximum horizontal distance between a radiant heater and a vent opening shall be:
   6 (six) times the vent height in the case of wall openings
   3 (three) times the vent height in the case of roof openings

VENTILATION BY MECHANICAL EVACUATION

a) Ventilation by mechanical evacuation is sufficient if 10 m^3/h of exhaust air per kW of operating heat input are ventilated out of the installation room.
b) The air/products of combustion mixture must be evacuated above the radiant heaters using fan(s).
c) It shall only be possible to operate the radiant heaters whilst the exhaust airflow is proven.
d) The maximum horizontal distance between a radiant heater and a fan shall be:
   6 (six) times the fan mounting height in the case of wall openings
   3 (three) times the fan mounting height in the case of roof openings

Note: Mechanical exhaust air openings must be positioned such that the burner stability of the nearest appliance is unaffected.

VENTILATION BY NATURAL AIR CHANGE

Gas-fired radiant heaters may be operated without any special exhaust system if the exhaust gases are discharged to the outside atmosphere by a sufficient natural air change in the installation room.

Furthermore, no provision for thermal or mechanical ventilation is required in the following particular cases:

Buildings with natural air change greater than 1.5 volumes per hour

Buildings with a density of operating heat input not greater than 5W/m^3

AIR SUPPLY

Air supply openings are required to admit air and shall be located below the radiant heaters.

The total area of the unobstructed cross-sections of all the air supply openings shall not be smaller than the total area of the unobstructed cross-sections of all the exhaust openings.

Slits and gaps of fixed cross-section can also be used as air supply openings.

Where the air supply openings can be closed, it shall only be possible to operate the radiant heaters when they are open.

B. FLUED

If the appliance is to be flued externally, then flue pipe of diameter stated in the table below and complying with National and Local Regulations should be used.

IMPORTANT: When flued horizontally, the flue pipe must be arranged to provide a continuous rise from the appliance of 25mm per 1m length.

The ventilation requirements for flued appliances are set out in **BS 6896 (latest edition)** and must be applied. The following is guidance to the standard:

NATURAL VENTILATION

Low level ventilation shall be provided in all cases below the level of the heater(s).

Up to and including 60kW: 4.5cm^2/kW

Over 60kW: 270cm^2 + 2.25cm^2 /kW in excess of 60kW total rated heat input.

Where the air supply openings can be closed, it shall only be possible to operate the radiant heaters when they are open.

MECHANICAL VENTILATION

Ventilation shall be provided in all cases at or below the level of the heaters.

Minimum proven air flow: 2.35m^3/h/kW of total rated heat input.

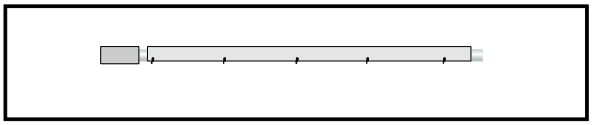
It shall only be possible to operate the radiant heaters whilst the ventilation airflow is proven.

C. FLUE AND COMBUSTION AIR CONFIGURATIONS

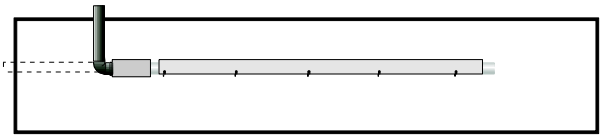
The heaters can be installed with different flue and combustion air configurations please review the diagrams on the following page for the overview of the permitted installations. The permissible maximum lengths associated with these options are listed in the table below.

Table 1

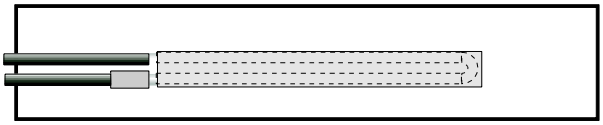
Flue Type	Max Combustion Air 100mm Ø	Max Flue Length 100mm Ø	Max flue length Concentric 150/100mm Ø	Reduce length for 90° bends 100mm Ø
A_3	N/A	N/A	N/A	N/A
B_{23}	10m + 1 l-bow	10m + 1 l-bow	N/A	-1.7m
B_{53}	10m + 1 l-bow	10m + 1 l-bow	N/A	-1.7m
$C_{13/63}$	10m + 1 l-bow	10m + 1 l-bow	Roof or wall terminal	-1.7m
$C_{33/63}$	10m + 1 l-bow	10m + 1 l-bow	Roof or wall terminal	-1.7m
$C_{53/63}$	10m + 1 l-bow	10m + 1 l-bow	Roof or wall terminal	-1.7m



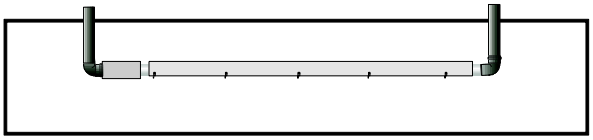
A3 - Fresh air horizontal



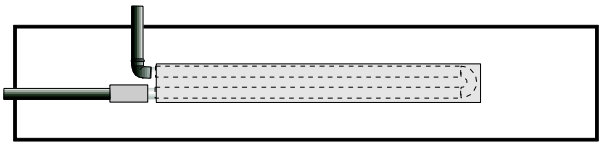
A3 - Fresh air vertical / horizontal



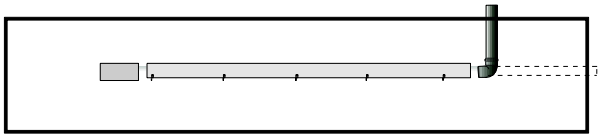
C13 - Fresh air and flue horizontal



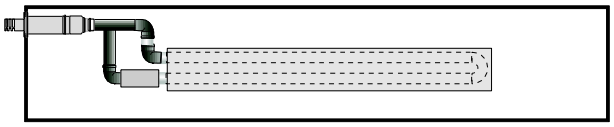
C33 - Fresh air and flue vertical



C53 - Fresh air & Flue horizontal in different pressure zones



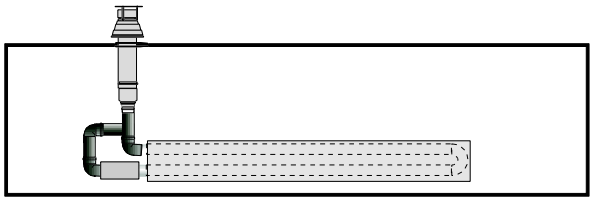
B23/53 - Flue vertical / horizontal



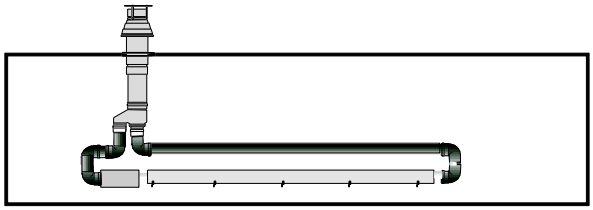
C13 - Fresh air & Flue horizontal in concetric ducts



C53 - Fresh air vertical & Flue horizontal in different pressure zones



C33 - Fresh air & Flue horizontal in concetric ducts



C33 - Fresh air & Flue vertical in concetric ducts

Figure 1

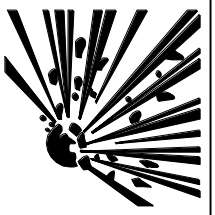
1. Type A_3:
   Outside (ducted) combustion air supply. When installed in a dusty or polluted atmosphere, the heater should be fitted with a ducted supply of clean fresh air. A length of 100mm flexible ducting should be installed between the Control Box Air Inlet and any rigid ducting and be secured to the Air Inlet with hose clips.
   Where outside combustion air is ducted directly to the burner(s) the low level **natural** ventilation openings shall be not less than 50% of the areas given in the section above.

2. Type $B_{23/53}$:
   When installing external flue single duct systems the distance between the flue terminal and fresh air intake shall be no less than 1 m for both vertical and horizontal systems. For heaters EPA 12, 15 and 20 the flue must be insulated if longer than 5m. For heaters EPA 25 the flue must be insulated if longer than 8m.

3. Type $C_{13,33,53,63}$:
   For type C appliances the fresh air and flue are run as separate pipes to the concentric roof/wall terminal (for $C_{33,63}$).

17.0) LIGHTING AND SHUTDOWN INSTRUCTIONS

⚠ WARNING



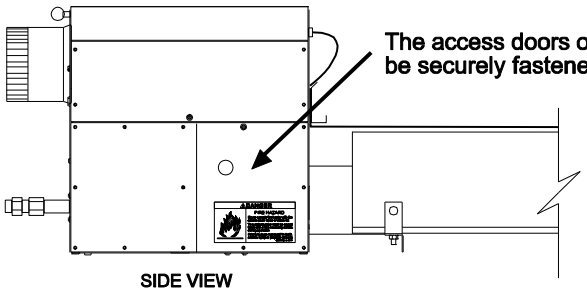


FIRE AND EXPLOSION HAZARD

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

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

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



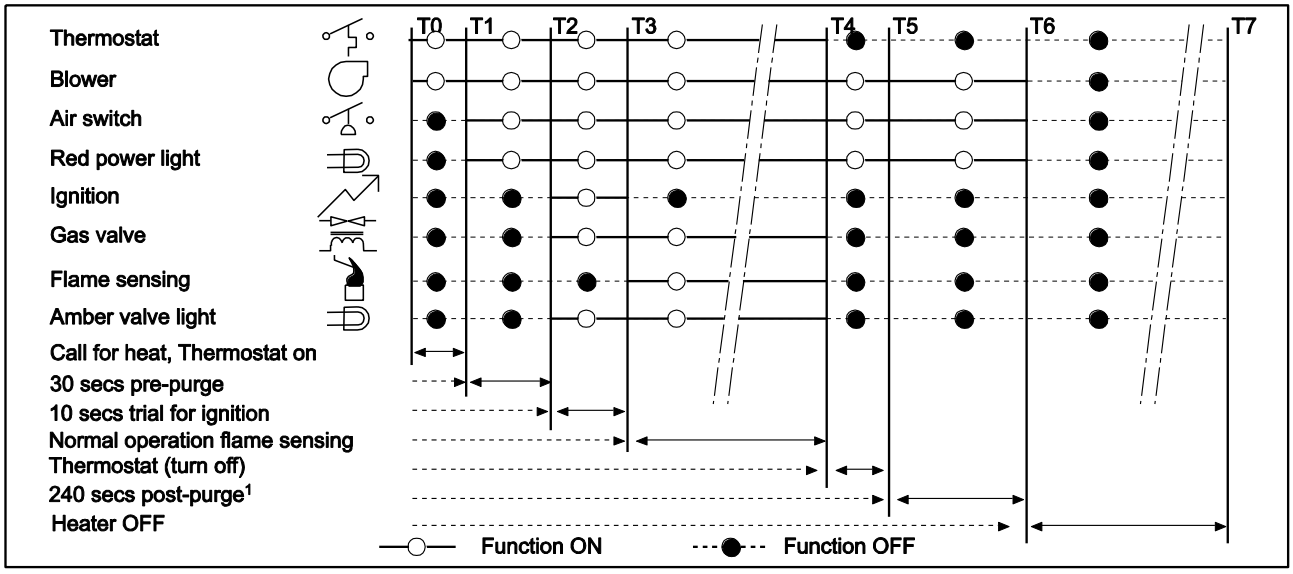
SIDE VIEW

1. Turn on the gas and electrical supply.
2. Set the thermostat to call for heat. The blower motor will energize.
3. Ignition should occur after the 30-second pre-purge.
4. If the burner fails to light, or flame is not detected during the first trial for ignition (a period of 10 seconds) the gas valve is de-energized and the control goes through an inter-purge delay of 30 seconds before another ignition attempt. The control will attempt two additional ignition trials before going into lockout, and the valve relay will be de-energized. The blower will be turned off following a post-purge period of approximately 24 seconds.
5. If the heater does not light, manually reset the thermostat or shut off power completely for 5 minutes before attempting to relight.
6. To permanently shut down the heater, turn off the gas and electrical supply.

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

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

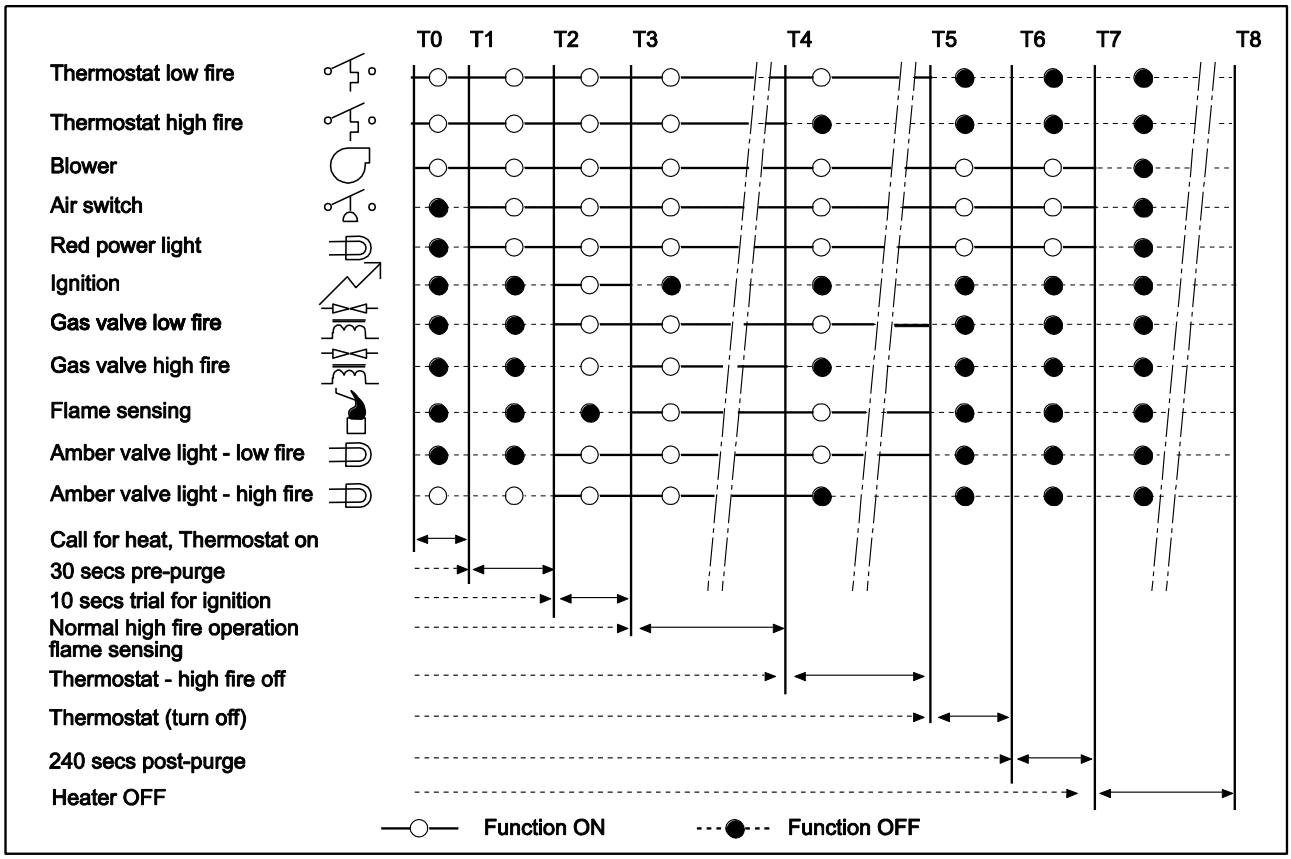
The chart below shows the sequence of operation for the normal operating cycle of the heater when connected to a permanent 230V power supply and the heater is turned on and off by a remote 230V thermostat.



Note: When the heater is operated by a thermostat interrupting the line voltage (230V) to the heater then the post purge function is disabled.

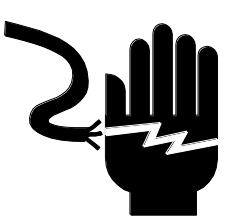
19.1) SEQUENCE OF OPERATION – TWO STAGE (N7/L7)

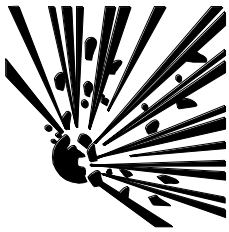
The chart below shows the sequence of operation for the normal operating cycle of the EPA (N7/L7) when connected to a permanent 230V power supply and the heater is turned on and off by a remote 230V thermostat. The heater can start in low or high fire.



19.0) 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, serious injury or property damage.

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. Detailed instructions for component removal are given in section 22.0 Replacing Parts.

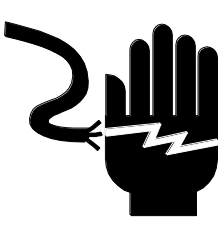
After any maintenance and/or replacement of components the heater must be re-commissioned to ensure proper operation. After working on gas carrying components the appliance must be checked for gas leaks and pressure settings verified.

The contractor shall check the following during periodic maintenance.

- **Clearances to combustibles:** Check that clearances are being maintained. Make sure there are no flammable objects, liquids or vapors near the heater. See also Section 4.0).
- **Reflectors:** Reflectors should be kept clean, at a minimum blow off the reflectors. (Dirty reflectors will reduce heat output). Reflector must be supported in hangar and must not touch tube. Ensure correct overlap.
- **Heat exchanger tubes:** Inspect the heat exchanger tubes to make sure they are not cracked, sagging or showing signs of fatigue. Make sure couplings are secured tightly and contain screws on each side.
- **Combustion air intake:** Disconnect combustion air intake from the burner box and inspect internally using a flashlight to make sure no foreign material has collected in the tubes and that there is no obstruction around the air intake openings. Clean any foreign materials. Inspect any joints to make sure they are completely sealed. See also Section 16.0).
- **Venting System:** Disconnect vent pipe and inspect internally using a flashlight to make sure no foreign material has collected in the pipes. Check the external vent cap and make sure that there is no obstruction around the exhaust openings. Clean any foreign materials. Inspect any joints to make sure they are completely sealed. See also Section 16.0).
- **Gas lines:** Make sure that the gas lines are not leaking. Check the gas connection to the heater for any signs of damage, fatigue or corrosion. If there are any signs of damage to the gas connection or leaks found in the gas piping, immediately stop using the heater until the gas pipe and connections have been repaired or replaced. Check that the gas lines are not bearing the weight of the heater. See also Section 13.0).
- **Burner Box:** In order to extend the longevity of the heater, the heat exchanger tube and the burner must be level. Check that the burner box is level; use the turnbuckle on the burner suspension eyebolt to adjust the level of the burner. See also Section 9.0).
- **Burner sight glass:** Check that the burner sight glass is clean and that the glass is sealed against the housing door. If there any signs of distortion, the sight glass must be replaced.
- **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 3mm (1/8") and that the tips of the flame sensor and spark electrode are free from deposits. Clean off any deposits. Check that the electrode ceramic is free from cracks. See Section 22.1).
- **Suspension system:** Check that the suspension system is holding the heater level. Make sure that the heater is hanging securely, look for any evidence where the heater may have been hit accidentally and tighten any loose hanging points. Check that S hooks are closed. Check that there is no evidence of wear on the chain at the connection to the heater and at the ceiling.
- **Tube Integrity Safety System:** Check that the tension of the tube integrity safety system is maintained at 11". Adjust tension if necessary. See Section 12.4).
- **Main Burner and Orifice:** Check the Main burner and orifice; remove any dirt or debris including spider webs.
- **Foreign Objects:** Check and remove any foreign objects that are logged between the reflector, heat exchanger tube, sports hall guards, decorative grilles, etc.
- **Sports Hall Guards and other Accessories:** Ensure they are attached securely, repair if needed.
- **Safety Labels:** Replace safety and all other labels if they are no longer visible. See section 24 for replacements.
- **Wall Tag:** Ensure a wall tag has been placed near the heaters thermostat or in a conspicuous area near the heater. Review the information for accuracy, replace if the information is no longer visible.

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

⚠ WARNING

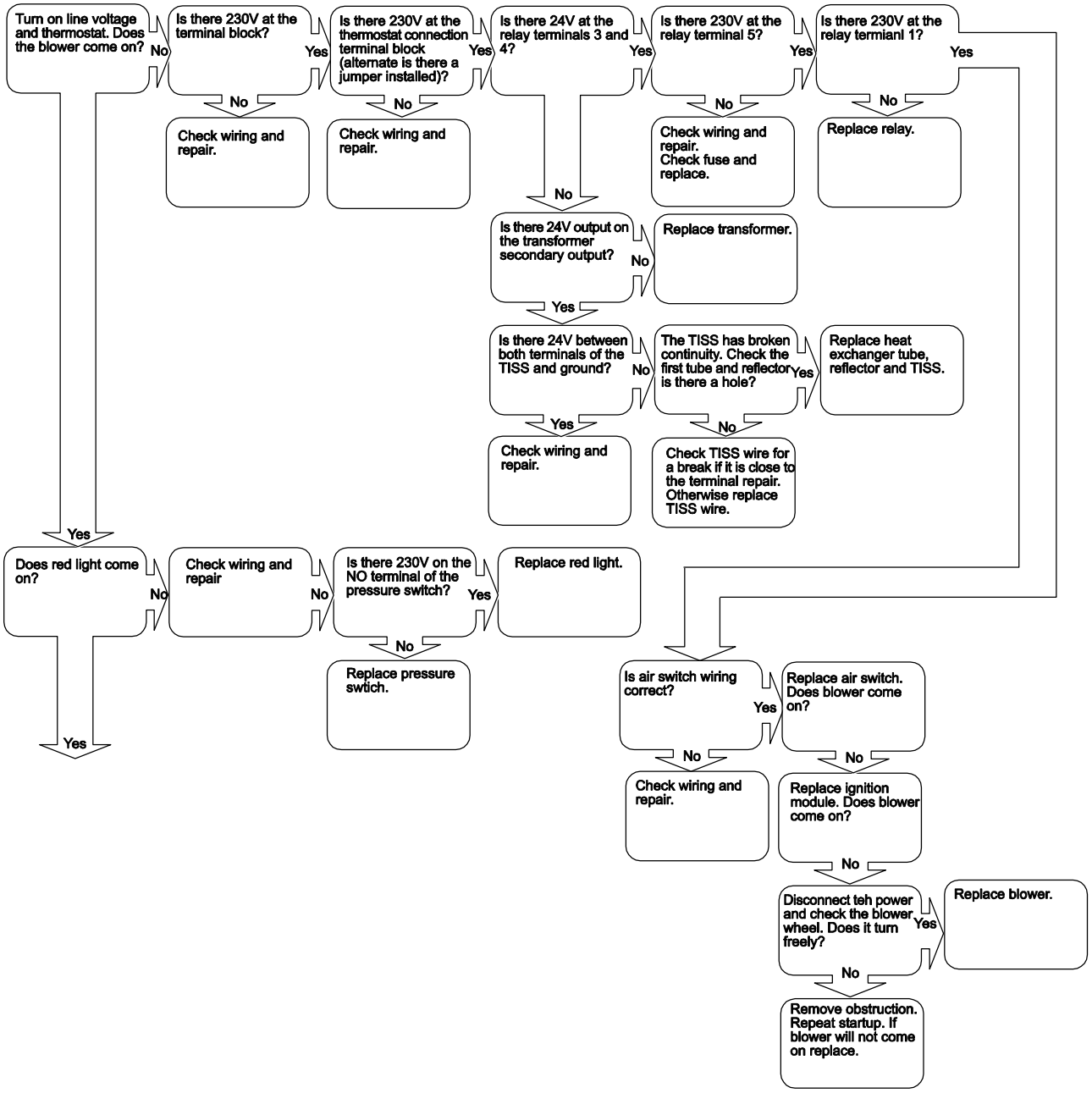


ELECTRIC SHOCK & EXPLOSION HAZARD

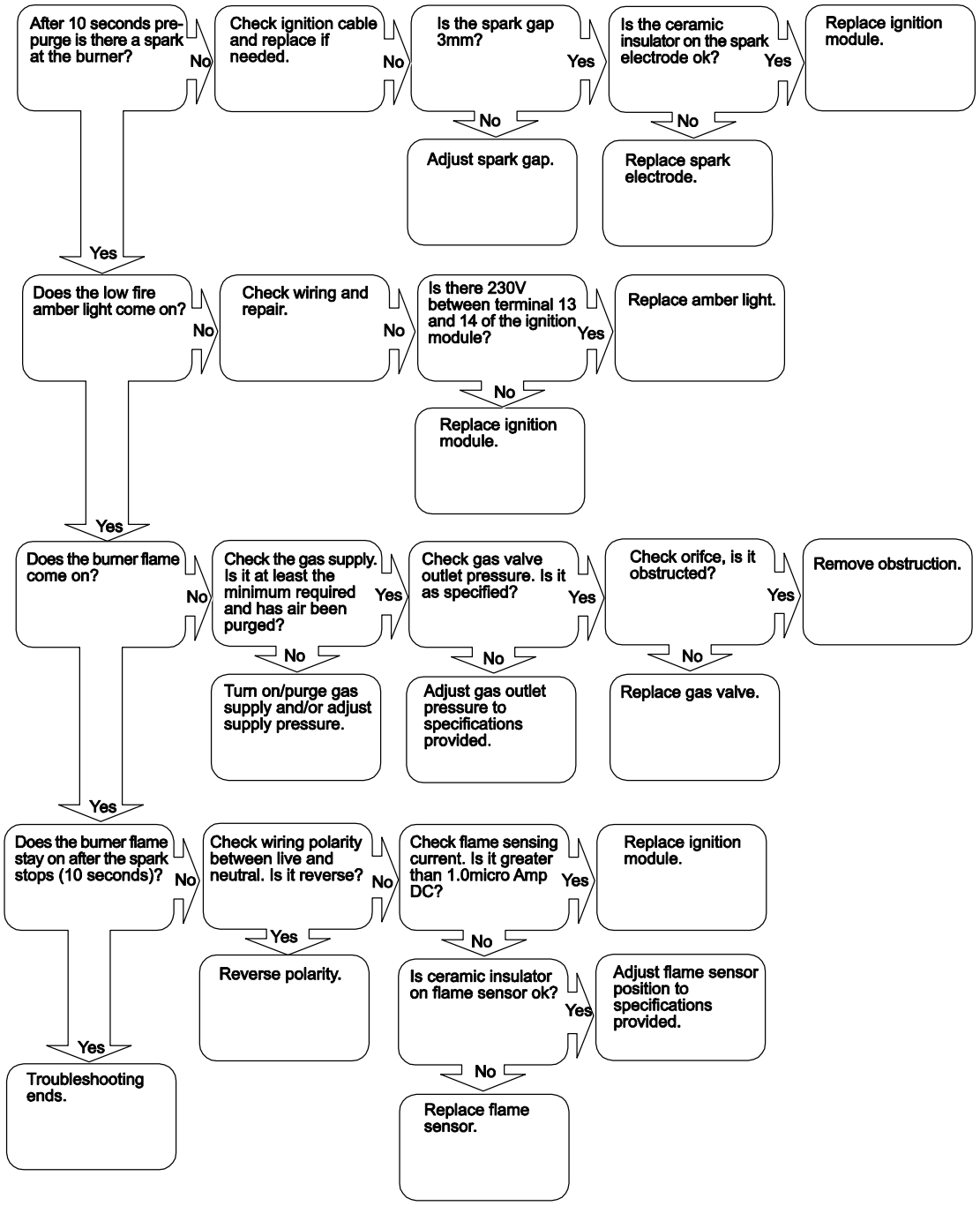
Disconnect electrical power and gas supply before servicing.

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

Prior to troubleshooting verify that the heater is installed and contains all components such as air plate, orifice, etc. as per these instructions.

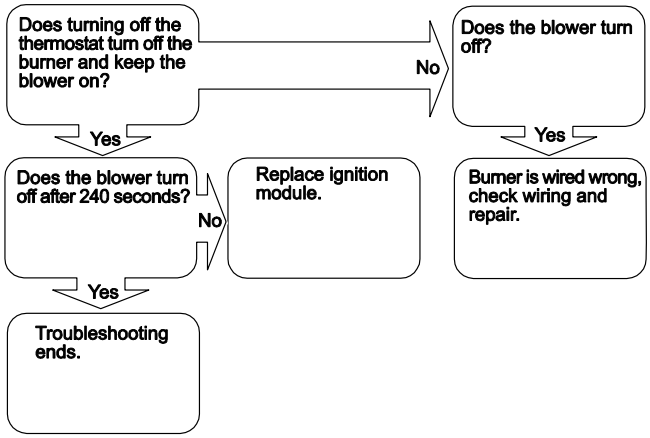


TROUBLESHOOTING GUIDE – SINGLE STAGE (CONTINUED)

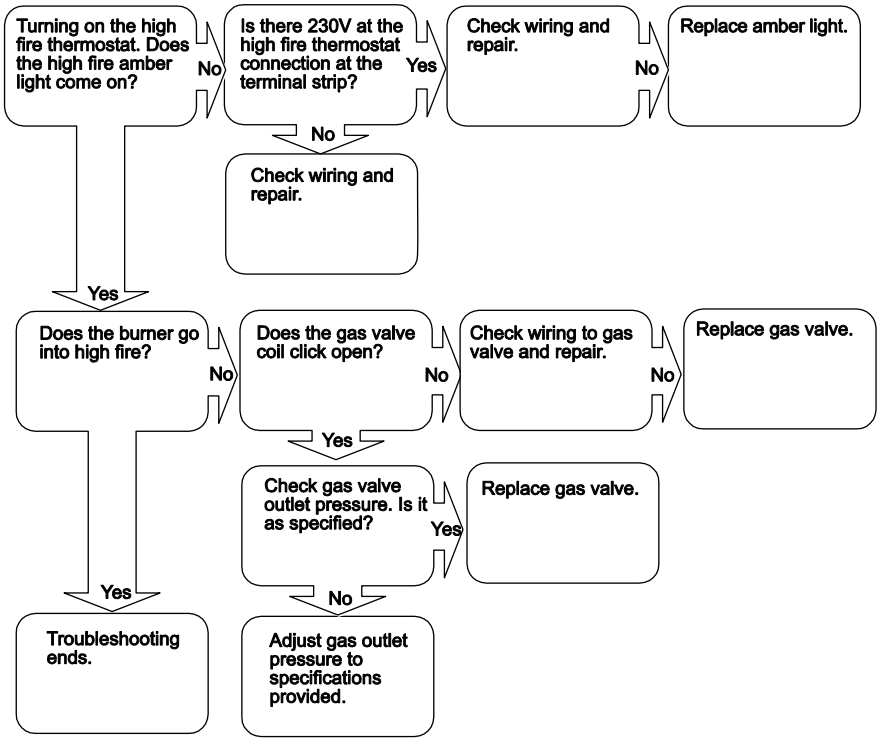


TROUBLESHOOTING GUIDE – SINGLE STAGE (CONTINUED)

For heaters installed with a permanent 230V power supply (post purge).

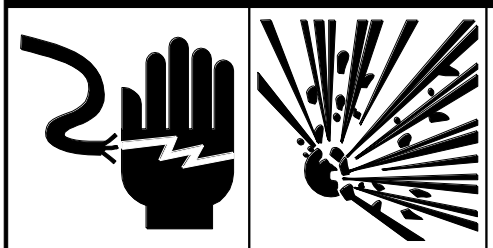


21.0) TROUBLESHOOTING GUIDE – TWO STAGE (N7/L7)



22.0) REPLACING PARTS

⚠ WARNING



ELECTRIC SHOCK & EXPLOSION HAZARD

Disconnect electrical power and gas supply before servicing.

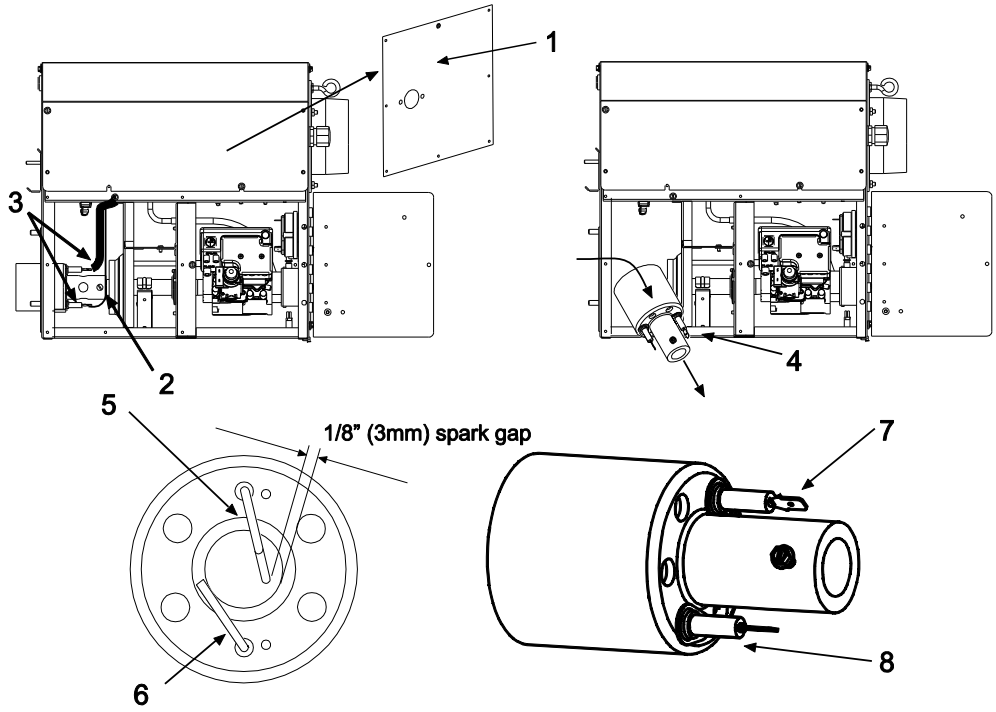
Failure to do so may result in death or serious injury.

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 25.0) for all replacement parts.

IMPORTANT: Disconnect gas and electricity supplies to the appliance before carrying out any repair work. This work can be carried out at high level using a purposes designed access tower, but it is preferable that this work should be carried out at ground level.

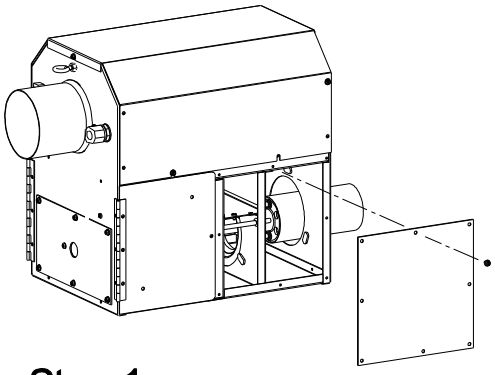
22.1) REMOVAL OF MAIN BURNER AND ELECTRODES

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

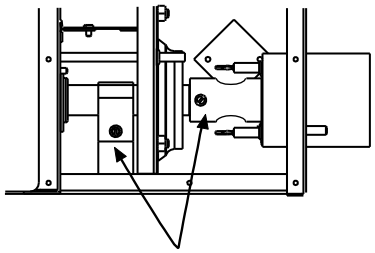


1. Disconnect electrical supply and Remove cover 1.
2. Remove screw securing burner casting to the gas manifold.
3. Disconnect Spark lead and sensing wire.
4. Pull burner forward from the gas manifold and then out through the side of the box as shown.
5. Check that the spark gap is 3mm between the electrode and the burner casting as shown. Spark electrode should be clean and free from debris.
6. Flame sensor should be clean and free from debris.
7. Check ceramic on the spark electrode, for replacement into the box the spark electrode is the 6.35mm terminal which connects to the spark lead.
8. Check ceramic on flame sense electrode, for replacement into the box the flame sense electrode is the 4.76mm terminal which connects to the violet wire. (in some models the terminal is 6.35mm painted violet)

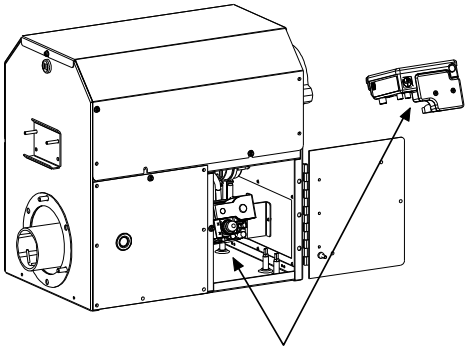
22.2) REMOVING GAS VALVE AND MANIFOLD ASSEMBLY



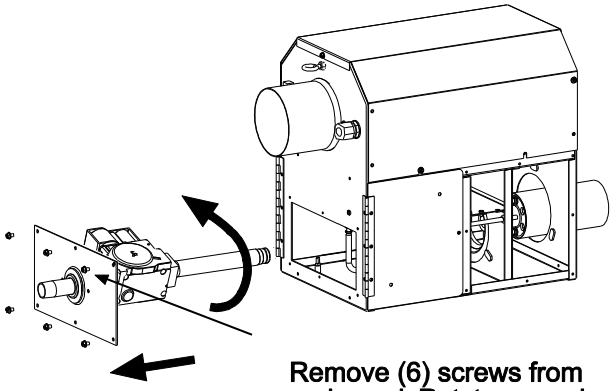
Step 1 Remove side access panel.



Step 2 Loosen screws from manifold clamp and burner assembly.

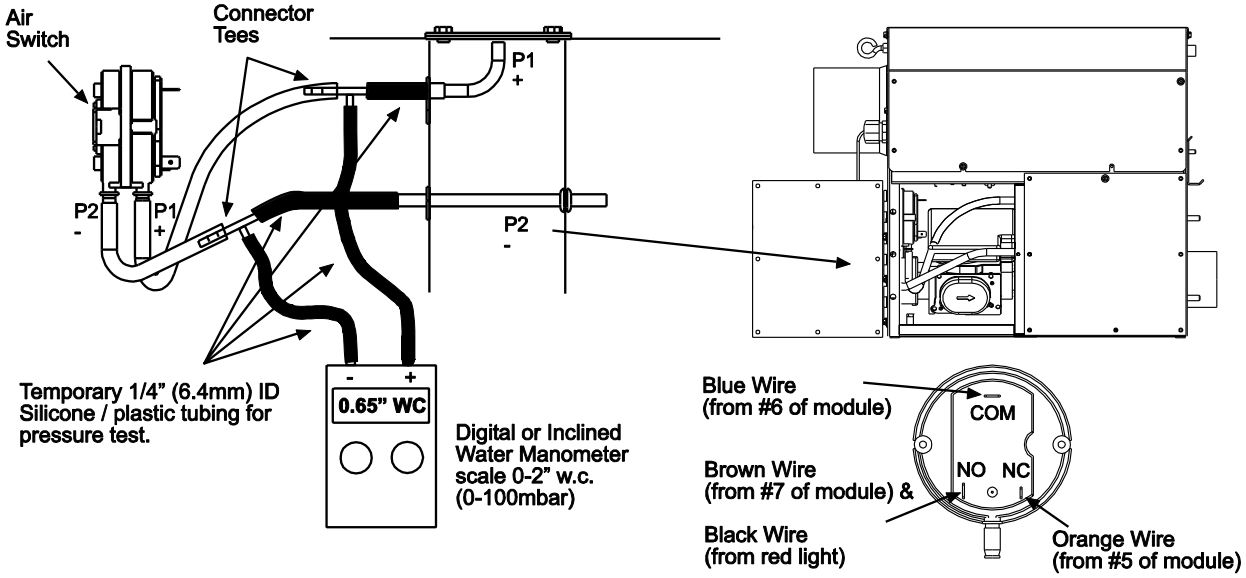


Step 3 Open hinged access panel and disconnect wire harness from module. Remove module from gas valve.



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

22.3) AIR SWITCH PRESSURE CHECK



1. Open hinged access panel.
2. Add tubing to connect the air switch tubing P1 + and P2 - with the connector tees and the probes P1+ and P2+.
3. Connect plastic tubing of a digital or inclined water manometer with a 0-100mbar 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
EPA 12	1.5 mbar Hot
EPA 15	1.5 mbar Hot
EPA 20	1.5 mbar Hot
EPA 25	1.5 mbar Hot
EPA 30	0.9 mbar Hot
EPA 38	0.5 mbar Hot
EPA 45	0.5 mbar Hot
EPA 55	0.6 mbar Hot

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

23.0) CONVERSION INSTRUCTIONS

a) Remove the Injector from the Injector Fitting (see Section 22.1) and replace it with the alternative Injector supplied with conversion kit. Check that the size reference marked on the Injector agrees with that listed in the Specifications table (Section 5.0) for the appliance model in question.

b) Remove the pressure governor cap from the integral pressure governor of the Control Valve and screw the adjuster clockwise to increase the gas pressure, check supply and manifold pressure in accordance with Section 14.0) Replace the pressure governor cap.

c) Affix the gas adjustment label supplied with conversion kit onto the Data Label, adjacent to the headings "Adjusted For" and "Setting Pressure", to cover the original gas adjustment label.

d) Carry out checks in accordance with Section 14.0) of this manual to ensure correct supply pressure relative to the gas type being used.

24.0) INSTALLATION DATA

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

Serial No. _____

Model: **EPA (L/U)** _____ N = Natural Gas L = Propane Gas

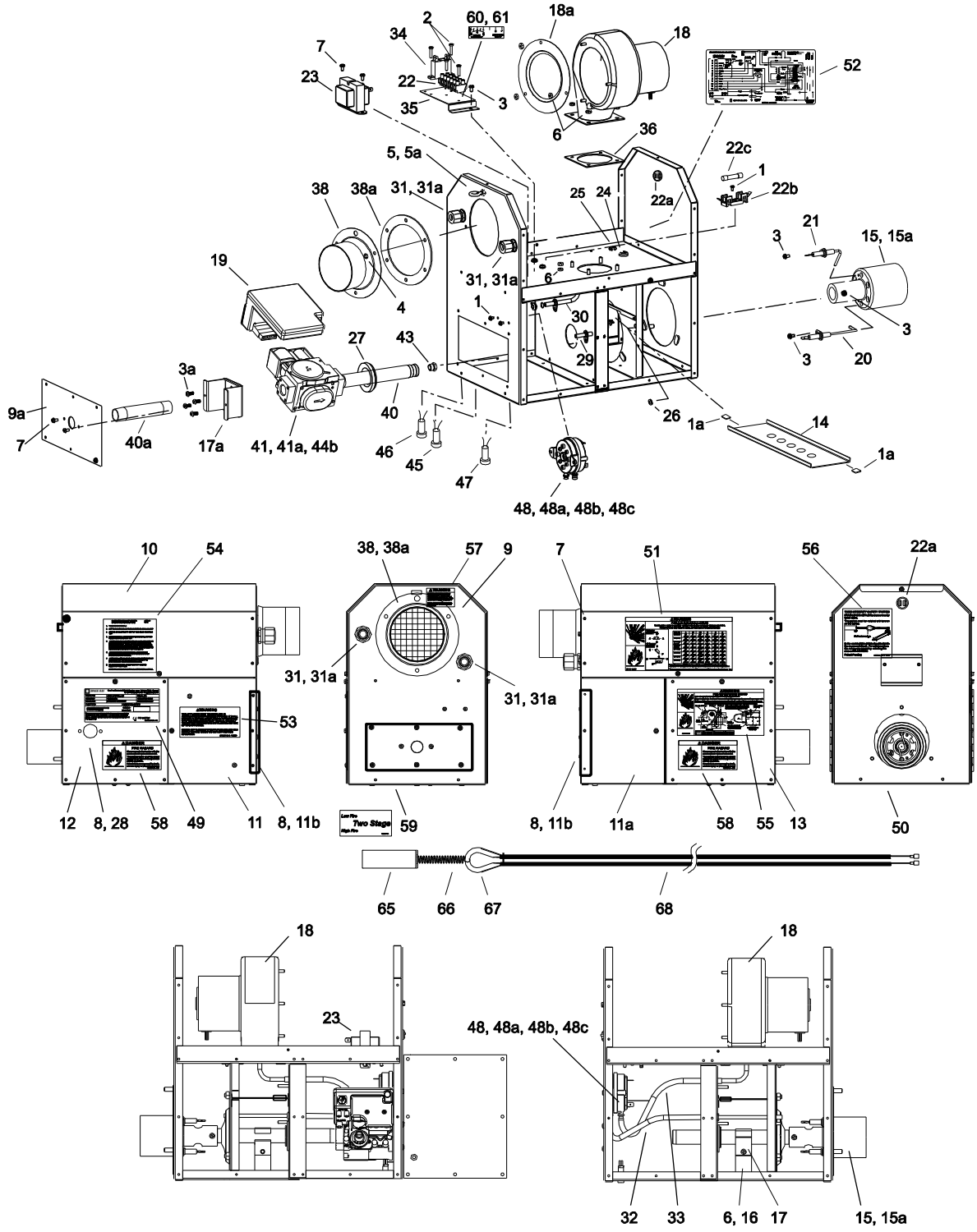
25.0) REPLACEMENT PARTS GUIDE

BURNER BOX			
Item No.	**Part No.**	**Description**	**Qty.**
		Fasteners	
1	02295040	PHTCS #6-32 x 3/8"	3
1a	02266010	Speed Clips (for air inlet plate)	2
2	02242030	PHTCS #6-32 x 5/8"	4
3	02242050	PHTCS #8-32 x 3/8"	5
3a	4267021	M4 x 8mm Pozi Pan Head Screw	4
4	02167029	Locknut #10-24 Keps SS	3
5	02167010	Locknut 1/4-20 Keps	2
5a	02309000	Eyebolt 1/4-20 x 2”	1
6	02167040	Locknut #8-32 Keps	7
7	02195010	HWHSMS #8 x 1/2” (4.2 x 13mm) Point (typical all access panels)	43
8	02132020	Rivet 1/8”	32
		Housing Components	
9	44139059	Housing Assembly (painted)	1
9a	44140119	Valve Holder Plate (painted)	1
10	44140009	Access Panel – Top (painted)	1
11	44140040	Access Panel - Hinged (with module holes)	1
11a	44140041	Access Panel – Hinged	1
11b	02201080	Hinge 1-1/2” x 6”	2
12	44140057	Access Panel - LH burner end –with sight glass (painted)	1
13	44140099	Access Panel - RH burner end (painted)	1
14	4414006x	Combustion Air Plate (see size requirements in Section 5.0)	1
		Burner Components	
15	42700250	Burner (with air inlet holes) 38 – 55 kw only	1
15a	42700300	Burner (without air inlet holes) 12 – 30kw only	1
16	44146090	Manifold Support Bracket (painted)	1
17	44146060	Manifold Support Clamp	1
17a	44146110	Manifold Extension Bracket (with 2.38´centers)	1
18	30703500	Blower Assembly – 230V/50Hz – Fasco #702113009)	1
18a	30215050	Air Inlet Plate	1
19	30797750	Digital Burner Control (DBC) – SIT #579-4117)	1
20	30702010	Flame Sensor #PSE-GF24	1
21	30702020	Electrode #PSE-GF25	1
22	30739010	Terminal Block – 6 Pole	1
22a	3073800	Terminal Bushing (2 x 1/4” tabs)	1
22b	30713000	Fuse Holder	1
22c	30202000	Fuse 1/4 x 1-1/4” (2 amp)	1
22d	30399000	Tab Adapter - 1/4 Double Male/Female –not shown-	2
23	30279880	Transformer 230v-24V 20VA (with wire terminals)	1
24	02175020	Strain Relief #SR-6P3-4 (ignition cable)	1
25	02175060	Strain Relief #SR-2M-1 (flame sensor wire)	1
26	30514020	Grommet .250ID #739 (air sensing tube)	1
27	30700040	Grommet, Pipe Sealing 1/2" #63595K34	1
28	30623010	Sight Glass #1295	1
29	42744079	Air Sensing Tube Asm. (straight) 1/4"od	1
30	42744069	Air Sensing Tube Asm. (90 deg bend) 1/4"	1
31	30635050	Cord Connector 1/2” #M4521 (Gray)	2
31a	30635049	Nut ½” #8463 (Black)	2
32	03988100	Plastic Vacuum Air Tube 10" (P2- to static pressure point)	1
33	03988100	Plastic Vacuum Air Tube 10" (P1+ to total pressure point)	1

34	30383000	Relay – 24V SPST - NO	1
35	43275020	Bracket, Relay/Terminal Block Holder	1
36	42395010	Gasket, Blower	1
37	03946030	Sealing Strip 1/8" x 3/8" wide (access panels) -not shown-	Ft.
38	42603629	Starting Collar (combustion air inlet)	1
38a	4260132	Gasket, Starting Collar (combustion air inlet)	1
39	30701248	Ignition Cable - Female (2) 1/4" QC x 24"lg #PSE-GF35 -not shown-	1
40	44145060	Manifold Pipe – 6-1/4"lg	1
40a	42605020	Pipe Nipple – 1/2 BSPT x 110mm	1
41	30797010	Gas Valve – SIT #0.840.027 – 230V Single Stage (on/off)	1
41a	30797510	Gas Valve – SIT #0.843.020 – 230V Two Stage (Hi/Lo)	1
43	03259xxx	Main Burner Orifice #7/16-27 (see size requirements in Section5.0)	1
44	44450940	Kit, Wire Harness (complete) – single stage models only –not shown-	1
44a	44450949	Kit, Wire Harness (complete) – two stage models only –not shown-	1
44b	30797990	Modulator Plug – SIT #0.960.458 - two stage models only – not shown-	1
45	42398210	Monitoring Light – Amber (low fire)	1
46	42398200	Monitoring Light – Amber (high fire) - two stage models only	1
47	42398220	Monitoring Light – Red (air switch)	1
48	30186320	Air Switch (set point @ 1.5mbar, GREEN LABEL)	1
48a	30186321	Air Switch (set point @ 0.9mbar YELLOW LABEL)	1
48b	30186322	Air Switch (set point @ 0.5mbar BLUE LABEL)	1
48c	30186323	Air Switch (set point @ 0.6mbar RED LABEL)	1

		Labels/Manual	
49	42848130GB	Label, Nameplate – Single Stage	1
50	4262000	Label, Logo (Space-Ray) -not shown-	1
51	43344190	Label, Clearances to Combustibles	1
52	42874090	Label, Wire Connection Diagram	1
53	4260420	Label, Warning (installation)	1
54	4260440	Label, Operating Instructions	1
55	43344110	Label, Flex Gas Connector	1
56	43269020	Label, TISS Connection	1
57	43269030	Label, Eyebolt Suspension Warning	1
58	43269050	Label, Burner Warning (access panel must remain closed)	2
59	43269070	Label, Low/High Fire – Two Stage	1
60	43269182	Label, 230V – Two Stage Thermostat Connection	1
61	43269183	Label, 230V – Single Stage Thermostat Connection	1
62	44201320	Installation & Operation Manual –not shown-	1
63			
64			

		Tube Integrity Safety Switch (TISS) Components	
65	44175000	Retainer clamp	1
66	30519020	Spring	1
67	30736000	Thimble	1
68	44176510	TISS replacement assembly **(does not include retainer clamp or spring)**	1



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 1.5M AND 3M 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.

E