

## Specifications, Installation, Operation Service and Spare Parts Manual **CAL-SERIES**



Vented Radiant Tube Heater/ L'Appareil de chauffage de Tube Rayonnant donné vent  
Gravity Vented Wall Furnace/ La gravité A Donné vent Fournaise de Mur  
Low Intensity Infrared Heater/Radiateur à infrarouge à faible intensité  
Also for Brooder Use/Auss pour l'éveage des poules

For either indoor or outdoor installation/Installer à l'intérieur ou à l'extérieur  
For Industrial, Commercial, Agricultural, Restaurant, Patio and Residential Garage Applications.

**⚠ WARNING:** Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read (refer to) the installation operating 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.

**⚠ ADVERTISSEMENT.** L'installation déplacée, l'ajustement, le changement, le service ou l'entretien peuvent causer les dommages de propriété, la blessure ou la mort. Lire (se référer à) l'installation qui fonctionne et les instructions d'entretien à fond avant d'installer ou entretenir cet équipement. Pour obtenir de l'aide ou les informations supplémentaires consultez un programme d'installation, une agence de service ou le fournisseur de gaz qualifié.

**⚠ WARNING:** If the information in these instructions are not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

**⚠ ADVERTISSEMENT:** Assurez-vous de bien suivre les instructions données dans cette notice pour réduire au minimum le risqué d'incendie ou d'explosion ou pour éviter tout dommage materiel, toute blessure ou la mort.

-Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

- Ne pas entreposer ni utiliser d'essence ni d'autres vapeurs ou liquids inflammables a proximité de cet appateil ou de tout autre appareil.

- ⚠ DANGER: WHAT TO DO IF YOU SMELL GAS:**
- 1) Extinguish any open flame
  - 2) DO NOT try to light any appliance.
  - 3) DO NOT use or touch any electrical switches.
  - 4) DO NOT use any phone in your building
  - 5) Turn off gas.
  - 6) Open Windows
  - 7) Leave the building
  - 8) Immediately call your gas supplier from a neighbour's phone or after you have left the building. Follow the gas supplier's instructions.
  - 9) If you cannot reach your gas supplier, call the fire department.

- ⚠ DANGER: QUE FAIRE SI VOUV SENTEZ UNE ODEUR DE GAZ:**
- 1) Eteindre la flamme ouverte
  - 2) Ne pas tenter d'allumer d'appareils
  - 3) Ne touchez á aucun interrupteur.
  - 4) Ne pas vous server des telephones dans le bâtiment où vous vous trouvez.
  - 5) le Virage du gaz.
  - 6) Ouvrir Windows
  - 7) Part le bâtiment
  - 8) Appelez immédiatement votre fournisseur de gaz depuis un voisin ou après que vous êtes parti le bâtiment. Suivez les instructions du fournisseur.
  - 9) Si vous ne pouvez rejoindre le service des incendies.

- Installation and service must be performed by a qualified installer, service agency or the gas supplier

- L'installation et l'entretien doivent être assures par un installateur ou un service d'entretien qualifié ou par fournisseur de gaz.

**⚠ WARNING:** Heat exchanger surface is hot. Do not touch surface or burn may result. Combustible material or articles should not be placed on or near heater. Observe clearance to combustibles as noted on heater and in this manual.

**INSTALLER:** Leave this manual with the appliance.

**INSATLLATEUR:** Laissez cette notice avec l'appareil.

**CONSUMER:** Retain this manual for future reference.

**CONSOMMATEUR:** Conservez cette notice our consultation ultérieure.

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## OWNER'S RESPONSIBILITY:

1

Thank you for purchasing our product. We have designed this unit to provide you with years of trouble free heating enjoyment.

**READ THIS MANUAL IN ITS ENTIRETY!** If you do not understand any of the safety or hazardous warnings contained in this manual, or have questions or concerns about the installation, operation, maintenance or service of this heater, or any other questions or concerns relating to this heater, you **MUST CALL THE FACTORY** at the telephone number noted on the front cover of this manual or as detailed on the rating plate on the heater before operating this heater. Store this manual in a location near the heater, for future reference. Make sure installation is performed by well-qualified, licensed contractors in the required field of work. If in doubt, DO NOT allow unit to be installed. DO NOT park vehicles or place combustible objects close to the heater other than specified on the Clearance to Combustible chart located in this manual and on the heater. Failure to observe the clearance to combustibles can result in property damage, injury or death.

**IMPORTANT NOTICE:** The installation portion of these instructions are for the use of qualified individuals specially trained, licensed and experienced in the installation of this type of equipment and related system components.

**NOTE:** - The words "shall" or "must", indicate a requirement, which is essential to satisfactory and safe performance.

**⚠ GENERAL HAZARD WARNING:** The heater and related gas piping, fitting & wiring must be installed by individuals or firms qualified, licensed and specially trained and experienced in installation of this type of equipment and related system components. Only persons who can understand and follow the instructions shall install or service this heater. Persons not qualified shall not install this equipment nor interpret these instructions. Failure to comply with the precautions and instructions provided with this heater can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning or electrical shock.

**⚠ WARNING:** Installation and repair should be done by a qualified service person. The heater should be inspected before use and at least annually by a qualified service person and prior to heating season. Heaters used in dusty locations such as brooder barns, sawmills, woodworking shops, etc. will require more maintenance on a more regular basis and more frequent cleaning may be required as necessary. It is imperative that the control compartments, burner(s) and circulating air passageways of the appliance be kept clean. Periodic examination of the venting system is to be performed.

No one should work on a heater unless they are a licensed/qualified gas fitter or contractor. For all repairs, parts **MUST** originate from the manufacturer of this heater in order not to void CGA/AGA certification. Safety devices are not allowed to be rendered inoperative and left unattended as this action can cause property damage, injury or death. Failure to do so will void your warranty.

**⚠ WARNING:** Do not store or use halogen-emitting substances in the vicinity of this heater. Such substances include chlorine based cleaners and swimming pool chemicals, water softening chemicals, de-icing salts and chemicals, cleaning solvents such as carbon tetrachloride or perchloroethylene, halogen type refrigerants, printing inks, paint and paint removers, varnishes, hydrochloric acid, cements and glues, and masonry acid washing materials. The air used by the burner for combustion must be free of halogens to avoid possible corrosion to the heating surfaces, which could result in asphyxiation, fire and/or death.

**⚠ WARNING:** Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns or clothing ignition.

Young children should be carefully supervised when they are in the same place as the heater.

Clothing or other flammable materials should not be hung from the heater, or placed on or near the heater.

Any safety screen, guard or other protective device removed for servicing a heater must be replaced prior to operating the heater

**⚠ WARNING:** Do not operate heater in a residential garage application without an approved (exhaust) venting system installed and connected to the heater. When this heater is installed in a residential garage, the operation of the heater, when not connected to a properly installed and maintained venting system, can result in carbon monoxide (CO) poisoning and possible death.

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

Ne pas se servir de cet appareil s'il a été plongé dans l'eau, complètement ou en partie. Faire inspecter l'appareil par un technicien qualifié et remplacer toute partie du système de contrôle et toute commande qui ont été plongées dans l'eau.

## INSTALLER RESPONSIBILITY



### **WARNING:**

#### **FIRE OR EXPLOSION HAZARD**

The heater and related gas piping and wiring must be installed only by individuals or firms well qualified and licensed in the required field of work.

Read and understand this manual in its entirety BEFORE you install this heater. If you have any questions call your local representative. Verify that the fuel on the installation site is the same as what is required for this heater. Check heater for damage or missing parts. If damage has occurred, notify carrier or point of purchase at once for reconciliation of damaged goods. We are not responsible for transit damage. Do not install if heater is damaged.

**If you do not understand any of the safety or hazardous warnings contained in this manual, or have questions or concerns about the installation, operation, maintenance or service of this heater, or any other questions or concerns relating to this heater, you MUST CALL THE FACTORY at the telephone number noted on the front cover of this manual or as detailed on the rating plate on the heater before operating this heater.**

Verify that model, input & length is what was ordered and is appropriate for installation. If heater is too small for the heating load of the building, property damage can occur due to freezing. If unit is too large, severe heat damage can occur to the building and/or its contents, fire, explosion, injury or death. If in doubt compare heat loss of building with unit on site. If you are unable to calculate heat loss call your local representative for assistance.

Installation shall be in accordance with local codes. (see code compliance).

If installation requires tilting, DO NOT over tilt the unit. Units are certified for installations up to 45°, however the maximum recommended tilt is 25°.

Install unit according to the Clearance to Combustibles for that particular heater and type of installation. Make sure that clearances are maintained from vehicles parked below or in front of heater. Take into consideration hoists. Failure to do so could result in property damage, injury or death.

Make sure unit is adequately suspended from ceiling or roof. Select hanging location that has adequate strength to support heater.

This heater needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air. In the USA, do not operate this heater without installing air intake hood or duct (pin #800209) and exhaust/chimney vent in a residential garage application. In Canada, the outside air intake is optional for residential garages.

This heater must not be connected to a chimney flue serving a separate solid-fuel burning appliance. This heater must only be installed with the venting that it is certified for. Refer to the installation instructions for installation details. See pages 29 & 30)

If unit is to be sidewall vented, use pin #800208 sidewall vent kit. Make sure vent cap is past eave. (see pages 31 & 32 titled 'Venting').

Do not render safety devices inoperable. Make sure gas line and/or service have adequate capacity for the increased load of heater.

Check line and manifold pressure with a manometer to confirm unit is set according to the specification on the rating plate and altitude. Perform check with all gas-fired appliances operating. (see pages 40, 41, 47 & 48 for further details).

Provide adequate accessibility clearances for servicing.

Leave copy of this manual with owner (or a copy) for future reference.

**HEATER OPERATION NOTE:** Heater will have a higher heat output at the burner end as compared to the exhaust end.

**SPACE HEATING:** As a general rule, it is suggested to locate the burner end toward the highest heat-loss area (doors) of the space being heated. If you have any concerns or questions concerning orientation or layout of the heater in your application, contact factory for assistance.

**SPOT HEATING:** On heaters with a straight line configuration as well as units that have the maximum length of radiant tube selected for the input capacity of a given burner, there will be a noticeable and more pronounced perception of greater heat output from the burner end of the heater as compared to the exhaust end. As a general rule, it is suggested for spot heating applications, to use a u-tube configuration to provide a more even source of heat. If you have any concerns or questions concerning orientation or layout of the heater in your application, contact factory for assistance.

**NOTE:** A small amount of condensation may occur from the heater when it starts the heating cycle. The condensation will stop once the heater warms up. Make sure venting is sealed according section titled "Venting".

## **CODE COMPLIANCE**

Installation shall be in accordance with local building codes, or in the absence of local codes, in accordance with:

**A) FUEL SUPPLY:**

CANADA: *Natural Gas and Propane Installation Code, CSA B149.1* or latest edition.

USA: *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or latest edition.

**B) ELECTRICAL GROUNDING:**

CANADA: *Canadian Electrical Code, CSA C22.1* or latest edition.

USA: *National Electrical Code, ANSI/NFPA 70* or latest edition

In Canada: Electrical equipment and wiring shall comply with the applicable provisions of the current *Canadian Electrical Code, CAN/CSA C22.1, Part I and Part II, and CAN/CSA C22.2 No. 3, Electrical features of Fuel Burning Equipment.*

**C) PUBLIC GARAGE INSTALLATION:** Adequate clearances must be maintained according to the following standards:

CANADA: *Natural Gas and Propane Installation Code, CSA B149.1* or latest edition.

USA: *Parking Structures, ANSI/NFPA 88A* or the standard for *Repair Garages, ANSI/NFPA 88B* or latest edition.

Heaters must be installed a minimum of eight feet above the floor. Minimum required safe distances to combustibles must be maintained from vehicles parked below the heater.

- When installed over hoists, the minimum required safe distances to combustibles must be maintained from the uppermost point of the combustible materials placed on the hoist.

**D) AIRCRAFT HANGERS:** Adequate clearances must be maintained according to the following standards:

CANADA: *Enforcing Authority*

USA: *Aircraft Hangars, ANSI/NFPA 409*

- Heaters in aircraft storage or service areas must be installed a minimum of ten feet above the upper surface of wings or engine enclosures of the highest aircraft which may be housed in the hangar. (This should be measured from the bottom of the heater to the top of the wing or engine enclosure, whichever is highest from the floor.)
- In other sections of aircraft hangars, such as shops or offices, heaters must be installed a minimum of eight feet above the floor.
- Heaters installed in aircraft hangars shall be located so as not to be subject to damage by aircraft, cranes, movable scaffolding or other objects.
- When installed over hoists, the minimum safe distances to combustibles must be maintained from the uppermost point of the combustible materials placed on the hoist.

**E) OTHER TYPES OF INSTALLATIONS:** If the installation is such that it doesn't meet the above mentioned criteria or there is a possibility of airborne combustible vapor or material in the building (HAZARDOUS LOCATION), consult the local Fire Marshall, the Fire Insurance Carrier or other authorities for approval of the proposed installation prior to installing the heater.

**SPECIFICATIONS:** General specifications

**Rating:** (Input: Natural and L.P. Gas)

In Canada: 0-4500' (1372m) In USA: 0-2000' (610m) – De-rate Above 2000' (610M) (see pg 40)

Model	Burner Input Btu/hr		Tube
	Min	Max	Length
CAL-40A	N/A	40,000	10' (3m)
CAL-40AHL	20,000	40,000	10' (3m)
CAL-40AM	20,000	40,000	10' (3m)
CAL-50A	N/A	50,000	15' (4.2m)
CAL-50AHL	25,000	50,000	15' (4.2m)
CAL-50AM	25,000	50,000	15' (4.2m)
CAL-75A	N/A	75,000	20' (6.1m)
CAL-75AHL	37,500	75,000	20' (6.1m)
CAL-75AM	37,500	75,000	20' (6.1m)

**Gas Pressure at Manifold:**

	<u>Single Input</u>	<u>Variable Input</u>
Natural Gas.....	3.5" (8.89cm) W.C.	Lo: 1.5" (3.8 cm) W.C. Hi 3.5" (8.89cm) W.C
L.P. Gas.....	10.5" (26.67 cm) W.C.	Lo: 5.5" (13.97 cm) W.C. Hi: 10.5"(26.67 cm) W.C.
Gas Connection Size.....	0.5" (1.27 cm) N.P.T.	

**Gas Inlet Pressure:**

<i>GAS</i>	<i>MINIMUM</i>	<i>MAXIMUM</i>
Natural	4.5" (11.43 cm) W.C.	14.0" (35.56 cm) W.C.
L.P.	11.5" (29.21 cm) W.C.	14.0" (35.56 cm) W.C.

Flue connection.....3" (7.62 cm)

**Electrical Rating:**

DSI Ignition, 120v. 60hz, 1 Amps, Appliance, 3 prong plug connection, 24 volt low voltage thermostat

**Standard Equipment:**

Burner control housing is pre-assembled and pre-wired, unit comes complete with the following: industry standard gas, electrical and venting connections, balanced air rotor, thermal overload protected motor, visual burner inspection sight glass, combustion and air proving safety switches, 3-try spark ignition control, low voltage thermostat connection, 4" aluminized steel combustion tube, polished aluminum standard reflector, 4" aluminized steel radiant heat exchanger, tube couplers, joint/hanger pieces, heat economizer baffle, low voltage thermostat, and hanging chain kit.

**Optional Equipment:**

- 90° Elbow Kit
- Variable Input Control
- Stainless Steel Construction
- 24 Volt input
- Hi/Lo Control
- Two Piece Construction
- 180° U-Bend Kit
- Fresh Air Kit
- Sidewall Vent Kit
- Protective Screen
- Three Piece Construction
- Four Piece Construction

DIMENSIONS

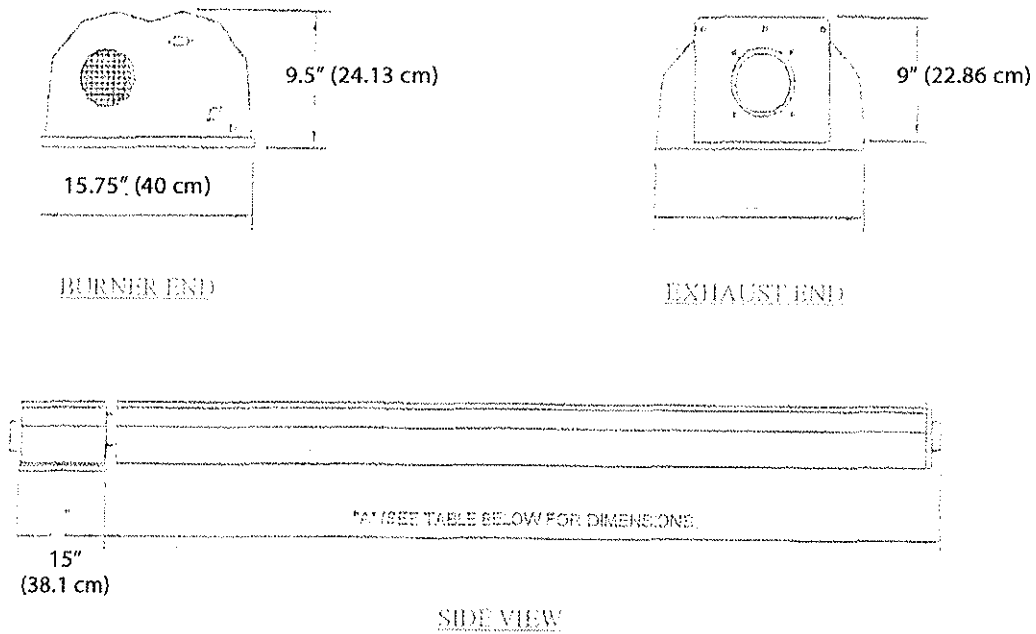


FIGURE #1 EQUIPMENT DIMENSIONS

TABLE OF DIMENSIONS

MODEL	DIMENSION "A"
Burner Input	Length
40,000 Btu/Hr	10' - 4" (3.15 m)
50,000 Btu/Hr	15' - 4" (4.7 m)
75,000 Btu/Hr	20' - 4" (6.4 m)

**INSTALLATION CLEARANCES AND CLEARANCE TO COMBUSTIBLES**

Installation of overhead heaters in garages or hangars MUST meet the requirements for bottom (below) clearances detailed in CANADA: *Natural Gas and Propane Installation Code, CSA B149.1* or latest edition or USA: *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or latest edition.

**⚠ WARNING:** In all situations, clearance to combustibles must be maintained. Minimum clearance from heater must be maintained from vehicles parked below heater. The posting of signs may be required in storage areas referring to clearance to combustibles to the heater and/or limiting the stacking height of stored items near the heater specifying a maximum height. Clearances are not for use in four (4) sided enclosures. Certain materials or items, when stored under the heater, will be subjected to radiant heat and could be seriously damaged.

The stated clearance to combustibles represents a surface temperature of 90°F (32°C) above room temperature. Building material with 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.

**END CLEARANCES** (Burner Head End)

Minimum clearances from air intake end of burner head to object is 12" (30.5 cm)

Provide adequate accessibility clearances for servicing and proper operation. Do not install unit in such a manner that the combustion air entering the heater is reduced in any manner.

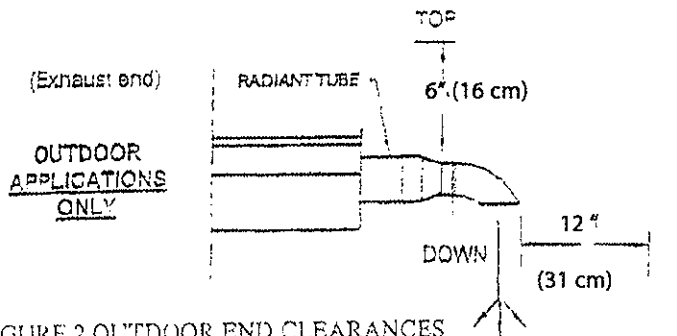


FIGURE 2 OUTDOOR END CLEARANCES

**VENTED**

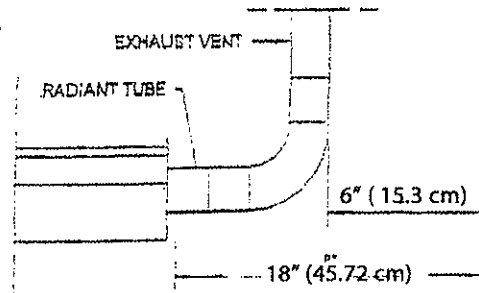


FIGURE 3 VENTED CLEARANCES

**WARNING:** DO NOT INSTALL INRESIDENTIAL GARAGE WITHOUT AN APPROVED VENTING SYSTEM For Brooder use and some industrial applications, unvented installations are permitted.

In these applications refer to page 35A for details On clearances and ventilation requirements.

**CLEARANCE TO COMBUSTIBLES FOR SPACE HEATING AND BROODER INSTALLATION**

**IN THE USA:** Residential Garage heater installations with less than an 8' (2.44 m) clearance from the bottom of the tube to the floor require the installation of the Protective Screen Kit PIN#3900212 (see page 15A for details) The minimum floor clearance is 6' (1.83 m) from the floor to the bottom of the reflector.

**IN CANADA:** Residential Garage heater installations with less than an 7' (2.14 m) clearance from the bottom of the tube to the floor require the installation of the Protective Screen Kit PIN#3900212 (see page 15A for details) The minimum floor clearance is 6' (1.83 m) from the floor to the bottom of the reflector.

**⚠ WARNING:** In all situations, clearance to combustibles must be maintained. Minimum clearance from heater must be maintained from vehicles parked below heater. The posting of signs may be required in storage areas referring to clearance to combustibles to the heater and/or limiting the stacking height of stored items near the heater specifying a maximum height. Clearances are not for use in four (4) sided enclosures. Certain materials or items, when stored under the heater, will be subjected to radiant heat and could be seriously damaged.

The stated clearance to combustibles represents a surface temperature of 90°F (32°C) above room temperature. Building material with 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.

TYPE 1

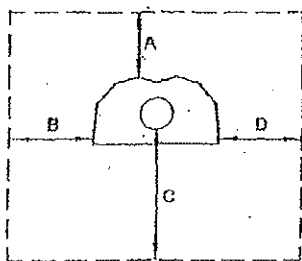


FIGURE #4

TYPE 2

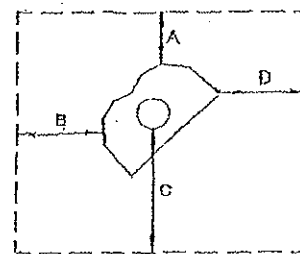


FIGURE #5

STANDARD REFLECTOR

INSTALLATION TYPE 1				
INPUT	A	B	C	D
40	4" (10.2 cm)	12" (31 cm)	36" (92 cm)	12" (31 cm)
50	4" (10.2 cm)	12" (31 cm)	43" (110 cm)	12" (31 cm)
75	4" (10.2 cm)	15" (32 cm)	48" (122 cm)	15" (32 cm)

25° TO 45° TILT

INSTALLATION TYPE 1				
INPUT	A	B	C	D
40	4" (10.2 cm)	4" (10.2 cm)	36" (92 cm)	28" (72 cm)
50	4" (10.2 cm)	4" (10.2 cm)	40" (102 cm)	28" (72 cm)
75	4" (10.2 cm)	4" (10.2 cm)	45" (115 cm)	31" (79 cm)

**PRE-INSTALLATION INSPECTION:**

Refer to pages 11 to 15 for packaging contents.

Inspect the shipping container and heater for any evidence of shipping damage. If heater damage is found, notify freight carrier and file a claim.


**WARNING**


If heater is damaged, DO NOT install.

Check that all parts and pieces are present and accounted for. Report any missing items to carrier or point of purchase at once,

Check that overall general appearance, source of fuel required and model numbers match unit requested. Report any discrepancy to carrier or point of purchase at once,

**THOROUGHLY INSPECT THE EQUIPMENT  
IMMEDIATELY UPON ARRIVAL**

**OUR RESPONSIBILITY FOR THIS SHIPMENT CEASED WHEN THE CARRIER.  
SIGNED THE WAYBILL.**

**If goods are received short or in damage condition, It is important that you notify the carrier and insist on a notation of the loss or damage across the face of the freight bill, otherwise no claim can be enforced against the transportation company.**

**If concealed loss or damage is discovered, notify your carrier at once and request an inspection. This is absolutely necessary. A concealed damage report must be made within 15-days of delivery of shipment Unless you do this the carrier will not entertain any claim for loss or damage. The Agent will make an inspection and grant a concealed damage notation. If you give the Transportation Company a clear receipt for goods that have been damaged or lost in transit, you do so at your own risk and expense.**

**WE ARE WILLING TO ASSIST YOU IN EVERY POSSIBLE MANNER TO COLLECT CLAIMS FOR LOSS OR DAMAGE, BUT THIS WILLINGNESS ON OUR PART DOES NOT MAKE US RESPONSIBLE FOR COLLECTION OF CLAIMS OR REPLACEMENT OF MATERIAL. THE ACTUAL FILING AND PROCESSING OF THE CLAIM IS YOUR RESPONSIBILITY.**

**WE ARE NOT RESPONSIBLE FOR FREIGHT DAMAGED IN TRANSIT!**

**IF CONTENTS ARE DAMAGED,**

**EVEN THOUGH CARTON DOES NOT LOOK DAMAGED:**

- A. MAKE CLAIM TO DELIVERY CARRIER AT ONCE**
- B. SAVE CARTONS FOR INSPECTION BY CARRIER**

A) CAL-40A-10' (3.m)  
Preassembled Model  
(For two piece model see page 13 for details)

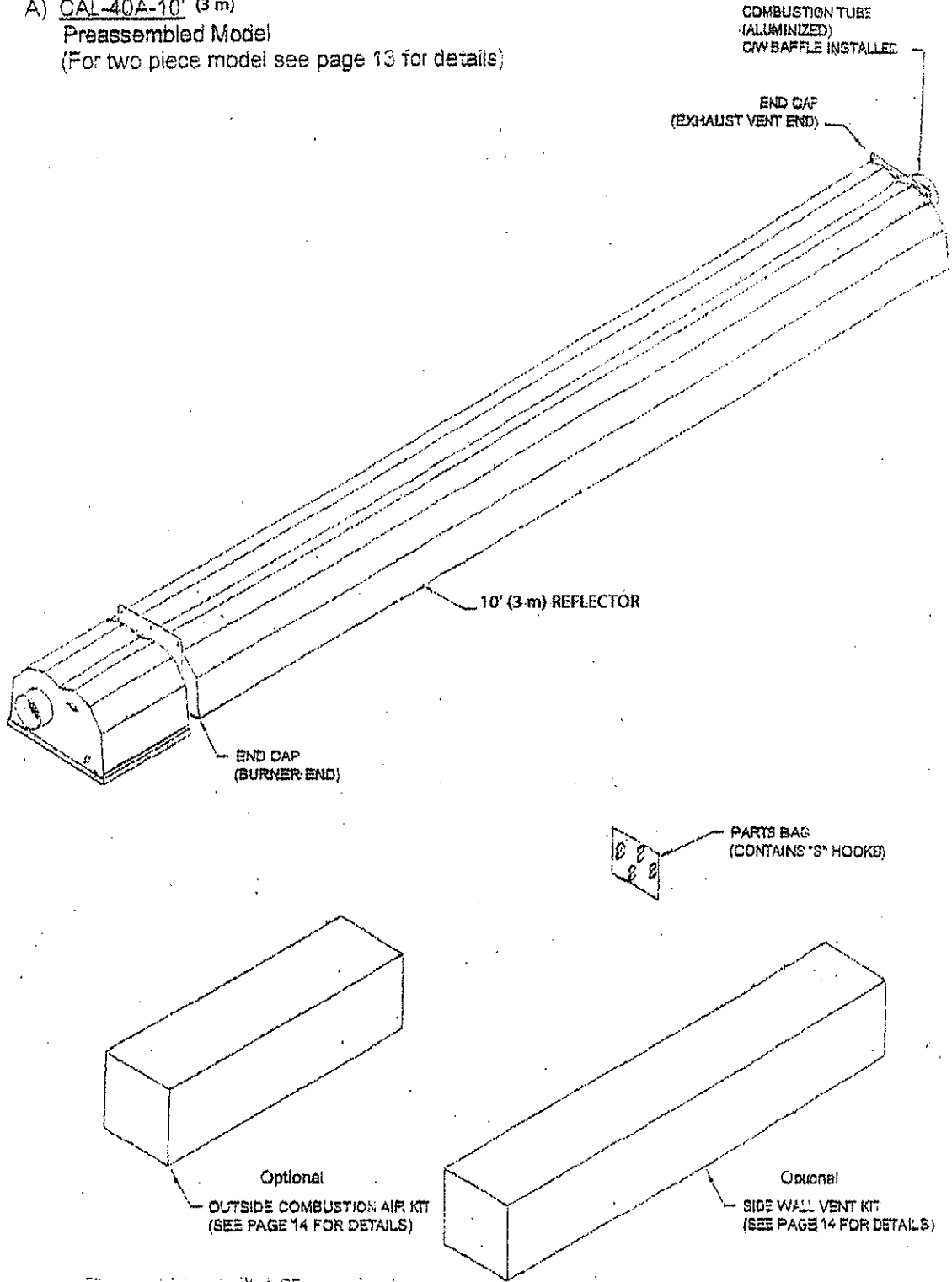
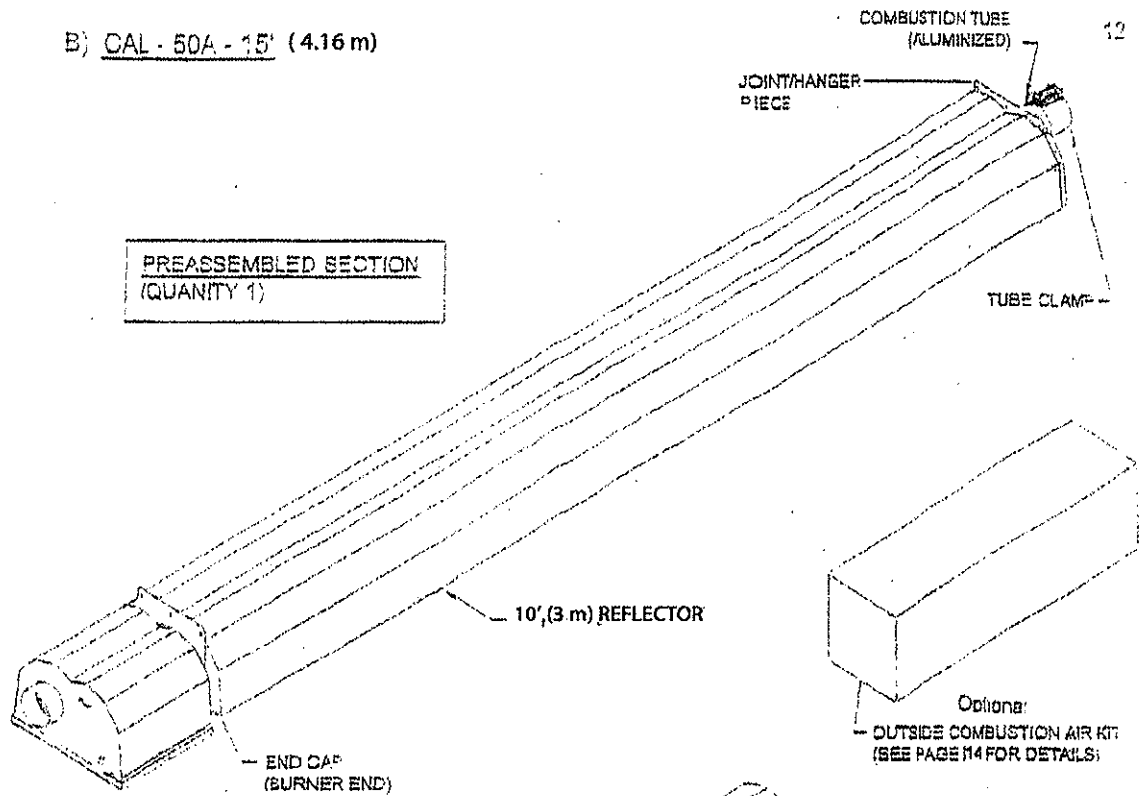
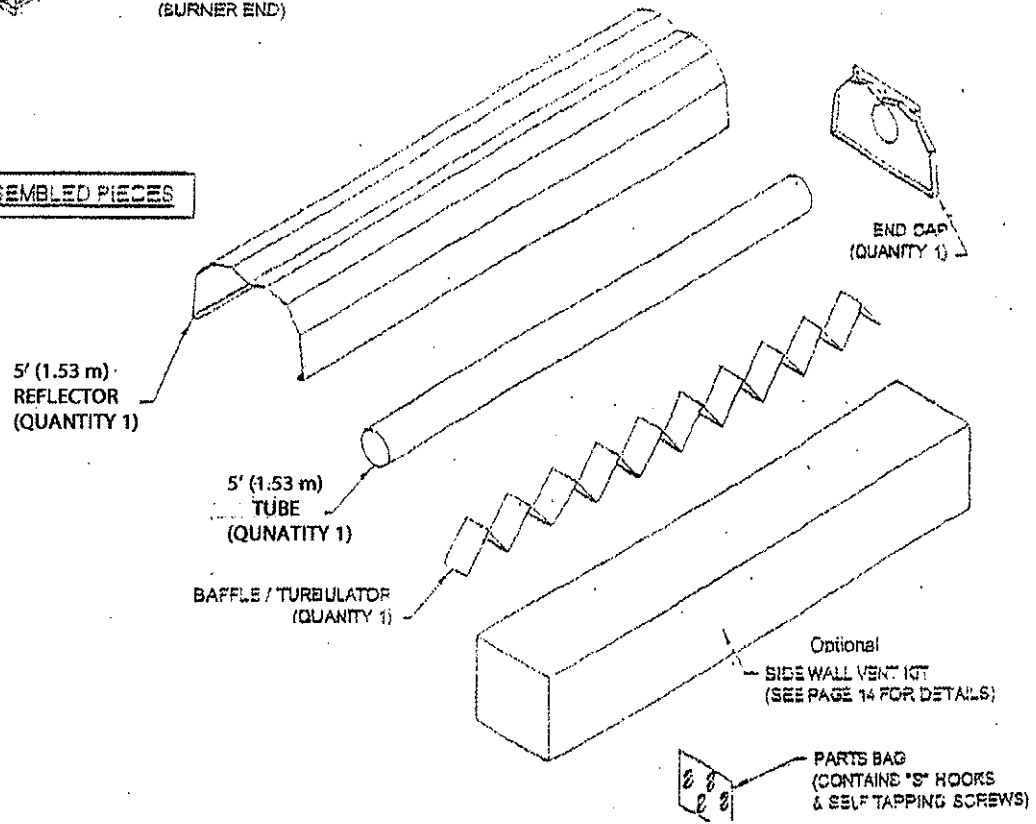


FIGURE #6 CAL-40A-10' (3 m) ASSEMBLED MODEL

B) CAL - 50A - 15' (4.16 m)

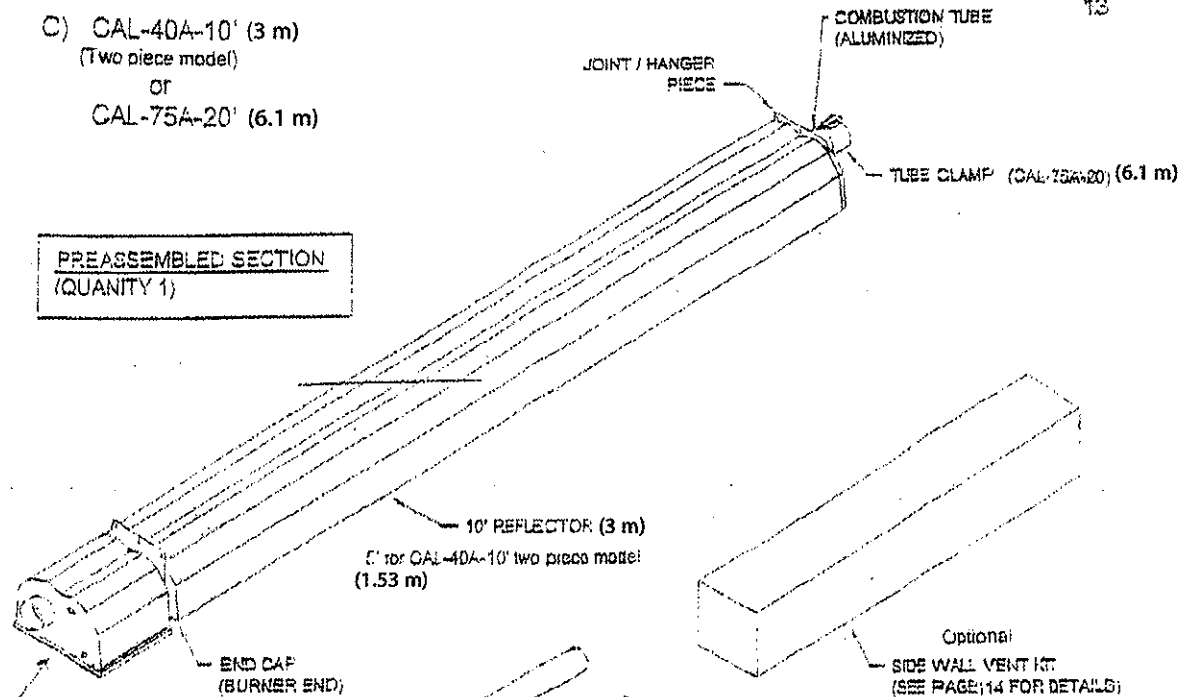


UNASSEMBLED PIECES



C) CAL-40A-10' (3 m)  
(Two piece model)  
or  
CAL-75A-20' (6.1 m)

**PREASSEMBLED SECTION**  
(QUANTITY 1)

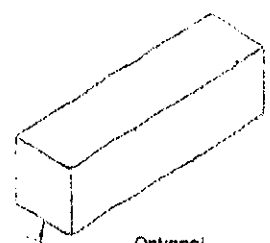
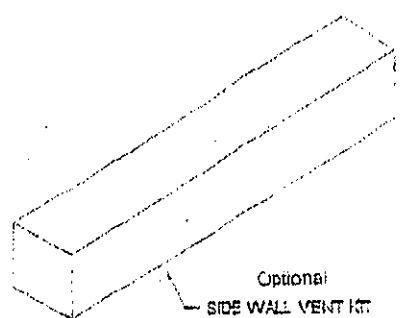
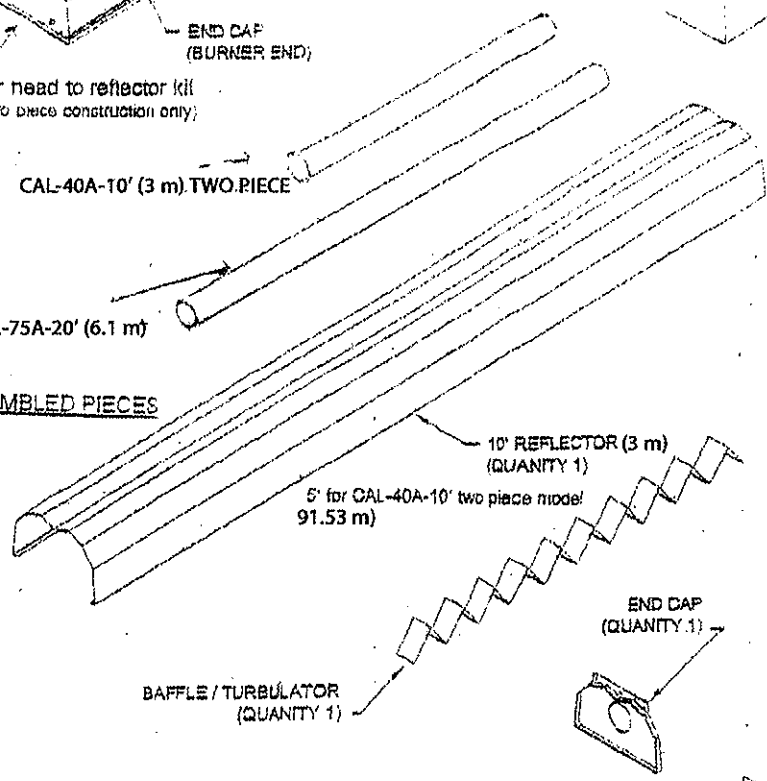


Attach burner head to reflector kit  
(CAL-40A-10' two piece construction only)  
(3 m)

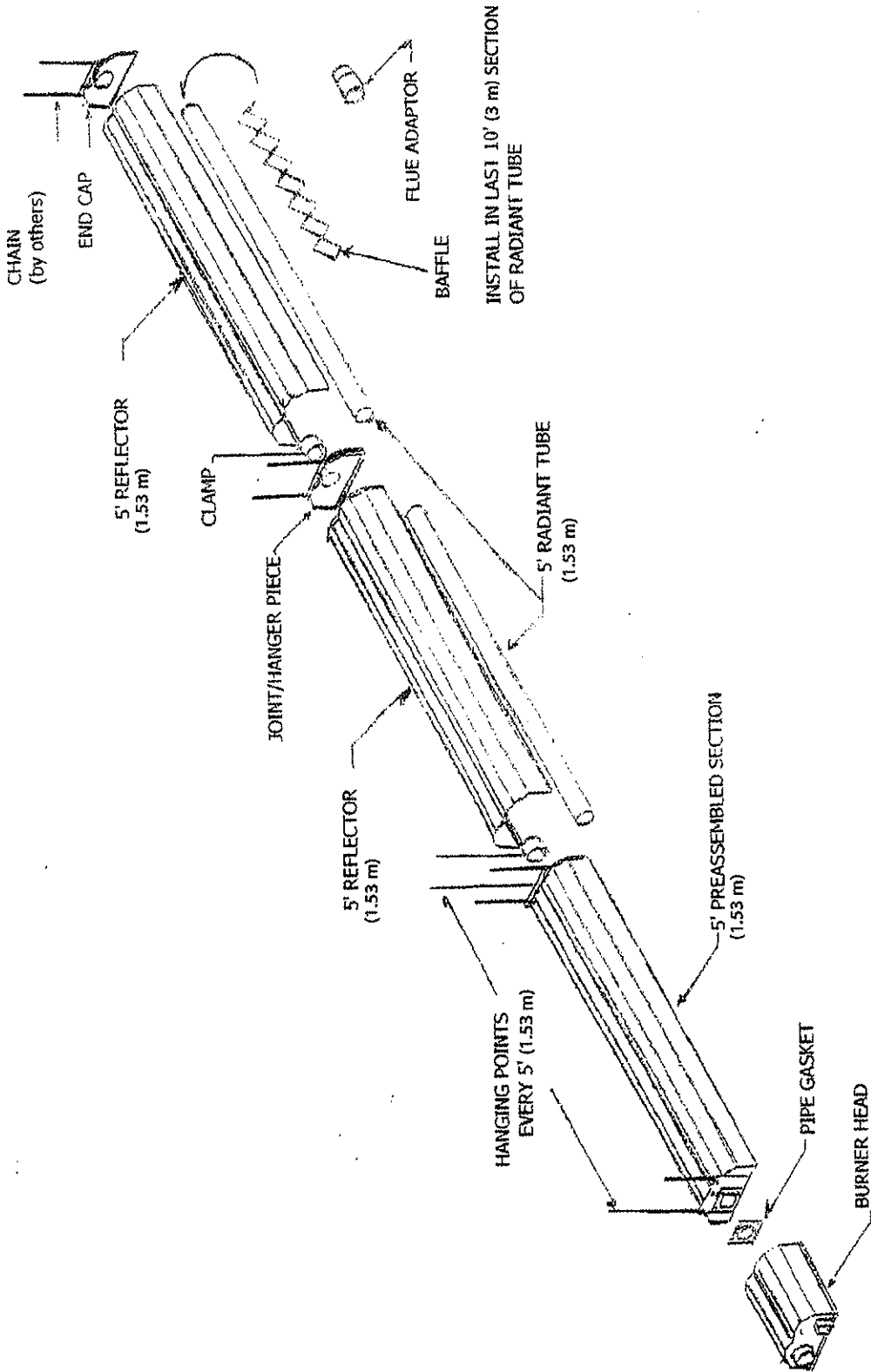
CAL-40A-10' (3 m) TWO-PIECE

CAL-75A-20' (6.1 m)

**UNASSEMBLED PIECES**

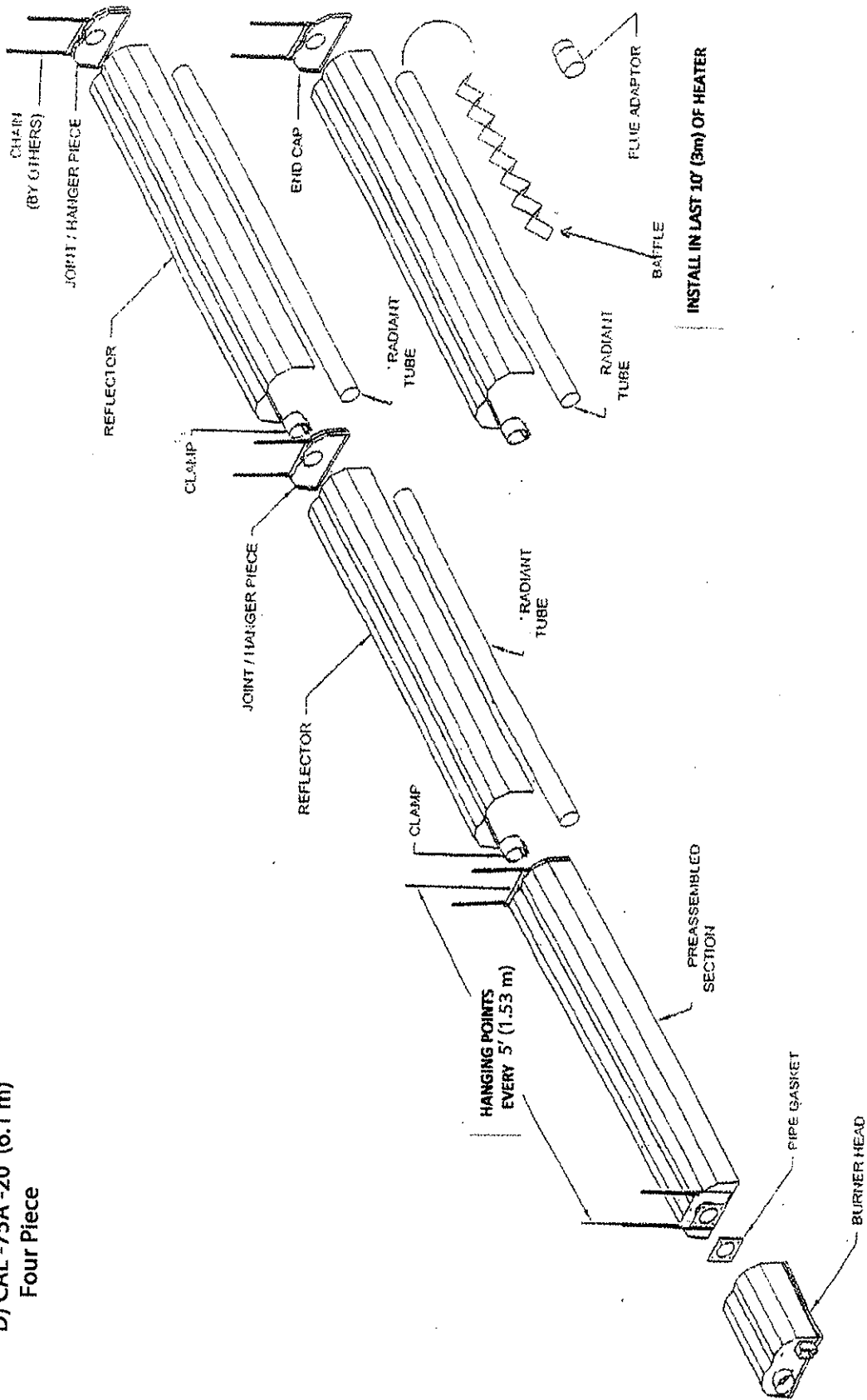


PARTS BAG  
(CONTAINS "S" HOOKS  
& SELF TAPPING SCREWS)  
(QUANTITY 1)



C) (1) CAL-50A-15' (4.16 m)  
(Three piece model)

D) CAL -75A -20' (6.1 m)  
Four Piece



D) OUTSIDE COMBUSTION AIR KIT

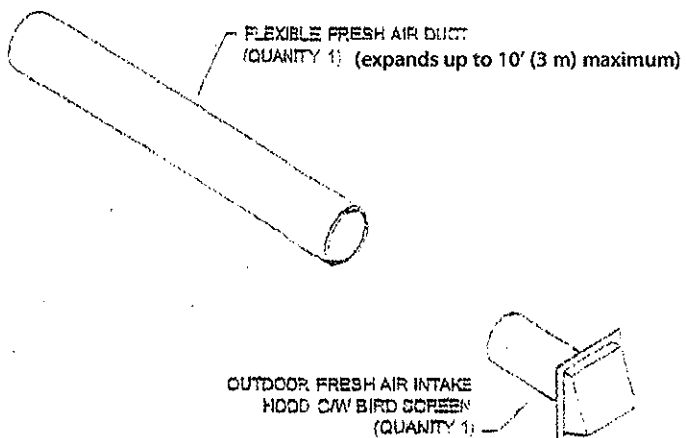
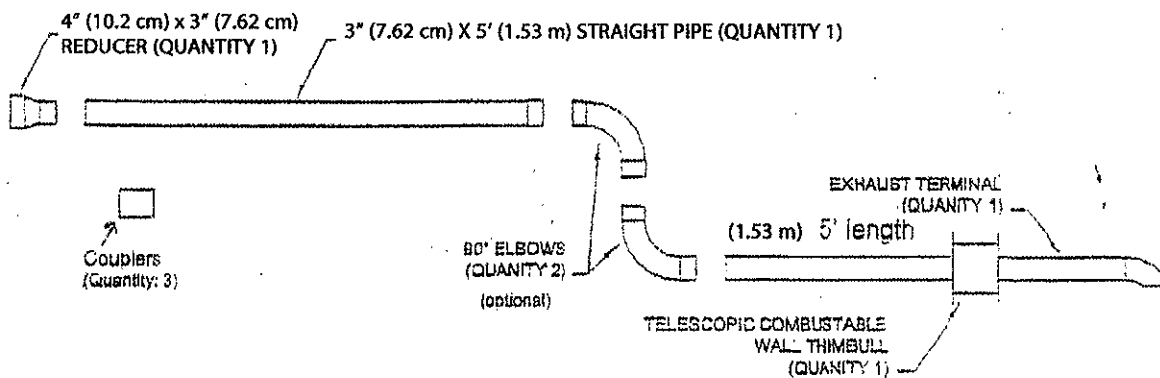


FIGURE #9. OUTSIDE COMBUSTION AIR KIT

E) SIDE WALL VENT KIT



F) 90° ELBOW PACKAGE

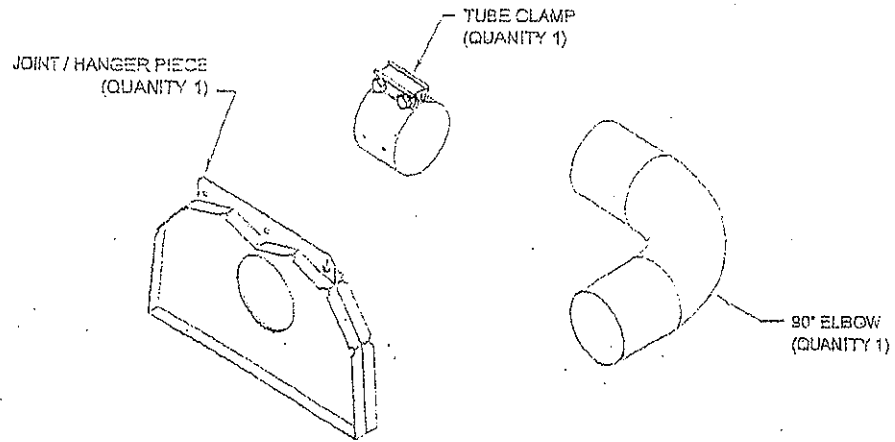


FIGURE #11. 90° ELBOW PACKAGE CONTENTS

G) 180° U-BEND PACKAGE

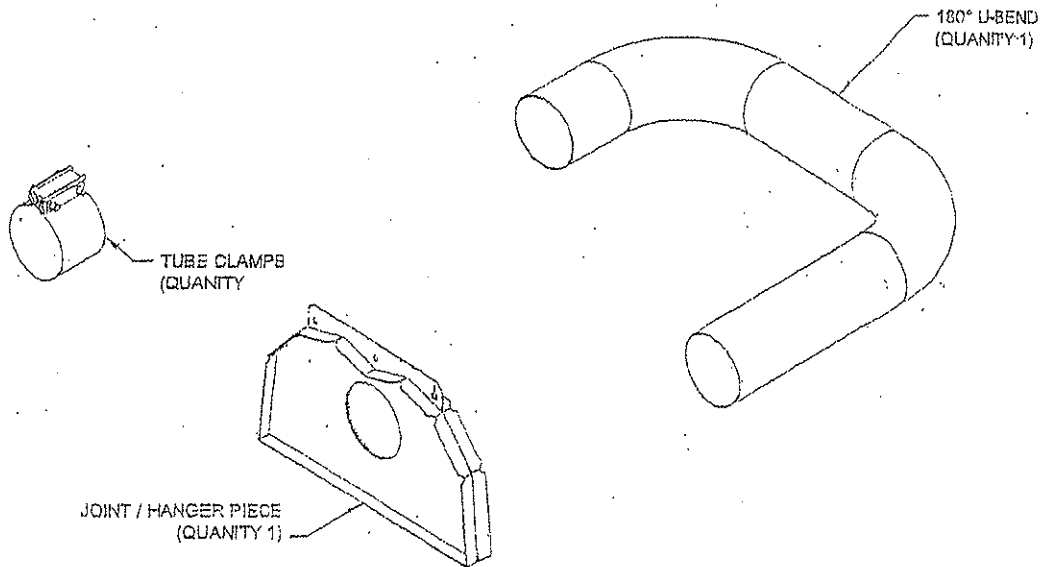
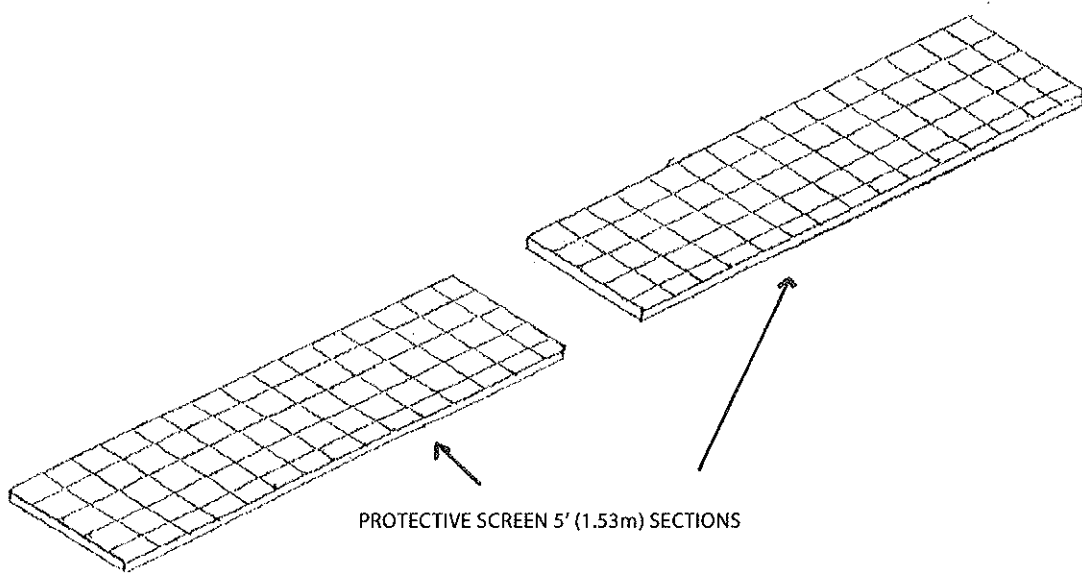
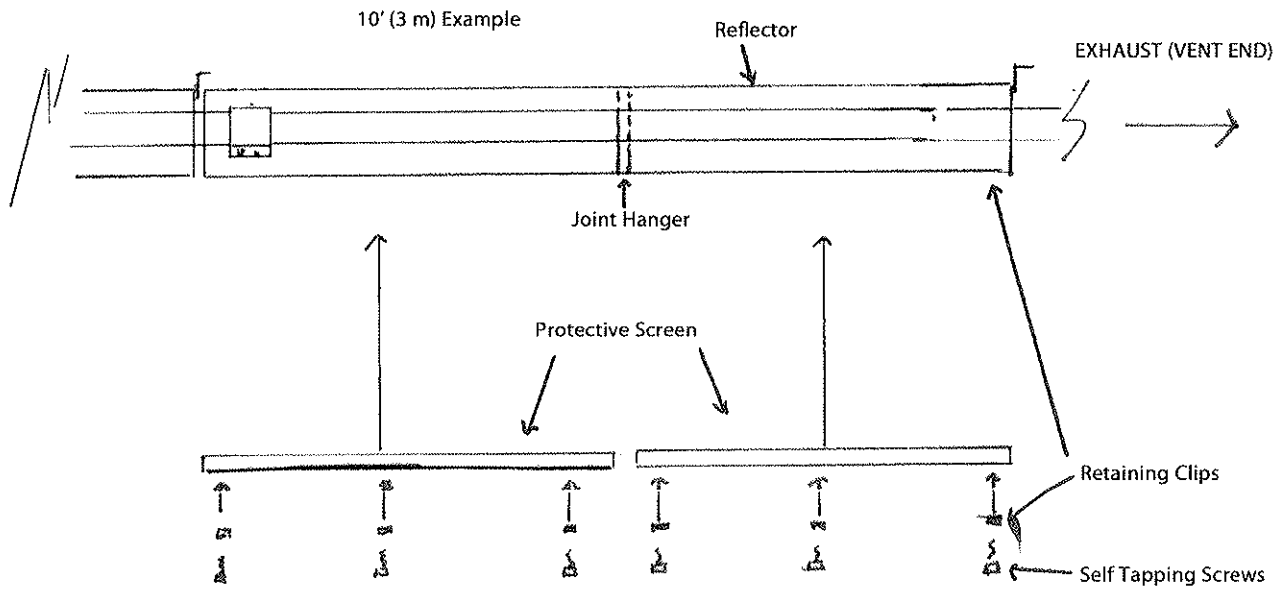


FIGURE #12. 180° U-BEND PACKAGE CONTENTS

# PROTECTIVE SCREEN KIT



## PROTECTIVE SCREEN INSTAIIATION



## **INSTALLATION:**

Provide for adequate clearance around air openings into the combustion chamber, clearances from combustible material, provisions for accessibility and for combustion and ventilating air supply.

### **PLANNING:**

- Familiarize yourself with the equipment and any accessories that you may require.
- Locate the area where unit is to be installed
- Locate area where any holes might have to be cut for:
  - a) Venting
  - b) Any gas piping requirements
- Make sure that there is no obstruction such as hidden electrical wiring, water lines etc... in the areas of concern.
- Locate the thermostat location.



## **WARNING**

Observe minimum clearance to combustibles. REFER TO PAGES 8 & 9

- Locate a grounded, three prong electrical source.
- Measure required amount of various materials required to do the installation, and have these materials on site in an organized manner prior to commencement.

### **SUSPENSION OF HEATER:**

#### **Horizontal Installation:**

Locate suspension points on ceiling or roof. Heater is suspended at standard 10' (3m) intervals (refer to page 17). Adequately secure chains to beam (refer to page 17 suspension points. Hang chains down from suspension point to desired level. Heater is to be hung level. NOTE: Front & rear endcaps are double chained.

#### **Tilt Installation:**

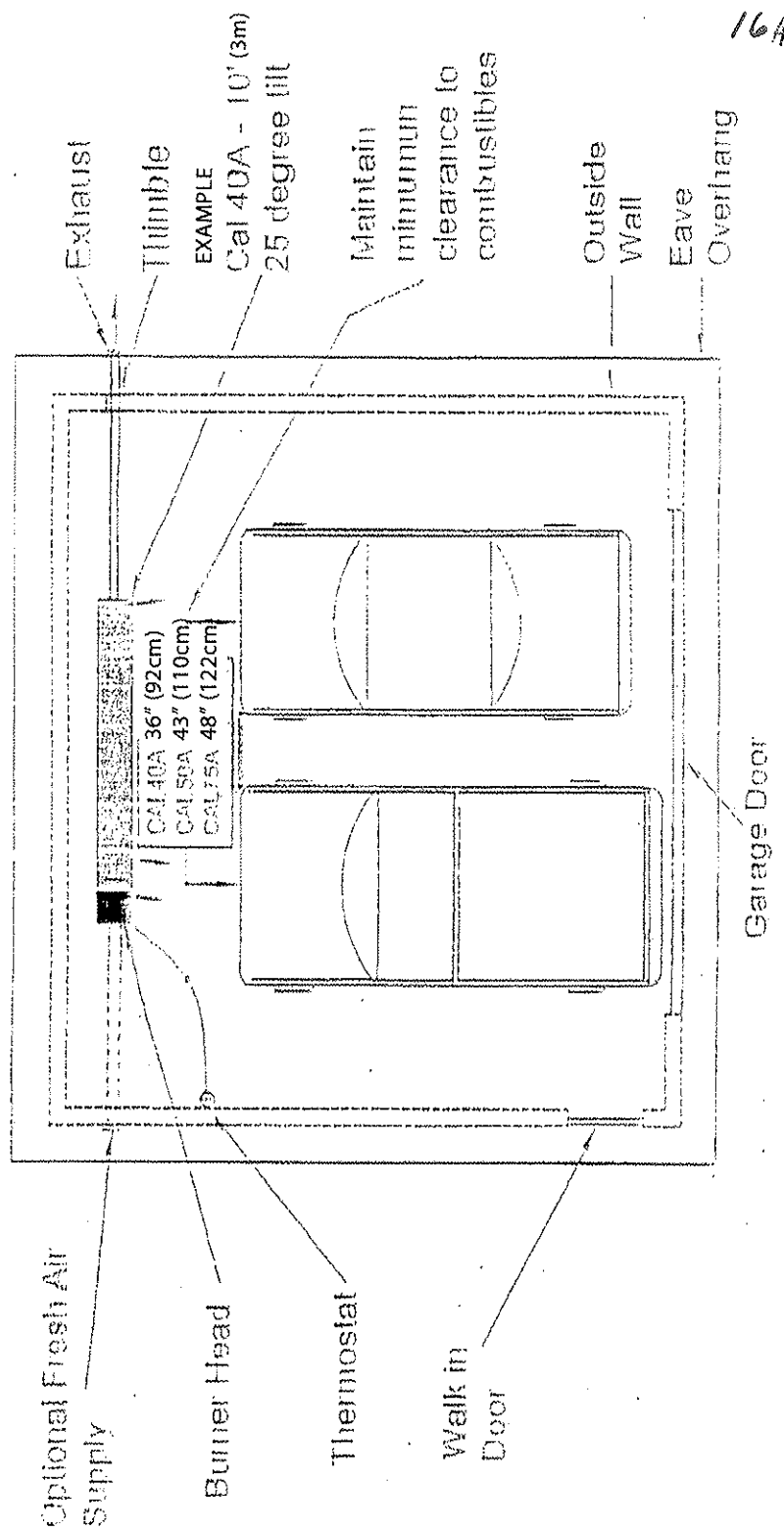
Refer to page 19, for 25° & 45° tilts. Locate suspension points as described above, Horizontal Installation. It is important NOT to over tilt the heater. Units are certified for installation up to 45°, however the **MAXIMUM** recommended tilt is 25°.

**⚠ WARNING:** It is the responsibility of the installer to use hanging chain that is a minimum of 2/0 or with a minimum support capacity of no less than 75 lbs. Also make sure all suspension points are adequate to support weight of heater and any accessories. Also make sure all S-Hooks are affixed properly and the open ends squeezed closed. If the suspension system fails, it is the responsibility of the installer. A failed suspension system can cause property damage, severe injury and/or death.

Refer to pages 20 to 28 for ASSEMBLY OF COMPONENTS and ASSEMBLY OVERVIEW.

FIGURE #12A. TYPICAL GARAGE INSTALLATION

TYPICAL GARAGE INSTALLATION  
(Plan view)



A) SUSPENSION POINTS

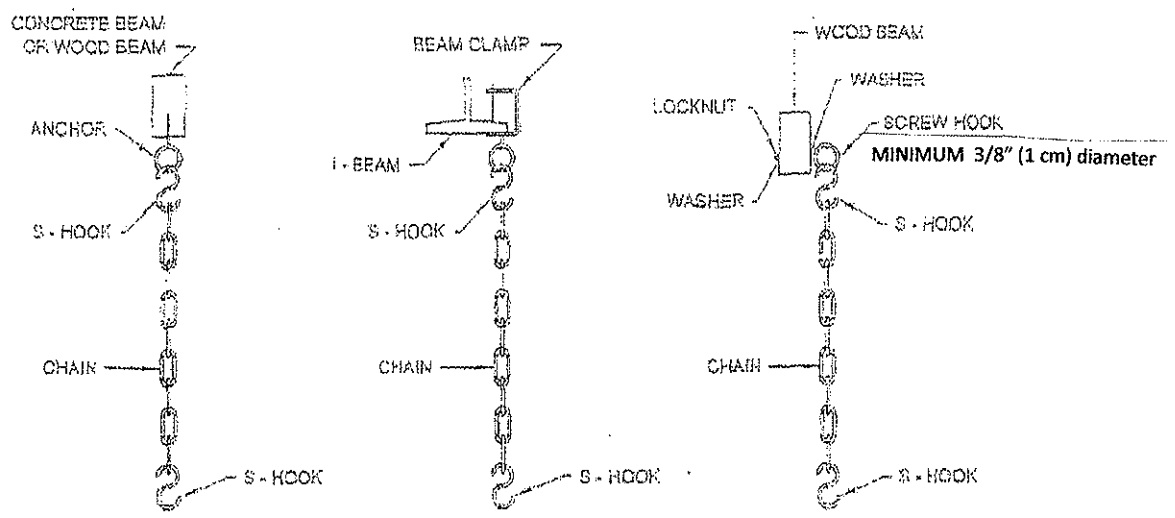
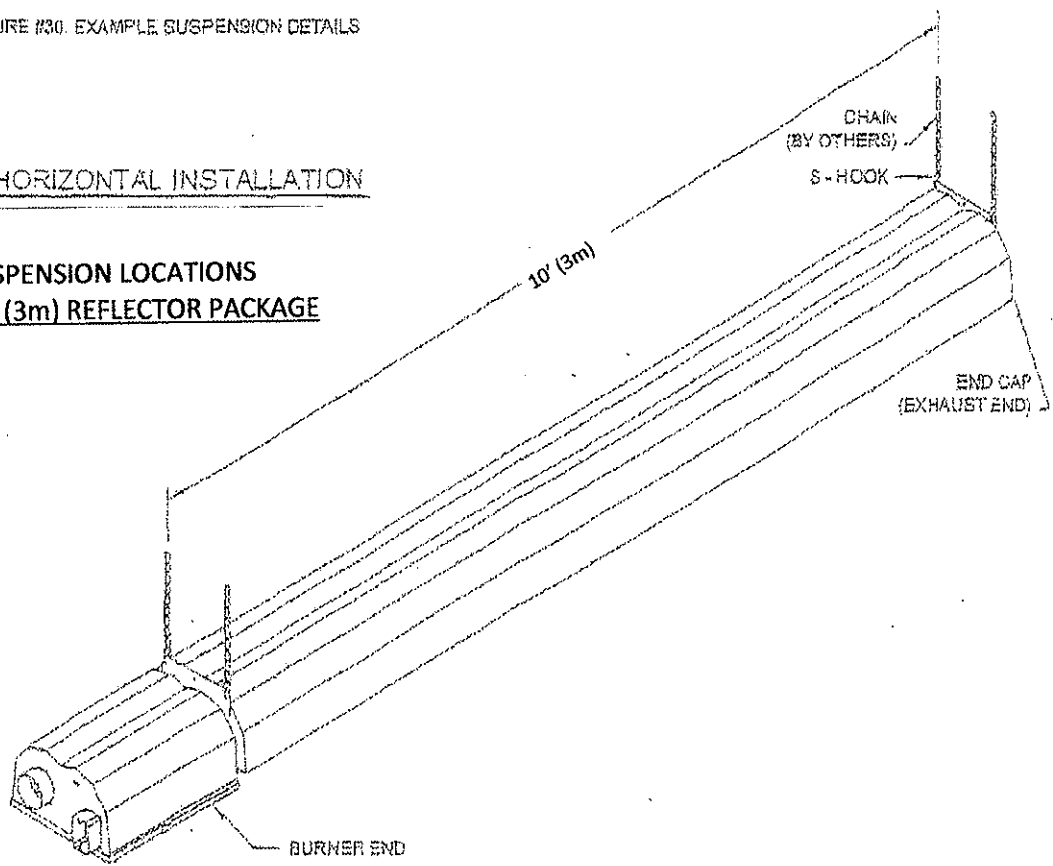


FIGURE #30. EXAMPLE SUSPENSION DETAILS

B) HORIZONTAL INSTALLATION

SUSPENSION LOCATIONS  
10' (3m) REFLECTOR PACKAGE



### C) HORIZONTAL INSTALLATION

Suspension Locations  
10' (3m) to 20' (6.1m) Reflector Packages

Note: 15' (4.6m) kit has 3 sections  
20' (6.1m) kit has 4 sections

2nd Section 10' (3m) Example  
Reflector Kit

5' (1.53 m)

5' (1.53 m)

CHAIN

JOINT / HANGER PIECE

END CAP  
(EXHAUST END)

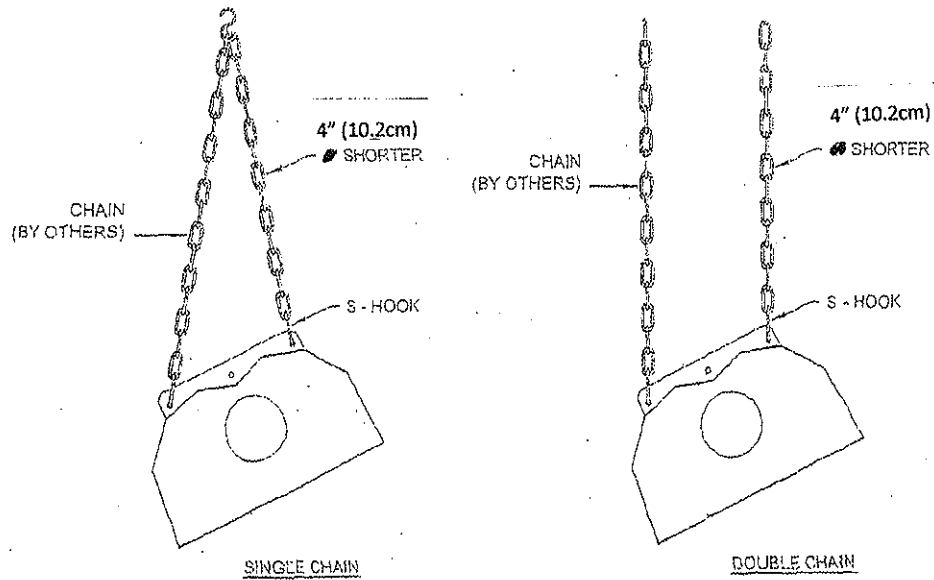
S - HOOK

BURNER END

FIGURE #15. HORIZONTAL INSTALLATIONS -

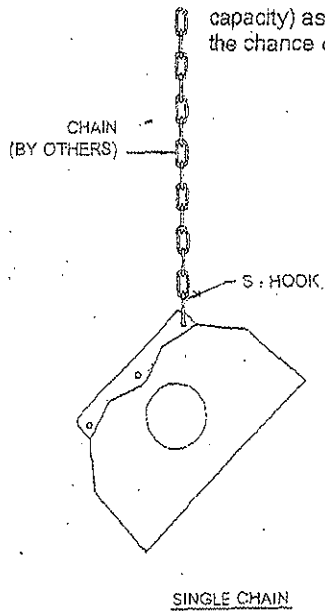
D) 25° TILT (ALL LENGTHS)

NOTE: 25° Tilt is the maximum recommended tilt for most tilt installations.



E) 45° TILT (ALL LENGTHS)

NOTE: 45 degree tilt is **NOT RECOMMENDED**. This angle of tilt causes the ambient air to form a convection current over the tube. The net effect of this action is reduced infrared output (decreased heating capacity) as well as decreased exhaust temperature which may increase the chance of condensation of combustion by-products.



## ASSEMBLY OF COMPONENTS

Refer to text & figures in section titled ASSEMBLY OVERVIEW  
Refer to COMPONENT ASSEMBLY (see pages 21 to 28)

### CAL-40A-10' (3m) TWO PIECE

- 1) Attach burner head to 5' (1.53 m) preassembled reflector section via bolts and washers
- 2) Assemble two piece baffle by inserting end with locking tabs into receiving end at 90° angle then rotating 90° until tabs are locked and baffle is in a straight line  
(see figure 22 page 23). **Set these baffles aside. They must be installed in the tube in the last 10' (3 m) of the heater. (see page 23)**
- 3) Install S-hooks onto joint hangers. Hang preassembled burner box, combustion tube and reflector (first 5' (1.53 m) of heater from chains. (see warning on page 16)
- 4) Secure joint/hanger piece to one end of a reflector by overlapping onto joint/hanger piece 3/4 inch (see page 21) and securing via provided self tapping screws.
- 5) Attach the above mentioned reflector to the pre-assembled joint/hanger by overlapping reflector on hanger and securing via provided self-tapping screws. (see page 21)
- 6) Hang assembly from suspended chains via 'S' hooks, installed from ceiling trusses ( see warnings on page 16)
- 7) Install radiant tube by positioning one end into the joint/hanger and butting the other end to the previously installed radiant tube. Secure with clamp and self-tapping screws.

**IMPORTANT: Make sure to secure clamp to tube via self-tapping screws.**  
(see diagram 19 on page 21)

- 8) Secure remaining joint/hanger pieces to reflectors as per item #4.
- 9) Install baffle assembly into the last (exhaust – vent end) 10' (3 m) of the heater. (see page 23)
- 10) If side wall venting, install side wall vent adaptor/reducer and continue with the installation of the venting.
- 11) If venting through the roof, install optional flue/vent adaptor and connect to approve "B" vent chimney system.
- 12) If required, install outside combustion air hood and ducting. (see page 29 & 30 for details)
- 13) Connect fuel supply (see pages 36 to 39)
- 14) Connect electrical supply and thermostat (see pages 42 to 46)

### CAL-50A-15' (4.6m) THREE PIECE

- 1) Follow CAL-40A-10' (3 m) Two Piece instructions item #1 thru #8 and then repeat from #4 thru #8 for the remaining items.
- 2) Continue to item #9

### CAL-75A-20' (6.1m) FOUR PIECE

- 1) Follow CAL-40A-10' (3 m) Two Piece instructions item #1 thru #8 and then repeat from #4 thru #8 twice for the remaining items.
- 2) Continue to item #9

JOINT HANGER TO REFLECTOR

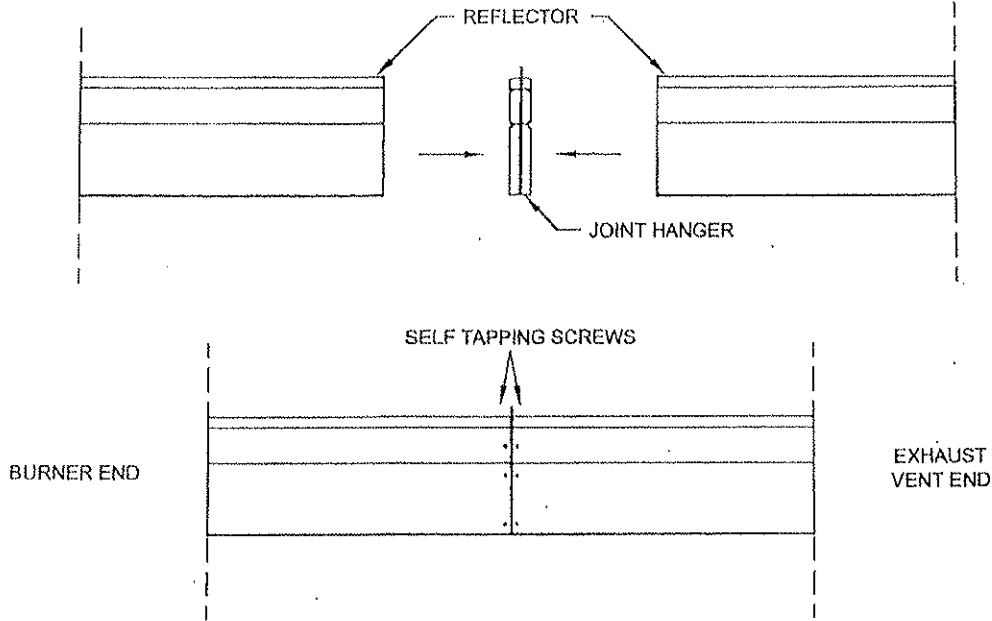


FIGURE #18. JOINT HANGER INSTALLATION

CLAMP COUPLER

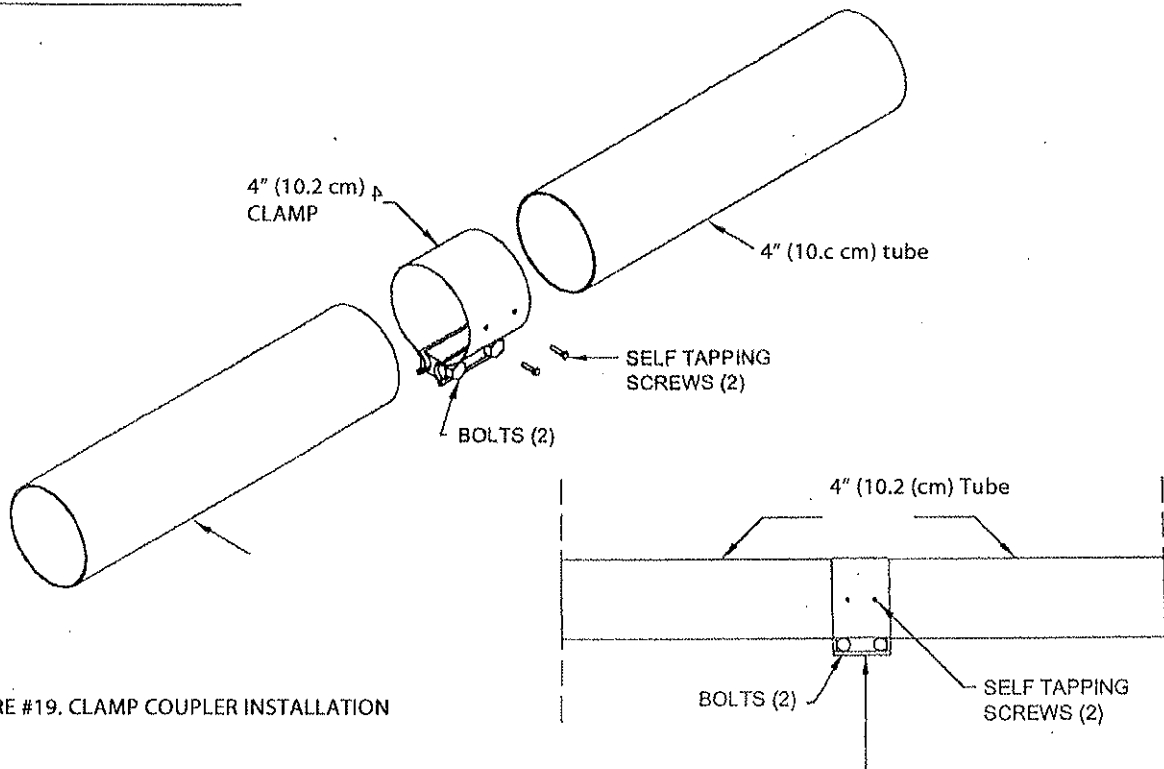


FIGURE #19. CLAMP COUPLER INSTALLATION

END CAP TO REFLECTOR

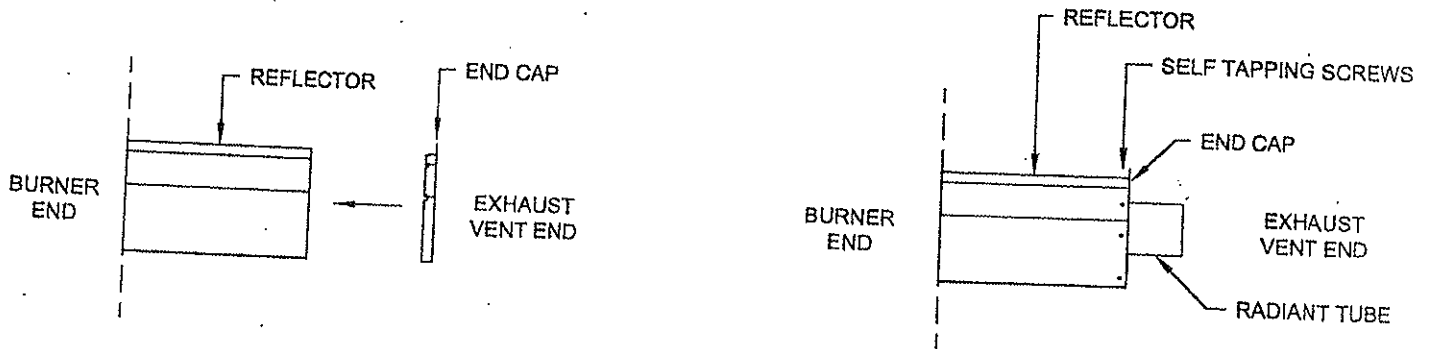


FIGURE #21. END CAP INSTALLATION

BAFFLE/TURBULATOR INSTALLATION

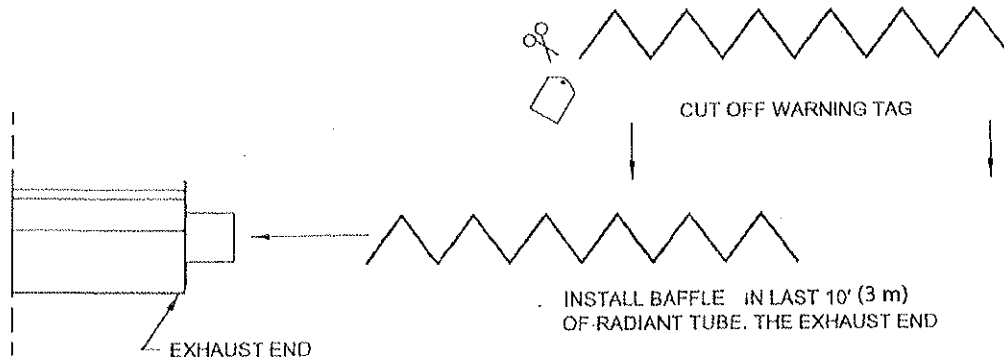


FIGURE #22. BAFFLE / TURBULATOR INSTALLATION

VENT ADAPTOR INSTALLATION

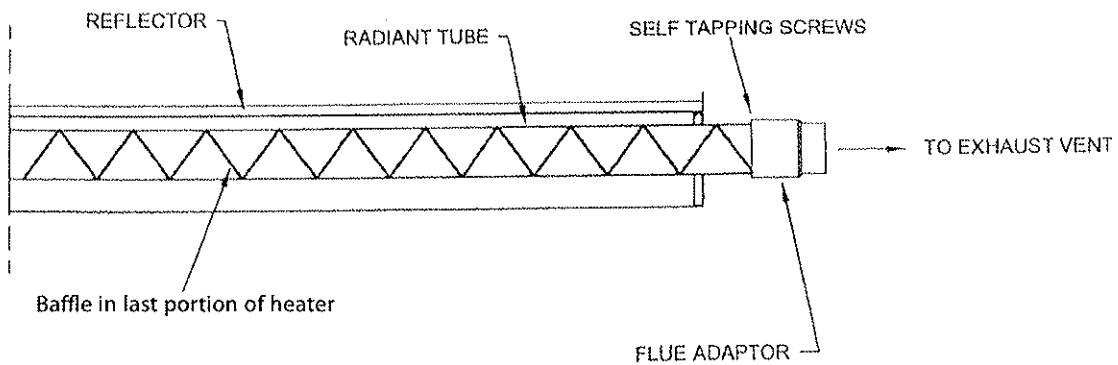


FIGURE #23. BAFFLE / TURBULATOR + FLUE ADAPTOR INSTALLATION

## **ASSEMBLY (OVERVIEW)**

1. Verify length of reflector package to be installed. Read 'ASSEMBLY OF COMPONENTS', on page 20 and view related diagrams on pages 21 - 23.
2. Locate section of manual that corresponds with length to be installed. View the corresponding exploded view. The illustration contains the details required to install the unit.

<b>Reflector Package Length</b>	<b>Corresponding Page</b>
10' (3 m)	25
15' (4.6 m)	26
20' (6.1 m)	27

## **ASSEMBLY OF OPTIONS**

Refer to section of manual containing accessories to be installed.

<b>Optional Accessories</b>	<b>Corresponding Page</b>
90° Elbow Kit	28
180° Elbow Kit	28
Combustion Air Kit	30
Sidewall Vent Kit	32
Outdoor Installation Kit	35
Low Voltage Thermostat	45
Line Voltage Thermostat	46

View exploded illustration, install accordingly.



90° ELBOW KIT

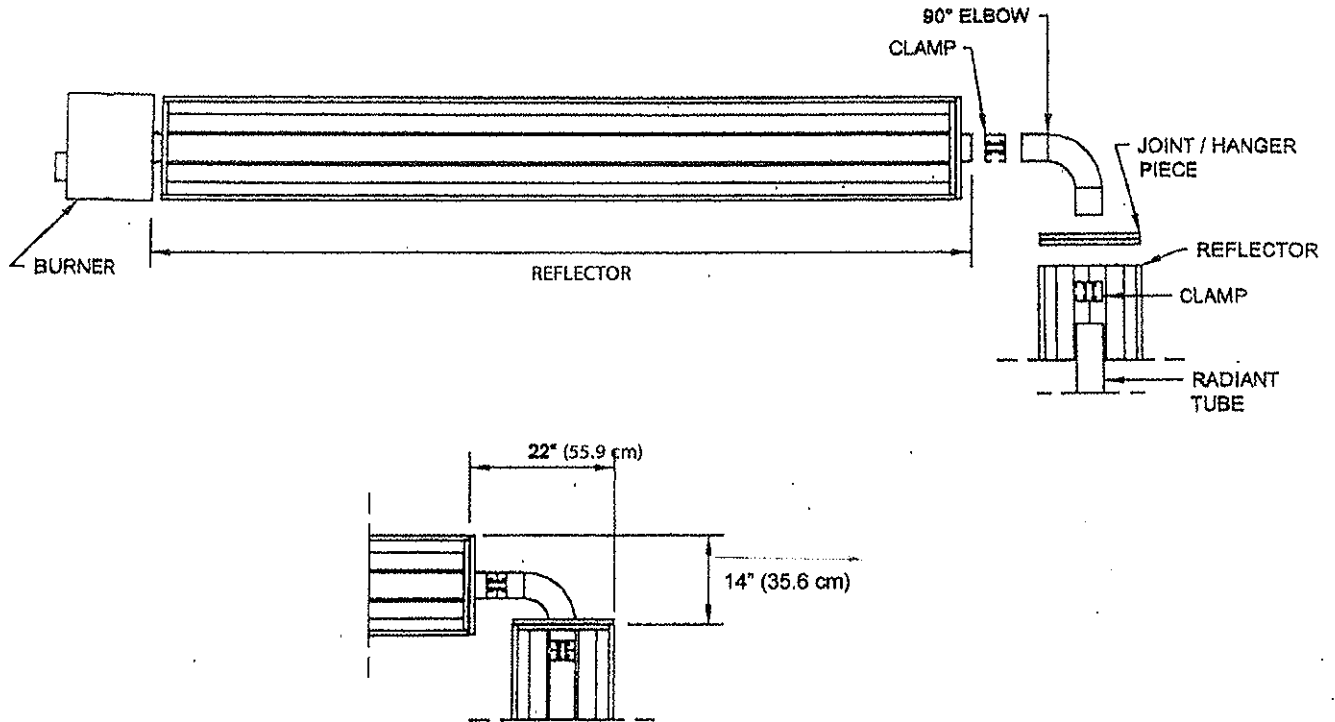
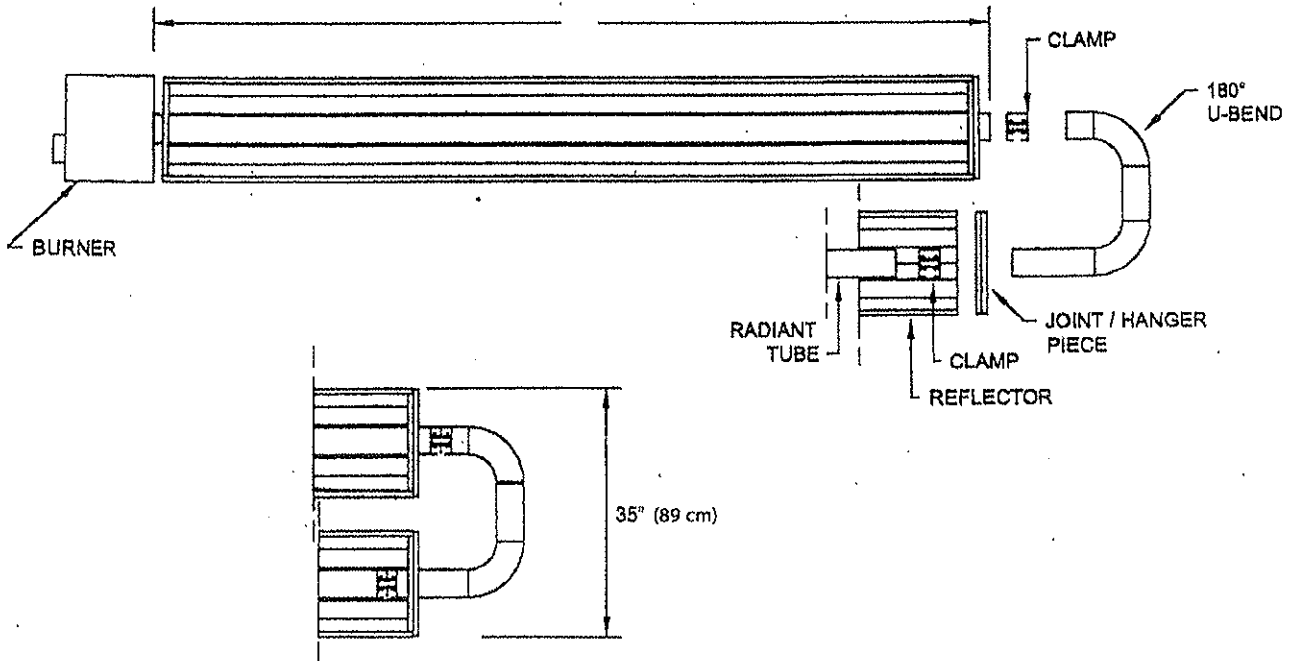


FIGURE #27. 90° ELBOW KIT INSTALLATION

180° U - BEND KIT



## **OUTSIDE COMBUSTION AIR SUPPLY** (refer to page 30)

The heater must be installed in a location where there is adequate air supply for combustion to take place.

Outside Combustion Air is required for U. S. Residential Garage Heater Installations, and optional for others. Outside air can either be ducted directly to the burner head or a 4" (10.2 cm) fresh air hood can be installed in the wall in such a fashion that the outside air can enter the space that the heater is installed in.

In other installations: If the heater is: 1) Installed in a tightly closed building that has less than one (1 sq inch (2.54 sq cm) of free opening for each 1,000 b.t.u input of heater or less than 100 square inches of free opening. Or, 2) If the building has contaminants in the air or the are is under a slight negative pressure.

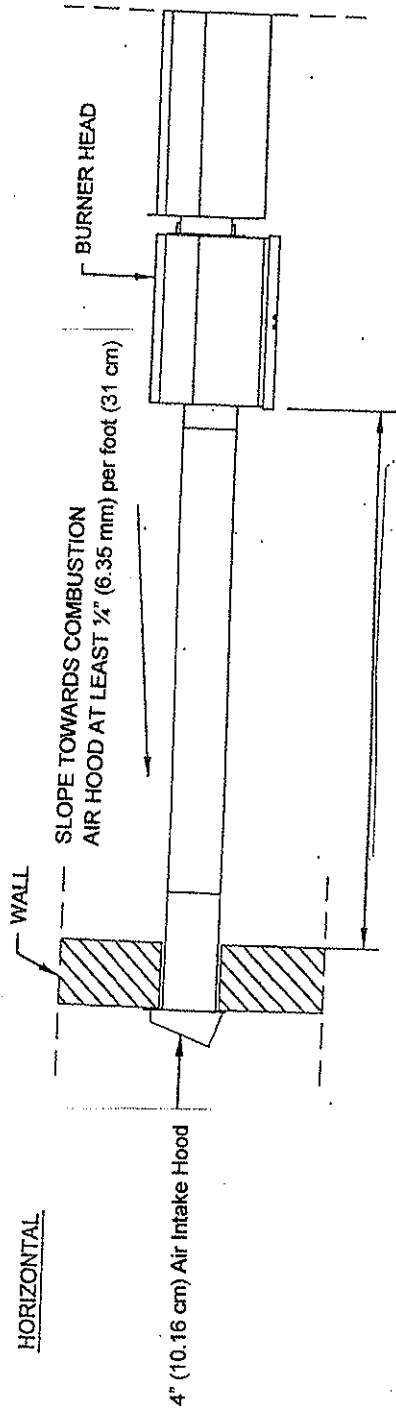
Provisions for adequate combustion and ventilation air must be provided. Adequate clearances around air openings into the combustion chamber must be provided.

**NOTE:** Maximum Duct Length is 15' (4.6 m). This length can have up to 2 - 90° elbows included, thereafter, deduct 10' (3 m) for every 90° elbow and 5' (1.53) for every 45° elbow used.

If condensation occurs, insulate duct or contact distributor for alternate methods for your installation. Slope duct down, away from burner box towards the combustion air intake hood. The combustion air intake hood must be installed at a height sufficient enough to prevent any blockage by snow.

**COMBUSTION AIR OPTION A  
DUCTED**

HORIZONTAL



MAXIMUM LENGTH IS 15' (4.6 m)  
INCLUDING 2 - 90° ELBOWS.  
DEDUCT 10' (3m) FOR EVERY  
ADDITIONAL 90° ELBOW AND 5 (1.5m)  
FOR EVERY 45° ELBOW USED.

**COMBUSTION AIR OPTION B  
UN-DUCTED**

VERTICAL

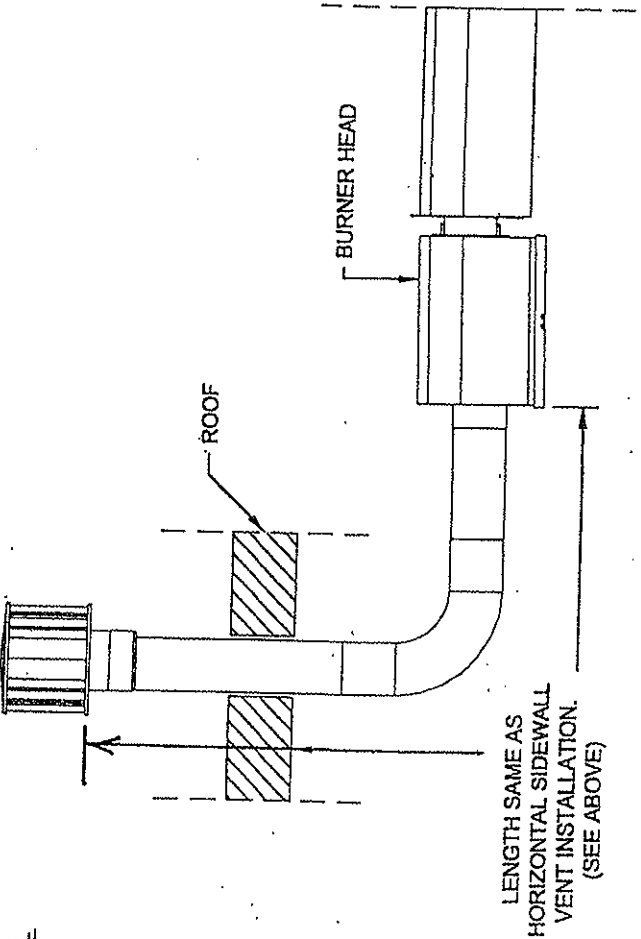
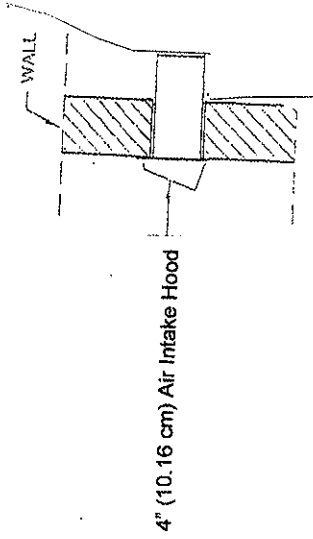


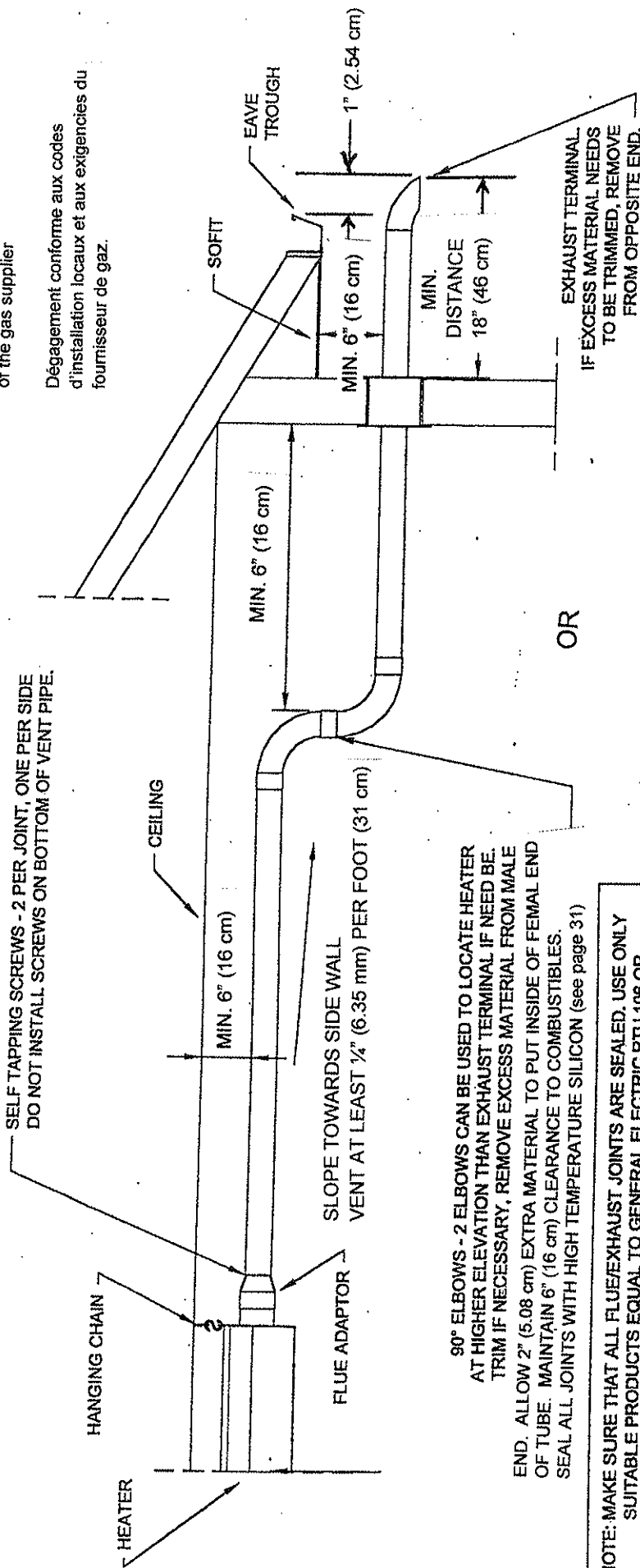
FIGURE #29. OUTSIDE COMBUSTION AIR SUPPLY

# SIDE WALL VENTING

Clearance in accordance with local installation codes and the requirements of the gas supplier

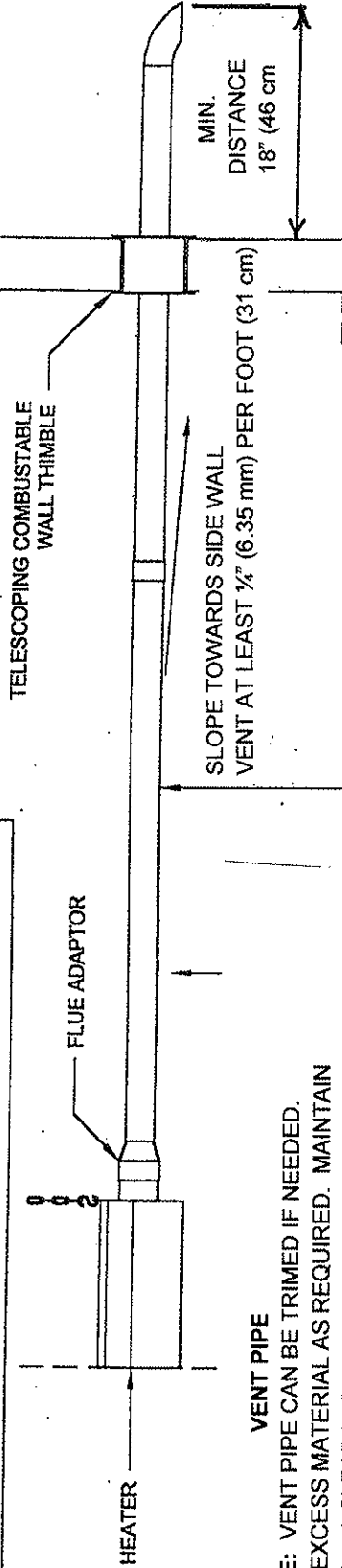
Dégagement conforme aux codes d'installation locaux et aux exigences du fournisseur de gaz.

SELF TAPPING SCREWS - 2 PER JOINT, ONE PER SIDE  
DO NOT INSTALL SCREWS ON BOTTOM OF VENT PIPE.



90° ELBOWS - 2 ELBOWS CAN BE USED TO LOCATE HEATER AT HIGHER ELEVATION THAN EXHAUST TERMINAL IF NEED BE. TRIM IF NECESSARY, REMOVE EXCESS MATERIAL FROM MALE END. ALLOW 2" (5.08 cm) EXTRA MATERIAL TO PUT INSIDE OF FEMAL END OF TUBE. MAINTAIN 6" (16 cm) CLEARANCE TO COMBUSTIBLES. SEAL ALL JOINTS WITH HIGH TEMPERATURE SILICON (see page 31)

NOTE: MAKE SURE THAT ALL FLUE/EXHAUST JOINTS ARE SEALED. USE ONLY SUITABLE PRODUCTS EQUAL TO GENERAL ELECTRIC RTU 108 OR PERMATEX FORM A GASKET RED HIGH TEMPERATURE SILICONE ADHESIVE SEALANT. (NOT SUPPLIED)



NOTE: VENT PIPE CAN BE TRIMED IF NEEDED. CUT EXCESS MATERIAL AS REQUIRED. MAINTAIN 6" (16 cm) CLEARANCE TO COMBUSTIBLES. SEAL ALL JOINTS WITH HIGH TEMPERATURE SILICONE (see page 31)

NOTE: ELBOWS ARE NOT REQUIRED IF HEATER AND VENT TERMINAL ARE TO BE INSTALLED AT SAME ELEVATION.

NOTE: ONE ELBOW CAN BE USED TO INSTALL HEATER 90° TO EXHAUST TERMINAL.

FIGURE #30. SIDE WALL VENTING, SINGLE UNIT

VERTICAL VENTING  
(SIDE VIEW)

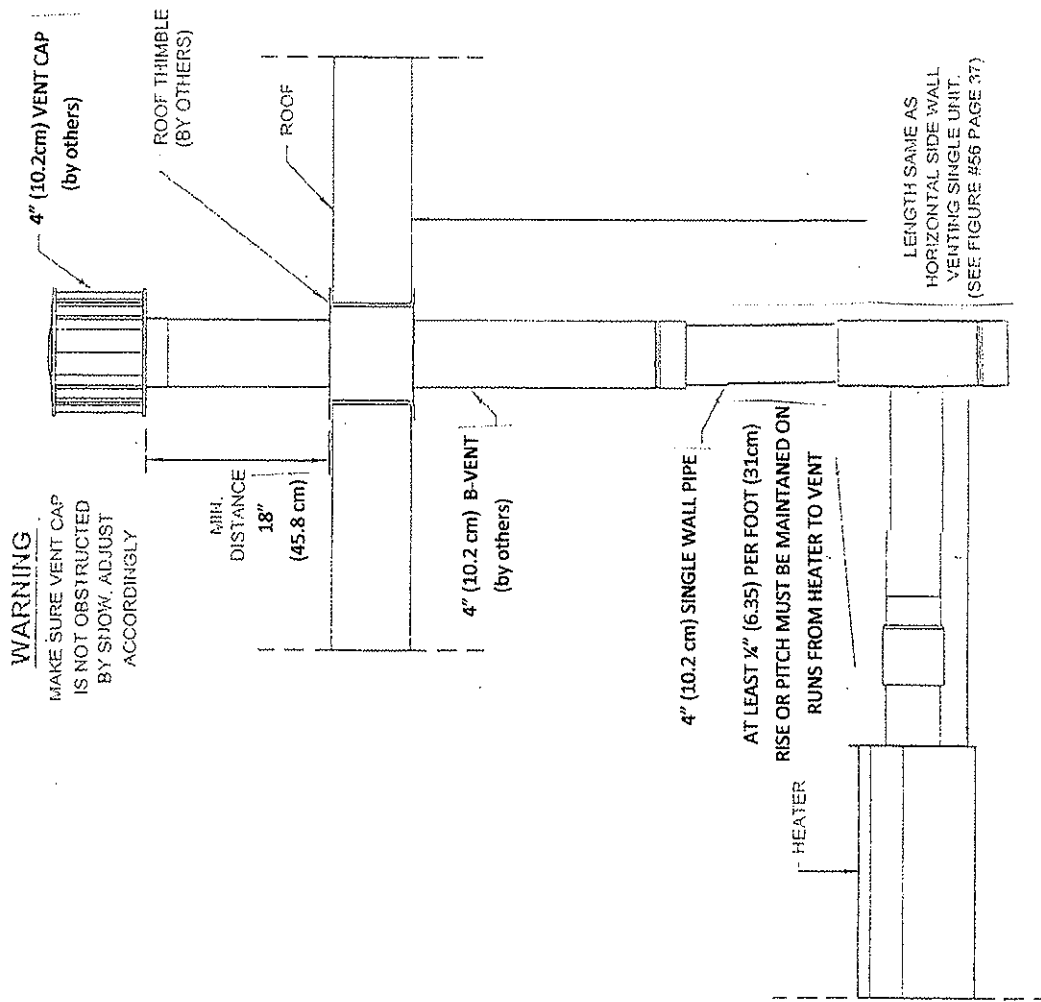


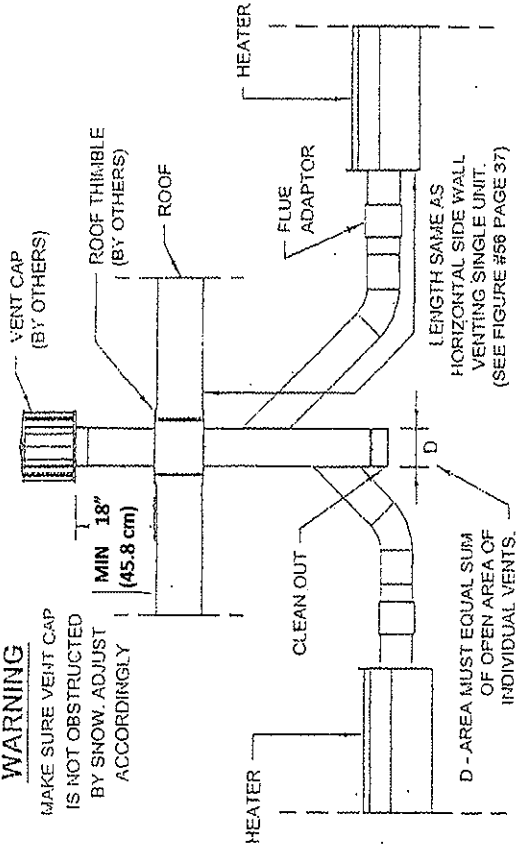
FIGURE #31. VERTICAL VENTING, SINGLE UNIT

COMMON  
VERTICAL VENTING

**WARNING**

MAKE SURE VENT CAP IS NOT OBSTRUCTED BY SNOW. ADJUST ACCORDINGLY

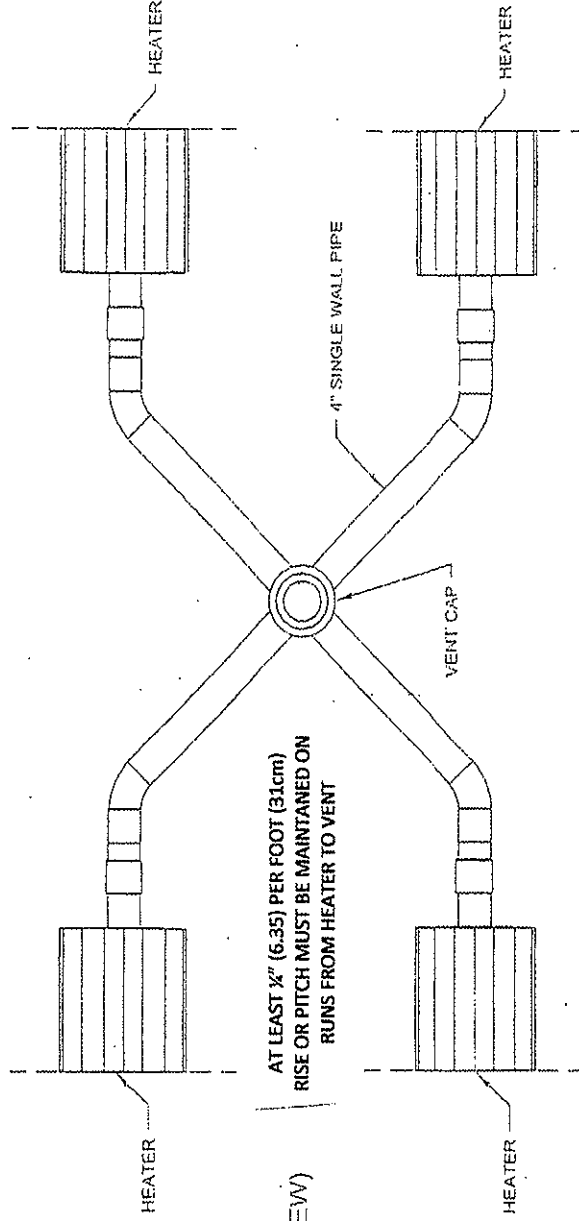
MIN 18"  
(45.8 cm)



(SIDE VIEW)

**NOTE**

UNITS THAT ARE COMMONLY VENTED MUST BE CONTROLLED BY THE SAME LINE VOLTAGE THERMOSTAT



(TOP VIEW)

FIGURE #22. COMMON VERTICAL VENTING. TWO OR MORE UNITS INTO ONE COMMON VENT

## FOR OUTDOOR APPLICATIONS

35

Units can be installed in outdoor locations.

Procedure:

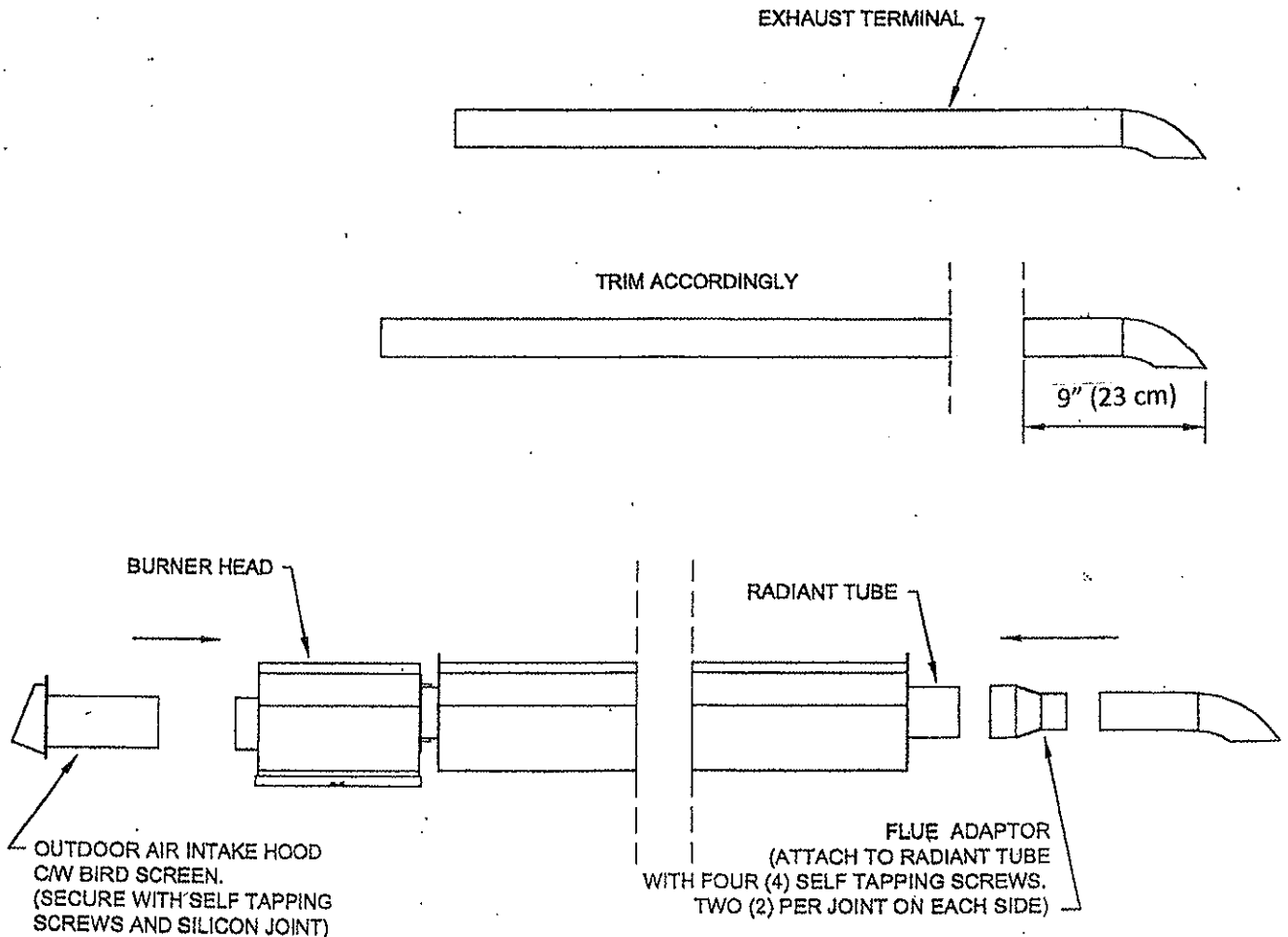
- Attach Outdoor Air Intake Hood to air intake collar located on end of burner box with three (3) screws. Apply silicone adhesive to seal joint.
- Attach vent cap to exhaust end of heater with two (2) screws. Trim excess length from vent cap prior to installing into adaptor.

- **FUEL SUPPLY:** Via approved flexible connector for your area. (see page 39)  
**CANADA:** *Natural Gas and Propane Installation Code, CSA B149.1* or latest edition.  
**USA:** *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or latest edition.

- **Electrical connections for outdoor locations must be made in accordance with:**  
**ELECTRICAL GROUNDING:**  
**CANADA:** *Canadian Electrical Code, CSA C22.1* or latest edition.  
**USA:** *National Electrical Code, ANSI/NFPA 70* or latest edition

In Canada: Electrical equipment and wiring shall comply with the applicable provisions of the current *Canadian Electrical Code, CAN/CSA C22.1, Part I and Part II, and CAN/CSA C22.2 No. 3, Electrical features of Fuel Burning Equipment.*

### OUTDOOR INSTALLATIONS



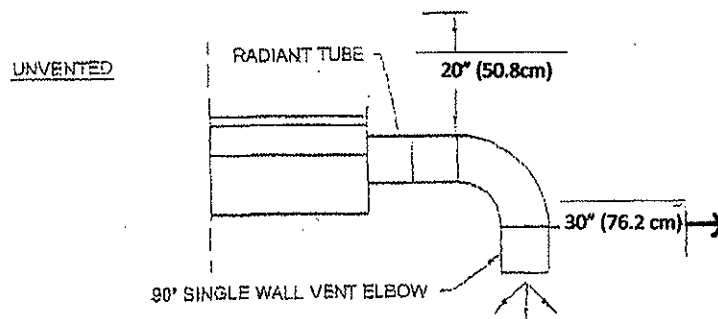
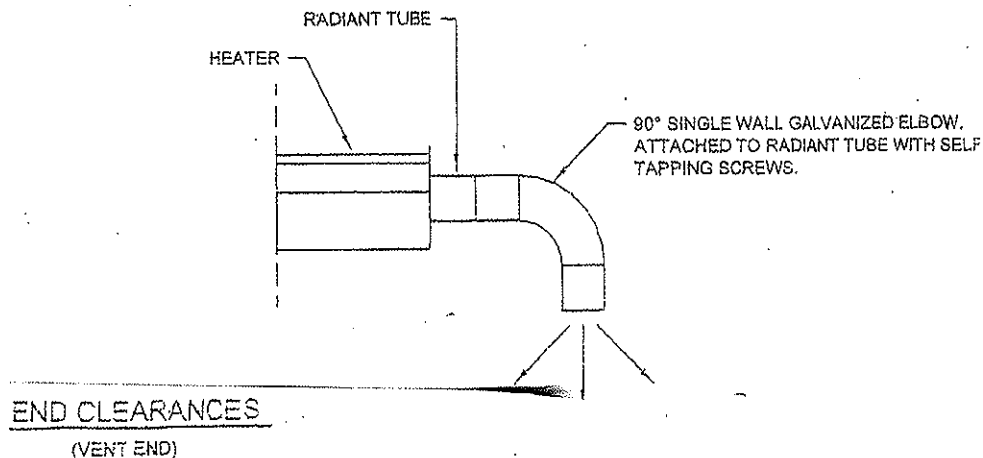
## UNVENTED INSTALLATIONS: BROODER OR APPROVED INDUSTRIAL APPLICATIONS

**⚠ WARNING: UNVENTED INSTALLATIONS ARE NOT APPROVED FOR RESIDENTIAL GARAGES.** Do not operate heater in a residential garage application without an approved (exhaust) venting system installed and connected to the heater. When this heater is installed in a residential garage, the operation of the heater, when not connected to a properly installed and maintained venting system, can result in carbon monoxide (CO) poisoning and possible death.

Units may **ONLY** be installed in unvented installations such as brooder barns or industrial buildings if the following conditions are met:

- 1) A 4" (10.2 cm) diameter by 90° elbow must be attached to the flue, vent or exhaust end of heater and turned down pointing towards the floor. (see diagram #62)
- 2) The heater must be interlocked with an exhaust fan sized at 4 (four) CFM (114 Liters) for every 1000 Btu/hr input.
- 3) For BROODER INSTALLATION ONLY, the fan interlock is not required only if the maximum input does not exceed 30 Btu/hr per cubic foot (28.32 Liters) of volume of air in the building or the input specified by local codes or authorities.
- 4) Maintain clearance to combustibles at exhaust (vent) end as noted below.

### UNVENTED INSTALLATIONS



GAS PIPING

**⚠ WARNING:** All gas work **MUST** be performed by qualified/licensed personnel with adequate training and experience in this field.

**⚠ WARNING:** Use only the type of gas for which the heater is equipped. Using the wrong gas could create a hazard, resulting in damage, personal injury or death.

In Canada refer to the **Natural Gas and Propane Installation Code, CSA B149.1** or latest edition and in the USA, the **National Fuel Gas Code, ANSI Z223.1/NFPA 54** or latest edition.

- a) Adequate supply of gas to the heater is required for it to produce the designed amount of heat output. The gas meter must have a large enough capacity to handle the extra consumption required by the heater.
- b) The gas line must be of an adequate size to deliver the necessary amount of fuel to the unit.
- c) If there is any question concerning a) or b) call your local gas company for further assistance.
- d) Make sure that all piping is supported properly.
- e) All connections must have special sealing compound applied to them.
- f) A drip leg must be installed before the heater to prevent contaminating matter interfering with the operation of the unit.
- g) Check piping for leaks via pressure test. **Install a 1/8" (3.175 mm) N.P.T. plugged tapping** immediately ahead of heater in gas supply. Use this location for test gauge. A soap and water test can be used to verify location of any possible leak.

**⚠ WARNING:** Do not use an open flame for testing!

**⚠ WARNING:** For high pressure testing, disconnect heater(s) and shut-off cocks and cap off pipe for test. Failure to do so will damage pressure ratings on the above mentioned equipment and cause a complete replacement of these parts.

**WARNING**

The heater and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing for that system at test pressures in excess of  $\frac{1}{2}$  psig.

The heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than  $\frac{1}{2}$  psig.

Refer to pages 38 & 39 for gas connection to heater.

## GAS CONNECTION

THE HEATER CAN BE CONNECTED TO THE GAS PIPING SYSTEM ONE OF THE FOLLOWING TWO (2) METHODS.

### #1 HARD PIPE

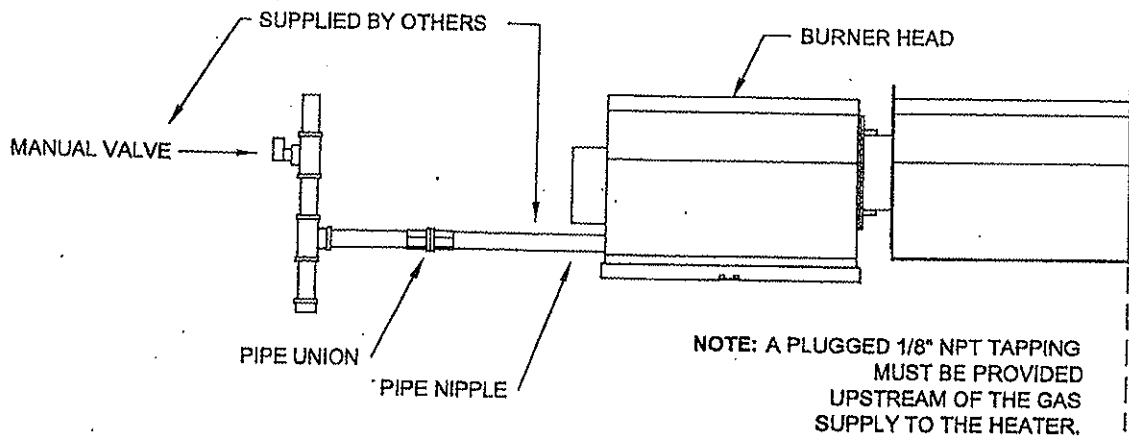


FIGURE #34. HARD PIPE GAS CONNECTION

### #2 FLEX CONNECTOR

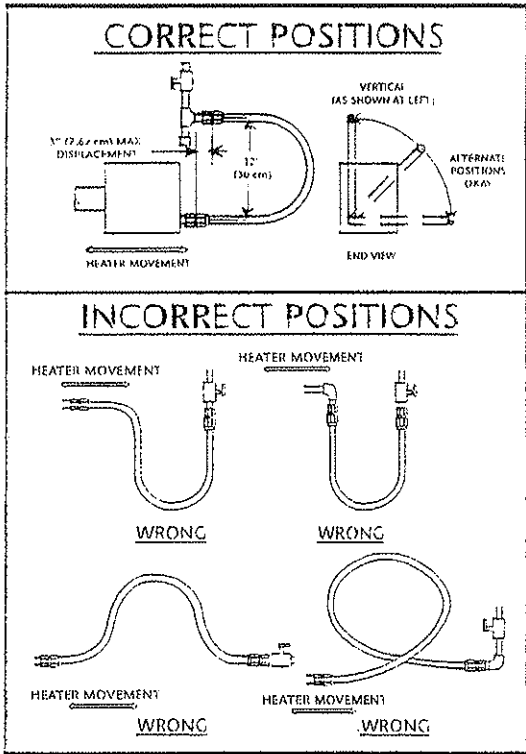
**WARNING**

**FIRE AND/OR EXPLOSION HAZARD**

*Can cause property damage, severe injury or death.*

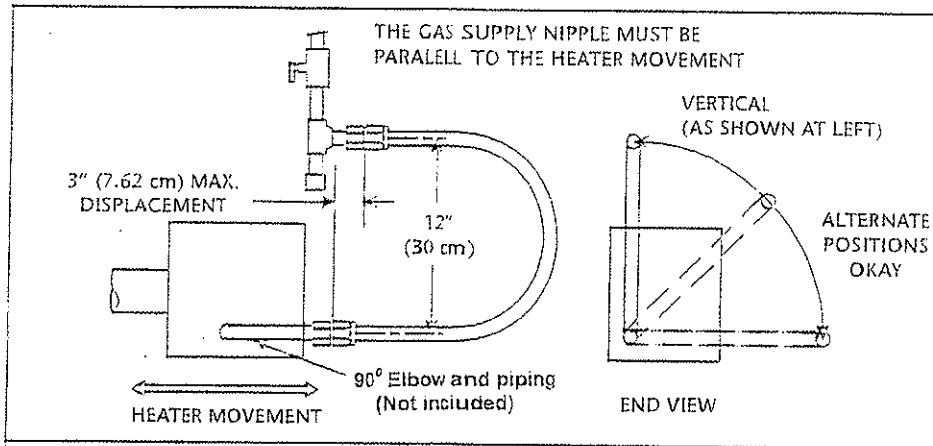
With each firing cycle, the radiant pipe will expand and contract which can cause the burner head to move horizontally with reference to the gas supply line. If the gas connection is not installed in strict accordance as shown in figure 35, a gas leak can occur resulting in an extreme unsafe condition.

" Certified connectors are recommended to be installed as shown, (figure 35 page 39) in one plane, and without sharp bends, kinks, or twists. The gas take off must be parallel to the burner gas inlet connection. "  
(CSA)



### Installation Position Instructions

### Connector Installation



#### **⚠ WARNING:**

**CONNECTOR MUST BE INSTALLED AS PER THE CONFIGURATION ILLUSTRATED ABOVE. USE ONLY THE 36" (90 cm) CONNECTOR OF 1/2" (1.27 cm) NOMINAL ID FOR LENGTHS FROM 10' (3m) TO 70' (21.3 m) AND A 36" (90 cm) CONNECTOR OF 3/4" (1.905 cm) NOMINAL ID FOR LENGTHS GREATER THAN 70' (21.3m).**

IN CANADA: "A radiant tube-type infrared heater shall only be connected with a Type 1 hose connector that is (a) certified as being in compliance with the Standard for Elastomeric Composite Hose and Hose couplings for Conducting Propane and Natural Gas, CAN/CGA 8.1 and (b) of a length of 36 +/- 6" (90 +/- 15 cm)."

IN USA: Flexible Metallic connectors must be certified for use on a radiant tube-type infrared heater as per the Standard for Connectors for Gas Appliances, ANSI Z21.24/CSA 6.10. Connector is available from manufacturer.

FIGURE #35. GAS LINE CONNECTION WITH CERTIFIED FLEXIBLE GAS CONNECTION


**WARNING**


Natural gas heating values can vary widely. It is the responsibility of the Installer to make sure that the input rate to the heater as installed does not exceed the nameplate rating of the heater. Failure to do so can cause radiant tube failure, resulting in injury or death.

The maximum BTUH input capacity for each model is shown on the heater's rating plate and in the specification table. This input must not be exceeded.

The input shown may be used in geographic area where the elevation is from 0 to 4,500 feet (1372 m) above sea level (Canada only) in accordance with CGA 2.17-M91 (R2003), no change required to main orifice. For installations above 4,500 (1372 m) refer to *Natural Gas and Propane Installation Code, CSA B149.1* or latest edition, or contact the factory. In the USA: For installations above 2000 feet (610 m), the appliance shall be de-rated 4 percent (%) for each 1000 feet (305 m) of elevation above sea level. The Btu/hr input depends on the calorific heating value of the gas, orifice size, and manifold pressure. Orifice sizes are based upon values of 1000 Btu/hr/cu. ft (.028316 cubic meter) and 2500 Btu/hr/cu. ft. (.028316 cubic meter) for L.P.G. (propane)


**WARNING**


NEVER ATTEMPT TO MODIFY THIS HEATER — FIRE, EXPLOSION, OR ASPHYXIATION MAY RESULT. If malfunction is apparent, contact qualified service agency and/or gas utility for assistance.

#### How to Determine Gas Input Rate:

Where gas is metered, the input rate may be determined by the following method; Contact the gas supplier, public utility company or LP (propane) gas distributor to obtain the calorific gas value of the gas being used. When checking the gas input rate, any other gas burning appliances connected to the same meter must be completely off. The heater should be allowed to operate for 5 minutes before attempting to check the gas input rate.

To check flow rate, observe the one cubic foot dial on the gas meter and determine the number of seconds required for the dial hand to complete one revolution (seconds to flow one cubic foot).

To determine the number of seconds per cubic foot that is necessary to achieve the correct input rate, use the following formula:

$$\text{GAS VALUE} \times 3600 / \text{DESIRED INPUT} = \text{SECONDS NEEDED}$$

Example: 1000 BTU gas, heater input 100,000 BTUH

Seconds for one cubic foot =  $1000 \times 3600 / 100,000 = 36$  seconds

If when clocking the meter, the one cubic foot dial makes a complete revolution in less time than was calculated that it should be derated. If it takes more time for the meter to make one revolution than was calculated, the unit is underfired.

The orifice size must be changed to correct an overfired or underfired condition. If it is determined that different orifices are needed, please contact your distributor for assistance in selecting the correct replacement.

## ELECTRICAL CONNECTION

Refer to rating plate on heater for electrical specifications. All electrical connections must be made by a qualified/licensed experienced electrician.

Supply grounded, adequate electricity to the three prong electrical cord attached to the burner head.

**WARNING:** DO NOT operate heater until it has been thoroughly installed, inspected and is ready for initial fire-up.

**NOTE:** All Electrical connections and wiring must be made in accordance as follows:

**CANADA:** *Canadian Electrical Code, CSA C22.1* or latest edition.

**USA:** *National Electrical Code, ANSI/NFPA 70* or latest edition

In Canada: Electrical equipment and wiring shall comply with the applicable provisions of the current *Canadian Electrical Code, CAN/CSA C22.1, Part I and Part II, and CAN/CSA C22.2 No. 3, Electrical features of Fuel Burning Equipment.*

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105 degree C (221 F).

This heater is equipped with a three-prong (grounding) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle. Do not cut or remove the grounding prong from this plug.

## ELECTRICAL CONNECTION BURNER HEAD

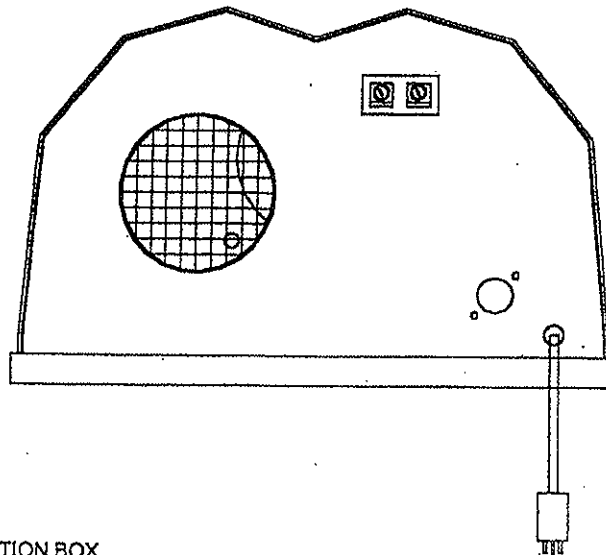
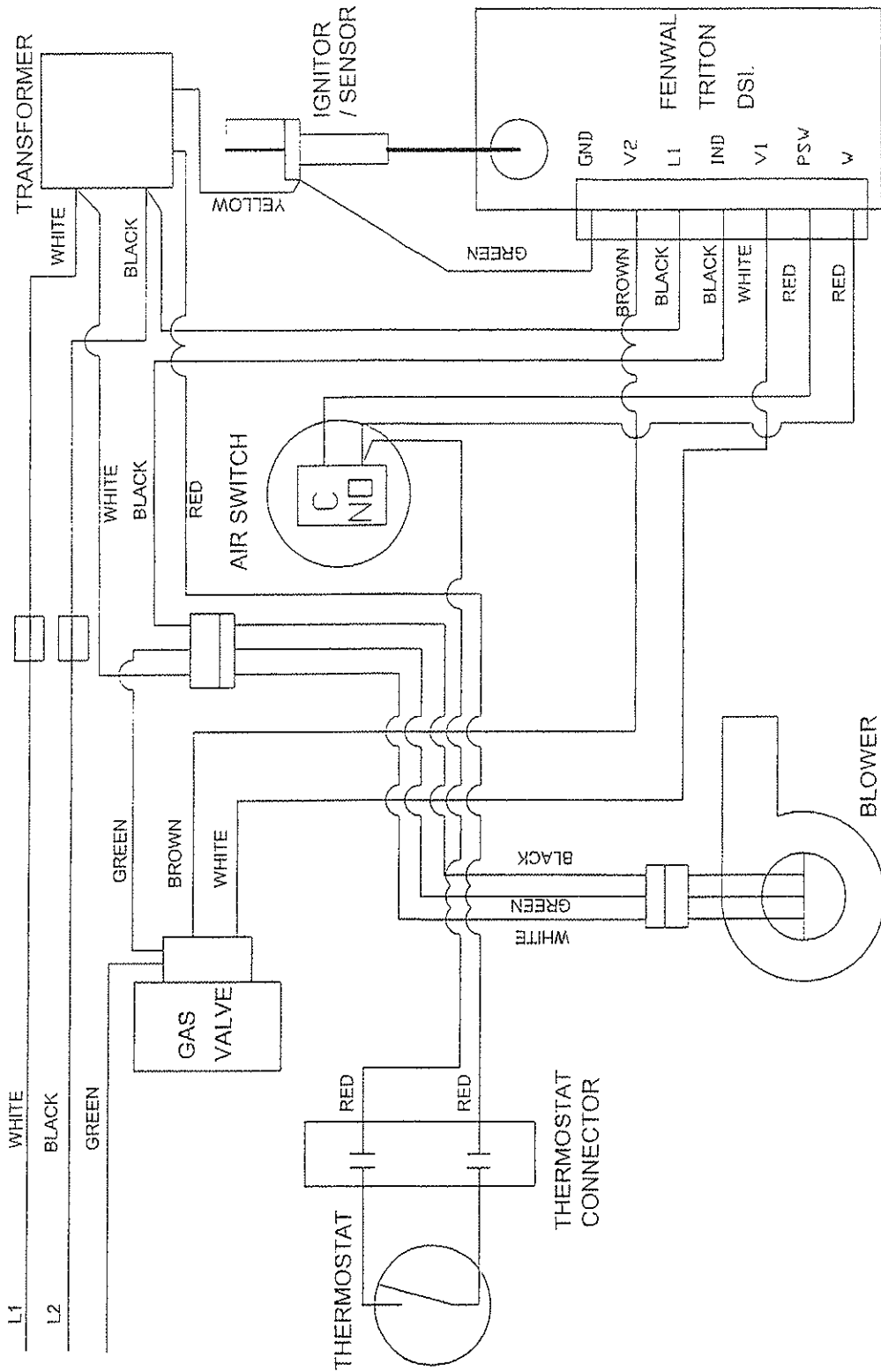


FIGURE #38. ELECTRICAL JUNCTION BOX

# CAL WIRING DIAGRAM

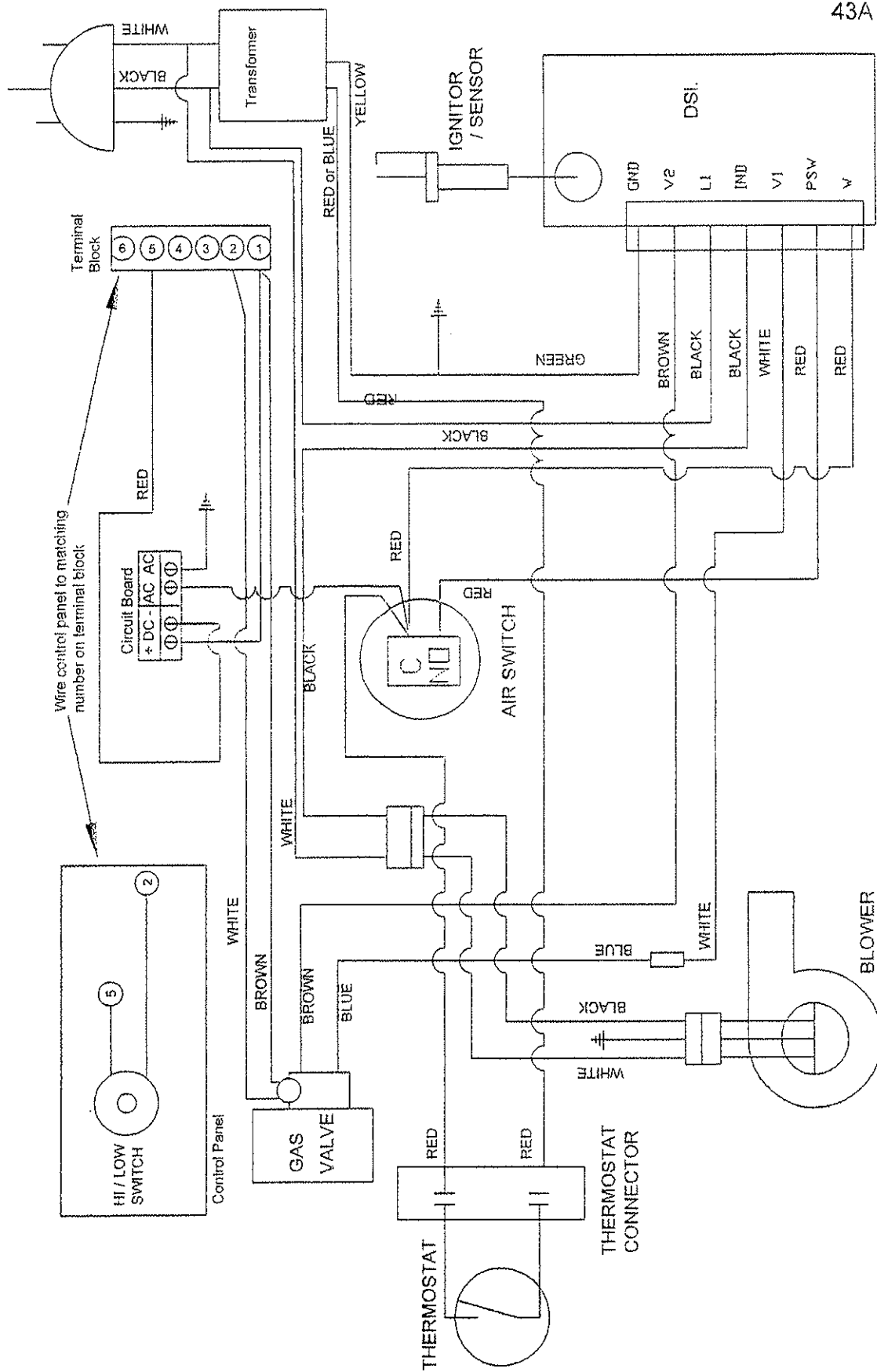
FIGURE #39 SINGLE INPUT 120 VOLT WIRING DIAGRAM



If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105 degree C (221 F).

# CAL HI/LOW WIRING DIAGRAM

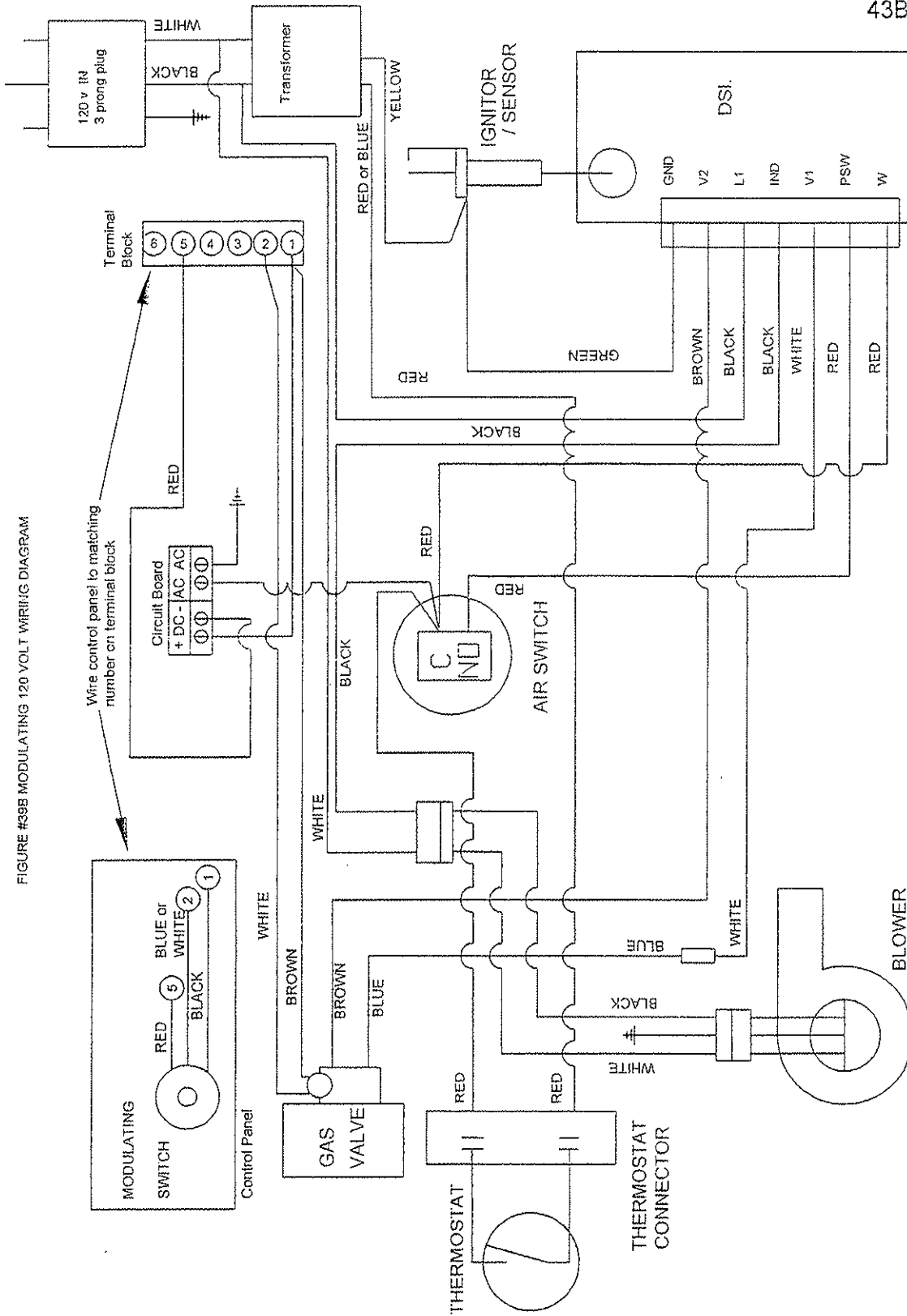
FIGURE #39A HIGH / LOW 120 VOLT WIRING DIAGRAM



If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105 degree C (221 F).

# CAL MODULATING WIRING DIAGRAM

FIGURE #39B MODULATING 120 VOLT WIRING DIAGRAM



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If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105 degree C (221 F).