

enerco ^{T.M.} **RADIANT II**

INSTALLATION and OPERATING INSTRUCTIONS for **GAS-FIRED INFRA-RED RADIANT TUBE HEATERS**

ANSI Z83.6
MOST RECENT EDITION

PLACE NEAR HEATING UNIT

MODELS

ER2-60, ER2-80

ER2-100, ER2-125

ER2-150

ER2-80S, ER2-100S

ER2-125S, ER2-150L

WARNING: IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE PROPERTY DAMAGE, INJURY OR DEATH. READ THE INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS THOROUGHLY BEFORE INSTALLING OR SERVICING THIS EQUIPMENT.



Enerco Technical Products, Inc.

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Phone: 800/251-0001

Stock No. 18677 3-96

WARNING

FIRE OR EXPLOSION HAZARD

Can cause property damage, severe injury or death.

- 1) Read this manual carefully before installing or servicing this equipment. Improper installation, service or maintenance can cause property damage, injury or death.
- 2) Check clearances given on the outside of each burner to make sure the product is suitable for your application.
- 3) Installer must be a trained, experienced service technician or representative.
- 4) All service must be performed only by a trained service technician or representative.
- 5) After installation is complete, check product operation as provided in these instructions.

WARRANTY

Enerco warrants that Infra-Red Heaters manufactured and sold by its Industrial Heating Division will be free from defects in material and workmanship.

Enerco pro-rated tube warranty shall continue in effect until the expiration of five (5) years from the date of shipment or original tube heat exchangers by Enerco.

Parts, assemblies, controls, etc. furnished by Enerco suppliers will carry a one (1) year warranty or the applicable warranties of the suppliers.

The sole responsibility of Enerco under this warranty shall be to replace or repair any part for which a written claim is made to Enerco within the time limit of the warranty, which is returned upon request to Enerco—F.O.B. Cleveland, Ohio—or F.O.B. an Enerco authorized service facility and which is proved to be defective upon inspection by Enerco.

This warranty shall not apply to any part or product which has been subjected to misuse or neglect, damage by accident, or rendered defective by reason of improper installation. THIS WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, and of any other responsibility of Enerco for parts or products sold by Enerco, including consequential or special damages

Section 1**WARNING****FAILURE TO FOLLOW THESE INSTRUCTIONS CAN CAUSE
PROPERTY DAMAGE, SEVERE INJURY OR DEATH:****FIRE OR EXPLOSION HAZARD: COMBUSTIBLES**

Failure to maintain the specified minimum clearances to combustibles could result in a serious fire hazard. Do not locate flammable or combustible materials within this distance. Do not locate in hazardous atmospheres containing flammable vapors or combustible dust. Installations in public garages or airplane hangers are permitted when in accordance with ANSI Z83.6 and NFPA-409 and 88 Codes.

FIRE OR EXPLOSION HAZARD: VEHICLES

Minimum clearances must be maintained from vehicles parked below the heater. Signs should be posted in storage areas to specify maximum stacking height to maintain required clearances to combustibles.

FIRE OR EXPLOSION HAZARD: GAS CONNECTION

There is an expansion of the radiant pipe with each firing cycle, and this will cause the burner to move with respect to the gas line. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with Figure 18 of these instructions.

FIRE OR EXPLOSION HAZARD: IGNITION

This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

MECHANICAL HAZARD: SUSPENSION

Use appropriate suspension hardware, beam clamps (rod or perforated strap) and tumbuckles at predetermined locations. The weight and normal movement of the heating system may cause support failure if the following minimum suspension requirements are not met: distance between supports must be 10 ft. or less; chain size must be 1/0 minimum or equivalent. Failure of the supports can cause property damage, severe injury, or death.

Continued on next page

IMPORTANT

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN CAUSE PROPERTY DAMAGE OR PERSONAL INJURY.

Do not use in an atmosphere containing halogenated hydrocarbons or other corrosive chemicals. Some compounds in the air can be drawn into the equipment and can cause an accelerated rate of corrosion of some parts of the heat exchanger. The use of such chemical compounds in or near the enclosure should be avoided where a longer life of the burner, tubing and other parts is desirable.

Caution should be used when running the system near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc. Table 1, Section 3, gives **minimum** acceptable clearances to combustibles. Clearances as shown in Table 1 are not for use in four-sided enclosures.

If the building has a slight negative pressure or contaminants are present in the air, an outside combustion air supply to the heaters is strongly recommended.

CAUTION

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN CAUSE DAMAGE TO THE SYSTEM COMPONENTS.

Do not high pressure test the gas piping with the burners connected. Failure to follow this procedure will exceed the pressure rating of burner gas controls and this will require complete replacement of these parts.

This heater is designed for heating non-residential indoor spaces. These instructions, the layout drawing, local codes and ordinances, and applicable standards such as apply to gas piping, electrical wiring, venting, etc., must be thoroughly understood before proceeding with the installation.

WARNINGS & WARRANTY**1****3**

Read this section carefully. Improper installation, adjustment, operation or maintenance can cause property damage, injury or death.

INDEX**4**

INTRODUCTION**2****5**

Checking Shipment-Installer Responsibility

INSTALLATION: Planning**3****6-14**

*National Codes-Critical Considerations-Installation Procedure-Accessory Parts List
Clearances to Combustibles-Parts List for packaged Ener-Radiant II Heaters*

INSTALLATION: Assembly**4****15-20**

*Assembly Overview-Couplings-Suspension-Tube Clamp-
Turbulator-Burner*

INSTALLATION: Venting and Ducting**5****21-26**

*General Requirements-Unvented Operation-Horizontal Venting-
Vertical Venting-Common Venting-Outside Air Supply*

INSTALLATION: Gas Piping**6****27**

Sizing-Installation - Flex Gas Connection

INSTALLATION: Wiring**7****28-31**

*Line Voltage Thermostat Wiring-Low Voltage Thermostat Wiring-
Burner Internal Wiring-Ladder Diagram*

OPERATION/MAINTENANCE**8****32-36**

Operation-Maintenance-Troubleshooting

APPENDICES**9****37-40**

*Replacement Parts I. Engineering Specifications II
General Specifications III*

INTRODUCTION**Section 2**

Ener-Radiant II models are low-cost, field assembled infrared heaters that are easy to install and require only minimal maintenance. They are designed to provide years of economical operation and trouble-free service.

Checking Shipment

Check the shipment against the Bill of Lading for shortages. Also, check for external damage to cartons. Note any shortages, and/or external damage to cartons on the Bill of Lading in the presence of the delivery trucker. The delivery trucker should acknowledge any shortages or damage by initialing this "noted" Bill of Lading. Immediately report any claims for damaged material, or shortages that were not evident at the time of shipment, to the carrier and your Enerco Factory Representative.

Installer Responsibility

All heaters and associated gas piping should be installed in accordance with applicable specifications and this installation made only by firms (or individuals) well qualified in this type of work. Consult local building inspectors, Fire Marshals or your local Enerco Factory Representative for guidance.

Ener-Radiant II heaters are installed on the basis of information given in a layout drawing, which together with the cited codes and regulations, comprise the basic information needed to complete the installation. The installer must furnish all needed material that is not furnished as standard equipment, and it is his responsibility to see that such materials, as well as the installation methods he uses, result in a job that is workmanlike and in compliance with all applicable codes.

Enerco Factory Representatives have had training and experience in the application of this equipment and can be called on for suggestions about installation which can save material and money.

PLANNING**Section 3**

The following codes and instructions should be followed when planning the installation of the Ener-Radiant II heater. In addition to these instructions, the warnings in Section 1 must be carefully adhered to since improper installation may lead to property damage, injury, or death.

National Standards and Applicable Codes

Gas Codes The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with local codes and recommendations of the local gas company, and the *National Fuel Gas Code, ANSI Z223.1 - latest revision*, (same as NFPA Bulletin 54).

- Clearance between the heater and its vent and adjacent combustible material (which is part of the building or its contents) shall be maintained to conform with the *Standard for Installation of Gas Appliances and Gas Piping NFPA-54/ANSI-Z223.1 - latest revision, National Fuel Gas Code*.

Aircraft Hangars Installation in aircraft hangars must be in accordance with the *Standard for Aircraft Hangars, ANSI/NFPA-409 - latest revision*.

- Heaters in aircraft storage or service areas shall be installed at a height of 10 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 wing or engine enclosure, whichever is highest from the floor.)
- In other sections of aircraft hangars, such as shops or offices, heaters must not be installed less than 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.

Public Garages Installation in garages must be made in accordance with the *Standard for Parking Structures NFPA-88A - latest revision or the Standard for Repair Garages, NFPA 88B - latest revision*

- Heaters must not be installed less than eight feet above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
- When installed over hoists, minimum clearances to combustibles must be maintained from the uppermost point on the hoist.

Electrical The heater must be electrically grounded in accordance with the *National Electrical Code, ANSI/NFPA-70 - latest revision*. Wiring must conform to the most current National Electrical Code, local ordinances, and any special diagrams furnished.

Venting The venting must be installed in accordance with *NFPA-54/ANSI-Z223.1 - latest revision, National Fuel Gas Code*. Partial information with regard to this code is provided in Section 5 of this installation manual with regard to size and configurations for venting arrangements.

Any portion of flue pipe passing through a combustible wall must be dual insulated or have an approved thimble. Refer to *ANSI Z223.1 - latest revision*.

Hazardous Locations Where there is the possibility of exposure to combustible airborne material or vapor, consult the local Fire Marshal, the fire insurance carrier or other authorities for approval of the proposed installation.

Critical Considerations

Ener-Radiant II is a suspended heater. Therefore, its stability, flexibility, and safety are very important. Before starting installation, be sure the system can meet the following requirements.

- Maintain specified clearances to combustibles, and safe distance from heat-sensitive material, equipment and work stations.
- Provide a suspension with vertical length of chain or swinging rod which has at least two inches of horizontal travel for each burner in a straight run. Be sure the suspension system is sufficiently flexible to accommodate thermal expansion which occurs as the system heats up (see Figure 5).
- Provide access to burners for servicing, preferable on both sides, above, and behind for burner removal.
- Provide for a minimum of 18 inches of clearance between burners and building walls. (Always observe minimum clearances to combustibles.)
- Be sure the heater has a downward pitch of one-half inch per 20 feet away from the burner.
- Provide signs in storage areas to specify maximum stacking height to maintain required clearances to combustibles.
- Plan location of supports (see Figure 2). Locate a support near all elbows.

Installation Procedure

Take maximum advantage of the building upper structure, beams, joists, purlins, etc., from which to suspend the heater. There is no unique sequence for installation of the tubing. On-site observation will usually reveal a logical sequence. Begin the installation at the most critical dimension. This could save time. Watch for swinging doors, overhead cranes, car lifts, etc. Reflectors and tubing can be installed as you move along. Carefully adjust system pitch at each position to level the heater. Pitch down one-half inch in 20 ft. (away from burner).

- Don't**
- Pressure test the gas line using high pressure (greater than 1/2 PSIG) without closing the high-pressure shutoff cocks. Failure to do so will result in damage to the burners.
- Do**
- Familiarize yourself with local and national codes.
 - Develop a planned procedure which will conserve material and labor on the job.
 - Check to see that all material and equipment is on the job before starting installation.
 - Allow for thermal expansion of the hot tube.
 - Install the gas connector only as shown in instructions (see Figure 18).
 - Have slip joints where required between reflectors to keep them from buckling or coming apart.
 - Provide one square inch of free air opening to each 1,000 BTU/hr. of heater input (but not less than 100 square inches) in enclosed spaces. One opening should be within 12 inches of the top and one within 12 inches of the bottom of the enclosure.

ACCESSORY PARTS LIST

<u>Stock Number</u>	<u>Description</u>
00172	Transf. Relay, DPDT
00183	Transf. Relay, SPDT
03445	Turbulator 10 Ft. Section
03447	Turbulator Adapter 5 Ft. Section
10368	Low Voltage Thermostat
10419	Thermostat (120V) Remote Bulb - 2 Circuit
10420	Thermostat (120V) Moisture Resistant SPDT
12397	Gasket (Burner to Transition Tube)
16401	Stainless Steel Flexible Gas Connector
17370	Chain Kit
18677	Installation Manual/ER2 Series
F106414	Elbow Package 180°
F106415	Elbow Package 90°
19021	Vent Adapter (Flue Pipe)
19022	Vent Terminal-Tjernlund VH1-4"
19023	Vent/Wall Terminal
06430	Vent Cap
19031	Turnbuckle
98012	Cap Screw 5/16"-18-2A-7/8 or (1")
98527	Splitlock Washers 5/16"

CLEARANCES TO COMBUSTIBLES

TABLE 1: Minimum Clearances to Combustibles (Use Figure 1 as a guide)

Reflector Type	Position	ER2-60	ER2-80	ER2-100	ER2-125	ER2-150
Standard Reflector (Horizontal)	A	6"	6"	6"	6"	6"
	B	30"	36"	36"	36"	36"
	C	55"	55"	74"	87"	87"
	D	30"	36"	36"	36"	36"
45° Reflector Tilt	A	12"	18"	18"	18"	18"
	B	30"	36"	36"	36"	36"
	C	55"	55"	74"	87"	87"
	E	36"	36"	36"	36"	36"
	F	60"	60"	60"	60"	60"
U-Tube Standard (Horizontal)	A	6"	6"	6"	6"	6"
	B	30"	36"	36"	36"	36"
	C	55"	55"	74"	87"	87"
	D	30"	36"	36"	36"	36"
U-Tube Opposite 45°	A	12"	18"	18"	18"	18"
	B	30"	36"	36"	36"	36"
	C	55"	55"	74"	87"	87"
	F	60"	60"	60"	60"	60"
U-Tube, Full 45°	A	12"	18"	18"	18"	18"
	B	30"	36"	36"	36"	36"
	C	55"	55"	74"	87"	87"
	E	36"	36"	36"	36"	36"
	F	60"	60"	60"	60"	60"
Unvented	Above A	36"	36"	36"	36"	36"

WARNING

FIRE OR EXPLOSION HAZARD

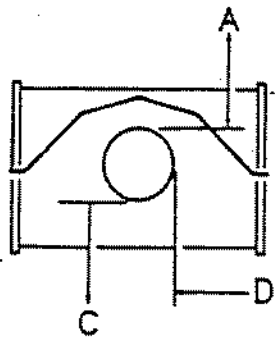
In all situations, clearances to combustibles must be maintained. Failure to observe clearances to combustibles may result in property damage, severe injury, or death.

Minimum clearances must be maintained from vehicles parked below the heater. Signs should be posted in storage areas to specify maximum stacking height to maintain required clearances to combustibles.

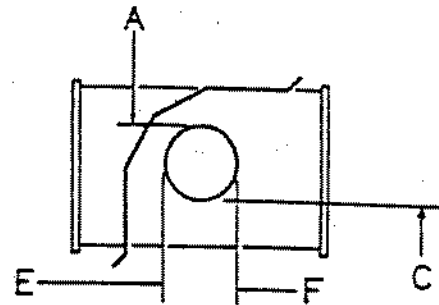
Caution should be used when running the system near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc."

Table 1 gives minimum acceptable clearances to combustibles. Clearances as shown in Table 1 are not for use in four-sided enclosures.

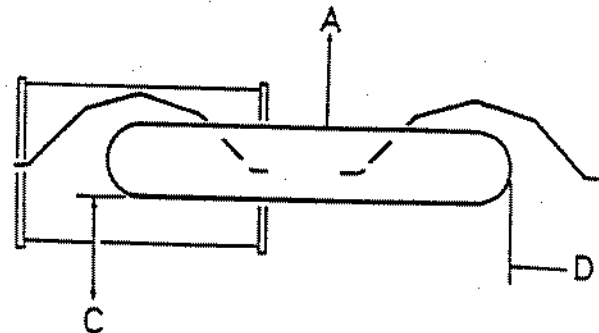
Figure I: Clearances to Combustible (Refer to Table 1)



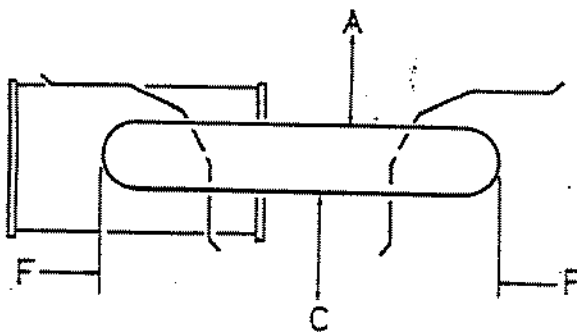
Standard Reflector



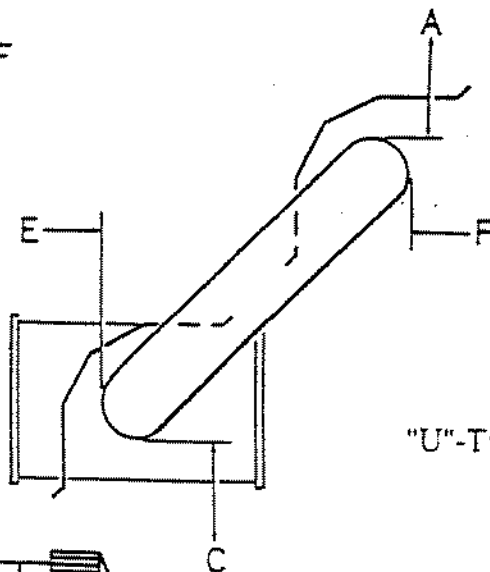
45° Reflector Tilt



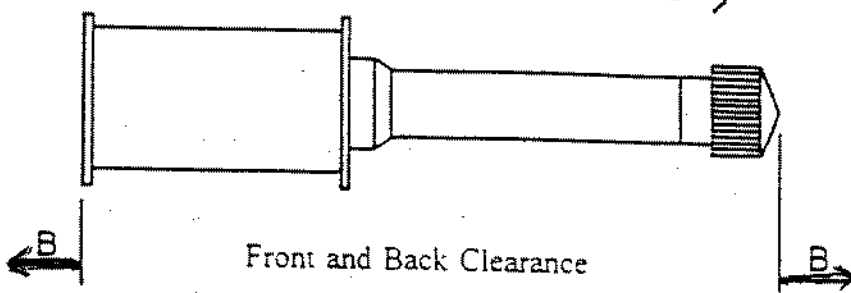
"U"-Tube Standard



"U"-Tube, Opposite 45°



"U"-Tube, Full 45°



Front and Back Clearance

Burner side must always be lower than exhaust side

PARTS LIST FOR PACKAGED ENER-RADIANT II TUBE HEATERS

ITEM	STOCK NO.	DESCRIPTION	NUMBER REQUIRED							
1	F107400	ER2-60 NG COMP/20'	X							
2	F107401	ER2-60 LP COMP/20'		X						
3	F107402	ER2-80 NG COMP/30'			X					
4	F107403	ER2-80 LP COMP/30'				X				
5	F107412	ER2-80S NG COMP/20'					X			
6	F107413	ER2-80S LP COMP/20'						X		
7	F107414	ER2-100S NG COMP/30'							X	
8	F107415	ER2-100S LP COMP/30'								X
9	F102650	ER2-60 NG/BRN & CONT BOX	1							
10	F102651	ER2-60 LP/BRN & CONT BOX		1						
11	F102652	ER2-80S, ER2-80 NG/BRN & CONT BOX			1	1				
12	F102653	ER2-80S, ER2-80 LP/BRN & CONT BOX				1	1			
13	F102654	ER2-100S/BRN & CONT BOX/NG							1	
14	F102655	ER2-100S/BRN & CONT BOX/LP								1
15	F106401	ER2-100S/TUBE SYS ONLY/30'							1	1
16	F106404	ER2-60, 80S/TUBE SYS ONLY/20'	1	1			1	1		
17	F106405	ER2-80/TUBE SYS ONLY/30'			1	1				
18	00418	REFLECTOR/T.H.	2	2	3	3	2	2	3	3
19	03445	TURBULATOR BAFFLE 10'	1	1	1	1	1	1		
20	03447	TURBULATOR BAFFLE 5'							1	1
21	06413	TUBE H.E. 4" O.D. X 10'	1	1	2	2	1	1	2	2
22	06423	TRANSITION TUBE ASSEMBLY	1	1	1	1	1	1	1	1
23	14585	HANGER/TUBE & REFLECTOR	4	4	6	6	4	4	6	6
24	14587	TUBE SUPPORT - 5"	1	1	1	1	1	1	1	1
25	14612	TUBE COUPLING ASSEMBLY	1	1	2	2	1	1	2	2

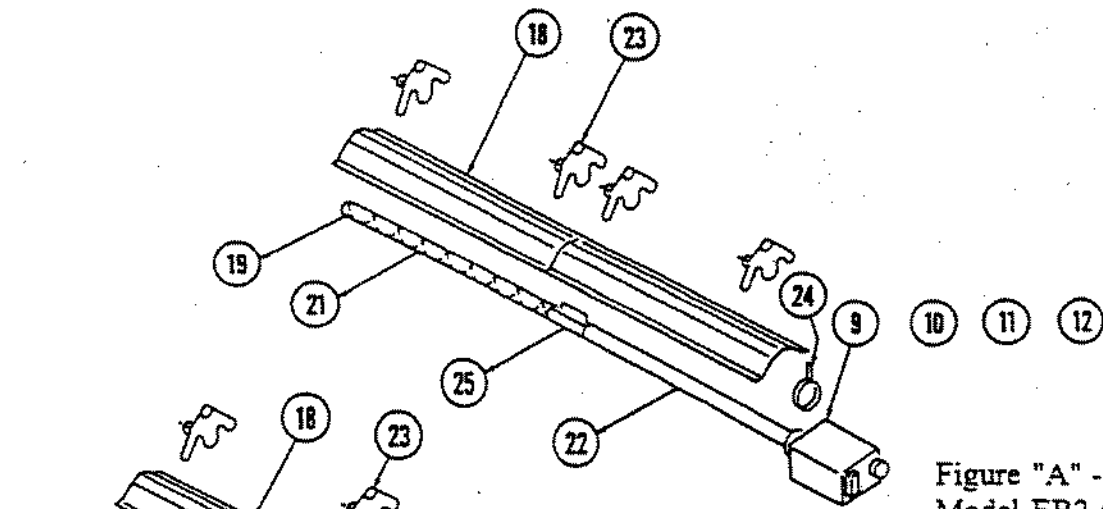


Figure "A" - Assembly
Model ER2-60, ER2-80S

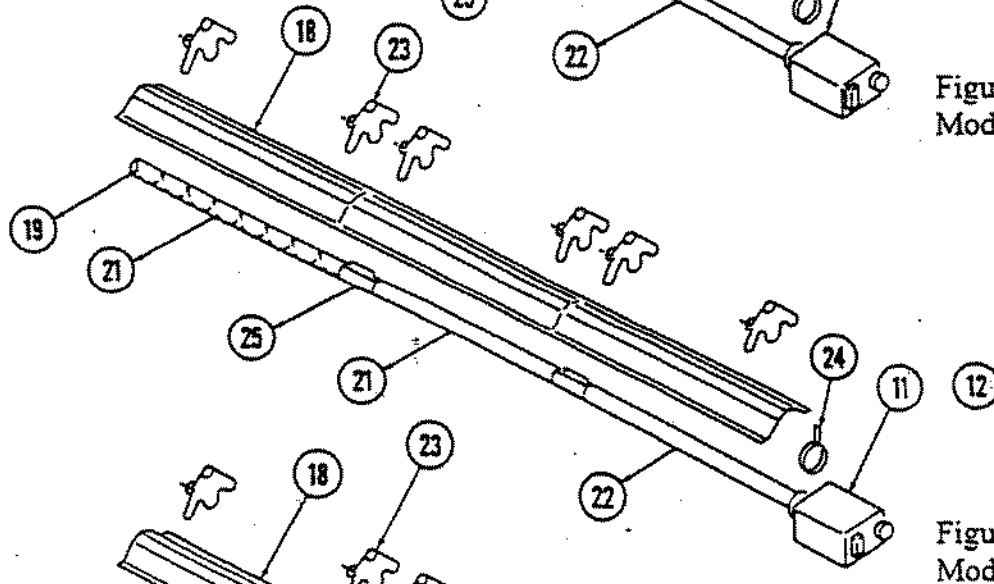


Figure "B" - Assembly
Model ER2-80

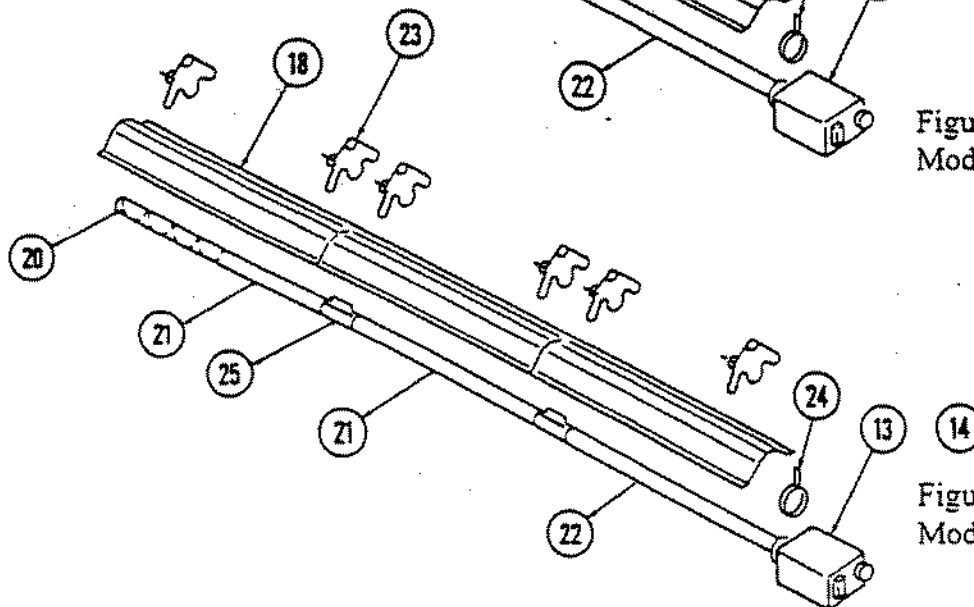


Figure "C" - Assembly
Model ER 2-100S

4-
63447

See Page 11
For Parts List

PARTS LIST FOR PACKAGED ENER-RADIANT II TUBE HEATERS

STOCK		DESCRIPTION	NUMBER REQUIRED									
ITEM	NO.											
1	F107404	ER2-100 NG COMP/40'	X									
2	F107405	ER2-100 LP COMP/40'		X								
3	F107406	ER2-125 NG COMP/50'			X							
4	F107407	ER2-125 LP COMP/50'				X						
5	F107408	ER2-150 NG COMP/50'					X					
6	F107409	ER2-150 LP COMP/50'						X				
7	F107416	ER2-125S NG COMP/40'							X			
8	F107417	ER2-125S LP COMP/40'								X		
9	F107418	ER2-150L NG COMP/60'									X	
10	F107419	ER2-150L LP COMP/60'										X
11	F102654	ER2-100 NG/BRN & CB	1									
12	F102655	ER2-100 LP/BRN & CB		1								
13	F102656	ER2-125S, ER2-125 NG/BRN & CB			1				1			
14	F102657	ER2-125S, ER2-125 LP/BRN & CB				1				1		
15	F102658	ER2-150L, ER2-150 NG/BRN & CB					1				1	
16	F102659	ER2-150L, ER2-150 LP/BRN & CB						1				1
17	F106403	ER2-150L/TUBE SYS/60'									1	1
18	F106406	ER2-100, ER2-125S/TUBE SYS/40'	1	1					1	1		
19	F106407	ER2-125, ER2-150/TUBE SYS/50'			1	1	1	1				
20	00418	REFLECTOR/T.H.	4	4	5	5	5	5	4	4	6	6
21	06413	TUBE H.E. 4" O.D. X 10'	3	3	4	4	4	4	3	3	5	5
22	06423	TRANSITION TUBE ASSEMBLY	1	1	1	1	1	1	1	1	1	1
23	14585	HANGER/TUBE & REFLECTOR	8	8	10	10	10	10	8	8	12	12
24	14587	TUBE SUPPORT - 5"	1	1	1	1	1	1	1	1	1	1
25	14612	TUBE COUPLING ASSEMBLY	3	3	4	4	4	4	3	3	5	5

Figure "D" - Assembly
Model ER2-100, ER2-125S

Figure "E" - Assembly
Model ER2-125, ER2-150

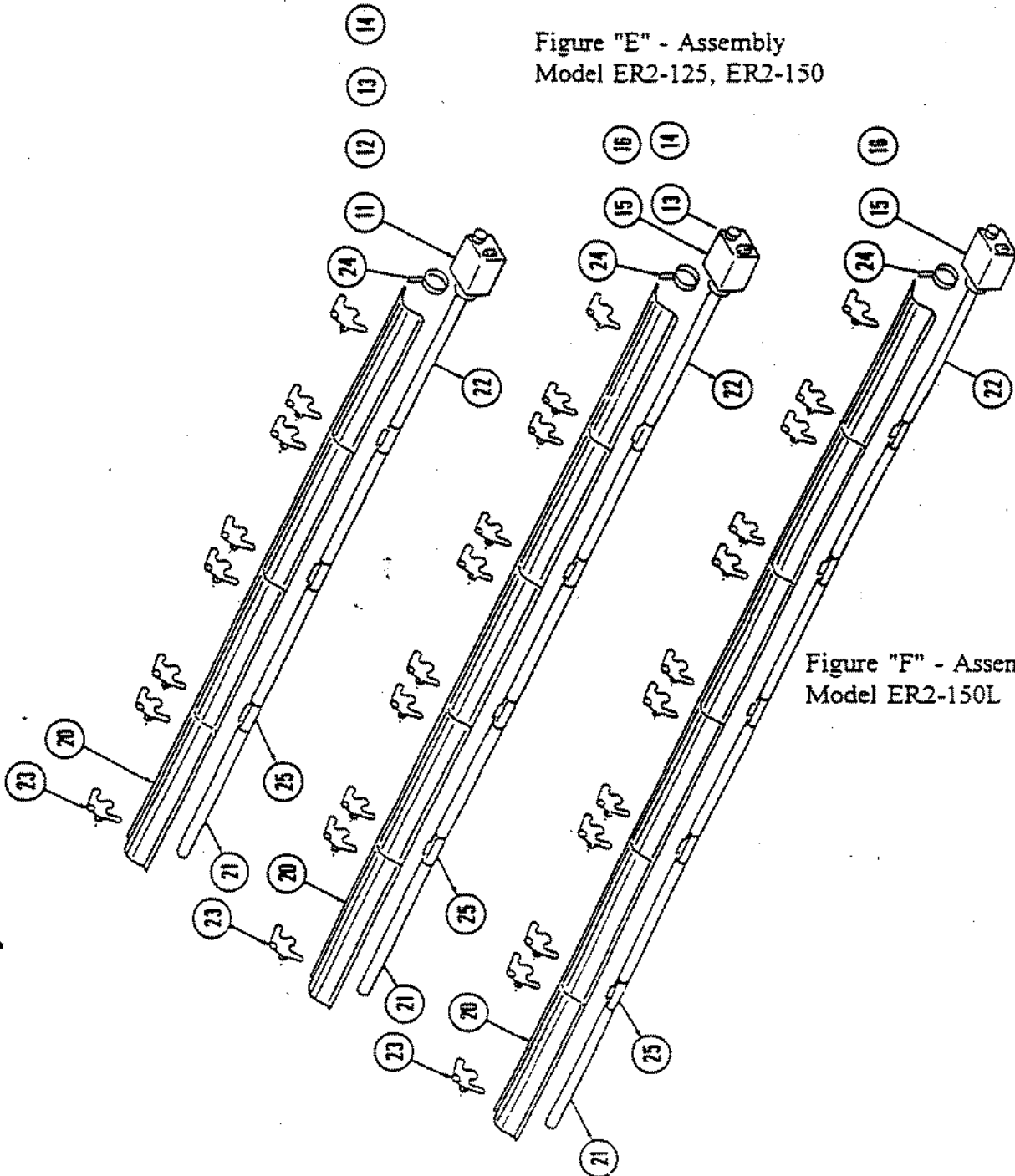
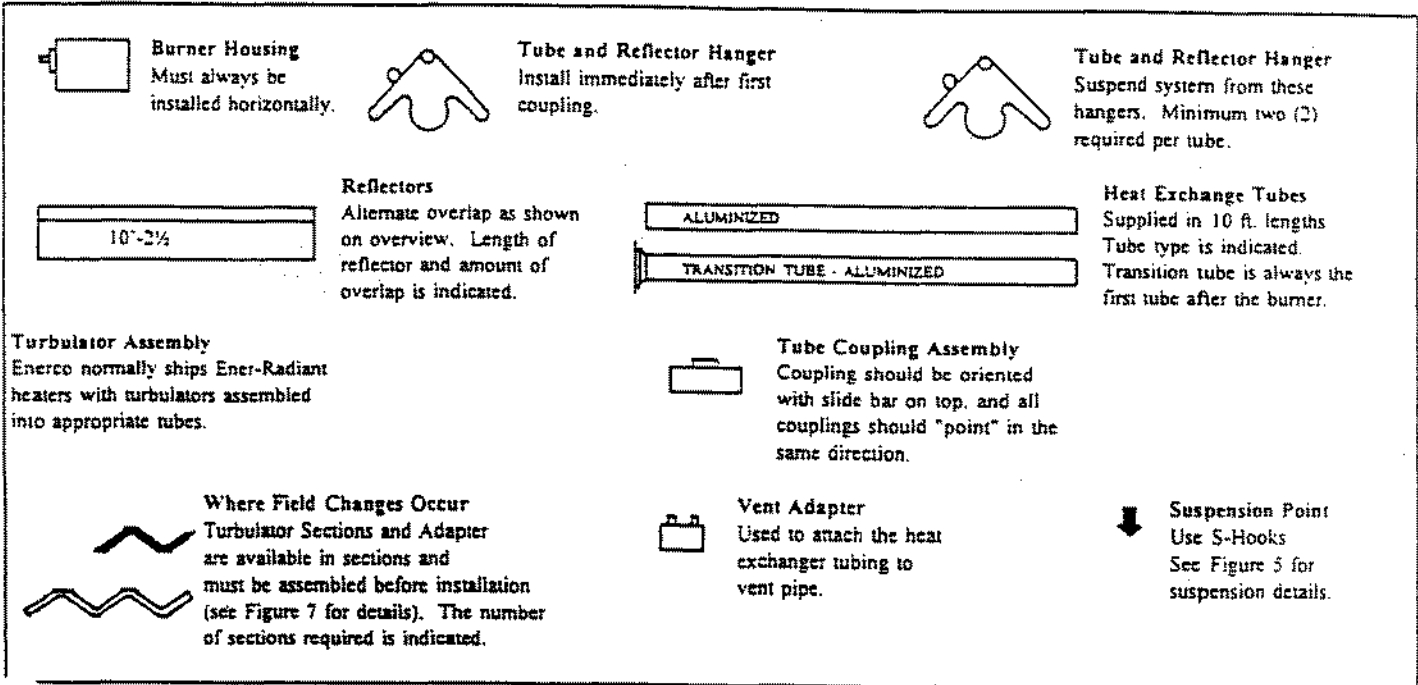
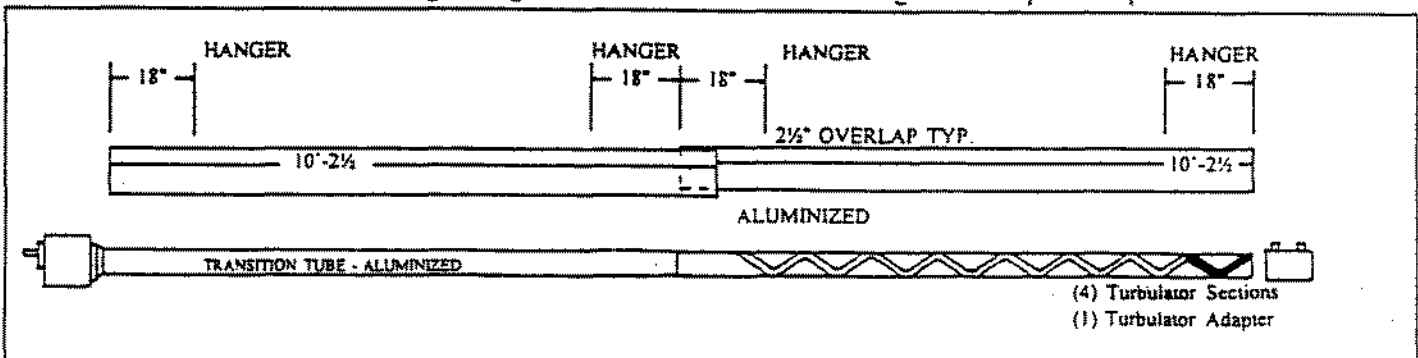


Figure "F" - Assembly
Model ER2-150L

See Page 13
For Parts List

ASSEMBLY**Section 4****FIGURE 2: Ener-Radiant II Overview Key****FIGURE 2a: Ener-Radiant II Model ER2-60, ER2-80S Assembly Overview**

20 ft. heat exchanger length. 21 ft.-4 in. total heater length. 4 suspension points as indicated.

**FIGURE 2b: Ener-Radiant II Model ER2-80 Assembly Overview**

30 ft. heat exchanger length. 31 ft.-4 in. total heater length. 6 suspension points as indicated.

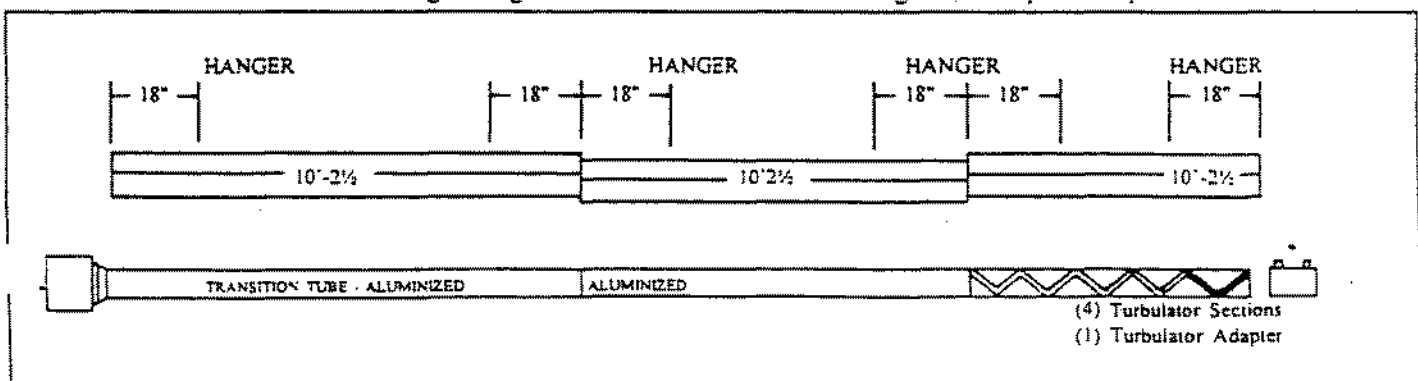
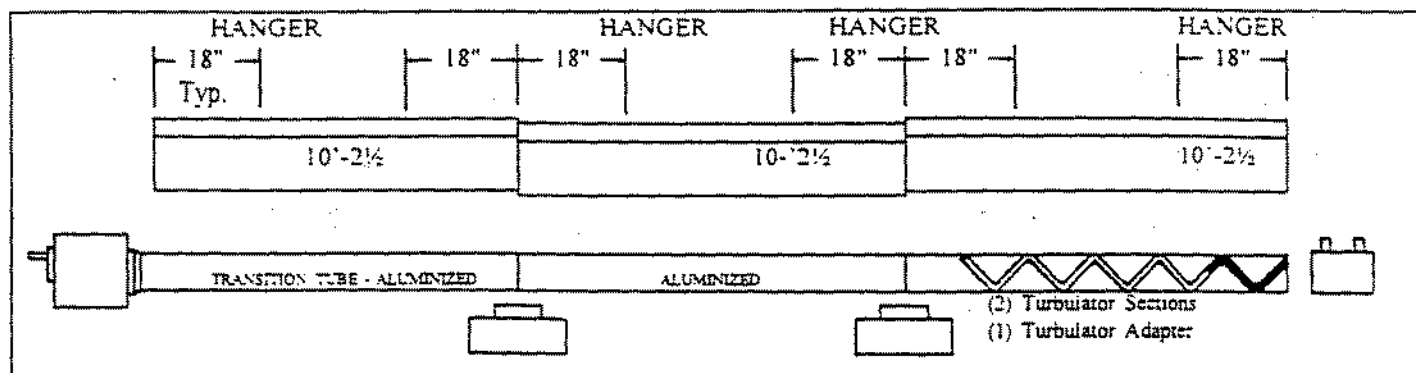
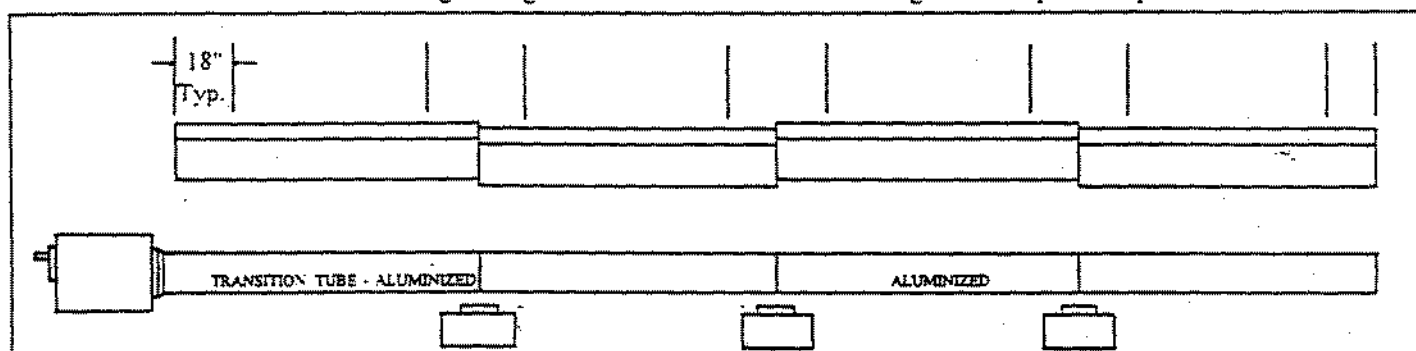


FIGURE 2c: Ener-Radiant II Model ER2-100S Assembly Overview

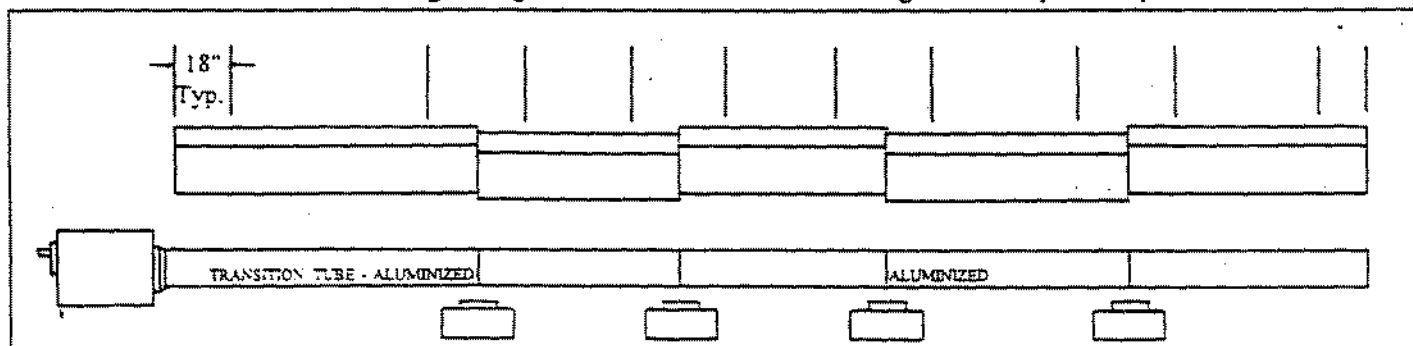
30 ft. heat exchanger length. 31 ft.-4 in. total heater length. 6 suspension points as indicated.

**FIGURE 2d: Ener-Radiant II Model ER2-100, ER2-125S**

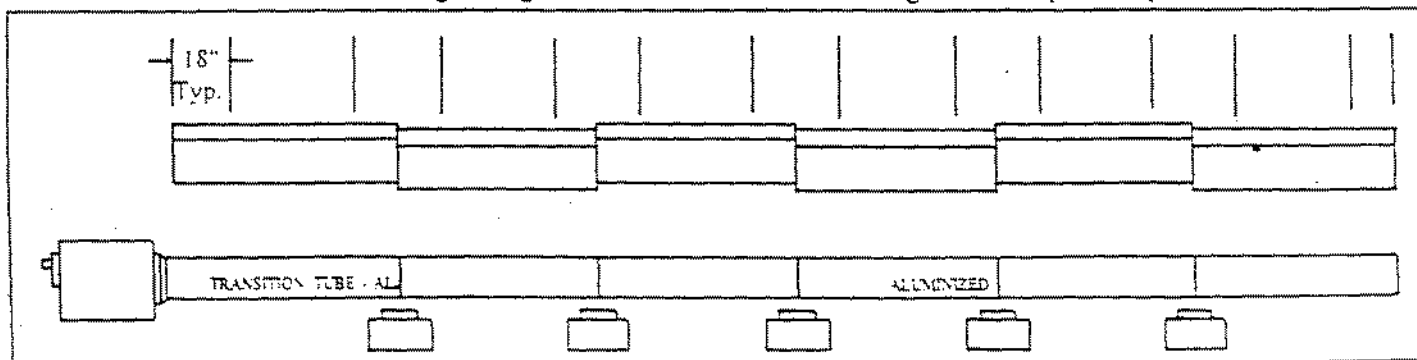
40 ft. heat exchanger length. 41 ft.-4 in. total heater length. 8 suspension points as indicated.

**FIGURE 2e: Ener-Radiant II Model ER2-125, ER2-150**

50 ft. heat exchanger length. 51 ft.-4 in. total heater length. 10 suspension points as indicated.

**FIGURE 2f: Ener-Radiant II Model ER2-150L**

60 ft. heat exchanger length. 61 ft.-4 in. total heater length. 12 suspension points as indicated.

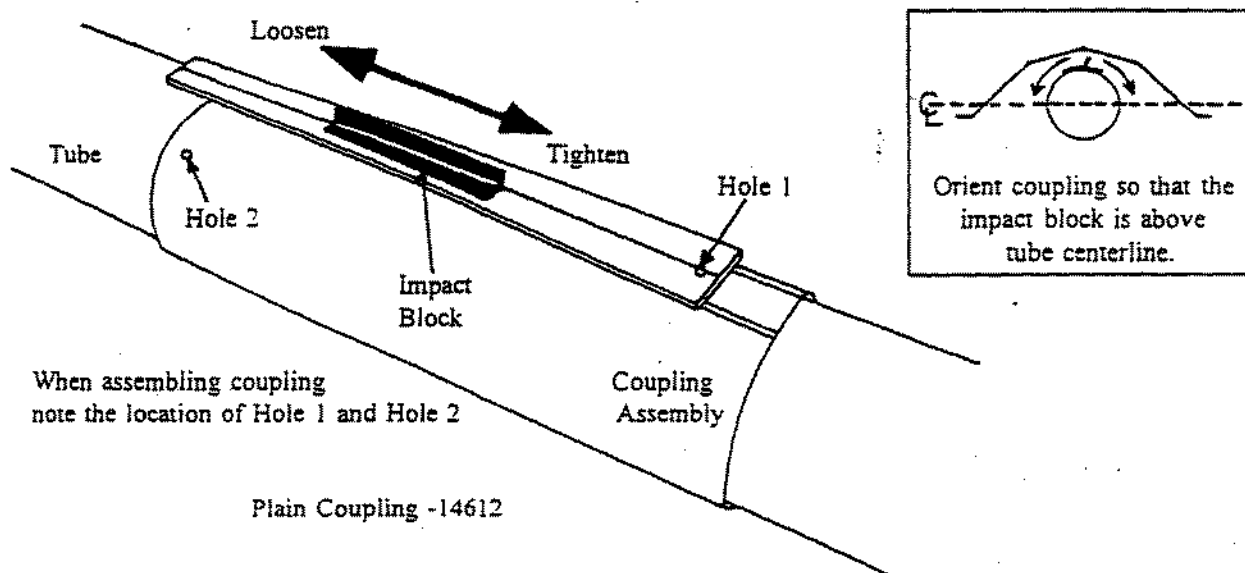


ASSEMBLY (continued)**Section 4**

Assemble the heater components as shown in Figures 2a, 2b, 2c, 2d, 2e and 2f. Optional reflector configurations are shown in Figure 1. Install appropriate suspension hardware, beam clamps, chain or rod at predetermined locations. Adjustment of chain length will provide uniform pitch.

Couplings

Tube and tube fittings are connected by wrap-around couplings which clamp by means of a tapered, hammer-driven lock member. The starting ends of the coupling and lock member are identified by 1/4" holes which are put together when starting assembly. Be sure the tube ends are in line and tube ends butt against stop pin(s) inside coupling. The slide bar is to be hammer-driven to a point of securing the coupling snugly to the tubes. Over-driving will result in distortion of the coupling or slide bar lip to a point decreasing the holding capability of the coupling. Coupling should be tight when the slide bar is ≈ 2 " from the end of the coupling. See Figure 3.

FIGURE 3: Coupling Assembly

Elbow Package Stk. #F106415 Elbow Package includes: (1) elbow and (1) coupling. Install elbow into radiant tube sequence where plans indicate a 90° bend (see Figure 4).

Stk. #F106414 Elbow Package includes: (1) elbow and (1) coupling. Install elbow into radiant tube sequence where plans indicate a 180° bend (see Figure 4).

FIGURE 4: Installation of Elbow and Coupling (optional equipment)

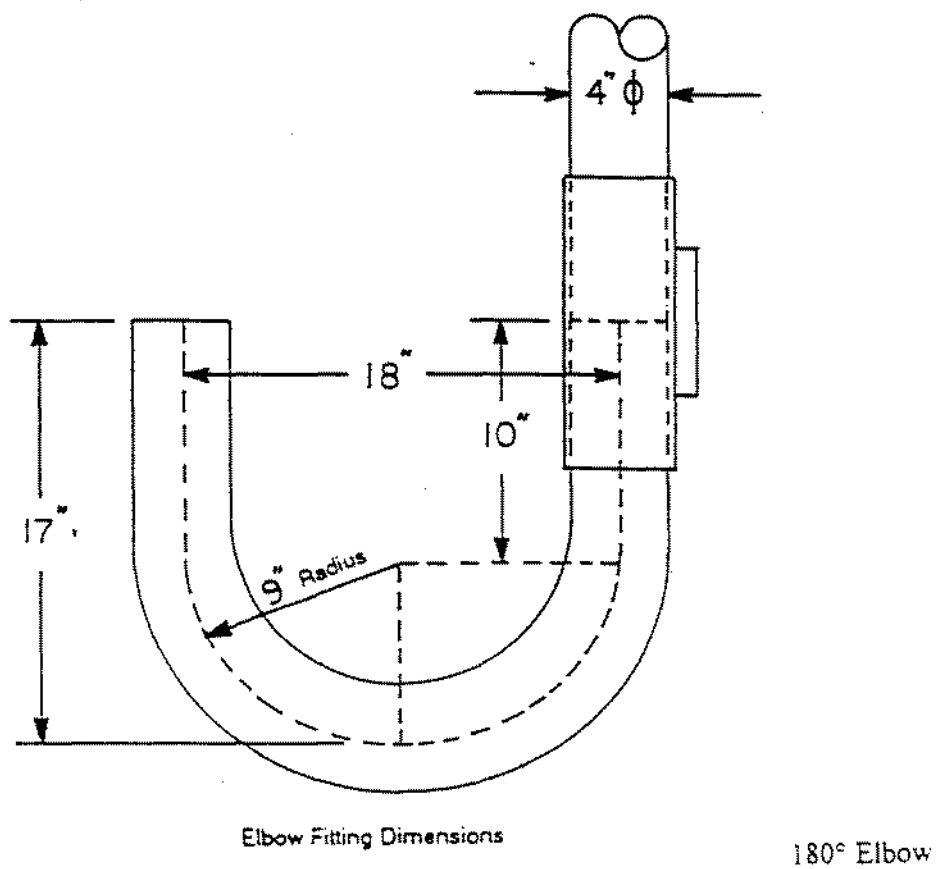
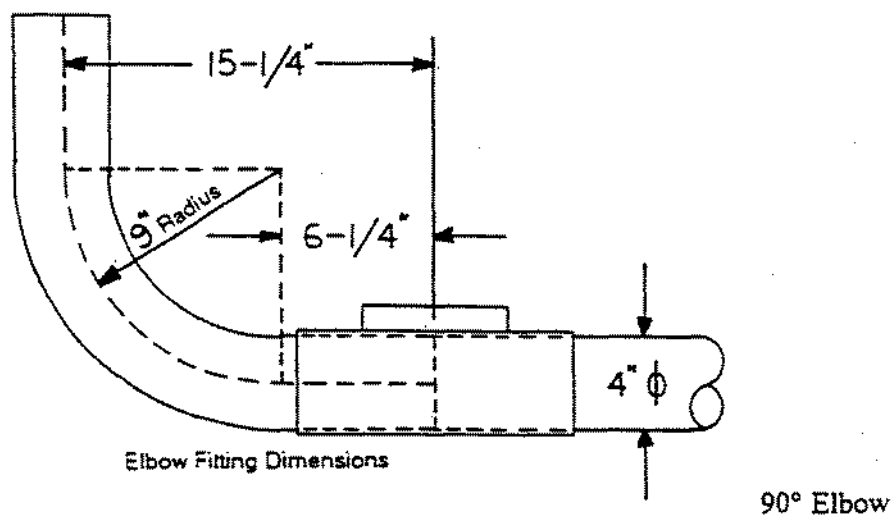
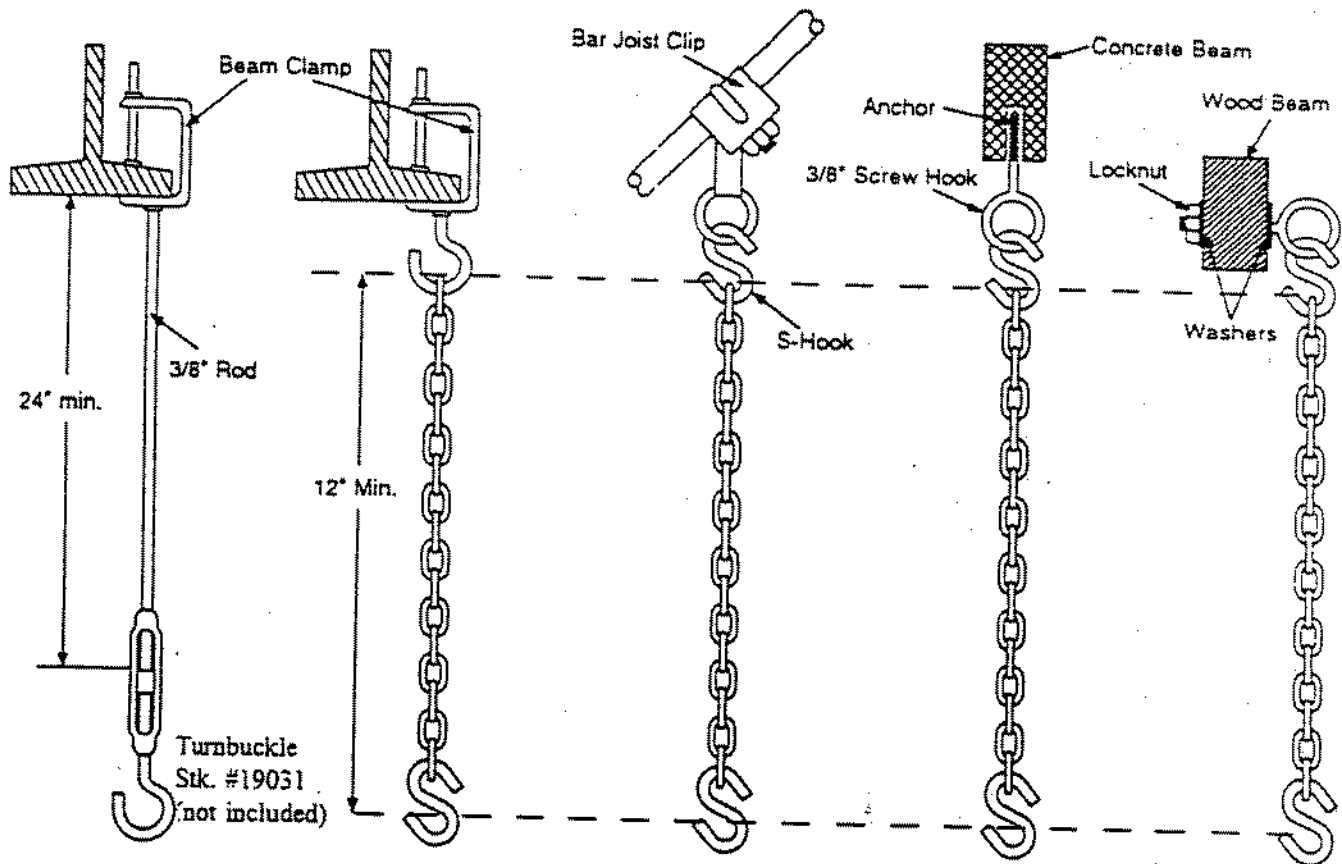
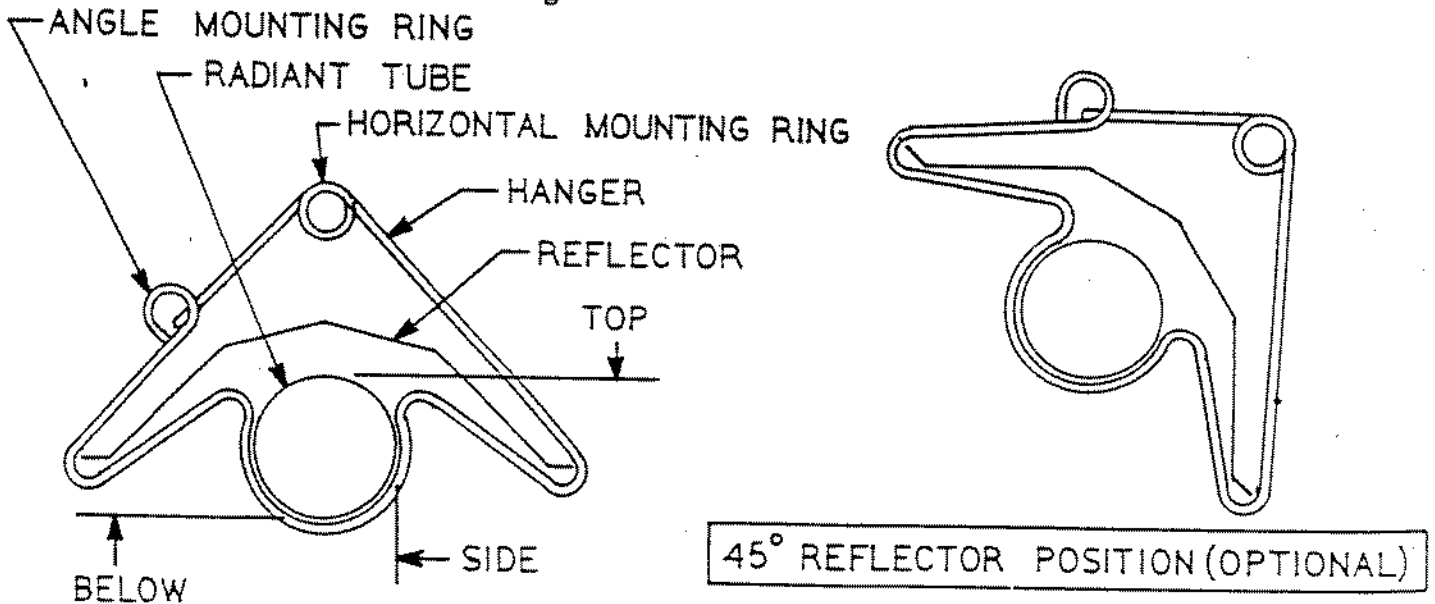


FIGURE 5: Typical Suspension Details



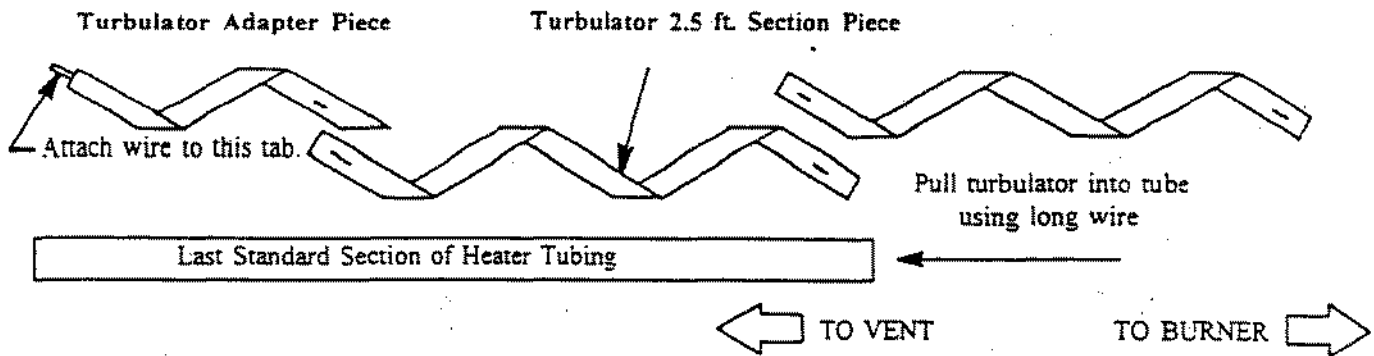
Chain Kit - Stk. #17370
 One chain kit will suspend
 One 10 ft. section of tube
 And one 10 ft. section of reflector

FIGURE 6: Tube and Reflector Hanger



HORIZONTAL REFLECTOR POSITION (OPTIONAL)

FIGURE 7: Turbulator Baffle Assembly Detail

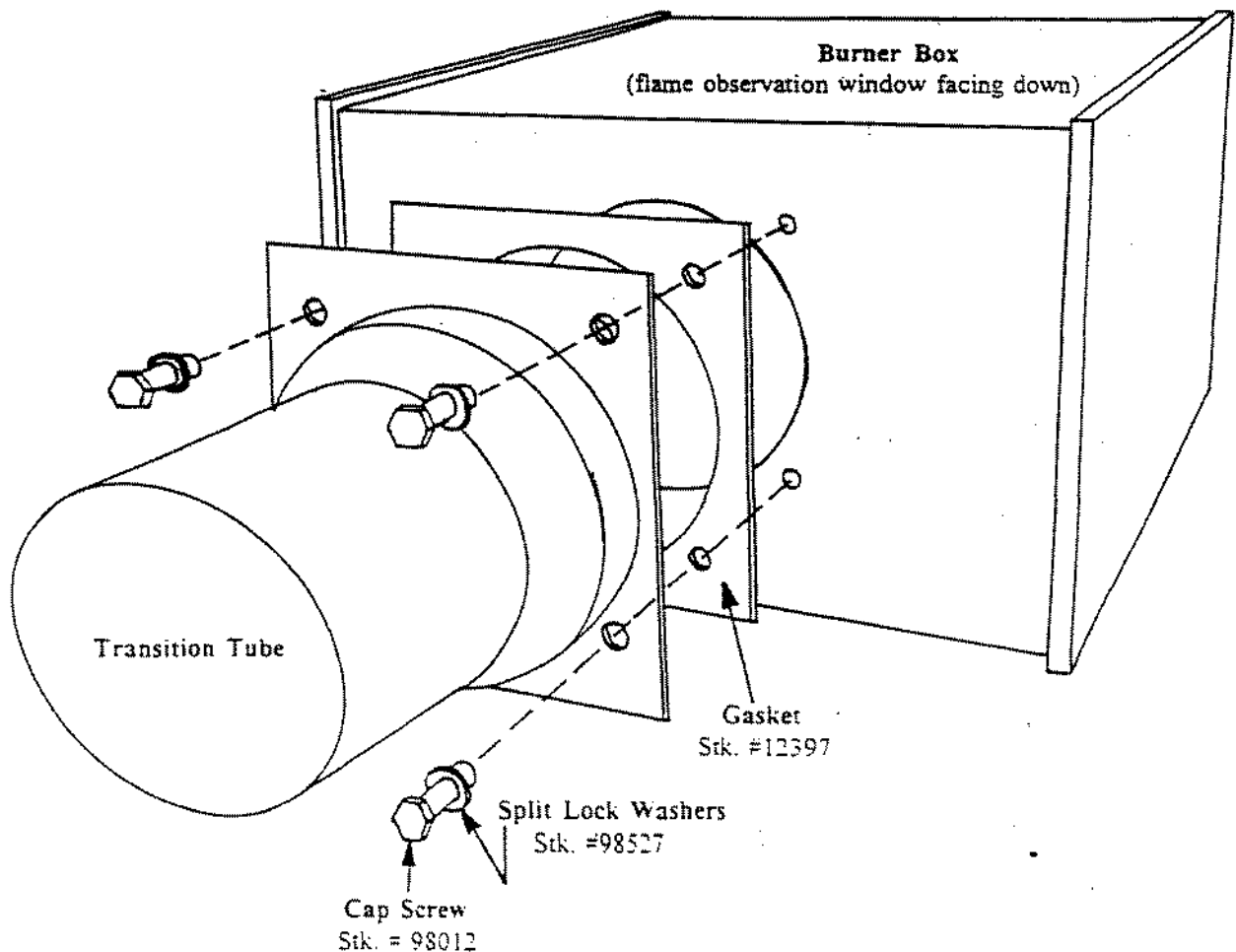


For ease of field installation, the turbulator should be installed in the tube before hanging the system.

Use the following procedure:

1. Assemble turbulator pieces by "twisting" matching ends together.
2. Insert a long wire (11 ft. minimum) down the length of the tube.
3. Attach the wire to the hole in the tab on the adapter piece.
4. Using the wire, pull the assembled turbulator into the tube from the opposite end.
5. Pull the turbulator through until just the tab comes out. Detach the wire.
6. Bend the tab around the tubing. When installing the tube, the tab will be locked in place by the flue adapter.

FIGURE 8: Burner Box/Transition Tube Detail



VENTING/DUCTING**Section 5***General Requirements*

Heater must be vented in accordance with specification ANSI Z223.1 - latest revision. Partial information relating to this specification is provided in this section with regard to size and configurations for venting arrangements (see Figures 12, 13, 14, 15, 16). For complete information, consult ANSI Z223.1 - latest revision and applicable local codes. Use the following guidelines to help insure an adequate, safe venting arrangement.

- a. Be sure that method selected for venting heater complies with all codes as required for each particular location.
- b. Exhaust end of heater will accept a four-inch (4") flue pipe using the flue pipe adapter.
- c. Heater may be vented to the outdoors either vertically or horizontally.
- d. If heater is to be vented horizontally:
 1. Vent must exit building not less than seven feet (7') above grade when located adjacent to public walkways.
 2. Vent must terminate at least three feet (3') above any forced air inlet located within 10 (ten) feet.
 3. Vent must terminate at least four feet (4') below, four feet (4') horizontally from, or one foot (1') above any door, window, or gravity inlet into any building.
 4. Vent terminal shall be located at least 12 (twelve) inches from any opening through which vent gases could enter a building.
- e. Vent terminal opening must be beyond any combustible overhang.
- f. If condensation in the flue is a problem, the flue length should be shortened or insulated.
- g. For vent specifications all of the following conditions must be met:
 1. Maximum total vent length allowed is 45 feet.
 2. Maximum outside air supply duct allowed is 45 feet.
 3. Maximum total vent length plus outside air supply length plus extension package shall not exceed 65 feet.
 4. Under length conditions 1) through 3) above, a total of two (2) elbows are allowed for vent and outside air supply together. Subtract 15 (fifteen) feet per additional elbow from maximum length allowed if more than two (2) elbows are used.

Alternative Arrangements/Optional Equipment for Venting

- For unvented operation:**
- a. Sufficient ventilation must be provided in the amount of 4 cfm per 1000 BTU/hr firing rate.
 - b. Refer to ANSI Z223.1 - latest revision (NFPA No 54) and local codes for additional information.
 - c. Use of optional outside combustion air is not recommended with unvented heaters due to pressure considerations.

- For horizontal venting:**
- a. In combustible or noncombustible walls, use Tjernlund VH1-4" (Stk. #19022). Follow vent manufacturer's instructions for proper installation. (Alternative vent Enerco Stk. #19023.)
 - b. Four-inch (4") O.D. flue pipe is required, 30 feet maximum length is recommended. Up to 45 feet maximum may be used if insulated to prevent excess condensation. (See *General Requirements* on page 21 for additional information.)
 - c. All flue joints should be sealed using suitable product such as General Electric RTV106 or Permatex Form-a-Gasket Red High Temperature Silicone Adhesive Sealant.
 - d. Vent terminal should be installed at a height sufficient to prevent blockage by snow.
 - e. Building materials should be protected from degradation by flue gases.

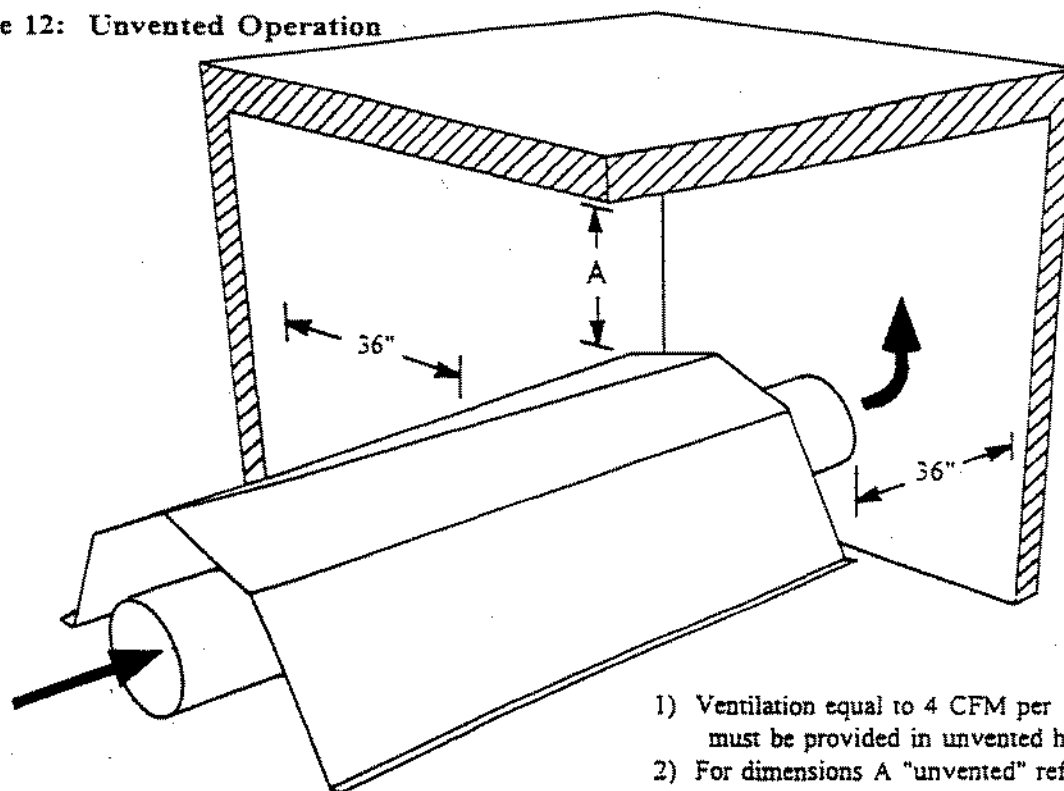
- For vertical venting:**
- a. Four-inch (4") O.D. flue pipe, maximum 45 feet in length may be used as shown with an approved vent cap. (See *General Requirements* on page 21 for additional information.)
 - b. An insulated thimble may be required to pass through combustible structures (check local codes).
 - c. All flue joints should be sealed using suitable products (see recommendation for horizontal venting).

- Venting with draft hood:**
- a. Refer to ANSI Z223.1 - latest revision (NFPA No. 54) for heights and vent sizes recommended for proper venting. (Check local codes for additional information.)
 - b. Minimum six-inch (6") O.D. vent is recommended.

- For common venting:**
- a. Horizontal run to vent must never exceed 75% of the vertical height of the vent. (Refer to ANSI Z223.1 - latest revision [NFPA No. 54] for proper vent sizes and installation.)
 - b. Open areas of common vent must equal the sum of the open area of individual vents connected to it (see chart on diagram).
 - c. Use double wall vent as required (check codes).
 - d. Heaters sharing a common vent must be controlled by the same thermostat.
 - e. All joints must be sealed using suitable products (see recommendation for horizontal venting).
 - f. Connections to common stack must be positioned to avoid direct opposition between streams of combustion gases.

- Outside Air Supply:**
- a. See procedure and diagram on page 26.

Figure 12: Unvented Operation



- 1) Ventilation equal to 4 CFM per 1000 BTU/hr firing rate must be provided in unvented heater installations.
- 2) For dimensions A "unvented" refer to Figure 1: "Minimum Clearances to Combustibles."

FIGURE 13a: Horizontal Venting - Combustible Walls

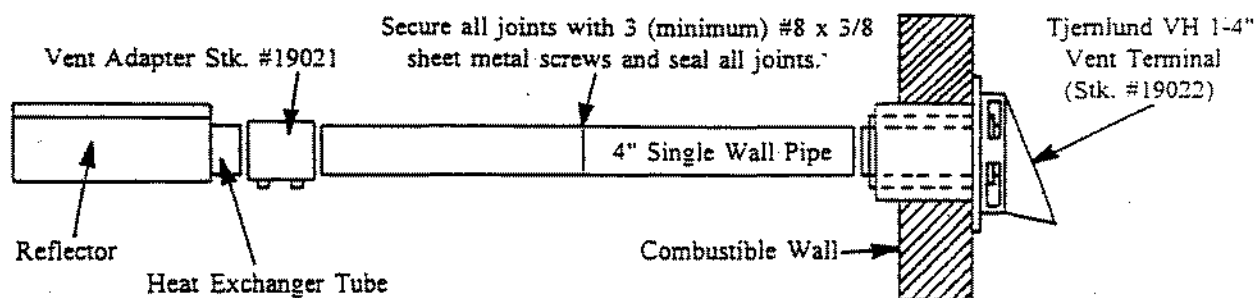


FIGURE 13b: Horizontal Venting - Non-Combustible Walls

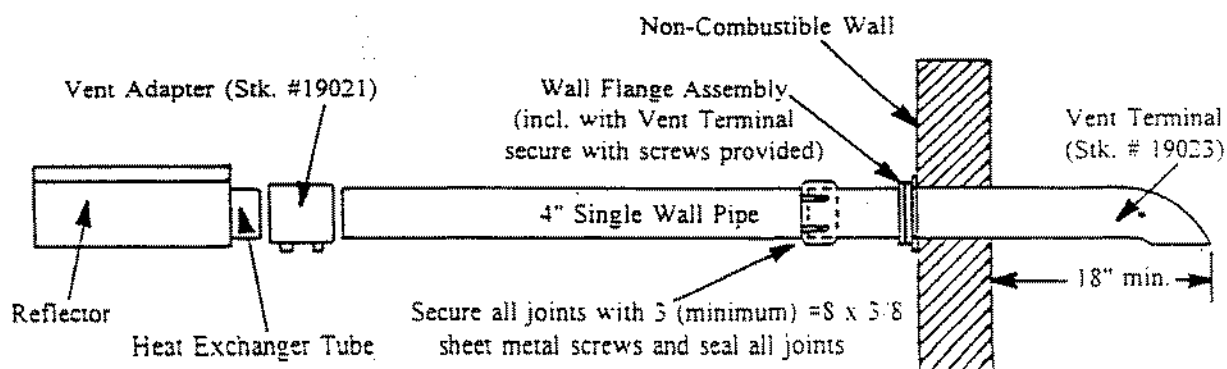


Figure 14: Vertical Venting

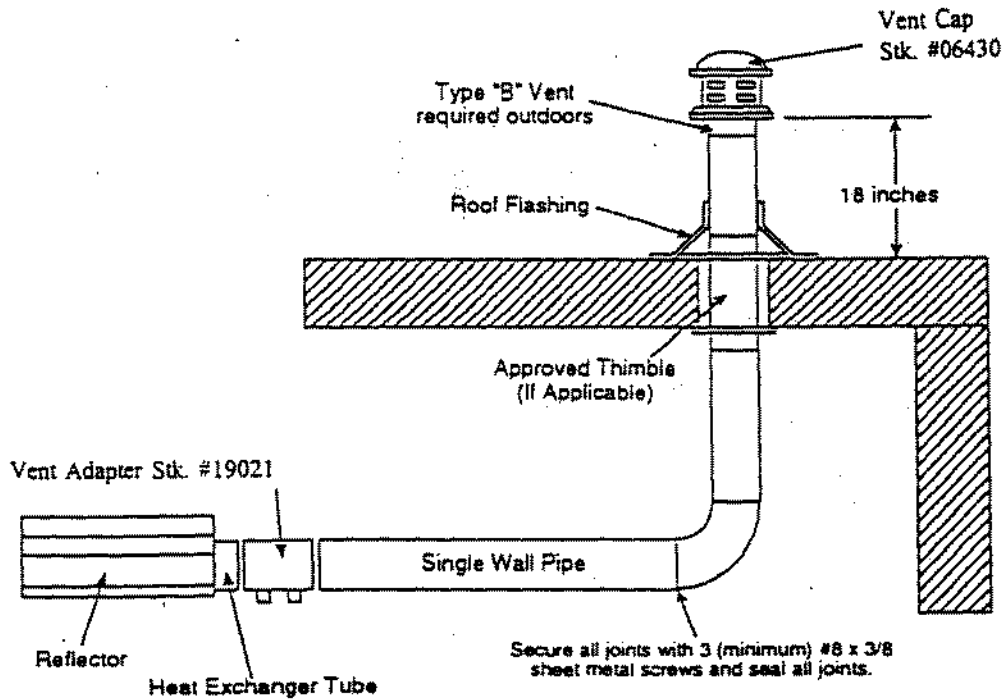


FIGURE 15: Vertical Venting with Draft Hood

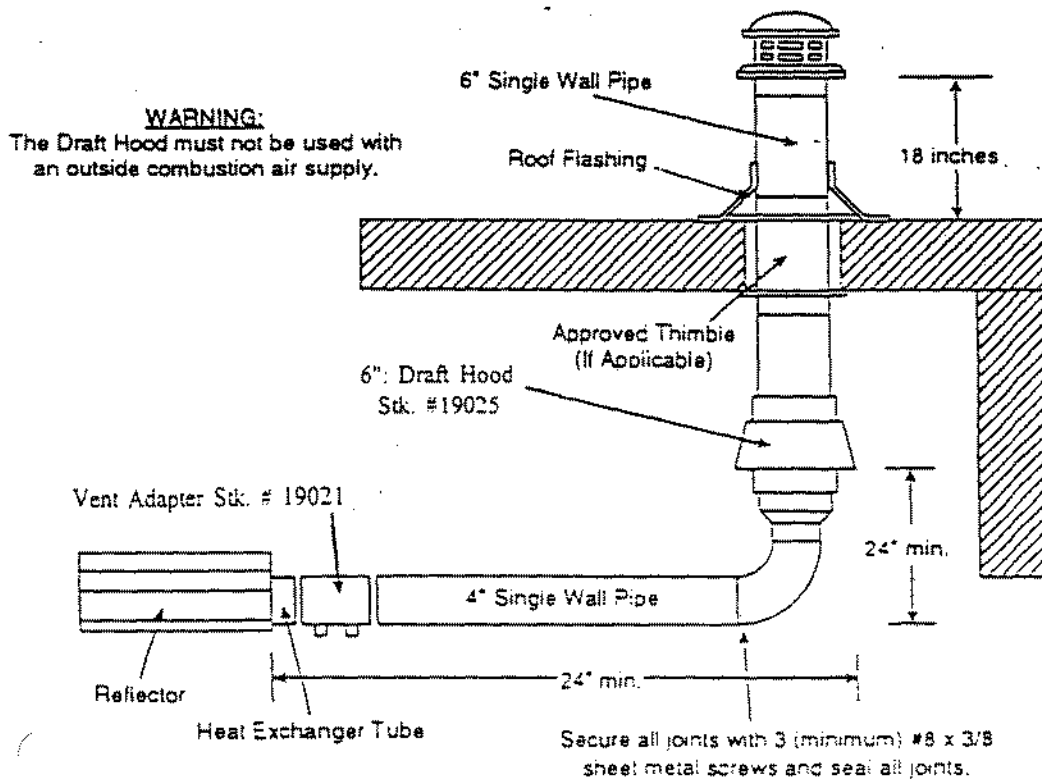
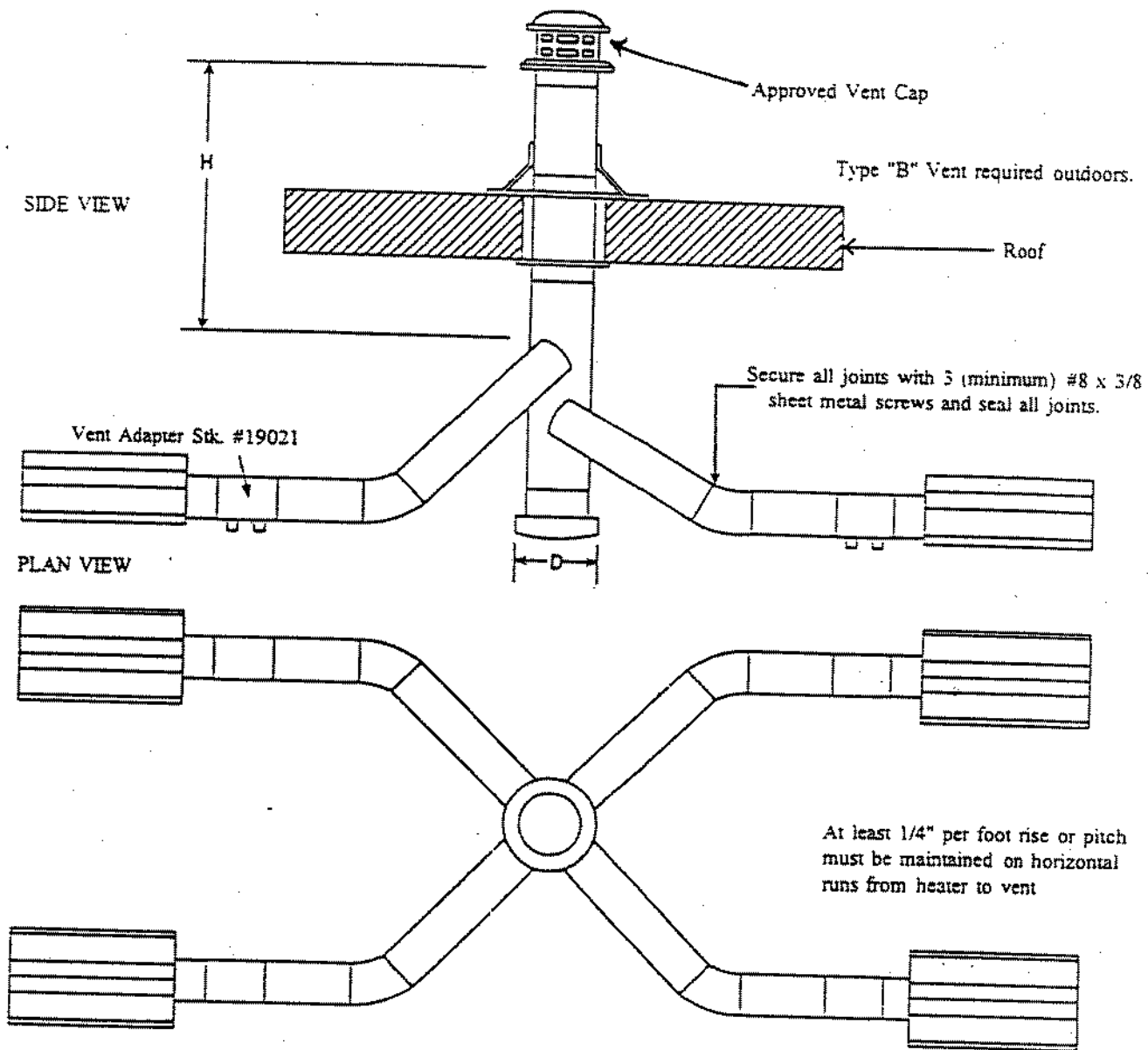


FIGURE 16: Common Roof Venting



COMMON VENTING - 2 HEATERS:

Model #	H = 6ft.	H = 8ft.	H = 15ft.
ER2-60	D = 7"	D = 6"	D = 6"
ER2-80	D = 8"	D = 7"	D = 6"
2-100	D = 8"	D = 8"	D = 7"
ER2-125	D = 10"	D = 10"	D = 8"
ER2-150	D = 10"	D = 10"	D = 8"

COMMON VENTING - 4 HEATERS:

Model #	H = 6ft.	H = 8ft.	H = 15ft.
ER2-60	D = 10"	D = 10"	D = 8"
ER2-80	D = 10"	D = 10"	D = 10"
ER2-100	N/A	D = 12"	D = 10"
ER2-125	N/A	D = 12"	D = 10"
ER2-150	N/A	N/A	D = 12"

Outside Combustion Air Supply

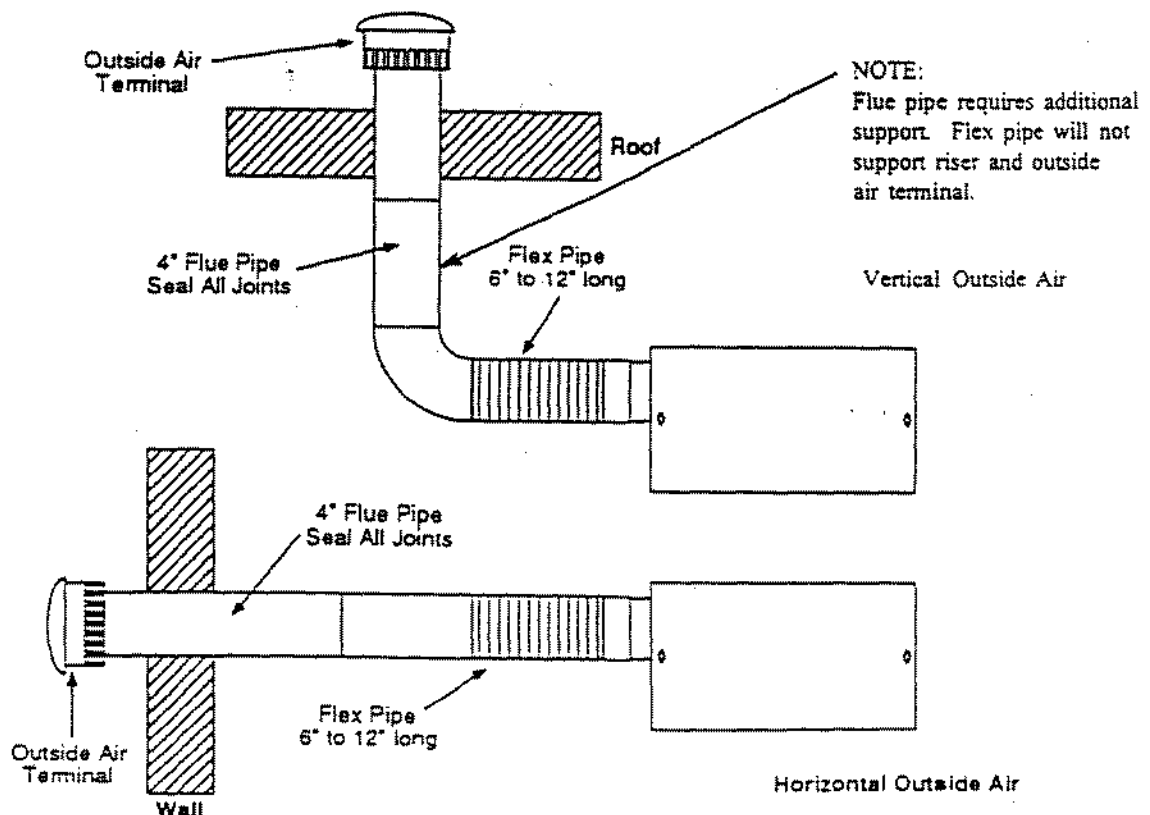
The Ener-Radiant II heater is approved for installation with an outside air supply system. Some compounds such as halogenated hydrocarbons or other corrosive chemicals in the air can be drawn into the equipment and cause an accelerated rate of corrosion of some of the heater components. The use of such chemical compounds near the enclosure should be avoided.

IMPORTANT: If the building has a slight negative pressure or contaminants are present in the air, an outside combustion air supply to the heaters is strongly recommended.

For an outside air supply, a four-inch (4") O.D. single wall pipe may be attached to the heater. The duct may be up to 45 ft. maximum length or 2 ft. minimum length with no more than two (2) elbows. See *General Requirements* heading on page 21 for more detailed guidelines. An outside air supply should not be used with the draft hood venting configuration.

The air supply duct may have to be insulated to prevent condensation on the outer surface. The outside air terminal should be securely fastened to the outside wall by drilling four (4) 1/4" diameter holes in the outside flange; wood screws or bolts and expansion sleeves may be used to fasten the terminal.

FIGURE 17: Non-Pressurized Outside Air Supply Duct



Outside Air Terminal: Use ACME # 104 Enerco Stk. #19030.

PVC pipe, "dryer hose", or equivalent may be used instead of standard vent pipe.

GAS PIPING**Section 6**

Read applicable warnings in Section 1 before proceeding with Gas Piping installation. Improper installation may result in property damage, severe injury, or death.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas line which feeds the system must be large enough to supply the required gas with a maximum pressure drop of $\frac{1}{4}$ " water column. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

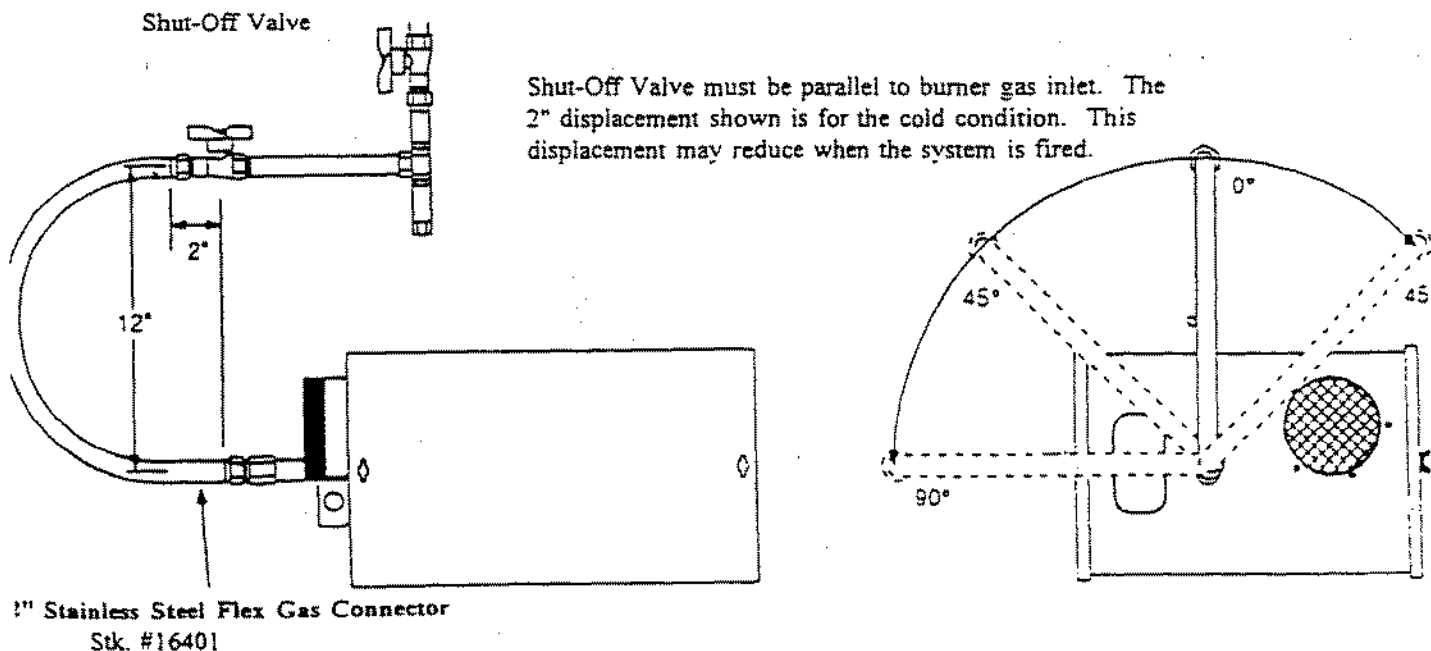
A $\frac{1}{2}$ " tapping at each burner location must be located and oriented as shown in Figure 18. To check system pressure, put a plugged $\frac{1}{8}$ " NPT tapping in the gas line at the connection to the burner farthest from the supply. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed. Do not high pressure test the gas piping with the burners connected.

Follow these instructions to ensure a professional gas supply system installation:

- Support all gas piping with suitable pipe hanging materials.
- Use wrought iron or wrought steel pipe and malleable iron fitting. All pipe and fittings should be new and free from defects. Carefully ream the pipe and tubing ends to remove obstructions and burrs.
- Use L.P. gas-resistant joint compound on all pipe threads.
- Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.

Install the flex gas connector as shown. The flex gas connector accommodates expansion of the heating system and allows for easy installation and service of the burner.

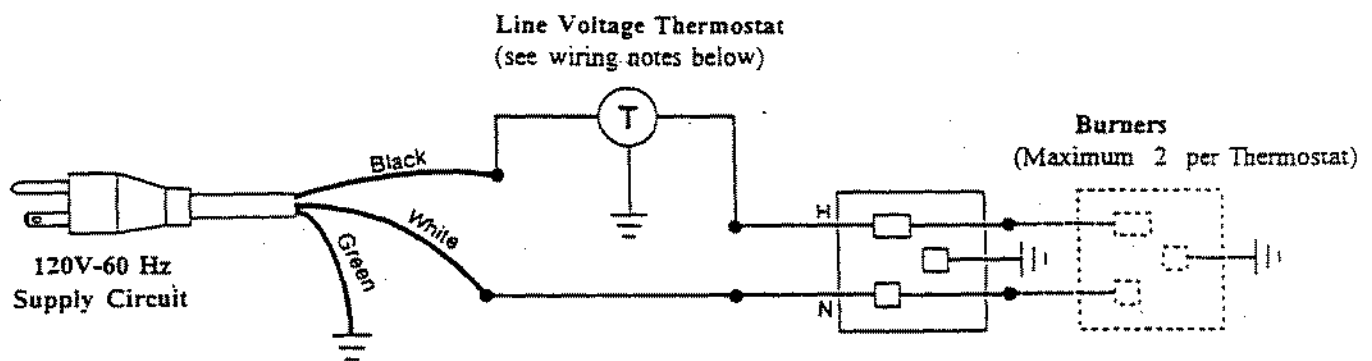
FIGURE 18: Gas Line Connection with Stainless Steel Flex Gas Connector



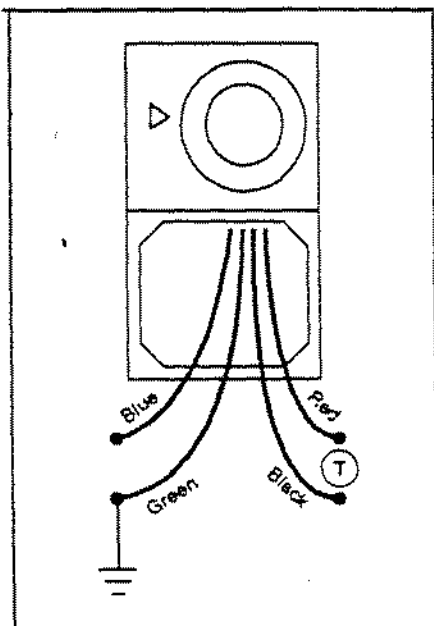
WIRING**Section 7**

Heaters are normally controlled by thermostats. Line voltage thermostats are wired directly (see Figure 19); the recommended 24V thermostats use a relay (see Figure 20). Heaters must be grounded in the accordance with National Electrical Code ANSI/NFPA 70 - latest revision. Heaters may also be controlled with a manual line voltage switch or timer switch in place of the thermostat.

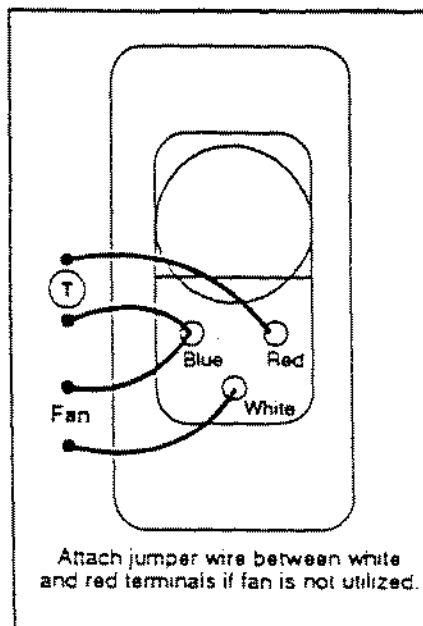
FIGURE 19: Line Voltage Thermostat Wiring



**Line Voltage Thermostat
Moisture Resistant SPDT
Stk. #10420
(Sunne Controls TF 115)**



**Line Voltage Thermostat
Heavy Duty - 2 Circuit
Stk. #10364
(White-Rodgers 176-12)**



**Line Voltage Thermostat
Remote Bulb - 2 Circuit
Stk. #10419
(White Rodgers 230-15)**

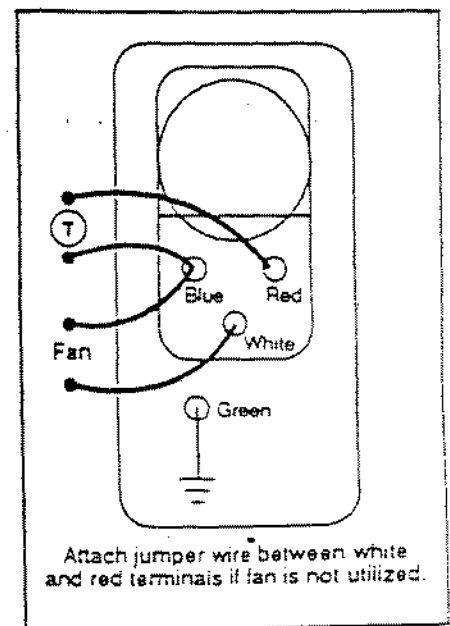


FIGURE 20: Wiring of Low Voltage Thermostat and Relay

When using 1-2 burners, use SPDT Transformer Relay Stk. #00172
 When using 3-4 burners, use DPDT Transformer Relay Stk. #00183

Wires marked with an asterisk (*) are for use only with the DPDT Transformer Relay

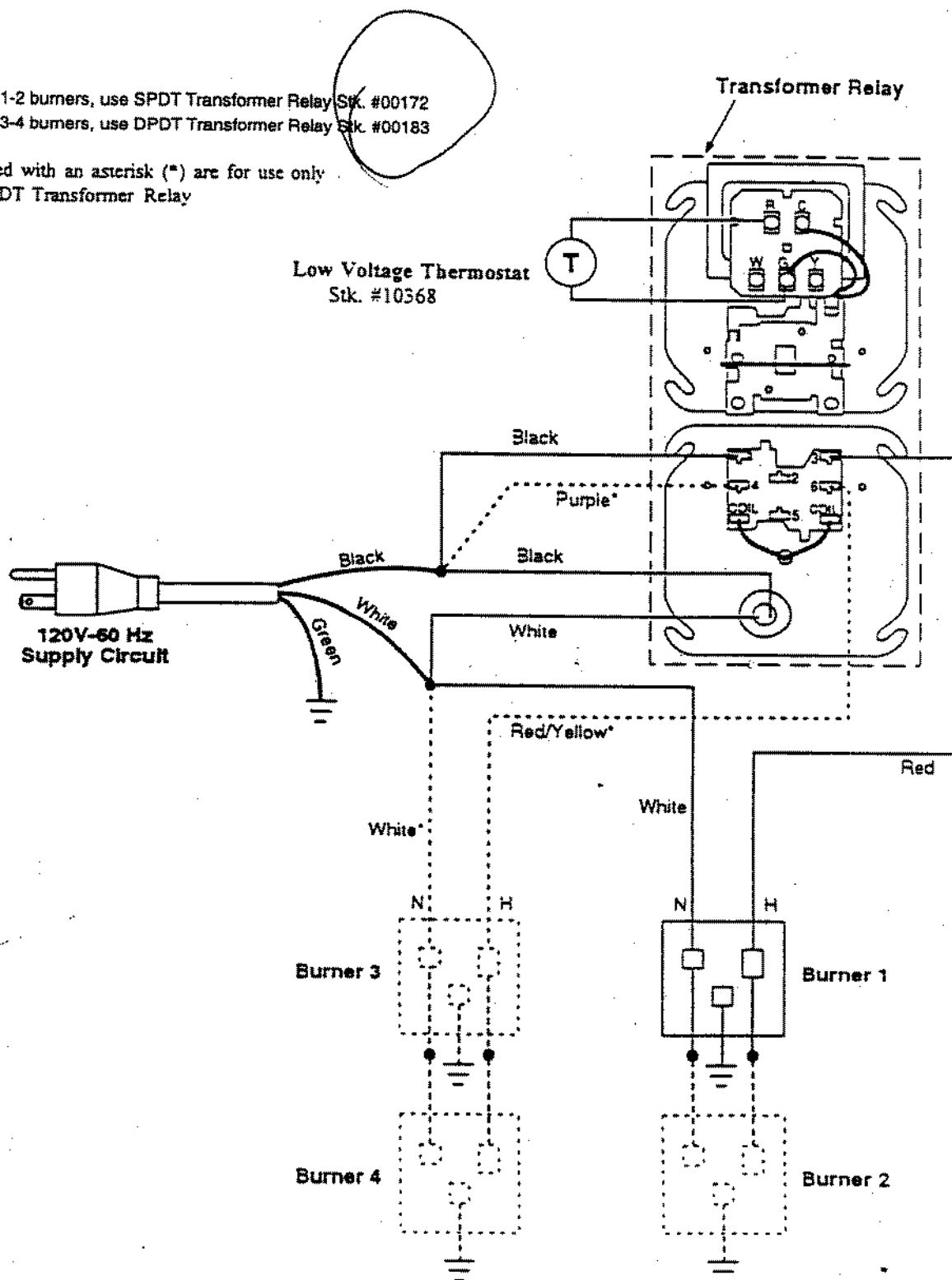
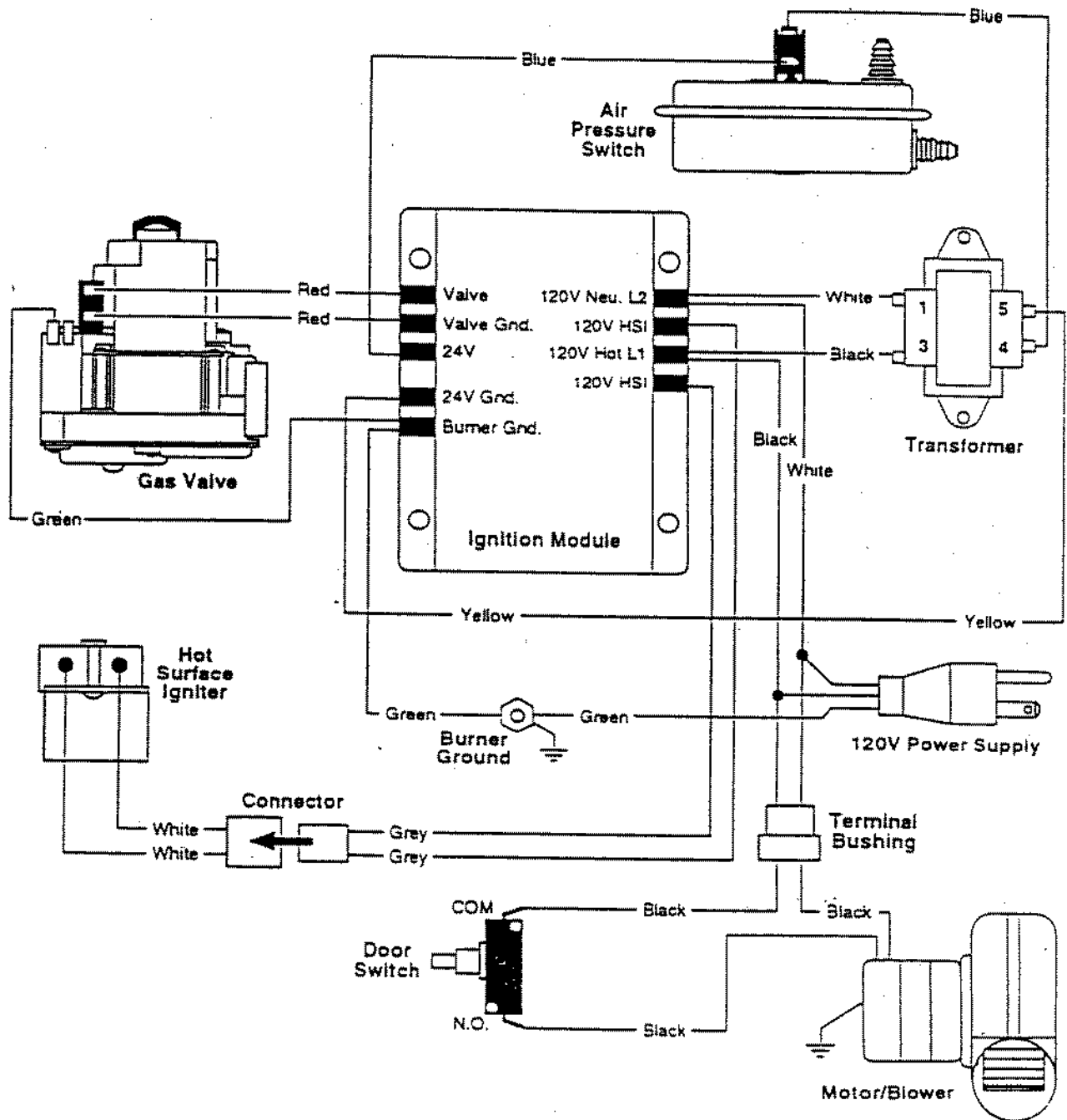
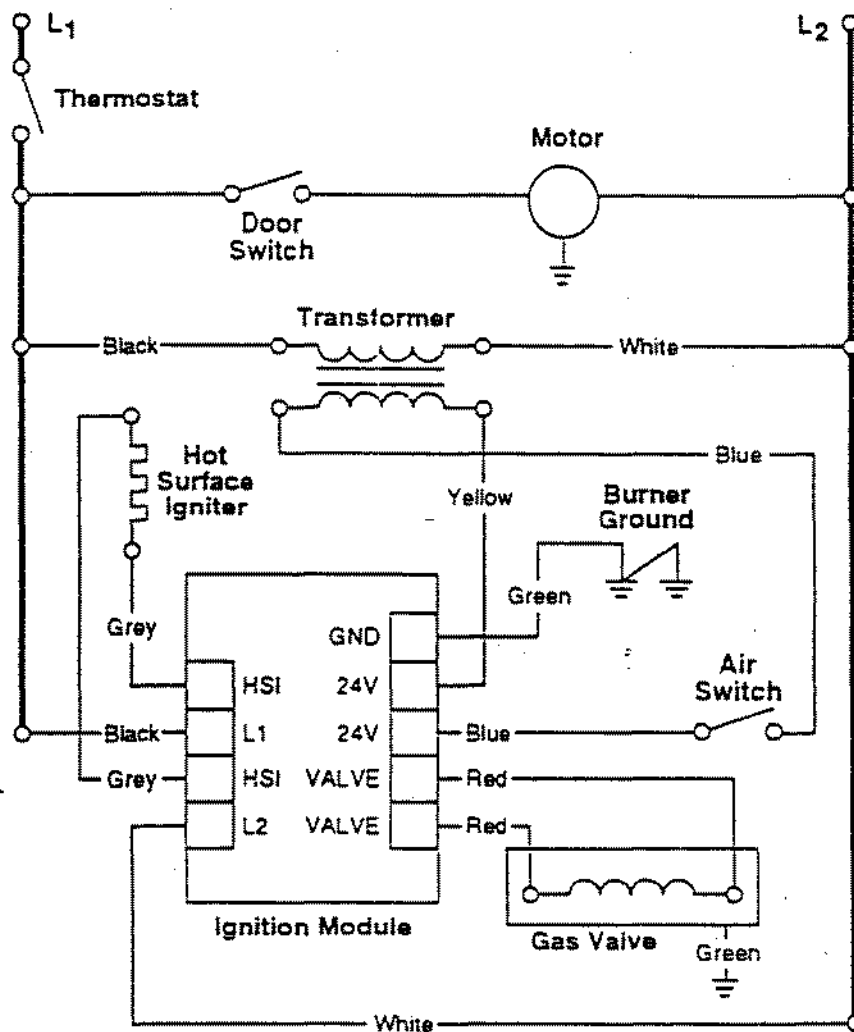


FIGURE 21: Ener-Radiant II Burner Internal Wiring



- 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°C and 600 volts.
- Each burner must be electrically grounded in accordance with National Electrical Code ANSI/NFPA 70 - latest edition.

FIGURE 22: Ener-Radiant II Burner Internal Wiring Ladder Diagram



OPERATION AND MAINTENANCE**Section 8***Sequence of Operation*

1. Turn the thermostat up. When the thermostat calls for heat, the blower motor will energize.
2. When the motor approaches nominal running RPM, the air proving switch closes and activates the ignition module.
3. The ignition module then energizes the hot surface igniter for a timed warm-up period (approximately 45 to 60 seconds).
4. After the warm-up period, the gas valve is energized.
5. During the last part of the sequence, the igniter is de-energized and is converted to a flame sensing rod.
6. If a flame is detected, the gas valve remains open. When the call for heat is satisfied, and the system control mechanism de-energizes the burner line voltage supply, the gas valves are turned off.
7. If no flame is detected on a single-try module, the gas valve is closed, and the module will lockout until it is reset. Reset is accomplished by removing power from the module for at least five (5) seconds (thermostat cycle required).
8. If no flame is detected on a three-trial module, the gas valve is closed, and a purge period begins. After the purge, the module acts to power the igniter for a second warm-up period, and a second trial for ignition period. If flame is still not established, a third and final purge, warm-up, and trial cycle begins. After three trials, the module will lockout until reset. Reset is accomplished by removing power from the module for at least five (5) seconds (thermostat cycle required).
9. On a three-trial module, if flame is established and lost on the first or second trial, the gas valve is turned off, a purge, warm-up, and trial for ignition will occur on a three-trial module, only three trials for ignition are allowed per thermostat cycle.

Maintenance

For best performance, the following maintenance procedures should be performed before each heating season:

1. **Be sure gas and electrical supply to heater are off before performing any service or maintenance.**
2. Check condition of blower scroll and motor. Dirt and dust may be blown out with compressed air, or a vacuum cleaner may be used.
3. Check condition of burner. Carefully remove any dust or debris from inside the burner box or burner cup.
4. Inspect the igniter. Replace igniter if there is excessive carbon residue, erosion, breakage or other defects.
5. Check the inside of the firing tube with a flashlight. If carbon or scale are present, scrape out the deposits with a wire brush or rod, or metal plate attached to a wooden pole.
6. Check to see that the burner observation window is clean and free of cracks or holes. Clean or replace as necessary.
7. Check the flue pipe for soot or dirt. After cleaning as necessary, re-attach the flue pipe to the heater.
8. Outside surfaces of heater may be cleaned by wiping with a damp cloth.
9. A qualified service agency should be contacted for service other than routine maintenance.
10. Check vent terminal and fresh air inlet to see that they have not become blocked during the non-heating season. If either pipe is restricted, the air switch won't close, resulting in a no-heat situation.

Troubleshooting

CAUTION: Before opening the Ener-Radiant II burner doors for any type of service, be sure the gas supply has been shut off at the heater and the electrical cord from the burner box has been unplugged.

- Blower Motor Fails to Run**
1. Is the thermostat calling for heat? Is there 115V at the burner receptacle?
 2. Check blower side door for seal. Check door switch. Replace if necessary.
 3. Check blower for obstructions. Replace blower if necessary.

- Igniter Does Not Glow**
1. Check igniter for damage. Replace if necessary.
 2. Check voltage and resistance at igniter. (Voltage should be 115V. Resistance should be 40-75 ohms.)
 3. Check for obstructions to the air inlet and outlet.
 4. Check wiring and hose connections to the air switch. Replace if necessary.
 5. Check voltages at transformer primary and secondary. Replace transformer or module as necessary.

- Valve Does Not Come On** Gas pressure downstream of gas control can be measured by using a manometer and connecting to pressure tap on control.
1. Check to see if manual valve to heater is ON.
 2. Check to see if manual valve knob on heater gas control is ON.
 3. Supply gas pressure can be checked at 1/8" NPT pressure tapping on heater external manual valve.
 4. Check to see if gas control is opening: no manifold pressure indicates valve is closed.

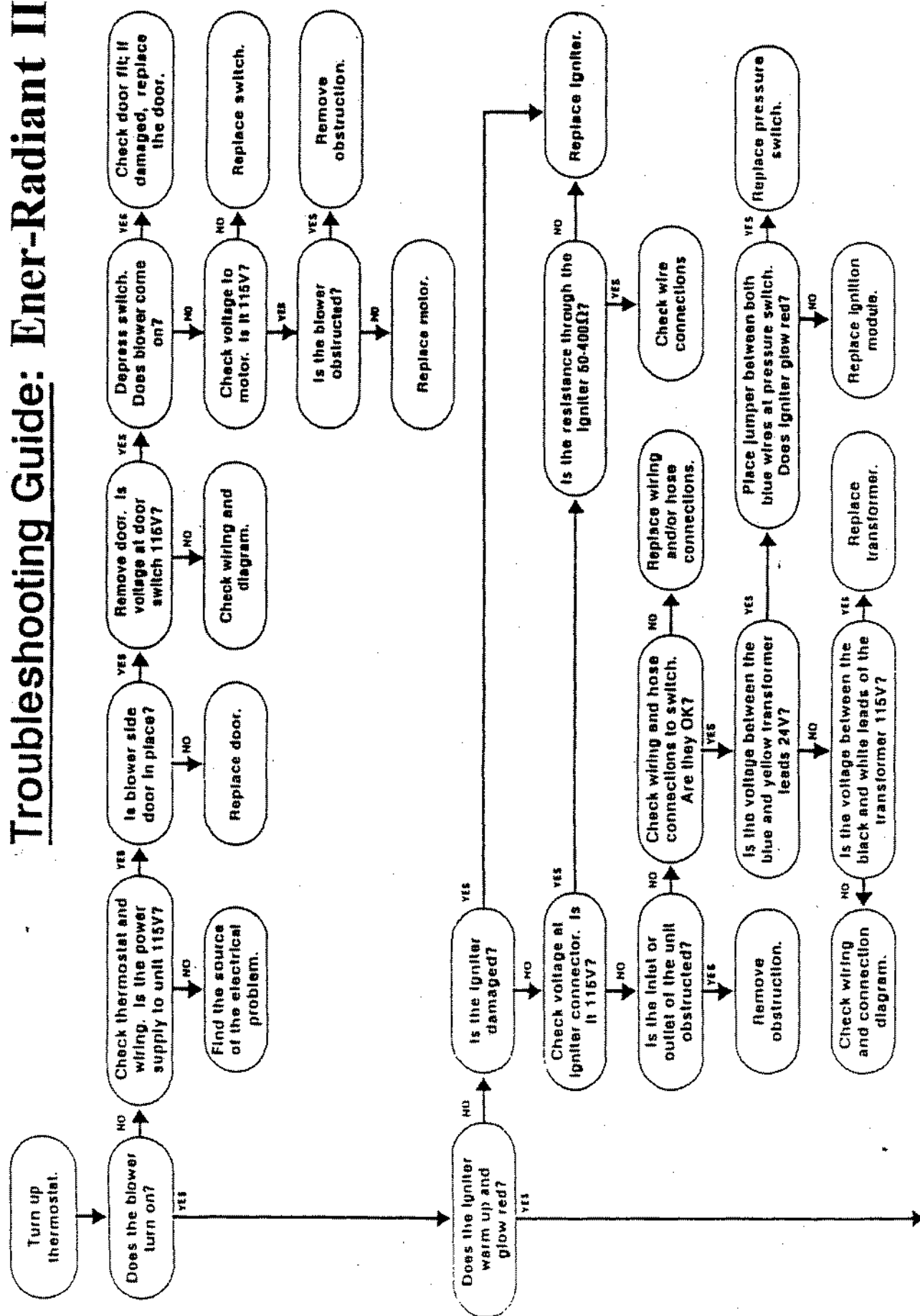
If the valve is closed, either the gas valve or the ignition module is faulty.

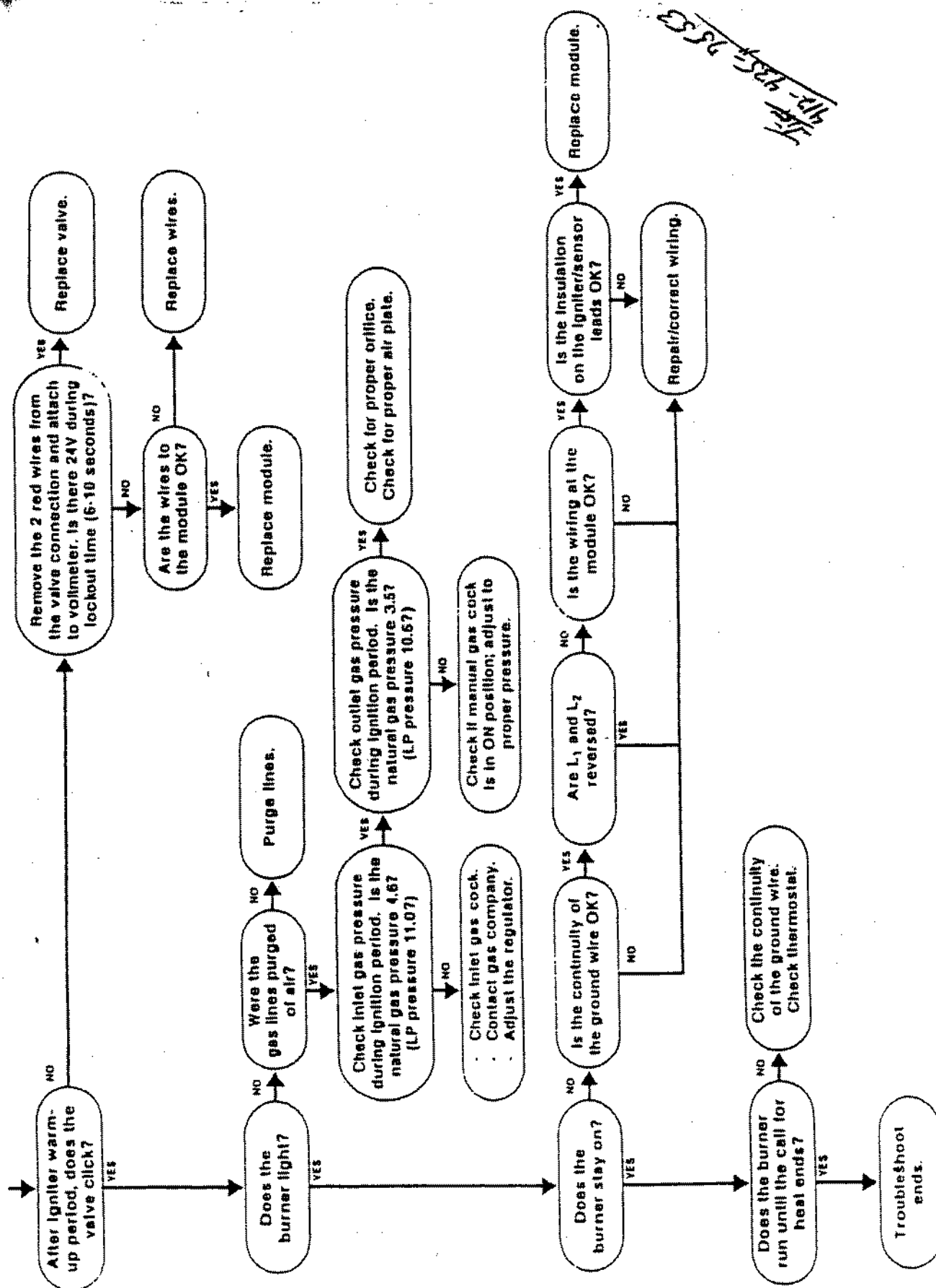
WARNING: Do not disconnect ground leads inside heater. Do not interchange grounded and ungrounded leads on transformer or ignition module.

- Burner Does Not Light**
1. Check to see if gas lines were properly purged of air.
 2. Check inlet and outlet gas pressure during ignition period.
Natural inlet pressure should be 4.6".
Natural outlet pressure should be 3.5".
LP inlet pressure should be 11.0".
LP outlet pressure should be 10.5".
 3. Check for proper orifice and air plate.

- Burner Does Not Stay Lit**
1. Check ground wire continuity.
 2. Check burner internal wiring for reversed leads.
 3. Check insulation on the igniter leads.
 4. Replace module if necessary.

Troubleshooting Guide: Ener-Radiant II



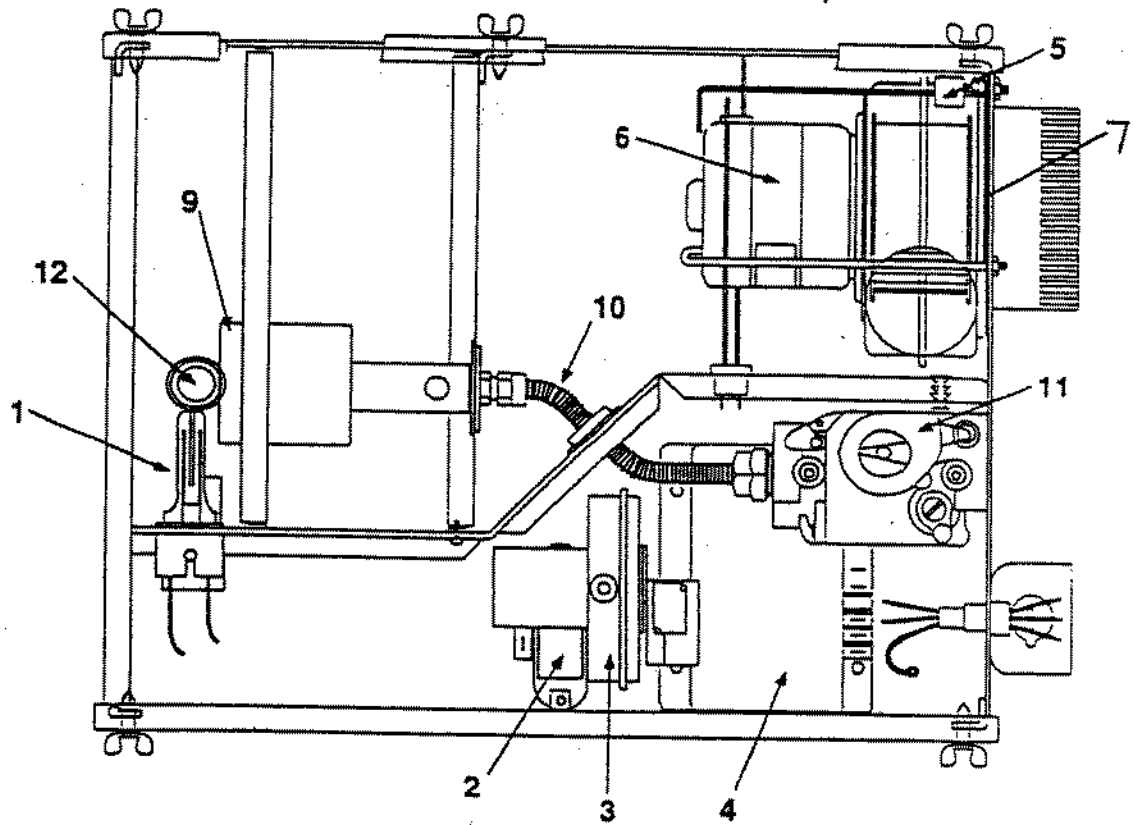


APPENDIX I: Replacement Parts**Section 9****TABLE 3: Ener-Radiant II Replacement Parts (see Figure 24)**

Item	Part Number	Description
1	10398	Hot Surface Igniter
2	08364	Transformer
3	10411 10412	Air Sensing Switch (ER2-60,80, 100, 125) Air Sensing Swith (ER2-150)
4	00099	Hot Surface Ignition Module
5	10391	Door Switch
6	07376	Motor and Blower Assembly
7	12395	Blower Inlet Gasket
8	17378	Air Adapter Collar
9	02371	Burner Cup Assembly
10	17379	Manifold
11	00100 00101	Gas Valve - Natural Gas Valve - LP
12	12404	Mica Window Assembly
13	12397	Tube Gasket

FIGURE 24: Ener-Radiant II Burner and Control Housing (see Table 3)

TOP VIEW



SIDE VIEW

