HL SERIES

TUBE HEATER

INSTALLATION, OPERATION,
MAINTENANCE
AND PARTS MANUAL

RE-VERBER-RAY

Detroit Radiant Products Company

FOR YOUR SAFETY!

IF YOU SMELL GAS:
1. Open windows.
2. Do not touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

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

LIOHL-3M-10/98-(RX)

FOREWARD

WARNING!

THIS HEATER **MUST** BE INSTALLED AND SERVICED BY TRAINED GAS INSTALLATION AND SERVICE PERSONNEL ONLY. READ AND UNDERSTAND THESE INSTRUCTIONS THROUGHLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE DETROIT RADIANT PRODUCTS COMPANY HEATER. FAILURE TO COMPLY WITH THESE WARNINGS AND INSTRUCTIONS, AND THOSE ON THE HEATER, COULD RESULT IN PERSONAL INJURY, DEATH, FIRE, ASPHYXIATION, AND/OR PROPERTY DAMAGE. RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE.

Approval Standards and Certifications

Detroit Radiant Products units comply with or are certified by the following Organizations or Standards:

- American National Standards (ANSI Z83.6)
- Occupational Safety and Health Act (OSHA)
- American Gas Association (AGA)
- International Approval Services (IAS)

IMPORTANT!

Any alteration of the system or of the factory authorized components specified either in this manual or by Detroit Radiant Products Company voids all certification and warranties.

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1 SAFETY INFORMATION

WARNING!

NOT FOR RESIDENTIAL USE!

Do not use in the home, sleeping quarters, attached garages, etc.

WARNING!

This is not an explosion-proof heater. Where there is the possibility of exposure to flammable vapors, consult the local fire marshal, the fire insurance carrier or other authorities for approval of the proposed installation.

This infrared heater is designed for use in industrial and commercial buildings such as warehouses, manufacturing plants, aircraft hangars, service garages, etc.

WARNING!

Detroit Radiant Products Company cannot anticipate every use which may be made of their heaters. Check with your local fire safety authority if you have questions about local regulations.

The following information **must** be reviewed before installing this heater:

- Check the AGA rating label on the heater to verify the proper gas to be used. Check the other labels on the heater to verify proper mounting and clearance to combustibles.
- Signs should be posted in storage areas to specify maximum stacking height allowed in order to maintain clearance to combustibles. DRP Part # PLQ warning plaques are recommended.
- The installation of this heater must conform with local building codes or, in the absence of local codes, to the latest edition of the National Fuel Gas Code, ANSI-Z223.1 (NFPA54).
- The installation of this heater in public garages must conform to the latest edition of the Standard for Parking Structures, ANSI/NFPA88A, or the Standard for Repair Garages ANSI/NFPA88B, and must be at least 8 ft. above the floor.
- The installation of this heater in aircraft hangars must conform with the latest edition of the Standard for Aircraft Hangars, ANSI/NFPA409. The heater must be installed at least 10 ft. above the upper wing surfaces and engine enclosures of the highest aircraft that might be stored in the hangar. In areas adjoining the aircraft storage area, the heaters must be installed at least 8 ft. above the floor. The heaters must be located in areas where they will not be subject to damage by aircraft, cranes, and moveable scaffolding or other objects.
- The heater, when installed, must be electrically grounded in accordance with the latest edition of the National Electrical Code, ANSI/NFPA70.
- Under no circumstance is either the gas supply line or the electrical supply line to the heater to provide any assistance in the suspension of the heater.
- The weight of the heater must be entirely suspended from a permanent part of the building structure having adequate load characteristics.
- Neither the gas supply line, electrical supply line or sprinkler heads shall be located within the minimum clearance to combustibles as shown in the Clearance to Combustibles Chart on page 3.

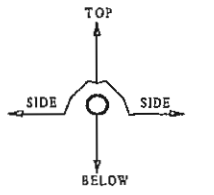
WARNING!
Failure to comply with the stated clearance to combustibles could result in personal injury, death and/or property damage.

WARNING!
This heater should be installed so that the minimum clearances to vehicles, as marked on the heater, will be maintained. If vehicle lifts are present, ensure that these clearances will be maintained from the highest raised vehicle.

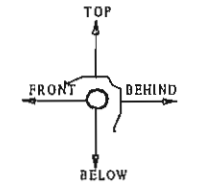
For the safe installation of this heater, the following table contains clearances that must be maintained:

CLEARANCES TO COMBUSTIBLES (IN.)

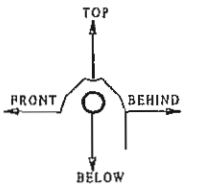
MODEL NO.	MOUNTING ANGLE	SIDE FRONT	SIDE BEHIND	TOP	BELOW
HL (20,30,40) -75(N,P)	0°	9	9	6	60
	45°	39	8	10	60
W/1 side shield	0°	29	8	6	60
W/2 side shields	0°	9	9	6	60
20 ft from burner	0°	7	7	6	30
HL (30,40,50) -100(N,P)	0°	14	14	6	66
	45°	39	8	10	66
W/1 side shield	0°	29	8	6	66
W/2 side shields	0°	16	16	6	66
20 ft from burner	0°	7	7	6	30
HL (40,50,60) -150(N,P)	0°	24	24	6	81
	45°	58	8	10	81
W/1 side shield	0°	42	8	6	81
W/2 side shields	0°	23	23	6	81
20 ft from burner	0°	11	11	6	44
HL (50,60,70) -175(N,P)	0°	34	34	6	92
	45°	63	8	10	92
W/1 side shield	0°	50	8	6	92
W/2 side shields	0°	30	30	6	92
20 ft from burner	0°	11	11	6	44
HL (50,60,70) -200(N,P)	0°	41	41	6	94
	45°	63	8	10	94
W/1 side shield	0°	54	8	6	94
W/2 side shields	0°	30	30	6	94
20 ft from burner	0°	11	11	6	44



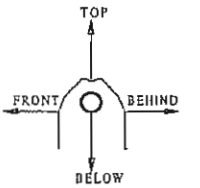
0° MOUNTING ANGLE



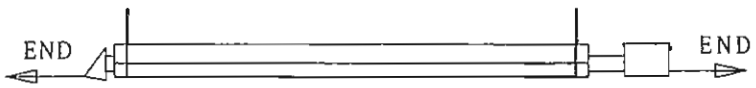
45° MOUNTING ANGLE



0° W/1 SIDE SHIELD



0° W/2 SIDE SHIELDS



Note: The minimum end clearance for all models is 12 inches.

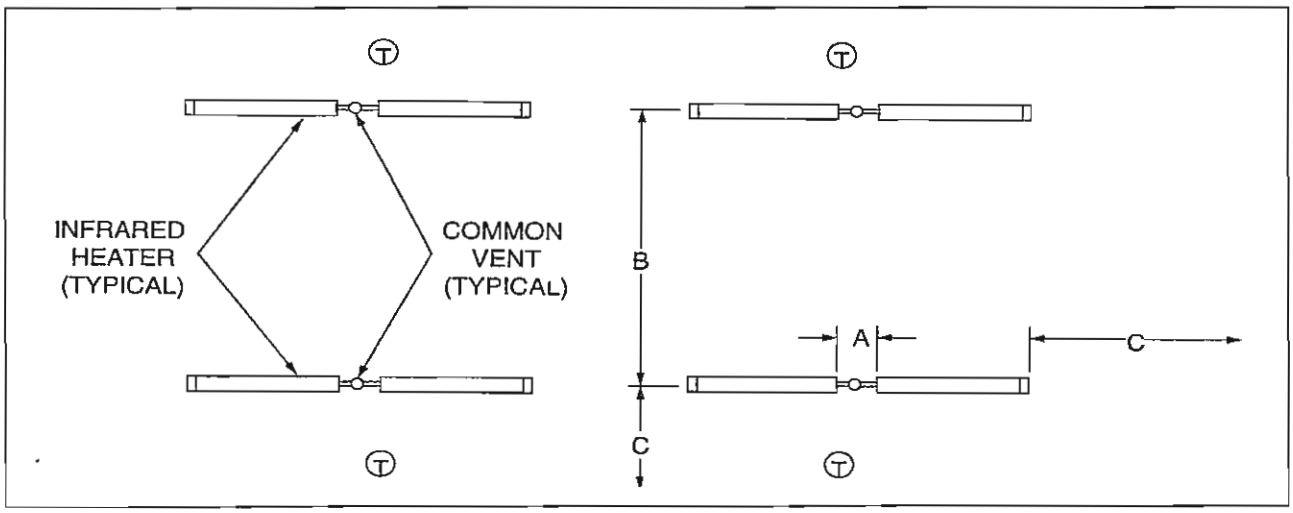
2 INSTALLATION

2.1 Design Criteria

Perimeter mounting of these infrared heaters provides for the most efficient installation. In Figure 2-1, the heaters are mounted at the perimeter of the space to be heated. Refer to the HL Heater Installation Chart for the recommended distances on the models being installed. Buildings that require the rows of heaters to be farther apart than the recommended distance in the chart may need additional heaters placed in the center of the space.

HL HEATER INSTALLATION CHART				
MODEL NO.	TYPICAL MOUNTING HEIGHT (FT)	DISTANCE BETWEEN HEATERS (FT) DIM "A"	DISTANCE BETWEEN HEATER ROWS DIM "B"	MAXIMUM DISTANCE BETWEEN HEATER AND WALL (FT) DIM "C"
HL (20,30,40) - 75 (N,P)	11-18	11-30	14-70	17
HL (30,40,50) - 100 (N,P)	12-20	12-40	15-80	20
HL (40,50,60) - 150 (N,P)	15-30	13-45	17-100	20
HL (50,60,70) - 175 (N,P)	16-35	14-50	17-110	25
HL (50,60,70) - 200 (N,P)	17-40	15-55	18-120	30

NOTE: This chart is provided as a guideline. Actual conditions may dictate variation from this data.



T Thermostat

Figure 2-1

TYPICAL BUILDING LAYOUT

When positioning heaters, keep in mind the clearance to combustible materials, lights, sprinkler heads, overhead doors, storage areas with stacked materials, gas and electrical lines, parked vehicles, cranes and any other possible obstructions or hazards. Refer to the Warnings, Cautions and the Clearance To Combustibles Chart in the Safety Information Section and on the heater to verify that a safe installation condition exists.

The following guidelines must also be met to ensure a good installation and proper heater performance:

- HL 200 models normally **must not** be mounted closer than stated.

Model	Above Finished Floor
HL 200	17 ft.
HL 175	16 ft.
HL 150	15 ft.

  Consult Detroit Radiant Products if you have a special case requiring a lower mounting height.

- A maximum of two 90° elbows or one 180° elbow can be installed on HL model heaters. The gas input of the heaters, as stated on the rating label, will determine the minimum length of radiant pipe from the control box to the first elbow (See optional 90° and 180° Elbows Section).

NOTE: Flue vent requirements do not change when elbows are installed.

- **Do not** exceed the maximum vent length (usually 20 feet) for exhausting the heater. Consult the Flue Venting Chart in section 2.6.

- **Do not** combine the exhaust vents of two heaters into a straight through tee. A Part No. Y or staggered tee arrangement **must be** used. Heaters sharing the same vent must share the same thermostat. Common vents must have a 6 inch diameter (see Figure 2-1).

- Outside air for combustion must be ducted to the heater if the building atmosphere where the heater is installed contains one of the following:

  - Chemicals such as chlorinated or fluorinated hydrocarbons.

  - High humidity such as car washes.

  - Contaminants such as sawdust, welding smoke, etc.

  - Negative static pressure.

Consult Combustion Air Requirements section on page 17.

- **Do not** exceed the maximum duct length for fresh air intake (usually 20 feet). Consult Air Intake Duct Chart on page 17.

- **Do not** draw fresh air to the heater from an attic space. There is no guarantee that adequate air will be supplied.

- All unvented heaters **must** use Part No. WVE-GALV vent with flapper.

Once all of the safety precautions and design criteria are met, the actual installation of the heater may begin.

2.2 Prechecks

1. Verify that all parts have been received by checking them against the packing list. If anything is missing, notify the Re-Verber-Ray representative or Detroit Radiant Products.

2. Check the AGA rating label on the heater to verify the model number, the gas to be used and that the clearance to combustibles will be met.

3. Make sure the finished installation will conform to the design requirements listed in the Clearance To Combustibles Chart and the figure shown on Page 3, and Figure 2-1.

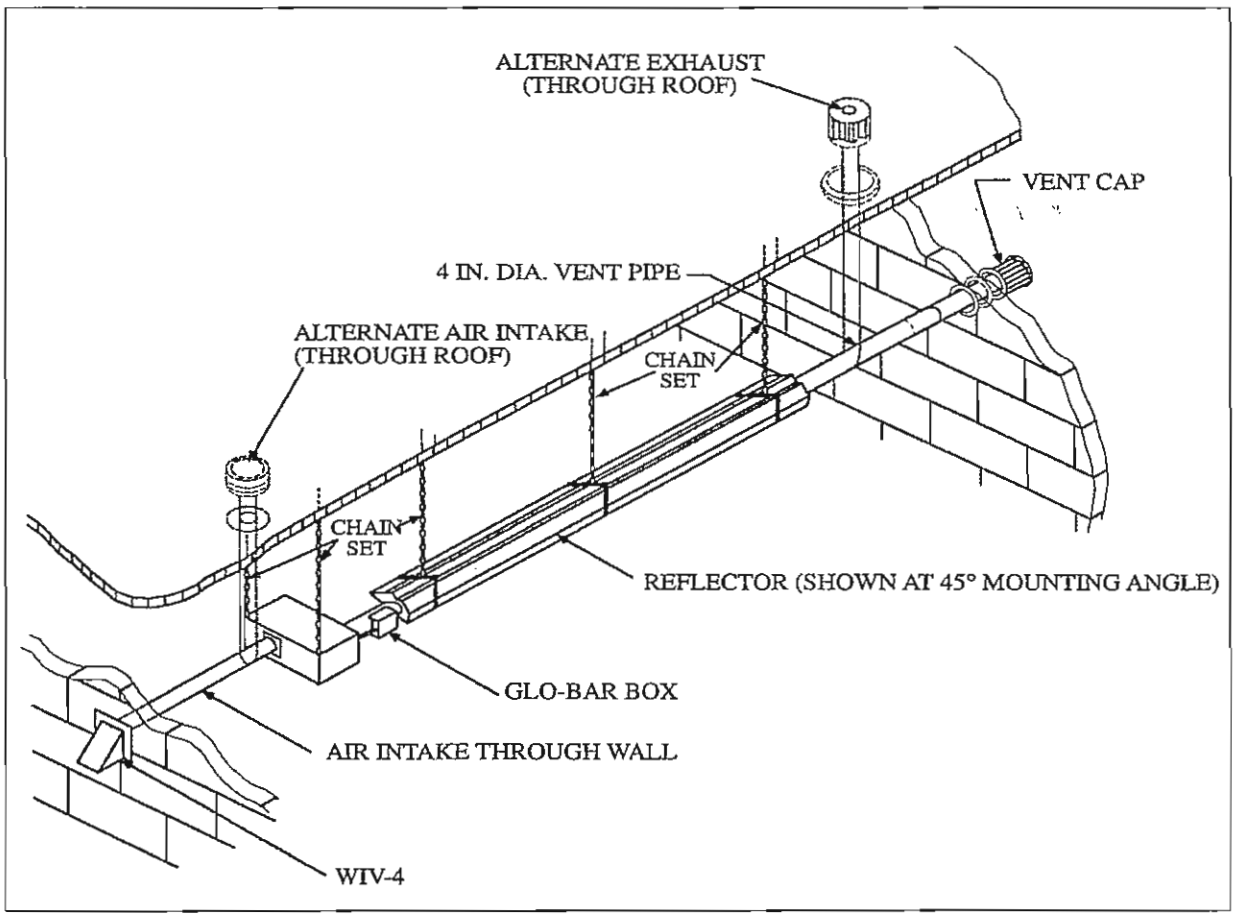
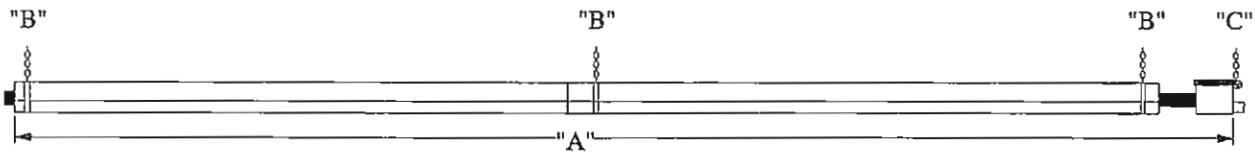
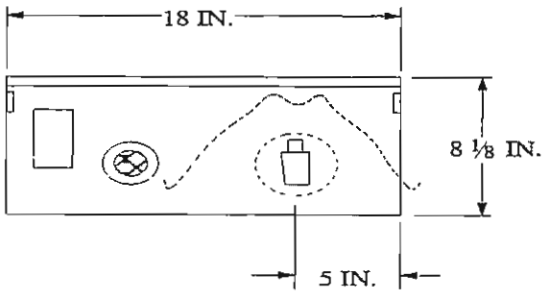


Figure 2-2

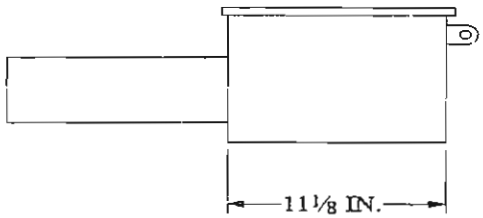
TYPICAL INSTALLATION DRAWING



MODEL NUMBER	DIMENSION "A"	SUSPENSION POINTS "B"	CONTROL BOX STABILIZER "C"
HL 20	259"	3	2
HL 30	375"	4	2
HL 40	491"	5	2
HL 50	607"	6	2
HL 60	723'	7	2
HL 70	839"	8	2



END VIEW



ENLARGED SIDE VIEW

Figure 2-3

DIMENSIONS FOR HL MODELS

2.3 Heater Mounting

1. Each heater comes equipped with the necessary hangers (Figure 2-4) for hanging.

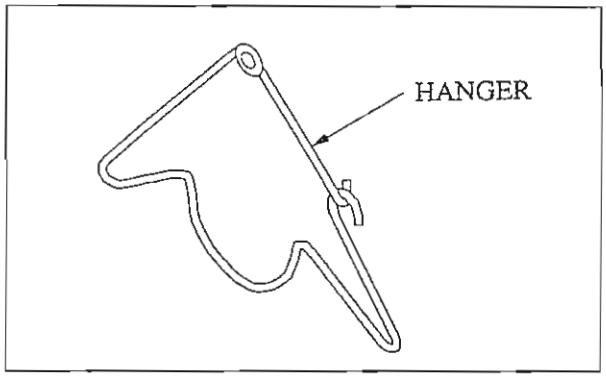


Figure 2-4

2. Use of number 1 double-loop chain is recommended for heater hanging (Accessory No. THCS). See Figure 2-5.

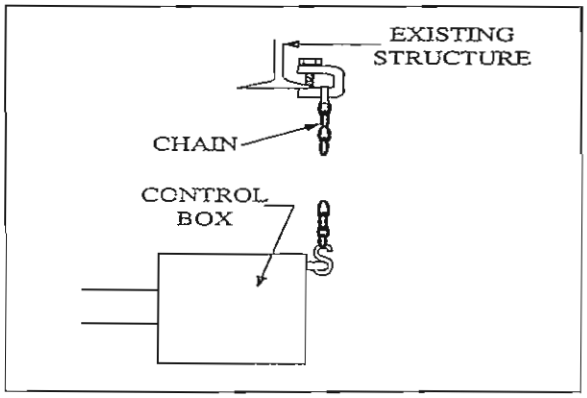
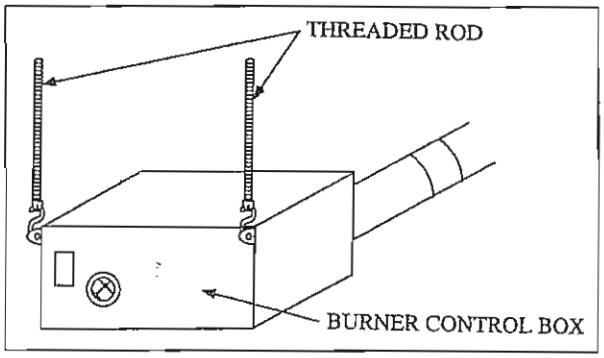


Figure 2-5

NOTE: If windy conditions exist in the space around the heater it may be necessary to rigidly mount the heater to prevent swaying. It is recommended that threaded rod be used for the two hanging points at the burner control box (see Figure 2-6). The remaining hanging points should use chains to allow for heater expansion.

3. Mount hangers on approximately 10 ft. centers. Slide tubes through hangers with weld seam downward (see Figure 2-7) and fasten with tube clamps (see Figure 2-8). Center clamps on seams.



IMPORTANT: HL 175,000 and 200,000 BTU/H models must be installed with a stainless steel tube clamp at the second joint of the exchanger between the first and second radiant tubes.

NOTE: The tube clamps provided with the heater are pre-assembled at the factory. If a clamp is dismantled, it is important that upon reassembly the spacer is properly inserted (see Figure 2-8). The spacer's concave surface **must** face the radiant tube. Incorrect spacer placement will result in shearing of the bolt when torqued to the recommended specifications (40-60 lb./ft).

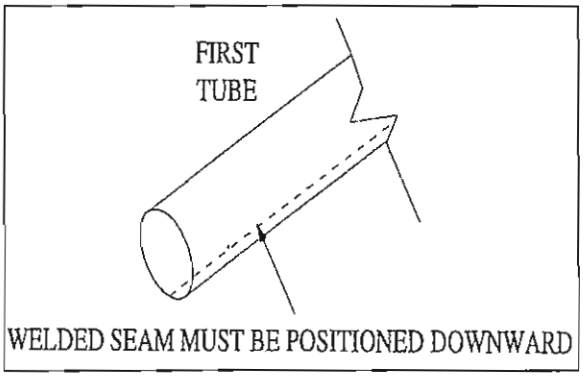


Figure 2-7

IMPORTANT: HL models 150,000 BTU/H, 175,000 BTU/H and 200 MBTU/H **must** be installed with the 10 ft. titanium alloy aluminized tube directly following the burner box. Titanium tubing may be identified by the identification sticker found on the swaged end of the tubing. A stamped "5A-TI" may also be found on this end.

IMPORTANT: Radiant tubes with baffles must be installed last (furthest from the burner). See Figure 2-9. All baffles must be in the vertical position.

4. Mount heaters in conformance with approval standards referenced in the Foreword.

5. Install chains perpendicular to the heater. Install heater so that it is independently supported and does not rely on the gas or electrical lines for any of its support.

6. Mount heater so that burner sight glass is visible from the floor.

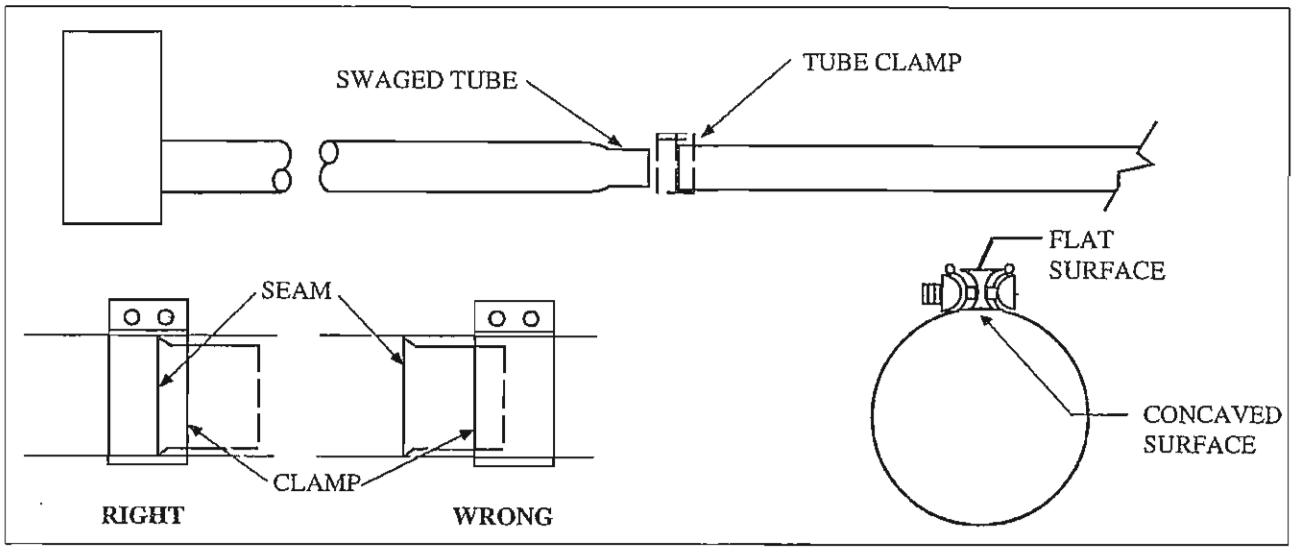


Figure 2-8

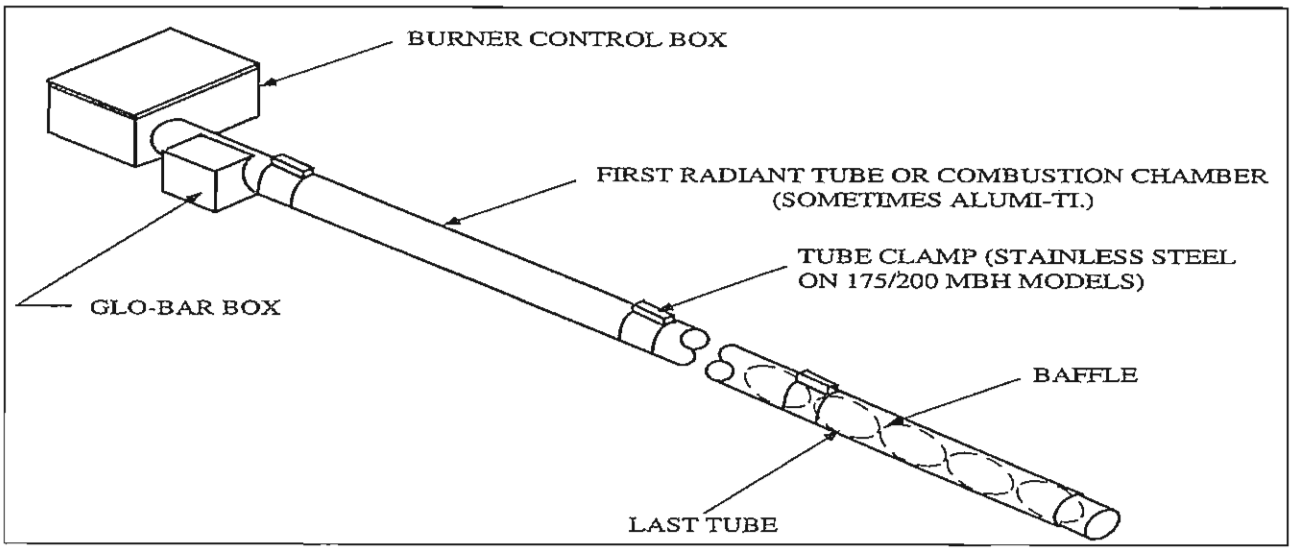


Figure 2-9

2.4 Reflector Assembly

1. Install reflector center supports (RCS) as shown in Figure 2-10.

2. Slide reflector through wire hangers and adjust the reflector positioning spring in the V-groove on top of the reflector as shown in Figure 2-11. Overlap reflectors 4 in. for support (see Figure 2-10).

NOTE: Assemble the reflector after every 10 ft. section of emitter pipe is installed.

3. Secure reflectors together with clips or sheet metal screws (preferred method) at points indicated by arrows (see Figure 2-12). Make sure to leave an expansion joint.

NOTE: The clips prevent the reflectors from shifting position due to heater operation.

4. Install reflector end caps at exposed ends of the reflector runs with clips (Figure 2-11).

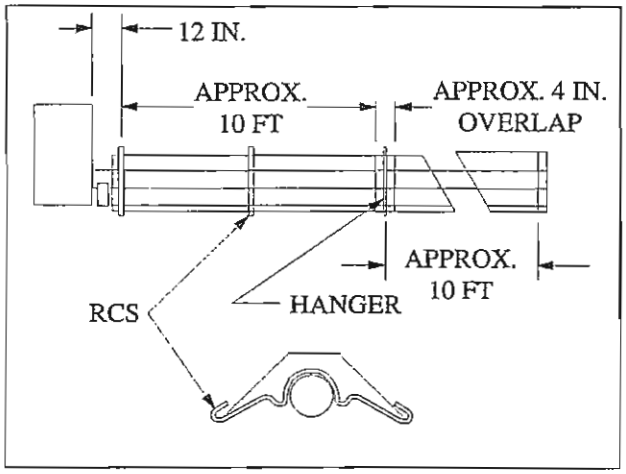


Figure 2-10

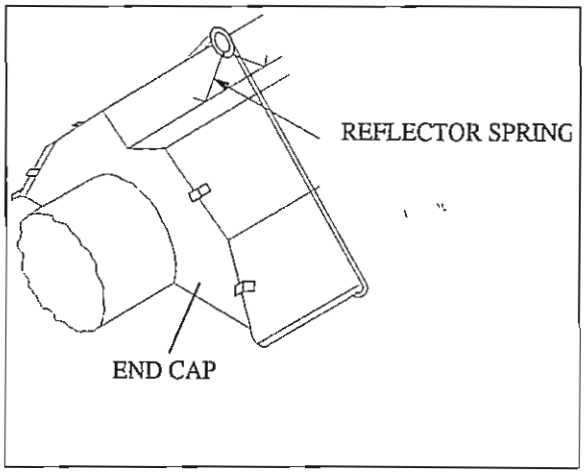


Figure 2-11

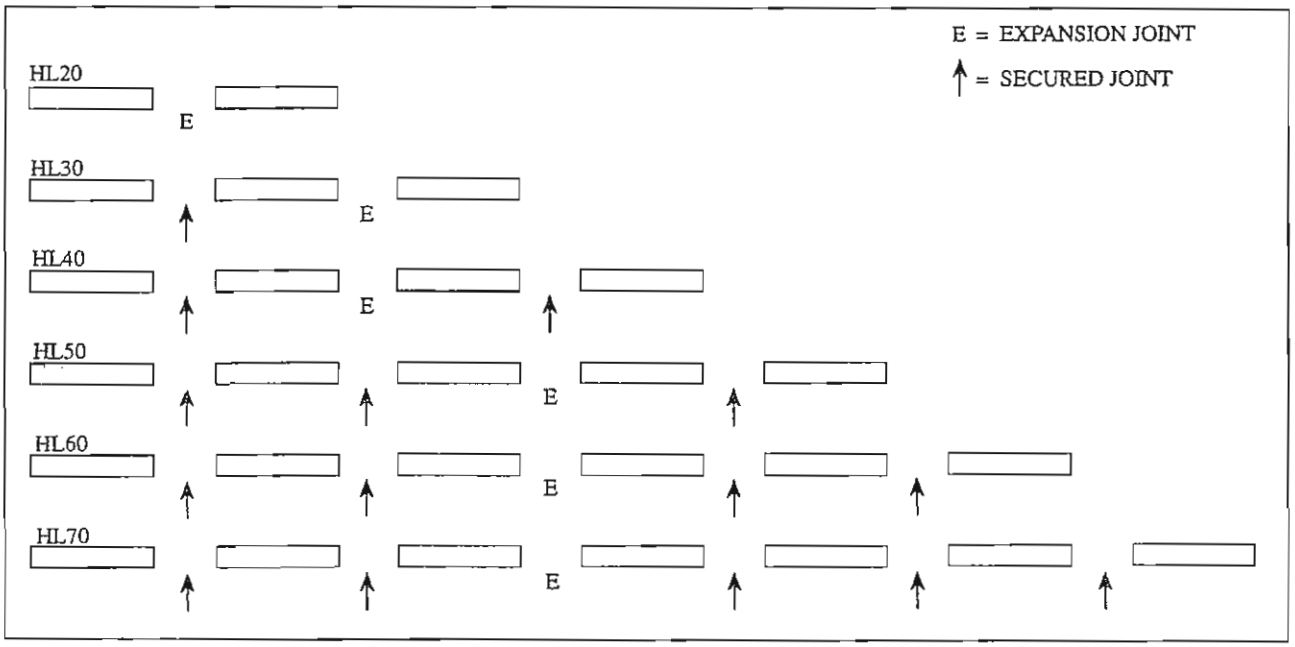


Figure 2-12

OPTIONAL SIDE INSTALLATION

1. Install an additional 2 reflector center supports (RCS) 4 ft. on each side of the standard RCS.

2. Install the side shield by hooking the edge holes onto the RCS's (Figure 2-13).

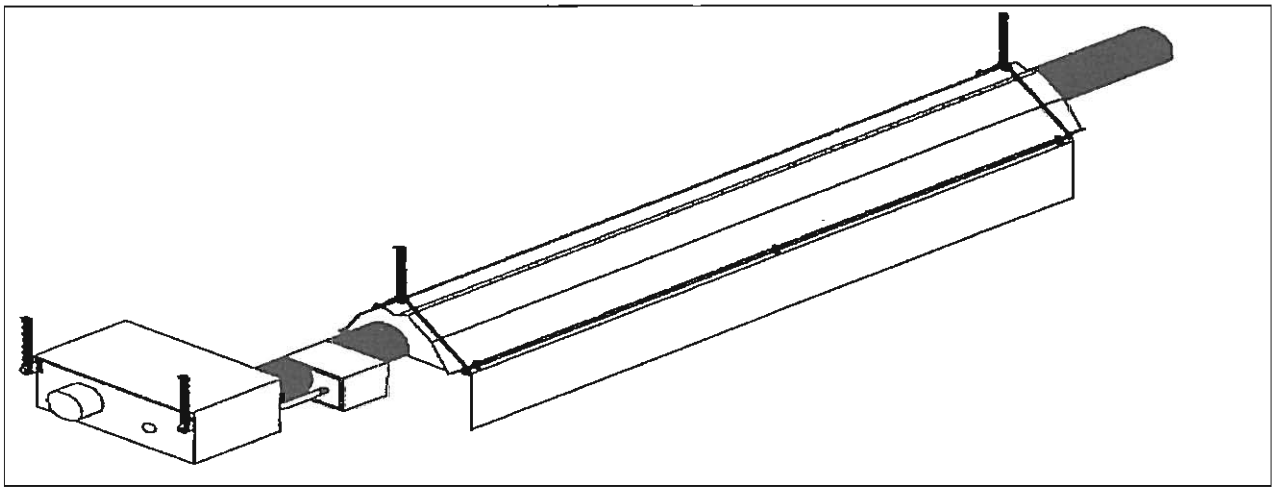


Figure 2-13

2.5 Optional "L" or "U" Configuration

A 90° elbow (DRP Accessory No. E6) or a 180° "U" (DRP Accessory No. TF1B) may be installed in the exchanger to make an "L" or "U" configuration. See the chart and figures below for dimensions and distance requirements from the burner control box to an elbow or "U".

NOTE: Only (2) E6 or (1) TF1B may be used on a HL heater.

MINIMUM DISTANCE FROM THE BURNER TO AN ELBOW OR "U" FITTING	
MODEL NO.	FT.
HL (20,30,40) - 75 (N,P)	10
HL (30,40,50) - 100 (N,P)	15
HL (40,50,60) - 150 (N,P)	20
HL (50,60,70) - 175 (N,P)	25
HL (50,60,70) - 200 (N,P)	25

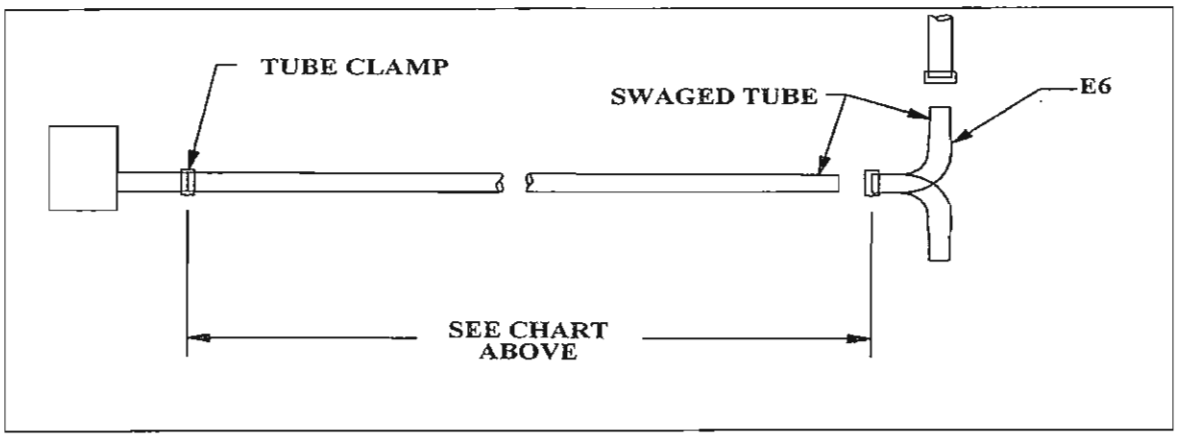


Figure 2-14

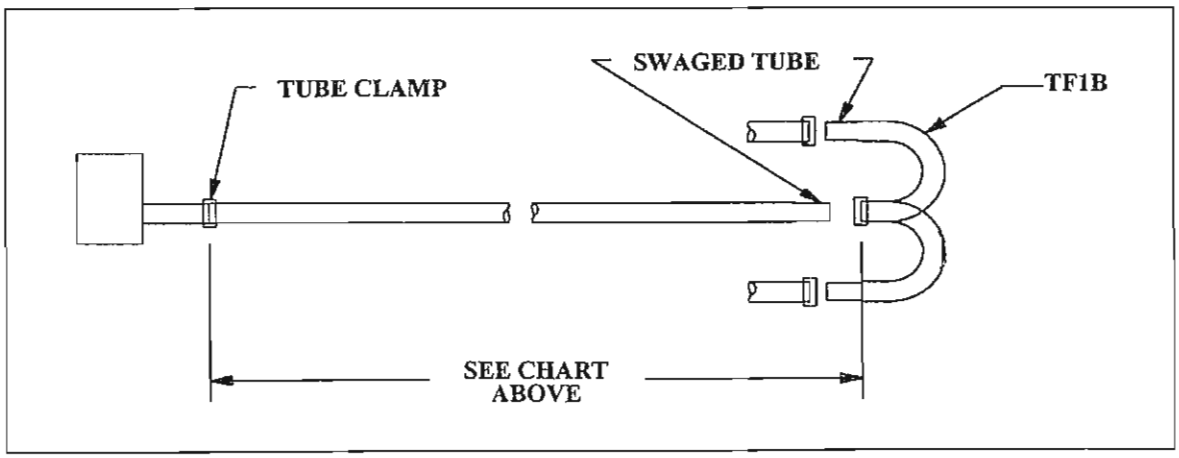


Figure 2-15

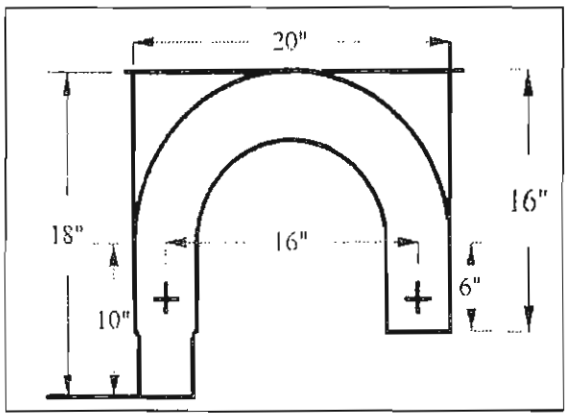


Figure 2-16

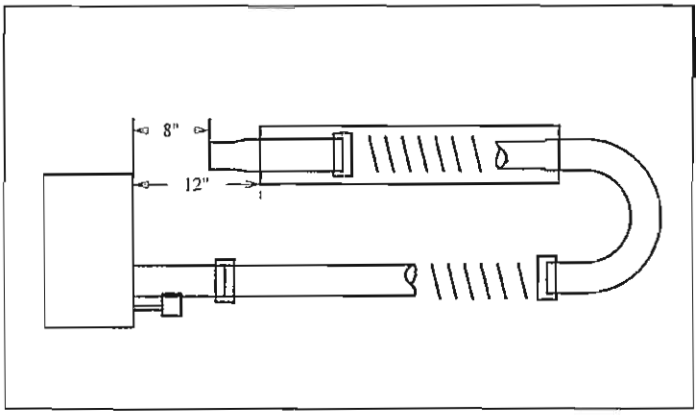


Figure 2-17

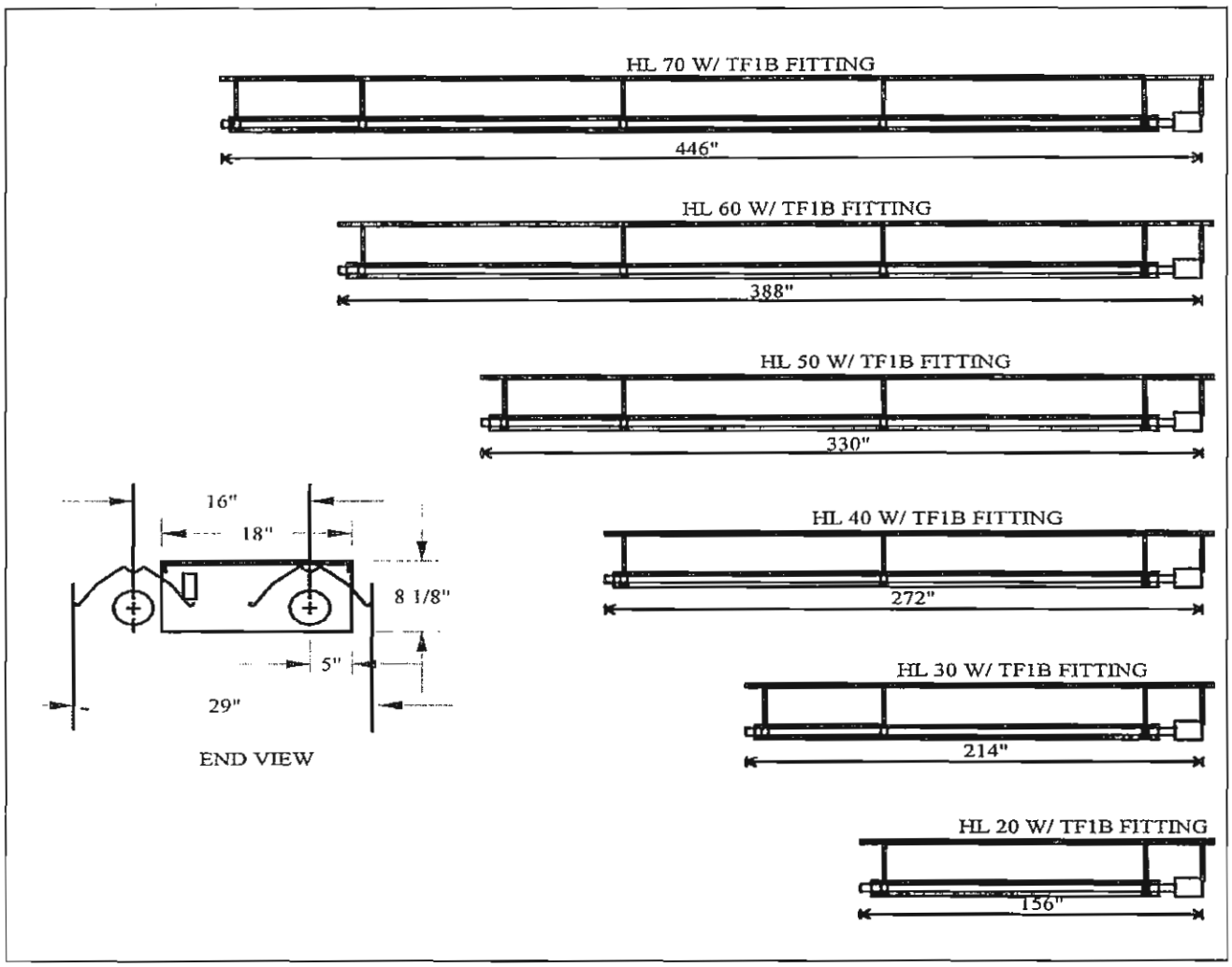


Figure 2-18

2.6 Flue Venting

The following guidelines must be observed to ensure proper system performance and safety:

- Check all applicable codes prior to installing flue stacks. Local codes may vary. In the absence of local codes see the National Fuel Code ANSI-Z223.1 (NFPA54) (latest edition).

- The heater is designed to operate with a 4 inch diameter exhaust stack.

- Single wall galvanized flue pipe or Dura/Connect single wall, flexible connectors must be used. The portion of the flue pipe which goes through combustible material in the building wall or roof must pass through a type "B" vent to maintain clearances (see Figures 2-19 and 2-20).

- Maximum vent length for all models is 20 feet.

- The venting system shall terminate at least 3 ft. (0.9m) above any forced air inlet located within 10 ft. (3.1m).

- The venting system shall terminate at least 4 ft. (1.2m) below, 4 ft. (1.2m) horizontally from, 1 ft. (30 cm) above any door, window, or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 12 in. (30 cm) above grade.

- Uninsulated single wall metal pipe shall not be used in cold climates for venting gas utilization equipment.

- The vent terminal of a horizontal venting system must be installed to prevent blockage by snow and protect building materials from degradation by flue gases.

- Stacks may exit the building either horizontally or vertically. Vertical venting exiting the roof should be 2 ft. above the roof. For horizontal venting, the flue should be 6 in. from the sidewall. Care should be exercised to ensure that vent opening is beyond any combustible overhang (see Figure 2-19).

- A 6 inch diameter common flue must be used for double venting of units. One thermostat must control both units. **When common venting is used, flues should be connected so that the by products of one heater cannot flow into the adjoining flue of the other heater.** A dual exhaust assembly is available from Detroit Radiant (Part No. Y or RT). See Figures 2-22 through 2-24. A Field Controls SK-6 vent cap must be used for sidewall common venting of HL 200 models.

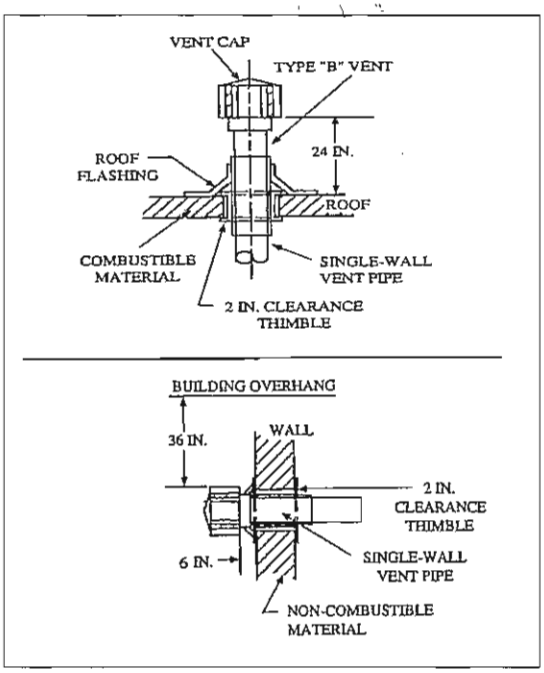


Figure 2-19

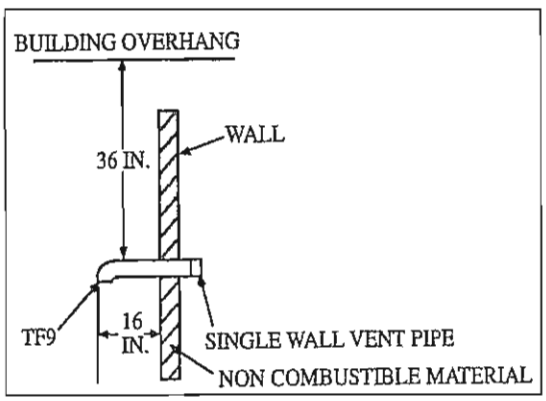


Figure 2-20

IMPORTANT	
HL MODELS	APPROVED VENT PACKAGES
50,000 thru 175,000 BTUH	4 DSK TF-9
200,000 BTUH	SK-4, SK-6 ONLY

4VC and 6VC Breidert Vent Caps are **not** approved for use with HL models.

- Vertical venting may utilize standard "B" vent caps or the above listed vent caps (except for TF9).

- Do not use more than two 90° elbows in the exhaust vent (all models).

- All vent pipes must be sealed with high temperature sealant and 3) No. 8 sheet metal screws to prevent leakage of flue gas into building.

- Horizontal flues should be pitched down toward outlet, ¼ in. per foot of the vent length, to prevent rain from entering the heater (see Figure 2-21). Do not pitch heater.

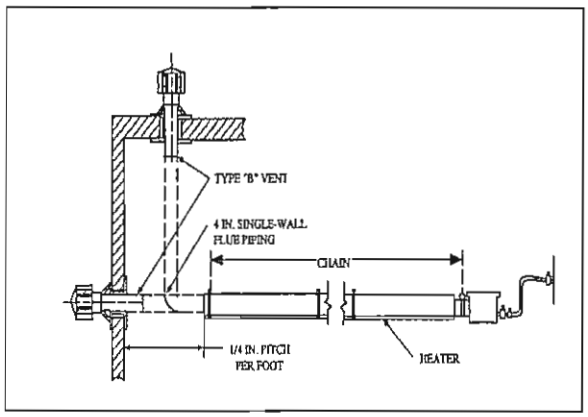


Figure 2-21

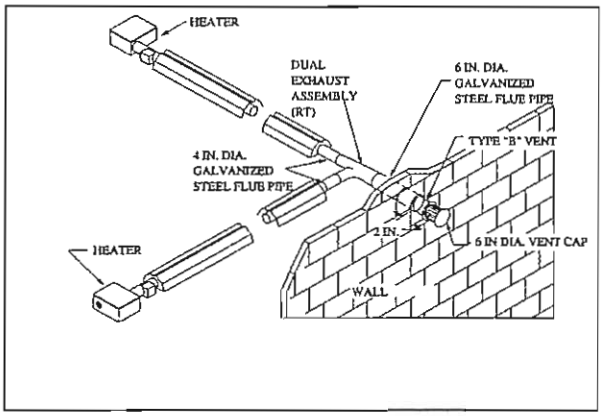


Figure 2-23

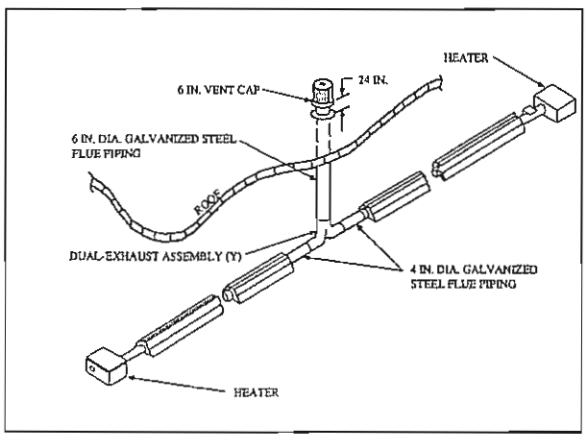


Figure 2-22

DUAL-EXHAUST ASSEMBLY
(THROUGH ROOF)

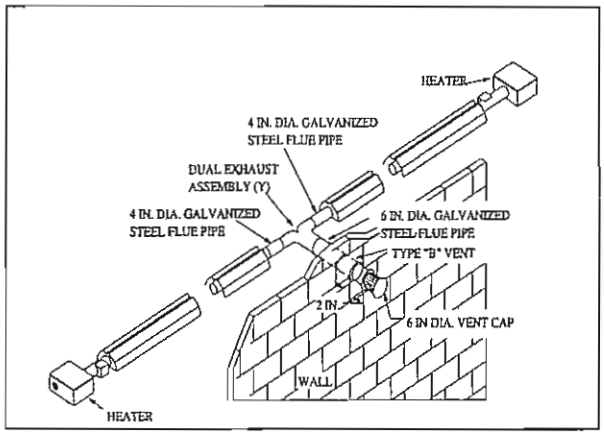


Figure 2-24

DUAL-EXHAUST ASSEMBLY
(THROUGH WALL)

2.7 Installation for Unvented Operation (Optional)

Model HL units are approved for unvented operation when equipped with a factory supplied end cap/diffuser, Part No. WVE-GALV (see Figure 2-25). This allows the products of combustion to be discharged from the unit into the space being heated.

Ventilation of the space is required to dilute those products of combustion sufficiently. For proper ventilation, it is recommended that a positive air displacement of at least 3.8 CFM per 1000 BTU/H of natural gas input be provided.

If propane is used, a positive air displacement of at least 4.5 CFM per 1000 BTU/H of gas input is recommended. This air displacement may be accomplished by either gravity or mechanical means. Provisions must be made for a sufficiently large fresh air intake area and exhaust system to be interlocked with the electrical supply line to the heaters, enabling both to function simultaneously.

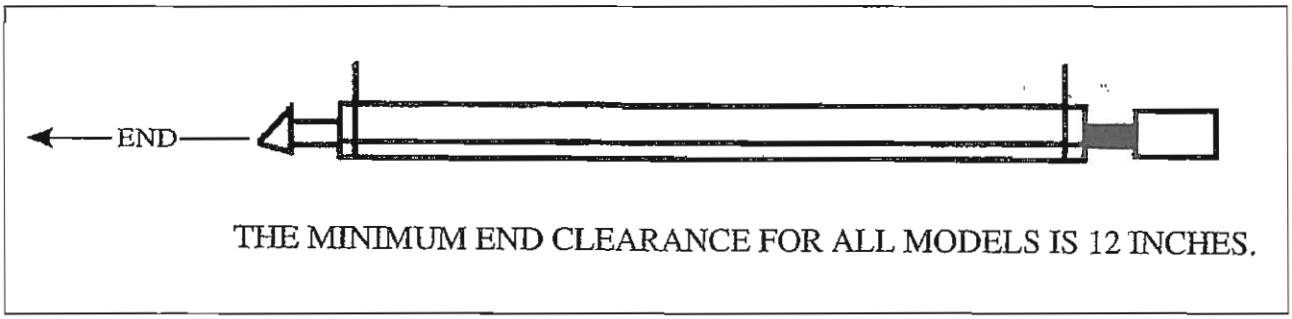


Figure 2-25

2.8 Combustion Air Requirements

Combustion air intake has a factory preset air orifice. If indoor combustion air is to be supplied for a tightly closed room, one square inch of free air opening should be provided for each 5000 BTU/H of heater input.

Noncontaminated air for combustion **must** be ducted to the heater if chlorinated or fluorinated contaminants are present in the area where the heater is installed, or if the building has a negative pressure. Typical sources of these contaminants are refrigerants, solvents, adhesives, degreasers, paint removers, paints, lubricants, pesticides, etc.

Outside combustion air may be provided by an accessory 4 in. duct directly attached over the air orifice (see Figure 2-26). A WIV-4 wall inlet vent must be used with horizontal outside air intake ducts.

The maximum number of 90° elbows allowed is two.

The air intake terminal must be installed to prevent blockage by snow.

NOTE: Use insulated duct or PVC pipe to prevent condensation on outer surfaces. Keep intake opening at least 3 ft. from any exhaust vent openings. For limitations of length and size, see the Air Intake Duct Chart.

AIR INTAKE DUCT CHART

MODEL	AIR INTAKE DUCT SIZE [in.]	MAXIMUM INTAKE LENGTH [ft]
ALL MODELS	4	20
	5	30

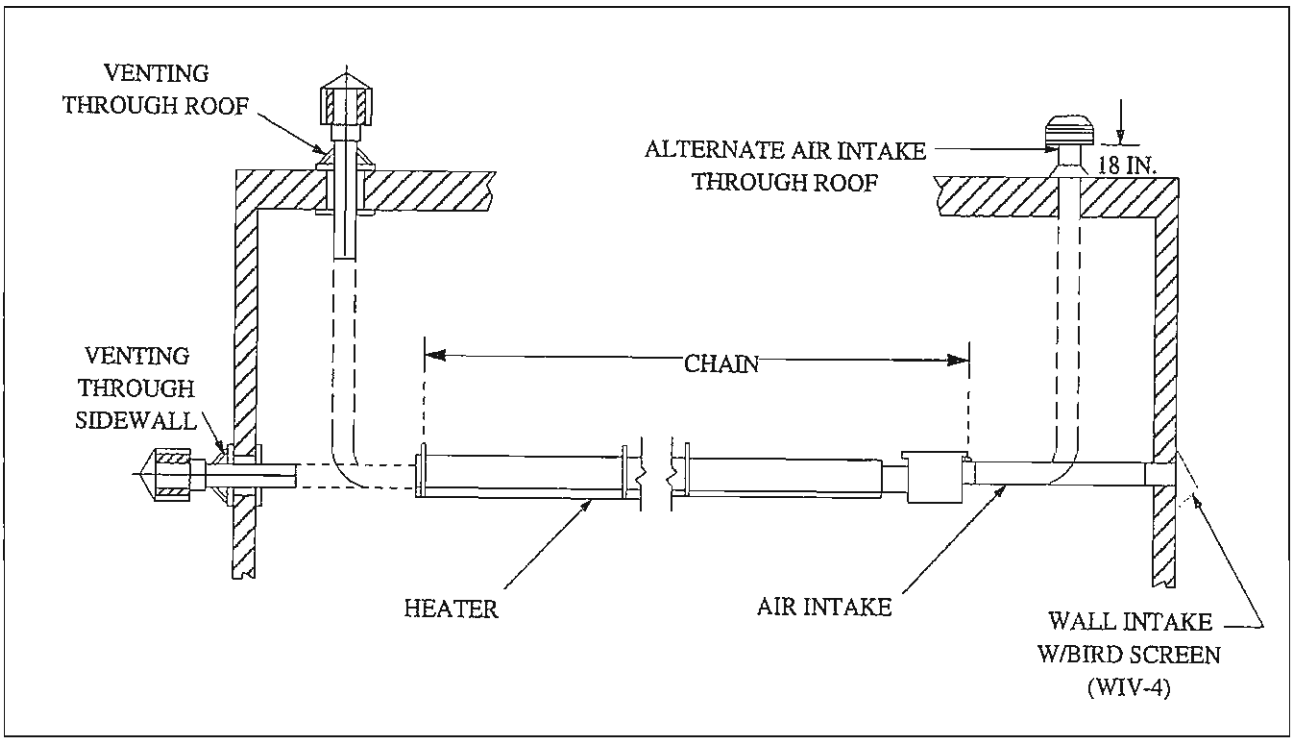


Figure 2-26

2.9 Gas Supply

CAUTION!

CORRECT INLET PRESSURES ARE VITAL FOR EFFICIENT OPERATION OF HEATERS. REFER TO AGA RATING LABEL AND, IF NECESSARY, CONSULT GAS COMPANY.

If all or a portion of the gas supply line consists of used pipe, it must be cleaned and then inspected to determine its equivalency to new pipe. Test all main supply lines according to local codes. **(Isolate heater gas valve and supplied gas cock during test.)**

Excessive torque on manifold may misalign orifice. Always use two wrenches when tightening mating pipe connections.

WARNING !

Never use a match or any other flame to test for leaks. Use soap and water solution to check for leaks.

If any portion of the gas supply line is located in an area that could cause an abnormal amount of condensate to occur in the pipe, a sediment trap should be installed (see Figure 2-27).

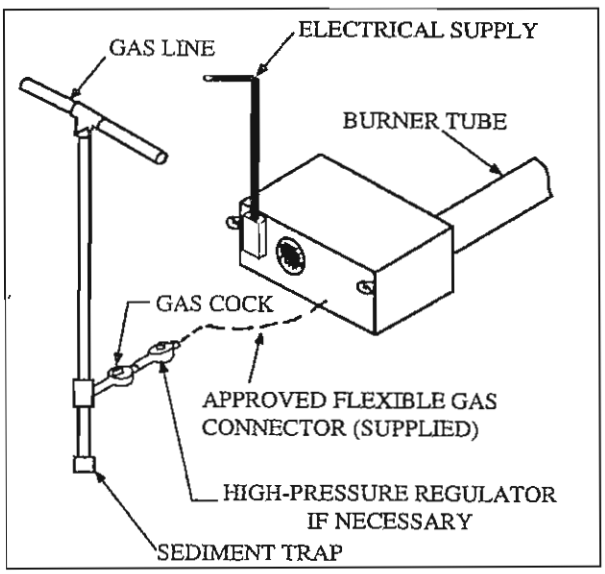


Figure 2-27

NOTE: For high pressure gas above 14 in. W.C.P. (Water Column Pressure), a high pressure regulator and gas cock must be used. If compressed air is used to detect leaks in the gas supply line, disconnect and cap at shutoff cock to avoid damage to regulator and gas valve.

A typical gas supply line connection is illustrated in Figure 2-28. The method shown will decrease the possibility of any loose scale or dirt in the supply line entering the heater's control system and causing a malfunction. Provide a 1/8 inch (3.2mm) NPT, plugged tapping accessible for test gauge connection immediately upstream of gas connection to heater. The gas supply line must be of sufficient size to provide the required capacity and inlet pressure to the heater (consult gas company) as follows:

NOTE: Manifold pressure should be checked at the tap on the gas valve. Readings will be above atmospheric pressure.

- **Natural Gas**

  To obtain the required manifold pressure of 3.5 in. W.C.P., a minimum inlet pressure of 14.0 in. W.C.P. is allowed for all units.

- **Liquefied Petroleum Gas**

  To obtain the required manifold pressure of 10.0 in. W.C.P., a minimum of 11.0 in. W.C.P. for purposes of input adjustment to a maximum of 14.0 in. W.C.P. must be provided ahead of the control system on each heater. **Do not** exceed a manifold operating pressure of 10.0 in. W.C.P.

Use only a pipe joint compound that is resistant to liquefied petroleum gases.

- **Pressure Equivalents**

  1 in. W.C.P. equals 0.58 oz/sq. in.

- Allowance for Expansion

  Allowance must be made for the system to expand. The supplied stainless steel, flexible gas connector is recommended. If, however, local codes require rigid piping to the heater, a swing joint can be used.

- Gas Line Connection

  a. The gas outlet shall be in the same room as the appliance and the connector must not be concealed within or run through any wall, floor or partition.

  b. The connector shall be of adequate length.

  c. The final assembly shall be tested for leaks. CAUTION: Matches, candles, open flame or other sources of ignition **shall not** be used for this purpose. Leak test solutions may cause corrosion-water rinse after test.

  d. Contact with foreign object or substances shall be avoided.

  e. The connector shall not be kinked, twisted or torqued.

  f. Connectors are not designed for movement after installation. Bending, flexing or vibration must be avoided.

  g. Connectors are for use only on piping systems having fuel gas pressures not in excess of ½ pound per square inch.

CAUTION!

CONNECTOR NUTS MUST NOT BE CONNECTED DIRECTLY TO PIPE THREADS. THIS CONNECTOR MUST BE INSTALLED WITH ADAPTORS PROVIDED. DO NOT REUSE.

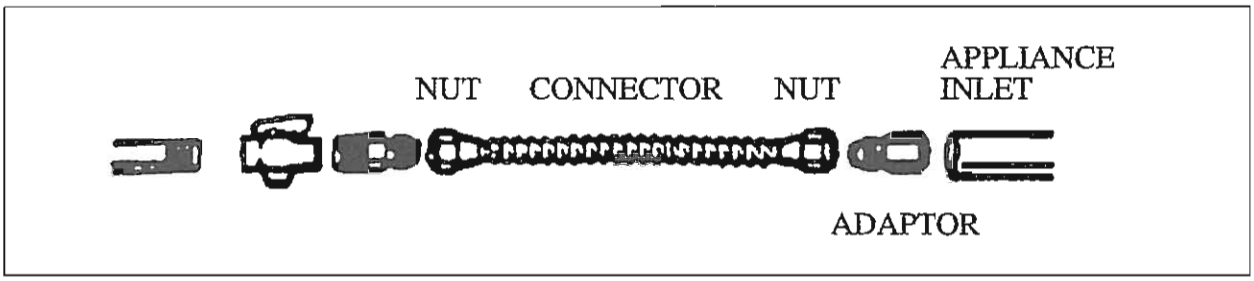


Figure 2-28

2.10 Electrical Requirements

1. Heaters operate on 120 Volts, 60 Hz, single phase. The maximum amperage requirement (starting current) is 4.8 amps per heater. The running current is 1.1 amps.

2. Heater must be grounded in accordance with the National Electrical Code ANSI/NFPA 70 (latest edition).

3. Wiring must not be above or below the heater, nor exposed to the radiant output.

4. Observe proper electrical polarity.

HL model heaters require a 24 Volt two stage thermostat to operate. Each heater has a round terminal strip, that accepts three ¼ in. insulated spade terminals for the thermostat wiring. Do not install 120V to round terminal control strip.

NOTE: A HL unit without a relay board (HLRB) supplies its own control voltage. See Figures 2-29, 3-1 and 3-2 for general wiring diagrams.

NOTE: If two or more HL models are to be controlled by a single thermostat, then they **must** be installed with optional relay boards (HLRB) and wired using an external transformer (field supplied), as shown in Figures 2-30, 2-31 and 2-32.

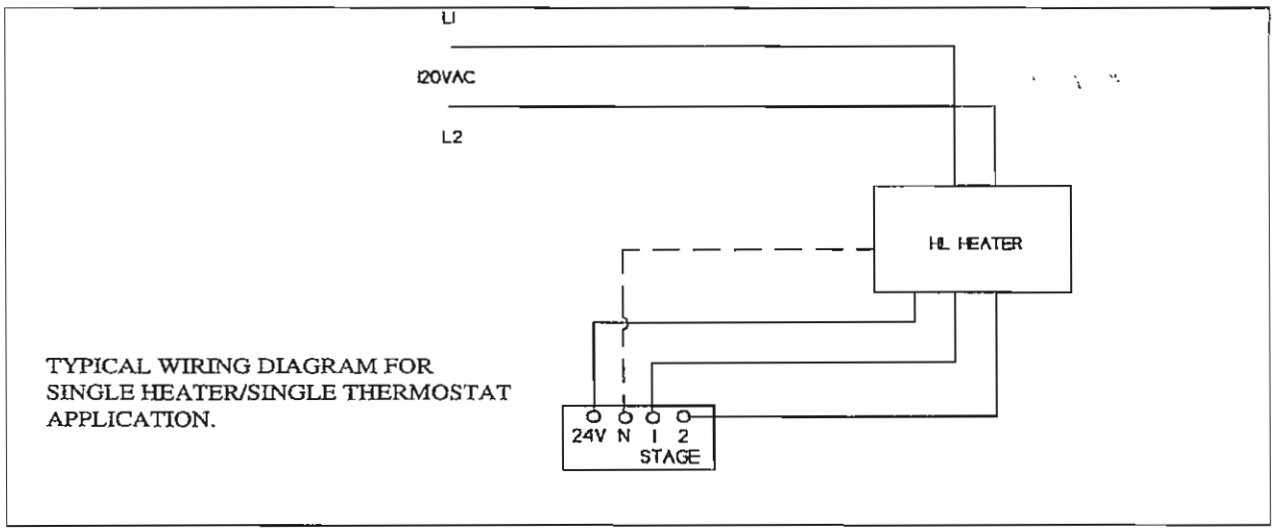


Figure 2-29

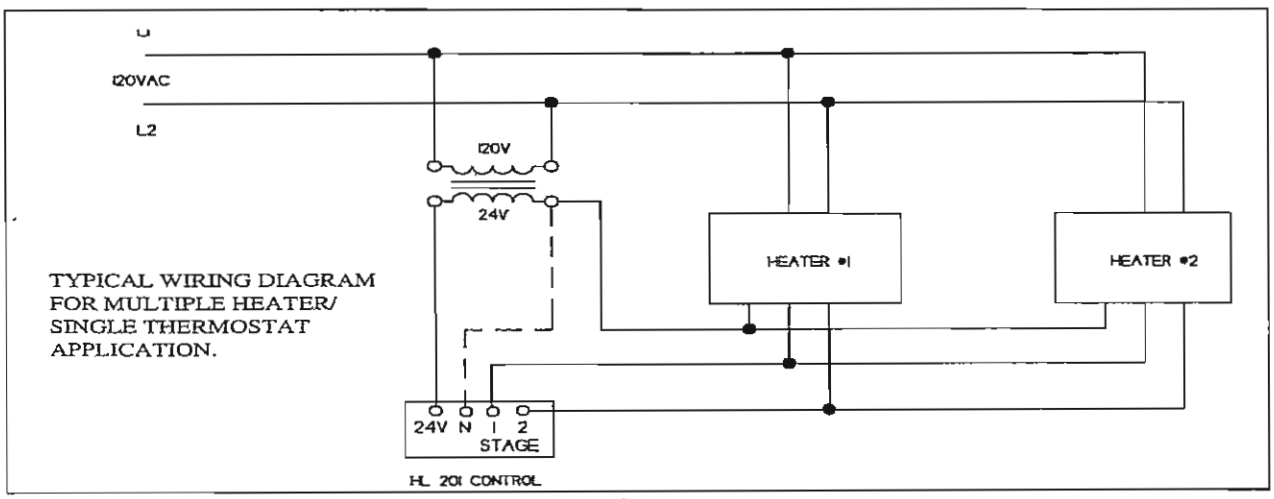


Figure 2-30

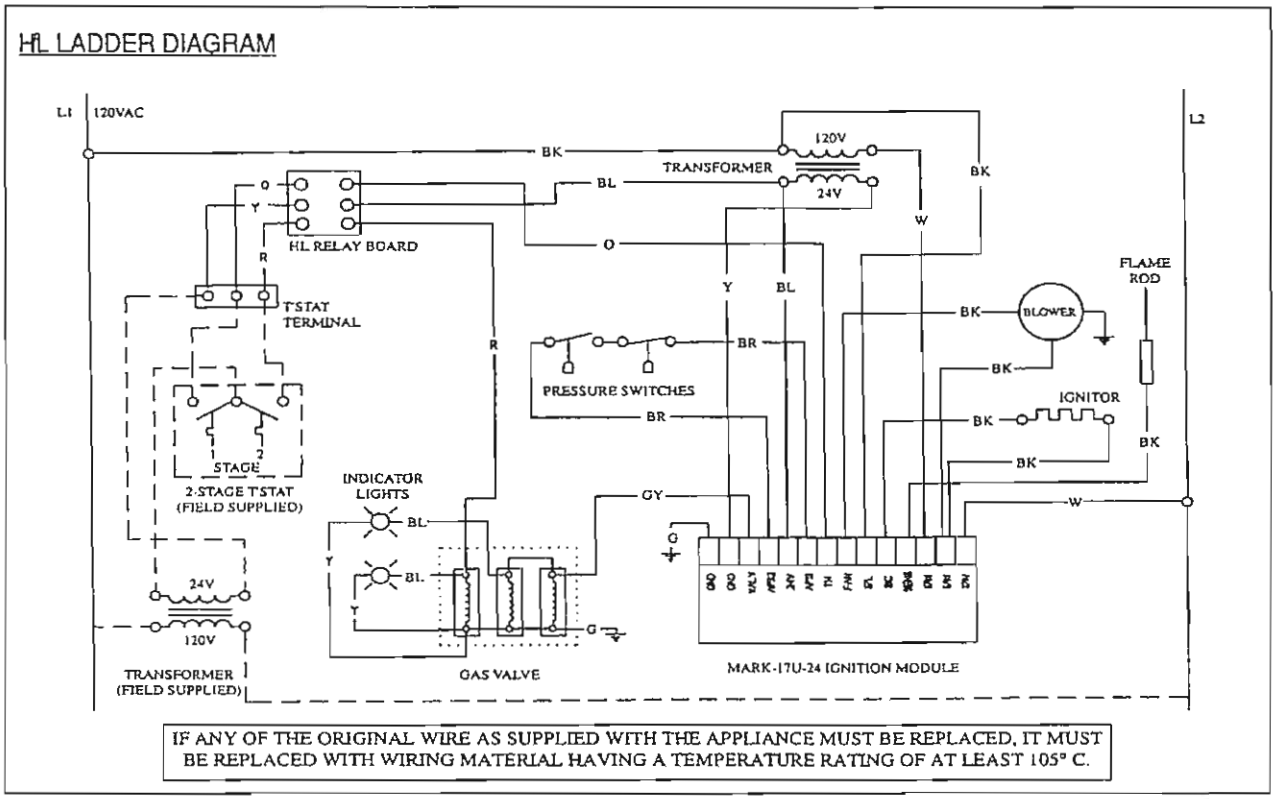


Figure 2-31

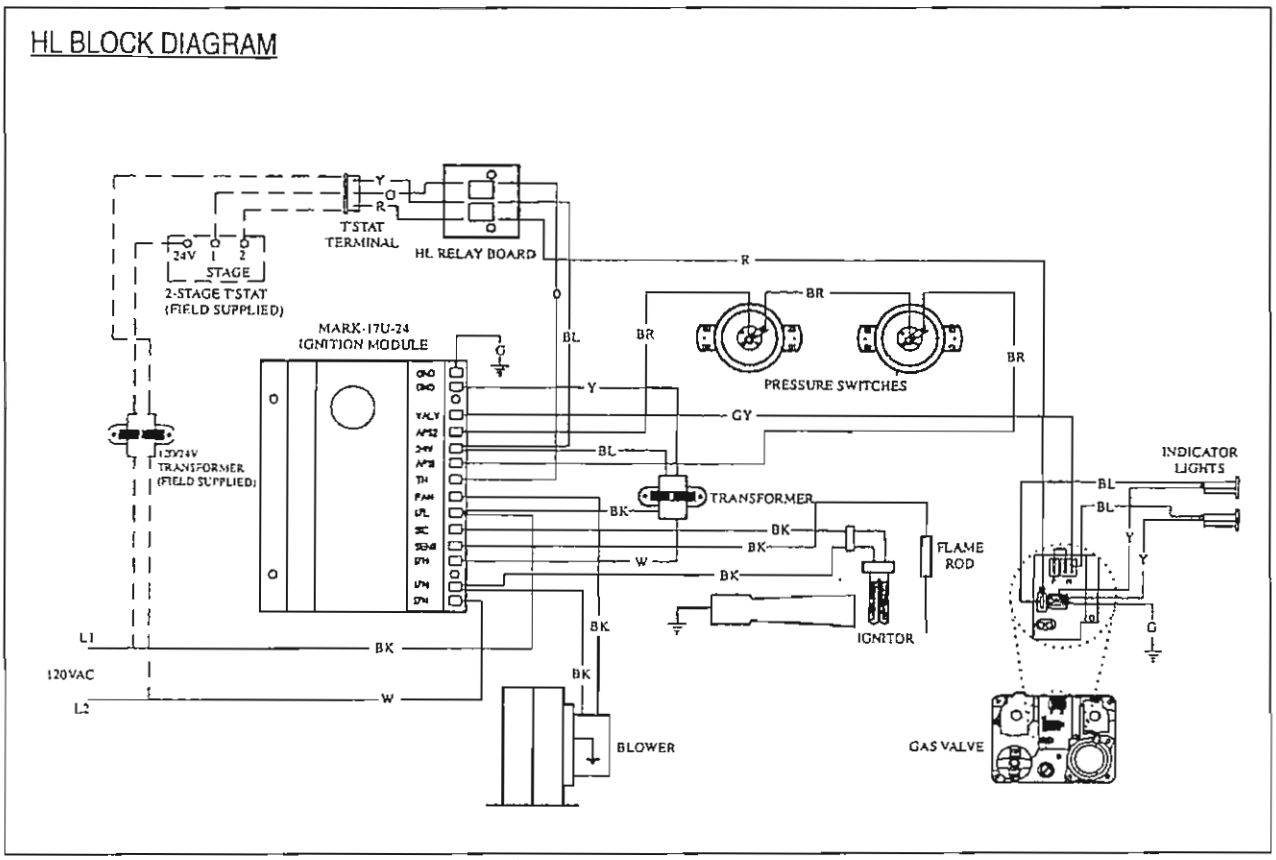


Figure 2-32

3 THEORY OF OPERATION

LO FIRE

- **Starting Circuit (Figures 3-1 and 3-2)**

When the first stage of a two stage thermostat calls for heat, a relay in the circuit control starts the fan. When the fan creates a sufficient positive pressure in the burner control box, the normally open pressure switch closes, initiating the igniter sequence. The glo-bar is powered and after 45 seconds the main valve opens. Power to the glo-bar is shut off during the last three seconds of the ignition trial.

Running Circuit

After ignition, the flame rod monitors the flame. As long as a flame is present, the valve is held open. If the flame is lost, the control acts to close the valve within one second, and a new trial sequence identical to that at start-up is initiated. If proof of flame is not established within 8.5 seconds, the unit will lock out. If lockout occurs, the control can be reset by briefly interrupting the power source.

HI FIRE

The second stage can be energized at any time during the operation causing the heater to operate in the high fire mode. This is accomplished by a solenoid, which pushes down on the regulator increasing the manifold pressure and therefore the BTU/H input of the heater.

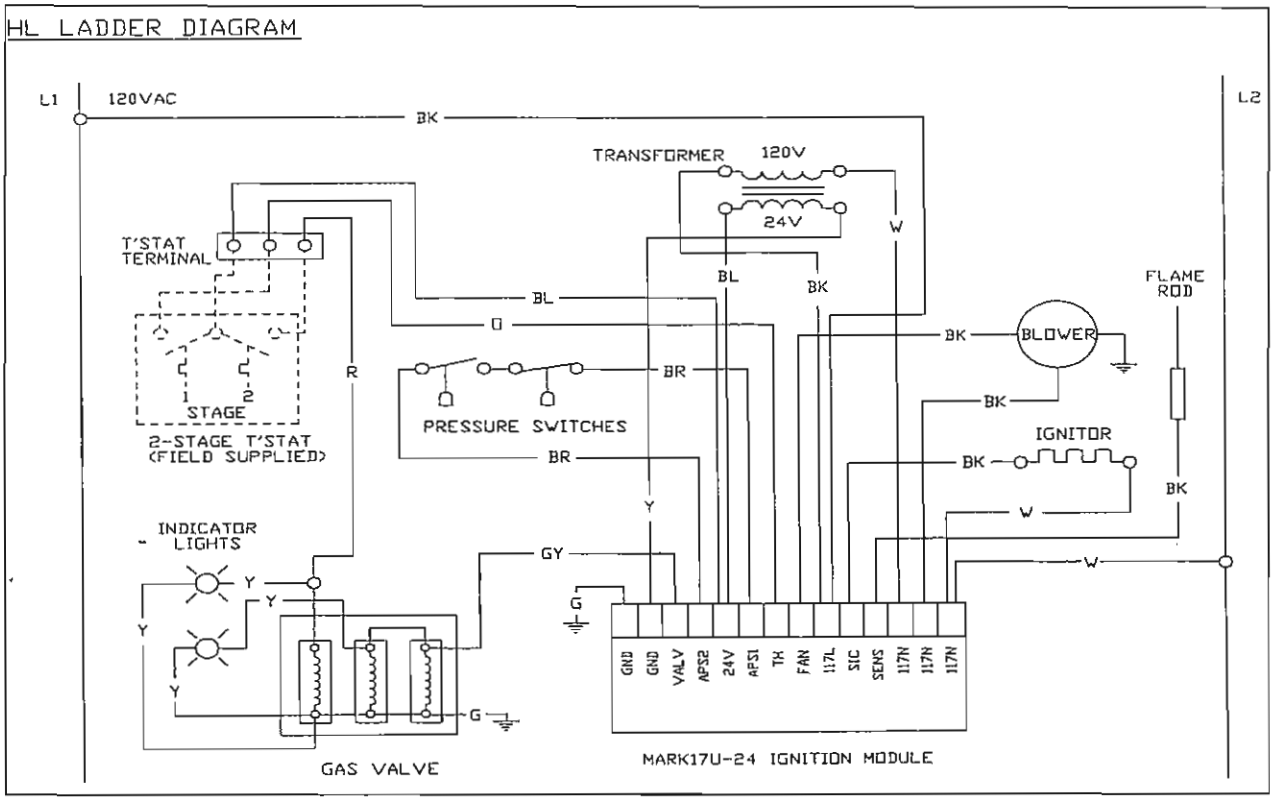


Figure 3-1

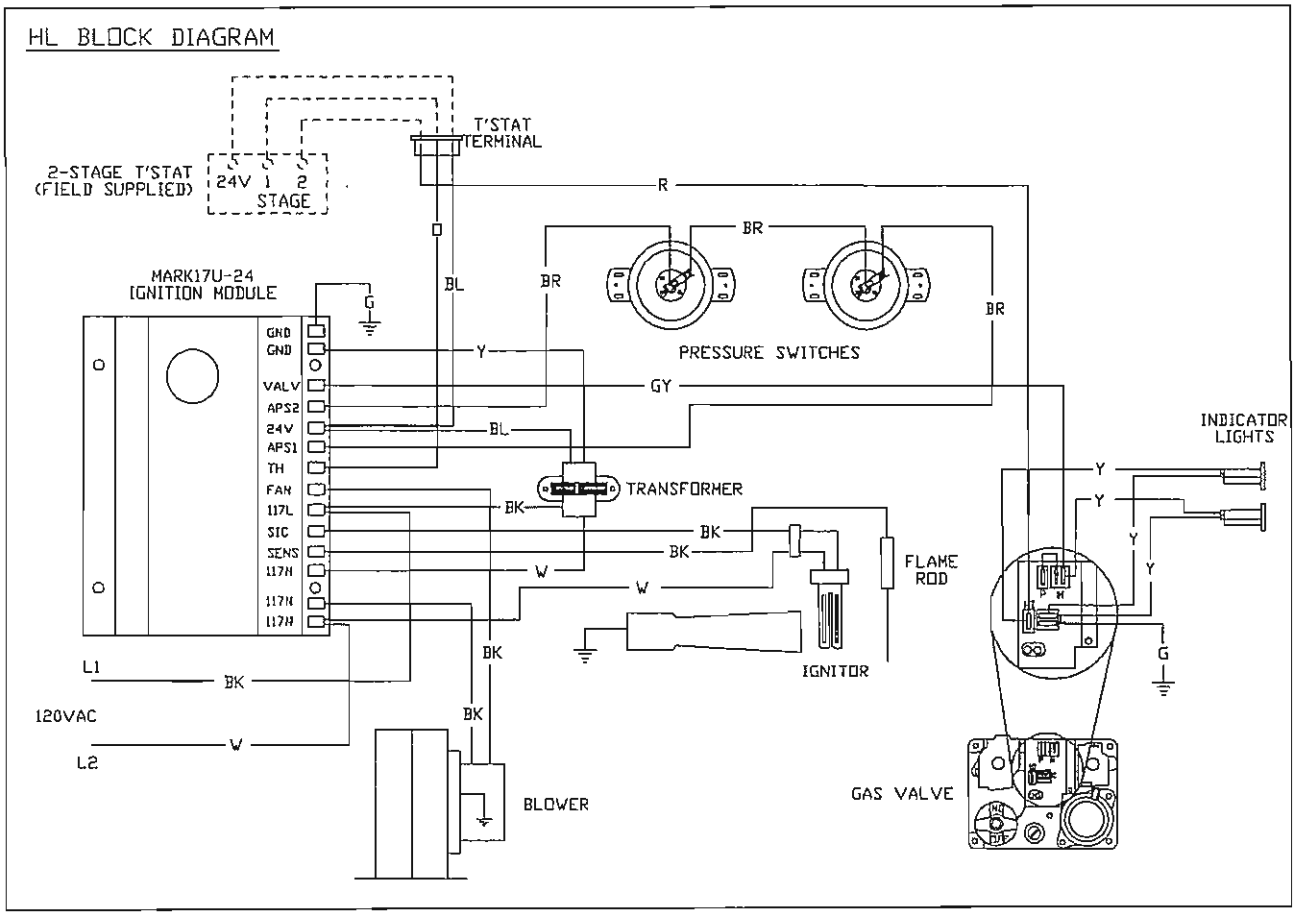

HL BLOCK DIAGRAM
2-STAGE T'STAT
(FIELD SUPPLIED)
24V
1
2
STAGE
T'STAT
TERMINAL
R
O
BR
BL
MARK17U-24
IGNITION MODULE
G
GND
GND
VALV
APS2
24V
APS1
TH
FAN
117L
SIC
SENS
117N
117N
117N
Y
GY
BL
BK
W
PRESSURE SWITCHES
TRANSFORMER
FLAME
ROD
IGNITOR
INDICATOR
LIGHTS
L1
120VAC
L2
BLOWER
GAS VALVE

Figure 3-2

3.1 Lighting Instructions

1. Purge main gas supply line at start-up.
2. Rotate heater's manual gas valve knob to the "ON" position.
3. Close electrical circuit.
4. If heater fails to light, turn off gas and wait five minutes before repeating the above procedure.

3.2 Shutdown Instructions

1. Open electrical circuit.
2. Rotate heater's manual gas valve knob to the "OFF" position.

4 MAINTENANCE

Model HL gas-fired, infrared heaters require a minimum of routine maintenance to keep them operating at peak performance.

WARNING!
Use protective glasses when cleaning the heater.

1. Ensure that the squirrel cage in the blower is kept clean. If dirt becomes a problem, installation of outside air intake ducts for combustion is recommended. Oiling the blower motor will extend bearing life beyond the 30,000 hour minimum.

2. Keep the aluminum reflectors clean.

4.1 TROUBLESHOOTING CHART

HL SERIES GENERAL TROUBLESHOOTING CHART		
SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed but nothing happens.	1. Blown fuse. 2. Defective thermostat 3. Loose or disconneted wire. 4. Defective fan.	1. Replace. 2. Replace. 3. Repair as required. 4. Lubricate, repair or replace.
Thermostat closed. Fan operates. No glo-bar energization.	1. Loose or disconnected wire. 2. Plugged or restricted exhaust vent. 3. Plugged pressure switch lines. 4. Defective pressure switches. 5. Defective glo-bar. 6. Defective circuit control. 7. Box lid or gasket not in place.	1. Repair as required. 2. Remove foreign matter. 3. Clean as necessary. 4. Replace only. Do not adjust. 5. Replace. 6. Replace circuit control. 7. Put in place.
Thermostat closed. Fan and glo-bar operate. After 45 seconds glo-bar shuts off. No reignition.	1. Closed gas supply. 2. Dirty or restricted orifice. 3. Defective valve. Disconnected valve wire.	1. Open all gas connections. 2. Remove and clean with a soft object. 3. Replace or repair.
Loss of heater efficiency.	1. Low gas pressure. 2. Dirty or restricted orifice. 3. Foreign mater inside burner assembly. 4. Unit cycles on and off. 5. Reflector is sooted and has lost its reflective ability. 6. Reflector not in place. 7. Clogged fan blower	1. Provide required gas pressure. 2. Remove and clean with a soft object. 3. Clean as necessary. 4. Check previous symptom. 5. Clean with aluminum cleaner and soft wiping cloth. 6. Put in place. 7. Clean.
Radiant tube leaking burnt gases.	1. Loose tube connections. 2. Holes or cracks in radiant tube.	1. Assure that tube is fully inserted into flared end and properly clamped. 2. Replace.
Condensation.	1. Stack length too long. 2. Light gauge flue stack used. 3. Low gas pressure.	1. Shorten stack. 2. Minimum of 26 gauge vent pipe is required. 3. Set proper gas pressure.
Tube bowing.	1. Insufficient combustion air. 2. Overfired.	1. Provide 2 sq. in. of free air per 5000 BTU/H of input. 2. Check gas pressure and orifice size.
Tube corroding.	1. Contaminated combustion air.	1. Provide fresh air inlet duct.
Visual inspection of burner operation not possible.	1. Dirty or sooted sight glass. 2. Unit mounted upside down.	1. Remove, clean or replace. 2. Mount correctly.
Stack sooting.	1. Insufficient combustion air. 2. Overfired.	1. Provide 1 sq. in. of free air for every 5000 BTU/H of input. 2. Check gas pressure and orifice size.
Thermostat closed. Fan and glo-bar operate. Iginition occurs. Burner cycles off and will not recycle.	1. No electrical ground. 2. Defective circuit control. 3. Low gas pressure. 4. Circuit control connection.	1. Connect electrical ground to junction box. 2. Replace. 3. Provide required gas pressure. 4. Repair or replace.
Thermostat closed. Fan and glor-bar operate. Ignition occurs. Burner cycles off. Burner cycles on.	1. Low gas pressure. 2. Baffle improperly positioned. 3. Defective exhaust pressure switch. 4. Restricted.	1. Provide required gas pressure. 2. Reposition baffle (see page 9). 3. Replace. 4. Remove foreign matter.

NOTES

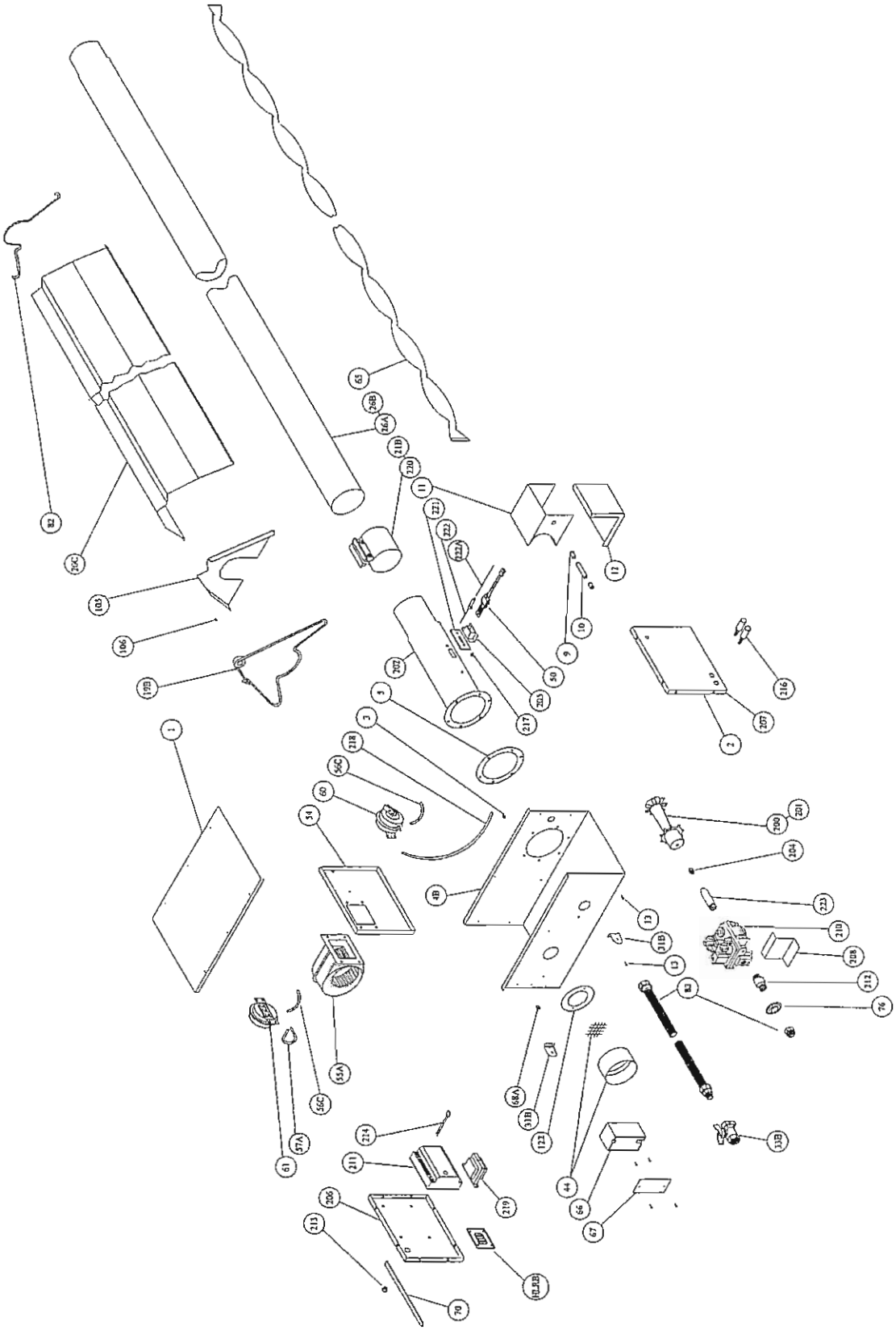
5 PARTS LISTS

5.1 Basic Parts List

HL SERIES PARTS LISTING

KEY	TP#	ITEM
	TP-1	CONTROL BOX COVER
	TP-4B	DX/HL CONTROL BOX
	TP-5	FLANGE GASKET
	TP-9	CONDUIT COUPLING
	TP-10	CONDUIT 4" X 1/2"
	TP-11	GLO-BAR IGNITOR BOX
	TP-12	GLO-BAR IGNITOR BOX COVER
	TP-14	SIGHT GLASS GASKET
	TP-15	SIGHT GLASS
	TP-16	SIGHT GLASS WASHER
	TP-19B	WIRE HANGER
	TP-20C	120" REFLECTOR
	TP-21B	TUBE CLAMP
	TP-26A	10 FT. RADIANT TUBE STRAIGHT
	TP-26B	10 FT. RADIANT TUBE STRAIGHT (AL-TI)
	TP-31B	CONTROL BOX BRACKET
	TP-33B	1/2" GAS COCK
	TP-44	AIR ORIFICE W/SCREEN (CONSULT FACTORY)
	TP-50	GLO-BAR IGNITOR
	TP-54	BURNER BOX DIVIDER
	TP-55A	FAN BLOWER
	TP-56C	1/4" ATMOSPHERIC TUBE (VINYL)
	TP-57A	1/4" PRESSURE TUBE
	TP-60F	EXHT PRESSURE SWITCH - 50 TO 150 MBTU/H
	TP60G	EXHT PRESSURE SWITCH - 175 & 200 MBTU/H
	TP-61B	BURNER PRESSURE SWITCH - 50 - 100 MBTU/H
	TP-61C	BURNER PRESSURE SWITCH - 200 MBTU/H
	TP-61D	BURNER PRESSURE SWITCH - 150 & 175 MBTU/H
	TP-65A	66" HEAT DIFFUSER (BAFFLE)
	TP-65B	99" HEAT DIFFUSER (BAFFLE)
	TP-65C	132" HEAT DIFFUSER (BAFFLE)
	TP-65D	166" HEAT DIFFUSER (BAFFLE)
	TP-66	2" X 4" OUTLET BOX
	TP-67	2" X 4" OUTLET BOX COVER
	TP-68A	STRAIN RELIEF BUSHING
	TP-70	CONTROL BOX COVER GASKET (PER FOOT**)
	TP-76	RUBBER GROMMET
	TP-82	REFLECTOR CENTER SUPPORT
	TP-83	STAINLESS STEEL FLEX CONNECTOR
	TP-101	SUB TP-223
	TP-104	SUB TP-223
	TP-105	REFLECTOR END CAP
	TP-106	REFLECTOR CLIP
	TP-108	5' AL-TI TUBE, PAINTED W. ONE CLAMP
	TP-111	5' ALUM. TUBE, PAINTED W/1 CLAMP
	TP-112	5' REFLECTOR
	TP-122	GASKET FOR AIR ORIFICE & AIR COLLAR
	TP-200	BURNER (50 MBTU/H TO 100 MBTU/H)
	TP-200A	BURNER (50 TO 100 MBTU/H LP GAS)
	TP-201	BURNER (125 MBTU/H TO 200 MBTU/H)
	TP-202	16" BURNER TUBE W/ FLANGE
	TP-204	GAS ORIFICE - CONSULT FACTORY
	TP-205	GLO-BAR HOLDER
	TP-206	HL END PANEL - LEFT
	TP-207	HL END PANEL - RIGHT
	TP-208	"Z" MOUNTING BRACKET
	TP-210	36E96-224 TWO STAGE GAS VALVE-NAT ASSY
	TP-210P	36E96-226 TWO STAGE GAS VALVE-LP ASSY
	TP-211	MARK 17X-24 CIRCUIT BOARD
	TP-211A	MARK 17U-24 CIRCUIT BOARD (REMOTE SENSE)
	TP-212	1/2" X 3" PIPE NIPPLE
	TP-213	THERMOSTAT TERMINAL STRIP
	TP-214	GLO-BAR WIRING HARNESS
	TP-216	INDICATOR LIGHT
	TP-217	PRESSURE BARB FITTING
	TP-218	EXHAUST PRESSURE TUBE (VINYL)
	TP-219	40VA TRANSFORMER
	TP-220	STAIN. STL. TUBE CLAMP (175 & 200 MBTU/H)
	TP-221	GLO-BAR HOLDER GASKET
	TP-222	FLAME ROD
	TP-222A	FLAME ROD W/RE
	TP-223	GAS MANIFOLD

** 6' TOTAL NEEDED TO COVER OUTER EDGES OF A BURNER BOX. HLRB OPTIONAL RELAY BOARD - SEE ACCESSORY GUIDE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