

HL-2 SERIES  
TUBE HEATER - VERSION 9/00

**MICRO 60U24 CONTROL**

Micro-Processor Based Control

INSTALLATION, OPERATION,  
MAINTENANCE AND PARTS MANUAL



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.

**CONSIGNES DE SÉCURITÉ**

Si vous sentez une odeur de gaz:

1. Ouvrez les fenêtres.
2. Ne touchez pas aux interrupteurs électriques.
3. Éteignez toute flamme nue.
4. Contactez immédiatement votre compagnie de gaz.

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

**Il est interdit d'utiliser des liquides inflammables ou dégagant des vapeurs inflammables, à proximité de tout appareil fonctionnant au gaz.**

## FOREWORD

### **WARNING!**

THIS HEATER **MUST** BE INSTALLED AND SERVICED BY TRAINED GAS INSTALLATION AND SERVICE PERSONNEL ONLY. READ AND UNDERSTAND THESE INSTRUCTIONS THOROUGHLY 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)
- ❖ Canadian Gas Association (CGA)
- ❖ National Standards of Canada
- ❖ Certification of Europe

**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.

### **Detroit Radiant Products Company**

21400 Hoover Road ♦ Warren MI 48089 ♦ (586) 756-0950 ♦ Fax: (586) 756-2626

<http://www.reverberray.com>

E-mail: [sales@detroitradiant.com](mailto:sales@detroitradiant.com)

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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/CGA 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). Applications in Canada must conform to CAN/CGA B149.1 and 2 Codes and Canadian Electrical Code C22.1-latest edition.
- 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. Applications in Canada must conform to the Canadian Electric Code C22.1-latest edition when an external electrical source is used.
- The installation of this heater in aircraft hangars must conform to 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 1 on page 3.

**WARNING!**

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

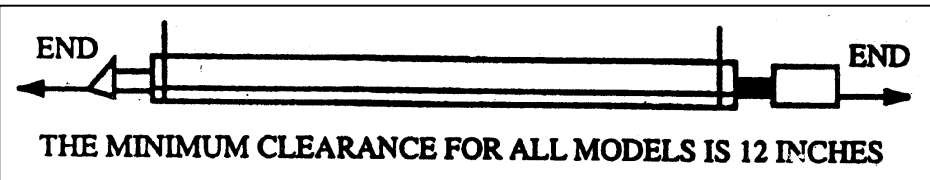
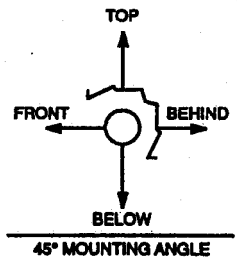
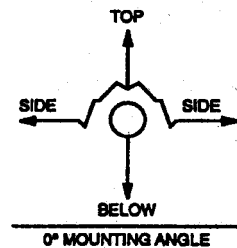
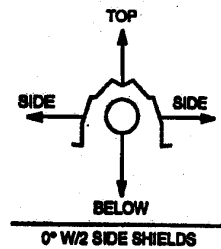
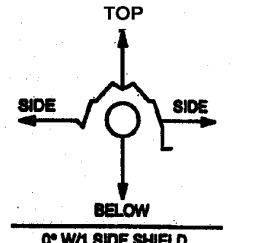
**WARNING!**

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	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 (20,30,40,50) - 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 (30,40,50,60)-125 [N,P]	0°	20	20	6	76	
	45°	58	8	10	76	
	W/1 side shield	0°	42	8	6	76
	W/2 side shields	0°	20	20	6	76
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 (40,50,60,70) - 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 (50,60,70,80) - 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	

CHART 1



## 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 (20,30,40,50) - 100 (N,P)	12-20	12-40	15-80	20
HL (30,40,50,60)-125 (N,P)	15-25	14-43	17-90	25
HL (40,50,60) - 150 (N,P)	15-30	13-45	17-100	20
HL (40,50,60,70) - 175 (N,P)	16-35	14-50	17-110	25
HL (50,60,70,80) - 200 (N,P)	17-40	15-55	18-120	30

CHART 2

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

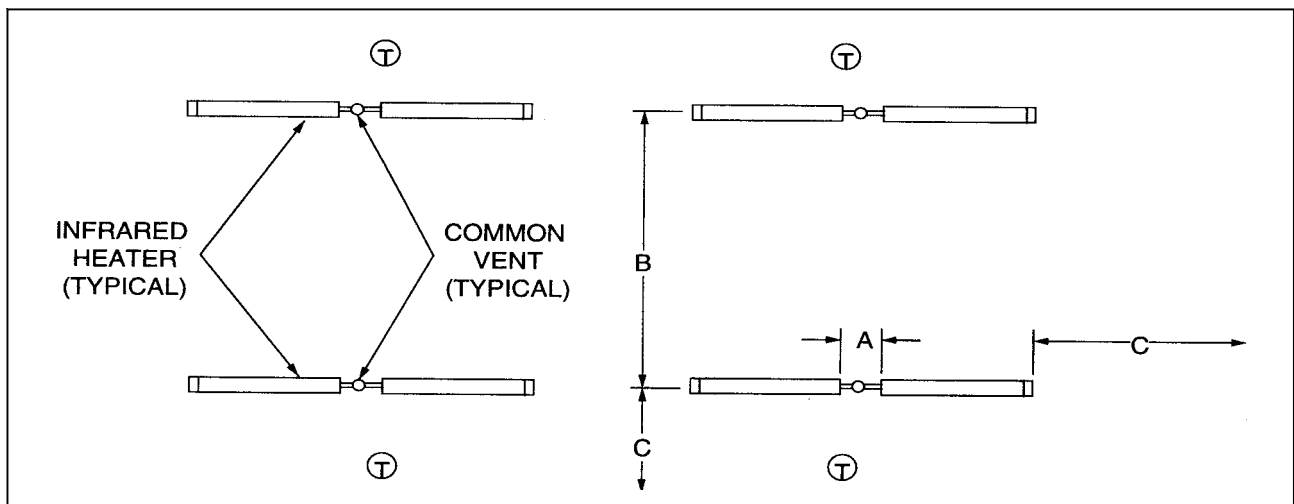
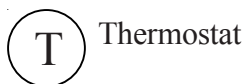


Figure 2-1



Thermostat

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.

<u>Model</u>	<u>Above Finished Floor</u>
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. Please consult factory for other considerations.
- **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/CGA 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 on page 4.

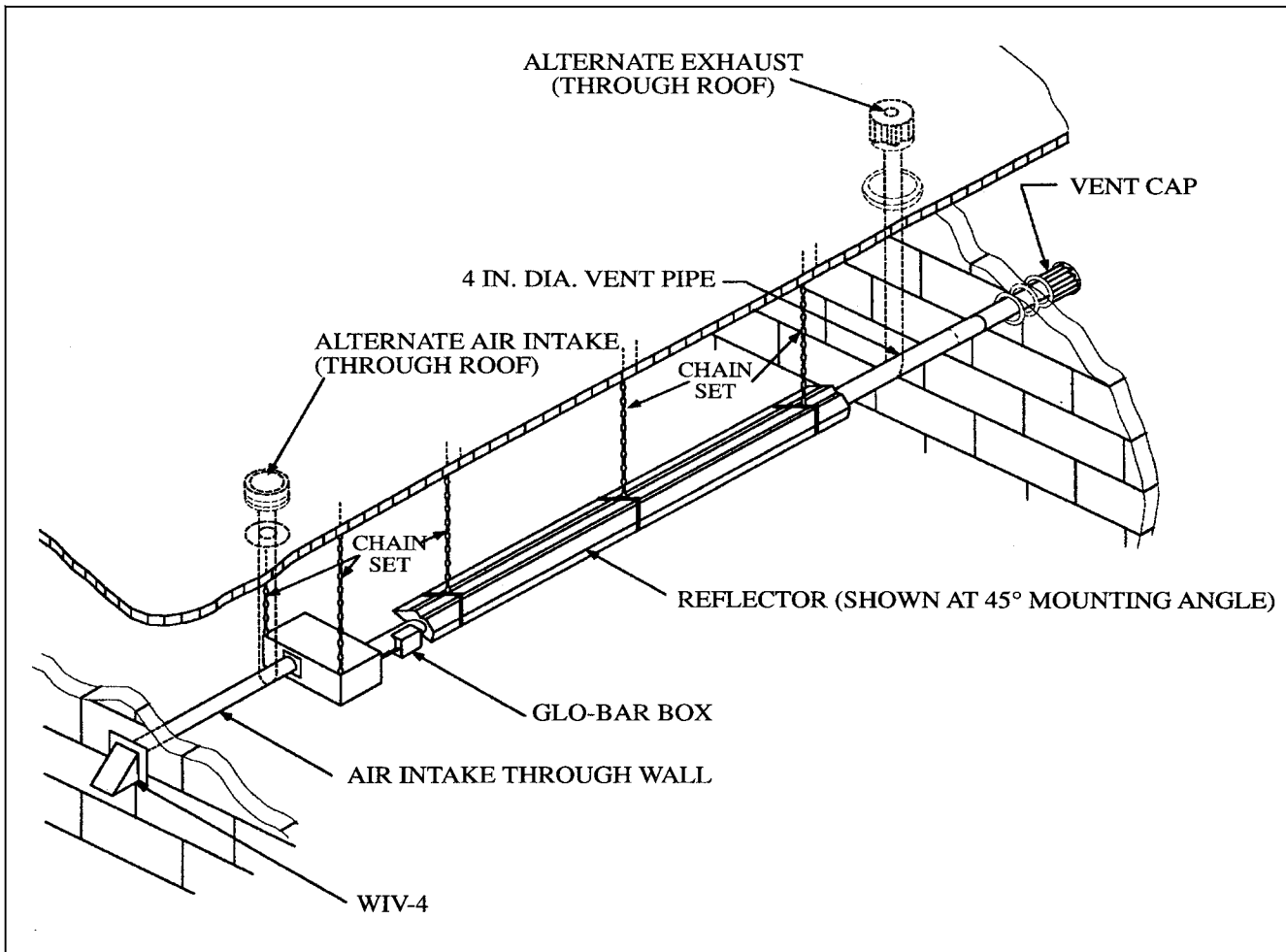
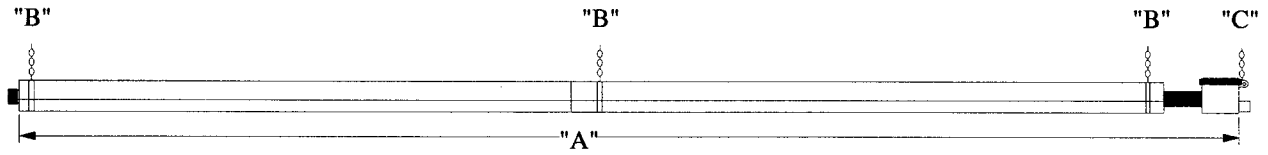


Figure 2-2

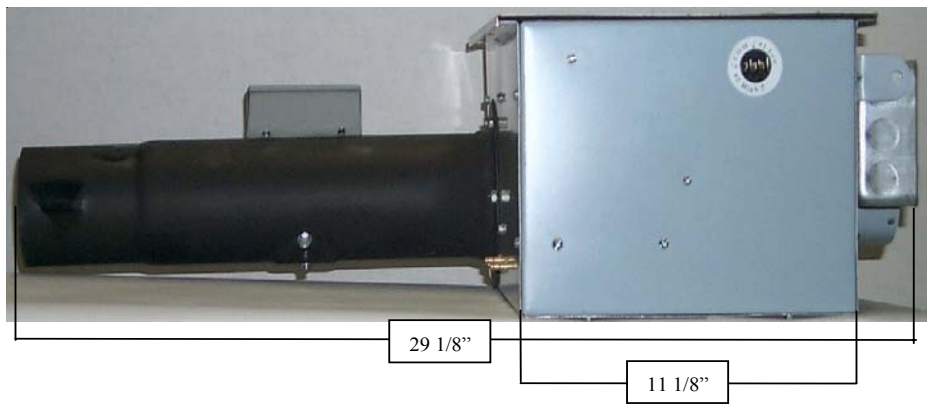
TYPICAL INSTALLATION DRAWING



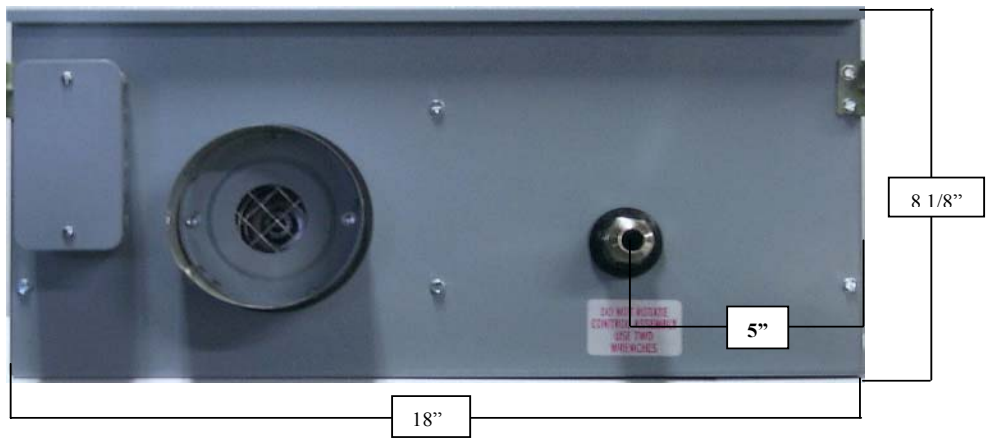


MODEL NUMBER	DIMENSION "A"	SUSPENSION POINTS "B"	CONTROL BOX STABILIZER "C"
HL 20	259"	3	2
HL 30	375"	4	2
HL 40	491"	5	2
HL 50	607"	6	2
HL 60	723"	7	2
HL 70	839"	8	2

CHART 3



END VIEW



ENLARGED SIDE VIEW

Figure 2-3  
DIMENSIONS FOR HL MODELS

## 2.3 Heater Mounting

Mount heaters in conformance with approval standards referenced in the foreword.

1. Each heater comes equipped with the necessary hangers (Figure 2-4) for hanging. If spacing does not allow for standard mounting, additional hangers (#TP-19B) may be necessary.

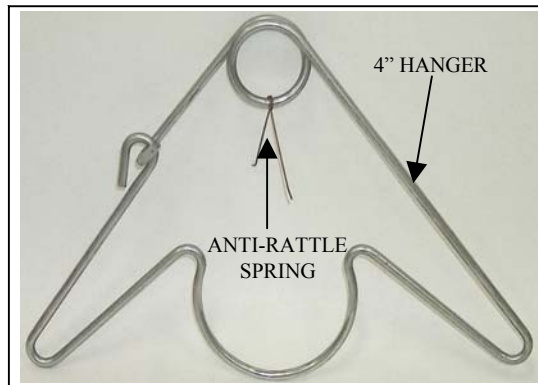


Figure 2-4

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

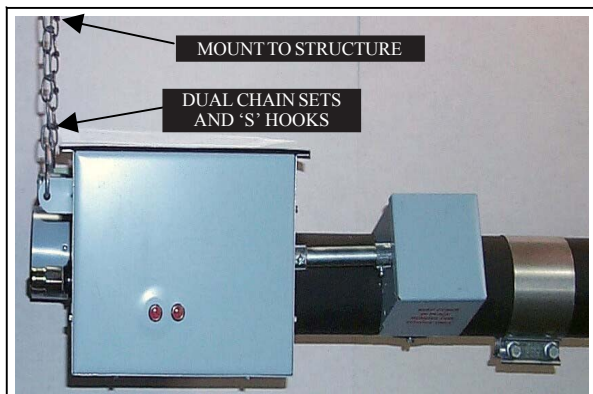


Figure 2-5

3. Lay out all tubing in proper position. 10' combustion chamber first, radiant tubes thereafter, baffle section last.
4. Two hangers support the first tube; one hanger per tube thereafter. The radiant tubes should be in straight alignment and level (perpendicular) to the ground. (See Figure 2-9).
5. Mount hangers. Spacing between burner box mounting brackets and the first hanger should be approximately 2 ft. - 4 in. (See figure 2-9). Spacing between the first two hangers should be approximately 8ft. -10in. so as to support the first tube. Spacing for every hanger thereafter should be approximately 9ft. - 8in.
6. Mount the burner in straight alignment with tubes. Burner sight glass should be visible from the floor.
7. Install heater so that it is independently supported and does not rely on the gas or electrical lines for support.
8. Installation of baffles. Baffle(s) should be installed in the tubes(s) farthest downstream from the burner. In some cases the baffles may have to be slid partially into the second from last tube. (See Figure 2-11). All baffles must be in the vertical position (See Figure 2-8).
9. Remove 33" of baffle section if utilizing a 'U' (TF1B) or 'L' (E6) accessory fitting.

## INSTALLATION NOTES:

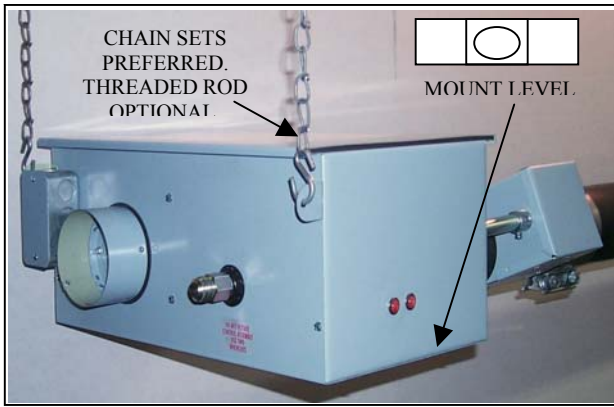


Figure 2-6

**IMPORTANT:** Mount burner control box and chain sets level (perpendicular) to the ground. Do not rotate control box assembly.

**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.

**IMPORTANT:** Baffles must be installed in the last (furthest from the burner) radiant tubes. (See Figure 2-11). All baffles must be in the vertical position. (See Figure 2-8)

**IMPORTANT:** HL models 150 MBTU/H, 175 MBTU/H and 200 MBTU/H must be installed with the 10 foot, titanium alloy aluminized tube directly following the burner box. The identification sticker found on the swaged end of the tubing will identify titanium combustion tube.

**IMPORTANT:** Mount all tubes with welded seam facing downward (See Fig. 2-7). Be sure to have swaged ends pointed towards the exhaust end of the heater.

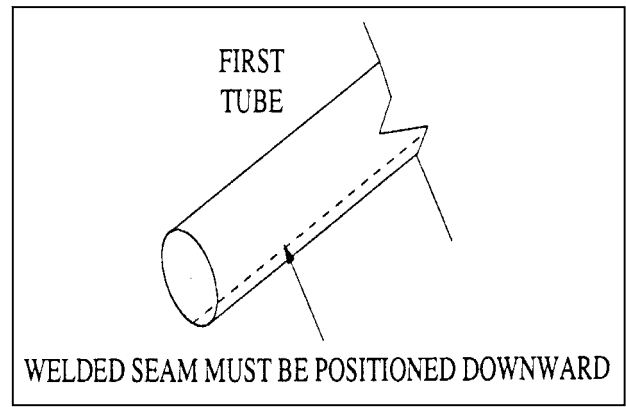


Figure 2-7

**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.

**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 2-10). 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.).

**NOTE:** Install baffle in the vertical position. (See Figure 2-8).



Figure 2-8

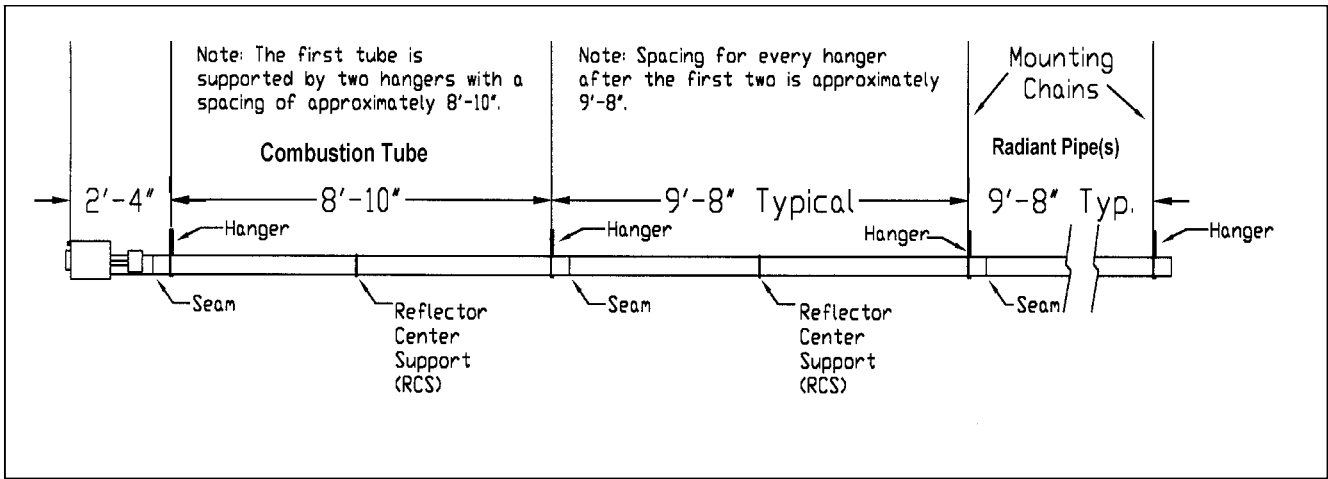


Figure 2-9

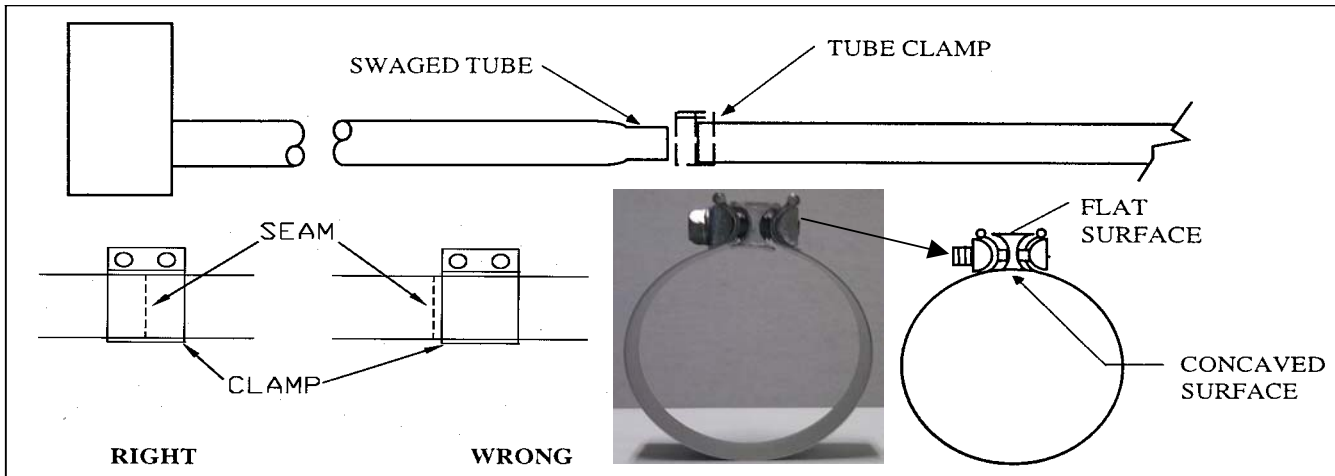


Figure 2-10

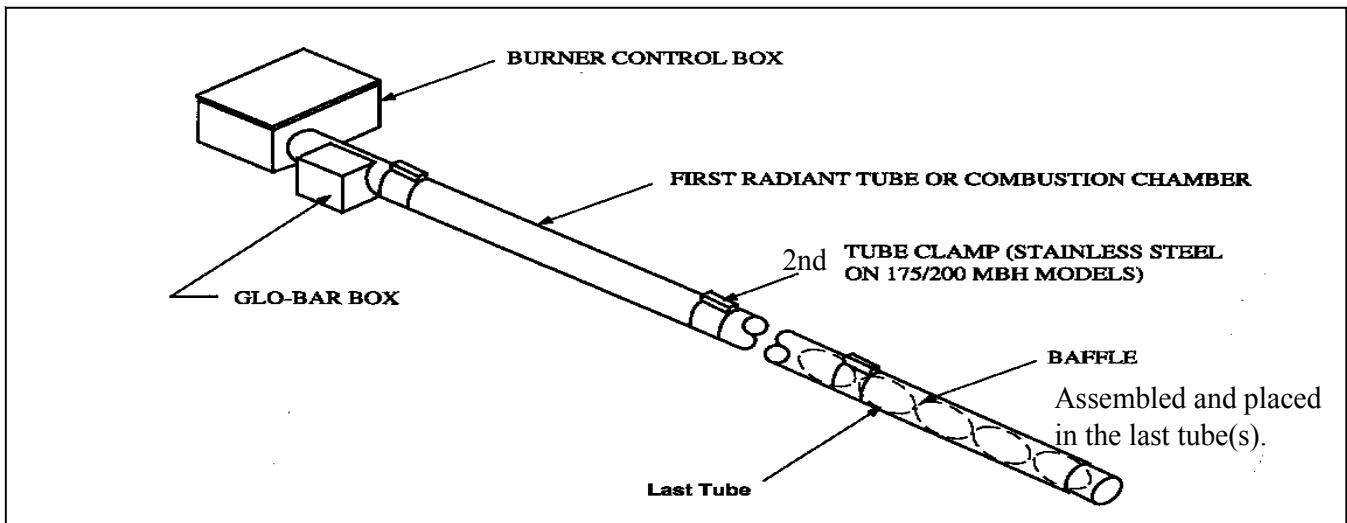


Figure 2-11

## 2.4 Reflector Assembly

1. Install reflector center supports (RCS) as shown in Figure 2-12.
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 2-13. Overlap reflectors 4 in. for support (See Figure 2-12).

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

3. Secure reflectors together with sheet metal screws at points indicated by arrows (See Figure 2-14). Make sure to leave an expansion joint.

**NOTE:** The screws 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 2-13).

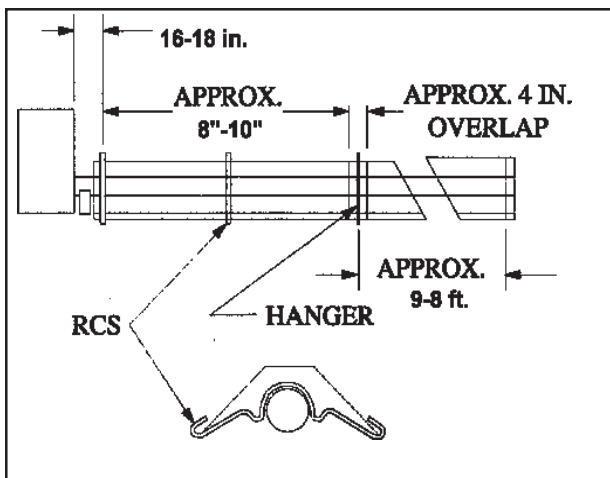


Figure 2-12

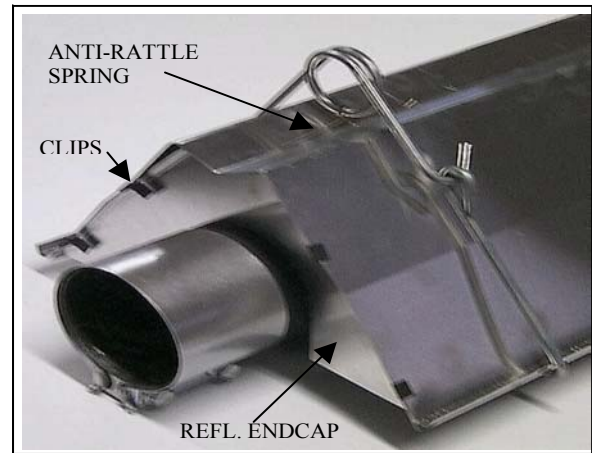


Figure 2-13

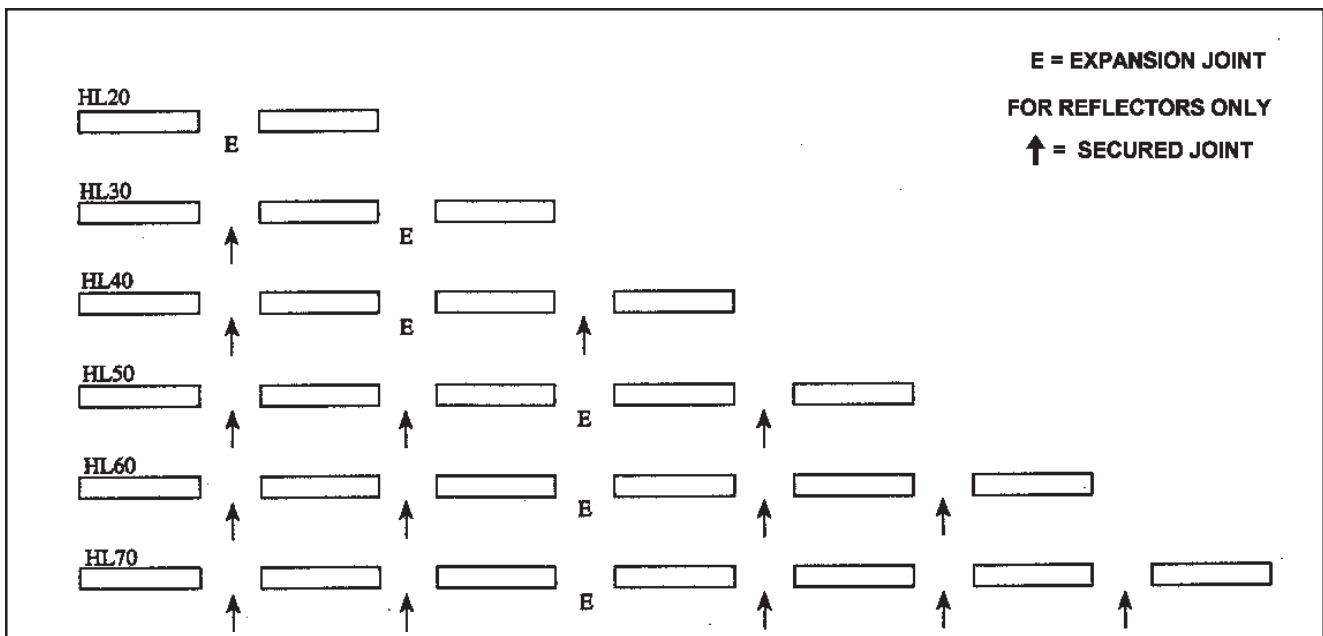


Figure 2-14

## 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.

**IMPORTANT:** If the heater is operating unvented, separate the intake air to the heater from its’ exhaust products. Although a minimum of 4’ is required, it may be necessary to provide further separation. See page 17.

See insert with E6 or TF1B fittings for proper baffle length changes with these fittings. In most cases, 33” of baffle should be removed.

MINIMUM DISTANCE FROM THE BURNER TO AN ELBOW OR “U” FITTING	
MODEL NO.	FT.
HL (20,30,40) - 75 (N,P)	10
HL (20)-100 (N,P)	10
HL (30,40,50) - 100 (N,P)	15
HL (30,40,50,60)-125 (N,P)	20
HL (40,50,60) - 150 (N,P)	20
HL (40,50,60,70) - 175 (N,P)	25
HL (50,60,70,80) - 200 (N,P)	25

CHART 4

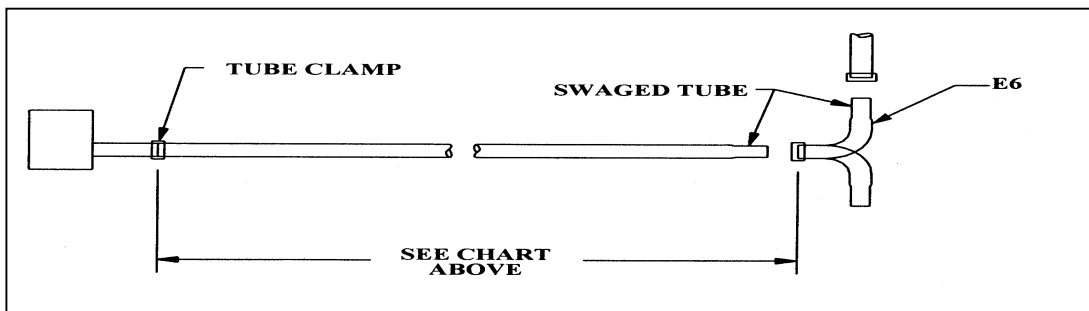


Figure 2-16

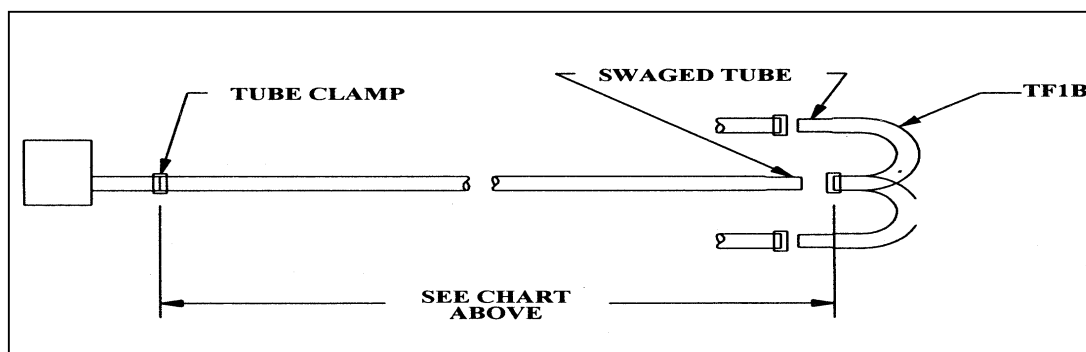


Figure 2-17

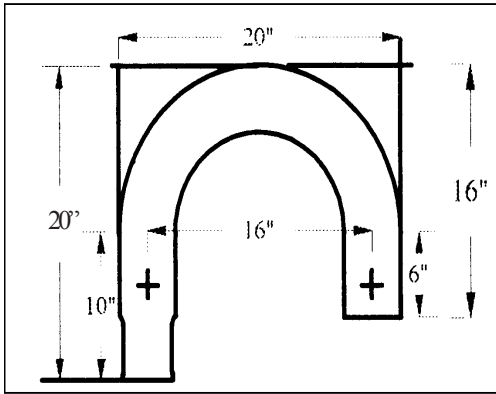


Figure 2-18

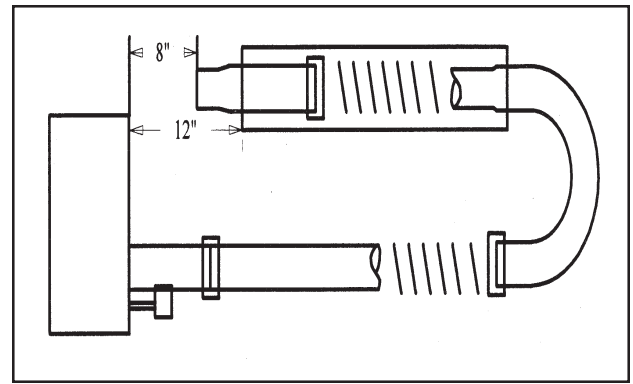


Figure 2-19

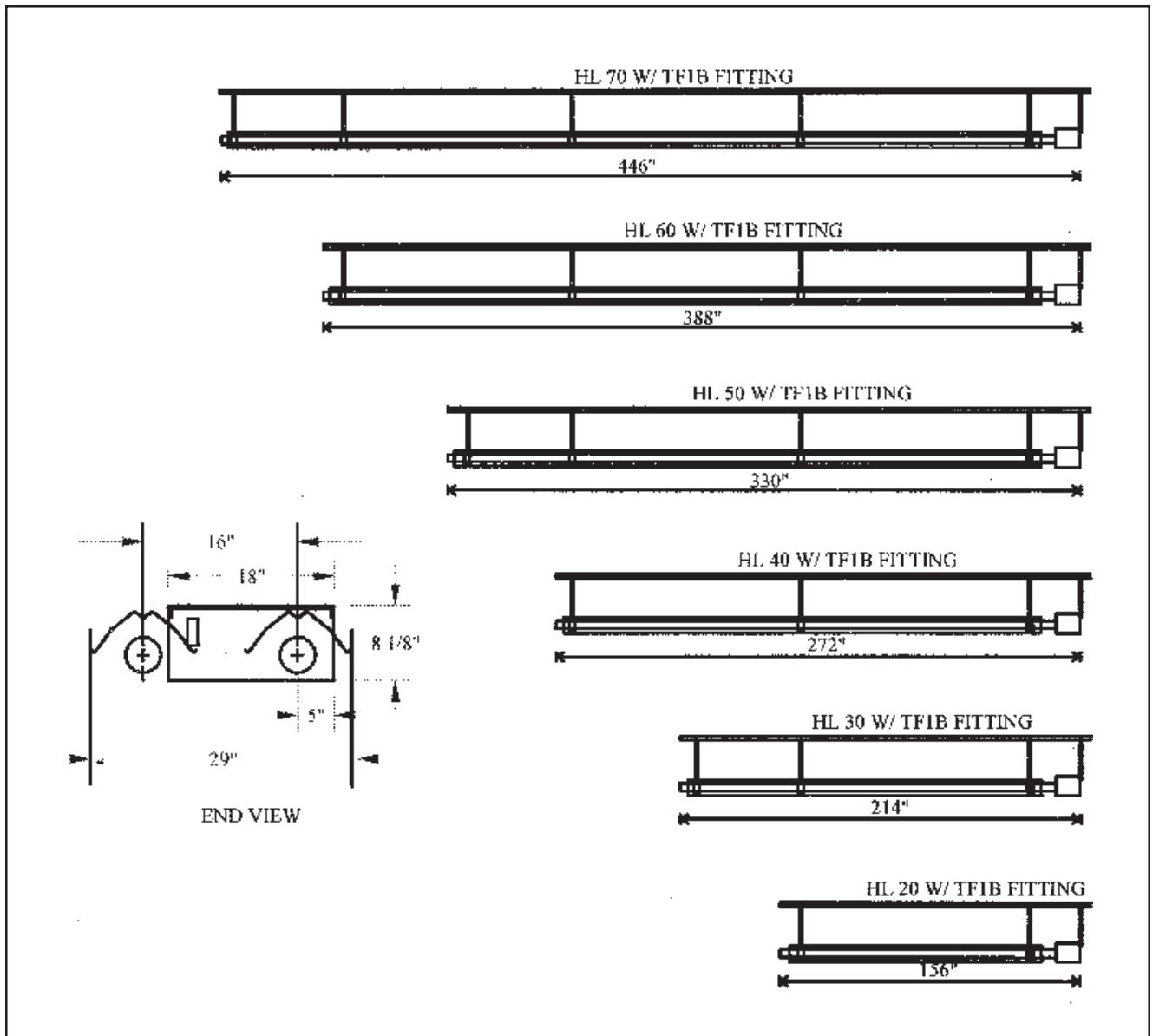


Figure 2-20

## 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 or the National Standards of Canada.
- 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 Figure 2-21 and 2-22).
- 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. (30cm) 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 form degradation by flue gases.
- Stacks that exit the building vertically should be 2 ft. above the roof.

- For stacks that exit the building horizontally, the flue should be 6 in. from the sidewall. Vent must also extend beyond any combustible overhang (Figure 2-21).
- A common flue of 6 in. diameter must be used for double venting of units. One thermostat must control both units. When common venting is used, flue should be connected so that the byproducts 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 2-23 through 2-26).
- Separate intake from exhaust by at least 4 feet. Vertical vents should be placed higher than adjacent intake pipes.

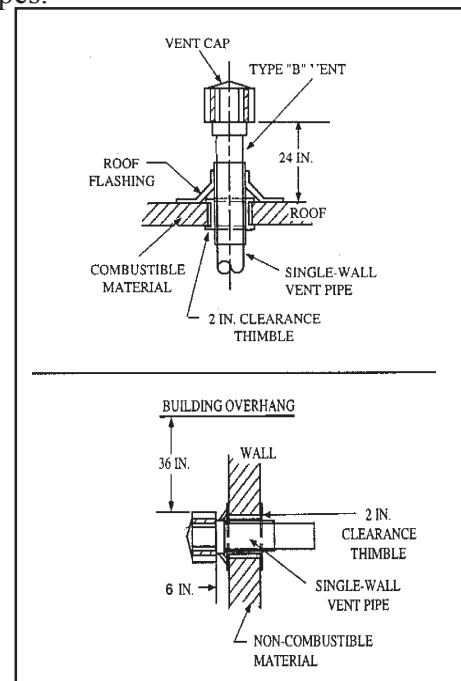


Figure 2-21

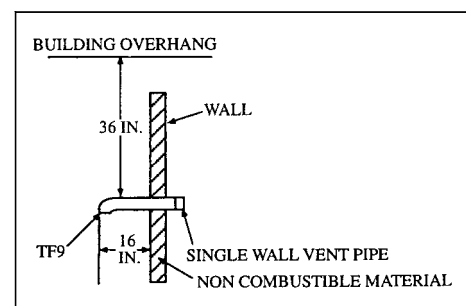


Figure 2-22



## FLUE VENTING CHART

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

CHART 5

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 qty. 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 2-23). Do not pitch heater.

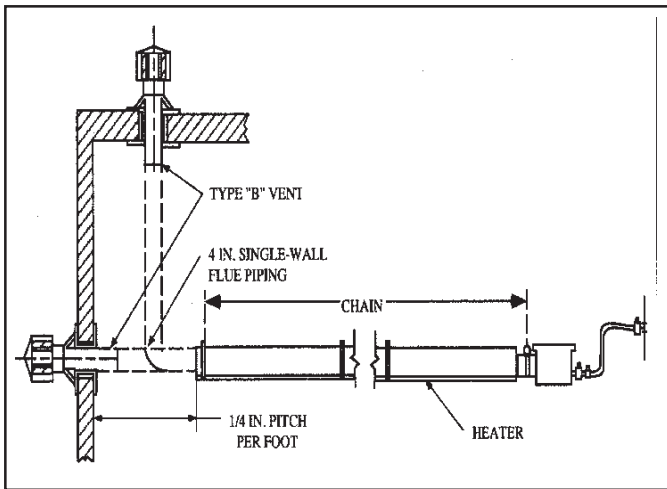


Figure 2-23

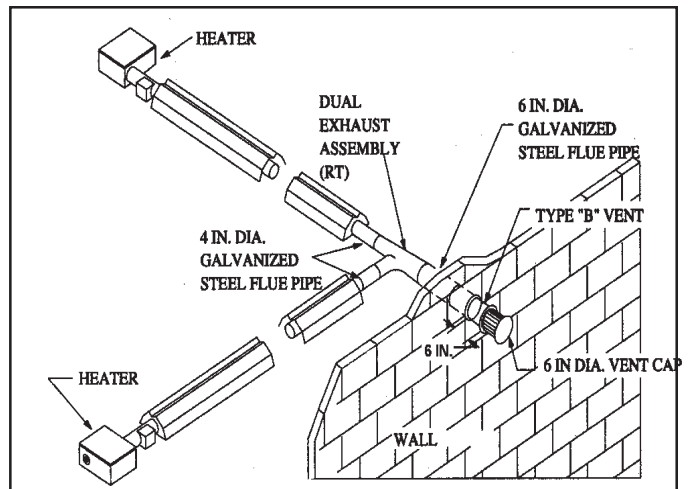


Figure 2-24

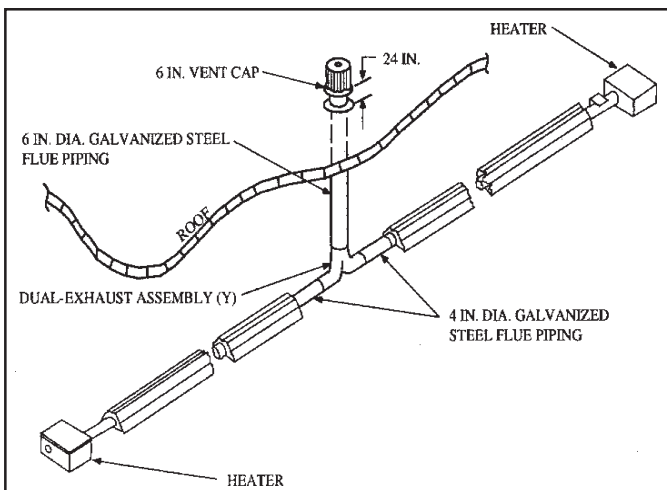


Figure 2-25

DUAL-EXHAUST ASSEMBLY  
(THROUGH ROOF)

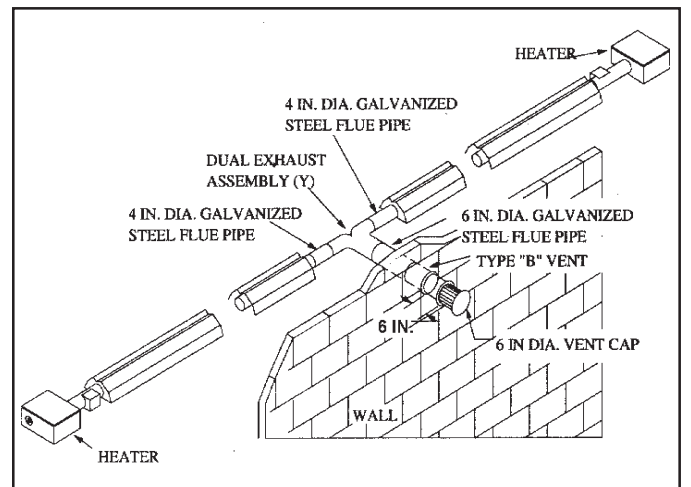


Figure 2-26

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 2-27). 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 3.9 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.

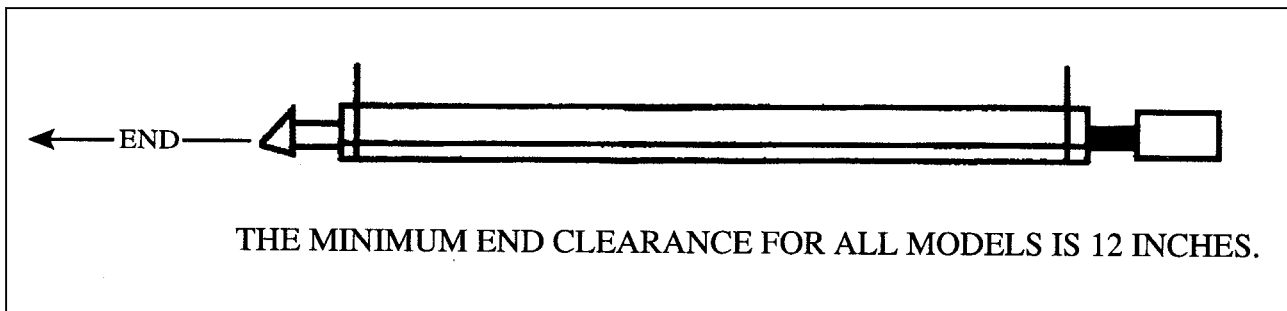


Figure 2-27

## 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 5,000 BTU/H of heater input.

Non-contaminated 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 air duct, and directly attached over the air orifice (See Figures 2-28 & 29). A WIV wall inlet cap must be used with horizontal outside air intake ducts. The use of flexible 4" hose, connecting the air intake pipe to the heater is recommended to allow flexibility to expand - (See Figure 2-28).

For limitation of length and size, see the Air Intake Duct-Chart. The maximum number of 90° elbows allowed is two.

Keep intake opening at least 4 ft. from any exhaust vent openings. On rooftop penetrations, always place the vent stack higher than the air intake stack.

The air intake cap must be installed to prevent blockage. Locate WIV air intake by an area that dirt, steam, snow, etc. will not contaminate or clog the ½" intake screen.

**NOTE:** In humid applications use insulated duct or PVC pipe to prevent condensation on outer surface of the intake pipe.

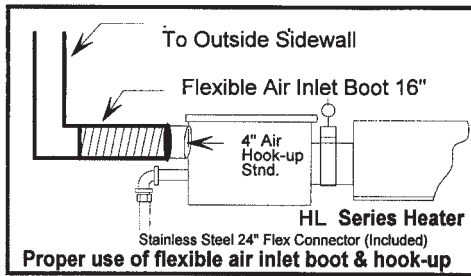


Figure 2-28

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

CHART 6

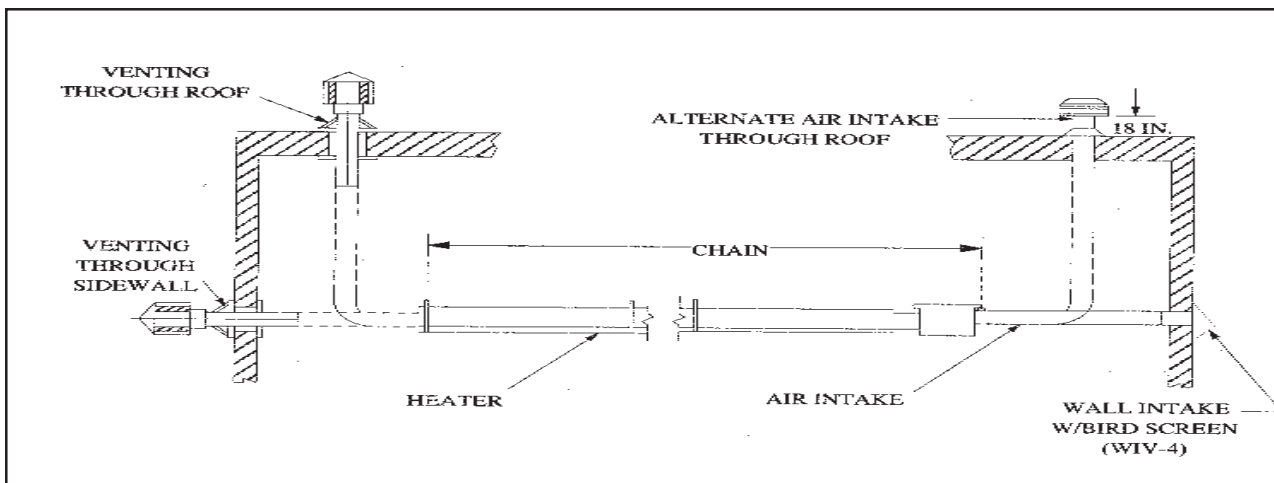


Figure 2-29

## 2.9 Gas Supply

### CAUTION!

CORRECT INLET PRESSURES ARE VITAL FOR EFFICIENT OPERATION OF HEATERS. REFER TO AGA/CGA 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 2-30).

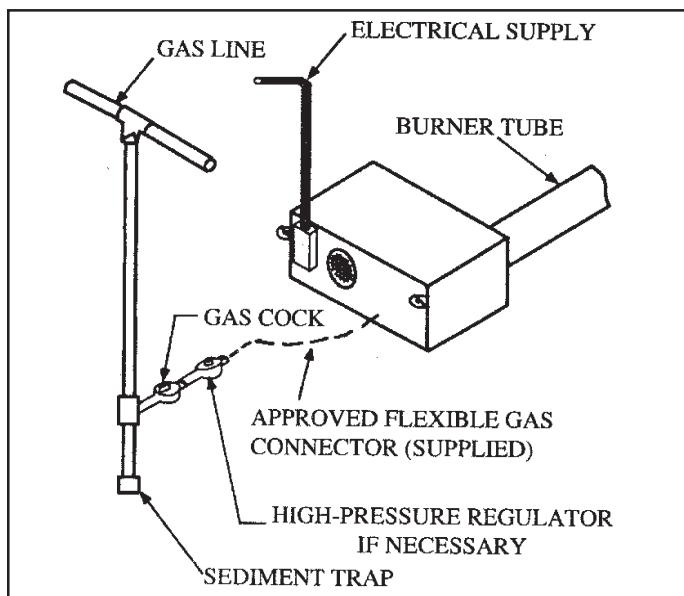


Figure 2-30

**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 shut-off cock to avoid damage to regulator and gas valve.

A typical gas supply line connection is illustrated in Figure 2-31. 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., the minimum inlet pressure is 5.0 inches. A maximum 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.+ 2.49 mbar.

- **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 1/2 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 2-31

## 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/NFPA70 (latest edition).
3. Applications in Canada must be grounded in accordance with the Canadian Electrical Code C22.1-latest edition when any external power source is utilized.
4. Observe proper electrical polarity.
5. It is recommended that the thermostat be installed on the hot side of a fused supply line and have a sufficient ampere rating for the heater(s) that it controls.
6. Clearance to combustibles must be maintained between electrical apparatus and wiring. See page 3.
7. Wiring must not be run above or below the heater, nor exposed to the radiant output.
8. **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 2-32, 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 2-33, 3-3 and 3-4.

**NOTE:** Block and ladder figures shown, with the Micro60 suffix, relate to the HL-2 Series.

## Typical Field Wiring Diagrams With Thermostat Control

HL-2 Series, without HLRB (white sticker) relay board. 24V supplied from an internal transformer. For controlling single heaters on a single control.

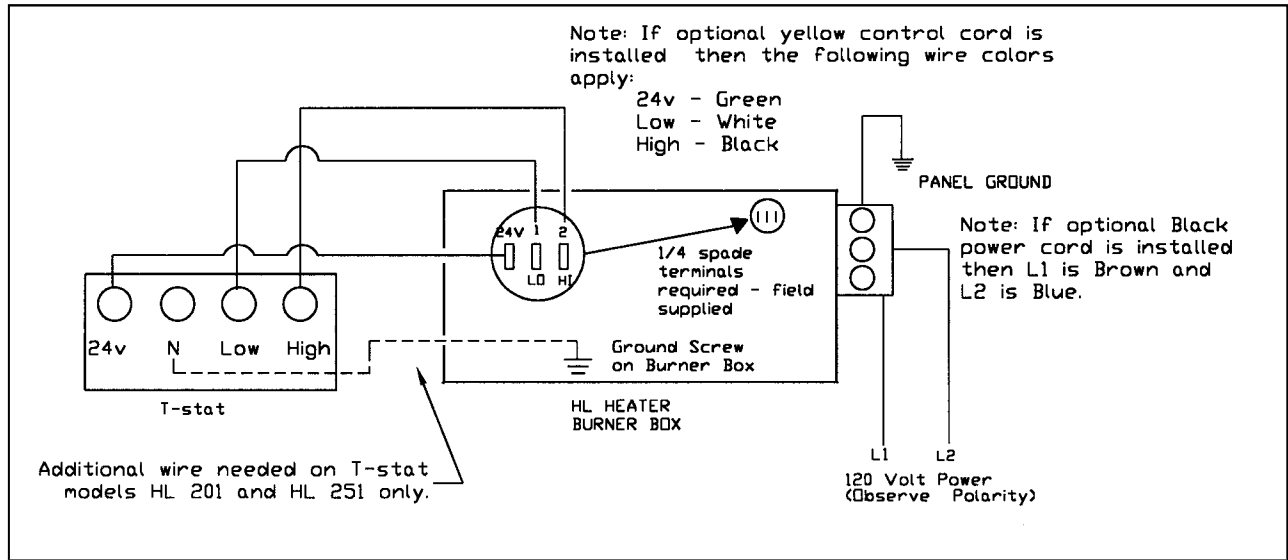


Figure 2-32

HL-2 Series, with HLRB (orange sticker) relay board. 24V supplied from external field supplied 40 VA transformer. For controlling multiple heaters on a single control. Required in common vent applications.

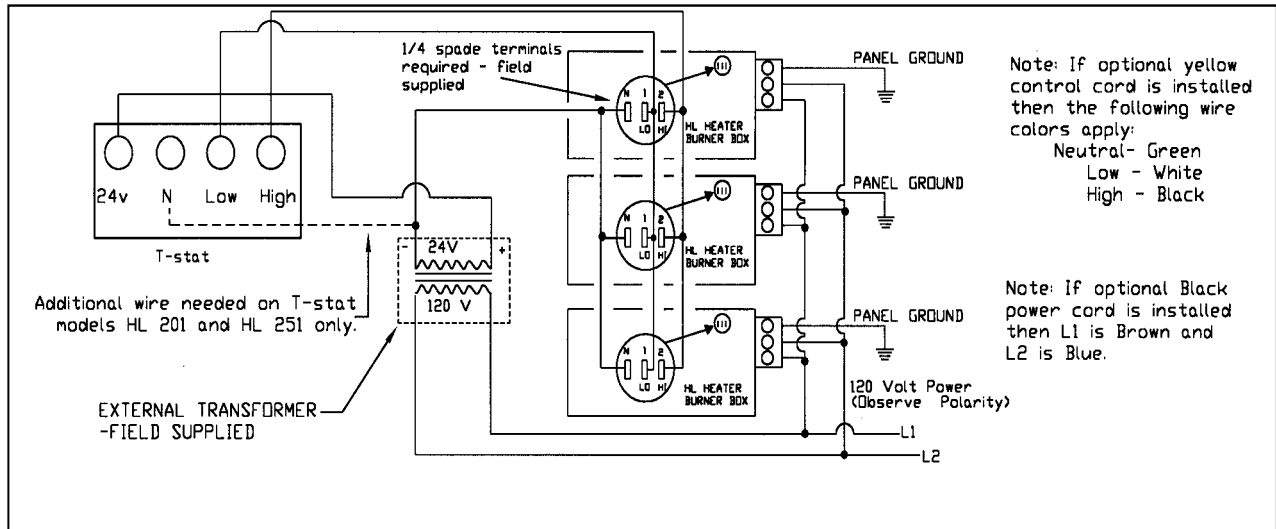


Figure 2-33

**WIRING DIAGRAMS FOR HEATERS WITH  
MICRO 60 ADD-ON CIRCUIT BOARD  
NO HLRB RELAY - WHITE STICKER**

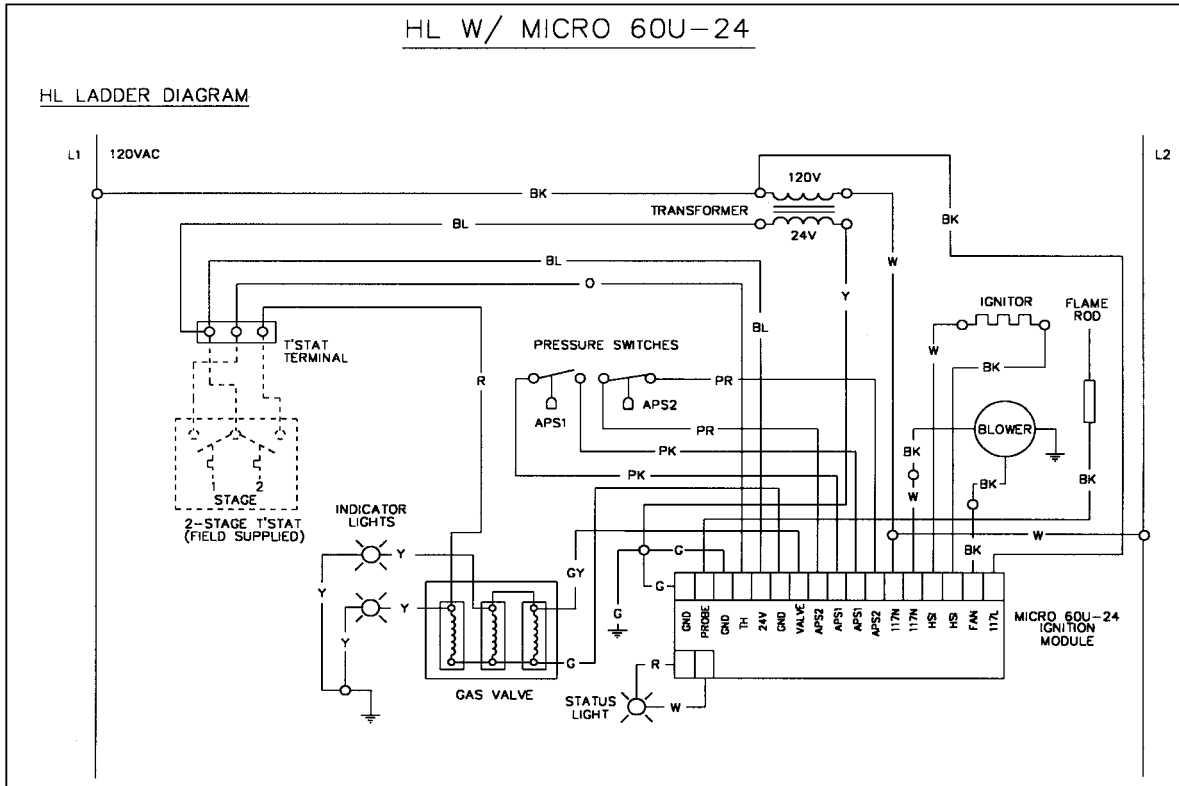


Figure 3-1

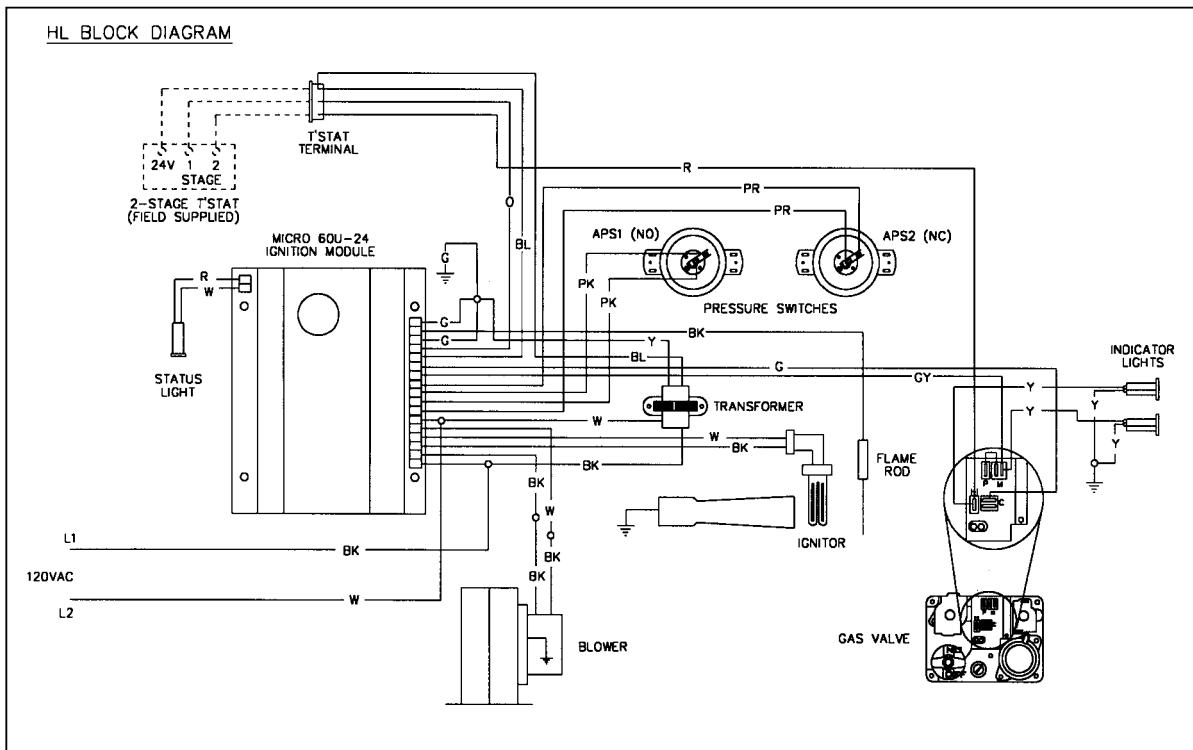


Figure 3-2



**WIRING DIAGRAMS FOR HEATERS WITH  
HLRB RELAY AND MICRO 60 INSTALLED  
ORANGE STICKER, FIELD SUPPLIED TRANSFORMER**

MICRO 60U-24 LADDER DIAGRAM - WITH RELAY BOARD

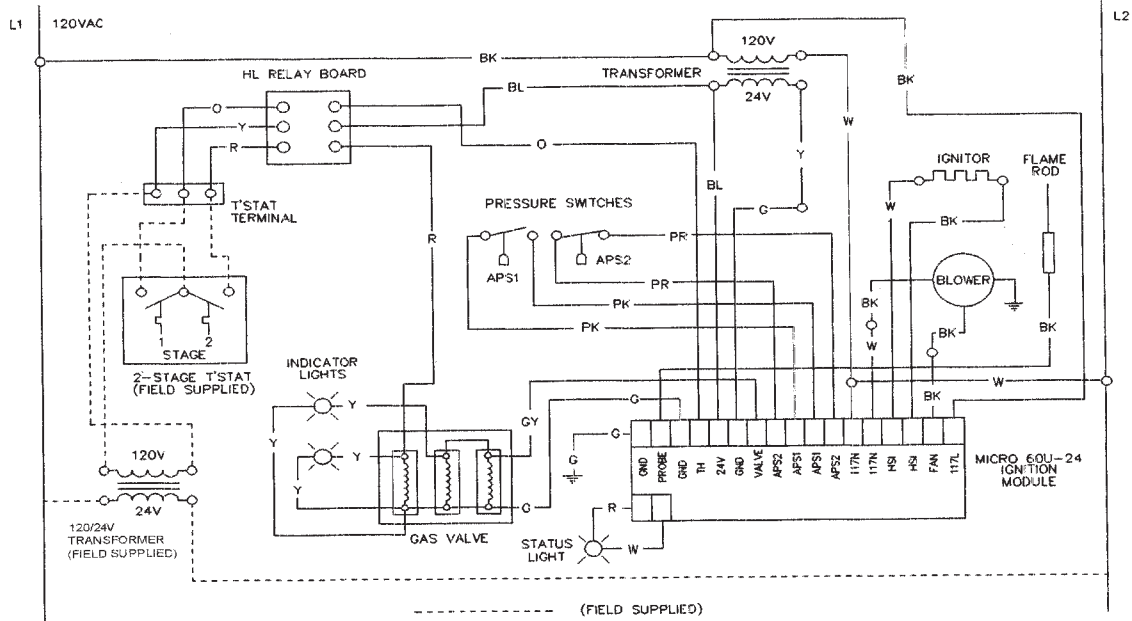


Figure 3-3

MICRO 60U-24 BLOCK DIAGRAM - WITH RELAY BOARD

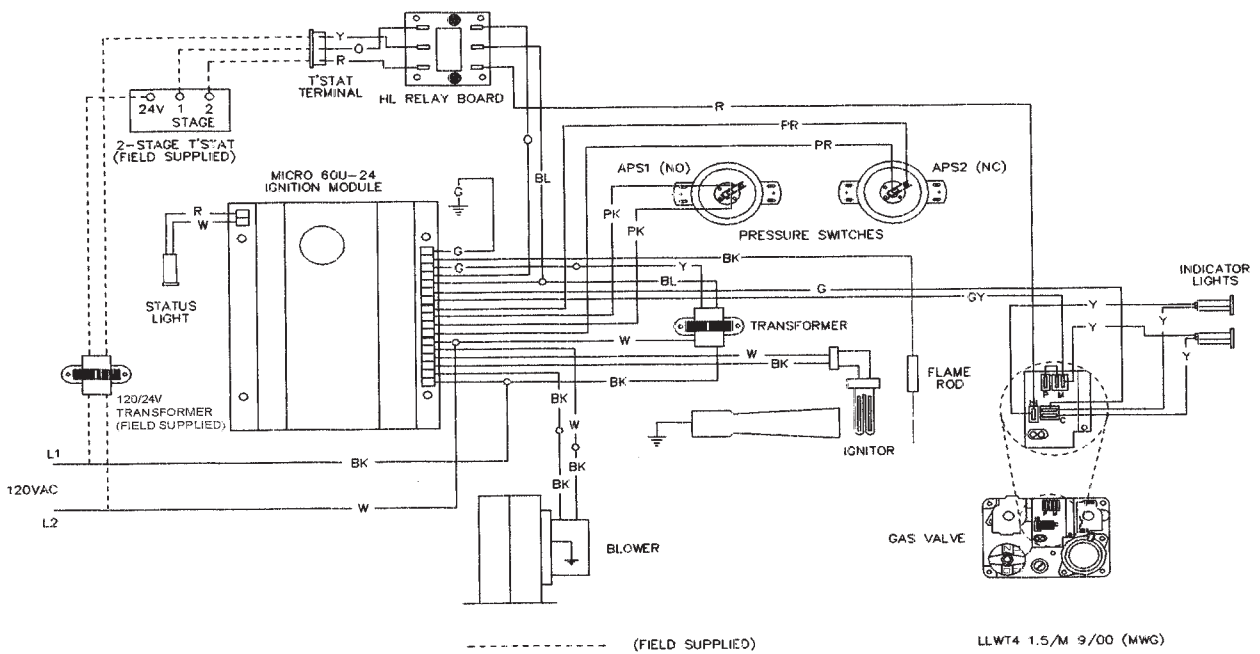


Figure 3-4

### 3. THEORY OF OPERATION

#### Standby:

The Micro 60U24 control continually checks for internal faults, safety circuit integrity, and relay contact positioning.

#### Starting Circuit:

Upon a call for heat, the control will verify that the burner and exhaust safety pressure switches are in their proper position. The fan relay energizes the fan, an operational static pressure is achieved and the normally open burner pressure switch will close, initiating the ignition sequence. The glow-bar is powered and after 45 seconds the main gas valve opens.

#### First Stage Running Circuit:

After ignition the flame-rod monitors the main burner flame. If flame is lost, the control acts to close the gas valve within one second and a new trial sequence, identical to the start up sequence, is initiated. If proof is not established within 8.5 seconds, the unit will retry 2 additional ignition sequences and then proceed to hard lock-out. The control can be reset by interrupting the power source or at the thermostat.

#### Second Stage Running Circuit:

Stage two on the gas valve is powered directly from the second stage of the thermostat. The gas valve will not pass gas unless the first stage sequence of operation has been completed. The thermostat will determine which stage is required to maintain the desired comfort level.

#### Shut Down:

When the thermostat is satisfied the fan will enter into a 2 minute post-purge cycle.

#### Soft Lockout:

In the event of an external interruption (wind, gas, etc.) the heater will go into a “soft-lockout” feature. In this mode the heater will attempt a normal start-up after a timed period. In the event of continued problems, the heater will go into a hard lock-out mode.

#### Lockout Codes:

In event of a component failure, a red LED diagnostic light located on the burner box end panel will flash a code identifying the fault. Lockout codes are summarized below in the table “Lock Out Codes” (Chart 7).

LED CODE	FAULT STATUS	CONTROL SEQUENCE
Initial Flash On Power Up, Then Steady Off	Normal Operation	Immediate
Steady On	Module Failure / Internal Fault	Immediate
1 Flash	Ignition Failure	32 min.
2 Flashes	APS 1 Failure	12 min.
3 Flashes	APS 2 Failure	22 min.
4 Flashes	Solenoid Valve Fault / Leaky Valve / Flame Amplifier Fault	Immediate
No Flash on 117V Start Up	Transformer Fault	Immediate

Note: Hard lockout LED Code will appear upon completion of the soft lockout sequence of operation.

CHART 7

### 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.

### INSTRUCTIONS POUR L'ALLUMAGE

1. PURGER LA CONDUITE D'ALIMENTATION EN GAZ PRINCIPALE.
2. TOURNER LE BOUTON DU ROBINET DE GAZ A COMMANDE MANUELLE JUSQU'A CE QU'IL SE TROUVE EN POSITION DE MARCHE ("ON").
3. FERMER LE CIRCUIT ELECTRIQUE.
4. SI L'APPAREIL DE CHAUFFAGE NE S'ALLUME PAS, ATTENDRE 5 MINUTE AVANT DE SUIVRE DE NOUVEAU LES INSTRUCTIONS CI-DESSUS

### 3.2 Shutdown Instructions

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

### POUR ETEINDRE L'APPAREIL

1. OUVRIR LE CIRCUIT ELECTRIQUE.
2. TOURNER LE BOUTON DU ROBINET DE GAZ A COMMANDE MANUELLE DE L'APPAREIL DE CHAUFFAGE JUSQU'A CE QU'IL SE TROUVE EN POSITION D'ARRET ("OFF").

## 4. MAINTENANCE

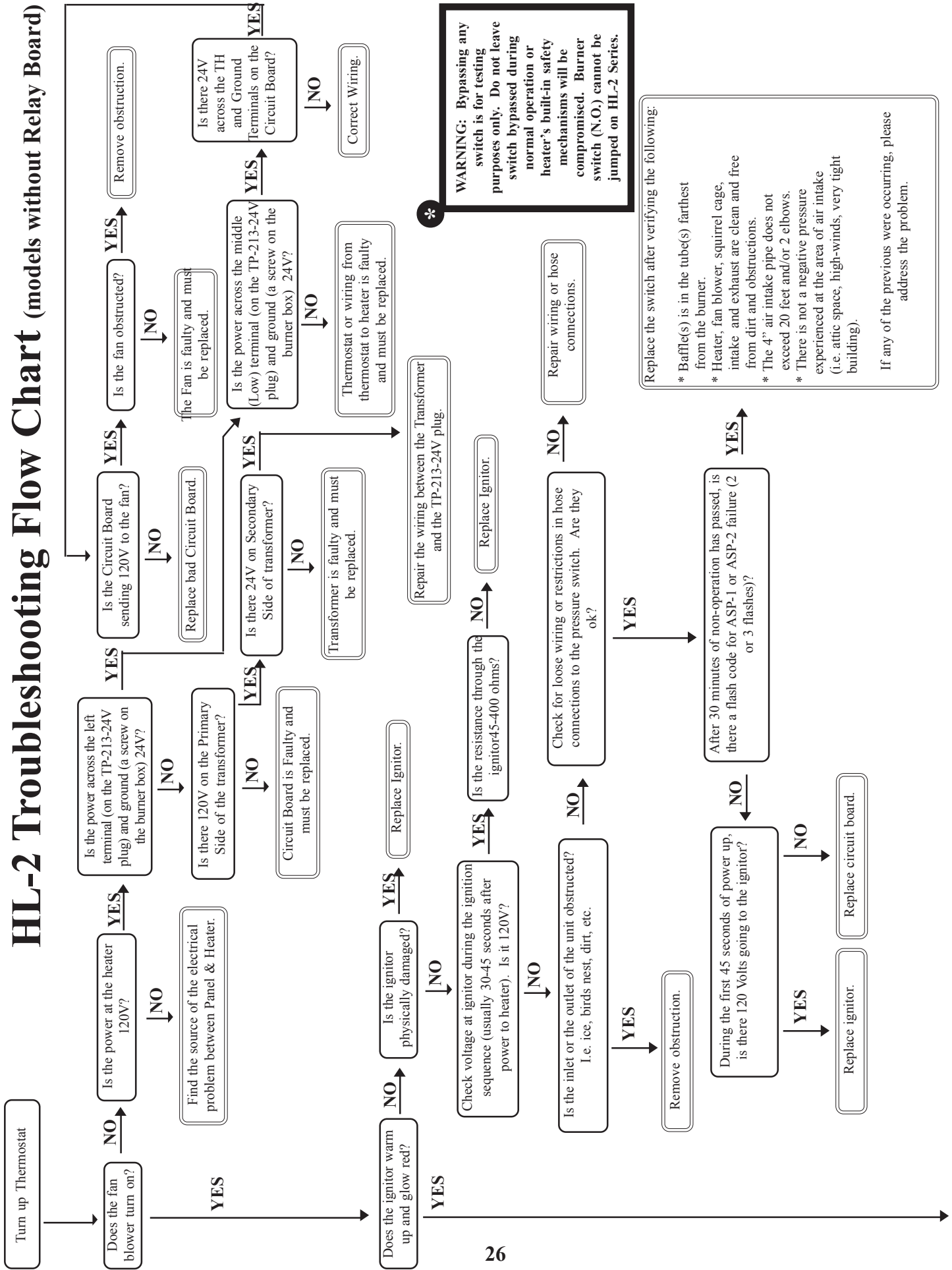
Model HL gas-fired, infrared heaters require a minimum of routine maintenance to keep them operating at peak performance.

### **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.

# HL-2 Troubleshooting Flow Chart (models without Relay Board)



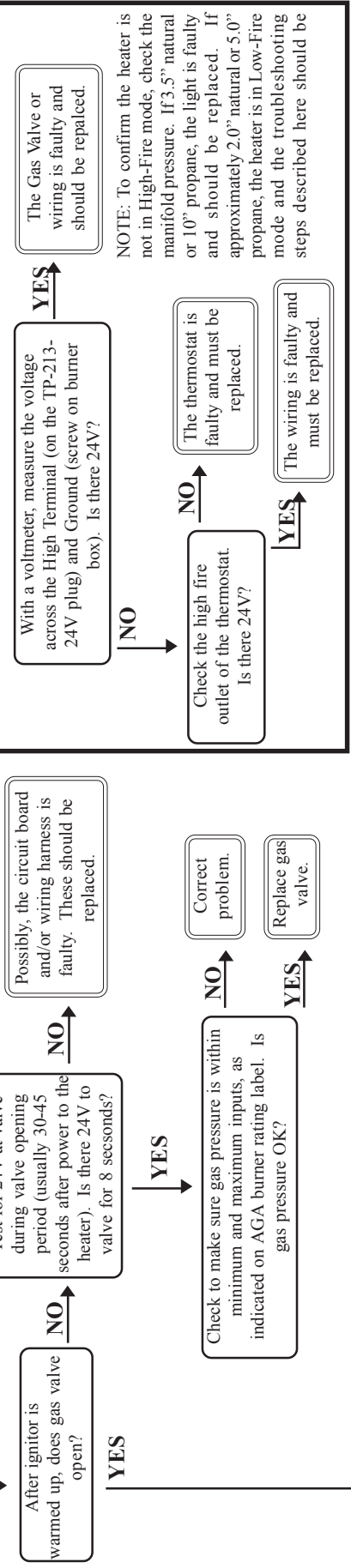
**WARNING:** Bypassing any switch is for testing purposes only. Do not leave switch bypassed during normal operation or heater's built-in safety mechanisms will be compromised. Burner switch (N.O.) cannot be jumped on HL-2 Series.

Replace the switch after verifying the following:

- \* Baffle(s) is in the tube(s) farthest from the burner.
- \* Heater, fan blower, squirrel cage, intake and exhaust are clean and free from dirt and obstructions.
- \* The 4" air intake pipe does not exceed 20 feet and/or 2 elbows.
- \* There is not a negative pressure experienced at the area of air intake (i.e. attic space, high-winds, very tight building).

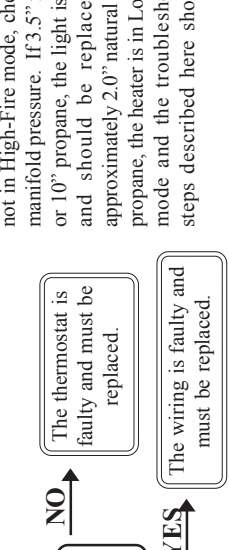
If any of the previous were occurring, please address the problem.

**If heater does not go into high-fire mode, check the following:**



With a voltmeter, measure the voltage across the High Terminal (on the TP-213-24V plug) and Ground (screw on burner box). Is there 24V?

NOTE: To confirm the heater is not in High-Fire mode, check the manifold pressure. If 3.5" natural or 10" propane, the light is faulty and should be replaced. If approximately 2.0" natural or 5.0" propane, the heater is in Low-Fire mode and the troubleshooting steps described here should be



Correct problem.  
Make sure gas lines were purged of air.

Check to make sure gas pressure is within minimum and maximum inputs, as indicated on AGA burner rating label. Is gas pressure OK?

With voltmeter, check DC voltage at flame rod. Is it greater than 30 Volts DC?

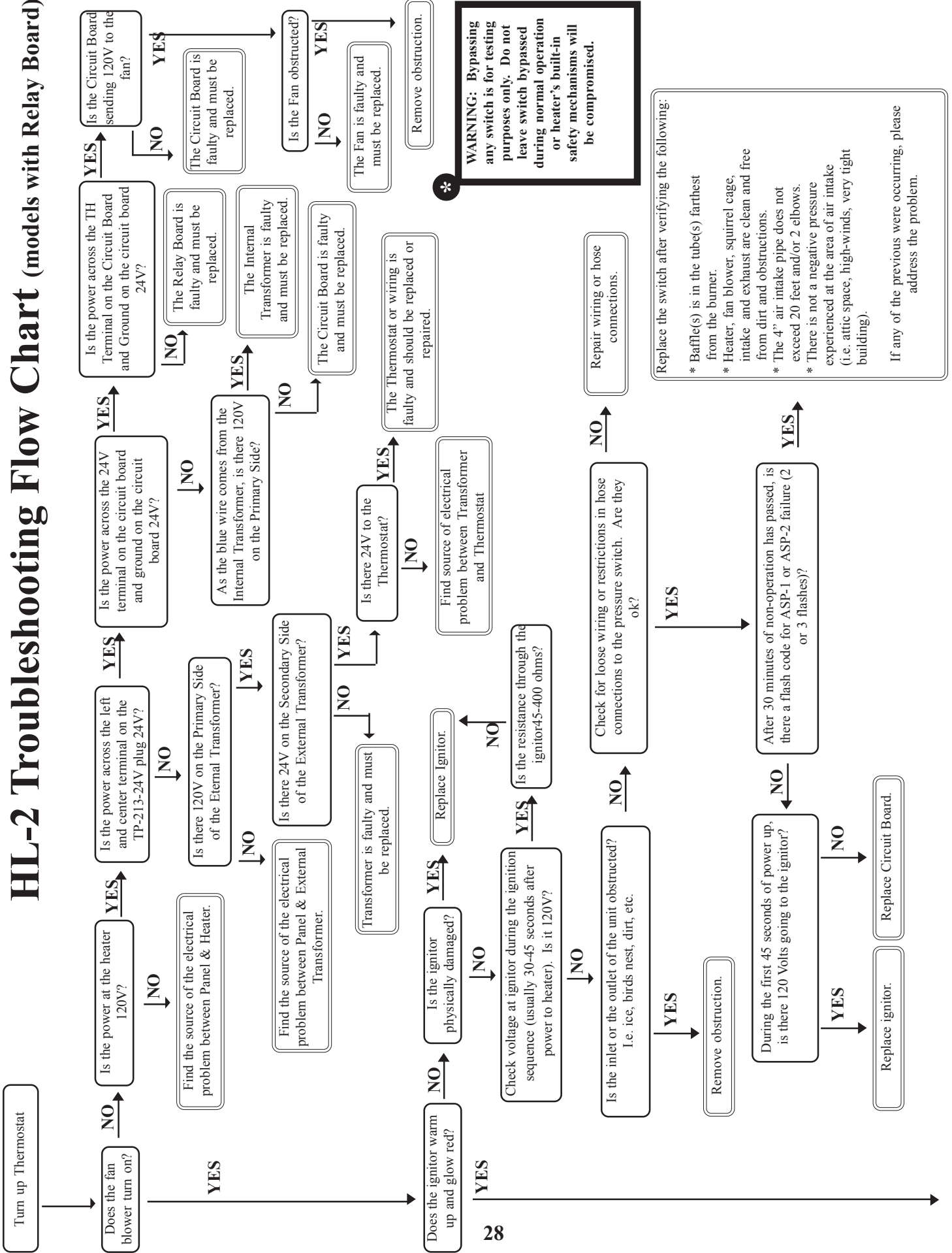
Check to make sure flame sensor wire is OK and then replace circuit board.

Sensing rod is faulty or flame is weak. Check to make sure heater is operating at proper gas pressure as indicated on AGA burner rating label and then replace sensing rod if

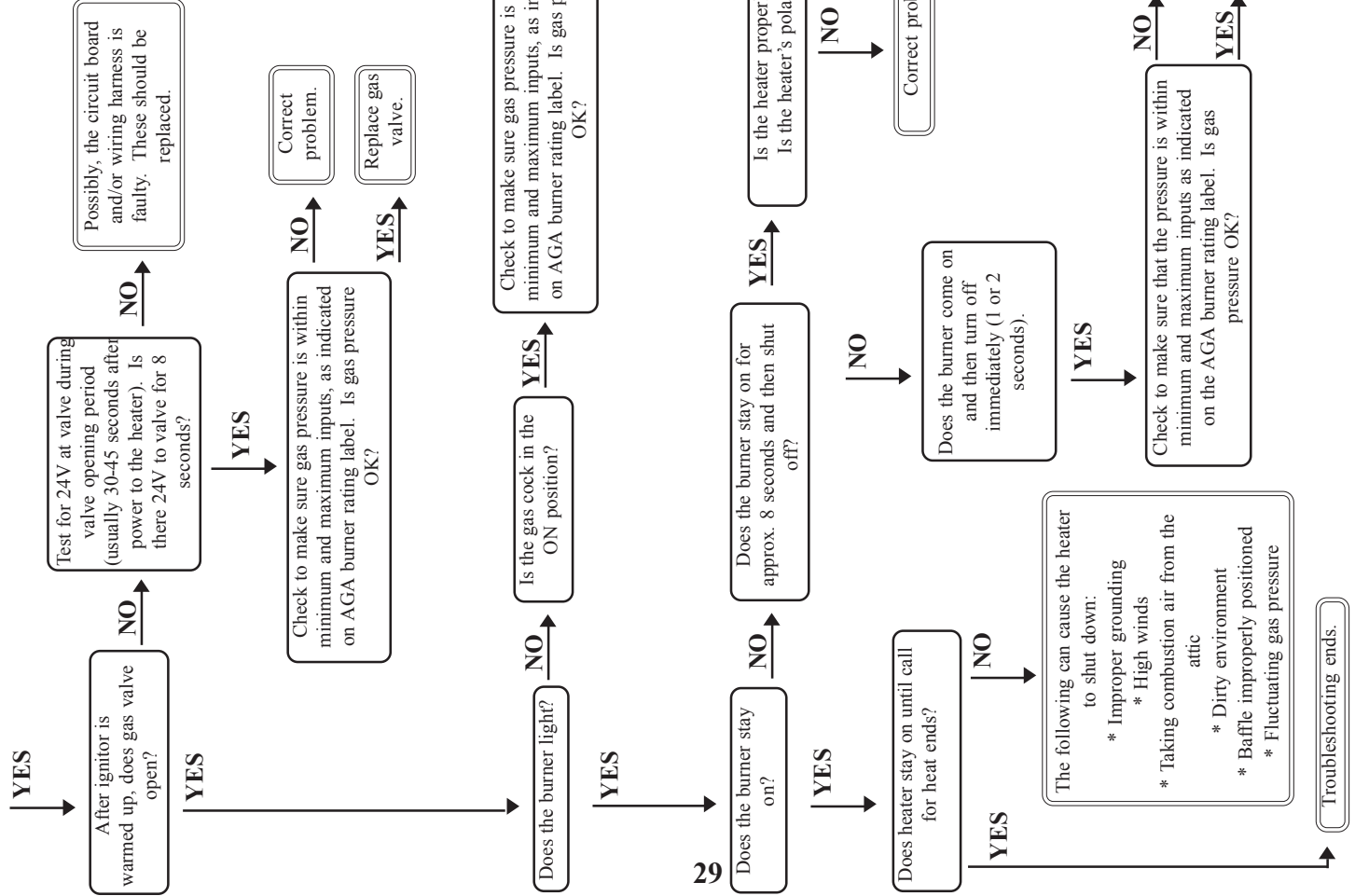
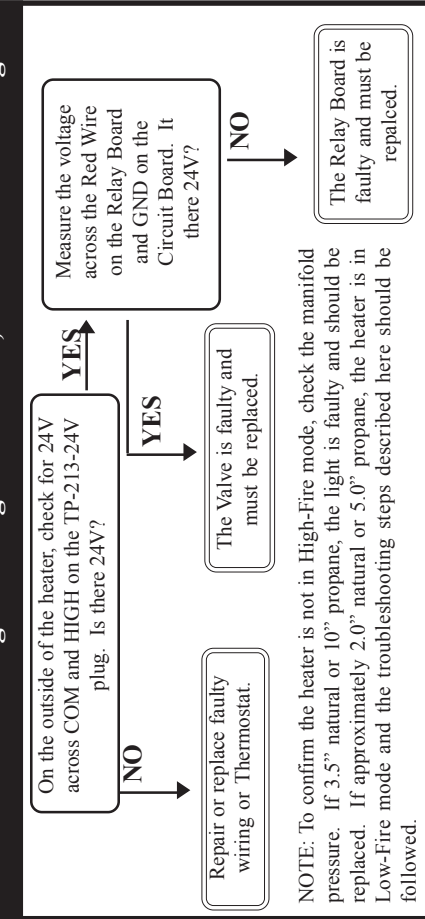
Correct problem.

Exhaust pressure switch may be faulty or there is a restriction in the exhaust.

# HL-2 Troubleshooting Flow Chart (models with Relay Board)



**If heater does not go into high-fire mode, check the following:**



## 4.1 TROUBLESHOOTING CHART

<b>HL SERIES GENERAL TROUBLESHOOTING CHART</b>		
<b>SYMPTOM</b>	<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
Thermostat closed but nothing happens.	<ol style="list-style-type: none"> <li>1. Blown fuse.</li> <li>2. Defective thermostat.</li> <li>3. Loose or disconnected wire.</li> <li>4. Defective fan.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> <li>2. Replace.</li> <li>3. Repair as required.</li> <li>4. Lubricate, repair or replace.</li> </ol>
Thermostat closed. Fan operates. No glo-bar energization.	<ol style="list-style-type: none"> <li>1. Loose or disconnected wire.</li> <li>2. Plugged or restricted exhaust vent.</li> <li>3. Plugged pressure switch lines.</li> <li>4. Defective pressure switches.</li> <li>5. Defective glo-bar.</li> <li>6. Defective circuit control.</li> <li>7. Box lid or gasket not in place.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair as required.</li> <li>2. Remove foreign matter.</li> <li>3. Clean as necessary.</li> <li>4. Replace only. Do not adjust.</li> <li>5. Replace.</li> <li>6. Replace circuit control.</li> <li>7. Put in place.</li> </ol>
Thermostat closed. Fan and glo-bar operate. After 45 seconds glo-bar shuts off. No reignition.	<ol style="list-style-type: none"> <li>1. Closed gas supply.</li> <li>2. Dirty or restricted orifice.</li> <li>3. Defective valve. Disconnected valve wire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Open all gas connections.</li> <li>2. Remove and clean with a soft object.</li> <li>3. Replace or repair.</li> </ol>
Loss of heater efficiency.	<ol style="list-style-type: none"> <li>1. Low gas pressure.</li> <li>2. Dirty or restricted orifice.</li> <li>3. Foreign mater inside burner assembly.</li> <li>4. Unit cycles on and off.</li> <li>5. Reflector is sooted and has lost its reflective ability.</li> <li>6. Reflector not in place.</li> <li>7. Clogged fan blower</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide required gas pressure.</li> <li>2. Remove and clean with a soft object.</li> <li>3. Clean as necessary.</li> <li>4. Check previous symptom.</li> <li>5. Clean with aluminum cleaner and soft wiping cloth.</li> <li>6. Put in place.</li> <li>7. Clean.</li> </ol>
Radiant tube leaking burnt gases.	<ol style="list-style-type: none"> <li>1. Loose tube connections.</li> <li>2. Holes or cracks in radiant tube.</li> </ol>	<ol style="list-style-type: none"> <li>1. Assure that tube is fully inserted into flared end and properly clamped.</li> <li>2. Replace.</li> </ol>
Condensation.	<ol style="list-style-type: none"> <li>1. Stack length too long.</li> <li>2. Light gauge flue stack used.</li> <li>3. Low gas pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shorten stack.</li> <li>2. Minimum of 26 gauge vent pipe is required.</li> <li>3. Set proper gas pressure.</li> </ol>
Tube bowing.	<ol style="list-style-type: none"> <li>1. Insufficient combustion air.</li> <li>2. Overfired.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide 2 sq. in. of free air per 5000 BTU/H of input.</li> <li>2. Check gas pressure and orifice size.</li> </ol>
Tube corroding.	<ol style="list-style-type: none"> <li>1. Contaminated combustion air.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide fresh air inlet duct.</li> </ol>
Visual inspection of burner operation not possible.	<ol style="list-style-type: none"> <li>1. Dirty or sooted sight glass.</li> <li>2. Unit mounted upside down.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove, clean or replace.</li> <li>2. Mount correctly.</li> </ol>
Stack sooting.	<ol style="list-style-type: none"> <li>1. Insufficient combustion air.</li> <li>2. Overfired.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide 1 sq. in. of free air for every 5000 BTU/H of input.</li> <li>2. Check gas pressure and orifice size.</li> </ol>
Thermostat closed. Fan and glo-bar operate. Ignition occurs. Burner cycles off and will not recycle.	<ol style="list-style-type: none"> <li>1. No electrical ground.</li> <li>2. Defective circuit control.</li> <li>3. Low gas pressure.</li> <li>4. Circuit control connection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect electrical ground to junction box.</li> <li>2. Replace.</li> <li>3. Provide required gas pressure.</li> <li>4. Repair or replace.</li> </ol>
Thermostat closed. Fan and glo-bar operate. Ignition occurs. Burner cycles off. Burner cycles on.	<ol style="list-style-type: none"> <li>1. Low gas pressure.</li> <li>2. Baffle improperly positioned.</li> <li>3. Defective exhaust pressure switch.</li> <li>4. Restricted.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide required gas pressure.</li> <li>2. Reposition baffle (see page 9 &amp; 10).</li> <li>3. Replace.</li> <li>4. Remove foreign matter.</li> </ol>





## 5. PARTS LISTS

### 5.1 Basic Parts List

#### HL-2 SERIES PARTS LISTING

VER.	TP#	ITEM	VER.	TP#	ITEM
9/92+	TP-1	CONTROL BOX COVER	9/92+	TP-105	REFLECTOR END CAP
9/92+	TP-5	FLANGE GASKET	9/92+	TP-106	REFLECTOR CLIP
9/92+	TP-9	CONDUIT COUPLING	9/92+	TP-108	5' AL-TI TUBE, PAINTED W. ONE CLAMP
9/92+	TP-10	CONDUIT 4" X 1/2"	9/92+	TP-111	5' ALUM. TUBE, PAINTED W/1 CLAMP
9/92+	TP-11	GLO-BAR IGNITOR BOX	9/92+	TP-112	5' REFLECTOR
9/92+	TP-12	GLO-BAR IGNITOR BOX COVER	9/92+	TP-122	GASKET FOR AIR ORIFICE & AIR COLLAR
9/92+	TP-14	SIGHT GLASS GASKET	9/92+	TP-200	BURNER (50 TO 100 MBTU/H)
9/92+	TP-15	SIGHT GLASS	9/92+	TP-201	BURNER (125 MBTU/H TO 200 MBTU/H)
9/92+	TP-16	SIGHT GLASS WASHER	9/92+	TP-202	16" BURNER TUBE W/ FLANGE
9/92+	TP-19B	WIRE HANGER	9/92+	TP-204	GAS ORIFICE - CONSULT FACTORY
9/92+	TP-20C	120" REFLECTOR	9/92+	TP-205	GLO-BAR HOLDER
9/92+	TP-21B	TUBE CLAMP	9/92+	TP-208	"Z" MOUNTING BRACKET
9/92+	TP-26A	10 FT. RADIANT TUBE STRAIGHT	9/92	TP-211	MARK 17X-24 CIRCUIT BOARD
9/92+	TP-26B	10 FT. RADIANT TUBE STRAIGHT (AL-TI)	9/95	TP-211A	MARK 17U-24 CIRCUIT BOARD (REMOTE SENSE)
9/92+	TP-31B	CONTROL BOX BRACKET	9/92+	TP-212	1/2" X 3" PIPE NIPPLE
9/92+	TP-33B	1/2" GAS COCK	9/92+	TP-214	GLO-BAR WIRING HARNESS
9/92+	TP-44	AIR ORIFICE W/SCREEN (CONSULT FACTORY)	9/92+	TP-217	PRESSURE BARB FITTING
9/92+	TP-50	GLO-BAR IGNITOR	9/92+	TP-218	EXHAUST PRESSURE TUBE (VINYL)
9/92+	TP-54	BURNER BOX DIVIDER	9/92+	TP-220	STAIN. STL. TUBE CLAMP (175 & 200 MBTU/H)
9/92+	TP-55A	FAN BLOWER	9/92+	TP-221	GLO-BAR HOLDER GASKET
9/92+	TP-56C	1/4" ATMOSPHERIC TUBE (VINYL)	9/95+	TP-222	FLAME ROD
9/92+	TP-57A	1/4" PRESSURE TUBE	9/95+	TP-222A	FLAME ROD WIRE
9/92+	TP-60F	EXHT PRESSURE SWITCH - 50 TO 150 MBTU/H	9/92+	TP-223	GAS MANIFOLD
9/92+	TP60G	EXHT PRESSURE SWITCH - 175 & 200 MBTU/H	9/00+	TP-802	HL END PANEL - LEFT
9/92+	TP-61B	BURNER PRESSURE SWITCH - 50 - 100 MBTU/H	9/00+	TP-803	HL END PANEL - RIGHT
9/92+	TP-61C	BURNER PRESSURE SWITCH - 200 MBTU/H	9/92+	TP-804	HL CONTROL BOX
9/92+	TP-61D	BURNER PRESSURE SWITCH - 150 & 175 MBTU/H	9/92+	TP-825	OPTIONAL HL RB RELAY BOARD
3/00+	TP-65I	33" INTERLOCKING HEAT DIFFUSER (BAFFLE)	9/92+	TP-826	40VA TRANSFORMER (OLD TP219)
9/92+	TP-66	2" X 4" OUTLET BOX	9/00+	TP-827	RED LED DISPLAY DIAGNOSTIC LIGHT
9/92+	TP-67	2" X 4" OUTLET BOX COVER	9/92+	TP-828	YELLOW OPERATIONAL IND. LIGHT (OLD TP216)
9/92+	TP-68A	STRAIN RELIEF BUSHING	9/92+	TP-832	THERMOSTAT TERMINAL STRIP (OLD TP213)
9/92+	TP-70	CONTROL BOX COVER GASKET (PER FOOT**)	9/92+	TP-840	36E96-224 TWO STAGE GAS VALVE-NAT (OLD TP210)
9/92+	TP-76	RUBBER GROMMET	9/92+	TP-841	36E96-226 TWO STAGE GAS VALVE-LP (OLD TP210P)
9/92+	TP-82	REFLECTOR CENTER SUPPORT	9/00+	TP-851	MICRO-60-24 DIAGNOSTIC CIRCUIT BOARD
9/92+	TP-83	STAINLESS STEEL FLEX CONNECTOR	9/00+	TP-852	WIRE HARNESS SET (3 PCS.) FOR MICRO 60 BOARD

\*\* 6' TOTAL NEEDED TO COVER OUTER EDGES OF A BURNER BOX.

+ INDICATES THAT THE PART IS BEING USED IN CURRENT PRODUCTION.

