

# DTHS SERIES TUBE HEATER

Operation, Installation, Maintenance  
and Parts Manual



## 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 & Health Act (OSHA)
- American Gas Association (AGA)

### IMPORTANT

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

### Detroit Radiant Products Company

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## SAFETY INFORMATION

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

### NOT FOR RESIDENTIAL USE!

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

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:

### 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.

### CAUTION

- Check the AGA rating label on the heater to verify the minimum clearance to combustibles and the proper gas to be used. Check the other labels on the heater to verify proper mounting.
- The installation of this heater must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) (latest edition).
- The installation of this heater in public garages must conform with the Standard for Parking Structures, ANSI/NFPA 88A (latest edition), or the Standard for Repair Garages, ANSI/NFPA 88B (latest edition), and must be at least 8 ft above the floor.
- The installation of this heater in aircraft hangars must conform with the standard for Aircraft Hangars, ANSI/NFPA 409 (latest edition). The heater must be installed at least 10 ft above the upper wing surfaces and engine enclosures of the highest aircraft which 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, movable scaffolding or other objects.
- The heater, when installed, must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA 70 (latest edition).
- 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 nor sprinkler heads shall be located within the minimum clearances to combustibles as shown in the Clearances-to-Combustibles Chart on page iv.
- Signs should be posted in storage areas to specify maximum stacking height allowed in order to maintain clearance to combustibles.

### 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.

### FOR YOUR SAFETY!

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

# SAFETY CLEARANCE INFORMATION

## WARNING

Failure to comply with the stated clearances 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 unit, the following table contains clearances that must be maintained:

CLEARANCES TO COMBUSTIBLES [in.]					
MODEL NO.	MOUNTING ANGLE	SIDE		TOP	BELOW
		BEHIND	IN FRONT		
DTHS20-40 (N, P) -2	0°	15		9	40
	0° - 45°	12	15	9	40
DTHS(20,30)-50 (N, P) -2	0°	15		9	52
	0° - 45°	12	15	9	52
DTHS(20,30)-60 (N, P) -2	0°	24		9	62
	0° - 45°	12	24	9	62
DTHS(20,30)-75 (N, P) -2	0°	24		9	70
	0° - 45°	12	24	9	70
DTHS40-50 (N, P) -2	0°	10		9	36
	0° - 45°	10	25	9	36
DTHS40-60 (N, P) -2	0°	10		9	40
	0° - 45°	10	38	9	40
DTHS40-75 (N, P) -2	0°	24		9	54
	0° - 45°	10	38	9	54
DTHS(30,40,50)-100 (N, P) -2	0°	24		9	72
	0° - 45°	24	50	9	72
DTHS(40,50)-125 (N, P) -3	0°	30		9	74
	0° - 45°	30	60	9	74
DTHS(40,50)-150 (N, P) -3	0°	30		9	74
	0° - 45°	30	60	9	74
DTHS60-125 (N, P) -3	0°	30		9	74
	0° - 45°	30	60	9	74
DTHS60-150 (N, P) -3	0°	30		9	74
	0° - 45°	30	60	9	74

7AS11  
7A318  
  
7AS15

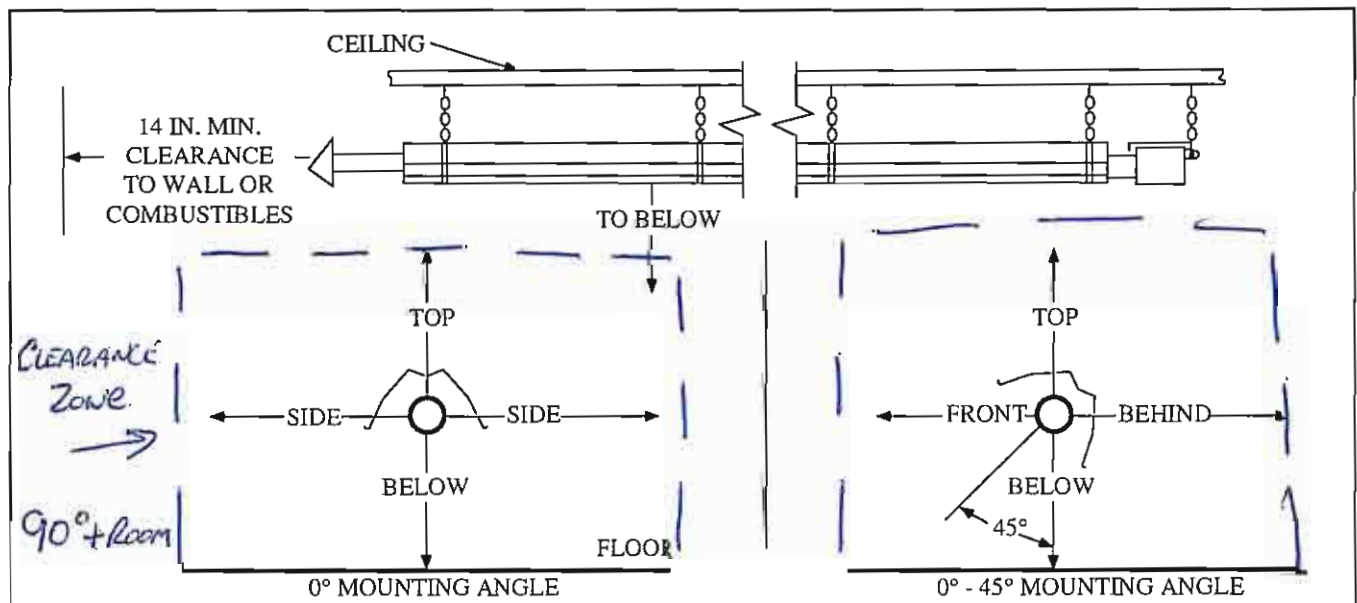


Figure i: CLEARANCES-TO-COMBUSTIBLES DIAGRAM

# 1 INSTALLATION

## 1.1 Design Criteria

Perimeter mounting of these infrared heaters provides for the most efficient installation. In Figure 1-1, the heaters are mounted at the perimeter of the

space to be heated. Refer to the DTHS 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.

DTHS HEATER INSTALLATION CHART						
MODEL	GAS INPUT [MBtuh]	TYPICAL MOUNTING HEIGHT [ft]	DISTANCE BETWEEN HEATERS [ft] (Dimension A)	DISTANCE BETWEEN HEATER ROWS [ft] (Dimension B)	MAXIMUM DISTANCE BETWEEN HEATER AND WALL [ft] (Dimension C)	
					Heater Angle 0°	Heater Angle 45°
DTHS20	40	9 – 15	8 – 26	10 – 50	15	5
DTHS(20,30)	50	10 – 16	10 – 32	12 – 60	16	6
DTHS(20,30)	60	11 – 18	12 – 38	14 – 70	17	7
DTHS(20,30)	75	13 – 20	15 – 43	16 – 85	20	8
DTHS40	50	9 – 16	6 – 26	9 – 50	14	6
DTHS40	60	10 – 18	8 – 32	11 – 60	16	7
DTHS40	75	11 – 20	10 – 36	13 – 70	18	8
DTHS(30,40,50)	100	13 – 25	13 – 40	15 – 85	20	10
DTHS(40,50)	125	15 – 30	15 – 43	17 – 100	22	12
DTHS(40,50)	150	15 – 35	16 – 45	19 – 110	25	14
DTHS60	125	15 – 30	15 – 43	17 – 100	22	12
DTHS60	150	15 – 35	16 – 45	19 – 110	25	14

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

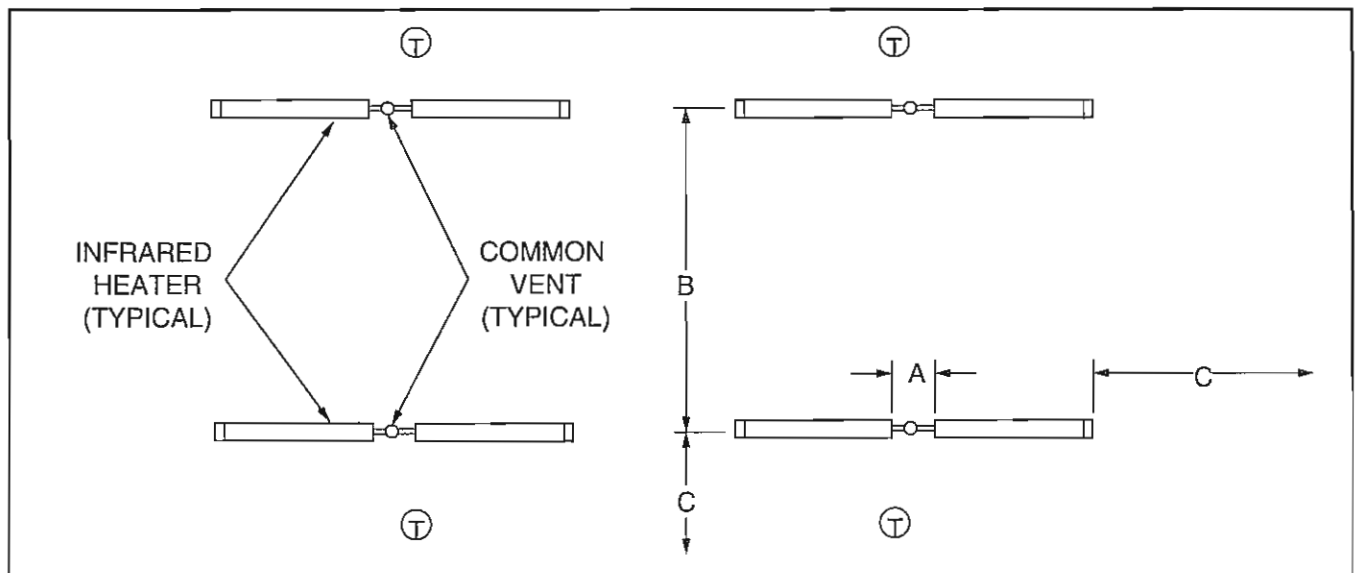


Figure 1-1

TYPICAL BUILDING LAYOUT

When positioning heaters, keep in mind the clearances 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 Foreword 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:

- DTHS(40,50,60)-125 and 150 models normally **must not** be mounted lower than **15 ft** above the finished floor. Consult Detroit Radiant if you have a special case requiring a lower mounting height.
- A maximum of two 90° elbows (factory-supplied Part No. E6 **only**) can be installed on DTHS model heaters. The gas input of the heaters, as stated on the rating label, will determine the minimum length of the 4 in. diameter emitter pipe from the control box to the first elbow. (See Figures 1-2 and 1-3.)

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

**WARNING**

The ceiling top clearance **must** be a minimum of 15 in. for heaters with a gas input rating of 60,000 and 75,000 Btuh and only 10 ft of 4 in. diameter emitter pipe to the first elbow. All other clearances are as stated in the Clearance-to-Combustibles Chart in the Foreword.

- **Do not** exceed the maximum vent length (usually 20 ft) for exhausting the heater. Consult the Flue Venting Chart on page 8.
- **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 in. diameter (see Figure 1-1).
- 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. Consult Combustion Air Requirements section on page 12.
- **Do not** exceed the maximum duct length for fresh air intake (usually 20 ft). Consult Air Intake Duct Chart on page 12.
- **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.

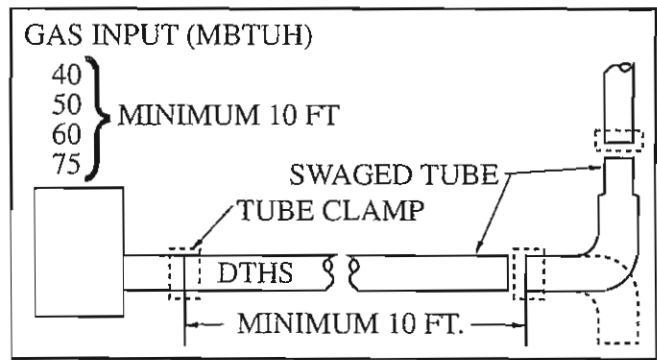


Figure 1-2

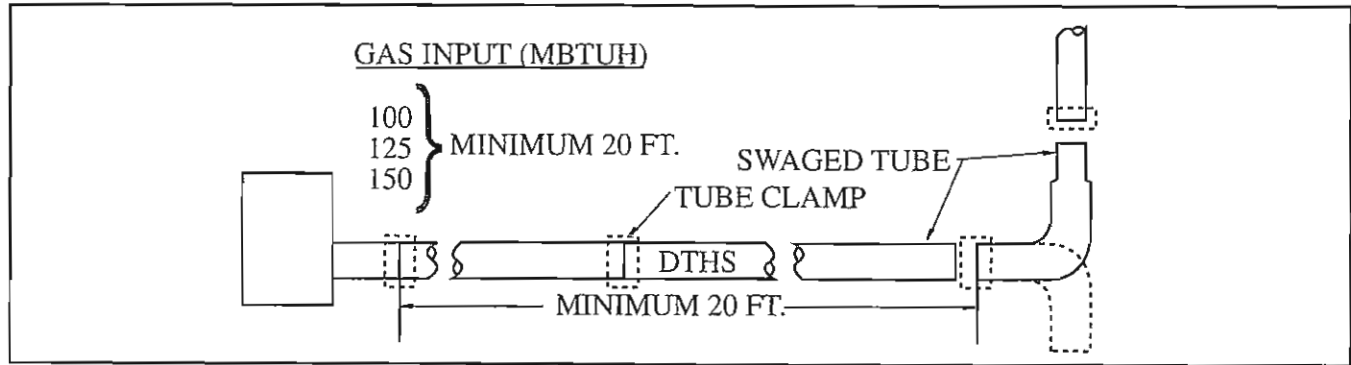


Figure 1-3

## 1.2 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 clearances 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 iv, and Figures 1-4 and 1-5.
4. While heater is still on the ground, connect a 120 V line to heater, and check glo-bar operation. If the glo-bar does not light, see Section 4.1, Glo-Bar Replacement, for replacement instructions.

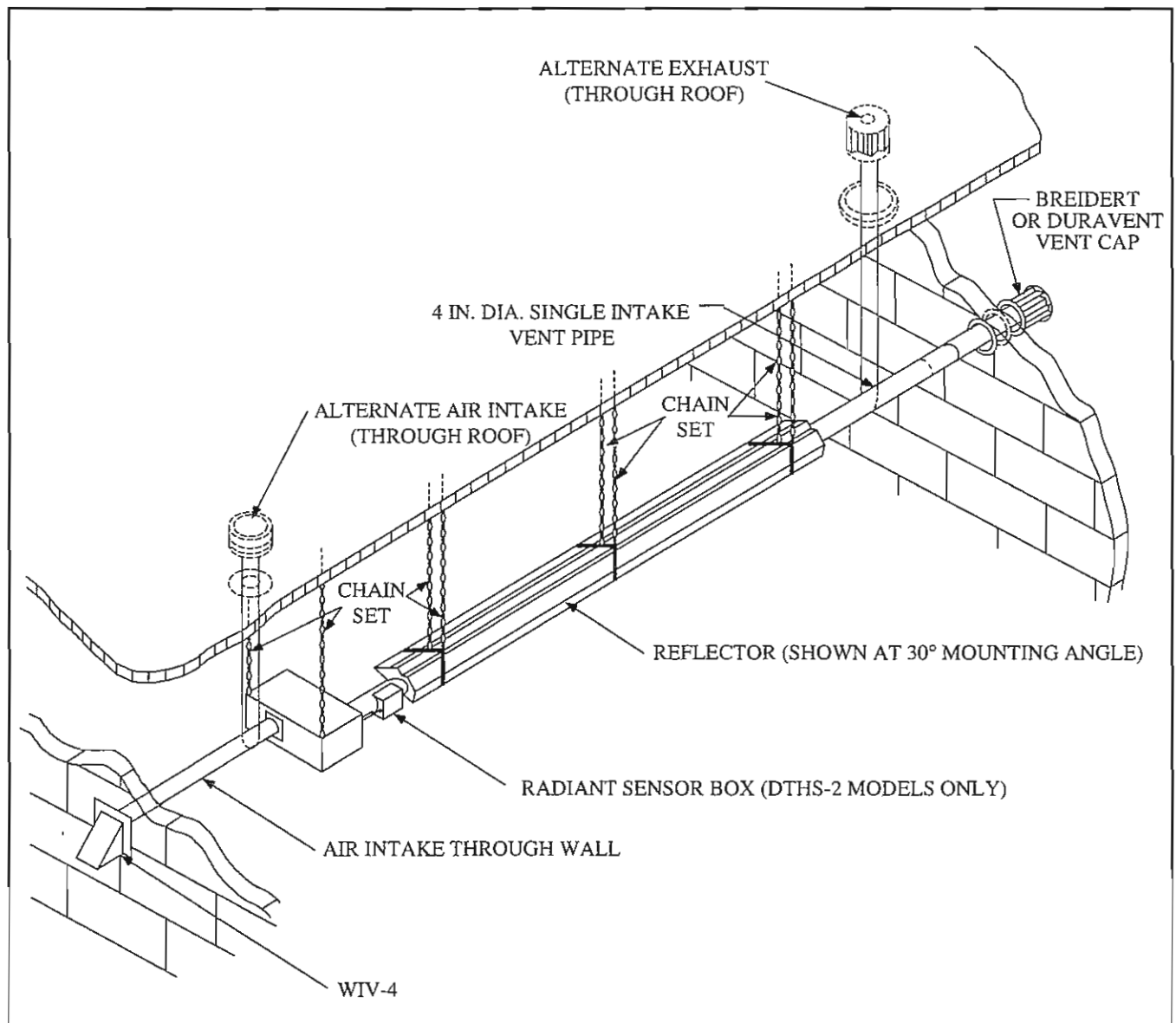


Figure 1-4

TYPICAL INSTALLATION DRAWING



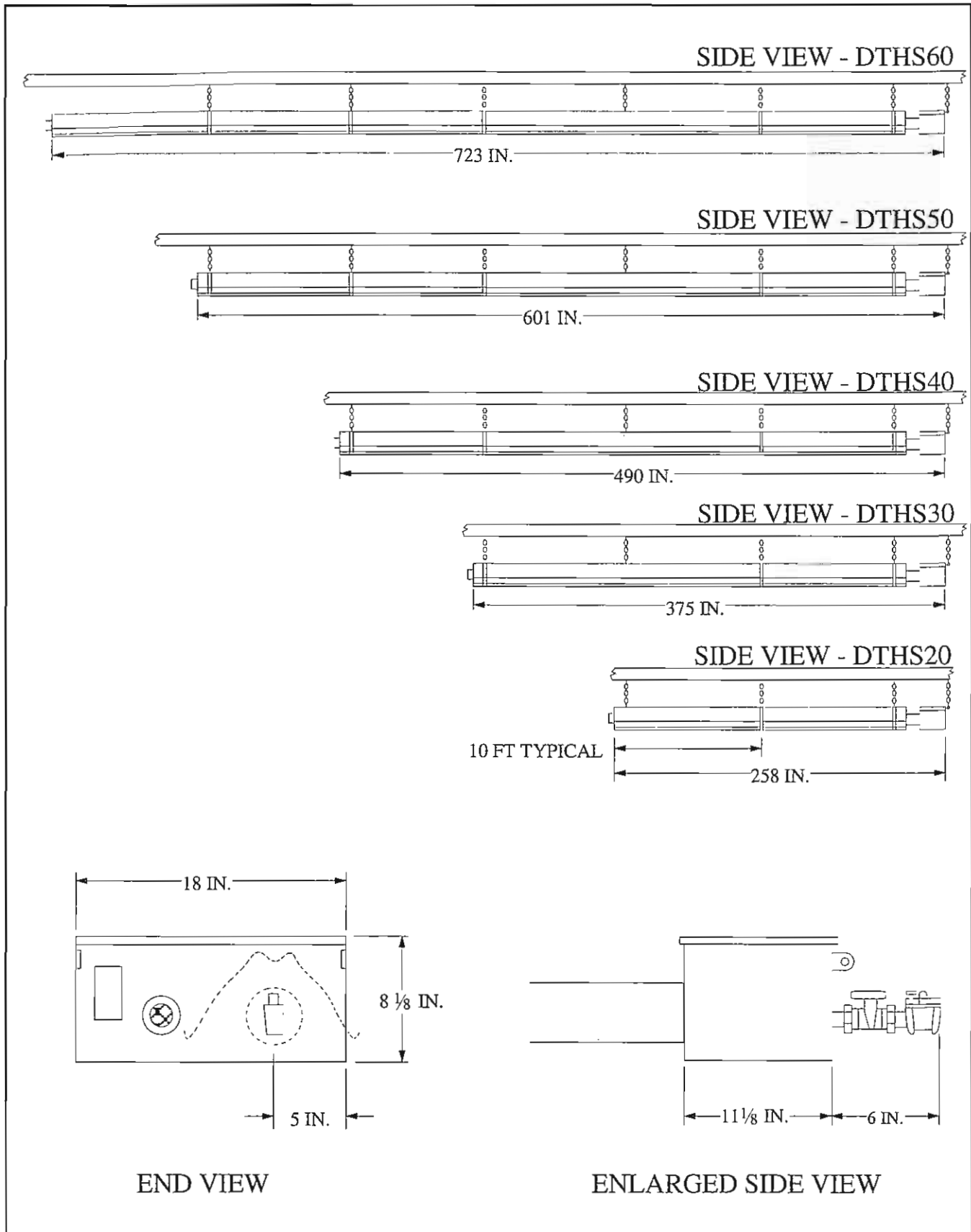


Figure 1-5

DIMENSIONS FOR MODELS DTHS20, 30, 40, 50 AND 60 INFRARED TUBE HEATER

### 1.3 Heater Mounting

- Each heater comes equipped with the necessary hangers (Figure 1-6) for hanging. The DTHS20 requires three hangers, the DTHS30 four hangers, the DTHS40 five hangers, the DTHS50 six hangers, and the DTHS60 seven hangers. Each heater also comes with one reflector center support (Figure 1-7) for each 10-ft section of reflector and one DTHS Installation Kit.

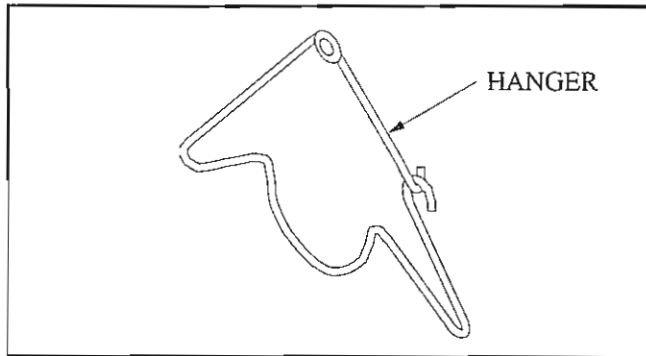


Figure 1-6

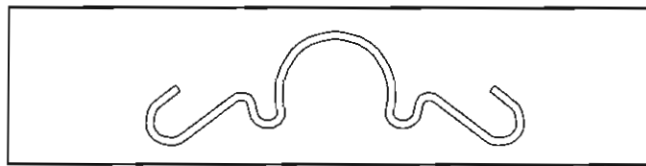


Figure 1-7

- Use of number 3 double-loop chain is recommended for heater hanging (DTHS accessory No. DTH-CS). See Figure 1-8.

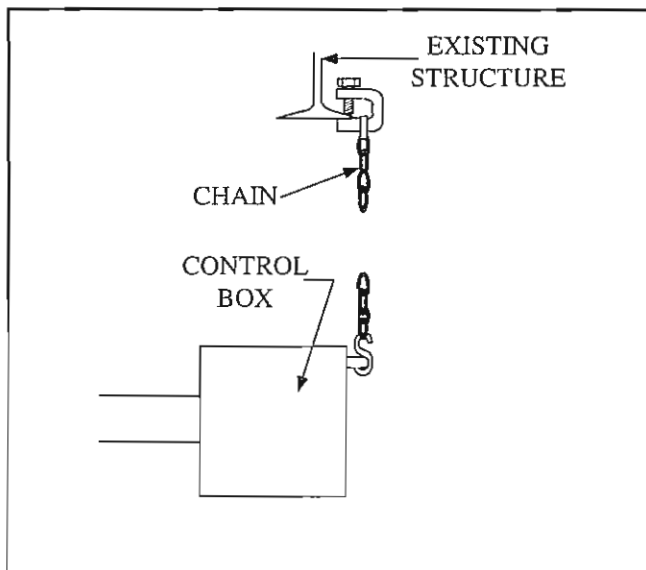


Figure 1-8

**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 1-9). The remaining hanging points should use chains to allow for heater expansion.

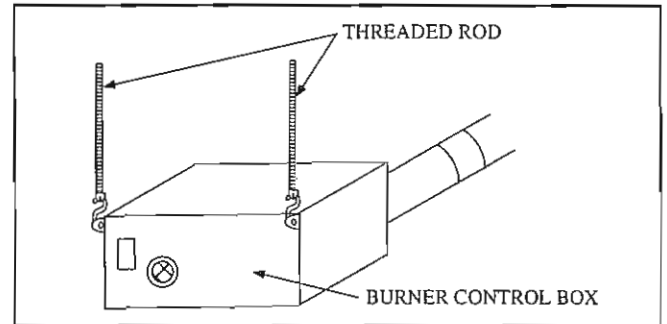


Figure 1-9

**IMPORTANT:** DTHS models 30ft.-100 MBTU/H, 40ft.-100 MBTU/H LP, 125 MBTU/H, 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. Titanium tubing may be identified by the identification sticker found on the swaged end of the tubing. A stamped "SA-TI" may also be found on this end.

- Mount hangers on approximately 10-ft centers. Slide tubes through hangers with weld seam downward (see Figure 1-10) and fasten with butt clamps (see Figure 1-11). Center clamps on seams.

**NOTE:** The butt 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 1-11). 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 (50 – 70 lb-ft).

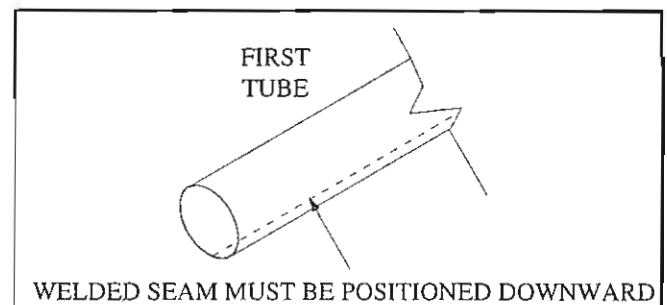


Figure 1-10

**IMPORTANT:** The DTHS models utilize one or two baffle(s) which must be installed in the last radiant tubes. Install these baffles before assembling tubes for ease of installation. See Figure 1-12. 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.

6. Install heater so that it is independently supported and must not rely on the gas or electrical line for any of its support.

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

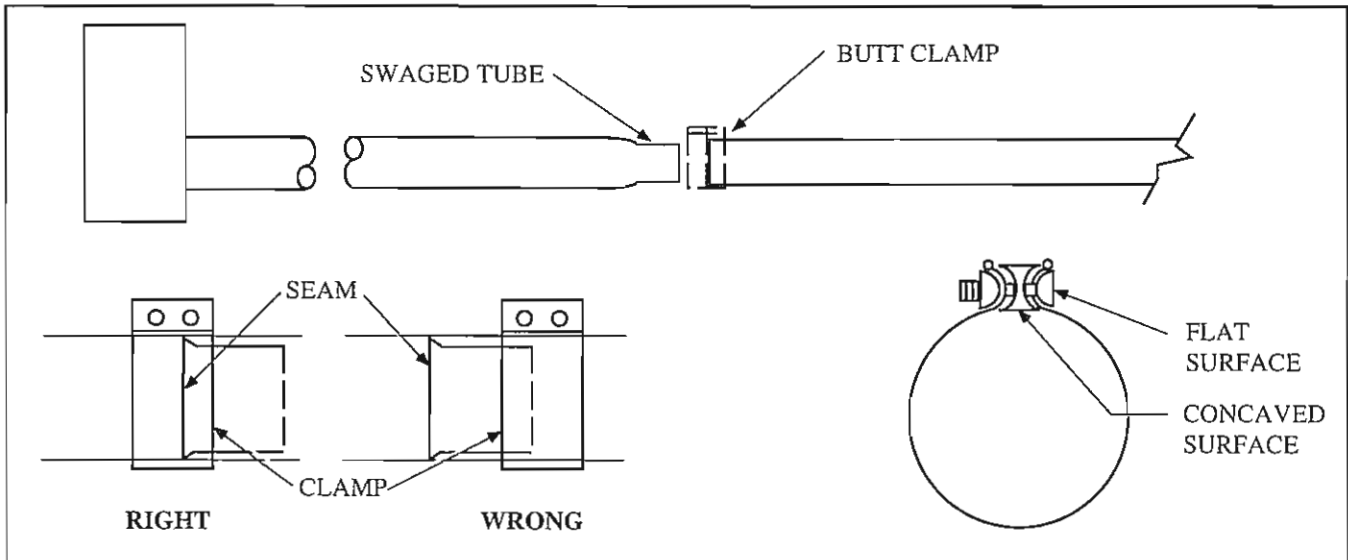


Figure 1-11

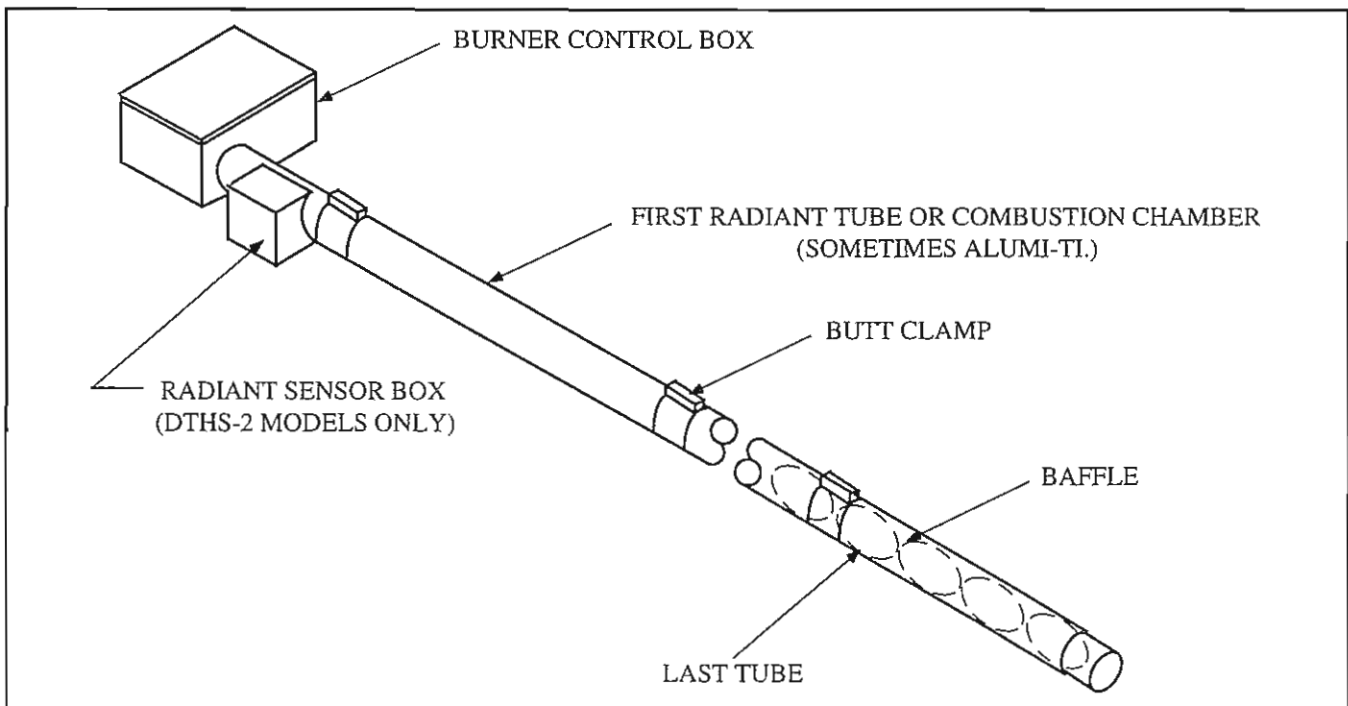


Figure 1-12

## 1.4 Reflector Assembly

1. Install reflector center supports RCS as shown in Figure 1-13.
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 1-14. Overlap reflectors 4 in. for support (see Figure 1-13).

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

3. Install reflector end caps at exposed ends of the reflector runs with clips (Figure 1-14).

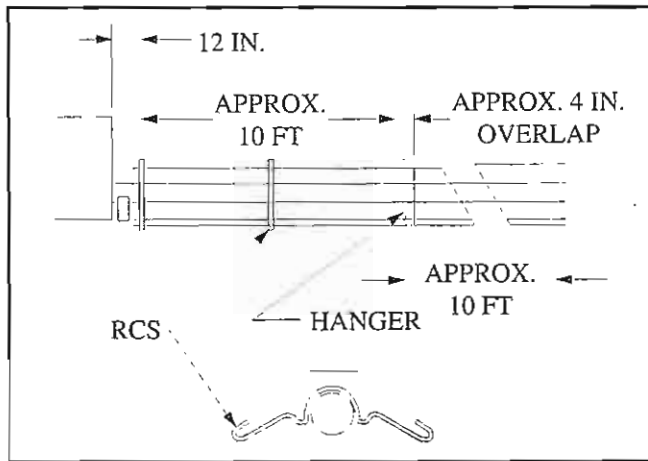


Figure 1-13

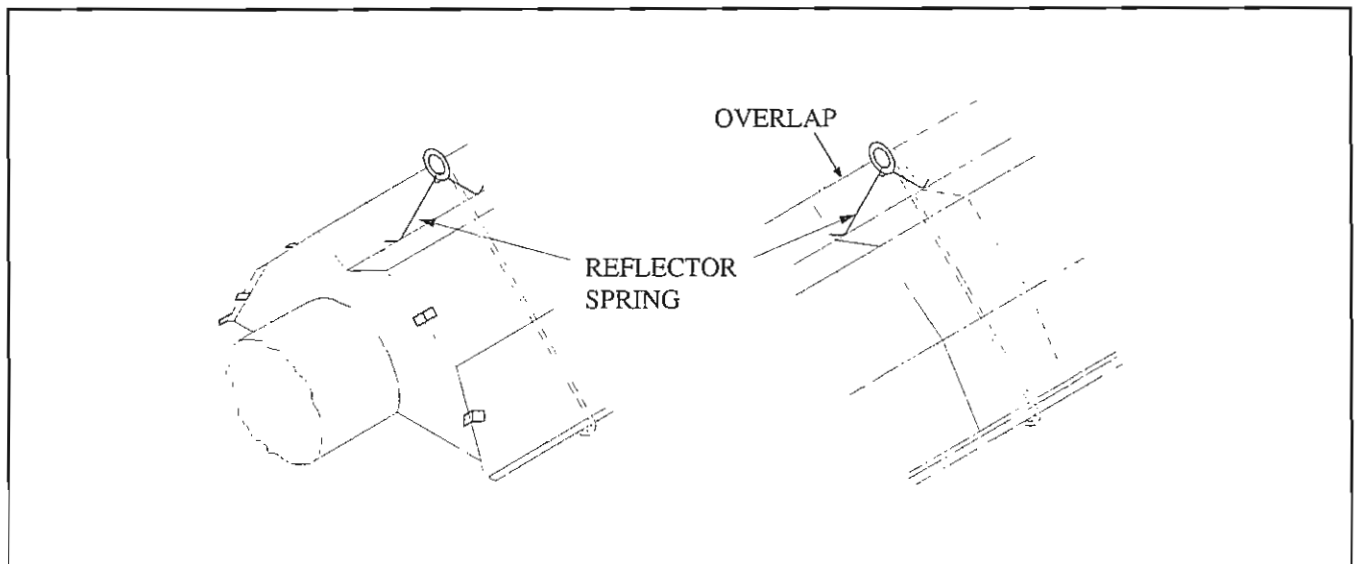


Figure 1-14

## 1.5 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 (NFPA 54) (latest edition).
- The heater is designed to operate with a 4-in. diameter exhaust stack.
- Stacks may consist of a 10-ft section of radiant tubing, if desired. Single-wall galvanized flue pipe 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 sleeve to maintain clearances (see Figures 1-15 and 1-16). See the Flue Venting Chart for maximum stack lengths.

FLUE VENTING CHART		
MODEL	GAS INPUT [MBtuh]	MAXIMUM STACK LENGTH INCLUDING OPTIONAL EXTENSION [ft]
DTHS20-2	40	25
DTHS(20,30)-2	50	35
	60	35
	75/100	35
DTHS40-2	50	20
	60	20
	75	20
DTHS(40,50)-2	100	20
DTHS(40,50)-3	125	30
	150	30
DTHS60-3	125	20
	150	20
MAXIMUM OF (2) 90° ELBOWS		

- 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 2 in. from the sidewall. Care should be exercised to ensure that vent opening is beyond any combustible overhang (see Figure 1-15).

- 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, 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 1-17 through 1-19).
- Do not use more than two 90° elbows in the exhaust vent (all models).
- A Breidert vent cap **must** be used for sidewall-venting.

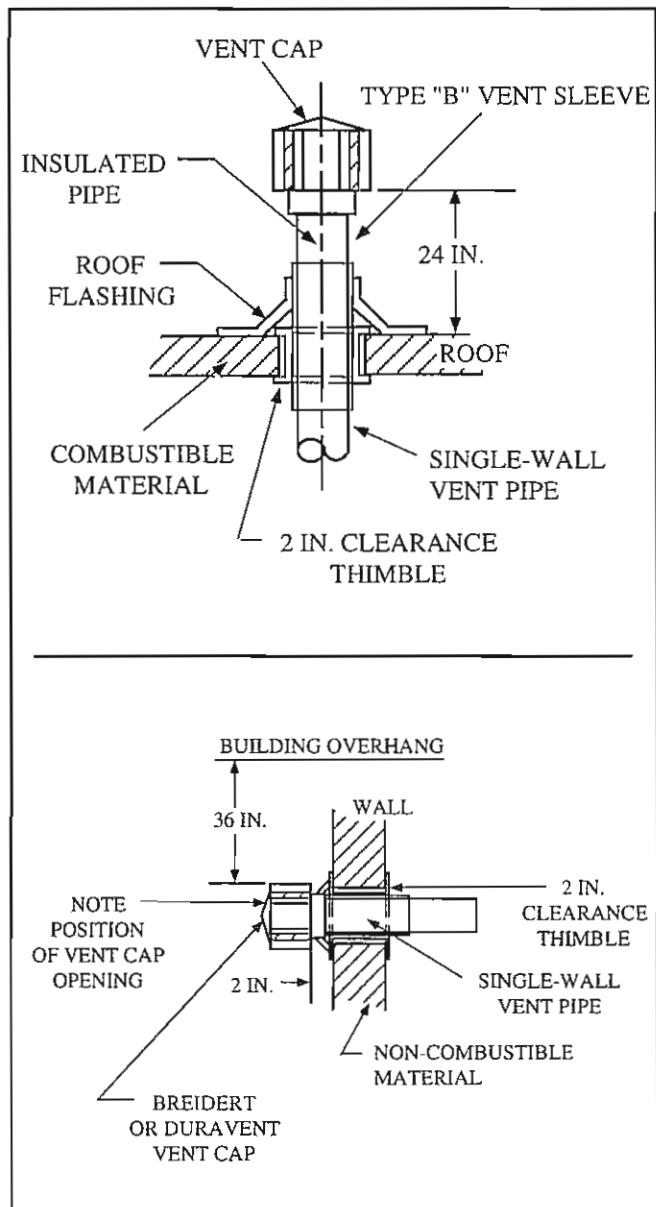


Figure 1-15

- All vent pipes must be with high temperature sealant and (3) #8 sheet metal screws.
- Horizontal flues should be pitched down toward outlet, 1/4 in. per ft of the vent length, to prevent rain from entering the heater (see Figure 1-16). **Do not pitch heater.**
- Horizontal flues should be pitched down toward outlet, 1/4 in. per ft of the vent length, to prevent
- Single-wall vent tube that is exposed to cold air must be insulated to prevent condensation.

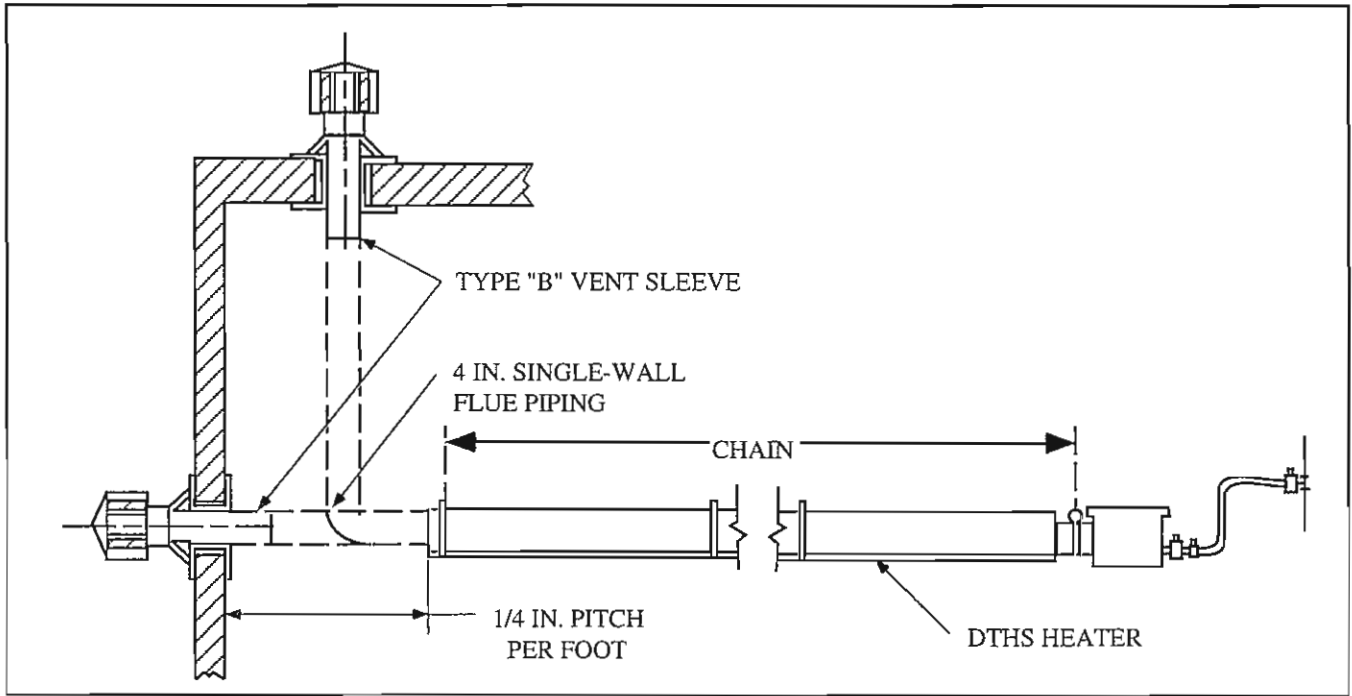


Figure 1-16

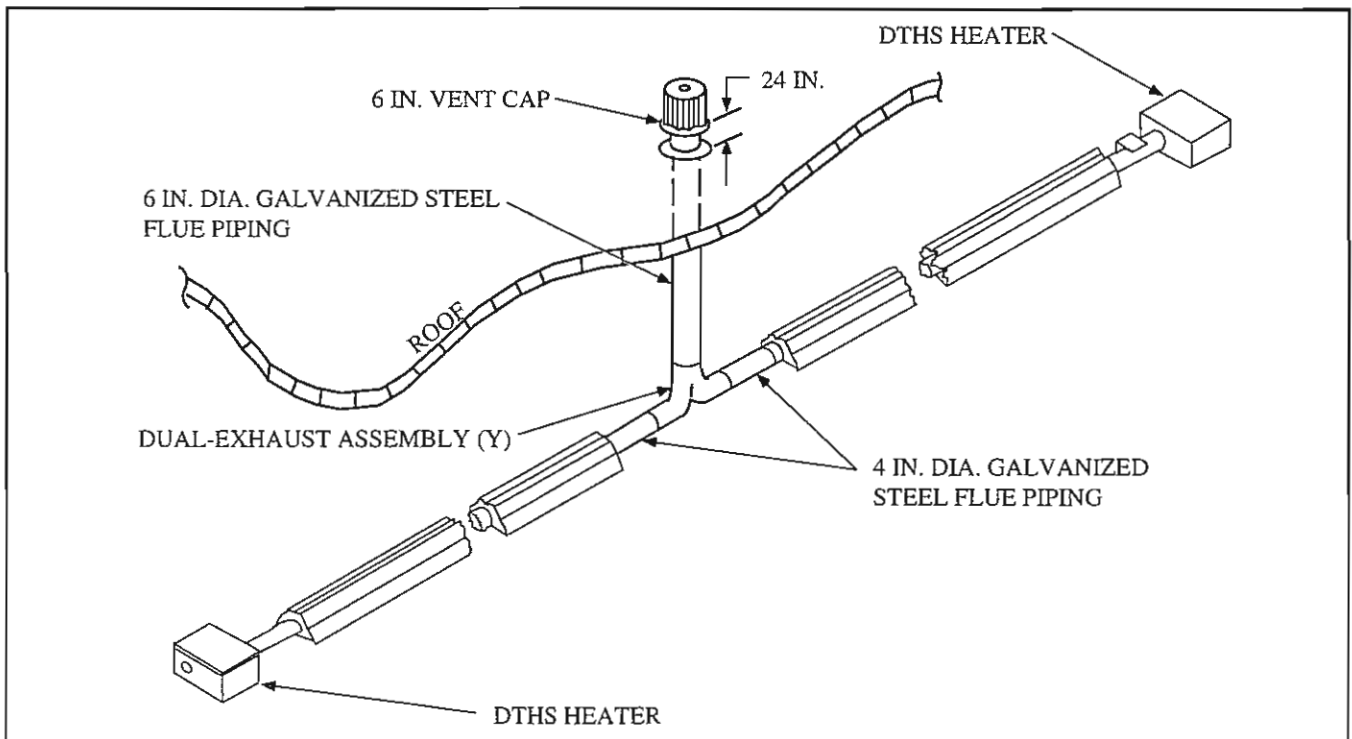


Figure 1-17

DUAL-EXHAUST ASSEMBLY (THROUGH ROOF)

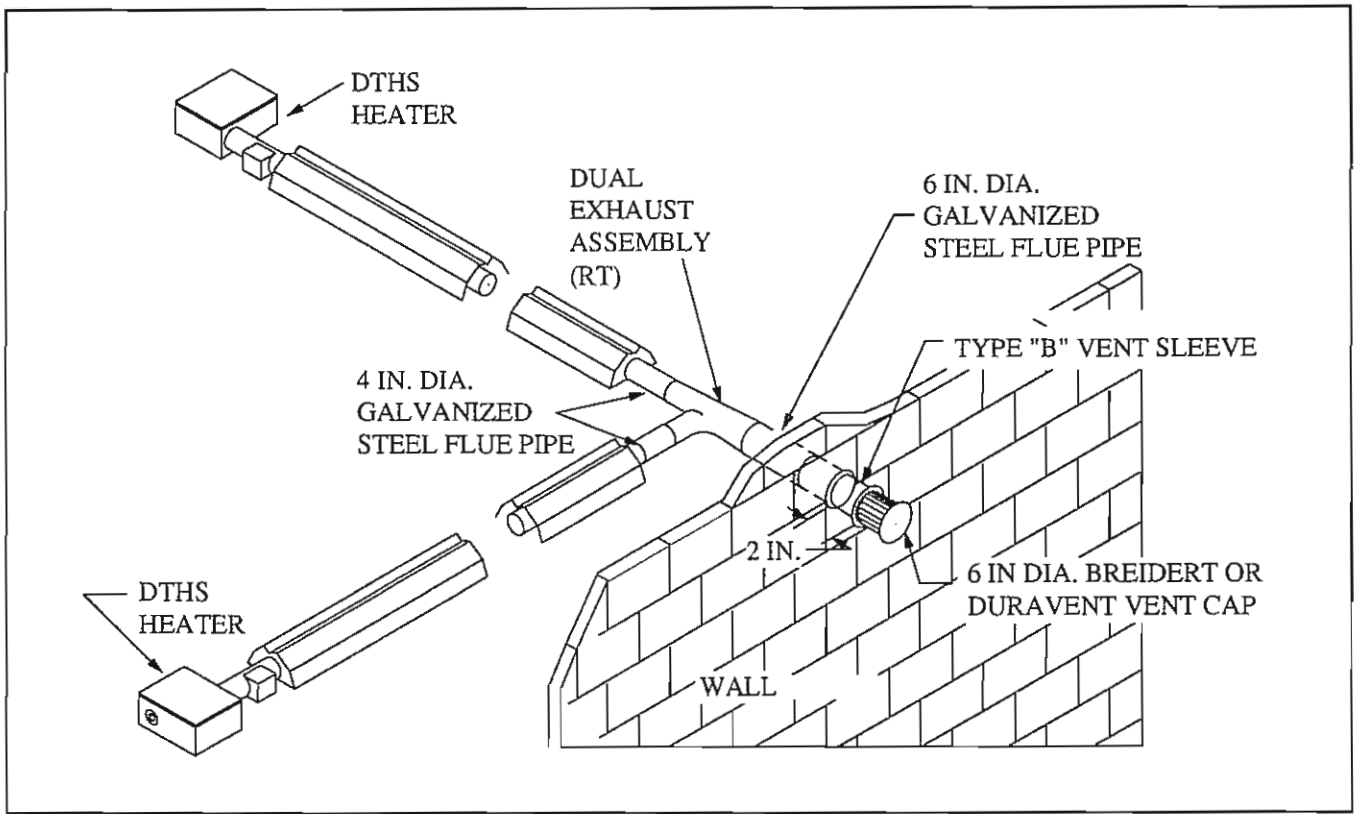


Figure 1-18

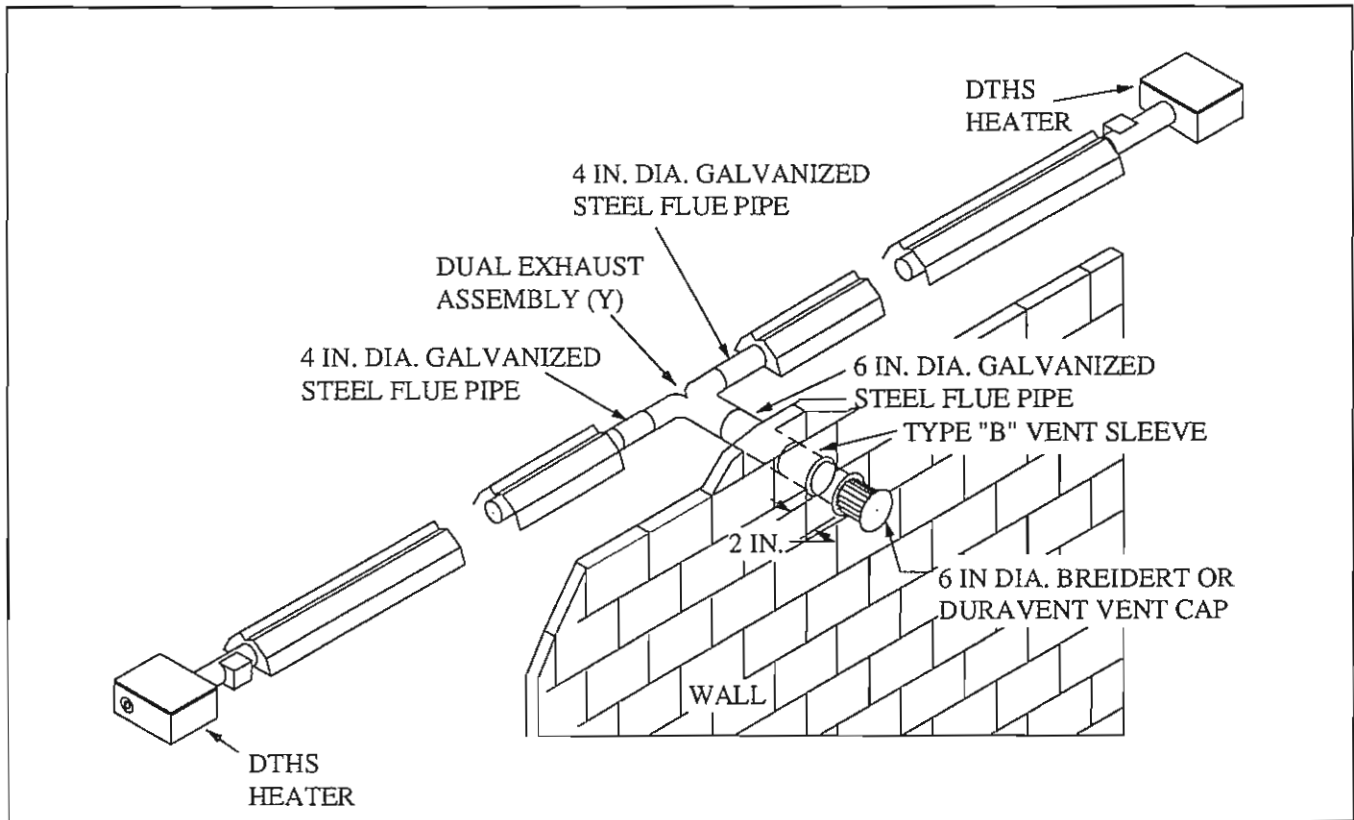


Figure 1-19

DUAL-EXHAUST ASSEMBLY (THROUGH WALL)

## 1.6 Installation for Unvented Operation (Optional)

The model DTH/S units are approved for unvented operation when equipped with a factory-supplied end cap/diffuser, Part No. WVE-GALV (see Figure i in the Foreword). This allows the products of combustion to be discharged from the units 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 Btuh of natural gas input be provided.

If propane is used, a positive air displacement of at least 4.5 cfm per 1000 Btuh 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-air outlet area, to accomplish the displacement. Local codes may require that the mechanical exhaust system be interlocked with the electrical supply line to the heaters, enabling both to function simultaneously.



## 1.7 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 Btuh 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 a 4-in. air duct directly attached over the air orifice collar (see Figure 1-20). A WIV-4 wall inlet vent must be used with horizontal outside air intake ducts.

**NOTE:** Use insulated duct or PVC pipe to prevent condensation on outer surface. 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	4	20
MODELS	5	30

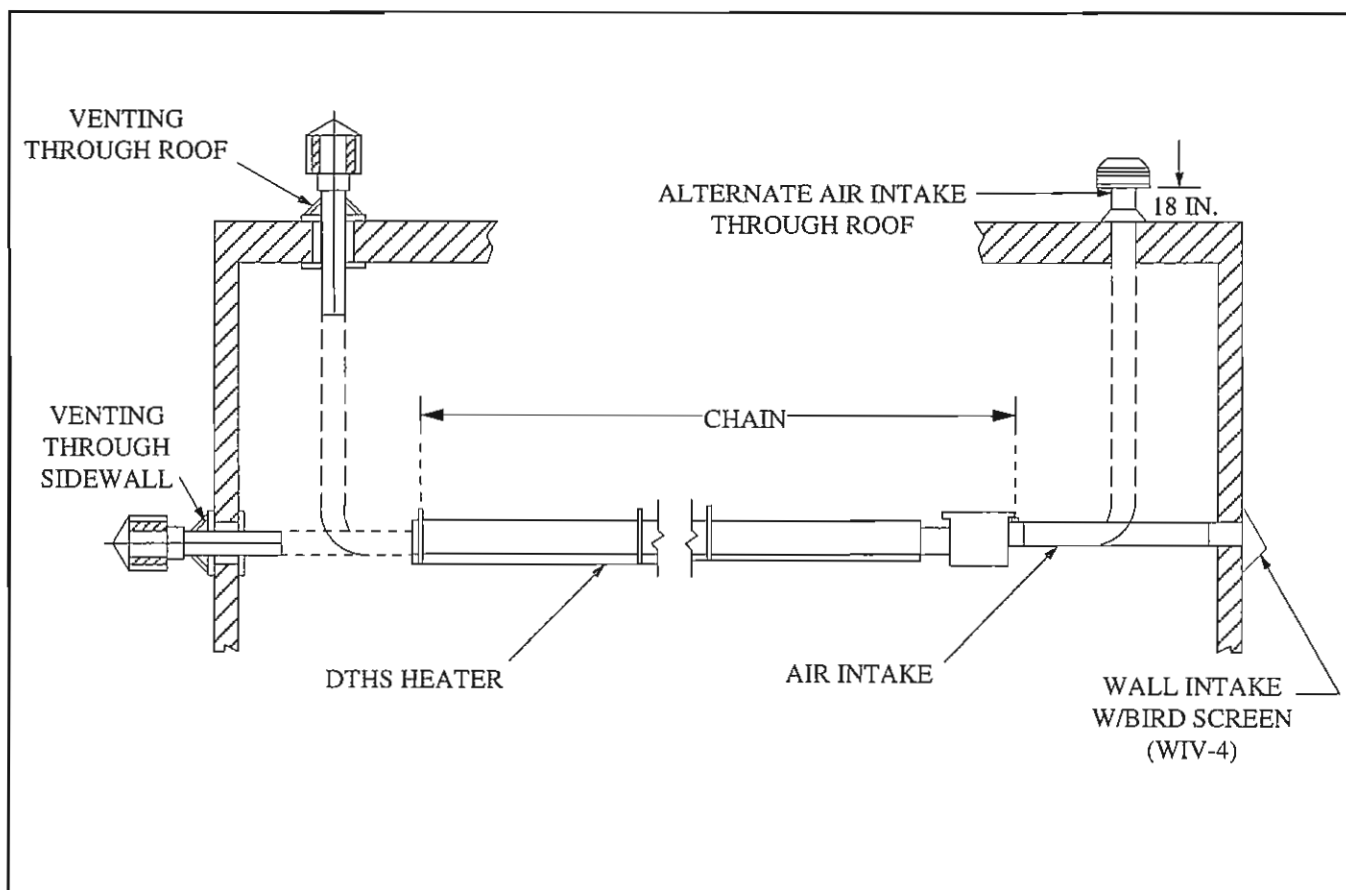


Figure 1-20

## 1.8 Gas Supply

### CAUTION

CORRECT INLET PRESSURES ARE VITAL FOR EFFICIENT OPERATION OF HEATERS. REFER TO AGA RATING PLATE 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 gas 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 1-21).

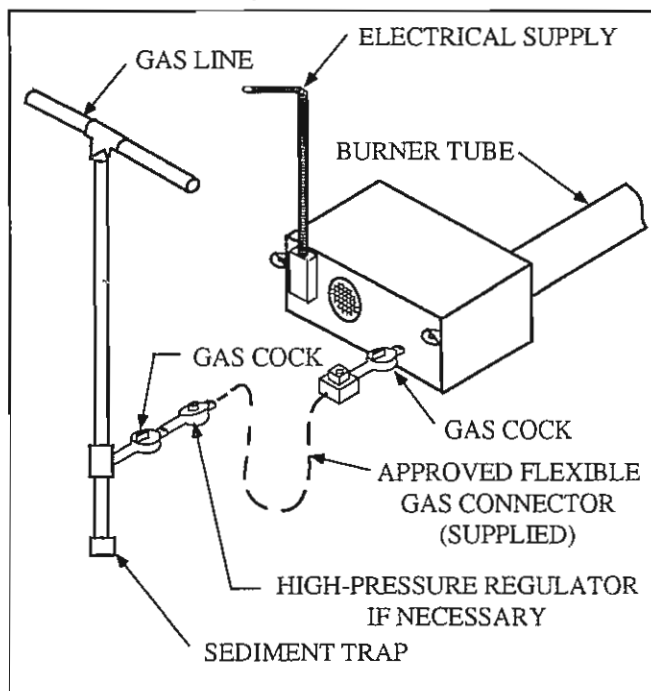


Figure 1-21

**NOTE:** For high-pressure gas above 14 in. W.C. (Water Column), 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 1-22. 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 in. 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 3.8 in. W.C., a minimum inlet pressure of 4.8 in. W.C. is necessary for purposes of input adjustment. The 150,000 Btuh unit requires a 6.0 in. W.C. manifold pressure and a minimum inlet pressure of 7.0 in. W.C. A maximum inlet pressure of 14.0 in. W.C. is allowed for all units.

- Propane Gas

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

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

- Pressure Equivalents

1 in. W.C.	equals	0.58 oz/sq. in.
4.8 in. W.C.	equals	2.78 oz/sq. in.
6 in. W.C.	equals	3.48 oz/sq. in.
11 in. W.C.	equals	6.38 oz/sq. in.
14 in. W.C.	equals	8.12 oz/sq. in.

- Allowance for Heater Expansion

Allowances must be made for the heater to expand. Use of the stainless-steel, flexible gas connector is recommended. If local codes require rigid piping to the heater, use a swing joint or a rigid mounting for the control box (provide for expansion in the opposite direction).

- Gas Line Connection

Utilize elbows when necessary to avoid sharp kinks or excessive bending in the gas line. For ease of movement, install with a “lazy” loop (Figure 1-22).

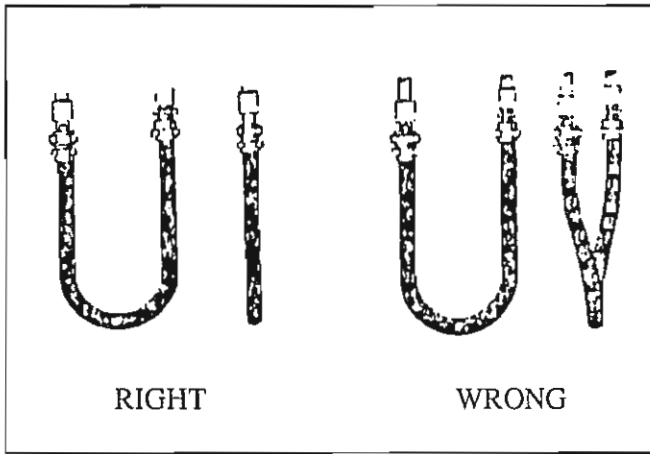


Figure 1-22

**NOTE:** Gas **must be** disconnected prior to maximum movement. Minimum movement is permissible while hose remains connected.

Couplings and hose should be installed in the same plane as shown in Figure 1-22. **Do not** offset couplings (Figure 1-22, “WRONG”). Off-setting causes torsional twisting and undue strain causing premature failure.

Figure 1-23 illustrates the correct way to install metal hose for vertical traverse. Note the single, natural loop. Allowing a sharp bend (Figure 1-23, “WRONG”) strains and twists the metal hose to a point of early failure at the coupling.

Maintain the minimum or larger bending diameter (Figure 1-24) between the couplings for the longest life. Closing in the diameter at the couplings (Figure 1-24, “WRONG”) creates double bends causing work fatigue failure of the fittings.

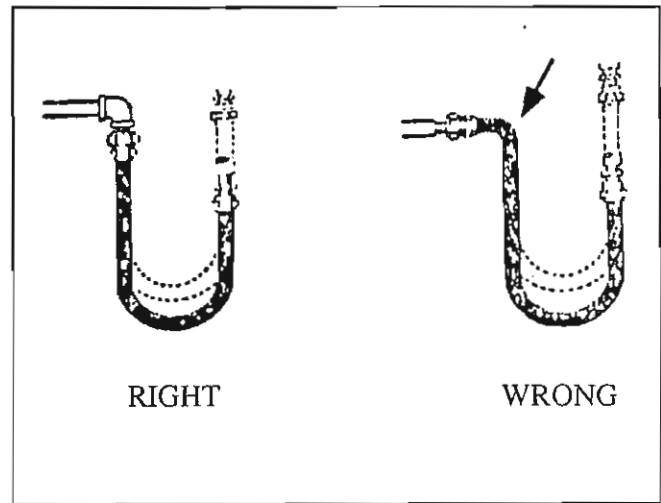


Figure 1-23

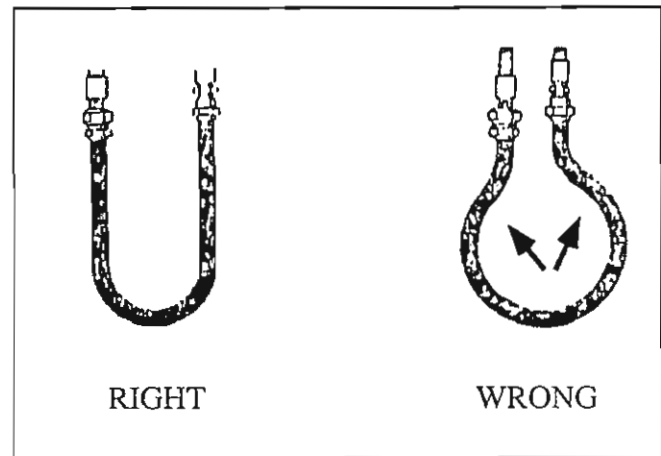


Figure 1-24

In all installations where self-draining is not necessary, connect metal hose in a vertical loop (Figure 1-25). **Do not** connect metal hose horizontally (Figure 1-25, “WRONG”) unless self-draining is necessary, then use a support on the lower plane.

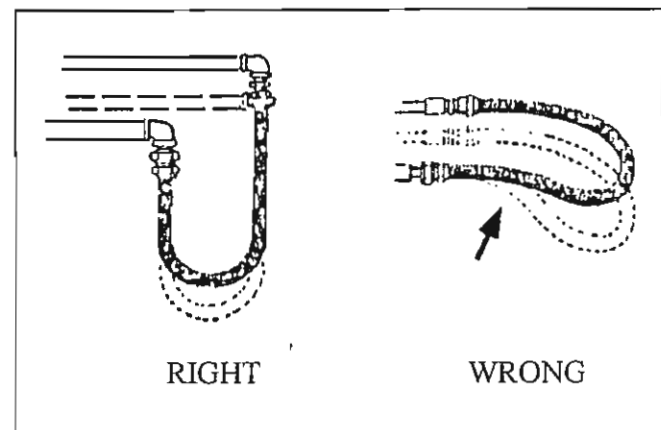


Figure 1-25

## 1.9 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. 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) it controls.
4. Wiring must not be run above or below the heater, nor exposed to the radiant output.
5. Observe proper electrical polarity.

### 1.10 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.

### 1.11 Shutdown Instructions

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

## 2 THEORY OF OPERATION

### 2.1 DTH/S-2 Models: 40,000 Btuh through 100,000 Btuh

#### • Starting Circuit (Figures 2-1 and 2-2)

When voltage is applied to L1 and L2, a circuit is completed from L1 via the blower motor to L2. The blower fan is mounted in the control box and rated to supply sufficient air for combustion.

Air pressure generated by the blower will cause the normally-open burner pressure switch No. 1 to close. The burner pressure switch is factory preset to ensure that a minimum of  $2/3$  the normal rate of combustion air is passed into the combustion chamber. Any air flow restriction resulting in less than  $2/3$  normal rate will cause the pressure switch to open and shut down the entire system.

Current will pass through the burner pressure switch to the normally-closed exhaust pressure switch No. 2. The exhaust pressure switch is factory preset to ensure that a minimum of  $1/2$  the normal rate of exhaust air is expelled from the heater. Any air flow restriction resulting in less than  $1/2$  normal rate will cause the pressure switch to open and shut down the entire system.

**NOTE:** Pressure switches are nonadjustable.

Another circuit is completed from L1 to the radiant sensor and glo-bar back to L2. Simultaneously, the safety and booster coils of the first of two redundant valves are energized through the contact of the radiant sensor. This causes the first valve to open and the glo-bar to heat up. No gas flows, however, until the second redundant valve is energized and opened.

#### • Running Circuit

When the glo-bar reaches ignition temperature, the radiant sensor is heated and opens (maximum 60 seconds). The radiant sensor is a heat-sensitive bimetal switch with a single-throw contact that is normally in the closed position and calibrated to open when the glo-bar has attained ignition temperature.

The second redundant valve, now in series with the glo-bar, is energized and opened. Gas flows through

the burner and is ignited by the glo-bar. The second coil remaining in series with the glo-bar causes the glo-bar to cool down. The radiant sensor is held open by radiant heat emitted from the gas flame. The booster coil of the first valve is now placed in series with the secondary coil, and very low current flows through the coil. The safety coil power is sufficient to hold only the first valve open. If a momentary power failure occurs, the first valve will shut down the gas supply to the burner. When power is restored, the safety coil alone does not have the power to pull the valve open, therefore, the radiant sensor cools down, the contacts close and the unit cycles (maximum 60 seconds).

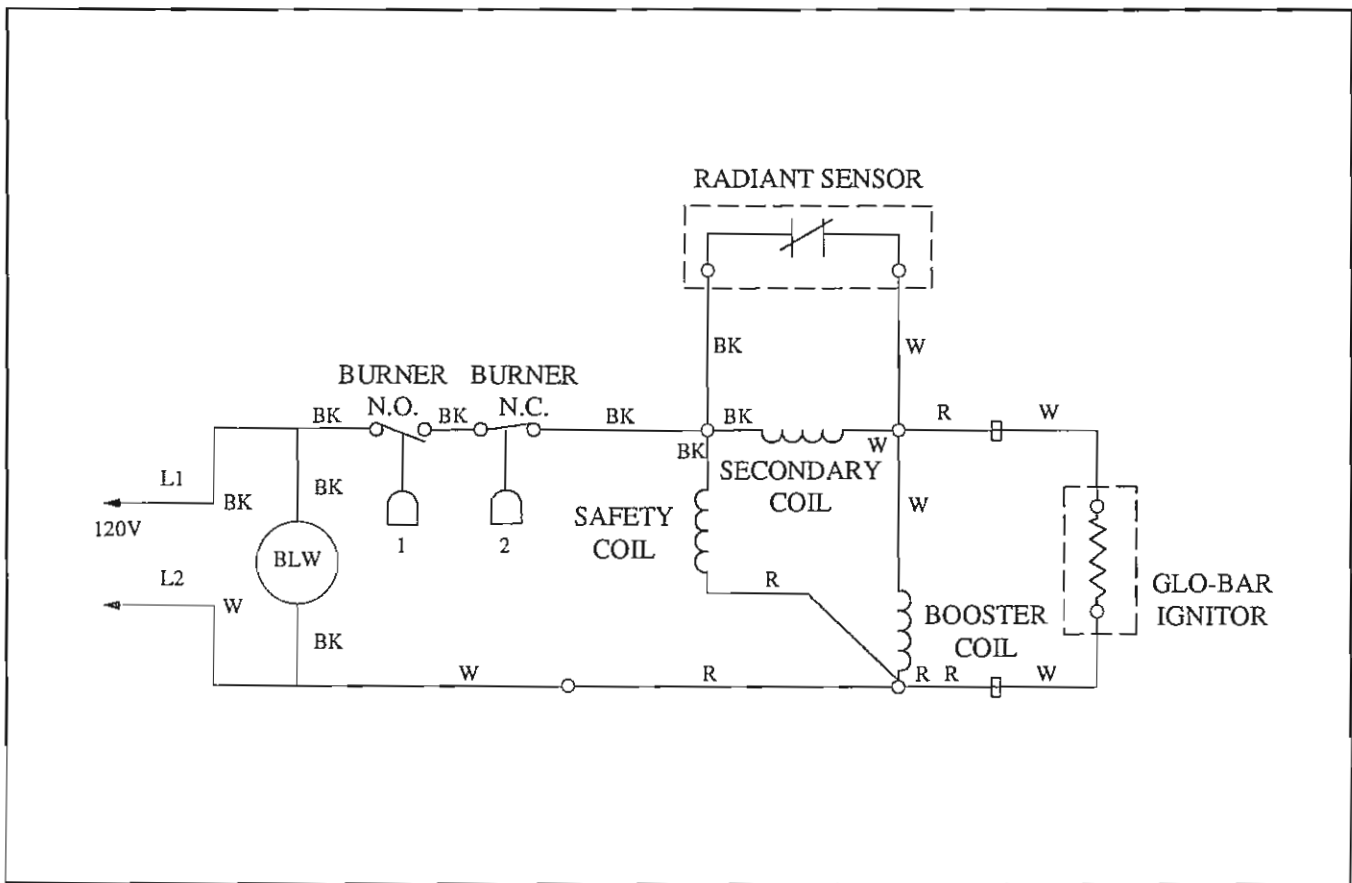


Figure 2-1

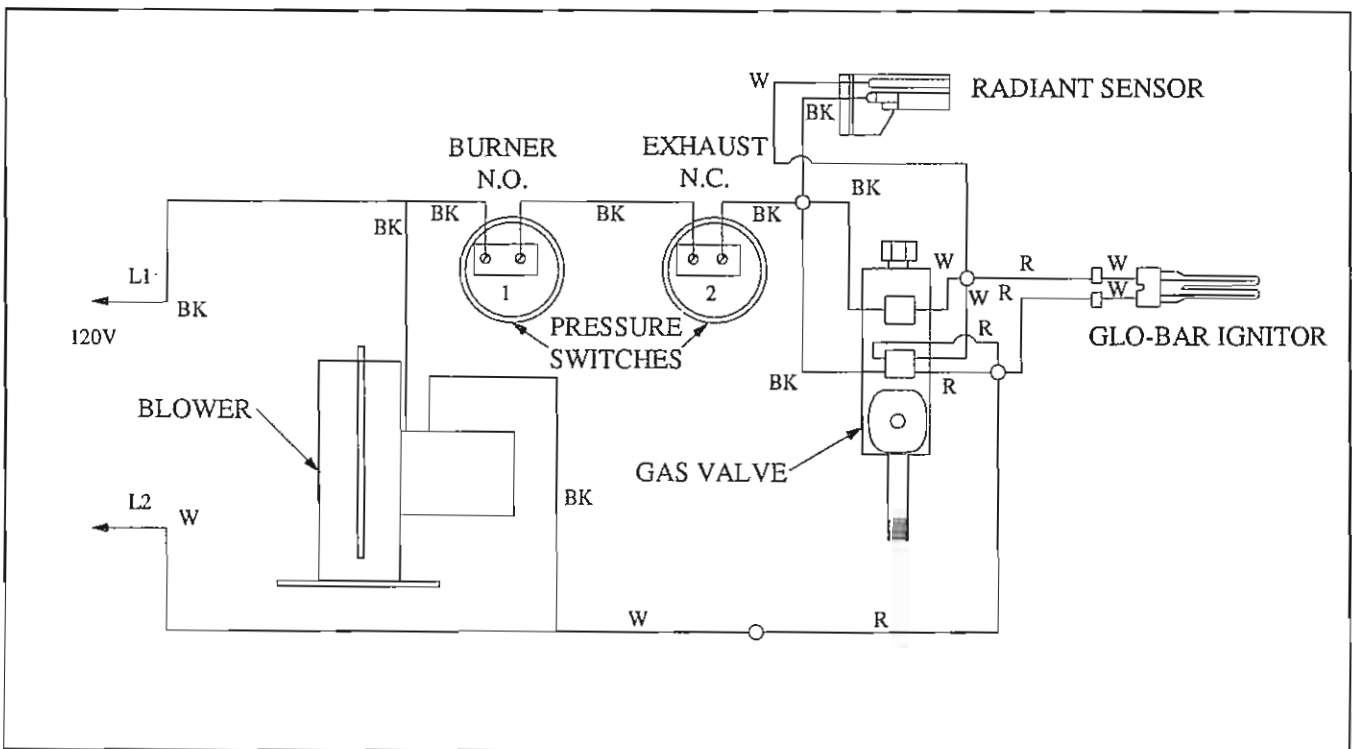


Figure 2-2

## 2.2 DTHS-3 Models: 125,000 Btuh and 150,000 Btuh

### • Starting Circuit (Figures 2-3 and 2-4)

When voltage is applied to L1 and L2, a circuit is completed from L1 via the blower motor to L2. The blower fan is mounted in the control box and rated to supply sufficient air for combustion.

Air pressure generated by the blower will cause the normally-open burner pressure switch No. 1 to close. Another circuit is completed from L1 to the hot surface ignition control and back to L2. There is a five-second delay, then the glo-bar is powered. After the glo-bar has been powered for 45 seconds,

the control causes the gas valve to open and initiates the ignition trial. Power to the glo-bar is shut off during the last two or three seconds of the ignition trial.

### • Running Circuit

When power is removed from the glo-bar, the glo-bar is utilized as a flame probe. 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.

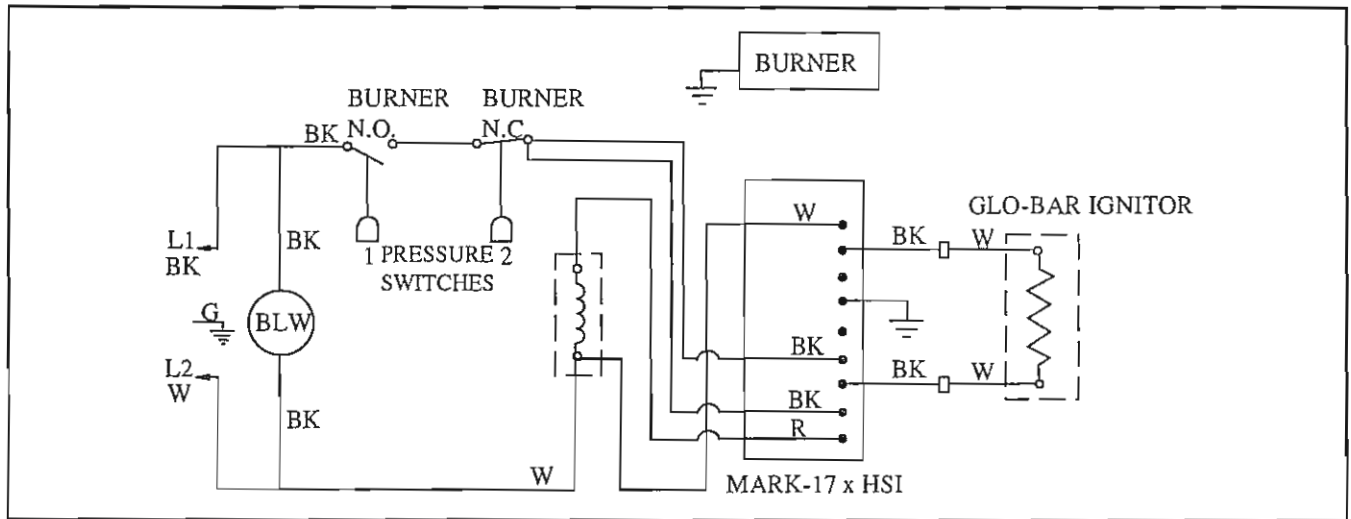


Figure 2-3

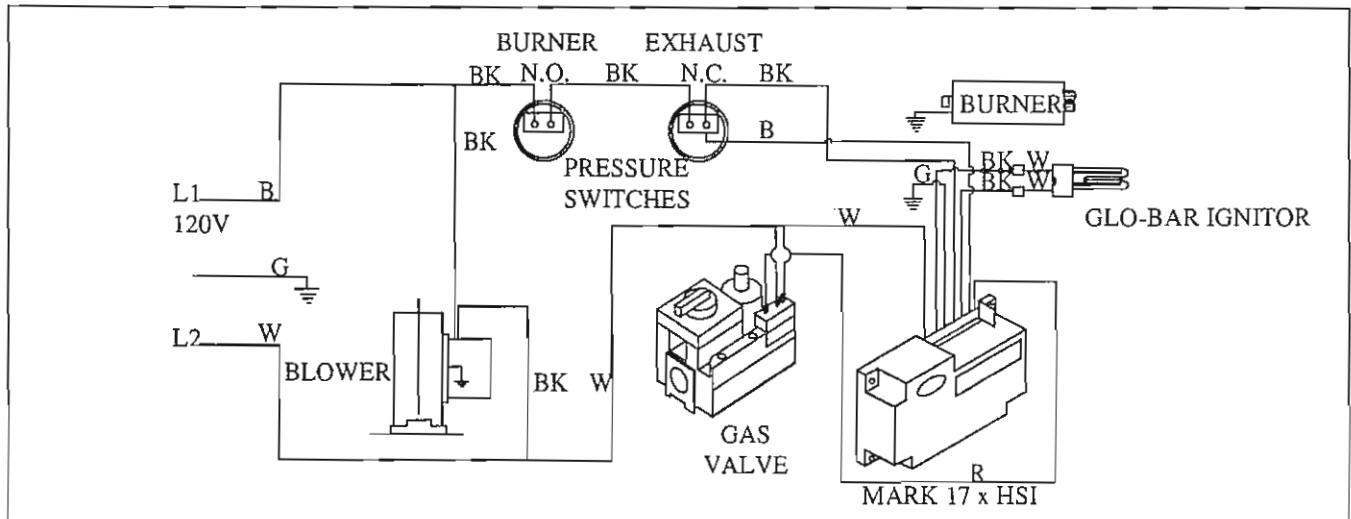


Figure 2-4



### 3 MAINTENANCE

Model DTHS 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 TROUBLESHOOTING

### 4.1 Glo-Bar Replacement

1. Shut off gas and electricity to unit if installed.
2. Remove cover from control box (see Figure 4-1).

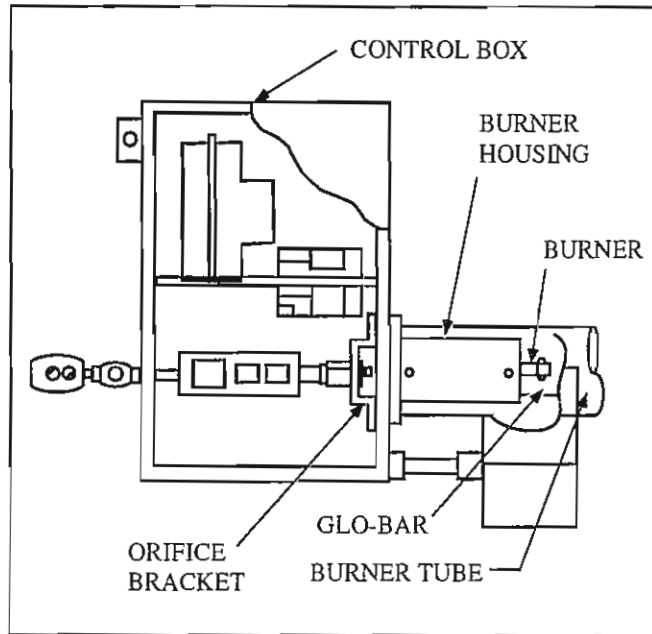


Figure 4-1

3. Unplug wire (A) at the glo-bar. Remove nut (B) and slide control assembly back. Unscrew bolts (C) fastening the orifice bracket to the control box, and pull out burner housing from tube (see Figure 4-2). Pull burner housing off fixed bolts, rotate counterclockwise 1/4 turn and remove.

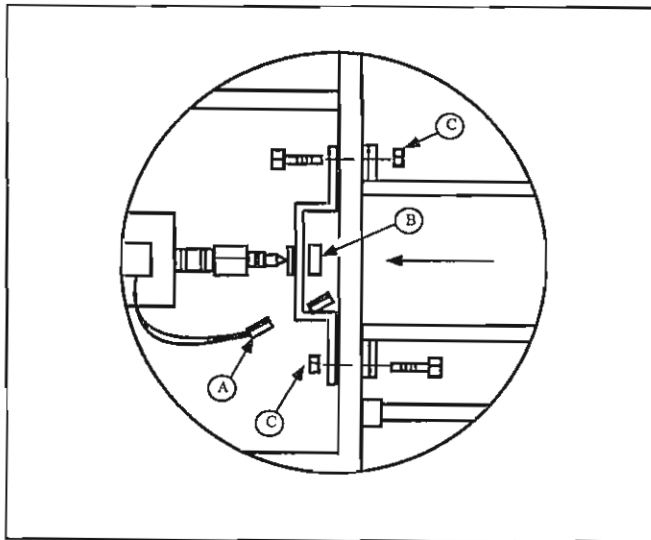


Figure 4-2

4. Remove screws (D) from top of burner housing and pull out burner (see Figure 4-3).

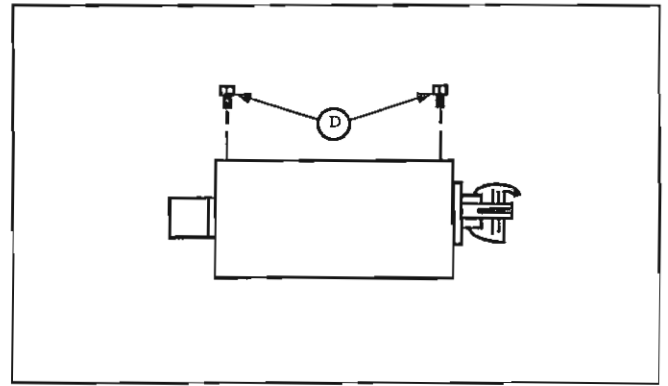


Figure 4-3

5. Remove screw (E) holding broken glo-bar to burner and replace glo-bar (see Figure 4-4).

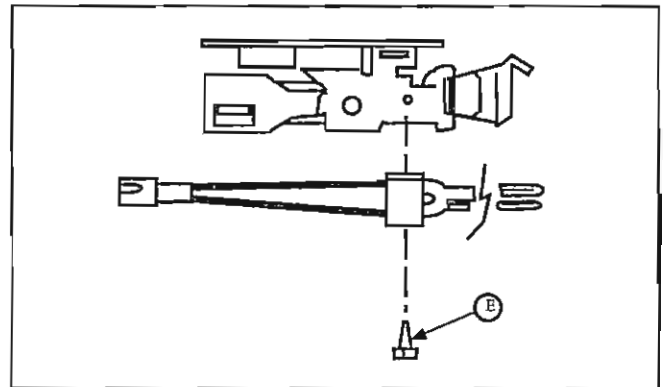


Figure 4-4

6. Install new glo-bar by reversing the above steps.

#### 4.2 Gas Valve Testing (Part No. TP 36)

This section can be used to troubleshoot 25K39A Gas Valves for open coils.

### CAUTION

DO NOT REMOVE THE VALVE WIRE NUTS OR DISASSEMBLE VALVE, AS THIS WILL VOID THE VALVE'S WARRANTY.

Using an ohmmeter, follow the steps listed below to determine if a coil is defective.

1. Remove valve and ensure that supply leads, sensor lead and ignitor leads are not touching one another.
2. Connect ohmmeter to supply leads. If reading ranges from 610 – 734 ohms, all coils are O.K. If reading ranges from 1100 – 1610 ohms, there is a bad coil and the valve must be replaced.

### 4.3 Troubleshooting Chart

GENERAL TROUBLESHOOTING CHART		
SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed but nothing happens.	<ol style="list-style-type: none"> <li>Blown fuse.</li> <li>Defective thermostat.</li> <li>Loose or disconnected wire.</li> <li>Defective fan.</li> </ol>	<ol style="list-style-type: none"> <li>Replace.</li> <li>Replace.</li> <li>Repair as required.</li> <li>Lubricate, repair or replace.</li> </ol>
Thermostat closed. Fan operates. No glo-bar energization.	<ol style="list-style-type: none"> <li>Loose or disconnected wire.</li> <li>Plugged or restricted exhaust vent.</li> <li>Plugged pressure switch lines.</li> <li>Defective pressure switches.</li> <li>Defective glo-bar.</li> <li>Defective radiant sensor.</li> <li>Box lid or gasket not in place.</li> </ol>	<ol style="list-style-type: none"> <li>Repair as required.</li> <li>Remove foreign matter.</li> <li>Clean as necessary.</li> <li>Replace only. Do not adjust.</li> <li>Replace.</li> <li>Replace radiant sensor.</li> <li>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>Closed gas supply.</li> <li>Dirty or restricted orifice.</li> <li>Defective valve. Disconnected valve wire.</li> </ol>	<ol style="list-style-type: none"> <li>Open all gas connections.</li> <li>Remove and clean with a soft object.</li> <li>Replace or repair.</li> </ol>
Loss of heater efficiency.	<ol style="list-style-type: none"> <li>Low gas pressure.</li> <li>Dirty or restricted orifice.</li> <li>Foreign matter inside burner assembly.</li> <li>Unit cycles on and off.</li> <li>Reflector is sooted and has lost its reflective ability.</li> <li>Reflector not in place.</li> <li>Clogged fan blower.</li> </ol>	<ol style="list-style-type: none"> <li>Provide required gas pressure.</li> <li>Remove and clean with a soft object.</li> <li>Clean as necessary.</li> <li>Check previous symptom.</li> <li>Clean with aluminum cleaner and soft wiping cloth.</li> <li>Put in place.</li> <li>Clean.</li> </ol>
Radiant tube leaking burnt gases.	<ol style="list-style-type: none"> <li>Loose tube connections.</li> <li>Holes or cracks in radiant tubes.</li> </ol>	<ol style="list-style-type: none"> <li>Assure that tube is fully inserted into flared end and properly clamped.</li> <li>Replace.</li> </ol>
Condensation.	<ol style="list-style-type: none"> <li>Stack length too long.</li> <li>Light gauge flue stack used.</li> </ol>	<ol style="list-style-type: none"> <li>Shorten stack.</li> <li>Minimum of 26 gauge vent pipe is required.</li> </ol>
Tube bowing.	<ol style="list-style-type: none"> <li>Insufficient combustion air.</li> <li>Overfired.</li> </ol>	<ol style="list-style-type: none"> <li>Provide 2 sq. in. of free air per 5000 Btuh of input.</li> <li>Check gas pressure and orifice size.</li> </ol>
Tube corroding.	<ol style="list-style-type: none"> <li>Contaminated combustion air.</li> </ol>	<ol style="list-style-type: none"> <li>Provide fresh air inlet duct.</li> </ol>
Visual inspection of burner operation not possible.	<ol style="list-style-type: none"> <li>Dirty or sooted sight glass.</li> <li>Unit mounted upside down.</li> </ol>	<ol style="list-style-type: none"> <li>Remove, clean or replace.</li> <li>Mount correctly.</li> </ol>
Stack sooting.	<ol style="list-style-type: none"> <li>Insufficient combustion air.</li> <li>Improper gas.</li> </ol>	<ol style="list-style-type: none"> <li>Provide 1 sq. in. of free air for every 5000 Btuh of input.</li> <li>Correct with proper gas input.</li> </ol>
<b>Models DTH/S-2 – 40,000 Btuh through 100,000 Btuh</b>		
Thermostat closed. Fan and glo-bar operate. After 1 minute glo-bar stays on. No ignition.	<ol style="list-style-type: none"> <li>Dirty or sooted radiant sensor window or mica.</li> <li>Misaligned radiant sensor window fails to detect glo-bar operation.</li> <li>Defective radiant sensor.</li> </ol>	<ol style="list-style-type: none"> <li>Clean as necessary.</li> <li>Adjust radiant sensor to radiant tube using prepunched mounting bores.</li> <li>Replace radiant sensor.</li> </ol>
Thermostat closed. Fan and glo-bar operate. Ignition occurs. Burner cycles off after a minimum of 1 minute.	<ol style="list-style-type: none"> <li>Dirty or sooted radiant sensor window.</li> <li>Misaligned radiant sensor.</li> <li>Low gas pressure.</li> <li>Dirty or restricted orifice.</li> <li>Defective radiant sensor.</li> <li>Baffle improperly positioned.</li> </ol>	<ol style="list-style-type: none"> <li>Clean as necessary.</li> <li>Adjust radiant sensor to radiant tube using prepunched mounting bores.</li> <li>Provide required gas pressure.</li> <li>Remove and clean with a soft object.</li> <li>Replace.</li> <li>Reposition baffle (see page 6).</li> </ol>
<b>Models DTH/S-3 – 125,000 Btuh through 150,000 Btuh</b>		
Thermostat closed. Fan and glo-bar operate. Ignition occurs. Burner cycles off and will not recycle.	<ol style="list-style-type: none"> <li>No electrical ground.</li> <li>Defective circuit control.</li> <li>Low gas pressure.</li> <li>Circuit control connection.</li> </ol>	<ol style="list-style-type: none"> <li>Connect electrical ground to junction box.</li> <li>Replace.</li> <li>Provide required gas pressure.</li> <li>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>Low gas pressure.</li> <li>Baffle improperly positioned.</li> <li>Defective exhaust pressure switch.</li> <li>Restricted flue vent.</li> </ol>	<ol style="list-style-type: none"> <li>Provide required gas pressure.</li> <li>Reposition baffle (see page 6).</li> <li>Replace.</li> <li>Remove foreign matter.</li> </ol>

## 5 PARTS LIST

### 5.1 Basic Parts List

Part No.	Description	Part No.	Description	Part No.	Description
TP 1.	Control Box Cover	TP 44D.	1-11/16 in. Inlet Air Orifice w/Screen	TP 76.	Rubber Grommet
TP 2.	Outside Control Box End	TP 44E.	1-5/8 in. Inlet Air Orifice w/Screen	TP 78A.	Mark-17 Circuit Board (DTHS-3 Models)
TP 3.	#8 x 1/4 in. Sheet Metal Screw	TP 44F.	1-7/16 in. Inlet Air Orifice w/ Screen	TP 78B.	Wiring Harness (DTHS-3 Models)
TP 4A.	Control Box for DTHS	TP 44J.	1-9/16 in. Inlet Air Orifice w/ Screen	TP 79.	1/2 in. Gas Valve (Natural Gas)
TP 5.	Gasket	TP 46-31.	Burner Orifice (40,000 Btuh Natural Gas)		(150N, DTHS-3 Models)
TP6A.	16 in. Burner Tube w/Flange (DTHS-2 Models)	TP 46-49.	Burner Orifice (40,000 Btuh Propane)	TP 79A.	1/2 in. Gas Valve (Propane)
TP 7.	1/4-20 x 1/2 in. Machine Screw	TP 46-29.	Burner Orifice (50,000 Btuh Natural Gas)		(150P, DTHS-3 Models)
TP 7A.	1/4-20 Hex Nut	TP 46-45.	Burner Orifice (50,000 Btuh Propane)		(MHV445A-1199 set 10.0 in. W.C.)
TP 8C.	16 in. Burner Tube w/Flange (no-slot) (DTHS-3 Models)	TP 46-26.	Burner Orifice (60,000 Btuh Natural Gas)	TP 80.	#6-32 x 1 in. Machine Screw
TP 9.	Conduit Coupling (DTHS-2 Models)	TP 46-43.	Burner Orifice (60,000 Btuh Propane)		(DTHS-3 Models)
TP 10.	Conduit 1/2 in. x 4 in. (DTHS-2 Models)	TP 46-19.	Burner Orifice (75,000 Btuh Natural Gas)	TP 81.	#6-32 Hex Nut (DTHS-3 Models)
TP 11.	Radiant Sensor Box (DTHS-2 Models)	TP 46-39.	Burner Orifice (75,000 Btuh Propane)	TP 82.	Reflector Center Support
TP 12.	Radiant Sensor Box Lid (DTHS-2 Models)	TP 46-11.	Burner Orifice (100,000 Btuh Natural Gas)	TP 83.	Flexible Gas Connector
TP 13.	#8 x 1/2 in. Self-Drilling Screw	TP 46-33.	Burner Orifice (100,000 Btuh Propane)	TP 100.	3/8 in. Adapter Fitting (DTHS-2 Models)
TP 14.	Sight Glass Gasket	TP 46-3.	Burner Orifice (125,000 Btuh Natural Gas)	TP 101.	1/2 in. Adapter Fitting (DTHS-3 Models)
TP 15.	Sight Glass	TP 46-30.	Burner Orifice (125,000 Btuh Propane)	TP 102.	9/16 in. Nut
TP 16.	Sight Glass Washer	TP 46-8.	Burner Orifice (150,000 Btuh Natural Gas)	TP 103.	3/8 in. x 1-1/2 in. Pipe Nipple (DTHS-2 Models)
TP 17.	1/4-20 x 3/8 in. Thread-Cutting Screw	TP 46-29B.	Burner Orifice (150,000 Btuh Propane)	TP 104.	1/2 in. x 2 in. Pipe Nipple (DTHS-3 Models)
TP 19B.	Wire Hanger	TP 48.	Main Burner	TP 105.	Reflector End Cap
TP 20C.	Reflector (120 in.)	TP 50.	Glo-Bar Ignitor	TP 106.	Reflector Clip
TP 21B.	Butt Clamp	TP 51.	1/4 in. Exhaust Pressure Tube	TP 107.	1/2 in. Gas Valve (Natural Gas)
TP26A.	10 ft Radiant Tube, Straight	TP 52.	#6 x 3/4 in. Sheet Metal Screw w/Washer		(125N, DTHS-3 Models)
TP26B.	10 ft Radiant Tube, Straight (AL-TI) (100, 125, 150 Models)	TP 54.	Burner Box Divider	TP 107P.	1/2 in. Gas Valve (Propane)
TP 31B.	Control Box Bracket	TP 55A.	Fan Blower		(WR36E36A-231 set 3.8 in. W.C.)
TP 33.	RV47L-3.8 Natural Gas Regulator (DTHS-2 Models)	TP 56C.	1/4 in. Atmosphere Tube (Vinyl)		(125P, DTHS-3 Models)
TP33P.	RV47L-11 Propane Regulator (DTHS-2 Models)	TP 57A.	1/4 in. Pressure Tube		(WR36E36A-240 set 10.0 in. W.C.)
TP33A.	1/2 in. Close Nipple (DTHS-2 Models)	TP 59.	#8 Hex Nut/Lock Washer		
TP33B.	Gas Cock	TP 60C.	Exhaust Pressure Switch (Tridelta #FS6628-1172) (DTHS-2 Models)		
TP34.	3/8 in. x 1/2 in. Bushing (DTHS-2 Models)	TP 60D.	Exhaust Pressure Switch (Tridelta #FS6628-1173) (DTHS-3 Models)		
TP35.	3/8 in. x 2-1/2 in. Pipe Nipple (DTHS-2 Models)	TP 61B.	Burner Pressure Switch (Tridelta #FS6581-1047)		
TP 35A.	1/2 in. x 4 in. Pipe Nipple (DTHS-3 Models)	TP 62.	#8 x 1/2 in. Machine Screw		
TP36.	3/8 in. Gas Valve (WR25K39A) (DTHS-2 Models)	TP 64.	Radiant Sensor (DTHS-2 Models)		
TP 41.	1/4-20 Keys Nut	TP 65B.	99 in. Heat Diffuser (Baffle)		
TP 42.	Burner Casing w/Orifice Bracket	TP 65C.	132 in. Heat Diffuser (Baffle)		
TP 44C.	1-1/2 in. Inlet Air Orifice w/Screen	TP 66.	2 in. x 4 in. Outlet Box		
		TP 67.	2 in. x 4 in. Outlet Box Cover		
		TP 68A.	Strain Relief Bushing		
		TP 70.	Control Box Cover Gasket		
		TP 71.	Radiant Sensor Mica (DTHS-2 Models)		

**NOTE:** When ordering heater parts, please state the model and serial number of the heater.

### 5.2 Optional Parts

Item No.      Description

WVE-GALV      Exhaust Vent w/ Flapper  
(Required on Unvented Models)

WTV-4          Wall Inlet Vent w/ Screen

4-VC            Breidert Vent Cap

MARK-IX FBI CONTROL PACKAGE FOR  
 DTHS 125.1 150-3 MODELS ONLY  
 DELETE PART 10'S  
 TP-9 TP-10 TP-11  
 TP-12 TP-54 TP-71  
 ALSO DELETE MOUNTING HARDWARE  
 FOR ABOVE PARTS.

L-FOR DTHS 125 ONLY

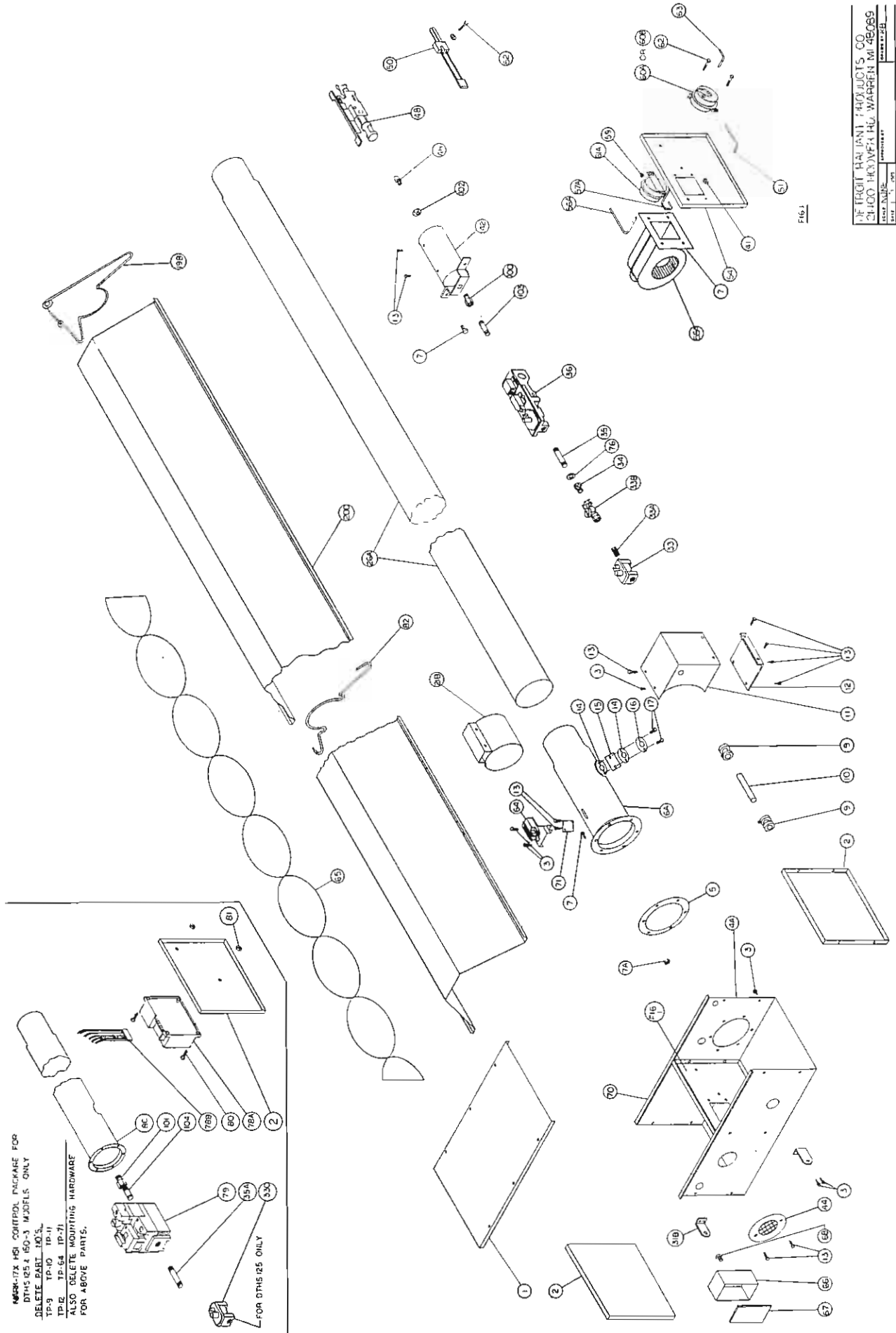


FIG. 1

FBI TRIGIT RAIL IAN1 PRODUCTS, CO	
21100 HICKORY RD. WARREN, MI 48069	
DATE	REV