

# DRV SERIES

## TUBE HEATER VACUUM SYSTEM

### 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.

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

# 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 Requirements 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**)
- ◆ International Approval Services (**IAS**)

## 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.

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## **SAFETY INFORMATION**

- This infrared heater is designed for use in nonresidential 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:

### **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 latest edition of the National Fuel Gas Code, ANSI Z223. 1 (NFPA 54).
- 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 to 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 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 movable scaffolding or other objects.
- The heater, when installed, must be electrically grounded in accordance with the latest edition of the National Electrical Code, ANSI/NFPA 70.
- 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 clearances to combustibles as shown in the Clearances to Combustibles Chart.
- Signs should be posted in storage areas to specify maximum stacking height allowed in order to maintain clearance to combustibles. Use of DRP part # PLQ, warning plaques, are recommended.

#### **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 flammable vapors and liquids 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.

Clearances listed in the following table apply to individual burners located in the DRV system. Inspect each burner rating label to ensure that clearances are maintained.

CLEARANCES TO COMBUSTIBLES [IN.]						
First 20 ft from burner						
MODEL NO.	MOUNTING ANGLE	SIDE			TOP	BELOW
		BEHIND		IN FRONT		
DRV-75 (N, P)	0°	24			6	54
	45°	8		46	8	54
DRV-100 (N, P)	0°	28			6	57
	45°	8		46	8	57
DRV-125 (N, P)	0°	30			6	67
	45°	10		47	10	67
DRV-150 (N, P)	0°	38			6	72
	45°	10		49	10	72

20 ft downstream of burner and beyond						
DRV-75 (N, P)	0°		8		5*	20
	45°	5		15	5*	20
DRV-100 (N, P)	0°		8		5*	20
	45°	5		15	5*	20
DRV-125 (N, P)	0°		8		6**	30
	45°	6		18	6**	30
DRV-150 (N, P)	0°		8		6**	30
	45°	6		18	6**	30

- \* Top clearance for any unshielded tubing should be 7 in.
- \*\* Top clearance for any unshielded tubing should be 10 in

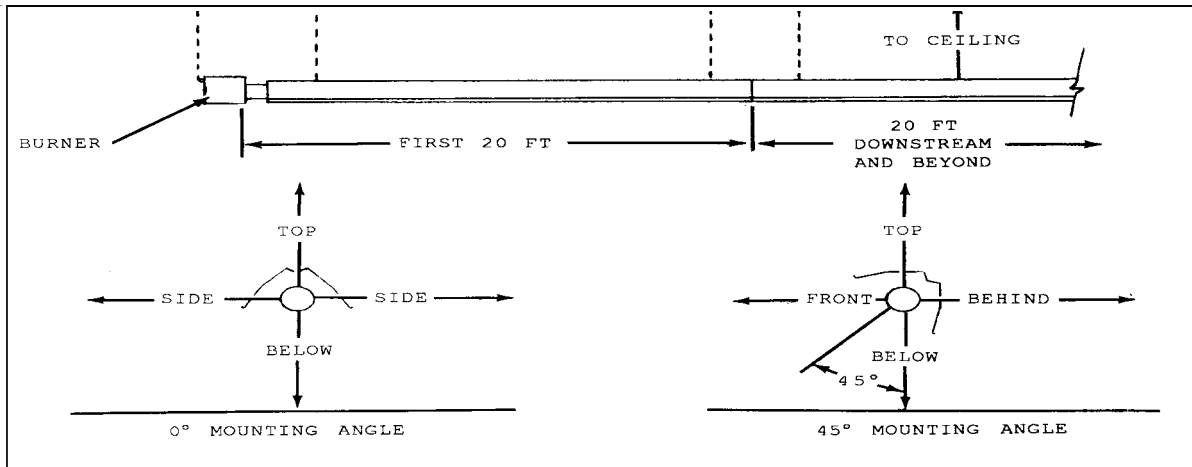


Figure 1: CLEARANCE TO COMBUSTIBLES DIAGRAM

# 1. INTRODUCTION

Detroit Radiant Products DRV Series, gas-fired, infrared, tube heater systems consist of four main components: burner control box, radiant tubes, reflectors and a vacuum pump (see Figure 1.1).

When this system is in operation, a vacuum is created in the burner control box by the vacuum pump. This vacuum draws a regulated gas-air mixture into the burner where it is ignited. The

hot gases produced by this combustion are then drawn through the radiant tubes toward the vacuum pump where they are vented to the outdoors. As these gases pass through, the tubes are heated and emit radiant energy. This energy is directed into the space to be heated by reflectors, heating the occupants, objects and floor directly. These objects then heat the surrounding air, creating a comfort zone at the floor level.

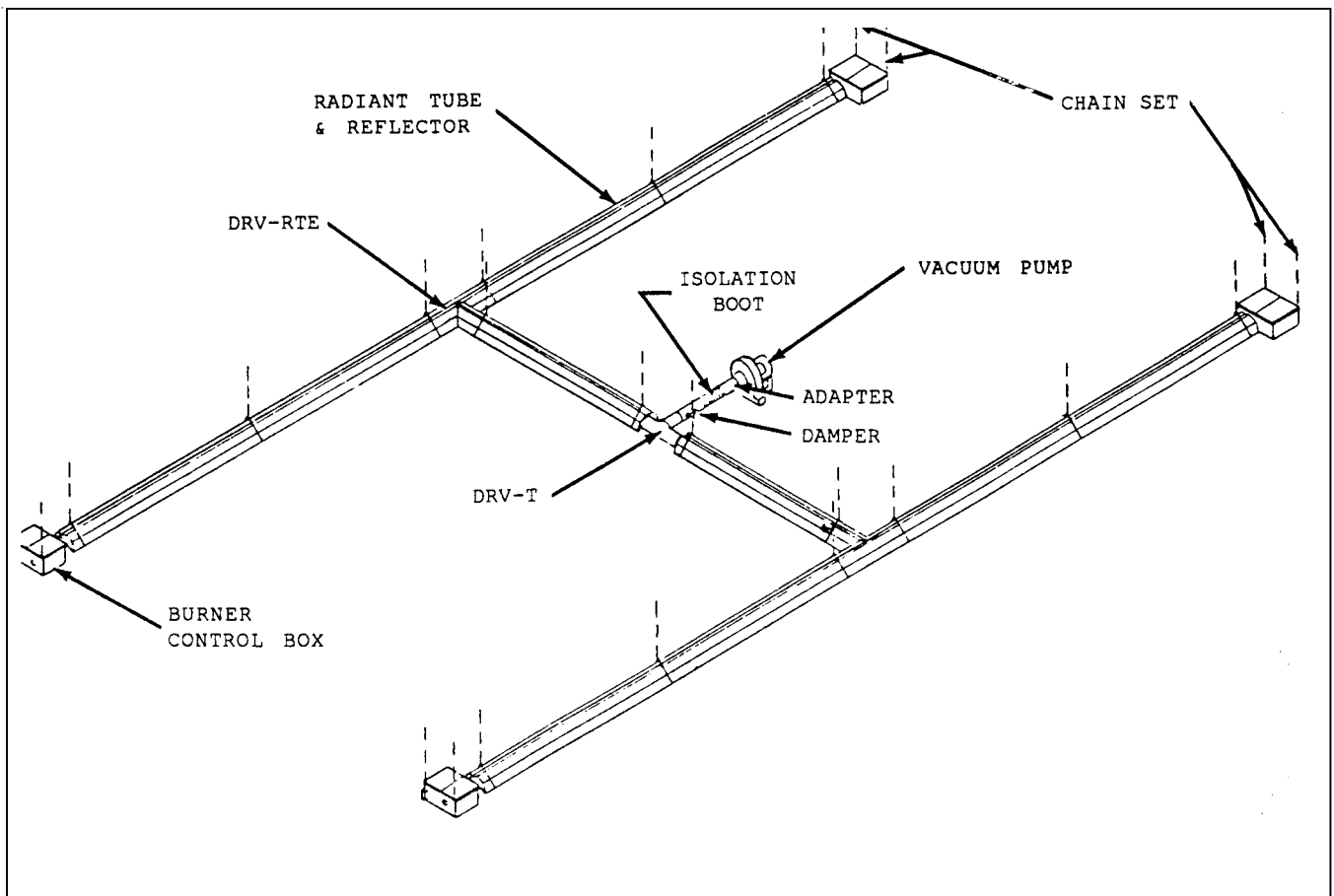


Figure 1.1

TYPICAL INSTALLATION DRAWING

## 2. INSTALLATION

### Design Criteria

The DRV Series system is custom designed and must be installed according to a factory approved layout drawing.

When determining the location of the system, keep in mind 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. Adequate clearance around air openings leading into the combustion chamber and accessibility for service must be provided. Refer to the Warnings, Cautions and the Clearances 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 system performance:

- The radiant tube length, from the burner to the vacuum pump, is determined by the gas input (BTU/H). The chart below indicates the minimum and maximum radiant tube lengths for each burner model used in a system. Elbows and tees have already been accounted for, therefore do not add them onto the tube length.

Note: If your design alters from the chart shown below, consult the factory.

RADIANT TUBE LENGTH				
BURNER MODEL NO.	GAS INPUT BTU	From Burner to Vacuum Pump		MIN. SINGLE FLOW [ft]
		MIN.	MAX	
		[ft]	[ft]	
DRV-75	75	50	70	30
DRV-100	100	55	75	30
DRV-125	125	65	85	35
DRV-150	150	75	95	45

Figure 2.1 is an example of how tube length is determined (system with two DRV-75 heaters and a vacuum pump). Measure the length of the tube starting at the vacuum pump back to each heater (20 + 50 = 70). This is within the radiant tube length specifications.

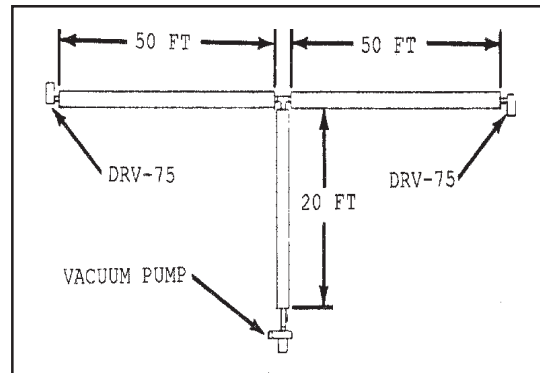


Figure 2.1

Chart 1 also specifies a minimum length that can be used for “single flow” (MSF) of radiant tube from the burner. For example, from the burner box to the first intersection (“TEE” or “CROSS” fitting) is considered “single flow”. However, starting at the first intersection after the burner box the flow is considered “common flow”. This is because a “common” tube length shares the combustion from two or more burner control boxes.

Figure 2.2 illustrates an example of what is considered “single flow” and what is considered “common flow”. The first 30 ft. after each burner box is “single flow” of radiant tube. The remaining 20 ft. of the system is considered “common flow”. This is because the combustion from the two burner boxes is now sharing “common tube”.

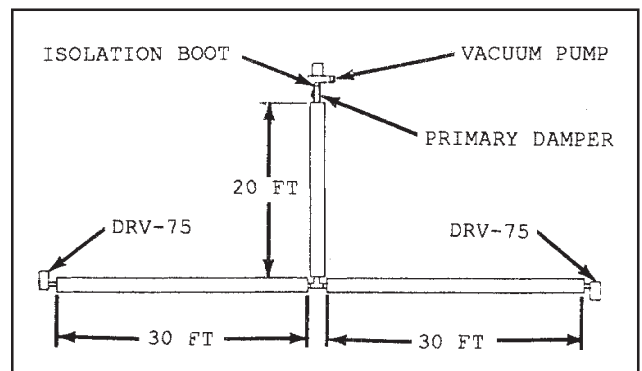


Figure 2.2

## Application Guidelines

- A maximum of two elbows per branch is allowed in a system.
- A maximum of three tees are allowed in a system (per vacuum pump).
- Exposed elbows and tees **cannot** be placed less than 20 ft. downstream of a burner (10 ft. if an elbow or tee reflector is used).
- DRV-125 and 150 burner models should be mounted not lower than 15 ft. above the finished floor. Consult Detroit Radiant Products or your Re-Verber-Ray representative if you have a special case requiring a lower mounting height.
- The dimensions for various components in the system are shown in Figures 2.5 through 2.7.
- Once all of the safety precautions and design criteria are met, the actual installation of the heater may begin.

## Vacuum Pump Application:

- The following table indicates which vacuum pump should be used for a system based on the specific BTU/H input.

VACUUM PUMP MODEL NO.	TOTAL SYSTEM INPUT RANGE [BTUH]
PB-8	75,000 - 250,000
PB-9	275,000 - 400,000
PB-10A	425,000 - 600,000

- A system containing a DRV-150 burner and two DRV-100 burners would have a total system input of 350,000 BTU/H. Therefore, this system requires a PB-9 vacuum pump as indicated in the table.
- The vacuum pump exhaust venting length must be between 2 ft. and 25 ft. The maximum numbers of elbows in the exhaust vent is two.
- Isolation boots provided with the system **must** be installed before vacuum pumps on all systems.



## Damper Application:

- The primary damper provided with the system **must** be installed before the vacuum pump. Due to variations in gas input and radiant tube length, secondary dampers should be installed at various points as necessary to balance the system's exhaust flow. A maximum of four dampers per system is allowed. The following are three typical examples of damper placement:
- A system containing two DRV-75 burners with equal lengths of radiant tube running to the vacuum pump from each burner. This system required only a primary damper as shown in Figure 2.2.

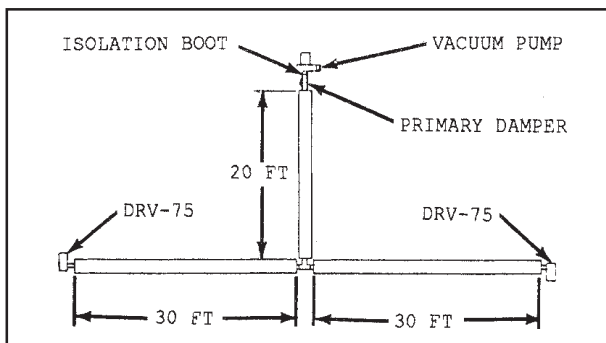


Figure 2.2

- The following is an example of how the above table should be used: A system containing a DRV-75 burner (gas input of 75 MBTU/H) and a DRV-100 burner (gas input of 100 MBTU/H) with equal lengths of radiant tube running to the vacuum pump from each burner. This system required a primary damper at the vacuum pump and a secondary damper before the tee (DRV-T) serving the lower MBTU/H heater as shown in Figure 2.3.

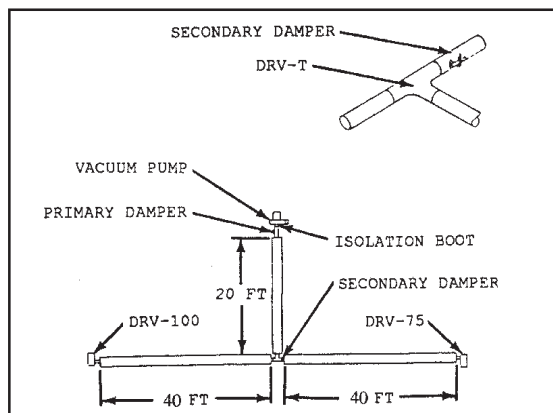


Figure 2.3

- A system containing two DRV-75 burners with unequal lengths of radiant tube running to the vacuum pump from each burner. This system requires a primary damper at the vacuum pump and a secondary damper before the tee (DRV-T) on the shorter tube length as shown in Figure 2.4.

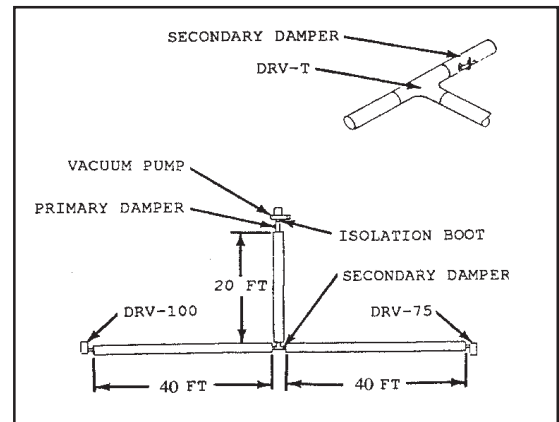


Figure 2.4

## Outside Combustion Air:

- The length of unassisted outside air inlet tubing must be between 3 ft. and 20 ft. per burner. The maximum number of elbows in the air inlet tubing is two.
- If fresh air to a burner is to be drawn from an attic space, the space must have a permanent opening to outside air of one square inch of net free area per 100 BTU/H input.

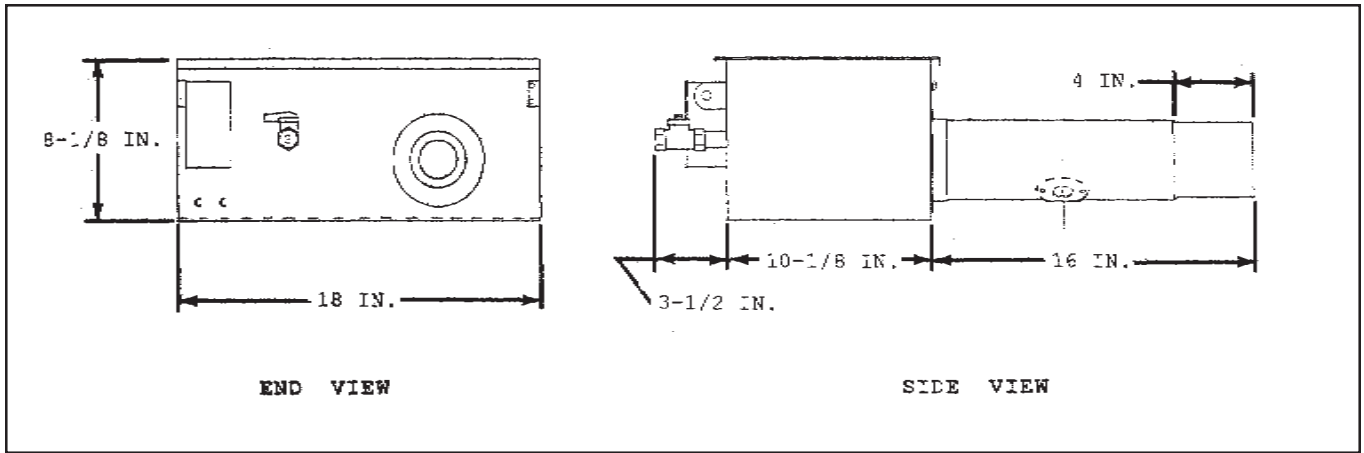


Figure 2.5

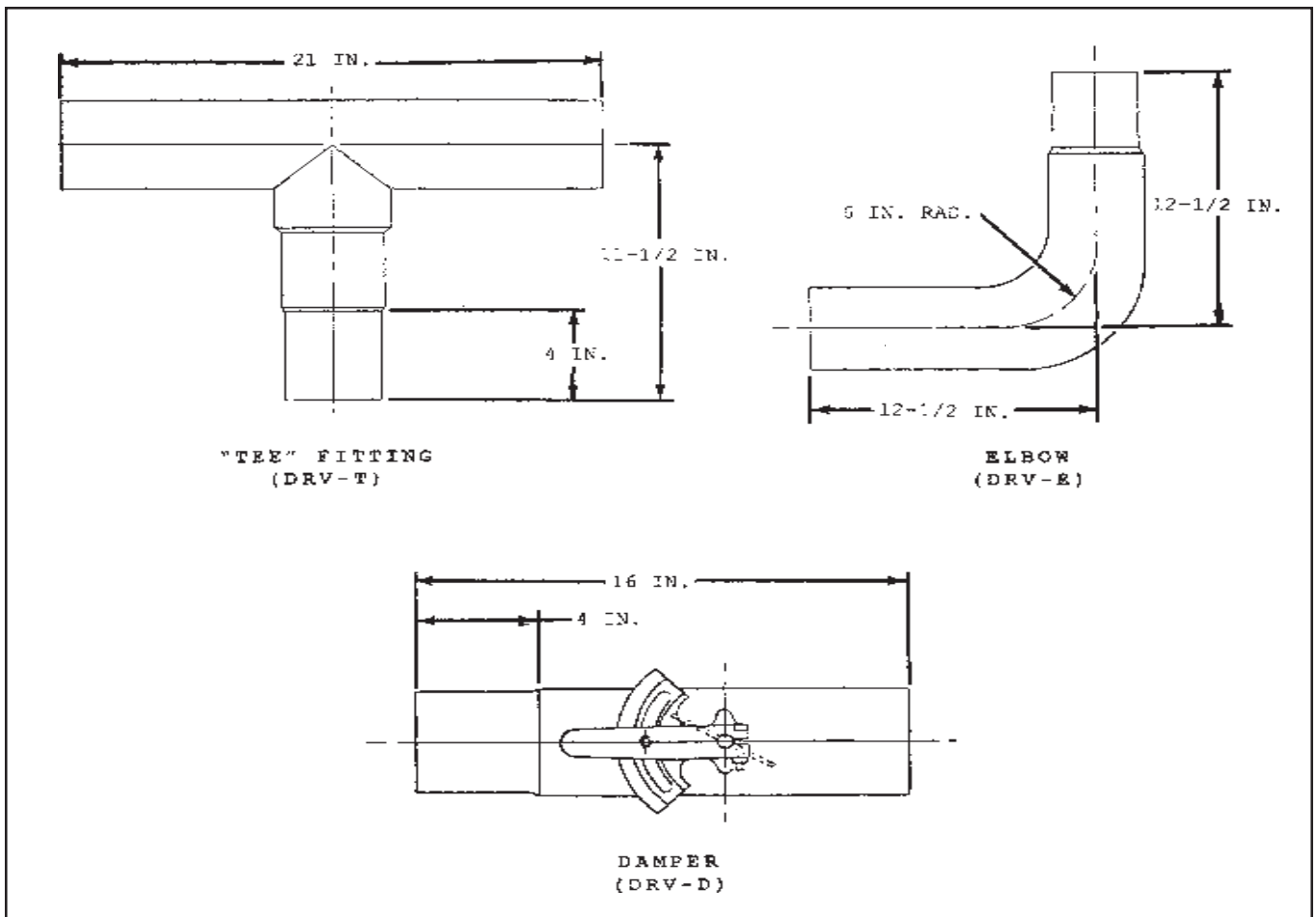
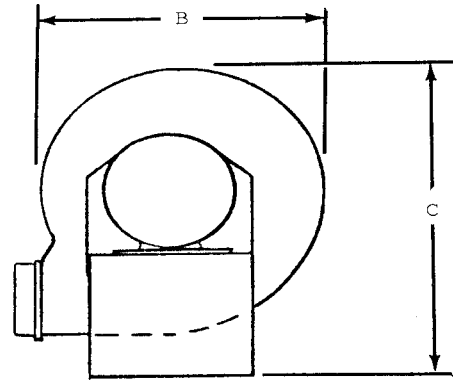
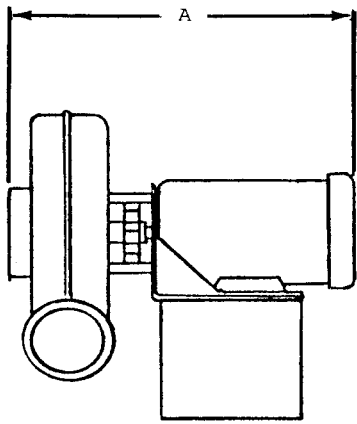
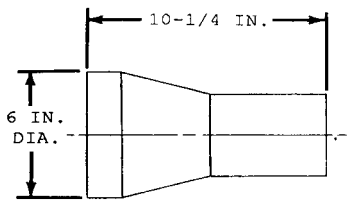


Figure 2.6

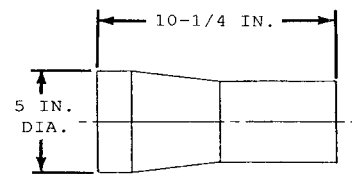
RADIANT TUBE FITTING DIMENSIONS



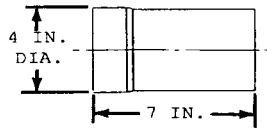
PUMP VACUUM	DIMENSIONS IN.1		
	A	B	C
PB8	19-1/4	10	13-5/16
PB9	19-11/16	13-1/4	16-15/16
PB10A	20-1/16	16-5/16	18-1/4



V-57A



V-56A



V-55A

Figure 2.7  
VACUUM PUMP AND ADAPTER DIMENSIONS

## 2.2 Prechecks

1. Verify that all parts have been received by checking them against the packing list. If anything is missing, notify the Re-Verber-Ray representative or Detroit Radiant Products.
2. Check the AGA rating label on the burner to verify the model number, the gas to be used and that the clearances to combustibles will be met.
3. Check the AGA rating label on the vacuum pump to verify that it is adequate for the gas input (BTU/H) of the system.
4. Identify the Alumi-ti 10 ft. tube(s), and ensure that one exists for each burner.
5. While heater is still on the ground, connect a 120V 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.

## 2.3 HEATER MOUNTING

1. Following a layout drawing, determine the location of the suspension points for the system in relation to the building structure. Ensure that the finished installation will conform to the design requirements listed in the foreword, clearances to combustibles chart and Section 2.1, Design Criteria.
2. Each system is supplied with the necessary wire hangers for suspending the burner, radiant tubing and reflectors (see Figure 2.8). The reflectors may be mounted on angles of 0 degree to 45 degrees (see Figure 2.9).

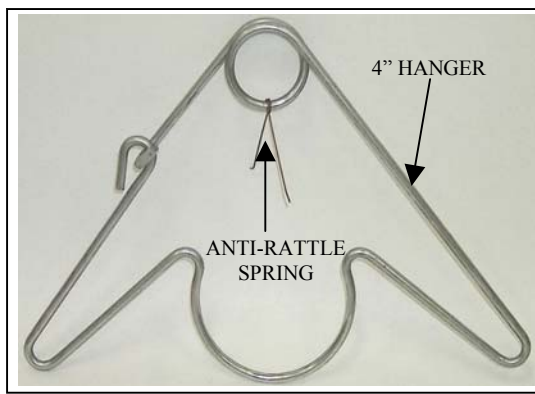


Figure 2.8

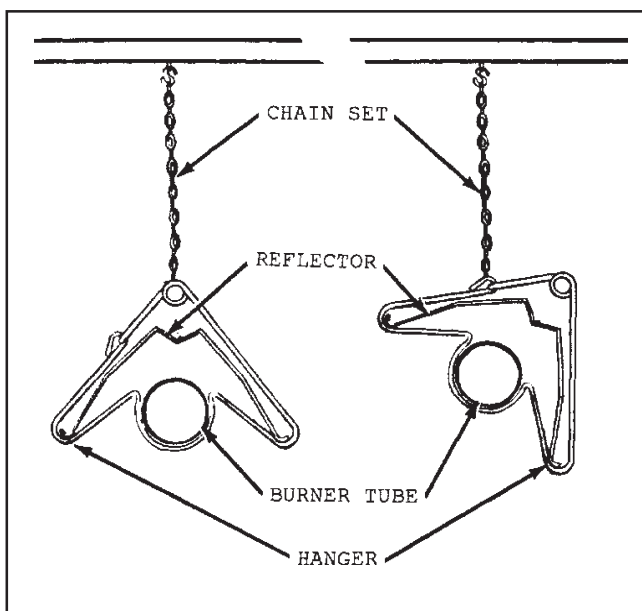


Figure 2.9

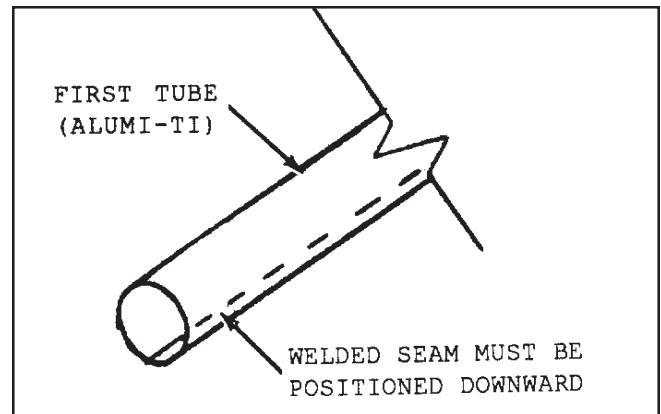


Figure 2.10

3. Use of 12 gauge, size #1, double-loop chain (THCS) is recommended when hanging the system. Quantity 3 per burner, 1 per tube.
4. Chains must hang perpendicular to the system.
5. The first 10 ft. of tube downstream from a burner **must** be titanium alloy aluminized steel tube (Alumiti). Install with welded seam down (see Figure 2.10).
6. Starting at the vacuum pump, mount hangers on approximately 10 ft. centers (see Figure 2.11). Slide tubes through hangers and fasten with butt clamps (see Figure 2.12). For ease of installation, it is recommended that reflectors be mounted with each tube as it is installed (see instructions on reflector assembly).
7. Install dampers, elbows and tees where specified on the layout drawing. **Set dampers half-closed.**
8. Adjust suspension hardware so that the tubes are in line and straight. Adjust chain lengths until system tubing is level.
9. Heater must be independently supported. It must not rely on the gas or electrical lines for any of its support.
10. Mount burner control box so that burner sight glass is visible from the floor.

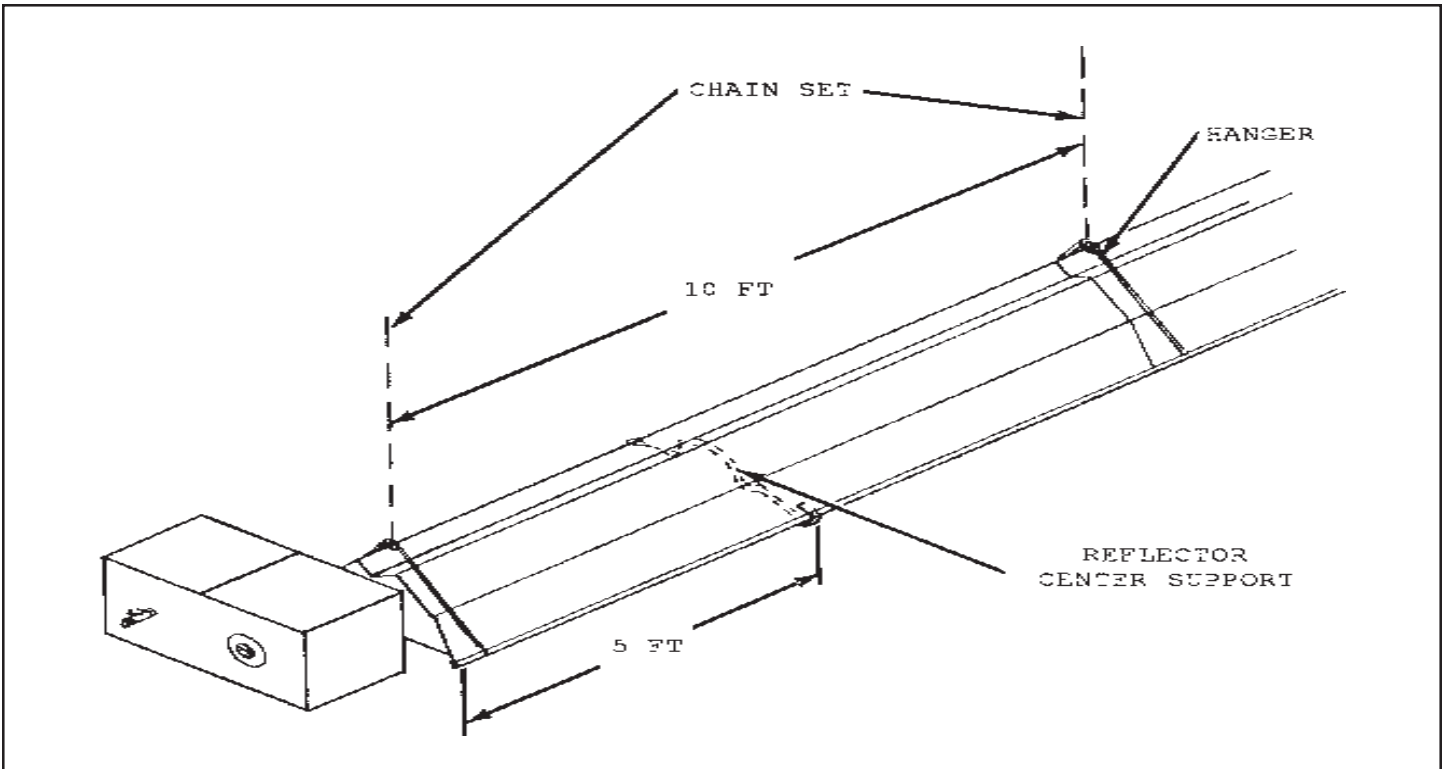


Figure 2.11

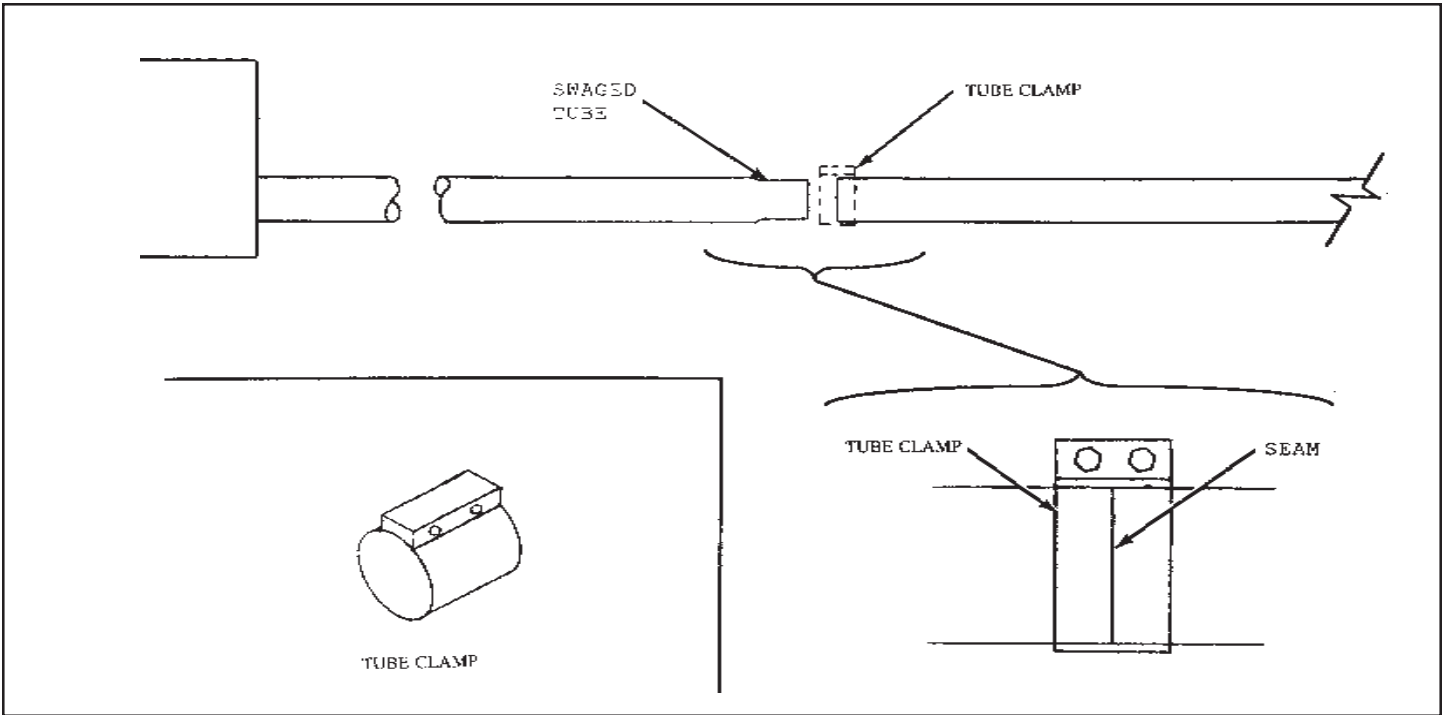


Figure 2.12

## 2.4 Reflector Assembly

1. Mount reflector center support at halfway point on first 10 ft. of tube for each burner (see Figure 2.11).
2. Slide reflectors through wire hangers and overlap mating reflector ends four inches for support (see Figure 2.13). Install sheet metal screws as shown.
3. Install elbow and tee reflector assemblies if used.
4. Install elbow and tee reflector end-caps at the exposed end of each reflector using four clips per end cap (see Figure 2.15).

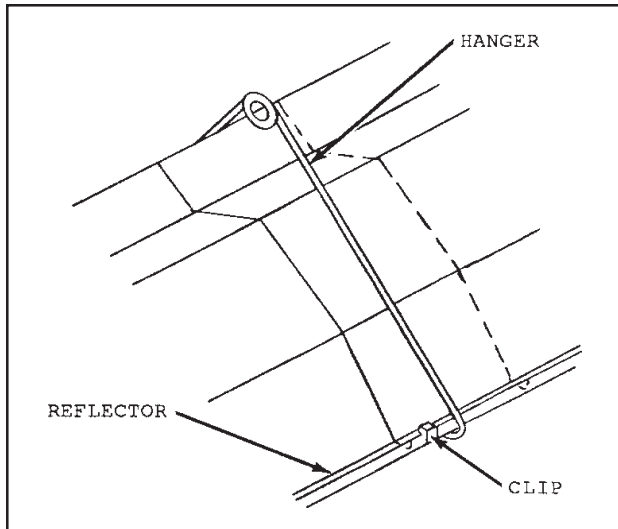


Figure 2.13

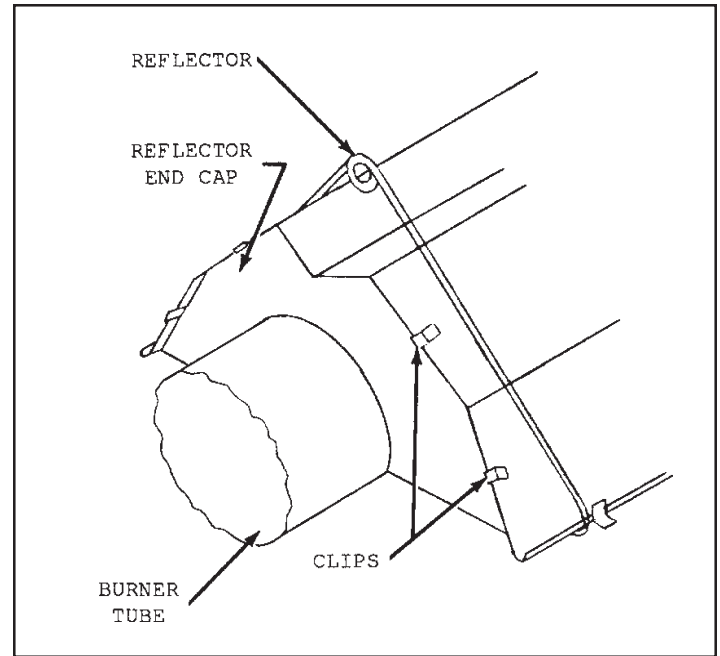


Figure 2.15

**Note:** Leave an expansion joint in each run of reflector, the preferred location is between reflector one and two. (see Figure 2.14).

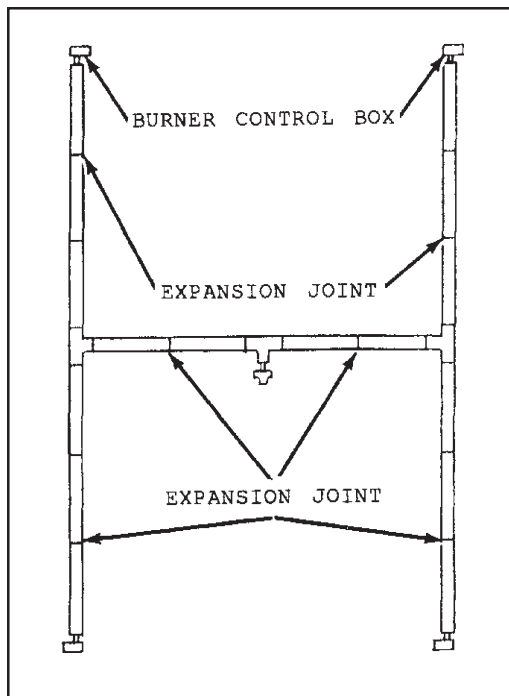


Figure 2.14

## 2.5 Vacuum Pump Assembly

1. Before mounting vacuum pump make sure that the building structure and support brackets have adequate load characteristics to support the pump (see chart below).

**NOTE:** The average sound level of the vacuum pumps is 60 DBA. If the application requires a lower sound level, relocation of the vacuum pump or a sound-deadening enclosure may be used. Consult factory.

VACUUM PUMP MODEL NO.	VACUUM PUMP WEIGHT [lb]
PB8	50
PB9	57
PB10A	63

2. Mount the inlet and outlet adapters to the vacuum pump using self-tapping sheet metal screws, and seal the joints with high temperature sealant. (The DRV-PB8 does not require an inlet adapter).
3. Install vacuum pump as shown on plan drawing. Make sure pump is properly aligned with system. Allow an 8" to 12" space for the isolation boot between the primary damper and the vacuum pump inlet adapter.
4. Install isolation boot with clamps provided (see Figure 2.16).

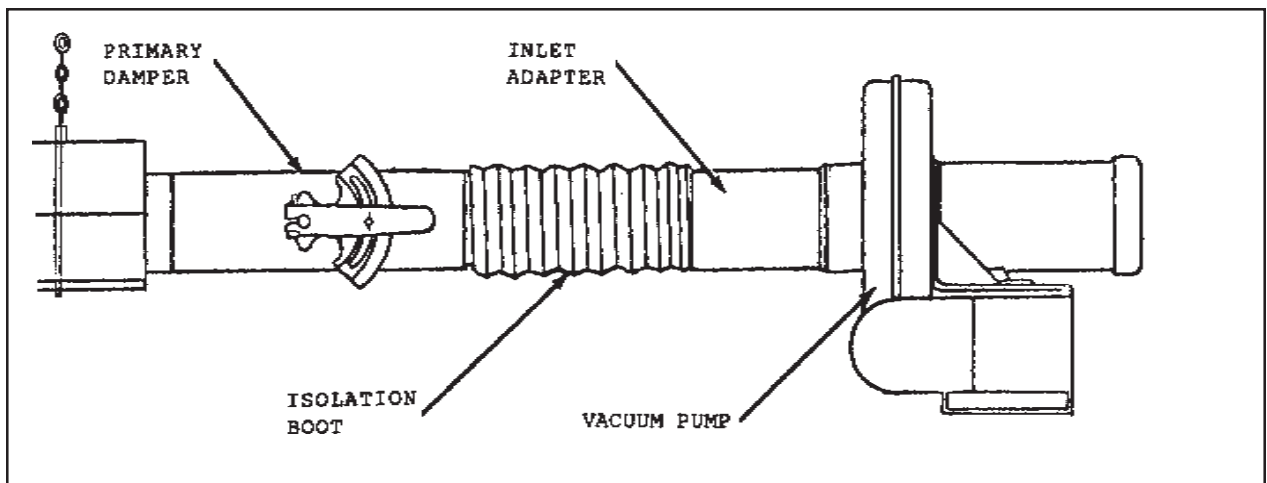


Figure 2.16



## 2.6 Flue Venting

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

- Check all applicable codes prior to installing any exhaust vent. Local codes may vary. In the absence of local codes see the National Fuel Code ANSI Z223.1 (NFPA 54) latest edition. This system is designed to operate with a 4" diameter exhaust vent.
- It is recommended that single-wall aluminum vent material be used. The portion of the vent which goes through combustible material in the building wall or roof must pass through a type "B" vent sleeve with an approved 1 inch clearance thimble (see Figure 2.17 and 2.18).
- Vertical vents which exit through the roof should be at least 2 ft. higher than any portion of the building within a horizontal radius of 10 ft. of where it passes through the roof of the building (see Figure 2.18). A standard rain cap may be used to shield the vent.
- The vent tube length allowed must be between 2 ft. and 25 ft. Do not use more than two 90° elbows in the vent (all models).
- Horizontal venting must be terminated using a vent cap with flapper (DRV-WVE) and have a 1 inch clearance from combustible walls (see Figure 2.17). Through the wall venting shall **not** terminate over public walkways and **must** be at least 4 ft. below, 4 ft. horizontally from, or 1 ft. above any door, window or gravity air inlet into any building.
- All vent tubes must be sealed to prevent leakage of flue gas into building.
- Single-wall vent tube that is exposed to cold air must be insulated to prevent condensation.
- Vent cap must be protected from blockage by snow.
- The building must be protected from damage by flue gases.

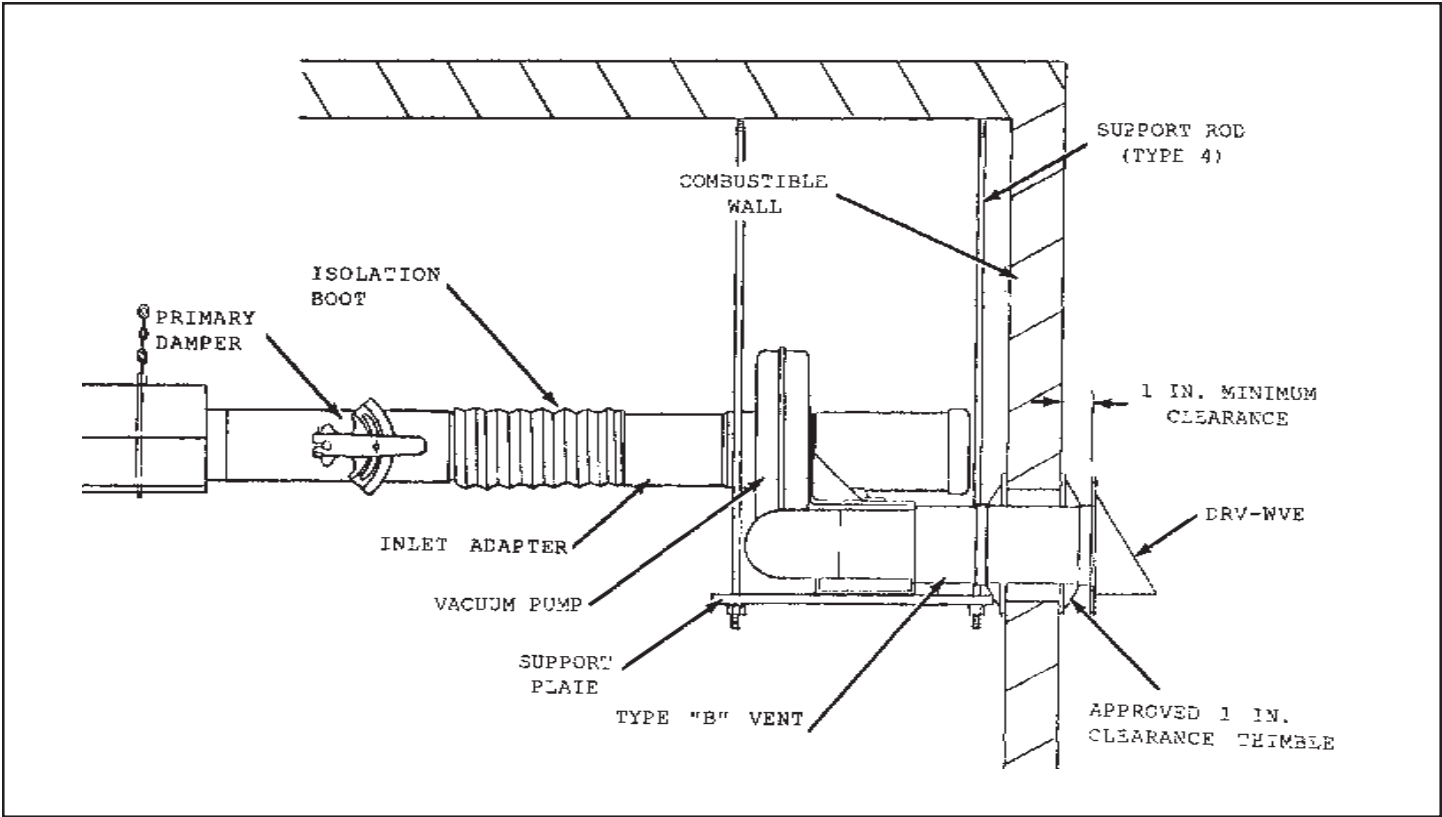


Figure 2.17  
TYPICAL HORIZONTAL VENTING

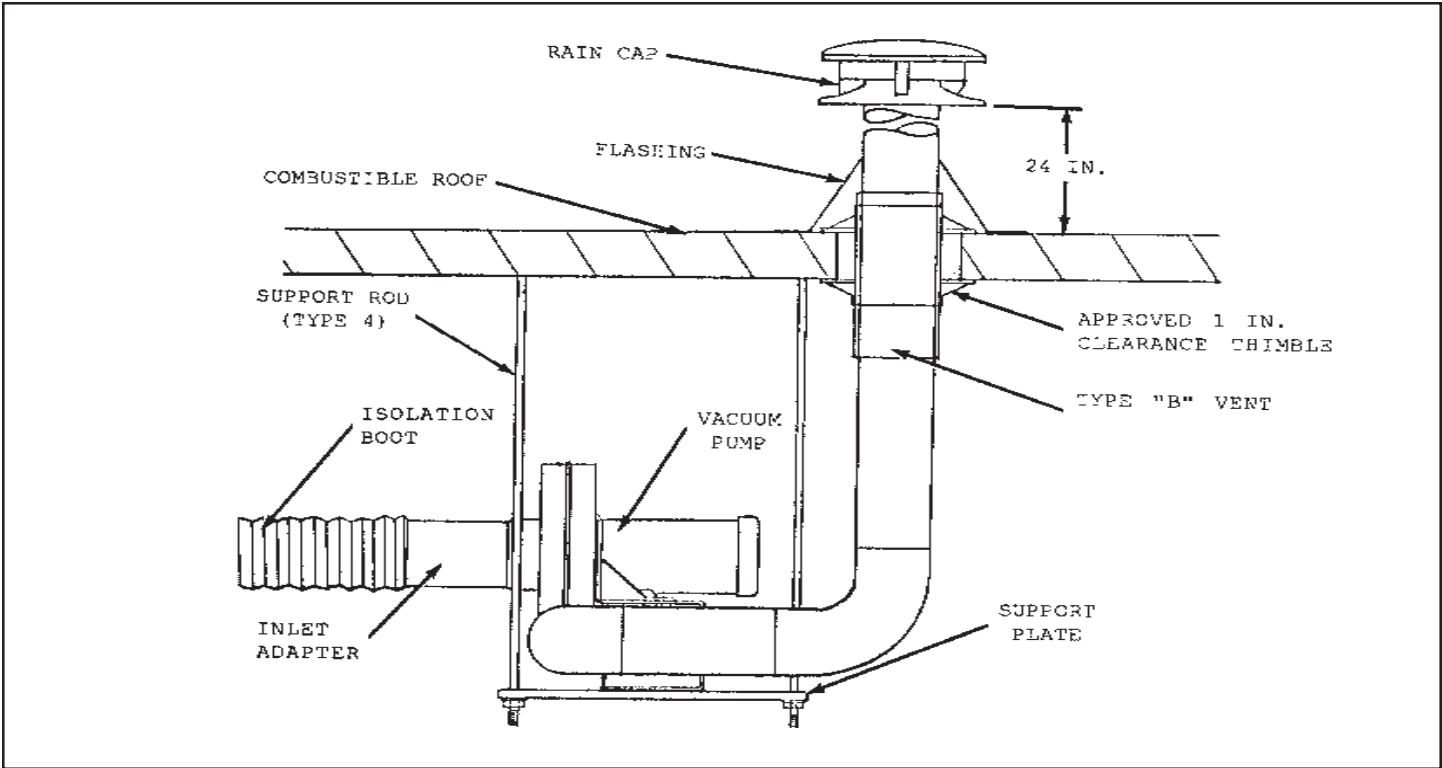


Figure 2.18  
TYPICAL VERTICAL VENTING

## 2.7 Combustion Air Intake

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

If the building has a negative pressure condition or if contaminants such as solvents, foreign particles or corrosive vapors are in the air, then outside combustion air must be supplied directly to the heater (see Figure 2.19).

### WARNING

THIS IS NOT AN EXPLOSION PROOF HEATER. WHERE THERE IS THE POSSIBILITY OF EXPOSURE TO FLAMABLE VAPORS, CONSULT THE LOCAL FIRE MARSHAL, THE FIRE INSURANCE CARRIER OR OTHER AUTHORITIES FOR APPROVAL OF THE PROPOSED INSTALLATION.

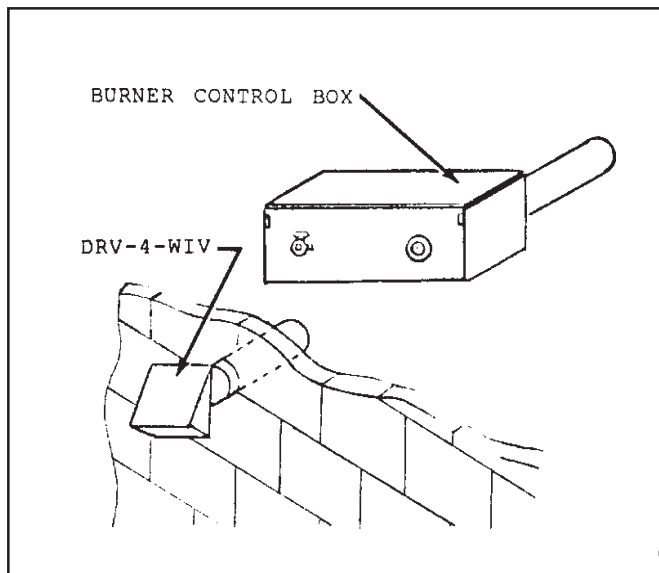


Figure 2.19

## Unassisted Outside Air Intake:

- Outside combustion air may be provided by an accessory 4-inch air duct with a length between 3 ft. and 20 ft. per burner. Do not use more than two 90° elbows in the inlet duct.
- Use insulated duct or PVC pipe ahead of the flexible hose to prevent condensation on the outer surface of the duct.
- A wall inlet vent with screen (#WIV-4) **must** be used for an outside air inlet through the wall (see Figure 2.19).
- A standard rain cap is recommended for an outside air inlet through the roof (see Figure 2.20).
- Intake opening **must** be at least 3 ft. away from any exhaust vent openings.

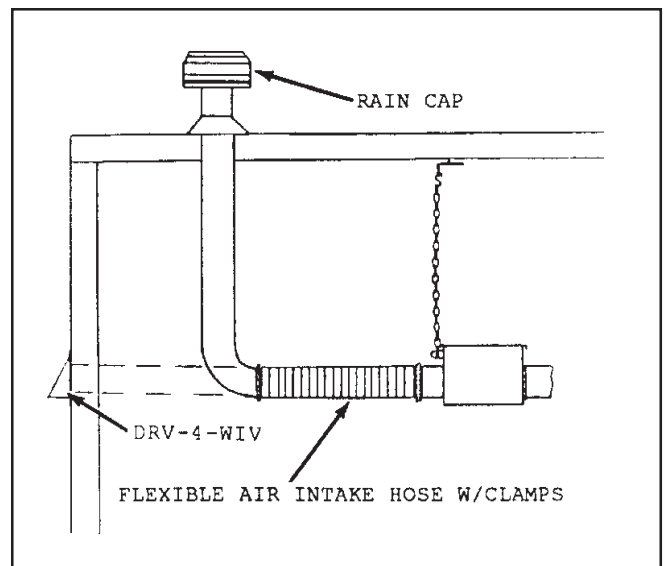


Figure 2.20

## Assisted Outside Air Intake (Optional)

Assisted outside air inlet duct consists of a 6" spiral tube, inlet air dampers and a supply fan. This system allows supply of air for an entire DRV system from a single source (see Figure 2.21).

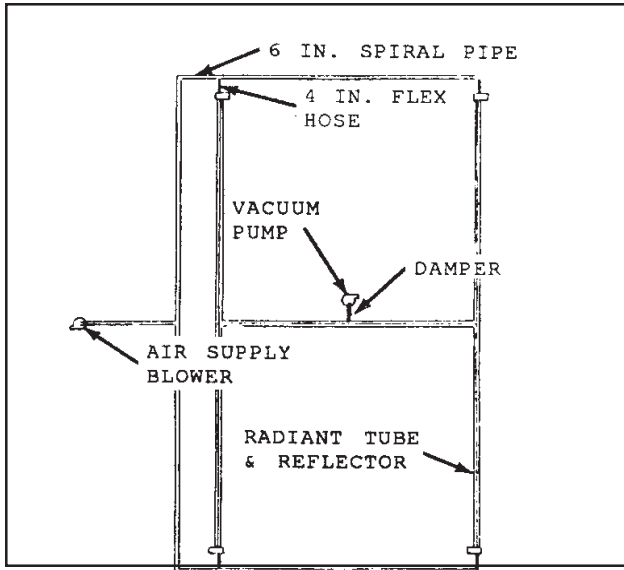


Figure 2.21

- The maximum length of assisted outside air intake is 150 ft. from a burner to the air supply blower (DRV-PAI). Do not use more than three elbows per branch from the main intake.
- To maintain a 1" burner vacuum, air inlet dampers are required to adjust the incoming air (4" damper plates are recommended). These dampers can be located in the tees and/or a small section of 4" tube installed between the reducer fittings and the flex hoses (see Figure 2.22).

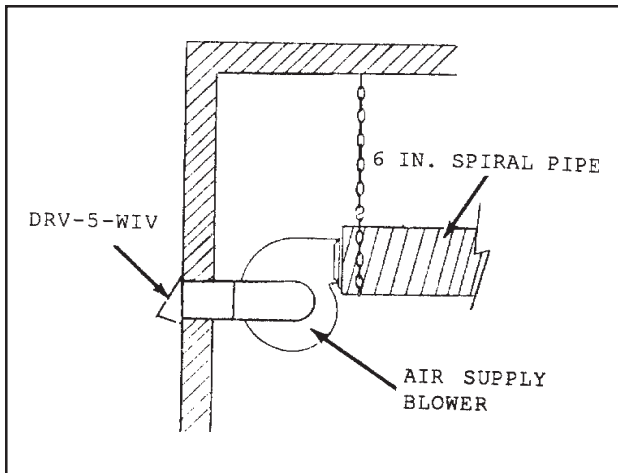


Figure 2.22

- A wall inlet vent with screen (DRV-5-WIV) **must** be used as the inlet through the wall for the optional blower assisted outside air supply (see Figure 2.23). A 5" duct must be used between the inlet vent and air supply blower.

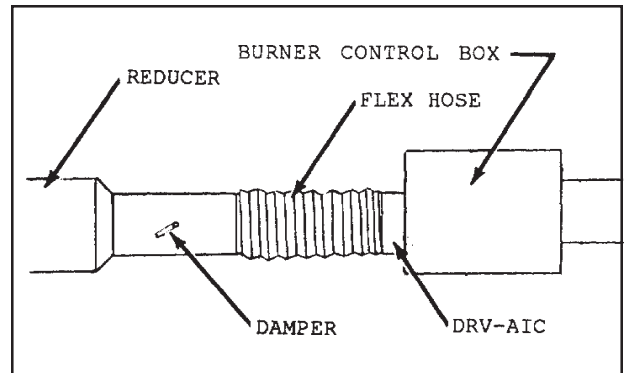


Figure 2.23

- A standard rain cap is recommended for an outside air inlet through the roof (see Figure 2.20).
  - Intake opening must be at least 3 ft. away from any exhaust vent openings when venting through a roof.
  - Intake opening must be at least 6 ft. away from any exhaust vent openings when venting through a side wall.
1. Install 6-inch spiral tube, elbows, tees and reducer fittings as shown on the plan drawing.
  2. Install dampers and hoses. Do not attach hoses to burners at this time. See instructions for start-up, Section 2.10, Initial Start-Up.
  3. Install air supply blower either on wall or from ceiling.

## 2.8 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 a 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 2.24).

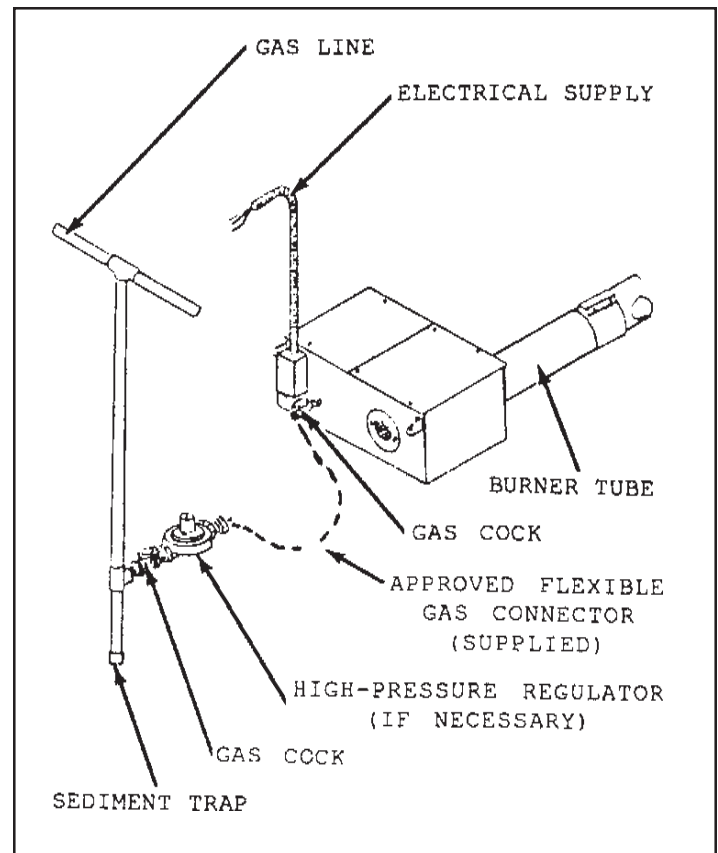


FIGURE 2.24

**NOTE:** For high pressure gas above 14" W.C.P. (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 2.24. The connection shown will decrease the possibility of any loose scale or dirt in the supply line entering the heaters control system and causing a malfunction. Provide a 1/8" NPT, plugged tapping accessible for a test gauge connection immediately upstream of the gas connection to the burner. The gas supply line must be of sufficient size to provide the required capacity and inlet pressure to the burner (consult Gas Company) as follows:

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

- **Natural Gas**

To obtain the required manifold operating pressure of 2.8" W.C.P., a minimum inlet pressure of 4.5" W.C.P. is necessary for purpose of input adjustment. A maximum inlet pressure of 14.0" W.C.P. is allowed for all units.

- **Propane Gas**

To obtain the required manifold operating pressure of 9.5" W.C.P., a minimum inlet pressure of 11.0" W.C.P. must be provided ahead of the control system on each burner for purposes of input adjustment. A maximum inlet pressure of 14.0" W.C.P. is allowed for all units. **DO NOT** exceed a manifold operating pressure of 9.5" W.C.P.

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

- **Pressure Equivalents:**

1.0"	W.C.P.	equals	0.58 oz/sq. in.
4.5"	W.C.P.	equals	2.61 oz/sq. in.
11 .0"	W.C.P.	equals	6.36 oz/sq. in.
14 .0"	W.C.P.	equals	8.12 oz/sq. in.

- **Allowance for Expansion**

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

## 2.9 Electrical Requirements

1. The system operates on 120V, 60 Hz.
2. The system must be grounded in accordance with the National Electrical Code NFPA 70 latest edition.
3. The system must be installed in accordance with the typical wiring diagrams (see Figure 2.25).
4. Figure 2.26 (following page) illustrates the factory wired DRV-CP, which assumes a single circuit requirement. A single circuit is sufficient when the total starting amperages of the burner control boxes in addition to the running amperage of the pump, does not exceed the capacity of the circuit (see chart 2).
5. Figure 2.27 illustrates the factory recommended wiring when two circuits are required. Two circuits are required if the total starting amperages of the burner control boxes in addition to the running amperage of the pump exceeds the capacity of the circuit (see Chart 2).
- 6.. All control panels may be wired for one or two zone thermostat operation on DRV systems.
7. Check vacuum pump for counter-clockwise rotation after installation.
8. The amperage draws for the individual DRV components are as follows.

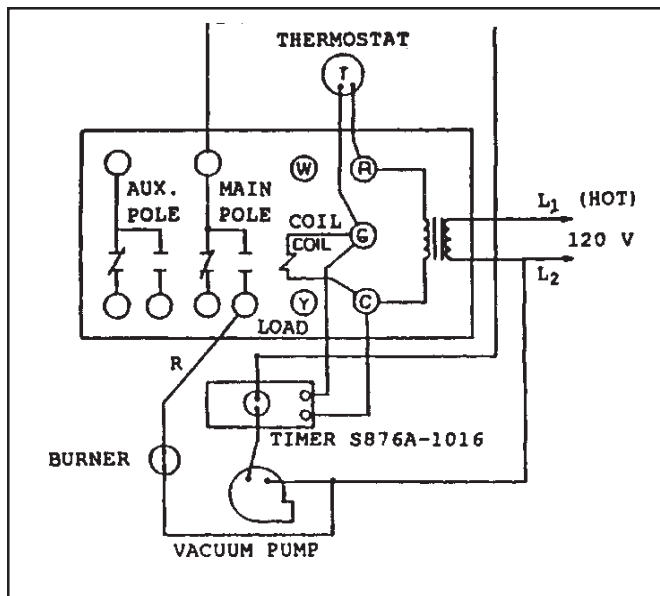


Figure 2.25

DRV COMPONENTS	CIRCUIT [amp]	
	STARTING	RUNNING
Burner Control Box	4.0	0.5
Vacuum Pumps		
PB8	34.0	7.4
PB9	42.0	9.4
PB10A	62.0	15
Air Supply Blower (7063 - 3277)	2.6	1.95

Chart 2

**SINGLE  
CIRCUIT  
WIRING FOR  
THE DRV  
CONTROL  
PANEL**

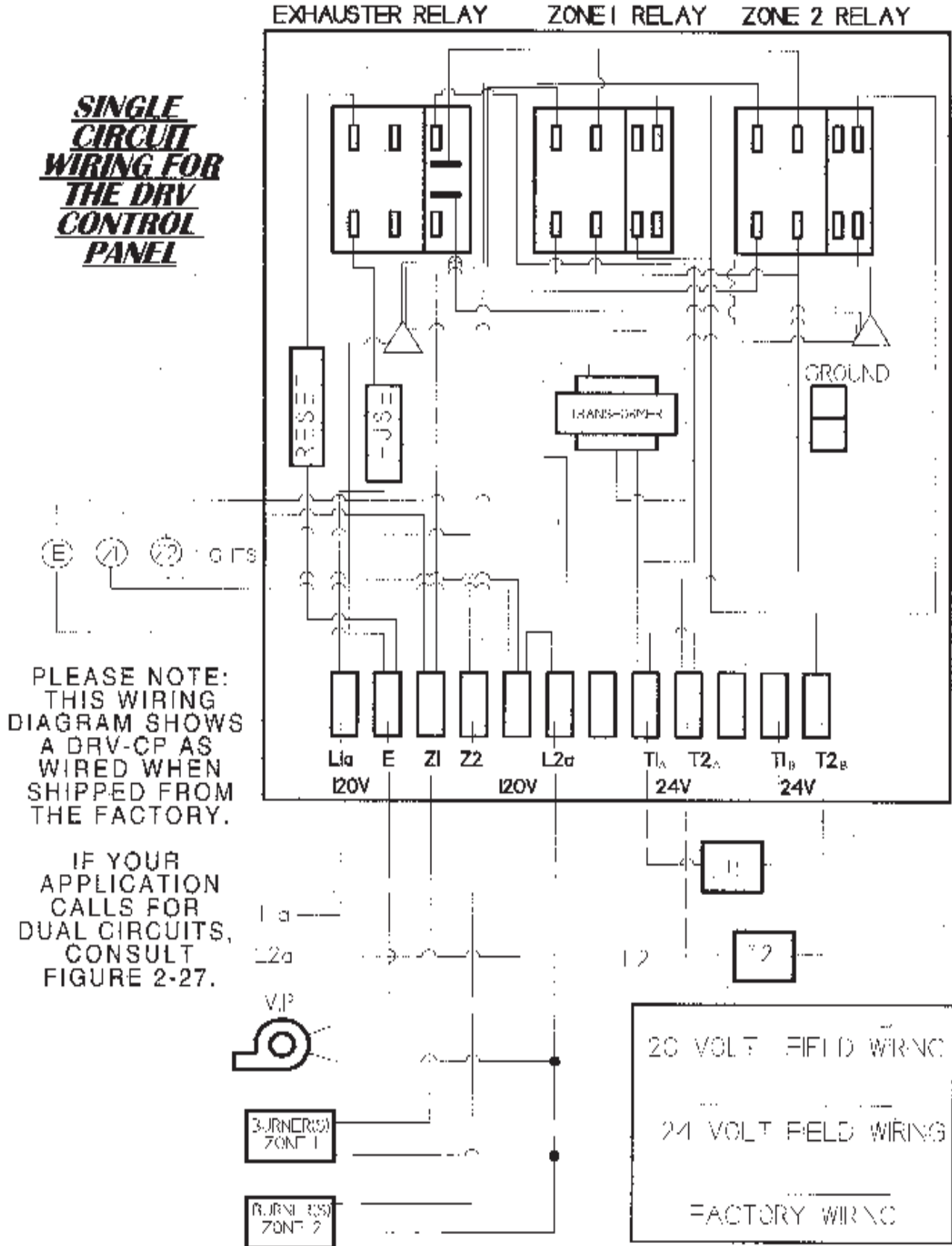


Figure 2.26



**FACTORY**  
**RECOMMENDED**  
**TWO CIRCUIT**  
**WIRING FOR**  
**THE DRV**  
**CONTROL PANEL**

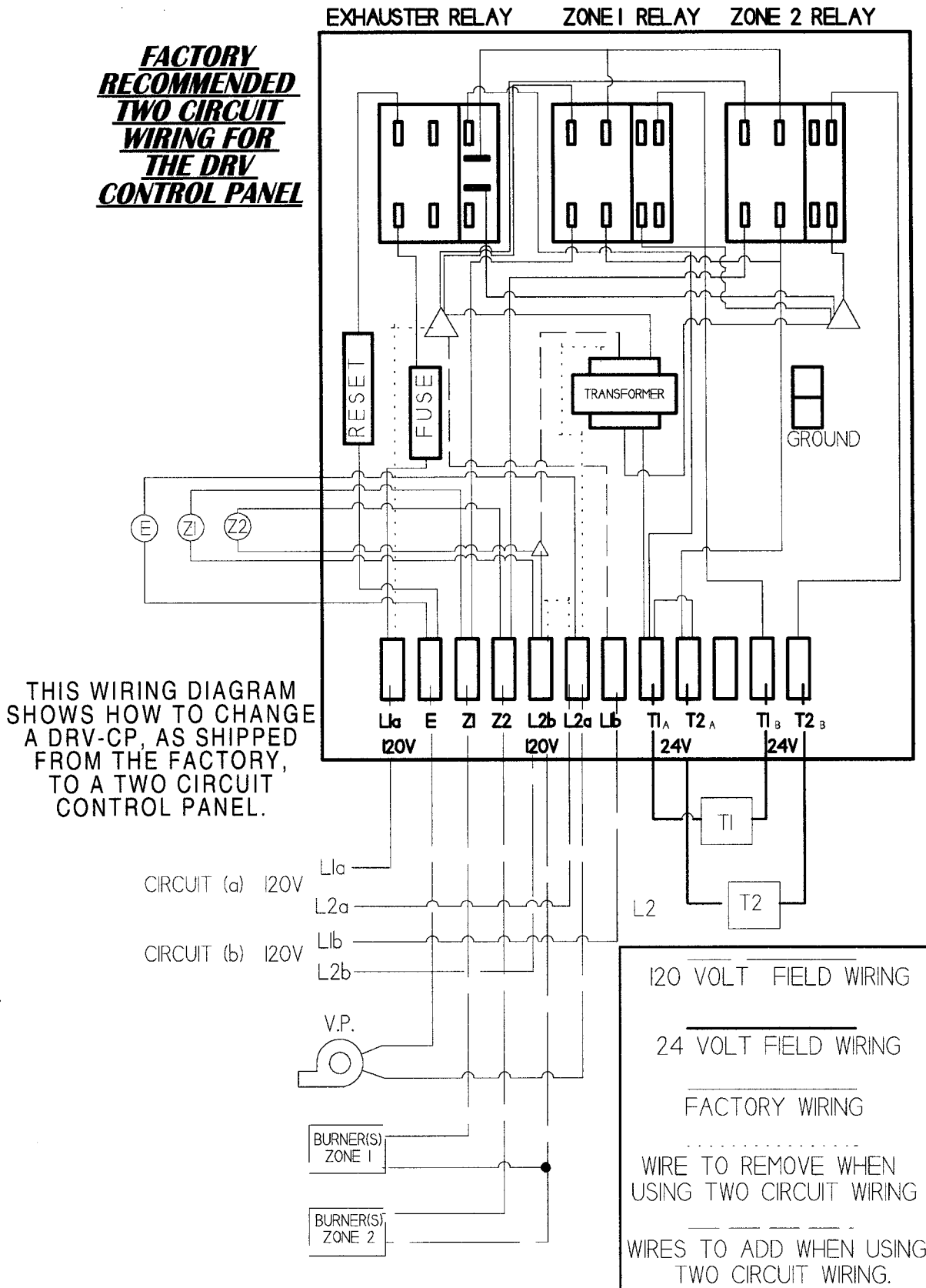


Figure 2.27

## 2.10 Initial Start-Up

1. Recheck installation of gas piping, electrical, etc.
2. Preset primary and secondary dampers to half open.
3. Unassisted outside combustion air ducts (if required) must be installed before start-up.
4. Fan assisted outside combustion air ducts must not be connected to control box upon initial start-up.
5. Let system operate for 15 minutes to ensure maximum operating temperature.
6. Using a manometer with an adequate range, measure the vacuum at the burner (Figure 2.32) farthest away from the vacuum pump. Adjust the primary damper at the pump until the manometer reading at the burner measures  $-1.0''$  (negative) W.C.P. (readings will be below atmospheric pressure), and lock damper in position.
7. If using the optional blower assisted outside air supply, connect the air supply blower to the system after the dampers on the heat exchanger have been set.
8. With the system at operating temperature, set the air inlet dampers so that each burner is operating at  $1.0''$  W.C.P. of vacuum, then lock the dampers in place.

If secondary dampers have been installed in the system, connect manometer to the designated burner and set secondary damper to  $-1.0''$  (negative) W.C.P., and lock damper in position.

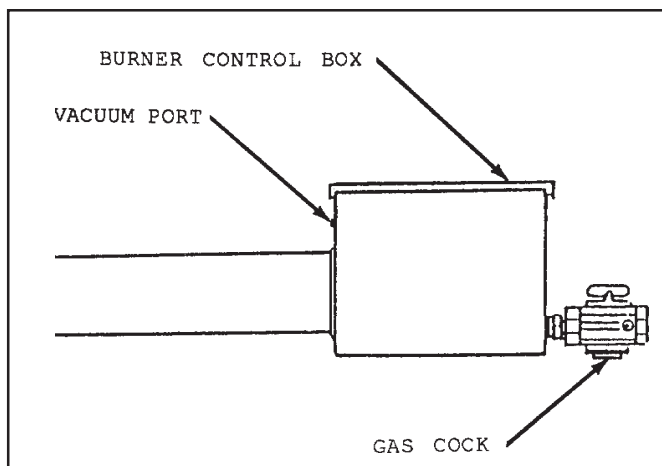


Figure 2.32

## **2.11 Lighting Instructions**

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

## **2.12 Shutdown Instructions**

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

### 3. THEORY OF OPERATION

#### 3.1 Starting Circuit (Figures 3.1 and 3.2)

When the thermostat calls for heat, it powers the burners and activates the relay located at the vacuum pump. When sufficient vacuum is present in the control box, the vacuum-proving switch closes, sending current to the hot surface ignition control. There is a five-second delay to allow for burner pre-purging, then the glo-bar is powered. After the glo-bar has been powered for 45 seconds, the control causes the gas valve to open initiating the ignition trial. Power to the glo-bar is shut off during the last two or three seconds of the ignition trial.

#### 3.2 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.

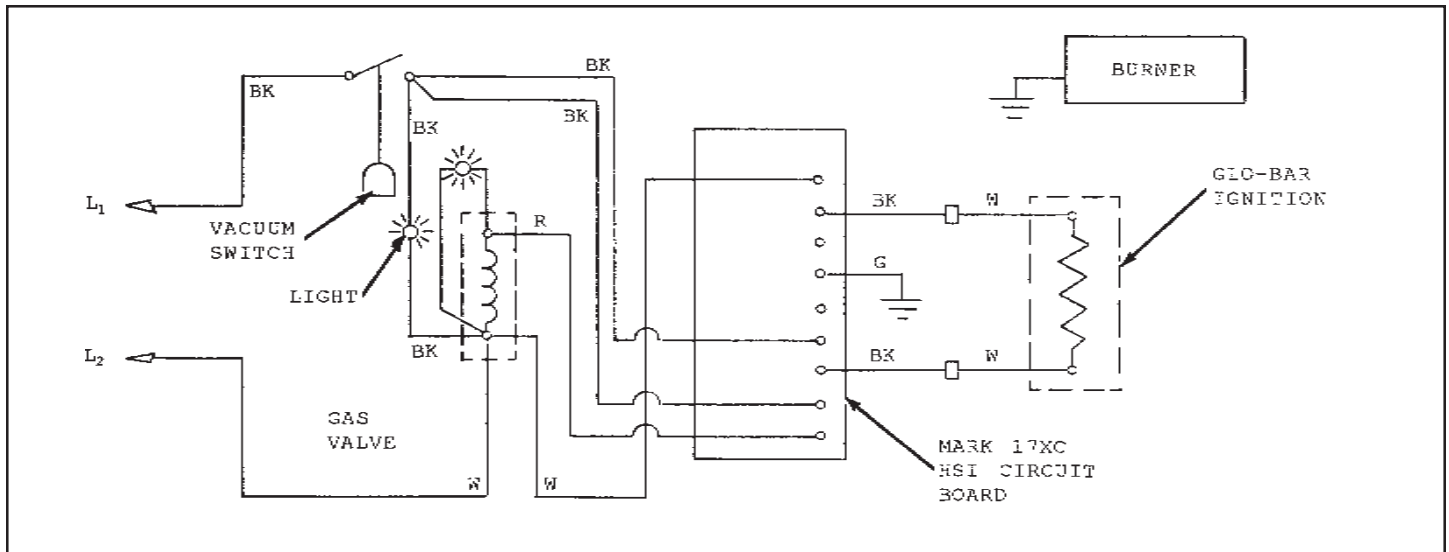


Figure 3.1

BURNER CONTROL BOX WIRING SCHEMATIC

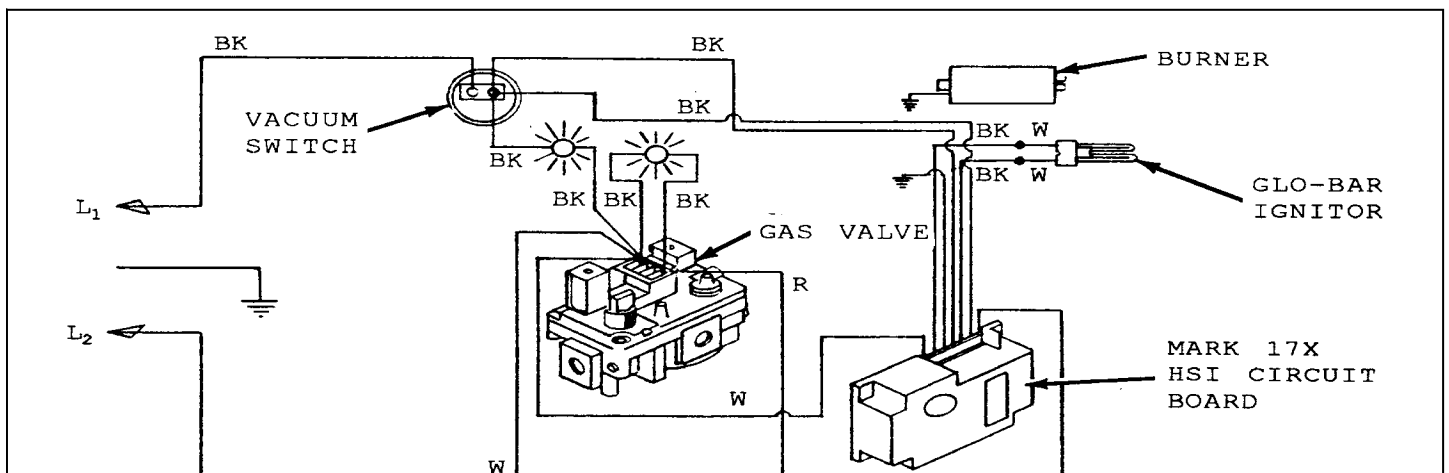


Figure 3.2

BURNER CONTROL BOX WIRING BLOCK DIAGRAM

## 4. TROUBLE SHOOTING

### 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).
3. Unplug glo-bar lead (A) at the burner baffle plate. Break unions (B) and move gas manifold from orifice bracket. Gas orifice removal is not necessary. (See Figure 4.2).
4. Remove bolts (C) and lock-washers that fasten the orifice bracket to the control box. Pull burner housing off fixed bolts, rotate counterclockwise  $\frac{1}{4}$  turn and remove (See Figure 4.2).
5. Remove screws (D) from top of burner housing and pull out main burner (See Figure 4.3).
6. Remove screws (E) holding broken glo-bar to burner and remove glo-bar (See Figure 4.4).
7. Install new glo-bar by reversing the above steps.

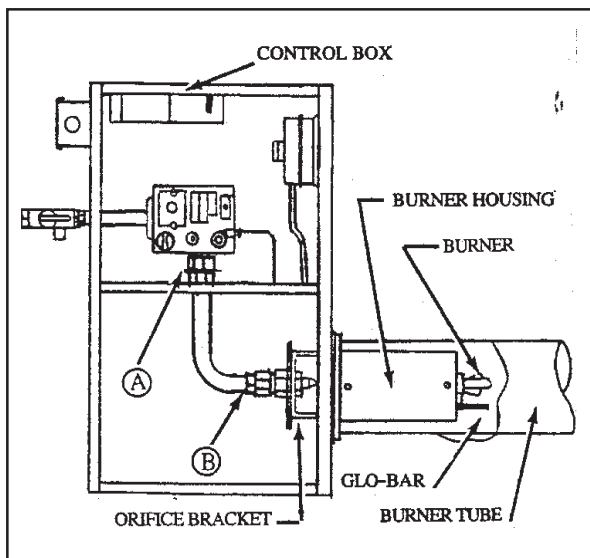


Figure 4.1

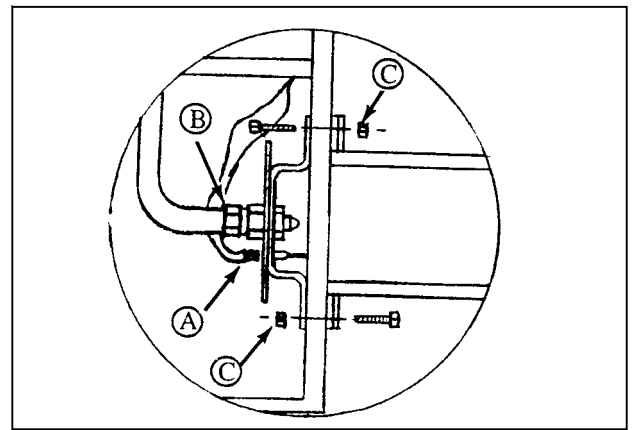


Figure 4.2

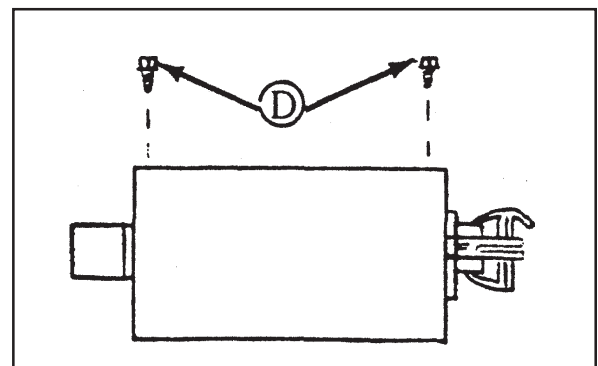


Figure 4.3

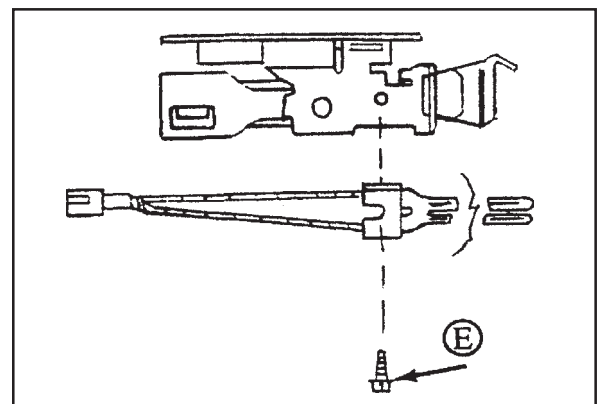


Figure 4.4

## 4.2 Troubleshooting Chart

General Troubleshooting Chart		
SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed but nothing happens.	<ol style="list-style-type: none"> <li>1. Blown fuse.</li> <li>2. Defective thermostat.</li> <li>3. Defective vacuum pump relay.</li> <li>4. Loose or disconnected wire.</li> <li>5. Defective vacuum pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> <li>2. Replace.</li> <li>3. Replace.</li> <li>4. Repair as required.</li> <li>5. Repair or replace.</li> </ol>
Thermostat closed. Vacuum pump operates. Vacuum indicating light off.	<ol style="list-style-type: none"> <li>1. Low vacuum pressure setting.</li> <li>2. Loose or disconnected wiring.</li> <li>3. Plugged or restricted exhaust vent.</li> <li>4. Plugged vacuum pressure switch lines.</li> <li>5. Defective circuit control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust to 1.0" W.C.P.</li> <li>2. Repair as required.</li> <li>3. Clean.</li> <li>4. Clean or replace.</li> <li>5. Replace.</li> </ol>
Thermostat closed. Vacuum pump operates. Vacuum indicating light on. No glo-bar energization.	<ol style="list-style-type: none"> <li>1. Defective glo-bar.</li> <li>2. Loose or disconnected wire.</li> <li>3. Defective circuit control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> <li>2. Repair or replace.</li> <li>3. Replace.</li> </ol>
Thermostat closed. Ignition occurs. Burner cycles off and will not recycle.	<ol style="list-style-type: none"> <li>1. System not grounded.</li> <li>2. Defective circuit control.</li> <li>3. Vacuum pressure set above 1.0" W.C.P.</li> <li>4. Low gas inlet pressure.</li> <li>5. Restricted air inlet.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect electrical ground.</li> <li>2. Replace.</li> <li>3. Adjust.</li> <li>4. Provide required gas pressure.</li> <li>5. Clean.</li> </ol>
Thermostat closed. Ignition occurs. Burner cycles off. Burner cycles on.	<ol style="list-style-type: none"> <li>1. Low gas inlet pressure.</li> <li>2. Defective vacuum pressure switch.</li> <li>3. Restricted air inlet.</li> <li>4. Vacuum pressure set above 1.0" W.C.P.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide required gas pressure.</li> <li>2. Replace.</li> <li>3. Clean.</li> <li>4. Reduce in length.</li> </ol>
Condensation.	<ol style="list-style-type: none"> <li>1. Vacuum pressure not set properly.</li> <li>2. Low gas inlet pressure.</li> <li>3. Restricted air inlet.</li> <li>4. Maximum radiant tube lengths have been exceeded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust to 1.0" W.C.P.</li> <li>2. Adjust to 2.8" W.C.P.</li> <li>3. Clean.</li> <li>4. Reduce lengths to be within specifications.</li> </ol>

# 5 PARTS LIST

## 5.1 Basic Parts List

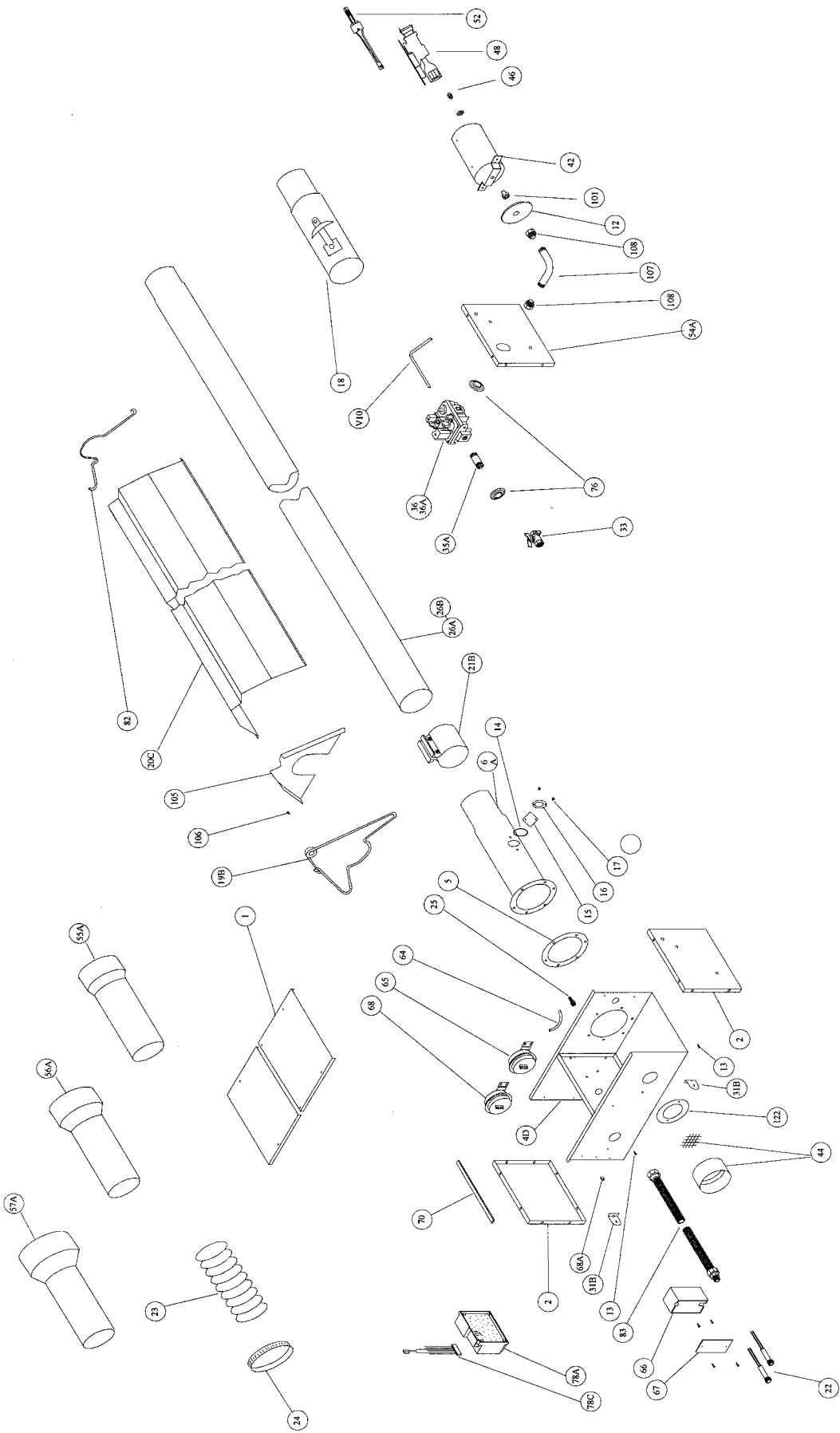
### DRV SERIES PARTS LISTING

KEY	TP#	ITEM	KEY	TP#	ITEM
B	V-1	TWO PIECE CONTROL BOX COVER	B	V-46	BURNER ORIFICE - CONSULT FACTORY
B	V-2	OUTSIDE CONTROL BOX END	B	TP-48	MAIN BURNER (FORMALLY V-48)
B	V-4D	DRV BURNER CONTROL BOX	B	V-50	GLO-BAR IGNITOR
B	TP-5	FLANGE GASKET (OLD# V-5)	B	V-51	GLO-BAR CONNECTOR
B	TP-6A	16" BURNER TUBE W/FLANGE (OLD# V-6A)	B	V-54A	BURNER BOX DIVIDER
B	V-10	REGULATOR VENT LINE	PB-8	V-55A	4" ADAPTOR
B	V-12	BAFFLE PLATE	PB-9	V-56A	5" ADAPTOR
B	TP-14	SIGHT GLASS GASKET (OLD# V-14)	PB-10A	V-57A	6" ADAPTOR
B	TP-15	SIGHT GLASS (OLD# V-15)	B	V-64	PRESSURE TUBE
B	TP-16	SIGHT GLASS WASHER (OLD# V-16)	B	V-65	VACUUM PRESSURE SWITCH-FS4450-808
T & R	TP-19B	WIRE HANGER	B	TP-66	2" X 4" OUTLET BOX (OLD# V-66)
T & R	TP-20C	120" REFLECTOR (OLD# V-20)	B	TP-67	2" X 4" OUTLET BOX COVER (OLD# V-67)
T & R	TP-21B	TUBE CLAMP (OLD# V-21B)	B	V-68	VACUUM PRESSURE SWITCH-FS 6100A-1937
B	V-22	INDICATOR LIGHT	B	TP-70	CNTRL BOX COVER GASKET/FT (OLD# V-70)
V	V-23	ISOLATION BOOT	B	TP-76	RUBBER GROMMET (OLD# V-76)
V	V-24	WORM GEAR CLAMP	B	TP-78A	MARK 17 HSI CIRCUIT BRD.(OLD# V-78A)
B	V-25	1/8" VACUUM TAP PLUG	B	TP-78C	MOLEX WIRE CONNECTORS (OLD# V-78B)
T & R	TP-26A	10"ALUM. RADIANT TUBE (OLD# V-26A)	T & R	TP-82	REFLECTOR CENTER SPRT. (OLD# V-82)
T & R	TP-26B	10"AL-TI RADIANT TUBE (OLD# V-26B)	B	TP-83	2' STAINLESS STEEL FLEX CONNECTOR
T & R	TP-31B	CONTROL BOX BRACKET (OLD# V-31B)	B	TP-101	1/2" ADAPTOR FITTING (OLD# V-40)
B	TP-33B	1/2" GAS SHUT OFF VALVE (OLD# V-33B)	T & R	TP-105	REFLECTOR END CAP (OLD# V-104)
B	TP-35A	1/2" X 4" PIPE NIPPLE (OLD# V-35A)	T & R	TP-106	REFLECTOR END CAP CLIP (OLD# V-106)
B	V-36	1/2" NAT GAS VALVE - 36E36A-233	B	V-107	90 DEGREE 1/2" NPT ELBOW
B	V-36A	1/2" LP GAS VALVE - 36E36A-234	B	V-108	ELBOW ATTACH FITTING-3 PC UNION-(DR-MU)
B	V-36B	1/2" NAT GAS VALVE - SUB V-36	B	TP-122	GASKET AIR ORIFICE
B	V-36C	1/2" LP GAS VALVE - SUB V-36B	V	V-301	PB-8 PUMP ONLY
B	TP-42	BRNR CASING W/ORIF.BRKT.(OLD# V-42)	V	V-302	PB-9 PUMP ONLY
B	TP-44	AIR ORIFICE & COLLAR W/SCR.(OLD# V-44)	V	V-303	PB-10A PUMP ONLY

NOTE: IN ORDER TO PLACE ORDERS CORRECTLY, YOU MUST REFER TO THE KEY AREA OF THIS LIST. ORDERS MUST BE PLACED USING THE CORRECT PART NUMBER.








#### KEY


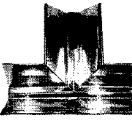




B= BURNER ASSEMBLY.  
T & R = TUBE & REFLECTOR ASSEMBLY.  
V = VACUUM PUMP ASSEMBLY.  
PB8, 9, 10A = VACUUM PUMP PACKAGE.





## ACCESSORIES USED ONLY ON THE DRV SERIES

PART #	DESCRIPTION	
 DRV-CR	Cross fitting used to join three branches of a vacuum system. 16 gauge aluminized steel, 4" diameter cross, with high temperature black coating. Includes: 1 tube clamp, 1 RCS, 4 endcaps and 16 clips. Swedged on one end of the four legs. Dimensions: 21" x 21".	12 lbs.
 † DRV-RCR	Reflector assembly designed to cover DRV-CR cross fitting. Reflector is constructed .025 highly polished aluminum. Field assembled with aluminum gussets and pop rivets provided. Included are 4 center sections, 4 angle brackets, and 24 screws.	10 lbs.
 DRV-T	Tee fitting used to join two branches of a vacuum system. 16 gauge aluminized steel, 4" diameter tee, with high temperature black coating. Includes: 1 tube clamp, 1 RCS, 3 endcaps and 12 clips. Dimensions: 21" across top with neither end swedged by 13". Note: the 13" middle leg is swedged. See drawing below.	10 lbs.
 DRV-TI	In-line tee fitting used to join two branches of a vacuum system. 16 gauge aluminized steel, 4" diameter tee, with high temperature black coating. Includes: 1 tube clamp, 1 RCS, 3 endcaps and 12 clips. Dimensions: 21" across top with one end swedged by 13". Note: the 13" middle leg is not swedged. See drawing below.	15 lbs.
 † DRV-TER	Tee and reflector package used to join two branches of a vacuum system. 16 gauge aluminized steel, 4" diameter tee, with high temperature black coating. Includes: one DRV-RTE, 1 tube clamp, 1 RCS. Dimensions: 21" across top with neither end swedged by 13". Note: the 13" middle leg is swedged. See drawing.	15 lbs.
 † DRV-TERI	In-line tee and reflector package used to join two branches of a vacuum system. 16 gauge aluminized steel, 4" diameter tee, with high temperature black coating. Includes: one DRV-RTE, 1 tube clamp, 1 RCS. Dimensions: 21" across top with one end swedged by 13". Note: the 13" middle leg is not swedged. See drawing.	5 lbs.
 E6	Elbow - 6" radius, 90° bend, 4" diameter 16 gauge aluminized steel with black coating, one tube clamp, one hanger, and two reflector end caps with 8 clips. Consult IOM for minimum distance from burner.	7 lbs.

PART #	DESCRIPTION	
 REP	Reflector and elbow package - 90° bend, 16 gauge aluminized steel elbow with high temperature black coating - with polished, one side bright reflector elbow, 8 mounting clips, one tube clamp, and one reflector center support. Consult IOM for minimum distance to burner.	9 lbs.
 † DRV-RTE	.025 highly polished aluminum reflector used to cover a DRV-T or DRV-TI. Reflector assembly includes: left, right and center sections, 3 brackets and 12 screws.	5 lbs.
 DRV-D	16" damper used to equalize the pressure on each leg of a vacuum system. 16 gauge aluminized steel, 4" diameter, with 1 tube clamp. A DRV-D <b>must be used</b> on each run from the pump (except the longest) that has a 5' (or greater) length differential from any other branch in the system.	8 lbs.
 DRV-PAI	Powered air inlet used to bring in outside air for combustion. To be used on runs that exceed 20' but are limited to 150'. 5" intake and a 6" exhaust adapter included. 265 CFM, 115V 50/60 HZ, auto-reset, & thermal protection.	12 lbs.
 DRV-CP	Up to a two zone control panel which can be interlocked with a thermostat(s). Can be used for single zone or two zone separation. Provides 90 second post purge and indicator lights specifying operating status. Built in thermal overload protection device complies with National Electric Code. Enclosed in one NEMA (1) box. <b>1 CP is needed per pump.</b>	16 lbs.
 WVE-ALUM	Aluminum sidewall vent cap with flapper. WVE is to be used for sidewall venting applications. 4" in diameter.	2 lbs.

### PROPER DRV-T OR DRV-TI USAGE

