

VANTAGE™

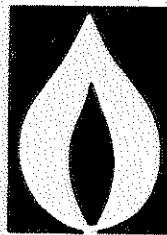
MODELS

CTH1-80 CTH1-100

CTH1-125 CTH1-150

INSTALLATION, OPERATION AND SERVICE INSTRUCTIONS

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.



Roberts Gordon

**A LEADER IN HEATING EQUIPMENT
FOR OVER 50 YEARS**

INSTALLER — Please take time to read and understand these instructions prior to any installation.

OWNER — Keep this manual in a safe place to provide your serviceman with helpful information if the need arises.

CAUTION: CLEARANCE AS SHOWN ARE NOT FOR USE IN FOUR SIDED ENCLOSURES

MODEL	FIG. 1			FIG. 2			FIG. 3			FIG. 4			FIG. 5			FIG. 6			FIG. 7			UNVENTED ABOVE	UNVENTED END	VENTED END						
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C				D	D	D			
CTH1-80	4	31	52	4	4	52	36	4	16	58	16	4	4	50	46	4	48	50	12	4	31	56	31	4	4	50	38	18	24	18
CTH1-100	4	35	62	4	4	62	42	4	21	67	21	4	4	63	58	6	58	63	12	4	36	72	36	4	4	63	50	18	24	18
CTH1-125	4	41	72	4	4	72	58	4	27	77	27	6	4	68	64	6	64	68	12	4	41	74	41	4	4	68	52	18	24	18
CTH1-150	4	45	78	4	4	81	62	4	30	84	30	6	4	74	70	8	70	74	12	4	45	78	45	4	4	73	56	18	30	18

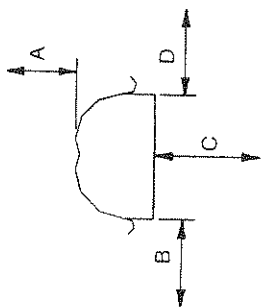


FIG. 1
STANDARD REFLECTOR

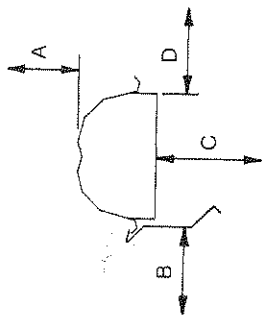


FIG. 2
ONE SIDE EXTENSION

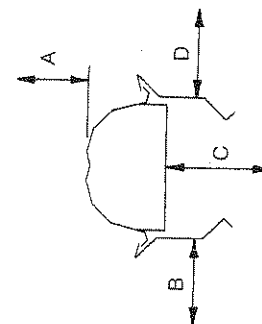


FIG. 3
TWO SIDE EXTENSIONS

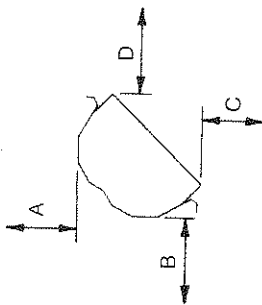


FIG. 4
45° STANDARD REFLECTOR

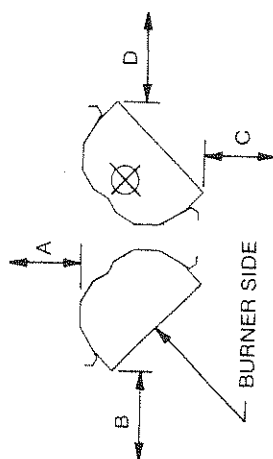


FIG. 5
STANDARD REFLECTOR
"U" CONFIGURATION OPPOSITE 45°

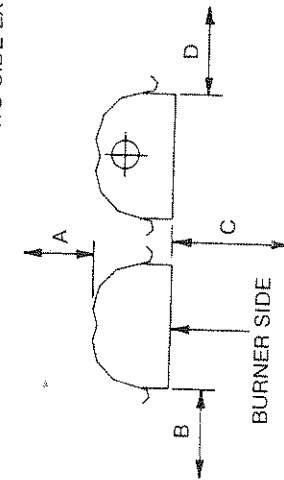


FIG. 6
STANDARD REFLECTOR
"U" CONFIGURATION

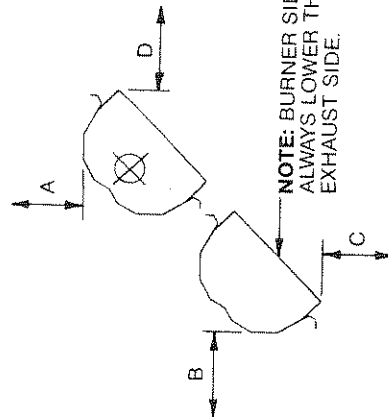


FIG. 7
STANDARD REFLECTOR
"U" CONFIGURATION 45°

NOTES: IN ALL SITUATIONS CLEARANCES TO COMBUSTIBLES MUST BE MAINTAINED.
MINIMUM CLEARANCES MUST BE MAINTAINED FROM VEHICLES PARKED BELOW HEATER.
SIGNS SHOULD BE POSTED IN STORAGE AREAS TO SPECIFY MAXIMUM STACKING HEIGHT TO MAINTAIN REQUIRED CLEARANCE TO COMBUSTIBLES.

**MINIMUM CLEARANCES TO COMBUSTIBLES
CTH1 SERIES RADIANT HEATER**

Figure 2

INSTALLATION

cont. from page 4

- Heaters installed in aircraft hangars shall be located so as not to be subject to damage by aircraft, cranes, moveable scaffolding or other objects. Heaters shall be placed so they will be readily accessible for maintenance purposes.

FIELD ASSEMBLY

Assemble the heater components as shown in Figure 3. Optional reflector and hanging positions shown in Figure 4.

Install appropriate suspension hardware (see Figure 5), beam clamps, chain (rod or perforated strap) at predetermined locations. Adjustment of chain length will provide uniform pitch. Weight to be supported may be figured as follows:

- Tubing — 3.5 lbs. per foot
- Burner — 40 lbs. per unit

COUPLINGS (See Figure 6, page 9 for coupling details)

Tubing and tube fittings are connected by wrap-around couplings which clamp by means of a tapered hammer-driven lock member. The starting ends of the coupling and lock member are identified by 1/4-inch holes which are put together when starting assembly.

Be sure tubes are in line and tube ends butt against stop pin(s) inside coupling. The slide bar is to be hammer-driven to a point of securing the coupling to the tubes. Over driving will result in distortion of the coupling or slide bar lip to a point decreasing the holding capability of the coupling.

The slide bar has a 2-inch tolerance in reference to it lining up with the end of the coupling at the point of being secure. (Slide bar may tighten coupling when driven two inches short or two inches past the edge of the coupling.)

BURNER UNIT (See Figure 3)

The burner unit is secured to the transition tube using three hex nuts, one hex screw and lockwashers. Align the gasket with the studs, install the lockwashers, hex nuts and hex screws and tighten securely. Assemble the burner unit to the transition tube assembly after tubes are hung.

IMPORTANT: Locate the suspension hangers as indicated in Figure 3 to provide proper support of the heater.

FLUE BAFFLE

IMPORTANT: For heaters supplied with a flue baffle, the baffle must always be installed in the last standard section of radiant tube at exhaust end of heater.

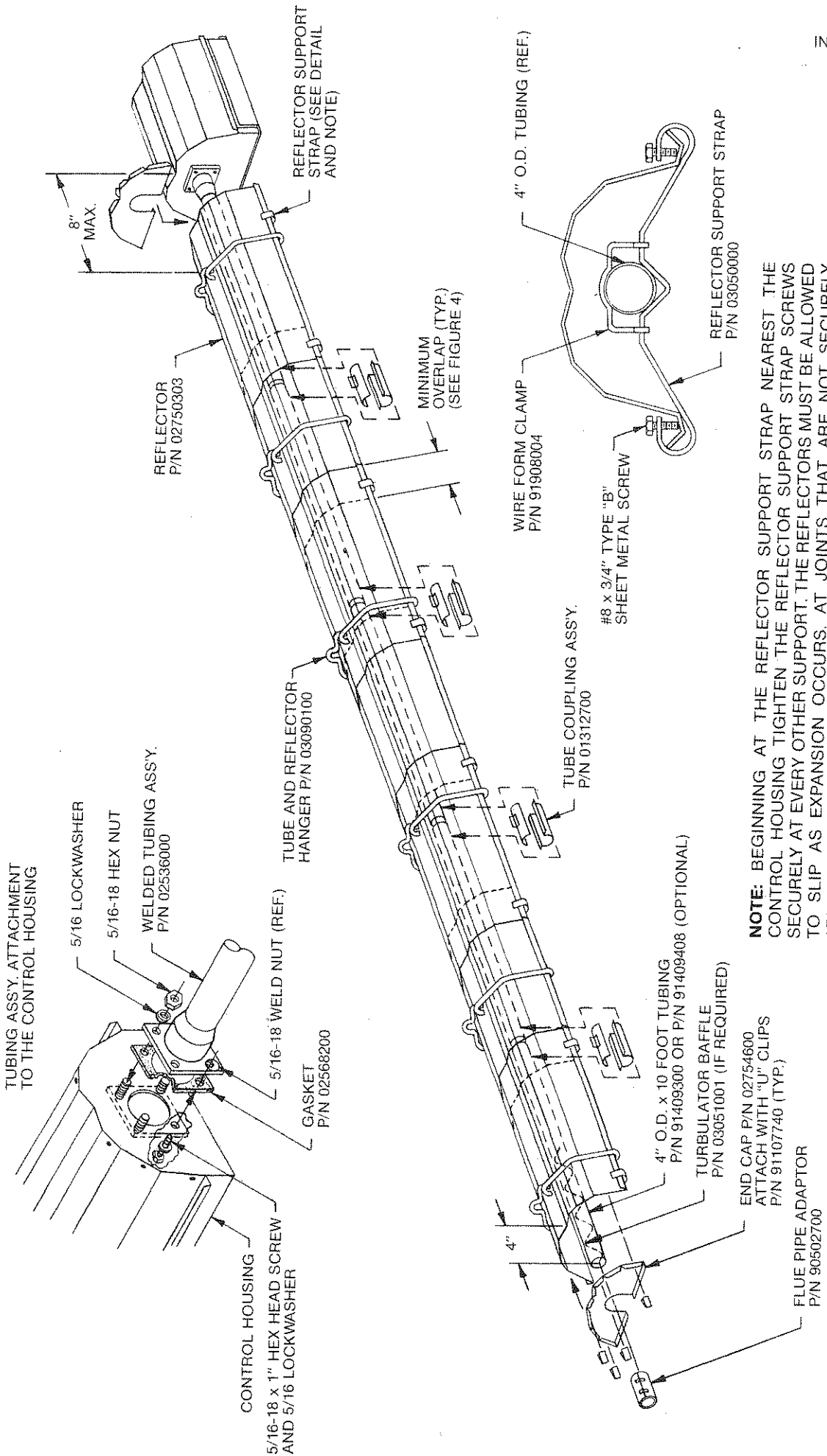
REFLECTORS

Locate the reflectors and slip joints as shown in Figure 3. For optional reflector positioning see Figure 7.

IMPORTANT: This is the part of the system that is most apparent and where a neat job marks the installer as a craftsman.

To insure a workmanlike installation:

- Locate the slip joints only as shown. Reflectors at all other joints are locked with reflector support screws.
- Reflector supports should be used as shown.
- Reflectors not supported by a hanger or reflector support should rest on a reflector that is supported. Provide an overlap to provide for thermal expansion (see Figure 4).
- Reflectors should be level side to side.
- Reflector end cap must be used at each end of the reflectors.
- Reflectors must be carefully handled to avoid fingermarks and dents.
- Fingermarks are best removed with window spray cleaner.



NOTE: BEGINNING AT THE REFLECTOR SUPPORT STRAP NEAREST THE CONTROL HOUSING TIGHTEN THE REFLECTOR SUPPORT STRAP SCREWS SECURELY AT EVERY OTHER SUPPORT. THE REFLECTORS MUST BE ALLOWED TO SLIP AS EXPANSION OCCURS. AT JOINTS THAT ARE NOT SECURELY ATTACHED THE SCREWS SHOULD BE KEPT APPROXIMATELY 1/16" FROM CONTACTING THE REFLECTOR.

TYPICAL ASSEMBLY OF A MODEL CTH1 HEATER
 Figure 3

VENTING

GENERAL REQUIREMENTS

Heater vent must be installed in accordance with specification ANSI Z223.1-1988 (NFPA No. 54). Partial information relating to this specification is provided in this section with regard to size and configurations for venting arrangements (see Figures 8, 9, 10, 11 and 12). For complete information consult ANSI Z223.1-1988 and applicable local codes.

Using the following guidelines to help insure an adequate, safe venting arrangement:

- Be sure that method selected for venting heater complies with all codes as required for each particular location.
- Exhaust end of heater will accept a four-inch flue pipe using the flue pipe adaptor provided.
- Heater may be vented to the outdoors either vertically or horizontally.
- If heater is to be vented horizontally:
 - a.) Vent must exit building not less than seven feet above grade when located adjacent to public walkways.
 - b.) Vent must terminate at least three feet above any forced air inlet located within 10 feet.
 - c.) Vent must terminate at least four feet below, four feet horizontally from or one foot above any door, window or gravity air inlet into any building.
 - d.) Vent terminal shall be located at least 12 inches from any opening through which vent gases could enter a building.
- Vent terminal opening must be beyond any combustible overhang.
- If condensation in the flue is a problem, the flue length should be shortened or insulated.
- For vent specifications:

All three (3) of the following conditions must be met.

 - a.) Maximum vent length allowed is 45 feet.
 - b.) Maximum intake length allowed is 45 feet.
 - c.) Maximum total of vent length **plus** intake length **plus** optional extension shall not exceed 65 feet.

IMPORTANT: Heaters should be placed so they will be readily accessible for maintenance.

ALTERNATE ARRANGEMENTS/OPTIONAL EQUIPMENT FOR VENTING

Alternate venting configurations and optional equipment for venting are shown in Figures 8 through 12.

For horizontal venting (see Figure 8):

- In combustible or non-combustible walls use Tjernlund VH1-4" (P/N 90502100). Follow vent manufacturer's instructions for proper installation. (Alternate vent Roberts-Gordon P/N 02537800, non-combustible wall only.)
- Four-inch O.D. flue pipe is required, 30 feet in length is recommended. Up to 45 feet maximum may be used if insulated to prevent excess condensation.
- All flue joints should be sealed using suitable product such as General Electric RTV106 or Permatex Form-a-Gasket Red High Temperature Silicone Adhesive Sealant.
- Vent terminal should be installed at a height sufficient to prevent blockage by snow.
- Building materials should be protected from degradation by flue gases.

For vertical venting (see Figure 9):

- A four-inch O.D. flue pipe, maximum 45 feet in length may be used as shown with an approved vent cap.
- An insulating thimble may be required to pass through combustible walls (check local codes).
- All flue joints should be sealed using suitable products (see recommendation for horizontal venting).

For vertical venting using a draft hood (see Figure 10):

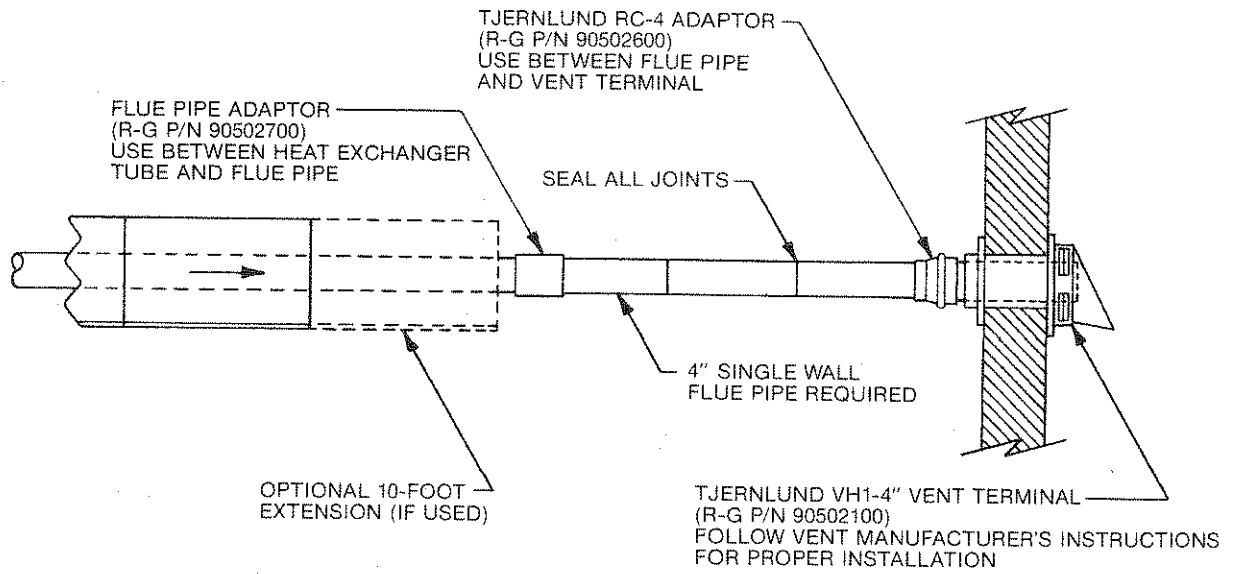
- Refer to ANSI Z223.1-1988 (NFPA No. 54) for heights and vent sizes recommended for proper venting. (Check local codes for additional information.)
- Minimum six-inch O.D. vent is recommended.

For common venting (see Figure 11):

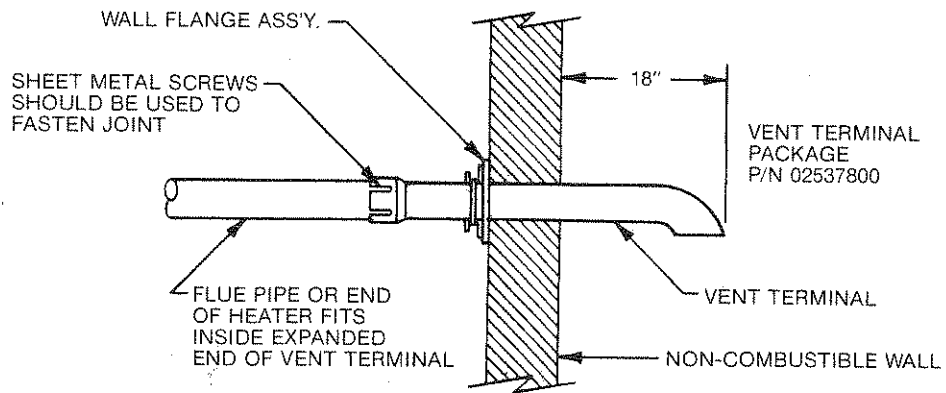
- Horizontal run to vent must never exceed 75% of the vertical height of the vent. (Refer to ANSI Z223.1-1988, NFPA No. 54 for proper vent sizes and installation.)
- Open area of common vent must equal the sum of the open area of individual flue vents connected to it (see chart on diagram).
- Use double wall vent as required (check codes).
- Heaters sharing a common vent should be controlled by the same thermostat.
- All joints must be sealed using suitable products (see recommendation for horizontal venting).

For unvented operation (see Figure 12):

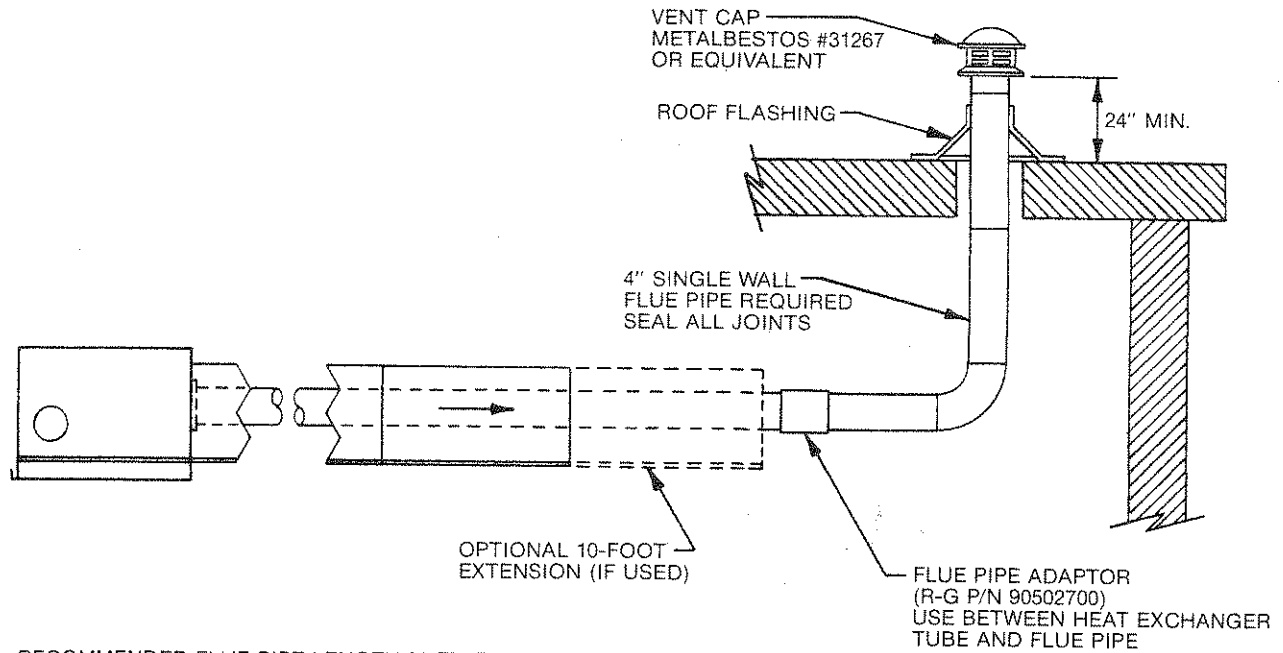
- Sufficient ventilation must be provided in the amount of 4 cfm per 1000 BTU/HR firing rate.
- Refer to ANSI Z223.1-1988 (NFPA No. 54) and local codes for additional information.
- Use of optional outside combustion air is not recommended with unvented heaters.



RECOMMENDED FLUE PIPE LENGTH 30 FEET (MINIMUM TWO FEET).
UP TO 45 FEET MAXIMUM MAY BE USED IF INSULATED IN ORDER
TO PREVENT EXCESSIVE CONDENSATION. LENGTH INCLUDES
OPTIONAL 10-FOOT EXTENSION.



HORIZONTAL VENTING
Figure 8

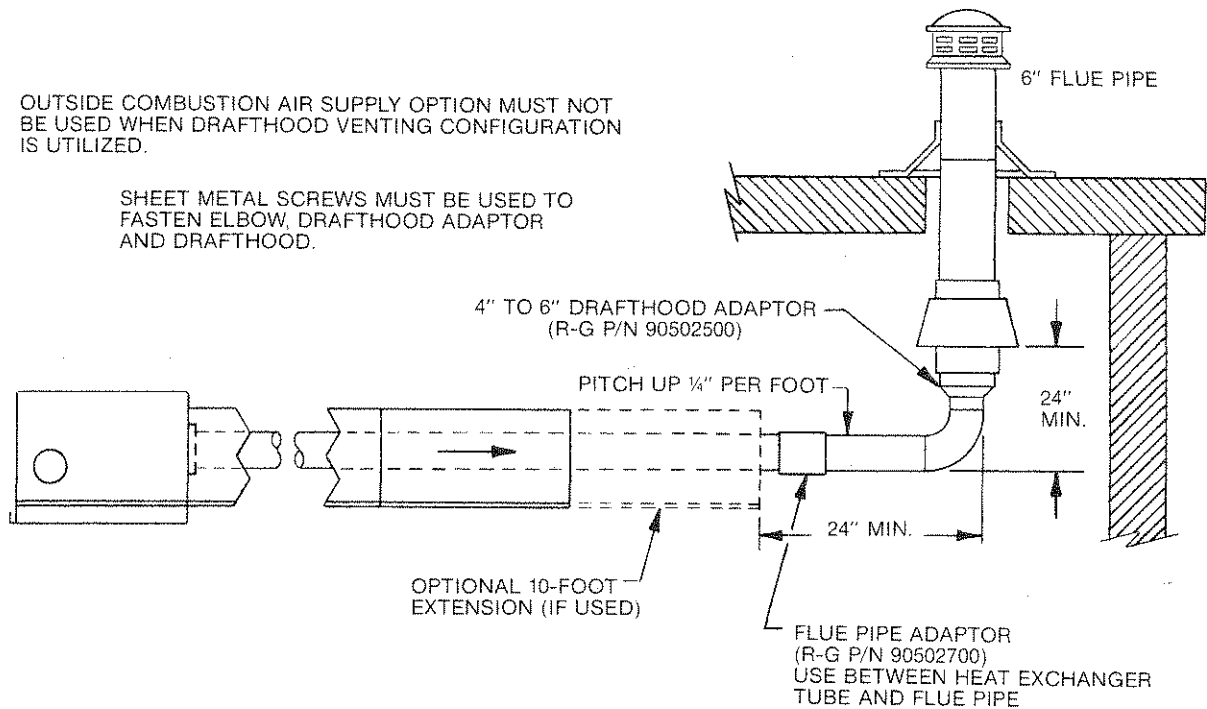


RECOMMENDED FLUE PIPE LENGTH 30 FEET (MINIMUM TWO FEET). UP TO 45 FEET MAXIMUM MAY BE USED IF INSULATED IN ORDER TO PREVENT EXCESSIVE CONDENSATION. LENGTH INCLUDES OPTIONAL 10-FOOT EXTENSION.

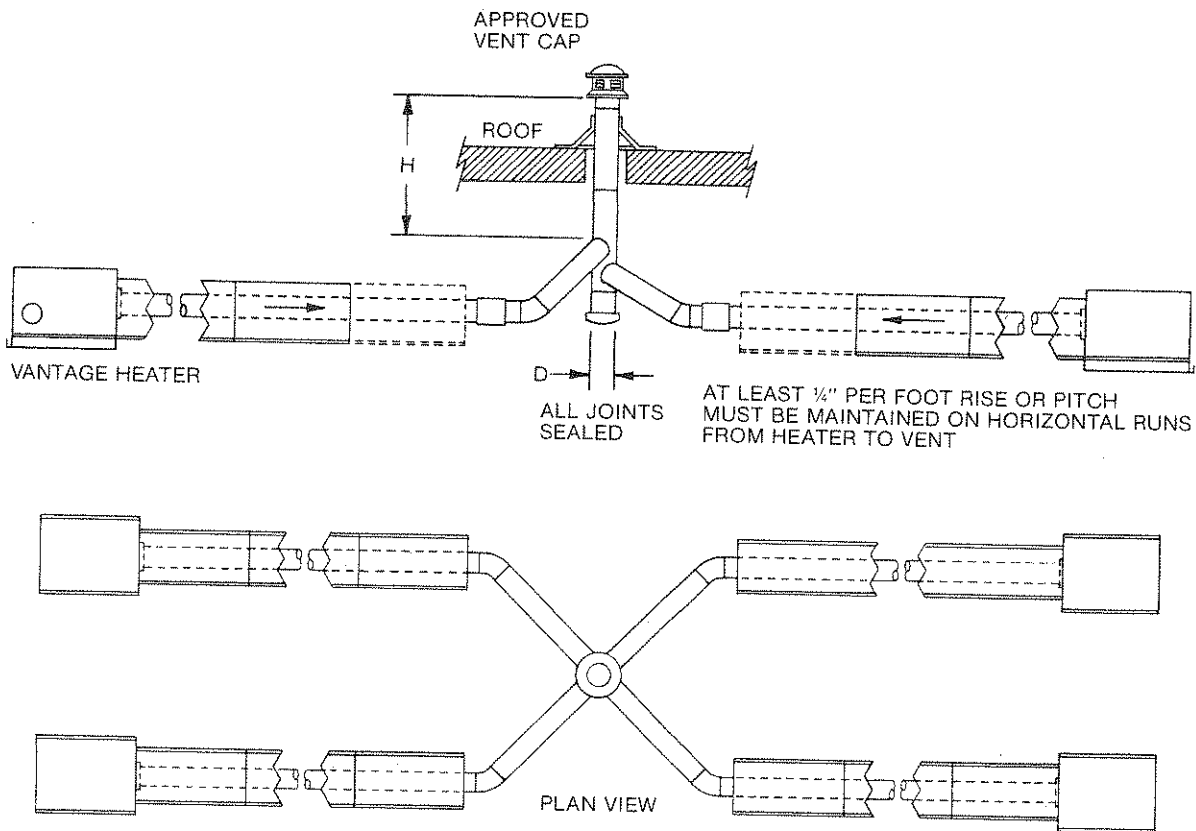
VERTICAL VENTING
Figure 9

OUTSIDE COMBUSTION AIR SUPPLY OPTION MUST NOT BE USED WHEN DRAFTHOOD VENTING CONFIGURATION IS UTILIZED.

SHEET METAL SCREWS MUST BE USED TO FASTEN ELBOW, DRAFTHOOD ADAPTOR AND DRAFTHOOD.



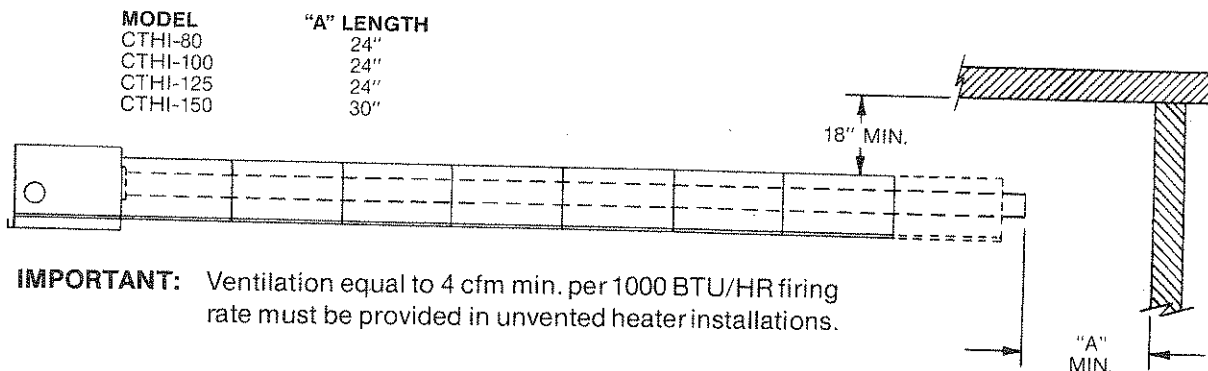
VERTICAL VENTING WITH DRAFTHOOD
Figure 10



Model Number	No. of Heaters	Stack Height "H" (Min.)		
		6'	8'	15'
CTH1-80	2	8"	7"	6"
CTH1-80	4	10"	10"	10"
CTH1-100	2	8"	8"	7"
CTH1-100	4	N/A	12"	10"
CTH1-125	2	10"	10"	8"
CTH1-125	4	N/A	12"	10"
CTH1-150	2	10"	10"	8"
CTH1-150	4	N/A	N/A	12"

- NOTES:**
1. HORIZONTAL RUN TO VENT MUST NEVER EXCEED 75% OF THE VERTICAL HEIGHT OF THE VENT. REFER TO ANSI Z223.1-1988 NFPA No. 54 FOR PROPER VENT SIZES AND INSTALLATION (SEE TABLE).
 2. HEATERS SHARING A COMMON STACK MUST BE CONTROLLED BY THE SAME THERMOSTAT.
 3. CONNECTIONS TO COMMON STACK MUST BE POSITIONED TO AVOID DIRECT OPPOSITION BETWEEN STREAMS OF COMBUSTION GASES.

COMMON VENTING
Figure 11



IMPORTANT: Ventilation equal to 4 cfm min. per 1000 BTU/HR firing rate must be provided in unvented heater installations.

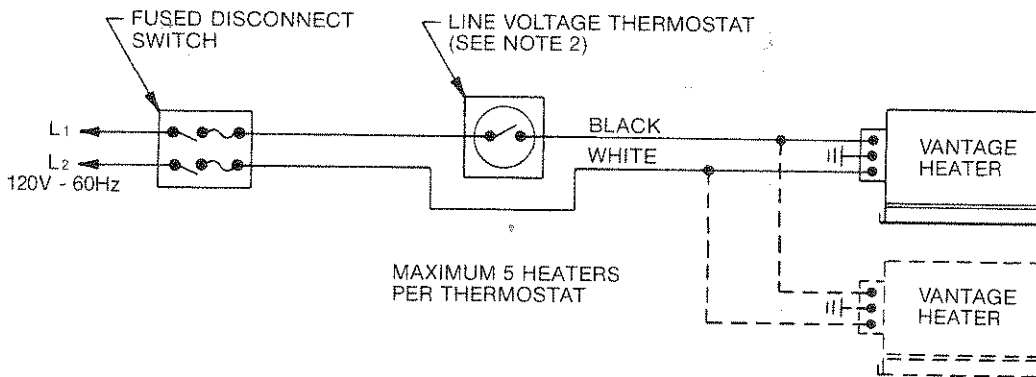
UNVENTED OPERATION
Figure 12

FIELD WIRING

Heaters are normally controlled by thermostats (see Figure 14). Line voltage thermostats are wired directly; the recommended 24-volt thermostats use a relay per Figure 15. Heaters must be grounded in accordance with National Electrical Code ANSI/NFPA 70-1987.

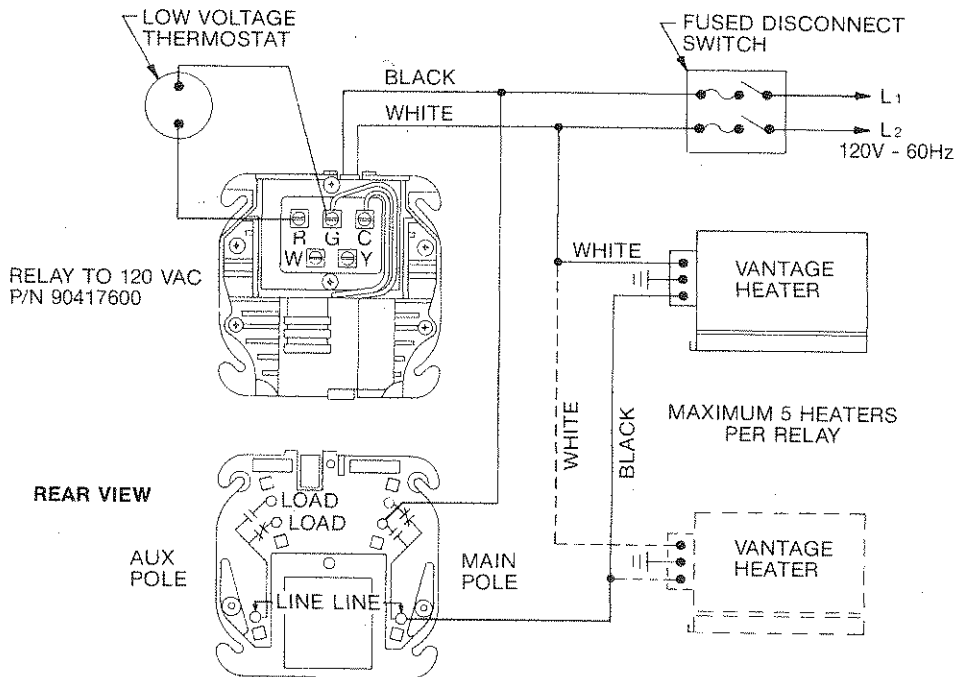
Heaters can also be controlled with a manual line voltage switch or timer switch in place of the thermostat.

- NOTES:**
1. If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.
 2. For wiring line voltage thermostat (R-G 90411300) use terminals "B" and "R" and jumper terminal "W" to "R".



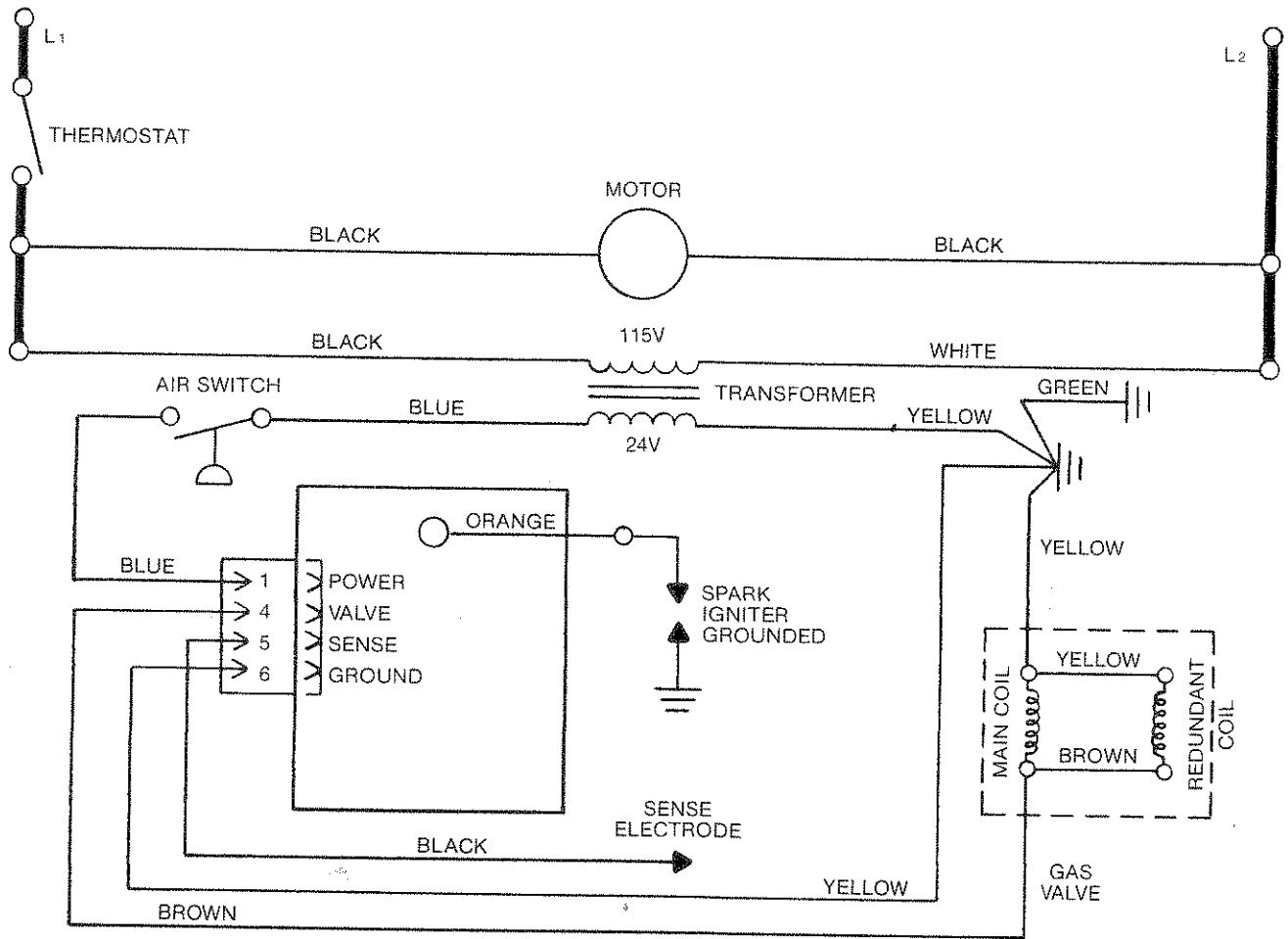
WIRING OF LINE VOLTAGE THERMOSTAT

Figure 14



WIRING OF LOW VOLTAGE THERMOSTAT AND RELAY

Figure 15



WIRING DIAGRAM
Figure 16

SERVICE INSTRUCTIONS

SEQUENCE OF OPERATION

The Vantage™ Heater is equipped with a direct spark ignition system. Operation sequence is as follows:

- Thermostat on a call for heat energizes the blower motor.
- When motor approaches nominal running RPM, the air proving pressure switch closes, energizing the control board which energizes the spark ignitor and opens the redundant gas valve.
- With normal operation as the flame is established, the spark ceases.
- If the flame is not established during the flame establishing period, the system closes the gas valve and locks out.
- If the flame is extinguished during the duty cycle, the igniter will provide one immediate retry for ignition before going into lockout.
- After lockout, control must be reset by turning down thermostat for five seconds and then raising it again to desired temperature.
- When thermostat is satisfied, all power to the unit is de-energized.

TROUBLESHOOTING

CAUTION: Before removing control housing cover for any type of service to heater, be sure that gas and electric supply to heater are turned OFF.

NO POWER TO HEATER:

1. Check to see that thermostat is calling for heat.
2. Check for blown fuse in electrical supply to heater.
3. Check for power on hot and ground leads entering heater junction box.
4. Check for loose or broken wire at heater junction box.

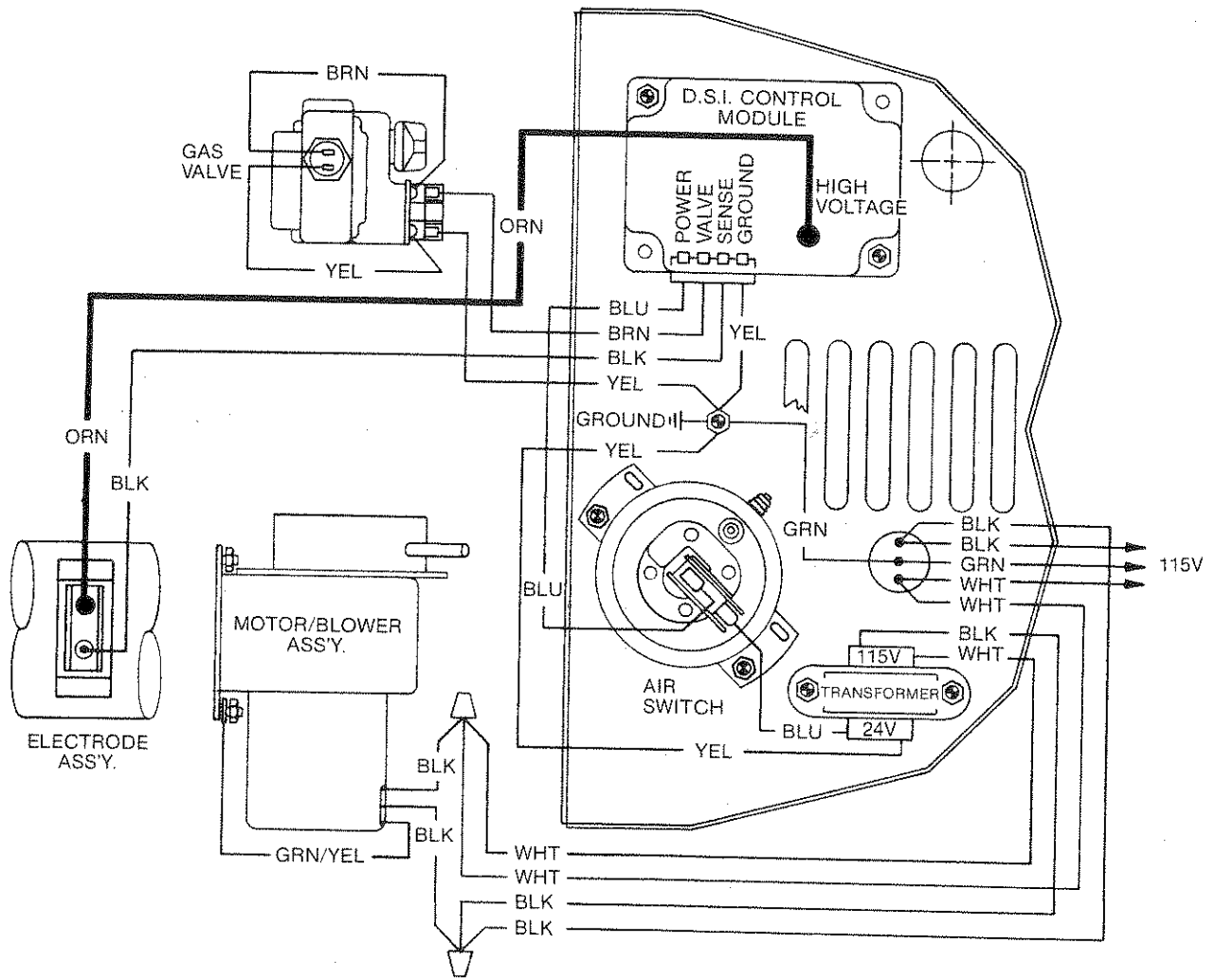
BLOWER MOTOR FAILS TO RUN:

1. Check for loose or broken wires from motor to hot and ground leads entering heater junction box.
2. Check to see if blower impeller turns freely; it may be hitting blower housing or motor shaft may be seized. Adjust to free impeller or repair or replace blower motor.

NO SPARK:

With gas to heater turned OFF, set the thermostat above room temperature. When blower motor attains running speed the air proving pressure switch energizes the spark module. The spark electrode may be observed by looking through the observation window of the burner control housing. Spark should appear as a bright blue arc across the electrodes. Spark duration is only a few seconds since main flame is not established, so recycling of the thermostat may be necessary for observation purposes. If no spark appears:

1. Check for loose or broken leads from air proving pressure switches.
2. Check for carbon bridge or broken porcelain insulator on spark electrode.
3. Check spark electrode gap; should be .125 inches.
4. Check leads from electrode for loose connections or frayed insulation.
5. Replace direct spark ignition module if defective; module is not field repairable.



- NOTES:**
1. If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.
 2. Each burner must be electrically grounded in accordance with National Electrical Code ANSI 70-1987.
 3. For low voltage thermostat and/or parallel burner operation see Wiring Diagram, Figures 14, or 15, Page 18.

INTERNAL WIRING DIAGRAM
Figure 24

NO GAS PRESENT

Set thermostat above room temperature. When blower attains running speed, air proving pressure switch energizes main gas valve. If no gas flow or flame is established:

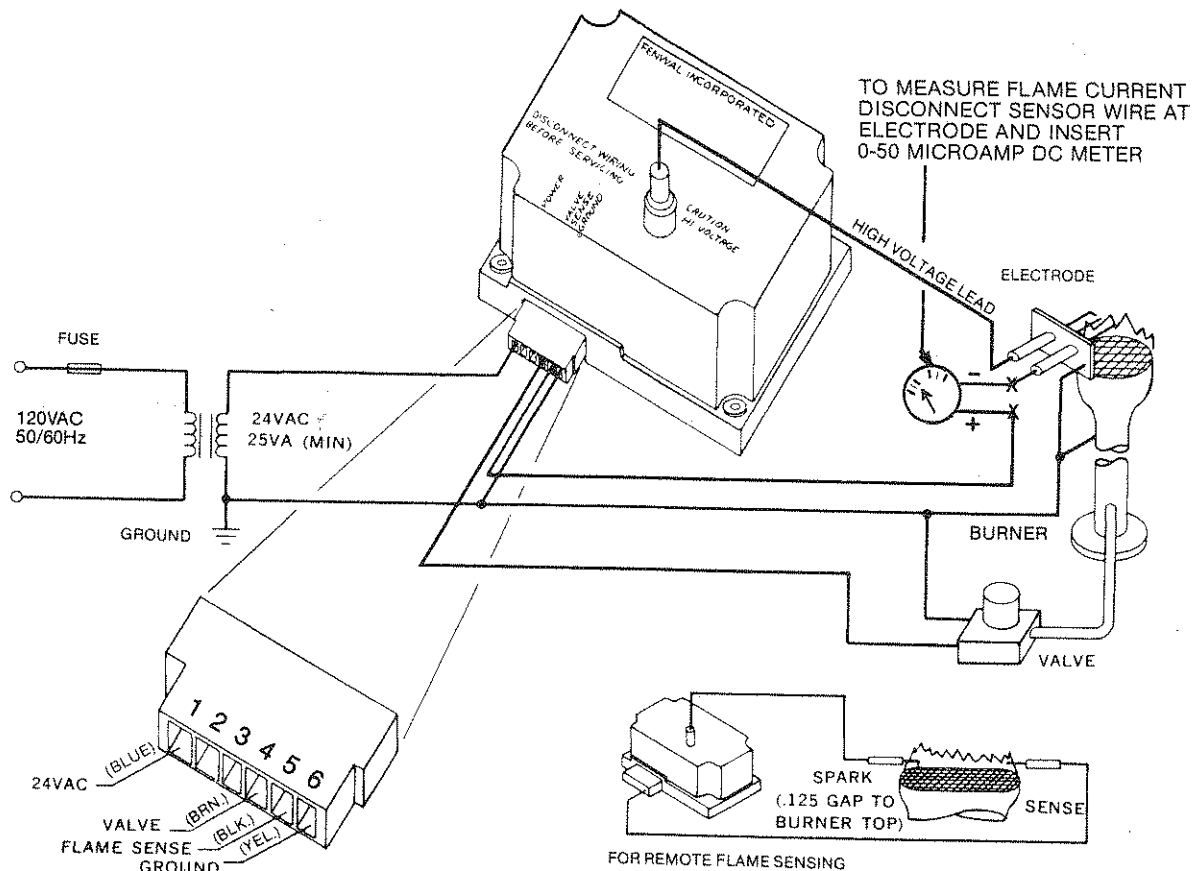
1. Check to see that manual gas supply valve to heater is ON.
2. Check to see that dial knob on redundant valve in control housing is turned to ON.
3. Check for gas pressure at 1/8" NPT Gauge tapping upstream of burner control.
4. Check for loose or broken wire leads from air proving pressure switches.
5. Check for loose or broken wire leads from gas valve to circuit board.
6. Replace defective gas valve.
7. Replace direct spark ignition module. Module is not field repairable.

FENWAL CONTROL (see Figure 25)

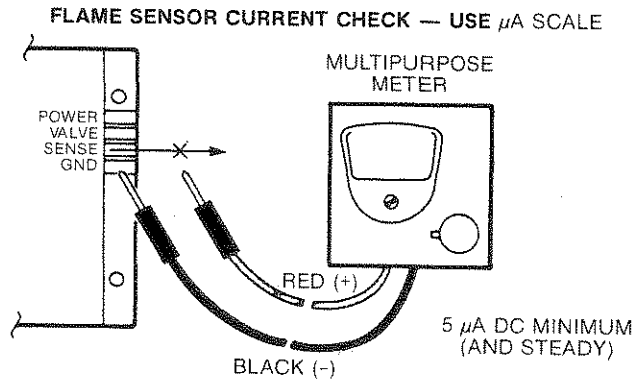
Flame current is the current which passes through the flame from the sensor to ground to complete the primary safety circuit. The minimum flame current necessary to keep the ignitor from lockout is five microamps. To measure flame current, DISCONNECT INPUT VOLTAGE then remove low voltage sensing lead wire from electrode terminal and insert a 0-50 DC microamp meter in a series with the sensor probe and sensor wire. Meter reading should be 5 microamps or higher (see Figure 25).

If meter reads below "0" on scale, the leads are reversed. Disconnect power and reconnect leads for proper polarity.

If the flame current reading is less than 5 microamps, reposition the electrode in the flame to get a higher reading.



FENWAL CONTROL
Figure 25



FLAME CURRENT MEASUREMENT

Figure 26

MAINTENANCE

For best performance, maintenance procedures should be performed before each heating season.

- Be sure gas and electric supply to heater are turned OFF before performing any service or maintenance on heater.
- Open control housing cover.
- Check condition of blower scroll and motor. Dirt and dust may be blown out with compressed air or a vacuum cleaner may be used.
- Remove burner and check its condition (see below). Clean or replace as necessary.
- Make visual check of electrode. Replace if there is excessive carbon residue, erosion of electrodes, or other defects. Gap should be .125 inches.
- Check to see that burner observation window is clean and free of cracks or holes. Clean or replace as necessary.
- Check inside of firing tube with flashlight. If carbon or scale are present, scrape out deposits with wire brush on rod or metal plate attached to wooden pole.
- Check firing tube inside and out for holes or cracks. Replace firing tube if any cracks are found.
- Check flue pipe for soot or dirt or any obstruction to the outdoors. After cleaning as necessary, reattach flue pipe.
- Outside surfaces of heater may be cleaned with damp cloth.
- Check for leaks with soap solution on any pipe joints that were disconnected during maintenance procedure before putting heater back in service.
- Check performance of heater and visually observe flame for proper flame characteristics.
- A qualified service agency should be contacted for service other than routine maintenance.

PROCEDURE TO REMOVE BURNER (see Figures 27 and 28)

- Remove gas connector from heater.
- Open housing cover.
- Disconnect wires between blower, valve, igniter/sensor and front component partition.
- Remove (6) screws holding burner housing top to burner tube partition (Figure 28, Item *A).
- Remove partition with control components and housing from burner; this exposes the blower and burner.
- Remove blower from burner tube.
- Remove burner.
- To reassemble, reverse above steps.