GORDON-RAY

VENTED INFRARED
RADIANT TUBE GAS HEATER

INSTALLATION INSTRUCTIONS
FOR

MODEL RTH-150B HEATER

Roberts Gordon

A LEADER IN HEATING EQUIPMENT FOR OVER 50 YEARS

Subsidiary of A.J. Industries Inc.

BUFFALO, N.Y. 14240
Form No. F2094E 12/88

In Canada
GRIMSBY, ONTARIO

GORDON-RAY SPECIFICATIONS
INSTALLATION, OPERATION, SERVICE & SPARE PARTS

TABLE OF CONTENTS

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.

INTRODUCTION

UNPACKING THE HEATER

Remove the heater carefully from the shipping carton so as not to damage any components. The unit is inspected and tested at the factory before shipment and is delivered to the carrier in good condition. Check the heater for possible damage in shipment. In case of damage, the carrier should be contacted immediately.

GENERAL INFORMATION

It is important that these instructions and all applicable specifications be read in their entirety before proceeding.

This heater is intended for heating non-residential indoor spaces. Installation of this heater must comply with local codes and recommendations of the local gas company, and the National Fuel Gas Code, ANSI Z223.1-1988 (same as Bulletin No. 54). Units must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA 70-1987. Installation in (1) aircraft hangars must be in accordance with the Standard for Aircraft Hangars, ANSI/NFPA 409-1985 and (2) garages in accordance with the Standard for Parking Structures, NFPA 88A-1985 or the Standard for Repair Garages, NFPA 88B-1985.

For locations where there is the possibility of exposure to combustible airborne materials or vapor, consult the authorities having local jurisdiction to obtain approval for proposed installation. The authorities with local jurisdiction are usually the Fire Marshal and fire insurance carrier.

All heaters and associated gas piping should be installed in accordance with applicable specifications and this installation made only by firms (or individuals) well qualified in this type of work. Local authorities such as Building Inspectors or Fire Marshals should be consulted for guidance in this matter.

GENERAL SPECIFICATIONS

General specifications for the RTH-150B heater are as follows:

RATING:

Natural Gas..... 150,000 BTU/Hr. Input
L.P. Gas ..... 140,000 BTU/Hr. Input

GAS INLET PRESSURE

Gas	*Minimum	Maximum
Natural	4.5" W.C.	14.0" W.C.
L.P.	11.0" W.C.	14.0" W.C.

*For purpose of input adjustment.

GAS PRESSURE AT MANIFOLD:

Natural Gas..... 3.5" W.C.
L.P. Gas ..... 10.5" W.C.
Gas Connection Size ..... 1/2" NPT

ELECTRICAL RATING:

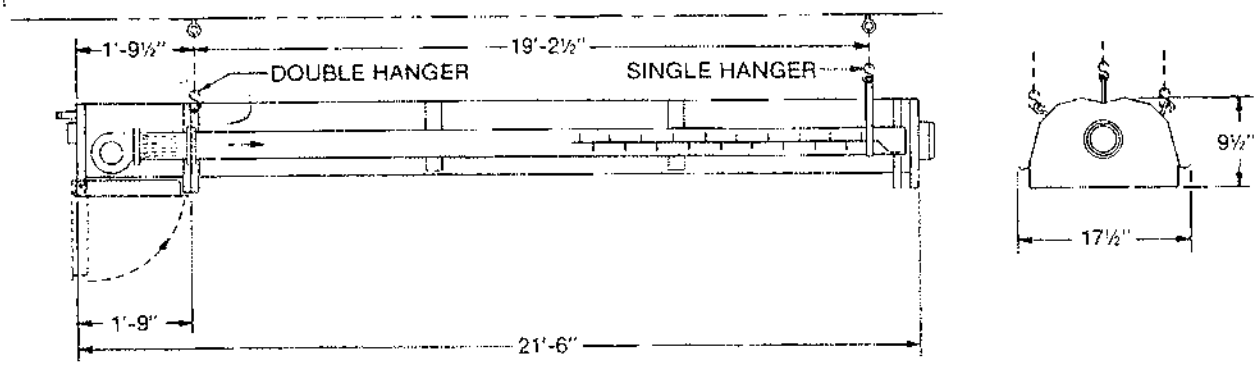
120V - 60Hz - 2.6 AMP
Flue Connection Size ..... 6" O.D.
Weight of Heater ..... 200 lbs.

DIMENSIONS

Refer to Figure 1 of these instructions for dimensional information.

STANDARD EQUIPMENT INCLUDES complete heater assembled, consisting of: Cast-iron burner, coated steel combustion chamber, heat exchanger, fully automatic controls, motor with thermal overload switch, balanced air rotor, five inch O.D. radiant tube with stainless steel air pre-heater and baffles; gas shut-off cock; aluminum reflector and built-in drafthood.

OPTIONAL: Thermostats, Reflector Side Extension.



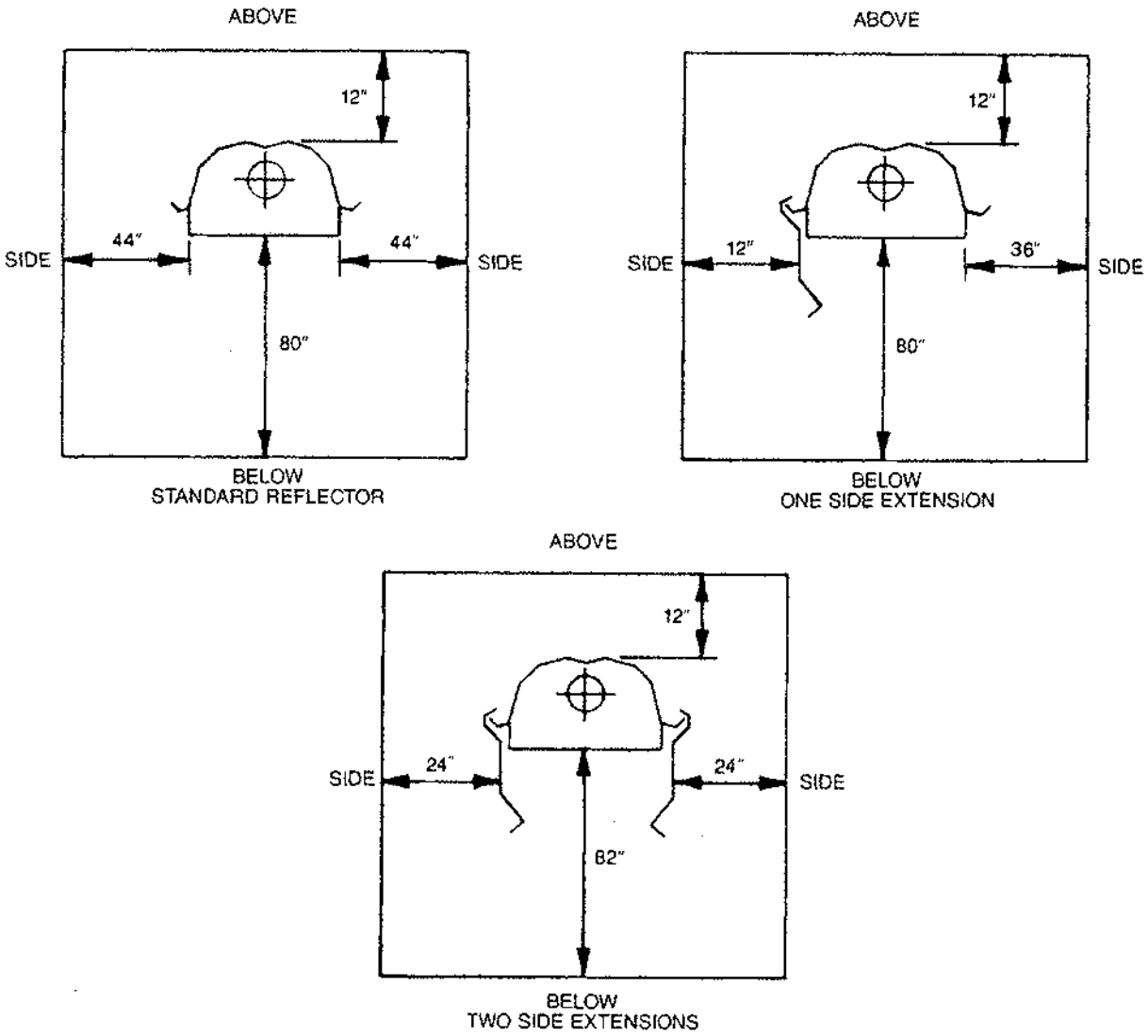
MODEL RTH-150B DIMENSIONS
Figure 1

CLEARANCE TO COMBUSTIBLES (From Heater Surfaces)

Caution must be used when installing the heater near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc. Figure 2 gives MINIMUM clearances.

WARNING: Minimum clearance from heater must be maintained from vehicles parked below heater.

NOTE: In all situations, clearances to combustibles must be maintained. Signs should be posted in storage areas to specify MAXIMUM stacking height to maintain required clearance to combustibles.



MODEL RTH-150B
CLEARANCE TO COMBUSTIBLES WITH
STANDARD REFLECTOR AND OPTIONAL EQUIPMENT
Figure 2

INSTALLATION

IN AIRCRAFT HANGARS

Heaters must be installed in accordance with specification ANSI/NFPA 409-1985 and with special consideration for the following:

1. Heaters in aircraft storage or service areas shall be installed at a height of at least 10 feet above the upper surface of wings or engine enclosures of the highest aircraft which may be housed in the hangar. (This should be measured from the bottom of the heater to the wing or engine enclosure, whichever is highest from the floor.)
2. In other sections of aircraft hangars, such as shops or offices communicating with airplane storage or servicing area, heaters shall be installed in accordance with their listings and not less than eight feet above the floor.
3. Heaters installed in aircraft hangars shall be so located 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.

IN PUBLIC GARAGES

In accordance with the standard for parking structures NFPA 88A-1985 or the standard for repair garages NFPA 88B-1985.

1. Heaters shall be installed in accordance with their listings and not less than eight feet above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
2. When installed over hoists, clearance to combustible material must be maintained from top of vehicle on hoist or in elevated position.
3. Clearance between the heater and its vent and adjacent combustible material (which is part of the building or its contents) shall be maintained to conform with the standard for Installation of Gas Appliances and Gas Piping (NFPA No. 54 ANSI Z223.1-1988).

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

INSTALLING THE HEATER

IMPORTANT: The type of gas appearing on the heater nameplate must be the type of gas used. Read all accompanying literature carefully before proceeding with installation. Allow for adequate clearances around air openings in heater, clearances to combustible materials, provide for accessibility for service, combustion and ventilating air supply as specified in ANSI Z223.1 National Fuel Gas Code.

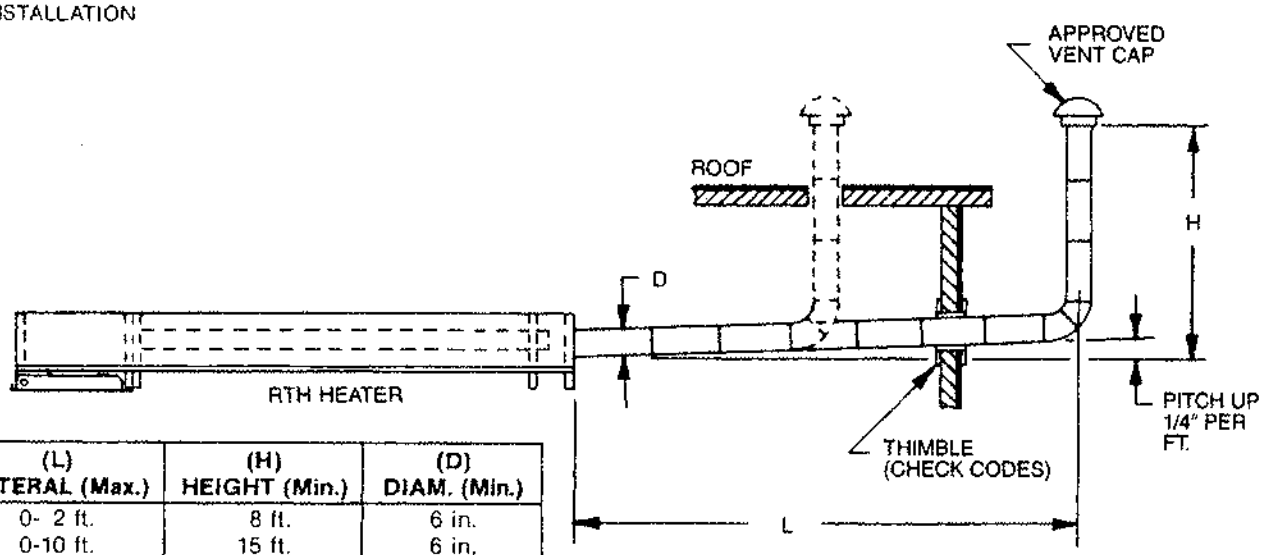
HANGING THE HEATER

Suspension straps and "S" hooks provided with the heater should be used as the only suspension points. Chain should be used to support the unit between the ceiling and suspension straps provided. Chain should have a load rating of at least 400 lbs. at each suspension point. For instructions on mounting height and locations of heaters, refer to installation plans or supplier of equipment.

VENTING

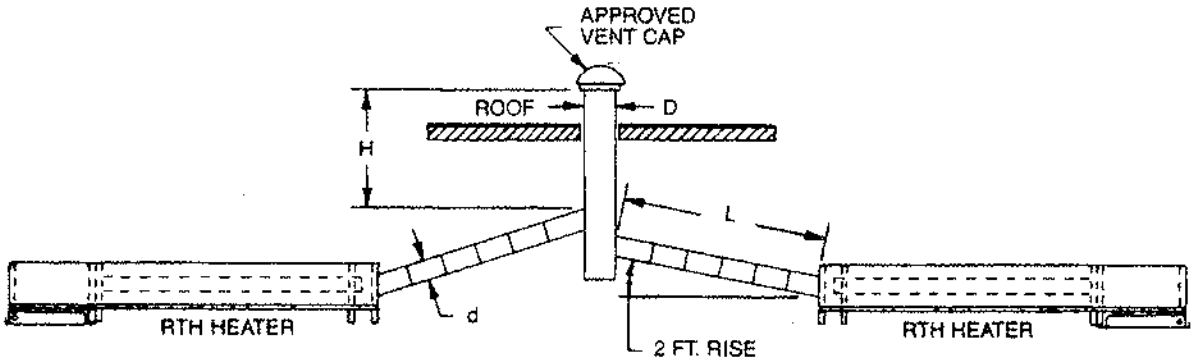
The venting must be installed in accordance with Specification ANSI Z223.1 (NFPA No. 54) National Fuel Gas Code. Partial information relating to this Specification is provided in this section with regard to size and configurations for venting arrangements (see following tables and diagrams). However, it is the responsibility of the installer to make the installation in strict accordance with National Fuel Gas Code ANSI Z223.1 to provide assurance of proper and safe operation.

RTH heaters are designed for outdoor venting. For best results RTH heaters should be vented individually or in groups of heaters with a common vent and controlled by a common thermostat. This reduces condensation and provides a stronger natural draft. The use of vent caps and positioning of the top of the vent with respect to roof structure should be in accordance with ANSI Z223.1. For other situations not covered here, the installer must consult ANSI Z223.1 or other sources to obtain the necessary information.



(L) LATERAL (Max.)	(H) HEIGHT (Min.)	(D) DIAM. (Min.)
0- 2 ft.	8 ft.	6 in.
0-10 ft.	15 ft.	6 in.
0- 5 ft.	6 ft.	7 in.
0-10 ft.	8 ft.	7 in.
0-15 ft.	10 ft.	7 in.

INDIVIDUAL VENTING
Figure 3



No. OF HEATERS	(D) (Minimum)	(H) (Minimum)
2	10 in.	6 ft.
3	10 in.	15 ft.
4	12 in.	15 ft.
5	12 in.	20 ft.

(L) CONNECTOR Maximum Length	(d) CONNECTOR Diameter Required
0- 8 ft.	7 in. min.
0- 9 ft.	7 in. min.
0-10 ft.	7 in. min.

MULTIPLE VENTING
(Vent connectors into a common stack)
Figure 4

POWER VENTING

Power venting should be used if conditions cannot be met for sizes and configuration as described herein, or if the heater is located in an area of negative pressure with respect to the point of discharge of flue products. For best results, all heaters connected to a common powered vent should meet both of the following conditions:

1. Be controlled by a single thermostat.
2. Be wired with an interlock circuit to preclude firing unless the power vent is operating. See Field Wiring Diagram (Figures 7 and 9).

A maximum of two (2) Model RTH-150B Heaters can be vented per power ventor R.G. P/N 90707500. This is for a distance up to 100 feet of equivalent length and a minimum duct diameter of six inches. The equivalent length is computed as actual length of straight sections plus 10 feet for 90 degree elbows, five feet for 45 degree elbows and 10 feet for Briedert cap or equivalent.

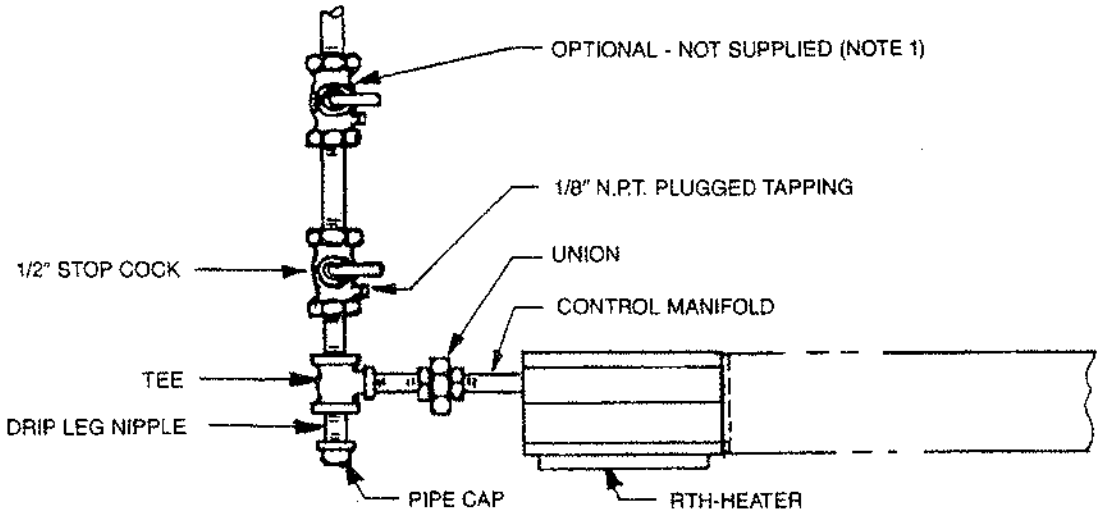
GAS PIPING

1. Check meter to be sure it is large enough to handle all the gas appliances on the line, including this heater. If necessary, request gas company to install a larger meter.
2. The gas line which feeds the heater(s) must be large enough to supply the required gas with a maximum pressure drop of 0.5 inches water column (w.c.). If there is any question, check with the gas company. Use the following capacity table as a guide:

Pipe Capacity @ 150 Cu. Ft./Hr. — Specific Gravity 0.6
Pressure Drop — 0.5 Inches Water Column

PIPE SIZE	LENGTH OF STRAIGHT PIPE-FEET
¾"	84
1"	160
1¼"	325

3. All pipe should be properly supported by using suitable pipe hanging materials.
4. Wrought iron or wrought steel pipe and malleable iron fittings are recommended. All pipe fittings should be new and free from defects.
5. For L.P. Gases, see your L.P. Dealer for details on pipe or tubing sizes and general information on handling Liquefied Petroleum gases.
6. Ends of pipes and tubing should be carefully reamed to remove obstructions or burrs.
7. Use a special compound in making all pipe connections. Compound should be of a type that is suitable for L.P. Gas.
8. Install a drip leg ahead of the heater to prevent foreign matter and moisture from entering the heater controls.
9. Provide a 1/8-inch N.P.T. plugged tapping immediately upstream of the gas supply connection to the heater, accessible for test gage connection.



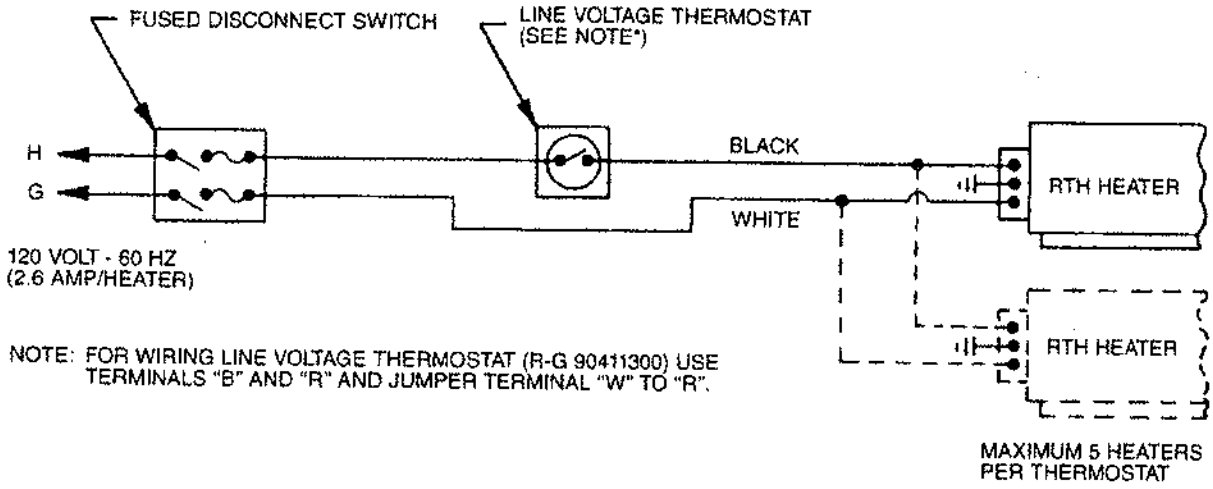
NOTE (1) HIGH PRESSURE STOP COCK AS SUPPLIED BY INSTALLER IF REQUIRED.

TYPICAL GAS PIPING ARRANGEMENT
Figure 5

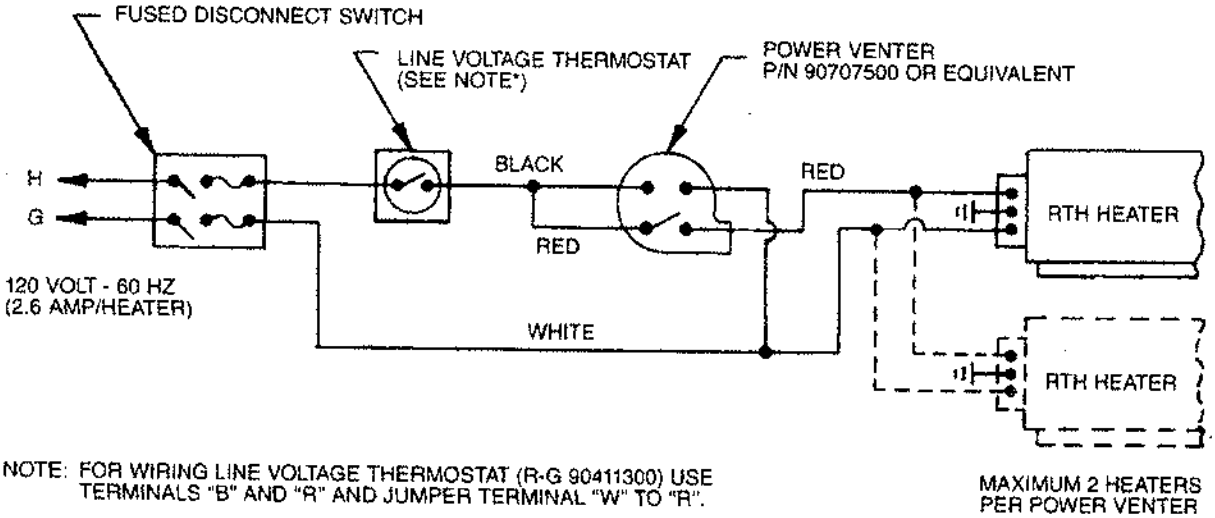
FIELD WIRING

Heaters are normally controlled by thermostats (see Figures 6 and 7). Line voltage thermostats are wired directly; the recommended 24 volt thermostats use a relay per Figures 8 and 9. 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 times switch in place of the thermostat.

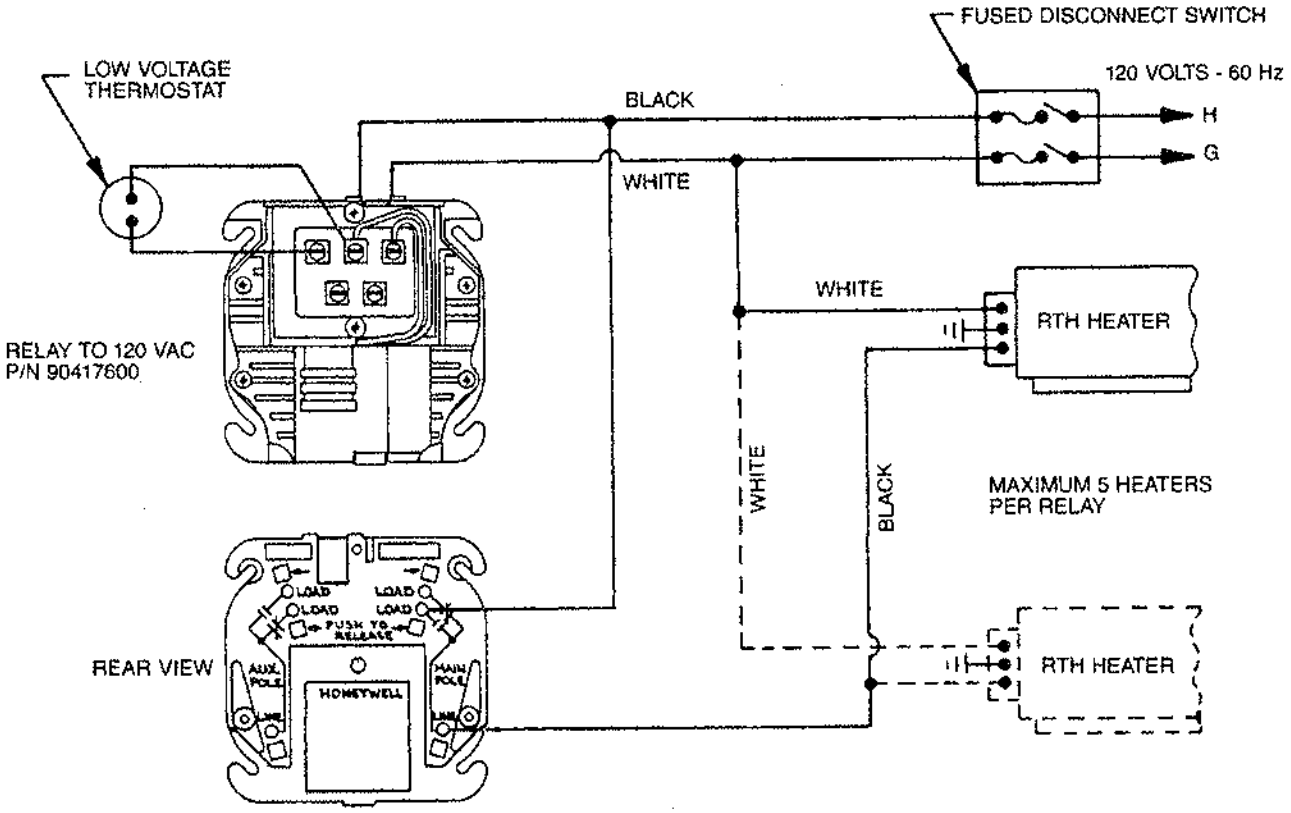
See Figure 11 for internal wiring of the heater.



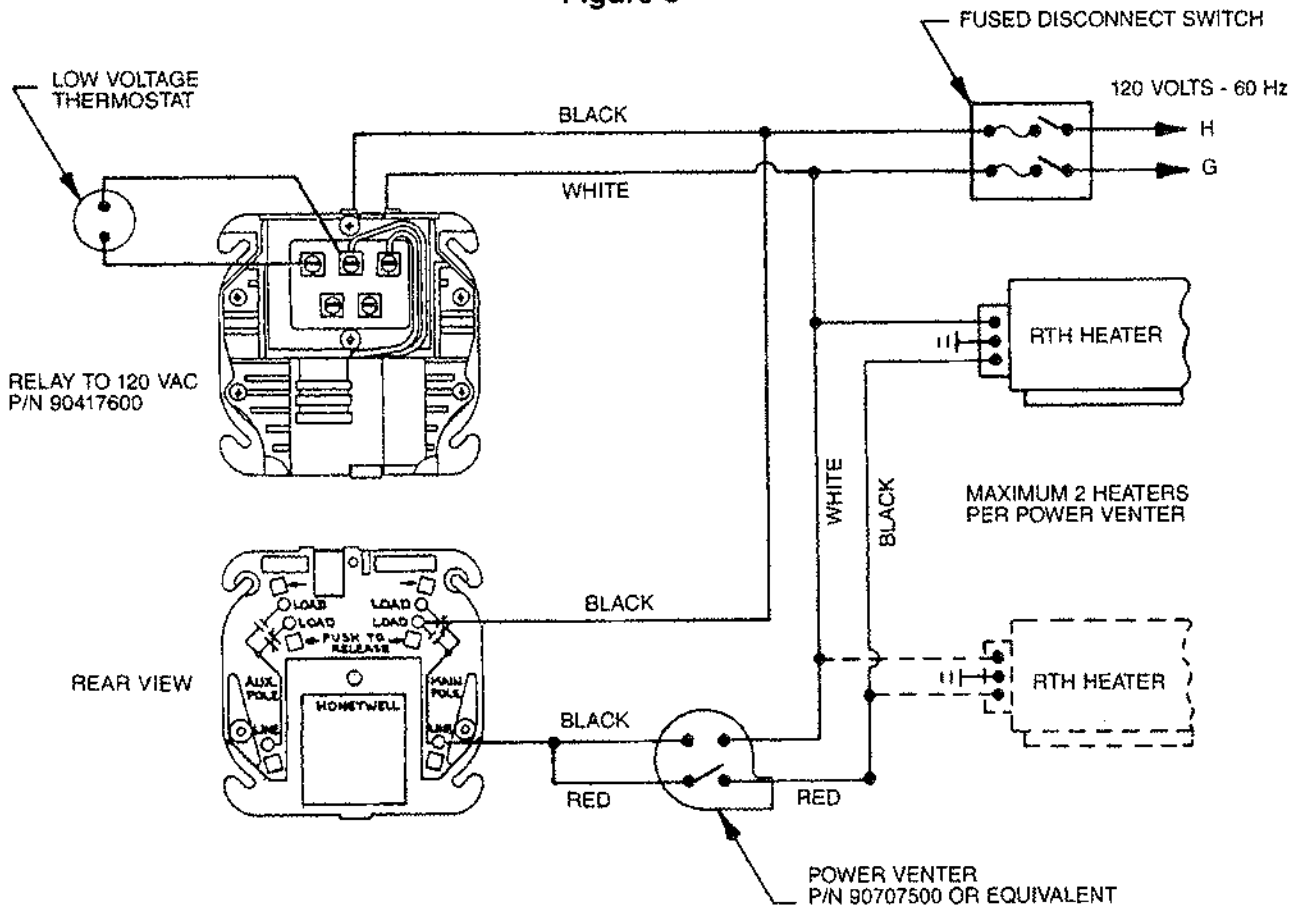
WIRING OF LINE VOLTAGE THERMOSTAT
Figure 6



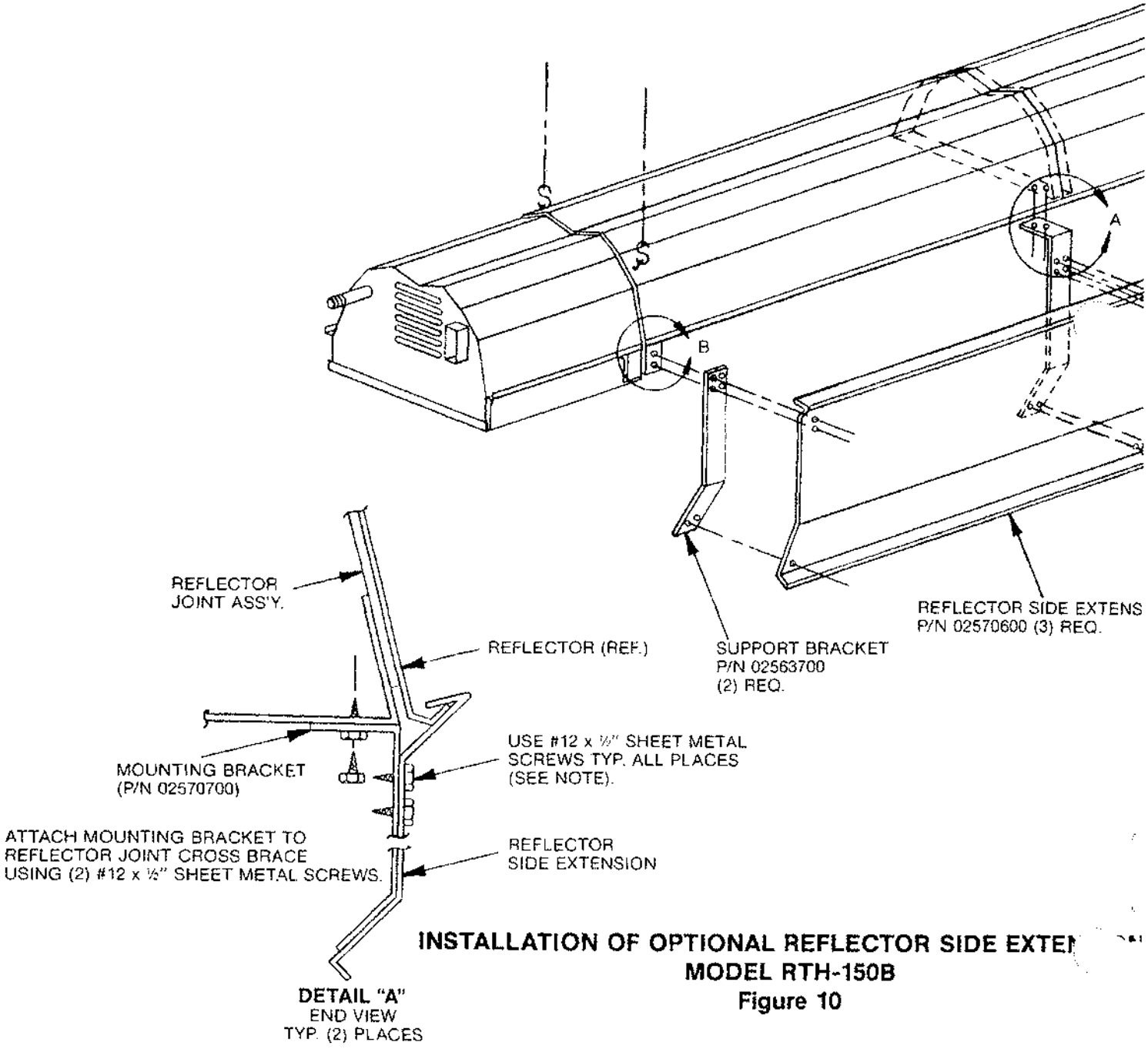
WIRING OF LINE VOLTAGE THERMOSTAT WITH POWER VENTING
Figure 7



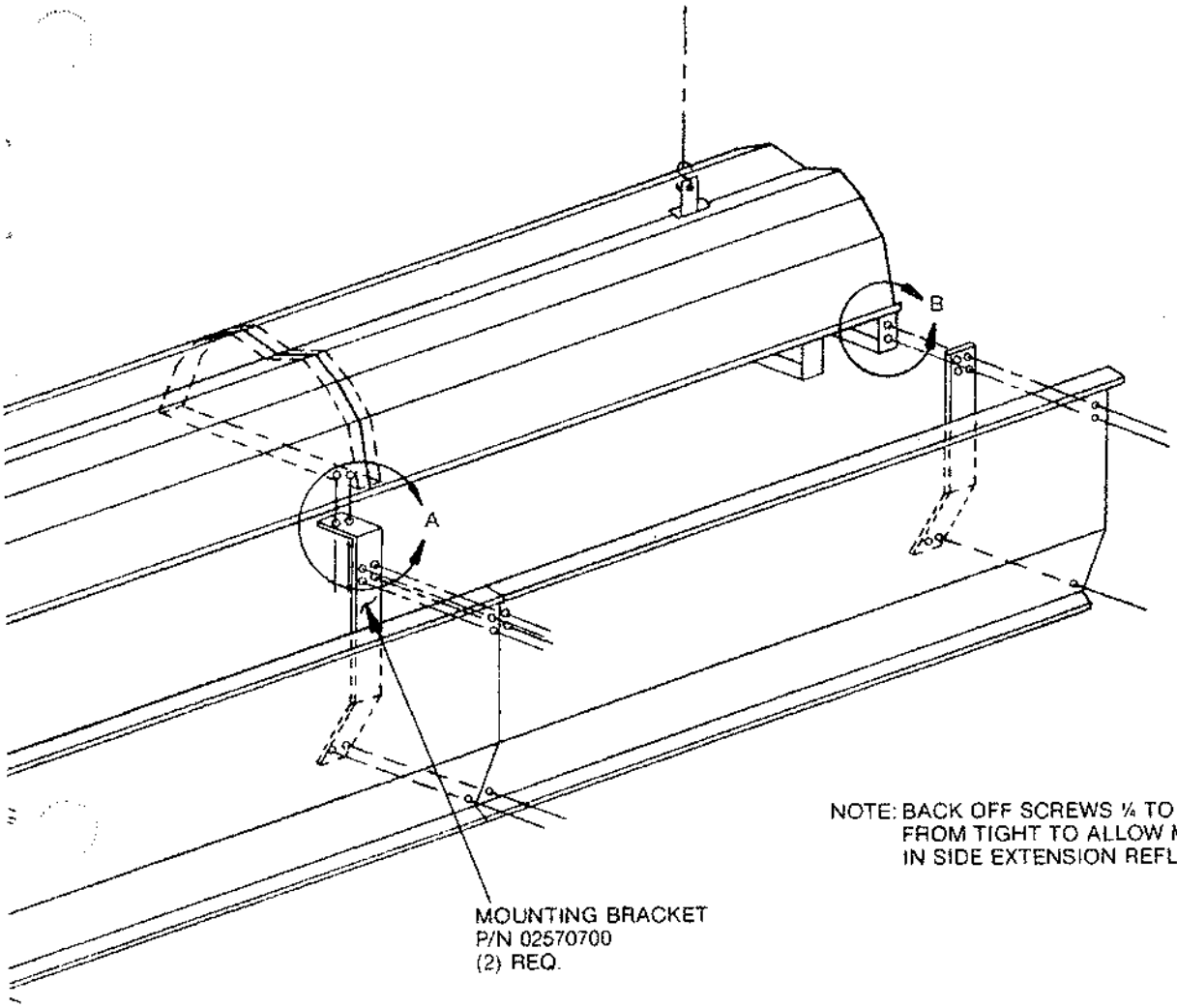
WIRING OF LOW VOLTAGE THERMOSTAT AND RELAY
Figure 8

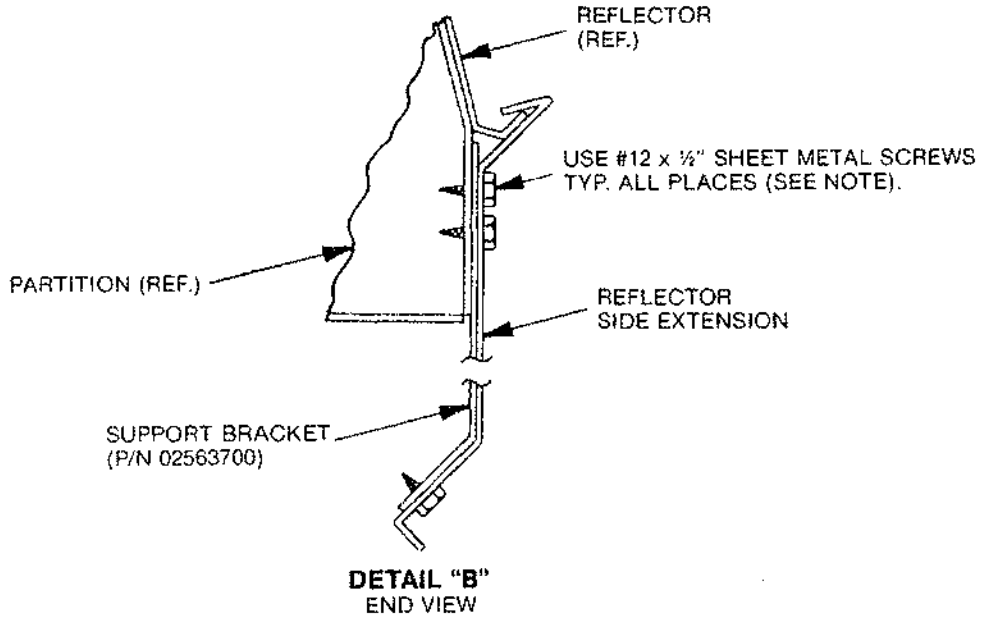


WIRING OF LOW VOLTAGE THERMOSTAT AND RELAY WITH POWER VENTING
Figure 9



INSTALLATION OF OPTIONAL REFLECTOR SIDE EXTEN
MODEL RTH-150B
Figure 10





DETAIL "B"
END VIEW

IMPORTANT: In all cases clearance to combustibles must be maintained. See Clearance to Combustibles Chart (Figure 2) of these instructions.

SERVICE INSTRUCTIONS

MODEL RTH-150B D.S.I. CONTROL

SEQUENCE OF OPERATION

The RTH Gordon-Ray Heater is equipped with a gas direct spark ignition system. This is how it works:

1. Thermostat on a call for heat energizes the blower motor and air proving pressure switch.
2. 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.
3. With normal operation as the flame is established, the spark ceases.
4. If the flame is not established during the flame establishing period, the system closes the gas valve and locks out.
5. If flame is extinguished during the duty cycle, the ignitor will provide one immediate retry for ignition before going into lockout.
6. After lockout, control must be reset by turning down thermostat for five seconds and then raising it again to desired temperature.
7. When thermostat is satisfied, all power to the unit is de-energized.

SERVICE PROCEDURES

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 blower 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 switch.
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.

NO GAS PRESENT

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

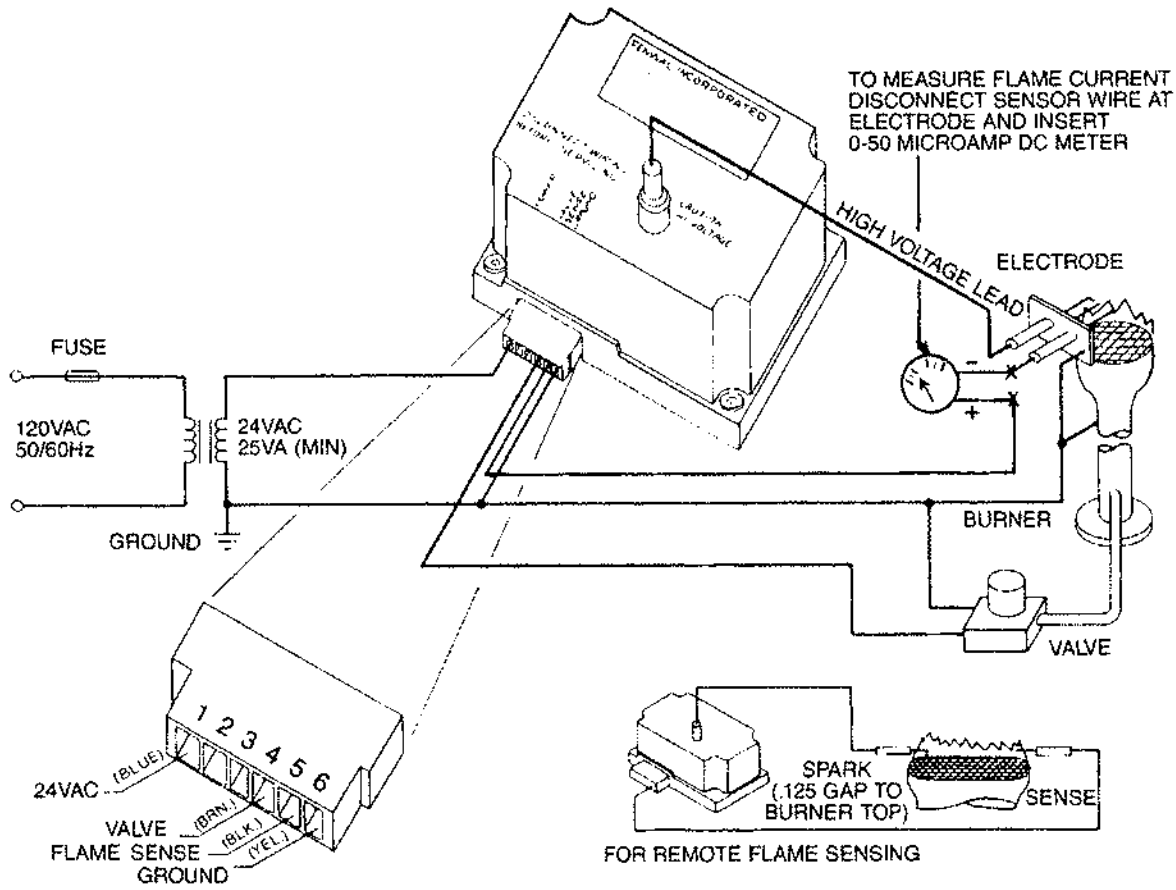
1. **Check** — to see that manual gas supply valve to heater is ON.
2. **Check** — to see that dial knob on redundant valve in control housing is turned to ON.
3. **Check** — for gas pressure at 1/8" N.P.T. Gauge tapping upstream of burner control.
4. **Check** — for loose or broken leads from air proving pressure switch.
5. **Check** -- for loose or broken wire leads from gas valve to circuit board.
6. **Replace** defective gas valve.
7. **Replace** circuit board. Board is not field repairable.

FENWAL CONTROL

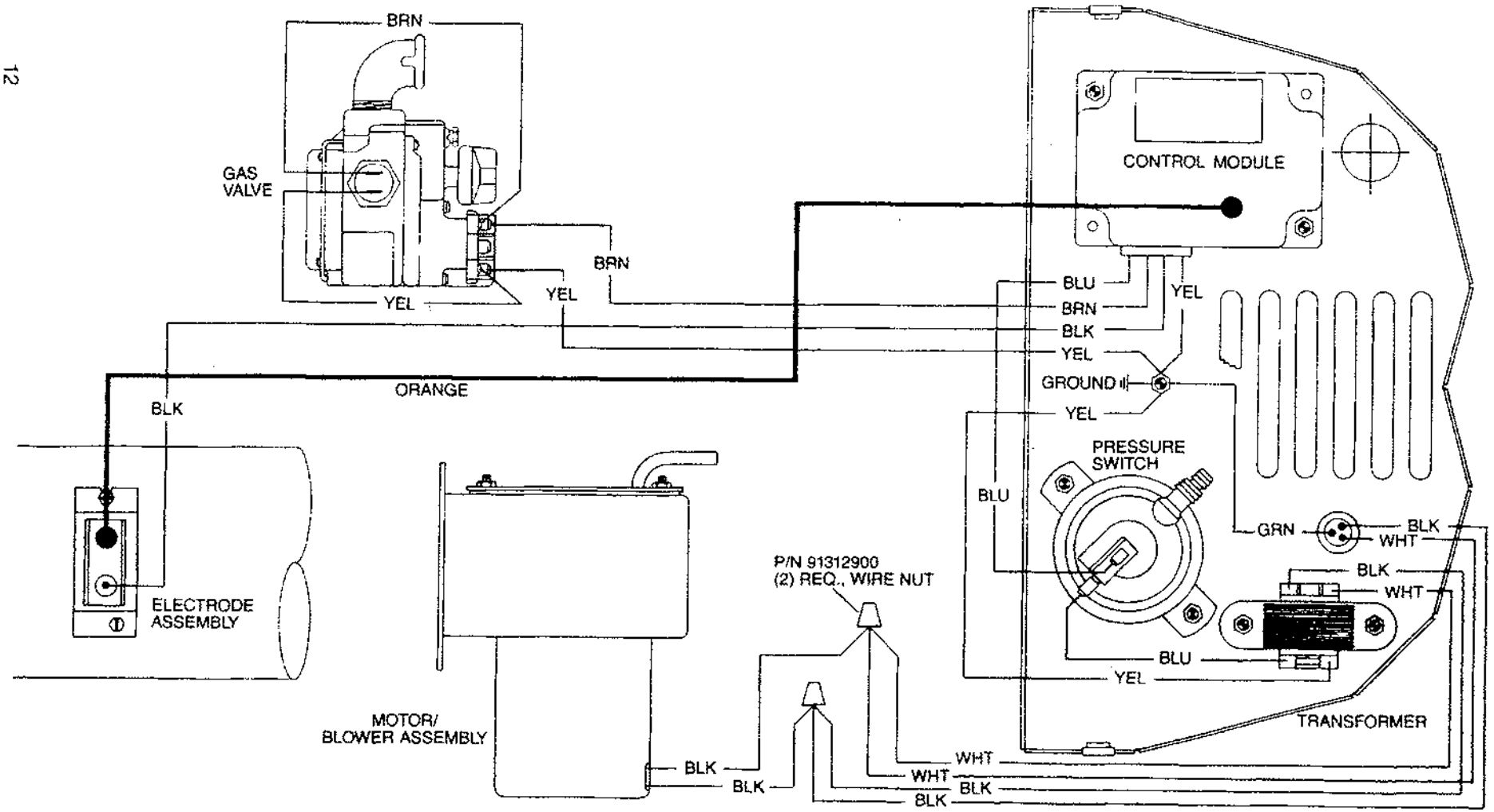
Flame current is the current which passes through the flame from the sensor to ground to complete the primary safety circuit. The minimum flame current necessary to keep the ignitor from lockout is five microamps. To measure flame current, DISCONNECT INPUT VOLTAGE then remove low voltage sensing lead wire from electrode terminal and insert a 0-50 DC microamp meter in a series with the sensor probe and sensor wire (see Figure 11). Meter reading should be 5 microamps or higher.

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.



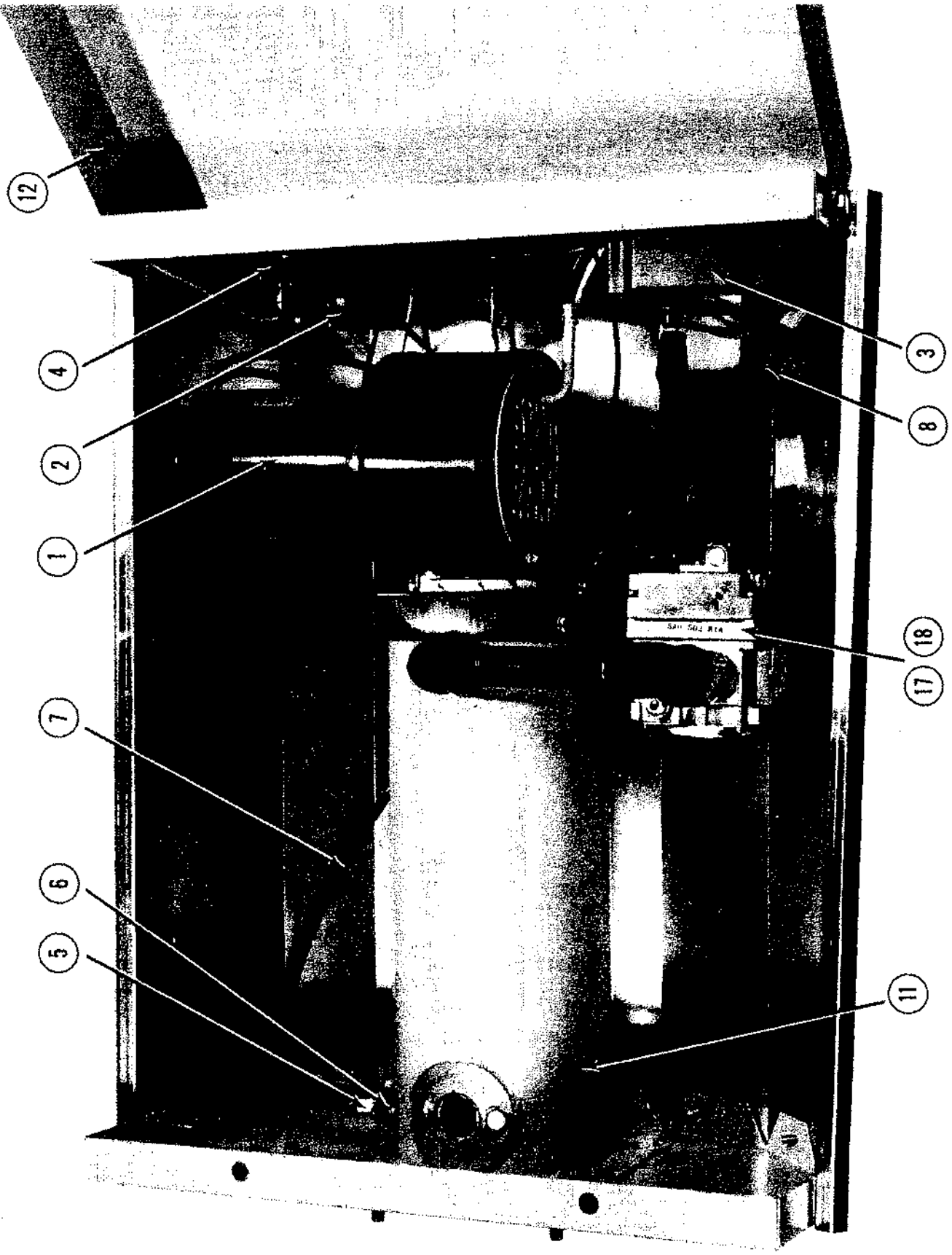
FENWAL CONTROL
Figure 11



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/NFPA 70-1987.
3. For low voltage thermostat and/or parallel burner operation see Wiring Diagram (Figure 9).

INTERNAL WIRING DIAGRAM
Figure 12



CONTROL HOUSING
Figure 13

REPLACEMENT PARTS FOR RTH-150B

ITEM	DESCRIPTION	PART NO.
1	Blower and Motor Assembly	02517400
2	Transformer	02535700
3	Control Module	90427302
4	Air Sensing Switch	90434901
5	Electrode Assembly	90427400
6	Electrode Mounting Bracket	02526100
7	Ignition Cable Assembly	90434800
8	Low Voltage Connector Assembly	02535600
9	Mixer Assembly With Adaptor and Orifice — Nat. Gas	02516400
10	Mixer Assembly With Adaptor and Orifice — L.P. Gas	02516500
11	Burner Tube Assembly	02538400
12	Bottom Cover (Control Housing)	02567401
15	Fuel Conversion Kit — L.P. to Natural	02514900
16	Fuel Conversion Kit — Natural to L.P.	02515000
17	Gas Valve — Natural Gas	90031200
18	Gas Valve — L.P. Gas	90031100
19	Orifice Adaptor	02591800
20	Orifice "B" Drill — Natural Gas	91910498
21	Orifice #29 Drill — L.P. Gas	91910429

WARRANTY CARD

Gordon-Ray Installation Information

Name _____

Address Where Installed _____

_____

Phone No. _____ Person To Contact _____

Installation Date _____ Installer _____

Purchased From _____

DID THESE UNITS REPLACE AN EXISTING HEATING SYSTEM? ☐ YES ☐ NO

Type _____ BTU's Replaced _____

Gordon-Ray Units No. _____ Type _____

Serial No's _____

Type of Application — Please Indicate

☐ AIRPORT FACILITY
- ☐ Hangar ☐ Warehouse
- ☐ Other _____

☐ AUTO BODY SHOP
☐ AUTO DEALER
☐ AUTO SERVICE SHOP
☐ ASSEMBLY PLANT
☐ BOTTLING PLANT OR WAREHOUSE
☐ CAR WASH
☐ CONSTRUCTION EQUIP. DEALER
☐ FABRICATION PLANT
TYPE _____
☐ FARM ☐ Cattle ☐ Dairy
☐ Horse ☐ Pig ☐ Poultry
☐ FARM BUILDING
TYPE _____
☐ FARM IMPLEMENT DEALER
☐ FIRE STATION
☐ GARAGE
TYPE _____
☐ GREENHOUSE
☐ HOCKEY RINKS
☐ HIGHWAY DEPT. BUILDING
TYPE _____
☐ LUMBER COMPANY
☐ MANUFACTURING PLANT
TYPE _____
☐ MACHINE SHOP
☐ PUBLIC BUILDING
TYPE _____
☐ POST OFFICE
☐ RESTAURANT
TYPE _____
☐ SCHOOL
TYPE _____
☐ STORE
TYPE _____
☐ SWIMMING POOL
☐ TENNIS COURT
☐ TRUCKING COMPANY
☐ UTILITY COMPANY BUILDING
TYPE _____
UTILITY _____
☐ WAREHOUSE
☐ WELD SHOP
TYPE _____
☐ ZOO
☐ OTHER _____

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 7406 BUFFALO, NY

POSTAGE WILL BE PAID BY ADDRESSEE

Roberts-Gordon, Inc.
Subsidiary of A.J. Industries, Inc.
P.O. Box 44
Buffalo, NY 14240

ROBERTS-GORDON, INC.
LIMITED WARRANTY

WARRANTY COVERAGE: ROBERTS-GORDON, INC. ("Seller") warrants that entire heating systems sold by it (individually a "System") and any replacement parts which it sells relating to any System ("Parts") shall be free from defects in workmanship and material for the time periods described as follows. With respect to a System this warranty shall apply for a period of three years from delivery to the original purchaser ("Buyer"). With respect to Parts, this warranty shall apply for the longer of the original System warranty period or for a period of one year. ("Systems" and "Parts" are hereinafter collectively referred to as "Products".) This warranty extends only to the original purchaser of Products.

Seller manufactures products which are designed only to provide predetermined ranges of heat rises in various enclosures when properly used in systems designed by purchaser or others and installed by others. Seller makes no representation or warranty with respect to the effect upon enclosure, or upon any of the contents of the enclosure, including, without limitation, all plant or animal life, kept or processed in the enclosure subject to the limitations outlined below.

WARNING: THIS WARRANTY IS VOID IF THE PRODUCTS HAVE BEEN DAMAGED DUE TO ACCIDENT, ABUSE, MISHANDLING OR ANY OTHER CAUSE WHATSOEVER OTHER THAN DEFECTS IN MATERIAL OR WORKMANSHIP. Specifically, Seller's warranty shall not apply: (a) to damage to Products when used in an atmosphere containing halogenated hydrocarbons or other corrosive chemicals. Some compounds in the air can be ingested into the equipment and can cause an accelerated rate of corrosion of some of the Products. The use of such chemical compounds in or near the enclosure should be avoided where a longer life of the burner, tubing and other parts is desirable; (b) to Products which have been repaired or replaced with other than factory parts, modified in any way, misused or damaged, or which have been installed and used contrary to Seller's written instructions or manuals; or (c) to any damage resulting from improper service or a lack of proper maintenance.

LIMITATIONS OF WARRANTY: OTHER THAN AS STATED HEREIN OR IN ANY OTHER WRITTEN WARRANTY OF SELLER, THERE ARE NO OTHER WARRANTIES OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, AND ALL OTHER EXPRESS AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR ANY PARTICULAR PURPOSE ARE HEREBY SPECIFICALLY DISCLAIMED.

EXCLUSIVE REMEDY: THE SOLE AND EXCLUSIVE REMEDY FOR ANY LOSS, DAMAGE OR LIABILITY, OR OTHERWISE, IS LIMITED TO THE OBLIGATION OF SELLER TO REPAIR OR REPLACE PARTS, AT ITS FACTORY, OF ANY PRODUCT OWNED BY ORIGINAL BUYER AND RETURNED TO SELLER'S FACTORY WITHIN THREE (3) YEARS AFTER SHIPMENT TO JOB SITE IN THE CASE OF SYSTEMS AND WITHIN ONE (1) YEAR AFTER SHIPMENT TO JOB SITE IN THE CASE OF PARTS, TRANSPORTATION CHARGES PREPAID, WHICH EXAMINATION REVEALS TO HAVE BEEN DEFECTIVE. UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY LOSS, DAMAGE, COSTS, EXPENSES, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, IN CONNECTION WITH THE SALE, INSTALLATION, USE, MAINTENANCE, OR REPAIR, OF ANY PRODUCT.

BUYER RESPONSIBLE FOR DATA: Seller and its representative may furnish Buyer, upon Buyer's request, data relating to the function and use of Products. Seller shall not be liable for loss, damage, cost, expenses or incidental or consequential damages of any kind, sustained directly or indirectly, by any person, or to any property, if Buyer adopts and uses such data in whole or in part.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES: No representative of Seller, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Seller's duly authorized Executive Officers.

Direct any questions or warranty claims to the original installer:

Company: _____

Address: _____

_____

Phone: _____

Or to: Warranty Claims, ROBERTS-GORDON, INC., 1250 William Street, Buffalo, New York 14206.

Quality

This Roberts-Gordon Gas-Fired Infrared Heater was manufactured in the United States by union labor dedicated to producing quality products.

What you should know about Roberts-Gordon, Inc.

- Pioneer developer and manufacturer of low-intensity gas-fired infrared heaters and heating systems.
- More than 60 years experience in the heating equipment industry.
- We cherish and work hard to protect our reputation for quality products.

Roberts Gordon, Inc.
Subsidiary of A.J. Industries Inc
P.O. Box 44, Buffalo, NY 14240