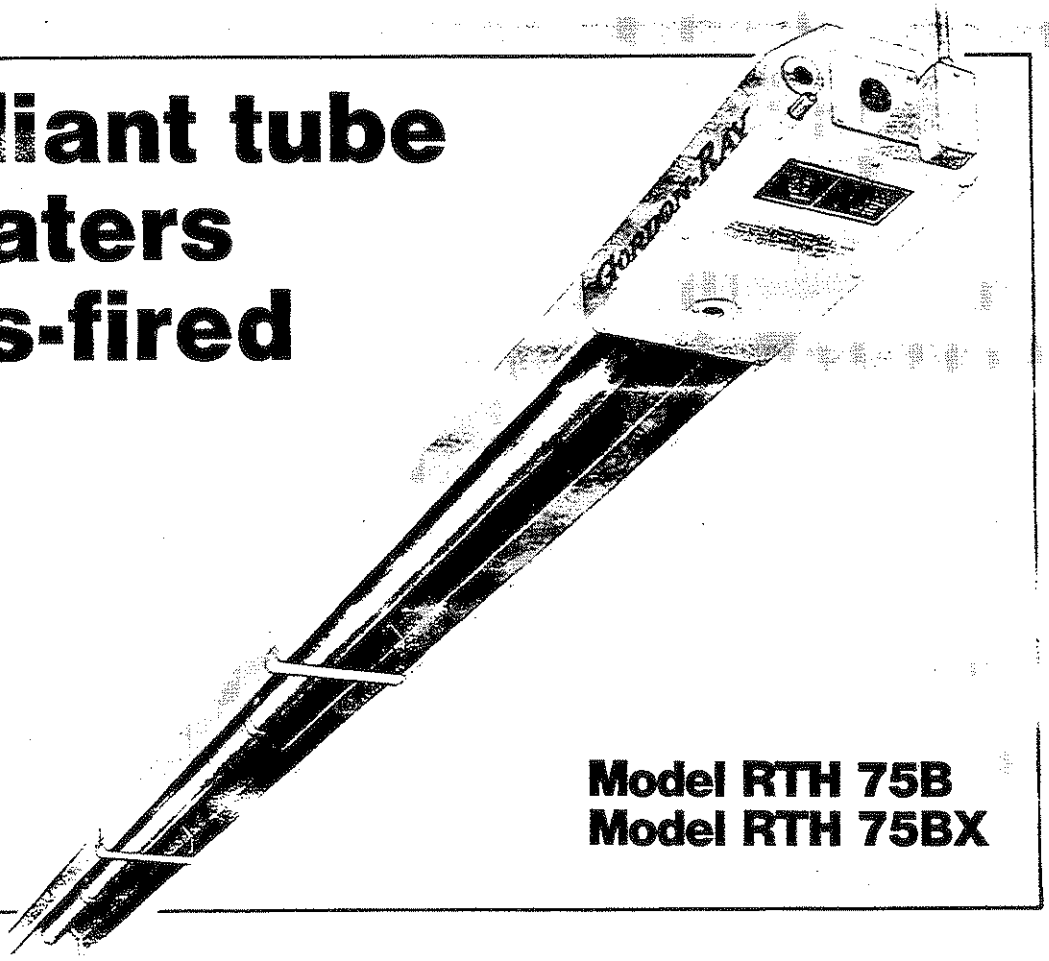
GORDON-RAY®

radiant tube heaters gas-fired



Model RTH 75B
Model RTH 75BX

SPECIFICATIONS
INSTALLATION, OPERATION, SERVICE & SPARE PARTS

Roberts-Gordon
CANADA INC.
241 South Service Road West,
Grimsby, Ontario L3M 1Y7
Telephone: 416-945-5403

In the U.S.A.: 44 Central Ave., Buffalo, N.Y. 14240
In Europe: Phoenix Burners Ltd., London, England

APPROVED®

G-042-84

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 should comply with local codes and recommendations of the local gas company.

All gas piping and connections shall be made in accordance with CGA B149.1 and B149.2 –Installation Codes for gas burning appliances and equipment and/or local codes.

For locations where there is the possibility of exposure to combustible air-borne 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.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

RTH-75BX MODEL

General Specifications

Model: RTH-75B, BX

Rating: (Natural and Propane Gas)—75 000 BTU/HR INPUT

Gas Pressure at Manifold:

Natural Gas .....3.5" W.C.
Propane Gas.....11.0" W.C.
Gas Connection Size.....3/8" IPS

Electrical Rating—120V. 60 Cy. 2.6 amp.
Flue Connection Size .....5" O.D.
Weight of Heater .....110 lbs.

Minimum clearances to combustibles (inches)**

Reflector	Front	Back	Top	Below
Standard	26	26	11	54
With Lower Radiant Sheild	26	26	11	30
With Single Extension	26	8	11	54
With Two Extensions	8	8	11	54

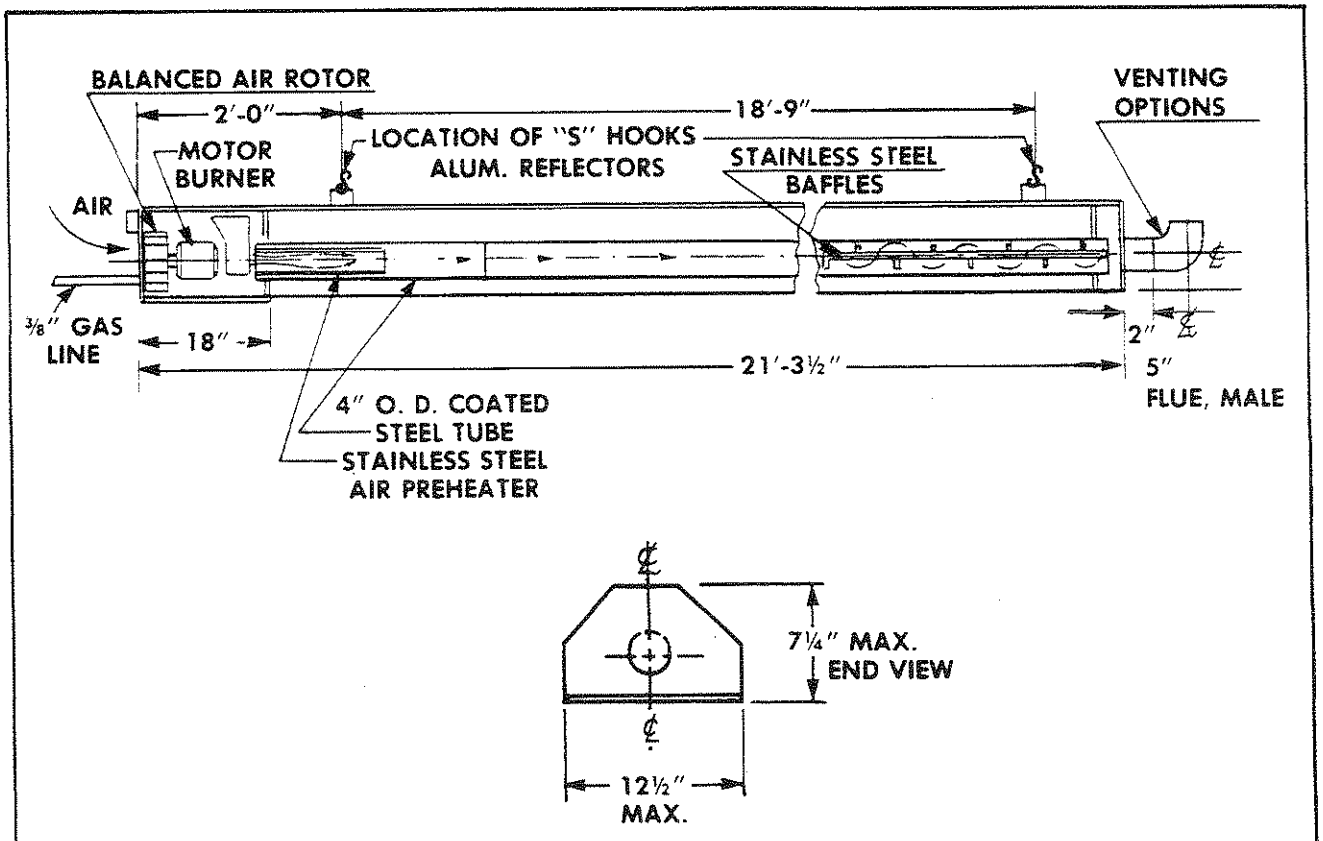
For Horizontal Installation only
**Measure from radiant tube.

In all situations, clearances to combustibles must be maintained.

Standard Equipment Includes:

Complete heater assembled, consisting of: Cast-iron burner, coated steel combustion chamber, fully automatic controls, motor with thermal overload switch, balanced air rotor, 4" O.D. radiant tube with stainless steel air pre-heater and baffles; shut-off cock; aluminum reflector and built in drafthood.

OPTIONAL: Thermostats, Decorative Aluminum Grill, Reflector Side Extension, and Adapter to outside air supply.



SIDE VIEW SHOWING HANGING SUPPORTS

RTH-75B

Figure 1

Installing the Heater

Important: — The type of gas appearing on the heater name plate must be the type of gas used. Read all acccompanying literature carefully before proceeding with installation.

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 150 lbs. at each suspension point. For instructions on mounting height and locations of heaters, refer to installation plans or supplier of equipment.

FOR UNVENTED INSTALLATIONS

The RTH-75B unit, with integral draft hood, may be installed as an unvented heater. The following conditions must be met.

1. A 5" dia. x 90° elbow must be attached to the flue collar and turned down, as shown on Figure 1a.
2. The heater must be interlocked with an exhaust fan sized at 300 CFM for every 100,000 BTU/HR input.

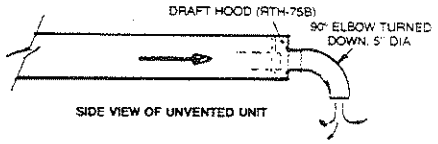


Figure 1a

NOTE: The RTH-75BX has no draft hood, and uses a differential air proving switch to prove air-flow. This model must be vented. Refer to Page 11, "Additional Instructions" for methods of venting this heater.

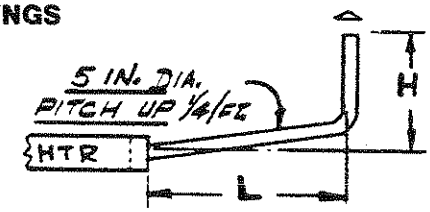
Venting

The venting must be installed in accordance with CGA B149 & B149.2 — Installation Codes. 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.) For complete information consult B149.1 & B149.2 and local codes.

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. With regard to the following charts, the number of units vented by a common stack, and the length of the horizontal runs will determine the vent size and stack height required. Individual RTH heaters can be vented with a 5 inch diameter vent pipe according to the table below. Multiple units vented by means of a common vent (stack) must be so arranged that individual vent connectors and the common vent meet the conditions of sizes and lengths specified for multiple unit venting. The use of vent caps and the positioning of the top of the vent with respect to roof structure should be in accordance with CGA B149.1 and B149.2 — Installation Codes.

INDIVIDUAL VENTINGS

Lateral (L)	Height (H)
5 ft.	6 ft.
10 ft.	8 ft.
15 ft.	10 ft.

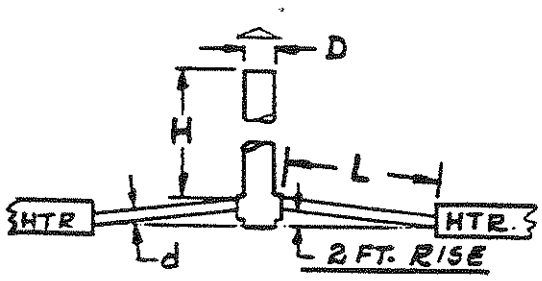


MULTIPLE VENTING

(Vent connectors into a common stack)

Connector Max. Lth. (L)	Connector Dia. Req'd (d)
8 ft.	5"
8 ft.	6"
10 ft.	7"

Number of Heaters	D	H (Minimum)
2	7"	6 ft.
3	8"	8 ft.
4	10"	8 ft.
5	10"	10 ft.
6	10"	15 ft.

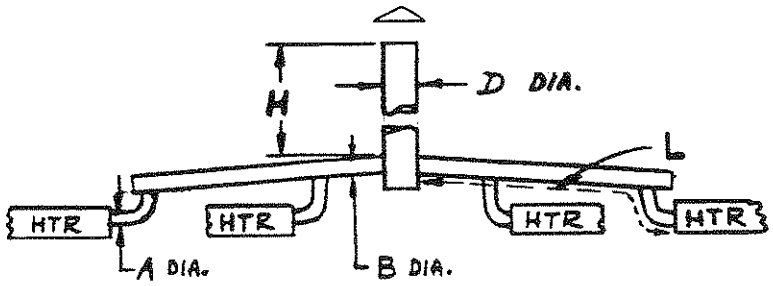


The diagram above shows a common stack serving two or more heaters.

THE STACK HEIGHT (H) MUST BE 1/3 MORE THAN THE LONGEST CONNECTOR LENGTH.

MULTIPLE VENTING
(Vent connectors into a manifold)

L	A	B - Manifold Dia.		
Max. Lth.	Conn. Dia.	Number of Heaters on Manifold		
		1	2	3
8 ft.	5″	5″	7″	8″
9 ft.	6″	6″	7″	8″
10 ft.	7″	7″	8″	8″



Number of Heaters	D Diameter	H Minimum
3	8″	8 ft.
4	10″	8 ft.
5	10″	10 ft.
6	10″	15 ft.

The diagram above shows a dual manifold system venting into a common stack.

THE STACK HEIGHT (H) MUST BE 1/3 MORE THAN THE LONGEST CONNECTOR PLUS MANIFOLD LENGTH (L)

Power venting should be used if conditions cannot be met for size 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.

Single heaters or combinations of heaters can be power vented in common, with flue lengths up to 100 ft..with flue sizes as follows:

Number of Heaters	1	2	3	4	5
Flue Diameter	5″	6″	6″	7″	8″

See Fig. 7 - "Venting example using power vent." Consult the equipment supplier for assistance in planning a power vented system.

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″ W.C. If there is any question, check with the gas company. Use the following capacity table as a guide:

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

Pipe Size	Length of Straight Pipe, Feet						
	20	40	60	80	100	150	200
1/2″	120	82	66	57	50	40	35
3/4″	250	170	138	118	103	84	72
1″	465	320	260	220	195	160	135

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 and fittings should be new and free from defects.
5. For LP Gases, see your LP 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 LP 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" N.P.T. plugged tapping immediately upstream of the gas supply connection to the heater, accessible f test gage connection.

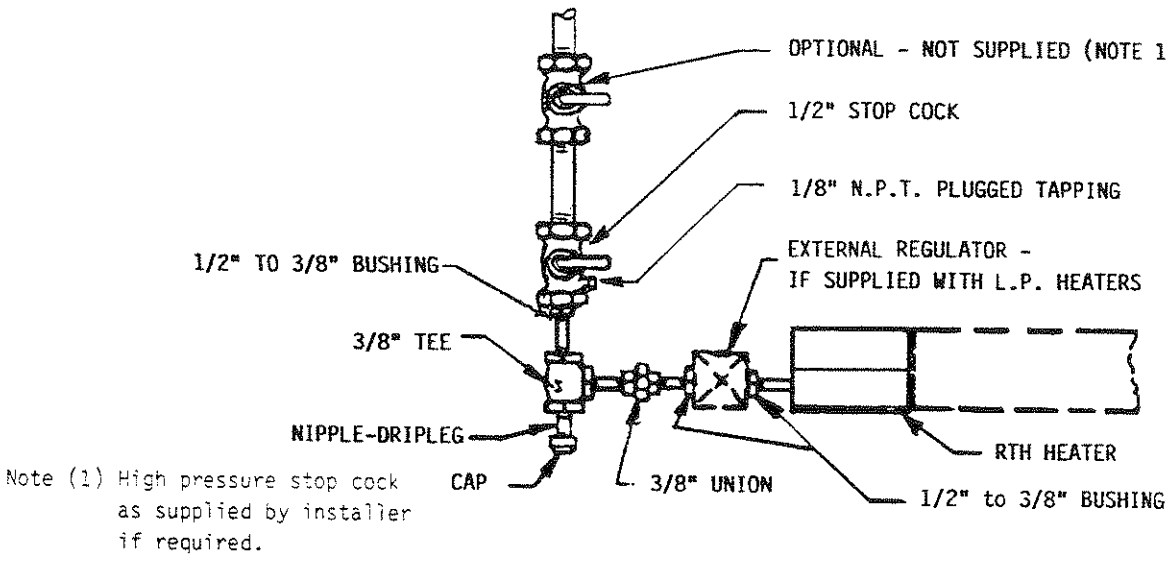


Fig. 2 - Typical Gas Piping Arrangement

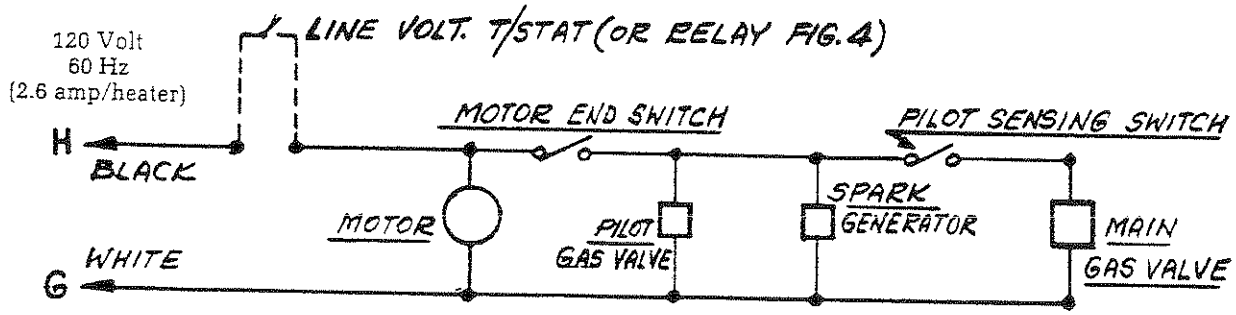
WIRING:

All electric wiring and connections must be made in accordance with the CSA standard C 22.1 – Canadian Electrical Code Part 1 and / or local codes.

Heaters are normally controlled by thermostats (see Fig. 3). Line voltage thermostats are wired directly; the recommended 24 volt thermostats use a relay per Figure 4.

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

Fig. 3 - Schematic of Factory Wired RTH Heater



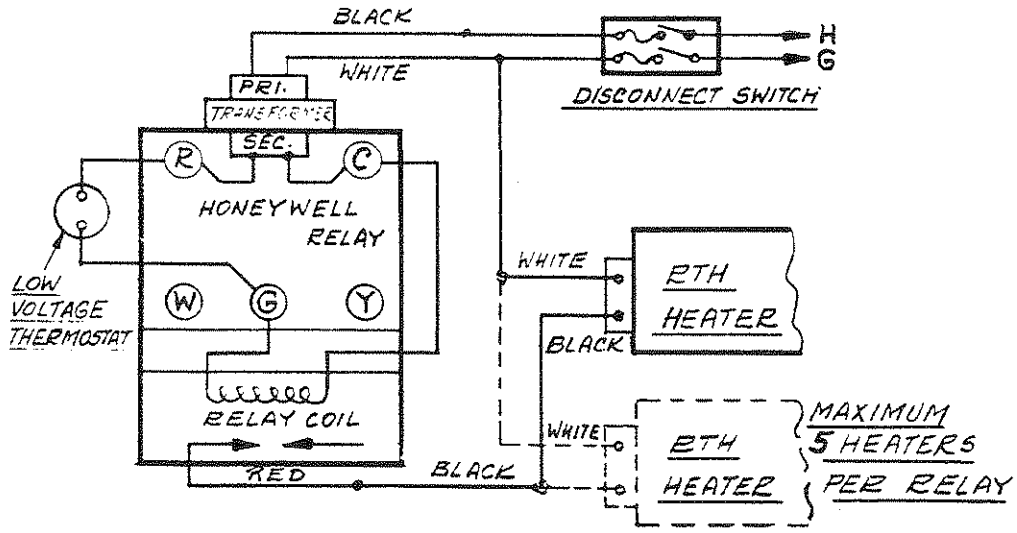


Fig. 4 - "Field" Wiring of Low Voltage Thermostat and Relay

SEQUENCE OF OPERATION

The Gordon-Ray® Heater is equipped with a gas saving spark ignited intermittent pilot. This is how it works:

1. Thermostat, on a call for heat, energizes blower motor of the heater.
2. After the blower motor achieves running speed, the centrifugal motor end switch closes, energizing the pilot valve, and the spark generator.
3. Gas flows through the pilot valve, and is ignited by the spark plug, establishing pilot flame.
4. The pilot flame heats the pilot sensing element, and through its contacts, energizes the main gas valve. Gas is ignited by the pilot, establishing main flame.
5. When the thermostat is satisfied, all current to the heater is deenergized and all gas is shut off.

SERVICE INSTRUCTIONS

CAUTION: BEFORE OPENING HINGED CONTROL HOUSING COVER TO SERVICE HEATER, BE SURE THAT GAS AND ELECTRIC SUPPLY TO HEATER ARE TURNED **OFF**. NEVER START HEATER WITH COVER OPEN.

No power to heater

1. Check to see that thermostat is calling for heat and check thermostat wiring.
2. Check for blown fuse in electrical supply to heater.
3. Check for loose or broken wire at heater junction box.

Blower motor fails to run

1. Check for loose or broken wire from motor to hot and ground leads entering the control housing.
2. Check to see if blower impeller turns freely, it may be rubbing or motor may be seized. Adjust to free impeller, or repair or replace motor.

Caution: Close and secure control housing before operating heater.

No Spark: (When blower motor attains running speed, the motor end switch energizes the spark plug.)

1. With gas to heater turned OFF, and control housing cover open, set thermostat above room temperature. The spark across the gap of the plug is normally audible. If no sound is heard:
   a. Check for loose or broken leads from motor end switch.
   b. Check spark plug for bridged gap or cracked insulator and gap for .125 in.
   c. Check spark plug lead and connectors for tightness and continuity.
   d. Check spark generator for loose or broken wires. Replace spark plug or generator if defective.

   Caution: Close and secure control housing before operating heater.

No Gas Present (Shut-off cock open)

1. Set thermostat above room temperature. When blower motor attains running speed the end switch energizes the pilot valve. At this moment an audible "click" should be heard, if not:
   a. Check for broken or loose wire lead from motor end switch.
   b. Check for loose or broken wire to pilot valve. Replace pilot valve coil if defective.

   Caution: Close and secure control housing before operating heater.

Cover - Air Seal

1. To secure the cover, screw down the 1/4 in. slotted hex head screw. This provides the air seal and maintains the positive pressure from the blower as required for proper operation of the burner. Covers with warping or bending must be repaired or replaced. Felt gasket strips are also essential for proper operation and heater should not be operated if the gaskets do not seal the complete perimeter of the cover.

Main Burner Does Not Light:

1. After pilot flame is established, it must heat the flame sensing element to energize the main valve. Pilot flame may be observed thru side or bottom observation window.
   a. Pilot flame should be blue, and extend at least 1 inch beyond the end of the pilot burner screen. If not, shut off gas and electricity, open cover, remove pilot burner and check orifice for dirt.
   b. If pilot flame appears suitable, observe color of pilot sensing element, which should glow a dark red or orange color. If the element is not a dark red or orange color check that the mounting bracket positions the element in the pilot flame and the proper pilot switch is installed (PN 75710). With PN 75710 the extension of the element beyond the mounting bracket will be at least 1-15/16 inch, see Figure 5.
   c. If element is red or orange, check for broken or loose wires from main gas valve. Replace defective pilot switch.

   Caution: Close and secure control housing before operating heater.

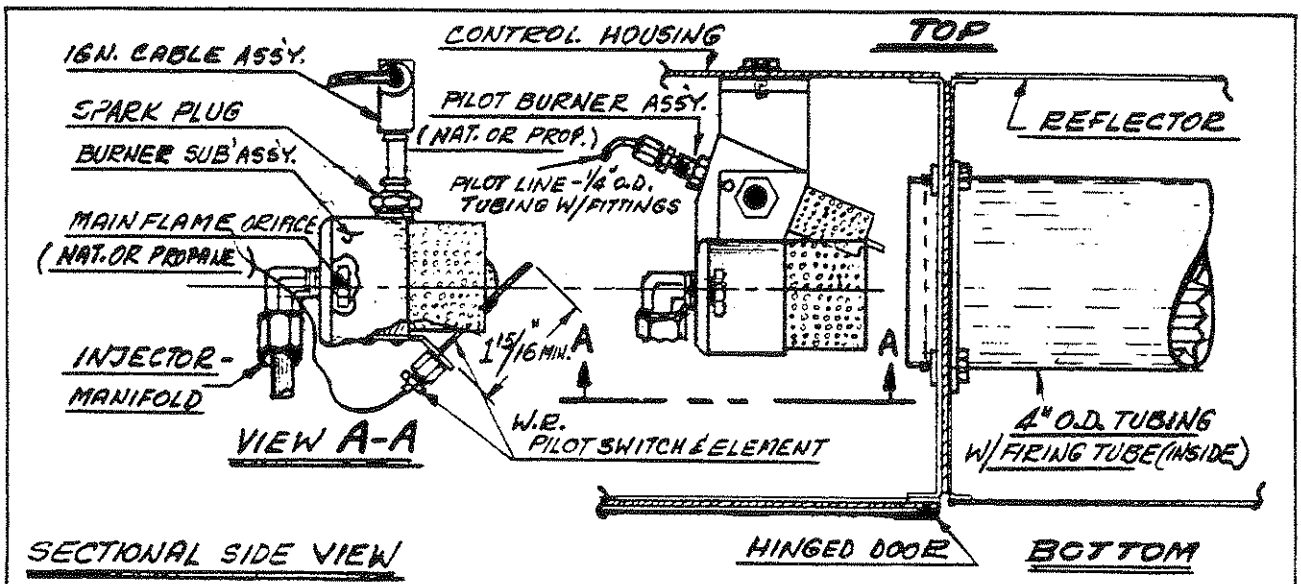


Figure 5 - Burner Detail

MAINTENANCE

For best performance, heater should be cleaned before each heating season.

1. BE SURE GAS AND ELECTRIC SUPPLY TO HEATER ARE **OFF**.
2. Open burner control housing cover.
3. Check condition of blower scroll and motor. Dirt and dust may be blown out with compressed air or a vacuum cleaner may be used.
4. Check condition of burner and pilot.
5. Make visual check of spark plug. Replace if there is excessive carbon residue, erosion of electrodes, or other defects. Gap should be .125".

Caution: Be sure control housing cover is closed tight before operating heater.

6. Remove elbow, or flue pipe from heater. Remove screw holding stainless steel baffle in place in heater tube; then remove baffle. Brush clean if any soot or scale deposits are found on baffle.
7. With baffle removed, check inside of firing tube with flashlight. If carbon or scale are present, scrape out deposits with wire brush on a rod, or metal plate attached to wooden pole.
8. Replace flue baffle, and baffle retaining screw.
9. Check flue pipe for soot or dirt. After cleaning, reattach flue pipe to heater.
10. Outside surfaces of heater reflector may be cleaned by wiping with a damp cloth.

FIELD CONVERTIBILITY

This unit has been approved for use with natural gas or propane. A conversion kit, as detailed below is available to convert this unit to the alternate fuel.

THE CONVERSION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROVINCIAL AUTHORITIES HAVING JURISDICTION AND IN ACCORDANCE WITH THE REQUIREMENTS OF THE CAN 1-B149.1 AND .2 INSTALLATION CODE.

RTH-75 - WHITE RODGERS CONTROLS USED ON NATURAL GAS

TO CONVERT TO L.P.G.

1. Remove Dust Cap on Regulator
2. Install W/R Part #69-1545 (Regulator Block Pin)
3. Change pilot burner to L.P.G. model
4. Change main orifice to #39 drill for L.P.G. 0-2000 ft. or #41 for 2000-4500 ft.
5. Check propane gas pressure to ensure that it is not over 11" W.C.
6. Affix conversion data label

RTH-75 - ROBERTSHAW CONTROLS USED ON L.P.G.

TO CONVERT TO NATURAL GAS

1. Remove Regulator from Robertshaw #7010 gas valve
2. Replace with Robertshaw #82445 regulator set for 3.5" W.C.
3. Change pilot burner to natural gas model
4. Change main orifice to #15 drill natural gas 0-2000 ft. or #19-2000-4500 ft.
5. Affix conversion data label

ADDITIONAL INSTRUCTIONS
RTH-75BX

This unit differs from the standard RTH-75B in that it may be vented directly to the outside through a vertical wall, using the vent terminal supplied. Fresh air may be ducted directly to the heater as well.

A differential air proving switch (see location in Figure 1 and Figure 2) is used to make certain adequate air for combustion is being supplied. The combustion air blower is slightly different than the one on the standard RTH-75B.

The maximum length of the 4" diameter inlet, or exhaust piping, or combination of both, is shown in the table in Figure 10.

Figure 10 also shows the general layout of the RTH-75BX. To handle expansion movement in the overall unit, a flexible boot on the air inlet end is employed when bringing in fresh air, as well as a flexible gas connector.

Venting

Flue pipe of single wall construction may be used up to combustible wall. All joints must be sealed and mechanically fastened. Vent pipe must be insulated if it passes through unheated spaces or if it exceeds 30 feet in length. Type "L" vent must be used when vent system passes through roof or combustible wall. To prevent excessive condensation heater and vent pipe must slope down towards the terminal 1/4" per foot.

We recommend the use of 4" O.D. welded steel tube (available from Roberts-Gordon) as vent pipe for this heater.

Combustion Air Supply

1. If indoor combustion air is supplied to the heater in a tightly closed room one square inch of free area opening should be provided for each 1,000 BTUH of heater input, but not less that 100 square inch. One opening should be within 12" of the top and one within 12" of the bottom of the enclosure.

2. If the building has a slight negative pressure or contaminants in the air are present, then outside combustion air may be supplied to the heaters using the optional outside air adaptor kit.

3. A duct of 4" O.D. flue pipe may be attached to the heater outside air adaptor. The duct may be up to 50' in length maximum with no more than 2 - 90° elbows in its total length.

4. Air supply duct may have to be insulated to prevent condensation on outer surface.

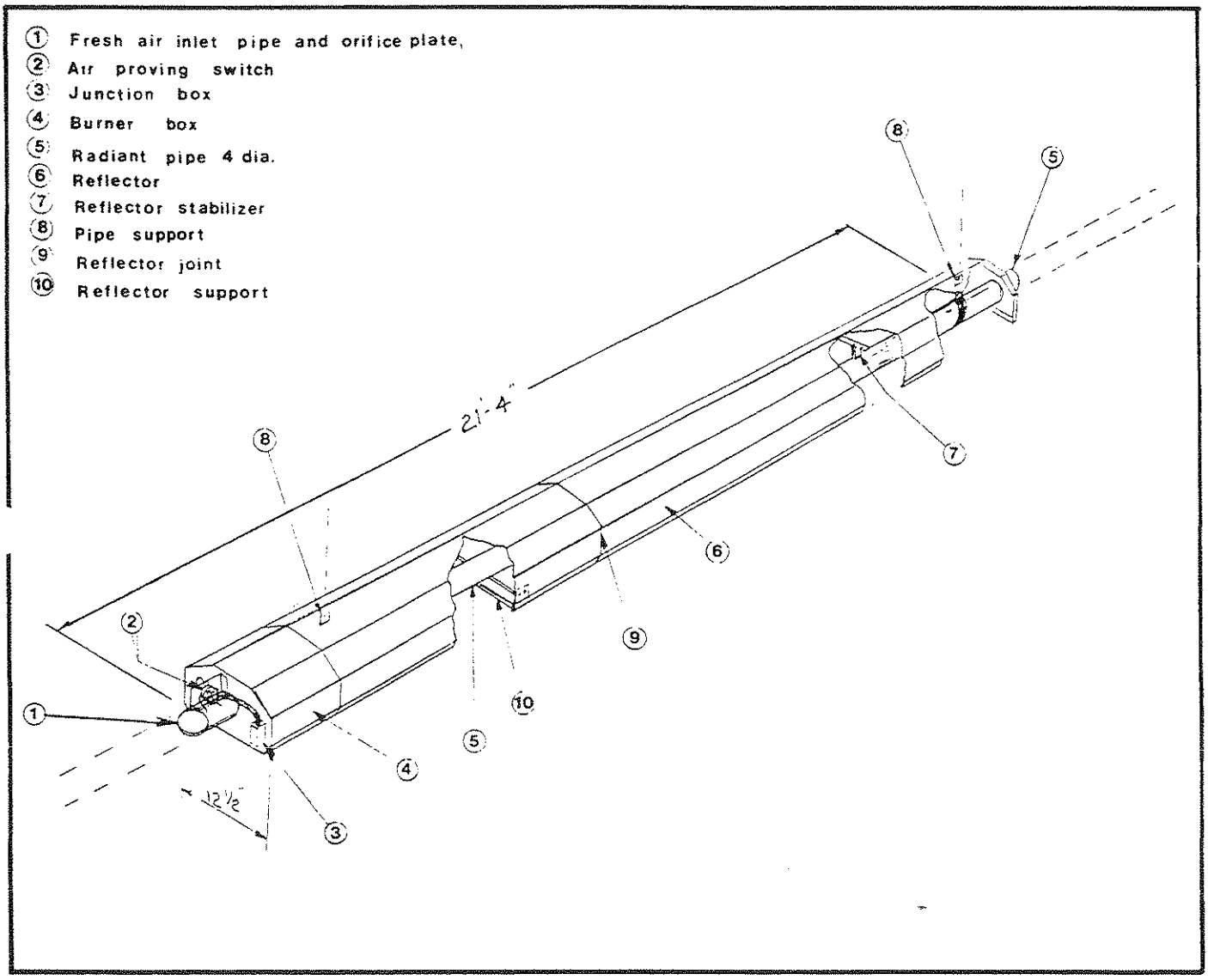

① Fresh air inlet pipe and orifice plate,
② Air proving switch
③ Junction box
④ Burner box
⑤ Radiant pipe 4 dia.
⑥ Reflector
⑦ Reflector stabilizer
⑧ Pipe support
⑨ Reflector joint
⑩ Reflector support
21'-4"
12½"

Figure 8

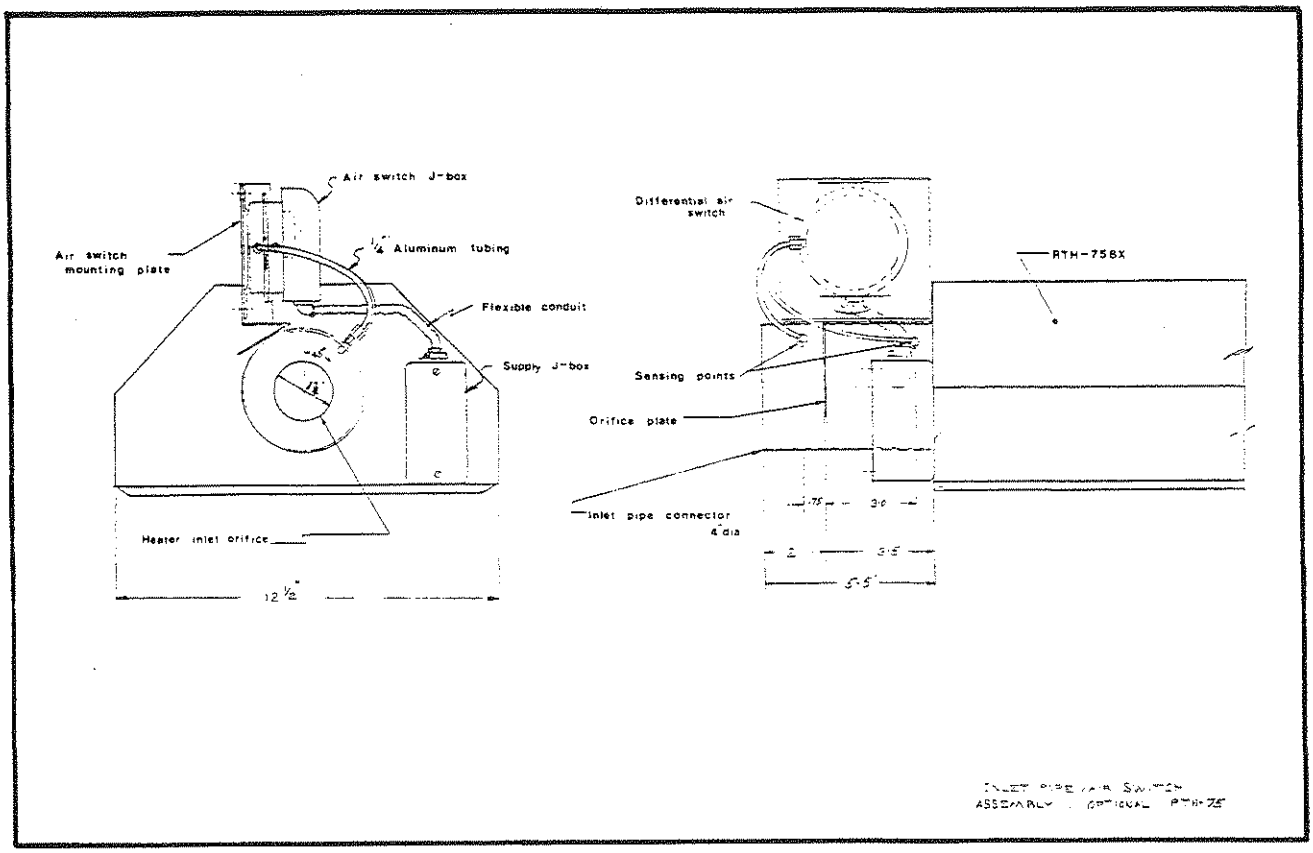


Figure 9

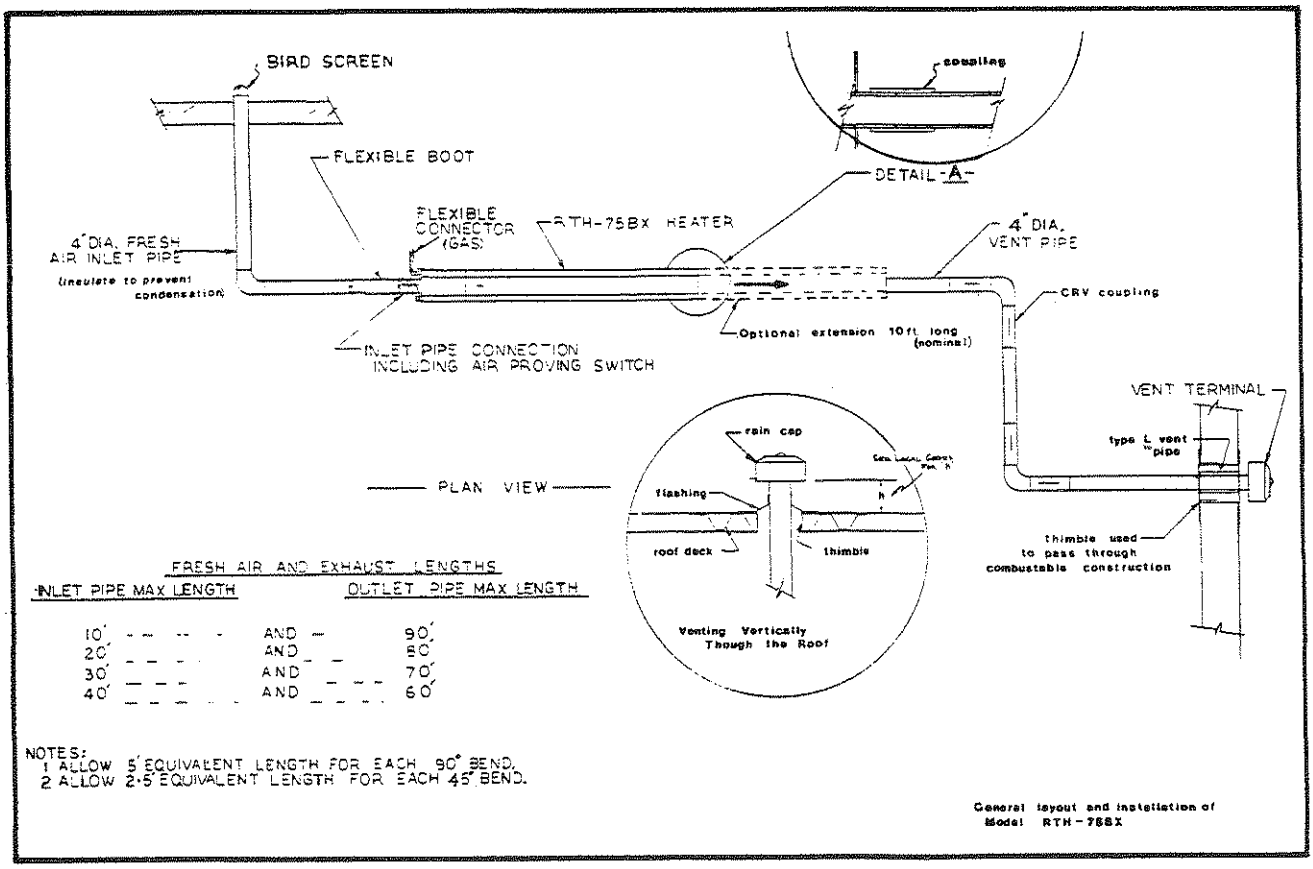


Figure 10

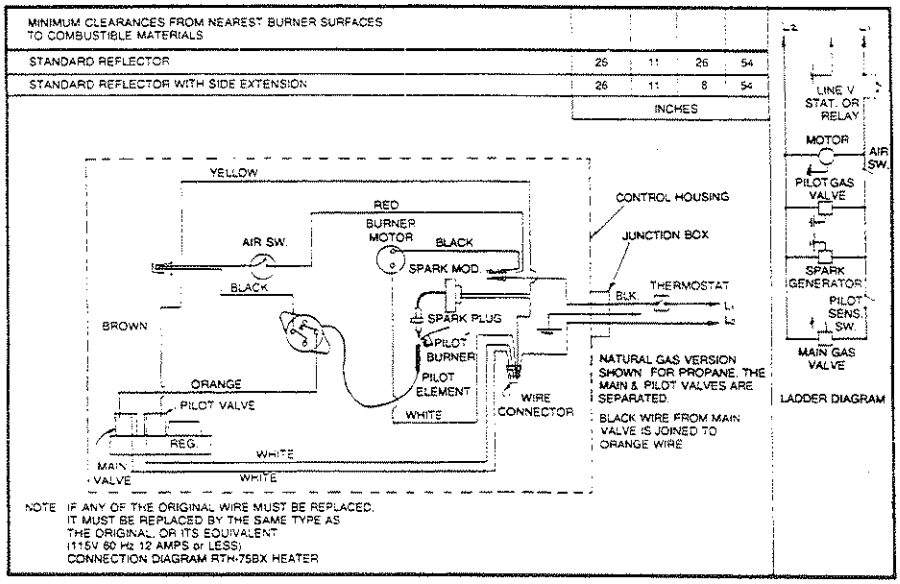
Location of Vent Terminal and Combustion Air Inlet

The vent terminal shall not be located:

1. Less than 36" from any service regulator.
2. Less than 36" from any building opening.
3. Less than 72" from the combustion air opening of this or any other applicance.
4. Directly over a gas utility meter or service regulator.
5. Over a walkway unless 84" above grade.

NOTE:

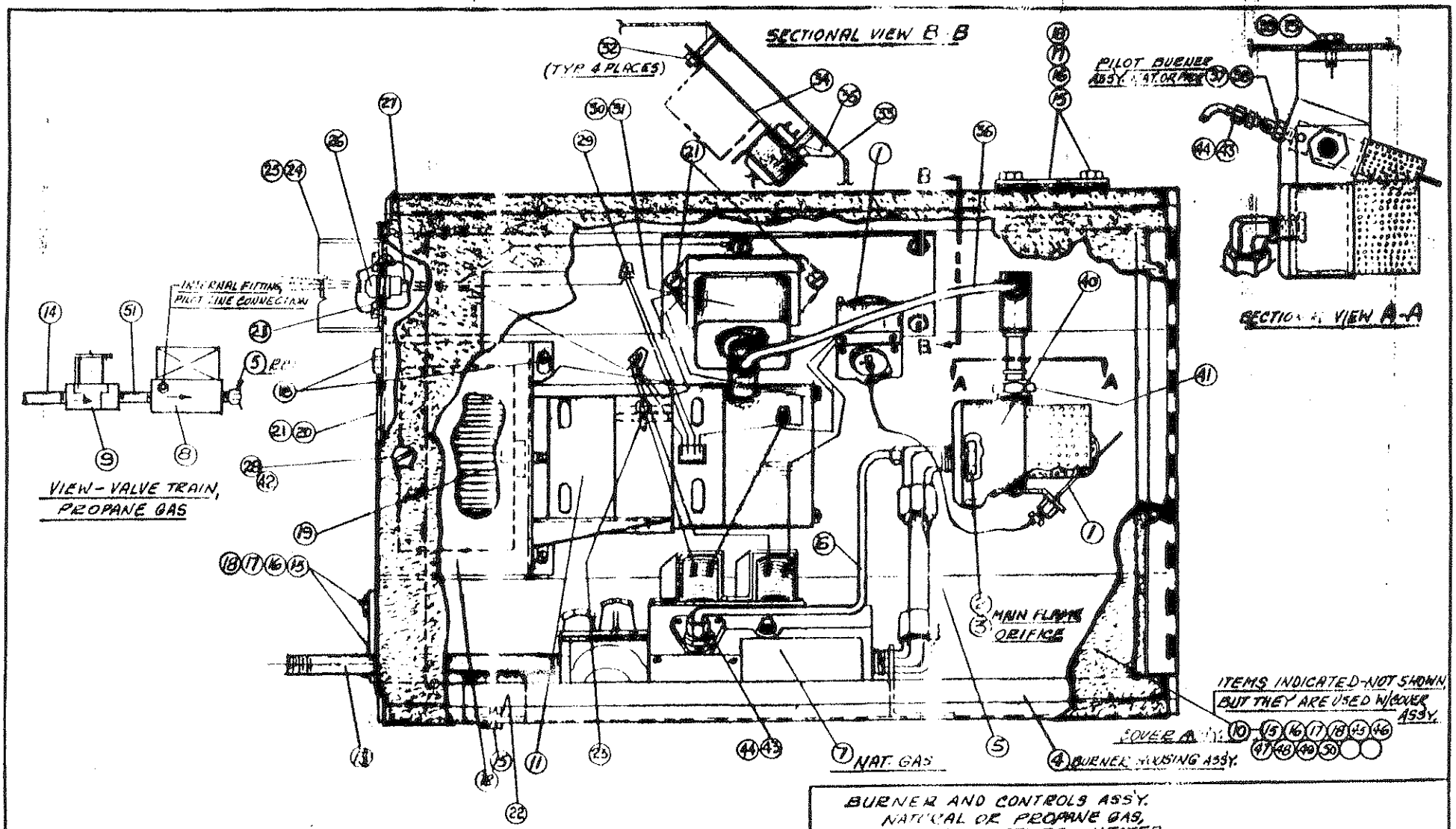
1. The vent terminal should not be installed in a recess or corner where flue products could be trapped due to wind eddy currents.
2. Since this system is under a slight positive pressure, we recommend that the system be checked once a year by a qualified serviceman.



WIRING DIAGRAM RTH-75BX

RTH-75B HEATER
Burner & Controls Assembly

ITEM	DESCRIPTION	PART NO.	QTY.
1	W. R. Pilot Switch Assembly	75710	1
2	Orifice, Main Flame (Natural Gas)	52380 - Nat.	Use
3	Orifice, Main Flame (Propane Gas)	52380 - L.P.	1
4	Burner Housing Assembly (Complete)	57471	1
5	Injector Manifold, Main Flame	57705	1
6	Aluminum Tubing 1/4 O.D. Pilot Line	51370	1
7	Gas Valve, Natural Gas	29860	1
8	Gas Valve, Propane (7010AGVERLP)	30025	1
9	Gas Valve, Propane (FJ.3/8)	30005	1
10	Cover Assembly	57481	1
11	Motor (Ball Bearing Type)	38615	1
12	Motor Mount Plate Assembly	57485	1
13	Manifold Nipple Assembly (Natural Gas)	57500	Use
14	Manifold Nipple Assembly (Propane Gas)	57502	1
15	Screw Hex Head, 1/4-20	30370	13
16	Ring, Viewer	53271	3
17	Gasket, Observ. Window	52340	3
18	Mica Window	52350	3
19	Airotor	52115	1
20	Air Inlet Plate Assembly	57475	1
21	Screw, Sheet Mtl., Hex Head #10, Type "A"	31080	8
22	Weld Nut, 1/4-20	31640	1
23	Screw, Socket Head, 1/4-20	30389	1
24	Junction Box	52635	1
25	Cover, Junction Box	52655	1
26	SR6P3-4 Heycos	52700	1
27	Wire Harness	57460	1
28	Screw, Hex Hd. Slotted, 1/4-20	30370	1
29	Wire Nuts	52690	3
30	Spark Igniter (Honeywell)	28285	Use
31	Spark Igniter (W.R.)	28285	1
32	"Keps" Nuts No. 8-32	31305	4
33	Wire Harness With Socket	57510	1
34	Plate, Pilot Switch & Igniter Mtg.	57495	1
35	Aluminum Sleeve	58955	4
36	Ignition Cable Assembly	57525	1
37	Pilot Burner Assembly (Natural Gas) No. 68	52375	Use
38	Pilot Burner Assembly (Propane) No. 77	52377	1
39	Ext. Tooth Lock Washer, 1/4"	31541	2
40	Burner Sub. Assembly	57491	1
41	Spark Plug, Auburn E4R8	52894	1
42	Screw, Retainer	31465	1
43	Ball Sleeve 1/4" O.D. Tubing	3740	2
44	Ball Sleeve Nut 1/4" O.D. Tubing	3810	2
45	Name Plate	51740	1
46	"Caution" Sign	51790	1
47	Connection Diagram	51780	1
48	Gasket, Door Sides	57560	2
49	Gasket, Door Ends	57565	2
50	Rivet	31710	4
51	Nipple 3/8 N.P.T. x 2" Lg.	18570	1
	Conversion Kit...LPG	57532	1
	Conversion Kit...NATURAL GAS	57533	1


SECTIONAL VIEW B-B
(TYP. 4 PLACES)
PILOT BURNER ASSY.
SECTIONAL VIEW A-A
INTERNAL FITTING PILOT LINE CONNECTION
VIEW - VALVE TRAIN, PROPANE GAS
MAIN FLAME ORIFICE
NAT. GAS
BURNER MIXING ASSY.
COVER ASSY.
ITEMS INDICATED-NOT SHOWN BUT THEY ARE USED W/COVER ASSY.
BURNER AND CONTROLS ASSY.
NATURAL OR PROPANE GAS,
MODEL BTH-75 HEATER