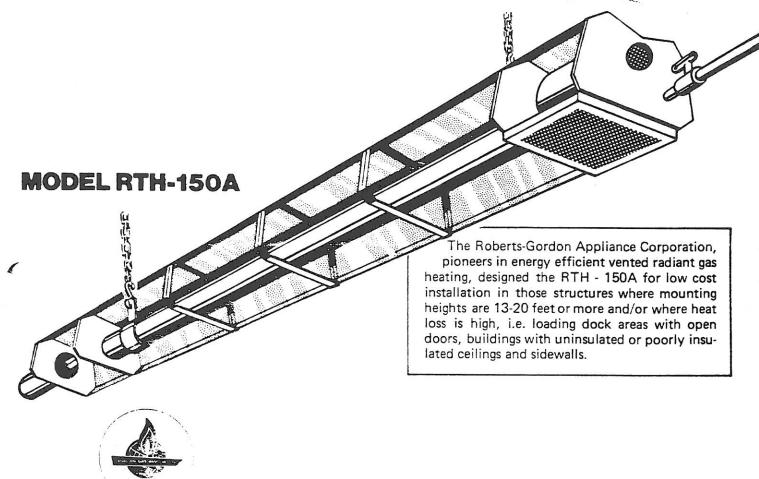
# GORDON-RAY.

# VENTED INFRARED RADIANT TUBE GAS HEATER



# SPECIFICATIONS INSTALLATION, OPERATION, SERVICE & SPARE PARTS



241 South Service Road West Grimsby, Ontario, Canada L3M 1Y7 Telephone (416) 945-5403

#### 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 CAN 1-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.

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#### General Specifications

Model: RTH-150A

Rating: Natural Gas - 150.000 BTU/HR INPUT L.P. Gas - 145.000 BTU/HR INPUT Gas Connection Size - 14" N.P.T.

Manifold Pressure

Natural 3.5" w.c. L.P. 11.0" w.c.

Orifice Pressure (Manifold-Burner)

Natural 2.8" w.c. L.P. 10.3" ELECTRICAL RATING - 120V 60Hz 2.6 Amp FLUE CONNECTION SIZE - 6" O.D.

WEIGHT OF HEATER - 200 LBS.

Gas Inlet Pressure

GAS	MAXIMUM	MINIMUM
Natural	13.0" w.c.	4.5" w.c.
L.P.	13.0" w.c.	11.0" w.c.

Mounting Height typically 13 feet minimum (plus additional height as necessary to maintain listed clearances to combustible material)

				Opposite	
Clearances to Combustibles, Stnd.	Above	Below	Side	Side	
Standard Reflector	12"	72"	36"	36"	
With 1-Side Extension Reflector	12"	76"	36"	12"	*Do not use with
With 2-Side Extension Reflectors	12"	84"	24"	24"	Side Extension
Radiant Shield*	12"	60"	60"	60"	Reflector

In all situations, clearances to combustibles must be maintained.

Warning: Minimum clearances from heater must be maintained from vehicles parked below heater.

#### Standard Equiment Includes:

Complete heater assembled, consisting of: Cast-iron burner, coated steel combustion chamber and heat exchanger, fully automatic controls, motor with thermal overload switch, balanced air rotor, 5" 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.

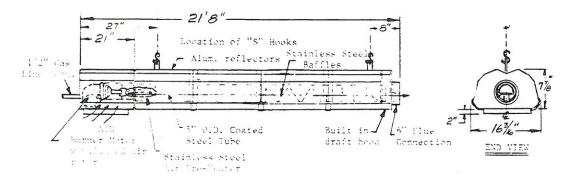


Fig. 1 - Side View Showing Hangar Supports

#### Installation in Aircraft Hangars

Heaters must be installed in accordance with CAN 1-B149.1 & B149.2 Installation Codes 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 areas, heaters shall be installed in accordance with their listings and not less than eight feet above the floor.
- 3. Heaters installed in aircraft hangar hangars shall be so located as not to be subject to damage by aircraft, cranes, movable scaffolding or other objects. Heaters shall be placed so they will be readily accessible for maintenance purposes.

#### Installation in Public Garages

Heaters must be installed in accordance with CAN,1-B 149.1 and B 149.2 with special consideration for the following:

- 1. Heaters must 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 combustibles 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.

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

#### 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

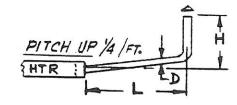
The venting must be installed in accordance with CAN 1-B149.1 and B149.2 Installation Codes.

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). However, it is the responsibility of the installer to make the installation in strict accordance with Codes 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 Codes. For other situations not covered here, the installer must consult Codes.

#### INDIVIDUAL VENTING

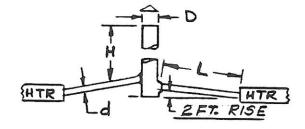
LATERAL (L) (Max.)	(H) HEIGHT (Min.)	(D) DIA. (Min.)
0 - 2 ft.	8 ft.	6"
0 - 10 ft.	15 ft.	6"
0 - 5 ft.	6 ft.	7
0 - 10 ft.	8 ft.	7
0 - 15 ft.	10 ft.	7



## MULTIPLE VENTING (Vent connectors into a common stack)

CONNECTOR	CONNECTOR
Maximum Length (L)	Diameter Required (d)
0 - 8 ft.	7″ Min,
0 - 9 ft.	7″ Min,
0 - 10 ft.	7″ Min,

Number of Heaters	D (Minimum)	H (Minimum)
2	10"	6 ft.
3	10''	15 ft.
4	12"	15 ft.
5	12"	20 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.

**NOTE:** For multiple vent connectors with converging flow, the connections must be positioned to a void direct opposition between the streams of combustion gases.

#### Power venting

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. See Field Wiring Dia. Fig. 3a and 4a.

A maximum of (2) Model RTH-150A Heaters can be vented per power ventor R.G. Part No. 907-075. This is for a distance up to 100 feet of equivalent length and a minimum duct diameter of 6". The equivalent length is computed as actual length of straight sections plus 10' for 90 degree elbows. 5' for 45 degree elbows and 10' 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" 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 O	F STRAIGHT	PIPE, FEET		
TIPE SIZE	20	40	60	80	100	150	200
3/4"	250	170	138	118	103	84	72
1"	465	320	260	220	195	160	135
1%"	950	660	530	460	400	325	280

- 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 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 carefuly 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 heater to prevent foreign matter and moisture frome 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 for test gage connection.

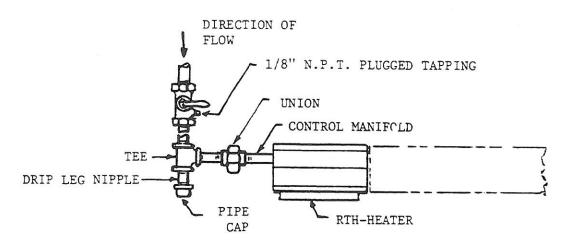


Fig. 2 - Typical Gas Piping Arrangement

#### Electrical

- 1. Heaters are normally controlled by thermostats (See Fig. 3 & 3a). Line voltage thermostats are wired directly: the recommended 24 volt thermostats use a relay per Figure 4 & 4a. Heaters must be grounded in accordance with the CSA standard-C22.1 Canadian Electrical Code. Part 1 and/or local codes. Heaters can also be controlled with a manual line voltage switch or timer switch in place of the thermostat.
- 2. For schematic of factory wiring RTH Heater refer to applicable wiring diagram supplied with these instructions.

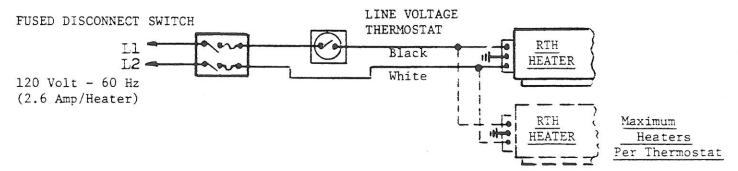


Fig. 3 - "Field" Wiring of Line Voltage Thermostat

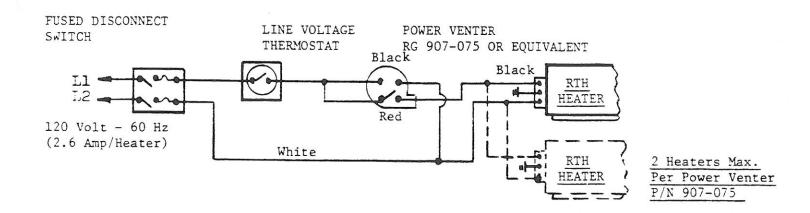
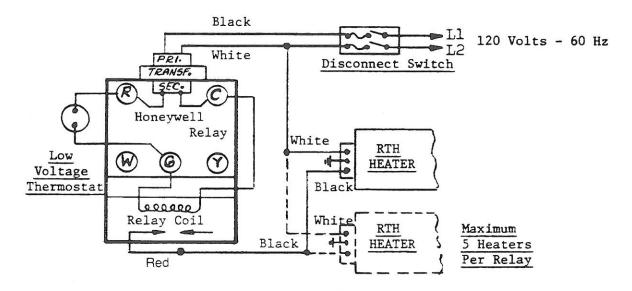


Fig. 3a - "Field" Wiring of Line Voltage Thermostat with Power Venting



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

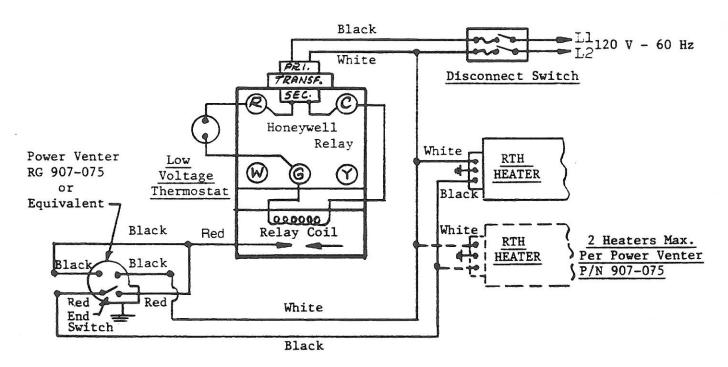


Fig. 4a - "Field" Wiring of Low Voltage Thermostat and Relay and Power Venting

#### SEQUENCE OF OPERATION

#### MODEL RTH-150A D.S.I. CONTROL

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 motor end switch.
- 2. When motor approaches nominal running R.P.M., the centrifugal end 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 deenergized.

#### SERVICE INSTRUCTIONS

#### MODEL RTH-150A

#### D.S.I. CONTROL

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 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 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

1. With gas to heater turned **off** set thermostat above room temperature. When blower motor attains running speed the blower motor end switch energizes the spark module. The spark electrode may be observed by looking thru 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 thermostat may be necessary for observation purposes, if no spark appears.

#### Service Instructions cont.

- a. Check for loose or broken leads from motor end switch.
- b. Check for carbon bridge or broken porcelain insulator on spark electrode.
- c. Check spark electrode gap should be .125 inches.
- d. Check leads from electrode for loose connections or frayed insulation.
- e. Replace D.S.I. module if defective, module is not field repairable.

#### No Gas Present

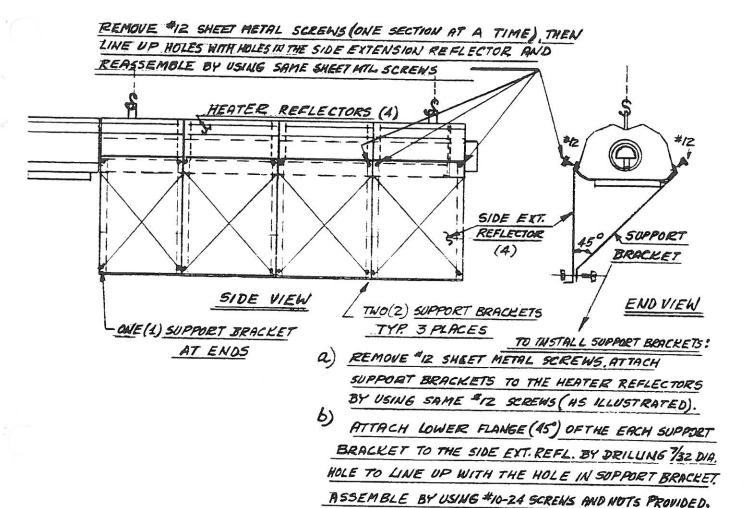
Set thermostat above room temperature. When blower attains running speed blower motor end switch energizes main gas valve if no gas flow or flame are established:

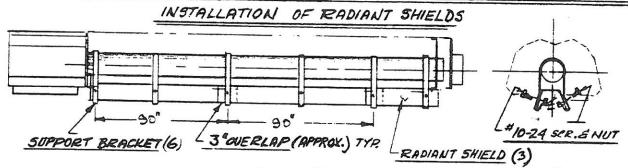
- a. Check to see that manual gas supply valve to heater is on.
- b. Check to see that dial knob on redundant valve in control housing is turned to on.
- c. Check for gas pressure at 1/8" N.P.T. Gauge tapping upstream of burner control.
- d. Check for loose or broken leads from motor end switch.
- e. Check for loose or broken wire leads from gas valve to circuit board.
- f. Replace defective gas valve.
- g. Replace circuit board. Board is not field repairable.

#### Burner Lights and then Goes Out

Flame current is the current which passes through the flame from the sensor to ground to complete the primary circuit, which allows the flame to remain lighted. A minimum flame current in micro amps is necessary to keep the ignitor from locking out. For proper procedure in measuring flame current refer to Fenwall Bulletin 5.16C under service checks or M.H. Bulletin 69.0007 under system trouble shooting, attached to these instructions.

### INSTALLATION OF SIDE EXTENSION REFLECTORS





SLIDE SUPPORTS BRACKETS OVER THE 5°O.D. TUBE.

SPACE THEM APPROX. AS SHOWN. INSTALL RADIANT

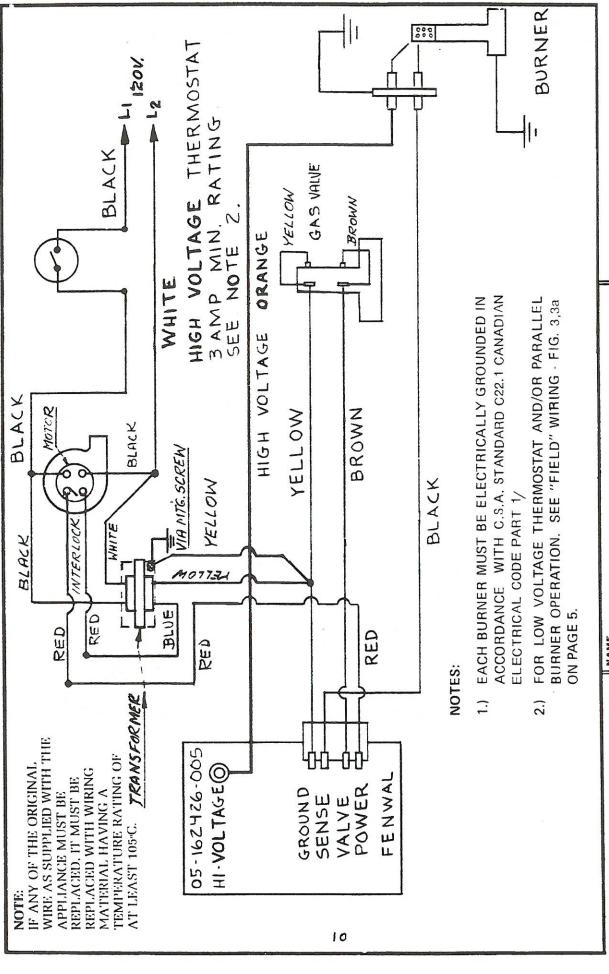
SHIELDS (2 PC'S EACH 96"LG. 3 PC. 48"LONG).

DRILL 7/32 DIR. HOLES THROUGH TAD. SMIELDS TO LINE UP WITH

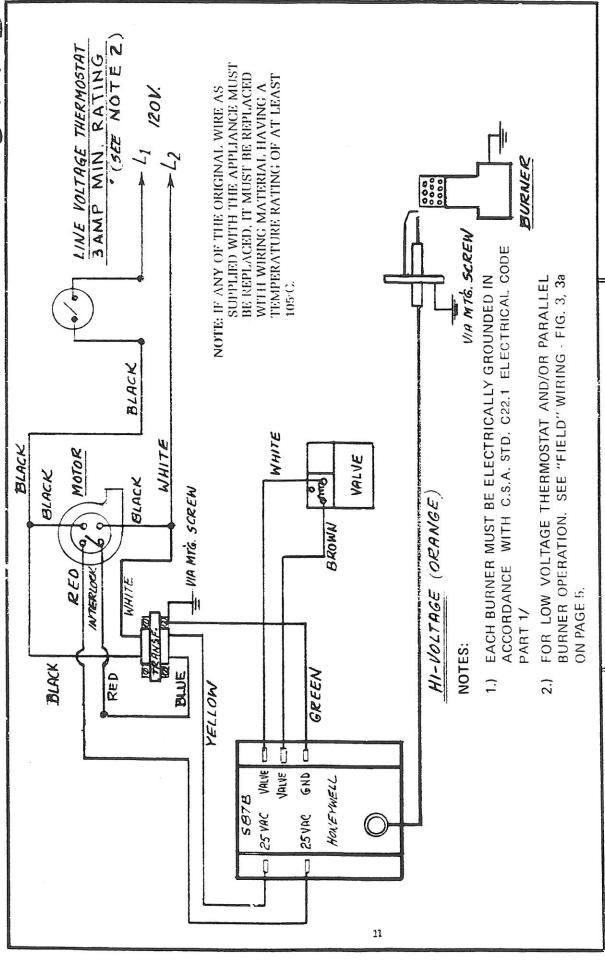
EXISTING HOLES IN THE SUPPORT BRACKETS.

ASSEMBLE BY USING \*10-24 SCREWS AND NOTS, PROVIDED.

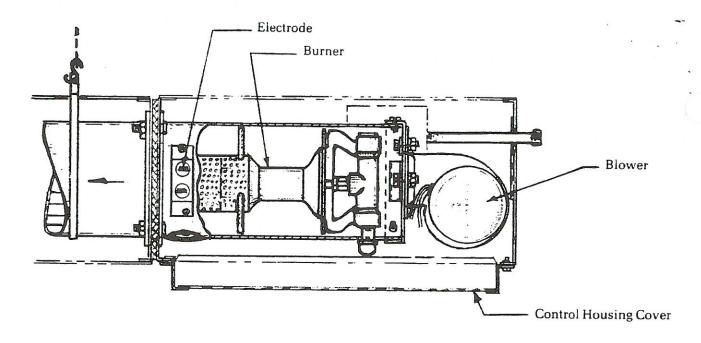
(SEE ILLUSTRATION)



WIRING DIAGRAM-FENWAL D.S.I. 24 VOLT, RTH-150A HTR.



WIRING DIAGR AM - HONEYWELL D.S.I. 24 VOLT, RTH-150A HEATER



RTH-150A BURNER AND CONTROL SECTION

#### MAINTENANCE

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

- 1. BE SURE GAS AND ELECTRIC SUPPLY TO HEATER ARE  $\overline{\text{OFF}}$  BEFORE PERFORMING ANY SERVICE OR MAINTENANCE.
- 2. Remove 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.
- Check condition of Burner.
- 5. Make visual check of Electrode. Replace if there is excessive carbon residue, erosion of electrodes, or other defects. Gap should be .125".
- 6. Remove 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. (See Figure 1)
- 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 as necessary, reattach flue pipe to heater.
- 10. Outside surfaces of heater reflector may be cleaned by wiping with a damp cloth.
- 11. A qualified service agency should be contacted for service and other than routine maintenance.

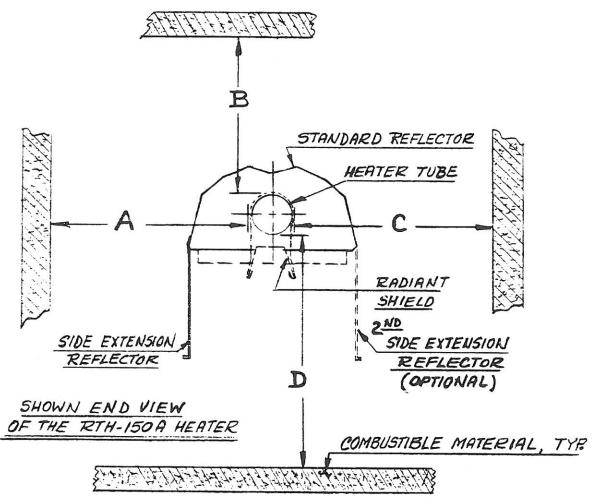


TABLE OF CLEARANCES TO COMBUSTIBLES:

	RTH-150A HEATER	A	B	C	D
0.00	STANDARD REFLECTOR.	36	12	36	72
	STD. REFL. WITH RADIANT SHIELD.	60	12	60	60
	STD. REFL. WITH ONE SIDE EXTENSION REFL.	12	112	36	76
	ST'D. REFL. WITH TWO SIDE EXTENSION REFL'S.	24	12	24	84
*	DO NOT USE WITH SIDE EXTENSION REFLECTOR.	IAI	CHEC	•	•

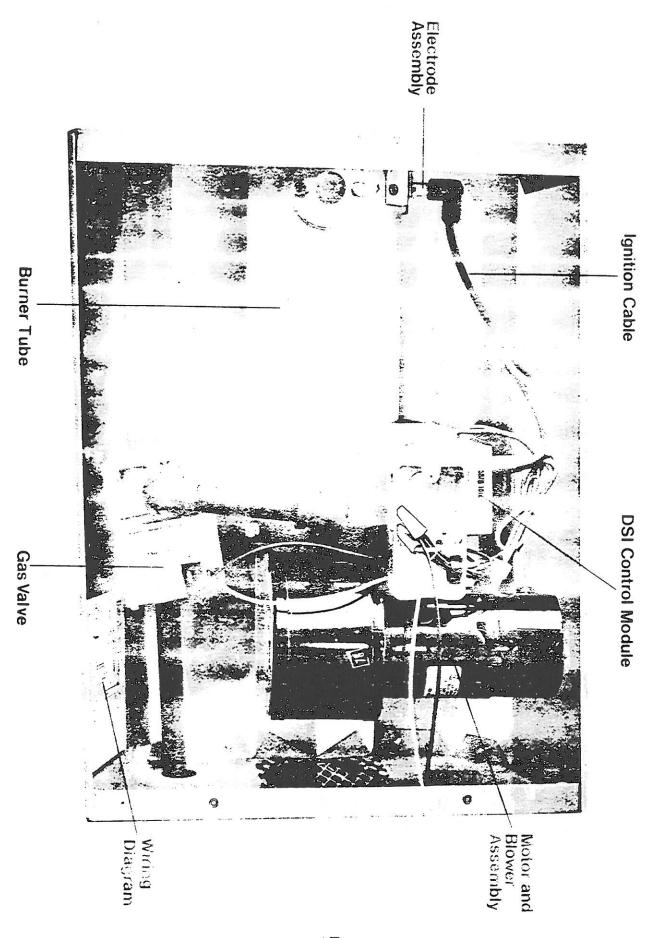
NOTE: IN ALL SITUATIONS CLEARANCES TO COMBUSTIBLES MUST BE MAINTAIN ED.

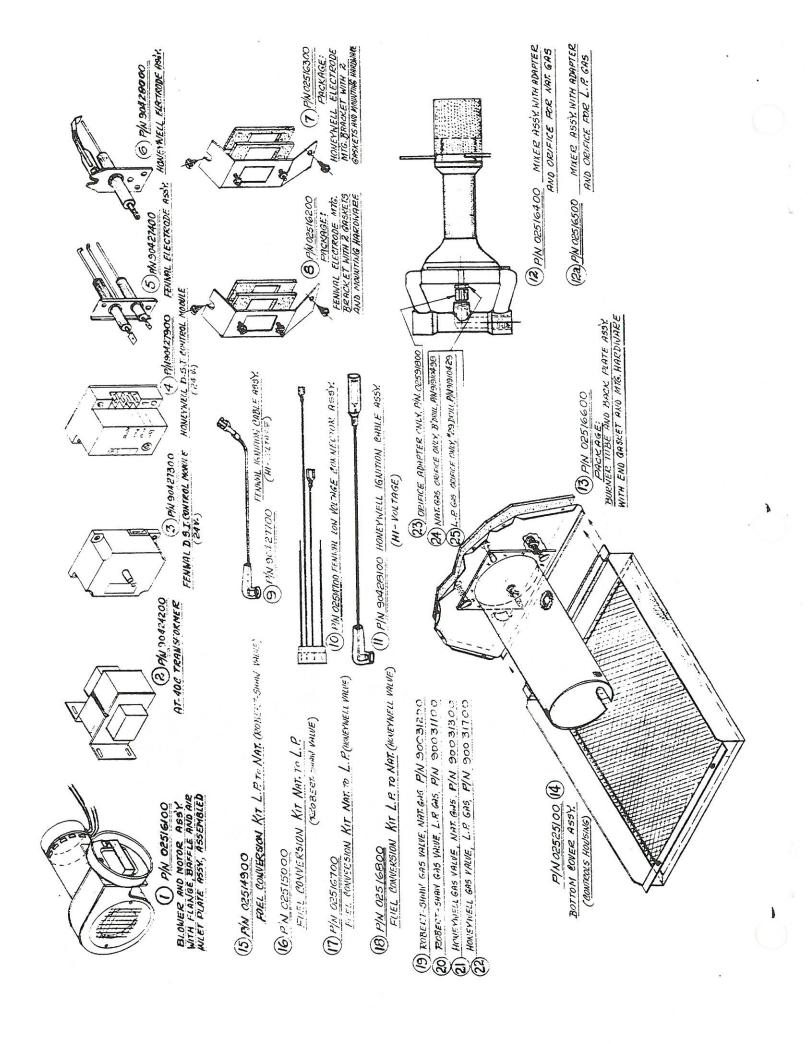
WARNING: A CLEARANCE 50% GREATER THAN MINIMUM CLEARANCES FROM HEATER MUST BE MAINTAINED FROM VEHICLES PARKED BELOW HEATER.

> SK-750 DRAWN BY: ANTONS MIKULS 1-22-82 REVISED: RON MCCUTCHEN 9-14-82

#### REPLACEMENT PARTS FOR RTH-150A

ITEM	DESCRIPTION	PART NO.
1 2 3 4 5 6	Blower and Motor Assembly AT-40C Transformer Fenwal D.S.I. Control Module 24 Volt Honeywell D.S.I. Control Module 24 Volt Fenwal Electrode Assembly Honeywell Electrode Assembly	02516100 90424200 90427300 90427900 90427400 90428000
7 8 9 10	Honeywell Electrode Mounting Bracket Fenwal Electrode Mounting Bracket Fenwal Ignition Cable Assembly Fenwal Low Voltage Connector Assembly Honeywell Ignition Cable Assembly	02516300 02516200 90427700 02514700 90428100
12 12a 13 14	Mixer Assembly with Adaptor and Orifice — Nat. Gas Mixer Assembly with Adaptor and Orifice — L.P. Gas Burner Tube and Back Plate Assembly Bottom Cover Assembly (Control Housing)	02516400 02516500 02516600 02525100
15 16 17 18	Fuel Conversion Kit L.P. to Nat. (Robert-Shaw Valve) Fuel Conversion Kit Nat. to L.P. (Robert-Shaw Valve) Fuel Conversion Kit Nat. to L.P. (Honeywell Valve) Fuel Conversion Kit L.P. to Nat. (Honeywell Valve)	02514900 02515000 02516700 02516800
19 20 21 22	Robert-Shaw Gas Valve - Nat. Gas Robert-Shaw Gas Valve - L.P. Gas Honeywell Gas Valve - Nat. Gas Honeywell Gas Valve - L.P. Gas	90031200 90031100 90031300 90031700
23 24 25	Orifice Adaptor Orifice "B" Drill - Nat. Gas Orifice #29 Drill - L.P. Gas	02591800 91910498 91910429





#### 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.

Part No.

O251490 FUEL CONVERSION KIT PROPANE TO NATURAL GAS (ROBERTSHAW VALVE)
Regulator - Robertshaw #82447
Main Orifice #B Drill 0-2000 Ft. #2 Drill 2000-4500 Ft.
Conversion Data Label

Part No.

02515000 FUEL CONVERSION KIT NATURAL GAS TO PROPANE (ROBERTSHAW VALVE)
Regulator - Robertshaw #82992
Main Orifice #29 Drill 0-2000 Ft. #30 Drill 2000-4500 Ft.
Conversion Data Label

Part No.

02516700 FUEL CONVERSION KIT NATURAL GAS TO PROPANE (HONEYWELL VALVE)

Regulator - Honeywell V5307All17

Main Orifice #29 Drill 0-2000 Ft. #30 Drill 2000-4500 Ft.

Conversion Data Label

Part No.

02516800 FUEL CONVERSION KIT PROPANE TO NATURAL GAS (HONEYWELL VALVE)
Regulator - Honeywell V5307A With Step Set at 2.5" W.C.
Main Orifice #B Drill 0-2000 Ft. #2 Drill 2000-4500 Ft.
Conversion Data Label

- A. To convert from the original fuel to the alternate the gas pressure regulator portion of the gas valve must be changed as follows.
  - 1. Remove original regulator and gasket.
  - 2. Before installing the new regulator, inspect gasket area (also ports) on the operator and remove any foreign material.
  - 3. Install new gasket and regulator and tighten evenly and securely.
- B. The gas orifice must also be replaced. See diagram 12 page 16 for location of orifice.
- C. The conversion data label must be attached to the unit adjacent to the rating plate.