



DTHS SERIES VENTED RADIANT TUBE HEATER OPERATION, INSTALLATION MAINTENANCE AND PARTS MANUAL

WARNING

Read instructions carefully before attempting to install, operate or service the Detroit Radiant Products Heater. Failure to comply with instructions could result in personal injury, death, and/or property damage. Retain instructions for future reference.

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DESCRIPTION

A pressurized burner is inserted into one end of an aluminized steel emitter with either twenty (20) feet or forty (40) feet of tube. After a momentary purge of the system, a glo-bar assures reliable ignition. Hot gases and air are forced down the tube which soon gets hot.

As the tube becomes hot, it radiates infra-red energy. The independent polished bright aluminum reflectors then direct the infra-red energy in a uniform pattern to the floor where it turns to heat.

This simple technology makes the RE—VERBER—RAY system a most cost effective and versatile form of heating, saving energy and installation cost, while providing maximum comfort.

APPROVAL STANDARDS & INSTALLATION CODES

RE—VERBER—RAY Radiant Tube Heaters are designed to comply with American National Standards (ANSI Z83.6 1984). Installation must be in accordance with local codes as well as the National Electrical Code (NEC) and NFPA 70-1 and the Occupational Safety and Health Act (OSHA).

In public garages, the heaters must be installed in accordance with NFPA 88-1979 Standards For Garages and shall not be installed less than eight (8) feet from the floor.

In aircraft hangars, the heaters must be installed in accordance with NFPA No. 409-1979 Standards For Aircraft Hangars. The heaters must be installed at least ten (10) feet above the upper surface of wings or engine enclosures of the highest aircraft which may be stored in the hangar. In areas adjoining the aircraft storage area, the heaters must not be installed less than eight (8) feet above the floor. Also, the heaters must be located to prevent damage from sections of the aircraft, cranes, scaffolds, or other movable objects.

The units must be electrically grounded in accordance with the National Electrical Code ANSI C1-1078 when an external electrical source is utilized.

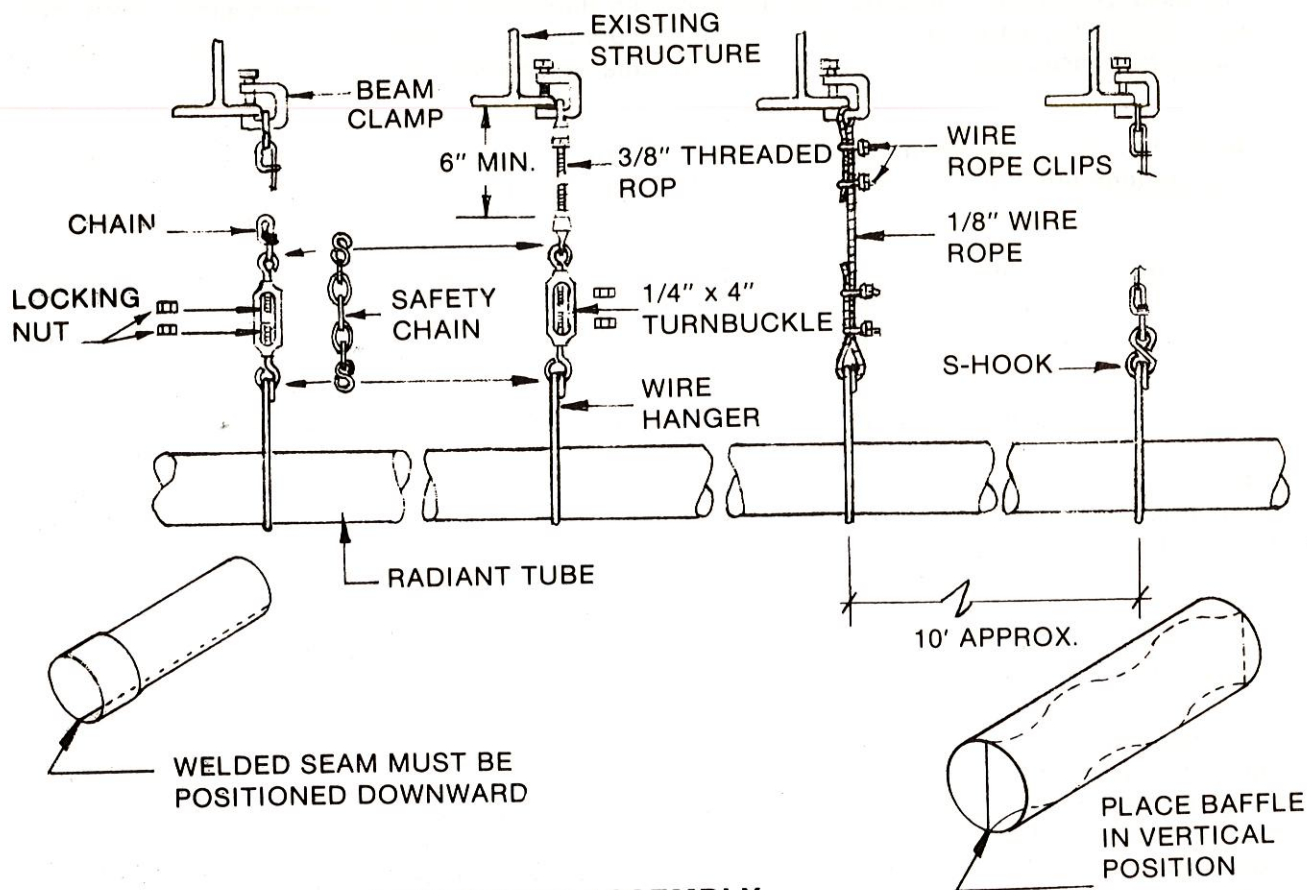
Installation must conform with requirements stated in the American National Standards, National Fuel Gas Code ANSI Z223.1-1980.

MOUNTING THE HEATER

NOTE: While heater is still on the ground, connect 120V to heater and check glo-bar operation.

1. Heater comes equipped with the necessary wire hangers for heater hanging. The DTHS20 has three (3), and the DTHS40 has five (5).
2. Number 3 double loop chain is recommended for heater hanging. Turnbuckles in combination with chains are recommended to assure heater leveling. When using a turnbuckle use a locking nut and/or safety chain loop. If rods or other rigid means are used, provide sufficient lengths or swing joints to allow for heater expansion. (See Below)
3. Mount wire hangers on approximately 10' centers slide tube through hanger **with weld seam downward** and fasten with **tube clamps**. **First tighten narrower end** to approximately 50-70 ft.-lbs. Then proceed to wider end and repeat. Tube with baffle must be installed farthest from the burner. Baffle should be in vertical position.
4. Mount heaters in conformity with standard approvals referenced on page 1 of this manual.

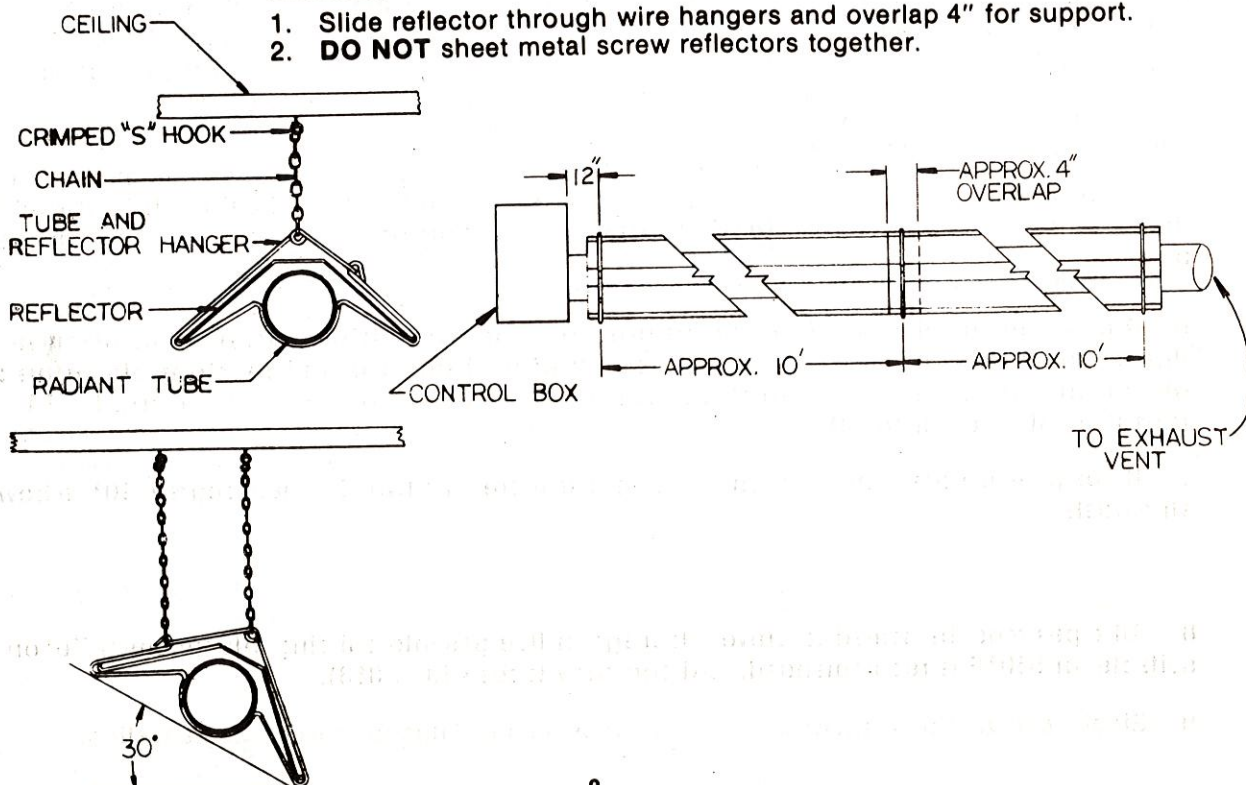
5. Heater must be independently supported and not rely on the gas or electrical line for any of its support.
6. Mount heater so burner sight glass is visible from the floor.



REFLECTOR ASSEMBLY

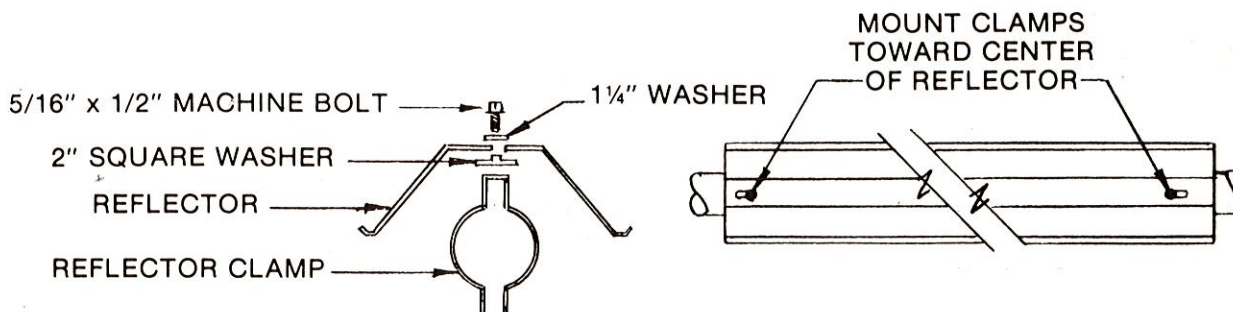
Option A

1. Slide reflector through wire hangers and overlap 4" for support.
2. **DO NOT** sheet metal screw reflectors together.



OPTION B

1. Assemble bolt with washers and clamps to the reflector, slide clamps in slot towards center of reflector. (See Below)
2. Attach reflector with clamp attachment to the heater tube.



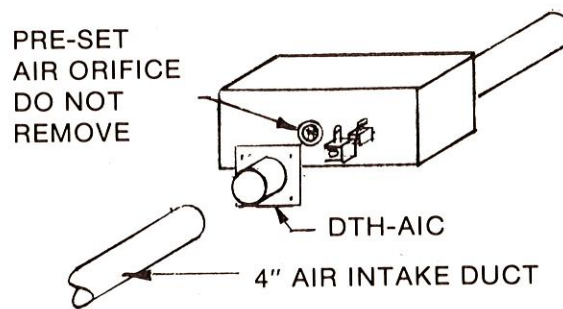
FLUE VENTING

1. Check all codes prior to installing any flue stacks. Local codes may vary.
2. Heater exhaust end will receive a four inch (4") diameter flared or swaged stack.
3. Stacks may consist of a ten foot (10') section of radiant tubing if desired. A minimum of 24 GA round pipe is required. Total stack length from the heater to the exit should not exceed twenty five to thirty five feet (25-35') on the DTHS 20 models, and ten to fifteen (10-15') on the DTHS 40 models, depending upon input. The portion of the stack that passes through combustible material of the building wall or roof must be dual insulated flue pipe. (See illustration on page 13).
4. Stacks may exit the building either horizontally or vertically. Vertical venting exiting the roof should be two (2) feet above the eave of the roof. For horizontal venting, flue should be (2) feet from the sidewall. Care should be exercised to assure that vent opening is beyond any combustible overhang. (See illustration on page 13).
5. A common flue of 6" diameter may be used for double venting of units. When common venting, flues should be connected so that the by-products of **one heater cannot flow into adjoining flue of the other heater**. A dual exhaust assembly is available from the factory; P/N DTH-Y or/DTH-RT. (See illustration on page 14)
6. If flue pipe is more than 10' in length do not use more than two (2) ninety degree (90°) elbows for all models.
7. Breidert, Mastervent, or equal vent cap should be used.
8. All pipes must be sealed to prevent leakage of flue gas into building. Aluminum or Teflon tape suitable for 550° F is recommended. (3M company tapes 433 or 363).
9. Single wall vent pipe exposed to cold air must be insulated to prevent condensation.

UNVENTED OPERATION

The DTHS model units are approved for unvented operation when equipped with a factory supplied end cap/diffuser. This allows the products of combustion from the units to discharge into the space being heated. Ventilation of the space is required to sufficiently dilute these products of combustion. For proper ventilation, it is recommended that a positive air displacement of at least 4 CFM per 1000 BTUH of gas input be provided. This air displacement may be accomplished by either gravity or mechanical means. Provisions must be made to provide sufficient fresh air intake area and exhaust air outlet area to accomplish the displacement. Local codes may require mechanical exhaust system to be interlocked with the electrical supply line to the heaters enabling both to function simultaneously.

COMBUSTION AIR



1. Combustion air intake is a factory pre-set air orifice.
2. If indoor combustion air is to be supplied for a tightly closed room, one square inch of free air opening should be provided for each 5,000 BTUH of heater input.
3. If the building has a negative pressure or if contaminants such as solvents, foreign particles, or corrosive vapors are in the air, then outside combustion air must be directly supplied to the heater. Outside combustion air may be provided by an accessory 4" air duct and directly attached over the air orifice. See illustration on page 15 for limitations of length and size.
4. 4" air intake collar is available from the factory. P/N DTH-AIC (See Above)

GAS SUPPLY

CORRECT INLET PRESSURES ARE VITAL
TO EFFICIENT OPERATION OF HEATERS. REFER TO AGA
RATING PLATE AND IF NECESSARY CONSULT GAS COMPANY.

If all or a portion of the gas supply line consists of used pipe, it must be cleaned and then inspected to determine its equivalency to new pipe. Excessive torque on manifold may misalign orifice. **Always use two (2) wrenches when mating pipe connections.**

Never use a match or lighted flame to test for gas leaks. If any portion of the gas supply line is located in an area that could cause an abnormal amount of condensate to occur in the pipe, a sediment trap should be installed.

Test all main supply lines at 1.5 times working pressure. **(Isolate heater gas valve and supplied gas cock during test).**

The tapping of the gas supply line should be made as illustrated in Figure A on page 12. This method will decrease the possibility of any loose scale or dirt in the supply line entering the heater's control system and cause a malfunction.

Provide a 1/8" NPT plugged tapping accessible for test gauge connection immediately upstream of gas connection to heater.

Natural Gas

The gas supply line must be of sufficient size to provide the required capacity and inlet pressure to the heater. To obtain the required manifold pressure of 3.8" W.C. (Water Column), a minimum of 6" W.C., to a maximum of 14" W.C., must be provided ahead of the control system on each heater.

Propane Gas

To obtain the required manifold pressure of 11" W.C. (Water Column), a minimum of 12" W.C. to a maximum of 14" W.C. must be provided ahead of the control system on each heater. Do not exceed manifold operating pressure of 11" W.C.

Use only a pipe joint compound that is resistant to liquified petroleum gasses.

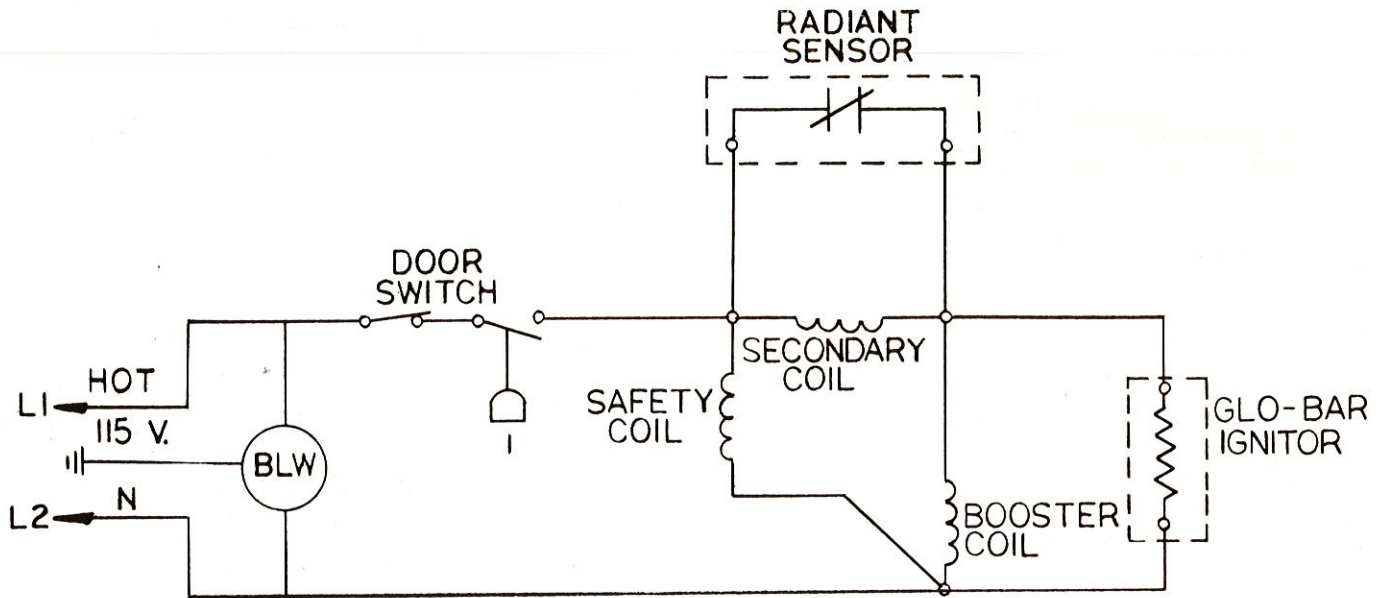
Allowance For Heater Expansion

Allowances must be made for the heater to expand. Use of the stainless steel flexible gas connector is encouraged. If local codes insist on rigid piping to the heater then a swing joint can be used or mount the control box rigid and provide for expansion in the opposite direction.

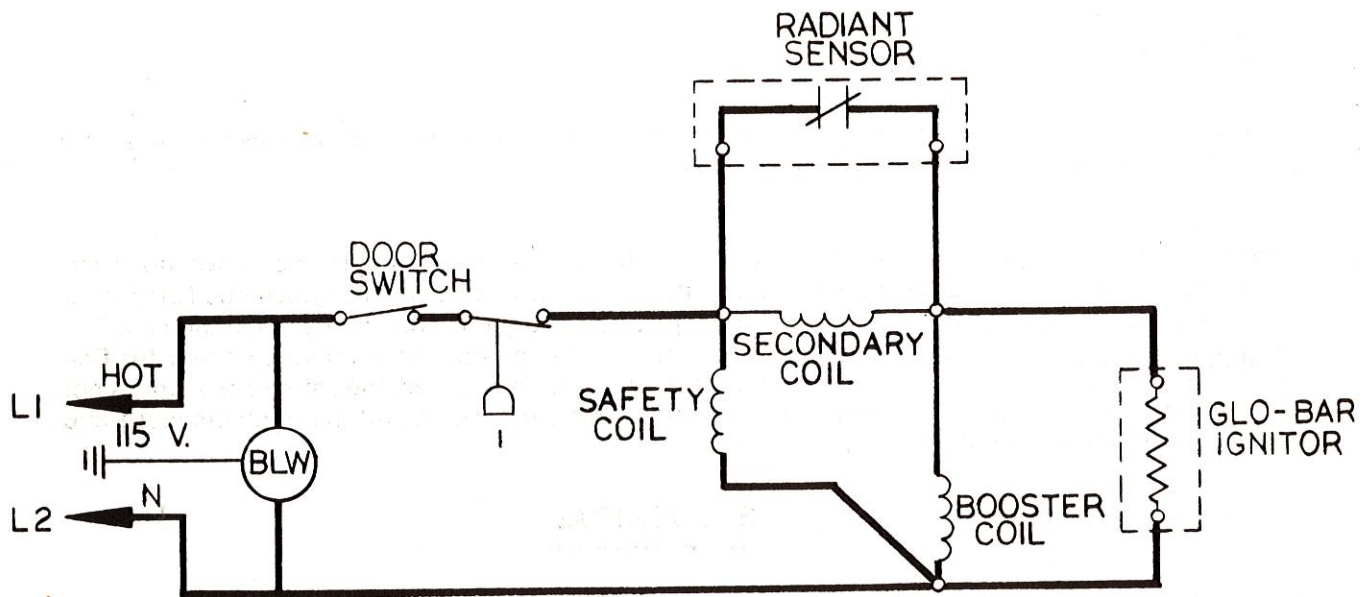
PRESSURE EQUIVALENTS

1" Water Column	— Equals —	0.58 oz. sq. in.
6" Water Column	— Equals —	3.58 oz. sq. in.
11" Water Column	— Equals —	6.36 oz. sq. in.
14" Water Column	— Equals —	1/2 P.S.I.

WIRING DIAGRAM AND SEQUENCE OF OPERATION

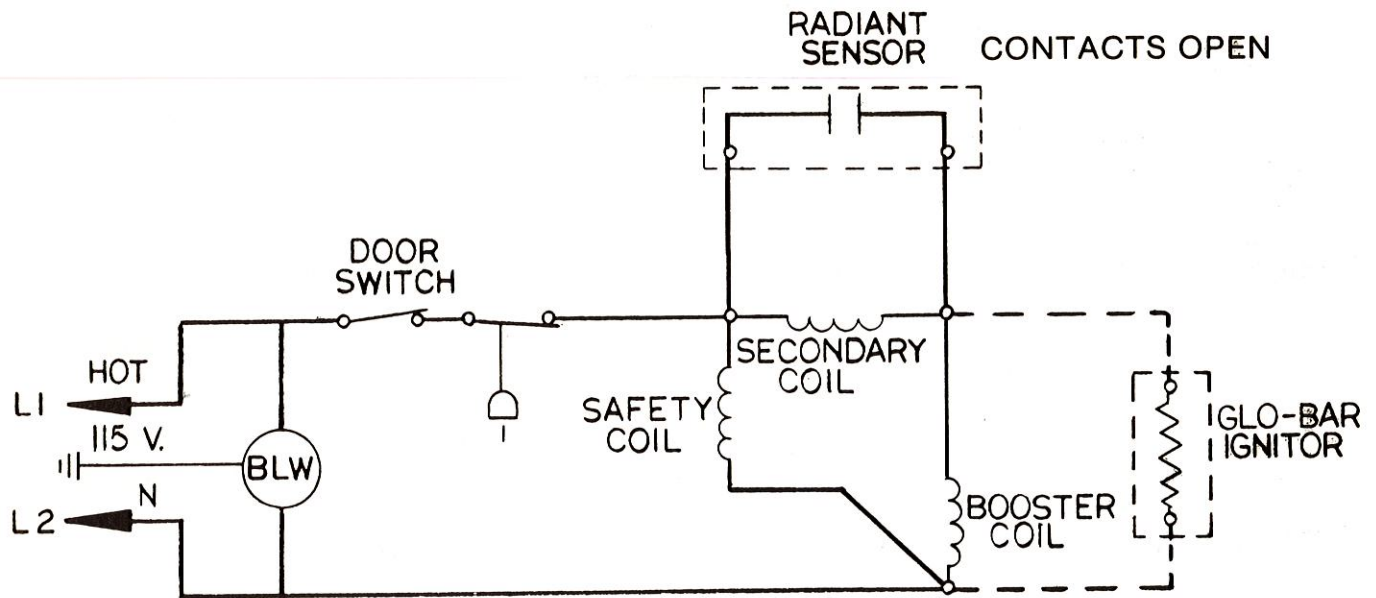


(A) BURNER CIRCUIT



STARTING CIRCUIT

When voltage is applied to L1 and L2 a circuit is completed from L1 to the blower motor to L2. Air pressure generated by the blower will cause the normally open pressure switch to close by this action. Another circuit is completed from L1 to the radiant sensor and glo-bar back to L2. Simultaneously, the safety and booster coils of the first of two redundant valves is energized through the contact of the radiant sensor. This causes the valve to open and the glo-bar to heat up. No gas flows, however, until the second redundant valve is energized and opened.



RUNNING CIRCUIT

When the glo-bar reaches ignition temperature, the radiant sensor is heated and opens (maximum 60 seconds).

The second redundant valve, now in series with the glo-bar, is energized and opened. Gas flow results at the burner and is ignited by the glo-bar.

The secondary coil remaining in series with the glo-bar causes the glo-bar to cool down, however, the radiant sensor is held open by radiant heat emitted from the gas flame. The booster coil of the first valve becomes placed in series with the secondary coil and very low current results in the coil. The safety coil only is sufficient to hold the first valve open. If a momentary power failure occurs, the first valve will shut down gas supply to the burner and when power is restored, the safety coil alone is not sufficient to pull valve open. Therefore, the radiant sensor cools down and the contacts close and recycle occurs (maximum 60 seconds).

ELECTRICAL

1. Heaters operate on 120 volts 60 Hz. Ignition current requires 4.8 amps. Running current requires .9 amps.
2. Heater must be grounded in accordance with the National Electrical Code NFPA 70-1981 when an external source is utilized.
3. It is recommended that the thermostat be installed on the hot side of a fused supply line and have a sufficient ampere rating for the heater(s) it will control.

4. Wiring must not be run above or below the heater nor exposed to the radiant output.
5. Observe electrical polarity.

GAS CONTROLS

A. GAS VALVES

Gas valve number 25K39A includes a safety and secondary valve with pressure regulator removed.

The safety valve is activated by means of a double coil (split coil -- safety and booster). Both coils are utilized to open the safety valve.

The secondary has a single coil. Should the safety coil or the booster coil require replacement, they must be replaced as a unit. The internal regulator is blocked open and an external regulator is used to regulate manifold pressure.

NOTE: If a high pressure regulator is used it must be a positive lock out type.

B. GLO-BAR IGNITOR

The Glo-Bar Ignitor consists of a recrystallized silicon carbide material which incandesce during the ignition cycle of the system. Main burner gas ignites after the gas valve opens and the ignitor has reached ignition temperature.

The ignitor has been design tested to withstand 100,000 cycles of operation. **(However, it is fragile and must be handled carefully to avoid breakage).**

NOTE: While heater is still on the ground, connect 120V to heater and check ignitor operation.
This is visible through sight glass on tube.

The ignitor is attached to the side of the venturi by means of a mounting screw and is electrically connected with wire harness.

Service to the Glo-Bar is limited to replacing it if determined to be defective.

C. RADIANT SENSOR

The radiant sensor is mounted in a covered box outside the radiant tube near the control box.

The radiant sensor is a heat sensitive bi-metal switch with a single throw contact that is normally in the closed position.

It is calibrated to open when the glo-bar has attained ignition temperature. After the burner has ignited, burner flame causes the radiant sensor to remain open. When the burner flame terminates, the radiant sensor contact recloses approximately thirty-five seconds later.

(Mounting of the radiant sensor to the radiant tube is critical). Any misalignment between the radiant sensor and the radiant tube "window" will cause the system to go into nuisance shutdown.

OPERATION

A. BURNER ASSEMBLY

1. Upon the thermostat calling for heat, the burner blower will operate and pressurize the control box and burner chamber. Pressure switch is satisfied, and the glo-bar will energize. This purge cycle will take approximately 35 seconds.
2. The radiant sensor's contacts will open, the glo-bar will de-energize and residual glo-bar energy will ignite burner gas. The radiant sensor will then sense main burner ignition and continue to operate.
3. When the thermostat is satisfied, the fan de-energizes, valve closes and system waits next cycle of operation.

B. BLOWER FAN

1. Blower fan mounted in the control box is rated to supply sufficient combustion air as applied to the heater.
2. Blower fan is U.L. listed and includes a thermal protector overload. Periodic lubrication is required.

C. PRESSURE SWITCH

1. The pressure switch is mounted adjacent to the blower.
2. The pressure switch is factory pre-set to sense the pressure difference between incoming combustion air and flue exhaust.

NOTE: The pressure switch should not be adjusted. Pressure switch setting is critical for proper combustion and exhaust characteristics.

3. Supplied door switch will shut down heater if control box cover is removed.

LIGHTING INSTRUCTIONS


1. Purge main gas supply line.
2. Rotate heater's manual gas valve knob to "ON" position.
3. Close electrical circuit.
4. If heater fails to light, turn off gas and wait five (5) minutes before repeating the above.

TO SHUT DOWN

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

TROUBLE SHOOTING SERVICE AND MAINTENANCE CHECK LIST

SYMPTOM	POSSIBLE CAUSES	SERVICE
1. Thermostat closed but nothing happens.	<ol style="list-style-type: none">1. Blown fuse.2. Defective thermostat.3. Loose or disconnected wire.4. Defective Fan.5. Defective door switch	<ol style="list-style-type: none">1. Replace.2. Replace.3. Repair as required.4. Lubricate, repair or replace.5. Replace
2. Thermostat closed. Fan operates. No Glo-Bar energization.	<ol style="list-style-type: none">1. Loose or disconnected wire.2. Plugged or restricted exhaust vent.3. Plugged pressure switch lines.4. Defective pressure switches.5. Defective Glo-Bar.6. Defective radiant sensor.7. Box lid or gasket not in place.	<ol style="list-style-type: none">1. Repair as required.2. Remove foreign matter.3. Clean as required.4. Replace only. Do not adjust.5. Replace.6. Replace radiant sensor.7. Put in place.
3. Thermostat closed. Fan and Glo-Bar operate. After 45 seconds glo-bar shuts off. No ignition.	<ol style="list-style-type: none">1. Closed gas supply.2. Dirty or restricted orifice.3. Defective valve, disconnected valve wire.	<ol style="list-style-type: none">1. Open all gas connections.2. Remove and clean with a soft object.3. Replace or repair.
4. Thermostat closed, fan and Glo-Bar operate. After 1 minute, Glo-Bar stays on. No ignition.	<ol style="list-style-type: none">1. Dirty or sooted radiant sensor window, or Mica.2. Misaligned radiant sensor window, fails to "see" glo-bar operation.3. Defective radiant sensor.	<ol style="list-style-type: none">1. Clean as necessary.2. Adjust radiant sensor to radiant tube using prepunched mounting holes.3. Replace radiant sensor.



5. Thermostat closed, fan and Glo-Bar operate. Ignition occurs. Burner cycles off after a minimum of 1 minute.

1. Dirty or sooted radiant sensor window.
2. Misaligned radiant sensor window, fails to "see" main burner operation.
3. Low gas pressure.
4. Dirty or restricted orifice.
5. Defective radiant sensor.
6. Burner side pressure tube misaligned.

1. Clean as necessary.
2. Adjust radiant sensor to radiant tube using prepunched mounting holes.
3. Provide required gas pressure.
4. Remove and clean with a soft object.
5. Replace
6. Tube should be at the top of the fan opening.

6. Loss of heater efficiency.


1. Low gas pressure.
2. Dirty or restricted orifice.
3. Foreign matter inside burner assembly.
4. Unit cycles on and off.
5. Reflector is sooted and lost its reflective ability.
6. Reflector not in place.
7. Clogged fan blower.

1. Provide required gas pressure.
2. Remove and clean with a soft object.
3. Clean as necessary.
4. Check symptom #5 above.
5. Clean with aluminum cleaner and soft wiping cloth.
6. Put in place.
7. Clean.

7. Visual inspection of burner operation not possible.

1. Dirty or sooted sight glass.
2. Unit mounted upside down.

1. Remove, clean or replace.
2. Mount correctly.



8. Radiant tubes leaking burnt gasses.

1. Loose tube connections.
2. Holes or cracks in radiant tubes.

1. Assure that tube is fully inserted into flared end and properly clamped.
2. Replace.

9. Condensation

1. Stack length too long.
2. Light gauge flue stack used.

1. Shorten stack.
2. Minimum of 24GA vent pipe is required.

10. Tube Bowing


1. Insufficient combustion air.
2. Over fired.

1. Provide 1 sq. inch of free air for every 5000 BTUH of input.
2. Check gas pressure and orifice size.

11. Stack Sooting

1. Insufficient combustion air.
2. Improper gas.

1. Provide 1 sq. inch of free air for every 5000 BTUH of input.
2. Correct.



12. Tube corroding.

1. Contaminated combustion air.

1. Provide fresh air inlet duct.

NOTE: Do not adjust any pressure switch.



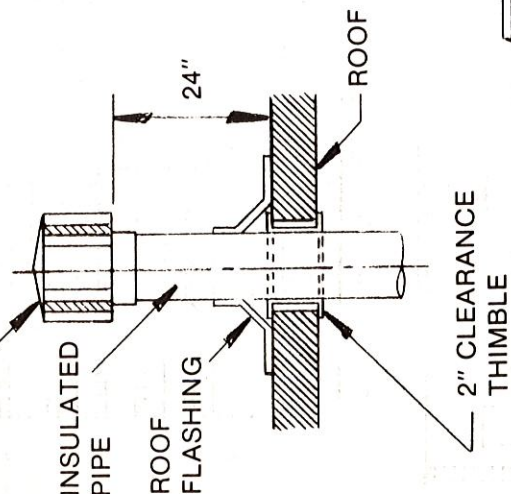
ELEVATION OF MOUNTING DETAIL

CONTROL BOX DETAIL

MODEL	QUA.	MTG. HT. DIM. 'A'	TO WALL (DIM. 'B')		CLEARANCE TO COMB.		
			0° ANG.	45° ANG.	TOP	BELOW	SIDE
DTHS 20-40 N or P		9-14 Ft.	10-15 Ft.	1-5 Ft.	9 In.	36 In.	10 In.
DTHS 20-50 N or P		10-15	10-16	1-6	9	42	10
DTHS 20-60 N or P		11-16	11-17	1-7	9	54	10
DTHS 20-75 N or P		13-17	13-20	1-8	9	60	10
DTHS 40-40 N or P		8-12	9-13	1-5	9	24	10
DTHS 40-50 N or P		9-13	10-14	1-6	9	36	10
DTHS 40-60 N or P		10-14	10-16	1-7	9	40	10
DTHS 40-75 N or P		11-15	11-18	1-8	9	54	10
DTHS 40-100 N		13-17	13-20	2-10	12	72	24

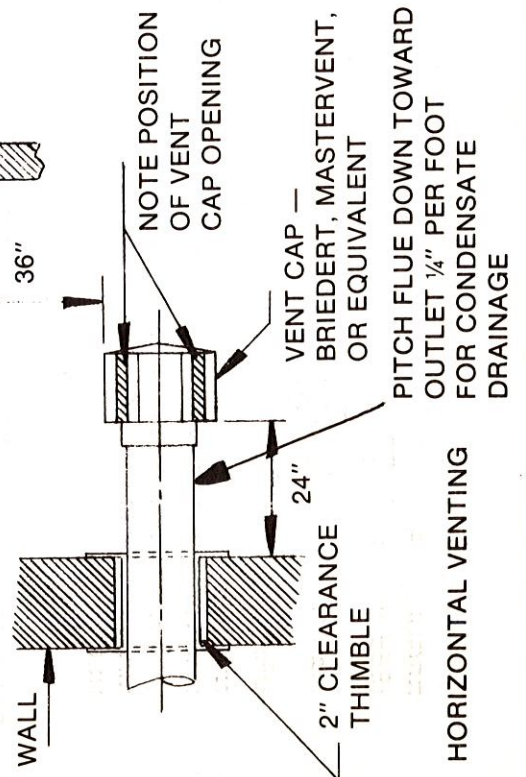
WARNING
FAILURE TO COMPLY
WITH STATED
CLEARANCES TO
COMBUSTIBLES
COULD RESULT IN
PERSONAL INJURY,
DEATH AND/OR
PROPERTY DAMAGE.

VENT CAP — BREIDERT, MASTERVENT
OR EQUIVALENT



VERTICAL VENTING

BUILDING OVERHANG



HORIZONTAL VENTING

NOTE POSITION
OF VENT
CAP OPENING

VENT CAP —
BREIDERT, MASTERVENT,
OR EQUIVALENT

PITCH FLUE DOWN TOWARD
OUTLET 1/4" PER FOOT
FOR CONDENSATE
DRAINAGE

MODEL	MBTUH INPUT	MAXIMUM STACK LENGTH OPT. EXTENSION INCL.
DTHS 20-40	40	25'
DTHS 20-50	50	30'
DTHS 20-60	60	35'
DTHS 20-75	75	35'
DTHS 40-50	50	10'
DTHS 40-60	60	15'
DTHS 40-75	75	15'
DTHS 40-100	100	15'

CHAIN

RADIANT TUBE
HEATER

SCALE:

APPROVED BY:

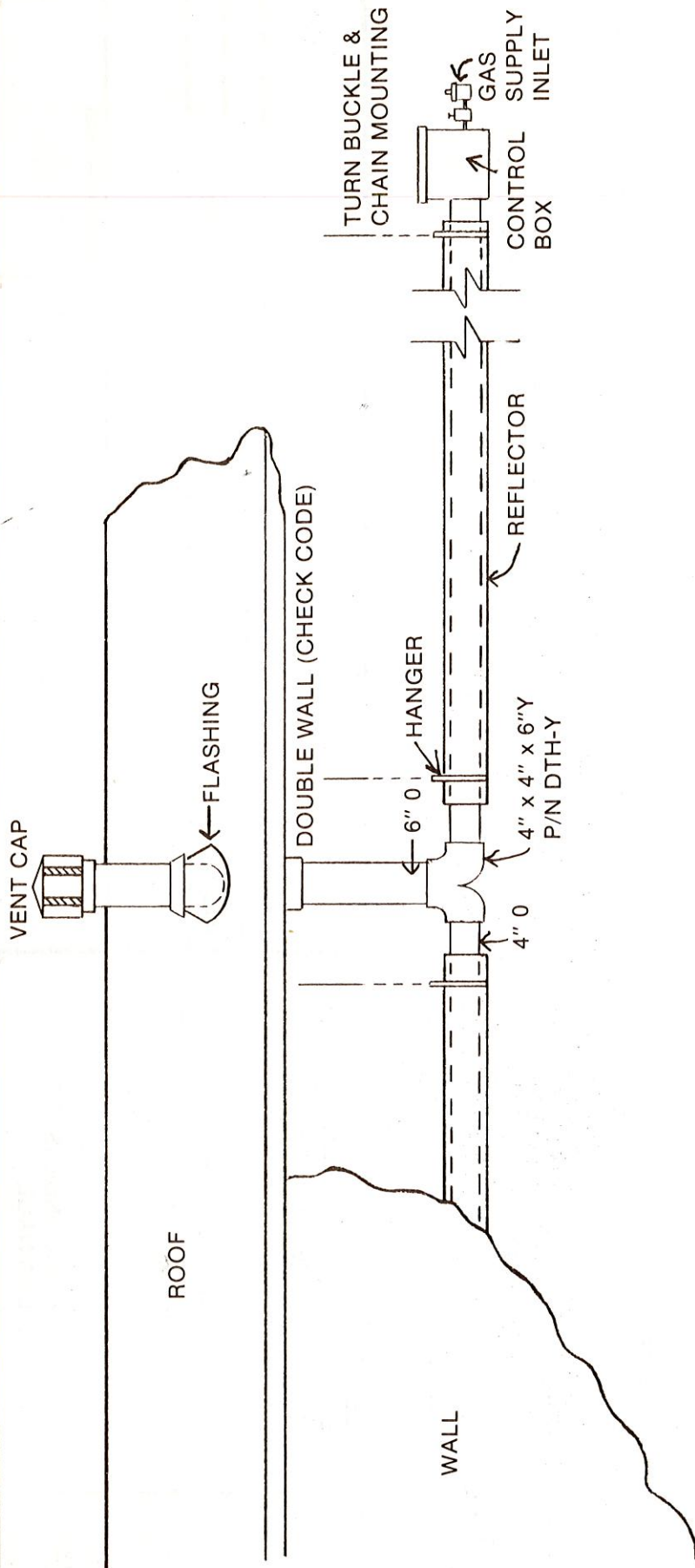
DRAWN BY

DATE:

REVISED

DRAWING NUMBER

ST-116

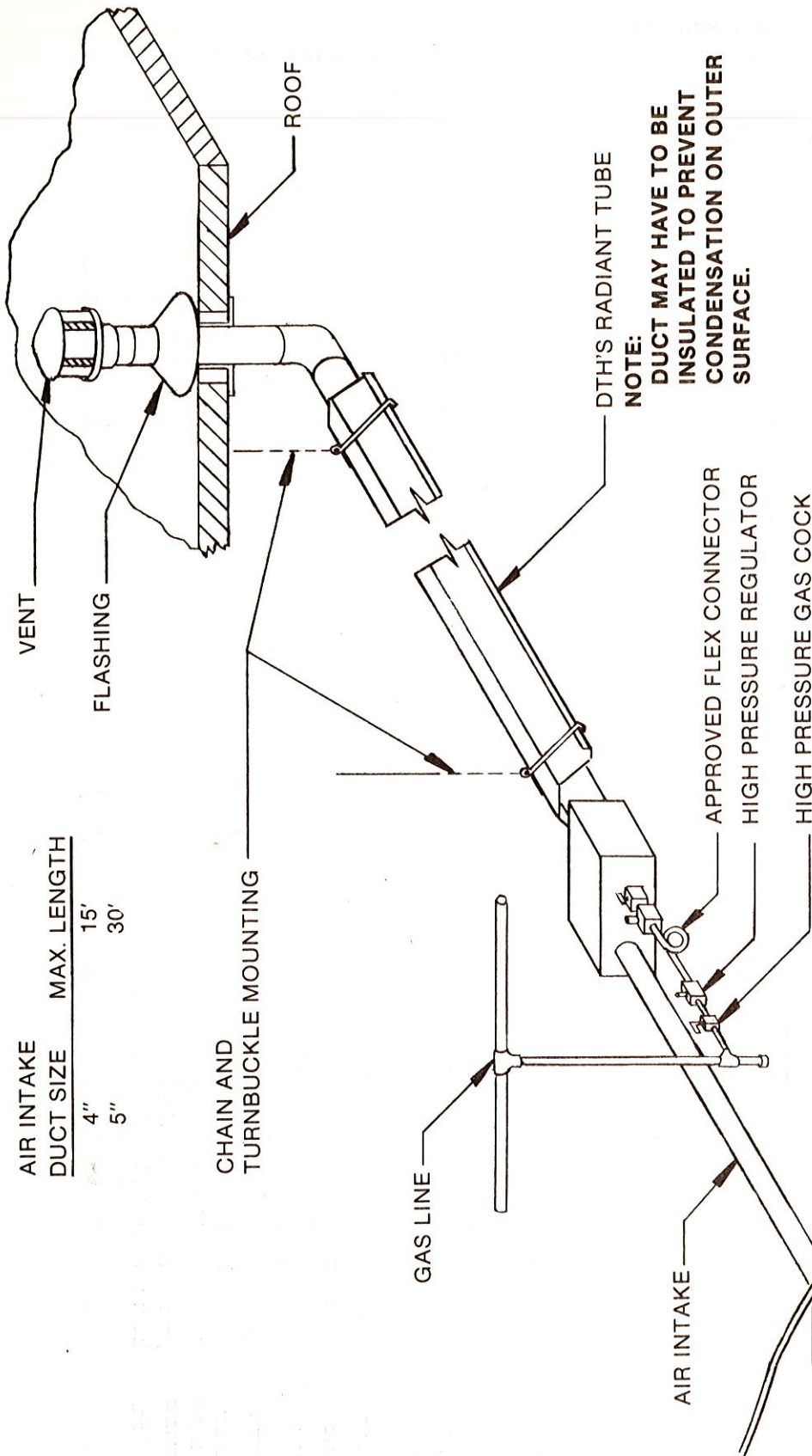


NOTES

- CONSULT YOUR LOCAL HEATING CODE ON ALL VENT INSTALLATIONS.
- THE STANDARDS OF THE NATIONAL FIRE PROTECTION ASSOCIATION, NFPA NOS. 54 AND 211 REQUIRE THAT UNLESS EQUIPPED WITH AN APPROVED VENT CAP THE VENT MUST EXTEND AT LEAST TWO FEET ABOVE THE HIGHEST PORTION OF A BUILDING WITHIN TEN FEET. A VENT CAP SHOULD BE USED ON ALL THROUGH ROOF INSTALLATIONS TO PREVENT BACK DRAFTS AND TO KEEP OUT RAIN AND DEBRIS.
- BE SURE THE HEATER HAS AN ADEQUATE FRESH AIR SUPPLY FOR PROPER COMBUSTION.

APPROVED BY:		DRAWN BY	
		REVISED	
SCALE:			
DATE:			
		DRAWING NUMBER	

AIR INTAKE	DUCT SIZE	MAX. LENGTH
4"	5"	15'
		30'



DETROIT RADIANT PRODUCT CO.
21400 HOOVER RD., WARREN, MICH. 48089

SCALE: NONE APPROVED BY:

DATE: 5/21/84

DRAWN BY D.S.

REVISED

STRAIGHT TUBE MOUNTING WITH
OUTSIDE AIR SUPPLY & TYPICAL ROOF VENTING

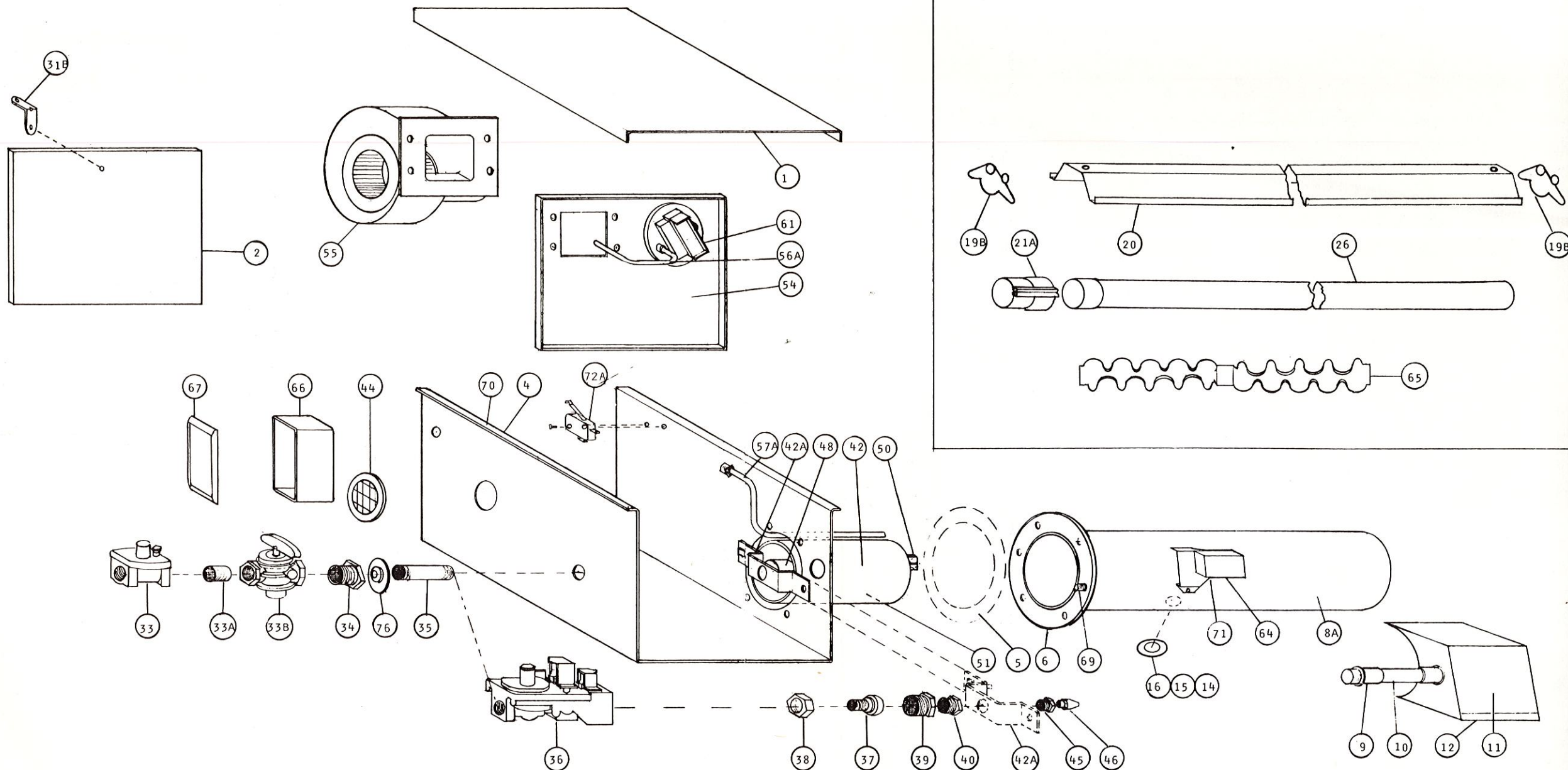
DRAWING NUMBER

ST-117

MAINTENANCE:

1. Blow all dust and debris off of unit with compressed air.
2. Keep underside of reflectors clean. Use soapy water and sponge. Dry with lint-free cloth.
3. Oil fan motor with S.A.E. 20.
4. Check fan squirrel cage for debris.
5. Check cover gasket and cover for proper seal.

AREA REPRESENTATIVE _____					
SHIPPER NO. _____			PHONE NO. _____		
INSTALLING CONTRACTOR _____			TRUCKLINE _____		
INSTALLATION DATE: _____			PHONE NO. _____		
NUMBER AND SIZE OF UNITS		1. _____			
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> CONTRACTOR COMMENTS: </div>		2. _____			
		3. _____			
		4. _____			
CUSTOMER NAME _____					
SERVICE AND MAINTENANCE RECORDS					
DATE	SERVICEMEN	WORK DONE	DATE	SERVICEMEN	WORK DONE



DESCRIPTION

- | | |
|-------------------------------|-------------------------------------|
| 1. CONTROL BOX COVER | 38. UNION NUT |
| 2. OUTSIDE CONTROL BOX END | 39. 1/2" UNION FITTING |
| 4. CONTROL BOX | 40. 1/2" X 1/4" BUSHING |
| 5. GASKET | 42. BURNER CASING |
| 6. TUBE FLANGE | 42A. BURNER CASING MOUNTING BRACKET |
| 8A. 16" STRAIGHT BURNER TUBE | 44. INLET AIR ORIFICE W/SCREEN |
| 9. CONDUIT COUPLING | 45. 1/4" X 1/8" BUSHING |
| 10. ALUMINUM TUBE 4" X 2" | 46. ORIFICE |
| 11. RADIANT SENSOR BOX | 48. MAIN BURNER |
| 12. RADIANT SENSOR LID | 50. GLO-BAR IGNITOR |
| 14. SIGHT GLASS WASHER | 51. MAIN BURNER BRACKET (NOT SHOWN) |
| 15. SIGHT GLASS | 54. BURNER BOX DIVIDER |
| 16. SIGHT GLASS GASKET | 55. FAN BLOWER |
| 19B. WIRE HANGER | 56A. 1/4" FAN PRESSURE TUBE |
| 20. REFLECTOR | 57A. 1/4" BURNER PRESSURE TUBE |
| 21A. TUBE CLAMP | 61. BURNER PRESSURE SWITCH |
| 26. 10" RADIANT STRAIGHT TUBE | 64. RADIANT SENSOR |
| 31B. HOUSING SUPPORT BRACKET | 65. HEAT DIFFUSER |
| 33. REGULATOR | 66. 2" X 4" OUTLET BOX |
| 33A. 1/2" CLOSE NIPPLE | 67. 2" X 4" OUTLET BOX COVER |
| 33B. 1/2" GAS COCK | 69. WELD BOLT |
| 34. 3/8" X 1/2" BUSHING | 70. CONTROL BOX COVER GASKET |
| 35. 2-1/2" X 3/8" PIPE NIPPLE | 71. RADIANT SENSOR MICA |
| 36. 3/8" GAS VALVE | 72A. DOOR SWITCH |
| 37. 3/8" UNION FITTING | 76. RUBBER BUSHING |

REVISIONS			DETROIT RADIANT PRODUCTS		
NO.	DATE	BY	STRAIGHT TUBE ASSEMBLY EXPLODED VIEW		
1	7-27-83	CDT	DRAWN BY	SCALE	MATERIAL
2			CHK'D	NONE	
3			DATE	5-24-83	DRAWING NO.
4			TRACED	APP'D	ST 107
5					