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

REZNOR Thomas Betts

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WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. See Hazard intensity Levels, column 2.

PARS YEARS

High-Intensity Gas Infrared Heaters

Installation/Operation Form RGM 450 (Version 10) Obsoletes Form 450 (Version 9)

APPLIES TO:

Models RIH and RIHV

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in the vicinity of this appliance is hazardous

If you smell gas:

- 1. Open Windows
- 2. Don't touch electrical switches
- 3. Extinguish any open flame
- 4. Immediately call your gas supplier.

HAZARD INTENSITY LEVELS

- 1. DANGER: Failure to comply will result in severe personal injury or death and/or property damage.
- 2. WARNING: Failure to comply could result in severe personal injury or death and/or property damage.
- 3. CAUTION: Failure to comply could result in minor personal injury or death and/or property damage.

1. General Information and Installation Codes

Model RIH/RIHV infrared heaters are designed and manufactured in compliance with the American National Standards Institute. They are design-certified by the Canadian Standards Association to ANSI Standards for installation in the United States and to CAN/CGA Standards for installation in Canada. These units are approved for indoor commercial and industrial installation only. Installation should be done by a Reznor distributor or other qualified agency in accordance with these instructions and in compliance with all codes and requirements of authorities having jurisdiction.

IMPORTANT: These infrared heaters are operated without venting. The fresh air requirement of four CFM per 1,000 BTUH for natural gas and five CFM per 1,000 BTUH for LP gas is mandatory when operating heaters in the unvented mode.

Model RIH and RIHV heaters should **not** be used in the following applications:

- 1. Enclosed swimming pool areas
- 2. Areas with contaminated atmospheres
- 3. Outdoor applications
- 4. Areas requiring explosion-proof equipment
- 5. Process applications

Infrared heaters should not be installed in buildings with uninsulated metal roof decks. Uninsulated metal roof decks will cause condensation of water vapor (contained in the unvented heater flue gas) on the inside of the building. Metal roof decks must be insulated using built-up insulation and roofing on the exterior or inside insulation that is not permeable to water vapor. Interior insulation that is permeable to water vapor must be completely sealed with a vapor barrier.

Installation Codes

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code (latest edition). A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements

All electrical wiring must be in accordance with the National Electric Code ANSI/NFPA No.70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. The installing contractor must be familiar with all of the various requirements and is responsible for installing the heater in compliance with the applicable codes.

Special Installations

Aircraft Hangars: In the United States, the heaters must be installed in accordance with ANSI/NFPA 409 (latest edition), Chapter 5 NFPA. Publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269. In Canada, installations in an aircraft hangar must comply with CAN/CGA-B149.2, Section 4.21. Both the ANSI/NFPA 409-1990 and the CAN/CGA-B149.2 specify that the heater shall not be located in an area of an aircraft hangar where it may be subjected to physical damage by aircraft, cranes, moveable scaffolding or other objects.

1. Installation Codes (cont'd)

NFPA 409-1990 specifies a clearance of 10 feet to the bottom of the heater from the highest surface of the wings or engine enclosures of the highest aircraft which may be housed in the hangar.

CAN/CGA-B149.2 specifies that an infrared heater installed in an aircraft hangar be at least 10 feet (3m) above either the highest fuel storage compartment of the highest engine enclosure or the highest aircraft which may occupy the hangar. NFPA 409-1990 and CAN/CGA-B149.2 specify a minimum clearance of eight feet (2.5m) from the top floor to the heater in other sections, such as offices or shops, that communicate with the aircraft hangar.

Repair Garages: In the United States, heaters installed in public garages must be in accordance with National Fire Protection Association (NFPA) 88B-1991, Section 3-2.3. Overhead heaters must be located not less than 8 feet (2.5m) above the floor and installed in accordance with the conditions of their approval. NFPA 88B-1991 requires the following warning.

WARNING: Minimum clearance marked on the heater must be maintained from vehicles parked under the heater.

In Canada, in a garage, the minimum clearance from the bottom of an infrared heater to the upper surface of the highest vehicle which may be housed therein shall be 50 percent greater than certified clearance, and in no case less than 8 feet (2.5m).

Parking Structures:

This heater is suitable for use in parking structures when installed in accordance with requirements in NFPA 88A (latest edition).

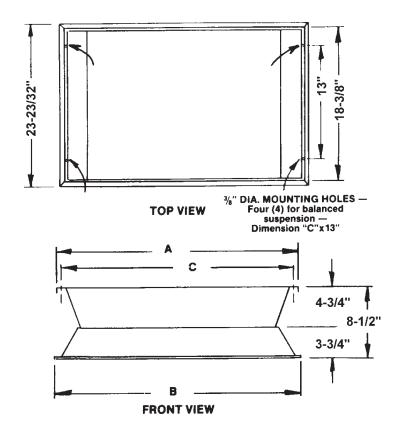
"INSTALLATIONS OTHER THAN SPACE HEATING"

Use for processing applications voids the warranty and certification.

WARRANTY IS VOID IF.....

- unit is used in atmosphere containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons.
- b. Unit is installed without proper clearance to combustible materials or in a location where the heater controls can be subjected to ambient temperatures in excess of 150°F.
- c. Unit is installed at an angle not approved for that model.
- d. Unit is installed for other than space heating applications.
- e. Unit is altered. Units are completely factory assembled and fire tested.

2. Dimensions



Size	A	В	C
30, 50, 60	15-5/16"	16-5/8"	14-5/8"
90, 100	23-15/16"	25-1/4"	23-1/4"
120, 150	32-9/16"	33-7/8"	31-7/8"
160	41-3/16"	42-1/2"	40-1/2"

3. Clearances

This heater model must be mounted with minimum clearances between the combustion surface and combustibles.

It should be located with respect to building construction and equipment as to provide sufficient clearance and accessibility for servicing and cleaning.

WARNING: Single or multi-heater placement must be such that continuous operation of the heater or heaters will not cause combustible materials or materials in storage to attain a temperature in excess of 160°F.

Under no circumstances should this heater be installed in a combustible atmosphere or in a location where the heater controls can be subjected to ambient temperatures in excess of 150°F. See Hazard Levels, page 1.

It is recommended that more distance than the minimum clearance be maintained above the unit whether or not the construction is combustible. This will reduce and/or eliminate hot spots and possible staining of painted ceiling surfaces. If the unit must be close to the roof or ceiling, interpose a non-combustible baffle (twice the size of the reflector) between the unit and the roof or ceiling. Allow at least 2" between the unit and the roof or ceiling and the non-combustible baffle. Allow at least 12" between the non-combustible baffle and the top of the heater.

Clearances to Combustibles (Inches)

		Na	tural Gas M	odels		Prop	ane Gas Mo	dels
Clearances - Refer to Figure 2, page 4, for measuring orientation for angled heater.	RIHN 30①	RIHN 60©	RIHVN 1003	RIHVN 150	RIHVN 1603	RIHL 503	RIHVL 903	RIHVL 1203
Side of Heater	30	30	36	46	48	30	36	46
Back of Heater	30	30	30	33	33	30	30	33
Top of Heater:								
Standard Mounted 0-29°	60	60	64	64	68	60	64	N/A
Standard Mounted 30° only	48	48	50	58	68	48	50	58
W/Option DO-2 Deflector 0-29°	34	34	38	N/A	N/A	34	38	N/A
W/Option DO-2 Deflector 30° only	28	34	38	N/A	N/A	28	38	N/A
Below the Heater:								
Standard Reflector	80	80	105	125	140	80	105	125
W/Option DM-2 Parabolic Reflector	110	110	135	165	180	110	135	165

① Model RIHN 30 is not available in Canada

To assure clearances to combustibles are maintained, signs **must** be posted specifying the maximum stacking height of material under and near the heater.

4. Location

Recommended Mounting Heights and Distances – Clearances to combustibles must be observed.

Minimum Mounting Height (feet) – Lower mounting height may be used if personnel are not kept directly under the heater.

Model	With Standard	Reflector	With Optional DM-2	Parabolic Reflector
	HORIZONTAL	30°	HORIZONTAL	30°
RIHN30	11.0 - 13.0	10.0 - 12.0	-	-
RIHL50*	13.5 - 15.5	12.5 - 14.5	15.5 - 18.5	14.0 - 17.0
RIHN60	14.5 - 16.5	13.0 - 15.0	16.0 - 20.0	15.0 - 18.0
RIHVL90*	16.0 - 18.5	14.5 - 17.0	19.5 - 22.5	17.5 - 20.5
RIHVN100*	17.0 - 19.5	15.0 - 17.5	20.5 - 23.5	18.5 - 21.5
RIHVL120*	N/A	15.5 - 18.5	N/A	20.0 - 23.0
RIHVN150	18.5 - 22.5	15.5 - 20.0	24.0 - 27.5	21.5 - 24.5
RIHVN160*	19.0 - 23.0	17.0 - 20.5	25.0 - 28.5	22.5 - 25.5

^{*}Must be within allowable mounting angle range (see Paragraph 5).

Coverage – For complete space heating coverage, maximum distance between heaters is two times the mounting height.

Recommended Distance (feet) from a Wall for Units Mounted HORIZONTALLY

Models	With Standard Reflector	With Option DM-2 Reflector	
RIHN 30	8 ft	5 ft	
RIHN 60	12 ft	9 ft	
RIHVN 150	20 ft	15 ft	

② Model RIHN 60 in Canada requires addition of a wire grid, Option DN2.

③ See allowable mounting angles in Paragraph 5.

5. Suspending the Unit

Before installing the unit check the supporting structure to determine that it has sufficient loadcarrying capacity to support the weight.

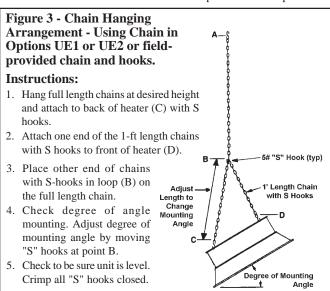
Mounting angle must be within the range allowed.

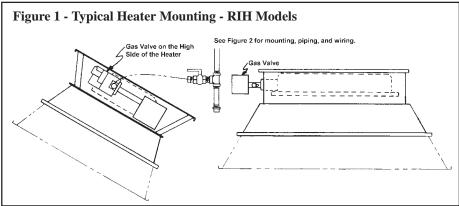
	Net Wt	Allowable Mounting
Model	(lbs)	Angle Range
RIHN 30	26	0° - 30°
RIHL 50	26	10° - 30°
RIHN 60	36	0° - 30°
RIHVL 90	36	10° - 30°
RIHVN 100	36	5° - 30°
RIHVL 120	48	30° Only
RIHVN 150	48	0° - 30°
RIHVN 160	61	5° - 30°

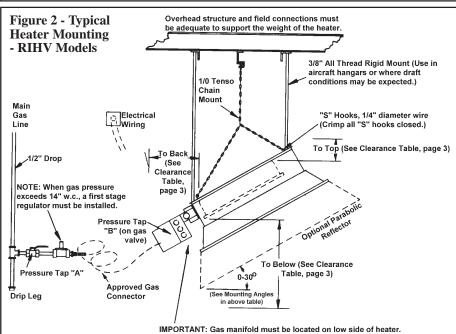
Be certain to check local codes for mounting requirements and permission to use flexible gas connectors. Local codes may require rigid mounting. It is recommended that either the piping or the mounting be flexible to prevent fatigue failure from vibration or thermal expansion. Heaters may be angle mounted as listed in the chart above. Do not angle heaters more than 30°. For proper operation, the heater must be level, whether horizontal or angle mounted. When angle mounted, all RIHV Models must be installed with the gas manifold located on the low end. When angle mounted, RIH Models must have the gas valve on the high side. (See Figures 1 and 2).

If permissible by local code, it is recommended that these heaters be suspended with chain and "S" hook mounting (See Figure 3). Chain with 200# working load (1/0 Tenso) is recommended. "S" hooks must be a minimum 1/4" diameter wire and must be closed after installation.

If a heater is located in an aircraft hangar or near overhead doors, it should be rigidly mounted to prevent swinging. The installer is responsible for suspension of the heater. Under no circumstances should either the gas supply line or electrical supply line to the unit be used to provide assistance in suspension. Do not run any gas or electric service lines above or below the heater or near the path of the flue products.







6. Ventilation Requirements

Every direct fired heater installation requires sufficient fresh air to provide adequate combustion air and removal of products of combustion. POSITIVE AIR DISPLACEMENT OF 4 CFM PER 1,000 BTU PER HOUR FOR NATURAL GAS AND 5 CFM PER 1,000 BTU PER HOUR FOR LP GASES IS REQUIRED. Many older buildings have sufficient air leakage to satisfy these requirements. Tightly constructed, well insulated buildings require mechanically powered systems. This may be accomplished by the use of exhaust fans and fresh air intake openings. Exhaust fans alone will not be sufficient. Inlet air openings are required.

Mechanical exhaust fans are typically located at high points of the building. For flat roof areas, a series of small exhausters should be distributed over the roof areas and interlocked with various heating zones. Local codes may permit the use of humidistat control to remove water vapor and products of combustion. Humidistat settings will typically be in the 40 to 55% relative humidity range.

Fresh air intake openings are typically located high on the building sidewalls on a level with the heaters. **ONE SQUARE INCH OF NET FREE INLET AREA PER 1,000 BTU PER HOUR IS REQUIRED.** Multiple inlets, well distributed should be used and should direct air upwards to prevent drafts at floor level. Inlets are typically limited to 1 to 2 square feet in size. **Total area required can be computed by dividing exhaust CFM by 500 feet per minute.**

7. Gas Supply Line

- 1. All piping must be installed according to local codes. Use new clean pipe. Inspect and clean out any chip or debris before installing the pipe and fittings.
- A flexible connection between the supply line and the heater may only be used if permitted by local code.
- 3. Always use two wrenches when mating pipe connections to the heater. Excessive torque on the manifold may misalign gas orifices.
- 4. Install a 1/8" (3.2 mm) N.P.T. plugged tap, accessible for test gauge connection, immediately upstream of the gas supply connection to the heater.
- 5. A 6" drip-leg trap at the inlet connection is recommended.
- 6. If a pressure regulator is required, be sure that it is installed in the gas line with the arrow indicating gas flow pointing in the proper direction.
- 7. Piping joint compound must be resistant to the action of liquefied petroleum gases.
- 8. Do not subject gas pressure regulators, flex connectors and gas cocks on the heater to test pressures over 14" w.c. while checking supply piping for leaks.
- 9. All piping joints must be tested for leaks with a leak detecting solution.

WARNING: All components of a gas supply system must be leak tested prior to placing equipment into service. Never test for leaks with an open flame. See Hazard Levels, page 1.

10. Purge all lines completely before attempting to ignite heater.

WARNING: Do not install any gas piping in heat zones.

8. Gas Pressure

The main supply line pressure must be limited to 14" w.c. If the line pressure can go above 14" w.c. (1/2 p.s.i.) at any time, a separate lockup type service regulator must be used. The minimum supply line pressure at the inlet to the heater regulator must, in no case, be lower than 7" w.c. pressure for natural gas and 11" w.c. pressure for LP gas.

Use a water or red oil manometer when checking gas pressure. Do not use a dial gauge. All measurements must be made when this heater and all other gas burning equipment are operating at maximum capacity.

	Line Pr	essure	Manifold Pressure
Gas	Min	Max	at Tap in Manifold
Natural	7.0"w.c.	14.0"w.c.	6.0"w.c.
Propane	11.0"w.c.	14.0"w.c.	10.0"W.C.

Natural gas models are orificed for 1000 BTU per cubic ft of gas. Propane gas models are orificed for 2500 BTU per cubic ft of gas.

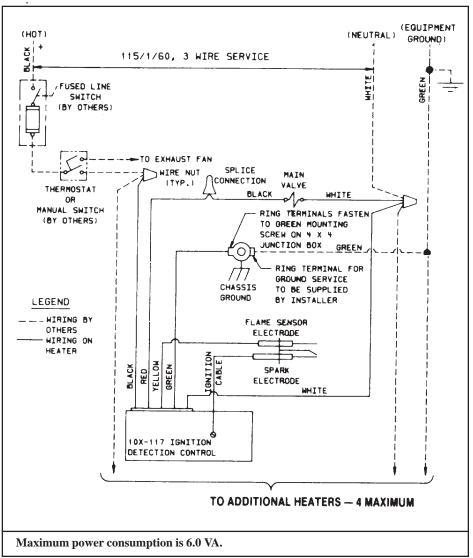
9. Electrical Supply, Wiring, and Controls

Field wiring must comply with the National Electrical Code ANSI/NFPA No. 70 (latest edition) or the Canadian Electrical Code, Part 1-C.S.A. Standard C22.1 and all local codes. A heater or group of heaters can be controlled by a thermostat or manual switch. Total load of all heaters must be considered in determining the required contact rating of the controlling thermostat or switch.

For wiring of controls, see the wiring diagram included with the heater. Standard control system is 120V. (Check the rating plate to verify voltage). Figure 4 illustrates a typical wiring diagram. Thermostats must be installed in the hot leg of a fused supply line. Assure sufficient thermostat ampacity rating and proper fuse sizing.

The electrical contractor should ensure the following:

- Electrical supply to the heater is of proper voltage and that heater is not energized until gas is available at the heater. Otherwise, control components may fail.
- Wiring, transformers, fusing and disconnects must conform to all applicable code requirements.
- Wiring must NOT run directly over or under the heaters. It must NOT be close enough to overheat.
- Each heater must be electrically grounded, in accordance with the National Electrical Code, ANSI/NFPA 70 (latest edition) or Canadian Electrical Code, Part 1 – C.S.A. Standard C22.1.
- If any of the original wire, as supplied with this equipment must be replaced,



9. Electrical Supply, Wiring, and Controls (cont'd)

it must be replaced with Type TFF wire with a minimum of 2/64" insulation thickness or equivalent.

Maximum Power Consumption (During Ignition)

ControlVoltage	Volt Amps	
Direct spark, 100% shutoff	115	6.0

IMPORTANT: The direct spark ignition system cannot determine the presence of flame if it is not grounded to the burner; it will lockout and shut-off. Proper grounding and polarity are essential to its operation.

10. Check-Test-Start

- ☐ Be certain electrical supply matches voltage of unit (120V).
- ☐ Clearance to combustibles must be maintained. (See Paragraph 3.)

 Check location of sprinkler heads; high temperature heads may be required. Space directly below the heater should be free of objects that may overheat or prevent infrared energy from reaching desired area. Post signs indicating maximum stacking height under or near heater.
- Heater may be angle mounted only as specified. (See Paragraph 5.)
 Heater must be level and suspended according to instructions in Paragraph 5. Be sure there are no gas or electric lines above or below the heater.
- ☐ Adequate ventilation MUST be provided. (See Paragraph 6.)
- ☐ Gas piping and supply must meet requirements. (See Paragraphs 7 and 8.) Purge air from gas supply line.

□ Lighting Instructions

- 1. Turn gas valve knob to OFF position.
- 2. Turn electrical supply OFF.
- 3. Wait at least five (5) minutes.
- 4. Set thermostat above room temperature.
- 5. Turn gas valve knob to ON position.
- 6. Turn electrical supply ON.
- 7. Set thermostat at desired temperature.
- 8. If heater does not light, repeat steps 1-7.

Sequence of Operation

- 1. Thermostat calls for heat.
- 2. Power is applied to the ignition detection control after 3 to 6 seconds. Spark is developed at electrodes, and after 25-30 seconds, the solenoid gas valve opens.
- 3. Burner then ignites, electrical current begins to flow from sensing electrode through the gas flame to ground.
- 4. Ignition detection control senses current, turns OFF spark, gas continues to flow through solenoid gas valve.
- 5. On the flame outage at sensing electrode, spark is reactivated immediately. If flame is not restored within 3 to 10 seconds, gas flow through solenoid is stopped by ignition detection control. (Follow lighting instructions to re-light heater.)
- ☐ Retain these instructions for future reference.

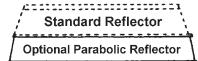
11. Accessories

Thermostat

Option CL34 is a 24/120 volt thermostat that can be used to control 1-5 units. This thermostat can also be used to control the exhaust fan circuit.

Parabolic Reflector, Option DM-2

The addition of the parabolic reflector increases the infrared intensity pattern while decreasing the scope of heating coverage.



Wire Grid, Option DN-2 - Required on Canadian

Model RIHN 60 (not available for Model RIHN30

Optional Wire Grid
to increase radiant efficiency

Protective Screen, Option DN-3

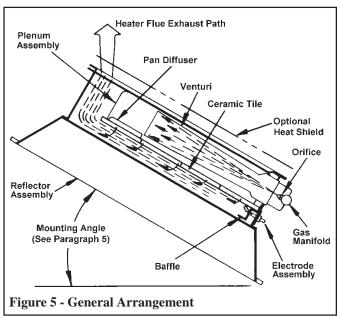
The screen is designed to protect the ceramic block from damage caused by the entrance of foreign objects. (Not for use with Option DM-2)

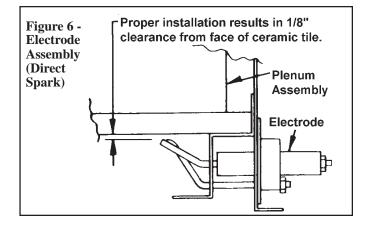
Heat Deflector, Option DO-2

A heat deflector is available on Sizes 30-100 to permit less clearance above the heater. See paragraph 3.

12. Maintenance and Service

Figure 5 shows the general arrangement of the heater. Figure 6 shows the direct spark assembly.





Annual maintenance should be performed as follows:

- Disconnect all power sources related to the installation and close the gas supply valve at heater.
- With an air hose of 20 PSIG or less, blow off all accumulated dust and dirt.

CAUTION: Always wear protective goggles when cleaning heaters.

13. Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
	1. M is aligned orifice	1. Consult Reznor representative or factory.
Ceramic Surface of	2. Obstruction in venturi tube	2. Clean with a bottle brush.
Burner		
Burner	3. Low gas pressure	3. Provide required pressure.
El 4 1 1 Cl 14	4. Wrong gas supplied to heater	4. Check label for type of gas required.
Electrical Circuit	1. Lack of gas supply caused control system lockout	1. Purge air from gas supply line. Check if all gas supply
Closed but Heater		connections are open. Turn the thermostat "OFF" - wait five minutes and turn the thermostat back to desired
not Functioning (for		setting.
troubleshooting of specific control	2. Disconnected wiring	2. See wiring diagram to repair.
system, see wiring	3. Exhaust fan interlock (if used) is defective	3. Replace or repair interlock.
diagrams and	4. Electrical short	4. Trace and correct. Replace line fuse or reset breaker if
sequence of operation	4. Electrical short	
sheets enclosed with	5. Electrical power surge causing blown line fuse or	necessary. 5. Replace line fuse or reset breaker.
each heater.)	tripped circuit breaker	3. Replace line fuse of feset bleaker.
Control Assembly is	1. Heater not mounted correctly	1. M ount heater with angles as specified. See Paragraph 5.
Overheating	1. Heater not indunted confectly	1. W out heater with angles as specified. See I anagraph 3.
Gas O dor	1. Loose pipe connection	1. Use soap solution to check connections and tighten if
Gus Guoi	1. Zoose p.pe connection	necessary.
Heater Will Not Turn	1. Defective thermostat	1. Break electrical circuit. Repair or replace thermostat.
Off	2. Stuck solenoid	2. Replace solenoid valve.
Burning of Gas/Air	Gas leaking from manifold or control assembly	1. See Paragraph 12.
Mixture Inside	connections causing gas ignition at orifice	
Plenum (flashback)	2. Separation of ceramic grids	2. Replace burner assembly.
	3. Ceramic grid(s) cracked	3. Replace burner assembly.
	4. Heater mounted at incorrect angle	4. Check angle of heater. See Paragraph 5.
	5. Excessive drafts	5. Shield or relocate heater.
Direct Spark Fails to	1. Ignition detection control defective	1. Replace control module.
Ignite Main	2. Electrode improperly located	2. Relocate to correct position.
Burner(s)	3. Electrode ceramic cracked	3. Replace electrode.
, ,	4. Electrode wire loose	4. Reconnect wire.
	5. Gas valve fails to open	5. Replace gas valve.
	6. M anifold gas pressure too low	6. Adjust regulator or inlet gas pressure.
	7. Electrode wire broken or fray ed	7. Replace electrode.
No Gas	1. Air in gas line	1. Purge gas line.
110 045	External manual shutoff valve closed	2. Open valve.
	3. External regulator sticking	3. Replace regulator.
	External regulator reversed	4. Remove and install properly.
Unit Cycles On and O		1. Shield from wind.
	1. Low manifold gas pressure	1. Adjust heater regulator until 6" w. c. for natural gas,
Temperature	11 20 W mamifold gas pressure	or 10" w. c. for propane is obtained.
2 cm perurure	2. Low gas inlet pressure	2. Adjust main supply regulator until at least 7" w.c. for
		natural gas, or 11" w.c. for propane precedes heater's
		control assembly
	3. Orifice partially blocked with foreign matter	3. See maintenance instructions, Paragraph 12.
	4. Combustion by-products not adequately ventilated	4. Provide adequate ventilation of by-products. See
	1 2	Paragraph 6.
	5. M anifold misaligned from excessive torque applied on	5. Replace manifold.
	pipe at installation	
	6. Gas supply piping too small	6. Increase gas pressure or replace piping.
	7. Spider web in venturi	7. Remove with a bottle brush.
	8. Foreign matter in venturi tube	8. See Paragraph 12.
Dark S pots on	1. Foreign matter behind the ceramic surface	1. See Paragraph 12.
Ceramic Surface	2. M ud daubers inside burner assembly	2. Replace burner assembly.
	•	· · ·

FOR SERVICE OR REPAIR, FOLLOW THESE STEPS IN ORDER:

Name _	
Address	
Phone	
Thone	
SECOND:	Contact the nearest distributor (See Yellow Pages). If no listing, contact Authorized Factory Representative, 1-800-695-1901 (Press 1).
THIRD: Contact:	REZNOR®/Thomas & Betts Corporation
	150 McKinley Avenue
	Mercer, PA 16137
	Phone: (724) 662-4400
Model No	
Jnit Serial No	
	n

