

2 INSTALLATION

2.12 Allowance for Expansion

Allowances must be made for the system to expand as detailed in the Heater Expansion Chart on this page. The supplied stainless-steel, flexible gas connector is recommended. If, however, local codes require rigid piping to the heater, a swing joint can be used.

HEATER EXPANSION CHART				
Exchanger length and gas input will determine overall expansion. Heaters in a typical installation will expand towards both the burner and vent ends. Review for proper flexible gas connector installation.				
EXCHANGER LENGTH FEET / METERS		FIXED OR HIGH-FIRE GAS INPUT BTUh	EXPANSION LENGTH	
			INCHES	MILLIMETERS
10	3.1	25,000	1/2	12.7
15	4.6	32,000	3/4	19.1
20	6.1	40,000	1	25.4
20	6.1	50,000	1 1/4	31.8
20	6.1	60,000	1 1/2	38.1
20	6.1	75,000	1 3/4	44.5
20	6.1	100,000	1 7/8	47.6
30	9.2	50,000	1 1/4	31.8
30	9.2	60,000	1 1/2	38.1
30	9.2	75,000	1 3/4	44.5
30	9.2	100,000	1 7/8	47.6
30	9.2	125,000	2	50.8
40	12.2	75,000	1 1/2	38.1
40	12.2	100,000	1 7/8	47.6
40	12.2	125,000	2 1/8	54.0
40	12.2	150,000	2 1/2	63.5
40	12.2	175,000	2 3/4	69.9
50	15.3	100,000	2	50.8
50	15.3	125,000	2 1/8	54.0
50	15.3	150,000	2 3/8	60.3
50	15.3	175,000	2 1/2	63.5
50	15.3	200,000	2 3/4	69.9
60	18.3	125,000	2 1/2	63.5
60	18.3	150,000	2 3/4	69.9
60	18.3	175,000	3	76.2
60	18.3	200,000	3 1/4	82.6
70	21.4	175,000	3 3/8	85.7
70	21.4	200,000	3 1/2	88.9
80	24.4	200,000	3 1/2	88.9

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2.13 Electrical Requirements

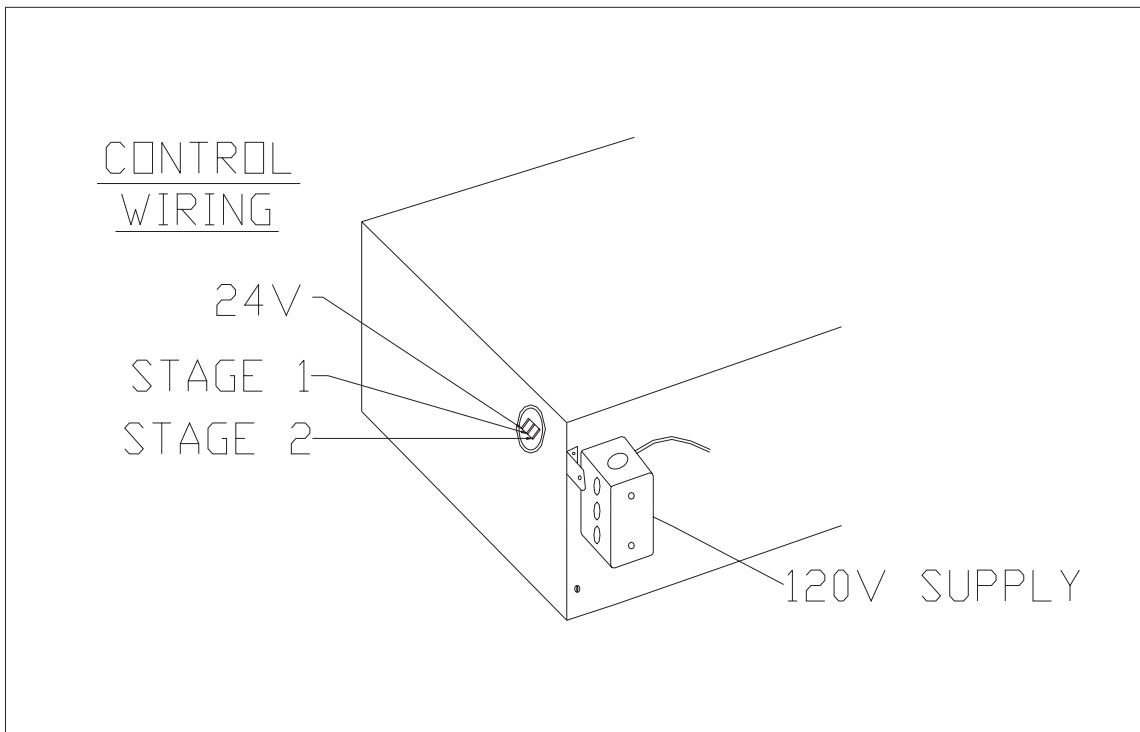
1. Heaters operate on 120 volts, 60 Hz, single phase. The maximum amperage requirement (starting current) is 1.7 amps per heater. The running current is 1.1 amps.
2. Heater must be grounded in accordance with the Canadian Electrical Code C22.1 (latest edition).
3. Wiring must not be exposed to direct radiant output.

2.14 Thermostat Wiring: One Two-Stage Thermostat and One Two-Stage Series Heater

The Burner box contains a 24 volt transformer that operates the control circuits. The thermostat is part of this circuit. When installing a “snap action” CE-2S or “mercury cell” 1F37-408 thermostat a three wire connection is required.

- 24 volt terminal from the heater to the thermostat terminal (R).
 - 1st stage 24 volt from the thermostat (W1) to heater number 1 low.
 - 2nd stage 24 volt from the thermostat (W2) to heater number 2 high.
- See Figure 2.13.1.

When utilizing a thermostat that requires a constant 24 volt power supply such as the HL 201 or other programmable thermostat, a fourth wire will be required. Attach this wire to heater chassis. See Figure 2.13.1.



NOTE: 120V supply will incorporate a cord and plug, secured by a liquid-light connect when “Outdoor Use” option is supplied.
24V control wiring will incorporate 5 ft. (1.5m) cord, secured by a liquid-light connect when “Outdoor Use” option is supplied.

Figure 2.13.1

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2.15 Thermostat Wiring: One Two-Stage Thermostat and Multiple Two-Stage Series Heaters

The Burner box contains a 24 volt transformer that operates the control circuits. When more than one heater is operated with a single thermostat, the 24 volt control circuit of each heater must be isolated. A factory supplied isolation relay HL-RB must be installed. See Figure 2.15.1 for internal wiring. Heaters with factory installed relay boards are labeled "Equipped with HL-RB". See Figure 2.15.2. The thermostat is not part of the burner control circuit, therefore an external (installer-supplied) 24 volt transformer will be required to operate all HL-RB's. Each HL-RB draws .03 amps. All heaters equipped with the HL-RB will use three wires to operate the relays:

- Connect Line 24 volt from installer supplied transformer to thermostat terminal (R).
 - Connect common 24 volt from installer supplied transformer to the 24 volt spade on the heater.
 - 1st stage 24 volt from the thermostat (W1) to heater number 1 low.
 - 2nd stage 24 volt from the thermostat (W2) to heater number 2 high.
- See Figure 2.15.2.

Wiring from thermostat to heater does not change due to thermostat type. Wiring from external transformer to thermostat may change. Refer to thermostat installation instructions.

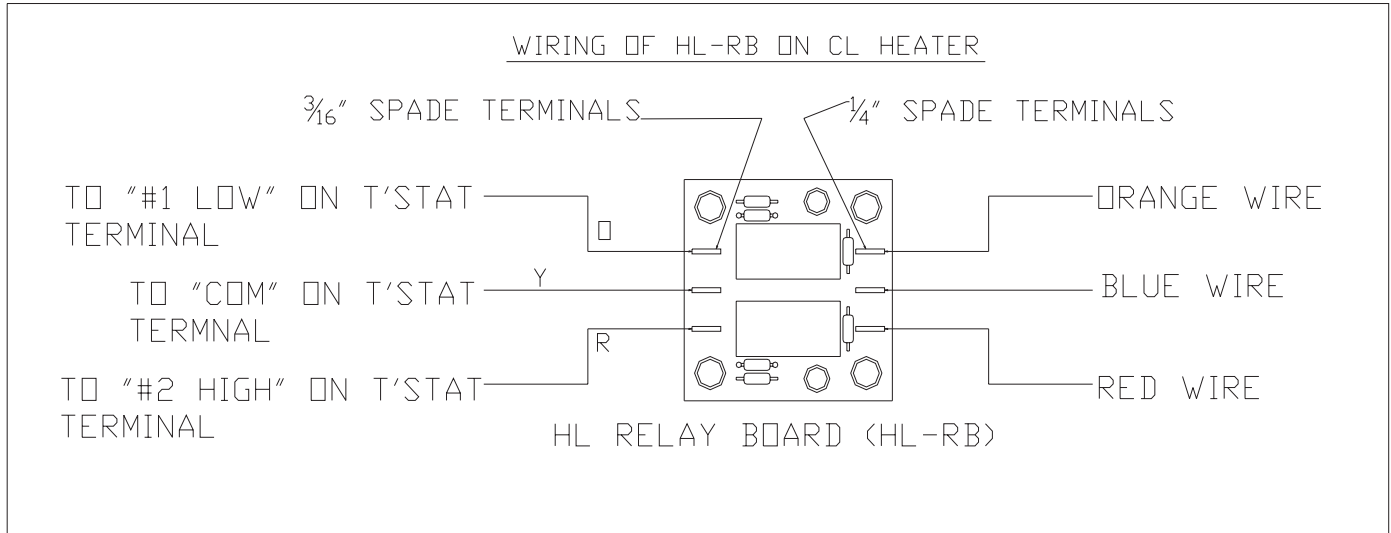


Figure 2.15.1

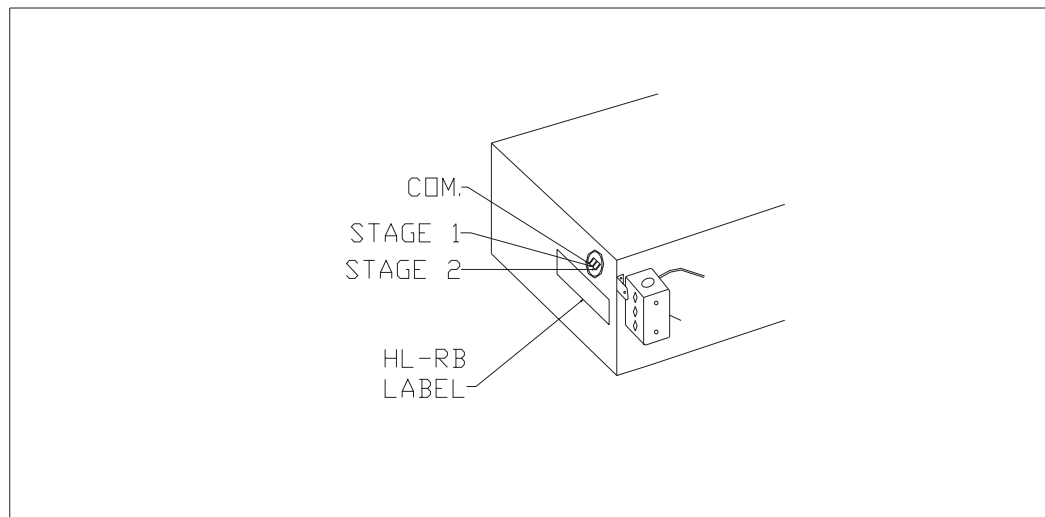


Figure 2.15.2

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2.16 Lighting Instructions

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

2.17 Shutdown Instructions

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

Instructions pour l'allumage

1. Purger la conduite d'alimentation en gaz principale.
2. Tourner le bouton du robinet de gaz a commande manuelle jusqu'a ce qu'il se trouve en position de marche ("ON").
3. Fermer le circuit electrique.
4. Si l'appareil de chauffage ne s'allume pas, attendre 5 minutes avant de suivre de nouveau les instructions ci-dessus.

Pour eteindre l'appareil

1. Ouvrir le circuit electrique.
2. Tourner le bouton du robinet de gaz a commande manuelle de l'appareil de chauffage jusqu'a ce qu'il se trouve en position d'arret ("OFF").

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2.18 Outdoor Installations

The two-stage series heaters have been certified for outdoors installations with the following factory requirements.

- * Sheet metal intake cap attached to the 4 in. combustion air intake collar pointing downward to prevent rain from entering. Factor supplied.
- * Water and UV resistant cord and plug factory installed through a liquid-tight box connector.
- * 5 ft./1.5m of 24 volt control wiring factory installed through a liquid-tight box connector.
- * Control box will be internally silicone sealed.
- * All manufactured Re-Verber-Ray outdoor approved heaters will display on the rating label “FOR OUTDOOR USE”.

When installing heaters in outdoor applications the following considerations must be met-

- * Locate heater away from snow load areas.
- * Heaters mounted lower than 8 ft./2.44m must use an optional protective grill. Part# BR-PS60
- * Ensure that the products-of-combustion dissipate without condensing on building surfaces.
- * Heaters located in high wind conditions must have the reflectors secured at beginning and end of total reflector run.

3 THEORY OF OPERATIONS

3.1 CT Models

STARTING CIRCUIT (FIGURES 3.1.1 & 3.1.2)

When the two-stage thermostat signals the low-fire circuit, the fan relay is energized. When the operational static pressure is achieved the normally open pressure switch closes initiating ignition sequence. After a 7 second pre-purge the spark electrode and gas valve are energized simultaneously. The trial for ignition is 15 seconds.

Stage two on the gas valve is powered directly from the second stage of the thermostat. The gas valve will not pass gas unless the first stage sequence of operation has been completed. The thermostat will determine which stage is required to maintain the desired comfort level.

RUNNING CIRCUIT

After ignition, the flame rod monitors the flame. As long as a flame is present, the valve is held open. If the flame is lost, the control acts to close the valve within one second, and a new trial sequence identical to that at start-up is initiated. If proof of flame is not established within the 15 second trial for ignition within the three try cycle, the unit will lock out. If lockout occurs, the control can be reset by briefly interrupting the power source.

SHUTDOWN

When the thermostat is satisfied the fan will enter into a 120 second post-purge cycle.

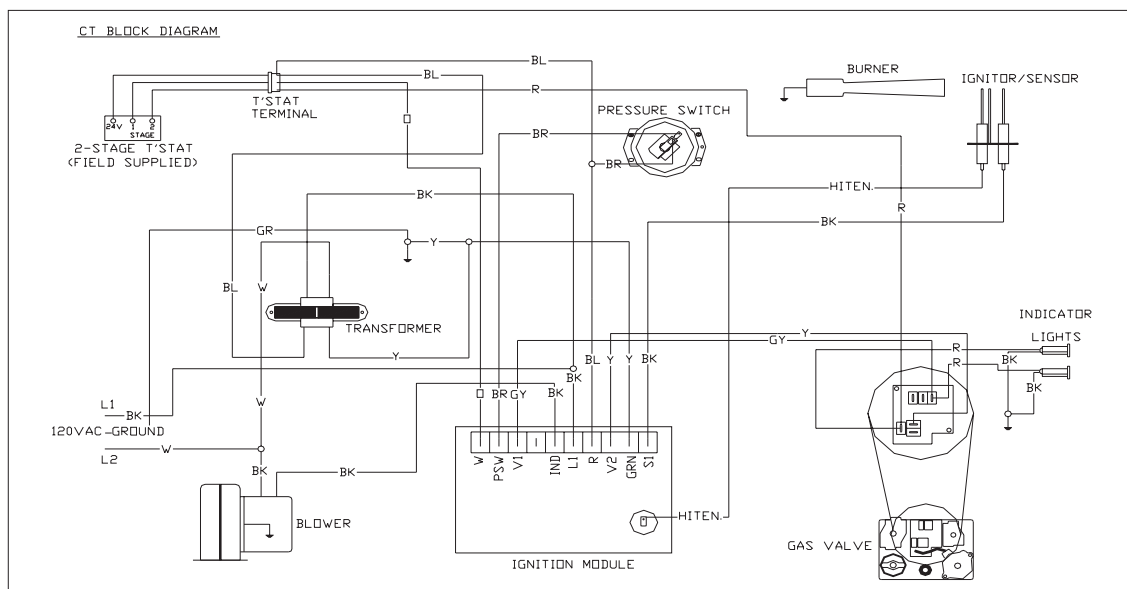


Figure 3.1.1

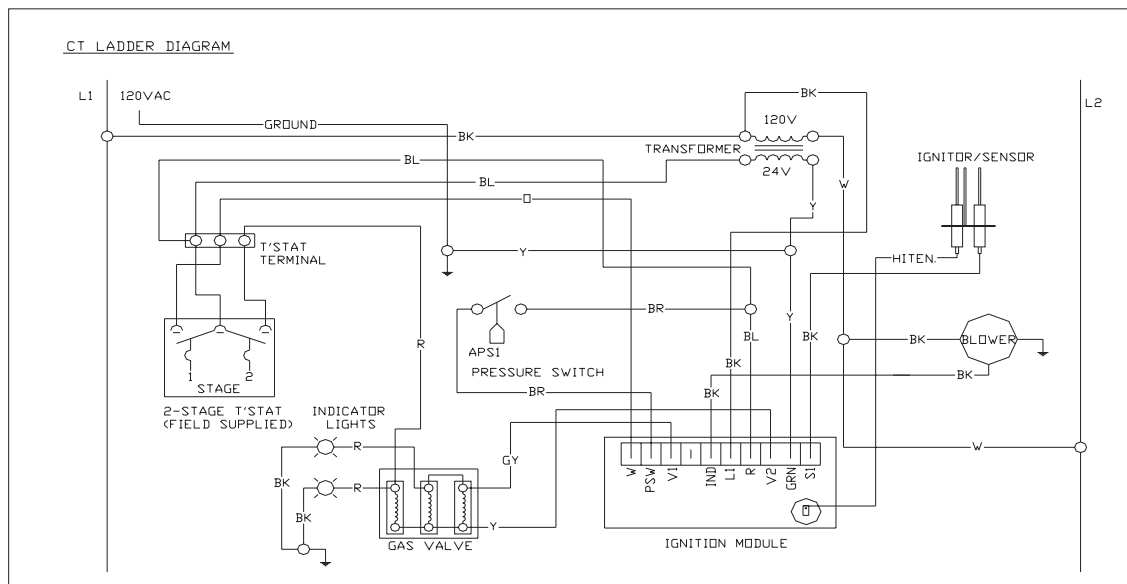


Figure 3.1.2

4 SERVICE

4.1 Maintenance

The gas fired infra-red heaters require a minimum of routine maintenance to keep them operating at peak performance.

1. Prior to the heating season heater operation must be verified by qualified service personnel.
2. Ensure that the blower impeller is kept clean. If dirt becomes a problem, installation of outside air intake duct for combustion is recommended. Oiling the blower motor will extend bearing life beyond the 30,000 hour minimum.
3. Keep the aluminum reflectors from accumulating deposited material.



WARNING

Use protective glasses when cleaning the heater.

4.2 GENERAL TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed, fan does not operate.	<ol style="list-style-type: none"> 1. Blown fuse. 2. Faulty thermostat. 3. Disconnected wire. 4. Faulty fan. 	<ol style="list-style-type: none"> 1. Replace. 2. Replace. 3. Repair. 4. Replace.
Thermostat closed. Fan operates. No spark.	<ol style="list-style-type: none"> 1. Loose or disconnected wire. 2. Box lid or gasket not in place. 3. Plugged pressure switch lines. 4. Plugged or restricted exhaust vent. 5. Faulty pressure switch. 6. Faulty circuit board. 7. Faulty electrode. 	<ol style="list-style-type: none"> 1. Repair as required. 2. Put in place. 3. Clean as necessary. 4. Remove foreign matter. 5. Replace only. Do not adjust. 6. Replace circuit control. 7. Replace.
Thermostat closed. Fan operates. Heater sparks. After 7 seconds electrode shuts off. No reignition.	<ol style="list-style-type: none"> 1. Closed gas supply. 2. Dirty or resisted orifice. 3. Faulty valve. Disconnected wire. 4. Inlet pressure exceeds 14" W.C.P. 5. Improper electrode gap. 	<ol style="list-style-type: none"> 1. Open all gas connections. 2. Remove and clean with a soft object. 3. Replace or repair. 4. Lower inlet pressure. 5. Confirm gap size is between 3/16" & 1/4".
Thermostat closed. Fan and electrode operate. Ignition occurs. Burner cycles off and will not recycle.	<ol style="list-style-type: none"> 1. No electrical ground. 2. Faulty circuit control. 3. Low gas pressure. 4. Open circuit control connection. 	<ol style="list-style-type: none"> 1. Connect electrical ground to junction box. 2. Replace. 3. Provide required gas pressure. 4. Repair or replace.
Thermostat closed. Fan and electrode operate. Ignition occurs. Burner cycles off. Burner cycles on.	<ol style="list-style-type: none"> 1. Low gas pressure. 2. Baffle improperly positioned. 3. Faulty pressure switch. 4. Restricted flue vent. 5. Improper electrode gap. 	<ol style="list-style-type: none"> 1. Provide required gas pressure. 2. Reposition baffle at vent end. 3. Replace. 4. Remove foreign matter. 5. Confirm gap size is between 3/16" & 1/4".
Loss of heater efficiency.	<ol style="list-style-type: none"> 1. Low gas pressure. 2. Dirty or restricted orifice. 3. Foreign matter inside burner. 4. Unit cycles on and off. 5. Reflector is sooted and has lost its reflective ability. 6. Reflector not in place. 7. Clogged fan blower. 	<ol style="list-style-type: none"> 1. Provide required gas pressure. 2. Remove and clean with a soft object. 3. Clean as necessary. 4. Check previous symptom. 5. Clean with aluminum cleaner and soft wiping cloth. 6. Put in place. 7. Clean.
Radiant tube leaking burnt gases.	<ol style="list-style-type: none"> 1. Loose tube connections. 2. Holes or cracks in radiant tubes. 	<ol style="list-style-type: none"> 1. Assure that tube is fully inserted into flared end and properly clamped. 2. Replace.
Condensation.	<ol style="list-style-type: none"> 1. Stack length too long. 2. Light gauge flue stack used. 3. Contaminated combustion air. 	<ol style="list-style-type: none"> 1. Shorten stack. 2. Minimum of 26 gauge vent pipe required. 3. Provide fresh air inlet duct.
Tube Bowing.	<ol style="list-style-type: none"> 1. Insufficient combustion air. 2. Overfired. 3. Contaminated combustion air. 4. Heater unable to expand properly. 	<ol style="list-style-type: none"> 1. Provide 2 sq. in. of free air per 5000 BTU/h of input. 2. Check gas pressure and orifice size. 3. Provide fresh air inlet duct. 4. Remount with flexible inlet or vent pipe.
Tube corroding.	<ol style="list-style-type: none"> 1. Contaminated combustion air. 	<ol style="list-style-type: none"> 1. Provide fresh air inlet duct.
Visual inspection of burner operation not possible.	<ol style="list-style-type: none"> 1. Dirty or sooted sight glass. 2. Unit mounted upside down. 	<ol style="list-style-type: none"> 1. Remove, clean or replace. 2. Mount correctly.
Stack sooting.	<ol style="list-style-type: none"> 1. Insufficient combustion air. 2. Improper gas. 	<ol style="list-style-type: none"> 1. Provide 1 sq. in. of free air for every 5000 BTU/h of input. 2. Correct with proper gas input.
Odor or fumes in space.	<ol style="list-style-type: none"> 1. Vaporized solvents decomposing when contacting radiant tubes. 2. Evaporation of oils/solvents at floor levels. 3. Lift trucks. 4. Loose tube connections. 	<ol style="list-style-type: none"> 1. Address ventilation concerns. 2. Address ventilation concerns. 3. Address ventilation concerns/repairs. 4. Tighten to 50-100 lb.-ft.

5.1 BASIC PARTS LIST

<i>Part No.</i>	<i>Description</i>	<i>Part No.</i>	<i>Description</i>	<i>Item No.</i>	<i>Description</i>
TP-1	Control Box Cover	TP-61K	Safety Pressure Switch	SK-4VC	Vent Cap
TP-3	#8 x 1/4" Sheet Metal Screw	TP-62	#8 x 1/2" Machine Screw		(Required For Sidewall Venting on 200,000 BTU)
TP-4	Control Box	TP-65	Heat Diffuser (Baffle)	BR-VCF	Exhaust Vent w/Flapper
TP-5	Flange Gasket	TP-68A	Strain Relief Bushing	BR-VC	(Required on Unvented Models)
TP-7	1/4-20 x 1/2" Machine Screw	TP-70	Control Box Gasket	BR-4-VK	Side Wall Venting Kit (also SK4-VK)
TP-7A	1/4-20 Hex Nut	TP-75	Gas Valve (DX-75)	TF-9	Truck Exhaust Terminal for Side Wall Venting
TP-9	Conduit Coupling	TP-76	Rubber Grommet	SK-6VC	Vent Cap (Required for Dual Side Wall Vents)
TP-10	Conduit 1/2" x 4"	TP-80	#6-32 x 1" Machine Screw	BR-NIR	Side Shield Extension
TP-11	Electrode Box	TP-81	#6-32 Hex Nut	BR-PS60	Radiant Tube Protective Screen 60"
TP-12	Electrode Box Cover	TP-83	Flexible Gas Connector	BR-4UA	180° 4" Radiant Pipe
TP-13	#8 x 1/2" Self-Drilling Screw	TP-101	1/2" Adapter Fitting	BR-4EA	90° 4" Elbow
TP-14	Sight Glass Gasket	TP-104	1/2" x 2" Manifold	TP-33B	Gas Cock
TP-15	Sight Glass	TP-105	Reflector End Cap (BR-ECR)		
TP-16	Sight Glass Washer	TP-106	Reflector Clip (BR-ECRC)		
TP-17	1/4-20 x 3/8" Thread-Cutting Screw	TP-122	Air Inlet Gasket		
TP-19B	Tube/Reflector Hanger (BR-4HGR)	TP-200	Burner (50,000 to 100,000 BTUH)		
TP-19C	Reflector Center Support (BR-4IH)	SE-202	16" Burner Tube (ST-16P)		
TP-20	Refector (120")	TP-208	"Z" Bracket		
TP-21B	Butt Clamp	TP-212	3" X 1/2" Pipe Nipple		
TP-26	10 ft. Radiant Tube, Straight	TP-217	Pressure Barb Fitting		
TP-26S	10 ft. Radiant Tube, Straight (S.S.)	TP-223	Manifold		
TP-31B	Control Box Bracket	TP-550	High Volt Wire (SE-HVW)		
TP-41	1/4-20 Keps Nut	TP-551	Circuit Control (ST-CC)		
TP-44	Inlet Air Orifice w/Screen	TP-552	Wiring Harness (ST-WH)		
TP-46	Orifice	TP-553	Electrode Bracket (SE-EB)		
TP-54	Burner Box Divider	TP-554	Electrode Gasket (SE-EG)		
TP-55	Fan Blower	TP-555	Electrode (SE-E)		
TP-56C	¼ " Atmosphere Tube (Vinyl)		Pressure Tube Hose		
TP-59	#8 Hex Nut/ Lock Washer	TP-563			

NOTE: When ordering heater parts, please state the model and serial number of heater.

5.2 Optional Parts

