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 Type I, 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	EXPANSION LENGTH MILLIMETERS
10	3.1	25,000	1/2	12.7
10	3.1	30,000	5/8	15.9
10	3.1	40,000	¾	19.1
15	4.6	25,000	5/8	15.9
15	4.6	30,000	¾	19.1
15	4.6	40,000	7/8	22.2
15	4.6	50,000	1	25.4
20	6.1	40,000	1	25.4
20	6.1	50,000	1 ¼	31.8
30	9.2	50,000	1 ¼	31.8

2.13 **Electrical Requirements**

1. Heaters operate on 120 volts, 60 Hz, single phase. The maximum amperage requirement (starting current) is 4.8 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.

4. Observe proper electrical polarity.

5. It is recommended that the thermostat be installed on the hot side of a fused supply line and have sufficient ampere rating for the heater(s) it controls.

2.14 **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.

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.

2.15 **Shutdown Instructions**

1. Open electrical circuit.

2. Rotate heater's manual gas valve knob to the "OFF" position.

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").

IMPORTANT

This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do **NOT** try to light the burner by hand. Use only your hand to turn the manual shutoff. Never use tools. Turn shutoff clockwise to "**OFF**". Turn shutoff counterclockwise to "**ON**". If the knob will not turn by hand, do not try to repair it, call a qualified technician. Force or attempted repair may result in a fire or explosion.

2.16 **Outdoor Installations**

The LS Series heaters have been certified for outdoors installations with the following factory requirements.

* BR-VC to be attached to the 4 in. combustion air intake collar pointing downward to prevent rain from entering the intake. Factory supplied.

* Water and UV resistant cord and plug 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 “FOR OUTDOOR USE” on the rating label.

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./ 2.4 m must use an optional protective grill (BR-PS60).

* Heaters must not be mounted lower than 7 ft./ 2.1 m above finished grade.

* Ensure that the products-of-combustion dissipate without condensing on buildings surfaces.

3 THEORY OF OPERATION

3.1 LS Models

STARTING CIRCUIT (FIGURES 3.1.1 & 3.1.2)
When voltage is applied to L1 and L2, a circuit is completed from L1 via the blower motor to L2. The blower fan is mounted in the control box and rated to supply sufficient air for combustion.

Air pressure generated by the blower will cause the normally open burner pressure switch No.1 to close. Another circuit is completed from L1 to the hot surface ignition control and back to L2. There is a five-second delay, then the glo-bar is powered. After the glo-bar has been powered for 45 seconds, the control causes the gas valve to open and initiates the Ignition trial. Power to the glo-bar is shut off during the last two or three seconds of ignition trial.

RUNNING CIRCUIT
After ignition the flame rod monitors the main burner 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 8.5 seconds, the unit will lock out. If lockout occurs, the control can be reset by briefly interrupting the power source.

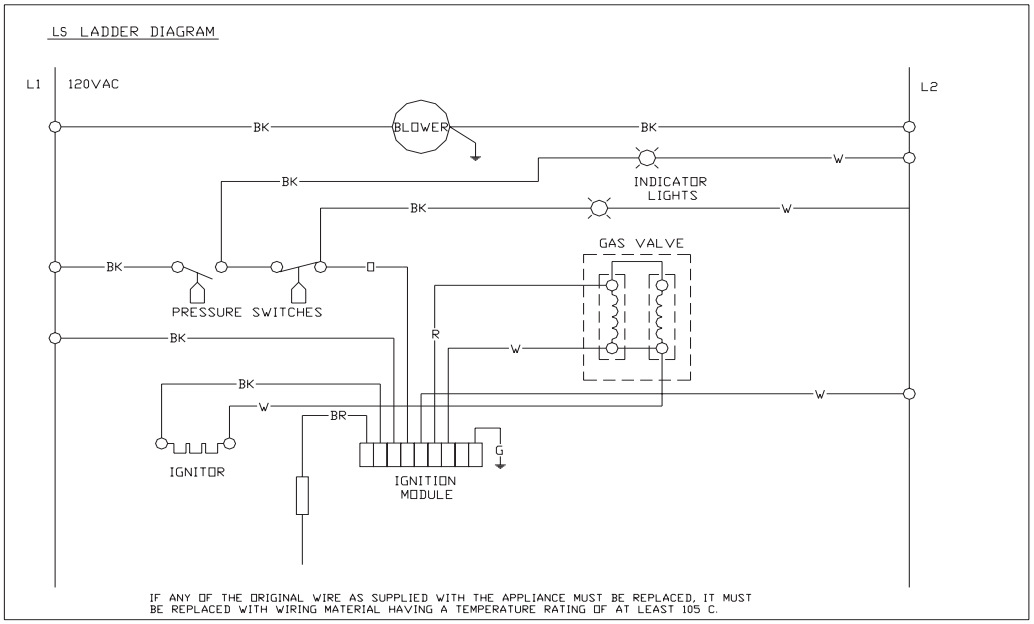


Figure 3.1.1

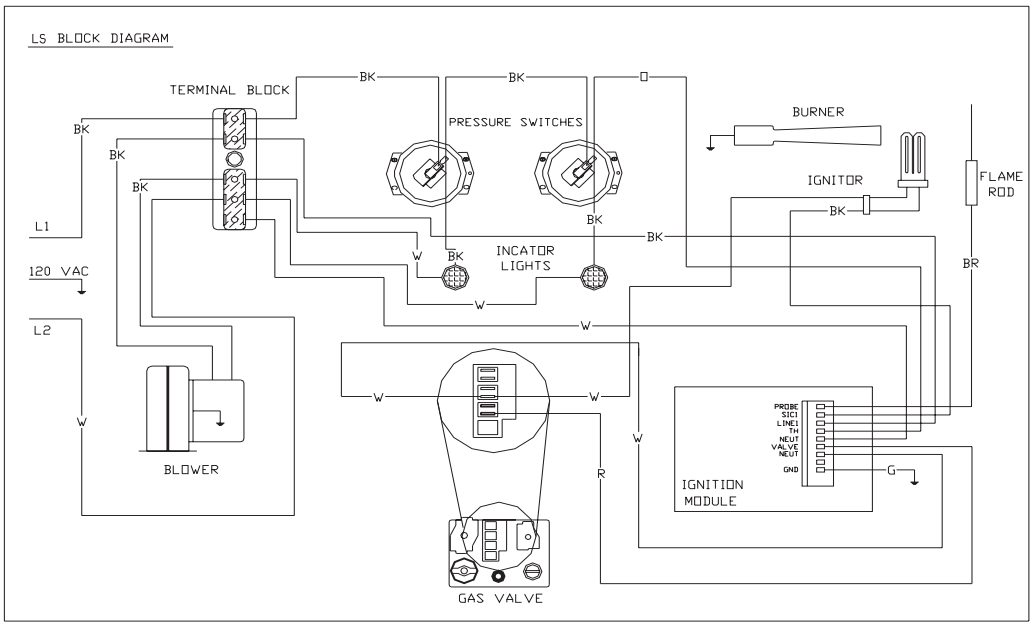


Figure 3.1.2

4 SERVICE

4.1 Maintenance

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

1. Ensure that the heaters air inlet and 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.

2. Combustion air inlets, grills or louvres must be inspected regularly to ensure that they are clear and free of dust, snow, ice, frost and other foreign material so that air may freely enter.

3. Ensure that all intake air ducts are sealed.

4. Heaters exhaust vent must be inspected periodically to ensure it is free and clear of foreign material.

5. Unvented heaters utilizing DB-3VCF vent cap with flapper must ensure that the flapper moves freely without obstructions.

6. Keep the aluminum reflectors from accumulating deposited material. Vacuum or blow all dust and debris off the heater.

WARNING

Use protective glasses when cleaning the heater.

4.2 Access Panels

Turn gas supply off and disconnect electrical source before attempting to service.

Service access panels may be removed as required. (see Figure 4.2.1)

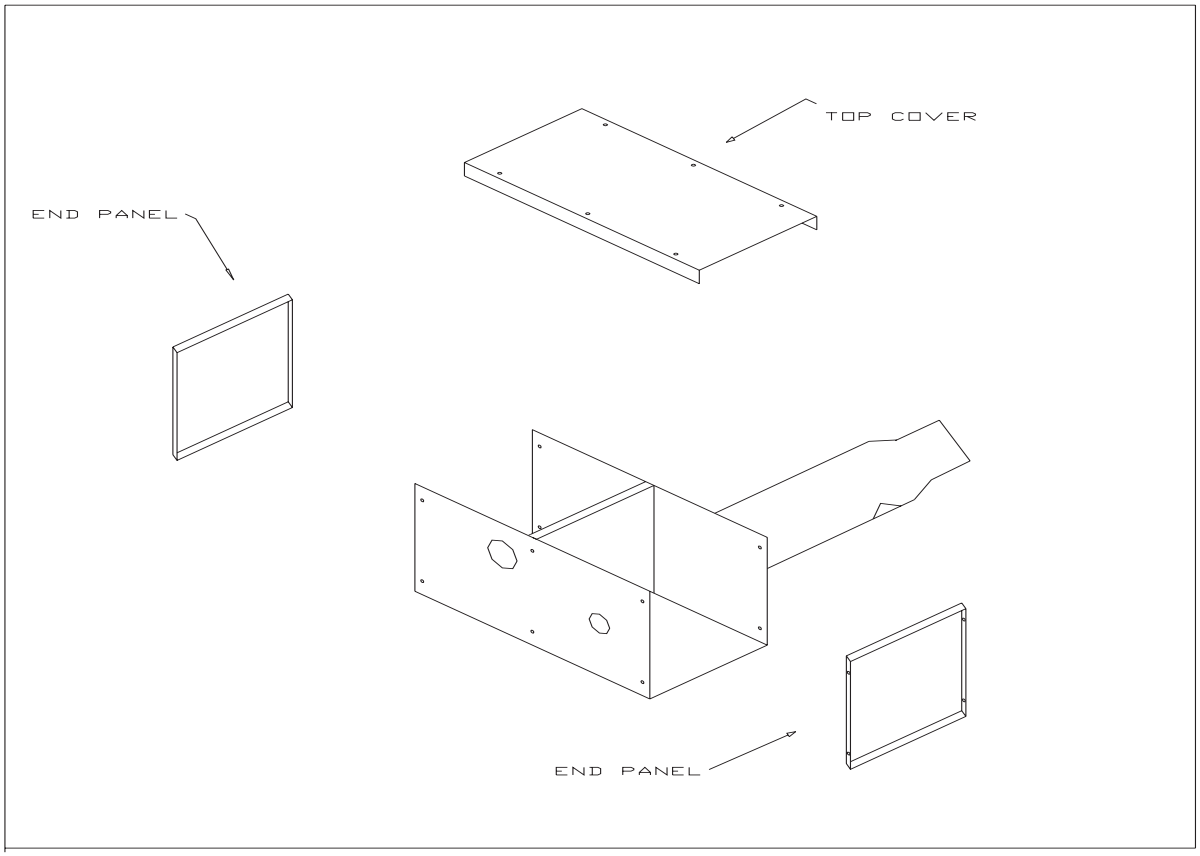


Figure 4.2.1

4.3 Thermal Limit Switch

The thermal limit switch is a safety device designed to discontinue heater operation if the control box temperature exceeds its operational limit.

To test: DISCONNECT ELECTRICAL POWER SUPPLY and check switch for continuity. If the Thermal limit switch circuit is “open”, remove and replace.

CAUTION

The failure of a thermal limit switch indicates a problem within the heater, or its venting systems. Problem areas must be located and rectified before a safe operating condition exists. Listed below are possible causes and corrective action.

Possible Cause	Corrective Action
1. Restricted outside air duct.	Clean
2. Restricted air inlet orifice.	Clean
3. Dirty fan blower wheel.	Clean
4. Faulty pressure switches.	Replace
5. Restricted vent.	Clean
6. Restriction in radiant pipes.	Clean
7. Gas leak in valve train.	Repair or replace
8. Negative pressure in building.	Install outside air duct
	Customer service toll free #1-800-387-4778

4.4 Service

* Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

* CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

* Verify proper operation after servicing.

* WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this appliance may result in property damage or personal injury.

* Ne pas se servir de cet appareil s'il a été plongé dans l'eau, complètement ou en partie. Faire inspecter l'appareil par un technicien qualifié et remplacer toute partie du système de contrôle et toute commande qui ont été plongées dans l'eau.

* ATTENTION: Au moment de l'entretien des commandes, étiquetez tous les fils avant le débranchement. Des erreursde câblage peuvant entraîner un fonctionnement inadéquat et dangereux.

* S'assurer que l'appareil fonctionneadéquatement une fois l'entretien terminé.

* AVERTISSEMENT: Risque de dommages ou de blessures si les pièces ne sont pas installées conformément à ces schémas et ou si des pièces autres que celles spécifiquement aprouvées avec cet appareil sont utilisées.

4.2 GENERAL TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed. - NO FAN	1. Blown fuse. 2. Faulty thermostat. 3. Disconnected wire. 4. Faulty fan.	1. Replace. 2. Replace. 3. Repair. 4. Replace.
Fan Operates - NO INDICATOR LIGHTS - NO HEATER OPERATION	1. Blocked air intake. 2. Burner switch wire disconnected. 3. Burner switch faulty. 4. Burner switch sensing tubes plugged. 5. Control box lid loose or leaking.	1. Remove all foreign matter in intake air stream. 2. Repair. 3. Replace. 4. Remove clean and install. 5. Secure or reseal.
Fan Operates Burner Switch Light Operates - NO EXHAUST SWITCH LIGHT - NO HEATER OPERATION	1. Exhaust vent blocked. 2. Exhaust switch wire disconnected. 3. Exhaust switch faulty. 4. Excessive wind pressure on vent cap. 5. Wrong baffle installed.	1. Remove all foreign matter in vent. 2.Repair. 3. Replace. 4. Verify cap, extend or relocate. (See Flue Venting 2.8) 5. Consult tube assembly baffle chart for proper lengths. (See page 14)
Fan Operates Indicator Lights Operates - NO GLOBAR	1. Glo-bar broken. 2. Circuit board faulty. 3. Wiring harness disconnected.	1. Replace. 2. Replace. 3. Reconnect or replace.
Indicator Lights Operate Glo-Bar Operates - NO GAS VALVE	1. Circuit board faulty. 2. Gas valve faulty. 3. Wire disconnected.	1. Replace. 2. Replace. 3. Reconnect.
Glo-Bar Operates Gas Valve Operates - NO IGNITION	1. Blocked gas orifice. 2. Low gas pressure. 3. Low glo-bar surface temperature.	1. Remove & clean. 2. Provide required gas pressure. 3. Replace-ensure a clean air supply.
Gas Valve Operates Ignition Occurs - HEATER CYCLES OFF - GOES INTO LOCKOUT	1. Flame sensor faulty. 2. Heater not grounded. 3. Electrical supply service panel not grounded. 4. Gas valve faulty. 5. Circuit board faulty. 6. Electrical polarity incorrect.	1. Replace. 2. Locate and repair. 3. Locate and repair. 4. Replace. 5. Replace. 6. Reconnect.
Heater Operating - TUBE BOWING	1. Insufficient combustion air. 2. Overfired. 3. Ensure exchangers have room to expand. 4. Heater not supported properly. 5. Reflectors not positioned properly. 6. Baffle installed wrong.	1. Check intake duct for blockage and sizing. 2. Check gas pressure. 3. Re-install vent connection. 4. Re-position hangers or chains. 5. Re-position. 6. Re-position.
Heater Operating - VENT CONDENSING	1. Stack length too long. 2. Light gauge flue pipe used. 3. Uninsulated vent pipe running through cold space. 4. Negative pressure in building. 5. Common vented heaters installed with individual thermostats.	1. Shorten stack. 2. Minimum 26 Ga. Required. 3. Insulate vent. 4. Install combustion air intake. 5. Install one thermostat.
Odor or fumes in space.	1. Vaporized solvents decomposing when contacting radiant tubes. 2. Lift trucks. 3. Loose tube connections.	1. Install exhaust fan at ceiling. 2. Install exhaust fan and repair. 3. Tighten to 50-60 lb.-ft.

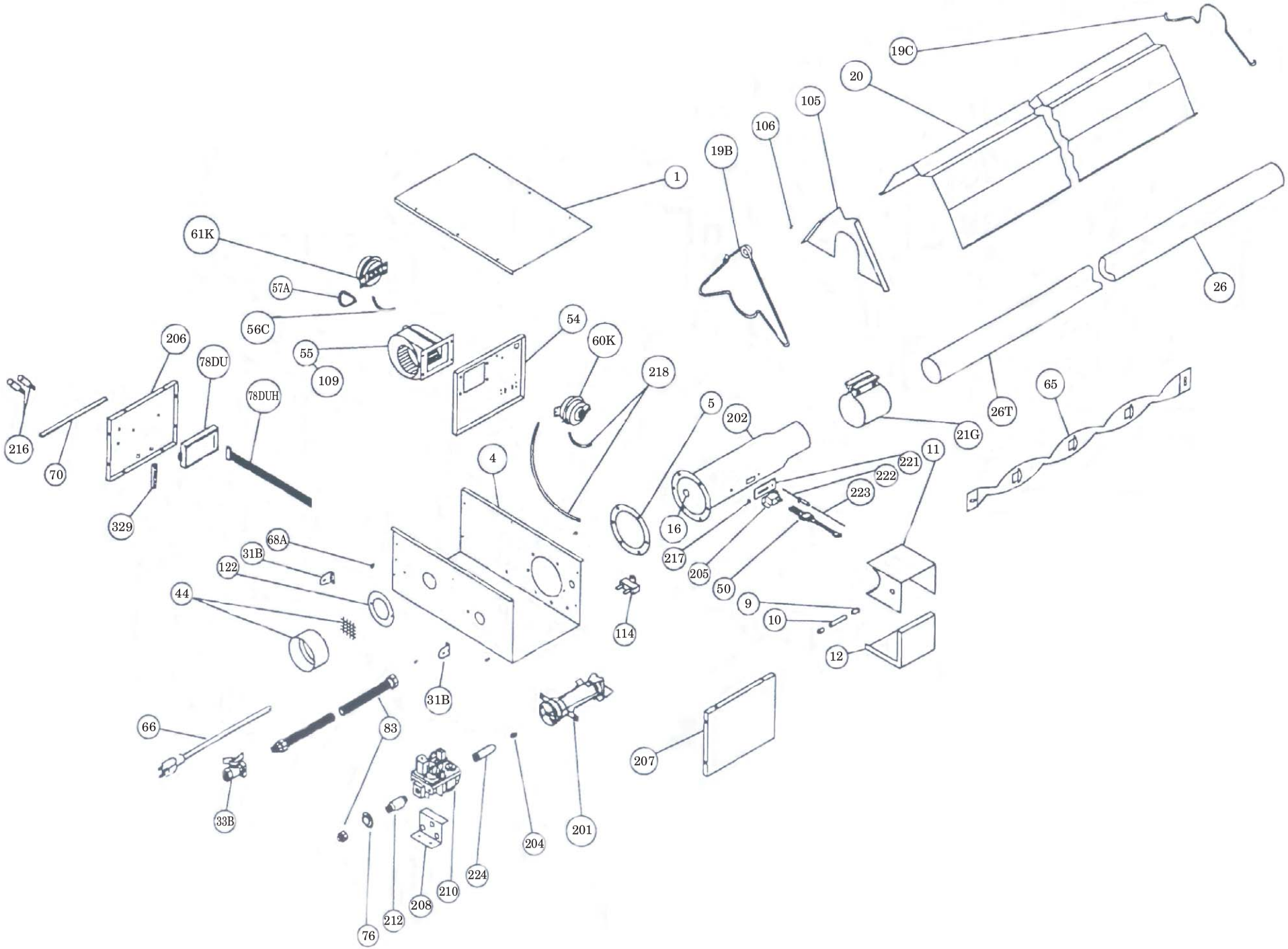
5.1 BASIC PARTS LIST

Part No.	*Description*
TP-1	Control Box Cover
TP 3	#8 x 1/4" Sheet Metal Screw
TP-4	Control Box
TP-5	Flange Gasket
TP-7	1/4-20 x ½" Machine Screw
TP-7A	1/4-20 Hex Nut
TP-9	Conduit Coupling
TP-10	Conduit ½" x 4"
TP-11	Glo-Bar Box
TP-12	Glo-Bar Box Cover
TP-13	#8 x 1/2" Self-Drilling Screw
TP-14	Sight Glass Gasket
TP-15	Sight Glass
TP-16	Sight Glass Washer
TP-17	1/4-20 x 3/8" Thread-Cutting Screw
DB-19B	Tube/Reflector Hanger (DB-3HGR)
DB-19C	Reflector Center Support (DB-3IH)
TP-20	Refector (120")
DB-21G	Tube Clamp 3"
DB-26	10 ft. Radiant Tube, Straight 3"
DB-26T	10 ft. Radiant Tube, Straight 3" (AL-TI)
TP-31B	Control Box Bracket
TP-41	1/4-20 Keps Nut
TP-44	Inlet Air Orifice w/Screen
TP-50	Globar Ignitor
TP-54	Burner Box Divider
TP-55/N	Fan Blower (40,000 & 50,000 BTU)
DB-109	Fan Blower (25,000 & 30, 000)
TP-56C	¼ in. Atmosphere Tube (Vinyl)
TP-57A	¼ in. Pressure Tube
TP-59	#8 Hex Nut/Lock Washer
TP-60K	Exhaust Pressure Switch (state model)
TP-61K	Burner Pressure Switch (state model)
TP-62	#8 x ½ in. Machine Screw
DB-65	Heat Diffuser (Baffle)(state model)
TP-66	Cord & Plug (DB-CP)
TP-67	Liquid Tight Connector (TP-LTC)
TP-68A	Strain Relief Bushing
TP-70	Control Box Cover Gasket
TP-76	Rubber Grommet
TP-80	#6-32 x 1 in. Machine Screw
TP-81	#6-32 Hex Nut
TP-83	Type I Gas Connector (RH-1/2)
TP-105	Reflector End Cap (BR-ECR)
TP-106	Reflector Clip (BR-ECRC)
DB-114	Thermal Limit Switch
TP-122	Air Inlet Gasket
TP-201	Burner (HD-201P)
TP-202	16 in. Burner Tube (AL-TI (LS-16P)
TP-204	Gas Orifice (TP-46)(state model)
TP-205	Glo-bar Holder
TP-206	End Panel-left
TP-207	End Panel-right
TP-208	"Z" Bracket
TP-210	Gas Valve (state N.G. or L.P.)(TP-75)
TP-212	3 in. X ½ in. Pipe Nipple
TP-216	Indicator lights (TP-IL)
TP-217	Pressure Barb Fitting
TP-218	Exhaust Pressure Tube (High Temp.)
TP-219	Glo-bar Gasket
TP-222	Flame Rod (BR-FR)
TP-223	Flame Rod Wire
TP-224	Manifold (HL-MFD)
TP-78DU	Circuit Control
TP-78DUH	Harness

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

5.2 Optional Parts

Item No.	*Description*
DB-3VCF	Exhaust Vent w/Flapper 3" (Required on Unvented Models)
BR-VC	Wall Inlet Vent w/Screen
DB-3-VK	Side Wall Venting Kit
BR-NIR	Side Shield Extension
BR-PS60	Radiant Tube Protective Screen 60"
DB-3UA	180° bend X 3" dia. tube kit
DB3EA	90° bend X 3" dia. tube kit
TP-33B	Gas Cock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20
105
106
19B
1
61K
57A
56C
54
60K
218
55
109
206
78DU
78DUH
216
70
329
5
202
21G
26T
65
26
11
221
222
223
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16
217
205
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9
10
12
114
68A
31B
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