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	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).

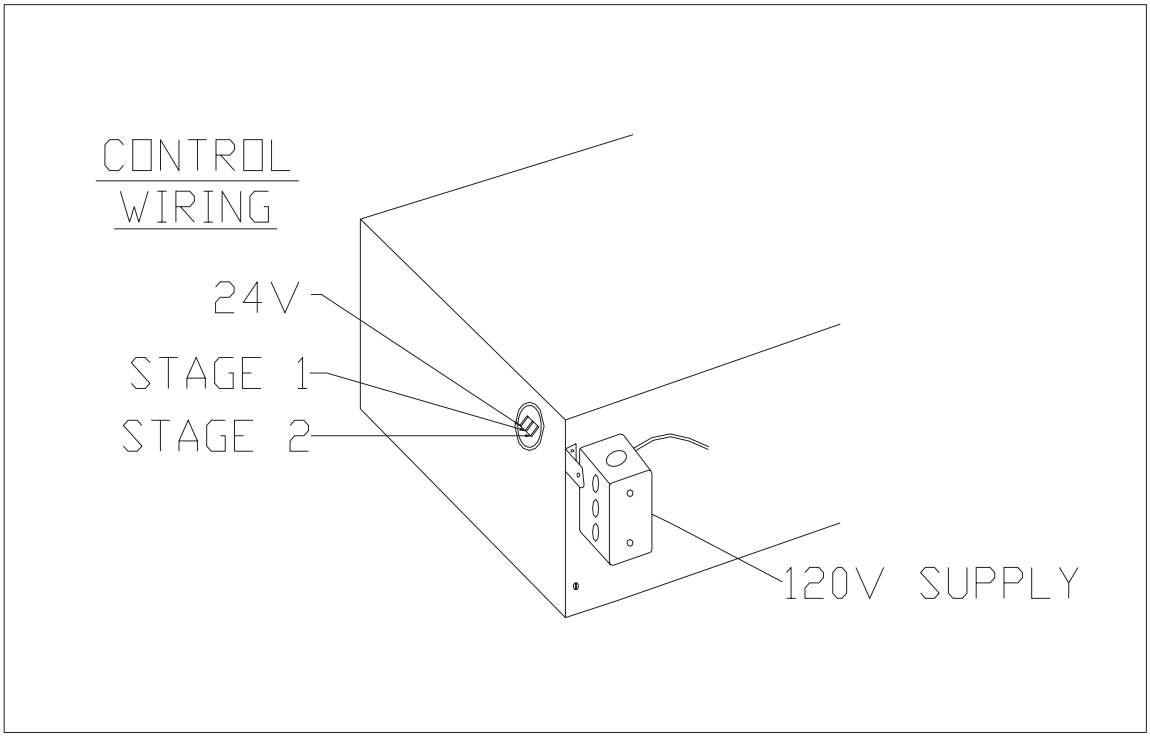
3. Wiring must not be exposed to direct radiant output.

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

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.

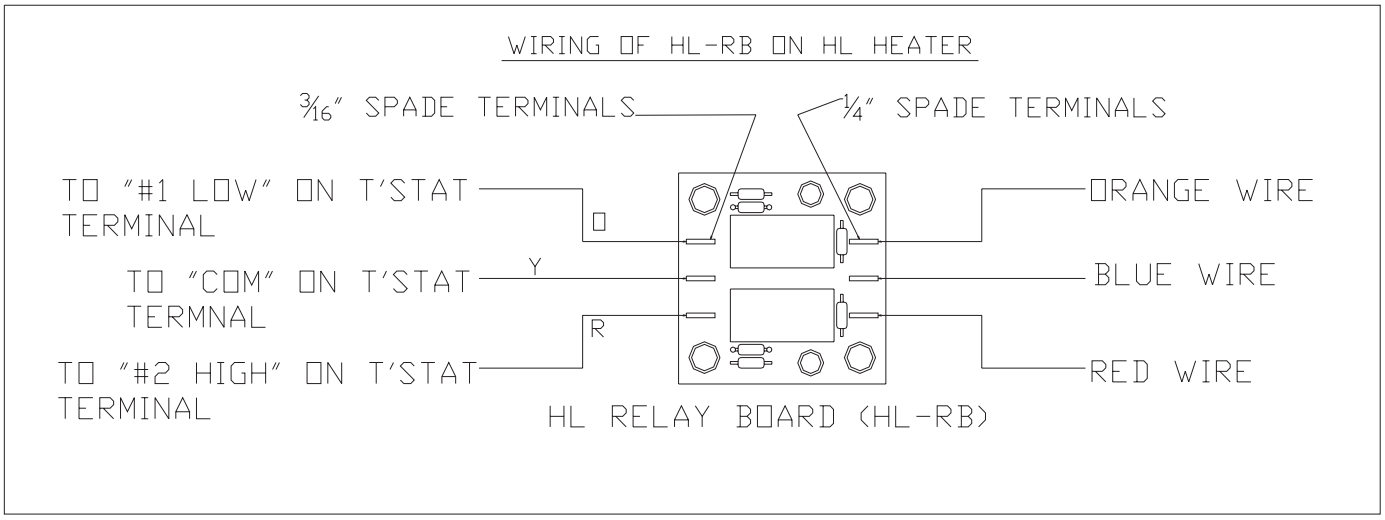


Figure 2.15.1

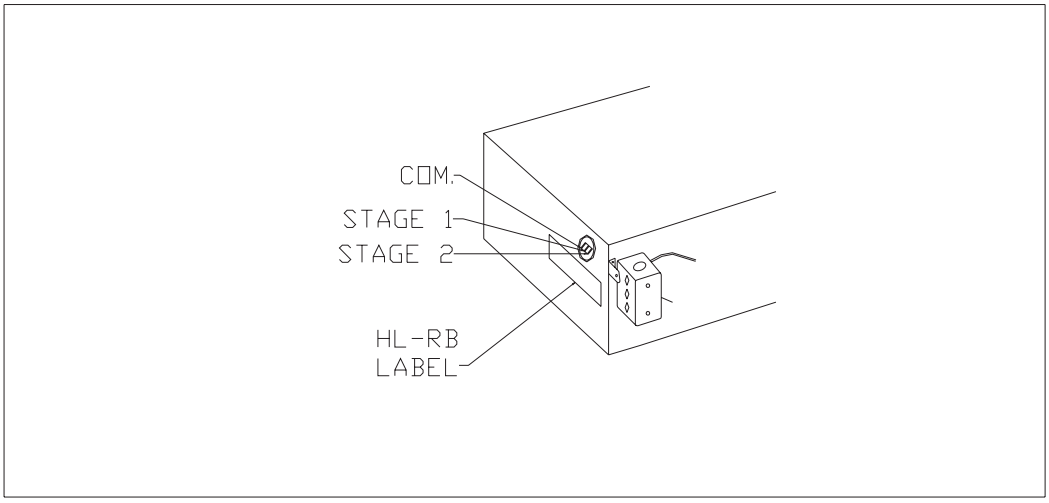


Figure 2.15.2

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.

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.

2.17 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.

2.18 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 OPERATION

3.1 Micro 60U24 Control

STANDBY
The Micro 60U24 circuit control continually checks for internal faults, safety circuit integrity and relay contact positioning.

STARTING CIRCUIT
Upon a call for heat, the control will verify that the burner and exhaust safety pressure switches are in their proper position. The fan relay energizes the fan, an operational static pressure is achieved and the normally open burner switch will close, initiating the ignition sequence. The glo-bar is powered and after 45 seconds the main gas valve opens.

FIRST STAGE RUNNING CIRCUIT
After ignition, the flame-rod monitors the main burner flame. If flame is lost, the control acts to close the gas valve within one second and a new trial sequence identical to the start-up is initiated. If proof is not established within 8.5 seconds, the unit will retry 2 times and proceed to a hard lock-out. The control can be reset by interrupting the power source or thermostat.

SECOND STAGE RUNNING CIRCUIT
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.

SHUTDOWN
When the thermostat is satisfied the fan will enter into a two minute post-purge cycle.

LOCKOUT CODES
In event of a component failure, a red LED diagnostic light located on the burner box end panel will flash a code identifying the fault. Lockout codes are summarized below.

LED STATUS	FAULT CODE
Initial flash on power up, then steady off	Normal Operation
Steady On	Module Failure/ Internal Fault
1 Flash	Ignition Fault
2 Flashes	APS1 Fault
3 Flashes	APS2 Fault
4 Flashes	Solenoid Valve Fault/ Leaky Valve/ Flame amplifier Fault
No flash upon initial 117 V power up	Transformer Fault

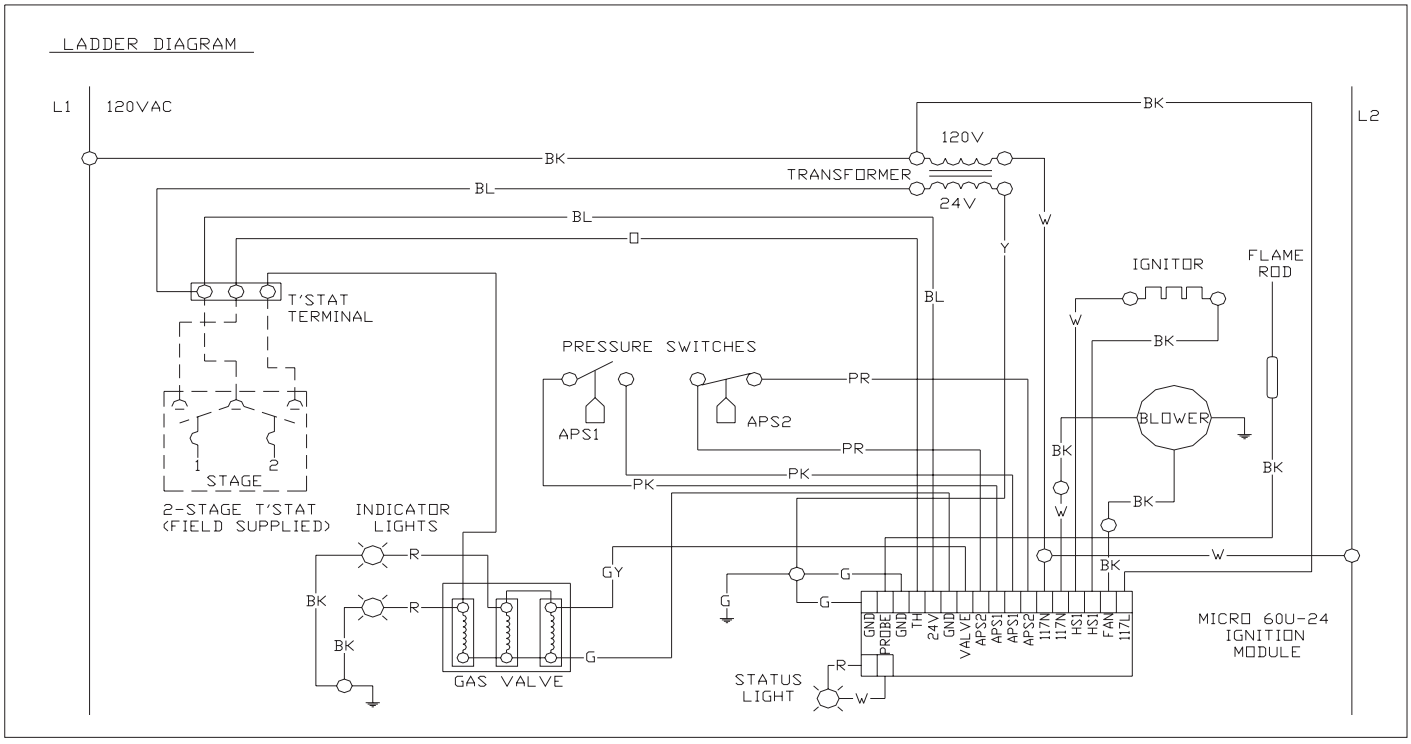


Figure 3.1.1

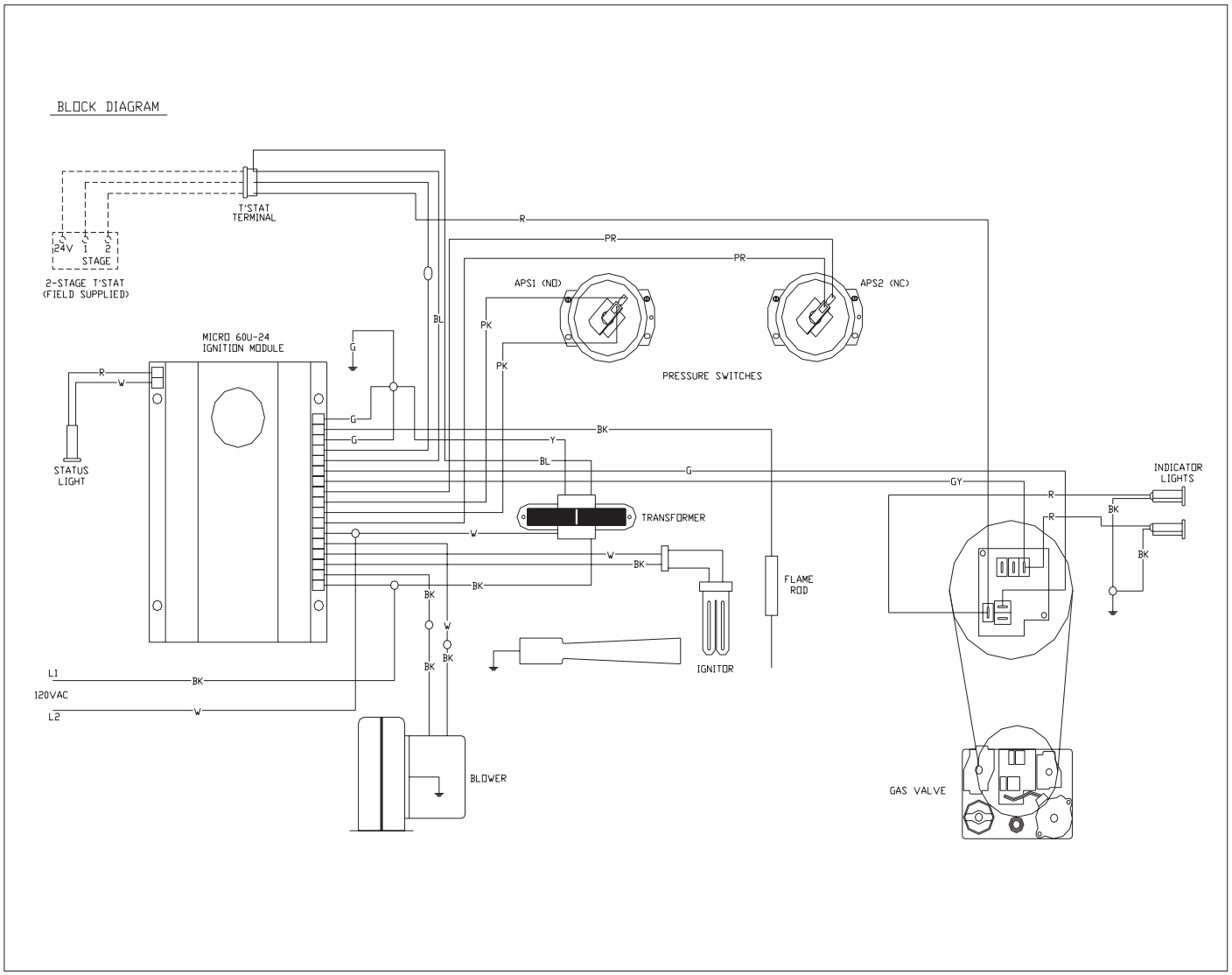

BLOCK DIAGRAM
T'STAT TERMINAL
24V
1
2
STAGE
2-STAGE T'STAT (FIELD SUPPLIED)
MICRO 60U-24 IGNITION MODULE
APS1 (NO)
APS2 (NC)
PRESSURE SWITCHES
STATUS LIGHT
TRANSFORMER
FLAME ROD
IGNITOR
INDICATOR LIGHTS
BLOWER
GAS VALVE
L1
120VAC
L2
R
W
G
BK
BL
PK
PR
Y
GY

Figure 3.1.2

4 SERVICE

4.1 Maintenance

LD 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)

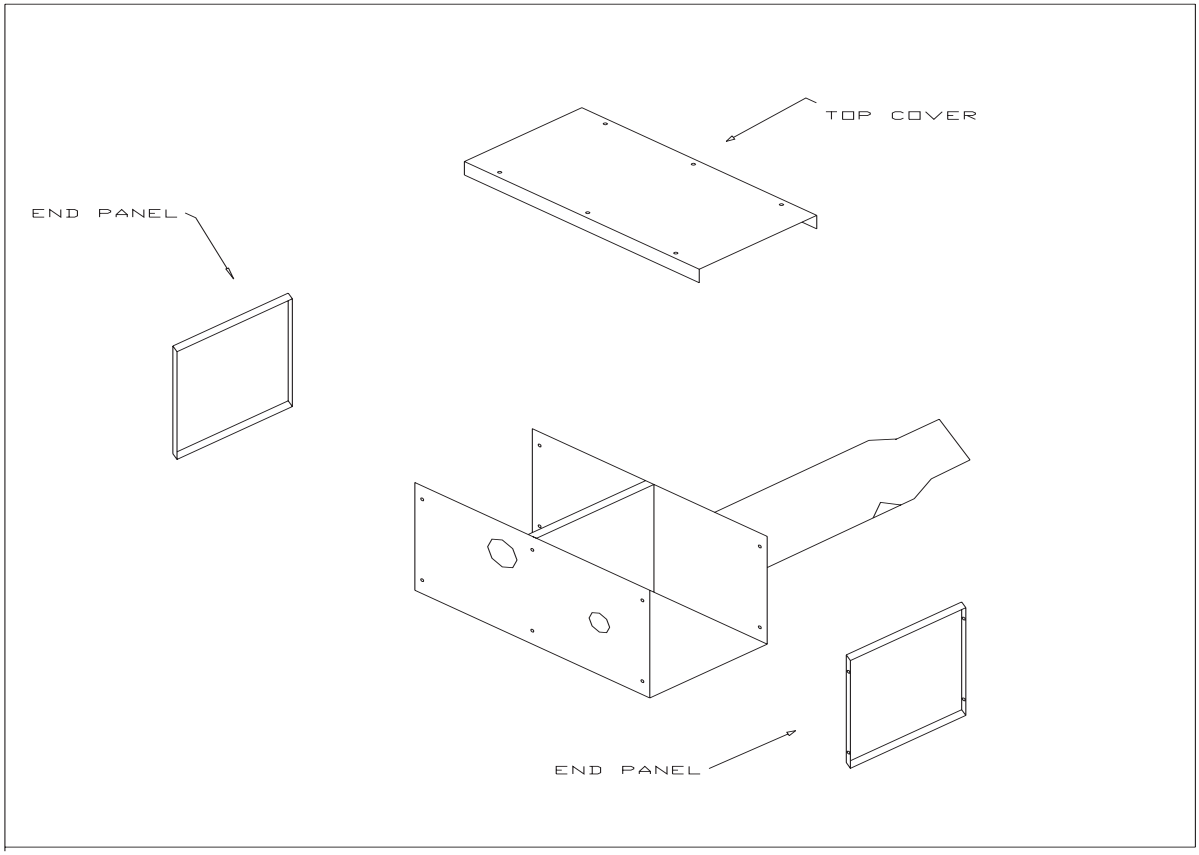


Figure 4.2.1

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

GENERAL TROUBLESHOOTING CHART FOR 2-STAGE SERIES EQUIPPED WITH MICRO 60U24 CONTROL		
SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermostat closed. - NO LED FLASH CODE	1. Blown fuse. 2. Faulty thermostat. 3. Disconnected wire. 4. No 24 volt signal.	1. Replace. 2. Replace. 3. Repair. 4. Interrupt 120 volt supply, LED will flash once if 24 volt is present.
Thermostat closed. - LED CODE STEADY ON	1. Internal fault in circuit control module.	1. Replace.
Thermostat closed. - LED CODE 1 FLASH	1. Faulty glo-bar. 2. Faulty flame sensor. 3. Gas valve not opening. 4. Gas orifice plugged. 5. Restriction in main burner.	1. Replace. 2. Replace. 3. Replace. 4. Remove, clean and reinstall. 5. Remove, clean and reinstall.
Thermostat closed. - LED CODE 2 FLASHES	1. Burner pressure switch fault. 2. Burner switch bypassed.	1. Replace. 2. Remove jumper wires.
Thermostat closed. - LED CODE 3 FLASHES	1. Exhaust pressure switch fault. 2. Blocked flue.	1. Replace. 2. Clean.
Thermostat closed. - LED CODE 4 FLASHES	1. Wire disconnected on valve. 2. Gas valve fault. 3. Flame rod fault.	1. Reconnect. 2. Replace. 3. Replace.
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.	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.
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)
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)

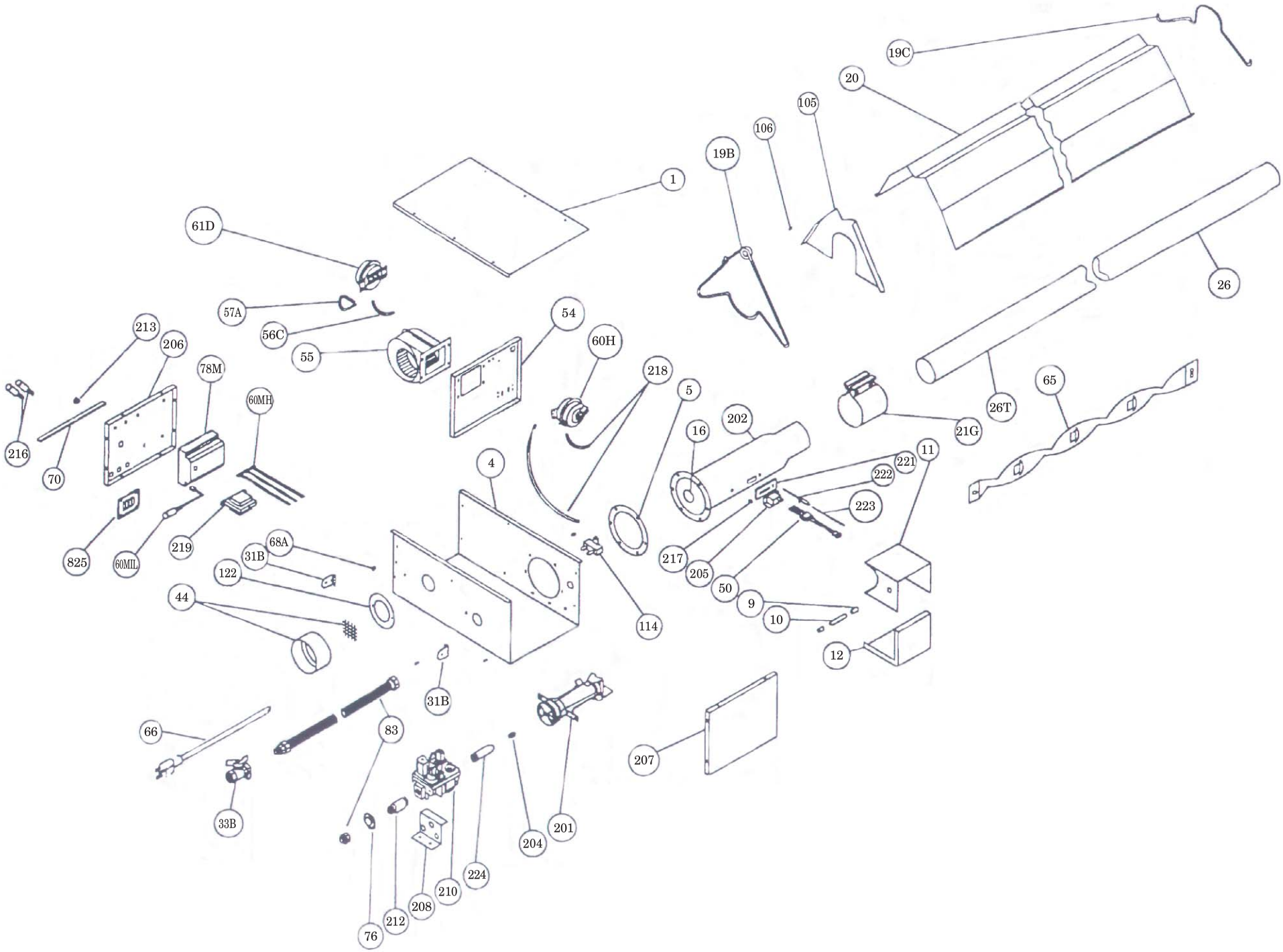
Part No.	*Description*
TP-61K	Burner Pressure Switch (state model)
TP-62	#8 x ½ in. Machine Screw
DB-65	Heat Diffuser (Baffle)(state model)
TP-66	Cord & Plug (DB-CP)
TP-67	Liquid Tight Connector (TP-LTC)
TP-68A	Strain Relief Bushing
TP-70	Control Box Cover Gasket
TP-76	Rubber Grommet
TP-80	#6-32 x 1 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.)(HL-75)
TP-212	3 in. X ½ in. Pipe Nipple
TP-216	Indicator lights (HL-L)
TP-217	Pressure Barb Fitting
TP-218	Exhaust Pressure Tube (High Temp.)
TP-219	Transformer 25V (HL-T)
TP-219	Glo-bar Gasket
TP-222	Flame Rod (BR-FR)

Part No.	*Description*
TP-223	Flame Rod Wire
TP-224	Manifold (HL-MFD)
HL-78M	Circuit Control
HL-60MH	Harness
HL-60MIL	Red Status Light

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


19C
20
105
106
19B
1
61D
57A
56C
55
54
60H
218
5
213
206
78M
60MH
216
70
825
60MIL
219
4
16
202
221
222
223
11
217
205
50
9
10
12
114
68A
31B
122
44
31B
66
83
33B
76
212
208
210
224
204
201
207
21G
26T
65
26

LIMITED
Seven Year Warranty
RE-VERBER-RAY TUBE TYPE GAS INFRA-RED HEATER

Brant Radiant Heaters Limited (hereinafter referred to as the Company) warrants to the original purchaser or original user that all Brant Radiant Heaters sold by it and all parts thereof are free from defects in material and/or workmanship under a normal use and service. The Company's sole obligation under this warranty shall be limited to furnishing replacement parts, F.O.B. Paris, Ontario, for 36 months from the date of initial installation of the heater, but not to exceed 36 months from the date of shipment by the Company to original purchaser for the heater, for any parts which the Company's examination shall disclose to its satisfaction to be defective. Defective parts to be returned to the Company, transportation charges prepaid.

FOUR YEAR ADDITIONAL WARRANTY ON COMBUSTION CHAMBER/ RADIANT TUBE

In addition to the above mentioned Three-Year Warranty, the Company warrants to the original purchaser or original user of TUBE TYPE Gas Infra-Red Heater that it will at any time during the two years next following the expiration date of the Three-Year Warranty, furnish combustion chamber / radiant tube F.O.B. Paris, Ontario, for any combustion chamber / radiant tube which is proved to the satisfaction of the Company to be inoperative due to defects in material or factory workmanship. The Company's sole obligation under the warranty shall be limited to furnishing combustion chamber radiant tube.

This two-year additional warranty covers the combustion chamber / radiant tube only.

GENERAL CONDITIONS

The warranties set out in this certificate are the exclusive remedy of the original owner or user in lieu of all other warranties written, oral and / or implied (including any warranty of merchantability or fitness for the purpose) and all other obligations and / or liabilities on the part of the Company, and the Company neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the sale, installation or use of the heater or any parts thereof.

The company will not be responsible for labour charges for the analysis of a defective condition in the heater and / or for the installation of replacement parts.

The warranties provided herein will not apply if the input of the heater exceeds the rated input, as indicated on the name plate, by more than 2%, or if the heater in the judgement of the Company has been subjected to misuse, excessive dust, negligence, accident, corrosive atmospheres, excessive thermal shock, excessive vibration, physical damage to the heater, alterations by unauthorized service, operation contrary to the Company's instructions or if the serial number has been altered, defaced or removed. The Company shall not be liable for any default and / or delay in the performance by it of these warranties caused by contingency beyond its control, including war, government restriction or restraints, strikes, fire, flood, Acts of God, short or reduced supply of raw materials, or parts.

The warranties herein shall be null and void if the heater is not installed by a competent heating contractor and / or if the heater is not installed according to Company instructions and / or if the heater is not maintained and repaired according to Company instructions.

Written permission is required for the return of any part and / or equipment and any such return must be made on the basis of transportation charges prepaid. Shipments may be refused unless prior written permission is obtained and goods returned prepaid.

This warranty applies only within Canada.

RE-VERBER-RAY

BRANT RADIANT HEATERS LIMITED