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

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).

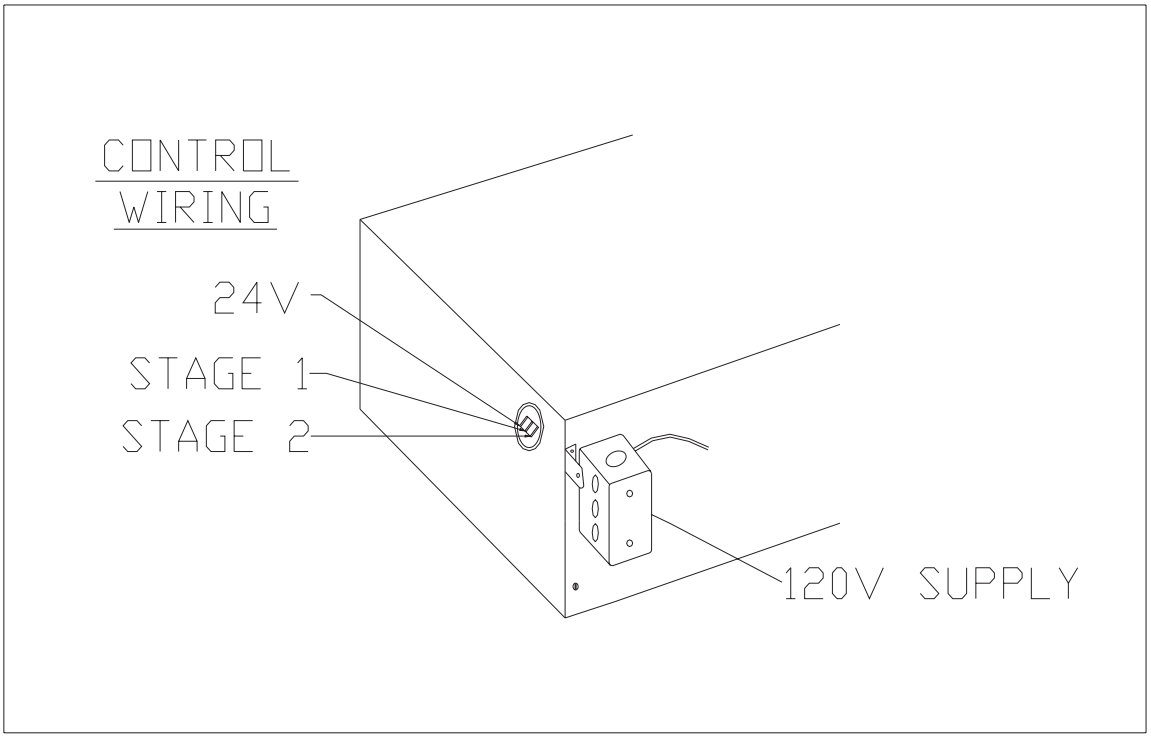
3. Wiring must not be exposed to direct radiant output.

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 INSTALLATION

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.

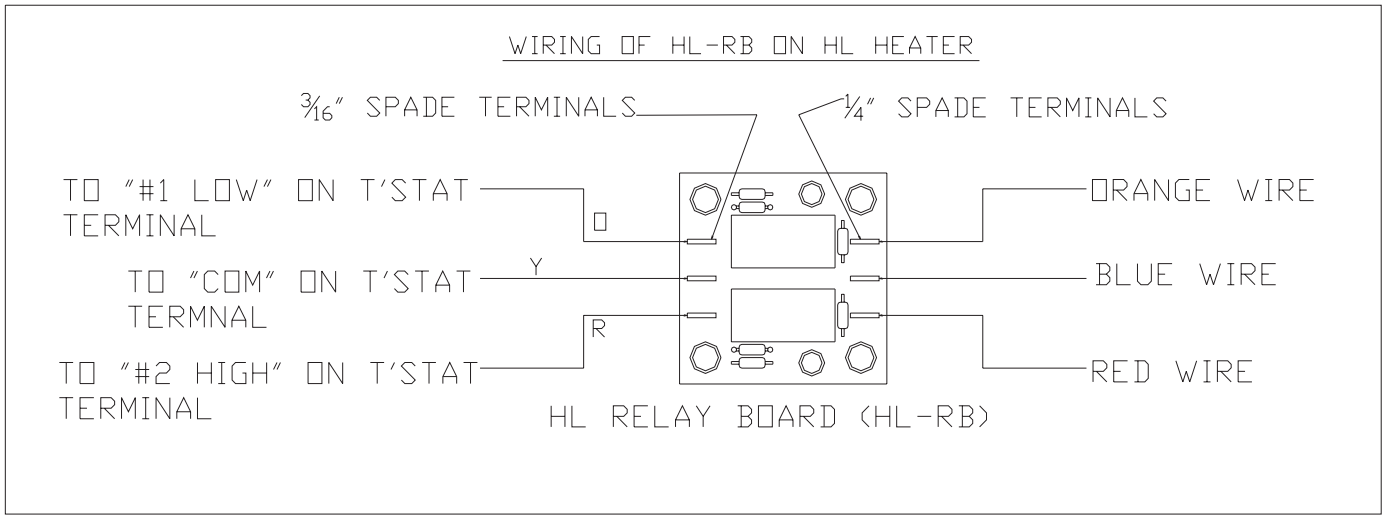


Figure 2.15.1

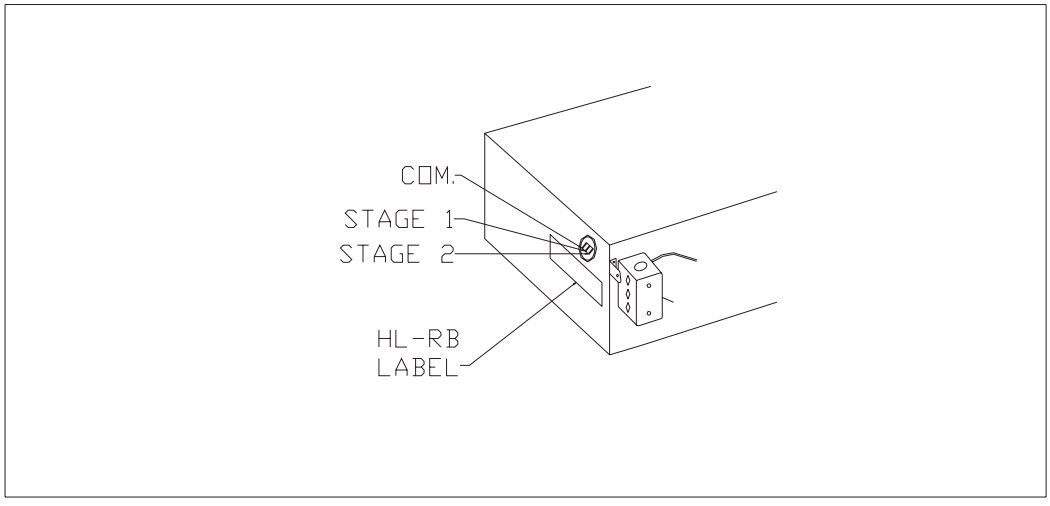


Figure 2.15.2

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”).

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

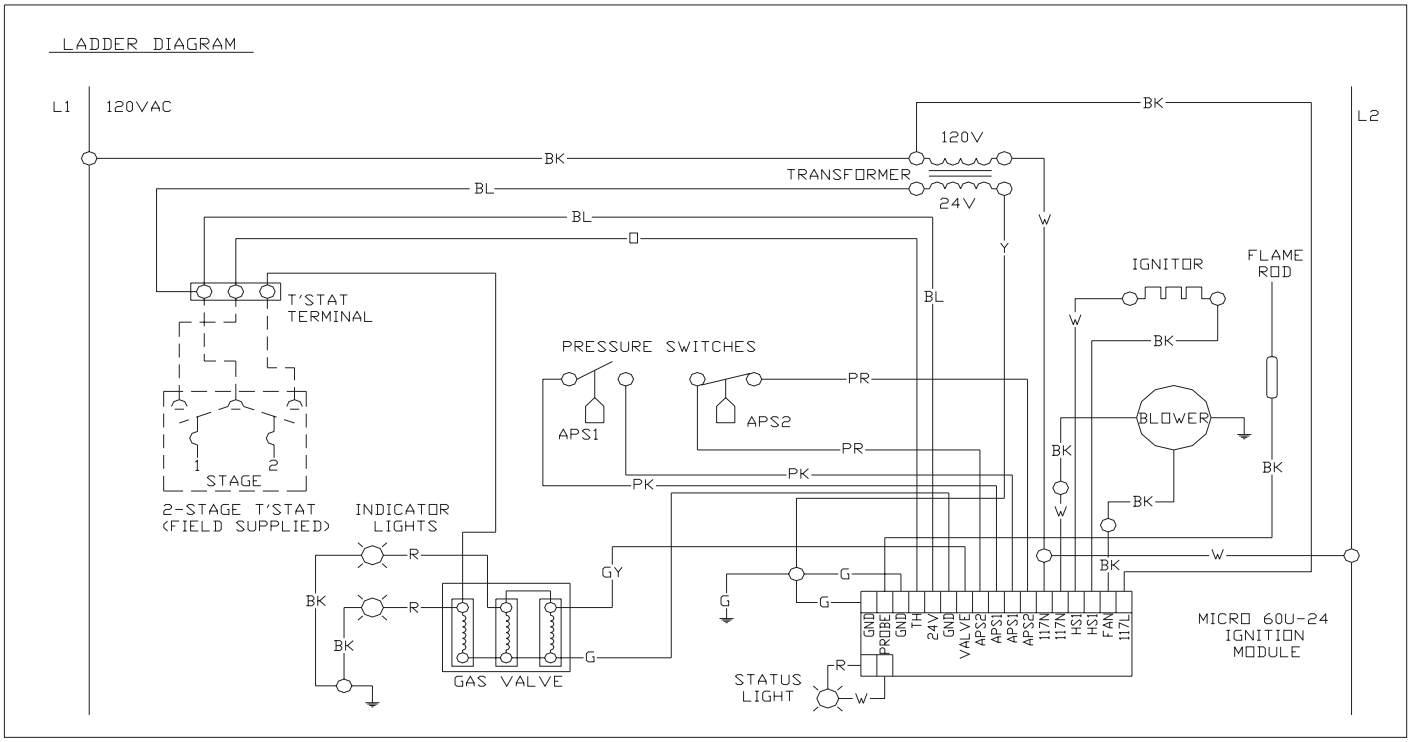


Figure 3.1.1

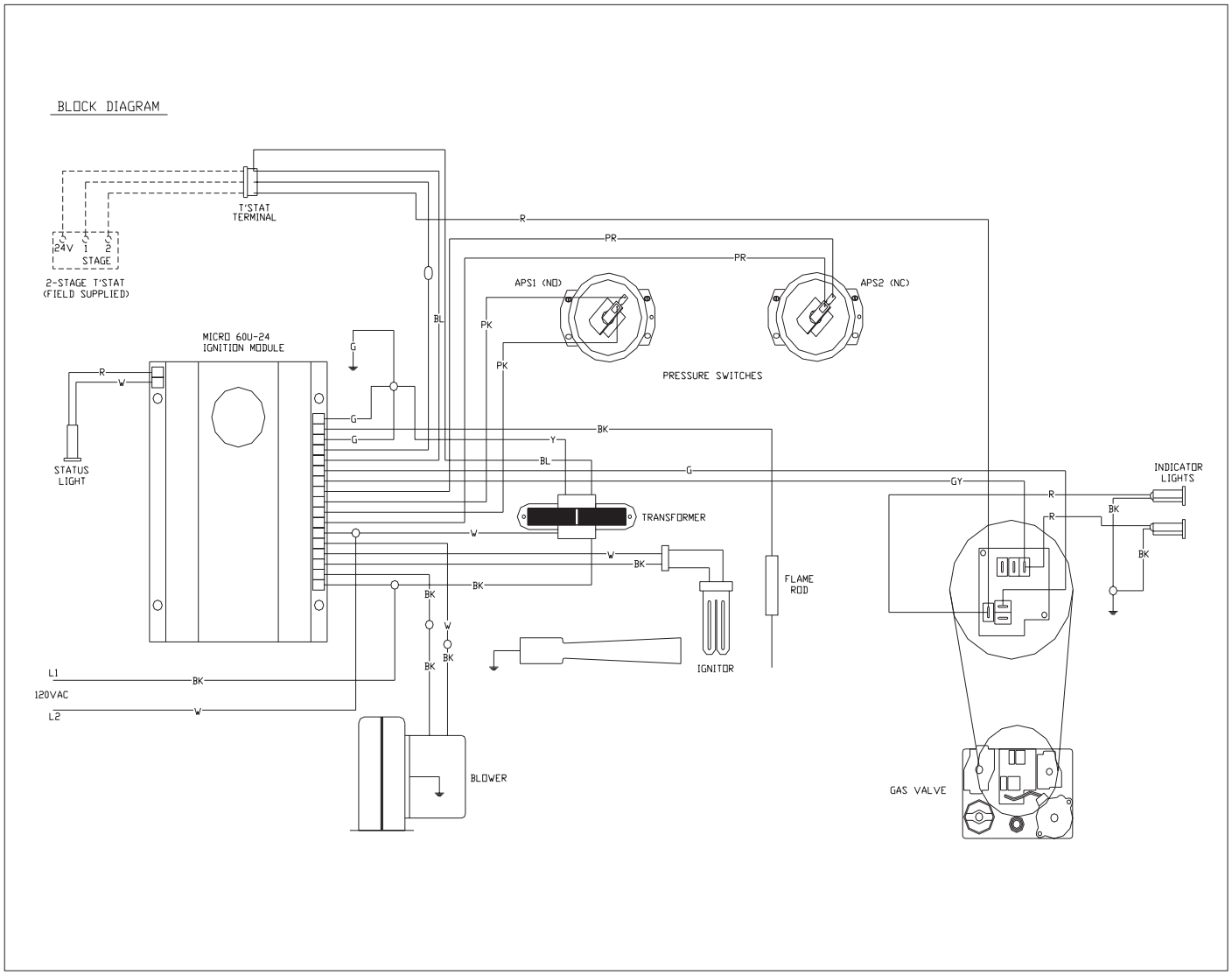

BLOCK DIAGRAM
T'STAT TERMINAL
24V
1
2
STAGE
2-STAGE T'STAT (FIELD SUPPLIED)
MICRO 60U-24 IGNITION MODULE
APS1 (NO)
APS2 (NC)
PRESSURE SWITCHES
STATUS LIGHT
TRANSFORMER
FLAME ROD
IGNITOR
INDICATOR LIGHTS
BLOWER
GAS VALVE
L1
120VAC
L2
R
W
G
BK
Y
BL
PK
PR
GY

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

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 1/2" Machine Screw
TP-7A	1/4-20 Hex Nut
TP-9	Conduit Coupling
TP-10	Conduit 1/2" 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
TP-19B	Tube/Reflector Hanger (BR-4HGR)
TP-19C	Reflector Center Support (BR-4IH)
TP-20	Refector (120")
TP-21S	Tube Clamp Stainless Steel
TP-26	10 ft. Radiant Tube, Straight
TP-26T	10 ft. Radiant Tube, Straight (Type #409 Stainless Steel)
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	Fan Blower
TP-56C	1/4" Atmosphere Tube (vinyl)
TP-57A	1/4 " Pressure Tube
TP-59	#8 Hex Nut/Lock Washer
TP-60H	Exhaust Pressure Switch (Tridelta #FS6628-1654)(State BTU's)

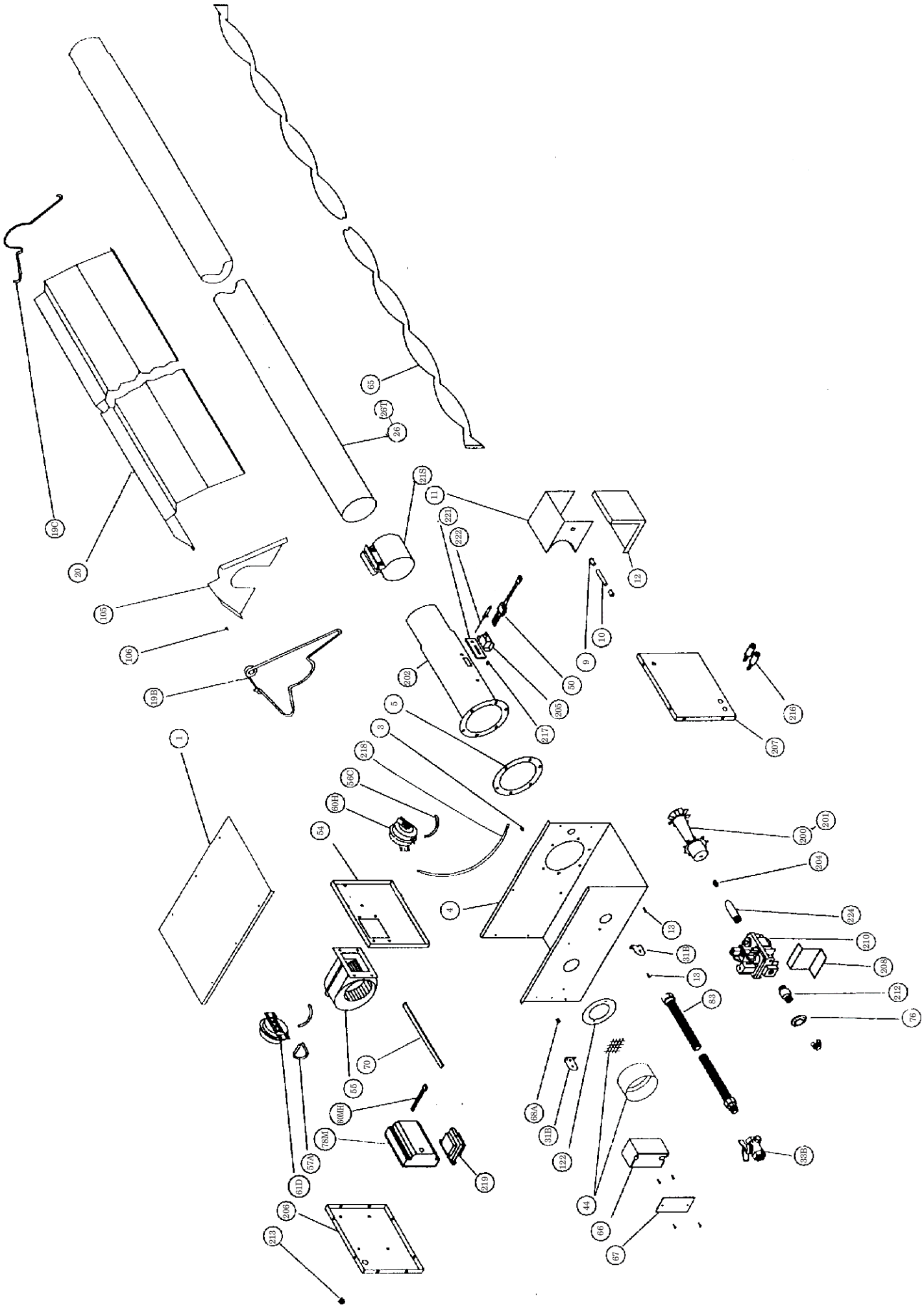
Part No.	*Description*
TP-61D	Burner Pressure Switch (Tridelta #FS6581-1047)
TP-62	#8 x 1/2" Machine Screw
TP-65	Heat Diffuser (Baffle)
TP-66	2" x 4" Outlet Box
TP-67	2" x 4" Outlet Box Cover
TP-68A	Strain Relief Bushing
TP-70	Control Box Gasket
TP-76	Rubber Grommet
TP-80	#6-32 x 1" Machine Screw
TP-81	#6-32 Hex Nut
TP-83	Flexible Gas Connector
TP-101	1/2" Adapter Fitting
TP-104	1/2" x 2" Pipe Nipple
TP-105	Reflector End Cap (BR-ECR)
TP-106	Reflector Clip (BR-ECRC)
TP-122	Air Inlet Gasket
TP-200	Burner (100,000 to 125,000 BTUH) (TP-B1P)
TP-201	Burner (175,000 BTUH) (TP-B2)
TP-202	16" Burner Tube (HL-16P)
TP-204	Gas Orifice (TP-46)
TP-205	Glo-Bar Holder
TP-206	End Panel-Left
TP-207	End Panel-Right
TP-208	"Z" Bracket
TP-210	36E96 2-Stage Gas Valve (State N.G. Or L.P.)(HD-75)
TP-212	3" x 1/2" Pipe Nipple
TP-213	T'Stat Plug (HL-TP)
TP-216	Indicator lights (HL-L)
TP-217	Pressure Barb Fitting

Part No.	*Description*
TP-218	Exhaust Pressure Tube (Vinyl)
TP-219	Transformer 25V (HL-T)
TP-221	Glo-Bar Gasket
TP-222	Flame Rod
TP-224	Manifold (HL-MFD)
HL-60MH	Micro-60 Harness
HL-60MIL	Diagnostic LED Lights
HL-78M	Micro-60 Self Diagnostic Board

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

5.2 Optional Parts

Item No.	*Description*
SK-4VC	Vent Cap (Required For Sidewall Venting on 200,000 BTU)
BR-VCF	Exhaust Vent w/Flapper (Required on Unvented Models)
BR-VC	Wall Inlet Vent w/Screen
BR-4-VK	Side Wall Venting Kit (also SK4-VK)
TF-9	Truck Exhaust Terminal for Side Wall Venting
SK-6VC	Vent Cap (Required for Dual Side Wall Vents)
BR-NIR	Side Shield Extension
TP-33B	Gas Cock


65
26T
26
21S
11
22T
22
12
10
9
50
205
217
202
19C
20
105
106
19B
1
5
3
218
56C
60H
54
4
216
207
200
201
204
224
210
208
212
76
13
61B
18
83
68A
31B
122
44
66
67
93B
70
55
60MH
78M
57A
61D
219
206
213