

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 safety pressure switch is in its 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 |
| 4 Flashes | Solenoid Valve Fault/ Leaky Valve/ Flame amplifier Fault |
| No flash upon initial 117 V power up | Transformer Fault |

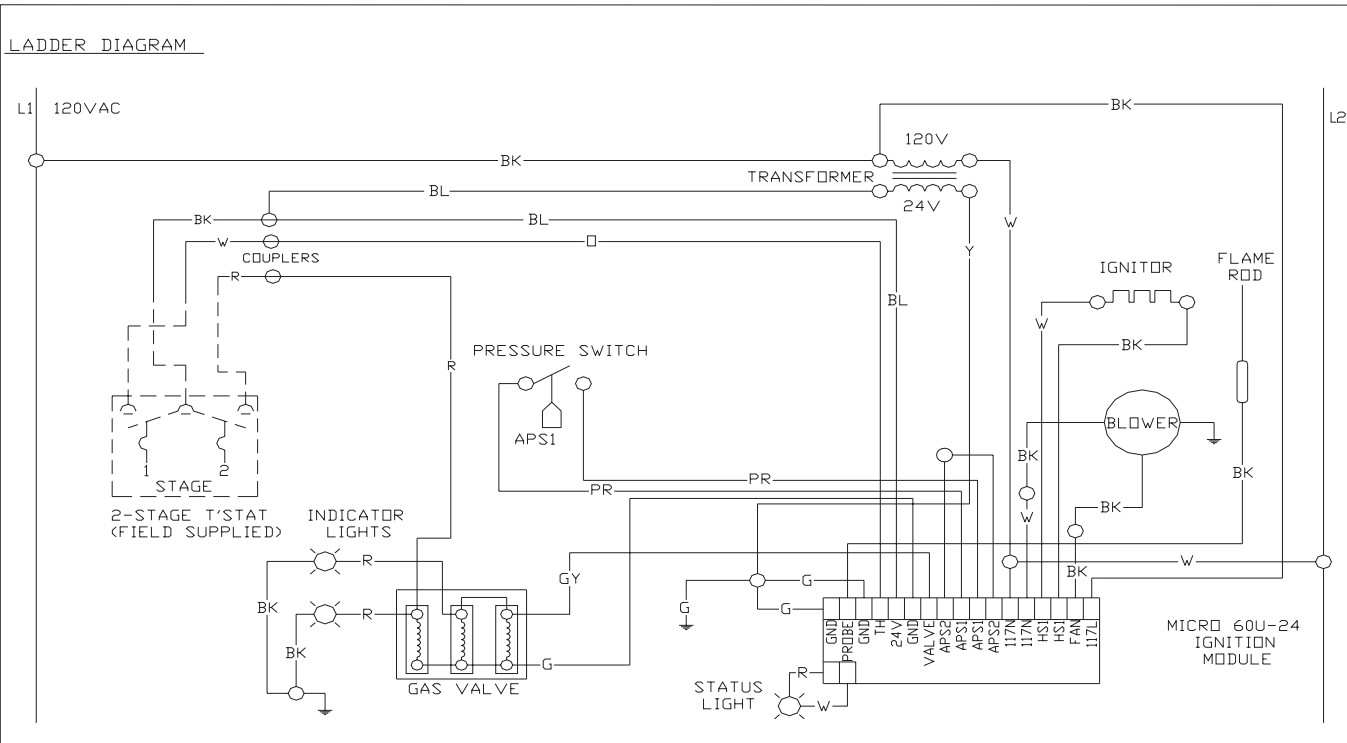


Figure 3.1.1

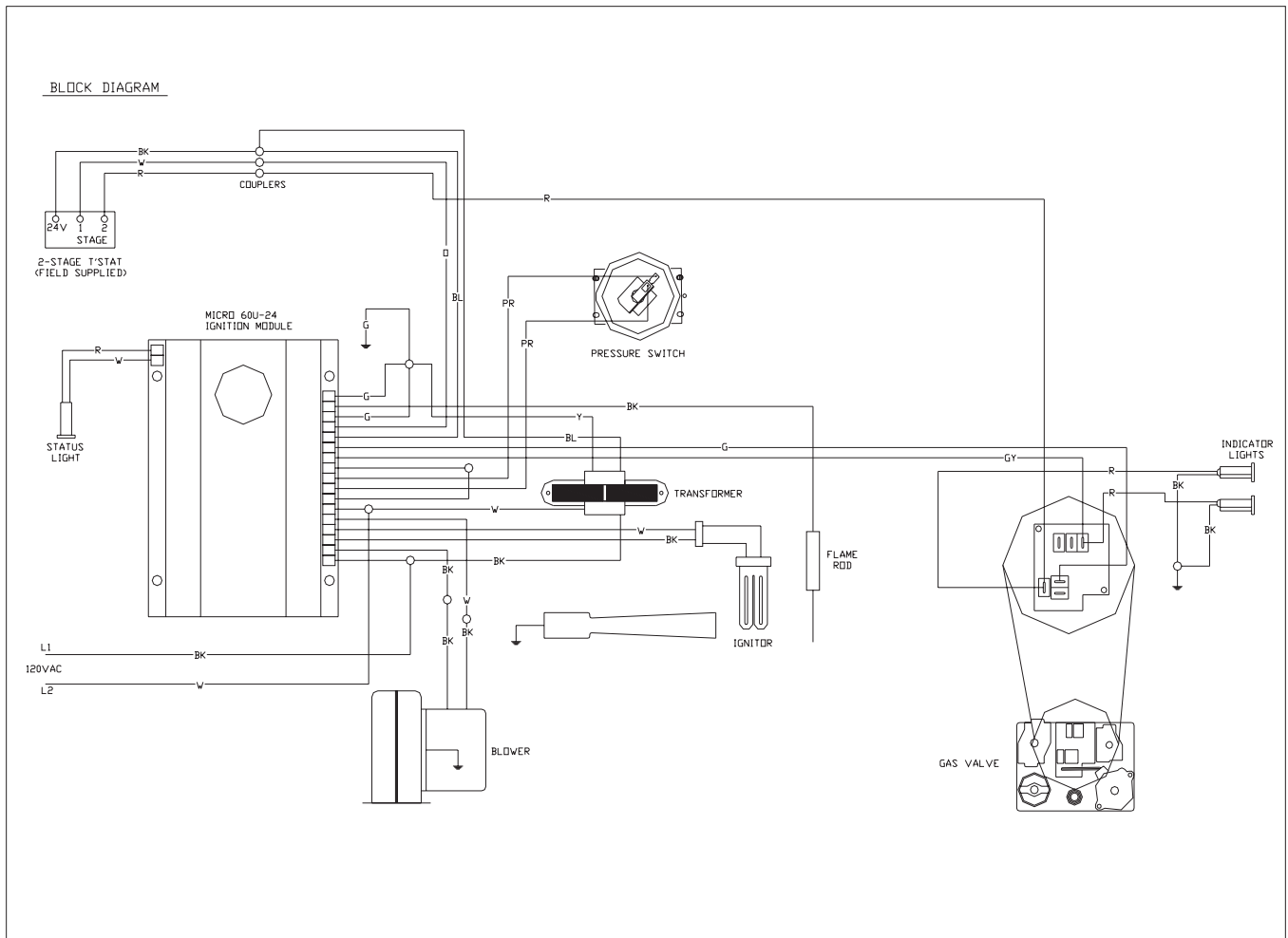


Figure 3.1.2

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

| 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. |

| Part No. | Description | Part No. | Description | Part No. | Description |
|----------|---------------------------------------|----------|---|----------|-------------------------------------|
| TP-1 | Control Box Cover | TP-61K | Pressure Switch (State btuh) | TP-218 | Exhaust Pressure Tube (Hi-Temp) |
| TP-3 | # 8 x 1/4" Sheet Metal Screw | | | TP-219 | Transformer 25V (HL-T) |
| TP-4 | Control Box | TP-62 | # 8 x 1/2" Machine Screw | TP-221 | Glo-Bar Gasket |
| TP-5 | Flange Gasket | TP-65 | Heat Diffuser (Baffle) | TP-222 | Flame Rod |
| TP-7 | 1/4-20 x 1/2" Machine Screw | TP-66 | 2" x 4" Outlet Box | TP-224 | Manifold (HL-MFD) |
| TP-7A | 1/4-20 Hex Nut | TP-67 | 2" x 4" Outlet Box Cover | HL-60MH | Micro-60 Harness |
| TP-9 | Conduit Coupling | TP-68A | Strain Relief Bushing | HL-60MIL | Diagnostic LED Lights |
| TP-10 | Conduit 1/2" x 4" | TP-70 | Control Box Gasket | HL-78M | Micro-60 Self Diagnostic Board |
| TP-11 | Glo-Bar Box | TP-76 | Rubber Grommet | | |
| TP-12 | Glo-Bar Box Cover | TP-80 | # 6-32 x 1" Machine Screw | | |
| TP-13 | # 8 x 1/2" Self-Drilling Screw | TP-81 | # 6-32 Hex Nut | | |
| TP-14 | Sight Glass Gasket | TP-83 | Flexible Gas Connector | | |
| TP-15 | Sight Glass | TP-101 | 1/2" Adapter Fitting | | |
| TP-16 | Sight Glass Washer | TP-104 | 1/2" x 2" Pipe Nipple | | |
| TP-17 | 1/4-20 x 3/8" Thread-Cutting Screw | TP-105 | Reflector End Cap (BR-ECR) | | |
| TP-19B | Tube/Reflector Hanger (BR-4HGR) | TP-106 | Reflector Clip (BR-ECRC) | | |
| TP-19C | Reflector Center Support (BR-4IH) | TP-122 | Air Inlet Gasket | | |
| TP-20 | Refector (120") | TP-200 | Burner (50,000 to 100,000 BTUH) (TP-B1P) | | |
| TP-21 | Tube Clamp | | | BR-VCF | Exhaust Vent w/Flapper |
| TP-26 | 10 ft. Radiant Tube, Straight | TP-201 | Burner (125,000 to 200,000 BTUH) (TP-B2) | BR-VC | (Required on Unvented Models) |
| TP-26T | 10 ft. Radiant Tube, Straight (AL-TI) | | | BR-4-VK | Wall Inlet Vent w/Screen |
| TP-31B | Control Box Bracket | TP-202 | 16" Burner Tube (HL-16P) | TP-9 | Side Wall Venting Kit (also SK4-VK) |
| TP-41 | 1/4-20 Keps Nut | TP-204 | Gas Orifice (TP-46) | | Truck Exhaust Terminal for Side |
| TP-44 | Inlet Air Orifice w/Screen | TP-205 | Glo-Bar Holder | | Wall Venting |
| TP-50 | Global Ignitor | TP-206 | End Panel-Left | SK-6VC | Vent Cap (Required for Dual Side |
| TP-54 | Burner Box Divider | TP-207 | End Panel-Right | | Wall Vents) |
| TP-55 | Fan Blower | TP-208 | "Z" Bracket | BR-NIR | Side Shield Extension |
| TP-57A | 1/4 " Pressure Tube | TP-210 | 36E96 2-Stage Gas Valve (State N.G. Or L.P)(HL-75) | TP-33B | Gas Cock |
| TP-59 | # 8 Hex Nut/Lock Washer | | | | |
| | | 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 | | |

