

Fig. 29: Status LED Indicator Decal

Heater Sequence of Operation

Models 302B-902B

1. The black (hot) wire lead goes directly to the main power switch. This black toggle switch is located at the middle front of the control compartment.
2. When the main power switch is placed in the "ON" position, 120 VAC is applied to the 120 VAC terminal block on the circuit board and the 120/24 VAC transformer is powered.
3. 120 VAC is waiting at the N.O. contacts of the Economaster pump delay.
4. Terminals L1 and F1 of the ignition module are powered with 120VAC.
5. 120 VAC power is also applied to the control power connector on the circuit board.
6. 120 VAC power is waiting at the N.O. contacts of K-3 relay to energize the heater blower.
7. The 120/24 VAC transformer outputs 24 VAC.
8. 24 VAC is sent to pin L1 of the low water cut-off (optional) and the red power light is energized.
9. 24 VAC is applied to the blue power light located on the status display board.
10. 24 VAC is also applied to the red LED safety shutdown light on the front status board until the safeties have been proven.
11. 24 VAC is applied to the alarm circuit (optional). If the E-5 sales option (Alarm) is included a 5 second time delay relay will not allow the alarm to sound unless a safety or limit circuit stays energized for more than 5 seconds.
12. Power is applied to terminal P1-1 of the Universal Diagnostics Board. 24 VAC power is then applied in series to all typically closed safeties wired into the heater. All safeties are verified to ensure that it is safe to operate the heater. The safety components wired into the diagnostic board are: low water cut-off (optional), blocked vent switch, manual vent temp switch (optional), manual reset high limit, low gas pressure switch (optional), high gas pressure switch (optional), and auto-reset high limit (optional).
13. If any of the safeties do not close, a signal is sent to the Universal Diagnostics Board to indicate a safety fault.
14. Power is applied to terminal TP-1 of the Economaster pump delay to energize the circuit board.
15. Once all safeties are closed and verified, a 24 VAC signal is output from the Auto High Limit to J5 pin 3 of the CPW board of the heater.
16. 24 VAC power is now sent to the coil of relay K-1.
17. Relay K-1 (N.C.) will now be energized, and opens the N.C. contacts to disable the alarm (optional) and turns off the red LED safety shutdown light on the front status board.
18. The common terminal of the Auto High Limit will now send a 24 VAC signal to pin 1 of the "panel switch".
19. The "panel switch" (rocker switch) located at the lower left front of the control compartment is now powered. If the switch is "ON" and there is no call for heat (CFH), the heater is in standby mode.
20. After the standby switch is placed into the "ON" position, a 24 VAC signal is sent to the "enable/disable" connection (normally jumpered).
21. 24 VAC switched power is applied to the S24V terminal on the ignition module.
22. When the "enable/disable" contacts are closed, the 24 VAC signal travels to pin 1 of the stage 1 connection and waits for a CFH.
23. When a CFH occurs, a 24 VAC signal is sent to the CFH light on the status panel located on the lower left front of the control compartment.

External Lights		
Light	Color	Indication
Power	Blue	Main power is on
Call For Heat	Yellow	Thermostat is closed
Safety	Red	One or more safeties is inoperative
Ignition	Red	Ignition module is inoperative
Flow	Green	Flow is present
Blower 1	Green	Blower 1 is on
Stage 1	Green	Stage 1 is on
Stage 2	Green	Stage 2 is on

Table P: Status LED Indicators

24. Power is also sent from pin 2 of the stage 1 connection to pin P1-3 of the universal diagnostic board.
25. Power is now sent to terminal TP4 of the Economaster to energize the relay and close the contacts.
26. Power is waiting at the common terminal of the flow switch waiting for closure and sufficient water flow.
27. The heater pump is energized upon relay closure of the Economaster.
28. Upon sufficient flow from the heater pump, the flow switch contacts will close.
29. If there is insufficient flow and the flow switch does not close, a 24 VAC signal is sent to the Universal Diagnostics Board to indicate the fault.
30. The flow light is energized; located on the front status panel.
31. A 24 VAC signal is also sent to the "TH" terminal located on the ignition module.
32. Once the 24 VAC "TH" signal is received at the ignition module, the internal contacts between F1 and F2 close sending a 120 VAC signal to the 120 VAC pilot duty terminals, located at J14 on the circuit board.
33. The 120 VAC signal continues to the coil of the blower relay K-3 (N.O.).
34. The 120 VAC signal continues to the 120 VAC safety terminals located at J13 on the circuit board.
35. When the coil on relay K-3 is powered, the N.O. relay contacts close and energizes the blower from the J8 connections on the CPW board.
36. After proper air pressure is received in the air plenum, the air pressure switch will close.
37. If there is insufficient air pressure and the air pressure switch does not close, a 24 VAC signal is sent to the Universal Diagnostics Board to indicate the fault.
38. A 24 VAC signal is now sent to the blower LED on the status board.
39. Power is applied to the optional equipment interlock connection J9 (normally jumpered).
40. The 24 VAC signal is then sent to the 24 VAC safety connector.
41. 24 VAC is now sent to the pressure switch (P.S.) terminal on the ignition module.
42. Once the pressure switch signal is received at the ignition module, the heater performs a 15-second pre-purge and then the hot surface igniter is energized by a 120 VAC signal from S-1 on the ignition module for approximately 30 seconds. (The hot surface igniter must draw greater than 3.1 amps while being energized or ignition lockout will occur after three tries.)
43. Once the ignition module determines that the hot surface igniter has heated up and operating properly, a 24 VAC signal is output from pin GV on the module.
44. 24 VAC signal is received at gas valve 1 thus energizing it.

45. The stage 1 LED on the status display board is now illuminated.
46. The coil of relay K-2 is now energized with the N.O. contacts closing downstream of the stage 2 connections.
47. The gas coming through the burners should ignite from the heat of the hot surface igniter and the flame should carry over from one burner to the other burners of stage 1. The remote sensor is now trying to sense the flame. If the flame is not sensed within 4 seconds, the ignition module will shut down gas valve 1 and retry the hot surface igniter. During ignition retry the heater must perform a 15-second pre-purge and an approximately 30-second igniter warm-up before opening gas valve 1 again. The standard ignition module will attempt ignition a maximum of three times prior to ignition lockout.
48. If the ignition module locks out, a signal will be sent to the Universal Diagnostics Board to indicate an ignition fault.
49. (Models 302B-402B only) 24 VAC is now waiting at pin 3 of the stage 2 connections on the CPW board.
50. (Models 502B-902B only) When power is sent to gas valve 1 it is also sent to time delay relay 1 (TD-1) which starts a 5-second countdown.
51. (Models 502B-902B only) After the 5-second countdown from TD-1, 24 VAC is waiting at pin 3 of the stage 2 connections on the CPW board.
52. After closure of the stage 2 contacts Gas valve 2 is energized.
53. The stage 2 LED on the status display board is now illuminated.
54. The Heater is now operating at full fire.

Ignition Module

When additional heat is needed, the combustion air blower starts to purge air from the combustion chamber for about 15 seconds. On proof-of-air flow, the

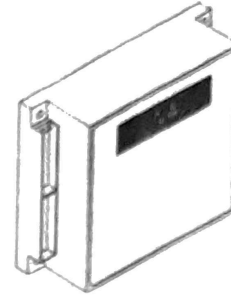


Fig. 30: Ignition Module

air-proving switch closes and the igniter is energized. To ensure safe operation, the gas valve cannot open until the igniter is verified. The main burner is automatically lit when the device is powered and pre-purged. The heater performs its own safety check and opens the main valve only after the igniter is proven to be capable of ignition.

The standard ignition module will attempt to light three times before locking out. To reset it, turn off power to the heater, wait 30 seconds and re-apply power. The optional single-try ignition module will lock out after failing to light one time. To reset it, press and release the small, recessed black push button located inside of the cut-out on the lower right-hand corner of the ignition module case. Turning off the power to the heater WILL NOT reset the ignition module.

Code	Condition
On	System OK; No faults present
Off	Possible control fault; Check power
1 Flash	Low air pressure, brief flashing normal on start-up
2 Flashes	Flame in combustion chamber. No call for heat
3 Flashes	Ignition lockout
4 Flashes	Low igniter current
5 Flashes	Low 24VAC, check control supply voltage
6 Flashes	Internal fault; Replace control

Table Q: Ignition Module Diagnostic LED Codes