

PL-021 BURNER CONTROL OPERATION SUPPLEMENT

FOR U.S. PRODUCTION FAN-HEATERS

The PL-021 Purge-Lockout burner control assembly, shown in Fig. 1, provides the same burner purge and safety lock-out features as earlier control boards such as the PL-02 and Master Control boards. Some wiring and terminal changes with respect to earlier boards have occurred, however. This bulletin describes the PL-021 board's function and wiring as a new or replacement part used on Farm Fans dryers and applicable fan-heaters. In some cases, this bulletin may supersede information originally packed with the Farm Fans dryer or fan-heater.

Please read and retain this bulletin with your literature pack for future reference. Also, note that the PL-

021 board is not designed for use with Silver King series heaters, which use the PL-100 control board.

Section 1 provides terminal identification, a simplified wiring diagram, and a sequence of burner operation relating to all applications. **Section 2** outlines the control as it relates to AB Series dryers, and shows how the board is wired to specific dryers. **Section 3** describes the PL-021 used with stand-alone fan-heaters units, and also includes specific wiring diagrams. **Section 4** provides general troubleshooting information for all applications.

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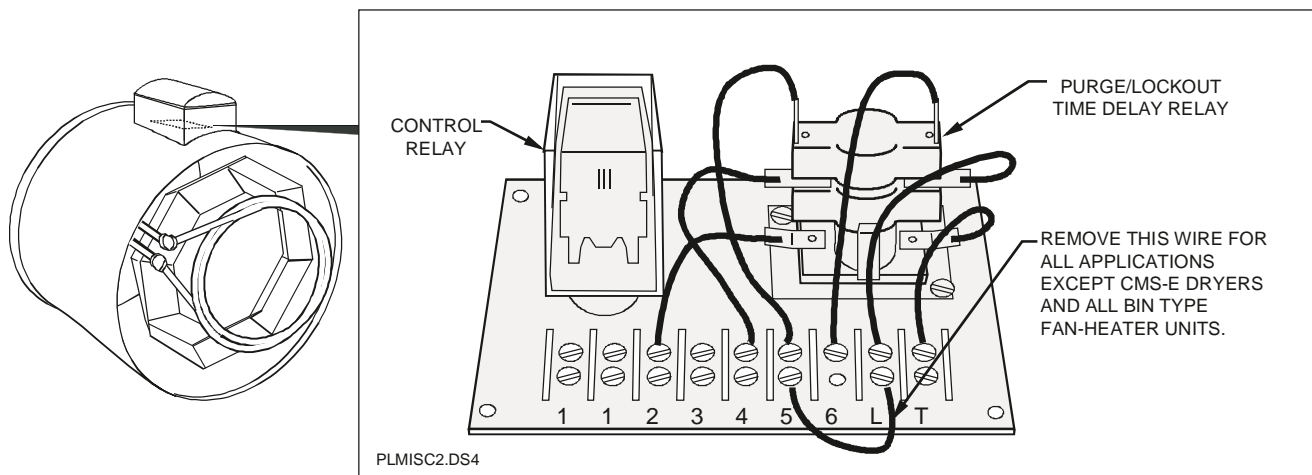


Fig. 1 PL-021 Burner Control Board assembly

PL-021 BURNER CONTROL ASSEMBLY PARTS - 240V

| Item | Part No. | Description | Quantity |
|------|------------|--|----------|
| - | 420-2255-8 | PL-021 Burner Control Kit (with Control Relay) | X - |
| - | 420-2563-5 | PL-021A Burner Control Board Kit (without Control Relay) | - X |
| 1 | 056-1670-1 | Printed Circuit Board Assembly | 1 1 |
| 2 | 056-1650-3 | Purge/Lockout Time Delay Relay - 240V (N.O. & N.C.) | 1 1 |
| 3 | 044-1014-8 | Control Relay - 230V 5A 8-pin | 1 - |

SECTION 1: GENERAL INFORMATION

PL-021 SEQUENCE OF OPERATION

(To be read in conjunction with wiring diagrams, Figs. 2 to 6.)

1. Power is available to the burner control ONLY WHEN THE FAN IS OPERATING.

With the fan operating and the burner switch closed, power is transmitted from the indicated motor lead wires through the two fuses, burner switch, and flame switch to supply power to PL terminals 2 and T, thereby energizing the heater element within the Purge/Lock-out relay.

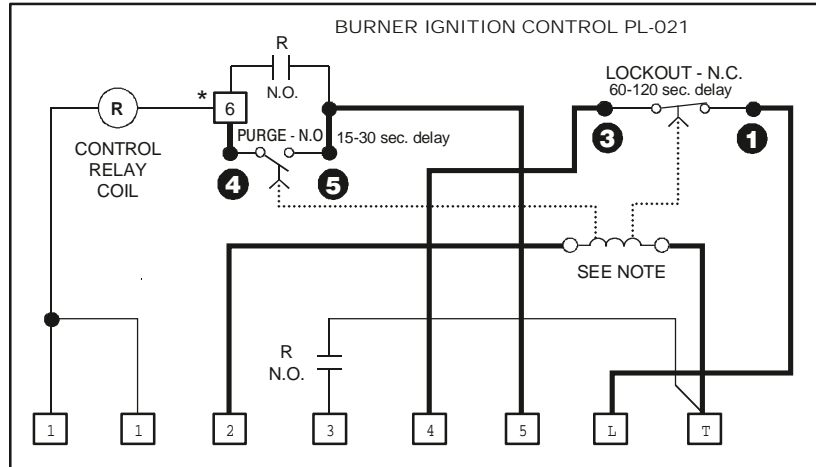
2. After the purge relay element has been energized for approximately 15-30 seconds and the fan has purged any possible stray gas, the purge relay contacts CLOSE the circuit between PL terminals 5 and 1, energizing the Control Relay coil. As the Control Relay coil becomes energized, it supplies voltage to the ignition transformer and gas solenoid valves by closing its contact points located between PL terminals 3 and T, thereby starting ignition and gas flow.
3. Shortly after the burner combustion begins, the flame switch responds to the heat by OPENING its contact points, thereby de-energizing the Purge/Lock-out relay heater element. After the Purge/Lockout relay de-energizes and its N.O. purge contacts reopen,

heater operation is maintained by the Control Relay holding contacts, which keep the Control Relay energized.

4. The burner will operate on Hi-Fire (if so equipped) until the Hi-Lo thermostat control opens its contacts and interrupts the circuit to de-energize the Hi-Fire gas solenoid valve.

When the thermostat control senses that additional heat is required and closes its contact points, the Hi-Fire gas solenoid valve will immediately open and repeat the Hi-Fire cycle to maintain the desired heat.

5. If the heater fails to start operating due to lack of fuel or possible malfunction, after the ignition transformer and gas solenoid valves are energized:
 - A. The flame switch remaining in its COLD (closed contacts) position will continue to energize the lock-out relay element.
 - B. After the lock-out heater has been energized for approximately 60-120 seconds, the lock-out relay contacts will OPEN and interrupt the circuit, thereby providing automatic shut-down of the entire dryer or fan-heater unit.
 - C. Once the dryer or fan-heater unit shuts down, the lock-out relay element will cool down within several minutes and automatically reset itself.



* This board assembly has an added terminal no. 6 which is shown out of position. Terminal 6 is used for relay connection purposes only. No field connection to this terminal is required.

NOTE: When the Purge/Lockout Time Delay Relay becomes energized, the N.O. (Purge) contacts 4 and 5 will close in approximately 15 to 30 seconds, and the N.C. (Lockout) contacts 1 and 3 will open in approximately 60 to 120 seconds.

- = External wire leads
- = Internal circuit board connection
- ③ = Time delay relay terminal
- 2 = Burner control board terminal

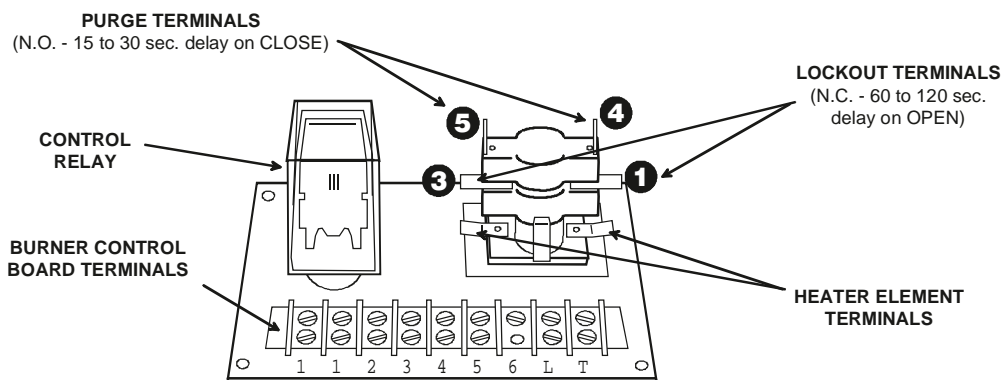


Fig. 2 Simplified wiring diagram and terminal identification

SECTION 2: AB SERIES DRYERS

This section provides the necessary information and wiring diagrams for all AB Series dryers equipped with the PL-021 type burner control. This applies to all AB -8, -12, -18, -120, -180, -250, -350, and -500 portable dryers. (For AB-18 models, consult factory.)

This material supersedes the burner control information within the standard operating instructions included with the dryer. Please read this information thoroughly and retain it within your literature pack for future reference.

IDENTIFICATION

Figs. 1 and 2 show the PL-021 board's main components. The PL-021 control can be distinguished from other boards by the two relays mounted on the circuit board as shown in Fig. 1. The PL-02 board, on the other hand, has three separate relays, while the very early Master Control type control unit and the 4-terminal type control boards have altogether different appearances.

RESTARTING THE HEATER AFTER SAFETY SHUTDOWN

If the PL-021 burner control shuts down the burner due to lack of fuel or possible malfunction, the burner can be restarted as follows:

On all AB Series dryers, the PL-021 burner control will interrupt the dryer safety control circuit and cause the entire dryer to stop operating. To restart the dryer, allow the burner control to cool down for several minutes, then depress the START button. Depending on the actual stage of the drying cycle where lock-out occurred, it may also be necessary to depress the MANUAL RESTART button.

Note that some early AB series dryers were equipped with a manually reset burner hi-limit thermostat instead of the current automatic reset type. In the event this manual-reset thermostat trips open, locate it within the burner control box and press its reset button to allow restarting the dryer.

WIRING DIAGRAMS

Figs. 3 and 4 show the current burner circuit wiring diagrams for AB Series dryers equipped with the PL-021 burner control.

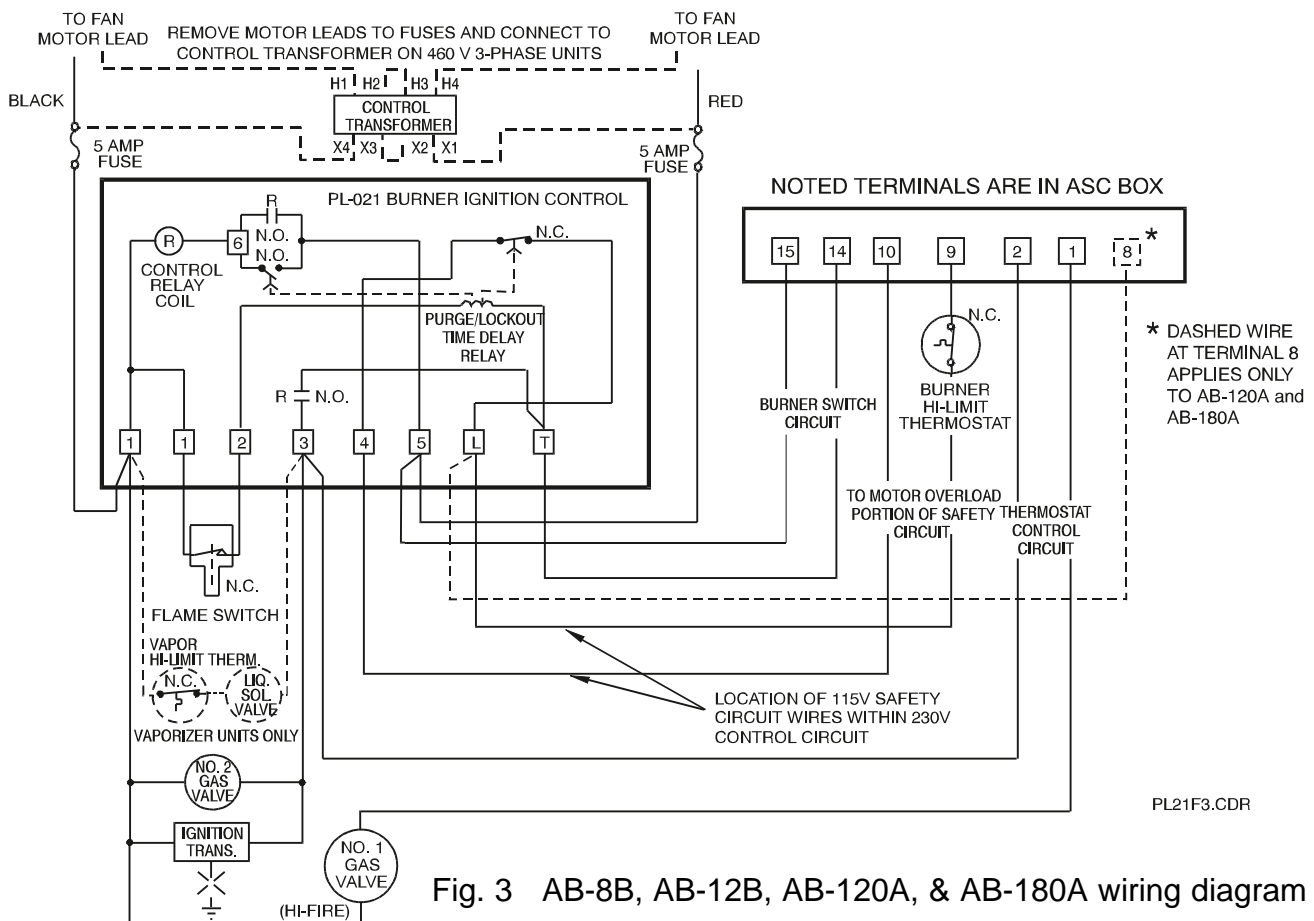


Fig. 3 AB-8B, AB-12B, AB-120A, & AB-180A wiring diagram

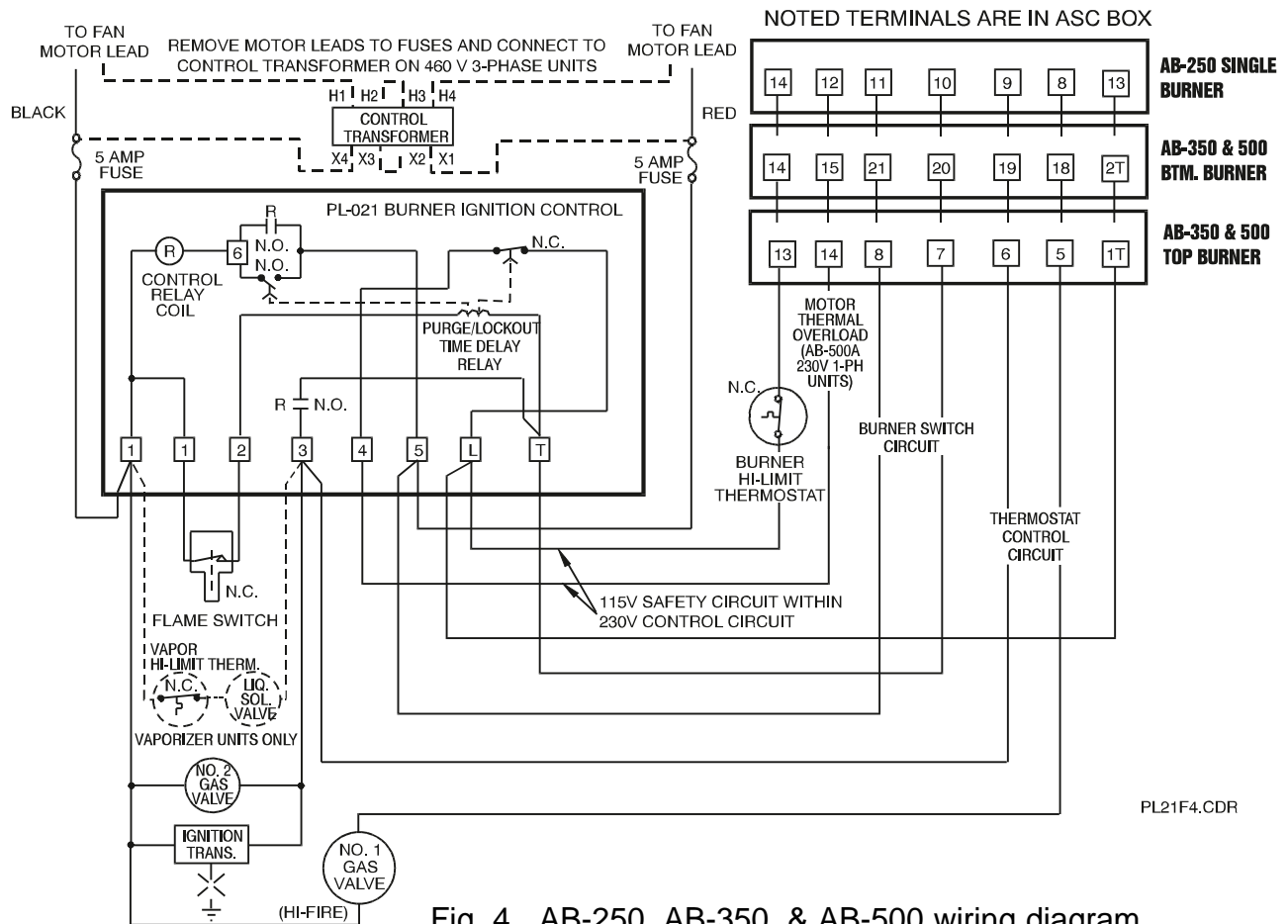


Fig. 4 AB-250, AB-350, & AB-500 wiring diagram

SECTION 3: FAN-HEATER UNITS

This section provides the necessary information and wiring diagrams for Farm Fans bin-type heaters equipped with the PL-021 type burner controls, as well as older models that need the PL-021 control as a service replacement part. This applies to burners on all models of U-24, U-28, U-36, and K-24 fan-heater units, and all DH and FFC-H series heaters (it does not apply to Silver King Series heaters).

This new material supersedes the burner control information within the standard operating instructions included with heaters and fan-heater units. Please read this information thoroughly and retain it within your literature pack for future reference.

IDENTIFICATION

Figs. 1 and 2 show the PL-021 burner control used on late model units.

Early models of the U-28 and U-36 fan-heaters, and the DH and FFC-H heaters were equipped with a Master Control burner control unit, and later a PL-02 type burner control. The PL-021 control appears altogether different than the Master Control unit, but only slightly different than the later PL-02 control, which has three independent relays mounted on the circuit board.

RESTARTING THE HEATER AFTER SAFETY SHUTDOWN

If the burner control device shuts down the burner due to lack of fuel or possible malfunction, the burner can be restarted as follows:

1. ALL FAN-HEATERS EQUIPPED WITH A SEPARATE BURNER SWITCH — Set burner switch to OFF position.
ALL FFC-H AND DH HEATERS WITHOUT A BURNER SWITCH — Turn fan switch to OFF position.
2. Allow the burner control to cool down for several minutes and become automatically reset.
3. Restart heater in the normal manner and resume the grain drying process.

WIRING DIAGRAMS

Figs. 5 and 6 show the wiring diagrams for all bin type units equipped with the PL-021 burner control. Fig. 5 shows the circuit for all standard model heaters. Fig. 6 applies only to special Hi-Lo Fire equipped models of U-24, U-28, and U-36 fan-heaters.

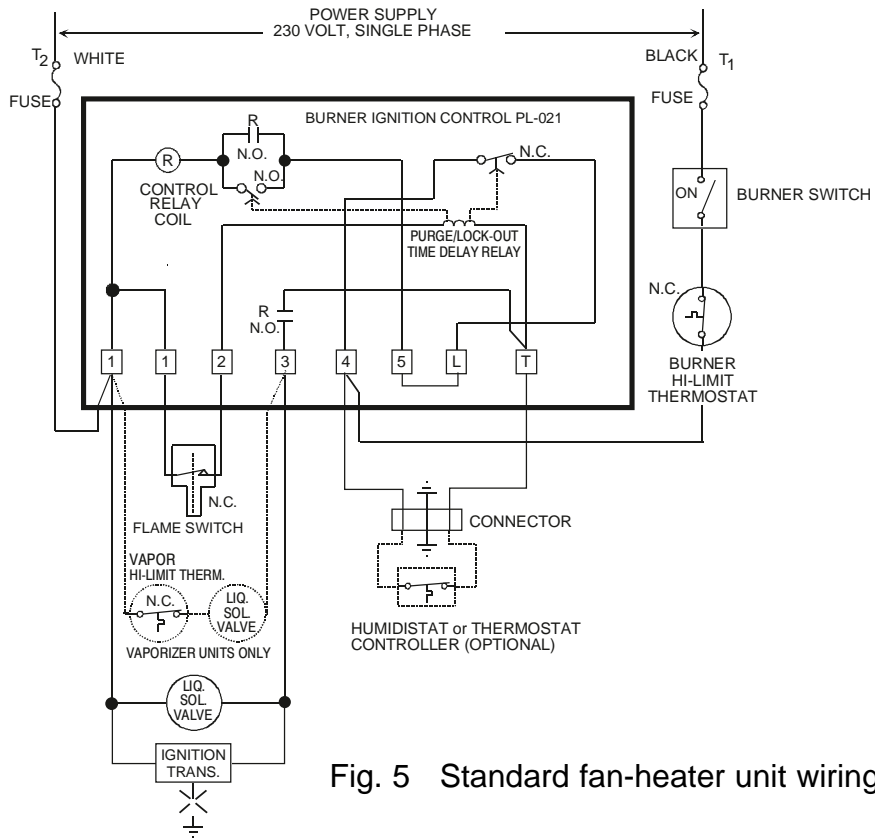


Fig. 5 Standard fan-heater unit wiring diagram

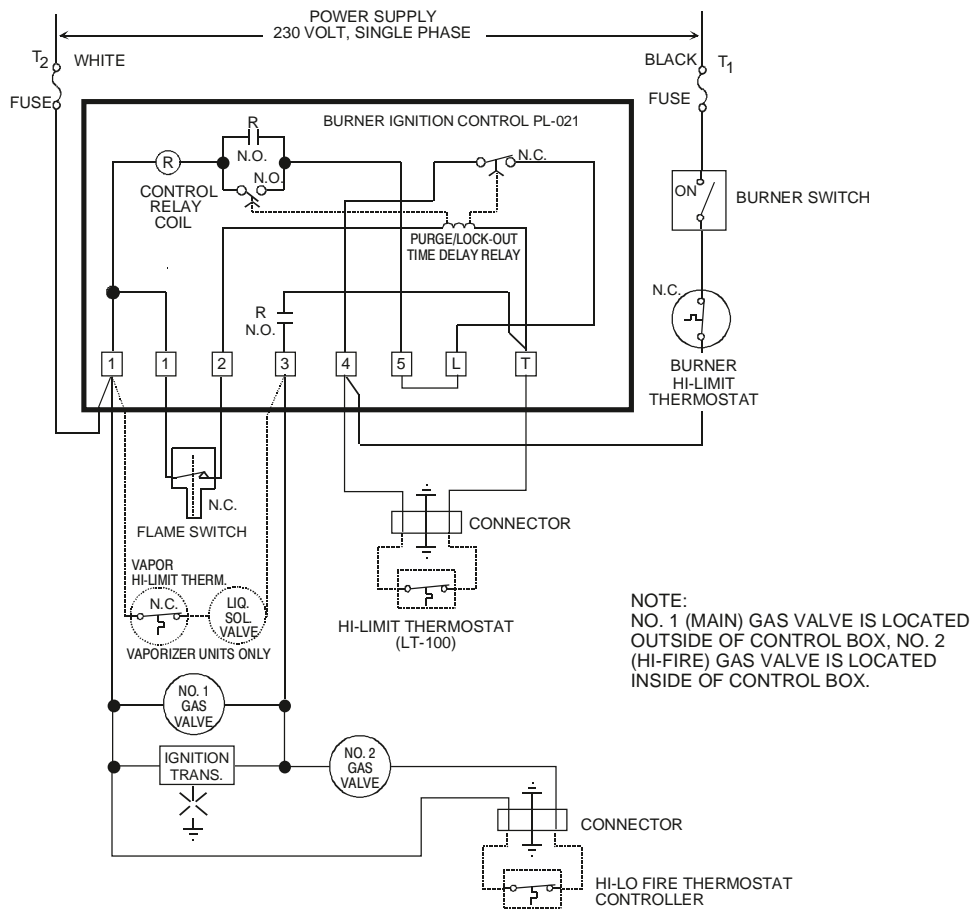


Fig. 6 Hi-Lo Fire type fan-heater wiring diagram

SECTION 4: TROUBLESHOOTING

NOTE: Refer to wiring diagrams and parts list for identification of parts and electrical terminals. The electrical circuit for all model heaters is single phase, 230V, or 220V, depending on the fan model.

DO NOT ATTEMPT TO MAKE THE DRYER OPERATE BY USING A JUMPER WIRE TO BYPASS A DEFECTIVE COMPONENT.



CAUTION: When making high voltage tests with "live" circuits, be extremely careful . . . follow established safety practices. Turn power ON for testing only.

FAN - HEATERS and DRYERS

• BURNER LIGHTS BUT OPERATES ONLY 1 to 2 MINUTES.

FLAME SWITCH — Wait several minutes for the time-delay relay to cool, then restart the unit. Immediately after the burner starts operating, connect the volt meter leads across terminals 2 and T and continue to observe the meter. When burner first comes ON (with a cold flame switch), the volt meter should indicate 230V. After the flame switch becomes HOT and opens its contacts, the meter should read ZERO. If burner shuts down without the meter indicating the contact points have opened, it indicates either a defective flame switch or insufficient heat exposure on the flame switch.

• HEATER CONTINUES TO BURN AFTER POWER IS OFF.

LEAKING VAPOR SOLENOID — Close fuel shut-off valve and allow fan and heater to operate until fire stops. Then stop fan and replace solenoid valve.

FAN - HEATERS ONLY

• BURNER WILL NOT LIGHT

A. Check for 230 VAC across the following PL board terminals with Fan and Burner switches ON.

IF NO VOLTAGE IS MEASURED, CHECK FOR:

| | |
|---|--|
| Terminals 1 and 4 | 1. Blown fuse. 2. Burner switch open. 3. Faulty burner hi-limit reset switch. 4. Faulty step-down transformer (460V models only). |
| Terminals 1 and T | 1. Thermostat or humidistat control is open. |
| Terminals 2 and T | 1. Flame switch is open. 2. Bad flame switch wire. |
| Terminals 1 and L | 1. Lockout relay is open (turn switch off to reset). 2. Faulty time-delay relay. |
| Terminals 1 and 5 | 1. Jumper not installed. |
| Terminals 1 and 6 (after 15-30 sec. purge is completed) | 1. Time-delay relay is bad. |
| Terminals 1 and 3 (after 15-30 sec. purge is completed) | 1. Bad control relay. 2. Bad PL board. |
| B. Check ignition spark. | 1. Dirty plug. 2. Incorrect plug gap. 3. Bad plug wire. 4. Faulty ignition transformer. |

C. Check fuel pressure.

1. Fuel supply is turned off.
 2. Liquid solenoid has failed.
 3. Vapor hi-limit thermostat is open.
 4. Vapor valve has failed.
 5. Inspect fuel strainer.
 6. Faulty fuel gage.
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• HEATER BLOWS FUSES

A. When burner switch or fan is first powered on:

1. Remove all wires on terminal 1 of the PL Board except the wire to the fuse. Remove wires from PL terminals 4 and T to the thermostat. Also, remove wire from terminal 2 to the time delay relay heater element.

2. If fuse is blown when:

- a. All the above wires have been removedCheck switch and burner hi-limit.
- b. Burner hi-limit is attached to terminal 4Replace PL board.
- c. Time delay wire is attached to terminal 2Replace time delay relay.
- d. Flame switch wire is attachedReplace flame switch or flame switch wire.
- e. Ignition transformer wire is attachedReplace ignition transformer.
- f. Vapor solenoid wire is attachedReplace solenoid coil.
- g. Hi-Fire valveReplace solenoid coil.
- h. Vapor hi-limit is attachedReplace hi-limit thermostat or liquid solenoid coil.

B. After 15-30 second purge cycle is completed:

1. Remove all wires on PL terminal 3.

2. If fuse is blown when:

- a. All wires are removed from terminal 3Replace control relay.
Replace PL board.
- b. Ignition transformer wire is attachedReplace ignition transformer.
- c. Vapor solenoid is attachedReplace vapor solenoid coil.
- d. Hi-Fire valveReplace hi-fire solenoid coil.
- e. Liquid solenoid is attachedReplace hi-limit thermostat or liquid solenoid coil.

DRYERS ONLY

• BURNER WILL NOT LIGHT

A. Check for 230 VAC across the following PL board terminals with fan and burner switches ON.

IF NO VOLTAGE IS MEASURED, CHECK FOR:

| | |
|---|--|
| Terminals 1 and 5 | 1. Blown fuses. 2. Faulty step-down transformer (460V models only). |
| Terminals 1 and T | 1. Burner switch circuit is open. |
| Terminals 2 and T | 1. Flame switch is open. 2. Bad flame switch wire. |
| Terminals 1 and 6 (after 15-30 sec. purge is completed) | 1. Faulty time-delay relay. |
| Terminals 1 and 3 (after 15-30 sec. purge is completed) | 1. Faulty control relay. 2. Faulty PL board. |

B. Check ignition spark.

1. Dirty plug.
2. Incorrect plug gap.
3. Bad plug wire.
4. Faulty ignition transformer.

C. Check fuel pressure.

1. Fuel supply is turned off.
2. Liquid solenoid has failed.
3. Vapor hi-limit thermostat is open.
4. Vapor valve has failed.
5. Inspect fuel strainer.
6. Faulty fuel gage.

D. Check whether burner hi-limit thermostat needs to reset.

Some early AB models were equipped with a manually reset thermostat located in the fan-heater control box. Later auto reset thermostats require a cooling period before dryer can be restarted.

• **HEATER BLOWS FUSES**

A. When fan is first powered on:

1. Remove all wires on terminal 1 of the PL Board except the wire to the fuse. Remove burner switch wires from PL terminals 5 and T. Also, remove wire from terminal 2 to the time-delay relay heater element.
2. If fuse is blown when:
 - a. All the above wires have been removed Replace PL board.
 - b. Burner switch wires are attached Check burner hi-limit.
Check burner switch and wiring.
 - c. Time delay wire is attached to terminal 2 Replace time delay relay.
 - d. Flame switch wire is attached Replace flame switch or flame switch wire.
 - e. Ignition transformer wire is attached Replace ignition transformer.
 - f. Vapor solenoid wire is attached Replace solenoid coil.
 - g. Hi-Fire valve Replace solenoid coil.
 - h. Vapor hi-limit is attached Replace hi-limit thermostat or liquid solenoid coil.

B. After 15-30 second purge cycle is completed:

1. Remove all wires on PL terminal 3.
2. If fuse is blown when:
 - a. All wires are removed from terminal 3 Replace control relay.
Replace PL board.
 - b. Ignition transformer wire is attached Replace ignition transformer.
 - c. Vapor solenoid is attached Replace vapor solenoid coil.
 - d. Hi-Fire valve Replace vapor solenoid coil.
 - e. Liquid solenoid is attached Replace hi-limit thermostat or liquid solenoid coil.

NOTES:

