

*ffi* Corporation / Farm Fans

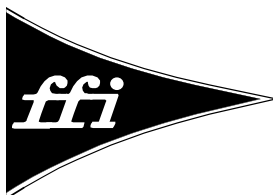


Silver King Series

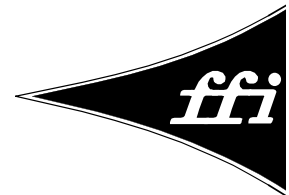
# Downstream Heater

## Operators Manual

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Models:  
CFDH27  
CFDH30  
CFDH33  
PV, N, &  
LP Fuel



# SAFETY PRECAUTIONS

## USE CAUTION IN THE OPERATION OF THIS EQUIPMENT

The design and manufacture of this system is directed toward operator safety. However, the very nature of any system using high voltage electrical equipment and rotation parts presents hazards to personnel which cannot be completely safeguarded against without interfering with efficient operation and reasonable access to components.

Use extreme caution when working around rotating parts which may start without warning when the system is operating on "Automatic" control.

Continued safe dependable operation of equipment relies, to a great degree, upon the operator. For a safe and dependable system, follow the recommendations within this manual, make it a practice to regularly inspect the operation of the system for any unsafe conditions or developing problems.

TAKE SPECIAL NOTE OF THE OPERATING PRECAUTIONS BELOW BEFORE ATTEMPTING TO OPERATE THE SYSTEM.

**CAUTION:** Guards, access doors and covers must be securely fastened before operating this equipment.

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT.



Look for this symbol to point out important safety precautions. It means ATTENTION!

1. Read and understand the operation manual before attempting to operate the unit.

2. Keep ALL guards, access doors, covers, safety decals and safety devices in place and securely fastened. NEVER operate system while guards are removed.
3. Keep all untrained personnel away from system components and control panel at all times.
4. NEVER attempt to operate the unit by jumping or otherwise bypassing any safety devices.
5. Always open the main power supply disconnect switch and lock it in the open position with a padlock when performing any service or maintenance work on the fan or heater unit.
6. Lock out power before removing guards, access doors, and covers.
7. Keep hands, feet and clothing away from all rotating parts.
8. Electrical repairs should be performed by trained qualified personnel only. Failure to follow safe electrical procedures can result in serious injury.
9. If it should become necessary to perform checks on system components or high voltage tests with "live" circuits, be extremely careful and follow all established safety practices.
10. Routinely check for any developing gas plumbing leaks. Check LP vaporizer for contact with burner vanes.

# WARRANTY

Farm Fans warrants its products to be free of defects in material and workmanship. The only obligation of the manufacturer is to repair or replace products which have been submitted and found to be defective within 24 months after installation. If so found defective, the products will be repaired or replaced without charge, this constituting and entirely fulfilling the warranty obligation. Farm Fans assumes no liability for expenses incurred without written authorization; in no event shall its liability include special or consequential damages or exceed the selling price of the product.

This warranty does not cover products or parts which have been damaged by negligent use, misuse, alteration or

accident. Some components supplied by manufacturers are warranted separately by those suppliers. This warranty is exclusive and in lieu of all other warranties, expressed or implied. Farm Fans reserves the right to make design or specification changes at any time without any contingent obligation to purchasers of products already sold.

All instructions, with the exception of those concerning safety, shall be construed as recommendations only; because of the many variable conditions in actual installation, Farm Fans assumes no liability for results arising from the use of such recommendations.

# SPECIFICATIONS

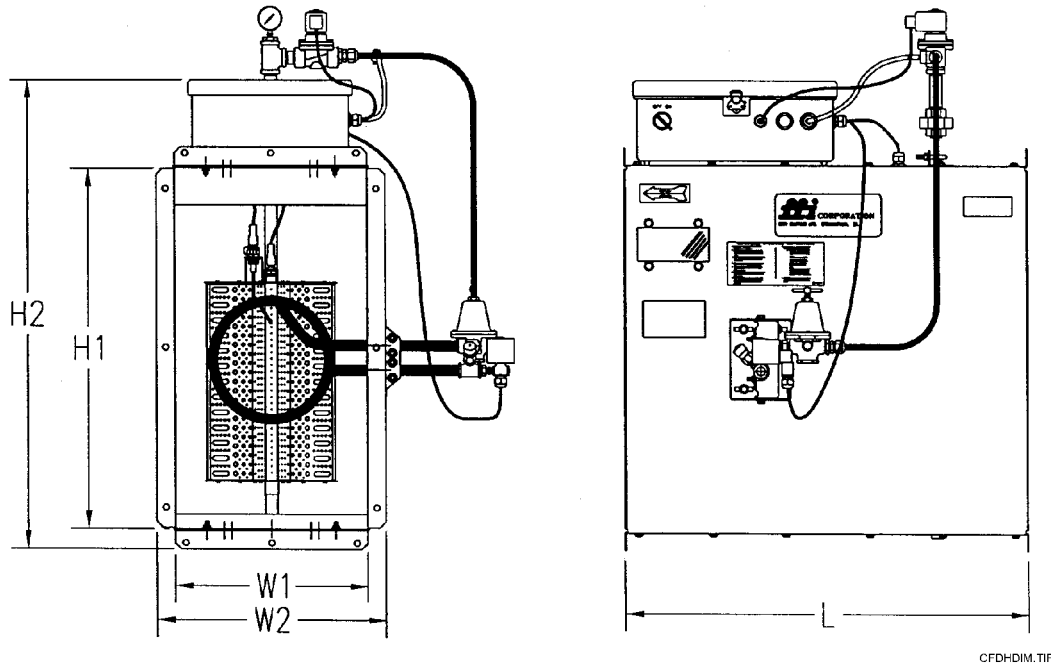
<b>TABLE 1 GENERAL SPECIFICATIONS</b>									
	CFDH2710			CFDH2715			CFDH2720		
	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp
Maximum Heat Capacity (BTU per hour) *									
Liquid Propane Models	1,180,000	1,770,000	2,120,000	1,600,000	2,300,000	2,800,000	1,750,000	2,600,000	3,100,000
Propane Vapor Models	1,180,000	1,770,000	2,120,000	1,600,000	2,300,000	2,800,000	1,750,000	2,600,000	3,100,000
Natural Gas Models	1,180,000	1,770,000	-	1,600,000	2,300,000	-	1,750,000	2,750,000	-
Shipping Weight - Approx. Add 25 lbs. for vaporizer equipped LP models.	150 lbs.			150 lbs.			150 lbs.		
	CFDH30			CFDH3340			CFDH3350		
	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp
Maximum Heat Capacity (BTU per hour) *									
Liquid Propane Models	2,230,000	3,300,000	4,000,000	2,900,000	4,400,000	5,200,000	3,500,000	5,300,000	6,300,000
Propane Vapor Models	2,230,000	3,300,000	4,000,000	2,900,000	4,400,000	5,200,000	3,500,000	5,300,000	6,300,000
Natural Gas Models	2,230,000	3,300,000	4,000,000	2,900,000	4,400,000	5,200,000	3,500,000	5,300,000	6,300,000
Shipping Weight - Approx. Add 25 lbs. for vaporizer equipped LP models.	160 lbs.			200 lbs.			200 lbs.		

\* BTUS are based on orifice size for particular fan flow.

<b>TABLE 2 FUEL SPECIFICATIONS &amp; RECOMMENDATIONS</b>														
		CFDH2710			CFDH2715/20			CFDH30			CFDH33			
		Low Temp	Standard	High Temp	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp	Low Temp	Standard	High Temp	
<b>Liquid Propane Models (LP)</b>	Typical Max. Fuel Flow, Gal. Per Hour *	14.4	20.25	25	14.4	30.5	35	25.4	40	43.5	40	57.4	78	
	Minimum Liquid Line Size	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	Heater Orifice	Hole Diameter	0.188"	0.281"	0.313"	0.281"	0.313"	0.344"	0.250"	0.344"	0.375"	0.313"	0.375"	0.438"
		Part Number	406-2430-6	406-2432-2	406-2433-0	406-2432-2	406-2433-0	406-2434-8	406-2431-4	406-2434-8	406-2436-3	406-2440-5	406-2487-6	406-2488-4
Operating Pressure Range (Heater Pressure Gauge) PSI**		1-8	1-8	1-5	1-10	1-9	1-9	1-10	1-9	1-9	1-10	1-10	1-10	
<b>Propane Vapor Models (PV)</b>	Typical Max. Fuel Flow, Cubic Feet Per Hour *	527	741	918	525	1116.8	1272	930	1471	1590	1463	2098	2862	
	Minimum Pressure at Connection to Heater, PSI	9	9	6	11	10	10	11	10	10	11	11	11	
	Minimum Line Size, 100' Transmission Line	.75	1.0	1.0	.75	1.0	1.0	1.0	1.25	1.25	1.25	1.25	1.25	
	Heater Orifice	Hole Diameter	0.188"	0.281"	0.313"	0.281"	0.313"	0.344"	0.250"	0.344"	0.375"	0.313"	0.375"	0.438"
Part Number		406-2430-6	406-2432-2	406-2433-0	406-2432-2	406-2433-0	406-2434-8	406-2431-4	406-2434-8	406-2436-3	406-2440-5	406-2487-6	406-2488-4	
Operating Pressure Range (Heater Pressure Gauge) PSI**		1-8	1-8	1-5	1-10	1-9	1-9	1-10	1-9	1-9	1-10	1-10	1-10	
<b>Natural Gas Models (N)</b>	Typical Max. Fuel Flow, Cubic Feet Per Hour *	1.2	1.8	2.1	1.3	2.5	3.0	2.9	4.5	5.3	3.1	5.3	6.3	
	Minimum Pressure at Connection to Heater, PSI	6.0	6.0	6.0	9.0	9.0	9.0	9.0	9.0	9.0	10.0	10.0	10.0	
	Minimum Line Size, 150' Transmission Line	1.0	1.0	1.0	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	
	Heater Orifice	Hole Diameter	0.250"	0.344"	-	0.250"	0.344"	-	0.313"	0.406"	0.469"	0.375"	0.500"	0.563"
Part Number		406-2431-4	406-2434-8	-	406-2431-4	406-2434-8	-	406-2440-5	406-2441-3	406-2442-1	406-2487-6	406-2489-2	406-2490-0	
Operating Pressure Range (Heater Pressure Gauge) PSI**		1-5	1-5	1-5	1-8	1-8	1-8	1-8	1-8	1-8	1-9	1-9	1-9	
<p>* Maximum fuel flow rates listed assume full heat output for gas line sizing purposes. In normal operation, the flow rates would be substantially lower than indicated, due to actual pressure setting used and cycling of the burner.</p> <p>** The gas pressures listed show the operating limits for each model heater and are not necessarily the recommended operating pressure. The actual gas operating pressure should be within these limits, but will vary depending on the type of grain and the drying system. The maximum setting assumes ideal conditions of relatively low static pressure conditions with high fan airflow and good quality combustion. High static pressure conditions will require lower maximum gas pressure settings than specified.</p>														

<b>TABLE 3 ACCESSORIES</b>	
Computerized Part Number	Description
TC-180	<b>Thermostat Control (40-180°F)</b>
HC-90	<b>Humidistat Control (0-90%)</b>
HL-240	<b>Hi-Limit Control (110-240°F) Field installed, for Hi-Lo Heater</b>
TC-250	<b>Temperature Control (110-250°F) for Hi-Lo Heater</b>
	<b>Heater Mounting Kit</b> — Includes mounting brackets, screen guard, conduit wiring harness (heater to motor control box)
415-4196-2	To mount 24" Axial Heater on the upstream (inlet) side of 22" Centrifugal Fan.
415-4197-0	To mount 24" Axial Heater on the upstream (inlet) side of 24" Centrifugal Fan.
415-4198-8	To mount 28" Axial Heater on the upstream (inlet) side of 27" Centrifugal Fan.
415-4199-6	To mount 28" Axial Heater on the upstream (inlet) side of 30" Centrifugal Fan.

# DOWNSTREAM HEATER DIMENSIONS

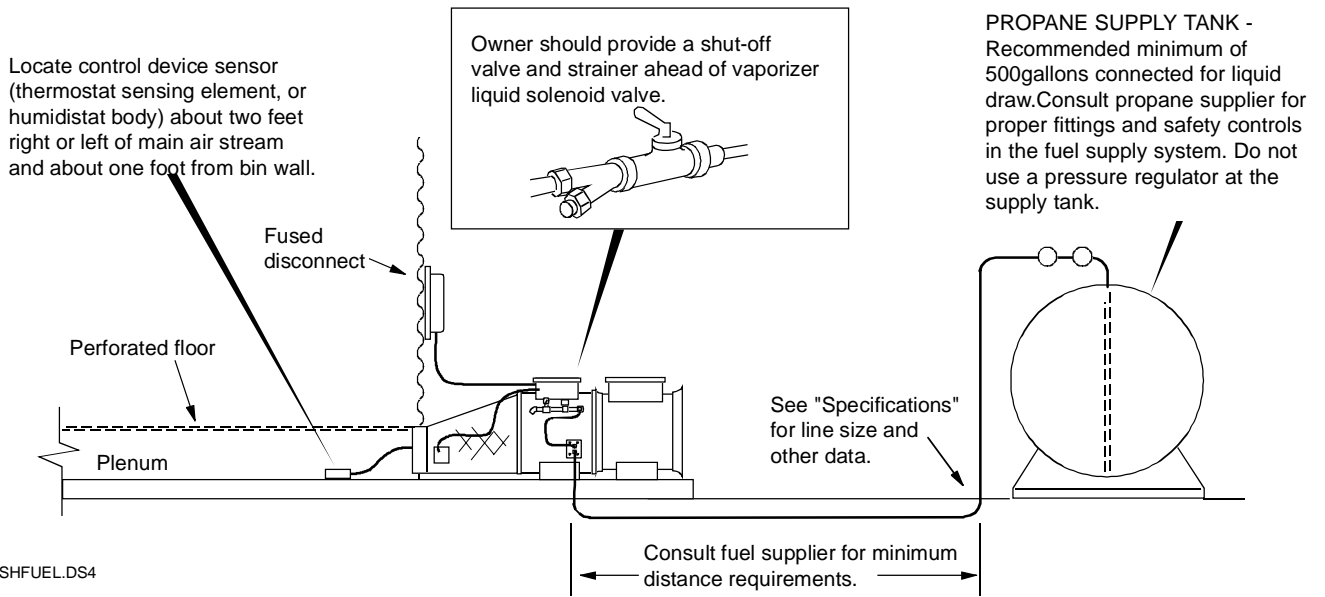


HEATER DIMENSIONS (IN INCHES)						
HEATER MODEL	L	H1	H2	W1	W2	BOLT
	HEATER LENGTH	OPENING HEIGHT	HEATER HEIGHT	OPENING WIDTH	HEATER WIDTH	SIZE
CFDH2710	33.00	29.75	38.50	16.00	19.00	5/16
CFDH2715	33.00	29.75	38.50	18.88	21.88	5/16
CFDH2720	33.00	29.75	38.50	20.12	23.12	5/16
CFDH30	33.00	33.25	42.00	21.50	24.50	5/16
CFDH33	33.00	36.62	50.25	23.31	26.31	5/16

# HEATER INSTALLATION

1. Refer to Figures 1 and 2 for a view of a suggested installation showing position of equipment and layout of system. Make sure to observe the following:
    - A. Make certain all joints and seams around the lower part of the bin are well sealed to prevent air leakage from the air space under the perforated drying floor. The connecting air duct must be reasonably air-tight. Air leakage results in slower drying and wastes fan power.
    - B. The connecting air duct, or "transition duct" should be all-metal construction, with a gradual angle to the rectangular opening through the bin wall.
    - C. Avoid abrupt angles or any type of connecting air duct that would restrict air flow. The cross-sectional area of the connecting duct should gradually increase to about 1.5 times the fan area where it enters the air chamber through the bin wall.
    - D. Keep the air entrance as clear as possible from obstruction by floor supports.
    - E. Adequate exhaust air openings in roof are required to prevent any additional back pressure (two to three times fan outlet cross-sectional area).
  2. Mount the Centrifugal Fan Heater to the discharge of the Centrifugal Series fan. Position the bottom heater flange into the slot at the base of the fan discharge. Using the provided self-locking screws and nuts, fasten the heater and fan flanges together. Apply sealant where required.
  3. Connect the fan and heater onto the bin transition and secure the assembly firmly to the foundation.
  4. Connect the heater power control cord as described:
    - A. Remove plug from rear side of fan control box and install heater conduit assembly into hole.
    - B. Connect heater power cord wires to the two-position terminal strip within the fan control box. Connect the green ground wire to the ground lug.
- Note:** The burner control circuit is designed for 120V operation. Do not attempt to wire the heater control circuit from any source other than the terminal strip. The terminal strip wires are connected to the motor side of

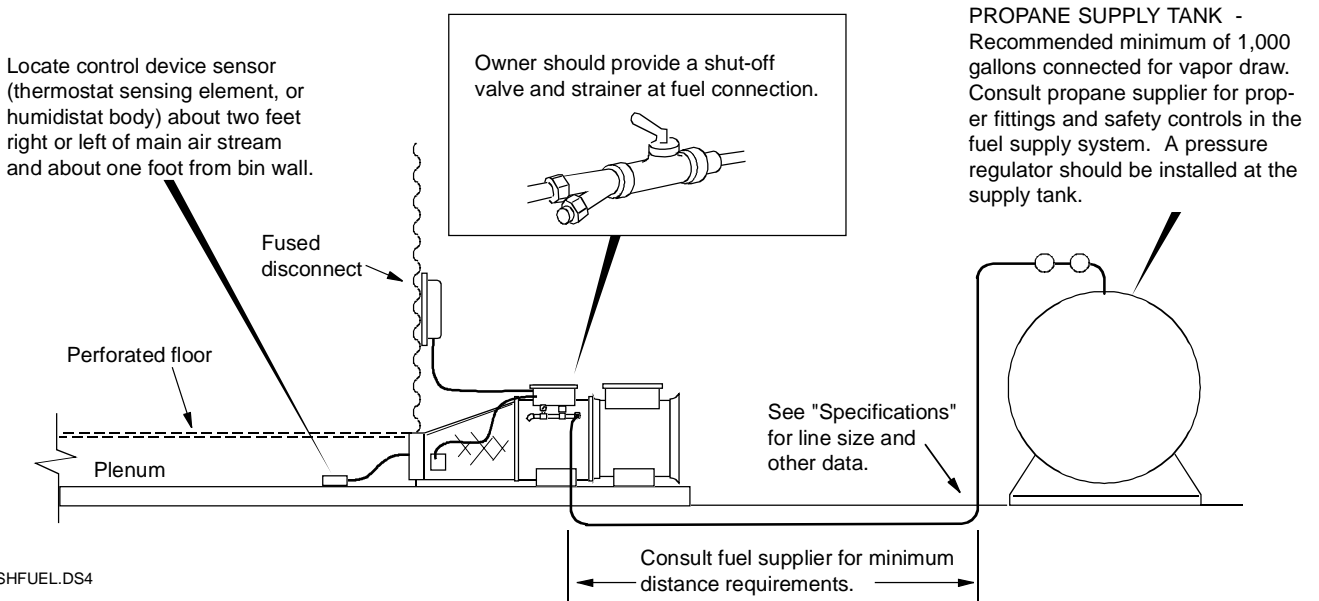
**IMPORTANT:** Propane tanks previously used for vapor draw may contain an accumulation of oil. Make sure to purge before connecting for liquid draw. Do not use ammonia storage tanks unless they have been properly purged and converted. Consult fuel supplier.



**Fig. 1 Suggested installation for downstream heaters with vaporizer - LP fuel supply**

**FOR NATURAL GAS** - Owner must provide a regulator ahead of the connection, capable of supplying the required pressure and typical maximum fuel flow. See "Specifications" for data on each model. A special orifice is required in Natural Gas models.

**IMPORTANT:** Supply tank and lines must be clean. Do not use ammonia storage tanks unless they have been properly purged and converted. Consult fuel supplier.



**Fig. 2 Suggested installation for downstream heaters without vaporizer - Propane Vapor or Natural Gas fuel supply**

the fan contactor to assure that heater will not operate unless fan is running.

5. Connect the heater controller device as outlined:

A. Install the strain relief of the device (either a humidistat or thermostat type control) into one of the holes located on rear of heater control box. Connect the thermostat wires to the appropriate two-position terminal strip. Connect the green ground wire to the ground lug.

B. Install the sensing bulb of the thermostat, or the sensing body of the humidistat within the plenum air chamber (located under the perforated floor). Position the unit so it is away from the direct air stream of the fan, approximately two feet to either the right or left-hand side and about one foot from the bin wall. Refer to figs. 1 and 2 and to the instructions packed with the controller device.

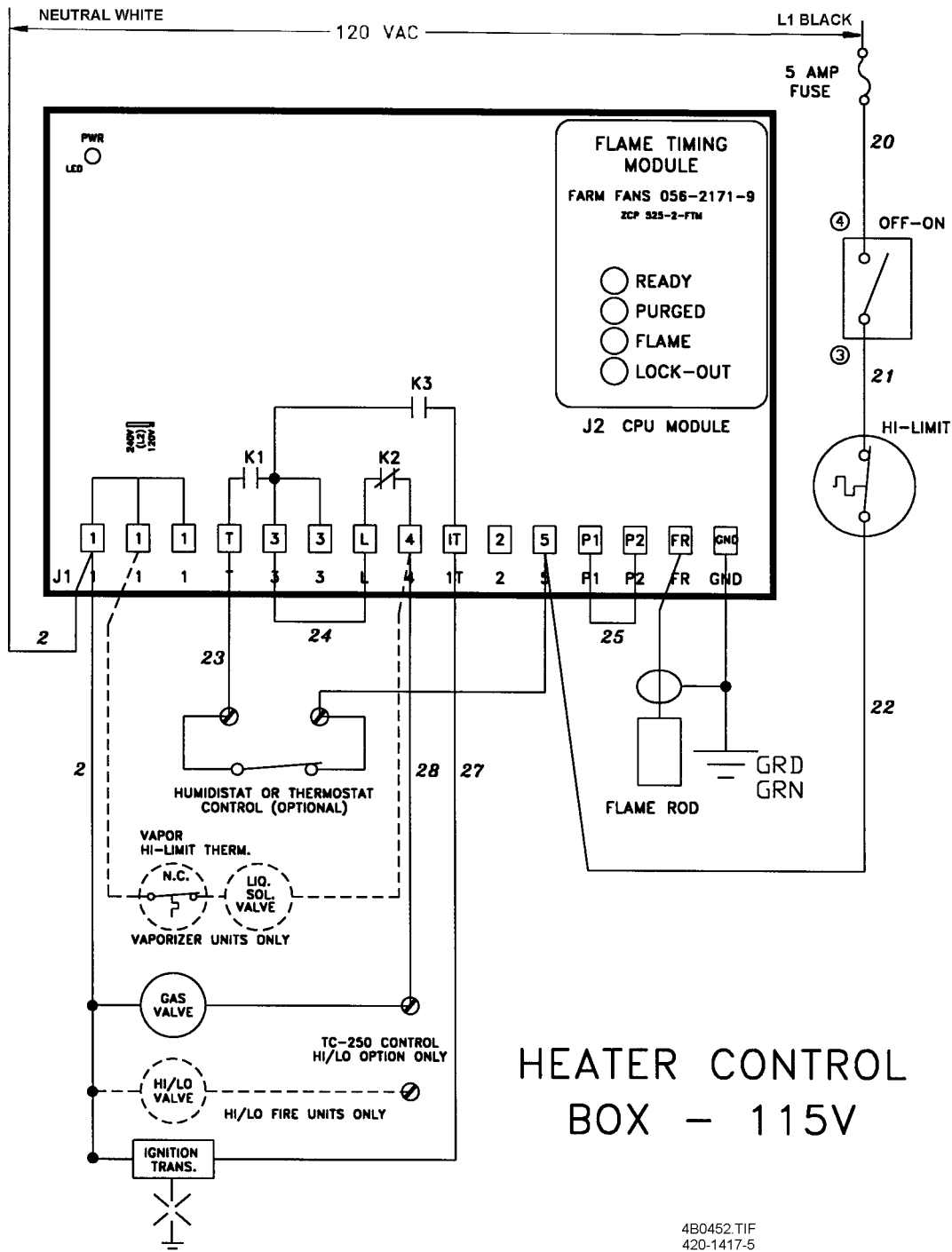


Fig. 3 Burner control wiring diagram

# FUEL CONNECTION



**IMPORTANT:** Do not use propane supply tanks that have previously contained ammonia unless they have been purged according to the procedure of the National LP Gas Association.

***Ammonia is extremely corrosive and will damage parts within the fuel supply system and heater!***

**Investigate and make certain the fuel supply system complies with national and local ordinances and codes for LP gas installations.**

Inspect ALL gas connections after the fuel installation is completed, to make certain there are no leaks.

## LIQUID PROPANE (LP) MODELS WITH INTERNAL VAPORIZER

Liquid propane models are equipped with a vaporizer assembly and are designed to operate on liquid propane, with liquid draw from the supply tank. The vaporizer assembly includes a vaporizer coil, liquid propane solenoid valve, relief valve, gas regulator, and vapor thermostat.

With liquid draw from the supply tank, any water present in the tank may freeze in the piping and controls in cold weather. To ensure that tanks are free of moisture, the usual precaution is to purge with methanol. Avoid tanks that may contain an accumulation of oil or heavy hydrocarbons from long use on a vapor withdrawal system.

A suggested fuel connection arrangement is shown in Fig. 1. See Table 2, Specifications, for pipe sizes, fuel flow rates, and operating pressures.

## PROPANE VAPOR (PV) MODELS WITHOUT VAPORIZER

Propane vapor models are designed to burn propane vapor received either directly from the fuel supply tank, or from a separate external vaporizer. Fig. 2 shows a suggested fuel installation arrangement. Also, refer to Table 2, Specifications, for suggested line sizes, operating pressures, and other data.

A regulator must be installed at the propane tank, capable of passing the necessary cubic feet of gas per hour (CFH), as listed in Table 2, Specifications. Use an ADJUSTABLE regulator so that the pressure can be adjusted to provide the desired operating pressure at the heater pressure gauge.

**IMPORTANT:** Use a "high pressure" regulator. Do not attempt to use a "low pressure" regulator designed for equipment operating on gas pressures measured in inches of water column.

A gas strainer and shut-off valve should be installed at the connection, as shown in Fig. 2.

Two or more heaters may be served by one propane gas supply tank. The gas supplier should be consulted regarding regulator and line sizes for such installations. Make sure that the regulator and main gas line have sufficient capacity for the necessary gas flow rates; refer to Table 2, Specifications, which lists flow rates for each model. It may be desirable to use an additional regulator at each heater to allow individual adjustment of each heater operating pressure (two stage regulation).

## NATURAL GAS (N) MODELS

Natural gas model heaters are very similar to propane vapor models, but have a larger size orifice designed to operate with natural gas having a heat value of approximately 1,000 BTU per cubic ft.

Natural gas models must be provided with an adjustable gas regulator located ahead of the connection to the heater, capable of supplying the required pressure and typical maximum gas flow. Refer to Table 2 for operating pressure limits and other information.

Consult the gas supply company regarding regulator and line sizes, using gas flow rates listed within Table 2 as a guide.

A suggested fuel connection is shown in Fig. 2.

# OPERATION

## OPERATING THE HEATER

1. Make sure fan and heater are properly installed and connected, as described earlier. All air passage joints and seams must be well sealed.
2. Open roof doors to allow exhaust air flow at all times when the fan is operating.
3. Make sure the correct type of heater control device is installed and properly adjusted for the desired type of drying operation.

The thermostat or humidistat controller must be connected to the heater control box. **THE HEATER WILL NOT OPERATE UNLESS THE CONTROLLER IS CONNECTED TO THE CIRCUIT.**

4. Open all hand shut-off valves within the fuel supply system.

**NOTE:** On LP models, open each valve slowly to prevent a sudden pressure surge to avoid accidentally closing the excess flow valve.

5. Check the gas regulator setting to make sure it is open, but not adjusted for excessive pressure:
  - A. Turn the handle out (up) as far as possible.
  - B. Slowly turn the handle down until the slight resistance of the spring is felt, then advance the screw IN two additional full turns.
6. With the control device set so it is calling for heat and the Heater switch in the ON position, depress the fan "START" button. After a delay of approximately 15 seconds, the burner should ignite and start operating.
7. Under normal operation, the burner should cycle ON and OFF occasionally.

**NOTE:** If heater continues to operate and does not cycle, increase burner pressure to the point where the controller device will begin to function and start to control heater operation.

8. Observe heater flame. Flame should be blue, with a minimum of white tip.
9. The heater utilizes the PL-100 solid-state flame control system, described as follows.

**Burner Control**

The burner is controlled by the PL-100 Solid State Flame Control Board. The board has terminals for connecting the gas valves and control switches. The board also has sockets for connecting the Flame Detection and Flame Timing Modules (see Fig. 4). The Flame Detection Module converts signals received from the flame rod. The Flame Timing Module contains a microprocessor that provides all the timing, monitoring, and control of the burner. The Flame Timing Module has four indicator lights on its top surface to show the current mode of operation. The indicators are also used for diagnostic purposes should problems occur with the burner control board.

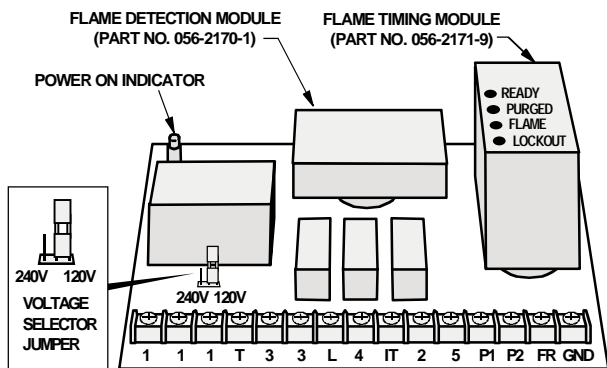
The PL-100 detects the presence of a flame by way of a flame rod sensor positioned directly in the flame. The flame acts as an electrical conductor and allows a current to flow between the flame rod and the burner. Since this current flow occurs as soon as a flame is present, the burner board can instantly detect the presence or absence of the flame.

**Operation**

When power is first applied to the PL-100 Burner Control, the Power On indicator on the base circuit board will turn on. The microprocessor in the Flame Timing Module will turn on all of the indicators on the Flame Timing Module. During this time, the microprocessor is checking for faults in its own circuitry. Once this self-check is complete, the Ready indicator on the Flame Timing Module will turn on and the Purged indicator will start flashing. This means that the Timing Module is in the purge cycle. After 15 seconds, the Purged light will stop flashing and remain ON; the gas valves will turn on and the ignitor will start. The ignitor will operate for 2 seconds then turn off. The Flame Detection Module then checks for the next 2 seconds for a flame. If a flame does not exist, the process will repeat. When a flame is detected, the Flame indicator on the Flame Timing Module will turn on. If a flame is not detected in 60 seconds, the Lock-out mode is initiated. The Flame Timing Module will go into the Lock-out mode if the module detects a problem with itself, detects a flame before the valves are energized, or detects a loss of air pressure (if a air proving pressure switch is used) or loss of flame.

If the PL-100 goes into the Lock-out mode, the gas valves will be turned off, the Lock-out indicator will turn ON and the Ready indicator will flash a number sequence then pause and repeat the sequence. The flashing Ready indicator represents a fault code which will help determine why the unit entered into the Lock-out mode. Count the number of times the Ready indicator flashes. Use the PL-100 Error Code Chart to find the meaning of the fault.

PL-100 ERROR CODE CHART		
No. of Flashes	Error Description	Corrective Action
2	Air flow switch failure	Check that fan is running and that pressure switch is closed. If pressure switch is not used, install jumper between terminals P1 and P2.
3	Flame rod detected a flame before ignition was attempted.	Visually check for presence of flame. Check for grounded or damaged flame rod.
4	Burner did not ignite before timed lockout.	Check for proper gas valve and ignitor operation. See heading "Burner Will Not Light" in Troubleshooting.
5	CPU checksum error.	Replace Flame Timing Module on PL-100 board.



**Fig. 4 PL-100 Flame Control Board**

The PL-100 will remain in the lock-out mode until it is reset. To reset the PL-100, turn off either the burner switch or the fan switch. **NOTE:** When the PL-100 is in the Lock-out mode, the fan will continue to operate.

PL-100 PARTS LIST		
Part No.	Description	Qty.
056-2169-3	PL-100 Base printed circuit board	1
056-2170-1	PL-100 Flame detection module	1
056-2171-9	PL-100 Flame timing module	1

10. **LIQUID PROPANE MODELS ONLY:** After initial installation and occasionally during the drying operation, check the temperature of the gas line between the regulator and pressure gauge. **ALLOW HEATER TO OPERATE AND STABILIZE TEMPERATURE BEFORE MAKING THIS CHECK.**

If gas line is very cold or "frosted," move the vaporizer slightly toward the flame. If gas line is too hot to touch, move vaporizer slightly away from the flame.

**NOTE:** If the gas temperature exceeds 220°F, the high vapor temperature thermostat will open the electrical circuit to the liquid solenoid valve and shut off fuel flow to heater, causing the unit to go into safety lock-out.

11. When stopping the unit at the end of the drying season (or for any type of service involving burner plumbing) **SHUT OFF GAS AND PURGE THE SYSTEM BEFORE DEPRESSING THE FAN STOP BUTTON OR TURNING THE BURNER SWITCH TO "OFF."**

## DRYING SYSTEM

For information and tables concerning conventional fill and dry and batch drying systems, refer to appropriate drying procedure manual. Follow the suggested settings, grain loading schedules, and the procedures listed to avoid overloading the system and prevent the inefficiency of over-dried grain.

**IF DRYING SYSTEM UTILIZES SPECIAL BIN CONSTRUCTION, OR HIGH SPEED STIRRING DEVICES, ALSO FOLLOW RECOMMENDATIONS THAT ACCOMPANIED THE SPECIAL EQUIPMENT.**

After drying has been completed and the grain cooled, shut off the gas and electricity at their source. Close the fan inlet and roof openings to prevent harmful back-draft air currents from passing through the grain and avoid grain infestation from rodents and insects.

# SERVICE

## SEASONAL INSPECTION & SERVICE

All parts are made of weather-proof construction and are designed to require a minimum of service; however, we recommend the following items be checked and serviced, as described, before the unit is used each season. Replace any damaged or questionable parts. **THESE CHECKS WILL HELP ELIMINATE POSSIBLE MINOR FAULTS AND ASSURE DEPENDABLE OPERATION OF THE EQUIPMENT WHEN IT IS NEEDED.**

1. Check fan and service it as described within the fan installation and operation manual.
2. Shut off electrical power. Remove heater control box cover and inspect for moisture, rodent damage, or accumulated foreign material. Remove any foreign material present. **INSPECT AND TIGHTEN ALL LOOSE TERMINAL CONNECTIONS.** Replace any damaged or deteriorated wiring.
3. Shut off fuel and remove and clean gas line strainer.
4. Remove the orifice from the burner venturi and inspect for obstructions. Also, inspect and clean out the burner venturi and the ports within the burner cup. Blow out with compressed air, or disassemble and thoroughly clean these parts. Foreign material in the venturi or burner cup will impair heater operation and cannot be expected to burn out when the heater is started.
5. Inspect and clean the electrodes on the ignitor plug. Use an ignition point file to remove carbon and rust between the electrode surfaces.
6. Inspect flame rod and ignitor plug wires for possible damage or poor connections.

7. After completing all checks and performing any necessary service, check the control device, as described under the following appropriate heading.

**HEATERS EQUIPPED WITH A HUMIDISTAT CONTROL** — Temporarily remove humidistat control from air plenum chamber of bin. Rotate the knob through the 20 to 80% humidity range. The switch within the humidistat should produce a small "click" when the lever passes the point of prevailing humidity.

**NOTE:** For additional information, refer to instructions that accompanied the humidistat.

**HEATERS EQUIPPED WITH A THERMOSTAT CONTROL** — Use a small screwdriver and slowly rotate the thermostat dial through its temperature range. The switch within the thermostat should produce a small "click" when the dial passes the point of prevailing temperature. Set the dial to a setting at least 10°F above the prevailing temperature and proceed to the next step.

8. Test operate the fan and heater. Make sure to follow operating instructions, **INCLUDING OPENING OF BIN DOORS.** After fan starts operating and the heater purge interval has elapsed (approximately 15 seconds delay), the heater should come ON and start operating.
9. Slowly change the humidistat or thermostat setting and cycle the heater OFF and ON to make sure the device is controlling the heater and is operating properly.
10. **LP MODELS ONLY** — After heater has been operating for some time and temperatures have stabilized, check temperature of the gas line between outlet side of vaporizer and the gas regulator.

If gas line becomes “frosted” with an accumulation of ice build-up, adjust vaporizer slightly closer to the flame.

If line reaches a high temperature where it is hot to the touch, adjust vaporizer further away from the flame.

**NOTE:** If gas temperature exceeds approximately 220°F, the hi-limit vapor thermostat will open the electrical circuit to the liquid gas solenoid valve and shut off fuel flow to stop the heater. This condition can be verified by temporarily connecting a jumper wire across the connections of the thermostat and observing that the burner relights.

If hi-limit vapor thermostat causes the burner to stop operating, it may also cause the burner to go into a safety lock-out condition. Refer to heater operating instructions for restarting procedure.

11. Vaporizers should be inspected and serviced prior to each season of operation, including the following:



A. Carefully inspect the surfaces of the vaporizer coil and the inlet and vapor outlet pipes for evidence of severe corrosion or abrasion of metal which could cause subsequent leakage of liquid propane, gross overheating, and fire hazard.

B. Insecure mounting of either the vaporizer or burner, due to loosened bolts, can cause interference between burner vanes and vaporizer pipes, with the natural vibration of the unit causing erosion of the pipe metal at the point of maintained contact.

C. If there has been significant abrasion of the steel vaporizer pipe, it must be replaced.

12. When satisfied that heater is operating properly, make sure to reset the control device to the proper setting and restore the fan and heater for normal type operation.

## TROUBLESHOOTING

Many of the troubleshooting tips below require the use of an AC/DC voltmeter. A digital voltmeter is preferred to obtain accurate readings.

### • Burner lights but operates only 1 to 2 minutes

1. Immediately after the PURGED indicator stops flashing and remains ON continuously:
  - A. Set the voltmeter to read AC volts. Place the leads of the meter on terminals marked FR and GND of the PL-100. The meter should indicate 4-10 volts AC for two seconds then switch to 0 volts AC. This cycle should repeat until either the Flame or the Lock-out indicator turns on.
    - If no AC voltage is measured:
      - a. Check the flame rod; flame rod should not touch any other metal in the burner
      - b. Check the ceramic portion of the flame rod for cracks; if cracked, replace
      - c. Check the condition of the flame rod wiring; if damaged, replace
      - d. Replace Flame Detection Module
      - e. Replace Base circuit board
    - B. If an AC voltage is observed as described in A, set the voltmeter to read DC volts. Place the leads of the meter on terminals marked FR and GND of the PL-100. The meter should indicate a DC reading greater than 2 volts DC for two seconds then switch to 0 volts DC. This cycle should repeat until the Flame or the Lock-out indicator turns on.
      - If no DC voltage is measured or the voltage was less than 2 volts:
        - a. Make sure the burner did light

b. Flame rod is not adjusted properly. Adjust flame rod so a larger portion of the rod is directed into the flame.

— If DC voltage is greater than 2 volts but the Flame indicator never turns on:

- a. Replace the Flame Detection Module
- b. Replace the Base circuit board

### • Burner will not light

The following procedure refers to indicators on the PL-100 board, and requires the Fan and Burner switches to be turned ON. If the described condition is observed, check for the possible faults listed.

- A. The PWR ON indicator on the PL-100 circuit board is not ON:
  1. Burner switch is not ON or is faulty
  2. Burner Hi-Limit has tripped. Reset or replace Burner Hi-Limit
  3. Fuse supplying voltage to the PL-100 is blown
  4. Interconnecting wiring between fan control and burner control is not correct.
- B. 15 seconds after turning the unit on, the PWR ON indicator on the base circuit board and the Ready indicator on the Flame Timing Module are the only indicators that are ON:
  1. Humidistat or thermostat controller is not calling for heat. (Contacts are open)
- C. 15 seconds after turning the unit on, the only lit indicators are the PWR ON indicator on the base circuit board and the Ready and Purge indicators on the Flame Timing Module.

1. Flame rod grounded, allow fan heater to cool then check flame rod and associated wiring for connections to ground. Visually inspect the ceramic portion of the flame rod. The ceramic portion of the flame rod should not be cracked.
  2. Larger portion of the flame rod needs to be in the flame.
  3. Gas valve or ignition transformer not operating
  4. Check PL-100 terminals for voltage as described below
- D. The only indicators ON are the PWR ON indicator on the base circuit board, the Lock-out indicator, and the flashing Ready indicator on the Flame Timing Module:
1. Count the number of times that the Ready indicator flashes between the pauses. Use the Error Code Chart to locate the cause of the problem.
- Check for 115 volts AC across the following PL-100 board terminals with the Fan and Burner switches in the ON position. If voltage is not present at the described locations then check the items listed:
- A. Terminal 1 and 5
1. Fuse supplying voltage to PL-100 is blown
  2. Burner switch is off or broken
  3. Burner Hi-Limit has tripped, reset or replace the Burner Hi-Limit
- B. Terminals 1 and T
1. Thermostat or humidistat control is not calling for heat
- Check for 115 volts AC across the following PL-100 board terminals after the 15 second purge time has completed - Purge indicator on solid.
- C. Terminals 1 and 3
1. The Humidistat or Thermostat controller is not calling for heat
  2. Replace PL-100 Base circuit board
- D. Terminals 1 and 4
1. PL-100 is in Lockout, check Flame Timing Module for fault indication. If the Lock-out indicator is not on and the Ready indicator is not flashing, Replace Flame Timing Module.
- Voltage is on terminals 1 & 3 but burner does not start.
- F. Check ignition system - Ignition transformer only operates while the burner is attempting to light. The ignition transformer is on for two seconds and then off for two seconds. This cycle is repeated until the PL-100 detects a flame or a Lock-out occurs. While the PL-100 is attempting to light,
1. Measure voltage on terminals 1 and IT - 115 volts AC should be present for two seconds and then 0 volts for two seconds. This will repeat until the PL-100 detects a flame or a Lock-out occurs.
  2. With POWER OFF - Check for:
    - a. Dirty spark plug
    - b. Incorrect plug gap
    - c. Damaged spark plug wire
    - d. Loose or poor connection at the ignition transformer
    - e. Loose or poor connection at the spark plug
    - f. Faulty ignition transformer
- G. Check fuel supply - Voltage is on terminals 1 & 3 but gas pressure is not displayed on pressure gauge.
1. Fuel supply is turned off
  2. Pressure regulator not set properly
  3. Fuel strainer is plugged
  4. Vapor hi-limit thermostat is open (LP units only)
  5. Liquid solenoid valve has failed (LP units only)
  6. Main gas solenoid valve has failed
- H. Vaporizer Hi-Limit (LP units only) - Voltage is on terminals 1 & 3 but burner cycles on and off independent of controlling thermostat or humidistat.
1. Feel the plumbing leaving the vaporizer - If the plumbing is extremely hot and the burner is cycling erratically, the vaporizer is not set properly. Move the vaporizer away from the burner or move the vaporizer closer to the outside of the burner housing.
- **Heater Blows Fuses**
- A. The fuse supplying voltage to the PL-100 board blows when the burner or fan switch is first turned ON:
1. With the power off, remove all wires on terminal 5 of the PL-100 board. Be sure to tape the ends of all wires that are not terminated to prevent accidental shorting.
  2. Apply power to the fan and turn the burner switch ON. If the Fuse blows when:
    - a. No wires are attached to terminal 5, then check the burner switch and burner hi-limit for possible short to ground.
    - b. Wire attached to the burner hi-limit is connected to terminal 5 of the PL-100, replace PL-100.
    - c. Wire attached to the humidistat or thermostat is attached to terminal 5 of the PL-100, then:
      - I. Turn the power off, remove wire on terminal T of the PL-100.
      - II. Turn the power on. If the fuse blows, then check the wiring to the humidistat/thermostat for damage.
- B. Fuse supplying voltage to the PL-100 board blows after the 15 second purge cycle is completed.
1. With the power off, remove all wires on terminal IT of the PL-100 board. Be sure to tape the ends of all

wires that are not terminated to prevent accidental shorting.

2. Apply power to the fan and turn the burner switch ON. If the Fuse blows when:

a. No wires are attached to terminal IT, then continue to step C.

b. When wire from the ignition transformer is attached to terminal IT, replace the ignition transformer.

C. Fuse supplying voltage to the PL-100 board blows after the 15 second purge cycle is completed.

1. With the power off, remove all wires on terminal 4 of the PL-100 board. Be sure to tape the ends of all wires that are not terminated to prevent accidental shorting.

2. Apply power to the fan and turn the burner switch ON. If the Fuse blows when:

a. No wires are attached to terminal 4, then check jumper wire from terminal 3 to L. Make sure wire is not damaged or shorting to ground replace if necessary. If no visible damage, replace PL-100 Base circuit board.

b. Liquid solenoid valve wire is attached to terminal 4 (LP units only) then inspect Liquid solenoid valve and Vapor Hi-Limit wiring for damage replace if necessary. If no visible damage, replace first the Liquid solenoid valve followed by the Vapor Hi-Limit.

c. Main valve wire is attached then, inspect the valve wiring for damage, replace if necessary. If no visible damage, replace the solenoid valve.

## SAFETY DECALS

Safety decals should be read and understood by all people in the grain handling area.

If a decal is damaged or missing, contact:

ffi Corporation  
5900 Elmwood Ave.  
Indianapolis, IN 46203

### **IMPORTANT**

**THIS UNIT IS WIRED FOR  
115 VOLT, 1-PHASE  
POWER SUPPLY**



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Indianapolis, Indiana 46203

