

SHIVERS

BLUE FLAME DRYER

OWNER'S MANUAL

FOR MODELS

4809 BFLP1P

4809 BFLP3P

4809 BFPV1P

4809 BFPV3P

4809 BFNG1P

4809 BFNG3P

 **WARNING** 

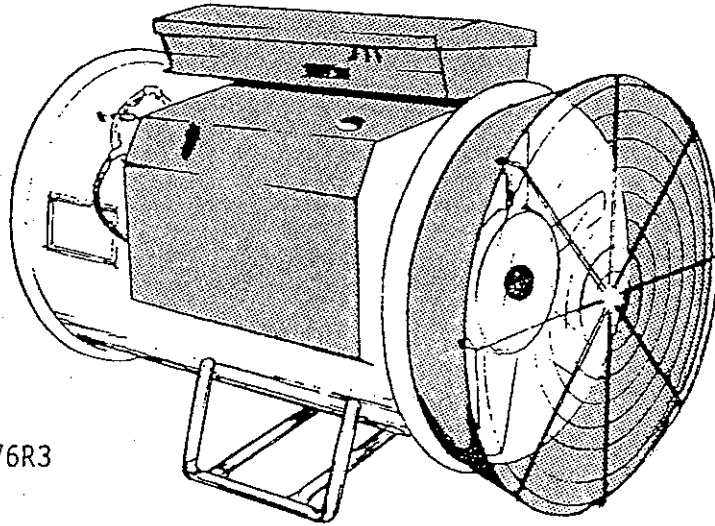
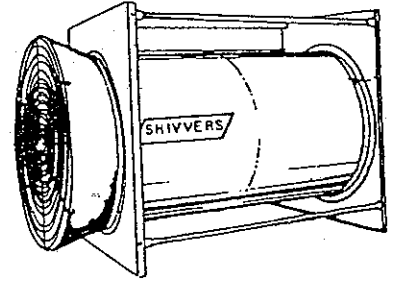
BLUE FLAME DRYER IS DIFFERENT THAN ANY OTHER CROP DRYER, IT MUST BE WIRED AND OPERATED AS PER THESE INSTRUCTIONS!

P-8433

3/81

INTRODUCTION

This manual is intended for use with the 4809 Model Blue Flame Dryers (which have a galvanized housing and square ends) but may be used with the Model 76 Blue Flame which is shown below.



Model 76R3

Included are instructions for hook-up to non-Shivers Control boxes and Shivers Circu-Trols labeled 295 (A,B,C,etc.) and 296 Model Small Circu-Trols. If you intend to wire your dryer to any other model Shivers Circu-Trol, please call the factory to obtain proper instructions.

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CROP DRYER WARRANTY

Shivvers Blue Flame Dryer is guaranteed for the First Season of Harvest Operation, irregardless of purchase date, when installed and operated as directed in the instructions. Under this warranty, Shivvers will repair or replace such parts as are returned to us and found defective. Shivvers will pay return shipping charges on defective parts.

Electric Motors are under warranty of the motor manufacturer and are not covered by Shivvers warranty.

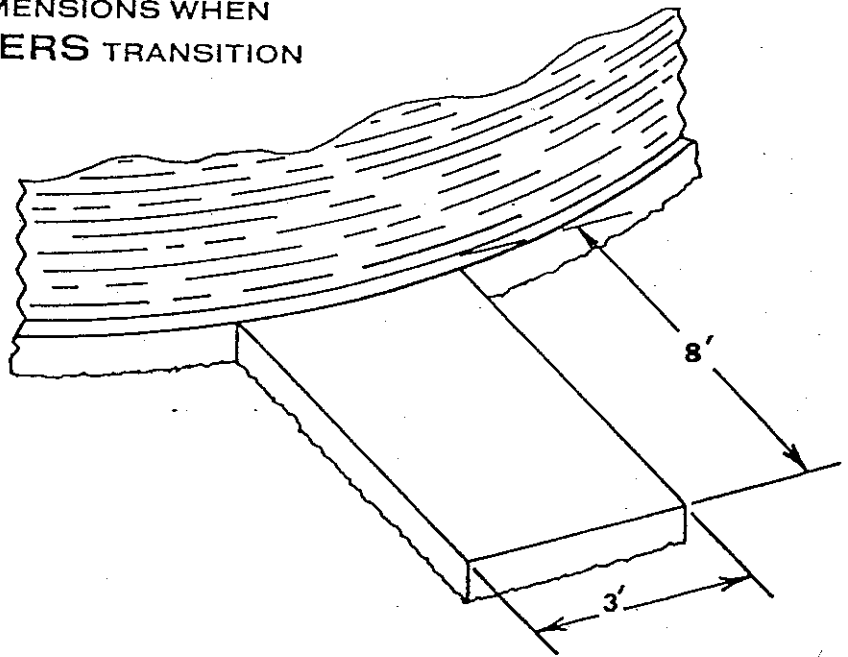
Shivvers makes no warranty of any kind, expressed or implied, except as stated herein and buyer assumes all risk and liability resulting from the use of products manufactured by Shivvers, whether used singly or in combination with other products.

For purposes of this warranty, "Season of Harvest" is defined at the period of time between June 1st and December 31st of a calendar year.

DESCRIPTION OF FAN MODELS

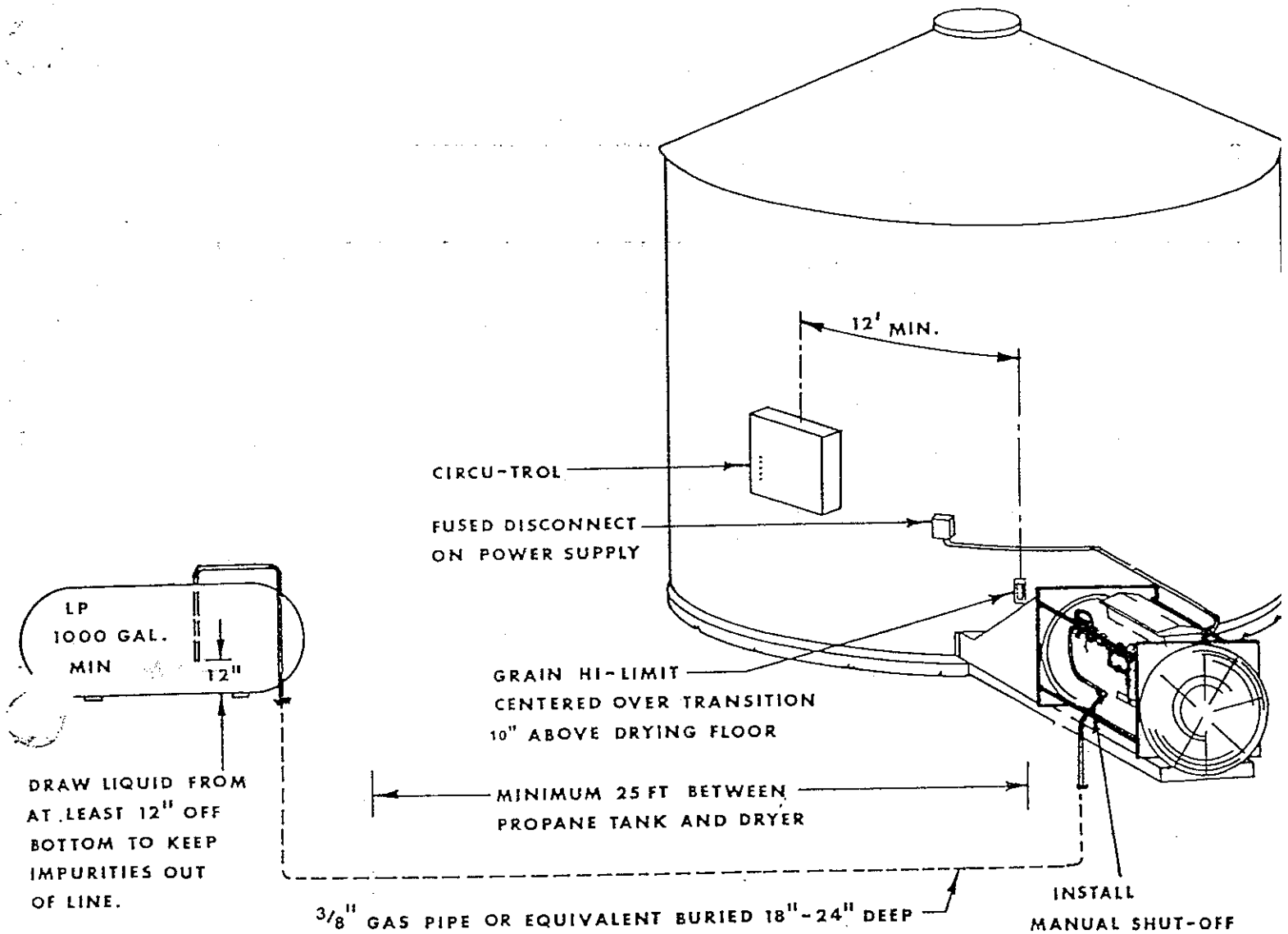
<u>DESCRIPTION</u>	<u>MODEL NUMBER</u>
13 HP Vaneaxial Fan, with Vaporizer, LP, 1Ø	4809 BFLP1P
13 HP Vaneaxial Fan, without Vaporizer, Propane Vapor, 1Ø	4809 BFPV1P
13 HP Vaneaxial Fan, with Vaporizer, LP, 3Ø	4809 BFLP3P
13 HP Vaneaxial Fan, without Vaporizer, Propane Vapor, 3Ø	4809 BFPV3P
13 HP Vaneaxial Fan, Natural Gas, 1Ø	4809 BFNG1P
13 HP Vaneaxial Fan, Natural Gas, 3Ø	4809 BFNG3P

CONCRETE PAD DIMENSIONS WHEN USING SHIVERS TRANSITION



Keep the floor space 6' in front of transition outlet as free of obstructions as possible. If using concrete blocks for floor supports, replace the concrete blocks in this area with steel supports or fashion some kind of steel substructure.

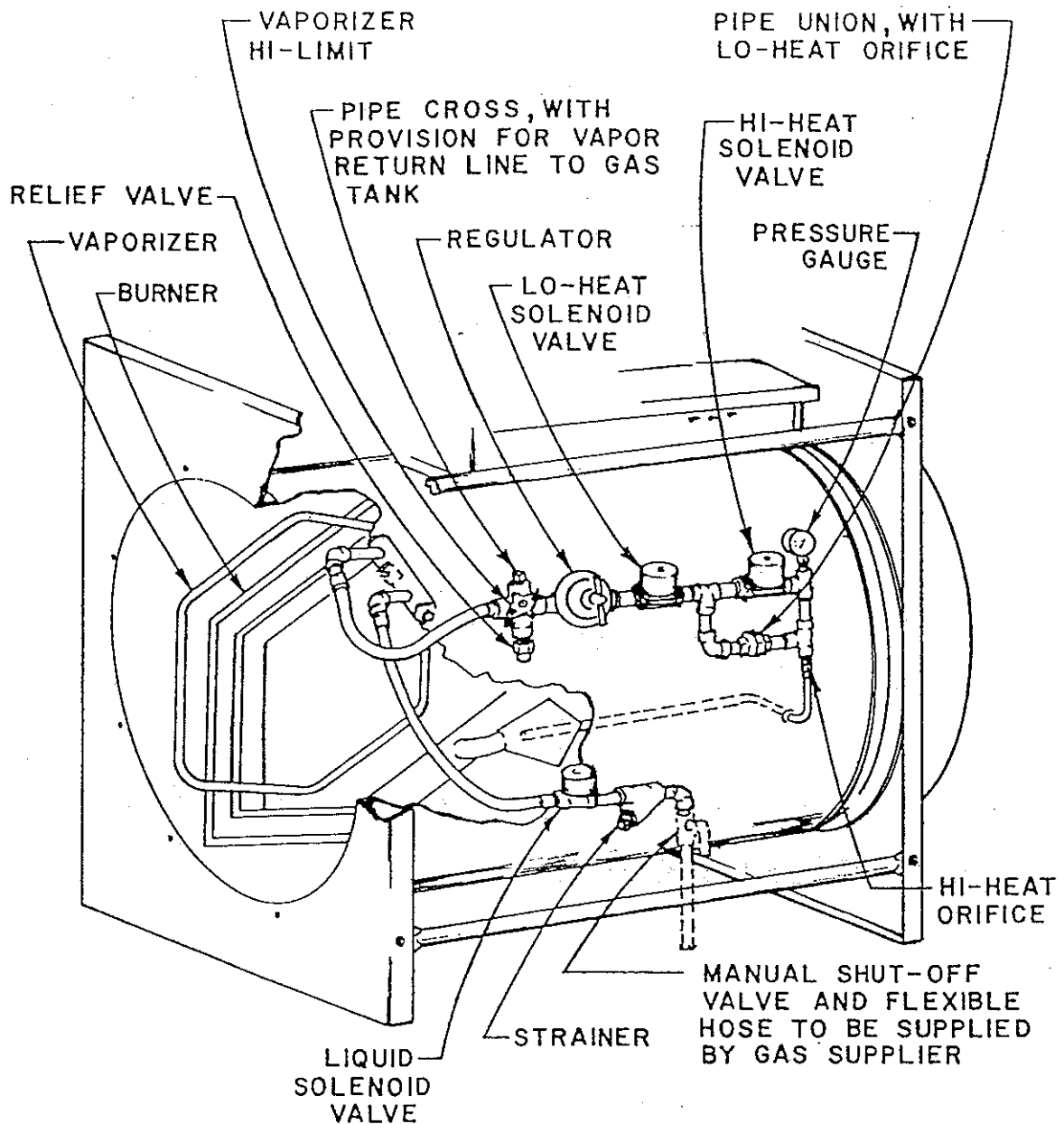
LIQUID PROPANE INSTALLATION AND GAS HOOK-UP



1. Storage tank should be placed at least 25' from the burner (some states require 50'.)
2. A 1000 gallon tank is recommended as minimum size to avoid nuisance refilling.
3. The liquid should be drawn thru a snorkel located 12" above the tank bottom. This prevents impurities which are in all L.P. gas from being fed into your burner and clogging the gas strainer and potentially causing problems.
4. Never use an ammonia tank for LP gas storage. It can be harmful to your dryer and is very dangerous.

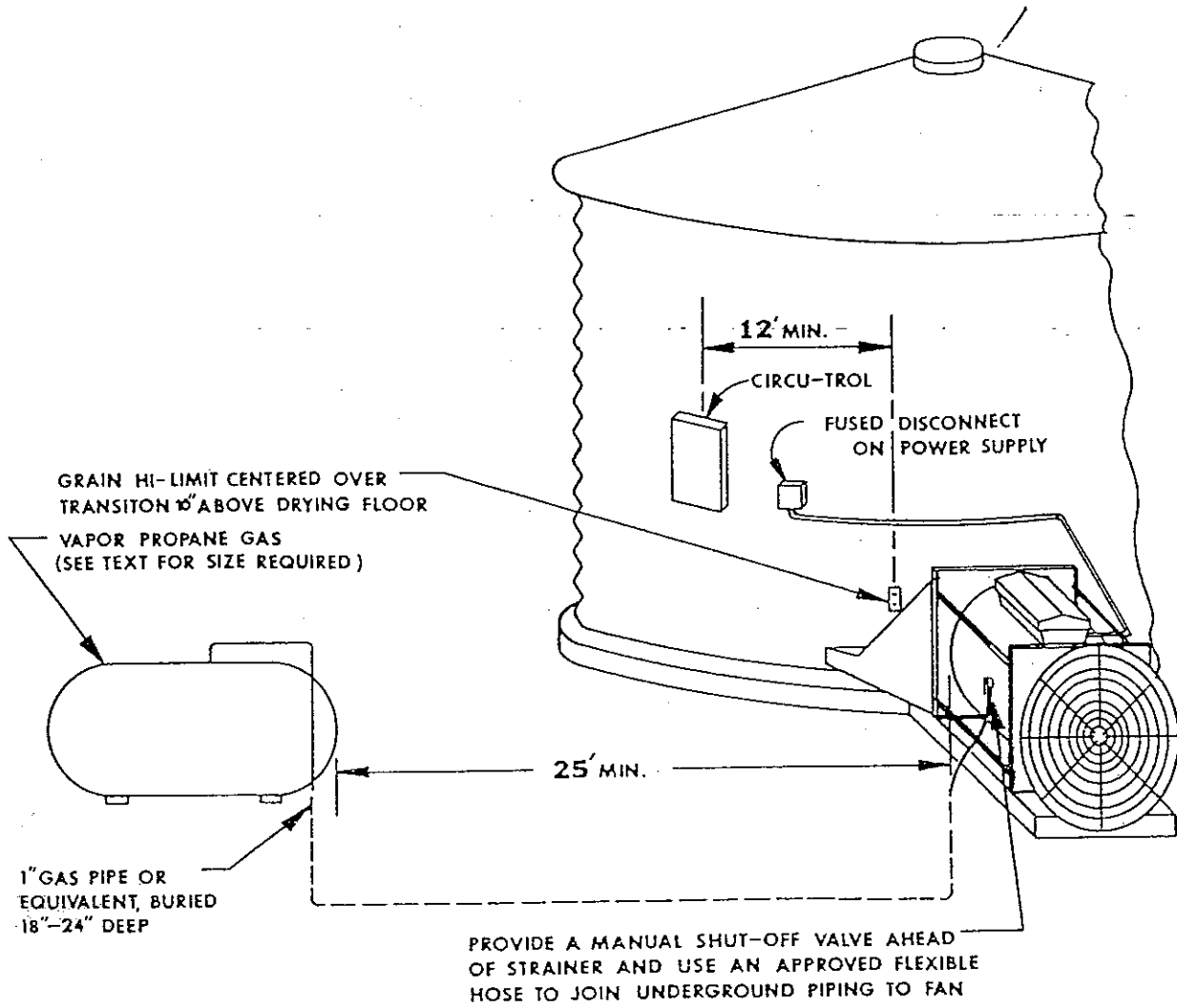
Use 3/8" gas pipe or equivalent for gas lines and be sure to use a flexible hose when joining it to the burner.

6. Put a manual shut off valve in gas line ahead of the gas strainer.

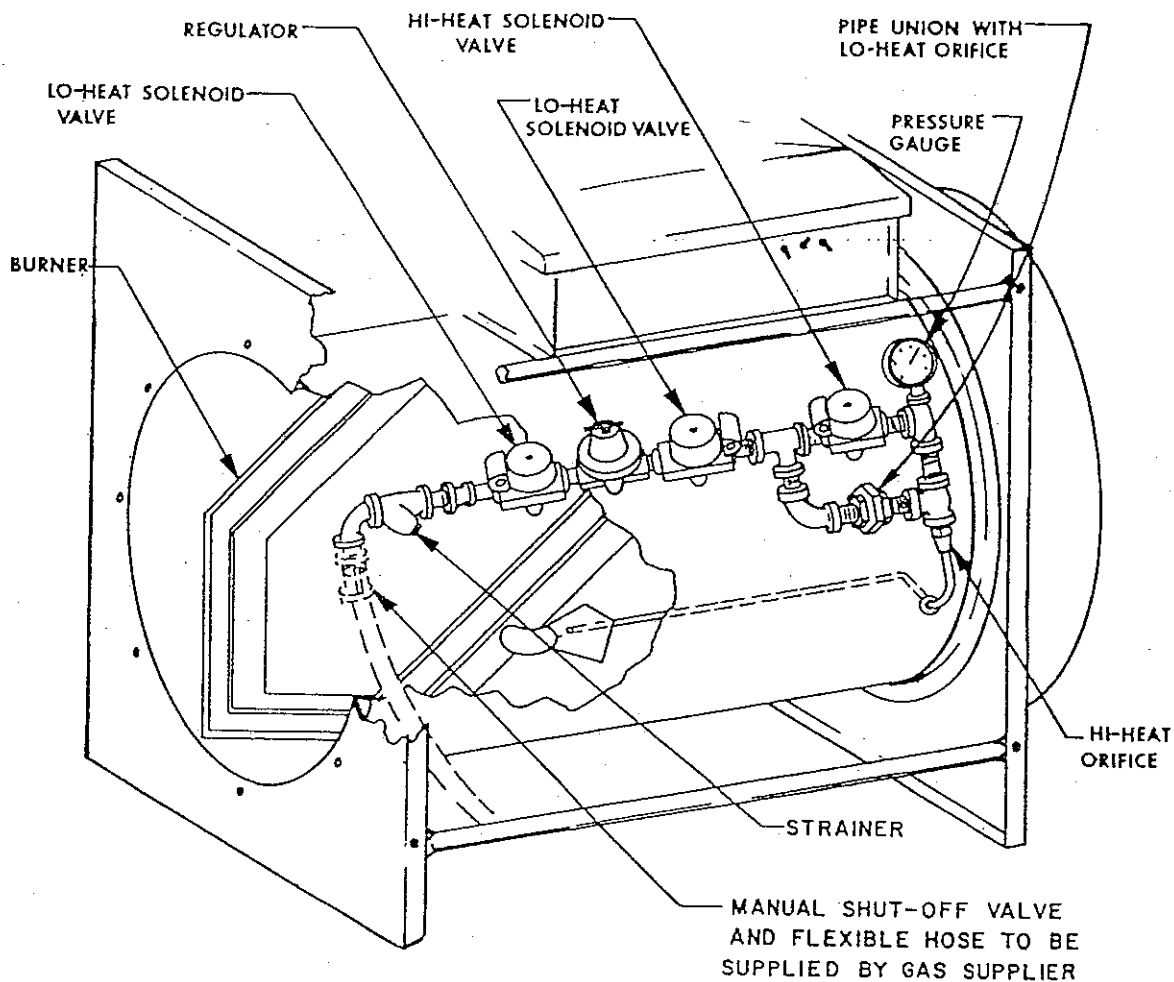


7. A pressure regulator is not required on storage tank.
8. Purge gas line before hooking to dryer to blow any debris out that may have collected in the pipe during hookup.
9. Check all connections for leaks.
10. If unit will be used when outside temperature is below 20°F., a vapor return line must be installed between the pipe cross which is immediately in front of the pressure regulator on the fan and the vapor outlet on your gas tank. Suggest using ½" O.D. copper tubing with a flexible hose connecting to fan.

VAPOR PROPANE INSTALLATION AND GAS HOOK-UP



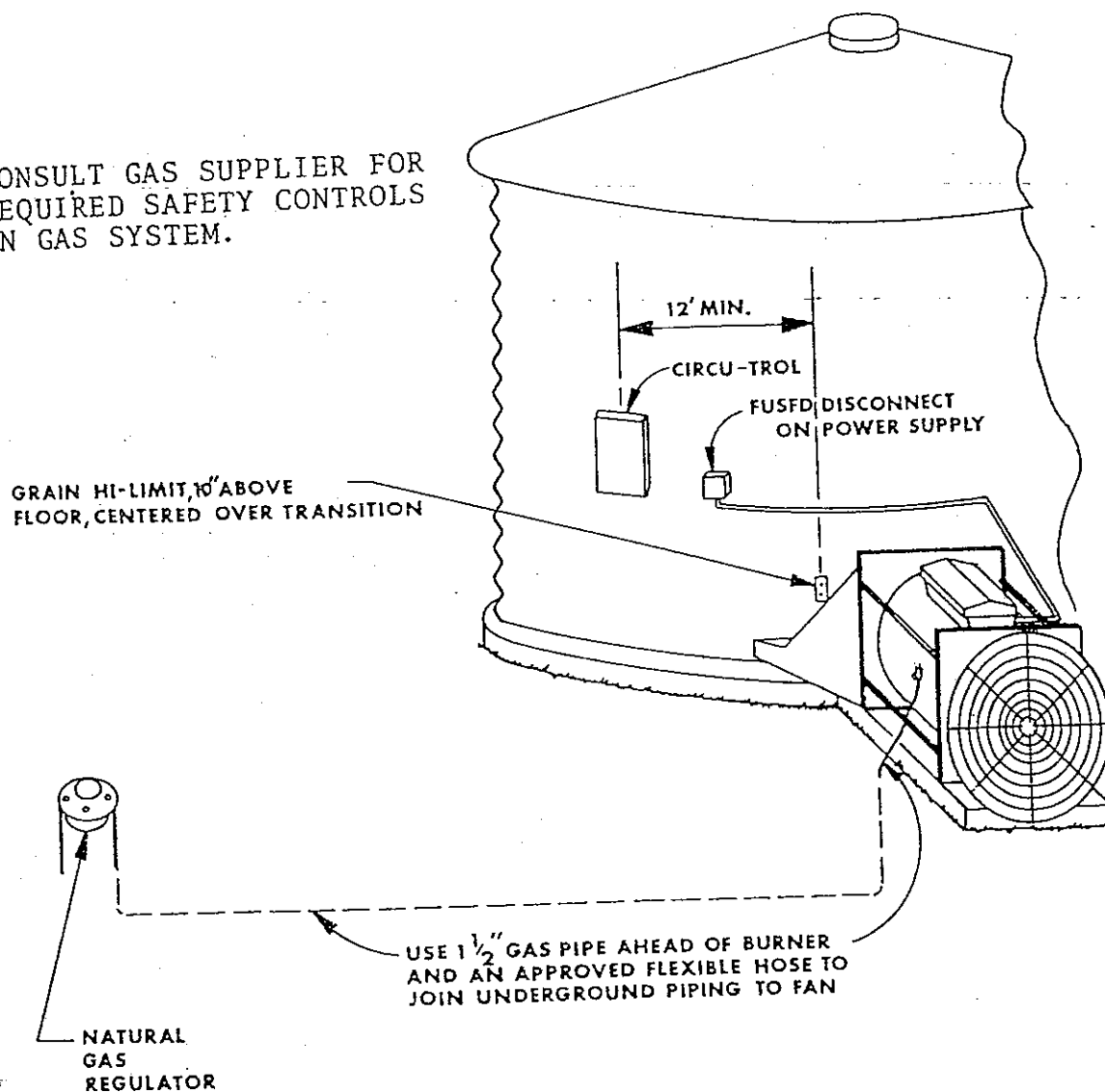
A vaporizer (liquid propane model) is required when the Blue Flame Dryer is used with a Circu-Lator or Dri-Flo in the Midwest. Some Southern U.S. locations may use a vapor propane model if sufficiently large propane tank(s) are used. Refer to Appendix for chart of tank size.



1. Storage tank should be placed at least 25' from the burner (some states require 50').
2. Never use an ammonia tank for LP gas storage. It can be harmful to your dryer and is very dangerous.
3. Use 1" gas pipe or equivalent for gas lines and be sure to use a flexible hose when joining it to the burner.
4. Put a manual shut off valve in gas line ahead of the gas strainer.
5. A pressure regulator is not required on storage tank.
6. Purge gas line before hooking to dryer to blow any debris out that may have collected in the pipe during hookup.
7. Check all connections for leaks.

NATURAL GAS INSTALLATION AND GAS HOOK UP

CONSULT GAS SUPPLIER FOR
REQUIRED SAFETY CONTROLS
IN GAS SYSTEM.

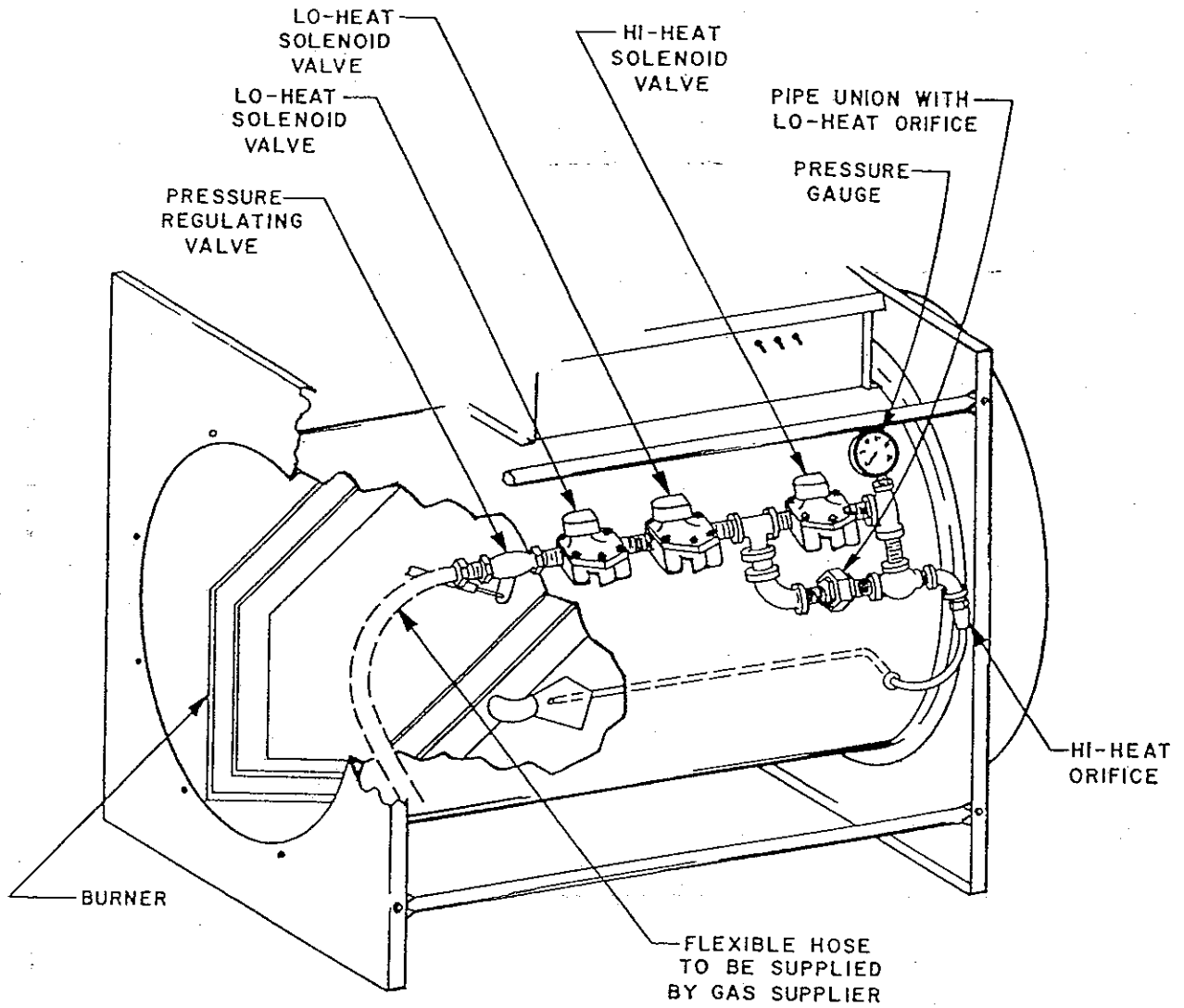


For adequate heat using your SHIVERS fan, your natural gas dealer must be able to supply to your fan 3,000,000 BTU/HR (3,000 cubic feet/HR) at 6 PSIG pressure. Maximum pressure allowable is 25 PSIG.

Plumbing should be done in accordance with all applicable safety codes.

1. Use 1 1/2" gas pipe for line coming to your burner and attach it to burner with flexible hose.
2. Purge gas line before hooking to dryer to blow any debris out that may have collected in the pipe during hookup.
3. Check all connections for leaks.

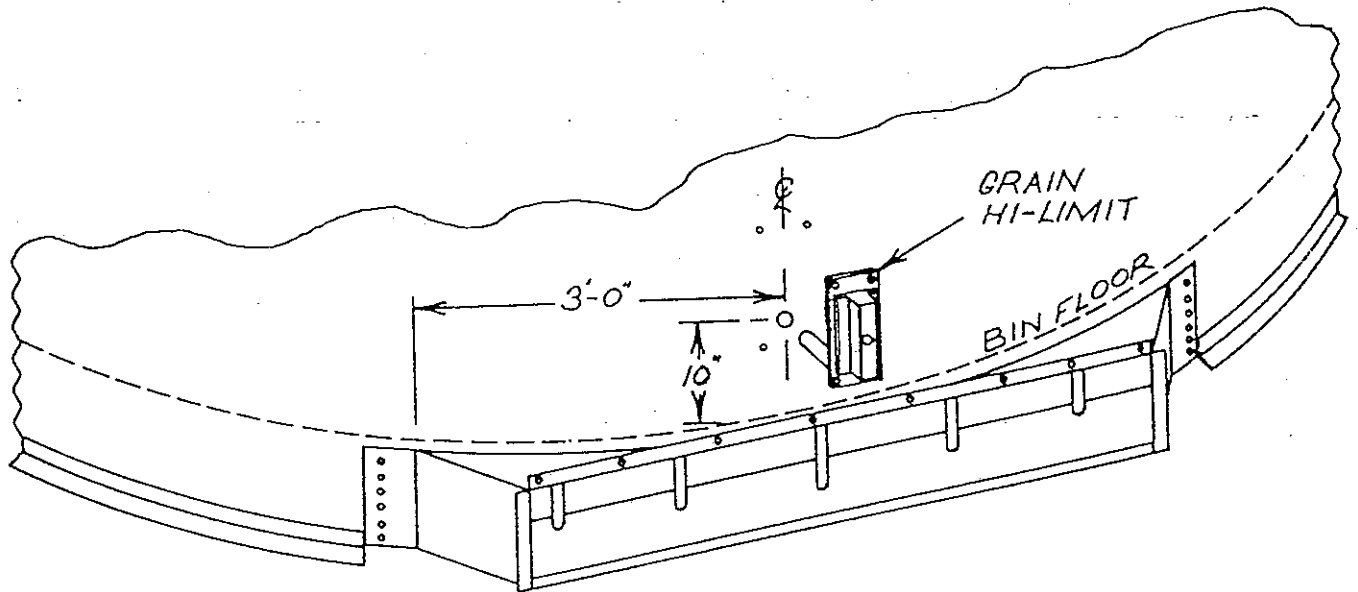
NATURAL GAS DRYER PIPE-TRAIN COMPONENTS



ELECTRICAL INSTALLATION-ONE BLUE FLAME DRYER

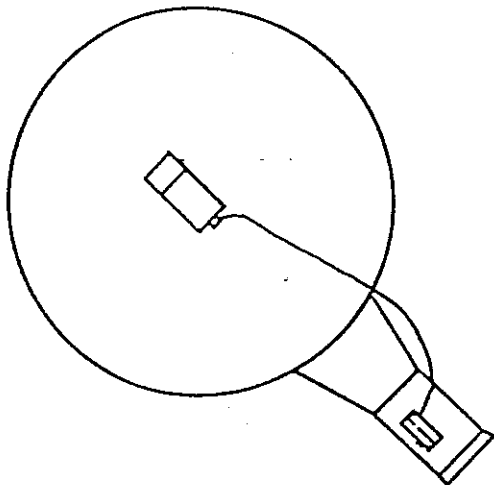
1. INSTALLING GRAIN HI-LIMIT

Install the Grain Hi-Limit as per drawing below. Hi-Limit is prewired into flexible conduit and connected to terminals F and G in Fan Control Box at factory.

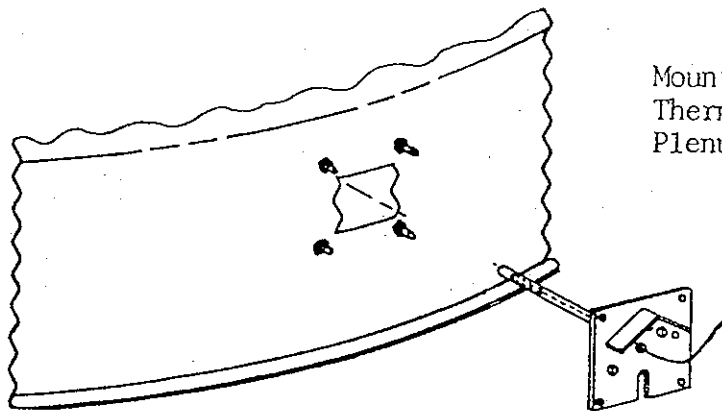


2. INSTALLING GEARBOX HI-LIMIT

Install Gearbox Hi-Limit as per drawing below. Field wiring from basket to fan should be done with heat resistant wire protected by conduit. Type SRML (Boiler room) wire should be used. This Hi-Limit should be connected to terminals N & O in dryer control box, to be in series with "holding circuit" on fan motor. Remove jumper in control box at this time.



2. CONTINUED

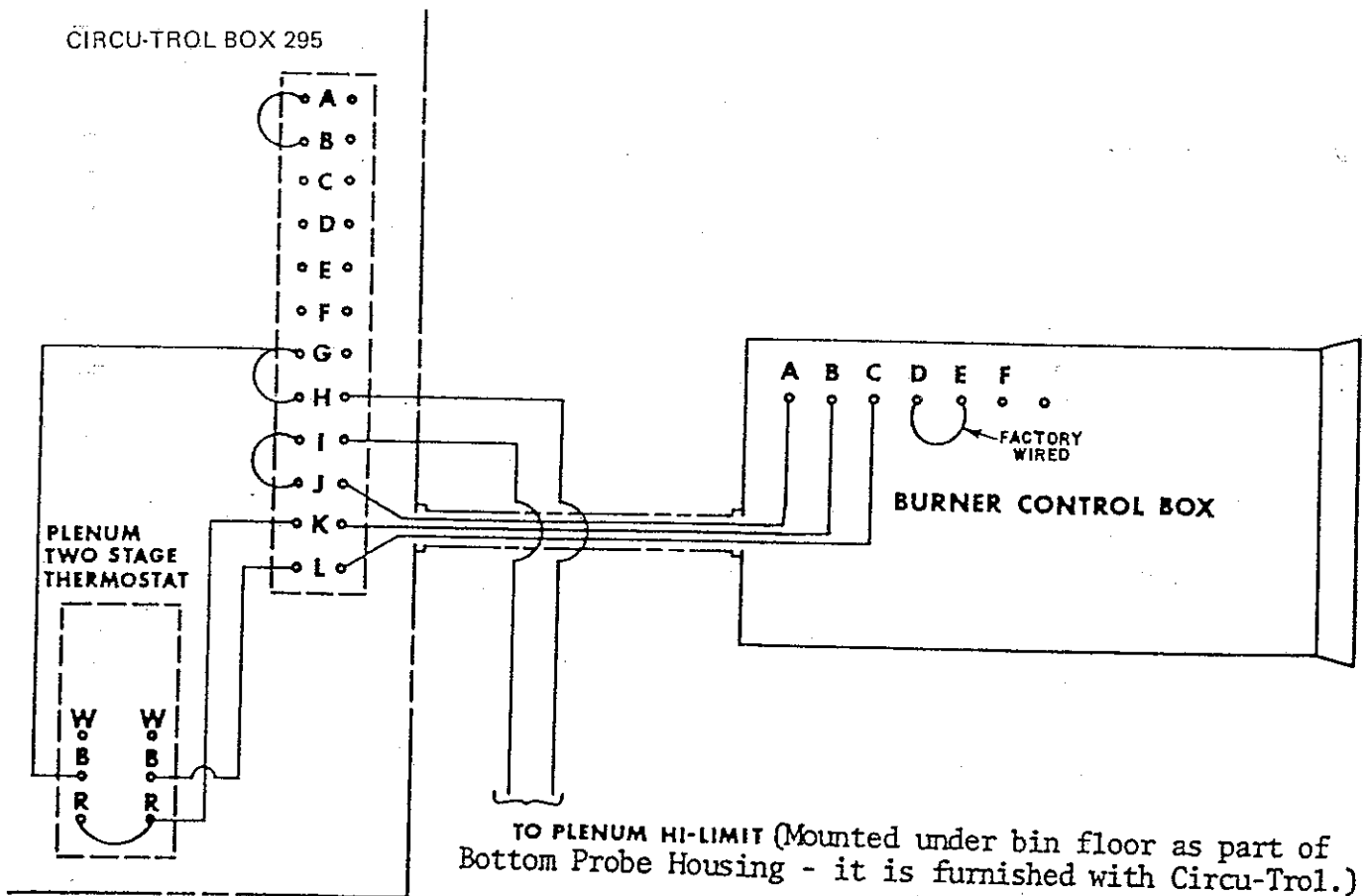


Mount coil of the Two-Stage Plenum Thermostat onto the Circu-Trol Plenum Probe as shown.

It is suggested that the plenum probe be installed by putting the bolts through from the inside of the bin and tightening nuts then mounting the probe, and then putting nuts on these bolts to hold probe. This facilitates removal of this probe to check the Hi-Limit wiring, and repair as necessary. Mice like to chew these wires and they should be checked annually.

3A. WIRING THERMOSTAT CIRCUIT - 295 CIRCU-TROL

If you have a Single Stage Plenum Thermostat, it must be replaced with a Two-Stage Thermostat. When Grain Level Indicator is not used the completed thermostat circuit is as shown below:



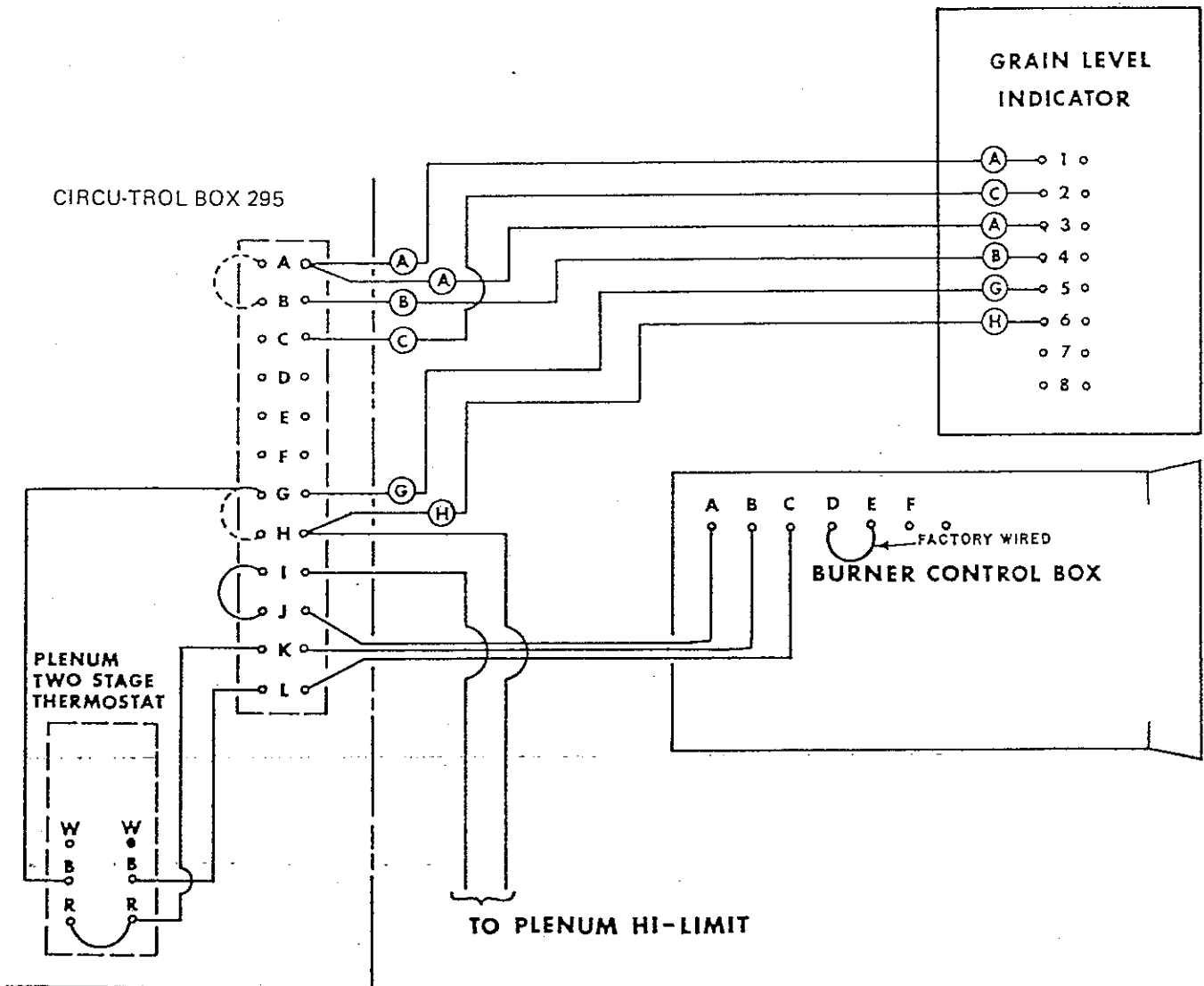
3A. CONTINUED

WIRING THERMOSTAT CIRCUIT - 295 CIRCU-TROL WITH GRAIN LEVEL INDICATOR

When Grain Level Indicator is installed, the completed thermostat circuit should be as shown below:

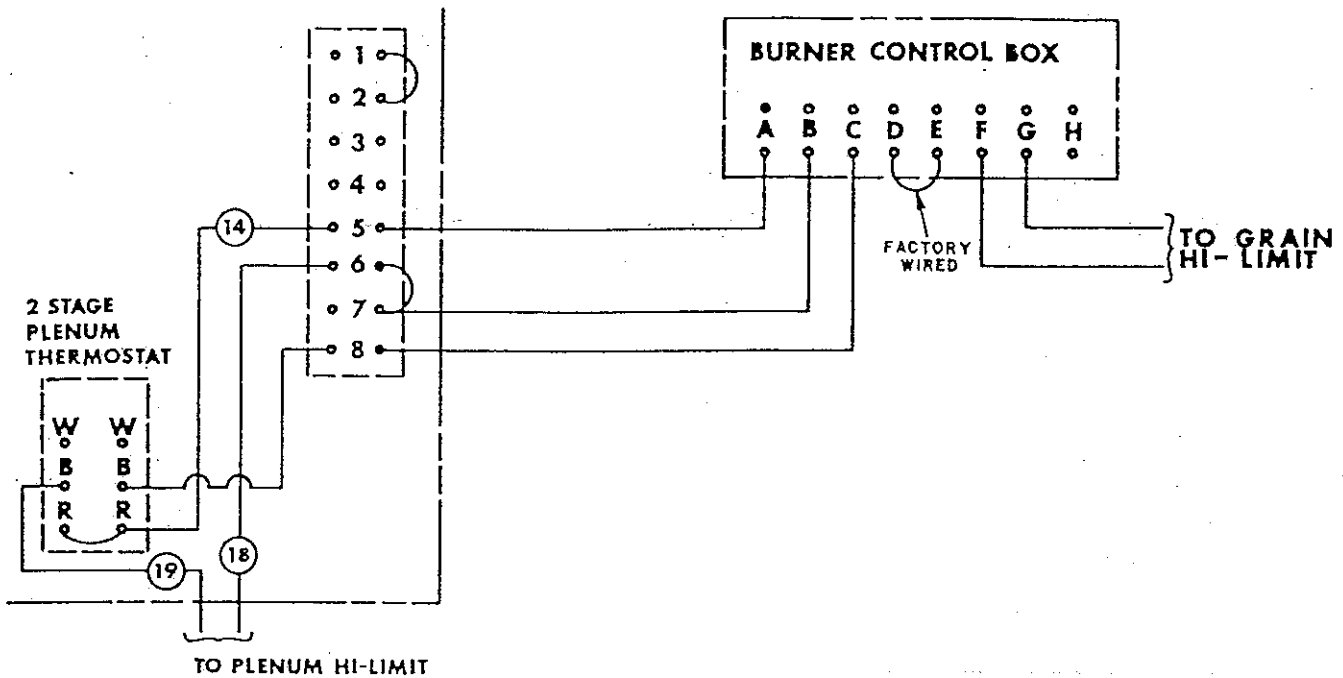
IMPORTANT

Remove and discard the jumper bars between terminals A and B and terminals G and H of Circu-Trol.



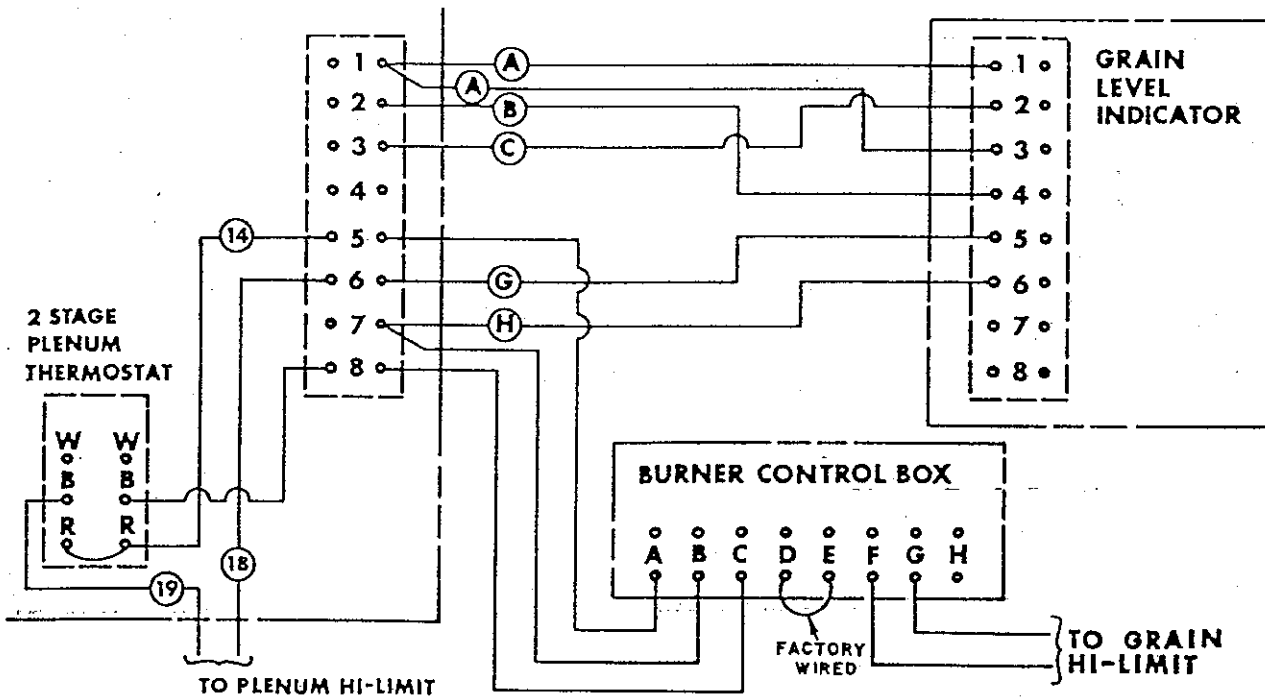
(Identify Model 296 Circu-Trol by 16½" x 18½" galvanized box, terminal strip labeled 1 through 8, and Plenum Hi-Limit on lower probe.)

If you have a single stage plenum thermostat, it must be replaced with a two-stage thermostat. When Grain Level Indicator is not used, the completed thermostat circuit looks like this:



GRAIN LEVEL INDICATOR

If this installation has a Grain Level Indicator it will be wired as shown below:



IMPORTANT - Remove jumpers between terminals 1 and 2, and terminals 6 and 7 of Circu-Trol when installing Grain Level Indicator.

Refer to Circu-Trol Installation Instructions for complete Grain Level Indicator installation details.

4. POWER HOOKUP

A 115/230 volt service must be supplied and a manual disconnect switch located ahead of fan. Use correct time delay fuses (fusetrons) in disconnect switch. 230V power must be fed into the magnetic contactor. Attach a physical ground to grounding lug provided. Power supply must be able to maintain 190V minimum during motor startup. Be sure motor is running in correct direction. See table below for required loading information. All wiring must meet all applicable safety codes.

Motor HP	Maximum Full Load Amps	Locked Rotor Amps	Recommended Fusetron Size
1Ø Baldor 13	60	294	60
1Ø Marathon 13	60	244	60
3Ø Baldor 13	40	202	40
3Ø Marathon 13	40	240	40

SUGGESTED COPPER WIRE SIZE, POWER LEADS

<u>Distance Between Transformer & Fan</u>	<u>Wire Size For 1Ø Units</u>	<u>Wire Size For 3Ø Units</u>
0-50	4	6
50-100	3	4
100-150	3	4
150-200	2	3
200-300	1/0	1
300-500	2/0	2/0

NOTE: For aluminum wire, the sizes above must be increased a minimum of two (2) wire sizes in each case.

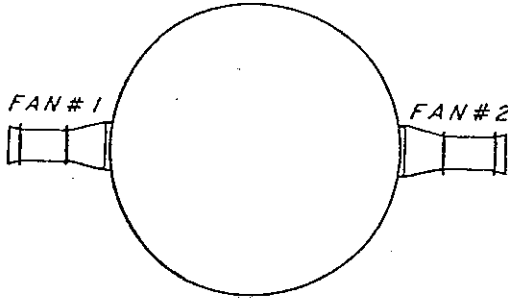
INSTALLATION OF 2 BLUE FLAME DRYERS ON ONE BIN

DO NOT TRY TO HOOK UP TWO BLUE FLAME DRYERS TO MODEL 296 SMALL CIRCUITROLS.
Call the factory for discussion of possible alternatives.

When two Blue Flame Dryers are installed on one bin, a "Hi-Lo Two Burner Control Kit" and a "Grain Hi-Limit Control Box" are required.

INSTALLATION PROCEDURE

1. Position fans directly opposing one another as shown:



2. Do all Gas Supply and Hookup as per directions for a single fan.
3. Power Hookup

A 115/230 volt service must be supplied and a manual disconnect switch located ahead of each fan. Use correct time delay fuses (fusetrons) in disconnect switch. 230V power must be fed into the magnetic contactor. Attach a physical ground to grounding lug provided. Power supply must be able to maintain 190V minimum during motor startup. Be sure motor is running in correct direction. See table below for required loading information. All wiring must meet all applicable safety codes.

SUGGESTED COPPER WIRE SIZE, POWER LEADS

Distance Between Transformer & Fan	Wire Size For 1Ø Units	Wire Size For 3Ø Units
0-50	4	6
50-100	3	4
100-150	3	4
150-200	2	3
200-300	1/0	1
300-500	2/0	2/0

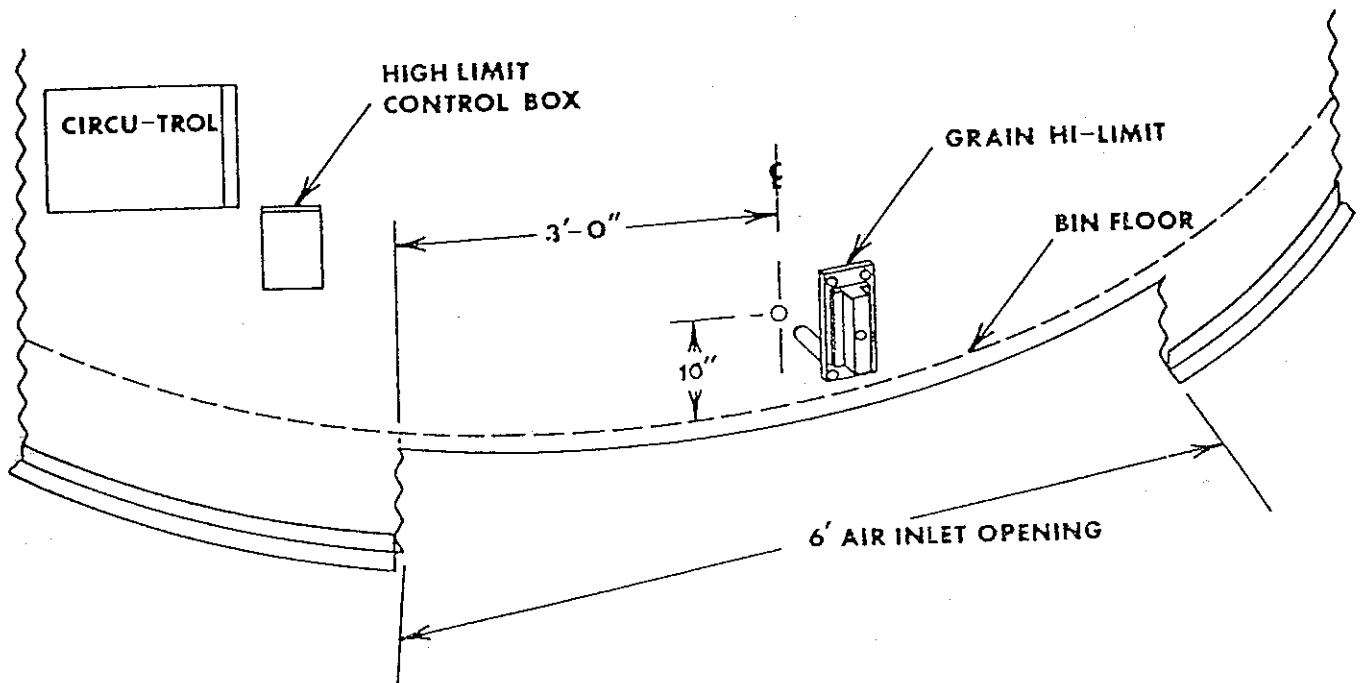
NOTE: Wire sizes must be increased by two-sizes for aluminum wire.

Motor HP	Maximum Full Load Amps	Locked Rotor Amps	Recommended Fusetron Size
1Ø Baldor 13	60	294	60
1Ø Marathon 13	60	244	60
3Ø Baldor 13	40	202	40
3Ø Marathon 13	40	240	40

4. GRAIN HI-LIMIT

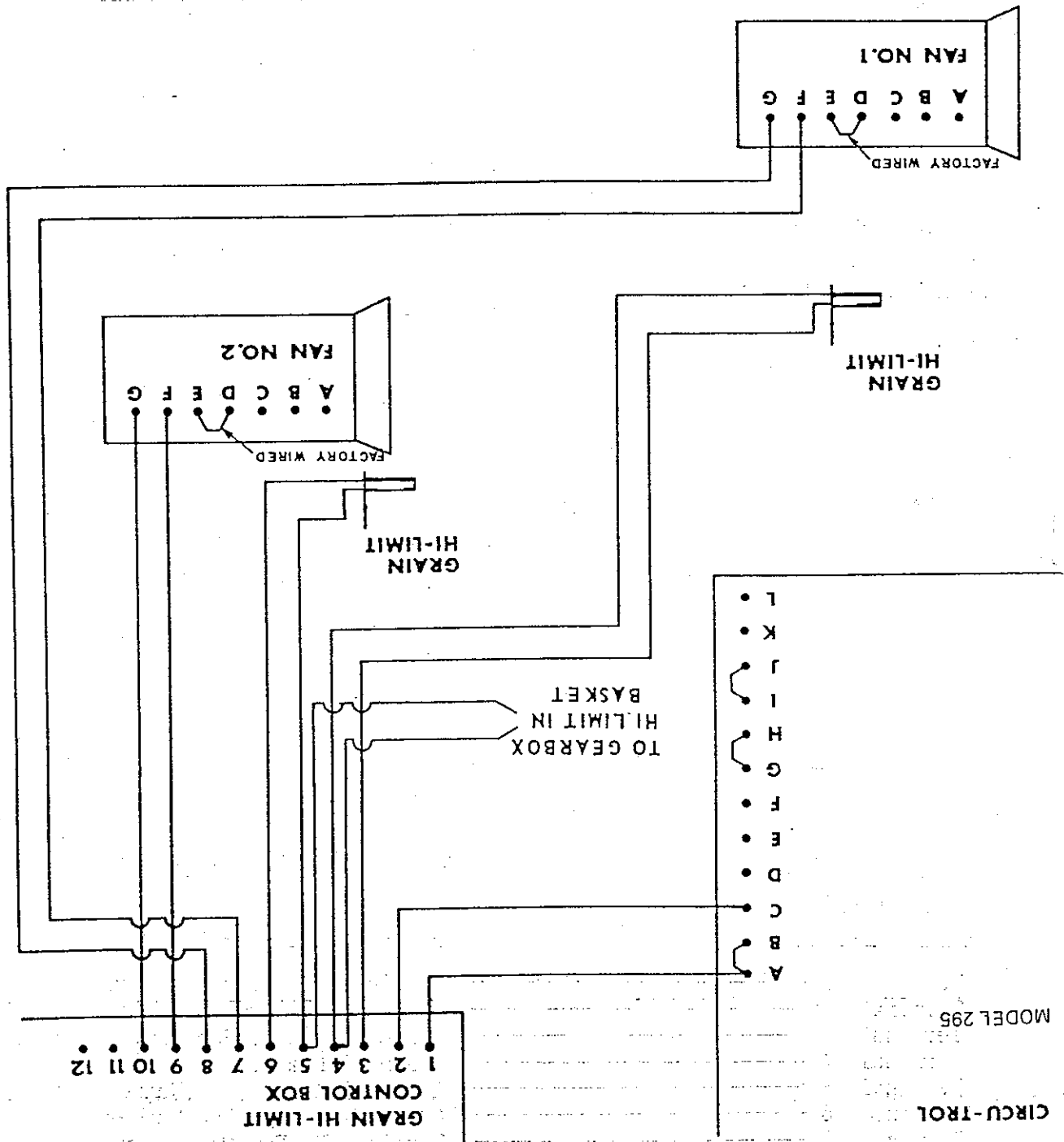
When two Blue Flame Dryers are installed on one Drying Bin, the Grain Hi-Limits are wired to a "Grain Hi-Limit Control Box", which shuts off both drying fans should either Hi-Limit sense dangerous temperatures.

Disconnect prewired Grain Hi-Limit probes from the Blue Flame Dryers. (Terminals F and G in the fan will be rewired later.) Install the Grain Hi-Limits above the entrance collars as shown below.



Mount the Grain Hi-Limit Control Box on the bin near the Circu-Trol panel. Wire it as follows:

Grain Hi-Limit Control Box	Connect To: Circu-Trol
Terminal 1	Terminal A, Circu-Trol Panel
Terminal 2	Terminal C, Circu-Trol Panel
Terminal 3	Grain Hi-Limit, Fan Number One
Terminal 4	Grain Hi-Limit, Fan Number One
Terminal 5	Grain Hi-Limit, Fan Number Two
Terminal 6	Grain Hi-Limit, Fan Number Two
Terminal 7	Terminal F, Fan Number One
Terminal 8	Terminal G, Fan Number One
Terminal 9	Terminal F, Fan Number Two
Terminal 10	Terminal G, Fan Number Two
Terminal 11	Not Used
Terminal 12	Not Used

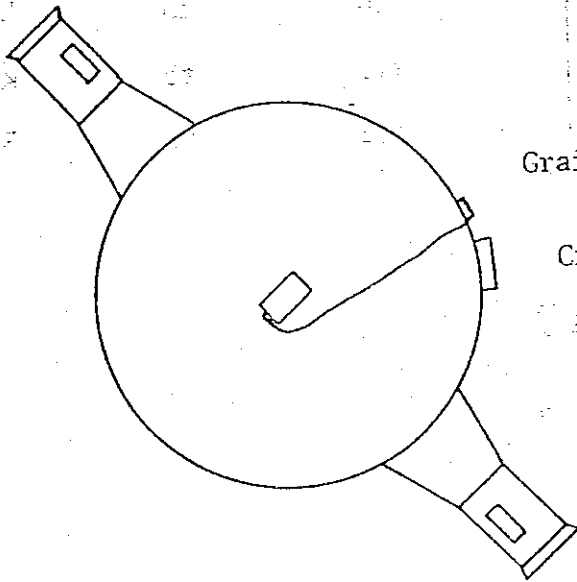


COMPLETED WIRING, GRAIN HI-LIMIT CONTROL BOX

CIRCU-TROL
MODEL 295

6. INSTALLATION OF GEARBOX HI LIMIT WITH TWO BURNERS

Install Gearbox Hi-Limit as per drawing below. Field wiring from basket to Grain Hi-Limit Control Box should be done with heat resistant wire protected by conduit. Type SRML (Boiler room) wire should be used. This Hi-Limit should be connected to terminals 4 & 5 in Grain Hi-Limit Control Box, to turn off both fan-motors. Remove jumper in Grain Hi-Limit Control Box at this time.

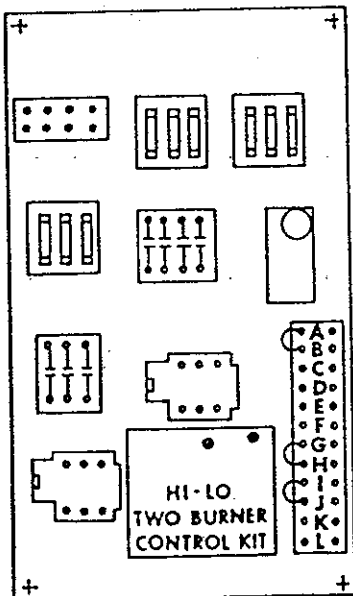


Grain Hi-Limit Control Box

Circu-trol

6A. INSTALLATION OF HI LO TWO BURNER CONTROL KIT FOR 295 CIRCU TROL

INSTALL HI-LO TWO BURNER CONTROL KIT AS FOLLOWS:

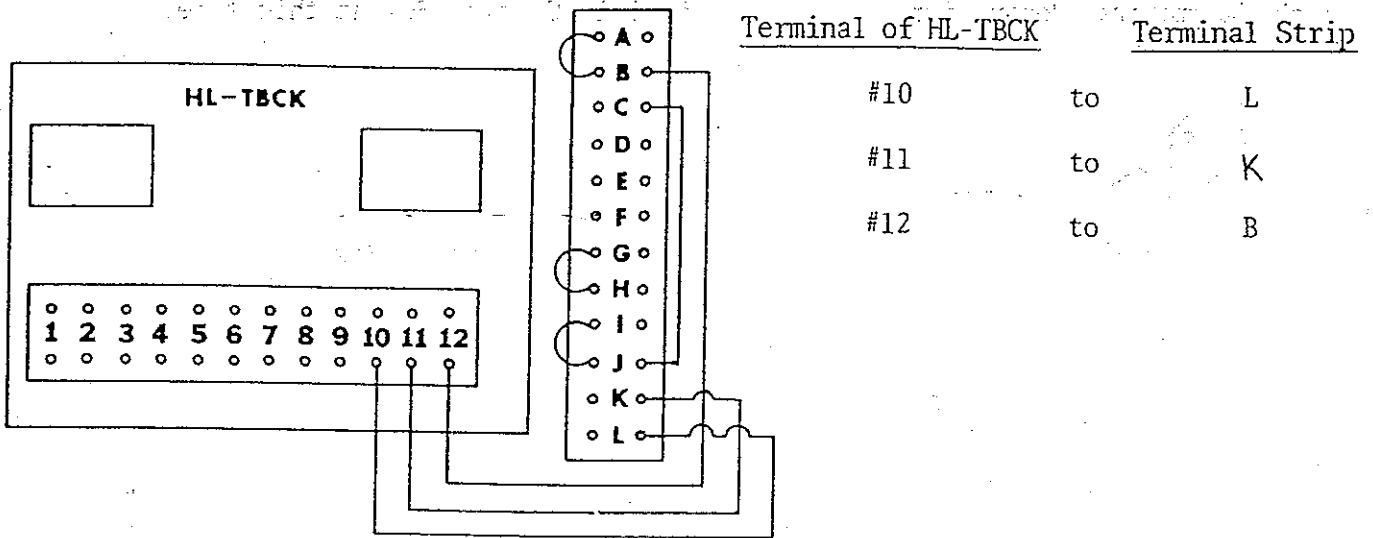


Mount the Hi-Lo Two Burner Control Kit with two 10-32 screws. There are two tapped holes located to the left of the terminal strip of the main Circu-trol panel provided for this purpose.

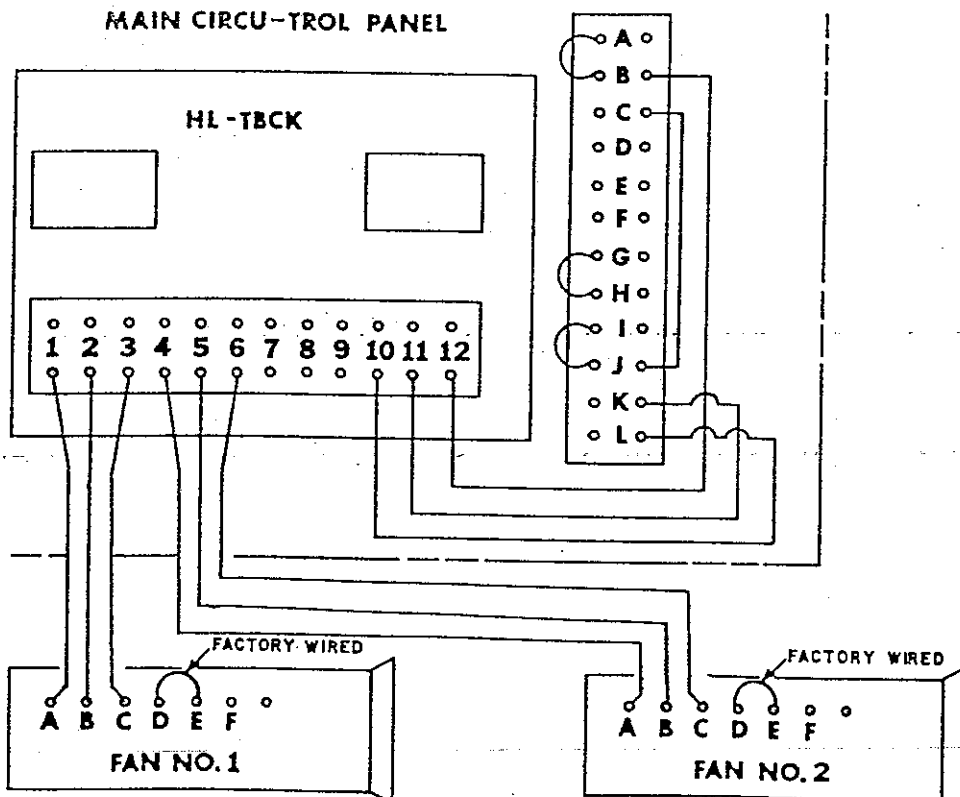
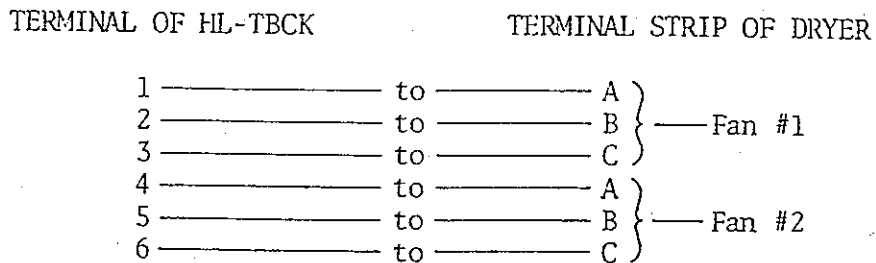
6A. CONTINUED

Connect black jumper wire between terminals C and J on terminal strip of Circu-Trol.

Connect wires from the HL-TBCK to the terminal strip of Circu-Trol as follows:

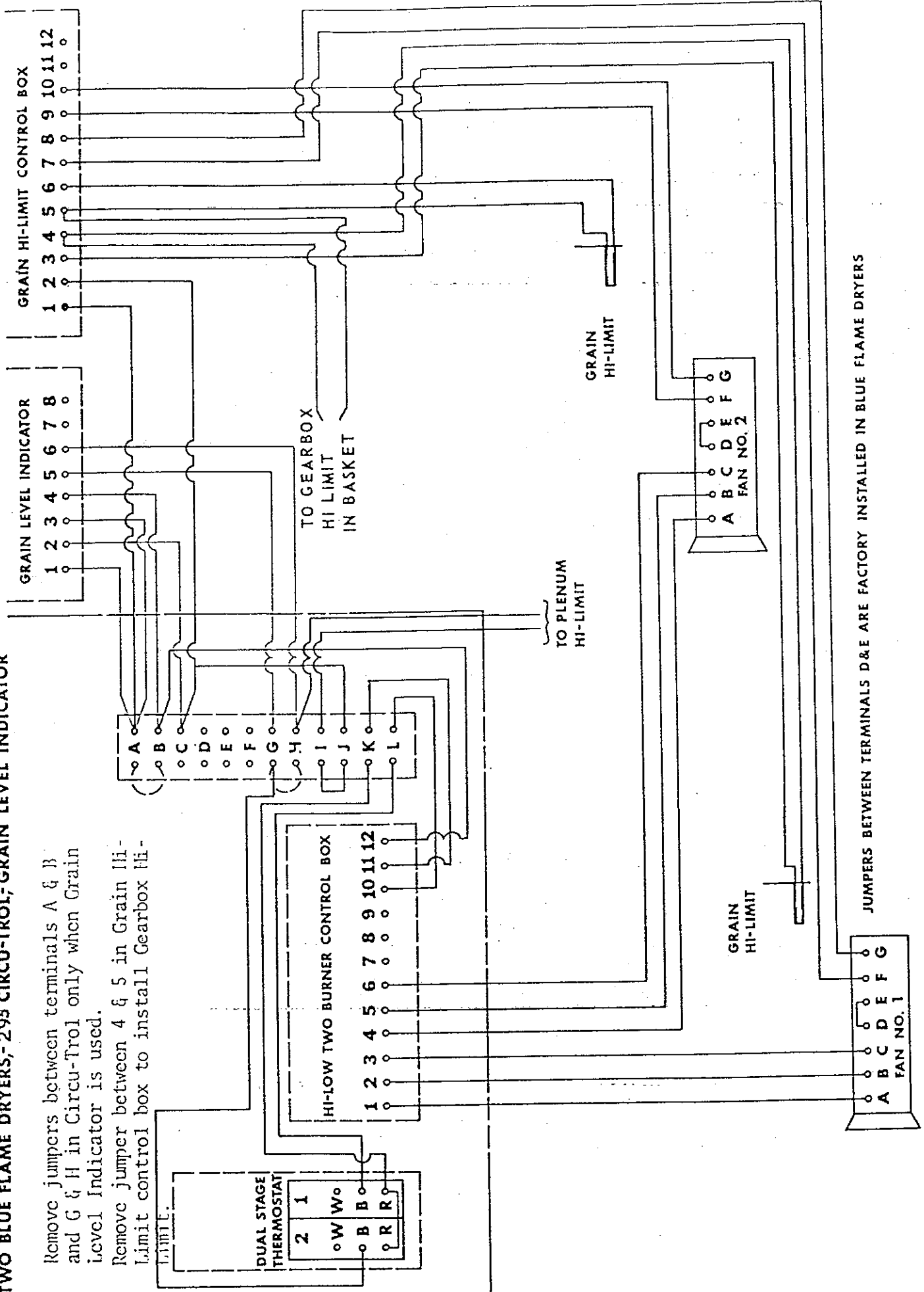


Connect three #16 AWG wires from each fan control box to the Hi-Lo Two Burner Control Kit. Attach to terminal strips as follows:



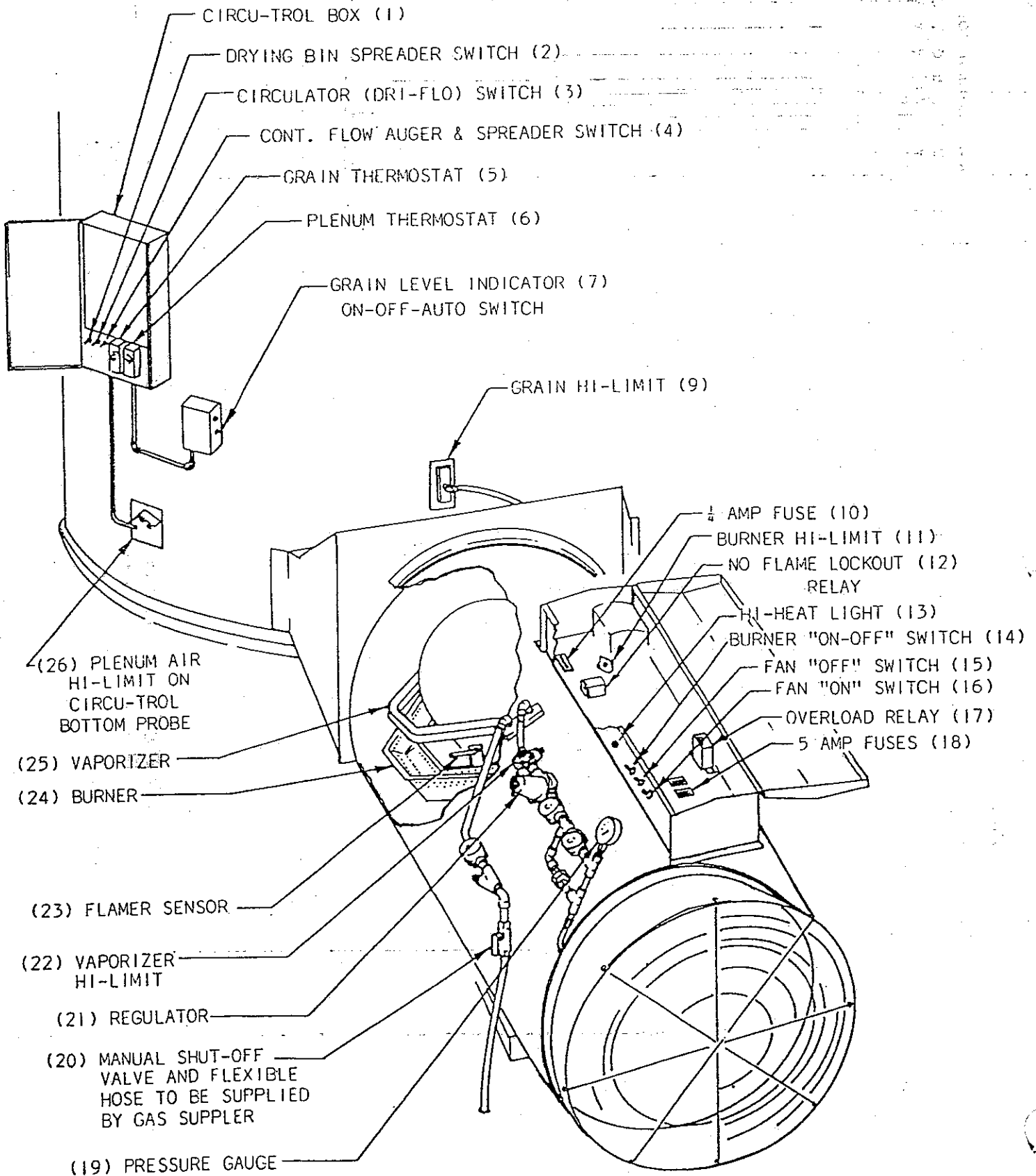
**COMPLETE CONTROL CIRCUIT WIRING
TWO BLUE FLAME DRYERS, 295 CIRCU-TROL, GRAIN LEVEL INDICATOR**

Remove jumpers between terminals A & B and G & H in Circu-Trol only when Grain Level Indicator is used.
Remove jumper between 4 & 5 in Grain Hi-Limit control box to install Gearbox Hi-Limit.

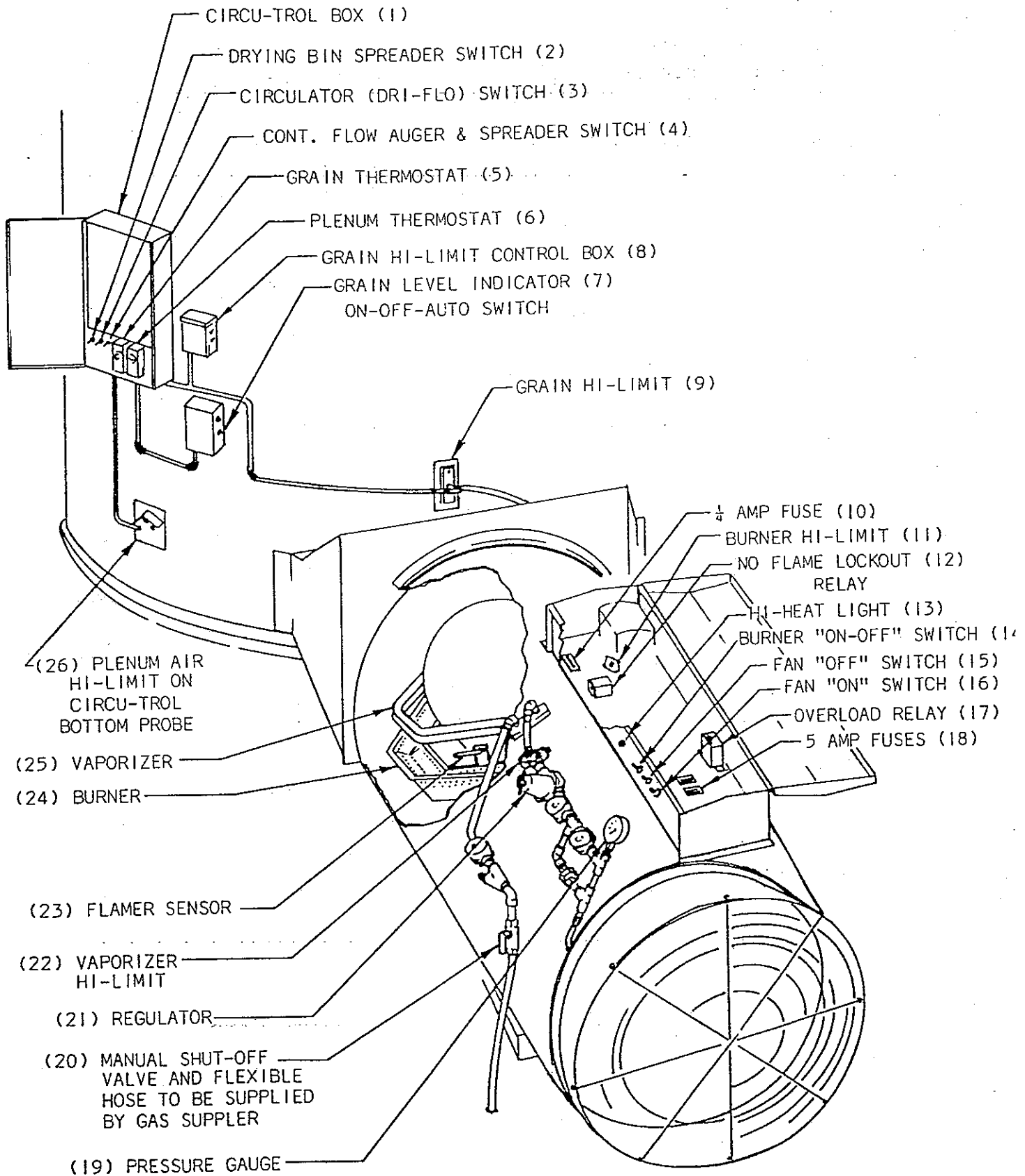


JUMPERS BETWEEN TERMINALS D & E ARE FACTORY INSTALLED IN BLUE FLAME DRYERS

SINGLE BLUE-FLAME INSTALLATION



INSTALLATION WITH TWO BLUE-FLAMES ON
ONE DRYING BIN



OPERATING INSTRUCTIONS
for
BLUE FLAME DRYER

SAFETY CHECK

Before starting unit, check to be sure that all electrical connections and gas connections are tight. Be sure that your election installed a physical ground wire to the fan.

Open gas valves at tank and dryer. A mixture of soap and water brushed onto the gas line connections with the valves open will indicate any possible leaks.

STARTING the FAN

Place the Burner Switch (14) in the OFF position.

Turn Fan Switch (16) on. This is a momentary switch and Fan should start immediately. If Fan does not start, check the following:

1. The power supply must furnish 230 volts to the magnetic contactor.
2. Push the Overload Relay (17) Reset button.
3. Check the 5 Amp fuses (18).
4. Ground lug should be connected to a physical ground.
5. Fan will NOT start if the Flame Sensor (23) is defective or improperly conneted.
NOTE: The Fan will not restart if the Flame Sensor (23) is hot from previously firing burner. Allow 5-10 minutes cooling time for the Flame Sensor. See Appendix IV.
6. Fan will NOT start if Grain Hi-Limit (9) has been tripped due to dangerous temperatures in the grain. Locate and correct the trouble before trying to restart the Fan.
7. Fan will NOT start if the Gearbox Hi-Limit has been tripped due to dangerous temperatures in the grain. Locate the trouble and correct before trying to restart the Fan.

STARTING THE BURNER

Be sure that gas valve is turned on at the tank. Adjust the vaporizer so that it is approximately 12" away from the burner ring. You can see the vaporizer through the inspection window on the burner housing.

STARTING the BURNER (con't)

Adjust the pressure regulator by turning the handle until a slight pressure is felt.

Set the Plenum Thermostat (6) in Circu-Trol (1) to the desired temperature for the grain you are drying.

Turn switch on Grain Level Indicator (7), if included, to the On position.

Turn Burner Switch (14) to the On Position. The burner will not fire until 30 seconds after the Fan has started running.

If Burner does not fire, check the following:

1. Push the reset button on the No-Flame Lockout Relay (12).
2. Check $\frac{1}{4}$ Amp fuse (10).
3. Push reset button on the Burner Hi-Limit (11).
4. Push reset button on the Vaporizer Hi-Limit (22).
5. Push reset button on the Plenum Hi-Limit. This Hi-Limit is located in the Plenum Probe for the Thermostat. Mice like to chew on wire insulation and may have chewed these wires in two.

After Burner fires, adjust the Vaporizer (25) so that it is warm to touch. Vaporizer temperature will require 2-8 minutes to stabilize after adjustment.

CAUTION: Vaporizer Line can become scalding hot if set too close to the burner! Vaporizer Hi-Limit (22) will trip if the gas line becomes too hot. Should this happen, it will shut off burner. Allow 10 minutes for the line to cool, reset the Hi-Limit and adjust Vaporizer to a cooler setting.

BURNER ADJUSTMENT

Blue Flame Dryers have a special continuous firing burner which normally alternates, or cycles, between a low fire and a high fire to maintain a constant drying temperature in the plenum. If the gas pressure is set too high, the burner will cycle on and completely off, but maintaining a reasonably constant drying temperature.

You can tell if the burner is on high fire, low fire, or off by (1) observing the flame through the inspection window, (2) watching the gas pressure gauge, or (3) the high heat light which comes on when the burner fires on high heat.

BURNER ADJUSTMENT (con't)

The gas pressure should be adjusted so that the burner cycles between high and low fire. If the burner cycles on and completely off, the gas pressure is too high. Reduce the gas pressure and the burner will cycle between high and low fire. If the burner does not come to high fire, the gas pressure may be too low and not reaching the plenum temperature that you have selected. Increase the gas pressure at the regulator until the burner fires on high fire occasionally.

The Blue Flame Dryer produces tremendous heat at gas pressures as low as 5 lbs. and will operate reliably at pressures as low as 1 lb. You may find that this is all the pressure that you need on low fire if the outside temperature is warm.

NOTE: The Vaporizer should be adjusted to be warm to the touch. If it is too hot, the seals in the regulator may be damaged---Too cold and the gas lines will frost over, possibly restricting the flow of fuel to the burner.

BURNER SHUT-OFF PROCEDURE

The best procedure to follow is to shut off the fuel at the gas tank and allow the gas line to burn out. Then immediately switch off the burner. If the burner switch is left on for over 30 seconds without a flame, the No-Flame Lockout Relay will have to be reset before the burner will relight.

FAN SHUT-OFF PROCEDURE

Stop fan by using the Fan Off switch (15). This is a momentary switch and Fan should shut off immediately.

for

TWO BLUE FLAME DRYERS

Multiple Fan installations should have a Grain Hi-Limit Control Box, which must be reset every time the power supply is turned off. The fans will not start if the Grain Hi-Limit Control Box (8) is not turned on.

This box automatically shuts off both fans if either Grain Hi-Limit (9) detects dangerous temperatures in the grain. The Grain Hi-Limit Control Box will not reset as long as these Hi-Limits are hot. Carefully check the grain for fire hazard before trying to restart the dryers.

TWO BLUE FLAME DRYERS (con't)

STARTING FANS

1. Check to see that transition dampers in Shivvers transitions move freely.

2. Set the Grain Hi-Limit Control Box (8) by momentarily depressing "On" switch on box.
3. Place burner switches in off position.
4. Turn fans on, one at a time. Fan should start immediately. NOTE: If transitions do not have a damper installed, fan blade must be blocked to prevent backwards rotation. Serious damage could be done to fan motor if started while it is rotating backwards.

If neither fan will start, check the following:

- a) Check power supply to each fan. Both should have 230 volts at the magnetic contactors.
- b) Recheck Grain Hi-Limit Control Box--- make sure it is turned on.
- c) Follow check out procedure for One Burner installation, for each fan.

APPENDIX I - DETERMINING TANK SIZE FOR USING VAPOR PROPANE

Step 1 - Use below Performance Chart to determine BTU/HR your system will require. Use the figures for 0" static pressure as a maximum estimate.

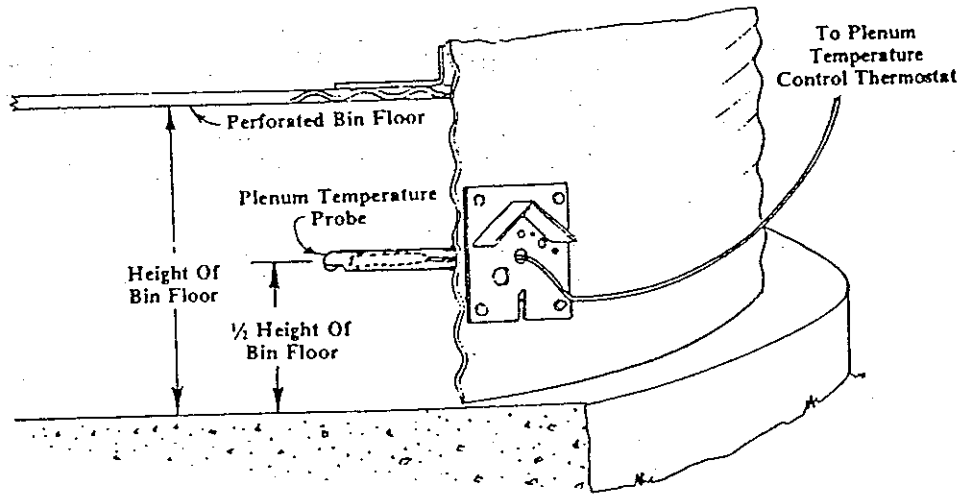
Static Pressure "H ₂ O	Air Delivery, CFM	40° Rise To Drying Air		70° Rise To Drying Air		100° Rise To Drying Air		130° Rise To Drying Air		160° Rise To Drying Air	
		PSI	BTU/HR	PSI	BTU/HR	PSI	BTU/HR	PSI	BTU/HR	PSI	BTU/HR
0"	19,000	1.7	865717	5.1	1514537	10.3	2164030	17.4	2812925	26.4	3462213
1"	18,200	1.5	828175	4.6	1451754	9.5	2072906	16.0	2694154	24.2	3316815
2"	16,625	1.3	756518	3.9	1325835	7.9	1893096	13.3	2461569	20.2	3029823
3"	14,500	1.0	660343	2.9	1155600	6.0	1650858	10.1	21471734	15.4	26422326
4"	10,500	.5	476562	1.5	836362	3.2	1196160	5.3	1554497	8.1	1913381
5"	5,875	.2	269584	.5	466933	1.0	673960	1.7	870948	2.5	1069878

Step 2 - Use Table below to determine how large a tank is required in order to vaporize the #BTU/HR you determined from Step 1 - use data for the coldest temperature you think it will ever be outside while you are drying.

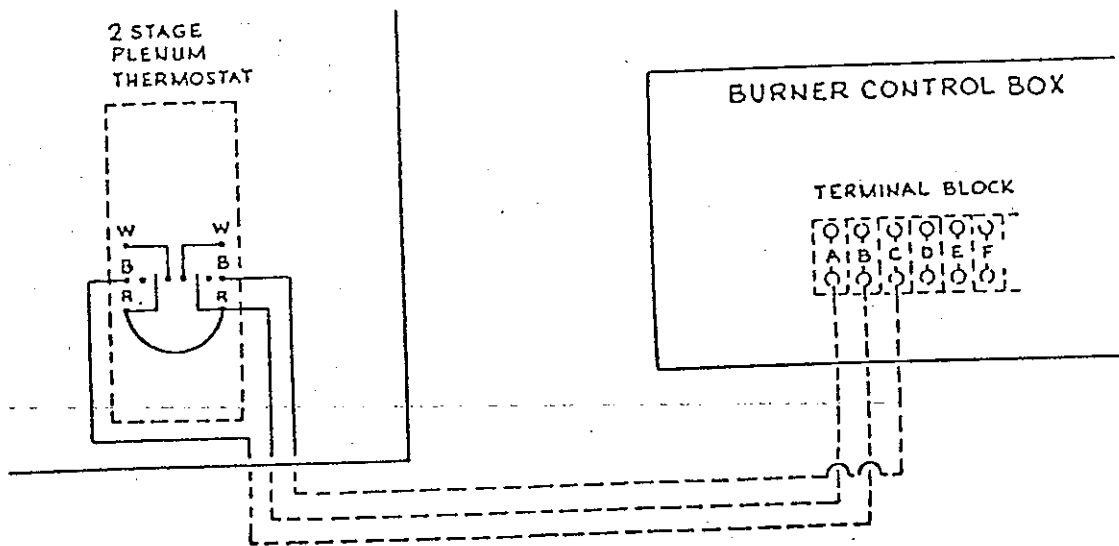
MINIMUM TANK SIZE FOR VAPOR PROPANE					
TANK SIZE	BTU/HR AT OUTSIDE TEMPERATURE				
	0°F	20°F	40°F	60°F	80°F
500 Gal.	350,000	500,000	650,000	800,000	950,000
750 Gal.	400,000	600,000	800,000	1,000,000	1,200,000
1,000 Gal.	500,000	700,000	900,000	1,100,000	1,300,000
1,500 Gal.	650,000	1,000,000	1,350,000	1,700,000	2,050,000
2,000 Gal.	800,000	1,300,000	1,800,000	2,300,000	2,800,000

APPENDIX II - INSTALLING 2 STAGE THERMOSTAT WHEN NOT USING SHIVVERS CIRCU-TROL

Mount the 2 Stage Thermostat in a water tight and vibration free enclosure in such a position that it allows the temperature probe to be mounted underneath perforated floor at least 12' from the fan(s). The probe may be suspended in the air chamber by any method that is convenient, however, it is recommended that you obtain a "Bottom Probe Housing" from SHIVVERS and install probe per diagram below.



Wire thermostat to terminal strip in fan control box per below:



APPENDIX III - MAINTAINANCE

The most common problem that occurs with any crop drying fan is bearing failure in the motor. In order to prevent rapid occurrence of this problem, we suggest that you do the following as a minimum maintainance program for your motor.

1. In the off season, allow the fan blade to be free wheeling, ie, do not prevent the blade from turning by covering or blocking blade.
2. Once every month, start the fan for thirty seconds to circulate the grease in the bearings, to relubricate all surfaces in the bearing. The oils in the grease may have settled to the bottom and this will help to re-mix.

As normal yearly maintainance, we suggest that the following be done prior to each drying season.

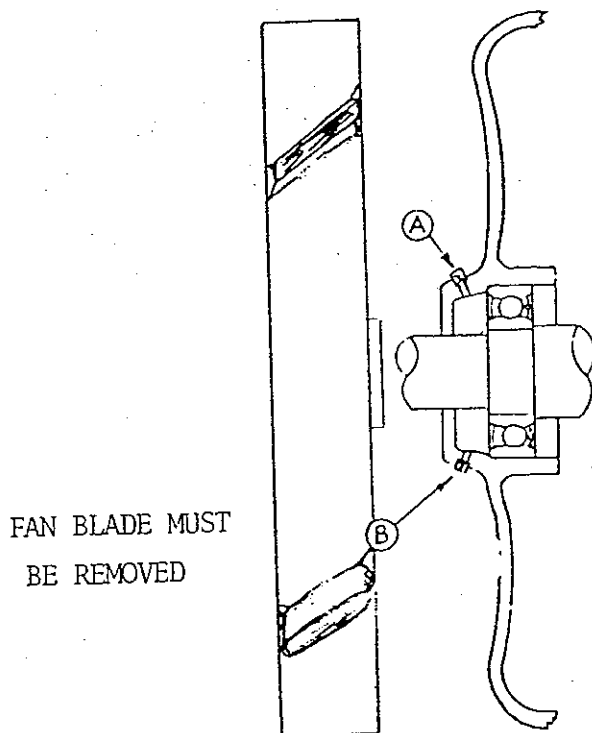
1. Remove the wire screen in the gas strainer and clean. You must remove both plugs at the bottom of the strainer to do so.
2. Rotate the fan blade by hand to be sure that it is free to turn.
3. Be sure that blade is not coated by any foreign material that could unbalance blade or prevent motor from coming up to full speed. In particular, check that blade is clean on motor side of blade.
4. Check all wiring and connections to be sure they are tight and in good condition. Be sure to check wire insulation as mice like to eat the insulation from the wires.

If you do want to regrease the motor bearings, follow the procedure listed below. We recommend relubricating these bearings every year, and replacing at five year intervals. Do NOT simply pump grease into the bearing as the wrong type of grease or too much grease can be as bad as no grease at all.

1. Remove fan venturi(shroud) and fan blade from motor. Be sure to note how these were installed.
2. For Marathon motors, use Chevron BRB-2 (made by Standard Oil) or equivalent. For Baldor motors, use Alvania #2 (made by Shell Oil) or equivalent. Be sure that any other grease you may choose to use is equivalent to these greases.

APPENDIX III - MAINTENANCE

3. Clean the housing around the filler and drain plugs (A) & (B). Remove the drain plug (B) and clean the hole of any hardened grease which may have accumulated. With motor not running, add new grease through the filler hole (A) until it starts to come out of the drain hole (B). Run the motor for about five minutes to expel any excessive grease. Replace plugs. Note: Do not run motors longer than five minutes as some of them do not have an internal fan and continual running could overheat the motor.



The procedure for rear end of motor is the same as described above.

CAUTION: When replacing fan blade on the motor, use utmost care in tightening bolts in tapered hub on blade. Reinstall bolt in the end of the motor shaft before starting fan. Clearance between the fan blade and housing should be set at $3/32$ " to $1/8$ " all around the blade. This blade must be centered in housing to insure good performance.

APPENDIX IV

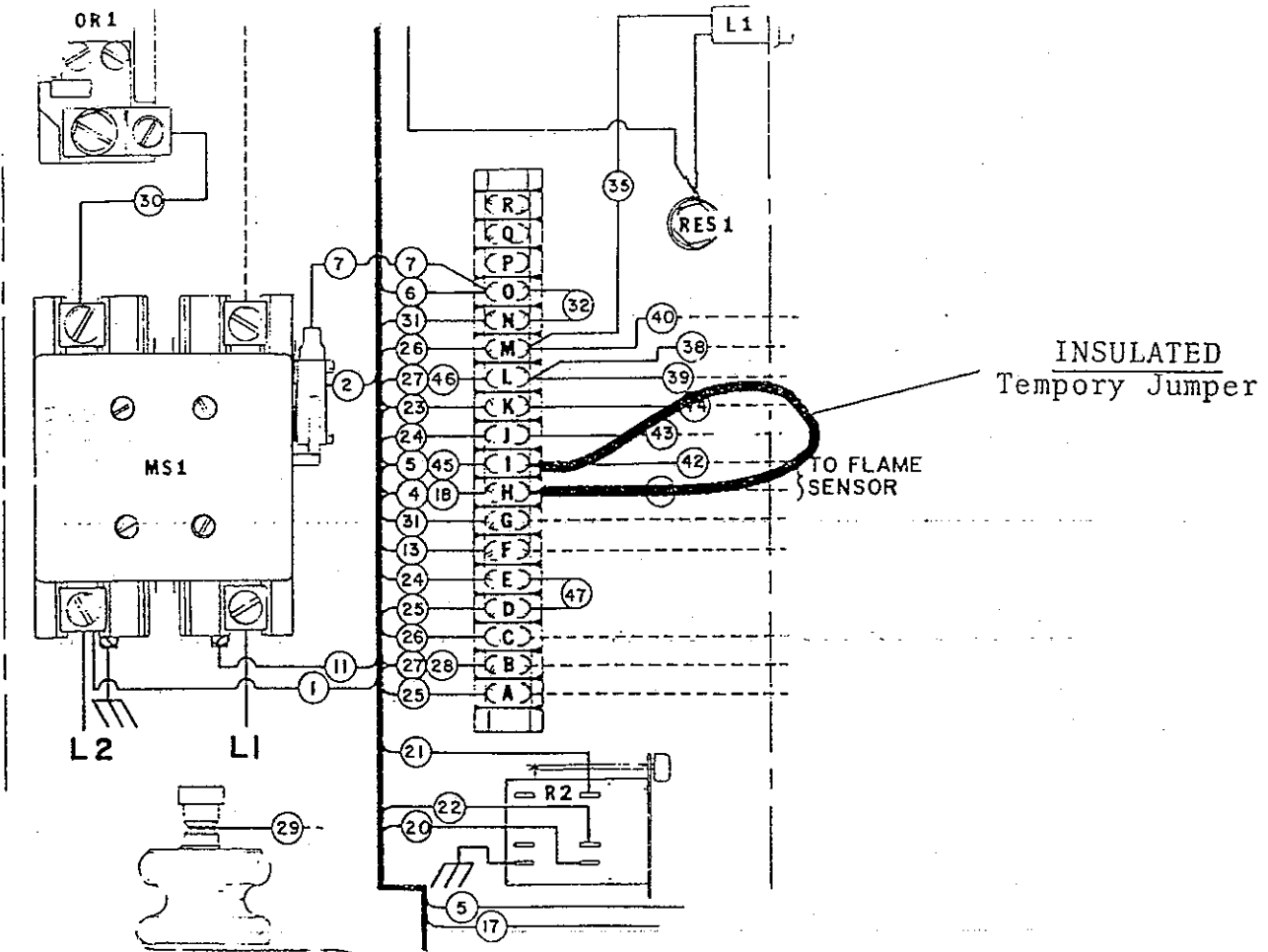
SPECIAL SAFETY DEVICE

YOUR BLUE FLAME DRYER IS EQUIPPED WITH A SPECIAL SAFETY DEVICE WHICH WILL PREVENT THE FAN MOTOR FROM STARTING IF THE FLAME SENSOR IS DEFECTIVE OR POORLY CONNECTED.

If your fan motor will not start you should:

- (1) Allow 10 minutes cooling if burner was fired. Fan will not start if flame sensor is hot.
- (2) Check for defective Flame Sensor if fan will not start after cooling. Temporarily connect jumper between terminals I and H on terminal strip inside fan control box. If fan starts only when jumper is in place, you have a bad flame sensor or poor connections to the flame switch. Replace flame sensor immediately. Operation of burner with defective flame sensor can result in dangerous accumulation of gas under bin floor.

Be careful. Jumper must be insulated.



SHIVVERS

CROP

DRYER

TROUBLE SHOOTING

GUIDE

DRYER TROUBLE SHOOTING MANUAL

DRYER CIRCUITS TO THE CIRCU-TROL

TROUBLE: THE FAN WILL NOT START

The following check list may be performed with a volt meter or test light that will operate on 120 volts. However, a meter that will read out 230 volts is preferable.

1. Make sure Main Power is turned on. L1 to L2 should read 220 volts on Single Phase. L3 is the wild leg on Three Phase.
 - (a) If two or more fans are used, be sure the Grain Hi-Limit Control Box is turned on.

(Checks 2 through 11 should read 120 volts to Ground.)

2. The F1 Fuse terminal at Wire #3 should read 120 volts. If no voltage exists, it indicates a bad fuse. Replace it with Part # E0918

(Hold down the Start Switch while making Checks 3 through 11.)

3. Check voltage at Terminal H. If no voltage exists and the fuse is good, it indicates a bad Start Switch S1. Replace it with Part # E1075.
4. If you have 120 volts at H, check I. If no voltage exists, it indicates a bad Flame Switch FS1. Temporarily jump H to I. If Fan runs, replace Flame Switch or wiring to Flame Switch. Do not continue to operate the Burner with a malfunctioning Flame Switch; as it is an essential part of the Safety Circuit. The Flame Switch Part # is E1078.
5. If Terminal I shows 120 volts, check Terminal O. If no voltage exists, it indicates a bad Fuse F2. If the fuse is okay, check the Start Switch S1 at Wire #9 or #10 connection, whichever the case may be.

The next 2 checks are performed on automatic resetting Hi-Limit Switches placed in the grain to detect high temperatures. They are designed to shut the drying units down if a malfunction should occur before the grain reaches dangerous or possible combustible temperatures.

HL6 is a 240° High Limit placed in the back of the Basket/Gear-box assembly and may be found on late 1979 and later models.

HL 1 and 2 are 200° High Limits place over the Entrance Collar and 8" to 10" above the Drying Floor.

If 2 or more drying units are used, these switches are wired back to a Grain Hi-Limit Control Box that shuts all drying units down if any 1 switch opens.

Wiring around these switches or jumping across and completing the circuit eliminates an important safety circuit. Caution: Do not operate the unit in this fashion.

6. If Terminal O shows 120 volts, check Terminal N. If no voltage exists, it indicates the Basket Hi-Limit has opened. You may unload some corn out of the unloading tube until the grain begins to come out cool. It may take a few minutes to cool the switch, closing it so the Fan will restart.
7. If Terminal N shows 120 volts, check Terminal F. If no voltage exists, the Grain Hi-Limit HL1 and HL2 has opened. You may remove the High Limits and allow them to cool while checking around the Probe Assembly to insure that fines or foreign material are not smoldering, causing the excess heat to open the switch. The fan may be started and the switches replaced if all else checks out okay. If high drying temperatures are being used and the problem reoccurs, it may be necessary to lower the drying temperature a few degrees. The High Limit Part # is E0970
8. If Terminal F shows 120 volts, check Stop Switch S2 at #12 Wire connection. If no voltage exists, it indicates the Overload Relay ORI needs to be pushed to be reset or Relay itself may be bad.
9. If Wire #12 on back of Stop Switch checks out at 120 volts, check Wire #11. If no voltage exists, replace Stop Switch S2, Part # E1075
10. If Wire #11 at Stop Switch checks out 120 volts, check it at the holding coil on the Magnetic Starter. If no voltage exists, the problem is the wire. If it shows 120 volts at the coil, check the Ground to the other terminal of the coil. If it is okay, the coil in the Starter is bad. It may be replaced, if one is available. If not, the complete Magnetic Starter will have to be replaced.
11. If Fan will run only as long as the Start Switch is held down, it indicates the Micro Switch on the side of the Magnetic Starter is open. The Switch Paddle may be broken or the Switch bad. Replace Micro Switch, if available. If it isn't, it is necessary to replace the complete Magnetic Starter.

Fast check of the preceding sequence while holding Start Switch down providing there is 120 volts at Wire #3 on Fuse:

	Description No.
Terminal H - Checks Start Switch	3
I - Checks Flame Switch	4
O - Checks Fuse F2	5
N - Checks Basket Hi-Limit	6
F - Checks Grain Hi-Limit	7
Wire #11 on Coil - Checks Stop Switch & OR1	8, 9 & 10

Pushing the Micro Switch Paddle down on the side of Magnetic Starter by-passes the Fuse's Start Switch and Flame Switch and should not be used if Fuses are blown or to by-pass the Flame Switch. This procedure may be used only as a check out procedure.

TROUBLE: THE FAN RUNS BUT THE HEATER WILL NOT FIRE

CHECK LIST

1. Grain Level Indicator may not be turned on.
2. Thermostat in Circu-Trol may be set to low. It should be set between 120 and 160 to start unit.
3. Gas may not be turned on at the tank or at the fan if there is a valve there.
4. Make sure T handle on Gas Regulator is screwed in far enough to allow gas pressure to flow through.

CHECK LIST OF RESETABLE SAFETY SWITCHES

1. No Flame Lockout R2

This will lock out any time (after the purge cycle) that the Burner tries to fire for 30 seconds, but no flame is present. For instance, if the unit runs out of gas, when it is restarted, it will be necessary to reset the No Flame Lockout R2. To reset, push the white button in the front of the unit.

It may be noted at this point - if the R2 Relay locks out a second time, the problem is not in the safety circuit. This indicates the safety circuit is complete, but that there still isn't any flame which indicates that the problem is in the Gas Solenoid Valves if no pressure shows on the gauge. If pressure shows on the gauge, check the Transformer for spark. The spark plug may be observed from the side window.

2. Burner Hi-Limit HL3 (Located next to the transformer in the right hand center of the Blue Flame Control Box.)

This Safety will sometimes be locked out by turning the fan and heater off at the same time and not allowing the fan to blow cool air across the burner ring allowing it to cool before turning the fan off. When the fan and heater are turned off at the same time, the heat in the burner ring will cause the Hi-Limit to lock out. Push the button in the center to reset.

3. Vaporizer Hi-Limit HL4

Located with the pipe train on the outside of the unit, this safety will lock out any time the gas vapor gets too hot. Push button in center to reset and move vaporizer out of the flame with the turnbuckle on the side to make the gas vaporizer cooler.

4. Plenum Hi-Limit (Located with Circu-Trol)

The Plenum Hi-Limit is usually placed in the same area as the Circu-Trol (Main Control Box for the Shivers Unit) It is located in the Plenum Probe Weldment that holds the thermostat bulb (or coil) that controls the cycling of the heater. Push the button to reset.

Special Note: If this unit is in the second year of use or after, it may be necessary to remove the Plenum Probe Weldment to check the back of the Hi-Limit. Sometimes mice get under the bin and will chew on the wires causing an open circuit, (heater not to turn on) or sometimes causing a short, blowing one of the 5 Amp Fuses in the Blue Flame Control Box.

This completes the list of Resetable Safety Switches.

CIRCUIT SEQUENCE CHECK LIST

The following check list may be preformed with a volt meter or test light that will operate on 120 volts. However, a meter that will read out 230 volts is preferable.

1. Check Terminal A. If it does not show 120 volts, the problem is in the Burner Safety Circuit.

Comment: We will go through the Burner Circuit in reverse to find the open part of the circuit.

- A. Check Terminal K. If it shows 120 volts, check Terminal J. No volts indicate open or bad vaporizer Hi-Limit HL4. Push button in center to reset. If it is bad, replace it with Part # E1095.
- B. Check Wire #22 connection on Burner Hi-Limit HL3. If it shows 120 volts, and Wire #23 or Terminal K shows no voltage, it indicates open or bad Burner Hi-Limit. Push button in the center to reset. If it is bad, replace it with Part # E0846.
- C. Check Wire #21 connection on No Flame Lockout. Relay R2, if it shows 120 volts and Wire #22 does not, the No Flame Lockout is open or bad. Push white reset button. If it is bad, replace with Part # E1096
- D. Check Wire #16 connection on Burner Switch S3. If it shows 120 volts and Wire #21 does not, the switch is open or bad. Replace it with Burner Switch Part # E1076

- E. Check Wire #9 connection on Purge Relay R1. If it shows 120 volts and Wire #16 does not, it indicates an open Purge Relay. See G through I below.
- F. If Wire #9 shows no voltage, check Fuse F2.
- G. If Wire #9 shows 120 volts, check Wire #14 connection on Delay Timer DT2. No voltage indicates Fuse F4 open or blown, providing Wire #8 connection on Fuse shows 120 volts. Replace with ¼ Amp Fuse, Part # E1118.
- H. If Wire #14 connection on the Delay Timer DT2 shows 120 volts, check Wire #15 connection on the Delay Timer. No voltage indicates bad Delay Timer. Replace it with Part # E1081.
- I. Sometimes Wire #15 will show 120 volts and not have enough amperage to pull in the Purge Relay. To check this, place a jumper between Wire #14 and Wire #15 on the Delay Timer. If the Purge Relay pulls in, it indicates a bad Timer. Replace it and do not operate Heater without this Timer in the Safety Circuit as its function is to allow the fan to clear any gases or dust out of the unit before the Heater fires.
- J. If Wire #15 shows 120 volts on connection at Purge Relay, check Ground wire. If it is okay, replace Purge Relay R1, Part # E1096.

Fast check of the preceding sequence #1 with the fan running:

	Description	Letter
Wire #16	- Checks the Purge Relay	E
#21	- Checks the Burner Switch	D
#22	- Checks the No Flame Lockout	C
Terminal K	- Checks the Burner Hi-Limit	B
J	- Checks the Vaporizer Hi-Limit	A

- 2. If Terminal A shows 120 volts, check Terminal B. If no voltage exists, the problem is in the Circuits at the Circu-Trol.

At the Circu-Trol, make the following checks after you have determined that Terminal A above reads 120 volts. The following checks should read out 120 volts. Terminals G through L in the Circu-Trol are a part of the Fan and Heater Circuit and not part of the Circu-Lator Circuit. Power from Terminal A at the Fan and Heater comes into the Circu-Trol at Terminal K.

FIELD WIRING REVISION

(3-1-81.)

We are recommending a change in the field wiring of the Blue Flame Dryer to the (74C Circu-trol previous Hutsonville model) (model 295 delux Circu-trol present model).

We are now recommending that terminal -A- in the Blue Flame be wired to terminal -J- in the Circu-trol (instead of -K-) and that terminal -B- be wired to terminal -K- (instead of -J-). In other words we are just reversing the wires to -J- and -K- to simplify the hookup and the circuit.

This wiring change reverses the checkout procedure, as follows.

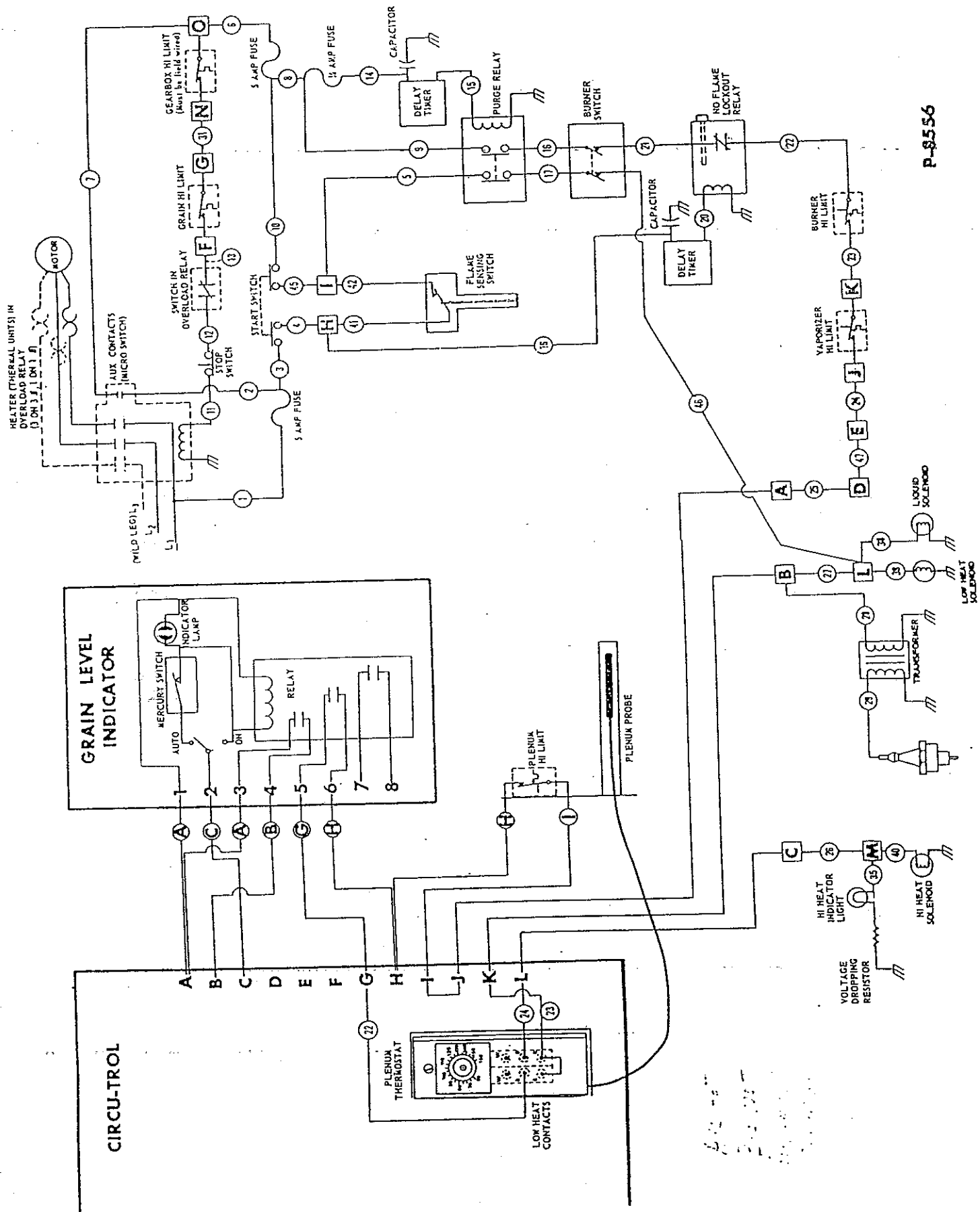
1. If terminal -A- at the fan and heater has 120 volts, check terminal -J- in the Circu-trol for 120 volts to insure that the wire from the fan and heater has not been broken.
2. If terminal -J- shows 120 volts check terminal -I- there should be a jumper from -J- to -I- making it show 120 volts.
3. If terminal -I- shows 120 volts check terminal -H- if no voltage exists, check the plenum Hi-Limit in the weldment that holds the thermostat bulb or coil, which controls the fan and heater. It may be necessary to remove the weldment to check the wiring on back of the switch. Mice sometimes chew on these wires and chew them in two. To check this an insulated jumper may be placed between -H- & -I-.
4. If terminal -H- shows 120 volts check terminal -G- if no voltage exists, it indicates a problem in the Grain Level Indicator. An insulated jumper may be placed between -G- and -H- to check this.
NOTE: Make sure the Grain Level Indicator is turned on.
5. If terminal -G- shows 120 volts check terminal -K-. If no voltage exists, check the thermostat. It should be turned up to 120° to 160°. After this has been done and terminal -K- still does not show 120 volts, remove the cover from the thermostat. Check the left hand terminal -B- screw, it receives power from -G- on the terminal strip. If the left hand -B- screw shows 120 volts, check the -R- terminals if no voltage exists it indicates a bad thermostat. Replace it with a like model. There have been different ones used over the years. Some are interchangeable. Check with the factory if questionable.

3-1-81

3. If Terminal B shows 120 volts, it is jumped to Terminal L. It should also show 120 volts. If it does, and the Burner still will not fire, the problem may be one of the following:
 - A. The Transformer can usually be checked by observing the Spark Plug firing through the glass window in the side of the Blue Flame.
 - B. If the Spark Plug is firing, check the Pressure Gauge for pressure. If no pressure exists and the gas is turned on at the tank, slowly loosen the connection between the gas line and the heater pipe train. If pressure exists here, check C below.
 - C. Slowly loosen a connection at the vaporizer. If no pressure exists, it indicates a problem in the Liquid Solenoid Valve or a plugged strainer. If pressure exists here, check D below.
 - D. Make sure the handle on Gas Regulator is screwed in enough to allow pressure to flow through. Slowly loosen the pipe union in the lower part of the gas train. If no pressure exists here, the problem is in the Gas Regulator or the Lo-Heat Solenoid Valve.
 - E. If pressure shows on the gauge and no spark can be observed, it indicates the problem is in the Transformer or Spark Plug.

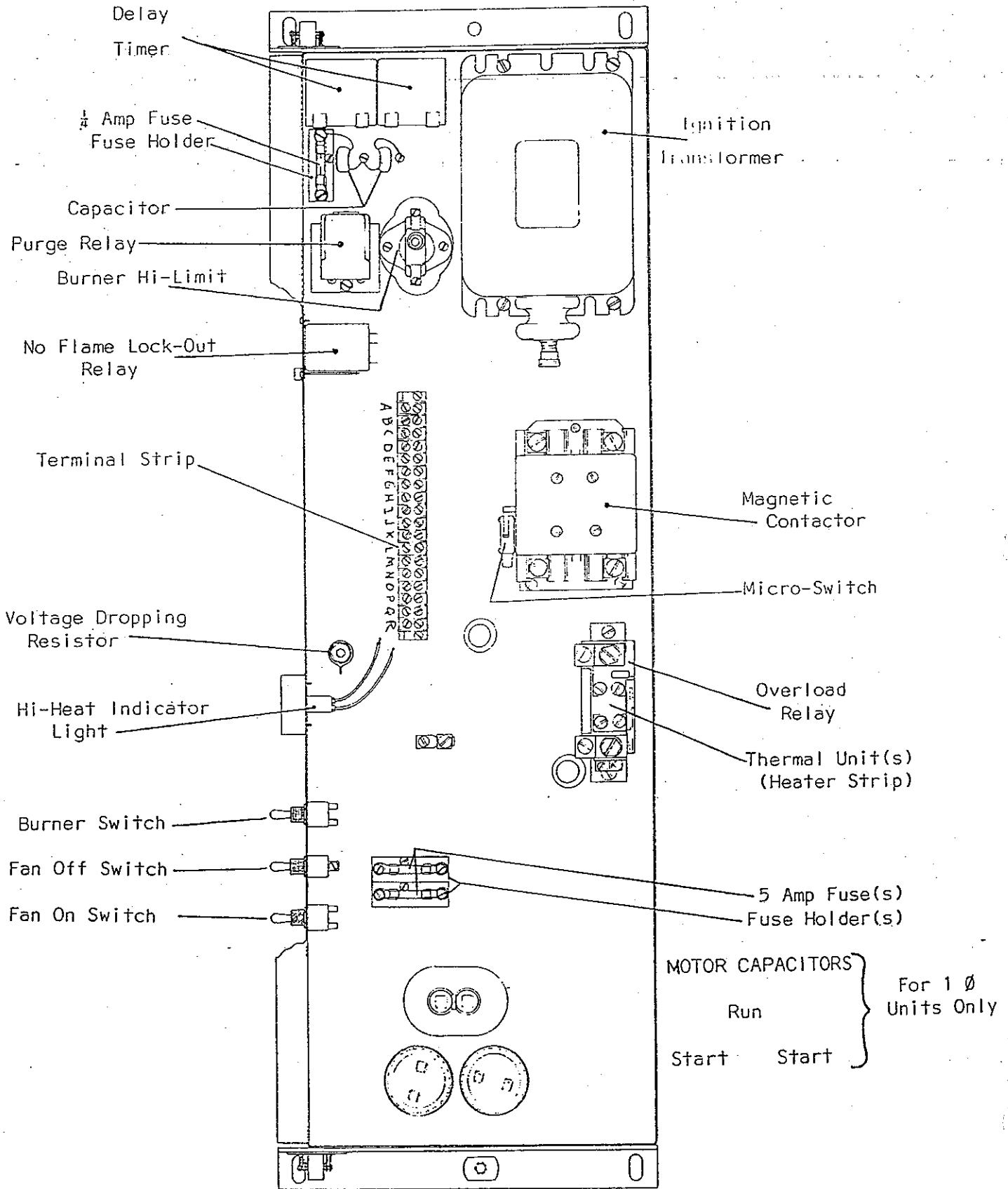
Fast Check: After the Fan has been running about 1 minute or time enough for the Purge Relay to close, push down on the Fan Start Switch. If the Burner fires while holding the Fan Start Switch down and goes out when it is let up:

1. It indicates the problem is in the (a) Burner Hi-Limit, (b) Vaporizer Hi-Limit in the Blue Flame Control Box or in the Circu-Trol, (c) Thermostat, (d) Grain Level Indicator (e) wiring between Blue Flame Control Box and the Circu-Trol.
2. If the Burner does not fire while holding the Start Switch down, the problem is in the (a) Purge Relay, (b) Burner Switch (c) Transformer or Spark Plug, (d) Liquid Solenoid, (e) Regulator, (f) Lo Heat Solenoid.

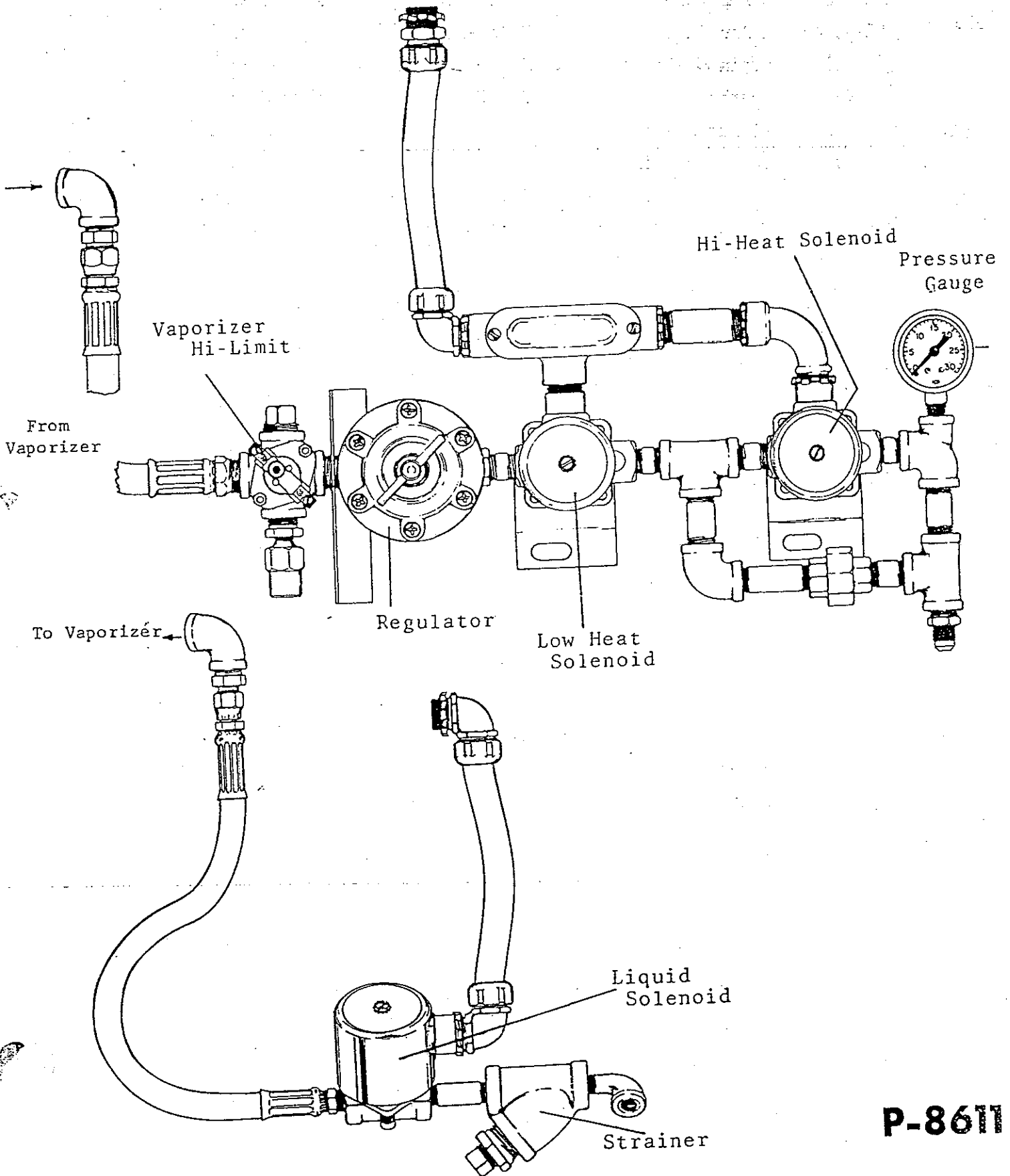


P-8556

BLUE FLAME COMPONENT DIAGRAM



BLUE FLAME PIPE TRAINS



P-8611

BLUE FLAME REPLACEMENT PARTS

FUSES	{	E-5267	5 Amp Fuse	"slow-blow" type fuse, glass
		E-5264	¼ Amp Fuse	"slow-blow" type fuse, glass
HI-LIMITS	{	E-5228	Grain Hi-Limit	200 F., auto reset protector
		E-5376	Gearbox Hi-Limit	240 F., auto reset protector
		E-5133	Plenum Hi-Limit	220 F., manual reset protector
		E-5133	Burner Hi-Limit	220 F., manual reset protector
		E-5227	Vaporizer Hi-Limit	140 F., manual reset protector
		E-5105	Plenum Thermostat	2-Stage bulb type, 5' capillary
		E-5272	Indicator Light	12 VAC, requires resistor
		E-5269	Resistor	Voltage dropping, 120 VAC-12 VAC
SWITCHES	{	E-5287	Fan Switch, On	Momentary switch, normally open
		E-5100	Fan Switch, Off	Momentary switch, normally closed
		E-5288	Burner Switch	DPST toggle switch
RELAYS	{	E-5077	Purge Relay	2 pole relay, 120 VAC coil
		E-5068	substitute	3 pole relay, 120 VAC coil
		E-5312	No Flame Lockout Relay	manual reset relay, 120 VAC coil
		E-5273	Capacitor	
		E-5268	Delay Timer	timer, transmits current after 30 sec.
PROPANE SOLENOIDS & PARTS	{	E-5252	Liquid Solenoid	B228, 1/4 inch, normally closed, complete
		E-5298	Solenoid Repair Kit	for liquid solenoid
		E-5250	Low Heat Solenoid	B3P, 3/8 inch, normally closed, complete
		E-5250	Hi Heat Solenoid	B3P, 3/8 inch, normally closed, complete
		E-5297	Solenoid Repair Kit	for LP vapor solenoids
		E-5299	Solenoid Coil	for all LP solenoids
MISC. ELECTRICAL	{	E-5238	Spark Plug	
		E-5293 5490	Transformer	ignition transformer, 120 VAC primary, 10,000 volt secondary
		E-5290	Flame Sensor	flame switch, N.C., opens at 200 F.
		E-5291	Ceramic Cap	normally sold as set w/ flame sensor
		E-5271	Fuse Holder	1 pole, for glass "slow-blow" fuses
		69-111P	Ignition Rod	used as ground rod for spark plug
		69-220A	Spark Plug Wire	complete w/ braided sheath
		H-1216	Pressure Gauge	30 lb., 1/4 inch bottom connection
		H-1123	Regulator	1584YL, 0-50 pound rated
69-157A	Wire Harness	for flame sensor, w/ braided sheath		

	M-5232	Motor, 1Ø	1Ø Marathon, 220 volt
	E-5382	Capacitor, Start	electrolytic, round, black, for Marathon
	E-5383	Capacitor, Run	oil, oval, metal, for Marathon
	M-5241	Motor, 1Ø	1Ø Baldor, 220 volt
	E-5241	Capacitor, Start	electrolytic, round, black, for Baldor
	E-5242	Capacitor, Run	oil, oval, metal, for Baldor
	M-5243	Motor, 3Ø	3Ø Marathon, 220-440 volt
	M-5242	Motor, 3Ø	3Ø Baldor, 220-440 volt
	E-5355	Magnetic contactor	contactor, 2 pole, for 1Ø unit
	E-5130	Overload Relay	for 1Ø unit, 1 pole
	E-5243	Thermal Unit	F61.4B heater strip, for 1Ø unit
	E-5356	Magnetic Contactor	contactor, 3 pole, for 3Ø unit
	E-5384	Overload Relay	for 3Ø unit, 3 pole
	E-5024-09	Thermal Unit	C36.6B heater strip, for 3Ø unit
MICRO-SWITCH---	E-5296	Micro-switch kit	auxiliary contacts for E-5355 & E-5356
	E-5357	" "	SHORT ARM

NATURAL
GAS
SOLENOIDS
&
PARTS

{	E-5240	Solenoid	ASCO 8215A70, 1½ inch, normally closed, complete. Used for all solenoids.
	E-5432	Solenoid Coil	for ASCO 8215A70 solenoid, all natural gas units

