GSI GRAIN CONDITIONING SYSTEMS

2003

DRYER OPERATION AND SERVICE MANUAL

PNEG-552
COMPETITOR SERIES 2000
DRYER MODELS

THE GSI GROUP

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ROOF DAMAGE WARNING AND DISCLAIMER

GSI DOES NOT WARRANT ANY ROOF DAMAGE CAUSED BY EXCESSIVE VACUUM OR INTERNAL PRESSURE FROM FANS OR OTHER AIR MOVING SYSTEMS. ADEQUATE VENTILATION AND/OR "MAKEUP AIR" DEVICES SHOULD BE PROVIDED FOR ALL POWERED AIR HANDLING SYSTEMS. GSI DOES NOT RECOMMEND THE USE OF DOWNWARD FLOW SYSTEMS (SUCTION). SEVERE ROOF DAMAGE CAN RESULT FROM ANY BLOCKAGE OF AIR PASSAGES. RUNNING FANS DURING HIGH HUMIDITY/COLD WEATHER CONDITIONS CAN CAUSE AIR EXHAUST OR INTAKE PORTS TO FREEZE.

DRYER OPERATION

Thank you for choosing a GSI/ Airstream product. It is designed to give excellent performance and service for many years.

This manual describes the operation and service for all standard Competitor Series 2000 single fan grain dryers. These models are available for liquid propane or natural gas fuel supply, with either single phase 230 volt, or three phase 220 or 440 volt electrical power.

The principal concern of the GSI Group, Inc. ("GSI") is your safety and the safety of others associated with grain handling equipment. This manual is written to help you understand safe operating procedures, and some of the problems that may be encountered by the operator or other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards and precautions exist, and to inform all personnel associated with the equipment, or who are in the dryer area. Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation, where serious injury or death may occur.

SAFETY ALERT SYMBOL

The symbol shown is used to call your attention to instructions concerning your personal safety. Watch for this symbol; it points out important safety precautions. It means "ATTENTION", "WARNING", "CAUTION", and "DANGER". Read the message and be cautious to the possibility of personal injury or death.

WARNING! BE ALERT!

Personnel operating or working around electric fans should read this manual. This manual must be delivered with the equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

SAFETY ALERT DECALS

The GSI Group, Inc. recommends contacting your local power company, and having a representative survey your installation so the wiring is compatible with their system, and adequate power is supplied to your unit.

Safety decals should be read and understood by all people in the grain handling area. The bottom right decal should be present on the inside bin door cover of the two ring door, 24" porthole door cover and the roof manway cover.

If a decal is damaged or is missing contact:

The GSI Group, Inc.
1004 E. Illinois St.
Assumption, IL 62510
217-226-4421

A free replacement will be sent to you.

SAFETY ALERT DECALS

Three decals displayed on all Airstream Dryers. Belt drives, chain driven meter rolls and combustible fuels must be treated as potential danger.

SAFETY PRECAUTIONS

1. Read and understand the operating manual before trying to operate the dryer.

2. Never operate the dryer while the guards are removed.

3. Power supply should be OFF for service of electrical components. Use CAUTION in checking voltage or other procedures requiring power to be ON.

4. Check for gas leaks at all gas pipe connections. If any leaks are detected, do not operate dryer. Shut down and repair before further operation.

5. Never attempt to operate the dryer by jumping or otherwise bypassing any safety devices on the unit.

6. Set pressure regulator to avoid excessive gas pressure applied to burner during ignition and when burner is in operation. See chart for operating procedures. Do not exceed maximum recommended drying temperature.

7. Keep the dryer clean. Do not allow fine material to accumulate in the plenum chamber.

8. Keep auger drive belts tight enough to prevent slippage.

9. Use CAUTION in working around high speed fans, gas burners, augers and auxiliary conveyors which START AUTOMATICALLY.

10. Do not operate in any area where combustible material will be drawn into the fan.

11. Before attempting to remove and reinstall any propellor, make certain to read the recommended procedure listed within the servicing section of the manual.

12. Be certain that capacities of auxiliary conveyors are matched to dryer auger capacities.

13. Clean grain is easier to dry. Fine material increases resistance to airflow and requires removal of extra moisture.

READ THESE INSTRUCTIONS BEFORE OPERATION AND SERVICE

SAVE FOR FUTURE REFERENCE

USE CAUTION IN THE OPERATION OF THIS EQUIPMENT

The design and manufacture of this dryer is directed toward operator safety. However, the very nature of a grain dryer having a gas burner, high voltage electrical equipment and high speed rotating parts, does present a hazard to personnel, which can not be completely safeguarded against, without interfering with efficient operation and reasonable access to components.

Use extreme caution in working around high speed fans, gas-fired heaters, augers and auxiliary conveyors, which may start without warning when the dryer is operating on automatic control.

KEEP THE DRYER CLEAN
DO NOT ALLOW FINE
MATERIAL TO ACCUMULATE
IN THE PLENUM CHAMBER
OR SURROUNDING THE
OUTSIDE OF THE DRYER

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

Take special note of the safety precautions listed above before attempting to operate the dryer.

DRYER CONTROL PANEL

Programming Instructions

Setting timers, time delays and temperatures

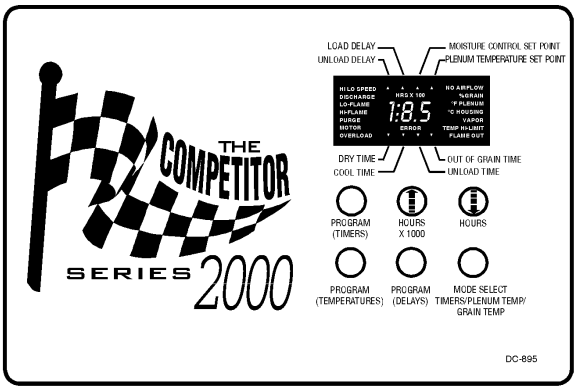
1. Press the button for the program that you wish to change the time or temperature in.
2. Use the increase and decrease buttons to change the present time or temperature.
3. After the time or temperature has been changed, the computer automatically accepts the new value.

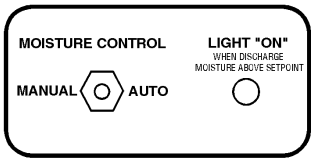
Using the mode select

1. Pressing the mode select button will toggle the display between timer values, grain temperature and plenum temperature.

Checking the hour meter

Pressing the increase button changes the display to the total hours on the dryer. It will automatically return to the main screen after the button is released.





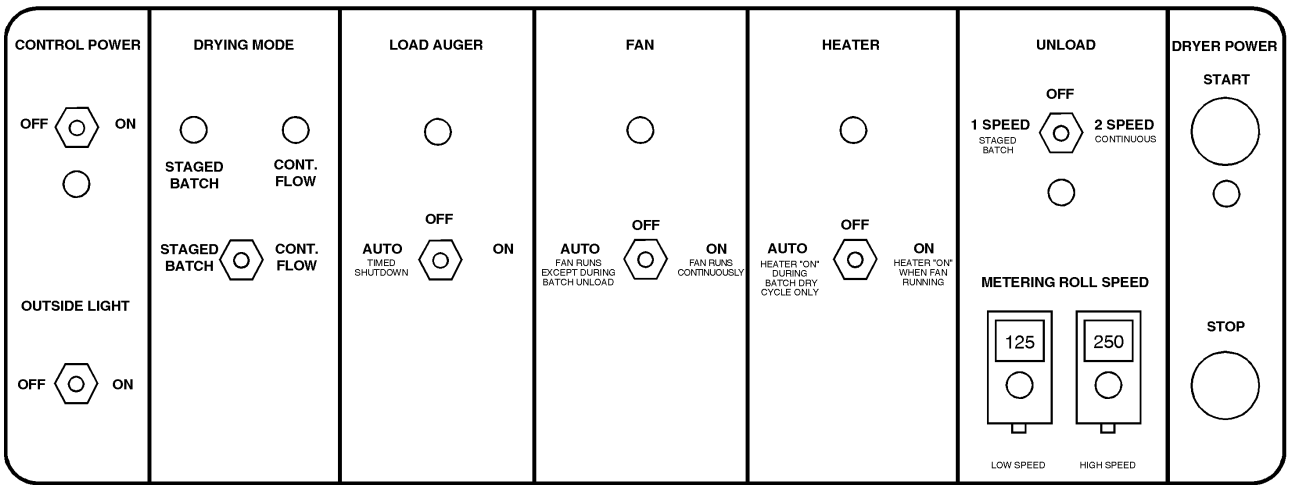


Figure 1: The grain dryer control panel.

DRYER CONTROL PANEL FEATURING THE COMPETITOR SERIES 2000 CONTROL SYSTEM

The control panel provides easy access to gauges and controls. The Competitor Series 2000 Control System is a computerized control system that gives instant information regarding dryer operation.

MOISTURE CONTROL

The Series 2000 Dryer has a built in moisture control. It controls the moisture level of discharged grain by sensing grain column temperature.

MOISTURE CONTROL SWITCH

This switch turns the power on or off to the moisture control. The light beside the switch is illuminated when the grain column temperature is below the moisture control set point.

CONTROL POWER SWITCH

The power to the Competitor 2000 Control System is turned on or off with this switch.

OUTSIDE LIGHT

The dryer outside light is turned on or off here.

DRYING MODE SWITCH

This is used to select staged batch or continuous flow drying.

LOAD AUGER SWITCH

This is used to select the operation of the fill auger. In both the auto and manual position the load auger will operate if the dryer is low on grain and will automatically shut off when the dryer is full. In the auto position only, the dryer will shut down after a preset period of time set on the out of grain timer.

Note: If the load auxiliary motor overload relay is being utilized in the dryer control panel, this switch will also control the operation of the auxiliary equipment.

FAN SWITCH

The fan is turned on or off with this switch. The on position operates the fan continuously during staged batch and continuous flow modes. The auto position operates the fan in staged batch during the dry and cool cycle. The light comes on only when air pressure is sensed.

HEATER SWITCH

This switch is used to turn the burner on or off. The auto position operates the burner in staged batch during the dry cycle. The on position will operate the burner only when the fan is running. The burner light comes on only when flame is detected.

UNLOAD SWITCH

The unload switch turns the metering rolls and discharge auger on or off, and selects the operation of the metering rolls.

- In the 2 speed position if the moisture control switch is on, and the drying mode switch is turned to continuous flow, the metering roll speed will alternate between the high speed metering roll potentiometer setting and the low speed metering roll potentiometer setting depending on the control signal from the moisture control thermostat. The discharge auger will operate continuously.

- In the 1 speed position, if the moisture control switch is on, and the drying mode switch is turned to continuous flow, the metering roll speed will operate at the high speed metering roll potentiometer setting or turn off depending on the control signal from the moisture control thermostat. The discharge auger will operate whenever the metering rolls are operating.

- In both the 1 speed or the 2 speed position, if the moisture control switch is off, and the drying mode switch is turned to continuous flow, the metering roll speed can be manually controlled by adjusting the high speed metering roll potentiometer. The discharge auger will operate continuously.

- If the drying mode switch is turned to staged batch, the unload switch should be set to the 1 speed position. The discharge auger and metering rolls will only operate during the unload cycle of the staged batch operation, and the speed of the metering rolls is adjusted using the high speed metering roll potentiometer.

Note: If the unload auxiliary motor overload relay is being utilized in the dryer control panel, the same switch will also control the operation of the auxiliary equipment.

LOW SPEED METERING ROLL POTENTIOMETER

This is used to adjust the low speed of the metering roll when the 2 speed automatic moisture control feature of the dryer is in use.

HIGH SPEED METERING ROLL POTENTIOMETER

This is used to:

- Set the high speed of the metering roll when the two speed automatic moisture control feature of the dryer is utilized.
- Set the speed of the metering rolls when the one speed automatic moisture control feature of the dryer is utilized.
- Set the speed of the metering rolls during continuous flow operation when the moisture control is not used.
- Set the rate of grain discharge from the dryer during the unload cycle of staged batch dryer operation.

DRYER POWER START SWITCH

This switch starts and operates the dryer based on switch settings. If other switch settings are in the off position, individual dryer components can be operated by turning the drying mode switch to continuous flow, pressing the dryer power start button and then turning on the desired dryer component.

DRYER POWER STOP SWITCH

This switch stops all dryer functions. If an automatic dryer shutdown occurs, first determine and correct the cause of the shutdown. Press the dryer power stop button to reset the dryer before restarting.

DRYER CONTROL PANEL

SERIES 2000 CONTROL SYSTEM

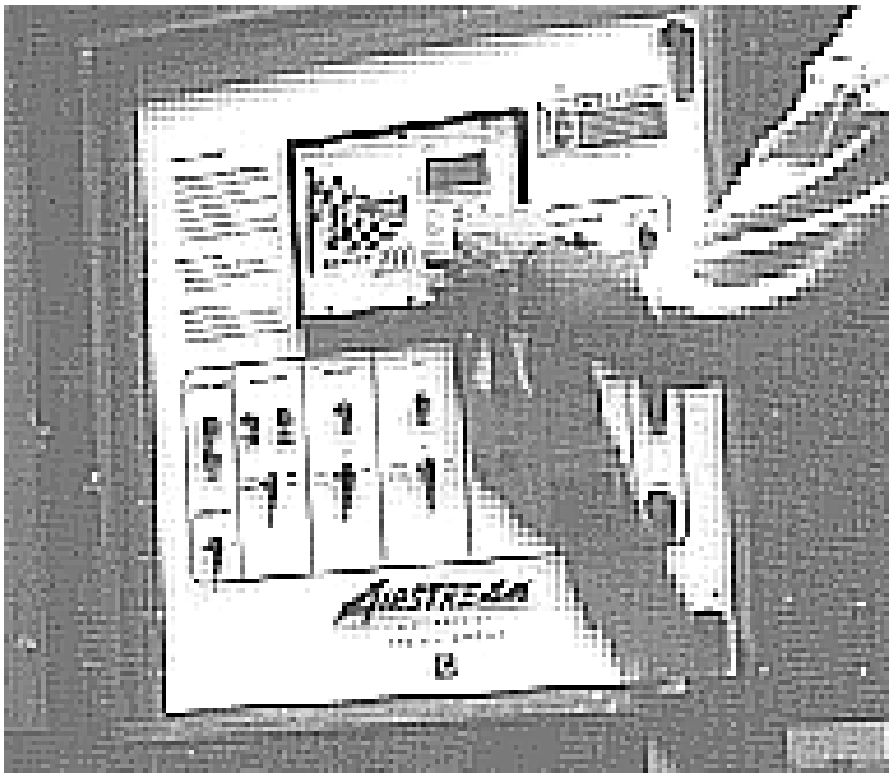
The 2000 Control System controls all timing functions and safety circuit checks. It is designed to simplify dryer operation by providing messages and warnings on its liquid crystal display (LCD).

TURNING ON THE SERIES 2000 CONTROL SYSTEM

Turn the control power switch to on. The monitor will display "GSI" and the current software version number.

SETTING THE DRY, COOL, UNLOAD AND OUT OF GRAIN TIMERS

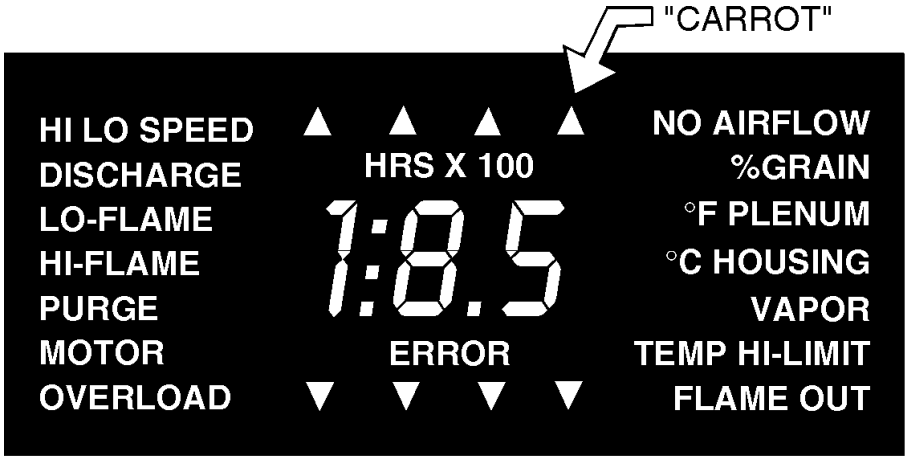
These switches are used to set the cycle times in the staged batch drying mode only. The drying mode switch must be in the staged batch position. Out of grain sets the length of time the dryer will run before shutting down when the load switch is in the auto position. To change the setting of these timers follow these instructions:



The Airstream Competitor 2000 Series Dryer Control Panel.

1. Press the PROGRAM (TIMERS) button until the "carrot" is above the timer you want to modify.
2. Use the up and down arrow keys to change from the present time to the desired setting. The new time is automatically accepted.
3. Keep pressing the PROGRAM (TIMERS) button until the carrot disappears or press the mode select button once to exit.

During the operation the remaining time on each timer is displayed on the screen. If the power goes out or if the dryer is stopped, these times are saved by the controller. When



The dryer LCD display.

the dryer is restarted the timers will continue timing down. The timers will return to their initial settings by pressing and holding the "stop" button for 5 seconds.

SETTING THE LOAD AND UNLOAD DELAYS

The load delay is used to delay the starting of the load auger when the dryer is unloading to prevent the load auger from starting and stopping too often. The unload delay is used to control the amount of time the unload auger runs after the metering rolls stop to allow for auger cleanout.

1. Press the PROGRAM (DELAYS) button until the carrot is under the time delay to be changed.

2. Use the up and down arrow keys to change from the present time to the new one. The new time is automatically entered.

3. Keep pressing the PROGRAM (DELAYS) button until the carrot disappears or press the mode select button once to exit.

SETTING THE MOISTURE CONTROL AND PLENUM SET POINT

1. Press the PROGRAM (TEMPERATURES) button until the carrot is under the temperature setting to be changed.

2. Use the up and down arrow keys to change from the present temperature to the new one. The new time is automatically entered.

3. Keep pressing the PROGRAM (TEMPERATURES) button until the carrot disappears or press the mode select button once to exit.

DRYER SAFETY CIRCUIT

The Competitor Series 2000 Control System continuously checks all safety circuits on the dryer, and will automatically shut the dryer down should a problem occur. The cause of the dryer shutdown will be shown on the LCD display. To restart the dryer after a safety shutdown, first correct the reason for the shutdown, and then press the dryer power stop button to reset the circuit. Press the start button.

MONITORING GRAIN TEMPERATURES, PLENUM TEMPERATURE OR TIMERS

Use the mode select to decide which of the modes you want to view.

CHECKING THE HOUR METER

Press the up arrow key and the total hours on the machine are displayed.

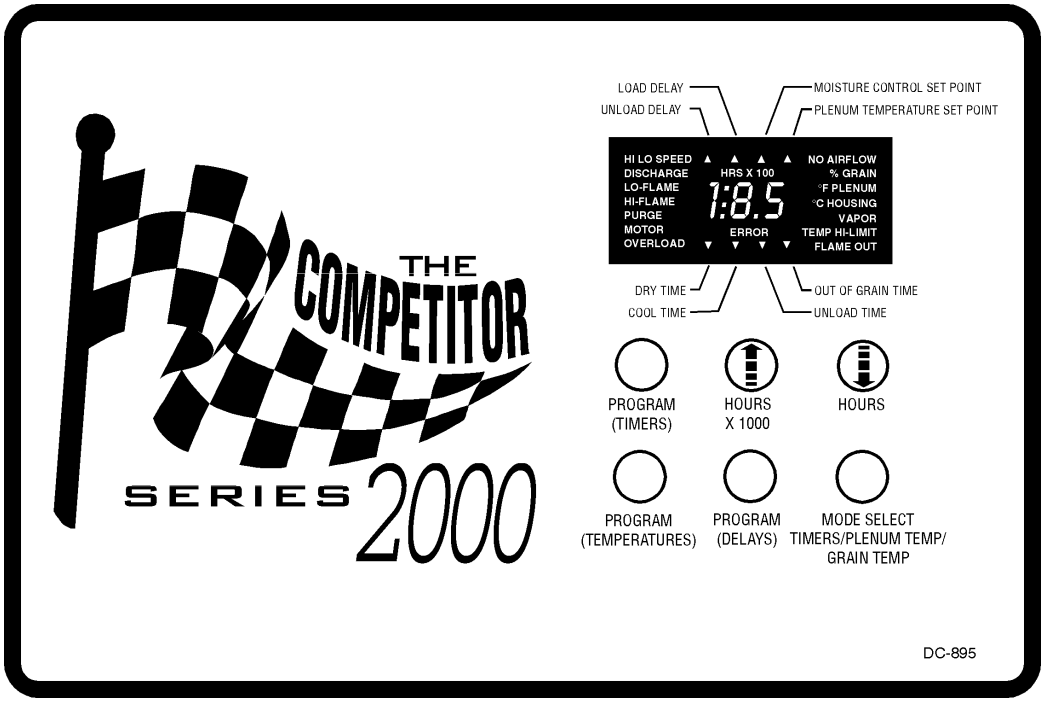


Figure 2: The Competitor Series 2000 Control System

DRYER CONTROL PANEL

SPECIAL FEATURES

EMERGENCY COOLING MODE

An emergency cooling mode can be entered by switching the next to the top switch (number seven) on the dip switch located inside the control box on the back of the computer control board. This will enable a mode which allows an operator to run the dryer fan only, in the case there is a plenum temperature or grain high limit warning. When either of these safeties shuts down the dryer, you can run the fan to help cool the grain and/or plenum high limit back down to a safe level. After changing the switch press the start button and only the fan will run for approximately five minutes.

BURNER ON/OFF OPERATION

The need has developed for an on/off burner in recent years, due to changing fuel conditions, and also to aid in drying wheat or other low temperature grains in hot weather.

By moving the third switch (number six) on the dip switch located inside the control box on the back of the computer control board, the burner can be changed from a hi-lo burner to an on/off burner operation. The burner will operate exactly the same as the hi-lo burner, however, when the set point is reached the burner is cycled off instead of going to a lower pressure. The vaporizer cools much quicker and allows us to keep a closer tolerance on the set point.

SAFETY CIRCUIT SHUTDOWN MESSAGES

VAPOR HIGH TEMPERATURE

The LP gas vapor temperature sensor located in the gas pipe train downstream from the vaporizer, has opened indicating that the vaporizor is running too hot and must be readjusted. This sensor is set at 200°F and automatically resets itself when cool.

LOSS OF FLAME

The flame sensor has failed to detect a burner flame indicating that the burner has failed to light, there is a problem with the flame sensing circuitry or the dryer is not getting burner fuel.

HOUSING HIGH TEMPERATURE

The temperature high limit located on the fan/burner housing has opened, indicating an over temperature condition has occurred toward the rear of the fan/heater housing in an oblong covered electrical box. This control is set at 200°F and **MUST BE MANUALLY RESET.**

REAR DISCHARGE WARNING

The lid on the grain discharge box has opened, indicating that grain is not being taken away fast enough at the discharge box.

MOTOR OVERLOAD

One of the thermal overloads on either the fan, load, unload or auxiliary motors has opened, indicating an overcurrent condition. The overloads **MUST BE MANUALLY RESET.**

GRAIN HIGH TEMPERATURE

An over temperature condition has occurred in one of the grain columns causing the control to shutdown the dryer. This control is set at 210°F and automatically resets itself when cool.

OUT OF GRAIN

The dryer has run low on grain, and the out of grain timer has timed out, shutting the dryer down. The unload auger will clean out the dryer if in continuous flow operation.

PLENUM HIGH TEMPERATURE

An over temperature condition has occurred inside the dryer plenum. This control is a 300°F limit and automatically resets itself when cool. See emergency cooling mode above.

NO AIRFLOW

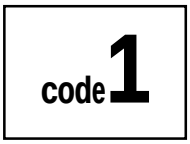
The contacts in the air switch have opened due to insufficient airflow for the burner to operate. The contacts in the air switch have opened due to the fan not turning, or the air switch may need adjusting.

AIR

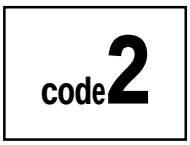
The air switch contacts have closed prior to the fan starting, indicating a freewheeling blade or improper setting of the air switch.

ERROR CONDITIONS

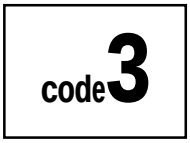
ERROR CODE BREAKDOWN



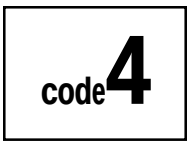
Continuous flow to batch mode change. This error occurs whenever you try to change from continuous flow mode to the batch mode without shutting down the dryer first.



Grain temperature probe open. This error occurs whenever one of the grain temperature probes or wires going to the probe opens, and the circuit has an infinite resistance.

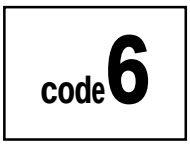


Grain temperature probe shorted. This error occurs whenever one of the grain probes or wires going to the probes shorts together or to the frame of the dryer.



Plenum temperature probe open. This error occurs whenever one of the plenum temperature probes or wires going to the probe opens, and the circuit has an infinite resistance.

Plenum temperature probe shorted. This error occurs whenever one of the plenum temperature probes or wires going to the probes shorts together or to the frame of the dryer.



Flame probe short. This error occurs whenever the flame probe shorts to ground or on the occasion the AC and DC neutrals somehow get shorted together. To try and fix this problem the first thing to check and see of the flame probe is actually shorted. If this is not the case then you must diagnose the AC and DC neutral circuit. These two circuits must be kept separate. Pull the white J7-13 wire loose from the circuit board. If this removes the problem then go to the temperature probes on the dryer and start unwiring them one at a time while continuing to check for the shorted condition between the AC and DC ground. If this does not remove the short then replace the J7-13 wire and recheck for a shorted neutral condition. The best way to check for an AC to DC ground short is to set your meter for resistance (usually about 200ohms) and place one probe on terminal J7-20 and put the other probe to the metal of the dryer (dryer control box). There should be an open circuit between these two points.

LIMIT SWITCHES

The following limit switch errors light up individually on the LCD screen: PLENUM, HOUSING, VAPOR, TEMP HI LIMIT, REAR DISCHARGE.

Note: When a shutdown does occur due to an error condition, the amount of time elapsed since the shutdown can be viewed by pressing the down arrow switch (up to 218 hours).

DRYER PRE START CHECKS

PRE SEASON INSPECTION

Before the dryer is filled, thoroughly inspect the unit and check the operation of the dryer as follows.

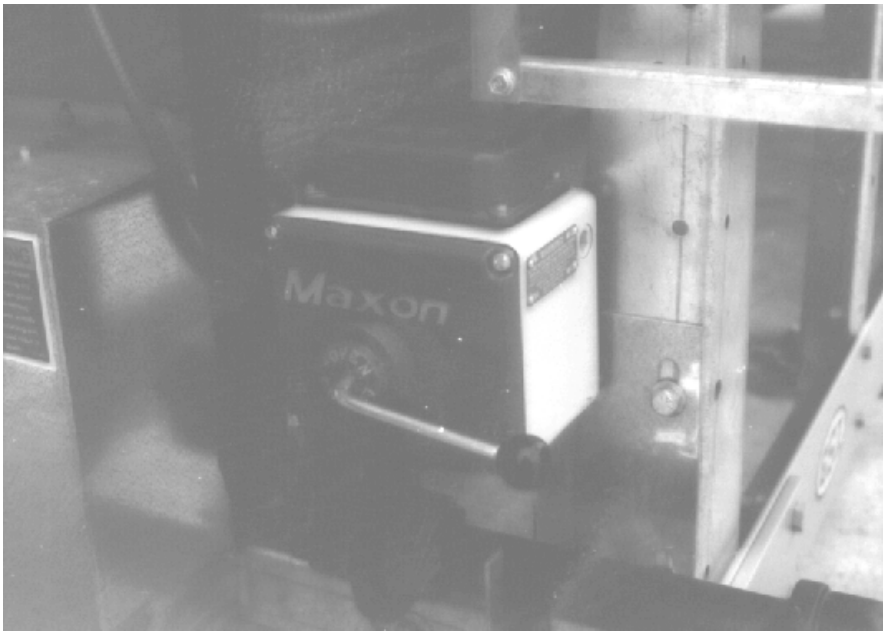
INSPECT THE METERING ROLLS

Open all metering roll access doors and inspect each compartment for any bolts, nuts or other foreign material, that may cause possible jamming of the metering rolls.

BEFORE ATTEMPTING TO OPERATE THE DRYER MAKE SURE ALL SAFETY SHIELDS ARE IN PLACE, ALL BOTTOM CLEANOUT AND REAR ACCESS DOORS ARE CLOSED AND ALL PERSONNEL ARE CLEAR OF THE DRYER

SET CONTROL SWITCHES

Moisture Control Switch-ON
Moisture Control Thermostat-200°
Load Switch-OFF
Unload Switch-OFF
Fan Switch-OFF
Burner Switch-OFF
Out of Grain Timer-8 MINUTE
Load Delay-30 SECONDS
Unload Delay-30 SECONDS
Metering Roll Speed-LOW AND HIGH SPEED SETTINGS PUT ON ZERO
Dry Timer-60 MINUTE
Cool timer-20 MINUTE
Unload timer-10 SECONDS
Mode Switch-CONTINUOUS FLOW



The Maxon safety shut off valve.

ELECTRICAL POWER

Turn on the electrical power supply to the dryer, set all circuit breakers to on, including the safety disconnect handle mounted on front of the dryer's power panel.

CONTROL POWER SWITCH

Turn the control power switch to on. The switch light comes on. "GSI" and the software version will appear. At this point the controller will lock out all other dryer functions and the dryer will perform its safety circuit check. If a fault is found, the cause will be displayed on the LCD. If all safeties are found safe, the controller will supply power to the electronic fuel shut off valve (if so equipped). Press the start button to initialize the computer.

POWER START BUTTON

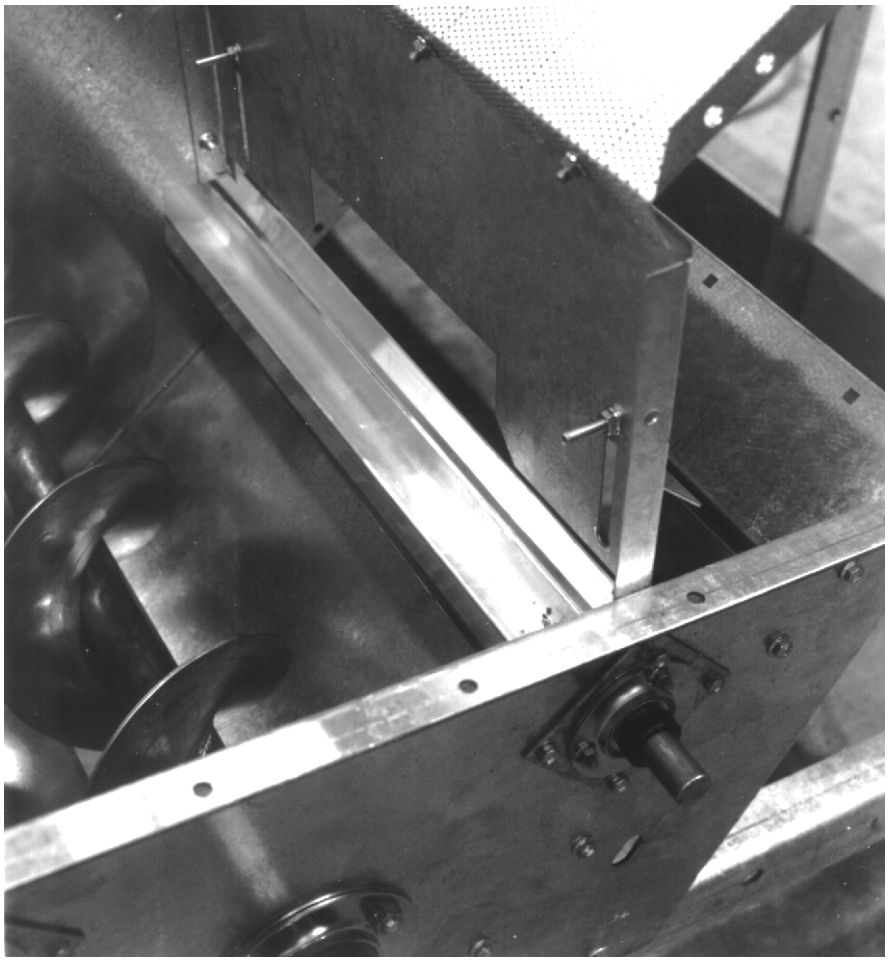
Push the dryer start button, and all the toggle switches on the control panel will be activated.

FUEL CHECK

If using LP gas, make sure the tank has plenty of fuel and that the **TANK DOES NOT HAVE A REGULATOR MOUNTED TO IT.** If using natural gas, make sure an adequate supply is available.

If using LP gas, slowly open the main fuel supply valve at the tank. If using natural gas, turn on the valve along the supply line. Then, open the electronic shut off valve (Maxon valve), if so equipped, or open the manual shut off valve on the dryer to allow fuel flow to the dryer. Inspect all gas lines and connections for possible leaks. **ANY GAS LEAKS NEED TO BE FIXED IMMEDIATELY!**

DRYER PRE START CHECKS



The metering roll access area.

LOAD AUGER

With the grain supply shut off, quickly bump the load auger switch to manual, and see if the load auger rotates clockwise as viewed from the drive end, or counterclockwise if the dryer is a front load model. If the wet grain supply auxiliary is wired to the dryer it should also rotate in the correct direction at this time. Turn the load auger switch to the auto position. The top auger and wet grain supply auxiliary should run for one minute, and then the dryer will shut down leaving the safety shutdown message (out of grain) displayed. Press the dryer power stop button to reset the panel, then press the start button to resume operation.

ONE SPEED OPERATION

To check one speed operation place the unload switch in the one speed setting. Turn up the high speed metering roll dial until the metering rolls start rotating. The bottom auger should rotate counterclockwise as viewed from the drive end. The metering roll drive motor should rotate clockwise as viewed from the drive end of the gear box. If the dry grain take away auxiliary is wired to the dryer, it should start and rotate in the proper direction.

METERING ROLL OPERATION

To check the metering roll operation turn either the low speed or high speed knob clockwise, and the metering roll speed should increase. Turning either knob counterclockwise will decrease the speed. Make sure the drive chain tension is properly adjusted and all sections of the metering rolls rotate. Turn the unload switch off after these checks are complete. The bottom auger will continue to run for 30 seconds after the switch is turned off to allow for cleanout.

FAN SWITCH

Bump the fan switch and observe the fan rotation. The fan should run counterclockwise. Sometimes on three phase models all motors on the dryer will run backwards. They can easily be reversed by interchanging two of three power supply wires. Reverse the two outside wires, L1 and L3, and leave the middle one in the same position.

Note: If the dryer is empty, the burner will not operate. The fans cannot create enough static pressure to engage the air switch. You will receive a "no airflow" message.

To start the dryer when it is low on grain, the airflow switches must be turned off.

BURNER SAFETY

To check the burner safety function, first make sure the main gas valve is off. Turn the fan switch on and allow the fan to start. Then, turn the

heater switch on. The dryer will shut down after 20 seconds. The safety message, "loss of flame" will appear.

BURNER TEST FIRE

Test fire the burner by starting the fan, and then turn the burner switch to on. Turn on the fuel supply, and the burner should ignite after a short purge delay of approximately 10 seconds. Gas pressure should be shown on the gauge. At this time set the hi-fire and lo-fire pressure settings. Use the pressure regulator for hi-fire and the ball valve for lo-fire. The burner should cycle between high and low fire, approximately 4 to 5 times per minute.

Approximate settings should be:

LP Gas	Hi-Fire 6-15 lbs.
	Lo-Fire 2-6 lbs.
Natural Gas	Hi-Fire 6-10 lbs.
	Lo-Fire 1-3 lbs.

If the burner remains on hi-fire and does not cycle, increase the regulator setting on the propane models, or the supply valve on the natural gas models in order to reach the thermostat setting. If the burner remains in lo-fire and does not cycle, slightly decease gas pressure with the lo-fire control valve. If the gas pressure is decreased too much a popping or fluttering sound will be heard. Also, anytime the high pressure regulator is adjusted the low pressure ball valve side needs to be checked.

STAGED BATCH CHECK

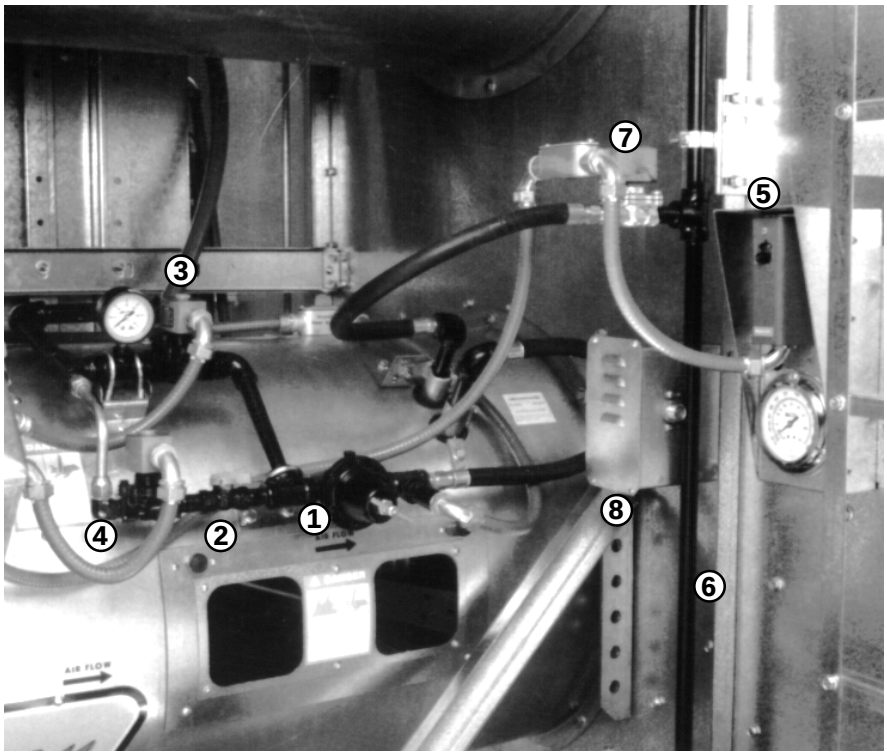
To check the staged batch operation, turn the control power switchto the on position. Open the main fuel supply valve at the tank on an LP dryer or valve in the fuel supply line on a natural gas dryer. Turn the drying mode switch to the staged batch position. Turn on the electric shut off valve to allow fuel flow to the dryer, if so equipped. Turn the load switch to auto, the unload switch to one speed and the fan and burner to on. Push the dryer power start button and the controller will sequentially start all dryer components in their proper order. If any switches are not in their correct position for staged batch operation, the dryer will indicate improper switch position, and will not start until the switches are in the proper position. After starting, all batch timers will time down in sequence. When the unload cycle is complete the timers will automatically reset to their original settings, and start the dry timer again.

DRYER SHUTDOWN

To shutdown the dryer, first close the fuel supply valve at the tank or valve along the fuel line. If the burner is operating, let the dryer run out of fuel, and it will shutdown automatically due to loss of flame. Close the fuel valve at the dryer, and press the dryer power stop button. Turn off the safety disconnect handle on the front of the power box, and turn off the main power to the dryer.

EMERGENCY

In case of emergency push the dryer power stop button. The fan, burner and all augers will stop immediately.



The dryer fan and heater controls featuring: 1-pressure regulator, 2-lo-fire ball valve, 3-high pressure solenoid, 4-low pressure solenoid, 5-hi-lo fire thermostat (assembly includes thermometer), 6-fuel supply line, 7-LP solenoid or supply ball valve(NG) and 8-air pressure switch.

DRYER START UP

STAGED BATCH OPERATION

1. Turn the control power switch to on.

2. Make sure the drying mode switch is turned to staged batch.

3. Open the main fuel supply valve on the tank if using LP gas, or the valve in the fuel supply line if using natural gas. Turn on the electric shut off, Maxon valve (if so equipped), or open the manual shut off valve to allow fuel flow to the dryer.

4. Set switches to the following settings:
   Load-Auto
   Fan-Auto
   Burner-Auto
   Unload-1 speed

5. To start the drying operation push the dryer power start button. The controller will start all the dryer components in their proper order. If any of the selected switches are improperly positioned for staged batch drying, the display will indicate the proper switch position, and will not allow the dryer to operate until the position of the switch is corrected.

6. The dryer should already be filled with grain. And the load auger switch is set to auto. In both the auto and manual position, the grain level switch will automatically keep the dryer full of grain. In the auto position the dryer will shut down after the preset time period on the out of grain timer, or if the grain flow to the dryer is interrupted.

7. The fan will start and airflow is checked.

8. After purging for approximately 10 seconds the burner will fire. For information concerning burner adjustment see the pre start section of this manual.

9. To properly set the correct dry, cool and unload time for various moisture content grains. See the chart on page 18.

10. If the dryer is being operated in all heat, move the fan switch to the on position. In this position the fan will run continuously during the dry, cool and unload stages of the staged batch operation. If the dryer is being operated in the dry and cool mode, the preferred position for the fan switch is the on position, so the fan will run continuously. If desired, the fan can be turned off during the un-

FAN & HEATER SWITCH SETTINGS

Fan Setting	Heater Setting	Fan Function	Heater Function
Auto	Auto	Fans stay on during dry and cool cycle only	Burners stay on during dry timer cycle only
Auto	On	Fans stay on during dry and cool cycle only	Burners stay on during dry and cool
On	On	Fans are on continuously	Burners are on continuously
On	Auto	Fans are on continuously	Burners shut down at the end of the dry cycle

At the end of the dry cycle in staged batch, the fans and heaters will continue running if the moisture control is "on", until the preset temperature on the moisture control thermostat is reached.

load cycle of the dry-cool-unload sequence by turning the fan switch to auto.

11. If the dryer is being operated in all heat, move the heater switch to on. The burner will operate whenever the fan is operating. If the dryer is being used in dry and cool, turn the heater switch to auto and the burner will automatically shut down during the cooling and unloading cycles.

12. The bottom auger and metering rolls will start automatically during the unload cycle of the dry-cool-unload mode, along with any grain handling equipment that is wired to the dryer. The speed at which the metering rolls operate during the unload cycle is adjusted by using the high speed metering roll knob. Turning the dial clockwise will increase the grain discharge rate, and counterclockwise will decrease the discharge rate.

13. To control the length of the dry cycle using only the dry time setting programmed into the system, turn the moisture control setting to off. To use the automatic moisture control so that the dry time is determined, not only by the dry time setting, but also by the moisture content of the drying grain, turn the moisture control switch to on.

14. To shutdown the dryer, close the fuel supply valve at the fuel tank or fuel source. If the burner is operating, let the dryer run out of fuel causing an automatic shutdown due to a loss of flame. Close the fuel valve at the dryer, and press the dryer power stop button. Turn off the dryer's main circuit breaker located on the front of the power panel. Turn off the main power supply to the dryer.

15. In case of an emergency press the dryer power stop button. The burner, fan and all augers will stop immediately.

DRYER START UP

100 SERIES BATCH TIMER SETTINGS

		Full Heat Fan & Burner Switches on Manual				Dry & Cool Fans on Manual Burners on Auto			
Initial Moisture	Moisture Removed	Approx. Dry Time	Dry	Cool	Unload*	Approx. Dry Time	Dry	Cool	Unload*
17%	2 pts.	16 min.	6 min.	0	10 min.	18 min.	18 min.	18 min.	10 min.
18%	3 pts.	21 min.	11 min.	0	10 min.	24 min.	24 min.	18 min.	10 min.
19%	4 pts.	26 min	16 min	0	10 min.	30 min	30 min	18 min	10 min.
20%	5 pts.	31.5 min.	21.5 min.	0	10 min.	35 min.	35 min.	18 min.	10 min.
21%	6 pts.	37 min.	27 min.	0	10 min.	40 min.	40 min.	18 min.	10 min.
22%	7 pts.	41.5 min.	31.5 min.	0	10 min.	45 min.	45 min.	18 min.	10 min.
23%	8 pts.	47 min.	37 min.	0	10 min.	50 min.	50 min.	18 min.	10 min.
24%	9 pts.	51 min.	47 min.	0	10 min.	55 min.	55 min.	18 min.	10 min.
25%	10 pts.	54 min.	44 min.	0	10 min.	60 min.	60 min.	18 min.	10 min.
26%	11 pts.	58 min.	48 min.	0	10 min.	65 min.	65 min.	18 min.	10 min.
27%	12 pts.	62 min.	52 min.	0	10 min.	70 min.	70 min.	18 min.	10 min.
28%	13 pts.	66.5 min.	56.5 min.	0	10 min.	75 min.	75 min.	18 min.	10 min.
29%	14 pts.	71.5 min.	61.5 min.	0	10 min.	80 min.	80 min.	18 min.	10 min.
30%	15 pts.	76 min.	66 min.	0	10 min.	85 min.	85 min.	18 min.	10 min.
31%	16 pts.	81 min.	71 min.	0	10 min.	90 min.	90 min.	18 min.	10 min.
32%	17 pts.	86 min.	76 min.	0	10 min.	95 min.	95 min.	18 min.	10 min.
33%	18 pts.	91 min.	81 min.	0	10 min.	100 min.	100 min.	18 min.	10 min.
34%	19 pts.	96 min.	86 min.	0	10 min.	105 min.	105 min.	18 min.	10 min.
35%	20 pts.	100 min.	90 min.	0	10 min.	110 min.	110 min.	18 min.	10 min.

These are approximate starting points.

*Set unload meter roll high speed setting to 999. If unload equipment cannot adequately keep up, lower the speed setting and add time to the unload timer setting to completely unload the batch. In full heat mode, the time added to the unload timer will need to be substracted from the dry timer. If fan is on auto and does not run during unload, set cool timer to 25 minutes.

New unload time calculation = present unload time $\times \frac{\text{new dial setting}}{1000}$

Example

$13.75 = 11 \div \frac{800}{1000}$

DRYER START UP

Standard electrical safety practices and codes should be used when working with a dryer. Refer to the National Electric Code Standard Handbook by the National Fire Protection Association. *A qualified electrician should make all wiring installations.*

ALWAYS DISCONNECT AND LOCK OUT POWER BEFORE WORKING ON OR AROUND DRYER

FULL START UP CHECK

This start up procedure assumes the following:

1. That you have read and understand the DRYER OPERATION AND SERVICE MANUAL.
2. That you have taken special note of all SAFETY PRECAUTIONS.
3. That all safety shields are in place.
4. That all meter roll access doors have been opened and all foreign objects have been removed.
5. That you have done a pre start up check out.
6. That all motors have been checked for proper rotation.
7. That all heaters have been test fired.
8. That the fuel has been turned on at the tank.
9. That the electric power has been turned on.
10. That the main disconnect switch on the dryer is on.
11. That you have wet grain in the wet holding bin.
12. That you know the incoming grain moisture.
13. That you have the dry grain take away equipment in place.
14. That you have the grain going to the proper bin.
15. That all switches have been set to the off position.
16. That the load mercury switch box is installed with the side stamped up, in the up position.

FILLING THE DRYER

1. Turn the CONTROL POWER switch to ON.
2. Turn the DRYING MODE switch to CONTINUOUS FLOW.
3. Make sure the UNLOAD switch is in the OFF position.
4. Push the DRYER POWER start switch.
5. Turn the LOAD AUGER switch to the MANUAL position to fill the dryer. The load auger should start and run until the dryer is full, then shut off automatically. (If the switch is set to the AUTO position the dryer will shut down each time the out of grain timer times out, and will have to be restarted.)
6. When the dryer has filled, turn the LOAD AUGER switch to the AUTO position.

DRYER START UP

STARTING THE DRYER

This start up procedure is for a cold start on wet grain for continuous flow operation.

1. Set the MAXON or FAST ACTION HAND VALVE on the incoming fuel line to the ON position.
2. Make sure the MOISTURE CONTROL switch is in the OFF position.
3. Turn the FAN switch to the ON position.
4. Adjust the AIR PRESSURE SWITCH if necessary.
5. Turn the HEATER switch to the ON position. The heater will purge for about 10 seconds then ignite. If flame is detected the dryer will run, if not a "loss of flame" error will occur. If this happens check gas supply, and all valves in the fuel line to make sure they are ON.

ADJUSTING THE TEMPERATURE

1. Press the PROGRAM(TEMPERATURES) button until the "carrot" is above the timer you want to modify.
2. Use the up and down arrow keys to change from the present temperature to the desired setting. The new temperature is automatically accepted.
3. Keep pressing the PROGRAM(TEMPERATURES) button until the carrot disappears or press the MODE SELECT button once to exit.
4. On LP gas models adjust the PRESSURE REGULATOR (high fire) on the burner fuel line, so that burner will reach the thermostat setting and switch to (low fire) (pressures may be required up to 25 lbs.). Natural gas does not have a regulator, but uses a LARGE BALL VALVE close to the vertical supply line for adjustment (pressures may be required up to 18 lbs.).

   On LP gas models adjust the small RED HANDLED BALL VALVE (low fire) so that the burner maintains flame then switches back to (high fire). Natural gas has a BALL VALVE close to the burner control box, for low fire adjustment.
5. Adjust the burner pressure so that the burner CYCLES 4 times per minute (approx. 10 sec. on HIGH--approx. 5 sec. on LOW). When on HIGH FIRE increasing the pressure with the pressure regulator **DECREASES** the time spent on high fire. When on LOW FIRE increasing the low fire pressure with the RED BALL VALVE **INCREASES** the time spent on low fire.
6. On LP gas models adjust the VAPORIZER so the fuel pipes going to the burner from the regulator are warm to the touch (not hot and cold).

How much gas pressure do I use? See step number four in the *Adjusting The Temperature* section.

How often should my burner cycle? See step number five in the *Adjusting The Temperature* section.

The vaporizer can be adjusted two ways. First, by loosening the bolt in the hinging mechanism and swinging it to a hotter or cooler position. Second, by loosening the two bolts in the hinge pipe and sliding the vaporizer in or out to a cooler or hotter position. Either one or both methods may have to be used to get the vaporizer to the proper temperature. Natural gas does not use a vaporizer.

FULL HEAT-CONTINUOUS FLOW OPERATION

How often do I make speed adjustment? See step number ten in the *Full Heat-Continuous Flow Operation* section.

1. Look at the chart on page 22 (CONTINUOUS FLOW METERING ROLL SETTINGS-FULL HEAT). You will see the settings for (Initial Moisture) (Moisture Removed) (Approx. Drying Time) (1 Speed) (2 Speed Low) (2 Speed High) pick the line that has your initial starting moisture. These are the settings we will be referring to during this start up procedure.
2. Make sure the UNLOAD switch is OFF.
3. Make sure the MOISTURE CONTROL switch is OFF.
4. Run the fan and heater for about 10% longer than the (Approx. Drying Time) required for the moisture you are trying to dry.
5. Example: 10% removal would be about 54 minutes, 15% removal would be about 76 minutes and 20% removal would be about 100 minutes. Add 10 minutes to insure that the grain is dry.
6. After the time in step 4 turn the UNLOAD to 1 SPEED and set the METER ROLL SPEED, (HIGH SPEED) potentiometer to the setting for 1 SPEED operation. Grain should begin to run at this time. Run time for this is about 10% longer than the (Approx. Drying Time) required for the moisture you are trying to dry, as shown in the example #5 above. This allows the moisture in the dryer to reach an even gradient top to bottom without having any highs or lows in it. It will however, over dry some of the corn a little.
7. Increase the plenum temperature set point to 190°F.
8. DO NOT TRY TO ADJUST THE DRYER FOR MOISTURE DURING THIS PROCESS OR YOU WILL ESTABLISH HIGH AND LOW SWINGS IN THE MOISTURE CONTROL. IT WILL TAKE SEVERAL HOURS TO WORK ITSELF OUT.
9. After the run time in step 6 you are ready to set up the moisture control. Turn the MOISTURE CONTROL to the ON position. Set the temperature to about 95°F.
10. Turn the UNLOAD to 2 SPEED. Set the METER ROLL SPEED, LOW SPEED and HIGH SPEED potentiometers to the settings listed for them. Let the dryer run on these settings as shown in the example #5 before

trying to adjust moisture or meter roll settings. These settings will not have your grain moisture adjusted exactly where you want it, but will be a good place to start initially. A little different moisture at the bottom of the storage bin is not usually a problem as long as you have full floor aeration.

11. After the run time in step 10 you are ready to adjust the moisture control, and the meter roll speeds if required. Each time you make an adjustment to the moisture control it will take about the time shown in example #5 to see the results of this adjustment.

100 SERIES CONTINUOUS FLOW METERING ROLL SETTINGS

		Full Heat			
Initial Moisture	Moisture Removed	Approx. Dry Time	1 Speed	2 Speed Low	2 Speed High
17%	2 pts.	16 min.	625	317	875
18%	3 pts.	21 min.	476	270	775
19%	4 pts.	26 min	385	241	675
20%	5 pts.	31.5 min.	317	213	575
21%	6 pts.	37 min.	270	196	476
22%	7 pts.	41.5 min.	241	185	385
23%	8 pts.	47 min.	213	172	317
24%	9 pts.	51 min.	196	161	270
25%	10 pts.	54 min.	185	150	241
26%	11 pts.	58 min.	172	140	213
27%	12 pts.	62 min.	161	132	196
28%	13 pts.	66.5 min.	150	123	185
29%	14 pts.	71.5 min.	140	116	172
30%	15 pts.	76 min.	132	110	161
31%	16 pts.	81 min.	123	104	150
32%	17 pts.	86 min.	116	100	140
33%	18 pts.	91 min.	110	096	132
34%	19 pts.	96 min.	104	087	123
35%	20 pts.	100 min.	100	082	116

These are approximate starting points.

How do I set my moisture control? See step number one in the *Adjusting The Moisture Control* section.

ADJUSTING THE MOISTURE CONTROL

1. 5° on the MOISTURE CONTROL will change the output moisture by about 1%. Example: 100° is set, you are getting 16% corn out, and want 17% corn out. Reduce the MOISTURE CONTROL set point temperature by 5° to 95°, and this should change the moisture out to about 17%. If you want the corn to come out dryer, raise the temperature on the MOISTURE CONTROL set point.
2. 4 sensors are averaged together for sensing MOISTURE CONTROL temperature, 1 on each side of the dryer in the front, and 1 on each side of the dryer in the back. They are located about 1/3 of the way up the grain column from the bottom, and in from the side about 4 inches.
3. Grain temperatures can be monitored by pressing the mode select button.
4. If the METERING ROLL switches to LOW and only stays on low for a minute or two and switches back to HIGH, speed up the (LOW SPEED) left potentiometer. It is set too slow.
5. If the METERING ROLL switches to HIGH and only stays on HIGH for a minute or two and switches back to LOW, slow down the (HIGH SPEED) right potentiometer. It is set too fast.
6. The MOISTURE CONTROL should stay on HIGH about 50% of the time and on LOW about 50%, give or take 25%. There is a broad range that will work. It should be switching low to high and back to maintain the desired moisture. A control that does not switch, will not maintain an evenly dried grain moisture, when the incoming wet grain moisture is varying.
7. When adjusting the meter roll speeds it is better not to change the speed more than 20 points at a time.
8. Anytime a change is made wait up to 60 minutes before checking the grain moisture level.

SERVICE

SEASONAL INSPECTION AND SERVICE

The dryer is made of weather resistant material, and is designed to require a minimum of service. However, each season we recommend the following items be checked before the unit is used, and any damaged or questionable parts replaced. These checks will help eliminate possible failures, and assure dependable operation of the equipment.

1. Shut off electrical power. Open power box and control box, and inspect for moisture, rodent damage or accumulated foreign material. Remove any foreign material present. Inspect and tighten any loose terminal con nections. Replace any damaged or deteriorated wiring.

2. Check propellor for freedom of rotation and uniform tip clear ance. It should also be in spected for dirt and grain dust, especially inside the hub. Any additional weight can seriously effect the balance, and result in harmful vibrations and a short bearing life.

3. Check propellor for free play. Any side play is an indication of defective motor bearings, which should be replaced to prevent a complete motor failure. Make sure motor mount bolts are tight.

4. Motor bearings should be lubricated periodically, depending on operating conditions. Under normal usage it is desirable to have the motor cleaned, checked and bearings repacked by an authorized service station every two to three seasons. If the unit is operated continuously through most of the year, this service should be performed each year.

Note: If on site bearing relubrication is to be performed, see lubrication instructions for ball bearing motors. To keep motor bearings properly lubricated, and dispel any accumulation of moisture within the windings, the fan and auger motors should be operated for 15 to 30 minutes each month.

LUBE PROCEDURES

If the motor is equipped with an alemite fitting, clean the tip of the fitting and apply grease gun. Use 1 or 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove drain plug and operate motor for 20 minutes before replacing drain plug. On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA frame and smaller. Insert 3 to 5 inch length on larger motors. On motors having grease drain plugs, remove plug and operate motor for 20 minutes before replacing drain plug.

LUBRICATION INSTRUCTIONS FOR BALL BEARING MOTORS
SUGGESTED LUBRICATION INTERVALS*

Hours of Service per Year	H. P. Range	Suggested Lube Interval
5000	1/8 to 7-1/2 10 to 40 50 to 150	5 years 3 years 1 year
Continuous Normal Applications	1/8 to 7-1/2 10 to 40 50 to 150	1 year 3 years 9 months
Seasonal Service (motor is idle for 6 months or more)	All	1 year-beginning of season
Continuous high ambient temperatures, dirty or moist locations, high vibrations or when shaft end gets hot	1/8 to 40 50 to 150	6 months 3 months

* The bearings have been lubricated at the factory, thus no lubrication should be added before start up.

SUGGESTED LUBRICANTS

Insulation Class	Consistency	Type	Grease	Frame Type
A & B	Medium	Polyurea	Shell Dolium R	215T & Smaller
A & B	Medium	Polyurea	Shell Dolium R	254 & Larger
F & H	Medium	Polyurea	Shell Dolium R	All

Note: All of the auger and metering roll bearings are lifetime lubricated and do not require service relubrication.

1. Remove and clean the gas line strainers. Make certain gas valves are closed and that gas is purged from the system before attempting disassembly.

2. Inspect the collector plate (at the top of the burner casting) and the burner cup for any accumulation of foreign material. Clean if required. Foreign material in the burner cup or casting will not burn out and will impair burner operation.

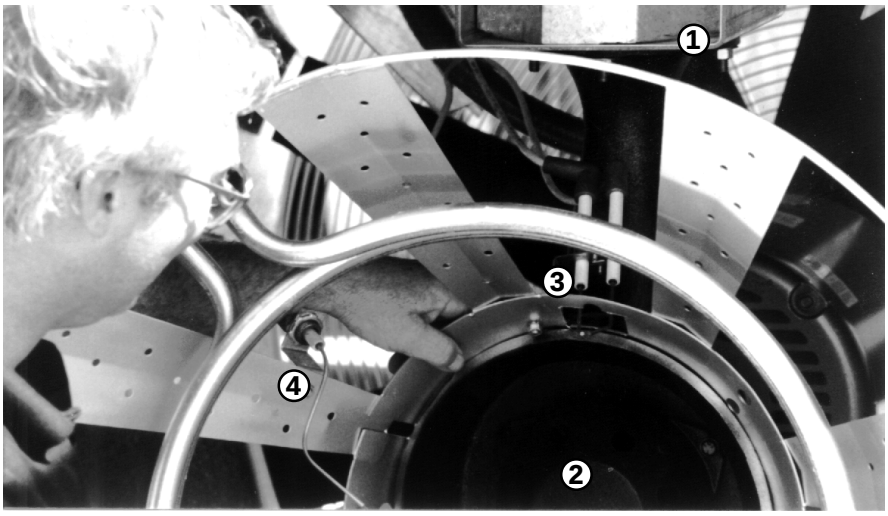
3. If required, inspect ignitor plug and clean the electrodes. Use an ignition point file to remove carbon and rust between the electrode surfaces. Ignitor gap should be about 1/8 inch.

4. Inspect flame sensor for possible damage or poor connections. Flame sensor wire must be in good condition.

5. Inspect and manually rotate the top auger paddle assembly. The paddle unit must rotate freely without any indication of sticking or binding.

6. Inspect the top auger and bottom auger drive lines for proper adjustment and condition. Readjust line tension as required.

Note: All of the auger and metering roll bearings are lifetime lubricated and do not require service relubrication.



7. Operate dryer clean out levers, and check clean-out hatch mechanism for proper operation. With hatch open, inspect and remove any accumulation of dirt, fines and foreign material from the bottom auger trough area.

Note: Do not allow high moisture material to collect within the trough area. It may adversely affect metal parts.

8. Inspect entire dryer for loose, worn or damaged parts. Include check of auger flighting, metering rolls and other internal parts. See that temperature sensors in air plenum chamber are secured by insulated clamps, and do not chafe on other metal parts.

9. Make sure all dryer guards and warning decals are securely installed. Guards should not interfere with moving parts. If guards or warning decals are missing, contact your dealer for a free replacement.

10. Test fire the dryer several weeks ahead of the drying season. Check for possible gas leaks. (See page 15 for burner test fire.)

Remove the Blue Burn Optimizer Cone and inspect the 1-collector plate, 2-burner cup, 3-ignitor plug and electrodes and the 4-flame sensor on the heater.

FAN PROPELLOR REMOVAL AND INSTALLATION

The fan propellor is secured to the motor shaft by the use of a taper-lock bushing, motor shaft key and three cap screws.

CAUTION: Although the taper-lock method of retaining the propellor onto the motor shaft is simple, it is essential that the following points be read carefully and fully understood. Improper installation can cause a loose flying propellor, and result in serious injury or death.

THREADED BUSHING HOLES

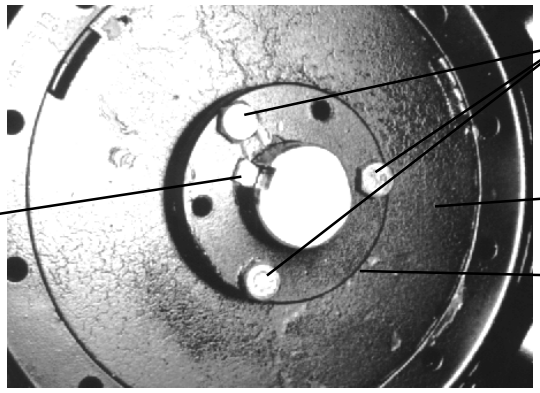
The threaded holes within the bushing are provided for disassembly purposes only. Do not attempt to use these holes for reassembly. They will not allow the parts to lock onto the shaft thereby causing a hazardous operating condition.

CLEARANCE HOLES

When reassembling parts, the cap screws must be installed through the untapped clearance holes as shown. This will cause the propellor to be pulled forward onto the tapered bushing, thus locking the parts securely onto the motor shaft.

When fan servicing requires removal and installation of the propellor, make sure the propellor is removed and reinstalled properly.

1. Lock out the fan power supply, remove the fan guard and the venturi, as required on some models.



Fan blade installation

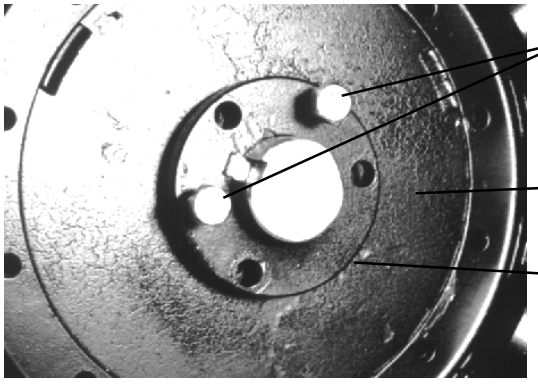
2. Remove the three cap screws from the clearance holes in the taper-lock bushing.

3. Install two grade 5 cap screws into the threaded holes in bushing, and turn them by hand until they bottom against the front surface of the propellor.

4. Block propellor to prevent it from turning, and gradually turn the cap screws (up to 1/4 turn at a time) until the propellor breaks loose from the bushing and motor shaft. Carefully remove bushing and propellor. With the propellor free from the bushing, a wheel can be used to pull the bushing off of the motor shaft. Reattach bushing onto propellor to prevent the loss of parts.

Note: During manufacture the propellor and bushing on the 26" and 28" solid aluminum blades are balanced together, and are marked with two small dots to identify their original alignment position. Check the bushing and propellor to make sure they have alignment marks. Mark the alignment of the propellor and bushing, if necessary.

On Crowley blades (a composite plastic), the propellor and bushing have a keyway that prevents any misalignment of the two pieces. There are alignment marks on the back of the fan hub assembly. If the user were to replace one of the blade fins, alignment would be necessary. However, this is not recommended. In most cases, the complete propellor should be changed.



Fan blade removal

FAN MOTOR REMOVAL AND INSTALLATION

In the event of motor failure, remove the motor as described, and take it to the nearest service station. An authorized service station is the only place that can provide possible motor warranty. Motor service and repair at other places will be at owners expense.

If the service station determines motor failure is caused by faulty material or workmanship within the warranty period, repair will be covered under the warranty. Motor failure caused by external sources will result in a charge to the owner for repair.

1. Make certain power is shut off and locked out. Remove fan guard and propellor.

2. Remove cover from fan heater control box, and disconnect the motor lead wires within the box. Note: Tag or otherwise identify wires for ease of reassembly.

3. Remove motor mount bolts. If there are shims between the motor and its base, note their location so they can be properly installed during reassembly.

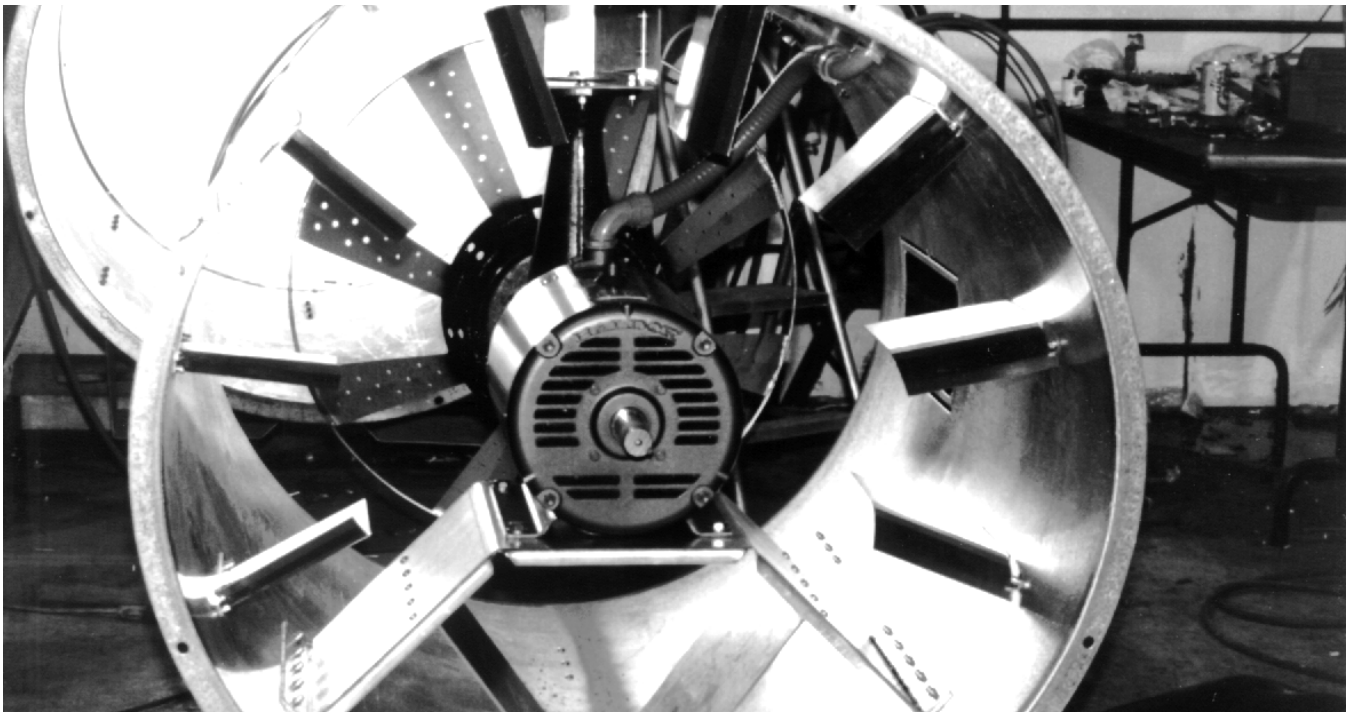
4. Disconnect the upper end of the motor conduit, then carefully pull the wires through the hole in the fan heater housing. Remove motor from the fan heater unit with the conduit still attached. If motor requires service, take it to an authorized service station.

5. To reinstall motor, slide onto motor base plate and replace shims (if required) between motor or base and plate. Reinstall motor mount bolts and washer, but do not fully tighten at this time.

6. Reinstall conduit and wires through hole in fan heater housing and carefully connect all electrical wiring.

7. Adjust position of motor by temporarily mounting fan blade on motor shaft. Rotate fan blade by hand, making the necessary adjustments, so the tip clear ance between blade and housing is uniform. If required, remove the fan blade and fully tighten all four motor mount bolts.

Note: Make sure to install and tighten the propellor in accordance with previous instructions.



The position of the fan motor provides easy access for service.

HEATER PARTS REMOVAL AND INSTALLATION

Most of the heater parts can be removed by simply identifying any attached wiring, and then disconnecting the obvious mounting parts.

1. **Flame sensor**: Disconnect the wire connector, and unscrew the flame sensor out of its mounting bracket. Important: Flame sensor has voltage present. Turn off main disconnect before removing or adjusting.

2. **Gas Solenoid valve coil**: Unsnap either the plastic cap, or the metal clip on the gas valve, and slide the housing and coil off the valve stem and body. Do not energize the coil when it is removed, as the coil may become damaged due to excessive current flow.

3. **Regulator and gas solenoid valve(s)**: The gas regulator and solenoid valve(s) are directional and must be connected as indicated by the markings near the port openings. Make sure gas is shut off and purged from the system before removing parts.

Note: When installing a liquid gas solenoid valve on LP models, do not over tighten the connection into the inlet side, as the inlet orifice may become partially blocked.

4. **Main Gas Orifice:** With fuel shut off and gas purged from system, proceed as follows:

   a. Disconnect the plumbing support brackets from the pipe train.

   b. Disconnect gas solenoid valve coils. Be sure to mark which one goes where.

   c. Lift pipe (with orifice, solenoid valve and other parts attached), straight up and remove from fan heater housing. Orifice and other parts can now be removed from pipe train, if desired.

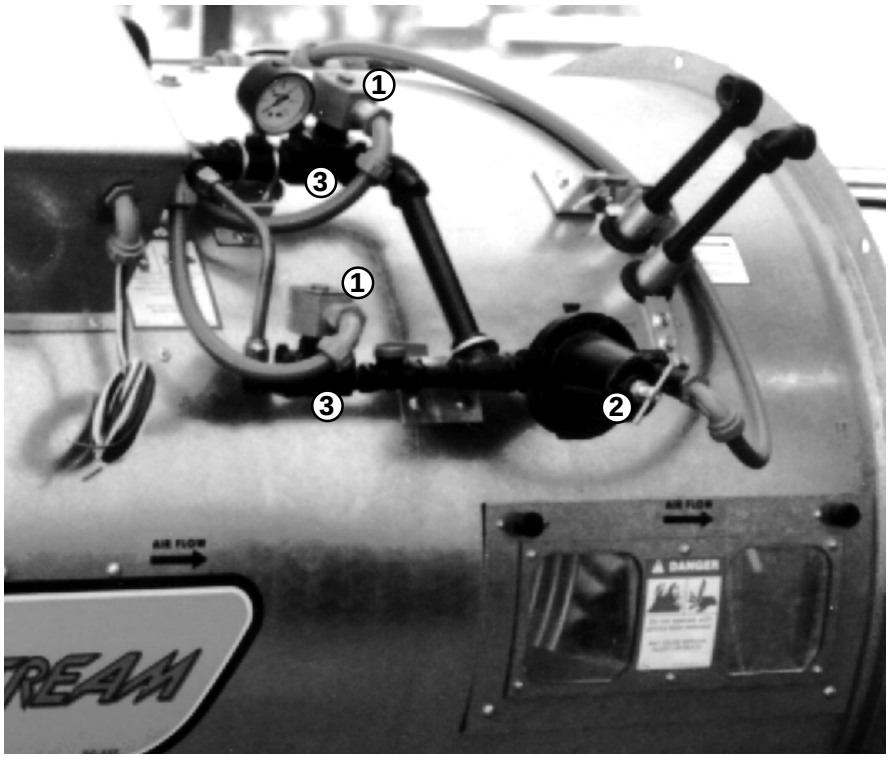
5. **Reassemble**: To reassemble parts, reverse the disassembly procedure and check the following:

   a. Make sure all parts are thoroughly cleaned and open.

   b. Use a dependable brand of high temperature pipe caulking compound when assembling gas connections. Apply only a light coating onto male threaded end of fittings.

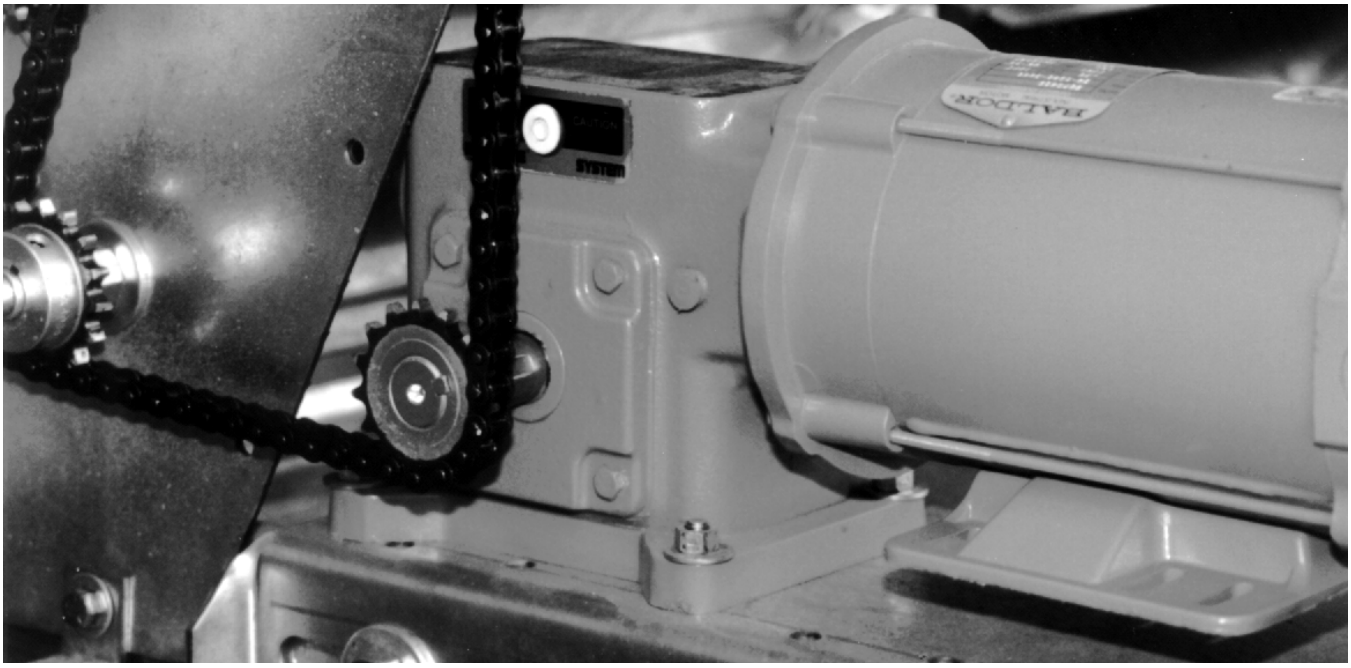
   c. Solenoid valves and gas regulators are directional and must be properly installed. Do not attempt to connect gas solenoid valve by applying force to the valve core stem as it may ruin the unit.

   d. Make sure all electrical wires are properly connected. Refer to wiring diagrams.



This view of the dryer heater shows 1-gas solenoid valve coils and 2-gas regulator and 3-gas solenoid valves.

METERING ROLL SERVICING



The speed reducer gear box for the metering rolls.

This dryer is equipped with SCR metering roll drive assembly. The metering rolls are driven by a separate DC type electric motor. The speed of the motor is variable and is controlled by an electric SCR (silicon controlled rectifier) control within the main control box.

MAIN CONTROLS

1. **SCR speed control**: The control unit dial on the front of the control box regulates the speed of the DC motor which drives the metering rolls.

The markings on the scale from 0 to 999 represent the flow of grain past the metering rolls as a percent of the maximum grain discharge rate for the dryer. The maximum setting of 999 provides a maximum 100% discharge of 1120 BPH for 108, 1400 BPH for 110, 1680 BPH for 112, 1960 BPH for 114, 2240 BPH for 116, 2520 BPH for 118, 2800 BPH for 120, 3080 BPH for 122 and 3640 BPH for 126 model dryers.

Note: When the control is set to the maximum discharge rate (999), the metering roll speed should be 17.5 RPM.

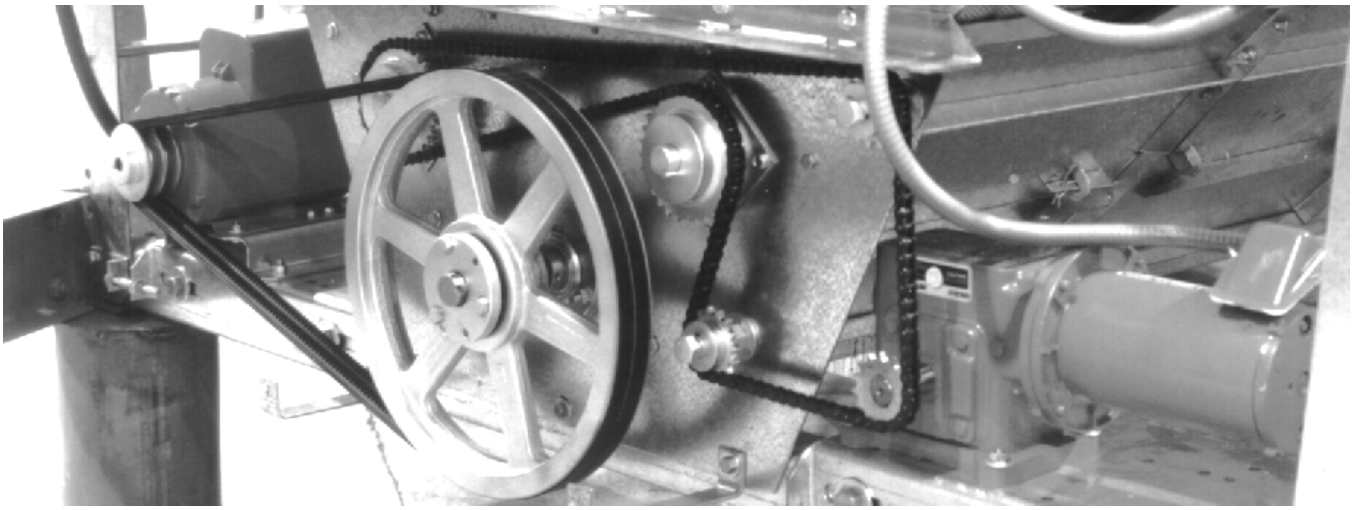
2. **DC electric motor**: The direct current (DC) motor provides the drive for the metering roll, and is located on the front left hand side of standard model dryers. The output shaft of the motor is connected directly to the gear box assembly.

The DC motor requires no operational adjustment as it is completely controlled from the control box.

3. **Speed reducer gear box**: The direct drive gear box provides the required speed reduction, and transmits power to the metering rolls through a drive chain arrangement. The gear box does not require adjustment. The drive chain should also be periodically lubricated and tensioned as necessary.

4. **Unload auger time delay**: The delay controls the bottom auger system and causes the unload auger (and any connected auxiliary unloading conveyors) to continue operating for the programmed amount of time, even after the metering rolls stop. This feature permits the clean out of grain within the unloading equipment at the end of all discharge cycles.

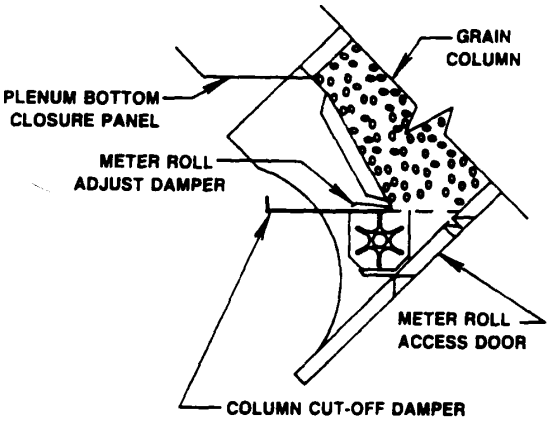
HOW TO DETERMINE A METERING ROLL PROBLEM



The metering roll drive.

To determine if the metering problem is from blockage, perform the following test with the power off. Remove the drive chain by loosening the motor mounting bolts. Refer to photo, and place a pipe wrench on the hub of the roller chain sprocket, on the left hand metering roll at the drive end of the dryer. Apply up to 100 ft. lbs. of force, and attempt to rotate the roll toward the inside of the dryer. If the metering roll will turn, then repeat for right hand side. If metering roll will turn, it can be assumed that no blockage exists, and the problem is from some other cause. Check for a break in the power train, chain, drive key, pin, etc.

CAUTION: Keep hands away from sprocket teeth to avoid injury from chain backlash, as a result of torsion build up in the system caused by the jam.



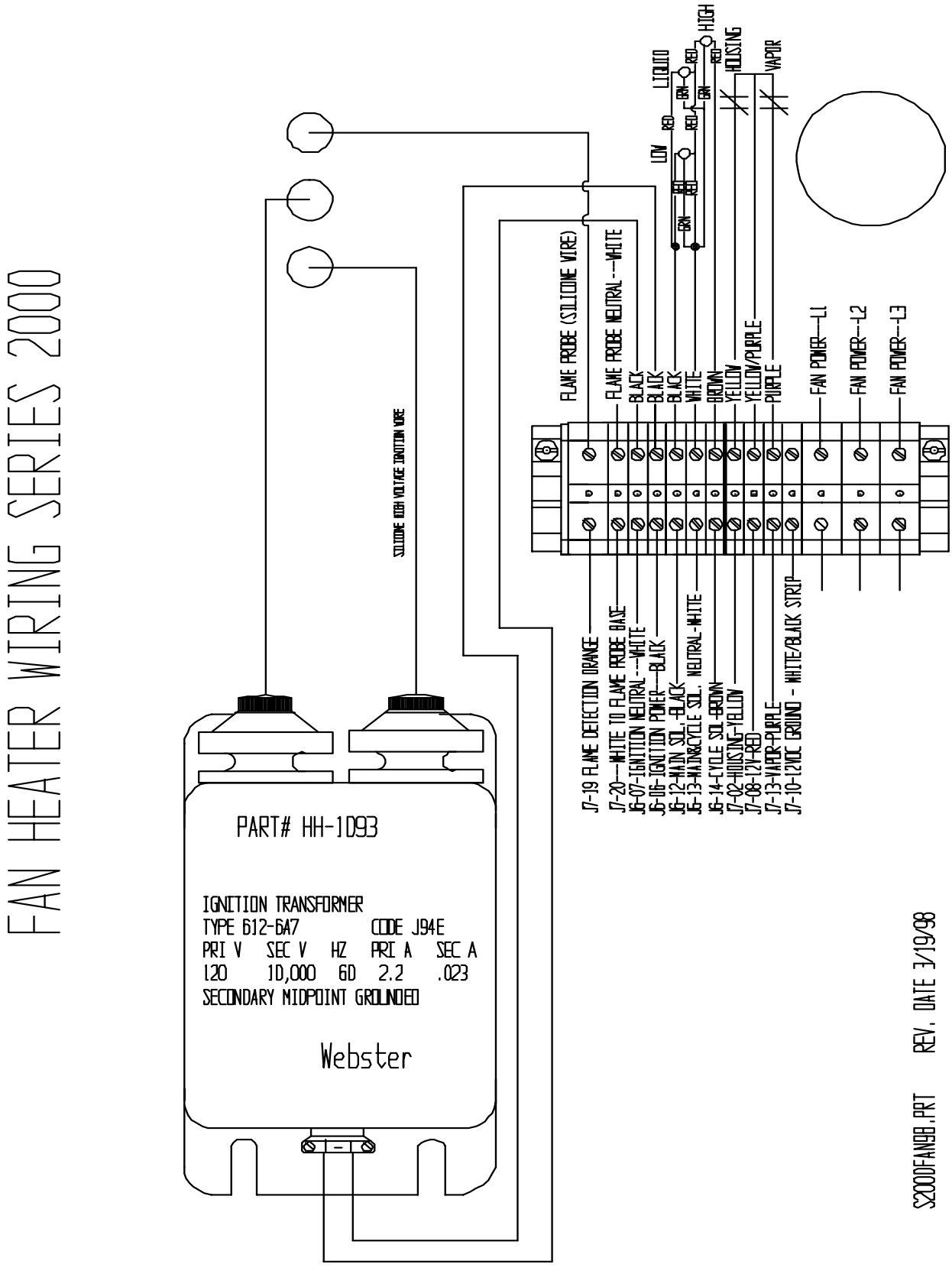
SERVICE TOOL

This column cutoff damper is designed to insert through the grain column (from the inside of the dryer) immediately above the metering roll. This permits opening of the metering roll access door. For service or inspection without unloading the dryer and prior to using the service tool, the plenum bottom closure panel and metering roll adjust damper must be removed.

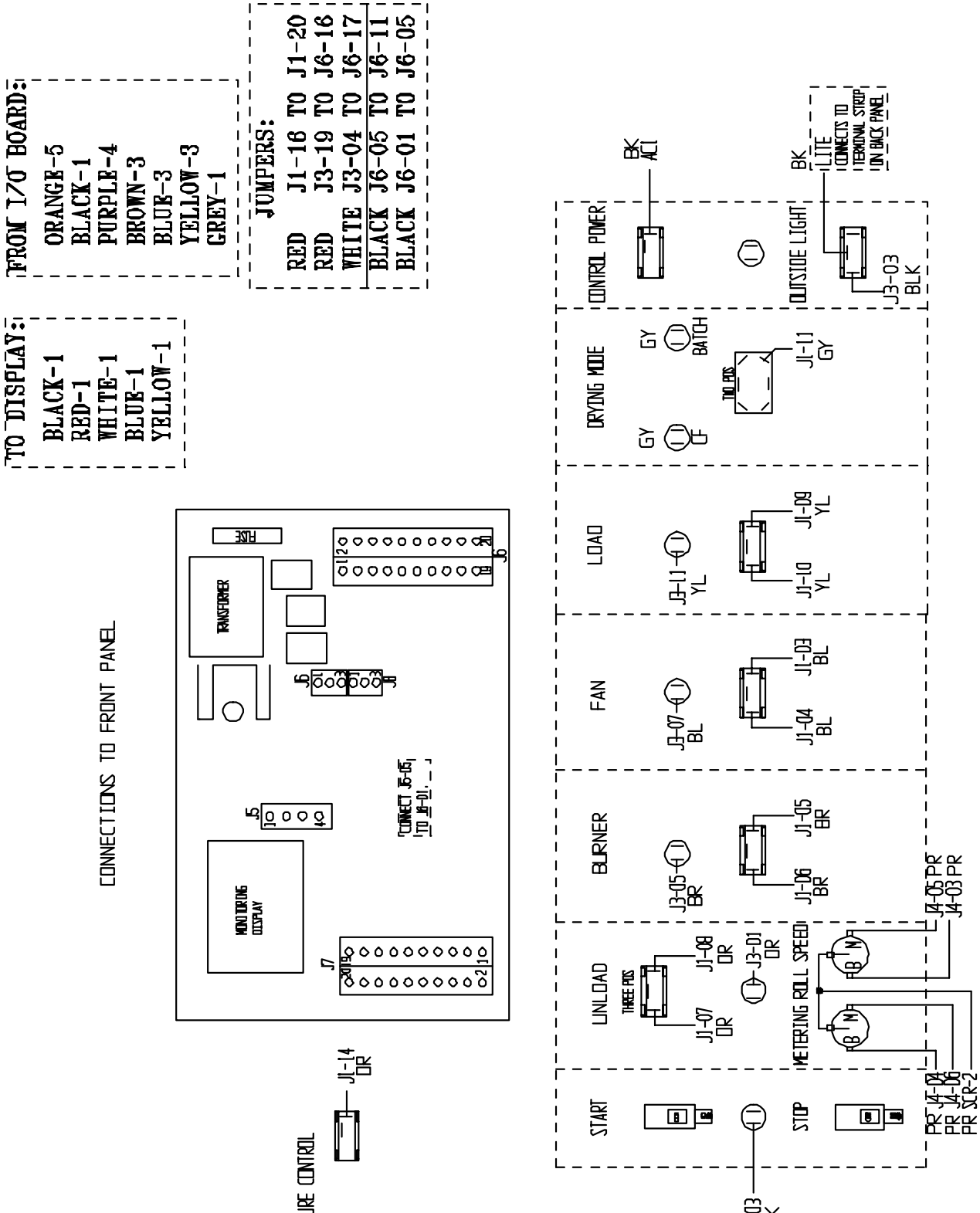
HOW TO CLEAR A JAMMED METERING ROLL

Place a pipe wrench on the hub of the sprocket of the jammed metering roll and turn the roll. First backward, and then forward several times in an attempt to dislodge the object, and clear it through the roll. If this is not successful, have an assistant turn the metering roll, and attempt to locate the jam by sound. Shut down the fan heater and eliminate any other noise when making this check. Once the location is determined, the roll can be reached from the outside by opening the access door to remove the foreign object causing the jam (before opening doors see below). The service tool must be inserted before opening doors. First, swing open the plenum bottom closure panel. Insert service tool above metering roll.

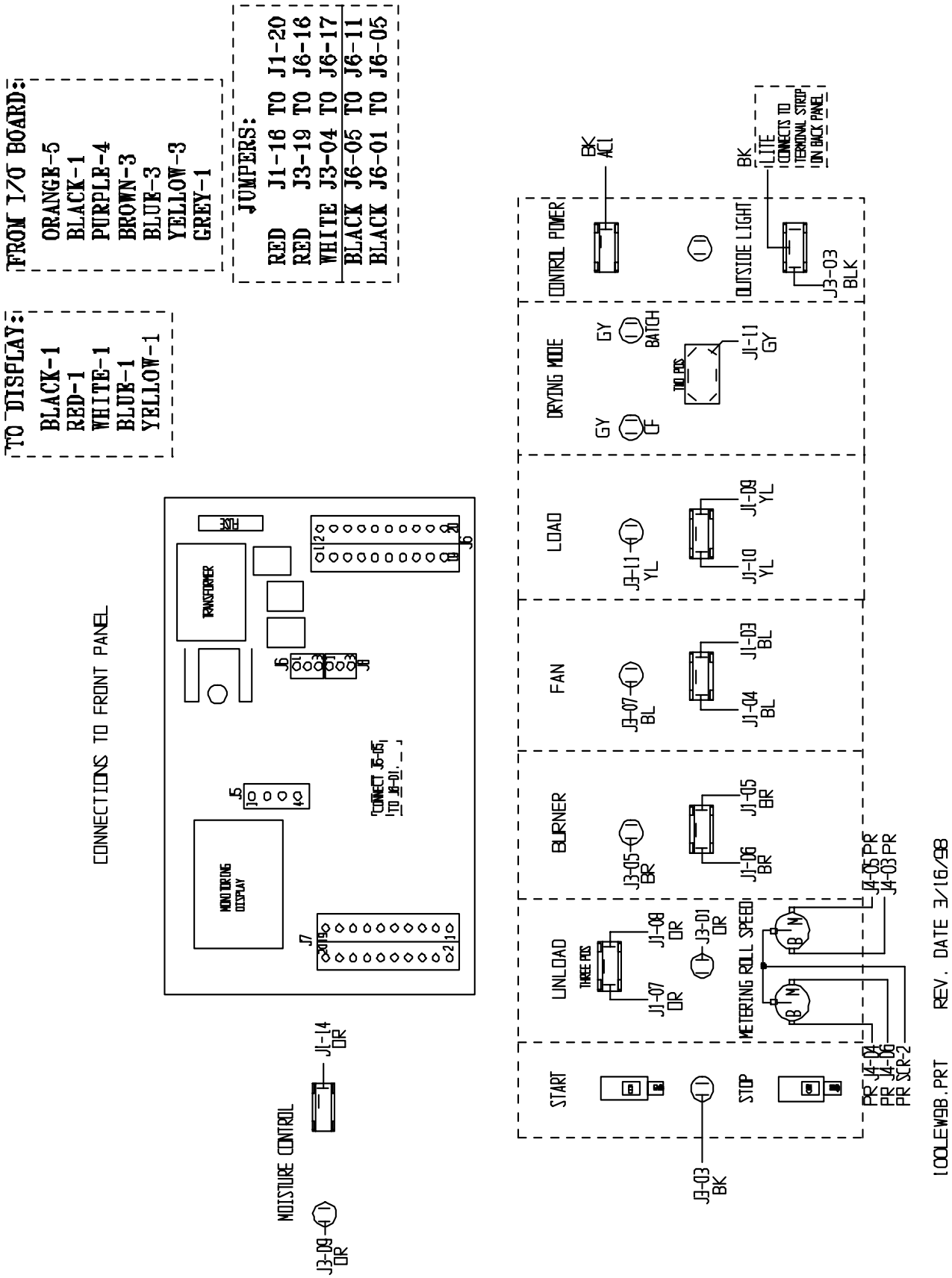
100 SERIES SINGLE FAN WIRING TO CONTROL BOX



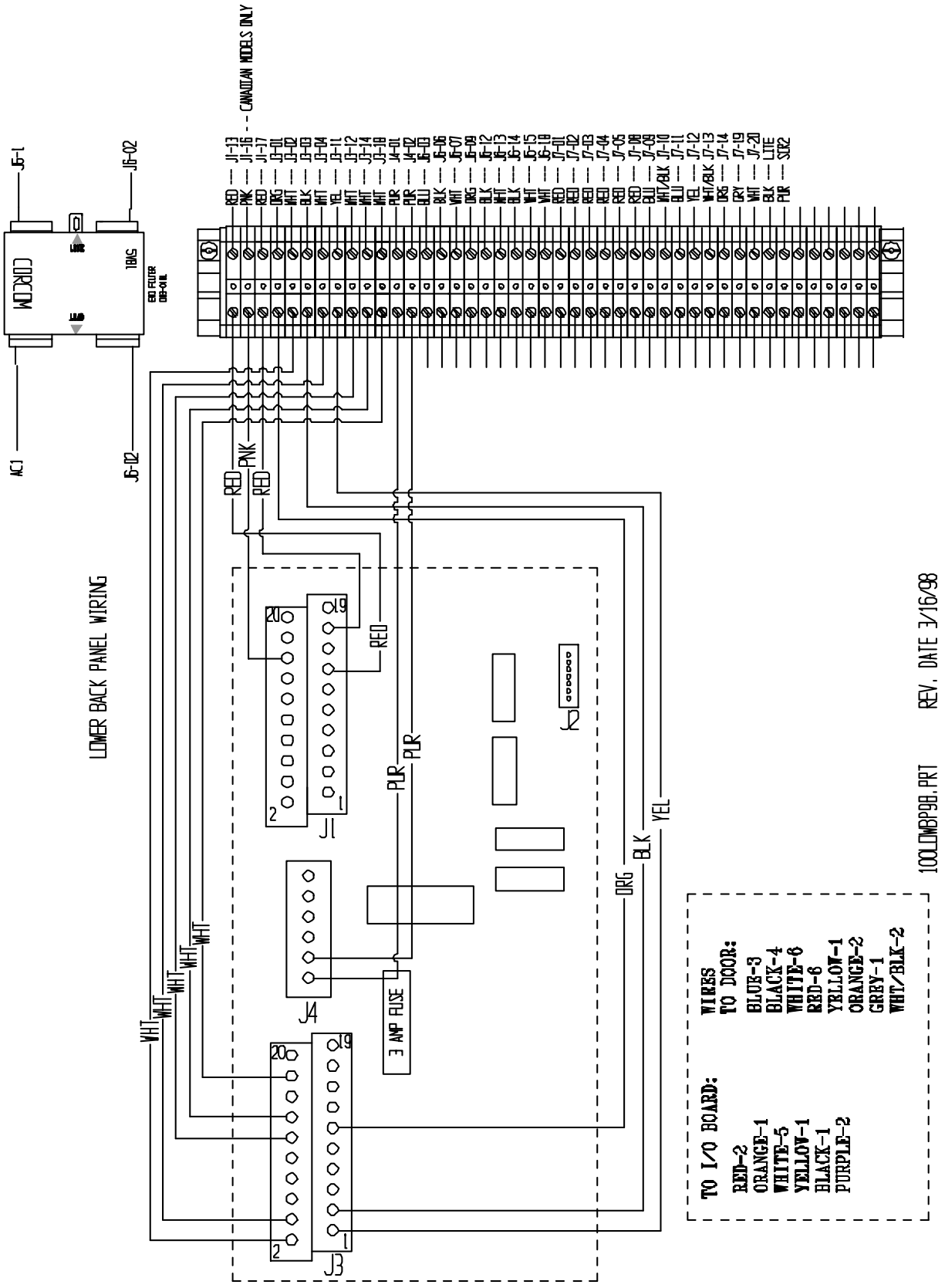
100 SERIES FRONT PANEL EXTERNAL WIRING



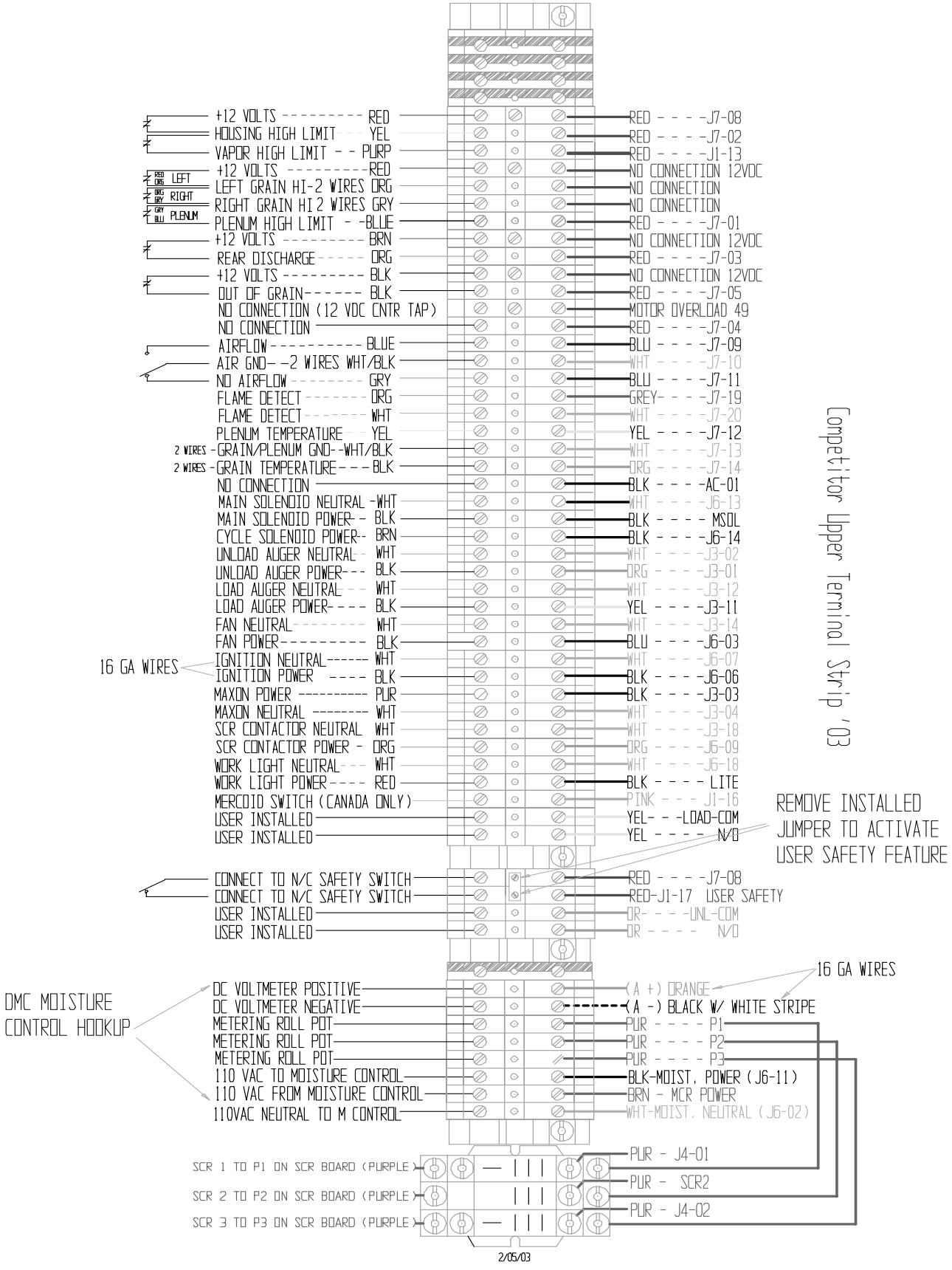
100 SERIES FRONT PANEL INTERNAL WIRING



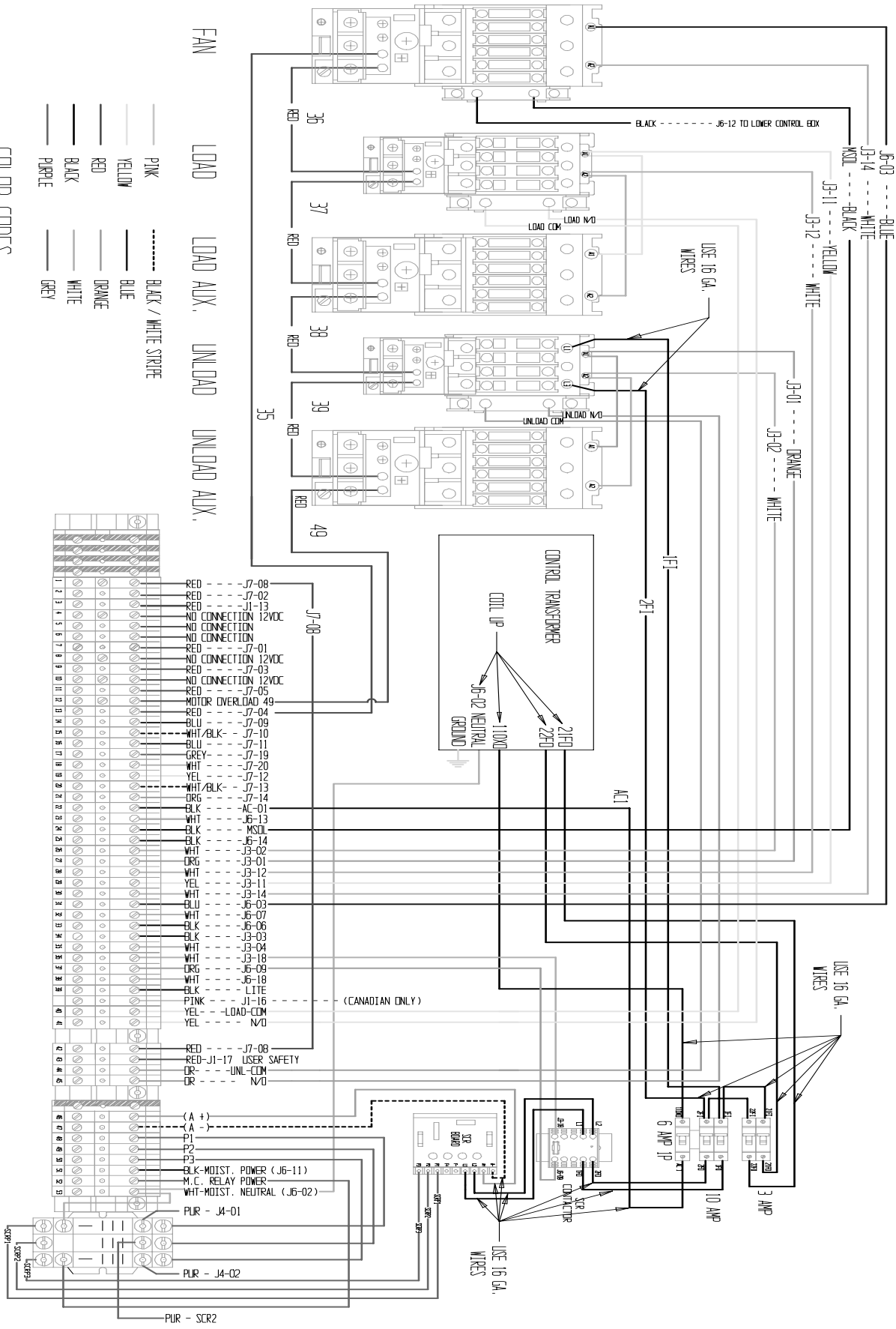
100 SERIES LOWER BACK PANEL COMPONENT LAYOUT



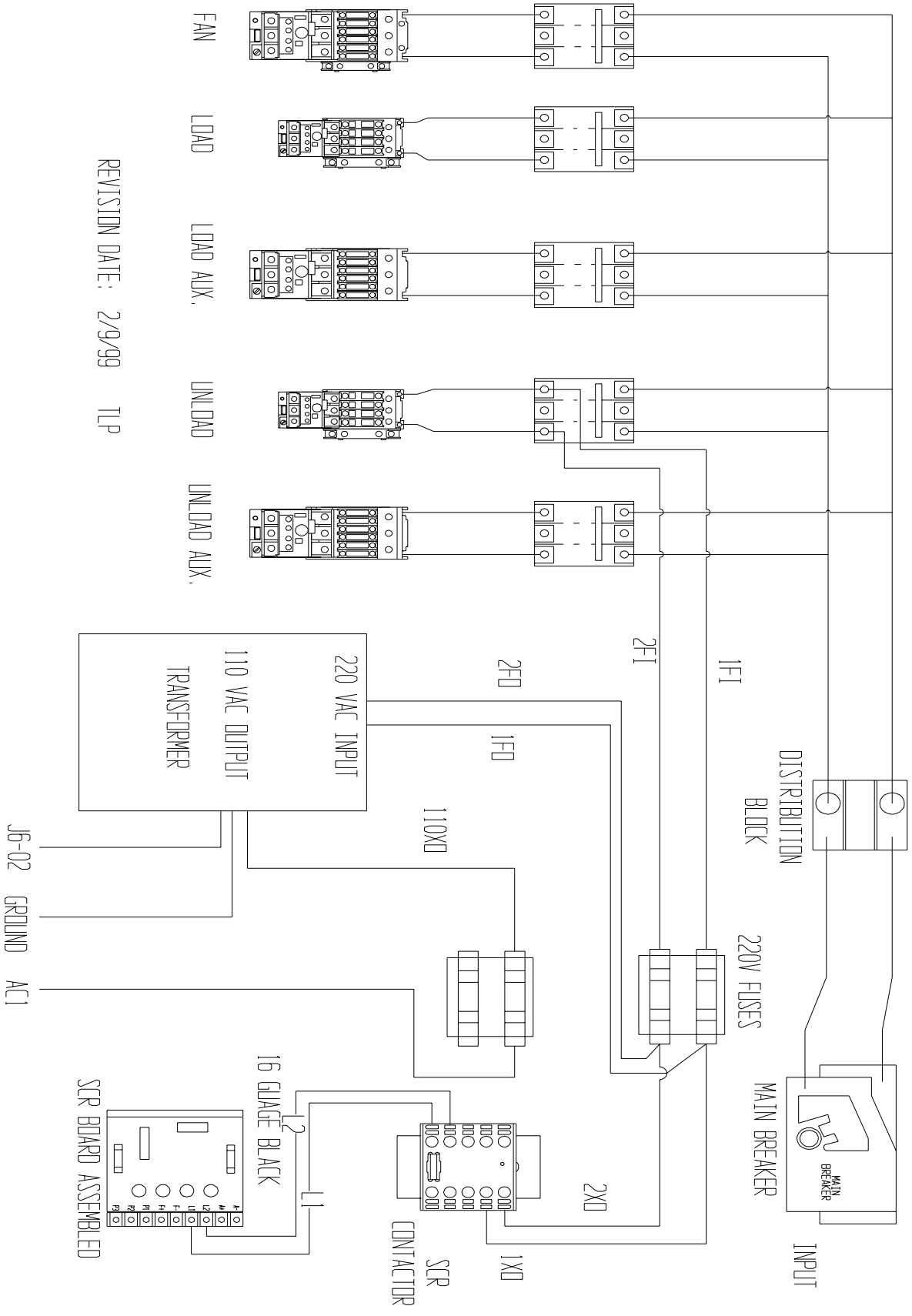
100 SERIES EXTERNAL WIRING TO DRYER



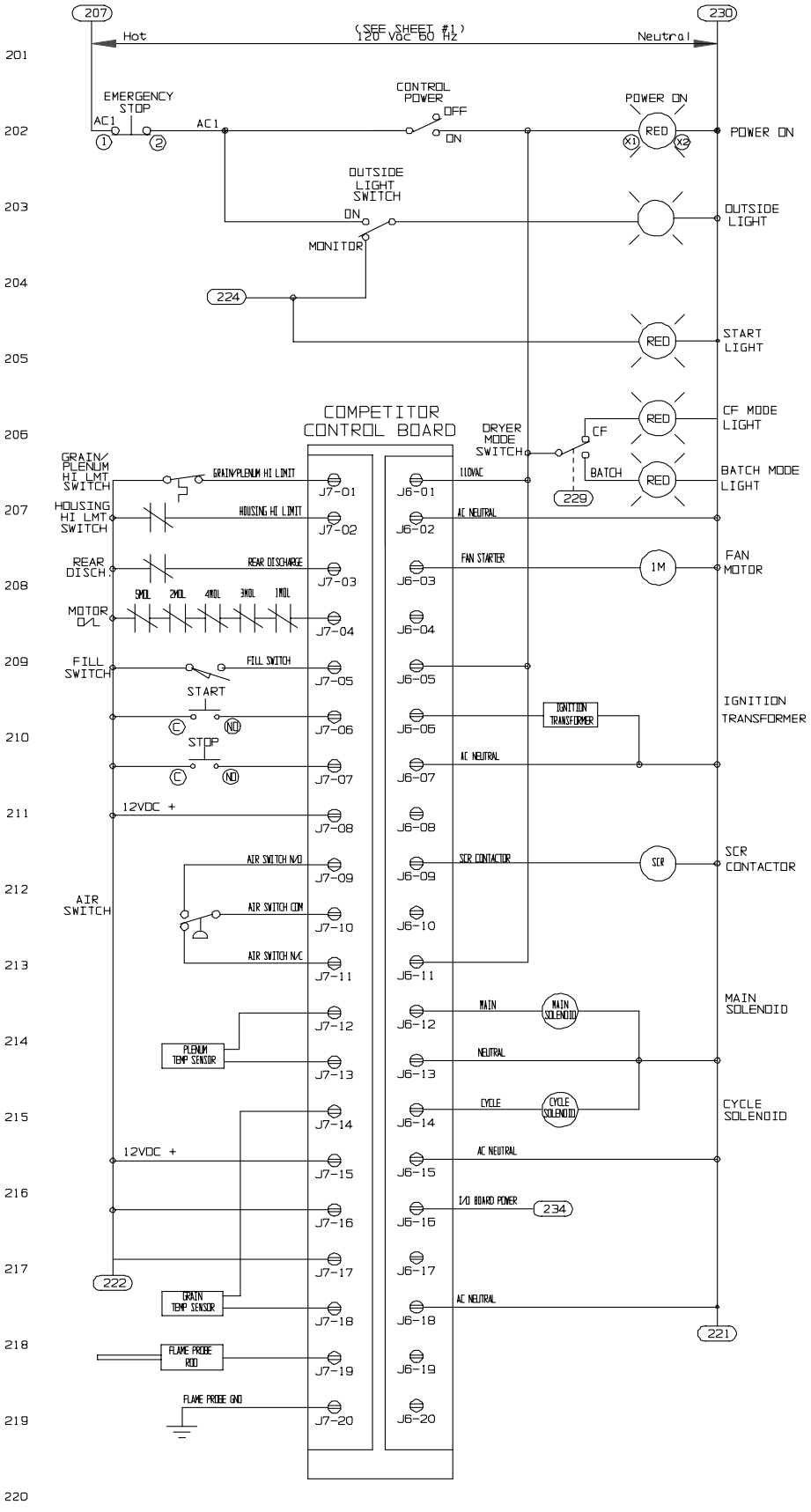
100 SERIES UPPER CONTROL BOX WIRING



100 SERIES MAIN POWER WIRING



100 SERIES CONTROL SCHEMATIC



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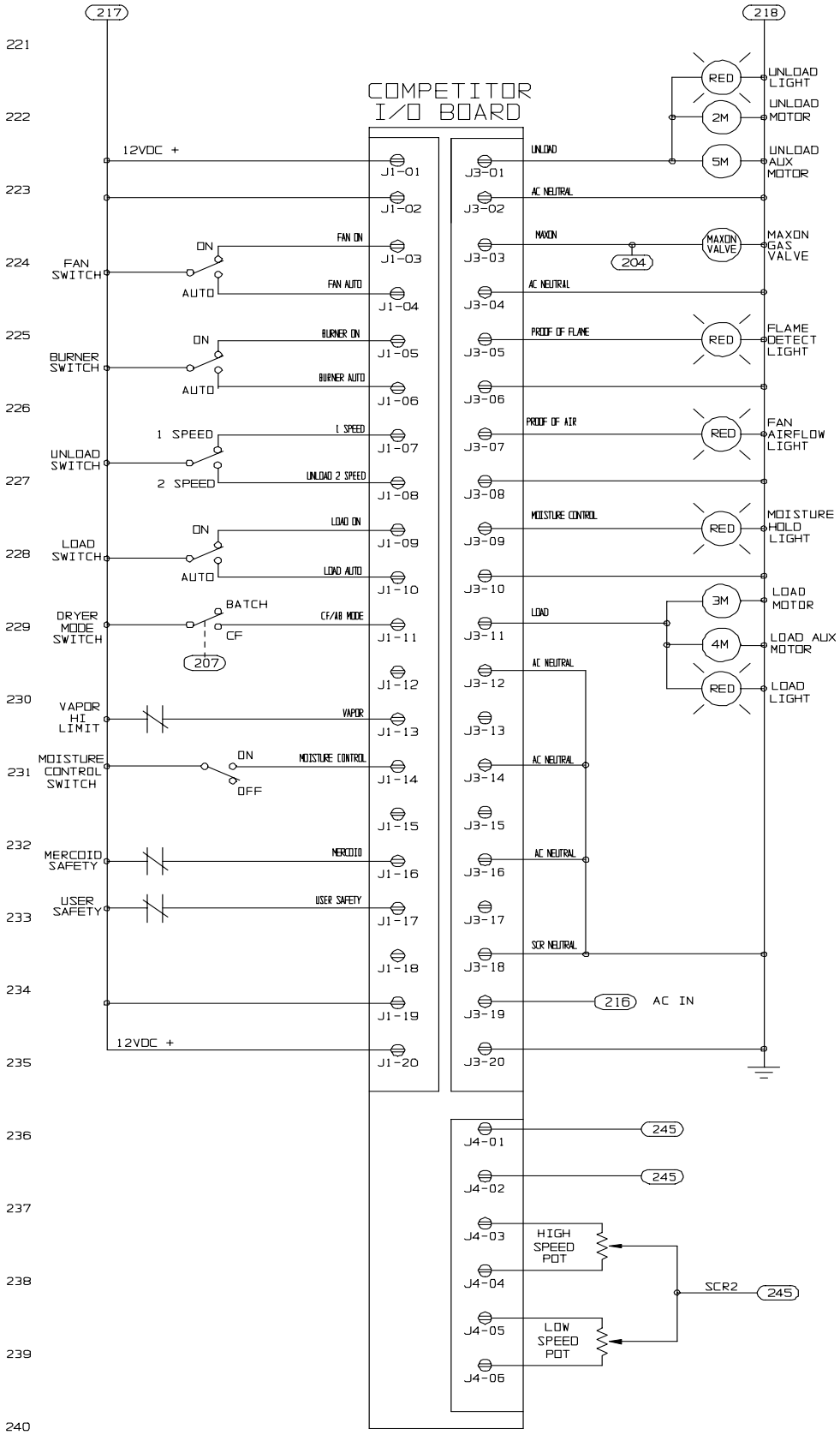
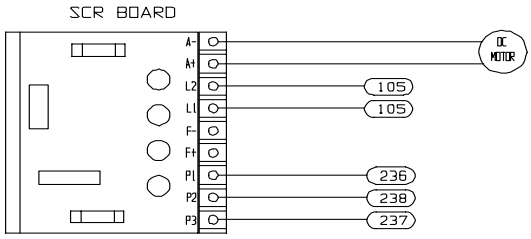
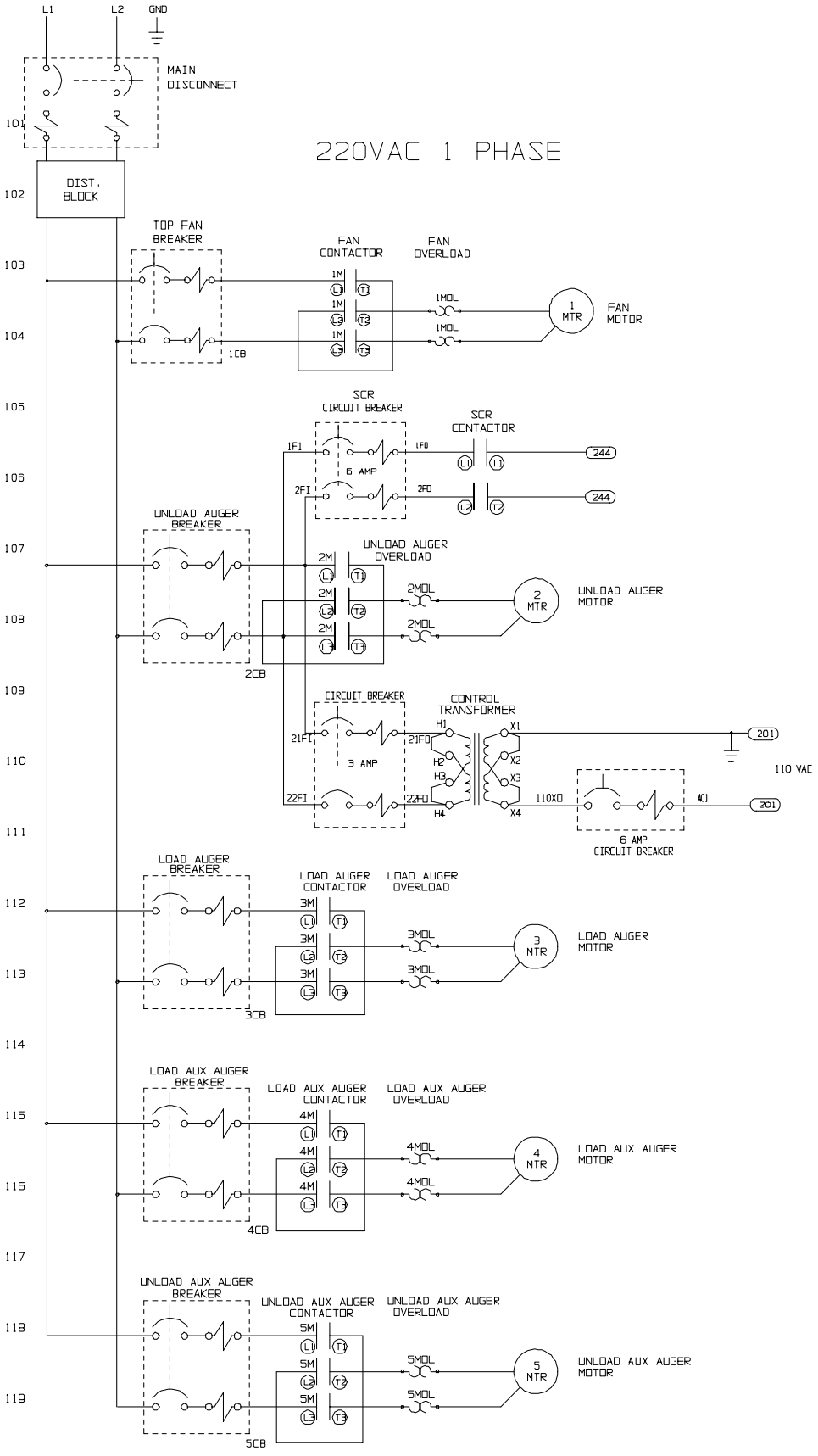


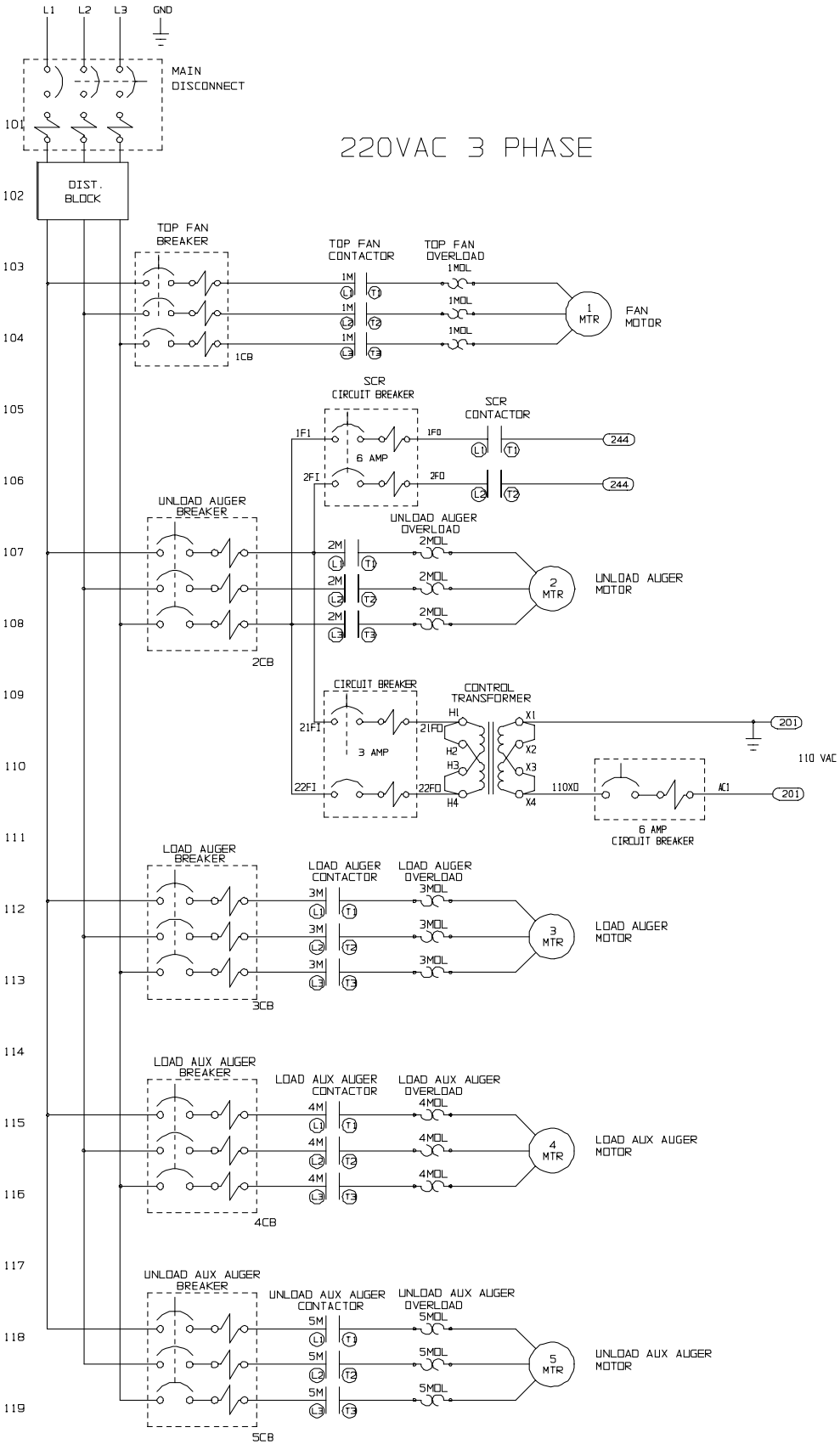
100 SERIES CONTROL SCHEMATIC



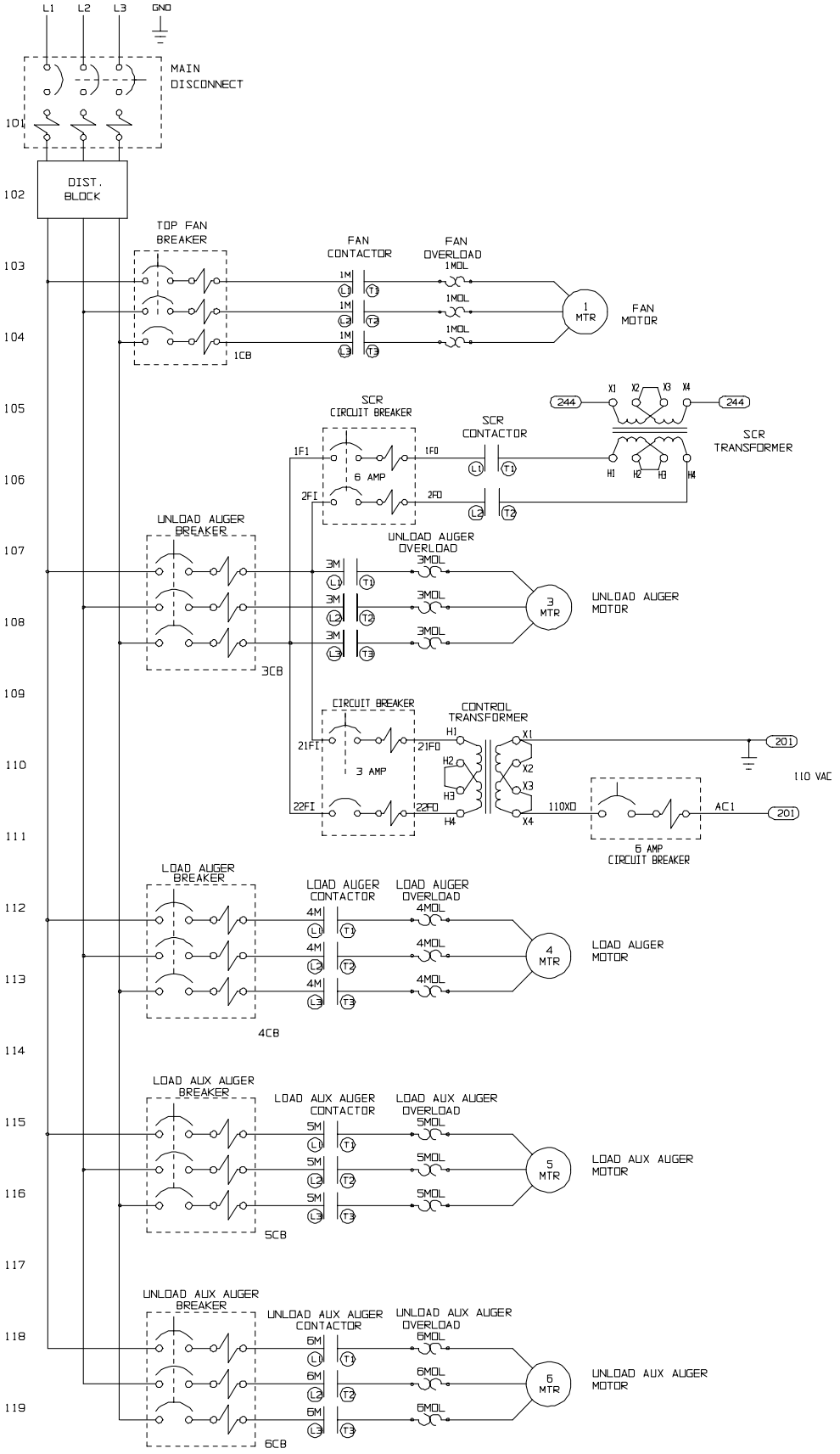
100 SERIES 220VOLT 1 PHASE POWER SCHEMATIC



100 SERIES 220VAC 3PHASE POWER SCHEMATIC



100 SERIES 440VAC 3 PHASE POWER SCHEMATIC



TROUBLE ANALYSIS PROCEDURE

A multimeter is required for some of the following checkout procedures. Before performing any tests, make certain if the dryer power supply is 1 phase, 230 volt, or 3 phase, 230 or 460 volt.

- The burner circuit is 120 volts AC on all standard U. S. production models.
- The control circuit to the motor starters is 120 volts AC.
- The safety circuit is 12 volts D. C.
- When checking these circuits, measure voltage between the circuit test location and to ground.
- D. C. circuits should be measured between the test location and its respective D. C. ground.

Refer to wiring diagrams and the parts list for identification of parts and the electrical terminals.

CAUTION: When making high voltage tests with "live" circuits, be extremely careful. Follow established safety practices. Turn power on for testing only. Do not attempt to make the dryer operate by using a jumper wire to bypass a defective safety component.

Problem	Possible Cause
Control power light off.	1. Check that main power and circuit breakers are turned on. Check for tripped breaker. 2. Check for blown 5 amp fuses. 3. Monitor relay is defective. 4. Defective transformer or wiring. 5. Check for a defective power switch. 6. Check wiring between fuses and input/output board. Refer to wiring diagram for test locations.
Control power is on. Drying mode light off. This indicates control power is present at input/output board, but no power is being transferred through the I/O board.	1. **Power interruption:** Incoming power to the dryer has been interrupted. The display screen will show the date and time if this has occured, once power has returned. 2. **Display not finished initial setup:** The monitor will display a copyright message and model number, total running time in hours and minutes and then the current date and time. To activate the controller press the reset button. 3. **Input/output board:** The input/output board has developed a problem that requires its replacement.
No display on LCD screen.	1. Check for a defective power switch. 2. Check wiring between fuses and input/output board. 3. Check for 120 volts AC between points J6-02 and AC-1. 4. The display may have a malfunction requiring its replacement.
Control power light is on, drying mode light is on--load auger, fan, heater, unload auger will not operate.	1. **Press the dryer power** start button. 2. Refer to the problem listed for load auger, fan heater and unload auger in the following sections.
Display shows **"MOTOR OVERLOAD"** message.	The thermal overload on the fan motor, load motor, unload motor or an auxiliary motor has opened indicating an overloaded motor. (The overloads must be manually reset).
Display shows **"VAPOR HIGH TEMPERATURE"** message.	The LP gas vapor temperature sensor located in the gas train downstream from the vaporizor has opened, indicating that the vaporizer is running too hot and must be readjusted. (This control is a 200°F limit which automatically resets when it cools).

Problem	Possible Cause
Display shows **"LOSS OF FLAME"** message.	The flame sensor has failed to detect a burner flame, indicating that the burner has failed to light, there is a problem with the flame sensing circuitry or the dryer is not getting burner fuel.
Display shows **"HOUSING HIGH TEMPERATURE"** message.	The temperature high limit located on the fan/burner housing has opened, indicating an over temperature condition has occurred towards the rear of the fan/heater housing. (This control is a 200°F limit control that must be manually reset).
Display shows **"REAR DISCHARGE WARNING"** message.	The cover on the grain discharge box has opened, indicating that grain is backing up into the discharge box.
Display shows **"OUT OF GRAIN"** message.	The dryer has run low on grain, and the out of grain timer has timed out shutting the dryer down. The unload auger will then clean out the dryer, if the unload switch is on during continuous flow operation. Check the out of grain timer setting, and if necessary adjust. Also, before restarting, inspect load equipment for possible damage or adjustment.
Display shows **"PLENUM HIGH TEMPERATURE"** message.	An over temperature condition has occurred inside the dryer plenum. (This control is a 300°F limit which automatically resets when it cools).
Display shows **"NO AIRFLOW"** message.	The air switch contacts have opened, indicating the fan may not be turning. The air switch may need adjustment.
Fan motor will not start.	1. Check that the fan circuit breaker and the fan switch are on. Also, check for defective switch or bad wiring connections. 2. If lighted switch does not light, the air switch needs adjustment, or the bulb may be burned out. 3. Verify closing of fan motor contactor. Check voltage on load side of contactor. See appropriate power wiring circuit diagram for terminal numbers. Inspect contactor for defective points or a burned out coil. 4. Inspect connections, and check voltage applied to the motor leads in the fan heater box to determine if the motor is defective. 5. Check capacitors on single phase motors, and replace if defective. If motor starts slowly, check for low voltage during starting due to excessive voltage drop in power supply wiring.
Top auger will not start.	1. Check that the top auger circuit breaker and the load auger switch are turned on. 2. If lighted switch does not light, the output power to the contactor is missing. Check connections, or if the bulb is burned out. 3. Check position of the upper auger paddle switch. It must be down to start auger. 4. Inspect for secure mounting and wiring of mercury switch in the terminal box on the top auger paddle switch shaft. Include check for a defective mercury switch. 5. Verify closing of the top auger contactor. Check voltage on load side of contactor. Inspect contactor for defective points, or a burned out coil. 6. Inspect connections, and check voltage applied to motor leads in motor junction box to determine if motor is defective. 7. Check that the mercury switch box is in the proper position.

SERVICE

Problem	Possible Cause
Bottom auger will not start.	1. Check that the bottom auger circuit breaker is on. 2. If the lighted switch does not light, the output power to the contactor is missing. Check connections, and whether the bulb is burned out. 3. Check that the unload switch is on (1 or 2 speed). 4. Verify closing of bottom auger contactor; check voltage on load side of contactor. 5. If using the moisture control, check for proper setting, or defective operation of the control. 6. Check for any loose wire connections in unload auger and moisture control thermostat circuits.
Grain not moving through columns.	1. Check the dryer for fine material buildup inside the columns. 2. Avoid leaving the dryer columns full for long periods at a time (2-3 days) while not operating the dryer, or during rainy weather.
Grain not moving through columns.	1. Check the dryer for fine material buildup inside the columns. 2. Avoid leaving the dryer columns full for long periods at a time (2-3 days) while not operating the dryer or during rainy weather. 3. Empty the dryer. Keep the dryer clean! Do not allow fine material to gather in the plenum chamber. 4. It may be necessary to open the strike off plates in the affected columns in half inch intervals.
Uneven drying-Some kernels appear brown while others are under dried. Uneven heat exiting from dryer columns.	1. Check plenum thermostat temperature setting. Some varieties of grain are more sensitive to higher operating temperatures. It may be necessary to lower the plenum operating temperature to accommodate this. 2. Check for proper burner alignment (side to side). Vibration during shipment may have caused misalignment.
Burner will not fire with fan operating.	1. Burner switch must be on. 2. Check for power to ignition board.
Heater light and gas solenoids go on and off erratically-The light blinks on and off while the solenoids "chatter".	1. The blinking light indicates the flame sensor is not detecting flame. 2. The "chattering" solenoids are caused by the loss of flame detection, and the thermostat and Fenwal Ignition Board trying to reestablish a flame. Check for loose wires on flame sensor; replace or repair wires or sensor.
Burner will not fire-No gas pressure with fan operating at least 15 seconds (gas supply or fan heater malfunction).	1. Check gas supply. Also, check gas filter and gas line for possible obstruction or closed valves. Refill tank; replace or repair parts, as required. 2. Inspect gas solenoid valves (including liquid valve on LP units) for defective coils or improper wiring. Replace valve or coil if valve will not open with proper voltage applied (115 volts). 3. Check for proper voltage. 115 volts across L1 and L2 incoming voltage to the Fenwal Ignition Board, and 115 volts outgoing across V1 and V2 to the solenoids.

Problem	Possible Cause
Burner will not fire-But gauge shows gas pressure.	1. Fenwal Ignition Board: Check board for spark by removing ignition wire from board, and holding an insulated screwdriver against the output terminal and 1/4" away from the control box casing. There should be a strong spark. Check board wire connections. Replace the Fenwal Board, if necessary. 2. Ignitor: Check that the ignitor is properly gapped to 1/8" and that it has a strong spark. Inspect the porcelain and electrodes for damage or cracking. Replace or clean if necessary.
Burner maintains desired drying temperature-but cycles from hi-fire to off (without going to lo-fire).	1. Make sure the low flow control valve is not completely closed. Valve must be adjusted open to provide the proper lo-fire gas pressure listed in this manual. 2. Check lo-fire solenoid valve for proper operation.
Burner operates-But will not cycle from hi-fire to lo-fire.	1. Check the gas pressure reading on the gauge. Problem may be due to insufficient gas regulator setting. Temporarily decrease the hi-lo fire thermostat setting to verify that the thermostat will function and cause the burner to cycle. If burner will cycle at the reduced thermostat setting, it indicates that the problem was due to insufficient heat to satisfy the original setting. Increase the gas regulator setting for additional heat output. Do not exceed the maximum pressure listed in this manual. 2. Hi-lo fire thermostat control may be defective. If the burner still will not cycle to lo-fire after decreasing the thermostat, the problem may be due to a broken or kinked thermostat sensor tube. Observe reading on the thermometer. Replace control assembly if it cannot be set to cause its switch to go to the open circuit position with normally hot air plenum temperatures. 3. If the burner continues to operate on hi-fire, check the hi-fire gas solenoid valve for a stuck or blocked open condition, or for reversed gas pipe connections. The solenoid valve must not allow gas flow when its coil is not energized.
Burner operates-But will not cycle from lo-fire to hi-fire.	1. Check for an excessive lo-fire gas pressure setting. Observe pressure setting shown on gauge, and compare reading with recommended low pressure settings listed in this manual. Readjust lo-fire setting on flow control valve, if necessary. 2. Check for improperly adjusted or defective hi-lo fire thermostat control. Temporarily increase the temperature setting. If the heater will still not cycle, check for problem in the control wire connections. The control wires should be connected to terminals R and B of the thermostat, so the switch will open upon temperature rise. If the burner will cycle with these two wires connected together, the thermostat is faulty. 3. Check for improperly connected or faulty hi-fire gas vapor solenoid valve. Correct any poor connections or defective wiring. If wiring appears proper, problem may be caused by a burned out valve coil or defective valve. Replace hi-fire solenoid valve, or its coil, if defective.

NOTES

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