MATHEWS COMPANY

Iron Horse Quality

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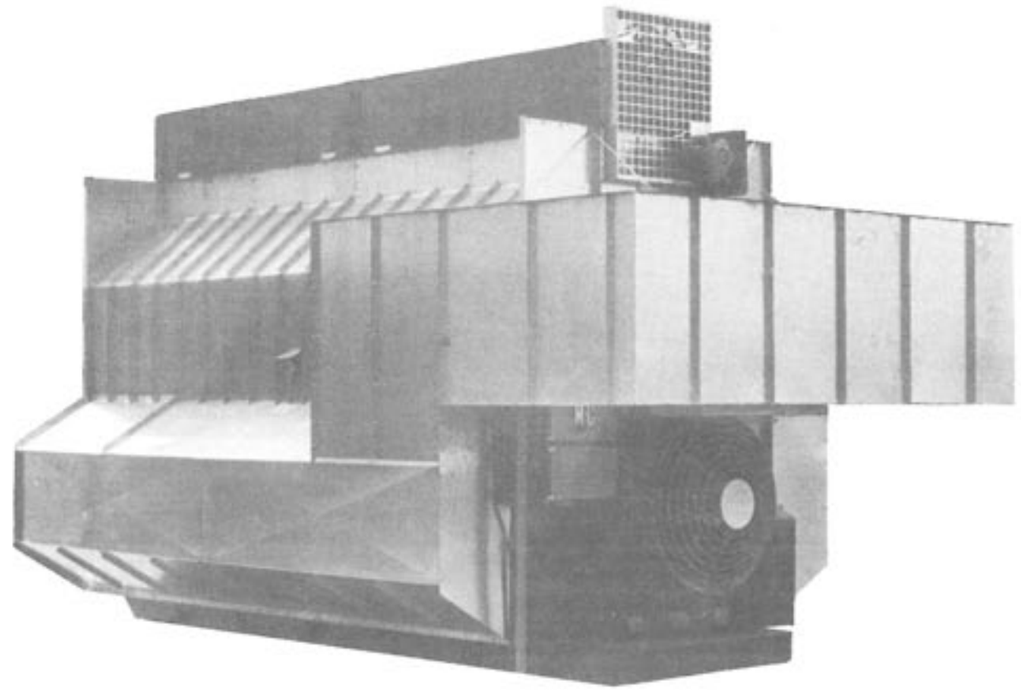
MATHEWS COMPANY

Model 665EM and 665EMS Continuous Flow Grain Dryers



Model 665EM with Optional Heat Recovery System

Set-Up and Operating Instructions

Mathews Co./ 500 Industrial Ave., Crystal Lake, IL 60014, U.S.A.
815/459-2210 Telex 72-2488

Form No. D121, March 1983

NOTES

4. Close the gas main hand valves in the cabinet (handles 90° to the piping).
5. **LP Gas** - Close the liquid line flip valve at the dryer (handle parallel to the pipe).
6. Run the fans approximately 20 minutes to cool the grain. Turn the upper fan **OFF**.
7. Flip the moisture control switch to the **MANUAL** position to unload all of the grain. When the dryer is empty, flip the moisture control switch **OFF** and turn the lower fan **OFF**.
8. Turn off the electric power supply to the dryer.
9. Remove the heat chamber door in the floor of the heat chamber. Remove the unload auger cover, see Figure 15, and clean out the grain metering rolls with a vacuum cleaner or compressed air. Clean the screens.

CAUTION: Be sure to wear safety goggles if compressed air is used.

10. Lubricate all bearings with a hand grease gun. See "Lubrication" below. Do not over lubricate. Too much grease may damage the bearing seals. Lubricate all chains, sprockets and ratchet drive moving parts, with engine oil.
11. Block the fans so that the wind cannot rotate them.

Lubrication

1. There are 8 lubrication fittings on the dryer. Lubricate with a hand grease gun. Use a good grade of bearing grease. Do not over lubricate. Too much grease may damage the bearing seals.
2. **Every 50 hours** - Lubricate the variable speed pulley shaft bearings sparingly, see Figure 16. Over greasing will damage the seals and possibly force grease out onto the belts.

CAUTION: The guards were removed in Figure 16 and 17 to provide clear illustrations. Do not operate the dryer without guards in place and secure.

3. **Every 100 hours** - Lubricate the 4 bearings on the reduction drive jackshafts, see Figure 17, the unloading auger front bearing and

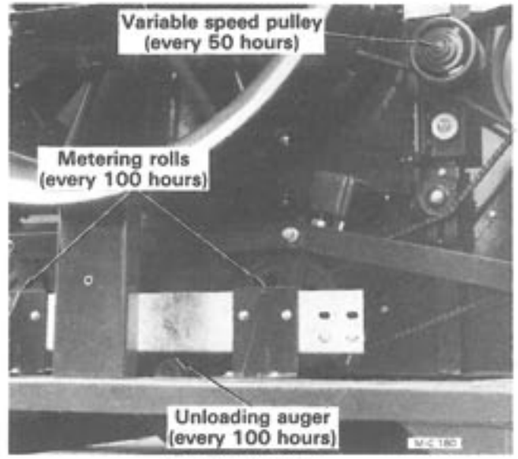


Figure 16

the front bearing on each grain metering roll, see Figure 16.

4. All other bearings used on the dryer are prelubricated and require no further lubrication.
5. Oil all sprockets, chains and ratchet drive moving parts with engine oil periodically. Be careful not to get oil into the ratchet solenoids or on the variable speed pulley belts.

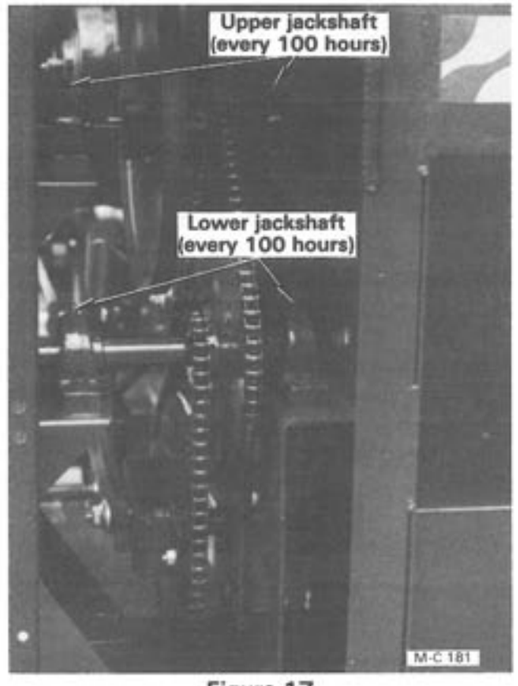


Figure 17

CONTENTS

NOTES

4. Flip the moisture control and level auger switches **OFF**.
5. Run the fans 20 minutes to cool the grain in the dryer, then turn them **OFF**.
6. Turn off the electric power supply to the dryer.

NOTE: Do not turn the electric power supply off if the upper control cabinet heat bulb is to remain on.

Restarts

1. Turn on the electric power supply to the dryer.
2. **LP Gas** - Open the tank supply valve and open (lift up) the liquid line flip valve.
3. **Natural Gas** - Turn the gas supply valve on.
4. Start the upper and lower fan.
5. Flip the upper burner ignition switch **ON**. Slowly open the upper burner gas main hand valve ¼ of the way.
6. When the flame is established, slowly open the gas main hand valve all the way (handle parallel to the piping).
7. If the dryer is to be operated "All Heat", start the lower burner. **LP Gas** - Run the upper burner 20 minutes before starting the lower burner. **Natural Gas** - The lower burner can be started anytime after the upper fan and burner are running.
8. Flip the moisture control switch **ON**. If the dryer is equipped with the Low Grain Level Timer System be sure the level auger switch is in the **AUTOMATIC** position so that the Low Grain Level Timer is activated.

CAUTION: If the outside temperature went below freezing (32°F) after the dryer was shut down, check to be sure that the grain in the lower part of the grain drying columns and/or in the metering rolls is not frozen. Frozen grain would prevent the dryer from unloading, which could possibly result in a fire.

9. If the grain is frozen, start the lower burner to thaw it out or clear it by hand. Follow steps 10 thru 13.
10. Shut the dryer down and turn off the electric power supply to the dryer.
11. The lower portion of the grain columns and the metering rolls are accessible from inside the dryer. Do not attempt to clear frozen grain through the quick drain ports (shown in Figure 4, page 9) on the outside of the dryer.
12. Open the dryer rear door and remove the heat chamber door in the floor of the upper heat chamber to gain access to the cooling chamber.

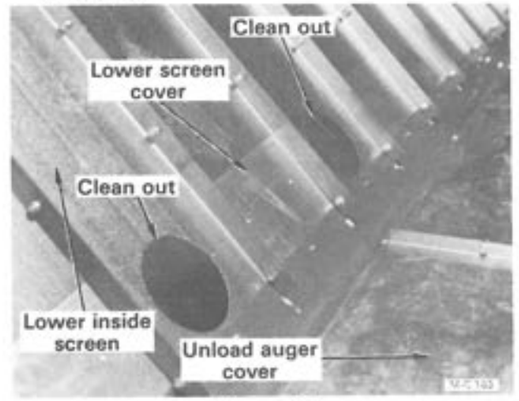


Figure 15

13. There is a clean out in every other lower inside screen (between each outside quick drain port). Remove every other lower screen cover, see Figure 15. After the frozen grain has been loosened, reinstall the lower screen covers, heat chamber door in the floor and close the dryer rear door. Turn on the electric power supply and restart the dryer.

Final Shut Down

When finishing a crop or at the end of the season all of the grain in the dryer must be dry before the dryer is completely unloaded.

1. Flip the moisture control and the level auger switches **OFF**.
2. Run both burners until all of the grain is at the desired moisture content. It will take approximately 6 minutes per point of moisture being removed to dry all of the grain.
3. When the grain is dry, close the LP Gas supply valve at the tank or close the natural gas supply valve. Operate the burners until the flame goes out. Flip the ignition switches **OFF**.

NOTE: When the Low Grain Level Timer shuts the dryer down check for lack or slow down of grain possibly caused by loading auger and/or conveyor drive belt slippage or loss of electric power. Also check for obstruction of grain flow from the wet holding tank.

4. When the problem has been corrected, flip the level auger switch to the **MANUAL** position. The level auger will start, the **hopper low level warning light** will go **out** and the Low Grain Level Timer will reset automatically. The "POWER" and "HIGH LIMIT" lights will be on. Flip the ignition switch(es) **OFF**.

NOTE: The timer will also reset automatically when the level auger switch is flipped to the **OFF** position or when there is a loss of electric power to the dryer.

5. When the dryer is full, restart the fans and burner(s). Flip the level auger switch to the **AUTOMATIC** position. The level auger delay will be activated if the **level auger mercury switch** is calling for grain.

CAUTION: Do not allow anyone to be in the hopper as the level auger will start automatically.

Rear Discharge Overload Door
(If Equipped)

1. If the customer supplied grain take away system fails, the dryer will continue to discharge grain until the rear discharge overload door, Figure 13, is raised by the grain.

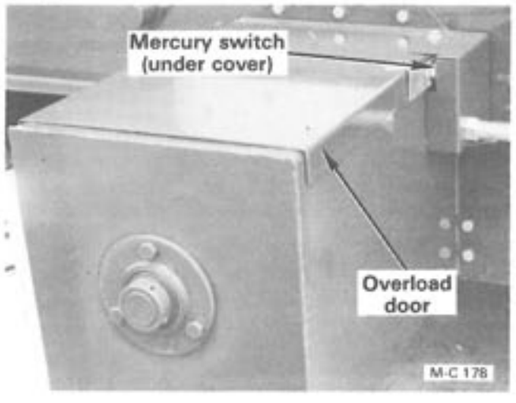


Figure 13

2. When the overload door raises, the dryer will shut down and all of the lights on the panel will be out. The Low Grain Level Timer, if equipped, will automatically reset.
3. When the problem has been corrected and the rear discharge overload door closes, the "POWER" and "HIGH LIMIT" lights on the panel will come on.
4. The level auger delay will be activated if the level auger switch is in the **AUTOMATIC** position and the level auger mercury switch in the hopper is calling for grain.
5. Flip the ignition switch(es) **OFF** and restart the fans and burner(s).

CAUTION: Do not allow anyone to be in the hopper as the level auger will start automatically.

Control Cabinet Heat Bulb
(If Equipped)

1. The heat bulb in the upper control cabinet, Figure 14, will always be on when the electric power supply to the dryer is on. It does not have an ON-OFF switch.
2. The bulb supplies heat to help keep the electrical components in the cabinet dry.

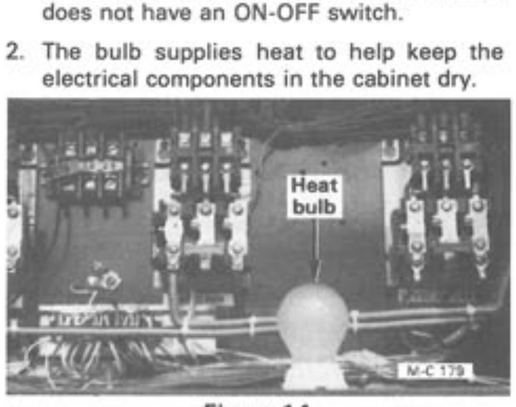


Figure 14

Shut Down

1. Close the LP Gas supply valve at the tank or close the natural gas supply valve. Operate the burner(s) until the flame goes out. Flip the ignition switch(es) **OFF**.
2. Close the gas main hand valves in the cabinet (handles 90° to the piping).
3. **LP Gas** - Close the liquid line flip valve at the dryer (handle parallel to the pipe).

INTRODUCTION

To The Owner

Before operating your Grain Dryer read the Set-Up, Start-Up and Operating instructions in this manual. Check each item referred to and become familiar with the adjustments and/or settings required to obtain efficient operation and maximum trouble free service.

Work Safely

This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions.

Warranty Registration

It is important to send in your warranty registration card as soon as your new Grain Dryer is delivered. Not only does the card validate your Grain Dryer warranty, but it is also our way of knowing who has purchased M-C equipment so that we can keep in touch with you.

Model and Serial Number Location

The model and serial number of your Grain Dryer are stamped on a plate located on the left front side, see Figure A. For future reference, record the model and serial number in the blank spaces in Figure B.

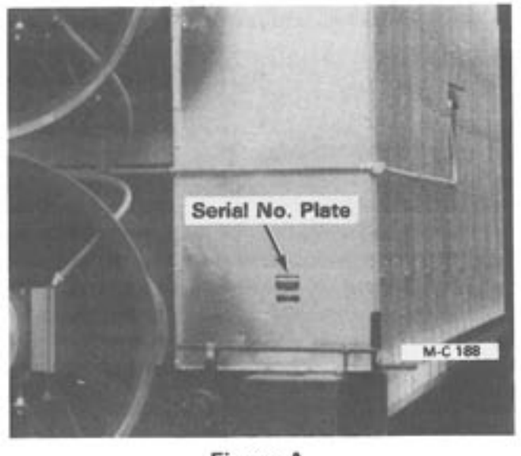


Figure A

Figure B

Parts Ordering Instructions

1. Order parts from your local M-C dealer or distributor.
2. Always furnish the Grain Dryer model and serial numbers. This information is stamped on the serial number plate.
3. Service parts for your Grain Dryer are listed in the 665 Dryer Manual DM 1179. When ordering parts be sure to furnish the part number, description and quantity required.
4. Inspect all shipments upon receipt. If any packages and/or boxes are missing, or parts are damaged, file a claim with the carrier immediately. Failure to do so may void a claim. Check the shipment against the packing list carefully. Report any shortages to the shipper immediately.
5. Do not return any parts to the Mathews Company without a "Return Goods Authorization" from the factory. All return parts shipments must be shipped prepaid (COD shipments will not be accepted). Shipments must also include the following:
   A. A letter of explanation including the "Return Goods Authorization Number", your name and address.
   B. A list of all parts being returned. List must include part number, description, quantity and original invoice number.

Capscrew Grade Identification

There are four grades of hex-head capscrews. Grade 1 and 2 are common capscrews, grade 5 and grade 8 are used when greater strength is required. Each grade can be identified by the marking on the head of the capscrew, see chart below.

When servicing the machine and/or replacing capscrews, be sure to use the correct size and grade. If in doubt, refer to the parts list. If a specific grade is not shown as part of the description, the capscrew is a grade 1 or 2.

CAPSCREW GRADE IDENTIFICATION CHART

S.A.E. Grade	Description	Capscrew Head Marking*
1 2	WILL HAVE A PLAIN HEAD - NO RADIAL LINES Low or Medium Carbon Steel Not Heat Treated	
5	WILL HAVE 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	WILL HAVE 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

*The center marking identifies the capscrew manufacturer.

Metric (SI) Measurements

(English Units & Metric (SI) Equivalents)

Area
1 square inch = 6.4516 square centimeters
1 square foot = 0.0929 square meters
1 square yard = 0.8361 square meters
1 acre = 4047 square meters
1 acre = 0.4047 hectare

Force
1 pound (force) = 4.45 newtons

Length
1 inch = 25.4 millimeters
1 inch = 2.54 centimeters
1 foot = 304.8 millimeters
1 foot = 30.5 centimeters
1 foot = 0.305 meters
1 yard = 0.9144 meters
1 mile = 1.6093 kilometers

Mass
1 ounce = 28.35 grams
1 pound = 0.454 kilograms
1 ton = 907.1848 kilograms

Power
1 horsepower = 0.7457 kilowatts

Pressure
1 psi = 6.89 kilopascals
1 psi = 0.00689 megapascals
1 inch of mercury = 3.377 kilopascals

Temperature
1 degree Fahrenheit (°F – 32) – 1.8 = °Celsius

Torque
1 inch pound = 0.113 newton meters
1 foot pound = 1.356 newton meters

Velocity
1 mile per hour = 1.61 kilometers per hour

Volume
1 bushel = 35.24 liters
1 bushel = 0.0352 cubic meters
1 pint = 0.4731 liters
1 quart = 0.9464 liters
1 gallon = 3.7854 liters
1 cubic inch = 16.387 cubic centimeters
1 cubic foot = 0.0283 cubic meters
1 cubic yard = 0.7646 cubic meters

NOTE: The Mathews Company reserves the right to incorporate any changes in design without obligation to make these changes on units previously sold.

the grain metering roll ratchet solenoid. The solenoid will lift the weight off of the ratchet pawl. The ratchet pawl will engage the ratchet wheel and the grain metering roll will start unloading grain, see Figure 11.

NOTE: If the grain unloading rate is too slow, the grain will be over dried because the grain metering rolls are not moving the dried grain out of the drying columns fast enough.

4. To correct this, speed up the unloading rate by adjusting the variable speed pulley, see Figure 9. Turn the crank clockwise until the moisture control activates the ratchet solenoids (on and off) intermittently so that the grain metering rolls discharge dried grain 90% of the time.

IMPORTANT: Note and mark the position of the variable speed pulley before any adjustment is made so that it can be returned to the original position. Make changes slowly, avoid over adjusting. Wait 1 hour for the dryer to react to each change.

5. If the moisture content of the grain coming out of the dryer starts to increase or decrease change the setting of the moisture control ½ mark, see Figure 10. Allow one hour for the dryer to react to the change before changing the moisture control setting again.

NOTE: It is suggested that a log be kept recording the variable speed pulley position, moisture control and temperature settings for various grain drying conditions that occur. This log can be referred to each season.

Low Grain Level Timer
(If Equipped)

Setting the Timer

1. The level auger switch **must** be in the **MANUAL** position.
2. When the level auger starts, check the length of time it takes to refill the dryer. Check the level auger refill time a minimum of 6 times. Add the 1 minute level auger circuit delay time explained in the **NOTE** below to each refill time.

NOTE: There is a 1 minute delay in the level auger circuit. It is activated when the level auger switch is in the **AUTOMATIC** position and the level auger mercury switch in the hopper calls for grain. This delay prevents nuisance starting and stopping of the level auger. If the level auger switch is flipped to **OFF** and back to **AUTOMATIC** the delay will recycle again.

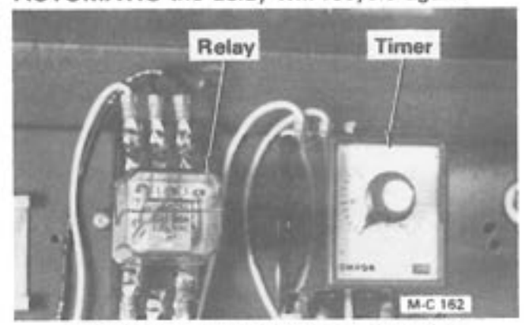


Figure 12 - Low Grain Level Timer

3. Average the 6 refill times and set the Low Grain Level Timer, Figure 12, to run 2 to 3 minutes longer than this. For example, if it takes the level auger an average of 5 minutes to refill the dryer (including the 1 minute delay), set the Low Grain Level Timer to run 7 or 8 minutes.
4. Flip the level auger toggle switch to the **AUTOMATIC** position to activate the Low Grain Level Timer. The timer does not operate when the level auger toggle switch is in the **MANUAL** or **OFF** position.

Timer Operation

With the Low Grain Level Timer set to run 2 or 3 minutes longer than the level auger refilling time, the timer will work as follows:

1. The timer will start when the **level auger mercury switch** calls for grain. The red light on the face of the timer will be on and the red needle on the timer dial will start to move to zero.
2. After the level auger refills the dryer and shuts off, the timer red needle will automatically reset to 7 to 8 minutes. The red light on the face of the timer will be out.
3. If there is an insufficient grain supply, the level auger will continue to run beyond the 5 minutes refilling period. When the level auger has run the length of time that the Low Grain Level Timer has been set for (7 or 8 minutes), the dryer will shut down and the control panel light labeled **"HOPPER LOW LEVEL WARNING"** will come on. All other lights will be out.

IMPORTANT: Note and mark the position of the variable speed pulley before any adjustment is made so that it can be returned to the original position. Make changes slowly, avoid over adjusting. Wait 1 hour for the dryer to react to each change. It is suggested that a log be kept recording the variable speed pulley position, moisture control and temperature settings for various grain drying conditions that occur. This log can be referred to each season.

4. The variable speed pulley should only be used for fine adjustment. The range from fast to slow is approximately equal to one tooth on the ratchet wheels. **Never** put extreme pressure on the belts by bottoming them out in the pulley.
5. It is suggested that the variable speed pulley be cycled from fast to slow at least once a day (when the dryer is operating) to keep all moving parts operating freely.

IMPORTANT: If the grain unloading rate must be increased or decreased beyond the range of the variable speed pulley adjustment, adjust the position of the transfer arm on the eccentric sprocket as outlined under "Grain Metering Roll Ratchets" on page 12.

Figure 10 - Moisture Control

Moisture Control

1. When the dryer has discharged grain at the desired moisture content for one hour, flip the moisture control switch to the **AUTOMATIC** position.
2. Set the moisture control, Figure 10, on each side of the dryer by turning each indicator knob just to the point where the grain metering roll ratchet solenoid lifts the weight off of the ratchet pawl, Figure 11. Each moisture control will probably have a slightly different setting, this is normal.

CAUTION: The guards were removed in Figure 11 to provide a clear illustration. Do not operate the dryer without guards in place and secure.

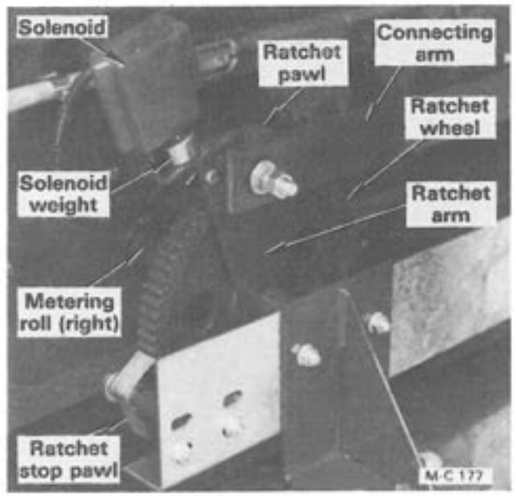


Figure 11

The following chart shows approximate moisture control dial settings when the dryer is being operated **"Dry and Cool"**.

Approximate Moisture Control Setting for Corn and Most Small Grains

Operating Temperature	Set Control Dial At	To Get % Moisture
180°F	3.5	13 - 14%
180°F	4.0	14 - 15%
180°F	4.5	13 - 15%
180°F	5.0	12 - 13%

NOTE: If the dryer is being operated **"All Heat"** the chart above can be used as a starting point. In most cases the final moisture control setting will be 1 to 3 marks lower than the settings shown in the chart. The final setting must be determined under actual drying conditions with each individual dryeration or combination drying system.

3. When the moisture content of the grain is reduced to the level that the moisture control is set for, the moisture control will activate

SET-UP INSTRUCTIONS

General

NOTE: The fan and control cabinet end of the dryer is the FRONT. LEFT and RIGHT is determined by standing at the REAR of the dryer looking at the rear door.

1. Place the dryer in a level position.
   A. **Permanent Installation**
   Place the dryer on a concrete slab designed to carry the weight of the dryer when full of grain (approx. 24,500 lbs.). A vibration damper (wood planks, flat belting etc.) should be used between the full length of the skids and the concrete slab. Anchor the dryer down to prevent blow over.
   B. **Portable or Temporary Installation**
   Timbers or railroad ties should be placed under every skid support (maximum 32" inches apart). Remove the wheels or dig holes for the wheels. The full weight of the dryer must rest on the dryer skids. Anchor the dryer down to prevent blow over.
2. Install the Level Auger and Hopper. See page 5 and 6 of 665 Dryer Manual DM 1179.
3. Install the Level Auger Belt Guard and both Fan Guards. See page 10 of 665 Dryer Manual DM 1179.

Electric Power Supply

1. Connect the electric power supply to the dryer. Refer to the wiring diagram at the back of these instructions. Be sure to connect the ground wire to the ground lug provided in the upper section of the control cabinet.
2. The 115 volt electric supply for the dryer controls must be connected to one of the 115 volt legs of the incoming power.

IMPORTANT: On three phase models serious damage will be done to the dryer control panel if the 115 volt supply for the control panel is connected to the 230 volt leg.

3. Turn both fans on for a short time to determine if rotation is correct. Standing at the front of the dryer facing the fans, the fan rotation **MUST** be counterclockwise. If not, proceed as follows:
   A. Single Phase — Have an electrician check fan motor wiring.
   B. Three Phase - Move the wires on the fan motor magnetic starter terminals in the control cabinet. Move T1 to T3 and T3 to T1.
4. **Customer Supplied Loading Augers and/or Conveyors** controlled by the dryer **MUST** have 115 volt coils in the magnetic starters.

IMPORTANT: All the power to the loading auger and/or conveyor magnetic starter(s) **MUST** be supplied by the 115 volt coil in the dryer level auger magnetic starter. The jumper wire(s) supplying power to the 115 volt coil on customer supplied magnetic starters must be removed before attaching any wires to the dryer level auger magnetic starter 115 volt coil. Follow the magnetic starter manufacturers instructions showing jumper wire(s) to be removed when a separate 115 volt coil voltage source is used.

5. Connect one wire from the customer supplied loading auger or conveyor 115 volt coil to the dryer level auger magnetic starter coil terminal that has the wire with "RLY-6> LAS" imprinted on it. Connect the other wire from the customer supplied loading auger or conveyor 115 volt coil to terminal block No. 5 (neutral) on the terminal track in the dryer control cabinet.
6. A separate electric power source must be provided to operate customer supplied take away equipment.

Gas Supply

LP Gas

1. Advise your LP Gas supplier that the dryer burners require liquid propane from the LP tank (not vapor). Use a minimum ½ inch ID gas line between the LP tank and the dryer. For distances over 100 feet use ¾ inch ID gas line.

IMPORTANT: Use type of supply line specified by Local Codes.

2. Install the "Excess Flow" tank valve that is furnished with the dryer on the LP tank. This valve was designed for use with the dryer and will operate better than those normally supplied by the LP Gas supplier. **NEVER** have two "Excess Flow" tank valves installed on the same LP Gas line.
3. Connect the LP Gas line from the tank valve to the short flexible LP Gas inlet hose at the front of the dryer on the right side. (Hose not used on dryers operated in Canada).

Natural Gas

1. Dryers equipped with 8 unit burners require approximately 5 to 10 lbs. and dryers equipped with ring burners require approximately 10 to 16 lbs. operating pressure at the pressure gauges in the gas manifolds.
2. The maximum BTU output of the dryer is as follows:

   A. Operating "Heat and Cool" 2,400,000 BTU.

   B. Operating "All Heat" 4,500,000 BTU.

   Consult the gas company for gas line size required to the dryer that will provide an adequate volume of gas to meet the BTU requirement at the required operating pressure.

Canadian Requirements

Dryers to be operated in Canada must comply with the following:

1. "The equipment shall be installed in accordance with the current Installation Code for Gas Burning Appliances and Equipment, CAN1 B149.1 and B149.2 and/or applicable Provincial Regulations which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before Installations are made."
2. "All electrical connections are to be made in accordance with CSA C22.1 Canadian Electrical Code Part 1 and/or Local Codes."

START-UP INSTRUCTIONS

General

1. Flip all switches on the control panel to the **OFF** position, see Figure 1. Be sure that the gas main hand valves, Figure 2 and 3, are closed (handles 90° to the piping). Also, be sure that the modulating valves have **not** been turned all the way in to the wide open position. The handles should be half way between the closed and fully open position.
2. Turn on the electric power supply to the dryer. The "POWER" and "HIGH LIMIT" lights will be **ON.**

NOTE: If the "High Limit" light(s) are not on, push the reset button on the upper and lower burner high limit switches, see Figure 2, 3 and 4.

Filling the Dryer

1. For the initial filling, flip the level auger toggle switch on the control panel to the **MANUAL** position. Make sure that the level auger mercury switch in the hopper stops the level auger when the dryer is full. If it does not, adjust the position of the level auger mercury switch as described in step 2.

CAUTION: Do not adjust the level auger mercury switch with the electric power turned on, as any movement of the mercury switch could start the level auger.

2. With the hopper full of grain, bend the level auger mercury switch mounting bracket up

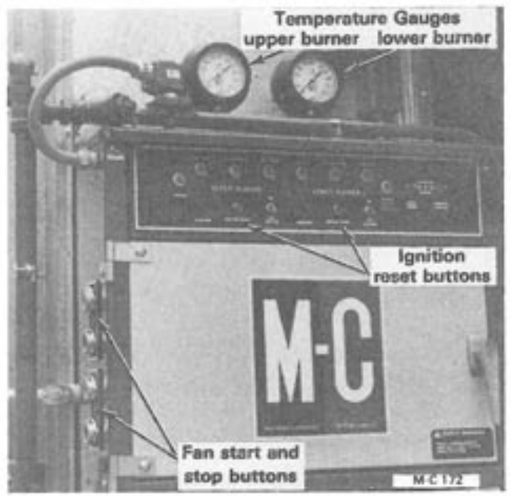


Figure 1

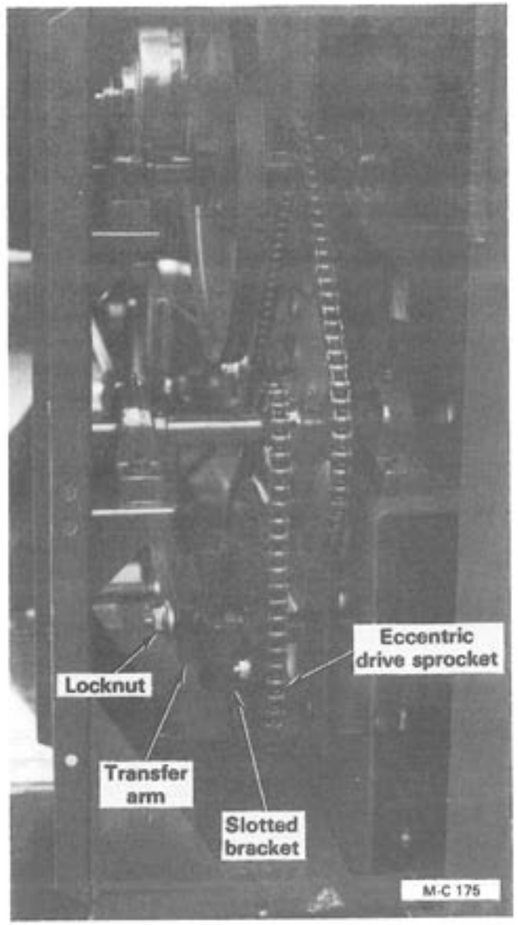


Figure 8

6. The transfer arm is anchored to a slotted bracket on the eccentric drive sprocket, see Figure 8. Loosen the locknut and adjust the transfer arm as follows:

CAUTION: Do not adjust the transfer arm until the eccentric drive sprocket has come to a complete stop.

To Decrease Ratchet Arm Stroke - Slide the transfer arm towards the center of the eccentric drive sprocket. This will decrease the number of teeth that the ratchet pawl engages the ratchet wheel per stroke.

To Increase Ratchet Arm Stroke - Slide the transfer arm away from the center of the eccentric drive sprocket. This will increase the number of teeth that the ratchet pawl engages the ratchet wheel per stroke.

NOTE: Moving the transfer arm approximately ⅛ inch will change the setting by one tooth.

Tighten the locknut and check the adjustment. Readjust if necessary.

6. The ratchet pawls must engage the same number of teeth on each ratchet wheel so that the metering rolls unload at the same rate. If they do not, move the ratchet stop pawl(s), shown in Figure 11 page 14, closer to the ratchet wheel(s) to prevent ratchet wheel roll back.

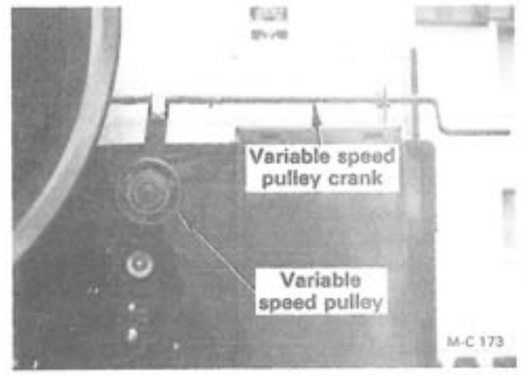


Figure 9

Variable Speed Pulley

CAUTION: The guards were removed in Figure 9 to provide a clear illustration. Do not operate the dryer without guards in place and secure.

1. The variable speed pulley, Figure 9, controls the speed of the unloading auger and the rate of speed that the two grain metering roll ratchet arms move back and forth, see Figure 7.
2. Changing the back and forth speed of the ratchet arms regulates the speed of the grain metering rolls when the ratchet pawls engage the ratchet wheels. Increasing the ratchet arm speed unloads the grain faster and decreasing the ratchet arm speed unloads the grain slower.
3. Turn the variable speed pulley crank clockwise to speed up the grain unloading rate. Turn the variable speed pulley crank counterclockwise to slow down the grain unloading rate, see Figure 9. Adjust **the variable speed pulley only** when the dryer **is operating.**

switch **OFF**. Push the reset button on the High Limit Switch to reset it, see Figure 2 and 3. Repeat steps 4 and 5, but open the gas main hand valve slower to prevent the temperature in the dryer from rising too fast.

9. Adjust the modulating valve to obtain the desired temperature, see Figure 2 and 3. Turn the "T" handle **in to increase** temperature and **out to decrease** temperature.

NOTE: The operating temperature of the **lower burner** should be **30°F** lower than the **upper burner.**

10. When both LP Gas burners are operating, the gas pressure will be a little lower than when only one burner is operating. This is a normal condition. The pressure regulator adjustment does not have to be changed. On Natural Gas burners, the pressure reading will remain nearly constant.

OPERATING INSTRUCTIONS

General

1. After the dryer has been operating for several hours, the LP gas regulator and the modulating valve(s) will be functioning properly. It will not be necessary to adjust them on future start-ups.
2. Be sure that the automatic moisture control switch is in the **OFF** position. Running on continuous heat, it will take approximately 6 minutes per point of moisture being removed to dry the first load.
3. When the first load is dry, flip the moisture control switch to the **MANUAL** position. This will activate the grain metering roll ratchet solenoids and the unloading auger will begin unloading grain.

NOTE: Turn the lower burner off (leave the fan on) if the dryer is to be operated "Dry and Cool".

4. When dried grain begins to auger out, test it for moisture content. If the moisture content is too high, decrease the unloading speed. If the moisture content is too low, increase the unloading speed.

   Wait 1 hour to allow the dryer to react to the change. Recheck moisture content and adjust unloading speed again if necessary.
5. The unloading speed is controlled by adjusting the grain metering roll ratchets and the variable speed pulley.

Grain Metering Roll Ratchets

CAUTION: The guards were removed in Figure 7 and 8 to provide clear illustrations. Do not operate the dryer without guards in place and secure.

1. The normal factory setting for the Grain Metering Roll Ratchets is two teeth per stroke of the ratchet arms.
2. When removing more than 10 points of moisture it may be necessary to adjust the ratchet arms to one tooth per stroke.
3. When removing less than 10 points of moisture it may be necessary to adjust the ratchet arms to three or more teeth per stroke.
4. Both ratchet arms are connected together with the connecting arm and the left ratchet arm is connected to the eccentric drive sprocket with the transfer arm, see Figure 7.
5. The transfer arm, Figure 7, controls the length of the ratchet arm stroke.

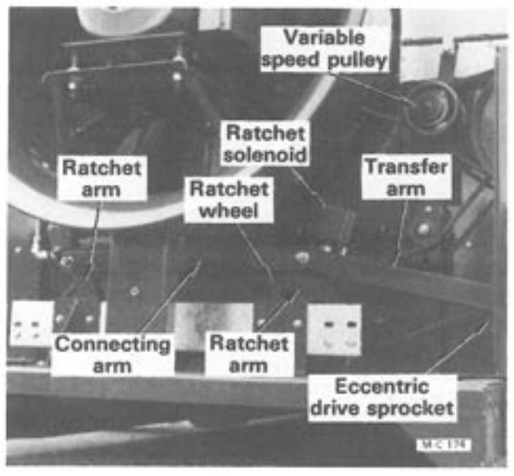


Figure 7

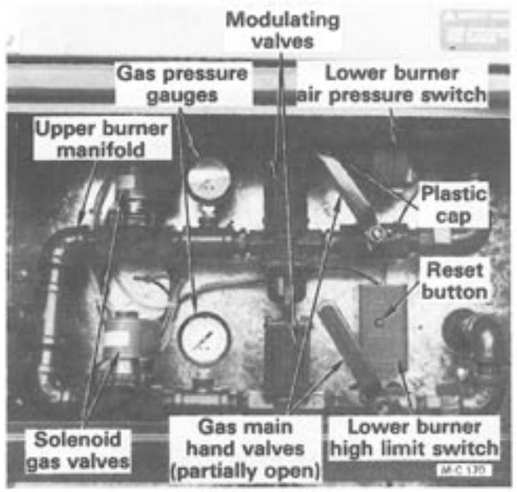


Figure 2 - LP Gas

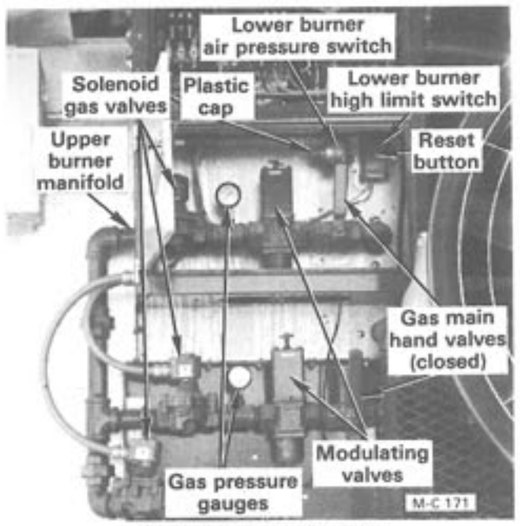


Figure 3 - Natural Gas

so that the mercury in the glass bulb just runs away from the forks in the wire end of the bulb, see Figure 5.

Starting the Upper Burner

NOTE: The upper burner must be operating before the lower burner can be started. The upper burner ignition switch controls the gas solenoid valve in the main gas supply line to the dryer and the gas solenoid valve for the upper burner.

1. **LP Gas** - Open the tank supply valve and open (lift up) the liquid line flip valve at the

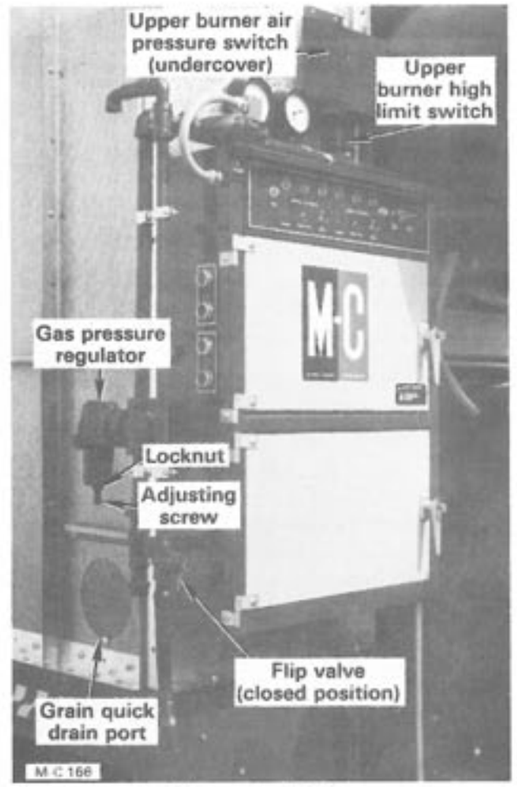


Figure 4 - LP Gas

dryer, see Figure 4. The flip valve is open when the handle is 90° to the piping.

2. **Natural Gas** - Turn the gas supply valve on.
3. Start the upper fan. The "AIR PRESSURE LIGHT" will come **ON** when the fan comes up to speed (the dryer must be full of grain). If the light does not come on or comes on too soon (before the fan comes up to speed) the air pressure switch must be adjusted. See page 10. If no adjustment is necessary, proceed to step 4.

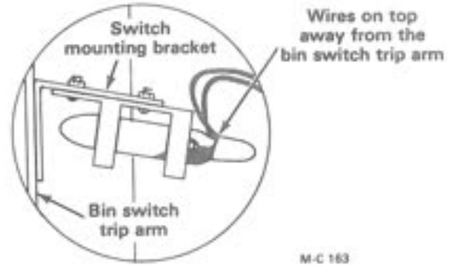


Figure 5 - Level Auger Mercury Switch

Air Pressure Switch Adjustment

CAUTION: The air pressure switch senses the static air pressure in the dryer when the fan is running. If the static air pressure drops because of fan failure or low grain level, the air pressure switch shuts down the burner. This safety feature is for your protection and protection of the dryer. The air pressure switches should be checked for correct operation at the start of the drying season and periodically during the season.

Light Does Not Come On

A. Remove the plastic cap on the end of the air pressure switch to expose the adjusting screw, see Figure 4 and 6.

B. Turn the adjusting screw out ¼ turn. If the air pressure light does not come on, turn the adjusting screw out another ¼ turn. Continue this procedure until the light comes on.

C. When the light comes on, turn the adjusting screw out an additional ¼ to ½ turn to allow for normal changes in static pressure.

D. Shut off the fan. The air pressure light should go out when the fan slows down to approximately half speed. If the light does not go out, the adjusting screw has been turned out too far. Readjust and check again. Install the plastic cap.

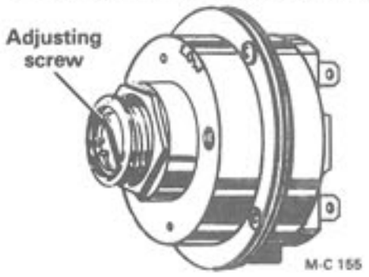


Figure 6 - Air Pressure Switch

Light Comes On Too Soon

A. Remove the plastic cap on the end of the air pressure switch to expose the adjusting screw, see Figure 4 and 6.

B. Stop the fan. Turn the adjusting screw in ¼ turn and start the fan. If the light still comes on before the fan is up to speed, stop the fan and turn the adjusting screw in another ¼ turn.

C. Continue this procedure until the light comes on when the fan is up to speed. Install the plastic cap.

4. Flip the upper burner ignition switch **ON**. The "GAS VALVE" light will be on. Slowly open the upper burner gas main hand valve, Figure 2 and 3, ¼ of the way.

5. When the burner lights and the flame is established, gradually increase the temperature inside of the dryer by slowly opening the gas main hand valve all the way (handle parallel to the piping).

NOTE: Opening the gas main hand valve slowly will prevent possible freezing of the LP Gas line and also prevent the temperature in the dryer from rising too fast. If the temperature rises too fast, the High Limit Switch will trip out and shut down the burner.

6. If the LP Gas line freezes, close the gas main hand valve and flip the ignition switch **OFF**. After the gas line thaws out repeat steps 4 and 5, but open the gas main hand valve slower.

NOTE: The ignition board is electronically timed so that the ignition system will continue to spark and hold the solenoid gas valves open for a "trial ignition" period (about 5 seconds). If the burner does not light the system will "lock out" (after the 5 second trial period) closing the solenoid gas valves. The "GAS VALVE" light will be out. Flip the ignition switch **OFF**, wait one minute, then **ON** again for another "trial ignition" period.

7. If the ignition switch is flipped **OFF** and **ON** too fast, the ignition board circuit breaker will trip out, see step 8.

8. If after several attempts for ignition there is still no flame, push the .01 (1/10th) amp. ignition reset button (circuit breaker) on the control panel, see Figure 1. This circuit breaker protects the ignition board from heat build up due to repeated ignition attempts.

9. If the High Limit Switch trips out, close the gas main hand valve and flip the ignition switch **OFF**. Push the reset button on the High Limit Switch to reset it, see Figure 4. Repeat steps 4 and 5, but open the gas main hand valve slower to prevent the temperature in the dryer from rising too fast.

10. **LP Gas** - When the flame is established, the heat causes the LP gas to vaporize, and a steady controlled heat is possible within 2 to 3 minutes. When the burner is operating normally with the gas main hand valve fully open (handle parallel to the piping) check the reading on the gas pressure gauge, see Figure 2. Gas pressure should be approximately 8 to 10 pounds on dryers equipped with 8 unit burners and approximately 12 to 18 pounds on dryers equipped with ring burners. If it is not, adjust the gas pressure regulator as follows, see Figure 4.

A. Loosen the adjusting screw locknut on the regulator.

B. Turn the adjusting screw **in to increase** gas pressure and **out to decrease** gas pressure.

C. Hold the adjusting screw to prevent any movement and tighten the locknut.

Setting Temperature

1. Adjust the modulating valve to obtain the desired temperature, see Figure 2 and 3. Turn the **"T"** handle **in to increase** temperature and **out to decrease** temperature.

2. Refer to the chart below for **suggested** operating temperature of the **upper burner** for various types of grain.

Drying Chart (Upper Burner)

Type of Grain	Drying Temperature
Corn	180°F to 200°F
Grain Sorghum	160°F to 180°F
Wheat or Oats	160°F to 170°F
Soybeans or Barley	130°F to 140°F
Seed Grains	Not over 110°F

Starting the Lower Burner

NOTE: If the dryer is to be operated "Dry and Cool" it is suggested that the lower burner be started and run until the first load of grain is dry to avoid having to recycle the wet grain in the cooling section back to the heating section.

1. **LP Gas** - Start the lower burner after the upper burner has been running at least 20 minutes. The lower burner gas manifold uses the top burner vaporizer to supply vapor for the lower burner.

2. **Natural Gas** - The lower burner can be started anytime after the upper fan and burner are running.

3. Start the lower fan. The "AIR PRESSURE LIGHT" will come **ON** when the fan comes up to speed. If the light does not come on or comes on too soon (before the fan comes up to speed) the air pressure switch must be adjusted as outlined on page 10. If no adjustment is necessary, proceed to step 4.

4. Flip the lower burner ignition switch **ON**. The "GAS VALVE" light will be on. Slowly open the lower burner gas main hand valve, Figure 2 and 3, ¼ of the way.

5. When the burner lights and the flame is established, gradually increase the temperature inside of the dryer by slowly opening the gas main valve all the way (handle parallel to the piping).

Opening the gas main hand valve slowly will prevent the temperature in the dryer from rising too fast. If the temperature rises too fast, the High Limit Switch will trip out and shut down the burner.

NOTE: The ignition board is electronically timed so that the ignition system will continue to spark and hold the solenoid gas valve open for a "trial ignition" period (about 5 seconds). If the burner does not light the system will "lock out" (after the 5 second trial period) closing the solenoid gas valve. The "GAS VALVE" light will be out. Flip the ignition switch **OFF**, wait one minute, then **ON** again for another "trial ignition" period.

6. If the ignition switch is flipped **OFF** and **ON** too fast, the ignition board circuit breaker will trip out, see step 7.

7. If after several attempts for ignition there is still no flame, push the .01 (1/10th) amp. ignition reset button (circuit breaker) on the control panel, see Figure 1. This circuit breaker protects the ignition board from heat build up due to repeated ignition attempts.

8. If the High Limit Switch trips out, close the gas main hand valve and flip the ignition