



Tower Dryers

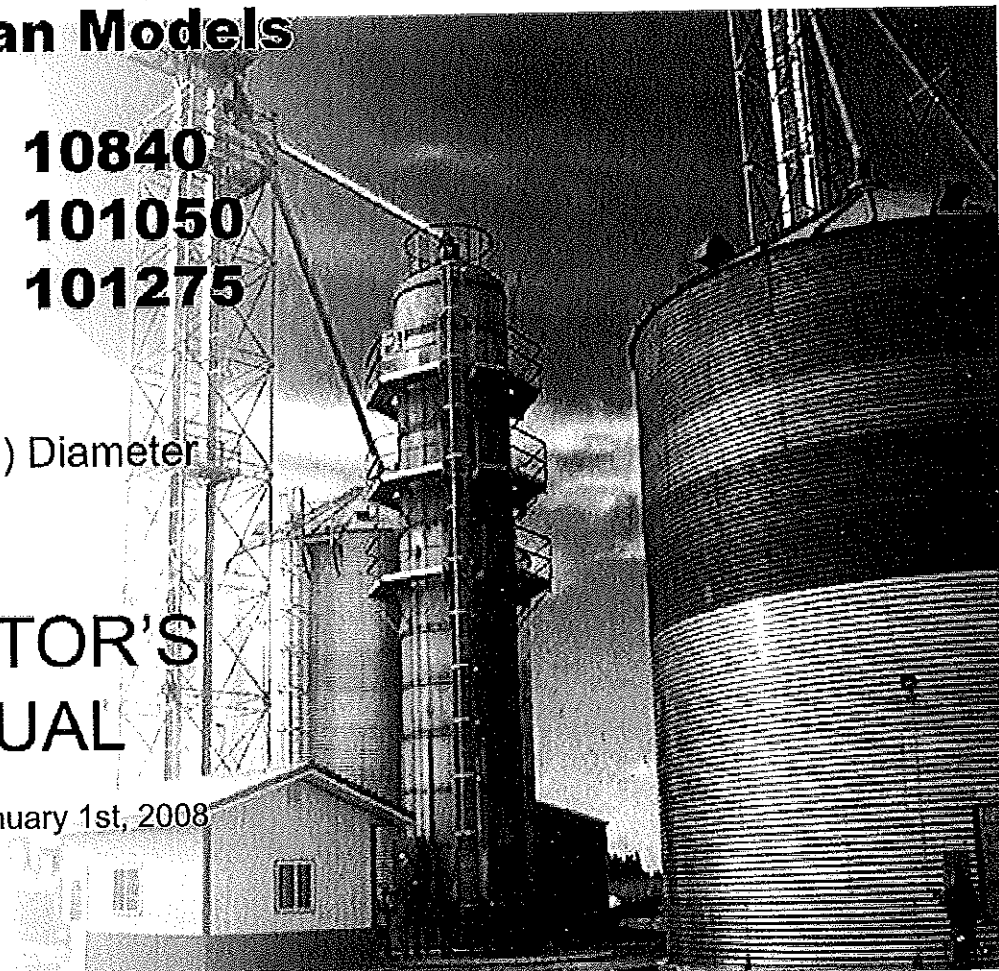
Single Fan Models

10520 10840
10630 101050
10730 101275

10 ft. (3m.) Diameter

OPERATOR'S MANUAL

Effective Date: January 1st, 2008



Mathews Company

500 Industrial Avenue
P.O. Box 70, Crystal Lake IL 60039-0070
Phone: 815.459.2210 Fax: 815.459.5889
www.mathewscompany.com

EQUIPMENT OVERVIEW	5
To the Owner-Operator	5
Warranty Registration	5
Model and Serial Number Location	6
Safety Precautions	6-7
Lock out / Tag out Procedure Requirements	7
End of Season Dryer Shutdown Procedure	8-9
Remote Cabinet Buttons, Lights, Switches and Controls	10
Cal Controller Features	11
Moisture Monitor and Printer	12
Weather Sensor	13
Printer Definitions	14
Sample Printer Readout	15
Gas Supply and Connections: Liquid Propane	16
Gas Supply and Connections: Natural Gas	17
10' Tower Dryer Direct Start High Voltage Cabinet	18
10' Tower Dryer Soft Start High Voltage Cabinet	19
Tower Dryer Ignition System	

OPERATION	21-22
Start Up Procedure	22
Filling the Dryer	23
Setting Grain Flow Timer	23
Grain Flow Timer Operation	24
Starting the Burner	24
Setting Drying Temperature	24
Cal Controller Wiring	25
Drying Temperatures	25
Manual Discharge Mode	25
Switching from Manual to Automatic	25-26
Automatic Moisture Control System	26
Operation of the Discharge System with the Automatic Moisture Control System	26
Moisture Control Setting and Adjustments when in Automatic	26
Approximate Discharge Speed Dial Settings	27
End-of-Day Shutdown	27
Next Day Startup	27
Going Back to Manual	27
Final Shutdown	27

MAINTENANCE	29
Cleanout Recommendations	29
Cleaning the Outside of the Dryer	29
Seasonal Daily Cleanout and Maintenance Guidelines	30
Preseason Check	30
Post-Season Dryer Maintenance	30
In Case of Fire	31
5 HP AC Discharge Drive Speed Control	31
Keypad Instructions	31
Codes that Display Faults on Drive	31
AC Drive Parameters	32
Changing Settings on AC Drive	33
Cal Controller Instrument Panel Features	34
Operating Instructions for the Cal Controller	35
Cal Controller Settings	36
Soft Starter Parameters	36-37
Changing Soft Starter Parameters	38-39
Lubrication	

TROUBLESHOOTING

Safety Circuit.....	41-42
Safety Circuit—Customer Connections	43-44
Moisture Monitor Troubleshooting Guide.....	45-46
Printer Troubleshooting Guide	47
Cal Controller Troubleshooting Guide.....	48
Single Fan Tower General Troubleshooting Startup and Running of Dryer.....	49-50
Dryer Troubleshooting Guide.....	51
Ignition Board Troubleshooting Guide	52

DRYER INFORMATION

10' Tower Dryer Specifications	54
10' Tower Dryer Discharge Data.....	55

DIAGRAMS

Sweep Arm System.....	56
Tower Dryer Sections 10520.....	57
Tower Dryer Sections 10630.....	58
Tower Dryer Sections 10730.....	59
Tower Dryer Sections 10840.....	60
Tower Dryer Sections 101050	61
Tower Dryer Sections 101275	62

TOWER DRYERS: THEORY, COMPONENT FUNCTION & CAPACITY CHARTS

Grain Drying Theory for Tower Dryers.....	63
Grain Dryer Component Functions	64-65
Capacity Charts 10520.....	66
Capacity Charts 10630.....	67
Capacity Charts 10730.....	68
Capacity Charts 10840.....	69
Capacity Charts 101050.....	70
Capacity Charts 101275.....	71

Section 1
Equipment Overview

INTRODUCTION

To the Owner-Operator

This manual was prepared to provide owners and operators of the M-C Model 10520, 10630, 10730, 10840, 101050 and 101275 Grain Dryers with operating instructions and maintenance information that will enable them to keep their M-C Grain Dryers operating at peak efficiency.

Before operating your grain dryer, read the Start-up and Operating Instructions. Check each item referred to and become familiar with the controls, adjustments and settings required to obtain efficient operation.

To keep the dryer operating at peak efficiency, it should be cleaned, lubricated, its belt tension adjusted and the ignition system, fill system and unloading system be tested each year prior to the drying season. Refer to "Pre-Season Check" in the Maintenance section. The Pre-season check can be made when the dryer is empty. Any necessary repairs or adjustments can be made so that the dryer will be ready to operate before the drying season.

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's 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, serial number and specifications of your Mathews Company continuous flow grain dryer are stamped on plates located on the base of the dryer. For future reference, record the model and serial number in the blank spaces of the plate shown in Figure 1.

PANEL LISTING SPECIFICATIONS			
MODEL	2000	CONTROL VOLTAGE	110 SERIAL NUMBER #58746
MAXIMUM CONTROL CABINET OPERATING AMPS		7	
LARGEST BLOWER MOTOR HP		100	RPM 1750
SHORT CIRCUIT CURRENT RATING IN AMPS			10KA
THERMAL TRIP SETTING FOR LARGEST MOTOR			75 Amps
MATHEWS COMPANY 500 INDUSTRIAL DR. CRYSTAL LAKE, ILL., U.S.A. PRODUCTION DATE JUN-08			

Example: Panel Listing

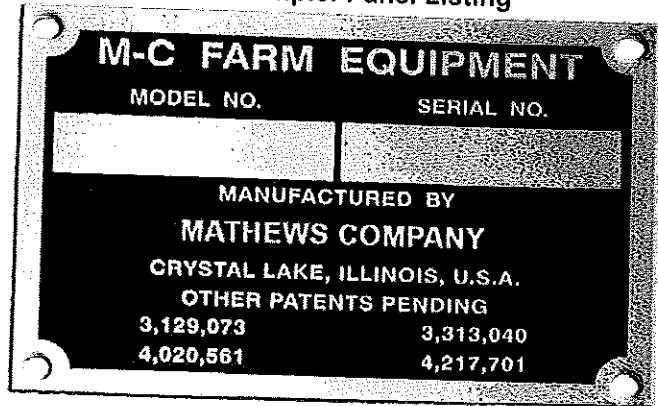


Figure 1: Model and Serial Number

M-C GRAIN DRYER			
MODEL	2000	CONTROL VOLTAGE	110 SERIAL NUMBER #58746
VOLTAGE	480 PHASE	3	HZ 60 MAX. OPER AMPS 180.0
FAN BLOWER MOTOR HP		100 AC	RPM 1750
AC DISCHARGE MOTOR HP		3 AC	RPM VARIABLE
FUEL	NATURAL GAS YES		LIQUID PROPANE
MAXIMUM ALLOWABLE SUPPLY PRESSURE			50 PSIG
MAXIMUM INPUT BTU			21760000 BTU
NORMAL INPUT BTU			12,870,000 BTU
MANIFOLD PRESSURE AT MAXIMUM INPUT			1.25 PSIG
PLENUM STATIC PRESSURE FROM 1/2 TO 6 INCHES, W.C.			
MINIMUM CLEARANCE TO COMBUSTIBLE CONSTRUCTION - 4 FEET			
WARNING - FOR OUTDOOR INSTALLATION ONLY			
MATHEWS COMPANY 500 INDUSTRIAL DR. CRYSTAL LAKE, ILL., U.S.A. PRODUCTION DATE JUN-08			

Example: High Voltage Cabinet Decal

SAFETY PRECAUTIONS



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

1. Read and understand the operation manual before attempting to operate the unit.
2. Keep ALL guards, access doors, covers, safety decals and safety devices in place and securely fastened. NEVER operate system while guards are removed.
3. Keep all untrained personnel away from system components and control panel at all times.
4. NEVER attempt to operate the unit by jumping or otherwise bypassing any safety devices.
5. Always open the main power supply disconnect switch and lock it in the open position with a padlock when performing any service or maintenance work on the fan or heater unit.
6. Lock out power before removing guards, access doors, and covers.
7. Keep hands, feet and clothing away from all rotating parts.
8. Electrical repairs should be performed by trained, qualified personnel only. Failure to follow safe electrical procedures can result in serious injury.
9. If it should become necessary to perform checks on system components or high voltage tests with "live" circuits, be extremely careful and follow all established safety practices.
10. Routinely check for any developing gas plumbing leaks.
11. Do not allow children or bystanders to be near the grain dryer or grain handling machinery while it is operating.
12. Do not operate the grain dryer without all safety shields in place and secure.

NOTE: To provide clear illustrations in this manual, some of the covers, guards and shields have been removed.

DANGER: HAZARDOUS VOLTAGE



The AC Drive Capacitor can continue to discharge voltage for up to 20 minutes after disconnect has been turned off.

Before servicing, disconnect all power, wait 15 minutes, then verify that no voltage is present.

Failure to follow these instructions will result in death or serious injury.

Lock out / Tag out Procedure Requirements

The purpose of a lock and tag out procedure is to prevent injury and/or death to personnel by requiring that certain precautions be taken before servicing or repairing equipment. This includes shutting off and locking out the electrical power source of the equipment.

1. All maintenance personnel are issued a suitable lock (or locks). The lock has the individual worker's name and other identification on it. Each worker has the only key to the lock.
2. Check to be sure that no one is operating the machinery BEFORE turning off the power. The machine operator must be informed before the power is turned off. Sudden loss of power could cause an accident.
3. Steam, air, and hydraulic lines should be bled, drained, and cleaned out. There should be no pressure in these lines or in reservoir tanks.
4. Any mechanism under load or pressure, such as springs, should be released and blocked.
5. Each person who will be working on the machinery should put a lock on the machine's lockout device(s). Each lock must remain on the machine until the work is completed. Only the worker who placed the lock should remove his/her lock.
6. All energy sources that could activate the machine must be locked out.
7. The main valve or main electrical disconnect must be tested to be sure that the power to the machine is off.
8. Electrical circuits must be checked by qualified persons with proper and calibrated electrical testing equipment. An electrical failure could energize the equipment, even if the switch is in the OFF position. Stored energy in electrical capacitors should be safely discharged.
9. CAUTION: Return disconnects and operating controls to the OFF position after each test.
10. Attach accident-prevention tags, which give the reason for placing the tag, the name of the person placing the tag, how he/she may be contacted and the date and time the tag was placed. No one removes the lock without proper authority.

Locks

Each worker must have his/her own lock and the only key to that lock.

The lock should be substantial and durable, and should have the name of the employee on it. In addition, locks can be color coded to indicate different shifts or types of crafts.

When more than one worker is servicing a piece of equipment that must be locked out, a lockout adaptor can be used, which allows all the workers to place their locks on the disconnecting means. After the work is completed, each worker removes his/her lock and the machine is then returned to service.

Tags

DO NOT USE TAGS ALONE. Use tags or signs in addition to locks.

Tags must state the:

- reason for the lockout.
- name of the employee who is working on the equipment and how that person may be reached.
- date and time the tag was put in place.

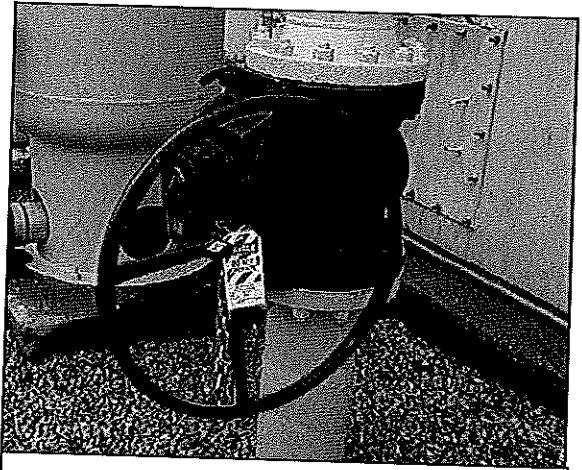
Tagout devices shall be capable of enduring at least 50 pounds of pull, and a non-reusable type.

Blocks

Suitable blocks are another important safety device for making a piece of equipment safe to be repaired or serviced. Blocks must be placed under raised dies, lifts, or any equipment that might inadvertently move by sliding, falling or rolling.

Blocks, special brackets, or special stands such as those commonly used under raised vehicles, must be available at all times. Another form of blocking is the placement of a blind. A blind is a disk of metal placed in a pipe to ensure that no air, steam, or other substance will pass through that point if the system is accidentally activated.

Before installing blinds or blocks, bleed down steam, air or hydraulic lines to get rid of any pressure. Coiled springs, spring-loaded devices or suspended loads must also be released so that their stored energy will not result in inadvertent movement.



Gas Lockout & Tagout



Electrical Power Lockout & Tagout

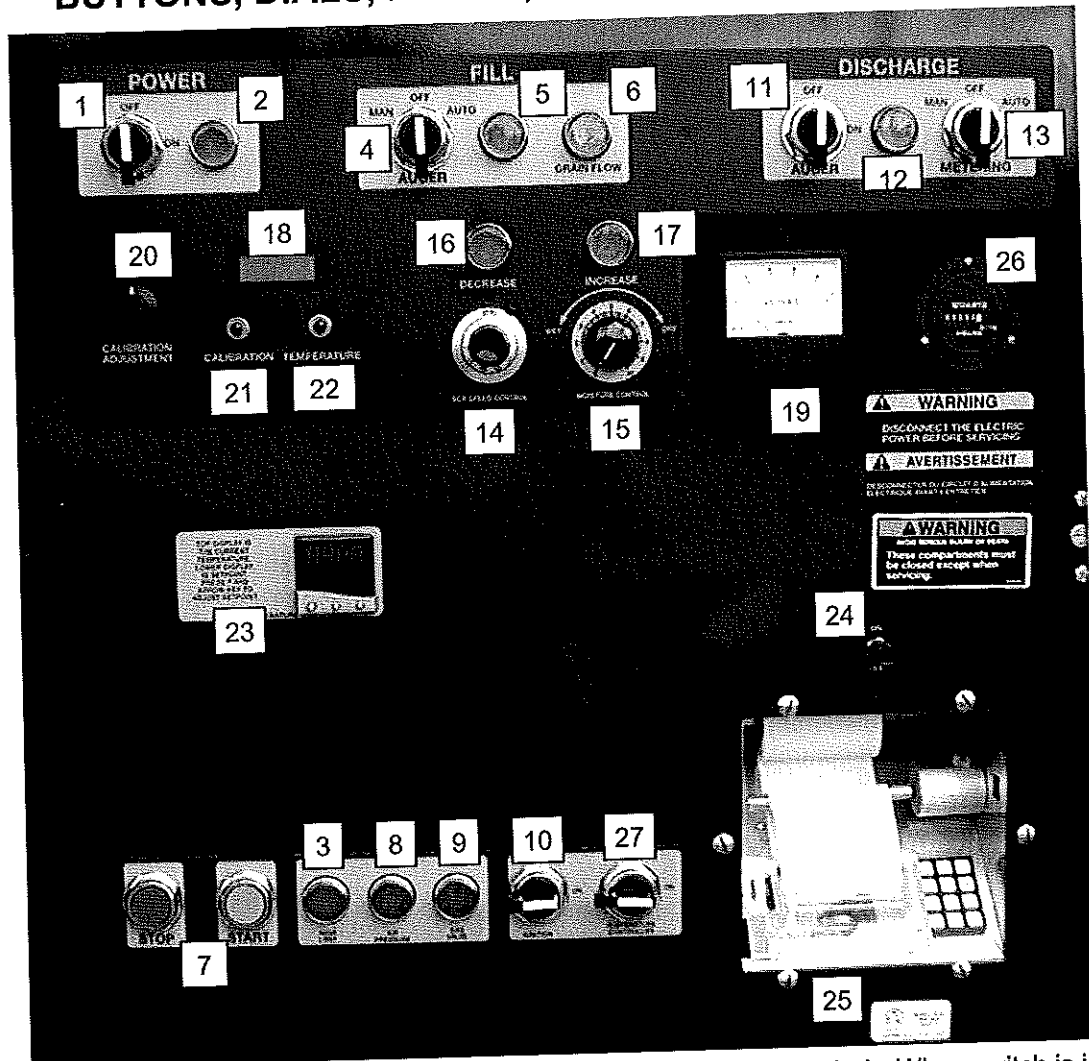
End of season dryer shutdown.

Once the dryer has completed drying for the season, it must be emptied and cleaned out. The use of the grain dryer as a grain storage unit will void the warranty. **The grain dryer was not designed as a storage unit for wet or dry grain.** The screen perforation allows the grain to rehydrate and swell in size if left in the machine too long, resulting in permanent structural damage. The stored grain can also bond together to form a solid piece, which can make discharging grain very difficult and may require manual separation of grain columns.

Grain left in the dryer for an extended period of time can be exposed to freezing, thawing and rain. This type of exposure can lead to rehydration and expansion of the kernels. Not only is this process harmful to the machine, it can damage grain as well. Clean-out of the machine is crucial for preservation of grain and mandatory for safe operating conditions.

REMOTE CABINET

BUTTONS, DIALS, LIGHTS, METERS & SWITCHES



1. — Power On Switch: When this spring-loaded switch is turned to the ON position, the power-on light will be on if the rear discharge overload door is closed, all magnetic starter overload relay blocks are closed, and the relay is activated. High-limit lights will also be on. If not, push the reset button on the high-limit switch.

NOTE: If there is a momentary loss of electricity, the dryer will shut down and will have to be restarted by turning power-on switch to the ON position again.

2. — Power On Light: Indicates power-on switch has been turned on, discharge overload door and starter overloads are closed, and dryer relay is activated.

3. — High Limit Light: Indicates power switch has been turned on and high-limit switch is closed.

4. — Wet Grain Fill Switch: When switch is in the MANUAL position, the wet hopper fill equipment will start immediately when the rotary FILL switch in the hopper signals for grain and stops when the hopper is full.

When the switch is in the AUTOMATIC position, the rotary FILL switch will start the fill equipment automatically after the preset time on the delay and stop fill equipment when hopper is full. Filling time is monitored with the grain flow timer.

5. — Fill Light: Indicates that the grain level in the hopper is low and the rotary FILL switch in the hopper has closed activating the customer-supplied fill equipment.

6. — Grain Flow Light: Indicates low grain level in wet hopper. Light comes on when Grain Flow Timer reaches zero and dryer is shut down. Grain flow shutdown occurs when the fill has run continuously for the timer setting without reaching the level switch to indicate full.

REMOTE CABINET

BUTTONS, DIALS, LIGHTS, METERS & SWITCHES CONTINUED

See Diagram on Page 8

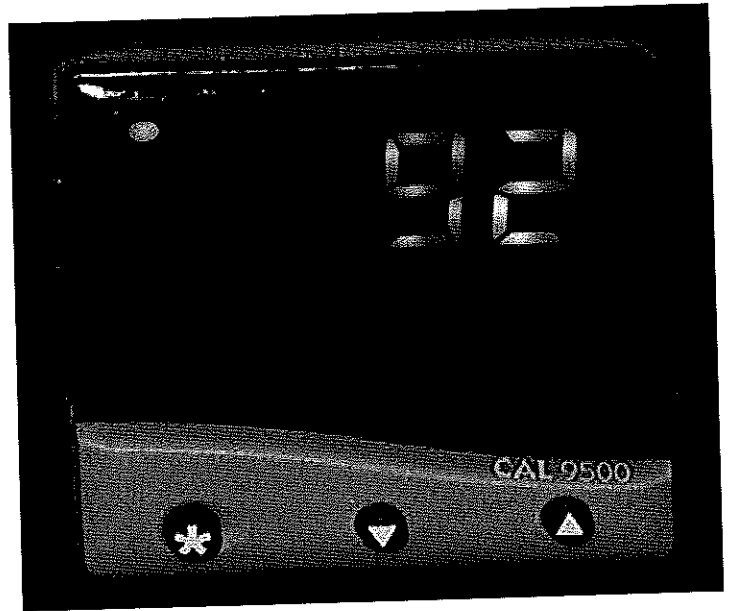
7. — **Fan Start-Stop Buttons:** Green button starts and red button stops the fan.
8. — **Air Pressure Switch:** Indicates that the air pressure switch is closed, the fan motor magnetic starter is engaged, and the dryer is full of grain.
9. — **Gas Valve Light:** Indicates ignition board terminal V1 is powered to open solenoid valves for burner ignition. Light remains lit as long as flame sense probe continues sensing burner flame and terminal V1 is powered. If sensing is lost, board will lock out and shut down solenoid valves and gas valve light.
10. — **Burner Ignition Switch OFF/ON:** After a (10) second delay, the Ignition Board terminal V1 is energized to open gas solenoids for burner ignition. Gas valve light will also be energized. If burner does not ignite in (10) seconds, ignition board will lock out, de-energizing the gas solenoid valves and gas valve light. Switch will have to be turned to OFF then back to ON for another try at burner ignition. The ignition switch has a second contact (NC) to bypass the temperature controller alarm relays when the burner is off.
11. — **Discharge (Unload) Auger Switch:** Discharge switch engages the discharge relay. The relay signals the external takeaway equipment to run and holds the momentary path to keep the relay coil on. If there is a momentary loss of electricity, the dryer will shut down and the discharge will have to be restarted.
12. — **Discharge Auger Light:** Indicates that the sweep and discharge auger is running.
13. — **Discharge Metering Switch:** When the switch is turned to the MANUAL position, the AC drive motor will run constantly and the speed of the sweep will be controlled by the manual drive speed control dial.
- When this switch is in the AUTOMATIC position, the Moisture Control Board will speed up or slow down the AC motor automatically.
14. — **Manual AC Drive Speed Control:** This manual speed control is used to adjust the speed of the AC motor that drives the grain sweep arm and changes discharge speed when discharge metering switch (Ref. 13) is in the MANUAL position only. Be sure to disengage lock before turning the dial.
15. — **Moisture Control Balance Dial:** This balance dial is used to equalize the moisture control decrease and increase indicator lights before turning the discharge metering switch to AUTOMATIC. Once in AUTOMATIC, the dial is used to make small adjustments in the moisture content of the discharged grain.
16. — **Moisture Control Decrease Light:** Indicates that the discharge rate is decreasing if moisture control is in AUTOMATIC.
17. — **Moisture Control Increase Light:** Indicates that the discharge rate is increasing if moisture control is in AUTOMATIC.
18. — **Digital Display Meter:** Displays discharge gain moisture constantly, grain temperature and calibration setting when respective display button is pushed.
19. — **Discharge Meter:** Indicates the rate of discharge when discharge metering switch is in MANUAL or AUTOMATIC.
20. — **Calibration Adjustment Dial:** Turn dial to change calibration of discharging grain moisture.
21. — **Calibration Display Button:** Push button to display amount added to or subtracted from (-9.9 to +9.9) the discharge grain moisture shown on the digital display meter (23).
22. — **Temperature Display Button:** Push button to display temperature of grain moving over discharge moisture sensor.
23. — **Temperature Controller:** Controls the proportional valve that regulates the amount of gas supplied to the burner. Digital display shows temperatures. Contains both plenum high and low shutdown +/- 40° from actual and set point.
24. — **Printer ON/OFF Switch:** Turns printer on or off.
25. — **Printer:** Provides printed records of time, day, discharge grain moisture, temperature, and average moisture content.
26. — **Hour Meter:** Records hours of dryer operation.
27. — **Temperature Control ON/OFF Switch:** Supplies power to temperature controller of plenum chamber (cal controller). This switch must be ON to light the burner. Switch is also used to reset temperature controller without shutting down the dryer.

CAL CONTROLLER FEATURES

- Cal Controller unit displays set point and actual plenum temperature simultaneously.
- Cal Controller unit reads plenum temperature with an RTD (Resistance Temperature Device).
- Cal Controller unit uses a PID loop control to keep temperature within +/- 2° in plenum chamber.
- Cal Controller unit has an auto-tuning feature to automatically set PID values. This allows the controller to maintain temperature tolerances as ambient conditions, media and gas pressure are changed.
- Gas flow is controlled with a proportional actuator on a butterfly valve that takes 30 seconds to fully rotate 90°
- The proportional valve opens and closes from 0 to 100% to change gas flow and fluctuate the plenum temperature.
- When actual temperature is more than 37.5° below the set point, the control signal will be at full output to open valve.
- Once actual temperature in plenum chamber nears the set-point temperature, the proportional valve starts to close to drive the temperature to the set point.
- The bottom end of the proportional valve can be adjusted to leave a percentage always open, which may be necessary to keep the burner lit.
- The travel of the proportional valve can be adjusted to either increase or decrease total amount open.
- Safety circuit for dryer is wired through controller, by means of a relay.
- The high temperature limit shutdown is 40° over set point. This alarm latches on, power to clear.
- The low temperature limit shutdown is 40° below set point.

NOTE: When first starting the dryer, the low temperature shutdown is inhibited and does not become active until it reaches a temperature within 40° of set point. If the dryer loses the flame of the burner and temperature drops more than 40°, the dryer will shut down.

- Diagnostics will display alarm after shutting down dryer.
- Red LEDs to the left of the SP display (bottom) indicate alarm (Upper LED is for high temperature, lower LED is for low temperature).
- The green LED (upper left corner) flashes as the control output is calculated and changed.



CAL Controller



Proportional Valve

Moisture Monitor and Printer

As soon as electric power is supplied to the dryer, the Moisture Monitor and printer will be activated. The printer is equipped with an ON/OFF switch to control its operation.

Moisture Monitor Instructions

- A. The digital display meter shows grain moisture constantly and should read approximately 6% when sensor is in open air (no grain passing over sensor). See **Figure 2**.
- B. The Push Grain Temperature button and the display meter will show temperature of grain on the sensor. See **Figure 2**.
- C. Push calibration button and the display meter will show the amount added to or subtracted from the displayed moisture (-9.9 to +9.9). See **Figure 2**.

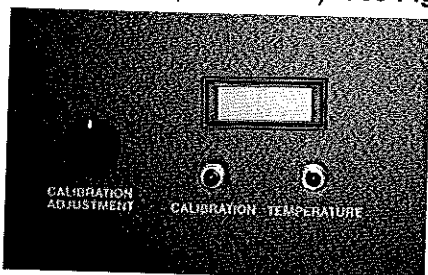


Figure 2

- D. The Moisture Monitor may need to be calibrated to compensate for different grains and sensor configurations. Make sure that the calibration is set at zero before comparing the displayed moisture values with the samples tested with a reliable moisture tester. See Figure 3, Moisture Monitor sampling chart.
 1. If the displayed moisture value is less than that from a moisture tester, push the "Display Calibration" button and turn the calibration knob to display the actual difference (+ value)
 2. If the displayed moisture value is more than that from the moisture tester value, push the "Display Calibration" button and turn the calibration knob to display the actual difference with a minus sign (- value).



CAUTION: Use a safe sampling procedure. Do not sample from a hopper with an unguarded auger. Keep hands, feet and clothing away from rotating parts.

3. The following sampling guidelines are recommended:
 - Take samples when the displayed moisture values are not changing rapidly

- Observe the moisture display when the sample is taken. Record both the displayed values and tested values for at least (6) samples and take the average of each.
- Take samples from the grain sampler located on the left side of the Unload

Moisture Monitor Sampling

The chart shows grain moisture readings (from a real situation) as they should be taken to obtain a realistic moisture value.

Time	M-C Monitor		Dole		Elevator
	Temp.	Moisture	Temp.	Corrected Moisture	Moisture
9:33AM	112	14.4%	109	14.7%	
9:36AM	112	14.4%	111	14.4%	
9:38AM	108	16.0%	107	17.5%	
9:40AM	110	14.6%	109	14.7%	
9:43AM	108	15.9%	104	17.3%	
9:50AM	111	14.5%	107	15.0%	
Total		89.8%		93.6%	
Average		15.0%		15.6%	15.3%

(discharge) auger box.

It is recommended to set the moisture offset at +0.3, which would make it match the point of sale's moisture reading.

Printer

The printer provides a printed record of:

1. Time
2. Mode
3. Grain Discharge Moisture
4. Grain Discharge Temperature
5. Ambient Temperature from weather station
6. Calibration (moisture offset)
7. Number of the bin being filled with dry grain

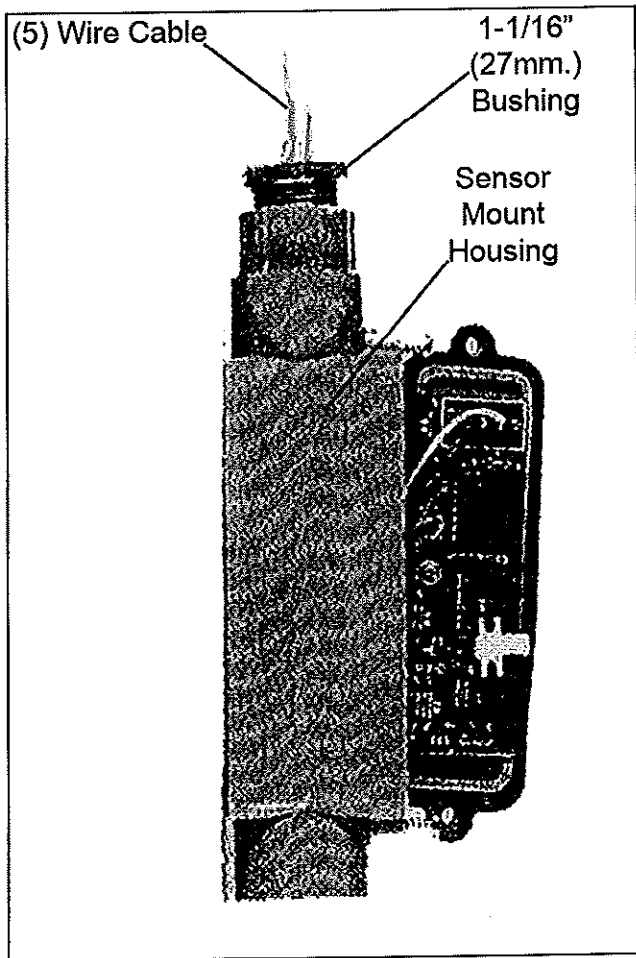


Figure 3—Weather Sensor

A weather sensor is supplied with the printer, but must be installed by the customer when dryer installation is completed. **See Figure 3**

The weather sensor is not required for the proper operation of the Monitor or Printer.

It is recommended that the sensor be located about (20) ft. (6.1 m.) from the heat and humidity of the dryer.

There are (5) colored wires that connect back to the weather sensor circuit board. In the remote cabinet, connect the colored wires to the matching label terminal (spring type). From the spring terminal, pre-wire back to the (36) pin black connectors (number side) attached to the top of the monitor and printer interface board holder in the control cabinet. The (5) wires are:

- White to terminal 11
- Black to terminal 10
- Brown to terminal 9
- Green to terminal 8
- Red to terminal 7

If the remote cabinet is a sufficient distance from the heat and humidity produced by the dryer, the weather sensor can be mounted to the outside bottom of the remote cabinet.

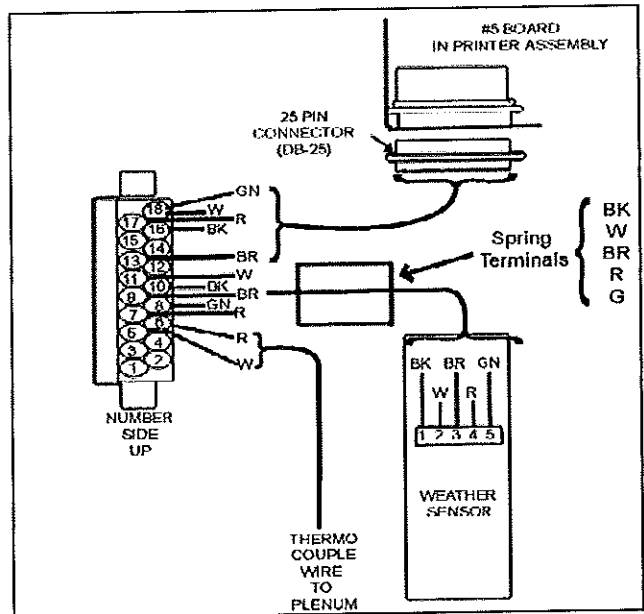


Figure 4

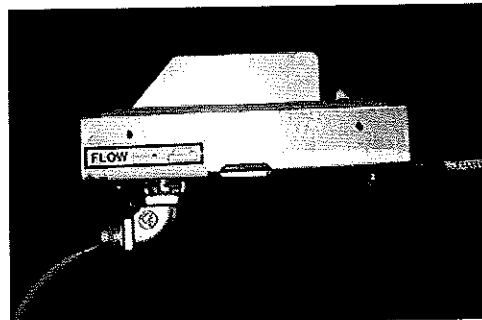
A 1-3/32" (27.8mm.) diameter hole will have to be drilled in the bottom of the remote cabinet. The special 1-1/16" (27 mm.) threaded bushing is then placed into the hole with the thread end to the bottom.

The (5) wire cable from the sensor board is pulled up through the bushing and the mount housing is secured to the bottom of the cabinet by turning the bushing into the mount housing until tight. Now place the (5) wires listed above into their correct terminals and tighten. **See Figure 4.**

If the remote cabinet is located too close to the dryer, a location about 20 ft. (6.1 m.) away from the dryer, if possible, is recommended. Once a suitable location has been selected, secure the weather sensor mount housing.

A length of (5) wire cable will probably have to be spliced and soldered to the 8 ft. (2.44m.) cable supplied with the weather sensor to reach the distance selected from the dryer. Be sure to allow 36" (92cm.) from the bottom of the remote cabinet to the (36) pin black connector at the top inside of the cabinet. **See Figure 4.**

The (5) wire cable should be placed into a separate 3/8" (9.5mm.) flexible liquatite conduit or a 1/2" (12.7mm.) metal conduit from sensor mount housing to the bottom of the control cabinet. No high voltage (115V) wires are to be placed in the same conduit as the (5) low voltage sensor wires.



Moisture Sensor

Printer Definitions

Printer Module and Printout

A "cold start" occurs when batteries are not installed or are weak and need replacing (approximately every 2 years).

This data needs to be entered for operation. If entry is not accepted, the question is repeated.

Acceptable number inputs are:

MM = Month	01 through 12
DD = Day	01 through 31
YY = Year	01 through 99
HH = Hour	01 through 12
MM = Minute	01 through 60

```

COLD START - CHECK BATTERIES
ENTER THE DATE    MMDDYY
DAY? - SUN=1 M=2 T=3 W=4 T=5 F=6 SAT=7
ENTER THE TIME    HHMM (12 HR FORMAT)
ENTER 0 FOR AM OR 1 FOR PM
DATE THURSDAY 08-17-89  TIME  08:36A
ENTER 0 TO CHANGE OR # TO ACCEPT
CURRENT INTERVAL IS  5 MINUTES
ENTER 2-DIGITS OR # TO ACCEPT
CURRENT BIN IS #    1
ENTER 3 DIGIT NUMBER OR # TO ACCEPT
    
```

Prints out your entered information..

Automatically set at five minutes. Can be set from two minutes through 30 minutes.

Automatically set at "1."

Can be numbered up to "999."

Menu is printed when any key is pushed.

Data entered at cold start.

Battery backup, even with power loss.

Enter if other grain is run

1	—	Corn
2	—	Milo
3	—	Rice
4	—	Wheat
5	—	Soybeans
6	—	Sunflower
7	—	Other

```

GRAIN TYPE? - CORN=1 MILO=2 RICE=3
WHEAT=4 SOYBEAN=5 SUNFLOWER=6 OTHER=7
-----
DATE THURSDAY 08-17-89  TIME 08:54A
1 TO BEGIN PERIODIC READOUT
2 TO CHANGE PRINT INTERVAL--NOW 5 MIN.
3 TO AVERAGE---BEGAN 08-17-89 AT 08:36A
4 TO CHANGE BIN NUMBER--NOW 1
5 TO CORRECT DATE/TIME
6 TO CHANGE GRAIN TYPE--NOW  CORN
    
```

Weather station input at time of printing. Reads "0" when not hooked up.

Header always printed after two hours of running time, moisture limit change, and moisture offset change.

Anytime you want to go to the menu, hit any key on the keyboard. This will interrupt the printing and print the menu.

NOTE: After you are finished using the menu, press "1" to again begin the readout. This will not affect the averaging, unless you had reset the averaging.

```

R.H.  67% CALIBRATION  0.0  PLENUM 00
HIT ANY KEY FOR MENU          CORN
-----
          MACH  GRAIN  GRAIN  AMB  AVE
        TIME  MODE  MOIST  TEMP  TEMP  MOIST
-----
09:09A  MON  15.0    77   76   14.8
09:10A  MON  15.2    77   76   14.8
09:10A  MON  14.6    77   76   14.8
    
```

Sample Printer Readout

Time:
Set at cold start.
Reset by menu input.

Mode:
MON=Monitor

```

03-11-98      SETPOINT 0.0      BIN #6
R.H.  67% CALIBRATION 0.0      PLENUM 00
HIT ANY KEY FOR MENU          CORN

  MACH  GRAIN  GRAIN  AMB  AVE
TIME  MODE  MOIST  TEMP  TEMP  MOIST
-----
09:09A  MON  15.0    77   76   14.8
09:10A  MON  15.2    77   76   14.8
09:10A  MON  14.6    77   76   14.8
    
```

Not used

Moisture Offset:
Direct reading from the control panel calibration.

Not used

Ambient Temperature:
From weather station input at time of reading

Average Moisture:
Gives a running average of all readings since start of averaging time. Starts when unit is started after Cold Start or when reset from menu.

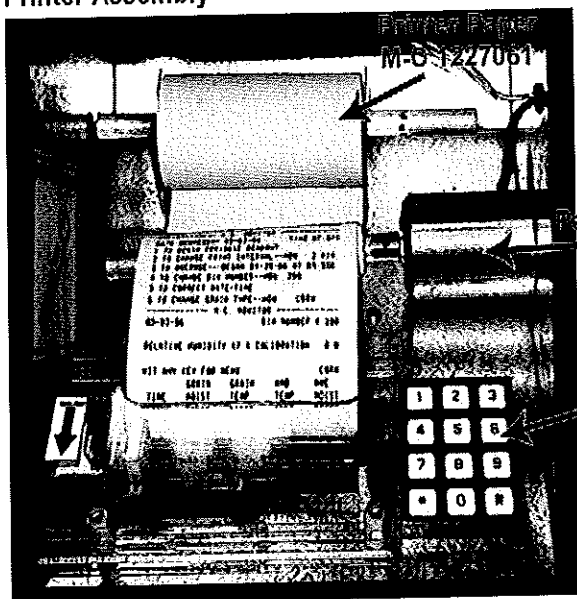
Grain Moisture:
Actual grain moisture at the sensor—temperature compensated.

Grain Temperature:
Actual grain temperature at the sensor.

NOTE: To find when last average began, push any key from Line 3 of menu. Push "1" to restart printing.

NOTE: Replace batteries every year. Use two "AA" alkaline batteries. Turn off power to unit, replace the batteries, then turn on power and reprogram if "Cold start" notation is printed.

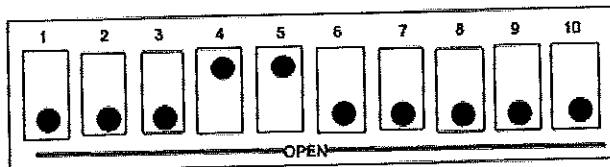
Printer Assembly



Paper Take-up Assembly

Keyboard 12-button

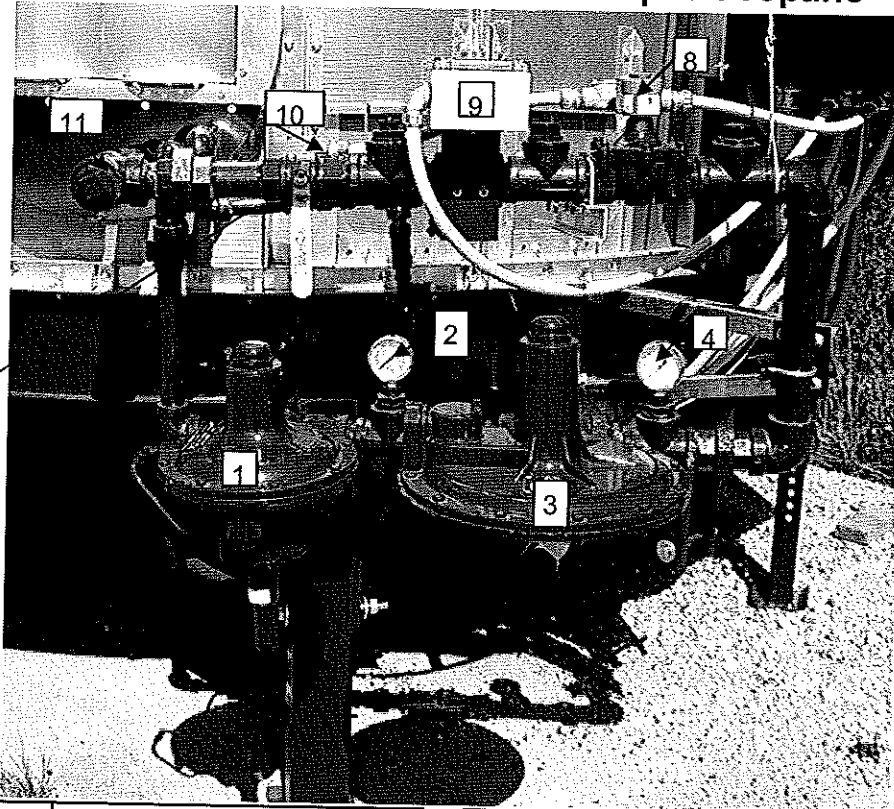
DIP SWITCH SETTING ON MONITOR BOARD



Gas Supply and Connections: Liquid Propane



Side View



1	High Pressure Regulator
2	High Pressure Gauge
3	Low Pressure Regulator
4	Low Pressure Gauge
5	Strainer
6.	Liquid Hand Valve

7	Liquid Solenoid Valve
8	Main Solenoid
9	Proportional Valve
10	Hand Vapor Valve
11	Vapor Line to Burner



CAUTION: Before starting the dryer, test for any gas leaks. Turn the gas supply on and apply soapy water to ALL pipe joints and unions, including pipes assembled on the site and those assembled at the factory.

IMPORTANT: Use type of supply line specified by local codes.

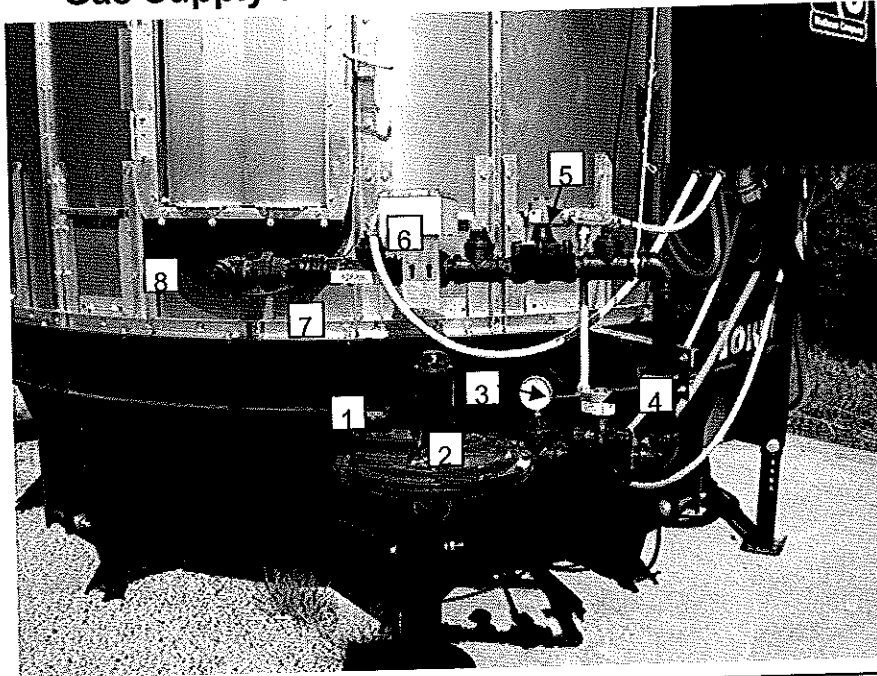
1. Advise your LP gas supplier that the burner requires liquid propane from the LP tank (not vapor).
2. The burner requires 1.5 to 3 psig. (10.6 to 21 kPa) of gas pressure on the Low Pressure Gauge.
3. Consult the LP gas supplier for gas line size required from the supply tank to the dryer manifold that will provide the amount of fuel to meet dryer BTU/Hr. requirements at the recommended operating pressure. See *Gas Consumption BTU/Hr. Chart*.
4. Connect the LP gas supply line from the tank valve to the 3/4" (19mm.) extra heavy duty intake pipe below the left side of the control cabinet (if you are facing the cabinet)

Gas Consumption (BTU/Hr.)*

Model	Normal Operating	Maximum
10520	2,904,000	5,280,000
10630	3,630,000	6,600,000
10730	4,114,000	7,480,000
10840	5,082,000	9,240,000
101050	6,171,000	11,220,000
101275	7,502,000	13,640,000

* Based on 200°F (93.3°C) drying temperature and 50°F (10°C) outside air temperature.

Gas Supply and Connections: Natural Gas



1	Natural Gas Entry
2	Low Pressure Regulator
3	Low Pressure Gauge
4	Gas Solenoid #1

5	Gas Solenoid #2
6	Proportional Valve
7	Main Vapor Hand Valve
8	Vapor Line to Burner



CAUTION: Before starting the dryer, test for any gas leaks. Turn the gas supply on and apply soapy water to ALL pipe joints and unions, including pipes assembled on the site and those assembled at the factory.

IMPORTANT: Use type of supply line specified by local codes.

1. Consult the natural gas company to obtain the size of the supply line to the dryer gas manifold. This supply line must be large enough to provide the volume of gas required for the burner at an operating pressure of 1.5 to 3 psig. (10.6 to 21kPa) on the Low Pressure Gauge. See Gas Consumption BTU/Hr. Chart

2. Connect the natural gas supply line to the 1 1/2" (50mm.) 10520-10730 or 2" (50mm.) 101050-101275 intake pipe.

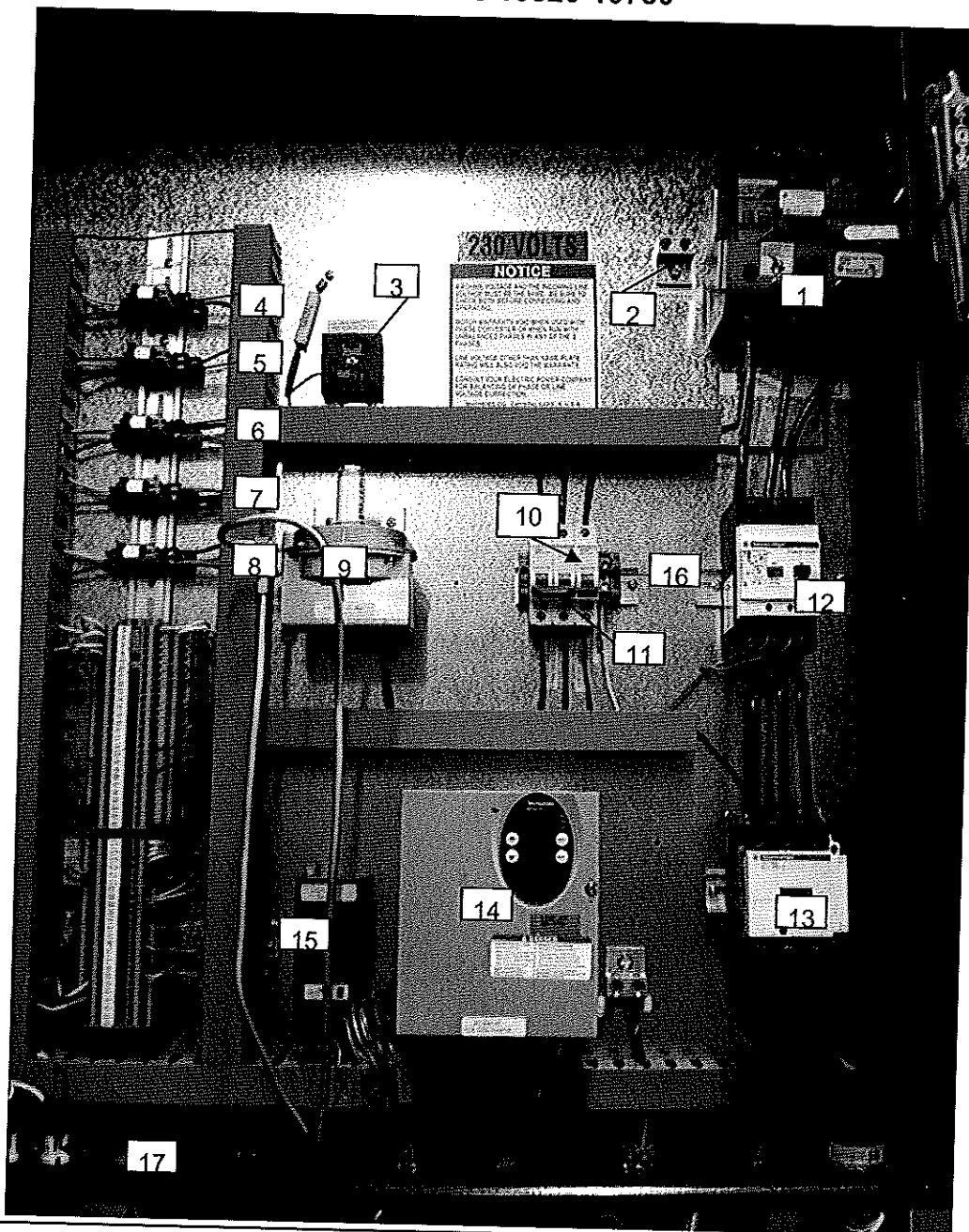
Gas Consumption (BTU/Hr.)*

* Based on 200°F (93.3°C) drying temperature and 50°F (10°C) outside air temperature.

Model	Normal Operating	Maximum
10520	2,904,000	5,280,000
10630	3,630,000	6,600,000
10730	4,114,000	7,480,000
10840	5,082,000	9,240,000
101050	6,171,000	11,220,000
101275	7,502,000	13,640,000

10' Tower Dryer Direct Start High Voltage Cabinet

Models 10520-10730

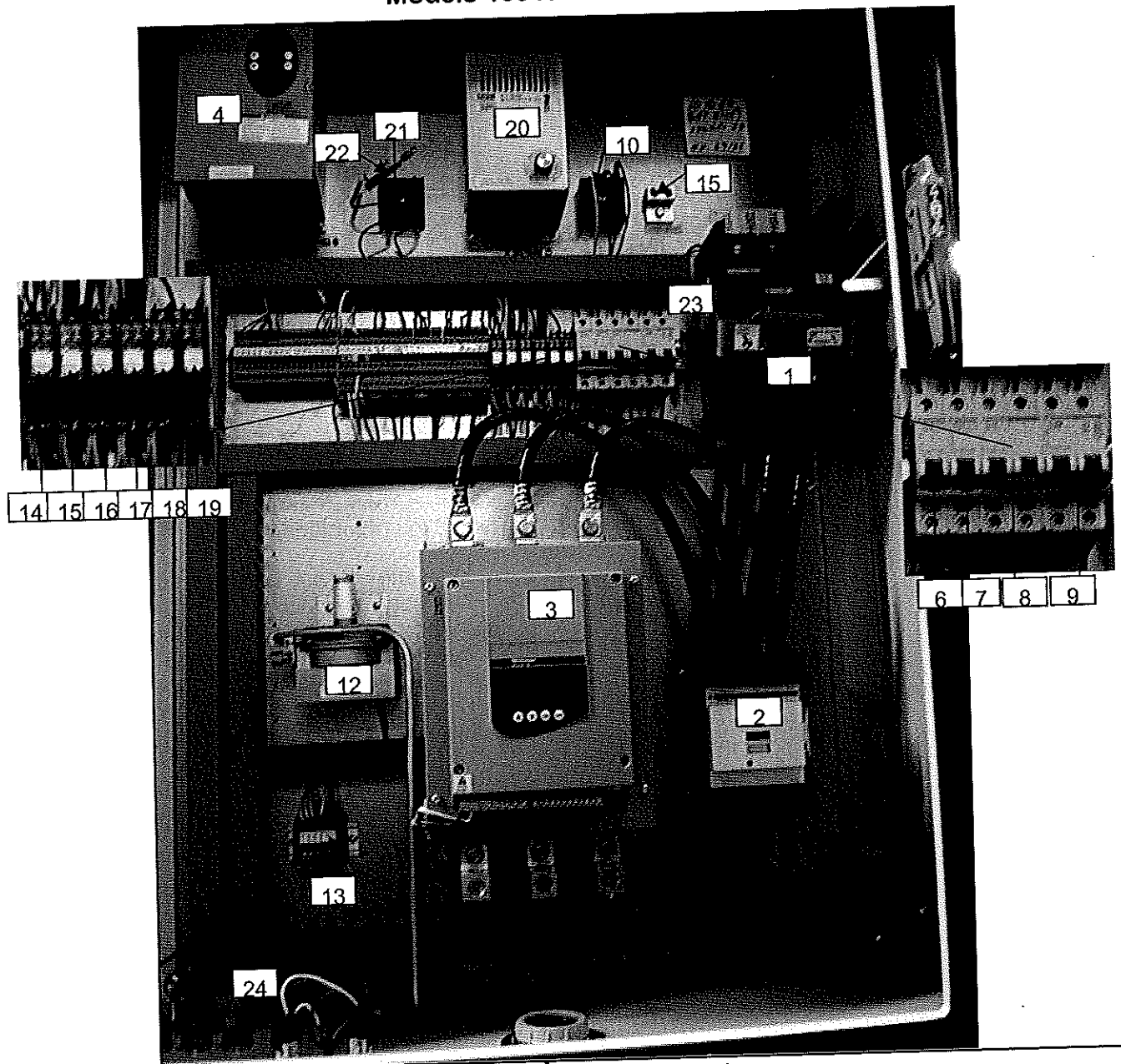


1	Disconnect Switch	10	Circuit Breaker 8 Amp (1) Pole
2	Ground Lug	11	Circuit Breaker 30 Amp (2) Pole
3	Purge Timer	12	Motor Protector
4	Alarm Relay	13	Motor Contactor
5	Fill Relay	14	5 HP AC Drive Unit
6	Discharge Relay	15	High Limit Switch *
7	Ignition Relay	16	Neutral Block
8	VFD Relay	17	Linear Limit Lights
9	Air Pressure Switch		

*7 sections or fewer, located remotely on larger models

10' Tower Dryer Soft Start High Voltage Cabinet

Models 10840-101275



1. Disconnect Switch

2. Motor Contactor

3. Soft Starter

4. Discharge AC Drive Unit

5. Double Pole 460v Transformer Circuit Breaker-35 Amps*

6. Single Pole Soft Starter Circuit Breaker—1/2 Amp

7. Circuit Breaker 7 Amps - 120 volt

8. Double Pole Cabinet Heater Circuit Breaker—4 Amps

9. Double Pole AC Drive Circuit Breaker—30Amp ?

10. Time Delay

11. Ground Lug

12. Air Pressure Switch

13. 24 & 120 Volt Terminal Block

14. Discharge Relay

15. VFD Relay

16. Ignition Relay

17. Fill Relay

18. Fan Control Relay

19. Alarm Relay

20. Cabinet Heater

21. Ignition Purge Timer

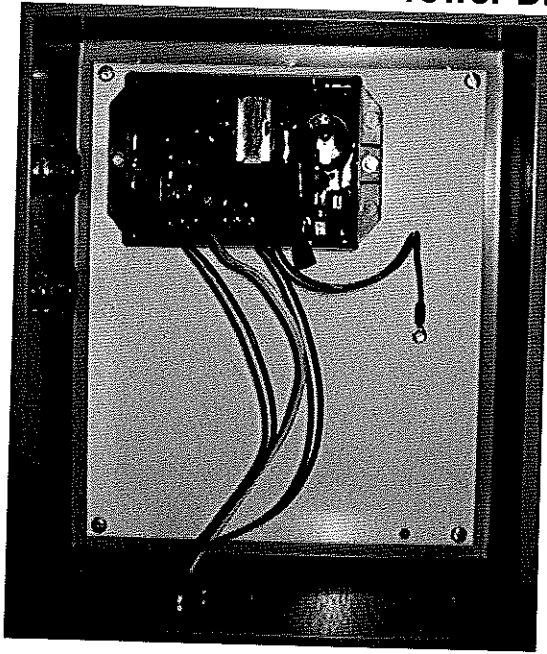
22. Ceramic Resistor 10W-3K OHM

23. Neutral Block

24. Linear Limit Lights

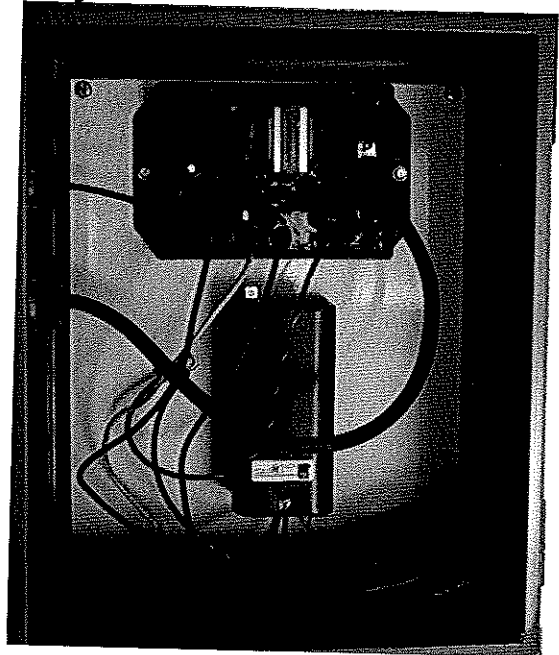
*Not pictured

Tower Dryer Ignition System



Tower Dryer Ignition Module for Models 10520-10730

1. Power is supplied to the air pressure switch through a fan-motor interlock. Once the fan is running, the air switch is powered up.
2. The air pressure light comes on, proving air flow. This then provides power to the ignition switch.
3. Once the ignition switch is turned to the ON position, power up the input side of the external 10-second timer. The load side of the timer has both a resistor-to-ground (eliminating excess voltage during timing cycle) and a hot lead to ignition board.
4. When the ignition board is powered up at L1 and neutral is L2, the board starts through lighting procedure.
5. The Red LED light on the ignition board will flash once when it first receives power. This is to reset the internal board protection and clear memory. This is a 1-second delay before the board starts the first trial for ignition.
6. Once the board is reset and memory is cleared, the board will send high voltage out of E1 (coil) to the spark plug in order to light burner and 120 volts output from V1 to open up solenoid valves & light up gas valve light. This trial for ignition will last for 10 seconds. The trial for ignition ends after 10 seconds as does the high voltage arc and 120 volts out to solenoids from V1.



Tower Dryer Ignition Module for Models 10840-101275

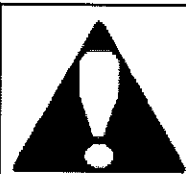
7. If the burner is successfully lit, the board will output between 40 and 60 volts to flame sense probe at burner. The flame sense probe will try to push voltage through flame and to chassis ground. Once the circuit from the flame sense probe to chassis ground is complete and the signal is strong, the board will keep power at V1 and the solenoids remain open.
8. If the signal drops down or is interrupted, the board will drop power to V1 and the solenoid will close, causing the flame to go out.
9. The ignition board has a second trial for ignition, which will occur immediately after dropping out the burner. This will occur so quickly that the gas valve light will not even flash off between loss of signal and re-trial for ignition. The second trial for ignition will not occur if we never establish a flame.
10. When we lose flame, the board will show three flashes on the red LED light on the ignition board, indicating lock out condition.
11. If burner does not light, turn ignition switch to OFF position and back to ON position. The sequence will begin again.

Section 2
Operation

Start-Up Procedure

General

IMPORTANT: Inspect for and remove any foreign material (nuts, bolts, tools, parts, etc.) from the grain columns, discharge auger and heat chamber before filling the dryer with grain.



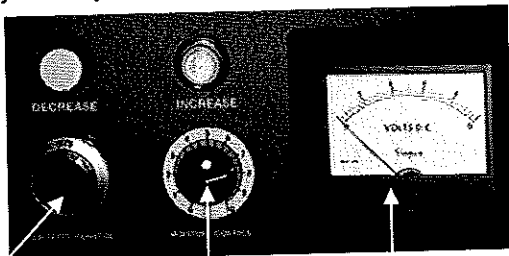
CAUTION: Lock out and tag out high voltage disconnect when working inside any control cabinet or inside dryer.

BE SURE TO REMOVE BURNER COVER!

1. Adjust high limit, located inside the high voltage cabinet on Models 10520-10730, and inside the ignition box on Models 10840 and 101275 (high limit is located in the high voltage cabinet for dryers smaller than 10 sections). Set high limit at 30 to 50 degrees above drying temperature. Recommended settings are to avoid nuisance shutdown.
2. Make sure that all gas supply is turned off and locked out.
 - A. Liquid Propane (LP) Fuel:
 - Turn the LP liquid line hand valve 90° to the piping to shut off the LP at the dryer.
 - Turn the vapor hand valve 90° to the piping to shut off the gas to the burner.
 - Open the LP valve at the source.
 - B. Natural Gas (NG) Fuel:
 - Turn the NG hand valve 90° to the piping to shut off the NG at the dryer.
 - Open the NG valve at the source.
3. Remove pipe cap from vapor line to burner and open hand valve to allow any built-up water to drain from gas lines. Once water has completely drained, recap end of vapor line using Teflon tape and non-hardening pipe dope to reseal and close. Gas supply can now be restored. **See diagram on page 15.**
4. The burner cover must now be removed from the burner. This is located directly on top of the burner in the heat chamber.
5. Make preliminary adjustment to timers located in remote cabinet. Adjust fill timer to 60 seconds and grain flow timer to 5 minutes. Make sure that arrows on grain flow timer are set at 1x and M & 5 (for five minutes). This can be easily adjusted with a small flathead screwdriver. See page 23
6. Turn disconnect on high voltage cabinet to ON position.
7. Turn Power switch to start position. ON light should energize.
8. Depress fan start button and fan should come on. Once the fan is running at full speed, the dryer is ready to be filled.
9. Turn fill switch to manual position and allow dryer to fill completely. Once dryer is filled, turn fill switch to automatic position.
10. Adjust air pressure switch (located inside high voltage cabinet) so that air pressure light energizes when dryer is full of grain and fan is running. **NOTE:** If fan stops for any reason or grain columns start to empty, the air pressure light should de-energize. To adjust the air pressure switch, perform when fan is running and grain columns are full. Turn adjustment screw clockwise until Air Pressure light goes out, then slowly turn counterclockwise until light comes back on. Then add one half turn CCW.
11. Open hand valve on gas train that would be located downstream of the optional maxon valve. Gas pressure should be indicated on the gauge located on the gas train.
12. Turn temperature control switch ON and turn ignition switch to the ON position. This will energize the ignition board and go through a 10-second purge time. Then the ignition board will attempt to light the burner for 10 seconds (trial for ignition). The gas valve light should be energized while the burner is trying to light (10 seconds).

NOTE: If burner will not attempt to light while temperature control is in OFF position, set the temperature control switch to the ON position and allow controller to run through test mode and display plenum chamber.
13. Once burner is lit, press * and ▲ to scroll the number up to the desired plenum temperature. The controller will display two numbers. The upper number is the actual plenum temperature in Fahrenheit. The lower number is the set point (SP) or desired plenum temperature in Fahrenheit. Bottom number SP is the only number you can adjust with arrow keys. The plenum temperature may take several minutes to stabilize. The controller is programmed to slow down the rate that temperature is increasing, the closer the plenum gets to the set point. This is to avoid tripping the high-limit device and overshooting the temperature. The Cal Controller automatically shuts down the dryer if there is a loss or gain in the temperature of more than 40 degrees from the set point.

14. After allowing dryer to warm up, start the discharge system by turning the switch to ON.



SCR Speed Control Dial Moisture Control Discharge Meter

FILLING THE DRYER

NOTE: Always have the fan running before filling the dryer! Either start with dry grain in the cool section or be prepared to catch wet grain and recycle it back into the dryer.

There is an adjustable 0- to 3-minute delay in the dryer wet-fill circuit. The delay is activated when the wet grain filling switch is in the AUTOMATIC position and the filling (fill) light is signaling for grain.

This delay prevents nuisance starting and stopping of the fill system. If the wet grain filling switch is placed in the OFF and back to the AUTOMATIC position, the delay will recycle.

When the dryer fills with grain up to the level of the rotary bin switch, the dryer has reached its capacity and automatically stops filling.

The grain flow timer will shut down the dryer if there is an insufficient amount of wet grain to fill the hopper. When the fill system starts, the grain flow timer will be activated. When the timer counts down to zero, the dryer will shut down and the grain flow light will be illuminated. Grain flow is only a part of the circuit when discharge is operating.

15. Once you are satisfied with grain discharge moisture content, it is time to balance discharge (+, -) lights. First, turn moisture control knob until both discharge lights go out simultaneously. This is the dryer discharge set point. It is now time to turn the Manual/Auto switch from the manual to the automatic position. The discharge speed meter should not change speed while changing from the manual to the automatic position on the switch.
16. Once you have dryer discharge in automatic mode, the discharge speed will change to maintain desired grain moisture content. When the minus light (-) is on, the system is decreasing speed to maintain moisture content. When the plus (+) light is on, the system is increasing speed to maintain moisture content. Once in automatic mode, the manual speed control dial is no longer functional.
17. To change moisture content while remaining in automatic, use the moisture control knob. The knob is graduated 0 to 10, with 0 being the wetter value and 10 being the drier value. If you want to change the discharge moisture content, simply turn the moisture control dial up to a higher number for drier grain and the minus (-) light will come on.
18. Running on continuous heat, it will take approximately (6) minutes per point of moisture being removed to dry the first load.

NOTE: As the dryer is operated "Dry and Cool," it will be necessary to recycle the wet grain in the cooling section back through the heat section after drying the first load or start with dry grain in the cooling section.

19. Test moisture content of the grain being discharged every (15) minutes until it stabilizes.
20. If the moisture content is too high after it stabilizes, turn the manual speed control dial down to a lower number to decrease the unloading speed. If it is too low, turn the speed control up to a higher number to increase the unloading speed.

NOTE: After any adjustment of the discharge speed, wait 1 1/2 to 2 hours to make further speed adjustments since it takes that long for grain to pass through the dryer and for the full effect of the speed adjustment.



CAUTION: Do not allow anyone to be in the dryer when filling it with grain. Always turn off and lock the electric power supply to the control cabinet before allowing anyone to work in the dryer.

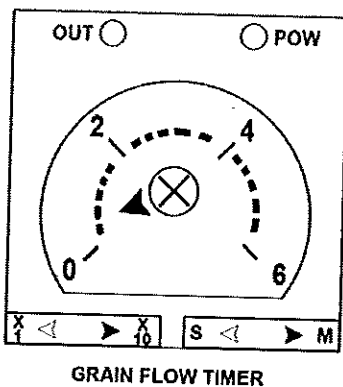
NOTE: Either start with dry grain in the cool section or be prepared to catch wet grain and recycle it back into the dryer.

Setting the Grain Flow Timer

IMPORTANT: If the timer has not been set, the dryer will shut down when the fill dial switch is turned from MANUAL to AUTOMATIC.

Conveyor Fill System (Slave System)

1. Set the adjustable wet fill delay for time desired (0 to 3 minutes) if not already set.
2. Set the Grain Flow Timer arrows at the bottom of the timer face to X10 (times ten) and to M (minutes). It may be necessary to remove the timer from its socket to make this adjustment. Now turn the timer control knob to 1 (3x10) or 10 minutes and flip the wet grain switch to AUTOMATIC. The fill system will start after the 0- to 3-minute delay if the filling (fill) light is on, signaling for grain.



GRAIN FLOW TIMER

Example: Timer setting for conveyor fill system

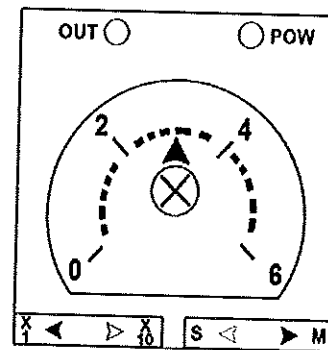
3. Check the refill time a minimum of six times. The filling (fill) light will come on when the rotary fill switch in the hopper signals for grain and will go out when the hopper is full. The length of time that the filling (fill) light is on is the refill time (including the 0- to 3-minute delay)
4. Average the (6) refill times and reset the grain flow timer to run five minutes longer. For example, if it takes the fill system an average of five minutes to refill the dryer, set the grain flow timer to run 10 minutes.

NOTE: The timer does not operate when the wet grain toggle switch or fill dial switch are in the MANUAL or OFF positions.

Gravity Feed Tube System (Choke Fill System)

1. Set the timer for refill time desired 2 to 180 at 10 seconds if not already set.
2. Set the grain flow timer arrows at the bottom of the timer to X1 (times one) and to M (minutes).
3. Grain flow should be set from 2 to 4 minutes.

NOTE: This will not cycle the fill system. The rotary fill switch is used to shut down the dryer on loss of wet grain only.



Example: Timer setting for gravity feed tube system

Grain Flow Timer Operation

With the grain flow timer set to run five minutes longer than the fill system refilling time, the timer will work as follows:

1. The timer will start when the fill system starts. The red light on the face of the timer will be on and the timer will start to count down to zero.
2. After the fill system refills the dryer and shuts off, the filling (fill) light will go out and the timer will automatically reset. The red light on the face of the timer will be out.
3. If there is an insufficient grain supply, the fill system will continue to run beyond the five minute refilling period. When the fill system has run the length of time that was set on the grain flow timer, the dryer will shut down.
4. The Remote Cabinet panel will have the grain flow light on. The (2) red lights at the top of the grain flow timer inside the remote cabinet will be on. Flip the wet grain switch or turn the fill switch remote to OFF
5. Discharge must be in operation for grain flow timer to function.

NOTE: The grain flow timer shuts the dryer down when it has run out of wet grain.

If equipped—the main gas supply safety shutoff valve must be opened manually before the burners can be started.

6. Turn Power -On switch to the OFF position then to the ON position to reset the grain flow timer.
7. Turn the fill switch to MANUAL. Restart the fan, burner, and discharge system. Turn the fill switch to the AUTOMATIC position. The fill system 0- to 3-minute delay will be activated if the filling (fill) light is signaling for wet grain.

Starting the Burner

1. Start fan by pressing the Fan Start button (green). Check to make sure that the air switch indicator light is ON.
2. Open the gas vapor hand valve.
3. Turn the temperature controller switch to ON. This switch controls the plenum burner temperature.
4. Turn the burner switch to the ON position. After a (10) second purge delay, the ignition indicator light will be ON and the burner will light. Once the burner is lit and the heat chamber is warm, turn on plenum control.

NOTE: The (10) second purge is a safety feature that allows the fan to purge the heat chamber of any unburned gases that may remain after a burner has been shut down for any reason.

The ignition board is electronically timed so that the ignition system will spark and hold the solenoid gas valves open for a "trial ignition" period of (10) seconds. If the burner does not light, the system will "lock out," closing the gas solenoid valves.

5. If the LP gas line freezes, close the gas vapor hand valve and turn the burner switch to OFF. After the gas line thaws out, **slowly** open the gas vapor hand valve all the way (handle parallel to the piping).

NOTE: Opening the gas vapor hand valve slowly will prevent possible freezing of the LP gas line and also prevent the temperature from rising too fast. If the temperature rises too fast, the high limit switch will trip out and the dryer will shut down.

6. Push the reset button on the high limit switch, located in the center of the standard control cabinet, in the lower right-hand corner of the Motor Control Cabinet on models 10520 to 10840, equipped with the optional remote cabinet controls, and in a special 12"x10"x5" junction box located in Section 2 of the 101050 dryers.

NOTE: When the high limit switch trips out, the dryer will shut down. The fan and burners will have to be restarted.

7. Push control circuit switch up to START or turn power on switch to the ON position and release.
8. Start the fan by pressing the FAN START BUTTON. Check to make sure that the indicator light for air pressure switch is on.
9. Open the gas vapor hand valve halfway.

10. Turn the burner switch to the ON position. The gas valve light will light and the burners will ignite.
11. The gas pressure reading on the pressure gauge should indicate from .75 to 3.0 (10 to 20.7 kPa.) to maintain the drying temperature during variations in the outside temperature (especially when drying at night).

Setting Drying Temperature

NOTE: Temperatures shown are initial settings and may have to be adjusted for local crop and weather conditions.

1. With the burner operating, set the drying temperature by adjusting the cal controller.
2. Press the * key with the up and down arrow to change the desired set point (drying temperature).

NOTE: After the dryer has been operating for one half hour, check the Cal Controller. The display, in operating mode, shows (2) numbers. The top number is the actual temperature detected by the sensor, and the bottom number is the current set point temperature. The controller is used to show drying temperatures.

Cal Controller Wiring

The proportional valve (Belimo actuator) is powered from 24v and opens according to a 0-10vdc signal. This signal comes from the temperature controller (Cal Controller). The controller will output 10v whenever the current temperature is significantly lower than the set-point temperature. To avoid overshoot upon initial lighting of the burner, this signal output is wired through one pole of the ignition relay.

The Cal controller has a high limit of 40° above the set point and a low limit of 40° below the set point. Upon initial power-up, the low limit is bypassed (inhibited) until the current temperature is within 40 degrees of the setpoint. Both the high and low alarms are bypassed when the ignition switch is off.

With the ignition off, the controller can be powered off and then turned back on to reset the low temperature inhibit or clear a high temperature alarm latch. After the controller powers up and is not in alarm, ignition can be attempted.

If holding a steady plenum temperature is a problem, check the proportional valve to make sure it rotates freely and turn down the pressure as low as possible while still maintaining temperature.

Drying Temperatures			
Model	Corn	Sorghum & Wheat	Sunflowers, Oats, Barley, Soybeans
	Dry & Cool	Dry & Cool	Dry & Cool
10520	210°F	160°F	130°F
10630	210°F	160°F	130°F
10730	210°F	160°F	130°F
10840	210°F	160°F	130°F
101050	210°F	160°F	130°F
101275	210°F	160°F	130°F

Manual Discharge Mode

The discharge system has two selector switches and one pilot light. The discharge switch on the left (labeled AU-GER) is a three-position switch, OFF, ON and Start (momentary) that powers the customer relay.

The momentary position energizes the relay coil to hold the circuit through one pole of the relay. The other pole closes a path between the C3 & C4 terminals to control the external takeaway system.

The right side discharge switch is labeled "metering" and is a three-position maintained switch (MANUAL, OFF, AUTO) that controls the discharge relay. The motor speed reference is either manual (potentiometer) or auto (moisture control system) input to a variable frequency drive (VFD). The switch energizes the VFD relay to give a run signal and turn on the discharge system light. Power comes from the first switch so the dryer discharge won't engage unless the takeaway system has been turned on.

Switching from Manual to Automatic

1. Before placing the metering switch into AUTOMATIC, the dryer should be operated in the MANUAL position to establish a setting on the manual speed control dial that will unload dry grain at the desired moisture content. When the moisture content of the discharged grain has been consistent for (2) or more hours, it is time to switch to AUTOMATIC. Be sure the set point dial or moisture control dial is set at 0.
2. While the metering switch is in MANUAL, turn the moisture control dial clockwise to balance the moisture control system to the point at which both the (-) decrease and (+) increase lights are off. At this point, the moisture control system is calibrated to the moisture content established in the MANUAL position.
3. Turn the Metering switch up to the AUTOMATIC position on the remote panel.

Now the manual speed control is OFF and the discharge rate is being controlled by the moisture control board, thermistors and the setting on the auto set point dial or the moisture control balance dial on the remote panel.

The unloading speed on the discharge meter should be the same as when the switch was in MANUAL, but the meter will begin to change automatically.

When the moisture content of the incoming grain changes (wetter or drier), the discharge rate will change automatically. If the speed slows down because the incoming grain is wetter, the (-) decrease light will come on and the discharge meter indicator will drop until the unload speed is automatically adjusted. When the adjustment is completed, the (-) decrease light will go out and the discharge meter indicator and the unload speed will remain constant until another change is required.

If the discharge speed increases because the incoming grain is drier, the (+) increase light will come on and the discharge meter indicator will move up until the unload speed is automatically adjusted. When the adjustment is completed, the (+) increase light will go out and the discharge meter indicator and the unload speed will remain constant until another change is required.

The system will automatically change speed (+) increase or (-) decrease to keep the discharge grain at the moisture content that was selected when the Moisture Control System was in the MANUAL position.

If the discharge speed increases because the incoming grain is drier, the (+) increase light will come on and the discharge meter indicator will move up until the unload speed is automatically adjusted. When the adjustment is completed, the (+) increase light will go out and the discharge meter indicator and the unload speed will remain constant until another change is required.

The system will automatically change speed (+) increase or (-) decrease to keep the discharge grain at the moisture content that was selected when the Moisture Control System was in the MANUAL position.

Automatic Moisture Control System

There is a direct relationship between grain temperature and grain moisture. Any change in grain temperature will mean a change in grain moisture. If the temperature of the grain goes down, the moisture content will have increased. If the temperature of the grain goes up, the moisture content will have gone down.

The automatic moisture control on M-C dryers maintains uniform moisture content of the grain being discharged from the dryer by changing the unloading speed of the dryer.

The moisture control is sensing grain temperature and reacting to it by slowing down or speeding up the unload rate of the metering rolls.

NOTE: As the dryer is operated "Dry and Cool," it will be necessary to recycle the wet grain in the cooling section back through the heat section after drying the first load or start with dry grain in the cooling section.

Running on continuous heat, it will take approximately (6) minutes per point of moisture being removed to dry the first load.

When the first load is dry, turn the spring loaded dial auger switch to ON and release. The discharge light will be ON.

Operation of the Discharge System with the Automatic Moisture Control System

The dryer sweep system is driven by a 5HP AC variable speed 3 phase 230V AC motor and reduction gearbox drive.

1. The discharge system is started by turning the spring-loaded auger switch, located inside the remote cabinet, clockwise all the way and releasing it. At this time, the customer takeaway system will be engaged.
2. When the metering switch is in the MANUAL position, power flows directly to the AC discharge system drive motor. The speed of the discharge system drive motor is controlled by the setting on the manual speed control dial and appears on the discharge speed meter. The speed control dial is graduated from (0) slow to (10) fast.
3. When the metering switch is in the AUTOMATIC position, the speed of the discharge system drive motor is determined by the moisture control board, thermistors, and setting of the Auto Set Point Dial.

When the moisture content of the incoming grain increases, the thermistors sense the change in grain temperature (cooler) and signal the automatic moisture control board to slow down or stop the discharge system motor to prevent the discharge of wet grain from the dryer when moisture is above the setting of the auto set point dial.

Then the moisture content of the incoming grain decreases, the thermistors sense the change in grain temperature (warmer) and signal the automatic moisture control board to increase the speed of the discharge motor to prevent the over drying of the grain.

Moisture Control Setting and Adjustments When in Automatic

The discharge rate will change to keep moisture content the same as when in manual. However, if you want to change the discharge moisture content when operating in automatic, simply turn the Moisture Control Dial up to a higher number for drier grain or down to a lower number for wetter grain. When you turn the dial, either the (+) increase light or the (-) decrease light will come on and you will see the discharge meter indicator change to reflect the change in speed.

Approximate Discharge Speed Dial Settings			
Model	Crop and Drying Mode	Moisture Removal	
		20%-15%	25%-15%
10520	Corn—Dry & Cool	3.6	1.8
10630	Corn—Dry & Cool	4.7	2.4
10730	Corn—Dry & Cool	5.5	2.9
10840	Corn—Dry & Cool	5.6	3.0
101050	Corn—Dry & Cool	7.1	3.8
101275	Corn—Dry & Cool	8.7	4.7

End of Day Shutdown

1. To shut off the dryer, close the liquid propane (LP) gas supply valve at the tank or close the natural gas supply valve. Operate burners until the flame goes out, then turn off the ignition switch.
2. Close gas vapor hand valve and liquid line intake valve on dryers equipped with liquid propane (LP) burners.
3. Operate fan about (15) to (20) minutes to cool grain in dryer, then turn off fan and flip the power on switch to OFF.
4. Turn off and lock the electric power supply to the dryer.

Next Day Startup

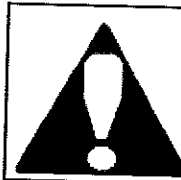
1. Turn on electrical power to dryer. Turn Power On switch to ON, place wet grain switch or fill switch into AUTOMATIC, place low temp shutdown switch into START and push green button to start fan.
2. Open the liquid propane (LP) gas supply valve at tank or natural gas (NG) supply valve and liquid line intake valve on dryers equipped with liquid propane burners. Now open the vapor hand valve.
3. Start burners. Allow thermometer to reach drying temperature before turning the discharge auger switch to ON and releasing. Now turn metering switch to MANUAL.
4. After the dryer has been unloading grain for at least (15) minutes, the metering switch can be placed into AUTOMATIC.

DO NOT ATTEMPT TO RE-BALANCE THE MOISTURE CONTROL SYSTEM.

Going Back to Manual

You can switch back to MANUAL at any time. Just turn the metering switch to the MANUAL position. At this time, the moisture control system will be off and the discharge system speed will be controlled by the manual speed control dial. The discharge meter will indicate the manual speed setting. If you want to unload at the same speed in manual as automatic, adjust the manual speed control dial until the discharge meter needle is at the same reading as in automatic.

When operating in MANUAL, the (+) Increase and (-) decrease lights may be lit. However, they are only indicating what would happen if you were in AUTOMATIC based on the set point of the moisture control knob. When in MANUAL, you can balance the (+) increase and (-) decrease lights, but unless you go to the AUTOMATIC position, nothing will change. In the MANUAL position, the discharge rate can only be changed by adjusting the manual speed control dial.



WARNING: Check and clean the inside of the dryer heating and cooling chambers daily, or more often if needed. Most dryer fires are caused by poor housekeeping.

Final Shutdown

When the last grain to be dried has been put into the dryer, place the discharge auger switch into the OFF position to stop the discharge system motor before the grain has dropped below the perforated area in the wet grain holding area of the roof section.

Dry this remaining grain for approximately (6) minutes per point of moisture to be removed. When grain is dry, close the LP gas supply valve at the tank or close the natural gas supply valve.

Operate the burner until the flame goes out, then place burner switch into the OFF position. Close gas vapor hand valve (handle 90° to the piping). LP gas—close the liquid intake valve, run the fan approximately (20) minutes to cool grain in the dryer.

After cooling, shut off fan and empty dryer by placing the discharge auger switch in the ON position. Wait until the last of the grain has been removed from the dryer discharge auger by the customer's dry grain take-away equipment. Place the discharge auger switch into the OFF position to stop the discharge motor.

Grain storage tower dryers are not designed to be a grain storage device. Once grain is dried, it needs to be emptied from the dryer and stored in an appropriate facility. Grain stored in a dryer for more than one week may cause damage to the machine.

Section 3
Maintenance

Cleanout Recommendations

Proper cleaning maintenance of a grain dryer allows the dryer to perform more efficiently. When the screens of a dryer are clean, the air flow moves more easily through the grain wall. As debris builds up inside the dryer, the likelihood for internal problems increases.

The recommended tool for cleanout is air—preferably from a vacuum; however, using a non-metallic brush or broom also works. Should water be used for cleanout, be aware that some residue can form a paste inside the dryer, sticking to internal surfaces and becoming difficult to fully remove.

Internal cleaning of the grain dryer should be performed on a daily basis to prevent screen perforations from becoming plugged. Dirty internal conditions can result in the combustion of debris.

Note: Setting the fill timers is very important in preventing internal debris buildup. The recycle fill timer (0-180) should be set for as short a time frame as possible. The grain flow timer needs to have time frame decreased to five minutes at maximum.

Cleaning the Outside of the Dryer

- The outside perforated screens of the dryer need to be kept as clean as possible for safety and performance reasons. The perforation of the screens allows heated air saturated with moisture from the grain to discharge from the machine. This process also creates a damp atmosphere on the outside of the screens and can allow the outer shell of the kernel to deposit or build up on the outside of the screen. These deposits of debris can eventually build up to a point of fully plugging the path of air through the screen. This will result in loss of capacity and higher cost of drying. In addition, the chamber inside can show static air pressure present when the dryer is not full of grain. The burners should not be lit when the dryer is not full of grain. The hot air will follow the path of least resistance and rush out the top of the dryer where grain is not present. This will change the drying condition and characteristics of the drying process. This change can lead to overheating the top of the grain column, damaging grain and potentially grain combustion.

- The outside screens can be cleaned on an as-needed basis using brushes, compressed air or water. This process can be done during the drying process and can affect discharge rate. The proper way to clean is to brush down the screens while grain is in process, as this will help push material out of perforations. The discharge rate should increase as the dryer is cleaned because more surface area is now exposed to heated air passing through the grain columns.

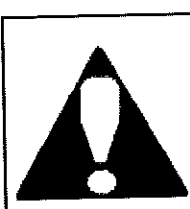
- Cleaning with water is a common method but if the dryer is empty, water will be permitted inside the plenum chamber, which may result in additional inside maintenance. When the outside screens become fully plugged, the inside screens also need to be checked. When air is no longer passing through the grain column, the inside screen will not self clean. If the inside screens plug, they will always create a debris buildup on the outside. The two surfaces are dependent on each other to keep clean from debris. The accumulation of debris on the inside and outside of screens affects both safety and function.

Seasonal Daily Cleanout and Maintenance

Note: When cleaning inside the grain dryer, a protective breathing mask is recommended for personal safety.

1. Disconnect all electrical power and gas; this is a lock-out and tag-out procedure.
2. Do not let grain fines, bees' wings and dust accumulate inside the dryer.
3. Keep the surroundings clean at all times, to prevent breeding places for insects and other pests.
4. Inspect any loose bolts or screws. Tighten as needed.
5. Using a non-metallic brush or broom, sweep inner screens and channel rings going from top to bottom.
6. Sweep clean the heat floor to remove any debris.
7. Check burner section to make sure wires look good and burner is clean of debris.
 - If burner ports are plugged, clear them with a piece of wire or a drill bit.
8. Open the cooling floor door and sweep any foreign material onto the grain deck floor or remove it from the dryer through air doors.
9. Clean outer screens and channel rings if necessary by sweeping them with a brush or power washing them with water to maintain current dryer capacity.
10. Wipe down and calibrate moisture sensors.
 - If sensors are reading high, extra fuel is being used to dry the grain.
 - If the sensors are reading lower than actual grain moisture, the risk of spoilage and reduced quality occurs.
11. Inspect any loose bolts or screws. Tighten as needed.
12. Re-engage both electrical power and gas fuel supply back on.
13. Once the dryer is back to normal operation, inspect the columns for grain movement. The grain should be moving down the grain column freely. If not, the dryer should be manually shut down. Empty the dryer to detect whether all columns are moving when discharge is running. This will determine whether there is a problem or not. If all columns are properly moving, fill dryer and restart the drying process. If grain is not moving, a cause must be determined. Debris buildup near the metering system can keep grain from exiting the dryer. This must be cleared manually before starting to dry grain through the dryer.

Preseason Check



CAUTION: Before starting the following steps, turn off and lock the electric power supply to the dryer. Place circuit breaker in the control cabinet into the OFF position and lock the control cabinet doors.

1. Clean out heating and cooling chamber.
2. Remove weather cover from burner. At this time, also check spark plugs and wires for cracks, heat damage and loose connections.
3. Check wires in 17 x 14 x 18 1/2" ignition board box(es) located in upper cooling section, for cracks and loose connections.
4. Grease fan motor bearings. Apply grease until it comes out relief port. Use Chevron SRI-2 grease or equivalent.
5. Check oil in 50:1 gearbox and grease.
 - A. Oil must be at least 1/4" over gears
 - B. Grease top bearing
6. Grease U-joint on 50:1 gearbox drive shaft.
7. Grease belt tightener pivot.
8. Replace spring tension on belt tightener.
9. Grease 1" discharge system jackshaft bearings.
10. LP gas—remove plug at end of gas strainer, remove and clean screen. Replace screen and plug.
11. Unlock control cabinet door (**be sure power is still OFF**) and check all wires for cracks, nicks and loose connections, especially on high voltage wires. Also be sure to check connections on earth ground wire lug in control cabinet and at copper ground rod next to dryer.

Post-Season Dryer Maintenance



CAUTION: Before starting the following steps, turn off and lock the electric power supply to the dryer. Place the circuit breaker in the control cabinet into the OFF position and lock the control cabinet doors.

NOTE: During this procedure, wearing a dust mask is strongly recommended.

1. Disconnect all power and turn off the gas supply before proceeding with any post-season maintenance.
2. Place supplied weather cover over burner.
3. Using a non-metallic brush or broom, sweep the inner screen clean, going from top down to bottom.
4. Sweep out the Heat Floor to remove any debris from the floor
5. Open the cooling floor access door, sweep out all foreign material.
6. Clean off the grain floor along with the sweep arms.

NOTE: Be sure to remove grain debris that has built up in the corner edge of the grain floor and sweeps.

7. Visually inspect bearings to see if there is any indication of one needing to be replaced and make a note to replace any that are suspicious. Inspect any drive belts and chains to note if any need replacing. Lubricate chains for the winter.
8. Use power washer on the outer screens if dirt has filled the perforations.
9. Remove cooling floor sections and remove grain from the bottom of the dryer.
10. Replace the cooling floor sections.
11. Grease fan motor bearings and fan bearings with Chevron SR1-2 or equivalent.
12. Use a vacuum cleaner to remove any dirt from control cabinet.
13. Place supplied weather cover over burner.

In Case of Fire

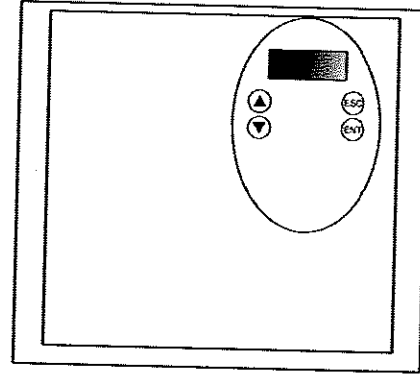
1. Call the Fire Department.
2. Shut off the electrical and fuel supply to the dryer.
3. Shut down the entire drying operation, including grain flow into and out of the dryer. The emergency controls may have already done this.
4. Do not try to cool a fire by running the fan(s).
5. Never run grain from the dryer into the elevator or storage if a fire is known or suspected.
6. Locate the area of the fire.
7. If the fire can be extinguished with a fire extinguisher, water hose or by removing the burning material, this should be done right away. Watch the dryer closely for another fire after one has occurred.
8. Emergency discharge slide gates at the bottom of each column as well as easy access gates located near the discharge area permit fast dumping of each individual grain column.
9. A fire extinguisher should be located at or near the dryer. If a fire seems to be getting out of control, call the fire department. Avoid chopping holes in the dryer if possible.

AC DISCHARGE DRIVE SPEED CONTROL

Keypad Instructions:

Keys are:

- **ESC** - Backs out of menus
- **ARROWS** - Scrolls up and down through menus
- **ENT** - Displays data numbers and saves data



Codes that Display Faults on Drive:

- OCF = Overcurrent
- SCF = Motor Short-circuit insulation fault
- InF = Internal Fault
- CFF = Configuration Fault
- SOF = Over Speed
- OHF = Drive Overload
- OLF = Motor Overload
- OSF = Over Voltage
- ObF = Over Voltage During Deceleration
- PHF = Line Phase Failure
- USF = Under Voltage
- CrF = Charging Circuit

AC Drive Parameters

Level	Code	Description	M-C Setting	Factory Default
SEt	ACC	Acceleration Time	5sec	3.0
	dEC	Deceleration Time	5sec	3.0
10'/12'	LSP	Low Speed	5.0hz	0.0
	HSP	High Speed	72hz/ 60hz	60.0
	ItH	Motor Thermal Current	12.2	11.0
	UFR	IR Compensation	25	20
	FLG	Frequency Loop Gain	20	20
	StA	Frequency Loop Stability	20	20
	SLP	Slip Compensation	100	100
	tdC1	Auto DC Injection Time	0.5 s	0.5 s
	SdC1	Auto DC Injection Current	7.7	7.7
	tdC2	2nd level DC injection time	0 s	0 s
	SdC2	2nd level DC Inject Current	5.5	6.1
	JPF	Skip frequency	0 Hz	0 Hz
	JF2	2nd skip frequency	0 Hz	0 Hz
	SP2	Speed preset 2	10 Hz	10 Hz
	SP3	Speed preset 3	15 Hz	15 Hz
	SP4	Speed preset 4	20 Hz	20 Hz
	CLI	Limiting Current	15.0	16.5
	tLS	Low Speed Operating Time	0 (disable)	0 (disable)
	Ftd	Motor Frequency Threshold	60	60
	ttd	Motor Thermal Threshold	100	100
	Ctd	Motor Current Threshold	12.2	11.0
	SdS	Scale Factor for SPd 1/2/3	30	30
	SFR	Switching Frequency	4 kHz	4kHz

Example: 5 HP AC Drive

Level	Code	Description	M-C Setting	Factory Default	
drC	bFr	Motor Frequency	60 Hz	50 Hz	
	UnS	Nominal Motor Voltage	230*	230	
	FrS	Nominal Motor Frequency	60	50 Hz	
	nCr	Nominal Motor Current	12.2	8.0	
	nSP	Nominal Motor Speed	1725	1715	
	COS	Motor Power Factor	0.88	0.88	
	rSC	Cold State Stator Resist	nO	nO	
	tUn	Auto Tuning		nO	
	tUS	Auto Tune Status	dOnE	tAb	
	Uft	Voltage/Freq ratio	n	n	
	nrd	Random switching freq	yES	yES	
	SFR	Switching frequency	4kHz	4kHz	
	10'/12'	tFr	Max Output Frequency	80Hz/ 72Hz	72Hz
		SSL	Suppress Speed Loop	nO	nO
	SCS	Save Parameter Config	nO	nO	
	FCS	Restore Factory Settings	nO	nO	
I-O	tCC	Type of Control	2C	2C	
	tCt	Type of 2 wire Control	trn	trn	
	rrS	Reverse	nO	LI2	
	CrL3	Current Input Low	4 ma	4 ma	
	CrH3	Current Input High	20 ma	20 ma	
	AOIt	Analog Output Config	IOU	OA	
	dO	Analog/Logic Output	OFR	nO	
	r1	Relay R1	FLt	FLt	
	r2	Relay R2	nO	nO	
	SCS	Configuration Backup	nO	nO	
	FCS	Reset the Configuration	nO	nO	
FUn	stC-	Stop Control			
	Stt	Normal Stop Type	nSt	rMP	
SUP		Monitoring Parameter	FrH or LCr Freq. or Current	FrH	

*UnS can be set to 208v for dryers of that supply voltage.

Changing Settings on AC Drive

How to Increase or Decrease Minimum Discharge Rate:

1. Press "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "LSP."
3. Press "ENT" to display data.
4. The data displayed is in units or hertz, our range is 0 to 60 Hz.
5. Arrow up or down to change the number. The higher the number, the faster the discharge. Factory setting should be at 5.0 Hz.
6. Press "ENT" twice to save value, once desired setting is reached.
7. Press ESC twice to return to "SEt" display.

How to Increase or Decrease Maximum Discharge Rate:

1. Press "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "HSP."
3. Press "ENT" to display data.
4. The data displayed is in units of hertz, our range is 0 to 60.
5. Arrow up or down to change the number. The higher the number, the faster the discharge. Factory setting should be at 60.0 Hz.
6. Press "ENT" twice to save the value, once desired setting is reached.
7. Press ESC twice to return to "SEt" display

How to Increase or Decrease Current Limit of Discharge Rate:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "drC."
3. Press "ENT" to display data (Motor Control Data)
4. Arrow down the menu until "nCr" appears.
5. The data displayed is in units of AC amps.
6. Arrow up or down to change the number. This will increase the amount of amps the motor can draw to drive the discharge system. The higher the number, the more torque the motor has. (Factory setting is 10 amps, but could be increased to 12 amps if discharge will not start up.)
7. Press "ENT" twice to save value, once desired setting is reached.
8. Press "ESC" to return to "SEt" display.

How to Increase or Decrease Acceleration for Discharge:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "ACC."
3. Press "ENT" to display data.
4. Data displayed is in units of seconds.
5. Arrow up or down to change the number. The higher the number, the faster the speed of discharge. Factory setting should be at 5 seconds.
6. Press "ENT" twice to save value, once desired setting is reached.
7. Press "ESC" to return to "SEt" display.

How to Increase or Decrease Deceleration for Discharge:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "dEC."
3. Press "ENT" to display data.
4. Data displayed is in units of seconds.
5. Arrow up or down to change the number. The higher the number, the faster the speed of discharge. Factory setting should be at 5 seconds.'
6. Press "ENT" twice to save value, once desired setting is reached.
7. Press "ESC" to return to "SEt" display.

DANGER: HAZARDOUS VOLTAGE



The AC Drive Capacitor can continue to discharge voltage for up to 20 minutes after disconnect has been turned off.

Before servicing, disconnect all power, wait 15 minutes, then verify that no voltage is present.

Failure to follow these instructions will result in death or serious injury.

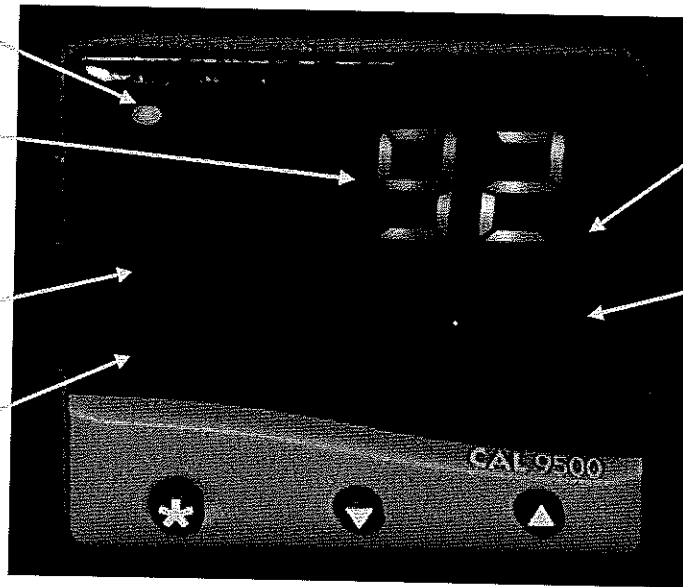
Cal Controller Instrument Panel Features

Green LED:
Actual Plenum Temperature

Green Display:
Process variable or
Function/Option

Upper Red LED:
Indicates high temperature
shut-down limit

Lower Red LED:
Indicates high temperature
shut-down limit.



Right Red LED:
Program holdback
Indicator

Orange Display:
Plenum Temperature Set
Point.

Adjustments

To enter or exit program mode:	Hold down ▼▲ together for 3 seconds
To scroll through functions:	Press ▼ or ▲
To change levels or options:	Press *
To view set-point units:	Press *
To increase temperature set point:	Press * ▲ together
To decrease temperature set point:	Press * ▼ together
To reset latched alarm or tune fail:	Press ▼▲ together briefly

NOTES: If in danger of becoming "lost in program mode," press the ▼ and ▲ together for three seconds to return to display mode, check the INSTRUMENT ADJUSTMENTS above and try again.

When in program mode, after 60 seconds of key inactivity, the display will revert to either **inPt : nonE** or, if the initial configuration has been completed, the measured value. Any settings already completed will be retained. During program configuration, it is recommended that this feature be inhibited. Select **ProG StAY** in level 4.

DIAGNOSTICS:

(-AL-) indicates both high and low plenum temperature conditions that shut down the dryer. Reset dryer safety circuit.

(INPT—FAIL) These two words will flash back and forth. This condition is an invalid plenum chamber temperature signal back to the Cal controller. Check the temperature input device wires to Cal controller.

(dAtA—Fail) These two words will flash back and forth. This condition is a failure of an internal component on the controller. Controller needs to be replaced.

(tunE—Fail) These two words will flash back and forth. The Cal controller could not complete the auto-tune process. This will only occur when trying to auto tune. Something happened in the process to make the auto-tuning process become corrupted. Restart auto-tuning process again to establish good PID numbers to control temperature.

Operating Instructions for the Cal Controller

All parameters for the Cal controller can be changed with power on to dryer. The disconnect must be powered on, so that the digital display on the unit is powered up. The display, in operating mode, shows two numbers. The top number is the actual temperature detected by the dryer sensor. The bottom number shows the current set point temperature. The controller will adjust the proportional valve output to drive the temperature to the set point. The controller has an auto-tune function to optimize how it adjusts to get to the temperature.

1.0 How to Increase or Decrease Temperature Set Point

- 1.1 Wait for the unit to power up.
- 1.2 Press * and ▼ or ▲ to change the desired set point.

2.0 How to Initiate Auto-tune Function

- 2.1 Start dryer. With fan on and dryer full, ignite burner. When temperature is near set point, start tuning.
- 2.2 Hold down ▲▼ together for 3 seconds. **TUNE** should be displayed.
- 2.3 Press ▲ or ▼ until the word **BAND** is displayed.
- 2.4 Press the * and ▼ to reduce **BAND** to 20.
- 2.5 Press ▲ or ▼ to return to **BAND**.
- 2.6 Press the * and ▲ or ▼ until **At.SP** is displayed.
- 2.7 Hold down ▲▼ together for 3 seconds.
- 2.8 You are now auto-tuning. Once **TUNE** disappears, auto tuning is complete.
- 2.9 To abort auto tune, press ▲▼ together for 3 seconds.
- 2.10 Press ▲ or ▼ until the word **TUNE** is displayed.
- 2.11 Press the * and ▲ or ▼ until **oFF** is displayed.
- 2.12 Hold down ▲▼ together for 3 seconds.
- 2.13 Auto-tuning is now disabled.

3.0 How to Change a Level

- 3.1 Hold down ▲▼ together for 3 seconds.
- 3.2 Press ▲ or ▼ separately to page through parameters.
- 3.3 When **LEVL** is displayed, press the * key with ▲ or ▼ to change level.
- 3.4 Press ▲ or ▼ separately to page through the parameters for that level.

4.0 How to Change Parameter Values

- 4.1 Hold down ▲▼ together for 3 seconds.
- 4.2 Press ▲ or ▼ separately to page through parameters
- 4.3 Press the * key with ▲ or ▼ to change a parameter value.
- 4.4 Press ▲ or ▼ separately to go on to the next parameter.
- 4.5 Hold down ▲▼ together for three seconds when finished.

PID Values (Standard)

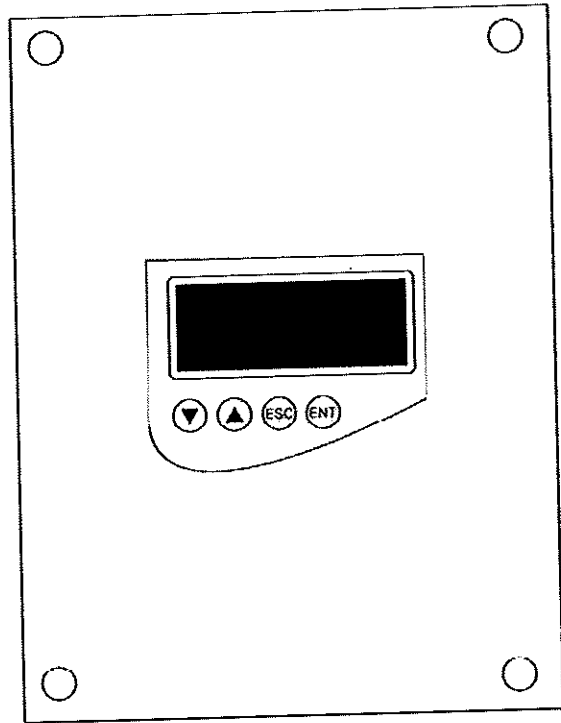
- For Cal Controller with Belimo Valve: **BAND: 119, int.t: 0.7, der.T: OFF**
- For Cal Controller with Asco Valve: **BAND: 75, int.t: 2.4, der.T: 11**

Cal Controller Settings

Function Level	Function Description	Function Name	Default	Setting	Function Level	Function Name	Setting Default
LEVEL 5 (On First Power-up)	Temp Input Device	inPt	<i>nonE</i>	<i>rtd</i>	LEVEL 4	dEr.S	0.5
	Scale Units	unit	<i>nonE</i>	F		di.SS	6
	Output 1 Type	SP1.d	<i>nonE</i>	<i>AnLG</i>		no.AL	<i>oFF</i>
LEVEL 2	Output 1 Level	SP1.P	100	100	ProG	<i>Auto</i>	
	Manual Mode	hAnd	<i>oFF</i>	<i>oFF</i>	LoCk	<i>nonE</i>	
	Max Output (heat)	PL.1	100	100	SEt.L	<i>oFF</i>	
	Max Output (cool)	PL.2	100	100	LEVEL 3	SP1.d	<i>AnLG</i>
	Output 2 Mode	SP2.A	<i>nonE</i>	dV.hi		SP2.d	<i>rLY</i>
	Output 2 Options	SP2.b	<i>nonE</i>	LtCh	burn	up.SC	
	Display Resolution	diSP	1	1	rEv.d	1r.2d	
	High Scale Limit	hi.SC	<i>varies</i>	260	rEv.L	1n.2n	
	Low Scale Limit	Lo.SC	32	0	SPAn	0.0	
	Temp Input Device	inPt	<i>nonE</i>	<i>rtd</i>	Zero	0.0	
LEVEL 1	Scale Units	unit	<i>nonE</i>	F	ChEk	<i>oFF</i>	
	Auto Tune Select	tunE	<i>Off</i>	<i>Off</i>	rEAD	*	
	Proportional Band	bAnd	18	119	tECh	*	
	Integral Time (Min)	int.t	5.0	0.7	Ver	953.1	
	Derivative Time (Sec)	der.T	25	<i>oFF</i>	rSET	<i>nonE</i>	
	Derv Approach Control	dAC	1.5	1.5	LEVEL P	ProG	1
	Cycle Time	CYC.t	20	0.1		run	<i>oFF</i>
	Offset/Man reset	oFSt	0	0	FAiL	<i>rSEt</i>	
	Setpoint Lock	SP.LK	<i>oFF</i>	<i>oFF</i>	St.u	<i>PV</i>	
	Setting for Output2	SEt.2	0	40	Spru	<i>hour</i>	
Band for Output 2	bnd.2	3.9	5	SEG	1		
Cycle Time 2	CYC.2	<i>on.of</i>	<i>on.of</i>	TYPE	<i>SPr</i>		
LEVEL A (Analog)	Lin Input Scale Max	An.hi	1000	1000	Sint	<i>cont</i>	
	Lin Input Scale Min	An.Lo	0	0	PCYC	<i>cont</i>	
	Lin Input Max	hi.in	50.0	50.0	Sub.P	<i>nonE</i>	
	Lin Input Min	Lo.in	10.0	10.0	SPr	100	
	Lin Input Resolution	dECP	0000	0000	t.SP	*	
	Output 3 Mode	SP3.A	<i>nonE</i>	dV.Lo	LEVEL C	Addr	1
	Output 3 Options	SP3.b	<i>nonE</i>	hoLd		Comms	bAud
	Setting for Output3	SEt.3	0	-40	Option	dAtA	18n1
	SP3 Hysteresis	hYS.3	3.6	3.6	Not Used	dbuC	<i>oFF</i>
	Sensor Burn-out	brn.3	<i>uPSC</i>	<i>uPSC</i>			
Output 3 Operation	rEU.3	3d	3d				

SOFT STARTER PARAMETERS

MENU	Parameter	Description	Value	
Set	In	Motor Current	REF	
	Ilt	Current Limit	400	
	ACC	Time to Full Speed	15	
	t90	Starting Torque	50%	
	S Y	Stop Type	-F-	
	dEC/EdC	Decel Ramp Time	*	
	brC/EbA	Brake Torque	*	
PRO	tHP	Thermal Protection	CL	
	ULL	Motor Underload	*	
	LUL/tUL	Motor Underload Thresh.	*	
	tLS	Excessive Start Time	*	
	OIL	Current Overload Active	*	
	LOC/tOL	Current Overload Thresh.	*	
	PHr	Phase Protection	*	
	tbS	Time Before Start	*	
	PHL	Phase Loss	*	
	PtC	Monitoring Probes	*	
	ArS	Automatic Restart	*	
	rth	Reset Motor Thermals	*	
	St2	In2		*
		IL2		*
AC2			*	
t92			*	
dE2			*	
Ed2			*	
tL2			*	
tl2			*	
drC		tLI	Torque Limit	*
		bSt	Voltage Boost	50%
	SSt	Small Motor Test	*	
	CLP	Torque Control	*	
	LSC	Stator Loss Compensation	*	
	tIG	Decel Gain	*	
	CSC	Cascade Activation	*	
	Uln	Line Voltage	?volt	
	FrC	Line Frequency	*	
	rPr	Reset Operating Time	*	
	FCS	Factory Control Settings	*	
IO	L13/L14	Logic Inputs	*	
	IPr	Preheating Level	*	
	tPr	Time Before Preheating	*	
	L01/L02	Logic Inputs	*	
	1	Relay 1 Assignment	*	
	2	Relay 2 Assignment	*	
	(shunt trip) 3	Relay 3 Assignment	tAI	
	AO	Analog Output	*	
	O 4	Output Configuration	*	
	ASC	Analog Scaling	*	
*	Default Value or Not Used	.		



Example: Soft Starter

MENU	Parameter	Description	Value	
COP	Add		*	
	tbr		*	
	FOr		*	
	tLP		*	
	Pct		*	
	*		Default Value or Not Used	
	Motor	Voltage	REF (Reference Current)	CL
	50	460	61	15
	75	460	82.4	15
	100	460	113	20
	50	230	122	15
	75	230	165	15
	100	230	226	20

CHANGING SOFT STARTER PARAMETERS

Parameters for the soft starter unit can be changed with power on to the dryer. The disconnect must be powered on, so that the digital display on the unit is powered up.

How to set Motor Current

1. Press the "ESC" key until "Set" appears on display
2. Arrow down until unit displays "In."
3. Press "ENT" to display data
4. The data displayed is in units of AC amps
5. Arrow up or down to change the number. Set number to match motor name plate AC amps. Factory setting should match motor name plate.
6. Press "ENT" twice to save value, once it is at desired setting.
7. Press "ESC" to get back to the "Set" display.

How to Set Current Limit:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "ILt."
3. Press "ENT" to display data.
4. The data displayed is in units of percentage of motor amps.
5. Arrow up or down to change the number. The number should be 450% of motor full-load amps. Factory setting should be 450%.
6. Press "ENT" twice to save value, once it is at desired setting.
7. Press "ESC" to get back to the "SEt" display.

How to Set Acceleration Time for Bypass Contactor Takeover:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "ACC."
3. Press "ENT" to display data.
4. The data displayed is in units of time (seconds).
5. Arrow up or down to change the number. The number represents the time from when the soft starter begins fan rotation until bypass contactor takes over. Factory setting is 15 seconds.
6. Press "ENT" twice to save value, once it is at desired setting.
7. Press "ESC" to get back to the "SEt" display.

How to Set Starting Torque:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "T90."
3. Press "ENT" to display data.
4. The data displayed is in units of percentage.
5. Arrow up or down to change the number. The number represents the starting applied motor torque in percentage. Factory set should be 50%.

How to Set Thermal Protection:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "PRO."
3. Press "ENT" to display data.
4. Arrow down until unit displays "tHP."
5. The data displayed is in units of classification.
6. Arrow up or down to change the number. The number that appears is the rated classification of the soft starter unit. Factory setting should be 20.
7. Press "ENT" twice to save value once it has reached the desired setting.
8. Press "ESC" to get back to the "SEt" display.

How to Voltage Boost:

1. Press the "ESC" key until "SEt" appears on display.
2. Arrow down until unit displays "drC."
3. Press "ENT" to display data.
4. Arrow down until unit displays "bSt."
5. The data displayed is in units of AC voltage by percentage.
6. Arrow up or down to change the number. The number represents the percentage of motor voltage available for motor and fan startup. Factory setting should be 50%.
7. Press "ENT" twice to save value, once it is at desired setting.
8. Press "ESC" to get back to the "SEt" display.

Lubrication

Lubrication is applied to all required areas before leaving the factory; however, a lubrication schedule should be maintained as described below.

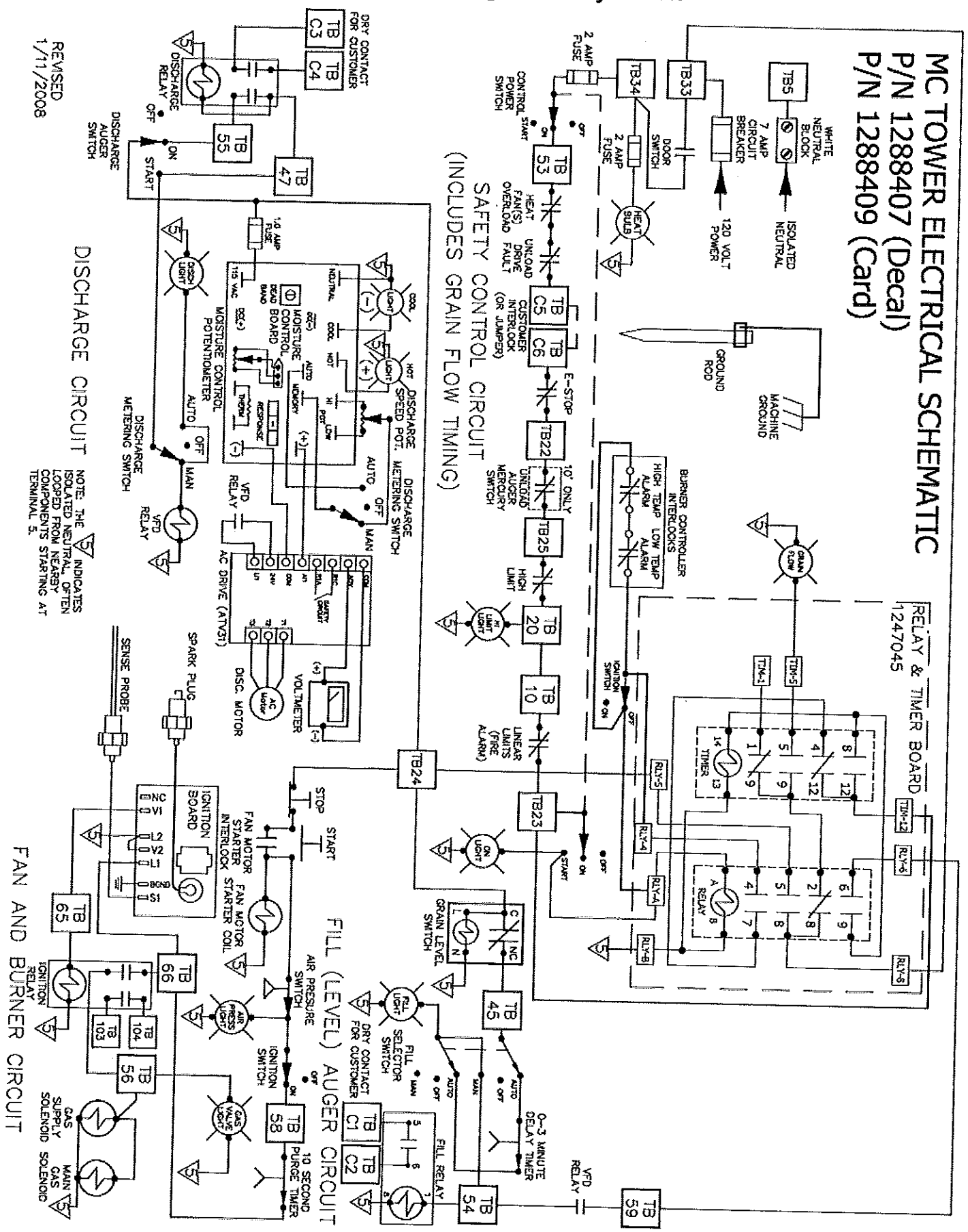
Avoid mixing greases. Bearings are filled with lithium-based grease before leaving the factory.

Item	Lubrication Required	Interval
50:1 Gearbox Oil Level	Fill 1/4" over gear with SAE 90 gear lubricant.	Maintain proper level. Check every 100 hours.
50:1 Gearbox Grease Fitting	Use (5) strokes of gun grease.	At beginning and end of season.
SCR Gearbox	Mobil SHC-634 or equivalent.	Maintain proper level. Check every 100 hours.
U-Joints	Use (1) stroke of gun grease.	Every 50 hours of operation
Fan Motor(s) & Discharge System 5HP (DC) Motor	Lubricate with SRI-2 (Chevron) grease or equivalent. (Equivalents below)	Prior to operation and at end of season
Motor Bearings	Use Exxon Corp-Plyrex-em product or Chevron, Inc.-SRI #2. Grease should be lithium based	At beginning and end of season.
Cent Fan Bearings	Use only # 2 consistency lithium-based grease with high-quality mineral oil with rust and oxidation inhibitor. Use Shell Alvania #2, Mobil Mobilux #2 or Texaco Multifak #2.	At beginning of season and every 100 hours until end of season.
Axial Fans	Exxon Polygrease	At beginning of season and between 4,000 and 5,000 hours of operation until end of season.
Unload Auger Bearings	Use Shell Alvania #2, Mobil Mobilux #2 or Texaco Multifak #2.	Grease every 100 hours. NOTE: In extremely dirty conditions once daily to weekly.
Metering Roll Bearings	Use grade #2 mineral oil lithium or lithium complex base grease.	Front bearings greasing is at beginning and end of season. Internal bearings are brass and do not need lubrication.
Unload Auger Gearbox Oil:	Mobil SHC-634 or equivalent	
Tower Sweep Gearbox Oil	Mobil SHC-634	At beginning of season and every 100 hours until end of season. Only fill box 1/4" over gears. NOTE: In extremely dirty conditions, it is recommended to grease sooner than every 100 hours.

Section 4
Troubleshooting

MC TOWER ELECTRICAL SCHEMATIC
P/N 1288407 (Decal)
P/N 1288409 (Card)

SAFETY CONTROL CIRCUIT
 (INCLUDES GRAIN FLOW TIMING)



REWSED
 1/11/2008

DISCHARGE CIRCUIT

NOTE: THE INDICATES ISOLATED NEUTRAL. OFTEN COMPONENTS STARTING AT TERMINAL 5.

FAN AND BURNER CIRCUIT

Troubleshooting the Safety Circuit

The contacts for incoming hot and neutral are found in the High Voltage cabinet.

The 120-volt input power to the dryer circuit for dryer controls comes from either the bottom side of the disconnect or the transformer (depending on voltage) and runs to the 7- or 6-amp mini-breaker. This breaker should be turned off and voltage should be checked before turning the mini-breaker on. If voltage reads anything outside of 110 to 120 volts, the supply voltage needs to be checked before powering on mini-breaker.

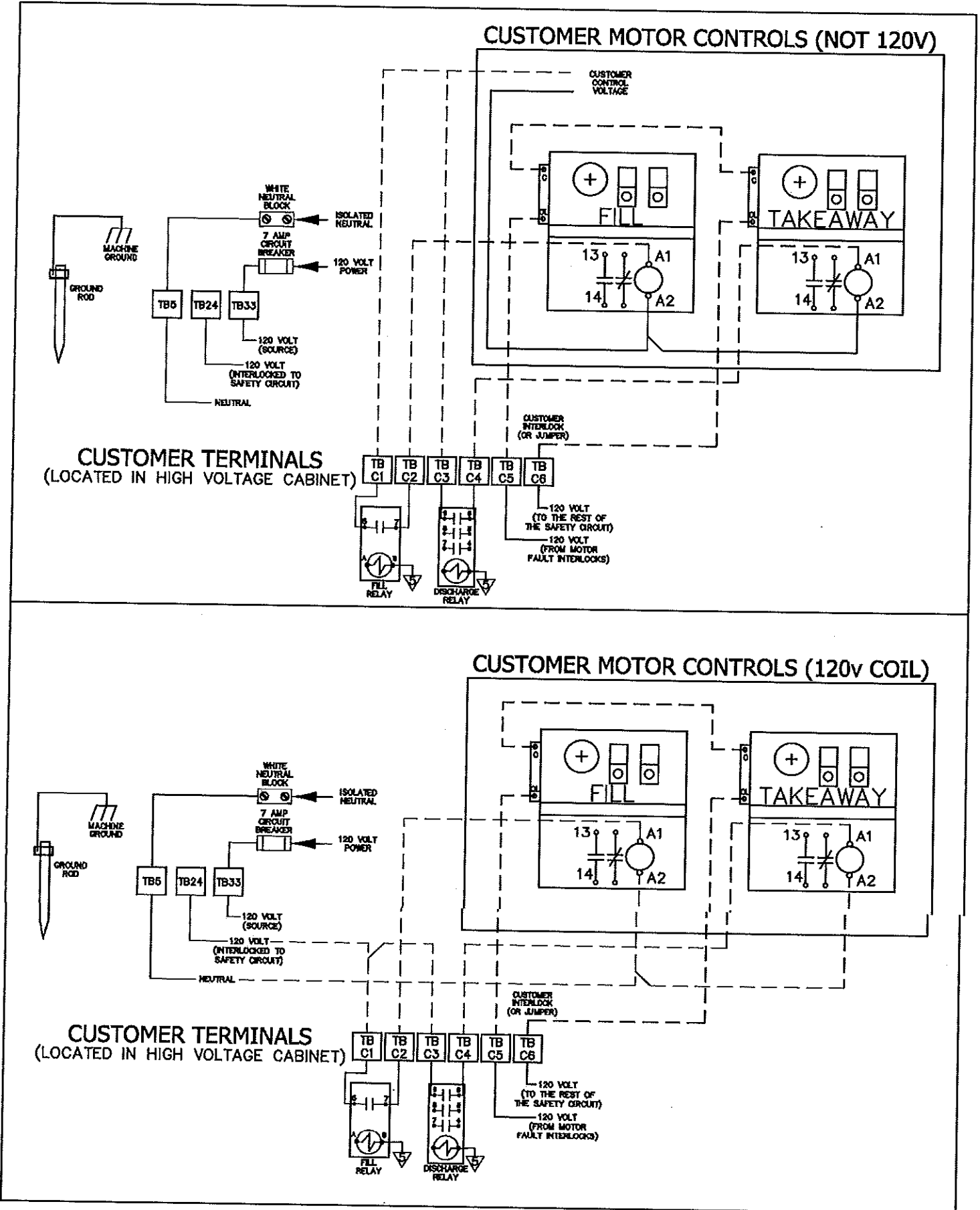
Next to the mini-breaker is a neutral block. This neutral block feeds all neutrals throughout the entire dryer. The electrician needs to supply neutral feed line to neutral block.

The incoming neutral line is connected to TB5 (white wire) and the hot line is on TB33 (after circuit breaker). The incoming 120-volt supply is a 7amp mini-breaker.

Using a volt meter, hook one lead to TB5 and set meter to AC voltage (wave sign or "V").

- Place second lead on TB33. If 110 to 120 volts show on meter, then mini-breaker is good. If no volt appears on meter, then mini-breaker is tripped.
- Place second lead on TB53. Turn power switch to ON position. If 120-voltage is good, move to the next step. If no volt is read on the meter, there is a problem with the power-on switch.
- Place second lead on TB-C5, if 120-voltage is good, move to next step. If there is no voltage on the meter, reset all manual motor protectors as AC drive unit may have faulted out. To reset AC drive, turn off the mini-breaker 30amp for drive. Wait until AC drive unit screen goes dead. Then restore mini-breaker to ON position and drive will automatically reset.
- Place second lead on TB-C6. If 120-voltage is good, move to next step. If there is no voltage on meter, reset all manual motor protectors or the AC drive unit might have faulted out. To reset the AC drive, turn the mini-breaker 30amp for drive off. Wait until AC drive unit screen goes dead. Then restore mini-breaker to ON position and drive will automatically reset.
- Place second lead on TB-C6. If 120-voltage is good, move on to next step. If there is no voltage on the meter, then the jumper from C5 to C6 has become disconnected. If the customer has pulled jumper and installed take-away and fill equipment into safety circuit, check to see if customer's remote-starter equipment needs to be reset.
- Place second lead on TB22. If 120 voltage is good, move to next step. If there is no voltage on the meter, E-stop switch is not functioning properly.
- Place second lead on TB25. If 120-voltage is good, move to next step. If there is no voltage on the meter, mercury switch on discharge system has tripped and door is raised or mercury switch is faulty.
- Place second lead on TB20. If 120-voltage is good, move to next step. If there is no voltage on the meter, the High Limit has tripped and must be manually reset on the front of the switch.
- Place second lead on TB10. If 120-voltage is good, move to next step. If there is no voltage on meter, Cal controller could have an alarm fault on the screen. This must be reset by powering down the Cal controller and then powering it back up. Alarm message should be cleared from screen. The Cal controller control contacts power up a safety relay and relay could be nonfunctional. Relay may need to be replaced.
- Place second lead on TB23. If 120-voltage is good, move to next step. If there is no voltage on meter, linear limits have overheated and must be checked. When linear limits overheat (218°F), they will automatically reset when temperature drops below 218°F. If they do not reset, they will need to be replaced. These can be checked with power off and run continuity test through each linear limit module.
- Place second lead on TB24. If 120-voltage is good, then safety circuit is completed. If there is no voltage on the meter, there is a problem with either the main relay, 0-60 minute timer, or relay/timer board. There is a 180-volt varistor on the side of the board. If this goes bad, the board has seen a spike in voltage and needs to have the board replaced. If board is good, replace either timer or main relay.
- TB24 is the main supply distribution point that will feed voltage to the fill circuit, fan/burner circuit and discharge circuit. These three circuits are all independently powered up.

Safety Circuit — Customer Connections



Safety Circuit — Customer Connections

Customer connections for remote equipment are the customer connection terminal blocks located in the remote cabinet. They are labeled:

- C1 - C2 which are remote fill equipment
- C3 - C4 which are remote discharge equipment
- C5 - C6 which are dryer safety circuit for remote starters

C1 - C2 are a dry set of contacts that are for customer to supply power to C1 and C2 and would run back to customer's fill starter and pull in starter. C1 and C2 contacts close when the dryer fill cycle begins. When this closes, the dryer will start the customer's equipment running, provided that remote fill equipment has a good power source.

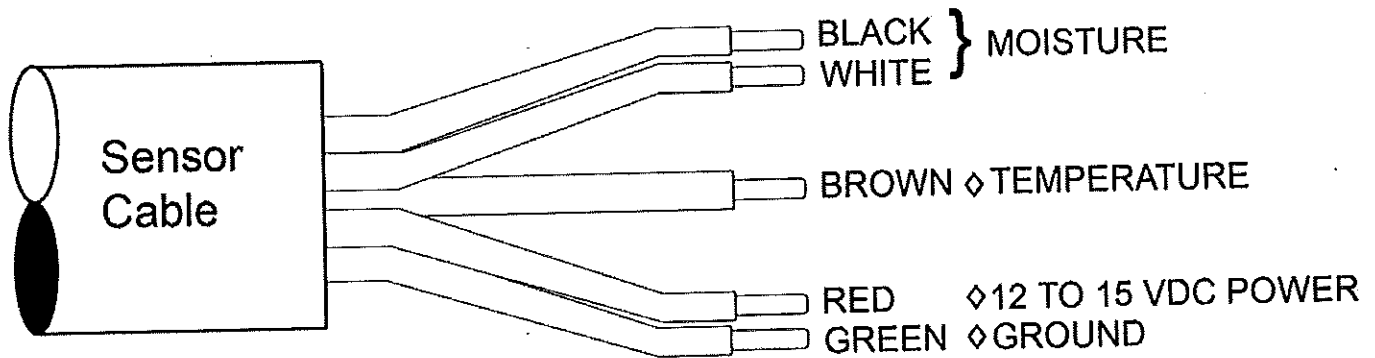
C3 - C4 are a dry set of contacts and are for customers to supply power to C3 and C4 and would run back to the customer's discharge starter and pull in starter. C3 and C4 contacts close when the dryer discharge system begins. When this closes, the dryer will start the customer's equipment running, provided that remote discharge equipment has a good power source.

C5 - C6 are part of the dryer safety circuit and carry 120 volts as long as the dryer power switch is in the ON position. The dryer originally is delivered to the customer with a jumper across C5 - C6 to allow complete testing of safety circuit. The jumper can be removed and two wires run from C5 & C6 to any motor starter overloads that will be engaged when dryer is running. This will attach through a normal closed path of contacts that will open when the motor starters trip if thermal conditions are exceeded. Opening of this pathway will drop out the entire dryer. Remember that the dryer is providing power from C5 to C6 and must be tied to a dry set of contacts on customer's equipment. **This is to be done ONLY by a trained Electrician.**

Moisture Monitor Troubleshooting Guide

PROBLEM	PROBABLE CAUSE	SOLUTIONS
Monitor reads approximately -110 degrees and 33% moisture.	<ol style="list-style-type: none"> 1. Sensor may be dirty 2. Ground strap is not hooked up. 	<ol style="list-style-type: none"> a. Verify sensor is clean b. Check that ground strap is hooked up c. Replace Sensor
Moisture readings to change, temperature readings are high negative.	<ol style="list-style-type: none"> 1. Sensor leads are broken or not hooked onto the terminal. 	<ol style="list-style-type: none"> a. Tighten terminal screws b. Replace sensor
Moisture readings are intermittently high then low.	<ol style="list-style-type: none"> 1. Sensor ground strap is not hooked up. 2. Sensor cable leads are broken. 3. Terminal leads where sensor is hooked are loose. 	<ol style="list-style-type: none"> a. Hook up strap b. Replace Sensor c. Tighten screws
Moisture readings are consistently high or low.	<ol style="list-style-type: none"> 1. Calibration needs adjustment 	<ol style="list-style-type: none"> a. Adjust to correct calibration
Blowing control fuses	<ol style="list-style-type: none"> 1. Check surge absorber for signs of smoke. 2. Leads may be shorted or loose. 3. Check for any bad component. 	<ol style="list-style-type: none"> a. Replace surge absorber if damaged b. Isolate and correct any shorted or loose leads c. Isolate and replace any bad components

Moisture Monitor Troubleshooting Guide



If the moisture temperature is reading incorrectly:

1.) Check Sensor:

- Remove monitor board and reinsert it to reset the monitor board.
- Disconnect the five wires from the sensor.
- If the sensor is disconnected and the display reads 110° Fahrenheit and 33% moisture, then the monitor board connections are good. The sensor needs to be looked at.
- Connect the five wire leads to the sensor. The display should read approximate ambient air temperature and 5% to 7% moisture. This reading should be taken with sensor in a free air condition, having no contact with the grain.
- Make sure the sensor is clean and ground strap is connected. If everything is intact, the sensor may need to be replaced.

2.) Check Display:

- Check DC voltage across black and green wire. It should be the same as display with decimal place moved one place to the left. (Example: 15.5% display will read 1.55 dcv.)

3.) Check Monitor:

- Check voltage to power supply and output of power supply. Output should be 12.3 to 12.7 volts DC between red and green wires and between blue and green wires.
- Check dipswitches on monitor board. All switches should be "open" except for #4 and #5.

4.) Check Printer:

- Check voltage to printer, via the red and green wires to printer unit. Should be from 5 to 5.2 dcv. If not, adjust pot on power supply unit until voltage is correct.
- Check printer fuse to make sure it is a AGC 1-amp and **not** MDL 1-amp. Slow blow fuse (MDL) will not let printer function properly.
- If time is incorrect, replace batteries on printer board.
- If voltage is correct, remove 26-pin connector from side of printer unit. Jumper from #2 to #3 and press any key 40 times. If the printer unit is operating correctly, it will print out 40 digits and fill one entire line.
- If printer does anything else or nothing at all, the printer unit is bad.
- If printer functions properly, then check connection or replace printer board.

Printer Troubleshooting Guide

PROBLEM	PROBABLE CAUSE(S)	SOLUTION
Blowing control fuses	<ol style="list-style-type: none"> 1. Check for loose or shorted leads. 2. Any component that is bad can cause this—check by isolating one component at a time. 	<ol style="list-style-type: none"> A. Isolate and correct. B. Replace bad component
Printer spaces several lines but nothing is printed	<ol style="list-style-type: none"> 1. Paper installed with the wrong side up. 2. Wrong type of paper is being used. 3. Print head is unplugged or bad 	<ol style="list-style-type: none"> A. Turn over paper B. Install correct type of paper
Printer spaces one line, nothing more.	<ol style="list-style-type: none"> 1. Computer control card bad or not seated correctly. 2. Number 5 conductor cable is loose or installed in error. 	<ol style="list-style-type: none"> A. Insert the computer card or replace card. B. Refer to decal for correct wiring at the computer jack. Insert the 25-pin jack at the printer.
Printer does not space, no night light and the paper take-up motor is not working.	<ol style="list-style-type: none"> 1. No DC power or no AC power or not hooked up. 	<ol style="list-style-type: none"> A. If 5V DC is missing, replace the power supply or repair loose or broken power leads (red and green) or (white and violet)
Printer does space but has night light	<ol style="list-style-type: none"> 1. Printer motor not plugged in. 	<ol style="list-style-type: none"> A. Plug in the flat, grey cable on the printer and check if broken.
Prints characters that are unintelligible.	<ol style="list-style-type: none"> 1. Computer not working. 	<ol style="list-style-type: none"> A. Power down and retry.
Top part of characters are missing.	<ol style="list-style-type: none"> 1. Plastic guard too close 	<ol style="list-style-type: none"> A. Raise the plastic shield.
Part of each character is missing	<ol style="list-style-type: none"> 1. Head cable loose or print head bad. 	<ol style="list-style-type: none"> A. Reset the flat brown cable or replace the printer.
Paper take-up not rolling up the paper.	<ol style="list-style-type: none"> 1. Loss of power or bad motor on aluminum shaft binding against the motor. 	<ol style="list-style-type: none"> A. The orange and the orange/white wire is loose or broken. Re-tighten or replace the motor assembly, or adjust the aluminum shaft by loosening the Allen screw.

Cal Controller Troubleshooting Guide

Always Overshoots Set Point Temperature:

If the set point is consistently overshooting and tripping the alarm on the Cal controller, the first-time start procedure needs to be changed.

1. Start fan air and establish air pressure. Make sure the air pressure light is on continuously and does not flutter.
2. Set point always overshoots. If pressure is too high, that means there is low pressure at the regulator.
3. If butterfly valve does not rotate freely, rotate it manually to free the valve.

If set point is not reached without tripping the high limit on the Cal controller, auto-tune from start-up position.

1. Once flame is established, press and hold down both arrow buttons simultaneously on the Cal controller for 3 seconds.
2. Cal controller displays **tune off**.
3. Press * and ▲.
4. Display will read **tune on**.
5. Press both arrows for 3 seconds to begin tuning function.
6. As the plenum temperature rises, the display will flash "tune" and the actual temperature during the tuning process.

Unable to Reach Set Point Temperature:

If the set point cannot be achieved, even when the valve is 100% open, there is not enough gas pressure to obtain the selected plenum temperature.

Adjust the pressure to obtain proper temperature. The Cal controller will start to control the opening of the valve. The closer to the set point we get, the more the Cal controller will shut the valve until desired temperature is reached.

Plenum Temperature will not hold Satisfactorily:

1. Turn down gas pressure
2. Free proportional valve by depressing the tab and rotating the shaft freely.
3. Attempt to auto-tune at set point.

NOTE: Plenum temperature must be around the set point to start this function

1. Press both arrow keys simultaneously and hold down for 3 seconds. Display will show **tune off**.
2. Press arrow up until display reads **bAnd—number?**
3. Press * and arrow until number is 20 (if possible, if trips alarm during tuning).
4. Press down arrow until display reads **tune off**. Press * and up arrow until display shows **tune—At.SP**.
5. Hold down both arrows for 3 seconds to begin auto-tuning function.

When the tuning function is complete, both actual and set-point values will be displayed on the Cal controller.

Once the Cal controller has tuned or auto-tuned for dryer conditions, PID numbers are automatically moved into the internal PID loop and saved for future use.

**Single Fan Tower
General Troubleshooting
Start-up and Running of Dryer**

	PROCEDURE	TROUBLESHOOTING
1.	Set HIGH LIMIT and LOW TEMP thermostats	
2.	Start of Operation of Dryer: 115 Volt light should be ON	If not, check: 1. Main disconnect 2. Fuse is not functional or 7A circuit breaker tripped. 3. TB33 for connection (110 Volts) 4. 115 Volt bulb and socket
3.	Switch control switch to ON position. HIGH LIMIT light should be ON.	If not, check: 1. RUN-START in START position 2. Overload circuit through starters 3. AC drive and fuses or circuit breaker 4. Back door mercury switch 5. High Limit reset 6. Soft starter 7. Burner resets 8. CAL or Honeywell controller
4.	Switch control switch to START position, POWER ON and FILL lights ON	If not, check: 1. FILL light will only come on when FILL switch is in MANUAL or AUTO position and calling for grain. 2. Main relay 3. Rotary fill switch is not calling for grain 4. Grain flow timer elapsing (EMPTY light)
PRIMARY CIRCUIT IS NOT COMPLETE (SAFETY CIRCUIT), TB24 IS ENERGIZED		
5.	Push fan start button. Fan should start and run.	If not, check: 1. Main power voltage through disconnect and breaker to starter 2. Starter 3. Soft starter
6.	Switch fill relay from ON to MANUAL Fill relay closes to provide 110 volts to customer-supplied fill equipment	
7.	Adjust .2 to 3-minute delay fill timer to desired setting.	
8.	After dryer has filled with grain, switch fill switch to AUTO position	
9.	Grain flow timer is only in the circuit in AUTO position	
10.	Set grain flow timer for 2 to 10 minutes	
DRYER IS NOW FILLED AND READY TO DRY GRAIN		
11.	Air switch light should light.	If not, check: 1. Dryer not full of grain 2. Air pressure switch not adjusted 3. Filter is dirty

**Single Fan Tower
General Troubleshooting
Start-up and Running of Dryer**

	PROCEDURE	TROUBLESHOOTING
12.	Switch ignition to ON position. After 10-second purge timer times out, #1 ignition light comes ON. This will ignite both (or all three) burners.	If not, check: 1. Purge timer 2. Ignition board, as follows: • L1 is hot, L2 is neutral (110 volt power to unit) • V1 is hot, V2 is neutral (110 volt power to solenoids) • S1 is voltage to flame sense probe • BGRD is grounded to the chassis • E1 is HIGH VOLTAGE to electrode (DANGER! Never test with meter)
13.	Switch Honeywell controller from manual to automatic after 30 seconds of having burner lit along with setting plenum temperature. Controller will bring plenum temperature up to selected set point and stabilize.	If not, check: 1. Controller 2. Controller parameter settings 3. Has controller been AUTO TUNED?
14.	Switch discharge system switch to START position. The sweep arms should start.	If not, check: 1. AC drive fault settings 2. AC drive parameter settings 3. AC drive fuses or circuit breaker 4. Voltage output to motor. Should be 230 volt, 3 phase. 5. 5HP motor 6. Drive belts
15.	Grain flow timer has a 1 to 60 minute range. Set the M-C control board response switch to 2. Set grain flow timer according to manual.	
16.	Use potentiometer to adjust sweep speed. Adjust speed until moisture content of grain is the desired percentage. After running dryer long enough to stabilize moisture output, dryer is ready for automatic mode.	
17.	Use moisture control potentiometer to balance lights so that both are OFF. Before switching to automatic mode, set response selector. Responses 1, 2, 3: 1 being the fastest, 3 being the slowest response from thermistors to change speed in the sweep system.	
18.	Switch discharge system into automatic at this point	If not, check: 1. Auto/manual switch for wiring problem. 2. 1.0 amp fuse 3. AC drive and motor

Dryer Troubleshooting Guide

PROBLEM	PROBABLE CAUSE
Main gas valve is opened. Main burner will not come on.	<ol style="list-style-type: none"> 1. The handle on the Maxon main gas shutoff valves should offer some resistance when they are opened. If they don't, check the latching solenoid inside the valve by removing the cover from the side of the valve opposite the handle. The solenoid should energize when a pilot is established. If it does not, check for faulty electrical connections or a faulty solenoid. 2. Check for water in the gas line by opening drain valve. 3. Check the hand valve in feedback line to the main gas regulator. It should be partially open.
Dryer will not reach operating temperature, or it reaches it slowly.	<ol style="list-style-type: none"> 1. Low gas pressure. Increase gas pressure on main gas regulator. 2. Check for water in gas train by opening drain valve. 3. Make sure dryer is completely full of grain by entering the heat plenum and looking for daylight in one of the grain columns. 4. Gas parts in burner need to be cleaned. Clean by drilling with a #47 drill bit. 5. Make sure that the gas butterfly valve is being driven wide open by the modulating motor. If not, check motor or motor linkage.
Blower motor(s) will not start.	<ol style="list-style-type: none"> 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, an 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. 4. Inspect contactor for defective points or a burned out coil. 5. Inspect connections, and check voltage applied to the motor leads to determine if the motor is defective. 6. If motor starts slowly, check for low voltage during starting due to excessive voltage drop in power supply wiring.
Burner will not fire.	<ol style="list-style-type: none"> 1. Check gas supply for possible obstruction or closed valves. Refill tank; replace or repair parts as required. 2. Inspect gas solenoid valves for defective coils or improper wiring. Replace valve or coil if valve will not open with proper voltage applied (115 volts).
Burner will not fire, but gauge shows gas pressure.	<ol style="list-style-type: none"> 1. Check that the igniter is properly gapped and has a strong spark. 2. Inspect the porcelain and electrodes for damage or cracking. Replace or clean if necessary. 3. Machine does not have chassis ground.
Uneven drying—some kernels appear brown while others are under-dried. Uneven heat exiting from dryer columns.	<ol style="list-style-type: none"> 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.
Grain is not moving through columns.	<ol style="list-style-type: none"> 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 and clean regularly. Do not allow fine material to gather in the plenum chamber.

Ignition Board Troubleshooting Guide 10' Tower

Problem	Possible Cause and Solution
<p>Difficulty lighting the burner</p>	<ol style="list-style-type: none"> 1. Ensure gas supply to the dryer is on and hand valves are open. 2. Fan must be on to achieve air pressure light. 3. Ignition switch set to ON, applies 120 VAC at L1 (0 volts at L2-Neutral) of the ignition board. 4. In some cases (towers), ignition switch powers on external pre-purge timer (10 seconds). Check for power to and from timer. 5. After pre-purge time, the ignition board should power out 120 VAC at V1 (V2 neutral) for a <i>trial for ignition</i> period to open the solenoid(s) and gas valve light. The normal trial time is 10 seconds. If trial is not successful, voltage output stops. 6. Check gas solenoid operation by listening for click/ snap or feeling the vibration as they open. If solenoid doesn't open, check the wiring and coil for damage, bad connections, etc. 7. Check the spark plug (igniter) for spark. Check the high voltage wire for damage, good connections. 8. Replace the ignition board.
<p>Burner lights but doesn't stay lit</p> <p>NOTE: This is most likely due to flame sensing</p>	<ol style="list-style-type: none"> 1. Ensure flame sense probe is located in the flame. 2. Inspect the sense wire for damage, loose or wet connections. 3. Sense wire must be routed separately from the high voltage ignition wire. 4. Check that the ignition board (B.GND) is grounded separately from all other connections. Sharing a ground connection can cause problems. 5. Clean sense probe with fine steel wool. 6. Burner may have to be grounded at the burner body to the burner housing.

Section 5
Dryer Information

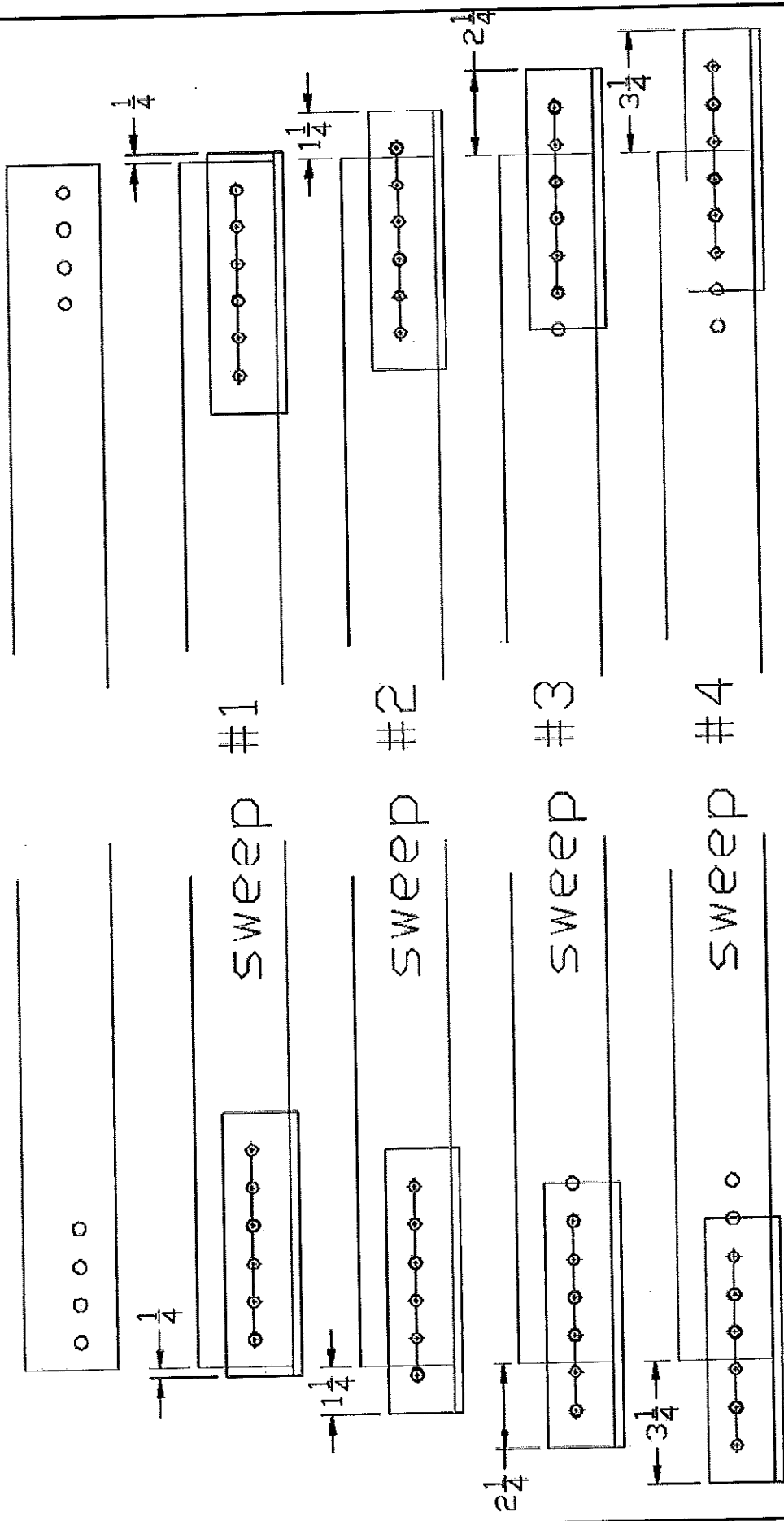
10' Tower Dryer Specifications

	10520	10630	10730	10840	101050	101275
Model	10520	10630	10730	10840	101050	101275
Diameter	10'	10'	10'	10'	10'	10'
Height	31'-7"	35'-8"	39'-8"	43'-8"	51'-10"	59'-11"
Motor Sizes						
Fans	20HP	30HP	30HP	40HP	50HP	75HP
Metering	5HP	5HP	5HP	5HP	5HP	5HP
Total Running Amps						
230V-3ph	99.5 Amps	123 Amps	123 Amps	156.1 Amps	189.5 Amps	243.3 Amps
460V-3ph	56.3 Amps	68 Amps	68 Amps	84.5 Amps	101.3 Amps	128 Amps
575V-3ph	44.4 Amps	54.4 Amps	54.4 Amps	67.6 Amps	77.8 Amps	102.4 Amps
Weight, Empty (Approx.)	9,775 lbs.	10,715 lbs.	12,155 lbs.	13,112 lbs.	15,055 lbs.	16,793 lbs.
Column Thickness	12 in.	12 in.	12 in.	12 in.	12 in.	12 in.
BTU Outputs						
Normal Operating	2,904,000	3,630,000	4,114,000	5,082,000	6,171,000	7,502,000
Maximum	5,280,000	6,600,000	7,480,000	9,240,000	11,220,000	13,640,000
Drying Rates						
10 pt. Removal 25%-15%	320 bu./hr.	400 bu./hr.	460 bu./hr.	555 bu./hr.	680 bu./hr.	820 bu./hr.
7 pt. Removal 22%-15%	440 bu./hr.	550 bu./hr.	630 bu./hr.	755 bu./hr.	920 bu./hr.	1115 bu./hr.
5 pt. Removal 20%-15%	560 bu./hr.	700 bu./hr.	800 bu./hr.	960 bu. Hr.	1175 bu./hr.	1415 bu./hr.
Total Holding Capacity (Approx.)	639 bu.	728 bu.	823 bu.	906 bu.	1082 bu.	1258 bu.

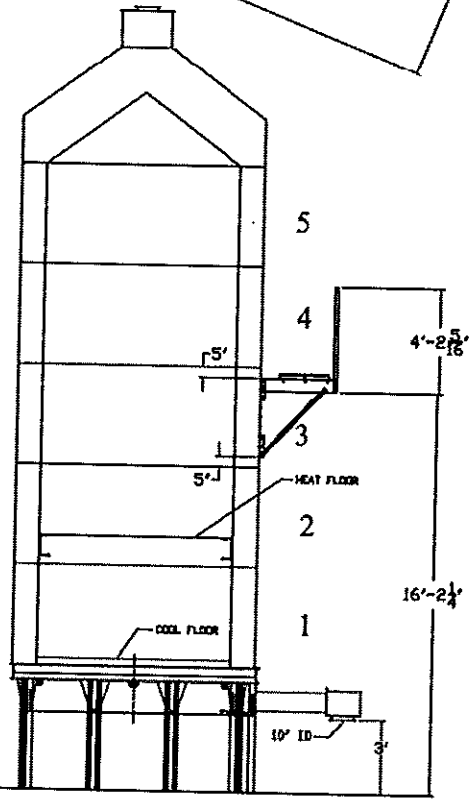
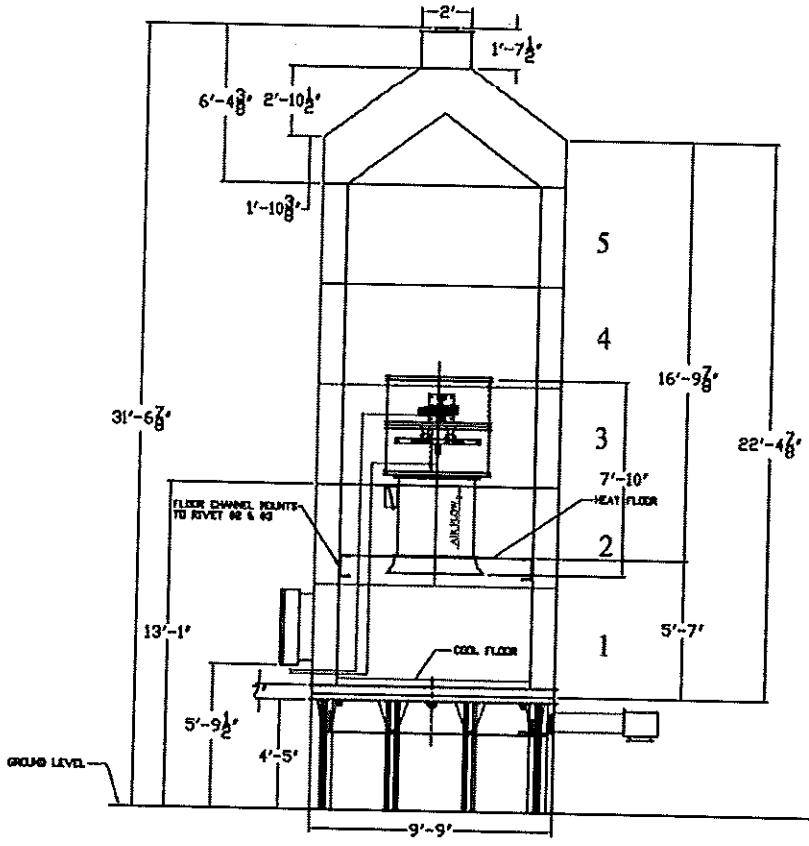
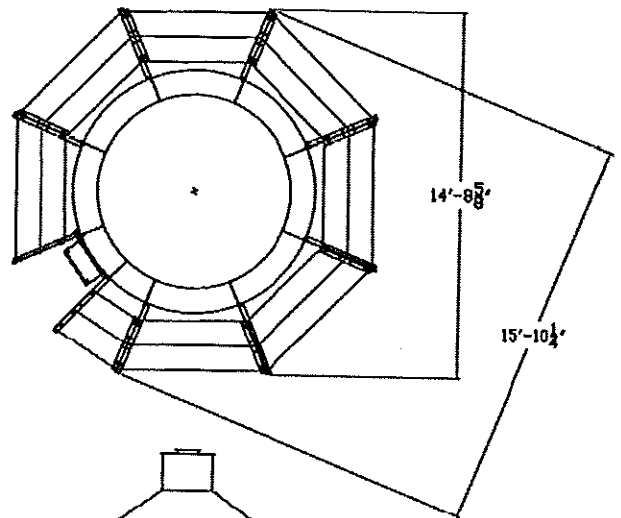
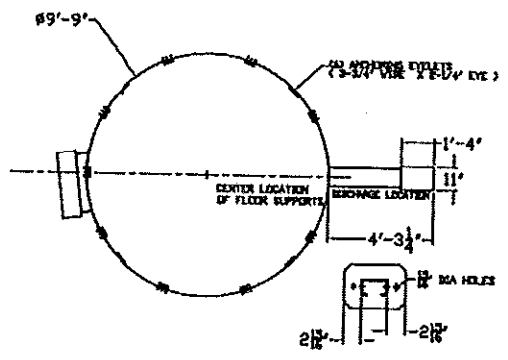
10' Tower Dryer Discharge Data

NOTE: Dryer capacity output is all calculated numbers, this does not take into account any changes made on finger adjustment on sweep arms.

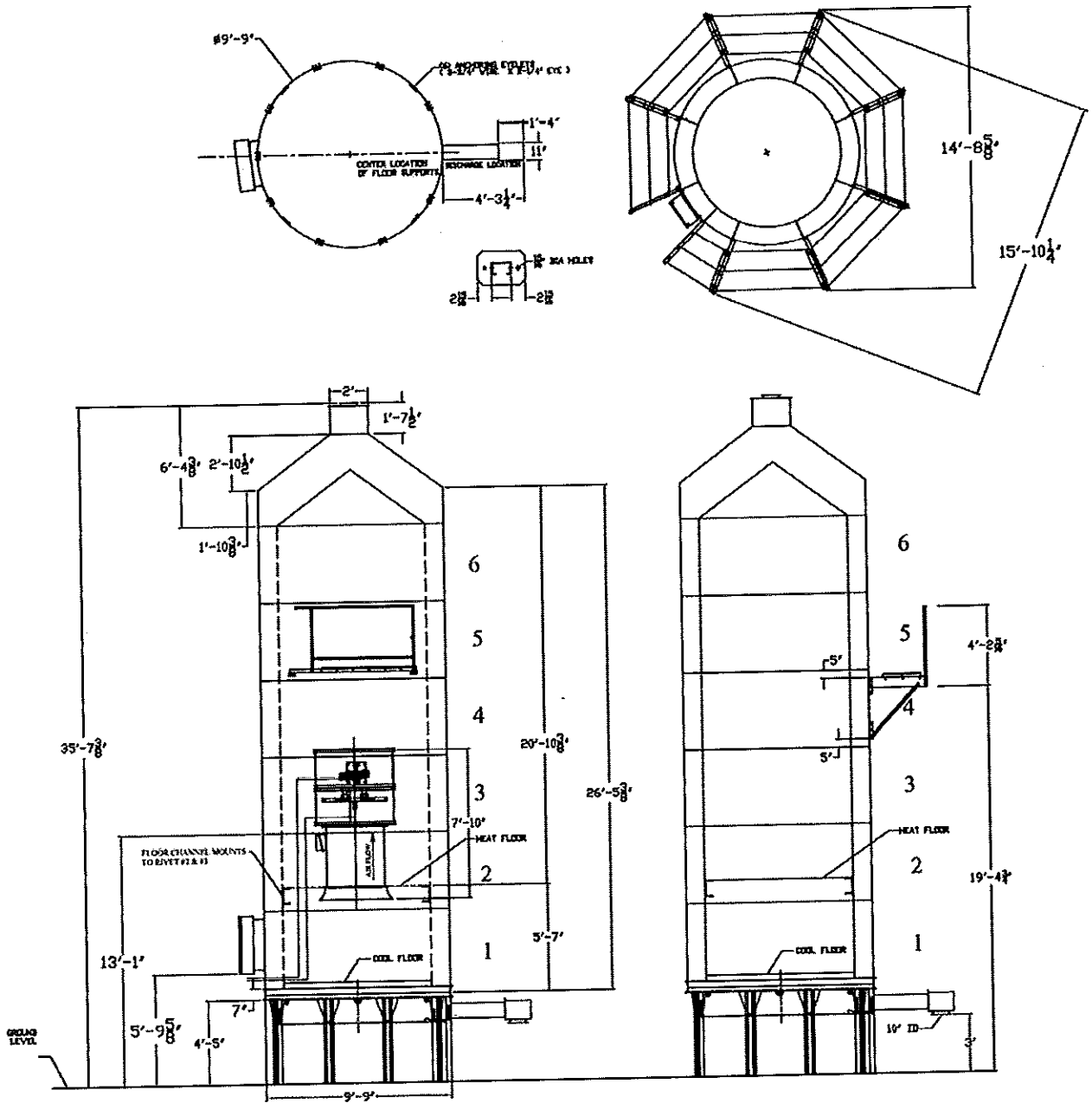
10' DRYER 5 HP MOTOR A/C DRIVE Smaller scale Pot Settings									
7" base POT SETTING	Overspeed MOTOR FREQ	MOTOR RPM	SWEEP RPM	Sweep #4 OUTPUT BU/HR	Sweep #3 OUTPUT BU/HR	Sweep #2 OUTPUT BU/HR	Sweep #1 OUTPUT BU/HR	5.208 AUGER RPM	4.91 AUGER MAX@RPM
10	72	2070.0	8.4	1613	1371	1129	807	397.5	1951.6
9.5	68.65	1973.7	8.0	1538	1308	1077	769	379.0	1860.8
9	65.3	1877.4	7.7	1463	1244	1024	732	360.5	1770.0
8.5	61.95	1781.1	7.3	1388	1180	972	694	342.0	1679.1
8	58.6	1684.8	6.9	1313	1116	919	657	323.5	1588.3
7.5	55.25	1588.4	6.5	1238	1052	867	619	305.0	1497.6
7	51.9	1492.1	6.1	1163	989	814	582	286.5	1406.8
6.5	48.55	1395.8	5.7	1088	925	762	544	268.0	1315.9
6	45.2	1299.5	5.3	1013	861	709	506	249.5	1225.1
5.5	41.85	1203.2	4.9	938	797	656	469	231.0	1134.3
5	38.5	1106.9	4.5	863	733	604	431	212.5	1043.5
4.5	35.15	1010.6	4.1	788	669	551	394	194.0	952.7
4	31.8	914.3	3.7	713	606	499	356	175.5	861.9
3.5	28.45	817.9	3.3	638	542	446	319	157.1	771.1
3	25.1	721.6	2.9	562	478	394	281	138.6	680.3
2.5	21.75	625.3	2.5	487	414	341	244	120.1	589.5
2	18.4	529.0	2.2	412	350	289	206	101.6	498.7
1.5	15.05	432.7	1.8	337	287	236	169	83.1	407.9
1	11.7	336.4	1.4	262	223	184	131	64.6	317.1
0.5	8.35	240.1	1.0	187	159	131	94	46.1	226.3
0	5	143.8	0.6	112	95	78	56	27.6	135.5



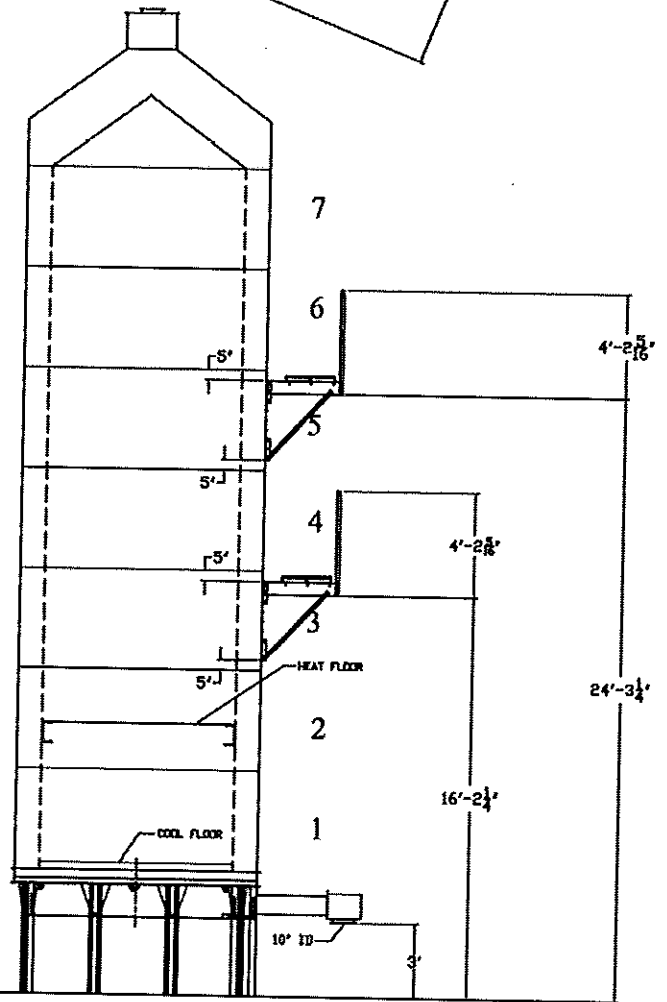
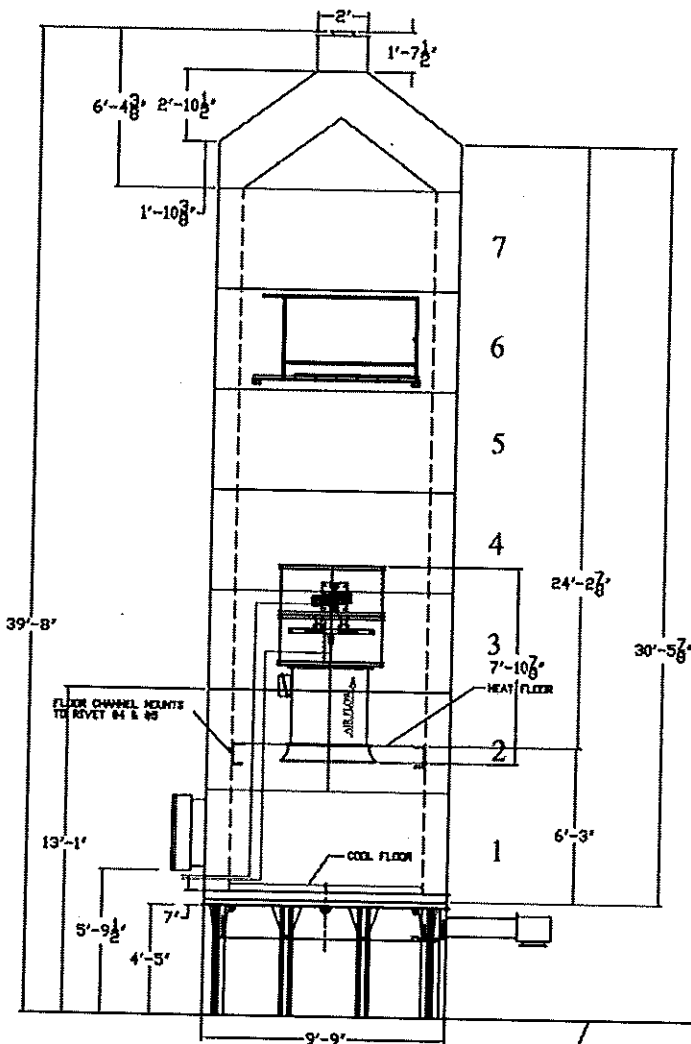
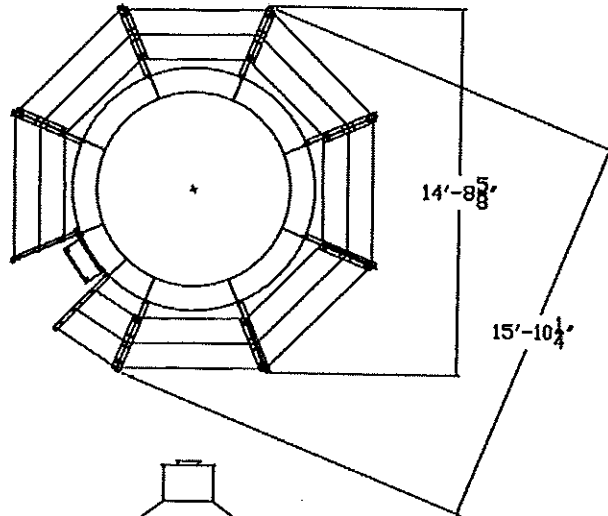
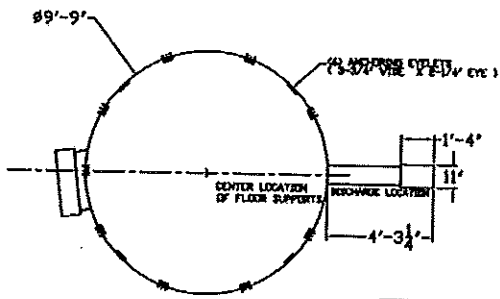
SWEEP #3 USE ON 10520 THRU 10730 TOWERS
 SWEEP #4 USE ON 10840 & 101275 TOWERS



10520 TOWER W/ 9 LEGS
 Revised 1/5/2007

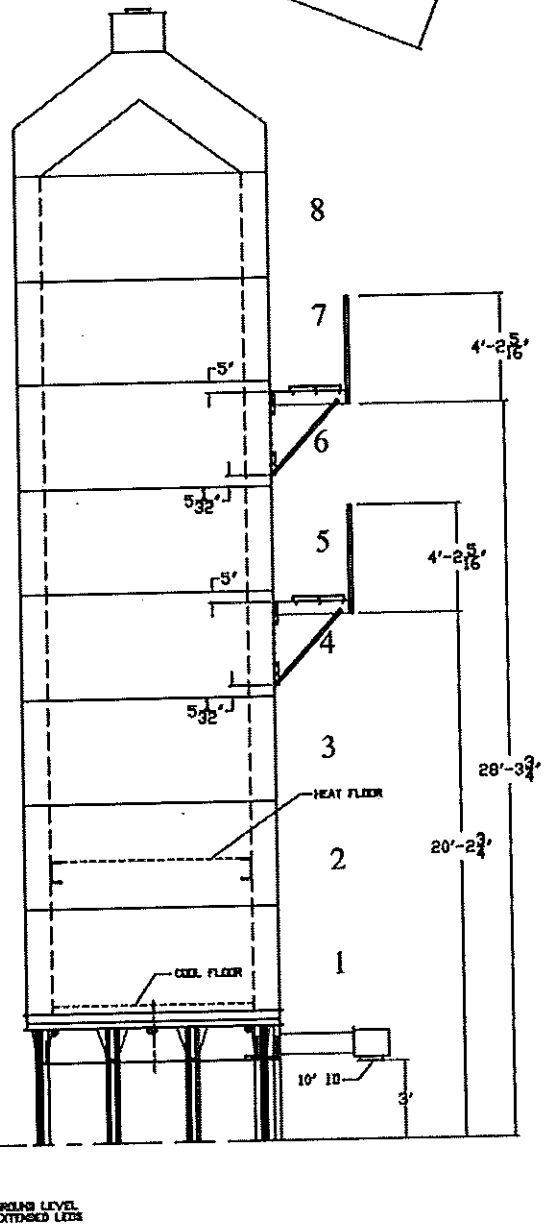
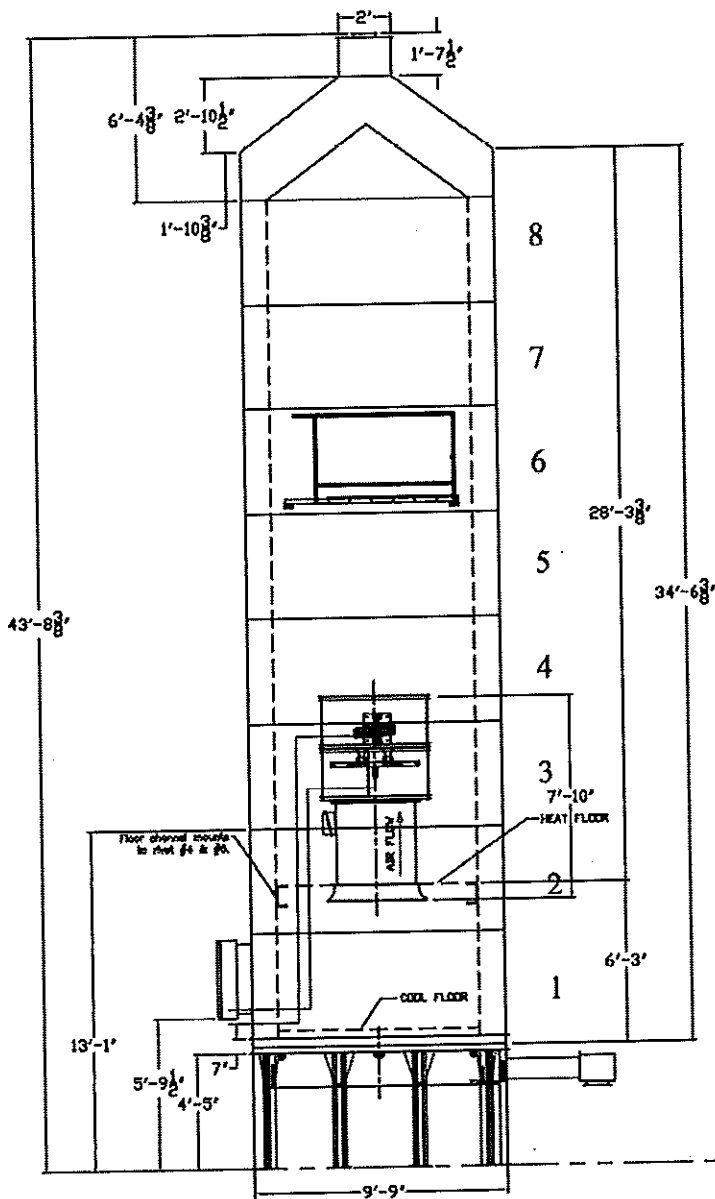
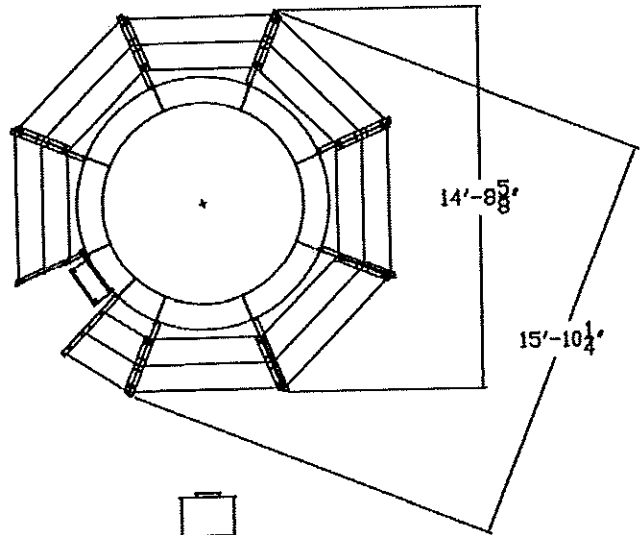
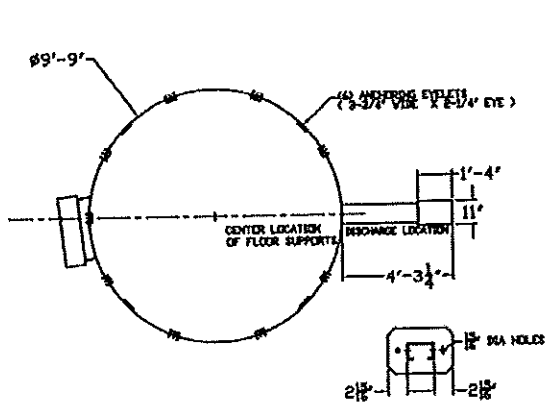


10630 TOWER W/ 9 LEGS
 Revised 1/5/2007



GROUND LEVEL
EXTENDED LEGS

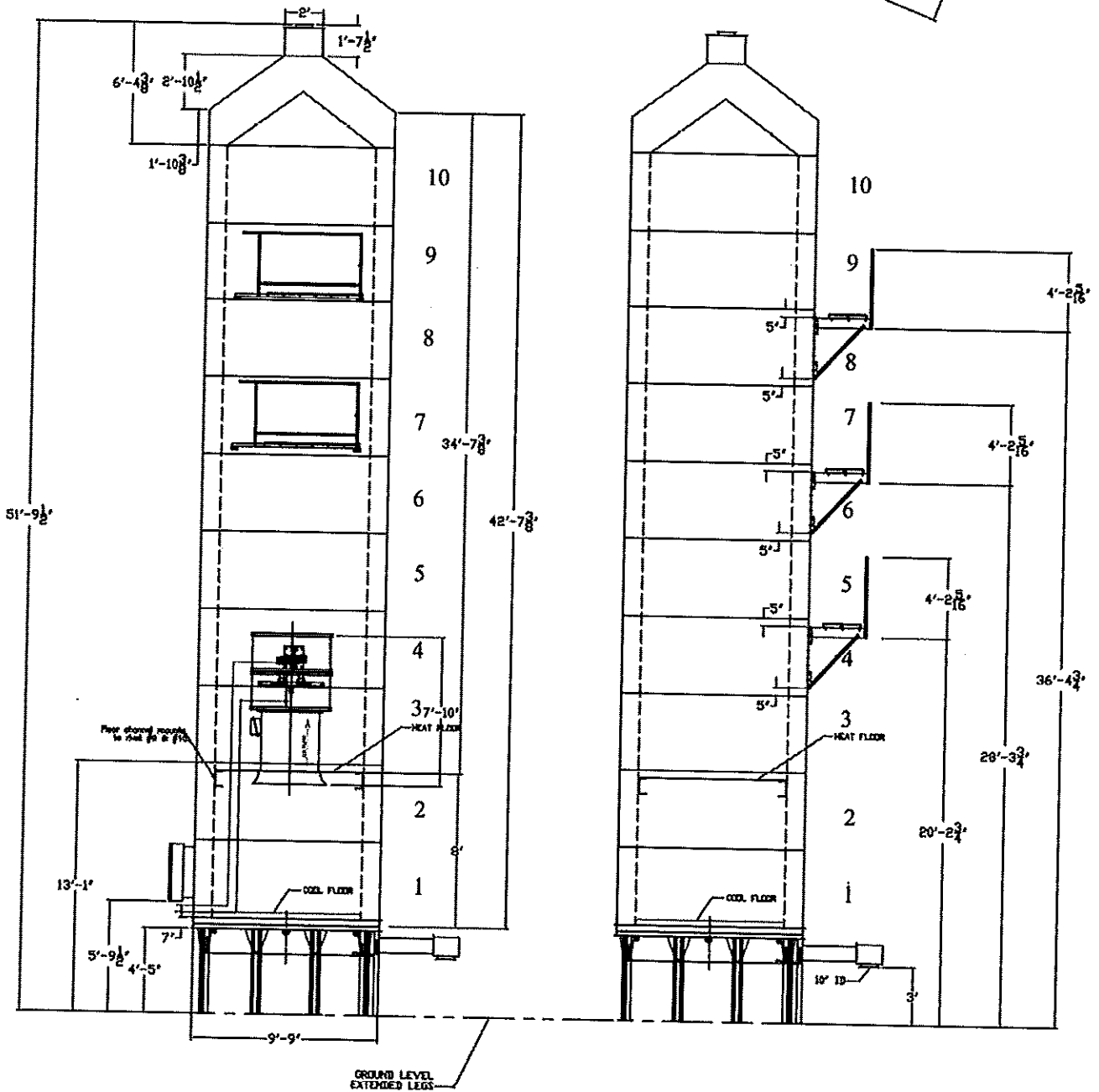
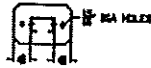
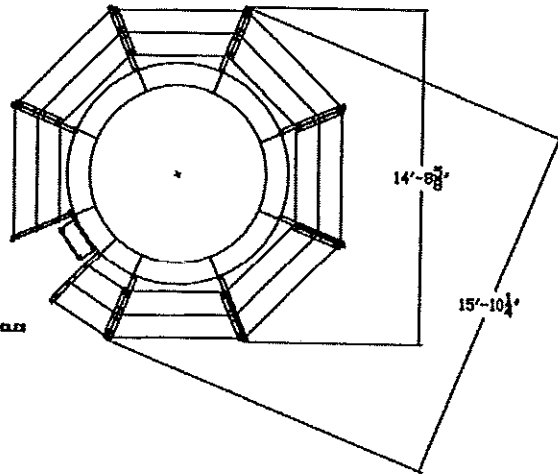
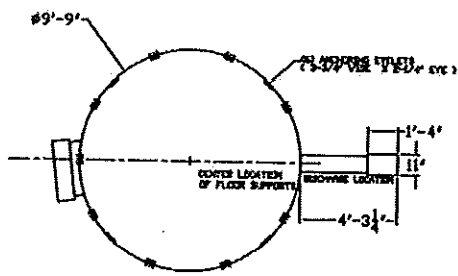
10730 TOWER W/ 9 LEGS
Revised 1/5/2007



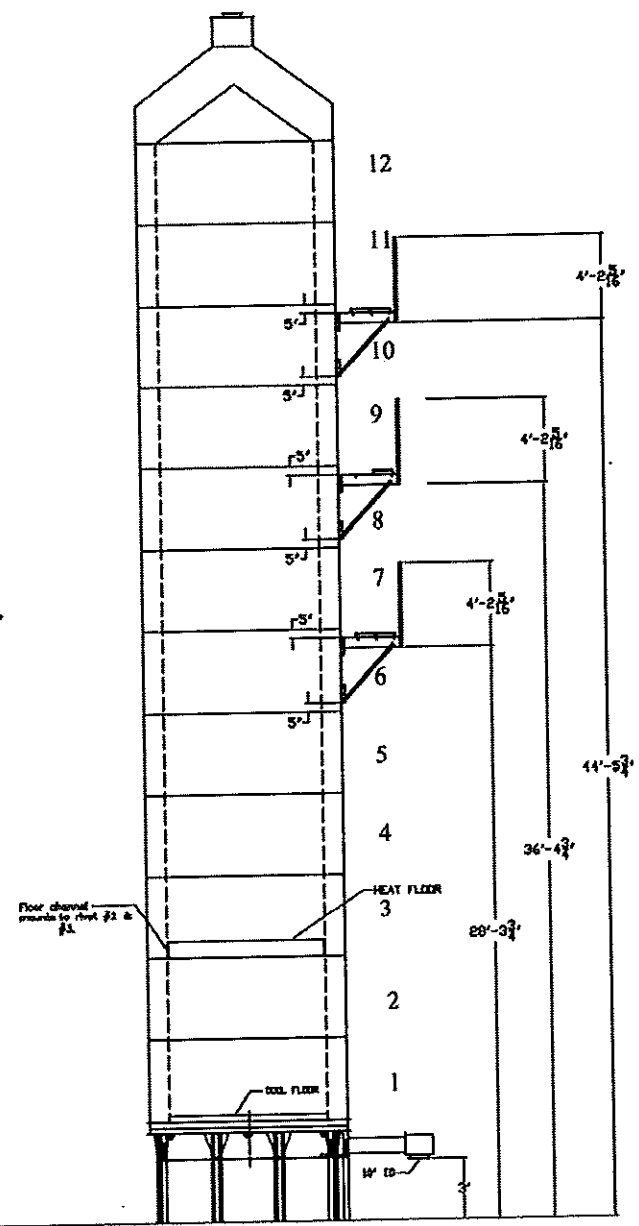
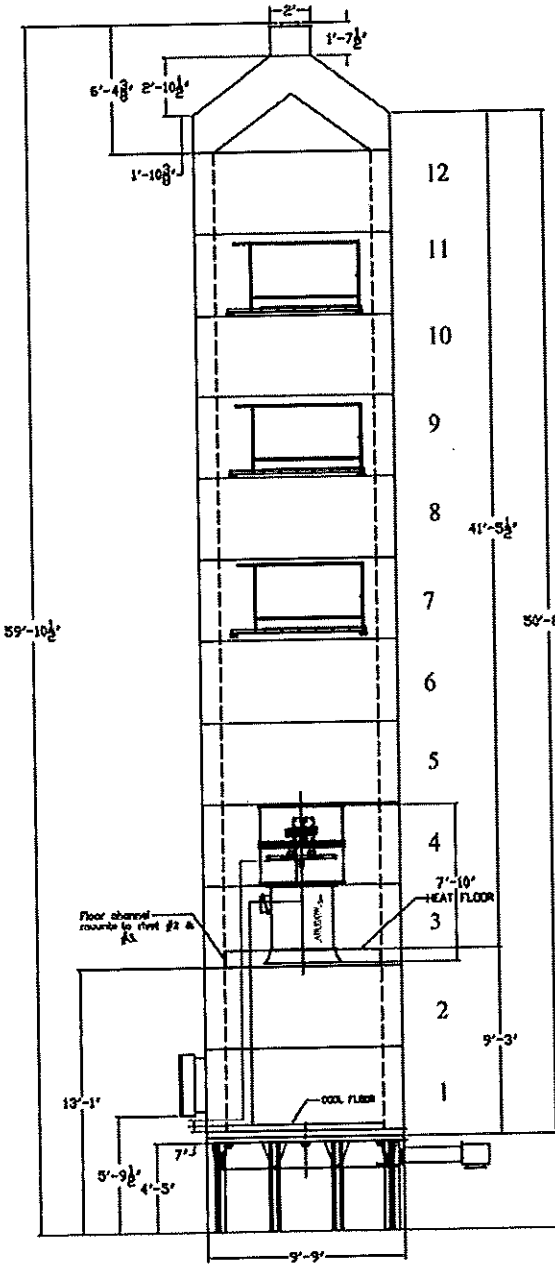
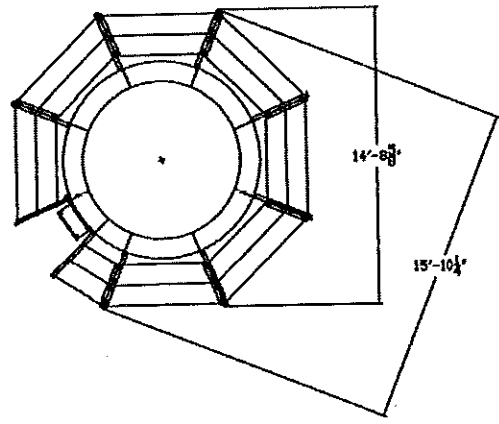
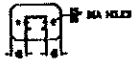
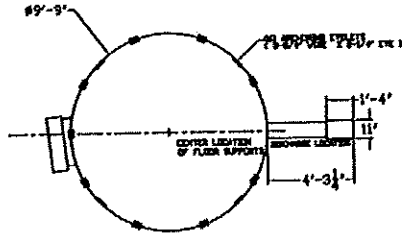
GROUND LEVEL
EXTENDED LEGS

10840 TOWER W/9 LEGS

Revised 1/5/2007



101050 TOWER W/ 9 LEGS
REVISED 1/5/2007



101275 TOWER W/ 9 LEGS
Revised 1/5/2007

Grain Drying Theory for Tower Dryers

The process of drying grain in a Mathews Company tower grain dryer requires 3 main components:

1. **Air:** The air volume is supplied by a blower that is vertically mounted inside the tower dryer. The function of the air is two-fold. It is a heat transfer mechanism and also provides a mode of transportation for grain moisture. The air transfers the heat from the burner or energy source to the grain. The air assists the heat in grain-shell penetration to dry the grain. The second function of the air is as a mode of transportation for moisture. The air absorbs the moisture from the grain and carries that moisture outside the dryer.
2. **Heat/Energy:** The burner that sits directly above the blower heats the air that fills the plenum chamber and transfers this heat from its origin to every kernel of grain. The heat is what dries the grain or releases the moisture from the kernel or seed. The accurate control of this heat or energy is what makes the equipment energy-efficient. The most effective way to regulate control of this energy is through modulating- or proportional-valve gas controls.
3. **Time:** Time, in this case, refers to the retention time of grain inside the dryer columns. The time that the grain is exposed to both air and heat determines how much moisture is driven out of the grain. The longer the exposure, the more moisture removal occurs. Thus, the best method for controlling the amount of moisture removal in grain is to increase and decrease the grain metering system of the dryer. The slower the metering systems run, the longer the grain is exposed to air and heat and the moisture removal is increased. The faster the metering system operates, the shorter the grain retention time and the moisture removal of grain is reduced. The easiest way to keep good grain quality and accurate control is to keep heat and air consistent while varying only grain retention time. This seems to be most common and efficient way of drying grain.

Functions of air, heat and time in the drying process:

The bottom third of the dryer is suction-cooled, pulls heat off of the grain and returns it to the burner to lower energy consumption. This is the method of heat reclamation that creates the most efficient use of energy in the dryer. The top two thirds of the dryer are pressure heated to dry grain. The air is pulled into the dryer through free air doors or dry grain in dryer columns. The amount of air volume the blower can move is dependent on the static air pressure in the chambers. The higher the static air pressure, the less air volume the blower moves. The free air doors have adjustable opening louvers. Increasing the amount of opening of the free-air doors increases the air volume of the blower. The increased air volume will correlate to increased drying capacity. The free-air door adjustment is also a means of controlling the discharge grain temperature. When the doors are closed, the discharge grain temperature is closer to the ambient temperature. The further open the doors are, the higher the discharge temperature will rise.

The dryer plenum temperature control system provides a method of entering one given temperature that the dryer will maintain for consistent plenum temperature. This temperature can be changed to an appropriate drying temperature for the product being processed. This is the method to control fuel efficiency.

The blower pushes the air volume through the burner and the air transfers this heat to fill the plenum chamber and heat the grain. The grain will absorb the heat and drive moisture out of the kernel or seed. The grain moisture emitted will saturate the air, and the air will carry the moisture out of the dryer and leave the kernel or seed dry and hot. This heat will be reclaimed when it moves down the dryer column and is exposed to the suction cooling process. The metering system at the base of the dryer is continuously running, providing a continuous flow-drying method. The moisture control system is meant to control the metering system or grain-flow rate. The rate is to change as grain moisture changes to maintain consistent discharging grain-moisture levels. The grain passes once through the dryer and is completely dry and ready for storage.

The dryer control system function is to provide safe operation and accurate control over the system.

Grain Dryer Component Function

Plumbing components:

- **Strainer:** This item contains a wire filter and will collect any foreign material that is in the fuel supply line.
- **Solenoid:** The solenoid is controlled by the Ignition Board. 120-volt power will energize the solenoid coil and open the gas line to allow fuel supply to flow to burner. The de-energizing of power will allow the solenoid to close within one second. This stops gas flow and extinguishes the burner flame.
- **Main Shutdown Valve:** This is a manual-ON gas supply switch that needs to be energized by the safety circuit in order to allow the gas line to be opened. If the safety circuit drops out for any reason, this device will automatically drop out and shut off the gas supply. This device is a gas-supply safety valve.
- **Modulating or Proportional Valve:** This valve opens and closes to allow fuel supply to change and to keep plenum temperature stable. The method of opening and closing to control gas flow is normally a butterfly gas valve. The proportional valve uses a controlling device to dictate to the valve the direction in which it should open or close to maintain temperature in chamber. This device will normally display and regulate temperature using the proportional valve as a slave to control signal. The modulating valve is not attached to any electrical device for control functions. The modulating valve contains a power element, which is inserted into the heated chamber. As temperature inside the chamber rises, the power element capillary bulb heats up and internal gas expands. This expansion causes the valve body to close the gas orifice down and decrease flow. This constant adjustment is how the valve maintains the set-point temperature.
- **Hand Valve:** Mechanically operated ball valve to manually open and close fuel supply to burner.
- **High Pressure Relief Valve:** When line pressure becomes too great, the valve automatically opens and relieves excess pressure until the pressure drops. Once pressure drops, the valve will close and seal for proper function.
- **Low Pressure Switch:** The low pressure switch is an adjustable-pressure switch that will shut down the burner if pressure drops below the set point on the switch. The switch is adjustable and can be set for any pressure from 0 to 9 psig. The normal low-pressure setting is 50% of low-end range of manifold pressure. This switch is normally used on CGA and CE Dryers.
- **High Pressure Switch:** The high pressure switch is an adjustable-pressure switch that will shut down the grain dryer if the pressure rises above set point on switch. The switch is adjustable and can be set for any pressure from 0 to 20 psig. The normal high-pressure setting is 50% of above high end range of manifold pressure. This switch is normally used on CGA and CE dryers.

- **Pressure Regulator:** This device reduces the pressure input to a controlled and adjustable output. These devices have different configurations and sizes, but functionally perform two tasks: pressure reduction and stabilization of output within reasonable ranges.

Field device components:

- **Ignition Board:** 120-volt power supply to function Ignition Board. The board function is to supply high voltage from coil to either spark plug or igniter to direct spark the burner. The board provides the flame sense probe with 60 volts. The voltage must transmit current from the flame sense probe, through the flame to burner ground. The completion of the circuit allows the ignition board to monitor and detect the presence of flame. The ignition board provides 120 volts to solenoids to open and maintain fuel supply to the burner. The timing sequence for the ignition board is 0 time for pre-purge and 10 second trial for ignition. The ignition board contains an automatic reset, which always resets on the board re-energizing of 120-volts.
- **Rotary Fill Switch:** The rotary fill switch is located in the receiving tube at the top of the dryer. This is powered by 120 volts and contains normally open and closed contacts. The switch is motorized and will rotate a slicer blade or paddle until wet grain contacts switch. The grain stops the rotation and proves the presence of grain. This switch is normally closed and allows the dryer to continue to fill as long as the switch rotates. When grain stops the device from rotating, the contact status changes to normally open and shuts off fill system.
- **High Limit Switch:** The high limit switch is located in a cabinet with a capillary bulb in the plenum chamber. This device is adjustable to be set 40 degrees higher than the plenum temperature set point. Once the plenum temperature reaches the high-limit set point, the device will shut down the dryer. It is a heat-over-temperature device for equipment and grain safety. The high-limit switch is a normal closed contact until the temperature reaches set point and then contacts open, shutting down the dryer.
- **Air Pressure Switch:** The air pressure switch is an air-proving device. The switch is fully adjustable, allowing the operator to set the air pressure switch to detect when the fan or blower is operating. The air pressure switch is normally open and will not close until air flow is detected. Once air flow is detected, the switch closes and provides 120 volts to the ignition switch, allowing the operator to light the burner.
- **Thermistor:** Used on the side of the dryer to detect the level of temperature present in the grain. It is used to drive the moisture control system.
- **RTD or Thermocouple :** Temperature sensing device to transmit signal to temperature controller. Located in the plenum chamber to monitor precise internal dryer temperature of static air.

- **Moisture Sensor:** The moisture sensor monitors moisture and temperature of discharge grain using DC power and micro-processing technology to change DC signal to moisture and temperature of discharging grain. Moisture is measured using capacitance to the ground. Temperature of grain is measured by a thermocouple device on a moisture sensor.

- **Linear Limit:** Located outside the grain column wrapped around the top screen section of dryer. The linear limit is an over-temperature-detection device. Once the exhaust air emitting from dryer reaches 218° F, contacts that are normally closed will open and shut down the dryer. The opening of linear limit contacts also sounds an audio alarm that can only be shut off by powering down the dryer. The linear limits will close the contacts once the temperature drops below 208° F.

- **Mercury Switch:** The mercury switch is an enclosed cylindrical tube that contains a liquid, which will readily conduct electrical current. At one end of the cylinder is a set of contacts that will pass power from one contact to the other only when the liquid is present. The cylinder can be mounted in such a manner so that the tube is rotated and the liquid runs away from the contacts and opens the contacts so that they are not capable of passing current. This device is located on the back door of the unloading auger.

- **Flame Sense Probe:** The flame sense probe is mounted to the burner assembly. This probe has 60 volts of power flowing through to the flame of the burner. The flame will allow current to connect a circuit to chassis ground. It is attached to the ignition board on terminal S1.

- **Spark Plug:** The spark plug receives high voltage current from the ignition board and arcs at the spark plug gap to provide direct spark ignition for burner. Used on low pressure burners only.

- **Low Pressure Burner:** The low pressure burner is located directly over the blower and is used to heat the air flowing into the plenum chamber to dry grain.

Electrical components inside cabinets

- **IEC Manual Motor Protectors:** Manual motor protectors are for operation of any motors. The protectors have both magnetic and thermal protection for the motor. They contain auxiliary contacts and fault contacts. The fault contacts trip or open whenever the magnetic or thermal protection is compromised. This, in turn, shuts down the dryer.

- **Soft Starter:** Soft starter is used to start up and monitor large blower motors. These are programmable devices that have built-in motor protection and adjustable features. The normal use of the soft starter is to lower start-up motor amp draw and protect motor life. Once the motor is running and amp draw is normal, the shorting contactor pulls in and carries the motor amp load and the soft starter monitors high voltage lines for irregularities to protect motor life.

- **AC Drive Unit:** The AC drive unit is a single-phase input and three-phase output to run and protect the unload motor. This device is controlled by means of a micro-processing board.

- **Cal Controller:** This device displays measured plenum temperature and controls the proportional valve. The valve will open and close butterfly to adjust gas flow and continually adjust to maintain stable plenum temperature. This device can also function to shut down the machine if actual plenum temperature rises or lowers by more than 40° F.

- **Moisture Control Board:** This printed circuit board controls AC Drive Unit signal to increase or decrease sweep and unload auger speed. These printed circuit board controls are in manual and automatic. In manual, the operator dials in a setting using the potentiometer. The automatic control is dialing in a set point and thermostat control printed circuit board to increase or decrease speed as needed.

- **Moisture Monitor:** The display unit is used to show both grain moisture and temperature that the moisture sensor is contacting as dry grain discharges.

- **Printer:** Printer will periodically print out discharge grain temperature and moisture for operator's information.

- **Relay:** The relay is a 120-volt coil that energizes relay contacts to close and pass power through to proper device.

- **Discharge Speed Meter:** Displays the DC output signal at which the sweep and auger system is running. It is used as a point of reference to the speed of the discharge system.

- **Push button:** These push buttons are used for starting and stopping the blower. The push buttons control the manual motor protector that runs blower.

- **LED lights:** All lights are 120-volt power LED lights for daylight viewable use.

- **Rotary Door Switches:** These come in a variety of combinations and are typically used to actuate items on and off or switch modes ON-OFF-ON.

Potentiometers: Potentiometers are used to vary resistance in a circuit.

10520 Tower Dryer Capacity Charts

Moisture Removal Corn	Dryer Models		10520 Dry & Cool @ 170 Degrees			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	157	0.5	5	152.1	56.7	2.9
29-15	171	0.6	6	137.9	51.4	2.8
28-15	186	0.7	7	124.6	46.4	2.8
27-15	204	0.9	9	112.2	41.8	2.8
26-15	224	1	10	100.8	37.6	2.7
25-15	246	1.2	12	90.4	33.7	2.7
24-15	272	1.4	14	80.9	30.1	2.6
23-15	301	1.6	16	72.1	26.9	2.6
22-15	335	1.9	19	64.0	23.8	2.6
21-15	375	2.2	22	56.4	21.0	2.5
20-15	426	2.6	26	49.0	18.3	2.5
19-15	495	3.1	31	41.7	15.5	2.4
18-15	600	4	40	34.0	12.7	2.4
17-15	786	5.4	54	25.6	9.5	2.4

Moisture Removal Corn	Dryer Models		10520 Dry & Cool @ 200 Degrees Fahrenheit			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	200	0.8	8	119.3	44.5	3.6
29-15	217	1	10	108.2	40.3	3.5
28-15	237	1.1	11	97.7	36.4	3.5
27-15	260	1.3	13	88.0	32.8	3.4
26-15	286	1.5	15	79.1	29.5	3.4
25-15	320	1.8	18	70.0	26.1	3.3
24-15	347	2	20	63.4	23.6	3.2
23-15	384	2.3	23	56.6	21.1	3.2
22-15	440	2.7	27	49.6	18.5	3.1
21-15	478	3	30	44.2	16.5	3.0
20-15	560	3.6	36	38.0	14.1	3.0
19-15	631	4.2	42	32.7	12.2	3.0
18-15	765	5.2	52	26.6	9.9	2.9
17-15	1002	7.1	71	20.1	7.5	3.0

This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.

10630 Tower Dryer Capacity Charts

Moisture Removal Corn	Dryer Models		10630 Dry & Cool @ 170 Degrees			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	198	0.8	8	153.5	45.0	3.6
29-15	215	0.9	9	139.2	40.8	3.6
28-15	235	1.1	11	125.7	36.8	3.5
27-15	257	1.3	13	113.2	33.2	3.5
26-15	282	1.5	15	101.7	29.8	3.4
25-15	311	1.7	17	91.2	26.7	3.4
24-15	343	1.9	19	81.6	23.9	3.3
23-15	379	2.2	22	72.8	21.3	3.3
22-15	422	2.6	26	64.6	18.9	3.2
21-15	472	3	30	56.9	16.7	3.2
20-15	537	3.5	35	49.5	14.5	3.1
19-15	624	4.1	41	42.0	12.3	3.1
18-15	756	5.2	52	34.3	10.0	3.1
17-15	991	7	70	25.8	7.6	3.2

Moisture Removal Corn	Dryer Models		10630 Dry & Cool @ 200 Degrees Fahrenheit			
	Bu/hr-Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	255	1.3	13	118.8	34.8	4.5
29-15	278	1.4	14	107.7	31.6	4.5
28-15	303	1.6	16	97.3	28.5	4.4
27-15	332	1.9	19	87.7	25.7	4.3
26-15	364	2.1	21	78.8	23.1	4.3
25-15	400	2.4	24	70.6	20.7	4.2
24-15	443	2.7	27	63.2	18.5	4.1
23-15	490	3.1	31	56.3	16.5	4.0
22-15	550	3.6	36	15.0	14.6	4.0
21-15	610	4	40	44.1	12.9	3.9
20-15	700	4.7	47	38.3	11.2	3.9
19-15	806	5.6	56	32.5	9.5	3.9
18-15	976	6.9	69	26.5	7.8	3.9
17-15	1280	9.3	93	20.0	5.9	4.1

This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.

10730 Tower Dryer Capacity Charts

Moisture Removal Corn	Dryer Models		10730 Dry & Cool @ 170 Degrees			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	223	1	10	153.1	44.7	4.1
29-15	243	1.2	12	138.8	40.5	4.0
28-15	265	1.3	13	125.4	36.6	4.0
27-15	290	1.5	15	112.9	33.0	3.9
26-15	319	1.8	18	101.5	29.6	3.9
25-15	351	2	20	91.0	26.5	3.8
24-15	387	2.3	23	81.4	23.7	3.8
23-15	429	2.6	26	72.6	21.2	3.7
22-15	477	3	30	64.4	18.8	3.6
21-15	534	3.4	34	56.8	16.6	3.6
20-15	607	4	40	49.3	14.4	3.6
19-15	705	4.8	48	41.9	12.2	3.5
18-15	855	6	60	34.2	10.0	3.5
17-15	1120	8	80	25.8	7.5	3.6

Moisture Removal Corn	Dryer Models		10730 Dry & Cool @ 200 Degrees Fahrenheit			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	289	1.5	15	118.5	34.6	5.1
29-15	314	1.7	17	107.4	31.4	5.1
28-15	343	1.9	19	97.1	28.3	5.0
27-15	375	2.2	22	87.4	25.5	4.9
26-15	412	2.5	25	78.6	22.9	4.8
25-15	460	2.9	29	69.5	20.3	4.8
24-15	500	3.2	32	63.0	18.4	4.7
23-15	554	3.6	36	56.2	16.4	4.6
22-15	630	4.2	42	49.2	14.4	4.6
21-15	690	4.7	47	43.9	12.8	4.5
20-15	800	5.5	55	37.7	11.0	4.5
19-15	911	6.4	64	32.5	9.5	4.4
18-15	1104	7.9	79	26.5	7.7	4.5

This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.

10840 Tower Dryer Capacity Charts

Moisture Removal	Dryer Models	10840				
		Dry & Cool @ 170 Degrees				
Corn	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	276	1.1	11	153.0	36.2	5.0
29-15	300	1.3	13	138.7	32.8	5.0
28-15	328	1.4	14	125.3	29.6	4.9
27-15	359	1.6	16	112.9	26.7	4.9
26-15	394	1.9	19	101.4	24.0	4.8
25-15	434	2.1	21	90.9	21.5	4.7
24-15	478	2.4	24	81.3	19.2	4.7
23-15	529	2.8	28	72.5	17.1	4.6
22-15	589	3.2	32	64.4	15.2	4.5
21-15	660	3.6	36	56.7	13.4	4.5
20-15	749	4.2	42	49.3	11.7	4.5
19-15	871	5.1	51	41.9	9.9	4.5
18-15	1055	6.3	63	34.1	8.1	4.5
17-15	1383	8.5	85	25.7	6.1	4.7

Moisture Removal	Dryer Models	10840				
		Dry & Cool @ 200 Degrees Fahrenheit				
Corn	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	352	1.6	16	120.0	28.4	6.3
29-15	383	1.8	18	108.8	25.7	6.2
28-15	418	2	20	98.3	23.1	6.1
27-15	457	2.3	23	88.5	20.9	6.0
26-15	502	2.6	26	79.5	18.8	5.9
25-15	555	3	30	71.3	16.9	5.8
24-15	610	3.3	33	63.8	15.1	5.8
23-15	675	3.7	37	56.9	13.4	5.7
22-15	755	4.3	43	50.5	11.9	5.6
21-15	841	4.9	49	44.5	10.5	5.6
20-15	960	5.6	56	38.9	9.2	5.6
19-15	1111	6.7	67	32.9	7.8	5.7
18-15	1346	8.2	82	26.8	6.3	5.8

This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.

101050 Tower Dryer Capacity Charts

Moisture Removal	Dryer Models		101050				Dry & Cool @ 170 Degrees		
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy			
Corn									
30-15	338	1.5	15	154.5	37.7	6.1			
29-15	368	1.7	17	140.0	34.2	6.1			
28-15	402	1.9	19	126.5	30.9	6.0			
27-15	440	2.2	22	114.0	27.8	5.9			
26-15	483	2.5	25	102.4	25.0	5.8			
25-15	532	2.8	28	91.8	22.4	5.7			
24-15	587	3.2	32	82.1	20.0	5.7			
23-15	649	3.6	36	73.2	17.9	5.6			
22-15	722	4.1	41	65.0	15.9	5.5			
21-15	809	4.6	46	57.3	14.0	5.5			
20-15	919	5.4	54	49.8	12.2	5.4			
19-15	1068	6.4	64	42.3	10.3	5.4			
18-15	1294	7.9	79	34.5	8.4	5.5			

Moisture Removal	Dryer Models		101050				Dry & Cool @ 200 Degrees Fahrenheit		
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy			
Corn									
30-15	430	2.1	21	121.2	29.6	7.6			
29-15	470	2.4	24	109.8	26.8	7.5			
28-15	512	2.7	27	99.2	24.2	7.4			
27-15	561	3	30	89.4	21.8	7.3			
26-15	616	3.4	34	80.3	19.6	7.2			
25-15	680	3.8	38	72.5	17.7	7.0			
24-15	750	4.2	42	64.4	15.7	7.0			
23-15	828	4.8	48	57.4	14.0	6.9			
22-15	920	5.4	54	51.3	12.5	6.8			
21-15	1031	6.1	61	44.9	11.0	6.7			
20-15	1175	7.1	71	39.3	9.6	6.7			
19-15	1362	8.3	83	33.2	8.1	6.8			

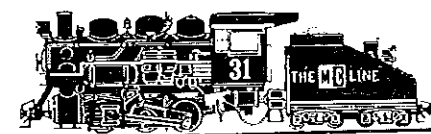
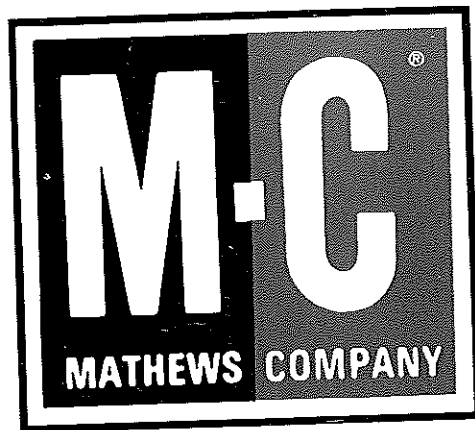
This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.

101275 Tower Dryer Capacity Charts

Moisture Removal Corn	Dryer Models		101275 Dry & Cool @ 170 Degrees			
	Bu/hr Capacity	Pot Set Speed	Unload % Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	410	2	20	154.0	35.7	7.4
29-15	446	2.2	22	139.7	32.4	7.4
28-15	487	2.5	25	126.2	29.2	7.3
27-15	533	2.8	28	113.6	26.3	7.2
26-15	586	3.2	32	102.1	23.7	7.1
25-15	645	3.5	35	91.5	21.2	7.0
24-15	711	4	40	81.9	19.0	6.9
23-15	787	4.5	45	73.0	16.9	6.8
22-15	875	5.1	51	64.8	15.0	6.7
21-15	981	5.8	58	57.1	13.2	6.7
20-15	1114	6.7	67	49.7	11.5	6.6
19-15	1295	7.9	79	42.2	9.8	6.6
18-15	1569	9.7	97	34.4	8.0	6.7

Moisture Removal Corn	Dryer Models		101275 Dry & Cool @ 200 Degrees Fahrenheit			
	Bu/hr Capacity	Pot Set Speed	Unload & Speed	Heat Time	Cool Time	Mbtu/hr Energy
30-15	525	2.8	28	120.8	28.0	9.3
29-15	570	3.1	31	109.5	25.4	9.2
28-15	620	3.4	34	99.0	22.9	9.0
27-15	680	3.8	38	89.1	20.7	8.9
26-15	750	4.2	42	80.1	18.6	8.8
25-15	820	4.7	47	72.3	16.7	8.6
24-15	910	5.3	53	64.2	14.9	8.5
23-15	1005	5.9	59	57.3	13.3	8.4
22-15	1115	6.7	67	51.2	11.9	8.3
21-15	1250	7.6	76	44.8	10.4	8.3
20-15	1415	8.7	87	39.2	9.1	8.2

This information is generated through grain dryer simulation programs and figures are approximated based on principles of drying, field experience and calculated computer simulation. There may be variations in calculated numbers due to grain physiological factors, external grain and weather conditions, etc. The purpose of the capacity chart is to give operators a good reference point for grain drying process data.



Iron Horse Quality