T-Series Tower Dryer

Operation Manual

PNEG-1458

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GSI GROUP

PNEG-1458

All information, illustrations, photos, and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

Contents

Safety Guidelines

This manual contains information that is important for you, the owner/operator, to know and understand. This information relates to protecting ***personal safety*** and ***preventing equipment problems.*** It is the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of these safety guidelines. To help you recognize this information, we use the symbols that are defined below. Please read the manual and pay attention to these sections. Failure to read this manual and its safety instructions is a misuse of the equipment and may lead to serious injury or death.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE indicates information about the equipment that you should pay special attention.

Dryer Operation

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

This manual describes the operation for all standard production model dryers. These dryers are available with liquid propane or natural gas fuel supply and 3 phase 230, 380, 460, or 575 volts (50 Hz or 60 Hz) electrical power.

Our foremost concern is your safety and the safety of others associated with this equipment. We want to keep you as a customer. This manual is to help you understand safe operating procedures and some problems which may be encountered by the operator and other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards and precautions exist, and to inform all personnel associated with the equipment or in the area. Safety precautions may be required from the personnel. Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation where SERIOUS INJURY or DEATH may occur.

This equipment shall be installed in accordance with the current installation codes and applicable regulations which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

Emergency Stop Switch

The Emergency Stop switch is located on the upper control box door. Pushing the Emergency Stop switch will interrupt the control power and stop all dryer functions.

Emergency stop

WARNING ***Pushing the Emergency Stop switch does not interrupt the main power to the upper control box panel.***

Operating Precautions

READ THESE INSTRUCTIONS BEFORE INSTALLATION AND OPERATION
SAVE FOR FUTURE REFERENCE

1. Read and understand the operations manual before attempting to operate the unit.
2. Keep ALL guards, safety decals, and safety devices in place. **NEVER** operate dryer while guards are removed.
3. Keep visitors, children and untrained personnel away from dryer at all times.
4. Never attempt to operate the dryer by jumping or otherwise bypassing any safety devices on the unit.
5. Always set the main power supply disconnect switch to OFF and lock it in the OFF position using a padlock before performing any service or maintenance work on the dryer or the auxiliary conveyor equipment.
6. Before attempting to remove and reinstall the fan blade on the models 1050 and 1260, make certain to contact GSI for the recommended procedure.
7. Keep the dryer and wet holding equipment CLEAN. **DO NOT** allow fine material to accumulate.
8. On LP fired units, set pressure regulator to avoid excessive gas pressure applied to a burner during ignition and when the burner is in operation. *See Page 20* for operating gas pressures. Do not exceed maximum recommended drying temperatures.
9. **DO NOT** operate the dryer if any gas leak is detected. Shut down and repair before further operation.
10. Clean grain is safer and easier to dry. Fine materials can be highly combustible, and it also requires removal of extra moisture.
11. Use **CAUTION** in working around high-speed fans, gas burner, augers and auxiliary conveyors which can **START AUTOMATICALLY.**
12. Be certain that capacities of auxiliary conveyors are matched to dryer metering capacities.
13. **DO NOT** operate in an area where combustible material will be drawn into the dryer.
14. The operating and safety recommendations in this manual pertain to the common cereal grains as indicated. When drying any other grain or products, consult the factory for additional recommendations.
15. Routinely check for any developing gas plumbing leaks.

Use Caution in the Operation of this Equipment

This dryer is designed and manufactured with operator safety in mind. However, the very nature of a grain dryer having a gas burner, high voltage electrical equipment and high speed rotating parts, presents hazards to personnel which cannot be completely safeguarded against without interfering with the efficient operation of the dryer and reasonable access to its components.

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

CAUTION

Keep the dryer clean. Do not allow fine material to accumulate in the plenum chamber or surrounding the outside of the dryer.

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

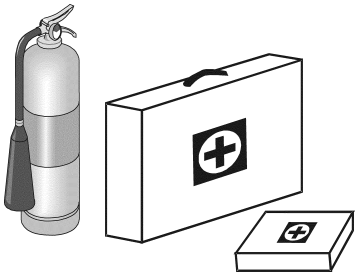
Take special note of the *Operating Precautions* before attempting to operate the dryer.

Prepare for Emergencies

Be prepared if fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.



Keep Emergency Equipment Quickly Accessible

Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Remove all jewelry.

Long hair should be tied up and back.

Safety glasses should be worn at all times to protect eyes from debris.

Wear gloves to protect your hands from sharp edges on plastic or steel parts.

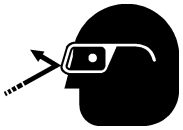
Wear steel toe boots to help protect your feet from falling debris. Tuck in any loose or dangling shoe strings.

A respirator may be needed to prevent breathing potentially toxic fumes and dust.

Wear hard hat to help protect your head.

Wear appropriate fall protection equipment when working at elevations greater than six feet (6').

Eye Protection



Gloves

Steel Toe Boots

Respirator

Hard Hat

Fall Protection

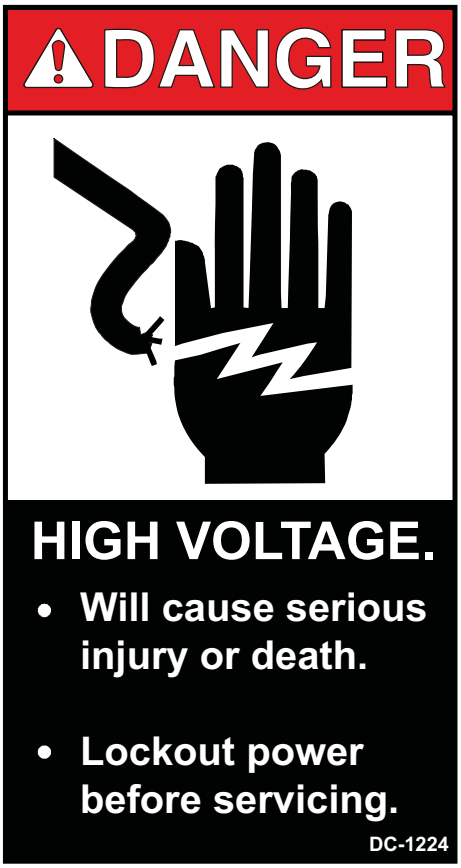
Contact the local power company to have a representative survey the installation to assure the wiring is compatible with their system and adequate power is supplied to the unit. Safety decals should be read and understood by all people in the grain handling area. **Inspect all decals and replace any that are illegible, worn, or missing. Contact your dealer or the factory to order replacement decals.**

If a decal is damaged or is missing, contact:

GSI Decals
1004 E. Illinois St.
Assumption, IL. 62510
Phone: 1-217-226-4421

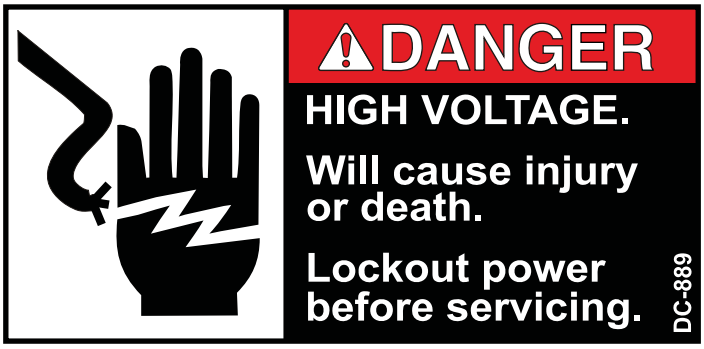
A free replacement will be sent to you.

NOTE: *Decals are not shown actual size.*



Decal: DC-1224

Decal DC-1224 is located in two places on the fan/heater control box. One on the lid and one on the front of the fan heater control box. Another location for this decal is inside the upper control box for the dryer.



Decal: DC-889

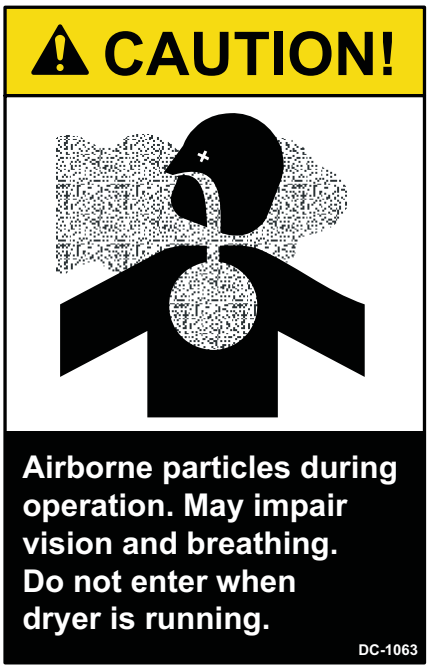
Decal DC-889 has two locations. One inside the fan/heater control box and another on the dryer upper control box door next to the main power disconnect.

Decal: DC-1061

Decal DC-1061 is located on the outside of the heat section door.

Decal: DC-1062

Decal DC-1062 is located inside the cooling section of the dryer on the two access doors to the metering section.



Decal: DC-1063

Decal DC-1063 is located on the louvered access door to the cooling section of the dryer.

Decal: DC-1064

Decal DC-1064 is located on the louvered access door to the cooling section of the dryer.

Models	1050	1260	1575	1875	20100	24100
Blower Size	43" Axial	43" Axial	8490	8542	8542	8600
Blower RPM	1750	1750	1035	856	981	818
Blower HP	50	60	75	75	100	100
Metering HP	1	1	1	1	1	1
Drying CFM	42300	48400	77100	81800	98600	108300
Cooling CFM	14500	17500	38550	40900	49300	54150
Burner Capacity (mBtu)	11100	11100	16654	17669	21298	23393
Average Heat Use (mBtu)	5711	6543	9576	10159	12246	13451
Grain Column	12-3/4"	12-3/4"	12-3/4"	12-3/4"	12-3/4"	12-3/4"
Tower Diameter	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"
Overall Height	45'-8"	52'-4"	59'-0"	69'-0"	75'-8"	85'-8"
Wet Holding (BU)	302	302	302	302	302	302
Heat Holding (BU)	610	756	914	1158	1256	1499
Cool Holding (BU)	219	268	305	354	451	500
Dryer Holding (BU)	1232	1427	1622	1915	2110	2401
Outside Catwalks	0	0	1	2	2	3
BPH (20%-5%)	1000	1200	1500	1800	2000	2400
BPH (25%-15%)	600	720	900	1080	1200	1440

Dimensions

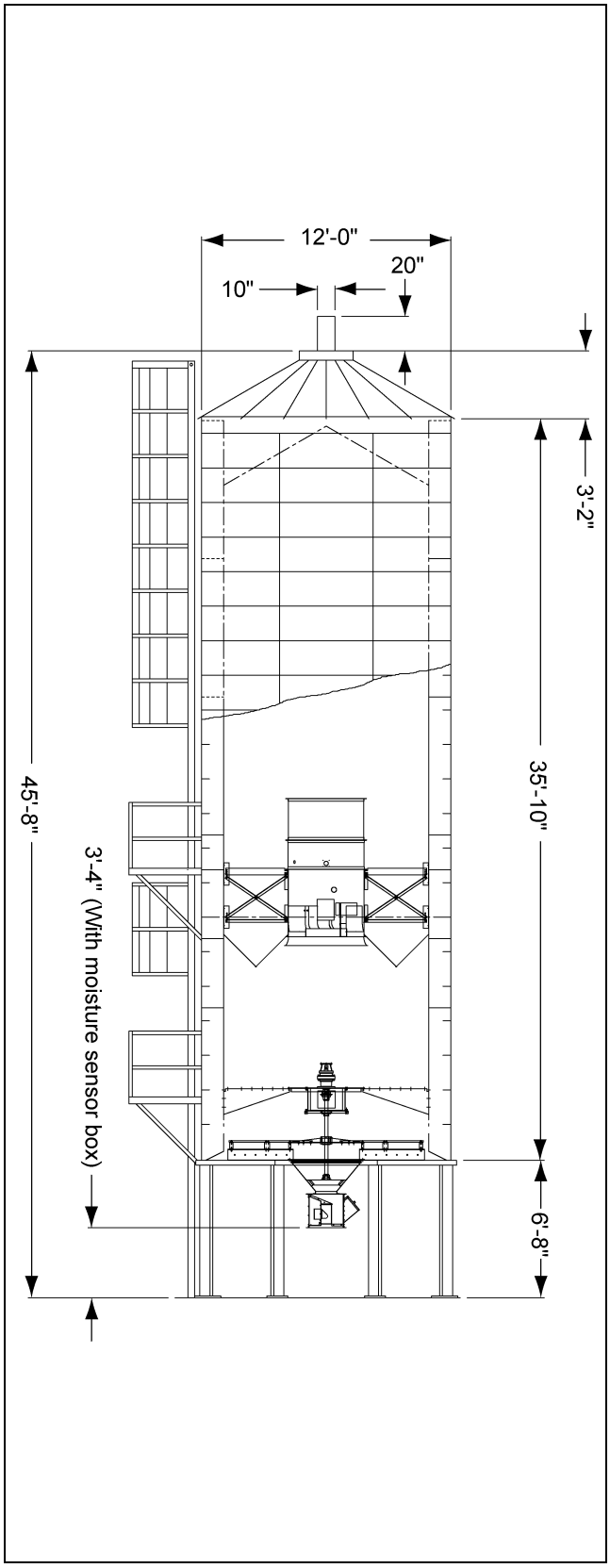


Figure 3A *1050*

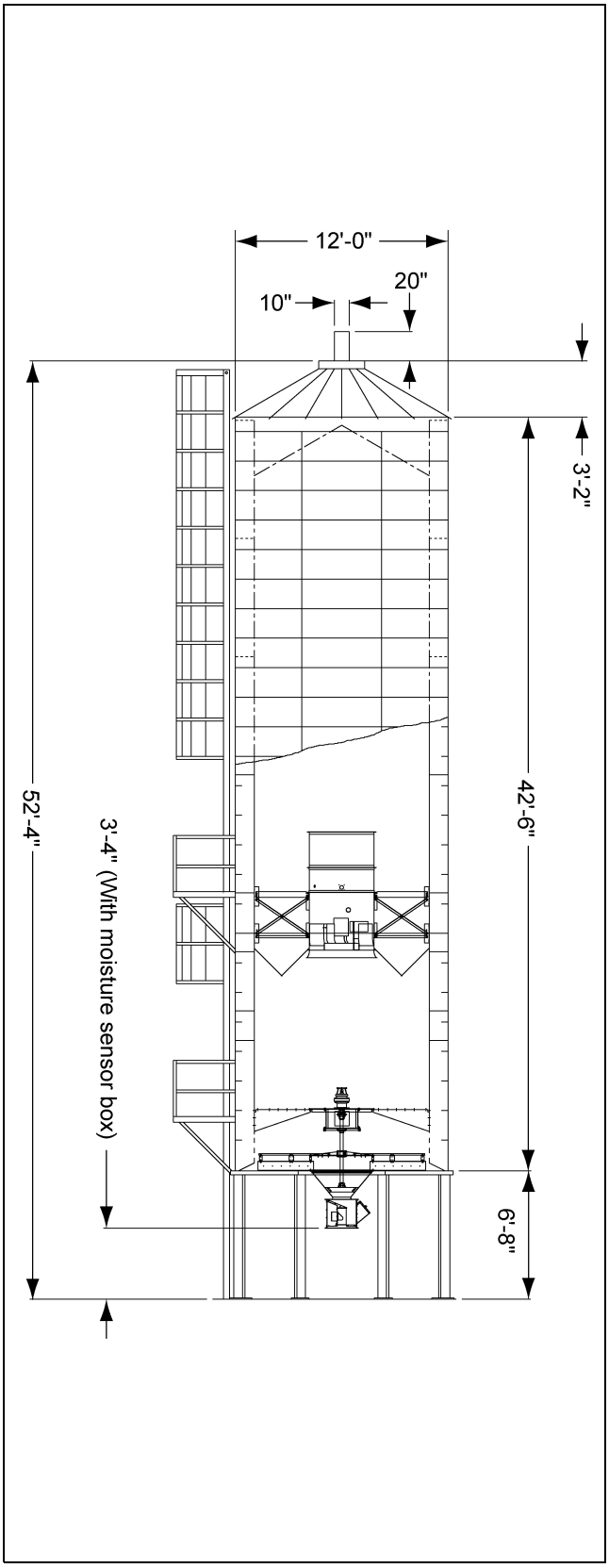


Figure 3B *1260*

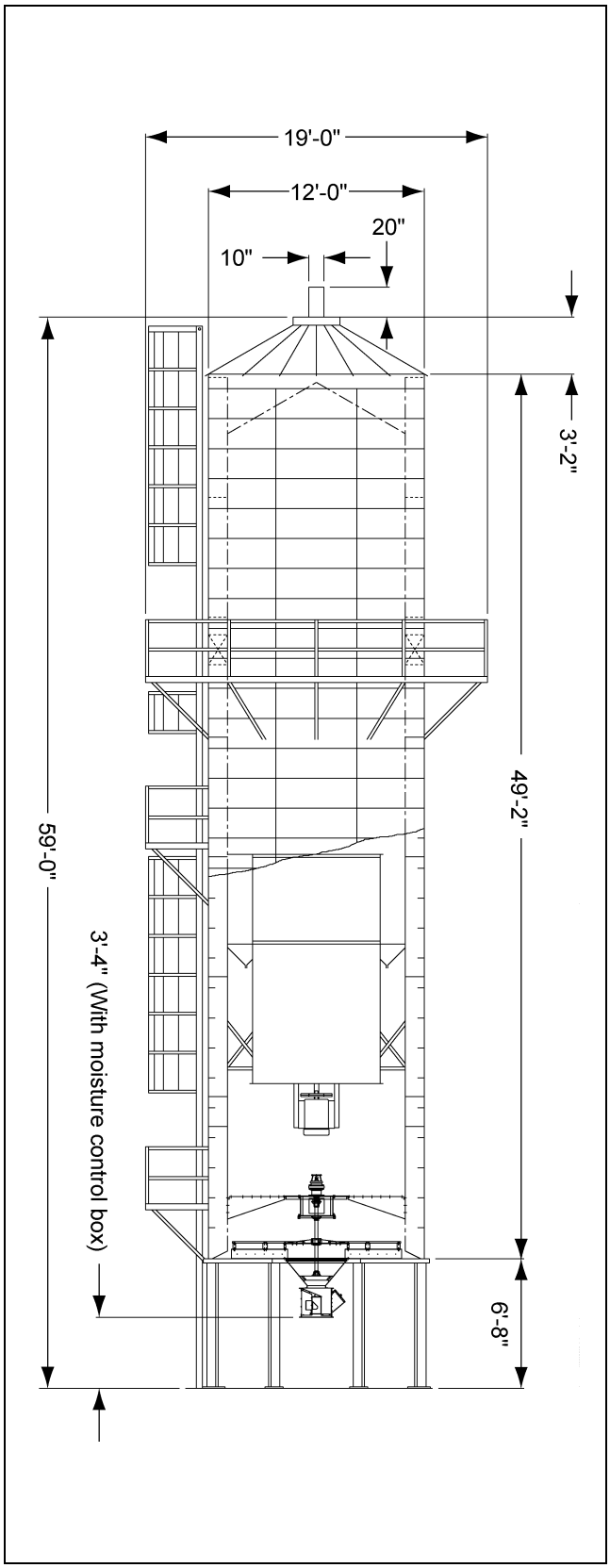


Figure 3C *1575*

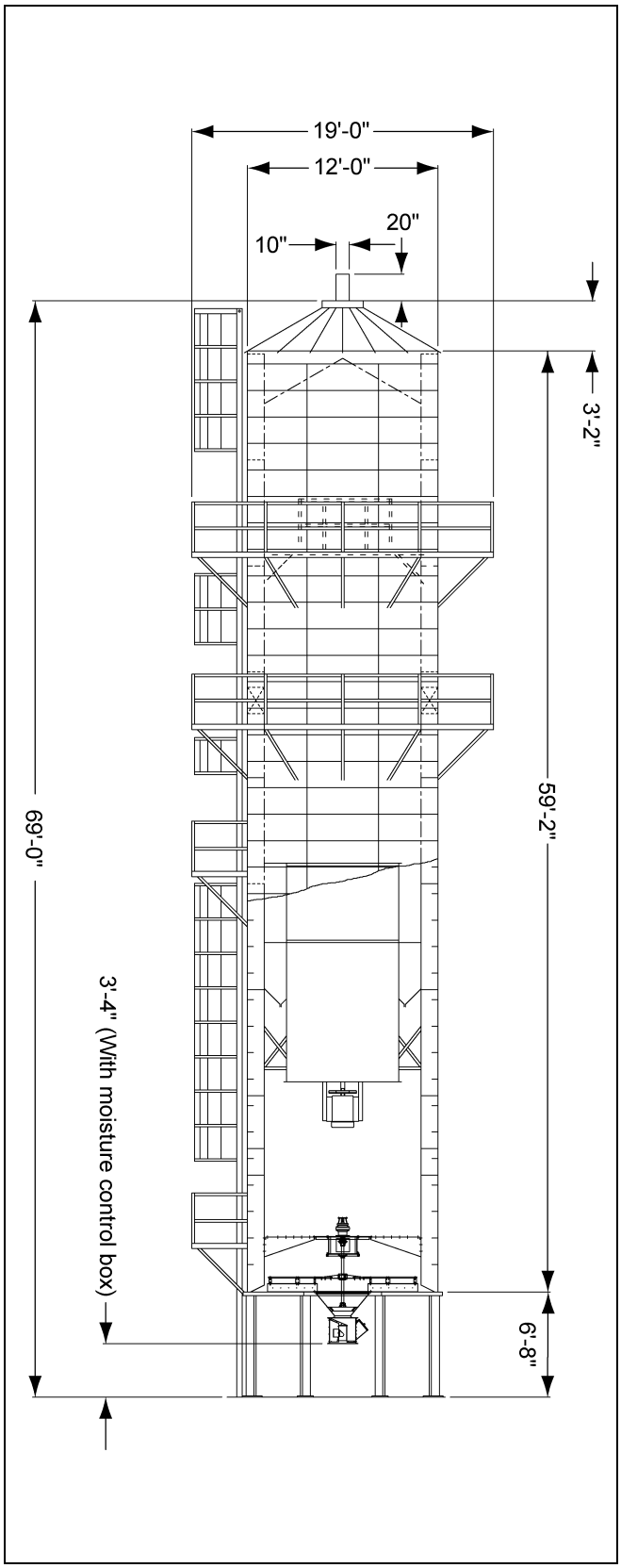


Figure 3D *1875*

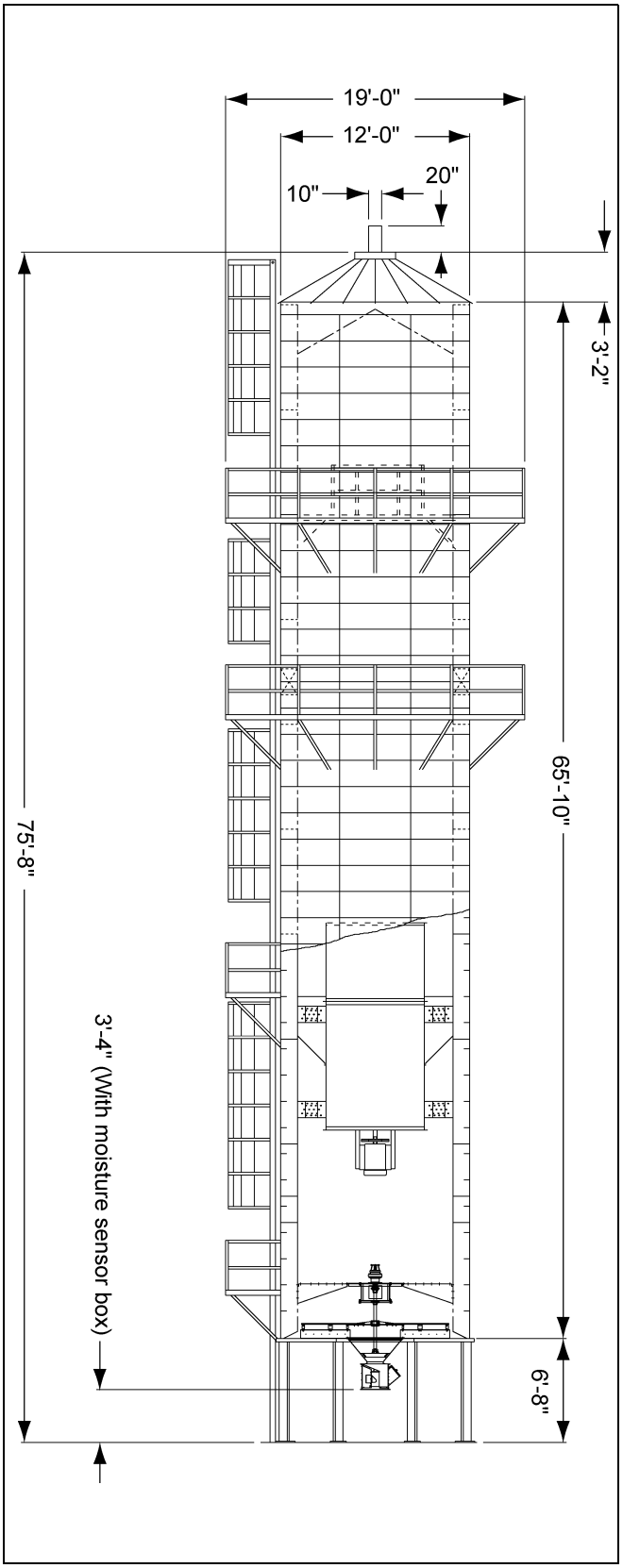


Figure 3E *20100*

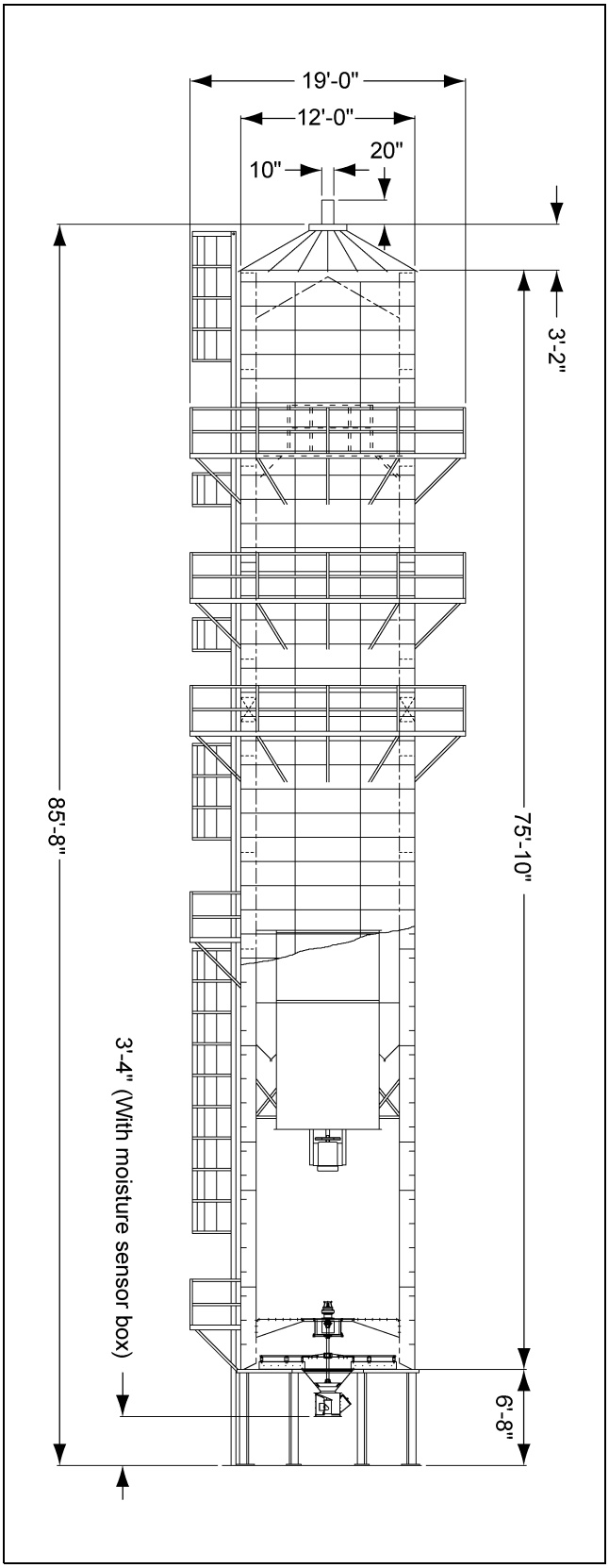


Figure 3F *24100*

Dryer Layout

System Layout

Consider the grain handling system and location of storage bins and existing conveyors when selecting dryer site, to facilitate wet grain supply and dry grain discharge to conveyors. Other considerations are prevailing wind direction, fuel and power supply locations, noise and convenience of control location.

Site Location

The dryer should not be operated inside a building or in any area not permitted by electrical code, fuel installation regulations, or insurance requirements. Do not operate in an area where combustible material can be drawn into the dryer. Maintain a minimum distance of five feet (5') to other structures. Refer to dryer specifications *on Page 11* and dimensions *on Pages 12, 13 and 14.*

Foundation

The dryer should be placed on a reinforced concrete slab located in a well drained area. *See Figure 4A on Page 16, Figure 4B on Page 17 and Figure 4C on Page 18* for recommended dryer foundations for soils with minimum soil bearing pressure of 3000 lbs/ft².

Liquid Propane (LP) Dryers with Internal Vaporizers

Liquid Draw

The dryer is designed to operate on liquid propane, with liquid draw from the supply tank. A piping system is provided on the dryer, including strainer, pressure relief valve, and manual shut off valve. *(See Figure 4D on Page 19.)*

Ammonia Tanks

Do not use propane supply tanks which have previously contained ammonia or fertilizer solutions. These substances are extremely corrosive and damaging to fuel supply and burner parts.

Oil or Water in Tanks

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

Natural Gas (NG) Dryers

Gas Volume and Pressure

The dryer is designed to operate on natural gas having a heat value of about 1000 BTU per cubic foot. The dryer is equipped with a natural gas supply pipe system connected to the heater solenoid valves. A regulated pressure of 10 PSI must be provided at the connection to the dryer, with gas available in sufficient volume to maintain operating pressure. *(See Figure 4E on Page 19.)*

Central United States Foundation for Dryer Sizes up to 20100

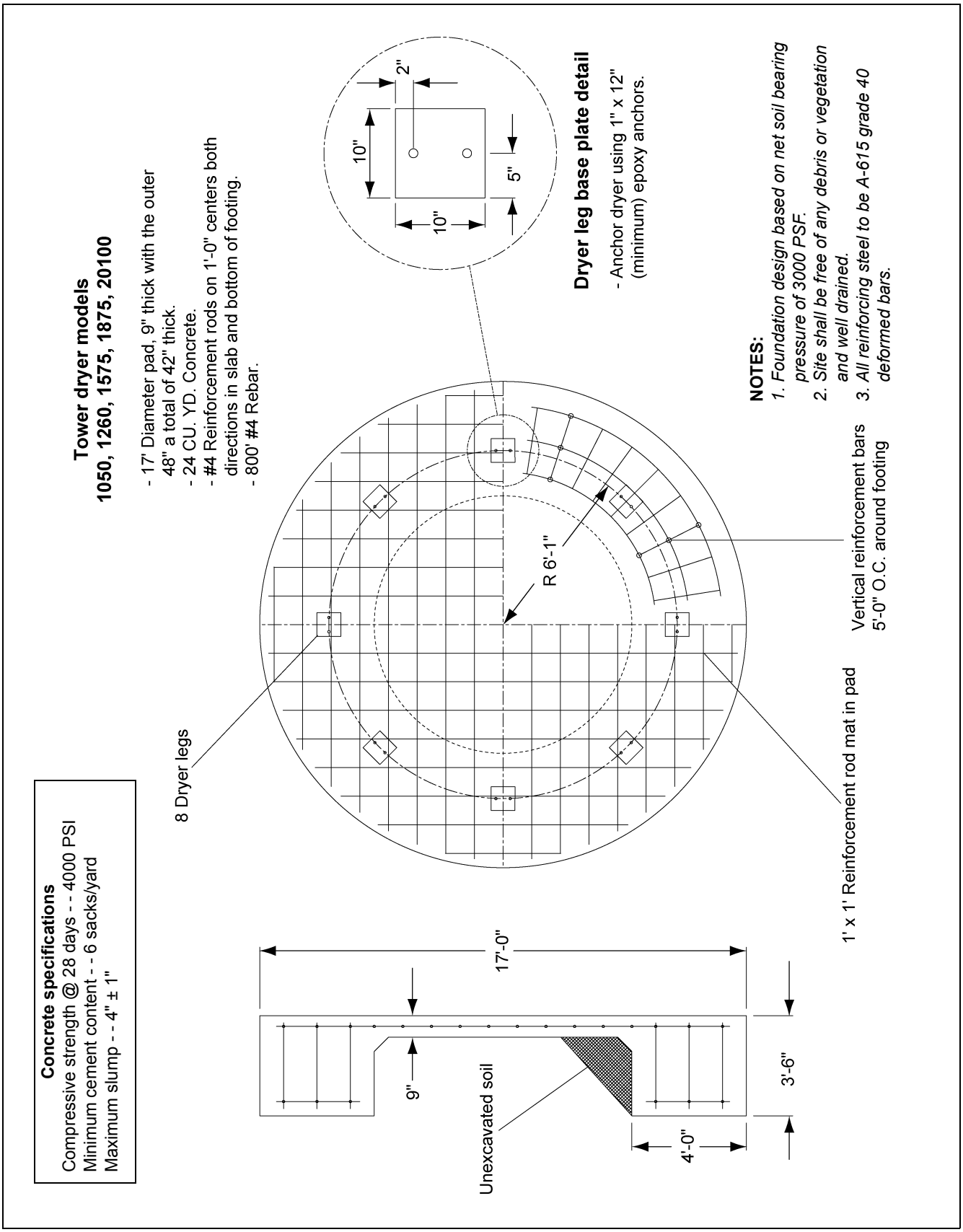


Figure 4A

Northern United States Foundation for Dryer Sizes up to 20100

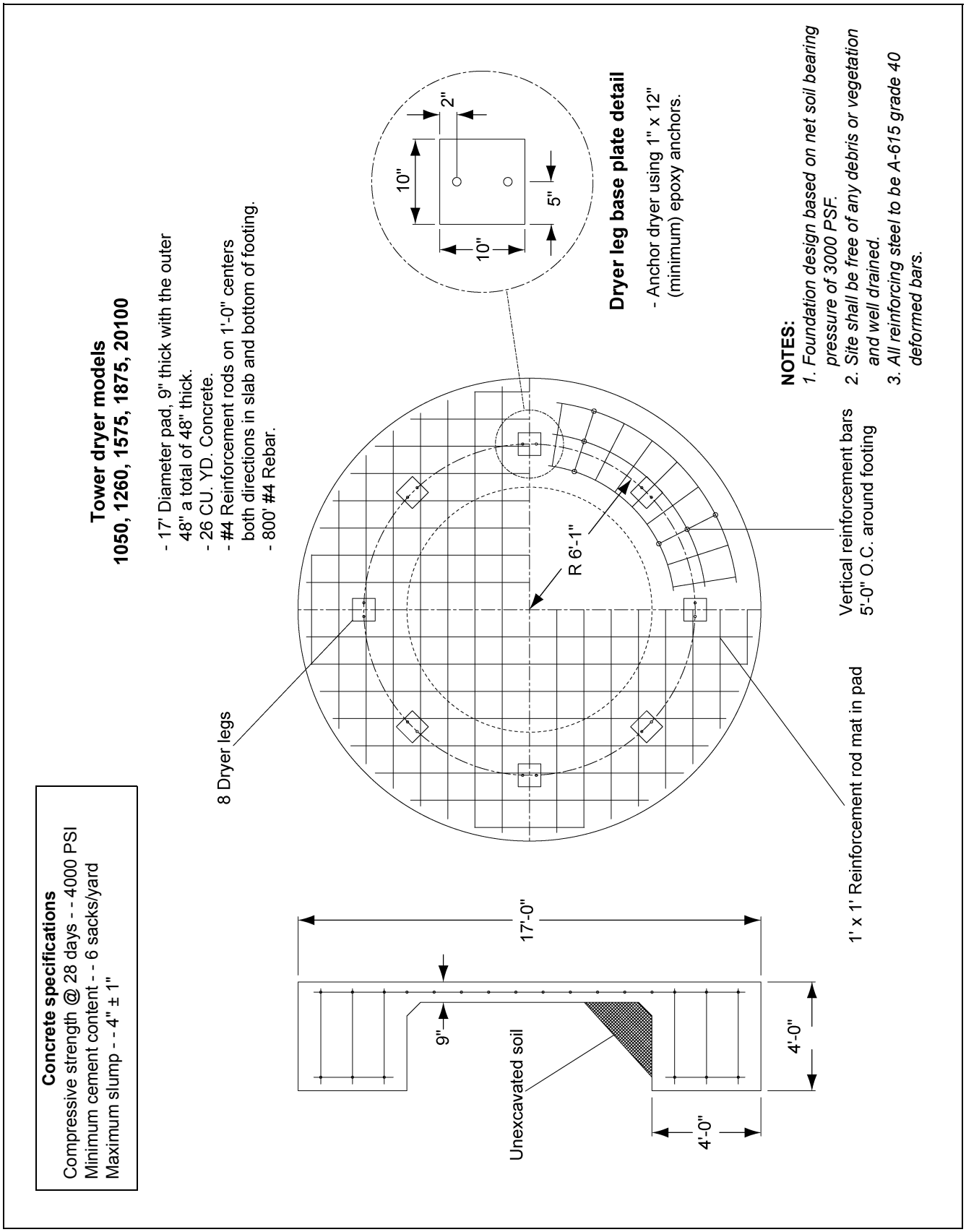


Figure 4B

Foundation for 24100 Dryer

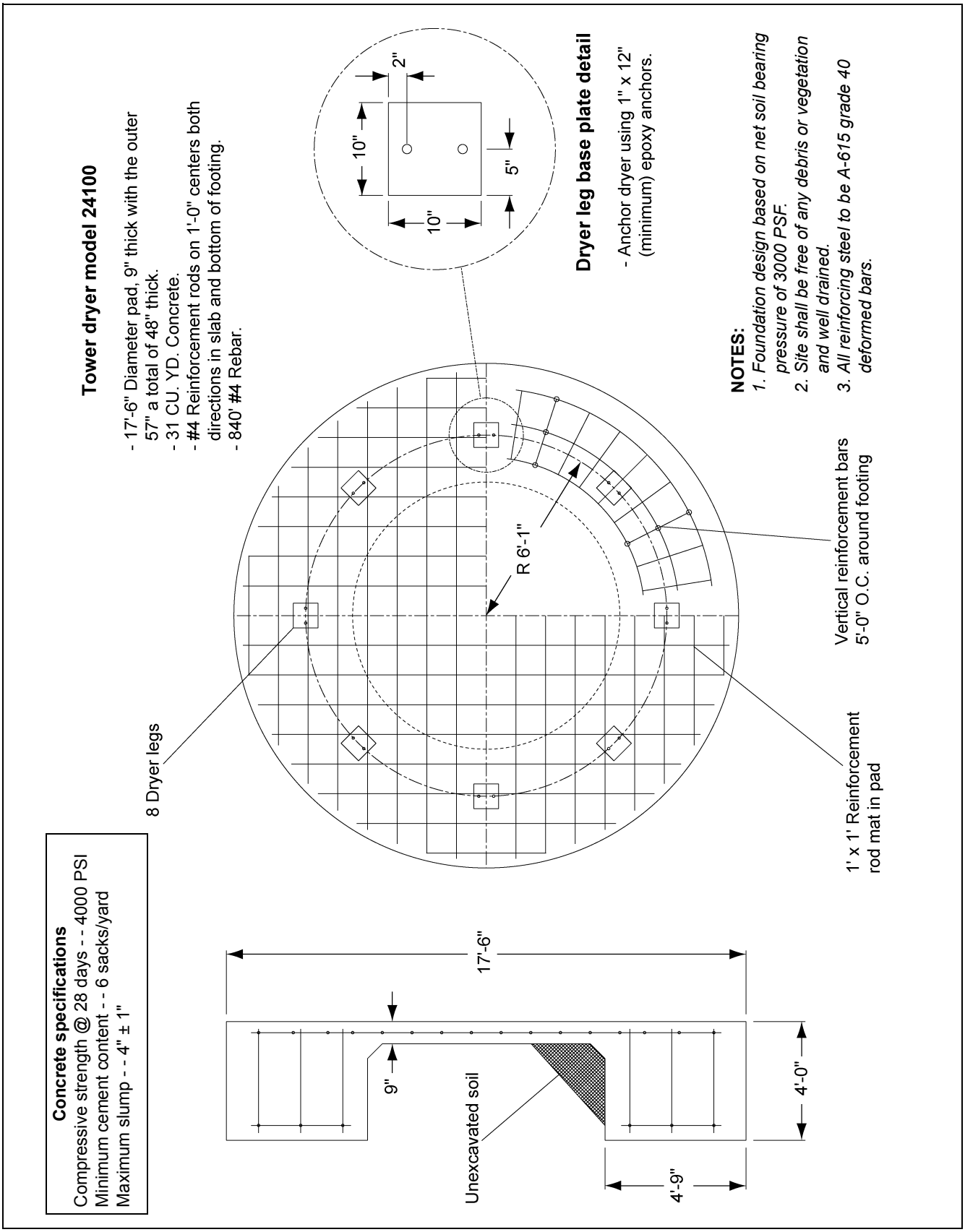


Figure 4C

Fuel Supply

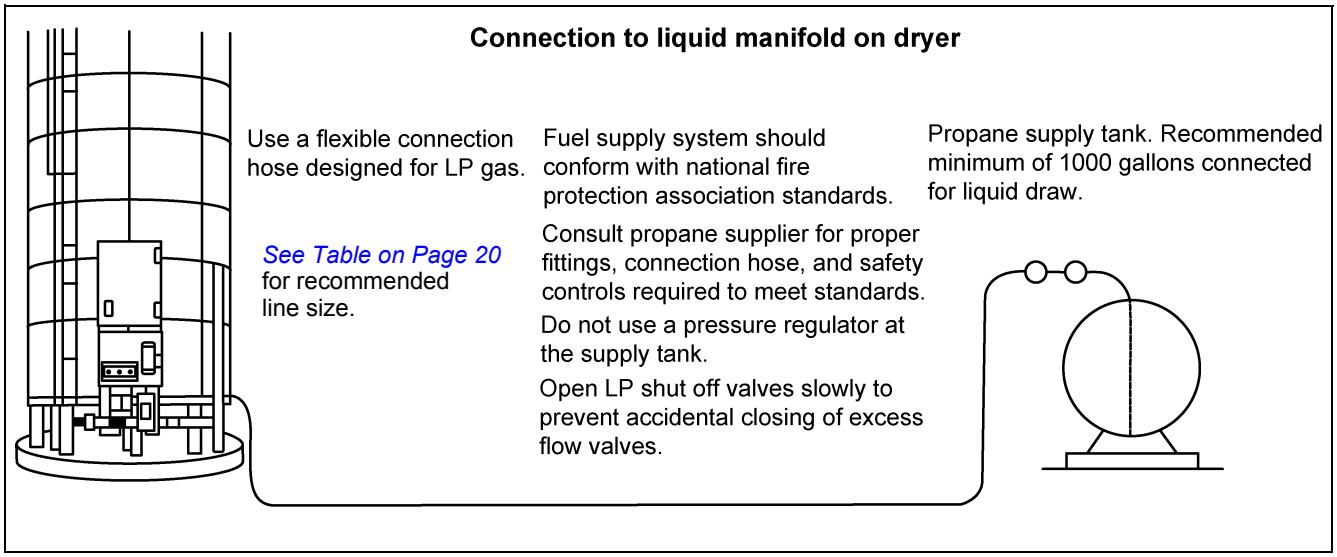


Figure 4D *Liquid Propane (LP) Fuel Supply*

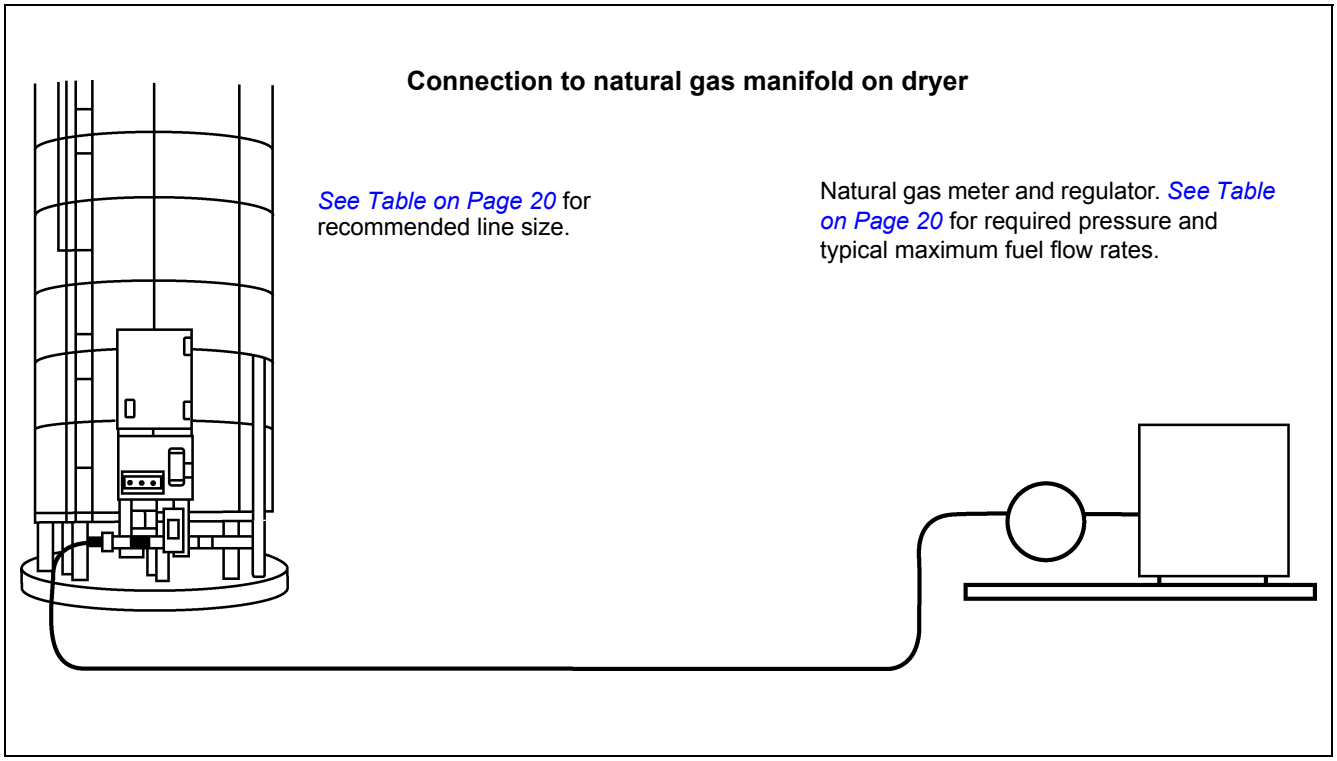


Figure 4E *Natural Gas (N) Fuel Supply*

Fuel System Recommendations

		1050	1260	1575	1875	20100	24100
Liquid Propane	Burner Capacity (Btu/Hr)[1]	11100000	11100000	16654000	17669000	21298000	23393000
	Maximum Fuel Usage (Gal/Hr)	121	121	182	193	233	255
	Recommended Liquid Line Size (>100')	3/4"	3/4"	3/4"	1"	1"	1"
	Fuel Train Orifice Size (inch)	0.625"	0.625"	0.7187"	0.787"	0.781"	0.781"
	Pressure Regulator Setting (PSI)	9	9	9	9	9	9
Natural Gas	Burner Capacity (Btu/Hr)	11100000	11100000	16654000	17669000	21298000	23393000
	Maximum Fuel Usage (Cu Ft/Hr)	11100	11100	16654	17669	21298	23393
	Recommended Liquid Line Size (>100')	2"	2"	2-1/2"	2-1/2"	2-1/2"	2-1/2"
	Fuel Train Office Size (inch)	0.7187"	0.7187"	0.8125"	0.875"	1.000"	1.000"
	Regulated Supply Pressure (PSI)	10	10	10	10	10	10

[1]Burner capacity for fuel line sizing. Actual average fuel usage is typically 50%-60% of the burner capacity.

Electrical Power Supply

An adequate power supply and proper wiring are important factors for maximum performance and long life of the dryer. Electrical service must be adequate enough to prevent low voltage damage to motors and control circuits.

Transformers and Wiring Voltage Drop

Advise the service representative of the local power supplier that an additional load will be placed on the line. Check on KVA rating of transformers, considering total horsepower load. The power supply wiring, main switch equipment and transformers must provide adequate motor starting and operating voltage. Voltage drop during motor starting should not exceed 14% of normal voltage, and after motor is running at full speed it should be within 8% of normal voltage.

Power Supply Disconnect

All dryers are equipped with a power disconnect switch in the power box to permit total power shut down before opening the power box door, as required for inspection and service. The power disconnect switch is located on the power box door for quick shut down.

Machine to Earth Grounding

It is very important that a machine to earth ground rod be installed at the dryer. Place the ground rod that comes standard, within eight feet (8') of the dryer and attach it to the dryer control panel with at least a #6 solid, bare, copper ground wire and the clamp provided. The grounding rod located at the power pole will not provide adequate grounding for the dryer. The proper grounding will provide additional safety in case of any short and will ensure long life of all circuit boards, SCR drive, and the ignition system. The ground rod must be in accordance with local requirements.

Proper Installation of Ground Rod

It is not recommended that the rod be driven into dry ground. Follow these instructions for proper installation.

1. Dig a hole large enough to hold one (1) to two (2) gallons of water.
2. Fill hole with water.
3. Insert rod through water and jab it into the ground.
4. Continue jabbing the rod up and down. The water will work its way down the hole, making it possible to work the rod completely into the ground. This method of installation assures good contact with the surrounding soil, making a proper ground.
5. Connect the bare, copper ground wire to the rod with proper clamp.
6. Connect ground wire to control panel with the ground lug provided in the control box.
7. Ground wire must not have any breaks or splices. Insulated wire is not recommended for grounding applications.

Connecting Auxiliary Conveyors

The auxiliary load and auxiliary unload augers or conveyors can be wired directly to the dryer. The maximum horsepower of auxiliaries that can be wired to the dryer is 10 horsepower. If an auxiliary motor is larger than what is recommended, then it must be powered from a source outside the dryer, and must use a separate contractor and overload protection device for each motor. However, the operation of the auxiliaries can be performed by the control panel.

It is recommended that you contact the local power company and have a representative survey the installation to see that the wiring is compatible with their system and that adequate power is supplied to the unit. Remember that the only thing connected to the recommended service amps should be the grain dryer. Standard electrical safety practices and codes should be used. (Refer to National Electrical Code Standard Handbook by National Fire Protection Association.) A qualified electrician should make all electrical wiring installations.

Vision Control Panel Layout

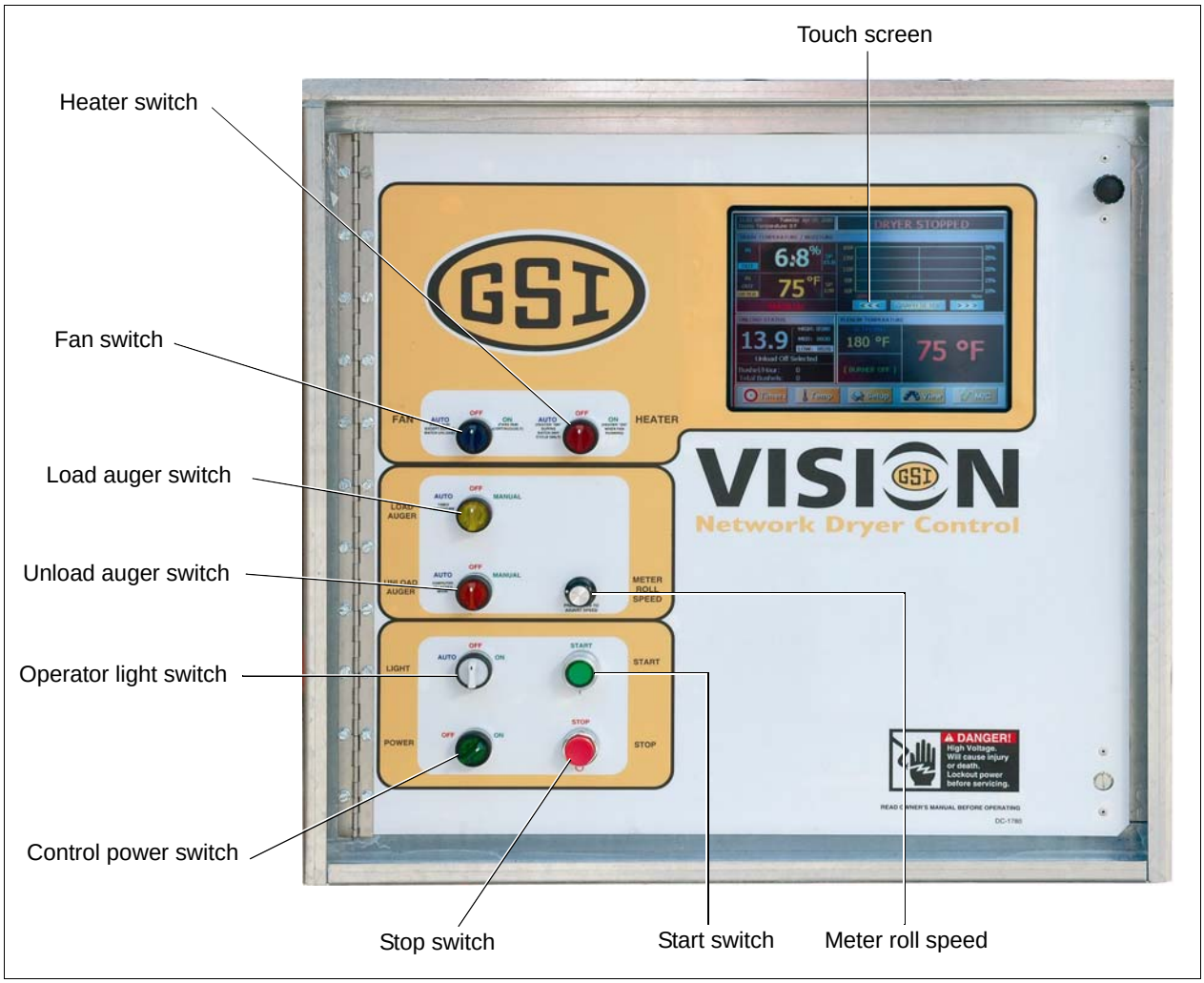


Figure 5A

The vision control system is a state of the art dryer controller used on several GSI drying products. The vision control can operate any dryer in either a batch or a continuous flow mode. Therefore, all operating instructions for the T-Series dryer describes **continuous flow** operation only.

Control Power Switch

The vision control system is turned ON or OFF with this switch.

NOTE: *This switch does NOT disconnect the power that is present at the breakers, contractors, transformers, fuses or other electrical components found in the control or power box. Turn the main disconnect handle located on the power box to the OFF position prior to servicing any of the installed components.*

Fan Switch

The fan is turned ON or OFF with this switch. Turning the switch to the ON position will turn the fan ON. Turning the switch to the OFF position turns the fan OFF. The light inside the switch will illuminate whenever the air pressure sensor senses air movement through the fan. (**NOTE:** *The fan AUTO position is not used.*)

Heater Switch

The burner is turned ON or OFF with this switch. Turning the switch to the ON position will start the burner ignition sequence if the fan is also running. Turning the switch to the OFF position turns the burner OFF. The light inside of the switch will illuminate only when the flame sensor detects the burner flame. (**NOTE:** *The heater AUTO position is not used.*)

Load Auger Switch

This switch is used to select the operation of the wet fill conveyor. In both the AUTO and the MANUAL position, the wet fill conveyor will operate if the dryer is low on grain and will automatically shut off when the dryer is full. In the AUTO position only, the dryer will automatically shut down should the dryer go low on grain. The time period between the dryer going low on grain and the actual shut down is determined by the setting on the out of grain timer. In the MANUAL position, the out of grain timer is deactivated. The MANUAL switch position should be used for initially filling the dryer. The AUTO switch position should be used during normal dryer operation. The switch will illuminate whenever the load auger is operating.

Unload Switch

The unload switch turns the accutrol metering system and the unload conveyor ON or OFF and also selects the operation of the metering system. In the MANUAL position, the metering system operates at the speed set by the METERING ROLL SPEED rotary switch. In the AUTO position, the metering system switches to a multi-speed operation controlled by the automatic moisture control. The switch will illuminate whenever the unload auger is operating.

Outside Light Switch

The service light is turned ON or OFF with this switch. In the AUTO position, the light is turned ON while the dryer is running automatically and turns OFF if a shut down occurs. In the ON position the light is turned ON.

Start Switch

This switch starts and operates the dryer. If all of the above Dryer Operational switches are in the OFF position, each component can be turned ON by turning the component switch to the ON position after the run switch has been pressed. Or, if the Operational switches are preset to their ON position, the vision controls will sequentially start the various dryer components after the run switch is pressed.

Stop Switch

This switch stops all dryer functions except the blower. If the Blower switch is in the ON position, the blower will continue to run for 15 minutes. If you desire the blower to be OFF, simply turn the Blower switch to the OFF position. If an automatic dryer shut down occurs, first determine and correct the cause of the shut down. Then press the Dryer Power Stop button to reset the dryer before restarting.

This section should be read first to familiarize yourself with the vision control computer. The dryer operation *on Page 37* of this manual will refer to instructions in this section.

Boot Screen

With the Power switch in the ON position, pushing the Start switch will start the vision computer. The first screen to appear will be the Boot screen. *(See Figure 6A.)* Notice that there are four (4) “buttons” on the Boot screen. The update/change program and look for new program on Flash Card buttons are only used for program updates that may be released at a later date. Touching the Start Dryer button will display the Default Operation screen.

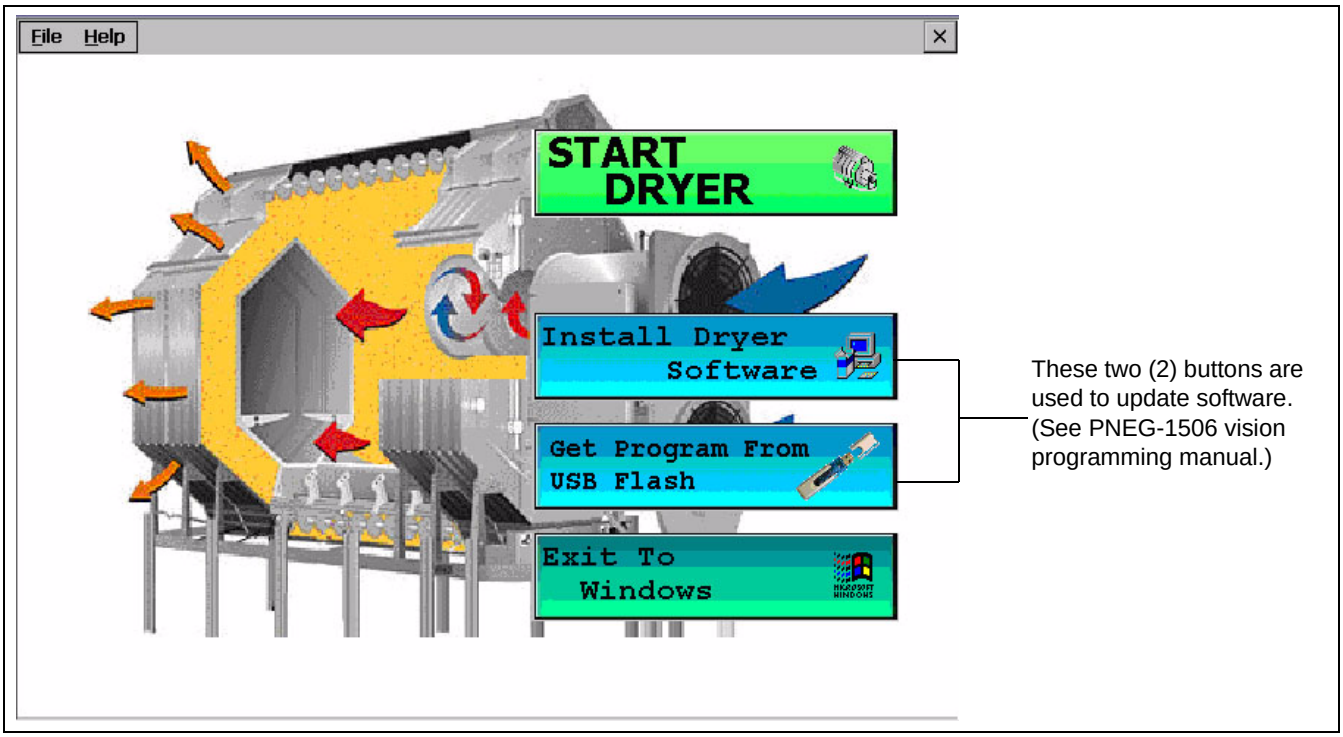


Figure 6A

Default Operation Screen

As you can see the Operation screen is divided into five (5) sections.

1. **Dryer operation animation:** Located on the left side of the Operation screen the operation animation shows the status of the fan/heaters, load and unload augers and meter rolls. It will also display the grain temperature, moisture content, M/C set point, and bushel counter.
2. **Dryer status:** Located at the very top of the right side of the Operation screen the dryer status will tell you if the dryer is stopped, started, loading or unloading.
3. **Dryer status chart:** Located directly below dryer status. This chart will show the grain temperature, moisture in/out, temperature out and M.R.O. over a period of time.
4. **Plenum:** Located directly below dryer status chart. This will show the plenum temperature set point (SP), actual plenum temperature and burner status.
5. **Setup buttons:** Located across the bottom of the Operation screen. By touching these buttons the timers, temperature set points, dryer model and moisture control can be set up.

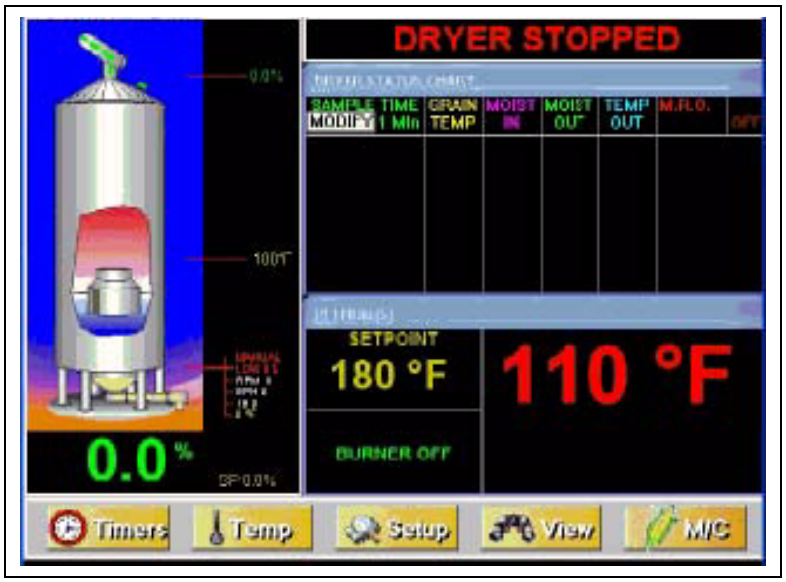


Figure 6B

Select Data Log Sample Time

Notice the Modify button in the upper left hand side of the dryer status chart. By touching this button the sample time can be changed from 1 minute to 5, 10 or 15 minutes. Select the desired sample time and touch Accept/Exit button to exit. Also notice that the chart can be cleared by selecting the Clear Table button at the bottom.

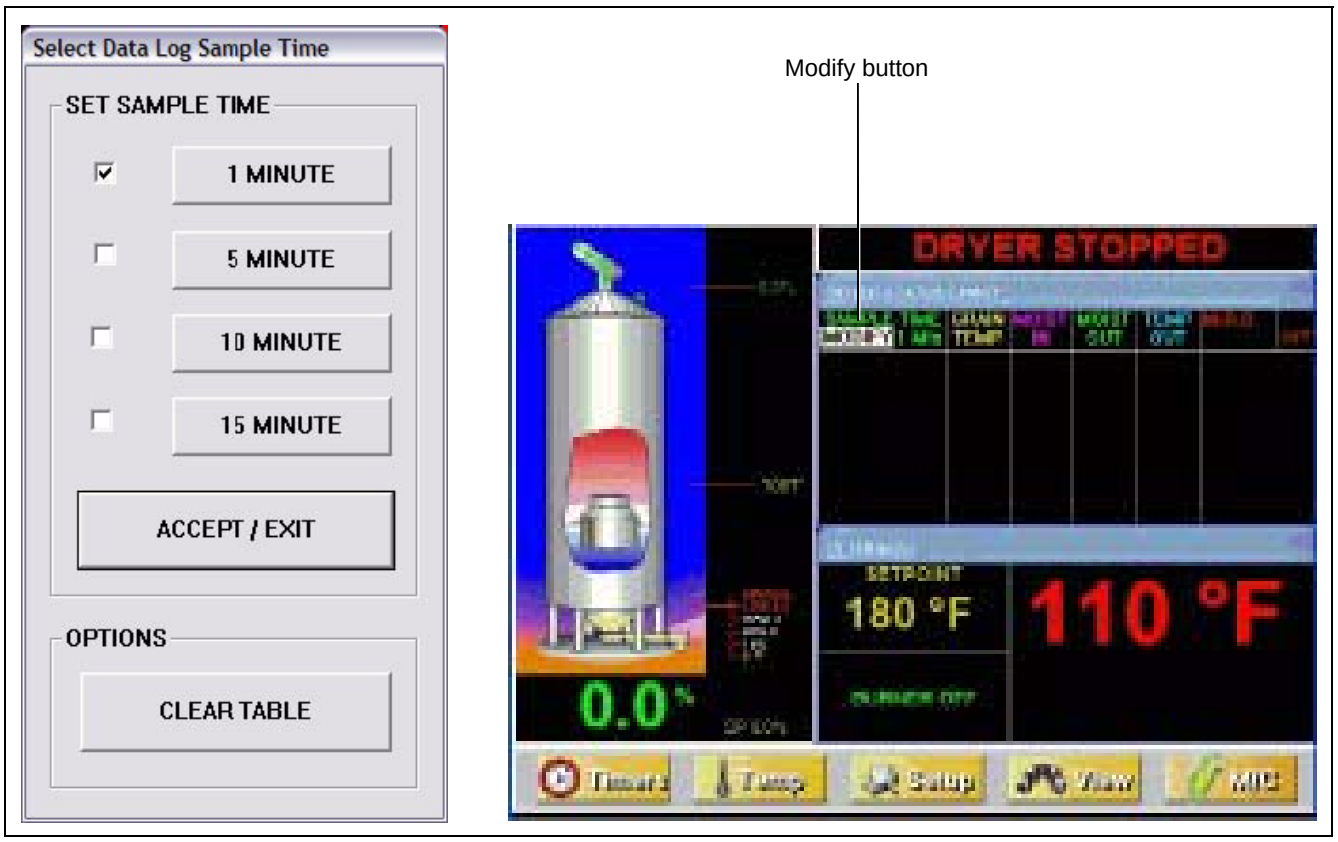


Figure 6C

Optional Operation Screen

An Optional Operation screen can be selected that shows a graph instead of the chart view.

Touching the View button at the bottom of the display will bring up the View Selection window. Notice that you have four (4) selections to choose from.

1. **Table view:** This is the Default Operation screen view. *(See Figure 6B on Page 25.)*
2. **Graph view:** This is the Optional Operation screen view. *(See Figure 6D.)*
3. **Owner's manual:** This option is described in greater detail *on Page 32*.
4. **History:** This option is described in greater detail *on Page 33*.

Touch the Graph View button then touch the Exit button. The Optional Operation screen will appear. Notice that the dryer status chart and the plenum(s) sections have been replaced by the graph view. *(See Figure 6D.)* You can choose what the graph will display by touching any of the colored buttons under the graph (i.e. moisture in, moisture out, dryer temperature, grain temperature in, grain temperature out and meter rolls).
Touching these buttons once will display them on the graph, and touching them again will remove them from the graph.

The Setup button will bring up the Graph Setup window and allow you to choose the length of time (1, 2, 4 or 8 hours) for the horizontal scale.

Figure 6D

Setting the Timers

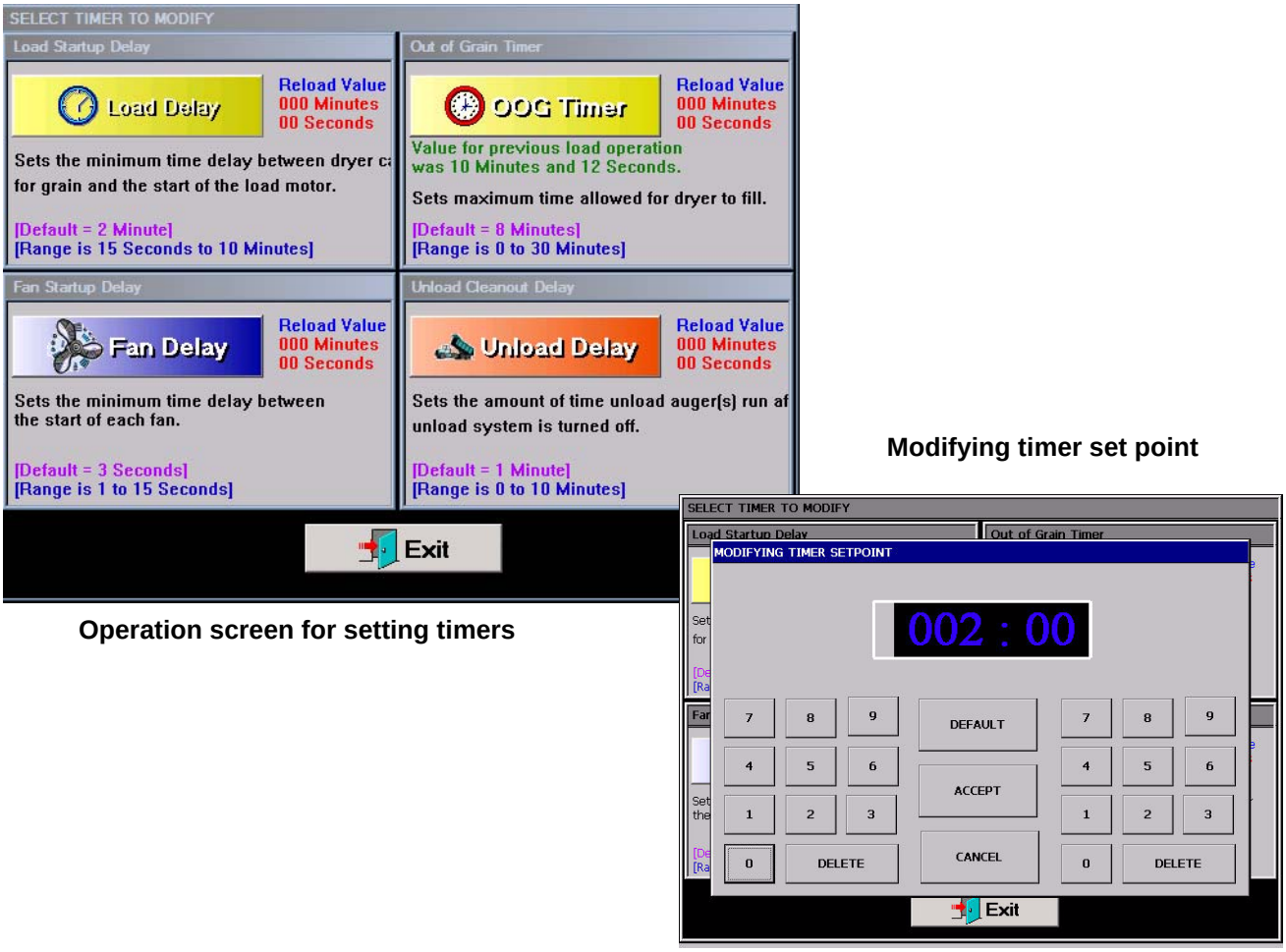
Setting the timers for the dryer is a simple procedure. To set the timers, touch the Timers button at the bottom of Operation screen. A new screen will appear called the Select Timers to Modify screen. *(See Figure 6E on Page 27.)* As you can see there are four (4) timers that you can modify:

1. **Load delay:** This delay is used to delay the starting of the load conveyor when the dryer is unloading to prevent the load conveyor from cycling to often.

2. **Out of grain (OOG) timer:** The OOG timer should be set to the maximum time it takes for the dryer to refill. Note that the computer will display the time required to fill the dryer on the previous load operation to aid you in setting an accurate time. If the dryer runs out of grain while the Load Auger switch is in the AUTO position, the OOG timer automatically shuts off the dryer after the period of time preset on the timer.

3. **Fan delay timer:** The fan sequence delay timer.

4. **Unload delay timer:** The unload delay timer is used to control the amount of time the unload auger runs after the metering system stops to allow the unload auger to clean itself out.



Operation screen for setting timers

Figure 6E

To setup a timer touch the button of the timer you wish to modify. The Modify Timer Set Point screen will then be displayed. *(See Figure 6E.)* Note that there are two (2) number pads on this Modify screen. The left number pad is used to modify the minutes and the right number pad will modify the seconds. Touching the Default button will automatically set the timer to the default set point for that timer. The Accept button will save the timer set point displayed in the time display. Touching cancel will exit the Modify Timer Set Point screen without saving any changes and the timer will stay at the currently saved set point.

Once you have the timer set points set touching the Exit button at the bottom of the Modify Timer Set Point screen will return you to the Operation screen.

Setting the Temperatures

Setting the plenum temperature set point for the dryer is a simple procedure. To adjust the plenum temperature touch the Temp button at the bottom of Operation screen. A new screen will appear called the Select Temperature Set Point to Modify screen. *(See Figure 6F.)*

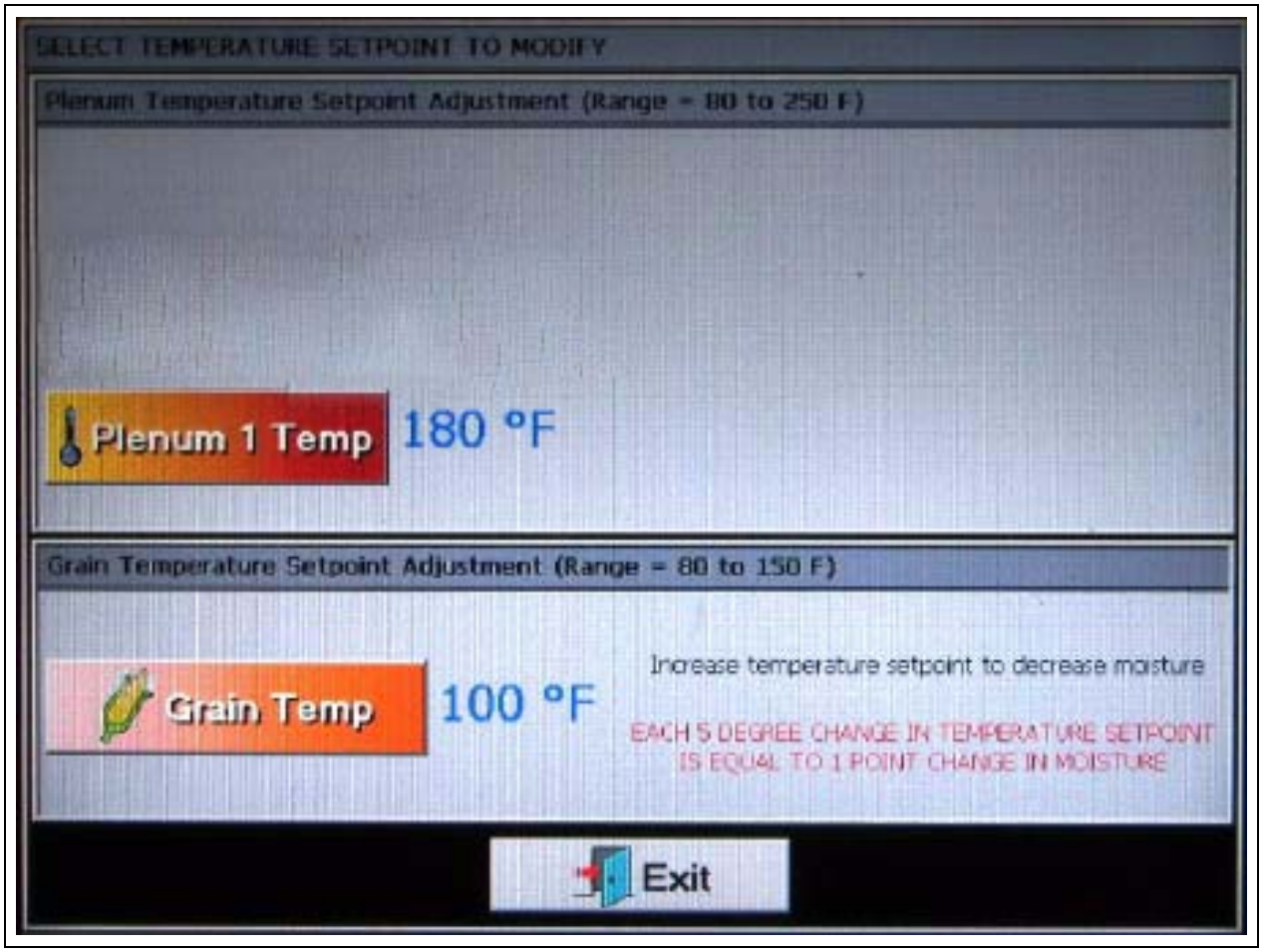


Figure 6F

The plenum temperature set point range is 80°F-250°F, and the current temperature set point for each plenum is displayed next to the corresponding Plenum button.

The grain temperature set point range is 80°F-150°F, and the current temperature set point for the grain temperature is displayed next to the Grain Temperature button.

Modifying a temperature set point is much like setting a timer described *on Page 26*. Touch the desired button of the set point you wish to change. The Modify Temperature Set Point screen will appear. Enter the desired temperature using the displayed number pad then touch the Accept button. Touching the Exit button at the bottom of the Select Temperature Set Point to Modify screen will return you to the Operators screen.

The Setup Screen

The Setup screen will allow you to setup other parameters of the dryer. To use the Setup screen touch the Setup button. The Select Hardware Setup Parameter to Modify screen will now be displayed. As you can see there are several different parameters that can be modified on this screen:

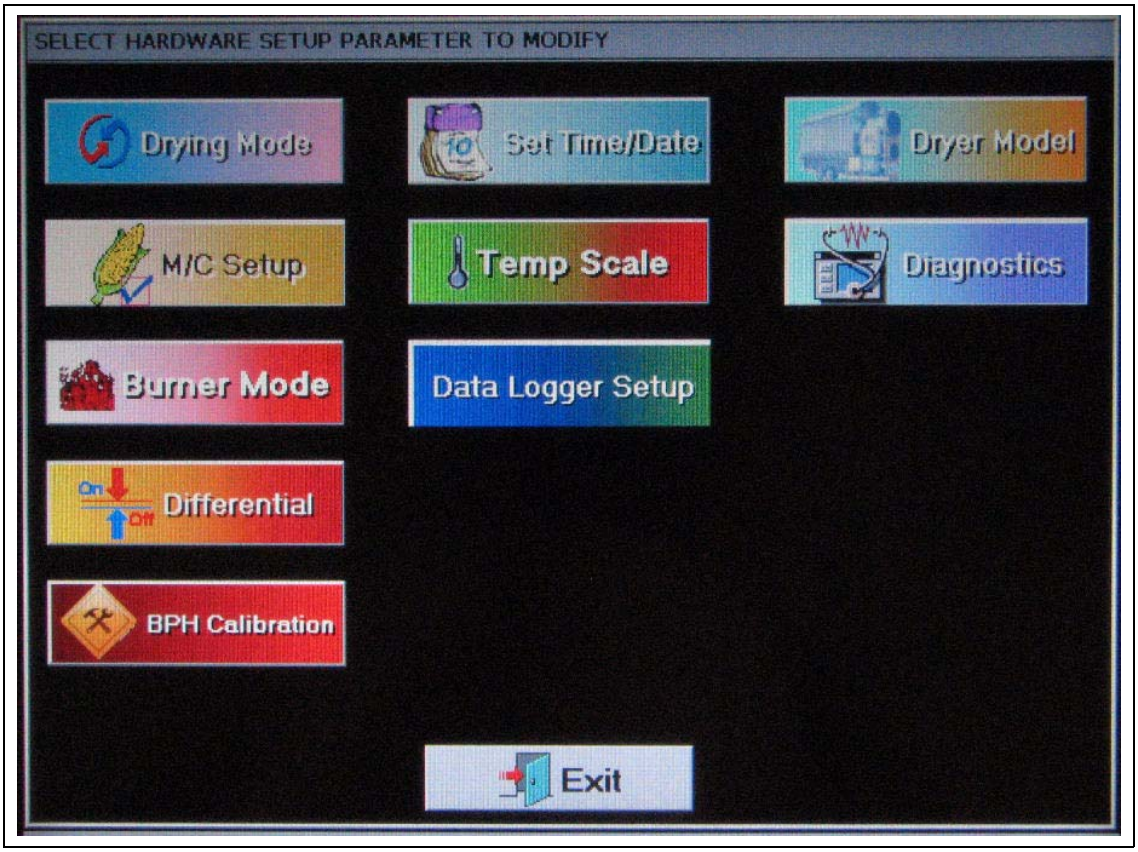


Figure 6G

1. **Drying mode:** Touching the Drying Mode button will display the Select Drying Mode window. Touch the desired Drying Mode button (continuous flow or staged batch). A check mark is displayed next to the currently selected drying mode. A tower dryer should always be set for continuous flow operation.

2. **Set time/date:** Touching the Set Time/Date button will display the Set Time/Date window. Use the Up and Down buttons to change each of the parameters for date and time. Touch Accept/Exit to save settings and return to the Select Hardware Parameter to Modify screen.

3. **Dryer model:** Touching the Dryer Model button will display the Dryer Hardware Setup window. In order for the dryer operate properly the following items must be entered correctly:

   a) Number fan/heaters = 1

   b) Load system = end

   c) Dryer length (ft.) = 22 (Models 1875, 20100, 24100)

   18 (Models 1050, 1260, 1575)

   d) Number modules = 1

   e) Fuel = LP

Touch the select button until a check mark appears next to the parameter corresponding to the dryer model.

4. **M/C Setup:** The M/C setup operations are described in greater detail in the dryer operation section *on Page 37* of this manual.

5. **Temp scale:** Touch the Temperature Scale button to choose either english units or SI units temperature scales. Depending what temperature scale you now operating in touching this button will display a Pop-Up window asking if you want to switch to SI (celsius, metric tons, etc.,) or english units (fahrenheit, bushels, etc.).

6. **Diagnostics:** The diagnostics operations are described in greater detail in the service section *on Page 51* of this manual.

7. **Burner mode:** Touching the Burner Mode button will display the Select Burner Mode screen. *(See Figure 6H.)* Tower dryer burner mode should always be set to ALL HIGH\LOW.

NOTE: *The bottom fan/heater on a two (2) fan dryer is always fan/heater one (1).*

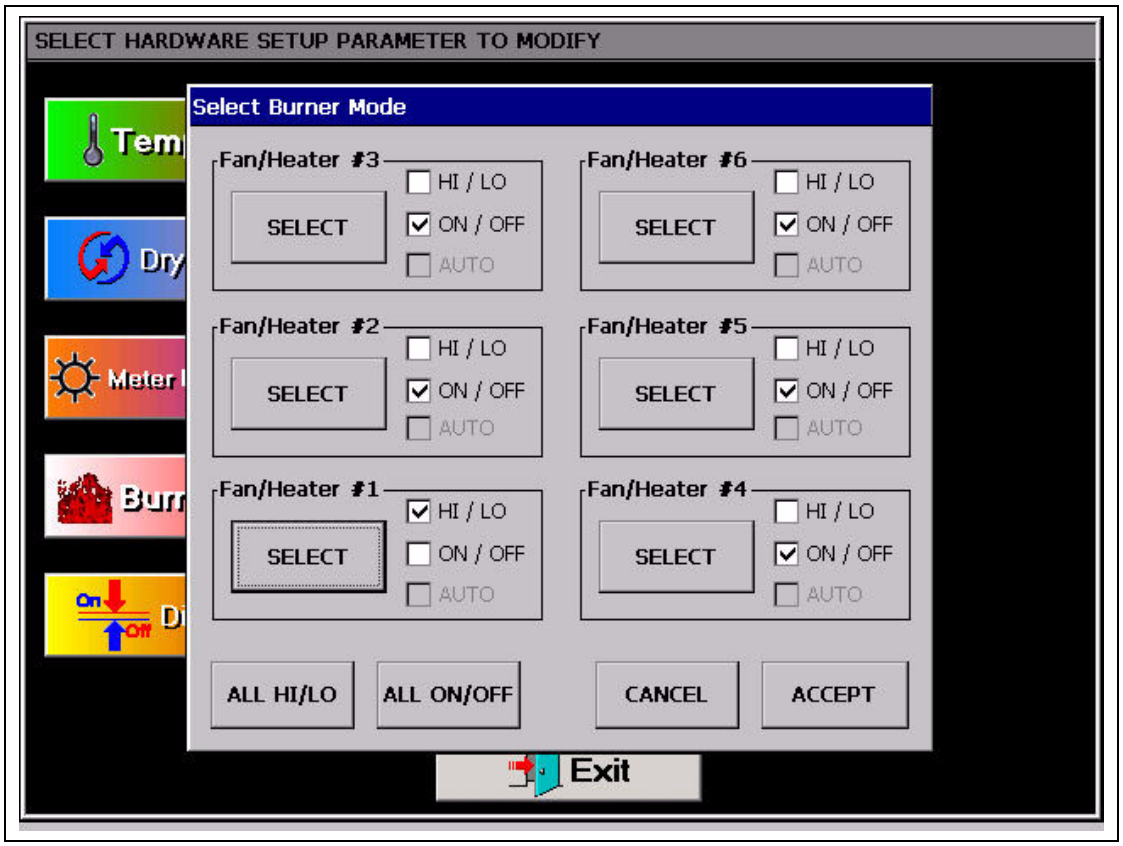


Figure 6H

8. **Differential:** Touching the Differential button will display the Modify Burner Differential Settings screen. *(See Figure 6I on Page 31.)* Adjusting the burner differential settings allows the operator to keep the plenum temperature within a certain range. For example: If you have the temperature set point at 180° and you select ± 3° as the burner differential, then the burner will switch to low heat at 183° and back to high heat at 177°. To modify a burner differential setting first touch the Plenum button you wish to modify, then select one of the five (5) differential setting button on the right side of the Modify Burner Differential Settings screen. Touch the Accept/Exit button to save settings and return to the Select Hardware Setup Parameter to Modify screen. **NOTE:** *Tower dryer only have plenum #1.*

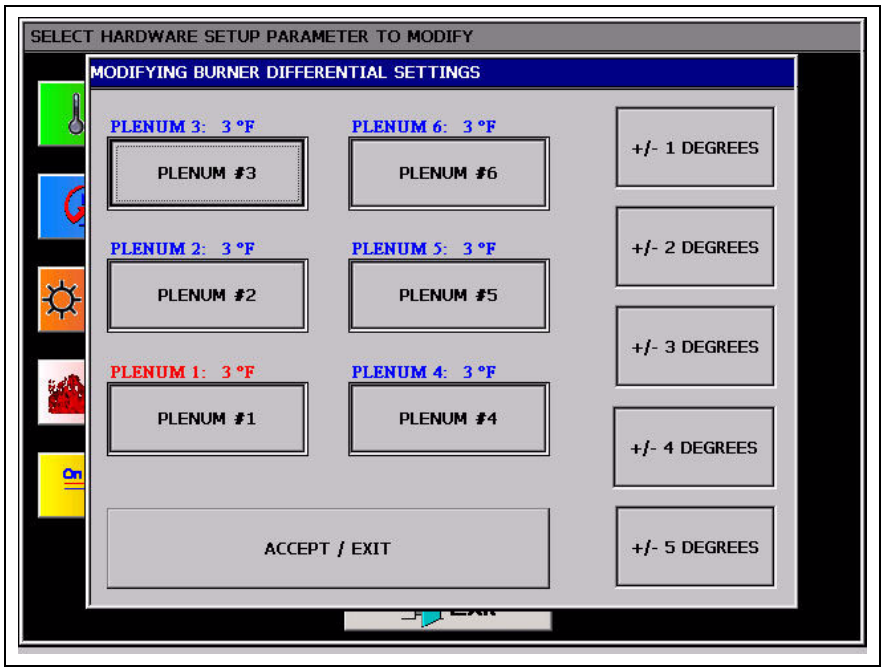


Figure 6I

9. **BPH calibration:** Touching the BPH Calibration button will display the Unload Bushels Setup screen. *(See Figure 6J.)* As you can see the bushel counter can be cleared by touching the CLEAR button. However if the bushel counter is out of calibration it can be calibrated by touching the INCREASE and DECREASE buttons.

   Example: If you ran 1000 bushels through the dryer but the bushel counter on the dryer reads 900 bushels then touch the DECREASE button until the calibration reads 90%, or if you ran a 1000 bushels and the counter reads 1100 bushels then touch the INCREASE button until the calibration reads 110%.

   When you are finished with the calibration or clearing the bushel counter touch the ACCEPT button to return to the Hardware Setup Parameter screen.

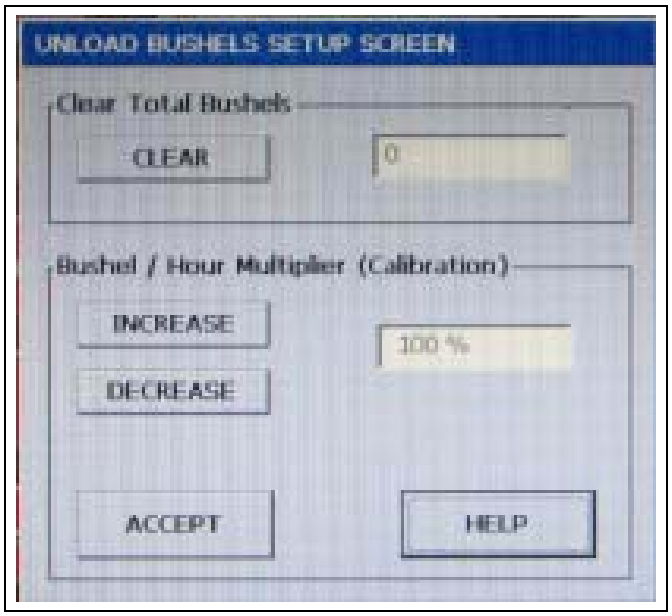


Figure 6J

10. **Meter roll reverse:** Touch the Meter Roll Reverse button to reverse the metering rolls. Reversing the metering rolls aids in cleaning out the fine material that builds up over the course of the drying season. Just touching this button will toggle between normal meter roll operation and reversed meter roll operation.

Viewing the Owner's Manuals on the Display Screen

The operators and parts manuals can be viewed on the Display screen. To view a manual touch the View button. When the View Selection window appears touch the Owner's Manual button. A new display will appear called an Explorer window. *(See Figure 6K.)* The Explorer window will show the manuals that are stored in the computer memory. To select a manual to view you must "double tap" the desired manual icon. Much like double clicking a mouse on the computer. Once selected it may take a few seconds for the manual to be displayed. Once the manual is displayed use the scroll bars on the right to scroll through the pages of the manual. To exit the manual and return to the Operation screen touch the X button in the upper right corner of the screen.

Figure 6K

Viewing the Dryer Shut Down History

The dryer will keep track of all safety shut down warnings. To view the shut down history touch the View button. When the View Selection window appears touch the History button. A new window called Shut Down History will appear. A list of all shut down warnings are listed. This list can be sorted by:

1. Warning
2. Date/Time
3. Node

By touching any of the three (3) sort by buttons.

The whole list can be copied to a USB flash drive and transferred to a personal computer as a text file by touching the copy to USB Flash Card button.

The list can also be cleared to start a new list by touching the Clear History button.

To return to the Operators screen touch the Exit button.

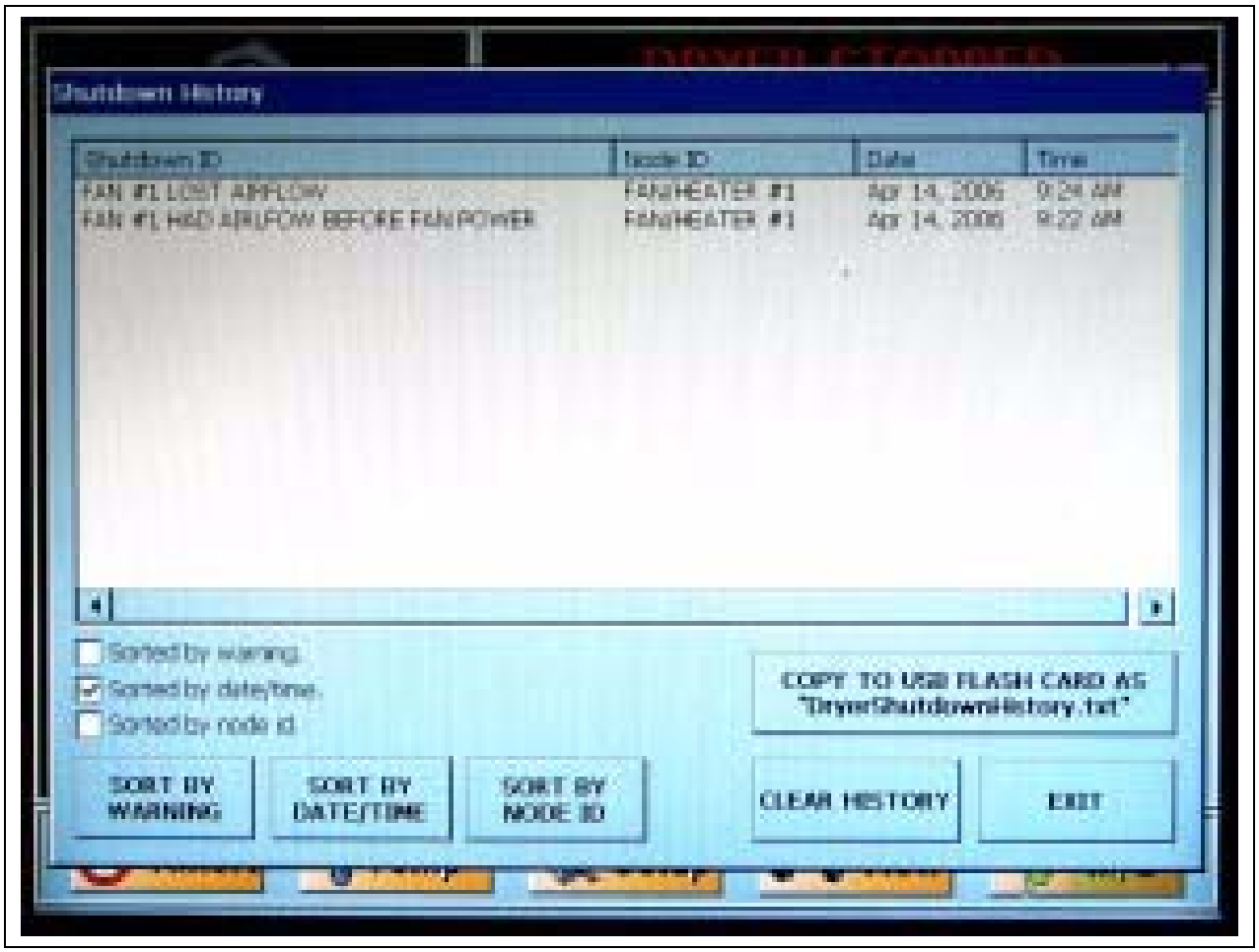


Figure 6L

Dryer Pre-season Checks

This section gives a series of checks to be carried out on the dryer before starting for the first time in the drying season. If any of the checks fail to produce the stated result, you should consult your dealer.

You should not attempt to use the dryer unless all the pre-start checks have been successfully completed.

WARNING

Before attempting to operate the dryer make sure all safety shields are in place, all access doors are closed and all personnel are clear of the dryer.

Inspect the Accutrol Metering System

Open the two (2) access doors and inspect the accutrol sweep metering system to ensure that the system is free of foreign material.

Electrical Power

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

Control Power Switch

Turn the Control Power switch to ON. At this point the controller will lock out all other dryer functions. Once the Boot screen appears *(See Page 24)*, touch the Start Dryer button and the dryer will perform a safety circuit check. If a fault is found, the cause will be displayed on the Main screen. If all are found safe, the Start switch will illuminate, indicating that the dryer is ready to be started.

Start Switch

Push the Dryer Start switch, and all the selector switches on the control panel will be activated.

Fuel Check

If using LP gas, make sure the tank has plenty of fuel and that the tank **does not** have a regulator mounted on the liquid line. Slowly open the main fuel supply valve at the tank. Then, open the manual shut off valve on the dryer to allow fuel flow to the dryer.

If using natural gas, make sure an adequate supply at 10 PSI of pressure is available. Turn ON the valve along the supply line. Inspect all gas lines and connections for possible leaks.

WARNING

Any gas leaks must be fixed immediately.

Load Auger

With the grain supply shut off, quickly bump the Load Auger switch to manual, and check all filling equipment for proper rotation.

Turn the Load Auger switch to the AUTO position. The filling equipment should run for eight (8) minutes, and then the dryer will shut down leaving the safety shut down message (out of grain warning) displayed. Press the Dryer Power Stop button to reset the panel, then press the Start button.

Unload Auto Operation

To check auto operation place the Unload switch in the AUTO setting. Check unload equipment for proper rotation.

Unload Manual Operation

To check manual operation move the Unload switch to the MANUAL position. Check unload equipment for proper rotation.

Accutrol Sweep Metering System Operation

To check the metering operation turn the knob clockwise, and the metering speed should increase. The metering system should be turning clockwise when viewed from above. Turning the knob counterclockwise will decrease the speed. When the meter system is set to maximum (1000) the meter roll speed should be 2.4 RPM. Turn the Unload switch OFF after these checks are complete. The bottom auger will continue to run for 60 seconds (default clean out delay setting) after the switch is turned OFF to allow for clean out.

Fan Switch

Momentarily turn the Fan switch to ON and observe the fan for rotation.

Burner Safety

To check the burner safety function, first make sure the main gas valve is OFF. Turn the Fan switch ON and allow the fan to start. Then, turn the Heater switch ON. The dryer will go through a 15 seconds purse time follower by a 10 seconds ignition time. The dryer will them shut down. The safety message, “Ignition Failure Fan #” will appear.

Burner Test Fire

Test fire the burner by starting the fan. Adjust the plenum temperature set point to 140°F (60°C). Turn ON the fuel supply them, turn the Burner switch to ON. After the 15 seconds purge time, manually latch the electronic shut off valve (maxon valve) during the ignition time. The burner should illuminate and the plenum temperature will start to increase. Adjust the High-Fire adjustment valve so that the burner pressure gauge reads 25-30 ounces of pressure. *(See Figure 7A on Page 36.)* When the plenum temperature reaches the set point, the cycle solenoid will close. Adjust the Low-Fire valve so that the burner pressure gauge reads 6-8 ounces of pressure. The computer should cycle the burner between high and low 3 to 4 times a minute. If, during normal operation, the burner remains on High-Fire or the dryer does not get to operating temperature, slightly open the High-Fire valve. If the burner stays on Low-Fire and does not cycle, slightly close the Low-Fire valve.

Dryer Shut Down

To shut down the dryer,

1. Close the fuel supply valve at the tank or valve along the fuel line.
2. If the burner is operating, let the dryer run out of fuel, and it will shut down automatically due to loss of flame.
3. Close the fuel valve at the dryer, and press the Dryer Power Stop button.
4. Turn OFF the control power.
5. Turn OFF the safety disconnect handle on the front of the power box, and turn OFF the main power to the dryer.

Emergency

In case of emergency push the Dryer Stop button or the Emergency Stop button. This will interrupt power to the control panel and the fan, burner and all augers will stop immediately.

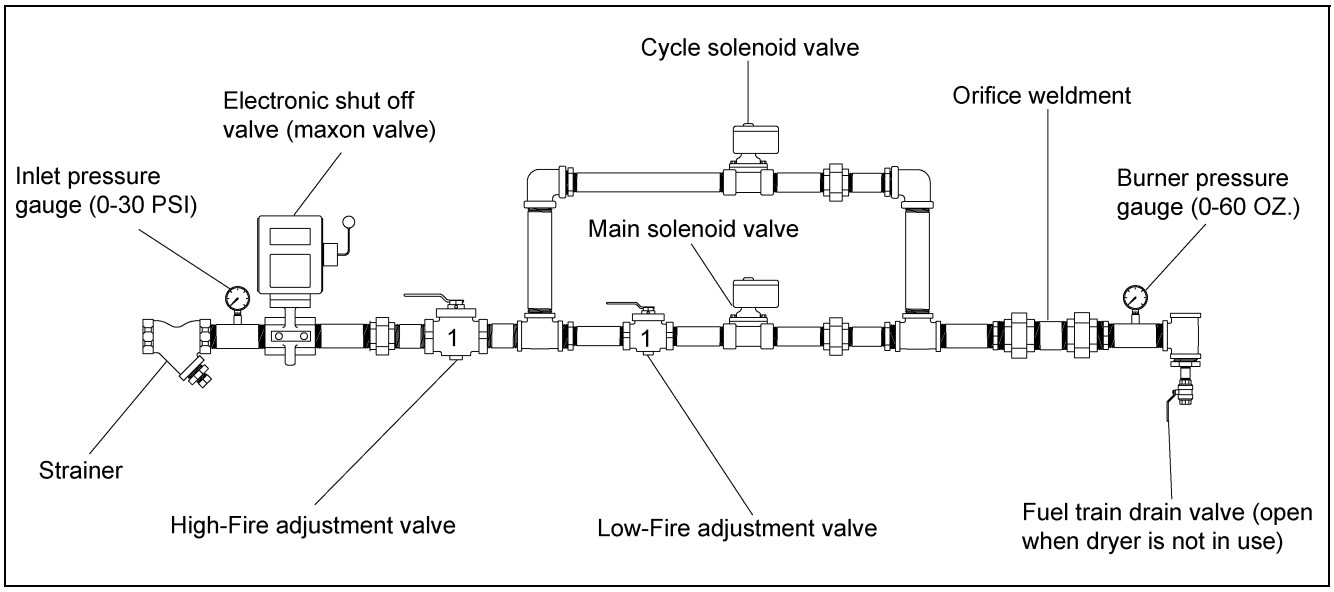


Figure 7A

Dryer Start-up and Operation

Drying Temperatures

Shelled Corn

For shelled corn with an initial moisture content of 20%-30%, the recommended drying temperature is 210°F- 220°F (93°C-104°C). For lower initial moisture content, lower drying temperatures in the 180°F-200°F (82°C-93°C) range.

Small Grain

For drying small grain (wheat, oats, barley, milo), 150°F (66°C) is suggested.

Soybeans

Drying temperatures are critical in drying soybeans. A temperature of 130°F (54°C) is recommended to keep grain temperature low.

Drying Efficiency

The general rule for obtaining the highest drying efficiency is to use the highest possible drying temperatures which will not adversely affect grain quality.

Dryer Shut Down

Cooling Hot Grain

If the dryer is to be shut down while filled with grain, it is recommended that hot grain be cooled for 10 to 15 minutes, especially in cold weather, to prevent water vapor condensation and possible freezing of such condensate following shut down.

Initial Setup Parameters

Turn the Control Power switch to ON. When the Boot screen appears touch the Start Dryer button. The computer will run a quick check of the system network after which the Operation screen will appear.

Timer and Delay Settings

Setting the timers for the vision dryer is a simple procedure. To set the timers touch the Timers button at the bottom of Operation screen. A new screen will appear called the Select Timers to Modify screen. *(See Figure 8A on Page 38.)* As you can see there are four (4) timers that you can modify:

1. Load timer
2. Out of grain (OOG) timer
3. Fan delay timer
4. Unload delay timer

1. **Load delay:** This delay is used to delay the starting of the load auger when the dryer is unloading to prevent the load auger from cycling to often.

2. **Out of grain (OOG) timer:** The OOG timer should be set to the maximum time it takes for the dryer to refill during continuous or batch drying modes. Note that the vision computer will display the time required to fill the dryer on the previous load operation to aid you in setting an accurate time. If the dryer runs out of grain while the Load Auger switch is in the AUTO position, the OOG timer automatically shuts off the dryer after the period of time preset on the timer.
   NOTE: *The time it took to load the dryer for the previous load operation is displayed directly below the OOG button in green letters.*

3. **Fan delay timer:** The fan sequence delay timer is not used on 1 fan dryers.

4. **Unload delay timer:** The unload delay timer is used to control the amount of time the unload auger runs after the metering rolls stop to allow the unload auger to clean itself out.

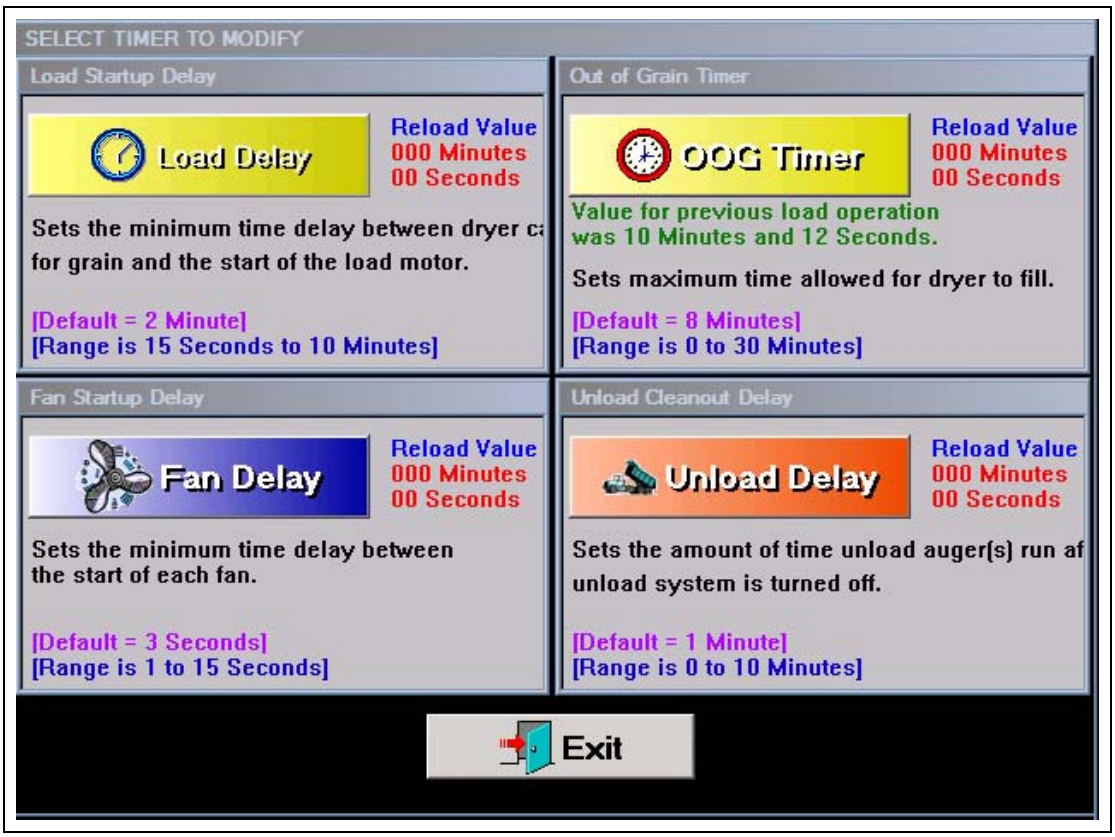


Figure 8A

To setup a timer touch the button of the timer you wish to modify. The Modify Timer Set Point screen will then be displayed. *(See Figure 8B on Page 39.)* Note that there are two (2) number pads on this Modify screen. The left number pad is used to modify the minutes and the right number pad will modify the seconds. Touching the Default button will automatically set the timer to the default set point for that timer. The Accept button will save the timer set point displayed in the time display. Touching cancel will exit the Modify Timer Set Point screen without saving any changes and the timer will stay at the currently saved set point.

Once you have the timer set points set touching the Exit button at the bottom of the Modify Timer Set Point screen will return you to the Operation screen.

Figure 8B

Setting the Temperatures

Setting the temperature set points for the dryer is a simple procedure. To adjust the temperature set points touch the Temp button at the bottom of Operation screen. A new screen will appear called the Select Temperature Set Point to Modify screen. *(See Figure 8C.)* As you can see you modify the set point for the plenum by touching the Plenum 1 Temperature button.

The plenum temperature set point range is 80°F-250°F, and the current temperature set point for each plenum is displayed next to the corresponding Plenum button.

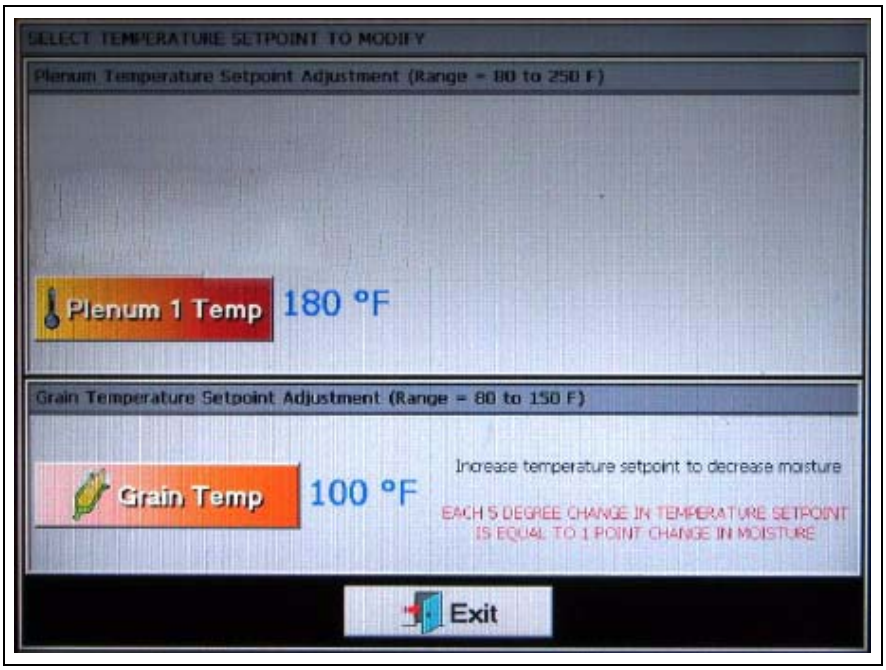


Figure 8C

The grain temperature set point range is 80°F-150°F, and the current temperature set point for the grain temperature is displayed next to the Grain Temperature button.

Modifying a temperature set point is much like setting a timer described *on Page 39*. Touch the desired button of the set point you wish to change. The Modify Temperature Set Point screen will appear. Enter the desired temperature using the displayed number pad then touch the Accept button. Touching the Exit button at the bottom of the Select Temperature Set Point to Modify screen will return you to the Operators screen.

Start-up

Start-up Procedure

At the beginning of each harvest and before filling the dryer with grain make sure to inspect the dryer for rodent damage, proper belt tension and missing or damaged safety shields. Test operate the dryer using the pre-start check procedures.

1. Before attempting to operate the dryer make sure that all safety shields and access doors are in place and closed and all personnel are clear of the grain dryer and grain handling machinery.
2. Turn all selector switches on the control panel to the OFF position.
3. Turn ON the electrical power supply to the dryer, and move the safety disconnect handle mounted on the dryer's power box to ON.
4. Turn the Control Power switch to ON. The switch will illuminate. The vision control computer will boot up. At this point the controller will lock out all other dryer functions. Once the Boot screen appears, touch the Start Dryer button and the dryer will perform its safety circuit checks. If a fault is found the cause will be displayed on the Display screen (Touch screen). If all safeties do not detect a problem. The dryer is ready to be started.
5. Move the Load Auger switch to MANUAL, and push the Dryer Start switch. The fill conveyor will immediately start, and the Load Auger switch will illuminate. If additional loading equipment is wired to the dryer it will also start immediately.
6. When the dryer is full of grain the fill conveyor will stop automatically, and any auxiliary loading equipment wired to the dryer will also stop.

The dryer is now ready to begin drying grain. *See below* for advanced moisture control dryer operation.

Continuous Flow Drying Mode Using Advanced Moisture Control

Full Heat Continuous Flow Operation

This section begins with *Step 7* and it is assumed that *Step 1* through *Step 6* in the start-up procedure described *above* have been completed.

7. Touch the SETUP button at the bottom of the Dryer Operation screen. Once the Hardware Parameter screen is displayed, touch the DRYING MODE button. When the Select Drying Mode window appears, touch the CONTINUOUS FLOW button to select the continuous flow drying mode. **NOTE:** *Tower dryers are always operated in the continuous flow mode. Press the EXIT button and return to the Hardware Parameter screen.*

8. Touch the M/C SETUP button. When the Moisture Control Selection window appears select the ADVANCED: REGULATION OF MOISTURE: VARIABLE MR SPEED moisture control option. Now touch the SETUP button. When the Set Unload Rate Limits window appears, set the % (percent) MAXIMUM unloading rate to a value slightly lower than the maximum unload rate of the unloading equipment. (**NOTE:** *This percentage will need to be experimentally found by manually operating the dryer unload at various unload rates to determine the maximum unload rate which the equipment can handle.*) Set the MINIMUM unloading rate at 10%. Once these values have been determined, touch the ACCEPT/EXIT button. In this screen, you also have the option of automatically adjusting the drying temperature downward if the automatic moisture control continuously calls for an unload rate which is higher than the maximum unload rate. To select this option, turn the plenum temperature manager to the “ON” position. You have the option of controlling the frequency at which the plenum temperature will be adjusted (time between possible steps) and the size of each temperature change for each step (size of temperature steps). These settings will be a trial and error adjustment that will be made based on the site of the unload equipment. Initially, the step time should be “15 MINUTES” and the size of the temperature step should be “AUTO”. If drying conditions change after the plenum temperature manager has lowered the drying temperature, the plenum temperature will also re-increase the drying temperature.

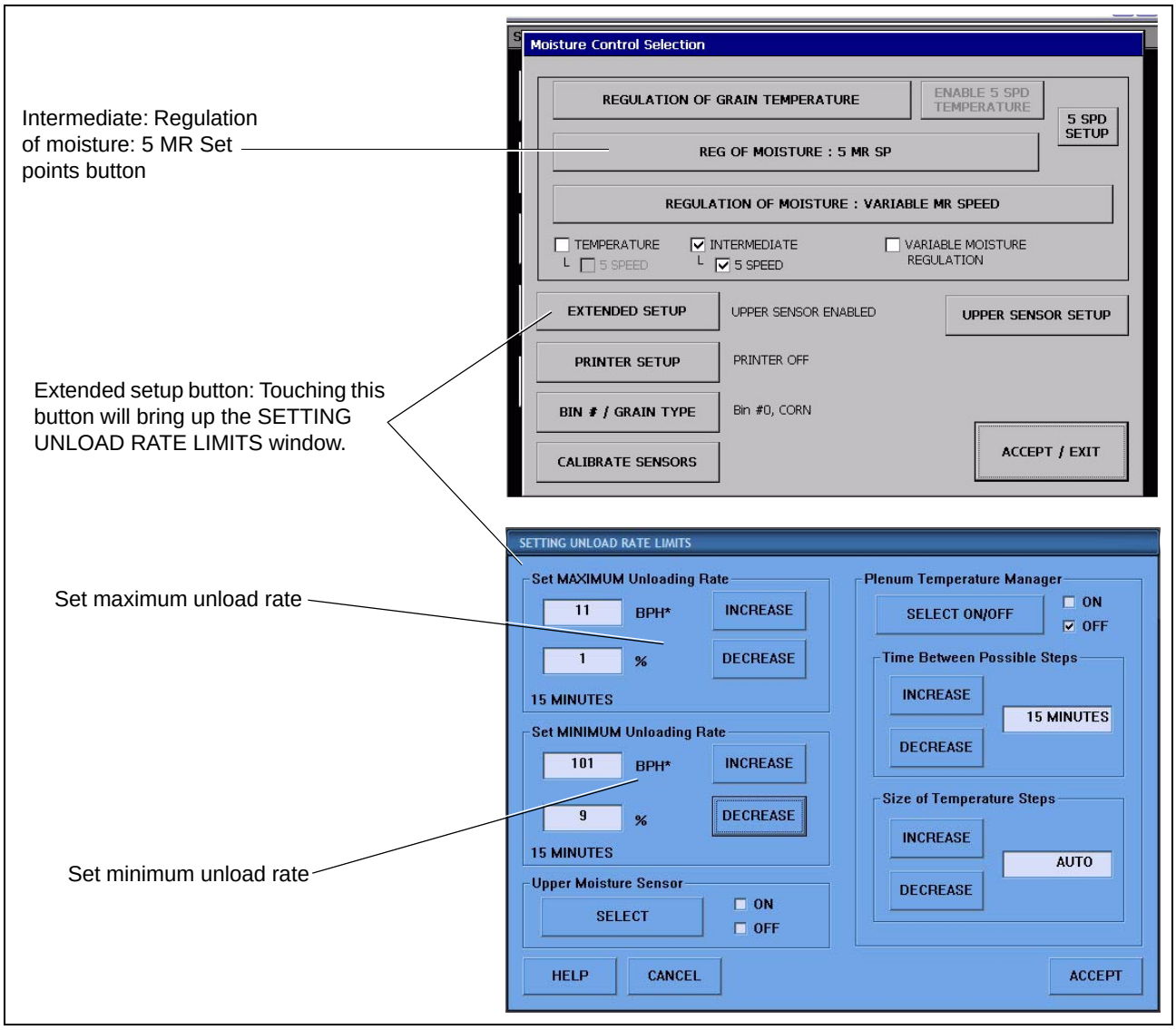


Figure 8D

9. You should now be back in the Moisture Control Selection window. Touch the BIN #/GRAIN TYPE button. When the Storage Parameters window appears select the type of grain that is to be dried and select the storage bin to be used (the bin number is for reference only and has nothing to do with the control of moisture). Then touch the EXIT button and return to the Moisture Control Selection window.

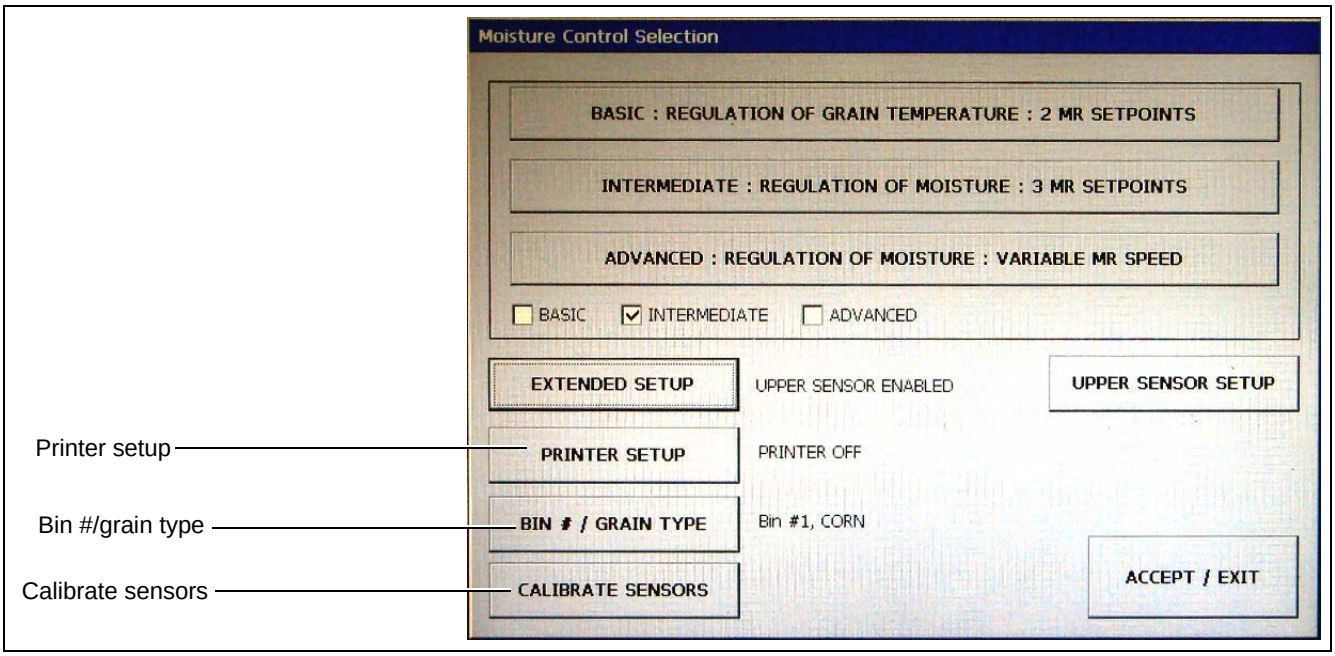


Figure 8E

10. The optional printer can also be enabled or disabled by touching the PRINTER SETUP button. After you have made the selection, touch the EXIT button to accept and exit.

11. You will also see a button to calibrate the moisture sensors. Do not calibrate the sensors at this time.

12. Now touch the EXIT button at the bottom of the screen and return to the Dryer Operation screen.

The setup is almost complete and you are now ready to begin drying grain using the advanced moisture control system. The following steps start the flow of grain through the dryer, and finish setting up the moisture control.

13. Make sure the UNLOAD switch is **OFF**.

14. Open the main fuel supply valve on the tank if using LP gas, or the valve in the fuel supply line if using natural gas.

15. The dryer should already be filled with grain. Turn the LOAD AUGER switch to the **AUTO** position. In both the AUTO and MANUAL positions, the Dryer Grain Level switch will automatically keep the dryer full of grain. In the AUTO position the dryer will shut down after a preset time period using the out of grain timer.

16. Look in the drying reference tables section *on Pages 45-50* for the chart settings that correspond to the model of dryer. Pick the initial moisture content and the drying temperature to select an initial unload rate.

17. Turn the FAN switch to **ON**. The fan will start, and the switch will illuminate when air pressure is detected.

18. Start the burner by turning the HEATER switch to **ON**. After purging for approximately 15 seconds the burner will fire, and the Heater switch will illuminate. This indicates that the flame sensing circuit is sensing burner flame. For information concerning burner adjustment see the dryer pre-start checks section *on Page 34* of this manual.

19. If the dryer is filled with wet corn, run the fan/heater 6 minutes/point of moisture to be removed before starting the unload.

20. After the time in *Step 19* turn the UNLOAD AUGER switch to MANUAL and set the METER ROLL SPEED, (MANUAL SPEED). Remember that manual is a true manual operation, with no moisture control. The meter rolls will run at the speed that you select using the meter roll speed encoder. To do this push on the meter roll adjustment knob. When the Modify Meter Roll Set Points window appears turn the meter roll adjustment knob until the speed indicator is set to the speed suggested from the reference setting table. Grain should begin to run at this time.

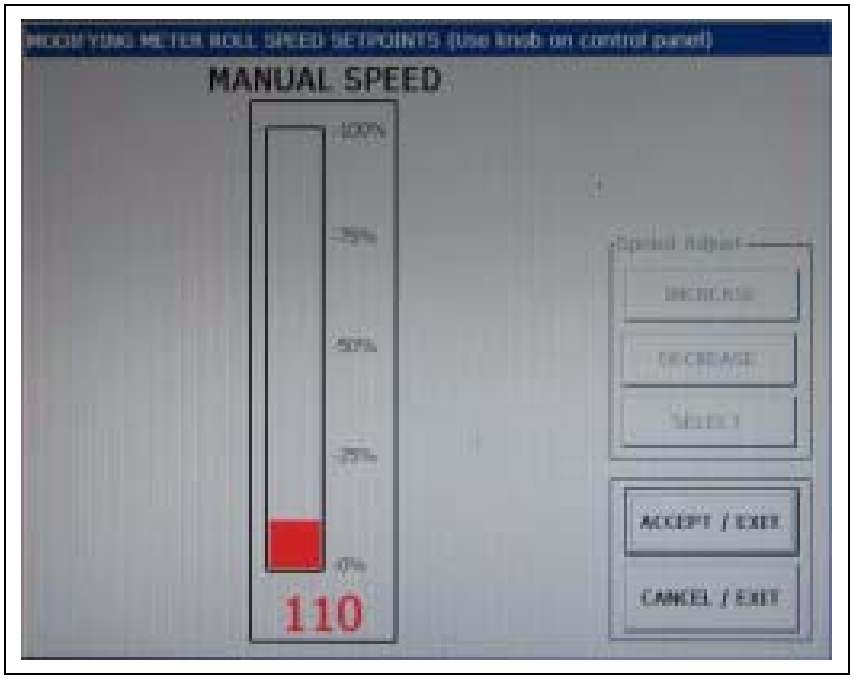
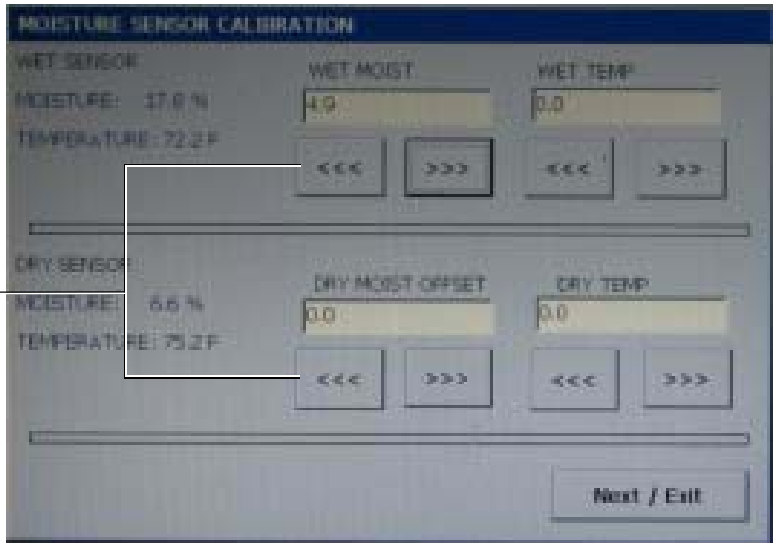


Figure 8F

21. After the run time in *Step 20* begin to test the moisture content with a moisture tester you consider to be accurate. Test at least three (3) samples for accuracy. Having determined the average discharge moisture, you may now calibrate the incoming and outgoing moisture sensors on the dryer. To do this you need to touch the SETUP button again and return to the Hardware Parameter screen. Touch the M/C SETUP then touch the CALIBRATE SENSORS button. Follow the example below to adjust the dryer to the moisture tester.

    Example: The moisture tester gives you an average moisture of 17% but the moisture sensor on the dryer is reading 18.3%. You would then calibrate the dryers moisture sensor (-1.3%), that would make the moisture sensor read 17% the same as the moisture tester.



Calibrate sensors by touching the arrow buttons.

Figure 8G

22. Once the moisture reading at the discharge is where you want it to be, turn the UNLOAD switch to AUTO.
23. Now that the UNLOAD AUGER switch is in the AUTO position the ADVANCED MOISTURE CONTROL is active. Now touch the M/C button at the bottom of the Dryer Operation screen. When the Moisture Set Point window appears set the moisture set point to the output moisture you desire. Let the dryer run on these settings before trying to adjust moisture or meter roll settings.
24. The dryer will run in MANUAL for the first 30 minutes after you turn the AUTO position. This will again make sure that the grain is flowing through the dryer on an even basis. After the 30 minutes period the moisture control will automatically switch to advanced and take full control of the dryer. There is a count down screen in the upper right hand of the main display that shows the time remaining before the advanced moisture control begins.

How the Advanced Moisture Control Works

The controller continuously monitors the moisture coming in and out of the dryer, and the column grain temperature at the end of the drying section. However, the control action is mainly based on the dry sensor at the outlet of the dryer. If the moisture coming out of the dryer is not right at the target, the controller will speed up or slow down the unload accordingly. The wet sensor and the column grain temperature sensor are intended to detect moisture spikes coming into the dryer so that the moisture controller can react ahead of time. For example, if the wet sensor detect a jump of moisture coming into the dryer, the controller will start to slow down the unload speed right away. However, the controller does not act to the full scale immediately. Instead, it slows down the dryer gradually so that the grain currently in the dryer would not get over dried.

The controller does not have enough information of the grain in the dryer in the first pass after the dryer is started. It controls the dryer by using the manual speed setting as the starting point. In other words, the manual speed setting is most responsible for the first pass of drying. Therefore, set the manual unloading speed as close as it should be for the grain currently in the dryer before switching to moisture control mode. The manual speed setting does not have to be adjusted after the moisture control is activated.

Reference Setting Table -- 1050

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	71	83	95
18%	15%	54	63	72
19%	15%	44	51	58
20%	15%	37	43	50
21%	15%	32	38	43
22%	15%	29	33	38
23%	15%	25	30	34
24%	15%	23	26	30
25%	15%	20	24	27
26%	15%	18	21	24
27%	15%	16	19	22
28%	15%	15	17	20
29%	15%	13	15	18
30%	15%	12	14	16
32%	15%	10	12	13
35%	15%	8	9	11

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	50	59	70
16%	13%	38	44	53
17%	13%	31	36	43
18%	13%	26	31	37
19%	13%	23	27	32
20%	13%	20	24	28
21%	13%	18	21	25
23%	13%	14	17	20
25%	13%	11	13	16

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	57	66	74
16%	13%	43	49	55
17%	13%	35	40	45
18%	13%	30	34	38
19%	13%	26	29	33
20%	13%	23	26	29
21%	13%	20	23	26
23%	13%	16	18	21
25%	13%	13	15	17

Reference Setting Table -- 1260

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	85	99	--
18%	15%	65	75	86
19%	15%	53	61	69
20%	15%	44	51	60
21%	15%	38	45	51
22%	15%	35	39	45
23%	15%	30	36	40
24%	15%	27	31	36
25%	15%	24	29	32
26%	15%	22	25	29
27%	15%	19	23	26
28%	15%	18	20	24
29%	15%	16	18	21
30%	15%	14	17	19
32%	15%	12	14	15
35%	15%	10	11	13

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	60	70	83
16%	13%	45	53	63
17%	13%	37	43	51
18%	13%	31	37	44
19%	13%	27	32	38
20%	13%	24	28	33
21%	13%	21	25	30
23%	13%	17	20	24
25%	13%	14	16	19

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	68	78	88
16%	13%	51	58	65
17%	13%	41	47	53
18%	13%	35	40	45
19%	13%	31	35	39
20%	13%	27	31	35
21%	13%	24	28	31
23%	13%	19	22	25
25%	13%	15	18	20

Reference Setting Table -- 1575

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	--	--	--
18%	15%	89	--	--
19%	15%	72	85	97
20%	15%	62	72	82
21%	15%	53	62	71
22%	15%	47	55	63
23%	15%	42	49	56
24%	15%	37	44	50
25%	15%	33	40	45
26%	15%	30	35	40
27%	15%	27	31	36
28%	15%	24	28	32
29%	15%	22	26	29
30%	15%	20	23	26
32%	15%	17	19	22
35%	15%	13	15	17

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	83	97	--
16%	13%	63	73	87
17%	13%	51	60	71
18%	13%	44	51	60
19%	13%	38	44	53
20%	13%	33	39	46
21%	13%	30	35	41
23%	13%	24	28	33
25%	13%	19	22	26

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	95	--	--
16%	13%	71	81	91
17%	13%	57	66	74
18%	13%	49	56	63
19%	13%	43	49	55
20%	13%	38	43	48
21%	13%	33	38	43
23%	13%	27	31	34
25%	13%	24	24	28

Reference Setting Table -- 1875

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	92	--	--
18%	15%	69	81	92
19%	15%	56	66	75
20%	15%	48	56	64
21%	15%	42	48	56
22%	15%	37	43	49
23%	15%	33	38	43
24%	15%	29	34	39
25%	15%	26	30	35
26%	15%	23	27	31
27%	15%	21	24	28
28%	15%	19	22	25
29%	15%	17	20	23
30%	15%	15	18	21
32%	15%	13	15	17
35%	15%	10	12	14

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	65	76	90
16%	13%	49	57	68
17%	13%	40	47	55
18%	13%	34	40	47
19%	13%	29	34	41
20%	13%	26	30	36
21%	13%	23	27	32
23%	13%	18	21	26
25%	13%	15	17	21

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	74	84	95
16%	13%	55	63	71
17%	13%	45	51	57
18%	13%	38	43	49
19%	13%	33	38	43
20%	13%	29	34	38
21%	13%	26	30	34
23%	13%	21	24	27
25%	13%	17	19	21

Reference Setting Table -- 20100

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	--	--	--
18%	15%	79	92	--
19%	15%	65	75	86
20%	15%	55	64	73
21%	15%	48	56	64
22%	15%	42	49	56
23%	15%	37	44	50
24%	15%	33	39	44
25%	15%	30	35	40
26%	15%	27	31	36
27%	15%	24	28	32
28%	15%	22	25	29
29%	15%	19	23	26
30%	15%	18	21	24
32%	15%	15	17	20
35%	15%	12	14	16

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	74	87	--
16%	13%	56	65	78
17%	13%	46	53	63
18%	13%	39	45	54
19%	13%	34	39	47
20%	13%	30	35	41
21%	13%	27	31	37
23%	13%	21	25	29
25%	13%	17	20	24

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	85	97	--
16%	13%	63	72	81
17%	13%	51	58	66
18%	13%	44	50	56
19%	13%	38	43	49
20%	13%	34	38	43
21%	13%	30	34	38
23%	13%	24	27	31
25%	13%	19	22	25

Reference Setting Table -- 24100

(Corn)

Moisture		170 F % Unload Rate	190 F % Unload Rate	210 F % Unload Rate
In	Out			
17%	15%	--	--	--
18%	15%	91	--	--
19%	15%	74	86	99
20%	15%	63	73	84
21%	15%	55	64	73
22%	15%	48	56	64
23%	15%	43	50	57
24%	15%	38	44	51
25%	15%	34	40	45
26%	15%	31	36	41
27%	15%	27	32	37
28%	15%	25	29	33
29%	15%	22	26	30
30%	15%	20	24	27
32%	15%	17	20	22
35%	15%	13	16	18

(Wheat, Barley, Milo)

Moisture		140 F % Unload Rate	155 F % Unload Rate	175 F % Unload Rate
In	Out			
15%	13%	85	99	--
16%	13%	64	75	89
17%	13%	52	61	73
18%	13%	44	52	62
19%	13%	39	45	54
20%	13%	34	40	47
21%	13%	30	36	42
23%	13%	27	28	37
25%	13%	19	23	27

(Soybeans)

Moisture		120 F % Unload Rate	130 F % Unload Rate	140 F % Unload Rate
In	Out			
15%	13%	97	--	--
16%	13%	72	82	92
17%	13%	58	67	75
18%	13%	50	57	64
19%	13%	43	50	56
20%	13%	38	44	49
21%	13%	34	39	44
23%	13%	27	31	35
25%	13%	22	25	28

Pre-seasonal Inspection and Service

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

1. Shut off electrical power. Open power box and control box, and inspect for moisture, rodent damage or accumulated foreign material present. Inspect and tighten any loose terminal connections. Replace any damaged or deteriorated wiring.
2. Lubricate the blowers, motors, and metering system as outlined in the lubrication table *on Page 54*.
3. Check blower belts for proper tension.
4. Inspect and clean the burner. Visually check that no holes in the stainless steel air mixing plates are plugged. If burner ports are plugged, clear them with a piece of wire or a drill bit. (**NOTE:** *Pre-2002 model dryers require a #47 drill bit.*)
5. Check electrical connections at both the flame rod and spark plug. Clean spark ignitor and flame rod. Replace if necessary.
6. Check drain valve on gas train to ensure that there is no water in the gas train. Valve should always be open when the dryer is not being used. Ensure that drain valve is closed prior to dryer operation.
7. Check the discharge area to ensure that the area is cleaned of stalks and old grain. Inspect the sweeps for excessive wear.

   IMPORTANT: *The covers to the discharge sections on the tower dryers must be in place and clamped down at all times when the dryer is in operation. If the cover is off during operation, the vacuum created by the blowers will suck foreign matter from the discharge area and deposit it in the heat section of the dryer plugging the inside screens of the dryer also creating a fire hazard.*

See pre-season check list *on Page 53*.

Seasonal Inspection and Service

IMPORTANT: *The covers to the metering system access door(s) must be in place at all times when the dryer is in operation. Before turning blowers always make sure this door is clamped into position.*

1. Follow lubrication guides as outlined in the lubrication table.
2. **Do not let grain fines and dust accumulate inside the cooling section of the dryer.** Bi-weekly if drying most products or daily if drying milo, clean the cooling chamber floor of fines and dust. Sweep down the cooling section sheets if necessary. Fines can be swept into the unload systems.
3. **Do not let grain fines and dust accumulate inside the heat section of the dryer.** Daily check the hopper divider that separates the heat section from the cooling section to ensure that it remains clean and open.
4. When cleaning dryer, check the grain discharge area on the dryer. On accutrol sweep dryers check the sweeps for trash or stalk build ups that could be obstructing grain flow.
5. If undried grain is left in the dryer for more than a week during the drying season, inspect the plenum roof to make sure that there is no wet grain sticking to the roof that could restrict grain flow. When the dryer is restarted make sure that all grain columns are evenly unloading.

6. When drying dirty corn in high humidity conditions, sludge may build up in the upper outside sheets of the dryer. This build up can be removed by either washing the sheets down with a high pressure water hose, or by shutting incoming grain, dropping the grain level to below the plugged area, and then running the fans and burner to dry the affected area. Tapping or sweeping the sheets will dislodge debris. Attempting to sweep off the sheet build up while it is still wet will usually plug the sheet more.

In Case of Fire

1. When you first detect a fire, the entire drying operation should be shut down, including grain flow into and out of the dryer. The emergency controls may have already done this. Also, shut off the electrical and fuel supply to the dryer.
2. Do not try to cool a fire by running fan(s).
3. Never run grain from the dryer into the elevator or storage if a fire is known or suspected.
4. Locate the area of the fire.
5. 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.
6. Emergency discharge slide gates at the bottom of each column as well as easy access gates located near the hopper discharge area permit fast dumping of each individual grain column.
7. 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.

End of Season Service

1. Empty the dryer at the end of the drying season. The dryer should not be used for grain storage. Grain left in there for an extended period of time can become wet, swell and spoil. Chunks of spoiled grain can plug the metering system and swelled grain places undue stress on the interior and exterior sheeting of the dryer.
2. Clean out the plenum roof grain cushion and remove any grain that may be hanging up on the plenum roof.
3. Make sure the grain exchangers are clean.
4. Clean out the hopper that divides the heat section from the cooling section.
5. Clean the cooling chamber floor.
6. Remove all grain and trash from the metering drum floor. This grain can be raked out by hand by opening the slide gates located in the hopper bottom of the dryer.
7. Make sure gas supply is shut off to the dryer.
8. Open the gas train drain valve located on the bottom of the gas train.
9. It is a good practice to cover the burner with a tarpaulin or plastic to ensure a clean burner.

Pre-season Service Check List

___ Lubricate blower bearings.

___ Lubricate blower motor bearings, if needed.

___ Check blower belts and adjust if necessary.

___ Clean burner ports.

___ Inspect flame rod and spark ignitor.

___ Check oil levels in gear boxes.

___ Inspect divider hopper between heat and cooling section. Clean if necessary.

___ Inspect bindicator grain level switches.

___ Inspect metering system access door cover seals.

___ Lubricate metering system access door cover hold down latches.

___ Lubricate modulator motor linkage.

___ Check butterfly operation in modulating valve.

___ Check gas pressure gauges.

___ Check interior of maxon shut off valves for corrosion. Clean if necessary.

___ Clean control and power panels, tighten loose connections, and check for leaks.

___ Inspect metering systems. Clean accumulated stalks and old grain.

___ Start-up dryer and check operating controls.

___ Other: Itemize _____

End of Season Shut Down Procedure

___ Start unload and empty all grain from dryers.

___ Clean out grain cushion (on plenum roof under fill spout). Clean plenum roof.

___ Clean off grain exchangers.

___ Clean out divider hopper, between heating and cooling section.

___ Clean inside cooling sheets and cooling floor.

___ Remove all grain and trash from unload section of dryer.

___ Open emergency grain discharge doors (and drain doors in zimmerman dryers).

___ Open drain valve in gas train.

___ Cover burner with a tarp or plastic sheeting.

Lubrication Table

Location	Instructions	Type of Lubrication	Lubrication Interval
Accutrol (sweep unload) top and bottom drive bearings.	Lubricate slowly until lube shows through seal. Wipe clean.	High quality, grade #2 lithium based grease.	Beginning of season (annually).
Accutrol (sweep unload) coupling hub.	Remove the two (2) lube plugs from the cover. Lubricate slowly until grease begins seeping through relief plug.	High quality, grade #2 lithium based grease.	Beginning of season (annually).
Blower shaft bearings.	Lubricate bottom bearing plug slowly counting the grease gun pump until lube shows through the seal. Wipe clean. Use same # of grease gun pumps for top bearing.	High quality, grade #2 lithium based grease.	Every 4 weeks of dryer operation.
Blower motor bearings.	See motor lubrication procedure *below*.	High quality, grade #2 lithium based grease.	Every 2 years (Normal operation, ever 8-10 months continuous operation).
Metering variable speed drive motor.	See motor lubrication procedure *below*.	High quality, grade #2 lithium based grease.	Every 2 years (Normal operation, ever 8-10 months continuous operation).
Accutrol gear box.	Grease filled gear box. Replenish grease to the first stage (upper) reduction mechanism through grease fitting provided (typically quantity= 0.3 oz. of grease.	High quality, grade #2 lithium based grease.	Beginning of season (annually).
[1]**Lubrication of motors** - Operate motor for 20 minutes. Clean grease fitting. Remove grease relief plug and using a low pressure grease gun, pump in the required grease. After re-lubricating, allow motor to run for 10 minutes before replacing relief hardware. ***DO NOT over grease***.			

Shut down warning window: Touch the HELP button to display the shut down help window.

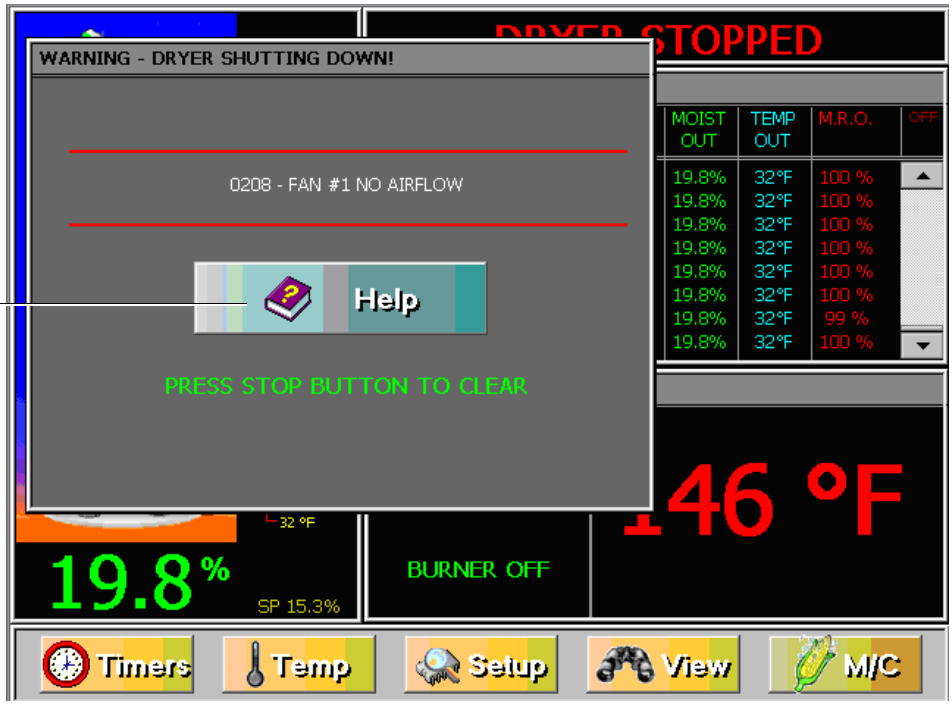


Figure 11A

Fan/Heater Generated Errors

The following is a list of errors that are generated with the fan/heater controller. Each fan/heater has there own set of safeties which are listed below. You will need to inspect the controller associated with the error. **Example**: If you get this error, it is telling you the problem is with housing 1 (bottom most fan) High-Limit. *(See Figure 11A.)*

Air Switch x Stuck

The air switch contacts have closed prior to the fan starting, indicating a freewheeling blade or improper setting of the air switch. The message will distinguish between which fan caused the shut down. This indicates that 12 VDC has been lost to terminal **J4-04** on the Fan/Heater board.

Fan x Loss of Airflow

This error message is displayed when airflow (air pressure) has been established but was lost for some reason. This could happen if while during the dryers operation the grain has settled or shrinkage in the grain columns causing a loss of air pressure in the plenum chamber.

Fan x No Airflow

Contacts in the air switch have never opened due to the fan not turning, or the air switch may need adjustment. The message will distinguish between which fan caused the shut down.

Flame Loss x

The flame sensor has failed to detect a burner flame which had been established but was lost for some reason and there is a problem with the flame sensing circuitry or the dryer is not getting burner fuel. The message will distinguish between which burner caused the shut down. The reference to the number one (1) is telling you that it is burner number one (1) which is the bottom most fan.

Grain Temp Short x

This error indicates there is a shorted condition with one of the grain temperature sensors located inside the left or right grain columns. This could be a shorted sensor or the sensor wires could be shorted.

Grain x Overheat

An over temperature condition has occurred in one of the grain columns causing the control to shut down the dryer. This control is set at 210°F (99°C) and automatically resets itself when cool. This can be caused from a grain column plugged with trash or the meter rolls may be adjusted to slow. Feel the grain columns to determine which one may be causing the problems. If all the columns are hot to the touch then you will probably need to check the meter roll settings. If not, then examine the column that feels hot, make sure you can see the grain moving down the column screens. For more information on service see meter roll servicing.

Housing x High-Limit

The temperature High-Limit located on the fan/burner housing has opened, indicating an over temperature condition has occurred towards the rear of the fan/heater housing. This control is set at 200°F (93°C) and must be manually reset. The message will distinguish between which fan housing caused the shut down. The reference to the number one (1) is telling you that it is fan number one (1) which is the bottom most fan.

Ignition Failure x

This condition happens during the initial ignition of the burner. If the burner fails to light, check to make sure that the gas has been turned ON and/or the maxon valve has been turned ON. The reference to the number one (1) is telling you that it is burner number one (1) which is the bottom most fan.

Illegal Flame x

This message is displayed when the flame detection circuit of the heater is sensing flame when the burner is supposed to be OFF. Example, if you shut down the dryer and the heater continues to burn due to a solenoid stuck in an open state, it will generate this type of error.

Motor Overload x

One of the thermal overloads on either the fan, load, unload or auxiliary motors has opened, indicating an over current condition. The overloads must be manually reset. The message will distinguish between which fan overload caused the shut down. The reference to the number one (1) is telling you that it is fan number one (1) which is the bottom most fan.

Vapor x High-Limit

The LP gas vapor temperature sensor located in the gas pipe train downstream from the vaporizer, has opened indicating that the vaporizer is running too hot and must be readjusted. This sensor is set at 200°F (93°C) and automatically resets itself when cool. The message will distinguish between which burner caused the shut down. The reference to the number one (1) is telling you that it is burner number one (1) which is the bottom most fan/heater unit, is where the malfunction is located. Try adjusting the vaporizer coils farther away from the burners flame. You may also want to try switching the burner mode from High/Low to ON/OFF, especially on warmer days.

Input/Output Generated Errors

The following is a list of errors that are generated with the Input/Output board located in the upper control box.

Air System Failure

A shut down has occurred due to a air system that was installed with an integral safety switch that was in the unit. The air system safety connections are located in the upper control box on the terminal strip. This can occur if this safety looses 12 VDC to terminal **J1-10** on the Input/Output board. This input is jumpered on the terminal strip when it leaves the factory and is usually installed in the field by a qualified electrician.

Aux Load Overload

The motor overload relay has tripped on the aux load motor circuit located in the upper control box. This can occur if this safety looses 12 VDC to terminal **J1-05** on the Input/Output board. Push the Red button on the overload to reset this error. This is caused from the motor operating with to much of a work load, which in turn uses more current (amperage). If the problem reoccurs then check the motor to make sure it is not being overworked. You may need to call an electrician to measure the motors full load amps (FLA).

Aux Unload Overload

The motor overload relay has tripped on the aux unload motor circuit located in the upper control box. This can occur if this safety looses 12 VDC to terminal **J1-04** on the Input/Output board. Push the Red button on the overload to reset this error. This is caused from the motor operating with to much of a work load, which in turn uses more current (amperage). If the problem reoccurs then check the motor to make sure it is not being overworked. You may need to call an electrician to measure the motors full load amps (FLA).

Load Motor Overload

The motor overload has tripped on the load motor overload located in the upper control box. This can occur if this safety looses 12 VDC to terminal **J1-03** on the Input/Output board. Push the Red button on the overload to reset this error. This is caused from the motor operating with to much of a work load, which in turn uses more current (amperage). If the problem reoccurs then check the motor to make sure it is not being overworked. You may need to call an electrician to measure the motors full load amps (FLA).

Meter Rolls Failed

If you have the meter roll speed adjustment turned too low (not turning), this will cause this error message. It also could indicate that you have a defective meter roll sensor, the metering roll drive system has failed to turn or broken chain or jammed metering roll is a possibility. This can occur if the input is not receiving a 5 volt pulse on terminal **J4-04** on the Input/Output board.

Out of Grain

The dryer has run low on grain, and the out of grain timer has timed out, shutting the dryer down. The unload auger will continue to run so it can clean out the remaining grain before shutting down.

Unload Motor Overload

The motor overload has tripped on the unload motor overload located in the upper control box. This indicates that 12 VDC has been lost to terminal **J1-02** on the Input/Output board. Push the Red button on the overload to reset this error. This is caused from the motor operating with to much of a work load, which in turn uses more current (amperage). If the problem reoccurs then check the motor to make sure it is not being overworked. You may need to call an electrician to measure the motors full load amps (FLA).

User Safety

A shut down has occurred due to a user installed safety switch that was installed on the dryer. The user installed safety connections are located in the upper control box on the terminal strip. This also indicates that 12 VDC has been lost to terminal **J2-01** on the Input/Output board. This input is jumpered on the terminal strip when it leaves the factory and is usually installed in the field by a qualified electrician.

Master Display Generated Errors

The following is a list of errors that are generated with the Master Display board located in the lower control box.

Cont-Batch Mode Chng

This error occurs when you switch the dryer mode switch from the continuous flow to the staged batch position while the dryer is running in the continuous flow mode. To avoid this shut down, stop the dryer before switching modes. Press stop to clear the error.

Network Failed FH x

This error is generated whenever Fan/Heater board has lost its communications link with the Input/Output board (upper control panel) and the Master Display board (lower control panel). Check the ethernet cable jacks to make sure they are plugged in tightly. An ethernet cable is a computer communication cable that looks like the phone cable in the home. *(See Figure 11B on Page 59.)*
The reference to the number one (FH1) is telling you that it is fan number one (1) which is the bottom most fan.

Network Failed Input/Output

This error is generated whenever Input/Output board (upper control panel) has lost its communications link with the master (lower control panel door) and the Fan/Heater boards. Check the ethernet cable jacks to make sure they are plugged in tightly. There are three (3) LED lights next to this plug, one (1) indicates power and the other two (2) indicate data being transmitted. These two (2) labeled RXD and TXD, should be flashing randomly back and forth indicating network activity.

Network Failed Mast

This error is generated whenever Master Display board (lower control panel) has lost its communications link with the Input/Output board (upper control panel door) and the Fan/Heater boards. Check the ethernet cable jacks to make sure they are plugged in tightly.

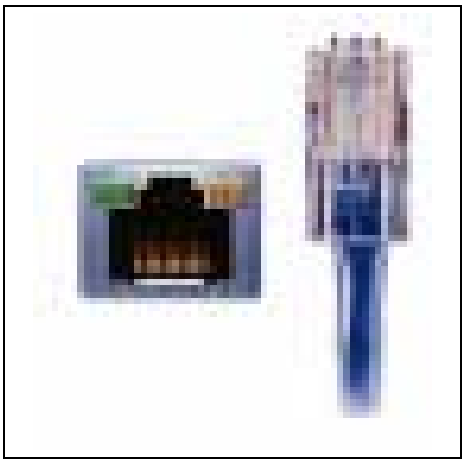


Figure 11B

Plenum Temp Open x

This error indicates there is a open condition with the plenum temperature sensor located inside the plenum chamber. This could be a open sensor or the sensor wires could have a open connection.

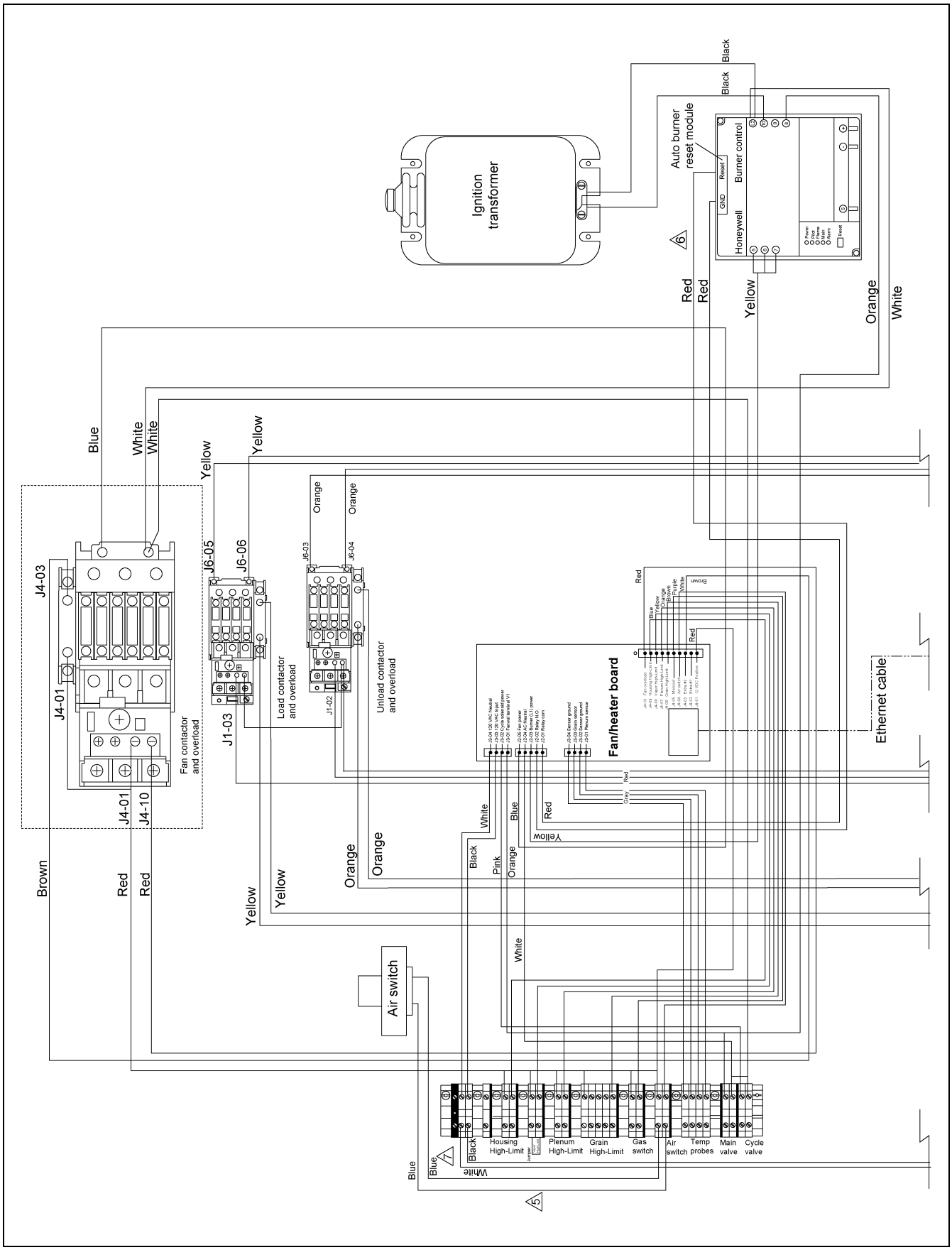
Plenum Temp Short x

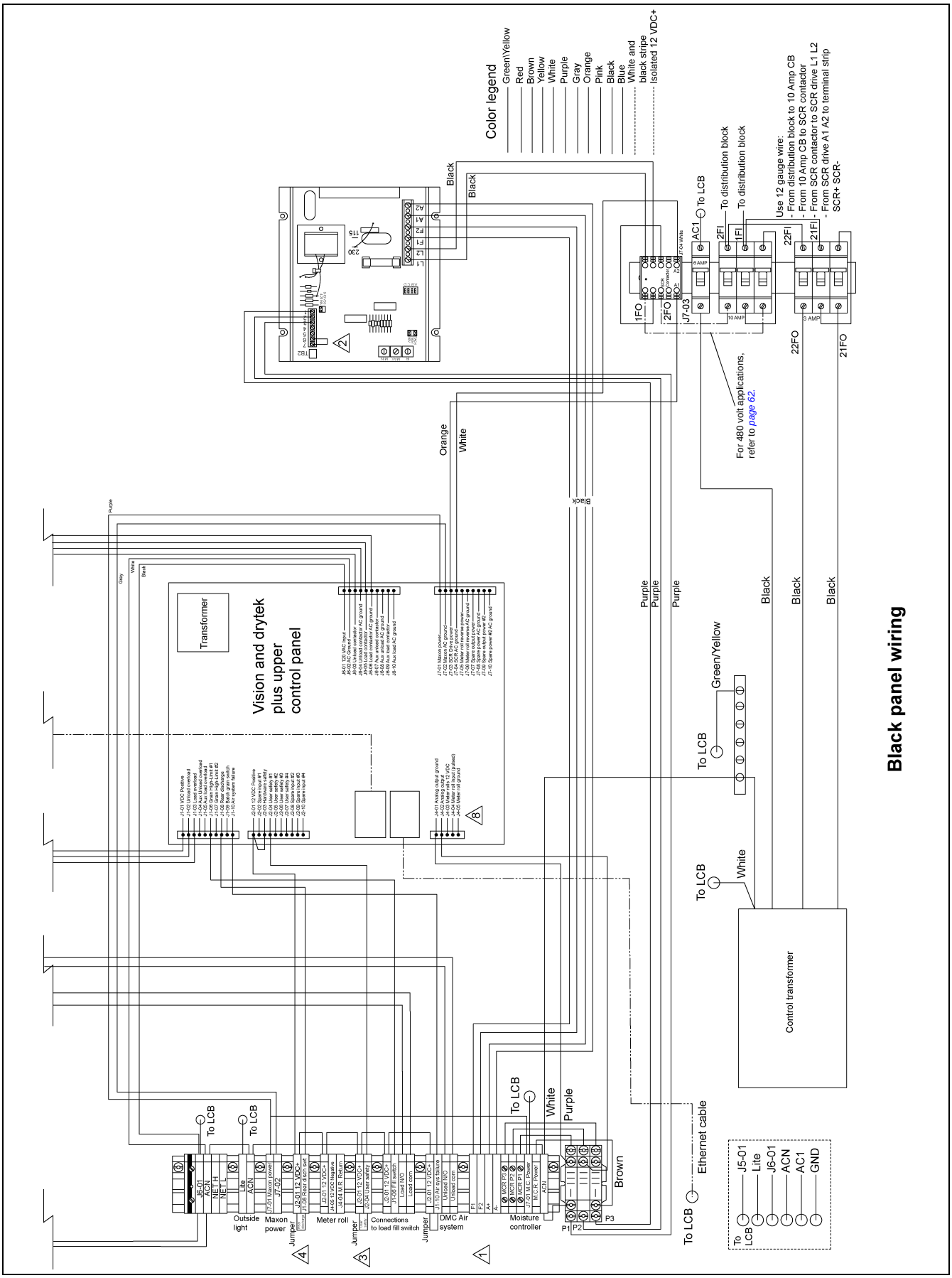
This error indicates there is a shorted condition with the plenum temperature sensor located inside the plenum chamber. This could be a shorted sensor or the sensor wires could be shorted.

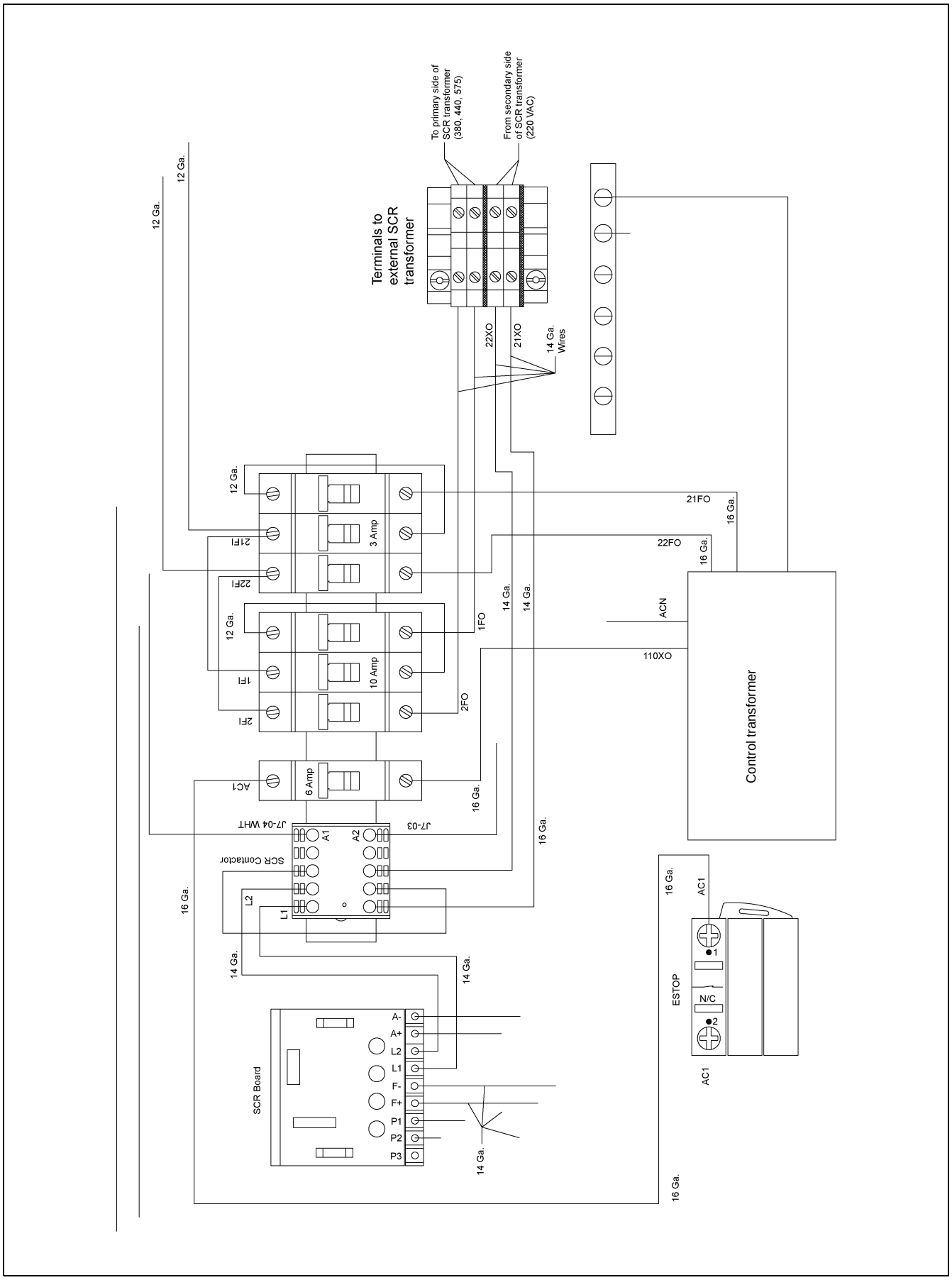
Plenum x Overheat

An over temperature condition has occurred inside the dryer plenum. This control is a 300°F (149°C) limit and automatically resets itself when cool. The message will distinguish between which plenum caused the shut down.

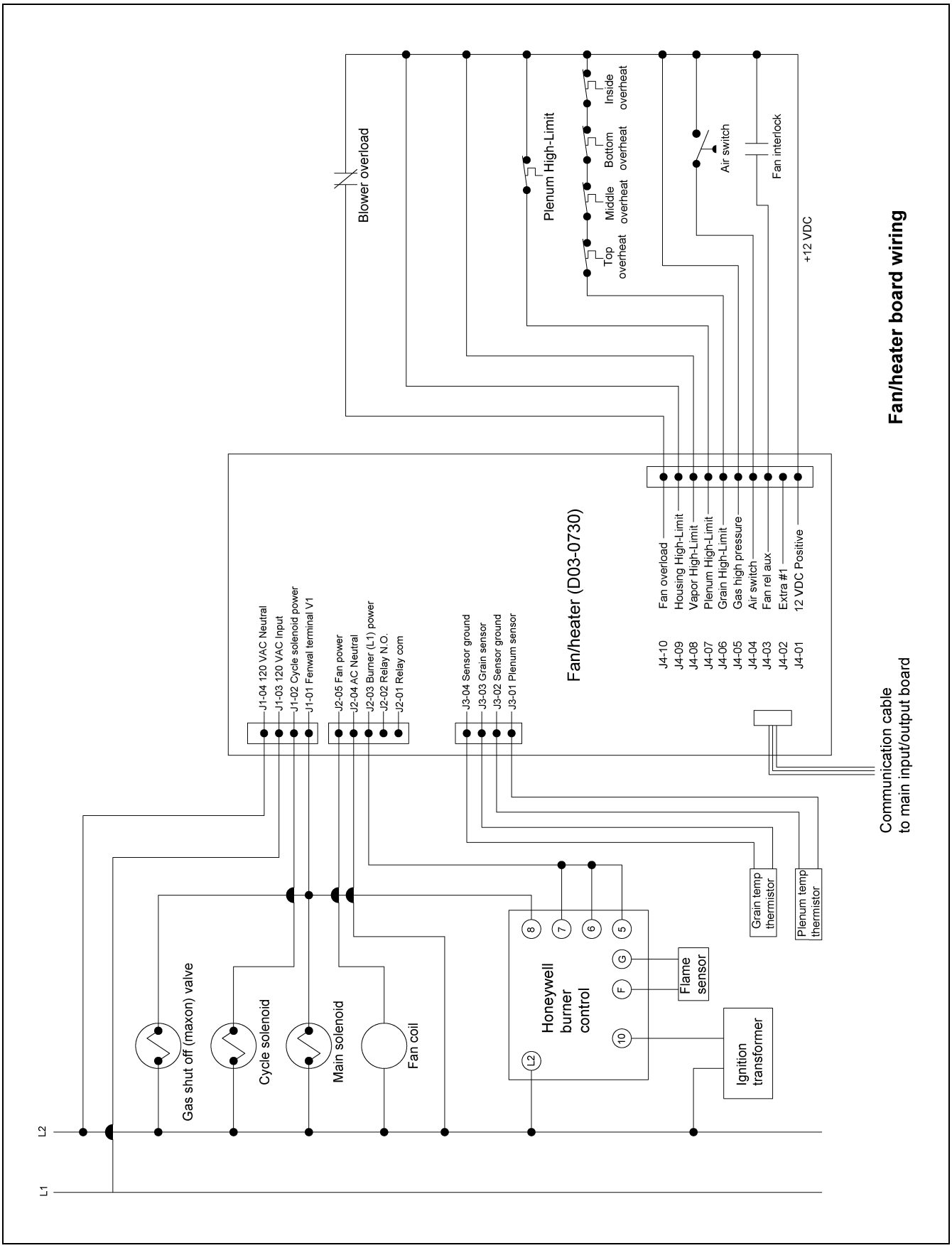
Back Panel Wiring



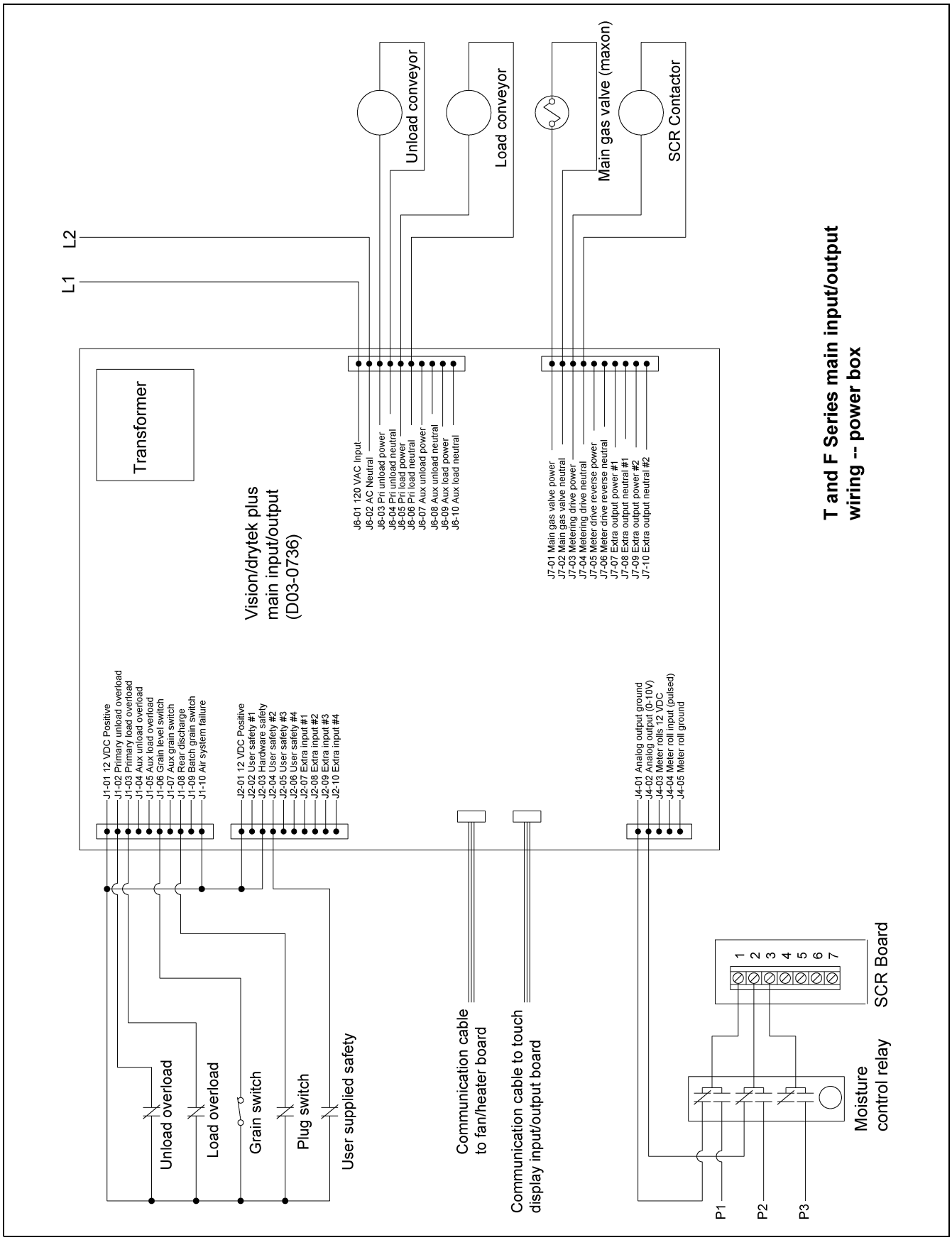

Color legend
Green\Yellow
Red
Brown
Yellow
White
Purple
Gray
Orange
Pink
Black
Blue
White and black stripe
Isolated 12 VDC+
Use 12 gauge wire:
- From distribution block to 10 Amp CB
- From 10 Amp CB to SCR contactor
- From SCR contactor to SCR drive L1 L2
- From SCR drive A1 A2 to terminal strip
SCR+ SCR-
To distribution block
To distribution block
To LCB
AC1
2FI
1FI
22FI
21FI
6 AMP
10 AMP
3 AMP
1FO
2FO
J7-03
22FO
21FO
For 480 volt applications, refer to page 62.
Black panel wiring
Vision and drytek plus upper control panel
Transformer
Control transformer
Green/Yellow
White
Purple
Black
Orange
Brown
Ethernet cable
Outside light
Maxon power
Jumper
Meter roll
Connections to load fill switch
DMC Air system
Moisture controller
J5-01
Lite
J6-01
ACN
AC1
GND


Terminals to external SCR transformer
To primary side of SCR transformer (380, 440, 575)
From secondary side of SCR transformer (220 VAC)
22XO
21XO
14 Ga. Wires
12 Ga.
21FO
22FO
16 Ga.
3 Amp
21FI
22FI
10 Amp
1FI
2FI
1FO
2FO
14 Ga.
ACN
110XO
Control transformer
6 Amp
AC1
J7-04 WHT
J7-03
A1
A2
SCR Contactor
L1
L2
SCR Board
A-
A+
F-
F+
P1
P2
P3
ESTOP
N/C
1
2

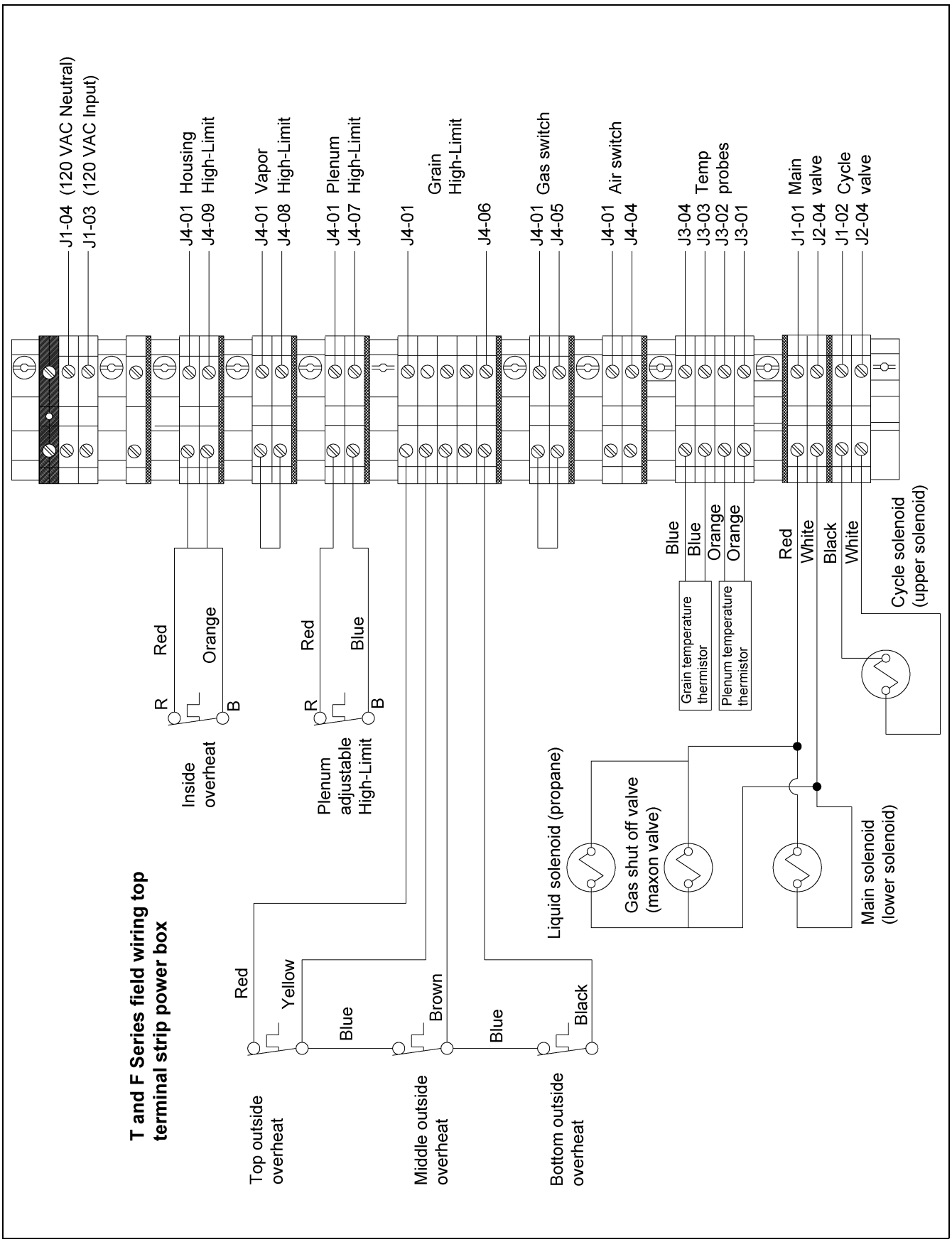
Fan/Heater Board Wiring



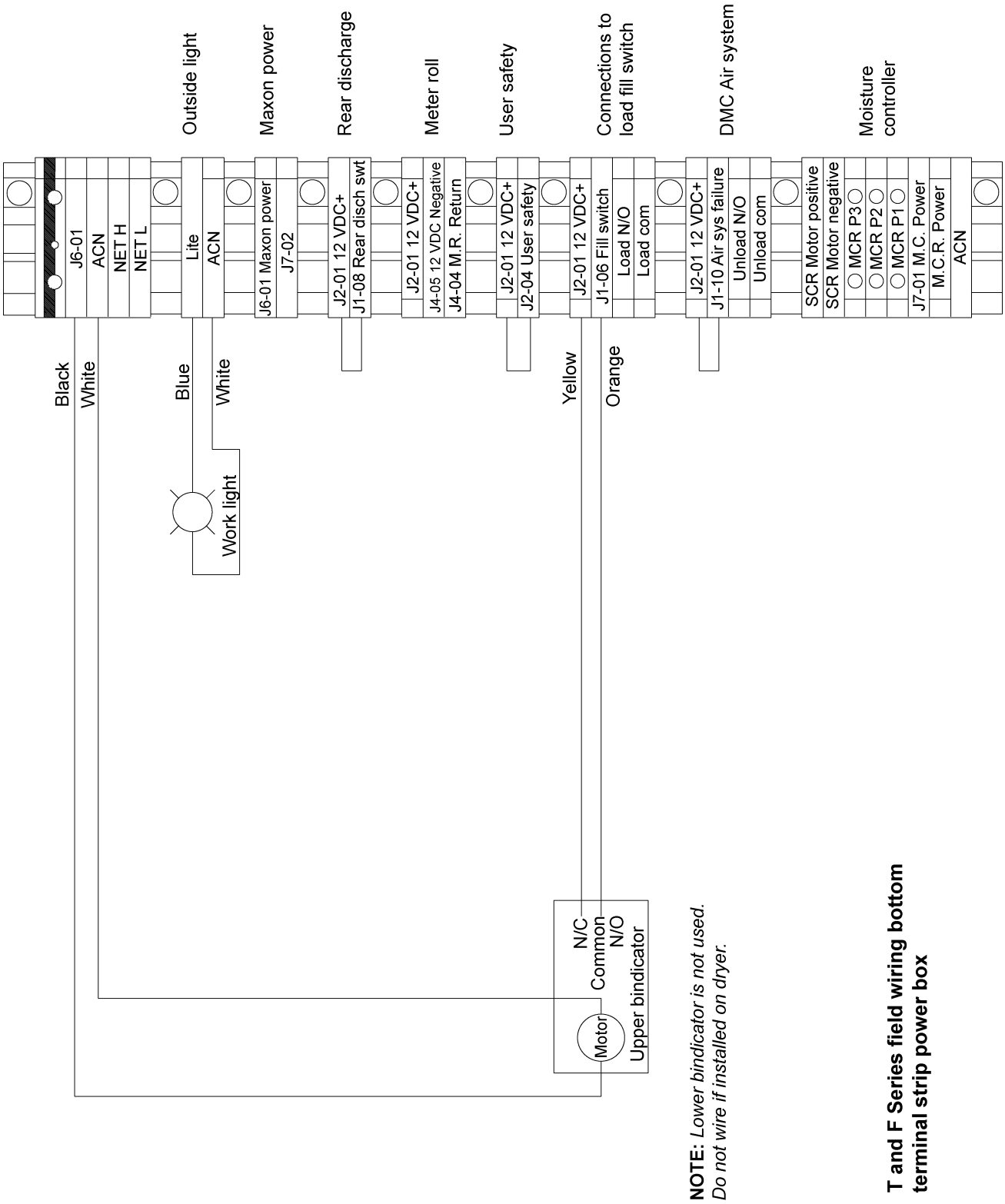
Main Input/Output Power Box Wiring



Top Terminal Strip Power Box



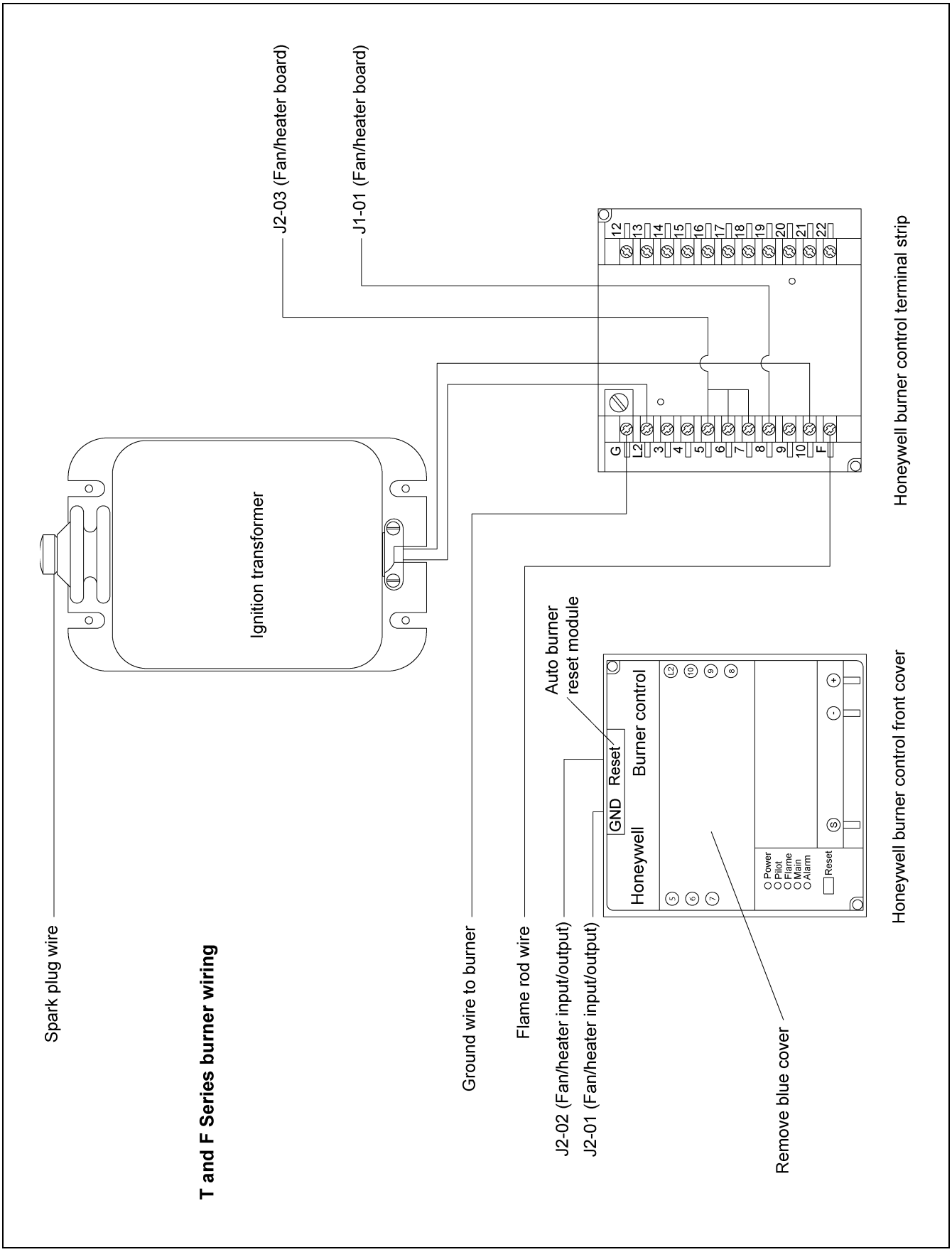
Bottom Terminal Strip Power Box



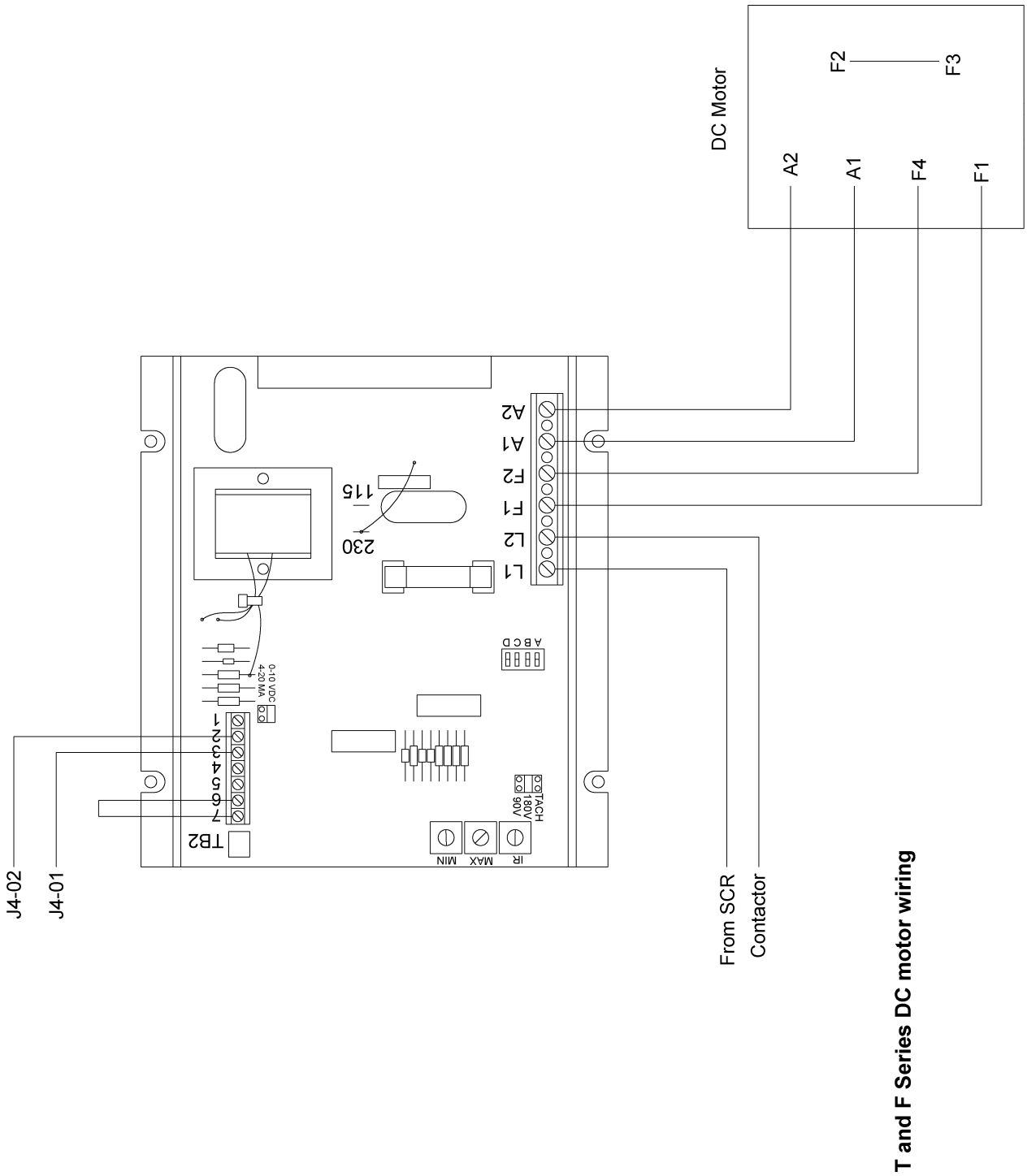
NOTE: *Lower bindicator is not used. Do not wire if installed on dryer.*

T and F Series field wiring bottom terminal strip power box

Burner Control Wiring

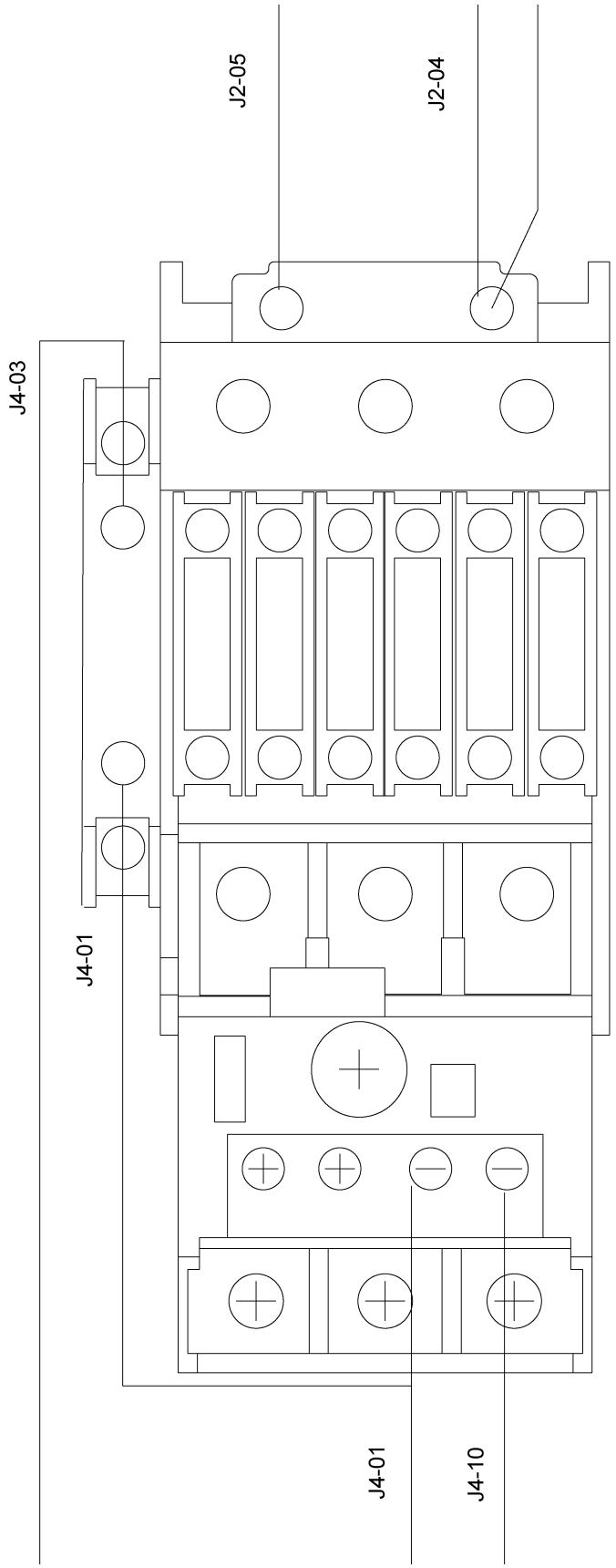


DC Motor Wiring



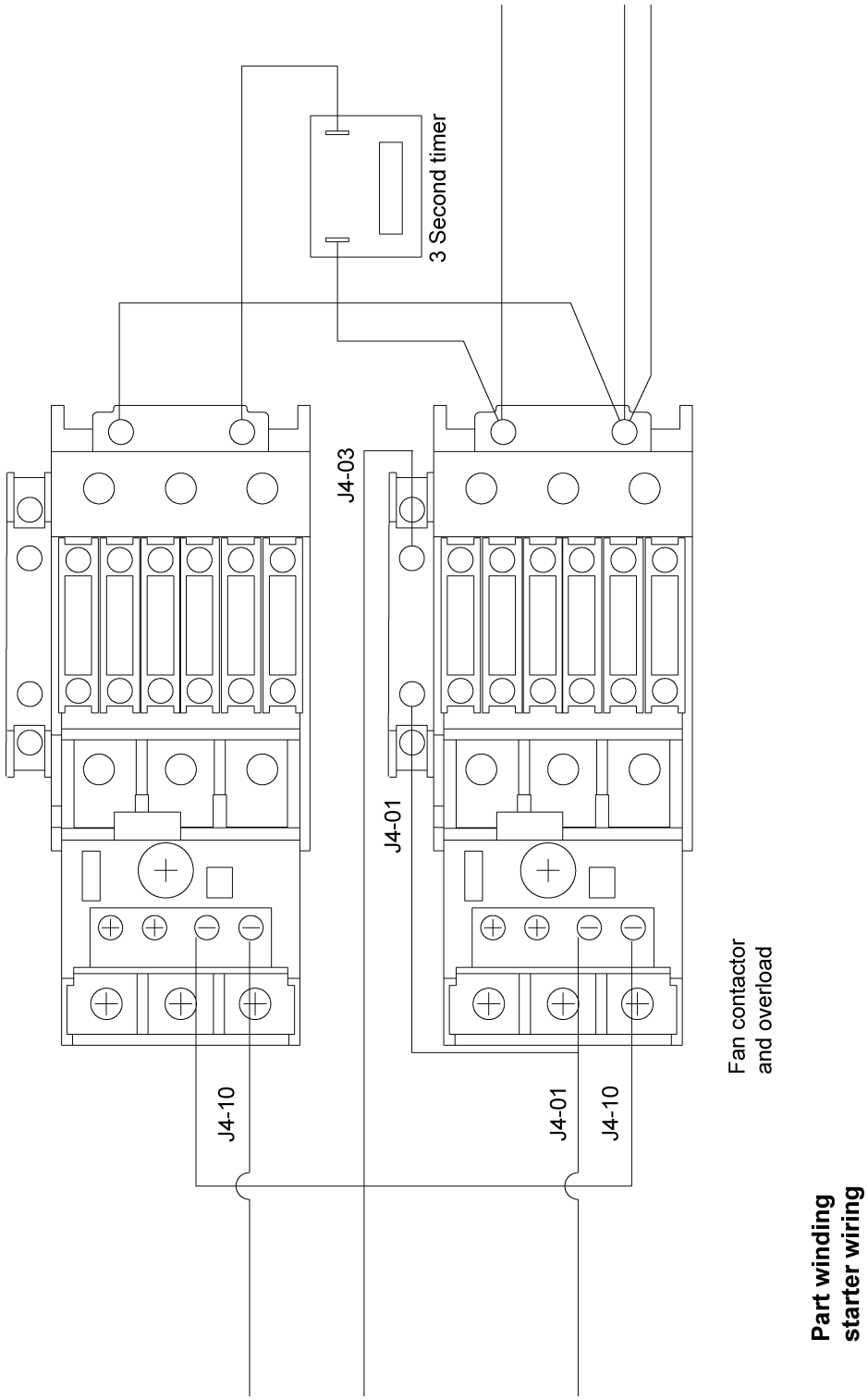
T and F Series DC motor wiring

Fan Contactor and Overload (ACL)



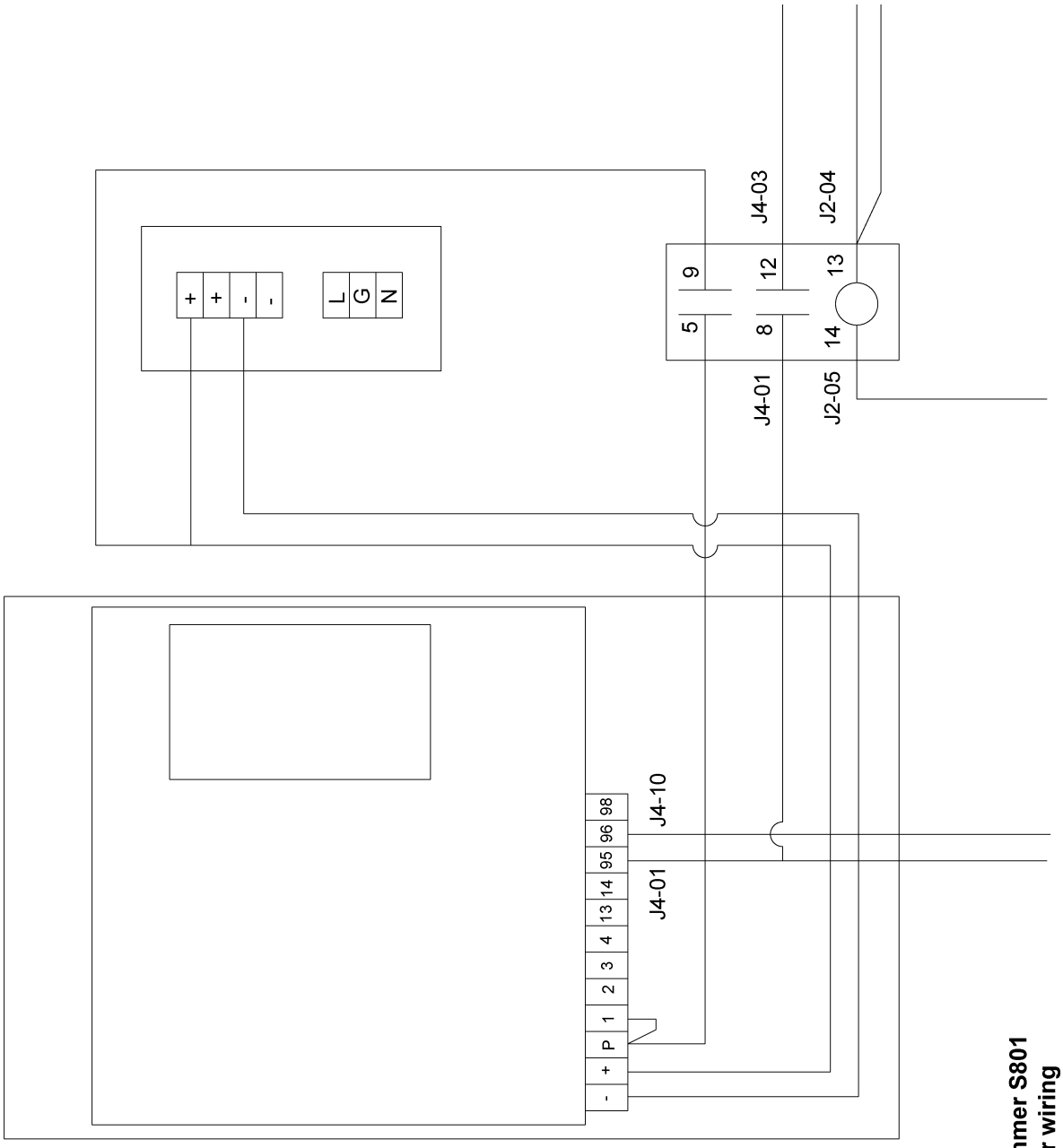
Fan contactor and overload

Fan Contactor Part Winding Starter



Part winding starter wiring

Fan Contactor Soft Starter



Cutler-hammer S801 soft starter wiring

NOTES

GSI GROUP

Limited Warranty

The GSI Group, LLC. ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

Warranty Extensions: The Limited Warranty period is extended for the following products:

	Product	Warranty Period
AP Fans and Flooring	Performer Series Direct Drive Fan Motor	3 Years
	All Fiberglass Housings	Lifetime
	All Fiberglass Propellers	Lifetime
Cumberland Feeding/Watering Systems	Feeder System Pan Assemblies	5 Years **
	Feed Tubes (1.75" & 2.00")	10 Years *
	Centerless Augers	10 Years *
	Watering Nipples	10 Years *
Grain Systems	Grain Bin Structural Design	5 Years
Grain Systems Farm Fans Zimmerman	Portable & Tower Dryers	2 Years
	Portable & Tower Dryer Frames and Internal Infrastructure †	5 Years

* Warranty prorated from list price:
0 to 3 years – no cost to end-user
3 to 5 years – end-user pays 25%
5 to 7 years – end-user pays 50%
7 to 10 years – end user pays 75%

** Warranty prorated from list price:
0 to 3 years – no cost to end-user
3 to 5 years – end-user pays 50%

† Motors, burner components and moving parts not included. Portable Dryer screens included. Tower Dryer screens not included.

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12th) month from the date of purchase and continuing until the sixtieth (60th) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation, and/or shipping costs incurred in the performance of this extended warranty.

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (i) PRODUCT MANUFACTURED OR SOLD BY GSI OR (ii) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

This equipment shall be installed in accordance with the current installation codes and applicable regulations which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

GSI GROUP

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