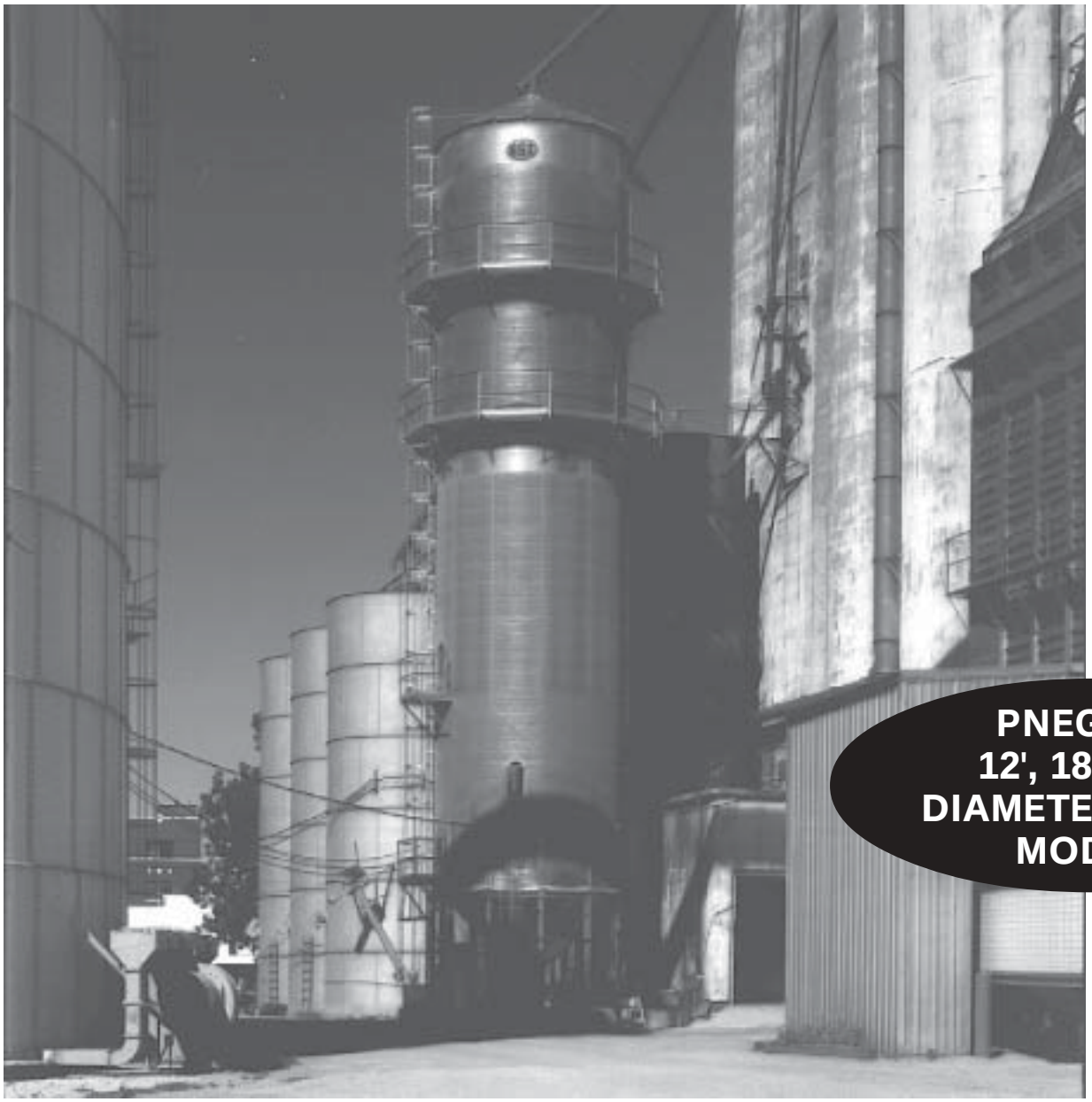
GRAIN SYSTEMS, INC.

1996

TOWER DRYER

OPERATION AND SERVICE MANUAL



PNEG-526
12', 18' & 24'
DIAMETER DRYER
MODELS

GSI

a division of

THE GSI GROUP

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PRIOR TO INSTALLATION, PURCHASER HAS THE RESPONSIBILITY TO RESEARCH AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL CODES WHICH MAY APPLY TO THE LOCATION AND INSTALLATION.

ROOF WARNING, OPERATION & SAFETY

ROOF DAMAGE WARNING AND DISCLAIMER

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

DRYER OPERATION

Thank you for choosing the GSI Tower Dryer. This dryer is one of the finest ever built. It is designed to give excellent performance and service for many years. This manual describes the operation and service for all standard production GSI Tower Dryers. These models are available for vapor propane, fuel oil or natural gas fuel supply, with either three phase 230, 380, 460 or 575 volt electrical power.

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

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

SAFETY ALERT SYMBOL

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

WARNING! BE ALERT!

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

SAFETY ALERT DECALS

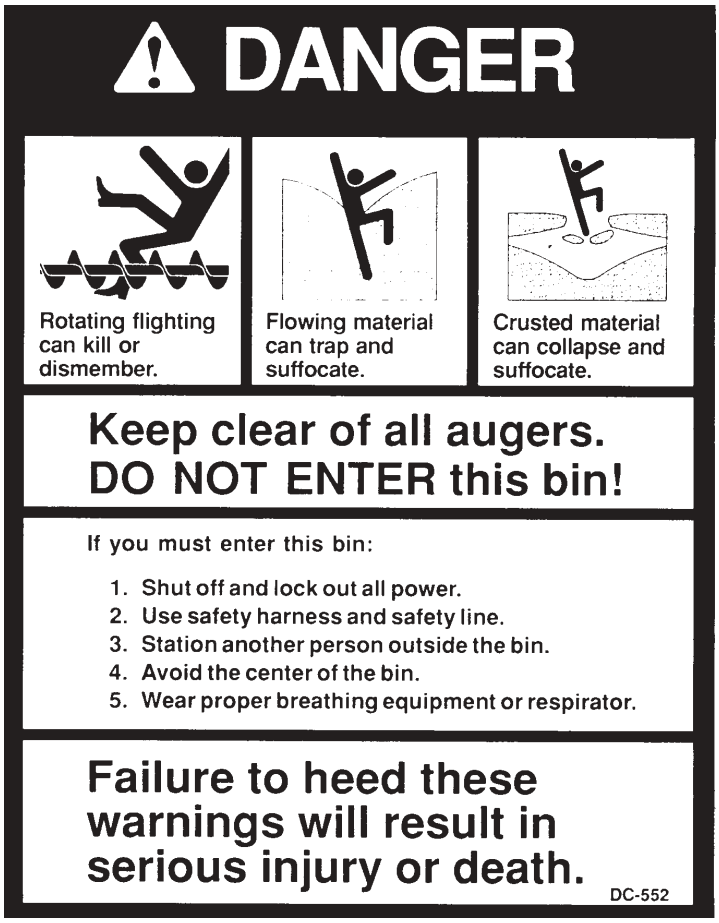
Grain Systems, Inc. recommends contacting your local power company, and having a representative survey your installation so the wiring is compatible with their system, and adequate power is supplied to your unit.

Safety decals should be read and understood by all people in the grain handling area. The top decal should be located on the electrical power box. The bottom decal should be present on the roof manway cover.

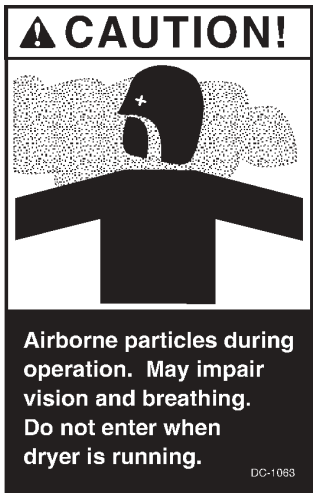
If a decal is damaged or is missing contact:

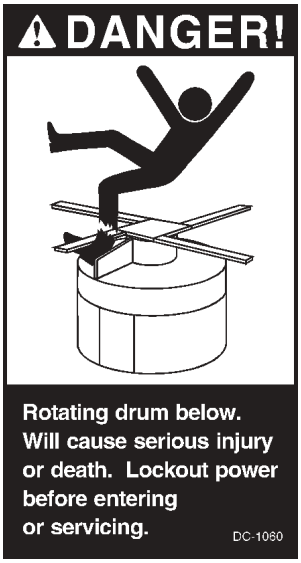
Grain Systems, Inc.
1004 E. Illinois St.
Assumption, IL 62510
217-226-4421

A free replacement will be sent to you.



SAFETY ALERT DECALS & FEATURES



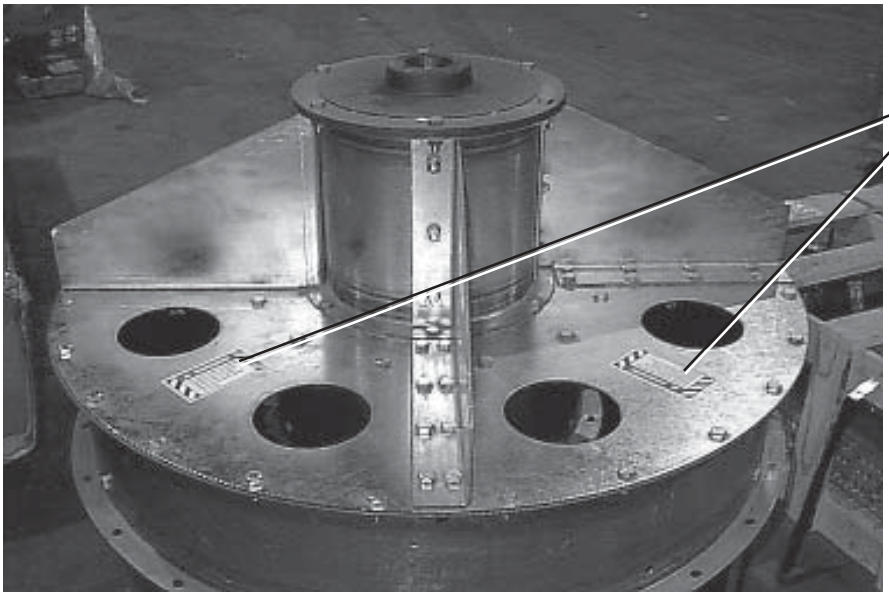


THESE DECALS SHOULD BE VISIBLE ON THE TOWER DRYER. IF THEY ARE MISSING OR DAMAGED, CONTACT GRAIN SYSTEMS, INC. FOR REPLACEMENTS

STANDARD TOWER DRYER SAFETY FEATURES

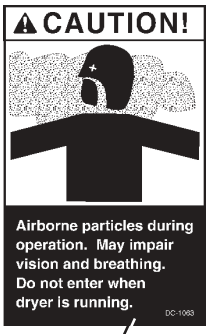
- OSHA type outside ladder and cage
- Walk in doors to blower and burner sections
- Easy access to plenum chamber and sealed metering sections
- Inside ladders and service catwalks
- Alarm lights and horn
- Grain level indication and shut down circuit
- 210° exhaust temperature sensors
- Two Maxon gas shut off valves
- Low fire burner start
- Fully modulated temperature control, (maximum temperature setting 220°F)
- One minute purge cycle and 15 second ignition trial
- Automatic ignition with independent pilot
- Airflow switches
- Starter auxiliary interlocks
- Overload motor protection
- Branch circuit breakers and main circuit breaker

SAFETY ALERT DECAL LOCATIONS

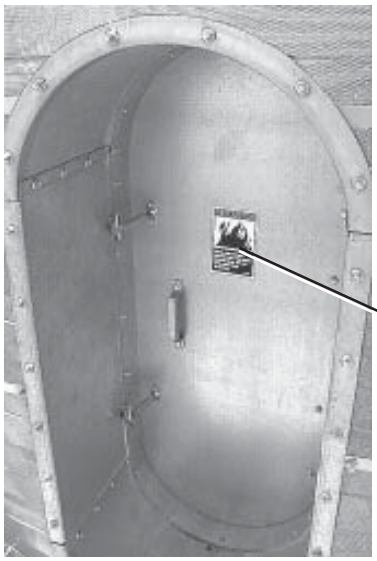


Decal located on metering drum (4).

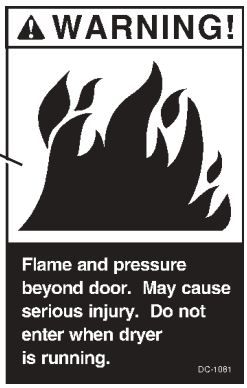
Decal located on hopper service door (2).



Both decals located on cooling section door (1).



Decal located on heat section door (1).



SAFETY PRECAUTIONS

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

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

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

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

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

6. Do not exceed maximum recommended drying temperatures.

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

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

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

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

11. Be certain that capacities of auxiliary conveyors are matched to dryer metering capacities.

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

13. Do not adjust any moving part on the dryer while it is running.

READ THESE INSTRUCTIONS
BEFORE OPERATION AND SERVICE

SAVE FOR FUTURE REFERENCE

USE CAUTION IN THE OPERATION OF THIS EQUIPMENT

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

Use extreme caution in working around high speed fans, gas-fired heaters, augers and auxiliary conveyors.

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

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

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

GSI TOWER DRYER

Large wet holding garner bin is sealed to help retain grain dust and bees wings

Stainless steel, roll formed, exterior sheeting promotes long dryer life and improved dryer appearance

Heavy-duty overall construction results in an extra rigid structure in a minimum of ground space

Inside and outside safety ladders, cages and catwalks provide safe and easy access to all areas of the dryer

Reducer cone equalizes air velocity past burners for optimum combustion and provides step-in access to burner assembly

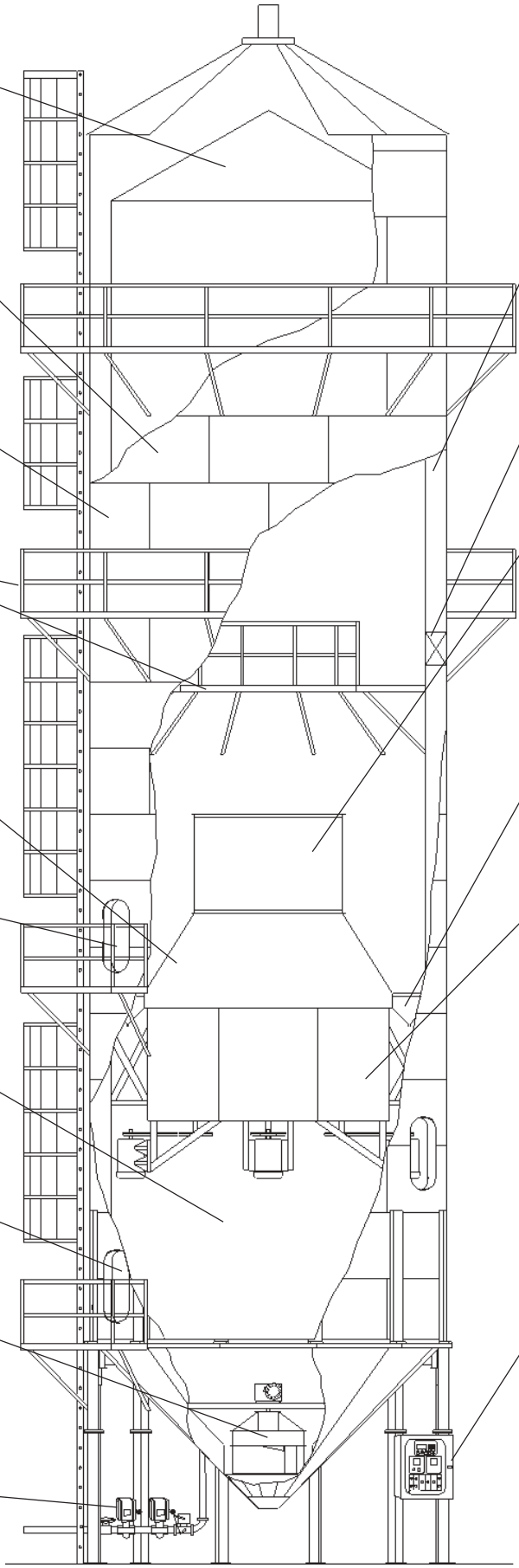
Walk-in heat section provides easy access for interior cleaning

Recycling heat from the cooling grain results in significant fuel savings

Walk-in cool section provides easy access to blowers and metering system

"Patent pending" discharge system provides simple, uniform metering and quick dryer clean out

Industrial quality components (including Maxon valves and burners) ensure years of reliable service



12" wide grain columns and long grain retention times result in high quality, efficiently dried grain

Grain turners in each column ensure even drying

In-line Maxon NP1 series burners provide even heat and efficient combustion from either natural gas or LP vapor (fuel oil burners are optional)

Divider hopper separates the heating and cooling sections while preventing build-up of particulate matter

Internally mounted tubular centrifugal blowers deliver high volumetric airflow to the pressure heat and suction cool sections

Internal mounting provides the added benefit of ultra quiet operation as the surrounding grain creates a natural noise barrier

"Patent pending" Electronic Monitoring Control System provides the most advanced and reliable dryer control on the market

Weather-proof NEMA IV cabinets and NEMA rated electrical components ensure safe and reliable operation in all conditions

INSTALLATION REQUIREMENTS

ELECTRICAL

The dryer can be furnished to operate off of 240, 480 or 575 volt, 60 Hz power or 380 volt, 50 cycle power. The dryer is furnished with a power panel equipped with a main circuit breaker disconnect and motor starters and branch breakers for the individual blower motors. Standard blower motor starting is across-the-line starting. When necessary, the dryer can be equipped with optional soft-start motor starting equipment.

No dry grain conveyor is furnished with the dryer, however, a size #1 motor starter for a dry grain conveyor is furnished in the control panel. If the dryer is ordered with a demand fill, a size #1 motor starter is also provided in the control panel to operate a wet conveyor.

GSI personnel will perform all necessary dryer wiring from the power panel to the dryer. The customer is responsible for bringing electrical power into the main circuit breaker and also for wiring the unload (and load) conveyor.

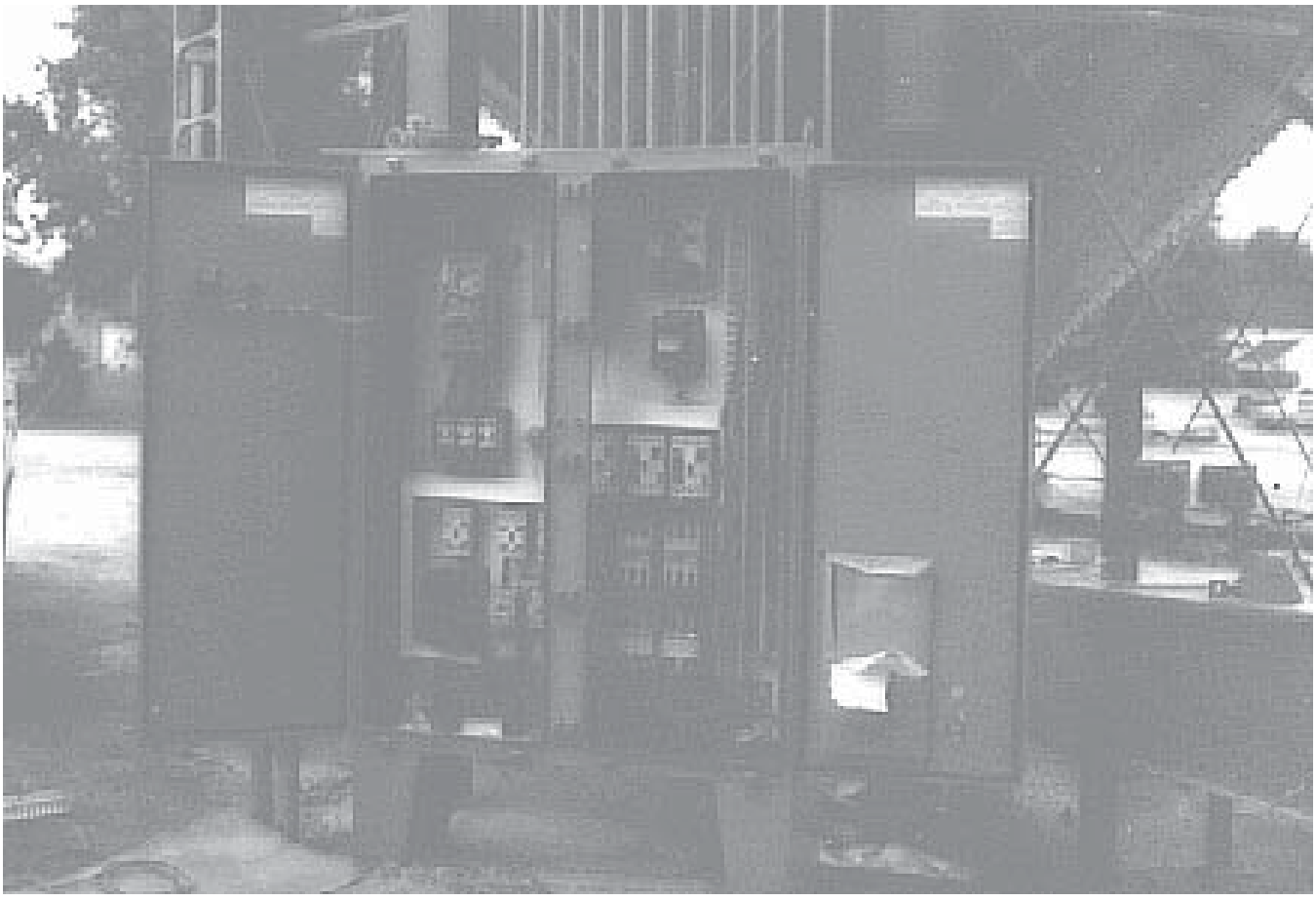
A wiring diagram is furnished for each particular dryer. Extensive safety controls are used on the dryer for equipment and personnel protection and should not be by-passed.

FUEL

The burner is designed to burn either natural gas or propane vapor fuel. The volume of fuel supplied must be sufficient to maintain a minimum of 7 to 10 psi pressure when the burner is operating at rated capacity.

When propane is used as the fuel source, external propane vaporizers must be used in order to supply vapor gas to the dryer. Vaporizers must be sized to the burner capacity of the dryer. Fuel pressure to the dryer must be regulated to approximately 10 psi.

GSI personnel will plumb all necessary gas piping from the dryer's gas shutoff valve to the burner. The customer must provide fuel to the gas shutoff valve.



The electrical box on the GSI Tower Dryer.

DRYER CONTROL PANEL

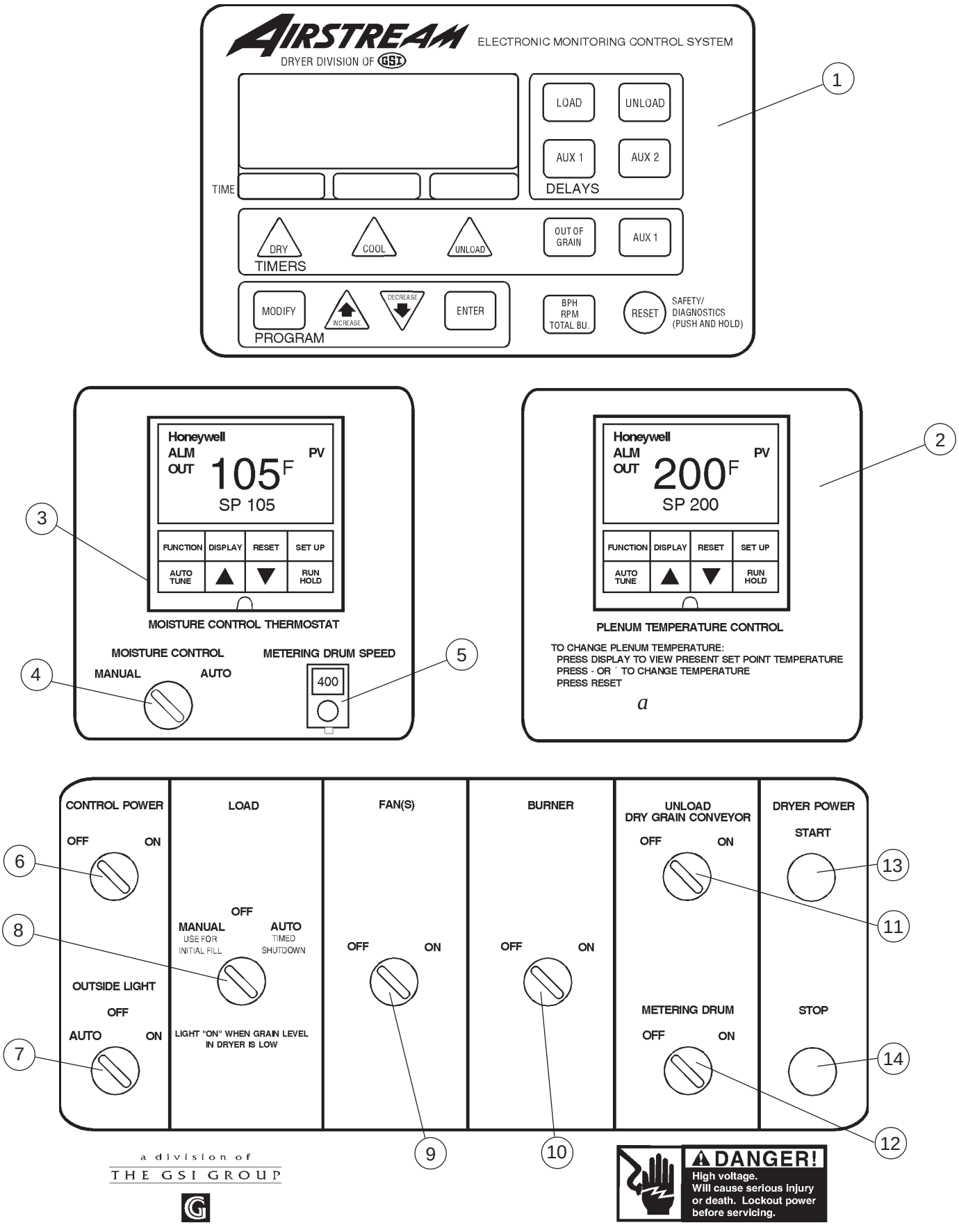


Figure 1: The grain dryer control panel with the Electronic Monitoring Control System in the upper panel.

DRYER CONTROL PANEL FEATURING THE ELECTRONIC MONITORING CONTROL SYSTEM

1. **ELECTRONIC MONITORING CONTROL SYSTEM** controls all the dryer's timing functions and safety circuit checks. It is designed to simplify dryer operation by providing messages and warnings on its liquid crystal display (LCD).

2. **PLENUM TEMPERATURE CONTROL** controls and indicates drying temperature.

3. **MOISTURE CONTROL THERMOSTAT** controls the metering drum discharge speed automatically based on grain moisture content when the dryer's MOISTURE CONTROL switch is in the "AUTO" mode.

4. **MOISTURE CONTROL SWITCH** is used to select automatic control or manual control of the metering drum speed.

5. **METERING DRUM SPEED** controls the speed of the metering drum when the dryer's MOISTURE CONTROL switch is in the "MANUAL" mode.

6. **CONTROL POWER SWITCH.** The power to the control panel and the Electronic Monitoring Control System is turned on or off with this switch.

7. **OUTSIDE LIGHT SWITCH.** A dryer service light can be turned on or off with this switch. It also may be set on "AUTO", which turns the light on while the dryer is running, and off if a shutdown occurs.

8. **LOAD SWITCH** controls the filling of the dryer in the following manner:

   On dryers filled on demand with a conveyor: In both the "MANUAL" and "AUTO" position the fill conveyor will operate if the dryer is low on grain. In the "AUTO" position only, the dryer will automatically shut down after a preset period of time set on the OUT OF GRAIN timer if the dryer goes low on grain. In both the "MANUAL"and "AUTO" position the conveyor will automatically turn off when the dryer gets full of grain. Use the "MANUAL" position to initially fill the dryer. The "OFF" position on the switch turns the conveyor off.

   On dryers filled on demand with a slide gate: In both the "MANUAL" and "AUTO" position the fill slide gate will open if the dryer is low on grain. In the "AUTO" position only, the dryer will automatically shut down after a preset period of time set on the OUT OF GRAIN timer if the dryer goes low on grain. In both the "MANUAL" and "AUTO" position the slide gate will automatically shut when the dryer gets full of grain. Use the "MANUAL" position to initially fill the dryer. The "OFF" position on the switch also shuts the slide gate.

   On choke filled dryers: In the "AUTO" position **only**, the dryer will automatically shut down after a preset period of time set on the OUT OF GRAIN timer if the dryer goes low on grain. In both the "MANUAL" and "OFF" position the OUT OF GRAIN timer is turned off.

   The light inside the switch is on whenever the grain level in the dryer is low (below the low level grain indicator).

9. **FAN(S) SWITCH** turns the blower(s) on or off. The light inside the switch turns on when the blower airflow switch(s) close indicating that the blowers are operating.

10. **BURNER SWITCH** turns the burner on or off. When the switch is turned on, the dryer automatically goes through a 60 second purge cycle followed by the automatic lighting of the burner pilot. The main burner can be fired by cocking the Maxon shutoff valves after the pilot light is lit. The light inside the switch turns on whenever flame is sensed at the pilot.

11. **UNLOAD DRY GRAIN CONVEYOR SWITCH** turns the unload conveyor off or on. The light in the switch illuminates when the conveyor is operating.

12. **METERING DRUM SWITCH** turns the metering drum off or on. The light in the switch illuminates when the conveyor is operating.

13. **DRYER POWER START BUTTON** energizes the control circuit on the dryer. When depressed, the dryer will start up and operate based on the switch positions of the other selector switches on the control panel. If the other switch settings are in the off position, individual dryer components can be operated by first depressing the DRYER POWER START button and then turning on the individual dryer components.

14. **DRYER POWER STOP SWITCH** stops all dryer functions. (**Important:** In the case of an automatic dryer shutdown, the DRYER POWER STOP button must be depressed to reset the dryer control circuit before the dryer can be restarted).

DRYER START UP

1. Before attempting to operate the dryer make sure all emergency discharge doors, grain exchanger clean out doors, louvered cooling section doors and the heat section door are closed. It is very important that the round hopper access door be closed and snapped into place before starting the dryer's blowers. Make sure that all personnel are clear of the dryer and any grain handling machinery.

2. Open main gas valve to dryer.

3. Provide electrical power to the dryer by placing the main circuit breaker handle located on the dryer power panel to the "ON" position.

4. Turn on power to the control panel by turning the CONTROL POWER selector switch to the "ON" position. The light inside the selector switch will illuminate indicating that the control panel has power. The LCD display screen on the Electronic Monitoring Control System will light up and display a copyright message followed a few seconds later by a second display screen giving the date and time.

5. Press the RESET button on the Electronic Monitoring Control System. (**IMPORTANT!!!** The RESET button must always be pressed anytime the Electronic Monitoring Control System is initially powered up.) Once the RESET button is pressed, the Electronic Monitoring Control System performs a dryer safety check. If a fault is found, the cause of the fault will be displayed on the LCD screen. If the dryer checks out, the dryer can be started and the dryer status will be displayed on the LCD screen.

6. Activate the selector switches on the control panel by pressing the DRYER POWER "START" button.

7. To initially fill the dryer, turn on necessary wet legs and conveyors and then turn the LOAD selector switch to the "MANUAL" position. On a demand fill dryer, either a wet conveyor will start operating or a slide gate will open and the dryer will start filling. Once the dryer is full, the dryer horn will sound to indicate that the dryer is full and on demand fill dryers the fill conveyor will stop or the fill slide gate will shut. Turn the LOAD selector switch to the "AUTO" position to silence the alarm and for normal dryer operation. In the "AUTO" position a shutdown timer is activated so that the dryer will automatically shut down should the dryer go low on grain after a preset period of time. The light in the LOAD selector switch illuminates whenever the grain level in the dryer is low.

8. Start the blower(s) by turning the FAN(S) selector switch to the "ON" position. The blower(s) will automatically start. On multi-blower units the Electronic Monitoring Control System will automatically, sequentially start the blowers. Once the blower(s) are up to speed, the light inside the switch will illuminate indicating that the blower airflow switches are sensing airflow.

9. Start the burner by turning the BURNER selector switch to the "ON" position. The dryer will automatically go through a 60 second purge period. The amount of time remaining on the purge cycle will be displayed on the LCD display screen. After the purge period the burner pilot will automatically light. Once the flame sensing circuit on the dryer senses flame, the light in the BURNER selector switch will illuminate.

10. After the pilot is ignited, the main burner can be lit by cocking and opening the two Maxon gas shutoff valves. The main burner will light and the dryer's plenum temperature will be automatically controlled and maintained at the preset selected temperature.

11. To discharge grain from the dryer first make sure all dry legs and conveyors are operating ahead of the dryer. Turn the UNLOAD DRY GRAIN CON-

VEYOR selector switch to the "ON" position to operate the conveyor leading from the dryer. Turn the METERING DRUM selector switch to the "ON" position to start grain discharging from the dryer.

12. To *manually* adjust the grain discharge rate from the dryer, the MOISTURE CONTROL selector switch must be in the "MANUAL" position. The METERING DRUM SPEED dial is used to speed up or slow down the speed of the metering drum, and thus the grain discharge rate from the dryer. The speed of the metering drum in RPM's is shown on the LCD display screen.

13. To use the *Automatic Moisture Control* to control the grain discharge rate from the dryer, follow the steps below:
    a. Manually operate the grain discharge rate.

    b. After the discharge moisture has stabilized at the desired moisture content for 20 to 30 minutes, note the grain temperature indicated on the MOISTURE CONTROL THERMOSTAT (usually 100° to 120°F).

    c. Adjust the set point on the MOISTURE CONTROL THERMOSTAT to equal this grain temperature reading by using the up or down keys located on the thermostat.

    d. Turn the MOISTURE CONTROL selector switch to the "AUTO" position. The MOISTURE CONTROL THERMOSTAT will automatically control the metering drum speed to try to maintain the same grain temperature (and grain moisture).

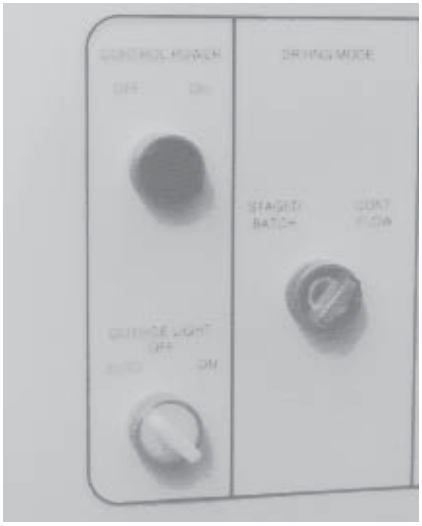
    e. After the *Automatic Moisture Control* is initially set up using the above steps, future setups will not be required. When the dryer is restarted following an extended shutdown, manually operate the discharge rate from the dryer until the grain temperature has warmed to the set point temperature indicated on the thermostat. Then, turn the MOISTURE CONTROL selector switch to the "AUTO" position for automatic operation.

    f. If grain is consistently discharging the dryer at too high a moisture content, increase the set point temperature on the MOISTURE CONTROL THERMOSTAT (5°F increase = 1 moisture point decrease). If grain is consistently discharging the dryer at too low a moisture content, decrease the set point temperature on the MOISTURE CONTROL THERMOSTAT (5°F decrease = 1 moisture point increase).

14. To set drying air (plenum) temperature use the PLENUM TEMPERATURE CONTROL. The larger digits on the controller indicate the actual plenum temperature and the small digits indicate the set point temperature (drying temperature you desire). To change the drying temperature press the up or down keys on the controller to create a new set point.

RECOMMENDED DRYING TEMPERATURES

Corn.....180° to 210°F
Soybeans.....140° to 160°F
Wheat.....140° to 160°F
Milo.....160° to 180°F
Barley.....140° to 160°F
Oats.....140° to 160°F



The work light switch can indicate a dryer shutdown.

DRYER SHUTDOWN

1. For short shutdown periods, the dryer can be shutdown by pushing the DRYER POWER "STOP" button. To restart the dryer, push the DRYER POWER "START" button. The Electronic Monitoring Control System will restart the dryer automatically based on selector switch settings.

2. For longer shutdown periods such as an overnight shutdown, first turn off the burner by turning the BURNER selector switch to the "OFF" position.

3. Continue to operate blowers for approximately 10 minutes to cool grain off. To avoid overdried grain upon restarting the dryer, continue to move grain through the dryer during the cooling off period.

4. Turn off the metering drum, unload conveyor, and blower(s).

5. Turn the CONTROL POWER selector switch to the "OFF" position to turn power off at the control panel.

6. Turn off main circuit breaker located on the power panel.

7. Close main gas valve to the dryer.

8. Always inspect the inside of the dryer (heat section and cooling section) after operation to insure against the possibility of hot spots or fires.

The lighted start switch indicates that the dryer is operational.

ELECTRONIC MONITORING CONTROL OPERATION

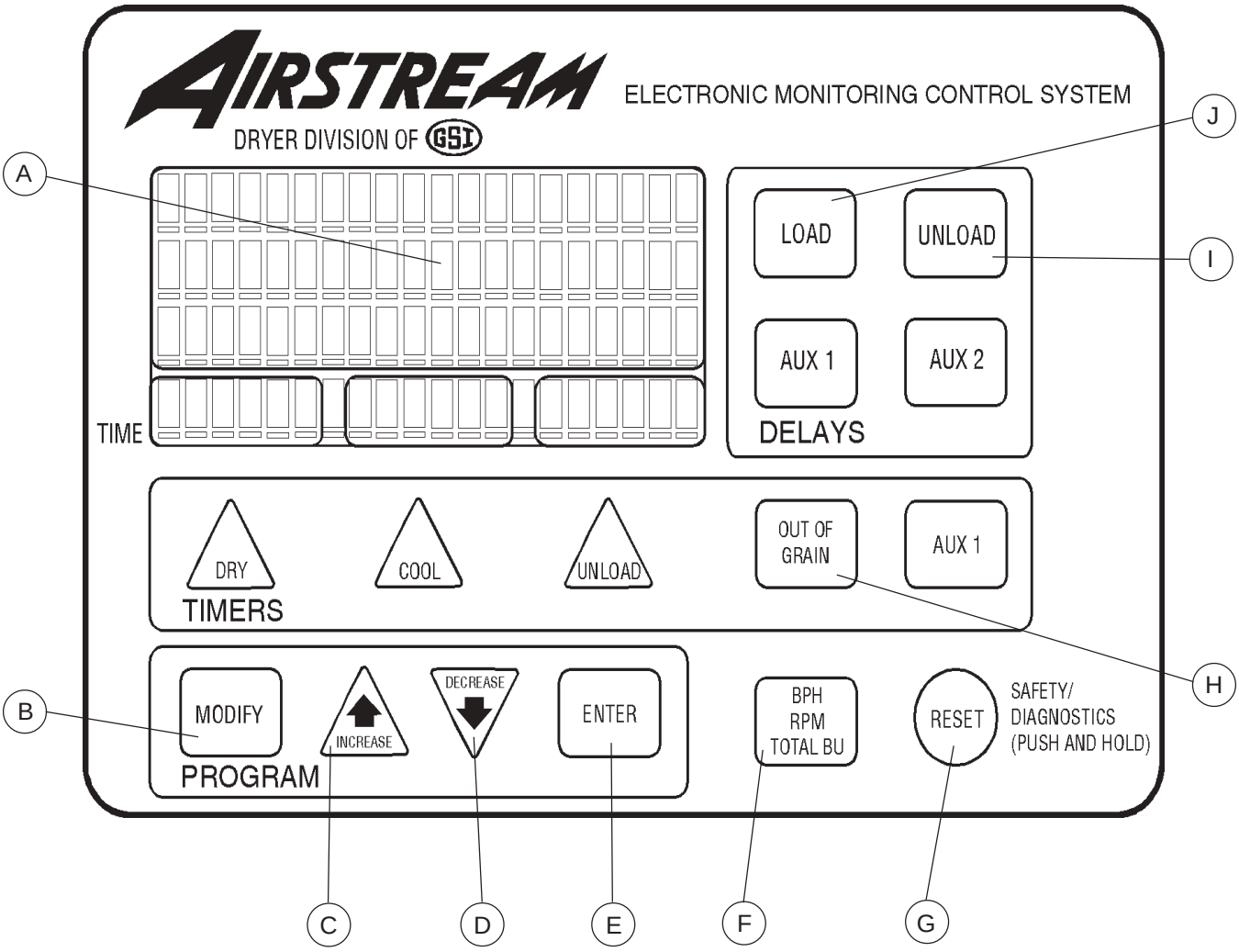


Figure 2: The computerized Electronic Monitoring Control System.

The *Electronic Monitoring Control System* (Figure 2) controls all dryer timing functions and safety circuit checks. It is designed to simplify dryer operation by providing the dryer operator with printed prompts, messages and warnings on its large liquid crystal display (ref. A). The *Electronic Monitoring Control System* is used on several different GSI product lines, therefore not all of the touch pad buttons are used on the Tower Dryer. Many of the features of the system are preprogrammed at the factory or will be setup by GSI service personnel upon initial dryer start-up, but the following items can be accessed by the dryer operator:

TURNING ON THE *ELECTRONIC MONITORING CONTROL SYSTEM*

To energize the *Electronic Monitoring Control System* turn the CONTROL POWER switch located on the control panel to the "ON" position. The LCD display screen (ref. A) on the monitor will display a copyright message and then a few seconds later a second screen will display the current time and date. To activate the controller press the RESET button (ref. G).

THE *ELECTRONIC MONITORING CONTROL SYSTEM* DISPLAY SCREEN

During dryer operation, the status of the blower(s) and burner are displayed on the top line of the display screen. The metering drum speed in RPM's is displayed on the third line of the display screen.

ELECTRONIC MONITORING CONTROL OPERATION

SETTING THE OUT OF GRAIN TIMER

The OUT OF GRAIN timer (ref. H) automatically shuts off the dryer after the period of time set on the timer, should the dryer run low on grain. To utilize this feature, the LOAD switch on the control panel must be in the "AUTO" position. To change the setting of this timer do the following:

1. Press the OUT OF GRAIN button (ref. H).
2. Press the MODIFY button (ref. B).
3. Press the INCREASE or DECREASE buttons to change the setting (ref. C or ref. D).
4. Press the ENTER button to enter the new setting into the controller (ref. E).

Note: After the OUT OF GRAIN button is pressed, screen messages on the LCD display of the *Electronic Monitoring Control System* will direct the dryer operator through the proper sequence for setting the timer).

SETTING THE LOAD AND UNLOAD DELAYS

The LOAD delay (ref. J) is used to delay the starting of a load conveyor or the opening of a slide gate when the dryer fill switch is activated. The UNLOAD delay (ref. I) is used to delay the stopping of the unload conveyor after the metering drum stops to allow the unload conveyor to empty out. Both the LOAD and UNLOAD delays are set using the same procedure as the OUT OF GRAIN timer.

UTILIZING THE BUSHEL COUNTER

By pressing the BPH/RPM/TOTAL BU button (ref. F), the third line of the display will toggle between showing either the metering drum RPM's, give the bushel per hour rate that the metering drum is currently removing grain from the dryer at, or give the total bushels dried since the bushel counter was last reset. To reset the bushel counter, press and hold the RESET button (ref. G) for five (5) seconds. Follow the instructions displayed on the LCD display for resetting the counter.

MODIFYING THE BUSHEL PER HOUR FACTOR

The bushel per hour reading given by the *Electronic Monitoring Control System* is a calculated value based on metering drum speed. Due to variations in grain test weight and the adjustment level of the metering drum baffles, the *Electronic Monitoring Control System* may need to be calibrated so that the calculated grain flow rate agrees with the actual rate. To adjust the correction factor, press and hold the BPH/RPM/TOTAL BU button (ref. F) for five (5) seconds. Follow the instructions displayed on the LCD display for adjusting the bushel per hour factor. (The bushel per hour factor is normally set at 1.0. If, for example, the actual grain flow rate is 5 percent higher than what is displayed, change the bushel per hour factor to 1.05).

DISPLAYING THE DRYER HOUR METER

By pressing the INCREASE button (ref. C) the total hours of dryer operation are displayed on the LCD screen. The screen will revert back to its original mode after a few seconds.

DRYER SAFETY CIRCUIT

The *Electronic Monitoring Control System* continuously monitors all safety circuits on the dryer and will automatically shut the dryer down should a problem occur. The cause of the dryer shutdown will immediately be displayed on the LCD display (ref. A) and an audible horn on the dryer will sound. To silence the horn turn the CONTROL POWER switch to the "OFF" position. To restart the dryer after a safety shutdown, first correct the reason for the shutdown and then turn the CONTROL POWER switch to the "ON" position. The dryer can be restarted by pressing the DRYER POWER "START" button.

DISPLAYING THE DRYER SAFETY SHUTDOWN LOG

By pressing the INCREASE button and DECREASE button (ref. C and ref. D) simultaneously, a log of the past 25 dryer safety shutdowns will be displayed on the LCD screen. Follow the instructions displayed on the screen for accessing the shutdown log.

ELECTRONIC MONITORING CONTROL SYSTEM MESSAGES

All of the possible dryer safety shutdown messages that appear on the LCD display of the Electronic Monitoring Control System are listed in the TROUBLESHOOTING section of this manual.

MAINTENANCE

PRE-SEASONAL INSPECTION AND SERVICE

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

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

2. Lubricate the blowers and metering system as outlined in the Lubrication Table below.

3. Check blower belts for proper tension, and adjust if necessary.

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. After a period of several years, it may become necessary to drill out the burner ports to clear away accumulated rust. Use a #47 drill bit to return burner ports to their original diameter.

5. Check electrical connections at both the flame rod and spark plug. Clean spark ignitor.

6. Lubricate linkage on gas modulating valve. Make sure drain valve in the fuel train is open at all times except when the dryer is operational.

LUBRICATION TABLE

LOCATION	INSTRUCTIONS	TYPE OF LUBRICATION	LUBRICATION INTERVAL
Metering drum drive shaft bearing.	Lubricate slowly until lub shows through seal. Wipe clean.	High quality, grade #2 lithium based grease.	Beginning of season (annually).
Blower shaft bearings.	Lubricate bottom bearing slowly counting the grease gun pumps until lub shows through the seal. Wipe clean. Use same number 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[1].	High quality, grade #2 lithium based grease.	Every 2 years (Normal operation, every 8-10 months continuous operaton).
Metering drum drive motor.	See motor lubrication procedure below[1].	High quality, grade #2 lithium based grease.	Every 2 years (Normal operation, every 8-10 months continuous operaton).
Metering drum gearbox.	Fill to check plug.	EP Gear Oil (Amoco Permagear (R) EP (220)) or equivalent.	Beginning of season. (Change every 2 years).

[1]**Lubrication of motors--**Operate motors for 20 minutes. Clean grease fitting. Remove grease relief plug and using a low pressure grease gun, pump in the required grease. After relubricating, allow motor to run for 10 minutes before replacing relief hardware. *Do not overgrease!*

SEASONAL INSPECTION AND SERVICE

1. The hopper access door 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.

2. Follow lubrication guides as outlined in the Lubrication Table.

3. Do not let grain fines and dust accumulate inside the dryer. Biweekly if drying most products or daily if drying milo, clean the cooling chamber floor of fines and dust. Sweep down the cool ing section sheets if necessary. Fines can be swept into the hopper. Make sure that the hopper divider that separates the heat section from the cooling section remains clean and open.

4. When cleaning dryer, check the grain discharge area around the metering drum to insure that grain is flowing freely from each column and that there is no trash build-up. Also, sweep accumulated dust off of the metering drum drive motor and gearbox.

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 not wet grain sticking to the roof that could restrict grain flow.

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 the 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. Try to keep them from chopping holes in the dryer.

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 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 insure a clean burner for the next drying season.

TROUBLESHOOTING

TROUBLE ANALYSIS PROCEDURE

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

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

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

Problem	Possible Cause
Control power switch light off.	1. Check that main power and circuit breakers are turned on. Check for tripped breaker. 2. Check for blown 5 amp fuses. 3. Defective transformer or wiring. 4. Check for a defective power switch. 5. Check wiring between fuses and input/output board. Refer to wiring diagram for test locations.
No display on LCD screen.	1. Check for a defective power switch. 2. Check wiring between fuses and input/output board. 3. Check for 120 volts A. C. between points J9-3 and AC-1. 4. The display may have a malfunction requiring its replacement.
Control power light is on, drying mode light is on--load auger, fan, heater, unload auger will not operate.	1. **Press the dryer power** start button. 2. Refer to the problem listed for load auger, fan heater and unload auger in the following sections.
Display shows **"L1 VOLTAGE LOST"** message.	The left circuit breaker located on the input/output board of the Electronic Monitoring Control System has tripped, or one of the hardware timers on the Electronic Monitoring Control System has shut down the dryer.
Display shows **"12 VOLT POWER SUPPLY WARNING"** message.	The right circuit breaker located on the input/output board of the Electronic Monitoring Control System has tripped.
Display shows **"_____ OVERLOAD"** message. Indicating either a fan, unload or load motor overload is tripped.	The thermal overload on the fan motor, load motor, unload motor or an auxiliary motor has opened indicating an overloaded motor. (The overloads must be manually reset).
Display shows **"LOSS OF FLAME"** message.	The flame sensor has failed to detect a pilot flame, indicating that the burner has failed to light, there is a problem with the flame sensing circuitry or the dryer is not getting burner fuel.
Burner pilot lights but goes out before Maxon Valves are cocked.	1. Operator is waiting too long to cock Maxon Valve to light main burner. (Maxons must be cocked within 60 seconds after establishing a pilot. 2. Pilot regulator pressure needs to be adjusted to achieve a more stable pilot flame.

TROUBLESHOOTING

Problem	Possible Cause
Pilot lights. Cocked and opened the main gas valve, but main burner will not come on.	1. The handle on the Maxon main gas shutoff valves should offer some resistance when they are opened. If they don't, check the latching solenoid inside the valve by removing the cover from the side of the valve opposite the handle. The solenoid should energize when a pilot is established. If it does not, check for faulty electrical connections or a faulty solenoid. 2. Check for water in the gas line by opening drain valve. 3. Check the hand valve in feed back line to the main gas regulator. It should be partially open. 4. Check for a broken or stuck butterfly in the gas butterfly valve.
Dryer will not reach operating temperature, or it reaches it slowly.	1. Low gas pressure. Increase gas pressure on main gas regulator. 2. Check for water in gas train by opening drain valve. 3. Make sure dryer is completely full of grain by entering the heat plenum and looking for daylight in one of the grain columns. 4. Gas parts in burner need to be cleaned. Clean by drilling with a #47 drill bit. 5. Make sure that the gas butterfly valve is being driven wide open by the modulating motor. If not, check motor or motor linkage.
Display shows **"OUT OF GRAIN"** message.	The dryer has run low on grain, and the out of grain timer has timed out shutting the dryer down. Check the out of grain timer setting, and if necessary adjust. Also, before restarting, inspect load equipment for possible damage or adjustment.
Display shows **"PLENUM HIGH TEMPERATURE"** message. Check that columns are flowing.	An over temperature condition has occurred inside the dryer plenum. This is an adjustable high limit with the controls mounted in the cooling section.
_____ exhaust high limit indicates either the **"UPPER, MIDDLE, LOWER OR EXHAUST HIGH LIMITS"** have tripped causing a dryer shutdown.	Check for plugged column, dryer is low on grain or a column hot spot.
Display shows **"BLOWER _____ INTERLOCK"** message.	Check contactor-wiring on interlock. The contacts on the side of the specified fan contactor have failed to close when the fan was turned on. This may indicate a problem with the contactor.
Display shows **"NO AIRFLOW BLOWER"** message.	Indicates the specified blower has failed to show airflow during the preset period of time. 1. Check airflow switch and tubes. 2. Check wiring to airflow switches. 3. Check belts on blowers, and blower wiring and motors.

TROUBLESHOOTING

Problem	Possible Cause
Display shows **"USER UNLOAD IS OFF"** message.	The user supplied unload that the user has wired to the dryer component has stopped. This will shutdown the dryer after 10 minutes. Check auxiliary user supplied unload equipment.
Display shows **"LOSS OF AIRFLOW"** message.	The airflow switch contacts have opened, indicating insufficient airflow for burner to operate.
Blower motor(s) will not start.	1. Check that the fan circuit breaker and the fan switch are on. Also, check for defective switch or bad wiring connections. 2. If lighted switch does not light, an air switch needs adjustment, or the bulb may be burned out. 3. Verify closing of fan motor contactor. Check voltage on load side of contactor. See appropriate power wiring circuit diagram for terminal numbers. Inspect contactor for defective points or a burned out coil. 4. Inspect connections, and check voltage applied to the motor leads to determine if the motor is defective. 5. If motor starts slowly, check for low voltage during starting due to excessive voltage drop in power supply wiring.
Wet conveyor will not start.	1. Check that the load breaker and the load auger switch are turned on. 2. If switch does not light, the output power to the contactor is missing. Check connections, or if the bulb is burned out. 3. Verify closing of the wet conveyor contactor. Check voltage on load side of contactor. Inspect contactor for defective points, or a burned out coil. 4. Inspect connections, and check voltage applied to motor leads in motor junction box to determine if motor is defective.
Dry conveyor will not start.	1. Check that the dry conveyor circuit breaker is on. 2. If the switch does not light, the output power to the contractor is missing. Check connections, and check to see if the bulb is burned out. 3. Check that the dry conveyor switch is on. 4. Verify closing of dry conveyor contactor; check voltage on load side of contactor. 5. Check for any loose wire connections in dry conveyor circuits.
Grain not moving through columns.	1. Check the dryer for fine material buildup inside the columns. 2. Avoid leaving the dryer columns full for long periods at a time (2-3 days) while not operating the dryer, or during rainy weather.
Dryer starts losing drying capacity.	1. Dryer not being kept full of grain. 2. Particulate matter has built up on the outside of the dryer and the dryer needs to be cleaned.

TROUBLESHOOTING

Problem	Possible Cause
Grain not moving through columns.	1. Check the dryer for fine material buildup inside the columns. 2. Avoid leaving the dryer columns full for long periods at a time (2-3 days) while not operating the dryer or during rainy weather. 3. Empty the dryer. Keep the dryer clean! Do not allow fine material to gather in the plenum chamber. 4. It may be necessary to open the strike off plates in the affected columns in half inch intervals.
Uneven drying-Some kernels appear brown while others are under dried. Uneven heat exiting from dryer columns.	1. Check plenum thermostat temperature setting. Some varieties of grain are more sensitive to higher operating temperatures. It may be necessary to lower the plenum operating temperature to accommodate this.
Heater switch light and gas solenoids go on and off erratically-The light blinks on and off while the solenoids "chatter".	1. The blinking light indicates the flame sensor is not detecting flame. 2. The "chattering" solenoids are caused by the loss of flame detection, and the thermostat and Fenwal ignition board trying to reestablish a flame. Check for loose wires on flame sensor; replace or repair wires or sensor.
Burner will not fire.	1. Check gas supply. Also, check gas filter and gas line for possible obstruction or closed valves. Refill tank; replace or repair parts, as required. 2. Inspect gas solenoid valves for defective coils or improper wiring. Replace valve or coil if valve will not open with proper voltage applied (115 volts).
Burner will not fire-But gauge shows gas pressure.	1. Ignitor: Check that the ignitor is properly gapped to 1/8" and that it has a strong spark. Inspect the porcelain and electrodes for damage or cracking. Replace or clean if necessary.
Gate failed to close-Slide gate did not close all the way.	1. Check limit switch on close side of gate for malfunction. 2. Check gate motor for loss of power. 3. Check for something stuck in gate. 4. The gate may have taken too long to close.
Gate failed to open-Slide gate did not open all the way.	1. Check limit switch on open side for malfunction. 2. Check gate motor for loss of power. 3. Check for something stuck in gate. 4. The Gate may have taken too long to open.
Display shows **"UNLOAD MOTOR INTERLOCK"** message.	1. Auxiliary contacts on side of unload contact failed to close when the contactor engaged. Contactor isn't getting power or has malfunctioned.
Display shows **"LOAD MOTOR INTERLOCK"** message.	1. Auxiliary contacts on side of unload contact failed to close when the contactor engaged. Contactor isn't getting power or has malfunctioned.

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