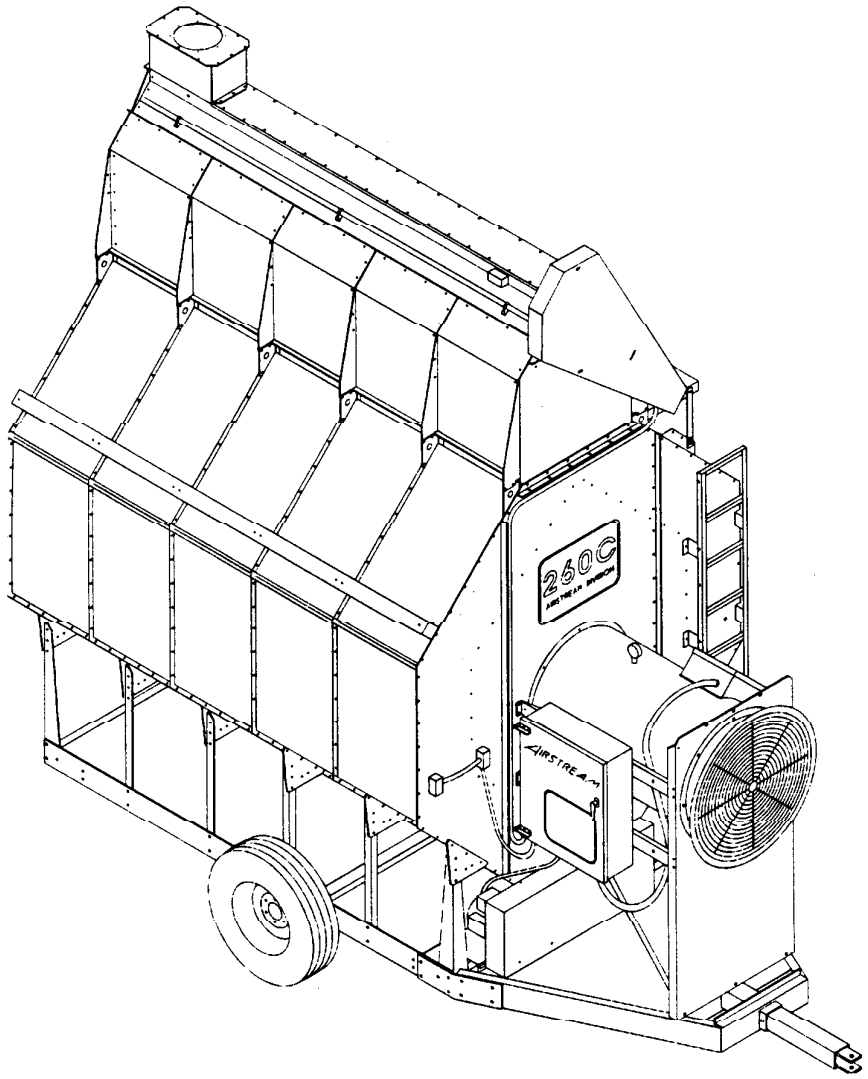
AIRSTREAM

OPERATION MANUAL



AIRSTREAM C-SERIES ONE-FAN GRAIN DRYERS

GSI

GRAIN SYSTEMS, INC.
ASSUMPTION, IL 62510 217/226-4421

PNEG-167

OPERATION MANUAL

Thank you for choosing the AIRSTREAM C-Series Single-Fan grain dryer. These units are one of the finest grain dryers ever built and designed to give excellent performance and service for many years.

This manual describes the operation for all standard production 210C, 260C, 340C and 400C dryers. These dryers are available for liquid propane or natural gas fuel supply, with either single phase 230 volt, or three phase 220 or 440 volt electrical power.

WARRANTY

Grain Systems, Inc. warrants its products to be free of defects in material and workmanship. The only obligation of the manufacturer is to repair or replace components which have been submitted and found to be defective within 24 months after installation. If so found to be defective, the components will be repaired or replaced without charge, this consitituting and entirely fulfilling the warranty obligation. Grain Systems, Inc. assumes no liability for expenses incurred without written authorizations; in no event shall liability include special or consequential damages, or exceed the selling price of the product.

This warranty does not cover products or parts which have been damaged by negligent use, misuse, alteration or accident. Electric motors, tires, and other components supplied by outside manufacturers are warranted separately by those suppliers. This warranty is exclusive and in lieu of all other warranties, expressed or implied. Grain Systems, Inc. reserves the right to make design or specification changes at any time, without any contingent obligations to purchasers of products already sold.

All instructions shall be construed as recommendation only. Because of the many variable conditions in actual installation, Grain Systems, Inc. assumes no liability for results arising from the use of such recommendations. Any alteration in design or operation of any Grain Systems, Inc. product must be submitted and approved in writing by Grain Systems, Inc. before alteration is made.

SAFETY FIRST

GENERAL SAFETY STATEMENTS

Grain Systems, Inc.'s principle concern is your safety and the safety of others associated with grain handling equipment. This manual was written with this thought in mind. 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 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.

SAFETY ALERT SYMBOL

The symbol shown below 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 that follows and be cautious to the possibility of personal injury or death.

WARNING!

BE ALERT Personel operating or working around dryer should read this manual. This manual must be delivered with equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

DANGER

Disconnect electricity before inspecting or servicing.

WILL CAUSE SERIOUS INJURY OR DEATH

Grain Systems, Inc. recommends that you contact your local power company and have a representative survey your installation so your wiring will be compatible with their system and so that you will have adequate power supplied to your unit.

SAFETY PRECAUTIONS

1. Read and understand the operating manual before trying to operate the dryer.
2. Never operate dryer while guards are removed.
3. Power supply should be OFF for service of electrical components. Use **CAUTION** in checking voltages or other procedures requiring power to be ON.
4. Check for gas leaks at all gas pipe connections, if any leaks are detected, do not operate dryer. Shut down and repair before further operation.
5. Never attempt to operate the dryer by jumping or otherwise bypassing any safety devices on the unit.
6. Set pressure regulator to avoid excessive gas pressure applied to burner during ignition and when burner is in operation. See chart for operating procedures. Do not exceed maximum recommended drying temperature.
7. Keep the dryer clean. Do not allow fine material to accumulate in the plenum chamber.
8. Keep auger drive belts tight enough to prevent slippage.
9. Use **CAUTION** in working around high speed fans, gas burners, augers, and auxiliary conveyors which **START AUTOMATICALLY.**
10. Do not operate in an area where combustible material will be drawn into the fan.
11. Before attempting to remove and reinstall any propellor, make certain to read the recommended procedure listed within the SERVICING section of the manual.
12. Be certain that capacities of auxiliary conveyors are matched to dryer auger capacities.
13. Clean grain is easier to dry. Fine material increases resistence to air flow and requires removal of extra moisture.

READ THESE INSTRUCTIONS BEFORE INSTALLATION AND OPERATION.
SAVE FOR FUTURE REFERENCE.

USE CAUTION IN 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 heater, augers and auxiliary conveyors which may start without warning when the dryer is operating on automatic control.

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.

KEEP THE DRYER CLEAN. Do not allow fine material to accumulate in the plenum chamber.

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT.

CONTENTS: PAGE:

1. Test Firing

Before the dryer is filled and placed into drying operation, thoroughly inspect the unit and check the operation as described below:

A. Inspect Metering Rolls:

1. Open all metering roll access doors and inspect each compartment for any bolts, nuts or other foreign hardware. Remove any material present to prevent possible jamming of the metering rolls. (Figure 1)
2. Set controls and switches as described in the chart below:

Control	Test Firing Setting
MC Switch	On
MC Thermostat	Min. Temperature
Hi-Limit Thermostats	Max. Temperature
Load Switch	Off
Unload Switch	Off
All Fan Switch	Off
All Burner Switch	Off
Loading Timer	30 Minutes
Metering Rate Adjustment	0
Dry Timer	1 Minute
Cool Timer	1 Minute
Unload Timer	30 Seconds
Mode Switch	Continuous Flow

3. Turn on Main Electric Power Supply.
4. Set all circuit breakers to ON and turn ON the Safety Disconnect.
5. Press the dryer START button. The red indicator light should come ON indicating that the safety circuit and control circuit are energized for dryer operation.

   NOTE: The red incicator light will not come ON unless all circuit breakers are turned on.

6. Make sure tank has adequate supply of gas, if using LP gas or adequate supply of of natural gas, if using natural gas.

ANY GAS LEAKS MUST BE IMMEDIATELY CORRECTED.

NOTE: On LP tanks, open shut-off valves SLOWLY to prevent accidental closing of excess flow valve within the system.

7. Open the main fuel supply valve at the tank. Turn on electric shut off valve to allow fuel flow to the dryer and inspect all gas lines and connections for possible leaks. (Figure 3)

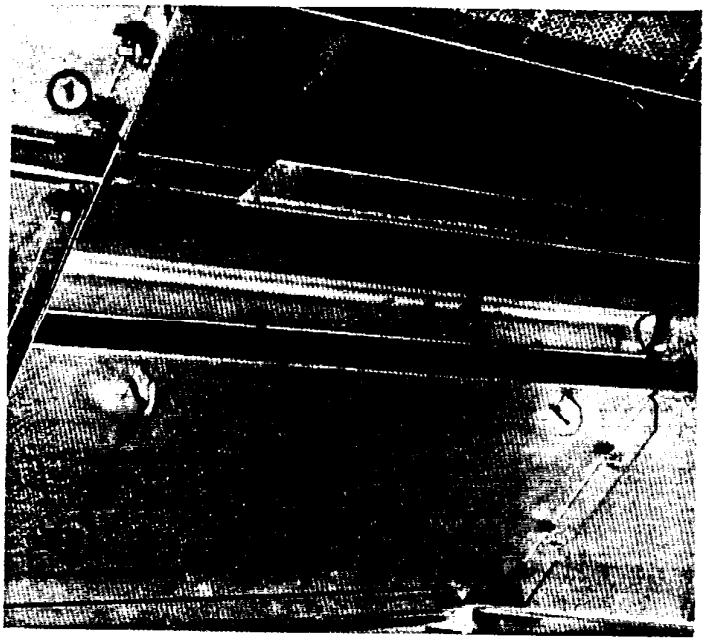


Figure 1

Metering Roll Access Door

1. Access Door
2. Meter Roll
3. Access Door Latch

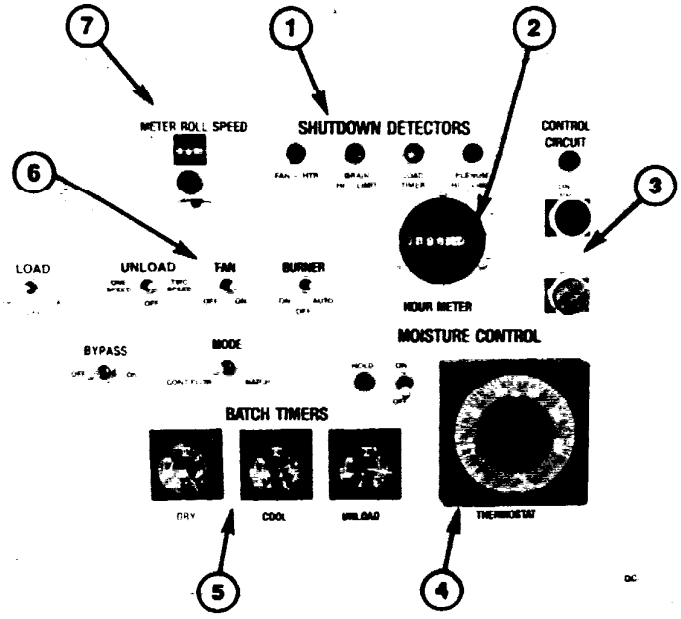


Figure 2

Dryer Control Board

1. Shut Down Indicator
2. Hour Meter
3. Stop and Start Switches
4. MC Thermostat
5. Batch Timers
6. Control Switches
7. Meter Roll Adjustment

8. CHECK CONVEYER FOR PROPER DIRECTION:

A. With the wet grain supply shut off, quickly bump the LOAD switch ON. The top auger should rotate CLOCKWISE, as viewed from the drive end. Any wet grain, auxiliary supply conveyers connected to the dryer power terminals should start and rotate in the proper direction.

B. Flip the UNLOAD switch to 1 SPEED. Turn up the meter roll dial until the meter roll begins. The bottom auger should rotate COUNTER-CLOCKWISE and the meter roll drive motor CLOCKWISE, as viewed from the drive end. Any dry grain, auxiliary conveyers connected to the dryer power terminals should start and rotate in the proper direction.

C. After checking bottom auger motor, leave the unloading switch on 1 SPEED and slowly turn up the MC Thermostat control. As the MC Thermostat setting is increased, the MC hold indicator light should come on and the meter roll should stop operating.

NOTE: The bottom auger will stop after the 30 seconds clean-out if the dryer is still being held by the MC Thermostat. Rotate the MC Thermostat down to its minimum setting. The MC light should go OFF and the meter roll should restart. If the bottom auger has stopped, it will restart.

9. CHECKING METERING ROLL OPERATION:

With the bottom auger still operating, check the metering roll operation by turning the metering roll adjustment knob, by turning the control clockwise the metering roll speed should increase, and by turning the control counterclockwise the metering roll speed should decrease. Check the metering roll drive for proper operation throughout the full range of operation. Make sure the drive chain tension is properly adjusted and that all sections of the metering rolls rotate properly.

Turn the UNLOAD switch OFF after these checks are completed. (Remember that the bottom clean out auger will continue to run for 30 seconds after the unload switch is turned off!)

10. CHECK FAN DIRECTION:

Bump the fan switch and observe the fan rotation. On 210C and the 400C, the fan should run clockwise; and on the 260C and the 340C, the fan should run counter clockwise.

NOTE: If all motors run backward on three phase model dryers, they can easily be reversed by interchanging wires L1 and L3 (leaving the high *leg in the center) of the three power supply connections* to the dryer. Auxiliary conveyors which have been field connected may have to be reversed individually.

11. CHECK BURNER SAFETY LOCK-OUT FUNCTION:

Start fan (and turn burner switch ON). With the main gas shut-off valve closed, the safety circuit within the burner control system must function after a short interval and cause the dryer to shut down.

Figure 3

Electronic Safety Shut-Off Valve

12. BURNER FIRING

Start the fan and turn the burner switch to the ON position. Turn on the fuel supply, the burner should fire after a short purge delay (approximately 10 seconds) and gas pressure should be indicated on the pressure gauge. Adjust burner Hi-Lo Fire thermostat to approximately 200°F to cause burner to operate on Hi-Fire. Observe gas pressure indicated on pressure gauge, then turn thermostat to its minimum setting which will cause burner to cycle into Lo-Fire. As the burner thermostat is turned down, the gas pressure gauge should show a noticable drop in pressure, indicating the Hi-Fire gas solenoid valve has closed and the burner is being supplied with only a reduced flow of gas through the flow control valve.

NOTE: For additional information concerning the actual recommended gas pressure setting and the adjustment procedure, refer to Gas and Heat adjustment.

13. CHECK STAGED AUTOMATIC MODE OF OPERATION:

A. With the unload switch in the OFF positon and the control circuit activated, set the burner switch to the auto positon and the batch timers to approximately one minute.

B. Turn fan switch to AUTO. Fan should start operating and burner should fire after the purge interval.

C. Turn the mode switch to STAGED and set the unload switch to 1 SPEED. Observe the following events as they occur:

1. The dryer timer will become energized and begin timing down.

2. After approximately one minute the drying time will expire and the cool timer will be energized, the burner will shut down but the fan will continue to run.

3. After another minute the cool timer will time out. This will cause the unload timer to begin. At the same time, the bottom auger and any auxiliary unloading conveyor should start and the fan should stop operating.

4. When the unload timer times out, all the timers will automatically reset to their original settings and start the dry timer again. At the same time the unload auger will stop after running an additional 30 seconds to clean out.

14. STOP DRYER OPERATION:

Push the STOP button. The fan, burner, and augers should immediately stop operating as the button is depressed. With dryer properly functioning, as described in previous steps, the unit may be considered ready for drying operation. Refer to Operating Instructions for procedure and control settings.

15. SHUT-DOWN:

To shut down dryer:

1. Close the valve on the fuel tank. Let the dryer run a few minutes to drain the fuel lines.

2. Close the fuel valves at the dryer.

3. Turn all switches OFF.

4. Push the Control Circuit Stop Button.

5. Turn off the Main Safety Disconnect.

6. Turn off the Main Power Supply.

2. GAS AND HEAT ADJUSTMENT HI-LO FIRE BURNER THERMOSTAT AND GAS PRESSURE SETTINGS

THERMOSTAT OPERATION:

The drying temperature from the fan/heater unit is controlled by the Hi-Lo Fire burner thermostat located on the front right hand side of the dryer.

The thermostat senses the air plenum temperature and cycles the burner from Hi-Fire to Lo-Fire to maintain the desired drying temperatures as indicated by the thermostat. (Figure 4)

HI-FIRE LO-FIRE:

When the heater is operating on Hi-Fire, the burner is supplied with a relatively large flow of gas from both the Hi-Fire gas solenoid valve and the flow control valve. When the burner is operating on Lo-Fire, only the flow control valve supplies the flow of gas in order to sustain burner operation.

PROPANE MODELS

HI-FIRE:

The Hi-Fire gas pressure for the burner is controlled by the gas pressure regulator. For maximum heat capacity, the regulator should be adjusted while operating on Hi-Fire to provide approximately 10-30 PSI, shown by the pressure gauge on the fan-heater.

LO-FIRE:

After Hi-Fire adjustment is made; set the Lo-Fire gas pressure to approximately 2-6 PSI by rotating the knob on the low side pressure flow control valve on the fan/heater unit. Lock the valve after making this adjustment. The burner must be on low fire to set this pressure. (Always set the high pressure before setting the low pressure and check the low pressure any time the high pressure is adjusted)

NATURAL GAS MODELS

HI-FIRE:

The Hi-Fire gas pressure is controlled by adjusting the large manual shut-off valve within the line which supplies the fan-heater. For maximum heat, set the shut-off valve to provide approximately 7-20 PSI while the burner is operating on Hi-Fire.

LO-FIRE:

After Hi-Fire adjustment is made; set the Lo-Fire gas pressure to approximately 1-3 PSI by rotating the handle on the small gas shut-off valve on the low pressure side of the fan/heater. (Always set the high pressure before setting the low pressure and check the low pressure any time the high pressure is adjusted)

BURNER CYCLE:

When the burner is operating properly, it should automatically cycle at regular intervals from Hi-Fire to Lo-Fire, as indicated by the corresponding pressure change on the gas pressure guage. It is not necessary for the burner to cycle with short 5 to 10 second intervals, but it is important that the burner does cycle occasionally.

If the burner remains in Hi-Fire and does not cycle, increase the gas regulator setting on propane models, or the main gas supply pressure on natural gas models, in order to satisfy the thermostat setting. Do not exceed 30 PSI for propane models, or 20 PSI for natural gas.

If the burner remains in Lo-Fire and does not cycle, decrease the Lo-Fire gas pressure slightly by readjusting the flow control valve.

NOTE: DO NOT DECREASE THE VALVE SETTING TO THE EXTENT WHERE A NOTICEABLE BURNER FLUTTER OR POPPING NOISE CAN BE HEARD, AS CAUSED BY FLAME BACKFIRE INTO THE BURNER CUP. ALSO ANY TIME THE HIGH PRESSURE IS ADJUSTED YOU NEED TO ADJUST THE LOW PRESSURE.

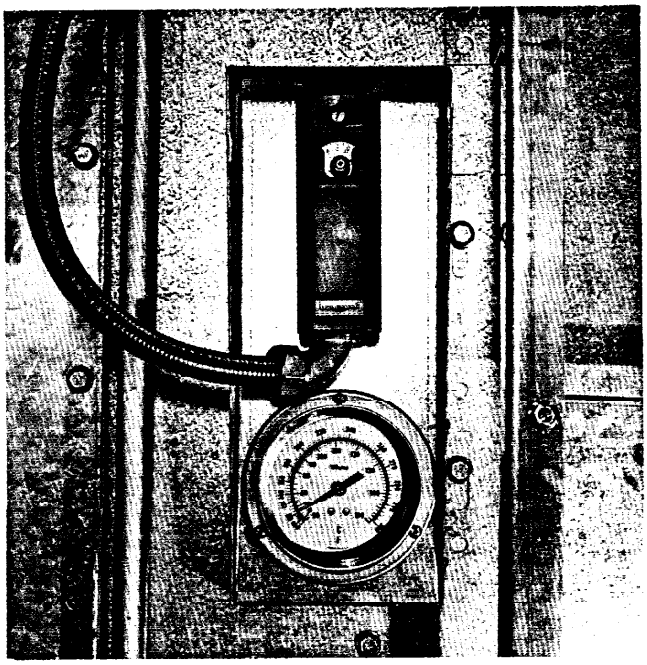


Figure 4

Hi-Lo Thermostat

3. OPERATING INFORMATION

LOAD SWITCH (TOP AUGER):

The load switch has three positons ON-OFF-AUTO. When the switch is set to Auto the out of grain timer will be energized whenever the top auger is operating. If the top auger and timer operate continuously for a period longer than the timer setting, the dryer will automatically shut down, put the load switch in the Auto position for normal operation. This will shut down the dryer when the wet supply is exhausted.

When the switch is in the ON positon, the out of grain timer will not operate. The ON position is recommended when filling an empty dryer.

With the switch on either AUTO or ON, the top auger will automatically start and stop as required to keep the dryer full of grain. (Figure 5)

UNLOAD SWITCH (BOTTOM AUGER):

The UNLOAD switch has three positions: 1 SPEED, OFF and 2 SPEED.

When in the continuous flow mode and the switch in the 1 speed position the unload auger will be controlled by the MC (MOISTURE CONTROL) thermostat. If the grain temperature is higher than the MC setting the unload auger will run. If the grain temperature is lower than the MC thermostat setting the unload auger will stop.

When operated in the 2 speed position, the meter roll speed will change to the low speed control rather than stop. The low speed control is located on the back of the front control panel.

In the batch mode, the unload switch should be in the 1 speed position. The MC thermostat will check the moisture after the dry time has run down. It will hold the grain for more heat if the grain temperature is not up to the temperature setting on the MC thermostat. If the temperature has been reached the cool timer will be energized.

In Continuous mode, the unload switch can be in either single or two speed.

When the switch is OFF, the unloading auger will stop, but the dryer fan and heater will continue to operate.

MODE SWITCH:

The MODE SWITCH is used to select either the CONTINUOUS FLOW or BATCH mode of dryer operation.

When in CONTINUOUS FLOW mode, the batch timers are switched out of the control circuit, grain is controlled by meter roll speed control.

When in the BATCH mode, the batch timers are switched into the control circuit and control drying, cooling and unloading time.

FAN SWITCH:

The fan switch has 3 positons ON-OFF-AUTO. When the switch is in the ON position the fan will run continuously. When it is in the AUTO position the fan will shut off during the unload cycle if the dryer is operating in the staged batch mode. When the switch is in the OFF position the fan will not operate.

BURNER SWITCH:

The burner switch has 3 positons ON-OFF-AUTO. When the switch is in the ON positon the burner will operate continuously. When the switch is in the AUTO

positon the burner will be controlled by the dry timer if you are in the batch mode, and will automatically shut off during the cooling and unloading cycle. If the switch is in the OFF position the burner will not light.

Refer to the appropriate STAGED AUTOMATIC OR CONTINUOUS FLOW operation chart for recommended burner switch settings for the different drying times and the type of drying process.

NOTE: Regardless of switch position, the heater will not operate unless the fan is running.

METER ROLL ADJUSTMENT DIAL

DISCHARGE RATE:

The high speed meter roll adjustment shown in Figure 9A controls the rate of dry grain discharge through the dryer. The mechanism's dial has a 0 to 999 scale which prepresents the flow of grain past the metering rolls as a percentage of the maximum grain discharge rate for the dryer. The maximum setting of 999 represents 100%, of approximately:

A. 570 bu/hr. for the 210C.
B. 720 bu/hr. for the 260C.
C. 860 bu/hr. for the 340C.
D.1960 bu/hr. for the 400C.

This dial also has a locking device to prevent accident movement of the setting.

The low speed meter roll adjustment shown in Figure 9B controls the grain discharge rate when the MC Thermostat has determined the grain moisture level is too high. The Low speed dial is only used in the continuous flow mode of operation. The dial is located on the back of the front panel of the main control box. The mechanism's dial has a 0 to 100 Scale. Zero being the minimum and 100 being the maximum.

ADJUSTMENT:

Turning the dial CLOCKWISE will INCREASE the grain discharge rate, whereas COUNTERCLOCKWISE rotation will DECREASE the discharge rate.

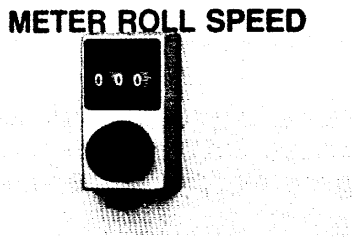


Figure 9A
High Speed Meter Roll Adjustment

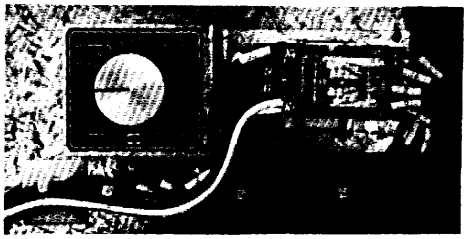


Figure 9B
Slow Speed Meter Roll Adjustment
And 2 Speed Relay

MOISTURE CONTROL (MC) THERMOSTAT AND INDICATOR LIGHT

The function of the MC thermostat is to sense the temperature of the grain being dried within the grain column and to automatically hold (batch) or slow the discharge rate (continuous flow) of higher moisture grain for additional drying until the grain temperature reaches the MC thermostat setting. With the thermostat properly set, it will prevent the unusually wet grain from being discharged at too high of a moisture content.

When the MC thermostat is holding the grain for further drying, the MC hold indicator will be ON, indicating that the grain temperature is below the MC setting.

The MC switch controls the operation of the MC thermostat within the dryer. The MC thermostat is located within the Main Control Panel and is equipped with four RTD platnum sensing probes. These probes are located in both sides of the dryer in the grain columns and are wired to measure the average temperature of the grain in the entire dryer.

The standard thermostat package is equipped with a long sensor lead which monitors the grain temperature near the outside of the right-hand grain column. This is only used in ON-OFF operation for the moisture control.

GRAIN COLUMN HI-LIMIT THERMOSTAT:

The Hi-Limit thermostats are located in electrical boxes mounted on both sides of the front of the dryer. These thermostats sense the grain temperature near the outside of both grain columns. The thermostats are safety monitoring devices designed to shut down the dryer if the grain column temperature exceeds the thermostat setting.

BURNER CONTROL-SEQUENCE OF OPERATION

The operating principle of the burner control is listed as follows (see burner control wiring diagram):

1. Power is available to the burner control only when the fan is operating.

   With the fan operating and the burner switch on, power is transmitted through the burner switch to supply power to the burner ignition board (Fenwal board).

2. The Fenwal board will determine if a flame has been established. If it has the burner will continue to operate. If the Fenwal board does not sense flame it will shut off power to the gas solenoid valves, discontinuing gas flow and will shut down the dryer after 60 seconds.

3. The heater will operate on Hi-Fire with both the main supply and the Hi-Fire gas solenoid valves energized until the Hi-Lo Thermostat reaches the assigned setting. When this temperature has been reached the power to the Hi-Fire solenoid will be shut off. Now power will only be supplied to the Lo-Fire solenoid and the burner will only operate on low flame.

   The Hi-Lo Thermostat contact points will stay open for an approximate 10 degree temperature loss in the plenum. Then the contacts close and the Hi-Fire solenoid is energized and the temperature will climb back up to the set point. When the set point is reached the process will start all over again.

4. If the heater fails to start operating due to lack of fuel or possible malfunction, the Fenwal system will de-energize the gas solenoids and shut the system down automatically by way of a 60 sec. time delay relay.

VAPORIZER ADJUSTMENT:
LIQUID PROPANE MODELS ONLY

After initial installation and occasionally during the drying operation, check the temperature of the regulator and the pipe train, where it is emerging from the vaporizer coil. The coil should be warm to the touch, not hot or cold. ALLOW HEATER TO OPERATE AND STABLIZE TEMPERATURES BEFORE MAKING THIS CHECK.

NOTE: If the gas temperature exceeds 160°F the high vapor temperature thermostat will open a safety monitoring circuit, thereby causing automatic shut-down of the dryer.

If the gas line is very cold or "frosted," move the vaporizer slightly closer to the flame. If gas line is too hot to touch, move vaporizer slightly away from the flame. The small wedge-shaped heat baffles can also be removed from the burner vanes to reduce the vapor temperature. If it is necessary to further reduce the vapor temperature, the vaporizer coil may be withdrawn slightly toward the fan housing. If vaporizer coil is shifted, use care not to kink gas lines or allow vaporizer to contact burner vanes or flame sensor. The vaporizer coil is moved by loosening a Bolt on the mounting bracket so that it will swivel.

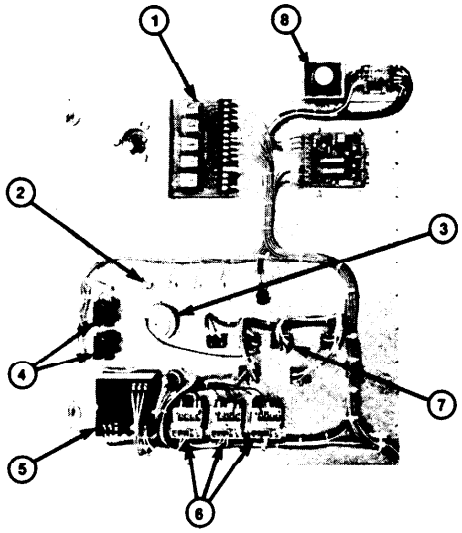


Figure 5

Dryer Control Board

1. Safety Circuit Shutdown Board
2. Shut Down Indicator
3. Hour Meter
4. Stop and Start Switches
5. MC Thermostat
6. Batch Timers
7. Control Switches
8. Low Speed Meter Roll Adjustment

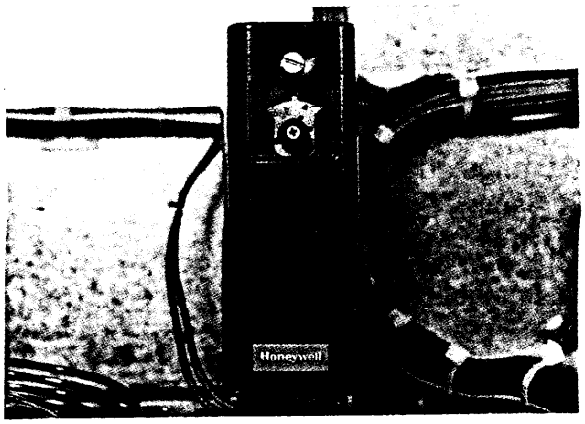


Figure 6

Adjustable Grain Hi-Limit

4. TIMER SETTING AND ADJUSTMENT

Factory production dryers are shipped with the batch timers set in the 60M (sixty minutes) mode of operation with the timer memory adjustments screw ON. The out of grain timer is shipped with the memory adjustment screw off. These settings should normally not be changed for the LOAD TIMER, COOL TIMER and the UNLOAD TIMER; however, for the DRY TIMER with the DRY AND COOL method, the 60M mode will normally be limited only to moderately wet grain (less than 25% moisture). When drying 25% or more initial moisture content grain, it will be necessary to set the DRY TIMER to the 12 HR (twelve-hour) mode of operation. This setting, as described in Section 6 (Adjusting the Time Range), allows longer timer settings. See chart for suggested drying times.

To adjust the time on any of the four timers, simply rotate the front dial to the desired setting when the timer is not energized. The No. 1 mark equals one-sixth of the selected range (for example, 1/6 of 60 Min. range= 10 minutes). The dial acts as a cycle progress indicated during operation, in that the outer mark shows the cycle time setting and the elapsed time.

NOTE: When a timer is energized, the time setting may be decreased manually, but the setting cannot be increased until the timer is de-energized and becomes reset.

5. OUT OF GRAIN TIMER

The out of grain timer shown in Figure 8 is located within the Control Box. It is an adjustable, automatic reset type timer and is designed to provide automatic shut-down of the dryer should the top auger operate continuously for a time period exceeding the adjustment setting. This shut-down indicates the absence of wet grain.

NOTE: The timer is factory set in the 60 minute mode, with the memory OFF. This setting is correct for the load timer.

To set the timer, observe the normal time required for the dryer to refill. Set the timer at the average refill time plus five additional minutes.

6. ADJUSTING THE TIME RANGE

To adjust the time range (not the time setting) of the timer, proceed as outlined:

A. Use a small screwdriver and rotate the time range adjustment screw to the desired range (either 6M, 60M, or 12HR) as shown in Figure 7.

B. If the timer has been replaced or the memory adjustment has been disturbed, use a small screwdriver and rotate the memory adjustment screw to the ON position. The screw is located on the base end of the timer. If a power interruption occurs, the timer will not be reset but will remain at that point in the time cycle and start timing from the point when the power is restored. If the timer is in the white section, the timer will reset.

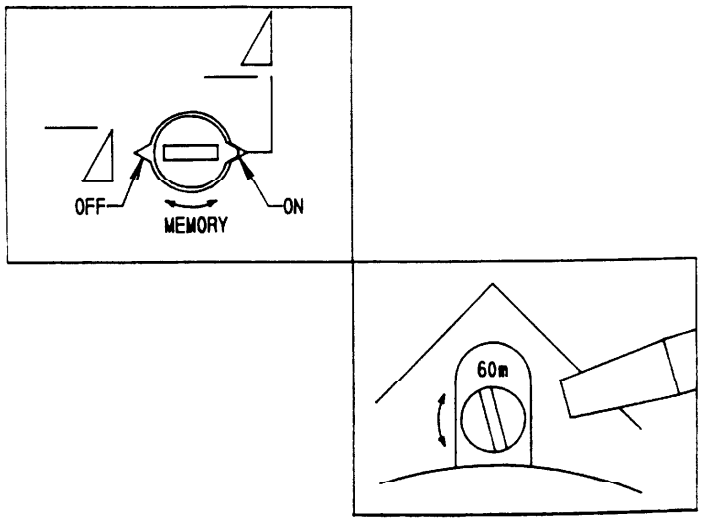


Figure 7

Memory and Time Range

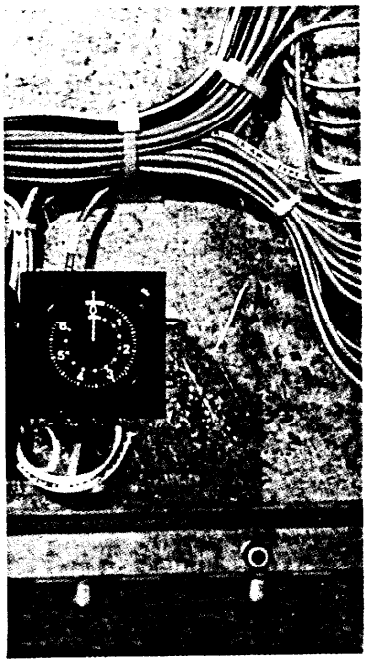


Figure 8

Load Timer

7. SETTING THE BATCH TIMERS FOR STAGED

A. DRY TIMER

These times will vary depending on the grain being dried. See drying time chart for the appropriate timer setting.

B. COOL TIMER

If no cooling is desired, set the time setting to zero. For dry and cool see drying time chart for proper setting.

C. UNLOAD TIMER

Check the final grain moisture during unloading. The discharge grain should remain the same moisture level until the completion of the unloading cycle. To check at the end of the cycle, immediately change the mode switch to CF to briefly continue the dryer unloading. The desired Unload Timer setting will allow a few additional bushels of dry grain to be discharged (15 to 30 seconds of unloading) before wet grain is observed. Make the necessary unload timer adjustments and return the mode switch and unload switch to their original positions. Changing the unload timer may affect the total drying time or cooling time. Necessary adjustment may need to be made.

8. OPERATING INSTRUCTIONS CONTINUOUS FLOW

1. Refer to Section 3 (OPERATING INSTRUCTIONS) for important information concerning adjustments for gas pressure, thermostat settings, out of grain timer, metering rolls and control settings.
2. Measure moisture content of wet grain.
3. Refer to DRYING TIME TABLE and determine the approximate drying time required to provide the required moisture reduction.
4. Refer to TEST FIRING and START-UP INSTRUCTION chart and perform the procedures listed.
5. Using the recommended drying time, refer to the DRYING TIME CHARTS for suggested drying setting and other information.
6. For Continuous Flow mode, decrease meter roll discharge rate for lower final moisture content in the dried grain. Increase the meter roll discharge rate for higher final moisture content. Raising or lowering drying air temperatures will increase or decrease final moisture. Changes in moisture content of wet grain require adjustments of discharge rate.
7. Set MC Thermostat.
8. Set time on out of grain Timer.

9. CONTINUOUS FLOW START-UP

TEST OPERATE the dryer prior to start-up. Make certain all motors and controls are functional before loading the dryer with wet grain.

1. Set Controls As Listed:
   - **A.** Temporarily set the burner (plenum) thermostat at the drying temperature recommended for normal operation of the burner (for example: 220°-230°F for shelled corn).
   - **B.** Turn MC switch OFF.
   - **C.** Turn Mode switch on CONTINUOUS FLOW.
   - **D.** Turn load switch OFF. Turn unload switch OFF.
   - **E.** Turn fan switch OFF. Turn burner switch OFF.
2. Press the dryer START button. The red indicator light should come on.
3. Turn Load Switch ON to fill the dryer.
4. Determine the approximate total drying time for the type of grain and the drying process to be used from the Drying Time Table.

   NOTE: For example, with 25% moisture shelled corn use the DRY AND COOL process. If the final moisture is to be 15% (10% removal), the estimated drying time is 60 minutes.
5. Using the total drying time from Step 4, refer to the appropriate drying time chart for Continuous FLow operation and determine the normal drying time per stage.
6. Turn FAN and BURNER switch ON and operate one start-up time period, as established in Step 5.
7. While the dryer is operating, adjust the metering roll dial to the recommended trial setting. To determine the setting, refer to the appropriate drying time chart for CONTINUOUS FLOW OPERATION and determine the approximate drying capacity corresponding to the proper total drying time. Then, use this capacity and refer to the metering roll discharge chart (located at the far right-hand side of the chart) to determine the required initial dial setting.
8. At the end of this cycle, turn unload switch to 2 SPEED and set all SWITCHES as indicated by the appropriate drying time chart.
9. Check the final moisture content and readjust the unloading rate slightly, if required.

   NOTE: The time required for the grain to pass completely through the dryer is the time necessary to notice a stabilized change in final moisture content after adjustment. During start-up, some variation will naturally occur.

APPROXIMATE DRYING TIME TABLE FOR VARIOUS INITIAL MOISTURE CONTENTS

CORN - DRY & COOL

Initial Moisture	Minutes *Approx. Time
15	NA
16	7
17	14
18	21
19	28
20	35
21	41
22	47
23	53
24	59
25	65
26	70
27	75
28	80
29	85
30	90
31	95
32	100
33	105
34	110
35	115

CORN - ALL HEAT

Initial Moisture	Dryeration	Combination
	Minutes *Approx Time	
15	NA	NA
16	6	NA
17	12	NA
18	18	NA
19	24	NA
20	30	NA
21	35	6
22	40	11
23	45	16
24	50	21
25	55	26
26	60	32
27	65	37
28	70	41
29	75	46
30	80	50
31	85	54
32	90	58
33	95	62
34	100	66
35	105	70

DRYERATION-SHELLED CORN
To approximate 17% final moisture in dryer: 15% in cooling bin by full heat process. 200-220°F average drying temp.

COMBINATION DRYING-SHELLED CORN
To approximate 20% final moisture in dryer. 220-230°F average drying temperature 15% in bin by low temperature drying.

OTHER GRAINS

Initial Moisture	DRY & COOL	ALL HEAT
	Minutes *Approx Time	
13	NA	NA
14	7	6
15	14	12
16	21	18
17	27	23
18	33	28
19	39	33
20	45	38
21	50	42
22	55	46
23	60	50
24	65	54
25	70	58
26	75	62
27	79	65
28	83	68
29	87	71
30	91	74
31	95	77
32	99	80
33	103	83

OTHER GRAINS
Wheat, Milo, Soybeans, Rough Rice to approximately 13% final moisture in dryer. 150°F drying temperature for Wheat and Milo, 130°F drying temperatures for Soybeans and Rough Rice.

*Actual drying time varies with grain physiological factors (kernal size, chemical composition, seed variety, seasonal weather), weather conditions during drying, and other operating variables; lower final moisture content significantly increases drying time; moisture contents are % wet basis.

Basic Definition-Bushel, Shelled Corn:	56 lbs. @ 15.5%;
	56 x .845 = 47.32 lbs. Dry Matter
To Yeild a Bushel @ 15.5%:	47.32/.85 = 55.67 lbs. @ 15%
	47.32/.80 = 59.15 lbs. @ 20%
	47.32/.75 = 63.09 lbs. @ 25%
Dry to Wet Bushel Conversion Ratios:	20 - 15%, 59.15/55.67 = 1.06
	25 - 15%, 63.09/55.67 = 1.13

10. DRYING TIME CHART

C-Series 210C-Continuous Flow Operation		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approx. #2 Drying Cap. BU/HR
20	776	450
24	647	375
28	555	322
32	486	282
36	431	250
40	388	225
44	353	205
48	324	188
52	298	173
56	278	161
60	259	150
64	243	141
68	228	132
72	216	125
76	203	118
80	193	112
84	184	107
88	176	102
92	169	98
96	162	94
100	155	90
104	148	86
108	143	83
112	138	80
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels.		

C-Series 260C-Continuous Flow Operation		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximate *2 Drying Cap. Bu/Hr.
20	792	570
24	660	475
28	565	407
32	494	356
36	440	317
40	396	285
44	360	259
48	331	238
52	304	219
56	283	204
60	264	190
64	247	178
68	233	168
72	219	158
76	208	150
80	199	143
84	189	136
88	180	130
92	172	124
96	165	119
100	158	114
104	153	110
108	147	106
112	142	102
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels.		

11. DRYING TIME CHART

C-Series 340C-Continuous Flow		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximate *2 Drying Cap. Bu/Hr
20	931	810
24	776	675
28	664	578
32	581	506
36	517	450
40	466	405
44	423	368
48	389	338
52	357	311
56	332	289
60	310	270
64	291	253
68	274	238
72	258	225
76	245	213
80	232	202
84	222	193
88	211	184
92	202	176
96	194	169
100	186	162
104	179	156
108	172	150
112	167	145
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.		
*2. Approx. Drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels		

C-Series 400C-Continuous Flow Operation		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximate *2 Drying Cap. Bu/Hr.
20	490	962
24	409	802
28	351	688
32	307	602
36	273	535
40	245	481
44	223	438
48	205	401
52	188	370
56	176	344
60	163	321
64	153	301
68	144	283
72	136	267
76	129	253
80	123	241
84	117	229
88	112	219
92	107	209
96	102	200
100	098	192
104	094	185
108	090	178
112	087	172
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu ft.; wet bushels of 25% corn=1.13 x dry bushels		

12. DRYER OPERATION

DRYING TEMPERATURE

THERMOMETER:

The drying temperature is shown by the thermometer located on the front right-hand side of the dryer. The thermometer and the thermostat may not read the same as they use different sensors. Use the thermometer as the proper gauge for setting the thermostat.

SHELLED CORN:

For shelled corn with an initial moisture content of 25-30%, the recommended maximum drying temperature is 210°F-230°F. For lower initial moisture content, lower drying temperatures are recommended.

DRYING EFFICIENCY:

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

SMALL GRAIN:

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

SOYBEANS:

Drying temperatures are critical in drying soybeans. A temperature of 130°F-140°F is recommended to keep grain temperature low.

RICE:

Drying temperatures are critical in drying rice. A temperature of 105°F-120°F is required. It is recommended to keep the grain kernal temperature below 99°F. Rice quality is greatly affected by temperature.

FULL HEAT DRYING

FULL HEAT OPERATION:

With this type of drying, the grain is discharged hot with no cooling. Drying capacity is substantially higher with FULL HEAT than the DRY AND COOL process. Refer to FULL HEAT OPERATION CHART (pages 30-35) for additional information concerning dryer settings and drying capacity.

DRYERATION PROCESS:

The full heat process is called Dryeration. Recommended procedure is to temper the hot grain for 4 to 10 hours in a cooling bin or storage bin, then cool by an aeration fan at an air flow rate of 1/2 to 1 CFM per bushel in the hot batch being cooled. The process of tempering and slow cooling provides higher quality in shelled corn because of less cracking of kernels and less breakage during handling of the grain.

FINAL MOISTURE:

1% to 3% moisture is usually removed in the cooling process. If the final desired moisture content is 15%, hot shelled corn is removed from the dryer at about 17% moisture.

13. MOISTURE CONTROL (MC) THERMOSTAT SETTINGS

WITH THE MC SWITCH ON, THE MC THERMOSTAT SHOULD BE SET AS FOLLOWS:

SETTING MC THERMOSTAT FOR CONTINUOUS FLOW 1 SPEED OPERATION

ADJUSTMENT PROCEDURE:

1. Turn the MC thermostat to the lowest setting.
2. Operate the dryer and make final changes in DRYING TEMPERATURES and DRYER UNLOADING SPEED until the dry grain being discharged is stabalized at the desired moisture content.
3. Turn the MC thermostat up slowly. As the dial is turned up, the MC indicator light will come ON and the Meter Roll will stop unloading.
4. Immediately after the light comes ON, SLOWLY turn down the thermostat until the light just goes out and the Meter Roll starts unloading. The exact point where the MC light shuts off is the correct thermostat setting.

SETTING MC THERMOSTAT FOR CONTINUOUS FLOW 2 SPEED OPERATION

1. Turn the MC thermostat to 95 degrees f.
2. Determine high speed meter roll setting.
   A. Determine what the driest grain will be put through dryer.
   B. Use drying time table to determine amount of time to dry the grain.
   C. Go to the drying time chart for the appriopriate model. Use the time found in step 2 and read bu/hr capacity.
   D. Use bu/hr capacity to figure the potentimeter setting.
3. Determine low speed meter roll setting. Follow same steps as in step #2 except for wettest grain that will be put through system.

   This will create a drying window. The parameters for this window can be set very tight or lose depending on the operator.

   To adjust the output moisture of the grain increase or decrease the temperature setting on the MC thermostat. Each mark on the thermostat is approximately one point of moisture.

   If the grain moisture is to wet increase the temperature setting. If the moisture is to dry , decrease the temperature setting.

SETTING OUT OF GRAIN FOR CONTINUOUS FLOW OPERATION

Observe the amount of time required to refill the dryer. Add 5 minutes to the time. This is the correct amount of time to be set on the out of grain timer. For further information. See section 5.

FINAL MOISTURE CONTENT

METER ROLL ADJUSTMENT

It is necessary to frequently check the moisture content of discharged grain while the proper meter roll setting is being established. Moisture should be checked periodically to indicate any change in the setting. It will take about 1 hour to accurately see the results of a change in the Meter Roll speed.

FUEL BURN-OUT:

When a vaporizer-equipped burner is to be shut down for serveral hours or more, it is recommended that pressure be relieved on vaporizer and supply lines. Close the valve at the supply tank, then let the burner operate until the flame stops: immediately turn burner OFF. After the burner is OFF, close all other valves in fuel supply pipe train.

SHUT-DOWN:

To shut down the dryer:

1. Close the valve on the fuel tank. Let the dryer run a few minutes to drain the fuel lines.
2. Close the fuel valves at the dryer.
3. Push the Control Circuit Stop Button, shutting the fan off and the dryer down.
4. Turn off the Main Safety Disconnect.
5. Turn off the Main Power Supply.

14. BATCH START-UP

TEST OPERATE the dryer prior to start-up. Make certain all motors and controls are functional before loading the dryer with wet grain.

1. Set Controls As Listed:

   A. Temporarily set the burner (plenum) thermostats at the drying temperature recommended for normal operation of the top stage burner (for example, 220°F-230°F for shelled corn).

   B. Turn MC switch OFF.

   C. For start-up purposes, set mode switch on CONTINUOUS FLOW.

   D. Turn Load switch OFF. Turn Unload switch OFF.

   E. Turn Fan OFF. Turn Burner OFF.

2. Press the dryer START button. The red indicator light should come on.

3. Turn Load switch ON to fill the dryer.

4. Determine the approximate START-UP drying time for the type of grain and the dry ing process to be used from the Drying Time Table (page 20).

   NOTE: For example, with 25% moisture shelled corn using the DRY AND COOL process, and the final moisture being 15% (10% removal), the estimated drying time is 60 minutes.

5. Using the total drying time from Step 4, refer to the appropriate drying time chart for BATCH operation and determine the normal operating drying times.

   NOTE: For the 60 minute drying time example mentioned earlier, the dry timer would be 60 and cool timer would be 7 minutes for the 340C with DRY AND COOL process.

6. Turn the FAN and BURNER switch ON.

   NOTE: The dry timer may be used as a timing device. Set it to the required time and move the mode switch to and observe timer operation.

7. Set mode switch to BATCH.

8. Set all controls as listed in the appropriate dryer time chart for the estimated drying time and proceed in the BATCH mode of operation.

NOTE: The timer settings listed are based upon a meter roll adjustment setting of 100%. This setting provides an unload time of approximately 3.7 minutes for the bottom stage. If a lower discharge rate is required, unoading timer setting should be increased by the amount of additional unloading time needed. The drying timer needs to be decreased so that the overall time remains the same.

11. A couple of cycles are required for final moisture content to stabilize. Check final moisture and readjust the timers, if required.

15. DRYING TIME CHART

C-Series 210C-Automatic Batch Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Dring Time Minute.	Dry Timer Setting Minute	Cool Timer Setting Minute.	Unload Timer Setting Minute	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Minute.	Unload Timer Setting Minute	Approx*2 Drying Cap. BU/HR
20	20	15	15	176	4	16	450
24	24	15	15	164	8	16	375
28	28	15	15	153	12	16	321
32	32	15	15	143	16	16	281
36	36	15	15	134	20	16	250
40	40	15	15	127	24	16	225
44	44	15	15	120	28	16	205
48	48	15	15	114	32	16	188
52	52	15	15	108	36	16	173
56	56	15	15	103	40	16	161
60	60	15	15	99	44	16	150
64	64	15	15	95	48	16	141
68	68	15	15	91	52	16	132
72	72	15	15	87	56	16	125
76	76	15	15	84	60	16	118
80	80	15	15	81	64	16	112.5
84	84	15	15	78	68	16	107
88	88	15	15	75	72	16	102
92	92	15	15	73	76	16	98
96	96	15	15	71	80	16	94
100	100	15	15	69	84	16	92
104	104	15	15	67	88	16	88
108	108	15	15	65	92	16	85
112	112	15	15	63	96	16	82
Top Auger Switch		Automatic			Automatic		
Bottom Auger Switch		Automatic			Automatic		
Mode Switch		Staged			Staged		
Fan Switch		On			On		
Burner Switch		Auto			On		
MC Selector Switch		On			On		
Dry Timer		Set as Indicated			Set as Indicated		
Cool Timer		Set as Indicated			0		
Meter Roll Adjustment		As Required by Transfer Equipment					
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reduction.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% cor =1.13xdry bushels. Greater or less actual loading rate affects drying capacity for SA and D&C.							

16. DRYING TIME CHART

C-Series 260C-Automatic Batch Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR
20	20	15	16	235	4	16	600
24	24	15	16	218	8	16	500
28	28	15	16	203	12	16	429
32	32	15	16	190	16	16	375
36	36	15	16	179	20	16	333
40	40	15	16	169	24	16	300
44	44	15	16	160	28	16	273
48	48	15	16	152	32	16	250
52	52	15	16	145	36	16	231
56	56	15	16	138	40	16	214
60	60	15	16	132	44	16	200
64	64	15	16	126	48	16	188
68	68	15	16	121	52	16	176
72	72	15	16	117	56	16	167
76	76	15	16	112	60	16	158
80	80	15	16	108	64	16	150
84	84	15	16	104	68	16	143
88	88	15	16	101	72	16	136
92	92	15	16	98	76	16	130
96	96	15	16	94	80	16	125
100	100	15	16	92	84	16	120
104	104	15	16	89	88	16	115
108	108	15	16	86	92	16	111
112	112	15	16	84	96	16	107
Top Auger Switch		Automatic			Automatic		
Bottom Auger Switch		Automatic			Automatic		
Mode Switch		Staged			Staged		
Fan Switch		On			On		
Burner Switch		Auto			On		
MC Selector Switch		On			On		
Dry Timer		Set as Indicated			Set As Indicated		
Cool Timer		Set as Indicated			0		
Meter Roll Adjustment		As Required by Transfer Equipment					
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for AB and D&C.							

17. DRYING TIME CHART

C-Series 340C-Staged Automatic Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx *2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx *2 Drying Cap. BU/HR
20	20	15	18	306	2	18	810
24	24	15	18	284	6	18	675
28	28	15	18	266	10	18	579
32	32	15	18	249	14	18	506
36	36	15	18	235	18	18	450
40	40	15	18	222	22	18	405
44	44	15	18	210	26	18	368
48	48	15	18	200	30	18	338
52	52	15	18	191	34	18	312
56	56	15	18	182	38	18	289
60	60	15	18	174	42	18	270
64	64	15	18	167	46	18	253
68	68	15	18	160	50	18	238
72	72	15	18	154	54	18	225
76	76	15	18	149	58	18	213
80	80	15	18	143	62	18	203
84	84	15	18	138	66	18	193
88	88	15	18	134	70	18	184
92	92	15	18	130	74	18	176
96	96	15	18	126	78	18	169
100	100	15	18	122	82	18	162
104	104	15	18	118	86	18	156
108	108	15	18	115	90	18	150
112	112	15	18	112	94	18	145
Top Auger Switch		Automatic			Automatic		
Bottom Auger Switch		Automatic			Automatic		
Mode Switch		Staged			Staged		
Fan Switch		On			On		
Burner Switch		Auto			On		
MC Selector Switch		On			On		
Dry Timer		Set as Indicated			Set as Indicated		
Cool Timer		Set as Indicated			0		
Meter Roll Adjustment		As Required by Transfer Equipment					
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for SA and D&C.							

18. DRYING TIME CHART

C-Series 400C-Staged Automatic Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR
20	20	15	10	427	10	10	962
24	24	15	10	392	14	10	802
28	28	15	10	362	18	10	688
32	32	15	10	337	22	10	602
36	36	15	10	315	26	10	535
40	40	15	10	270	30	10	481
44	44	15	10	256	34	10	438
48	48	15	10	243	38	10	401
52	52	15	10	231	42	10	3700
56	56	15	10	221	46	10	344
60	60	15	10	211	50	10	321
64	64	15	10	202	54	10	301
68	68	15	10	194	58	10	283
72	72	15	10	186	62	10	267
76	76	15	10	179	66	10	253
80	80	15	10	173	70	10	241
84	84	15	10	167	74	10	229
88	88	15	10	161	78	10	219
92	92	15	10	156	82	10	209
96	96	15	10	151	86	10	200
100	100	15	10	147	90	10	192
104	104	15	10	142	94	10	185
108	108	15	10	138	98	10	178
112	112	15	10	134	102	10	172
Top Auger Switch		Automatic			Automatic		
Bottom Auger Switch		Automatic			Automatic		
Mode Switch		Staged			Staged		
Fan Switch		On			On		
Burner Switch		Auto			On		
MC Selector Switch		On			On		
Dry Timer		Set as Indicated			Set as Indicated		
Cool Timer		Set as Indicated			0		
Meter Roll Adjustment		As Required by Transfer Equipment					
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for SA and D&C.							

19. SETTING MC THERMOSTAT FOR BATCH OPERATION

ADJUSTMENT PROCEDURE:

1. Turn the MC thermostat to the lowest setting.
2. Make final changes in DRYING TEMPERATURES until the dry grain being discharges is stabilized at the desired moisture content.
3. Turn the MC thermostat to the highest setting.
4. When the drying timer has completed and the MC hold indicator light comes ON, slowly turn the MC setting DOWN until the light goes out and the next cycle begins.
5. This initial setting must be confirmed by testing the final grain moisture content during the unloading cycle.

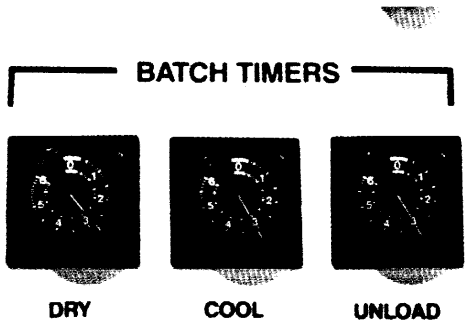


Figure 11
Batch Timers

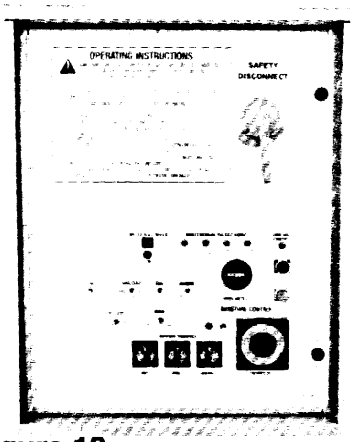


Figure 12
Control Box-Front Panel

FUEL BURN-OUT:

When a vaporizer-equipped burner is to be shut down for several hours or more, it is recommended that pressure be relieved on vaporizer and supply lines. Close the valve at the supply tank, then let the burner operate until the flame stops: immediately turn burner OFF. After the burner is OFF, close all other valves in fuel supply piping.

SHUT-DOWN:

To shut down the dryer:

1. Close the valve on the fuel tank. Let the dryer run a few minutes to drain the fuel lines.
2. Close the fuel valves at the dryer.
3. Push the Control Circuit Stop Button, shutting the fans off and the dryer down.
4. Turn off the Main Safety Disconnect.
5. Turn off the Main Power Supply.

20. INSTRUCTION-STAGED AUTOMATIC

Refer to the following Staged Automatic Operation Chart and find the suggested dry timer setting; depending upon the type of grain, initial moisture content and drying method (DRY AND COOL, or FULL HEAT). The method may be changed from the DRY AND COOL to the FULL HEAT by rotating the COOL TIMER dial counterclockwise to O. The load timer is designed to shut down when the grain supply is exhausted. The Load Timer will reset after each filling cycle.

The dry timer will allow the burner to operate for a predetermined time at the temperature set by the burner thermostat. At the end of the drying period, the moisture control (MC) thermostat will monitor the grain. If the grain temperature satisfies the moisture control setting, the burner will stop operating and the cooling cycle will start. If the dryer is filled with unusually high moisture grain, the MC thermostat will remain on MC HOLD and continue the drying prrocess until it meets the MC requirements.

NOTE: Refer to MC thermostat section for additional details. The MC thermostat can be set so high as to hold on each drying cycle in an attempt to obtain automatic moisture control. However, the MC thermostat may not provide sufficient accuracy in controlling final moisture with uniform and consistent results; considering the somewhat variable relationship between grain temperature and final moisture, as well as the effect of other operating variables. Proper adjustment of the Dry Timer is a more reliable method of controlling final grain moisture.

The cool timer is easily adjusted for either full cooling or any degree of partial cooling. At the completion of the cooling cycle, the unloading cycle will start. The unload timer is set at the time to unload the full content of the bottom stage. During this unloading cycle, wet grain is being added to eliminate the down time to load. Also, the fan continues to run permitting cooling to continue during unloading. For the Staged Auto drying mode, the meter rolls should be adjusted to provide maximum discharge rate, of the auxiliary take away system.

At the completion of the unloading cycle, the time delay relay will allow a 10 second time delay and will then automatically reset all three timers to their initial setting and a new drying cycle will begin.

When setting load timer staged automatic to figure the proper amount of time, Add 5 minutes to the unload timer setting. For further information about the function of the load timer see page 16.

21. MAINTAINING GRAIN QUALITY

To properly maintain the quality of stored grain, it is necessary to keep the grain dry, cool, and insect free. If not, any one of these problems can contribute to spoilage. Wet, warm grain promotes insect growth as well as grain spoilage. Cool dry grain can keep for long periods of time if properly maintained.

It is recommended that the grain be kept cool (avoid freezing as freezing can reduce quality.) Grain should be cooled through the fall and winter, warmed in the spring and summer.

RULE OF THUMB FOR STORING GRAIN:

Average grain temperature should be above 35°F in the winter and below 65°F in the summer. Always try to keep the grain within 10-15°F of the average monthly outside temperature. This means grain may need to be aerated on warm days during the winter to stay above 35°F when freezing temperatures are predominate. During the summer, it may be necessary to aerate the grain on cool nights, so the 65°F temperature is not exceeded during the hot days of summer.

Conditions and requirements may vary from area to area. We suggest that you contact your local Agriculture Extension Office or State Ag. University for more exact guidelines, in your area.

If the grain is to be stored more than one year, it has to be re-cooled the following fall and winter, repeating the process as long as the grain is in storage. **Frequent and regular inspection (at least weekly during fall and spring) is the best prevention against grain spoilage.**

EQUILIBRIUM MOISTURE CHART

Air Temperature	Relative Humidity— Percent													
	35	40	45	50	55	60	65	70	75	80	85	90	95	100
20°F	11.2	11.7	12.7	13.7	14.5	15.1	16.2	17.1	18.0	19.6	21.2	23.5	25.8	29.1
30°F	10.8	11.3	12.2	13.1	13.9	14.6	15.5	16.4	17.4	18.7	20.2	22.5	25.0	28.3
40°F	10.5	11.0	11.7	12.5	13.3	14.0	14.8	15.5	16.6	17.8	19.4	21.5	24.2	27.5
50°F	10.1	10.6	11.3	12.0	12.7	13.3	14.1	14.8	15.8	16.9	18.6	20.5	23.4	26.7
60°F	9.7	10.2	10.9	11.6	12.1	12.7	13.4	14.2	15.0	16.0	17.8	19.5	22.6	25.9
70°F	9.0	9.7	10.4	11.1	11.5	12.0	12.8	13.5	14.5	15.4	16.8	18.5	21.3	24.5
80°F	8.3	9.1	9.8	10.5	10.8	11.2	12.1	13.0	13.9	14.8	15.8	17.4	20.0	22.8

Safe moisture for normal winter storage of shelled corn is about 15%. Grain to be stored through the summer or long term, needs to be 1 to 3 points dryer.

For more information, see the chart on the following page.

APPROXIMATE ALLOWABLE HOLDING TIME FOR FIELD-SHELLED CORN, TO MAINTAIN GRADE*

	CORN MOISTURE							
Grain (°F) Temperature	15% days	18% days	20% days	22% days	24% days	26% days	28% days	30% days
40	898	195	85	54	38	28	24	20
50	451	102	46	28	19	16	13	11
60	242	63	26	16	10	8	6.5	5.5
70	147	37	13	8	5	4	3.5	3
80	109	27	10	6	4	3	2.5	2

* Allowable holding time for field-shelled corn at various grain temperatures and moistures

Drying fronts and/or temperature fronts move through grain at different rates for different size bins, different size fans and different moistures and temperatures.

The table below lists the approximate time required to completely change the temperature of a bin. Conditions at the time, can cause this time to vary greatly. Therefore this should only be used as a guide.

It may be necessary to run the fan only part of a day, because of changing weather conditions. It would be necessary to run it a few hours each day on several days to complete the temperature change.

APPROXIMATE HOURS OF FAN TIME TO CHANGE BIN TEMPERATURE

Fan Size H.P.	Bin Diameter Apx. 22 Feet to Eave Approximate Hours of Fan Time Required									Apx. 32 Feet To Eave		
	18	21	24	27	30	33	36	42	48	36	42	48
1	73	79	90	NR	NR	NR	NR	NR	NR	NR	NR	NR
1.5	56	61	65	66	76	82	92	NR	NR	NR	NR	NR
3	44	51	52	57	63	69	78	93	NR	NR	NR	NR
5-7	38	42	44	47	52	56	61	71	81	79	93	NR
7.5-10	35	37	41	42	45	49	53	62	71	72	82	92
10-15	30	32	35	39	40	42	45	54	63	62	70	80
Apx.Bu.	4,500	6,500	8,500	11,000	13,500	16,500	19,500	27,000	35,500	28,000	38,500	50,500

Bushels are rounded and approximate.

The hours required are based on clean grain. High moisture grain and grain containing fines or foreign material will require more time to complete the air change.

NR Not Recommended: Bins in the NR range, may require fan(s) of a different size to get the cool time into the acceptable range.

Bins requiring more than 100 hours of aeration to totally change the temperature may require continuous aeration at about 1/10th cfm per bushel or some other acceptable method.

Notes

22. DRYING TIME CHART

C-Series Sample A		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximate *2 Drying Cap. Bu/Hr
20	489	1233
24	408	1027
28	350	881
32	304	765
36	272	685
40	244	614
44	223	561
48	201	507
52	187	472
56	173	436
60	162	409
64	152	383
68	145	365
72	134	338
76	127	320
80	120	303
84	117	294
88	110	276
92	106	267
96	102	258
100	099	249
104	095	240
108	092	231
112	088	222
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels.		

23. DRYING TIME CHART

C-Series Sample B		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximately *2 Drying Cap. Bu/Hr.
20	487	1500
24	406	1250
28	348	1071
32	305	938
36	270	833
40	244	750
44	221	682
48	203	625
52	187	575
56	173	535
60	162	500
64	152	469
68	143	441
72	135	416
76	128	395
80	122	375
84	116	357
88	110	340
92	106	326
96	101	312
100	097	300
104	094	288
108	090	278
112	087	268
Top Auger Switch	Automatic	
Bottom Auger Switch	Automatic	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels.		

24. DRYING TIME CHART

C-Series Sample C		
	Full Heat Process	
Total *1 Drying Time Minute	Approximate Meter Roll Dial Setting	Approximate *2 Drying Cap. Bu/Hr.
20	495	1800
24	412	1500
28	353	1285
32	309	1125
36	275	1000
40	247	900
44	225	818
48	206	750
52	190	692
56	177	643
60	165	600
64	154	562
68	145	529
72	137	500
76	130	473
80	124	450
84	118	428
88	112	409
92	107	391
96	103	375
100	099	360
104	095	346
108	091	333
112	088	321
Top Auger Switch	Automatic	
Bottom Auger Switch	2 Speed	
Mode Switch	Continuous Flow	
Fan	On	
Burner	On	
M C Switch	On	
Batch Timers	Not Used	
*1. See Drying Time Table for estimated drying for various grain drying processes and moisture reductions.		
*2. Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn=1.13 x dry bushels.		

25. DRYING TIME CHART

C-Series Sample A-Staged Automatic Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR
20	20	15	10	572	10	10	1287
24	24	15	10	525	14	10	1073
28	28	15	10	486	18	10	919
32	32	15	10	452	22	10	804
36	36	15	10	422	26	10	715
40	40	15	10	396	30	10	644
44	44	15	10	373	34	10	585
48	48	15	10	353	38	10	536
52	52	15	10	334	42	10	495
56	56	15	10	317	46	10	460
60	60	15	10	303	50	10	429
64	64	15	10	289	54	10	402
68	68	15	10	276	58	10	388
72	72	15	10	265	62	10	358
76	76	15	10	255	66	10	339
80	80	15	10	245	70	10	322
84	84	15	10	236	74	10	306
88	88	15	10	228	78	10	293
92	92	15	10	220	82	10	280
96	96	15	10	213	86	10	268
100	100	15	10	206	90	10	257
104	104	15	10	200	94	10	248
108	108	15	10	194	98	10	238
112	112	15	10	188	100	10	230
Top Auger Switch					Automatic		
Bottom Auger Switch					Automatic		
Mode Switch					Staged		
Fan					On		
Burner					On		
MC Selector Switch					On		
Dry Timer					Set as Indicated		
Cool Timer					0		
Meter Roll Adjustment							
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for SA and D&C.							

26. DRYING TIME CHART

C-Series Sample B-Staged Automatic Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR
20	20	15	10	683	10	10	1536
24	24	15	10	627	14	10	1280
28	28	15	10	580	18	10	1097
32	32	15	10	539	22	10	960
36	36	15	10	504	26	10	853
40	40	15	10	473	30	10	768
44	44	15	10	445	34	10	698
48	48	15	10	421	38	10	640
52	52	15	10	399	42	10	591
56	56	15	10	379	46	10	549
60	60	15	10	361	50	10	512
64	64	15	10	345	54	10	480
68	68	15	10	330	58	10	452
72	72	15	10	317	62	10	427
76	76	15	10	304	66	10	404
80	80	15	10	293	70	10	384
84	84	15	10	282	74	10	366
88	88	15	10	272	78	10	349
92	92	15	10	263	82	10	334
96	96	15	10	254	86	10	320
100	100	15	10	246	90	10	307
104	104	15	10	238	94	10	295
108	108	15	10	231	98	10	284
112	112	15	10	224	102	10	274
Top Auger Switch					Automatic		
Bottom Auger Switch					Automatic		
Mode Switch					Staged		
Fan					On		
Burner					On		
MC Selector Switch					On		
Dry Timer					Set as Indicated		
Cool Timer					0		
Meter Roll Adjustment							
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for AB and D&C.							

27. DRYING TIME CHART

C-Series Sample C-Staged Automatic Operation							
	Dry and Cool Process				Full Heat Process		
Total *1 Drying Time Min.	Dry Timer Setting Min.	Cool Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR	Dry Timer Setting Min.	Unload Timer Setting Min.	Approx*2 Drying Cap. BU/HR
20	20	15	10	815	10	10	1833
24	24	15	10	748	14	10	1528
28	28	15	10	692	18	10	1309
32	32	15	10	643	22	10	1146
36	36	15	10	601	26	10	1018
40	40	15	10	564	30	10	917
44	44	15	10	531	34	10	833
48	48	15	10	502	38	10	764
52	52	15	10	476	42	10	705
56	56	15	10	453	46	10	655
60	60	15	10	431	50	10	611
64	64	15	10	412	54	10	573
68	68	15	10	394	58	10	539
72	72	15	10	378	62	10	509
76	76	15	10	363	66	10	482
80	80	15	10	349	70	10	458
84	84	15	10	336	74	10	436
88	88	15	10	324	78	10	417
92	92	15	10	313	82	10	398
96	96	15	10	303	86	10	382
100	100	15	10	293	90	10	367
104	104	15	10	284	94	10	353
108	108	15	10	276	98	10	339
112	112	15	10	268	102	10	327
Top Auger Switch					Automatic		
Bottom Auger Switch					Automatic		
Mode Switch					Staged		
Fan Switch					On		
Burner Switch					On		
MC Selector Switch					On		
Dry Timer					Set as Indicated		
Cool Timer					0		
Meter Roll Adjustment							
*1. See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.							
*2. Drying capacities assume a meter roll setting of 100% and are shown as dry bushels or 1.25 cu.ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater or less actual unloading rate affects drying capacity for SA and D&C.							

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