OPERATOR’S MANUAL

C-2120A, C-2125A,
C-2130A, and C-2140A
Model Grain Dryers
READ THESE INSTRUCTIONS BEFORE INSTALLATION and OPERATION. SAVE FOR FUTURE REFERENCE.

Thank you for choosing a Farm Fans C-2100A Series grain dryer. These units are among the finest grain dryers ever built; designed to give you excellent operating performance and reliable service for many years.

This manual describes the installation and operation for all standard production type C-2100A Series dryers. These dryers are available for liquid propane or natural gas fuel supply, with either 230V or 460V three phase (60 Hz) electrical power.

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 cannot 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 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 the 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 Operating Precautions and warning listed on page 2 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.

WARRANTY

Farm Fans warrants its products to be free of defects in material and workmanship. The only obligation of the manufacturer is to repair or replace products which have been submitted and found to be defective within 12 months after installation. If so found defective, the products will be repaired or replaced without charge, this constituting and entirely fulfilling the warranty obligation. Farm Fans assumes no liability for expenses incurred without written authorization; in no event shall its 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. Some components supplied by manufacturers are warranted separately by those suppliers. This warranty is exclusive and in lieu of all other warranties, expressed or implied. Farm Fans reserves the right to make design or specification changes at any time, without any contingent obligation to purchasers of products already sold.

All instructions, with the exception of those concerning safety, shall be construed as recommendations only; because of the many variable conditions in actual installation, Farm Fans assumes no liability for results arising from the use of such recommendations.
Operating Precautions

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

Warning! Dryer Must Be Kept Clean for Safe Operation.

Important: Keep inside of dryer clean! Do not allow chaff and other combustible material to accumulate within air plenum chamber. Make certain to turn off and lock out the main power before entering dryer!
**SPECIFICATIONS**  
**SECTION 1**

**TYPE:** Continuous flow, single module with two fan-heater units and two temperature zones provided for Dry & Cool or Full Heat dryeration process. The upper temperature zone and fan-heater is sized larger than the lower to optimize Dry-Cool operation.

**GRAIN COLUMNS:** Two 14" galvanized steel grain columns. Solid column dividers every two feet. Grain movement through columns is controlled by the advanced electronic variable speed Vari-Trol VMD metering roll drive system designed to precisely control grain moisture.

**FANS:** Two heavy-duty direct driven, quiet, vane axial fans with full motor overload protection. All fans run at 1750 RPM, with the exception of the 3500 RPM cooling fan of the C-2120A and C-2125A. Air Volume, HP and static pressure are matched to grain volume.

**HEATERS:** Two high capacity direct-fired, efficient burners with full electric ignition. Electronic temperature control for precise drying heat. Starfire burners used on all lower fans and the upper fan of the C-2120A and C-2125A; stainless steel octagonal burners used on upper fan of C-2130A and C-2140A models.

**AUGERS:** Automatically controlled top leveling augers with power circuit for simultaneous operation of auxiliary loading conveyor. Bottom auger unloads grain discharged from metering rolls. Power circuits for loading and take away conveyors are standard. Heavy-duty construction.

**AUTOMATIC CONTROL:** Automatic control of all functions: loading, drying, cooling, and discharge. Full safety control system; automatic shutdown on wet grain outage, grain high limit, and discharge safety shutoff. Safety circuit shutdown indicators. Discharge shutoff feature designed to shut down dryer and relieve grain pressure in the event the auxiliary grain unloading system stops or becomes plugged.

**NOTE 1:** DIMENSION 'D', LEG HEIGHT, IS 16" STANDARD. OTHER HEIGHTS ARE AVAILABLE.

**Fig. 1-1 C-2100A Series dimensions**

<table>
<thead>
<tr>
<th>Model</th>
<th>'A'</th>
<th>'B'</th>
<th>'C'</th>
<th>'D'</th>
<th>'E'</th>
<th>Leg Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2120A</td>
<td>14'-0&quot;</td>
<td>21'-0&quot;</td>
<td>22'</td>
<td>16' MIN.</td>
<td>13'-11&quot;</td>
<td>3 1/2</td>
</tr>
<tr>
<td>C-2125A</td>
<td>18'-0&quot;</td>
<td>25'-0&quot;</td>
<td>26'</td>
<td>16' MIN.</td>
<td>15'-2&quot;</td>
<td>3 1/2</td>
</tr>
<tr>
<td>C-2130A</td>
<td>20'-0&quot;</td>
<td>27'-0&quot;</td>
<td>28'</td>
<td>16' MIN.</td>
<td>15'-2&quot;</td>
<td>3 1/2</td>
</tr>
<tr>
<td>C-2140A</td>
<td>26'-0&quot;</td>
<td>33'-0&quot;</td>
<td>34'</td>
<td>16' MIN.</td>
<td>15'-2&quot;</td>
<td>4 1/2</td>
</tr>
</tbody>
</table>
### TABLE 1-1  C-2100A SERIES SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>C-2120A</th>
<th>C-2125A</th>
<th>C-2130A</th>
<th>C-2140A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Construction</strong></td>
<td>1 Module with Two Zones</td>
<td>1 Module with Two Zones</td>
<td>1 Module with Two Zones</td>
<td>1 Module with Two Zones</td>
</tr>
<tr>
<td><strong>Grain Column by Length</strong></td>
<td>14'</td>
<td>14'</td>
<td>20'</td>
<td>26'</td>
</tr>
<tr>
<td><strong>Grain Column Width</strong></td>
<td>14&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td><strong>Holding Capacity (total)</strong></td>
<td>375 Bu.</td>
<td>535 Bu.</td>
<td>595 Bu.</td>
<td>775 Bu.</td>
</tr>
<tr>
<td><strong>Holding Capacity (dry and cool)</strong></td>
<td>320 Bu.</td>
<td>415 Bu.</td>
<td>460 Bu.</td>
<td>600 Bu.</td>
</tr>
<tr>
<td><strong>Transport Length (hitch to dis. auger)</strong></td>
<td>23'-1-1/2&quot;</td>
<td>27'-1-1/2&quot;</td>
<td>29'-1-1/2&quot;</td>
<td>35'-1-1/2&quot;</td>
</tr>
<tr>
<td><strong>Transport Width</strong></td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td><strong>Transport Height</strong></td>
<td>13'-5&quot;</td>
<td>12'-10&quot;</td>
<td>12'-10&quot;</td>
<td>12'-10&quot;</td>
</tr>
<tr>
<td><strong>Installed Length</strong></td>
<td>21'-6&quot;</td>
<td>25'-0&quot;</td>
<td>27'-0&quot;</td>
<td>33'-0&quot;</td>
</tr>
<tr>
<td><strong>Installed Width</strong></td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td><strong>Installed Height (above foundation supports)</strong></td>
<td>15'-2&quot; + 8&quot; Fill Hopper</td>
<td>15'-2&quot; + 8&quot; Fill Hopper</td>
<td>15'-2&quot; + 8&quot; Fill Hopper</td>
<td>15'-2&quot; + 8&quot; Fill Hopper</td>
</tr>
<tr>
<td><strong>Top Fan</strong></td>
<td>28&quot; Dia, 1750 RPM, 13 HP</td>
<td>36&quot; Dia, 1750 RPM, 15 HP</td>
<td>39&quot; Dia, 1750 RPM, 20 HP</td>
<td>39&quot; Dia, 1750 RPM, 25 HP</td>
</tr>
<tr>
<td><strong>Bottom Fan</strong></td>
<td>24&quot; Dia, 3500 RPM, 7 HP</td>
<td>24&quot; Dia, 3500 RPM, 10 HP</td>
<td>28&quot; Dia, 1750 RPM, 13 HP</td>
<td>28&quot; Dia, 1750 RPM, 13 HP</td>
</tr>
<tr>
<td><strong>Heaters - Max. Capacity in Million BTU/Hr.</strong></td>
<td>3.0</td>
<td>4.6</td>
<td>6.0</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Top Heater</strong></td>
<td>2.3</td>
<td>2.3</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Btm. Heater (for full heat operation)</strong></td>
<td>1800 BPH, 6&quot; Dia, 5 HP</td>
<td>2800 BPH, 8&quot; Dia, 5 HP</td>
<td>2800 BPH, 8&quot; Dia, 7.5 HP</td>
<td>2800 BPH, 8&quot; Dia, 10 HP</td>
</tr>
<tr>
<td><strong>Bottom Auger Size and Capacity - Maximum Rate</strong></td>
<td>945 BPH, 8&quot; Dia, 3 HP</td>
<td>1220 BPH, 8&quot; Dia, 3 HP</td>
<td>1350 BPH, 8&quot; Dia, 5 HP</td>
<td>1760 BPH, 8&quot; Dia, 7.5 HP</td>
</tr>
<tr>
<td><strong>Meter Roll Drive</strong></td>
<td>3/4 HP, SCR</td>
<td>3/4 HP, SCR</td>
<td>3/4 HP, SCR</td>
<td>3/4 HP, SCR</td>
</tr>
<tr>
<td><strong>Electric Load (fans, top &amp; btm. augers)</strong></td>
<td>145 Amps</td>
<td>186 Amps</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Single Phase 230V</strong></td>
<td>145 Amps</td>
<td>186 Amps</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Three Phase 230V</strong></td>
<td>86 Amps</td>
<td>96 Amps</td>
<td>132 Amps</td>
<td>154 Amps</td>
</tr>
<tr>
<td><strong>Three Phase 460V</strong></td>
<td>43 Amps</td>
<td>51 Amps</td>
<td>66 Amps</td>
<td>77 Amps</td>
</tr>
<tr>
<td><strong>Drying Capacity - Shelled Corn</strong></td>
<td>226 BPH</td>
<td>300 BPH</td>
<td>350 BPH</td>
<td>455 BPH</td>
</tr>
<tr>
<td><strong>Dry &amp; Cool 25-15%</strong></td>
<td>390 BPH</td>
<td>505 BPH</td>
<td>595 BPH</td>
<td>774 BPH</td>
</tr>
<tr>
<td><strong>Dry &amp; Cool 20-15%</strong></td>
<td>395 BPH</td>
<td>515 BPH</td>
<td>600 BPH</td>
<td>780 BPH</td>
</tr>
<tr>
<td><strong>Full Heat 25-15%</strong></td>
<td>640 BPH</td>
<td>835 BPH</td>
<td>980 BPH</td>
<td>1274 BPH</td>
</tr>
<tr>
<td><strong>Full Heat 20-15%</strong></td>
<td>640 BPH</td>
<td>835 BPH</td>
<td>980 BPH</td>
<td>1274 BPH</td>
</tr>
</tbody>
</table>

1. 24" high supports required for heat reclaimer installation.
2. Actual discharge rate is controlled by meter roll speed adjustment, at 5% to 100% of maximum rate.
3. Excludes auxiliary load and unload conveyor equipment.
4. Capacities listed are wet bushels at listed input moisture content and are estimates based on drying principles, field results, and computer simulation. Variances may occur due to physiological grain factors (kernel size, chemical composition, variety, maturity), excessive fines, adverse weather conditions, etc.
5. Grain discharged hot from the dryer at approximately 17% output moisture should result in a final moisture content of approximately 15% after cooling (dryeration).
### TABLE 1-2 AUGER DRIVE DATA

<table>
<thead>
<tr>
<th>AUGERS</th>
<th>MOTORS</th>
<th>SPROCKETS</th>
<th>SHEAVES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approx. Capacity Bu./hr.</td>
<td>HP</td>
<td>RPM</td>
</tr>
<tr>
<td>Top Auger</td>
<td>6&quot;</td>
<td>420</td>
<td>1800</td>
</tr>
<tr>
<td>C-2120A</td>
<td>8&quot;</td>
<td>342</td>
<td>2800</td>
</tr>
<tr>
<td>C-2125A</td>
<td>8&quot;</td>
<td>342</td>
<td>2800</td>
</tr>
<tr>
<td>C-2130A</td>
<td>8&quot;</td>
<td>342</td>
<td>2800</td>
</tr>
<tr>
<td>C-2140A</td>
<td>8&quot;</td>
<td>342</td>
<td>2800</td>
</tr>
</tbody>
</table>

Bottom Auger

| Bottom Auger | 8" | 114 | 952² | 3 | 1750 | BX-93 (2) | #50 | 15 | 48 | 2.8"/1-1/8" | 13.4"/1-3/4" |
| C-2120A | 8" | 147 | 1220² | 3 | 1750 | BX-93 (2) | #50 | 15 | 48 | 2.8"/1-1/8" | 10.4"/1-3/4" |
| C-2125A | 8" | 159 | 1350² | 5 | 1750 | BX-93 (2) | #50 | 15 | 48 | 3.6"/1-1/2" | 12.4"/1-3/4" |
| C-2130A | 8" | 218 | 1760² | 7.5 | 1750 | BX-93 (2) | #50 | 25 | 48 | 3.2"/1-3/8" | 13.4"/1-3/4" |

1. Dryer auger capacities and power requirements vary with grain moisture content and amount of fine material in grain.
2. This Bu./Hr. listing represents the maximum meter roll discharge rate. The bottom auger capacity exceeds the maximum meter roll rate.

### TABLE 1-3 SCR DRIVE INFORMATION

<table>
<thead>
<tr>
<th>SCR Control - Part No. &amp; Supply Voltage</th>
<th>DC Motor</th>
<th>Motor Sheave</th>
<th>Gearbox - Part no. and ratio</th>
<th>Gearbox Drive</th>
<th>Meter Roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2120A / C-2125A</td>
<td>415-2302-8, 230V</td>
<td>002-1192-0, 3/4 HP, 1600 RPM</td>
<td>017-1393-2, 50:1</td>
<td>5.7&quot;</td>
<td>6 Flute, 8.42 rpm</td>
</tr>
<tr>
<td>C-2130A</td>
<td>415-2302-8, 230V</td>
<td>002-1192-0, 3/4 HP, 1600 RPM</td>
<td>017-1393-2, 50:1</td>
<td>5.7&quot;</td>
<td>6 Flute, 8.42 rpm</td>
</tr>
<tr>
<td>C-2140A</td>
<td>415-2302-8, 230V</td>
<td>002-1192-0, 3/4 HP, 1600 RPM</td>
<td>017-1403-9, 50:1</td>
<td>5.7&quot;</td>
<td>6 Flute, 8.42 rpm</td>
</tr>
</tbody>
</table>

### APPROXIMATE DISCHARGE RATES — BU/HR AT VARIOUS SETTINGS

<table>
<thead>
<tr>
<th>Setting</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
<th>45%</th>
<th>50%</th>
<th>55%</th>
<th>60%</th>
<th>65%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2120A</td>
<td>95</td>
<td>143</td>
<td>190</td>
<td>238</td>
<td>285</td>
<td>333</td>
<td>381</td>
<td>428</td>
<td>476</td>
<td>523</td>
<td>571</td>
<td>618</td>
<td>666</td>
<td>761</td>
<td>856</td>
<td>952</td>
</tr>
<tr>
<td>C-2125A</td>
<td>122</td>
<td>183</td>
<td>244</td>
<td>305</td>
<td>366</td>
<td>427</td>
<td>488</td>
<td>549</td>
<td>610</td>
<td>671</td>
<td>732</td>
<td>793</td>
<td>854</td>
<td>976</td>
<td>1098</td>
<td>1220</td>
</tr>
<tr>
<td>C-2130A</td>
<td>135</td>
<td>202</td>
<td>270</td>
<td>337</td>
<td>405</td>
<td>472</td>
<td>540</td>
<td>607</td>
<td>675</td>
<td>742</td>
<td>810</td>
<td>877</td>
<td>945</td>
<td>1080</td>
<td>1215</td>
<td>1350</td>
</tr>
<tr>
<td>C-2140A</td>
<td>176</td>
<td>264</td>
<td>352</td>
<td>440</td>
<td>528</td>
<td>616</td>
<td>704</td>
<td>792</td>
<td>880</td>
<td>968</td>
<td>1056</td>
<td>1144</td>
<td>1232</td>
<td>1408</td>
<td>1584</td>
<td>1760</td>
</tr>
</tbody>
</table>
TRANSPORTING DRYER

An optional Transport Kit is available for transporting the unit by truck or tractor. Make certain to observe the following safety precautions:

1. Recommended towing hitch height: 16 to 17 inches.
2. Hitch pin to be not less than 3/4 inch in dia. and securely fastened so it will not come out in travel.
3. Use a safety chain.
4. Dryer must be towed empty and in accordance with applicable state or provincial regulations.
5. Recommended tire pressure 55-60 psi (cold).
6. Maximum towing speed: 45 mph
7. After first 50 miles and every 200 miles thereafter:
   a. Check temperature of transport wheels' hubs and spindles immediately after stopping. Temperature should not exceed 150°F. May be hot to touch, but not melting lubricant.
   b. Check wheel lug bolts; they are factory torqued at 115 to 120 ft/lbs. Retighten, if required, to approximately 90 ft/lbs.

INSTALLATION

SYSTEM LAYOUT — Consider the grain handling system and location of storage bins and existing conveyors in selecting the dryer site, to facilitate wet grain supply and dry grain discharge to conveyors.

SITE SELECTION — The dryer is not to be operated inside a building or in any area not permitted by electrical codes, fuel installation regulations, or insurance requirements. Do not operate in an area where combustible material can be drawn into the fans. Maintain the required minimum distance from other structures. Refer to Fig. 1-1 for installed dryer dimensions.

FILLING POINT — Wet grain must enter the dryer at the hopper at the rear end of the top auger, since the top auger moves grain forward, toward the paddle switch controlling the top auger (except for special build front-loading units).

WET GRAIN SUPPLY — A wet holding bin may be utilized to supply grain to the dryer, with gravity flow into the dryer loading conveyor. Also, gravity flow from a wagon or truck into a loading conveyor may be used to fill the dryer. The top leveling auger will accept grain at any rate up to its maximum capacity as listed in Table 1-1. In any case, the dryer must have a constant supply of wet grain. Auxiliary loading conveyors should be sized to nearly match the capacity of the top auger, to avoid air loss problems caused by underfilling during high drying rate operations.

WET GRAIN LOADING — The dryer will automatically start the top auger and any loading conveyor electrically connected to the power terminal strip on the power panel (see Section 8 - Wiring Diagrams). At the beginning, dryer will completely fill, requiring approximately its full holding capacity. During drying, the top auger will start and stop as required to maintain the dryer full of wet grain.

LOAD TIMER — The unit is equipped with a top auger Load Timer (inside ASC control box), to provide automatic shutdown on wet grain outage, if the top auger operates for a time exceeding the timer setting (field adjustable).

DISCHARGE AUGER EXTENSIONS — Special discharge auger extension kits are available, with an additional length of 1 to 10 feet (one foot increments) to provide dry grain discharge points at various distances from the rear of the dryer, for direct discharge into elevator legs or other conveyors. Extensions are available with either a solid or perforated tube.

 AUXILIARY CONVEYOR OVERLOAD RELAYS — Overload relays for the loading conveyor and take away conveyor are factory equipped with heater elements as listed in Table 2-2 for motors on auxiliary conveyors. If other HP ratings are used, it is necessary to change the heater elements to provide proper running load protection for the motors.

DRYER FOUNDATION — The wheels are provided only for transportation of the empty dryers to the site location. Before assembling and installing the dryer, prepare a level, secure foundation, with provisions for dryer tie-down.

NOTE: If the dryer is to be equipped with an optional Heat Reclaimer Package, also refer to instructions included with the Heat Reclaimer. Heat Reclaimers for C-2100A dryers include special dryer support structures which are intended for a conventional, flat type concrete foundation.

DRYER PREPARATION

1. Remove Parts — Remove hopper and other parts shipped inside dryer.
2. Wet Bin — Standard C-2120A models are equipped with a Compact Wet-Bin. Refer to Bulletin CWB-01-2 for installation instructions. All other standard models are equipped with a Fold-up Wet-Bin, which is installed according to Bulletin WBF-01-2. Assemble the top auger drive according to appropriate wet-bin installation bulletin.
3. Install Fill Hopper according to the appropriate wet-bin installation bulletin.
5. Inspection & Testing — Thoroughly inspect dryer to make certain all parts have been properly installed and tightened. See FUEL CONNECTION and ELECTRI-
CAL POWER SUPPLY headings in this section for important fuel and electrical requirements. Check that all gas fuel lines are free of leaks. Also check vaporizer assembly on all liquid propane models to ensure that vaporizer coil does not contact the burner vanes; see Section 7 - SERVICE, for vaporizer coil inspection details.

After dryer and all systems have been completed, start dryer and check it for proper operation as outlined in Section 4 - TEST FIRING.

FUEL CONNECTION

LIQUID PROPANE (LP) DRYERS WITH INTERNAL VAPORIZERS

LIQUID DRAW — The dryer is designed to operate on liquid propane, with liquid draw from the supply tank. A piping system is provided on the dryer, including strainer, pressure relief valve, and manual shut-off valve; a pressure regulator is provided on each fan-heater unit, between the vaporizer and burner.

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

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

NATURAL GAS (NG)

GAS VOLUME AND PRESSURE — The dryer is designed to operate on natural gas having a heat value of about 1,000 BTU per cubic foot. The dryer is equipped with a natural gas supply pipe system connected to the heater solenoid valves. A regulated pressure of 8 to 10 PSI must be provided at the connection to the dryer, with gas available in sufficient volume to maintain operating pressure.

LP CONNECTION

CONNECTION TO LIQUID MANIFOLD ON DRYER
Use a flexible connection hose designed for LP gas.
See Table 2-1 for recommended line size.

PROpane supply TANK
Recommended minimum of 1,000 gallons connected for liquid draw.

Fuel supply system should conform with National Fire Protection Association standards.
Consult propane supplier for proper fittings, connection hose, and safety controls required to meet standards.
Do not use a pressure regulator at the supply tank.
Open LP shut-off valves slowly to prevent accidental closing of excess flow valves.

NATURAL GAS CONNECTION

CONNECTION TO NATURAL GAS MANIFOLD ON DRYER
See Table 2-1 for recommended line sizes.

NATURAL GAS METER and REGULATOR
See Table 2-1 for required pressure and typical maximum fuel flow rates.

Fig. 2-1 Fuel hookup
ELECTRICAL POWER SUPPLY

POWER SUPPLY — An adequate power supply and proper wiring are important factors for maximum performance and long life of the dryer. Electrical service must be of adequate size to prevent low voltage damage to motors and control circuits. All dryers should be field provided with a dependable equipment ground. Electrical power supply should conform to local, state, or provincial requirements.

POWER SUPPLY DISCONNECT — All dryers should be equipped with a power disconnect switch external to the ASC Control Box to permit total power shutdown before opening ASC dead front, as required for inspection and service. The power disconnect switch should be located close to the dryer for quick shutdown.

TRANSFORMERS WIRING VOLTAGE DROP — Contact the service representative of the power supplier to advise of the additional load to be placed on the line. Check on KVA rating of transformers, considering total horsepower load. The power supply wiring, main switch equipment, and transformers must be capable of providing adequate motor starting and operating voltage. Voltage drop during motor starting should not exceed 14% of normal voltage, and running voltage (after motor is at full speed) should be within 8% of normal voltage.

ELECTRICAL LOAD — Table 2-2 indicates the electrical load in horsepower and full load current, for motors on the dryer, and for auxiliary loading and take-away conveyors which can be directly connected to the power circuits in the dryer control panel.

OVERLOAD RELAYS — Most overload relays are adjustable from 85% to 115% of normal load in amperes by an adjustment knob in each relay (see Overload Relay Heater specs in Table 2-2). Dryers are shipped with overload relay heater elements installed for the auxiliary conveyor motor sizes as listed in Table 2-2. If different motors are used, the heater elements must be changed to provide adequate motor overload protection.

CONNECTING AUXILIARY CONVEYORS

The maximum sizes of auxiliary conveyor motors which can be powered directly from the dryer's power terminals are listed in Table 2-2. See appropriate power circuit wiring diagram for terminal connection numbers.

To connect auxiliary auger motors which are LARGER than the maximum, refer to the following information.

A. Motors that must be powered from a source outside the dryer must use a separate contactor and overload protection device for each motor.

B. For automatic operation with 230V 3-phase dryers: use 230V contactor coils and connect LOADING coil to POWER TERMINALS 7 and 9. Connect UNLOADING coil to POWER TERMINALS 13 and 15.

C. For automatic operation with 460V 3-phase dryers: either use a control stepdown transformer to power 230V contactor coil, or use 460V contactor coils and connect them as described in item B above.

D. When conveyor motors are powered from an external source and they are connected for automatic opera-
tion, their overload protective switches should be connected in series and then connected into the dryer safety circuit. For recommended connections, refer to motor overload protection connections shown in the SAFETY CIRCUIT portion of the control circuit wiring diagram in Section 8.

### TABLE 2-2 ELECTRICAL LOAD, OVERLOAD RELAYS, AND CIRCUIT BREAKERS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 HP DC</td>
<td>3a 230V</td>
<td>20/13</td>
<td>13/13</td>
<td>7.5/5</td>
<td>5/5</td>
<td>10/10 (two)</td>
</tr>
<tr>
<td>3a 460V</td>
<td>20/13</td>
<td>13/13</td>
<td>7.5/5</td>
<td>5/5</td>
<td>10/10 (two)</td>
<td></td>
</tr>
</tbody>
</table>

| Full Load | 3a 230V | 56/36   | 20/18    | 10/6.5    | 6.5/4.3    | 10/6.5    |
| Max Running Load (dryer only, amps) | 3a 230V | 50/30   | 30/30    | 30/30     | 30/30     |

### AUXILIARY MOTOR DATA

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2120A</td>
<td>7.5 HP</td>
<td>10 HP (3e 230V)</td>
</tr>
<tr>
<td>C-2125A</td>
<td>7.5 HP</td>
<td>10 HP (3e 230V)</td>
</tr>
<tr>
<td>C-2130A</td>
<td>10 HP</td>
<td>15 HP (3e 230V)</td>
</tr>
<tr>
<td>C-2140A</td>
<td>10 HP</td>
<td>15 HP (3e 230V)</td>
</tr>
</tbody>
</table>

### SCR MOTOR DATA

<table>
<thead>
<tr>
<th>Size</th>
<th>Control Amps / Volts</th>
<th>Motor Amps / Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 HP DC</td>
<td>7.5A / 230VAC</td>
<td>4.8A / 155VDC</td>
</tr>
</tbody>
</table>

### NOTES:

1. The motor current and maximum dryer running loads listed above are based on auxiliary conveyor motor sizes shown. The maximum size motor that can be powered directly through the dryer’s ASC control is listed in the Aux. Motor Data chart. All larger than maximum auxiliary conveyor motors require separate contactors and overload protectors with coil circuits connected to the dryer for automatic operation.

   **IMPORTANT:** All standard Model C-2100A dryers are factory equipped with overload relay heater elements sized for auxiliary motors listed in charts above. If the actual auxiliary motors used are of a different size, the elements must be changed.

2. Auxiliary motors are controlled by the top and bottom auger circuit breakers.
MISCELLANEOUS COMPONENTS

CONTROL STOP/START

The Main Control circuit is energized by pushing the green START button. The green light on the START button indicates the control circuit is ON and that all the safety switches are reset.

Push the red STOP button to stop the dryer control circuit.

FAN SWITCHES

The group of FAN switches controls the UPPER and LOWER fan motors. The green START button will light when the fan motor contactor has been energized.

MAIN/SAFETY GAS SHUT-OFF VALVE

VALVE OPERATION — This valve is an electrically energized, manual reset type valve. The valve’s electric solenoid is energized only when the dryer CONTROL CIRCUIT is turned ON. See Figs. 6-1 for valve location.

The valve has a "free handle" lever that cannot allow gas flow to the dryer until the dryer control circuit is energized. Only then does the lever engage to allow the handle to be manually raised to the latched position, thereby opening the valve. The gas flow will stop when the valve’s solenoid is de-energized (see CAUTION below).

CAUTION: Do not use the operating handle to close the valve. Always de-energize the electrical holding circuit while the valve is fully open for positive closing action.

An "open" and "shut" indicator is provided on the side of the Main/Safety Shut-off valve. (An orange indicating bar aligns itself with the words "open" or "shut." Note 6-2)

BURNER SWITCHES

The group of BURNER switches controls the UPPER and LOWER burners. Each burner switch has a red light to indicate a LOCKOUT condition.

Each burner is ignited by turning the appropriate burner switch ON. Ignition should take place after a short purge time.

NOTE: In order to light the burner, the Main/Safety Gas Shut-off Valve’s handle must be manually reset to OPEN and the appropriate fan must be ON.

Both burner switches should be ON for FULL HEAT drying. The lower burner switch should be OFF for DRY/COOL drying. Turn the burner selector switch OFF to stop each burner.

A dryer shutdown will occur and the appropriate burner LOCKOUT light will be energized if the burner fails to ignite or the burner flame is not sensed for a period of approximately 60 seconds. Several minutes may be required to allow the lockout to automatically reset itself before ignition may again be attempted.

PLENUM TEMPERATURE CONTROLS

PLENUM CONTROLLER OPERATION — Drying temperatures are controlled by the Electronic Temperature (ET) plenum controllers located on the ASC control panel. Each fan-heater is controlled by a separate controller (see Fig. 6-7).

The controller senses air plenum temperature and cycles burner from Hi-Fire to Lo-Fire operation to maintain desired drying temperature as indicated by plenum temperature indicator on the asc panel.

CHECKING AND ADJUSTING PLENUM TEMPERATURE — To determine drying temperature within the air plenum chamber(s), depress the appropriate CHECK SWITCH (labeled "HOLD TO READ") and observe temperature indicated on the meter. To reset the plenum drying temperature, simply rotate the proper adjustment knob to the desired temperature setting. The ET system will automatically cycle the burner to maintain the set temperature (see Fig. 6-7).

HI/LO FIRE PRESSURE CONTROLS

HI-FIRE / LO-FIRE — When a heater is operating on Hi-Fire, its burner is supplied with a relatively large flow of gas from both the Hi-Fire gas solenoid valve and the Flow Control valve. When a heater is operating on Lo-Fire, only the Flow Control valve supplies gas flow to its burner.

PROPANE HI-FIRE — On propane models, 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 maximum burner pressure, as shown by the pressure gauge on the unit. For maximum pressure, see Table 2-1 - Fuel System Specifications (maximum listing for LP "Operating Pressure Range").

NATURAL GAS HI-FIRE — For natural gas models, 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 approx. 8 PSI of pressure WHILE BURNER IS OPERATING ON HI-FIRE. For maximum pressure, see Table 2-1 - Fuel System Specifications (maximum listing for Natural Gas "Operating Pressure Range").

LO-FIRE — The Lo-Fire gas pressure is controlled by the Flow Control valve (see Fig. 6-4).

PROPANE LO-FIRE — On propane models, set the Lo-Fire gas pressure to the lowest setting listed in the LP "Operating Pressure Range" in Table 2-1, by rotating the knob on the Flow Control valve. Lock setting with an Allen wrench after making this adjustment.
Burner must be operating on Lo-Fire when making this adjustment.

**NATURAL GAS LO-FIRE** — For natural gas models, turn the Flow Control valve handle to provide the lowest pressure listed for (N) "Operating Pressure Range" in Table 2-1, while the burner is operating on Lo-Fire (see Fig. 6-4).

**BURNER CYCLE** — When 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 gauge. It is not necessary for burner to cycle with short 5 to 10 second intervals, BUT IT IS IMPORTANT THAT THE BURNER DOES CYCLE OCCASIONALLY.

If burner remains in Hi-Fire and does not cycle, increase Gas Regulator pressure setting on propane models, or the Manual Shut-off valve pressure on natural gas models (see Fig. 6-5), in order to satisfy the thermostat setting. Do not exceed the maximum operating pressure range listed in Table 2-1.

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

**LOAD AUGER SWITCH (Top Auger)**

The LOAD AUGER switch has three positions: ON, OFF, and AUTO.

The ON position is recommended when initially filling an empty dryer. With switch ON, the top auger will operate, but the Load Timer will be de-energized.

With the switch in either AUTO or ON, the top auger automatically starts and stops, as required, to keep the dryer full of grain.

The AUTO switch position is the normal setting and is used to automatically stop the dryer when the wet grain supply is exhausted. With switch in the AUTO position, the Load Timer will be energized whenever the load auger is operating. If the load auger and timer operate continuously for a period longer than the timer setting, the timer will automatically shut down the dryer.

**LOAD (Top Auger) TIMER**

FUNCTION — The top auger loads the wet bin intermittently, depending on when the paddle switch calls for more grain. The Load Timer checks that the load auger doesn't run beyond the normal time to fill the wet grain holding bin. If, due to inadequate wet grain supply, the load auger runs longer than a normal refill time, the Load Timer causes a dryer shutdown.

The Load Timer, located within the ASC control box, is an automatic reset type timer. The amber LOW GRAIN shutdown indicator will light whenever a shutdown is caused by the Load Timer.

**TIMER SETTING** — To set the Load Timer, observe the normal time required to fill the wet bin, then rotate the front dial to set timer to the average refill time plus several additional minutes.

**NOTE:** The Load Timer can be set to several time ranges of operation. The timer is factory set in the 60-minute range mode. With this arrangement, the no. 1 mark on the dial face equals 1/6 of the 60-minute range or 10 minutes.

**UNLOAD AUGER SWITCH**

The UNLOAD AUGER switch has two positions: OFF or AUTO.

With switch in the AUTO position, the auger runs continuously and the meter rolls are controlled by the Meter Roll Selector Switch position (manual/off/auto).

With switch in the OFF position, the meter rolls and auger are stopped.

The UNLOAD AUGER switch will energize the meter roll safety circuit monitor. This monitor will cause a dryer shutdown if meter roll rotation is not sensed for a period longer than (3) minutes and the METER ROLL shutdown indicator will be energized.

**DRYER OPERATOR LIGHT**

**LIGHT OPERATION** — The dryer operator light is designed to act as either a dryer monitor signal light, or a night convenience light.

**SWITCH POSITIONS** — The three-position switch provides ON, OFF, or MONITOR operation. When the switch is set ON, the light will stay energized even when the dryer is shut down. When the switch is set to MONITOR, the light will be ON only when the dryer is operating.

**NOTE:** The 115V light circuit is intended for 100 watt bulb operation. Do not install an oversize light bulb!

**HOUR METER**

The hour meter, located on the ASC Control Panel, is useful in keeping track of seasonal use of the dryer and determining when service is required. The hour meter is non-resetting and accumulates hours only when the upper fan is powered.

**DISCHARGE SAFETY SHUTOFF SWITCH (DSS)**

The DSS functions as an electrical safety shutoff switch and a grain release hatch. Located on the discharge tube assembly (see Fig. 3-1), this feature is designed to automatically shut down the dryer and relieve grain

![Fig. 3-1 Discharge assembly](image)
pressure, in the event the auxiliary grain unloading system stops or becomes plugged. After grain overflow is removed from the discharge tube and the grain release hatch falls to its normal position, the device will automatically reset and allow the dryer to be restarted.

The discharge assembly is equipped with a Collect-A-Sample tube to allow a safe and easy method of obtaining a grain sample. To operate, simply rotate the tube; 180° rotation provides maximum discharge.

HINGED FAST-TRIP CLEANOUT

The dryer is factory equipped with a "fast-trip" cleanout mechanism beneath the unload auger, as shown in Fig. 3-2. The individual fast-trip doors allow easy cleanout of accumulated materials.

METER ROLL CONTROLS

METER ROLL SELECTOR SWITCH

Switch has three positions: MANUAL, OFF, and AUTO. The UNLOAD AUGER switch must be ON in order to operate meter rolls. With switch in the MANUAL position, the meter roll speed is controlled by the MANUAL CONTROL dial on the ASC panel (see Fig. 6-7).

With switch in the AUTO position, meter rolls are controlled automatically by the Moisture Controller.

With the Meter Roll Selector set to Manual, the Moisture Controller can only display grain temperature, but cannot control anything. With Meter Roll Selector set to OFF, the Moisture Controller display is also off.

MANUAL UNLOAD CONTROL DIAL

The Manual Control dial sets meter roll speed to a constant unload rate. Set the desired % unload rate by watching the % Unload Rate volt meter as the Manual Control dial is adjusted. See Dryer Tables in Section 5 for suggested start-up settings.

% UNLOAD RATE (METER ROLL) VOLT METER

The % UNLOAD RATE volt meter monitors the DC ARMATURE VOLTAGE on the SCR MOTOR driving the meter rolls. This voltage represents the % UNLOAD RATE of the dryer and should range from 7% to 100% as the unload speed is changed. Be sure to use the % Unload Rate volt meter as the primary indicator of the % unload rate, as the Manual Control Dial setting will be close to but not as accurate as the volt meter reading.

VARI-TROL MOISTURE CONTROL

The Vari-Trol Moisture Control works on the principle that grain moisture and grain temperature are closely related. Monitoring grain temperature, combined with manual testing of the grain's final moisture content, will allow the operator to determine the proper temperature/moisture relationship. Using the digital-display temperature control assembly on the ASC panel, the operator can view the current grain temperature and set the desired grain temperature (setpoint), in the manner described as follows.

Fig. 3-2 Fast-trip cleanout assembly

SERVICE TIP: Open cleanout doors at end of season and remove debris. Doors may be left open during the off season for better drainage.

Fig. 3-3 Vari-Trol moisture controller
NOTE: As previously stated, with the Meter Roll Selector set to Manual, the Moisture Controller can only display grain temperature, but cannot control meter roll speed. With Meter Roll Selector set to OFF, the Moisture Controller display is also off.

SETTING TEMP

a. Push the DISP (display) button once and current setpoint will be displayed as indicated by the letters SP (setpoint) in the lower left-hand corner.

b. Raise or lower Setpoint to desired temperature by pushing the triangle buttons to increase or decrease.

c. Push RESET to return to measured temperature. SP will not be displayed. If display is inactive for 60 seconds, it will automatically return to measured temperature display. If moisture control is turned off while in the SP mode, the newly entered setpoint will be canceled.

Operating with Automatic Moisture Control

1. See Drying Time Tables in Section 5 for initial drying time, and Dryer Operation Charts also in Section 5 for initial % Unload Rate. Then start the dryer on manual control.

2. Measure discharged grain moisture. If adjustments are required, change the Manual Control Dial as required; allow dryer to operate for one grain pass before rechecking moisture.

Note: Time (min.) = Holding Capacity (Bu.) x 60
for one grain pass
Unload Rate (Bu/Hr)

3. After the grain discharge has been readjusted and stabilized at desired moisture content, note the temperature on the Moisture Controller and adjust the setpoint to the temp noted. Be sure to push Reset button after entering a new setpoint before proceeding.

4. Move the Unloading Switch from MAN to OFF, then to AUTO, pausing 5 to 6 seconds in the OFF position. This pause is necessary for the Moisture Control to reinitialize. If the Moisture Control has been correctly reinitialized, first zero degrees and then the correct grain temperature will display after the switch is set to AUTO. Failure to wait for a complete reset can cause a lengthy delay in the time the Moisture Control needs to arrive at the correct meter roll speed. Also important: Do not change the manual unload rate dial while in the auto mode.

5. The Moisture Controller will begin automatically controlling the meter roll speed to compensate for changes in the grain input moisture by maintaining the setpoint temperature entered.

6. If large changes in grain input moisture are encountered, repeat the setup procedure to establish a new setpoint temperature.

7. When restarting a loaded dryer following a shutdown period, the dryer should be operated in the MANUAL mode, until the newly dried grain has passed the RTD grain sensor (2/3 of the grain pass time) and the grain temperature has stabilized, before switching to the AUTOMATIC mode. The Moisture Control setpoint should not require readjustment.

METER ROLL MONITOR SYSTEM

Operation — The meter roll monitor system is designed to provide automatic shutdown of the dryer if the meter rolls fail to rotate due to obstructions, malfunction, or forgetting to turn the meter roll selector switch ON. The monitor system will function only when the unload auger circuit is energized, as required for normal meter roll operation.

The main monitor system components are briefly described as follows:

Proximity — The Meter Roll Proximity switch is mounted on the meter roll drive end of the dryer, on the side opposite the SCR drive motor. This switch senses the rotation of the meter rolls and sends an electrical signal to the meter roll monitor in the ASC control box. (See Fig. 3-4 and General Control Circuit in Section 8.) The light on the switch indicates LOAD ON each time a rotation has been sensed.

The proper switch adjustment is 1/4” clearance between Proximity switch head and the rotating target. The Proximity switch is slotted to allow readjustment, if required. When properly adjusted, the LOAD ON indicator will light every time the target rotates near the proximity switch. (For service information, see Bulletin MRM-02-2.)

NOTE: Earlier meter roll monitor switches used a set screw and two hex nuts as a rotating target. The suggested gap for this type switch is 3/4” between the bearing collar and proximity switch sensing head.

Meter Roll Monitor — The meter roll rotation is monitored by the solid state Meter Roll Monitor Relay in the ASC control box. The monitor is active whenever the Unload Auger switch is in the AUTO position. If the Monitor fails to see a change (either opening or closing) in the Proximity Switch signal within three minutes, the safety circuit will be broken and the dryer will automatically shut down. The Monitor resets automatically when the control start button is pushed.
SHUTDOWN FEATURES

SHUTDOWN INDICATOR LIGHTS

The Shutdown Indicator Lights are connected within the 115V safety control circuit to identify the causes of unexpected dryer shutdown problems. These lights are located on the ASC control panel and are identified in Fig. 3-5.

NOTES:

• NO indicator light will come ON if a motor overload relay trips open.

• The shutdown detector unit is designed so that if a malfunction occurs within the unit, such as a bad light or poor wiring connections, it will not prevent the dryer from operating, but will only cause abnormal action of the indicator lights.

RESTARTING DRYER AFTER A SHUTDOWN

1. Investigate the cause of shutdown and perform any necessary adjustments or corrections. For additional information, refer to "Control Circuit Not Energized" heading within Section 9, TROUBLESHOOTING. As a future reference, it may be advisable to make a record of the cause, as indicated by the shutdown indicator.

NOTE: On rare occasions, several dryer safety devices may act to interrupt the safety control circuit simultaneously. If this occurs, the LOWEST NUMBER INDICATOR LIGHT on the detector will always take priority, as the unit is constructed to indicate only one cause at a time.

2. Press the dryer START button. When the start button is pressed, the dryer control light should come ON, indicating that all safety devices have been reset and the dryer is operational.

SHUTDOWN INDICATOR LIGHTS - ASC PANEL

- LOW GRAIN (auto resets immediately)
- METER ROLL MONITOR (auto resets immediately)
- GRAIN HI-LIMIT (auto resets after cooling)
- BURNER HI-LIMIT (auto resets after cooling)
- PLENUM HI-LIMIT, upper & lower (auto resets after cooling)

UNMONITORED SAFETY SHUTDOWN DEVICES

- Unload auger overload relay
- Load auger overload relay
- Upper fan overload relay
- Lower fan overload relay
- SCR overload relay
- Discharge shut-off switch
- Auxiliary load overload relay

Fig. 3-5  Shutdown indicator lights  (For connection details and additional information, see Section 9 - Troubleshooting, and the safety circuit portion of the control circuit in Section 8.)
Before the dryer is filled with grain and placed into actual drying operation, thoroughly inspect the unit and check out the operation as described in the following steps.

1. Set controls and switches as follows:

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>TEST FIRING SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Load Auger switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Unload Auger Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Unloading Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Manual Unload Setting</td>
<td>Adjust to minimum</td>
</tr>
<tr>
<td>Loading Timer</td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

2. Inspect metering rolls and inside of dryer.

   Open all metering roll access doors and all hinged fast-trip clean-out doors and carefully inspect each compartment for any bolts, nuts or other foreign hardware which may have dropped into these areas during dryer installation and setup. Remove all material present to prevent possible jamming of the meter rolls or bottom auger and contamination of dried grain.

   Check the inside of air plenum chambers and remove all foreign materials.

3. Check plumbing for leaks.

   Open the main fuel supply valve to allow fuel flow to the electrically operated Main/Safety Gas Shut-off Valve.

   Note: Open the supply valve slowly to prevent accidental closing of the excess-flow valve within supply system.

   Proceed only after all fuel leaks have been corrected.

4. Turn on all circuit breakers located in the PSC power box.

5. Start dryer control circuit.

   Push the control START button. The green light on the control START button should immediately light, indicating the safety circuit and control circuit are energized to allow dryer operation.

6. Check conveyor motors rotation.

   A. With the wet grain supply shut off, quickly bump (jog) the Load Auger Switch to the ON position. The top auger should rotate clockwise as viewed from the drive end. Any dry grain auxiliary supply conveyors connected to the dryer power terminals should also start and rotate in the proper direction.

   B. Quickly bump (jog) the Unload Auger Switch to the ON position. The lower auger should rotate counterclockwise as viewed from drive end. Any dry grain auxiliary conveyors connected to the dryer power terminals should also start and rotate in the proper direction.

   C. With the Unload Auger Switch ON, set the Meter Roll Selector Switch to MANUAL position and check the direction of rotation. The RH metering roll shaft should rotate clockwise as viewed from rear end of the dryer. See Fig. 6-14.

7. Check meter roll operation.

   With Unloading Auger still operating, rotate the MANUAL UNLOADING control to increase meter roll speed and check the metering roll drive mechanism for proper operation throughout its full speed range. The UNLOAD RATE should range from approximately 7% to 100%. Make sure all drive belts and chains are properly tensioned and that all sections of the meter rolls rotate properly and smoothly.

8. Check fan motor rotation.

   Bump (jog) each fan switch and observe direction of motor rotation. All fans should turn COUNTERCLOCKWISE, as seen when looking into the fan inlet.

   NOTE: On three-phase model dryers, if all dryer motors run backward, they can easily be reversed by changing the dryer’s power supply connection. Auxiliary conveyors which have been field connected may have to be reversed individually.

9. Check burner safety lock-out function.

   Start the Upper Fan and turn the Upper Burner switch to the ON position. With the Main/Safety Shutoff valve kept in the normally closed position for this portion of the test, the burner control system’s PL Safety Circuit should cause a dryer shutdown after a short interval. The red Upper Burner LOCKOUT light should indicate the shutdown.

   Turn the Upper Burner OFF, Restart the Control Circuit, and repeat the test procedure for the Lower Burner.

10. Open the Main/Safety Gas Shut-off valve by using the handle.

   With the control circuit activated (green light ON), manually operate the lever on the Main/Safety Gas Shut-off valve to turn the fuel ON. Inspect all fuel lines and connections for possible leaks. ANY GAS LEAKS MUST BE CORRECTED.

11. Starting fan and firing burner.

   Individually start Upper and Lower Fans. Observe the number of seconds for each fan motor to reach FULL RPM. With proper voltage supply and wire sizing to dryer, the fan should reach full speed within 7 seconds and the motor running current should be within accept-
able limits to the full load amperage listed in the Electrical Specification Charts.

If fans start properly, turn the Upper and Lower Burner switches to ON position. The burners should fire after a short purge interval and gas pressure should be indicated on the pressure gauge for each burner.

Adjust Upper and Lower Plenum Temperature Controllers on the ASC panel to approximately 200°F to cause both burners to operate on Hi-Fire. Observe gas pressure indicated on each pressure gauge, then turn plenum controllers down to their minimum setting to cause burners to cycle into Lo-Fire. As the burner controllers are turned down, each gas pressure gauge should show a noticeable drop in pressure, indicating the Hi-Fire gas solenoid valve has closed and the burner is being supplied with only the reduced flow of gas through the flow control valve and the Lo-Fire solenoid valve.

**NOTE:** For additional information concerning the actual recommended gas pressure settings and the adjustment procedure, refer to Section 3 - OPERATING CONTROLS.

The final gas pressure adjustments MUST be made after dryer is filled with grain.

12. Check moisture control operation.

A. Set all switches to the positions shown in chart in step 1.

B. Start the dryer control circuit, turn the Unload Auger Switch to ON, and set the Meter Roll Selector Switch to the MANUAL position. Adjust the UNLOADING RATE to 30%.

C. The Moisture Controller should be reading approximately the same as ambient temperature unless there is still residual heat in the dryer from previous burner operation. Set the Moisture Controller to match the measured temperature displayed. See Section 3 - OPERATING CONTROLS for setting controller.

D. Set the Meter Roll Selector switch to AUTO, pausing for a few seconds in the off position. The unloading rate should start at the previously adjusted manual unloading rate.

E. Increase the Moisture Controller set point approximately 30°F above the current measured temperature. The Unloading Rate should drop to approximately 2/3 the manual unloading rate, or 20%. Additional temperature increase will not cause further unloading rate reduction.

F. Decrease the Moisture Controller set point approximately 95°F below the measured temperature. The unloading rate will increase to approximately twice the manual unloading rate, or 60%.

G. Set the Meter Roll Selector Switch to MANUAL position and reset the unload rate to 60%. Set the Moisture Control back to match the displayed measured temperature. Again switch the Meter Roll Selector Switch to AUTO, pausing in the OFF position. Verify that the control starts at the manual unload rate.

13. Check safety shutdown devices.

A. Meter roll monitor

Start dryer control circuit and turn Unload Auger Switch to ON, position Meter Roll Selector Switch to MANUAL, and set Unload Rate to minimum setting. Allow unloading to operate for approximately (5) minutes. No shut down should occur.

Set Unload Rate to 100% for at least 15 seconds then position the Meter Roll Selector Switch to OFF. In approximately (3) minutes, the dryer should shut down and the meter roll monitor shutdown indicator will be lit.

B. Low grain monitor and fill switch

Adjust the Load Timer to a short time period of approximately five minutes or less. Start the dryer control circuit and set the Load Auger Switch to ON. The Load Timer should not be powered and no shut down should occur after a five-minute or longer filling time.

If the physical setup of the grain drying system permits safe access to the fill switch (also known as the paddle switch), located on the wet bin, perform the following test:

**CAUTION:** Use care to avoid falling and causing personal injury.

While the load auger is running, slowly rotate the fill switch box counterclockwise by hand until the load auger stops. The load auger should stop when the switch box is rotated to a position 50-55° from horizontal. Slowly rotate the box clockwise and the dryer should restart at 15-20° before horizontal. Readjust fill switch if required. See Fig. 4-1 for switch position diagram.

Position the Load Auger Switch to AUTO. The Load Timer should begin counting down and the dryer should shut down after five minutes of loading. The LOW GRAIN indicator light should be energized on the control panel. Be sure to reset the Load Timer to the appropriate time.

C. Discharge shut-off switch

Remove the shipping screw securing the hinged cover on the discharge box if required. Check to see that the cover works freely and seats tightly against the discharge box approx. 1/4" from proximity switch.

Start the control circuit, turn the Unload Auger Switch to ON, and Meter Roll Selector Switch to MANUAL. Lift the cover on the discharge auger approximately one inch. The dryer should immediately shut down; however, no monitor indicator will be energized.

14. Stop dryer operation.
Push the STOP button. All fans, burners, and augers should immediately stop operating as the button is depressed.

With the dryer properly functioning as described in the previous steps, the unit can be considered ready for drying operation. Refer to Section 5 - Dryer Operation for procedure and control settings.

**NOTE:** Each time the stop button is depressed or the dryer shuts down, the Main/Safety Gas Shut-off valve will become de-energized and its handle will trip closed. The valve handle must be manually opened to allow gas flow for burner operation.

Shut off the circuit breakers and main power supply, and close fuel supply valves if you are not ready to begin the drying operation.

---

**Fig. 4-1  Top auger fill switch**

Locator hole - Assemble to dryer with hole in UP position.

Free hang - Dryer calling for grain. Switches A and B both closed.

Partially activated - Dryer almost full. Switch A closed, switch B opens.

Fully activated - Dryer full. Switch A and B both open.

Switch A = Top Auger Stop   •   Switch B = Top Auger Start
DRYING TEMPERATURES

TEMP CONTROL & INDICATION — The drying temperature within the air plenum chambers is shown by the Temperature indicator on the ASC control panel. Refer to Section 3 - OPERATING CONTROLS for additional information concerning the plenum controller. See Figs. 6-7 and 6-8 for ASC control panel illustrations.

SHELLED CORN — For shelled corn with an initial moisture content of 25-30%, the recommended MAXIMUM drying temperature is 230-240°F for the TOP air plenum chamber (top stage). For lower initial moisture content corn, lower drying temperatures are recommended. Food-grade corn often requires lower drying temperatures.

The recommended maximum drying temperature for the BOTTOM stage is 170°F.

SMALL GRAIN — For drying small grain (wheat, oats, milo), 170°F is suggested for the TOP stage.

RICE, SOYBEANS — Drying temperatures are critical in drying rice and soybeans. A temperature of 140°F is recommended for the top stage to keep grain temperature low.

SUNFLOWERS — Sunflower seed drying requires special care and operating precautions. Contact factory for additional information and drying recommendations.

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

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 headings in the Drying Tables ahead for dryer capacity, settings, and other information.

DRYERATION PROCESS — The full heat process is called "Dryeration." The 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 of grain in the hot batch being cooled. The process of tempering and slow cooling provides higher quality in shelled corn because of less stress cracking of kernels and less breakage during subsequent handling of the grain.

FINAL MOISTURE — From 1 to 3% moisture is usually removed in the cooling process, so hot shelled corn is removed from the dryer at about 17% moisture if the final desired moisture content is 15%.

FINAL MOISTURE CONTENT

It is necessary to frequently check the moisture content of discharge grain while the final meter roll setting adjustment is being established, and moisture should subsequently be checked periodically to indicate the need of any change in the setting. Such a change will be necessary if there is an appreciable change in average initial moisture content. Setting the automatic moisture control will minimize the changes in discharge moisture as initial moisture varies.

DRYER SHUTDOWN

COOLING HOT GRAIN — If the dryer is to be shut down for more than a few hours while filled with grain, it is recommended that hot grain be cooled for about 10 to 15 minutes. This is especially important in COLD weather, to prevent water vapor condensation and possible freezing of such condensate following shutdown.

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 the vaporizer and supply lines by first closing the valve at the supply tank, then letting the burner operate until flame stops from lack of fuel; immediately turn burner OFF. After the burner is OFF, close all other valves in the fuel supply piping.

SHUTDOWN — To stop the dryer, push control circuit STOP button, move all circuit breakers OFF, turn off the power supply disconnect (external to dryer) and CLOSE all valves in the fuel supply lines to the dryer.
1. Refer to OPERATING CONTROLS for important information concerning adjustments for gas pressures, thermostat settings, top auger timer, meter rolls, and other control settings. Ensure that Test Firing Procedure has been performed as described in Section 4 of this manual.

2. Measure moisture content of the wet grain and determine method of drying to be performed.

3. Refer to the DRYING TABLES ahead to determine the approximate drying time required to provide the required moisture reduction for the drying method and dryer model to be used.

4. Refer to the START-UP PROCEDURE within this section. Perform all procedures listed.

5. Using the recommended drying time, refer to appropriate DRYING TABLES ahead for suggested dryer settings and other information.
START-UP PROCEDURE

Test operate the dryer immediately prior to start-up to make certain that all motors and controls are functional before loading the dryer with wet grain.

1. Set controls:
   - Burner switches OFF
   - Load Auger switch OFF
   - Unload Auger switch OFF
   - Meter Roll Sel. Switch OFF
   - Load Timer 10 min
   - Plenum temperature See drying tables for recommended settings

2. Turn all circuit breakers in the PSC box ON and press green START button. Green indicator light should come ON.

3. Reset the Main Safety Gas Shut-off Valve to OPEN position.

4. Set Load Auger Switch to ON and allow dryer to fill. Load auger will automatically shut off when dryer is filled.

5. Using the Drying Time Tables, determine the approximate drying time required for the type of grain, drying process used, and required moisture reduction.

DRY & COOL

6. Start the lower fan and burner and operate at the plenum temperature for normal operation of the upper burner for a period of 3/4 the drying time determined from the Drying Time Tables in step (5).

7. Start the upper fan and burner and operate at the normal operating temperature for a period of 1/4 the drying time.

8. Reduce the plenum temperature setting on the lower burner to its normal operating temperature.

9. Turn the Unload Auger to ON, the Meter Roll Selector Switch to MANUAL, and adjust the % Unload Rate as indicated in the Drying Tables to achieve the required drying time for FULL HEAT operation.

FULL HEAT & DRY/COOL

NOTE: During initial start-up of a continuous flow dryer, the grain moistures discharged may not be of the desired moisture content until the dryer has been unloading for the time required to make one grain pass:

\[
\text{time (min.)} = \left( \frac{\text{holding capacity (bu)} \times 60}{\text{unload rate (bph)}} \right)
\]

10. Observe the typical operating time for the load auger and set the Load Timer to a longer time to provide shutdown on wet grain outages. Set load switch to AUTO to energize this low-grain shutdown feature.

11. After the dryer has been allowed to operate for one grain pass, check the grain moisture discharged for the desired drying results and make unload rate changes as required to obtain the proper discharge moistures. Allow another grain pass time and recheck grain moisture.

12. Set the Moisture Controller temperature and set Unload Switch to AUTO, referring to the procedure outlined in Section 3 - Operating Controls.

13. Make periodic checks of incoming grain moisture, discharged grain moisture, and plenum temperature to monitor dryer operation. Keep in mind that grain drying is a very slow process and that changes in the unload rate made either by the automatic moisture controller or manually will require 1/2 to 3 hrs to be measured in the grain discharge moisture depending on grain pass time. Do not overreact due to slow response to an unload speed change by making a second correction before the first has been analyzed.

14. If dryer shutdown occurs, check for a shutdown indicator light. Check the listing of safety circuit monitors in Sections 3 and 9 for more information about indicator lights.

FULL HEAT

6. Start the lower fan and burner and operate at the temperature recommended for the upper burner for a period of 1/2 the drying time determined from the Drying Time Tables in step (5).
The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
### DRYING TABLES — C-2120A

#### WHEAT, BARLEY, MILO... dry & cool

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#### SOYBEANS... dry & cool

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#### CANOLA... dry & cool

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Based on 100% Unload rate of 945 bph

The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
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*represents the target moisture out of the dryer. Expected final moisture in the bin is 15.0%
Based on 100% Unload rate of 1220 bph
DRYING TABLES — C-2125A

WHEAT, BARLEY, MILO ...dry & cool

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SOYBEANS ...dry & cool

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Based on 100% Unload rate of 1220 bph

c2125b.tbf

The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain’s physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
**DRYING TABLES — C-2130A**

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*represents the target moisture out of the dryer. Expected final moisture in the bin is 15.0%  
Based on 100% Unload rate of 1350 bph

The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
**DRYING TABLES — C-2130A**

**WHEAT, BARLEY, MILO ...dry & cool**

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**CANOLA ...dry & cool**

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Based on 100% Unload rate of 1350 bph

The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.

The target moisture out of the dryer is 15.0%. Based on 100% Unload rate of 1760 bph.
### DRYING TABLES — C-2140A

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#### CANOLA...dry & cool

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Based on 100% Unload rate of 1760 bph

The above drying capacities are estimates based on drying principles, field results, and computer simulations. Variances may occur due to the grain’s physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.
Fig. 6-1  Typical C-2100A Series dryer, LP fuel

Fig. 6-2  LP model fuel shutoff
Fig. 6-3  LP fuel supply components, C-2130 and C-2140 models

Fig. 6-4  Gas flow control and solenoid valves, C-2130 and C-2140 models
Fig. 6-5  Typical natural gas fuel supply

Fig. 6-6  Typical fan heater control box
Fig. 6-7  ASC control panel

Fig. 6-8  ASC control panel, internal view
Fig. 6-9  C-2100A power panel — typical 3-phase model shown
Retension top and bottom auger drive belts after several hours of operation during initial start-up. Check periodically thereafter.

Fig. 6-10  Bottom auger drive components

Note: Auger and meter rolls have sealed bearings that do not require lubrication

Fig. 6-11  Auger drive and meter roll crossover lubrication and adjustment details
Fig. 6-13 SCR motor mount and gearbox belt drive

Retension belt drive after first few hours of operation. Check periodically thereafter.

Fig. 6-12 SCR meter roll drive

Motor mounting bolts - Retighten securely after adjusting belt.
Gearbox
Lubrication:

C-2120A, C-2125A, & C-2130A models: Initially filled with mineral-based oil. See Section 7 - Service, for relube recommendations.

C-2140A models are equipped with a different brand gearbox that is initially filled with synthetic oil. See Section 7 - Service, for relube recommendations.

#40 drive chain - Adjust to provide 1/4 to 1/2 inch total deflection

Motor mount bolts - Retighten securely after adjusting chain

Chain tension adjusting bolt

Oil level plug (hidden) - Maintain to bottom of plug opening (near shaft level)*

Normal direction of rotation

* C-2120A, C-2125A, & C-2130A models: Under normal conditions, replace lubricant after first 250 hours of operation, then change every drying season (or 2500 hours) thereafter using an AGMA #8 gear lubricant. For cold ambient temperatures conditions (16°F to 50°F), use AGMA #7 gear lubricant. (C-2140 models use long-lasting synthetic lubrication.)

Fig. 6-14  SCR gearbox and meter roll drive arrangement

Fig. 6-15  View of meter roll with access door open
Important: Keep inside of dryer clean! Do not allow chaff and other combustible material to accumulate within air plenum chamber. Make certain to turn off and lock out the main power before entering dryer!
SEASONAL INSPECTION AND SERVICE

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

1. Shut off electrical power. Open main ASC control box and inspect for any moisture, rodent damage, or accumulated foreign material. Remove all foreign material present. Inspect for and tighten any loose terminal connections. Replace any damaged or deteriorated wiring. Remove fan-heater control box cover and repeat the inspection and cleaning procedure.

2. Check propeller for freedom of rotation and uniform tip clearance. It should also be inspected for accumulated dirt and grain dust, especially inside the hub, as any additional weight can seriously affect the balance and result in harmful vibrations and shortened bearing life. Keep inside of the housing free of dirt build-up for efficient fan performance.

3. Check propeller for free side play. Any side play is an indication of defective motor bearings which should be replaced to prevent a complete motor failure. Make sure all motor mount bolts are tight.

4. Motor bearings should be relubricated periodically, depending upon operating conditions. Under normal usage, it is desirable to have the motor cleaned and checked, and the bearings repacked by an authorized service station every two to three seasons. If the unit is operated continuously through most of the year, this service should be performed each year.

NOTE: If on-site bearing relubrication is to be performed, use CHEVRON SR1-2 high temperature grease or a compatible equivalent product.

To keep motor bearings properly lubricated and dispel any accumulation of moisture within the windings, the fan and auger motors should be operated for 15 to 30 minutes each month. The motor manufacturers' Authorized Service Station list is packed with all units and should be saved for reference and identification of service stations.

5. Remove and clean the gas line strainers. Make certain gas valves are closed and that gas is purged from system before attempting disassembly.

6. C-2130A and C-2140A upper (octagonal) burners: Check burner for loose or missing hardware. Also, inspect the burner's combustion holes for excess buildup, using a .086 dia. (#44) drill bit to clean if necessary. See Fig. 7-1.

All other (Starfire) burners: Inspect the primary air screen (each burner - at the top of the burner casting) and the burner cup for any accumulation of foreign material. Clean, if required. Foreign material in the burner cup or casting will not burn out and will impair burner operation.

7. Inspect ignitor plug and clean the electrodes, if required (each burner). Use an ignition point file to remove carbon and rust between the electrode surfaces. Spark gap should be about 3/32 inch.

8. Inspect flame switch for possible damage or poor connections (each burner). The flame switch and ignitor plug wires must be in good condition.

9. Inspect and manually rotate the top auger paddle assembly. The paddle unit must rotate freely without any indication of sticking or binding.

10. Inspect all drive belts and chains for proper adjustment and condition. Readjust tension as required. See Figs. 6-10 to 6-15.

NOTE: All auger and meter roll end bearings are lifetime lubricated and do not require service relubrication.

Remove gearbox drive cover and check SCR drive belt for proper adjustment and condition. Also check oil level in gearbox. See Fig. 6-14 for oil level plug location. For recommended lubricant, see the SPEED REDUCER GEARBOX subhead under "SCR Drive and Meter Roll" later in this section.

11. Lubricate the auger drive SPEEDJACK SLEEVE BEARING FITTINGS as follows:

Relubricate the top and bottom auger speedjack bearings every 100 hours of operation using a dependable brand of multi-purpose lithium base bearing grease. See Fig. 6-11 (top auger speedjack bearings not shown).

12. Operate dryer clean-out mechanism and check it for proper operation. See Fig. 3-2. With clean-out open, inspect for and remove all dirt and trash accumulation.

NOTE: Do not allow high moisture material to collect within the auger trough area as it may adversely affect the metal parts.
13. Inspect entire dryer for loose, worn, or damaged parts. Include check of auger flighting, meter rolls, and other internal parts. Check that temperature sensors within air plenum chamber are secured within the insulated clamps and do not chafe on other metal parts.

14. Inspect that all dryer guards and warning decals are in place and securely installed. Make certain guards do not interfere with moving parts.

15. Test fire the dryer several weeks ahead of the drying season. Include a check for possible gas leaks. See Section 4 - TEST FIRING for suggested procedure.

PROPANE VAPORIZER SEASONAL INSPECTION

LIQUID PROPANE MODELS ONLY — Liquid propane fueled dryers are equipped with a vaporizer that operates at relatively high pressure. Since leakage can result in release of liquid propane, it is extremely important to maintain the condition of all components to provide safe operation. Vaporizers should be inspected and serviced prior to each season of operation, including the following:

1. Carefully inspect the surfaces and welds of the vaporizer coil and the liquid inlet and vapor outlet pipes for evidence of severe corrosion or abrasion of metal which could cause subsequent leakage of liquid propane, gross overheating, and fire hazard. Such inspection may be through the inspection port, and by removing the vaporizer mounting plate and partially withdrawing the vaporizer, and by inspection from the exhaust end of the fan-heater unit.

   Insecure mounting of either the vaporizer or the burner, due to loosened bolts, can cause interference between burner vanes and vaporizer pipes, with the natural vibration of the unit causing erosion of the pipe metal at the point of maintained contact. Such contact also depends on adjustment of the vaporizer toward or away from the burner.

   If there is contact between the vaporizer pipe and burner or fan housing, adjust the position of the vaporizer to provide clearance. For Starfire burner models, bend the edge of the burner vane if necessary to provide clearance. If there has been significant abrasion of the steel vaporizer pipe, it must be replaced.

2. Inspect the fuel train components: Liquid solenoid valve, pressure relief valve, pressure regulator, vapor hi-limit thermostat, and the fuel lines and fittings. The burner hi-limit thermostat should also be checked, since it is an automatic reset safety device that stops burner operation by closing the liquid solenoid valve in the event of excessive heat from liquid propane release, possibly due to a vaporizer leak.

VAPORIZER ADJUSTMENT

LIQUID PROPANE MODELS ONLY — After initial installation and occasionally during the drying operation, check the temperature of the gas line between the pressure regulator and the fan-heater control box. Allow heater to operate and temperature to stabilize before making this check. See Fig. 6-3.

NOTE: If the gas temperature exceeds 220°F, the Vapor Hi-limit thermostat will open the electrical circuit to the liquid solenoid valve and shut off fuel flow to heater, thereby causing automatic shutdown of the dryer.

• Stainless steel octagonal burners (upper burners of C-2130A and C-2140A): If the gas line is very cold or "frosted," ensure that vaporizer coil is centered with the burner. If gas line is too hot to touch, locate vaporizer slightly off center to cool it, by manually forcing the coil up or down. Recheck fuel line for leaks following adjustment.

• All other (Starfire) burners: 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 burner vanes to

Keep vaporizer mounting hardware fully tightened!

Fig. 7-2  Starfire and octagonal burners with LP fuel vaporizer
reduce the vapor temperature. If due to extreme operating conditions 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 the burner vanes.

**NOTE:** High vaporizer temperatures may be caused by fuel vaporizing before reaching the vaporizer. Check for:

A. Improper fuel hookup. Should be drawing liquid from tank.
B. Frosted lines, fittings or valves. Frost indicates a restriction or pressure drop in piping, causing vaporization.

**BURNER CONTROL SEQUENCE OF OPERATION**

The following text should be read in conjunction with the Burner Control Circuit diagram in Sect. 8.

**NOTE:** Power is available to a fan circuit's burner control ONLY WHEN THE FAN IS OPERATING.

1. When the fan is started and the burner switch is ON, power is supplied to PL-021 Burner Control Board terminals 2 and T, thereby energizing the Purge/Lockout time delay relay. This causes a 15- to 30-second delay to the ignition while the system is purged of any accumulated gas.

The normally open purge element will close after a 15- to 30-second delay. The normally closed lockout element opens after a 60-second delay. (The lockout element should not have to open unless the flame switch fails to detect heat.) Fig. 7-3 shows the combination Purge/Lockout relay.

2. After a 15- to 30-second purge period, the purge contacts close PL-021 terminals 1 and 5 and energize the Burner Control Relay. As the relay energizes, it closes the holding contacts between PL-021 terminals 1 and 5, and also terminals 3 and T, supplying voltage to the Ignition Transformer, No. 2 Gas Solenoid Valve, and (LP models only) Liquid Solenoid Gas Valve. Burner should now fire.

3. Shortly after the burner starts, the flame switch responds to burner heat and OPENS its contacts, thereby de-energizing the purge and lockout relay elements. The purge contacts open, but the holding contacts (controlled by the Burner Control Relay) stay closed to maintain burner operation.

4. The burner will operate on Hi-Fire until the Thermostat Control circuit opens its contacts and de-energizes the Hi-Fire gas solenoid valve (No. 1 Gas Valve).

When the Thermostat Control sensor is calling for more heat and closes its contacts, the Hi-Fire gas solenoid valve immediately opens; then it cycles as required to maintain the desired heat.

5. If the burner fails to start due to lack of fuel or malfunction, and the Ignition Transformer and gas solenoid valves are known to be energized, then the following sequence is probably occurring:

   A. The flame switch is in the COLD (closed contacts) state and continues to energize the lockout relay element.

   B. The lockout relay element trips open after 60 to 120 seconds and cuts off power to the entire dryer via the Safety Shutdown portion of the control circuit in Section 8.

   C. Once the dryer shuts down, the lockout relay element takes several minutes to reset itself.

**FAN PROPELLER REMOVAL AND INSTALLATION**

The fan propeller is secured to the motor shaft by the use of a taper-lock bushing, motor shaft key and three capscrews. Fig. 7-4 shows a typical cutaway sketch of the propeller and bushing installation.

**CAUTION:** Although the taper-lock method of retaining the propeller onto the motor shaft is very simple and obvious, it is essential that the following points be read carefully and fully understood, as improper installation can result in serious or fatal injury, caused by a loose, flying propeller.

**THREADED BUSHING HOLES** — the threaded holes within the bushing are provided for disassembly purposes only. See Fig. 7-5. Do not attempt to use these holes for reassembly, as they will not allow the parts to become locked onto the shaft, thereby causing a hazardous operating condition.

**CLEARANCE HOLES** — When reassembling parts, the capscrews must be installed through the UNTAPPED CLEARANCE HOLES, as shown in Fig. 7-6, to cause the propeller to be pulled forward onto the tapered bushing, thus locking the parts securely onto the motor shaft. Refer to text for assembly details.

Whenever any servicing is to be performed which requires removal and installation of the propeller, make
sure propeller is removed and installed properly. The recommended procedure is as follows:

REMOVAL

1. LOCK OUT THE MAIN POWER SUPPLY and remove the fan guard, and also the venturi, as required on some models of equipment.

2. Remove the three capscrews from the clearance holes in taper-lock bushing. Inspect for thread damage and set capscrews aside for later reinstallation (do not use these bolts for step 3, bushing removal).

3. Install three GRADE 5 CAPSCREWS into the THREADED HOLES in the bushing and turn them in by hand until they bottom against the front surface of the propeller. These capscrews should not be used for reassembly, as some thread distortion could occur during the removal operation. Grade 5 screws are marked with three 120° spokes on the head and are more durable than low strength unmarked bolts (see Fig. 7-5 for bolt identification).

**NOTE:** Early type bushings have only two threaded holes, whereas the current type have three holes to provide a more uniform pushing force. **Do not attempt to use low strength (unmarked) bolts to remove the bushing, as the bolts may break off.** This is especially important for the early two-hole type bushing which provides off-center forcing action.

4. Block propeller to prevent it from turning, and gradually turn in the capscrews (up to 1/4 turn at time), as shown in Fig. 7-5, until the propeller breaks loose from the bushing and motor shaft. Carefully remove bushing and propeller. With the propeller free from the bushing, a wheel puller can be used to pull the bushing off of motor shaft, if required. Reattach bushing onto propeller to prevent the loss of parts and also to maintain the original bushing/propeller alignment. Inspect propeller and bushing at this time, looking for any cracks, thread or bolt damage, warpage, etc. Consult your dealer or the factory for any questions concerning damage.

**NOTE:** During manufacture, the propeller and bushing are balanced together and the parts are marked with two small punch dots to identify their original alignment position (propeller hub punch dots are near bushing keyway). Observe bushing and propeller to make sure they have alignment marks. Mark the alignment of the propeller and bushing, if required.

INSTALLATION

1. Carefully clean the motor shaft, key, bushing and bore of propeller. Make sure main power is locked out, and that shaft and key are completely free of rust and burrs. Do NOT lubricate the bushing or capscrews. **Check and make sure all motor mount bolts are properly tightened.**

2. Before installing the propeller, check the following: (1) If any balance weights are installed, they must be tightly secured. (2) All foreign material must be removed from the propeller, especially inside the hub area. (3) Carefully inspect the propeller casting for damage, cracks or other defects. Contact the factory if there is any question regarding the structural integrity of the propeller casting.

**NOTE:** During manufacture, the propeller and bushing are balanced together and the parts are marked with two small punch dots to identify their original alignment position (propeller hub punch dots are near bushing keyway). Observe bushing and propeller to make sure they have alignment marks. Mark the alignment of the propeller and bushing, if required.

Fig. 7-4 Cutaway of typical propeller installation

Fig. 7-5 Capscrew arrangement for disassembly

Fig. 7-6 Capscrew arrangement for reassembly
3. Slide propeller over motor shaft and locate it against the motor.

4. Align the keyway in the bushing with the key and SLIDE bushing onto motor shaft. Do not attempt to drive the bushing onto the shaft, as it may damage the motor bearings.

5. Rotate the bushing and propeller so their alignment marks are in line and loosely attach the propeller to the bushing. Make sure the capscrews are inserted into the unthreaded clearance holes in the bushing. Refer to previous CAUTION note. Locate the bushing so it is approximately flush with end of motor shaft.

NOTE: The bushing must be located far enough forward so the inside web portion of the propeller will not contact the motor. If motor make has a short shaft, it may be necessary to position bushing slightly beyond end of shaft.

6. Slide the propeller forward onto the taper-lock bushing and turn the capscrews in by hand as far as possible.

7. Use an INCH-POUNDS torque wrench and GRADUALLY TIGHTEN the capscrews (1/4 turn at a time) until the taper bushing becomes fully seated. Refer to the following chart for the recommended cap screw tightening torques. Do not excessively overtighten the bushing. See Fig. 7-6 and CAUTION ahead.

<table>
<thead>
<tr>
<th>Bushing Size</th>
<th>Bolt Dia.</th>
<th>Torque (inch-lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>1/4&quot;</td>
<td>95 in-lbs</td>
</tr>
<tr>
<td>P</td>
<td>5/16&quot;</td>
<td>192 in-lbs</td>
</tr>
<tr>
<td>Q</td>
<td>3/8&quot;</td>
<td>348 in-lbs</td>
</tr>
</tbody>
</table>

8. Turn propeller by hand and check it for freedom of rotation and uniform tip clearance before reinstalling the fan guard.

CAUTION: Do not attempt to pull the flange of the bushing flush with the propeller hub. A clearance of from 1/8" to 7/32" must be maintained between bushing flange and propeller hub surface. See Fig. 7-7.

FAN MOTOR REMOVAL AND INSTALLATION

In the event of a motor failure, remove the motor, as described, and take it to the nearest authorized service station. Authorized service stations are the only places that can provide possible motor warranty. Motor service and repair at other places will be at owner’s expense.

If service station determines motor failure to be caused by faulty material or workmanship, repair will be under warranty when it is within the warranty period. Motor failure because of external causes will result in a charge to the owner for repair.

1. Make certain power is shut off and locked out, then remove fan guard and propeller, as outlined earlier.

2. Remove cover from fan-heater control box and disconnect the motor lead wires from within the box.

NOTE: Tag or otherwise identify wires for ease of reassembly.

3. Remove motor mount bolts. If there are any shims between the motor and its base, note their location so they can be properly installed during reassembly.

4. Disconnect the upper end of the motor conduit, if required, then carefully pull conduit and wires through hole in fan-heater housing.

Remove motor with conduit still attached from fan-heater unit. If motor requires service, take it to an authorized service station. The motor is heavy. Use suitable lifting equipment and/or additional assistance.

5. To re-install motor, slide onto motor base plate and replace shims (if required) between motor and base plate. Re-install motor mount bolts and washers, but do not fully tighten them at this time. Re-install conduit and wires through hole in fan-heater housing and carefully remake all electrical wiring connections.

Check and adjust position of motor by TEMPORARILY mounting fan blade on motor shaft, and rotate it by hand, making the necessary adjustments so that the tip clearance between blade and housing is uniform. Remove the fan blade after obtaining proper tip clearance, and fully tighten all motor mounting bolts.

Fig. 7-7 Ensuring the necessary hub to flange clearance
NOTE: Make sure to install and tighten the propeller in accordance with earlier instructions.

HEATER PARTS REMOVAL AND INSTALLATION

Most of the heater parts can be removed by simply identifying any attached wiring and then disconnecting the obvious mounting parts.

The following list provides information and procedures for some of the more important components:

1. FLAME SWITCH — For removal, disconnect the two slip-on connectors and unscrew flame switch from its mounting bracket. Make sure to use a wrench. Do not attempt to turn by twisting the terminals, as it may ruin the switch. For installation, finger-tighten only — do not use a wrench.

2. GAS SOLENOID VALVE COIL — Unsnap either the plastic cap, or the metal clip, on the gas valve and slide the housing and coil off the valve stem and body. Do not energize the coil when it is removed, as the coil may become damaged due to excessive current flow.

3. REGULATOR AND GAS SOLENOID VALVE(S) — The gas regulator and solenoid valve(s) are DIRECTIONAL and must be connected as indicated by markings near the port openings. Make sure gas is shut off and purged from the system (including LP vaporizer) before removing parts.

When installing a liquid gas solenoid valve on LP models, do not over-tighten the connection into the inlet side, as the inlet orifice may become partially blocked.

4. MAIN GAS ORIFICE — With fuel shut off and gas purged from system, proceed as follows:

   **Starfire Burners:**
   A. Disconnect gas supply line close to the fan-heater control box and disconnect the plumbing closure plate from side of control box.
   B. Disconnect the pressure gauge line fitting from the pipe tee.

   **Octagonal Burners:**
   Disconnect the gas supply line where it connects with the octagonal burner, loosening nearby plumbing elbows and joints as required. Orifice is located where gas supply line joins with octagonal burner. See Fig. 7-8.

5. BURNER CUP — Remove the screws which secure the cup within the venturi portion of burner weldment. Remove burner cup, clean all parts and remove any foreign material in venturi. Reinstall burner cup and tighten screws.

   **NOTE:** To aid in future removal of these parts, use NEW stainless steel hardware during reassembly. Apply a light coating of “anti-seize” lubricant (or equivalent extreme temperature product) to screw threads.

6. REASSEMBLY — To reassemble parts, reverse the disassembly procedure, noting the following special points.

   A. Make sure all parts are thoroughly cleaned and free of obstruction.
   B. Use a dependable brand of high temperature pipe caulking compound when assembling gas connections. Apply only a slight coating onto MALE threaded end of fittings.
   C. Solenoid valves and gas regulator are directional and must be properly installed. Do not try to connect gas solenoid valve by applying force to valve core stem as it may ruin the unit.
   D. Make sure all electrical wires are properly connected. Refer to wiring diagrams for details.
   E. The flame switch is a precision part. Tighten by hand, do not use a wrench.

---

Fig. 7-8 Octagonal burner orifice
The following sensor location diagram is provided for servicing convenience.

Fig. 7-9 Grain and plenum temperature sensors

SCR DRIVE AND METER ROLL INFORMATION

SCR DRIVE — GENERAL INFO.

The meter rolls (which regulate the rate of grain flow through the dryer) are driven by a separate DC type electric motor. The DC motor speed is variable and is controlled by an electronic SCR type (silicon controlled rectifier) control located within the ASC control box. See Table 1-3 for SCR system specifications.

The main SCR components are the SCR control board assembly, DC motor, and speed reducer gear box. These parts are briefly described as follows:

1. SCR SPEED CONTROL — The Manual Control Dial on the ASC control panel regulates the SCR control board, to control the speed of the DC motor which drives the meter rolls.

2. DC ELECTRIC MOTOR — The 3/4 HP direct current (DC) motor provides the drive for the meter rolls and is located on the rear left-hand side of the Dryer (except on special front discharge models). The motor powers the gearbox through a V-belt drive arrangement. The V-belt drive provides protection from possible severe damage to the meter rolls and other components, in the event the meter rolls ever become jammed with any large foreign object.

The DC motor requires no operational adjustments and is completely controlled by the SCR control board assembly.

3. SPEED REDUCER GEARBOX — The 50:1 gearbox provides the required speed reduction and transmits power to the meter rolls through a drive chain arrangement.

The gearbox requires no adjustment and under normal conditions is considered lifetime lubricated.

C-2140A models only: The gearbox is initially filled with a Union Carbide synthetic lubricant which has an operating temperature range of minus 40°F to 250°F. If after prolonged usage the unit requires additional lubricant (due to leaks or repair), drain and flush with solvent. Then refill unit with 1.05 pts. of FF part no. 069-1132-5 oil (Mobil SHC634 or equivalent lubricant).

C-2120A, C-2125A, & C-2130A models only: Although the gearbox requires no adjustment, it is initially filled with an AGMA #8 mineral-base oil which should be replaced after the first 250 hours of operation, then changed every drying season (or 2500 hrs.) thereafter. AGMA #8 oil has an operating temperature range of 51° to 110°F. For cold ambient temperatures (16° to 50°F), use AGMA #7 rated oil. If the unit requires additional lubricant due to leakage or repairs, be advised that Farm Fans offers a highly durable, synthetic oil, FF part no. 069-1132-5 (Mobil SHC634 or equivalent lubricant). Fill to oil level plug (near shaft level). Before changing to synthetic oil, first drain and flush with solvent. Synthetic oil allows for wider temperature operation (minus 40° to 250°F typical) and longer lifetime use (5000 hours operation typical). The drive chain should be periodically lubricated and the drive belt and drive chain should be checked and retensioned as required.

METER ROLL BLOCKAGE

In the event a foreign object becomes lodged in the meter rolls and jams the system, the following events could be expected to occur.

A. The unloading auger and the SCR meter roll drive would briefly continue to operate.

B. However, the moment the meter roll becomes jammed, the self-limiting SCR drive motor will stop rotating (and SCR drive belt may begin slipping) and the meter rolls would not rotate.

HOW TO DETERMINE METERING PROBLEM

To determine if a metering problem is caused by blockage of the meter rolls, remove the drive covers from front and rear ends of dryer and perform the following: Referring to Fig. 6-14, remove meter roll drive chain from the meter roll sprocket. Using a pipe wrench, rotate the hub of the drive-side meter roll sprocket back and forth. Apply up to 100 ft.-lbs. of force to attempt to free any lodged object. If both metering rolls will turn, it can be assumed that no blockage exists and that the
problem is due to some other cause. Check for a break in the power train (broken chain, drive key, clevis pin, coupler, etc.).

**NOTE:** In freezing weather, the meter rolls may be loaded with frozen grain. Operate lower burner for several minutes to thaw grain, then reattempt to operate meter rolls.

**TO LOCATE THE JAM**

To determine which meter roll is jammed, whether drive-side or driven-side, feel the tension in the top and bottom sections of the meter roll crossover chain (see Fig. 6-11). If tension is equal in both sections, the drive-side meter roll is likeliest to be jammed. If lower section of crossover chain is extremely tight and the tension will not equalize when attempting to deflect the bottom section, the jam is likely to be in the driven-side meter roll.

**TO CLEAR JAM FROM METER ROLL**

Make certain power is OFF and locked out. Loosen the chain tighten and remove the crossover chain.

**CAUTION:** Keep hands away from sprocket teeth to avoid injury from chain backlash as a result of any torsional buildup in the system (as caused by the jam).

With crossover chain removed, place a pipe wrench on the sprocket hub of the jammed meter roll and attempt to turn the meter roll. Rotate backward and then forward several times in an attempt to dislodge the object and clear it through the roll. If this is not successful, have an assistant turn meter roll and attempt to locate jam by sound. Once location is determined, first seal off grain flow by inserting the Grain Column Cut-Off Damper service tool from inside the plenum as described in Fig. 6-16. Then from outside the dryer, open the meter roll access door to remove any foreign object.

**SCR MOTOR CONTROL**

When installing a new SCR motor control, check torque switch setting, control voltage jumper position, and armature voltage jumper position. Set as shown in Fig. 7-10.

**ADJUSTING SCR MOTOR SPEED**

1. **Max Pot Adjustment**

   With dryer unload circuit energized, set the SCR Speed Control knob on the ASC panel to 100%. Using a small-blade screwdriver, adjust the Max pot to obtain 155 VDC across the DC motor armature terminals A1 and A2 on the Woods SCR motor control board. When this adjustment is completed, the Unload Rate meter on the ASC panel should indicate 100%.

2. **Min Pot Adjustment**

   Set the SCR Speed Control knob on the ASC panel at the 10% setting. Adjust the Min pot to obtain 15.5 VDC across the DC motor armature terminals A1 and A2. When this adjustment is completed, the Unload Rate meter on the ASC panel should indicate 10%.

3. **Recheck Max pot setting (step 1) and readjust if necessary. Repeat step 2 and readjust Min pot if necessary. Rechecking the Max and Min pot settings one time should be sufficient.**
Fig. 8-1   C-2100A power circuit — 220V 1-phase
Fig. 8-2  C-2100A power circuit — 220V 3-phase models
Fig. 8-3  C-2100A power circuit — 440V 3-phase models
Fig. 8-4  C-2100A general control circuit, p. 1 of 3
Fig. 8-4  C-2100A general control circuit, p. 2 of 3
Fig. 8-4  C-2100A general control circuit, p. 3 of 3
Fig. 8-5  C-2100A burner control circuit circuit
A voltmeter is required for some of the following checkout procedures. Before performing any tests, make certain to determine if dryer power supply is 1-phase 230V, 3-phase 230V, or 3-phase 460V.

The burner control circuit is 230 volts on all standard U.S. production dryers. When performing tests within the burner circuit, measure voltage ACROSS BOTH SIDES OF THE LINES AND NOT TO GROUND.

The general control circuit and safety circuits are 115 volt on all model dryers. When checking these circuits, MEASURE VOLTAGE BETWEEN THE CIRCUIT TEST LOCATION AND GROUND.

REFER TO WIRING DIAGRAMS AND PARTS LIST FOR IDENTIFICATION OF PARTS AND ELECTRICAL TERMINALS. When right- or left-hand side of dryer is mentioned, it is as viewed from the rear end of the dryer.

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 COMPONENT.

--- TROUBLE CHECKOUT PROCEDURE & INFORMATION ---

Control circuit not energized - Shutdown indicator lights OFF.

1. POWER SUPPLY - Check that MAIN POWER SUPPLY and CIRCUIT BREAKERS are turned ON. Also check for a tripped circuit breaker.
2. FUSES - Check for blown safety circuit fuse(s). See appropriate POWER CIRCUIT diagram for location and number used.
3. OVERLOAD RELAY - Check for tripped overload relay.
4. STOP OR START SWITCHES - Check for a defective STOP or START switch. Also check switch wiring connections.
5. 1CR RELAY - Check for a defective 1CR relay, relay base, or faulty wiring.

--- SHUTDOWN INDICATOR LIGHTS - on ASC Panel ---

• LOW GRAIN LIGHT
  Auto-resets immediately. May indicate:
  a. Insufficient grain to fill dryer.
  b. Load Timer is set incorrectly:
     - load time set too low
     - timer set to incorrect range
     - timer memory set incorrectly to ON
  c. Failed load drive

• METER ROLL MONITOR LIGHT
  Auto-resets immediately. Indicates meter roll rotation has not been sensed for three minutes due to the following possible reasons:
  a. Meter roll selector switch is OFF.
  b. Meter rolls are jammed.
  c. Meter roll drive failed.
  d. Meter roll proximity switch requires adjustment.
  NOTE: It is normal for the meter roll light to be ON when circuit breakers are powered, but the Control Circuit has not been started.

• GRAIN HI-LIMIT LIGHT
  Auto-resets after cooling. Indicates that the RH and/or LH grain column high limit switch has reached 210°F.
  a. Grain has over-dried due to:
     - Unload Auger is turned OFF
     - Meter roll speed is set too low
     - Batch dry timer set too long
     - Moisture control temperature is set too high
     - Grain column is plugged
     - Meter roll system has jammed or failed
  b. Failed grain hi-limit thermostat

• BURNER HIGH LIMIT LIGHT
  Auto-resets after cooling. Indicates burner high limit switch has reached 200°F for the following possible reasons:
  a. Inadequate air flow:
- inlet air blocked
- fan motor failed
b. Backdraft currents during shutdown period.

**NOTE:** In the event the dryer shuts down, the backdraft currents of hot air passing through the housing may cause the burner hi-limit to trip open.

• **PLENUM HI-LIMIT LIGHTS** (Upper & Lower)
  Auto-resets after cooling. Indicates Plenum high limit switch has reached 300°F for the following possible reasons:
  a. Plenum temperature set too high, or blocked air flow within dryer perforations.
  b. Minimum gas pressure setting is too high.
  c. Plenum controller failed.
  d. Plenum RTD sensor failed.
  e. Plenum High Limit switch failed.

• **BURNER LOCKOUT LIGHTS** (Upper & Lower)
  Auto-resets after cooling. Indicates flame was not sensed for 60 seconds for the following possible reasons:
  a. Burner failed to ignite:
    - main shut-off valve was not opened
    - minimum fire set too low
    - hand valves closed
    - insufficient fuel supply
    - failed or fouled ignitor plug; also check for defective flame switch
    - failed liquid LP solenoid valve
    - vapor high limit sensor has reached 220°F and has closed the liquid solenoid
  b. Burner flame has gone out:
    - minimum fire set too low
    - insufficient fuel supply
    - defective or improperly located flame switch
    - failed liquid LP solenoid valve
    - vapor high limit sensor has reached 220°F and has closed the liquid solenoid

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**— UNMONITORED SHUTDOWN DEVICES (No ASC Panel Indicator Lights) —**

Control circuit energized - No ASC panel shutdown light ON.

• **DISCHARGE SHUT-OFF SWITCH LIGHT** - located on the grain discharge assembly.
  May require cleaning of grain from under grain discharge door for switch to reset. Indicates that unload auger discharge switch has opened for the following possible reasons:
  a. Auxiliary unload equipment has failed or overloaded.
  b. Discharge door is not seated properly.
  c. Discharge proximity switch failed.

• Various circuit breakers (as shown in wiring schematics or Power Panel illustration)

• Overload relays (manual reset required):
  - Auxiliary unload relay
  - Load auger overload relay
  - SCR overload relay
  a. amperage draw on motor is too high
    - low voltage
    - motor load too high
    - failed motor
    - shorted motor wires
  b. overload heaters improperly sized
  c. failed heater strip or relay
  d. relay has not been manually reset
  e. low voltage

---

Top auger will not start

1. Check that top auger circuit breaker is turned ON, also that control circuit is energized and LOAD AUGER SWITCH is set to ON or AUTO position.
2. Check position of upper auger paddle & its switch box - paddle must be "down" with switch box horizontal to start auger. Paddle should rotate freely without "sticking."
3. Inspect for secure mounting and wiring of mercury switches in terminal box on top auger paddle switch shaft. Include check for defective mercury switch. When calling for grain, both mercury switches should be closed and passing 120V to top auger contactor coil.
4. Verify closing of top auger contactor; check voltage on load side of contactor, power terminals 7, 8, and 9 (3-phase). Inspect contactor for defective points or a burned out coil.
5. Inspect connections and check voltage applied to motor leads in motor junction box to determine if motor is defective.
<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>CHECKOUT PROCEDURE &amp; INFORMATION</th>
</tr>
</thead>
</table>
| **Fan motor will not start** | 1. Check that fan circuit breaker and fan switch are ON; also for defective switch or bad wiring connections.  
2. Verify closing of fan motor contactor; check for voltage on load side of contactor and for 120V to contactor coil. See POWER CIRCUIT and GENERAL CONTROL CIRCUIT wiring diagrams for fan circuit details. Inspect contactor for defective points or burned-out coil.  
3. Inspect connections and check voltage applied to motor leads in fan-heater control box to determine if motor is defective.  
4. If motor starts slowly, check for low voltage during starting, due to excessive voltage drop in power supply wiring. |
| **Bottom auger will not start** | 1. Check that bottom auger circuit breaker is ON.  
2. Check that UNLOAD switch is set to AUTO.  
3. Verify closing of bottom auger contactor; check voltage on load side of contactor, power terminals 13, 14, and 15.  
4. If power was present in previous step, inspect connections and check voltage applied to motor leads in junction box to determine if motor is defective. |
| **Meter rolls will not operate (SCR drive)** | 1. Check that UNLOAD circuit breaker is ON, SCR SPEED CONTROL is properly set, UNLOAD switch is on AUTO and that meter rolls are not jammed (with SCR motor stalled or drive belt slipping).  
2. Check that 230V is present across the load side of the special 10 Amp rectifier fuses (terminal nos. 60 and 62). Replace fuses if blown and determine cause (short circuit or severe voltage spikes, etc.).  
3. Check that the unload contactor is energized and that it has closed its auxiliary contacts which complete the switch circuit of SCR board assembly (terminals 6 & 7 on Woods SCR boards).  
• Check for 230V present across AC line terminals L1 and L2 on SCR board assembly (with unload auger operating).  
• Motor field terminals (F1 [+ ] and F2 [- ] on Woods make boards) should indicate 190-200V DC. If no voltage, replace SCR board.  
• Check SCR board terminals 1 and 3 for 10V DC.  
• Check SCR board terminals 2 and 3 for 1-10V DC varying with speed setting (with Meter Roll Selector Switch in manual). If no voltage or voltage does not vary, check SCR speed control pot (on ASC panel) or wiring to pot.  
5. Turn SCR speed pot fully clockwise; check DC voltage between ARM. A1 (+) and A2 (-) terminals on SCR board. Voltage should increase from near 10V DC to 155V DC as speed control is moved to the MAXIMUM SCR speed setting. If no voltage or erratic voltage is indicated, check for possible bad wiring connections or a defective speed pot before replacing SCR board. Check for voltage on load side of armature fuse. Replace fuse as required.  
6. Inspect wiring connections and check voltage applied to motor leads in motor junction box to determine if DC motor is bad. If there is no DC voltage, suspect a blown armature fuse or SCR board assembly. |
| **Burner will not fire with fan operating (Control circuit malfunction)** | 1. Burner switch must be ON.  
2. Check for 230 volts across burner side of fuses located within fan-heater control box. Replace fuses, if blown, and determine cause of excess current (shorted wiring connections, etc.).  
3. Check for 230 volts across Burner Control Circuit (PL) terminals 1 and 5. If there is no voltage, check for improper wiring connections. See BURNER CONTROL CIRCUIT wiring diagram in Section 8 for circuit details.  
4. Check for proper voltage across PL terminals 1 and T. If there is no voltage, check burner switch circuit. |
| **Burner will not fire - No gas pressure with fan operating at least 15 seconds (gas supply or fan-heater component)** | 1. Check gas supply. Also, check gas filter and gas line for possible obstructions or closed valves. Refill tank and service parts, as required.  
**NOTE:** The electric Main/Safety Gas Shut-off valve cannot be opened until after the dryer control circuit has been energized.  
2. Check for proper voltage across Burner Control Circuit (PL) terminals 2 and T. If there is no voltage, check for defective flame switch or improper burner switch circuit wiring.  
3. Check voltage across PL terminals 2 and 3. If no voltage, substitute a new control relay and time delay relay assembly, then repeat the test. If these new parts do not correct the problem, replace the printed circuit base and repeat test.  
4. If 230 volts is present across PL terminals 2 and 3, but burner will not operate, check the following:  
A. Inspect gas solenoid valves (includes liquid valve on LP units) for defective coils or improper wiring. Replace valve or valve coil if valve will not open with proper voltage applied.  
B. Inspect for a defective high vapor thermostat (LP models only). Replace thermostat if its circuit is open (without overheated vapor). |
Burner fires - but operates only about one minute and dryer shuts down

1. Wait for several minutes for lock-out device to cool down, then restart the dryer. Immediately after the burner starts operating, connect voltmeter leads across Burner Control Circuit terminal nos. 2 and T and continue to observe the meter. When burner first comes ON (with a cold flame switch), the voltmeter should indicate 230 volts. After the flame switch becomes HOT and opens its contacts, the meter should read ZERO. After the burner fires, the flame switch should OPEN within approximately 15 seconds or less.

If burner shuts down without the meter indicating that the contact points have opened, it indicates either a defective flame switch or insufficient heat exposure on the flame switch.

 Burner will not fire - but gauge shows gas pressure

1. IGNITION TRANSFORMER - Check transformer for spark by removing ignition wire from transformer and holding an insulated handle screwdriver against the output terminal and 1/4" away from the case. There should be a strong spark. Check transformer wiring and connections. Replace the ignition transformer, if required. Make sure transformer case is properly grounded to heater housing.

2. IGNITOR PLUG - Check that ignitor plug is properly gapped to 3/32 inch and has a strong spark. Inspect ignition wire and its connections. Make sure wire is not shorted or broken. Check ignitor plug for damaged electrodes or cracked insulator. Replace, or clean and service ignitor plug, as required.

3. FUEL SUPPLY - Inspect burner venturi and orifice for possible obstructions. Clean parts as required.

Burner operates but will not cycle from Lo-Fire to Hi-Fire

1. Check for an excessive Lo-Fire gas adjustment setting. Observe pressure shown on gauge and compare reading with recommended flow control valve pressure setting listed in manual. Readjust Lo-Fire setting on flow control valve, if required.

2. Check for improperly adjusted or problems within Hi-Lo Fire thermostat control (plenum controller) circuit. Temporarily increase the temperature setting. If heater will still not cycle, check for problem in control wires connections or sensor. See Electronic Temperature Control Trouble in this Troubleshooting Section.

3. Check for improperly connected or faulty Hi-Fire gas vapor solenoid valve. Correct any poor connections or defective wiring. If wiring appears proper, problem may be caused by a burned-out valve coil or defective valve. Replace Hi-Fire solenoid valve, or its coil, if defective.

Burner operates but will not cycle from Hi-Fire to Lo-Fire

1. Check gas pressure reading on gauge. Problem may be due to insufficient gas regulator setting. Temporarily decrease the thermostat setting to verify that thermostat will function and cause the burner to cycle. If burner will cycle at reduced thermostat setting, it indicates that problem was due to insufficient heat to satisfy the original thermostat setting. Reset thermostat to original setting and increase gas regulator setting for additional heat output. Do not exceed the maximum pressure listed for Operating Pressure Range in Fig. 2-3.

2. Hi-Lo Fire thermostat control may be defective. If burner still will not cycle to Lo-Fire after decreasing the thermostat, the problem may be due to a failed sensor. See Electronic Temperature Control Trouble in this Troubleshooting Section. Observe reading on thermometer. Replace control assembly if it cannot be set to cause its switch to go to the open circuit position with normally hot air plenum temperatures.

3. If burner continues to operate on Hi-Fire, check the Hi-Fire gas solenoid valve for a stuck or blocked open condition, or for reversed gas pipe connections. THE SOLENOID VALVE MUST NOT ALLOW GAS FLOW WHEN ITS COIL IS NOT ENERGIZED.

Burner maintains desired drying temperature, but cycles from Hi-Fire to OFF (without going into Lo-Fire)

1. Make sure the flow control valve is not set completely closed. Valve must be adjusted open to provide the proper Lo-Fire gas pressure listed in manual.
Improper Electronic Temperature Control Operation - Zytron Type

1. Low Meter reading with burner(s) staying on Lo-Fire.
   - SHORTED SENSOR CIRCUIT - Disconnect appropriate pair of sensor wires from terminal strip. Using a VOM tester, test the sensor leads for approx. 1000 ohms resistance (at 70°F). Also test each lead for continuity to ground, which would indicate a wiring short or failed sensor. If test indicates a SHORTED condition, trace wires back to the sensor and repeat the test. Replace defective sensor or correct the wiring problem as required.

2. Meter pegged on high reading - with burner(s) staying on Lo-Fire.
   - OPEN SENSOR CIRCUIT - Use VOM and repeat test as described in previous test. If the circuit tests OPEN (too high a resistance), replace defective sensor or correct wiring problem as required.

3. Meter reads correctly but burner(s) does not cycle to Hi-Fire in response to control setting.
   - SEVERAL POSSIBILITIES - Isolate problem by connecting a jumper wire across the appropriate relay terminals on controller. If burner will now operate on Hi-Fire, controller or wiring connection is probably defective.
   - If burner does not operate on Hi-Fire with jumper connected, check burner for bad Hi-Fire gas solenoid valve.

4. Meter reading and set point do not agree.
   - A. If burner remains in Hi or Lo-Fire continuously, check gas pressure and readjust as required.
   - B. If burner continues to cycle from Hi to Lo-Fire, check dial thermometer for temperature comparative reading. See following problems and corrections.

5. Incorrect meter reading.
   - Check with a 1260 ohm calibration resistor (FF part no. 38-322) as outlined in Bulletin ETS/FC-03-5. When connected to terminals 10 and 11 of controller, the resistor will cause the thermostat to switch at 180°F. Readjust METER OFFSET trim pot as required.

6. Incorrect set point.
   - Check with calibration resistor as mentioned above, readjust SETPOINT OFFSET trim pot as required.

Improper Moisture Controller Operation - Honeywell UDC 2000

1. IN1RNG Error Message
   - SHORTED SENSOR CIRCUIT - Disconnect sensor leads from terminal strip. Using a VOM tester, test the sensor leads for approx. 100 ohm resistance (at 32°F). If test indicates a SHORTED condition, trace wires back to the sensor and repeat the test. Replace defective sensor or correct the wiring problem as required.
   - OPEN SENSOR - Disconnect sensor leads from terminal strip. Using a VOM tester, test the sensor leads for approx. 100 ohm resistance (at 32°F). If the circuit tests OPEN, replace defective sensor or correct wiring problem as required. Test each sensor lead for continuity to ground. If continuity is confirmed, replace sensor.

2. FAILSF Error Message
   - This error message shows whenever the controller goes into a failsafe mode of operation. This will happen if the controller fails to pass its memory test, configuration tests, or calibration test. Return controller to the factory for analysis.

3. IN1FAIL Error Message
   - Controller has detected two consecutive failures of the input signal. Check for shorted or open sensor condition as listed above.