OPERATOR’S MANUAL

CF/AB EXPANDED SERIES
GRAIN DRYERS

CF/AB-400

CF/AB-510

CF/AB-460

CF/AB-600

FARM FANS
Division of ffI Corporation
5900 Elmwood Ave. • Indianapolis, IN 46203
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Thank you for choosing a Farm Fans CF/AB 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 CF/AB-400, CF/AB-460, CF/AB-510, and CF/AB-600 model dryers. These dryers are available with liquid propane or natural gas fuel supply, three phase 230 or 460 volt (60Hz) electrical power, with single phase 230 volt power available for the CF/AB-510 model only.

**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 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 within the SERVICING section of the manual.

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 airflow 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 LP vaporizer for contact with burner vanes.
**SPECIFICATIONS**  
**SECTION 1**

**TYPE:** Continuous Flow Full Heat or Automatic Batch operation in either Dry and Cool or Full Heat. CF/AB-400 and -460 models equipped with single fan-heater unit; CF/AB-510 and -600 models equipped with dual fan-heaters.

**GRAIN COLUMNS:** Two grain columns, 14" thickness, with grain movement through dryer controlled by metering rolls. Grain columns constructed of galvanized steel, with heavy steel partitions each two feet of length, and with meter roll access panels and grain clean-out mechanism.

**FAN(S):** Heavy-duty axial fan(s), direct drive, with total airflow, static pressure, and horsepower matched to grain volume, and with full motor overload protection.

**HEATER(S):** High capacity direct-fired heater(s), with Star-Fire burners used on the CF/AB-510 model, and stainless steel octagonal burners used on the CF/AB-400, -460, and -600 models. Full electronic ignition, and thermostat temperature control by two-level fuel flow modulation (Hi-Lo burner control).

**METER ROLL DRIVE:** All models are equipped with variable speed DC motor drive using SCR motor control.

**AUGERS:** Top leveling auger automatically controlled, with power circuit provided for simultaneous operation of auxiliary loading conveyor; bottom auger for grain discharge from metering rolls, with power circuit provided for operation of take-away conveyor; heavy-duty construction in augers and auger drive systems.

**AUTO CONTROL:** The following features come standard on CF/AB-400, -460, -510, and -600 model dryers:

- Fully equipped for automatic control of all functions such as loading, drying and discharge.
- Continuous Flow Full Heat, or Automatic Batch with either Dry and Cool or Full Heat.
- Grain discharge process controlled by variable, adjustable rate metering roll system.
- Hourmeter
- Dual-heat drying control for automatic batch operation.
- Digi-Trol moisture control circuit.
- Digital timers for batch timing functions.
- Full safety control system:
  - Automatic shut-down on wet grain outage or excessive temperature
  - Discharge shutoff feature designed to shut down dryer and relieve grain pressure in the event the auxiliary grain unloading system stops or becomes plugged
  - Circuit monitor system to identify the cause of safety shutdown

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Fig. 1-1  
Dryer dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>No. of Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF/AB-400</td>
<td>18'</td>
<td>25'</td>
<td>26'</td>
<td>16' Min.</td>
<td>7</td>
</tr>
<tr>
<td>CF/AB-460</td>
<td>20'</td>
<td>27'</td>
<td>28'</td>
<td>16' Min.</td>
<td>7</td>
</tr>
<tr>
<td>CF/AB-510</td>
<td>22'</td>
<td>29'</td>
<td>30'</td>
<td>16' Min.</td>
<td>9</td>
</tr>
<tr>
<td>CF/AB-600</td>
<td>26'</td>
<td>33'</td>
<td>34'</td>
<td>16' Min.</td>
<td>9</td>
</tr>
</tbody>
</table>

* Wheel assembly is removable. Installed height (14'-8" shown) depends on height of dryer support above the concrete slab.

** Standard discharge length is shown at 2'-2". Optional discharge auger extension kits are available in 1' increments to provide 1' thru 10' additional discharge lengths.
Table 1-1 Dryer Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>CF/AB-400</th>
<th>CF/AB-460</th>
<th>CF/AB-510</th>
<th>CF/AB-600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Construction</td>
<td>1 Module</td>
<td>1 Module</td>
<td>1 Module</td>
<td>1 Module</td>
</tr>
<tr>
<td>Grain Column by Length</td>
<td>18'</td>
<td>20'</td>
<td>22'</td>
<td>26'</td>
</tr>
<tr>
<td>Grain Column by Width</td>
<td>14&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td>Holding Capacity (total)</td>
<td>469 Bu.</td>
<td>515 Bu.</td>
<td>561 Bu.</td>
<td>653 Bu.</td>
</tr>
<tr>
<td>Holding Capacity (dry and cool)</td>
<td>414 Bu.</td>
<td>460 Bu.</td>
<td>506 Bu.</td>
<td>598 Bu.</td>
</tr>
<tr>
<td>Transport Length (from hitch to</td>
<td>27'-1-1/2&quot;</td>
<td>29'-1-1/2&quot;</td>
<td>31'-1-1/2&quot;</td>
<td>35'-1-1/2&quot;</td>
</tr>
<tr>
<td>discharge auger)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Width</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>Transport Height</td>
<td>13'-5&quot;</td>
<td>13'-5&quot;</td>
<td>13'-5&quot;</td>
<td>13'-5&quot;</td>
</tr>
<tr>
<td>Installed Length</td>
<td>25'-0&quot;</td>
<td>27'-0&quot;</td>
<td>29'-0&quot;</td>
<td>33'-0&quot;</td>
</tr>
<tr>
<td>Installed Width</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>Installed Height (above foundation</td>
<td>13'-9&quot; + 8&quot; fill hopper</td>
<td>13'-9&quot; + 8&quot; fill hopper</td>
<td>13'-9&quot; + 8&quot; fill hopper</td>
<td>13'-9&quot; + 8&quot; fill hopper</td>
</tr>
<tr>
<td>supports)†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan(s)</td>
<td>(1) 39&quot; dia.</td>
<td>(1) 39&quot; dia.</td>
<td>(2) 36&quot; dia.</td>
<td>(2) 39&quot; dia.</td>
</tr>
<tr>
<td>Heater(s) - Max. Capacity (millions)</td>
<td>7.5 MM Btu/Hour</td>
<td>7.5 MM Btu/Hour</td>
<td>6.6 MM Btu/Hour Top</td>
<td>6.6 MM Btu/Hour Top</td>
</tr>
<tr>
<td>Top Auger</td>
<td>8&quot; dia., 5 HP</td>
<td>8&quot; dia., 7.5 HP</td>
<td>8&quot; dia., 7.5 HP</td>
<td>8&quot; dia., 10 HP</td>
</tr>
<tr>
<td>Capacity</td>
<td>2800 Bu./Hour</td>
<td>2800 Bu./Hour</td>
<td>2800 Bu./Hour</td>
<td>2800 Bu./Hour</td>
</tr>
<tr>
<td>Bottom Auger</td>
<td>8&quot; dia., 3 HP</td>
<td>8&quot; dia., 5 HP</td>
<td>8&quot; dia., 5 HP</td>
<td>8&quot; dia., 7.5 HP</td>
</tr>
<tr>
<td>Capacity - Max. Rate²</td>
<td>1225 Bu./Hour</td>
<td>1360 Bu./Hour</td>
<td>1495 Bu./Hour</td>
<td>1770 Bu./Hour</td>
</tr>
<tr>
<td>Meter Roll Drive</td>
<td>1/3 HP, SCR</td>
<td>1/3 HP, SCR</td>
<td>1/3 HP, SCR</td>
<td>1/3 HP, SCR</td>
</tr>
<tr>
<td>Electrical Load (Fan[s], Top &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom Augers)³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Phase, 230 Volt</td>
<td>---</td>
<td>---</td>
<td>217 Amps</td>
<td>---</td>
</tr>
<tr>
<td>Three Phase, 230 Volt</td>
<td>95 Amps</td>
<td>107 Amps</td>
<td>126.7 Amps</td>
<td>166 Amps</td>
</tr>
<tr>
<td>Three Phase, 460 Volt</td>
<td>46 Amps</td>
<td>53 Amps</td>
<td>63 Amps</td>
<td>83 Amps</td>
</tr>
<tr>
<td>Drying Capacity: Shelled Corn³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry &amp; Cool 25-15%</td>
<td>305 BPH</td>
<td>330 BPH</td>
<td>375 BPH</td>
<td>445 BPH</td>
</tr>
<tr>
<td>Dry &amp; Cool 20-15%</td>
<td>415 BPH</td>
<td>450 BPH</td>
<td>505 BPH</td>
<td>605 BPH</td>
</tr>
<tr>
<td>Full Heat 25-15%²</td>
<td>505 BPH</td>
<td>540 BPH</td>
<td>615 BPH</td>
<td>745 BPH</td>
</tr>
<tr>
<td>Full Heat 20-15%²</td>
<td>865 BPH</td>
<td>925 BPH</td>
<td>1060 BPH</td>
<td>1280 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 the grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, adverse weather conditions, etc. Grain discharged hot from the dryer at 17% output moisture should result in a final moisture content of approximately 15% after cooling (drying).

---

Table 1-2 Auger Drive Data

<table>
<thead>
<tr>
<th>Auger</th>
<th>Motor</th>
<th>Sprockets</th>
<th>Sheaves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approx. Capacity</td>
<td>HP RPM</td>
<td>Drive</td>
</tr>
<tr>
<td></td>
<td>bph¹</td>
<td>Belts</td>
<td>Chain</td>
</tr>
<tr>
<td>Top Auger</td>
<td>CF/AB-400</td>
<td>8&quot;</td>
<td>2873</td>
</tr>
<tr>
<td></td>
<td>CF/AB-460</td>
<td>8&quot;</td>
<td>2873</td>
</tr>
<tr>
<td></td>
<td>CF/AB-510</td>
<td>8&quot;</td>
<td>2873</td>
</tr>
<tr>
<td></td>
<td>CF/AB-600</td>
<td>8&quot;</td>
<td>2873</td>
</tr>
<tr>
<td>Bottom Auger</td>
<td>CF/AB-400</td>
<td>8&quot;</td>
<td>1220²</td>
</tr>
<tr>
<td></td>
<td>CF/AB-460</td>
<td>8&quot;</td>
<td>1350²</td>
</tr>
<tr>
<td></td>
<td>CF/AB-510</td>
<td>8&quot;</td>
<td>1485²</td>
</tr>
<tr>
<td></td>
<td>CF/AB-600</td>
<td>8&quot;</td>
<td>1760²</td>
</tr>
</tbody>
</table>

Dryers Equipped with Optional Maximum Discharge:

| Top Auger | CF/AB-400 | 8" | 2873 | 5 | 1750 | BX-100 (two) | N/A | N/A | N/A |
| Bottom Auger | CF/AB-400 | 8" | 1950² | 3 | 1750 | BX-93 (two) | #50 | 15 | 48 |

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 max. meter roll rate.
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”.
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. Hitch 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 hub and spindle temperature immediately after stopping. Temperature should not exceed 150 degrees 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 LAY-OUT — Consider the grain handling system, storage bins, and existing conveyors in selecting the dryer site, in order 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 a minimum distance of three feet to other structures. Refer to Fig. 1-1 for dryer dimensions.

LEG SUPPORT — The wheels are provided only for transportation of the empty dryer. Before loading any grain into the dryer, it is necessary to support the frame of the unit. The optional Leg Set Package with a 16” minimum height is the recommended method of support. See Fig. 1-1 for recommended number of supports. Concrete blocks or other means may be used provided they can carry the total weight of dryer when filled with grain. If using blocks or other means, use shims to provide uniform, level support, at a minimum of 16” above the concrete slab to provide space for clean-out and for aux. conveyors. Hitch tongue should be removed, but hitch and fan support must be left on; they are not a part of the transport.

CONCRETE SLAB — An 8” thick reinforced concrete slab is recommended as the basic support for the dryer, located in a well drained area. The slab should be large enough to provide working area around the dryer, with a surface elevation consistent with other parts of the grain handling and storage system.

TIE-DOWN ANCHORS — Anchor points may be cast into the concrete slab, or dryer may be tied down by cable and turn-buckle to anchors installed at edge of slab. In any case, dryer must be securely anchored to support blocks and concrete base, to prevent overturn or lateral movement by wind forces.

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 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, or 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 1-2. 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 circuit provided in the main control box. 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 load timer within ASC control box to provide automatic shut-down on wet grain outage, if the top auger operates for a time exceeding the adjustable timer setting.

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 — The dryer is factory equipped with overload protection devices for a 10 HP loading conveyor and a 7.5 HP take-away conveyor. If other HP ratings are used, it will be necessary to change the settings of the overload devices or possibly replace the overload device with one properly sized for the HP rating. See Tables 2-2 to 2-5 for standard overload settings. Also see the AUXILIARY LOAD & UNLOAD MOTOR PARTS & SETTINGS chart later in this section for a listing of protection devices sized for standard and non-standard motors.

FUEL CONNECTIONS

LIQUID PROPANE (LP) DRYERS WITH INTERNAL VAPORIZERS

LIQUID DRAW — The dryer is designed to operate on liquid propane, with liquid draw from a 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 the fan-heater unit, between vaporizer and burner.

AMMONIA TANKS — Do not use propane supply tanks that have previously held ammonia or fertilizer solutions. These substances are extremely corrosive and may damage 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 (N)**

**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 5 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.

**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.

**PROPANE SUPPLY TANK**

RECOMMENDED MINIMUM OF 1,000 GALLONS CONNECTED FOR LIQUID DRAW.

**HUGUP.DS4**

**NATURAL GAS CONNECTION**

**CONNECTION TO NATURAL GAS MANIFOLD ON DRYER**

SEE TABLE 2-1 FOR RECOMMENDED LINE SIZE.

**NATURAL GAS METER AND REGULATOR.**

SEE TABLE 2-1 FOR REQUIRED PRESSURE AND TYPICAL MAXIMUM FUEL FLOW RATES.

**HUGUP.DS4**

**Fig. 2-1 Fuel hookup**

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**Table 2-1 Fuel Specifications**

<table>
<thead>
<tr>
<th>Liquid Propane (LP)</th>
<th>CF/AB-400</th>
<th>CF/AB-460</th>
<th>CF/AB-510</th>
<th>CF/AB-600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Maximum Heat Capacity (Million BTU/Hr.)</td>
<td>7.5</td>
<td>7.5</td>
<td>9.2</td>
<td>12.0</td>
</tr>
<tr>
<td>Typical Max. Fuel Flow' (Gal/Hr)</td>
<td>91</td>
<td>91</td>
<td>100</td>
<td>130</td>
</tr>
<tr>
<td>Recommended Liquid Line Size</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>Heater Orifice Drill Size</td>
<td>0.50</td>
<td>0.50</td>
<td>0.281</td>
<td>0.438</td>
</tr>
<tr>
<td>Operating Pressure Range (Heater Gauge)²</td>
<td>3-8</td>
<td>3-8</td>
<td>5-22</td>
<td>3-8</td>
</tr>
<tr>
<td>Natural Gas (N)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical Max. Fuel Flow' (Cu.Ft./Hr)</td>
<td>7500</td>
<td>7500</td>
<td>9200</td>
<td>12,000</td>
</tr>
<tr>
<td>Min. Pressure at Connection to Dryer</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Recommended Min. Line Size - 100 ft.</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>Heater Orifice Drill Size</td>
<td>0.625</td>
<td>0.625</td>
<td>0.438</td>
<td>0.562</td>
</tr>
<tr>
<td>Operating Pressure Range (Heater Gauge)²</td>
<td>3-8</td>
<td>3-8</td>
<td>3-9</td>
<td>3-8</td>
</tr>
</tbody>
</table>

1. Maximum fuel flow rates listed assume full heat output for gas line sizing purposes. In normal operation the flow rates would be considerably lower than indicated, due to actual setting used and cycling of heater.

2. Uses stainless steel octagonal type burner.

3. For dual-burner dryers (510 and 600 models), the upper and lower burners should be set to the same operating fuel pressure.
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. Power supply for 1-phase models must include a neutral wire. 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 PSC Control Box to permit total power shut-down before opening ASC or PSC dead front, as required for inspection and service. The power disconnect switch should be located close to the dryer for quick shut-down.

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 — Tables 2-2 to 2-5 indicate 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 — Dryers are shipped with overload protection devices for auxiliary conveyors (adjacent to top and bottom auger contactors) to operate 10 HP auxiliary load and a 7.5 HP auxiliary take-away. If different motors are used, the O/L settings must be changed to provide adequate motor overload protection. See the following chart, AUXILIARY LOAD & UNLOAD MOTOR PARTS & SET-TINGS, for standard and nonstandard auxiliary motor protection devices.

CONTROL CIRCUIT JUMPERS

The standard CF/AB control panel is shipped with several wire jumpers used to control certain auxiliary motor operation and batch counter features. The jumpers may be removed or changed to alter the function of the dryer. The jumpers are one of two types. The jumpers may be a wire with purple insulation, or a metal clip inserted in the center of the terminal strip. Jumper locations and functions are as follows:

Terminal 30-78 — Proof that auxiliary equipment is operating. A contact pair associated with the auxiliary unload equipment may be wired into the dryer control panel. This contact must be closed when the auxiliary equipment is operating. If the dryer unload system is operating and the contact wired into terminals 30 & 78 opens, the dryers unload system will stop operating. This may be used when connecting a Convey Air System to the dryer to temporarily stop the flow of grain into the Convey Air Airlock.

Terminal 12-99 — Proof that auxiliary equipment is operating - safety circuit. A contact pair associated with the auxiliary equipment may be wired into the dryer's safety circuit. This contact must remain closed at all times unless there is a problem with the auxiliary equipment. If the contact is opened, the entire dryer will shut-down. This would be the location to wire the safety circuit of a Convey Air System into the dryer.

Terminal 48 — 120 volts AC is present on this terminal whenever the dryers unload system is operating. The customer may use this signal to control auxiliary equipment. If a different control voltage is required, remove the jumper connecting terminal 27 to 47. This will remove the dryers 120 volt control system from the terminals, providing a “dry” contact between terminals 47 & 48. This may be useful if the auxiliary equipment is controlled by 220 volts.

Terminal 51 — 120 volts AC is present on this terminal whenever the dryers unload system is operating. The customer may use this signal to control auxiliary equipment. If a different control voltage is required, remove the jumper connecting terminal 27 to 50. This will remove the dryers 120 volt control system from the terminals, providing a “dry” contact between terminals 50 & 51. This may be useful if the auxiliary equipment is controlled by 220 volts.

Terminal 39, 40 & 41 — Changing Batch Count to Meter Roll Revolution Count: The control panel is shipped from the factory with a jumper located between terminals 39 and 40. When the jumper is in this position, the small counter will count the number of Batches that the dryer has unloaded. If the dryer is to be operated in the continuous flow mode of operation, the counter will never increment. If the jumper is removed between terminals 39 & 40 and re-installed between terminals 40 & 41, the counter will increment on every revolution of the meter-rolls. The count value may then be multiplied by a multiplier to represent an approximation of the number of bushels discharged by the dryer. Multipliers are listed below for the dryer models:

<table>
<thead>
<tr>
<th>DRYER</th>
<th>MULTIPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF/AB-400</td>
<td>4.86</td>
</tr>
<tr>
<td>CF/AB-460</td>
<td>5.40</td>
</tr>
<tr>
<td>CF/AB-510</td>
<td>5.94</td>
</tr>
<tr>
<td>CF/AB-600</td>
<td>7.02</td>
</tr>
</tbody>
</table>

If jumper is removed between terminals 39 & 40 and re-installed between terminals 40 & 41:

Approximate bushel count = Counter Value x Multiplier
The maximum size auxiliary conveyor motors which can be powered directly from the power terminals of the dryer is a 10 HP auxiliary load and a 7.5 HP auxiliary take-away. See appropriate power circuit wiring diagram for terminal connection numbers. See the CONTROL CIRCUIT JUMPERS heading in Section 3 for the jumper connections required to run auxiliary equipment.

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

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

B. For automatic operation with single phase dryers — Use 230 V contactor coils and connect LOADING coil to POWER TERMINALS 214 and 215. Connect UNLOADING coil to POWER TERMINALS 210 and 211.

C. For automatic operation with 230 V, 3-PH dryers — Use 230 V contactor coils and connect LOADING coil to POWER TERMINALS 219 and 221. Connect UNLOADING coil to POWER TERMINALS 213 and 215.

D. For automatic operation with 460 V, 3-PH dryers — Either use a control stepdown transformer to power a 230 V contactor coil, or use 460 V contactor coils and connect them as described earlier in Item C.

E. When conveyor motors are powered from an external source and are connected for automatic type operation, 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 within the SAFETY CIRCUIT wiring diagram, which is included within the general control circuit wiring diagram in Section 8.

### Table 2-2 CF/AB-400 Electrical Load, Overload Relays, & Circuit Breakers

<table>
<thead>
<tr>
<th>Horsepower</th>
<th>Voltage</th>
<th>Fan</th>
<th>Top Auger</th>
<th>Bottom Auger</th>
<th>Auxiliary Load Conveyor</th>
<th>Auxiliary Unload Conveyor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-PH · 230V</td>
<td>25</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3-PH · 460V</td>
<td>25</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Max. Running Load (Dryer Only) - Amps</td>
<td>3-PH · 230V</td>
<td>32</td>
<td>6.6</td>
<td>4.1</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Max. Running Load, with Aux. Conv. - Amps</td>
<td>3-PH · 230V</td>
<td>3-PH · 460V</td>
<td>95 Amps</td>
<td>46 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel Overload Settings</td>
<td>3-PH · 230V</td>
<td>3-PH · 460V</td>
<td>145 Amps</td>
<td>71 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel Circuit Breaker Rating - Amps</td>
<td>3-PH · 230V</td>
<td>3-PH · 460V</td>
<td>28</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCR Motor</td>
<td>Size</td>
<td>Control Amps / Volts</td>
<td>Motor Amps / Volts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/3 HP DC</td>
<td>2.2 A / 230 VAC</td>
<td>1.6 A / 180 VDC</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Motor current and maximum dryer running loads shown are based on listed HP auxiliary conveyor motors.

**IMPORTANT:** All standard CF/AB dryers are factory equipped with starters sized for the listed HP auxiliary motors. If the actual motors used are different, it may be necessary to resize components as listed in the AUXILIARY LOAD & UNLOAD MOTOR PARTS & SETTINGS chart in Section 2.
Table 2-3  CF/AB-460 Electrical Load, Overload Relays, & Circuit Breakers

<table>
<thead>
<tr>
<th></th>
<th>Voltage</th>
<th>Fan</th>
<th>Top Auger</th>
<th>Bottom Auger</th>
<th>Auxiliary Load Conveyor¹</th>
<th>Auxiliary Unload Conveyor¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horsepower</td>
<td>3-PH - 230V</td>
<td>25</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>25</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td>Full Load Current (Amps per Motor)</td>
<td>3-PH - 230V</td>
<td>66</td>
<td>20</td>
<td>13.2</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>32</td>
<td>10</td>
<td>6.6</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Max. Running Load (Dryer Only) - Amps</td>
<td>3-PH - 230V</td>
<td>107 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>53 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Running Load, with Aux. Conv. - Amps</td>
<td>3-PH - 230V</td>
<td>167 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>78 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel Overload Settings</td>
<td>3-PH - 230V</td>
<td>66</td>
<td>20</td>
<td>13.2</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>32</td>
<td>10</td>
<td>6.6</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Control Panel Circuit Breaker Rating - Amps</td>
<td>3-PH - 230V</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>63</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>63</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>SCR Motor</td>
<td>Size</td>
<td>Control Amps / Volts</td>
<td>Motor Amps / Volts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/3 HP DC</td>
<td>2.2 A / 230 VAC</td>
<td>1.6 A / 180 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Motor current and maximum dryer running loads shown are based on listed HP auxiliary conveyor motors.

**IMPORTANT:** All standard CF/AB dryers are factory equipped with starters sized for the listed HP auxiliary motors. If the actual motors used are different, it may be necessary to resize components as listed in the AUXILIARY LOAD & UNLOAD MOTOR PARTS & SETTINGS chart in Section 2.

Table 2-4  CF/AB-510 Electrical Load, Overload Relays, & Circuit Breakers

<table>
<thead>
<tr>
<th></th>
<th>Voltage</th>
<th>Fan</th>
<th>Top Auger</th>
<th>Bottom Auger</th>
<th>Auxiliary Load Conveyor¹</th>
<th>Auxiliary Unload Conveyor¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horsepower</td>
<td>1-PH - 230V</td>
<td>10-16</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>10-16</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>10-16</td>
<td>7.5</td>
<td>5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td>Full Load Current (Amps per Motor)</td>
<td>1-PH - 230V</td>
<td>78</td>
<td>32</td>
<td>21</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>43</td>
<td>20</td>
<td>13.2</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>21</td>
<td>10</td>
<td>6.6</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Max. Running Load (Dryer Only) - Amps</td>
<td>1-PH - 230V</td>
<td>217 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>128.7 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>63 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Running Load, with Aux. Conv. - Amps</td>
<td>1-PH - 230V</td>
<td>298 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>178 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>88 Amps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel Overload Settings</td>
<td>1-PH - 230V</td>
<td>78</td>
<td>32</td>
<td>21</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>43</td>
<td>20</td>
<td>13.2</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>21</td>
<td>10</td>
<td>6.6</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Control Panel Circuit Breaker Rating - Amps</td>
<td>1-PH - 230V</td>
<td>125</td>
<td>63</td>
<td>50</td>
<td>100</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>3-PH - 230V</td>
<td>80</td>
<td>40</td>
<td>40</td>
<td>63</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>40</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>SCR Motor</td>
<td>Size</td>
<td>Control Amps / Volts</td>
<td>Motor Amps / Volts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/3 HP DC</td>
<td>2.2 A / 230 VAC</td>
<td>1.6 A / 180 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Motor current and maximum dryer running loads shown are based on listed HP auxiliary conveyor motors.

**IMPORTANT:** All standard CF/AB dryers are factory equipped with starters sized for the listed HP auxiliary motors. If the actual motors used are different, it may be necessary to resize components as listed in the AUXILIARY LOAD & UNLOAD MOTOR PARTS & SETTINGS chart in Section 2.
<table>
<thead>
<tr>
<th></th>
<th>Voltage</th>
<th>Fan</th>
<th>Top Auger</th>
<th>Bottom Auger</th>
<th>Auxiliary Load Conveyor</th>
<th>Auxiliary Unload Conveyor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horsepower</td>
<td>3-PH - 230V</td>
<td>20</td>
<td>10</td>
<td>7.5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>20</td>
<td>10</td>
<td>7.5</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td>Full Load Current (Amps per Motor)</td>
<td>3-PH - 230V</td>
<td>56</td>
<td>26</td>
<td>20</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>28</td>
<td>13</td>
<td>10</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Max. Running Load (Dryer Only) - Amps</td>
<td>3-PH - 230V</td>
<td></td>
<td></td>
<td>166 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td></td>
<td></td>
<td>83 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Running Load, with Aux. Conv. - Amps</td>
<td>3-PH - 230V</td>
<td></td>
<td></td>
<td>216 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td></td>
<td></td>
<td>108 Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel Overload Settings</td>
<td>3-PH - 230V</td>
<td>56</td>
<td>26</td>
<td>20</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>28</td>
<td>13</td>
<td>10</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Control Panel Circuit Breaker Rating - Amps</td>
<td>3-PH - 230V</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>63</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>3-PH - 460V</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>SCR Motor</td>
<td>Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/3 HP DC</td>
<td></td>
<td></td>
<td></td>
<td>2.2 A / 230 VAC</td>
<td>1.6 A / 180 VDC</td>
</tr>
</tbody>
</table>

1. Motor current and maximum dryer running loads shown are based on listed HP auxiliary conveyor motors.

**IMPORTANT:** All standard CF/AB dryers are factory equipped with starters sized for the listed HP auxiliary motors. If the actual motors used are different, it may be necessary to re-size components as listed in the AUXILIARY LOAD & UNLOAD MOTOR PARTS & SETTINGS chart in Section 2.
FUEL CONTROLS

MAIN/SAFETY GAS SHUT-OFF VALVE (NATURAL GAS MODELS ONLY)

VALVE OPERATION — This valve is of the electrical type and is installed only onto NATURAL GAS model dryers. This unit is a electrically energized, manual reset valve. The valve is equipped with an electric solenoid which is energized only when the dryer CONTROL CIRCUIT is turned ON.

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 valve will trip closed instantly when its solenoid is de-energized or when the lever is rotated to the closed position.

Visual indication of "open" and "shut" positions is provided by a position indicator in the side of the unit. An orange indicating bar aligns itself with the words "open" or "shut."

HI-LO FIRE THERMOSTAT and GAS PRESSURE SETTINGS

THERMOSTAT OPERATION — Combustion in the fan-heater unit is controlled by the HI-LO Fire burner thermostat assembly located on the front of the dryer.

The thermostat senses the air plenum temperature and cycles the burner from HI-FIRE to LO-FIRE operation to maintain the desired drying temperature AS INDICATED BY THE THERMOMETER.

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

PROPANE 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 to the burner's highest recommended operating pressure WHILE OPERATING ON HI-FIRE, as indicated by the fan-heater control box pressure gauge. See Table 2-1 (maximum listing under "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. 7 to 8 psi WHILE THE BURNER IS OPERATING ON HI-FIRE. See Table 2-1 (max. listing under "Operating Pressure Range").

LO-FIRE — The LO-FIRE gas pressure is controlled by the flow control valve.

PROPANE LO-FIRE — On propane models, set the LO-FIRE gas pressure to the "LO-FIRE" setting as listed within Table 2-1 by rotating the knob on the flow control knob. 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 handle on the small gas shut-off valve to provide the "LO-FIRE" gas pressure as listed in Table 2-1, while the burner is operating on LO-FIRE.

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 the burner remains in HI-FIRE and does not cycle, increase gas regulator setting on propane models, or the main gas supply pressure on natural gas models, in order to satisfy the thermostat setting. DO NOT EXCEED THE MAXIMUM PRESSURE LISTED IN Table 2-1. For dual burner models (510 and 600), always make sure that upper and lower burners are set to the same fuel pressure.

If the burner remains in LO-FIRE and does not cycle, decrease the LO-FIRE gas pressure slightly by readjusting the flow control valve. 510 models only: 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.

METER ROLL ADJUSTMENT

The dry grain discharge rate is adjusted by rotating the SCR speed control knob, labelled "% UNLOAD RATE" on the ASC control panel as shown in Fig. 6-5. This control ranges from 0 to 100, representing the flow of grain past the metering rolls as a percent of the maximum grain discharge rate for the dryer.

ADJUSTMENT — Turn the % Unload Rate knob clockwise to increase the discharge rate, counterclockwise to decrease.

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 light circuit is 115 volts and is intended for 100 watt bulb operation. Do not install an oversize light bulb.

MISCELLANEOUS SWITCHES

UNLOAD AUGER SWITCH

If switch is turned OFF the bottom auger will not operate. When operating in AUTOMATIC BATCH mode, setting the switch to OFF will stop the automatic cycle when the dryer would normally begin unloading (at the end of the Cool timer setting). The ability to "Hold" or delay the unloading is helpful where an elevator leg may be in use for wet grain when the dryer would start unloading (if on AUTO), or where the operator desires to be present when unloading occurs. If switch is set to OFF position when dryer is operating, the fan and burner (if Burner switch is in ON position) will continue to operate. If switch is turned OFF after unloading has begun, the cooling fan will remain on and the Unload timer's "in-progress" memory will allow dryer to resume the unload cycle when Unload switch is set back to AUTO. Leaving the Unload switch OFF during Full-Heat Batch drying is not recommended. It would remain on full heat until a grain or plenum hi-limit thermostat would cause a safety-circuit shut-down. When the Unload Auger switch is in AUTO with the dryer operating in CF mode, the bottom auger will operate continuously.

Unload Auger Timer — TheUnload Auger timer, located within the ASC control box, is adjustable from 0 to 100 seconds. The timer is designed to allow the unload auger (and any connected auxiliary unloading equipment) to operate for 0 to 100 seconds AFTER) the meter rolls stop operating. This feature allows the operator to "fine tune" the amount of bottom auger cleanout. For example, to set the timer for 30-seconds delay, simply rotate the dial pointer to the 3 mark on the dial.

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, this feature is designed to automatically shut down the dryer and relieve grain 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. It may be necessary to clear grain from under the door to allow it to fully clear and reset the circuit.

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 degree rotation provides maximum discharge.

FAN SWITCH

The FAN SWITCH has two operating positions, OFF or ON. If the switch is set to OFF, the fan, and likewise the burner, will not operate. In Batch mode, the batch timers will not operate unless the Fan switch is ON.

If switch is set to ON position, the fan will operate continuously (for both CF and BATCH modes of operation). On dual-fan models, the second fan will start approximately 5 seconds after the first.

BURNER SWITCH

ON, OFF or AUTO — The Burner switch has three operating positions. With switch in the OFF position, the burner will not operate.

Table 3-1 SCR Drive Information and Data

<table>
<thead>
<tr>
<th>Approx. Discharge Rates</th>
<th>BU/HR at Various % Unload Settings (Standard Discharge Models)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>10%</td>
</tr>
<tr>
<td>CF/AB-400</td>
<td>123</td>
</tr>
<tr>
<td>CF/AB-460</td>
<td>136</td>
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<tr>
<td>CF/AB-510</td>
<td>150</td>
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<tr>
<td>CF/AB-600</td>
<td>177</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SCR Component or Specification</th>
<th>All Models</th>
<th>With Max. Dis. Option</th>
</tr>
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<tbody>
<tr>
<td>SCR Control - Part No. &amp; Supply Volt.</td>
<td>415-4589-9, 230V</td>
<td></td>
</tr>
<tr>
<td>DC Motor</td>
<td>002-1299-3</td>
<td>004-1299-3</td>
</tr>
<tr>
<td>Horsepower &amp; Set RPM</td>
<td>1/3 hp, 1750 RPM</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>PM</td>
<td></td>
</tr>
<tr>
<td>Set Voltage (arm.)</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Full Load Amps (arm.)</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Motor Sheave</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Pitch Dia.</td>
<td>AK22, 5/8&quot;</td>
<td></td>
</tr>
<tr>
<td>Number &amp; Bore</td>
<td>AK22, 5/8&quot;</td>
<td></td>
</tr>
<tr>
<td>Gearbox - Part No. &amp; Ratio</td>
<td>017-1544-0, 100:1</td>
<td></td>
</tr>
<tr>
<td>Gearbox Drive</td>
<td>6.0&quot;</td>
<td>6.0&quot;</td>
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<tr>
<td>Input Sheave</td>
<td>H-/3/4</td>
<td>H-/3/4</td>
</tr>
<tr>
<td>Bore</td>
<td>A26</td>
<td>A26</td>
</tr>
<tr>
<td>Belt</td>
<td>4018-1, 1 1/8</td>
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<tr>
<td>Output Sprocket No. &amp; Bore</td>
<td>4017-1, H-1 1/8</td>
<td></td>
</tr>
<tr>
<td>Chain</td>
<td>#40 x 106&quot;</td>
<td></td>
</tr>
<tr>
<td>Meter Roll</td>
<td>6 Flute, 2.1 rpm</td>
<td>6 Flute, 3.3 rpm</td>
</tr>
<tr>
<td>Type &amp; Max RPM</td>
<td>40P50, P1-1</td>
<td>40H30, H-1</td>
</tr>
<tr>
<td>Drive Sprocket No. &amp; Bore</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

12
With switch in the ON position, the burner will operate continuously when the fan is running. When Burner switch is in AUTO position with the dryer operating in BATCH MODE, the burner will be automatically controlled by the dryer (to provide the desired grain heating and cooling time).

**MODE SWITCH**

CONTINUOUS FLOW or BATCH — When Mode switch is set to the CF position the dryer will operate as a full-heat continuous flow type dryer. In this mode the batch timers are bypassed and become inoperative. Drying charts and the recommended start-up procedure for CF dryer operation are located in OPERATION section of manual. When mode switch is set to the BATCH position, the dryer will operate as a batch dryer and be controlled by the adjustment settings of the DRY, COOL, UNLOAD, and HI-HEAT timers. See TIMERS heading later in this section for additional information.

**TIMERS**

Solid-state timers are used to control the Dry, Cool, Unload, and Hi-Heat times used in Automatic Batch operation. The timers can be set to the nearest 1/10 of a minute. The timing sequence is in operation when the display on the timer is backlit and the Run Indicator is blinking. The timing sequence is completed when display reads 0.0 and the OUT indicator is lit.

In the event of a safety shut-down or power failure during timer operation, each timer has a battery backup that retains the elapsed time in memory. When dryer is turned back on, the timer will resume its cycle where it left off. If desired, timer settings can be changed or reset during the power outage or safety shutdown.

**KEY DEFINITIONS**

- **Set Value**: The timer setting in minutes.
- **Present Value**: Time remaining until timer "times out." Reset: Resets Present Value to Set Value. Pressing the Reset button causes the timer to start at the beginning of its cycle, regardless of the previous timing cycle. For example, pressing the Dry Timer's reset button during the Unload cycle would immediately restart the Dry cycle. Therefore, use care to avoid accidentally resetting the cycle timers. See the following definition for how to change a timer's setting without disrupting the cycle in progress.

- **Up Keys 1 to 4**: Used to enter a Set-Value time. Keys 1 to 4 increase the corresponding digits as follows: key 1 changes 1st digit, key 2 changes 2nd digit, etc.

The best time to change the Set Value is before the drying cycles have begun. However, the Up Keys allow the Set Value to be changed at any time (even when the dryer is shut down). If a timer's Set Value absolutely must be changed while its cycle is in progress, take note of the following important precautions:

- If you try to set the timer to an amount less than the possible remaining time, the timer will reset to 0 and begin the next cycle.

The Set Value can be safely increased at any time during a particular cycle as long as the Set Value never falls below the Present Value. The following tip allows you to bypass this restriction.

**Example**: A timer that is running was initially given a Set Value of 20 minutes. Ten minutes have elapsed, with ten minutes remaining. You wish to lower the Set Value to 15 minutes, which is more than the possible remaining time. First, increase the Set Value by pressing the number 4 Up Key once to display 120.0. Next, increment the number 2 and 3 Up Keys until the 115.0 is displayed. Then increment the number 4 Up Key until 15.0 is displayed. You will then have safely shortened the cycle by 5 minutes.

**TIME TRAINERS**

- **DRY TIMER** — Allows the burner to operate for a predetermined time at the temperatures set by the Hi-Lo Fire (dual temp) plenum thermostats. At the end of the dry time period, the Digi-Trol controller will check whether the grain has reached the set-point temperature. When grain reaches set-point, the burner will stop operating and the cooling cycle will start.

- **HI-HEAT TIMER** — The Hi-Heat feature provides two stages of drying (high heat and low heat) for Automatic Batch mode operation. The Hi-Heat timer, located on the control panel, can set the initial high-heat drying stage from 0 to 999.9 minutes.

  **NOTE**: The Hi-Heat timer does not effect total drying time, which is set by the Dry timer. As a general recommendation, the high heat period should be approximately 2/3 the Dry timer setting.

  Hi- and Lo-heat temperatures are set by the Hi-Lo Fire thermostats located on the front of the dryer near the access ladder.

  To establish the optimal timer setting for your drying needs:

  1. Begin with a dry timer setting as recommended in the appropriate batch drying chart in Section 5. Run a full drying cycle with the Hi-Heat timer set at approximately 2/3 the total Dry time.
2. Test output grain for moisture content. In general, if drier grain is desired, increase Dry timer setting; decrease setting for higher moisture output.

3. Repeat this setup procedure until output moisture is in the desired range. To achieve a greater degree of moisture control, use the Digi-Trol setpoint as explained later in this section. See Section 5 for more detailed operating instructions.

**CAUTION:** If significant changes in grain input moisture occur, repeat set-up procedure to reset the Dry timer.

**COOL TIMER** — The Cool timer may be adjusted for either full cooling or any degree of partial cooling. At the completion of the cooling cycle, the unload cycle will start.

**UNLOAD TIMER** — The Unload timer should be set to the time to unload one full content of the dryer. During the unload cycle, wet grain is being added, thus eliminating the down time to load, as is required in typical batch dryers. Also the fan continues to run, permitting cooling to continue during unloading. For the Batch drying mode, the meter rolls should be adjusted to provide maximum (100%) discharge rate if possible (see Batch Drying Operating Instructions in Section 5 for an adjustment formula).

See AUTOMATIC BATCH OPERATION CHARTS in Section 5 for suggested dryer start-up and initial trial settings for timers for different grain types and moisture conditions.

**LOAD TIMER** — The Load timer is located within the ASC control box. It is an adjustable, automatic reset type timer designed to provide automatic shutdown of the dryer if the top auger operates continuously for longer than the timer setting, thereby indicating an absence of wet grain.

**TIMER SETTING:** To set the timer, observe the normal time required for the dryer to refill, then rotate the front dial to the average refill time plus several additional minutes.

**NOTE:** Load timers are factory-set to the 60-minute mode. With this arrangement, the No. 1 mark on the dial face equals 1/6 of the 60 minute range, for example.

### DIGI-TROL AUTOMATIC MOISTURE CONTROL

Digi-Trol™ is a temperature-based moisture control system consisting of a Moisture Controller unit and an Auto Two-Speed module to control the unloading rate.

Digi-Trol uses grain temperature sensed within the grain column to monitor, predict, and steer the drying process. Whenever the sensed temperature varies from an operator-set moisture control temperature, the Moisture Controller will vary the discharge rate during Continuous Flow (CF) operation or alter the drying time during Automatic Batch (AB) mode. If the sensed temperature falls below the set-point temperature, Digi-Trol increases the drying time by either slowing the discharge rate for Continuous Flow (CF) operation, or extending the dry time for Automatic Batch (AB) operation. A rise in sensed grain temperature indicates to Digi-Trol that drier than expected grain has entered the dryer, calling for quicker discharge (CF mode) or reduced drying time (AB mode).

In the Continuous Flow (CF) mode, Digi-Trol uses a technique called "pulse width modulation" to make a two-speed motor simulate a more advanced variable speed control such as Farm Fans' Vari-trol™. Digi-Trol's microprocessor-based controller sends a series of Hi and Lo pulses to the Auto Two-Speed module. Based on the ratio of Hi to Low signals, drying time is proportionally changed to control discharge moisture.

In Automatic Batch (AB) mode, Digi-Trol's controller automatically extends drying time as needed. In this mode, the controller has no effect on the unload rate but simply extends drying time in response to wetter than expected grain.

The Moisture Controller unit displays both grain temperature, indicated by PV (short for "Process Variable") and set-point temperature, indicated by SV (short for "Set-point Value"). The control utilizes an averaging RTD sensor inside a grain column, extending horizontally across the entire dryer length, at approximately 1/2 to 2/3 of the way down from the top of the grain column.

### KEY COMPONENTS and DEFINITIONS

**MOISTURE CONTROLLER UNIT**

- **PV** Process Variable. Grain temperature sensed at the RTD sensor.
- **SV** Set-point Value. The grain temperature corresponding to the target moisture level. Digi-trol will attempt to operate at temperatures below this set-point. To set this value, press the Mode key on the Moisture Controller, then use the up or down arrow keys to change. After the Setpoint Value is displayed, push the Mode key to save and exit.

**NOTE:** An accurate Set-point Value is critical in obtaining effective moisture control, therefore care should be taken when determining this value. The proper Set-point Value should be equal to the grain temperature (PV) when the drying process has stabilized and the dryer is discharging grain at the target moisture content. Because the sensor is located 1/2 to 2/3 into the drying pass, however, note that grain being sensed and displayed will not be discharged for another 1/3 to 1/2 of a drying pass (this lag is illustrated near the heading Reacting to Moisture Variation ahead).

- **OUT** Lights when Digi-Trol senses wetter than expected grain, calling for the lower speed meter roll operation. When not lit, the higher speed signal is sent. (In AB mode, the high or low signal has no effect on the unload rate or drying time.)
- **ALM** Lights primarily when grain temperature meets or exceeds the operator-set moisture control temperature, allowing the higher of the two meter roll speeds. In AB mode, the drying time will be extended until grain temperature meets or exceeds the set-point.

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AUTO TWO-SPEED MODULE

Selector switch settings

ON  In Continuous Flow (CF) mode, allows for two-speed meter roll action needed for Digi-Trol control. When the ASC panel's Unload Auger switch is set to AUTO, the meter roll speed will cycle between low speed (2/3 of manually set Unload Rate) and high speed (twice the manually set Unload Rate). The cycling interval is controlled by the Moisture Controller unit.

OFF  The Auto Two-Speed should never be placed in the OFF position. (The meter rolls will not operate with switch in the OFF position.)

Unload Limit  Provides maximum discharge rate protection by allowing an operator to set the maximum discharge rate allowable to prevent overloading the take-away equipment. The Unload Limit is always active regardless of the drying mode (CF or AB). For maximum capacity in AB mode and for best moisture control in CF mode, set the Unload Limit as high as possible within the limits of the take-away equipment.

MOISTURE CONTROL (MC) SWITCH

Meter roll control is enabled by the MC switch in the Moisture Control area of the control panel. This switch has two positions: OFF and AUTO.

OFF  — For MANUAL meter roll control, turn the MC switch to OFF. Meter rolls will discharge at the rate set by the % Unload Rate dial. The Moisture Controller does not display or control when in the OFF position.

AUTO  — Automatic operation. The Moisture Controller unit displays and controls meter roll action.

1. Setting the Auto Two-Speed Unload Limit Setting — Determine the maximum unload rate allowed by the take-away equipment. Divide this amount by the 100% dryer discharge rate for the dryer model and multiply by 10. This is the correct Unload Limit setting.

Example:
Take away auger capacity = 800 BPH
Max btm. auger capacity = 1000 BPH
(800 / 1000) x 10 = 8.0
Conclusion:  Set Unload Limit to 8.0

2. Manual Start-up & Initial Temperature Reading — Refer to the continuous flow start-up procedure chart in section 5 of this manual. Follow the listed procedures including starting and filling the dryer, using the drying times from the DRYING TIME TABLE. During this initial start-up the Moisture Controller unit must not be in a controlling mode.

3. Stabilizing Grain Moisture in Manual Mode — If grain moisture variation requires adjustment of the meter roll rate, rotate the Unload Rate knob slightly in the required direction (decrease setting to reduce grain moisture). Allow dryer to operate for one complete grain pass to stabilize grain moisture, then recheck moisture.

The Minutes for one grain pass is calculated as follows:

\[
\text{Minutes for one} = \frac{\text{Holding Capacity (Bu) x 60}}{\text{Unload Rate (BPH)}}
\]

4. Establishing the Set-Point Value — After discharge grain moisture has been stabilized by adjustment of the meter roll rate and the output moisture is at the desired level, the Set-point Value is determined to be equal to the grain temperature (PV) observed over the last 1/2 to 1/3 of the drying pass. To set the Set-point Value, turn the MC switch to AUTO, push the Moisture Controller's Mode key, then use the arrow keys to change the Set-point Value. Once the correct Set-point is displayed, press the Mode key to exit the Set mode.

Variations of incoming grain moisture may not allow the grain temperature and moisture to fully stabilize during setup. A proper Set-point temperature can be determined when a sample of discharged grain meeting the target moisture is known to have the same PV temperature as when it had passed the sensor 1/2 to 1/3 of a drying pass prior to sampling. Minor temperature variation in the meantime can be disregarded.

5. Reacting to Moisture Variation — The Moisture Controller will react to changes in input grain moisture by automatically changing the unload rate. In drastic moisture change situations, however, such as a sudden slug of wetter grain, temporary changes in the discharge grain moisture are to be expected. Be assured that the controller will bring the discharge moisture back to the target after a necessary adjustment period. Since the Moisture Controller’s temperature sensor is located 1/2 to 2/3 into the drying pass, the different moisture grain has already seen over half
its dry time before the controller can act to correct the discharge rate (see "LAG TIME" illustration). Grain discharged 1/2 to 2/3 of a drying pass after a sharp moisture/temperature variation should fall back into line with the target moisture.

6. When to Change the Set-Point — If discharged grain is not at the desired moisture content, investigate the following points before changing the Set-point:
   a. Check incoming moisture to determine if a significant change has occurred. If this change averages more than 3% from the moisture measured during the set-up procedure, then repeat the set-up procedure to establish a new Set-point.
   b. Determine whether a change in moisture is a result of a temporary condition (for example, a small load of wetter or drier grain). The Set-point should not be changed if incoming moisture returns to the average seen during the most recent set-up procedure. (The Moisture Controller will allow a slight moisture deviation for a short period of time.)
   c. Observe either the meter roll speed or the Moisture Controller's "Out" indicating light for 15 to 20 seconds. If the meter roll speed is not noticeably cycling between High and Low speed every 5 to 10 seconds, and the lack of cycling is not due to a temporary change in incoming grain moisture, then repeat the manual set-up procedure to establish a new Set-point.

7. Restarting a Loaded Dryer after a Shut-down — When restarting a loaded dryer following a shut-down period, the operator should run the dryer in MANUAL mode until the grain that had sat in the dryer is purged and the grain temperature has stabilized before switching to the AUTO mode. The grain temperature Set-point should not necessarily require readjustment.

See the “Digi-Trol Continuous Flow Operation Summary” chart for a summary of the operation procedure. Refer to Section 5, DRYER OPERATION, for further operation details.

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**DIGI-TROL CONTINUOUS FLOW OPERATION SUMMARY**

After initial start-up procedure and the Continuous Flow (CF) mode has been selected:

A. Set Unload Limit on the Auto Two-Speed.
B. Ensure that the Auto Two-Speed is set to the ON position.
C. Set the MC switch to the OFF position.
D. Set unload rate (using the % Unload Rate control knob) according to recommended setting based on incoming moisture, desired moisture, and the drying time tables.
E. Allow dryer to operate one complete pass without any changes to the % Unload Rate.
F. During the last 1/2 to 1/3 of the drying pass, observe the grain temperature (PV) on the Moisture Controller by momentarily switching the MC switch to the ON position, and then back to the OFF position.
G. Measure discharge grain moisture content at the end of the drying pass.
H. If grain is discharged at the desired moisture content, then the Set-point Value should be set to the grain temperature (PV) observed. If grain moisture is too dry or wet, then adjust the % Unload Rate control knob and repeat steps E through H.
I. Turn the MC switch to the AUTO position.
J. Enter the appropriate Set-point Value into the Moisture Controller.
AUTOMATIC BATCH OPERATION USING DIGI-TROL — PRELIMINARY SETTINGS and INFORMATION

To establish the Set-point Value in the AB operating mode, set the batch timers according to suggested initial settings listed in the cycle time chart in Section 5. Set the MC switch to the OFF position. Run a batch of grain at the suggested timer settings. Then check the grain temperature at the end of the batch to see whether discharge moisture is near target. If it is near target, the Set-point Value (SV) should be set to the grain temperature (PV) displayed at the end of the batch cycle.

If grain temperature is failing to reach the Set-point Value during Digi-Trol control, this would normally indicate the grain has become wetter than when the Set-point was established, requiring additional drying time. The Moisture Controller will then "hold" in the drying mode until the grain temperature rises to the Set-point Value. This control feature only helps to protect against discharging wetter than desired grain and does not alter the dry time for AB operating mode, however. The risk of over-dried grain can be reduced by lowering the Dry Timer setting and relying on the Moisture Controller to “hold” the grain during normal operation.

See the “Digi-Trol Automatic Batch Operation Summary” chart for a summary of the operation procedure. Refer to Section 5, DRYER OPERATION, for further operation details.

SAFETY SHUTDOWN CONTROLS

OVERLOAD RELAYS
STANDARD EQUIPMENT — The dryer is equipped with a complete set of overload protection devices. These devices are factory set to the values shown in Tables 2-2 to 2-5. The safety control circuit of the single and three phase units has five current overload protection devices in the safety circuit.

MANUAL RESET — All of the current overload protection devices are the manual reset type. If an electrical overload occurs, the PSC box must be opened to push the reset lever on the tripped overload.

SHUT-DOWN INDICATOR LIGHTS

LIGHT OPERATION — The shut-down indicator lights are connected within the 115 volt safety control circuit to identify the cause of unexpected dryer shut-down problems.

Due to the special circuitry of the shut-down indicators, they will quickly verify power interruption problems and locate intermittent malfunctions within the various self-resetting type safety devices within the dryer. Once an indicator light is activated, it will continue to identify the cause of dryer shut-down until the dryer is manually restarted. This will apply even if a safety device which has interrupted the dryer circuit may have already reset itself.

NOTE: The 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.

DIGI-TROL AUTOMATIC BATCH OPERATION SUMMARY

After initial start-up and Automatic Batch (AB) mode has been selected:

A. Set Unload Limit on the Auto Two-Speed module.
B. Set the MC switch to the OFF position.
C. Set the Dry/Cool/Unload timers to recommended setting based on incoming moisture, desired moisture, and drying time tables.
D. When the Dry Timer times out, immediately observe the grain temperature (PV) on the Moisture Controller by momentarily switching the MC switch to the AUTO position, and then returning control back to the OFF position.
E. Measure the discharge grain moisture content during the next Unload cycle. Grain samples should be taken over a period of 5 minutes during the middle portion of the Unload cycle to get a good representative sample. (Avoid sampling immediately after the Unload cycle begins or just before the cycle ends.)
F. If discharged grain is at the desired moisture content, then the correct Set-point Value should be the grain temperature (PV) observed in step D above. If the grain moisture is too dry or too wet, then adjust the Dry/Cool/Unload timers and repeat steps D through F.
G. Turn the MC switch to the AUTO position.
H. Enter the appropriate Set-point Value into the Moisture Controller.
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 unload auger drive end of the dryer, on the same side as the auger 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 1/8" to 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.

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.

Fig. 3-4  Meter roll monitor

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.

   For the most common shutdown causes, see Section 9, Troubleshooting.
Before the dryer is filled and placed into actual drying operation, thoroughly inspect the unit and check out the operation as described:

1. Set controls and switches as follows:

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>TEST FIRING SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Switch</td>
<td>CF</td>
</tr>
<tr>
<td>MC Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Unload Auger Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Fan Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Burner Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Load Auger Switch</td>
<td>OFF</td>
</tr>
<tr>
<td>Load Timer</td>
<td>30 Minutes</td>
</tr>
<tr>
<td>% Unload Rate Setting</td>
<td>Adjust to Zero Position</td>
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</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.

3. Turn ON the main electrical power supply and set all circuit breakers in the PSC box to the ON position.

4. Open the main fuel supply valve to allow fuel flow to the dryer and inspect all gas lines and connections for possible leaks. ANY GAS LEAKS MUST BE CORRECTED.

   NOTE: On LP models, open shut-off valves SLOWLY to prevent accidental closing of excess flow valve within system. On natural gas models, step 5 must be performed before the main/safety valve can be manually opened.

5. Depress the dryer START button. The control circuit indicator light should immediately come ON, indicating that safety circuit and control circuit are energized to allow dryer operation.

6. Check Conveyor Motors for proper direction of 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 wet grain auxiliary supply conveyors connected to the dryer power terminals should also start and rotate in the proper direction. Refer to NOTE in Item 8.

   B. Quickly bump (jog) UNLOAD switch to AUTO position. The bottom auger drive motor should rotate COUNTERCLOCKWISE, as viewed from the drive end. Any dry grain auxiliary conveyors connected to dryer power terminals should also start and rotate in the proper direction.

   NOTE: The meter roll drive motor will stop first, then after a short delay the auger will stop.

7. Check Metering Roll operation. With bottom auger still operating, turn the meter roll adjustment control and check metering roll drive mechanism for proper operation throughout the full speed range of operation. Make sure all drive chains are properly tensioned and that all sections of the meter rolls rotate properly. (Drive meter roll-CW, driven meter roll-CCW).

8. Check Fan Motor direction of rotation. Bump (jog) fan switch and observe direction of motor rotation. The fan should turn COUNTERCLOCKWISE, as viewed from the fan inlet.

   NOTE: On three phase model dryers, if all of the motors run backward, they can easily be reversed by interchanging ANY TWO of the three power supply connections to the dryer. Auxiliary conveyors which have been field connected may have to be reversed individually.

9. Turn fan switch ON and observe the number of seconds required for the fan to reach FULL RPM. (On dual-fan models, the second fan will start approximately 5 seconds after the first.) The fan should reach full speed within 7 seconds and motor running current should be within acceptable limits to the full load amperage listed in Tables 2-2 to 2-5.

10. Burner Firing. Turn burner switch to ON position. The burner should fire after a short purge interval and gas pressure should be indicated on pressure gauge.

   Set the High Heat plenum thermostat on front plenum panel to approximately 200 deg. F, to cause burner to operate on Hi-Fire. Observe gas pressure indicated on pressure gauge, then turn thermostat down to its MINIMUM setting to cause burner to cycle into Lo-Fire. As the thermostat is turned down, the 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.

   NOTE: Gas pressures and thermostat settings cannot be finalized until dryer is filled with grain. For additional information concerning the actual recommended gas pressure settings and the adjustment procedures, refer to Table 2-1 and Section 3, OPERATING CONTROLS.

   If heater fails to ignite within one to two minutes (due to gas being shut off or for any other reason), the safety lock-out within the burner control assembly will automatically shut down the entire dryer. If this condition occurs, wait several minutes for lock-out to cool before again restarting dryer and attempting to fire the burner.

   On single phase models, the fan starting capacitors can be damaged by heat if the motor is started repeatedly. Allow capacitors to cool down before restarting motor.

11. Check Burner Safety Lockout function. With the fan-heater operating, shut off the main fuel supply valve. With the main gas shutoff valve closed, the burner control system’s P/L safety circuit should force the dryer into a safety shutdown shortly after the flame extinguishes. If heater cannot be forced into safety lock-out condition, consult your local service man or the Factory Service Department. Do not attempt to place the dryer into actual operation until the problem has been located and corrected.

12. Check Discharge Safety Shutoff operation. Test the operation of the Discharge Safety Shutoff (DSS) by lifting the discharge box cover while the unload auger is running. If a
13. Check Meter Roll Monitor safety shutdown. Start dryer control circuit and turn Unload Auger Switch to AUTO, and set Unload Rate to minimum setting. Allow unload to operate for approximately (5) minutes. No shut down should occur.

Turn Unload Switch to OFF. Remove fuse number 4, located in PSC chassis. CAUTION: High voltage is present inside the PSC chassis enclosure.

Turn Unload Auger Switch to ON. In approximately (3) minutes, the dryer should shut down and the meter roll monitor shutdown indicator will be lit.

Turn Unload Auger Switch OFF and reinsert fuse number 4.

14. Check Moisture Control. Start dryer control circuit and turn Unload Auger Switch to AUTO, set the Unload Rate to the 50% setting. Turn the Moisture Control Switch to Auto and set the Moisture Controller Set-point Value equal to the current grain temperature (PV) displayed on the Moisture Controller. The Out indicator on the Moisture Controller should pulse on and off. With the Set-point Value equal to the grain temperature display, the Out indicator should be on for approximately 5 seconds and off for 5 seconds. When the Out indicator is off, the meter-rolls should operate at approximately 2 times the Unload Rate setting. When the Out indicator is on, the meter-rolls should operate at two-thirds the Unload Rate setting.

Adjust the Set-point Value on the Moisture Controller so that it is 20 degrees greater than the grain temperature display. The Out indicator should remain ON for a period of time longer than the length of time than the indicator is OFF.

Adjust the Set-point Value on the Moisture Controller so that it is 20 degrees less than the grain temperature display. The Out indicator should remain OFF for a period of time longer than the length of time than the indicator is ON.

Turn the Moisture Control Switch to the Off position and turn the Unload Switch to the Off position. The meter-rolls should stop as soon as the Unload Switch is placed in the Off position. The Unload auger will continue to operate for a few seconds as set by the Unload Delay timer.

15. Check Digital Batch Timers. Set the batch timers a listed:

Dry Timer: 4 minutes
Cool Timer: 1 minute
Unload Timer: 1 minute
Hi-Heat Timer: 2 minutes

Start dryer control circuit, turn the Mode Switch to the AB position, set the Burner Switch to the Auto position, and turn the Fan Switch to the On position. The Dry Timer and the Hi-Heat timer should start operating. While the Hi-Heat timer is operating, the Hi-Heat thermostat may be adjusted up and down to verify that the Hi-Heat thermostat is operating. After two minutes, the Hi-Heat Timer will reach zero. The Lo-Heat thermostat may now be adjusted up and down to verify that the Lo-Heat thermostat is operating. While the Hi-Heat Timer is timing, the Lo-Heat thermostat should not have any effect on the control of the burner. Once the Hi-Heat Timer reaches zero, the Hi-Heat thermostat should not have any effect on the control of the burner.

When the Dry Timer reaches zero, the burnert should stop and the Cool Timer should illuminate and start timing.

When the Cool Timer reaches zero, theUnload Timer should NOT start. Turn the Unload Switch to the ON position. The Unload Timer should illuminate and start timing. When the Unload Timer reaches zero, all timers should reset to the set value, the Cool and Unload Timers back light should turn OFF and the Burner should start operating.

Repeat the test to verify timer operation. Turn the Fan Switch OFF, turn the Unload Switch OFF and reset the timers by pressing the Reset button on each timer.

16. With dryer properly functioning, as described in previous steps, the unit may be considered ready for drying operation. Refer to operating instructions for procedure and control settings.

Shut off the circuit breakers, the main power supply, and fuel supply valves.
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 heading within either CONTINUOUS FLOW DRYING CHARTS or AUTOMATIC BATCH OPERATION CHART for additional information concerning dryer capacity and settings.

DRIERATION PROCESS — The full heat process is called “Drieration.” 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%.

DRIEDING TEMPERATURES (Plenum Temp.)

THERMOMETER — The drying temperature is shown by the thermometer located on the front left-hand side of the dryer.

SHELLED CORN — For shelled corn with an initial moisture content of 25-30%, the recommended maximum drying temperature is 210-220 degrees F. For lower initial moisture content, lower drying temperatures are recommended.

SMALL GRAIN — For small grain (wheat, oats, milo), 155 degrees F is the suggested drying temperature, with 175 degrees F maximum.

RICE, SOYBEANS — Drying temperatures are critical in drying rice and soybeans. A temperature of 130 degrees F is recommended to keep grain temperature low.

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

FINAL MOISTURE CONTENT

It is necessary to frequently check the moisture content of discharge grain while the final adjustment setting(s) is (are) being established (meter roll setting for CF mode, or Dry Timer setting for Batch mode), 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.

DRIER SHUT-DOWN

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

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.

SHUT-DOWN — To stop the dryer, push control circuit STOP button, move all circuit breakers OFF, turn main power supply OFF, and CLOSE all valves in the fuel supply lines to the dryer.
CONTINUOUS FLOW START-UP PROCEDURE

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

Set Controls

1. Set Controls as follows:
   A. Set Mode switch to CF (CONTINUOUS FLOW).
   B. Set High Heat plenum thermostat on the Dual Temp control assembly to the drying temperature recommended for normal operation (for example, 210 degrees F for shelled corn).
   C. Set the Moisture Control (MC) switch OFF.
   D. Temporarily set Load Timer at 30 min.
   E. Set Unload Auger switch OFF.
   F. Set Load switch OFF.
   G. Set Fan switch OFF; set Burner switch OFF.
   H. Turn all circuit breakers ON.

Load Dryer

2. Depress dryer START button; Start button should illuminate.
3. Turn Load Auger switch to ON position; fill the dryer. After dryer is full, set switch to AUTO.

Start-up Cycle

4. Set FAN switch and BURNER switch ON. Check and readjust gas pressure as required. Then operate dryer for approximately 1/2 the total Dry Time listed in the Continuous Flow Drying Charts.

Normal Continuous Operation

5. At the end of the start-up cycle, turn Unload Auger switch to AUTO and set % Unload Rate as indicated by the appropriate Continuous Flow Drying Chart.

NOTE: The time required for grain to pass completely through dryer is the time necessary to notice a stabilized change in final moisture content after adjustment. During start-up, some variation will naturally occur. The first half of grain discharged from the dryer will be slightly underdried, while the next half discharged will be slightly overdried.

6. Check the discharge moisture content and readjust the % Unload Rate slightly if required.
7. Set the Digi-trol's grain temperature Setpoint and Top Auger Timer as described in Section 3 of this manual.
BATCH DRYING OPERATING INSTRUCTIONS

Refer to the appropriate AUTOMATIC BATCH OPERATION CHART and find the suggested Dry Timer setting, depending upon the type of grain, initial moisture content and drying method (DRY AND COOL, or FULL HEAT).

NOTE: To change from DRY AND COOL to FULL HEAT method of drying, set the COOL TIMER to "O" and set the BURNER SWITCH to "ON."

TIMER SUMMARY

Following is a summary of the three batch timers and the unload timer. (For more information, see TIMER heading in Section 3, Controls.)

The DRY TIMER sets the total drying time, which is divided into a Hi-Heat portion (as set by the HI-HEAT TIMER), and the remainder, which is the Lo-Heat portion. Hi-Heat and Lo-Heat temperatures are set by the Hi-Lo Fire plenum thermostats. As a general rule, the Hi-Heat timer should be set to approximately 2/3 the Dry Timer setting.

At the end of the Dry Timer cycle, the Digi-trol Moisture Controller will monitor grain temperature. If the temperature is sufficiently high, the burner will stop operating and the cooling cycle will start. If the dryer is filled with unusually high moisture grain, drying time will be extended.

At the completion of the drying time, the cooling cycle will run for the time set by the COOL TIMER, which is adjustable for either full or partial cooling. After the cooling cycle, the unload cycle will start.

The UNLOAD TIMER should be set to the time it takes to unload one full content of the dryer. During the unload cycle, wet grain is being added, thus eliminating the downtime to load, as is required in typical batch dryers. Also, the fan continues to run, permitting cooling to continue during unloading. For Batch drying, the meter rolls should be adjusted to provide maximum (100%) discharge rate. If the take-away equipment cannot handle the 100% discharge rate, then the Unload timer setting will need to be increased accordingly. A handy formula for calculating the adjusted Unload time is as follows:

Unload Timer Adjustment Formula

\[
\frac{\text{Unload Time (minutes)} \times 100}{\% \text{ Unload Rate (no decimal used)}} = \text{Adjusted Unload Timer Setting in Minutes}
\]

At the completion of the unloading cycle, the Unload Timer will automatically reset all three batch timers to their initial settings and a new drying cycle will begin.

MOISTURE CHECK

Check the final grain moisture during unloading. The discharged grain should be near the desired moisture level right up to the completion of the unload cycle. To make a quick check at the end of the cycle, immediately change the Unload Auger switch setting to "AUTO" and change the Mode selector setting to "CF" to briefly continue dryer unloading. The desired Unload timer setting will allow a few additional bushels of dry grain to be discharged (15 to 30 seconds of unloading) before wet grain is observed. Make the necessary Unload timer adjustments and return the Mode selector and Unload Auger switch to their previous positions.

See AUTOMATIC BATCH START-UP PROCEDURE ahead for start-up instructions.
AUTOMATIC BATCH START-UP PROCEDURE

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

Set Controls

1. Set Controls as follows:
   A. Set Mode switch to AB (AUTOMATIC BATCH).
   B. Set Hi-Heat and Lo-Heat plenum thermostats.
   C. Set the Moisture Control (MC) switch OFF.
   D. Temporarily set Load Timer at 30 min.
   E. Set Unload Auger switch OFF.
   F. Set Load switch OFF.
   G. Set Fan switch OFF; set Burner switch OFF.
   H. Turn all circuit breakers ON.

Load Dryer

2. Depress dryer START button; Start button should illuminate.
3. Turn Load Auger switch to ON position; fill the dryer. After dryer is full, set switch to AUTO.

Set Timers

4. Measure wet grain moisture.
5. Set timers using drying charts:
   A. Set Dry timer to minutes shown in the appropriate chart.
   B. Set the Hi-Heat timer to 2/3 of Dry timer.
   C. Set Cool timer per drying time chart for dry/cool. Set to 0 min. For full heat.
   D. Set Unload timer based on chart for 100% discharge. Use the Unload Time Adjustment formula in this section to calculate other discharge rates.

Start Batch

6. Set switches as follows:
   A. Burner switch to AUTO for dry/cool or ON for full heat operation.
   B. Set Unload switch to AUTO, and set % Unload Rate.
   C. Reset counter as desired.
   D. Set Fan switch to ON (batch will begin).
7. Adjust Hi-Lo firing valves to the pressure ranges listed in Table 2-1.

Unload First Batch

8. Observe Moisture Controller temperature near end of drying time by temporarily turning Moisture Controller switch ON.

9. As grain unloads, observe top auger refill time and adjust top auger timer as described in Section 3.
10. As grain unloads, check moisture and record average final moisture. Observe moisture toward end of Unload cycle as described under the MOISTURE CHECK heading on the preceding page.

Moisture Control and Adjustments

11. Make adjustments to heating and unload times as required.
12. Set the Digi-Trol's grain temperature Setpoint as described in Section 3.
DRYING TABLES — CF/AB-400

CORN...Dry & Cool (automatic batch)

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<th>MOISTURE</th>
<th>DRY TIME</th>
<th>COOL</th>
<th>Capacity</th>
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Drying table based on 100% meter roll speed of... 1225 bph
Unload timer set for 20.3 minutes

CORN...Full Heat (automatic batch)

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<th>DRY TIME</th>
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Drying table based on 100% meter roll speed of... 1225 bph
Unload timer set for 20.3 minutes

*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%

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.

### DRYING TABLES — CF/AB-400

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*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

Drying table based on 100% meter roll speed of... 1225 bph

#### WHEAT, BARLEY, MILO...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of... 1225 bph

#### SOYBEANS...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of... 1225 bph

Unload timer set for 20.3 minutes

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.

### DRYING TABLES — CF/AB-400 with Max Drive Option

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#### CORN...Full Heat (automatic batch)

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*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

Drying table based on 100% meter roll speed of......

Unload timer set for 12.9 minutes

Drying table based on 100% meter roll speed of......

1928 bph

Unload timer set for 12.9 minutes

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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*Target moisture out of the dryer. Expected final moisture in the bin 15.0% Drying table based on 100% meter roll speed of...... 1928 bph

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Drying table based on 100% meter roll speed of...... 1928 bph
Unload timer set for 12.9 minutes

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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*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

Drying table based on 100% meter roll speed of…… 1361 bph

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Drying table based on 100% meter roll speed of…… 1361 bph

Unload timer set for 20.3 minutes

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 — CF/AB-460
with Max Drive Option

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.

### CORN...Dry & Cool (automatic batch)

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Drying time based on 100% meter roll speed of…... 2142 bph
unload timer set for 12.9 minutes

### CORN...Full Heat (automatic batch)

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Drying time based on 100% meter roll speed of…... 2142 bph
unload timer set for 12.9 minutes

*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

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 — CF/AB-460 with Max Drive Option**

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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*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

Drying table based on 100% meter roll speed of... **2142 bph**

### WHEAT, BARLEY, MILO...Dry & Cool (automatic batch)

<table>
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<tr>
<th>MOISTURE</th>
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<th>DRY TIME COOL Capacity</th>
<th>DRY TIME COOL Capacity</th>
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Drying table based on 100% meter roll speed of... **2142 bph**

### SOYBEANS...Dry & Cool (automatic batch)

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<th>DRY TIME COOL Capacity</th>
<th>DRY TIME COOL Capacity</th>
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Drying table based on 100% meter roll speed of... **2142 bph**

Unload timer set for **12.9 minutes**

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.

### DRYING TABLES — CF/AB-510

**CORN...Dry & Cool (automatic batch)**

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<th>230 °F</th>
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<td>hrs</td>
<td>% out</td>
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Drying table based on 100% meter roll speed of...... unload timer set for **20.3 minutes**

### DRYING TABLES — CF/AB-510

**CORN...Full Heat (automatic batch)**

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*Target moisture out of the dryer. Expected final moisture in the bin is **15.0%**

Drying table based on 100% meter roll speed of...... unload timer set for **20.3 minutes**

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 — CF/AB-510**

**CORN...Full Heat**  
*Continuous flow*

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*Target moisture out of the dryer. Expected final moisture in the bin is 15.0%.

Drying table based on 100% meter roll speed of...1497 bph

**WHEAT, BARLEY, MILO...Dry & Cool**  
*automatic batch*

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**SOYBEANS...Dry & Cool**  
*automatic batch*

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<th>Dry &amp; Cool Time Capacity Bph</th>
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</table>

Drying table based on 100% meter roll speed of...1497 bph

Unload timer set for 20.3 minutes

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.
Drying tables — CF/AB-510 with Max Drive Option

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.

**CORN...Full Heat (Continuous flow)**

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*Target moisture out of the dryer. Expected final moisture in the bin 15.0% Drying table based on 100% meter roll speed of...... 2356 bph

**WHEAT, BARLEY, MILO...Dry & Cool (automatic batch)**

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Wheat, Barley, Milo...Dry & Cool (automatic batch)

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SOYBEANS...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of...... 2356 bph

Unload timer set for 12.9 minutes

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.

### DRYING TABLES — CF/AB-600

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*Target moisture out of the dryer. Expected final moisture in the bin

Drying table based on 100% meter roll speed of......

Unload timer set for **20.3 minutes**

1769 bph
DRYING TABLES — CF/AB-600

CORN...Full Heat (Continuous flow)

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*Target moisture out of the dryer. Expected final moisture in the bin 15.0%
Drying table based on 100% meter roll speed of...... 1769 bph

WHEAT, BARLEY, MILO...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of...... 1769 bph

SOYBEANS...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of...... 1769 bph

Unload timer set for 20.3 minutes

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 — CF/AB-600

with Max Drive Option

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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#### CORN...Dry & Cool

(automatic batch)

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Drying table based on 100% meter roll speed of......
unload timer set for 12.9 minutes

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#### CORN...Full Heat

(automatic batch)

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Drying table based on 100% meter roll speed of......
Unload timer set for 15.0%

---

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.

### DRYING TABLES — CF/AB-600 with Max Drive Option

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*Target moisture out of the dryer. Expected final moisture in the bin 15.0%*

Drying table based on 100% meter roll speed of...... 2785 bph

#### WHEAT, BARLEY, MILO...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of...... 2785 bph

#### SOYBEANS...Dry & Cool (automatic batch)

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Drying table based on 100% meter roll speed of...... 2785 bph

Unload timer set for 12.9 minutes

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  CF/AB-510 natural gas model
Fig. 6-2  CF/AB-400 natural gas model
Fig. 6-3  CF/AB-400 LP model

Fig. 6-4  PL-021 burner control board
Fig. 6-5  ASC control panel, exterior view

Fig. 6-6  ASC control panel, interior view
Retension drive belt after first few hours of operation. Check periodically thereafter.

Motor Mount Adjustment Bolt: Retighten securely after adjusting chain.

Motor Mounting Bolts: Retighten securely after adjusting belt.

Fig. 6-7  SCR gearbox, motor, and belt drive

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

Meter roll crossover chain - Adjust to provide 1/4 inch total deflection.

Chain tightener (plate is slotted to allow adjustment)

Fig. 6-8  Meter roll drive and crossover lubrication and adjustment details
Retension top and bottom auger drive belts after several hours of operation during initial start-up. Check periodically thereafter.

To avoid misaligning speed-jack bearings, loosen drive belts before adjusting chain tension.

Drive chain - Adjust to provide 1/2 inch total deflection.

Speed-jack assembly retaining bolts - Retighten securely after adjusting chain tension.

Belt tension adjusting bolt

Front motor mount bolts - Retighten securely after adjusting belts

Fig. 6-9  Bottom auger drive

Top Auger Drive Belts - Retension after several hours of initial operation. Check periodically thereafter.

Fig. 6-10  Top auger drive
Fig. 6-11  Plenum chamber, CF/AB-510 model
Seasonal Inspection and Service

At the end of a drying season, between dryer runs, or when changing from one crop to another it is **IMPORTANT** to dump any excess grain off of the meter roll pan after the dryer has been emptied for the following reasons:

1. Grain not dumped off of the meter roll pan will contaminate the next crop that is dried.
2. Grain left over could also draw moisture and stick to the pan. This condition could cause a boundary layer to form in the column and prevent grain from sliding smoothly into the meter roll.
3. A boundary layer could also be formed if the dryer is allowed to set partially full. For example, if the left over grain were to get rained or snowed on.

**TO DUMP THE METER ROLL PAN:**

1. Pull the hitch pin that locks the pan in the operating position as shown in the diagram.
2. Shove up on the actuator arm as shown. (The pan may resist movement at first and the operator may need to pound up on the arm at first to break the pan loose.)
3. Once the pan has started to move continue to shove up on the arm until you feel the pan make contact with the meter roll. This will ensure that all excess grain has been dumped off the pan.
4. Return the pan to its operating position and be sure to put the hitch pin back in. If the hitch pin is left out the pan may not stay completely down in the operating position during filling of the dryer causing flow problems in the column and into the meter roll.

**SERVICE TIP:**

It is a good idea to leave the meter roll pan in the up or dump position during the off-season to allow any foreign material that may get into the column to fall through into the auger trough, thus not obstructing the meter roll opening upon start up.

**ATTENTION!**

**REMEMBER TO PULL THE PAN DOWN INTO THE OPERATING POSITION AND PUT THE HITCH PIN BACK IN BEFORE LOADING.**

**HINGED FAST-TRIP CLEANOUT**

The dryer is factory equipped with a “fast-trip” cleanout mechanism beneath the unload auger, as shown in Fig. 7-2. The individual fast-trip doors allow easy cleanout of accumulated materials.

**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. 7-2  Fast-trip cleanout assembly

**Fig. 7-1  Meter roll pan cleanout**
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 ASC and PSC control boxes 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 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 lists are 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. Starfire Burner models (CF/AB-510 only): Inspect the primary air screen (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. Octagonal Burner models: 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. 7-3.

7. Inspect flame switch for possible damage or poor connections. The flame switch and ignitor plug wires must be in good condition.

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

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 the top auger and bottom auger drive belts and chains for proper adjustment and condition. Readjust tension as required. See Figs. 6-8, 6-9 and 6-10. Also check all meter roll drive chains.

NOTE: All of the auger and meter roll end bearings are lifetime lubricated and do not require service relubrication. Remove gearbox drive cover and check drive belt for proper adjustment and condition. Also check oil level in bottom auger gearbox.

Speedjack sleeve bearing fittings — all models:

11. Lubricate the drive mechanism parts as follows: Relubricate the bottom auger speedjack bearings every 100 hours of operation using a dependable brand of multi-purpose lithium base bearing grease. See Fig. 6-9.

12. Operate dryer clean-out mechanism and check it for proper operation. See Figs. 7-1 and 7-2. With clean-out open, inspect for and remove any trash accumulation.

NOTE: Do not allow high moisture material to collect within the trough area as it may adversely affect the metal parts.

13. Inspect entire dryer for loose, worn, or damaged parts. Include check of auger flights, meter rolls, and other internal parts. Check that temperature sensors within air plenum chamber are secured within insulated clamps and do not chafe on other metal parts.

14. Inspect that all dryer guards and warning decals are 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 procedure.
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 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 inspection from the exhaust end of the fan-heater unit, and by removing the vaporizer mounting plate and partially withdrawing the vaporizer.

   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 burner vane and vaporizer pipe, adjust the position of the burner and/or vaporizer, or bend the edge of the burner vane if necessary (CF/AB-510 Starfire burner models only), to provide clearance. If there has been significant abrasion of the steel vaporizer pipe, it must be replaced. See Figs. 7-4 and 7-5 for vaporizer and related components.

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 vaporizer leakage.

**VAPORIZER ADJUSTMENT**

**LIQUID PROPANE MODELS ONLY** — After initial installation and occasionally during the drying operation, check the temperature of the gas line between the regulator and the fan-heater control box. Allow heater to operate and stabilize temperatures before making this check. See Figs. 6-1 to 6-3 for many of the major fuel line components.

NOTE: If the gas temperature exceeds 220 degrees F the high vapor temperature thermostat will open the electrical circuit to the liquid solenoid valve and shut off fuel flow to heater, thereby causing automatic shut-down of the dryer.

**Stainless Steel Octagonal Burners** (all models except CF/AB-510): 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. See Fig. 7-4.

**Starfire Burner Models, Slotted Plate Vaporizer Adjusters (CF/AB-510):** If the gas line is very cold or “frosted,” loosen the adjustment plate bolts and move the vaporizer slightly closer to the flame. If gas line is too hot to touch, move vaporizer slightly away from the flame. See Fig. 7-5.

**Starfire Burner Models, Swivel Vaporizer Adjusters (CF/AB-510):** Vaporizer adjustment is accomplished by first loosening the swivel elbow adaptor on the LP plumbing assembly and the bolts on the hinged vaporizer plate. The vaporizer can now be rotated closer to or farther away from the burner by loosening and tightening the two 5/16” bolts on the hinged plate. After the vaporizer has been repositioned, check for leaks and adjust as necessary.
tioned, tighten the swivel elbow adaptor, making certain the LP plumbing assembly runs parallel to the fan housing. See Fig. 7-5.

Additional Adjustment for Starfire Burners: Also, the vaporizer's small wedge-shaped heat baffles can be removed from burner vanes to 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.

High Vaporizer Temperatures (all burners): 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 operating principle of the PL-021 burner control is as follows. See page 6 of the Control Circuit schematic in Section 8 for circuit diagram.

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

   With the fan operating and the burner switch closed, power is transmitted from indicated motor lead wires through the two fuses, burner switch and flame switch to supply power to P/L Terminals No. 2 and No. T, thereby energizing the heater elements within the purge/lock-out relay.

2. After the purge relay has been energized for approximately 15-30 seconds, the purge relay contacts CLOSE the circuit between P/L Terminals No. 5 and No. 1 and energizes the control relay coil. As the relay coil becomes energized it supplies voltage to the ignition transformer and gas solenoid valves by CLOSING the relay contact points located between P/L Terminals No. 3 and No. T, thereby starting ignition and gas flow.

3. Shortly after the heater starts operating, the flame switch responds to burner heat and OPENS its contact points, thereby de-energizing the purge relay and lock-out relay heater element circuit. After the circuit becomes de-energized and the purge relay contacts reopen, a second set of closed contact points within the relay acts to keep the relay coil energized to maintain heater operation.

4. The heater will operate on Hi-Fire (with Hi-Fire gas solenoid valve energized) until Hi-Lo thermostat control opens its contacts and interrupts the circuit to de-energize the Hi-Fire gas solenoid valve.

When the thermostat control senses that additional heat is required and closes its contact points, the Hi-Fire gas solenoid valve will immediately open and repeat the ON-OFF cycle to maintain the desired heat.

5. If the heater fails to start operating, due to lack of fuel or possible malfunction, after the ignition transformer and gas solenoid valves are energized:
A. The flame switch remaining in its COLD (closed contacts) position will continue to energize the lock-out relay heater circuit.
B. After the lock-out heater has been energized for approximately 60-120 seconds, the lock-out relay contacts will OPEN and interrupt the circuit, thereby providing automatic shut-down of the entire dryer.
C. Once the dryer shuts down, the lock-out relay will cool down within several minutes and automatically reset itself.

**FAN PROPELLER REMOVAL and INSTALLATION**

The fan propeller is secured to the motor shaft by use of a taper-lock bushing, motor shaft key and three cap screws. Figure 7-7 shows a typical cutaway sketch of the propeller and bushing installation. (*NOTE: H-type bushings have only two threaded holes instead of three.)

**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. 7-8. 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 cap screws must be installed through the UNTAPPED CLEARANCE HOLES, as shown in Fig. 7-9, 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 drying fan servicing is to be performed which requires removal and installation of the propeller, make sure the 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 if so equipped.
2. Remove the three cap screws from the clearance holes in taper-lock bushing. Inspect for thread damage and set aside for later reinstallation (do not use for step 3, bushing removal). (*NOTE: H-type bushings have only two threaded holes instead of three.)
3. Install three Grade 5 (or better) cap screws 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 degree spokes on the head and are more durable than low strength unmarked bolts.

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 H-type (two-hole) bushings, which provide 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. 7-8, 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 alignment of bushing to propeller. 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.

Fig. 7-7  Cutaway of typical propeller installation

Fig. 7-8  Capscrew arrangement for disassembly

**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 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. Slide propeller over motor shaft and locate it against the motor.

3. 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.

4. 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. Make certain that proper capscrews are used for reassembly and no damage has occurred to these screws during disassembly! Use only the special type bolts supplied with the original propeller.

**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.

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

6. Use an INCH-POUNDS torque wrench and gradually tighten the three cap screws (1/4 turn at a time) until the taper bushing becomes fully seated. Refer to the following chart for recommended cap screw tightening torques. Do not excessively overtighten the bushing.
BROWNING TAPER-LOCK BUSHING BOLT TIGHTENING TORQUES

<table>
<thead>
<tr>
<th>Bushing Size</th>
<th>Bolt Dia.</th>
<th>Torques (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>

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. 7-10.

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

FAN MOTOR REMOVAL and INSTALLATION

In the event of 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 owners 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.
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, if required, and FULLY TIGHTEN ALL FOUR MOTOR MOUNTING BOLTS.

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 the 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 overtighten 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 (CF/AB-510 Models):

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.

Fig. 7-10 Ensuring the necessary hub to flange clearance
C. Disconnect electrical connections to gas solenoid valve(s) located within control box.

D. Lift pipe tee (with orifice, solenoid valve, and other parts attached) straight up and remove from control box. Orifice and other parts can now be removed from pipe tee, if desired.

Octagonal Burner Models:
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. 7-11.

5. REASSEMBLY — To reassemble parts, reverse the disassembly procedure, noting the following special points.
A. Make sure all parts are thoroughly cleaned and open.
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 attempt to connect gas solenoid valve by applying force to the valve core stem as it may ruin the unit.
D. Make sure all electrical wires are properly connected. Refer to wiring diagrams for connection details.

TEMPERATURE SENSOR LOCATIONS
The sensor location diagram, Fig. 7-12, is provided as a reference for any related servicing needs that might arise.

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 speed of the DC motor is variable and is controlled by an electronic SCR type (silicon controlled rectifier) control located within the ASC control box. See Table 3-1 for SCR system information.

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 speed control knob on the ASC control panel, regulates the output from the SCR control board, to control the speed of the DC motor which drives the meter rolls.
2. DC ELECTRIC MOTOR — The 1/3 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 gear box 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 100:1 gearbox provides the required speed reduction and transmits power to the meter rolls through a drive chain arrangement. The drive chain should be periodically lubricated and the drive belt and drive chain should be checked and retensioned as required.

METER ROLL BLOCKAGE
Since the geometry of the new meter roll system is quite large, a blockage will be unusual.

In the event a foreign object does become 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**

Check to see if meter roll drive is rotating (drive roll cw, driven roll ccw). If the drive is rotating correctly, then no blockage exists. 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 with a couple of the meter roll access doors left open 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. 6-8). 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**

**CAUTION:** Make certain power is OFF and locked out.

Enter the plenum and remove the meter roll access doors. These doors are secured with two 1/2” Head Whiz Lock Bolts. Lift up the regulator plate over the indicated meter roll. The regulator plate can be removed by pulling the two hitch pins at the pivot points which allows easy access and inspection. (It is critical that the hitch pins are re-installed once the regulator plate is placed back in position.) Visually check for any foreign objects that may be jammed between the grain diverter and the meter roll. Also check for any objects that may be submerged under the grain which may be jammed in the lower section of the meter roll. Check each column until jam is located, clear jam and confirm that all regulator plates and access doors have been correctly re-installed prior to restarting the dryer.

**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. 7-14.

**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 180 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 18 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. 7-13 Cutaway of meter roll access area](mrsection.tif)

![Fig. 7-14 Woods SCR motor control board and settings](cfabscrcontrol.tif)
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Fig. 8-1  Power circuit — 220V 3-phase, CF/AB-400 & -460 models . . . . . .58
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NOTE:
The wiring diagrams within this section have been updated for the 1999 and later production models. When servicing dryers made prior to 1999, it is best to follow the circuits provided in the literature that shipped with the dryer.
Fig. 8-1  Power circuit — 220V 3-phase, CF/AB-400 & -460 models.
Fig. 8-2  Power circuit — 440V 3-phase, CF/AB-400 & -460 models.
Fig. 8-3  Power circuit — 220V 1-phase, CF/AB-510 models, page 1 of 2.
Fig. 8-3   Power circuit — 220V 1-phase, CF/AB-510 models, page 2 of 2.
Fig. 8-4   Power circuit — 220V 3-phase, CF/AB-510 & -600 models, page 1 of 2.
Fig. 8-5  Power circuit — 440V 3-phase, CF/AB-510 & -600 models, page 1 of 2.
Fig. 8-6  Control circuit — Page 1 of 7, all models.
Fig. 8-6  Control circuit — Page 2 of 7, all models.
NOTES:

1. NO FIELD CONNECTIONS (#63 & #64) ARE USED IN NEW METER ROLL SYSTEM
2. USED ONLY ON CF/AB-510; ALL OTHER MODELS HAVE A JUMPER ACROSS THESE TERMINATIONS

Fig. 8-6  Control circuit — Page 3 of 7 (Digi-Trol & SCR Control), all models.
Fig. 8-6  Control circuit — Page 4 of 7 (Safety Circuit Monitor), all models.
Fig. 8-6  Control circuit — Page 5 of 7 (CF/AB-400 & -460 Burner Control).
Fig. 8-6   Control circuit — Page 6 of 7 (CF/AB-510 & -600 Lower Burner Control).
CF/AB-510 & 600 MODELS

NOTE:
1. TIME DELAY RELAY DEVICE HAS A
   SPECIAL HEATER CONSTRUCTION. WHEN
   ENERGIZED, IT CAUSES N.O. CONTACTS TO "CLOSE"
   IN APPRX. 15 SEC., AND N.C. CONTACTS TO "OPEN" WITHIN
   APPRX. 60 SEC.

Fig. 8-6  Control circuit — Page 7 of 7 (CF/AB-510 & -600 Upper Burner Control).
Fig. 8-7  Top auger mercury switch and control 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.

CONTROL CIRCUIT NOT ENERGIZED - PANEL LIGHT AND SHUTDOWN INDICATOR LIGHT OFF.

1. POWER SUPPLY - Check that MAIN POWER SUPPLY and CIRCUIT BREAKERS are turned ON. Also check for a tripped circuit breaker. All circuit breakers must be ON before the control circuit light will come ON.

2. FUSES - Check for blown safety circuit fuse or control transformer fuses (460v models). 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.

6. RS RELAY (1-phase models only) - Check for defective RS Relay, relay base, or faulty wiring.

SHUTDOWN INDICATORS - Within ASC Control Box

BURNER HEATER SAFETY LIGHT May be any of the following safety devices.

BURNER HIGH LIMIT
Auto-resets after cooling. Indicates burner high limit switch has reached 200 deg. F for the following possible reasons:

a. Inadequate air flow:
   - Inlet air blocked
   - Fan motor failed
b. Backdraft currents during shut-down 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.

FAN THERMAL OVERLOAD (1-phase motors only)
Auto-resets after cooling. Indicates excessive temperature within the motor windings.

a. Voltage supply problem
b. Defective motor

GRAIN HI-LIMIT LIGHT
Auto-resets after cooling. Indicates that the RH and/or LH grain column high limit switch has reached 210 deg. 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 high limit thermostat.

BURNER LOCKOUT
Auto-resets after cooling. Indicates flame was not sensed for 60 seconds for the following possible reasons:

a. Burner failed to ignite:
... continued

Control Circuit Not
Energized - Panel Light
OFF with Shutdown
Indicator Light ON

- main shutoff 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 deg. 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 deg. F and has closed the liquid solenoid

LOAD TIMER 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

PLENUM HI-LIMIT LIGHT
Auto-resets after cooling. Indicates Plenum high limit thermostat has reached 300 deg. 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 thermostat has failed.
  d. Plenum high limit switch failed.

**UNMONITORED Safety Shut-down devices are as follows:**

Various circuit breakers (as shown in wiring schematics or Power Panel illustration)
Overload relays (manual reset required):
- Auxiliary load overload relay
- Load auger overload relay
- Auxiliary unload overload relay
- Unload auger overload relay
- Fan 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
- RS relay

DISCHARGE SHUT-OFF SWITCH
May require cleaning of grain from under the grain discharge door for switch to reset. Indicates that the 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 switch has failed.

**Top Auger Will Not Start**

1. Check that top auger circuit breaker is turned ON, also that control circuit is energized.
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. 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. Check that SCR relay (3CR) and contactor are energized.  
3. Isolate problem by performing the following checks:  
   a. Rotate DRY and COOL timers to “0” and set UNLOAD TIMER to approximately 1 min.  
   b. Temporarily set MOISTURE CONTROL SWITCH to OFF.  
   c. Set DRYING MODE SELECTOR switch to BATCH mode, then turn ON fan switch. The auger should now operate, after a one to two minute delay.  
   d. Set Selector switch to CONTINUOUS FLOW MODE. The auger should operate. If auger will operate in CF mode, but NOT in Batch mode, check for an improperly adjusted or defective unload timer.  
4. Verify closing of bottom auger contactor by checking for power on the unload motor power terminals.  
5. 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 120VAC is present at the SCR relay 3CR. Also that 240VAC is present across the load side of the special 6-amp rectifier fuses. Replace fuses if blown and determine cause (short circuit or severe voltage spikes, etc.).  
3. If bottom auger is also not operating, see step 3 under previous bottom auger heading and reattempt operation with the MC and MODE switches reset. SCR and bottom auger control circuits are both controlled by the MC, MODE and UNLOAD selector switches.  
4. Check that SCR relay (3CR) or the unload contactor is energized and that it has closed its contacts which complete the switch circuit of SCR board assembly (terminals 6 & 7 on Woods SCR board).  
Check for 240V present across AC line terminals L1 and L2 on SCR board assembly (with unload auger operating). If no voltage, check SCR fuses.  
Check terminals 1 and 3 for 10V DC.  
Check terminals 2 and 3 for 0-10V 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 the 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 10 V DC to 180V 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.  
6. Inspect wiring connections and check voltage applied to motor leads in motor junction box to determine if DC motor is bad. |
| Burner Will Not Fire with Fan Operating (Control Circuit Malfunction) | 1. Burner switch must be ON or in AUTO.  
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 P/L Terminal Nos. 1 and 5. If there is no voltage, check for improper wiring connections. See BURNER CONTROL CIRCUIT wiring diagram for circuit details.  
4. Check for proper voltage across No. 1 and No. T terminals. 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 valve cannot be opened until after the dryer control circuit has been energized. |
**TROUBLE CHECKOUT PROCEDURE & INFORMATION**

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**Burner Will Not Fire - No Gas Pressure with Fan Operating at Least 15 Seconds (Gas Supply or Fan-Heater Component)**

1. Check for proper voltage across P/L Terminal Nos. 2 and T. If there is no voltage, check for a defective flame switch or improper burner switch circuit wiring. If burner will operate in ON switch setting, but not in AUTO, check for a problem within the burner relay or its wiring connections.

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 thermostat. The control cord should be connected to the VIOLET (common) and BLACK (normally closed) thermostat wires, so the switch will open on temperature rise. If burner will cycle to Hi-Fire with control cord wires connected together, the thermostat is faulty.

3. If burner continues to operate on Hi-Fire, check the Hi-Fire gas solenoid valve for a stuck or blocked air plenum temperatures.

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**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 Terminal Nos. 2 and T and continue to observe the meter. When fan 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.

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**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.

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**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 thermostat. The control cord should be connected to the VIOLET (common) and BLACK (normally closed) thermostat wires, so the switch will open on temperature rise. If burner will cycle to Hi-Fire with control cord wires connected together, the thermostat is faulty.

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.

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**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 in manual.

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. 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.

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**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.
## DIGI-TROL TROUBLESHOOTING

<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>CHECKOUT PROCEDURE &amp; INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature or Moisture Controller Error Messages</strong></td>
<td></td>
</tr>
<tr>
<td>1. Controller displays three blinking bottom dashes.</td>
<td>SHORTED SENSOR CIRCUIT - Disconnect sensor leads from terminal strip. Using a VOM tester, test the sensor leads for approx. 100 ohm resistance (at 32 deg. 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. Test each sensor lead for continuity to ground. If continuity is confirmed, replace sensor.</td>
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<tr>
<td>2. Controller displays three blinking top dashes and the HB light is ON.</td>
<td>OPEN SENSOR - Disconnect sensor leads from terminal strip. Using a VOM tester, test the sensor leads for approx. 100 ohm resistance (at 32 deg. F). If the circuit tests OPEN, replace defective sensor or correct wiring problem as required.</td>
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<tr>
<td><strong>1. Grain moisture discharged too wet.</strong></td>
<td></td>
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<tr>
<td>• Increase moisture control temperature set point.</td>
<td></td>
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<tr>
<td>• If controller's OUT (low speed) indicator is ON during most of the 10-second cycle, switch to manual and establish a new lower unload rate.</td>
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<tr>
<td><strong>2. Grain moisture discharged too dry.</strong></td>
<td></td>
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<tr>
<td>• Decrease moisture control temperature set point.</td>
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<tr>
<td>• If discharge rate is running at or near 100%, it may be necessary to reduce plenum temperatures to allow moisture control more freedom to work.</td>
<td></td>
</tr>
<tr>
<td>• If controller's OUT (low speed) indicator is OFF during most of the 10-second cycle, switch to manual and establish a new higher unload rate.</td>
<td></td>
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<tr>
<td><strong>3. Grain moisture discharged inconsistent.</strong></td>
<td></td>
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<tr>
<td>• Check that plenum temperatures are being held consistent.</td>
<td></td>
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<tr>
<td>• Check for plugged grain columns (empty column to correct).</td>
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<tr>
<td>• If large variations in incoming moisture are occurring, the control can only minimize changes in discharge moisture. Some variation must be accepted.</td>
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<tr>
<td>• Check fill auger for proper operation and that an adequate grain supply is available to maintain grain seal.</td>
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<tr>
<td><strong>4. Moisture controller temperature is not stable.</strong></td>
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<tr>
<td>• Be sure to allow 2/3 grain pass before starting into Auto control. See operation sections. Starting Auto Control when grain temperature and Set Point temperature are not nearly equal will greatly increase the time required to stabilize on set point.</td>
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<tr>
<td>• Be patient, as grain drying is a slow process. 1-3 hours for a grain pass is not uncommon.</td>
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