$5.00

Mathews Company

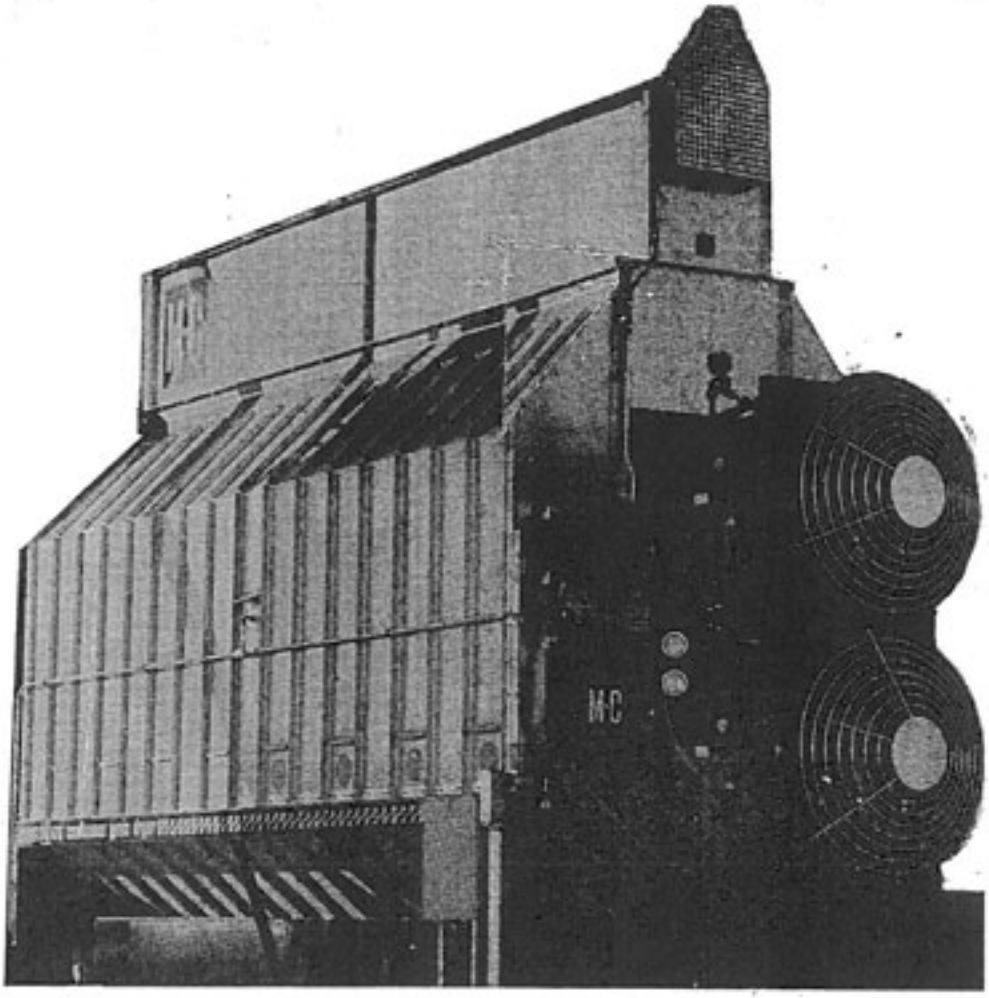
# 70 SERIES

## Models 370, 570, 670, 690 & 970

(EM and EMS)

## Continuous Flow Grain Dryers

(Starting w/Serial No. 57957)




# OPERATOR'S MANUAL

Form No. D372, February 2003

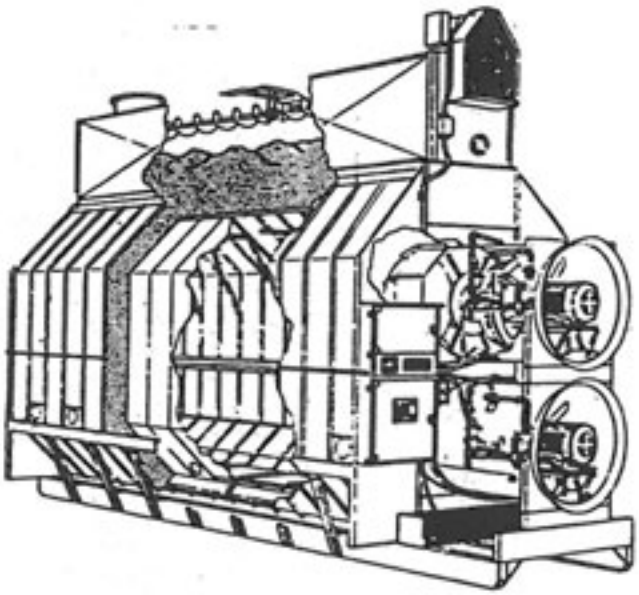
**Mathews Company /**
500 Industrial Avenue, P.O. Box 70,
Crystal Lake, Illinois 60039-0070 U.S.A.
Phone: 815/459-2210 ♦ Fax: 815/459-5889
www.mathewscompany.com

370

570

Model 570 Shown w/Optional Walkway

670



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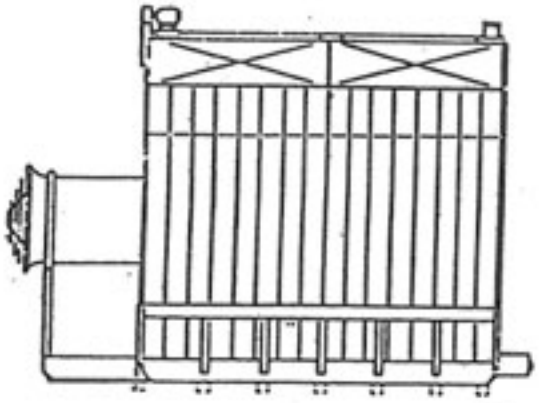

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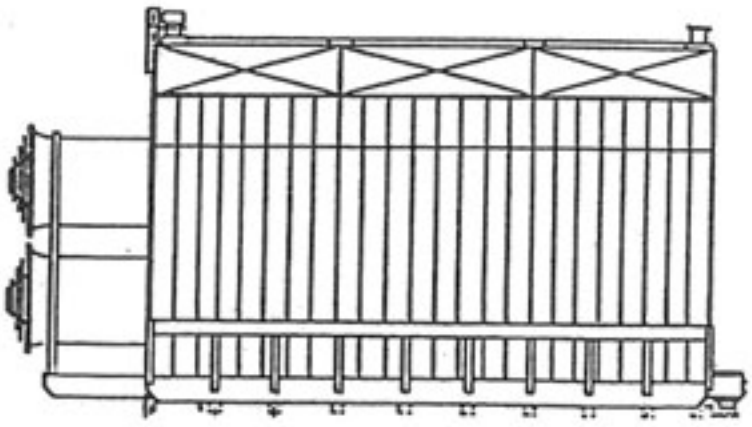

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Continued on next page

## NOTES

# INTRODUCTION

## To the Owner-Operator

This manual was prepared to provide owners and operators of M-C Model 370, 570, 690, 670 and 970 Grain Dryers (starting with serial number 57957) with Operating Instructions and Maintenance Information that will enable them to keep their M-C Grain Dryer operating at peak efficiency.

Before operating your Grain Dryer read the Start-Up and Operating Instructions. Check each item referred to and become familiar with the controls, adjustments and settings required to obtain efficient operation.

To keep the dryer operating at peak efficiency it is suggested that it be cleaned, lubricated, belt tension adjusted and the ignition system, level auger and unloading system be tested each year prior to the drying season. Refer to "Pre-Season Check" in the Maintenance section. The pre-season check can be made when the dryer is empty. Any necessary repairs or adjustments can be made so that the dryer will be ready to operate before the drying season.

## Safety Precautions

This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions.

A safe operator is the best insurance against accidents. The precautions listed below must be observed at all times.

- Do not allow children or bystanders to be near the Grain Dryer or grain handling machinery while it is operating.
- Do not operate the Grain Dryer without all safety shields in place and secure.

**NOTE: To provide clear illustrations some of the covers, guards and shields were removed.**

## Warranty Registration

It is important to send in your warranty registration card as soon as your new Grain Dryer is delivered. Not only does the card validate your Grain Dryer warranty, but it is also our way of knowing who has purchased M-C equipment so that we can keep in touch with you.

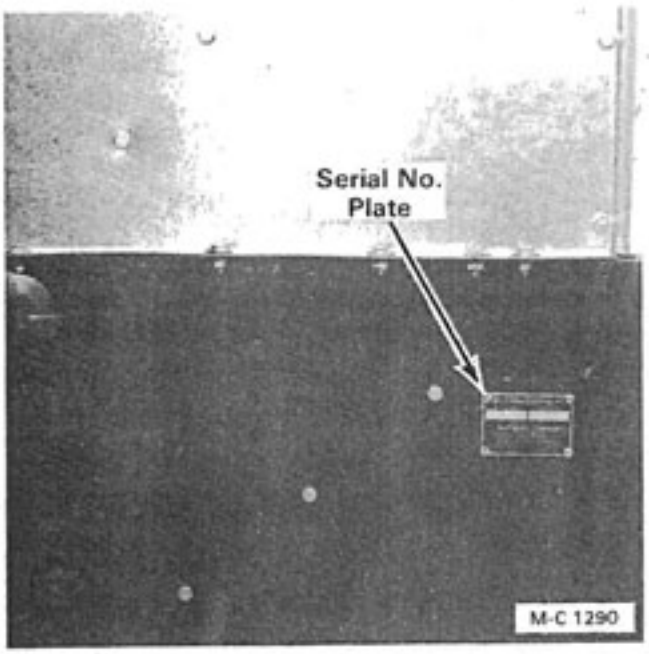



Figure A


Figure B

## Model and Serial Number Location

The model and serial number of your Grain Dryer are stamped on a plate located on the left front end panel of the base, see Figure A. For future reference, record the model and serial number in the blank spaces in Figure B.

## Capscrew Grade Identification

There are four grades of hex-head capscrews. Grade 1 and 2 are common capscrews, grade 5 and grade 8 are used when greater strength is required. Each grade can be identified by the marking on the head of the capscrew, see chart. When servicing the dryer and/or replacing capscrews, be sure to use the correct size and grade.

## Capscrew Grade Identification

There are four grades of hex-head capscrews. Grade 1 and 2 are common capscrews, grade 5 and grade 8 are used when greater strength is required. Each grade can be identified by the marking on the head of the capscrew, see chart.

When servicing the Dryer and/or replacing capscrews, be sure to use the correct size and grade.

### CAPSCREW GRADE IDENTIFICATION CHART

| S.A.E. Grade | Description | Capscrew Head Marking* |
|---|---|---|
| 1<br>2 | WILL HAVE A PLAIN HEAD - NO RADIAL LINES<br>Low or Medium Carbon Steel Not Heat Treated |  |
| 5 | WILL HAVE 3 RADIAL LINES<br>Quenched and Tempered Medium Carbon Steel |  |
| 8 | WILL HAVE 6 RADIAL LINES<br>Quenched and Tempered Special Carbon or Alloy Steel |  |

*The center marking identifies the capscrew manufacturer.

# Metric (SI) Measurements

## (English Units & Metric (SI) Equivalents)

### Area
1 square inch = 6.4516 square centimeters
1 square foot = 0.0929 square meters
1 square yard = 0.8361 square meters
1 acre = 4047 square meters
1 acre = 0.4047 hectare

### Force
1 pound (force) = 4.45 newtons

### Length
1 inch = 25.4 millimeters
1 inch = 2.54 centimeters
1 foot = 304.8 millimeters
1 foot = 30.5 centimeters
1 foot = 0.305 meters
1 yard = 0.9144 meters
1 mile = 1.6093 kilometers

### Mass
1 ounce = 28.35 grams
1 pound = 0.454 kilograms
1 ton = 907.1848 kilograms

### Power
1 horsepower = 0.7457 kilowatts

### Pressure
1 psi = 6.89 kilopascals
1 psi = 0.00689 megapascals
1 inch of mercury = 3.377 kilopascals

### Temperature
1 degree Fahrenheit (°F – 32) ÷ 1.8 = °Celsius

### Torque
1 inch pound = 0.113 newton meters
1 foot pound = 1.356 newton meters

### Velocity
1 mile per hour = 1.61 kilometers per hour

### Volume
1 bushel = 35.24 liters
1 bushel = 0.0352 cubic meters
1 pint = 0.4731 liters
1 quart = 0.9464 liters
1 gallon = 3.7854 liters
1 cubic inch = 16.387 cubic centimeters
1 cubic foot = 0.0283 cubic meters
1 cubic yard = 0.7646 cubic meters

NOTE: The Mathews Company reserves the right to incorporate any changes in design without obligation to make these changes on units previously sold.

# SET-UP INSTRUCTIONS

## General

Check to make sure that all the parts and hardware listed on the packing list have been received. Make claims for any shortages immediately.

The fan end of the dryer is the FRONT. LEFT and RIGHT is determined by standing at the rear of the dryer looking at the rear doors. LEFT and RIGHT of the control cabinet is determined by looking from the inside out through the control cabinet doors.

**IMPORTANT:** When setting up the dryer avoid dropping nuts, bolts or parts down the grain columns. If anything is accidentally dropped, it must be removed before filling the dryer with grain.

## Permanent Installation

The dryer must be installed on a level concrete foundation designed to carry the weight of the dryer when full of grain. The foundation must be engineered locally for ground and weather conditions to prevent settling and frost upheaval.

**Don't forget to place a support under the front of each fan housing mount channel.**

**IMPORTANT:** The dryer must be a minimum of 13" (33cm) above the ground to provide clearance to open the quick clean unload auger pans. If the dryer is set on concrete piers perpendicular to the dryer skids, they must be notched to provide the minimum 13" (33cm) clearance. Refer to the dryer base dimension drawing at the back of this manual.

A dryer dimension drawing and an electrical and gas piping entrance drawing are at the back of this manual.

A vibration damper (treated wood planks, flat belting, etc.) should be used between the skids and the top of the piers. Be sure to anchor the dryer base to the foundation.

Lift the dryer onto the piers with four slings – two on each side. Attach the slings to or around the skids just behind the fan housings and approximately one-third in from the rear of the dryer. Use spreader bars across the top to avoid damage when lifting.

**NOTE:** The top of each pier must be level. If they are not, shim between the top of the pier and the vibration damper.

## Dryer Weight – Approximate in pounds (kgs)

**NOTE:** Weights include hopper and level auger.

| MODEL | EMPTY | FILLED w/No. 2 Corn (Maize) |
|---|---|---|
| 370 | 5,000 (2,268) | 16,800 (7,620) |
| 570 | 6,250 (2,835) | 27,250 (12,360) |
| 690 | 6,150 (2,790) | 27,150 (12,315) |
| 670 | 6,600 (2,994) | 27,600 (12,519) |
| 970 | 9,200 (4,173) | 40,672 (18,449) |

## Portable or Temporary Installation

Place timbers or railroad ties under the skids (parallel). The dryer must be a minimum of 13" (33cm) above the ground to provide clearance to open the quick clean unload auger pans.

**Don't forget to place a support under the front of each fan housing mount channel.**

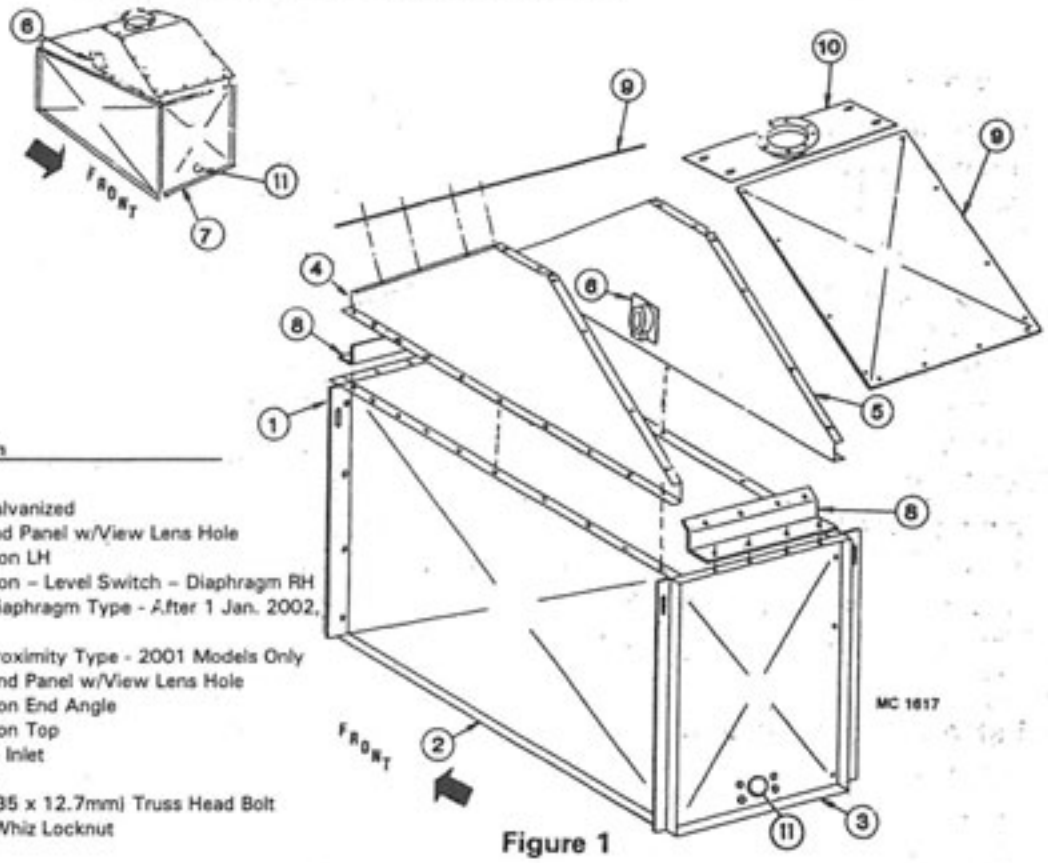
A dryer dimension drawing and an electrical and gas piping entrance drawing are at the back of this manual.

## Anchoring the Dryer

Immediately after installation, anchor the base of the dryer to the foundation. The dryer should also be guy wired in locations where the possibility of "blow-over" from wind exists.

All anchoring material and cable are to be supplied and installed by the customer.

## 370 HOPPER AND HOPPER EXTENSION




| Ref. | Part No. | Qty. | Description |
|---|---|---|---|
| 1 | 129 3412 | 4 | Lifting Bar |
| 2 | 129 2836 | 2 | Hopper Side Galvanized |
| 3 | 129 4953 | 1 | Rear Hopper End Panel w/View Lens Hole |
| 4 | 124 4777 | 1 | Hopper Extension LH |
| 5 | 129 2849 | 1 | Hopper Extension – Level Switch – Diaphragm RH |
| 6 | 128 6992 | 1 | Level Switch-Diaphragm Type - After 1 Jan. 2002, |
| | 125 6824 | 1 | Level Switch-Proximity Type - 2001 Models Only |
| 7 | 129 4953 | 1 | Front Hopper End Panel w/View Lens Hole |
| 8 | 124 4776 | 2 | Hopper Extension End Angle |
| 9 | 124 4775 | 2 | Hopper Extension Top |
| 10 | 128 0336 | 1 | Grain Receiving Inlet |
| 11 | 129 5702 | 2 | Port View Lens |
| | 000 8212 | 8 | ¼-20 x ½" (6.35 x 12.7mm) Truss Head Bolt |
| | 000 8167 | 8 | ¼" (6.35mm) Whiz Locknut |

Figure 1

## Assembly of 370EM Wet Grain Hopper and Level Switch (See Figure 1)

**NOTE:** The Hopper can be assembled on the dryer screen section or on the ground and then lifted onto the dryer screen section. If hopper is assembled on the dryer screen section, be sure to place a 28" (71cm) Stiffener Strap #1292947 across the center of the screen section top connecting both mount angles that are bolted to the top of the outer screens. See Figure 5.

**IMPORTANT:** The Model 370EM dryer does not have a level auger. Customer's filling equipment will function in place of level auger when wired into dryer Level Switch.

If Hopper is to be assembled on the ground, proceed as follows:

1. Bolt the Hopper Sides and End Panels together with ⅜-16 x ¾" (9.5 x 19mm) capscrews and flanged whiz locknuts (#0018210 and 0008168). Be sure to place (1) #1293412 Lifting Bar at each end of the Hopper Sides so that there will be (1) bar at each corner of the Hopper. See Figure 1.
2. Bolt the Hopper Extensions #1244777 LH and #1292849 RH to the Hopper Sides with ⅜-16 x¾" (9.5 x 19mm) washer head hex bolts and whiz locknuts. See Figure 1.
3. Bolt the Hopper Extension End Angles #1244776 to the top of the front and rear hopper end panels with the same bolts and nuts used in #2.
4. Bolt the (2) Hopper Extension Top Panels #1244775 to the sloping flanges of the hopper extensions with the same bolts and nuts used in #2.
5. Place #1280336 Grain Receiving Inlet with 10" (25.4cm) angle ring onto top of hopper extensions and secure with ⅜ x 16 x ¾" (9.5 x 19mm) capscrews and flanged whiz locknuts.

## Installation of 370EM Hopper (Assembled on Ground)

1. Place a 28" (71cm) Stiffener Strap #1292947 across the center of the screen section top connecting the mount angles that are bolted to the top of the outer screens. See Figure 5.

2. Attach cables to the (4) Lifting Bars bolted to the hopper sides. Use spreader bars between the cables and lift hopper assembly onto the top of the screen section. Check position of the Stiffener Strap so it lines up with holes in hopper sides and hopper mount angles. Hopper Assembly weighs about 180 lbs. (82 kgs).

3. Bolt Hopper Assembly to Hopper Mount Angles with ⅜-16 x ¾" (9.5 x 19mm) hex washer head bolts and flanged whiz nuts.

## Installation of Level Switch

Once the wet holding hopper is bolted to the dryer screen section, unwind the ⅜ (9.5mm) gray liquatite conduit that has the Level Switch Mount Plate #1292855 and the Level Switch Housing attached. There is a hole in the lower center of the right hopper extension #1292849 that has a 5/16" (7.9mm) rivnut at each corner. Use (4) 5/16-18 x ½" (7.9 x 12.7mm) washer head hex bolts to attach the mount plate to the outside of the hopper extension. The level switch housing will be inside the wet hopper and the ⅜" (9.5mm) liquatite for the (2) yellow level auger switch wires TB24-LSW-C and LSW-NC-LASW will be on the outside of the hopper. This will make for easy access to the level switch if necessary.

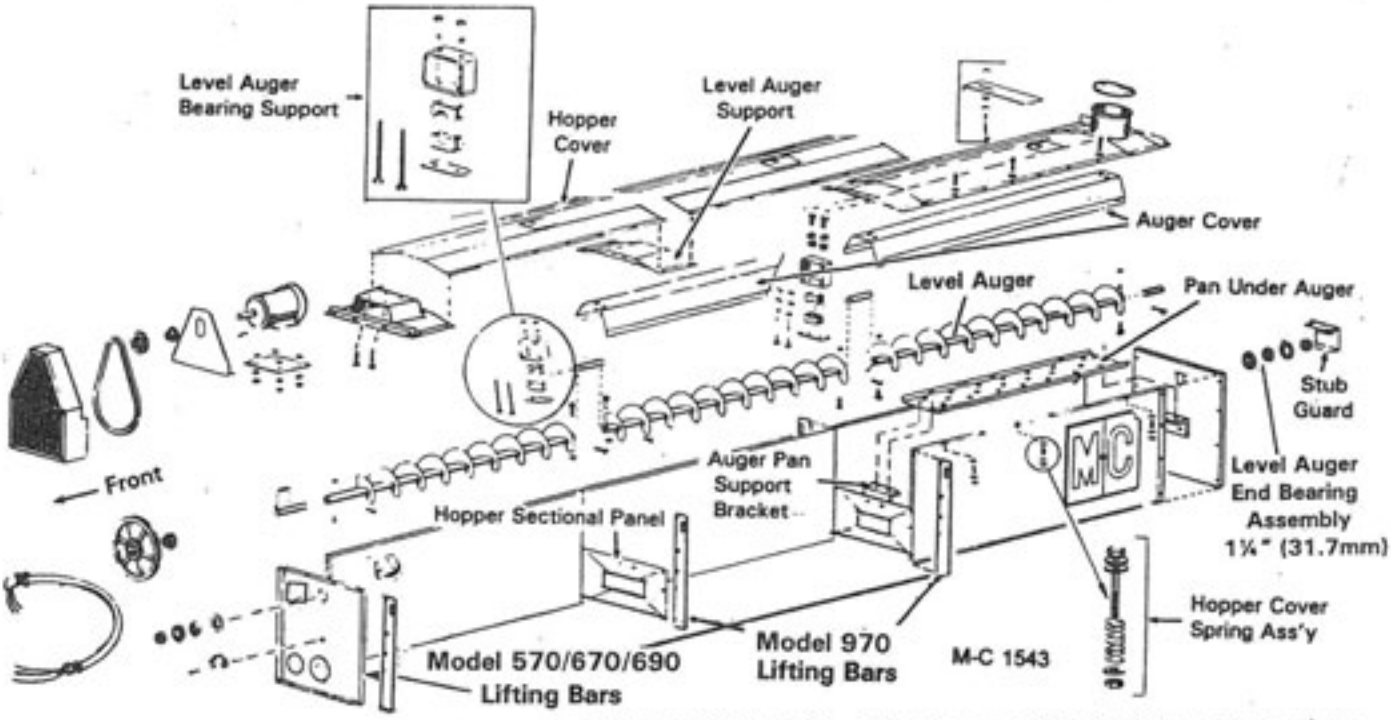



**Figure 1A – Hopper and Level Auger 570/670/690 & 970** **- Check pages 10 & 11 for part numbers.**

## Hopper and Level Auger (See Figure 1A)

**NOTE:** The hopper and level auger can be assembled on the peak or on a hard flat level surface and then placed onto the top of the peak.

1. Bolt the hopper sides and end panels together with ⅜-16 x ¾" (9.5 x19mm) hex capscrews and flanged locknuts. Place the hopper sectional panels between the hopper side panels. Be sure to bolt (1) auger pan support bracket to the rear hopper end panel and (1) to the sectional panel. These brackets will support the slotted pan under the rear level auger section. Use ⅜" x ¾" (9.5 x 19mm) capscrews where bracket is bolted to end and sectional panels and ⅜" x ¾" (9.5 x 19mm) round truss head screws where pan is bolted to support brackets (round head toward auger).

   At this time also install the (4) lift bars at the (4) corners on 570/690/670 dryers and at the front of the 2nd and 3rd hopper side panels on 970 dryers. Use ⅜-16 x 1" (9.5 x 25.4mm) capscrews and flanged whiz locknuts

2. Bolt level auger bearing assemblies to level auger bearing support brackets and then to the level auger support(s). See Figure 3.

**DO NOT** put pressure on the wood bearings by over tightening the ⅜-16 x ¾" (9.5 x 19mm) carriage bolts and flanged locknuts.

3. Install 1¼" (31.75mm) bearing w/lock collar and flangettes in each hopper end panel. Secure with ⅜-16 x ¾" (9.5 x 19mm) carriage bolts and flanged locknuts.

4. Install the level auger front shaft 10" (25.4cm) long with keyway and a center shaft 10¼" (26cm) long into the front auger (86" [218cm] flighting). Bolt the shafts to the auger with two ⅜-16 x 2" (9.5 x 51mm) capscrews (grade 5) and two-way locknuts.

5. Insert the auger front shaft through the bearing in the front end panel. Do not tighten the bearing lock collar.

6. Slide the level auger support assembly onto the center shaft and bolt the level auger support to the hopper sides with ⅜-16 x ¾" (9.5 x 19mm) capscrews and flanged locknuts.

7. **On 970 dryers,** install a center shaft 10¼" (26cm) long into the back of the center level auger (93½" [238cm] flighting) and secure with two ⅜-16 x 2" (9.5 x 51mm) capscrews (grade 5) and two-way locknuts. Slide the front of the center auger onto the center shaft in the front level auger. Slide the other level auger support assembly onto the center shaft and bolt the level auger support to the hopper sides. Align the flighting and bolt the center auger to the center shaft of front auger with two ⅜-16 x 2" (9.5 x 51mm) capscrews (grade 5) and two-way locknuts.

8. Slide the rear auger (93½" [238cm] flighting) onto the center auger shaft and support the rear of the auger. Align the flighting and bolt the rear auger to the center shaft with two ⅜-16 x 2" (9.5 x 51mm) capscrews (grade 5) and two-way locknuts.

9. Slide the level auger rear shaft 8" (20cm) long through the bearing in the rear end panel into the rear auger. Do not tighten the bearing lock collar. Bolt the rear shaft to the rear level auger with two ⅜-16 x 2" (9.5 x 51mm) capscrews (grade 5) and two-way locknuts.

10. Rotate the level auger by hand and check alignment. Tighten both bearing lock collars and set screws.

11. Bolt the receiving hopper and level auger motor mount to the top of the hopper with ⅜-16 x ¾" (9.5 x 19mm) capscrews, flatwashers and flanged locknuts. Bolt the stub guard to the top of the hopper rear end panel.

12. Install the hopper covers. The front and rear covers (570/670/690) are 76" (193cm) long and the center cover on 970 dryers is 83" (211cm) long. Secure the covers to the left side with (4) ¼-2 x 2" (7.35 x 51mm)

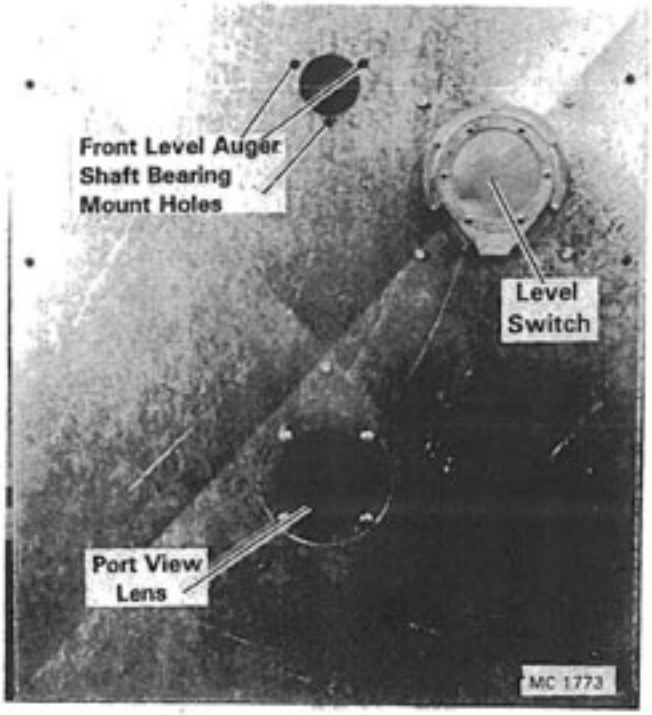



**Figure 2 – Level Switch (Inside Hopper View – 570-970)**

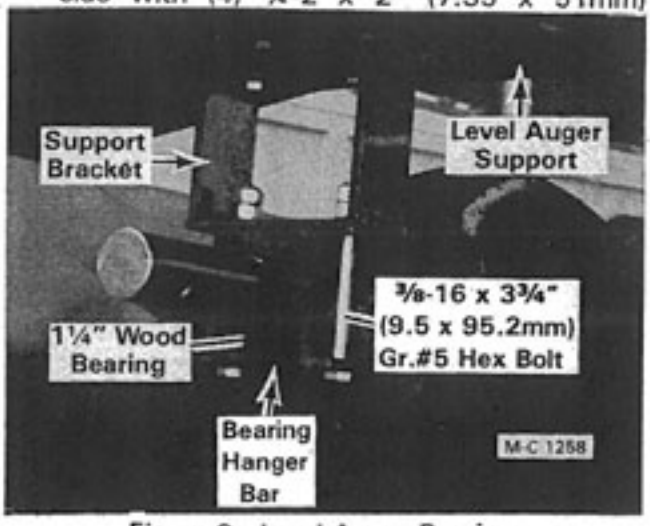



**Figure 3 - Level Auger Bearing**

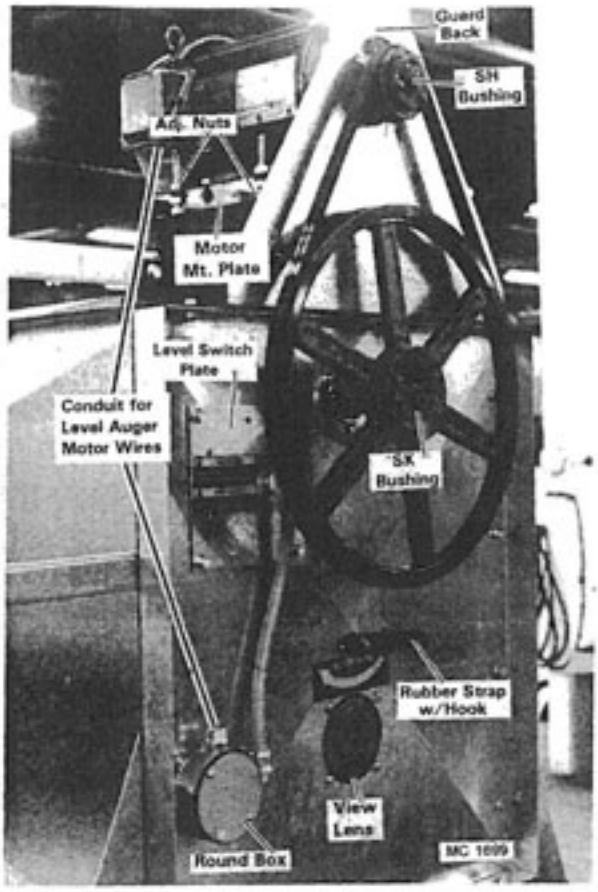



**Figure 4**

capscrews, flatwashers, springs and two-way locknuts as shown in Figure 1. Use the end holes and two middle holes only. One (1) flatwasher is to be placed under the bolt head, one (1) at the top of the spring and one (1) at the bottom of the spring next to the locknut. These bolt assemblies are to act as a hinge so that the hopper cover can be lifted by just removing the ⅜-16 x ¾" (9.5 x 19mm) capscrews, flatwashers and whiz nuts on the right side of the covers.

## Level Auger Motor

1. Bolt the level auger motor to the motor mount plate. Use ⅜-16 x 1¼" (9.5 x 31.75mm) capscrews and flanged locknuts on 3HP single phase motors and 5/16-18 x ¾" (7.9 x 19mm) capscrews and flanged locknuts on 3HP (570/670/690) and 5HP (970) three phase motors.

2. Put four ½-13 x 3½" (12.7 x 89mm) full thread capscrews in the level auger motor mount and lock in place with flanged locknuts. Thread a ½-13 (12.7mm) hex nut onto each capscrew and install the motor mount plate with motor, see Figure 4.

3. Install the level auger guard back as shown in Figure 4. Install a ¼" x ¼" x 2" (6.35 x 6.35 x 51mm) key in the level auger shaft and a ¼" x ¼" x 1¾" (6.35 x 6.35 x 44.5mm) key in the 3HP motor shaft or 5HP motor shaft.

4. The level auger pulley and motor pulley are held on the shafts with tapered bushings. Before installing the pulleys and bushings thoroughly inspect the tapered bore of the pulleys and the tapered surface of the bushings. Any paint, dirt, oil or grease **must** be removed.

5. Place the SK bushing 1¼" (31.75mm) bore into the level auger pulley and the SH bushing 1⅛" (28.6mm) bore into the motor pulley. The bushing and the bore of the pulley are tapered. Be sure to install the bushing into the large ID of the pulley tapered bore. If the bushing is installed into the small ID of the pulley, the pulley hub will crack when the mounting capscrews are tightened.

6. Place the three capscrews through the open holes in the bushing and thread them into the pulley by hand. **DO NOT** tighten the capscrews.

**IMPORTANT:** The capscrew and pulley threads must be clean and dry. Do not lubricate.

7. Slide the pulley and bushings onto the shafts. If the bushings are too tight on the shaft, wedge a screwdriver blade into the saw cut in the flanged (not the tapered surface) to spread the bushing.

8. Install the belt and adjust the position of the pulleys to align the belt.

9. Tighten the three capscrews in the bushings evenly and progressively. Torque motor bushing capscrews to 9 ft. lbs. (1.25kgm) and level auger pulley bushing capscrews to 15 ft. lbs. (2.07kgm).

**IMPORTANT:** The tightening force on the three capscrews is multiplied many times by the wedging action of the bushing tapered surface. Do not exceed the specified torque or use a lubricant on the capscrew threads. To do so may create bursting pressures in the hub of the pulley.

**Continued on page 12.**

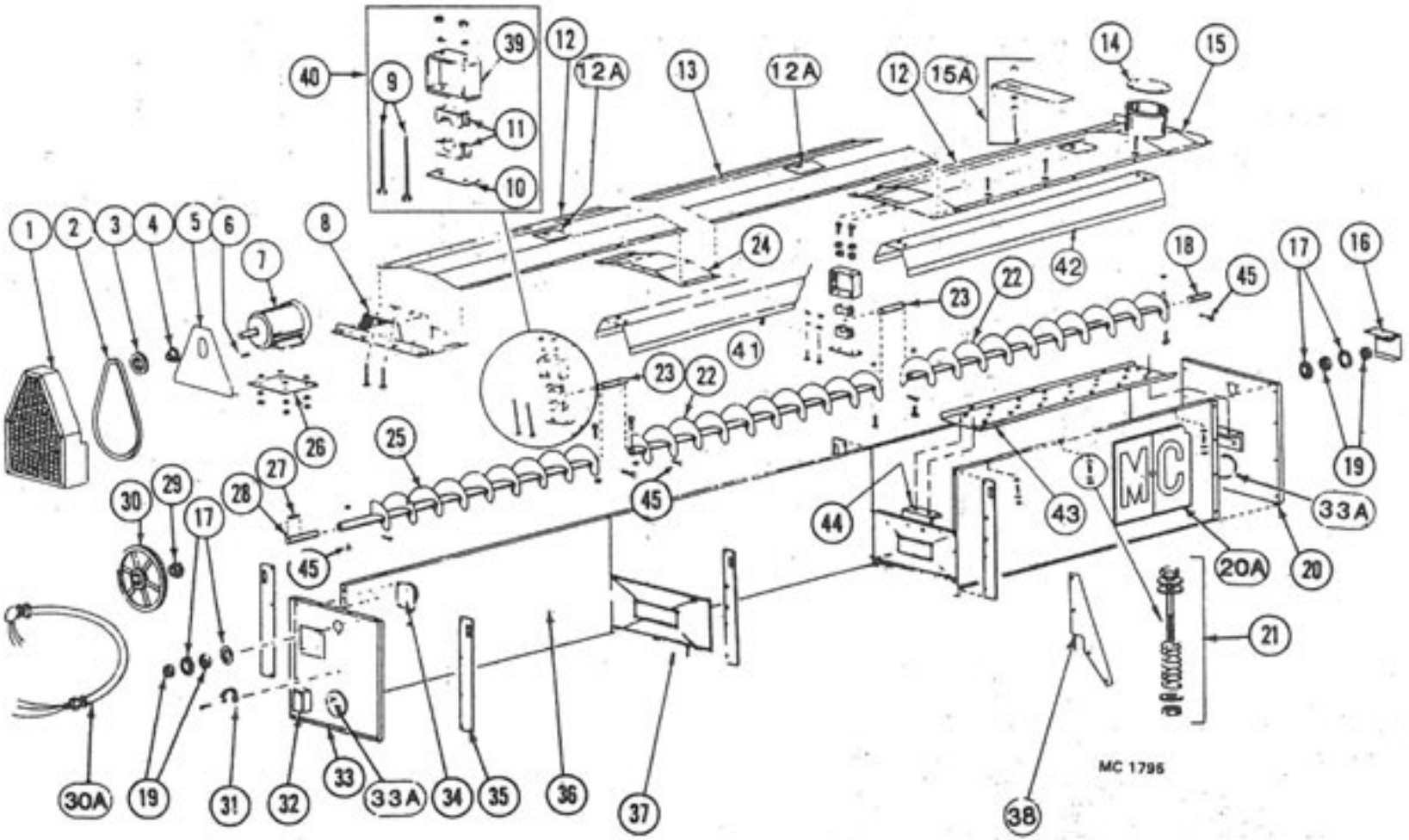



Figure 5

| Ref. | Part No. | 16 ft. (4.9m) Qty. | 24 ft. (7.3m) Qty. | Description |
|---|---|---|---|---|
| 1 | 129 0003 | 1 | 1 | Level Auger Guard |
| 2 | 128 6103 | 1 | 1 | 2/3V/710 (banded belt) or 128 6104 in matched set of two |
| 3 | 128 6207 | 1 | 1 | 3V/3.65 x 2 Groove Pulley 60 Cycle |
| | 128 6220 | 1 | 1 | 3V/4.5 X 2 Groove Pulley 50 Cycle |
| 4 | 128 6214 | 1 | 1 | 1⅛" (28.6mm) SH Bushing for 3HP & 5HP motor (Incl. capscrews & lockwashers) |

| Ref. | Part No. | 16 ft. (4.9m) Qty. | 24 ft. (7.3m) Qty. | Description |
|---|---|---|---|---|
| 22 | 128 0122 | 1 | 2 | Level Auger 93½" (238cm) RH Flighting |
| 23 | 128 5050 | 1 | 2 | Level Auger Center Shaft 1¼" x 10¼" (3.175 x 26cm) |
| 24 | 129 0000 | 1 | 2 | Level Auger Support |
| 25 | 128 0317 | 1 | 1 | Level Auger 86" (218cm) RH Flighting |
| 26 | 129 4202 | 1 | 1 | Level Auger Motor Mount Plate |

| | | | | |
|---|---|---|---|---|
| 5 | 129 4944 | 1 | 1 | Level Auger Guard Back |
| 6 | 001 5119 | 1 | 1 | Key - ¼"x¼"x2" (6.35x6.35x51mm) 3HP & 5HP motors |
| 7 | 128 6818 | 1 | – | 3HP 3Ø Motor 230/380/460V |
| | 128 6815 | – | 1 | 5HP 3Ø Motor 230/380/460V |
| | 128 6829 | 1 | 1 | 3HP 1Ø Motor 230V-520/620/720/820 |
| 8 | 129 0001 | 1 | 1 | Level Auger Motor Mount |
| 9 | 001 8287 | 2 | 4 | ⅜"-16 x 3¾" (9.5 x 95.2mm) Capscrew - Grade 5 |
| | 000 8162 | 4 | 8 | ⅜-16 Hex Nut |
| 10 | 128 3415 | 1 | 2 | Bearing Hanger Bar |
| 11 | 128 6021 | 1 | 2 | Wood Bearing - 1¼" (31.75mm) 2 halves |
| 12 | 129 2945 | 2 | 2 | Hopper Cover - Front & Rear 76" (193cm) |
| 12A | 128 8355 | 2 | 3 | Warning Decal |
| 13 | 129 2946 | – | 1 | Hopper Cover - Center 83" (211cm) |
| 14 | 129 4204 | 1 | 1 | Receiving Tube Cover |
| 15 | 129 0002 | 1 | 1 | Receiving Hopper |
| 15A | 129 4205 | 1 | 1 | Flow Restrictor |
| | 129 5703 | 1 | 1 | Position & Locking Bolt |
| | 000 8168 | 3 | 3 | ⅜-16 Flanged Locknut |
| 16 | 129 4947 | 1 | 1 | Stub Guard |
| 17 | 001 6004 | 4 | 4 | Bearing Flangette 1¼" (31.75mm) |
| 18 | 128 5052 | 1 | 1 | Level Auger Rear Shaft 1¼" x 8" (31.75 x 203mm) |
| 19 | 001 6003 | 2 | 2 | Bearing w/Lock Collar 1¼" (31.75mm) |
| 20 | 129 2848 | 1 | 1 | Hopper End Panel - Rear w/View Lens |
| 20A | 124 8307 | 2 | 2 | M-C Decal 23" x 23" (58.4x58.4cm) |
| 21 | 000 8101 | 12 | 18 | ¼-20x2" (6.35x51mm) Capscrew |
| | 131 8718 | 12 | 18 | Spring ⅝" OD x 1¾" (15.9 x 44.5mm) Plated |
| | 000 8172 | 36 | 54 | ¼" (6.35mm) Flatwasher |
| | 000 8210 | 12 | 18 | ¼-20 Two-Way Locknut |
| | 000 8161 | 4 | 4 | ½-13 x 3½" (12.7 x 89mm) Capscrew (Full Thread) |
| | 000 8170 | 4 | 4 | ½-13 (12.7mm) Flanged Locknut |
| | 000 8163 | 8 | 8 | ½-13 (12.7mm) Hex Nut |
| 27 | 001 5120 | 1 | 1 | Key-¼" x 1½" (6.35 x 38.1mm) |
| 28 | 128 5051 | 1 | 1 | Level Auger Front Shaft 1¼" x 10" (3.175 x 25.4cm) |
| 29 | 121 6241 | 1 | 1 | 1¼" (31.75mm) SK Bushing Incl. capscrews & lockwashers |
| 30 | 128 6208 | 1 | 1 | 3V/19.0 x 2 Groove Pulley |
| 30A | 128 1960 | 1 | 1 | L.A. Motor Flexible Conduit w/Wires |
| 31 | 128 8951 | 1 | 1 | Rubber Strap w/Hook |
| 32 | 123 6884 | 1 | 1 | Round Box ½" (12.7mm) |
| 33 | 129 2850 | 1 | 1 | Hopper End Panel - Front **for Proximity Switch** |
| | 129 2851 | 1 | 1 | Hopper End Panel - Front **for Diaphragm Switch** |
| 33A | 129 5702 | 2 | 2 | Port View Lens |
| 34 | 125 6824 | 1 | 1 | Level Switch - **Proximity Type** - 2001 Models Only |
| | 128 6992 | 1 | 1 | Level Switch - **Diaphragm Type** - After 1 Jan. 2002, see page 37 |
| 35 | 129 3412 | 4 | 4 | Lifting Bar |
| 36 | 129 2836 | 4 | 6 | Hopper Side |
| 37 | 129 2715 | 1 | 2 | Hopper Sectional Panel |
| 38 | 129 2603 | 6 | 8 | Hopper Brace |
| 39 | 128 0292 | 1 | 2 | Level Auger Brg. Support Bracket |
| | 001 8209 | 2 | 4 | ⅜-16 x 1" (9.5 x 25.4mm) Hex Washer Head Bolt - Grade 5 |
| | 001 8139 | 2 | 4 | ⅜" (9.5mm) Lockwasher |
| | 000 8162 | 2 | 4 | ⅜-16 (9.5mm) Hex Nut |
| 40 | 122 1008 | 1 | 2 | Level Auger Bearing Kit (Incl. Ref. 9, 10, 11 & 39 in quantities reqd. for one bearing) |
| 41 | 129 2839 | – | 1 | Auger Cover Long |
| 42 | 129 2838 | 1 | 1 | Auger Cover Short |
| 43 | 128 2761 | 1 | 1 | Pan Under Auger |
| 44 | 128 2760 | 2 | 2 | Auger Pan Support Bracket |
| 45 | 001 8137 | 8 | 12 | ⅜"-16 x 2" (9.5 x 50mm) Capscrew - Grade 5 |
| | 001 8149 | 8 | 12 | ⅜"-16 (9.5mm) Two-Way Locknut |

**NOTE:** There should be ⅛" to ¼" gap (3.2 to 6.4mm) between the pulley hub and the flange of the bushing. If the gap is closed, the shaft is undersize.

10. Adjust the belt tension by loosening the locknuts and raising the motor mount plate evenly with the four adjusting nuts, then tighten the locknuts.

11. Install the rubber strap with hook to the front end panel as shown in Figure 4. Hook the level auger guard over the top of the guard back and secure with the rubber strap and hook.

12. Remove the level auger motor junction box cover and the round junction box cover. Connect the flexible conduit and wire assembly 36" long (91.5cm) to the motor and round box. See Figure 4.

**NOTE:** All wiring to be completed by a qualified electrician.

13. **Three phase motor** – Connect the wires in the level auger motor junction box to the terminals on the motor as follows:

    Connect the red wire to terminal T1, blue wire to terminal T2 and the black wire to terminal T3. Connect the green wire to the motor grounding screw.

14. **Single phase motor** – Refer to the wiring information on the inside of the level auger motor junction box cover. The level auger pulley **MUST** turn clockwise (viewed from the front of the dryer). Determine correct motor rotation and connect the red and black wires to the motor terminals specified on the diagram in the junction box cover. Connect green wire to the motor grounding screw.

## Hopper Installation

1. Place a stiffener strap #1292947 28" (71cm) long across the center of each set of hopper mount angles bolted to the top of the outer screens. A 570/670/690 dryer requires (2) straps and a 970 dryer (3). See Figure 5.

2. Attach cables to the lift bars on the hopper. Use spreader bars between the cables and lift the hopper onto the top of the peak assembly, see Figure 1.

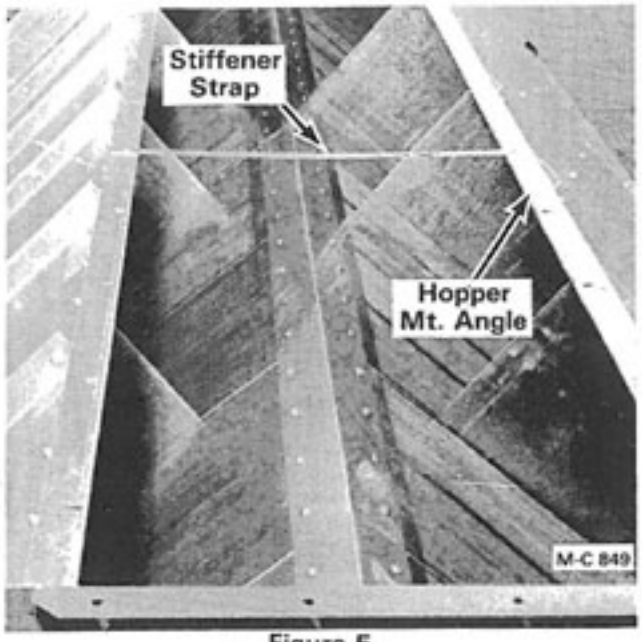



**Figure 5**

The hopper for a 570/670/690 dryer weighs approximately 615 pounds (279 kgs) and the 970 hopper approximately 745 pounds (338 kgs).

3. Bolt the hopper to the hopper mount angles with ⅜-16 x ¾" (9.5 x 19mm) capscrews and flanged locknuts.

## Level Auger Motor and Hopper Level Switch Wiring

**NOTE:** The level auger switch and motor wire assembly consists of a length of ½" (12.7mm) flexible conduit and wire.

1. Connect the flexible conduit to the bottom of the round junction box on the hopper front end panel. See Figure 4.

2. Connect the wires in the round junction box together with wire nuts furnished (tape all connections).
   A. Connect the (2) yellow wires imprinted TB24 → LSW-C together and connect the (2) yellow wires imprinted LSW-NC- → LASW together.
   B. Connect the (2) black wires together, (2) red wires together and (2) blue wires together (blue used on three phase dryers only). There are (2) green motor ground wires that also must be connected.

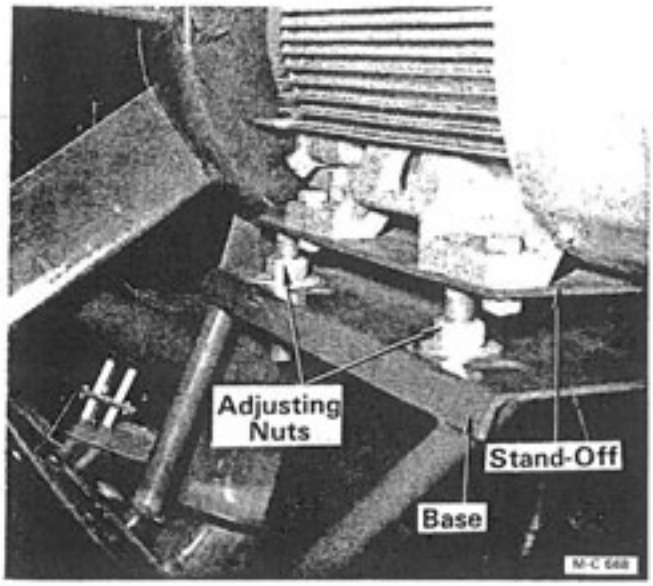



Figure 6

## Fan Clearance

**NOTE:** Remove the tie down wire from each fan. These wires keep the fans from rotating during shipment.

1. Before turning on the electric power, check for clearance between fan and fan housing. The fit between fan and housing is very close. Some shifting may have occurred during shipping. Clearance can be checked by turning fan(s) by hand.

   **CAUTION:** Do not touch any part of the fan while it is in motion – even when turned by hand.

2. To adjust fan clearance, loosen the four locknuts under the motor base and turn the adjusting nuts on top to raise or lower the motor. See Figure 6. The holes in the base are slotted to allow for side to side adjustment. Tighten locknuts after adjustment has been completed.

3. Install the fan guards.

## Filling Equipment (Customer Supplied)

1. There are two general methods used to fill the dryer – downspouting from an overhead wet bin or with an auger from the wet bin.

2. Be sure that the system used has the grain moving capacity to fill the dryer faster than the grain shrinks and dries. If it does not, the Grain Flow Timer will shut the dryer down when the grain level in the hopper is low.

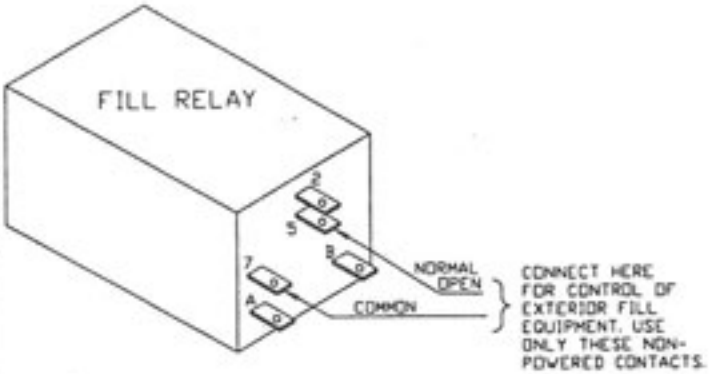



Figure 7A – 370 Relay Non-Powered Contacts

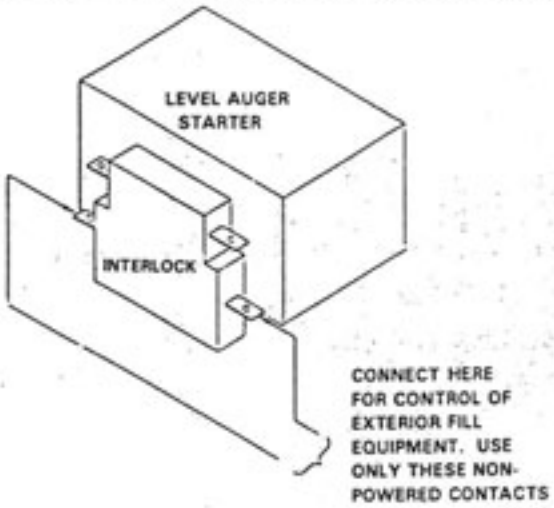



Figure 7B – 570/670/690 & 970 Level Auger & Unload Auger Motor Magnetic Starter Non-Powered Auxiliary Contacts

3. **Gravity Filling System** – To prevent overloading the level auger, a slide gate must be installed in the downspout to regulate the flow of grain to the level auger.

## Fill Auger and Take Away Equipment (Customer Supplied)

1. The fill auger MUST be controlled by the dryer. The take-away equipment can be controlled by the dryer or separately.

2. On Model 370, the power for the fill auger motor magnetic starter coil is controlled by the non-powered contacts of the relay provided in the magnetic starter cabinet. See Figure 7A.

3. On Models 570/670/690 and 970, which have a level auger, the non-powered auxiliary contacts of the level auger starter are used to control the fill auger motor magnetic starter coil. See Figure 7B.

4. On Models 570/670/690 and 970 unload auger magnetic starters have non-powered auxiliary contacts that can be used to control the customer supplied take-away equipment. See Figure 7B.

## Electric Power Supply

**NOTE: All wiring must be done by a qualified electrician.**

1. It is the customer's responsibility to provide the power source to the control cabinet that meets all requirements of the local electrical codes. The power supply must be adequately fused and have a main disconnect.

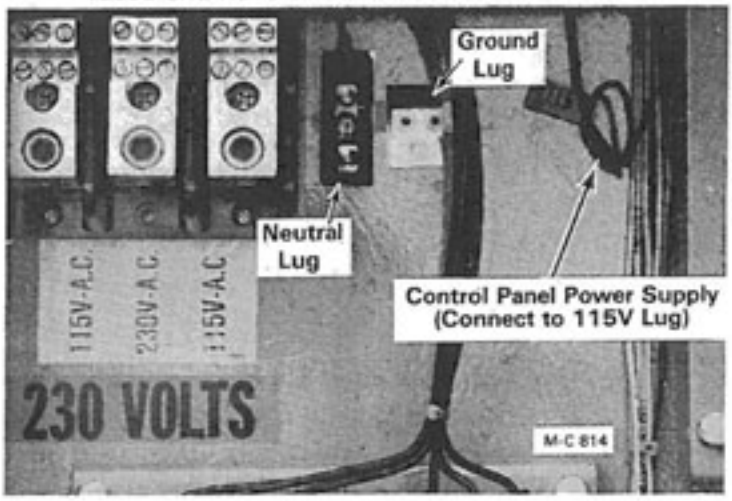



**Figure 8 - Magnetic Starter Cabinet Model 670 Single Phase 230 Volt**

2. Connect the power supply to the lugs on the splitter block in the bottom control cabinet. See Figure 8.

**IMPORTANT:** The dryer controls operate on 115V. On 230V three phase models, the 230V power supply must be connected to the center lug of the splitter block as shown in Figure 8. If the 230V power supply is connected to a 115V lug, the dryer controls will be seriously damaged.

3. For this reason, the 115V power supply wire to the control cabinet was not connected to the splitter block at the factory. There is a loose black wire close to the splitter block with an orange tag on it that reads "115 VOLTS." See Figure 8. Connect this wire to one of the 115 volt lugs.

4. When a 230 volt power supply is used, connect the supply neutral wire to the isolated neutral lug located in the starter cabinet. See Figure 8.

5. The dryer must be connected to the earth ground rod that is supplied with the dryer. Connect the ground lug in the dryer magnetic starter cabinet to the ground rod with at least a #6 solid copper wire or in accordance with local code.

## Gas Supply and Connections

### LP Gas

1. Advise your LP Gas supplier that the dryer burner requires liquid propane from the LP tank (not vapor).

**IMPORTANT:** Do not store liquid propane in tanks that have contained anhydrous ammonia. Mixing liquid propane and anhydrous ammonia produces an extremely caustic solution that will damage the dryer controls. It is recommended that only clean LP Gas equipment be used.

2. Each burner requires 12 to 20 lbs. (less in mild weather) of gas pressure at the gauge in the manifold when operating. Always operate dryer with the lowest gas pressure possible that still maintains the selected drying temperature!

3. Consult the LP Gas supplier for gas line size required from the supply tank to the dryer that will provide the amount of fuel to meet the dryer BTU/Hr. requirement at the required operating pressure. See the Gas Consumption (BTU/Hr.) chart.

**IMPORTANT:** Use type of supply line specified by Local Codes.

4. Connect the LP Gas line from the tank valve to the 1" (2.54cm) LP Gas inlet hose at the front of the dryer on the left side (when viewed from rear).

**CAUTION:** Before starting the dryer test for any gas leaks. Turn the gas supply on and apply soap water to **ALL** pipe joints and unions, including pipes assembled on the site and those assembled at the factory.

### Natural Gas

1. Each burner requires 5 to 10 lbs. of gas pressure at the gauge in the manifold when operating.

2. Consult the gas company for gas supply line size required to the dryer that will provide an adequate volume of gas to meet the dryer BTU/Hr. requirement at the required operating pressure. See Gas Consumption (BTU/Hr.) chart.

**IMPORTANT:** Use type of supply line specified by Local Codes.

**CAUTION:** Before starting the dryer test for any gas leaks. Turn the gas supply on and apply soap water to **ALL** pipe joints and unions, including pipes assembled on the site and those assembled at the factory.

**Gas Consumption BTU/Hr. (KgCal.)***

| MODEL | DRY & COOL | ALL HEAT | OPERATING MAXIMUM |
|---|---|---|---|
| 370 | 1,562,572 (393,768) | 2,404,072 (605,826) | 3,111,152 (784,010) |
| 570 | 2,074,204 (522,699) | 3,191,155 (804,171) | 4,129,730 (1,040,692) |
| 670 | 2,404,072 (605,826) | 4,577,947 (1,153,643) | 5,924,402 (1,492,949) |
| 690 | N/A | 3,668,005 (924,337) | 4,746,830 (1,196,201) |
| 970 | 3,668,005 (924,337) | 6,072,007 (1,530,146) | 7,857,982 (1,980,211) |

*Approximate BTU/Hr. based on normal drying temperatures at 50°F (9°C) drying shelled corn

## Fan Rotation

**IMPORTANT:** Before checking fan rotation, inspect for and remove any foreign material (nuts, bolts, tools, parts, etc.) from the hopper, grain columns, metering rolls, unload auger and heat chambers.

1. Check fan rotation from the front of the dryer. Both fans must turn counterclockwise.

**CAUTION:** Do not turn the electric power on until the fan guards have been installed.

2. Flip all switches on the control panel OFF. Turn on the electric power supply to the dryer. The 115V POWER ON light will be on.

3. Flip the control circuit toggle switch ON. The control circuit ON light and high limit light will be on. If the high limit light is not on, push the reset button on the high limit switch.

4. Push the spring loaded control circuit toggle switch up the START position and release it. The READY light and LEVEL AUGER light will be on.

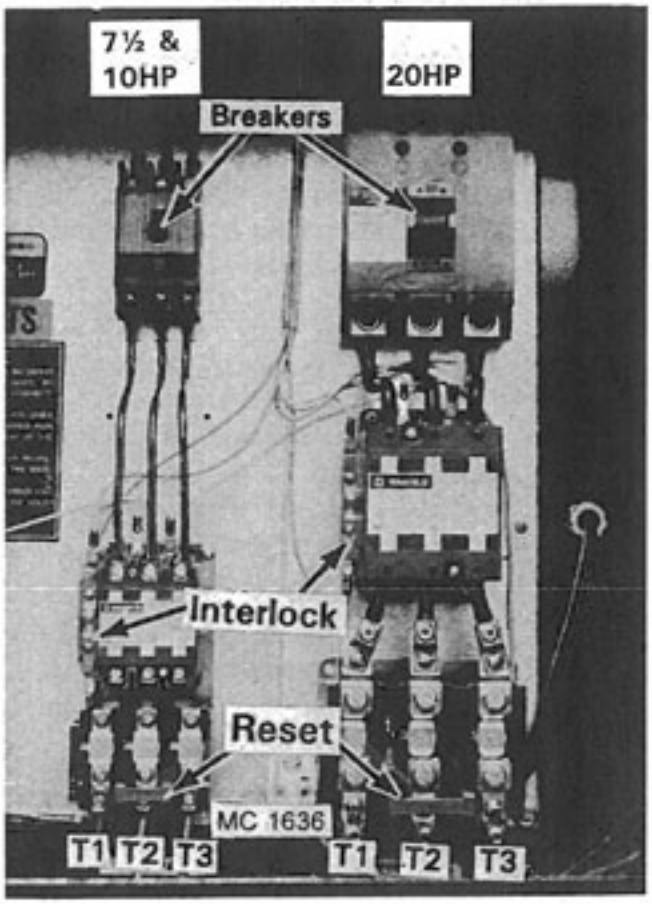



**Figure 9 – Fan Magnetic Starters – 3 Phase 230V**

5. With everyone clear of the fan, push the fan start button. Immediately push the stop button, check fan rotation and be sure the fan is not rubbing the housing.

6. If fan rotation is not correct it can be changed as follows:

**CAUTION:** Turn off and lock the electric power supply to the dryer.

A. **Three phase motors** - Move the wire from terminal T1 to T3 and T3 to T1 on the fan magnetic starter in the lower control cabinet. See Figure 9 .

B. **Single phase motors** – Refer to the wiring information on the inside of the level auger motor junction box cover.

## Level and Unload Auger Rotation

1. Looking at the front of the dryer, the level auger pulley **MUST** turn clockwise and the unload auger pulley **MUST** turn counter-clockwise. If rotation is not correct, it can be changed as follows:

**CAUTION:** Turn off and lock the electric power supply to the dryer.

A. **Three phase motors** - Move the wire from terminal T1 to T3 and T3 to T1 on the magnetic starter in the lower control cabinet. See Figure 10.

B. **Single phase motors** - Refer to the wiring information on the inside of the motor junction box cover.

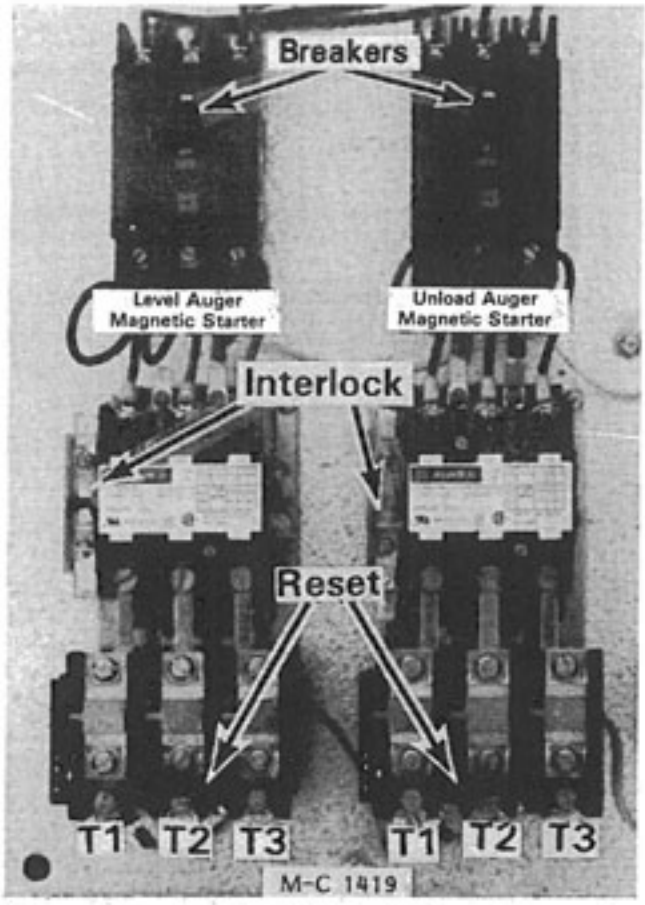



**Figure 10 – Level and Unload Auger Magnetic Starters – 3 Phase 230V**

## Grain Level in Wet Hopper

The level auger should start before the grain level appearing in the front View Lens of the wet holding hopper only covers the bottom half of the lens.

If the grain level drops below the entire View Lens before the level auger starts, the auger may not provide enough wet grain to fill the hopper and will run constantly until the Grain Flow Timer locks out and the dryer is shut down (if level auger switch is in AUTOMATIC). Keeping the wet hopper full of grain is essential for maximum drying capacity and helps reduce fuel consumption.

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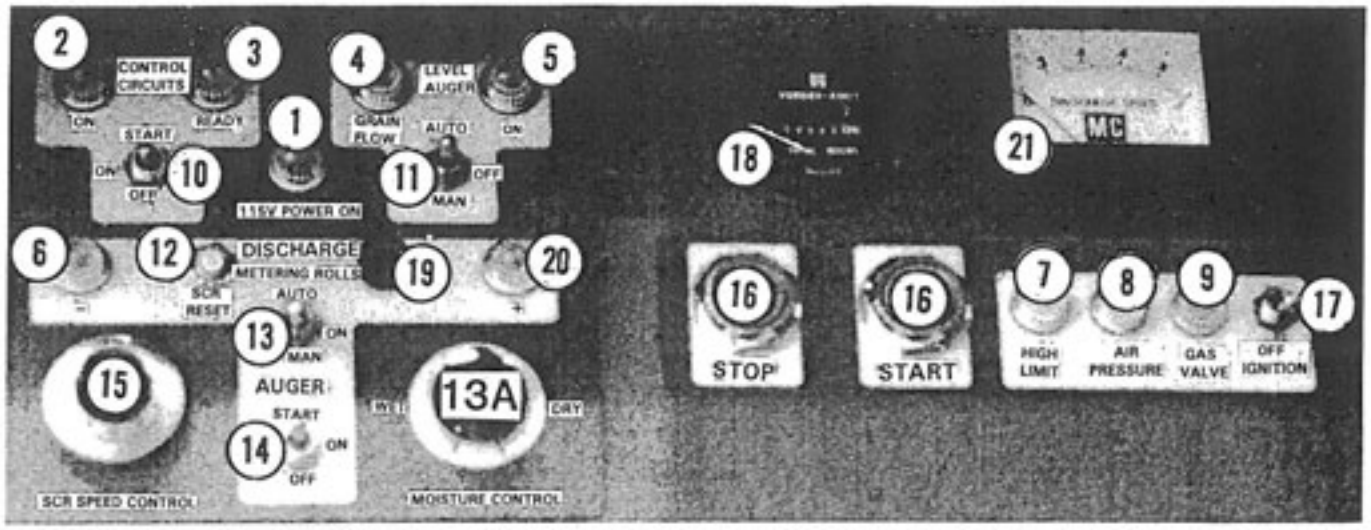



Figure 12 - 370, 570, or 690 shown.

# CONTROL PANEL LIGHTS, SWITCHES & CONTROLS

## Control Panel Lights (see Figure 12)

**Ref. 1 - 115V Power On Light**

Indicates that 115 Volt electric power to the dryer control panel is on.

**Ref. 2 - Control Circuit On Light**

Indicates that the control circuit toggle switch is in the on position, the rear discharge overload door is closed and all motor magnetic starter overload relay blocks are closed.

**Ref. 3 - Control Circuit Ready Light**

Indicates that the control circuit toggle switch has been pushed up to the start position and the dryer is ready to be started.

**Ref. 4 - Grain Flow Light**

Indicates low grain level in the hopper. The dryer will shut down when this light comes on.

**Ref. 5 - Level Auger Light**

Indicates that the grain level in the hopper is low and the level auger switch in the hopper has closed, activating the level auger circuit.

**Ref. 6 - (–) Light**

Indicates that the discharge rate is slowing down if Moisture Control is in automatic.

**Ref. 7 - High Limit Light**

Indicates that the high limit switch is closed and the temperature in the plenum chamber has not exceeded the high limit setting.

**Ref. 8 - Air Pressure Light**

Indicates that the air pressure switch is closed and the fan motor magnetic starter is engaged. (Dryer must be full of grain and fans running.)

**Ref. 9 - Gas Valve Light**

Indicates that the ignition board has supplied power to the gas solenoid valves.

**Ref. 10 - Control Circuit Switch**

When the switch is in the on position, the control circuit on light will be on if the rear discharge overload door is closed and all magnetic starter overload relay blocks are closed. High limit lights will be on. If they are not, push the reset button on the high limit switches.

When the switch is pushed up to the start position, the ready light will be on if both high limit lights are on. When the ready light is on, the dryer can be started.

**NOTE:** If there is a momentary loss of electric power, the dryer will shut down. When the power comes back on, the 115V POWER ON light and the control circuit ON light will be on. The dryer will have to be restarted. This feature prevents an unattended dryer restarting.

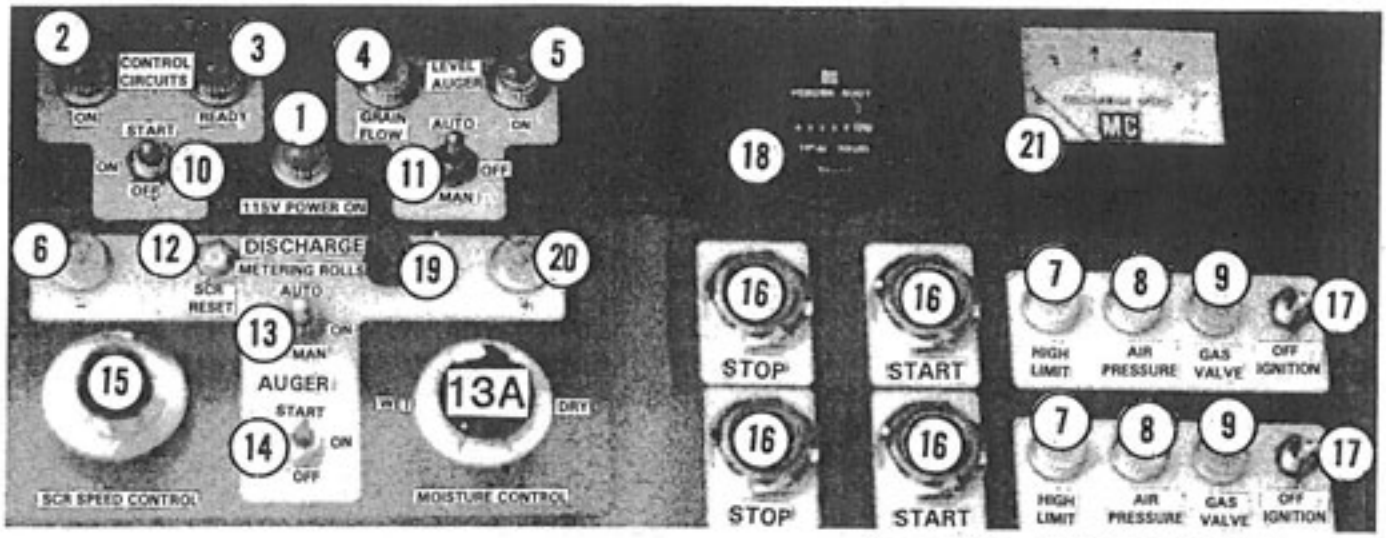



Figure 12A - 670 or 970 shown.

**Ref. 11 - Level Auger Switch**

When the switch is in the manual position, the level auger will start immediately when the level auger switch in the hopper closes and stops when the hopper is full.

When the switch is in the automatic position, the grain flow timing circuit is activated.

**NOTE:** The operation of the level auger circuit is explained in detail under "Level Auger Operation" on page 18.

**Ref. 12 - SCR Drive Reset Button**

The SCR drive reset button (8 amp. circuit breaker) protects the SCR drive control board.

**Ref. 13 - Discharge Metering Roll Switch**

When the switch is in the automatic position, the Moisture Control will speed up and slow down the SCR drive motor automatically. Unloading starts when the moisture content of the grain is reduced to the level that the moisture control is set for and slows down or stops when the moisture content is above this setting.

When the switch is in the manual position, the SCR drive motor will run continuously. The operation of the moisture control is explained under "Operation of the Discharge System" on page 25.

**Ref. 13A - Moisture Control Balance Knob**

When the discharge metering roll switch is in the automatic position, the Moisture Control will control the SCR drive motor to maintain the moisture content of discharge grain.

**Ref. 14 - Discharge Auger Switch**

This switch starts and stops the discharge auger. Push this spring loaded switch up to start the unload auger and release it. It will move down to the on position.

**Ref. 15 - Manual SCR Drive Speed Control**

This manual speed control is used to adjust the speed of the DC motor that drives the grain metering rolls and changes discharge speed when metering rolls switch is in the manual position.

**Ref. 16 - Fan Start-Stop Buttons**

Green button starts and red button stops the fan.

**Ref. 17 - Ignition Switch**

Flip this switch on to light the burner. After a 15 second delay the gas valve light will come on and the burner will light. If the burner does not light in 5 seconds (after the gas valve light comes on) the ignition board will "lock out" closing the gas solenoid valves.

**Ref. 18 – Hour Meter**

**Ref. 19 - Moisture Control Fuse**

**Ref. 20 - (+) Light**

Indicates that the discharge rate is speeding up if Moisture Control is in automatic.

**Ref. 21 - Discharge Meter**

Indicates the rate of discharge in manual and automatic.

# INITIAL START-UP INSTRUCTIONS

## General

**IMPORTANT:** Inspect for and remove any foreign material (nuts, bolts, tools, parts etc.) from the hopper, grain columns, metering rolls, unload auger and heat chambers before filling the dryer with grain.

1. Flip all of the toggle switches on the control panel to the OFF position.
2. **LP Gas** - Close the liquid line flip valve for each burner (handle down), see Figure 13.
3. Close the gas main hand valve for each burner (handle 90° to the piping), See Figure 14.
4. Check the modulating valve in each burner gas manifold to be sure the **"T"** handle has not been turned all the way in to the wide open position, see Figure 14. The **"T"** handle should be halfway between the closed and fully open position.
5. Turn on the electric power supply to the dryer. The 115V POWER ON light will be on.
6. Flip the control circuit toggle switch ON. The control circuit ON light and high limit lights will be on. If the high limit lights are not on, push the reset button on the high limit switch, see Figure 15.

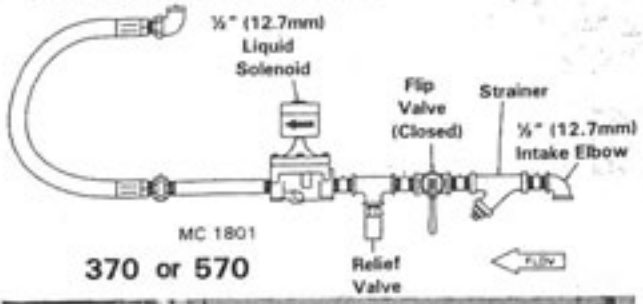
## Filling the Dryer

**CAUTION:** Do not allow anyone to be in the hopper when filling the dryer. **Always** turn off and lock the electric power supply to the control cabinet before allowing anyone to work in the hopper.

1. Flip the level auger toggle switch to the MANUAL position. The level auger will start immediately and the level auger light on the control panel will be ON.
2. When the dryer is full, the grain will open the level auger switch in the hopper. The level auger will stop and the LEVEL AUGER light will be out.

## High Limit Switch

Adjust High Limit 30° to 50° above operating temperature. This will avoid nuisance shut-downs during start up.



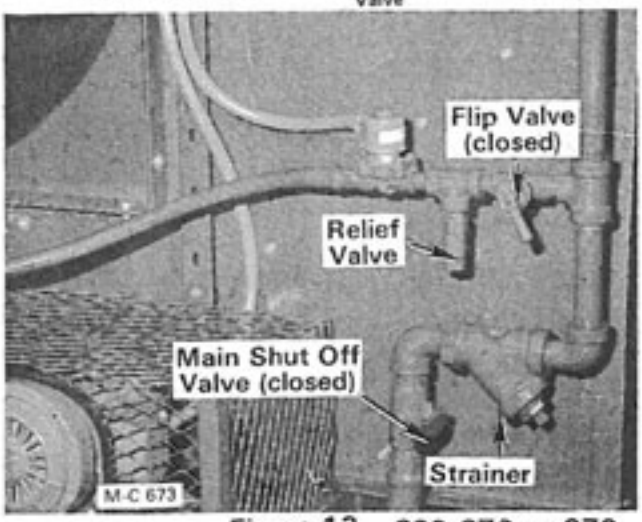
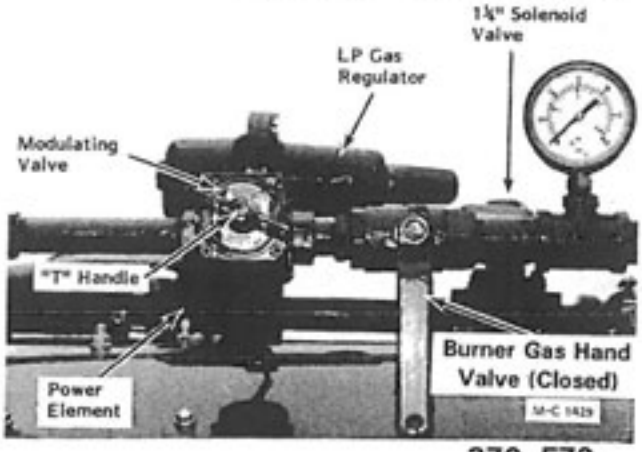




Figure 13 690 670 or 970




370, 570

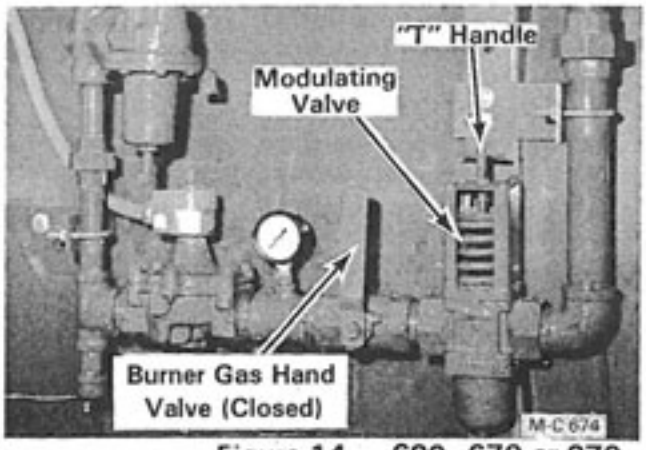



Figure 14 690 - 670 or 970

## Air Pressure Switches

### General

1. There is an air pressure switch in the heat chamber, see Figure 15. The air pressure switch senses the static air pressure in the heat chamber when the dryer is full of grain and the fan is running. If the static air pressure drops because of fan failure, the air pressure switch opens stopping current flow to the ignition switch. The gas solenoid valves will close and the burner will shut down.
2. The air pressure switch is designed to protect the dryer from fire that may result from fan (air flow) failure while the burner is ignited and flame is present.

**CAUTION:** This safety feature is for your protection and protection of the dryer. The air pressure switch should be checked for correct operation at the start of the drying season and periodically during the season.

### Checking

1. After the dryer has been filled and before any burners are started, the operation of the air pressure switch **MUST** be checked. Be sure the rear doors are closed.
2. Start the fan or fans. When it comes up to speed, start the second fan.

**NOTE:** The fan magnetic starters are wired in series. If one fan magnetic starter overload relay trips, the dryer will shut down. All lights except the POWER ON light will be out. When the overload relay is reset the control circuit ON and high limit lights will be on.

Flip the control circuit switch up to the start position and release it, the READY light will be on. Flip the ignition switches OFF and restart the fans, burners and discharge auger.

3. The air pressure light on the control panel will come ON as the fan comes up to speed.
4. If the light does not come ON or comes ON too soon (before the fan comes up to speed) the air pressure switch must be adjusted.

### Adjusting

**NOTE:** Fan(s) must be running before the air pressure switch(es) can be accurately adjusted.

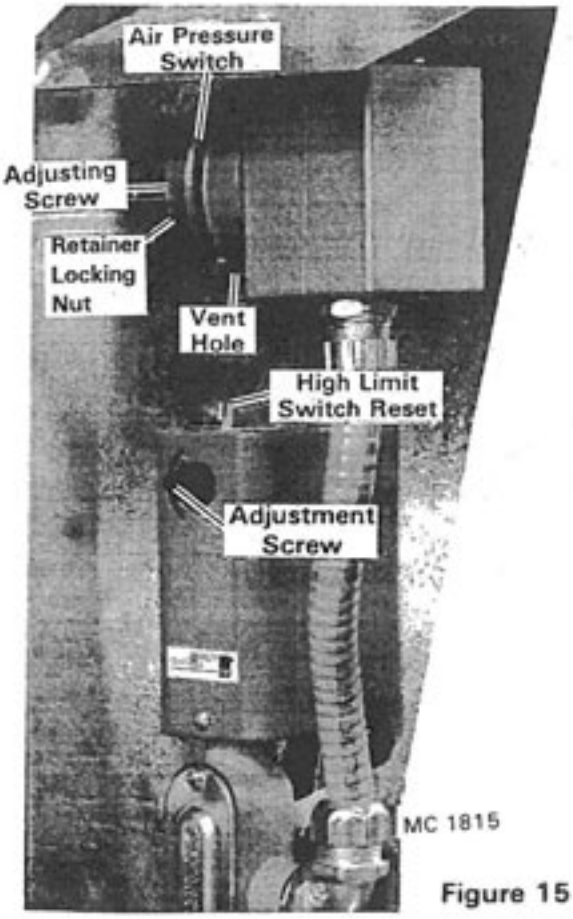



**Figure 15**

1. Remove the plastic cap on the air pressure switch. The slotted screw is the adjusting screw. See Figure 15.
2. Turn the adjusting screw in (clockwise) until the air pressure light goes out.
3. Turn the adjusting screw out (counter-clockwise) until the air pressure light comes on. After the air pressure light comes on, turn the adjusting screw out an additional ½ turn to allow for normal changes in static pressure.
4. Shut off the fan. The Air Pressure light will go out when the fan stop button is pushed. These dryers are wired so that the power flows from the fan start button to the air pressure switch.
5. If all air pressure switch adjustment is used and the Air Pressure light does not come on, check to be sure the ⅛" (3.2mm) vent hole in the bottom of air switch is open. See Figure 15. Also check for an obstruction in the air pressure tube and filter. See Figure 16.
6. If the air pressure light is blinking, turn the adjusting screw out a small amount.

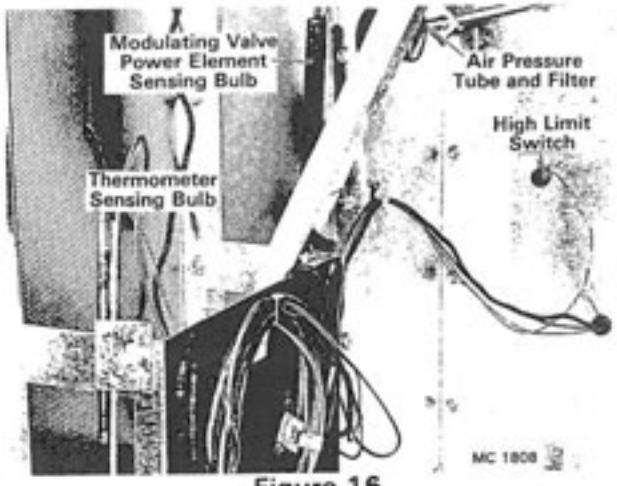


Figure 16

## Starting the Burner(s)

1. **LP Gas** - Open the supply valve at the tank, the hand valve at the LP Gas inlet hose and open (lift up) the liquid line flip valve on each burner, see Figure 13. The flip valve is open when the handle is 90° to the piping.

   **Natural Gas** - Open the supply valve.

2. Start fan (370/570/690). Start bottom fan (670/970). When fan comes up to speed, start top fan (670/970).

3. Open burner gas hand valve (Figure 14) ¼ of the way. Flip burner or top burner ignition switch ON. After a (15) second delay the gas valve light will be ON and the burner will light.

**NOTE:** The (15) second delay before ignition is a safety feature that allows the fan to purge the heat chamber of any unburned gas that may remain after a burner has been shut down for any reason.

4. After flame is established, **slowly** open burner gas hand valve all the way (handle parallel to the piping).

**NOTE:** Opening the burner gas hand valve slowly will prevent possible freezing of the LP gas line and also prevent the temperature from rising too fast. If the temperature rises too fast, the High Limit Switch will trip out and the dryer will shut down.

5. If the LP Gas line freezes, close the burner gas hand valve and flip the ignition switch OFF. After the gas line thaws out repeat steps 3 and 4, but open the burner gas hand valve slower.

**NOTE:** The ignition board is electronically timed so that the ignition system will continue to spark and hold the solenoid gas valves open for

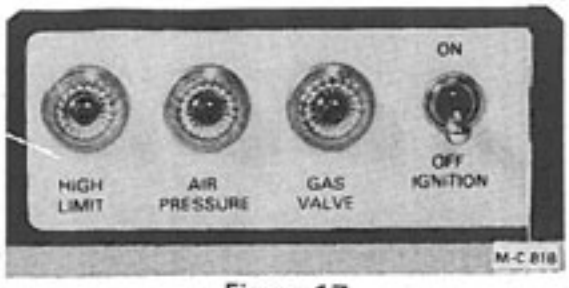


Figure 17

a "trial ignition" period (about 5 seconds). If the burner does not light, the system will "lock out" (after the 5 second trial period) closing the solenoid gas valves. The gas valve light will be out.

6. Flip the ignition switch OFF then ON again. The gas valve light will come ON after the (15) second delay and another trial for ignition period (5 seconds) will start.

7. If the burner fails to light, turn off fan and electric power supply to dryer. Flip all toggle switches on control panel(s) to OFF position. Review Direct Spark Ignition, page 28. Check for burned or broken wires, loose or corroded connections. Check ignition switch with a voltage tester. Also check to be sure electrode is dry. Make sure wires are connected correctly.

8. If the High Limit Switch trips out, close the gas main hand valve and flip the ignition switch OFF. Push the reset button on the High Limit Switch to reset, see Figure 15. Adjust High Limit 30° to 50° above operating temperature. This will avoid nuisance shutdowns during start up.

**NOTE:** When a High Limit Switch trips out, the dryer will shut down. Both fans and burners will have to be restarted.

9. Push the control circuit switch up to the START position and release it. Restart the fan. Repeat steps 3 and 4, but open the gas main hand valve slower to prevent the temperature from rising too fast.

10. **LP Gas Only** - When the flame is established, the heat causes the LP Gas to vaporize. After the burner has been running for 10 minutes check the vaporizer coil as follows:
    A. Check the LP Gas line coming out of the fan housing from the vaporizer coil to the pressure regulator with your hand.

**CAUTION:** The line may be very hot.

B. When the vaporizer coil is positioned correctly in the flame, the LP Gas line coming out of the fan housing from the vaporizer coil to the pressure regulator should feel very warm, but not so hot that you cannot hold your hand on it.

C. If it feels cool, the vaporizer coil is not close enough to the flame. If it is very hot, the vaporizer coil is too close to the flame.

D. Shut the burner and both fans off.

**CAUTION:** Turn off and lock the electric power supply to the control cabinet.

E. **Adjustable Vaporizer** - At top and bottom of the fan housing, there are vaporizer adjusters, see Figure 18. There are two bolts on each of the vaporizer seal plates that have to be loosened. Loosen the two adjusting nuts at the tab welded to the fan housing at top and bottom, see Figure 18. Turn outside nut at top, and inside nut at bottom, to move vaporizer closer to flame. Turn inside nut at top, and outside nut at bottom, to move vaporizer away from flame. Keep the vaporizer vertical in the fan housing by moving top and bottom adjusters the same amount, but in opposite directions. Tighten both inner and outer nuts when adjustment has been made. Tighten two bolts on each of the vaporizer seals.

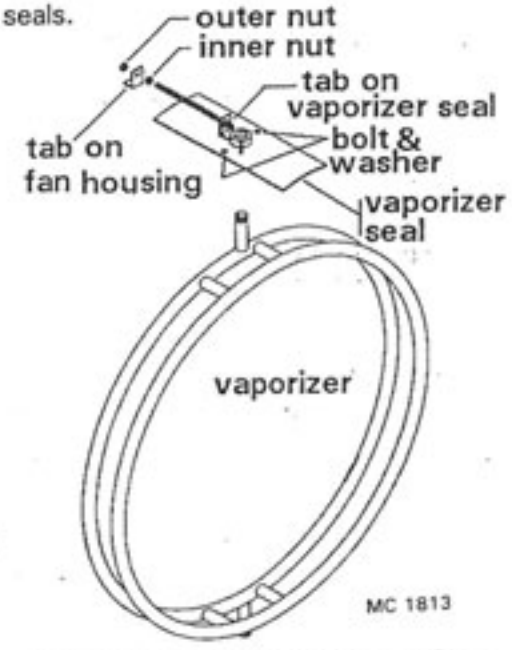



**Figure 18 – Adjustable Vaporizer**
**(2) Ring 570, (1) Ring 370, 690, 670 & 970**

F. After the adjustment has been made, turn on the electric power supply. Restart the fan and burner, and recheck temperature.

11. **LP Gas Only** - With the burner operating, check the reading on the gas pressure gauge in the manifold. See Figure 19. It should be approximately 12 to 20 pounds (less in mild weather). If not, loosen the locknut on the pressure regulator adjusting screw. See Figure 19. Turn the adjusting screw IN to increase and OUT to decrease pressure.

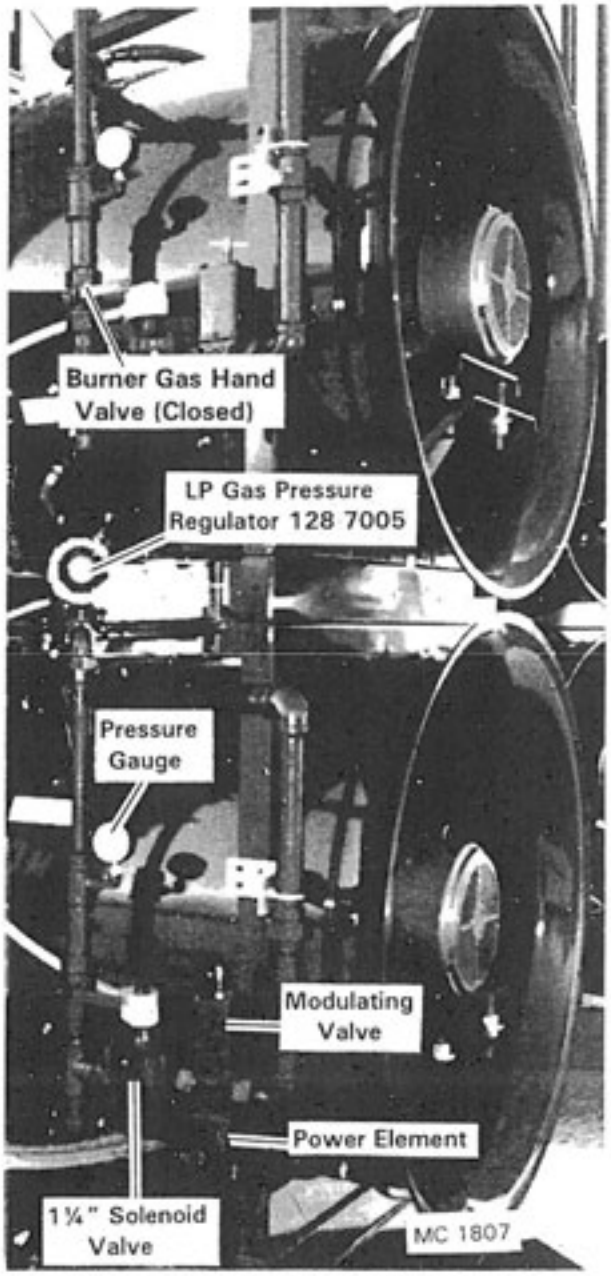



**Figure 19 – LP Manifolds 670/970**

## Setting Burner Operating Temperature

**NOTE:** Refer to the "Suggested Burner Operating Temperature Setting Chart" on page 24. Temperatures shown are initial settings and may have to be adjusted for local crop and weather conditions.

1. With the burner(s) operating, set the operating temperature by adjusting the modulating valve.
2. Turn the "T" handle on the modulating valve IN to INCREASE temperature and OUT to DECREASE temperature. See Figure 18. There is a temperature gauge on the side of the control cabinet for each burner.
3. After the burner operating temperature has been set, close the burner gas hand valve, flip the ignition switch off and then turn off fan(s).

**NOTE:** After the dryer has been operating for several hours, check the burner gas pressure gauge and temperature gauge to make sure the settings are correct. If not, make adjustments to gas regulator or modulating valve whichever is incorrect. It will not be necessary to make adjustments on future start-ups unless burner operating temperature is to be changed.

## All Heat (Dryeration)

To operate a 370 or 570 as an all heat dryer, check instructions on page 37.

To operate a 670 or 970 as an all heat dryer, just turn on the bottom burner.

### Suggested Burner Operating Temperature Settings °F (°C)

**IMPORTANT:** Use this chart as a starting point for drying the crops listed. Depending on the condition of the crop, you may have to increase or decrease the temperature shown. When drying seed grain, use lower temperatures.

| | MAIZE (CORN) | | SORGHUM & WHEAT | | RAPE (CANOLA), SUNFLOWERS, OATS, BARLEY, SOYBEANS | |
|---|---|---|---|---|---|---|
| DRYER MODEL | DRY & COOL | ALL HEAT | DRY & COOL | ALL HEAT | DRY & COOL | ALL HEAT |
| 370 & 570 | 230 (110) | 235 (113) | 170 (77) | 170 (77) | 140 (60) | 140 (60) |
| | COOL | | COOL | | COOL | |
| 670 & 970 | 230 (110) | 235 (113) | 170 (77) | 170 (77) | 140 (60) | 140 (60) |
| | COOL | 200 (93) | COOL | 150 (60) | COOL | 130 (54) |
| 690 | - | 235 (113) | - | 170 (77) | - | 140 (60) |

Figure 20

# OPERATING INSTRUCTIONS

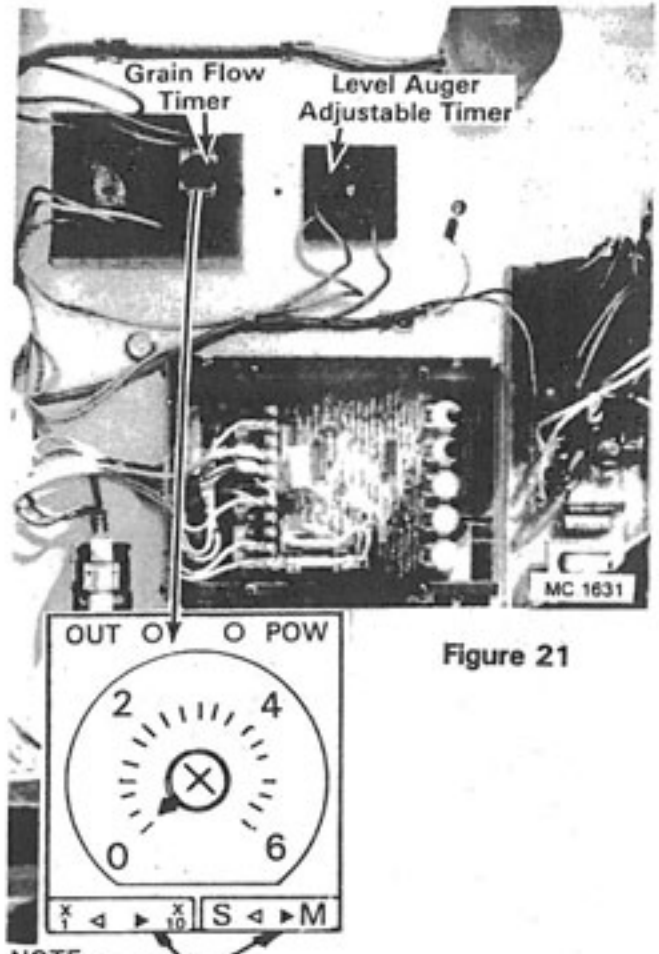
## Level Auger Operation

### Description

There is an adjustable 0 to 3 minute delay in the level auger circuit. See Figure 21. It is activated when the level auger switch is in the AUTOMATIC position and the level auger light is signaling for grain.

This delay prevents nuisance starting and stopping of the level auger. If the level auger switch is flipped to OFF and back to the AUTOMATIC position the delay will recycle.

The Grain Flow Timer, Figure 21, will shut the dryer down if there is an insufficient grain supply to fill the hopper. When the level auger starts, the Grain Flow Timer will be activated. When the timer counts down to zero, the dryer will shut down and the Grain Flow light will come on.




NOTE:
SET TIMER FOR X 10 AND MINUTES. ADJUST FROM UNDERSIDE OF TIMER.

Figure 21

**Setting the Grain Flow Timer**

**IMPORTANT:** If the timer has not been set, the dyer will shut down when the level auger toggle switch is flipped from MANUAL TO AUTOMATIC.

1. Set the adjustable level auger delay, Figure 21, for time desired (0 to 3 minutes).
2. Set the Grain Flow Timer arrows at the bottom of the timer face to X10 (times ten) and to M (minutes). It may be necessary to remove the timer from its socket to make this adjustment. Now turn the timer control knob to 3 (3x10) or 30 minutes and flip the level auger switch to AUTOMATIC. The level auger will start after the 0 to 3 minute delay if the level auger light is on signaling for grain.
3. Check the level auger refill time a minimum of 6 times. The level auger light will come ON when the level auger switch in the hopper signals for grain and will go OUT when the hopper is full. The length of time that the level auger light is on is the refill time (including the 0 to 3 minute delay).
4. Average the 6 refill times and reset the Grain Flow Timer, Figure 21, to run 5 minutes longer. For example, if it takes the level auger an average of 5 minutes to refill the dryer, set the Grain Flow Timer to run 10 minutes.

**NOTE:** The timer does not operate when the level auger toggle switch is in the MANUAL or OFF position.

**Grain Flow Timer Operation**

With the Grain Flow Timer set to run 5 minutes longer than the level auger refilling time, the timer will work as follows:

1. The timer will start when the level auger starts. The red light on the face of the timer will be on and the timer will start to move to zero.
2. After the level auger refills the dryer and shuts off, the level auger light will go out and the timer will automatically reset. The red light on the face of the timer will be out.
3. If there is an insufficient grain supply, the level auger will continue to run beyond the 5 minute refilling period. When the level auger has run the length of time that the Grain Flow Timer has been set, the dryer will shut down.
4. The grain flow, high limit, control circuit ON, 115V power ON and the two red lights at the top of the Grain Flow Timer will be on. Flip the level auger switch OFF.

**NOTE:** When the Grain Flow Timer shuts the dryer down determine the problem.

**CAUTION:** Turn off and lock the electric power supply to the dryer before any service work is performed.

## Operation of the Discharge System

(See Figures 22 thru 26)

The unload (discharge) auger and metering rolls are used to unload grain from the dryer. The unload auger operates at a constant speed while the metering roll speed can vary depending upon the speed of the DC motor that drives the metering rolls.

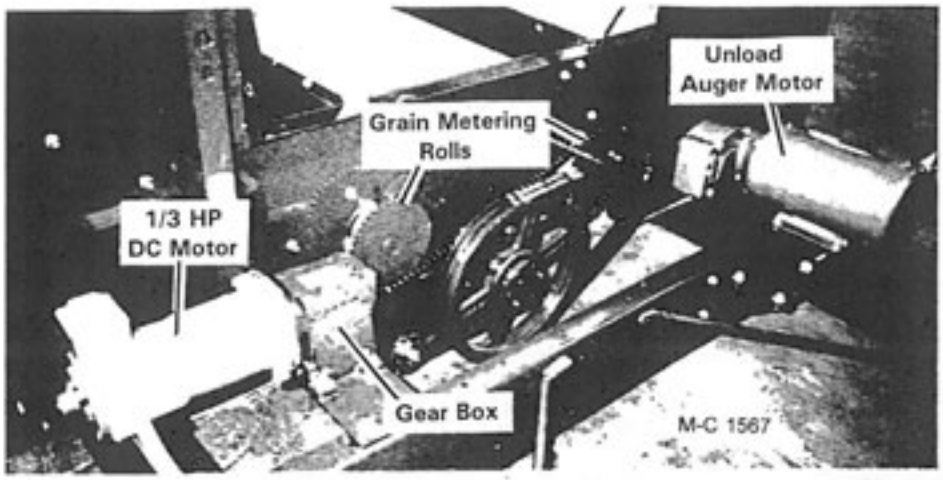



Figure 22

1. The discharge auger spring loaded toggle switch must be pushed up to the START position and released so that it will move to the ON position and start the auger before the metering roll switch is activated. This prevents the metering rolls from dumping grain onto a stopped discharge auger. If the electricity to the dryer is interrupted for any reason, the discharge auger toggle switch will lock out and must be pushed down to the OFF position and then back up to the START position to restart the discharge auger and metering rolls.

2. The grain metering rolls are driven by a 1/3HP direct current motor and gearbox. The speed of the motor when the metering roll switch is in MANUAL is controlled by a potentiometer (SCR drive speed control) located on the control door. The speed control dial is graduated from 0 (slow) to 10 (fast).

3. When the discharge metering roll switch is in the AUTOMATIC position, the automatic moisture control determines the speed of the 1/3HP DC drive motor and the discharge metering rolls in response to grain temperature changes.

4. A rear discharge overload door at the top rear of the discharge auger is provided in case the customer supplied grain take-away system fails. If such a failure occurs, the dryer will continue to discharge grain until the rear discharge overload door is raised by the excess grain.
   When the overload door raises, the unload switch opens, the dryer shuts down, and all of the indicator lights except the 115V POWER ON light will be out. The grain flow timer will automatically reset. When the problem has been corrected and the rear discharge overload door closes, the control circuit ON and high limit lights will be on. Flip the control circuit switch up to the start position and release it, the READY light will

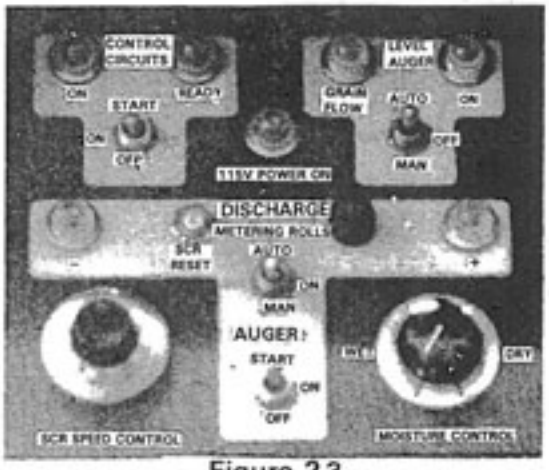



Figure 23

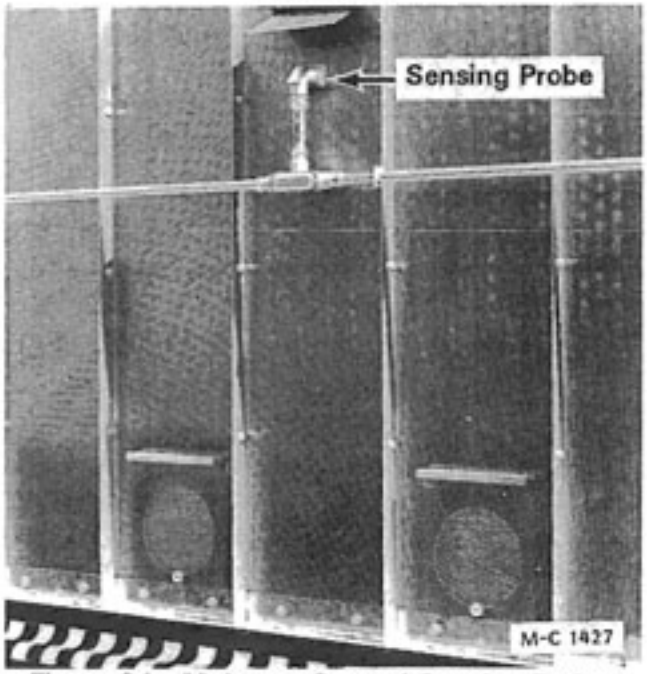



Figure 24 - Moisture Control Sensing Probe

be on. The level auger delay will also be activated if the level auger toggle switch is in the AUTOMATIC position and the level switch in the hopper is signaling for grain.

**CAUTION:** Do not allow anyone to be in the hopper as the level auger will start automatically.

Flip the ignition switches OFF and restart the fans, burners and discharge auger.

## Automatic Moisture Control System

There is a direct relationship between grain temperature and grain moisture and any change in grain temperature will mean a change in grain moisture. If the temperature of the grain goes down, the moisture content will have increased. If the temperature of the grain goes up, the moisture content will have gone down.

The automatic moisture control on M-C Dryers maintains uniform moisture content of the grain being discharged from the dryer by changing the unloading speed of the dryer.

The moisture control is sensing grain temperature and reacting to it by slowing down or speeding up the unload rate of the metering rolls.

## Drying Grain

1. Flip all of the toggle switches on the control panels to the OFF position.
2. Turn on the electric power supply to the dryer. The 115V POWER ON light will be on.
3. Flip the Control Circuit Switch ON. The control circuit ON light and high limit lights will be on.
4. Push the Control Circuit Switch up to the START position and release it. The READY light will be on. The level auger light will be on if the dryer is not full of grain.
5. Flip the Level Auger Switch to the MANUAL position. Set the Grain Flow Timer as explained under "Level Auger Operation" on page 24.
6. With the dryer full of grain, flip the Level Auger Switch to AUTOMATIC and start the bottom fan. When it comes up to speed, start the next fan.

**NOTE:** If the dryer is to be operated "Dry and Cool" it is suggested that the lower burner be started and run until the first load of grain is dry to avoid having to recycle the wet grain in the cooling section back to the heating section.

7. Start the burners in order from the bottom to the top.
8. Running on continuous heat, it will take approximately 6 minutes per point of moisture being removed to dry the first load.
9. When the first load is dry, push the Discharge Auger Spring Loaded Toggle Switch up to the START position and release it. It will move down to the ON position.
10. Flip the Discharge Metering Roll Switch to the MANUAL position. The SCR drive motor will start and the dryer will begin unloading grain.

    If the SCR drive motor does not start, push the SCR drive circuit breaker reset button in. See Figure 12.
11. The SCR Drive Speed Control Dial, Figure 12, is graduated from 0 (slow) to 10 (fast). Use the Grain Metering Roll Discharge Rate Chart, Figure 25, as a guide to set the SCR Drive Speed Control.
12. Test the moisture content of the grain being discharged every 15 minutes until it stabilizes. Use grain sampler on unload auger discharge housing. See Figure 26.
13. If the moisture content is too high after it stabilizes, turn the SCR Drive Speed Control down to a lower number to decrease the unloading speed. If it is too low, turn the speed control up to a higher number to increase the unloading speed. Avoid over adjusting. Make small changes in dial setting. Then wait (1) hour to allow dryer to react before making any further changes.

**Switching from Manual to Automatic**

1. Before placing the discharge metering roll switch into automatic position, the dryer must be operated in the MANUAL position. Set the manual SCR speed control to

**Start-Up SCR Manual Drive Speed Settings**

**NOTE:** These dial settings are not final and are based on normal drying temperature (see page 21). Exact settings will vary with outside temperatures, humidity, crop maturity, variety, cleanliness of grain, test weight, drying temperatures, etc. All values based on 70 volts as SCR maximum voltage. Under 0.5 setting of SCR dial, voltage to SCR motor may become inadequate to properly turn loaded feed rolls. Care should be taken when operating at these low speeds.

Sprocket Gear Ratios: †266:1, *180:1

| CROP AND DRYING MODE | | MOISTURE REMOVAL | SCR SETTING MODEL 370† | 570† | 670† | 690† | 970* |
|---|---|---|---|---|---|---|---|
| Corn | Dry & Cool | 20% - 15% | 4.2 | 3.6 | 3.6 | | 2.4 |
| Corn | Dry & Cool | 25% - 15% | 2.4 | 2.1 | 2.1 | | 1.5 |
| Corn | All Heat | 22% - 17.5% | 6.8 | 6.0 | 6.0 | 6.0 | 4.1 |
| Corn | All Heat | 25% - 17.5% | 4.4 | 4.4 | 4.4 | 4.4 | 2.7 |
| Wheat | Dry & Cool | 17% - 12% | 4.7 | 3.9 | 3.9 | | 2.5 |
| Sorghum | Dry & Cool | 20% - 15% | 4.2 | 3.5 | 3.5 | | 2.2 |

Figure 25

establish a discharge rate that will unload dry grain at the desired moisture content. See Figure 25. When the moisture content of the discharged grain has been consistent for two or more hours, it is time to switch up to AUTOMATIC.

2. While the discharge metering roll switch is in MANUAL, turn the moisture control dial to balance the Moisture Control to the point where both the (-) and (+) lights are off. At this point the Moisture Control is calibrated to the moisture content established in the MANUAL setting.

3. Now flip the metering roll switch up to the AUTOMATIC position.

   The manual SCR speed control is OFF and the discharge rate is being controlled by the Moisture Control board and the thermistor (sensing probe).

   The unloading speed on the discharge meter indicator should be the same as when the switch was in MANUAL, but the meter will begin to change automatically.

   When the moisture content of the incoming grain changes (wetter or drier), the discharge rate will change automatically. If the speed slows down because the incoming grain is wetter, the (-) light will come on and the discharge meter indicator will drop until the unload speed is automatically adjusted. When the adjustment is completed, the (-) light will go out and the discharge meter indicator and the unload speed will remain constant until another change is required.

   If the discharge speed increases because the incoming grain is drier, the (+) light will come on and the discharge meter indicator will move up until the unload speed is automatically adjusted. When the adjustment is completed, the (+) light will go out and the discharge meter indicator and the unload speed will remain constant until another change is required.

   The system will automatically change speed (+) or (-) to keep the discharge grain at the moisture content that was selected when the metering roll switch was in the MANUAL position.

## Moisture Control Setting and Adjustments When in Automatic

The discharge rate will change to keep moisture content the same as when in manual. However, if you want to change the discharge moisture content when operating in automatic, simply turn the moisture control dial up to a higher number for drier grain or down to a lower number for wetter grain. When you turn the dial either the (+) light or the (-) light will come on and you will see the discharge meter indicator change to reflect the change in speed.

## Cold Grain Shut-Down Timer

**(Starting with Serial Number 56052)**

This 0 to 60 minute timer is provided to limit the time that the dryer will discharge grain after the burner unexpectedly goes out (lack of fuel, etc.).

The timer is only activated when the Discharge Metering Roll Switch is in the automatic position and the Moisture Control System reduces the speed of the metering rolls. At this time one of the red lights on the face of the timer will be on and the timer will start to move to zero.

If the speed of the metering rolls is not increased before the time selected on the timer is reached, the dryer will be shut down and only the 115V power ON, control circuit ON, and high limit lights will be on.

Set the timer arrows at the bottom of the timer face to X10 (times ten) and to M (minutes). Now turn the time control knob to 3 (3x10) or 30 minutes for a starting point.

## End of Day Shutdown

1. To shut off the dryer, close the liquid propane gas supply valve at the tank or close the natural gas supply valve. Operate burner(s) until the flame goes out then turn off ignition switch(es).
2. Close gas main hand valve and liquid line flip valve on dryers equipped with liquid propane (LP) burner(s).
3. To make next day start-up much easier, be sure to set the Manual SCR Dial to match the reading on the discharge meter before placing the Metering Roll Switch into the OFF position from automatic.

   After at least one minute place the Discharge Auger and Level Auger Switches into the OFF position.
4. Operate fan(s) about 15 to 20 minutes to cool grain in dryer, then turn off fan and flip the Control Circuit Toggle Switch to the OFF position.
5. Turn off and lock the electric power supply to the dryer.

## Next Day Start-Up

1. Turn on electrical power to dryer, flip Control Circuit Switch up to START, place Level Auger Switch into AUTOMATIC, and start fan(s).
2. Open liquid propane gas supply valve at tank or natural gas supply valve and liquid line flip valve(s) on dryers equipped with liquid propane burner(s).
3. Open gas main hand valve ¼ of the way and flip the Burner Ignition Switch ON. After flame is established, slowly open burner gas hand valve all the way.
4. Heat grain for (5-10) minutes then place Discharge Auger Switch into ON position and Discharge Metering Roll Switch into MANUAL. Discharge Grain for (30) minutes then place Metering Roll Switch into AUTOMATIC. DO NOT RE-BALANCE THE MOISTURE CONTROL SYSTEM!

## Going Back to Manual

You can switch back to manual at any time. Just flip the metering roll switch down to the MANUAL position. At this time the Moisture Control will be off and the discharge metering roll speed will be controlled by the manual SCR drive speed control. The discharge meter dial will indicate the manual speed setting. If you want to unload at the same speed in manual as automatic, adjust the SCR drive speed control until the discharge meter indicator is at the same reading as in automatic.

When operating in manual the (+) and (-) lights may be lit. However, they are only indicating what would happen if you were in automatic based on the set point of the moisture control knob. When in manual you can balance the (+) and (-) lights. However, unless you go to the automatic position nothing will change. In the manual position the discharge rate can only be changed by adjusting the SCR speed control dial.

## Rear Discharge Overload Door

1. If the customer supplied grain take away system fails, the dryer will continue to discharge grain until the rear discharge overload door, Figure 26, is raised by the grain.
2. When the overload door raises, the dryer will shut down and all of the lights except the 115V.POWER ON light will be out. The Grain Flow Timer will automatically reset.
3. When the problem has been corrected and the rear discharge overload door closes, the control circuit ON and the high limit lights will be on. Flip the control circuit switch up to the start position and release it, the READY light will be on.
4. The level auger delay will be activated if the level auger switch is in the AUTOMATIC position and the level auger switch in the hopper is calling for grain.

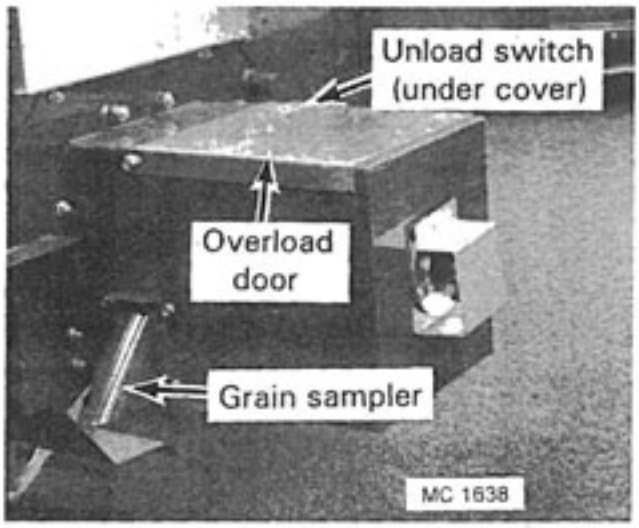



**Figure 26**

**CAUTION:** Do not allow anyone to be in the hopper as the level auger will start automatically.

5. Flip the ignition switches OFF and restart the fans, burners and discharge auger.

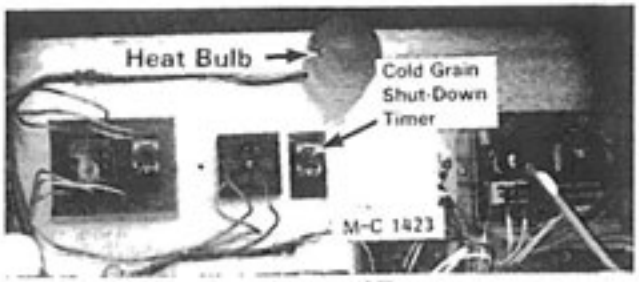



**Figure 27**

## Control Cabinet Heat Bulb

1. The heat bulb in the upper control cabinet, Figure 27, will always be on when the electric power supply to the dryer is on. It does not have an ON-OFF switch.
2. The bulb supplies heat to help keep the electrical components in the cabinet dry.

## Temporary Shut Down

1. Close the LP Gas supply valve at the tank or close the natural gas supply valve. Operate the burners until the flame goes out. Flip the ignition switches OFF.
2. Close the gas main hand valves (handles 90° to the piping).
3. **LP Gas** - Close the liquid line flip valve for each burner (handle down) and the hand valve at the LP Gas inlet hose.
4. Flip the discharge metering roll, level auger and discharge auger toggle switches OFF.
5. Run the fans approximately 20 minutes to cool the grain in the dryer, then turn them OFF. Flip the control circuit toggle switch OFF.
6. Turn off and lock the electric power supply to the dryer.

**NOTE:** Do not turn the 115V electric power supply off if the heat bulb in the control cabinet is to remain on.

## Restarts

**CAUTION:** If the outside temperature dropped below freezing (32°F) after the dryer was shut down, check to be sure that the grain in the lower part of the grain drying columns or in the metering rolls is not frozen. Frozen grain would prevent the dryer from unloading, which could possibly result in a fire.

If the grain is frozen, start burner to thaw out grain. Be careful not to run burner more than 5 to 10 minutes to avoid exposing dry grain to excessive heat and the chance of fire. Once grain is flowing evenly down columns, drying can begin again.

1. Flip all of the toggle switches on the control panel to the OFF position. Turn on the electric power supply to the dryer.
2. **LP Gas** - Open the tank supply valve, hand valve at the LP gas inlet hose and the liquid line flip valve for each burner.
3. **Natural Gas** - Open the gas supply valve.
4. Flip the control circuit switch ON. Then push it up to the START position and release it.
5. Start the bottom fan. When it comes up to speed, start the top fan.
6. Start the burners. Flip the level auger switch to AUTOMATIC.
7. Push the discharge auger spring loaded toggle switch up and release it. It will move down to the ON position.
8. Flip the discharge metering roll switch to the AUTOMATIC position to begin discharging grain.
9. The moisture control will automatically control the metering rolls to maintain the desired moisture content.

## Final Shut Down

When finishing a crop or at the end of the season all of the grain in the dryer must be dry before the dryer is completely unloaded.

1. When wet grain level is below sight glass, flip the discharge metering roll switch OFF.
2. Run the burners until all the grain is at the desired moisture content (approx. 5 minutes per point of moisture to be removed).
3. When the grain is dry, close the LP Gas supply valve at the tank or close the natural gas supply valve. Operate the burners until the flame goes out. Flip the ignition switches OFF.

4. Close the gas main hand valves (handle 90° to the piping).
5. **LP Gas** - Close the liquid line flip valve for each burner (handle down) and the hand valve at the LP Gas inlet hose.
6. Run the fans approximately 20 minutes to cool the grain in the dryer, then turn them off.
7. Flip the discharge metering roll toggle switch to the MANUAL position and start the discharge auger to unload all of the grain. When the dryer is empty, flip the discharge metering roll and discharge auger toggle switches OFF. Flip the control circuit toggle switch OFF.

**CAUTION:** Before continuing to the next step, turn off and lock the electric power supply to the dryer. Flip all of the circuit breakers in the bottom cabinet OFF and lock the control cabinet doors.

8. Clean out the unload auger and the grain metering rolls. Each unload auger pan is hinged on the left side and secured on the right side with two overcenter latches. Push the handle on the latches down to open the pans and pull them up overcenter to lock the pans.
9. Clean the fans, burners and heat chambers.

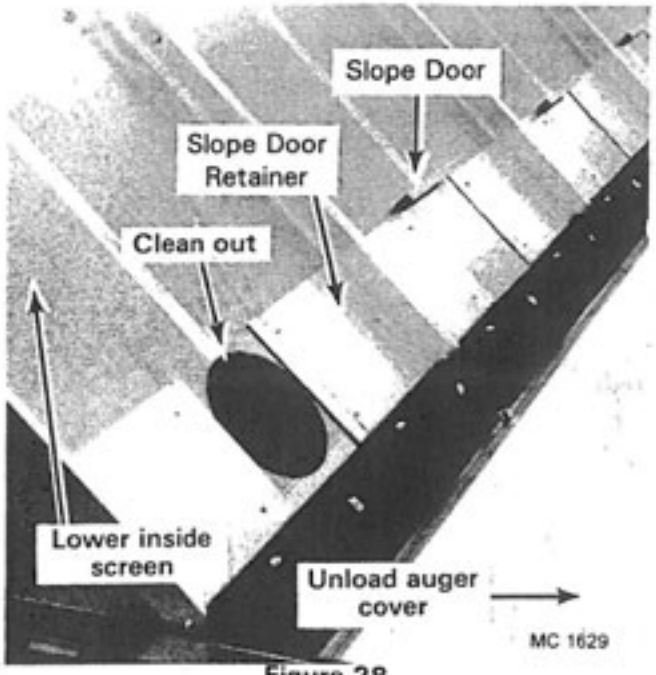


Figure 28

10. Clean all of the screens. If the dryer is equipped with a heat recovery system, remove and clean the bottom covers.
11. Lubricate all bearings with a hand grease gun, see "Lubrication". Do not over lubricate. Too much grease may damage the bearing seals. Lubricate the SCR drive chain and sprockets with engine oil.
12. Loosen the level auger and unload auger drive belts.

# MAINTENANCE

**CAUTION:** Do not allow children or bystanders near the dryer while it is being adjusted and/or serviced.

## Lubrication

**CAUTION:** To prevent accidental starting of the motors during lubrication, turn off and lock the electric power supply to the dryer. Flip all of the circuit breakers in the bottom cabinet OFF and lock the control cabinet doors.

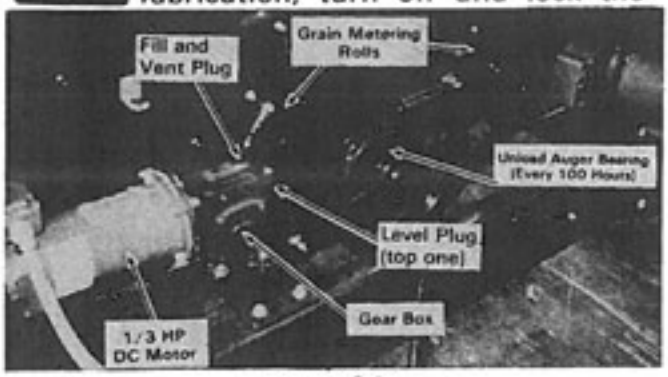


Figure 29

**NOTE:** Use a hand grease gun to lubricate bearings. Use a good grade of bearing grease and **do not** over lubricate. Too much grease may damage the bearing seals. Avoid getting grease on any of the belts.

Change the oil in the SCR drive gear box after the first two weeks of operation. Use Mobil SHC 634 oil or equivalent. Gear box capacity is ¾ pint. Also change the oil at the start of each drying season.

### Every 100 Hours

1. Lubricate the unloading auger front bearing and the front bearing on each grain metering roll, see Figure 29.

2. All other bearings used on the dryer are prelubricated and require no further lubrication.

### Periodically

1. Remove the oil level plug (top one) on the end of the SCR drive gear box, see Figure 29. The oil level should be even with the bottom of the hole. If not, remove the vent plug on top of the gear box and add Mobil SHC 634 oil or equivalent until it just runs out. Install the level and vent plug.
2. Oil SCR drive sprockets and chain with engine oil. Be careful not to get oil on the belts.

## Screens and Heat Recovery System

**NOTE:** Be sure to keep the inside screens and heat chambers as clean as possible to reduce the possibility of fire. Also, a clean dryer works better than a dirty one.

1. Check the exterior screens periodically and clean as necessary.
2. Clean the inside screens and heat chambers every 8 to 10 hours.
3. If the dryer is equipped with a heat recovery system, remove and clean the bottom covers.

**NOTE:** Under some drying conditions, the inside screens and heat recovery bottom covers may have to be cleaned more often.

## Belt Adjustment

### General

1. After approximately 24 hours of operation the belts will seat themselves in the pulley grooves and the tension may have to be readjusted. If the belts squeal when the motor starts they are not tight enough.
2. Never apply belt dressing as this will damage the belt and cause early belt failure.

### Discharge Auger

1. Loosen the unload auger motor mounting locknuts. Turn the locknut on the "J" bolt to adjust tension.

### Level Auger

1. Adjust the belt tension by loosening the locknuts and raising the motor mount plate evenly with the four adjusting nuts, then tighten the locknuts, see Figure 30

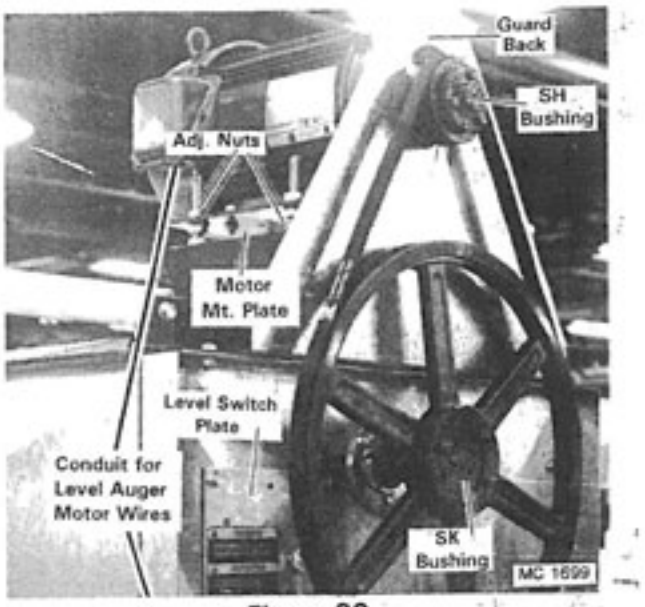



Figure 30

## Pre-Season Check

All of the following tests and adjustments can be made when the dryer is empty. The air pressure switch, modulating valve and vaporizer coil (LP Gas) adjustments can only be made when the dryer is full of grain.These adjustments are covered under "Initial Start-Up Instructions" on page 20.

**CAUTION:** The gas and electric power supply to the dryer **MUST** be off when performing steps 1 thru 7. Flip all of the circuit breakers in the bottom cabinet OFF. Lock the main electric supply to the dryer so that the power cannot be accidently turned on.

### General

1. Lubricate all bearings, chains and sprockets. Check the oil level in the SCR drive gear box. Refer to "Lubrication" on page 31.
2. Check and adjust the unload and level auger belts. Refer to "Belt Adjustment".
3. Tighten all electrical connections in the bottom control cabinet. Check the ground connection in the cabinet to be sure it is clean and tight. Also check the ground connection from the dryer base to the grounding rod.
4. Clean out the unload auger and grain metering rolls. Each unload auger pan is hinged on the left side and secured on the right side with two overcenter latches. Push the handle on the latches down to open the pans and pull them up overcenter to lock the pans.

5. Clean all of the screens, fans, burners and heat chambers. Remove and clean heat recovery system bottom covers (if equipped)

6. Remove the air pressure switches and clean the tube and filter, see Figure 32. Be sure the vent hole in the bottom of the air pressure switch body is open, see Figure 32A.

7. **LP Gas** - Remove the plug at the end of each strainer, see Figure 33 and 34. Remove and clean the screen in each strainer. Check flexible LP hoses for signs of fatigue, replace as necessary.

### Level Auger and Discharge System

1. Flip all of the toggle switches on the control panel to the OFF position. Flip all of the circuit breakers in the bottom cabinet ON. Turn the electric power supply to the dryer ON.

2. Flip the control circuit toggle switch ON. Then push it up to the start position and release it. The READY light will be on.

3. Check the level auger. Flip the level auger toggle switch to the MANUAL position. The level auger will start immediately.

4. Push the discharge auger toggle switch up and release it. The discharge auger will start.

5. Flip the discharge metering roll toggle switch to the MANUAL position. The SCR drive motor will start, then turn the SCR speed control to change speed.

6. Check the SCR motor maximum speed by moving the Speed Control Dial to ten (10) and read voltage between the (2) terminals on the back of the Discharge Meter.

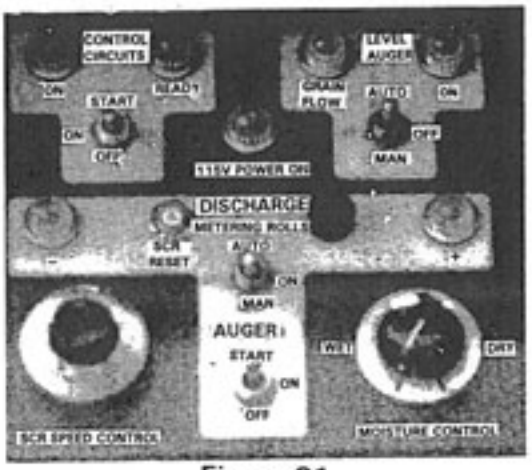



Figure 31

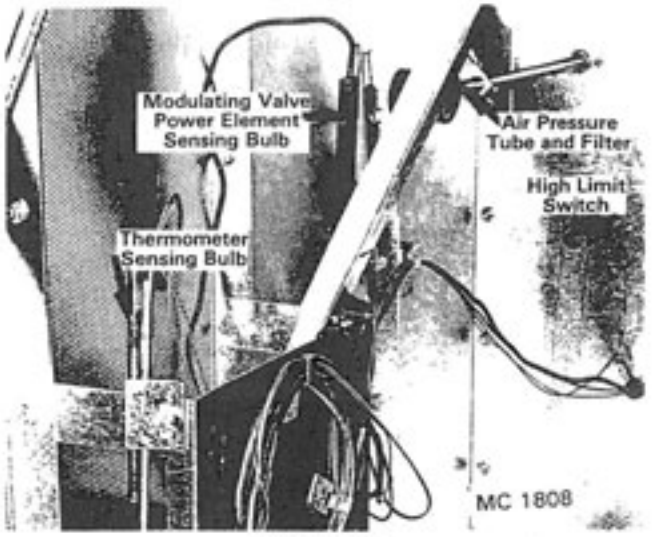



Figure 32

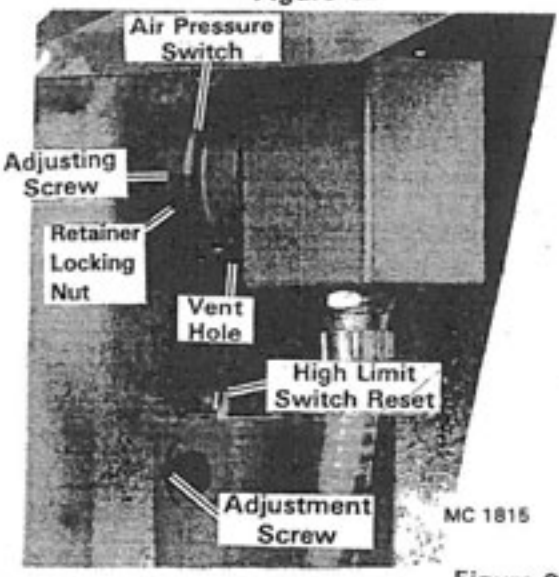
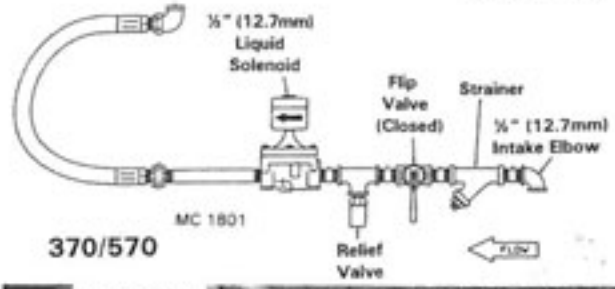



Figure 32A



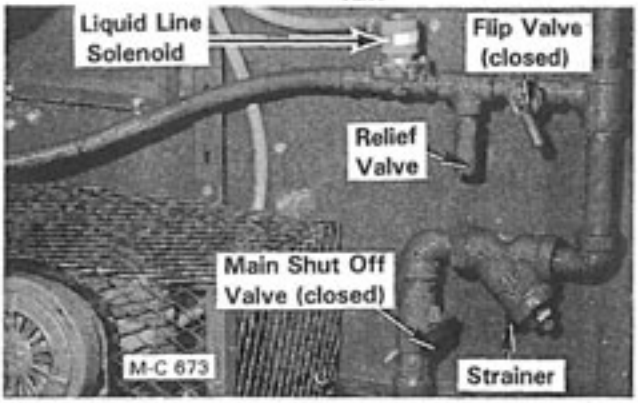




Figure 33 - LP Gas Intake Manifolds 670/690/970

**NOTE:** To perform the balance of the discharge system, check the outside air temperature, it must be above 50°F (10°C).

7. Set the SCR speed control to mid-range and lock in place. Turn the moisture control to balance the lights.
8. Flip the discharge metering roll switch to AUTOMATIC. The SCR drive motor will run at the speed selected in step 7.
9. Turn the moisture control balance up until (-) light goes on. The SCR motor speed will decrease.
10. Turn the moisture control balance down until the (+) light goes on. The SCR motor will increase.

**Fan(s) and Burner(s)**

1. Turn off the electric power supply to the dryer. Flip all of the toggle switches on the control panel(s) to the OFF position.
2. Close the burner gas hand valve for each burner (handle 90° to piping), see Figure 35.
3. To test burner(s) without grain in dryer, place a jumper wire between terminal (4) of the fan motor Start Button and the middle terminal of the Ignition Switch. Both of these switches are located on the Center Control Cabinet Door. This jumper wire will by-pass the air pressure switch.
4. **LP Gas** - Open the supply valve at the tank, the hand valve at the LP Gas inlet hose and open (lift up) the liquid line flip valve on each burner, see Figure 33.

   **Natural Gas** - Open the supply valve.

**CAUTION:** This is only a temporary procedure for checking the burner. When drying grain, **NEVER** operate the dryer with the air pressure switches disconnected or by-passed. This safety air pressure switch is for your protection and the protection of the dryer.

5. Turn on the electric power supply to the dryer. Flip the control circuit toggle switch ON. The control circuit ON light and high limit lights will be on. If any high limit light is not on, push the reset button on the high limit switch, see Figure 32A.
6. Push the control circuit toggle switch up to the start position and release it. The READY and LEVEL AUGER lights will be on.

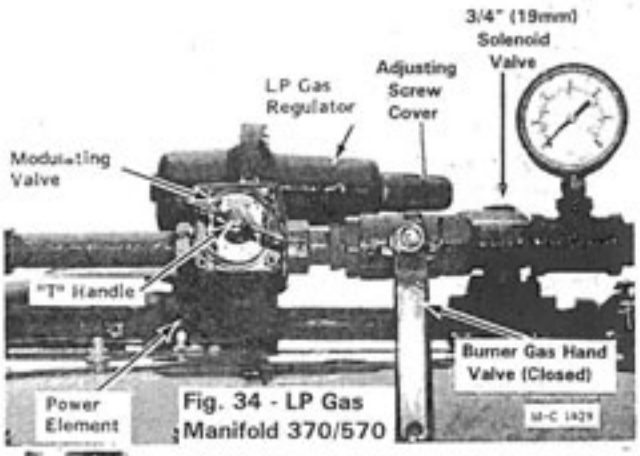


Fig. 34 - LP Gas Manifold 370/570

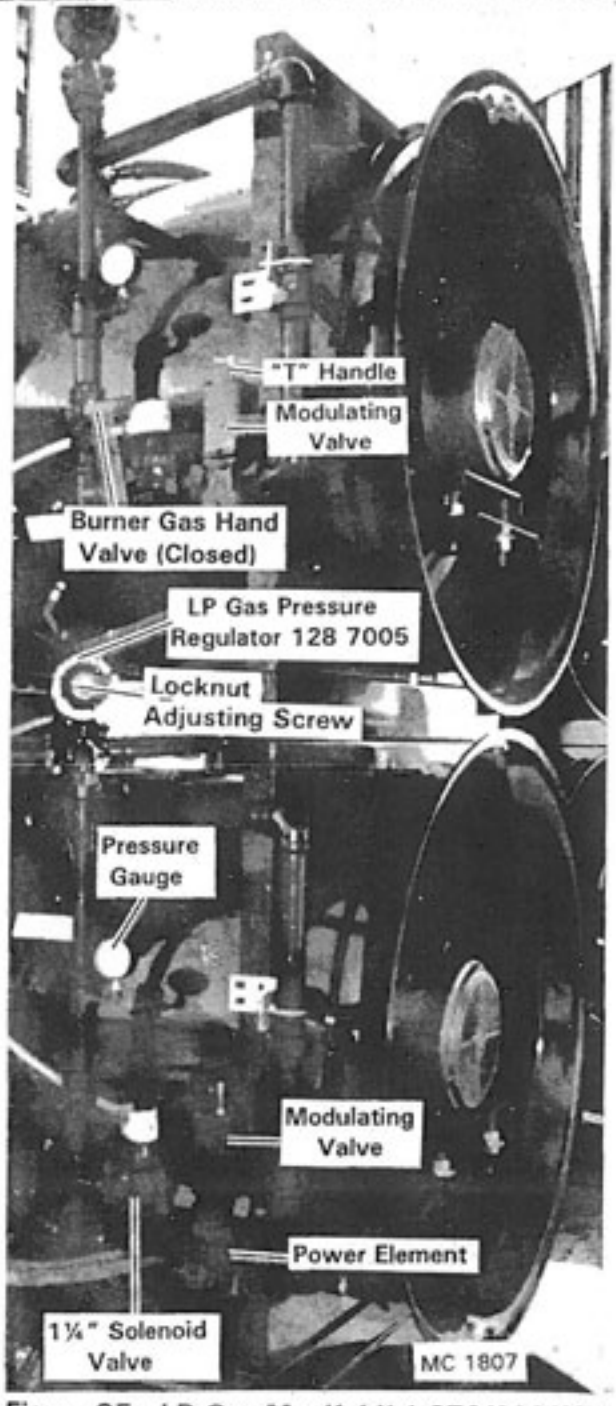


Figure 35 - LP Gas Manifold(s) 670/690/970

7. Start burner fan, the air pressure light will be ON. When the fan comes up to speed, open the burner gas hand valve ¼ of the way. Flip the ignition switch ON. After a (15) second delay the gas valve light will be ON and the burner will light.

8. If after several attempts for ignition the burner fails to light, turn off fan, electric power supply to dryer, fan motor circuit breaker, and close the burner gas hand valve (handle 90° to piping). Flip all control panel toggle switches to the OFF position. Check for broken or loose wires, corroded connections, and incorrect wire connections. Check ignition switch with voltage tester.

9. Now check 115V power to Ignition Board. Connect a voltmeter between terminal L1 and L2 on ignition board. Turn on electric power supply to dryer. Be sure fan #1 circuit breaker is still off and jumper wire is still in place between terminal #4 of the fan #1 Start Button and middle terminal of the Ignition Switch. Now flip the control circuit toggle switch ON, then push it up to the START position and release. Push the fan start button and air pressure bulb will light. Flip the ignition switch ON and after the (15) second delay the voltmeter should read 115V. If not, place ignition switch in OFF position and turn off electric power to dryer. Now check for loose or broken wires from ignition switch to ignition board.

   If there is 115V between terminal L1 and L2, check for 115V at terminal V1 on the ignition board. Flip Ignition Switch down to the OFF position. Connect a voltmeter between terminal V1 and V2 on the ignition board. Flip the ignition switch up to ON and after (15) second delay the voltmeter should read 115V. If not, the ignition board is defective and must be replaced.

**NOTE:** The voltmeter will show a reading during the "trial ignition" period only (5 seconds). To check again, flip the ignition switch OFF then ON. The (5) second "trial ignition" period starts after the (15) second delay.

If there is 115V at terminal V1, check to be sure that both solenoid valves are working. Two (2) persons will be required to make this test of the solenoid valves: (1) to operate the ignition switch and the other to be at the valves as there is only (5) seconds to check the solenoid valves.

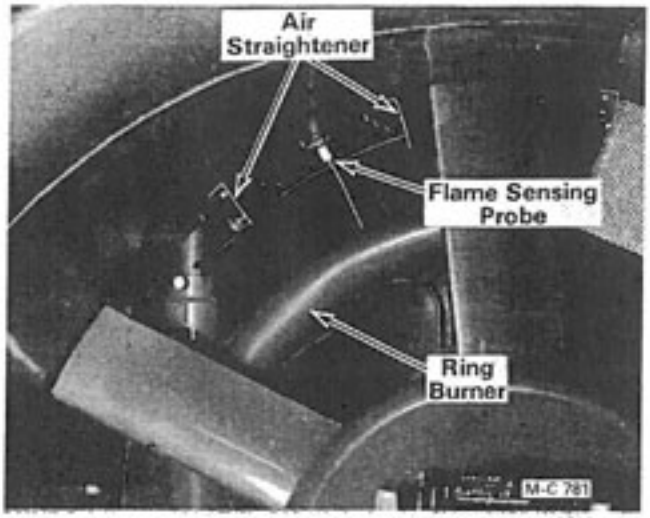



**Figure 36 - Lower Burner #1 (670 & 970)**

Liquid propane burners have a ½" (12.7mm.) liquid line solenoid on the left front side of the dryer and a 370 or 570 has a vapor solenoid on the top of the fan housing. A 690, 670, or 970 has (1) 1¼" (31.75mm.) vapor solenoid per burner on the right front side of the dryer. See Figures 33, 34, and 35. Natural gas burners have (2) 1¼" (31.75mm.) vapor solenoids per burner.

To check solenoid valves, remove red cap on top of solenoid valve and hold a screwdriver near coil and flip the ignition switch up to ON. If coil is working, a magnetic attraction will be felt after (15) second delay. You will also hear a click when the coil energizes. On liquid propane (LP) burners check the ½" (12.7mm.) liquid line first, then either the ¾" (19mm) 370/570 or the 1¼" (31.75mm.) 670/690/970 vapor solenoid. If no click is heard or there is no magnetic attraction of the screwdriver, the solenoid coil will have to be replaced. If the solenoid coils are being energized, assume for the moment gas is being allowed to enter the vaporizer and burner. Turn off power supply to dryer.

**CAUTION:** Before working on electrode, be sure to ground high tension coil (E1 terminal) on ignition board to eliminate any charge that may remain in coil. Be sure to read description of Direct Spark Ignition System on page 38 and check Figures 37 and 38.

Now check the electrode by removing Electrode Mount Seal (Plate) with Electrode Assembly from fan orifice by unscrewing the (4) ¼" (6.35mm.) self-tapping screws from orifice. Examine electrode for cracks and correct gap ⅛" (3.2mm.). If cracked, replace. At this time also check the thick ignition wire from E1 to the electrode for continuity making sure there are no breaks.

Now check electrode for spark. Be sure burner gas hand valve is still closed, fan #1 motor circuit breaker is in OFF position, jumper wire between terminal #4 of fan #1 Start Button and the middle terminal of the Ignition Switch is still connected, and the Ignition Switch is in the OFF position. Turn on power to the dryer. Hold Electrode Mount Seal (Plate) with Insulated Pliers to avoid any possibility of electrical shock from electrode during test. Flip control circuit toggle switch up to ON, then push it up to the START position and release. Push fan #1 Start Button and air pressure bulb will light. Flip ignition switch up to ON and after the (15) second delay, observe the electrode during the "trial ignition" period of (5) seconds.

If there is no spark, flip ignition switch OFF then ON for another "trial ignition" period. If there is still no spark, the ignition board will have to be replaced. Flip ignition switch down to the OFF position and turn off electric power to dryer.

If there is a good spark, turn off ignition switch and power to the dryer and replace Electrode Mount Seal (Plate) with Electrode onto fan orifice and secure with ¼" (6.35mm.) screws.

Now place fan #1 motor circuit breaker into ON position, make sure jumper wire is still connected, and turn on power supply to dryer. Flip the control circuit toggle switch up to ON, then up to START and release. Push fan #1 start button and air pressure bulb will light. Flip ignition switch up to ON and after the (15) second delay, the gas valve light will be on and the burner will ignite.

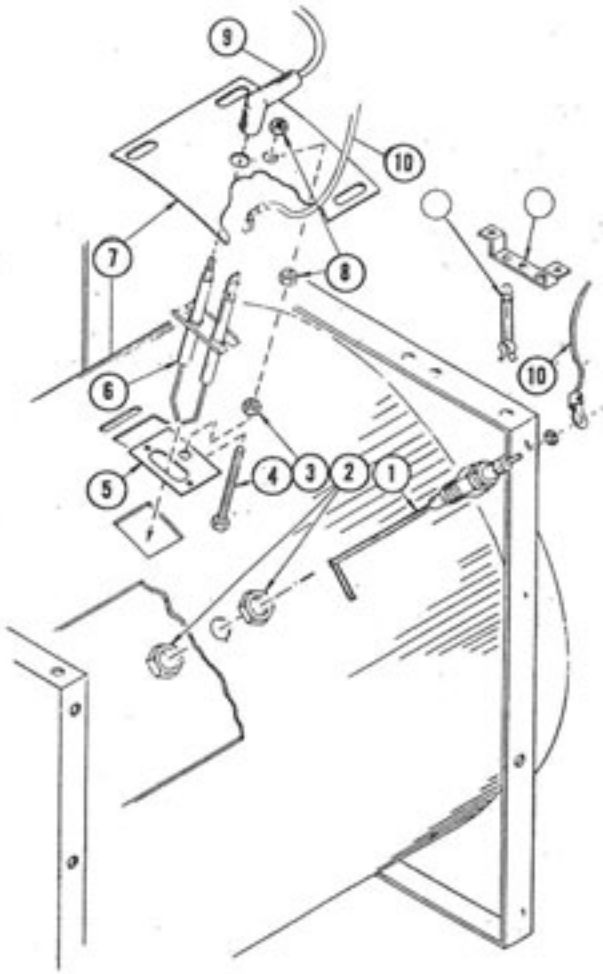



**Figure 37** Electrode and Flame Sensing Probe

NOTE: Quantities shown are for one burner.

| Ref. | Part No. | Qty. | Description |
|---|---|---|---|
| 1 | 124 6872 | 1 | Flame Sensing Probe |
| 2 | 121 6915 | 2 | Locknut - ½" |
| 3 | 000 8162 | 1 | ⅜ - 16 Hex Nut |
| 4 | 000 8227 | 1 | ⅜ - 16 x 2¼" Capscrew - Full Thread |
| 5 | 128 2746 | 1 | Electrode Mt. Plate |
| 6 | 128 6995 | 1 | Style 2 Electrode |
| | 000 8186 | 2 | 6 - 32 x ½" Machine Screw |
| | 000 8245 | 2 | No. 6 Lockwasher |
| | 000 8185 | 2 | 6 - 32 Flanged Locknut |
| 7 | 128 2747 | 1 | Electrode Mt. Seal |
| | 001 8104 | 4 | ¼ - 20 x ½" Self Tapping Screw |
| 8 | 000 8168 | 2 | ⅜ - 16 Flanged Locknut |
| 9 | 122 9003 | 1 | Ignition Wire Ass'y |
| 10 | 124 1079 | 2 | Low Voltage Wire Ass'y |

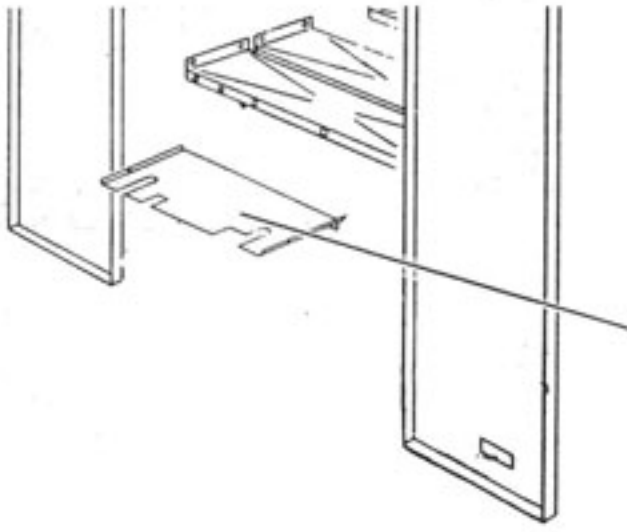
After burner #1 ignites, allow burner to operate for about (2) minutes, then close 1" (25.4mm.) inlet valve (LP only), or burner gas hand valve on natural gas burners. Operate fan until burner goes out, then close ½" (12.7mm.) liquid line flip valve, and burner gas hand valve on (LP) burners. Place ignition switch down into OFF position.

**CAUTION:** Be sure to remove the jumper wire between #4 terminal of fan #1 Start Button and middle terminal of Ignition Switch #1.

10. Now check upper burner #2 using the same procedure outlined in steps (1) thru (7) under Fans and Burners on pages 27 and 28. Let burner #2 operate for at least (2) minutes, then close supply tank valve if liquid propane burner, or main gas supply valve if natural gas burner. Operate fan #2 until burner goes out, then close liquid propane (LP) supply tank valve, or main natural gas supply valve. Operate fan #2 until burner goes out, then close 1" (25.4mm.) inlet valve, ½" (12.7mm.) liquid line flip valve (LP only), and 1¼" (31.75mm.) main gas hand valve (either fuel). Place all control panel switches into the OFF position.

**CAUTION:** Be sure to remove the jumper wire between #4 terminal of fan #2 Start Button and middle terminal of Ignition Switch #2.

11. After fan(s) and burner(s) have been checked, be sure that the gas supply to dryer is off, the electric power supply is off and locked, and the control cabinet doors are locked.



## 370 and 570 Unit Burner Burner and Floor Configurations

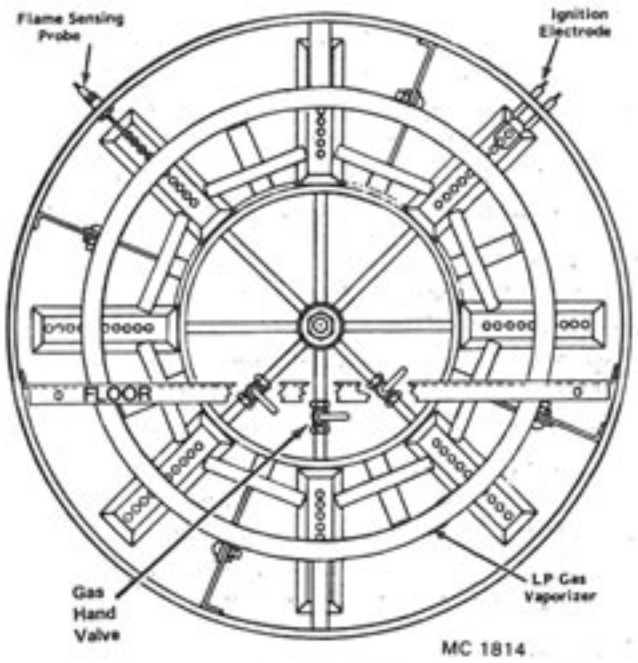



**Figure 37 - 370 & 570 Unit Burner - Inside View**

### Dry and Cool Operation

1. Close hand gas valves on the (3) burner lead tubes that supply gas to the (3) lower burners.
2. Install burner unit floor panel #1242846 to divide fan housing.
3. Install heat chamber door #1211113 in floor. Model 570 has (2).

### All Heat Operation

1. Open the hand gas valves on the (3) burner lead tubes that supply gas to the (3) lower burners.
2. Remove burner unit floor panel #1242846 that divides fan housing.
3. Remove heat chamber door #1211113 from floor. Model 570 has (2).

## Direct Spark Ignition System

### Operation

The direct spark ignition system consists of an electronic ignition board, an ignition electrode and flame sensing probe. See Figure 38. For ignition to occur, the dryer must be running and the High Limit and Air Pressure lights on the control panel must be on.

The dryer is wired so that the current flow from the control cabinet goes to the High Limit Switch, Fan Start and Stop Buttons, Fan Magnetic Starter, Air Pressure Switch, Ignition Switch, and the (15) Second Delay that is built into the Ignition Board. These safety features prevent ignition if the heat chamber temperature is too high or there is insufficient air flow, and allows for a (15) second air purge of any unburned gas that may remain in the heat chamber after burner shutdown.

When the ignition switch is flipped up to ON, the ignition board is energized (after the 15 second built-in delay) and generates a high voltage spark between the tips of the electrode and opens the gas solenoid valves at the same time. The gas valve light on the control panel will be on.

The electrode provides the spark for ignition and the flame sensing probe senses the presence of the flame. See Figure 38. A small amount of electrical current passes from the flame sensing probe to the flame completing the electrical circuit. If the flame is not present, the circuit will be broken and the ignition system will "lock out."

The ignition board is electronically timed so that when the ignition switch is flipped ON, the electrode will continue to spark and the gas solenoid valves will be held open for a "trial ignition" period (about 4.7 seconds) -- after the (15) second delay.

When ignition occurs and a flame is present, the ignition system will continue to operate (spark shuts off). If ignition fails, flame is not present, and the ignition system will "lock out" (after the 4.7 second trial period) closing the gas solenoid valves. The gas valve light on the control panel will be out. Flip the ignition switch OFF, then ON for another "trial ignition" period. See Figure 17.

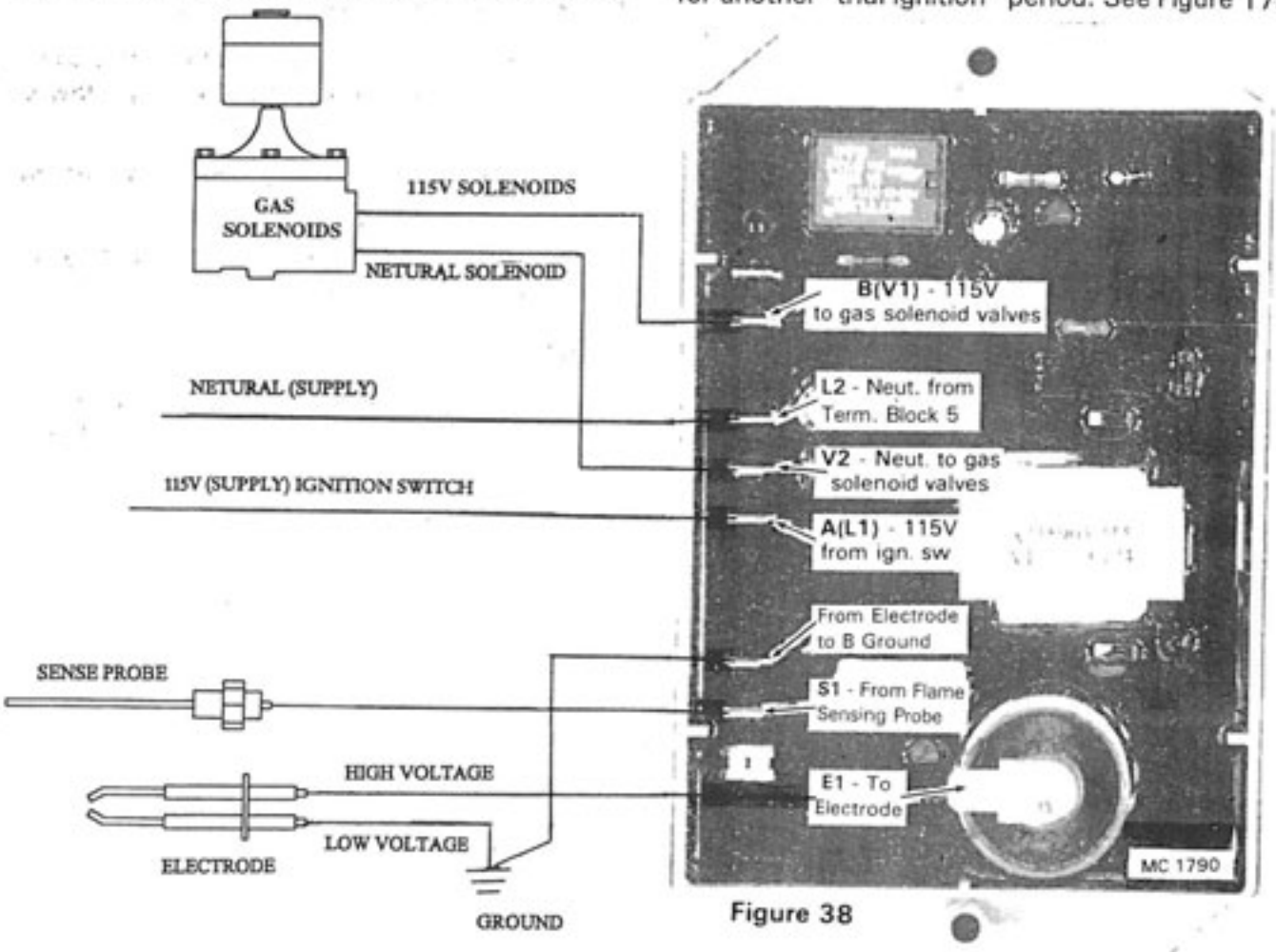



Figure 38

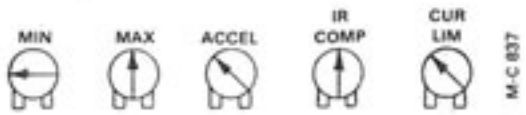



Figure 41 - Approximate Trim Pot Settings

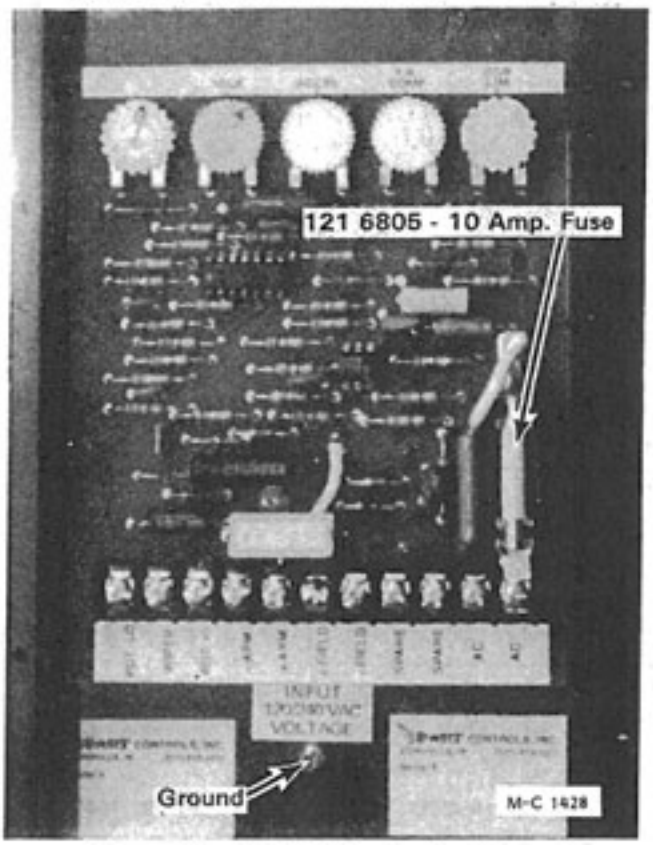



Figure 42 - SCR Drive Control Board

### Description

The metering rolls are driven by a 1/3HP variable speed permanent magnet DC motor and reduction gear box. The RPM range of the metering rolls is ½ to 10.

The speed of the motor is directly proportional to the amount of DC voltage supplied to it. When voltage increases speed increases and when voltage decreases speed decreases.

The SCR control board converts incoming AC current to DC current and controls the amount of DC voltage going to the motor.The SCR speed control regulates the amount of DC voltage the SCR control board supplies to the motor.

When the discharge metering roll switch is in the AUTOMATIC position, the moisture control controls the SCR board.

### SCR Board Terminal Strip Connections

| | |
|---|---|
| POT LO - | NOT USED |
| WIPER - | Connects to (+) of Moisture Control Board. |
| POT HI - | NOT USED |
| + ARM - | Connects to motor armature wires 0-90 volts DC. MUST NOT BE SWITCHED OR BROKEN WHILE POWER IS ON or serious damage to SCR board may result. |
| - ARM - | Connects to motor armature wires. Reverse + and - motor leads to reverse motor rotation. MUST NOT BE SWITCHED OR BROKEN WHILE POWER IS ON or serious damage to SCR board may result. |
| + FIELD - | NOT USED |
| - FIELD - | Connects to (-) of Moisture Control Board. |
| SPARE - | NOT USED |
| SPARE - | NOT USED |
| AC LINE - | Connect hot wire 115 volt AC. |
| AC LINE - | Connect neutral wire (white). |

# SCR Board Trim Pot Adjustment Procedure

**NOTE:** Figure 41 shows approximate trim pot settings. Follow adjustment procedure below for final calibration.

| Trim Pot | Function | Adjustment |
|---|---|---|
| **MIN.** | **(Starting with S/N 56052)** The Dart SCR Board minimum speed trim pot is non-functional. The minimum speed is now fixed by the M-C Moisture Control Board for both the auto and manual mode. | 1. TURN DRIVE POWER OFF!<br>2. Connect DC Voltmeter + to + ARM, - to - ARM.<br>3. Set meter voltage range: (90 VDC).<br>4. Turn power ON.<br>5. Set SPEED CONTROL to zero (Fully CCW).<br>6. Rotate MIN Pot CW until desired MIN speed is reached (7.5 volts DC or 100 RPM). Min Pot now located on Moisture Control Board.<br><br>None. |
| **MAX.** | Sets Maximum Motor Speed when Speed Control is set at maximum (10) 100% rotation CW. CW rotation of MAX trim pot increases maximum motor speed. | 1. TURN DRIVE POWER OFF!<br>2. Connect DC Voltmeter + to + ARM, - to - ARM.<br>3. Set meter voltage range: (90 VDC).<br>4. Turn power on. Set SPEED control at 100% (10).<br>5. Adjust MAX pot to rated motor armature voltage as shown on meter (70 volts DC).<br>**NOTE:** A tachometer or strobe may be used in lieu of a meter. Follow above steps, except adjust MAX pot to rated motor speed (1750 RPM). |
| **ACCEL** | Allows Adjustment of Acceleration | 1. CW rotation increases time of acceleration (.5 to 8 seconds). |
| **IR COMP** | Calibrates speed regulation – % speed change from no load to full load at adjusted speed. | 1. Set SPEED control at 50% (5).<br>2. Turn IR COMP pot CW until motor begins to hunt.<br>3. Turn IR COMP CCW until hunting stops.<br>4. Set IR COMP pot 1/3 of the span between where motor hunting stopped and fully CCW position. NOTE: For more precise calibration, a tachometer or strobe may be substituted for the above. |
| **CUR. LIM** | Limits DC motor armature current (torque) to prevent damage to the motor or SCR board. The current limit is set for the rated motor current. CW rotation of this trim pot increases the armature current (or torque produced). | 1. TURN DRIVE POWER OFF!<br>2. Connect a DC Ammeter between A1 on motor and + ARM on SCR board. This is in series with motor.<br>3. Turn power on.<br>4. Set SPEED control at 50% (5).<br>5. Apply friction braking to the motor shaft until motor stalls (zero RPM).<br>6. While motor is stalled, set current at 125% of rated motor armature current on the nameplate 4.4 amps (3.5 amps x 125%) by adjusting the CUR LIM pot. Remove ammeter after calibration. |

**CAUTION:** To avoid electrical shock that could result in personal injury or possible death, always use properly insulated tools when checking electrical components and circuits. **NEVER** check circuit continuity by shorting terminals with a screwdriver or other metal devices.

## SCR Drive Motor Does Not Run (Metering roll switch in MANUAL position)

| Problem | Possible Cause | Remedy |
|---|---|---|
| A. No 115 volt AC input between "AC Line" terminals on SCR board. | 1. Discharge auger not running. | 1. Start discharge auger. |
| | 2. SCR 8 amp. circuit breaker tripped. | 2. Reset. |
| | 3. Defective or dirty discharge relay. | 3. Clean or replace if necessary. |
| | 4. Loose wire or defective switch(es). | 4. Trace power flow. See discharge circuit schematic at back of this manual. |
| B. No DC voltage output between "Arm + and Arm -" terminals on SCR board. | 1. SCR board 10 amp. fuse blown. | 1. Replace. |
| | 2. Minimum motor speed set incorrectly. | 2. See "Trim Pot Adjustment" on page 40 |
| | 3. Defective speed control. | 3. Replace. |
| | 4. Defective SCR board. | 4. Replace. |
| C. Have 115 volt AC input between "AC Line" terminals and output of 6 to 70 volts DC between "Arm + and Arm -" terminals. | 1. Overload condition. | 1. Check metering rolls and gear box for binding. |
| | 2. Current limit set incorrectly. | 2. See "Trim Pot Adjustment" on page 40. |
| | 3. Maximum motor speed set incorrectly. | 3. See "Trim Pot Adjustment" on page 40. |
| | 4. Worn or improperly seated motor brushes. | 4. Replace or adjust. |
| | 5. Moisture or dirt accumulation in motor. | 5. Disassemble and dry or clean. |
| | 6. Defective motor. | 6. Replace. |

## SCR Drive Motor Does Not Run (Metering roll switch in AUTOMATIC position)

Note: Operation of the moisture control is explained on page 27.

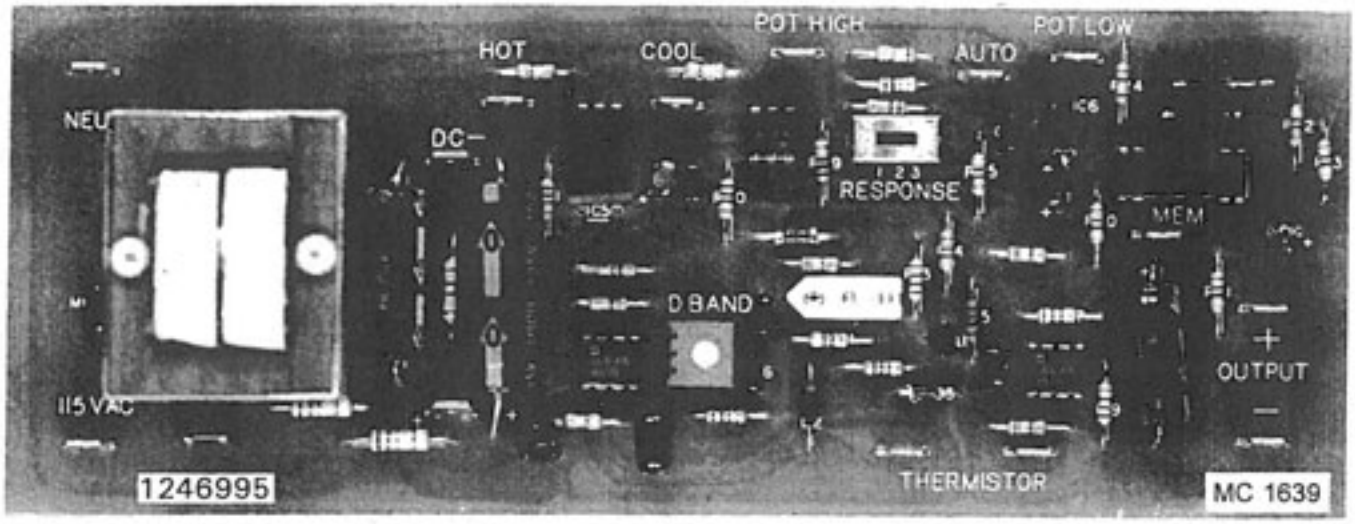
| Problem | Possible Cause | Remedy |
|---|---|---|
| A. Motor operates normally when metering roll switch is in the MANUAL position, but not in the AUTOMATIC position. | 1. Moisture control set too high. | 1. Adjust set point. |
| | 2. Grain temperature not high enough to allow discharge. | 2. Allow time. |

| Problem | Possible Cause | Remedy |
|---|---|---|
| | 3. Wet grain slug covering temperature probe. | 3. Operate in MANUAL for several minutes to clear area. |
| | 4. Loose wire or defective switch(es). | 4. Trace power flow. See discharge circuit schematic at back of this manual. |
| | 5. Defective Moisture Control System. | 5. Replace. |

## SCR Drive Motor Runs Erratically (Metering roll switch in MANUAL position)

| Problem | Possible Cause | Remedy |
|---|---|---|
| A. Motor speed fluctuates. | 1. Loose connection from speed control potentiometer. | 1. Trace power flow. See discharge circuit schematic at back of this manual. |
| | 2. Defective speed control potentiometer. | 2. Replace potentiometer. |
| | 3. Motor is at current limit. | 3. See "Trim Pot Adjustment" on page 40. |
| | 4. Too much "IR" compensation. | 4. See "Trim Pot Adjustment" on page 40. |
| B. Speed control does not regulate motor speed. | 1. Loose connection from speed control potentiometer. | 1. Trace power flow. See discharge circuit schematic at back of this manual. |
| | 2. Defective speed control potentiometer. | 2. Replace. |
| | 3. Minimum and maximum speed set incorrectly. | 3. See "Trim Pot Adjustment" on page 40. |
| | 4. Defective SCR board. | 4. Replace. |
| C. Motor runs backwards. | 1. Motor leads reversed. | 1. Switch leads. |
| D. Repeated blowing of SCR board 10 amp. fuse. | 1. Low input voltage between "AC Line" terminals on SCR board. | 1. Check - should be above 110 volts AC. |
| | 2. Current limit set too high. | 2. See "Trim Pot Adjustment" on page 40. |
| | 3. Motor shorted. | 3. Replace or repair. Check for moisture in motor. |
| | 4. Worn motor brushes. | 4. Replace. |
| | 5. Defective motor bearings. | 5. Replace. |
| | 6. Defective SCR board. | 6. Replace. |

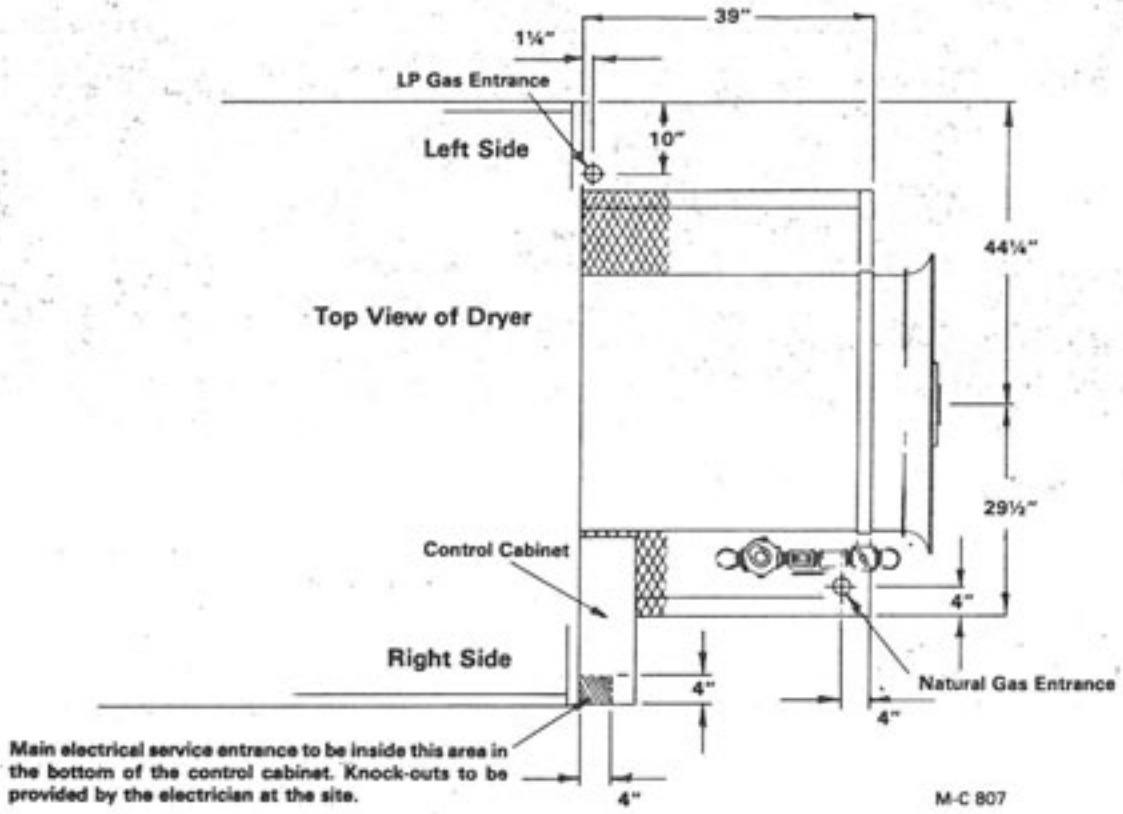
Continued on next page




## M-C MOISTURE CONTROL SYSTEM

| Problem | Corrective Action |
|---|---|
| A. Plus (+) and minus (-) lights will not go off when calibrating Moisture Control System. | 1. Adjust the deadband trip pot on Moisture Control System board (R-7) until both lights stay off when turning moisture control dial two spaces on the scale. |
| B. Metering rolls will not run. | 1. Discharge auger starter interlock bad.<br>2. Discharge auger not started.<br>3. Moisture Control System amp fuse is blown.<br>4. Moisture Control System board inoperative. Check output voltage at (+) and (-) terminals on Moisture Control System board. Voltage should be approximately 3 to 11 volts DC depending on the SCR speed control potentiometer setting in manual or moisture control setting in automatic. If no voltage, consult factory. |
| C. Moisture Control System does not control grain moisture. | 1. Moisture Control System MANUAL OFF-AUTO switch not in AUTO position.<br>2. Bad thermistor. Check response with ohmmeter.<br>Thermistor Temp. — Thermistor Resistance<br>30°F — 29,000 OHMS<br>40°F — 23,000 "<br>50°F — 18,000 "<br>60°F — 14,500 "<br>70°F — 11,000 "<br>110°F — 5,200 "<br>120°F — 4,200 "<br>130°F — 3,600 "<br>140°F — 3,000 "<br>150°F — 2,500 "<br>160°F — 2,100 "<br>3. Bad Moisture Control System board.<br>4. Bad moisture control potentiometer. Check potentiometer with ohmmeter.<br>5. Burner temperature not holding steady. |

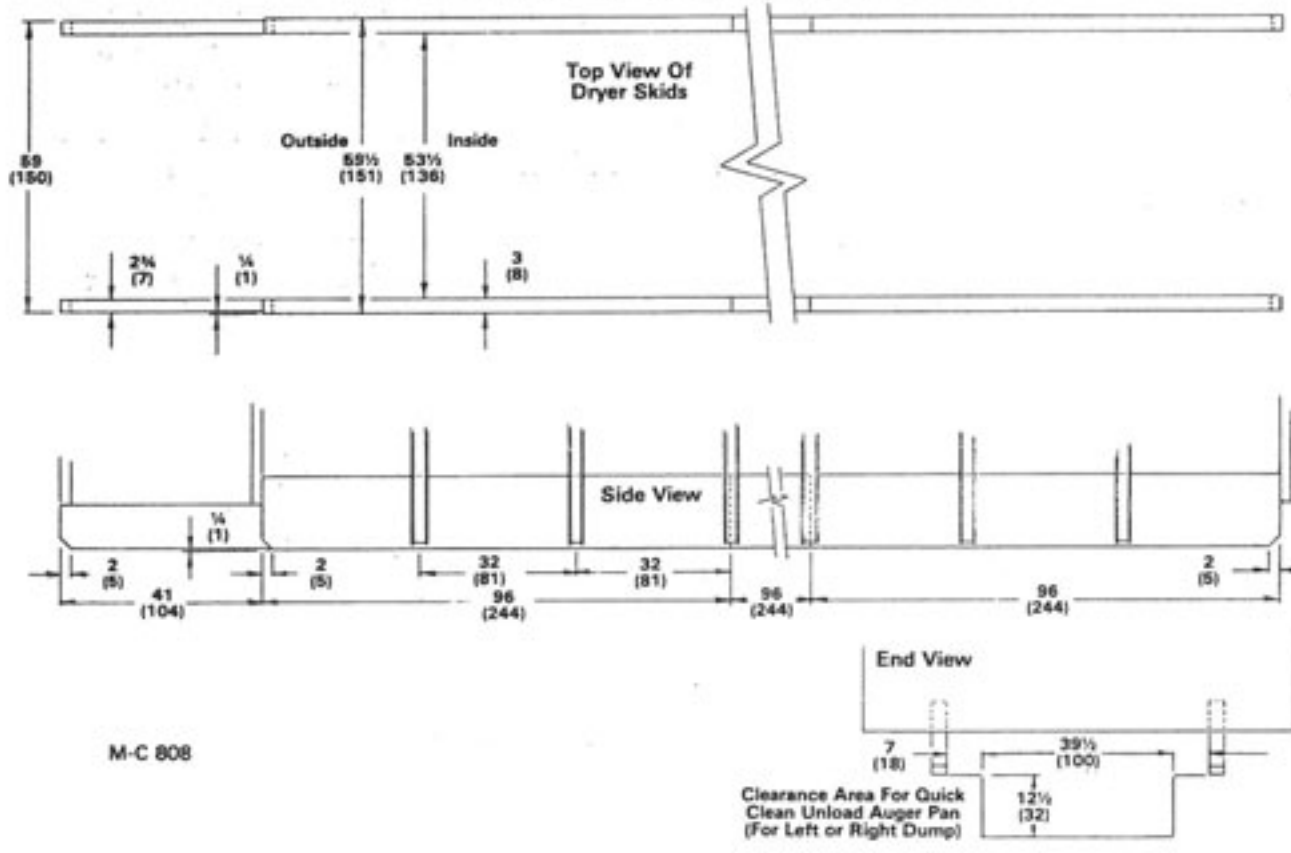
## Electrical and Gas Piping Entrance




M-C 807

## Dryer Base Dimensions

All Dimensions Are In Inches (Centimeters)

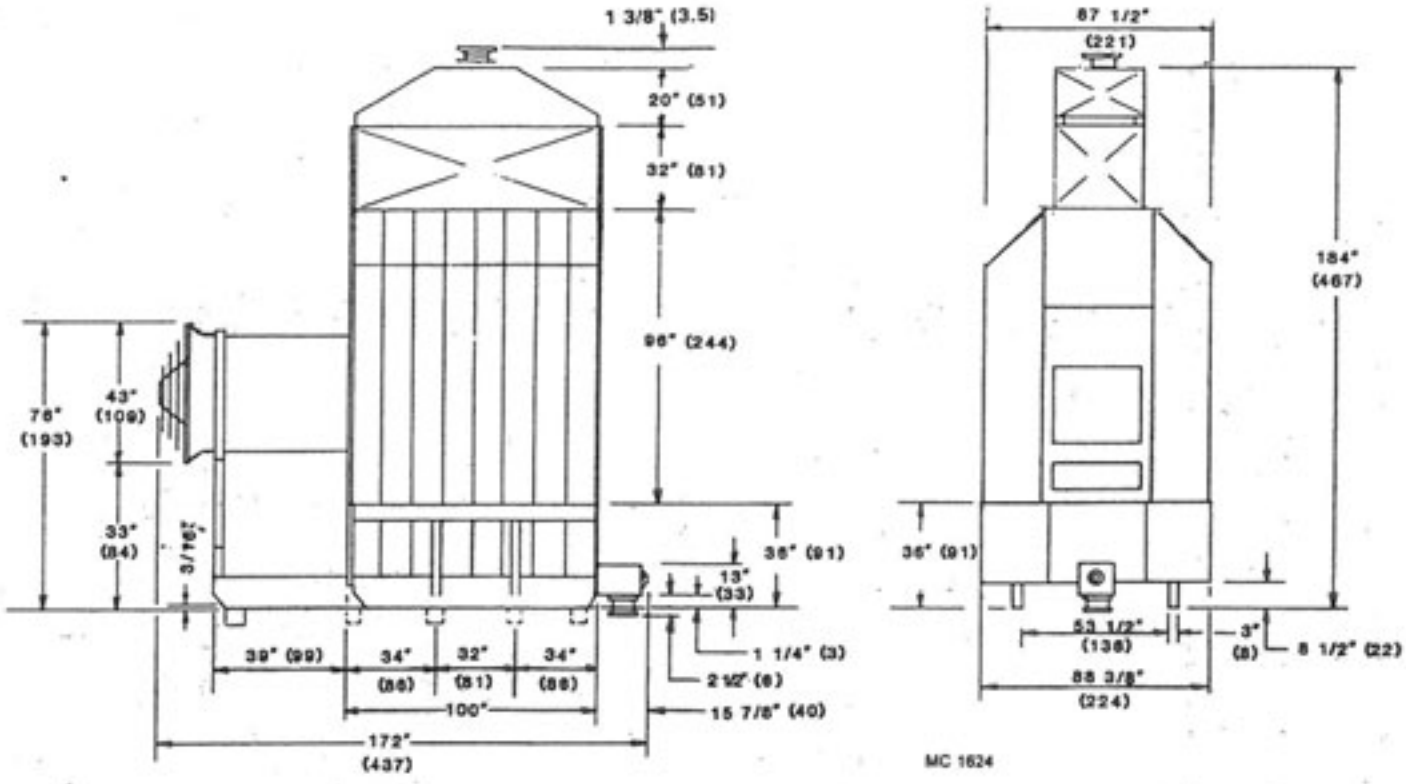



M-C 808

## Model 370 Dryer Dimension Chart

All Dimensions Are in Inches (Centimeters)

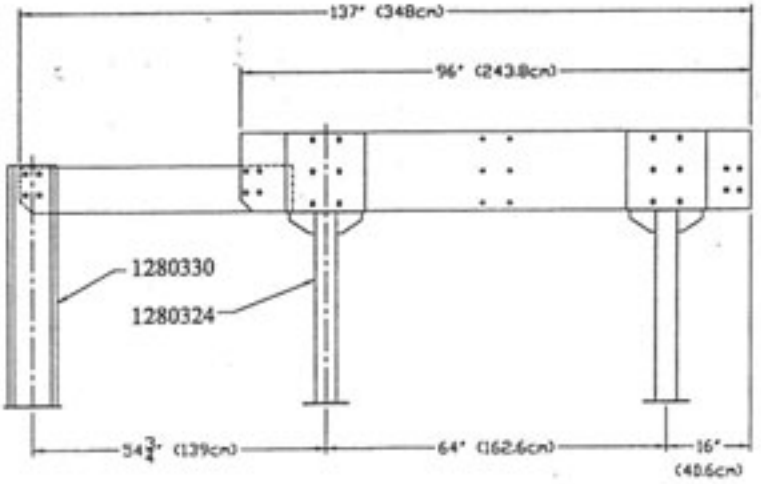
**NOTE:** The Grain Receiving Hopper Tube Ring is 10" (25.4cm.) I.D. - 12.5" (31.75cm.) O.D.
The Grain Unload Auger Discharge Ring is 10" (25.4cm.) I.D. - 12.5" (31.75cm.) O.D.

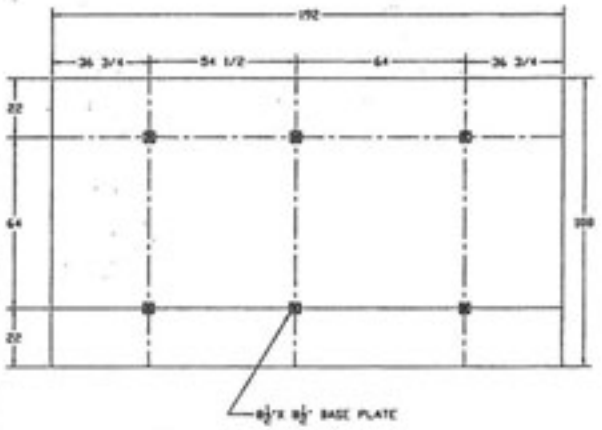



## Model 370 Stand Kit Placement

1280329 - 24" (61cm) Front Stand Weldment
1280326 - 24"Dryer Stand Weldment

1280330 - 36" (91.5cm) Front Stand Weldment
1280324 - 36"Dryer Stand Weldment



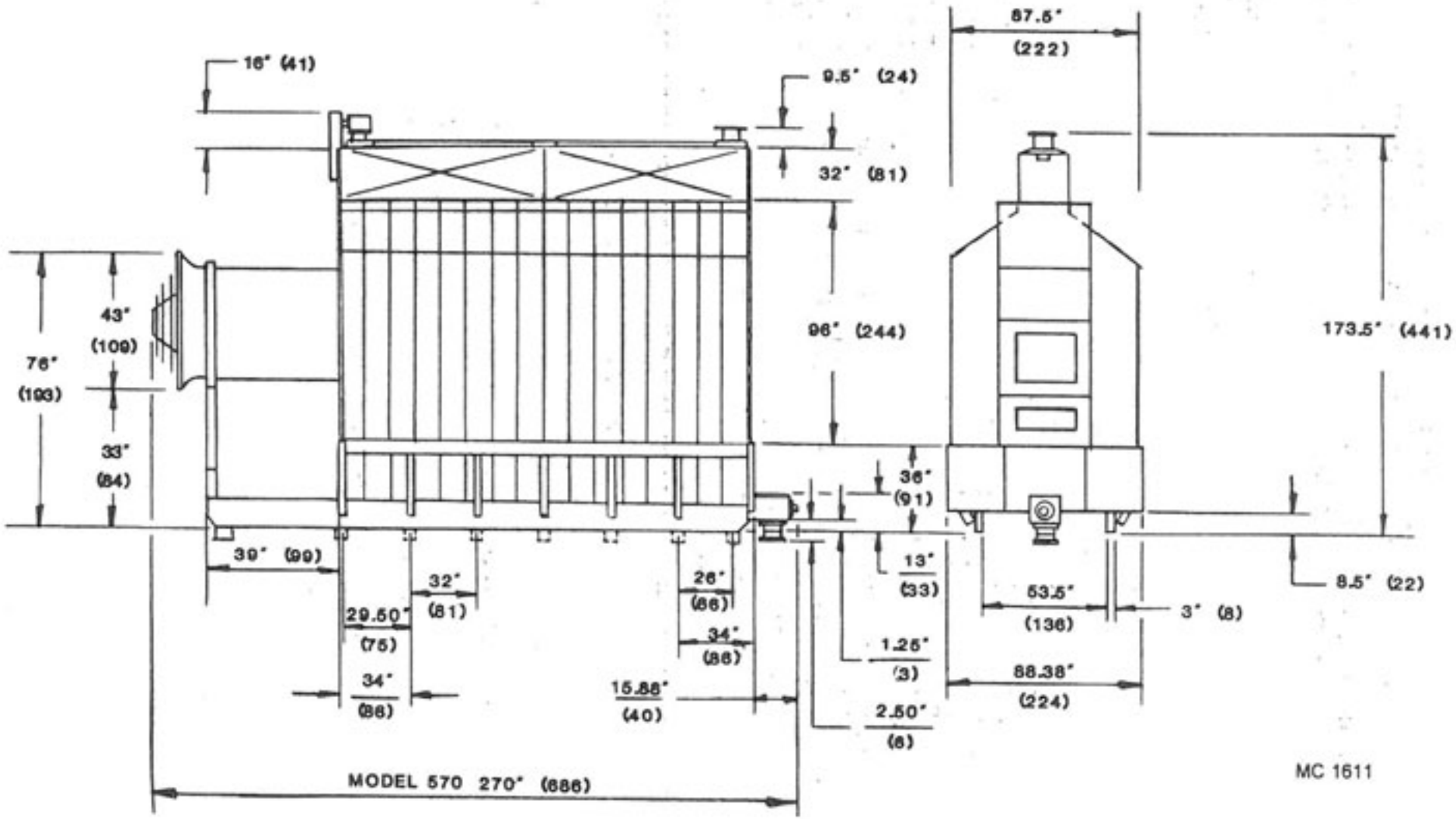




8' FOUNDATION LAYOUT LEG KIT

# Model 570 Dryer Dimension Chart

**All Dimensions Are In Inches (Centimeters)**

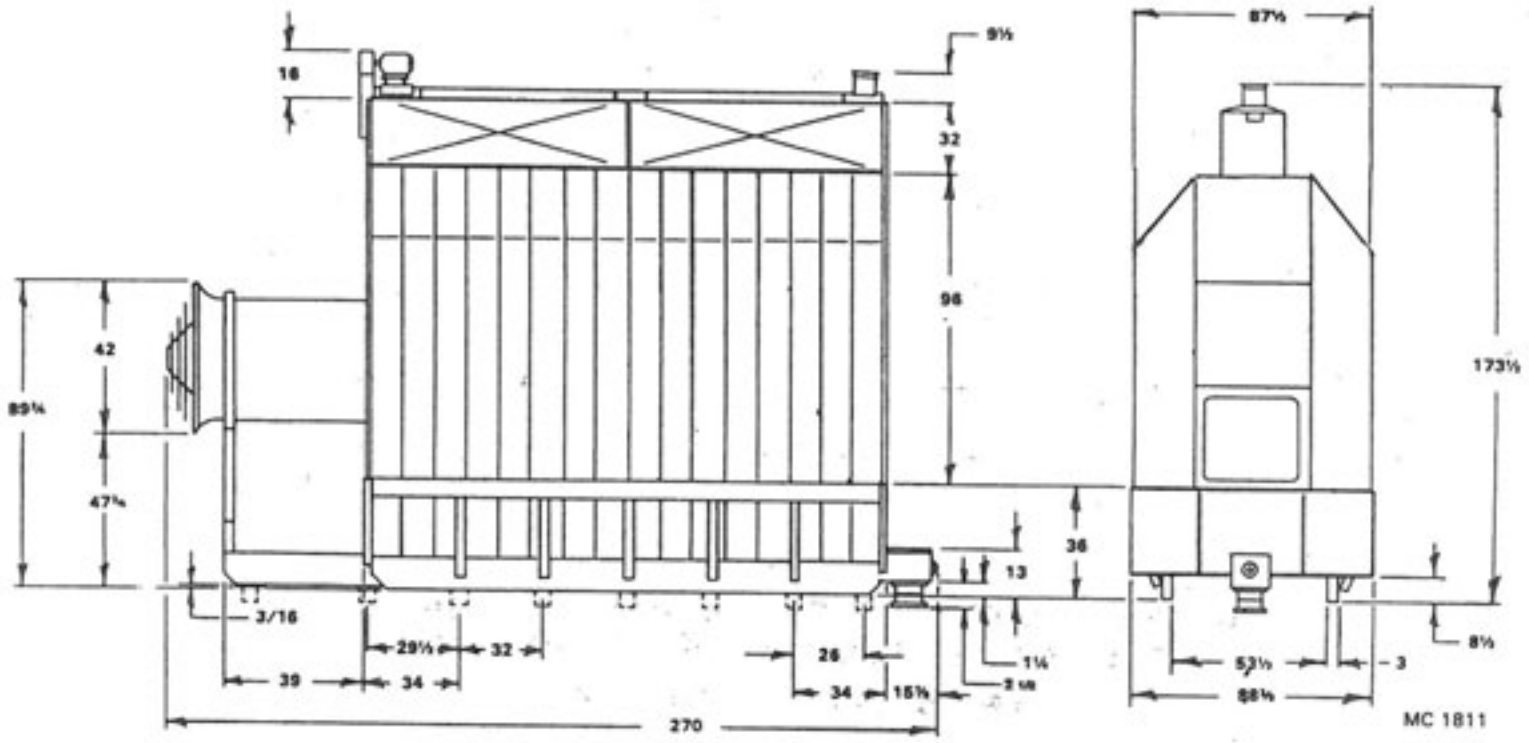
**NOTE:** The Grain Receiving Hopper Tube Ring is 10" (25.4cm.) I.D. - 12.5" (31.75cm.) O.D.
The Grain Unload Auger Discharge Ring is 10" (25.4cm.) I.D. - 12.5" (31.75cm.) O.D.



## Model 690 Dryer Dimension Chart

### All Dimensions Are In Inches

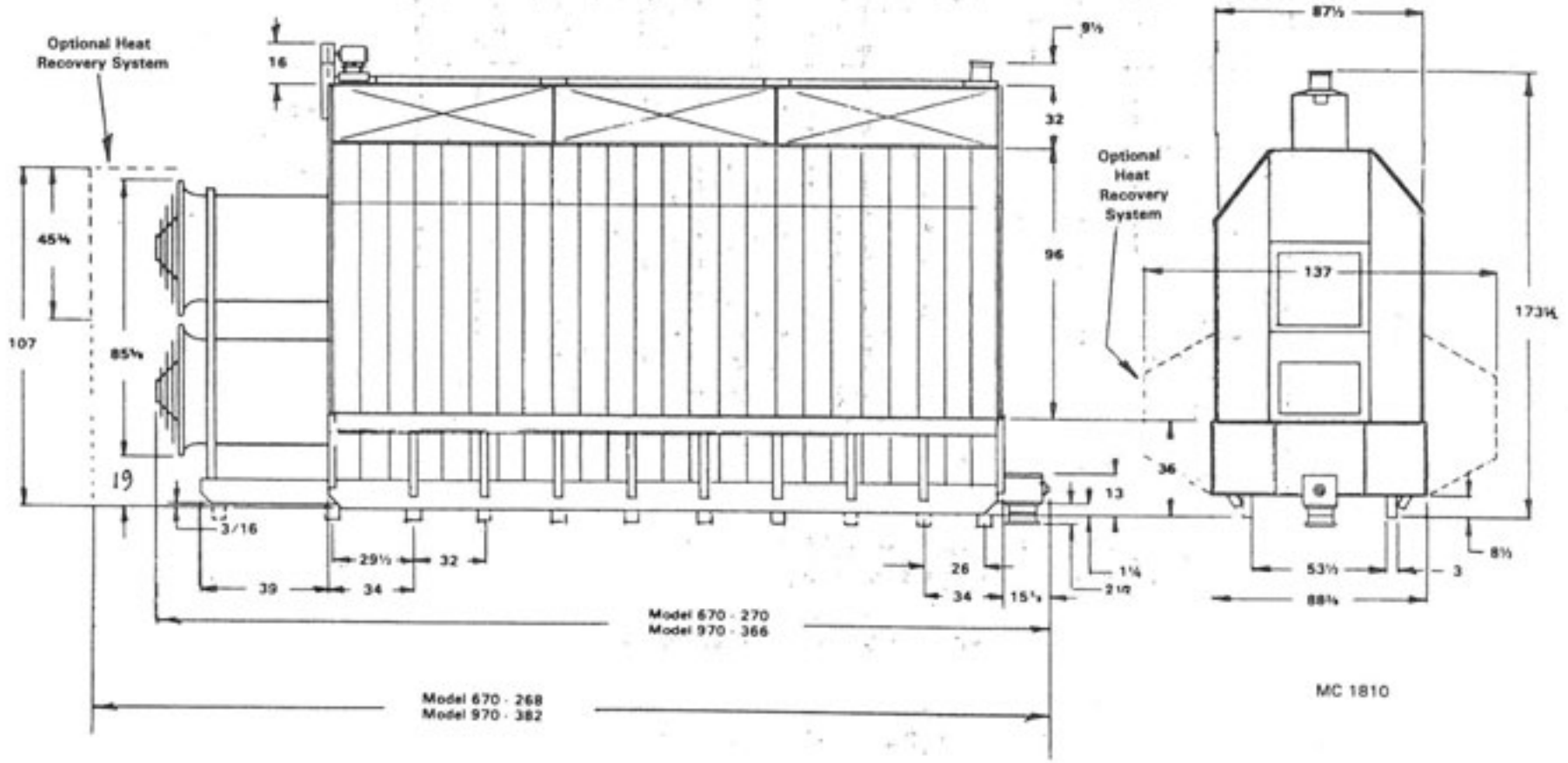
**NOTE:** The Grain Receiving Hopper Tube Ring is 10" I.D. - 12.5" O.D.
The Grain Unload Auger Discharge Ring is 10" I.D. - 12.5" O.D.



# Model 670 & 970 Dryer Dimension Chart

## All Dimensions Are In Inches

**NOTE:** The Grain Receiving Hopper Tube Ring is 10" I.D. - 12.5" O.D.
The Grain Unload Auger Discharge Ring is 10" I.D. - 12.5" O.D.



## GENERAL NOTES

**GENERAL**

1. REFER TO DESIGN LOADS LISTED BELOW.
2. CONTRACTORS TO ASSUME FULL RESPONSIBILITY FOR:
   a. COMPLIANCE WITH THE CONTRACT DOCUMENTS.
   b. DIMENSIONS TO BE CONFIRMED AND CORRELATED ON THE JOB SITE AND BETWEEN INDIVIDUAL DRAWINGS OR SET OF DRAWINGS.
   c. FABRICATION PROCESSES AND CONSTRUCTION TECHNIQUES (INCLUDING EXCAVATION, SHORING, SCAFFOLDING, BRACING, ERECTION, FORMWORK, ETC.)
   d. COORDINATION OF THE VARIOUS TRADES.
   e. SAFE CONDITIONS ON THE JOB SITE.
3. UNLESS OTHERWISE NOTED, ALL DETAILS, SECTIONS, AND NOTES ON THE DRAWINGS ARE INTENDED TO BE TYPICAL FOR SIMILAR SITUATIONS ELSEWHERE.

**FOUNDATIONS**

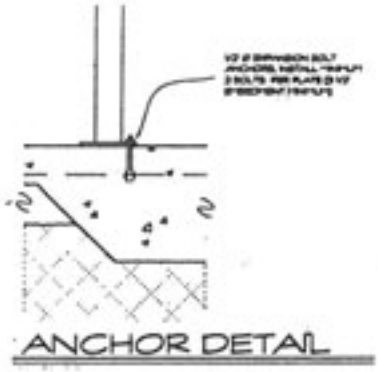
1. FOOTINGS ARE DESIGNED FOR A MINIMUM SOIL BEARING CAPACITY OF 3,000 PSF.
2. ALL FOUNDATIONS SHALL BE CARRIED DOWN TO DEPTHS SHOWN ON THE DRAWINGS, OR DEEPER, IF NECESSARY TO REACH UNDISTURBED SOIL OF DESIGN CAPACITY.
3. APPROVED FILL MATERIAL IN LOCATIONS WHERE ENGINEERED FILL IS REQUIRED TO OBTAIN PROPER FOUNDATION BEARING CONDITIONS SHALL BE PLACED IN LAYERS NOT EXCEEDING 9" IN LOOSE THICKNESS AND COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DENSITY OBTAINED IN ACCORDANCE WITH ASTM SPECIFICATION D1557, MODIFIED PROCTOR METHOD, LATEST EDITION.
4. BENEATH SILO AREA SUBGRADE PREPARATION SHALL INCLUDE THE REMOVAL OF ALL UNSUITABLE SURFACE SOILS INCLUDING SOFT CLAYS, HIGHLY ORGANIC TOPSOIL, ROOT MATTER, DEBRIS AND OTHER DELETERIOUS MATERIALS.
5. IF FILL MATERIAL IS REQUIRED, THE ZONE OF COMPACTED FILL SHALL EXTEND BEYOND THE EDGES OF THE FOOTING A DISTANCE OF ONE FOOT FOR EACH FOOT OF THICKNESS COMPACTED FILL BELOW THE FOOTINGS.

**CONCRETE**

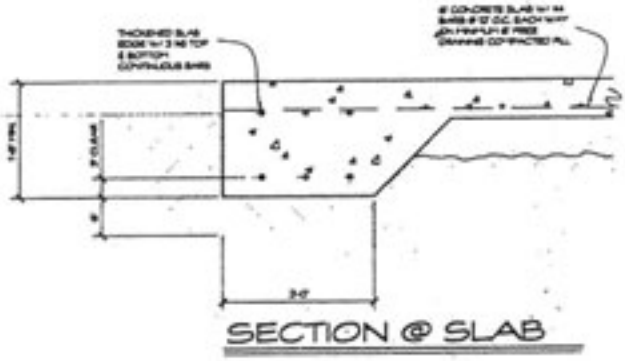
1. CONCRETE WORK SHALL CONFORM TO:
   a. ACI 318-89,R92 STANDARD BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.
   b. ACI 301, SPECIFICATION FOR STRUCTURAL CONCRETE IN BUILDINGS.
2. ULTIMATE COMPRESSIVE STRENGTH OF PORTLAND CONCRETE, STANDARD WEIGHT, AT 28 DAYS, SHALL BE 3,000 PSI, AIR ENTRAINED (5% +/- 1%)
3. CONCRETE CONTRACTOR SHALL NOT POUR ANY CONCRETE IN ADVERSE WEATHER CONDITIONS OR WHEN SUCH ARE FORECAST FOR THE TIME PERIOD FOLLOWING THE POUR UNLESS PROPER CURING AND PROTECTION IS PROVIDED CONTINUOUSLY UNTIL CONCRETE DEVELOPS ITS DESIGN STRENGTH.
4. CONCRETE CONTRACTOR SHALL SUPERVISE ALL TRADES REGARDING PIPING, ELECTRICAL CONDUIT, FIXTURE INSERTS, ANCHORS, ETC., PASSING THRU CONCRETE. BARS SHALL NOT BE CUT OR DISPLACED UNLESS ABSOLUTELY NECESSARY, AND THEN ONLY BY CONCRETE CONTRACTOR. MATCHING BARS EQUAL TO CUT BARS SHALL BE ADDED WITH PROPER LAPS AND EMBEDMENTS. CLEAR DISTANCE BETWEEN SLEEVES SHALL BE MINIMUM OF 8".
5. NO ALUMINUM OF ANY TYPE SHALL BE ALLOWED IN THE CONCRETE WORK UNLESS COATED TO PREVENT ALUMINUM-CONCRETE REACTION. THIS INCLUDES PUMPING THROUGH ALUMINUM PIPE.
6. REINFORCING BARS SHALL CONFORM TO ASTM SPECIFICATIONS A-615, GRADE 60.
7. ALL LAPS FOR REBAR, WHEN NOT DIMENSIONED ON DRAWINGS, SHALL BE 40 BAR DIAMETERS.
8. UNLESS OTHERWISE NOTED, PRINCIPAL REINFORCEMENT SHALL HAVE THE FOLLOWING CONCRETE PROTECTION:
   a. SURFACES NOT FORMED - 3" COVER MINIMUM.
   b. FORMED SURFACES IN CONTACT WITH SOIL OR WATER OR EXPOSED TO WEATHER - 2" COVER MINIMUM.

## NOTES

1. MAX. DRYER OPERATING WEIGHT = 110,000#
2. DESIGN WIND SPEED: 80 MPH (25 PSF)
3. DESIGN SOIL PRESSURE: 3,000 PSF (SOILS ENGINEER TO VERIFY)
4. CONCRETE: F'c = 3,000 PSI, AIR ENTRAINED (5% +/- 1%)



ANCHOR DETAIL



SECTION @ SLAB

1280329 - 24" (61CM) Front Stand Weldment
1280326 - 24"Dryer Stand Weldment

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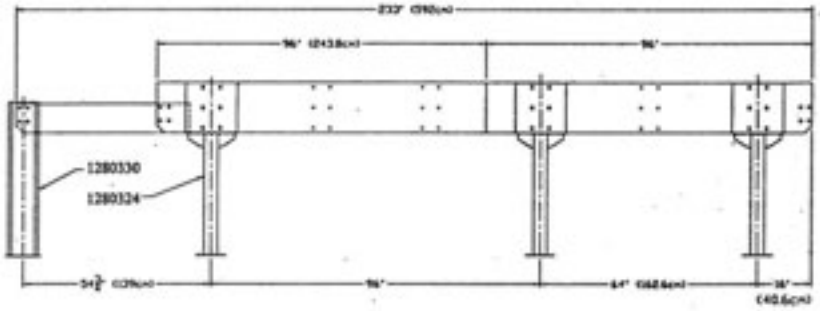
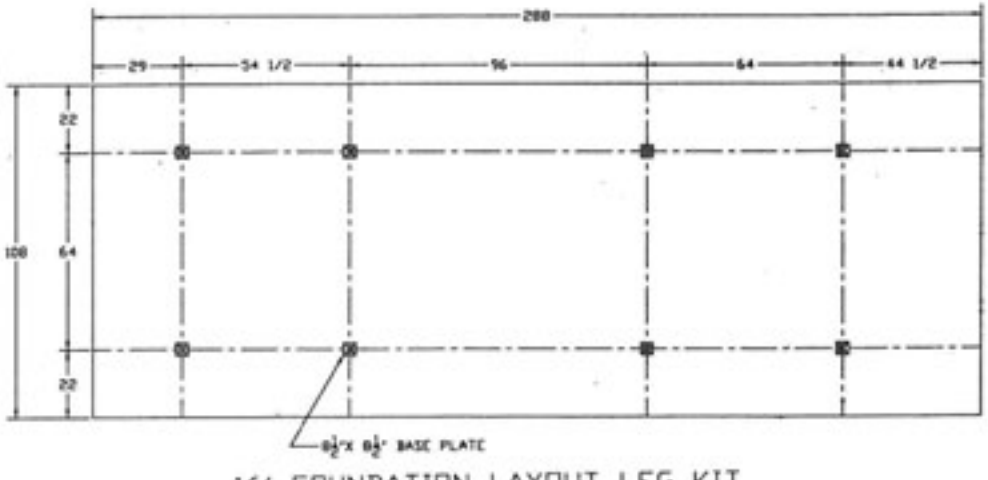



MC 690 / 570 / 670 STAND KIT PLACEMENT




16' FOUNDATION LAYOUT LEG KIT

| | | | |
|---|---|---|---|
| DATE 1-19-99 | JOB NUMBER 9877 | MARK ELMORE ASSOCIATES ARCHITECTS | FOUNDATION DESIGN FOR: **Models 570, 670 & 690** MATHEWS COMPANY - 500 Industrial Ave.,Crystal Lake, Illinois 60014 |

## GENERAL NOTES

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3. APPROVED FILL MATERIAL IN LOCATIONS WHERE ENGINEERED FILL IS REQUIRED TO OBTAIN PROPER FOUNDATION BEARING CONDITIONS SHALL BE PLACED IN LAYERS NOT EXCEEDING 9" IN LOOSE THICKNESS AND COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DENSITY OBTAINED IN ACCORDANCE WITH ASTM SPECIFICATION D1557, MODIFIED PROCTOR METHOD, LATEST EDITION.
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2. ULTIMATE COMPRESSIVE STRENGTH OF PORTLAND CONCRETE, STANDARD WEIGHT, AT 28 DAYS, SHALL BE 3,000 PSI, AIR ENTRAINED (6% +/- 1%)
3. CONCRETE CONTRACTOR SHALL NOT POUR ANY CONCRETE IN ADVERSE WEATHER CONDITIONS OR WHEN SUCH ARE FORECAST FOR THE TIME PERIOD FOLLOWING THE POUR UNLESS PROPER CURING AND PROTECTION IS PROVIDED CONTINUOUSLY UNTIL CONCRETE DEVELOPS ITS DESIGN STRENGTH.
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**NOTES**

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2. DESIGN WIND SPEED: 80 MPH (35 PSF)
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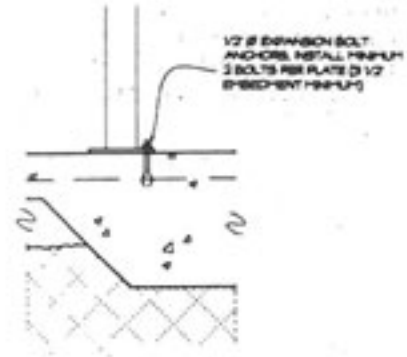
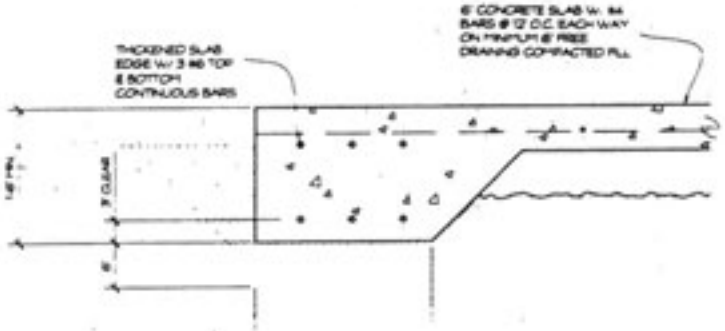



ANCHOR DETAIL

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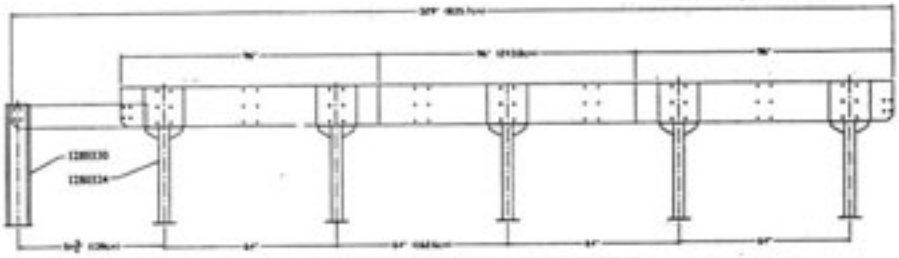



MC 970 / 975 / 980 STAND KIT PLACEMENT


24' FOUNDATION LAYOUT LEG KIT

| | | | | |
|---|---|---|---|---|
| A1 | DATE 1-30-09 | JOB NUMBER 99077 | MARK ELMORE ASSOCIATES ARCHITECTS | FOUNDATION DESIGN FOR: **Model 970** MATHEWS COMPANY - 900 Industrial Ave., Crystal Lake, Illinois 60014 |

# GENERAL TROUBLESHOOTING
# START-UP AND RUNNING OF DRYER

Main power to the dryer comes into the Starter Cabinet and to the splitter block. Control voltage (110) is obtained through one leg to neutral for 230 volt or by using a step-down transformer.

All dryers are to be grounded. A ground rod is supplied with all dryers. Ground wires are all green and run from chassis to motors, control panels and control doors.

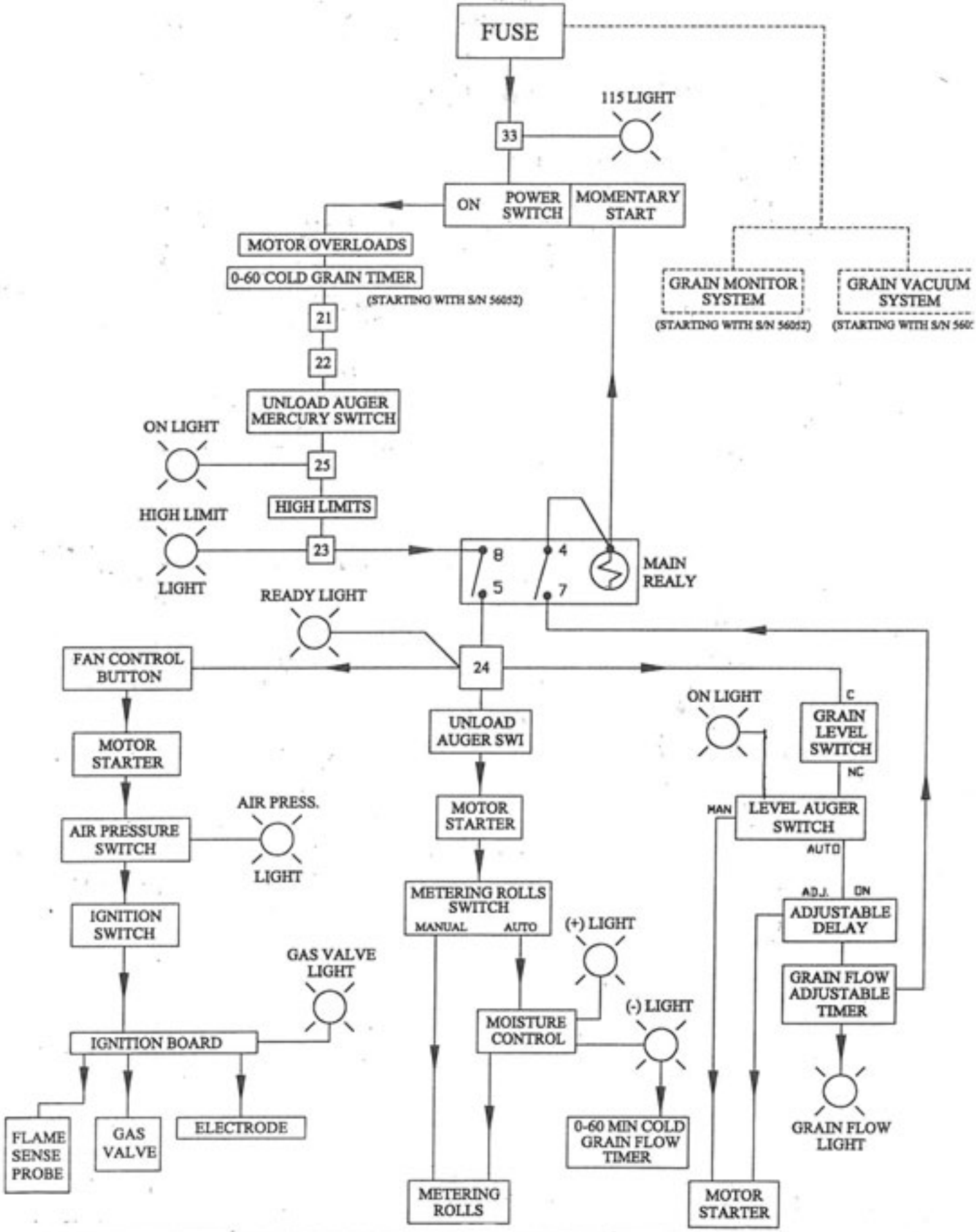
Isolated neutral block wired to all 230 volt dryers only. "B" phase 230 volt excluded. For 208, 460, 575 voltage and 230 "B" phase voltage, neutral from transformer will wire direct to TB5/neutral.

When dryer is ready for testing operation, make sure Lexan Guard for HIGH VOLTAGE is properly installed. This Lexan Guard is on every dryer.

| | PROCEDURE | TROUBLESHOOTING |
|---|---|---|
| 1. | Start of Operation of Dryer: 115 volt power light should be ON. | If not, check:<br>a. Main disconnect.<br>b. Fuse is not functional.<br>c. TB33 for connections.<br>d. 115 volt bulb and socket. |
| 2. | Switch control toggle to ON position. ON and HIGH LIMIT lights should be ON. | If not, check:<br>a. Unload auger switch.<br>b. Overload circuit through starters.<br>c. Cold grain timer.<br>d. High limit reset.<br>e. Level auger switch not wired.<br>f. Motor saver (used on single phase 20HP motors only). |
| 3. | Flip control toggle switch up to START and release. Ready light will light. | If not, check:<br>a. Main relay.<br>b. Grain flow timer may have elapsed (grain flow light ON). |
| | PRIMARY CIRCUIT IS NOW COMPLETE (SAFETY CIRCUIT), TB24 IS NOW ENERGIZED. | |
| 4. | Switch level auger toggle to MANUAL position. | The following occurs:<br>a. Switch should engage contacts on starter<br>b. When contacts pull in, interlock also engages (115 volt).<br>c. 115 volt is at starter interlock and coil, regardless of starter voltage. |
| 5. | Adjust 0 to 3 minute fill timer to desired setting. | |
| 6. | After dryer has filled with grain, switch Level Auger Toggle to AUTO position. | |
| 7. | Fill Timer and Grain Flow Timer are only in the circuit in AUTO discharge position. | |
| 8. | Set both Fill Timer and Grain Flow Timer | |
| 9. | Start Fan with push button. Air pressure light should come ON. | If not, check:<br>a. Should have 115 volts through air switch.<br>b. Air Pressure Switch not adjusted correctly.<br>c. Problem with start or stop push button contacts.<br>d. Problem with Starter, reset Overloads or Contacter Coil<br>e. Fan rotation incorrect |
| | DRYER IS NOW FILLED AND READY TO DRY GRAIN | |

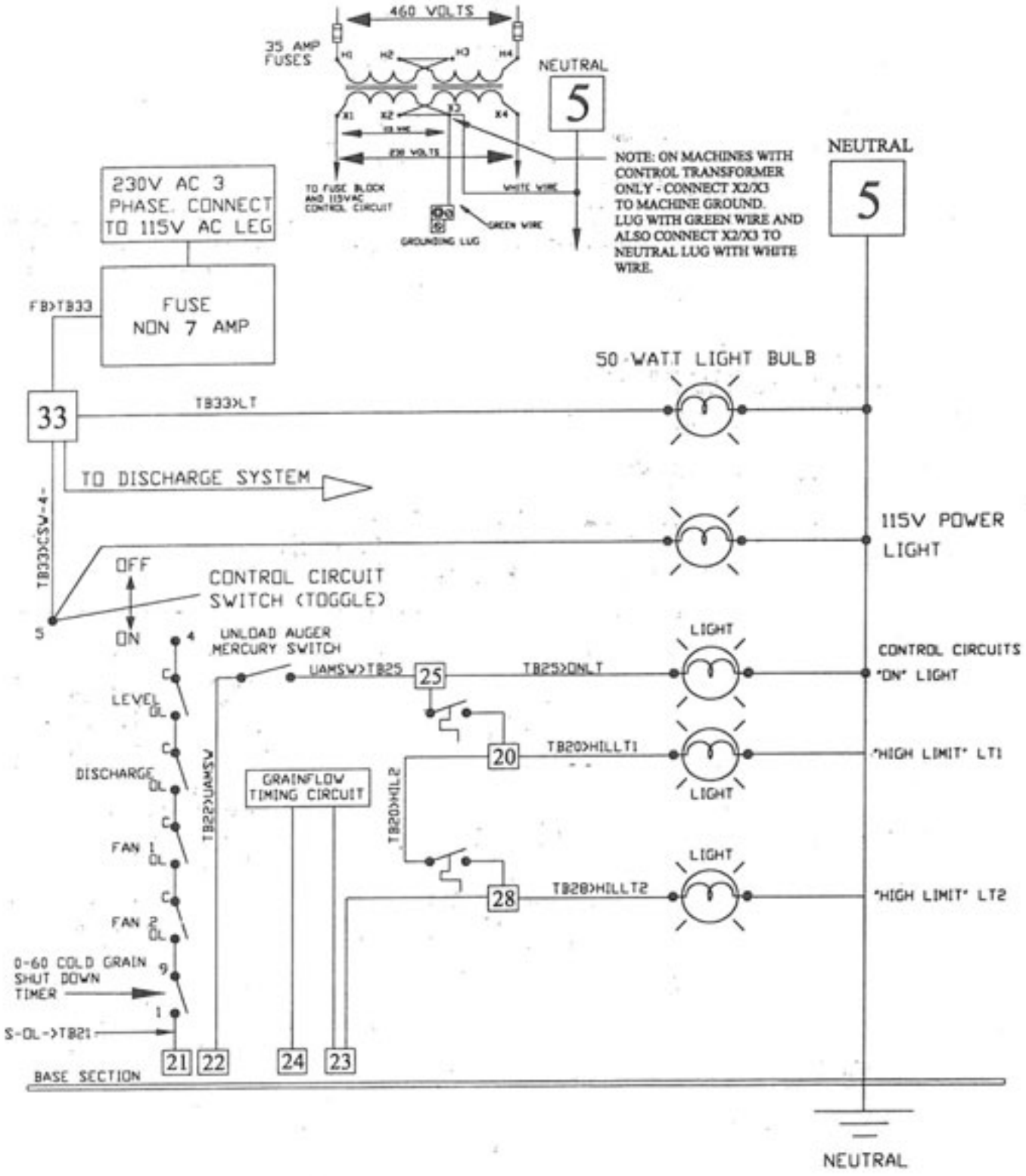
Continued . . . . .

| | PROCEDURE | TROUBLESHOOTING |
|---|---|---|
| 10. | Switch Ignition Toggle to ON position. Gas Valve Light should come ON. 15 second internal purge on Ignition Board times out. | |
| 11. | Ignition Board receives power. Summary:<br>L1 is hot, L2 is neutral (power to unit).<br>V1 is hot, V2 is neutral (power to solenoids).<br>E1 high voltage to electrode. (DANGER: Never test with a meter.)<br>Ground low voltage wire from electrode.<br>BGRD terminal also has a wire running straight to chassis ground in box.<br>S1 senses flame using chassis ground to ignition board, very low millivolts.<br>Solenoid problems usually result from lack of proper sensing. | |
| 12. | Switch Discharge Auger Toggle to momentary "start" position. No indicator lights. Auger Starter should engage. Metering Rolls will also start if not in OFF position. | |
| 13. | Set Cold Grain Flow Timer. This is a programmable timer. It has a range of 1 second to 60 minutes. Set for appropriate time for dryer shutdown (safety feature). Grain flow light will only come ON when Grain Flow Timer has shut down entire dryer. Timer is set at 30 minutes when it leaves the factory. | |
| 14. | Switch Metering Roll to MANUAL position. Metering starts immediately. | If not:<br>a. Check 8 amp circuit breaker to SCR board.<br>b. Check AC Fuse on SCR board.<br>c. Check to see if brushes on DC motor are seating properly.<br>d. Check if unload auger is running. |
| 15. | Set maximum DC volts on SCR board. Turn SCR Pot to 10 and set voltage between ARM- & ARM+ on SCR board to be 70 volts DC or take-away maximum. | |
| 16. | Use SCR Speed Pot to adjust metering speed. Adjust speed until moisture content of grain is desired percentage. After running dryer long enough to stabilize moisture output, dryer is ready for Automatic Mode. | |
| 17. | Use Moisture Control Pot to balance lights so that both are OFF | If not, check:<br>Dead band on M-C Control Board adjusted incorrectly. Rotate clockwise to open dead band wider. |
| 18. | Before switching to automatic mode, set Response Selector and adjust Cold Grain Timer. Response 1, 2, 3: 1 being fastest response, 3 the slowest response from Thermistor to change speed in metering. Timer will shut down entire dryer if "-" light is held on past the setting of the Cold Grain Timer. | |
| 19. | Switch Metering Roll to AUTO position. | If not:<br>a. Check Auto/Manual Switch wiring or 1.0 amp fuse.<br>b. Check SCR Board and DC Motor. |

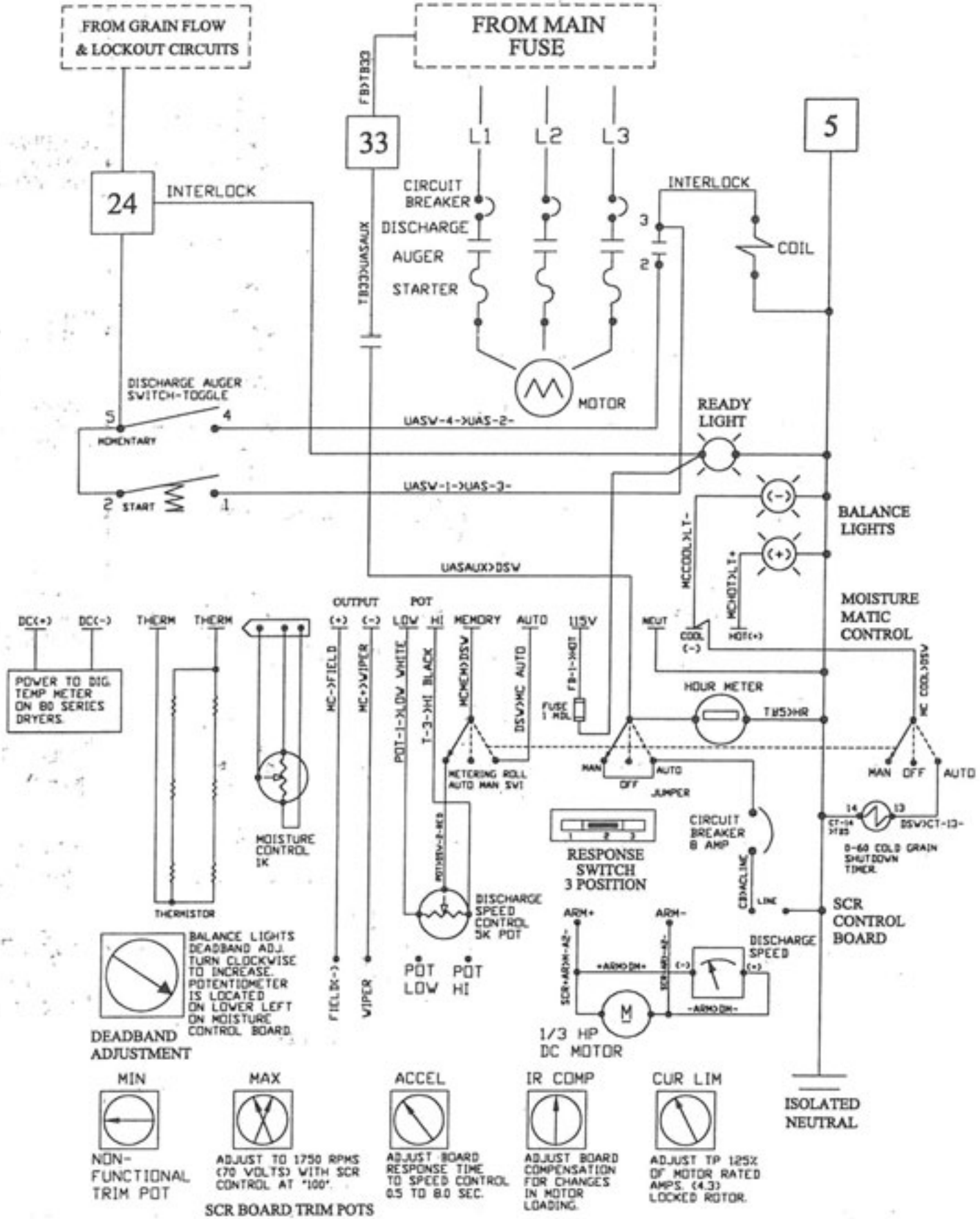



# MC FLOW CHART

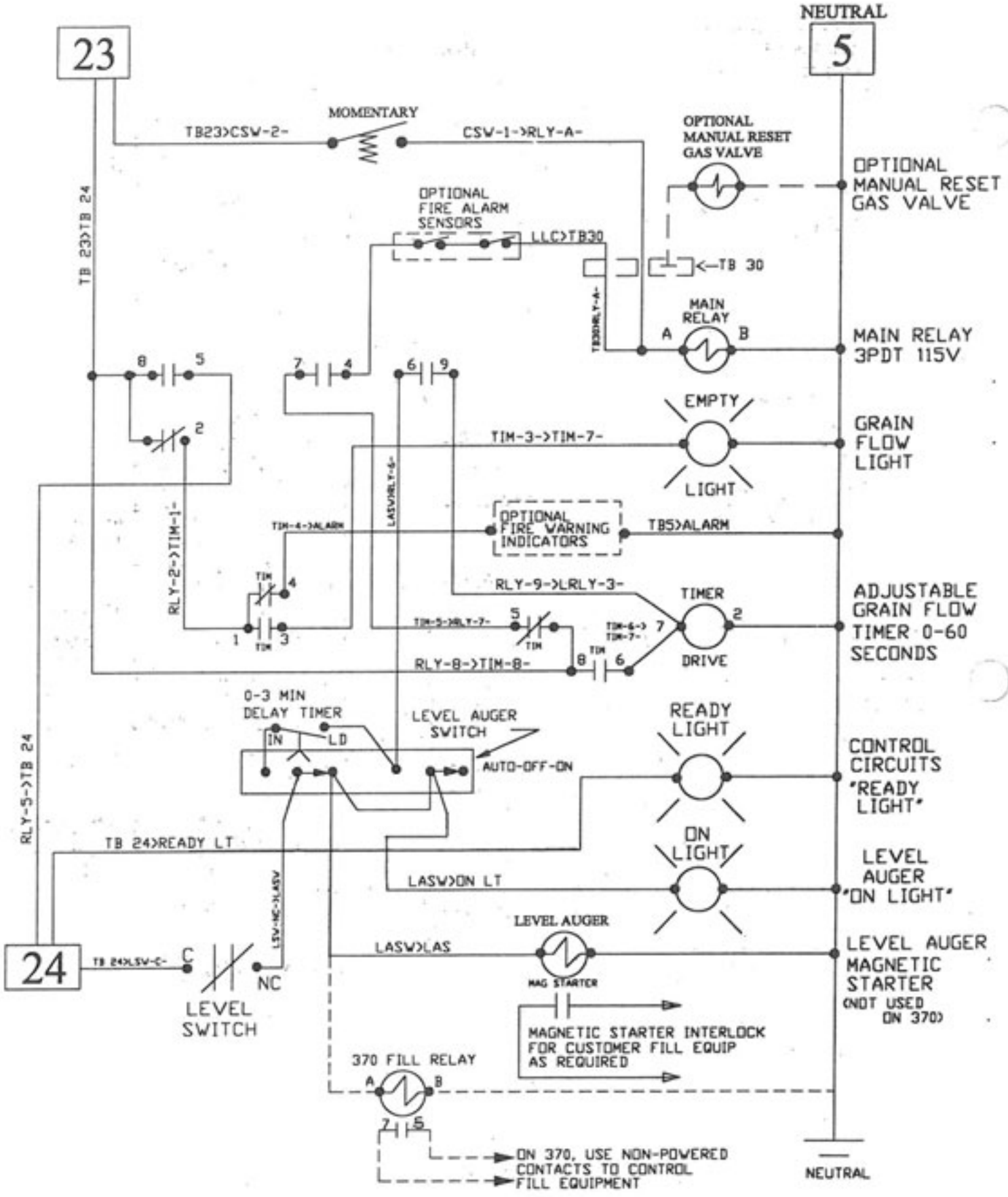
| MC 70, 75 & 80 SERIES | START S/N 55467 | |
|---|---|---|
| ALL DRYERS 1615000 THRU 1615009 | REVISED 10-19-99 | PG.1 |



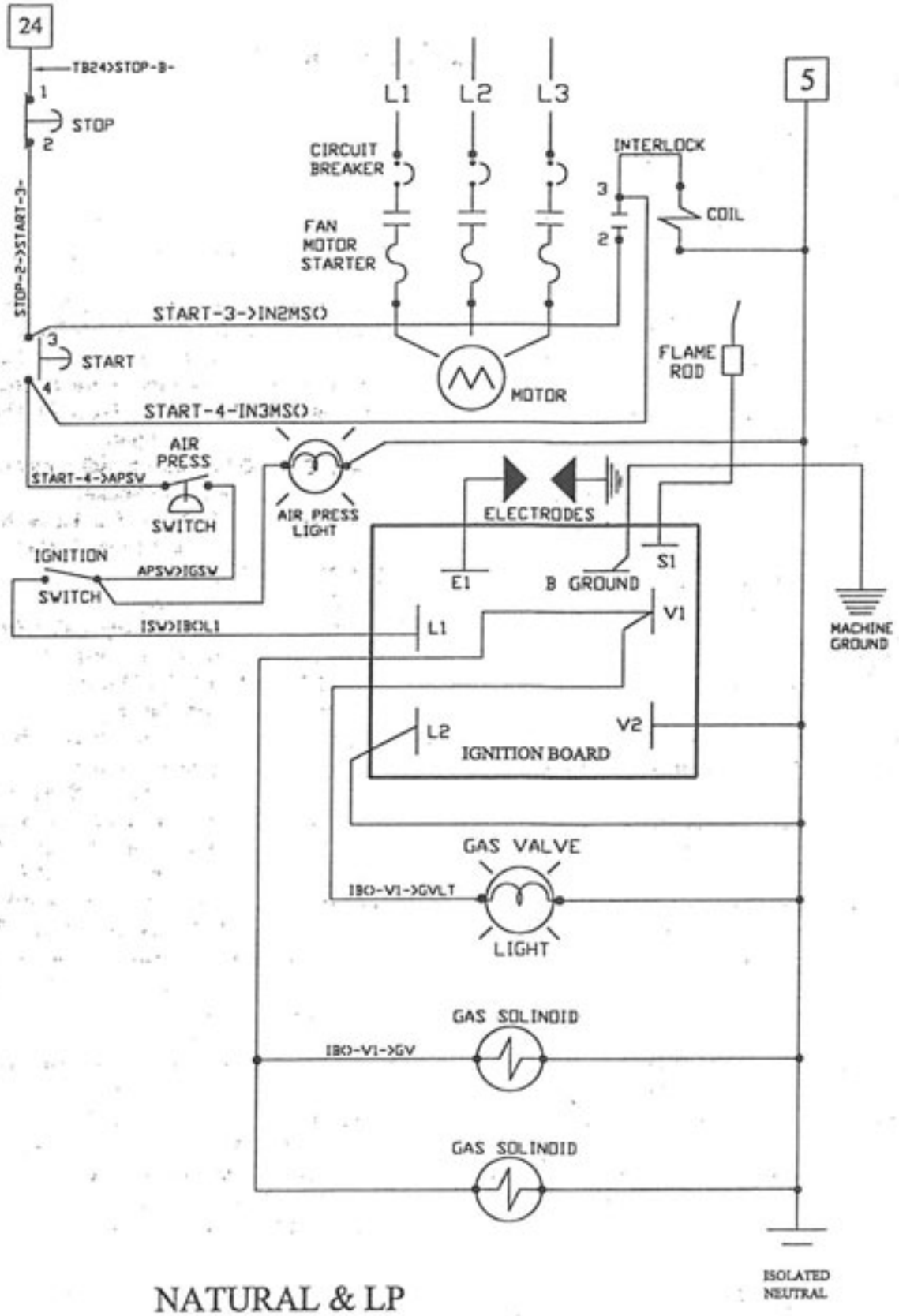

| PRIMARY SAFETY CIRCUIT 70 SERIES | MC 70 SERIES | START S/N #55467 | |
|---|---|---|---|
| | PART No. 1615000 | REVISED 8-16-2000 | P. 2 |




| MC MOISTURE CONTROL DISCHARGE SYSTEM | 70 & 75 SERIES DRYERS | START S/N 55467 | |
|---|---|---|---|
| | 1615000, 1615001 1615004, 1615005 | REVISED 8-15-2000 | PG 5 |




| GRAIN FLOW TIMING & SYSTEM LOCKOUT CIRCUITS | MC 70 & 75 SERIES | START S/N #55467 |
|---|---|---|
| | P/N 1615000, 1615001 1615004, 1615005 | REVISED 8-15-2000 P.3 |




NATURAL & LP

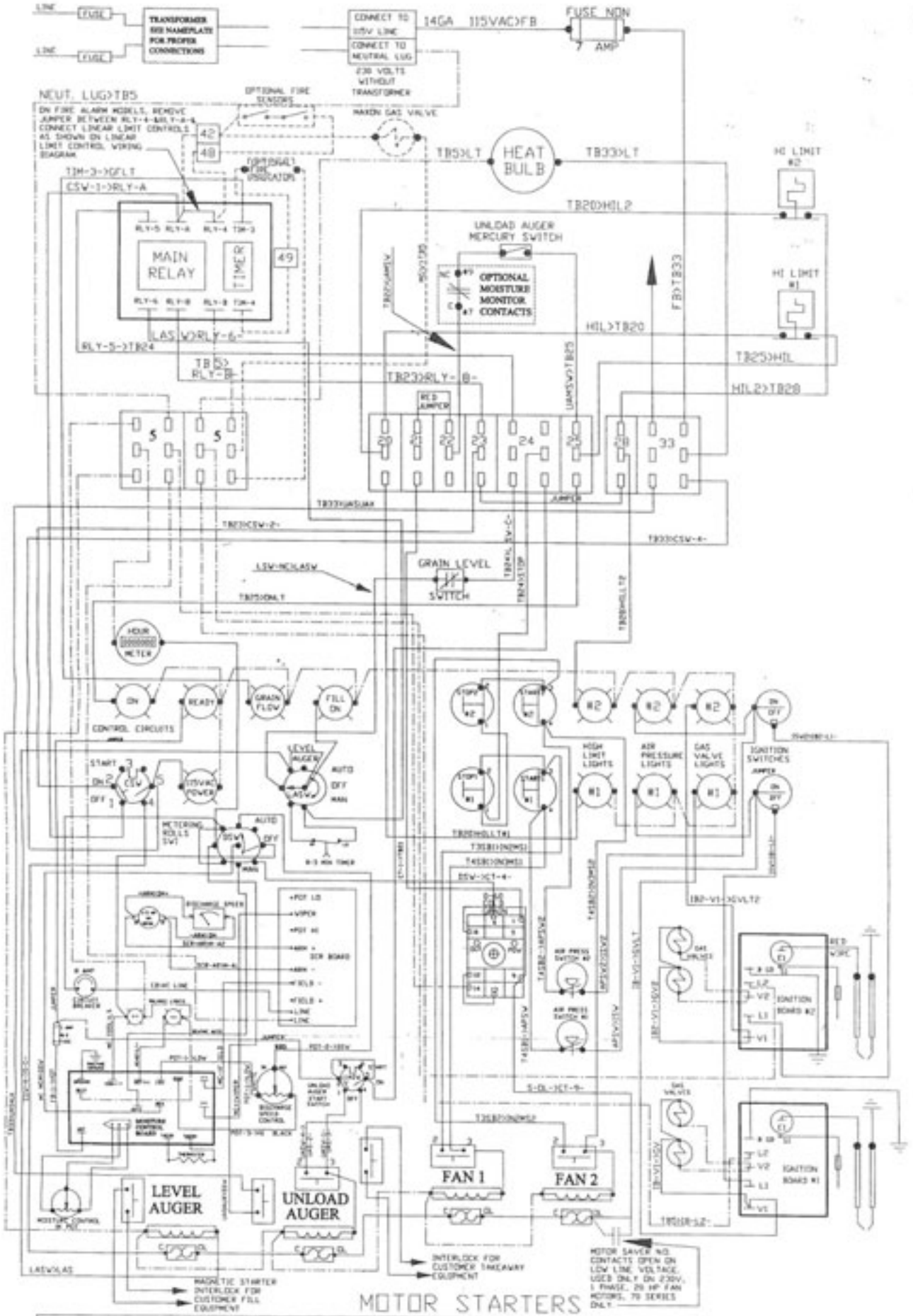
| 70 SERIES DRYER FAN/BURNER SCHEMATIC | | START S/N 55467 | |
|---|---|---|---|
| | 1615000 | REVISED 1/99 | PG 4 |

# Electrical Components

## 370, 570, 670, 690 & 970
## Starting with S/N 57957

| Part No. | Description |
|---|---|
| 120 6800 | Unload Switch |
| 121 6849 | Air Pressure Switch |
| 128 9051 | High Limit Switch 10 ft. (3m) Capillary |
| 125 6965 | 115V Ignition Board |
| 128 1910 | Ignition Wire 36" (91.5cm) w/Boot (370/570) |
| 122 9003 | Ignition Wire 84" (215cm) w/Boot (670/690/970) |
| 128 6995 | Electrode |
| 124 6872 | Flame Sensing Probe |
| **Terminal Block** | |
| 124 6928 | 12 Position |
| 124 6929 | 3 Position |
| **115V LP Gas Solenoid Valves** | |
| 125 7082 | ½" (12.7mm) Solenoid Valve in LP Liquid Line |
| 128 7001 | 1¼" (31.75mm) Solenoid Valve in Gas Manifold |
| **115V Natural Gas Solenoid Valves** | |
| 128 7001 | 1¼" (31.75mm) Solenoid Valve in Gas Manifold |
| 125 6956 | 7 Amp. Fuse (NON-10) |
| 128 6851 | Fuse Holder |
| 128 6845 | Stop Button (Red) |
| 128 6844 | Start Button (Green) |
| 124 6848 | 8 Amp. Circuit Breaker (SCR Drive) |
| 121 6808 | 125V Indicator Lamp Assembly |
| 122 6810 | 125V Indicator Lamp |
| 122 6800 | Indicator Lamp Lens (Clear) |

| Part No. | Description |
|---|---|
| 121 6815 | SPST ON-OFF Toggle Switch (Ignition) |
| 124 6895 | 3PDT ON-OFF-ON Toggle Switch (Discharge Metering Rolls) |
| 120 6827 | Momentary Contact Toggle Switch |
| 121 6807 | DPDT ON-OFF-ON Toggle Switch (Level Auger) |
| 124 6996 | 0 to 3 Minute Adj. Timer (Level Auger) |
| 124 6841 | Light Bulb Socket |
| 124 6842 | 50W Rough Service Bulb |
| 124 6972 | Relay and Timer Socket |
| 021 6809 | Relay |
| 127 6823 | Neutral Lug |
| 124 6978 | 60 Minute Adjustable Timer |
| 124 6874 | SCR Board (Dart) |
| 124 6837 | 1/3HP DC Motor |
| 128 6957 | Splitter Block |
| 128 6992 | Level Switch (Inside Mt.) |
| - - - - - - - | Magnetic Starters (See Magnetic Starters Table) |
| 127 6855 | Transformer-208V (750VA) |
| 127 6829 | Transformer-230/460/575V (750VA) |
| 124 7935 | FRS-9 Amp. Fuse (208V) |
| 124 6829 | FRS-4 Amp. Fuse (460V) |
| 127 6839 | FRS-3.2 Amp. Fuse (575V) |
| 124 1195 | SCR Speed Control 10 Turn Potentiometer w/Wires 42" (107cm) |
| 124 6892 | Multi-Dial |
| 124 6893 | Thermistor |
| 124 6955 | Moisture Control Potentiometer w/Wires 60" (152cm) |
| 121 6805 | 10 Amp. GLH Fuse |
| 124 6995 | Moisture Control Board |
| 124 6981 | Discharge Meter |
| 124 6938 | Fuse Holder |
| 124 6937 | 1 Amp. Fuse |




| | | | |
|---|---|---|---|
| 70 SERIES DRYER MASTER DIAGRAM PT. TO PT. | MC 70 SERIES NAT & LP | START S/N | #57713 |
| | 1615002-70-PT | REVISED 12-08-02 | DRAWN BY WJS |

Mathews Company

Iron Horse Quality

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