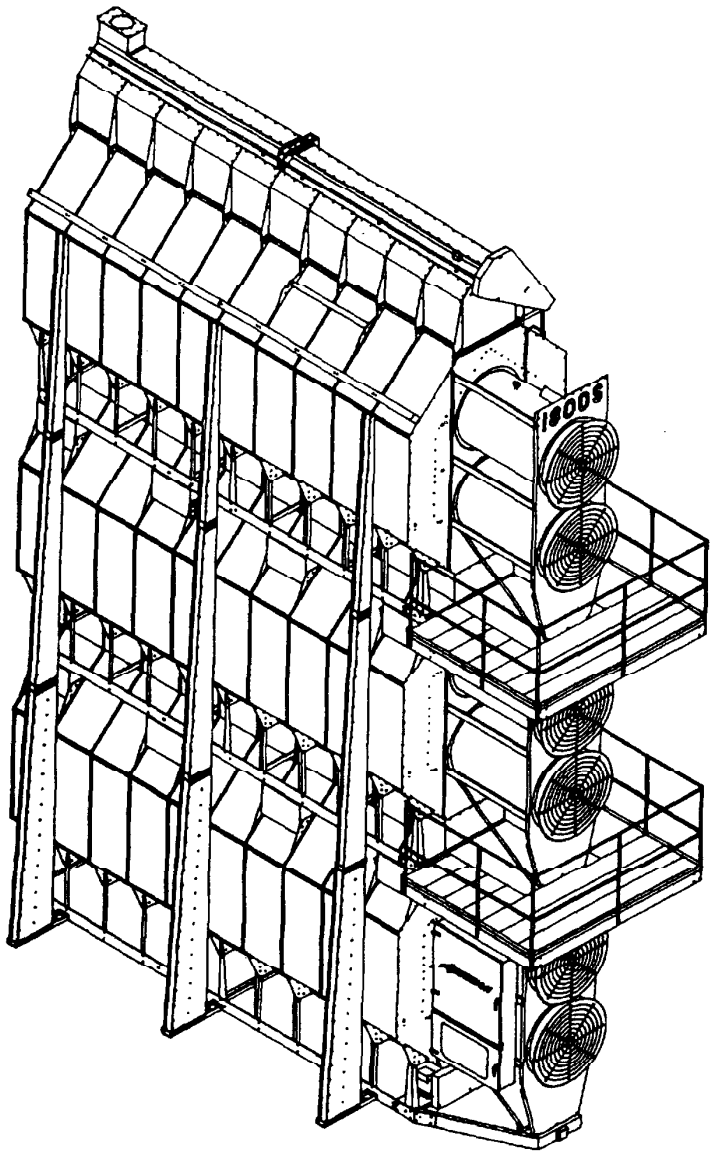
AIRSTREAM



INSTALLATION & OPERATION MANUAL

AIRSTREAM S & LS-SERIES GRAIN DRYERS

PNEG-207

GSI GRAIN SYSTEMS, INCORPORATED
ASSUMPTION, IL 62510 217/226-4421

WARRANTY

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

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

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

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

Thank you for choosing an AIRSTREAM S or LS-Series Modular grain dryer. These units are one of the finest grain dryers ever built; designed to give you excellent performance and service for many years.

This manual describes the installation and operation for all standard production S-Series and LS-Series dryers. These dryers are available for liquid propane or natural gas fuel supply, with either single phase (600S only), 230 volt, or three phase 220 or 440 volt electrical power.

USE CAUTION IN THE OPERATION OF THIS EQUIPMENT

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

Use extreme caution in working around high speed fans, gas-fired heaters, augers and auxiliary conveyors which may start without warning when the dryer is operating on automatic control.

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

Take special note of the Operating Precautions listed on Page 2 before attempting to operate the dryer.

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

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT.

CONTENTS:

OPERATING PRECAUTIONS

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

SPECIFICATIONS

TYPE: Continuous multi-stage, modular construction, with two fan-heater units per module for staged drying temperatures; equipped for either staged, intermittent discharge or continuous flow discharge.

GRAIN COLUMNS: Two grain columns, 14" thickness, with grain movement through columns controlled by variable speed metering rolls; grain column construction of galvanized steel, with heavy steel partitions each two feet of length, and with meter roll access panels and grain clean out mechanism.

FANS: Two heavy duty axial fans (per module), direct drive, 1750 RPM, with total air flow, static pressure, and horsepower matched to grain volume, and with full motor overload protection.

HEATERS: High capacity direct fired heaters, with ACCU-FIRE burners, full electric ignition, and thermostat temperature control by two level fuel flow modulation (Hi-Lo burner control).

AUTO CONTROL: Fully equipped for: (1)Dry and Cool, Staged Automatic, (2)Dry and Cool, Continuous Flow, (3)Full Heat, Staged Automatic, (4)Full Heat, Continuous Flow. Automatic control of all functions - loading, drying, cooling, and discharge. Staged Automatic process controlled by automatic reset timers: Continuous Flow process controlled by adjustable rate metering roll system. Full safety control system; automatic shut-down on wet grain outage or excessive temperature; moisture control thermostat control circuit; circuit monitor system to identify cause of safety shut-down; hour meter.

SPECIFICATIONS CHART FOR S-SERIES MODEL DRYERS

	600S	1200S	1800S
BASIC CONSTRUCTION	1 Module, 2 Stages	2 Modules, 4 Stages	3 Modules, 6 Stages
GRAIN COLUMNS	14", 20' Long	14", 20' Long	14", 20' long
GRAIN COLUMN HOLDING CAPACITY	595 Bu.	1100 Bu.	1590 Bu
HOLDING CAPACITY, EXCL. 135 BU WET BIN	460 Bu	965 Bu	1455
TRANSPORT LENGTH (Hitch to Discharge Auger)	29'-1.5"	29'-1.5"	29'-1.5"
TRANSPORT WIDTH	8'	8'	8'
TRANSPORT HEIGHT	13'-5"	13'-5"	13'-5"
TRANSPORT WEIGHT	9800 Lbs. (Approx.)	9800 Lbs. (Approx.)	9800 Lbs. (Approx.)
INSTALLED LENGTH	27'-0"	29'-10.25"	29'-10.25"
INSTALLED WIDTH	8'	11'-2"	11'-2"
INSTALLED HEIGHT (Above Foundation Supports)	15'-10"	27'-2"	38'-6"
Fans	(2) 10-16 HP 1-PH, 36" (2) 15 HP 3-PH, 1750 RPM	(4)-15 HP, 36" 1750 RPM	(6) 15 HP, 36" 1750 RPM
Heater (Max. BTU per Burner)	(2) 4.6 MIL Btu/Hr.	(4) 4.6 MIL Btu/Hr	(6) 4.6 ML Btu/Hr
TOP LOADING AUGER	8", 7.5 HP	8", 10 HP	8", 10 HP
CAPACITY	3000 BPH	3000 BPH	3000 BPH
BOTTOM AUGER	8", 10" Tube, 7.5 HP	8", 10" Tube, 7.5 HP	8", 10 Tube, 7.5 HP
METER ROLL SYSTEMS, MAX. RATE *1	SCR 3/4 HP 3000 BPH	SCR 3/4 HP 3000 BPH	SCR 3/4 HP 3000 BPH
ELECTRIC LOAD (Fan, Top Aug., Bot. Aug.) *2			
Single phase, 230 V	210 Amps.	N/A	N/A
Three phase, 220 V	126 Amps.	206 Amps	286 AMPS
Three phase, 440 V.	63 Amps.	103 Amps	143 AMPS
DRYING CAPACITY, SHELLED CORN *3			
DRY & COOL, 25% to 15%	375 BPH	800 BPH	1220 BPH
DRY & COOL, 20% to 15%	520 BPH	1035 BPH	1670 BPH
FULL HEAT, 25% to 15% *4	595 BPH	1190 BPH	1785 BPH
FULL HEAT, 20% to 15% *4	1010 BPH	2015 BPH	3020 BPH

*1 Actual discharge rate is controlled by meter roll speed adjustment, at 0% to 100% of maximum rate.

*2 Excludes auxiliary load and unload motors.

*3 Capacities listed are wet bushels at input moisture content.

*4 Grain discharged hot from the dryer at 17% output moisture should result in a final moisture content of 15% to 15 1/2% after cooling (dryeration).

*5 Wet bin, service platforms, and structural supports shipped knock down, for field installation.

SPECIFICATIONS CHART FOR LS-SERIES MODEL DRYERS

	750LS	1500LS	2300LS
BASIC CONSTRUCTION	1 Module, 2 Stages	2 Modules, 4 Stages	3 Modules, 6 Stages
GRAIN COLUMNS	14", 26' Long	14", 26' Long	14", 26' long
GRAIN COLUMN HOLDING CAPACITY	775 Bu.	1430 Bu.	2067 Bu
HOLDING CAPACITY, EXCL. 176 BU WET BIN	600 Bu	1245 Bu	1892 Bu
TRANSPORT LENGTH (Hitch to Discharge Auger)	35'-1.5"	35'-1.5"	35'-1.5"
TRANSPORT WIDTH	8'	8'	8'
TRANSPORT HEIGHT	13'-5"	13'-5"	13'-5"
TRANSPORT WEIGHT	10000 Lbs. (Approx.)	10000 Lbs. (Approx.)	10000Lbs.(Approx.)
INSTALLED LENGTH	33'-0"	35'-10.25"	35'-10.25"
INSTALLED WIDTH	8'	11'-2"	11'-2"
INSTALLED HEIGHT (Above Foundation Supports)	15'-10"	27'-2"	38'-6"
Fans	(2) 25 HP, 40" 1750 RPM	(4) 25 HP, 40" 1750 RPM	(6) 25 HP, 40" 1750 RPM
Heater (Max. BTU per Burner)	(2) 6 MIL Btu/Hr.	(4) 6 MIL Btu/Hr	(6) 6 MIL Btu/Hr
TOP LOADING AUGER	8", 10 HP	8", 10 HP	8", 10 HP
CAPACITY	3800 BPH	3800 BPH	3800 BPH
BOTTOM AUGER	8", 10" Tube, 10 HP	8", 10" Tube, 10 HP	8", 10 Tube, 10 HP
METER ROLL SYSTEMS, MAX. RATE *1	SCR 3/4 HP 3500 BPH	SCR 3/4 HP 3500 BPH	SCR 3/4 HP 3500 BPH
ELECTRIC LOAD (Fan, Top Aug., Bot. Aug.) *2			
Three phase, 220 V	172 Amps.	292 Amps	412 Amps
Three phase, 440 V.	86 Amps.	146 Amps	206 Amps
DRYING CAPACITY, SHELLED CORN *3			
DRY & COOL, 25% to 15%	488 BPH	1075 BPH	1586 BPH
DRY & COOL, 20% to 15%	676 BPH	1245 BPH	2250 BPH
FULL HEAT, 25% to 15% *4	774 BPH	1547 BPH	2320 BPH
FULL HEAT 20% to 15% *4	1313 BPH	2620 BPH	3926 BPH

*1 Actual discharge rate is controlled by meter roll speed adjustment, at 0% to 100% of maximum rate.

*2 Excludes auxiliary load and unload motors.

*3 Capacities listed are wet bushels at input moisture content.

*4 Grain discharged hot from the dryer at 17% output moisture should result in a final moisture content of 15% to 15 1/2% after cool ing (dryeration).

*5 Wet bin, service platforms, and structural supports shipped knock down, for field installation.

TRANSPORTING DRYER

The dryer is available with an optional Transport Kit for transporting the unit by truck or tractor. Make certain to observe the following safety precautions.

1. Recommended Towing Hitch Height 16-17 Inches.
2. Hitch Pin to be NOT LESS THAN 3/4 INCH in DIA. and SECURELY FASTENED so it WILL NOT COME OUT in TRAVEL.
3. Use a Safety Chain.
4. Dryer must be towed empty and in accordance with applicable state or Provincial Regulations.
5. Recommended tire pressures 55-60 P.S.I. (Cold)
6. Maximum towing speed 45 Miles Per Hour.
7. After first 50 miles and every 200 miles thereafter:
   a. Check hub and spindle temperature immediately after stopping. Temperature should not exceed 150°F.; May be hot to touch, but not melting lubricant.
   b. Check wheel bolts; They are factory torqued at 115 to 120 Ft.-Lbs. Retighten, if required, to approximately 90 Ft.-Lbs.

INSTALLATION

SYSTEMS LAY-OUT: Consider the grain handling systems and the location of storage bins and existing conveyors in selecting the dryer site, to facilitate wet grain supply and dry grain discharge to conveyors.

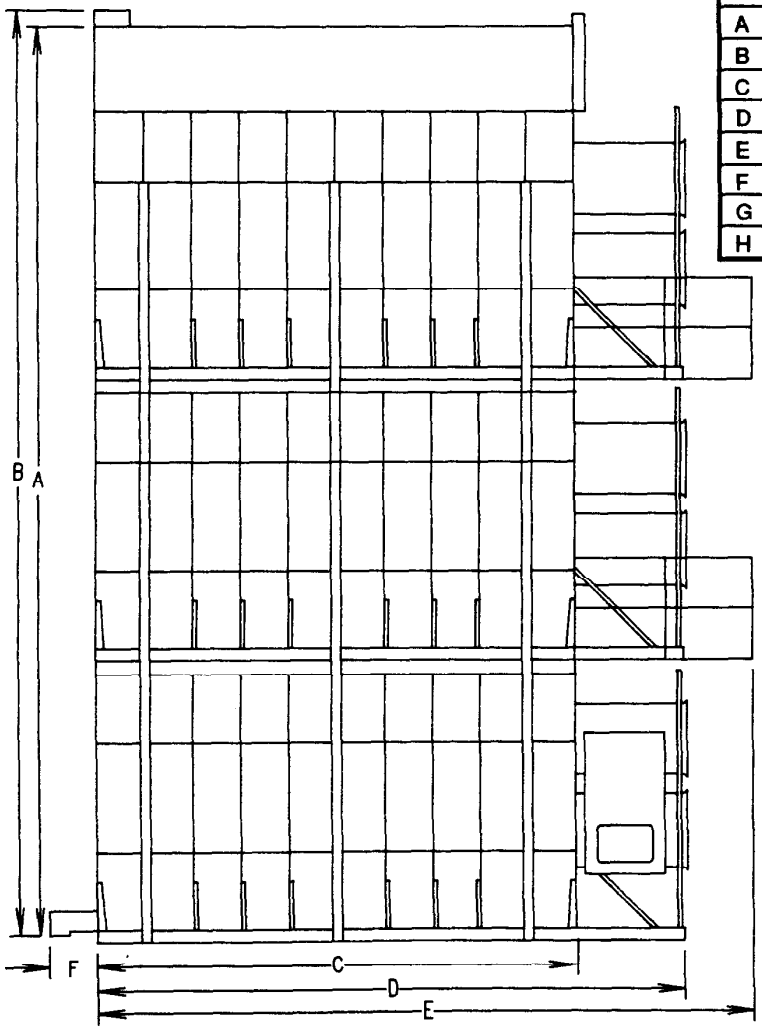
SITE SELECTION: The dryer is not to be operated inside a building or in any area not permitted by electrical codes, fuel installation regulations, or insurance requirements. Do not operate in an area where combustible material can be drawn into the fans. Maintain a minimum distance of three feet to other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

FOUNDATION: See Foundation Layout pamphlet.

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

WET GRAIN SUPPLY: A wet holding bin is provided, with gravity flow into the dryer loading conveyor, or gravity flow from a wagon or truck into a loading conveyor may be used to fill the dryer. The top leveling auger will accept grain at any rate up to about 3000 bu. per hour for S-Series and 3800 bu. per

	AIRSTREAM MODEL					
	600S	1200S	1800S	750LS	1500LS	2300LS
A	15'-2"	26'-6"	37'-10"	15'-2"	26'-6"	37'-10"
B	15'-10"	27'-2"	38'-6"	15'-10"	27'-2"	38'-6"
C	20'-0"	20'-0"	20'-0"	26'-0"	26'-0"	26'-0"
D	24'-9"	24'-9"	24'-9"	30'-9"	30'-9"	30'-9"
E	25'-0"	27'-10"	27'-10"	31'-0"	33'-10"	33'-10"
F	24"	24"	24"	24"	24"	24"
G	6'-4"	6'-4"	6'-4"	6'-4"	6'-4"	6'-4"
H		11'-2	11'-2		11'-2	11'-2



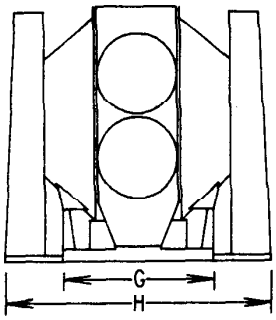


FIG 1 ILLUSTRATION OF DIMENSIONS

AUGER DRIVE DATA

S-SERIES AUGER DRIVE DATA	AUGER		MOTOR			SHEAVES	
	SIZE	APPROX. CAPACITY BU./HR.*	HP	RPM	BELTS	DRIVE OD	DRIVEN OD
TOP AUGER	8"	3000	7.5	1750	BX 120 (TWO)	2BK40	2TB184
BOTTOM AUGER	8"	3000**	7.5	1750	BX53 (TWO)	2BK40	2BK160

LS-SERIES AUGER DRIVE DATA	AUGER		MOTOR			SHEAVES	
	SIZE	APPROX. CAPACITY BU./HR.*	HP	RPM	BELTS	DRIVE OD	DRIVEN OD
TOP AUGER	8"	3800	10	1750	BX120 (TWO)	2BK40	2TB184
BOTTOM AUGER	8"	3500**	10	1750	BX53 (TWO)	2BK40	2BK160

* Dryer auger capacities and power requirements vary with grain moisture content and amount of fine material in grain.

** The 3000 bu/hr and 3500 bu/hr listings represent the maximum metering roll discharge rate. The bottom auger capacity exceeds the max. metering roll rate.

FIG 2

hour for LS-Series. In any case, the dryer must have a constant supply of wet grain. Auxiliary loading conveyors should be sized to nearly match the capacity of the top auger, to avoid air loss problems caused by under filling during high drying rate operations.

WET GRAIN LOADING: The dryer will automatically start the top auger and any loading conveyor electrically connected to the power circuit provided in the Main Control Box. At the beginning, the dryer will completely fill. During drying, the top auger will start and stop, as required, depending upon the dry grain discharge rate and grain shrinkage, to maintain the dryer full of wet grain.

LOAD TIMER: The unit is equipped with a load timer (within Control Box), to provide automatic shut-down on wet grain outage. If the top auger operates for a time exceeding the setting of the load timer (field adjustable), the dryer will shut down.

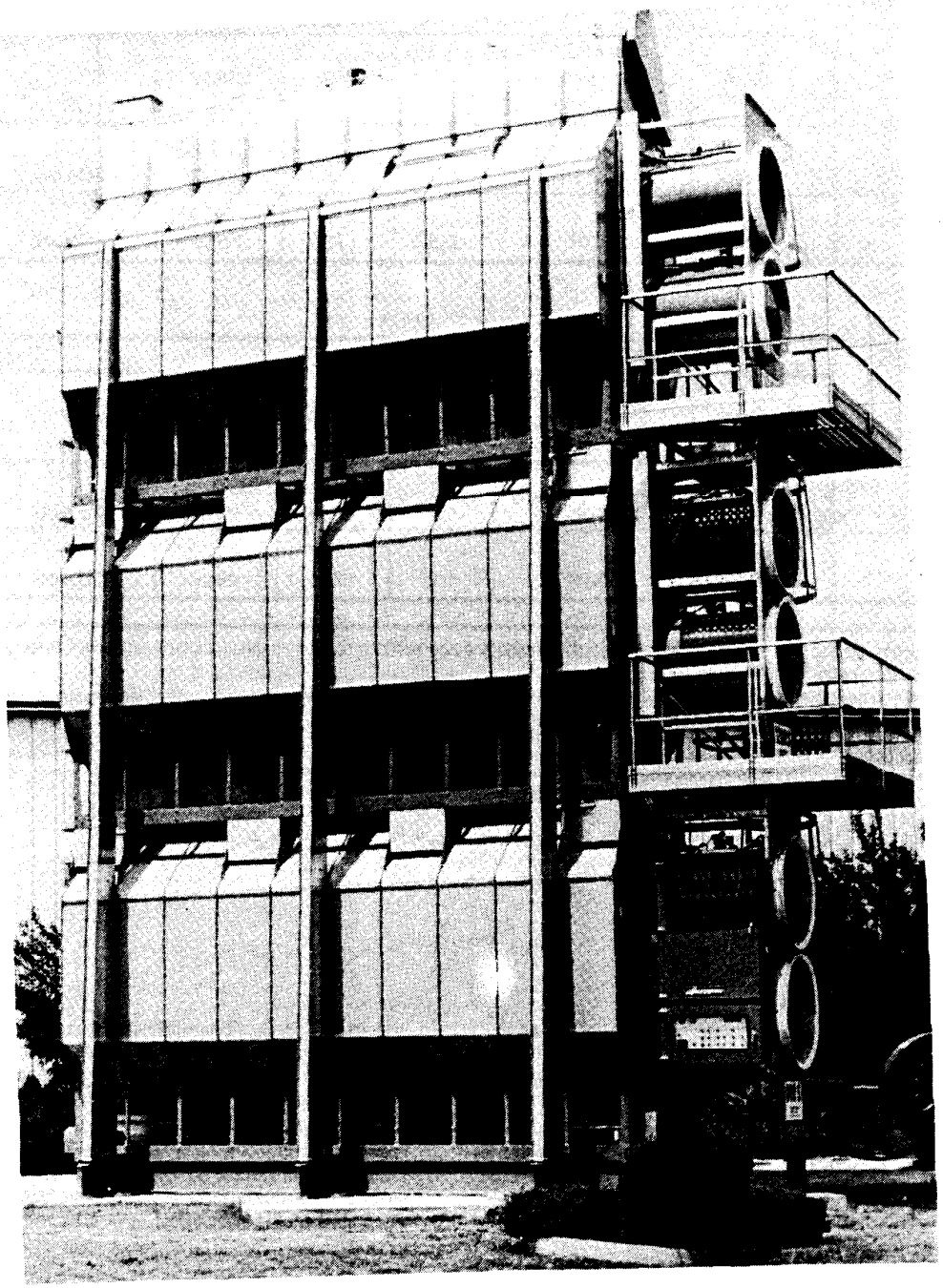
OVERLOAD RELAYS

STANDARD EQUIPMENT: The dryer is equipped with a complete set of current overload relays with heater ratings as shown by Fig. 6. The safety control circuit of the single phase unit includes current overload relays, plus a thermal overload protector in each fan motor winding. Three phase units have current overload relays in the safety circuit.

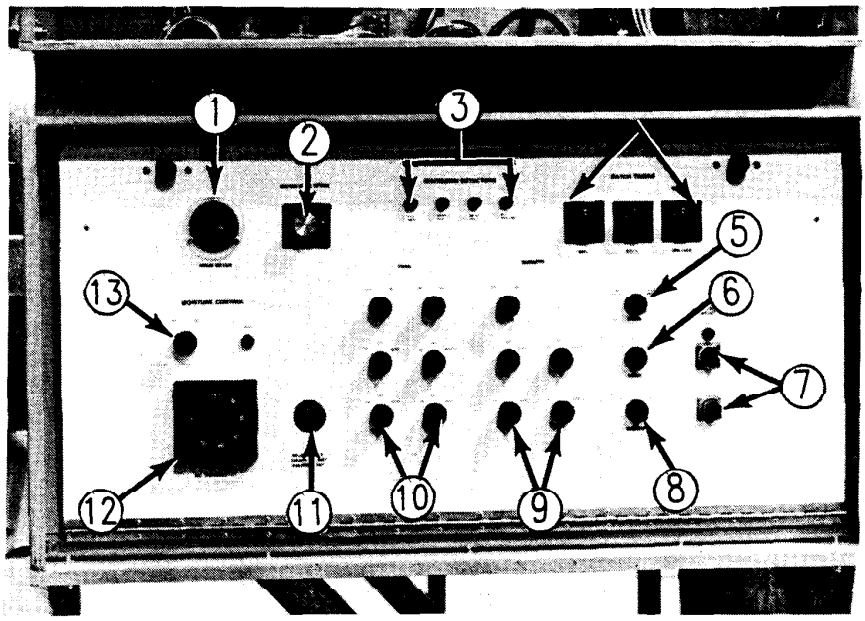
MANUAL RESET: All current overload relays are manually reset, except for the automatic reset locked rotor overload and the thermal protector on the single phase fan motors. If an electrical overload occurs, the Control Box must be opened to push the reset lever.

LOAD ADJUSTMENT: *Current overload relays are adjustable* from 85% to 115% of the rated current of the heater strip, by turning the knob (clockwise turning to 85%).

AUXILIARY CONVEYOR OVERLOAD RELAYS: Overload relays are provided for up to 15 HP motors for on the auxiliary conveyors. However, all information is based on 10 HP motors. It is necessary to provide the heater elements to provide running load protection for the motors. See Fig. 6 for heater element specification.

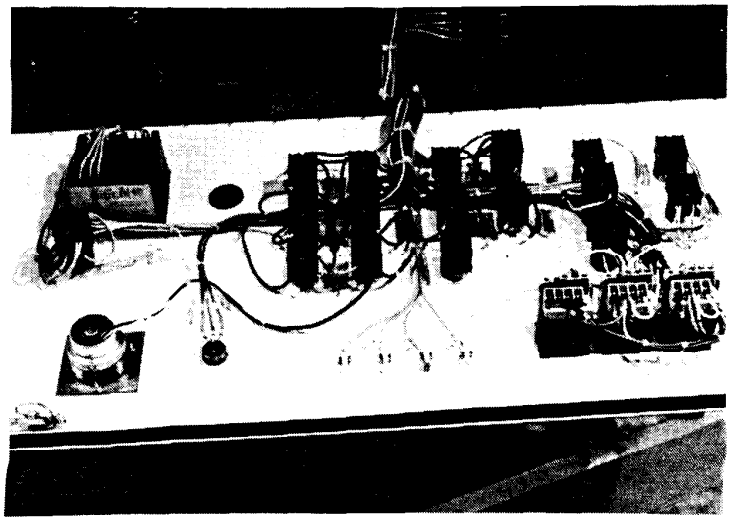


AIRSTREAM 1800S GRAIN DRYER



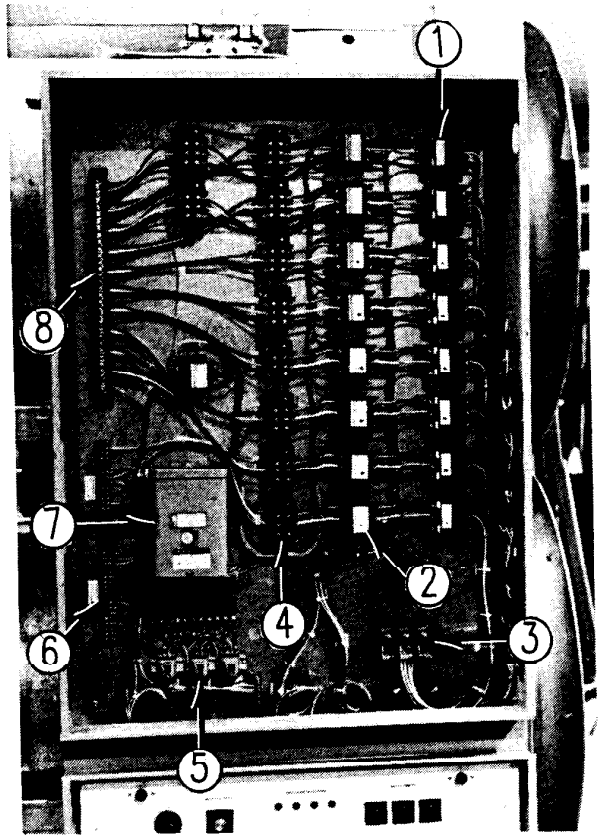
1 HOUR METER
2. METER ROLL ADJUSTMENT
3. SHUT DOWN INDICATOR LIGHTS
4. BATCH TIMERS
5. MODE SWITCH
6. LOAD SWITCH
7. STOP & START SWITCHES
8. UNLOAD SWITCH
9. BURNER SWITCHES
10. FAN SWITCHES
11. ADJ. HI-LIMIT THERMOSTAT
12. MC THERMOSTAT
13. MC SWITCH

DRYER CONTROL PANEL



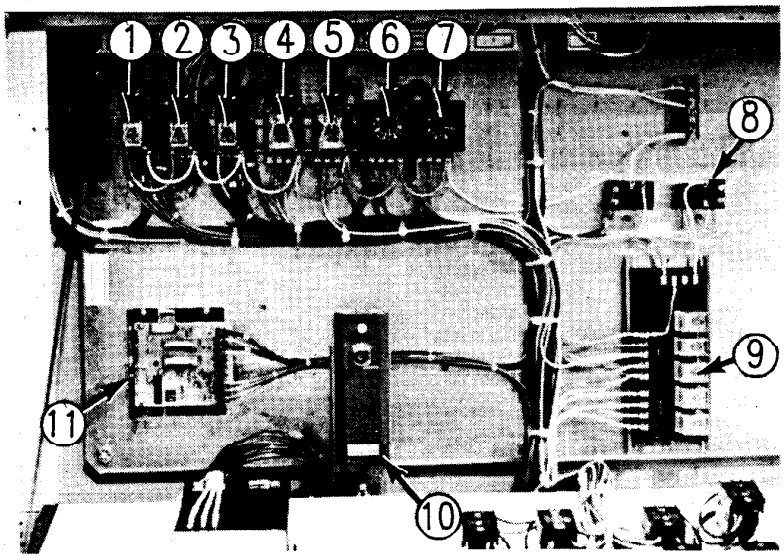
CONTROL BOX -FRONT PANEL

1. CIRCUIT BREAKERS
2. CONTACTORS
3. POWER DISTRIBUTION BLOCK
4. OVERLOAD RELAYS
5. RS1, RS2, RS3
6. CONTROL TERMINALS
7. CONTROL TRANSFORMER
8. POWER TERMINAL

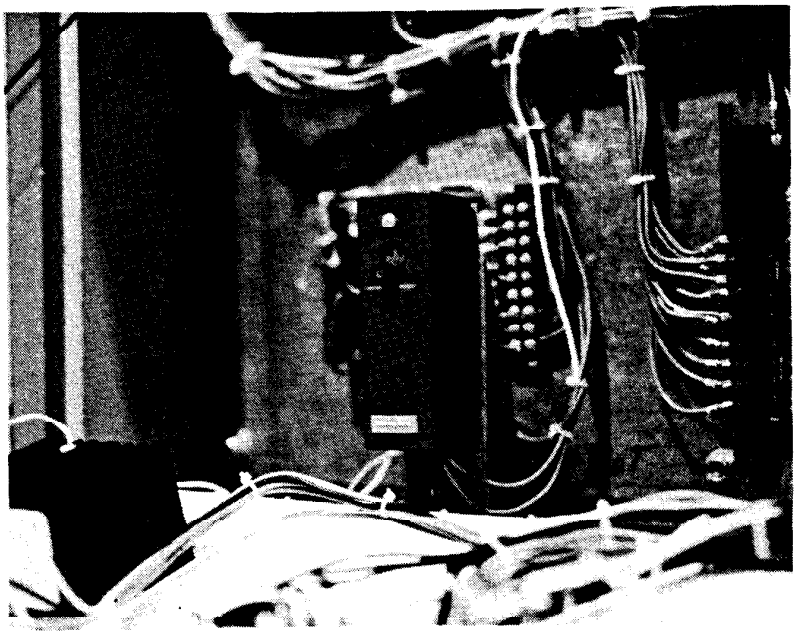


CONTROL BOX UPPER BACK PANEL

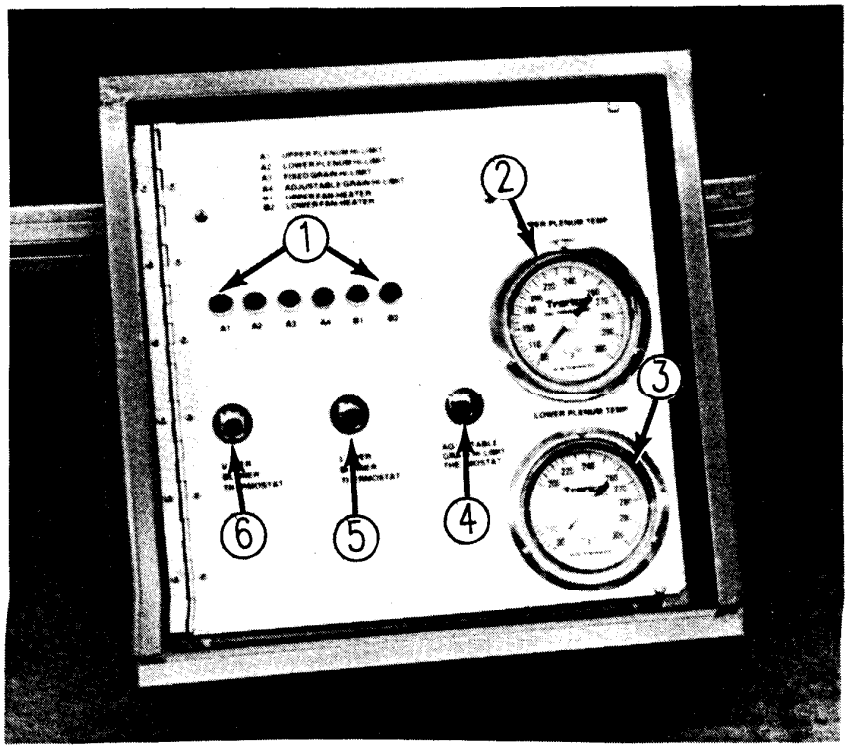
1. BURNER RELAY #1
2. BURNER RELAY #2
3. FAN RELAY
4. R1 RELAY
5. MC RELAY
6. METER ROLL TIMER
7. LOAD TIMER
8. TIME DELAY RELAYS
9. SAFETY CIRCUIT BOARD
10. ADJ. HI-LIMIT THERMOSTAT
11. SCR DRIVE BOARD



CONTROL BOX LOWER BACK PANEL

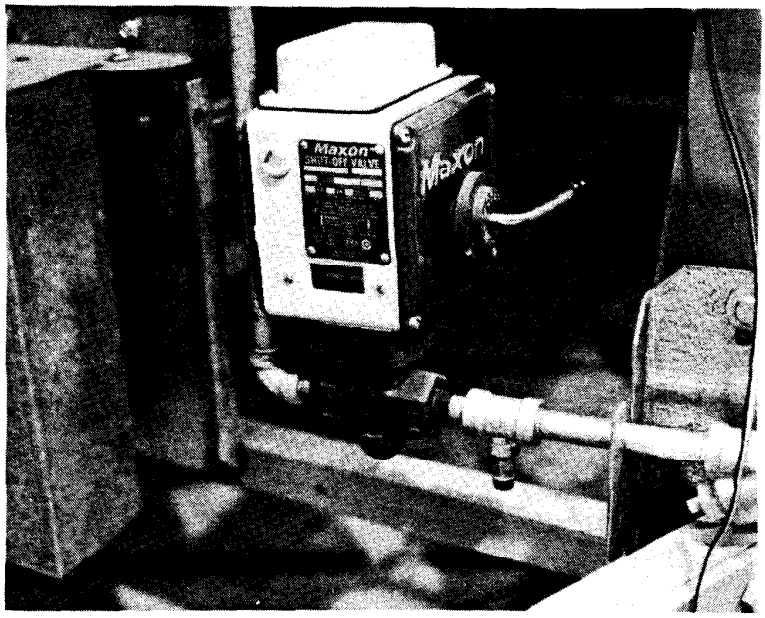


ADJUSTABLE GRAIN HI-LIMIT



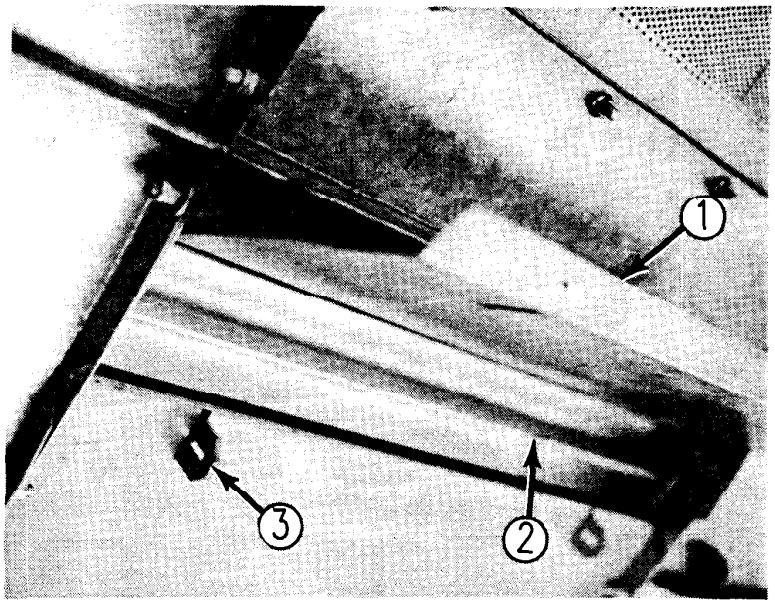
1. SHUT DOWN INDICATOR LIGHTS
2. UPPER PLENUM THERMOSTAT
3. LOWER PLENUM THERMOSTAT
4. ADJ. GRAIN HI-LIMIT
5. LOWER HI-LO THERMOSTAT
6. UPPER HI-LO THERMOSTAT

BRANCH CIRCUIT BOX

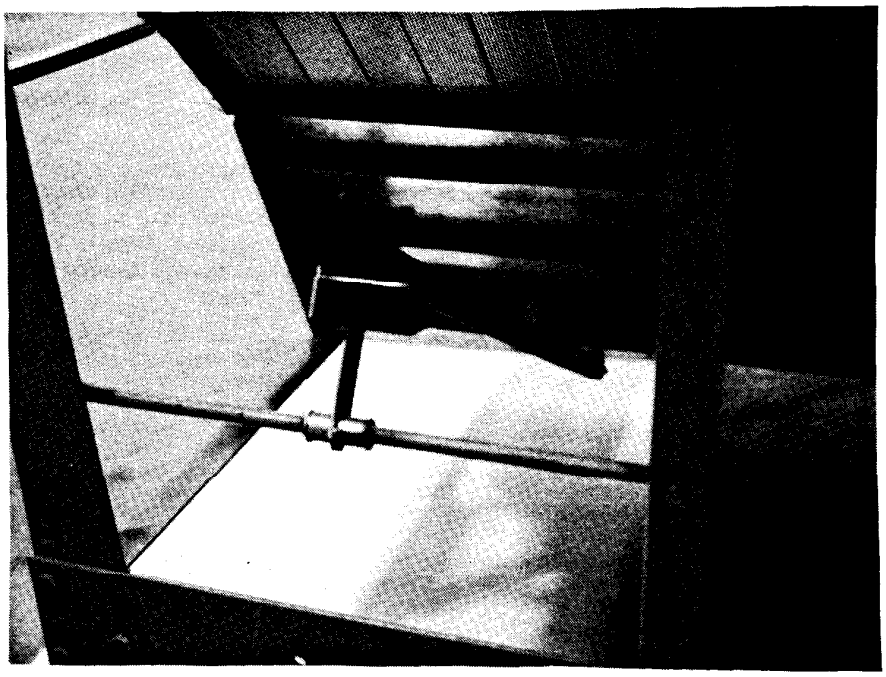


ELECTRONIC SAFETY SHUT-OFF VLAVE

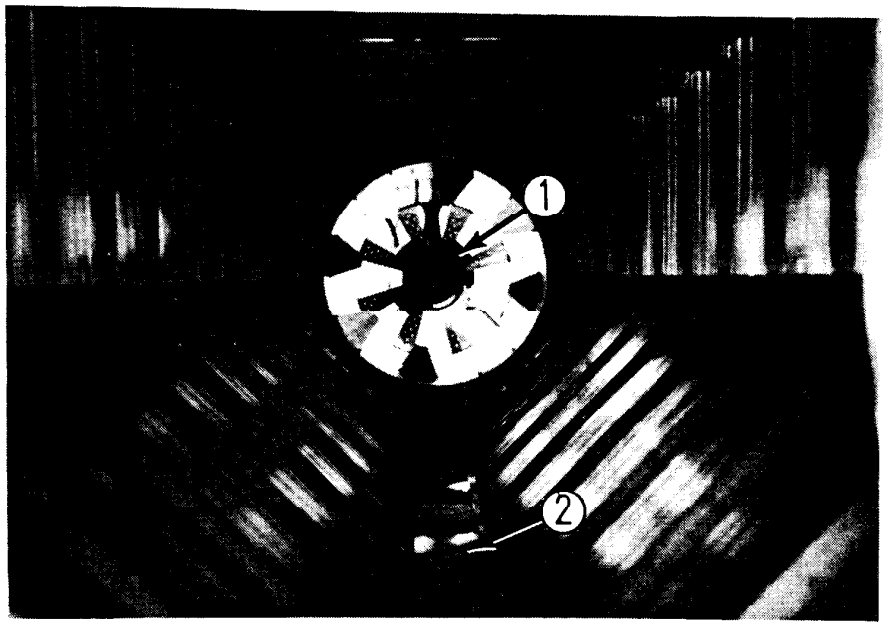
1. ACCESS DOOR
2. METER ROLL
3. ACCESS DOOR LATCH



METER ROLL ACCESS DOOR



CLEAN-OUT DOOR MECHANISM



1. FAN-HEATER
2. PLENUM BOTTOM CLOSURE PANEL

DRYER PLENUM

FUEL CONNECTION

LIQUID PROPANE (LP) DRYERS WITH INTERNAL VAPORIZERS

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

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

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

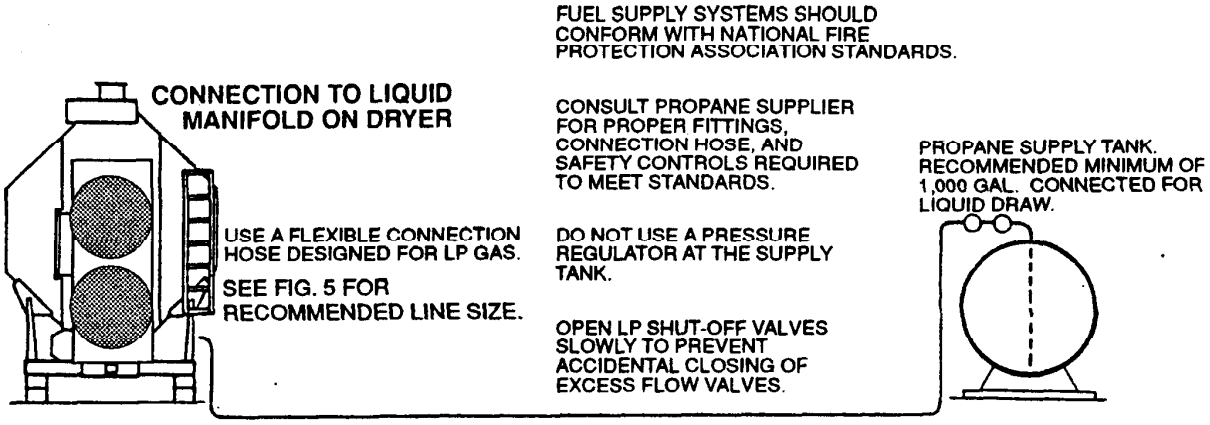


FIG. 3 LIQUID PROPANE FUEL SUPPLY

NATURAL GAS (N)

GAS VOLUME AND PRESSURE: The dryer is designed to operate on natural gas having a heat value of about 1,000 BTU per cubic foot.

The dryer is equipped with a natural gas supply pipe system connected to the heater solenoid valves. A regulated pressure of 5 to 10 PSI must be provided at the connection to the dryer, with gas available in sufficient volume to maintain the operating pressure.

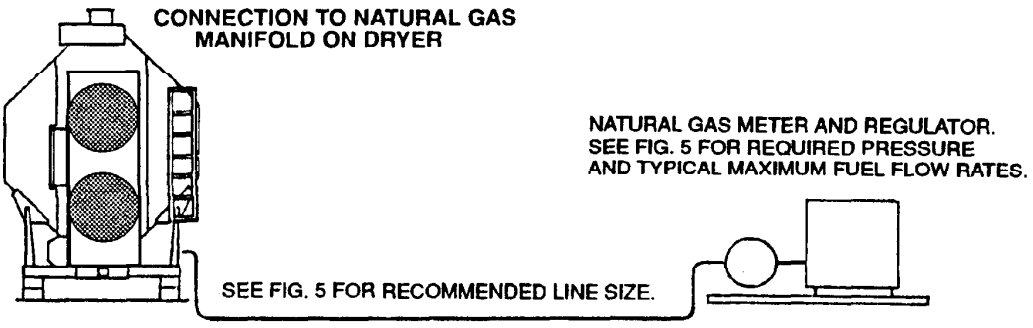


FIG. 4 NATURAL GAS FUEL SUPPLY

FUEL SYSTEM SPECIFICATIONS & RECOMMENDATIONS

		S	LS
	MAXIMUM HEAT CAPACITY (BTU PER HOUR PER MODULE)	9,200,000	12,000,00
LIQUID PROPANE (LP)	TYPICAL MAXIMUM FUEL FLOW *(GALLONS PER HR. PER MODULE)	98	142
	RECOMMENDED LIQUID LINE SIZE	3/4" PIPE	3/4" PIPE
	HEATER ORIFICE DRILL SIZE	.297 INCH	.328 INCH
	OPERATING PRESSURE RANGE (heater pressure gauge), PSI	5-20	5-20
	LO-FIRE PRESSURE SETTING, PSI	5 PSI	5 PSI
NATURAL GAS (N)	TYPICAL MAXIMUM FUEL FLOW * (CUBIC FT. PER HR. PER MODULE)	9,200	12,000
	MINIMUM PRESSURE AT CONNECTION TO DRYER, PSI	8 PSI	8 PSI
	RECOMMENDED MINIMUM LINE SIZE -100' DISTANCE	3" PIPE	3" PIPE
	HEATER ORIFICE DRILL SIZE	.438 INCH	.531 INCH
	OPERATING PRESSURE RANGE (heater pressure gauge), PSI	4-8 PSI	4-8 PSI
	LO-FIRE PRESSURE SETTING, PSI	4 PSI	4 PSI

*MAXIMUM FUEL FLOW RATES LISTED ASSUME FULL HEAT OUTPUT FOR GAS LINE SIZING PURPOSES. IN NORMAL OPERATION THE FLOW RATES WOULD BE CONSIDERABLY LOWER THAN INDICATED, DUE TO ACTUAL PRESSURE SETTINGS USED & CYCLING OF HEATER.

FIG. 5 FUEL SYSTEMS SPECIFICATIONS AND RECOMMENDATIONS

ELECTRICAL POWER SUPPLY

POWER SUPPLY: An adequate power supply and proper wiring supply are important factors for maximum performance and long life of the dryer. Electrical service must be adequate size to prevent low voltage damage to motors and control circuits. Power supply for 1-phase models must include a neutral wire. All dryers should be field provided with a dependable equipment ground. Electrical power supply must conform to local, state, or provincial requirements.

POWER SUPPLY DISCONNECT: All dryers are equipped with a power disconnect switch on the Control Box to permit total power shut-down before opening dead front, as required for inspection and service. The power disconnect switch is located on the door of the dryer Control Box for quick shut-down.

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

ELECTRICAL LOAD: Fig. 6 indicates the electrical load in horsepower and full load current, for the motors on the dryer, and for auxiliary loading and take-away conveyors which can be directly connected to the power circuits in the dryer Control Panel.

OVERLOAD RELAYS: Overload relays are adjustable from 85% to 115% of normal load in amperes, as shown by the overload relay heater specifications of Fig. 6, by an adjustable knob in each relay. Dryers are shipped with overload relays for auxiliary conveyors (adjacent to top and bottom auger contactors) to operate 15 HP, 1 phase (600S only) or 3 phase motors. However, all infomation is based on 10 HP motors, if different motors are used, the heater elements must be changed to provide adequate motor overload protection.

NOTE: The heater elements are not provided with the relays for the auxiliary conveyors.

CONNECTING AUXILIARY CONVEYORS: The maximum size auxiliary conveyor motors which can be powered directly from the power terminals of the dryer is 15 HP single phase and three phase. See appropriate power circuit wiring diagram for terminal connection numbers.

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

A. Motors must be powered from a source outside of the dryer with the use of a separate contactor and overload protection device for each motor for 110V coil operation.

B. For automatic operation with auxiliary loading, connect one lead to the top of the load contactor wire yellow number 3. Connect the other led to the grounding lug.

C. For automatic operation with auxiliary unloading, connect one lead to the top of the unload contactor wire orange number 14. Connect the other led to the grounding lug.

D. When conveyor motors are powered from an external source and are connected for automatic type operation, their overload protective switches should be connected in series and then connected into the dryer safety circuit. For recommended connections, refer to motor overload protection connections shown within the SAFETY CIRCUIT wiring diagram.

ELECTRICAL LOAD, OVERLOAD RELAYS, & CIRCUIT BREAKERS

MODEL 600S DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOER	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	10-16 15 15	7.5 7.5 7.5	7.5 7.5 7.5	10 (TWO) 10 (TWO) 10 (TWO)
FULL LOAD CURRENT AMPS PER MOTOR	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	74 40 20	31 20 10	31 20 10	40 26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	210 120 60			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	290 172 86			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	1-PH.-230 V. 3-PH.-220 V 3-PH.-440 V.	400 200 100			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	F848B C440B C250B	C303B C228B C137B	C303B C228B C137B	C330B C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	1-PH.-230 V. 3-PH.-220 V. 3-PH.-440 V.	100 100 225 (one breaker)	125 100	125 100	(2) (2)

FIG. 6a

MODEL 1200S DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	15 15	7.5 7.5	7.5 7.5	10 (TWO) 10 (TWO)
FULL LOAD CURRENT AMPS PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	40 20	20 10	20 10	26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	3-PH.-220 V. 3-PH.-440 V.	200 100			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	3-PH.-220 V. 3-PH.-440 V.	252 126			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	300 150			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC	3-PH.-220 V. 3-PH.-440 V.	C440B C250B	C228B C137B	C228B C137B	C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	100 225 (one breaker)	100	100	(2)

FIG. 6b

APPLY THE FOLLOWING INFORMATION TO THE ABOVE CHARTS:

(1) THE MOTOR CURRENT AND MAXIMUM DRYER RUNNING LOADS SHOWN ARE BASED UPON THE LISTED 10 HP AUXILIARY CONVEYOR MOTORS. THE MAXIMUM SIZE MOTOR WHICH CAN BE POWERED DIRECTLY THROUGH THE DRYER CONTROL BOX IS 15 HP (10 HP 600S 1-PH). ALL LARGER THAN MAXIMUM AUXILIARY CONVEYOR MOTORS REQUIRE SEPARATE CONTACTORS AND OVERLOAD PROTECTORS WITH COIL CIRCUITS CONNECTED TO THE DRYER FOR AUTOMATIC OPERATION.

IMPORTANT: ALL STANDARD MODEL DRYERS ARE FACTORY EQUIPPED WITHOUT OVERLOAD RELAY HEATER ELEMENTS SIZED FOR LISTED HP AUXILIARY MOTORS. HEATER ELEMENTS MUST BE MATCHED TO THE ACTUAL HORSEPOWER MOTORS USED.

(2) AUXILIARY MOTORS ARE CONTROLLED BY THE TOP AND BOTTOM AUGER CIRCUIT BREAKERS

ELECTRICAL LOAD, OVERLOAD RELAYS, & CIRCUIT BREAKERS (Continued)

MODEL 1800S DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	15 15	7.5 7.5	7.5 7.5	10(TWO) 10(TWO)
FULL LOAD CURRENT PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	40 20	20 10	20 10	26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	3-PH.-220 V. 3-PH.-440 V.	280 140			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	3-PH.-220 V. 3-PH.-440 V.	334 166			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	400 200			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	3-PH.-220 V. 3-PH.-440 V.	C440B C250B	C228B C137B	C228B C137B	C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	100 225 (one breaker)	100	100	(2)

FIG. 6c

MODEL 750LS DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	25 25	10 10	10 10	10(TWO) 10(TWO)
FULL LOAD CURRENT PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	60 30	26 13	26 13	26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	3-PH.-220 V. 3-PH.-440 V.	172 86			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	3-PH.-220 V. 3-PH.-440 V.	224 112			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	300 150			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	3-PH.-220 V. 3-PH.-440 V.	F658B C303B	C303B C163B	C303B C163B	C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	100 60	100 60	100 60	(2) (2)

FIG. 6d

APPLY THE FOLLOWING INFORMATION TO THE ABOVE CHARTS:

(1) THE MOTOR CURRENT AND MAXIMUM DRYER RUNNING LOADS SHOWN ARE BASED UPON THE LISTED 10 HP AUXILIARY CONVEYOR MOTORS. THE MAXIMUM SIZE MOTOR WHICH CAN BE POWERED DIRECTLY THROUGH THE DRYER CONTROL BOX IS 15 HP. ALL LARGER THAN MAXIMUM AUXILIARY CONVEYOR MOTORS REQUIRE SEPARATE CONTACTORS AND OVERLOAD PROTECTORS WITH COIL CIRCUITS CONNECTED TO THE DRYER FOR AUTOMATIC OPERATION.

IMPORTANT: ALL STANDARD MODEL DRYERS ARE FACTORY EQUIPPED WITHOUT OVERLOAD RELAY HEATER ELEMENTS SIZED FOR LISTED HP AUXILIARY MOTORS. HEATER ELEMENTS MUST BE MATCHED TO THE ACTUAL HORSEPOWER MOTORS USED.

(2) AUXILIARY MOTORS ARE CONTROLLED BY THE TOP AND BOTTOM AUGER CIRCUIT BREAKERS

ELECTRICAL LOAD, OVERLOAD RELAYS, & CIRCUIT BREAKERS (Continued)

MODEL 1500LS DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	25 25	10 10	10 10	10(TWO) 10(TWO)
FULL LOAD CURRENT PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	60 30	26 13	26 13	26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	3-PH.-220 V. 3-PH.-440 V.	292 146			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	3-PH.-220 V. 3-PH.-440 V.	344 172			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	400 200			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	3-PH.-220 V. 3-PH.-440 V.	F658B C303B	C303B C163B	C303B C163B	C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	100 60	100 60	100 60	(2) (2)

FIG. 6e

MODEL 2300LS DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	25 25	10 10	10 10	10(TWO) 10(TWO)
FULL LOAD CURRENT PER MOTOR	3-PH.-220 V. 3-PH.-440 V.	60 30	26 13	26 13	26 13
MAX. RUNNING LOAD DRYER ONLY-AMPS	3-PH.-220 V. 3-PH.-440 V.	412 206			
MAX. RUNNING LOAD (1) WITH AUX. CONV.-AMPS	3-PH.-220 V. 3-PH.-440 V.	464 232			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	600 300			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	3 PH. 220 V. 3-PH.-440 V.	F658B C303B	C303B C163B	C303B C163B	C303B C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	3-PH.-220 V. 3-PH.-440 V.	100 60	100 60	100 60	(2) (2)

FIG. 6f

APPLY THE FOLLOWING INFORMATION TO THE ABOVE CHARTS:

(1) THE MOTOR CURRENT AND MAXIMUM DRYER RUNNING LOADS SHOWN ARE BASED UPON THE LISTED 10 HP AUXILIARY CONVEYOR MOTORS. THE MAXIMUM SIZE MOTOR WHICH CAN BE POWERED DIRECTLY THROUGH THE DRYER CONTROL BOX IS 15 HP. ALL LARGER THAN MAXIMUM AUXILIARY CONVEYOR MOTORS REQUIRE SEPARATE CONTACTORS AND OVERLOAD PROTECTORS WITH COIL CIRCUITS CONNECTED TO THE DRYER FOR AUTOMATIC OPERATION.

IMPORTANT: ALL STANDARD MODEL DRYERS ARE FACTORY EQUIPPED WITHOUT OVERLOAD RELAY HEATER ELEMENTS SIZED FOR LISTED HP AUXILIARY MOTORS. HEATER ELEMENTS MUST BE MATCHED TO THE ACTUAL HORSEPOWER MOTORS USED.

(2) AUXILIARY MOTORS ARE CONTROLLED BY THE TOP AND BOTTOM AUGER CIRCUIT BREAKERS

OPERATING INFORMATION

LOAD SWITCH (TOP AUGER)

The load switch has three positions ON - OFF - AUTO. When the switch is set to AUTO, the load timer will be energized whenever the top auger is operating. If the top auger and timer operate continuously for a period longer than the timer setting, the timer will automatically shut down the dryer. The AUTOMATIC switch position is the normal setting and is used to automatically stop the dryer when the wet grain supply is exhausted.

When the switch is set in the ON position, the load timer will not operate. The ON position is recommended when filling an empty dryer.

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

UNLOAD SWITCH (BOTTOM AUGER)

The unload switch has two positions: OFF-AUTO. When operating in AUTOMATIC, the bottom auger will operate continuously if not being held by the MC thermostat. If the switch is turned OFF, only the unloading will stop and the dryer fan and burner will continue to operate.

MODE SWITCH

The MODE SWITCH switch is used to select either the CONTINUOUS FLOW or STAGED AUTOMATIC mode of dryer operation. The batch timers do not operate when the dryer is in the Continuous Flow Mode of operation.

FAN SWITCH

The fan switches for No. 1 and No. 2 (and 3&4 for Double and Triple Stacked) fans have two operating positions. If a switch is set in the ON position, the fan will operate continuously. If the switch is set to the AUTOMATIC position the fan will automatically stop during unloading when the dryer is operating in the Staged Automatic mode

The fan switch installed for the upper module on the Triple Staked dryers is designed for ON-OFF manual type control of the fans.

BURNER SWITCH

The burner switches for No. 1 and No. 2 (and 3&4 on Double and Triple Stacked) burner have two operating positions. When either switch is set to the ON position the burner will operate continuously. When set in the AUTOMATIC position, the burner will automatically stop during cooling and unloading if the dryer is operating in the Staged Automatic mode. If the switch is set in OFF position, the burner will not operate.

The heater switch for the upper module on the Triple Stacked dryers control the ON-OFF operation of the burner. Both heaters of each module are controlled by one switch. With this arrangement, both burners are either operating or shut off.

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

As a general rule: (1) If the fan switch is set in the AUTOMATIC position, the corresponding burner switch should also be set in AUTOMATIC. (2) If the No. 3 and 4 fan and burner switches are set in AUTOMATIC, the No. 1 and 2 fan switch should be set to the ON position and the No. 1 and 2 burner switch in the OFF position.

NOTE: REGARDLESS OF SWITCH POSITION, THE HEATER WILL NOT OPERATE UNLESS THE FAN IS RUNNING.

GRAIN COLUMN HI-LIMIT THERMOSTAT

The Hi-Limit thermostats are located in boxes mounted on both sides of the front of the dryer and sense the grain temperature near the outside of both grain columns above the upper burner of each module. The thermostats are a safety monitoring device designed to shut down the dryer, if the grain column temperature exceeds the thermostat setting.

The dryer is equipped with two types of Hi-Limits . One type is a Fixed Hi-Limit that is set at 220°F. The other is an Adjustable Hi-limit that can be set at any point that is desired.

MOISTURE CONTROL (MC) THERMOSTAT AND INDICATOR LIGHT

The function of the MC thermostat is to sense the temperature of the grain being dried within the grain column and to automatically hold any loads of higher moisture grain for additional drying until the grain temperature reaches the MC thermostat setting. With the thermostat properly set, it will prevent the unusually wet grain from being discharged at too high of a moisture content.
When the MC thermostat is "holding" the grain for further drying, the MC indicator light will be ON, indicating that the grain temperature is below the MC setting.

The MC switch controls the operation of the MC thermostat within the dryer. The thermostat is located within the Main Control Panel and is equipped with a 4 sensing points which monitors the grain temperature near the outside of both grain columns near the No. 2 burner.

The upper location used on Double and Triple Stacked models, is located between burners No. 3 and 4.

The dryer is normally operated with the thermostat ON. The dryer will automatically determine which location that should be used.

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

SETTING MC THERMOSTAT FOR CONTINUOUS FLOW OPERATION

ADJUSTMENT PROCEDURE:

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

SETTING MC THERMOSTAT FOR STAGED AUTOMATIC OPERATION

ADJUSTMENT PROCEDURE:

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

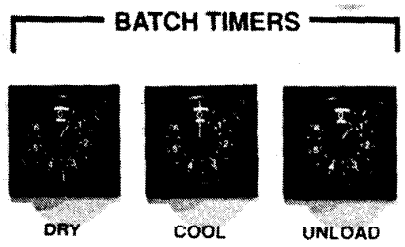


FIG. 7 BATCH TIMERS

TIMER SETTING AND ADJUSTMENT

Factory production dryers are shipped with the timers set in the 60M (sixty minutes) mode of operation, with the timer memory adjustments screw set In the "ON" position. These settings should normally not be changed for the COOL TIMER and the UNLOAD TIMER; however, for the DRY TIMER, with the DRY AND COOL method, the 60M mode will normally be limited only to moderately wet grain (less than 25% moisture). When drying 25%, or more, initial moisture content grain, it will be necessary to set the DRY TIMER to the 12HR (twelve-hour) mode of operation, as describe within "ADJUSTING THE DRYING TIME RANGE", to allow longer timer settings. See chart for suggested drying times.

The load timer shown in Fig. 8 is located within the Control Box. It is an adjustable, automatic reset type timer and is designed to provide automatic shut-down of the dryer if the top auger operates continuously for a time period exceeding the adjustment setting, thereby indicating an absence of wet grain.

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

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

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

FIG. 8 LOAD TIMER

ADJUSTING THE TIME RANGE

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

A. Use a small screwdriver and rotate the time range adjustment screw to the desired range (either 60M or 12HR) as shown in FIG. 9.

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

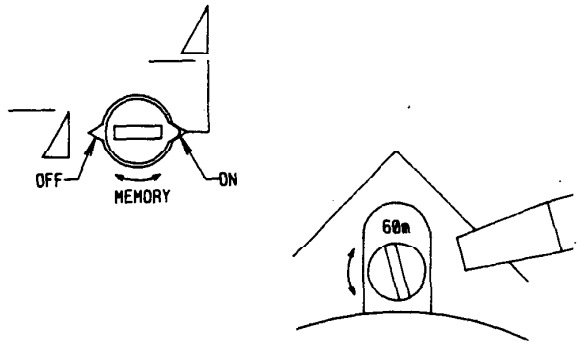


FIG. 9 MEMORY & TIME RANGE

ADDITIONAL OPERATING INSTRUCTION - STAGED AUTOMATIC

Refer to the following Staged Automatic Operation Chart and find the suggested dry timer setting, depending upon the type of grain, initial moisture content and drying method (DRY AND COOL, or FULL HEAT). The method may be changed from the DRYING AND COOL to the FULL HEAT, by rotating the COOL TIMER dial fully counterclockwise to the "0" position.

The load timer is designed to shut down when the grain supply is exhausted. The load timer will reset after each filling cycle.

The drying timer, when set to the recommended setting, will allow the burner to operate for this predetermined time at the temperature set by the burner thermostat. At the end of the drying period, the moisture control (MC) thermostat will monitor the grain, and if the grain temperature satisfies the moisture control setting, the burner will stop operating and the cooling

cycle will start. If the dryer is filled with unusually high moisture grain, the MC thermostat will remain on "MC HOLD" and continue the drying process until it meets the MC requirements.

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

The cool timer is easily adjusted for either full cooling or any degree of partial cooling. At the completion of the cooling cycle, the unloading cycle will start.

The unload timer is set at the time to unload the full content of a stage. During this unloading cycle, wet grain is being added, thus eliminating the down time to load, as is required in typical batch dryers. Also the fan continues to run, permitting cooling to continue during unloading. For the staged automatic drying mode, the meter rolls should be adjusted to provide maximum (100%) discharge rate.

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

SETTING THE LOAD TIMER - STAGED

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

SETTING THE UNLOAD TIMER - STAGED

Check the final grain moisture during unloading. The discharge grain should be dry up to the completion of the unloading cycle. To make a quick check at the end of the cycle, immediately change the mode switch setting to "Cont Flow" to briefly continue the dryer unloading. The desired unload timer setting will allow a few additional bushels of dry grain to be discharged (15 to 30 seconds of unloading) before wet grain is observed. Make the necessary unload timer adjustments and return the mode switch and unload switch to their original positions.

HI-LO FIRE BURNER THERMOSTAT & GAS PRESSURE SETTINGS

THERMOSTAT OPERATION: The drying temperature for the fan-heater unit is controlled by the HI-LO FIRE burner thermostat located on the front left of the dryer.

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

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

PROPANE MODELS

HI-FIRE: The HI-FIRE gas pressure for the burner is controlled by the gas pressure regulator. For maximum heat capacity, the regulator should be adjusted WHILE OPERATING ON HI-FIRE to provide approximately 20 PSI, shown by the pressure gauge on the fan-heater.

LO-FIRE: Set the LO-FIRE gas pressure to approximately 5 PSI by rotating the knob on the flow control knob. Lock the setting after making this adjustment. The burner must be operating on LO-FIRE when making this adjustment.

NATURAL GAS MODELS

HI-FIRE: The HI-FIRE gas pressure is controlled by adjusting the large manual shut-off valve within the line which supplies the fan- heater. For maximum heat, set the shut-off valve to provide approximately 8 PSI WHILE THE BURNER IS OPERATING ON HI-FIRE.

LO-FIRE: Turn the handle on the small gas shut-off valve to produce a LO-FIRE gas pressure of approximately 4 PSI while the burner is operating on LO-FIRE.

NOTE: On Triple Stacked models, both burners on the upper module are controlled by the same thermostat, but gas pressures must be set individually for each burner.

BURNER CYCLE: When the burner is operating properly, it should automatically cycle at regular intervals from HI-FIRE to LO-FIRE, as indicated by the corresponding pressure change on the gas pressure gauge. It is not necessary for the burner to cycle with short 5 to 10 second intervals, BUT IT IS IMPORTANT THAT THE BURNER DOES CYCLE OCCASIONALLY.

If the burner remains in HI-FIRE and does not cycle, increase the gas regulator setting on propane models, or the main gas supply pressure on natural gas models, in order to satisfy the thermostat setting. DO NOT EXCEED 20 PSI FOR PROPANE MODELS, OR 8 PSI FOR NATURAL GAS.

If the burner remains in LO-FIRE and does not cycle, decrease the LO-FIRE gas pressure slightly by readjusting the flow control valve. **DO NOT DECREASE THE VALVE SETTING TO THE EXTENT WHERE A NOTICEABLE BURNER FLUTTER OR POPPING NOISE CAN BE HEARD, AS CAUSED BY FLAME BACKFIRE INTO THE BURNER CUP.**

METER ROLL ADJUSTMENT DIAL

DISCHARGE RATE: The meter roll adjustment shown in Fig. 10 controls the rate of dry grain discharge through the dryer.

The mechanism is equipped with a dial and 0 to 100 scale to represent the flow of grain past the metering rolls as a percent of the maximum grain discharge rate for the dryer. The maximum setting of 100% represents approximately 2500 BPH for S-Series and 3500 BPH for LS-Series. The Staged Automatic Drying Time Charts are based on an 80% setting.

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

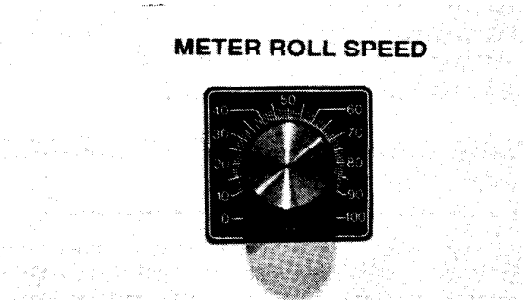


FIG. 10 METER ROLL ADJUSTMENT

SHUT-DOWN INDICATOR

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

SHUT-DOWN INDICATOR LIGHT IDENTIFICATION

CONTROL	LOCATION	MONITOR BOARD CONNECTION TERMINALS SENSOR TERM BOARD A	SENSOR TERM BOARD B	TERMINAL
MAIN CONTROL BOX:				
LOAD TIMER	IN CONTROL BOX	1 + 2		1-2
BRANCH BOX	FRONT LEFT-HAND SIDE	2 + 3		2-3
METER ROLL	BACK RIGHT-HAND SIDE	3 + 4		3-4
ADJUSTABLE GRAIN	IN CONTROL BOX	4 + 5		4-5
BRANCH CIRCUIT BOX #1:				
PLENUM HI-LIMIT THERMOSTAT #2	RIGHT-HAND SIDE ON FRONT PANEL	1 + 2		1-2
PLENUM HI-LIMIT THERMOSTAT #1	RIGHT-HAND SIDE ON FRONT PANEL	2 + 3		2-3
FIXED GRAIN HI-LIMIT THERMOSTATS	LEFT-HAND COLUMN: in Handy Box on front panel	3 + 4		3-4
FAN-HEATER # 1*	FAN-HEATER # 1		1 + 2	1-2
FAN-HEATER # 2*	FAN-HEATER # 2	4 + 5		4-5
BRANCH CIRCUIT BOX #2:				
PLENUM HI-LIMIT THERMOSTAT #4	RIGHT-HAND SIDE ON FRONT PANEL	1 + 2		1-2
PLENUM HI-LIMIT THERMOSTAT #3	RIGHT-HAND SIDE ON FRONT PANEL	2 + 3		2-3
FIXED GRAIN HI-LIMIT THERMOSTATS	LEFT-HAND COLUMN: in Handy Box on front panel		2 + 3	2-3
ADJUSTABLE GRAIN HI-LIMIT THERMOSTAT	IN BRANCH BOX		1 + 2	1-2
FAN-HEATER #3*	FAN-HEATER # 3	4 + 5		4-5
FAN-HEATER # 4*	FAN-HEATER # 4	3 + 4		3-4
BRANCH CIRCUIT BOX #3:				
PLENUM HI-LIMIT THERMOSTAT TOP	RIGHT-HAND SIDE ON FRONT PANEL	1 + 2		1-2
FIXED GRAIN HI-LIMIT THERMOSTATS	RIGHT-HAND COLUMN: in Handy Box on front panel	2 + 3		2-3
ADJUSTABLE GRAIN HI-LIMIT THERMOSTAT	IN BRANCH BOX	3 + 4		3-4
FAN-HEATER # 5*	FAN-HEATER # 5		1 + 2	1-2
FAN-HEATER # 6*	FAN-HEATER # 6	4 + 5		4-5

*The Safety controls being monitored in the fan-heater consist of a fan motor thermal overload, burner hi-limit thermostat and burner lockout. FIG. 11

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

Anytime the circuit breakers are turned ON to energize the safety and control circuits the #1 Fan Heater indicator light should come ON and remain ON until the dryer has been started. Once the start button has been depressed and the dryer starts operating, the light should go out.

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

TO RESTART THE DRYER AFTER SHUT-DOWN

LIGHT PRIORITY:

1. Investigate the cause of shut-down and perform any necessary adjustment or corrections. For additional information, refer to heading "Control Circuit Not Energized" within trouble analysis procedure. As a future reference, it may

be advisable to make a record of the cause, as indicated by the shut-down indicator.

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

IMPROPER OPERATION:

2. Press the dryer START button. When the start button is pressed, the dryer control light should come ON, indicating the dryer is operational.

   If the dryer will not restart, the cause must be further investigated and corrected. In the event of a dryer shut-down where the dryer will not restart and there is no detector light ON, the problem can be further identified as follows:

   A. Depress the dryer start button and observe if the dryer circuit becomes energized.

   B. If the dryer will now start while the button is held depressed, it will isolate the problem to within the dryer safety circuit and verify that the detector unit is not operating properly. Refer to TROUBLE-SHOOTING and THE SAFETY CIRCUIT WIRING DIAGRAM for additional information.

   C. The reason the dryer may now restart is due to the fact that holding the button depressed will act to by-pass the various safety devices within the circuit of the dryer.

OPERATING PRECAUTIONS

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

TEST FIRING

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

1. SET CONTROLS AND SWITCHES AS DESCRIBED IN THE FOLLOWING CHART:

CONTROL	TEST FIRING SETTING
MC SWITCH	ON
MC THERMOSTAT - Lower	Minimum Temperature
HI-LIMIT THERMOSTATS	Maximum Temperature
LOAD SWITCH	OFF
UNLOAD SWITCH	OFF
ALL FAN SWITCHES	OFF
ALL BURNER SWITCHES	OFF
LOAD TIMER	30 Minutes
METERING RATE ADJUSTMENT	0
DRY TIMER	1 Minute
COOL TIMER	1 Minute
UNLOAD TIMER	30 Seconds
MODE SWITCH	Continuous Flow

2. **INSPECT METER ROLLS:** Open all metering roll access doors and inspect each compartment for any bolts, nuts or other foreign hardware. Remove any material present to prevent possible jamming of the metering rolls.
3. Set all circuit breakers to ON position and turn ON the Safety Disconnect.
4. Open the main fuel supply valve at the tank, also turn on electric shut off valve to allow fuel flow to the dryer and inspect all gas lines and connections for possible leaks.

ANY GAS LEAKS MUST BE CORRECTED, IMMEDIATELY.

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

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

   NOTE: The dryer is designed so the red indicator light will not come ON unless ALL CIRCUIT BREAKERS ARE TURNED ON.

6. **CHECK CONVEYOR MOTORS FOR PROPER DIRECTION OF ROTATION**

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

   B. Flip the UNLOAD switch to AUTO position. Turn up the meter roll dial until the meter roll begins. The bottom auger and metering roll drive motor should rotate COUNTERCLOCKWISE, as viewed from the drive end. Any dry grain auxiliary conveyors connected to the dryer power terminals should also start and rotate in the proper direction.

   C. After checking bottom auger motor, leave the unloading switch in AUTO position and slowly turn up the MC thermostat control. As the MC thermostat setting is increased, the MC indicator light should come ON and the meter roll should stop operating.

NOTE: The bottom auger will stop after the one minute clean out, if the dryer is still being held by the MCThermostat.

Rotate the MC thermostat down to its minimum setting. The MC light should go OFF again, and the meter rolls should restart. The bottom auger will restart provided it had previously stopped.

7. CHECK METERING ROLL OPERATION:

With bottom auger still operating, turn the metering roll adjustment dial and check the metering roll drive mechanism for proper operation through out the full speed range of operation. Make sure all drive chains are properly tensioned and that all sections of the metering rolls rotate properly.

Turn the UNLOAD switch to OFF position after checks are completed.

8. CHECK FAN MOTOR DIRECTION OF ROTATION:

Bump (jog) fan switch and observe direction of motor rotation. All fans should run counterclockwise.

NOTE: On three phase model dryers, if all of the motors run backward, they can easily be reversed by interchanging L1 and L3 (leaving the high leg in L2) of the three power supply connections to the dryer. Auxiliary conveyors which have been field connected may have to be reversed individually.

9. CHECK BURNER SAFETY LOCK-OUT FUNCTION

Start the No. 1 fan on the base module and turn No. 1 burner switch to the ON position. WITH THE MAIN GAS SHUT-OFF VALVE CLOSED, THE SAFETY CIRCUIT WITHIN THE BURNER CONTROL SYSTEM MUST FUNCTION AFTER A SHORT INTERVAL AND CAUSE THE DRYER TO SHUT DOWN.

Turn the fan switch to the OFF position, then wait for several minutes and turn the next fan and burner switches to the ON position. Depress the start button and perform the same type of safety circuit check for all burners.

Repeat this test for the all burners to verify that the burner safety circuits for all fan-heaters are functioning properly.

If any burner can not be forced into the safety lock-out condition, consult local serviceman or the Factory Service Department. **DO NOT ATTEMPT TO PLACE THE DRYER INTO ACTUAL OPERATION UNTIL THE PROBLEM HAS BEEN LOCATED AND CORRECTED.**

10. BURNER FIRING

Turn on Main Fuel Supply Line. With the control circuit activated (red light ON), manually operate the lever on the main/safety gas shutoff-valve to turn the fuel ON. Inspect all fuel lines and connections for possible leaks.

ANY GAS LEAKS MUST BE CORRECTED.

Start all fans and turn all burner switches to the ON position. All burners should fire after a short purge interval and gas pressure should be indicated on the pressure gauge for each burner.

Adjust No. 1 and No. 2 burner Hi-Lo fire thermostats (located within the Branch Circuit Box I on base module) to approximately 200° F to cause burners to operate on Hi-Fire. Observe gas pressure indicated on pressure gauge, then turn thermostat down to its minimum setting to cause burners to cycle into Lo-Fire. As the burner thermostats are turned down, the gas pressure gauges should show a noticeable drop in pressure, indicating the Hi-Fire gas solenoid valves have closed and the burners are being supplied with only the reduced flow of gas through the flow control valves. Perform the same adjustment for all Modules.

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

Repeat procedures for each burner and verify that all burners will function in both Hi-Fire and Lo-fire.

11. CHECK STAGED AUTOMATIC MODE OF OPERATION

A. With the unload switch OFF and the control circuit activated, set No. 1 and No. 2 (and No.3 & 4 on Double and Triple Stacked) burner switches to AUTO position.

B. Turn No. 1 and No. 2 (and No.3 & 4 on Double and Triple Stacked) fan switch to Auto position. All fans should start operating and the burners should fire after the purge interval.

C. Turn the mode switch to STAGED AUTOMATIC and set the unload switch to AUTO position. Observe the following events as they occur:

The dry timer will become energized and begin.

After approximately one minute, all burners will shut down (except for the top two burners on Triple stack dryers) and the fans will continue to operate.

After another minute the cool timer will reach zero. This will cause the unloading timer to begin. At the same time, the bottom auger and any auxiliary unload conveyors should start, and all fans should stop operating (except for the top two burners on Triple stack dryers).

When the unload timer reaches zero it will automatically reset to its original setting and cause the dry timer to operate and begin. At the same time: (1) the unloading should stop (bottom auger will continue to run for one minute), (2) All fans should start operating, (3) All burners should operate after the short purge period.

12. STOP DRYER OPERATION

Push the STOP button. The fans, burners, and augers should immediately stop operating as the button is depressed.

With dryer properly functioning, as described in previous steps, the unit may be considered ready for drying operation. REFER TO OPERATING INSTRUCTIONS FOR PROCEDURE AND CONTROL SETTINGS.

NOTE: Each time the stop button is depressed, or the dryer shuts down, the main/safety gas shut-off valve must be manually opened to allow gas flow for burner operation.

DRYER OPERATION

FULL HEAT DRYING

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

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

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

DRYING TEMPERATURES

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

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

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

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

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

FINAL MOISTURE CONTENT

METER ROLL ADJUSTMENT: It is necessary to frequently check the moisture content of discharged grain while the proper meter roll setting is being established, and moisture should subsequently be checked periodically to indicate the need of any change in the setting. Such change will be necessary if there is an appreciable change in average initial moisture content.

DRYER SHUT-DOWN

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

FUEL BURN-OUT: When a vaporizer-equipped burner is to be shut down for several hours or more, it is recommended that pressure be relieved on vaporizer and supply lines by first closing the valve at the supply tank, then letting the burner operate until the flame stops from lack of fuel; immediately turn burner OFF. After the burner is OFF, close all other valves in fuel supply piping.

SHUT-DOWN: To stop the dryer, push control circuit STOP button, turn OFF safety disconnect, move all circuit breakers OFF, turn main power supply OFF, and close all valves in the fuel supply lines to the dryer.

OPERATING INSTRUCTIONS CHART

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

FIG. 14

APPROXIMATE DRYING TIME TABLE FOR VARIOUS INITIAL MOISTURE CONTENTS

DRYING PROCESS	FINAL MOISTURE IN DRYER	DRYINGTIME-MINUTES * — INITIAL MOISTURE CONTENT - PERCENT
DRYERATION-SHELLED CORN To approximate 17% final moisture in dryer: 15% in cooling bin by full heat process. 200-220°F.average drying temp.	17%	20 21 23 25 27 29 30
COMBINATION DRYING-SHELLED CORN To approximate 20% final moisture in dryer. 220-230°F. average drying temp. 15% in bin by low temperature drying.	20%	23 25 27 29 30 32
To approximate 22% final moisture in dryer. 220-230°F. Average drying temp. 15% in bin by low temperature drying.	22%	25 20 30 32
FULL HEAT-OTHER GRAINS Wheat, Milo, Soybeans, Rough Rice to approximately 13% final moisture in dryer. 150°F. drying temperature for Wheat and Milo. 130°F drying temperatures for Soybeans and Rough Rice.	13%	15 17 18 20 22

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

Basic Definition-Bushel, Shelled Corn: 56lbs. @15.5%;
56x.845=47.32lbs. Dry Matter

To Yield a Bushel @ 15.5%: 47.32/.85 = 55.67 lbs. @ 15%
47.32/.80 = 59.15 lbs. @ 20%
47.32/.75 = 63.09 lbs. @ 25%

Dry to Wet Bushel Conversion Ratios: 20-15%, 59.15/55.67 = 1.06
25-15%, 63.09/55.67 = 1.13

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
SINGLE MODULE MODELS
STAGED AUTOMATIC START-UP PROCEDURE

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

1. Set Controls As Listed:
   - A. Set the bottom burner thermostat (No. 1 stage) and the top burner (No. 2) thermostat at the drying temperature recommended for normal operation of the top stage burner (for example, 220-230°F for shelled corn).
   - B. MC Switch OFF.
   - C. For start-up purposes only, set Mode switch on CONTINUOUS FLOW.
   - D. Load OFF; Unload OFF
   - E. Fans OFF; Burners OFF
2. Depress the dryer START button; red light should come on.
3. Load ON; fill the dryer
4. First, determine the approximate total drying time for the type of grain and the drying process to be used from the Drying Time Table.

   NOTE: For example, with 25% moisture shelled corn using the DRY AND COOL process, and final desired moisture of 15% (10% removel), the estimated drying time is 60 minutes.
5. Using the total drying time from Step 4, refer to the appropriate drying time chart for staged automatic operation and determine the normal operating dryer time.

DRY AND COOL

6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period.
7. Mode switch to STAGED AUTOMATIC.
8. Set all controls as indicated by the Drying Time Chart; set the two burner thermostat at the recommended drying temperatures (220-230°F on No. 2 and 170-180°F on No. 1 for shelled corn for example). Check plenum thermometers for desired drying temperatures and adjust thermostats as necessary.
9. Check the grain discharge rate on the first cycle to verify adequate take-away conveyor capacity.

   Note: The drying time chart is based upon an unloading rate of 2000 bu per hour, which requires about 7 minutes to unload the bottom No. 1 stage. If it is necessary to use a different unloading rate, such as 1000 bu per hour, for example, the unloading time must be changed to approximately 14 minutes to completely unload the 236 bushels in the bottom stage. Add 7 minutes to the unloading time and subtract 3.5 minutes from the dry timer.
10. Observe the typical operating time for the top auger and set the loading timer to a slightly longer time, to provide shut-down on wet grain outage.
11. Three or four cycles are required for final moisture content to stabilize; check final moisture and adjust drying time.
12. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. Using the approximate total drying time from step 4 above, refer to drying Time Chart.
6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period.

   Note: The dry timer can be used as a timing device for this initial drying in No. 1 stage, by moving the Mode switch to STAGED AUTOMATIC and setting the timer to the required number of minutes, then watching the timer dial move to zero.

7,8,9,10,11,12. Same as above for Dry and Cool Process, except for unloading rate.

Note: The Drying Time Chart is based upon an unloading rate of 2000 bu. per hour, which requires about 7 minutes unloading time to exactly unload the bottom No. 1 stage. If it is necessary to use a different unloading rate, such as 1000 bu per hour, for example, the unloading time must be changed to approximately 14 minutes to completely unload the 236 bushels in the bottom stage. Add 7 minutes to the unload time and subtract 7 from the dry timer.

METER ROLL DISCHARGE CHART

Initial Dial Setting	0	10	20	30	40	50	60	70	80	90	100
S-SERIES	0	250	500	750	1000	1250	1500	1750	2000	2250	2500
LS-SERIES5	0	350	700	1050	1400	1750	2100	2450	2800	3150	3500

DRYING TIME CHART

S-SERIES 600S - STAGED AUTOMATIC OPERATION

	DRY AND COOL PROCESS						FULL HEAT PROCESS		
TOTAL [1] DRYING TIME MIN.	DRY TIMER MIN.	COOL [2] TIMER MIN.	UNLOAD TIMER [4] MIN.	NO.[1] FAN SWITCH	NO.[1] BURNER SWITCH	APPROX [3] DRYING CAP. BU/HR	DRY TIMER MIN.	UNLOAD TIMER [3] MIN.	APPROX [3] DRYING CAP. BU/HR
20	0	13	7	ON	OFF	708	3.0	7	1416
24	0	17	7	ON	OFF	590	5.0	7	1180
28	1.5	18	7	AUTO	AUTO	534	7.0	7	1012
32	3.5	18	7	AUTO	AUTO	497	9.0	7	886
36	5.5	18	7	AUTO	AUTO	464	11.0	7	786
40	7.5	18	7	AUTO	AUTO	436	13.0	7	708
44	9.5	18	7	AUTO	AUTO	410	15.0	7	644
48	11.5	18	7	AUTO	AUTO	388	17.0	7	590
52	13.5	18	7	AUTO	AUTO	368	19.0	7	544
56	15.5	18	7	AUTO	AUTO	350	21.0	7	506
60	17.5	18	7	AUTO	AUTO	333	23.0	7	472
64	19.5	18	7	AUTO	AUTO	318	25.0	7	442
68	21.5	18	7	AUTO	AUTO	305	27.0	7	416
72	23.5	18	7	AUTO	AUTO	292	29.0	7	394
76	25.5	18	7	AUTO	AUTO	280	31.0	7	372
80	27.5	18	7	AUTO	AUTO	270	33.0	7	354
84	29.5	18	7	AUTO	AUTO	260	35.0	7	338
88	31.5	18	7	AUTO	AUTO	251	37.0	7	322
92	33.5	18	7	AUTO	AUTO	242	39.0	7	308
96	35.5	18	7	AUTO	AUTO	234	41.0	7	296
100	37.5	18	7	AUTO	AUTO	227	43.0	7	284
104	39.5	18	7	AUTO	AUTO	220	45.0	7	272
108	41.5	18	7	AUTO	AUTO	213	47.0	7	262
112	43.5	18	7	AUTO	AUTO	207	49.0	7	252

Top Auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
BOTTOM Fan & Burner Switches	Set as indicated	ON
TOP Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dryer Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	SEE NOTE 4 AND METER ROLL DISCARGE CHART	SEE NOTE 4 AND METER ROLL DISCARGE CHART

*1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

*2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

*3 Drying capacities assume a meter roll adjustment setting of 100% and are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater of less actual unloading rate affects drying capacity for SA, D&C.

*4 Unloading timer setting of 7 mins. provides complete unloading of No. 1 stage at a rate of 2000 bu/hr for staged auto matic operation; greater of less unloading rate affects drying capacity for SA, D&C.

DRYING TIME CHART

S-SERIES 750LS - STAGED AUTOMATIC OPERATION

	DRY AND COOL PROCESS						FULL HEAT PROCESS		
TOTAL [1] DRYING TIME MIN.	DRY TIMER MIN.	COOL [2] TIMER MIN.	UNLOAD TIMER [4] MIN.	NO.[1] FAN SWITCH	NO.[1] BURNER BU/HR	APPROX [3] DRYING CAP. MIN.	DRY TIMER MIN.	UNLOAD TIMER [3] BU/HR	APPROX [3] DRYING CAP.
20	0	13	7	ON	OFF	900	3.0	7	1800
24	0	17	7	ON	OFF	750	5.0	7	1500
28	1.5	18	7	AUTO	AUTO	679	7.0	7	1285
32	3.5	18	7	AUTO	AUTO	631	9.0	7	1125
36	5.5	18	7	AUTO	AUTO	590	11.0	7	1000
40	7.5	18	7	AUTO	AUTO	553	13.0	7	900
44	9.5	18	7	AUTO	AUTO	521	15.0	7	818
48	11.5	18	7	AUTO	AUTO	493	17.0	7	750
52	13.5	18	7	AUTO	AUTO	467	19.0	7	692
56	15.5	18	7	AUTO	AUTO	444	21.0	7	643
60	17.5	18	7	AUTO	AUTO	423	23.0	7	600
64	19.5	18	7	AUTO	AUTO	404	25.0	7	563
68	21.5	18	7	AUTO	AUTO	387	27.0	7	529
72	23.5	18	7	AUTO	AUTO	371	29.0	7	500
76	25.5	18	7	AUTO	AUTO	356	31.0	7	474
80	27.5	18	7	AUTO	AUTO	342	33.0	7	450
84	29.5	18	7	AUTO	AUTO	330	35.0	7	429
88	31.5	18	7	AUTO	AUTO	318	37.0	7	409
92	33.5	18	7	AUTO	AUTO	307	39.0	7	391
96	35.5	18	7	AUTO	AUTO	297	41.0	7	375
100	37.5	18	7	AUTO	AUTO	288	43.0	7	360
104	39.5	18	7	AUTO	AUTO	279	45.0	7	346
108	41.5	18	7	AUTO	AUTO	270	47.0	7	333
112	43.5	18	7	AUTO	AUTO	262	49.0	7	321

Top Auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
BOTTOM Fan & Burner Switches	Set as indicated	ON
TOP Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dryer Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	SEE NOTE 4 AND METER ROLL DISCARGE CHART	SEE NOTE 4 AND METER ROLL DISCARGE CHART

*1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

*2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

*3 Drying capacities assume a meter roll adjustment setting of 100% and are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels. Greater of less actual unloading rate affects drying capacity for SA, D&C.

*4 Unloading timer setting of 7 mins. provides complete unloading of No. 1 stage at a rate of 2700 bu/hr for staged auto matic operation; greater of less unloading rate affects drying capacity for SA, D&C.

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
SINGLE MODULE MODELS
CONTINUOUS FLOW START-UP PROCEDURE

TEST OPERATE THE DRYER IMMEDIATELY PRIOR TO START-UP, TO MAKE CERTAIN ALL MOTORS AND CONTROLS ARE FUNCTIONAL BEFORE LOADING THE DRYER WITH WET GRAIN.

1. Set Controls As Listed:
   - A. Set the bottom burner thermostats (No. 1) and the top burner (No. 2) thermostat at the drying temperature recommended for normal operation of the top burner (for example, 220-230°F for shelled corn).
   - B. MC switch OFF.
   - C. Mode switch on CONTINUOUS FLOW.
   - D. Load OFF; Unload OFF.
   - E. Fans OFF; Burners OFF.
2. Depress the dryer START button; the red indicator light should come on.
3. Load ON; fill the dryer.
4. First, determine the approximate total drying time for the type of grain and the drying process to be used from the Drying Time Table.

DRY AND COOL

5. No. 1 fan ON; No. 1 burner ON; operate at the temperature recommended for normal operation of the No. 2 burner.
6. After the No. 1 burner has been operating for a time equal to about 2/3 of the total drying time (step 4), start the top burner by switching No. 2 fan ON and No. 2 burner ON; operate at the temperature recommended for normal operation. Check plenum thermometer for desired drying temperature and adjust thermostat as necessary.
7. After the No. 1 burner has been operating for a time equal to the total drying time (Step 4), stop the drying and start cooling in No.1 stage, by No. 1 burner switch OFF.
8. After about 20 minutes cooling in No. 1 stage, Start the discharge by moving unload switch to AUTO, and adjust the discharge rate to the initial trail rate corresponding to the total drying time line in the Drying Time Chart for dry and cool, continuous flow. Set all controls as indicated by the chart.
9. Observe the operating time period for the top auger; set the loading timer to a slightly longer time, to provide shut-down on wet grain outage.
10. Check the final grain moisture and adjust the unloading rate.

    Note: The time required for grain passage completely through the dryer indicates the amount of time delay between a change in discharge rate and a stabilized change in final moisture content. During the start-up there may be some variation in grain moisture content when grain originally in the dryer is being discharged.
11. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. No. 1 fan ON; No. 1 burner ON.
6. After the No. 1 burner has been operating for a time equal to about 2/3 the time per stage on the Drying Time Chart, reduce the No. 1 burner thermostat setting to the temperature recommended for second stage drying (170-180°F for shelled corn, for example), and start the top No. 2 stage by switching No. 2 fan ON and No. 2 burner ON.
7. After the No. 1 burner has been operating for a time equal to about the total drying time, start the discharge by moving the unload switch to AUTO, and adjust the discharge rate to the initial trial rate corresponding to the total drying time line in the Drying Time Chart for full heat, continuous flow. Set all controls as indicated by the Drying Time Chart.

9, 10, 11. Same as above for Dry and Cool Process.

DRYING TIME CHART

S-SERIES 600S - CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS			FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	TOTAL TIME IN DRYER MIN.	COOL TIME MIN.	APPROX. [2] DRYING CAP. BU/HR	DRYING TIME PER STAGE MIN.	APPROX[2] DRYING CAP. BU/HR
20	40	20	708	10	1416
24	48	24	590	12	1180
28	56	28	506	14	1012
32	64	32	443	16	886
36	72	36	303	18	786
40	80	40	354	20	708
44	88	44	322	22	644
48	96	48	295	24	590
52	104	52	272	26	544
56	112	56	253	28	506
60	120	60	236	30	472
64	128	64	221	32	442
68	136	68	208	34	416
72	144	72	197	36	394
76	152	76	186	38	372
80	160	80	177	40	354
84	168	84	169	42	338
88	176	88	161	44	322
92	184	92	154	46	308
96	192	96	148	48	296
100	200	100	142	50	284
104	208	104	136	52	272
108	216	108	131	54	262
112	224	112	126	56	252

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
BOTTOM Fan	ON	ON
BOTTOM Burner	OFF	ON
TOP Fan & Burner	ON	ON
MC Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu ft.; wet bushels of 25% corn = 1.13 x dry bushels.

DRYING TIME CHART

S-SERIES 750LS - CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS			FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	TOTAL TIME IN DRYER MIN.	COOL TIME MIN.	APPROX. [2] DRYING CAP. BU/HR	DRYING TIME PER STAGE MIN.	APPROX[2] DRYING CAP. BU/HR
20	40	20	900	10	1800
24	48	24	750	12	1500
28	56	28	643	14	1285
32	64	32	563	16	1125
36	72	36	500	18	1000
40	80	40	450	20	900
44	88	44	375	22	818
48	96	48	375	24	750
52	104	52	346	26	692
56	112	56	321	28	643
60	120	60	300	30	600
64	128	64	281	32	563
68	136	68	265	34	529
72	144	72	250	36	500
76	152	76	237	38	474
80	160	80	225	40	450
84	168	84	214	42	429
88	176	88	205	44	409
92	184	92	195	46	391
96	192	96	188	48	375
100	200	100	180	50	360
104	208	104	173	52	346
108	216	108	167	54	333
112	224	112	161	56	321

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
BOTTOM Fan	ON	ON
BOTTOM Burner	OFF	ON
TOP Fan & Burner	ON	ON
MC Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu ft.; wet bushels of 25% corn = 1.13 x dry bushels.

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
DOUBLE MODULE MODELS
STAGED AUTOMATIC START-UP PROCEDURE

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

1. Set Controls As Listed:
   - A. Set all burner (plenum) thermostats at the drying temperature recommended for normal operation of the top stage burner (for example, 220-230°F for shelled corn).
   - B. MC Switch OFF.
   - C. For start-up purposes only, set Mode switch on CONTINUOUS FLOW.
   - D. Load OFF; Unload OFF
   - E. Fans OFF; Burners OFF
2. Depress the dryer START button; red light should come on.
3. Load ON; fill the dryer
4. First, determine the approximate total drying time for the type of grain and the drying process to be used from the Drying Time Table.

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

DRY AND COOL

5. Using the total drying time from Step 4, refer to the appropriate Drying Time Chart for staged automatic operation and determine the normal operating dryer time.
6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period.
7. Reduce No. 1 burner thermostat to the recommended temperature for middle stage drying (200°F for shelled corn); No. 2 fan ON; No. 2 burner ON; operate for the same time period as in Step 6.
8. Reduce No. 1 thermostat to last stage drying temperature (180°F for shelled corn) reduce No. 2 burner thermostat to middle stage temperature (200°F for shelled corn); No. 3 fan ON: No. 3 burner ON; operate for the same time period as in Step 6.
9. Reduce No. 2 thermomstat to last stage drying temperature (180°F for shelled corn). Reduce No. 3 burner thermostat to middle stage temperature (200°F for shelled corn). Turn No. 4 fan ON; turn No. 4 burner ON, operate for the same time period as in Step 6.
10. Control selector to STAGED AUTOMATIC.
11. Set all controls as indicated by the Drying Time Chart; set the two burner thermostats at the recommended drying temperatures (220-230°F on No. 3 & 4, 200°F for No. 2 and 170-180°F on No. 1 for shellled corn for example). Check plenum thermometers for desired temperatures and adjust thermostats as necessary.
12. Check the grain discharge rate on the first cycle to verify adequate take-away conveyor capacity.

    Note: The Drying Time Chart is based upon an unloading rate of 2000 bu per hour, which requires about 7 minutes to unload the bottom No. 1 stage. If it is necessary to use a different unloading rate, such as 1000 bu per hour, for example, the unloading time must be changed to approximately 14 minutes to completely unload the 236 bushels in the bottom stage. Adding 7 minutes to the unloading time.
13. Observe the typical operating time for the top auger and set the load timer to a slightly longer time, to provide shut-down on wet grain outage.
14. Four or five cycles are required for final moisture content to stabilize; check final moisture and adjust drying time.
15. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. Using the approximate total drying time from step 4 above, refer to Drying Time Chart.
6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period.

   Note: The dry timer can be used as a timing device for this initial drying in No. 1 stage, by moving the Mode switch to STAGED AUTOMATIC and setting the timer to the required number of minutes, then watching the timer dial move to zero.

7,8,9,10,11,12,13,14,15. Same as above for Dry and Cool Process.

DRYING TIME CHART

S-SERIES 1200S - STAGED AUTOMATIC OPERATION

	DRY AND COOL								FULL HEAT		
TOTAL[1] DRYING TIME MIN.	DRY[4] TIMER MIN.	COOL[2] TIMER MIN.	UNLOAD[3] TIMER MIN.	NO.1 FAN SWITCH	NO.1 BURNER SWITCH	NO.2 FAN SWITCH	NO.2 BURNER SWITCH	APPROX[5] DRYING CAP. BU/HR	DRY TIMER MIN.	UNLOAD TIMER MIN.	APPROX[5] DRYING CAP. BU/HR
20	0	3.0	7	ON	OFF	ON	OFF	1416	USE CONT. FLOW		
24	0	5.0	7	ON	OFF	ON	OFF	1180	USE CONT. FLOW		
28	1.5	4.8	7	ON	OFF	AUTO	AUTO	1069	USE CONT. FLOW		
32	3.5	3.8	7	ON	OFF	AUTO	AUTO	994	USE CONT. FLOW		
36	5.5	2.8	7	ON	OFF	AUTO	AUTO	929	USE CONT. FLOW		
40	7.5	1.8	7	ON	OFF	AUTO	AUTO	871	USE CONT. FLOW		
44	9.5	0.8	7	ON	OFF	AUTO	AUTO	821	3.0	7	1416
48	11.25	0.0	7	ON	OFF	AUTO	AUTO	775	4.0	7	1287
52	0	11.0	7	ON	OFF	ON	ON	775	5.0	7	1180
56	0	11.6	7	ON	OFF	ON	ON	758	7.0	7	1011
60	0	13.0	7	ON	OFF	ON	ON	708	8.0	7	944
64	0	14.3	7	ON	OFF	ON	ON	664	9.0	7	885
68	0	15.7	7	ON	OFF	ON	ON	625	10.0	7	833
72	0	17.0	7	ON	OFF	ON	ON	590	11.0	7	787
76	0	18.3	7	ON	OFF	ON	ON	559	12.0	7	745
80	1.3	18.0	7	AUTO	AUTO	ON	ON	539	13.0	7	708
84	2.3	18.0	7	AUTO	AUTO	ON	ON	520	14.0	7	674
88	3.3	18.0	7	AUTO	AUTO	ON	ON	501	15.0	7	644
92	4.3	18.0	7	AUTO	AUTO	ON	ON	484	16.0	7	616
96	5.3	18.0	7	AUTO	AUTO	ON	ON	468	17.0	7	590
100	6.3	18.0	7	AUTO	AUTO	ON	ON	453	18.0	7	566
104	7.3	18.0	7	AUTO	AUTO	ON	ON	439	19.0	7	545
108	8.3	18.0	7	AUTO	AUTO	ON	ON	426	20.0	7	524
112	9.3	18.0	7	AUTO	AUTO	ON	ON	413	21.0	7	506

Top Auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
NO. 1 Fan & Burner Switch	Set as indicated	ON
NO. 2 Fan & Burner Switch	Set as Indicated	ON
NO. 3 & 4 Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dry Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	See Note 3 and Meter Roll Discharge Chart	See Note 3 and Meter Roll Discharge Chart

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

3 Unloading timer setting of 7 mins. provides complete unloading of No. 1 stage at a rate of 2000 bu/hr for staged automatic operation; greater or less actual unloading rate affects drying capacity for SA, D&C.

4 Dry timer setting is equal to minutes of No. 1 or No. 2 burner operation when on Automatic.

5 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

DRYING TIME CHART

S-SERIES 1500LS - STAGED AUTOMATIC OPERATION

	DRY AND COOL								FULL HEAT		
TOTAL[1] DRYING TIME MIN.	DRY[4] TIMER MIN.	COOL[2] TIMER MIN.	UNLOAD[3] TIMER MIN.	NO.1 FAN SWITCH	NO.1 BURNER SWITCH	NO.2 FAN SWITCH	NO.2 BURNER SWITCH	APPROX[5] DRYING BU/HR	DRY TIMER CAP. MIN.	UNLOAD TIMER MIN.	APPROX[5] DRYING CAP. BU/HR
20	0	3.0	7	ON	OFF	ON	OFF	1867	USE CONT. FLOW		
24	0	5.0	7	ON	OFF	ON	OFF	1556	USE CONT. FLOW		
28	1.5	4.8	7	ON	OFF	AUTO	AUTO	1409	USE CONT. FLOW		
32	3.5	3.8	7	ON	OFF	AUTO	AUTO	1310	USE CONT. FLOW		
36	5.5	2.8	7	ON	OFF	AUTO	AUTO	1224	USE CONT. FLOW		
40	7.5	1.8	7	ON	OFF	AUTO	AUTO	1149	USE CONT. FLOW		
44	9.5	0.8	7	ON	OFF	AUTO	AUTO	1082	3.0	7	1698
48	11.25	0.0	7	ON	OFF	AUTO	AUTO	1023	4.0	7	1556
52	0	11.0	7	ON	OFF	ON	ON	1037	5.0	7	1436
56	0	11.6	7	ON	OFF	ON	ON	1004	7.0	7	1334
60	0	13.0	7	ON	OFF	ON	ON	933	8.0	7	1245
64	0	14.3	7	ON	OFF	ON	ON	878	9.0	7	1167
68	0	15.7	7	ON	OFF	ON	ON	820	10.0	7	1099
72	0	17.0	7	ON	OFF	ON	ON	778	11.0	7	1038
76	0	18.3	7	ON	OFF	ON	ON	739	12.0	7	983
80	1.3	18.0	7	AUTO	AUTO	ON	ON	711	13.0	7	934
84	2.3	18.0	7	AUTO	AUTO	ON	ON	685	14.0	7	889
88	3.3	18.0	7	AUTO	AUTO	ON	ON	661	15.0	7	849
92	4.3	18.0	7	AUTO	AUTO	ON	ON	638	16.0	7	812
96	5.3	18.0	7	AUTO	AUTO	ON	ON	617	17.0	7	778
100	6.3	18.0	7	AUTO	AUTO	ON	ON	597	18.0	7	747
104	7.3	18.0	7	AUTO	AUTO	ON	ON	579	19.0	7	718
108	8.3	18.0	7	AUTO	AUTO	ON	ON	561	20.0	7	692
112	9.3	18.0	7	AUTO	AUTO	ON	ON	545	21.0	7	676

Top Auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
NO. 1 Fan & Burner Switch	Set as indicated	ON
NO. 2 Fan & Burner Switch	Set as Indicated	ON
NO. 3 & 4 Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dry Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	See Note 3 and Meter Roll Discharge Chart	See Note 3 and Meter Roll Discharge Chart

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

3 Unloading timer setting of 7 mins. provides complete unloading of No. 1 stage at a rate of 2700 bu/hr for staged automatic operation; greater or less actual unloading rate affects drying capacity for SA, D&C.

4 Dry timer setting is equal to minutes of No. 1 or No. 2 burner operation when on Automatic.

5 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
DOUBLE MODULE MODELS
CONTINUOUS FLOW START-UP PROCEDURE

TEST OPERATE THE DRYER IMMEDIATELY PRIOR TO START-UP, TO MAKE CERTAIN ALL MOTORS AND CONTROLS ARE FUNCTIONAL BEFORE LOADING THE DRYER WITH WET GRAIN.

1. Set Controls As Listed:
   A. Set all of the burner (plenum) thermostats at the drying temperature recommended for normal operation of the top burner (for example, 220-230°F for shelled corn).
   B. MC switch OFF.
   C. Mode switch on CONTINUOUS FLOW.
   D. Load OFF; Unload OFF.
   E. Fans OFF; Burners OFF.
2. Depress the dryer START button; the red indicator light should come on.
3. Load ON; fill the dryer.
4. First, determine the approximate total drying time for the type of grain and the drying process to be fused rom the Drying Time Table.

DRY AND COOL

5. No. 1 fan ON; No. 1 burner ON; operate at the temperature recommended for the top stage.
6. After the No. 1 burner has been operating for a time equal to the indicated drying time per stage, on the Drying Time Chart for dry and cool, continuous flow, reduce the thermostat setting to second stage drying temperature (220°F for shelled corn), and start the No. 2 stage by switching No. 2 fan ON and No. 2 burner ON.
7. After operating for the same time period as Step 6, reduce No. 1 burner to drying temperature for last stage (180°F for shelled corn); reduce the No. 2 burner to second stage drying temperature (220°F for shelled corn); No. 3 fan and burners ON.
8. After operating for the same time period as Step 6, turn No. 1 burner switch OFF and turn No. 4 fan and burner ON. Reduce No. 3 thermostat to second stage drying temperature (220°F for shelled corn) and No. 2 to last stage drying temperature (180°F for shelled corn). Operate about 15 minutes, with cooling in No. 1 and drying in 2, 3, and 4. Start the discharge by moving unload switch to AUTO, and adjust the discharge rate to the initial trial rate corresponding to the total drying time line in the Drying Time Chart for dry and cool, continuous flow. Set all controls as indicated by the chart.
9. Observe the operating time period for the top auger; set the load timer to a longer time, to provide shut-down on wet grain outage.
10. Check the final grain moisture and adjust the unloading rate.

    Note: The time required for grain passage completely through the dryer indicates the amount of time delay between a change in discharge rate and a stabilized change in final moisture content. During the start-up there may be some variation in grain moisture content when grain, that was originally in the dryer, is being discharged.

11. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. No. 1 fan ON; No. 1 burner ON.
6. Operate for a time equal to the indicated drying time per stage, on the Drying Time Chart for full heat, continuous flow, the reduce the No. 1 thermostat setting to middle stage drying temperature (200°F for shelled corn) and start No. 2 stage by No. 2 fan ON and No. 2 burner ON.
7. After operating for the same time period as Step 6, reduce No. 1 burner to drying temperature for last stage (180°F for shelled corn); reduce the No. 2 burner to stage three drying temperature (200°F for shelled corn); No. 3 fan ON; No. 3 burner ON.
8. After operating for thhe same time period as in step 6, reduce No. 1 burner to drying temperature for last stage (180°F for shelled corn): reduce No. 2 burner to middle stage drying temperature (200°F or shelled corn): reduce No. 3 burner to stage 3 temperature (220°F for shelled corn): No. 4 fan and burner ON.
9. Operate for half the time period as in Step 6, start the discharge by moving the Unload switch to AUTO, and adjust the discharge rate to the initial trial rate corresponding to the total drying time in the Drying Time Chart. Set all controls as indicated by the Drying Time Chart.

DRYING TIME CHART

S-SERIES 1200S CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS				FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	DRYING TIME PER STAGE MIN	COOL TIME MIN.	NO. 2 BURNER SWITCH	APPROX. [2] DRYING CAP. BU/HR	DRYING TIME PER STAGE MIN.	APPROX[2] DRYING CAP. BU/HR
20	10.0	20.0	OFF	1416	5	2832
24	12.0	24.0	OFF	1180	6	2360
28	14.0	28.0	OFF	1011	7	2022
32	16.0	32.0	OFF	889	8	1770
36	18.0	36.0	OFF	787	9	1574
40	20.0	40.0	OFF	708	10	1416
44	22.0	44.0	OFF	644	11	1288
48	24.0	48.0	OFF	590	12	1180
52	26.0	52.0	OFF	545	13	1090
56	18.7	18.7	ON	758	14	1011
60	20.0	20.0	ON	708	15	944
64	21.3	21.3	ON	664	16	885
68	22.7	22.7	ON	625	17	833
72	24.0	24.0	ON	590	18	787
76	25.3	25.0	ON	550	19	745
80	26.7	27.0	ON	530	20	708
84	28.0	28.0	ON	506	21	674
88	29.3	29.0	ON	483	22	644
92	30.7	31.0	ON	461	23	616
96	32.0	32.0	ON	442	24	590
100	33.3	33.0	ON	425	25	566
104	34.7	35.0	ON	408	26	545
108	36.0	36.0	ON	393	27	524
112	37.3	37.0	ON	380	28	506

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
NO.1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO 2 Fan	ON	ON
NO. 2 Burner	SET AS INDICATED	ON
NO. 3 & 4 Fan & Burner	ON	ON
MC Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu ft.; wet bushels of 25% corn = 1.13 x dry bushels.

DRYING TIME CHART

S-SERIES 1500LS CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS				FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	DRYING TIME PER STAGE MIN	COOL TIME MIN.	NO. 2 BURNER SWITCH	APPROX. [2] DRYING CAP. BU/HR	DRYING TIME PER STAGE MIN.	APPROX[2] DRYING CAP. BU/HR
20	10.0	20.0	OFF	1868	5	3735
24	12.0	24.0	OFF	1556	6	3113
28	14.0	28.0	OFF	1334	7	2668
32	16.0	32.0	OFF	1167	8	2334
36	18.0	36.0	OFF	1038	9	2075
40	20.0	40.0	OFF	934	10	1868
44	22.0	44.0	OFF	849	11	1698
48	24.0	48.0	OFF	778	12	1556
52	26.0	52.0	OFF	714	13	1436
56	18.7	18.7	ON	998	14	1334
60	20.0	20.0	ON	933	15	1245
64	21.3	21.3	ON	877	16	1167
68	22.7	22.7	ON	823	17	1099
72	24.0	24.0	ON	778	18	1038
76	25.3	25.3	ON	738	19	983
80	26.7	26.7	ON	699	20	934
84	28.0	28.0	ON	667	21	889
88	29.3	29.3	ON	637	22	849
92	30.7	30.7	ON	608	23	812
96	32.0	32.0	ON	584	24	778
100	33.3	33.3	ON	561	25	747
104	34.7	34.7	ON	538	26	718
108	36.0	36.0	ON	519	27	692
112	37.3	37.3	ON	501	28	676

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
NO. 1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO. 2 Fan	ON	ON
NO. 2 Burner	SET AS INDICATED	ON
NO. 3 & 4 Fan & Burner	ON	ON
MC Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu ft.; wet bushels of 25% corn = 1.13 x dry bushels.

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
TRIPLE MODULE MODELS
STAGED AUTOMATIC START-UP PROCEDURE

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

1. Set Controls As Listed:
   - A. Set all burner (plenum) thermostats at the drying temperature recommended fornormal operation of the top stage burner (for example, 230°F for shelled corn).
   - B. MC Switch OFF.
   - C. For start-up purposes only, set mode switch on CONTINUOUS FLOW.
   - D. Load OFF; Unload OFF
   - E. Fans OFF; Burners OFF
2. Depress the dryer START button; red light should come on.
3. Load ON; fill the dryer
4. First, determine the approximate total drying time for the type of grain and the drying process to be used from the Drying Time Table.

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

10, 11, 12. Same as above 9, 10, 11 for Dry and Cool Process.

DRY AND COOL

5. Using the total drying time from Step 4, refer to the appropriate Drying Time Chart for staged automatic operation and determine the normal operating dryer time (dry timer + cool timer + unload timer).
6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period .
7. Turn No. 2 fan ON; No. 2 burner ON; operate for the same time period as in Step 6.
8. Reduce No. 1 thermostat to second stage drying temperature (200°F for shelled corn) ; No. 3 fan ON: No. 3 burner ON; operate for the same time period as in Step 6.
9. Reduce No. 1 thermostat to last stage drying temperature (180°F for shelled corn); Reduce No. 2 thermostat to second stage drying temperature (200°F for shelled corn); No. 4 fan ON; No. 4 burner ON; operate for the same time period as in Step 6.
10. After the same time period, turn No. 1 burn OFF. Reduce No. 2 burner to last stage temperature (180°F for shelled corn), reduce No. 3 to third temperature (200°F for shelled corn); No. 5 & 6 fans ON; No. 5 & 6 burners ON: operate for the same time period.
11. Mode selector to STAGED AUTOMATIC.
12. Set all controls as indicated by the Drying Time Chart; set the burner thermostatat to the recommended drying temperatures (230°F on No. 5 & 6, 220°F for NO. 4, 200°F for NO. 3 & 2, 180°F on No. 1 for shellled corn for example). Check plenum thermometers for desired temperatures and adjust themostats as necessary.
13. Check the grain discharge rate on the first cycle to verify adequate take-away conveyor capacity.

    Note: The Drying Time Chart is based upon an unloading rate of 2000 bu per hour, which requires about 7 minutes to unload the bottom No. 1 stage. If it is necessary to use a different unloading rate, such as 1000 bu per hour, for example, the unloading time must be changed to approximately 14 minutes to completely unload the 236 bushels in the bottom stage. Adding 7 minutes to the unloading time.
14. Observe the typical operating time for the top auger and set the load timer to a longer time, to provide shut-down on wet grain outage.
15. Five or six cycles are required for final moisture content to stabilize; check final moisture and adjust drying time.

16. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. Using the approximate total drying time from step 4 above, refer to Drying Time Chart.
6. No. 1 fan ON; No. 1 burner ON; operate for approximately the above time period.

   Note:
7. Turn No. 2 fan ON; No. 2 burner ON; operate for approximately the above time period.
8. Reduce No. 1 thermostat to third stage drying temperature (220°F for shelled corn). Turn No. 3 fan ON; No. 3 burner ON; operate for approximately the above time period.
9. Reduce No. 1 thermostat to forth stage drying temperature (200°F for shelled corn). Reduce No. 2 thermostat to third stage drying temperature (220°F for shelled corn). Turn No. 4 fan ON; No. 4 burner ON; operate for approximately the above time period.
10. Reduce No. 2 thermostat to forth stage drying temperature (200°F for shelled corn). Reduce No. 3 thermostat to third stage drying temperature (220°F for shelled corn). Turn No. 5&6 fan ON; No. 5&6 burner ON; operate for approximately the above time period.
11. Reduce No. 1 thermostat to last stage drying temperature (180°F for shelled corn). Reduce No. 3 thermostat to third stage drying temperature (200°F for shelled corn). Reduce No. 4 thermostat to third stage drying temperature (220°F for shelled corn). Operate for approximately half of the above time period.

DRYING TIME CHART

S-SERIES 1800S - STAGED AUTOMATIC OPERATION

	DRY AND COOL							FULL HEAT		
TOTAL [1] DRYING TIME MIN	DRY TIMER SETTING MIN.	COOL [2] TIMER SETTING MIN.	UNLOAD [3] TIMER SETTING MIN.	NO.2 FAN SWITCH	NO.2 BURNER SWITCH	NO.3 BURNER SWITCH	APPROX[4] DRYING CAP. BU/HR	DRY TIMER SETTING MIN.	UNLOAD TIMER SETTING MIN.	APPROX[4] DRYING CAP. BU/HR
20	0.0	0.0	7	ON	OFF	OFF	2025	USE CONT. FLOW		
24	0.0	1.0	7	ON	OFF	OFF	1770	USE CONT. FLOW		
28	0.0	2.3	7	ON	OFF	AUTO	1857	USE CONT. FLOW		
32	0.0	1.0	7	ON	OFF	ON	1770	USE CONT. FLOW		
36	0.0	2.0	7	ON	OFF	ON	1573	USE CONT. FLOW		
40	0.0	3.0	7	ON	OFF	ON	1416	USE CONT. FLOW		
44	0.0	4.0	7	ON	OFF	ON	1287	USE CONT. FLOW		
48	0.0	5.0	7	ON	OFF	ON	1180	USE CONT. FLOW		
52	0.7	5.1	7	AUTO	AUTO	ON	1103	USE CONT. FLOW		
56	2.0	4.5	7	AUTO	AUTO	ON	1049	2.3	7	1522
60	3.3	3.9	7	AUTO	AUTO	ON	1000	3.0	7	1416
64	4.7	3.1	7	AUTO	AUTO	ON	1018	3.7	7	1323
68	6.0	2.5	7	AUTO	AUTO	ON	913	4.3	7	1253
72	7.3	1.9	7	AUTO	AUTO	ON	875	5.0	7	1180
76	8.7	1.1	7	AUTO	AUTO	ON	841	5.7	7	1115
80	10.0	0.5	7	AUTO	AUTO	ON	809	6.3	7	1064
84	0.0	9.8	7	ON	ON	ON	843	7.0	7	1011
88	0.0	10.6	7	ON	ON	ON	805	7.7	7	963
92	0.0	11.4	7	ON	ON	ON	770	8.3	7	925
96	0.0	12.2	7	ON	ON	ON	738	9.0	7	885
100	0.0	13.0	7	ON	ON	ON	708	9.7	7	848
104	0.0	13.8	7	ON	ON	ON	681	10.3	7	818
108	0.0	14.6	7	ON	ON	ON	650	11.0	7	786
112	0.0	15.4	7	ON	ON	ON	632	11.7	7	757

Top auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
NO 1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO. 2 Fan & Burner Switches	Set as Indicated	ON
NO. 3 Fan Switch	ON[5]	ON
NO. 3 Burner Switch	Set as Indicated	ON
NO. 4,5,&6 Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dryer Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

3 Unloading timer setting of 7 mins. provides complete unloading of No 1 stage at a rate of 2000 bu/hr for staged automatic operation; greater or less unloading rate affects drying capacity for SA, D&C.

4 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

5. Except when burner is in AUTO, also use AUTO

DRYING TIME CHART

S-SERIES 2300LS - STAGED AUTOMATIC OPERATION

	DRY AND COOL							FULL HEAT		
TOTAL [1] DRYING TIME MIN	DRY TIMER SETTING MIN.	COOL [2] TIMER SETTING MIN.	UNLOAD [3] TIMER SETTING MIN.	NO.2 FAN SWITCH	NO.2 BURNER SWITCH	NO.3 BURNER SWITCH	APPROX[4] DRYING CAP. BU/HR	DRY TIMER SETTING MIN.	UNLOAD TIMER SETTING MIN.	APPROX[4] DRYING CAP. BU/HR
20	0.0	0.0	7	ON	OFF	OFF	2700	USE CONT. FLOW		
24	0.0	1.0	7	ON	OFF	OFF	2362	USE CONT. FLOW		
28	0.0	2.3	7	ON	OFF	AUTO	2025	USE CONT. FLOW		
32	0.0	1.0	7	ON	OFF	ON	2362	USE CONT. FLOW		
36	0.0	2.0	7	ON	OFF	ON	2100	USE CONT. FLOW		
40	0.0	3.0	7	ON	OFF	ON	1890	USE CONT. FLOW		
44	0.0	4.0	7	ON	OFF	ON	1718	USE CONT. FLOW		
48	0.0	5.0	7	ON	OFF	ON	1575	USE CONT. FLOW		
52	0.7	5.1	7	AUTO	AUTO	ON	1472	USE CONT. FLOW		
56	2.0	4.5	7	AUTO	AUTO	ON	1400	2.3	7	2025
60	3.3	3.9	7	AUTO	AUTO	ON	1334	3.0	7	1890
64	4.7	3.1	7	AUTO	AUTO	ON	1288	3.7	7	1772
68	6.0	2.5	7	AUTO	AUTO	ON	1219	4.3	7	1667
72	7.3	1.9	7	AUTO	AUTO	ON	1169	5.0	7	1575
76	8.7	1.1	7	AUTO	AUTO	ON	1134	5.7	7	1492
80	10.0	0.5	7	AUTO	AUTO	ON	1080	6.3	7	1418
84	0.0	9.8	7	ON	ON	ON	1134	7.0	7	1350
88	0.0	10.6	7	ON	ON	ON	1080	7.7	7	1288
92	0.0	11.4	7	ON	ON	ON	1030	8.3	7	1232
96	0.0	12.2	7	ON	ON	ON	986	9.0	7	1181
100	0.0	13.0	7	ON	ON	ON	945	9.7	7	1134
104	0.0	13.8	7	ON	ON	ON	908	10.3	7	1090
108	0.0	14.6	7	ON	ON	ON	872	11.0	7	1050
112	0.0	15.4	7	ON	ON	ON	859	11.7	7	1012

Top auger Switch	AUTO	AUTO
Bottom Auger Switch	AUTO	AUTO
Mode Switch	STAGED AUTO	STAGED AUTO
NO 1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO. 2 Fan & Burner Switches	Set as Indicated	ON
NO. 3 Fan Switch	ON[5]	ON
NO. 3 Burner Switch	Set as Indicated	ON
NO. 4,5,&6 Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Dryer Timer	Set as Indicated	Set as Indicated
Cool Timer	Set as Indicated	0
Unload Timer	Set as Indicated	Set as Indicated
Meter Roll Adj. Dial	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Assumed cooling time is 18 mins.; greater or less actual required cooling time will affect capacity.

3 Unloading timer setting of 7 mins. provides complete unloading of No 1 stage at a rate of 2700 bu/hr for staged automatic operation; greater or less unloading rate affects drying capacity for SA, D&C.

4 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

5. Except when burner is in AUTO, also use AUTO

START-UP INSTRUCTIONS FOR S and LS-SERIES GRAIN DRYERS
TRIPLE MODULE MODELS
CONTINUOUS FLOW START-UP PROCEDURE

TEST OPERATE THE DRYER IMMEDIATELY PRIOR TO START-UP, TO MAKE CERTAIN ALL MOTORS AND CONTROLS ARE FUNCTIONAL BEFORE LOADING THE DRYER WITH WET GRAIN.

1. Set Controls As Listed:
   A. Set all of the burner (plenum) thermostats at the drying temperature recommended for normal operation of the top burner (for example, 230°F for shelled corn).
   B. MC switch OFF.
   C. Mode switch on CONTINUOUS FLOW.
   D. Load OFF; Unload OFF.
   E. Fans OFF; Burners OFF.
2. Depress the dryer START button; the red indicator light should come on.
3. Load ON; fill the dryer.
4. First, determine the approximate total drying time for the type of grain and the drying process to be from the Drying Time Table.

12,13,14, 15, 16, 17. Same as 11, 12, 13, 14, 15, 16 above for Dry and Cool Process.

DRY AND COOL

5. No. 1 fan ON; No. 1 burner ON; operate at the temperature recommended for the top stage.
6. After the No. 1 burner has been operating for a time equal to the indicated drying time per stage, on the Drying Time Chart for dry and cool, continuous flow, and start the No. 2 stage by No. 2 fan ON and No. 2 burner ON.
7. After operating for the same time period as Step 6, reduce No. 1 burner to drying temperature for third stage (200°F for shelled corn); Turn No. 3 fan ON; No. 3 burner ON.
8. After operating for the same time period as step 6, reduce No. 1 burner to drying temperature for last stage (180°F for shelled corn); reduce No. 2 burner to the third stage drying temperature (200°F for shelled corn); Turn No. 4 fan ON; No. 4 burner ON.
9. After operating for the same time period as Step 6, turn No. 1 burner OFF; reduce No. 2 burner to drying temperature for last stage (180°F for shelled corn); reduce No. 3 burner to the third stage drying temperature (200°F for shelled corn); and start drying in stages 5 & 6 by No. 5 & 6 fans ON, and No. 5 & 6 burners ON.
10. After operating for the same time period as Step 6, turn No. 2 burner switch OFF. Reduce No. 3 burner to drying temperature for last stage (180°F for shelled corn); reduce No. 4 burner to the third stage drying temperature (200°F for shelled corn). Operate for the same time period as Step 6, with cooling in No. 1 & 2 and drying in 3, 4, 5 and 6. Start the discharge by moving unload switch to AUTO, and adjust the discharge rate to the initial trial rate corresponding to the total drying time line in the Drying Time Chart for dry and cool, continuous flow. Set all controls as indicated by the chart.
11. Observe the operating time period for the top auger; set the load timer to a longer time, to provide shut-down on wet grain outage.
12. Check the final grain moisture and adjust the unloading rate.

    Note: The time required for grain passage completely through the dryer indicates the amount of time delay between a change in discharge rate and a stabilized change in final moisture content. During the start-up there may be some variation in grain moisture content when grain, originally in the dryer, is being discharged.

13. Set the MC thermostat by following the MC Operating Procedure.

FULL HEAT

5. No. 1 fan ON; No. 1 burner ON.
6. Operate for a time equal to the indicated drying time per stage, on the Drying Time Chart for full heat, continuous flow, the reduce the No. 1 thermostat setting to middle stage drying temperature (200°F for shelled corn) and start No. 2 stage by No. 2 fan ON and No. 2 burner ON.
7. After operating for the same time period as Step 6, reduce No. 1 burner to drying temperature for last stage (180°F for shelled corn); reduce the No. 2 burner to middle stage drying temperature (200°F for shelled corn); No. 3 & 4 fans ON; No. 3 & 4 burners ON.
8. After operating for the same time period as step 6, continue with the same drying temperature on No. 1 burner, reduce No. 2 burner to the last stage drying temperature, reduce No. 3 & 4 burners to the middle stage drying temperature (200°F for shelled corn), and start drying in stages 5 & 6 by No. 5 & 6 fans ON, and No. 5 & 6 burners ON.
9. Operate for the same time period as in Step 6, start the discharge by moving the Unload switch to AUTO, and adjust the discharge rateto the initial trial rate corresponding to the total drying time in the Drying Time Chart. Set all controls as indicated by the Drying Time Chart.

10, 11, 13. Same as above for Dry and Cool Process.

DRYING TIME CHART

S-SERIES 1800S - CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS					FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	DRYING TIME PER STAGE MIN.	COOL TIME MIN.	NO. 2 BURNER SWITCH	NO. 3 BURNER SWITCH	APPROX. [2] DRYING CAP BU/HR	DRYING TIME PER STAGE MIN.	APPROX. [2] DRYING CAP. BU/HR
20	6.7	20.0	OFF	OFF	2123	3.3	4252 [3]
24	8.0	24.0	OFF	OFF	1770	4.0	3540 [3]
28	9.3	28.0	OFF	OFF	1518	4.7	3032 [3]
32	8.0	15.0	OFF	ON	1770	5.3	2657
36	9.0	18.0	OFF	ON	1573	6.0	2360
40	10.0	20.0	OFF	ON	1416	6.7	2123
44	11.0	22.0	OFF	ON	1287	7.3	1932
48	12.0	24.0	OFF	ON	1180	8.0	1770
52	13.0	26.0	OFF	ON	1089	8.7	1633
56	14.0	28.0	OFF	ON	1011	9.3	1518
60	15.0	30.0	OFF	ON	944	10.0	1416
64	16.0	32.0	OFF	ON	885	10.7	1327
68	17.0	34.0	OFF	ON	833	11.3	1253
72	18.0	36.0	OFF	ON	787	12.0	1180
76	19.0	38.0	OFF	ON	745	12.7	1118
80	20.0	40.0	OFF	ON	708	13.3	1062
84	21.0	42.0	OFF	ON	674	14.0	1011
88	17.6	17.6	ON	ON	805	14.7	965
92	18.4	18.4	ON	ON	770	15.3	924
96	19.2	19.2	ON	ON	738	16.0	885
100	20.0	20.0	ON	ON	708	16.7	849
104	20.8	20.8	ON	ON	681	17.3	817
108	21.6	21.6	ON	ON	656	18.0	787
112	22.4	22.4	ON	ON	632	18.7	758

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
NO. 1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO. 2 Fan	ON	ON
NO. 2 Burner	SET AS INDICATED	ON
NO. 3 Fan	ON	ON
NO. 3 Burner	SET AS INDICATED	ON
NO. 4,5,&6 Fan & Burner Switches	ON	ON
MC Selector Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

3 Actual capacity limited to approximately 3000 bu/hr maximum discharge rate.

DRYING TIME CHART

S-SERIES 2300LS - CONTINUOUS FLOW OPERATION

	DRY AND COOL PROCESS					FULL HEAT PROCESS	
TOTAL [1] DRYING TIME MIN.	DRYING TIME PER STAGE MIN.	COOL TIME MIN.	NO. 2 BURNER SWITCH	NO. 3 BURNER SWITCH	APPROX. [2] DRYING CAP BU/HR	DRYING TIME PER STAGE MIN.	APPROX. [2] DRYING CAP. BU/HR
20	6.7	20.0	OFF	OFF	2835	3.3	5670[3]
24	8.0	24.0	OFF	OFF	2363	4.0	4725[3]
28	9.3	28.0	OFF	OFF	2065	4.7	4050[3]
32	10.7	32.0	OFF	OFF	1772	5.3	3544[3]
36	9.0	18.0	OFF	ON	2180	6.0	3150
40	10.0	20.0	OFF	ON	1890	6.7	2835
44	11.0	22.0	OFF	ON	1718	7.3	2577
48	12.0	24.0	OFF	ON	1575	8.0	2363
52	13.0	26.0	OFF	ON	1454	8.7	2180
56	14.0	28.0	OFF	ON	1350	9.3	2025
60	15.0	30.0	OFF	ON	1260	10.0	1890
64	16.0	32.0	OFF	ON	1181	10.7	1772
68	17.0	34.0	OFF	ON	1112	11.3	1667
72	18.0	36.0	OFF	ON	1050	12.0	1575
76	19.0	38.0	OFF	ON	995	12.7	1492
80	20.0	40.0	OFF	ON	945	13.3	1418
84	21.0	42.0	OFF	ON	900	14.0	1350
88	17.6	17.6	ON	ON	1074	14.7	1288
92	18.4	18.4	ON	ON	1027	15.3	1232
96	19.2	19.2	ON	ON	984	16.0	1181
100	20.0	20.0	ON	ON	945	16.7	1134
104	20.8	20.8	ON	ON	909	17.3	1090
108	21.6	21.6	ON	ON	875	18.0	1050
112	22.4	22.4	ON	ON	844	18.7	1012

Top Auger Switch	AUTOMATIC	AUTOMATIC
Bottom Auger Switch	AUTOMATIC	AUTOMATIC
Mode Switch	CONTINUOUS FLOW	CONTINUOUS FLOW
NO. 1 Fan	ON	ON
NO. 1 Burner	OFF	ON
NO. 2 Fan	ON	ON
NO. 2 Burner	SET AS INDICATED	ON
NO. 3 Fan	ON	ON
NO. 3 Burner	SET AS INDICATED	ON
NO. 4,5,&6 Fan & Burner Switches	ON	ON
MC Switch	ON	ON
Batch Timers	NOT USED	NOT USED
Meter Roll Adjustment	SEE METER ROLL DISCHARGE CHART	SEE METER ROLL DISCHARGE CHART

1 See Drying Time Table for estimated drying time for various grain drying processes and moisture reductions.

2 Approx. drying capacities are shown as dry bushels or 1.25 cu. ft.; wet bushels of 25% corn = 1.13 x dry bushels.

3 Actual capacity limited to approximately 3500 bu/hr maximum discharge rate.

SERVICE

SEASONAL INSPECTION AND SERVICE

The dryer is made of weather resistant construction and is designed to require a minimum of service; however, we recommend the following items be checked before the unit is used each season. Replace any damaged or questionable parts. THESE CHECKS WILL HELP ELIMINATE POSSIBLE FAILURES AND ASSURE DEPENDABLE OPERATION OF THE EQUIPMENT WHEN IT IS NEEDED.

1. Shut-off electrical power. Open Main Control Box and remove Fan- Heater Control Box cover and inspect for moisture, rodent damage, or accumulated foreign material. Remove any foreign material present. INSPECT FOR AND TIGHTEN ANY LOOSE TERMINAL CONNECTIONS. Replace any damaged or deteriorated wiring.
2. Check propellor for freedom of rotation and uniform tip clearance. It should also be inspected for accumulated dirt and grain dust, ESPECIALLY INSIDE THE HUB, as any additional weight can seriously affect the balance and result in harmful vibrations and shortened bearing life. Keep inside of the housing free of dirt build-up for efficient fan performance.
3. Check propellor for free side play. Any side play is an indication of defective motor bearings which should be replaced to prevent a complete motor failure. MAKE SURE MOTOR MOUNT BOLTS ARE TIGHT.
4. Motor bearings should be relubricated periodically, depending upon operating conditions. Under normal usage, it is desirable to have the motor cleaned and checked and the bearings repacked by an authorized service station every two to three seasons. If the unit is operated continuously through most of the year, this service should be performed each year.

   NOTE: If on site bearing relubrication is to be performed, see LUBRICATION INSTRUCTIONS FOR BALL BEARING MOTORS, FIG. 15.

   To keep motor bearings properly lubricated and dispel any accumulation of moisture within the windings, the fan and auger motors should be operated for 15 to 30 minutes each month.

   The motor manufacturers' Authorized Service Station list is packed with all units and should be saved for reference and identification of service stations.
5. Remove and clean the gas line strainers. Make certain gas valves are closed and that gas is purged from systems before attempting disassembly.
6. Inspect the primary air screen (at the top of the burner casting) and the burner cup for any accumulation of foreign material. Clean if required. Foreign material in the burner cup or casting will not burn out and will impair burner operation.
7. Inspect ignitor plug and clean the electrodes, if required. Use an ignition point file to remove carbon and rust between the electrode surfaces. Spark gap should be about 3/32 inch.
8. Inspect flame switch for possible damage or poor connections. Flame switch and ignitor plug wires must be in good condition.
9. *Inspect and manually rotate the top auger paddle assembly.* The paddle unit must rotate freely without any indication of sticking or binding.
10. Inspect the top auger and bottom auger drive lines for proper adjustment and condition. Readjust line tension, as required. See Figures 16.

    NOTE: All of the auger and meter roll bearings are lifetime lubricated and do not require service relubrication.
11. Operate dryer clean-out levers and check clean-out hatch mechanism for proper operation. With hatch open, inspect for and remove any accumulation of dirt, fines, and foreign material from the bottom auger trough area.

LUBRICATION INSTRUCTIONS FOR BALL BEARING MOTORS (FIG. 15)

SUGGESTED RELUBRICATION INTERVALS *

HOURS OR SERVICE PER YEAR	H.P. RANGE	SUGGESTED RELUBE INTERVAL
5000	1/8 to 7 1/2 10 to 40 50 to 150	5 years 3 years 1 year
Continuous Normal Applications	1/8 to 7 1/2 10 to 40 50 to 150	1 year 3 years 9 months
Seasonal Service Motor *is Idle for 6 Months or More*	All	1 year (beginning of season)
Continuous High Ambients, Dirty or Moist Locations, High Vibrations or where Shaft End is Hot (Pumps-Fans)	1/8 to 40 50 to 150	6 months 3 months

* THE BEARINGS HAVE BEEN LUBRICATED AT THE FACTORY, THUS, NO LUBRICATION NEED BE ADDED BEFORE START-UP.

SUGGESTED LUBRICANTS

INSULATION CLASS	CONSISTENCY	TYPE	TYPICAL GREASE	FRAME TYPE
A & B	Medium	Polyurea	Shell Dolium R	215T & smaller
A & B	Medium	Polyurea	Shell Dolium R	254 & Larger
F & H	Medium	Polyurea	Shell Dolium R	All

PROCEDURE: If motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 thru NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove grease drain plug and operate motor for 20 minutes before replacing drain plug.

On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA 215 frame and smaller. Insert 3 to 5 inch length on larger motors. On motors having grease drain plugs, remove plug and operate motor for 20 minutes before replacing drain plug.

CAUTION: *Keep grease clean. Lubricate motors at standstill.* Remove and replace drain plugs at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

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

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

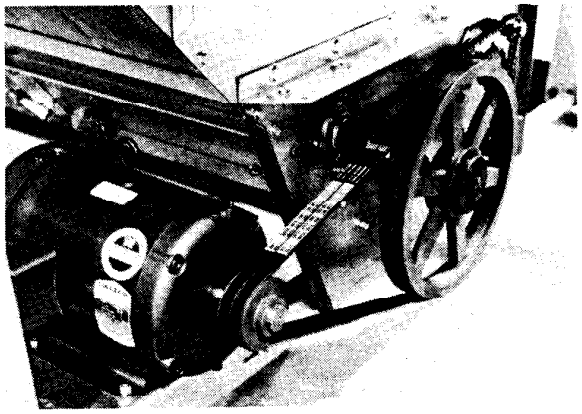


FIG. 16

13. Inspect that all dryer guards and warning decals are securely installed. Make certain guards do not interfere with moving parts.
14. Test fire the dryer several weeks ahead of the drying season. Include check for possible gas leaks. See earlier TEST FIRING heading for procedure.

BURNER CONTROL - SEQUENCE OF OPERATION

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

1. Power is available to the burner control ONLY WHEN THE FAN IS OPERATING.

   With the fan operating and the burner switch closed, power is transmitted from the indicated motor lead wires through the fuse, burner switch and flame switch to supply power to the Fenwal board.
2. Shortly after the heater starts operating, the flame switch responds to burner heat and maintains burner operation.
3. The heater will operate on HI-FIRE with both the main supply and the HI-FIRE gas solenoid valves energized until the HI-LO thermostat control opens its contacts and interrupts the circuit to de-energize the HI-FIRE gas solenoid valve.

   When the thermostat control senses that additional heat is required and closes its contact points, the HI-FIRE gas solenoid valve will immediately open and repeat the ON-OFF cycle to maintain the desired heat.
4. If the heater fails to start operating, due to lack of fuel or possible malfunction, after the ignition transformer and gas solenoid valves are energized:

   A. The flame switch remaining in its COLD (closed contacts) position will interrupt burner operation, thereby providing automatic shut-down.

VAPORIZER ADJUSTMENT

LIQUID PROPANE MODELS ONLY - After initial installation and occasionally during the drying operation, check the temperature of the regulator and the Fan-Heater Control Box. ALLOW HEATER TO OPERATE AND STABILIZE TEMPERATURES BEFORE MAKING THIS CHECK.

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

If the gas line is very cold or "frosted" move the vaporizer slightly closer to the flame. If gas line is too hot to touch, move vaporizer slightly away from the flame. The small wedge-shaped heat baffles can also be removed from the burner vanes to reduce the vapor temperature. If due to extreme operating conditions it is necessary to further reduce the vapor temperature, the vaporizer coil may be withdrawn slightly toward the fan housing. If vaporizer coil is shifted, use care not to kink gas lines or allow vaporizer to contact burner vanes.

FAN PROPELLOR REMOVAL AND INSTALLATION

The fan propellor is secured to the motor shaft by the use of a taper-lock bushing, motor shaft key, and three capscrews. Fig. 18 shows a cut away sketch of the propeller and bushing installation.

CAUTION: Although the taper-lock method of retaining the propellor onto the motor shaft is very simple and obvious, IT IS ESSENTIAL THAT THE FOLLOWING POINTS BE READ CAREFULLY AND FULLY UNDERSTOOD, AS IMPROPER INSTALLATION CAN RESULT IN SERIOUS OR FATAL INJURY CAUSED BY A LOOSE, FLYING PROPELLOR.

THREADED BUSHING HOLES - THE THREADED HOLES WITHIN THE BUSHING ARE PROVIDED FOR DISASSEMBLY PURPOSES ONLY, See Fig. 18. DO NOT ATTEMPT TO USE THESE HOLES FOR REASSEMBLY, AS THEY WILL NOT ALLOW THE PARTS TO BECOME LOCKED ONTO THE SHAFT, THEREBY CAUSING A HAZARDOUS OPERATING CONDITION.

CLEARANCE HOLES - When reassembling parts, the capscrews must be installed through the UNTAPPED CLEARANCE HOLES, as shown in Fig. 19 to cause the propellor to be pulled forward onto the tapered bushing, thus locking the parts securely onto the motor shaft. Refer to text for assembly details.

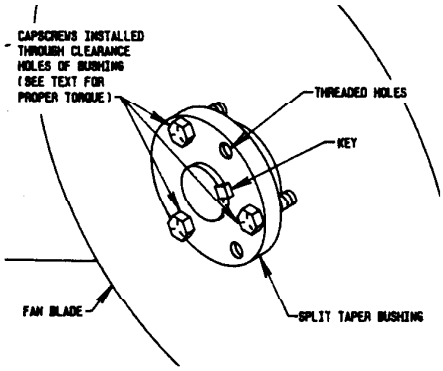


FIG. 17 FAN BLADE INSTALLATION

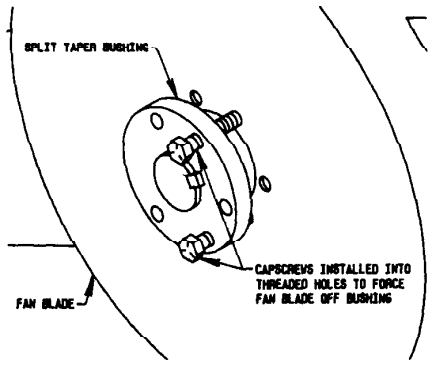


FIG. 18 FAN BLADE REMOVAL

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

REMOVAL

1. LOCK OUT THE FAN POWER SUPPLY and remove the fan guard, also the venturi, as required on some models of equipment.
2. Remove the three capscrews from the clearance holes in the taper-lock bushing.
3. Install two GRADE 5 CAPSCREWS into the THREADED HOLES in the bushing and turn them in by hand until they bottom against the front surface of the propellor.

   NOTE: DO NOT ATTEMPT TO USE LOW STRENGTH (UNMARKED) BOLTS TO REMOVE THE BUSHING, AS THE BOLTS MAY BREAK OFF.
4. Block propellor to prevent it from turning, and GRADUALLY TURN IN THE CAPSCREWS (up to 1/4 turn at a time), as shown in Fig. 19, until the propellor breaks loose from the bushing and motor shaft. Carefully remove bushing and propellor. With the propellor free from the bushing, a wheel puller can be used to pull the bushing off of the motor shaft, if required. Reattach bushing onto propellor to prevent the loss of parts.

   NOTE: During manufacture, the propellor and bushing are balanced together and both parts are marked with a small dot to identify their original alignment position. Observe bushing and propellor to make sure they have alignment marks. Mark the alignment of the propellor and bushing, if required.

INSTALLATION

1. Carefully clean motor shaft, key, bushing and bore of propellor. MAKE SURE MAIN POWER IS LOCKED OUT, and that shaft and key are completely free of rust and burrs.

WARNING: DO NOT LUBRICATE THE BUSHING OR CAPSCREWS!

CHECK AND MAKE SURE ALL MOTOR MOUNT BOLTS ARE PROPERLY TIGHTENED.

2. Slide propellor over motor shaft and locate it against the motor.
3. Align the key way in the bushing with the key and SLIDE bushing onto motor shaft. Do not attempt to drive the bushing onto the shaft, as it may damage the motor bearings.
4. Rotate the bushing and propellor so their alignment marks are in line and loosely attach the propellor to the bushing. MAKE SURE THE CAPSCREWS ARE INSERTED INTO THE UNTHREADED CLEARANCE HOLES IN THE BUSHING. Refer to previous CAUTION note. Locate the bushing so it is approximately flush with end of motor shaft.

   NOTE: The bushing must be located far enough forward so the inside web portion of the propellor will not contact the motor. If the motor has a short shaft, it may be necessary to position bushing slightly beyond the end of shaft.
5. Slide the propellor forward onto the taper-lock bushing and turn the capscrews in by hand as far as possible.
6. Use an INCH-POUND torque wrench and GRADUALLY TIGHTEN the three capscrews (up to 1/4 turn at a time) until the taper bushing becomes fully seated; under normal conditions, a minimum tightening force of 175-180 in.-lbs. (15 ft. lbs.) will be required to firmly seat the bushing. DO NOT EXCESSIVELY OVERTIGHTEN THE BUSHING. See Fig. 19.
7. Turn propellor by hand and check it for freedom of rotation and uniform tip clearance before reinstalling the fan guard.

FAN MOTOR REMOVAL AND INSTALLATION

In the event of motor failure, remove the motor, as described and take it to the nearest authorized service station. AUTHORIZED SERVICE STATIONS ARE THE ONLY PLACES THAT CAN PROVIDE POSSIBLE MOTOR WARRANTY. Motor service and repair at other places will be at owners expense.

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

1. Make certain power is shut-off and locked out, then remove fan guard and propellor. as outlined earlier.
2. Remove cover from Fan-Heater Control Box and disconnect the motor lead wires from within the box.

   NOTE: Tag or otherwise identify wires for ease of reassembly.
3. Remove motor mount bolts. If there are any shims between the motor and its base, note their location so they can be properly installed during reassembly.
4. Disconnect the upper end of the motor conduit if required, then carefully pull conduit and wires through hole in Fan-Heater housing. Remove motor with conduit still attached from Fan-Heater unit. If motor requires service, take it to an authorized service station.
5. To re-install motor, slide onto motor base plate and replace shims (if required) between motor and base plate. Re-install motor mount bolts and washer, BUT DO NOT FULLY TIGHTEN THEM AT THIS TIME.

   Re-install conduit and wires through hole in Fan-Heater housing and carefully remake all electrical wiring connections.

   Check and adjust position of motor by temporarily mounting fan blade on motor shaft, and rotate it by hand, making the necessary adjustments so that the tip clearance between blade and housing is uniform. Remove the fan blade, if required, and FULLY TIGHTEN ALL FOUR MOTOR MOUNTING BOLTS.

   NOTE: Make sure to install and tighten the propellor in accordance with earlier instructions.

HEATER PARTS REMOVAL AND INSTALLATION

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

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

1. FLAME DETECTOR - Disconnect the slip-on connectors and unscrew the flame switch out of its mounting bracket.
2. GAS, SOLENOID VALVE COIL - Unscrew the screw on the gas valve and slide the housing and coil off the valve stem and body. DO NOT ENERGIZE THE COIL WHEN IT IS REMOVED, AS THE COIL MAY BECOME DAMAGED DUE TO EXCESSIVE CURRENT FLOW.
3. REGULATOR AND GAS SOLENOID VALVE(S) - The gas regulator and solenoid valve(s) are DIRECTIONAL and must be connected as indicated by the markings near the port openings. MAKE SURE GAS IS SHUT-OFF AND PURGED FROM THE SYSTEMS BEFORE REMOVING PARTS.

   When installing a liquid gas solenoid valve on LP models, do not over-tighten the connection into the inlet side, as the inlet orifice may become partially blocked.
4. MAIN GAS ORIFICE - With fuel shut-off and gas purged from system, proceed as follows:
   A. Disconnect gas supply line close to the Fan-Heater Control Box and disconnect the plumbing support from side of fan can. Refer to Fig. 20.
   B. Disconnect the pressure gauge line fitting from the pipe tee.
   C. Disconnect electrical connections to gas solenoid valve located within Control Box.
   D. Lift pipe tee (with orifice, solenoid valve, and other parts attached) straight up and remove from fan can. Orifice and other parts can now be removed from pipe tee, if desired.
5. REASSEMBLY - To reassemble parts, reverse the disassembly procedure, noting the following special points:
   A. Make sure all parts are thoroughly cleaned and open.
   B. Use a dependable brand of high temperature pipe caulking compound when assembling gas connections. Apply only a light coating onto male threaded end of fittings.
   C. Solenoid valves and gas regulator are directional and must be properly installed. Do not attempt to connect gas solenoid valve by applying force to the valve core stem as it may ruin the unit.
   D. Make sure all electrical wires are properly connected. Refer to wiring diagrams.

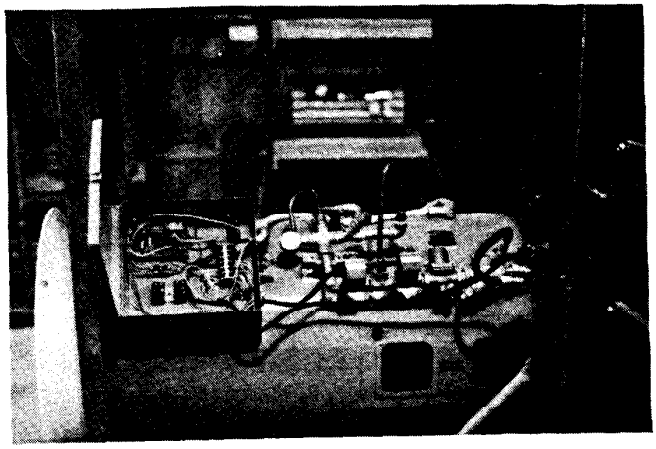


FIG. 19 FAN HEATER

METERING ROLL SERVICING

DESCRIPTION & OPERATION

This dryer is equipped with SCR metering roll drive assembly. The metering rolls are driven by a separate DC type electric motor. The speed of the motor is variable and is controlled by an electric SCR (silicon controlled rectifier) control within the Main Control Box.

MAIN CONTROLS

1. SCR SPEED CONTROL - The control unit dial on the front of the Control Box regulates the speed of the DC motor which drives the metering rolls.

   The markings on the scale from 0 to 100 represent the flow of grain past the metering rolls as a percent of the maximum grain discharge rate for the dryer. The maximum setting of 100% provides a maximum discharge of 2500 BPH for S-Series and 3500 BPH for LS-Series model dryers.

   NOTE: When the control is set to the maximum discharge rate (100%), the metering roll speed should be 17.5 RPM.
2. DC ELECTRIC MOTOR - The 3/4 HP direct current motor provides the drive for the meter roll and is located on the rear left-hand side of standard (rear discharge) model dryers. The output shaft of the motor is connected by belt to the gear box assembly.

   The DC motor requires no operational adjustments as it is completely controlled from the Control Box.
3. SPEED REDUCER GEAR BOX - The direct drive gear box provides the required speed reduction and transmits power to the metering rolls through a drive chain arrangement.

   The gear box does not require adjustment, but should be checked occasionally for proper oil level. Maintain the oil level up to the filler plug opening with a high quality 90-140 weight gear oil. The drive chain should also be periodically lubricated and retension as required.
4. UNLOADING AUGER TIME DELAY RELAY - This special relay is located within the Control Box. The relay is specially connected into the bottom auger system in such a manner it causes the unloading auger (and any connected auxiliary unloading conveyors) to continue to operate for approximately 60 seconds AFTER the metering rolls stop operating. This feature permits the cleanout of grain within then unloading equipment at the end of all discharge cycles.

   In the event a foreign object becomes lodged in the metering rolls and jams the system, the following events would occur. The unloading auger would stay in motion. However, the metering roll drive would stop. The DC motor should stall out.

HOW TO DETERMINE METERING PROBLEM

To determine if the metering problem is caused by blockage, perform the following test with the power off. Remove the drive chain by loosening the motor mounting bracket and adjustment bolt. Refer to Fig. 21 and place a pipe wrench on the hub of the roller chain sprocket of the left-hand metering roll at the discharge end of the dryer and apply up to 100 ft. lbs. of force to attempt to rotate the roll toward the outside of the dryer. If the metering roll will turn, it can be assumed that no blockage exists and that the problem is due to some other cause. Check for break in power train, chain, drive key, pin, etc.

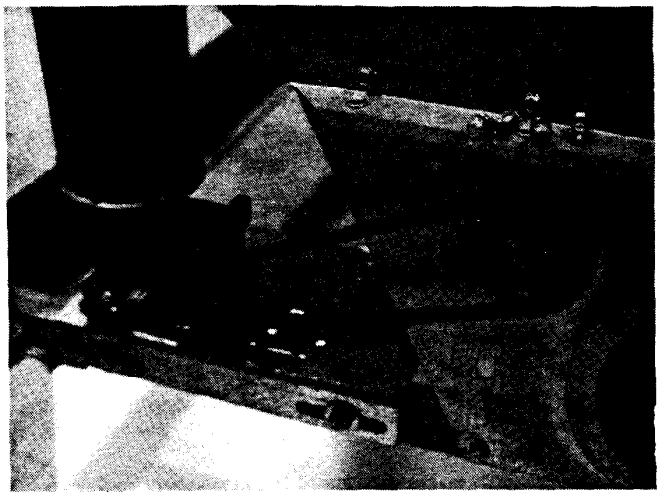


FIG. 20 METER ROLL DRIVE

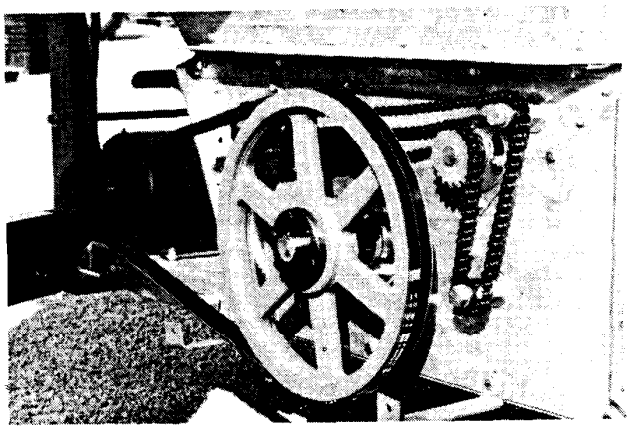


FIG. 21 METER ROLL CROSS OVER

TO LOCATE THE JAM

To determine if the right-hand or left-hand metering roll is jammed, go to the front end of the dryer and feel the tension in the top and bottom section of the metering roll crossover chain (FIG. 22). If the tension is equal in both sections, it can be assumed that the right-hand roll is clear. However, if the lower section is extremely tight and the tension will not equalize when attempting to deflect the bottom section, it can be assumed that the jam is in the right-hand roll. If one is unable to determine the jammed side, cautiously remove the crossover chain (loosen tightener) and place pipe wrench on one of the meter roll sprockets and turn it towards the outside of the dryer.

CAUTION: **Keep hands away from sprocket teeth to avoid injury that may result from chain backlash as a result of torsional build up in the system caused by the jam. If it turns then the jam is located in the other roll.**

TO CLEAR JAMMED ROLLER

At this time, place a pipe wrench on the hub of the sprocket of the jammed metering roll and turn the roll, first backward and then forward several times in and attempt to dislodge the object and clear it through the roll. If this is not successful, have an assistant turn the metering roll and attempt to locate the jam by sound. Shut down the fan-heater and eliminate any other noise when making this check. Once the location is determined, access can be made to the roll from the outside by opening access door (before opening doors SEE FIG. 23) to remove foreign object. The service tool must be inserted before opening doors. Before this can be done swing open the plenum bottom closure panel. Meter Roll Adjustment Damper must be removed (see Main Assembly). Remove the four bolts in the base of the Meter Roll Upper Shield.

SERVICE TOOL

THIS COLUMN CUT-OFF DAMPER IS DESIGNED TO INSERT THROUGH THE GRAIN COLUMN (FROM THE INSIDE OF THE DRYER) IMMEDIATELY ABOVE THE METER ROLL. THIS PERMITS OPENING OF THE METER ROLL ACCESS DOOR. FOR SERVICE OR INSPECTION WITHOUT UNLOADING DRYER THE PLENUM BOTTOM CLOSURE PANEL & METER ROLL ADJUST DAMPER MUST BE REMOVED PRIOR TO USING SERVICE TOOL.

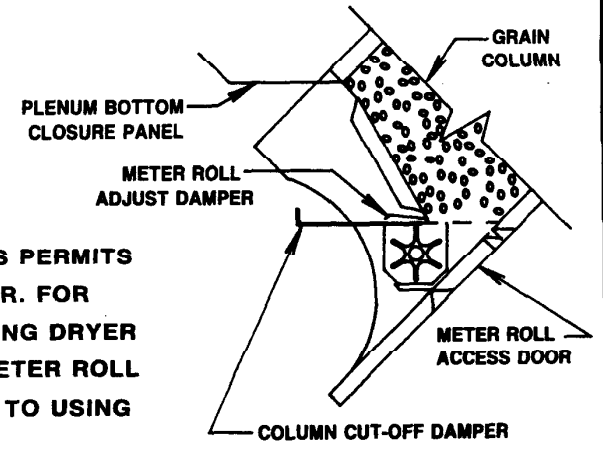
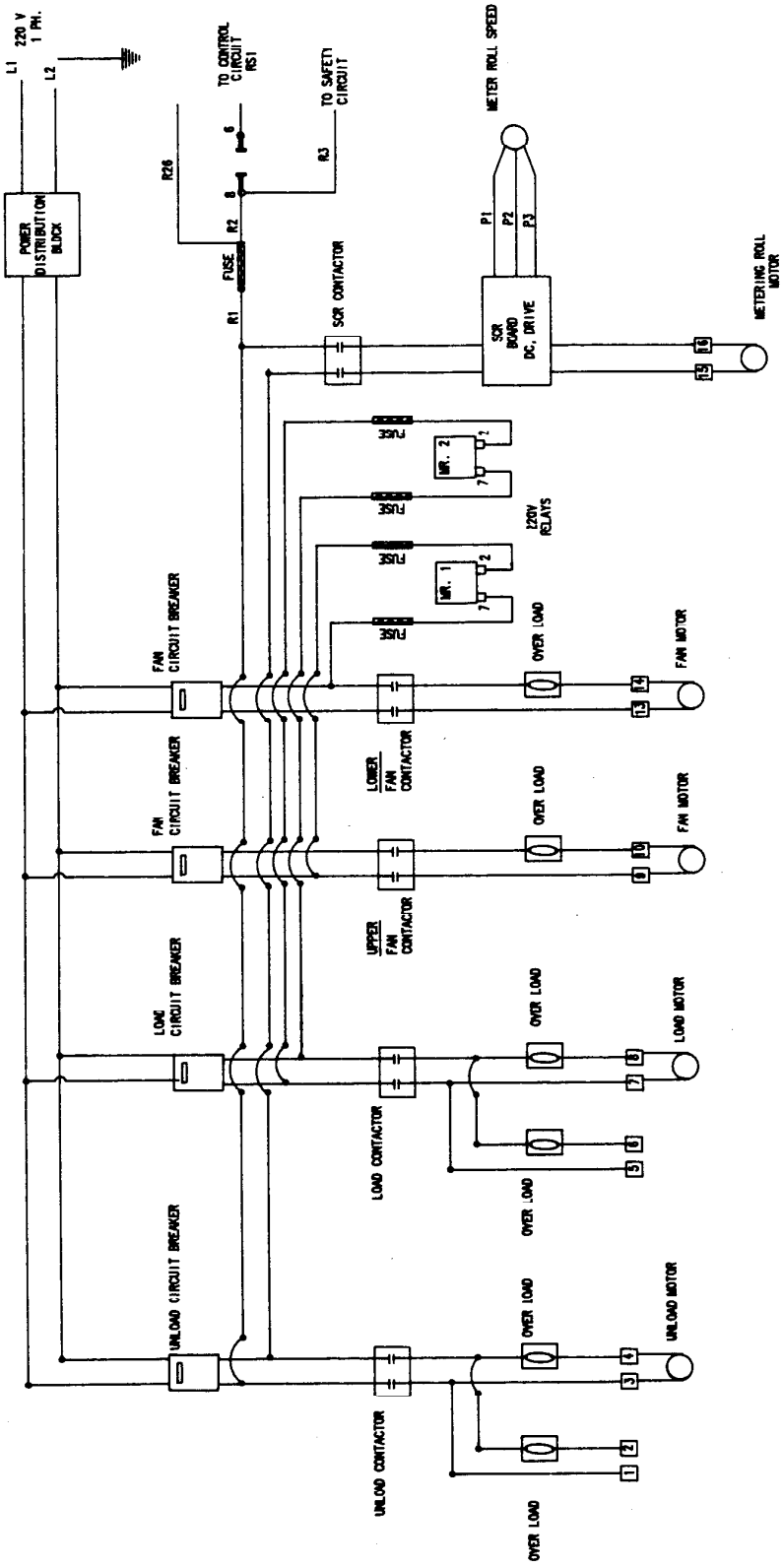


FIG. 22 SERVICE TOOL DECAL

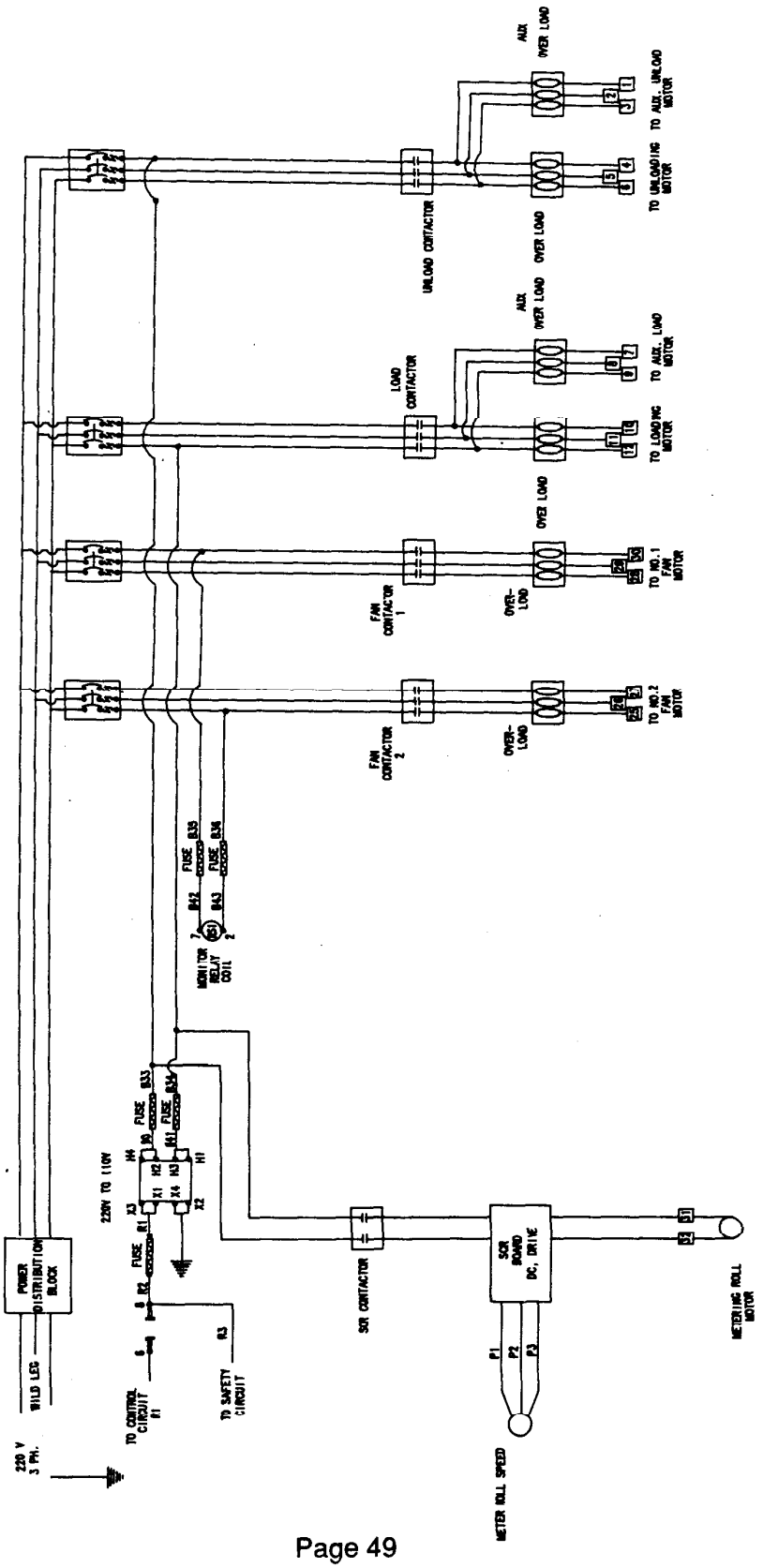
600S POWER WIRE CIRCUIT

1 PH 220V



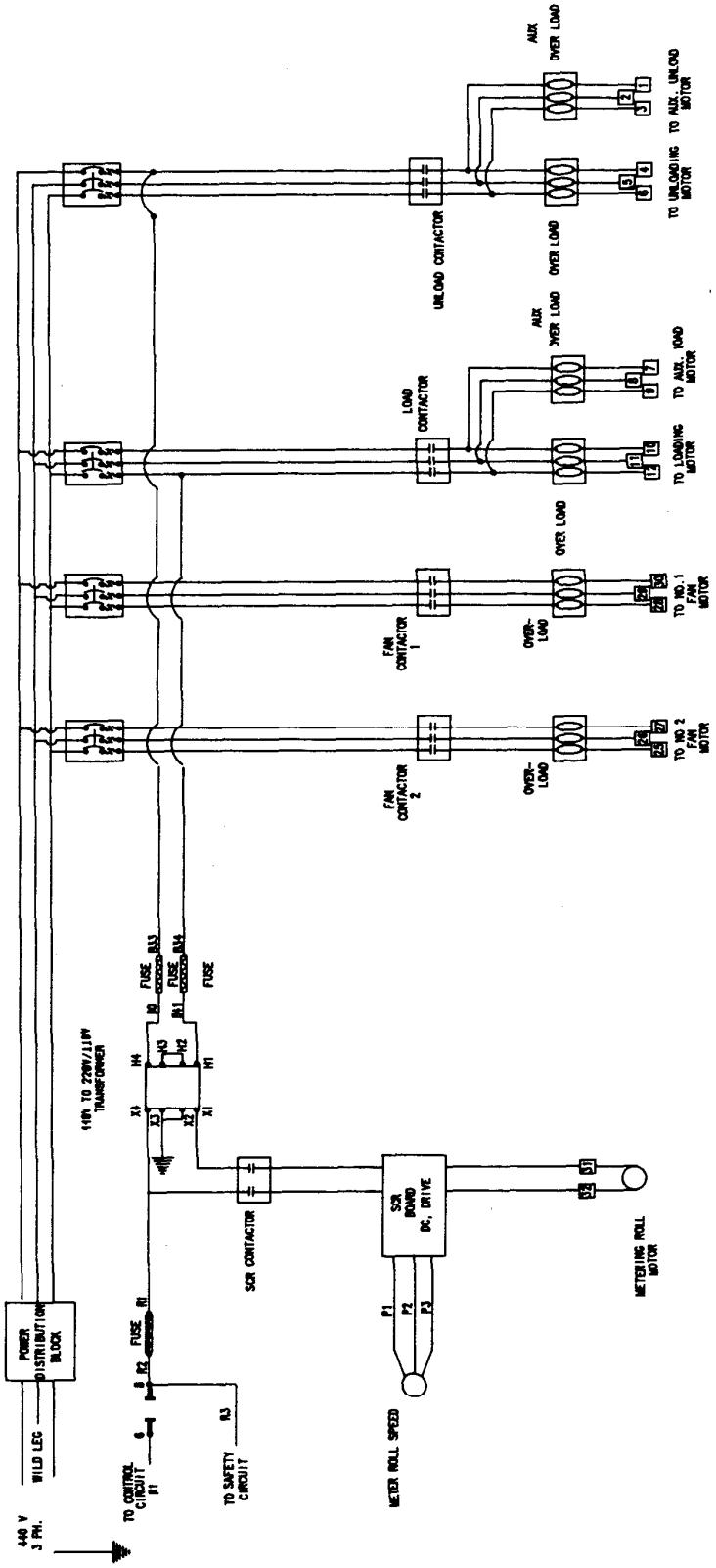
600S & 750LS POWER WIRE CIRCUIT

3 PH 220V



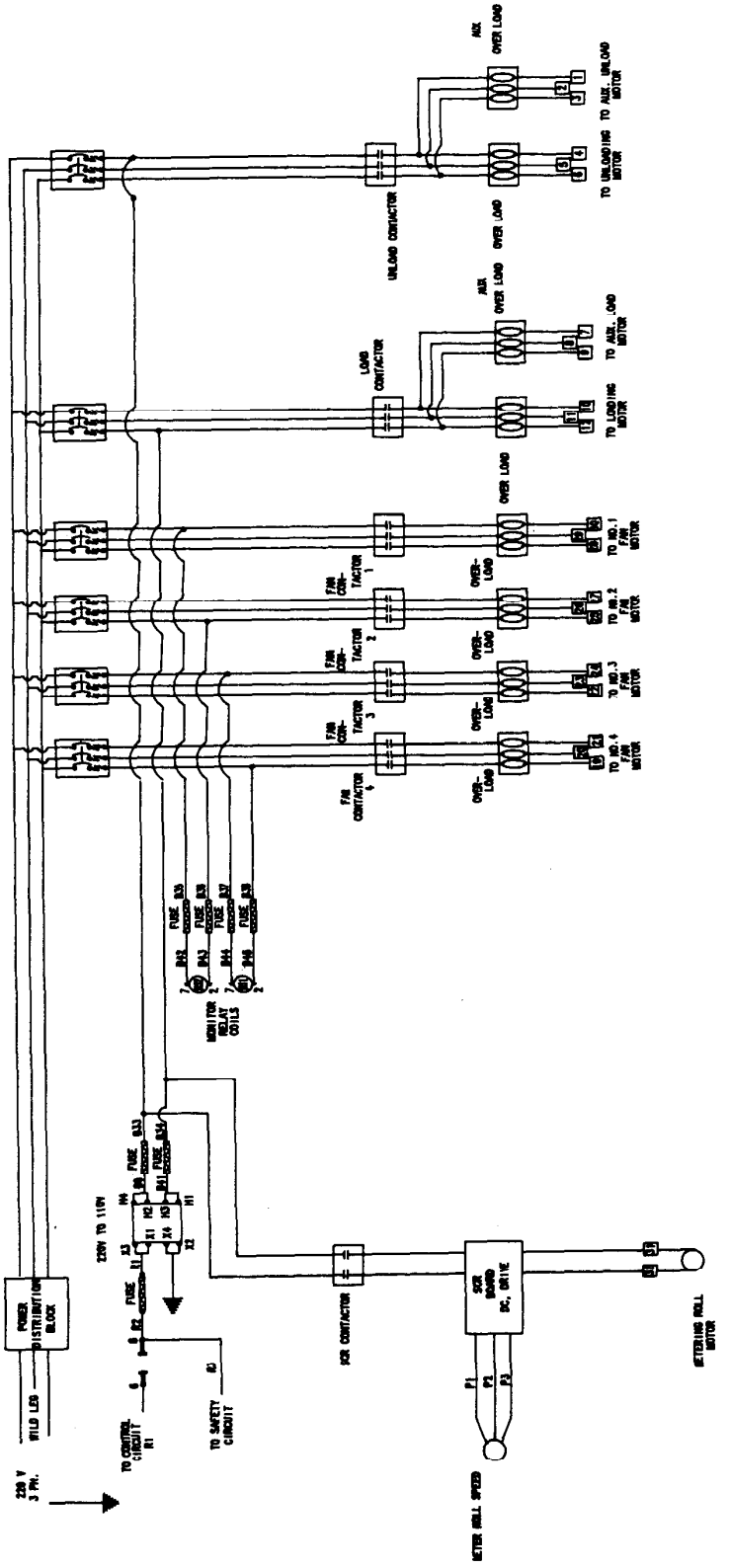
600S & 750LS POWER WIRE CIRCUIT

3 PH 440V



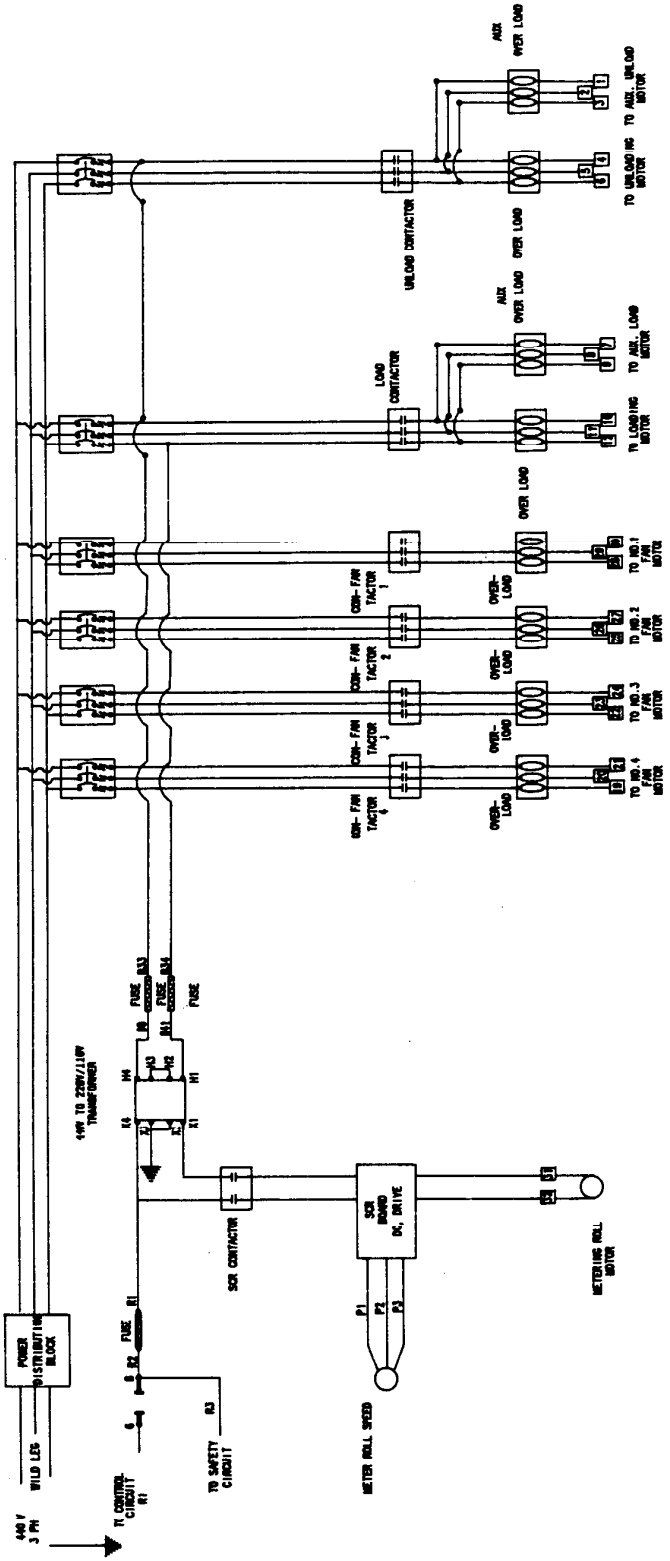
1200S & 1500LS POWER WIRE CIRCUIT

3 PH 220V



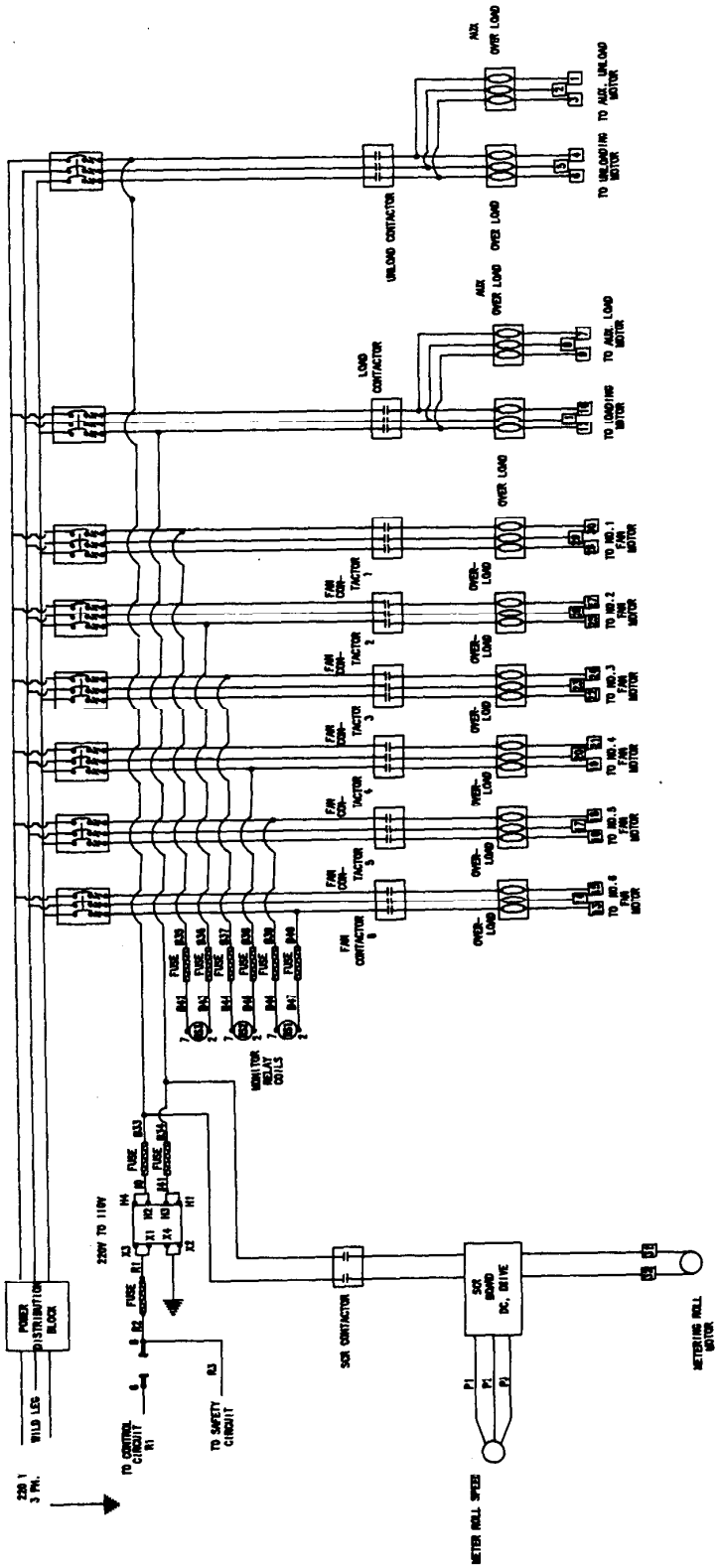
1200S & 1500LS POWER WIRE CIRCUIT

3 PH 440V



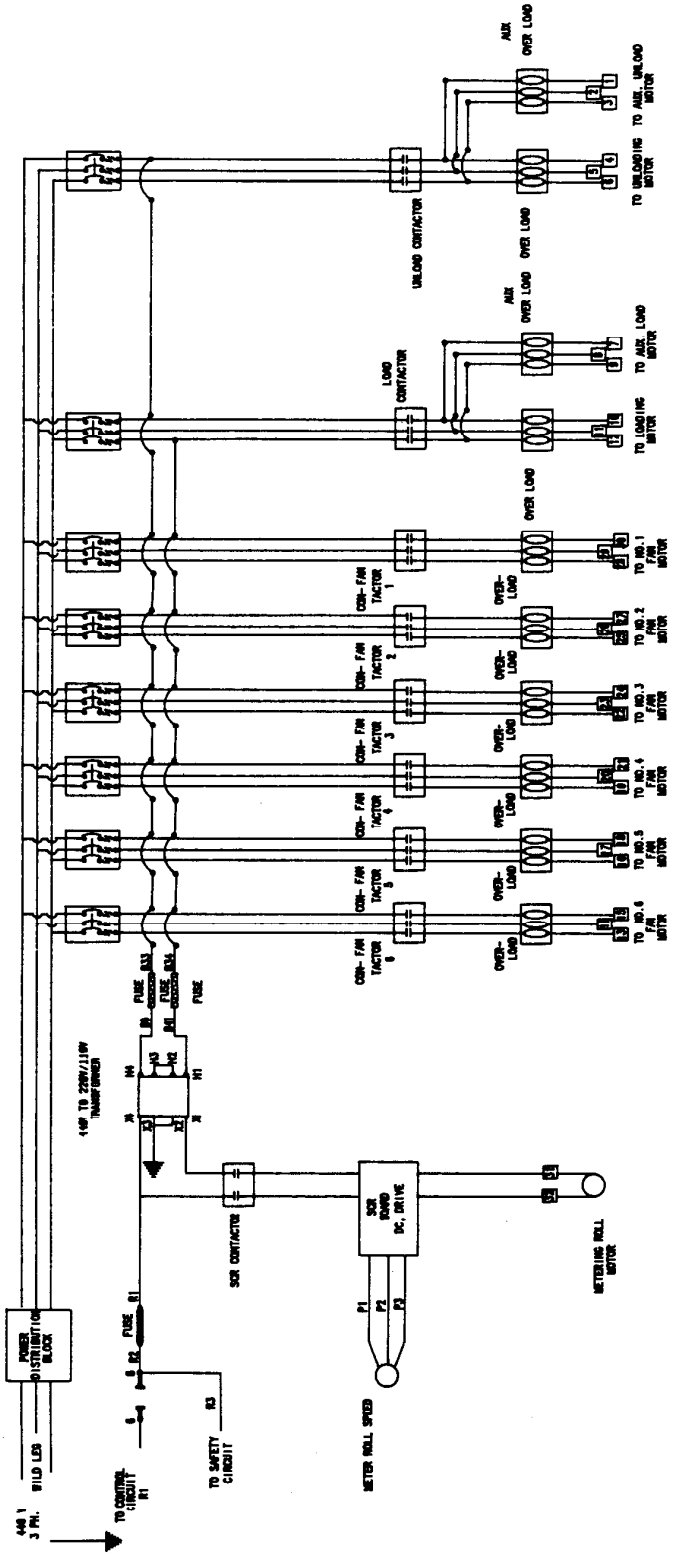
1800S & 2300LS POWER WIRE CIRCUIT

3 PH 220V



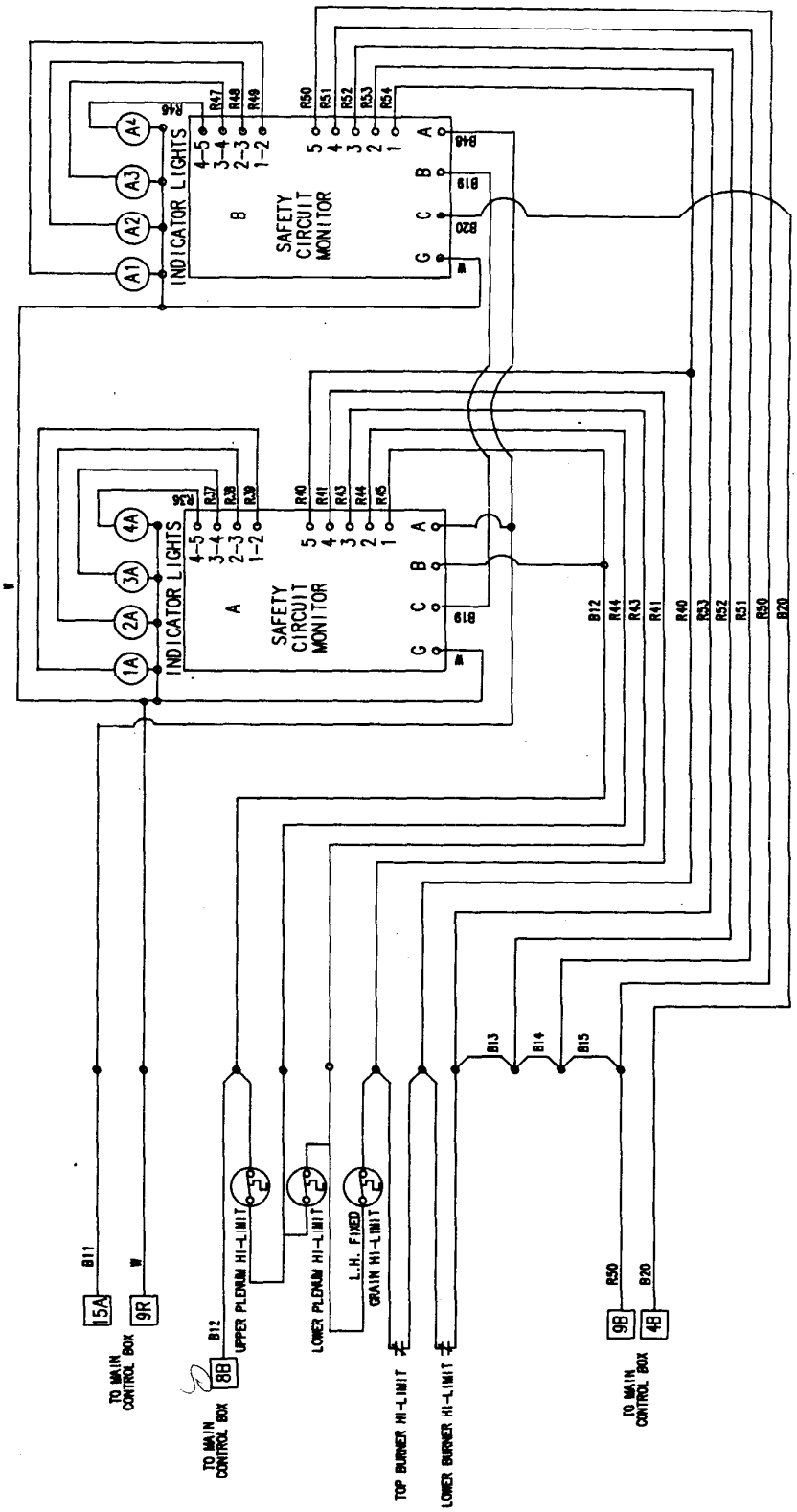
1800S & 2300LSPOWER WIRE CIRCUIT

3 PH 440V



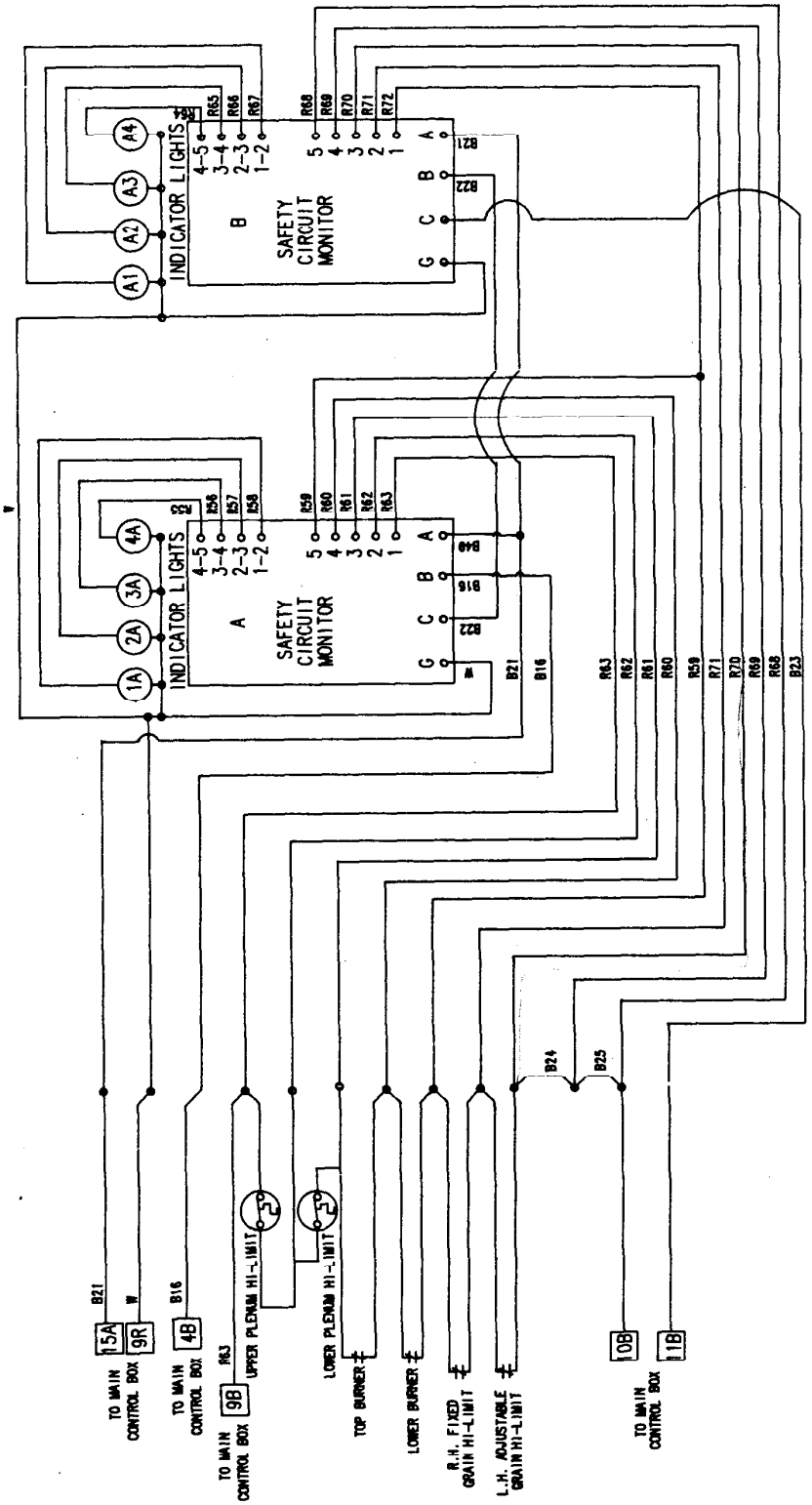
BRANCH CIRCUIT BOX #1

600S & 750LS MODULE



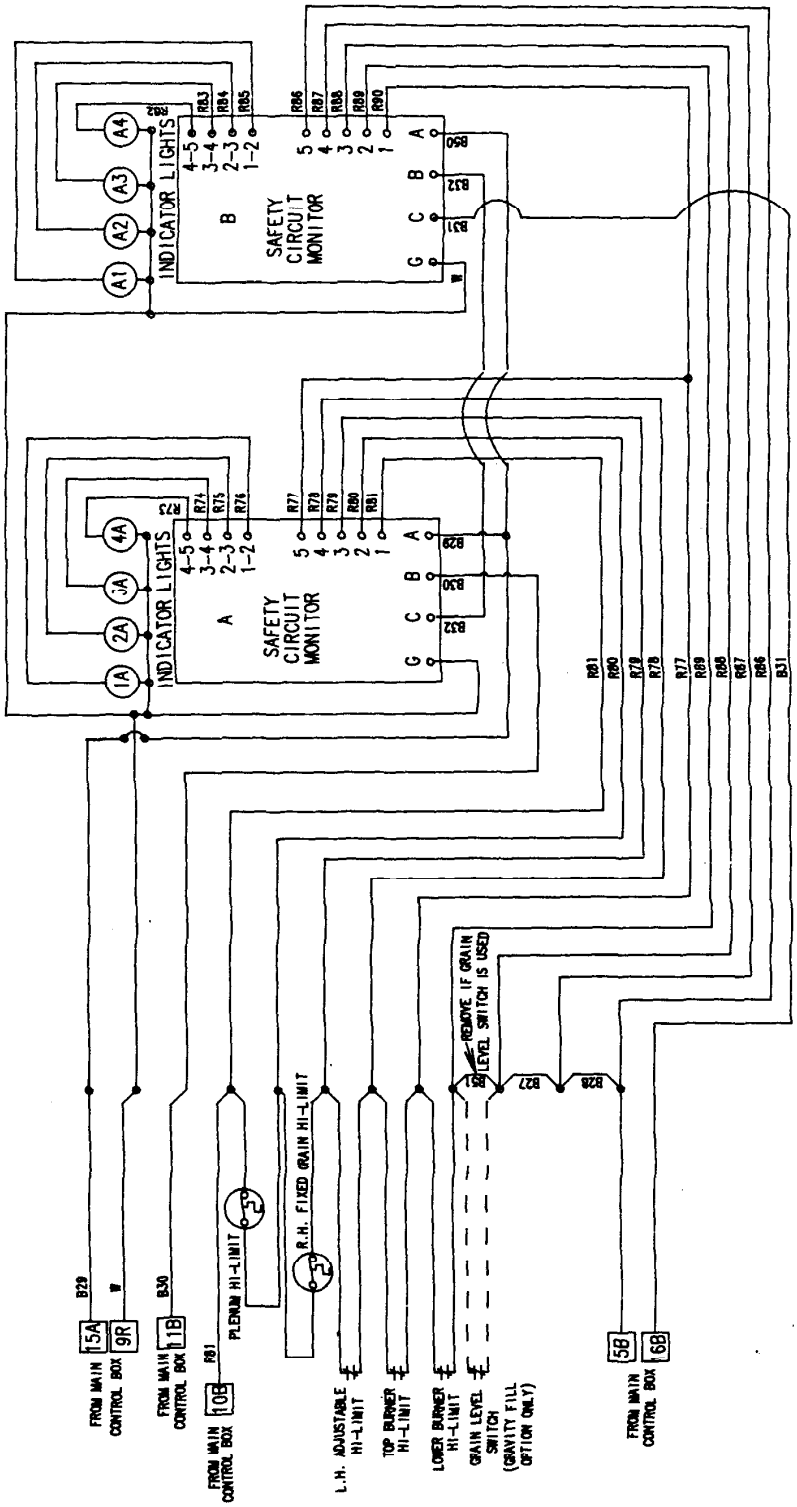
BRANCH CIRCUIT BOX #2

1200S & 1500LS MODULE

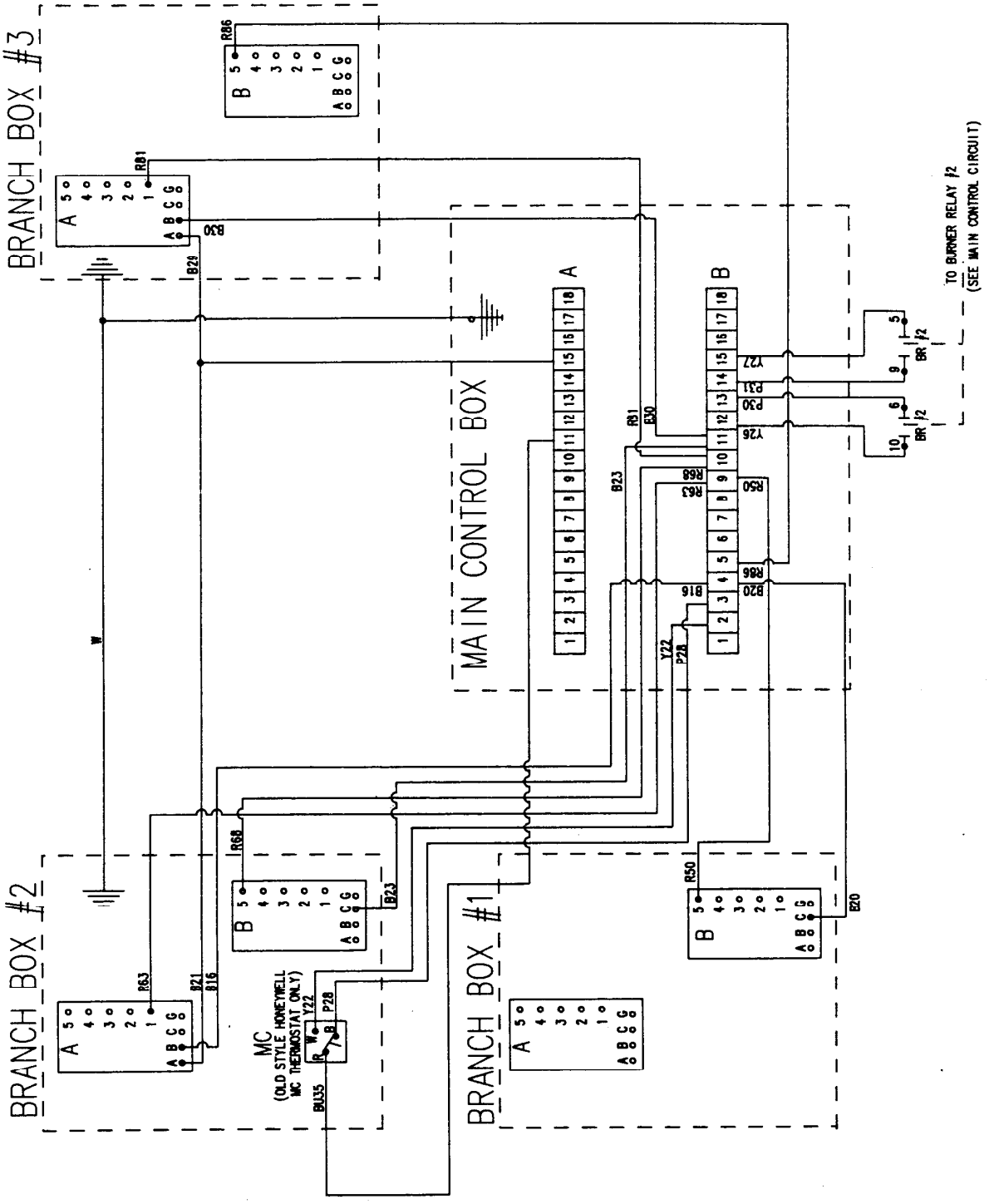


BRANCH CIRCUIT BOX #3

1800S & 2300LS

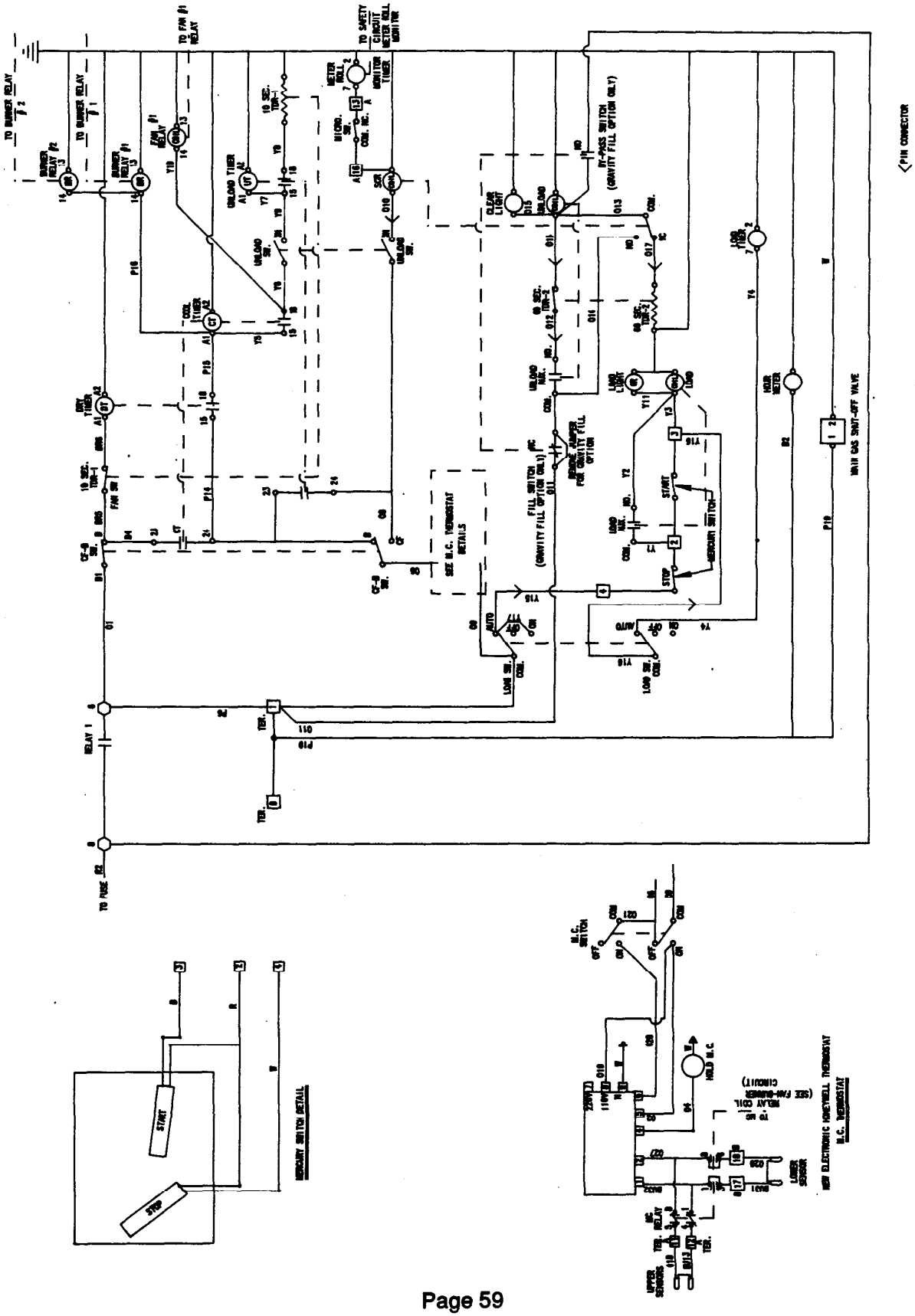


BRANCH BOXES TO MAIN CONTROL BOX



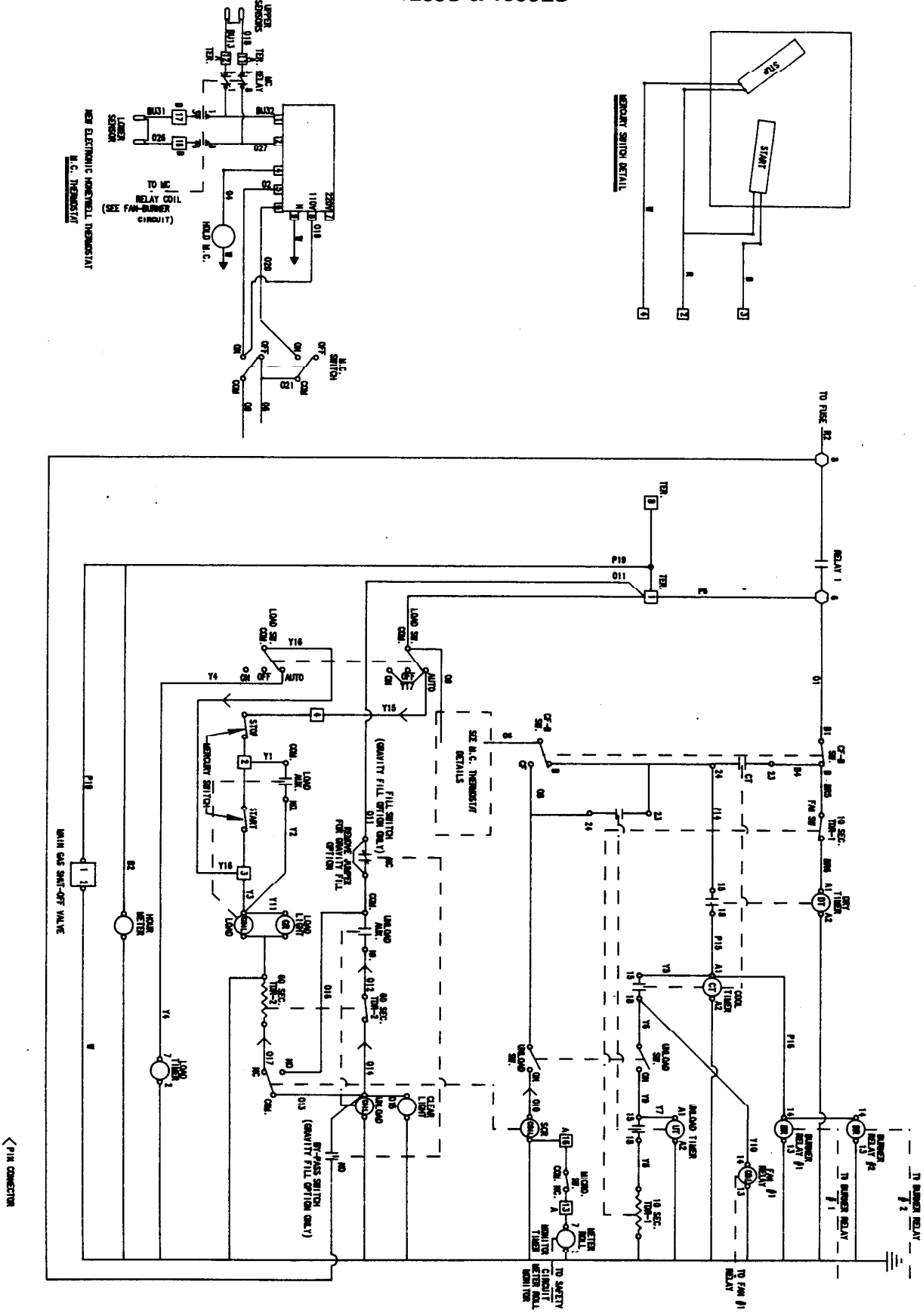
GENERALCONTROL CIRCUIT

600S & 750LS



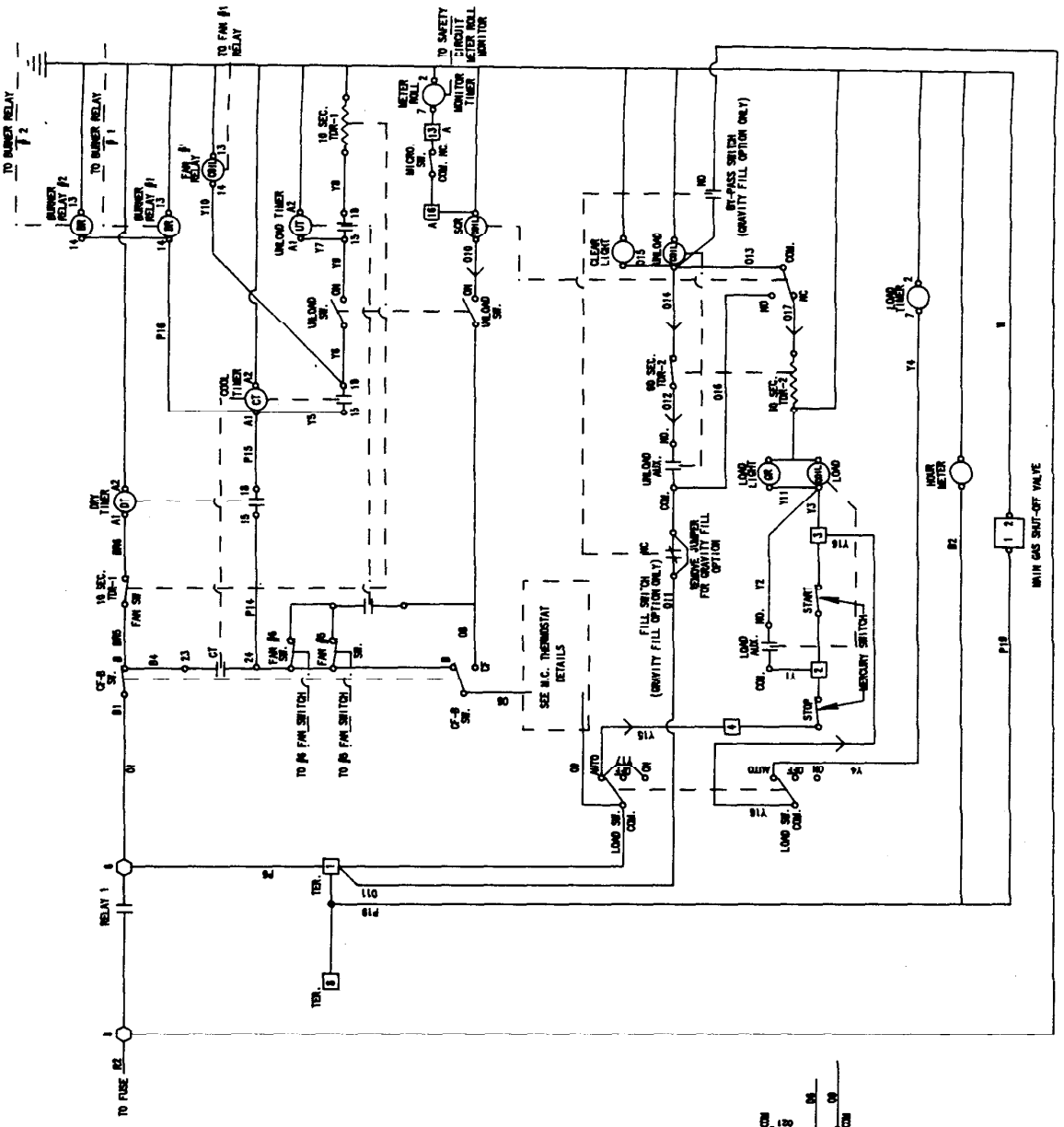
GENERAL CONTROL CIRCUIT

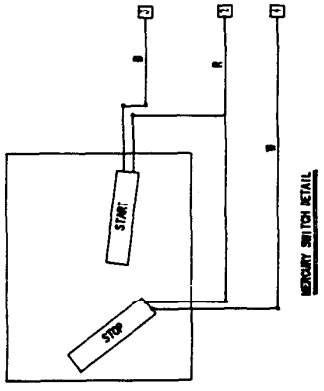
1200S & 1500LS

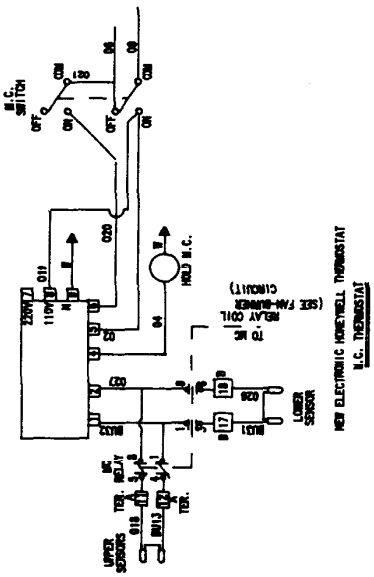


GENERAL CONTROL CIRCUIT

1800S & 2300LS

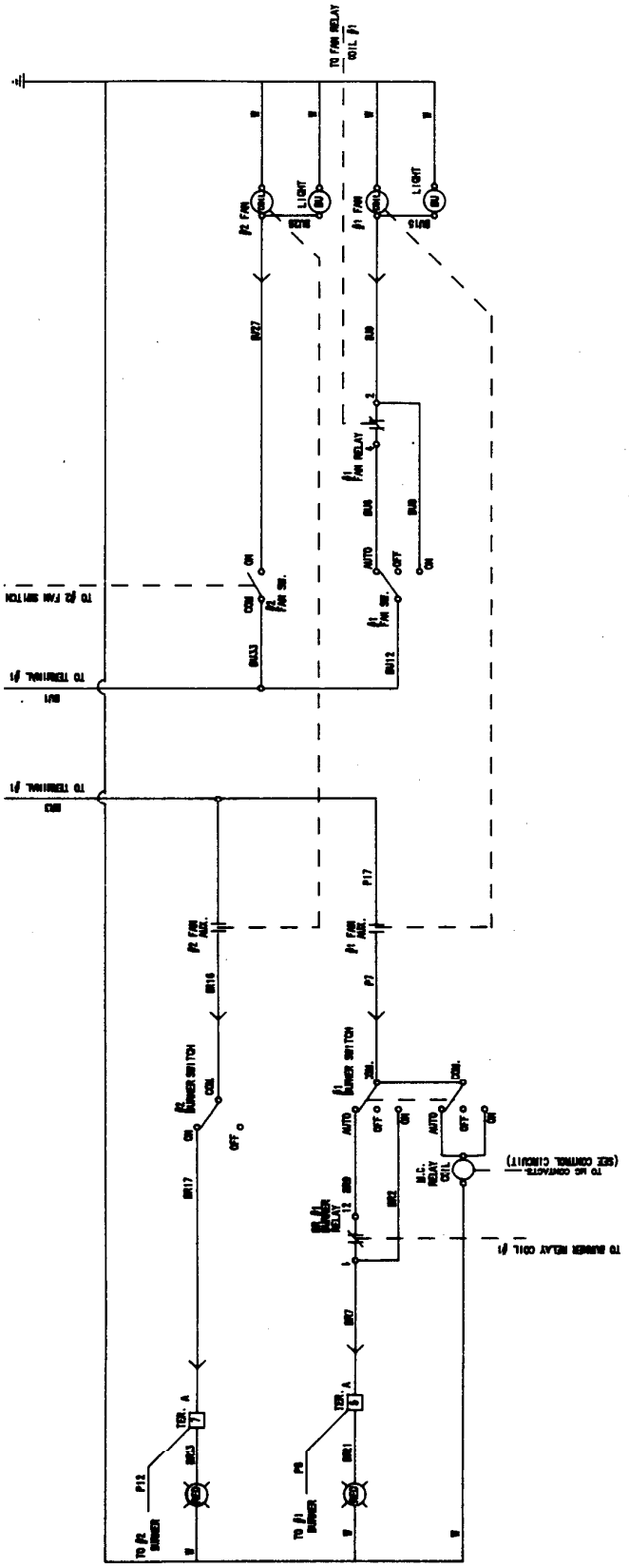






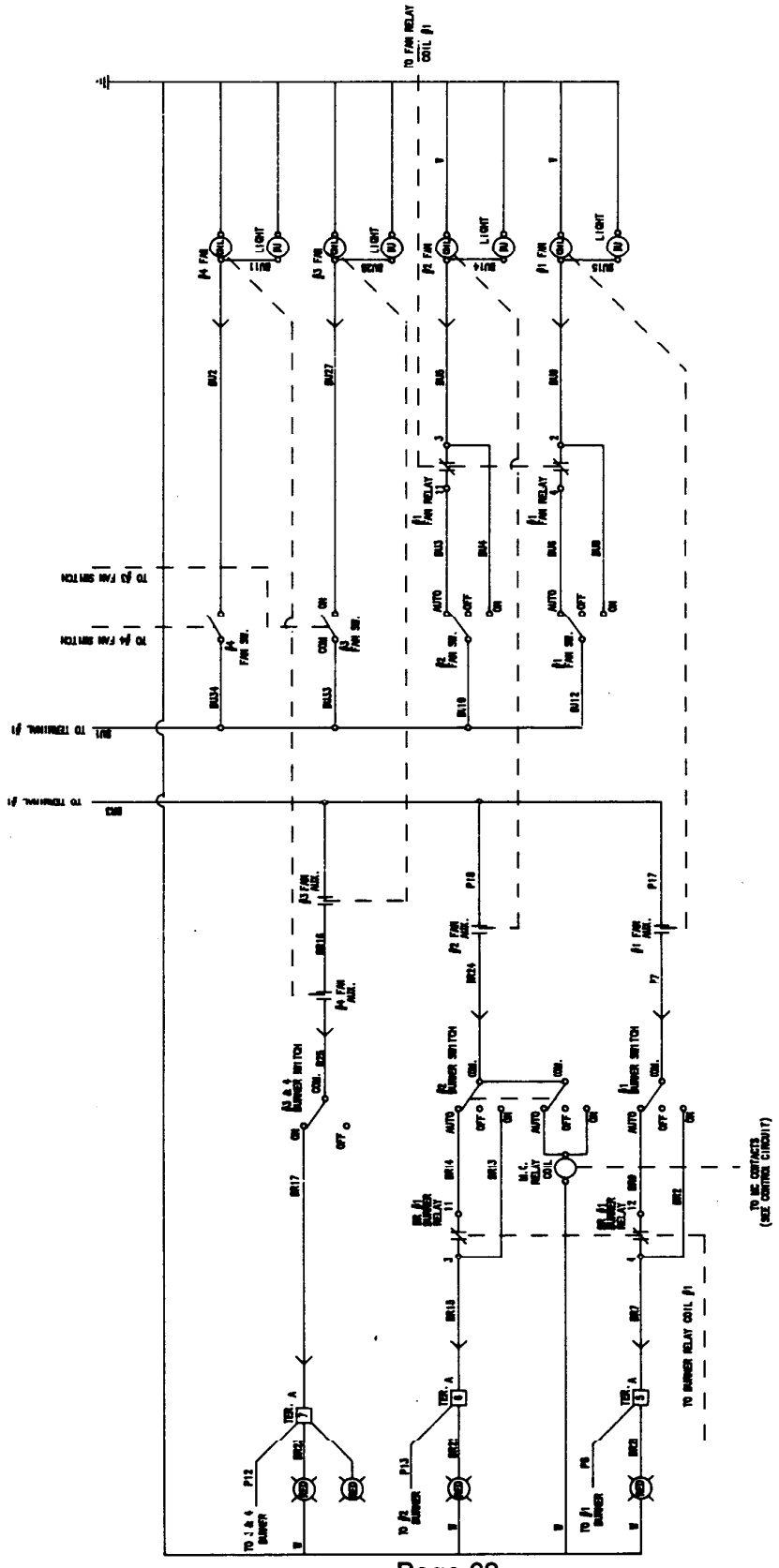
FAN & BURNER CIRCUIT

600S & 750LS



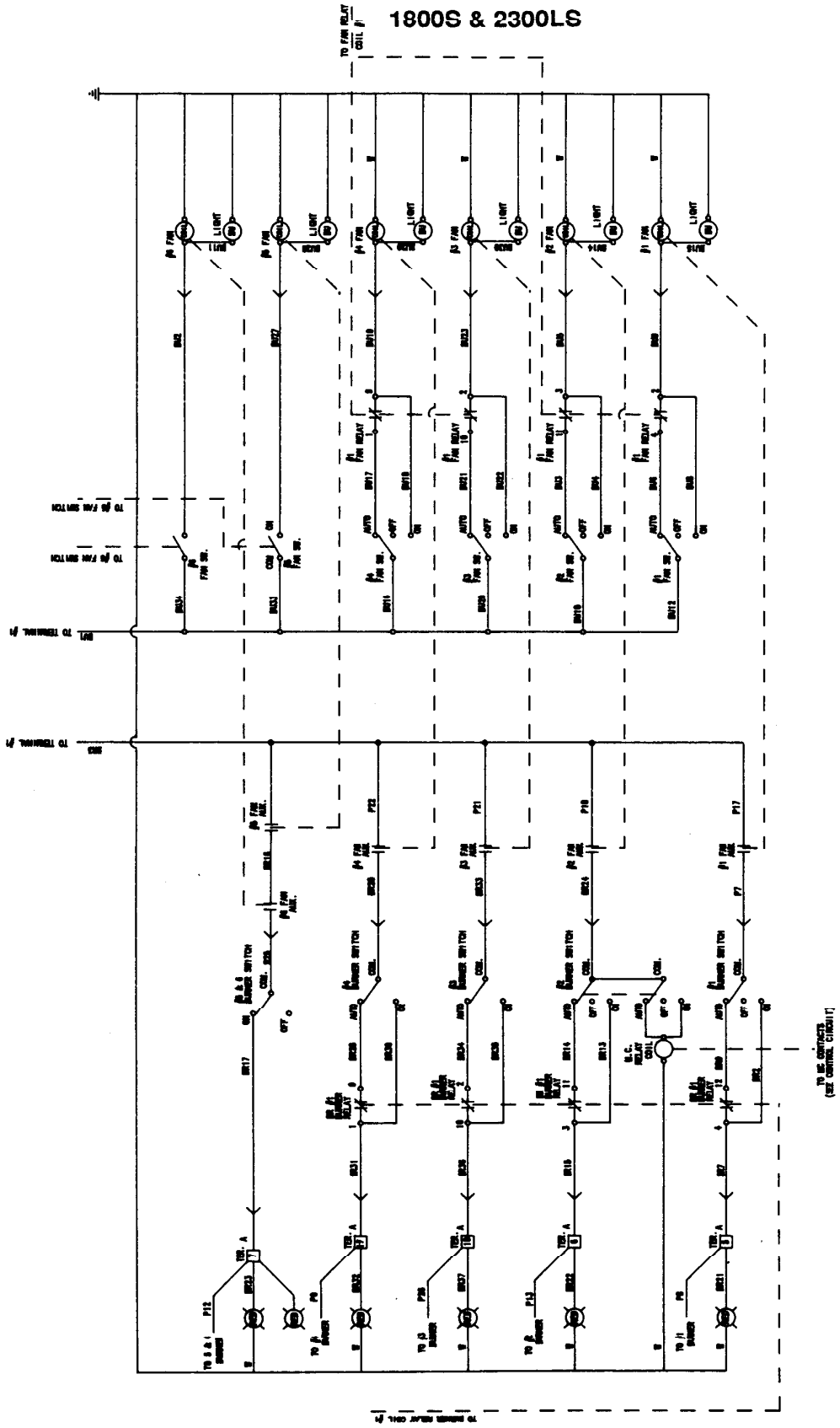
FAN & BURNER CIRCUIT

1200S & 1500LS



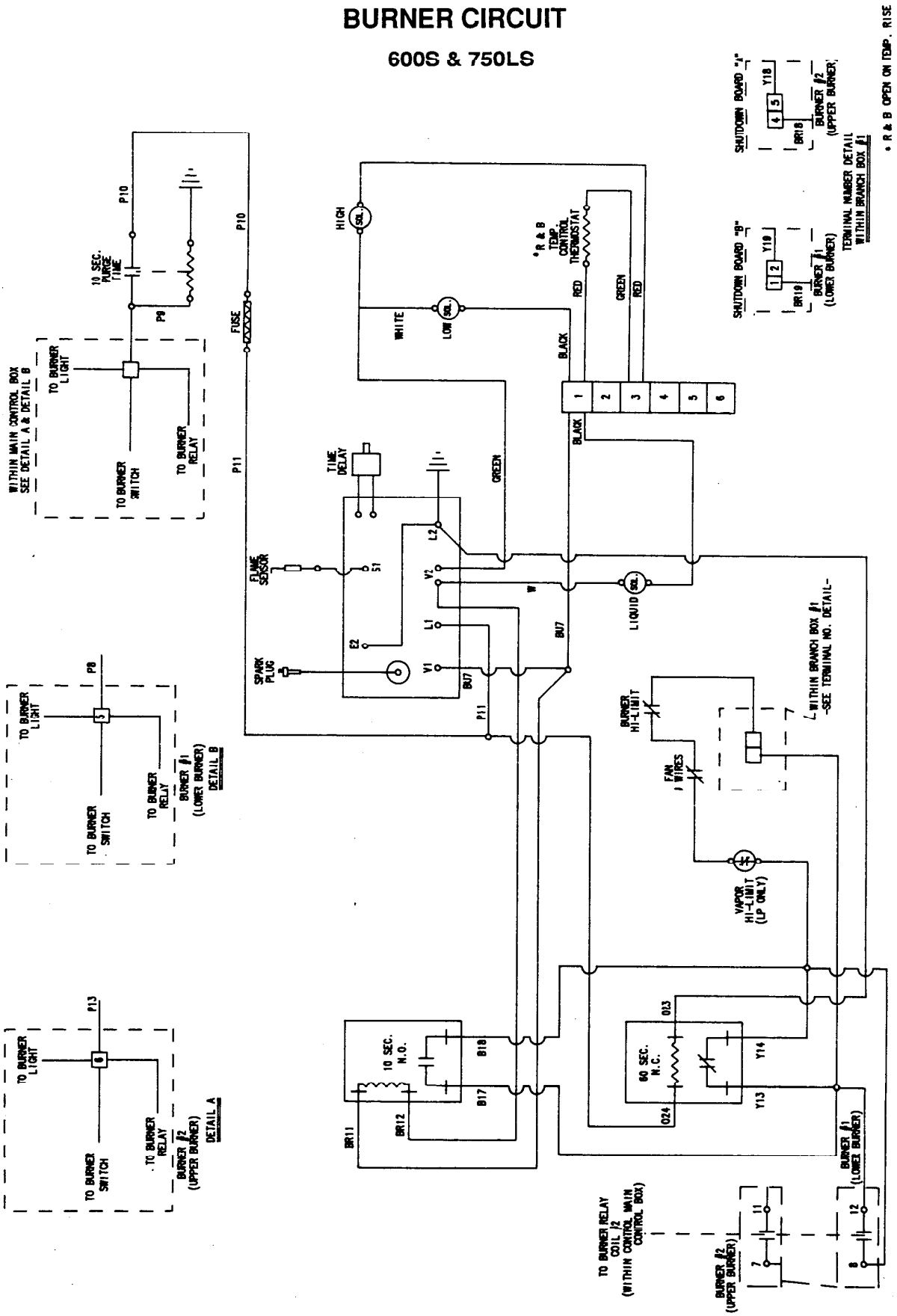
FAN & BURNER CIRCUIT

1800S & 2300LS



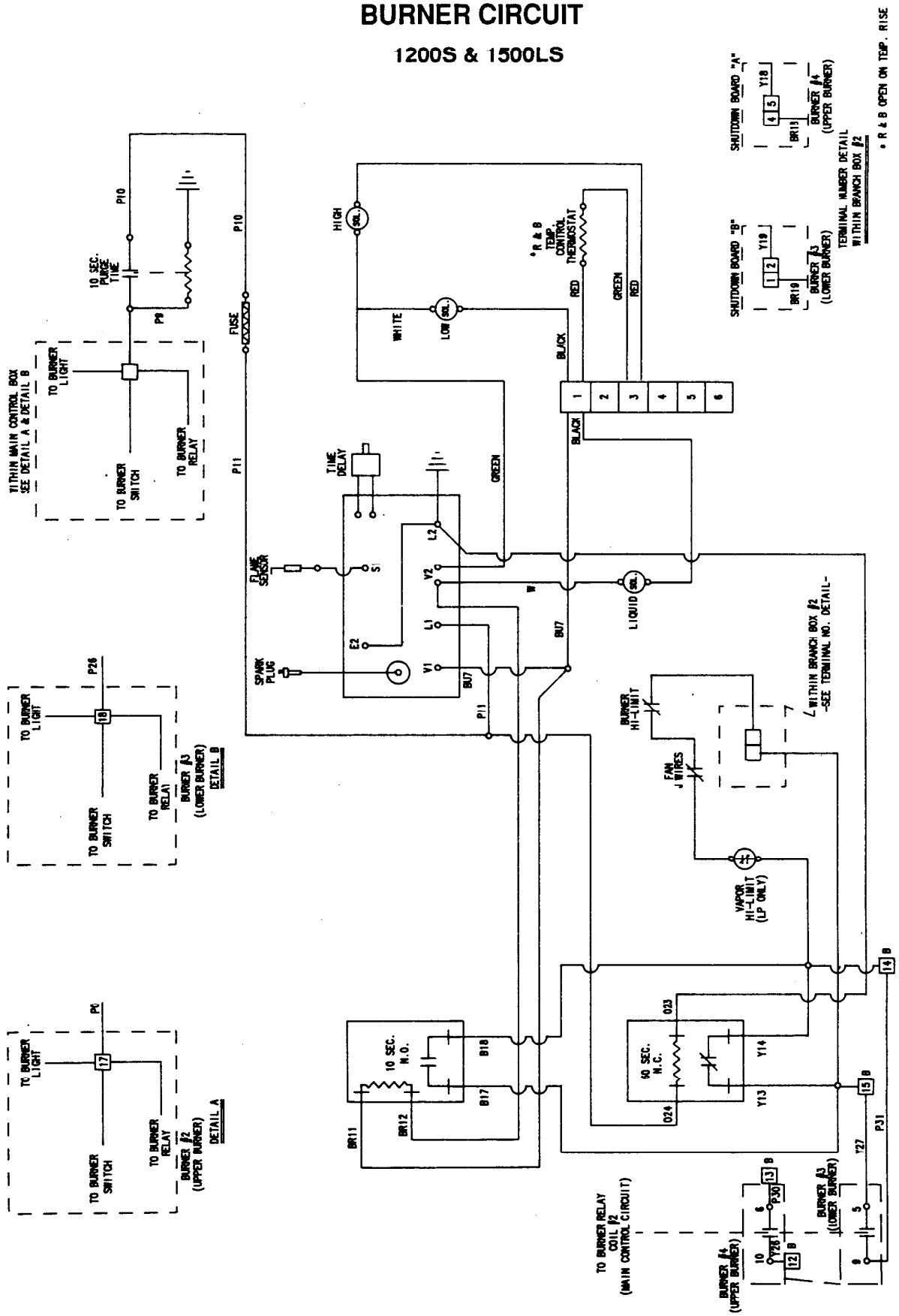
BURNER CIRCUIT

600S & 750LS



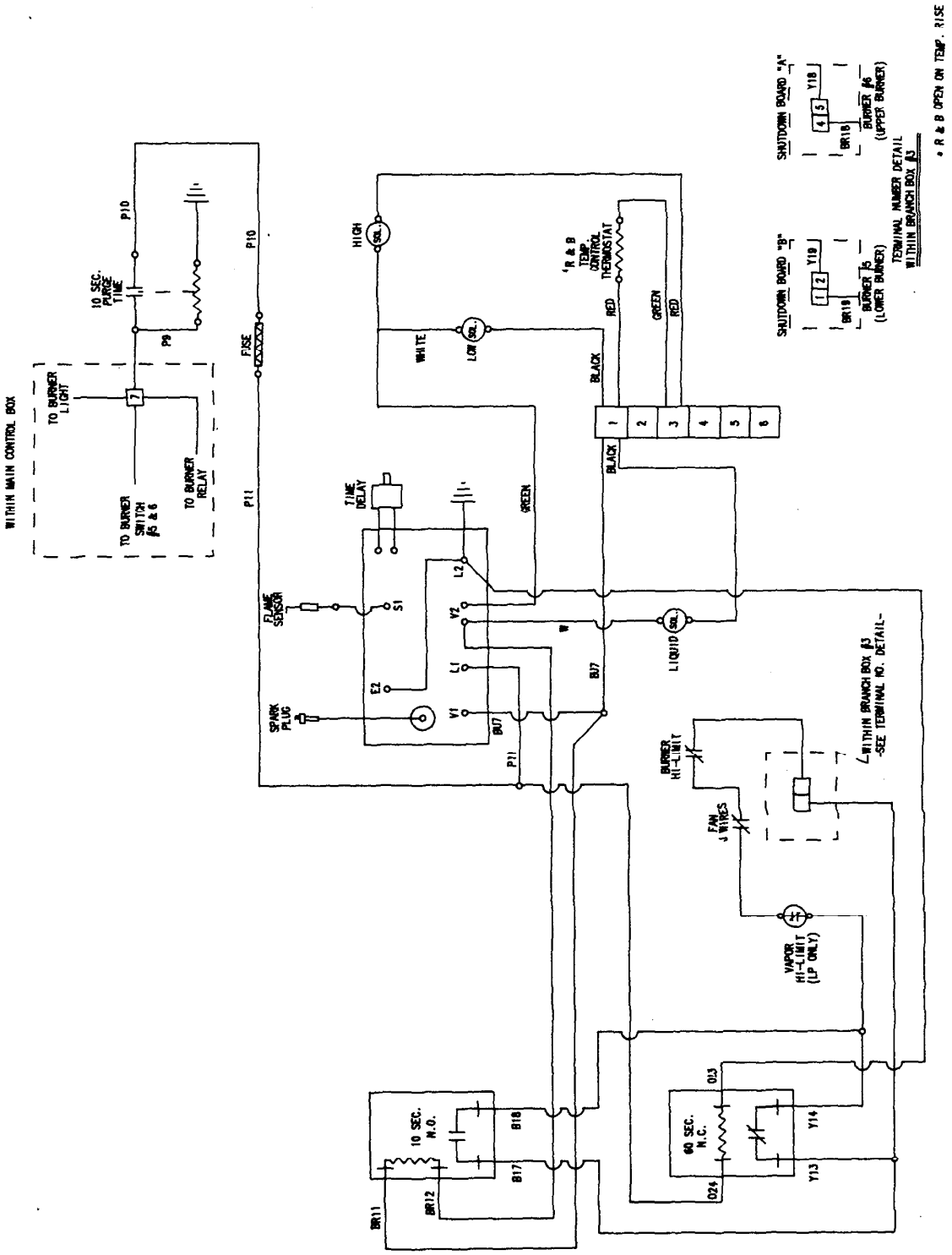
BURNER CIRCUIT

1200S & 1500LS

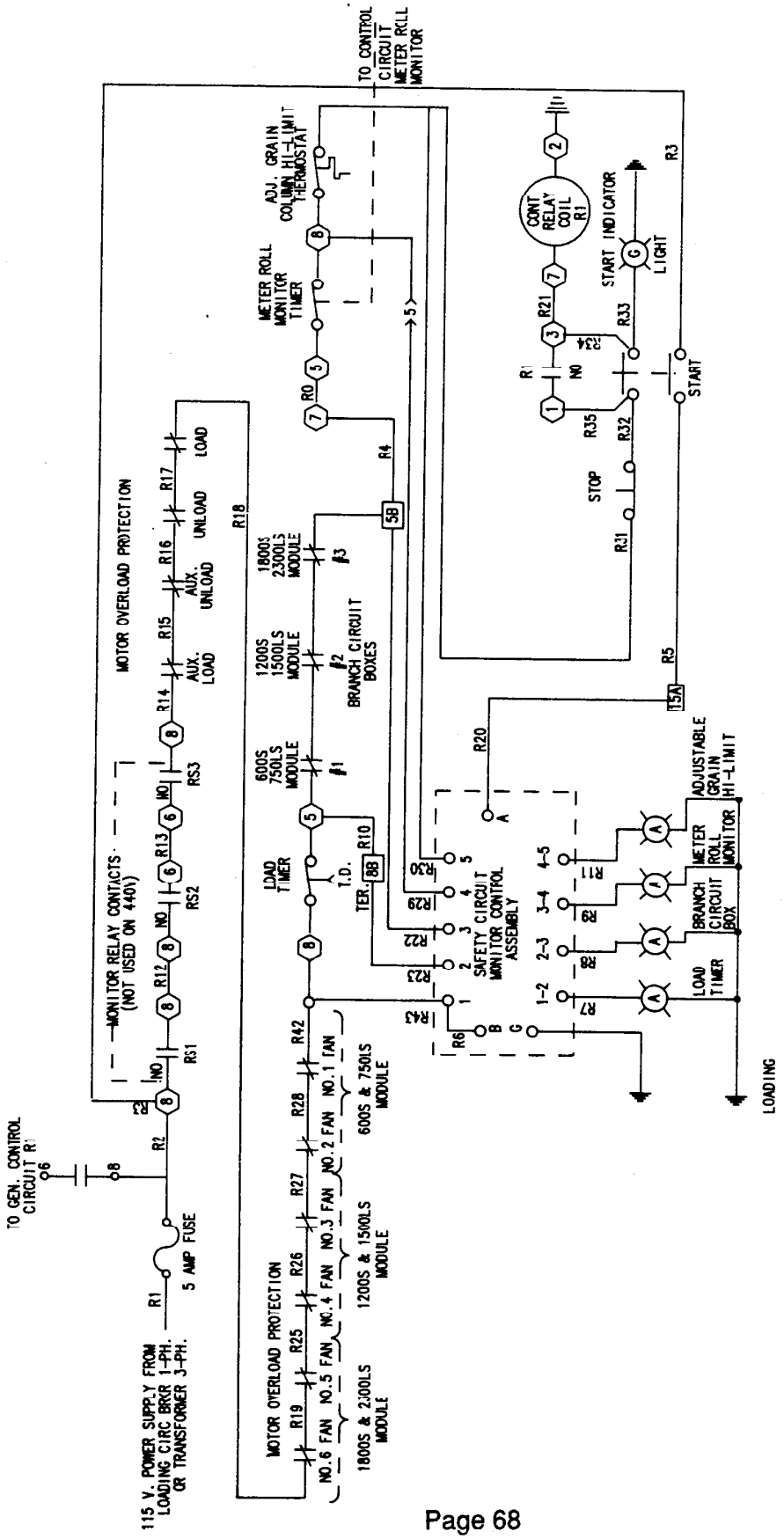


BURNER CIRCUIT

1800S & 2300LS



SAFETY CIRCUIT



TROUBLE ----- CHECK-OUT PROCEDURE

TROUBLE ANALYSIS PROCEDURE

A voltmeter is required for some of the following check-out procedures. Before performing any tests, make certain if the dryer power supply is 1 phase, 230 volt, or 3 phase, 230 volt.

The burner control circuit is 115 volts on all standard U.S. production dryers.

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

REFER TO WIRING DIAGRAMS AND PARTS LIST FOR IDENTIFICATION OF PARTS AND ELECTRICAL TERMINALS.

CAUTION: When making high voltage tests with "live" circuits, be extremely careful...follow established safety practices. Turn power ON for testing only. DO NOT ATTEMPT TO MAKE THE DRYER OPERATE BY USING A JUMPER WIRE TO BY-PASS A DEFECTIVE COMPONENT.

PROBLEM:	POSSIBLE CAUSE:
CONTROL CIRCUIT NOT ENERGIZED. Panel light and shut-down indicator light OFF.	1. POWER SUPPLY: Check that MAIN POWER SUPPLY and CIRCUIT BREAKERS are turned ON. Also check for tripped circuit breaker. 2. FUSES : Check for blown 5 amp fuses. See POWER CIRCUIT diagram for location and number used. 3. OVERLOAD RELAY: Check for a tripped overload relay. 4. STOP OR START SWITCHES - Check for a defective STOP or START switch. Also check switch wiring connections. 5. R1 RELAY: Check for a defective R1 relay, relay base, or faulty wiring connections.

PROBLEM:	POSSIBLE CAUSE:
CONTROL CIRCUIT NOT ENERGIZED- Panel light OFF with shut-down indicator light ON.	1. **FAN THERMAL OVERLOAD:** The fan thermal overload device is the self-resetting type and is located within the windings of the fan motors to indicate excessive motor temperature. If the thermal overload causes dryer shut-down, check for voltage supply problems, or for a defective motor. If this type of problem exists, do not continue restarting and operating the dryer, as it may cause the motor to burn out. 2. **BURNER LOCK-OUT:** Burner lock-out is provided by the lock-out breaker which is a part of the burner control located within the Fan-Heater Control Box. If this safety control operates, check for an interruption in the fuel supply, or for a defective or improperly located flame sensor. 3. **BURNER HI-LIMIT THERMOSTAT:** The Burner Hi-Limit Thermostat is mounted on the fan housing and is a fast acting device which monitors the temperature within the rear end of the fan-heater housing. Most dryers are equipped with a manual reset type thermostat which must be reset by hand before the dryer can be restarted. If the Burner Hi-Limit causes shut-down, check for inadequate airflow, as caused by blockage at air inlet or fan motor failure. **NOTE:** In the event the dryer shuts down, the back-draft currents of hot air passing through the housing may cause the Burner Hi-Limit to trip open. 4. **GRAIN HI-LIMIT THERMOSTAT INDICATOR LIGHT-FIXED** (non-adjustable) **GRAIN HI-LIMIT THERMOSTATS:** The Grain Hi-Limit thermostats are of a fixed temperature, automatic self-resetting type and act to monitor the temperature of the grain within the dryer columns. If the grain temperature becomes excessive (approx. 210°F), the thermostats will automatically shut down the dryer. The thermostats are located within a handy boxs on the front of the dryer. Each thermostat has a long sensor tube which extends almost the full length of the grain column. 5. **GRAIN HI-LIMIT THERMOSTAT INDICATOR LIGHT ADJUSTABLE:** The thermostat has an adjustable dial to set the thermostat at the desired temperature. The thermostat is located in the control box and in the branch boxs. 6. **LOAD TIMER INDICATOR LIGHT:** The load timer is located within the dryer Control Box and is designed to automatically stop the dryer if it does not refill with grain within the selected time setting of the timer knob. If the load timer causes shut down of dryer, it normally indicates the wet grain supply was either reduced, interupted, or exhausted, or that the timer was improperly adjusted.

PROBLEM:	POSSIBLE CAUSE:
CONTROL CIRCUIT NOT ENERGIZED- Panel light OFF with shut-down indcator light ON (continued)	7. **PLENUM HI-LIMIT THERMOSTAT INDICATOR LIGHT:** This thermostat is of a fixed temperature, automatic self-resetting type, and acts to monitor the drying air temperature within the air plenum chamber of the dryer. If thermostat causes shut down of the dryer, it indicates excessive drying temperature, usually due to improper burner adjustment or blocked airflow within dryer perforations. 8. **IMPROPER LIGHT OPERATION SHUT-DOWN DETECTOR:** In the event of a malfunction within the detector, or poor wiring connections within its leads, the unit will not prevent the dryer from operating, but will cause only improper action of the indicator lights. If the dryer shuts down due to any of the above listed items and can be restarted again without any of the indicator lights coming ON, or if any lights stay "ON" when the dryer is operating, it indicates improper operation of the unit. If this condition occurs, it is possible to continue operating the dryer and delay repairing the detector unit until a convenient time. When inspecting the unit, make certain to check for loose wiring connections, and for a faulty relay or printed circuit board.
TOP AUGER WILL NOT START	1. Check that the top auger circuit breaker and switch are turned ON. 2. Check position of upper auger paddle switch- must be "down" to start auger 3. Inspect for secure mounting and wiring of mercury switches in terminal box on top auger paddle switch shaft. Include check for defective mercury switch. 4. Verify closing of top auger contactor: check voltage on load side of contactor, power terminals 7 and 8 (1-phase), or 10, 11 and 12 (3-phase). Inspect contactor for defective points or a burned out coil 5. Inspect connections and check voltage applied to motor leads in motor junction box to determine if motor is defective. 6. Check that Handy Box on Paddle shaft is right side up. See wire diagrams for proper location of mercury switches.
FAN MOTOR WILL NOT START	1. Check that fan circuit breaker and fan switch is ON; also for defective switch or bad wiring connections. 2. Verify closing of fan motor contactor: check voltage on load side of contactor, see appropriate Power Wiring Circuit for Power Terminal Numbers Inspect contactor for defective points or a burned out coil. 3. Inspect connections and check voltage applied to motor leads in Fan-Heater Control Box to determine if motor is defective. 4. Check capacitors on single phase motors; replace if defective. If motor starts slowly, check for low voltage during starting, due to excessive voltage drop power supply wiring.

PROBLEM:	POSSIBLE CAUSE:
BOTTOM AUGER WILL NOT START	1. Check that the bottom auger circuit breaker is on. 2. Check that the **UNLOAD** switch is on **AUTO.** 3. Check for an improperly adjusted or defective **MC** thermostat. Also, check switch and thermostat wire connections. 4. Verify closing of bottom auger contactor; check voltage on load side of contactor, power terminals 3 and 4 (1-phase), or 4, 5 and 6 (3-phase).
BURNER WILL NOT FIRE WITH FAN OPERATING (control circuit malfunction)	1. Burner switch must be ON. 2. Check for 115 volts across burner side of fuse located within Fan-Heater Control Box. Replace fuses, if blown, and determine cause of excess current (shorted wiring connections, etc.).
BURNER WILL NOT FIRE- No gas pressure with fan operating at least 15 seconds (gas supply or fan-heater component malfunction)	1. Check gas supply. Also, check gas filter and gas line for possible obstruction or closed valves. Refill tank and service parts, as required. 2. If 115 volts is present;: a. Inspect gas solenoid valves (includes liquid valve on LP units) for defective coils or improper wiring. Replace valve or valve coil if valve will not open with proper voltage applied. b. Inspect for a defective high vapor thermostat (LP Models only). Replace thermostat if its circuit is open (without overheated vapor). 3. **FUEL SUPPLY:** Inspect gas line piping, fuel strainer, burner venturi and orifice for possible obstructions. Clean parts, as required. 4. Check for 115 volts across L1 & L2 and across V1 & V2 on Fenwal Board. Reset circuit breaker on board.
BURNER WILL NOT FIRE- but gauge shows gas pressure	1. **FENWAL BOARD:** Check board for spark by removing ignition wire from board and holding an insulated handle screwdriver against the output terminal and 1/4" away from the case. There should be a strong spark. Check board wiring and connections. Replace the Fenwal Board, if required. Make sure board is properly grounded to heater housing. 2. **IGNITOR PLUG:** Check that ignitor plug is properly gapped to 3/32 inch and has a strong spark. Inspect ignition wire and its connections. Make sure wire is not shorted or broken. Check ignitor plug for damaged electrodes or cracked insulator. Replace or clean and service ignitor plug, as required.

PROBLEM:	POSSIBLE CAUSE:
BURNER OPERATES- BUT WILL NOT CYCLE FROM LO-FIRE TO HI-FIRE	1. Check for an excessive Lo-Fire gas adjustment setting. Observe pressure shown on gauge and compare reading with recommended flow control valve pressure setting listed in manual. Readjust Lo-Fire setting on flow control valve, if required. 2. Check for improperly adjusted or defective HI-Lo Fire thermostat control. Temporarily increase the temperature setting. If heater will still not cycle, check for problem in control cord wires, connections or thermostat. The control cord should be connected to the R and B, so the switch will open on temperature rise. If burner will cycle to Hi-Fire with control cord wires connected together, the thermostat is faulty. 3. Check for improperly connected or faulty Hi-Fire gas vapor solenoid valve. Correct any poor connections or defective wiring. If wiring appears proper, problem may be caused by a burned-out valve coil or defective valve. Replace Hi-Fire solenoid valve, or its coil, if defective.
BURNER OPERATES- BUT WILL NOT CYCLE FROM HI-FIRE TO LO-FIRE	1. Check gas pressure reading on gauge. Problem may be due to insufficient gas regulator setting. Temporarily decrease the HI-Lo Fire thermostat setting to verify that thermostat will function and cause the burner to cycle. If burner will cycle at reduced thermostat setting, it indicates that problem was due to insufficient heat to satisfy the original thermostat setting. Reset thermostat to original setting and increase gas regulator setting for additional heat output. Do not exceed the maximum pressure listed in manual. 2. Hi-Lo Fire thermostat control may be defective. If burner still will not cycle to Lo-Fire after decreasing the thermostat, the problem may be due to a broken or kinked thermostat sensor tube. Observe reading on thermometer. Replace control assembly if it cannot be set to cause its switch to go to the open circuit position with normally hot air plenum temperatures. 3. If burner continues to operate on Hi-Fire, check the Hi-Fire gas solenoid valve for a stuck or blocked open condition, or for reversed gas pipe connections. **THE SOLENOID VALVE MUST NOT ALLOW GAS FLOW WHEN ITS COIL IS NOT ENERGIZED.**
BURNER MAINTAINS DESIRED DRYING TEMP. BUT CYCLES FROM HI-FIRE TO OFF (without going into Lo-Fire)	1. Make sure the flow control valve is not set completely closed. Valve must be adjusted open to provide the proper Lo-Fire gas pressure listed in manual.

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