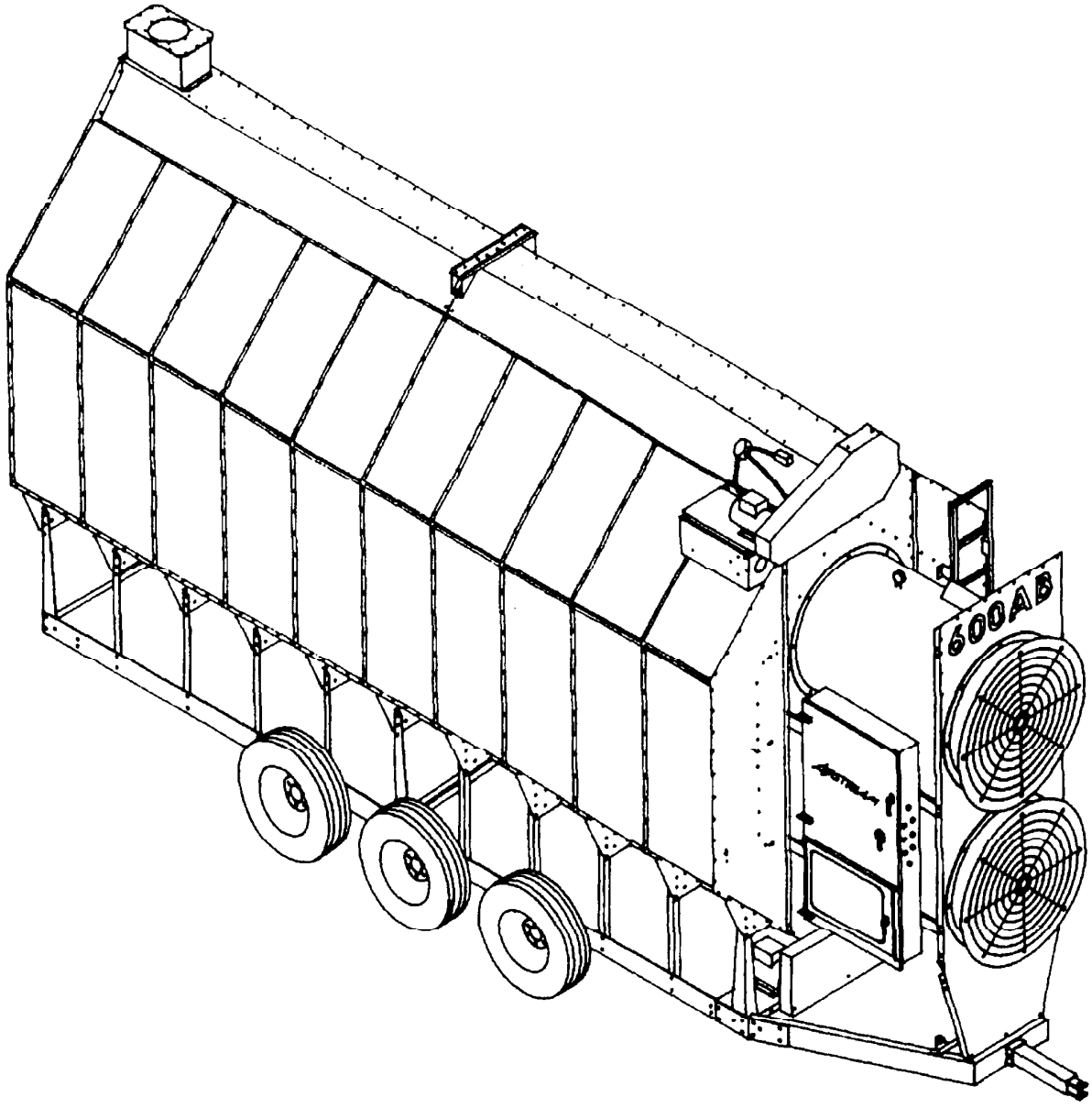
AIRSTREAM



INSTALLATION & OPERATION MANUAL

AIRSTREAM AB-SERIES MULTI-FAN GRAIN DRYERS

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 AB-Series Multi-Fan 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 415AB, and 600AB dryers. These dryers are available for liquid propane or natural gas fuel supply, with either single phase 230 volt, or three phase 220 or 440 volt electrical power.

USE CAUTION IN THE OPERATION OF THIS EQUIPMENT

The design and manufacture of this dryer is directed toward operator safety. However, the very nature of a grain dryer having a gas burner, high voltage electrical equipment and high speed rotating parts does present a hazard to personnel which 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.

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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.

SPECIFICATIONS

TYPE: Automatic Batch, with automatically controlled fan/heater unit for high and low heat drying stages; Dry and Cool (three stage) or Full Heat (two stage).

GRAIN COLUMNS: Two grain columns, 14" thickness, with grain movement through both columns to the discharge auger. Grain column construction of galvanized steel, with heavy steel partitions each two feet of length.

FAN: Heavy-duty axial fans, direct drive, with total airflow, static pressure, and horsepower matched to grain volume, and with full motor overload protection.

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

AUGER: Both top leveling and bottom discharge augers are automatically controlled, with power circuit provided for simultaneous operation of auxiliary loading and unloading conveyor.

AUTO CONTROL: Fully equipped for automatic control of all functions loading, drying, cooling, and discharge. Dry and Cool or Full Heat; full safety control systems; 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 SINGLE FAN MODEL DRYERS

	415AB	600AB
GRAIN COLUMNS	14", 14' Long	14", 10' Long
GRAIN COLUMN HOLDING CAPACITY	350 Bu.	500 Bu.
TRANSPORT LENGTH (Hitch to Discharge Auger)	23'-1"	29'-1"
TRANSPORT WIDTH	8'	8'
TRANSPORT HEIGHT	13'-3"	13'-3"
TRANSPORT WEIGHT	7000 Lbs. (Approx.)	9000 Lbs. (Approx.)
INSTALLED LENGTH	21'-1"	27'-1"
INSTALLED WIDTH	8'	8"
INSTALLED HEIGHT (Above Foundation Supports)	13'-3"	13'-3"
FAN	(2) 10-15 HP, 28"	(2) 10-16 HP, 36"
HEATER (Max. BTU)	(2) 3,000,000 Btu/Hr	4,500,000 Btu/Hr
TOP LOADING AUGER	8", 5 HP	8", 7.5 HP
CAPACITY	2600 BPH	2600 BPH
BOTTOM AUGER	8", 10" Tube, 5 HP	8", 10" Tube, 7.5HP
MAXIMUM CAPACITY *1	2600 BPH	2600 BPH
ELECTRIC LOAD (Fan, Top Aug., Bot. Aug.)		
Single phase, 230 V	160 Amps	200 Amps
Three phase, 220 V	100 Amps	132 Amps
Three phase, 440 V.	50 Amps	66 Amps
DRYING CAPACITY, SHELLED CORN-FULL HEAT *2		
DRY AND COOL 25% to 15%	300 BPH	430 BPH
DRY AND COOL 25% to 20%	472 BPH	675 BPH
FULL HEAT 25% to 15% *3	415 BPH	591 BPH
FULL HEAT 25% to 15% *3	828 BPH	1182 BPH

*1 Discharge rate is adjustable by the use of the bottom auger dampers.

*2 Capacities listed are wet bushels at input moisture content. Excluding load and unload time.

*3 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).

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.

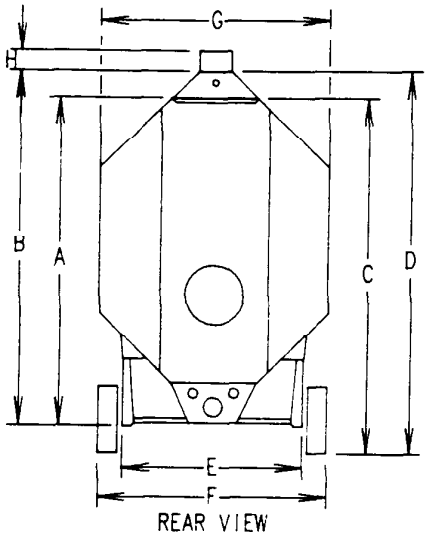
INSTALLATION

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.

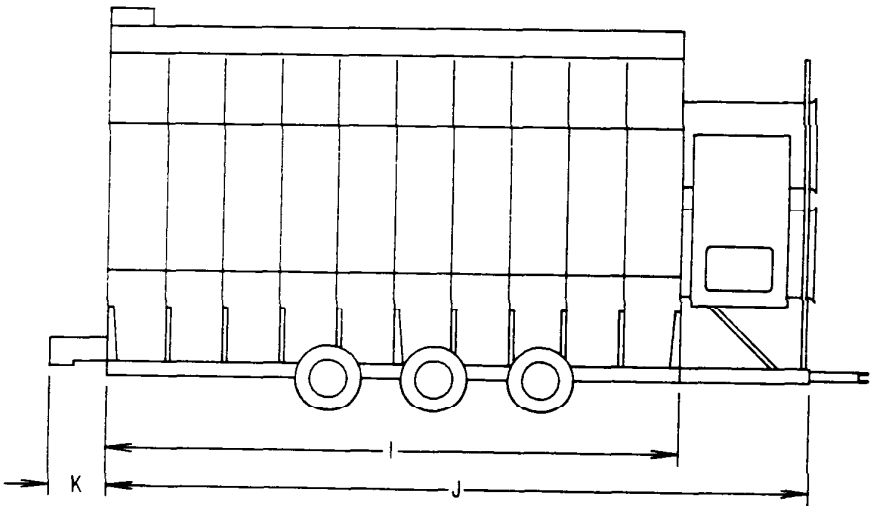
SITE SELECTION: The dryer is not to be operated inside a building or in any area not permitted by electrical codes, fuel installation regulations, or insurance requirements. Do not operate in an area where combustible material can be drawn into the fans. Maintain a minimum distance of three feet to other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

BLOCK SUPPORT: The wheels are provided only for transportation of the empty dryer. Before loading any grain into the dryer, it is necessary to support the frame of the unit on each side, by concrete blocks or other means, to carry the total weight when filled with grain. Use shims to provide uniform, level support, at a minimum of 16" above the concrete slab, to provide space for clean-out and for auxiliary conveyors. Use a minimum of four supports on each side, plus one support at the hitch point. The hitch tongue should be removed, but the hitch assembly and the fan support must be left on during operation; they are not a part of the transport assembly.

	AIRSTREAM MODEL	
	415AB	600AB
A	11'-4 1/2"	11'-4 1/2"
B	12'-3 1/2"	12'-3 1/2"
C	12'-3 1/2"	12'-3 1/2"
D	13'-2 1/2"	13'-2 1/2"
E	6'-4"	6'-4"
F	8'-1"	8'-1"
G	8'	8'
H	14'-1/2"	18'-1/2"
I	18'-9"	22'-9"
J	24"	24"



REAR VIEW



SIDE VIEW

FIG. 1 ILLUSTRATION OF DIMENSIONS

AUGER DRIVE DATA

415AB AUGER DRIVE DATA	AUGER		MOTOR			SHEAVES	
	SIZE	UPTO CAPACITY BU.\HR.*	HP	RPM	BELTS	DRIVE OD	DRIVEN OD
TOP AUGER	8"	2600	5	1750	B-52 (TWO)	3.0"	16"
BOTTOM AUGER	8"	2600	5	1750	B-80 (TWO)	3.0"	16"
600AB TOP AUGER	8"	2600	7.5	1750	B-52 (TWO)	3.0"	16"
BOTTOM AUGER	8"	2600	7.5	1750	B-80 (TWO)	3.0"	16"

* Dryer auger capacities and power requirements vary with grain moisture content and amount of fine material in grain. Bottom auger capacities are controlled by the adjustable auger damper.

FIG. 2

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

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

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 may be 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 2600 bu. per hour. 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 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 top load timer (field adjustable), the dryer will shut down.

UNLOAD DELAY: The Unload Auger switch may be set to the OFF position to stop the automatic drying cycle when the dryer would normally begin unloading. To start the bottom auger, move the switch to AUTO. The ability to "hold" or delay the unloading is of advantage where and elevator leg may be in use for wet grain supply or where the operator desires to be present when unloading occurs.

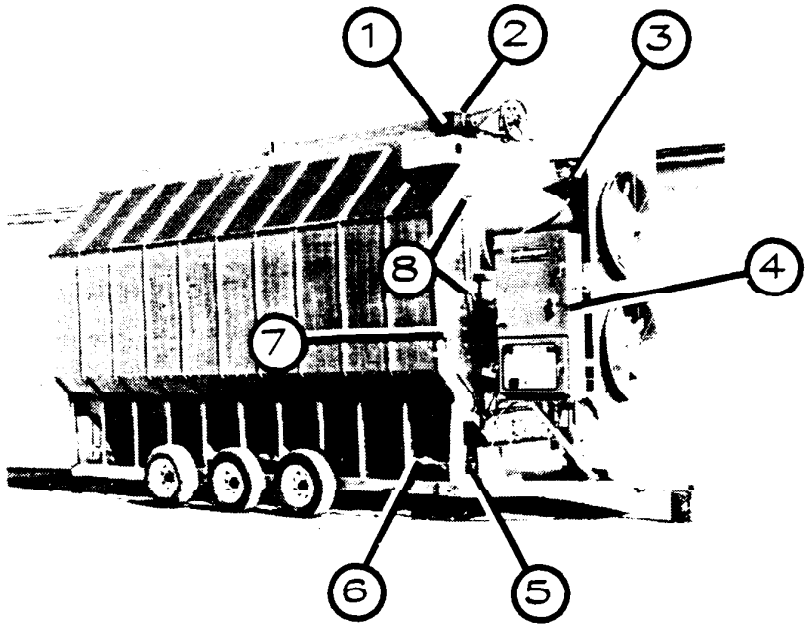
OVERLOAD RELAYS

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 6 current overload relays, plus a thermal overload protector in each fan motor winding. Three phase units have 6 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.

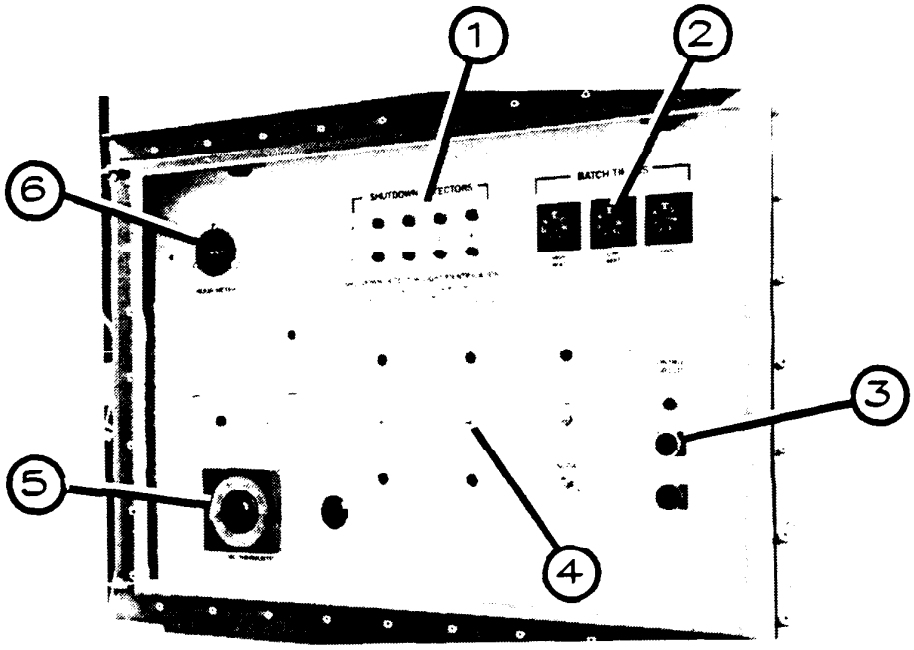
LOAD ADJUSTMENT: Current overload relays are adjustable from 85% to 115% of the rated current of the heater strip, by turning the knob (clockwise turning to 85%).

AUXILIARY CONVEYOR OVERLOAD RELAYS: Overload relays are provided for up to 7.5 HP 1-ph and 10 HP 3-ph motors for on the auxiliary conveyors. It is necessary to provide the heater elements to provide running load protection for the motors. See Fig. 6 for heater element specification.



1. LOADING MOTOR
2. MERCURY SWITCH
3. FAN-HEATER CONTROL BOX
4. MAIN CONTROL BOX
5. UNLOADING MOTOR
6. BOTTOM AUGER CLEAN-OUT MECHANISM
7. GRAIN HI-LIMIT
8. PLENUM HI-LIMIT

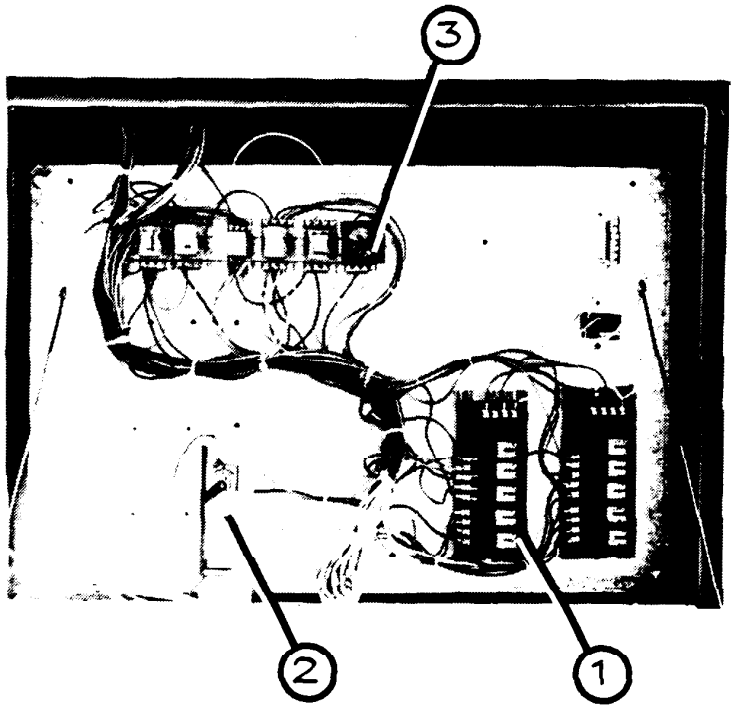
AIRSTREAM AB-SERIES MULTI-FAN DRYERS



1 SHUT DOWN INDICATOR LIGHTS
2 BATCH TIMERS
3. STOP & START SWITCHES
4. CONTROL SWITCHES
5. MC THERMOSTAT
6. HOUR METER

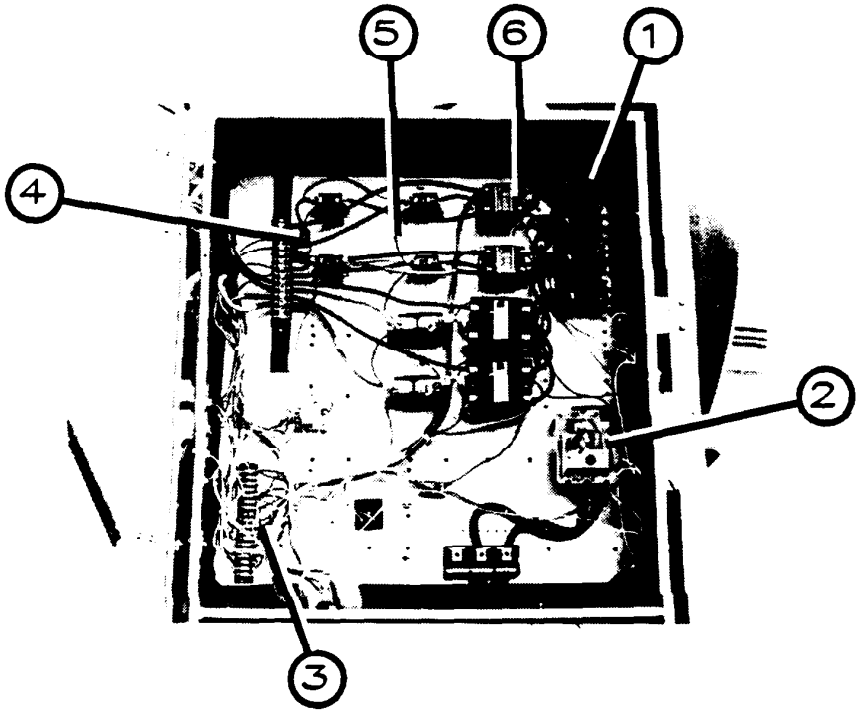
DRYER CONTROL PANEL

1. SAFETY CIRCUIT BOARD
2. ADJ. GRAIN HI-LIMIT
3. LOAD TIMER

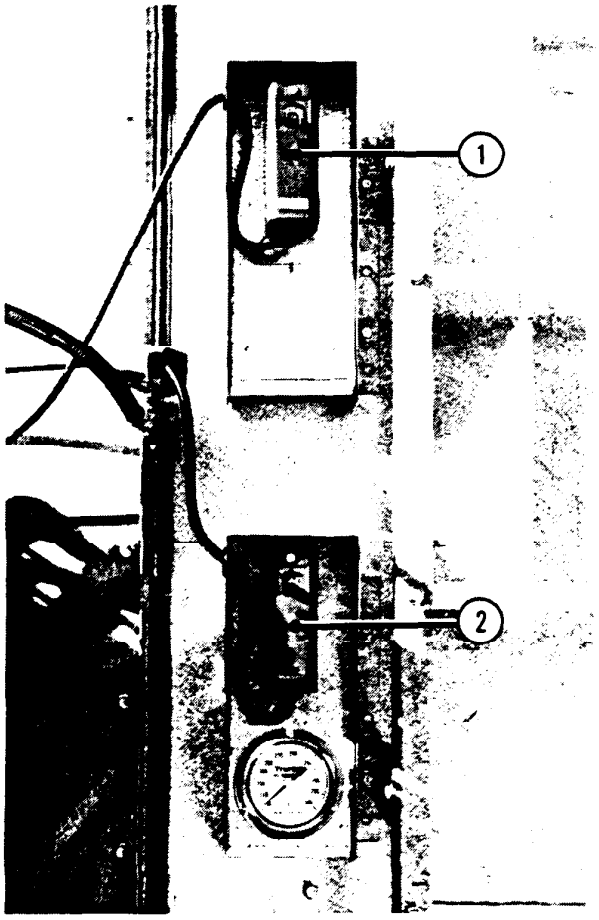


CONTROL BOX- BOTTOM BACK PANEL

1. CIRCUIT BREAKERS
2. SAFETY DISCONNECT
3. CONTROL TERMINAL
4. POWER TERMINAL
5. OVERLOAD RELAYS
6. CONTACTORS

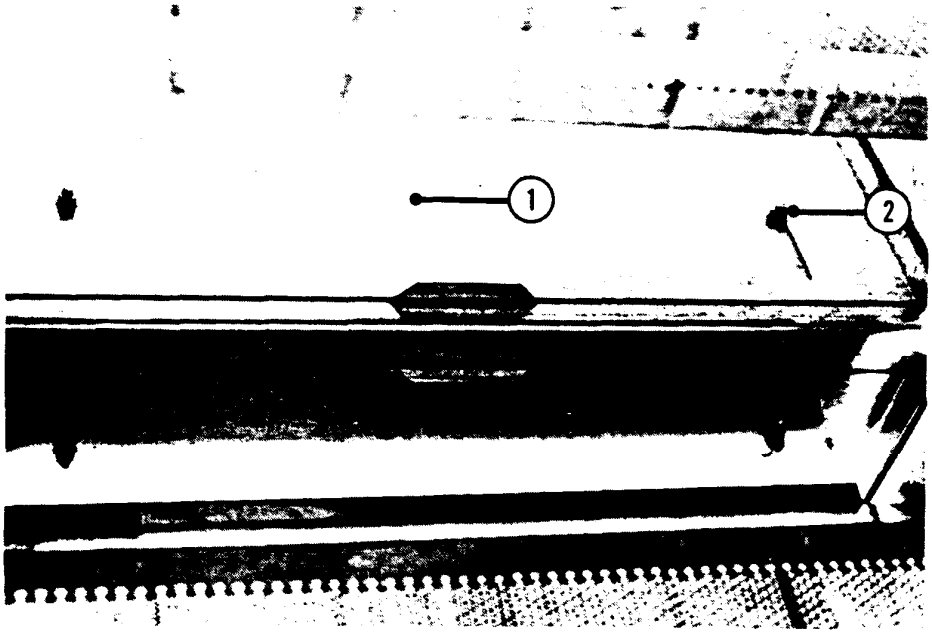


CONTROL BOX- UPPER BACK PANEL



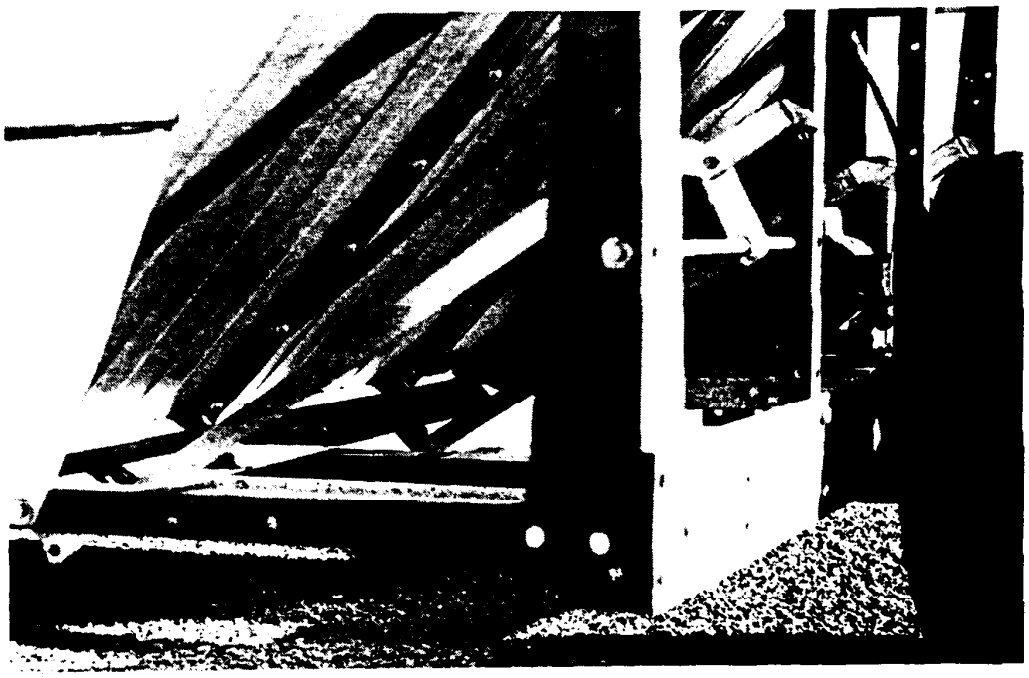
1. HIGH HEAT THERMOSTAT
2. LOW HEAT THERMOSTAT

HI- LO THERMOSTATS

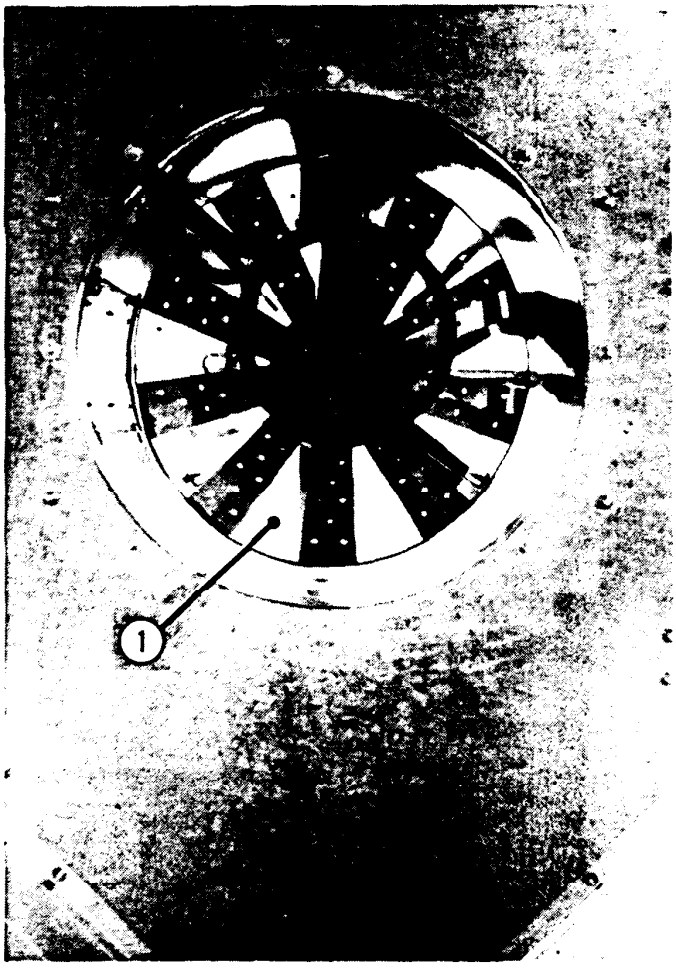


1. ADJUSTABLE DAMPER
2. ADJUSTMENT SCREWS

BOTTOM AUGER ADJUSTABLE DAMPER



CLEAN-OUT DOOR MECHANISM



1. FAN-HEATER

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 manual 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 in cold weather. To ensure that tanks are free of moisture, the usual precaution is to purge with methanol. Avoid tanks which may contain an accumulation of oil or heavy hydrocarbon from long use on a vapor withdrawal system.

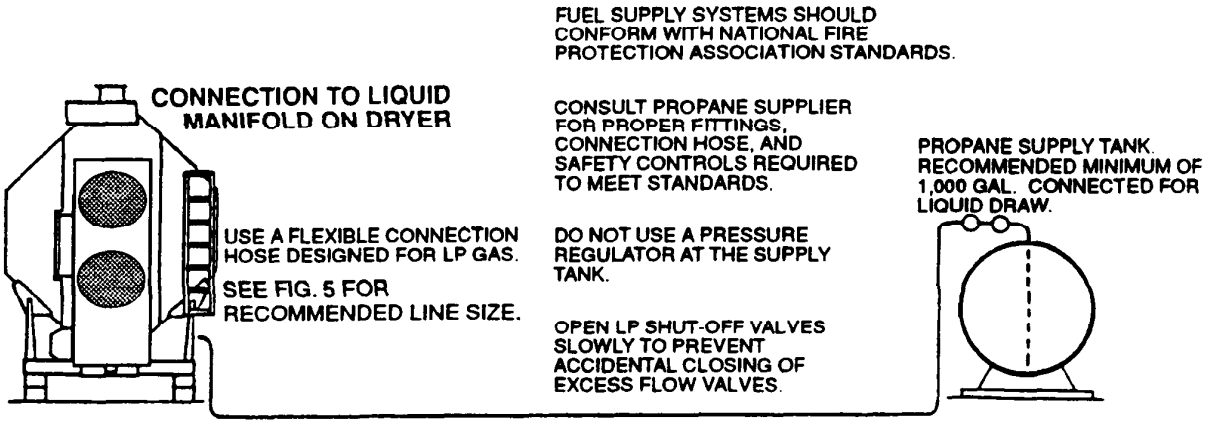


FIG. 3 LIQUID PROPANE FUEL SUPPLY

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.

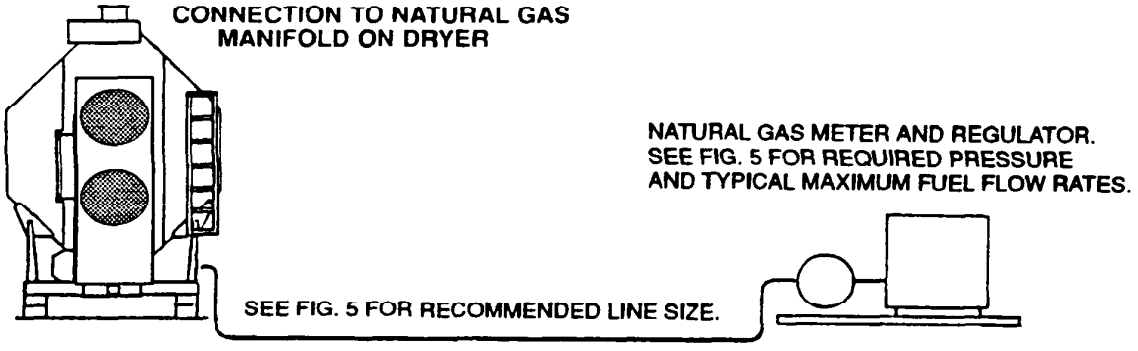


FIG. 4 NATURAL GAS FUEL SUPPLY

FUEL SYSTEM SPECIFICATIONS & RECOMMENDATIONS

		415AB	600AB
MAXIMUM HEAT CAPACITY (BTU PER HOUR)		6,000,000	9,200,000
LIQUID PROPANE (LP)	TYPICAL MAXIMUM FUEL FLOW *(GALLONS PER HR.)	32	49
	RECOMMENDED LIQUID LINE SIZE	1/2" PIPE	1/2" PIPE
	HEATER ORIFICE DRILL SIZE	.250 INCH	.281 INCH
	OPERATING PRESSURE RANGE (heater pressure gauge), PSI	3-15	5-20
	LO-FIRE PRESSURE SETTING, PSI	3 PSI	3 PSI
NATURAL GAS (N)	TYPICAL MAXIMUM FUEL FLOW * (CUBIC FT. PER HR.)	6,000	9,200
	MINIMUM PRESSURE AT CONNECTION TO DRYER, PSI	8 PSI	8 PSI
	RECOMMENDED MINIMUM LINE SIZE -100' DISTANCE	2" PIPE	2" PIPE
	HEATER ORIFICE DRILL SIZE	.375 INCH	.438 INCH
	OPERATING PRESSURE RANGE (heater pressure gauge), PSI	2-7 PSI	4-8 PSI
	LO-FIRE PRESSURE SETTING, PSI	2 PSI	2 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

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 should conform to local, state, or provincial requirements.

POWER SUPPLY DISCONNECT: All dryers are equipped with a power disconnect switch in 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 inner 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 motor 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 relay heaters, for auxiliary conveyors (adjacent to top and bottom auger contactors) to operate 7.5 HP for 1-PH AND 10 HP for 3-PH 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 7.5 HP 1-ph and 10 HP 3-ph. 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 . 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 21. 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 415AB DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER	1-PH.-230 V.	10-15	5	5	7.5(TWO)
	3-PH.-220 V.	10-15	5	5	10(TWO)
	3-PH.-440 V.	10-15	5	5	10(TWO)
FULL LOAD CURRENT	1-PH.-230 V.	58	22	22	32
	3-PH.-220 V.	34	13	13	26
	3-PH.-440 V.	17	6.5	6.5	13
MAX. RUNNING LOAD DRYER ONLY-AMPS	1-PH.-230 V.	136			
	3-PH.-220 V.	81			
	3-PH.-440 V.	41			
MAX. RUNNING LOAD (1)(2) WITH AUX. CONV.-AMPS	1-PH.-230 V.	170			
	3-PH.-220 V.	107			
	3-PH.-440 V.	54			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	1-PH.-230 V.	225			
	3-PH.-220 V.	150			
	3-PH.-440 V.	100			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	1-PH.-230 V.	F658B	C228B	C228B	C303B
	3-PH.-220 V.	C330B	C163B	C163B	C303B
	3-PH.-440 V.	C180B	C867A	C867A	C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	1-PH.-230 V.	100	100	100	(3)
	3-PH.-220 V.	50	60	60	(3)
	3-PH.-440 V.	90 (one breaker)			

MODEL 600AB DRYER	VOLTAGE	FAN	TOP AUGER	BOTTOM AUGER	CONVEYOR (1) MOTORS
HORSEPOWER	1-PH.-230 V.	10-16	7.5	7.5	7.5(TWO)
	3-PH.-220 V.	15	7.5	7.5	10(TWO)
	3-PH.-440 V.	15	7.5	7.5	10(TWO)
FULL LOAD CURRENT	1-PH.-230 V.	74	32	32	32
	3-PH.-220 V.	40	20	20	26
	3-PH.-440 V.	20	10	10	13
MAX. RUNNING LOAD DRYER ONLY-AMPS	1-PH.-230 V.	180			
	3-PH.-220 V.	100			
	3-PH.-440 V.	50			
MAX. RUNNING LOAD (1)(2) WITH AUX. CONV.-AMPS	1-PH.-230 V.	212			
	3-PH.-220 V.	126			
	3-PH.-440 V.	63			
RECOMMENDED SERVICE EQUIP. RATING-AMPS	1-PH.-230 V.	250			
	3-PH.-220 V.	150			
	3-PH.-440 V.	100			
CONTROL PANEL OVERLOAD RELAY HEATER ELEMENT SPEC.	1-PH.-230 V.	F848B	C303B	C303B	C303B
	3-PH.-220 V.	C440B	C228B	C228B	C303B
	3-PH.-440 V.	C250B	C137B	C137B	C163B
CONTROL PANEL CIRCUIT BREAKER RATING-AMPS	1-PH.-230 V.	100	100	100	(3)
	3-PH.-220 V.	50	60	60	(3)
	3-PH.-440 V.	90 (one breaker)			

APPLY THE FOLLOWING INFORMATION TO BOTH FIG. 6 CHARTS:

(1) The motor current and maximum dryer running loads shown are based upon the listed HP auxiliary conveyor motors. The maximum size motor which can be powered directly through the dryer control box is indicated. 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) Max. running load is less than total connected load. Max. load occurs with fan, top auger and aux. loading conveyor in operation (during refill for shrink within the drying portion of the batch).

(3) Auxiliary motors are controlled by the top and bottom auger circuit breakers.

FIG. 6

OPERATING INFORMATION

LOAD SWITCH (TOP AUGER)

OFF-AUTO: The load switch has two positions: OFF-AUTO. When operating in AUTOMATIC, the top auger will operate according to the top auger paddle mercury switch. The top auger will automatic fill for shrink only while drying , not during cooling.

UNLOAD SWITCH (BOTTOM AUGER)

OFF-AUTO: The UNLOAD switch has two positions: OFF-AUTO. When operating in AUTOMATIC, the bottom auger will operate, if not being held by the MC thermostat, when the batch timers have timed out. If the switch is turned OFF, only the unloading will stop and the dryer fan and burner will continue to operate as normal.

FAN SWITCH

AUTO or ON: The FAN SWITCH has two positions: either ON or AUTO. If the switch is set in the AUTO position, the fan will operate only when the fan mercury switch in the top auger paddle box shows there is grain in the dryer. If the switch is set in the ON position, the fan will operate continouosly.

BURNER SWITCH

OFF or AUTO: The burner switch has two positions: either OFF or AUTO. When the switch is set in the OFF position, the burner will not operate. When the switch is set in the AUTO position, the burner will cycle according to the Dry Timers.

GRAIN HI-LIMIT THERMOSTAT

The Hi-Limit Thermostats are located in electrical boxes mounted on both sides of the front panel and senses the grain temperature near the outside of both grain columns just below the burner. One is of a fixed style the other is an adjustable type.

MOISTURE CONTROL (MC) THERMOSTAT AND INDICATOR LIGHT

The MC thermostat is located within the Main Control Panel and is equipped with a long sensor lead which monitors the grain temperature within the right-hand grain column.

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 Electronic Control Option: This option consists of an Electronic Moisture Control Thermostat, with 4 sensing points, two in each column. Operating lights are also included in this package.

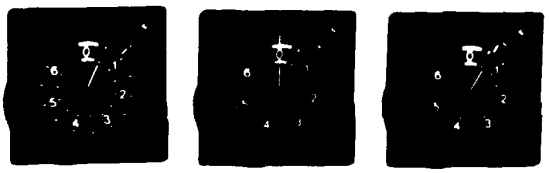
WITH THE MC SWITCH IN THE ON POSITION, THE MC THERMOSTAT SHOULD BE SET AS FOLLOWS:

SETTING MC THERMOSTAT FOR 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 cycle is completed and the MC hold indicator light comes ON, slowly turn the MC setting DOWN until the light goes out and the cooling cycle begins.
5. This initial setting must be confirmed by testing the final grain moisture content during the unloading cycle.

BATCH TIMERS



HIGH HEAT | LOW HEAT | COOL

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 DRY TIMERS. When drying high initial moisture content grain, it may be necessary to set the HIGH HEAT 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.

FIG. 8 LOAD TIMER

To adjust the time on any of the four timers, simply rotate the front dial to 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 indicator 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.

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.

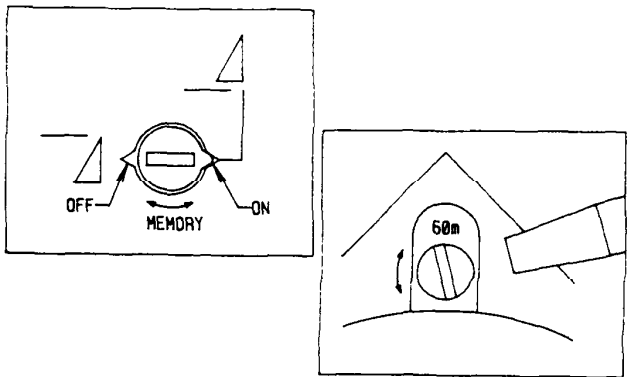


FIG. 9 MEMORY & TIME RANGE

OPERATING INSTRUCTION - BATCH DRYING

Refer to the following Automatic Batch Operation Chart and find the suggested dry timers setting. depending upon the type of grain. initial moisture content and drying method (DRY AND COOL, or FULL HEAT). The method may be changed from the DRY AND COOL to the FULL HEAT, by rotating the COOL TIMER dial 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 timers, when set to the recommended setting, will allow the burner to operate for these predetermined time at the temperature set by the *burner thermostats. At the end of the Low Heat 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 Cool Timer 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 Timers 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.

During this unloading cycle, the full content of the dryer will be unloaded. When the dryer is empty, the bottom auger paddle switch will activate the TDR2. 60 second time delay relay, to begin the auger cleanout. After the 60 seconds the bottom auger will shut off.

SETTING THE LOAD TIMER

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.

HI-LO FIRE BURNER THERMOSTATS & GAS PRESSURE SETTINGS

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

The thermostats sense 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 THERMOSTATS.

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 10-20 PSI, shown by the pressure gauge on the fan-heater.

LO-FIRE: Set the LO-FIRE gas pressure to approximately 4 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 7 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 2 PSI while the burner is operating on LO-FIRE.

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.**

BOTTOM AUGER DAMPER ADJUSTMENT

The bottom auger shield runs the length of the dryer. However each column has its own adjustment damper on each side. This damper can be closed down to 3/8" and opened up to 2 5/8". The dampers should be all adjusted to the same distance.

The damper may be adjusted be loosening the two wing nuts on each column and sliding the damper up or down. This must be done while the dryer is empty and all power is shut off and lock out to the dryer.

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.

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 theFan 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.

SHUT-DOWN INDICATOR LIGHT IDENTIFICATION

CONTROL	LOCATION	MONITOR BOARD CONNECTION TERMINALS: CONTROL CONNECTION	SENSOR TERMINALS	TERMINAL
FAN-HEATER LOWER FAN-HEATER MIDDLE FAN-HEATER UPPER *SEE BELOW	FAN-HEATER FAN-HEATER FAN-HEATER	17 + 16 16 + 15 15 + 14	2 + 3 3 + 4 4 + 5	2-3 3-4 4-5
FIXED GRAIN HI-LIMIT THERMOSTATS	LEFT-HAND COLUMN: In Handy Box on front panel (behind ladder).	18 + 17	1 + 2	1-2
ADJ. GRAIN	RIGHT-HAND COLUMN: In Control Box		3 + 4	3-4
LOAD TIMER	IN CONTROL BOX		4 + 5	4-5
PLENUM HI-LIMIT THERMOSTAT	RIGHTHAND SIDE ON FRONT PANEL	14 + 13	1 + 2	1-2
MOTOR OVERLOAD	IN CONTROL BOX		2 + 3	2-3

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

FIG 10

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 Chhart 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 opreation.
5. Clena grain is easier to dry. Fine material increases resistence to air flow and reqires 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 comustible 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 THERMOSTAT	MINIMUM TEMPERATURE
GRAIN HI-LIMIT THERMOSTAT	MAXIMUM TEMPERATURE
LOAD SWITCH	OFF
UNLOAD SWITCH	OFF
FAN SWITCH	AUTO
BURNER SWITCH	OFF
LOAD TIMER	30 MINUTES
HIGH HEAT TIMER	1 MINUTE
LOW HEAT TIMER	1 MINUTE
COOL TIMER	1 MINUTE

2. Set circuit breakers to ON position and turn ON the Safety Disconnect.
3. Push START button and open the main fuel supply valve to allow fuel flow to the dryer and inspect all gas lines and connections for possible leaks. Push STOP button.

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.

4. Move load switch, burner switch, and unload switch to the AUTO position.

5. With the wet grain supply shut-off, 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. The top auger should start (as well as any connected auxiliary load conveyors). Check motor direction, the auger should run clockwise when veiwed from the drive end.

6. Turn load switch to the OFF position.

7. CHECK FAN MOTORS DIRECTION OF ROTATION:

   Bump (jog) fan switch from AUTO to ON and observe direction of motor rotation. Fans should run counter-clockwise.

   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 the center post, of the three power supply connections to the dryer. Auxiliary conveyors which have been field connected may have to be reversed individually.

8. Turn fan switch to ON. The fan should reach full speed within a few seconds (The bottom fan should start 10 seconds after the top fan. The batch timers will begin timing. The burner should fire after a short purge interval and gas pressure should be indicated on the pressure gauge.

9. Adjust the HIGH HEAT FIRE thermostat to approximately 200° F, to cause burner to operate on HI-FIRE. Observe gas pressure indicated on pressure gauge, then turn thermostat down to its MINIMUM setting to cause burner to cycle into LO-FIRE. As the burner thermostat is turned down, the solenoid valve has closed and the burner is being supplied with only the reduced flow of gas through the flow control valve.

   After the High Heat Timer has timed out (one minute) the Low Heat timer will begin. The burner will then be controled by the LOW HEAT FIRE thermostat. Adjust thermostat to approximitly 180°F and follow same procedure as for HIGH HEAT FIRE thermostat.

   NOTE: Gas pressures and thermostat settings cannot be finalized until the dryer is filled with grain. For additional information concerning the actual recommended gas pressure settings and the adjustment procedure, refer to the Operating Instructions.

   If the heater fails to ignite within one to two minutes (due to gas being shut off or for any other reason), the safety lock-out within the burner control will automatically shut down the entire dryer.

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

10. After the Cool Timer has timed out the Unload Auger will run for one minute. Check dirction of auger, it should run counterclockwise when viewed from the drive end. The fan heater will start up at this time also, however, it will only do this with the fan switch in the ON position.

    Turn unload switch OFF.

11. CHECK BURNER SAFETY LOCK-OUT: Turn High Heat timer to five minutes. With the fan and heater operating, shut-off the main fuel supply valve. 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.

    If the heater 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.

12. STOP DRYER OPERATION

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

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

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

It is necessary to check the moisture content of the discharged grain while determining the proper batch times and moisture should subsequently be checked periodically to indicate the need of any change in the timer settings. 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, 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.

DRYING TEMPERATURES: DIFFERENT GRAINS

CROP	AVERAGE DRYING TEMP	HIGH HEAT TEMP	LOW HEAT TEMP
CORN	210° F.	230°F	190°F
WHEAT	150° F.	170°F	130°F
SOYBEAN	130° F.	150°F	110°F
MILO	150° F.	170°F	130°F

For increased or decreased intitial moisture content a higher or lower average temperature may be used.

FIG. 11

AUTOMATIC BATCH START-UP PROCEDURE
AIRSTREAM AB-SERIES SINGLE FAN

1. Set the following controls as described:
   A.-Load Switch . . . . . "AUTO" C. Burner Switch . . . . . "AUTO"
   B.-Unload Switch . . . . . "AUTO" D. -Fan Switch . . . . . "AUTO"
2. Determine the initial grain moisture content and fill the dryer with wet grain. When the start button is depressed the dryer should fill with wet grain. The Load Timer setting may have to be temporarily increased for this operation.
3. Refer to "Suggested Initial Timer Settings" within the chart and set the DRY TIMERS depending upon initial grain moisture and drying method (dry and cool, or full heat). Also set COOL TIMER as indicated in chart.
4. The fan will begin operating when the dryer is full. After a short purge period, the burner should ignite and begin operating. Set the HI-FIRE and LO-FIRE gas pressures, and adjust both HIGH HEAT and LOW HEAT thermostats to the desired temperature.
5. IMPORTANT: The dryer must be continually supervised during the drying of the initial batch, to properly perform the Moisture Check "MC" Thermostat setting and check the unload timer setting.

MODEL 415AB AUTOMATIC BATCH OPERATION CHART (FIG. 12a)

TOTAL DRY TIME MIN.	SUGGESTED INITIAL TIMER SETTING * HIGH HEAT TIMER	LOW HEAT TIMER	COOL TIMER	APPROX. CAP.-DRY w/o load & unload (Bu/Hr)	APPROX. CAP.-DRY w/ load & unload (Bu/Hr)
DRY AND COOL					
18	5	13	18	583	404
25	8	17	18	500	356
29	10	19	18	446	333
37	15	22	18	381	296
40	18	22	18	362	284
47	25	22	18	318	259
57	35	22	18	276	231
77	55	22	18	218	189
87	65	22	18	198	174
100	78	22	18	178	157
FULL HEAT					
12	5	7	0	1750	750
18	7	11	0	1166	618
24	10	14	0	875	525
30	12	18	0	700	457
36	18	18	0	583	404
42	24	18	0	500	362
48	30	18	0	437	328
54	36	18	0	388	300
60	42	18	0	350	276
66	48	18	0	318	256
72	54	18	0	291	239
78	60	18	0	269	223
84	66	18	0	250	210

IMPORTANT: These initial settings, especially the unloading timer, MUST BE CHECKED during actual drying operation. Readjust timer settings as required to produce the desired results.

* 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

MODEL 600AB AUTOMATIC BATCH OPERATION CHART (FIG. 12b)

DRY AND COOL					
TOTAL DRY TIME MIN.	SUGGESTED INITIAL TIMER SETTING * HIGH HEAT TIMER	LOW HEAT TIMER	COOL TIMER	APPROX. CAP.-DRY w/o load & unload (Bu/Hr)	APPROX. CAP.-DRY w/ load & unload (Bu/Hr)
18	5	13	18	833	508
25	8	17	18	698	455
29	10	19	18	638	429
37	15	22	18	545	385
40	18	22	18	157	370
47	25	22	18	462	341
57	35	22	18	400	306
77	55	22	18	316	254
87	65	22	18	286	234
100	78	22	18	254	213
FULL HEAT					
12	5	7	0	2500	857
18	7	11	0	1667	732
24	10	14	0	1250	638
30	12	18	0	1000	566
36	18	18	0	833	508
42	24	18	0	714	462
48	30	18	0	625	423
54	36	18	0	556	390
60	42	18	0	500	361
66	48	18	0	455	337
72	54	18	0	417	316
78	60	18	0	385	297
84	66	18	0	357	280

APPROXIMATE DRYING TIME TABLE FOR VARIOUS INITIAL MOISTURE CONTENTS

DRYING PROCESS	FINAL MOISTURE IN DRYER	DRYINGTIME-MINUTES * — INITIAL MOISTURE CONTENT - PERCENT (20 30 40 50 60 70 80 90 100)
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 28 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.

FIG. 13

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 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. 14.

   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.
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 1/8 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 and bottom auger paddle assembly. The paddle units 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 15.

    NOTE: All of the auger bearings are life time 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.

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

LUBRICATION INSTRUCTIONS FOR BALL BEARING MOTORS

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 4 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 hold. 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.

FIG. 14

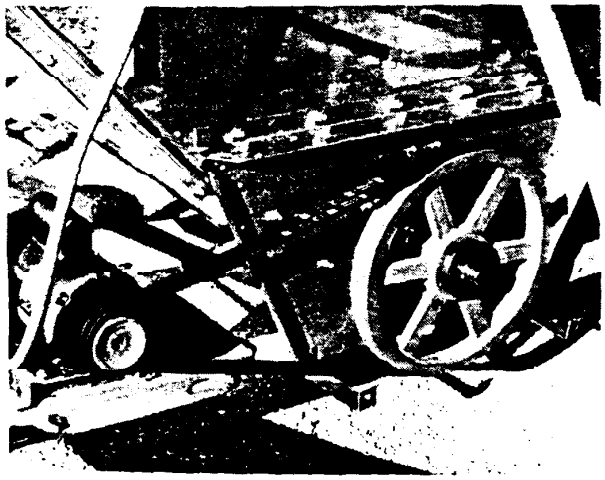


FIG. 15 BOTTOM AUGER DRIVE

12. Inspect entire dryer for loose, worn, or damaged parts. Include check of auger flight and other internal parts. Check that temperature sensors within air plenum chamber are secured within insulated clamps and do not chafe on other metal parts.
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 control circuit wires through the burner switch and fuse to supply power to the Fenwal board.
2. The Fenwal board maintains burner operation and constantly checks for flame.
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 Fenwal board 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. 16 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. 15. 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. 16 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.

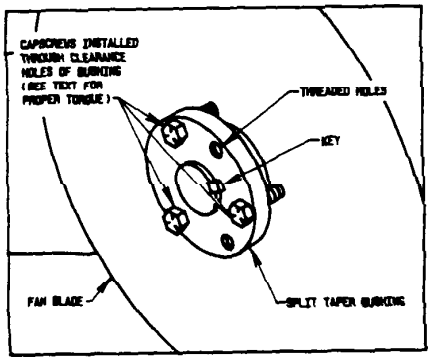


FIG. 16 FAN BLADE INSTALLATION

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. 17, 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.

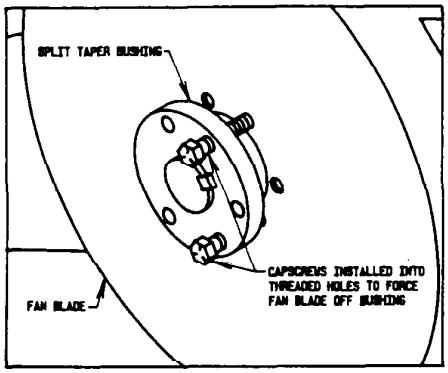


FIG. 17 FAN BLADE REMOVAL

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. 17.
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 - Unsnap either the plastic cap, or the metal clip, on the gas valve and slide the housing and coil off the valve stem and body. DO NOT ENERGIZE THE COIL WHEN IT IS REMOVED, AS THE COIL MAY BECOME DAMAGED DUE TO EXCESSIVE CURRENT FLOW.
3. REGULATOR AND GAS SOLENOID VALVE(S) - The gas regulator and solenoid valve(s) are DIRECTIONAL and must be connected as indicated by the markings near the port openings. MAKE SURE GAS IS SHUT-OFF AND PURGED FROM THE 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 pipetrain from mounting brackets, and at the union on LP models. Refer to Fig. 18.
   B. Lift pipetrain straight up.
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.

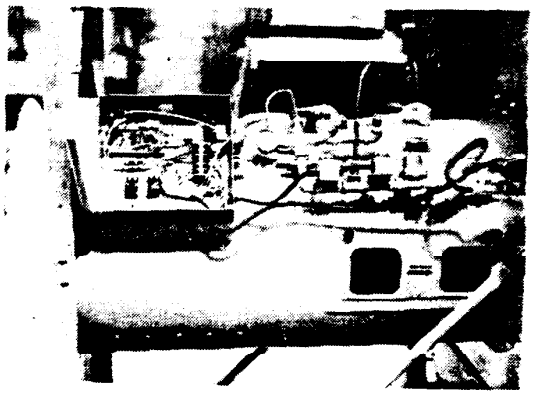
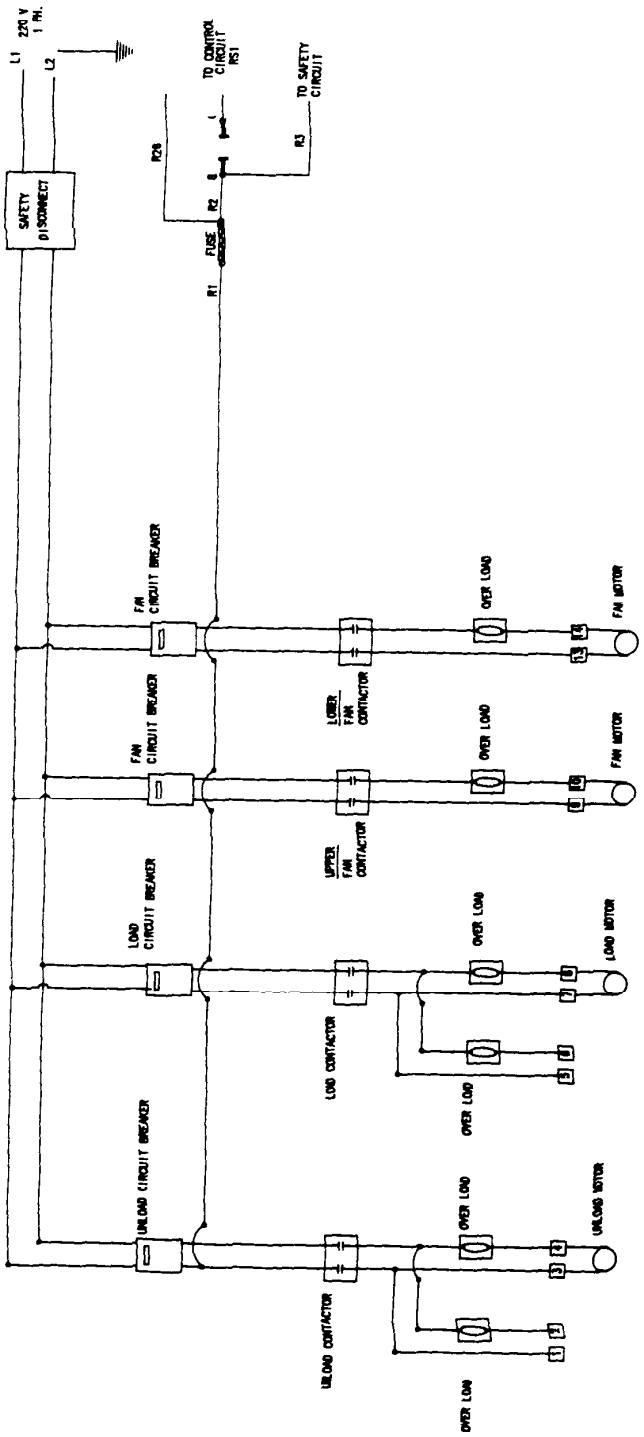
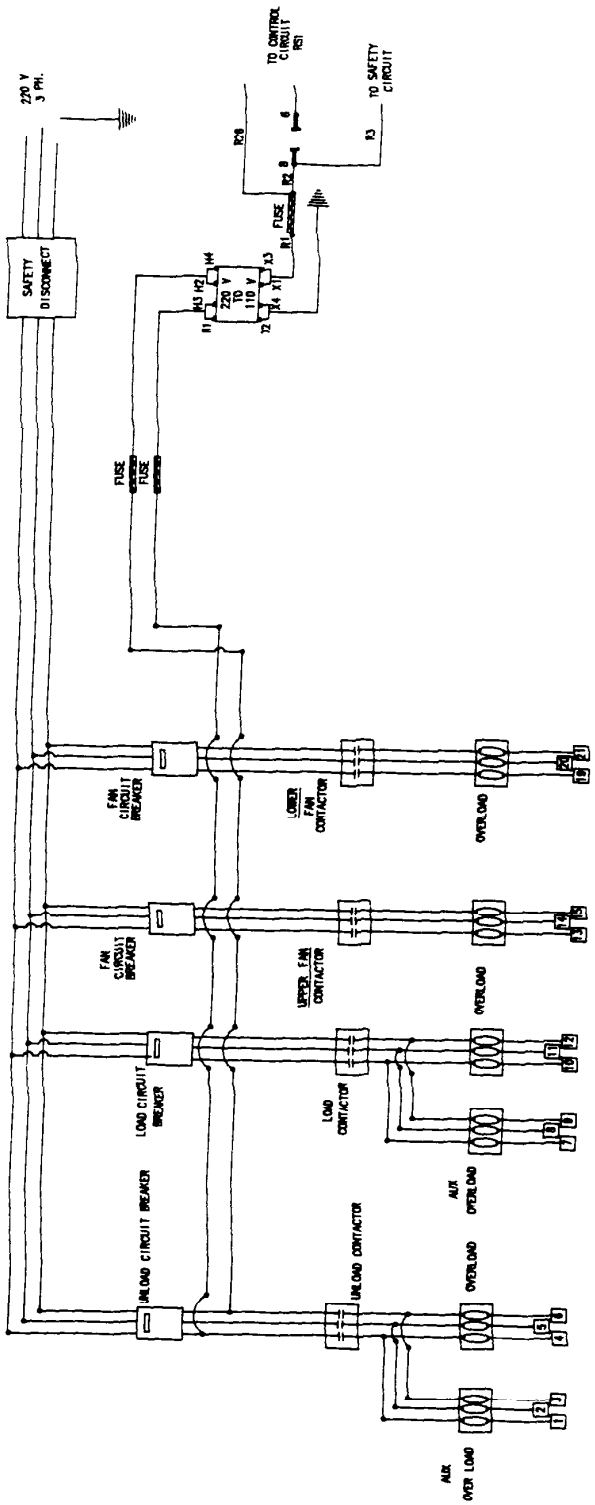


FIG. 18 FAN HEATER

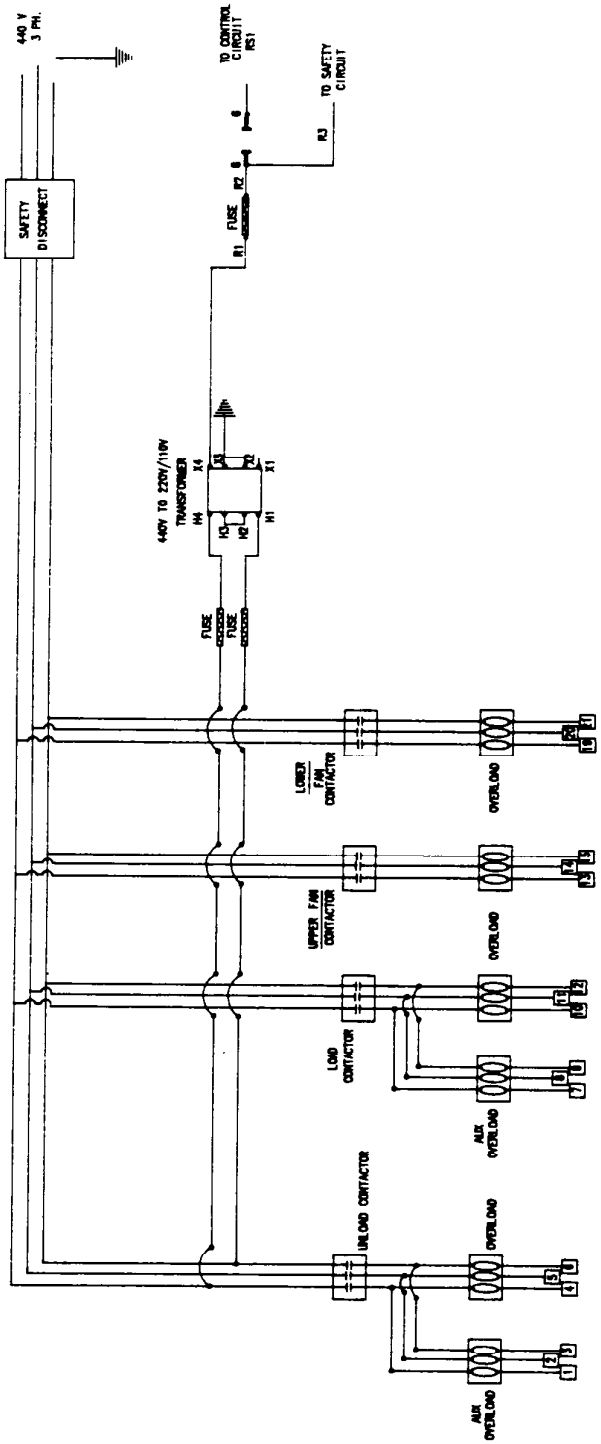
POWER CIRCUIT - 1PH., 230 V.



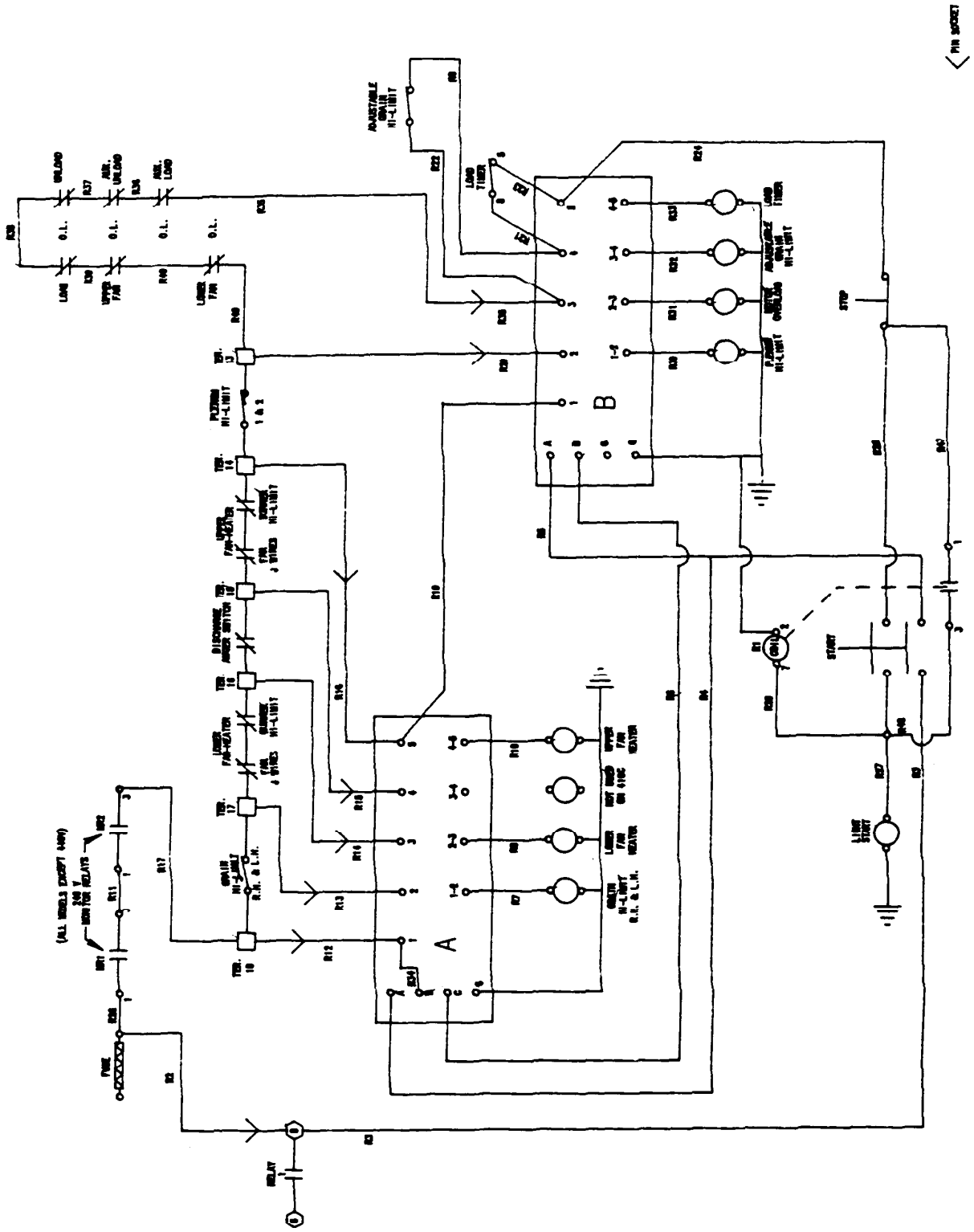
POWER CIRUIT - 3 PH., 220 V.



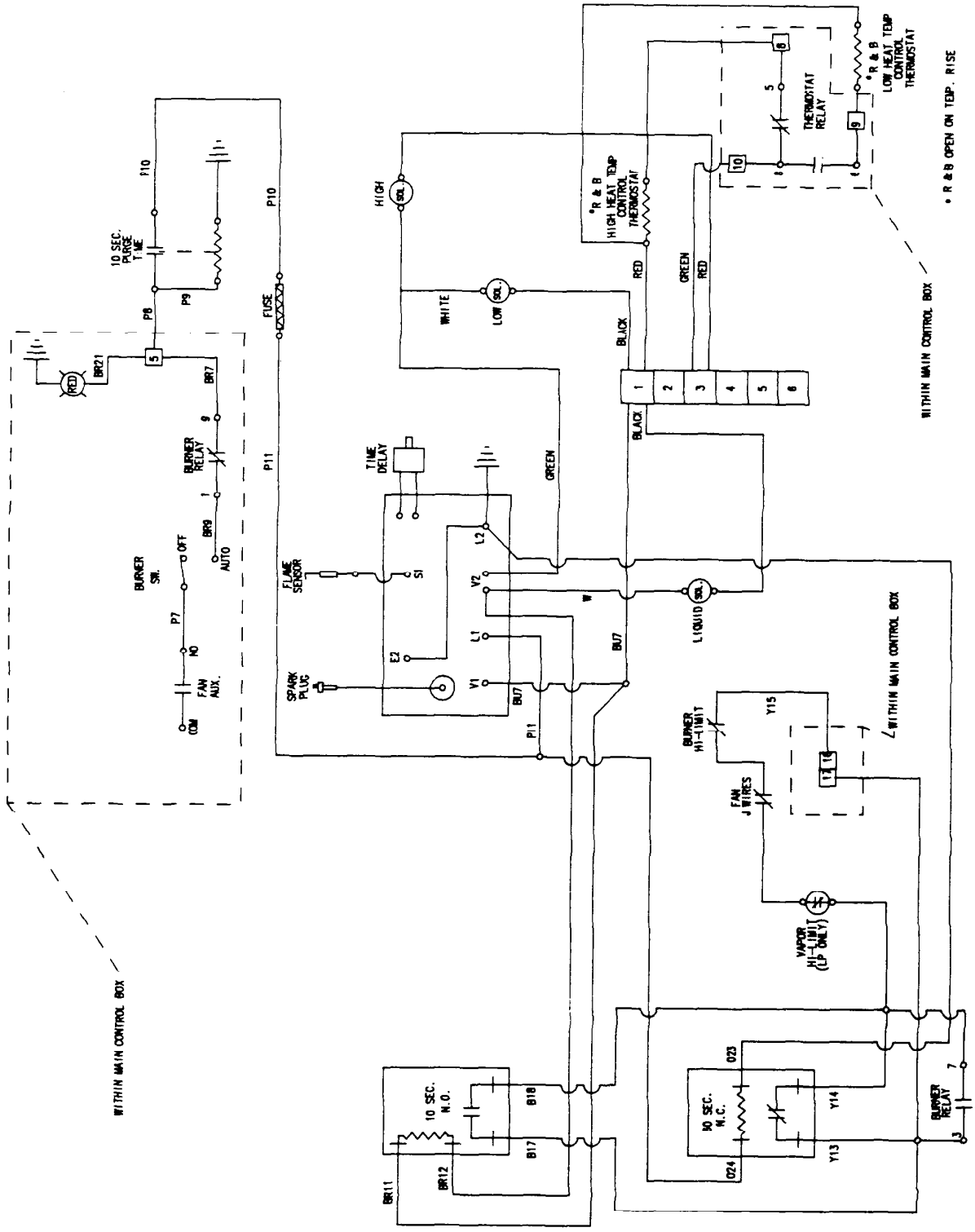
POWER CIRUIT - 3PH., 440 V.



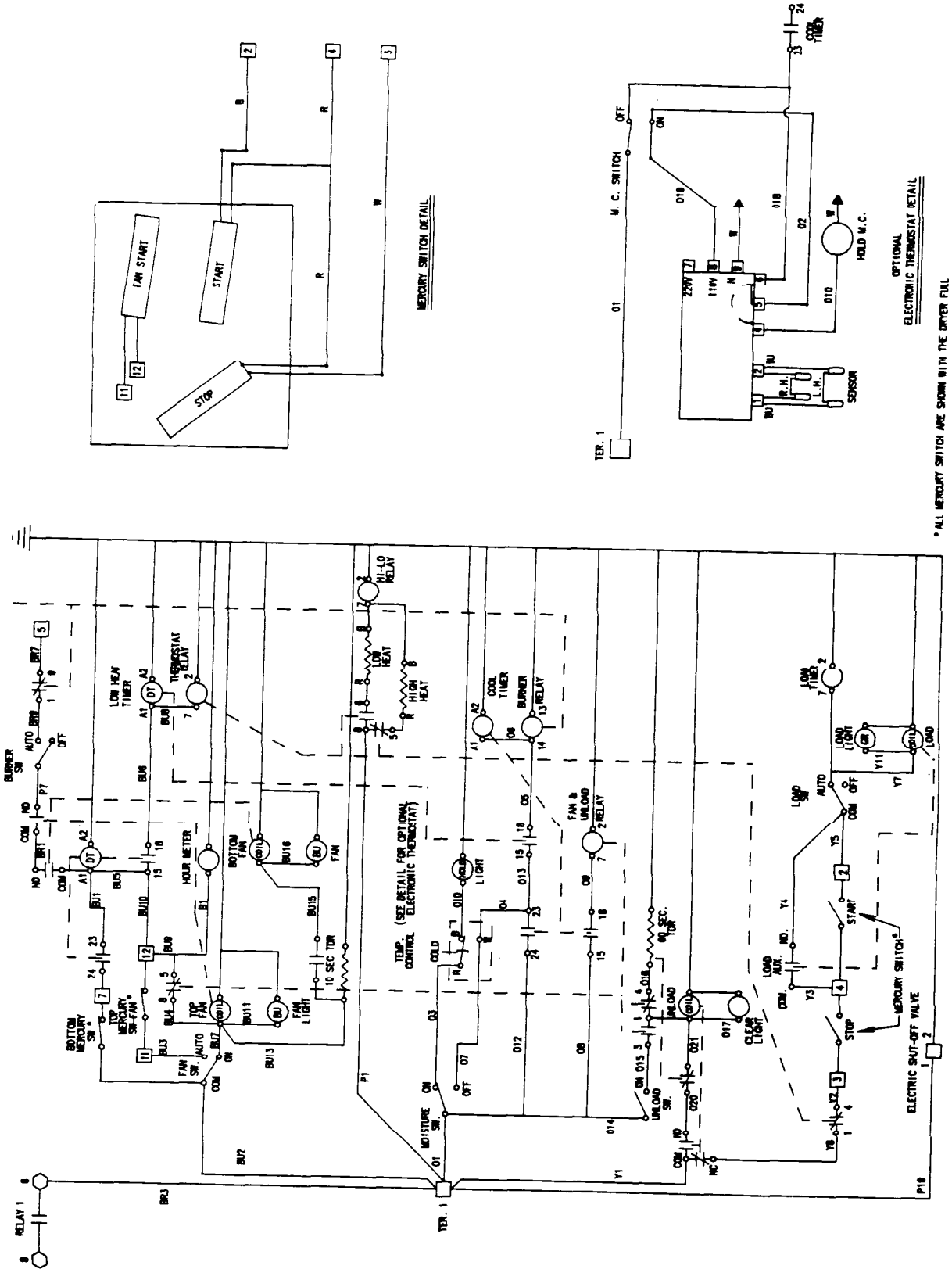
SAFETY CIRCUIT



BURNER CONTROL CIRCUIT



GENERAL CONTROL CIRCUIT



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 1 phase 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 switch. 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 THERMOSTAT: The left Grain Hi-Limit thermostat is of a fixed temperature, automatic self-resetting type and acts to monitor the temperature of the grain within the dryer column. If the grain temperature becomes excessive (approx. 210°F). the thermostats will automatically shut down the dryer. The lthermostat is located within a handy box on the front L-H side of the dryer. Each thermostat has a long sensor tube which extends almost the full length of the grain column. ADJUSTABLE GRAIN HI-LIMIT THERMOSTAT: The right-hand column thermostat is located within the control box and may be adjusted by simply turning the dial. It operates i n the same mainer as the fixed hi-limit. 5. LOADING TIMER INDICATOR LIGHT: The loading 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 loading timer causes shut down of dryer, it normally indicates the wet grain supply was either reduced, interupted, or exhausted, or that timer was improperly adjusted.

PROBLEM:	POSSIBLE CAUSE:
CONTROL CIRCUIT NOT ENERGIZED- Panel light OFF with shut-down indcator light ON (continued)	6. 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. 7. 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 or 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 (small hole on bottom of box should be down).
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, power terminals 9 and 10 for 1-phase, or 13, 14, and 15 for 3-phase. 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 over heated 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 Fenwal 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 1/8 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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