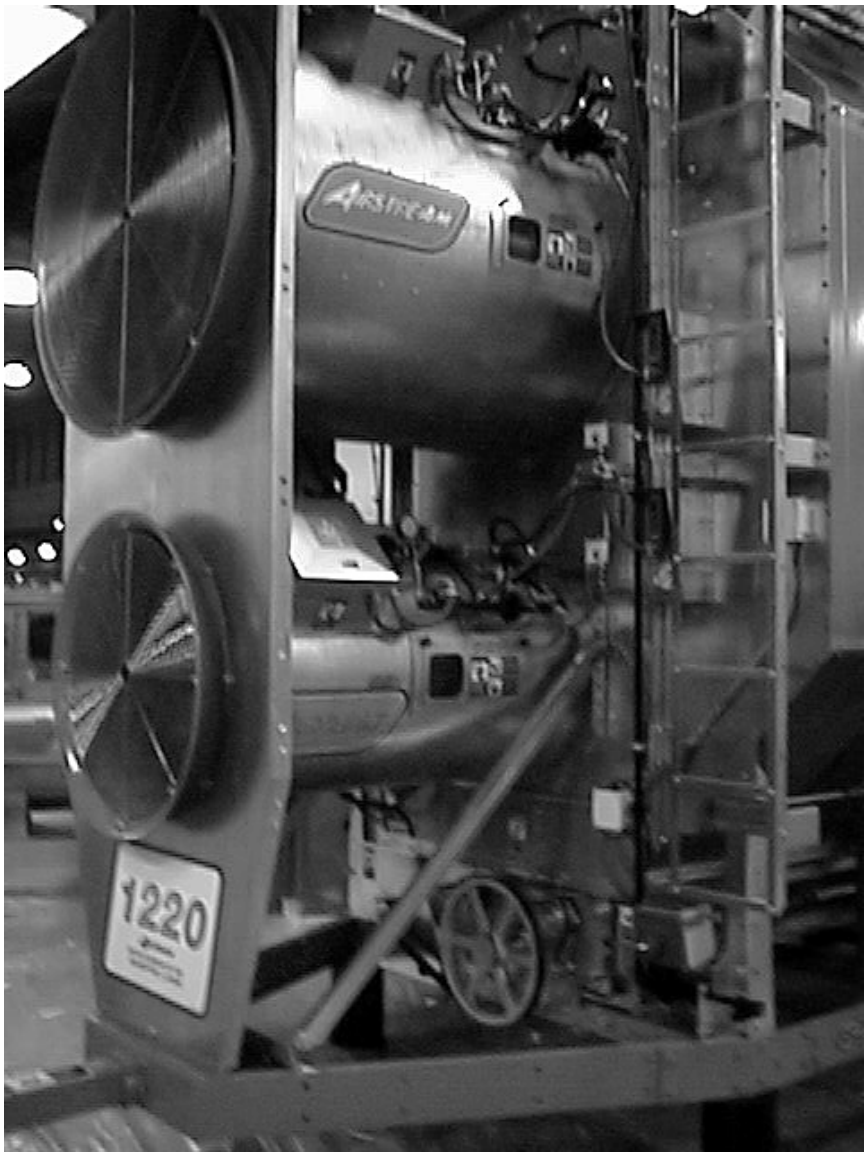
Portable Dryer Models

Troubleshooting and Reference Manual

PNEG-630
February 1999

a division of
THE GSI GROUP

Fan/Heater Installation and Operating Instructions



Thank you for choosing an Airstream Grain Dryer. It is designed to provide excellent performance and service for many years.

This manual refers to the troubleshooting of the E.M.C.S.and Series 2000 models. Different models 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.

The principal concern of the GSI Group, Inc. ("GSI") is your safety and the safety of others associated with grain handling equipment. This manual is written to help you understand safe operating procedures, and some of the problems that may be encountered by the operator or other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards and precautions exist, and to inform all personnel associated with the equipment, or who are in the fan area. Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation, where serious injury or death may occur.

WARNING! BE ALERT!

Personnel operating or working around electric fans should read this manual. This manual must be delivered with the equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

Safety Alert Symbol

The symbol shown is used to call your attention to instructions concerning your personal safety. Watch for this symbol; it points out important safety precautions. It means "ATTENTION", "WARNING", "CAUTION", and "DANGER". Read the message and be cautious to the possibility of personal injury or death.

Grain Systems, Inc. recommends you contact your local power company and have a representative survey your dryer installation, so your wiring will be compatible with their system and you will have adequate power supplied to your unit.

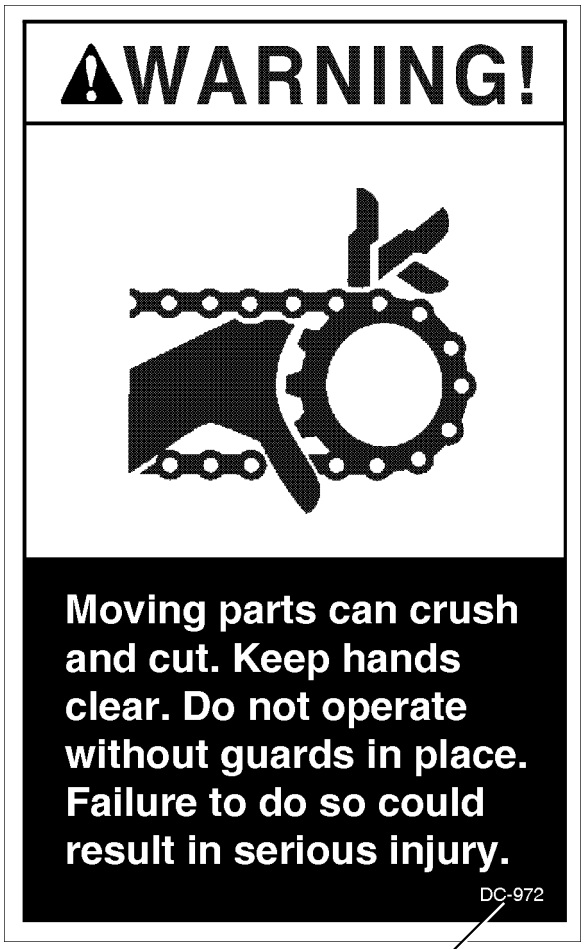
Safety decals should be read and understood by all people in and around the dryer area. If the following safety decals are not displayed on your dryer, or if they are damaged, contact Grain Systems, Inc. for replacement.

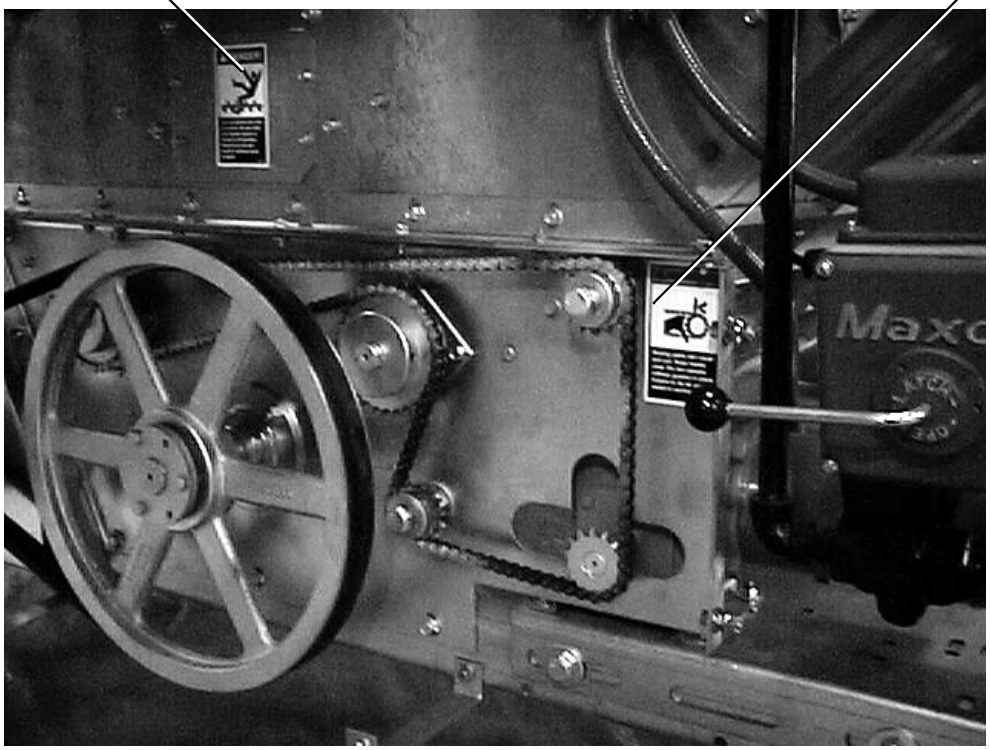
A CAREFUL OPERATOR

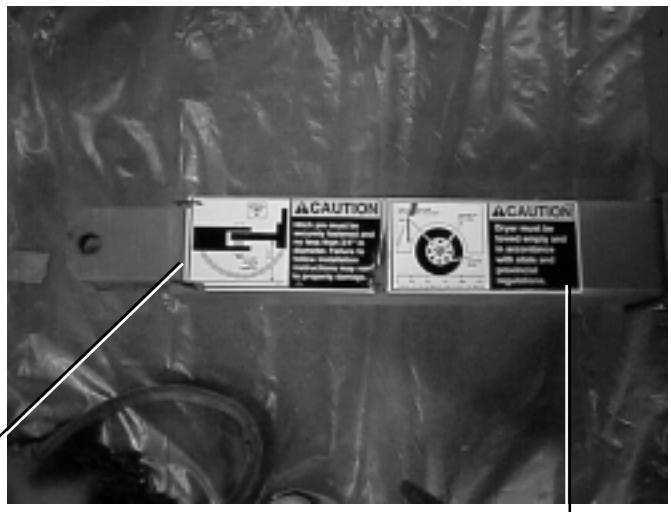
IS THE BEST INSURANCE

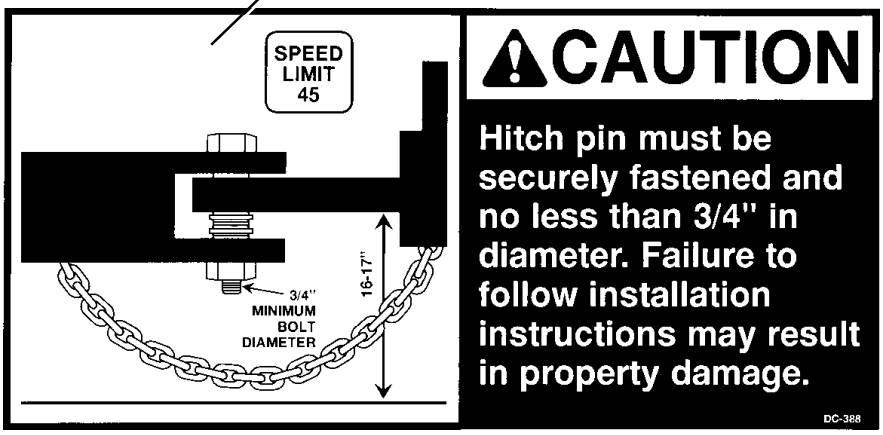
AGAINST AN ACCIDENT

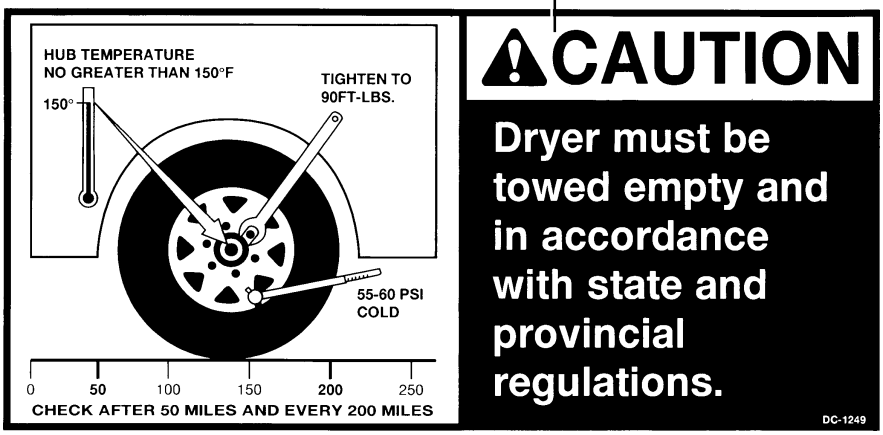

DANGER!
Auto equipment can start at anytime. Do not enter until electric power is locked in off position. Failure to do so will result in serious injury or death.
DC-974


WARNING!
Moving parts can crush and cut. Keep hands clear. Do not operate without guards in place. Failure to do so could result in serious injury.
DC-972




CAUTION
CAUTION


SPEED LIMIT 45
3/4" MINIMUM BOLT DIAMETER
16-17"
CAUTION
Hitch pin must be securely fastened and no less than 3/4" in diameter. Failure to follow installation instructions may result in property damage.
DC-388


HUB TEMPERATURE NO GREATER THAN 150°F
150°
TIGHTEN TO 90FT-LBS.
55-60 PSI COLD
0 50 100 150 200 250
CHECK AFTER 50 MILES AND EVERY 200 MILES
CAUTION
Dryer must be towed empty and in accordance with state and provincial regulations.
DC-1249

READ THESE INSTRUCTIONS
BEFORE OPERATION AND SERVICE
SAVE FOR FUTURE REFERENCE

1. Read and understand the operating manual before trying to operate the dryer.

2. Power supply should be OFF for service of electrical components. Use CAUTION in checking voltage or other procedures requiring power to be ON.

3. Check for gas leaks at all gas pipe connections. If any leaks are detected, do not operate the dryer. Shut down and repair before further operation.

4. Never attempt to operate the dryer by jumping or otherwise bypassing any safety devices on the unit.

5. Set pressure regulator to avoid excessive gas pressure applied to burner during ignition and when burner is in operation. Do not exceed maximum recommended drying temperature.

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

7. Use CAUTION in working around high speed fans, gas burners, augers and auxiliary conveyors which START AUTOMATICALLY.

8. Do not operate in any area where combustible material will be drawn into the fan.

9. Before attempting to remove and reinstall any propeller, make certain to read the recommended procedure listed within the servicing section of the manual.

10. Clean grain is easier to dry. Fine material increases resistance to airflow and requires removal of extra moisture.

This product is intended for the use of grain handling only. Any other use is considered a misuse of the product.
Some edges of the product components can be sharp. It is recommended that each component of this product be examined to determine if there are any safety considerations to be taken. Any and all necessary personal protective equipment should be worn at all tines when handling, assembling, installing and operation of the product and/or components.
Guards are removed for illustration purpose only. All guards must be in place before/during operation.

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.

KEEP THE DRYER CLEAN
DO NOT ALLOW FINE
MATERIAL TO ACCUMULATE
IN THE PLENUM CHAMBER
OR SURROUNDING THE
OUTSIDE OF THE DRYER

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 this 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 safety precautions listed at left before attempting to operate the dryer.

Date	Employer's Signature	Employee

Safety Voltage Check Points

FAN #	1		2		3		4		5		6		RESULT
Error Message	-	+	-	+	-	+	-	+	-	+	-	+	
Fan # Housing High Temperature	J5-12	J1-7	J5-12	J1-8	J5-12	J2-7	J5-12	J2-8	J5-12	J3-7	J5-12	J3-8	12VDC
Burner # Vapor High Temperature	J5-12	J1-5	J5-12	J1-6	J5-12	J2-5	J5-12	J2-6	J5-12	J3-5	J5-12	J3-6	12VDC
Burner # Flame not Detected	J5-12	J1-9	J5-12	J1-10	J5-12	J2-9	J5-12	J2-10	J5-12	J3-9	J5-12	J3-10	12VDC
Plenum # High Temperature	J5-12	J1-11	J5-12	J1-12	J5-12	J2-11	J5-12	J2-12	J5-12	J3-11	J5-12	J3-12	12VDC
Burner # Shutdown Loss of Airflow	J5-12	J1-13	J5-12	J1-14	J5-12	J2-13	J5-12	J2-14	J5-12	J3-13	J5-12	J3-14	Note 1
Fan # Failure No Airflow	J5-12	J1-13	J5-12	J1-14	J5-12	J2-13	J5-12	J2-14	J5-12	J3-13	J5-12	J3-14	Note 2
Fan # cannot Start Check Air Switch	J5-12	J1-13	J5-12	J1-14	J5-12	J2-13	J5-12	J2-14	J5-12	J3-13	J5-12	J3-14	Note 3

1100/1200/1300			2200/2300/2400			3300/3400/3600		
Lower or Left Fixed Grain	J5-12	J1-19	J5-12	J1-19		J5-12	J1-19	
Lower Adjustable or Right Fixed Grain	J5-12	J4-19	J5-12	J4-19		J5-12	J4-19	
Middle Fixed Grain	J5-12	N/A	J5-12	N/A		J5-12	J4-4	
Middle Adjustable Grain	J5-12	N/A	J5-12	N/A		J5-12	J4-8	
Upper Fixed Grain	J5-12	N/A	J5-12	J4-4		J5-12	J4-2	
Upper Adjustable Grain	J5-12	N/A	J5-12	J4-8		J5-12	J4-6	

Misc Errors		
Auxilliary Safety Shutdown	J5-12	J1-20
Motor Overload	J5-12	J4-12
Grain Discharge Warning	J5-12	J5-5
Maxon Valve Shut Warning	J5-12	J5-2
Unknown Safety Error	J5-12	J5-10
20 Second Safety Circuit Failure	J5-12	J5-6

Note:

1 This error will occur if the fan and burner were both operating and the air switch opens which indicates loss of static pressure. 12 volts should be present if the fan is on.

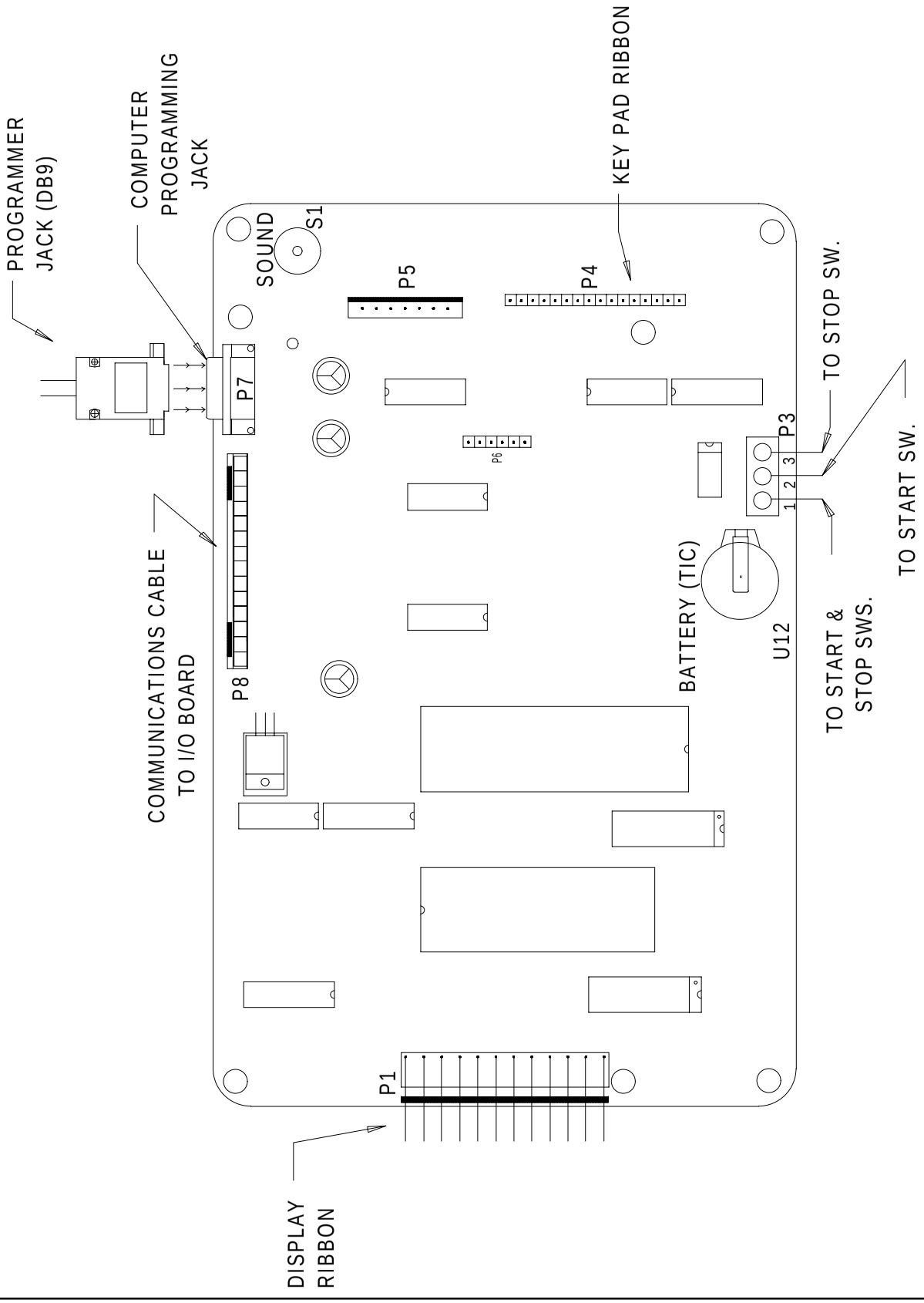
2 This error will occur if after the fan has started the air switch does not detect any static pressure. 12 volts should be present if the fan is on.

3 The condition for this error will occur if the air switch is stuck in the closed postition. No voltage should be present if the dryer is stopped.

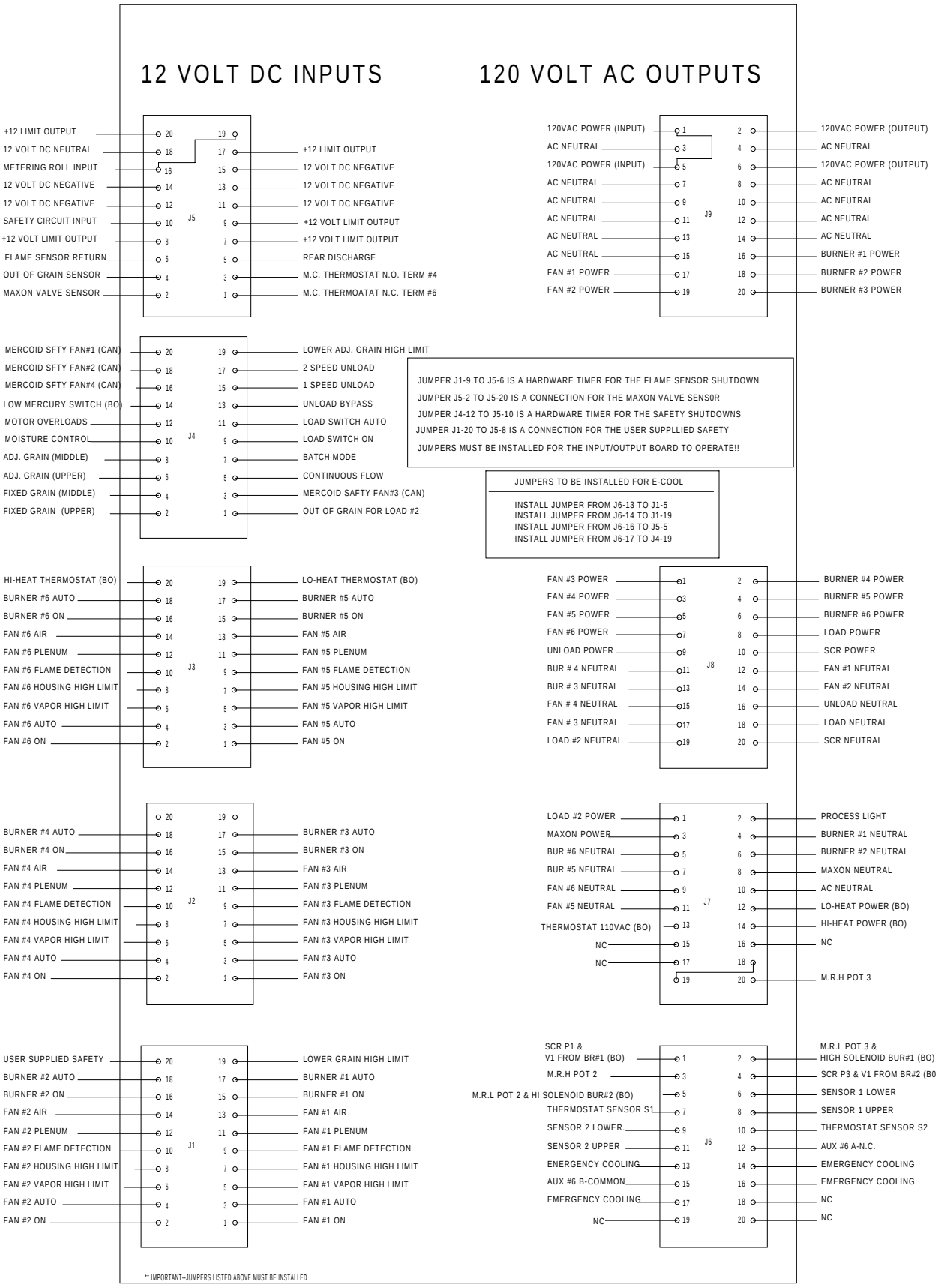
Programming Instructions for EMCS Grain Dryers

1. Turn Control Power on dryer to off.
2. Locate programming jack (P7) on back of computer. (See page 13).
3. Plug the DB-9 jack of the programmer into the computer's jack.
4. Be sure that the rotary switch on the programmer is set to position 8.
5. Turn on Control Power to the dryer.
6. The four (4) lights on the programmer will come on, then three (3) will go out leaving the power light still on.
7. Push the start button on the programmer to start the transfer of Software.
8. The busy light will flash until the transfer process is complete.
9. When completed the pass light will flash indicating a successful transfer.
10. If the fail light flashes then check your connections and repeat the above process.
11. Turn Control Power on dryer to off and remove the cable.
12. Turn on the dryer and the opening screens should indicate the newer version of software.

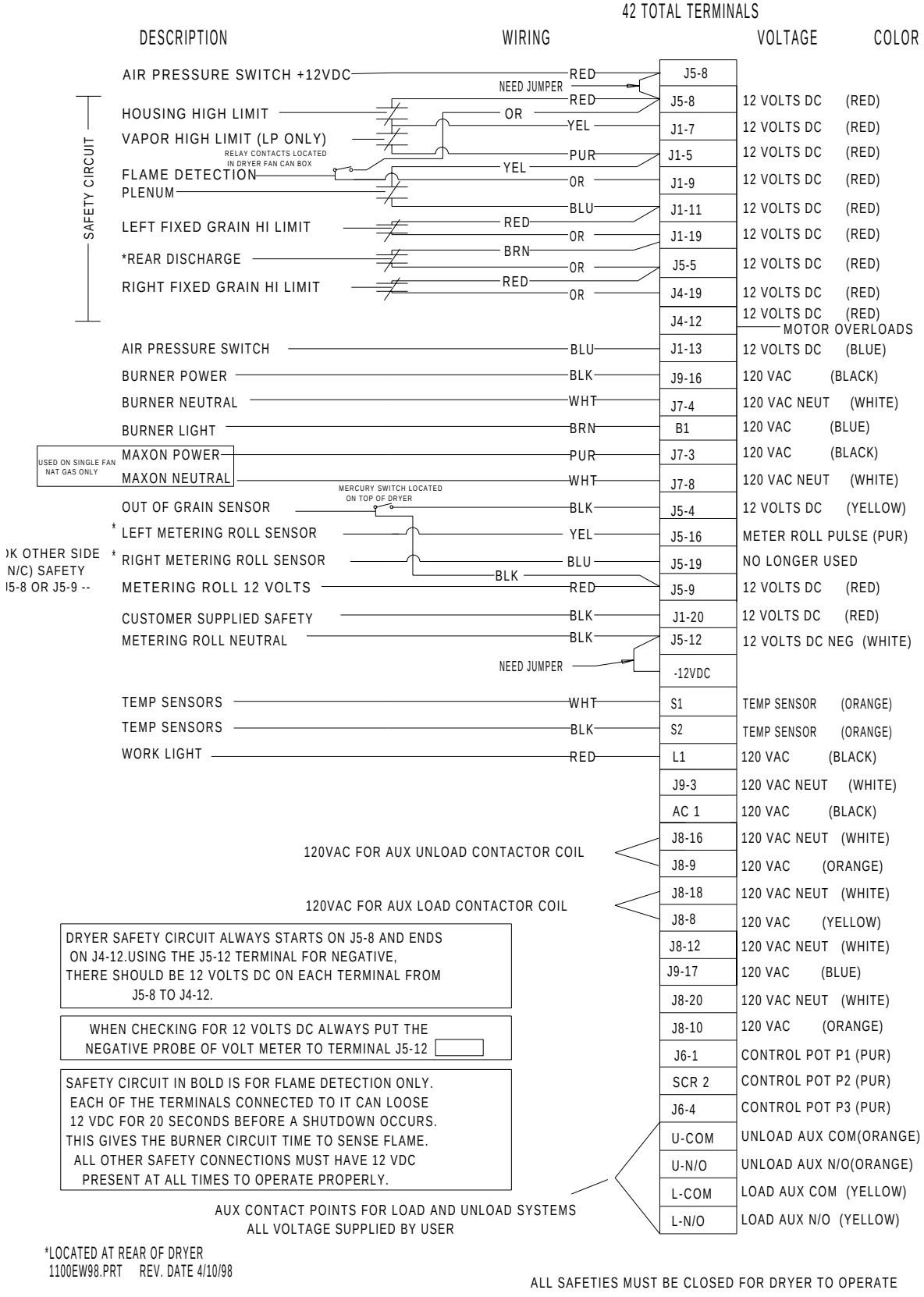
EMCS Display Board



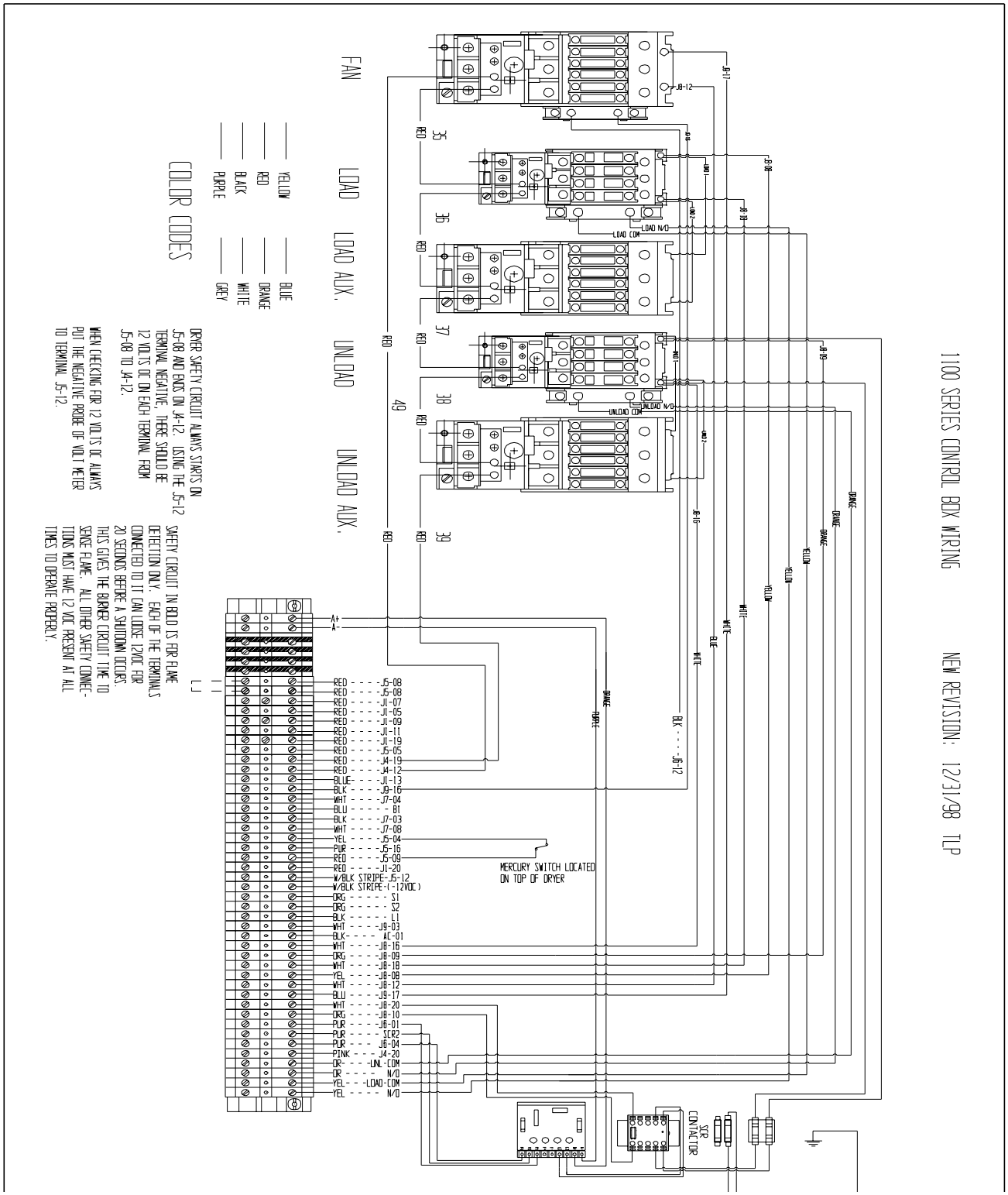
Input/Output Board Identification



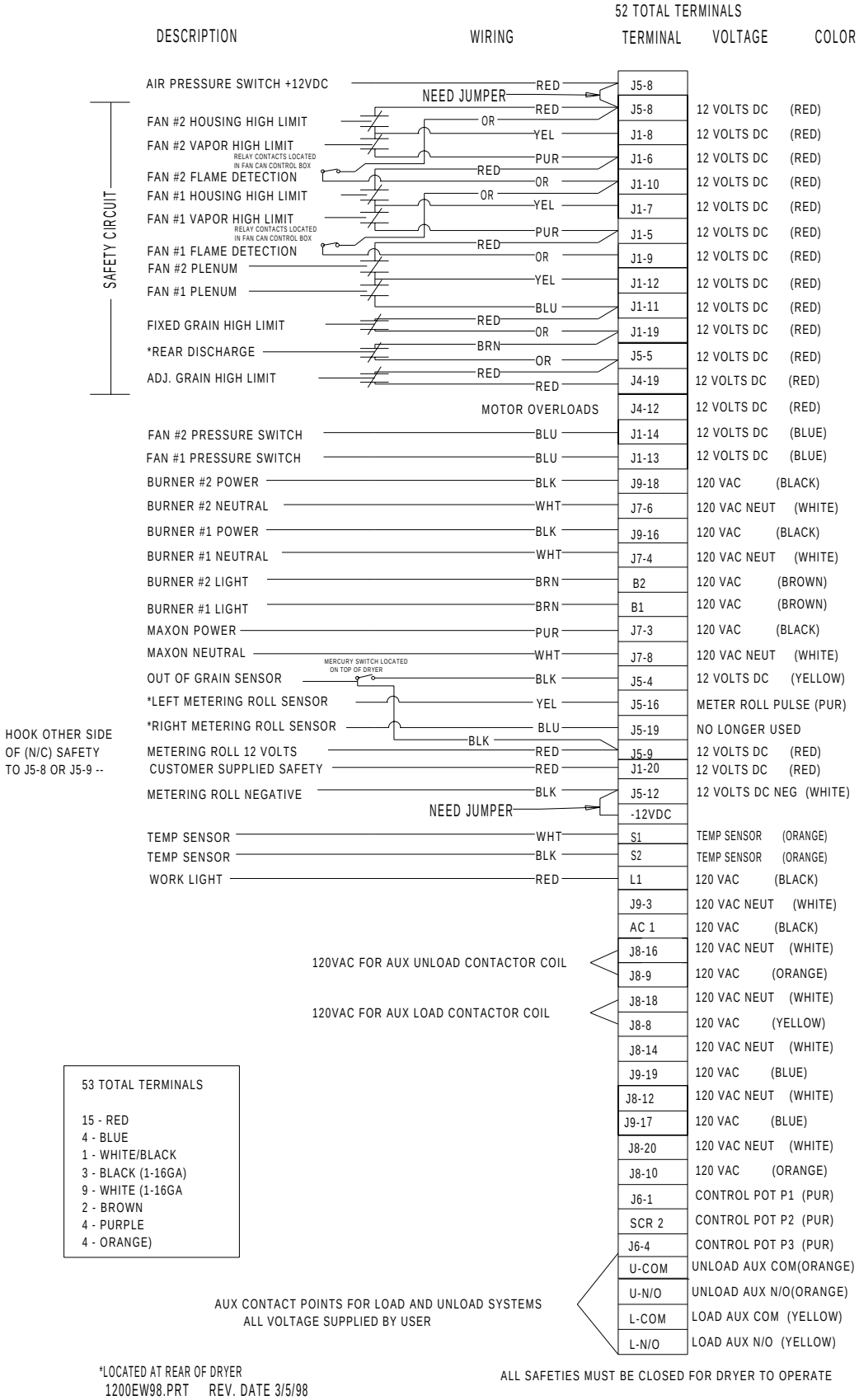
1100 Series Control Box Wiring



1100 Series Control Box Wiring (New Version)

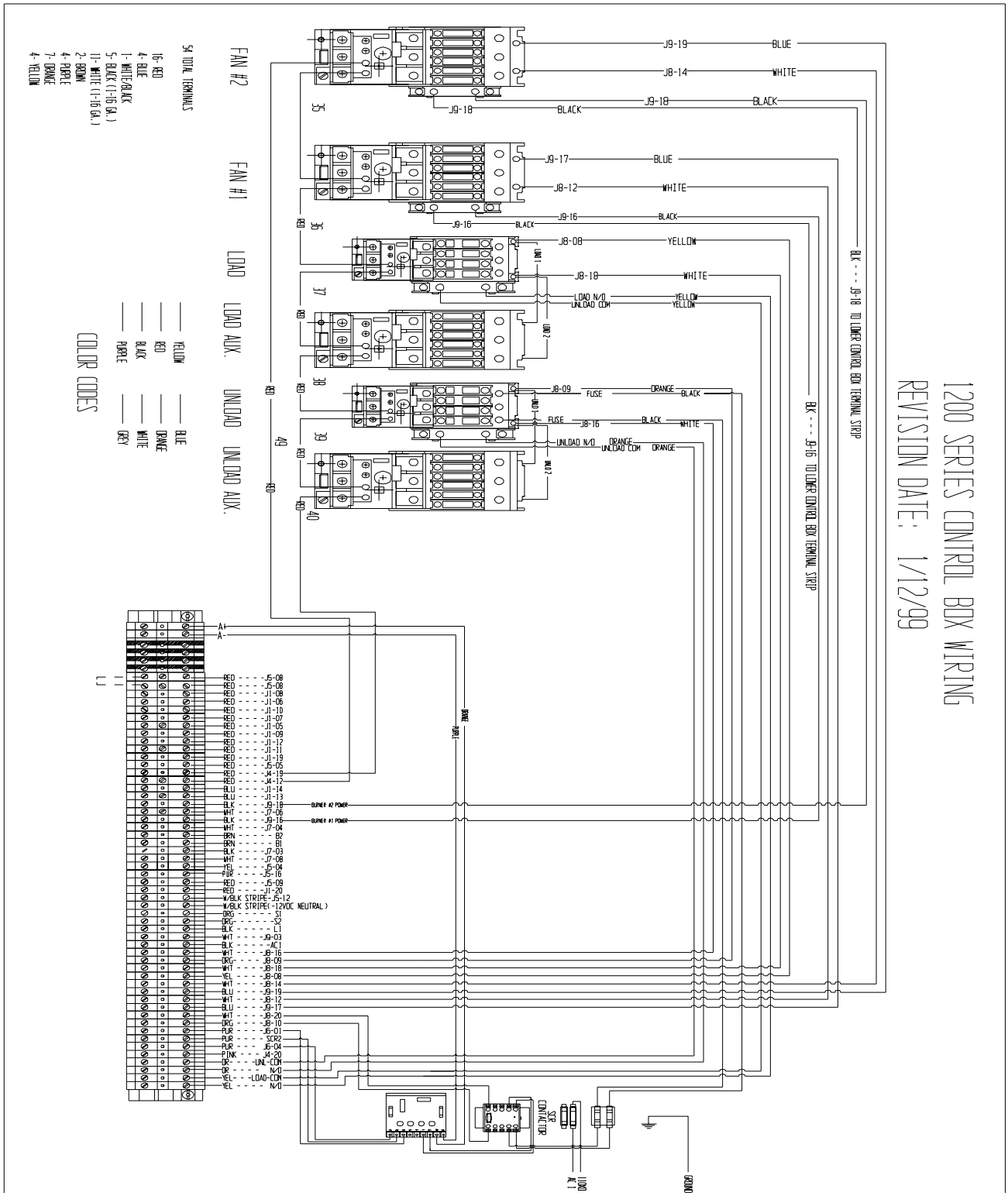


1200 Series Control Box Wiring

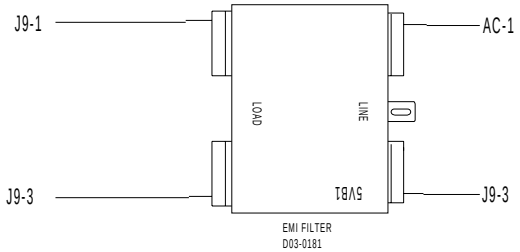


WIRING	TERMINAL	VOLTAGE	COLOR
RED	J5-8		
RED	J5-8	12 VOLTS DC	(RED)
YEL	J1-8	12 VOLTS DC	(RED)
PUR	J1-6	12 VOLTS DC	(RED)
OR	J1-10	12 VOLTS DC	(RED)
YEL	J1-7	12 VOLTS DC	(RED)
PUR	J1-5	12 VOLTS DC	(RED)
OR	J1-9	12 VOLTS DC	(RED)
YEL	J1-12	12 VOLTS DC	(RED)
BLU	J1-11	12 VOLTS DC	(RED)
OR	J1-19	12 VOLTS DC	(RED)
OR	J5-5	12 VOLTS DC	(RED)
RED	J4-19	12 VOLTS DC	(RED)
RED	J4-12	12 VOLTS DC	(RED)
BLU	J1-14	12 VOLTS DC	(BLUE)
BLU	J1-13	12 VOLTS DC	(BLUE)
BLK	J9-18	120 VAC	(BLACK)
WHT	J7-6	120 VAC NEUT	(WHITE)
BLK	J9-16	120 VAC	(BLACK)
WHT	J7-4	120 VAC NEUT	(WHITE)
BRN	B2	120 VAC	(BROWN)
BRN	B1	120 VAC	(BROWN)
PUR	J7-3	120 VAC	(BLACK)
WHT	J7-8	120 VAC NEUT	(WHITE)
BLK	J5-4	12 VOLTS DC	(YELLOW)
YEL	J5-16	METER ROLL PULSE	(PUR)
BLU	J5-19	NO LONGER USED	
BLK	J5-9	12 VOLTS DC	(RED)
RED	J1-20	12 VOLTS DC	(RED)
BLK	J5-12	12 VOLTS DC NEG	(WHITE)
	-12VDC		
WHT	S1	TEMP SENSOR	(ORANGE)
BLK	S2	TEMP SENSOR	(ORANGE)
RED	L1	120 VAC	(BLACK)
	J9-3	120 VAC NEUT	(WHITE)
	AC 1	120 VAC	(BLACK)
	J8-16	120 VAC NEUT	(WHITE)
	J8-9	120 VAC	(ORANGE)
	J8-18	120 VAC NEUT	(WHITE)
	J8-8	120 VAC	(YELLOW)
	J8-14	120 VAC NEUT	(WHITE)
	J9-19	120 VAC	(BLUE)
	J8-12	120 VAC NEUT	(WHITE)
	J9-17	120 VAC	(BLUE)
	J8-20	120 VAC NEUT	(WHITE)
	J8-10	120 VAC	(ORANGE)
	J6-1	CONTROL POT P1	(PUR)
	SCR 2	CONTROL POT P2	(PUR)
	J6-4	CONTROL POT P3	(PUR)
	U-COM	UNLOAD AUX COM	(ORANGE)
	U-N/O	UNLOAD AUX N/O	(ORANGE)
	L-COM	LOAD AUX COM	(YELLOW)
	L-N/O	LOAD AUX N/O	(YELLOW)

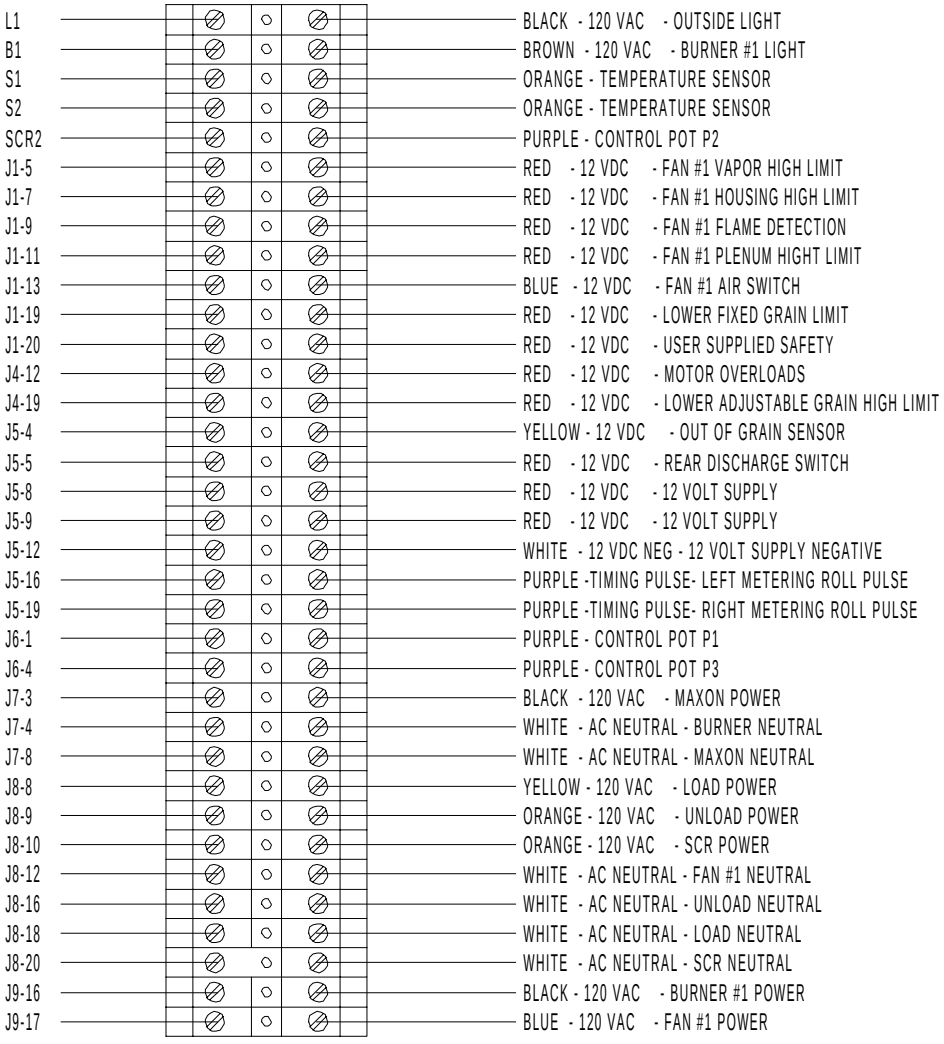
1200 Series Control Box Wiring (New Version)



1100 Fan Lower Control Box Interconnect Strip



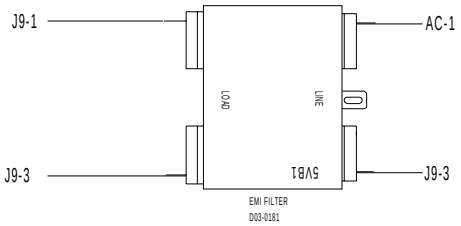
EMERGENCY COOLING JUMPERS
INSTALL J6-13 TO J1-5
INSTALL J6-14 TO J1-19
INSTALL J6-16 TO J5-5
INSTALL J6-17 TO J4-19



35 - D01-0531 ENTRELEC TERMINALS
2 - D01-0533 END STOPS
1 - D01-0532 BLANK PROTECTOR END

I/O BOARD JUMPERS
INSTALL J1-9 TO J5-6
INSTALL J5-2 TO J5-20
INSTALL J4-12 TO J5-10
INSTALL J1-20 TO J5-8

1200 Fan Lower Control Box Interconnect Strip



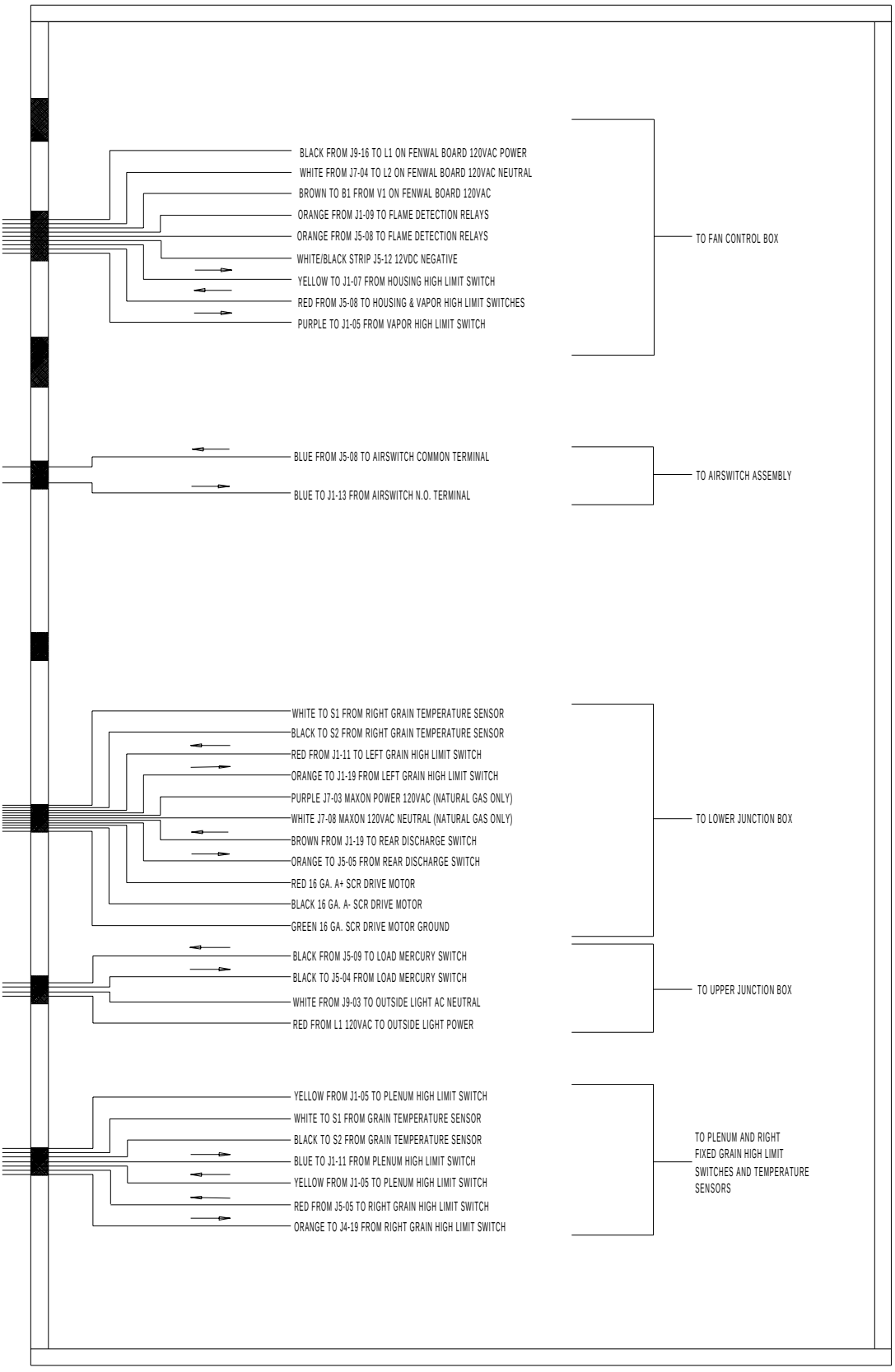
L1	BLACK - 120 VAC - OUTSIDE LIGHT
B1	BROWN - 120 VAC - BURNER #1 LIGHT
B2	BROWN - 120 VAC - BURNER #2 LIGHT
S1	ORANGE - TEMPERATURE SENSOR
S2	ORANGE - TEMPERATURE SENSOR
SCR2	PURPLE - CONTROL POT P2
J1-5	RED - 12 VDC - FAN #1 VAPOR HIGH LIMIT
J1-6	RED - 12 VDC - FAN #2 VAPOR HIGH LIMIT
J1-7	RED - 12 VDC - FAN #1 HOUSING HIGH LIMIT
J1-8	RED - 12 VDC - FAN #2 HOUSING HIGH LIMIT
J1-9	RED - 12 VDC - FAN #1 FLAME DETECTION
J1-10	RED - 12 VDC - FAN #2 FLAME DETECTION
J1-11	RED - 12 VDC - FAN #1 PLENUM HIGHT LIMIT
J1-12	RED - 12 VDC - FAN #2 PLENUM HIGHT LIMIT
J1-13	BLUE - 12 VDC - FAN #1 AIR SWITCH
J1-14	BLUE - 12 VDC - FAN #2 AIR SWITCH
J1-19	RED - 12 VDC - LOWER FIXED GRAIN LIMIT
J1-20	RED - 12 VDC - USER SUPPLIED SAFETY
J4-12	RED - 12 VDC - MOTOR OVERLOADS
J4-19	RED - 12 VDC - LOWER ADJUSTABLE GRAIN HIGH LIMIT
J5-4	YELLOW - 12 VDC - OUT OF GRAIN SENSOR
J5-5	RED - 12 VDC - REAR DISCHARGE SWITCH
J5-8	RED - 12 VDC - 12 VOLT SUPPLY
J5-9	RED - 12 VDC - 12 VOLT SUPPLY
J5-12	WHITE - 12 VDC NEG - 12 VOLT SUPPLY NEGATIVE
J5-16	PURPLE -TIMING PULSE- LEFT METERING ROLL PULSE
J5-19	PURPLE -TIMING PULSE- RIGHT METERING ROLL PULSE
J6-1	PURPLE - CONTROL POT P1
J6-4	PURPLE - CONTROL POT P3
J7-3	BLACK - 120 VAC - MAXON POWER
J7-4	WHITE - AC NEUTRAL - BURNER #1 NEUTRAL
J7-6	WHITE - AC NEUTRAL - BURNER #2 NEUTRAL
J7-8	WHITE - AC NEUTRAL - MAXON NEUTRAL
J8-8	YELLOW - 120 VAC - LOAD POWER
J8-9	ORANGE - 120 VAC - UNLOAD POWER
J8-10	ORANGE - 120 VAC - SCR POWER
J8-12	WHITE - AC NEUTRAL - FAN #1 NEUTRAL
J8-14	WHITE - AC NEUTRAL - FAN #2 NEUTRAL
J8-16	WHITE - AC NEUTRAL - UNLOAD NEUTRAL
J8-18	WHITE - AC NEUTRAL - LOAD NEUTRAL
J8-20	WHITE - AC NEUTRAL - SCR NEUTRAL
J9-16	BLACK - 120 VAC - BURNER #1 POWER
J9-17	BLUE - 120 VAC - FAN #1 POWER
J9-18	BLACK - 120 VAC - BURNER #2 POWER
J9-19	BLUE - 120 VAC - FAN #2 POWER

EMERGENCY COOLING JUMPERS
INSTALL J6-13 TO J1-5
INSTALL J6-14 TO J1-19
INSTALL J6-16 TO J5-5
INSTALL J6-17 TO J4-19

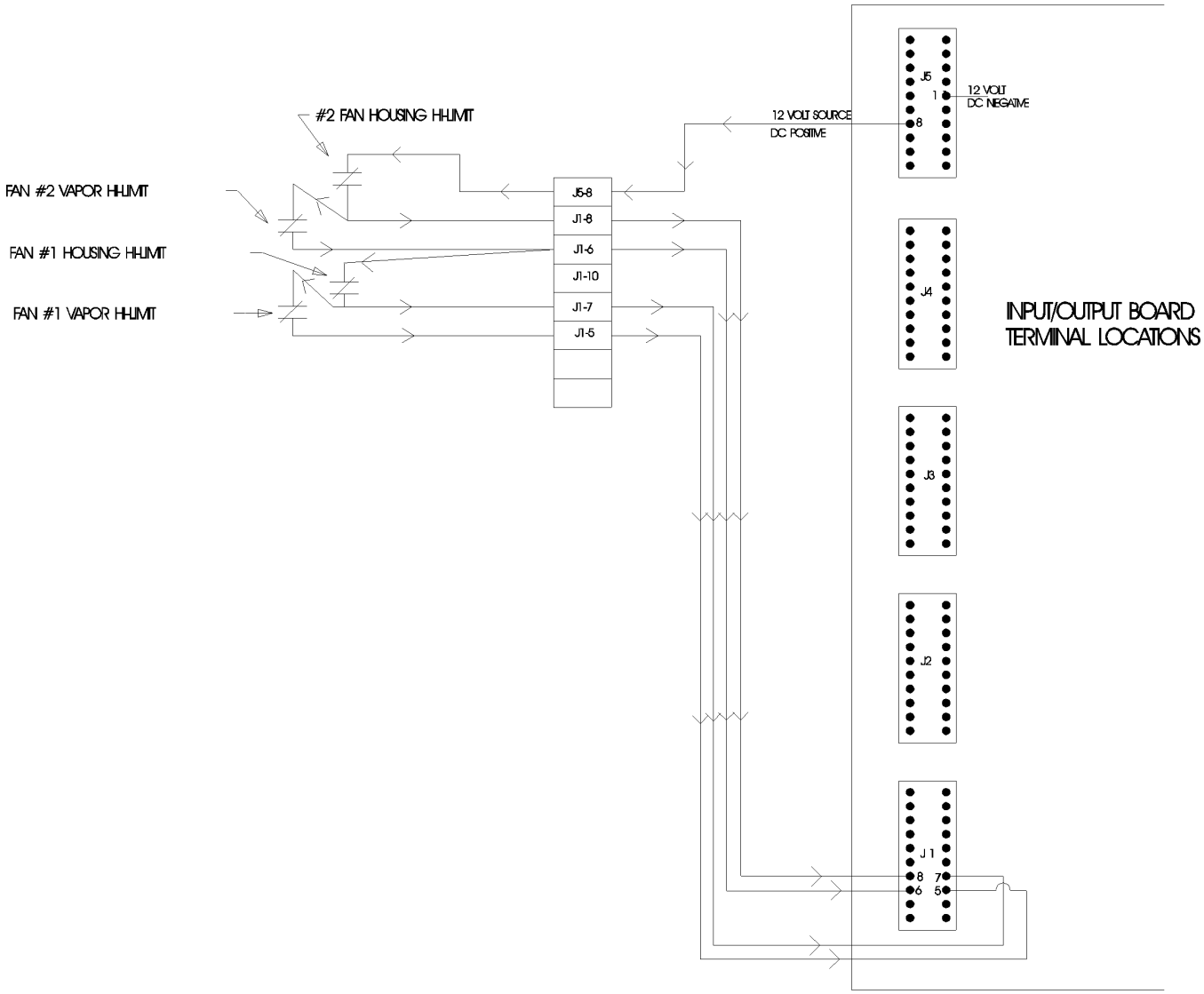
I/O BOARD JUMPERS
INSTALL J1-9 TO J5-6
INSTALL J5-2 TO J5-20
INSTALL J4-12 TO J5-10
INSTALL J9-1 TO J9-5

45 - D01-0531 ENTRELEC TERMINALS
2 - D01-0533 END STOPS
1 - D01-0532 BLANK PROTECTOR ENDS

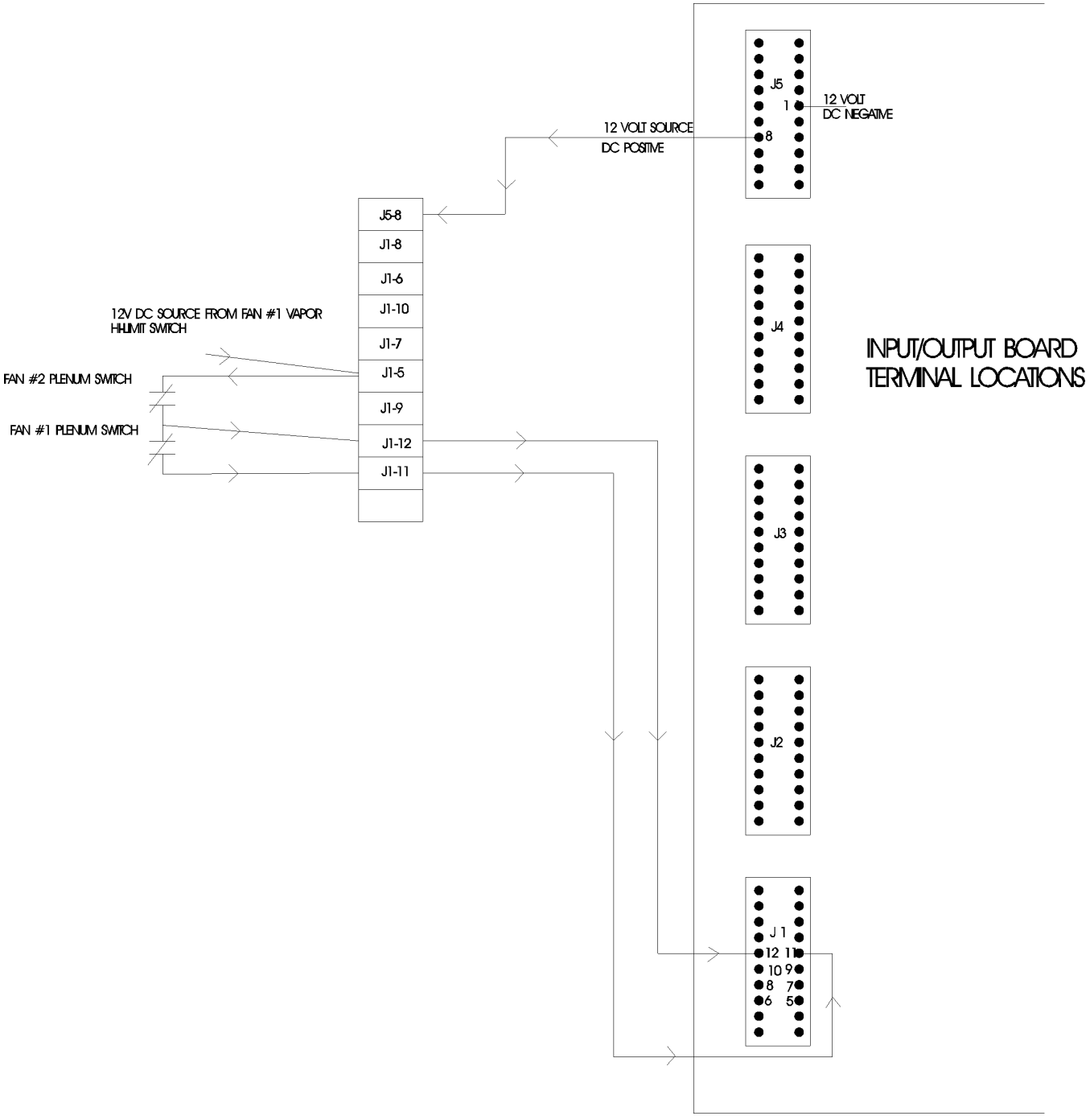
Upper Control Box External Wiring



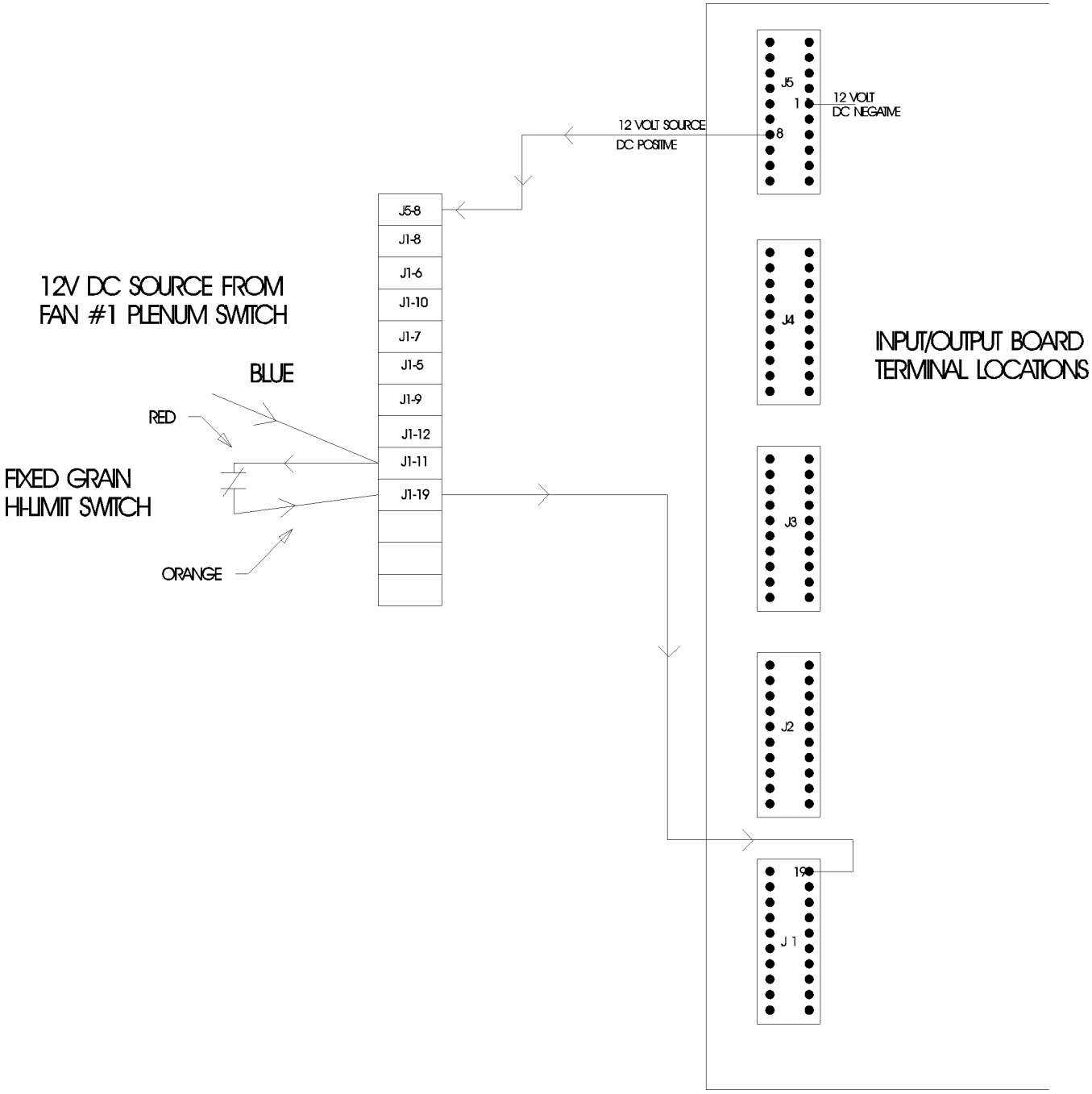
Fan Housing and Vapor Hi-Limit Circuit



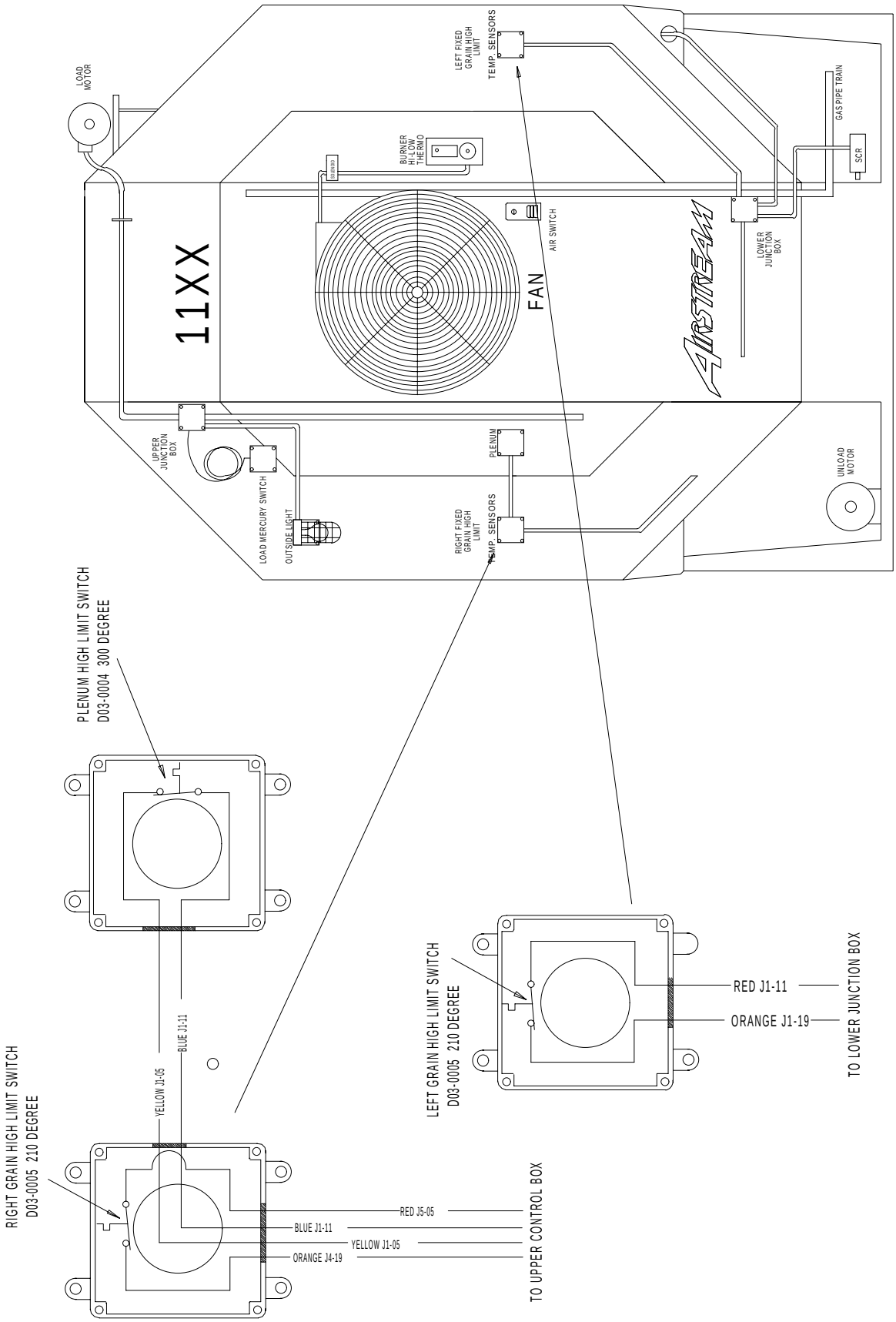
Plenum Hi-Temperature Switch



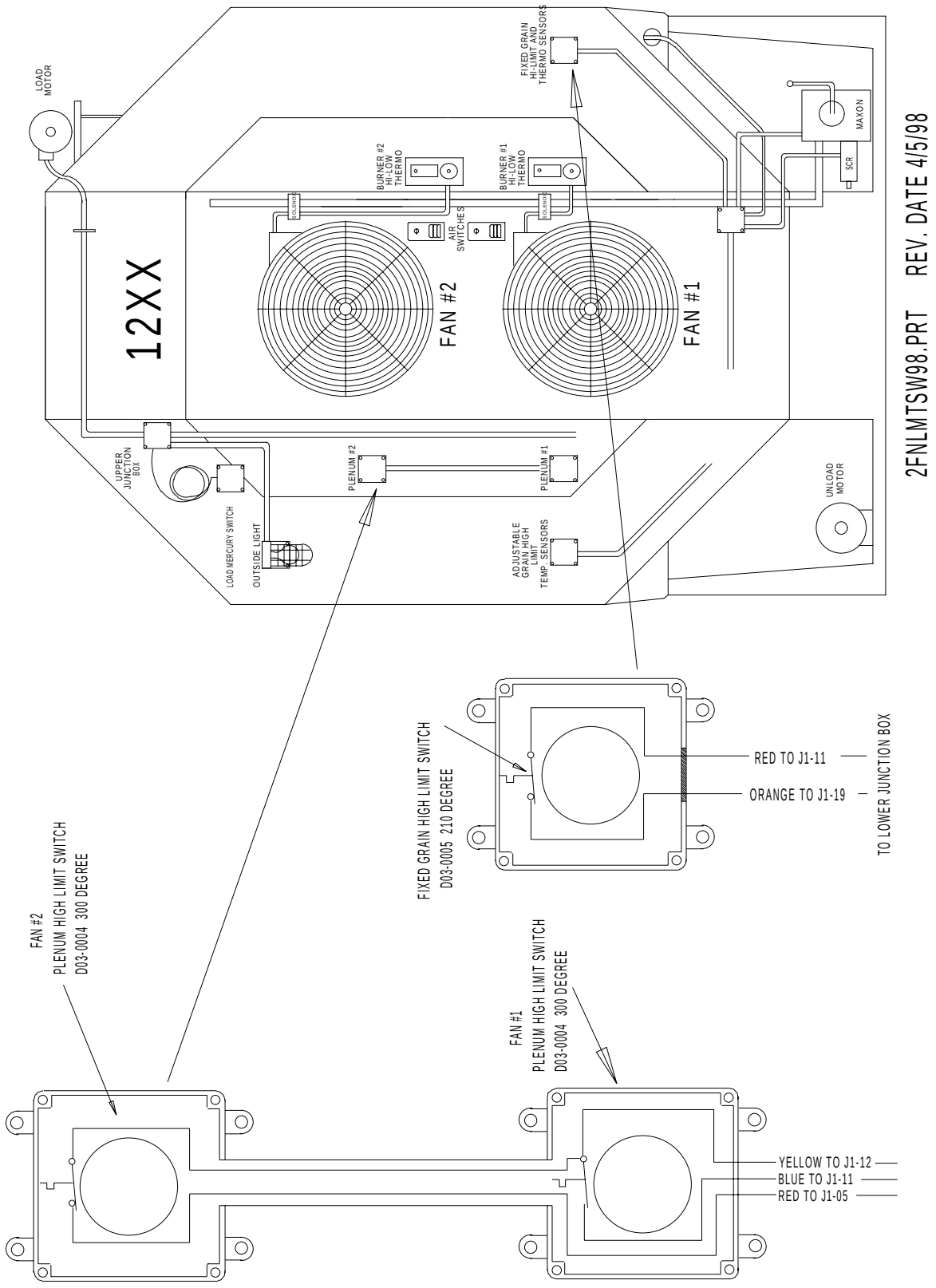
Fixed Grain Hi-Limit



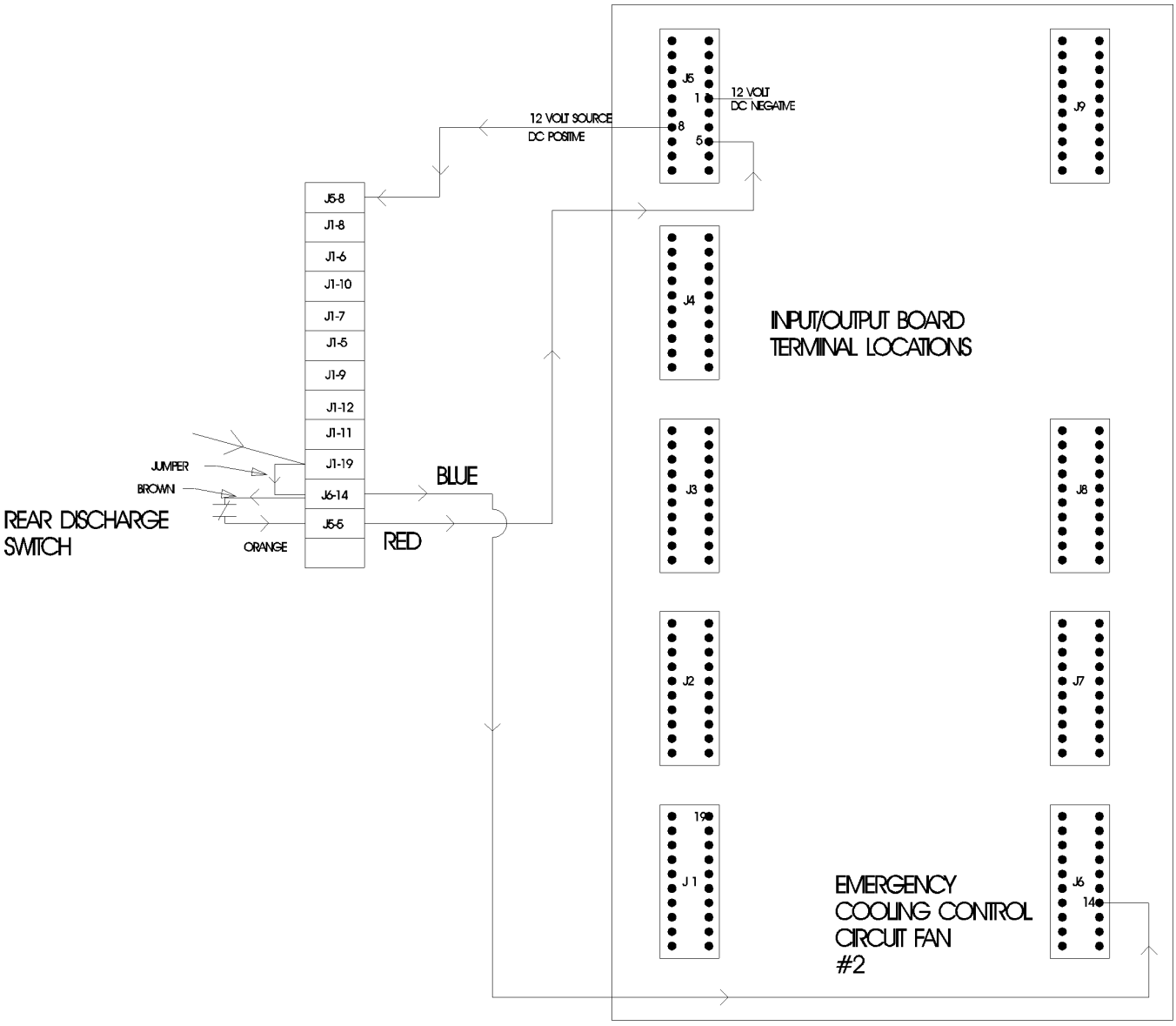
Grain & Plenum Hi-Limit Locations



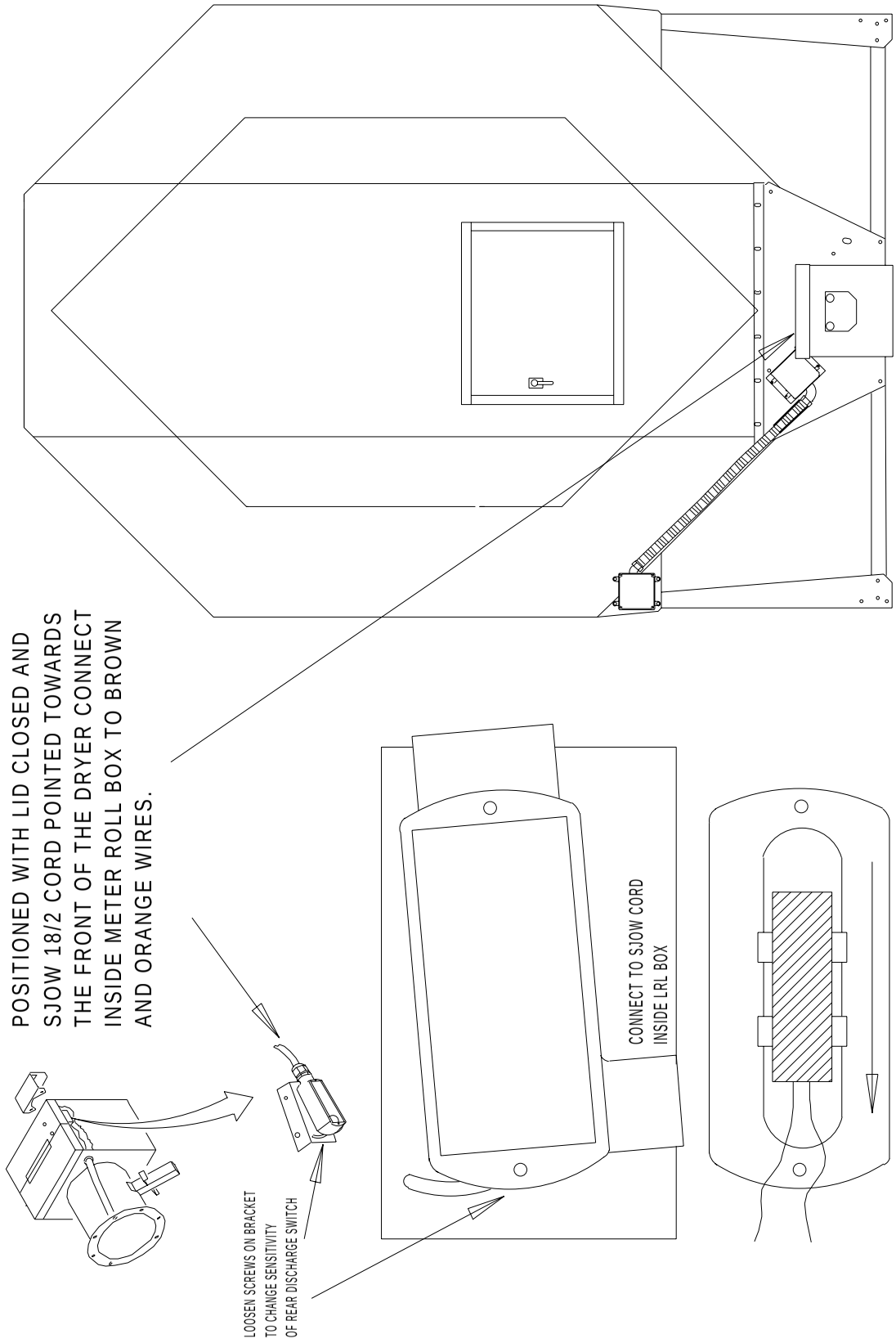
Two Fan Plenum and Grain Limit Switch Wiring



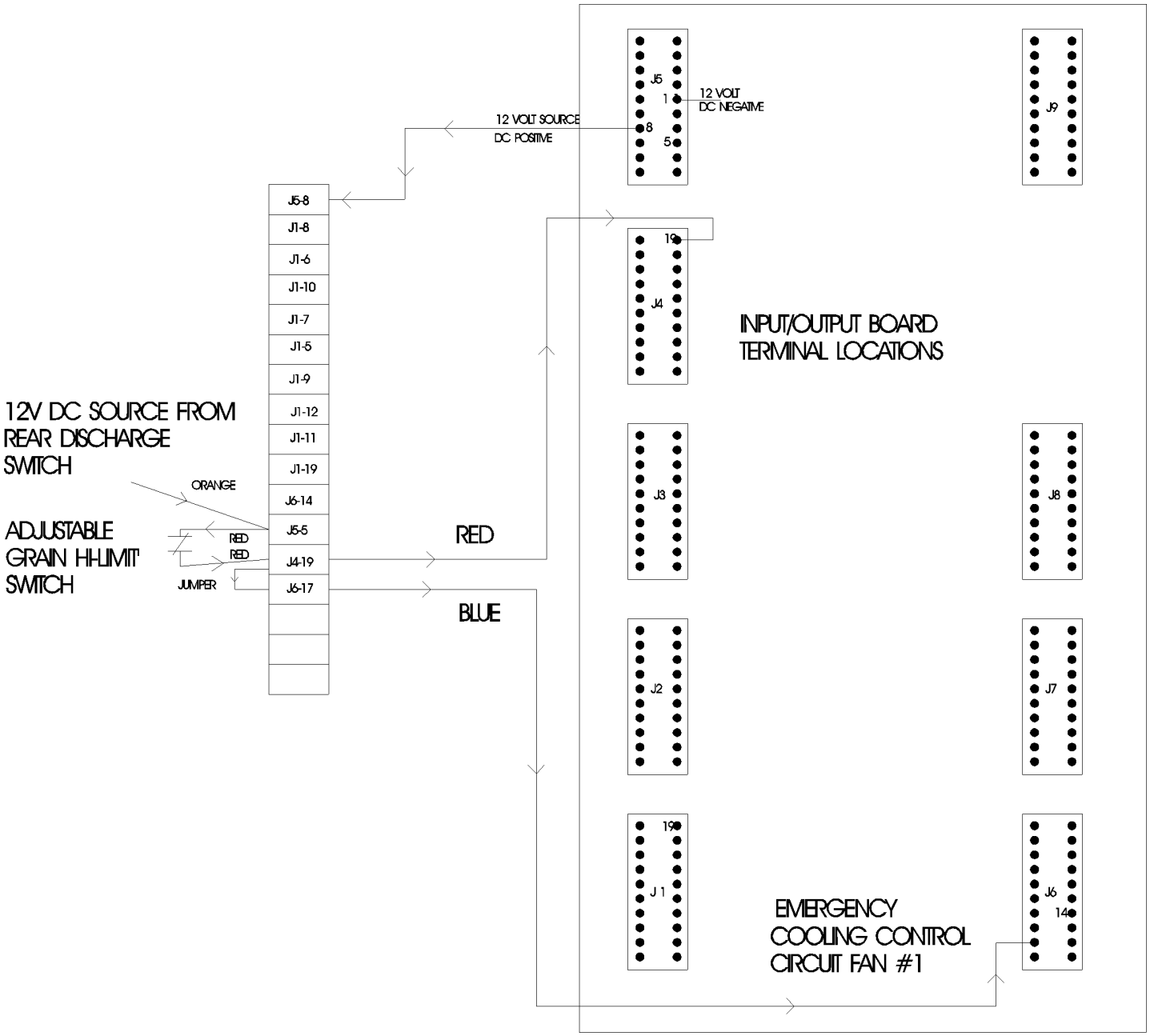
Rear Discharge & Emergency Cooling Circuit



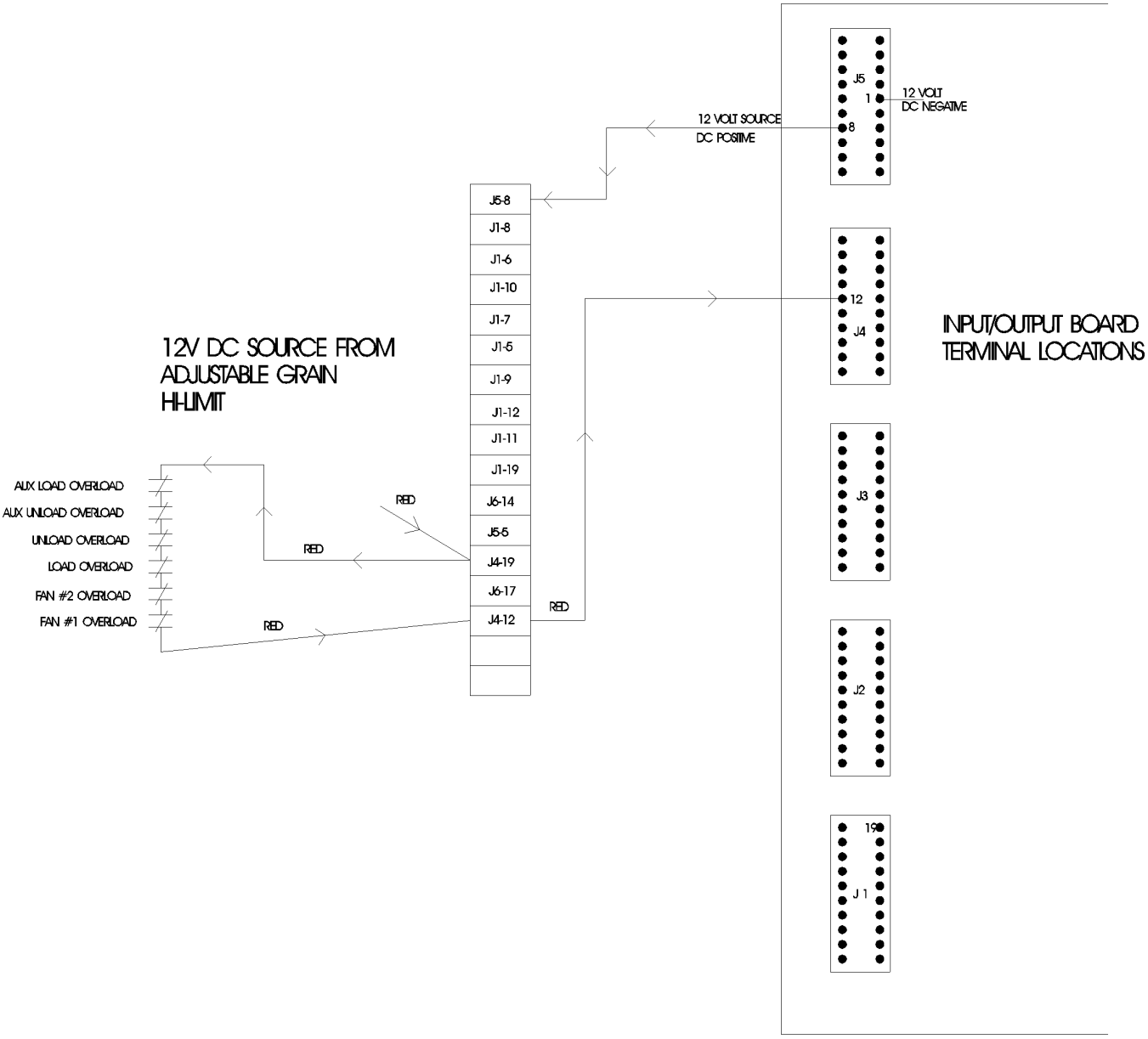
Rear Discharge Mercury Switch



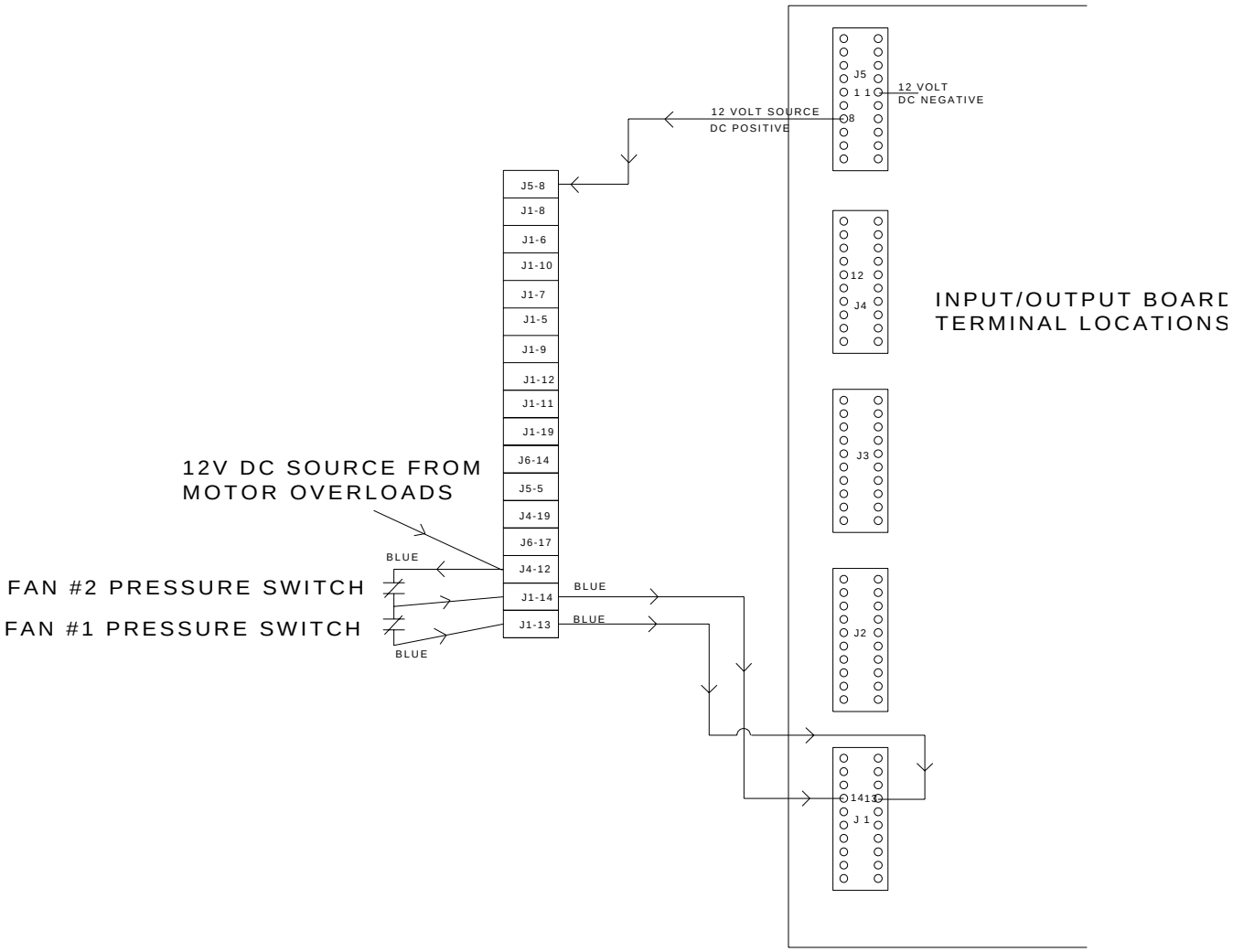
Adjustable Hi-Limit & Emergency Cooling Circuit



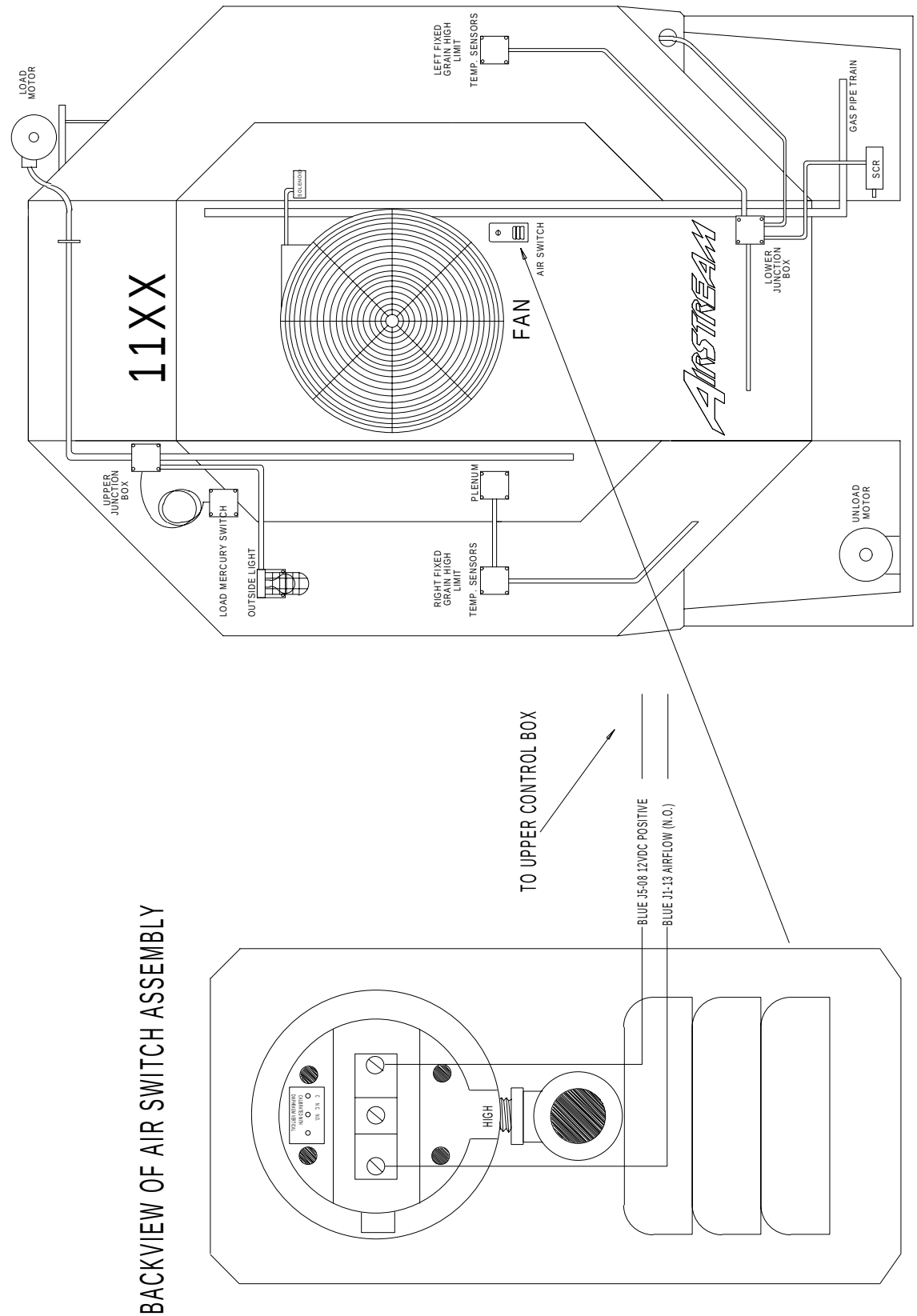
Motor Overloads



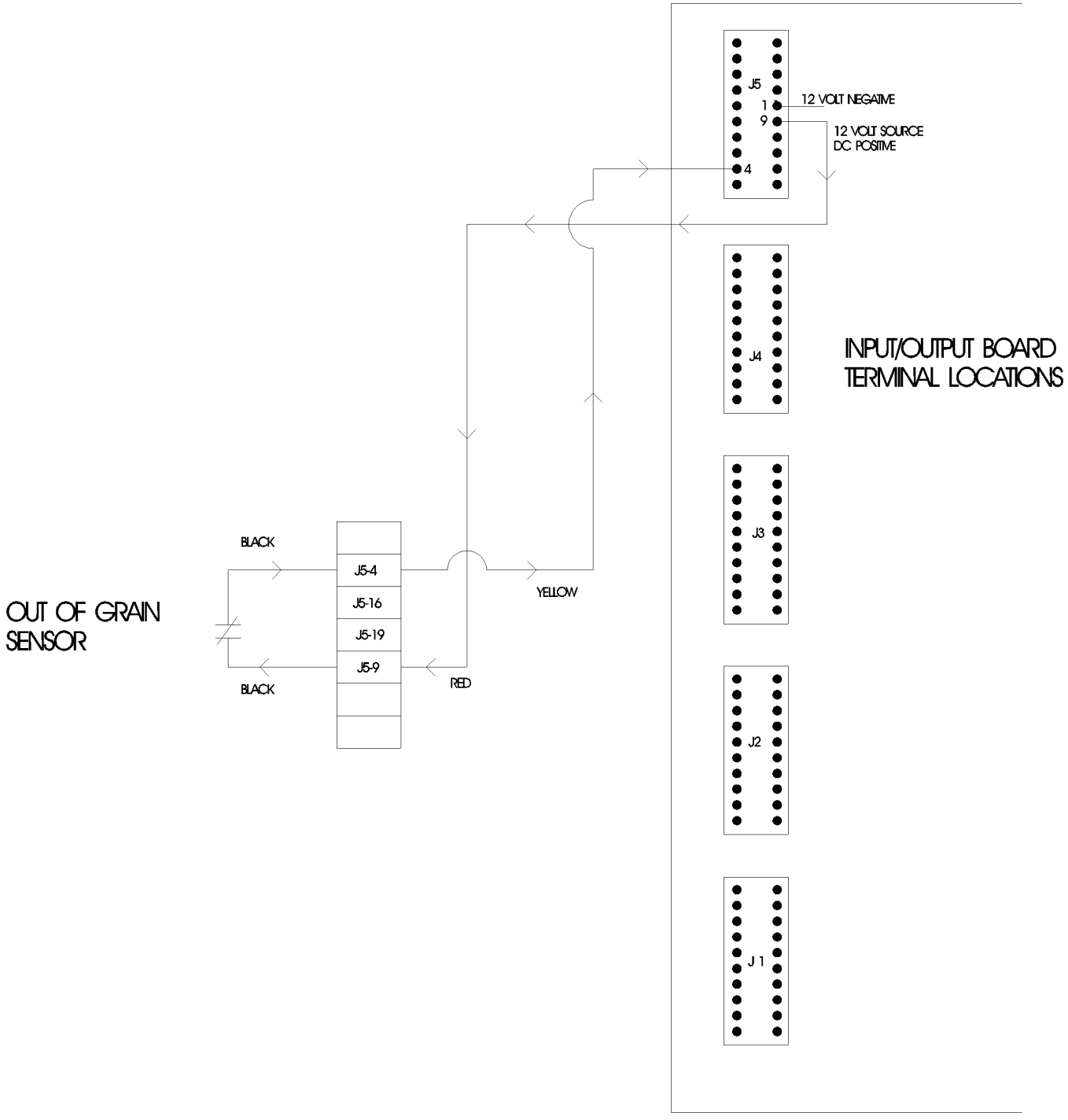
Air Pressure Switch



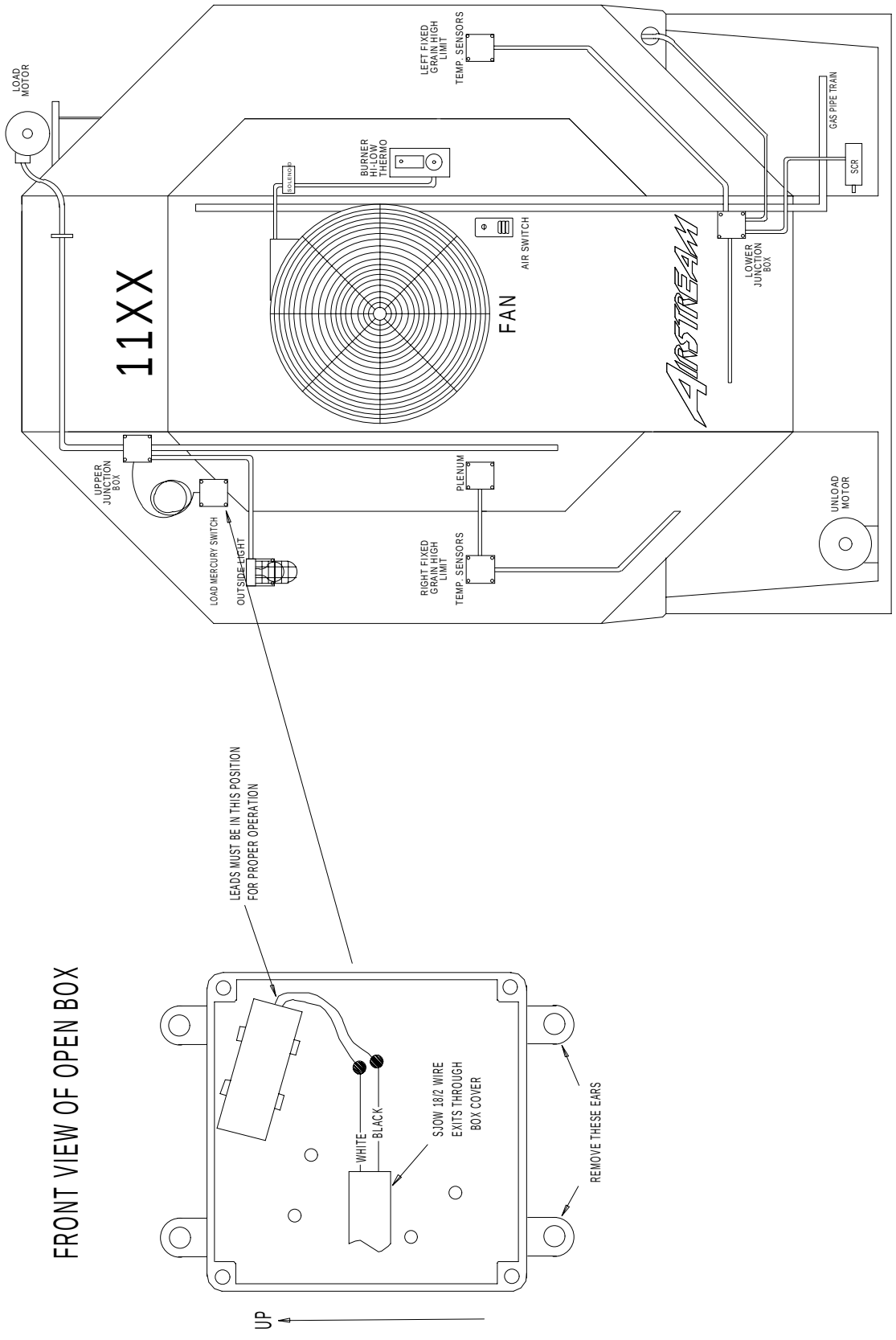
Air Pressure Switch Drawing



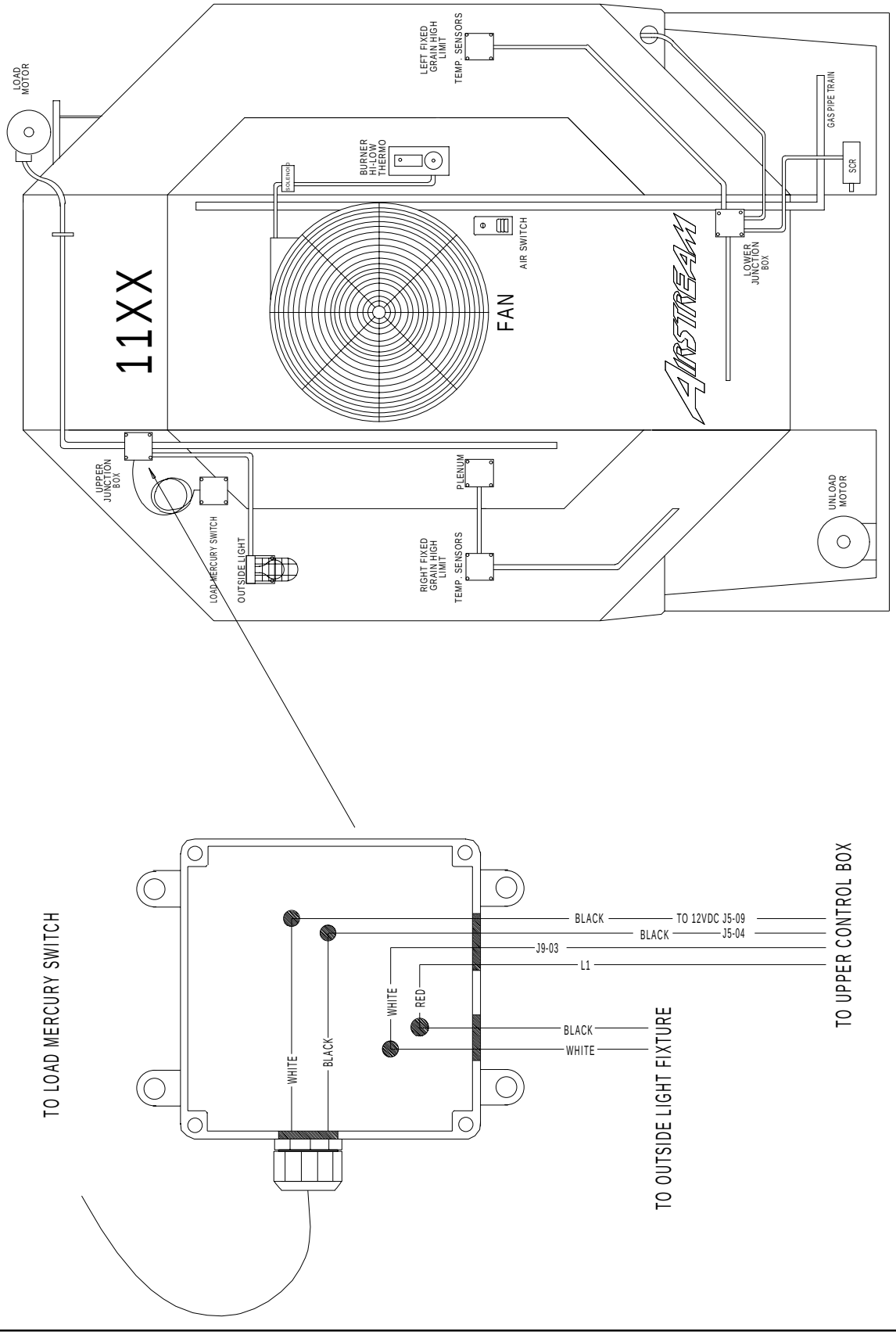
Out of Grain Safety Circuit



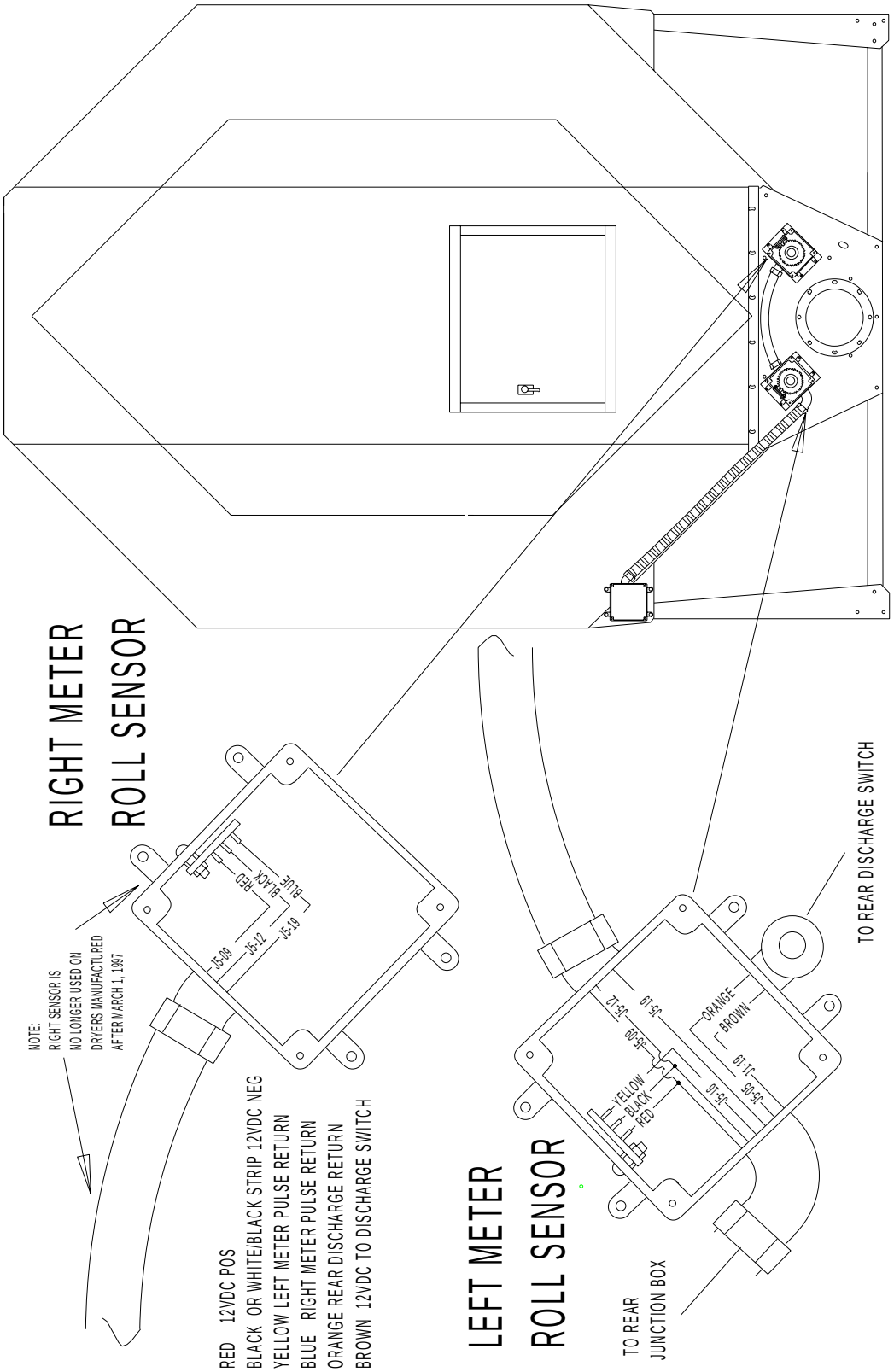
Out of Grain Safety Circuit Location



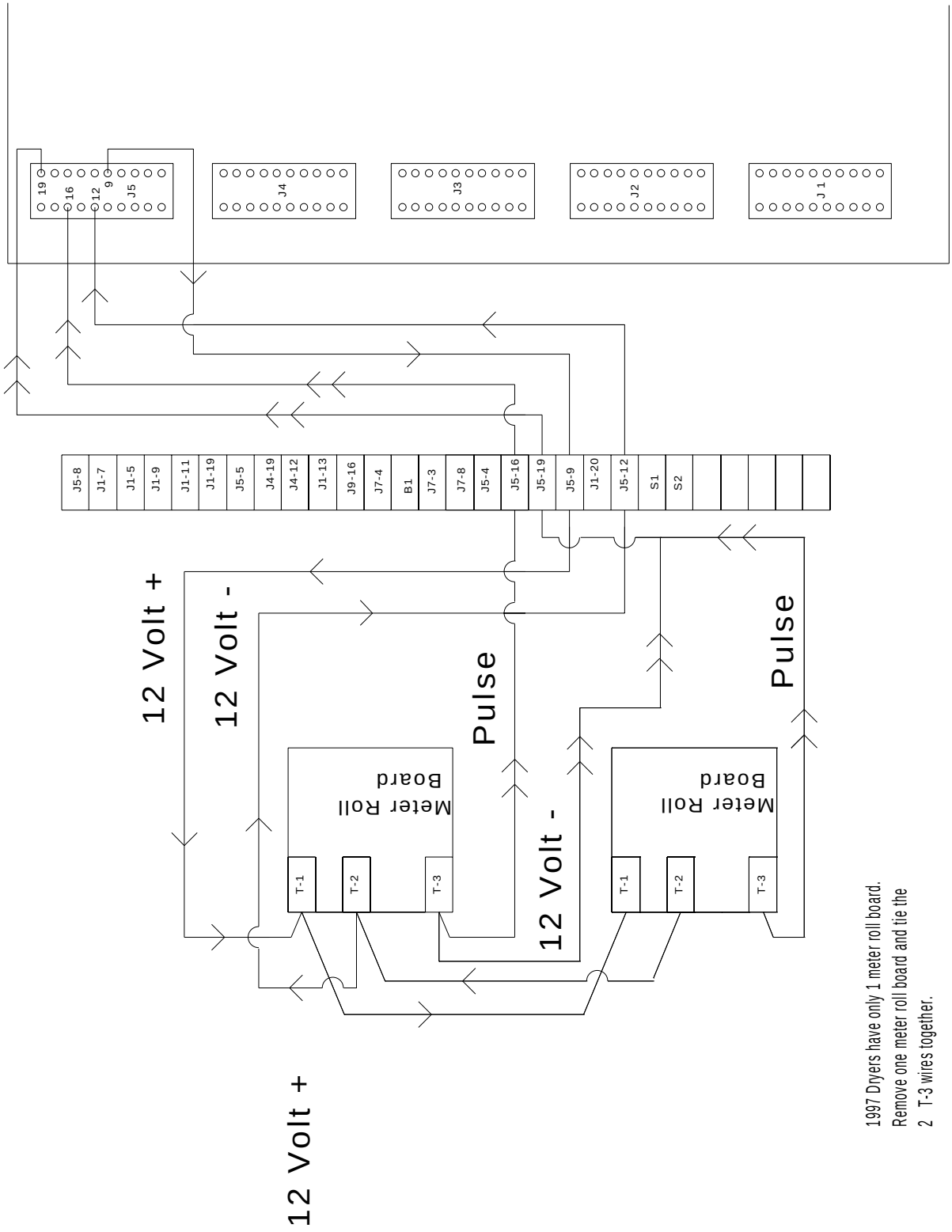
Upper Junction Box Drawing



Meter Roll Sensor



Meter Roll Sensor Wiring



1997 Dryers have only 1 meter roll board.
Remove one meter roll board and tie the
2 T-3 wires together.

Meter Roll Reversing

YOU MUST ENTER INTO THE DRYER PARMETER MODE BY PRESSING THE INCREASE AND DECREASE BUTTONS SIMULTANIOUSLY. YOU WILL HAVE THE FOLLOWING OPTIONS LISTED:

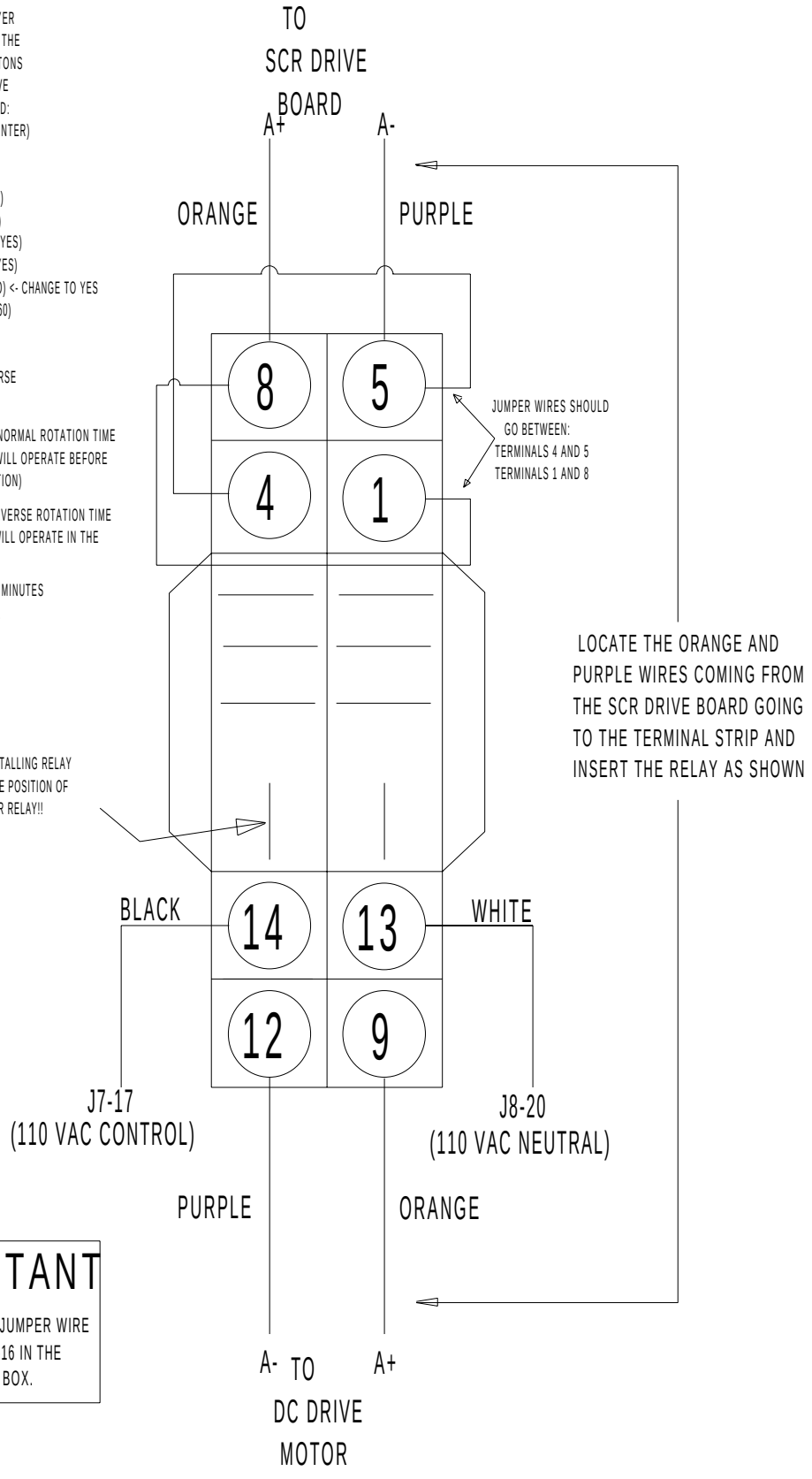
- SHUTDOWN HISTORY (PRESS ENTER)
- DRYER MODEL # (IE. 1112)
- FAN DELAY (DEFAULT = 5)
- FILL AUGER (DEFAULT = END)
- BPH FACTOR (DEFAULT = 1.0)
- TEST METER ROLL (DEFAULT = YES)
- TEST AIR SWITCH (DEFAULT = YES)
- M.R. REVERSE (DEFAULT = NO) <- CHANGE TO YES
- * REVERSE DELAY (DEFAULT = 60)
- * REVERSE TIME (DEFAULT = 1)

* DISPLAYED ONLY IF M.R. REVERSE IS CHANGED TO YES

REVERSE DELAY = METER ROLLS NORMAL ROTATION TIME (AMOUNT OF TIME METER ROLLS WILL OPERATE BEFORE THEY WILL BEGIN REVERSE ROTATION)

REVERSE TIME = METER ROLLS REVERSE ROTATION TIME (AMOUNT OF TIME METER ROLLS WILL OPERATE IN THE REVERSED ROTATION MODE)

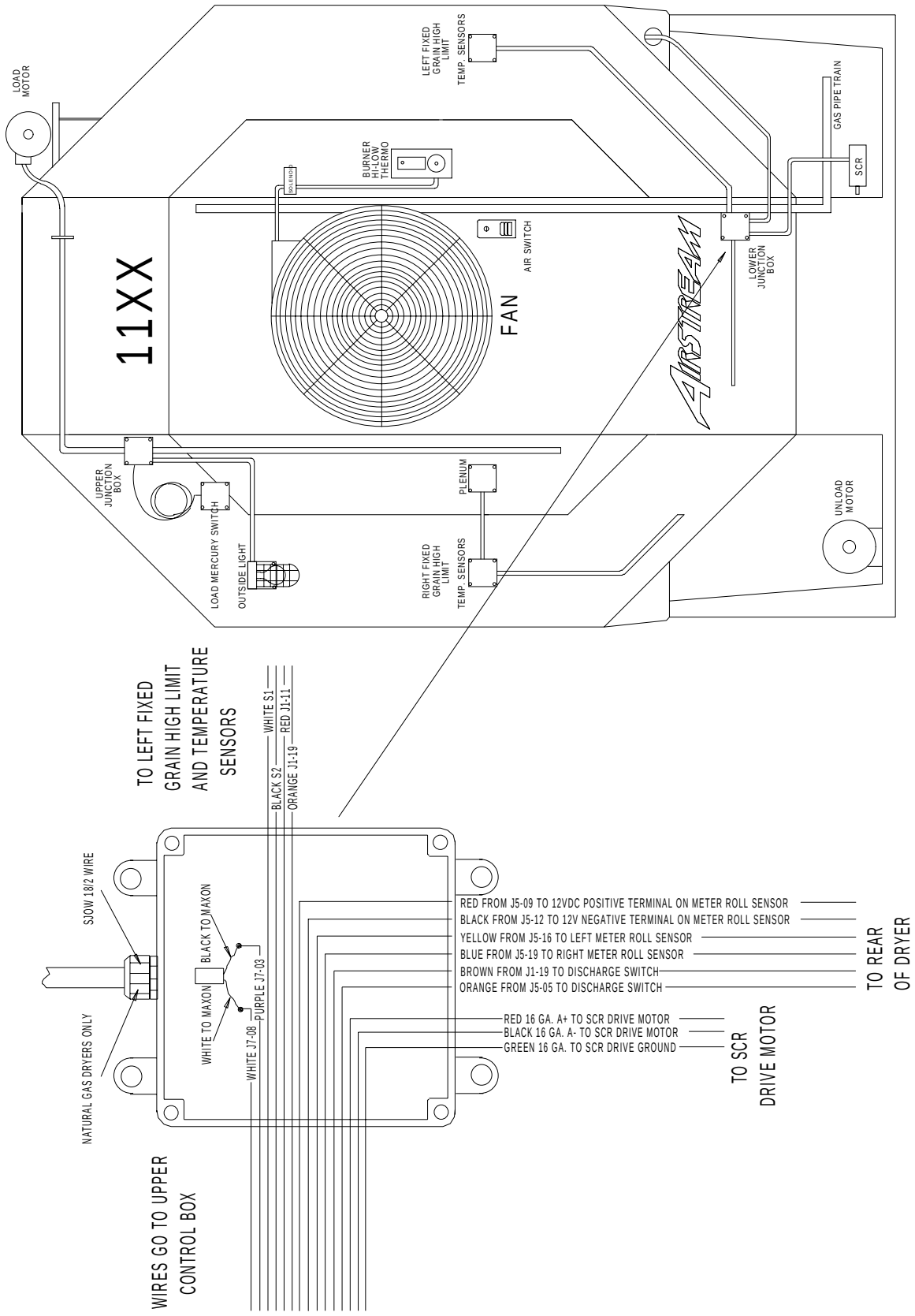
EXAMPLE: REVERSE DELAY = 10 MINUTES
REVERSE TIME = 1 MINUTE



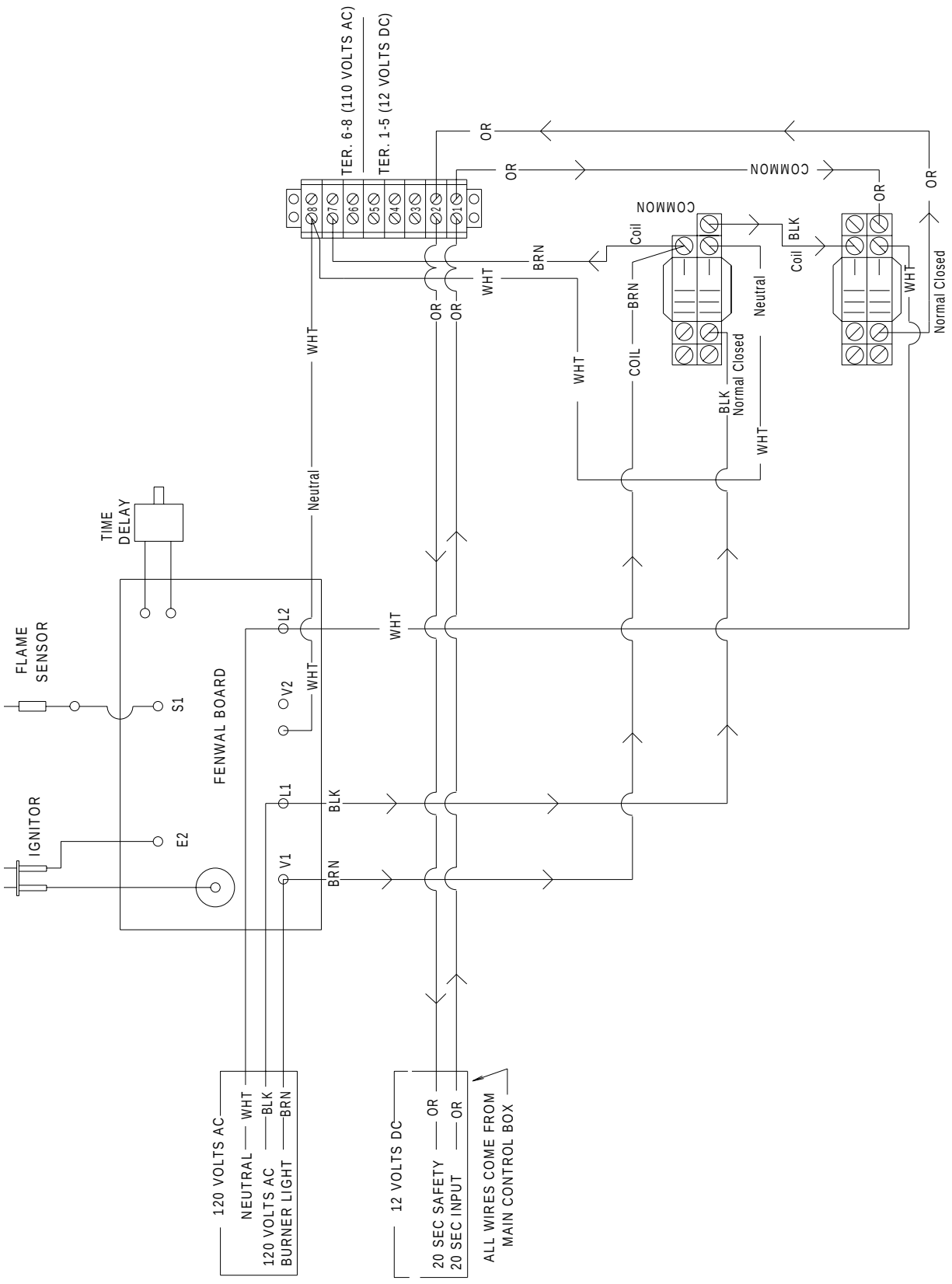
IMPORTANT

YOU MUST ADD A JUMPER WIRE FROM J9-09 TO J7-16 IN THE LOWER CONTROL BOX.

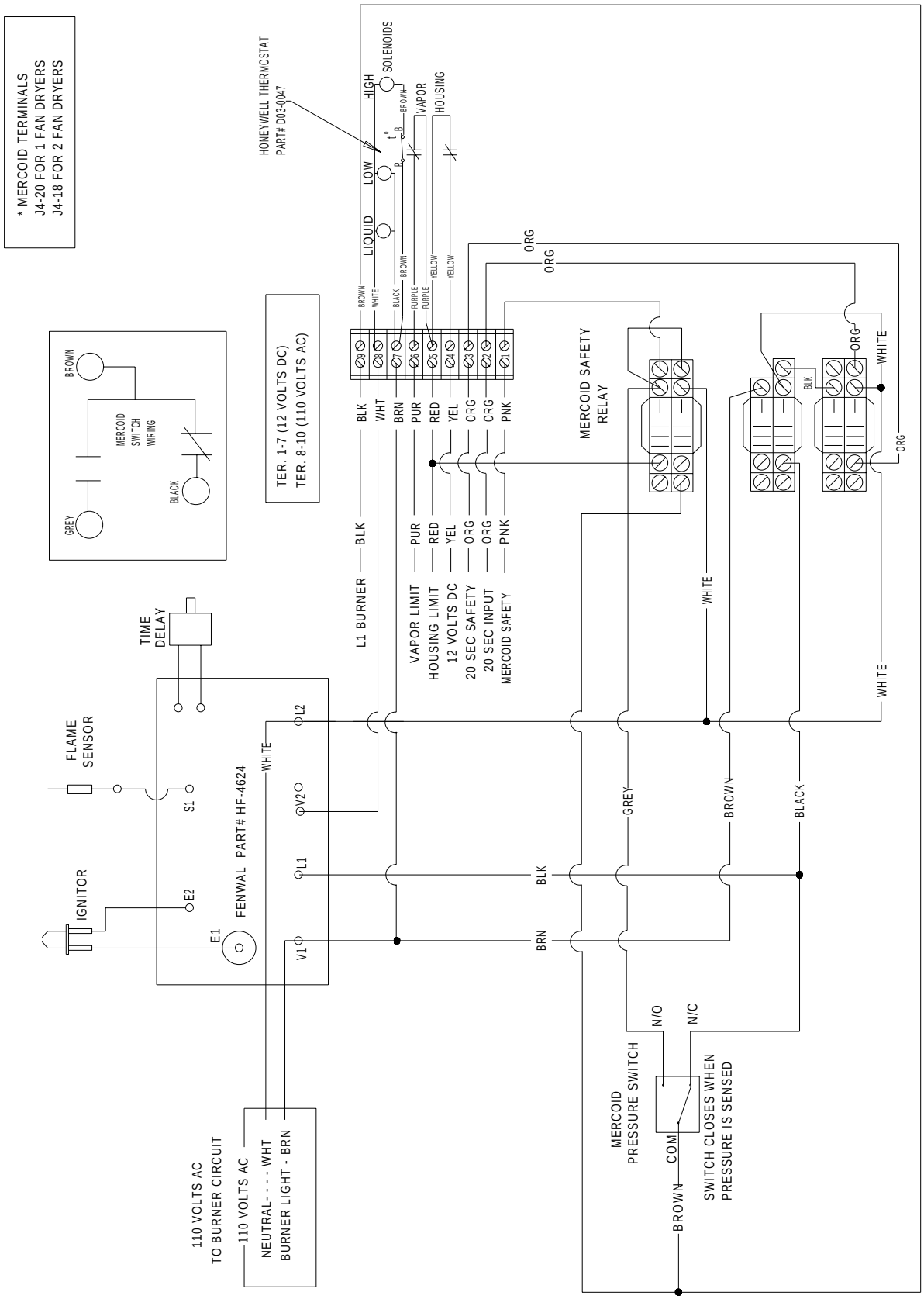
Lower Junction Box Wiring



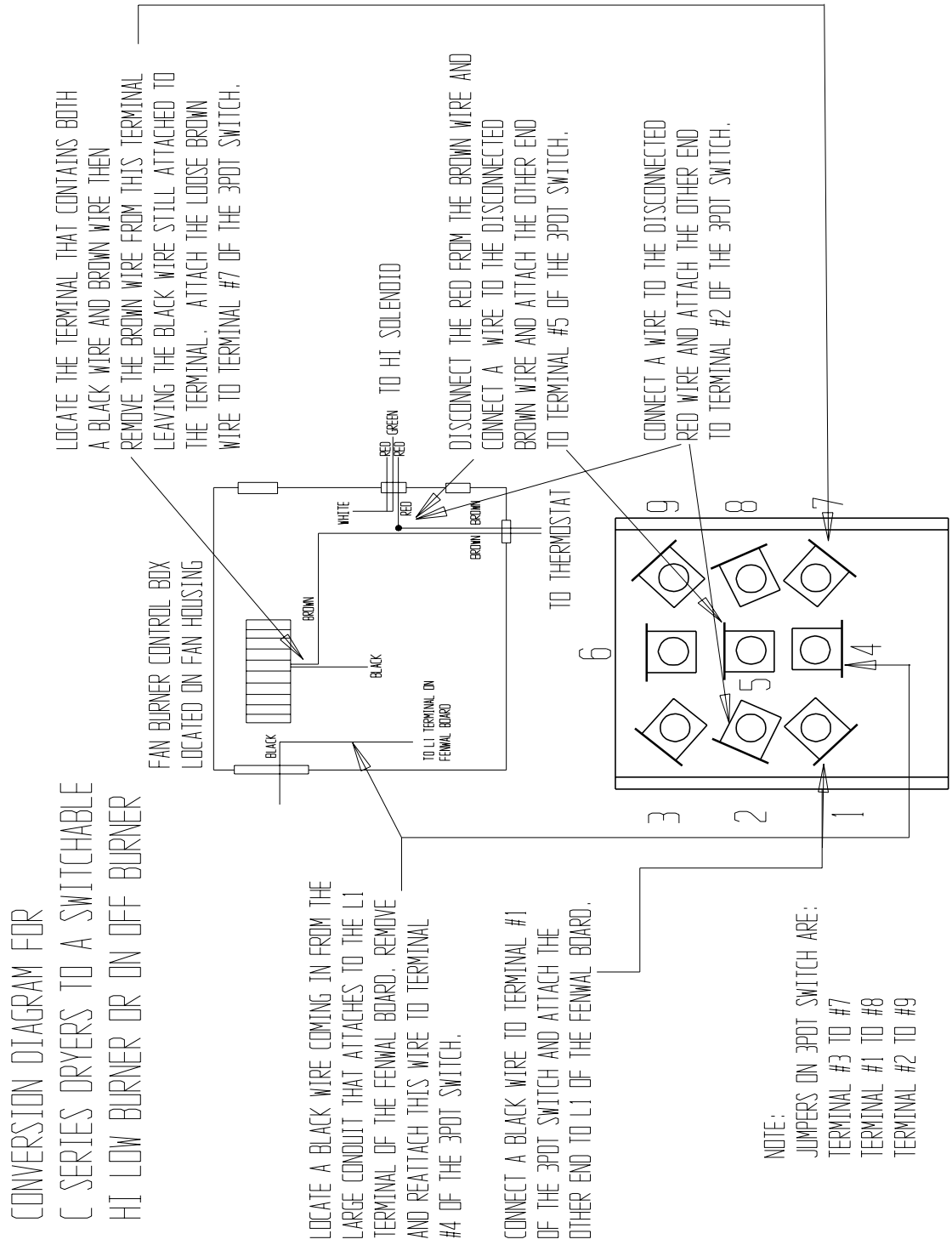
Flame Control Circuit



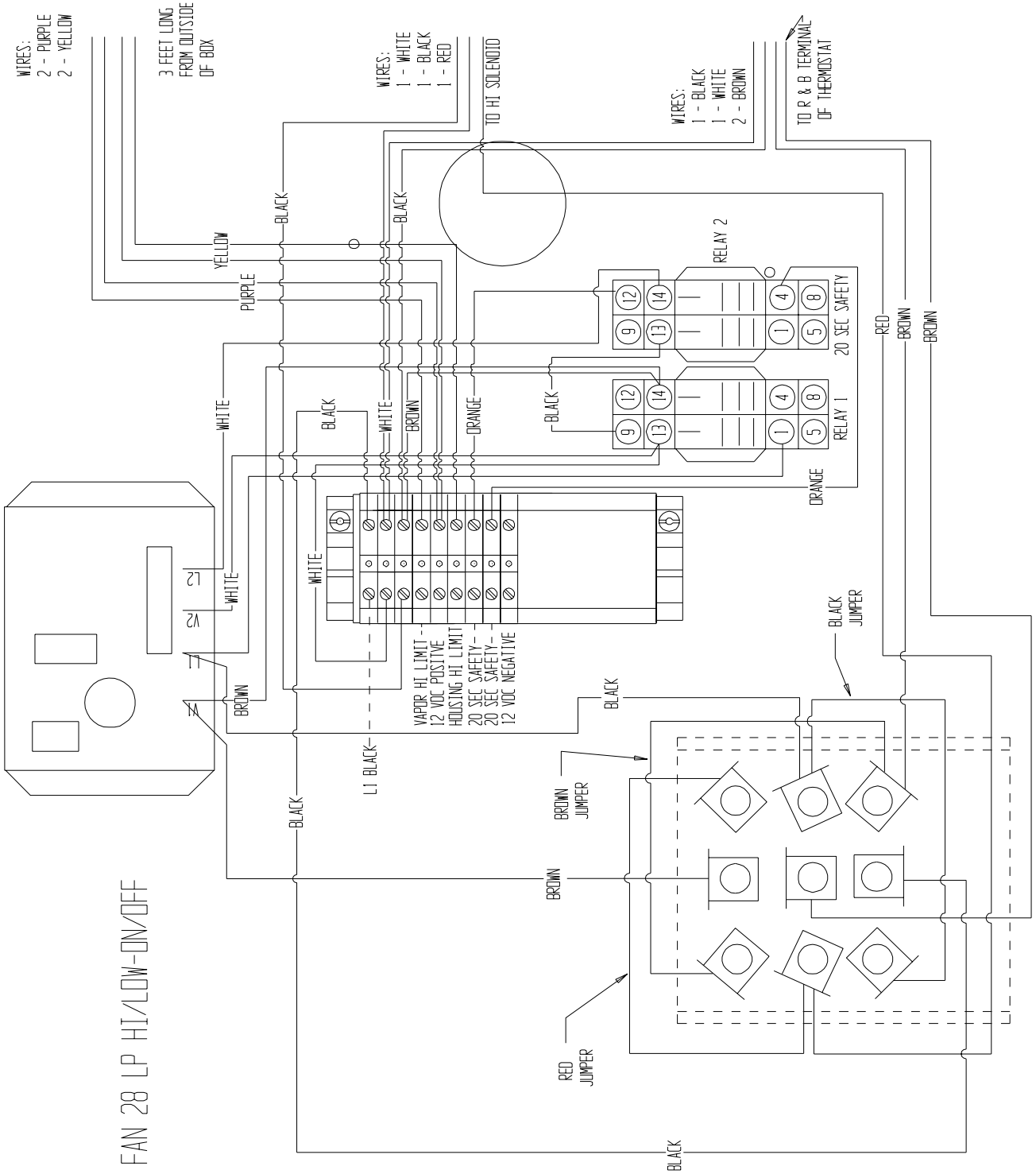
Fan Burner Circuit for Canadian Models Only



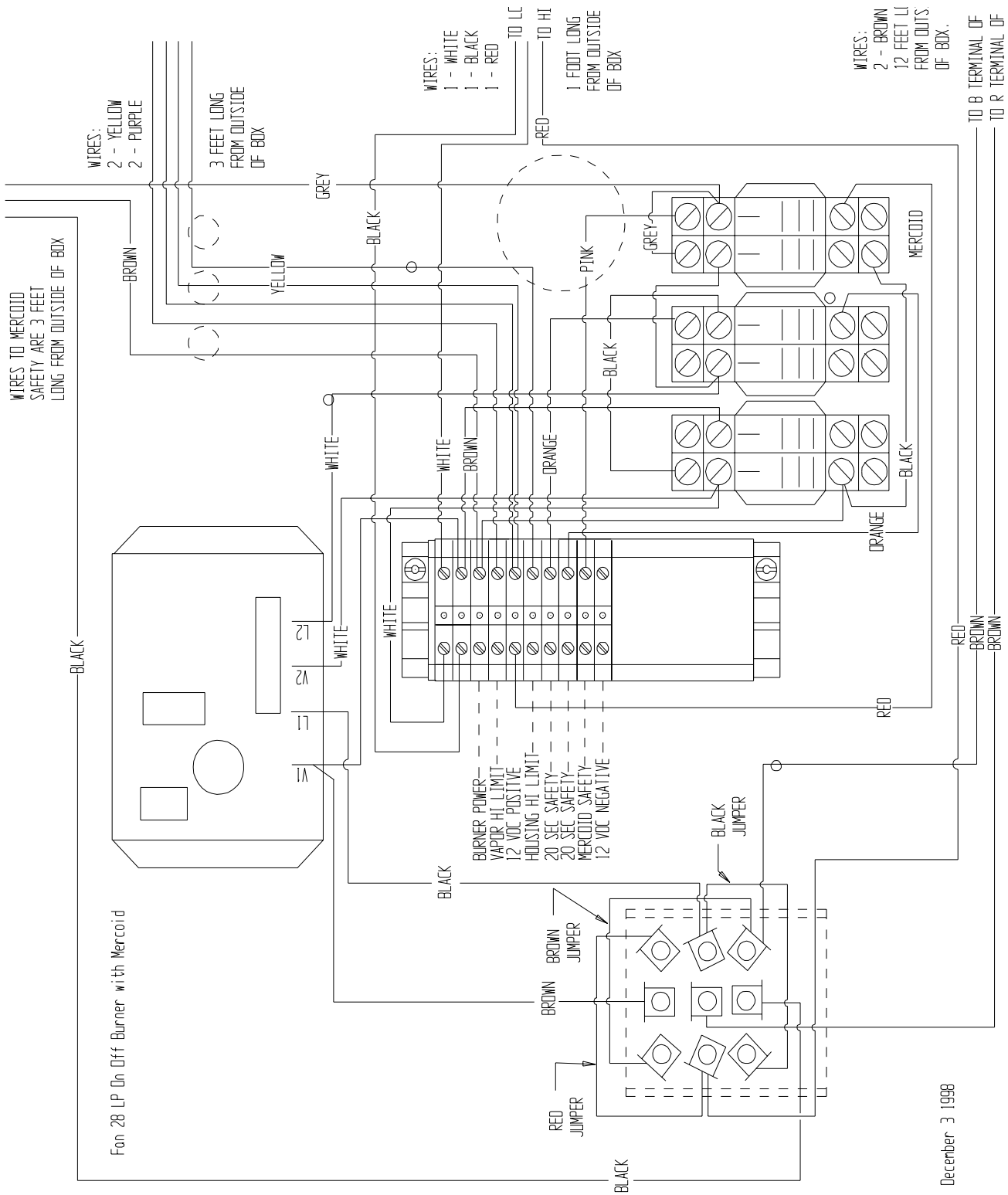
Conversion Diagram For C Series Dryers To A Switchable Hi/Low Burner Or A On/Off Burner



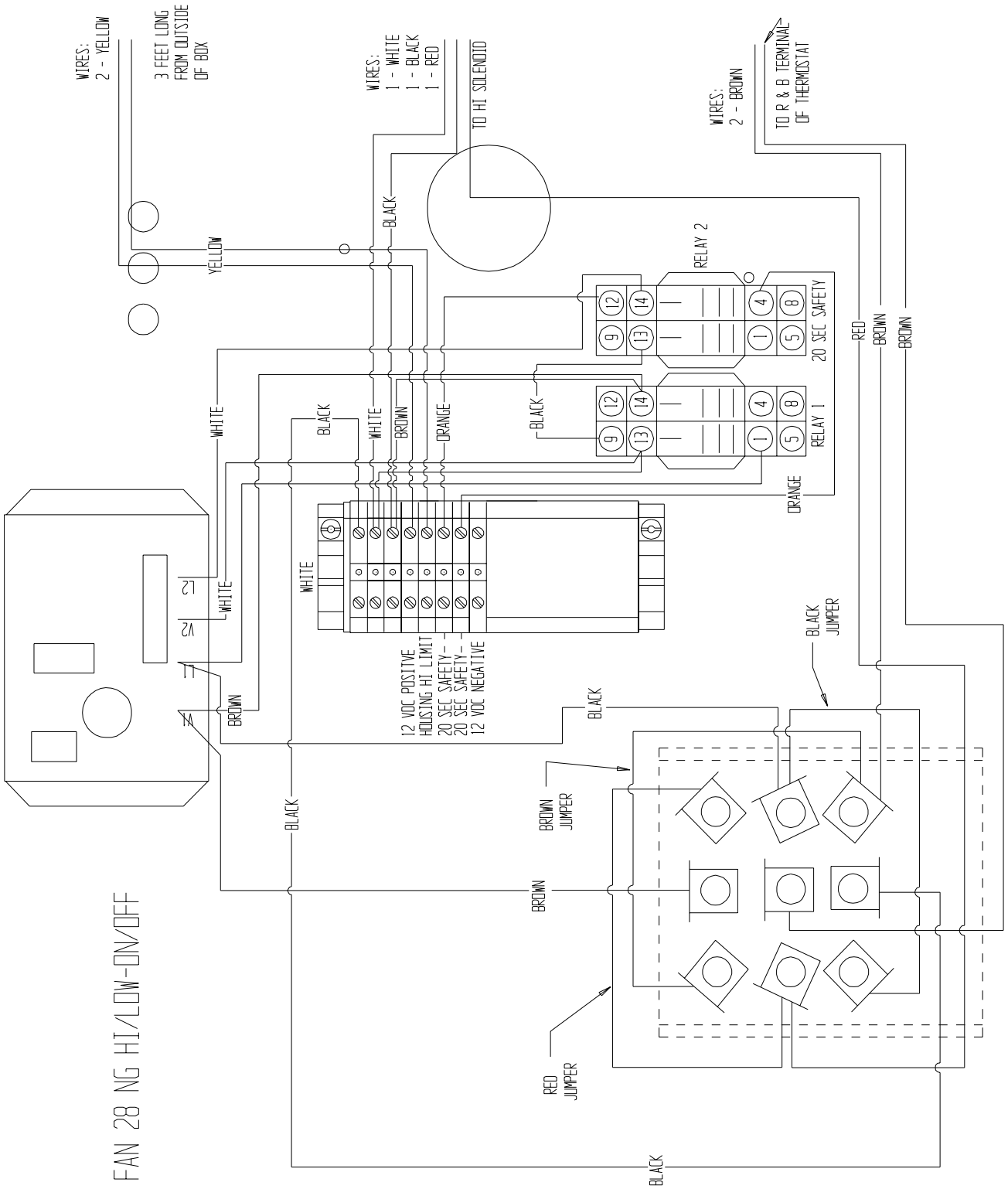
Fan 28 LP Hi/Low-On/Off



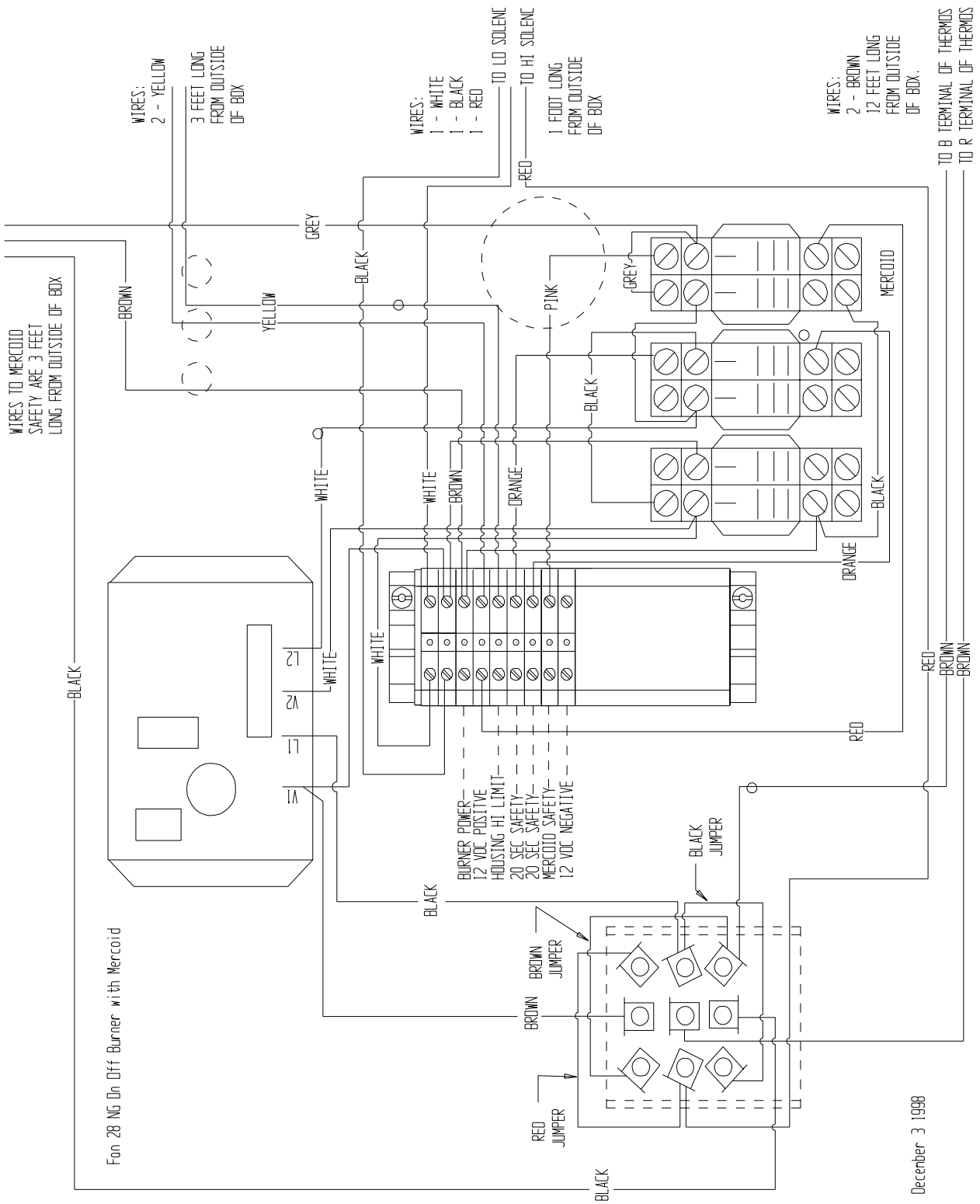
Fan 28 LP Hi/Low-On/Off Burner With Mercoid



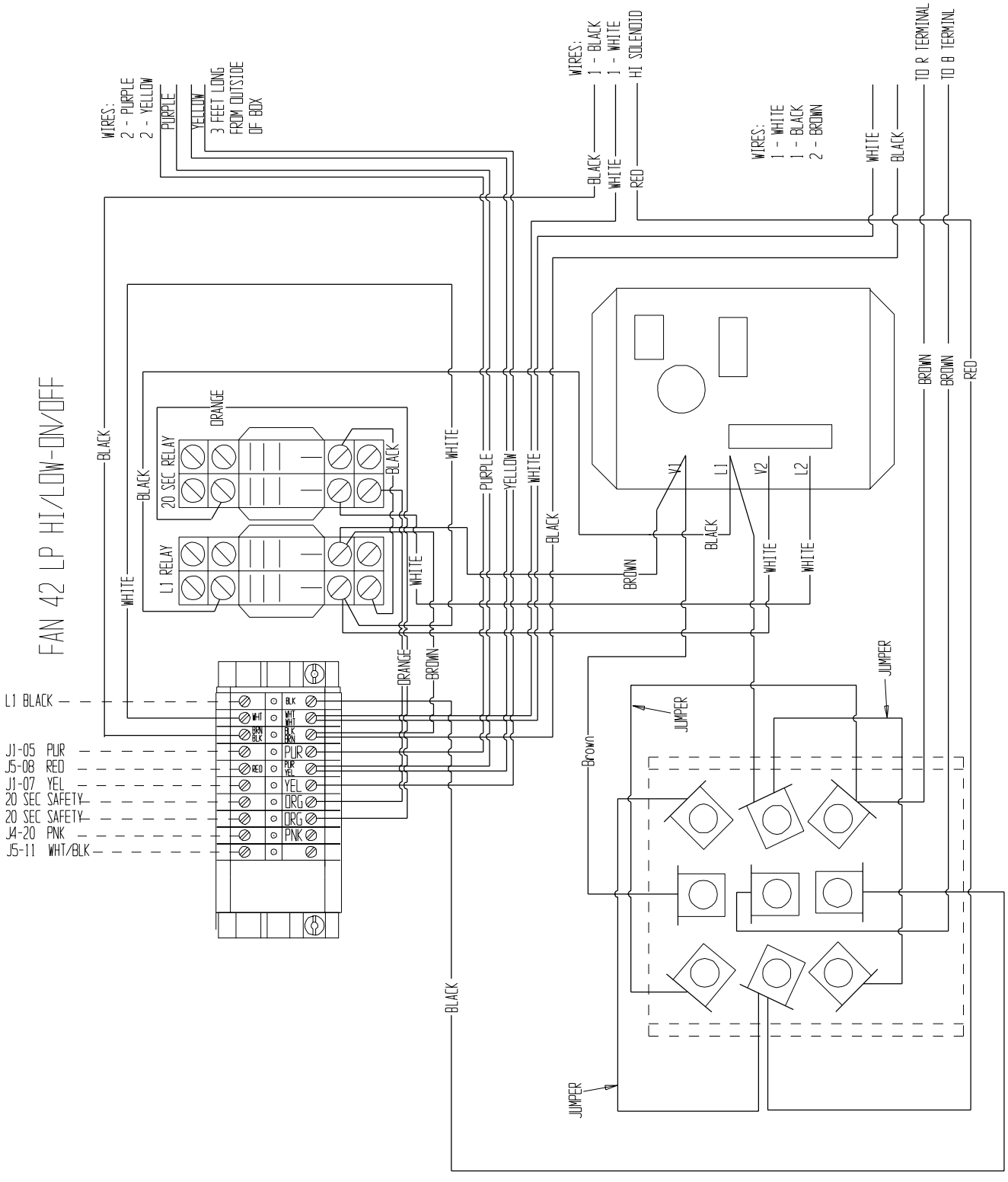
Fan 28 NG Hi/Low-On/Off



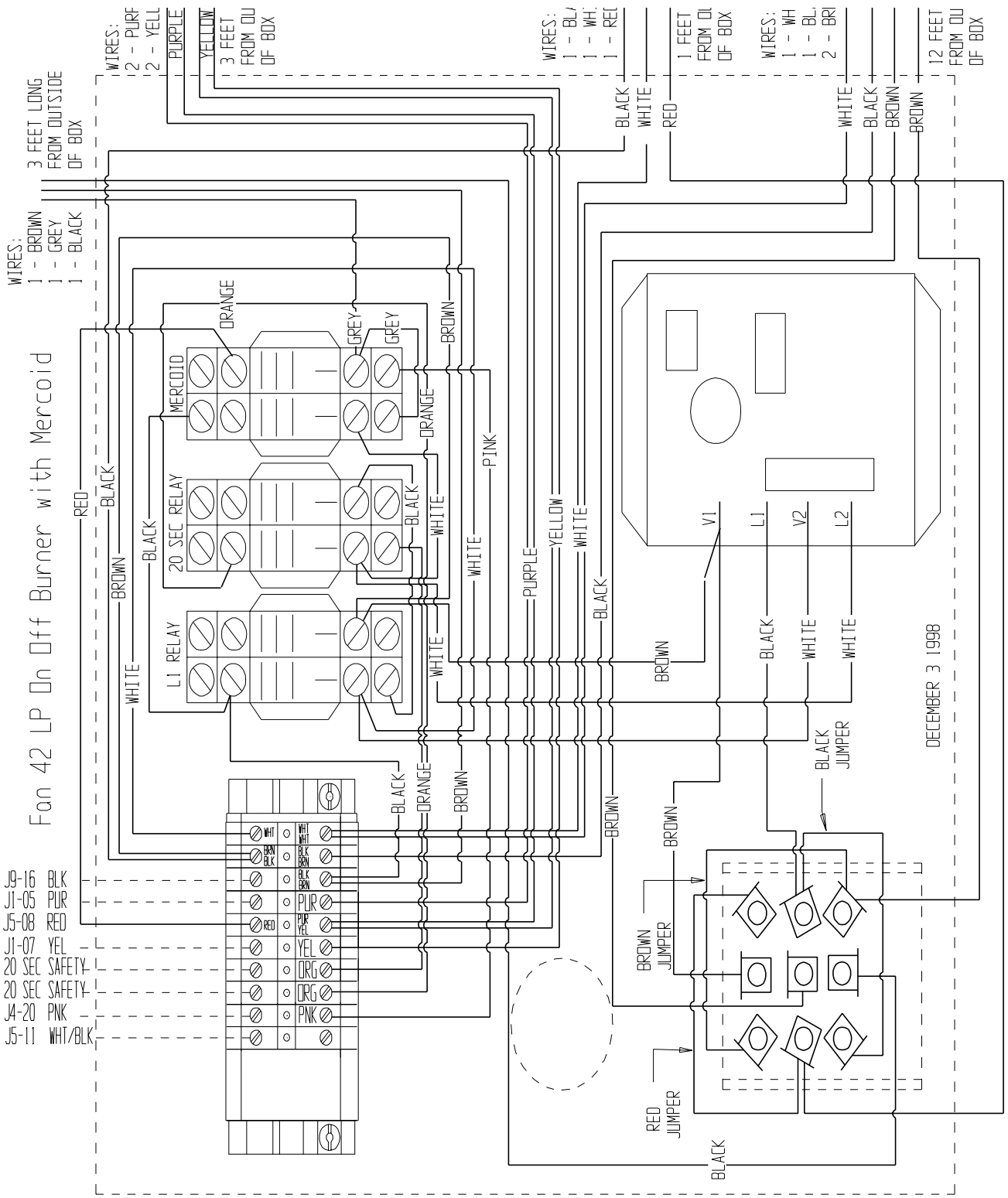
Fan 28 NG Hi/Low-On/Off Burner With Mercoid



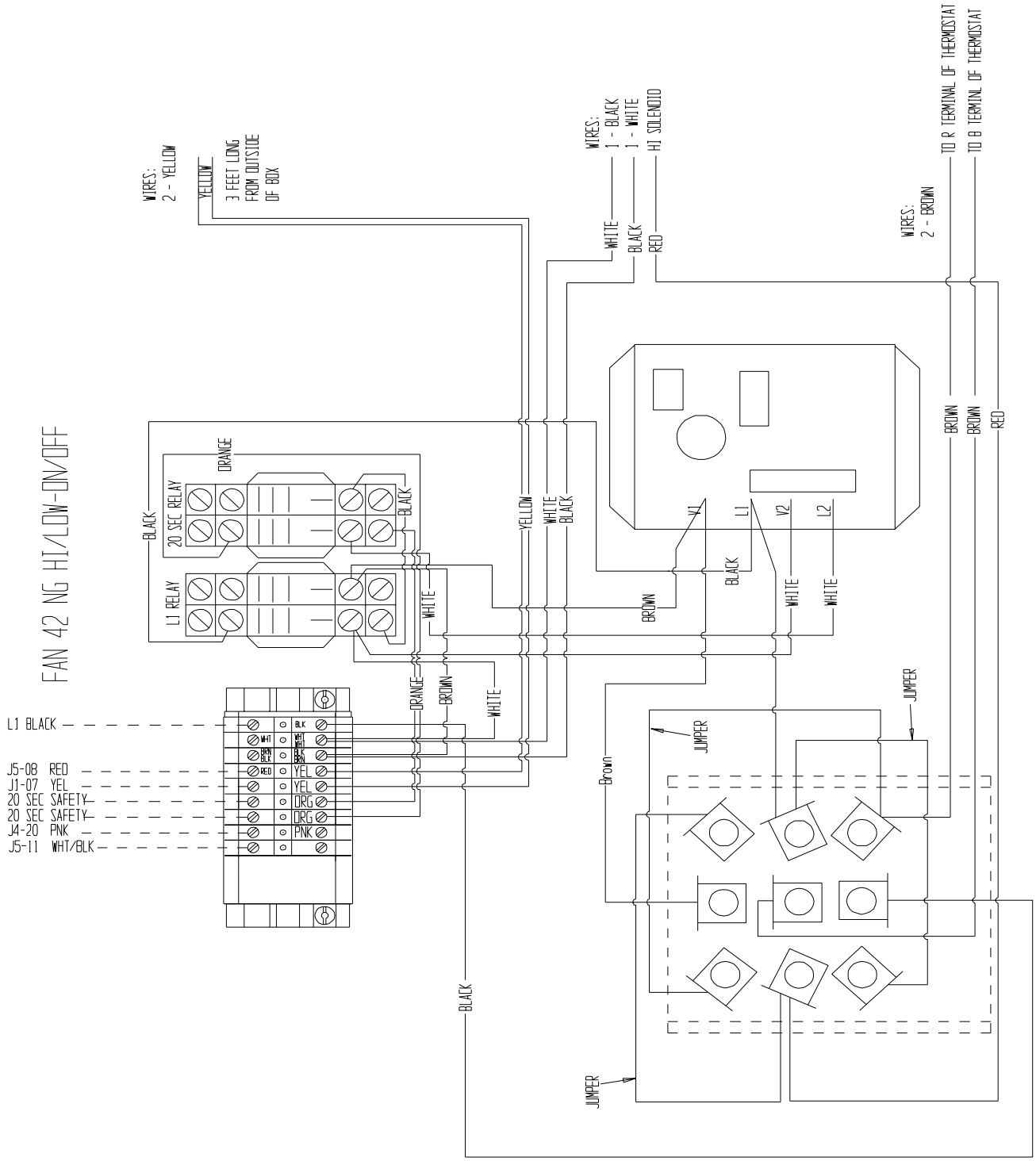
Fan 42 LP Hi/Low-On/Off



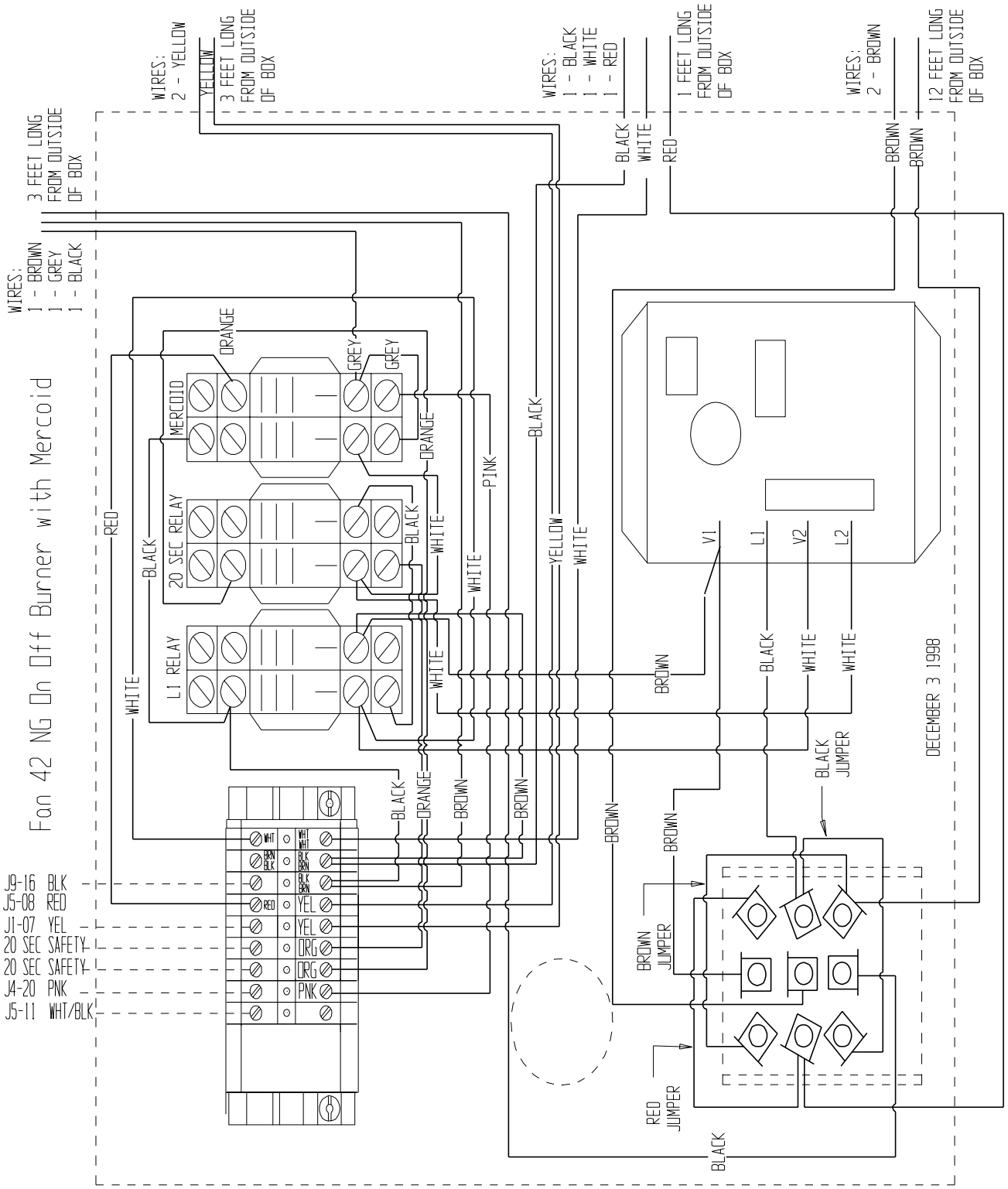
Fan 42 LP Hi/Low-On/Off Burner With Mercoid



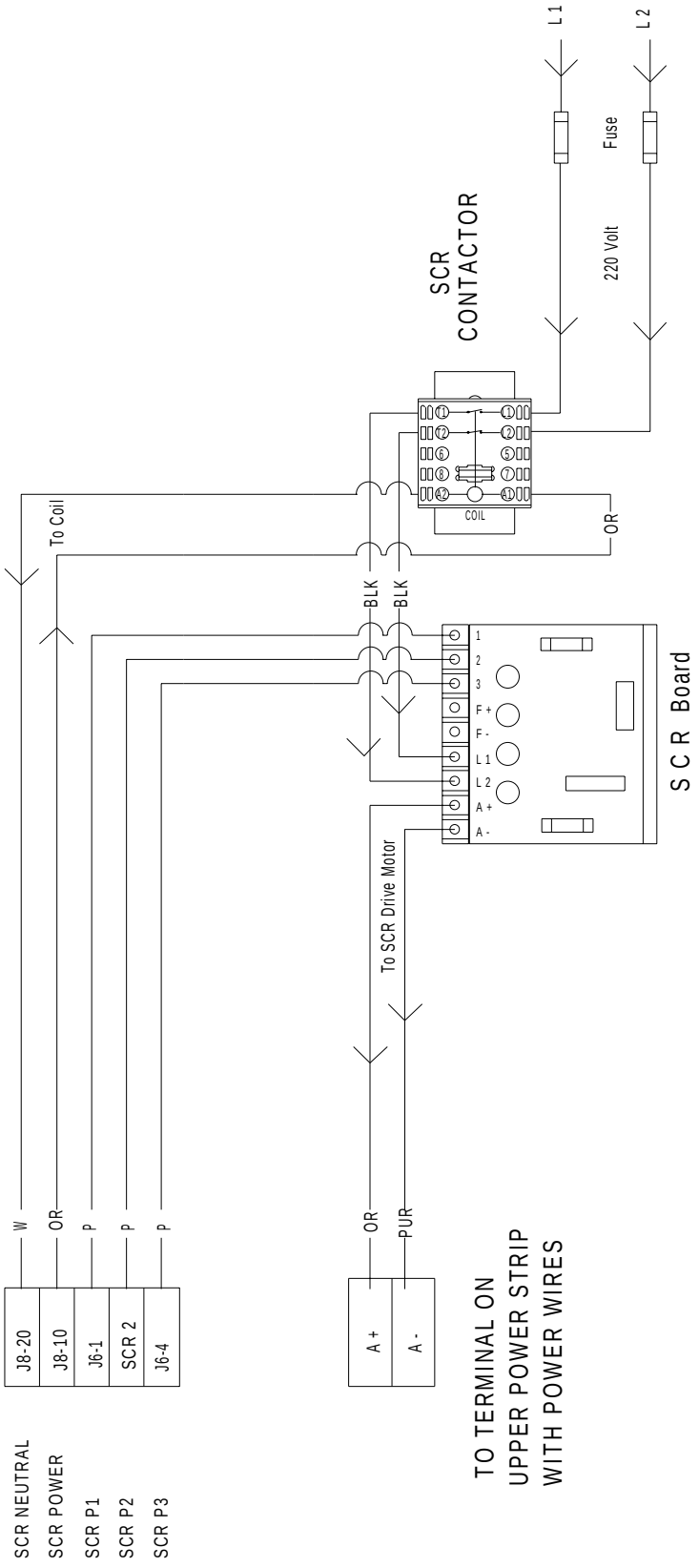
Fan 42 NG Hi/Low-On/Off



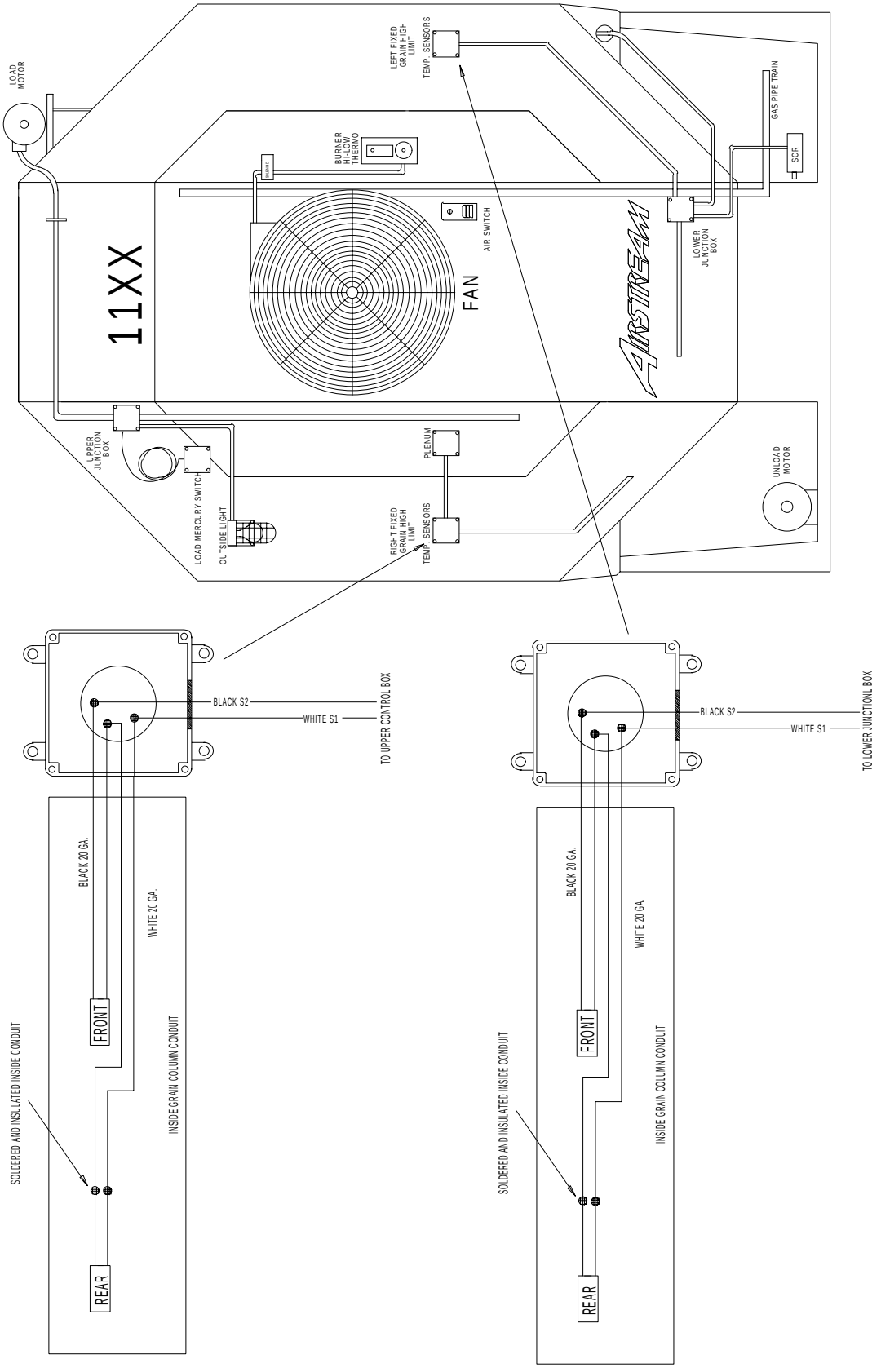
Fan 42 NG Hi/Low-On/Off Burner With Mercoid



SCR Drive Circuit



RTD Temperature Sensor



Test Procedure for E.M.C.S. Dryers

USING OHM METER BEGIN CHECKING
THE SENSORS FOLLOWING FIG. 1

IF OHMS DOES NOT = 3.4 K
CHECK LOWER AND UPPER TERMINAL
STRIP (ON SINGLE MODULES CHECK S1 & S2)
(ON DOUBLE OR TRIPLE MODULES
CHECK J6-9 TO J6-6 = 3.4 AND
CHECK J6-11 TO J6-8 = 3.4)

IF MEASUREMENTS DO NOT = 3.4 K
CHECK CONNECTIONS IN WHITE
JUNCTION BOX ON FAR LEFT AND
RIGHT SIDES FACING THE FAN END.

IF NONE OF THE MEASUREMENTS = 3.4 K,
THEN CHECK EACH INDIVIDUAL SENSOR.

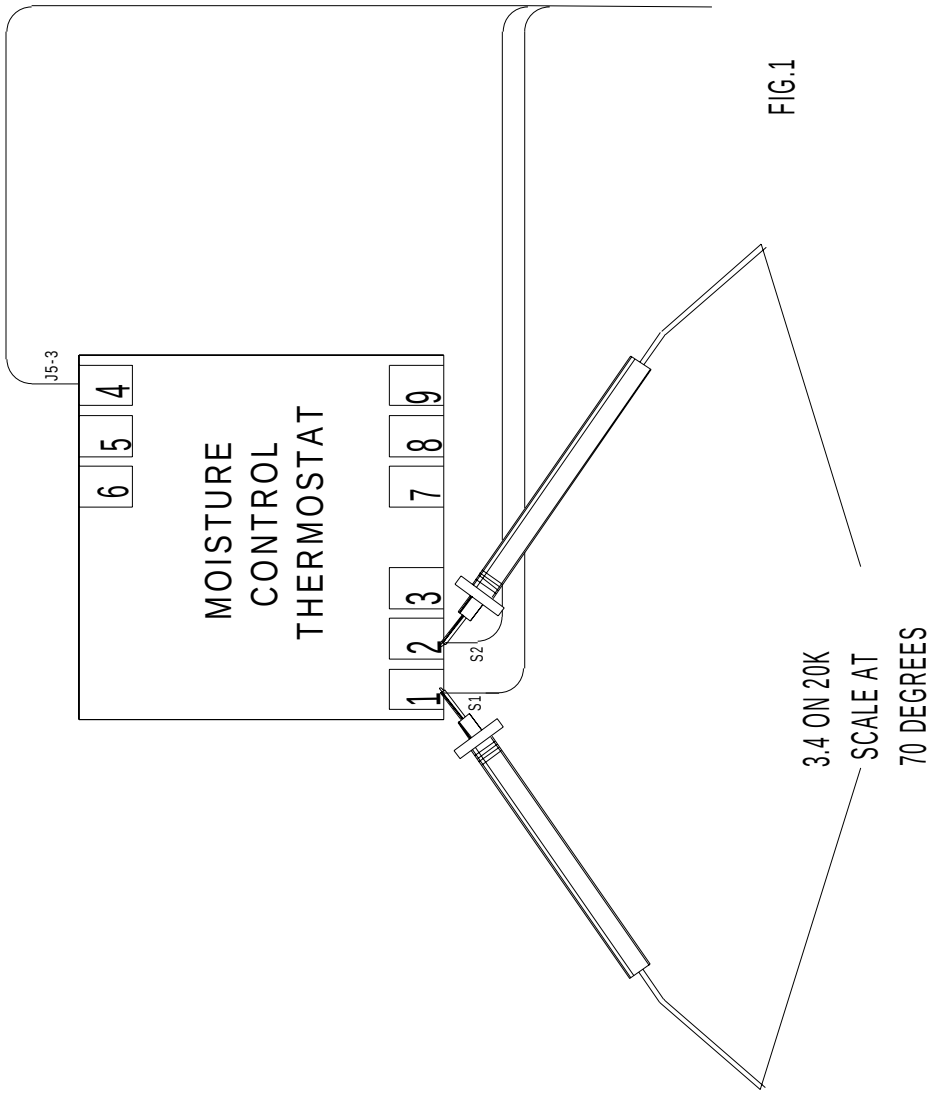
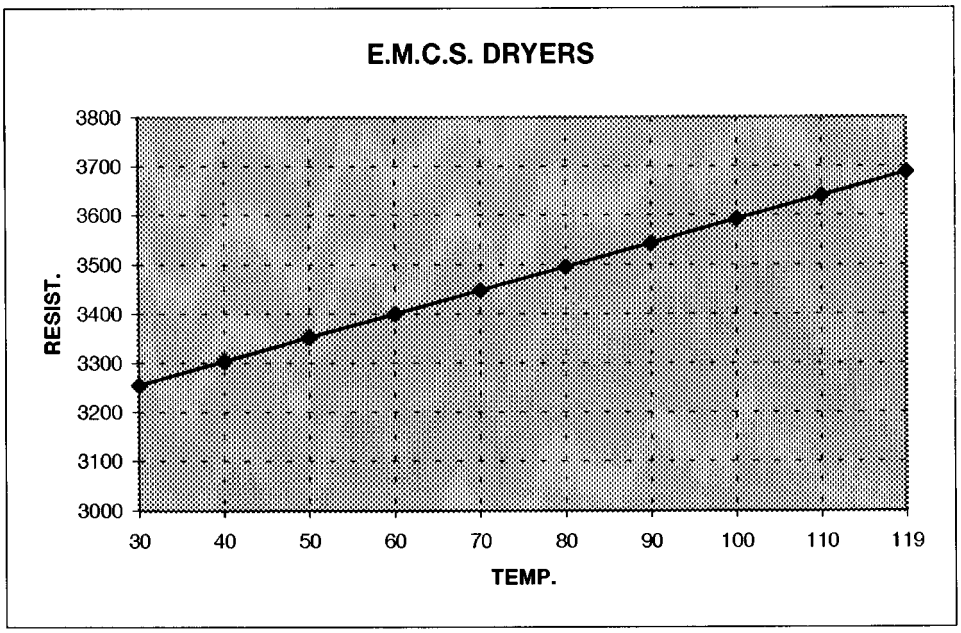
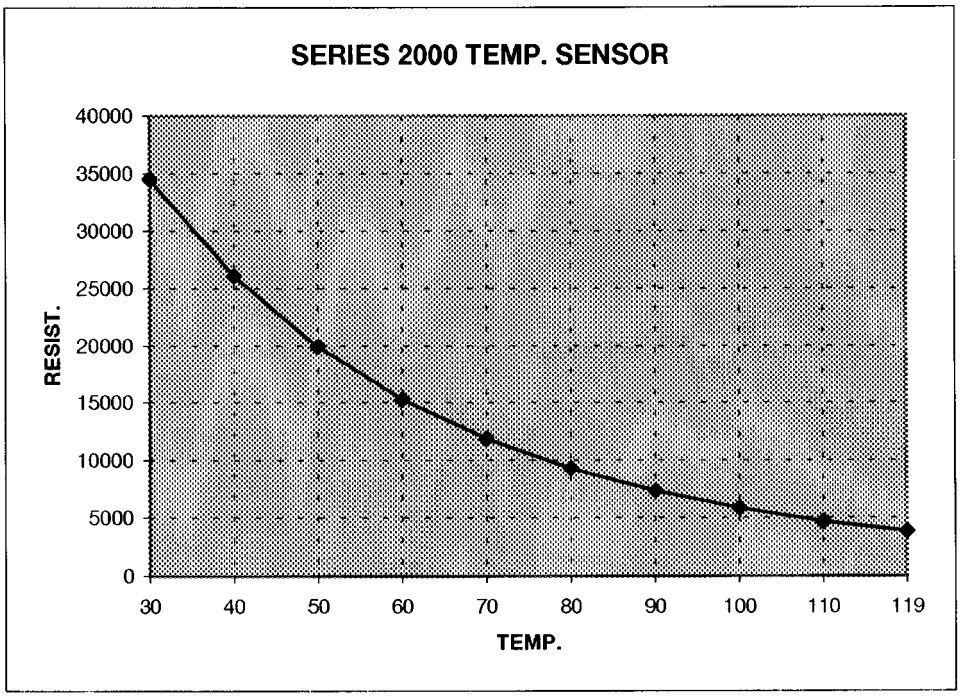


FIG.1





We use two (2) different types of sensors (NTC thermistor on the Competitor Series 2000, and an encapsulated sensor on the E.M.C.S dryer) in our dryers. The resistance of the sensors varies according to the outside temperature. For example, on the E.M.C.S. dryers, for every one (1) degree rise in temperature the resistance increases 4.8 ohms. However, on the Competitor Series 2000 dryer, the sensor reacts just the opposite, the resistance rises with colder temperatures. The charts displayed above will help when troubleshooting any sensor problems.

DC Drive Metering Roll System

Symptoms: Metering Roll will not turn, dryer shutdown-"Metering Roll Drive Failure"

Metering Roll Operation

- The DC drive system on the portable dryer is used to control the output of grain from the dryer. It is adjusted from the front of the control box using the high and low metering roll potentiometers. Components used in this circuit are the SCR contactor, SCR drive board, DC motor/ gear box, and the input/output board from the Electronic Monitoring Control System.

- All voltage for the drive system comes from terminals 1-(L1) and 3-(L2) of the SCR contactor. There should be 220 volts AC *across* these two points even if the unload system is turned off. If this voltage is zero, check your incoming main power.

- When the unload system is turned on you should be able to observe the SCR contactor energizing. The power to the contactor should turn on and off with the unload switch. You can check for power by putting an AC voltmeter *across* terminals *A1 and A2. Across these points you should read 120 Volts AC.* Also on the top of the contactor you can see a plunger pulling in whenever the contactor coil gets power. When the contactor is energized, power is transferred from terminals L1 and L2 to terminals T1 and T2. Understand that *L1 and L2 are the Input* of the SCR contactor and *T1 and T2 are the Output of the contactor.*

Check the SCR Drive Board

- Next if all the above checks out okay, put your voltmeter *across terminal L1and L2* of the SCR drive board. You should get 220 Volts AC across these points when the Unload Switch Is *in the 2 Speed position*. If this is present then the SCR contactor and input/output board are okay.

- If 220 volts AC is present across input of the SCR drive board (L1 and L2) then check for voltage across the output of the board. *Change your voltmeter to check for DC voltage* at a range above the 200 volt scale. Put the leads *across A+ and A-*. The voltage *across* these two points will vary depending on where the speed control potentiometer is turned. Also try turning the potentiometer up and down. The voltage should go from zero to approximately *180 Volts DC*. If zero voltage is present across the A+ and A- terminal, first try to disconnect the wires from these two points and then check for DC volts again. If the voltage returns, suspect a bad motor or a problem in the wiring to the motor. If the voltage does not return, suspect a bad DC drive board.

Check the Motor

- The wires attached to A+ and A- go directly to the DC drive motor on the dryer. You may remove the top cover of the motor and check for the same DC voltages mentioned above at the motor. If the voltage is not present try to disconnect the wires, then check for DC volts again. If you do not get any voltage then look for a broken or loose wire between the motor and the drive board terminals.

- If the voltage is present suspect the motor or the gear box. Removing the motor from the gear box and trying to run the motor only is one way of narrowing down the problem, or you may want to remove the chain and see if the metering rolls are froze up. Using a pipe wrench is an easy way to try and rotate the metering rolls.

Fenwal Ignition System

Symptoms: Burner will not light, dryer shutdown for "Loss of Flame"

Fenwal Ignition Operation

- The Fenwal Ignition System ignites the burner and monitors the flame. Once 120 VAC is applied to the Fenwal, the solenoids are powered up and the transformer begins ignition through the ignitor. If flame is sensed during the ignition period (about 4 seconds), the transformer is turned off, but the solenoids stay on. If no flame is detected after the ignition period, both the solenoids and transformer lose power and the dryer begins a shutdown sequence.

- All voltage for the Fenwal Ignition System is derived from the input/output board of the Electronic Monitoring Control System. For ignition to occur:
  1. The fan must be turned on.
  2. The pressure switch in the plenum must indicate the fan is operating.
  3. The burner switch must be in the auto or manual position.
  4. The dryer must go through a 10 second purge delay, which is indicated on the LCD screen.

  These steps must take place before troubleshooting of the Fenwal System can occur. The following assumes the above steps have been taken.

Fenwal Troubleshooting

- The Fenwal Board located in the fan can control box on the dryer has seven(7) terminals. They are L1, L2, V1, V2, S1, S2 and E2. L1 and L2 are considered the input to the board. After the 10 second purge delay, an AC voltmeter connected *Across L1 and L2 should read 120 Volts AC*. If this is true, you can assume the input/output board is operating properly and the problem is in the Fenwal Ignition System. If no voltage is present after the 10 second purge delay, check for voltage going through the auxiliary switch mounted on the side of the fan contactor for that burner. This switch has to close before the Fenwal gets power. If this is OK, check the appropriate output on the input/output board for that burner.

- If voltage is present across L1 and L2, check for voltage across the *Output* of the Fenwal board. The output terminals are *V1 and V2*, and they will also have *120 VAC across them for approximately four(4) seconds*. The four(4) seconds is the amount of time the Fenwal has to ignite and sense flame or it concludes no flame is detected and begins a "Loss of Flame" shutdown. If you have power on the in put terminals and no voltage on the output terminals, unload the secondary (take the wires off of V1 and V2) and recheck for voltage. If no voltage is present then suspect a bad Fenwal board. If power returns, look for a bad solenoid valve or a problem in the wiring.

Note: All of the above voltage checks can be bypassed if you can hear one or more of the solenoids on the gas train snap on after the 10 second purge delay. This is true because the solenoids are connected across V1 and V2, and for the solenoids to come on, power must be going through the Fenwal board. Also during the four(4) second ignition period the transformer is energized and you should be able to observe sparking across the ignitor. If the solenoids snap, but no ignition takes place, check for loose ignitor wires or check the ignitor condition/ignition gap (1/8 " to 3/16"). Remember even if flame is sensed the sparking will discontinue after the ignition period (4 seconds).

Continued on page 55.

Fenwal Ignition System continued...

Hints

- Hearing the solenoids snap on after the 10 second purge delay means that power is coming to and through the Fenwal board. The Fenwal board is probably okay.
- If flame is sensed, the power to the solenoids stays on but the power to the ignitor always goes off after about four(4) seconds.
- Power to the low pressure solenoid is always on anytime flame is sensed. This is because the power to the low solenoid is hooked directly across terminals V1 and V2 of the Fenwal board.
- Power to the high pressure solenoids is controlled by the Plenum thermostat. One side of the solenoid is hooked to V2(neutral) and the other side is run through the normally closed switch of the thermostat and then back to V1. This is how the burner is made to cycle. When the plenum is below temperature, power is run through the thermostat to the high pressure solenoid. When temperature is reached, the thermostat opens and the high solenoid loses power.
- L2 and V2 are connected internally in the Fenwal, and they *must be nuetral*.

Ignitor Tips

- Make sure that the ignitors are mounted correctly through an opening in the burner skirting. Also, make sure that they are not close enough to the edges of the opening to cause a spark to jump the skirting, instead of between the ignitors.
- Be sure that the ignitor tips are no more than 1/8" apart from each other.
- Make sure that the wire connections on the ignitors are good and tight.
- On stubborn lighting burners reverse the direction the ignitor tips are facing. Instead of having the tips pointing toward the fan or burner, change the direction so the tips are facing the exhaust end of the dryer. (This is especially true on burners with no burner cone installed (i.e. Natural Gas).

Metering Roll Sensors

Symptoms: No BPH, Total Bushels, RPM displayed on LCD or dryer shutdown with metering roll problems

Metering Roll Sensor Operation

- Each metering roll on the portable dryer has a sensor mounted to read pulses as the metering roll is turning. These pulses are transmitted to the input/output board of the Electronic Monitoring Control System. The computer interprets this information and then displays the data on the LCD screen.
- All voltage for the metering roll sensors is derived from the input/output board of the Electronic Monitoring Control System. The sensors are operated with *12 Volts DC from terminals J5-9 and J5-12 on the board*. When checking for voltage the negative or black probe (-)of a voltmeter should always go to terminal J5-12.

Always use j5-12 for the negaitve anytime you check for any DC voltage on the dryer.

Then put the red probe (+) of the voltmeter on terminal J5-9. Across these two points there should be 12 volts DC. This voltage needs to be checked, but you can be reasonably assured the 12 volts DC is present if the rest of the dryer is operating. Check for this voltage on the terminal strip in the upper control box.

- 12 volts DC is transmitted from J5-8 and J5-12 *directly* to the metering roll sensors located on the back of the dryer. Each of the metering rolls is enclosed in a white plastic box mounted to the back of the metering rolls. Inside each box is the metering roll sensor and the metering roll wheel.

- Each sensor has three(3) wires connected to it. Two(2) of these wires are the incoming 12 volts DC (the T1-+12V and T2-GND terminals), and one is a pulsing 12 volts DC back to the input/output board (the T3 out terminal). Checking across T1 and T2 will verify that 12 volts DC is getting to the sensor.

- The T3 (out) terminal is what delivers the metering roll information back to the input/output board in the main control box. The information for the metering roll on the left side of the dryer is sent on a yellow wire and goes to terminal J5-16. The information for the metering roll on the right side is sent on a blue wire and goes to terminal J5-19.

- You can use a DC voltmeter to observe this pulsing voltage. The best place to check for this voltage is directly on the input/output board located in the very back of the lower control box on the dryer. Check for a pulsing voltage from J5-16 to J5-12 (negative) and J5-19 to J5-12 (negative). Across each of these test points you should be able to observe a pulsing DC voltage when the metering rolls are turning. You should be able to speed up or slow down the pulses by turning the speed of the metering rolls up or down.

Note: Because a digital voltmeter cannot react fast enough you may not see a full 12 volts DC, instead you may see a pulsing from zero to about eight(8) volts.

Hints

- When checking for a pulsing voltage on J5-16 or J5-19 you should always leave the voltmeter across the terminals for about 30 seconds. Watch the meter closely. Each pulse should be about the same length and about the same time apart. If this is not true, suspect a problem with the sensor on the back of the dryer.

Air Pressure System

- When inspecting the sensor make sure that the wheel going through the sensor is positioned in the center and is not touching either side. If the sensor is scratched it is either bad or will probably go bad.

Airflow Operation

Symptoms: Dryer will indicate a "Loss of Airflow"

- After turning on a fan the computer must get a signal from the air pressure switch telling it that the fan is actually running and the plenum has been pressurized. If the switch does not show the air pressure within 20 seconds a "Loss of Airflow" shutdown occurs.

Troubleshooting: "Loss of Airflow"

- This error message indicates that the fan is running and the air pressure in the plenum did not pressurize. First, verify that the fan is running, and the dryer is full of grain. There must be grain in the dryer or no pressure will develop. If the fan does come on and the dryer is full of grain, but a "Loss of Airflow" shutdown still occurs, check the air pressure switch circuit.

- Watching the blue light in the fan switch is the easiest way to tell if the air pressure switch is sensing air pressure. Each air pressure switch has a light in the fan switch that will only come on if air pressure has developed. Turn on the fan and after it has run up to about one half of its operating speed the light should go on. If the fan light is not coming on then the air pressure circuit is not sensing pressure.

- Try adjusting the air switch on the front of the plenum to see if it is just out of adjustment. Use a straight blade screwdriver and turn the adjusting screw counterclockwise. Turning it this way makes the switch more sensitive to pressure and will turn on the light easier.

- If adjusting the screw does not solve your problem consult the layout diagram of the input/output board. Look for the input for the problem switch. Example: Fan #1 switch's input is J1-13. This is a 12 volt DC input and it can be checked with a DC voltmeter. One of the following conditions will exist when checking this input.

  NO AIR PRESSURE---ZERO VOLTS
  HAS AIR PRESSURE---12 VOLTS DC

  Remember when checking for 12 volts DC you should always use one of the DC negatives for the black probe(-) of your voltmeter. Some of the terminals that may be used for the negative(-) are J5-11, J5-12 or J5-13.

- To check fan #1 for air pressure with a voltmeter:
  1. Turn on the dryer.
  2. Place the black probe(negative) of your voltmeter on J5-11 or J5-12.
  3. Place the red probe(positive) of your voltmeter on J1-13. At this point there should be zero volts here because the fan is not running.
  4. Turn on the fan and watch your voltmeter.

- If the air switch is adjusted properly you should have zero volts across these test points when you first turn on the fan. After the fan has run up to about one half of its normal operating speed you should see the voltmeter change from zero volts to 12 volts DC. This also works in reverse when turning off the fan. After the fan is first turned off, the voltmeter should still show 12 volts DC until the fan has slowed down to about one half of its operating speed. This is because even though the fan is turned off it is still turning and developing some pressure in the plenum.

- If all the above fails to work then remove the two wires while blowing into the air tube. Blowing into the switch is the same as having air pressure in the plenum. You should have an open circuit until you blow into the switch, then it should close. If the switch does not close try adjusting it, or replace it with a known good one.

Hints

1. Dryer must be full of grain.
2. Light in the fan switch can be used exactly like a voltmeter to test.
3. Make adjustments of the pressure in one quarter turns.
4. Make sure the air tube in the plenum is not plugged after sitting over the summer.
5. Check the bulb in the fan light. It is a 12 volt bulb.

Vapor High Temperature

Symptoms: Dryer runs for only a short period of time, then a shutdown occurs.

- This message indicates that the vaporizer on an LP Dryer is not properly adjusted. LP (liquified petroleum) must be vaporized before the burner can operate properly. If LP is being fed to the dryer it must run through a vaporizer before it can be burned. If the vaporizer is getting the fuel too hot it will cause a Vapor High Limit shutdown.

- The vaporizer is located in the fan/heater unit. It is wrap of pipe mounted inside the fan can directly in front of the burner. It can be seen by looking through the inspection door on the side of the burner.

- To properly adjust the vaporizer a 1/2" wrench is needed. Knowing that the gas can get too hot, you must feel the pipe train before the regulator to check this temperature. This point may be very hot so be careful while checking the temperature. *The temperature before the regulator must be warm to the touch.* This point cannot be hot, nor can it be cold...only warm. Use the 1/2" wrench to loosen the hold down bracket on the vaporizer. Move the vapor izer away from the flame to cool down the pipe train or move it closer to the flame to make the pipe train warmer.

Troubleshooting: Vapor High Temperature

- The dryer will shutdown but will probably restart as soon as the computer is reset. This is because the high limit is an automatic reset and after the dryer shuts down it allows the pipe train to cool down.

- After the dryer is reset, it will run from a few seconds to a few minutes and then shutdown again. This is because the Vapor High Limit is heating up again as

soon as the burner is turned on. The vaporizer must be adjusted to solve this problem.

Using J5-11 as the negative test point for all voltage tests, check for 12 volts DC using the following terminals to help diagnose the problem:

Fan #1-J1-5	Fan #2-J1-6
Fan #3-J2-5	Fan #4-J2-6
Fan #5-J3-5	Fan #6-J3-6

Remember that each of these input terminals is part of the main safety circuit of the dryer, and *each must have 12 volts DC on it before the dryer will operate.*

Vapor High Limit Hints

1. Anytime you adjust the Vapor High you should wait and be sure that the pipe train temperature stays constant. It may slowly allow the pipe train to get hotter or colder the longer the dryer runs.

2. If a dryer is shutting down constantly from a Vapor High Limit, it may also be caused from a gas line that is exposed to direct sunlight. If the fuel line to the dryer is exposed to direct sunlight, the liquid in the line will start to vaporize before it even gets to the dryer. Then, when it runs through the vaporizer it gets too hot and causes a shutdown (no matter where you try and adjust the vaporizer). This problem can be helped by insulating the gas line from outside heat.

3. In extreme cases the vaporizer may have to be changed before it will run the proper temperature. Example: If a dryer has a burner with a three wrap vaporizer and the dryer is located in the southern United States, you may have problems adjusting thevaporizer far enough from the flame. In this case, you may have to install a two wrap vaporizer. The two wrap has less surface area and it will not heat the LP quite as much. This may also be true in colder climates where a two wrap will not heat up enough. In this case, the pipe train may develop frost or even freeze the solenoids open.

4. The Vapor High Limit is an automatic reset safety device. It will reset itself as soon as its temperature drops below 190° F. Because the pipe train of the burner cools down rapidly when there is a dryer shut down, the Vapor High Limit will generally be cool before the operator gets back to the dryer. As soon as he hits the stop button to reset the computer, it comes back up to normal operation. It appears that the dryer is shutting down for no apparent reason. Usually if this happens the dryer will shut down again a short while after restarting the dryer.

5. If the LP tank feeding the dryer is getting very low on fuel, it can also cause the dryer to shutdown on a Vapor High Limit. Before adjusting the vaporizer always check the fuel level in the customers tank. If the fuel pressure is very low, try suggest ing that the tank be refilled. Usually this will solve the problem.

Out Of Grain Warning Shutdown

Out Of Grain Warning

- This message indicated that the dryer has run low on grain. The shutdown occurs when the loading equipment has run longer than the time the operator has set on the Out of Grain timer. *The mercury switch located on top of the dryer tells the computer when the dryer is full or calling for grain*. The shutdown usually occurs when the loading equipment is having trouble keeping up with the output of the dryer.

Possible Solution

- Look at the loading equipment to see if this is the problem. Remember, the top hopper of the dryer should always have grain in it. If any of the side screens are opening up at anytime, then you are losing heat along with efficiency. This indicates that you are not filling fast enough. *Speed up the loading equipment to the dryer.*

- *Using J5-11 for the test point ground, test for 12 volts on J5-4 to test the load mercury switch*. This switch should have 12 volts DC on it when the dryer is calling for grain and has zero volts on it when the dryer is full.

Out of Grain Hints

1. The out of grain timer is only in use when the fill switch is in the auto position. In the manual position the top mercury switch will still shut off the fill auger, but the dryer will not shutdown if the source of grain to the fill auger is depleted.

2. Before setting the Out of Grain timer, monitor how long it takes the dryer to refill for shrink. Then, set the Out of Grain timer accordingly. Example: If a dryer takes six minutes to refill for shrink, add an additional five minutes to this, and use this as the amount of time to program into the Out of Grain timer. The additional five minutes is to avoid any nuisance shutdowns. A lot of customers don't want their fill augers to run empty if the source of grain runs out. They may want to set the Out of Grain timer closer than the additional five minutes. (this is fine, but caution the customer that it may cause some nuisance shutdowns.)

3. For the Out of Grain warning to work properly, the fill equipment must be large enough to handle the capacity of the dryer. You do not want the side columns to get low on grain. This will allow the airflow to escape from the dryer through the side screens. If this happens you lose efficiency and may start having a loss of airflow shutdown.

Motor Overload Shutdown

This indicates that one of the Motor Overloads has tripped, shutting down the dryer. Each of the Motor Overloads is located in the upper main power control box. They are all wired into a single series circuit that goes to the input/output board on terminal J4-12. Before the dryer will start terminal J4-12 must have 12 volts DC present, or the Motor Overload shutdown will occur.

Visually inspect each of the overloads. You can tell by looking at them if a trip has occurred. Simply press the reset handle on the overload to reset it. After resetting the overloads press the stop button to clear the error.

If no overloads are tripped try the following voltage tests: Using terminal J5-11 as the negative terminal for all DC voltage checks. Look for 12 volts DC on terminal J-419. This is the terminal that feeds power to the Motor Overloads. If the 12 volts DC is present then check for voltage on J4-12. During a Motor Overload shutdown J4-12 should have zero volts. If you have power going to and not returning to J4-12 inspect the siring from J4-19 to the overloads and then back to J4-12. If the wiring is okay, turn off all power to the dryer and do a continuity check from J4-19 to J4-12. This must be closed circuit to operate properly.

Motor Overload Helpful Hints

1. Each of the Motor Overload is run in a series circuit. This means, if any of the Motor Overloads trip, a shutdown will occur. Visually inspect the overload to tell which has caused the shutdown.

2. Even though GSI uses ambient compensated overloads, hot weather or positioning the dryer control box in the sunlight may cause a Motor Overload shutdown to occur. This can usually be tested by trying to run the dryer with the control box door open a little bit.

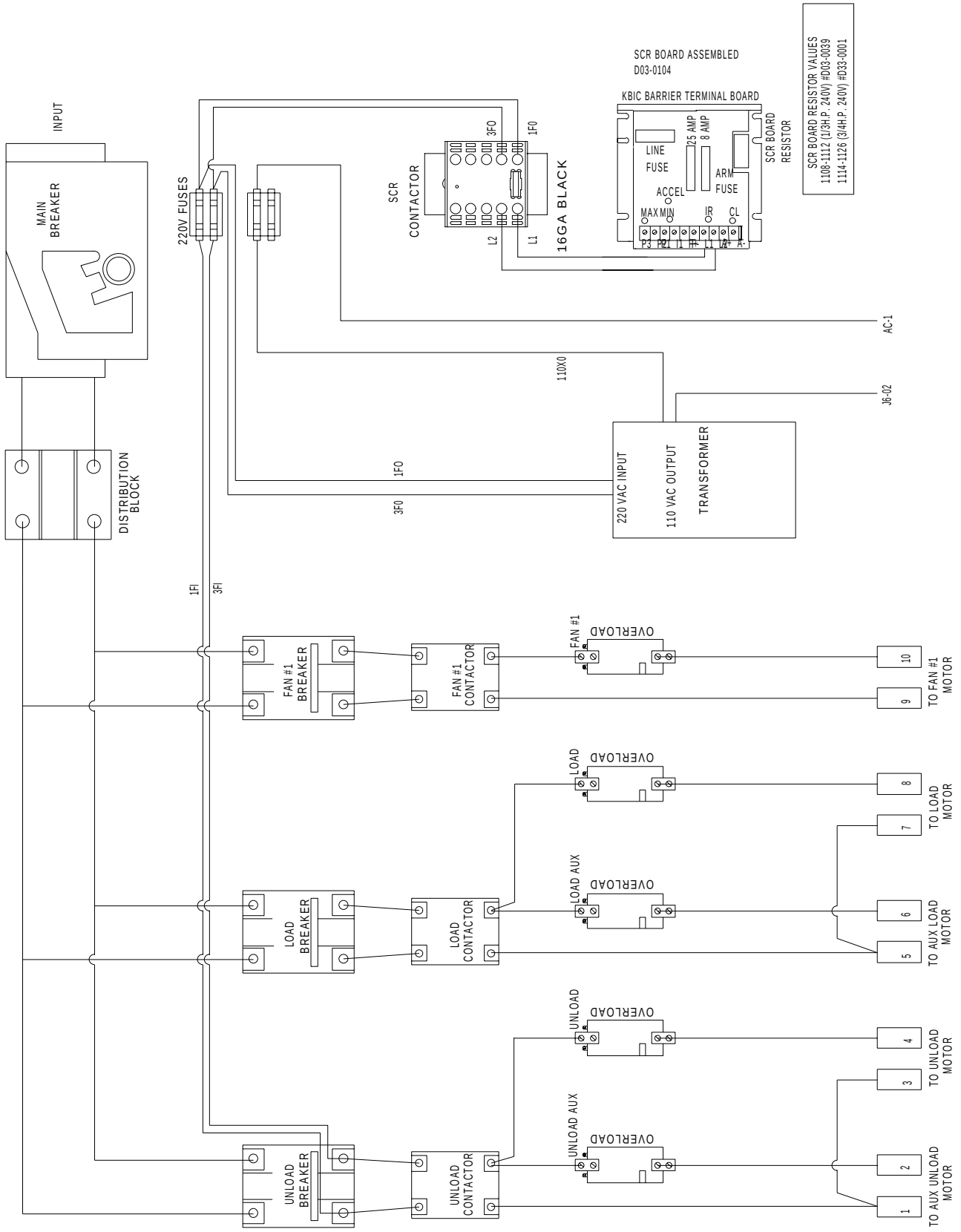
3. Each of the overloads has an adjustable trip setting that can set up to 115 %. At 115% the overload will hold in longer before it trips.

4. Always check amperages on the motors to be sure that the problem is not in the motor itself.

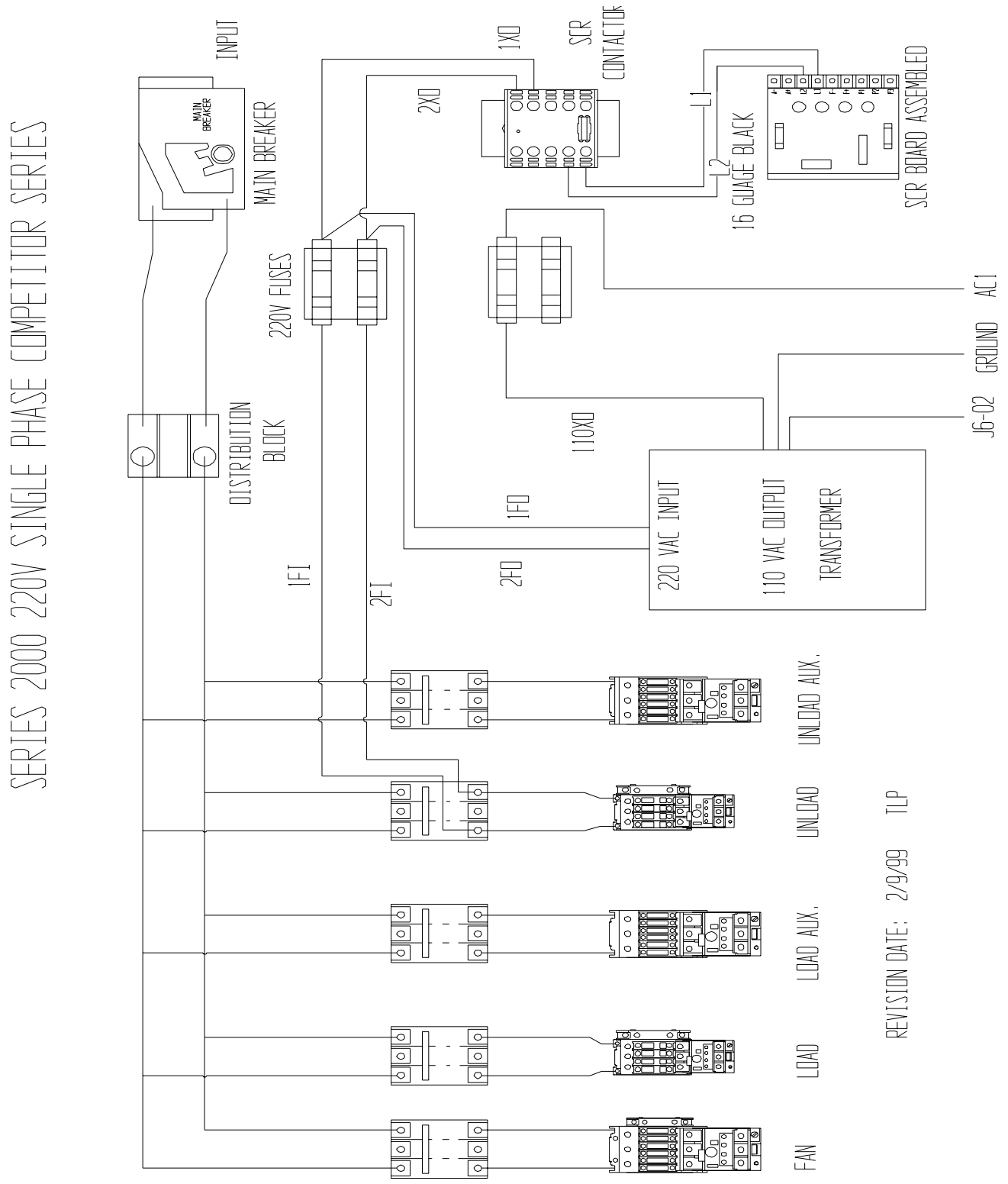
5. Remember that each motor has a built-in service factor. This allow the motor to actually run over the rated full load amps. The motor manufacturers have allowed GSI, *on a number of applications*, to run motors over the full load amp rating. this is possible because they are being used in an air over application.


122
GSI

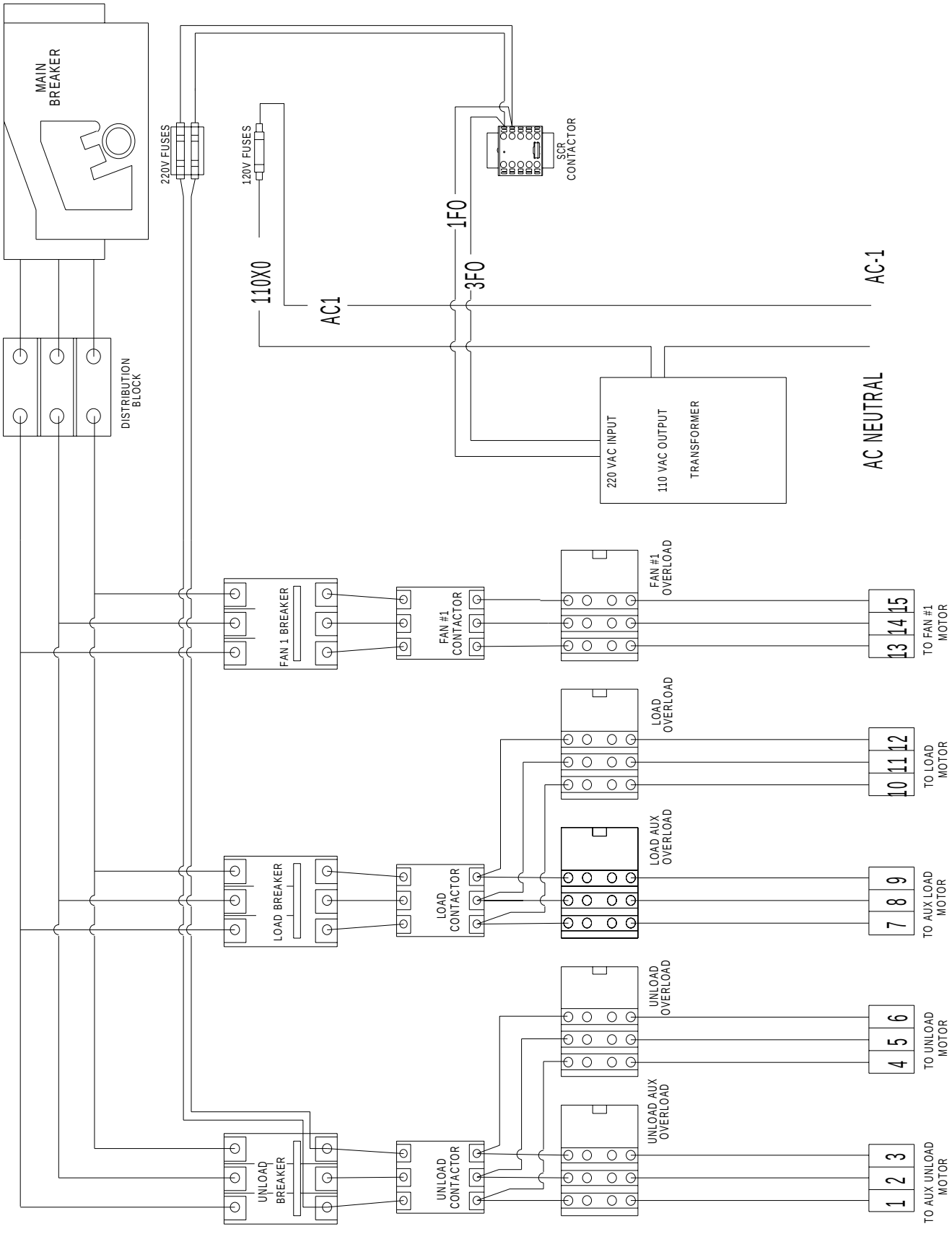
220 Volt Single (1) Phase Power Drawing



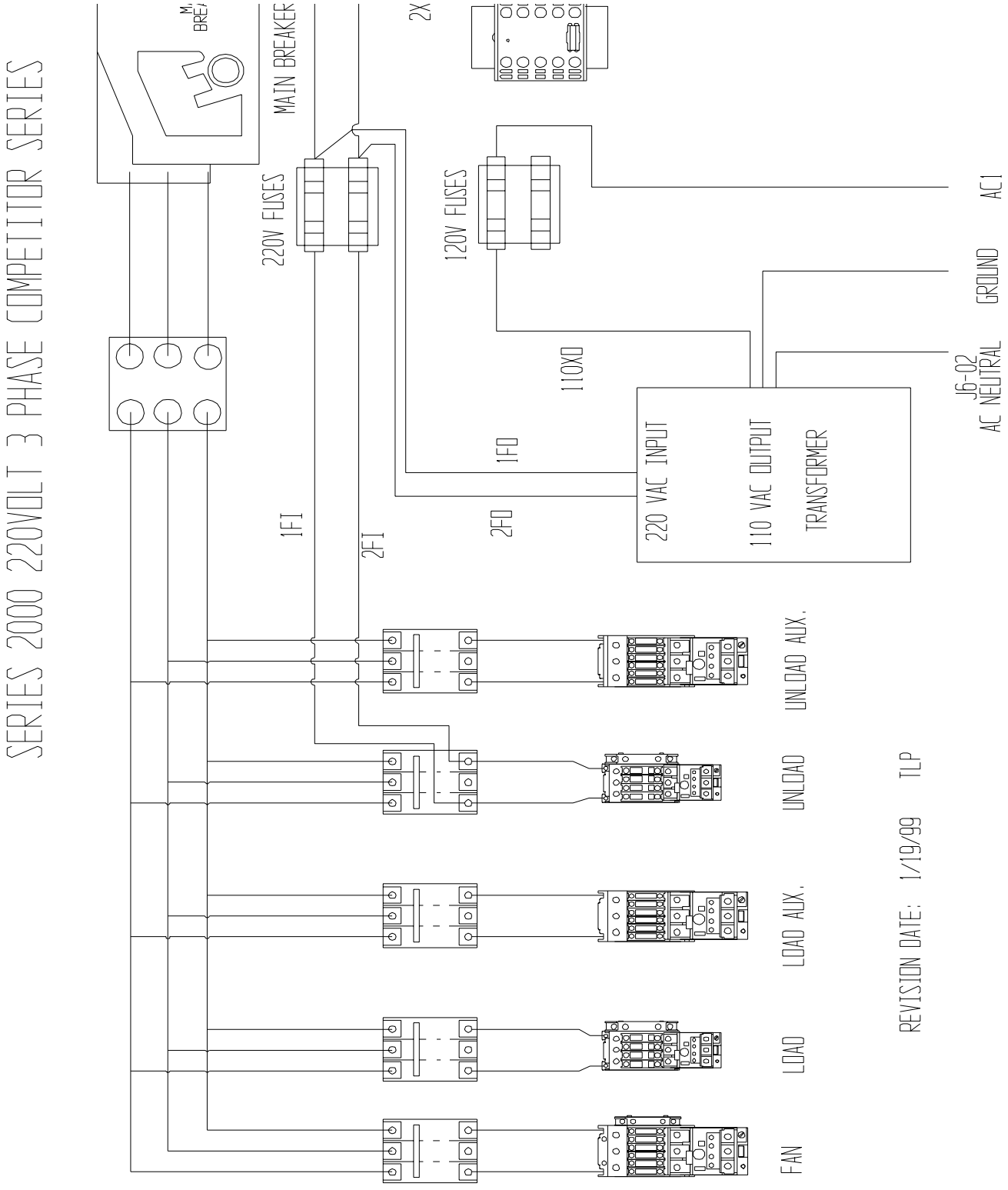
220 Volt Single (1) Phase Power Drawing (New Version)



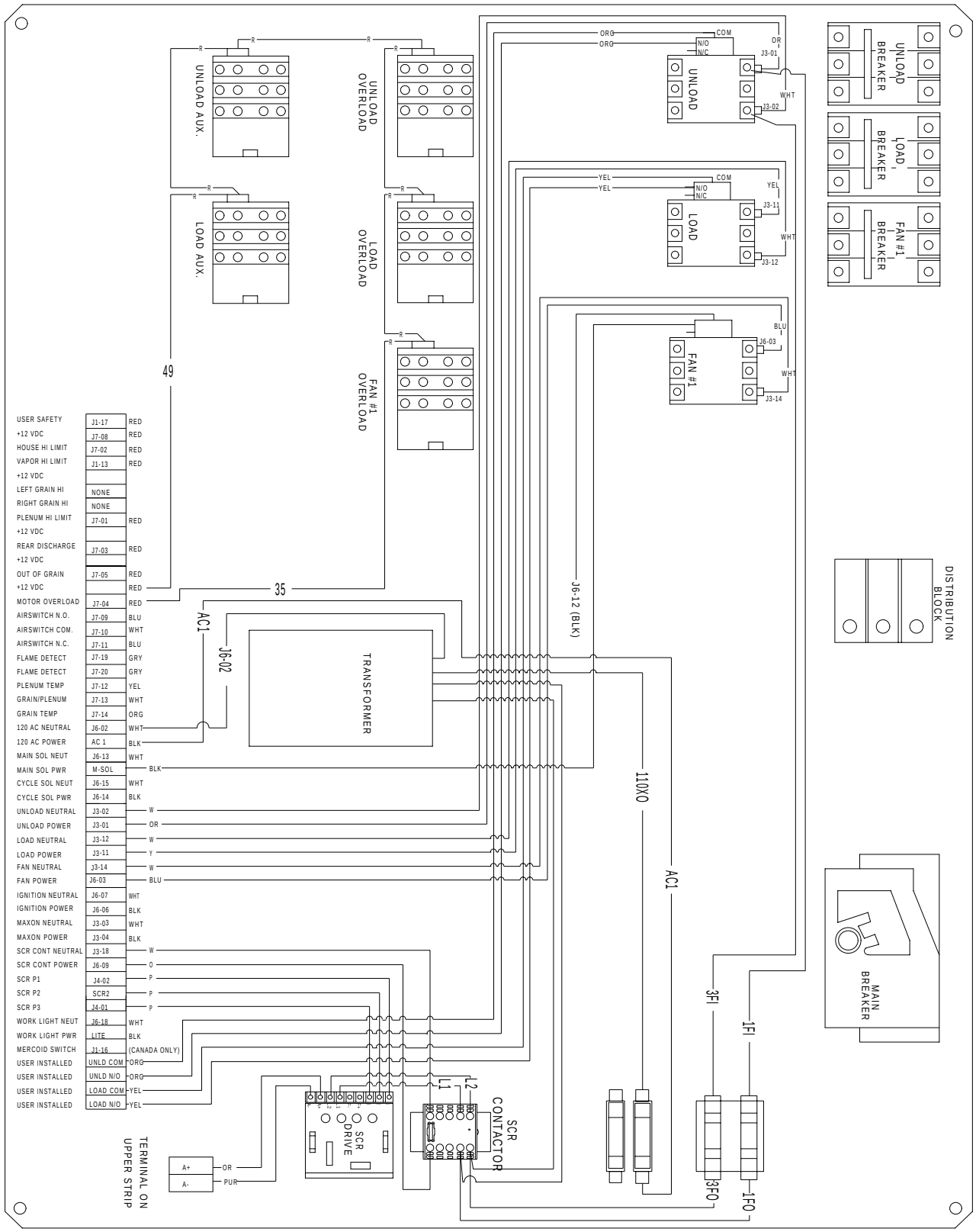
220 Volt Three (3) Phase Power Drawing



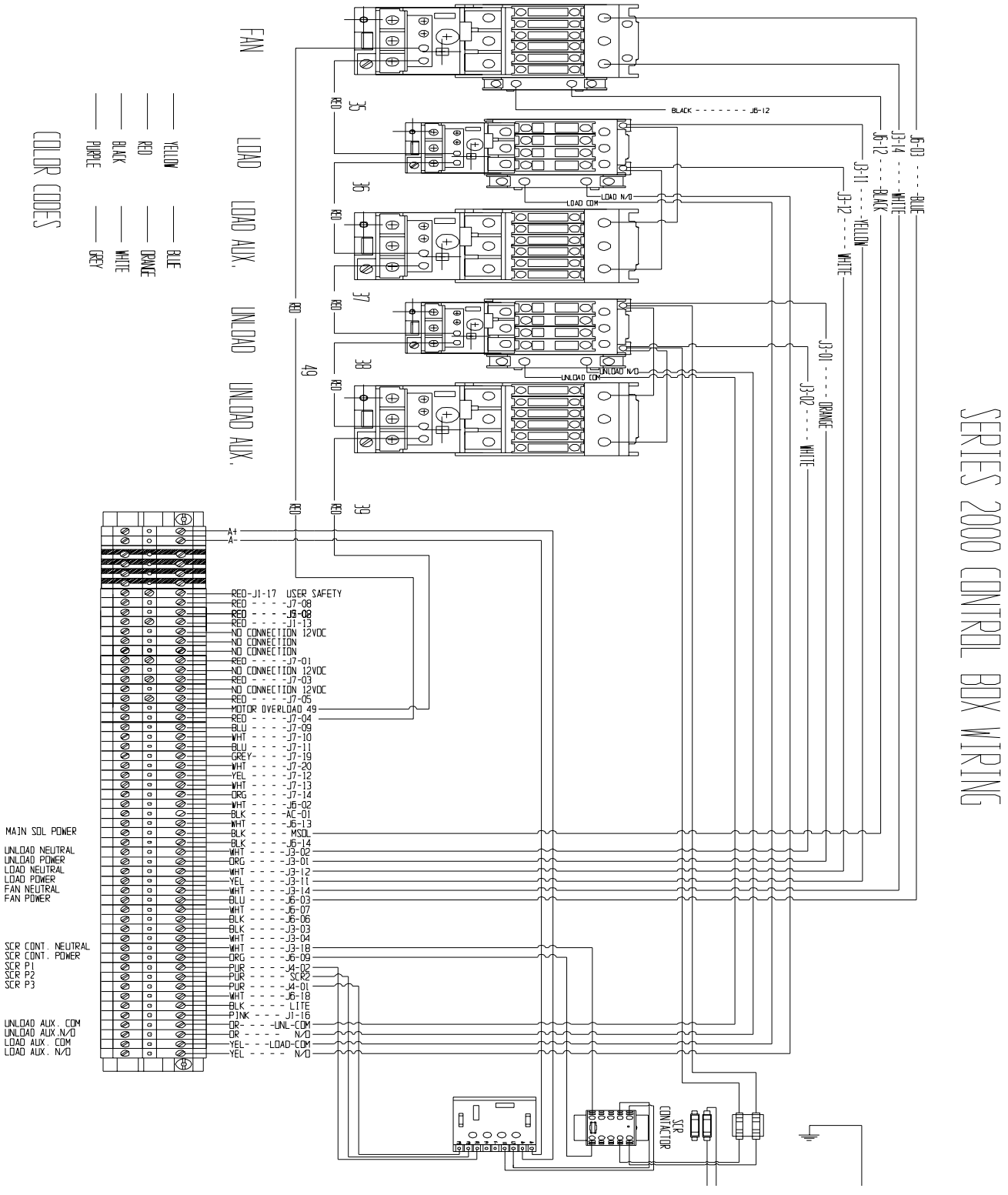
220 Volt Three (3) Phase Power Drawing (New Version)



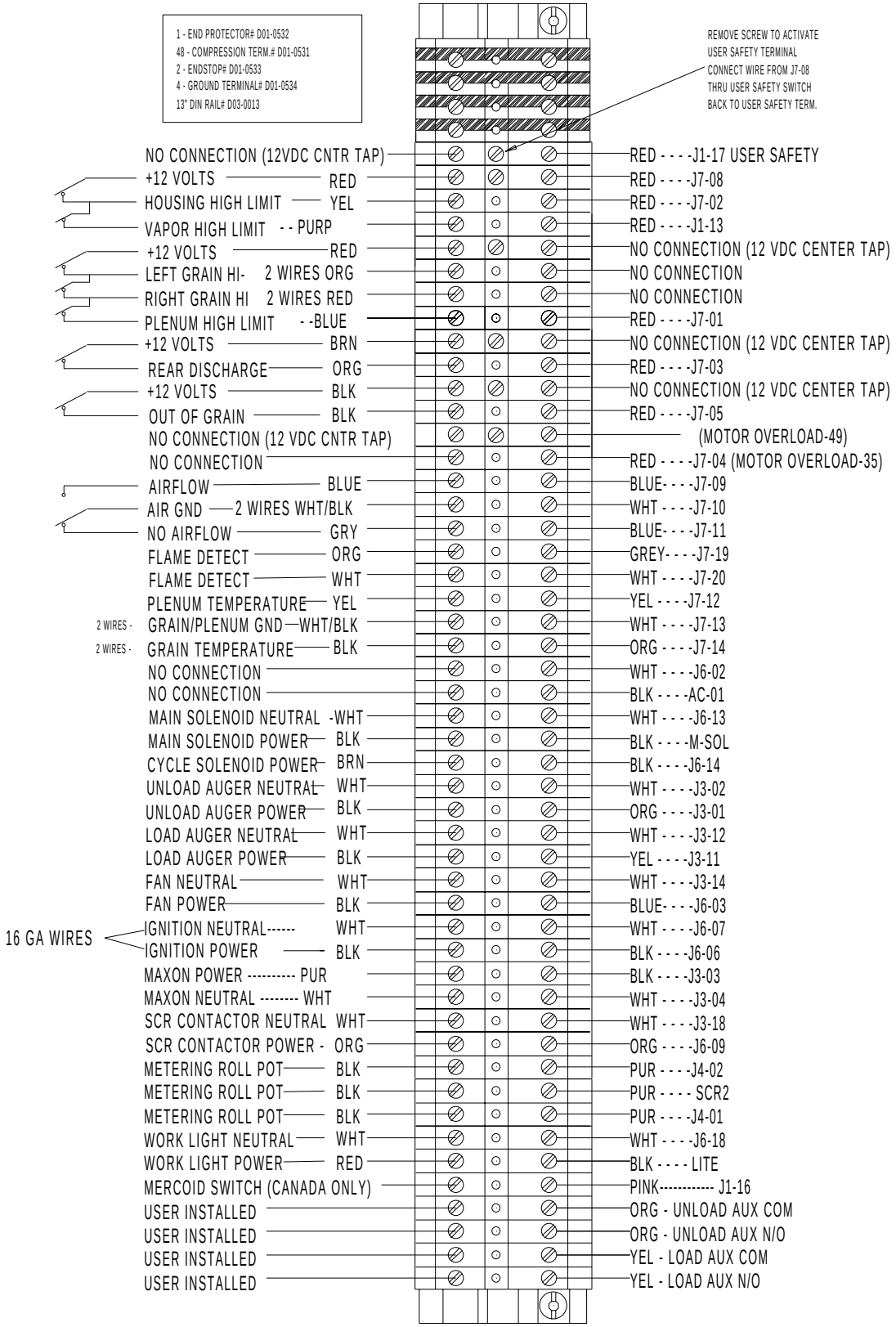
Upper Control Box Internal Wiring



Series 2000 Control Box Wiring (New Version)

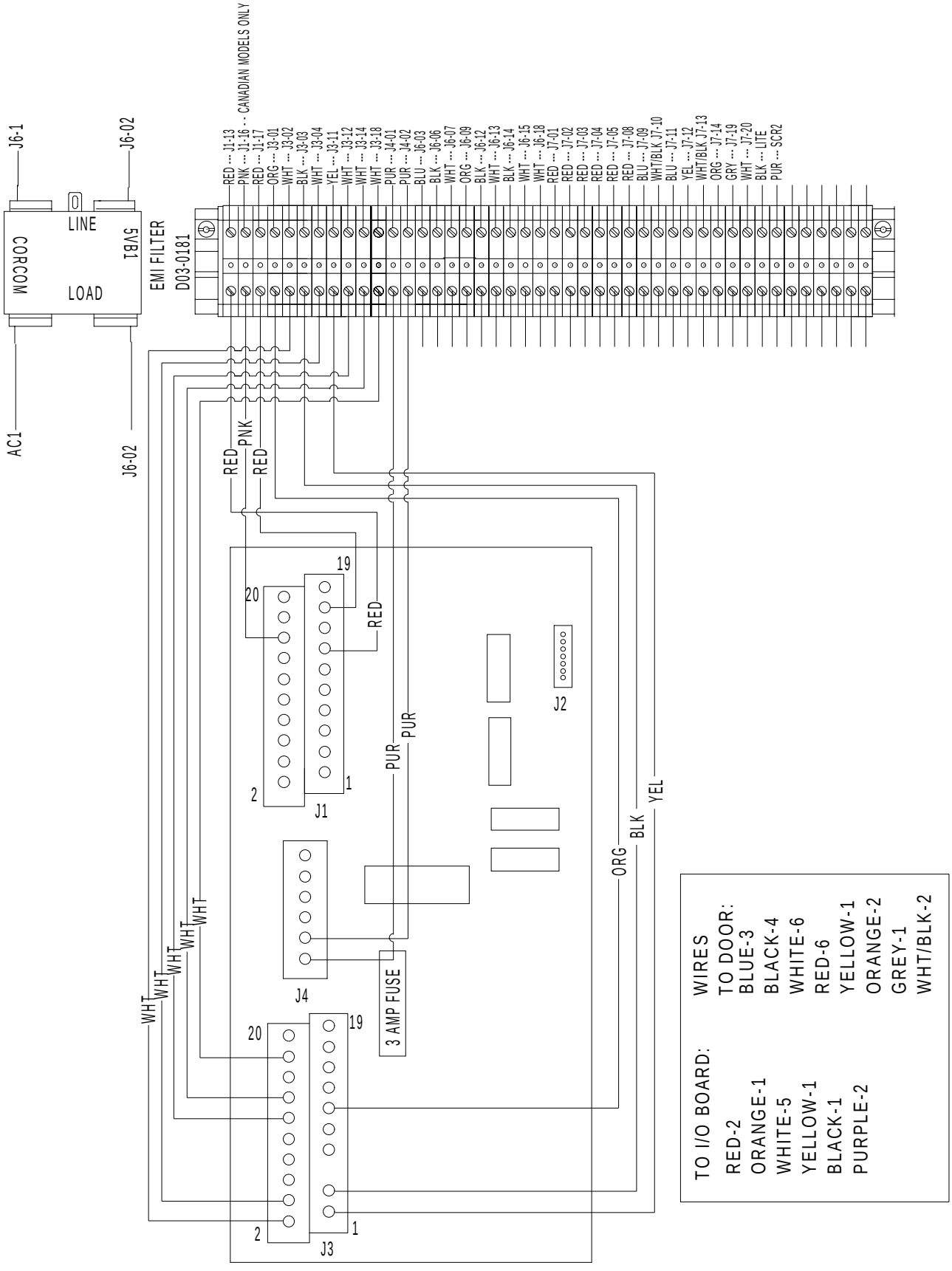


Series 100 Control Box Wiring

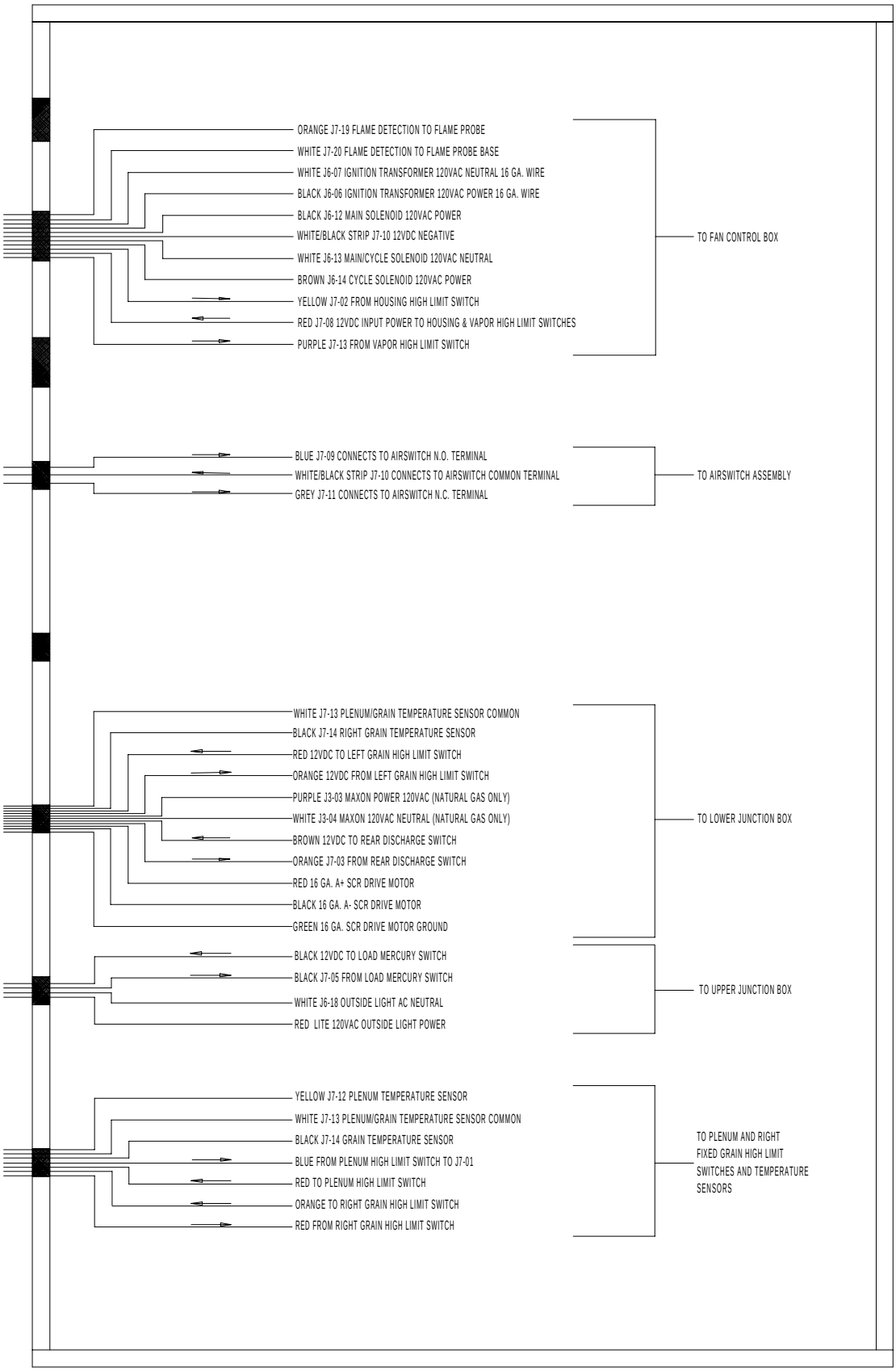


100STRIP98.PRT REV. DATE 3/12/98

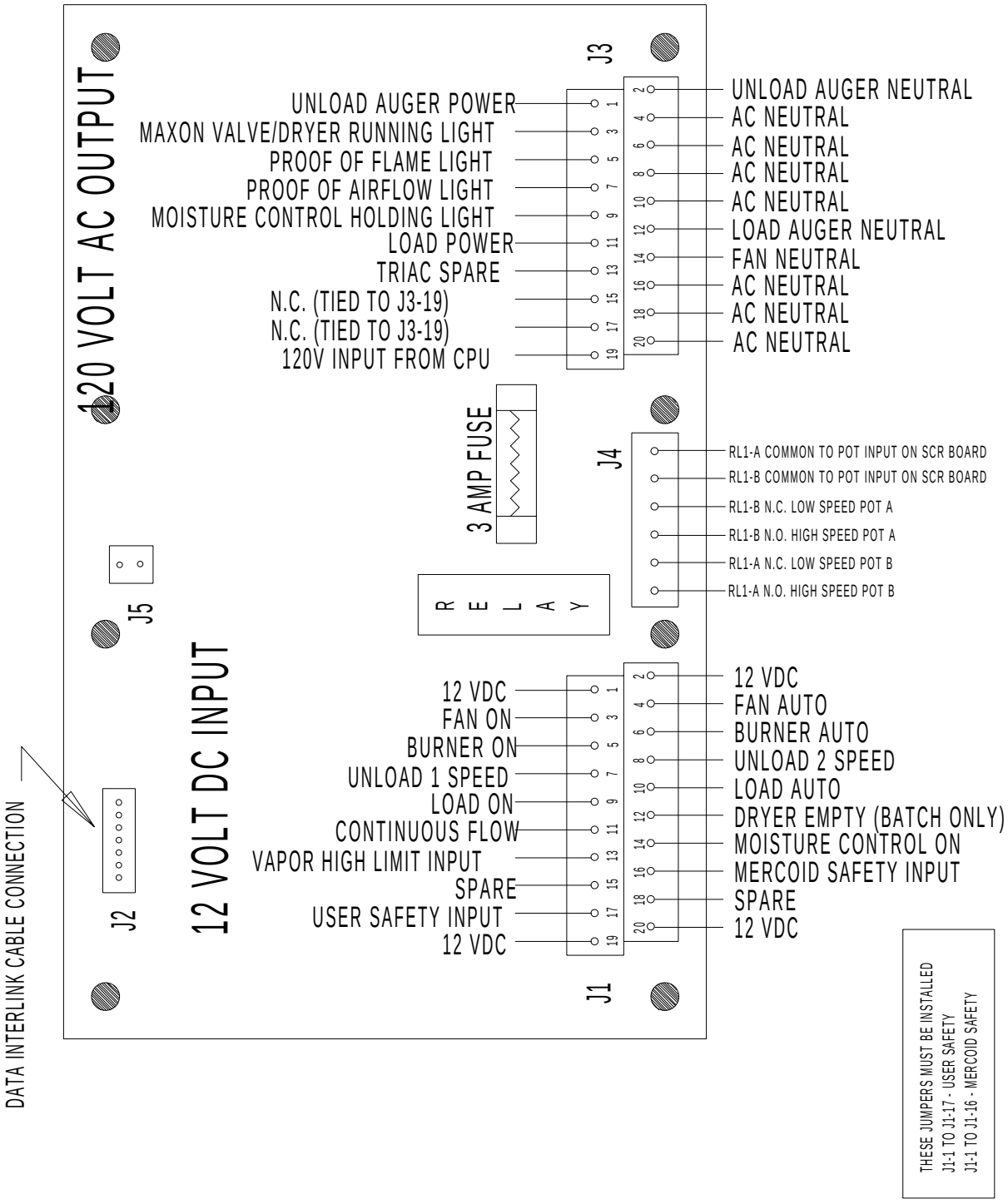
Input/Output Board & Terminal Strip



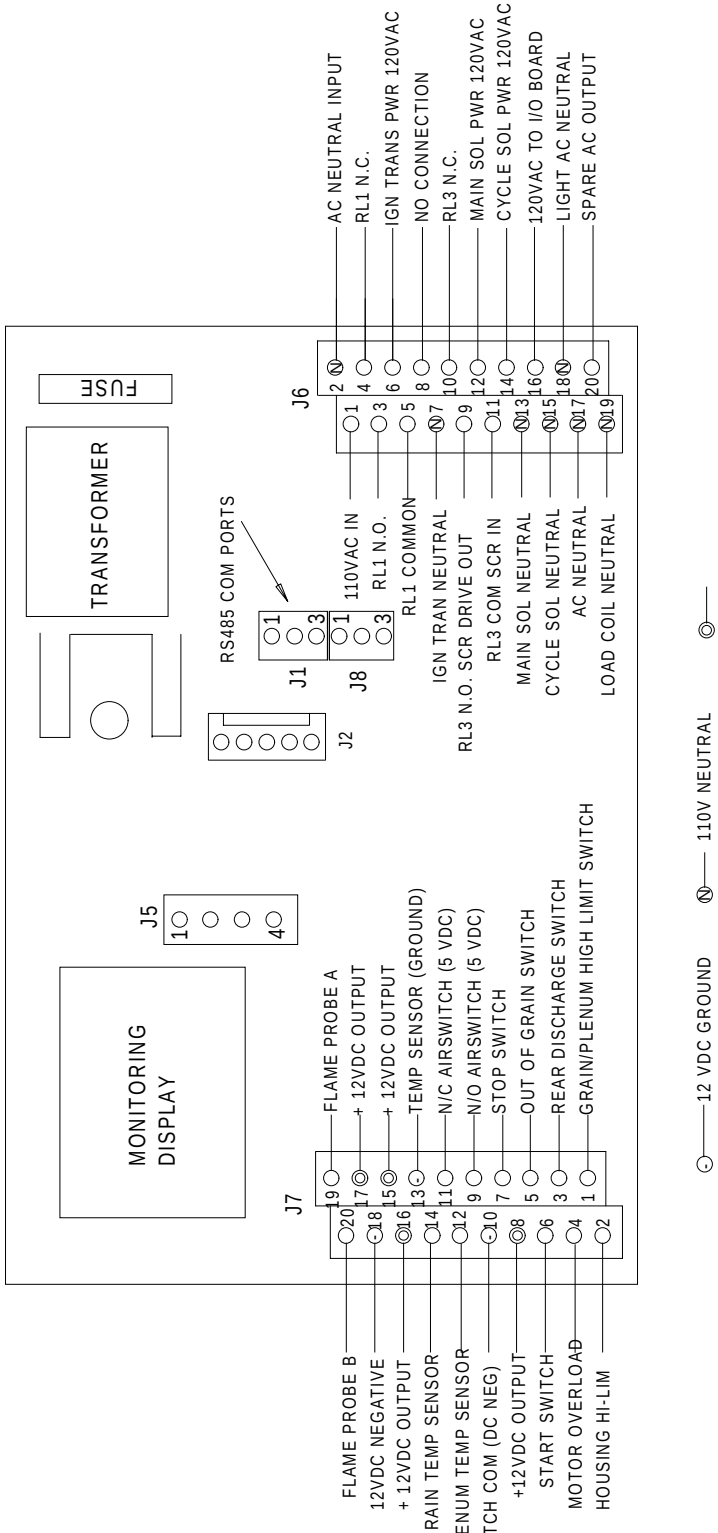
Upper Control Box External Wiring



Input/Output Board 12 Volt



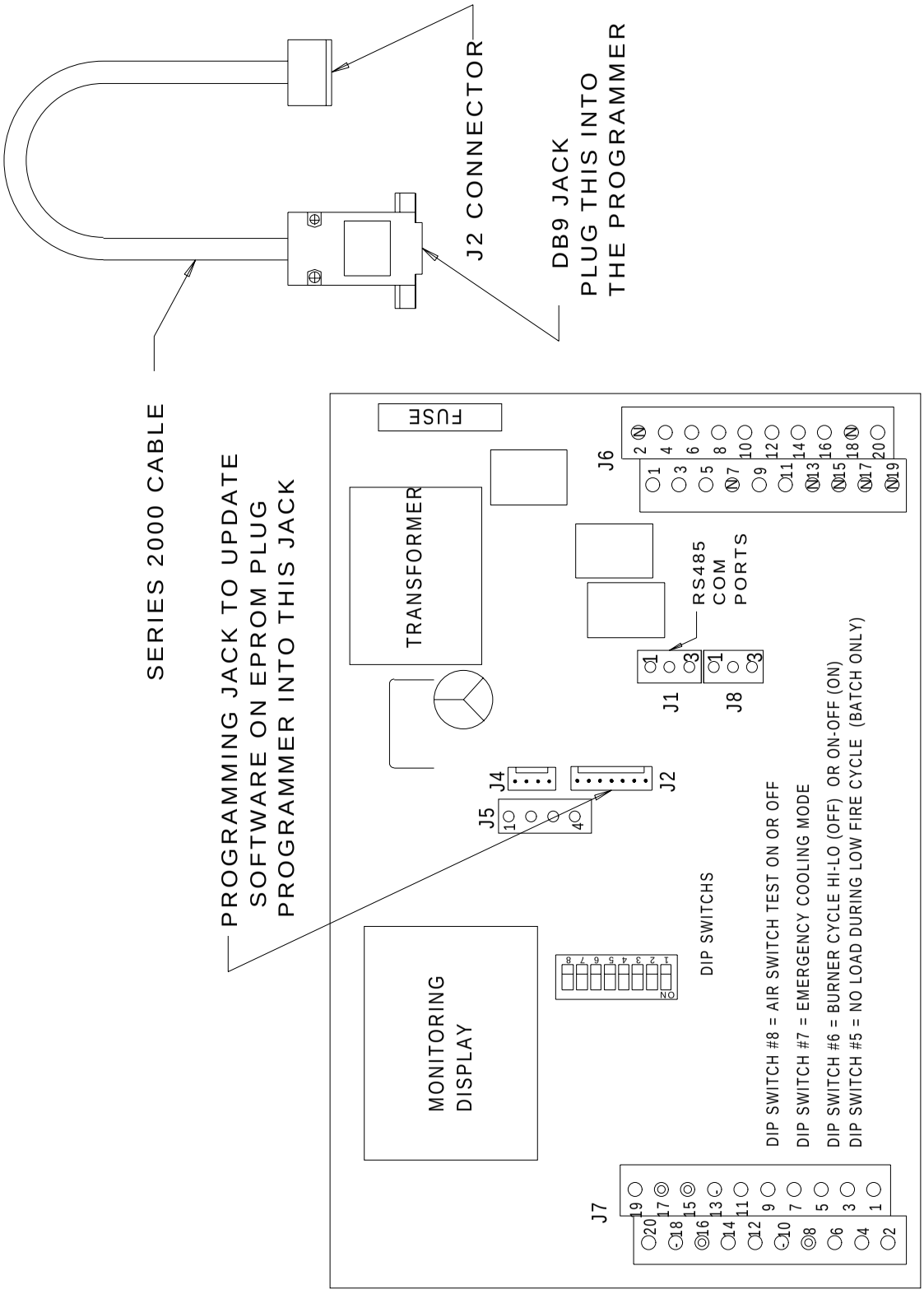
Cpu Board Wiring



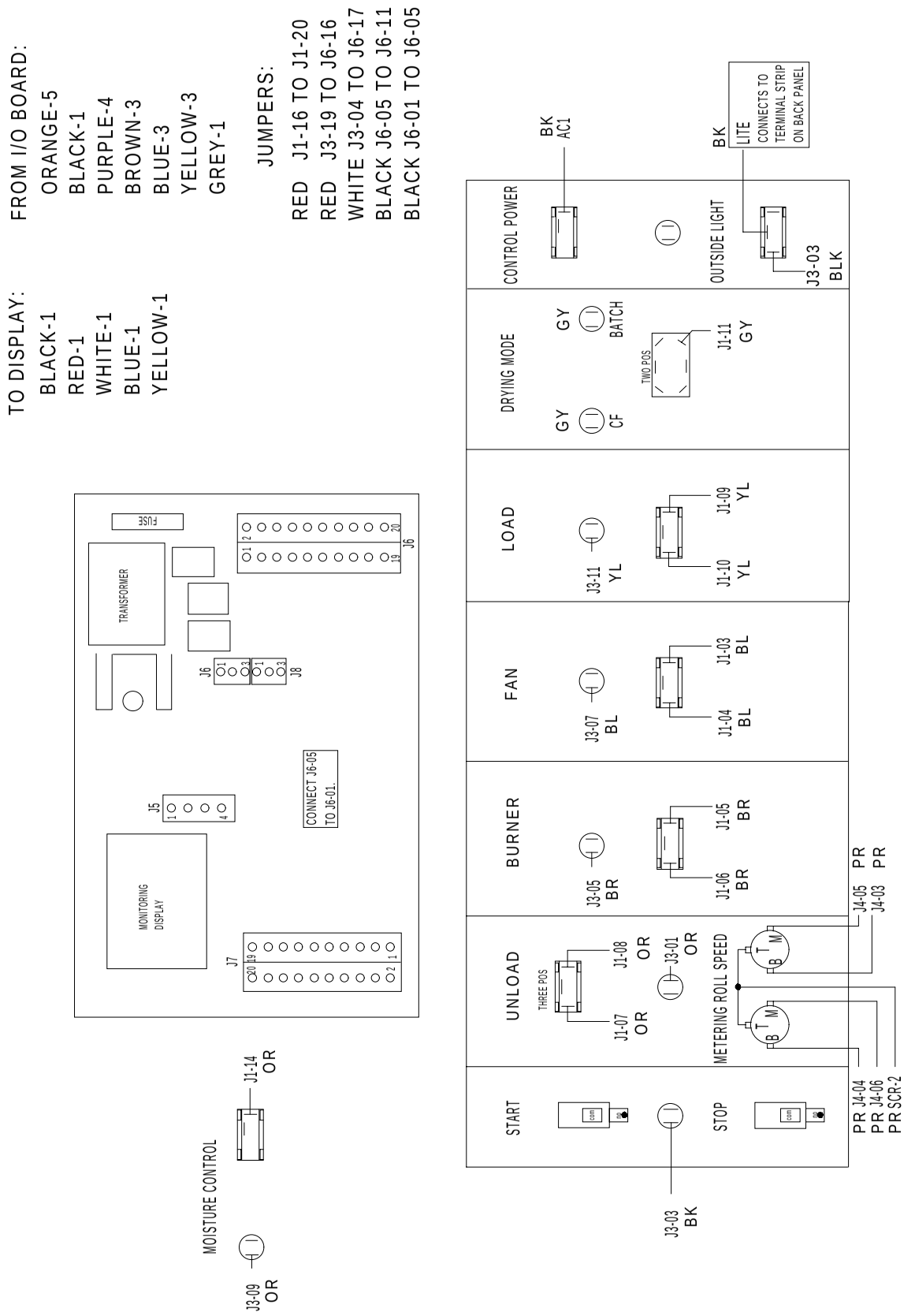
Programing Instructions for Competitor Series Grain Dryers

1. Turn Control Power on dryer to the off position.
2. Locate programming jack (P7) on back of computer. (See page 72). There will be a cable plugged into this jack that comes from the other computer board. Unplug this cable to plug the programmer into the jack.
3. Plug the series 2000 cable into programming jack and into programmers DB-9 jack.
4. Be sure that the rotary switch on the programmer is set to position 8.
5. Turn on Control Power to the dryer.
6. The four (4) lights on the programmer will come on, then three (3) will go out leaving the power light still on.
7. Push the start button on the programmer to start the transfer of Software.
8. The busy light will flash until the transfer process is complete.
9. When completed, the pass light will flash indicating a successful transfer.
10. If the fail light flashes then check your connections and repeat the above process.
11. Turn Control Power on dryer to off and remove the cable.
12. Turn on the dryer and the opening screens should indicate the newer version of software.

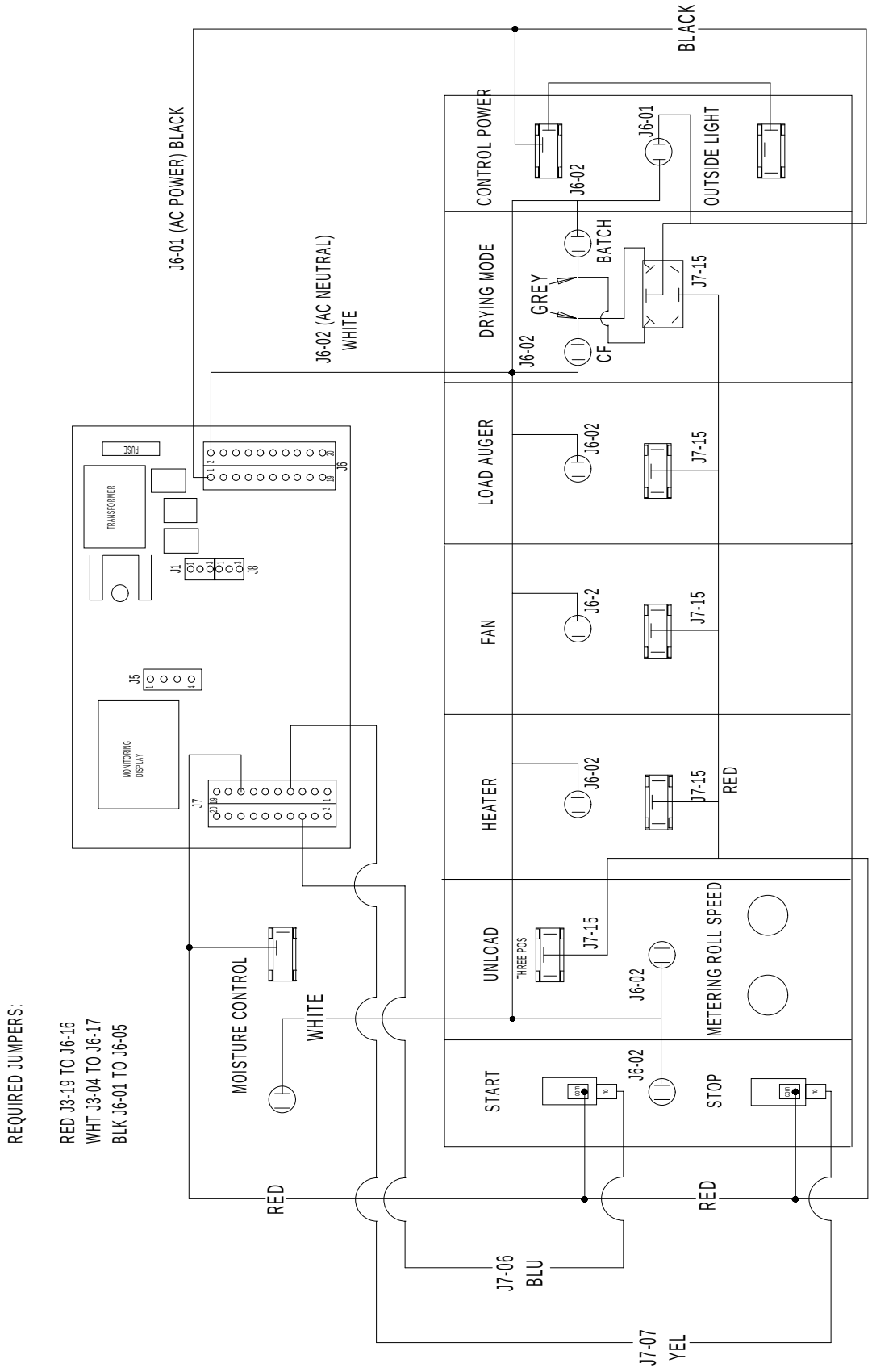
Programmer Hook Up Diagram



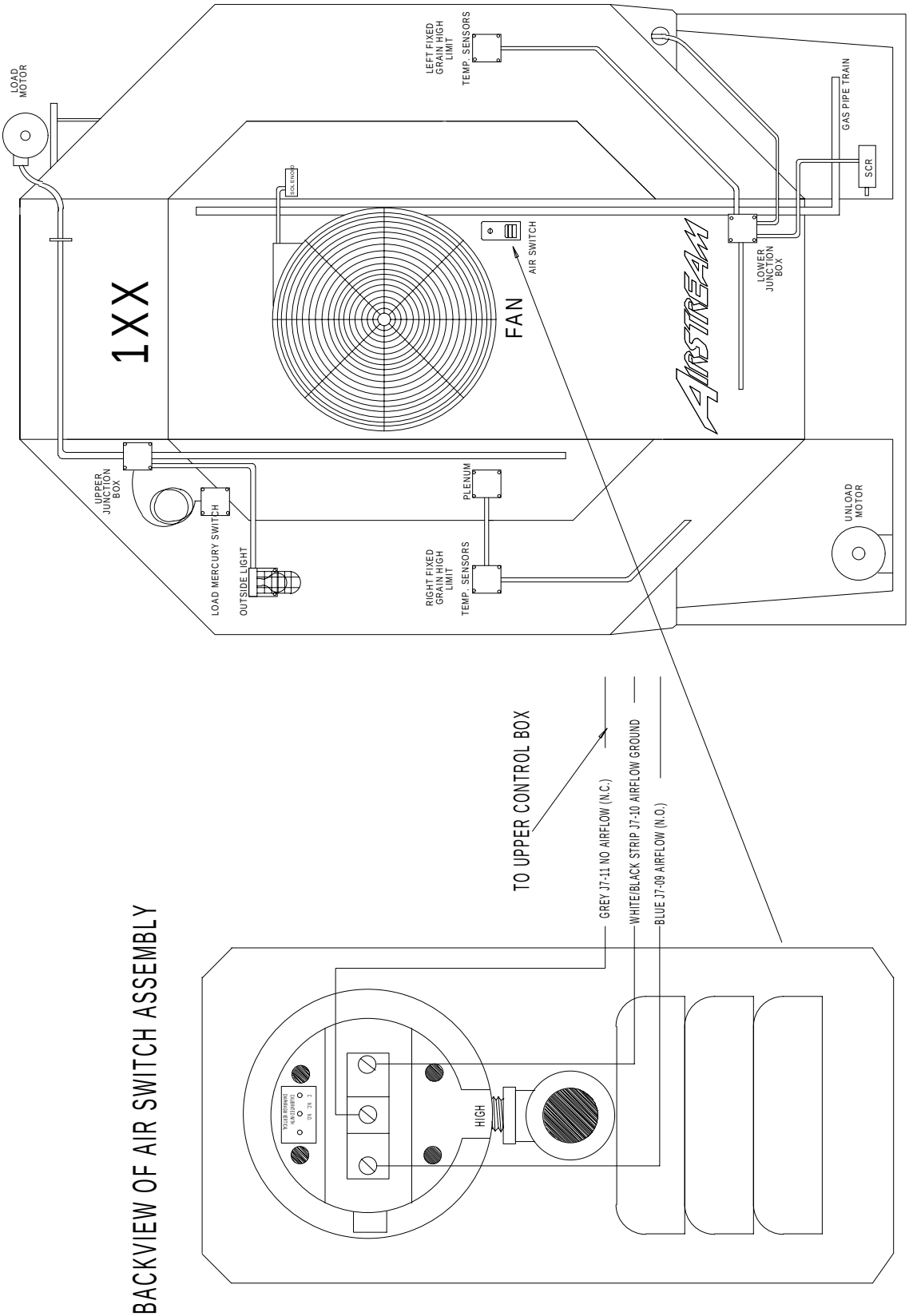
Back of Switch Panel Layout



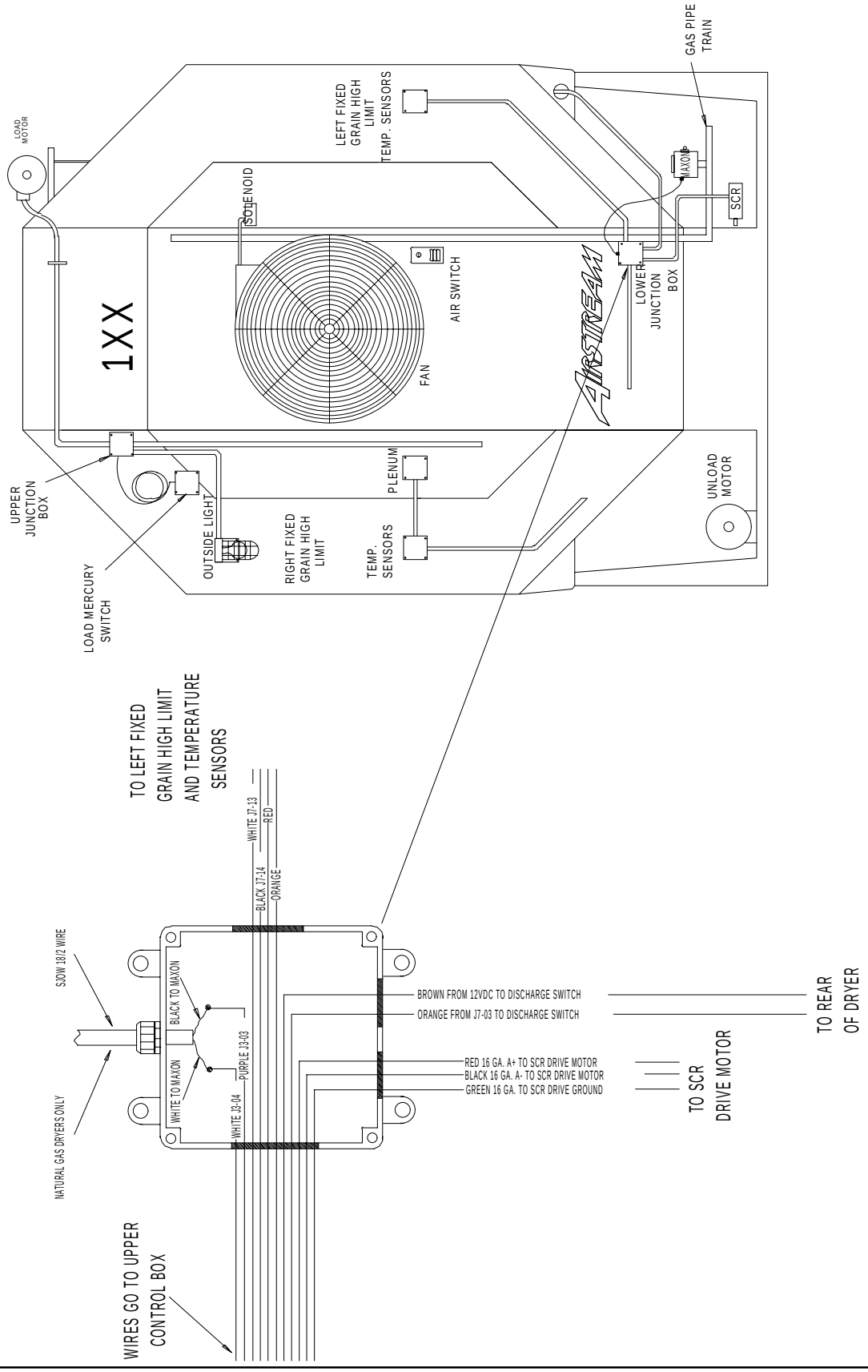
Back of Switch Panel Wiring



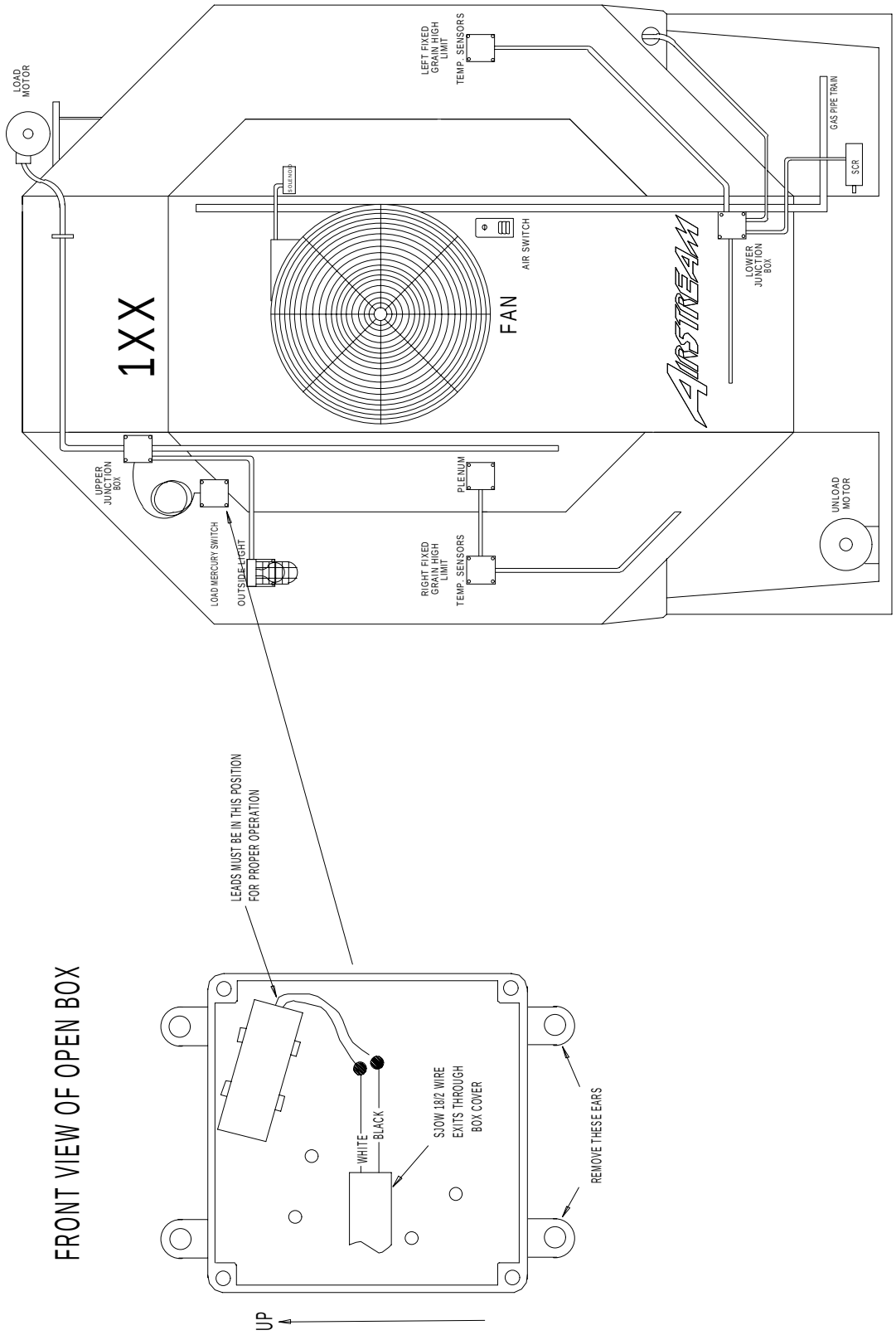
Air Switch Assembly



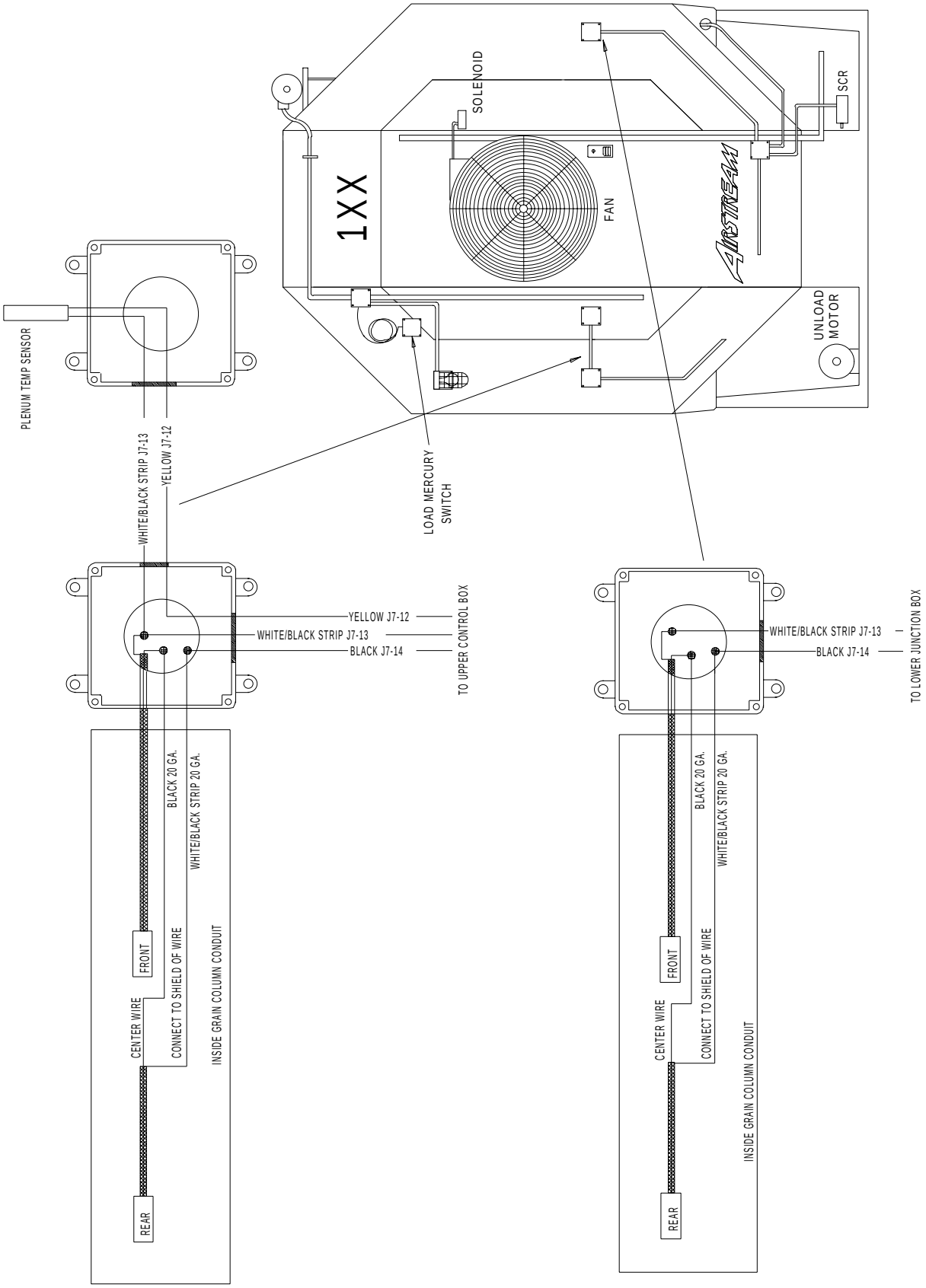
Fixed Grain Hi-Limit & Temperature Sensor



Out of Grain Sensor

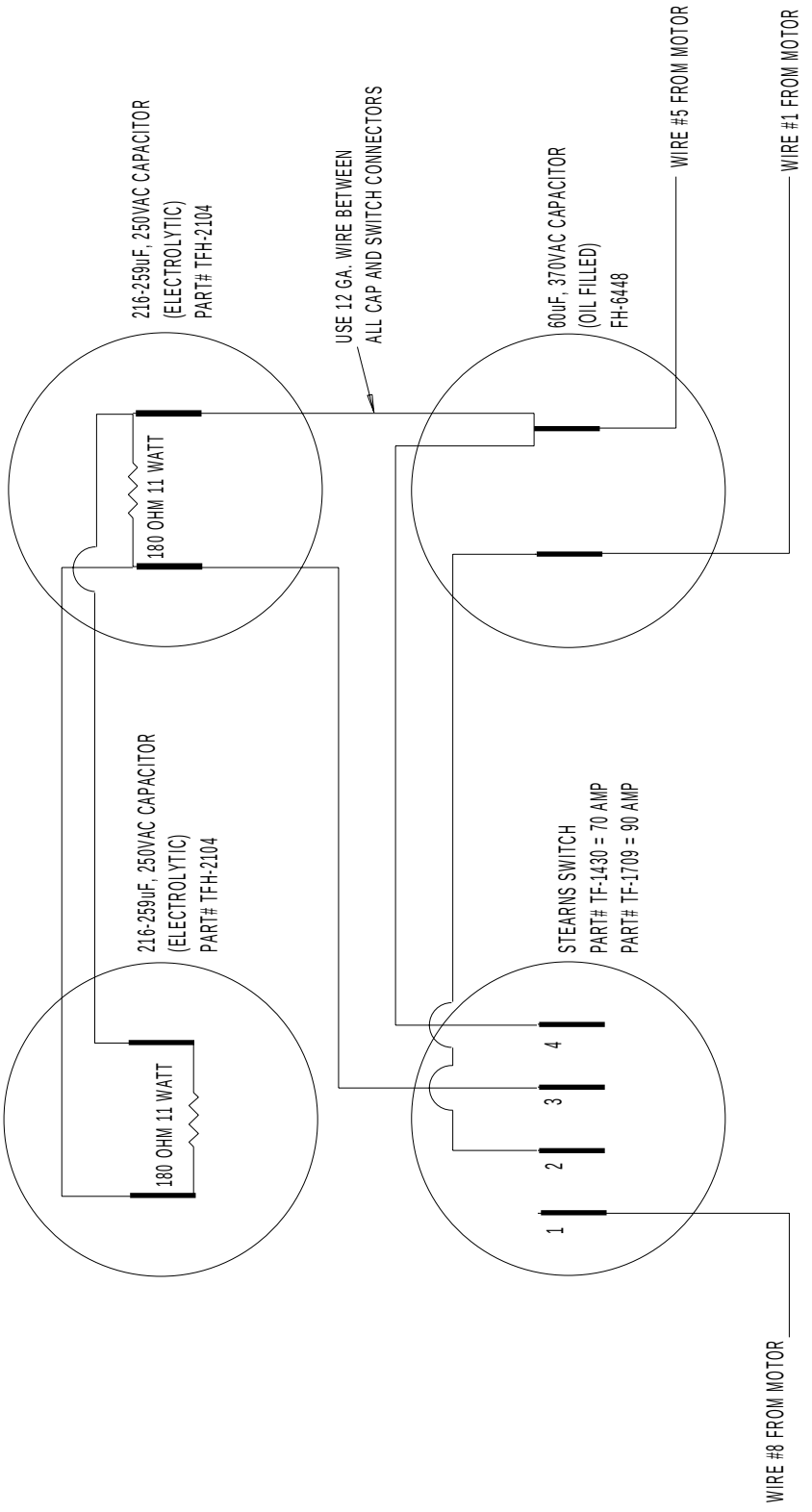


Grain Temperature Sensor



Grain Sensor Testing

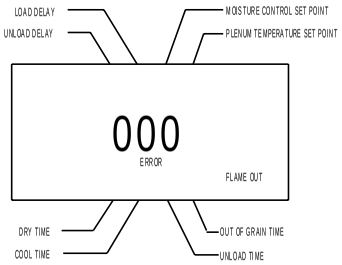
Stern and Capacitor Diagram 10-17 HP 1Phase

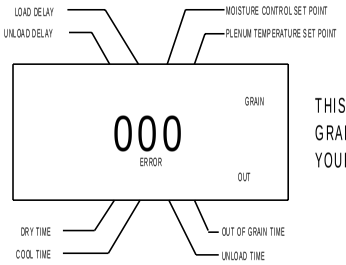


Series 100 Error Conditions

Series 100 Error Conditions

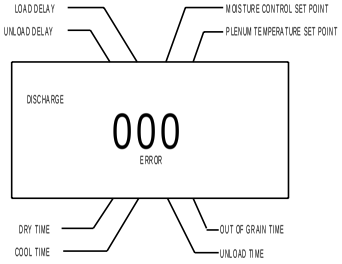
THIS DISPLAY INDICATES THE COMPUTER HAS STOPPED SENSING FLAME. THIS CAN BE CAUSED FROM RUNNING OUT OF FUEL, FLAME PROBE OUT OF ADJUSTMENT, OR THE BURNER FAILED TO IGNITE DURING IGNITION SEQUENCE.

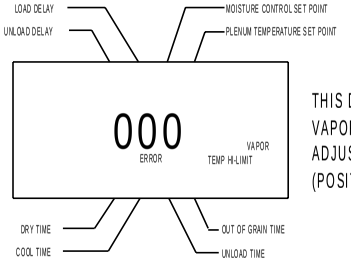




THIS DISPLAY INDICATES THAT THE OUT OF GRAIN TIMER HAS EXPIRED. TRY INCREASING YOUR TIME ON THE OUT OF GRAIN TIMER.

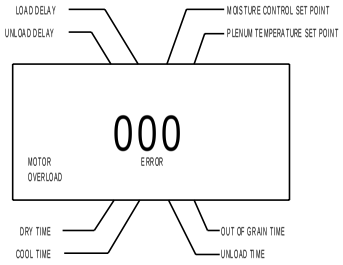
THIS DISPLAY INDICATES THAT THE GRAIN DISCHARGE SWITCH LOCATED IN THE REAR OF THE DRYER WAS ACTIVATED. THIS IS CAUSED BY THE GRAIN EXITING THE DRYER WAS NOT TAKEN AWAY FAST ENOUGH OR SOMEONE HAS OPENED THE DISCHARGE LID. (SEE FIGURE 13)

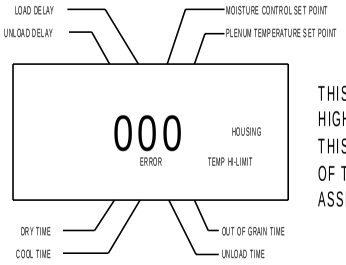




THIS DISPLAY INDICATES THAT THE VAPORIZER COIL NEEDS TO BE ADJUSTED SO THAT IT RUNS COLDER. (POSITION COIL AWAY FROM FLAME)

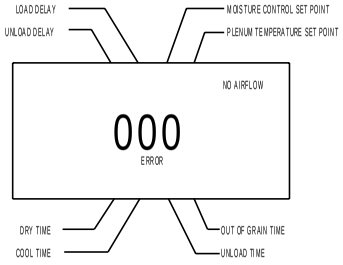
THIS DISPLAY INDICATES THAT A MOTOR OVERLOAD RELAY HAS TRIPPED. THIS RELAY MUST BE RESET MANUALLY. OPEN THE UPPER CONTROL BOX DOOR MAKE SURE THE POWER IS DISCONNECTED AND PUSH IN THE RED LEVERS ON ALL OF THE OVERLOAD RELAYS. NOTICE IF ONE OF THE LEVERS CLICKS AS IT IS PUSHED IN. THEN INSPECT THE MOTOR THAT TRIPPED THE RELAY. DETERMINE IF THE MOTOR IS BEING OVERWORKED.

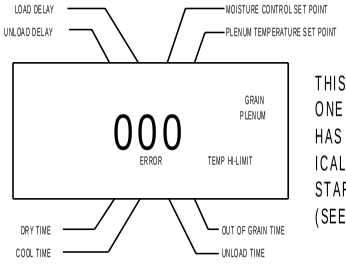




THIS DISPLAY INDICATES THAT THE HOUSI HIGH LIMIT SWITCH HAS TRIPPED. TO RESE THIS SWITCH, REMOVE 2 SCREWS TO THE OF THE LRL BOX ON TOP OF THE FAN/BUR ASSEMBLY AND PUSH THE RED BUTTON IN

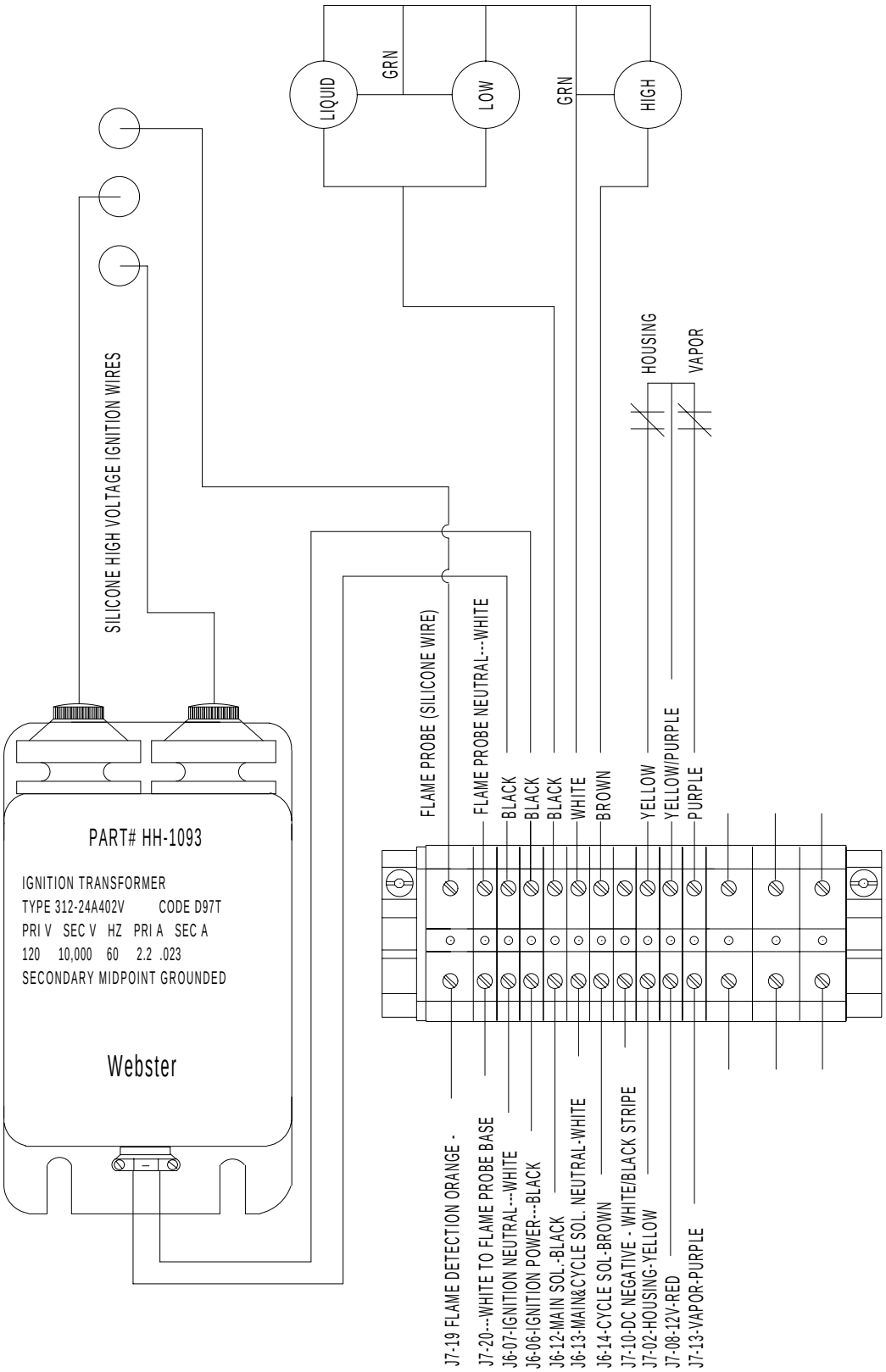
THIS DISPLAY INDICATES A LOSS OF AIR PRESSURE INSIDE THE DRYER. THIS IS USUALLY CAUSED BY LACK OF GRAIN INSIDE THE DRYER. THE AIRSWITCH MAY ALSO NEED TO BE ADJUSTED SO THAT IT BECOMES MORE SENSITIVE TO AIR PRESSURE. (SEE FIGURE 1)



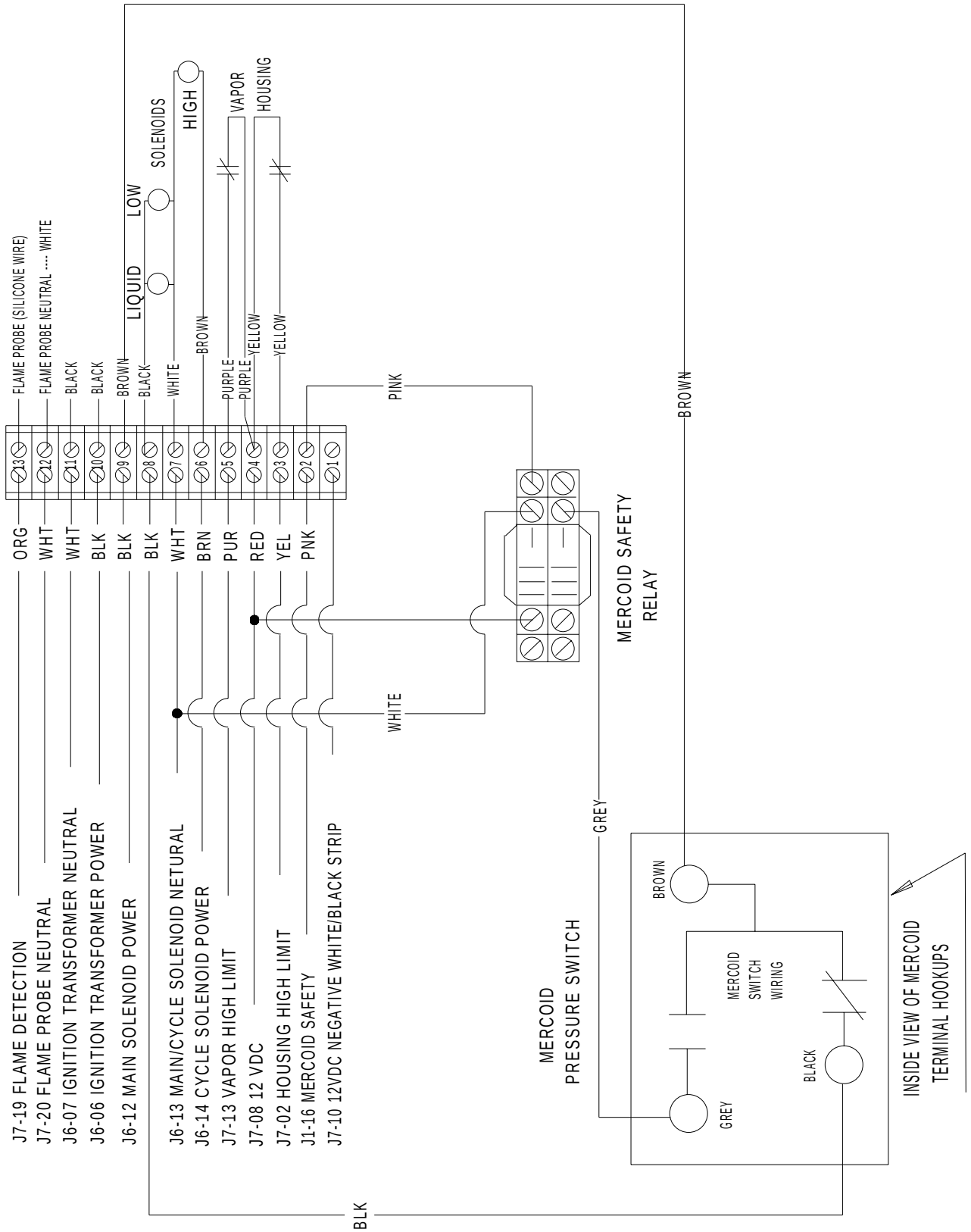


THIS DISPLAY INDICATES THAT THE PLENU ONE OF THE FIXED GRAIN HIGH LIMIT SWIT HAS TRIPPED. THESE SWITCHES RESET AU ICALLY WHEN COOLED DOWN. YOU MAY H START THE DRYER IN EMERGENCY COOLIN (SEE FIGURE 5 AND FIGURE 14)

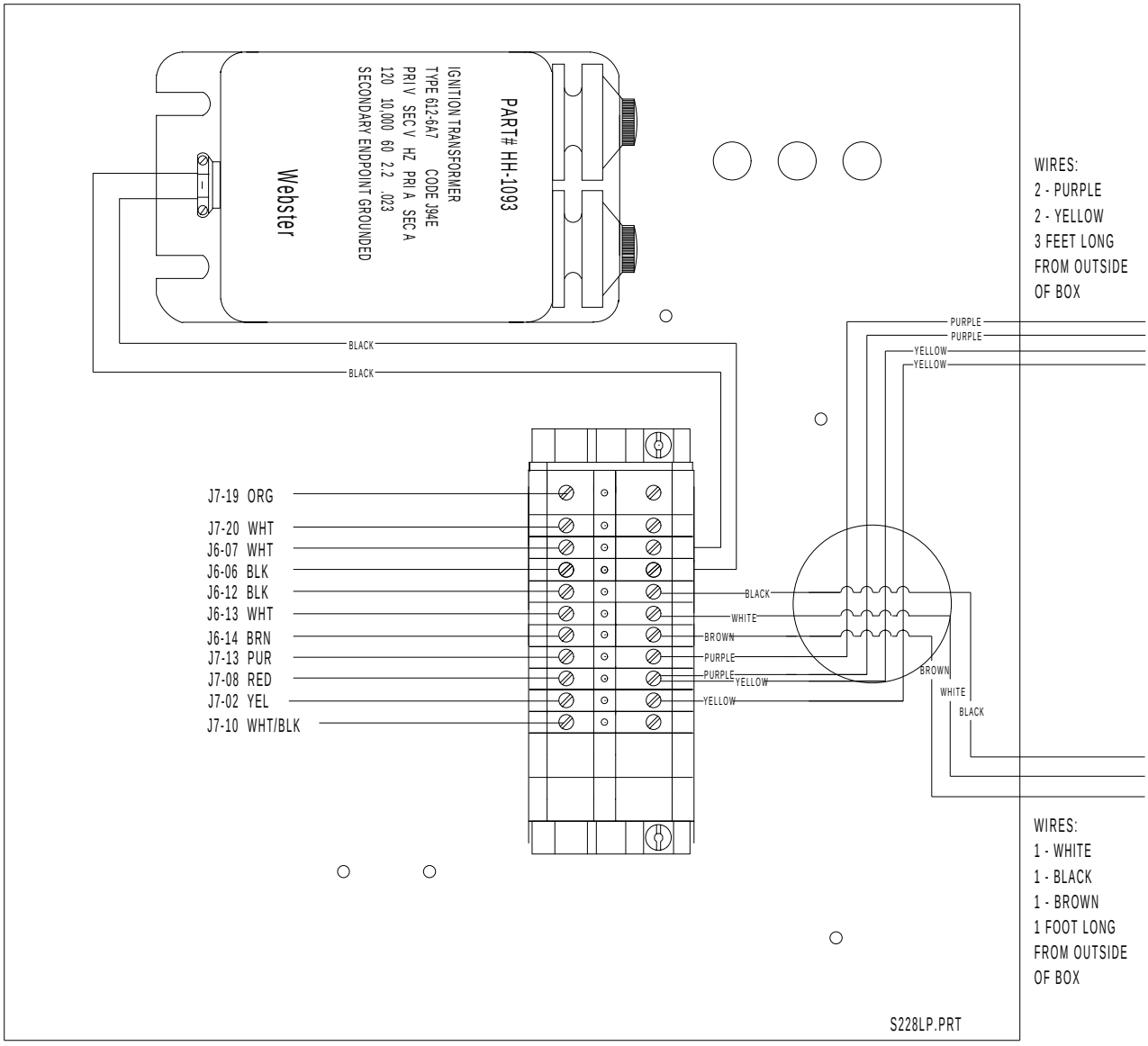
Heater Circuit



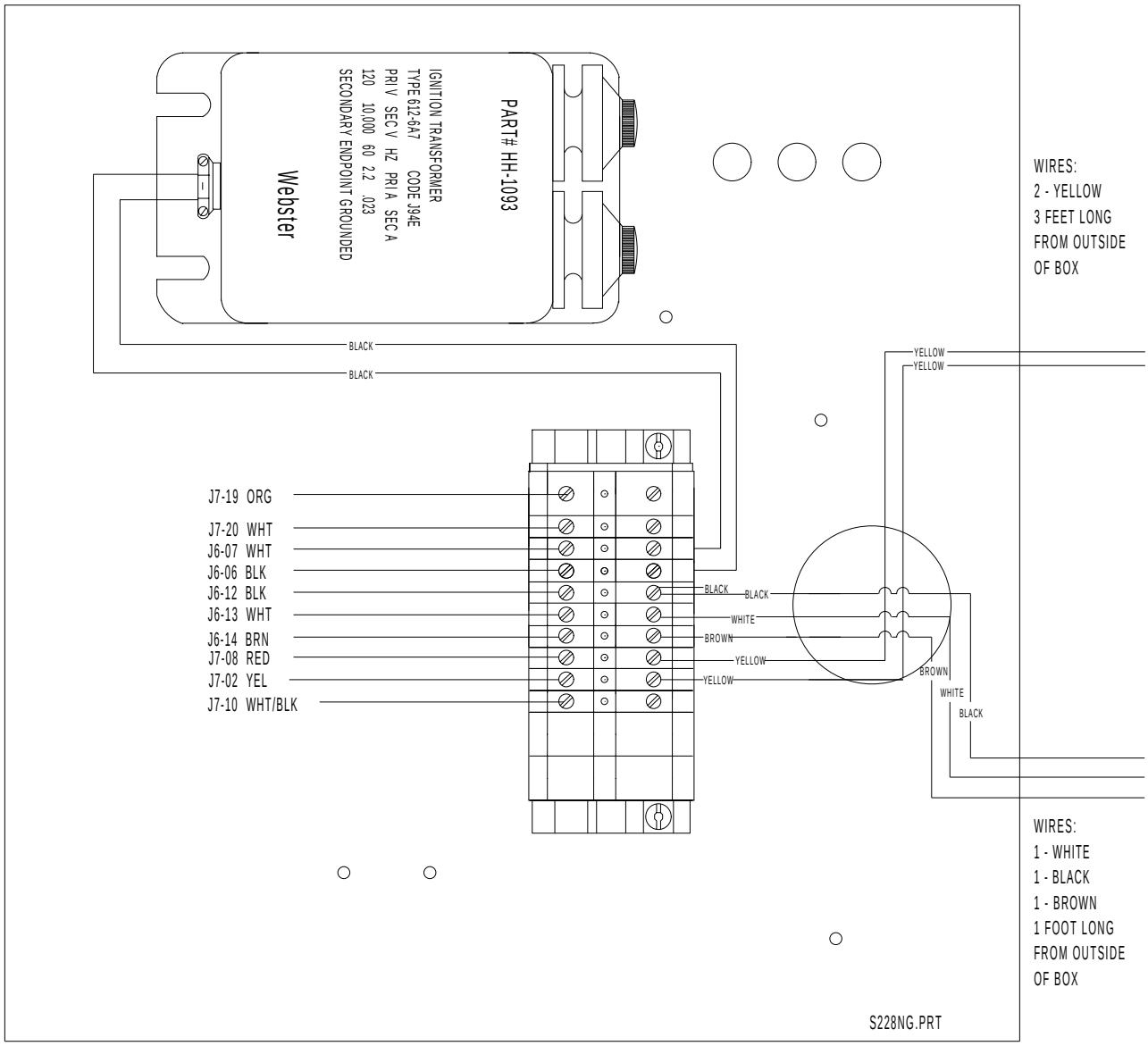
Fan Burner Circuit For Canadian Models Only



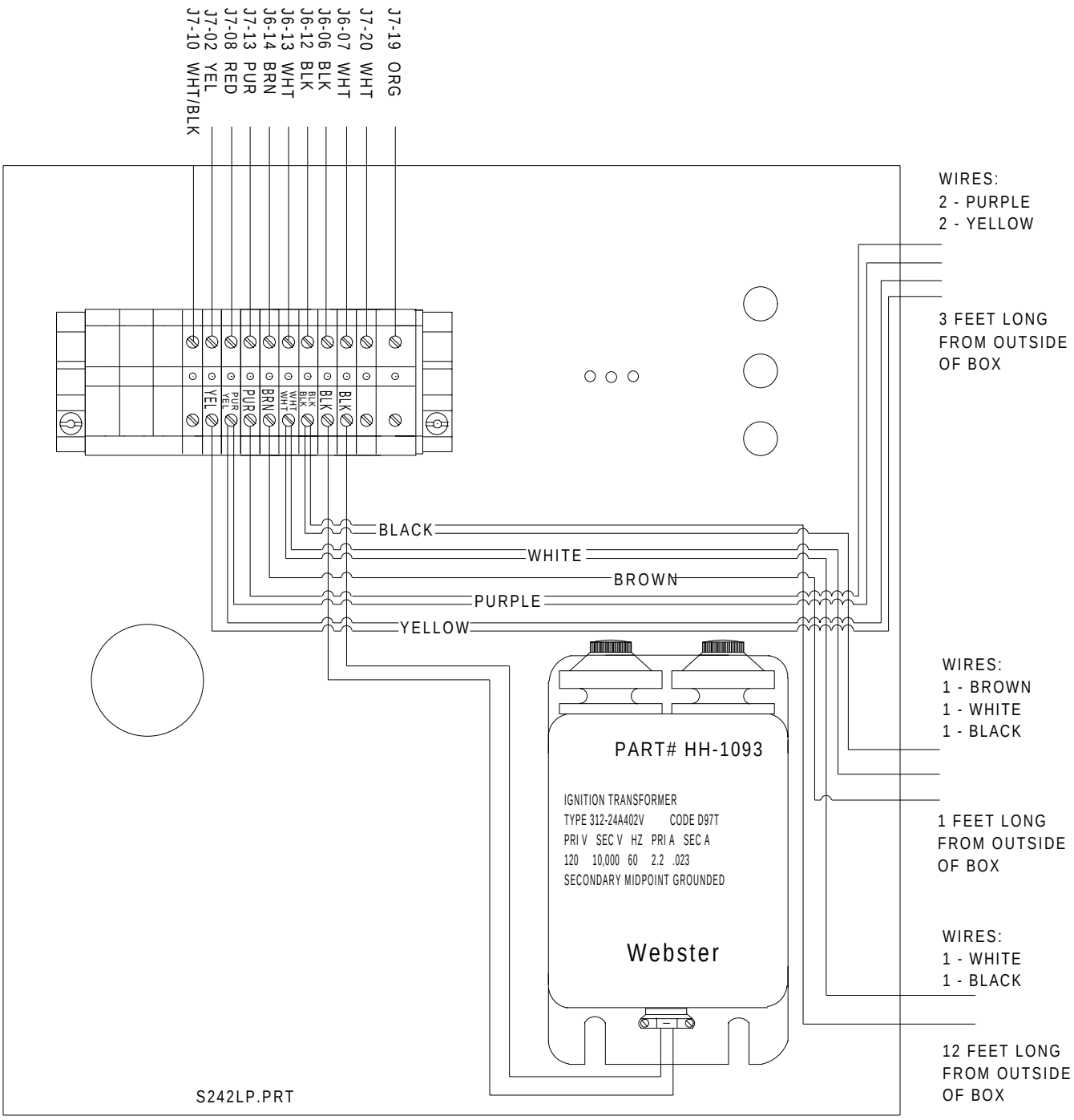
Series 100 LP 26"/28" Fan



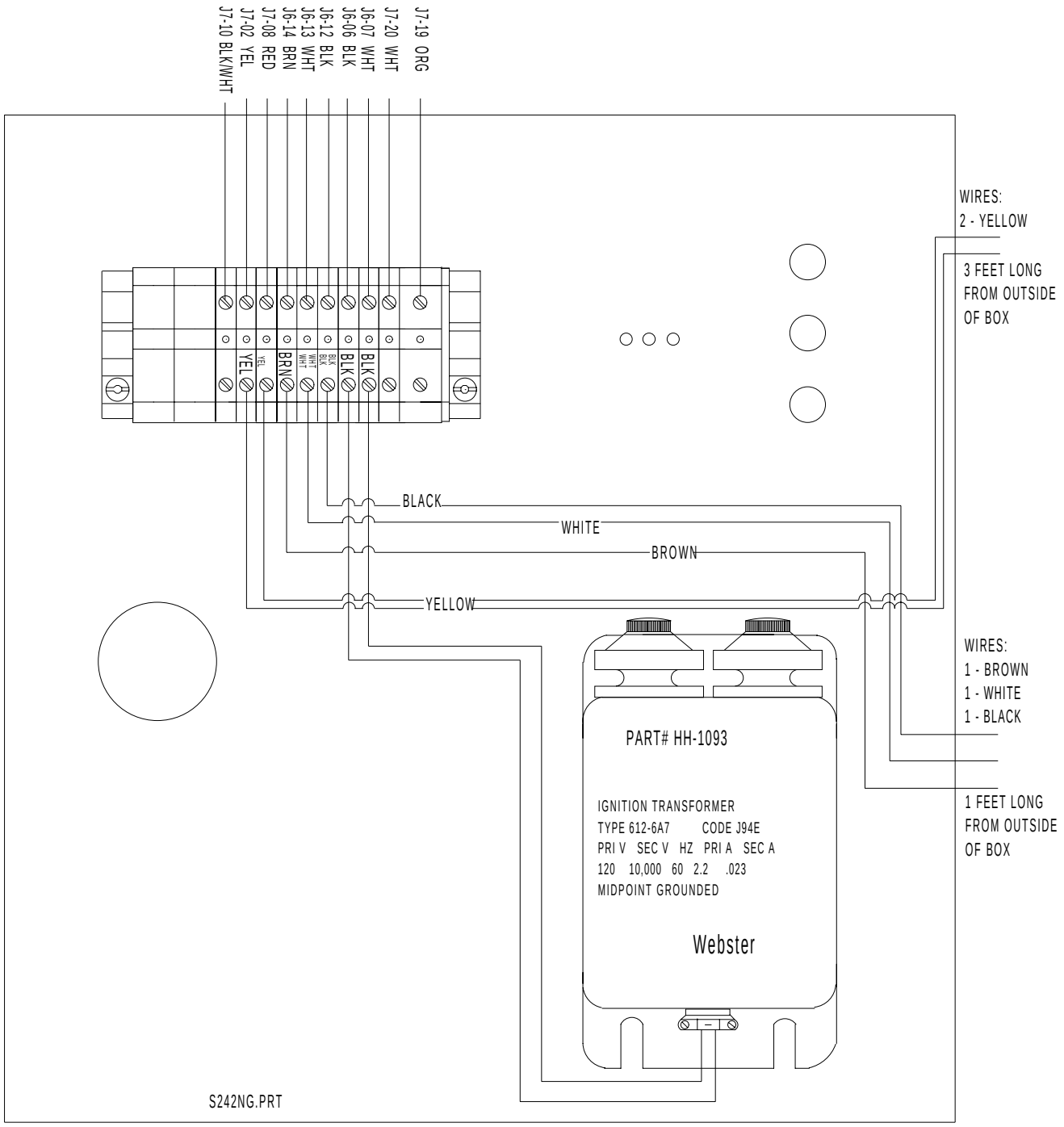
Series 100 Natural Gas 26"/28" Fan



Series 100 LP 36"/42" Fan



Series 100 Natural Gas 36"/42" Fan



THE GSI GROUP, INC. ("GSI") WARRANTS ALL PRODUCTS MANUFACTURED BY GSI TO BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USAGE AND CONDITIONS FOR A PERIOD OF TWENTY-FOUR MONTHS AFTER RETAIL SALE TO THE ORIGINAL END USER OF SUCH PRODUCTS. GSI'S ONLY OBLIGATION IS, AND PURCHASER'S SOLE REMEDY SHALL BE FOR GSI, TO REPAIR OR REPLACE, AT GSI'S OPTION AND EXPENSE, PRODUCTS THAT, IN GSI'S SOLE JUDGMENT, CONTAIN A MATERIAL DEFECT DUE TO MATERIALS OR WORKMANSHIP. ALL DELIVERY AND SHIPMENT CHARGES TO AND FROM GSI'S FACTORY WILL BE PURCHASER'S RESPONSIBILITY. EXPENSES INCURRED BY OR ON BEHALF OF THE PURCHASER WITHOUT PRIOR WRITTEN AUTHORIZATION FROM AN AUTHORIZED EMPLOYEE OF GSI SHALL BE THE SOLE RESPONSIBILITY OF THE PURCHASER.

EXCEPT FOR THE ABOVE STATED EXPRESS LIMITED WARRANTIES, GSI MAKES NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH (i) PRODUCT MANUFACTURED OR SOLD BY GSI OR (ii) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCT OR PRODUCTS.

IN NO EVENT SHALL GSI BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR BENEFITS. PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE LIMITED TO THAT STATED ABOVE, WHICH SHALL NOT EXCEED THE AMOUNT PAID FOR THE PRODUCT PURCHASED. THIS WARRANTY IS NOT TRANSFERABLE AND APPLIES ONLY TO THE ORIGINAL PURCHASER. GSI SHALL HAVE NO OBLIGATION OR RESPONSIBILITY FOR ANY REPRESENTATIVE OR WARRANTIES MADE BY OR ON BEHALF OF ANY DEALER, AGENT OR DISTRIBUTOR OF GSI.

GSI ASSUMES NO RESPONSIBILITY FOR FIELD MODIFICATIONS OR ERECTION DEFECTS WHICH CREATE STRUCTURAL OR STORAGE QUALITY PROBLEMS. MODIFICATIONS TO THE PRODUCT NOT SPECIFICALLY COVERED BY THE CONTENTS OF THIS MANUAL WILL NULLIFY ANY PRODUCT WARRANTY THAT MIGHT HAVE BEEN OTHERWISE AVAILABLE.

THE FOREGOING WARRANTY SHALL NOT COVER PRODUCTS OR PARTS WHICH HAVE BEEN DAMAGED BY NEGLIGENT USE, MISUSE, ALTERATION OR ACCIDENT. THIS WARRANTY COVERS ONLY PRODUCTS MANUFACTURED BY GSI. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. GSI RESERVES THE RIGHT TO MAKE DESIGN OR SPECIFICATION CHANGES AT ANY TIME.

PRIOR TO INSTALLATION, PURCHASER HAS THE RESPONSIBILITY TO RESEARCH AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL CODES WHICH MAY APPLY TO THE LOCATION AND INSTALLATION.

a division of

THE GSI GROUP

1004 E. Illinois St.
Assumption, IL 62510
Phone 217-226-4421
Fax 217-226-4498

February 1999