

SUKUP TOWER DRYER



Operation and Service Manual

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Congratulations on your purchase of a new Sukup Tower Dryer! We're pleased to add your name to the growing list of Sukup Dryer customers. Your Sukup Tower Dryer offers the most advanced automatic operation of any tower dryer on today's market. You can feel confident that you have purchased your Tower Dryer from a company committed to serving farmers for years to come. Sukup Manufacturing is one of the few family-owned companies in an era of corporate mergers. Our family has more than 40 years of grain drying and handling experience and an excellent reputation for standing behind our products - we appreciate your purchase! You can look forward to many years of superior performance from your Sukup Tower Dryer!

Limited Warranty

SUKUP MANUFACTURING COMPANY (Sukup) warrants to original retail purchaser that within time limits set forth, new equipment shall be free from defects in material and workmanship. A part will not be considered defective if it substantially fulfills performance specifications. Should any part prove defective within the warranty period, the part will be replaced without charge F.O.B. Sukup Mfg. Co., Sheffield, Iowa USA or Distribution Centers - Arcola, Illinois; Aurora, Nebraska; Defiance, Ohio; Jonesboro, Arkansas; Cameron, Missouri; Watertown, South Dakota. To obtain warranty, a copy of original invoice is required.

THE FOREGOING LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS OR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESSED OR IMPLIED. Sukup neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part, and will not be liable for incidental or consequential damages. THE REMEDIES STATED HEREIN SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS LIMITED WARRANTY.

Sukup reserves the right to change specifications, add improvements or discontinue manufacture of any of its equipment without notice or obligation to purchasers of its equipment. This warranty gives you specific legal rights. You may also have other rights, which vary according to state or province.

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. ITEMS NOT MANUFACTURED BY SUKUP (i.e. Tires, Belts, Motors, etc.) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY. Since the down augers are so critical to the successful operation of the stirring machine, Sukup Mfg. will not warranty any machines unless they are equipped with Sukup down augers.

BASIC WARRANTY – All Sukup manufactured products are warranted for one year from date of purchase.

EXTENDED STIRRING MACHINE WARRANTY – Sukup warrants Stirring Machines for two years from date of purchase.

EXTENDED STIRRING AUGER WARRANTY – Stirring Augers are warranted for two years from date of purchase. Must return top 18" of down auger to obtain credit.

EXTENDED FAN WARRANTY - Sukup warrants fans for two years from date of purchase.

EXTENDED GRAIN DRYER WARRANTY - Sukup warrants grain dryers for two years from date of purchase.

EXTENDED HEATER CIRCUIT BOARD WARRANTY - Sukup warrants heater circuit boards for three years from date of purchase.

ELECTRIC MOTOR WARRANTY - The manufacturers of electric motors warranty their motors through authorized service centers. Contact motor manufacturer for nearest location. If motor warranty is refused by a service center based upon date of manufacture, use the following procedure: Have the motor repair shop fill out the warranty report form as if they were providing warranty service. State on the report the reason for the refusal. Send the report, motor nameplate, and proof of purchase date to Sukup. If electric motor warranty is not satisfactorily handled by motor service center, contact Sukup for assistance. Warranty may also be obtained by returning motor to Sukup Mfg. Co. or Distribution Centers with prior authorization.

NOTE: Sukup will not be responsible for unauthorized motor replacement or repair.

WARRANTY CERTIFICATION - Warranty registration card and the Start-up Checklist performed by your dealer upon successful completion should be mailed to certify warranty coverage.

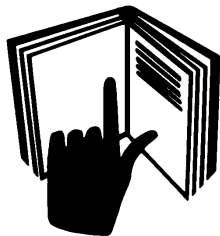
UNAPPROVED PARTS OR MODIFICATION - All obligations of Sukup under this warranty are terminated if: unapproved parts such as stirring augers are used, or if equipment is modified or altered in any way not approved by Sukup.

TOWER DRYER**Safety Section****RECOGNIZE SAFETY ALERT SYMBOL**

The above safety-alert symbol means "Attention! Be Alert! Your personal safety is involved!" This symbol draws your attention to important instructions concerning your personal safety. Read the message carefully to avoid personal injury or death.

FOLLOW MACHINE SAFETY SIGNS & MESSAGES

Observe safe operating practices. Carefully read this manual and all safety signs on your equipment. Safety signs must be kept in good condition. Replace missing or damaged safety decals or shields; available from Sukup Manufacturing Co., Box 677, Sheffield, Iowa 50475 at no charge.



Learn how to use controls and operate equipment. Do not let anyone operate unit (especially youth) without thorough training of basic operating and safety procedures.

Make no unauthorized modifications to equipment. Modifications may endanger function and/or safety of unit. Periodically check all mechanical and electrical components. Keep unit in good working condition.

EMERGENCIES - KNOW WHAT TO DO

Have emergency numbers near your telephone:

For doctors:
Emergency medical squad:
Ambulance service:
Hospital:
Fire department:

Have written directions to your location:

**DANGER!**

Never enter bin unless all power is locked off and another person present.

Rotating augers can kill or dismember!

NEVER, NEVER, clean out bin with augers running!

When bin is nearly empty, sweep (floor) augers travel at increasing speed, just turning around can give augers time enough to trap you. Exposed auger in sump can cause serious injury if stepped or fallen into.

Failure to follow the above precautions may cause serious injury or death.

**NEVER ENTER BIN**

DANGER: Never enter bin, unless all power is locked off and another person is present.

Flowing grain may trap and suffocate. If you enter a bin of flowing grain you can be completely submerged in grain in about 8 seconds.

Failure to heed this warning may cause serious injury or death.

**CAUTION:**

Metal edges are sharp. To avoid injuries wear protective clothing and handle equipment and parts with care.

Failure to do so may cause serious injury.



CAUTION: Maintain secure hand and foot hold when climbing on bin.

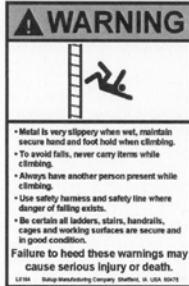
Metal is slippery when wet. Never carry items while climbing on bin to avoid falls.

Purchase ladder and safety cages and use safety harness. Failure to do so may cause serious injury or death.



TOWER DRYER SAFETY - DECAL PACKET- U99999

Safety decals should be mounted on your equipment as shown on this page.



L0164



L0165



L0237



L0281



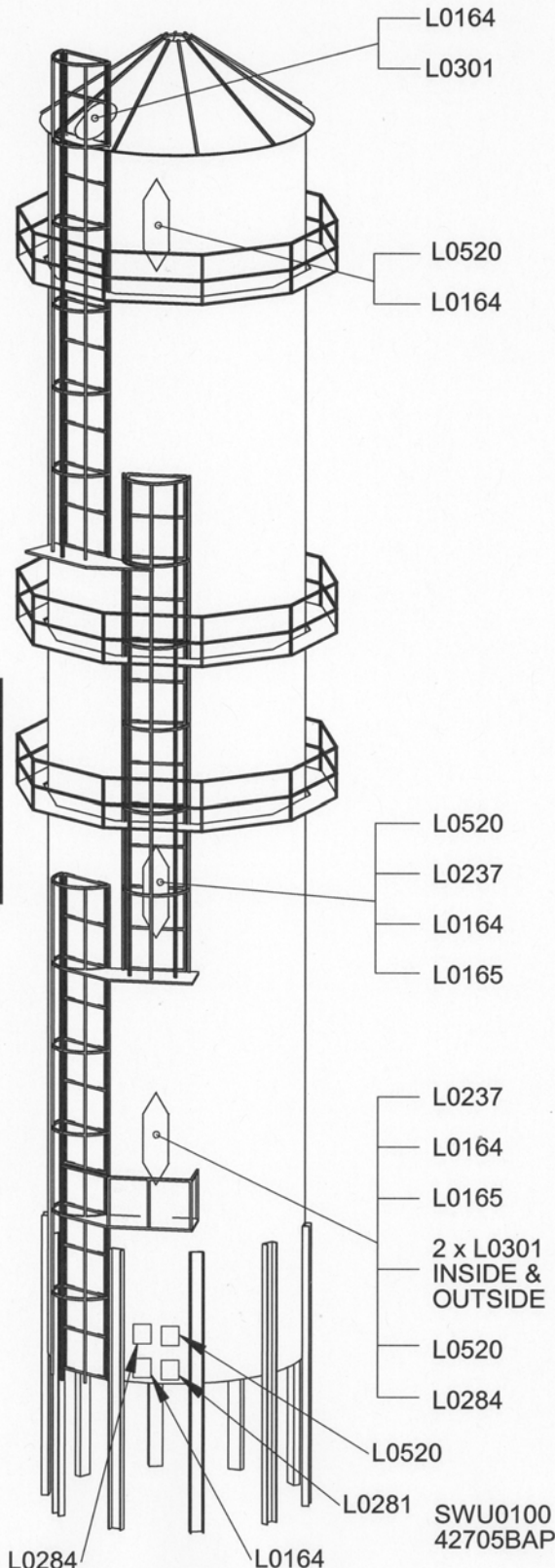
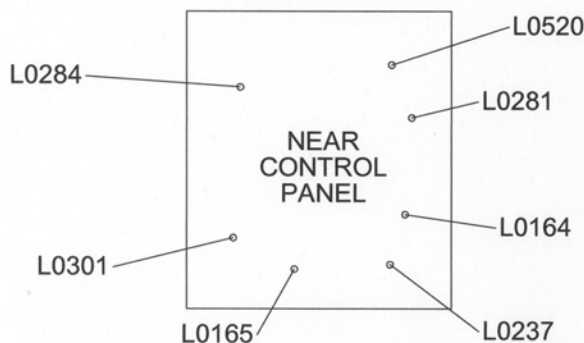
L0284



L0520

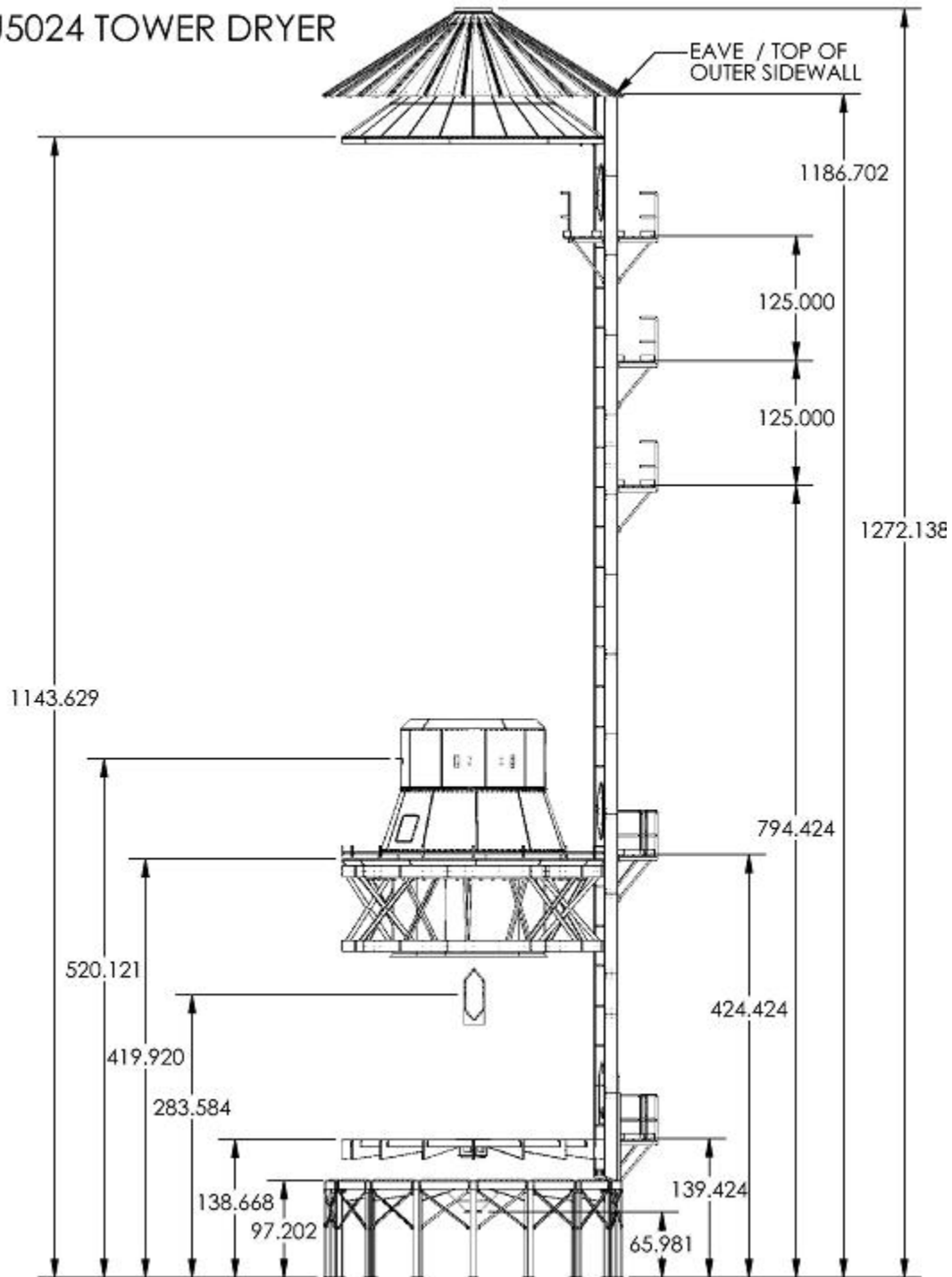


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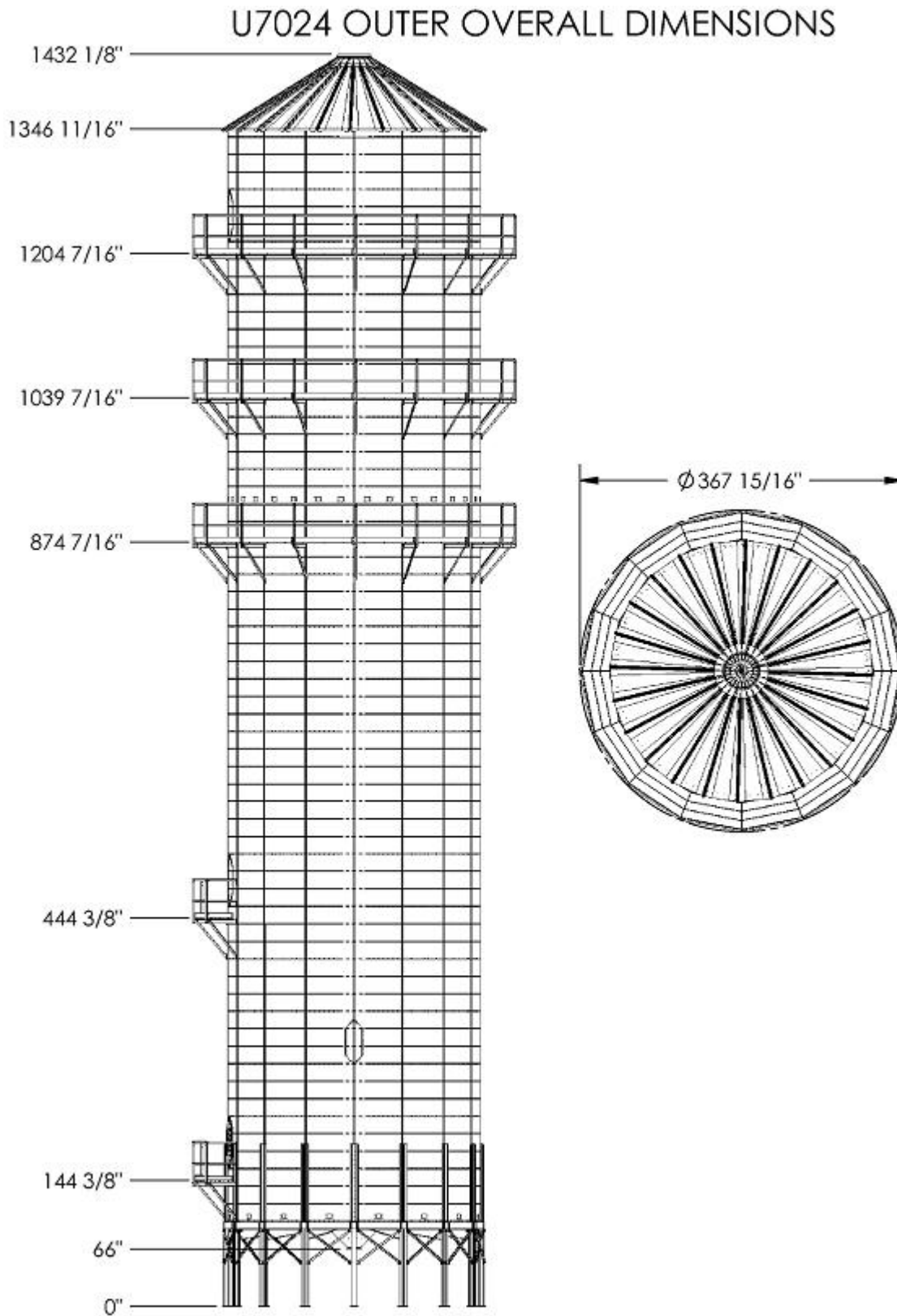


Tower Dryer Dimensions (24') – 5,000 BPH

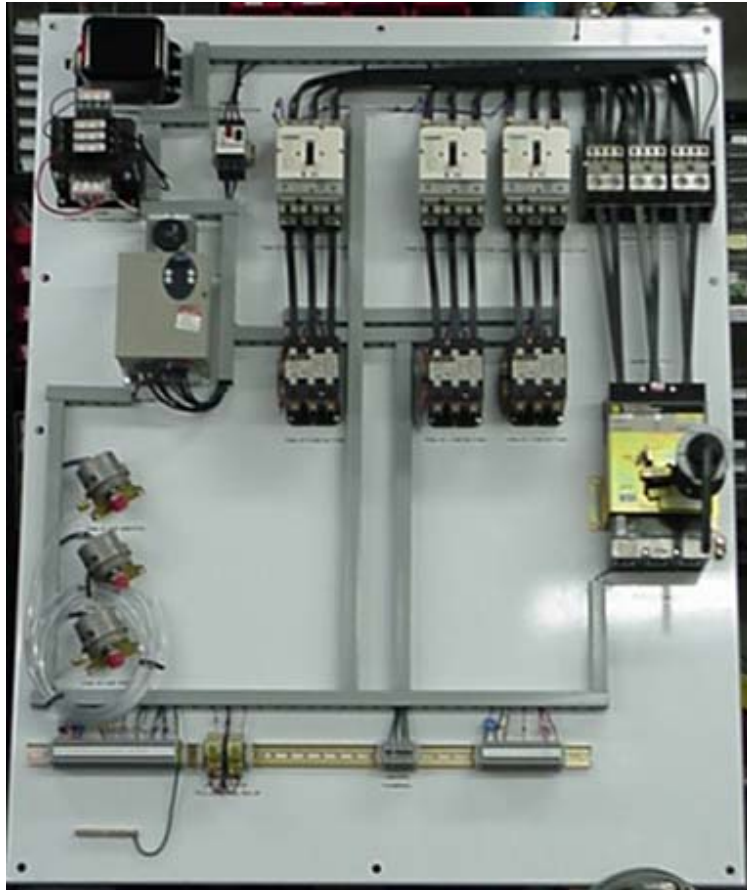
U5024 TOWER DRYER



Tower Dryer Dimensions (24') – 7,000 BPH

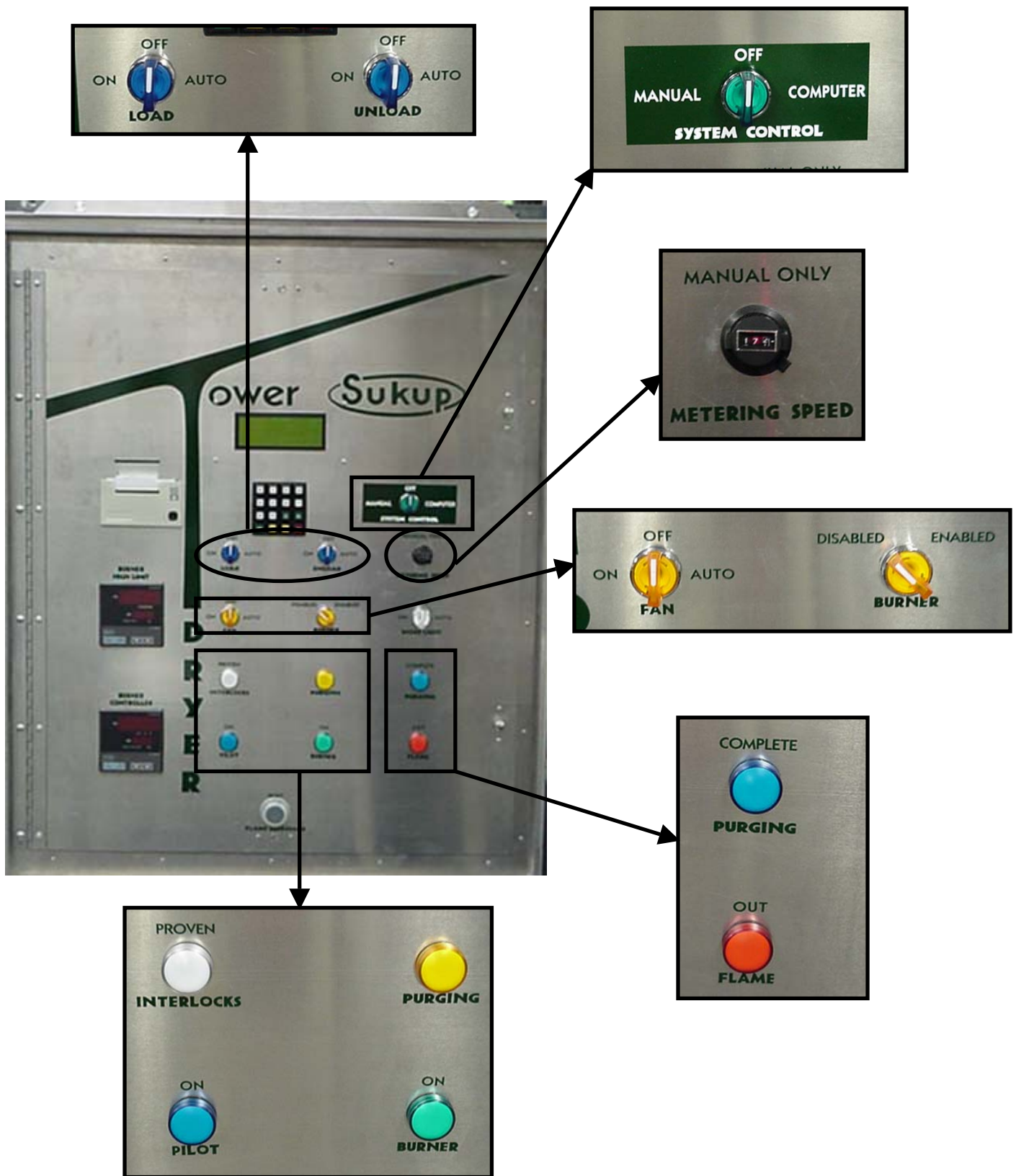


Power Box Interior Panel

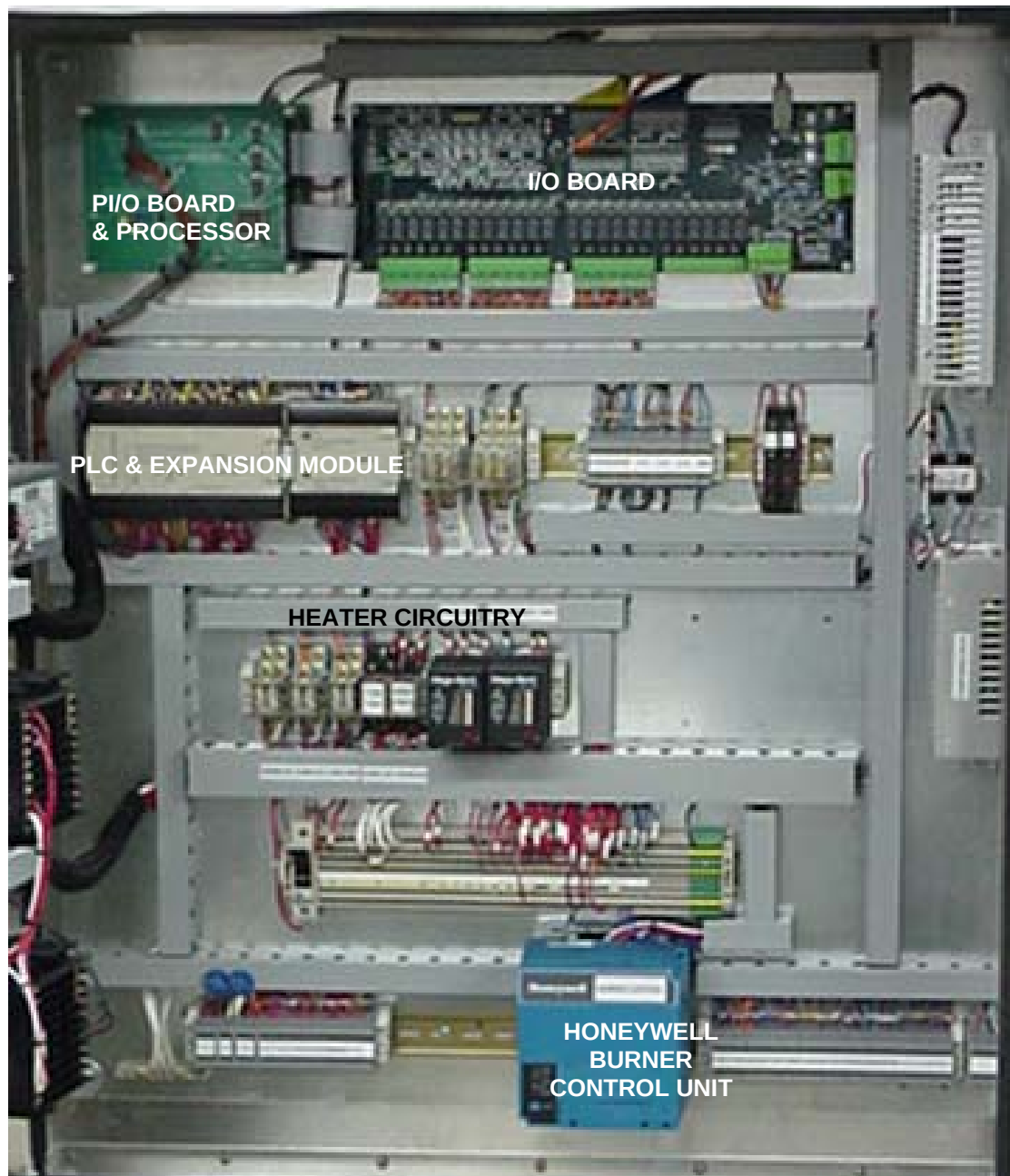


General Dryer Operation

Control Box Front Panel



Control Box Internal Panel



Maxon Controller



General Dryer Operation

Continuous Flow

Tower dryer continuous flow operation requires creating a gradient of moisture from the top to the bottom of the dryer and is accomplished by three main functions: initial dry, stabilization, and continuous flow. Before the first drying operation is started, the user must enter the incoming moisture and the desired output moisture into the control panel. The desired grain temperature measured in the column at the base of the heat chamber must also be entered. This will be used as the controlling factor once the dryer enters continuous flow operation. The input and output moistures are used to calculate the time necessary to perform the initial dry at 160°F temperature, during which no grain is unloaded from the dryer. After initial dry is complete, the user will set the desired drying plenum temperature and the controller calculates an unload speed corresponding to the plenum temperature entered. The dryer then performs a stabilization routine. During stabilization, a gradient of moisture is established in the dryer by drying and unloading one full load of grain without adjusting the unload speed. After stabilization has completed, the dryer enters continuous flow operation. During this operation, the dryer adjusts the unload speed for variances seen in the actual grain temperature compared to the desired grain temperature. When the final dry of the season is achieved, the user simply enters the final dry function and follows the simple instructions listed on the screen of the control panel.

When continuing a drying operation after the dryer has run out of grain or has been shut down, it is often desirable to run with the settings as before the shut down. Therefore, quick methods of restarting the dryer have been developed to meet this demand. Restarting the dryer with or without stabilization, depending upon the particular situation, can be accomplished by following a short series of steps, laid out on the control panel screen during normal startup operation.

Manual

Manual operation serves many purposes. When operators want complete control of the dryer, manual operation fulfills this need. Manual operation serves as a redundant control set, allowing the user to operate the dryer while the dealer meets any necessary service demands. Manual operation is a simple procedure of manually turning on fans, heaters, loads, and unloads. The dryer automatically loads the dryer during manual operation while the user has control of the unload speeds.

Before Loading or Starting the Dryer

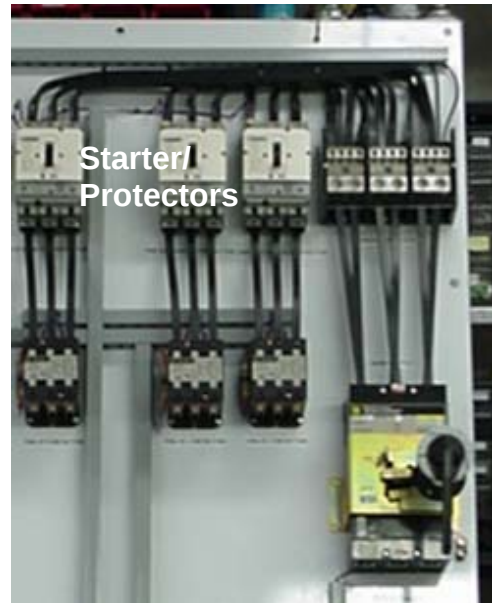
Caution

Ensure that all safety shields are in place. Also ensure that outside access covers on both sides of dryer are secured and latched and the tarp is covering the burner before loading grain.

Dryer Startup Preliminary Steps

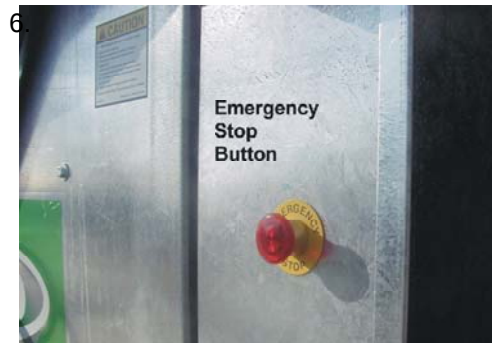
1. Prior to starting the dryer, turn the Main Disconnect on the front of the power box to "OFF".
2. Open the front panels of the power box by turning the chrome cabinet latch 1/4 turn clockwise (see next page).

3. Ensure that all circuit breakers and/or starter/protectors in the power box (shown at right) are turned ON for dryer operation.



4. Close the power box front panel and latch by turning the chrome cabinet latch to the left 1/4 turn.
5. Engage the main disconnect, by turning the lever 45° clockwise indicating "ON".

The main disconnect lever must appear as shown for dryer operation. On the left front side of the power box, pull the red "Emergency Stop" button out. The "Emergency Stop" button illuminates RED if pulled out with the main disconnect "ON".



Dryer Operation

Four operations have been designed to operate the Sukup Grain Dryer.

1. Continuous Flow
2. Manual Operation
3. Grain Transfer

To operate continuous flow or grain transfer, select the computer position of the system control switch on the front panel. The on screen menus will guide the operator through the startup process. Operating the dryer in manual requires turning the system control switch to manual and all other switches to on. In manual, when turning the other switches to the on position, the corresponding device will be started *immediately*.

Instructions for operation of the dryer are in the following locations:

- Continuous Flow, next page
- Manual p. 22
- Grain Transfer p. 25

Continuous Flow

Three options exist to begin the operation of continuous flow: Initial Dry, Restart with Stabilization, and Restart. The table below details the starting scenarios to choose the correct method to start the dryer.

Start/Restart scenario	Initial Dry w/ Stabilization	Restart w/ Stabilization	Restart
All wet grain, No gradient established	Yes	No	No
Shutdown greater than 3 Hours, gradient established, grain cool	Yes	No	No
Shutdown 3 to 6 Hours, gradient established, grain warm	No	Yes	No
Shutdown less than 1 Hour, gradient established	No	No	Yes
Change of plenum temperature more than 20°F.	No	Yes	No

Instructions for starting the dryer in continuous flow:

- Initial Dry, below
- Restart with or without Stabilization and Restart page 17

Initial Dry

During initial dry, two procedures are performed followed by continuous flow operation. The first procedure is to perform an initial dry. Initial dry dries the grain at a specific temperature, 160° F, over a calculated period of time without unloading. The time value is calculated based upon the input moisture and desired output moisture entered into the controller. The second procedure performed is stabilization. Stabilization begins unloading the grain and does not adjust the unload speed until the dryer has completely turned over the grain in the dryer. This unload speed is calculated based on the input moisture, desired

output moisture, and the plenum temperature. The time for stabilization is calculated to completely turn the dryer over based on the given unload speed.

Press start to begin automatic operation.

***** SUKUP MFG. *****
TOWER DRYER
PRESS START TO BEGIN
8/20/05 2:00PM

Select continuous Flow by pressing 1.

OPERATION	PRESS
CONT. FLOW	1
GRAIN TRANS.	2
FINAL DRY	3

Select initial dry by pressing 1.

OPERATION	PRESS
INITIAL DRY	1
STAB & RESTART	2
RESTART	3

A series of menus is then displayed to enter the appropriate settings for the date/time, input moisture, desired output moisture, desired grain temperature, and maximum unload speed. The previously saved values will be displayed on these menus; to accept the value press (+), or to change the value press (-).

After setting these values, the operator will be prompted to load the dryer if not full.

****DRYER NOT FULL****
PRESS START TO LOAD
OR RESET TO ABORT
OR '1' FOR FINAL DRY

The operator is prompted to set or accept the maximum fill time.

INITIAL FILL
SAFETY TIMEOUT
IS SET TO 68 MIN
YES(+) OR NO(-) ?

The operator is then prompted as to whether the fan(s) be turned on while loading the dryer.

SHOULD FANS BE ON
DURING INITIAL FILL?
YES(+) OR NO(-) ?

If fan(s) on is selected, the burner tarp **must** be removed. The fan(s) are then started.

VERIFY THAT THE
BURNER TARP HAS
BEEEN REMOVED AND
PRESS ANY KEY

If fan(s) off is selected, the operator will be prompted to tarp the burner. Burner tarp **must** be in place.

BURNER SHOULD BE
TARPED- INITIAL FILL
TARP IS ON - PRESS 1
CANCEL - PRESS 2

The operator is then prompted to turn the Load selector switch to ON in order to perform the initial fill.

**** DRYER NOT FULL **
TURN LOAD SELECTOR
SWITCH TO ON
OR RESET TO ABORT**

After turning the load selector switch ON, the fill will begin. If the fill time exceeds the maximum allowed fill time, the fill will shutdown. Ensure that the dryer is filling correctly and that sufficient grain is present to fill the dryer. Once the dryer is full, determined by the dryer's bin level indicators, the load auger(s) will turn off automatically.

Upon completion of the initial fill, the horn will sound and the operator will be prompted to turn the Load selector switch to auto.

**TURN LOAD SELECTOR
SWITCH TO AUTO**

The operator is then prompted to set the initial dry time. Press (+) to accept or (-) to change.

**INITIAL DRY TIME
IS SET TO 30 MIN**

YES(+) OR NO(-) ?

The operator is prompted to set the initial drying temperature on the burner control unit to 160F.

**SET PLEN CONTROL TMP
FOR 160F**

START TO CONTINUE

If the fan(s) are not yet running, the operator is prompted to remove the burner tarp.

**VERIFY THAT THE
BURNER TARP HAS
BEEN REMOVED AND
PRESS ANY KEY**

The fan selector switch must be set to auto before the fan(s) will start.

**TURN FAN SELECTOR
SWITCH TO AUTO
FOR FAN START**

The fan(s) are then started and the status of the air switch(es) are shown.

FAN AIR SWITCH

#1	#2	#3
OFF	OFF	OFF

The burner switch must be set to the enabled position before the burner can be started. The burner will then be automatically started. Operation will not resume until the burner has been lit.

**VERIFY THAT THE
BURNER SWITCH IS IN
THE ENABLED POSITION
WAITING FOR IGNITION**

The plenum temperature will then be allowed to stabilize for 100 seconds. The burner is automatically controlled to the temperature entered into the plenum control unit.

**PLENUM TEMPERATURE
STABILIZING
PLEASE STAND BY
90 SECONDS REMAINING**

The dryer will now perform initial dry. The remaining time and grain temperature is shown. Upon completion of initial dry, the horn will sound to alert the operator.

**INITIAL DRY 160F
TIME = 30:00 MINUTES
29:04 REMAINING
COLUMN TEMP. = 95F**

Press any key to continue to dryer stabilization.

Dryer Stabilization

After initial dry is complete, the dryer must enter a stabilization period.

The operator is prompted to set the desired drying temperature on the burner control unit.

**SET PLEN CONTROL TMP
FOR DRYING TEMP.
(140–220F) & PRESS
START TO CONTINUE**

The desired drying temperature must also be entered into the controller. Press (+) to accept or (-) to change.

**BURNER CONTROL UNIT
PLENUM TEMPERATURE
IS SET TO 220F
OK(+) OR CHG(-)**

Upon entering the plenum temperature, the controller calculates the proper unload speed for the desired moisture removal. Allowed unload speeds are 10% to 99%. If the calculated speed exceeds the maximum unload user setting or cannot reach the minimum unload speed, the user will be prompted to adjust the plenum temperatures settings or accept the setting with a warning. After setting the temperature and accepting the calculated unload speed, the stabilization countdown will occur. Changing the unload speed from the calculated speed for stabilization is not recommended.

When stabilization completes, the dryer will automatically proceed to continuous flow operation. Refer to continuous flow operation section.

Restart With or Without Stabilization

Restart simplifies the process of restarting the dryer with settings similar to those previously set. Restart can also be used when the dryer has been or will be loaded with dry grain.

When selecting restart without stabilization, it is necessary to check whether the dryer must be re-stabilized. The control panel display will show when the dryer was last shut down. Use this information, along with the chart on p.14, to determine whether or not it is necessary to re-stabilize the dryer. If it is necessary to re-stabilize the dryer, press (-), otherwise press (+).

Once it has been determined whether or not to run stabilization, the display will prompt the operator to approve or change dryer settings. The display will show previous input moisture, plenum temperature, and the last unload speed. Upon changing plenum temperature or unload speed, the unload speed will be recalculated. This is necessary to prevent the dryer from running in an undesirable manner.

After accepting or resetting the settings, the operator will be guided through the initial fill process, if necessary, by pressing Start (as seen in the initial dry section). The fan(s) and burner would then also be started (as seen in the initial dry section). Pressing reset would take the operator to the standby screen. Pressing 1 would allow the operator to perform the end of season final dry procedure.

****DRYER NOT FULL**
PRESS START TO LOAD
OR RESET TO ABORT
OR '1' FOR FINAL DRY**

Dryer Stabilization from restart

If stabilization is required, the dryer will immediately begin stabilization, otherwise, refer below for continuous flow operation.

When stabilization completes, the dryer will automatically proceed to continuous flow operation.

Continuous Flow

During continuous flow, the dryer will begin sampling the grain moisture and temperature. The current unload speed, column grain temperature, and output moisture and temperature are displayed along with a three-minute running average column temperature.

The desired column temperature will also be displayed alternately with the current column temperature

The average column temperature is continuously being monitored and adjustments to the unload speed are made as needed to maintain the desired column grain temperature.

Printout Information

Once the dryer is running, discharged grain temperature, current moisture, 3-minute moisture average as well as the current roll order will be printed once every 10 minutes.

If a shutdown occurs, the date & time that the shutdown occurred will be printed along with a brief description of the particular shutdown.

Starting operation Initial Dry, Restart, or Restart with Stabilization	SUKUP TOWER DRYER VERSION 1.2 MODEL U7024 CONTINUOUS FLOW OPERATION INITIAL DRY Date:8/22/05 Time: 8:21AM INPUT MOISTURE = 20.0% COL TEMP SET = 125F MAXIMUM UNLOAD = 75% MINIMUM UNLOAD = 10% MOISTURE CAL ADJ= 0.0 TEMP CAL ADJ = 0%	Program version number Tower model # Operation selected Continuous Flow or Grain Transfer																				
Input Moisture setting Column Temp setting																						
Temperature sensor calibration adjustment Indicator		Maximum unload setting Minimum unload setting Moisture sensor calibration adjustment indicator																				
Time Initial load started Time Initial load ended Time Initial Dry started Time Initial Dry ended Dryer stabilization completed	9:23AM INITIAL LOAD STARTED 9:49AM INITIAL LOAD COMPLETED 9:51AM INITIAL DRY STARTED-30 MIN. 10:15AM INITIAL DRY COMPLETE 10:15AM STABILIZATION STARTED-28MIN 10:43AM STABILIZATION COMPLETE	Computer calculated time for stabilization																				
Computer goes into full automatic temperature control	GRAIN 10 MIN PRINTOUT <table><tr><th>TIME</th><th>TEMP</th><th>COL</th><th>MOIST</th><th>UNLOAD %</th></tr><tr><td>10:53</td><td>80F</td><td>125F</td><td>15.1%</td><td>39%</td></tr><tr><td>11:03</td><td>82F</td><td>124F</td><td>15.0%</td><td>39%</td></tr><tr><td>11:13</td><td>79F</td><td>126F</td><td>14.9%</td><td>38%</td></tr></table> 11:20AM USER SHUTDOWN	TIME	TEMP	COL	MOIST	UNLOAD %	10:53	80F	125F	15.1%	39%	11:03	82F	124F	15.0%	39%	11:13	79F	126F	14.9%	38%	Prints time, output and column temperature, moisture content, and unload speed
TIME	TEMP	COL	MOIST	UNLOAD %																		
10:53	80F	125F	15.1%	39%																		
11:03	82F	124F	15.0%	39%																		
11:13	79F	126F	14.9%	38%																		
Data is printed every 10 minutes		When ever the dryer shuts down, it will print the time and reason for shutdown																				

Setting's Adjustment During Continuous Flow

Pressing the set key during continuous flow operation allows the user to change the settings listed on the display right.

1=CALIBRATE SENSORS
2=PLENUM TEMPERATURE
3=COL TEMP 4=MST IN
5=CONFIGURATION

Output Calibration Procedure During Continuous Flow

Once the dryer has begun sampling and the grain kernel temperature has stabilized, the output moisture sensor's accuracy should be verified.

1. Obtain a sample of discharged grain from the sample spout at the rear of the dryer.
2. Test the temperature and moisture of the sample. The moisture tester should be calibrated with the tester from the location where the grain will be sold.
3. Once samples have been taken, the discharge temperature must be calibrated prior to calibrating moisture. This sequence is **required** as the moisture readout is temperature compensated.
4. To calibrate discharge temperature, press "SET" from the continuous flow operation screen, then press "1" and then "2" to set the temperature. Enter the temperature obtained from the sample.
 - Example: The dryer read 120°F kernel temperature and the actual temperature was 110°F. The difference between the recorded versus the set temperature was minus 10 degrees. After pressing set, the displayed temperature is 115°F. Update the current temperature to read 105°F.
5. To calibrate discharge moisture, press "SET" from the continuous flow operating screen, then press "1" and then "1" again to set the moisture. Enter in the moisture obtained from the sample.
 - Example: The dryer read 16.5 moisture and the actual moisture was 16.0%. The difference between the recorded versus the set moisture was -0.5 %. After pressing set, the displayed moisture was 15.5%. Update the current moisture to read 15.0%.
6. Wait a few minutes and obtain another sample to verify. Recalibrate if necessary.

**CURRENT MOISTURE
VALUE IS 16.0%
DESIRED INDICATED
VALUE ??.%**

Stopping of Automatic Moisture Control

Continuous flow operation can be stopped by any of the three following methods:

1. User shutdown by pressing the 'Reset' button.
2. Automatic shutdown due to an Out-of-Grain timeout
3. Automatic shutdown due to a fault. Refer to Fault Shutdown section.

**OUT OF WET GRAIN
PRESS ANY KEY**

Final Dry

The final dry procedure allows the operator to dry the remaining grain and empty the dryer.

When Final Dry has been selected, the operator will be prompted for the current input moisture. Press (+) to accept or (-) to change.

**THE CURRENT INPUT
MOISTURE SET=20.0%**

OK(+) OR CHG(--)

The operator is prompted to set the final drying temperature on the burner control unit to 140F.

**SET PLEN CONTROL TMP
FOR 140F**

START TO CONTINUE

After setting the burner control temperature, the operator will be prompted for the final dry time. The amount of dry time is calculated by the computer based on 3 minutes per point of moisture removal by comparing the incoming moisture content with desired moisture out. Press (+) to accept or (-) to change between 5 minutes and 60 minutes.

**RECOMMEND 140F DRY
TIME FOR 15.0 MIN.**

OK(+) OR CHG(--)

The final dry process will begin and countdown the drying time.

**FINAL DRY 140F
TIME = 15.0 MINUTES
13:29 REMAINING
COLUMN TEMP. = 113F**

At the end of the timed sequence, the burner will be shut down. Press any key on the keypad to start the final unload.

**BURNER IS NOW OFF
PRESS ANY KEY TO
START FINAL UNLOAD
OR 'RESET' TO ABORT**

During the final unload, the unload speed will be set to the maximum and the fan(s) will continue to run. The fan(s) may be turned off by turning the fan selector switch to "OFF."

*** FINAL UNLOAD *
MOIST=14.5% TMP=71F
UNLOAD SPEED = 75%
10:07 REMAINING**

After the calculated time has elapsed, the fan(s) are automatically shut down. "Final Unload Complete, Press Any Key" is displayed to the operator. The final dry cycle is now complete and the last of the dried grain will have been transferred. If there is still grain in the dryer, a manual unload can be performed to empty it. Press any key on the keypad to return to the main screen. If it is the end of the drying season, place the tarp over the burners to protect until next season.

Manual Control Introduction

This mode of operation is provided primarily as a backup for operating the dryer should there be a problem with the automatic controller. However, the dryer may be operated in manual at any time.

When operating in the manual mode, safety circuits are monitored by the PLC, and a fault condition will cause a system shutdown. In the event of a fault, the switches must be turned to the "OFF" position to reset the control system.

Starting Dryer from Empty

To start the dryer in the manual mode, turn the system power switch to manual and if the computer is operational, the following screen will appear:



**** SYSTEM READY ****
**** MANUAL CONTROL ****
START TO MONITOR
8/22/05 12:45PM

The dryer is now ready for manual operation.

Step 1. Load Dryer

Load the dryer by turning the load auger switch to "ON". When the dryer is full, the load auger will shut off automatically. It is not necessary to turn the load auger off with the switch.



During manual operation, the PLC will monitor the dryer and control the load device to automatically fill the dryer during operation.

If the computer is operational, and the operator desires to monitor the moisture and temperature of the output grain, press "START" and the following screen will appear:

**** MANUAL CONTROL ****
NO AUTO CONTROL OR
SENSING OF UNLOAD
START TO CONTINUE

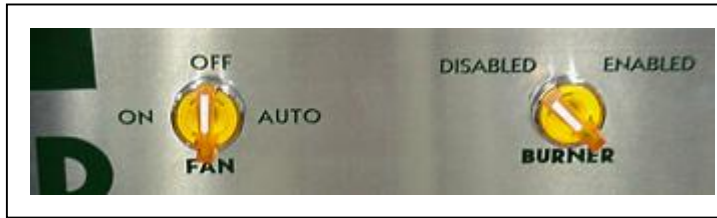
Press "START" on the keypad to continue to the monitoring function.

Step 2. Starting Fans/Burner

Next, start the fan(s) and burner by first turning the fan switch to "ON" and then turning the heater switch to "ON".

Note:

The burner will have a purge delay before starting.



Allow the plenum temperature to stabilize for approximately 100 seconds.

Step 3. Initial Dry Time

Adjust the burner control unit for a plenum temperature of 160F. The amount of time to keep the dryer in this condition is determined by the incoming grain moisture and the desired output moisture.

Use the formula below to determine the Initial Dry time.

(Incoming Moisture Content – Desired Moisture Content Out) x 5 Minutes = Initial Dry Time

Example

(21% Incoming – 16% Desired Out) x 5 Minutes = 5% x 5 Minutes = 25 Minute Initial Dry Time

After the Initial Dry time is complete, it is necessary to allow the dryer to stabilize the moisture gradient. At this time, manually increase the plenum temperature to the desired drying temperature (140-220F).

Step 4. Dryer stabilization

After the initial dry time is completed, set the plenum temperature to the operating temperature.

Begin dryer stabilization by turning the unload auger switch to "ON".



Next adjust the Unload Speed to the desired speed. To adjust the unload setting, move the locking lever up, and rotate the knob to the desired setting.

A 3-digit indicator in the center of the knob indicates the speed setting. This value indicates 000 to 999. Example: If desired speed is 25%, dial indicator to 250.



At this point it is very important to let the dryer stabilize. DO NOT make any further unload adjustments until the dryer has turned the grain over completely one time.

At this point a proper moisture gradient will have been established if the roll speed was left alone.

Step 5. Dryer Operating under Manual Unload Control

At the end of the Dryer stabilization period as determined above, monitor the discharge moisture content by either observing the control box display (only if computer is operational) or by performing a manual sample test using the sample spout. Calibrate temperature and moisture readout if necessary.

This display, detailed here, will monitor the output moisture while running in manual.

SAMPLING...
COLUMN TEMP. = 102F
MOIST=15.2% TMP=68F
AVG COL TEMP = %104F

If the discharge moisture content is not correct, adjust the unload potentiometer if moisture content is too high, or if moisture content is too low.

Important

After adjusting the unload speed, allow at least 15 minutes of operation before re-checking moisture and/or re-adjusting meter speed again.

Tower Dryer Unload Rates*

12' Tower Dryer										
Speed (%)	10	20	30	40	50	60	70	80	90	100
RPM	0.22	0.45	0.67	0.9	1.12	1.34	1.57	1.79	2.02	2.24
Freq (Hz)	6	12	18	24	30	36	42	48	54	60
BU/HR*	240	480	720	960	1200	1440	1680	1920	2160	2400

18' Tower Dryer										
Speed (%)	10	20	30	40	50	60	70	80	90	100
RPM	0.17	0.35	0.52	0.7	0.87	1.05	1.22	1.4	1.58	1.74
Freq (Hz)	6	12	18	24	30	36	42	48	54	60
BU/HR*	470	940	1410	1880	2350	2820	3290	3760	4230	4700

24' Tower Dryer										
Speed (%)	10	20	30	40	50	60	70	80	90	100
RPM	0.17	0.35	0.52	0.7	0.87	1.05	1.22	1.4	1.57	1.74
Freq (Hz)	6	12	18	24	30	36	42	48	54	60
BU/HR*	700	1400	2100	2800	3500	4200	4900	5600	6300	7000

*Unload rates are an **approximation only**. Rates can vary due to flow gate and paddle arm settings, varieties of grain, and amount of fines. For an accurate rate, an accrual flow test should be done on site.

Flow Gate Openings Used for Calculations:

12' Tower Dryer – 4.25" opening
 18' Tower Dryer – 5.5" opening
 24' Tower Dryer – 5.5" opening

Step 6. Dryer Shut Down

To shut the dryer down when in manual operation, perform the following steps in sequence.

- a. Set the unload potentiometer to "000" and lock.
- b. Turn the burner switch to "DISABLED".
- c. Turn the load auger switch to "OFF".
- d. Turn the unload auger switch to "OFF".
- e. Turn the fan switch to "OFF".
- f. Turn the system power switch to "OFF".
- g. Place the tarp over the burners if ending drying season.

Starting the Dryer after a Shutdown

The following table is a guideline for restarting the dryer after a shutdown.

Start/Restart scenario	Initial Dry w/ Stabilization	Restart w/ Stabilization	Restart
All wet grain, No gradient established	Yes	No	No
Shutdown greater than 3 Hours, gradient established, grain cool	Yes	No	No
Shutdown 3 to 6 Hours, gradient established, grain warm	No	Yes	No
Shutdown less than 1 Hour, gradient established	No	No	Yes
Change of plenum temperature more than 20°F.	No	Yes	No

The method used for restarting the dryer depends on how long the dryer has been shut down.

Grain Transfer Introduction

It may be required for the dryer to transfer grain through it to reach storage facilities. The grain transfer mode simplifies this process. The control panel display steps the user through a simple process to begin and end the procedure through normal startup operation. During grain transfer the dryer will not run the fans or burner.

Starting Grain Transfer

Press "2" to continue with the Grain Transfer mode.

OPERATION	PRESS
CONT. FLOW	1
GRAIN TRANS.	2
FINAL DRY	3

Set the maximum unload speed. This speed will be used to transfer grain as quickly as possible.

**MAX UNLOAD SPEED
IS SET TO 75%**

OK(+) OR CHG(-)?

The operator is then prompted to press start to perform an initial fill, if necessary.

****DRYER NOT FULL**
PRESS START TO LOAD
OR RESET TO ABORT
OR '1' FOR FINAL DRY**

After pressing start, if the dryer requires filling, the fill will begin (completely filling the dryer is necessary in order to still monitor safety functions by the PLC). If the fill time exceeds the maximum allowed load time, the fill will shut down. Ensure that the dryer is filling correctly and that sufficient grain is present to fill the dryer. Once the dryer is full, determined by the dryer's bin level indicators, the load system will turn off automatically.

After the unload speed has been set, and the dryer filled, the operator will be prompted to press start to begin transferring grain.

**READY TO START
UNLOADING
PRESS ANY KEY
TO START**

The operator is asked whether the 30-minute "Out of Wet Grain" timeout is to be used. If selected, the load system will automatically be shut down after 30 minutes of no grain being detected by the bin level indicator. The unload system will continue to run for another 10 minutes to clean out.

**IS 30 MINUTE OUT
OF WET GRAIN
TIMEOUT DESIRED?
YES(+) OR NO(-)?**

The grain transfer operating screen will display the unload speed and output moisture and temperature. To change maximum unload speed, press "SET" to access CONFIGURATION menu. To end the Grain Transfer mode, press "RESET".

****GRAIN TRANSFER**
MOIST=15.2% TMP=68F
UNLOAD SPEED = 75%
TO EXIT PRESS RESET**

Tower Dryer Control System Menus – Quick Reference Guide V1.2

[SET] Menu:

1=CALIBRATE SENSORS
2=PLENUM TEMPERATURE
3=COL TEMP 4=MST IN
5=CONFIGURATION

- 1 – Calibrate Moisture/Temperature Sensors
- 2 – Set Plenum Temperature(s) and Options
- 3 – Set Grain Column Control Temperature
- 4 – Set Input Moisture
- 5 – Set Configuration Parameters

[1] Calibrate Sensors Menu:

CALIBRATE SENSORS
1=OUTPUT MST 2=TEMP
4=COLUMN RTD TEMP
5=INPUT MST 6=TEMP

- 1 – Calibrate Output Moisture
- 2 – Calibrate Output Temperature
- 4 – Calibrate Grain Column RTD Temp
- 5 – Calibrate Input Moisture (if applicable)
- 6 – Calibrate Input Temperature (if applicable)

[2] Plenum Temperature Menu:

PLENUM TEMP SETUP
1=PLENUM TEMPERATURE
3=MIN TMP 4=MAX TMP

- 1 – Enter Plenum Temperature from Maxon Control
- 3 – Set Minimum Plenum Temperature
- 4 – Set Maximum Plenum Temperature

[5] Configuration Menu:

1=TIME/DATE 2=LANG
3=UNLOAD MIN 4=MAX
6=FAN 7=CLEANOUT DLY
8=LOAD STOP 9=AUGERS

- 1 – Set Time and Date
- 2 – Set Language Selection (if applicable)
- 3 – Set Minimum Allowed Unload Speed
- 4 – Set Maximum Allowed Unload Speed
- 6 – Set Fan Shutdown Delay Time
- 7 – Set Auxiliary Unload Auger Cleanout Delay Time
- 8 – Set Load Auger Stop Delay Time
- 9 – Set # of Auxiliary Load Augers

[MODE] Menu:

MODE = ?
2=DRY FIRE/TEST
4=CAL/SETUP 5=SENSOR
6=SET PROC 7=UNITS

- 2 – Perform Dryer Dry Fire Diagnostics
- 4 – Monitor Sensors
- 5 – Select Moisture Sensor
- 6 – Select Processor PCB Version
- 7 – Select Temperature Units (F or C)

Maintenance

Maintenance

Performing preventative maintenance on the dryer is very important and can help to ensure that the dryer will perform well throughout the drying season.

The following guidelines are the minimum recommended procedures to be performed.

Caution

When performing maintenance and using the ladder attached to the dryer, make sure the ladder is dry before climbing. Ladder may be slippery when wet.

Caution

All bolts used to keep enclosures locked **MUST** be tightened beyond hand removal after opening to prevent undesired access.

Seasonal Maintenance

1. Before using dryer, clean the cooling chamber of fines and debris weekly to prevent build up. Also, make sure that the divider between the cooling chamber and the heating section remains clean. Build up could cause damage to the dryer.
2. Clean out the grain discharge to ensure that the grain will flow uniformly and that clogs will not occur.
3. Wash down the interior sidewalls with a pressure washer or high pressure hose to remove sludge and dried on corn material. Make sure to do this when the grain level is below the plugged up area or when the dryer is empty.
4. Lubricate all fan motor bearings every 5000 hours of operation. Use high temperature grease, Shell Dolium R or Chevron SRI3#2. Remove pipe plug each end if so equipped.

Caution

Over greasing either in quantity or speed of injection can cause premature bearing failure.

Apply 0.61 to 0.81 oz. of grease gradually, taking at least 1 minute to do so.

5. Check all motor openings for any blockage.
6. Check wiring on fans and heater. Look for loose connections, bare wires, or rodent damage. Be sure to check the ignition wires for damage or shorting.
7. Examine the Maxon burner for debris or fines. Make sure the burner is clean before use. If debris is left on the burner, it could ignite and cause a fire inside the burner.
8. Inspect the valve train components for physical integrity and tightness.

Barry Blower Fan Maintenance

The following information is given by Lau Industries, Inc. Contact Barry Blower for more information.

Pre-Operative Inspection

1. Inspect the fan and its accessories for any visible signs of damage. Also check for shortage of items or accessories. Report any noted damage and/or shortage of the bill of lading to the carrier.
2. Rotate fan wheel by hand to check for free rotation and any shifting of the wheel on the shaft, which might have occurred during shipment. If necessary, loosen hub set screws, shift wheel to correct position and re-tighten setscrews to correct for a grinding or rubbing wheel. See Table 1 for correct wheel overlap.

FAN SIZE	"A" DIMENSION (in.)
150	9/16
165	5/8
182	5/8
200	3/4
222	7/8
245	1 1/16
270	1 1/8
300	1 1/8
330	1 1/4
365	1 3/8
402	1 1/2
445	1 5/8
490	1 7/8
542	2 1/16
600	1 1/4
660	2 1/2
730	2 3/4

Table 1. Inlet funnel/wheel cone overlap

3. Assemble motor and drive in their proper relative position, if not already assembled on fan.
4. Install any accessories such as belt guard or weather cover, and vibration isolating pads.
5. Remove discharge end cover plate and check belt and pulley alignment.
6. Check belt tension, if necessary. Belt tension can be adjusted by means of the adjustment base.
7. Assure that all bolted connections are tight.
 - a. Check tightness of inlet funnel bolts and any flanged connection bolts.
 - b. **Important:** Check tightness of setscrews in blower wheel hub.
 - c. Check tightness of adjustable motor base bolts.
 - d. **Important:** Check tightness of setscrews in motor and fan pulley sheaves.
 - e. Check tightness of setscrews in bearing locking collar.
 - f. Check tightness of bearing mounting bolts.

Maintenance

Operation

After all per-operative inspection checks have been completed, the unit is ready for operation.

1. Momentarily start the blower motor to check for correct rotation as indicated by arrow on the fan outer shell.
2. If fan wheel rotates in opposite direction, check motor manufacturer's wiring instructions and rewire accordingly.
3. Run fan. Look for vibration. Check motor amp draw.
4. If belts squeal excessively at startup, they are too loose and should be tightened.
5. Recheck all bolts and setscrews in one hour and again after 24 hours of operation. When belts have had time to seat in the sheave grooves, readjust belt tension. Check belt tension after 8, 24, and 100 hours of operation.

Maintenance

A regular maintenance program for inspection of all fan parts should be established as it is imperative for good fan performance. Inspection intervals will depend on each particular installation and the severity of application.

1. Bearings should be lubricated as indicated on the supplemental Bearing Lubrication Instructions (IM 406) and on the fan outer shell. Always use the same type of grease or an equal for re-greasing.
2. Check V-belts for alignment and proper tension. Replace belts that show evidence of wear. Remember that for multiple belt drive, belts must be a matched set.
3. Check impeller blades for build-up of particulate matter. Any appreciable amount of matter may cause an unbalance condition.

FAN SIZE	CLASS	
	I	II
150	NA	3409
165	NA	3111
182	2236	2796
200	2041	2551
222	1835	2294
245	1665	2082
270	1476	1846
300	1330	1662
330	1208	1510
365	1072	1341
402	973	1216
445	880	1100
490	800	1000
652	NA	903
600	NA	816
660	NA	742
730	NA	671

Table 2. Max speeds (rpm) for steel & aluminum wheels

Maintenance

Barry Blower Lubrication Instructions

Bearing Types

Barry Blower typically furnishes one of three basic bearing types for centrifugal, axial, and propeller fans – ball bearing, spherical roller bearing, spherical roller bearing with split housing. The bearing type and manufacturer are indicated on each bearing.

Operating Conditions

Bearings should not be located in the airstream or an environment with a heavy concentration of abrasive elements. Barry Blower does not recommend grease lubricated bearings for ambient temperatures above 200°F. For information on water or oil-cooled bearings contact Barry factory.

Grease Selection

Various types and brands of grease are suggested for your specific bearing type and application can be used. In all cases on should avoid mixing different brands of grease.

Initial Greasing

All standard bearings provided by Barry Blower should be purged and relubricated before operation. Using the approved grease or an equivalent, lubricate the bearing and housing reservoir through the pressure lubrication fitting. Complete greasing is assured if grease is worked in on one side of the bearing until grease appears on both sides. If the bearing will be operated at less than 150 RPM, and in dirty conditions, more grease is desirable. The bearing will discharge excess grease through seals after a short period of operation. It is not necessary to replace this initial discharge because leakage will cease when the excess grease is worked out.

Relubrication

The initial greasing interval can be determined by the conditions or bearing instructions which follow. By carefully observing the condition of the grease expelled from bearings at the time of relubrication, it can be determined whether the maintenance schedule should be altered. When regreasing, avoid mixing different brands of grease.

OPERATING CONDITION		BEARING OPERATING TEMP.	GREASING INTERVAL *	USE GREASE EQUIVALENT TO THESE GRADES	REMARKS
DIRT	MOISTURE				
Fairly Clean	None	32°F to 120°F 120°F to 160°F 160°F to 200°F	6 to 12 Months 1 to 2 Months 1 to 4 Weeks	Philips Petroleum Co. – <i>Philube L #1</i> Master Lubricants Co. – <i>Lubrike M-3 Spec</i> Atlantic Refining Co. – <i>Atlantic 62</i> Imperial Oil Ltd. – <i>Andok 280</i> Standard Oil Co. (Ind.) – <i>Amelith #1</i> Sun Oil Co. – <i>Sunoco 844-X</i> New York & New Jersey Lubricant Co. – <i>F-925</i> Mobil Oil Co. – <i>Mobilux #1</i>	
Moderate to Extremely Dirty	None	32°F to 160°F 160°F to 200°F	1 to 4 Weeks 1 Week		
Fairly Clean	Heavy Moisture and Direct Water Splash	32°F to 200°F	1 Week		Customer should provide flinger or place a hood over bearing housing and fasten a disc to shaft just inside of hood shaft opening. Consult Link-Belt
		32°F to 200°F	Determined by frequent inspection of installation	Shell Oil Co. – <i>Alvania EP2</i> Texas Co. – <i>Sovarex grease L-1</i>	
	None	32°F to - 40°F	Consult Link-Belt Application Engrg.	Mobil Oil Co. – <i>Mobilgrease BRB Zero</i> Texas Co. – <i>2324 Uni Temp Ep</i>	Cold storage room
	None	Over 200°F or - 40°F	Consult Link-Belt Application Engrg.	Special lubrication may be required. Consult Link-Belt	A different Link-Belt bearing may be required using oil as a lubricant, etc.

* Frequency of regreasing will vary, depending on the hours of operation, temperature, and surrounding conditions.

Storage

All fan bearings **must be relubricated** soon as they arrive from the factory. To prevent corrosion, all bearings should receive grease and be rotated the first of **every** month. Turn the wheel by hand while greasing bearings. A clean 1/16" bead of grease must appear on each side of each bearing. Refer to specific bearing lubrication instructions on the fan.

Bearings which are to be stored or idle for an extended period of time should be wrapped in a neutral greaseproof paper, foil, or plastic film. Compounds can be recommended by the bearing manufacturer to provide protection for several months to several years.

After long-term storage, grease should be purged from the bearings and fresh grease injection prior to start-up.



Spherical Roller Bearing



Ball Bearing



**Spherical Roller Bearing
With Split Housing**

Grease lubrication schedule

Link-Belt® ball bearings – Series 300

SKF ball bearings – SY

Sealmaster ball bearings

For use on horizontal shaft equipment

SHAFT SIZE INCHES	OPERATING SPEED (RPM)									
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
	LUBRICATION CYCLE (MONTHS)									
5/8 thru 1	6	6	6	6	4	4	4	4	2	2
1 1/8 thru 1 1/2	6	6	6	4	4	4	2	2	2	1
1 5/8 thru 1 15/16	6	6	6	4	4	2	2	1	1	
2 thru 2 1/2	6	6	4	4	2	1	1	Consult Manufacturer For specific Recommendations		
2 11/16 thru 3 3/16	6	4	2	2	1	1	1/2			
3 7/16 thru 3 15/16	6	4	2	1						
Lubricate with the following greases or their equivalent:										
Shell	-- Alvania EP Grease No. 2						Gulf	-- Gulfcrown		
Grease No. 2										
Texaco	-- Molytex Grease No. 2						American	-- Amolith		
Grease No. 2										
Mobil	-- Mobilux EP2									
1. If fans are to be stored after arrival at job site, bearings should be immediately relubricated and shaft rotated monthly for corrosion protection.										
2. Normal conditions are defined as a clean, dry atmosphere at temperatures between - 20°F and 180°F. Greater temperatures, moisture or dirt content will require more frequent lubrication cycles.										
3. Use sufficient volume of grease to purge the bearing seals. Rotate bearings during relubrication where good safety practice permits.										

Maintenance

Grease lubrication schedule

Link-Belt® spherical roller bearings – Series B22400 & B22500

For use on horizontal shaft equipment

Shaft Sizes		Amount of grease		Operating Speed (rpm)									
				500	1000	1500	2000	2200	2700	3000	3500	4000	4500
Inches	MM	IN ³	CM ³	Lubrication Cycle (months)									
3/4 – 1	25	0.39	6.4	6	6	6	4	4	4	2	2	1	1
1 1/8 – 1 1/4	30	0.47	7.7	6	6	4	4	2	2	1	1	1	1
1 7/16 – 1 1/2	35	0.56	9.2	6	4	4	2	2	1	1	1	1	1/2
1 5/8 – 1 3/4	40	0.80	13.1	6	4	2	2	1	1	1	1	1/2	
1 15/16 – 2	45-50	0.89	14.6	6	4	2	1	1	1	1	1/2		
2 3/16 – 2 1/4	55	1.09	17.9	6	4	2	1	1	1	1/2			
2 7/16 – 2 1/2	60	1.30	21.3	4	2	1	1	1	1/2				
2 11/16 – 3	65-75	2.42	39.7	4	2	1	1	1/2					
3 3/16 – 3 1/2	80-85	3.92	64.2	4	2	1	1/2						
3 11/16 – 4	90-100	5.71	93.6	4	1	1/2							
4 3/16 – 4 1/2	110-115	6.50	106.5	4	1	1/2							
4 15/16 – 5	125	10.00	163.9	2	1	1/2							

These guidelines are for usage on applications approved by FMC.

Lubricate with a multipurpose roller bearing NLGI Grade 1 or 2 grease having rust inhibitors, antioxidant additives, and minimum oil viscosity of 400 SSU at 100°F. For operation requiring a monthly or less cycle the grease should also be suitable for temperatures up to 250°F continuous, dynamically stable and must not churn or whip.

Some greases having the desired properties are:

American – Rykon Grease No. 2, Mobil - Mobilgrease® 28, Texaco – Molytex EP2 grease.

If bearings are subjected to temperatures below 32°F or above 200°F, consult equipment manufacturer for proper lubrication.

Conditions of vibration exceeding 1 to 2 mils, moisture or dirt will require a more frequent lubrication cycle or special lubricant selection. Rotate bearings during relubrication where good safety practice permits.

Lubricate bearings prior to extend shutdown or storage and rotate shaft monthly to aid corrosion protection.

Maintenance

Grease Lubrication schedule

FYR and SYR unit pillow blocks with SKF spherical roller bearing – Relub Interval (Hours)

Shaft Dia.	Pillow Block Number	Speed (RPM)											Grease To Be Added (oz.)
		300	500	700	900	1100	1300	1500	1800	2400	2700	3000	
1 7/16	107	7220	4265	3000	2300	1850	1545	1315	1070	760	660	580	0.33
1 11/16	111	6775	3995	2800	2140	1715	1425	1210	980	690	595	515	0.35
1 15/16	115	6400	3760	2630	2000	1600	1325	1120	900	625	535	460	0.37
2 3/16	203	6070	3555	2475	1880	1495	1230	1040	830	565	480	410	0.45
2 7/16	207	5530	3215	2220	1670	1320	1075	900	705	465	385	320	0.67
2 11/16	211	5090	2935	2010	1495	1170	945	780	600	375	300	-	0.72
2 15/16	215	5090	2935	2010	1495	1170	945	780	600	375	300	-	0.72
3 7/16	307	4560	2590	1750	1280	980	775	625	460	200	-	-	1.15
3 11/16	311	4265	2400	1600	1155	875	675	536	380	-	-	-	1.50
3 15/16	315	4265	2400	1600	1155	875	675	535	380	-	-	-	1.50

Notes:

- Lubricate with a Grade 2 lithium or non-soap base grease having oil viscosity of 500-1000 SUS at 100°F.
Some suggested greases are:

Amoco Rykon Premium Grease No.2	Gulfcrown Grease No. 2
Shell Alvania Grease 2	Mobile Mobilith AW2
Texaco Premium RB	Shell Alvania #2
- Should bearing operating temperature be below -20°F or above 180°F, consult fan manufacturer for lubrication recommendations.
- If fans are to be stored after arrival at job site, bearings should be **immediately** relubricated and shaft rotated monthly for corrosion protection.

Maintenance

Grease Lubrication schedule SAF 225/226 Split Housing Pillow Blocks with SKF Spherical Roller Bearings

Pillow Block Number 225/226	Shaft Dia.	Relubrication Interval (hours)	Speed (rpm)										Grease Added at Each Interval (Ounces) Pillow Block Series		
			300	500	700	900	1100	1300	1500	1800	2400	2700	3000	225	226
09	1 7/16		6775	3995	2800	2140	1715	1425	1210	980	690	595	515	0.35	0.52
10	1 11/16		6400	3760	2630	2000	1600	1325	1120	900	626	535	460	0.37	0.79
11	1 15/16		6070	3555	2475	1880	1495	1230	1040	830	565	480	410	0.45	0.93
13	2 3/16		5530	3215	2220	1670	1320	1075	900	705	465	385	320	0.67	1.21
15	2 7/16		5090	2935	2010	1495	1170	945	780	600	375	300		0.72	1.58
16	2 11/16		4900	2810	1915	1420	1105	885	725	550	330	260		0.83	1.77
17	2 15/16		4720	2700	1830	1345	1040	830	670	505	295			0.97	1.94
18	3 3/16		4560	2590	1750	1280	980	775	625	460				1.15	2.19
20	3 7/16		4265	2400	1600	1155	875	675	535	380				1.49	2.82
22	3 15/16		4010	2230	1465	1045	775	585	450	300				1.91	3.45
24	4 3/16		3780	2075	1385	940	680	505	370					2.24	4.02
26	4 7/16		3575	1935	1235	845	595	425	300					2.65	4.68
28	4 15/16		3385	1805	1130	755	515	350						3.06	5.50
30	5 3/16		3210	1685	1035	670	440	280						3.54	6.21
32	5 7/16		3050	1575	940	590	365							4.17	6.97
34	5 15/16		2900	1470	855	515	295							4.79	7.77

Notes:

1. Lubricate with a Grade 2 lithium or non-soap base grease having oil viscosity of 500-1000 SUS at 100°F.
2. Should bearing operating temperature be below 32°F or above 200°F, consult fan manufacturer for lubrication recommendations.
3. Clean and repack annually.
4. If fans are to be stored after arrival at job site, bearings should be immediately relubricated and shaft rotated monthly for corrosion protection.

Grease Lubrication schedule

Link-Belt® split housing pillow blocks

Dodge split housing pillow blocks

Adapter mounted Split housing pillow blocks

- Oil:** Use only highest quality mineral when operating temperature is: 32°F to 150°F.
 Use SAE oil: 150°F to 200°F.
 Use SAE 50 oil. Add oil until level reaches middle of bottom roller.
 Maintain this level.
 Keep dirt and grit out of bearing.
- Grease:** Pack bearing by hand, working grease into all cavities. Fill housing reservoir to bottom of shaft.

Operating Condition	Bearing Operating Temperature	Greasing Interval	Lubricate with:	High Speed Operation Lubricate with:
Fairly clean. No moisture	32°F to 120°F 120°F to 160°F 160°F to 200°F	6 to 12 mo. 1 to 2 mo. 1 to 4 wk.	Texaco Molytex #2 Imperial Oil Molub-Alloy#2 Standard Oil (Ind) Amolith #2 Mobil Oil - Mobilux #2 Gulf Crown #2	Texaco Molytex #2 Imperial Oil Molub-Alloy #2 Use of an alternate grease will require more frequent lubrication cycles.
Moderate to extremely dirty. No moisture.	32°F to 160°F 160°F to 200 °F	1 to 4 wk. 1 wk.		

Notes:

1. If fans are to be stored after arrival at job site, bearings should be immediately relubricated and shaft rotated monthly for corrosion protection.
2. Normal conditions are defined as a clean, dry atmosphere at temperatures between -20°F and 180°F. Greater temperatures, moisture, or dirt content will require more frequent lubrication cycles.
3. Use sufficient volume of grease to purge the bearing seals. Rotate bearings during relubrication where good safety practice permits.

For more information about the Barry Blower Fans, contact the following:

Barry Blower
 Lau Industries, Inc.
 99 NE 77th Way
 P.O. Box 32066
 Minneapolis, MN 55432-0006
 763-571-5200
www.lau-ind.com

Gyromax® Speed Reducer Maintenance

The following information is given by Shimpo Drives, Inc. Please contact if more information is needed.

Warning:

The keyways on all shafts are extremely sharp. Care should be exercised when working with all shafts!

In addition to changing the lubricant periodically, the following checks should be performed on a regular basis.

Depending on application, it may be desirable to make such checks on a weekly or monthly basis.

1. Check the case temperature of the reducer. A temperature of up to 90°F (50°C) above ambient is acceptable.
2. Check to see if the unit is being overloaded. This can often be done by measuring the drive motor's current.
3. Be sure that the reducer is not making an abnormal or irregular noise.
4. Check the reducer for abnormal vibration.
5. Look for lubricant leaks around the reducer.
6. Check all power transmitting components for misalignment and excessive wear.
7. Check for loose bolts. This includes the reducer body bolts and mounting bolts.

Repair Instructions

The following notes, in combination with the exploded view assembly drawing, are provided to assist in the inspection and repair of the reducer.

Caution:

The reducer should be worked on only by a person who is familiar with mechanical assembly and disassembly techniques, including the proper handling of bearings. The reducer can be damaged by improper disassembly and assembly techniques.

Disassembly Instructions

1. Disassembly always starts from the output side of the reducer.
2. Jack screw holes are provided between many sections to assist in the disassembly.
3. The output shaft bearings on reducers with case sizes A through C are held in place using two cone point set screws; these must be backed out in order to remove the output shaft assembly.
4. Reducer case sizes D and larger have a snap ring around the outside of the output shaft bearing. This snap ring must be removed in order to separate the output housing from the pin body.

Inspection Guidelines

1. Inspect all oil seals for damage. Also inspect the shaft surfaces on which they contact.
2. Inspect the oil or grease for signs of metal flakes.
3. Check all bearings to ensure that they rotate freely and do not have excessive free play.
4. Inspect the housing and all torque transmitting components for cracks and excessive wear.

Assembly Guidelines

1. Assembly always starts at the input side of the reducer.
2. An aerobic gasket compound or gaskets should be used between all mating housing parts.
3. Removable thread locking compound should be used on all bolts and nuts.
4. When reassembling a reducer (case sizes B and larger), ensure that the two eccentric roller bearings are installed in opposite directions. For reducer case size A, be sure that the cam on the balance weight is pointing in the opposite direction of the large lobe on the eccentric roller bearing. Failure to do this will result in excessive vibration when the reducer is returned to operation.
5. On case sizes B and larger, the two wheels must be installed exactly 180° opposite to each other. Match marks are provided on the wheels for this purpose. Failure to do this will result in a reducer that will not turn.
6. It is generally easier to install the wheel first and then the eccentric bearing. In this way, the rollers do not interfere with the hole in the wheel that forms that bearing's outer race.
7. On case sizes A through C, it is important to ensure that the bushings remain seated in the wheel as the output shaft assembly is installed. It is often useful to use some grease to hold the bushings in position on the wheels.
8. When case sizes A through C are reassembled, the cone point set screws should be alternately tightened to pull the output shaft in place. Each should be loosened a quarter of a turn after the output shaft is completely seated in the output housing.

Gyromax® Lubrication Specifications

Gyromax® Speed Reducers are internally lubricated using either grease or oil. The table describes the type of lubricant that is normally used with these reducers.

Because different lubricants may be used for extreme environmental conditions, check the nameplate of the reducer to determine the type of lubricant that is being used. Lubrication quantities listed are approximate.

Follow the instructions below when adding lubricant to the reducer.

Grease lubricated reducers should be disassembled, cleaned and filled with new grease every 5 years or 20,000 hours operation, whichever comes first. Under extreme environmental conditions, the grease may need to be replaced more frequently. The grease should be packed into the reducer in a similar manner to the way that an anti-friction bearing is re-greased. Approximately 20% air space should remain.

Oil lubricated units should receive an oil change after the first 500 hours of operation. After this initial oil change, the oil should be changed after every 5,000 hours of operation or annually, whichever comes first. Under extreme environmental conditions, the oil may need to be replaced more frequently. To drain the oil, remove the oil breather plug and the oil drain plug. To refill the reducer, install the drain plug and remove the level plug. Add oil through the oil fill opening until the oil overflows from the level plug opening. Replace the level plug and the breather.

Single Reduction

Frame Size	All Mounting Positions
A190/A195 2A190 – 2A197 B195 – B20H 2B100 – 2B20H C110 – C335 2C110 – 2C225	NLGI # 0 Grease
D135 – D365 2D130 – 2D365 E165 – E485 2E160 – 2E375 F080 – F195 2F080 – 2F195 2I205 2J215 2K225 2L235	ISO VG 220 Oil (AGMA 5 EP) *ISO VG 320 Oil

*For high temperature applications, ISO VG 320 is available upon request

Double Reduction

FRAME SIZE	HORIZONTAL	VERTICAL OUPUT SHAFT DOWN	VERTICAL OUTPUT SHAFT UP
	INPUT AND OUTPUT STAGES		
AB/2AB	NLGI #0 Grease	NLGI #0 Grease	NLGI #0 Grease
AC/2AC			
AD/2AD	ISO VG 220 Oil		ISO VG 220 Oil
BD/2BD			
BE/2BE			
CE/2CE			
CF/2CF			
DF/2CF			
2DI		ISO VG 220 Oil	
2DJ			
2EJ			
2DK			
2FK			
2EL			

Lubrication Specifications

LUBRICANT TYPE	GENERIC SPECIFICATION	BRAND REFERENCE		
		SHELL	MOBIL	EXXON
GREASE	NLGI #0 GREASE	Darina EP No. 0	-	-
OIL	ISO VG 220 GEAR OIL	Omala Oil 220	Mobil Gear 630	Spartan EP 220
OIL	ISO VG 320 GEAR OIL	Omala Oil 320	Mobil Gear 632	Spartan EP 320

The lubricants listed are for normal industrial service, and other oils may be specified for severe operating conditions. Refer to the nameplate of the reducer for specific lubrication type.

Approximate Lubricant Quantities

FRAME SIZE	MOUNTING POSITION	
	HORIZONTAL	VERTICAL
A190/A195 2A190 – 2A197	5 oz	
B195 – B20H 2B100 – 2B20H	7 oz	
C110 – C335 2C110 – 2C225	14 oz	
D135 – D365 2D130 – 2D365	0.25 gal	0.40 gal
E165 – E485 2E160 – 2E375	0.50 gal	0.65 gal
080 – F195 2F080 – 2F195	0.85 gal	1.15 gal
2I205	1.45 gal	1.50 gal*
2J215	2.24 gal	2.00 gal*
2K225	2.63 gal	2.63 gal*
2L235	3.95 gal	3.16 gal*

*Contact SHIMPO Drives Customer Service for Vertical Up Mounting

FRAME SIZE	MOUNTING POSITION		
	HORIZONTAL	VERTICAL OUTPUT SHAFT DOWN	VERTICAL OUTPUT SHAFT UP
AB/2AB	10 oz		
AC/2AC	15 oz		
AD/2AD	0.31 gal	29 oz	0.45 gal
BD/2BD	0.32 gal	31 oz	0.51 gal
BE/2BE	0.58 gal	42 oz	0.90 gal
CE/2CE	0.63 gal	49 oz	0.98 gal
CF/2CF	1.00 gal	72 oz	1.53 gal
DF/2DF	1.08 gal	2.06 gal	2.06 gal
2DI	1.58 gal	2.90 gal	C/F
2DJ	2.63 gal	3.68 gal	
2EJ	2.63 gal	3.68 gal	
2DK	2.90 gal	4.74 gal	
2FK	2.90 gal	4.74 gal	
2EL	4.47 gal	6.05 gal	

Grease quantities are given in oz. Oil quantities are given in gal.

C/F: Contact SHIMPO Drives Customer Service

For more information contact SHIMPO Drives at the following:

SHIMPO DRIVES, INC.
1701 Glenlake Avenue
Itasca, IL 60143 USA
1-800-842-1479
www.shimpodrives.com

Maxon® Burner Maintenance Instructions

The following information is given by the Maxon Corporation. Please contact if more information is needed.

Periodic maintenance will insure continued trouble-free operation of your Series NP-LE AIRFLO® Burner system.

At least a yearly inspection is recommended for make-up air heating installations and more frequently for process applications in year-round operation. Your own experience is the best guide in determining frequency of inspection. As a minimum, the following procedure should be followed:

1. Shut the system down totally. Disconnect or lock out power supply so there can be no accidental start-up during inspection.
2. Inspect the burners carefully, including upstream and downstream sides of mixing plates as well as burner body face. Any accumulation of scale or foreign material of either side of the mixing plates should be removed with a wire brush. Check visually that no holes in the mixing plates are blocked.

Warning:

Do not enlarge burner ports or performance may be drastically affected!

If any mixing plates are loose or missing fasteners, tighten/replace as necessary. Always use zinc plated or stainless metric fasteners.

3. Put system back into operation and, if possible, view from downstream side while cycling burner through full firing range. This will give a visual check for blocked burner ports.
4. Observe flame pattern and, if necessary, take steps to correct velocity and/or air distribution problems.

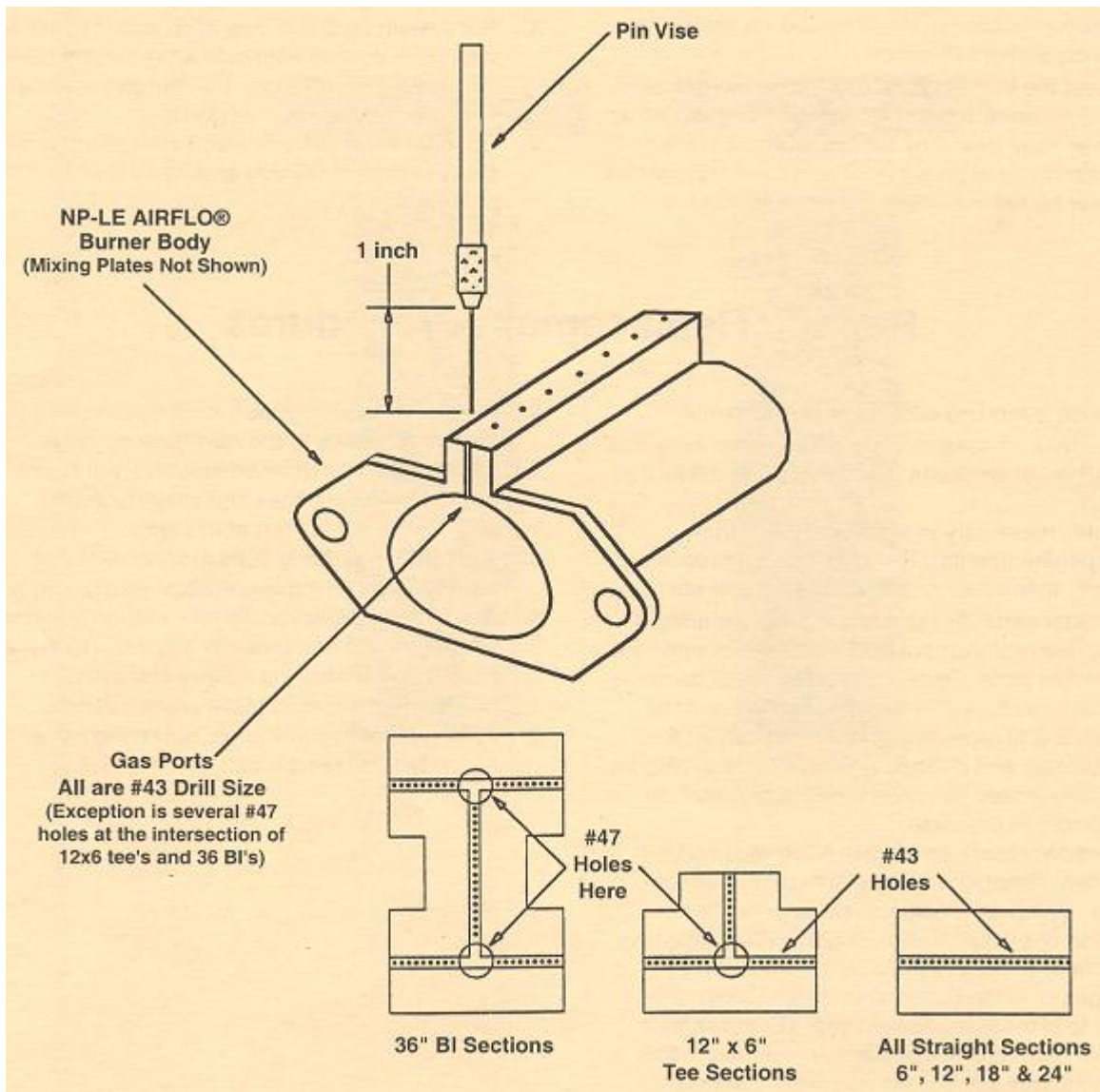
Repair / Replacement Procedures

If adverse operating conditions or accidental damage make it necessary to replace either individual mixing plates or complete burner sections, follow this procedure:

1. Identify necessary replacement parts from component identification drawings, then order required quantities of each. Consider carefully the economics of installing a complete replacement burner instead of replacing individual parts. Once exposed to actual flame temperatures, burner castings harden and the removal and replacing of fasteners can be time consuming and difficult. Accessibility may also be severely limited requiring removal of complete assembly in any case.
2. When necessary parts have been received, remove damaged mixing plates or burner sections, taking care not to damage remaining portion of burner. If new burner bodies are being installed, place body gasket on the mating flanges of loose cast iron bodies (This is necessary to provide a gas-tight seal after assembly.). Inset new section into place, making sure that both flanges are square and flush, then bolt sections together.
3. Install new mixing plates, back up bars, and plate support brackets to the new body castings.
4. If end plate sets must be installed, put in position between mixing plates and inset fasteners loosely. Do not tighten at this time.
5. Tighten burner body bolts making sure that mating cast iron flanges remain square and flush.
6. Align mixing plates and check that body gaskets are in position and properly aligned. Tighten all mixing plate mounting screws and bolts.
7. Double check that all fasteners are secure.
8. Return burner to operation, observing flame carefully at all firing rates.

Inspection and Maintenance of Gas Ports

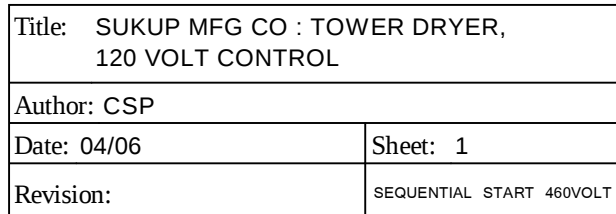
- Conduct initial inspection within the first month after commissioning. Visually check the gas ports of new burner assemblies for any piping scale or debris. Use Pin Vise with drill bit to remove.
- Annual inspections are normally adequate once the initial piping debris is removed. The operating conditions of the burner will determine how frequently maintenance is actually required.
- Use of an electric drill motor is not suggested unless both Pin Vise and Drill (as shown below) can be chucked up in a vari-speed drill unit. Use caution, because it is easy to snap the bits off in a port when using a drill motor. Removal of broken bits from the gas ports is difficult.
- Contact your Maxon representative to answer questions or address any problems.

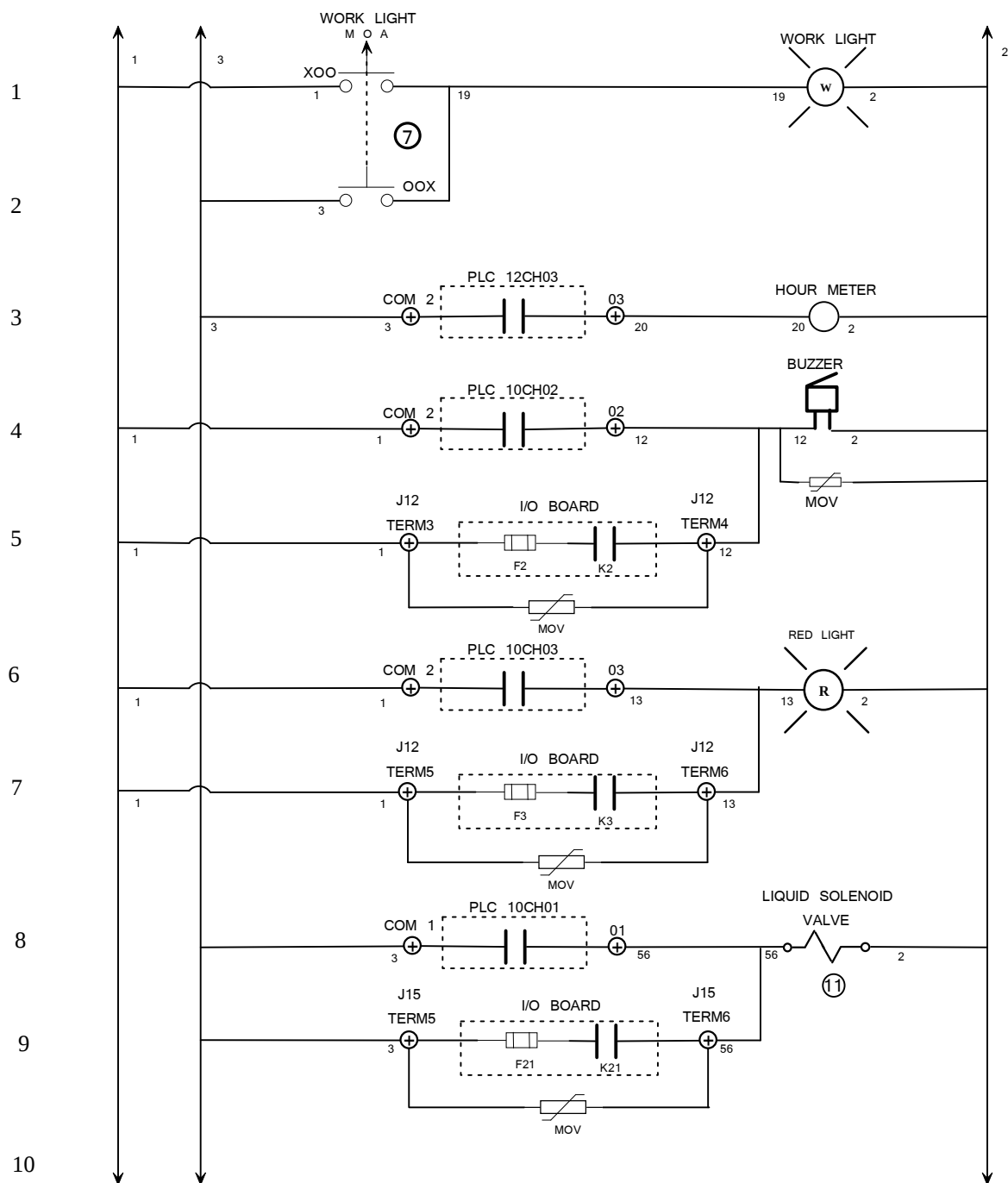


Wiring Diagrams

1. Sequential Start
2. Soft Start

ELECTRICAL DRAWINGS
SEQUENTIAL START OF FANS
2007





NOTES CAN BE FOUND ON DRAWING #23

Title: SUKUP MFG CO : TOWER DRYER,
120 VOLT CONTROL

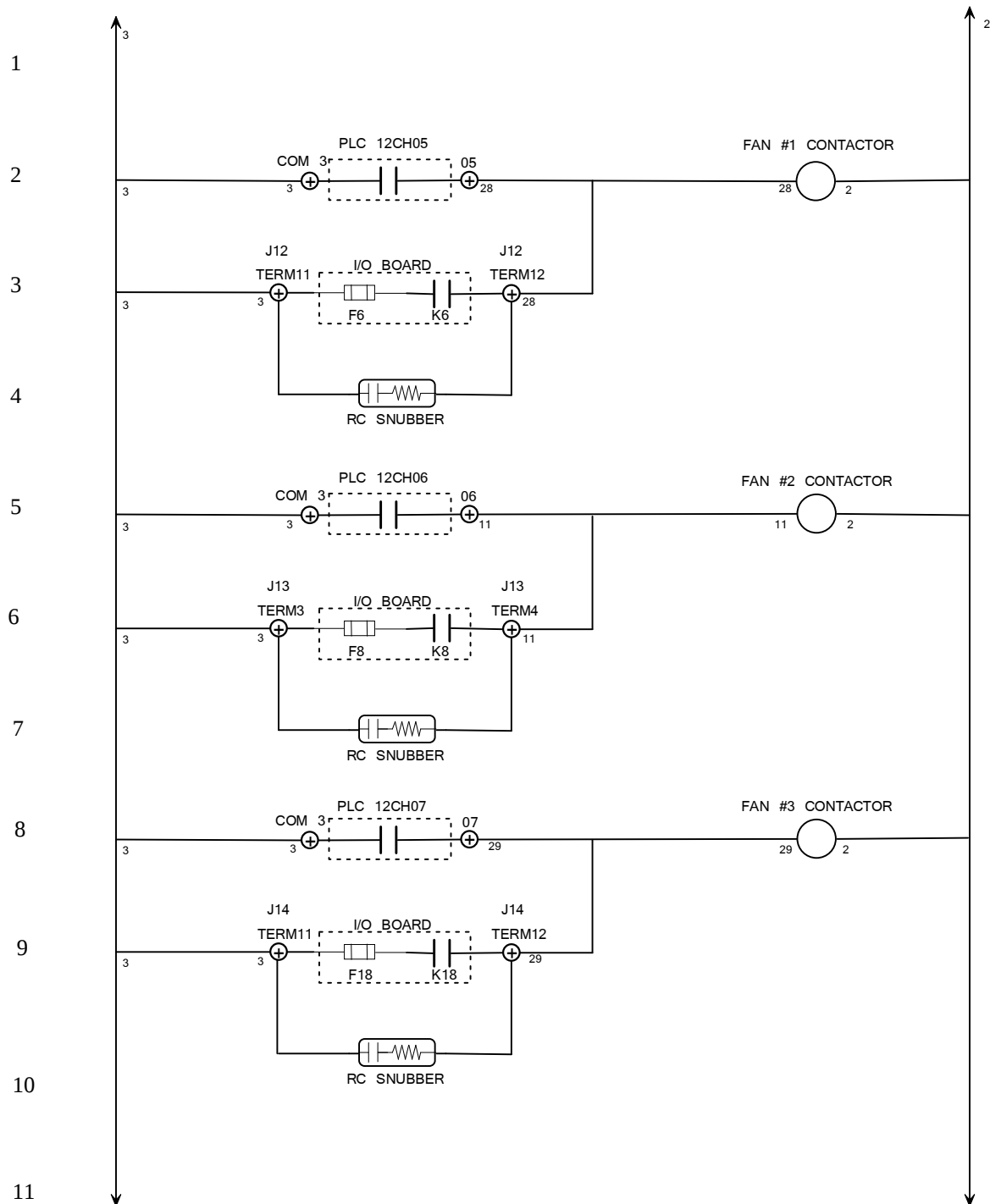
Author: CSP

Date: 04/06

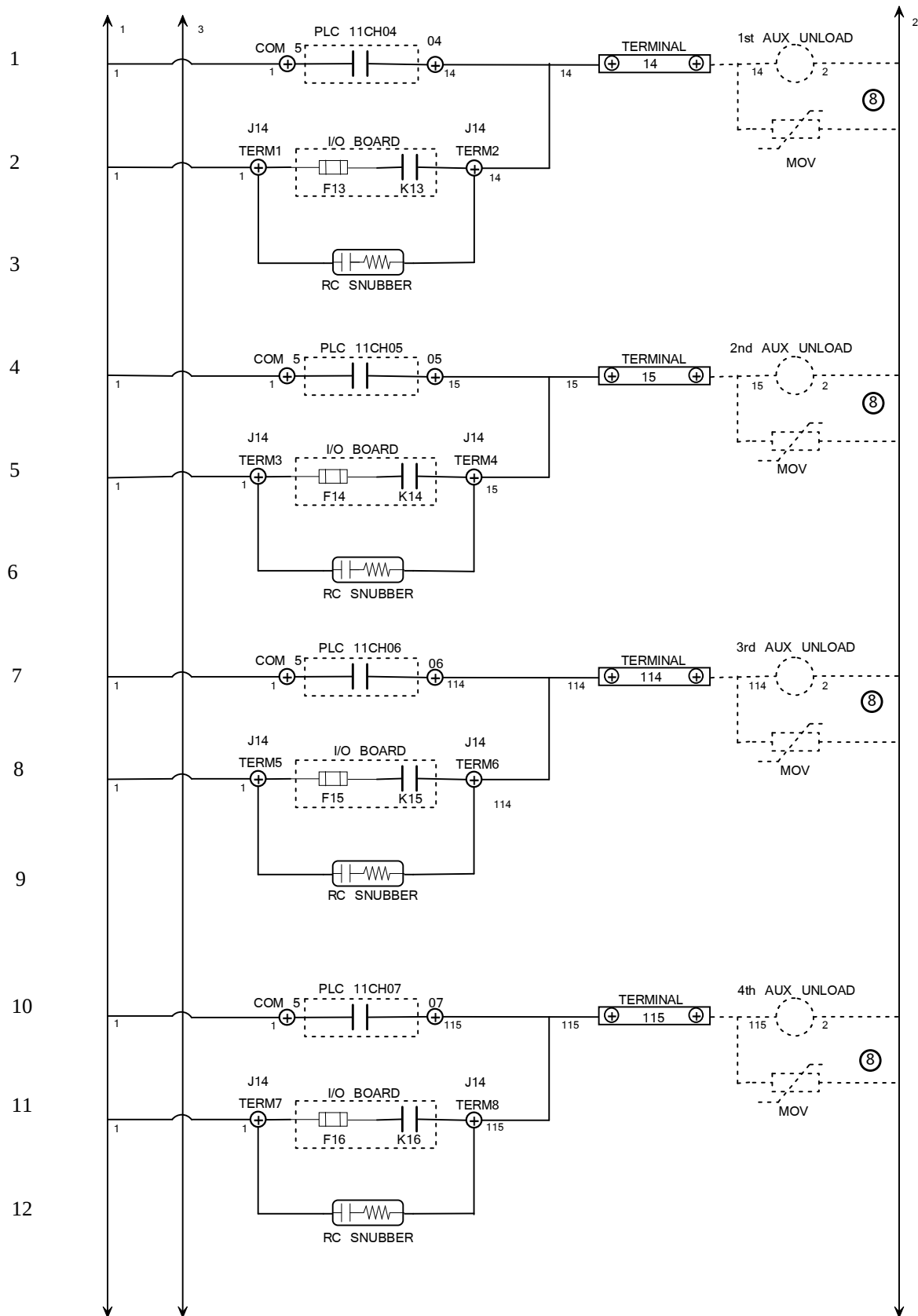
Sheet: 2

Revision:

SEQUENTIAL START 460VOLT



Title: SUKUP MFG CO : TOWER DRYER, SEQUENTIAL START CONTROL WIRING	
Author: CSP	
Date: 04/06	Sheet: 3
Revision:	SEQUENTIAL START 460VOLT



NOTES CAN BE FOUND ON DRAWING #23

Title: SUKUP MFG CO : TOWER DRYER,
AUX UNLOAD CONTROL WIRING

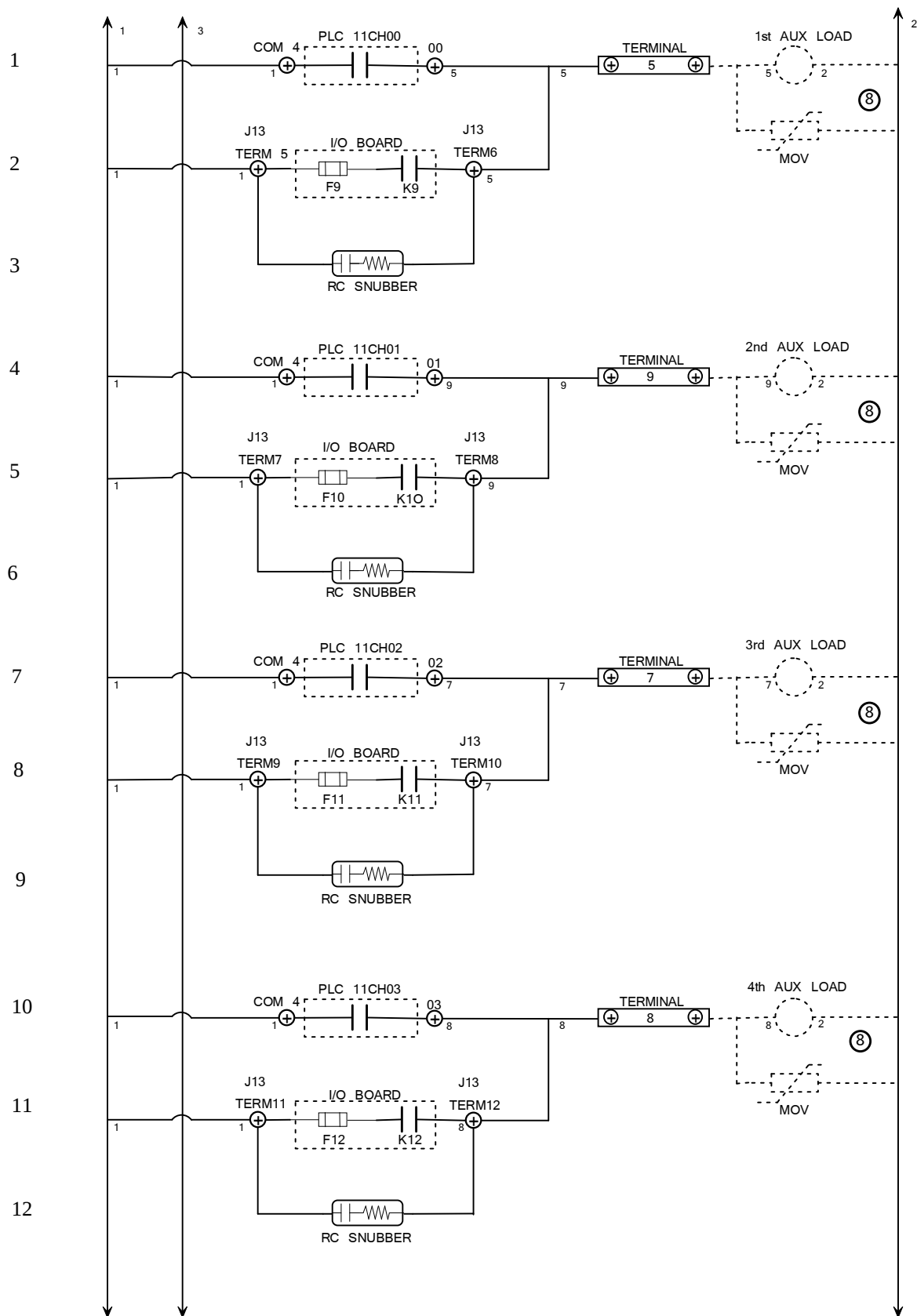
Author: CSP

Date: 04/06

Sheet: 4

Revision:

SEQUENTIAL START 460VOLT



Title: SUKUP MFG CO : TOWER DRYER,
AUX LOAD CONTROL WIRING

Author: CSP

Date: 04/06

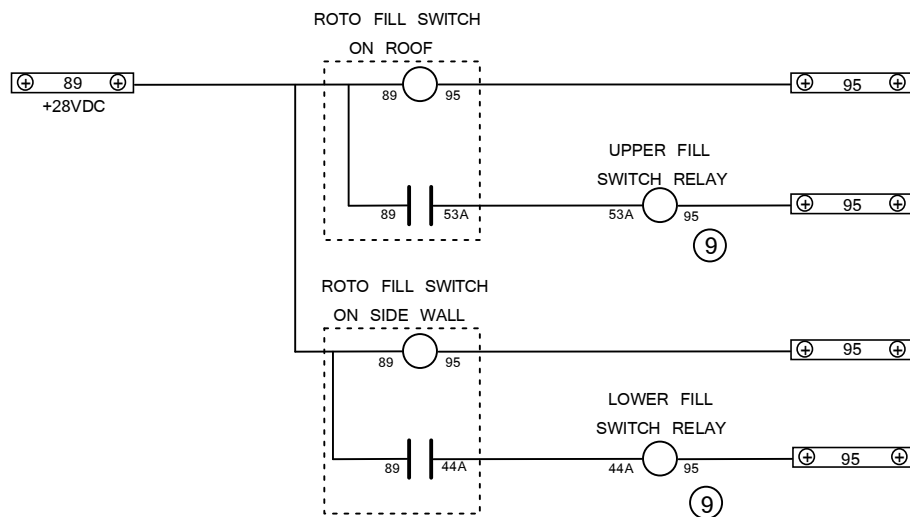
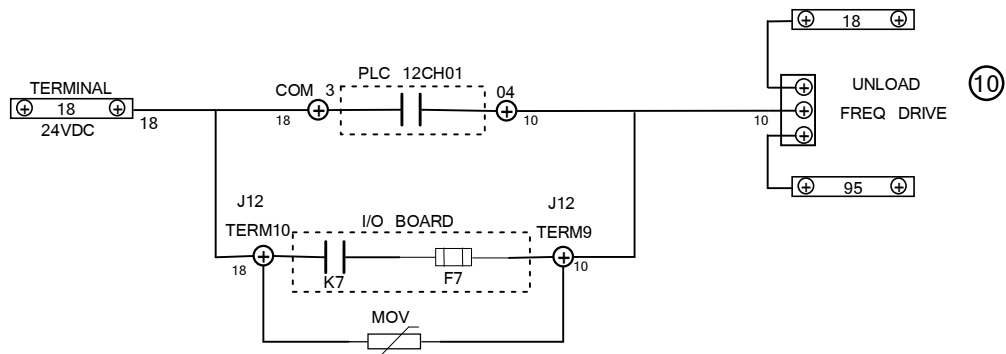
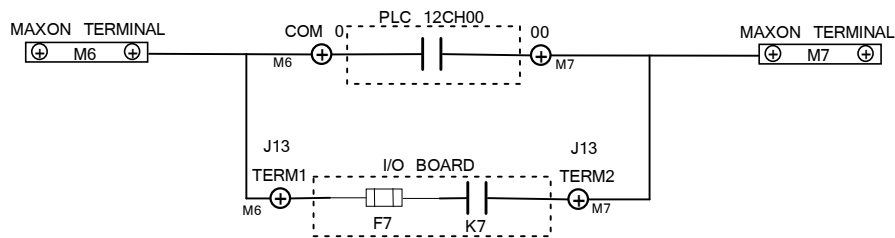
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Revision:

SEQUENTIAL START 460VOLT

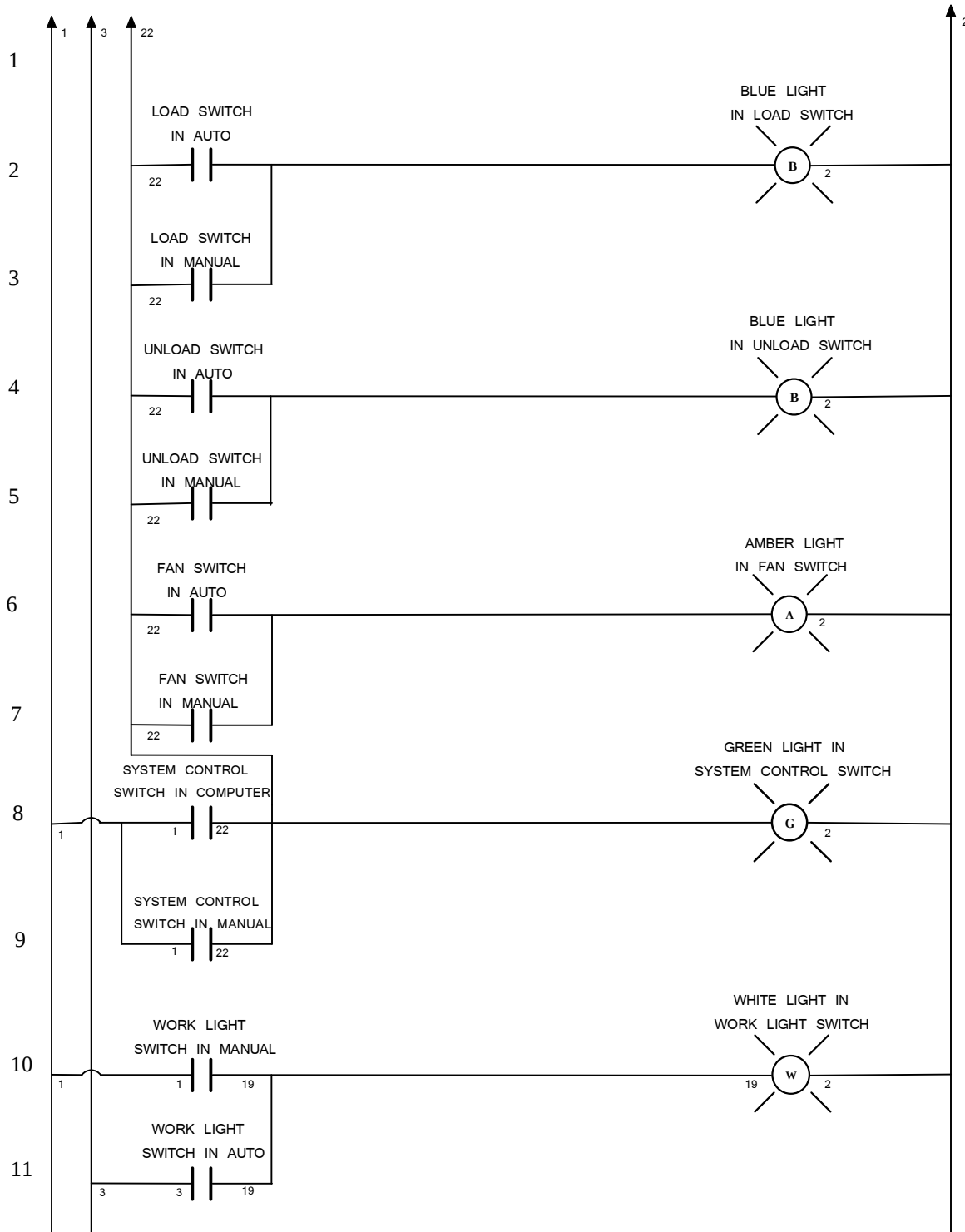
NOTES CAN BE FOUND ON DRAWING #23

1
2
3
4
5
6
7
8
9
10
11
12



Title: SUKUP MFG CO : TOWER DRYER BURNER INTERLOCK, ROTO FILL SWITCH & UNLOAD FREQ DRIVE WIRING	
Author: CSP	
Date: 06/06	Sheet: 6
Revision:	SEQUENTIAL START 460VOLT

NOTES CAN BE FOUND ON DRAWING #23



Title: SUKUP MFG CO : TOWER DRYER
FRONT PANEL SWITCH LIGHT WIRING

Author: CSP

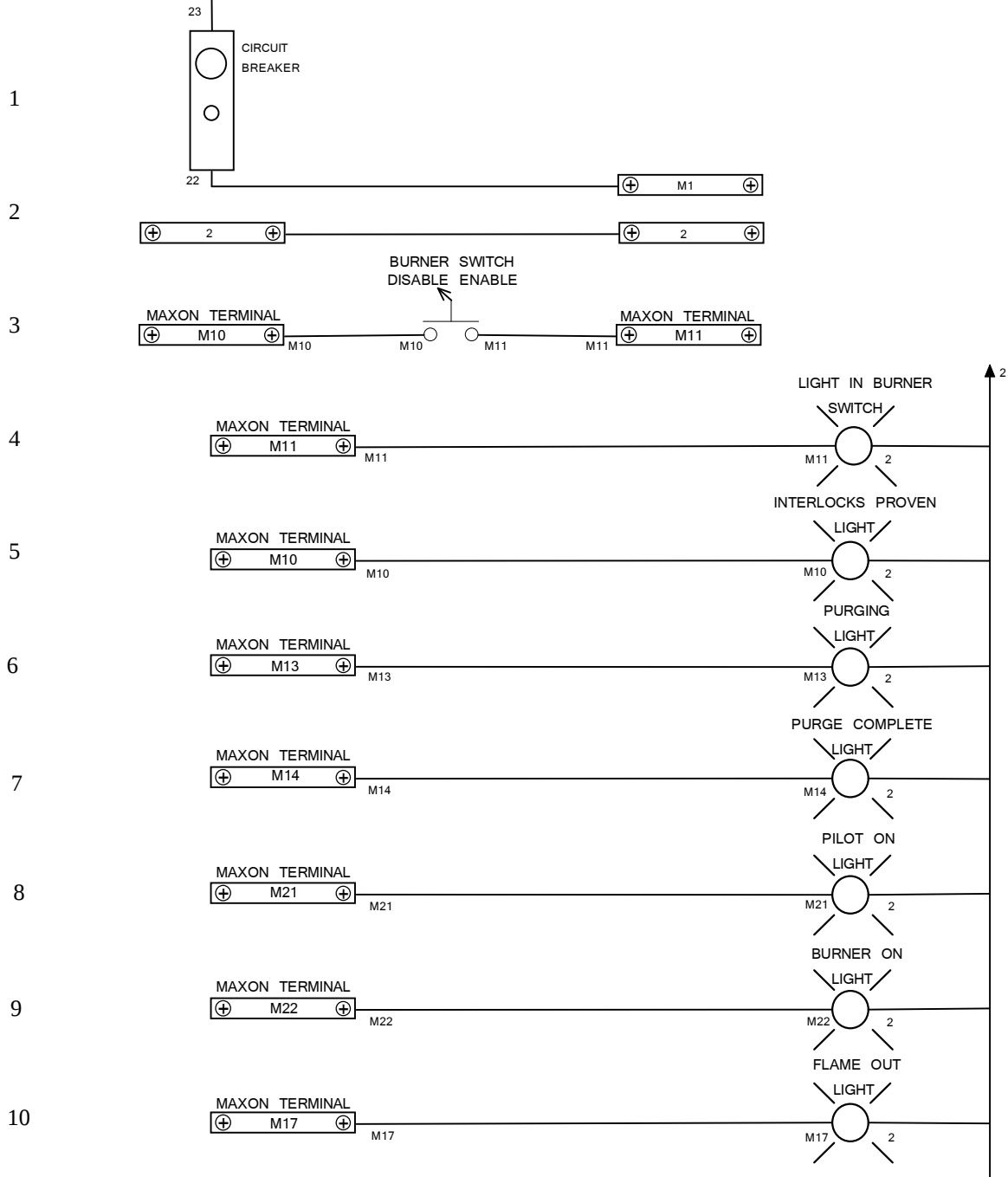
Date: 04/06

Sheet: 7

Revision:

SEQUENTIAL START 460VOLT

NOTE: FULL DETAILED DRAWINGS CAN BE FOUND IN THE MAXON PANEL INFORMATION MANUAL



Title: SUKUP MFG CO : TOWER DRYER
FRONT PANEL SWITCH LIGHT WIRING

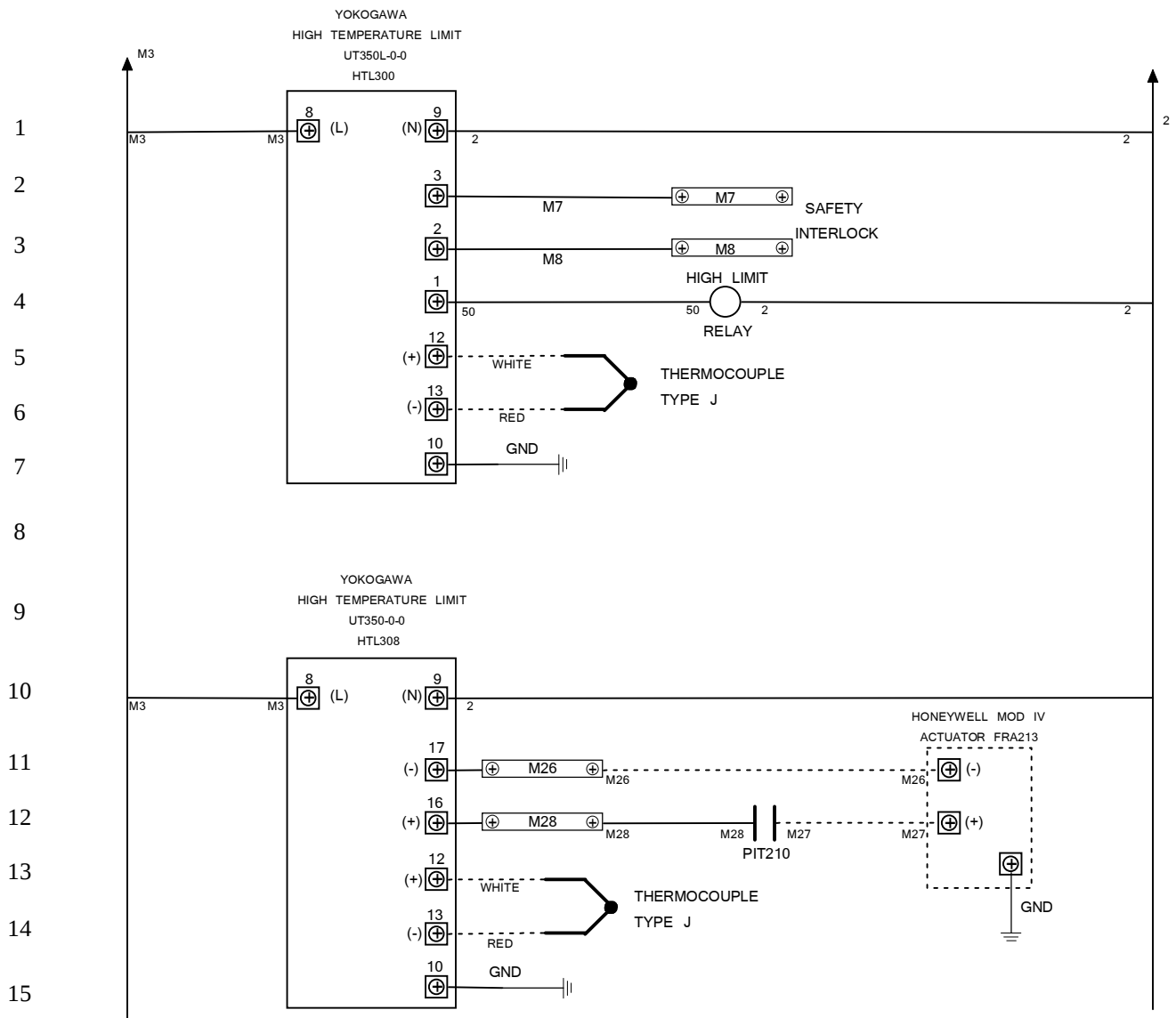
Author: CSP

Date: 04/06

Sheet: 8

Revision:

SEQUENTIAL START 460VOLT



NOTE: FULL DETAILED DRAWINGS CAN BE FOUND IN THE MAXON PANEL INFORMATION MANUAL

DOTTED LINES SHOW WIRING OUTSIDE OF CONTROL OR POWER BOX.

Title: SUKUP MFG CO : TOWER DRYER
YOKOGAWA CONTROLLER'S WIRING

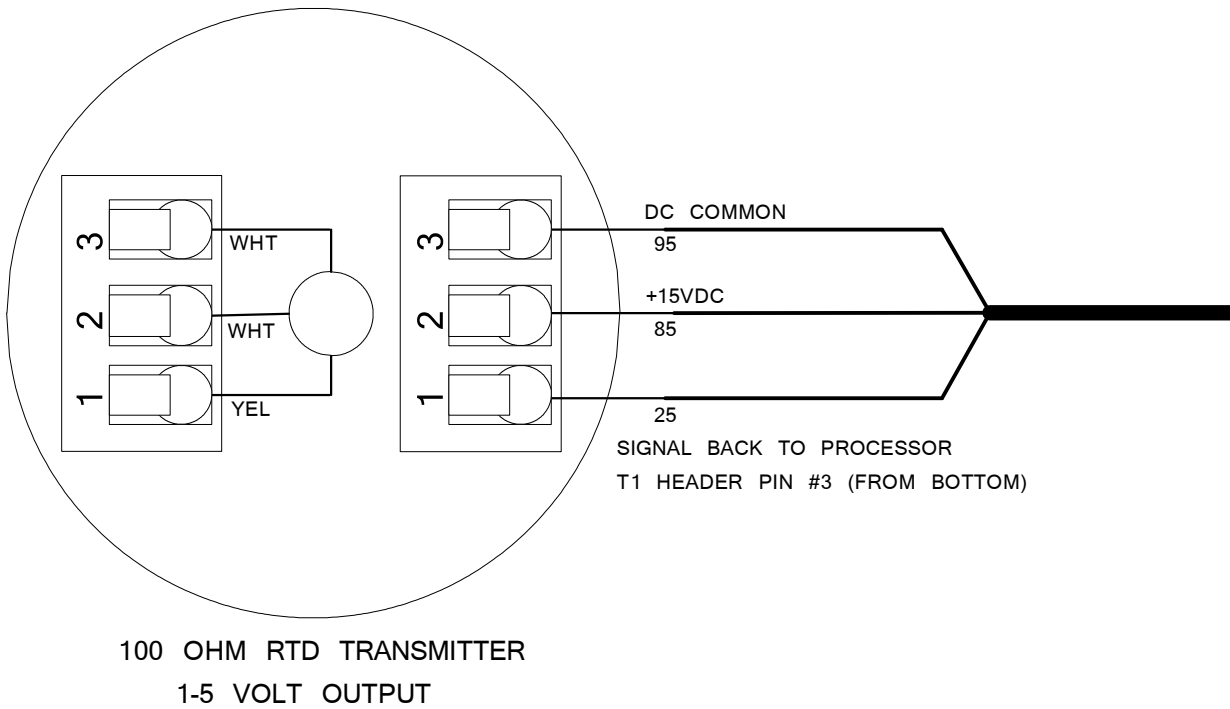
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Date: 06/06

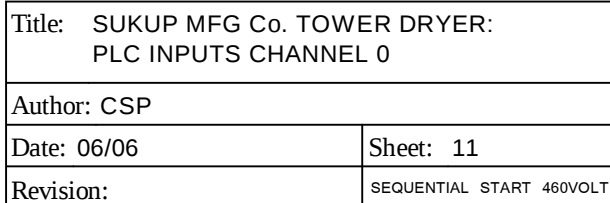
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Revision:

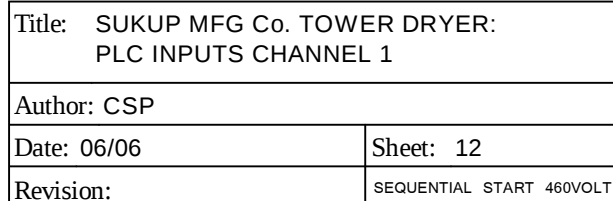
SEQUENTIAL START 460VOLT



Title: SUKUP MFG CO : TOWER DRYER RTD WIRING FOR GRAIN COLUMN	
Author: CSP	
Date: 06/06	Sheet: 10
Revision:	SEQUENTIAL START 460VOLT



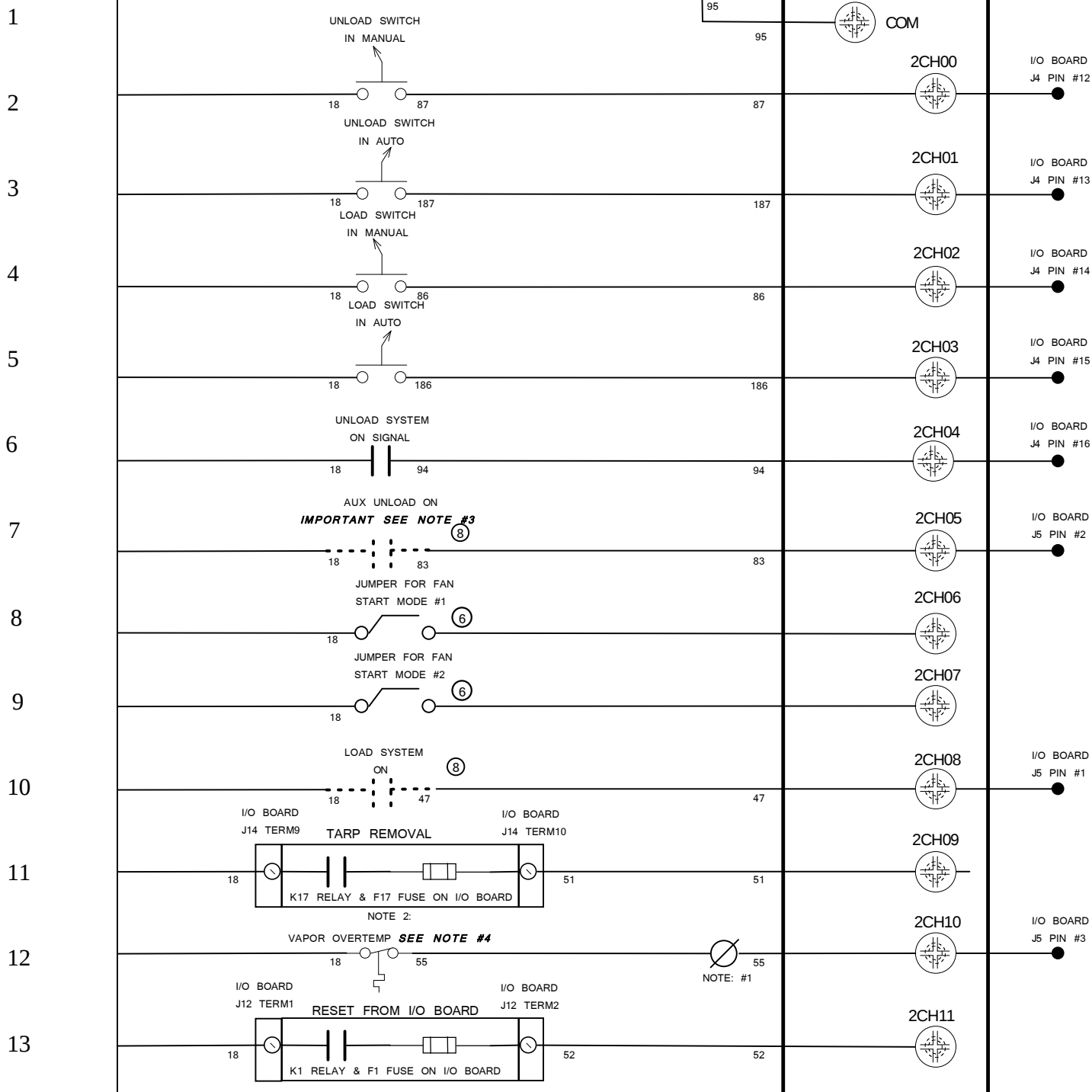
NOTES CAN BE FOUND ON DRAWING #23



+24 VDC

0 VC
COMMON

PLC CHANNEL 2



6

2CH06	2CH07	FAN STARTING MODE
O	O	SOFT START
X	O	REDUCED TORQUE
O	X	SEQUENTIAL START

O INDICATES NO JUMPER

X INDICATES JUMPER

Title: SUKUP MFG Co. TOWER DRYER:
PLC INPUTS CHANNEL 2

Author: CSP

Date: 06/06

Revision:

Sheet: 13

SEQUENTIAL START 460VOLT

NOTES CAN BE FOUND ON DRAWING #23

PLC OUTPUT CHANNEL 10

2

1

COM 0



1

TERMINAL

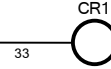
1

2

10CH00



33



33

2

3

COM 1



3

TERMINAL

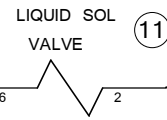
3

4

10CH01



56



56

2

5

COM 2



1

TERMINAL

1

6

10CH02



12

BUZZER



12

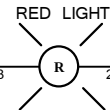
2

7

10CH03



13



13

2

8

COM 3



18

TERMINAL

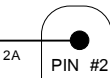
18

9

10CH04



2A



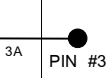
FAN #1 5 SEC
AIR FAULT

10

10CH05



3A



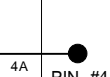
FAN #2 5 SEC
AIR FAULT

11

10CH06



4A



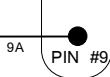
FAN #3 5 SEC
AIR FAULT

12

10CH07



9A



OUT OF
WET GRAIN

I/O BOARD
J3 HEADER

Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 10

Author: CSP

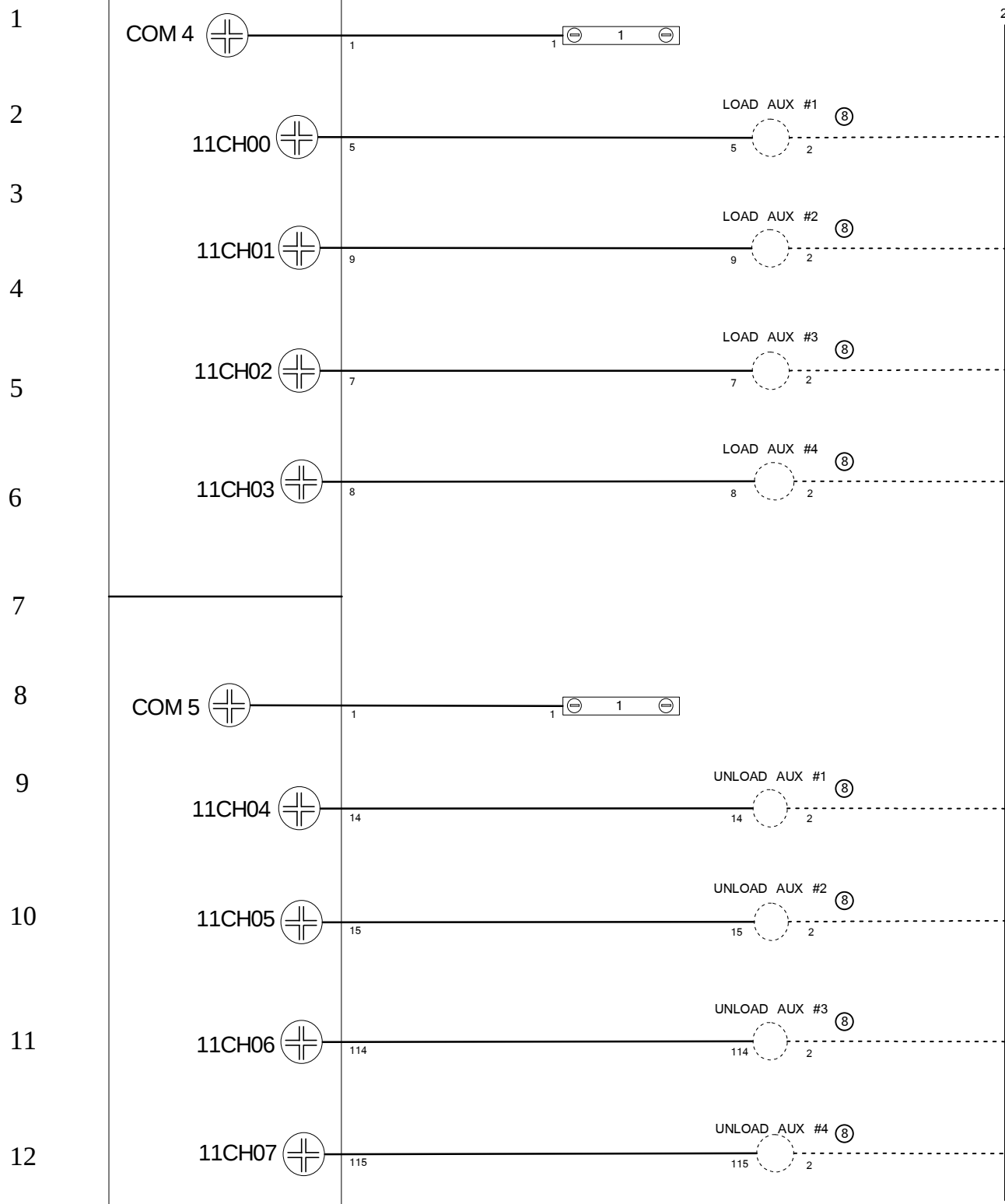
Date: 04/06

Sheet: 14

Revision: 3/07

SEQUENTIAL START 460VOLT

NOTES CAN BE FOUND ON DRAWING #23



NOTES CAN BE FOUND ON DRAWING #23

Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 11

Author: CSP

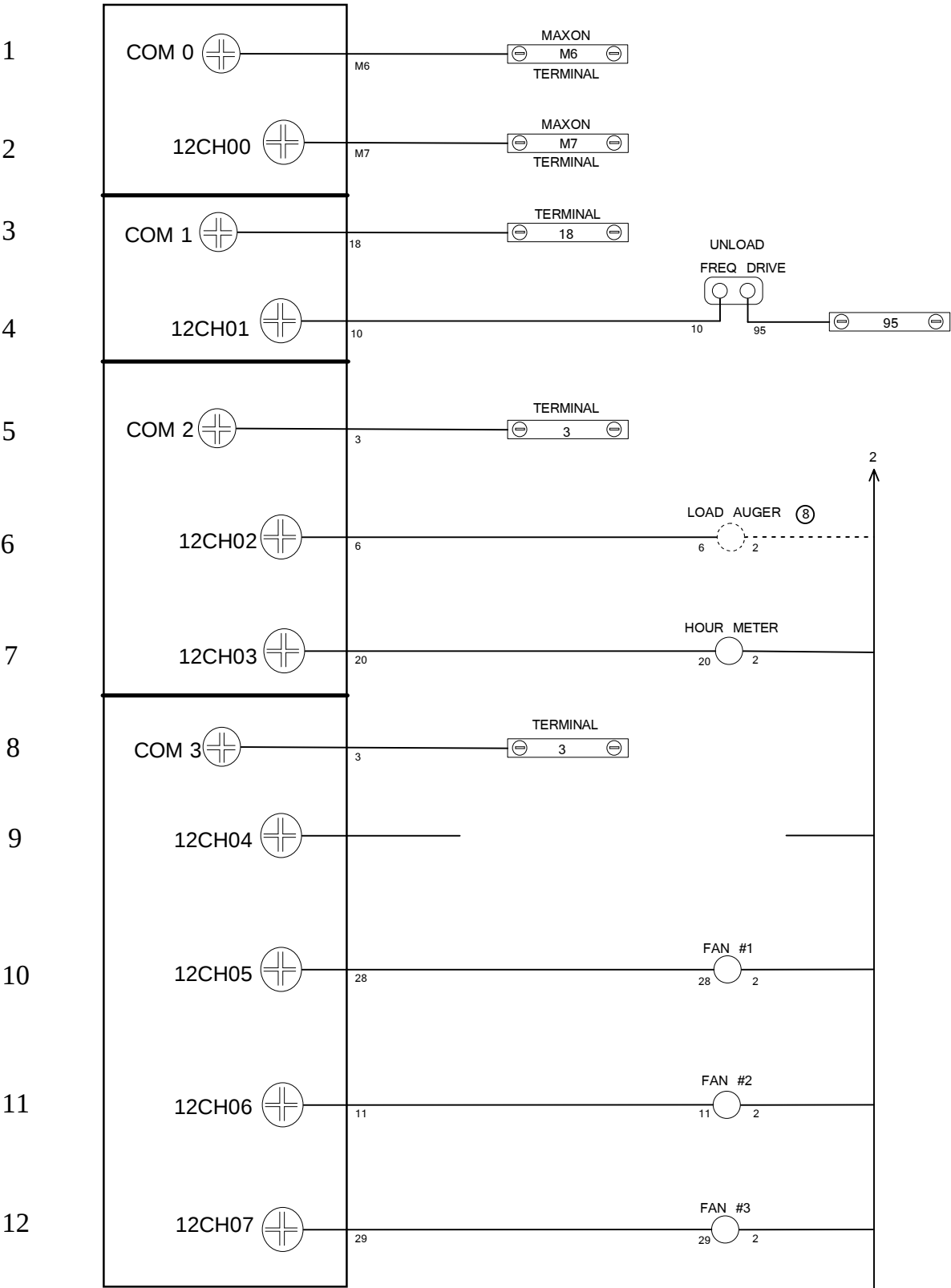
Date: 04/06

Revision: 03/07

Sheet: 15

SEQUENTIAL START 460VOLT

PLC OUTPUT CHANNEL 12



Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 12-SEQ START

Author: CSP

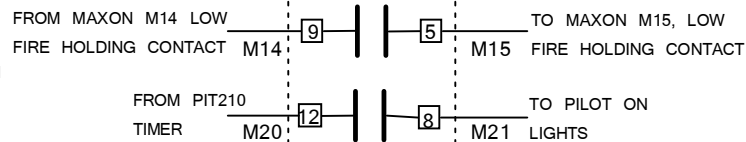
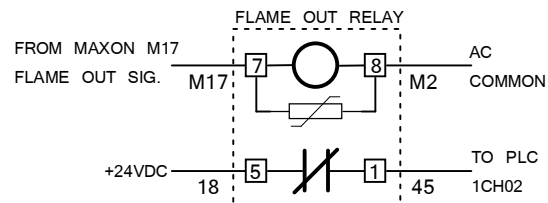
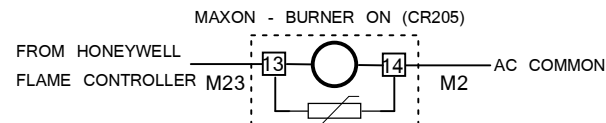
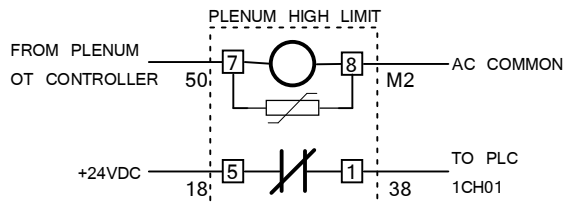
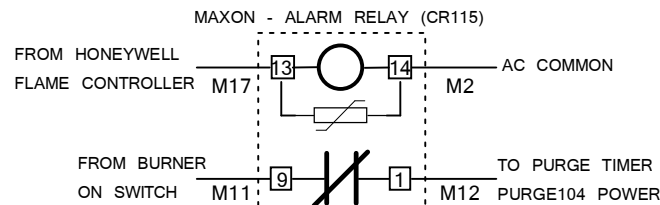
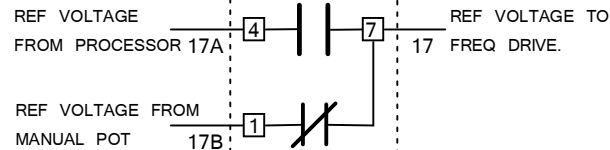
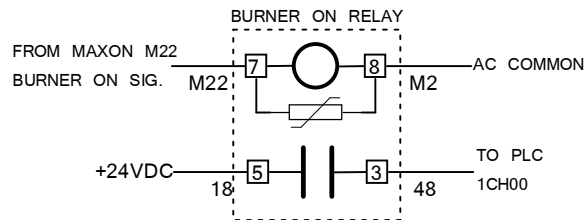
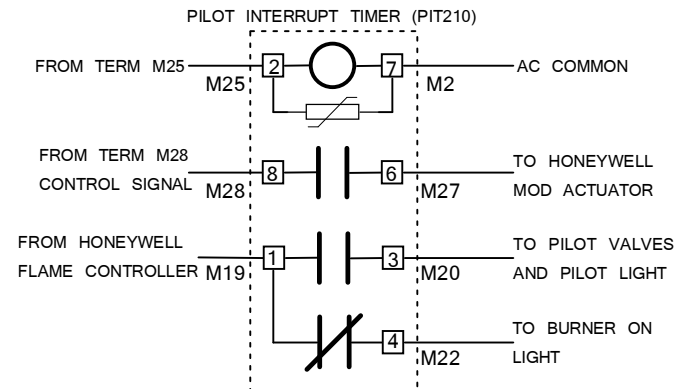
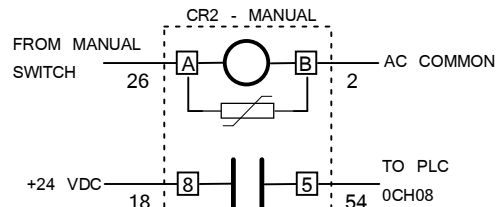
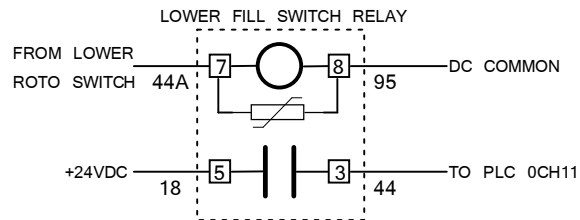
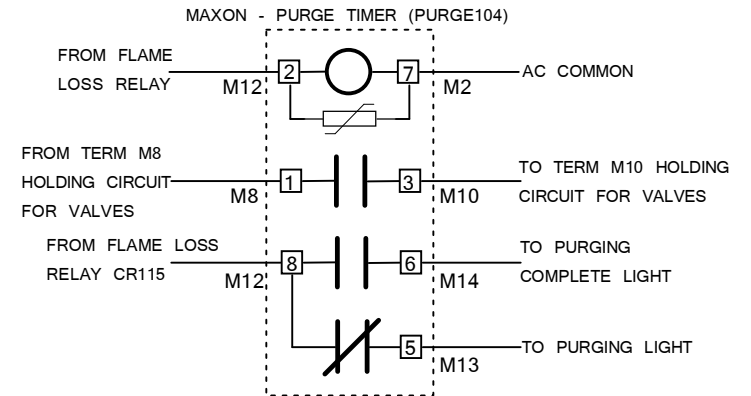
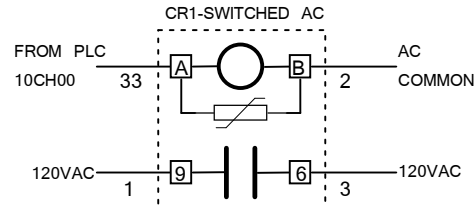
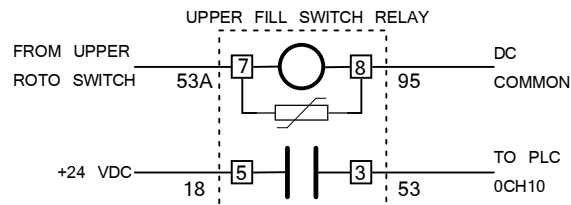
Date: 06/06

Revision:

Sheet: 16

SEQUENTIAL START 460VOLT

NOTES CAN BE FOUND ON DRAWING #23



- INDICATES MOV

- INDICATES COMPONENT TERMINALS

Title: TOWER DRYER: RELAY AND CONTACT WIRING.

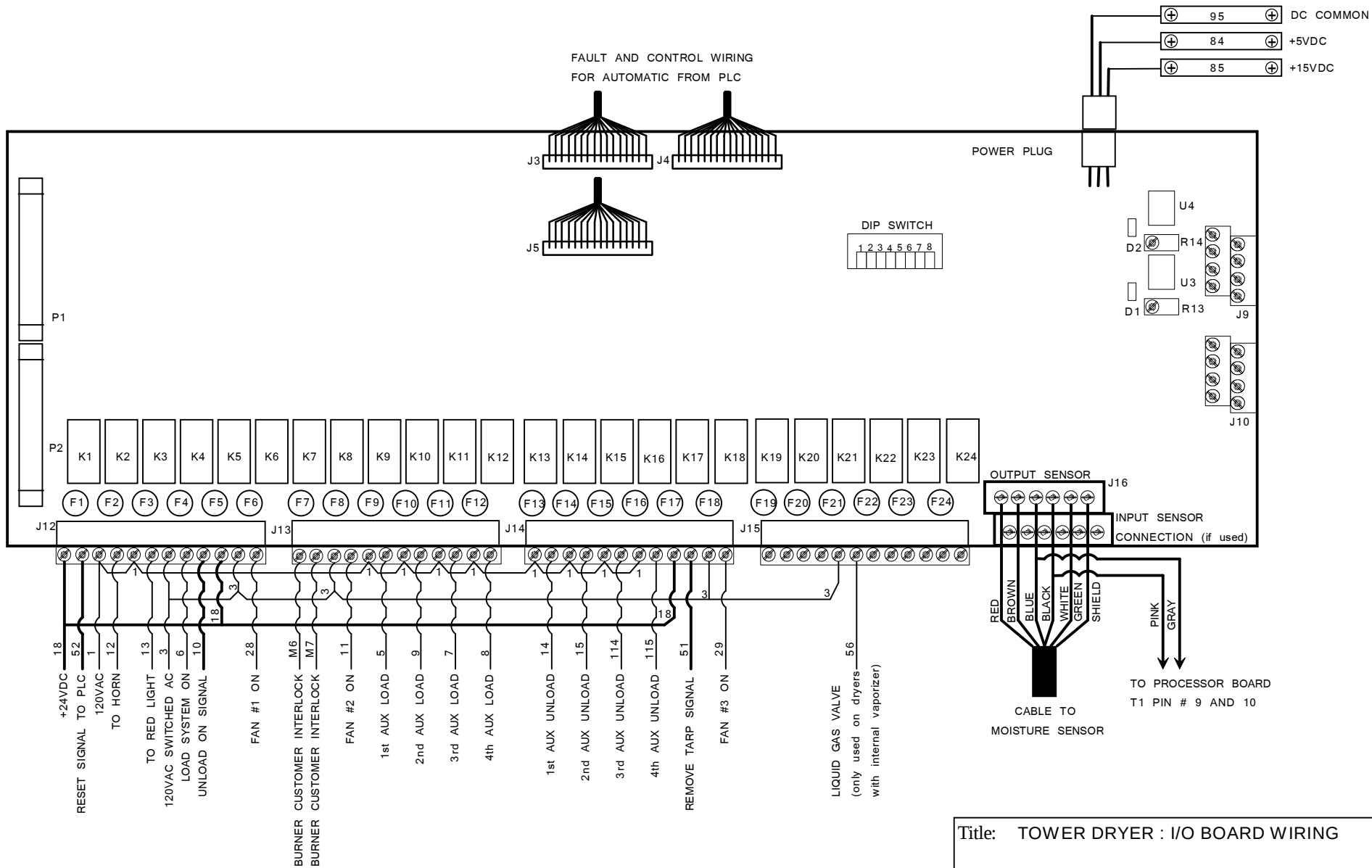
Author: CSP

Date: 03/07

Sheet: 17

Revision:

RIBBON CABLE CONNECTIONS TO PIO BOARD



Title: TOWER DRYER : I/O BOARD WIRING

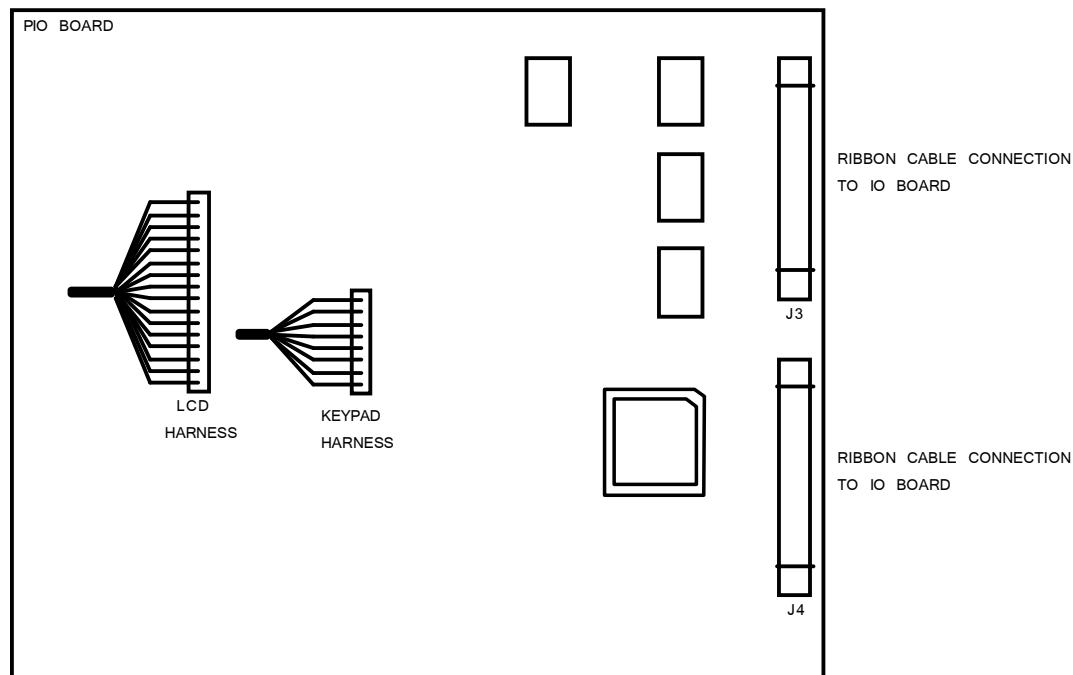
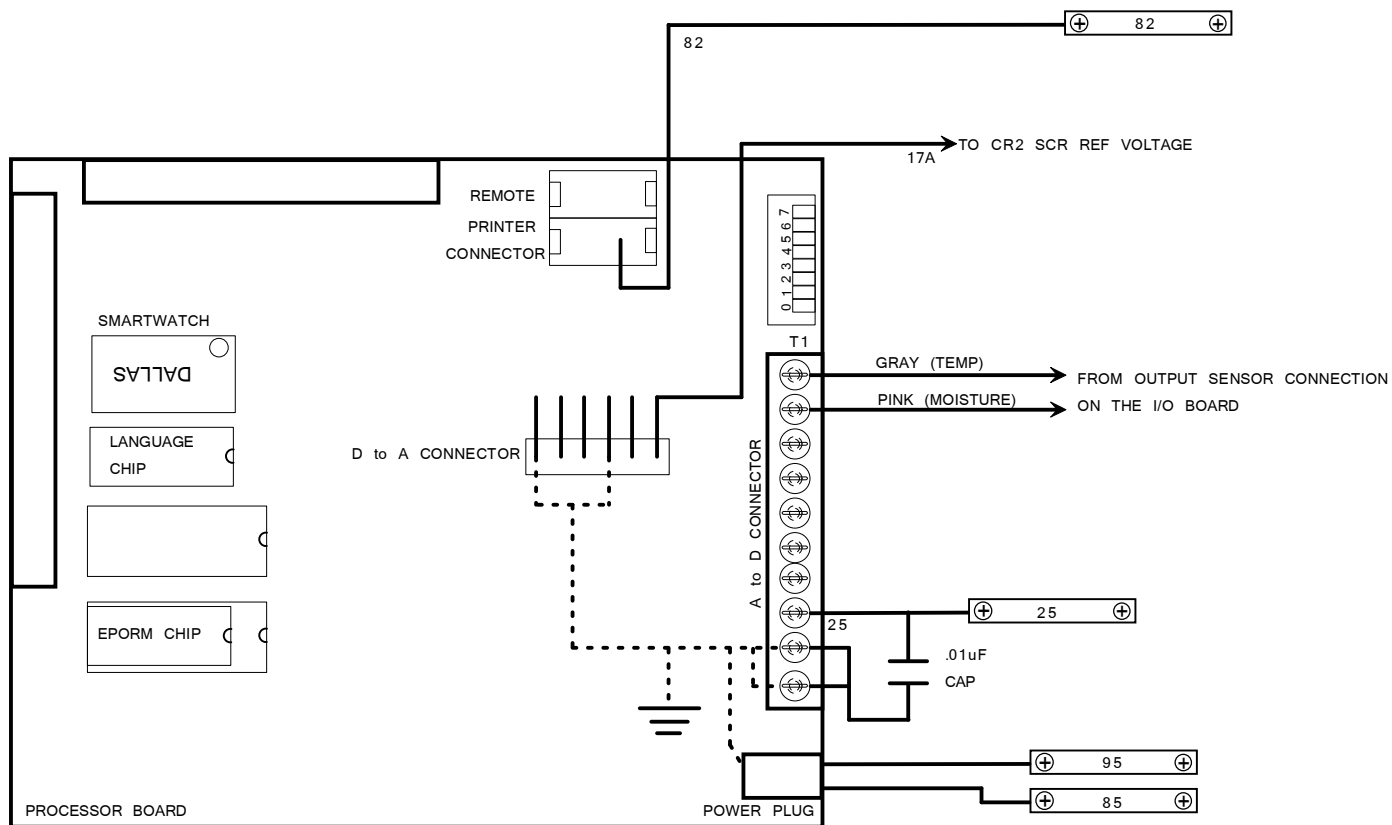
Author: CSP

Date: 04/07

Revision:

Sheet: 18

SEQUENTIAL START 460 VOLT



Title: TOWER DRYER: PIO & PROCESSOR BOARD WIRING

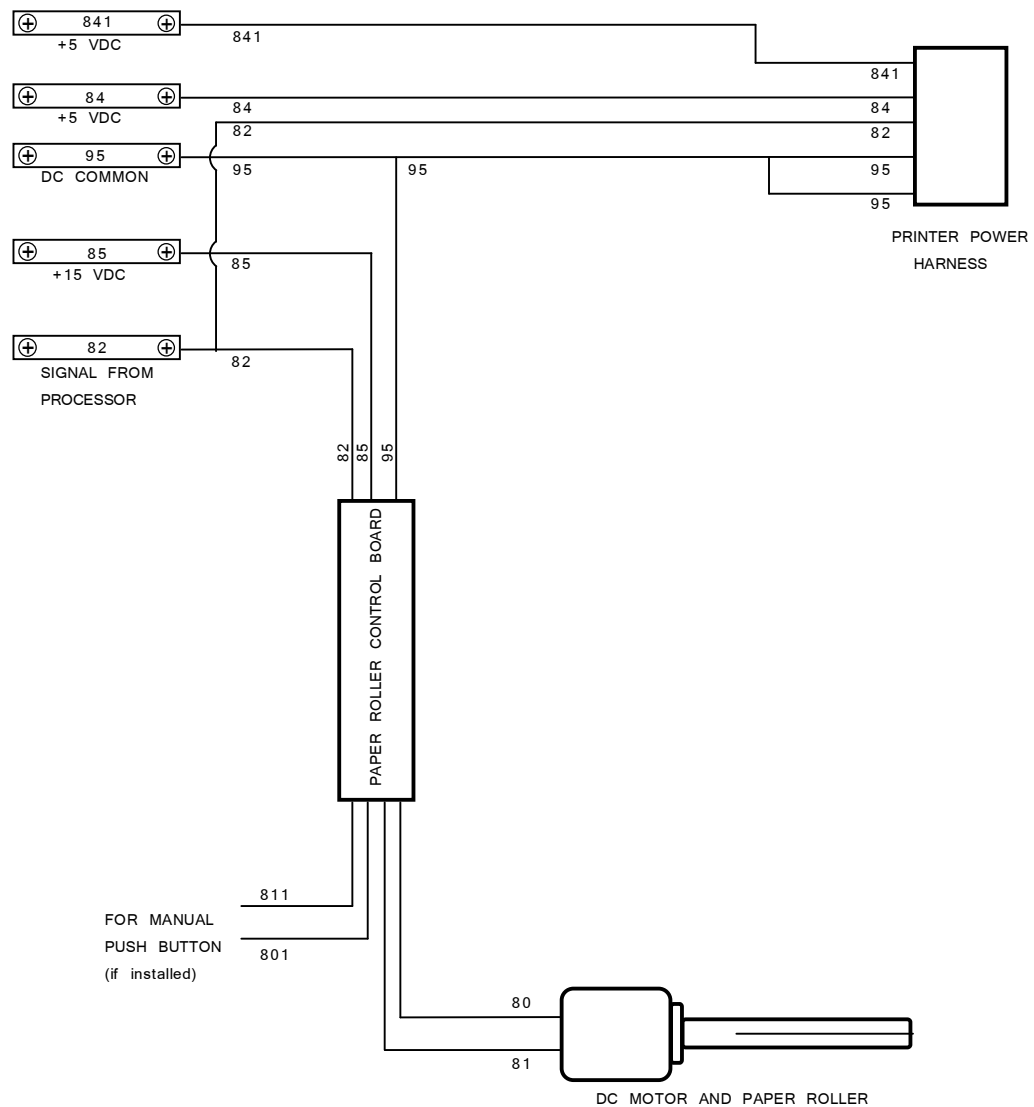
Author: CSP

Date: 04/07

Sheet: 19

Revision:

SEQUENTIAL START 460 VOLT



Title: TOWER DRYER: PRINTER AND PAPER ROLLER WIRING

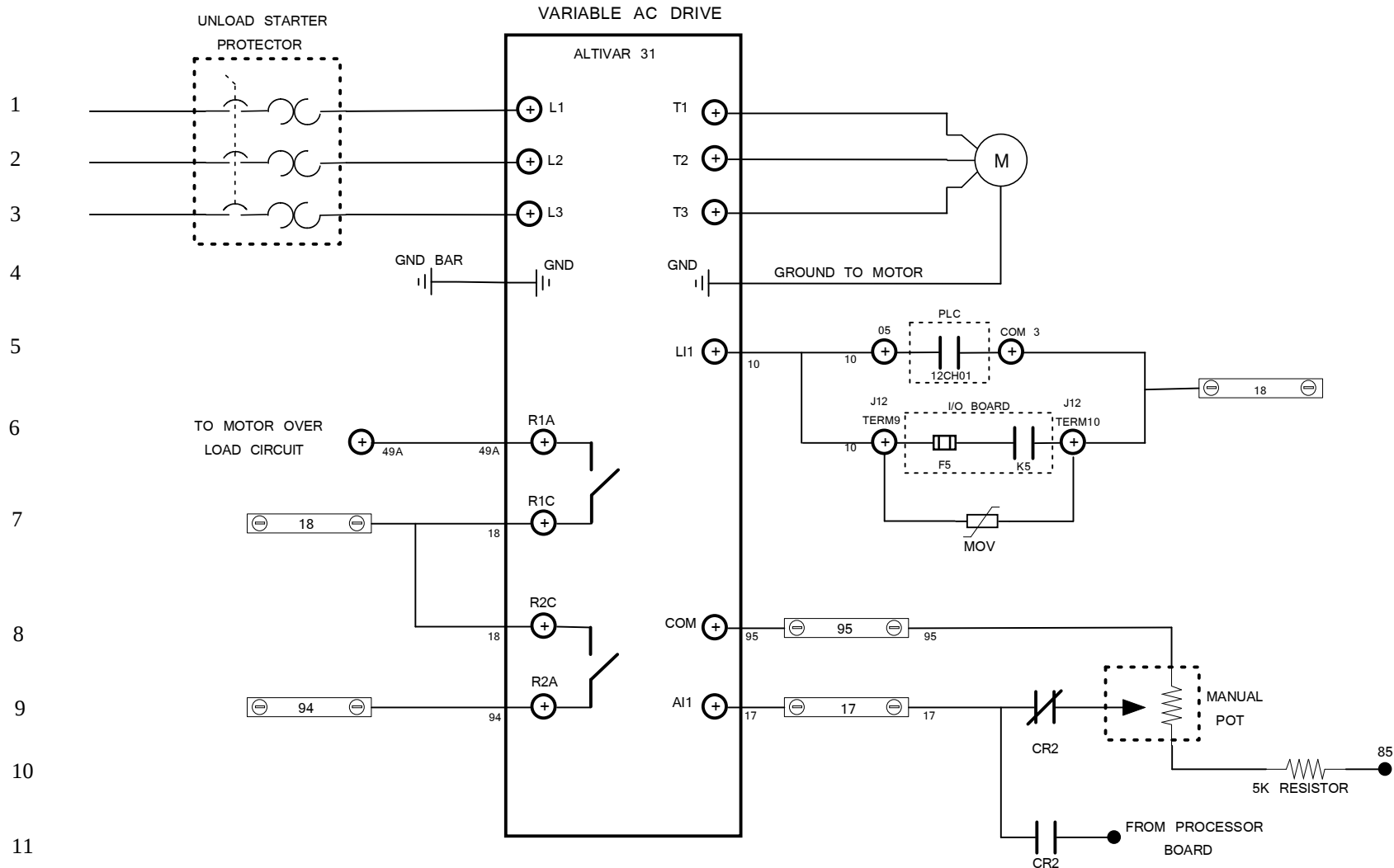
Author: CSP

Date: 01/07

Sheet: 20

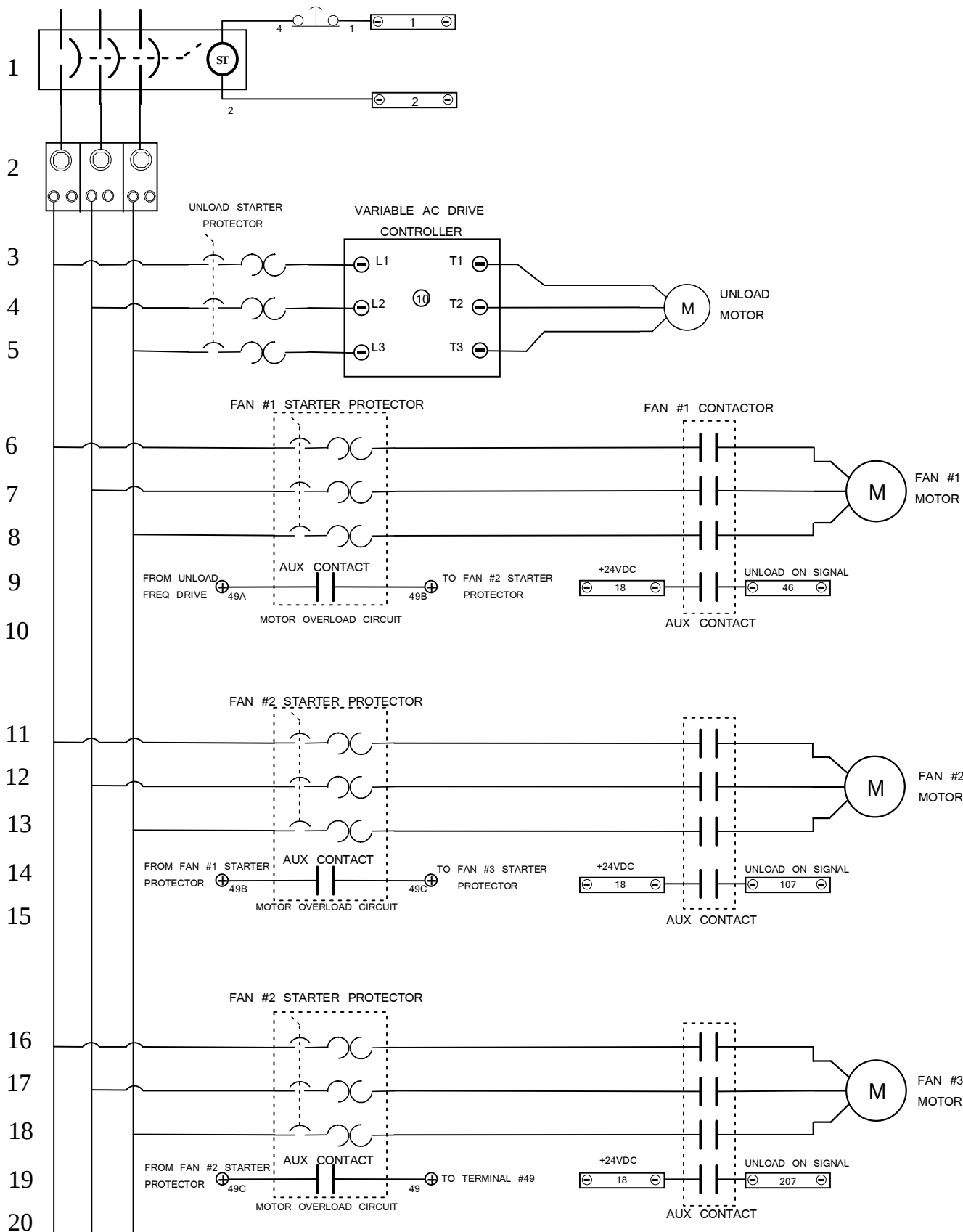
Revision:

SEQUENTIAL START 460 VOLT



NOTE:
R1 CONTACTS OPEN IF THERE IS A FAULT
OR THE DRIVE CONTROLLER IS OFF

Title: SUKUP MFG CO. : TOWER DRYER UNLOAD FREQ DRIVE- ALTIVAR 31	
Author: CSP	
Date: 06/06	Sheet: 21
Revision:	SEQUENTIAL START 460VOLT



Title: SUKUP MFG CO : TOWER DRYER
POWER WIRING

Author: CSP

Date: 04/06

Sheet: 22

Revision:

SEQUENTIAL START 460VOLT

NOTE #1: INDICATES THAT A WIRE IS REQUIRED
BETWEEN THE POWER BOX AND CONTROL

NOTE #2: THE TARP REMOVAL RELAY COMES FROM THE I/O BOARD.
IT WILL BE ENERGIZED WHEN IT IS TIME TO REMOVE THE TARP
ON THE BURNER. IT IS USED SO THAT THE ACCESS DOOR FAULT
CAN BE IGNORED AT THIS POINT.

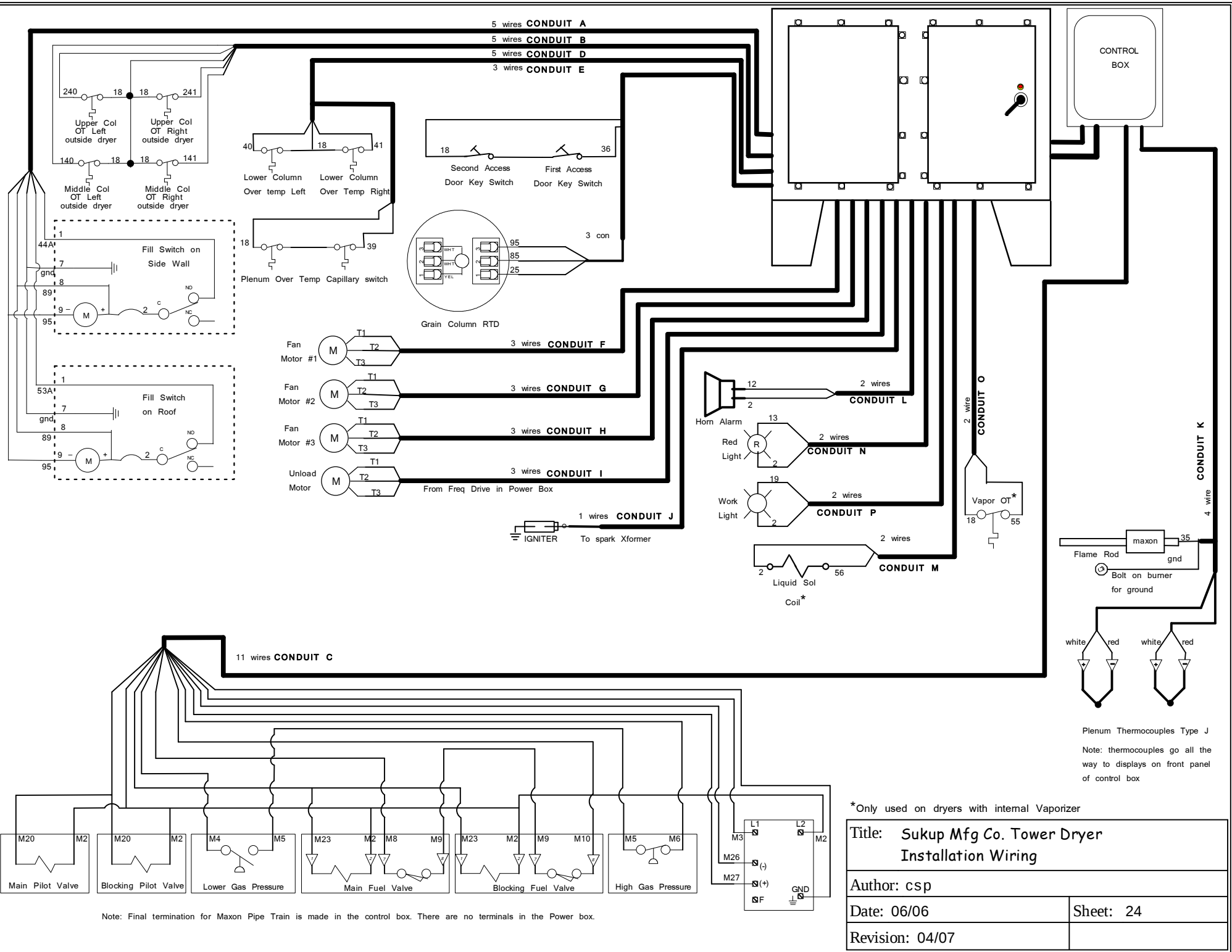
NOTE #3: THIS IS A INPUT SO THAT IF THE UNLOAD TAKE AWAY WOULD STOP
THE UNLOAD ON THE DRYER WOULD SHUTDOWN. IF AUX UNLOAD
DOES NOT GET RESTARTED IN SET TIME THE HEATER WILL SHUT OFF.

**UNLOAD WILL NOT START UNTIL THIS SIGNAL IS PRESENT. INSTALL
JUMPER FOR TESTING AND IF FUNCTIONS IS NOT GOING TO BE USED**

NOTE #4: ONLY USED ON DRYERS WITH INTERNAL VAPORIZER. INSTALL JUMPER
WHEN NOT USED.

- ⑦ ON ALL SWITCHES XOO INDICATES THAT THE SWITCH
IS IN THE MANUAL OR ON POSITION. OOX INDICATES THAT
THE SWITCH IS COMPUTER OR AUTO POSITION
- ⑧ DOTTED LINES INDICATE THAT PARTS ARE NOT IN POWER OR
CONTROL BOX. THEY WILL NEED TO BE PROVIDED BY CUSTOMER
- ⑨ CONTACT WIRING FOR THE UPPER & LOWER FILL SWITCH
RELAY CAN BE FOUND ON DRAWING #11 LINES 12 & 13
- ⑩ A DETAILED DRAWING OF THE VARIABLE FREQUENCY DRIVE
CAN BE FOUND ON DRAWING #21
- ⑪ LIQUID SOLENOID VALVE IS ONLY USED ON 12' DRYERS WITH INTERNAL
VAPORIZER

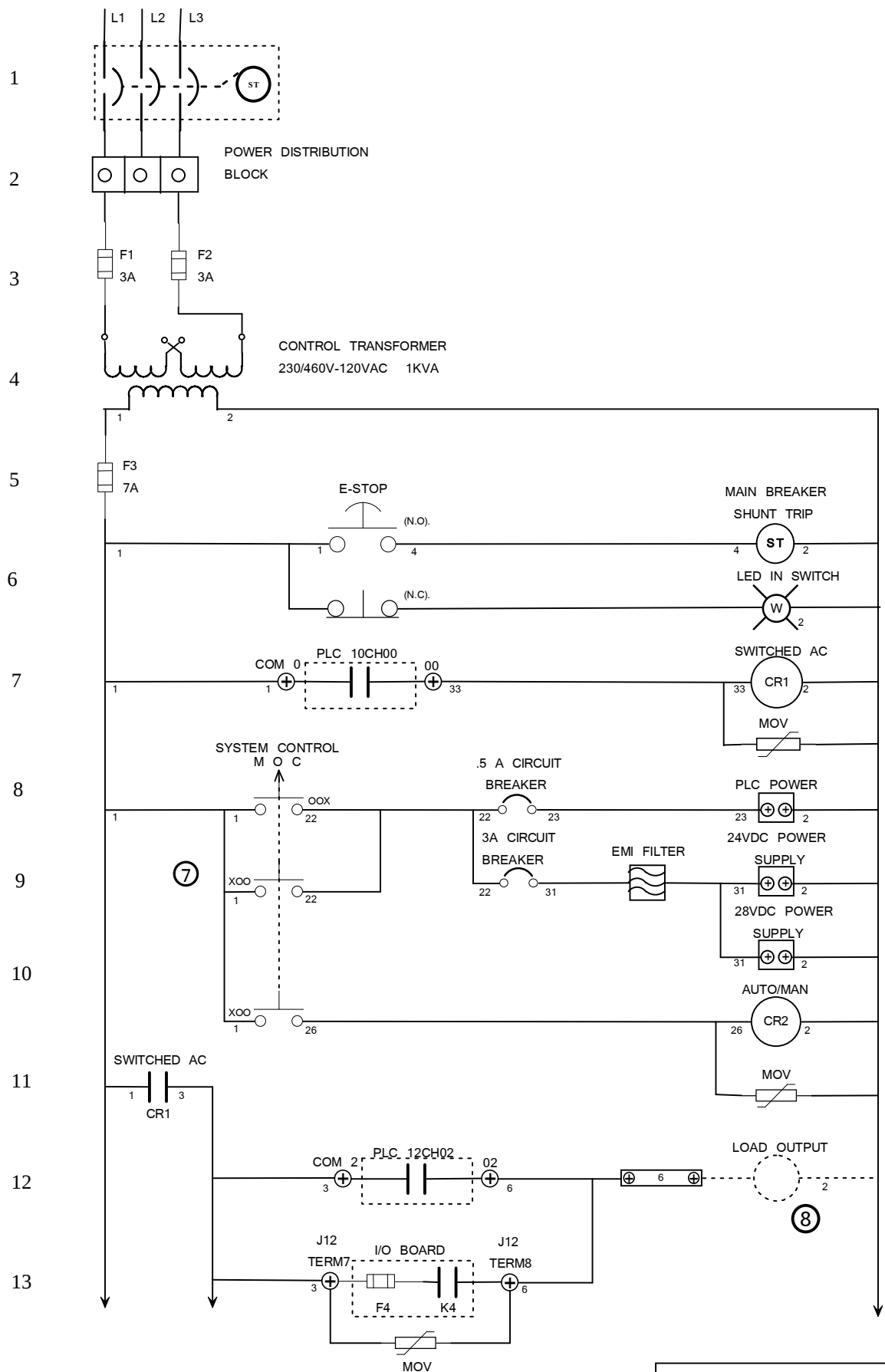
Title: TOWER DRYER: PANEL WIRING NOTES	
Author: CSP	
Date: 04/07	Sheet: 23
Revision:	



Dryer Wiring			
Location	Wire color	Conduit Letter	Conduit Destination
Roof roto sw(48" UP from eve)	#89- Black (28vdc power), #83- White (Dc common), #53A- Yellow (control Signal), Gnd- Green	A	Power Box
Side wall Roof sw (20" down form top soild sheet)	#89- Black (28vdc power), #83- White (Dc common), #44A- Blue (control Signal), Gnd- Green	A	Power Box
Upper Col OT #1 or RT (Top of 1st Perforated Sheet)	#18- Red (24VDCpower shared with all outside OT Switches), #241- Orange (signal back to box)	B	Power Box
Upper Col OT #2 or LT (Top of 1st Perforated Sheet)	#18- Red (24VDCpower shared with all outside OT Switches), #240- Yellow (signal back to box)	B	Power Box
Middle Col OT #1 or RT (1st perforated sheet below grain exchanger above toe kick on 3rd	#18- Red (24VDCpower shared with all outside OT Switches), #141- Blue (signal back to box)	B	Power Box
Middle Col OT #2 or LT (1st perforated sheet below grain exchanger above toe kick on 3rd	#18- Red (24VDCpower shared with all outside OT Switches), #140- Purple (signal back to box)	B	Power Box
Plenum OT (1-2 feet below top of burner cylinder)	#18- Red (24VDCpower Shared with inside col OT switches), #39- Orange (signal back to boxes)	D	Power Box
Lower Col #1 or RT (inside) (2-3 ft below cooling chamber divider)	#18- Red (24VDCpower Shared with inside col OT switches and plenum OT switchs), #41- Yellow (signal back to boxes)	D	Power Box
Lower Col #2 or LT (inside)(2-3 ft below cooling chamber divider)	#18- Red (24VDCpower Shared with inside col OT switches and plenum OT switches), #40- Blue (signal back to boxes)	D	Power Box
Thermocouple(1-2 feet below top of burner cylinder)	Type J Thermocouple wire for Maxon (Red is negative White is Positive)	K	Control Box
Flame Sense	#M35- Purple (To Falme Rod), GND- Green (ATTACH TO BURNER)	K	Control Box
Spark	Spark plug wire	J	Power Box
RTD (1-2 feet below top of burner cylinder)	three conductor cable 85(15vdc),95(dc com),25(signal back)	E	Power Box
Door Key switch Upper & Lower	#18- Red (24VDC power), # - Orange (Connects between Lower & Upper), #36- Purple (signal back to boxes)	E	Power Box
Horn	#12 - Red (120VAC) #2 - White	L	Power Box
Work Light	#19 - Red (120VAC) #2 - White	P	Power Box
Red Light	#13 - Red (120VAC) #2 - White	N	Power Box
Liquid Coil	#55 - Red (120VAC) #2 - White	M	Power Box
Vaporizer OT	#18 - Orange #56- Yellow	O	Power Box
Maxon Main Piolt Valve	120vac	C	Control Box
Maxon Blocking Piolt Valve	120vac	C	Control Box
Maxon Low Gas Pressure SW	120vac	C	Control Box
Maxon Main Fuel Valve	120vac	C	Control Box
Maxon Blocking Fuel Valve	120vac	C	Control Box
Maxon High Gas Pressure SW	120vac	C	Control Box
Maxon Honeywell Mod Motor	120vac	C	Control Box
	ALL 120 VAC WIRING NEEDS TO HAVE WIRE NUMBERS		

ELECTRICAL DRAWINGS
SOFT START OF FANS
2007

DRAWINGS COVER BOTH SINGLE
FAN AND THREE FAN DRYERS



Title: SUKUP MFG CO : TOWER DRYER,
120 VOLT CONTROL

Author: CSP

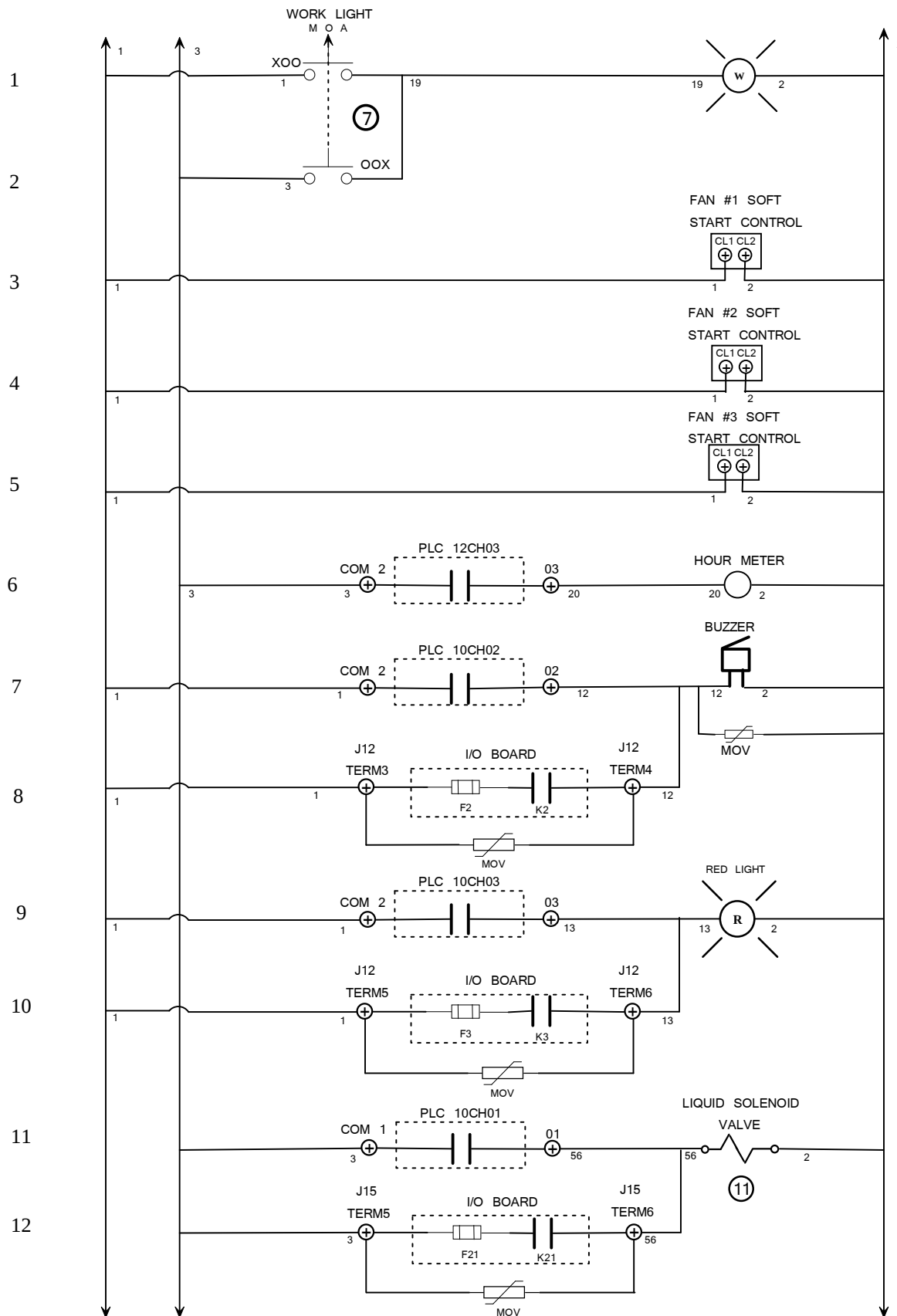
Date: 04/06

Sheet: 1

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG CO : TOWER DRYER,
120 VOLT CONTROL

Author: CSP

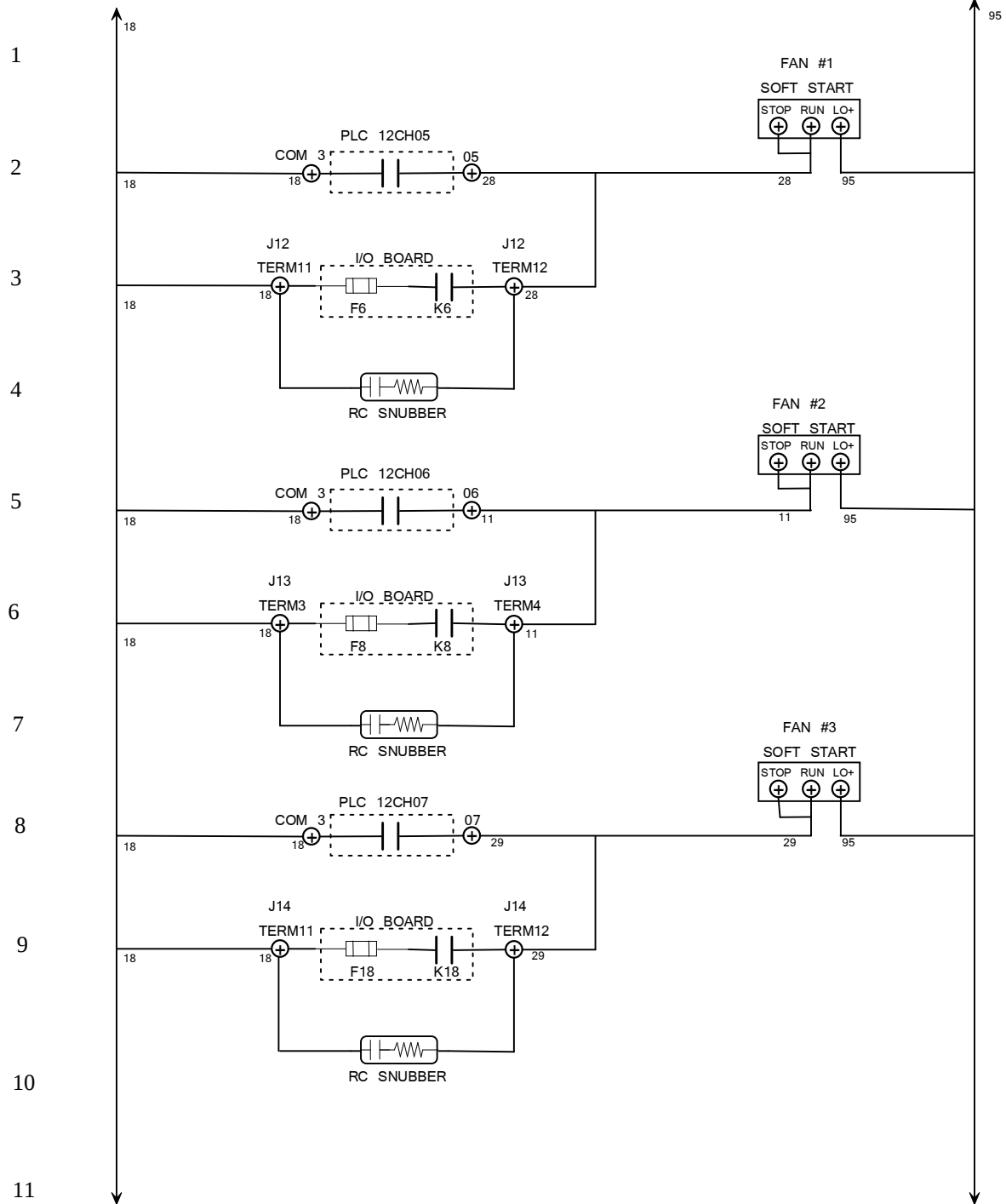
Date: 04/06

Sheet: 2

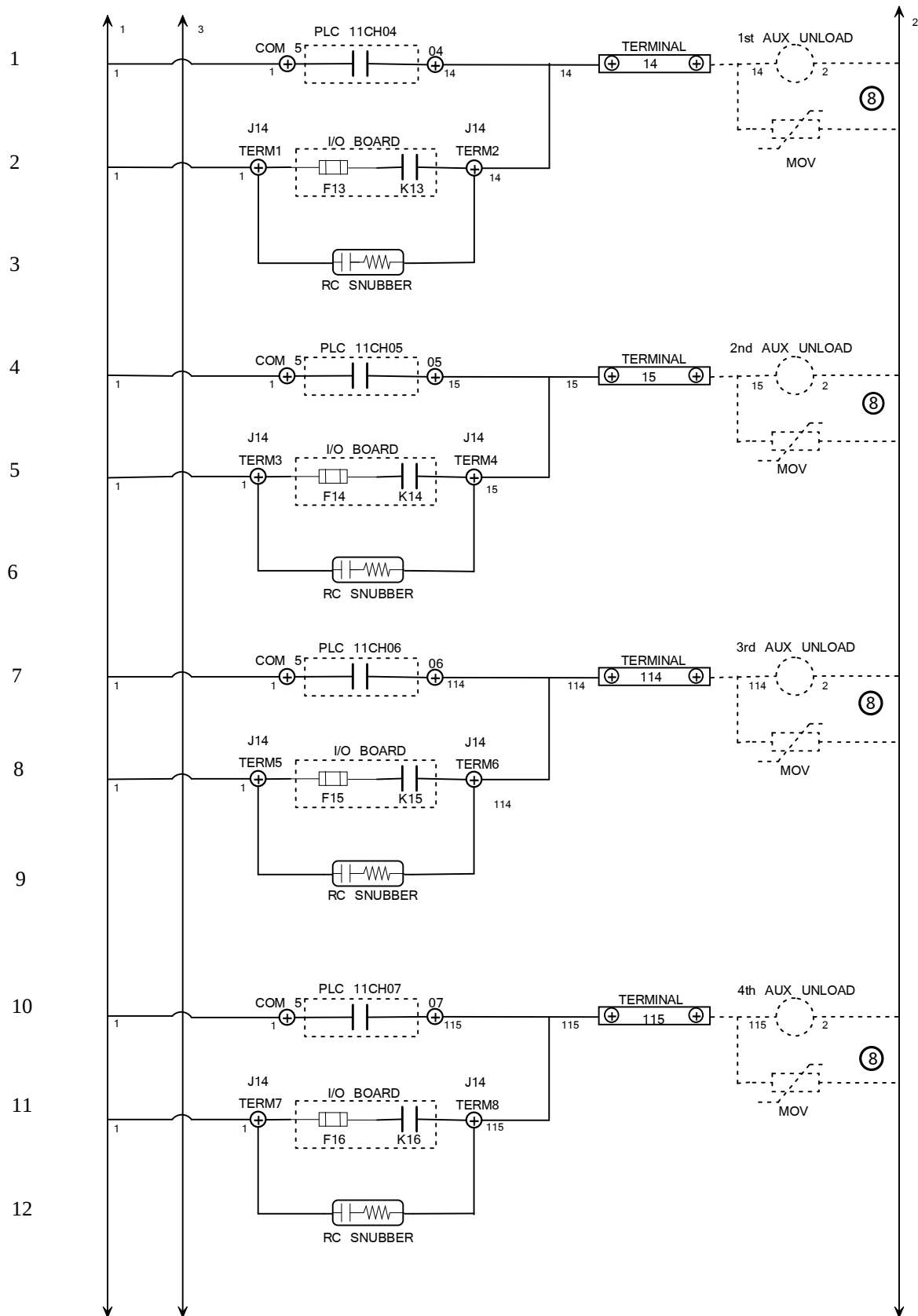
Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG CO : TOWER DRYER, SOFT START CONTROL WIRING	
Author: CSP	
Date: 06/06	Sheet: 3
Revision:	SOFT START



Title: SUKUP MFG CO : TOWER DRYER,
AUX UNLOAD CONTROL WIRING

Author: CSP

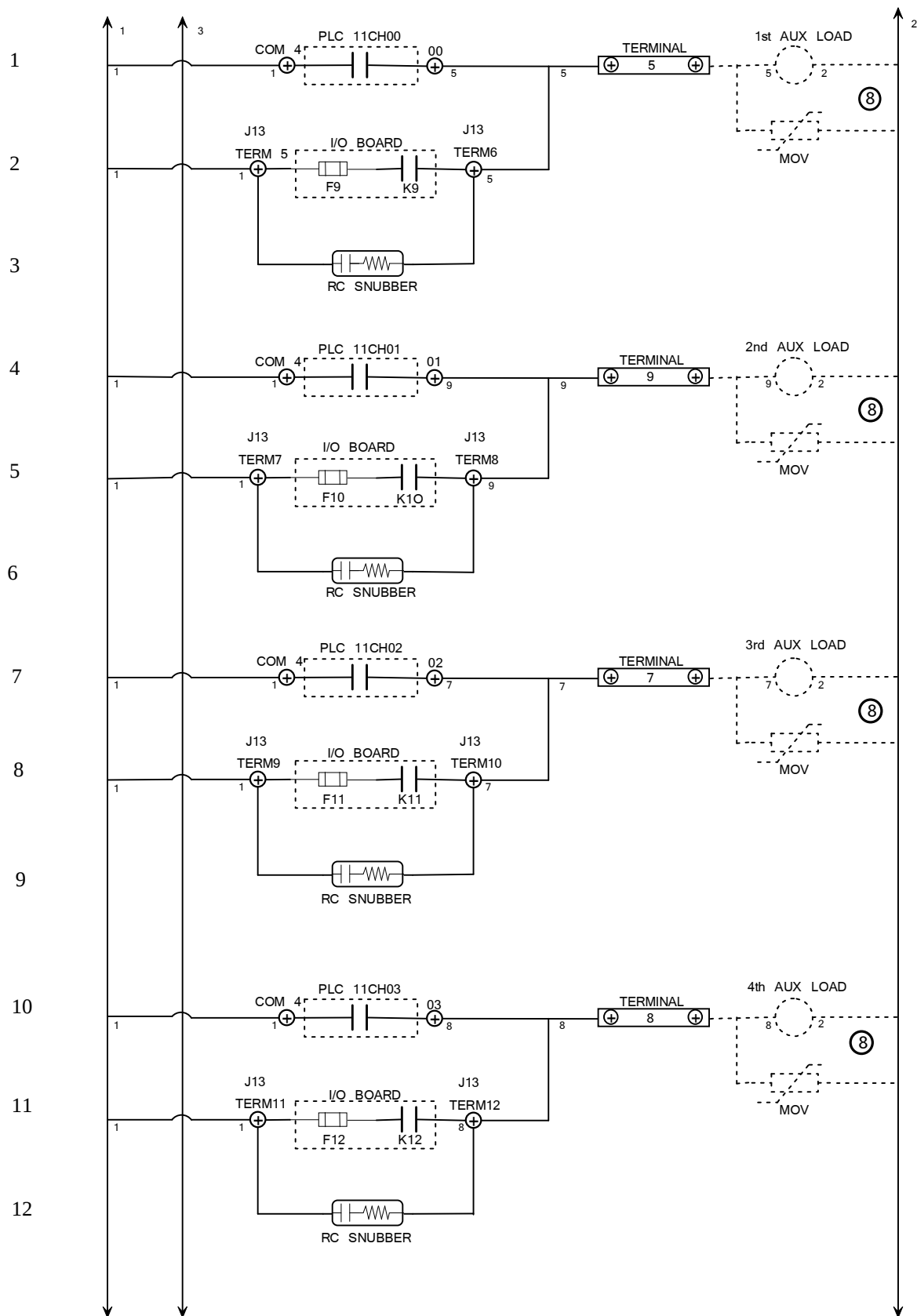
Date: 04/06

Sheet: 4

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG CO : TOWER DRYER,
AUX LOAD CONTROL WIRING

Author: CSP

Date: 04/06

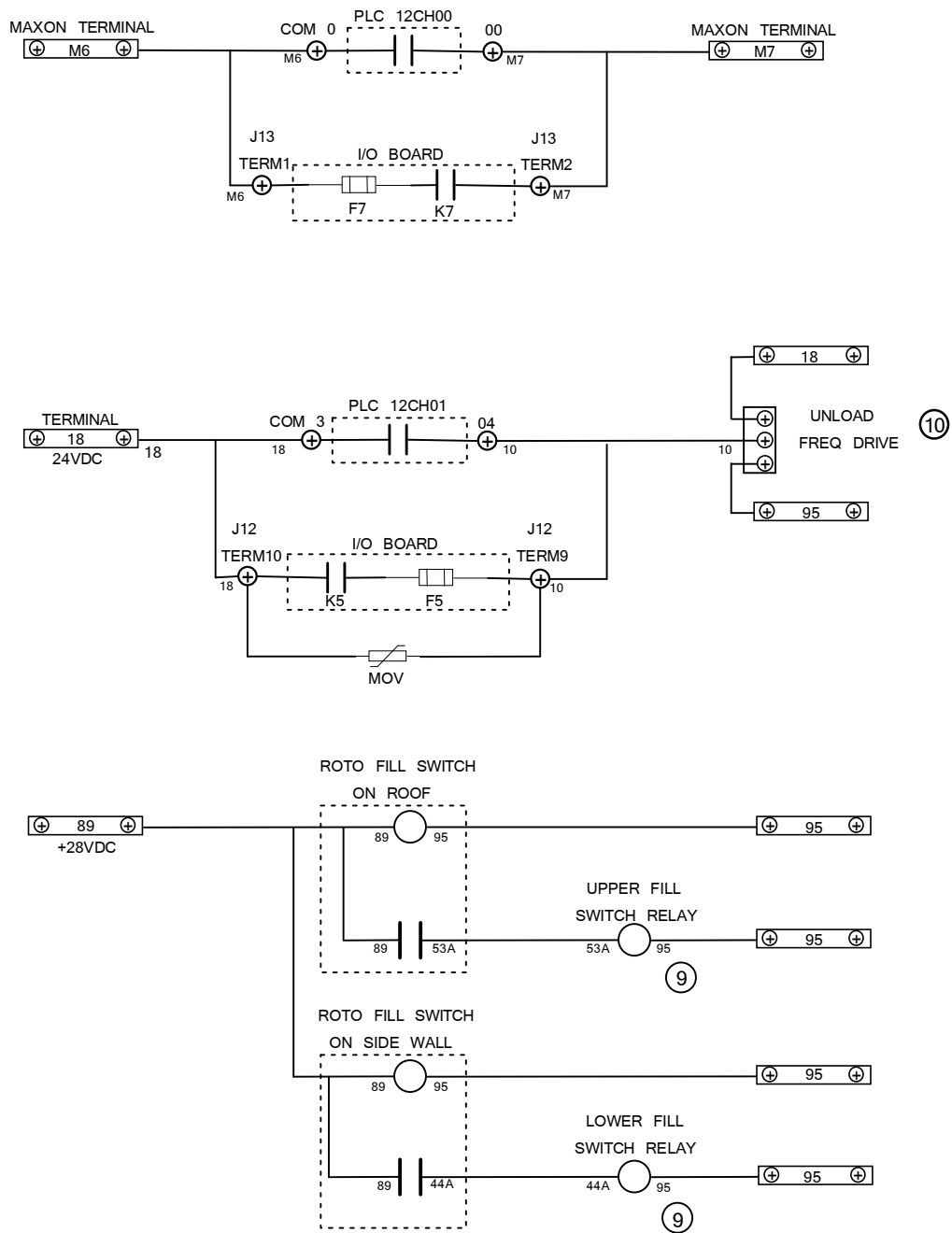
Sheet: 5

Revision:

SOFT START

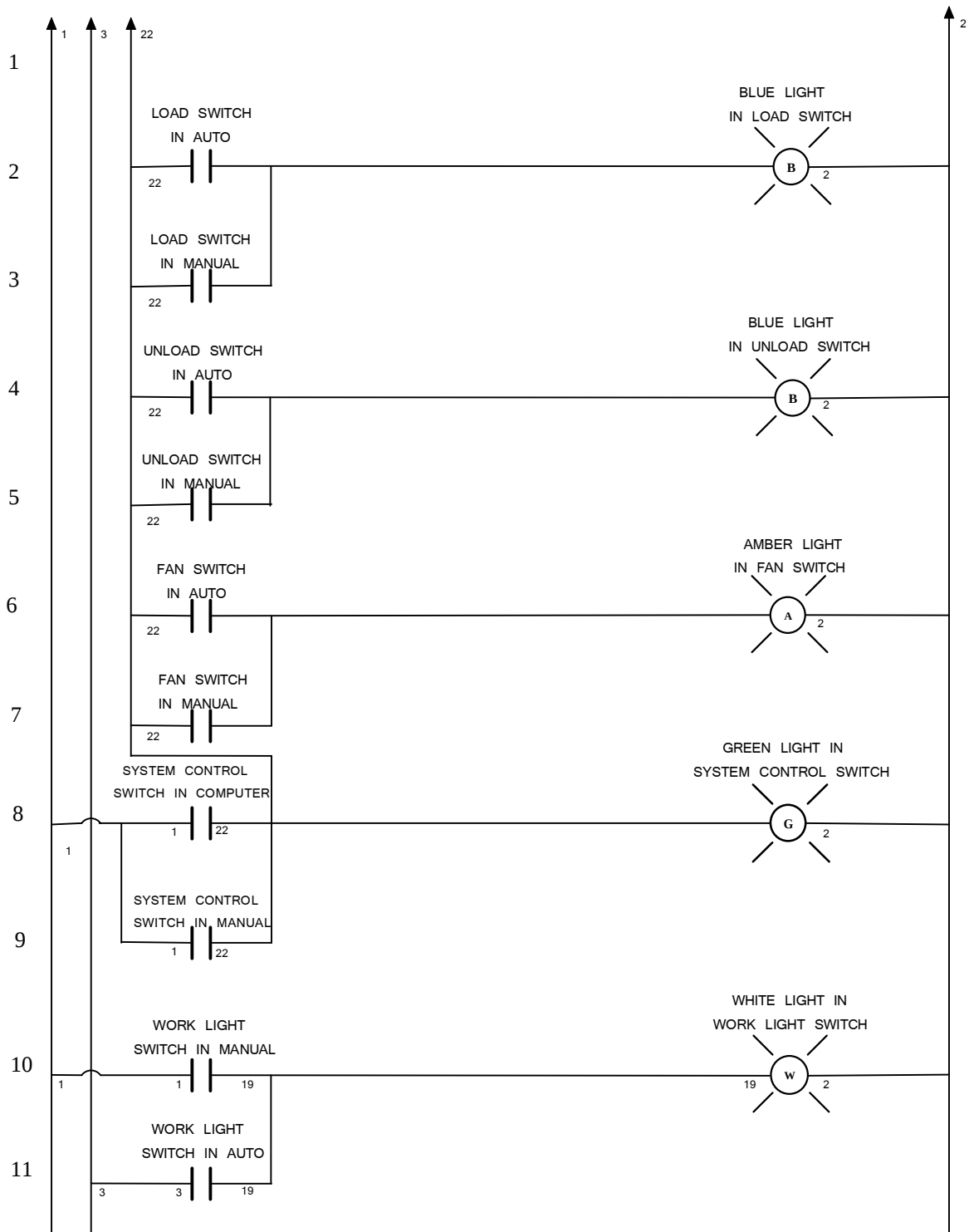
NOTES CAN BE FOUND ON DRAWING #28

1
2
3
4
5
6
7
8
9
10
11
12



NOTES CAN BE FOUND ON DRAWING #28

Title: SUKUP MFG CO : TOWER DRYER BURNER INTERLOCK, ROTO FILL SWITCH & UNLOAD FREQ DRIVE WIRING	
Author: CSP	
Date: 06/06	Sheet: 6
Revision:	SOFT START



Title: SUKUP MFG CO : TOWER DRYER
FRONT PANEL SWITCH LIGHT WIRING

Author: CSP

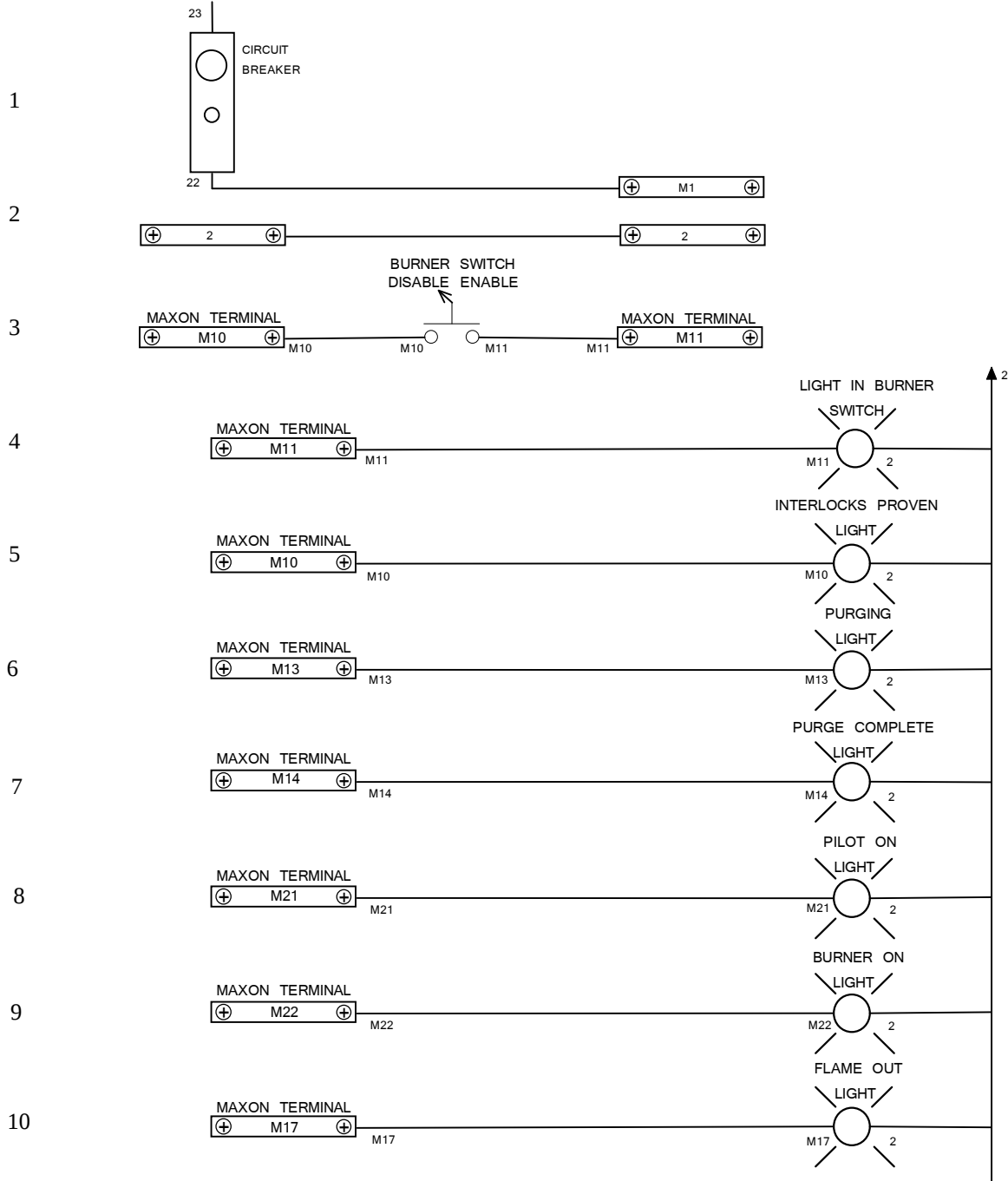
Date: 04/06

Sheet: 7

Revision:

SOFT START

NOTE: FULL DETAILED DRAWINGS CAN BE FOUND IN THE MAXON PANEL INFORMATION MANUAL



Title: SUKUP MFG CO : TOWER DRYER
FRONT PANEL SWITCH LIGHT WIRING

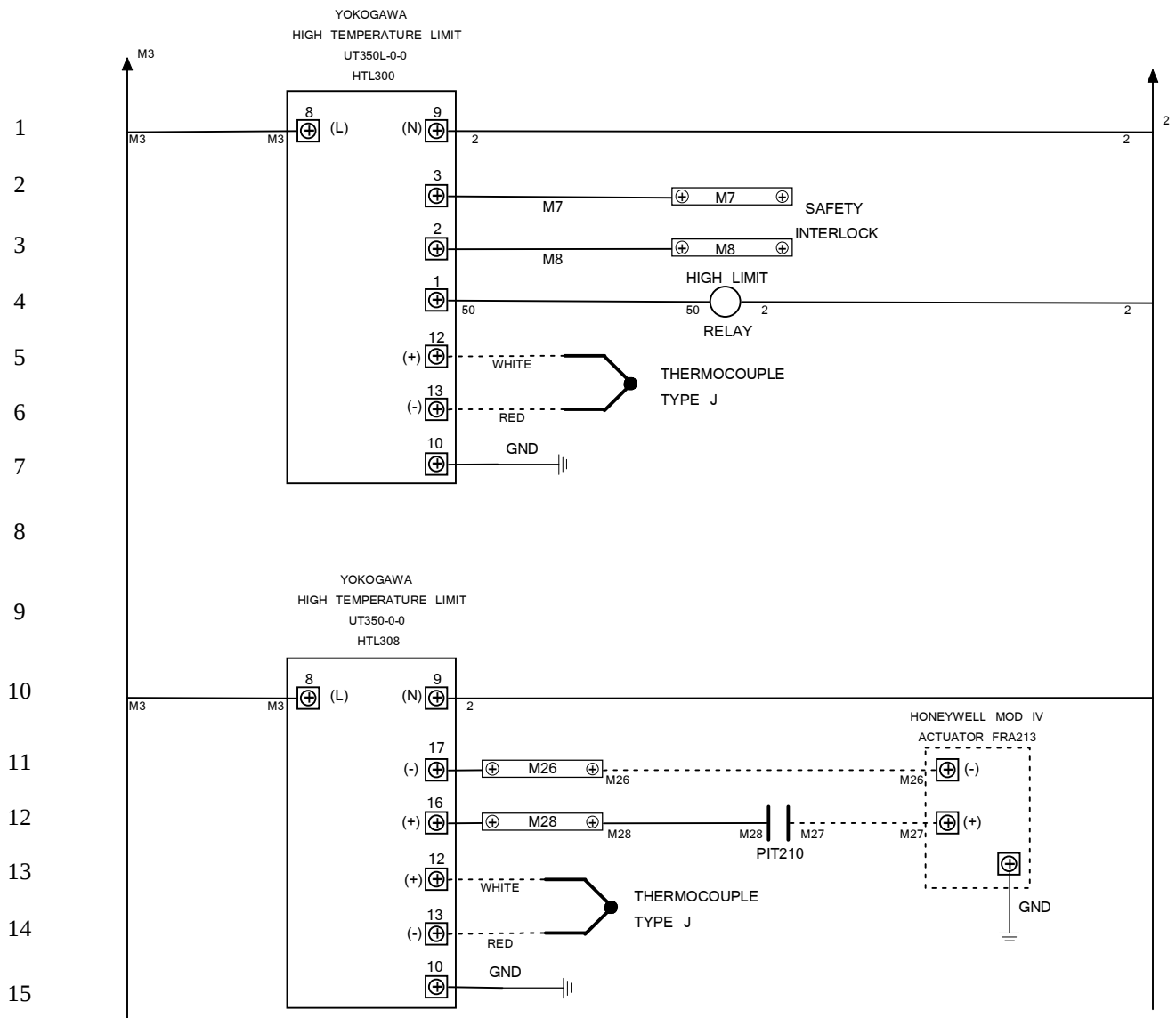
Author: CSP

Date: 04/06

Sheet: 8

Revision:

SOFT START



NOTE: FULL DETAILED DRAWINGS CAN BE FOUND IN THE MAXON PANEL INFORMATION MANUAL

DOTTED LINES SHOW WIRING OUTSIDE OF CONTROL OR POWER BOX.

Title: SUKUP MFG CO : TOWER DRYER
YOKOGAWA CONTROLLER'S WIRING

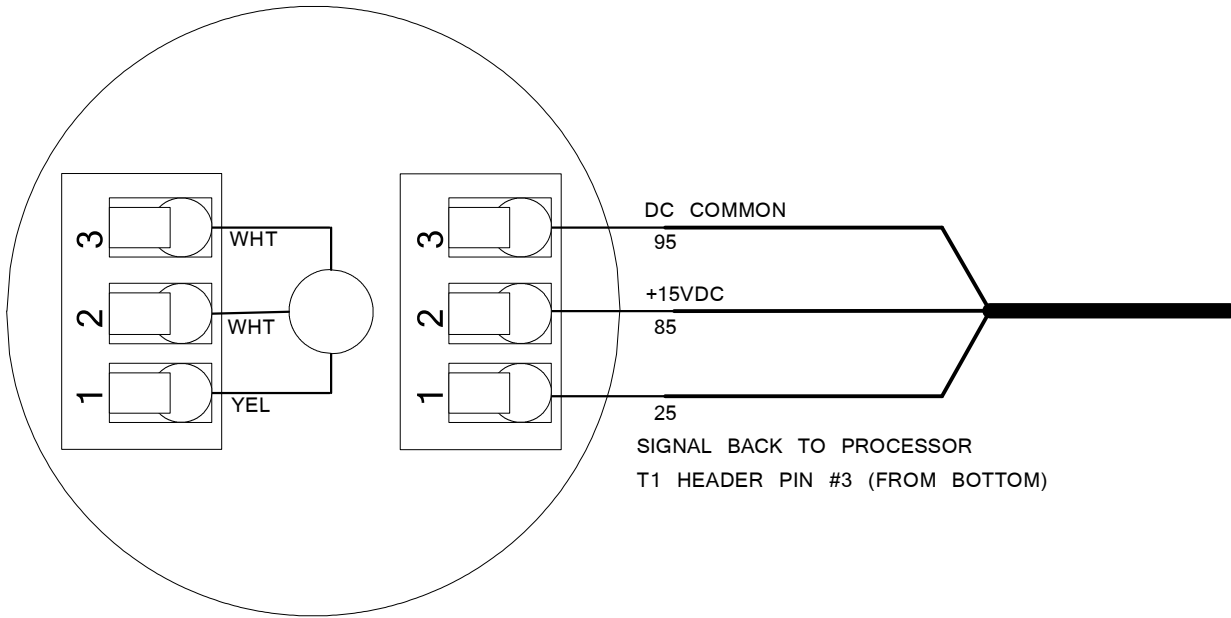
Author: CSP

Date: 06/06

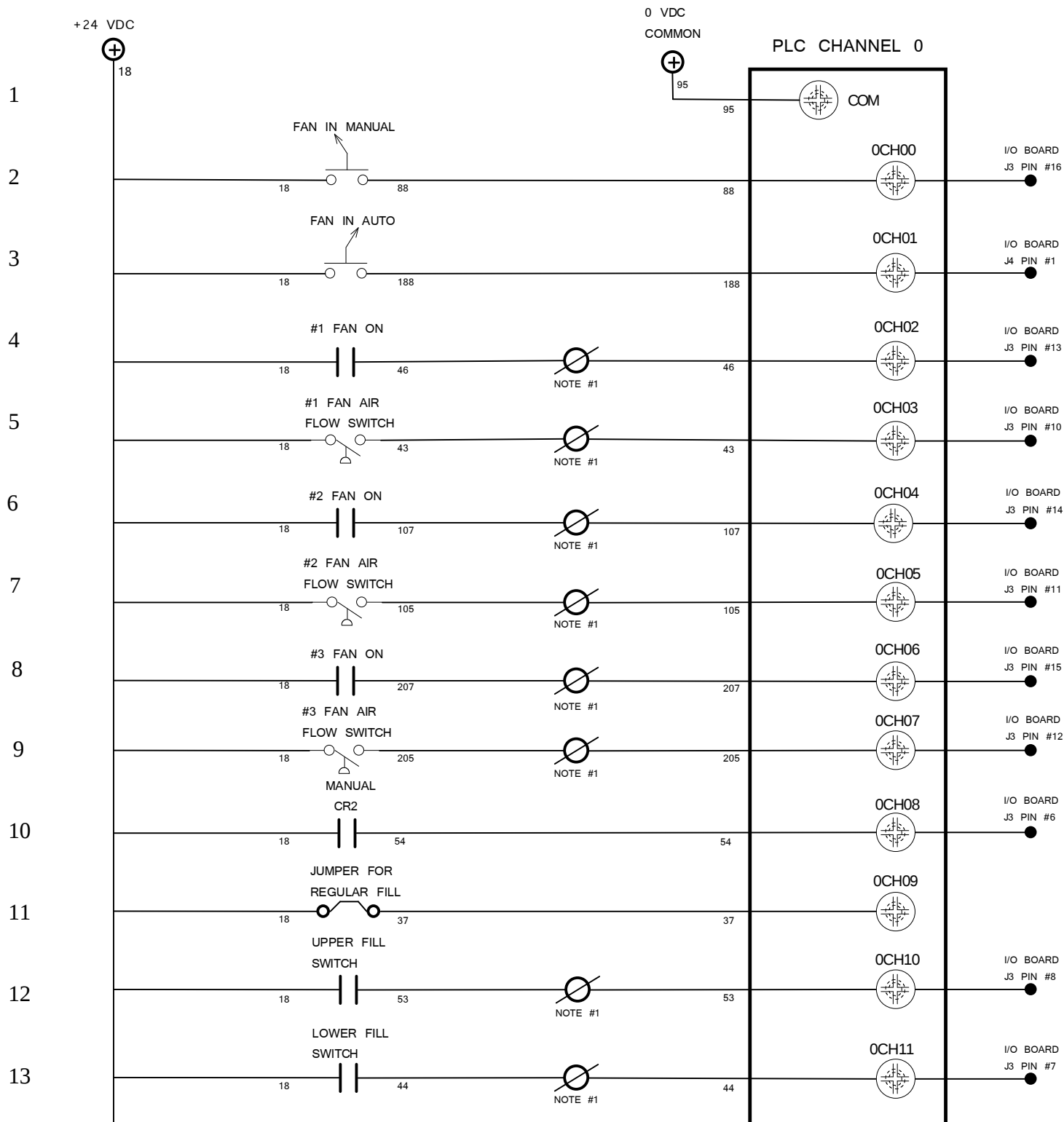
Sheet: 9

Revision:

SOFT START



Title: SUKUP MFG CO : TOWER DRYER RTD WIRING FOR GRAIN COLUMN	
Author: CSP	
Date: 06/06	Sheet: 10
Revision:	SOFT START



Title: SUKUP MFG Co. TOWER DRYER:
PLC INPUTS CHANNEL 0

Author: CSP

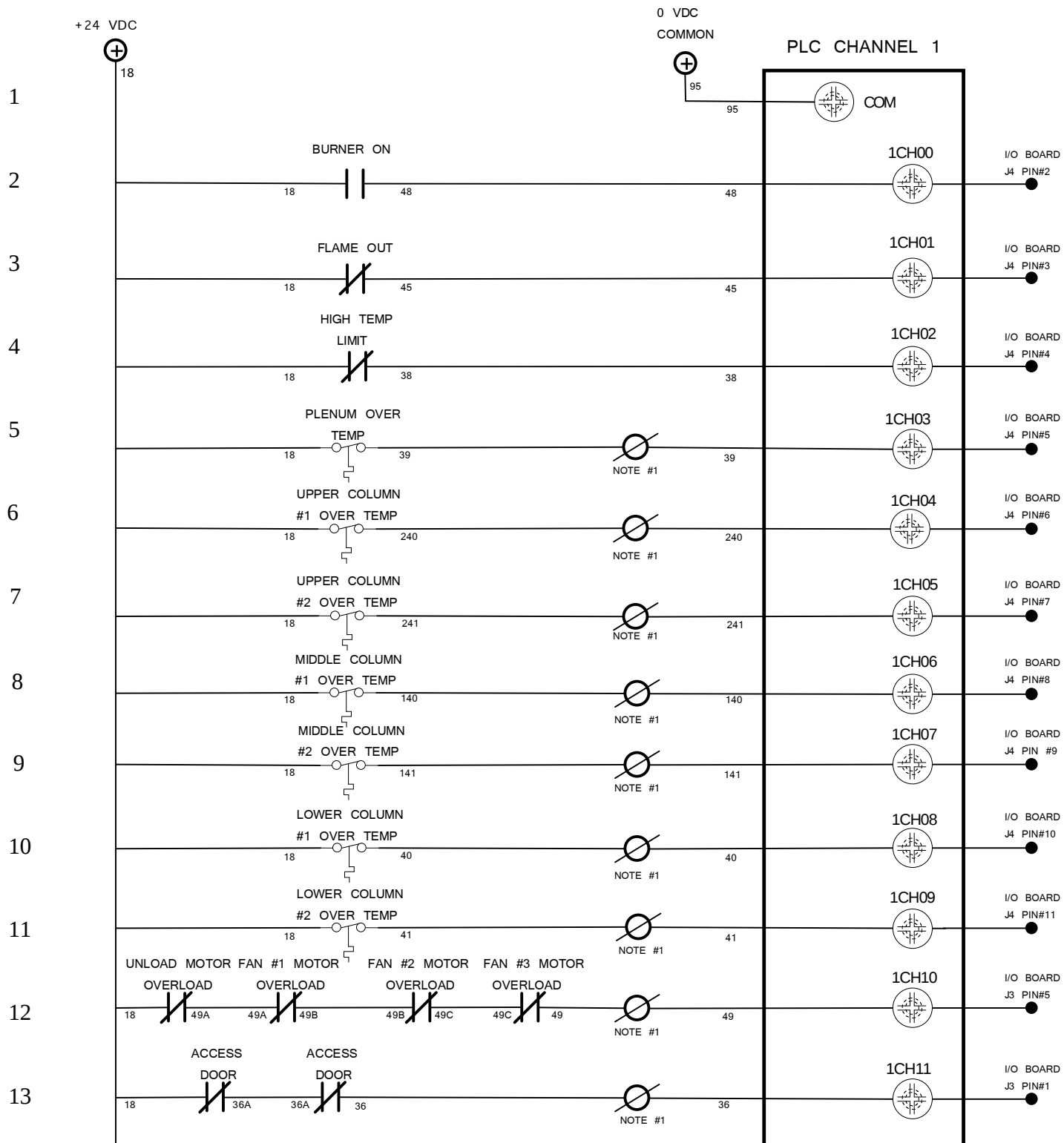
Date: 06/06

Sheet: 11

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG Co. TOWER DRYER:
PLC INPUTS CHANNEL 1

Author: CSP

Date: 06/06

Sheet: 12

Revision:

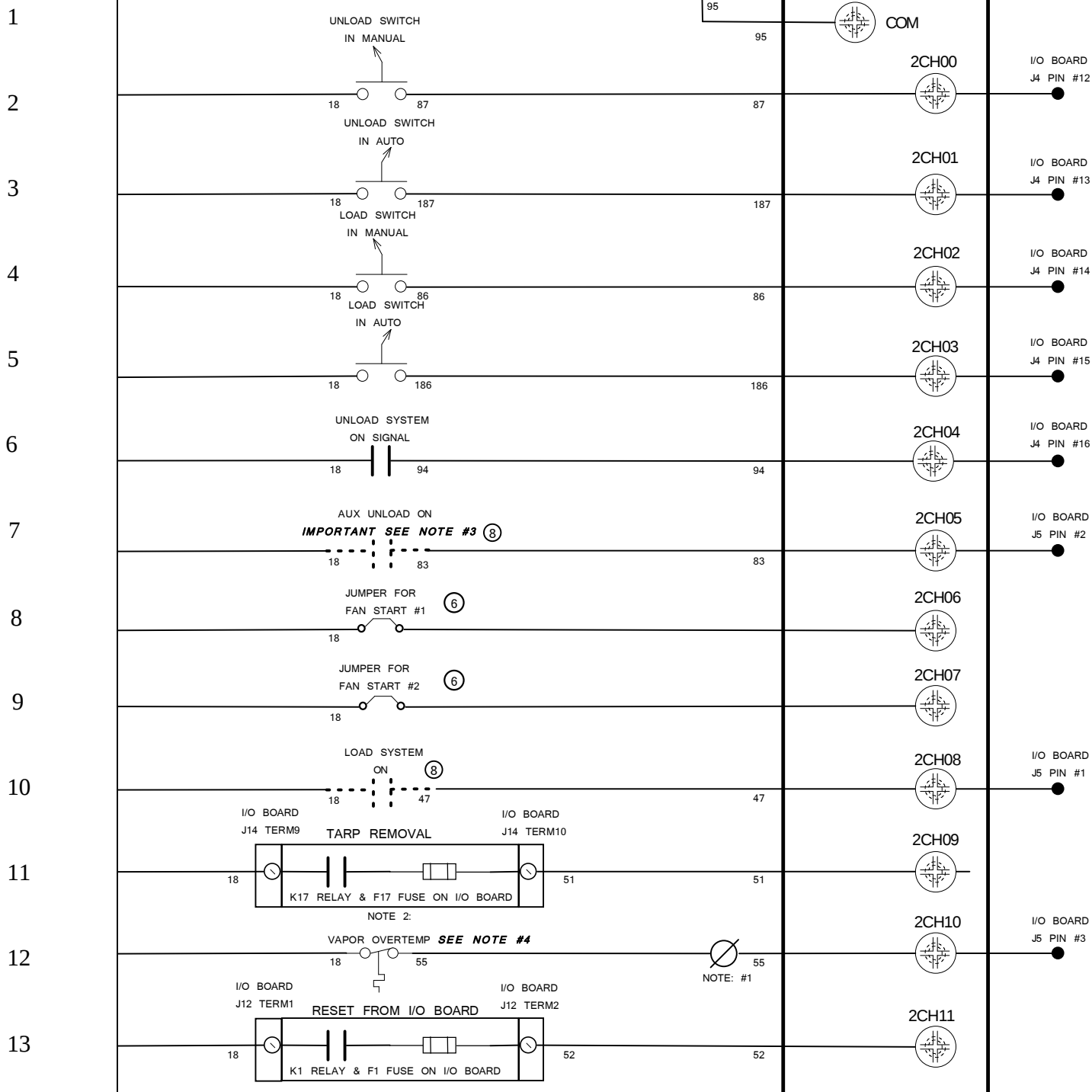
SOFT START

NOTES CAN BE FOUND ON DRAWING #28

+24 VDC

0 VC
COMMON

PLC CHANNEL 2



(6)

2CH06	2CH07	FAN STARING MODE
O	O	SOFT START
X	O	REDUCED TORQUE
O	X	SEQUENTIAL START

O INDICATES NO JUMPER

X INDICATES JUMPER

Title: SUKUP MFG Co. TOWER DRYER:
PLC INPUTS CHANNEL 2

Author: CSP

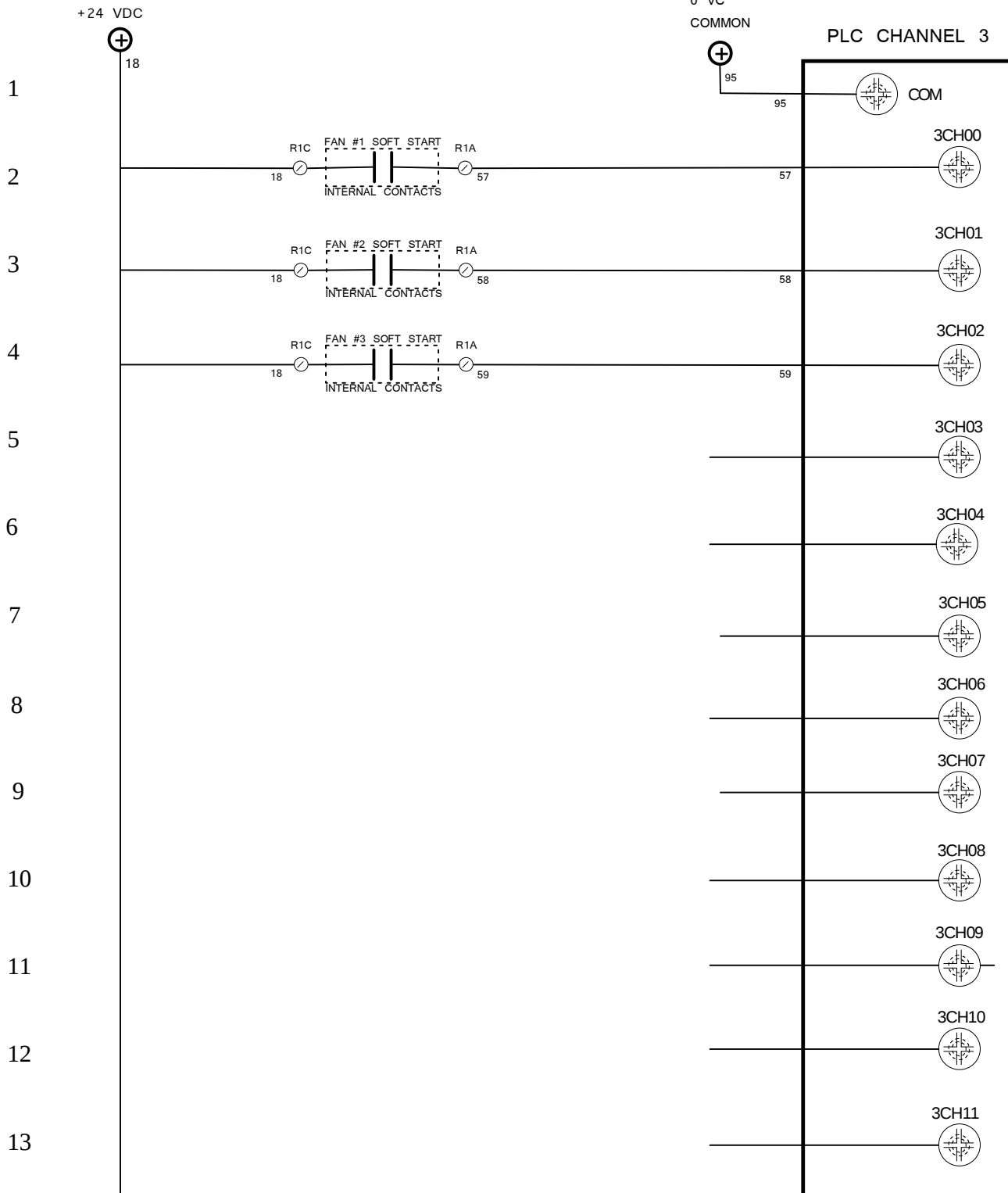
Date: 06/06

Sheet: 13

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG Co. TOWER DRYER: PLC INPUTS CHANNEL 3	
Author: CSP	
Date: 06/06	Sheet: 14
Revision:	SOFT START

NOTES CAN BE FOUND ON DRAWING #28

PLC OUTPUT CHANNEL 10

2

1

COM 0



1

TERMINAL

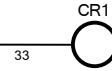
1

2

10CH00



33



33

2

3

COM 1



3

TERMINAL

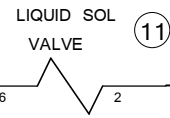
3

4

10CH01



56



56

2

5

COM 2



1

TERMINAL

1

6

10CH02



12

BUZZER



12

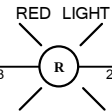
2

7

10CH03



13



13

2

8

COM 3



18

TERMINAL

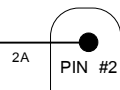
18

9

10CH04



2A



2A

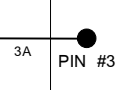
FAN #1 5 SEC
AIR FAULT

10

10CH05



3A



3A

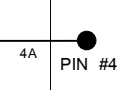
FAN #2 5 SEC
AIR FAULT

11

10CH06



4A



4A

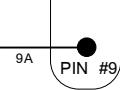
FAN #3 5 SEC
AIR FAULT

12

10CH07



9A



9A

OUT OF
WET GRAIN

I/O BOARD
J3 HEADER

Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 10

Author: CSP

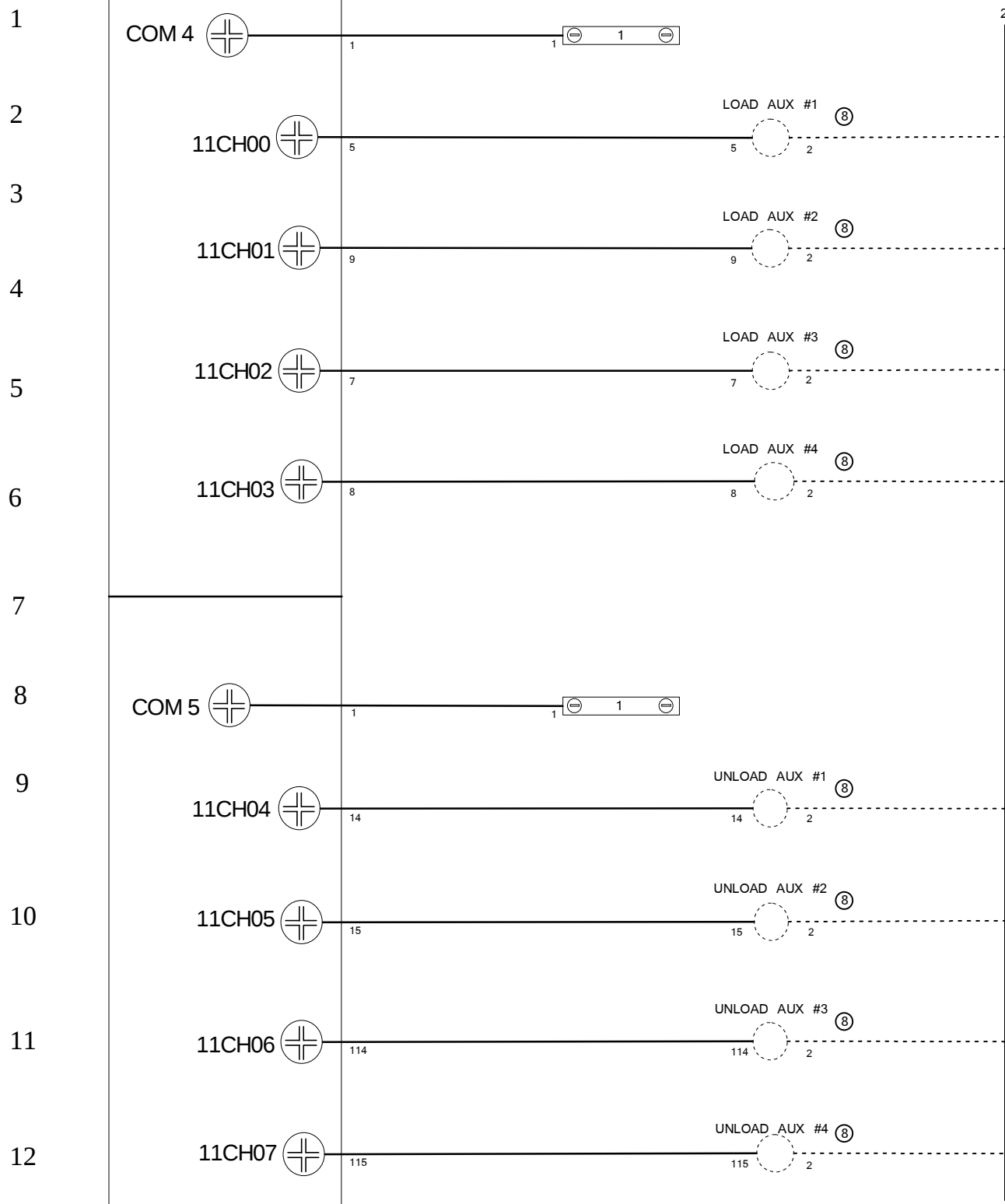
Date: 04/06

Sheet: 15

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 11

Author: CSP

Date: 04/06

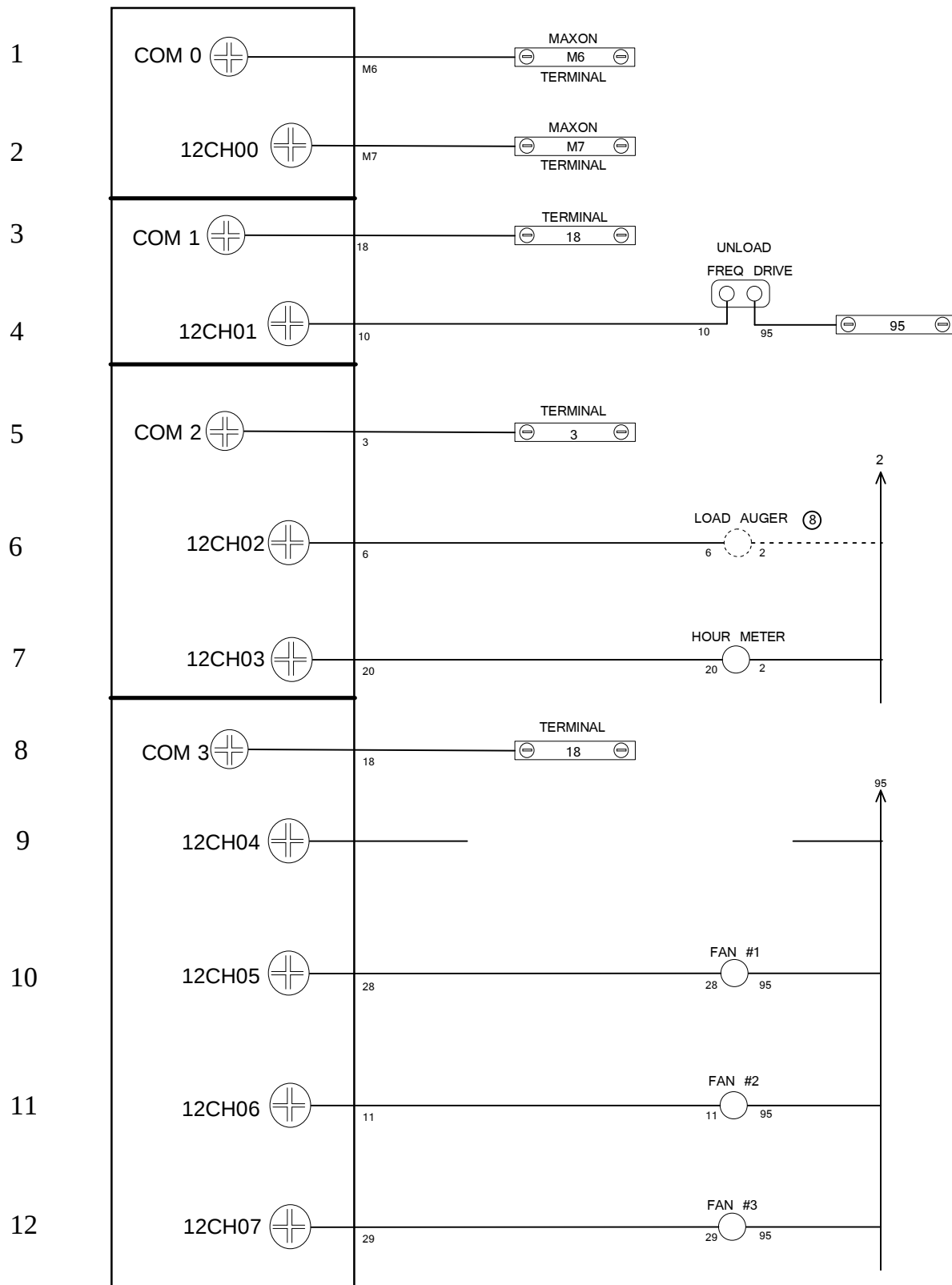
Sheet: 16

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28

PLC OUTPUT CHANNEL 12



Title: SUKUP MFG. CO. : TOWER DRYER
PLC OUTPUT CHANNEL 12-SOFT START

Author: CSP

Date: 06/06

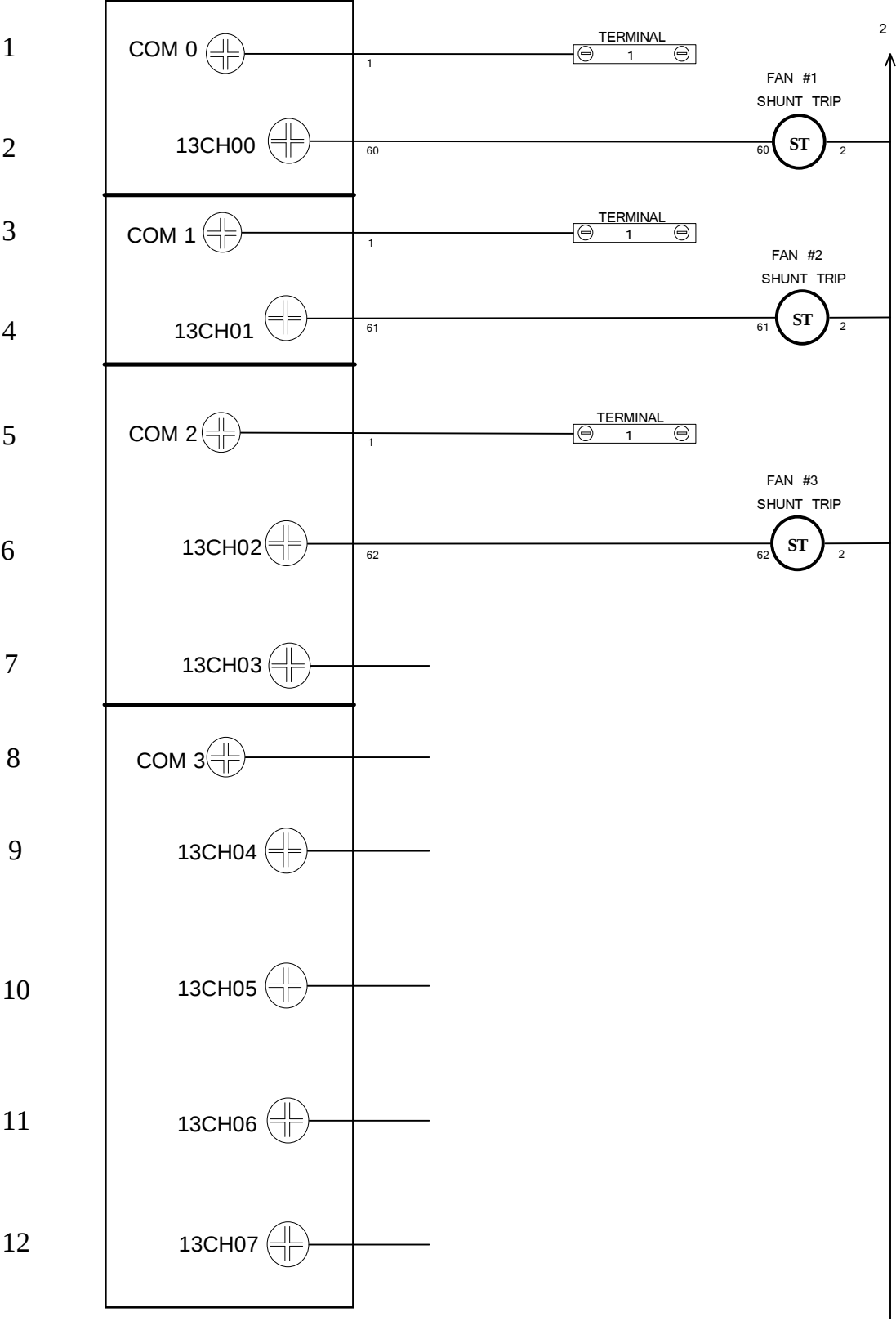
Sheet: 17

Revision:

SOFT START

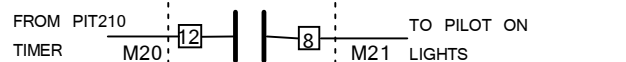
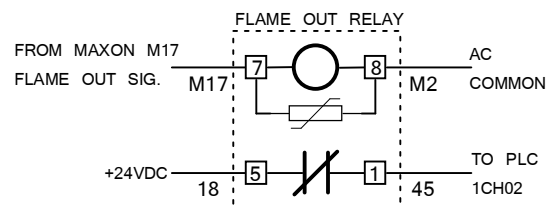
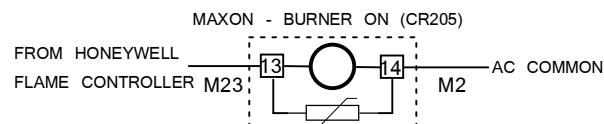
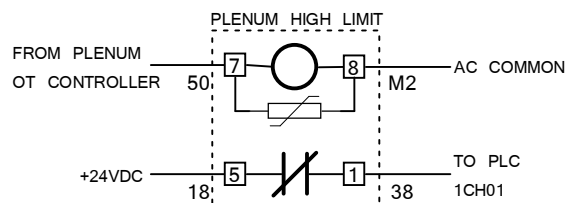
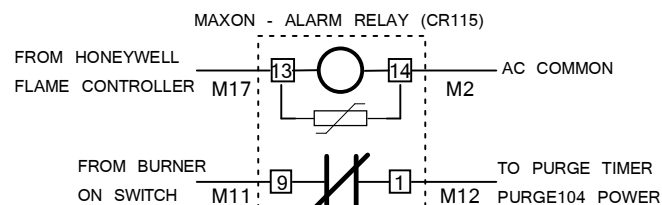
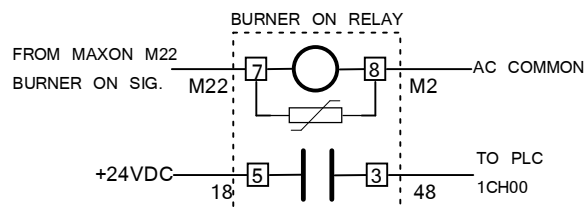
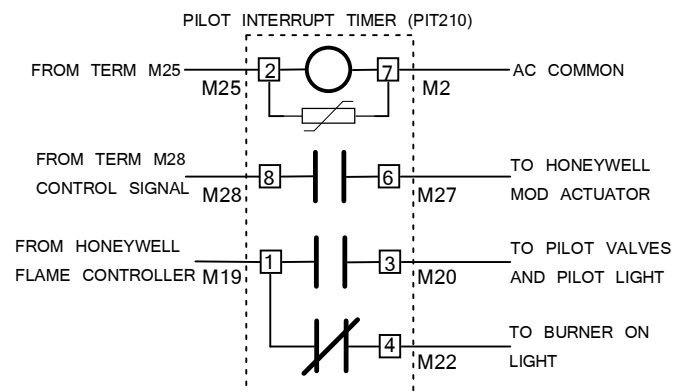
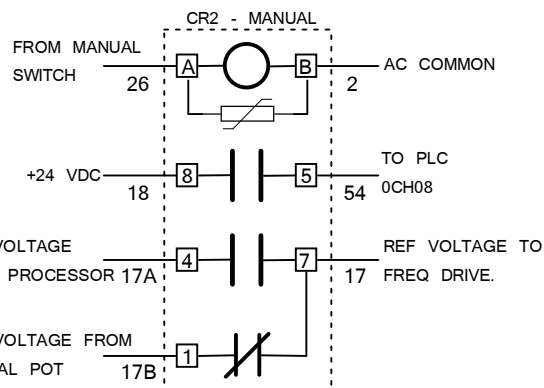
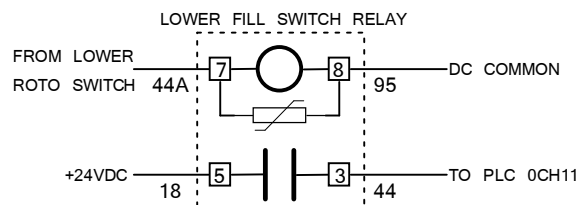
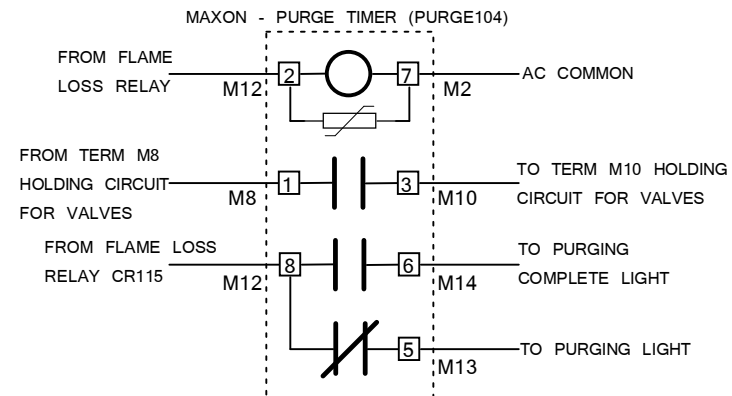
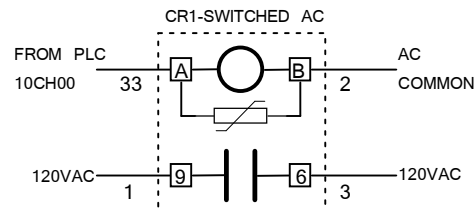
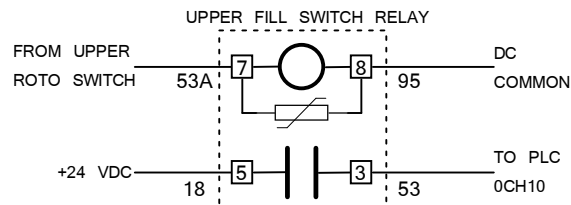
NOTES CAN BE FOUND ON DRAWING #28

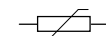
PLC OUTPUT CHANNEL 13



Title: SUKUP MFG. CO. : TOWER DRYER PLC OUTPUT CHANNEL 13	
Author: CSP	
Date: 04/06	Sheet: 18
Revision:	SOFT START

NOTES CAN BE FOUND ON DRAWING #28



 - INDICATES MOV

 - INDICATES COMPONENT TERMINALS

Title: TOWER DRYER: RELAY AND CONTACT WIRING.

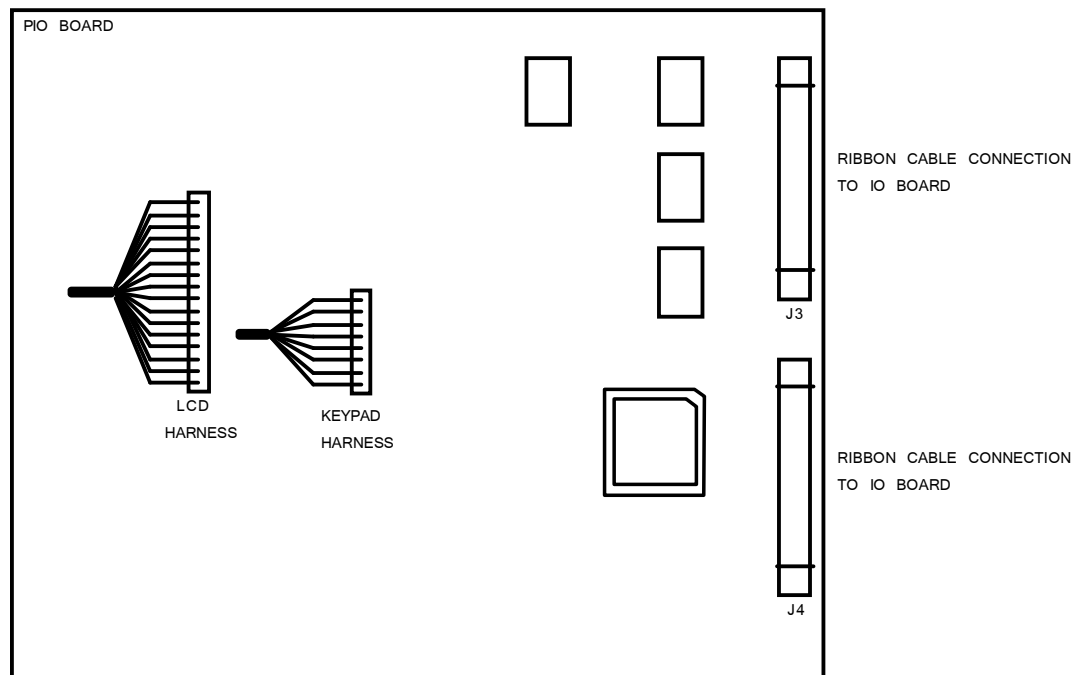
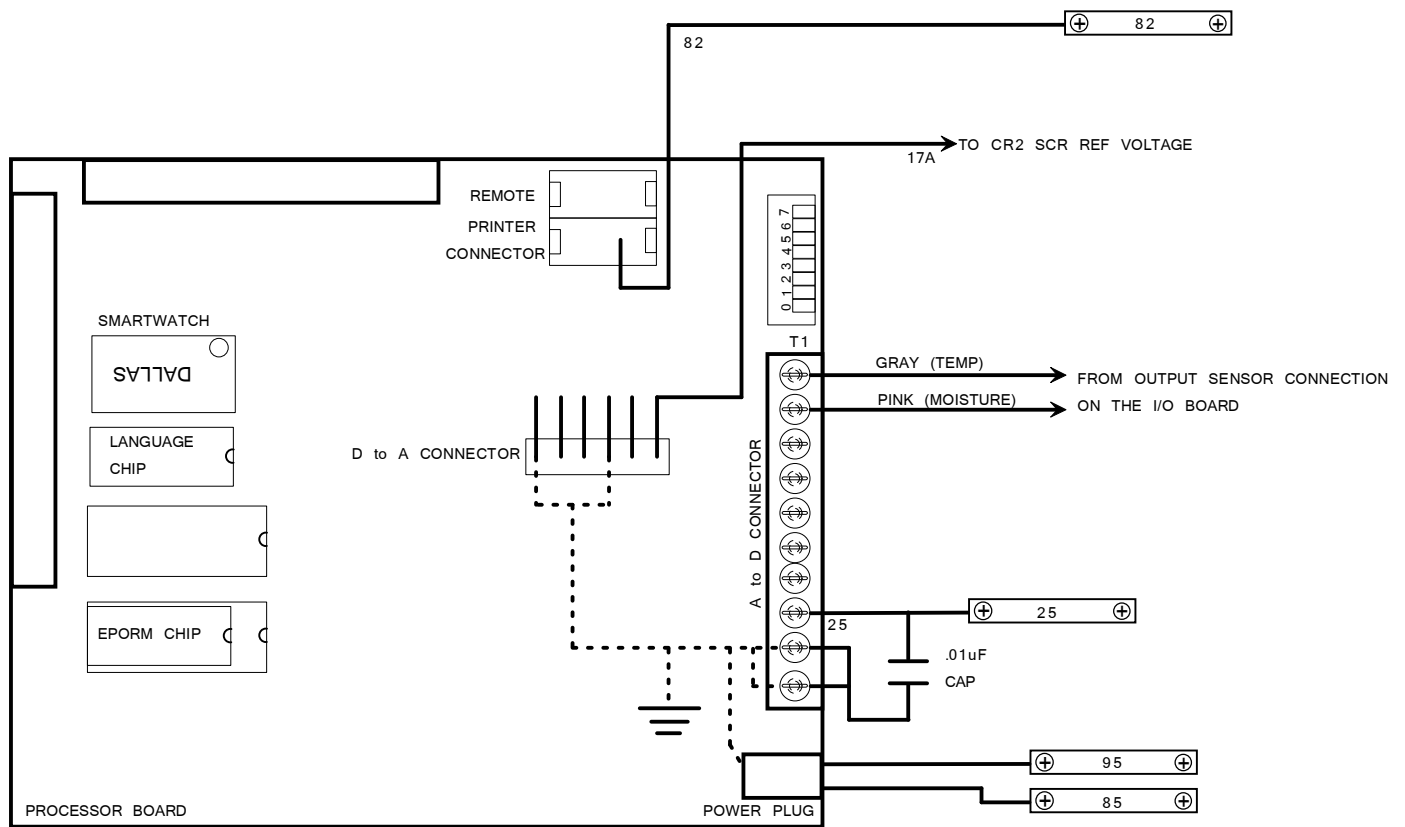
Author: CSP

Date: 03/07

Sheet: 19

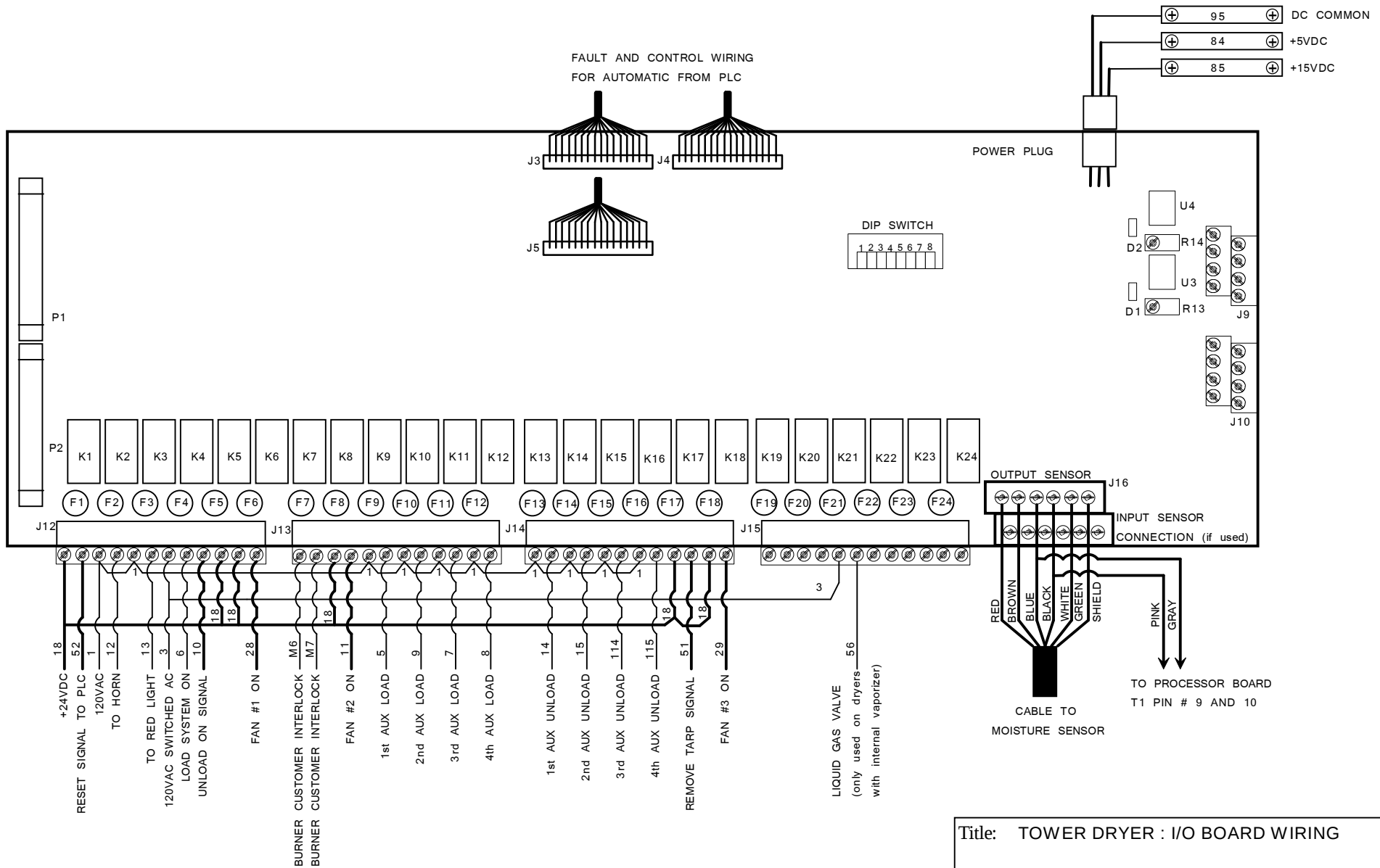
Revision:

SOFT START



Title: TOWER DRYER: PIO & PROCESSOR BOARD WIRING	
Author: CSP	
Date: 04/07	Sheet: 20
Revision:	SOFT START

RIBBON CABLE CONNECTIONS TO PIO BOARD



Title: TOWER DRYER : I/O BOARD WIRING

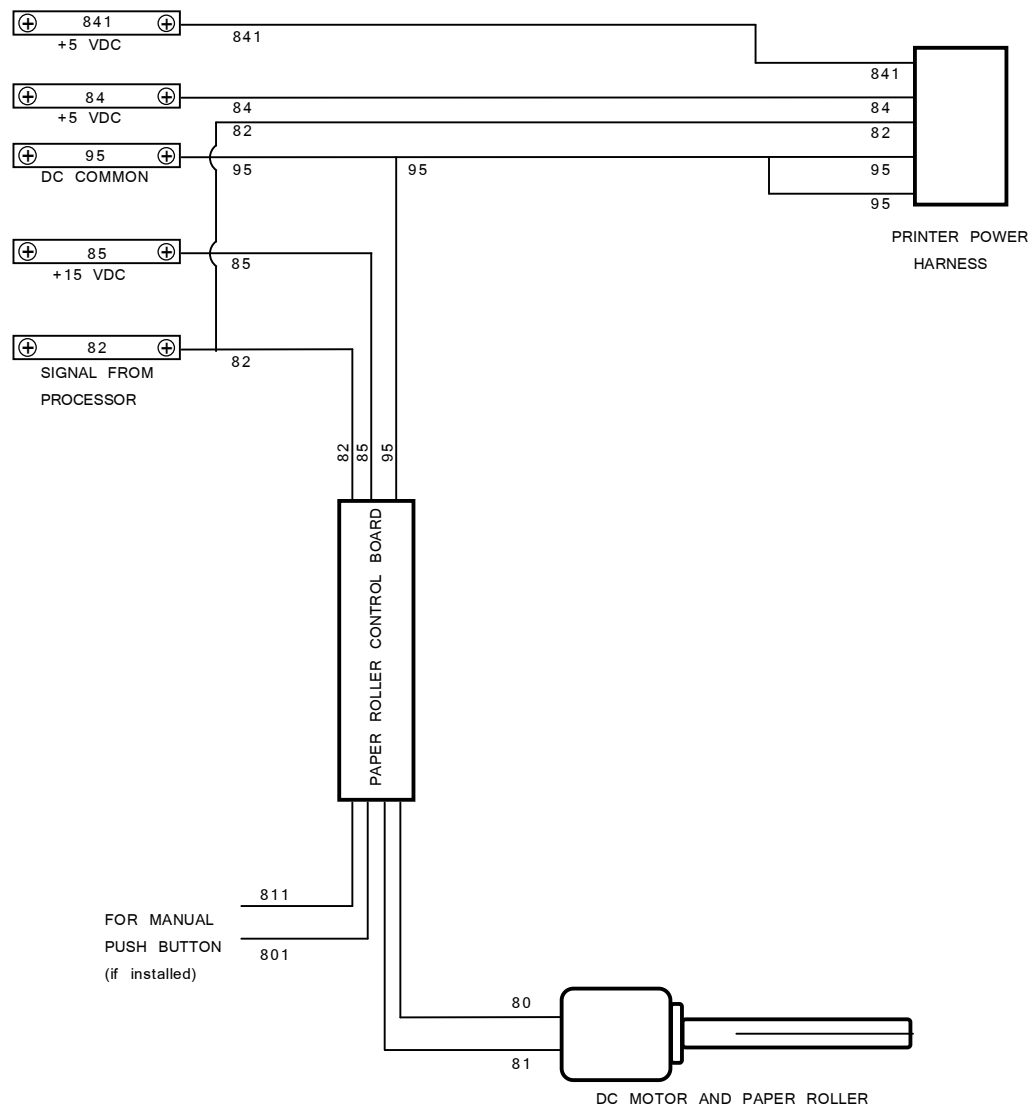
Author: CSP

Date: 04/07

Revision:

Sheet: 21

SOFT START



Title: TOWER DRYER: PRINTER AND PAPER ROLLER WIRING

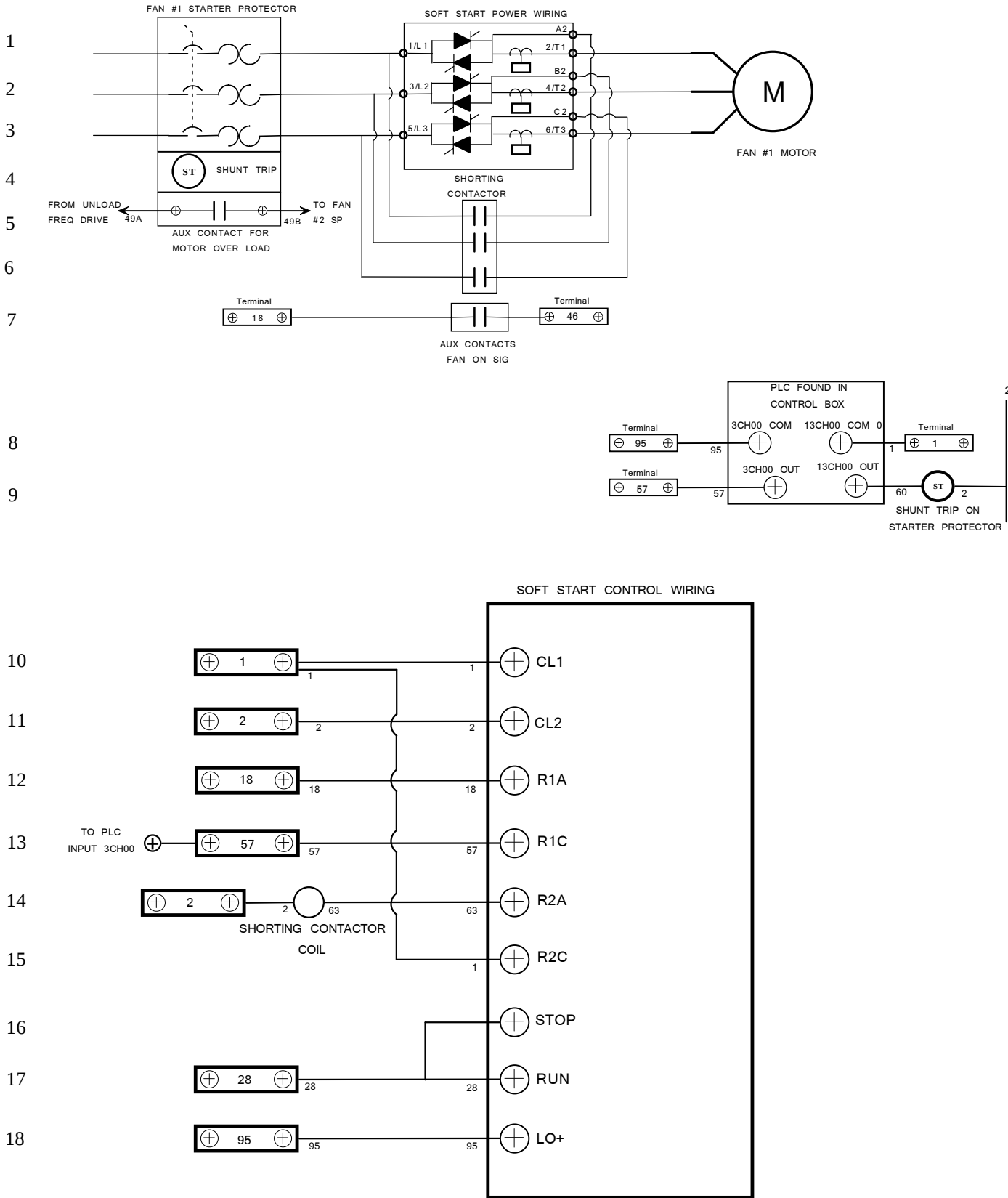
Author: CSP

Date: 01/07

Sheet: 22

Revision:

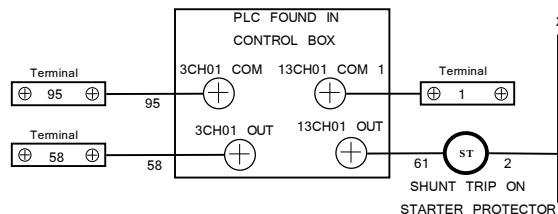
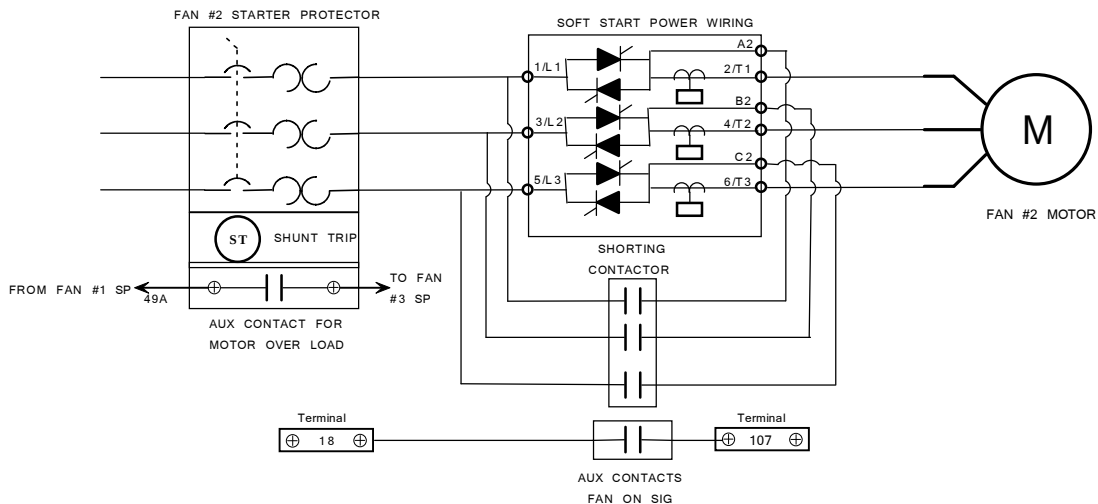
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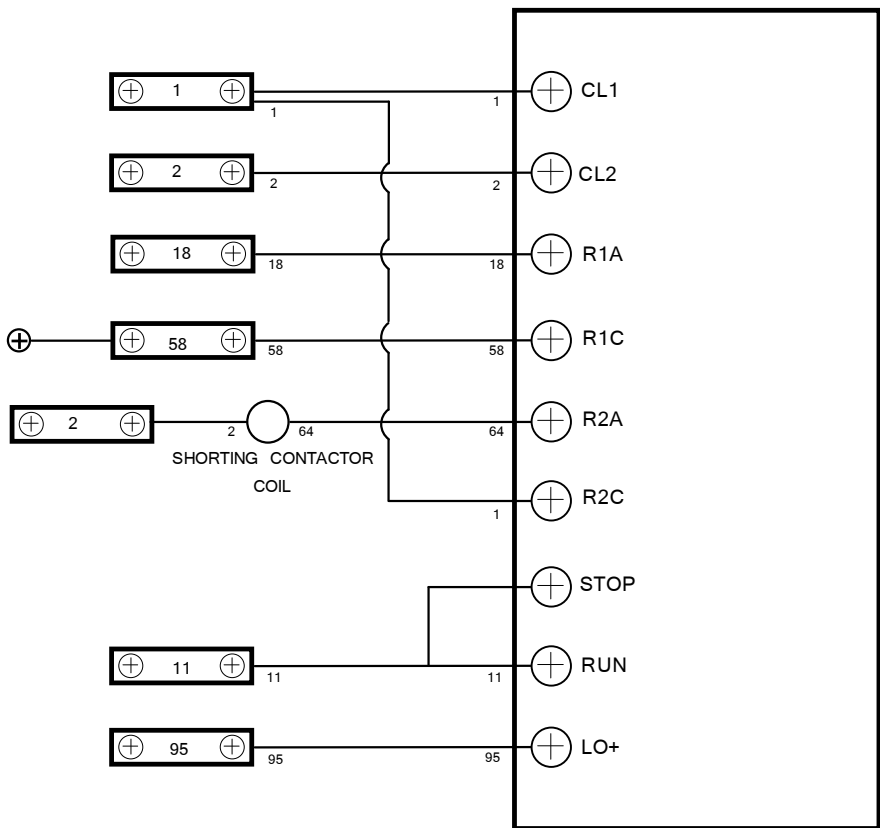
Title: SUKUP MFG. Co. : TOWER DRYER FAN #1 SOFT START WIRING	
Author: CSP	
Date: 06/06	Sheet: 23
Revision: 2	SOFT START

NOTES CAN BE FOUND ON DRAWING #28

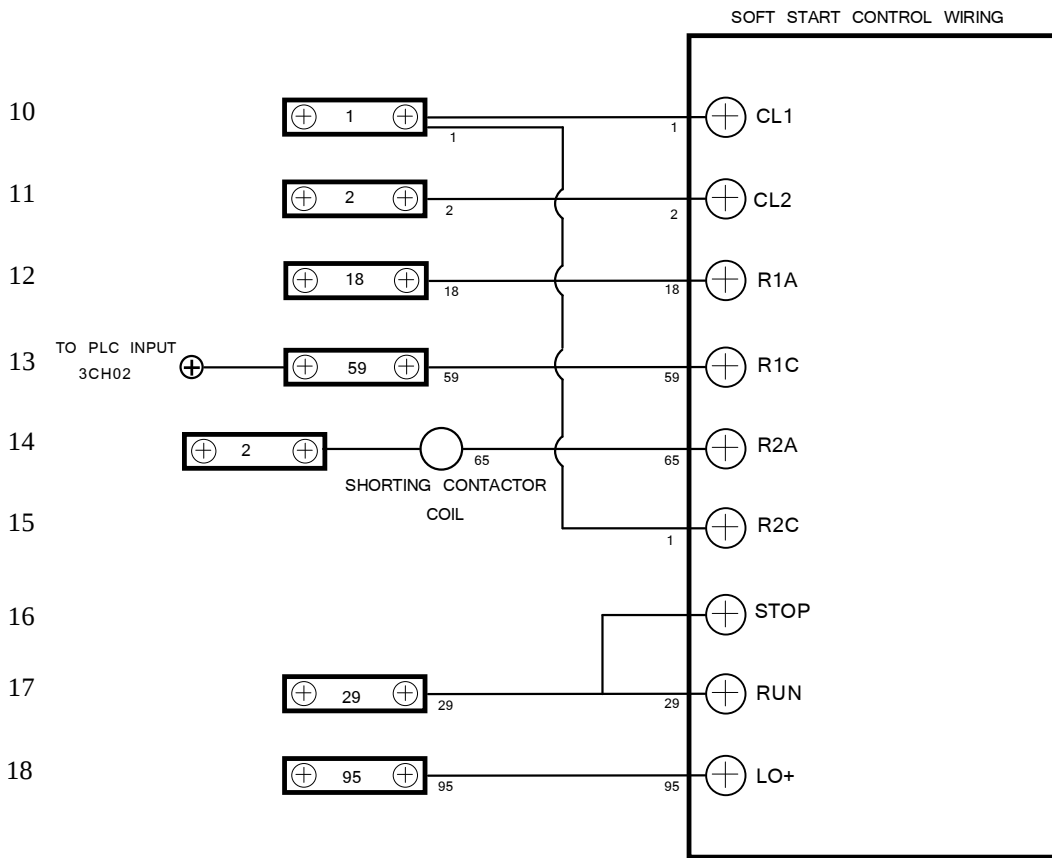
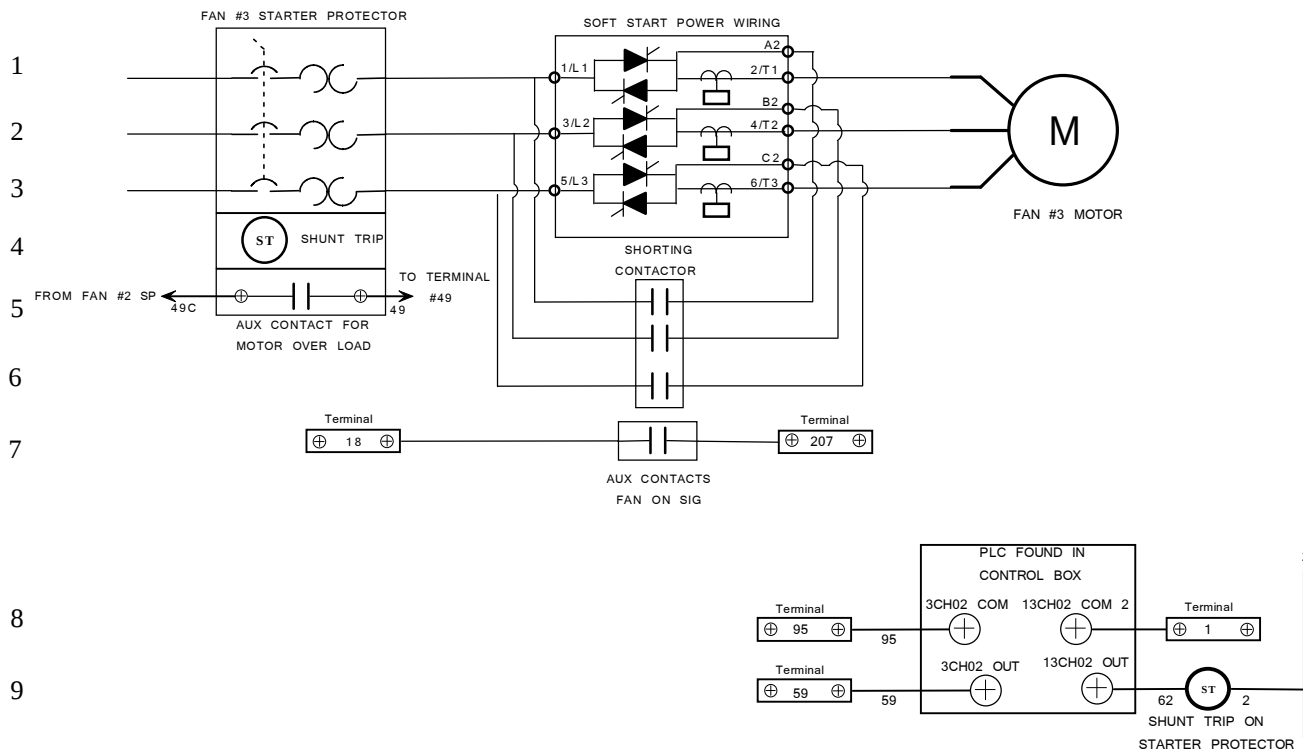
1
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SOFT START CONTROL WIRING



Title: SUKUP MFG. Co. : TOWER DRYER FAN #2 SOFT START WIRING	
Author: CSP	
Date: 06/06	Sheet: 24
Revision:	SOFT START



Title: SUKUP MFG. Co. : TOWER DRYER
FAN #3 SOFT START WIRING

Author: CSP

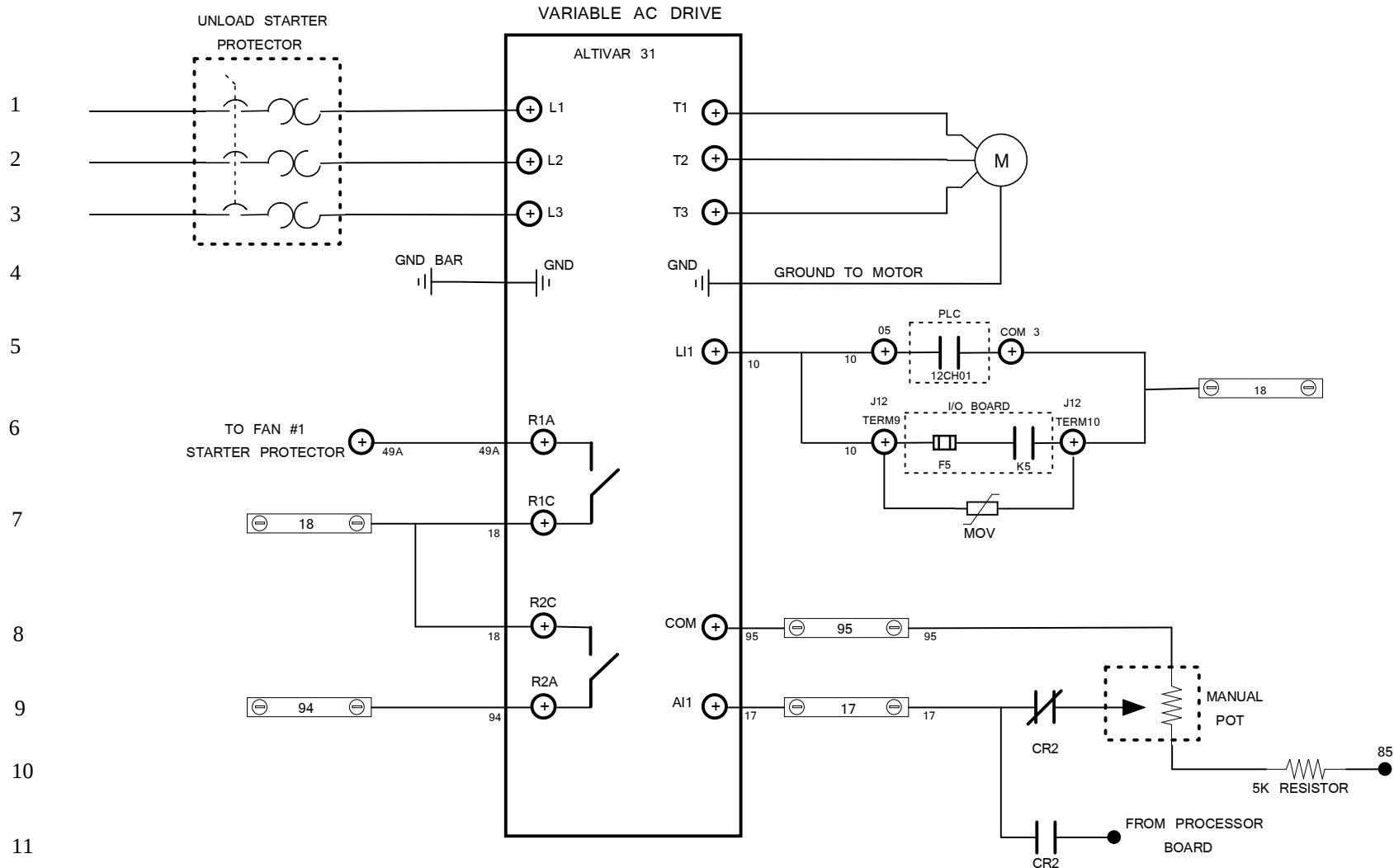
Date: 06/06

Sheet: 25

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28



NOTE:
R1 CONTACTS OPEN IF THERE IS A FAULT
OR THE DRIVE CONTROLLER IS OFF

NOTES CAN BE FOUND ON DRAWING #28

Title: SUKUP MFG CO. : TOWER DRYER
UNLOAD FREQ DRIVE- ALTIVAR 31

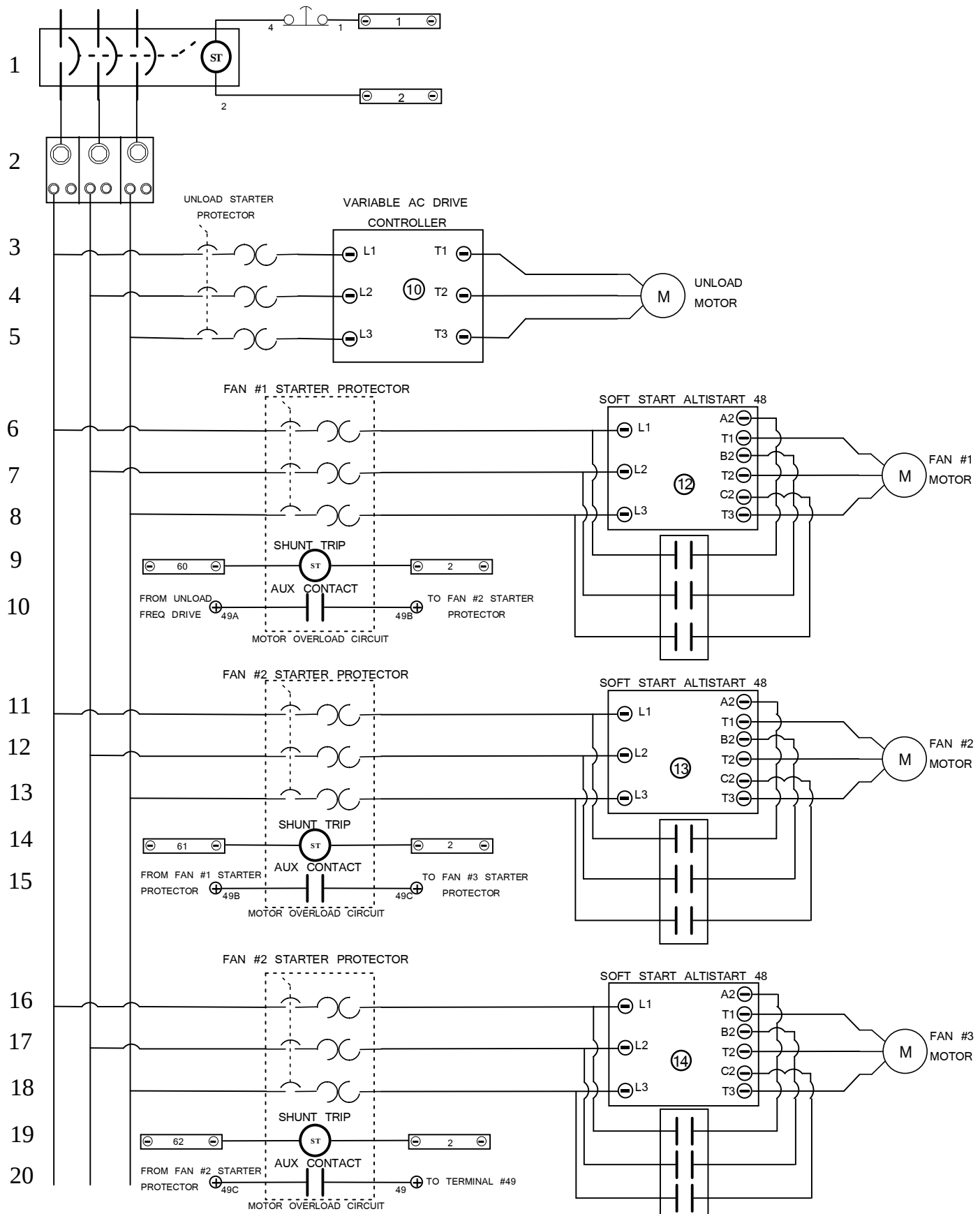
Author: CSP

Date: 06/06

Sheet: 26

Revision:

SOFT START



Title: SUKUP MFG CO : TOWER DRYER
POWER WIRING

Author: CSP

Date: 04/06

Sheet: 27

Revision:

SOFT START

NOTES CAN BE FOUND ON DRAWING #28

NOTE #1: INDICATES THAT A WIRE IS REQUIRED
BETWEEN THE POWER BOX AND CONTROL

NOTE #2: THE TARP REMOVAL RELAY COMES FROM THE I/O BOARD.
IT WILL BE ENERGIZED WHEN IT IS TIME TO REMOVE THE TARP
ON THE BURNER. IT IS USED SO THAT THE ACCESS DOOR FAULT
CAN BE IGNORED AT THIS POINT.

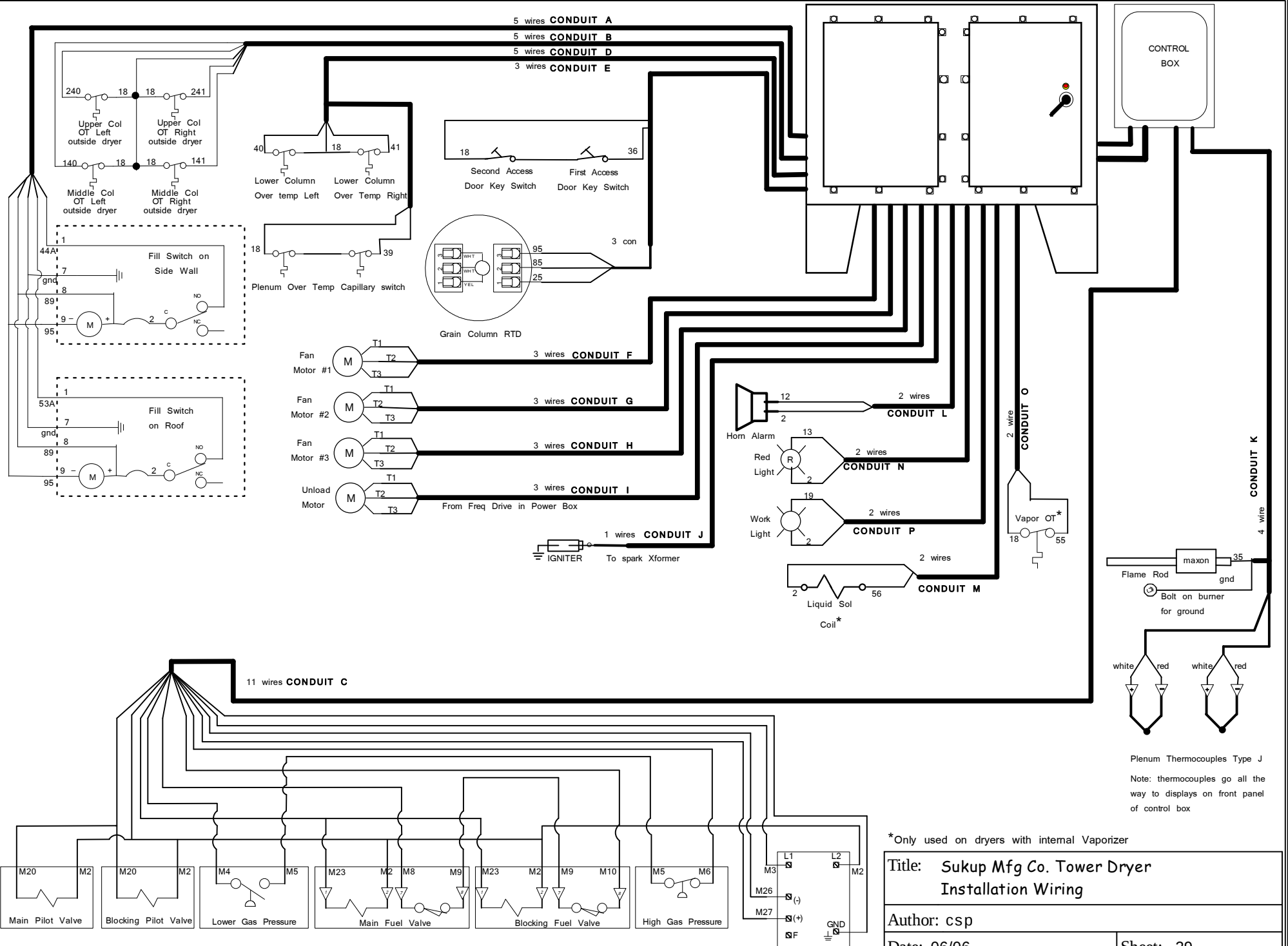
NOTE #3: THIS IS A INPUT SO THAT IF THE UNLOAD TAKE AWAY WOULD STOP
THE UNLOAD ON THE DRYER WOULD SHUTDOWN. IF AUX UNLOAD
DOES NOT GET RESTARTED IN SET TIME THE HEATER WILL SHUT OFF.

**UNLOAD WILL NOT START UNTIL THIS SIGNAL IS PRESENT. INSTALL
JUMPER FOR TESTING AND IF FUNCTIONS IS NOT GOING TO BE USED**

NOTE #4: ONLY USED ON DRYERS WITH INTERNAL VAPORIZER. INSTALL JUMPER
WHEN NOT USED.

- ⑦ ON ALL SWITCHES XOO INDICATES THAT THE SWITCH
IS IN THE MANUAL OR ON POSITION. OOX INDICATES THAT
THE SWITCH IS COMPUTER OR AUTO POSITION
- ⑧ DOTTED LINES INDICATE THAT PARTS ARE NOT IN POWER OR
CONTROL BOX. THEY WILL NEED TO BE PROVIDED BY CUSTOMER
- ⑨ CONTACT WIRING FOR THE UPPER & LOWER FILL SWITCH
RELAY CAN BE FOUND ON DRAWING #11 LINES 12 & 13
- ⑩ A DETAILED DRAWING OF THE VARIABLE FREQUENCY DRIVE
CAN BE FOUND ON DRAWING #26
- ⑪ LIQUID SOLENOID VALVE IS ONLY USED ON 12' DRYERS WITH INTERNAL
VAPORIZER
- ⑫ A DETAILED DRAWING OF FAN #1 SOFT START CAN BE FOUND ON DRAWING #23
- ⑬ A DETAILED DRAWING OF FAN #2 SOFT START CAN BE FOUND ON DRAWING #24
- ⑭ A DETAILED DRAWING OF FAN #3 SOFT START CAN BE FOUND ON DRAWING #25

Title: TOWER DRYER: PANEL WIRING NOTES	
Author: CSP	
Date: 04/07	Sheet: 28
Revision:	SOFT START



Note: Final termination for Maxon Pipe Train is made in the control box. There are no terminals in the Power box.

*Only used on dryers with internal Vaporizer

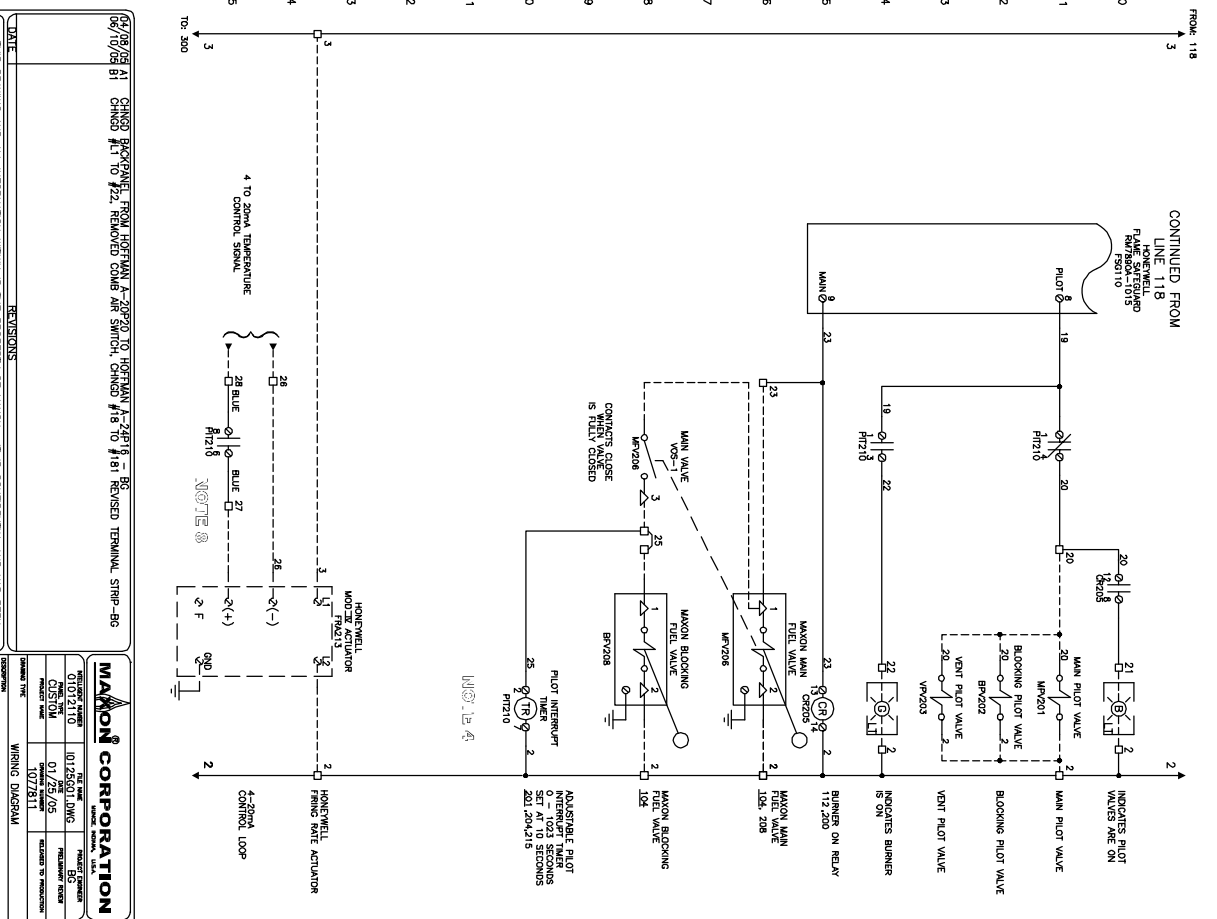
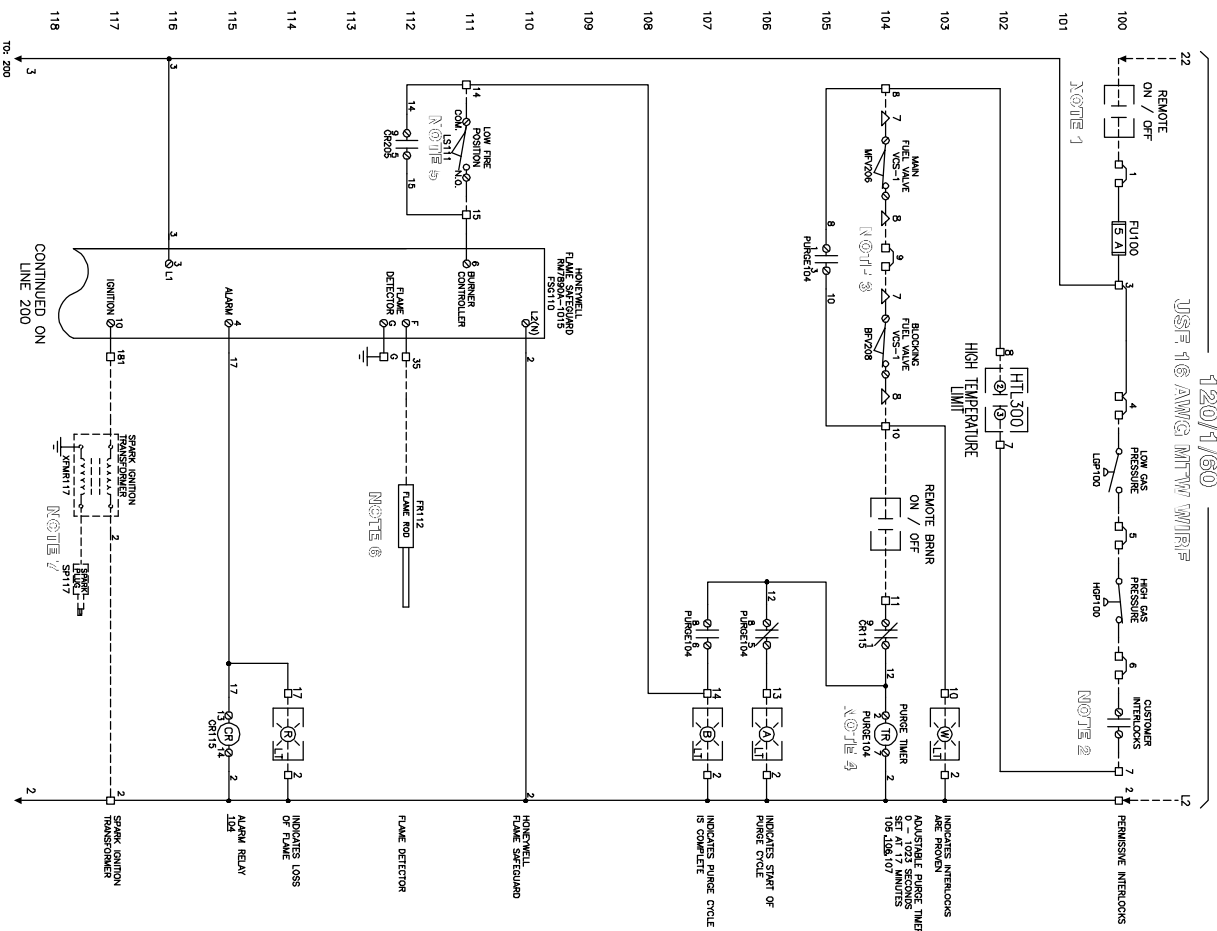
Title: Sukup Mfg Co. Tower Dryer Installation Wiring	
Author: csp	
Date: 06/06	Sheet: 29
Revision: 04/07	

Dryer Wiring			
Location	Wire color	Conduit Letter	Conduit Destination
Roof roto sw(48" UP from eve)	#89- Black (28vdc power), #83- White (Dc common), #53A- Yellow (control Signal), Gnd- Green	A	Power Box
Side wall Roof sw (20" down form top soild sheet)	#89- Black (28vdc power), #83- White (Dc common), #44A- Blue (control Signal), Gnd- Green	A	Power Box
Upper Col OT #1 or RT (Top of 1st Perforated Sheet)	#18- Red (24VDCpower shared with all outside OT Switches), #241- Orange (signal back to box)	B	Power Box
Upper Col OT #2 or LT (Top of 1st Perforated Sheet)	#18- Red (24VDCpower shared with all outside OT Switches), #240- Yellow (signal back to box)	B	Power Box
Middle Col OT #1 or RT (1st perforated sheet below grain exchanger above toe kick on 3rd	#18- Red (24VDCpower shared with all outside OT Switches), #141- Blue (signal back to box)	B	Power Box
Middle Col OT #2 or LT (1st perforated sheet below grain exchanger above toe kick on 3rd	#18- Red (24VDCpower shared with all outside OT Switches), #140- Purple (signal back to box)	B	Power Box
Plenum OT (1-2 feet below top of burner cylinder)	#18- Red (24VDCpower Shared with inside col OT switches), #39- Orange (signal back to boxes)	D	Power Box
Lower Col #1 or RT (inside) (2-3 ft below cooling chamber divider)	#18- Red (24VDCpower Shared with inside col OT switches and plenum OT switchs), #41- Yellow (signal back to boxes)	D	Power Box
Lower Col #2 or LT (inside)(2-3 ft below cooling chamber divider)	#18- Red (24VDCpower Shared with inside col OT switches and plenum OT switches), #40- Blue (signal back to boxes)	D	Power Box
Thermocouple(1-2 feet below top of burner cylinder)	Type J Thermocouple wire for Maxon (Red is negative White is Positive)	K	Control Box
Flame Sense	#M35- Purple (To Falme Rod), GND- Green (ATTACH TO BURNER)	K	Control Box
Spark	Spark plug wire	J	Power Box
RTD (1-2 feet below top of burner cylinder)	three conductor cable 85(15vdc),95(dc com),25(signal back)	E	Power Box
Door Key switch Upper & Lower	#18- Red (24VDC power), # - Orange (Connects between Lower & Upper), #36- Purple (signal back to boxes)	E	Power Box
Horn	#12 - Red (120VAC) #2 - White	L	Power Box
Work Light	#19 - Red (120VAC) #2 - White	P	Power Box
Red Light	#13 - Red (120VAC) #2 - White	N	Power Box
Liquid Coil	#55 - Red (120VAC) #2 - White	M	Power Box
Vaporizer OT	#18 - Orange #56- Yellow	O	Power Box
Maxon Main Piolt Valve	120vac	C	Control Box
Maxon Blocking Piolt Valve	120vac	C	Control Box
Maxon Low Gas Pressure SW	120vac	C	Control Box
Maxon Main Fuel Valve	120vac	C	Control Box
Maxon Blocking Fuel Valve	120vac	C	Control Box
Maxon High Gas Pressure SW	120vac	C	Control Box
Maxon Honeywell Mod Motor	120vac	C	Control Box
	ALL 120 VAC WIRING NEEDS TO HAVE WIRE NUMBERS		

TOWER DRYER
MAXON HEATER CONTROLS
ELECTRICAL DRAWINGS

120/1/60

USE 16 AMG MTR WTR



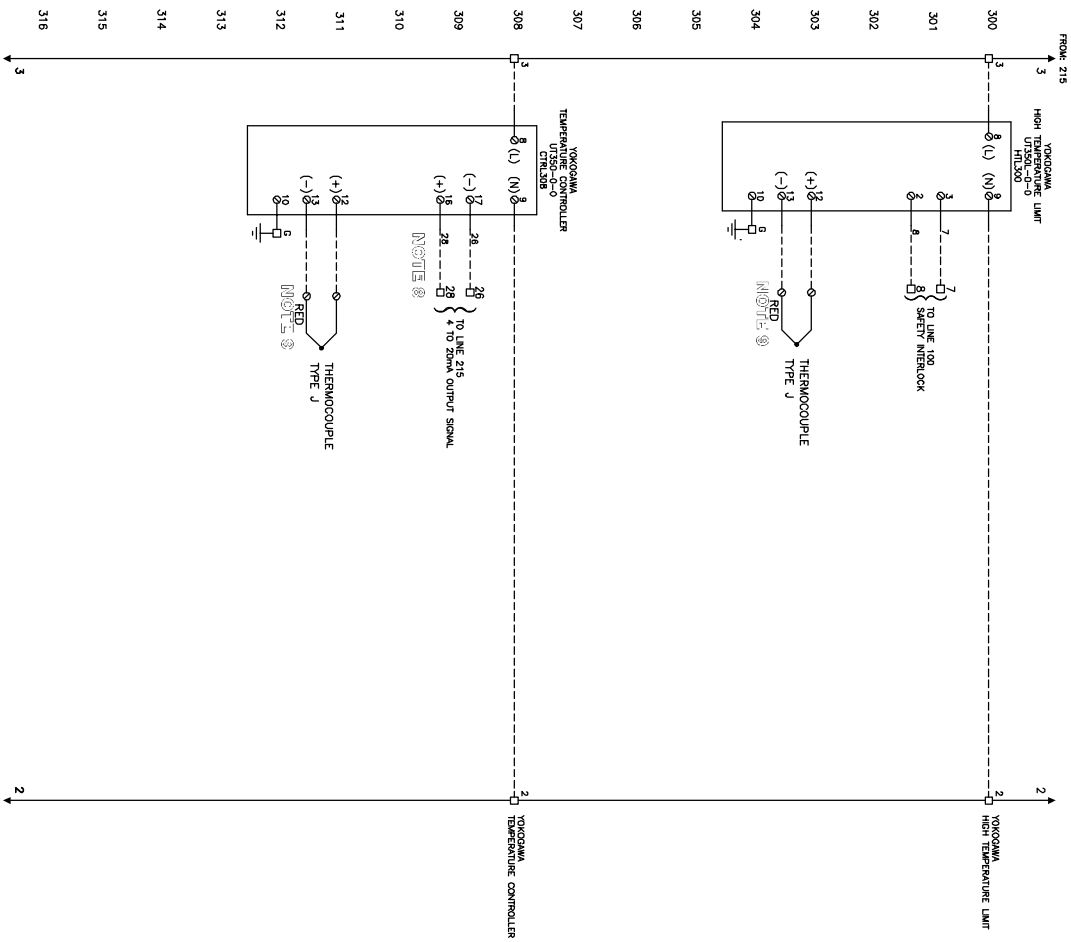
REVISIONS

DATE	DESCRIPTION
06/08/08	CHANGED FROM HORTMAN A-2000 TO HORTMAN A-2400 - BG
06/10/08	CHANGED #11 TO #22 REMOVED COME AIR SWITCH, CHANGED #18 TO #181 REVISED TERMINAL STRIP - BG

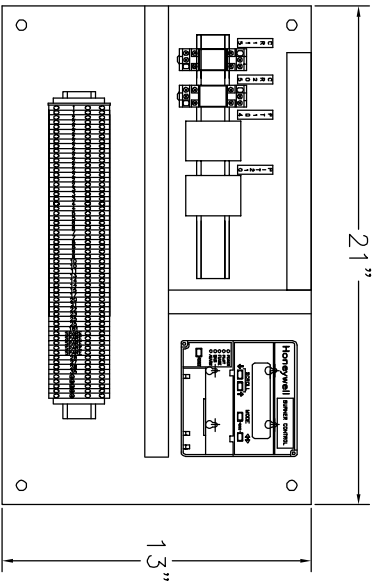
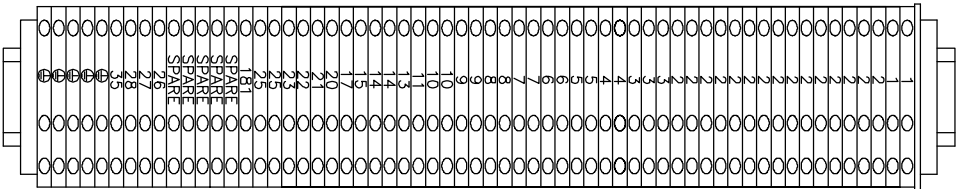
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10125G01



06/10/04 61 CHINO EXCHANGE FROM HOFFMAN A-20920 TO HOFFMAN A-44818 - BG CHINO #11 TO #22 REMOVED COULD AIR SWITCH, CHINO #18 TO #181 REVISED TERMINAL STRIP-BG	
DATE: _____	
REVISION: _____	
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DRAWING TYPE: _____	
36 V PUL - SHUP MFG. CO.	
46	
10125G02	
10125G02	



06/08/08 AT CHINO BUREAU FROM HORTMAN A-20920 TO HORTMAN T-4818 - BE 06/10/08 B1 CHINO #11 TO #22 REMOVED CONE AIR SWITCH, CHINO #18 TO #181 REVISED TERMINAL STRIP-BG	
DATE	REVISIONS
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MAXON CORPORATION TITLE: DESIGN ENGINEER 01/01/2110 CUSTOMER: 01/25/09 PROJECT NAME: 10125G61 DRAWING TYPE: PANEL LAYOUT 36 V PUL - SKIP MFG. CO. 461 sheets sheet 3 of 4	

10125G61