TOWER DRYER

with
QuadraTouch™
Dryer Control System

OWNER'S OPERATION MANUAL

Sukup Manufacturing Co.
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Manual L13891
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Thank you for purchasing a Sukup Grain Dryer.

At Sukup Manufacturing Co., we strive to provide our customers with the best products available. It's important to us that you get the best value for your money. This means producing top-quality products that will provide you and your grain operation with many years of satisfied ownership.

We back our products with an experienced staff and the best customer service in the industry. Our dedicated employees have done their very best to ensure that your Sukup Grain Dryer provides a hassle-free grain drying experience. With proper installation and use, it will serve you for many years.

Thank you again for your purchase. We wish you years of profitable, effective, and safe use of your Sukup Grain Dryer.

The Entire Sukup Family

Sukup Manufacturing Co.
Sheffield, Iowa, USA

Tower Dryer Owner's Operation Manual

This manual is comprised of several tabbed sections. The first provides warranty and safety information and identifies components of dryer. Others provide instructions for operation, troubleshooting and maintenance of dryer. Please read entire manual thoroughly before installation or operation.

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Preliminary Information

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Sukup Manufacturing Co.
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Limited TOWER Dryer Warranty

SUKUP MANUFACTURING CO. (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 warranty period, part will be replaced or repaired without charge F.O.B. Sukup Manufacturing Co., Sheffield, Iowa USA or Distribution Centers - Arcola, Illinois; Aurora, Nebraska; Cameron, Missouri; Defiance, Ohio; Jonesboro, Arkansas; Watertown, South Dakota. To claim 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 (e.g., belts, motors) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY.

Upon taking delivery of product, purchaser (dealer and/or end user) assumes responsibility for proper storage of all materials. Proper storage includes dry, temperature and humidity controlled facilities that eliminate the potential of moisture, including condensation, from causing white rust and/or corrosion of any sort. Warranty does not extend to defects, damage or cosmetic (appearance) issues caused by improper storage or handling.

TOWER DRYER WARRANTY - Sukup warrants stick-built tower dryers for one year from date of purchase and modular tower dryers for two years from date of purchase.

An optional **FOUR-YEAR** (stick-built) or **THREE-YEAR** (modular) **LIMITED WARRANTY EXTENSION** may be purchased **only** at time of dryer purchase. Period of extended warranty begins on 13th month (stick-built) or 25th month (modular) after date of purchase and continues through 60th month from date of purchase. Dryer parts found to be defective during this period will be replaced or repaired, with the exception of motors (as excluded herein) or "wear parts" (any parts worn by high usage, such as rotors, bearings, burner components, moving parts, sensors, etc.). Extended limited warranty does not apply to labor, transportation, shipping or any cost related to a service call.

ELECTRIC MOTOR WARRANTY - The manufacturers of electric motors warranty their motors through authorized service centers for a 2-year period from motor date code. 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 motor repair shop fill out the warranty report form as if they were providing warranty service. State on report reason for refusal. Send report, motor nameplate, and proof of purchase date (invoice from Sukup and invoice for your customer) to Sukup. If electric motor warranty is not satisfactorily handled by motor service center, contact Sukup for assistance. Sukup will attempt to obtain warranty from motor manufacturer. Any credit obtained will be passed on. Warranty may also be obtained by returning motor to Sukup Manufacturing Co. or Distribution Centers with prior authorization. **NOTE**: Sukup will not be responsible for unauthorized motor replacement or repair. Labor for removal of motor from fan not included.

WARRANTY CERTIFICATION - Warranty registration card should be mailed within one month of product delivery to certify warranty coverage.

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

Purchaser must adhere to applicable safety regulations and federal, state and local codes in the location, installation, and use of this product. Sukup assumes no responsibility for property damages or personal injuries.

GENERAL SAFETY PRACTICES

On safety decals, this symbol and the signal words Danger, Warning, Caution and Notice draw your attention to important instructions regarding safety. They indicate potential hazards and levels of intensity.

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

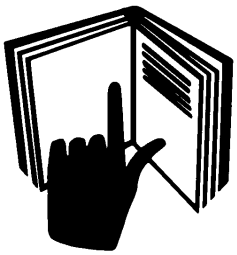
WARNING indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

NOTICE alerts you to practices unrelated to personal injury, such as messages related to property damage.

IMPORTANT: To prevent serious injury or death to you or your family, it is essential that safety decals are clearly visible, in good condition, and applied to the appropriate equipment.

FOLLOW MANUAL & SAFETY DECAL MESSAGES



Observe safe operating practices. Carefully read this manual and all safety decals on your equipment. Safety decals must be kept in good condition. Replace missing or damaged safety decals free of charge by contacting Sukup Manufacturing Co. by mail at Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or on our website, www.sukup.com.

Learn how to use controls and operate machine. Do not let anyone operate unit without thorough training of basic operating and safety procedures.

Make no unauthorized modifications to machine. Modifications may endanger function and/or safety of unit. Keep unit well maintained according to procedures in Maintenance section.

EMERGENCIES - KNOW WHAT TO DO

Have emergency numbers and written directions to your location near your telephone in case of emergency. An area to record emergency information is provided below.

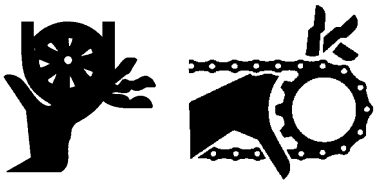
Ambulance • Fire • Police 9-1-1
Farm rescue team: _____
Local EMS team: _____
Address of work site: _____
Directions to work site:_____

WARNING: PREVENT EXPLOSION OR FIRE

- Carefully review operator's manual.
- Keep dryer clean inside and out, as fines may cause a fire.
- Check for gas leaks. Spray soapy solution on piping and joints.
- Run fan at least a half minute before starting heater.
- NEVER start heater if you smell gas or hear a hissing sound.
- NEVER run heater with access door open.

Failure to heed these warnings may cause serious injury or death.

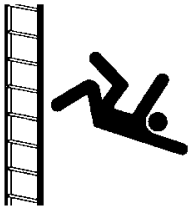
WARNING: KEEP CLEAR OF ALL MOVING PARTS



Keep people (ESPECIALLY YOUTH) away from equipment, particularly during operation. Keep away from all moving parts. Entanglement can cause serious injury or death. Keep fan screen guards and all shields in place and in good working condition. Replacement screen guards and shields are available from Sukup Manufacturing Co. at no charge.

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

WARNING: USE SAFE CLIMBING PROCEDURES



Inspect ladder carefully before use. Never climb deteriorated, damaged or improperly assembled ladder components. Maintain secure hand and foothold when climbing. Metal is slippery when wet. Never carry items while climbing. Use safety harness and safety line as required by safety regulations.

Failure to heed these warnings may cause serious injury or death.

ANALYZE ARC FLASH/SHOCK HAZARD. Installations of equipment containing switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers are subject to National Electrical Code (NEC) and National Fire Protection Association (NFPA), and enforced under Occupational Safety and Health Administration (OSHA) regulations. These installations must be analyzed for arc flash and shock hazard. Additional requirements under these standards include:

- Facility needs to have written electrical safety program.*
- Equipment shall be FIELD MARKED with a label containing available incident energy and/or required Personal Protective Equipment (PPE) level.

This labeling requirement is employer's responsibility and not that of equipment manufacturer or installer.

- All persons working on or near affected equipment must be properly trained.
- Proper tools and equipment must be provided by installation operator or employer.

*NFPA 70E has numerous significant changes in 2012 edition. Be sure to update your facility's safety program.

USE PROPER LOCKOUT PROCEDURES. Facility management needs to proactively train employees to ensure use of proper lockout procedures while working on dryer. Management also needs to inspect this unit for any covers or guards not in proper place. It is everyone's responsibility to report any missing grates, guards, equipment failures or failures to lock out. Make certain that no cover is removed unless power is locked out. **NOTE:** Refer to the OSHA document 1910.147 App A for a typical minimum lockout procedure.

SAFETY QUESTIONS OR CONCERNS
Please contact Sukup Manufacturing Co. with any specific safety questions about dryer or its use!

Good housekeeping practices and correct safety procedures will help protect lives, jobs, property and profits.

Basic Safety Rules
1. Learn how to use controls and operate equipment.
2. Do not let anyone operate unit without thorough training of basic operating and safety procedures. **Always follow a proper lockout procedure.**
3. Periodically check all mechanical and electrical components. Keep unit in good working condition.
4. Handle equipment and parts with care. **Wear protective clothing** to avoid injury from sharp metal edges.
5. Wear Personal Protective Equipment (PPE) such as safety glasses, gloves, hardhat, steel-toe boots, ear protection and dust mask as required by local, state and national regulations.

Keep unit well maintained according to procedures outlined elsewhere in this manual.

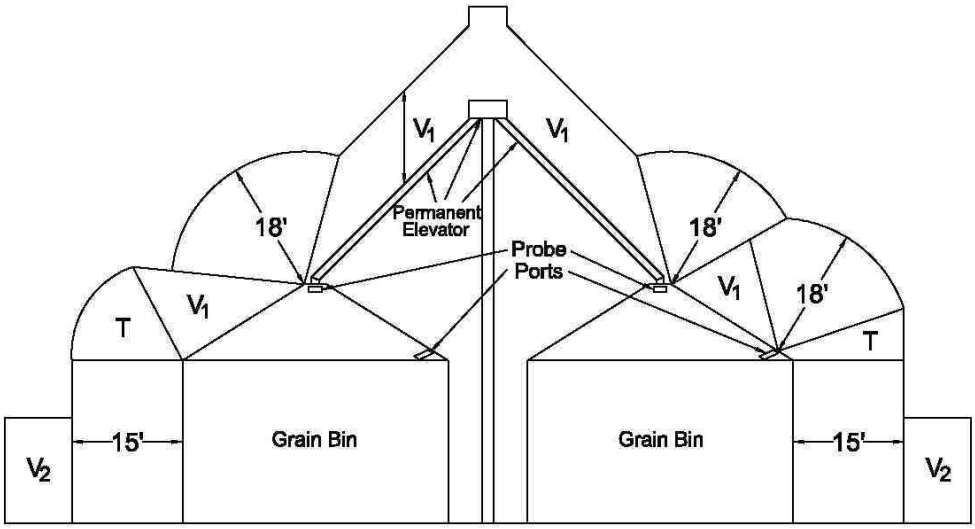
Do not dump polluting liquids, worn parts and maintenance waste into the environment. Dispose of all such materials as specified by applicable standards.

Electrical Wire Clearances

Your local electric utility may be able to provide assistance in planning a safe environment for working around tower dryers and associated structures. State codes may vary regarding specific clearances for electrical lines around structures. Be certain your local electric utility is in accordance with your state's regulations. **To prevent overhead safety issues, bury electrical lines.**

The American National Standards Institute (ANSI) provides clearance envelopes for Grain Bins filled by permanently installed augers, conveyors or elevators in (ANSI) C2 2007 "National Electrical Safety Code," Rule 234, page 120.

NOTE: An electric utility company may refuse to provide electrical service to any tower dryer or grain bin built near an existing electric line that does not provide clearance required by ANSI and the National Electrical Safety Code.



V_1 = Vertical clearance above a building required by Rule 234C (Table 234-1)

V_2 = Vertical clearance above land required by Rule 232

T = Transition clearance

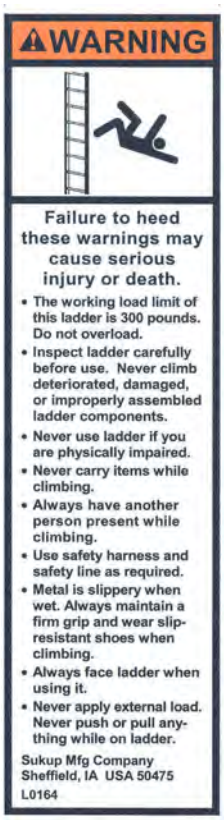
Fig. 1 – Electrical wire clearances

To prevent serious injury or death to all persons involved in operation of this equipment, it is essential that these safety decals be mounted on dryer. Check that all are in place according to decal placement drawing and are legible when dryer is installed.

IMPORTANT: If suggested locations are not clearly visible, place safety decals in a more suitable area. Never cover up existing safety decals.

Make sure location for decal is free from grease, oil and dirt. Remove backing from decal and place in proper position. Replace missing or damaged safety decals or shields free of charge by contacting Sukup Manufacturing Co. by mail at PO Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com. Please specify computer number when ordering.

1. **Decal L0164 - WARNING:** Ladder safety – falling from heights hazard. Overall precautions for ladder safety.



2. **Decal L0258A - DANGER:** Do not enter this bin! Keep clear of all augers.

3. **Decal L0520 - CAUTION:** Failure to keep unit clean may cause fire and serious injury or death.

4. **Decal L0237** - **DANGER:** Door interlock switch. Augers are dangerous.

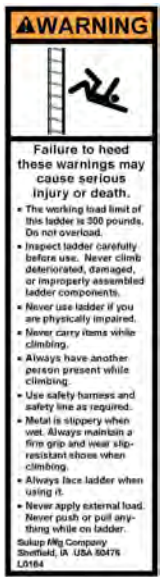
5. **Decal L0165 - WARNING:** Disconnect Electricity; Bleed gas; etc.

6. **Decal L0284 - WARNING:** Keep away from all moving parts.

7. **Decal L0281 - WARNING:** To avoid serious injury or death.

TOWER DRYER SAFETY (DECAL PACKET- U99999)

Safety decals should be mounted on dryer as shown on this page.



L0164

L0165

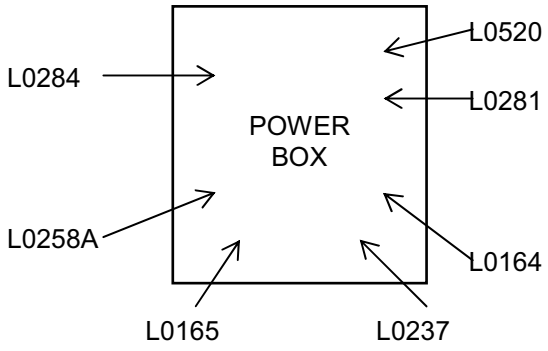
L0237

L0520

L0281

L0258A

L0284



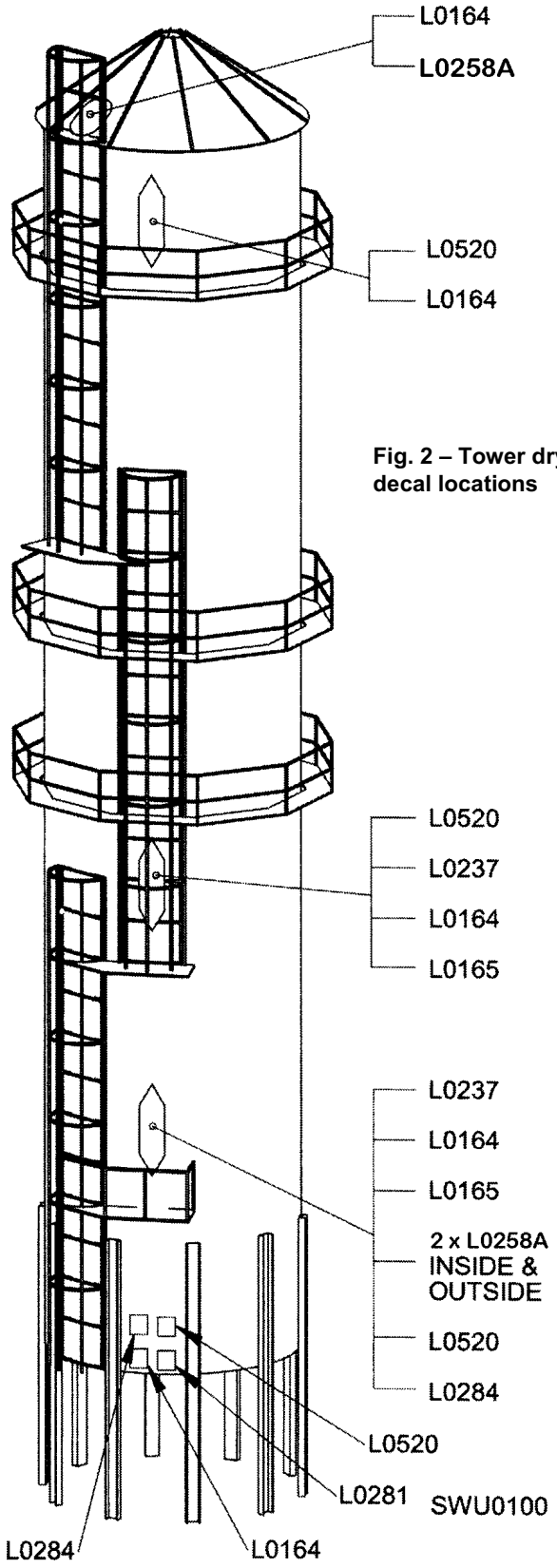


Fig. 2 – Tower dryer decal locations

Emergency Shutdown Locations

Image 1 – Power distribution box

Power distribution box is located at front of dryer. It contains all main power distribution components. Door latch secures door and can be locked. Main Disconnect switch prevents opening of power box while power is present in system.

Image 1 shows power box on a one-fan dryer. Box for three-fan dryer is different, with side-by-side doors each having its own handle. Main Disconnect switch is at right on front box.

WARNING – High voltage is still present on bottom terminals of main switch in power distribution box (see Item 14 in Images 4 and 5) even if Main Disconnect switch is in "Off" position. To remove voltage from power box, shut off main breaker ahead of dryer.

Image 2 – Door latch and Main Disconnect switch

Image 2 shows Main Disconnect switch of single-fan dryer in "Off" position. Power is not present in system except as noted in warning above.

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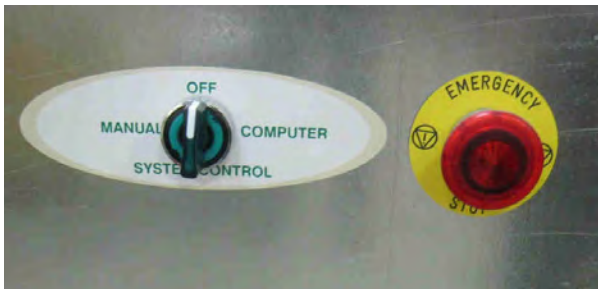

Image 3 – System Control and Emergency Stop switches

Emergency Stop switch is located on side of power distribution box for both single-fan and three-fan dryers. During operation, switch is pulled out and red knob is illuminated.

Pressing Emergency Stop button or turning Main Disconnect switch to "Off" position will shut down power to PLC and backup control system. Main power is still present inside box as noted in warning above.

Tower Dryer Sensor Locations

See Fig. 3 and Table 1 to identify tower dryer sensor/switch locations.

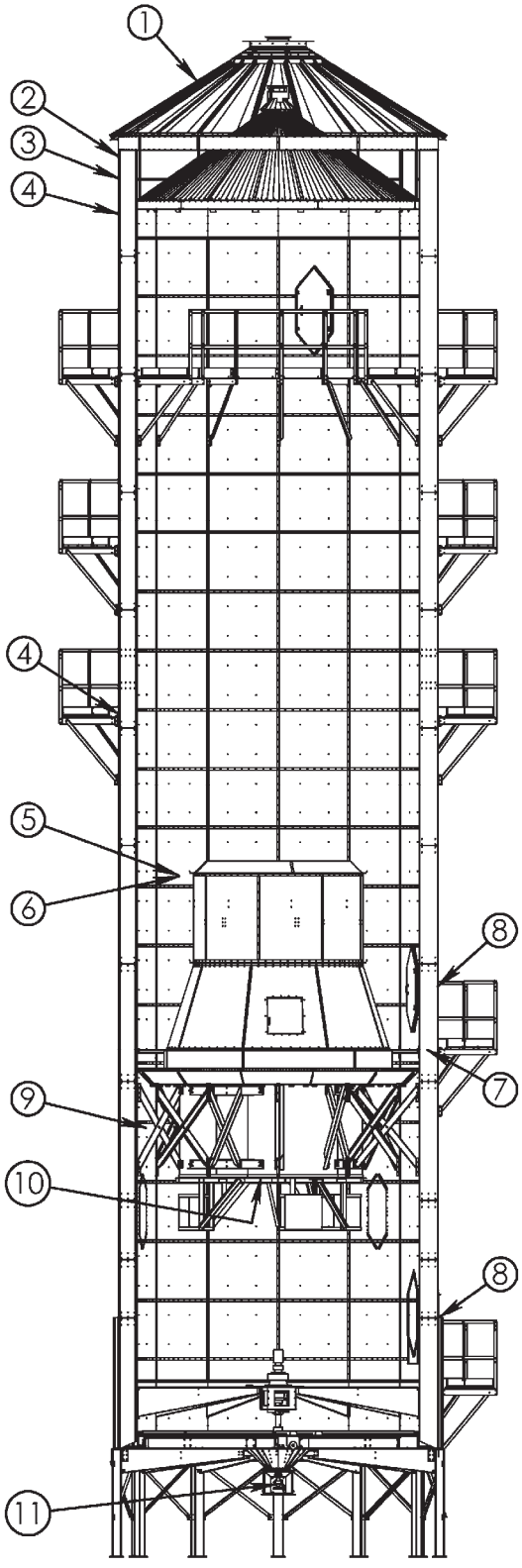

Fig. 3 – Tower dryer sensor/switch locations

ITEM #	COMP. #	DESCRIPTION	QTY.	LOCATION
1	U10601	Upper Rotary Fill Switch	1	On roof, approximately 48" up from eave. (Mounting near stairs simplifies future maintenance.)
2	U10600	Lower Rotary Fill Switch-Side Wall (Not used on Modular Tower Dryer)	1	Use solid sheet with pre-punched hole - installed on first full row; switch is mounted toward bottom of sheet. Mounting near ladder simplifies future maintenance.
3	F60337X	Incoming Moisture Sensor	1	Near lower side rotary fill switch. Mounting near ladder simplifies future maintenance
4*	**Dryer Dia.** 10': J4532 (16') 12': J4533 (24') 18': J4534 (28') 24': J17287 (40')	Upper Column Over-Temp Sensor All trip at 240℉ --- Middle Column Over-Temp Sensor (Not used on Modular Tower Dryer). All trip at 240℉	4	Top of first perforated sheet (below first two solid sheets) --- On first perforated sheet below grain exchangers. If platform is in same location, mount sensor above toe-kick plate.
5*	**Dryer Dia.** 10': J67961 (28') 12': J6796 (24') 18': J6796 (24') 24: J67961 (28')	Plenum Over-Temp Switch. All trip at 325℉	1 2 2 2	Inside plenum/heat chamber, 1 ft. below top of burner cylinder. It can share holding clip with plenum RTD (Resistance Temperature Detector). To prevent large bends in copper tube, route it around top of door. This aids in future switch replacement.
6	J5648 (28')	Plenum RTD Sensor	1	Inside plenum/heat chamber, 1 ft. below top of burner cylinder (can share holding clip with Plenum Over-Temp Sensor).
7	J5660	Single-Point Grain Column RTD Sensor	1	Two feet above plenum heat/cool divider in grain column
8	J4487	Access Door Switches	2	1 – In door leading into cooling chamber 1 – In door for heating chamber
9*	**Dryer Dia.** 10': J4534 (28') 12': J4532 (16') 18: J4533 (24') 24: J17287 (40')	Lower Column Over-Temp Sensor All trip at 240℉	1 2 2 2	Inside dryer in cool chamber, 2-3 ft. below divide
10	J5860	Blower Air Switch	1 or 3	Tube is at inlet of blower. Switch is in power box.
11	F60337X	Discharge Moisture Sensor	1	At discharge of dryer

* Sensors come in two sections, with length depending on diameter of dryer

Table 1 – Sensor/switch locations

Power Box Component Location

Image 4 identifies major components of power box for a one-fan tower dryer.

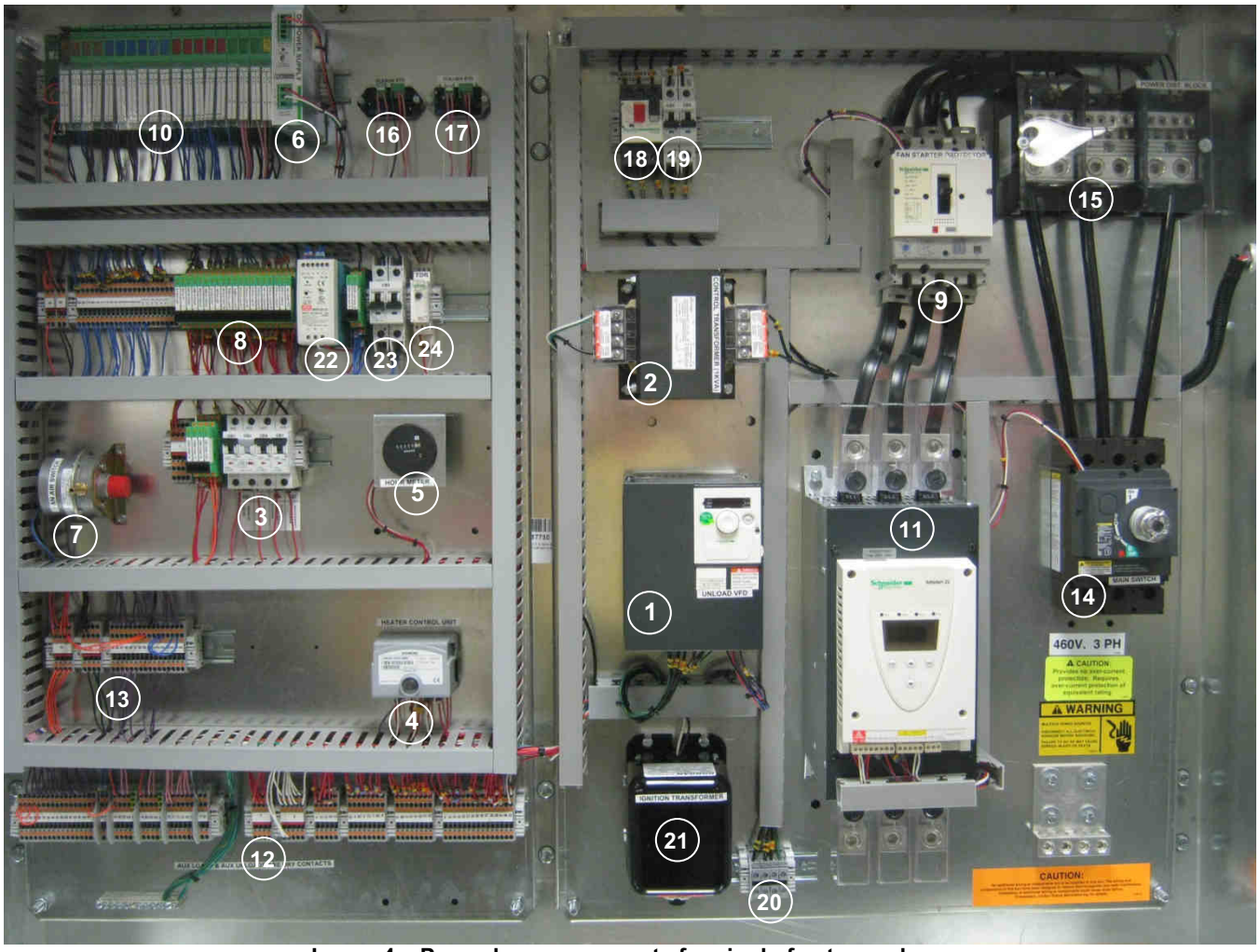

Image 4 – Power box components for single-fan tower dryer

1. Variable frequency drive
2. Control transformer
3. Control/heater circuit breakers
4. Burner control unit
5. Hour meter
6. 28V power supply
7. Blower air switch
8. 28VDC/110VAC relays
9. Blower starter protector
10. Programmable logic control (PLC)
11. Soft start w/ built-in bypass contactor
12. AC feed-through terminals
13. DC feed-through terminals
14. Main switch
15. Power distribution block
16. Column RTD transmitter
17. Plenum RTD transmitter
18. Unload rotor starter protector
19. Control transformer circuit breaker
20. Unload rotor connections
21. Ignition transmitter
22. Discharge gate actuator power supply
23. Discharge gate actuator circuit breaker
24. Burner control time delay relay

***IMPORTANT:** During initial setup or after relocation of dryer, it is highly recommended that ALL main power wiring connections be inspected for security and tight connections. Wires are tightened at factory; but connections should be checked after transport.

NOTICE All power boxes use 24VDC control voltage to minimize EM noise inside of box. AC/DC separation is key to reducing EMI inside of panel. When installing, make sure to practice good wire maintenance to ensure quality operation.

Image 5 identifies major components of power box for a three-fan tower dryer.

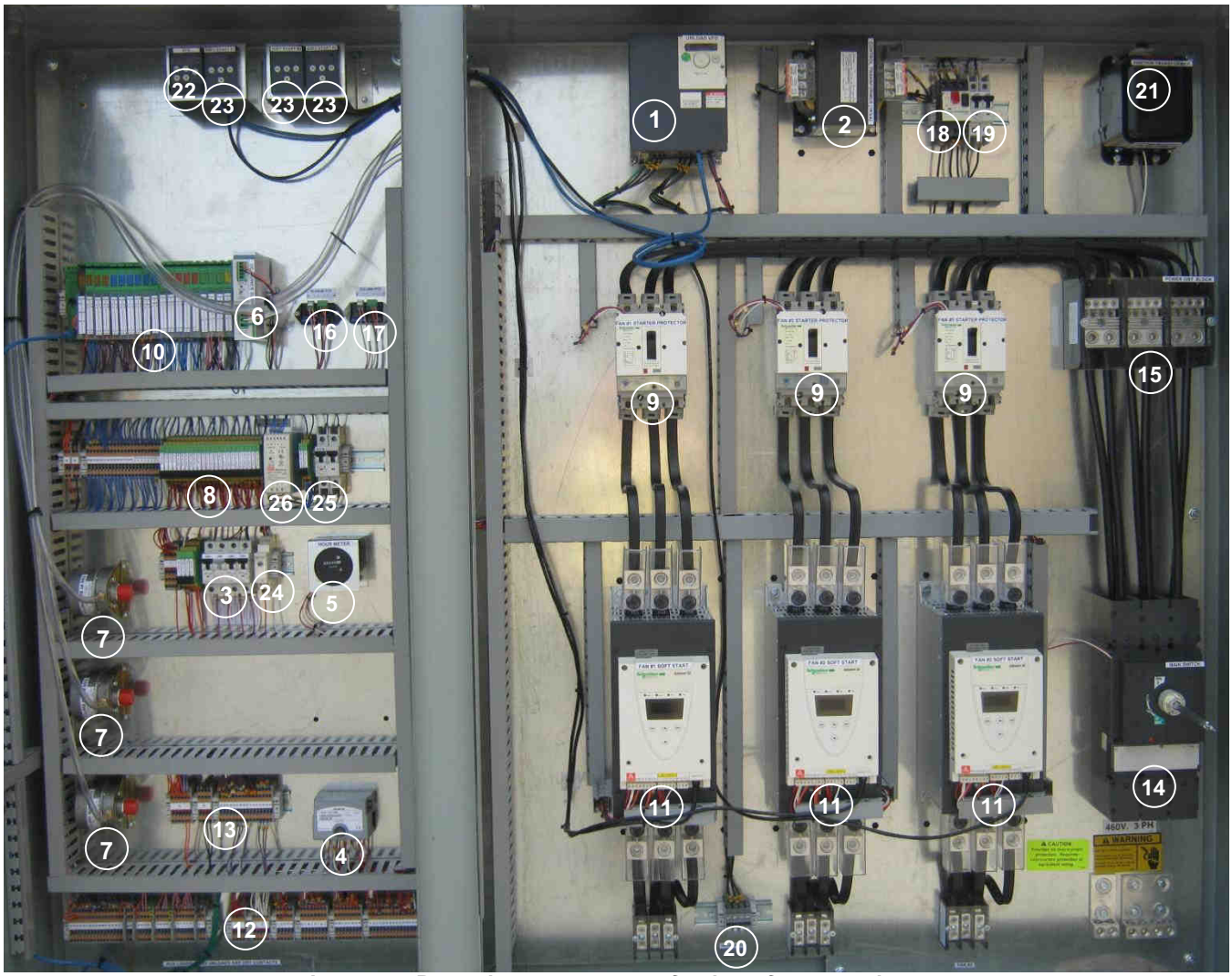

Image 5 – Power box components for three-fan tower dryer

1. Variable frequency drive
2. Control transformer
3. Control/heater circuit breakers
4. Burner control unit
5. Hour meter
6. 28V power supply
7. Blower air switch
8. 28VDC/110VAC relays
9. Blower starter protector
10. Programmable logic control (PLC)
11. Soft start w/ built-in bypass contactor
12. AC feed-through terminals
13. DC feed-through terminals
14. Main switch
15. Power distribution block
16. Column RTD transmitter
17. Plenum RTD transmitter
18. Unload rotor starter protector
19. Control transformer circuit breaker
20. Unload rotor connections
21. Ignition transmitter
22. Variable frequency drive remote display
23. Soft start remote display
24. Burner control time delay relay
25. Discharge gate actuator circuit breaker
26. Discharge gate actuator power supply

Tower Dryer Pipe Train Component Identification

Image 6 identifies pipe train components for a stick-built tower dryer. Pipe trains for modular tower dryers are shown in Images 7 and 8.

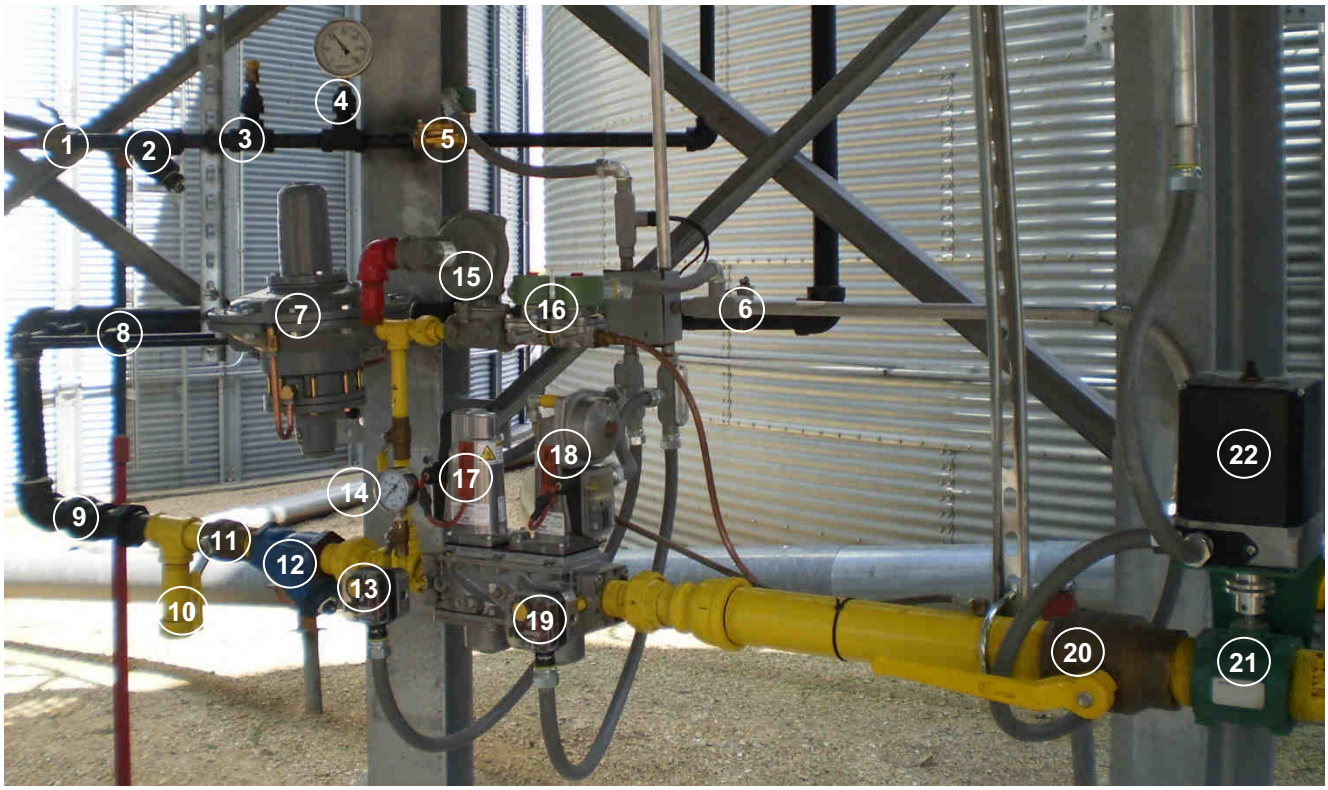

Image 6 – Stick-built tower dryer pipe train components

1. 1/4-turn LP inlet valve
2. Liquid propane wye strainer
3. Pressure-relief valve
4. Pressure gauge
5. Liquid solenoid valve
6. Vapor over temperature switch (behind electrical conduit)
7. Regulator
8. Regulator pressure sensor pipe
9. Fuel vapor inlet
10. Oil drain cap
11. 1/4-turn shutoff valve
12. Vaporized propane wye strainer
13. Low pressure switch
14. High pressure gauge
15. Pilot regulator
16. Pilot solenoid valves
17. First safety shutoff valve
18. Second safety shutoff valve and regulator
19. High pressure switch
20. Shutoff valve
21. Butterfly valve
22. Butterfly valve actuator

Modular Tower Dryer Pipe Train Component Identification

Image 7 identifies components of pipe train for a natural gas-fueled modular tower dryer.

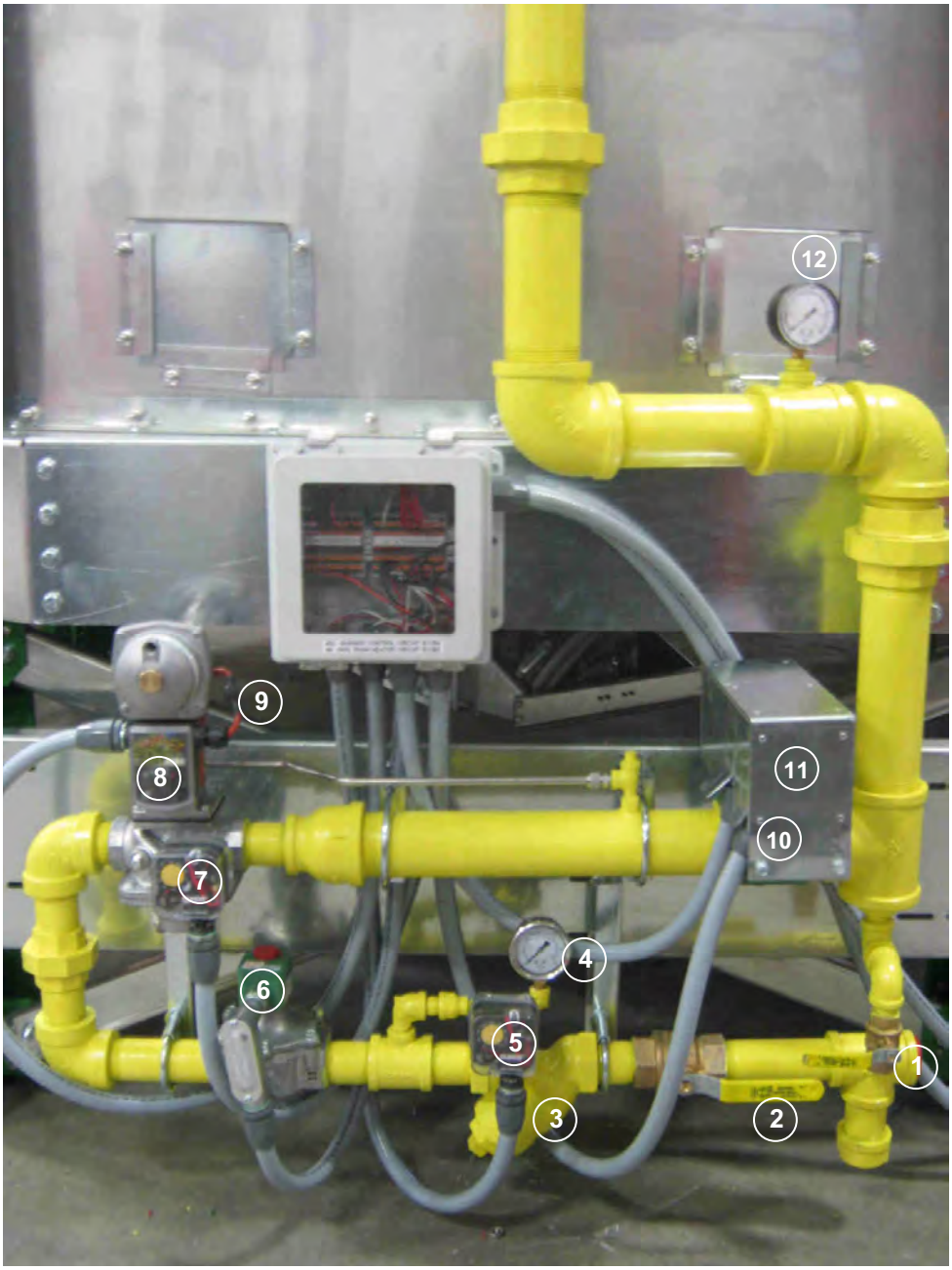

Image 7 – Natural gas-fueled modular tower dryer pipe train components

1. Natural gas supply line
2. 1/4-turn shutoff valve
3. Wye strainer
4. High-pressure gauge
5. Low-pressure switch
6. First safety shutoff valve
7. High pressure switch
8. Second safety shutoff valve and regulator
9. Heater thermostat
10. Butterfly valve (in box)
11. Butterfly valve actuator (in box)
12. Low pressure gauge

Image 8 identifies components of pipe train for an LP-fueled modular tower dryer.

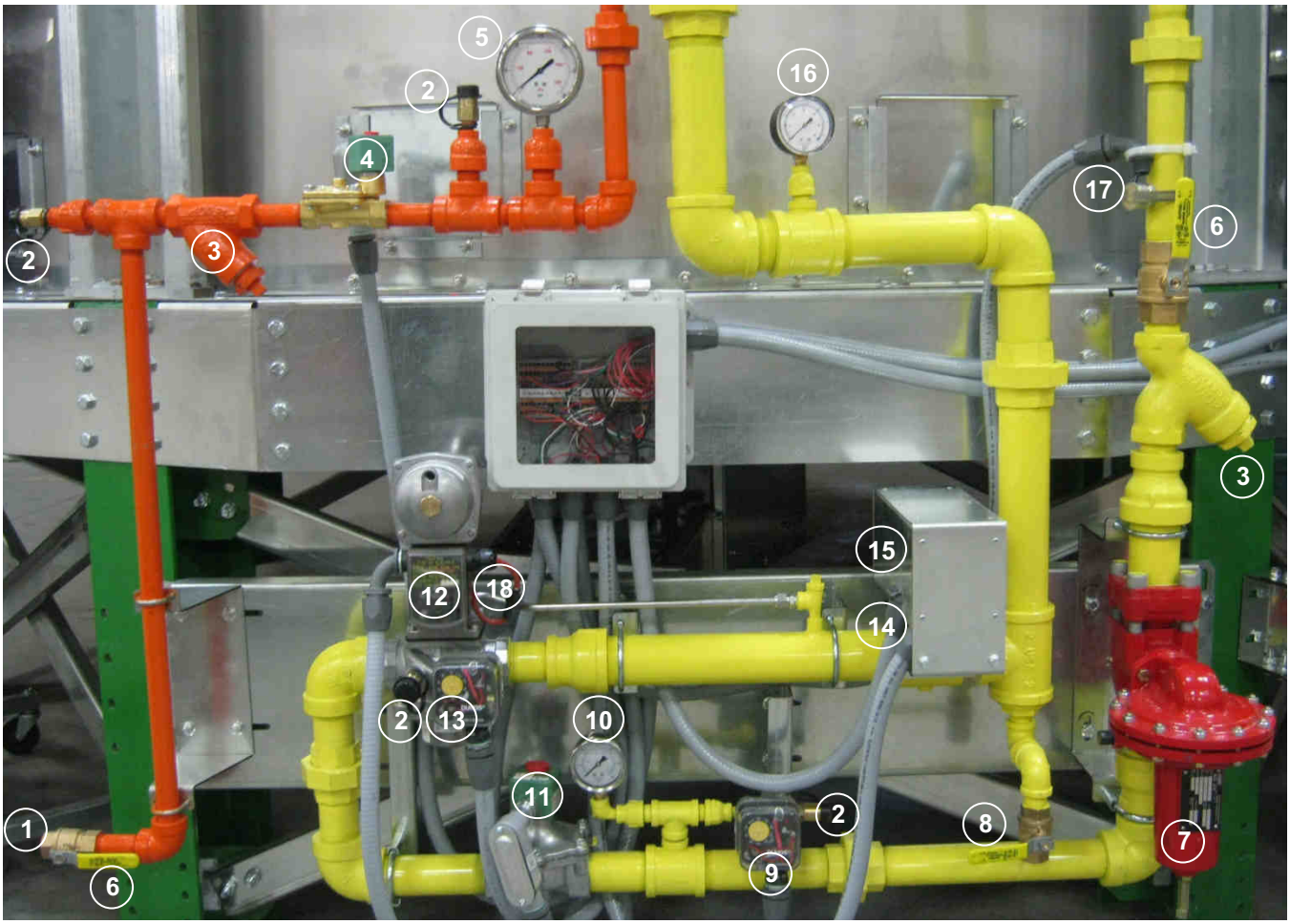

Image 8 – LP-fueled modular tower dryer pipe train components

1. Incoming LP supply line
2. Pressure-relief valve
3. Wye strainer
4. Liquid solenoid valve
5. Liquid pressure gauge
6. 1/4-turn shutoff valve
7. Regulator
8. 1/4-turn drain valve
9. Low-pressure switch
10. Vapor gas high-pressure gauge
11. First safety shutoff valve
12. Second safety shutoff valve and regulator
13. High pressure switch
14. Butterfly valve (in box)
15. Butterfly valve actuator (in box)
16. Vapor gas gauge
17. Vapor over temperature switch
18. Heater thermostat

Main Disconnect Switch, Emergency Stop Button

Image 9 – Latch and Main Disconnect switch in “Off” position

Image 9 shows door lock handle and Main Disconnect switch on a single-fan dryer. Door handle secures door and can be locked. Main Disconnect prevents opening of power box while power is present in system. Image 9 shows "Off" position. Power is not present in system.

Image 10 – Latch and Main Disconnect switch in “On” position

Image 10 shows power box latch on single-fan dryer in closed position and Main Disconnect switch in “On” position.

Image 11 – System Control switch and Emergency Stop switch

Image 11 shows System Control switch and Emergency Stop switch for a single-fan dryer. Items are located on left side of power box for both single-fan and three-fan models.

Switches

Images 12 and 13 – Rotary fill switch and fill sensor

Images 12 and 13 show upper rotary fill switch and sensor. Switch is located on roof of dryer and indicates when wet holding bin is full. A similar switch is located on side of stick-built tower dryer to indicate when wet holding bin is nearly empty.

Image 14 – Single-point grain temperature sensor RTD

Image 14 shows single-point RTD (Resistance Temperature Detector). It is located two feet above plenum heat-cool divider in grain column.

Image 15 – Key switch

Image 16 – Key switch with key inserted

Image 15 shows key switch for access door. Image 16 shows switch with key inserted.

Grain Exchangers, Rotor Arm and Scrapers

Image 17 shows grain exchangers, viewed from top.

Image 17 – Grain exchangers

Image 18 shows rotor arm and scraper (curved) of unload.

Image 18 – Rotor arm and scrapers

Image 19 shows work light, alarm light and alarm buzzer.

Image 19 – Work light, alarm light, alarm buzzer

Rotor, Blower Drive Shaft, Motor

Image 20 – Unload motor, gearbox

Image 20 shows AC motor and gearbox for unload rotor on a modular tower dryer. See Maintenance section for pictures of gearboxes for larger tower dryers.

Image 21 – Blower, drive shaft

Image 21 shows blower and drive shaft.

Image 22 – Blower motor

Image 22 shows blower motor and fan belts.

Louvers, Cleanouts, Roof Door

Image 23 – Louvers on door

Image 23 shows louvers on door. Louvered air vents help control amount of air pulled through grain for cooling.

Image 24 – Cleanout panel

Image 24 shows a cleanout panel at base of dryer. Cleanout panels are around base and near grain exchangers.

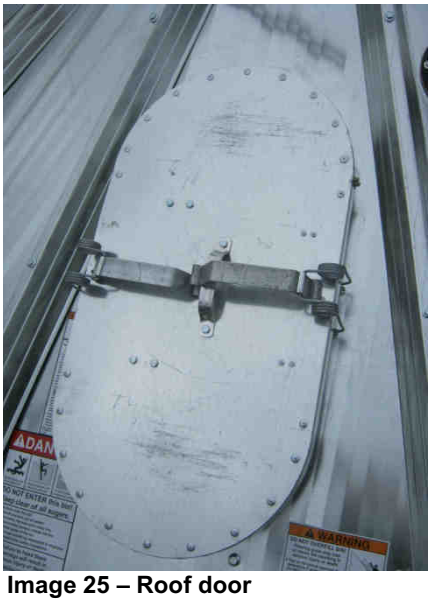

Image 25 – Roof door

Image 25 shows roof door.

Moisture, Temperature Sensors

Image 26 – Incoming moisture sensor

Image 26 shows incoming moisture sensor. Twist-clip latch allows for easy removal for cleaning sensor.

Image 27 – Outside over temperature sensor

Image 27 shows outside over temperature sensors.

Image 28 – Plenum RTD, capillary box

Image 28 shows plenum RTD and plenum over-temp capillary and junction box (lower).

Moisture sensors, Grain Flow Tube

Image 29 – Static moisture sensor

Image 29 shows discharge moisture sensor in static sample box.

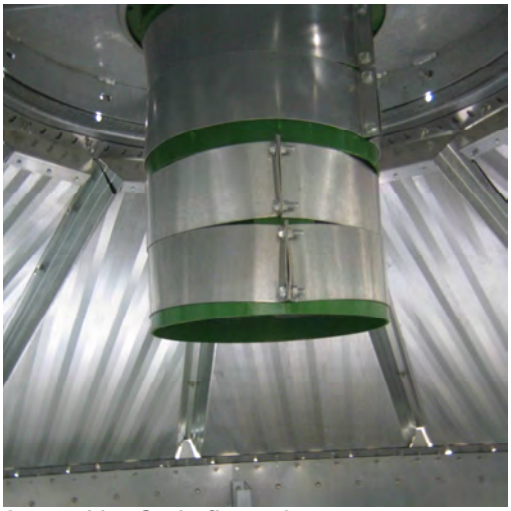

Image 30 – Grain flow tube

Image 30 shows grain flow tube. Sleeve clamps can be removed or added as needed to ensure grain does not press against roof of dryer. See installation instructions in appendices.

Image 31 – Upper moisture sensor

Image 31 shows upper moisture sensor in grain column

Touch Screen Controller

QuadraTouch™ Controller

Image 32 – QuadraTouch™ control screen

Control box (see Image 32) should be mounted away from dryer and connected by industrial, direct-bury Ethernet cable. Cable is available in 50', 100', 150', and 200' lengths (J8720, J8721, J8722, J8723). Panel needs its own independent 100VAC – 240VAC power supply.

Image 33 – Main power switch on

Main power switch is on bottom right-hand portion of box. See Images 32, 33. When turned on, switch will illuminate to a green color. See Image 33. Panel will boot up shortly and connect with PLC inside power box.

To connect, main power must also be supplied to dryer and system control switch should be in "COMPUTER" position. Back of panel becomes accessible by removing screws on bottom left- and right-hand corners of swing panel. See Images 32 and 33.

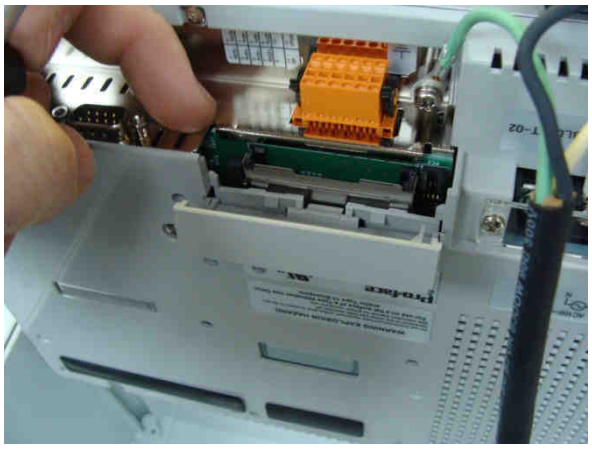

Image 34 – QuadraTouch™ controller

After removing screws, panel may be lifted up to find Compact Flash Type II card located on rear of panel. Door lifts up and swings back. See Image 34. All data logged during dryer operation is stored on this 1 GB compact flash card.

Each QuadraTouch™ controller includes this card. See software manual about accessing CF card's memory.

Operation

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Introduction

Sukup Tower Dryers use two variables to dry grain to desired moisture: plenum (drying) temperature and time of exposure to heat (unload speed). The higher the temperature, the faster the grain will dry. However, drying at too high a temperature can damage grain or, in worst case, burn it. Moving grain through dryer at a slower speed allows greater exposure to heat than running it through quickly. Speed of grain moving through columns of tower dryer is determined by speed of unload rotor, which is set by operator.

There are two modes of operation: manual and automatic. Manual operation should be used first in order to determine heat and speed levels that will dry grain to desired moisture level at discharge of dryer.

Before starting dryer, ensure that tarp has been removed from burner (Tarp is used to protect burner from moisture when not in use). As well, operator must close drain valve(s) on fuel line; remove and blow out copper tube for pilot light (if applicable) to ensure it is clear; and open valves to allow fuel into dryer's pipe train.

Sukup's QuadraTouch™ control system provides for easy operation of dryer. Press Start button to begin, and then follow prompts that appear on screen. Dark red (burgundy) buttons must be pressed for about two seconds to activate. Buttons will appear lime green when function is active, or burgundy when not. Software section elsewhere in this manual provides detailed instructions for QuadraTouch™ system.

Before filling dryer with grain, turn blowers on to remove any dust and/or debris from burner and plenum areas.

NOTE: When initially starting dryer, it is best to fill it with dry grain before loading it with wet grain. This will help avoid/limit the need to transfer wet grain to a temporary holding bin. Since most drying occurs in upper half of dryer, grain at bottom during initial start-up will not heat up much (lose moisture) before discharge. So unless dryer is equipped with a way to recycle wet grain back through dryer, it is advisable to start with dry grain.

Decide drying temperature and unload speed

Optimum drying temperature and unload speed will depend on moisture of grain coming into dryer. Drying (plenum) temperature setpoints are typically between 140 and 180 degrees Farenheit.

Plenum temperature sensor is located in heat chamber near burner. Since heat rises, readings from sensor are typically 20 to 50 degrees lower than air temperature near top of heat chamber (plenum). For instance, a reading of 180 degrees could mean that air near top of dryer is 220 degrees and average temperature is 200 degrees. Keep this in mind when setting desired drying temperature. Also keep in mind that wetter grain at top of dryer needs more heat than dryer grain near bottom of dryer.

Use QuadraTouch™ control screen and follow directions in QuadraTouch™ software manual to set temperature and drying (unload) speed.

Use tables in Appendix D (and prior experience) for guidance in setting drying (unload) speed. Be sure to read introduction to tables.

Run dryer long enough to cycle one batch of grain completely through, then check moisture of grain discharged from dryer. If moisture is too high, reset drying (unloading) speed lower so grain stays in dryer longer. Changing speed in increments of 5 percent (unless moisture level is drastically higher than desired) will help in zeroing in on optimum drying speed.

Repeat process every 20 to 30 minutes until desired output moisture is achieved consistently and grain is not becoming overstressed (cracked kernels). If overheated (cracked or burnt) grain is coming out of dryer, reduce drying plenum temperature and unload speed accordingly until dryer is not damaging grain.

NOTE: It takes 45 to 60 minutes for grain to move through a Sukup Tower Dryer running at maximum (100 percent) of drying (unload) speed, regardless of size of dryer. Capacities range from about 1,200 bushels in a U1010 Modular Tower Dryer to about 7,500 bushels in a U7024 dryer.

After dryer is consistently producing grain at desired moisture level and quality, decide whether to run it in Automatic or Manual mode. Use QuadraTouch™ control panel to choose which mode. In Automatic mode, user will have option of basing drying on grain temperature (at its hottest point) or moisture of grain exiting dryer.

Moisture is more difficult to measure consistently than temperature of grain in dryer. However, different varieties of grain may require different temperatures to dry to the same moisture level. Drying to a particular moisture content, such as 15 percent, generally produces more consistently dried grain.

Whether using plenum temperature or grain moisture as primary factor in drying grain, it is important to keep an eye on both factors, especially in commercial dryers where there is likely to be a variety of grain hybrids and moisture levels entering dryer.

In Automatic mode, to help dryer accommodate fluctuating levels of moisture of incoming grain, operator can set maximum and minimum drying (unload) speeds. Program both at 10 percentage points off of rate that would produce desired moisture level. For example, on a tower dryer that will be run at drying rate of 38 percent, set drying (unload) rate maximum at 48 percent and minimum at 28 percent. This lets dryer adjust unload rate some, but prevents it from getting too far off. Range can be set to be smaller if needed/desired.

IMPORTANT: Moisture sensor must be calibrated at least twice a day if using Automatic mode. See software manual for calibration instructions.

NOTE: Grain variety, maturity level, cleanliness, weather conditions and operation can all affect performance of dryer. To the extent possible, be aware of different varieties of grain being fed into dryer, as well as other factors that may affect performance.

WARNING: Unload rotor, fans, and heaters will start without warning at appropriate times. Please use caution around dryer.

NOTE: Please refer to software manual elsewhere in this manual for a detailed description of each operation mode. Software is frequently updated, so screens and images may differ slightly from those pictured.

Make sure to go through appropriate checklist in Maintenance section before initial, daily or seasonal operation of dryer.

Before Loading or Starting Dryer

Dryer Start-up Preliminary Steps

Image 2-1 – System Control switch, Emergency Stop button

Prior to starting dryer, pull out red Emergency Stop button. See Image 2-1. It will illuminate when pulled out. Turn System Control switch to "Computer," then engage Main Disconnect (shown in Images 2-2 and 2-3) by turning clockwise to "On" position.

Image 2-2 – Main Disconnect switch in "Off" position

Image 2.3 – Main Disconnect switch in "On" position

Operation

Before starting dryer, ensure that the latest operating software has been downloaded. Go to http://www.sukup.com/Products/QuadraTouch to download the latest version.

Sukup's QuadraTouch™ control system provides for easy operation of dryer. Press Start button to begin, and then follow prompts that appear on screen.

For detailed information, refer to software section of manual.

IMPORTANT: Temperatures inside of plenum will vary widely from bottom to top. For example, a plenum temp setting of 180°F may produce a temperature of 220°F at top of plenum. Wetter grain at top of dryer can withstand higher temperatures than drier grain at bottom. For this reason, temperature sensor is located at bottom of plenum. If there are signs of burned kernels or other heat damage to grain, reduce plenum temperature.

Dryer Shut-down

Pressing "Reset" button on *QuadraTouch*™ controller will shut down dryer in proper sequence. To allow fan to continue running, use Fan Delay option on second page of settings menu. **NOTE:** Never leave grain in dryer for extended periods of time.

Maintenance

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Tower Dryer Periodic Maintenance

Good maintenance practices can make start-up easier and will help to ensure good performance each drying season. The following guidelines are **minimum** recommended procedures to be carried out.

IMPORTANT: Do not leave grain in dryer without dryer running for longer than 24 hrs. Grain can absorb moisture and expand, putting unnecessary stress on screens and on dryer itself.

CAUTION: When performing maintenance and using ladder attached to dryer, use caution. Ladder will be slippery when wet.

CAUTION: After opening access points, all bolts used to re-lock enclosures MUST be tightened **beyond** hand removal to prevent undesired access.

PRIOR TO OPERATION

Burner	• Inspect closely to make sure no gas ports or holes are blocked.
Fan(s)/Heater	• Check wiring for loose connections, bare wires, or rodent damage. • Check heater ignition wires for damage or shorting.
Motor(s)	• Check openings for blockage. • Inspect belts for tension, cracks or excessive wear.
Moisture Sensor	• Remove moisture sensors. Make sure they are clean and inside of tube is clear of buildup. • Check condition of wire and ground wire.
Pipe Train	• Inspect pipe train components for physical integrity and tightness. • Open drain valve on pipe train. Make sure no water is in it or in pilot gas line. (Close drain valve before turning on gas supply.)
Unload	• Inspect rotor for obstructions. • Make certain rotor turns freely.

The most important maintenance on any grain dryer is keeping it clean. Clean dryers run more efficiently, have higher capacity, are safer and have a significantly lower risk of fire.

Items listed below should be checked daily and cleaning operations performed as needed. **Differences in each season's grain will affect amount of cleaning needed.** For example, in a season when grain is unusually dirty, some parts of dryer may require attention daily or every few days, while in another season they will need weekly care.

CLEANING DRYER DURING DRYING SEASON

Burner	• Clean off all fines and debris, especially after cleaning interior screens. If not removed, debris could ignite.
Catwalk	• Clean catwalk walking surface; it can become slippery with buildup of fines.
Cooling Chamber	• Remove fines and debris on floor (where unload rotor gearbox and motor are located). • Keep divider between cooling chamber and heating section clean. Build-up could damage dryer.
Grain Discharge	• Clean out to ensure uniform flow of grain and prevent clogs.
Screens (Exterior)	• Inspect and clean with broom, pressure washer or shop vacuum to remove dust, fines and bees wings. (Can be reached from service catwalks.)
Screens (Interior)	• Inspect and clean with broom.

PRE-WINTER/END-OF-SEASON MAINTENANCE

Burner	• Clean with shop vacuum. • Install tarp or cover over burner or entire burner can. (Prevents debris from collecting; prevents water from entering pipe train.)
Dryer	• Empty dryer. **Do not** use it to store grain.
Grain Table	• Clean, especially around columns on outside. (Floor and sweep are stainless steel, but columns are galvanized, thus susceptible to deterioration and corrosion.)
Oil Drain Cap*	• Remove cap on bottom of oil drain. Remove any buildup. Drain any waste oil into container for responsible disposal.
Pilot Gas Line*	• Disconnect and plug to prevent water/moisture freeze during cold weather
Pipe Train Drain Valve*	• Shut off gas. • Open drain valve on bottom of vertical gas line (it is a quarter-turn ball valve) to allow drainage of moisture. Water allowed into pipe train could freeze and break expensive components.
Y-Strainer*	• Remove screen, clean it and reinstall it.

* See photos and identifiers on next page.

IMPORTANT: When tower dryer is not in regular use, burner should be tarped. Also, gas supply to dryer should be shut off and pipe train drain valve should be opened to prevent water from getting into pipe train valves.

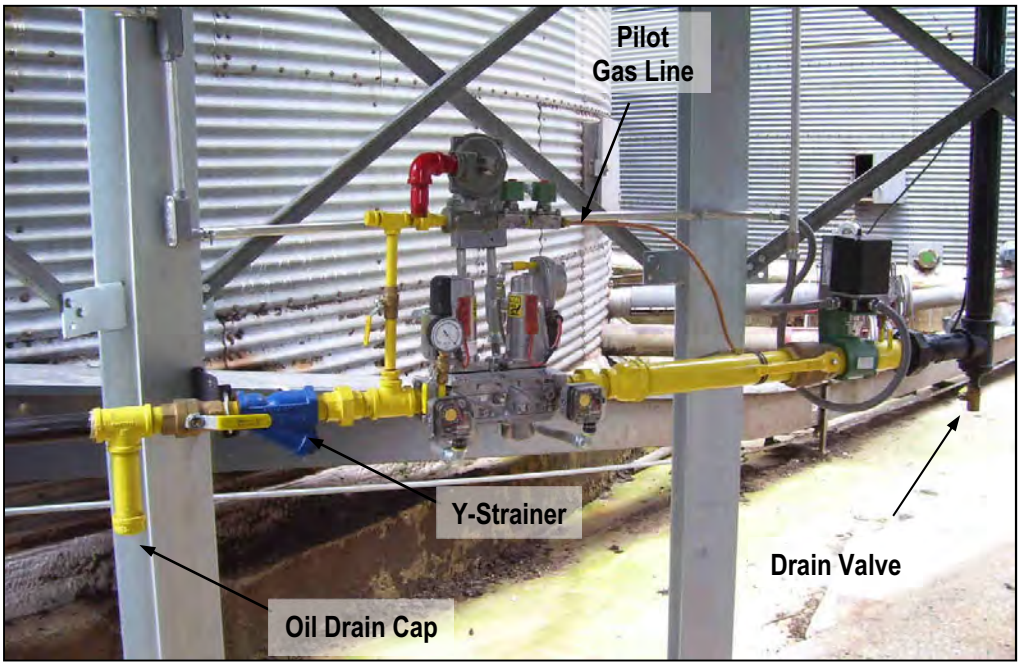


Image 3-1 – Pipe train components

Blower, Unload Motors

See Table 3-1 to identify blower motor and Table 3-2 to identify unload motor used on each model of tower dryer, as well as electrical loads.

Model #	Blower Motor HP	Motor Pt. #	Service Factor	FLA 460V (w/SF)	FLA 230V (w/SF)	FLA 208V (w/SF)
U1010	50	H7210	1.15	67	135	144
U1510	75	H7211	1.15	98	197	215
U1812	75	H7212	1.15	98	197	215
U2012	100	H7213	1.15	130	259	292
U2412	100	H7214	1.15	130	259	292
U3018	50 (3)	H7215	1.12	67	135	144
U3518	60 (3)	H7216	1.15	80	160	170
U4018	75 (3)	H7217	1.15	98	197	215
U4718	75 (3)	H7218	1.15	98	197	215
U5024	100 (3)	H7219	1.15	130	259	292
U6024	100 (3)	H7220	1.15	130	259	292
U7024	125 (3)	H7221	1.25	172	N/A	N/A

Table 3-1 – Blower motor specifications

Model #	Unload Motor HP	Motor Pt. #	Service Factor	FLA 460V (w/SF)	FLA 230V (w/SF)	FLA 208V (w/SF)
U1010	1.5	H1445	1	2.3	4.6	5.1
U1510	1.5	H1445	1	2.3	4.6	5.1
U1812	1.5	H1445	1	2.3	4.6	5.1
U2012	1.5	H1445	1	2.3	4.6	5.1
U2412	1.5	H1445	1	2.3	4.6	5.1
U3018	2	H2040	1	3	6	6.6
U3518	2	H2040	1	3	6	6.6
U4018	2	H2040	1	3	6	6.6
U4718	2	H2040	1	3	6	6.6
U5024	3	H2980	1	4	8	8.8
U6024	3	H2980	1	4	8	8.8
U7024	3	H2980	1	4	8	8.8

Table 3-2 – Unload motor specifications

Greasing Blower, Unload Motors

Motor bearings are greased at factory. Lubricate at start of each season. Use Shell Dolium R or Chevron SR1 No. 2 grease – 1 to 2 strokes for 1.5 HP to 3 HP motors; 2 to 3 strokes for 50 HP to 70 HP motors; 3 to 4 strokes for 100 HP and 125 HP.

Greasing Blower Bearings

See Table 3-3 for blower bearing greasing frequency and type of grease to use.

NOTE: Bearings are not sealed. Pump grease until it begins coming out of bearings.

NOTE: Shaft should be turned at least monthly. See lubrication sticker on blower for additional information. See Images 3-3 and 3-4.

Model #	Blower Model	Part #	Shaft Dia.	RPM	Bearing Greasing Interval	Type of Grease
U1010	QSL402	J7719	2-3/16"	1200	30 days	*
U1510	QSL445	J7718	2-7/16"	1200	15 days	*
U1812	QSL542	J7716T	2-5/16"	900	45 days	*
U2012	QSL542	J7716T	2-5/16"	964	45 days	*
U2412	QSL600	J7709T	3-7/16"	800	45 days	*
U3018	ESI402 (3)	J7702	2-11/16"	1200	60 days	**
U3518	ESI445 (3)	J7704	2-15/16"	1040	60 days	**
U4018	ESI490 (3)	J7701	3-7/16"	940	60 days	**
U4718	ESI490 (3)	J7701	3-7/16"	990	60 days	**
U5024	ESI542 (3)	J7703	2-11/16"	890	60 days	**
U6024	ESI600 (3)	J7705	3-15/16"	780	60 days	**
U7024	ESI600 (3)	J7705	3-15/16"	816	60 days	**

Table 3-3 – Blower models, greasing specifications

*** Lubricate with high-quality NLGI No. 2 lithium-based R&O grease w/ minimum oil viscosity of 500 SUS at 100 °F. Examples: Shell Alvania RL, Mobil Mobilith SHC100 or SHC220, Exxon Ronex MP.**

**** Lubricate with following grease or equivalent: Shell Alvania EP No. 2, Texaco Molytex No. 2, Mobile Mobilux EP2, Gulf Golfcrown No. 2.**

Image 3-2 – Twin City Fan & Blower lubrication sticker

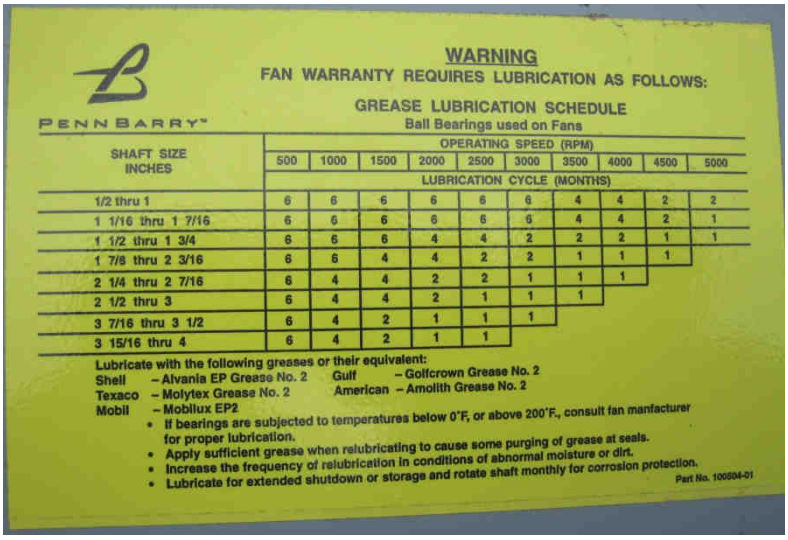


Image 3-3 – Penn Barry blower lubrication sticker

Image 3- 4 – Model U1010 blower

Images 3-4 and 3-6 show grease zerks for shaft bearings. Blowers are shown prior to installation. When placed upright on base, shown in Image 3-5, zerks will be connected to grease feeding tubes shown at rear of base in Image 3-5. Bearings are packed with grease at factory, but must be relubricated periodically. See table on previous page for frequency. Make sure tubes are full of grease if not filled at factory. Use zerks at front of blower base to apply grease.

Image 3-5 – Base for Model U1010 blower

Image 3-8 shows blower installed in U1510 modular tower dryer.

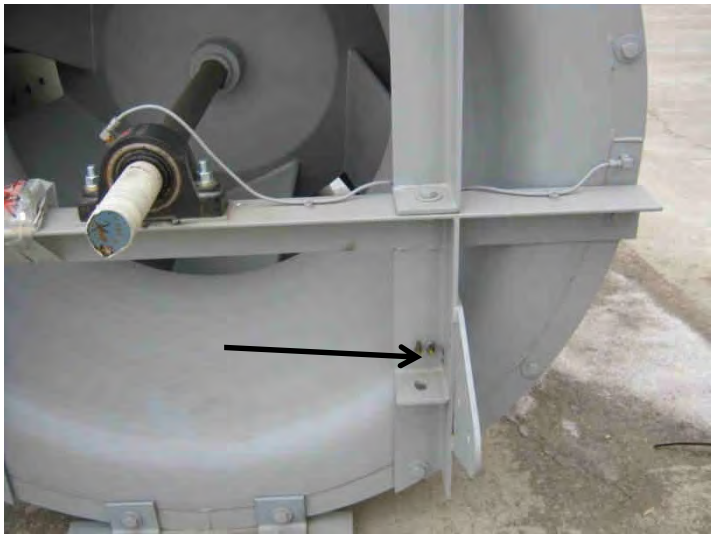


Image 3-6 – Model U1510 blower

Image 3-7 – Model U1510

Tensioning Belts

See Table 3-4 and Fig. 3-1 to properly tension belts.

Model #	Belt Part #	# of Belts	Belt Profile / Length	Small (motor) pulley dia. (inches)	Large (driven) pulley dia. (inches)	Deflection (inches)	Pounds of force for new belt	Pounds of force for used belt
U1010	J0263	2	CX / 96	9.5	14	0.46	23.5	15.9
U1510	J02483	4	5VX / 106	7.9	11.7	0.59	22.1	14.8
U1812	J02751	3	CX / 124	9	18	0.64	21.8	14.7
U2012	J0276	4	CX / 144	13	24	0.67	23.5	15.9
U2412	J02761	4	CX / 136	11	24	0.63	23.5	15.9
U3018	J0263	6	CX / 96	9.5	14	0.46	23.5	15.9
U3518	J0269	6	CX / 109	10.5	18	0.5	23.5	15.9
U4018	J0269	9	CX / 109	9.5	18	0.51	23.5	15.9
U4718	J0277	9	CX / 112	10	18	0.53	23.5	15.9
U5024	J0275	12	CX / 128	9	18	0.67	21.8	14.7
U6024	J0276	12	CX / 144	10.5	24	0.7	23.5	15.9
U7024	J0276	12	CX / 144	11	24	0.7	23.5	15.9

Table 3-4 – Blower motor specifications

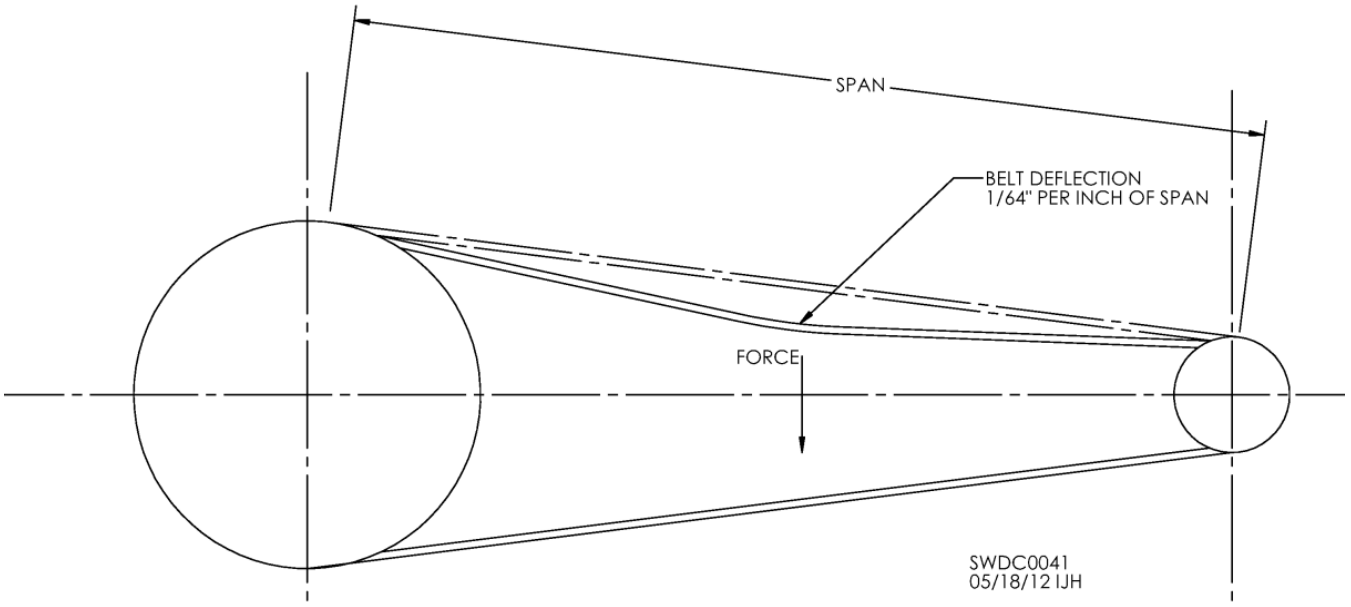


Fig. 3-1 – Adjusting belt tension

Follow these steps to tension belt.

1. Measure span length. See Fig. 3-1.
2. At center of span, apply enough force to deflect belt 1/64” for every 1” of belt span. If span is 32”, deflection amount should be 32/64”, or 1/2”.
3. Use Table 3-4 to determine pounds of force to apply to gauge proper deflection per belt.

Gearbox Lubrication

See Table 3-5 and Images 3-8 through 3-10 for gearbox lubrication specifications and locations.

Model #	Gearbox	Part #	Oil Change Interval	Amount of Oil	Type/Weight of Oil
U1010	Rossi	J36873	2 to 4 yrs.	3.38 qts.	ISO VG 320
U1510					
U1812					
U2012					
U2412					
U3018	Shimpo	J3685	Gearbox is packed with grease at factory. No relubrication is required.		
U3518					
U4018					
U4718					
U5024	Sumitomo	J3686	Gearbox is packed with grease at factory. Add 8 oz. Shell Alvania No. 2 grease each year.		
U6024					
U7024					

Table 3-5 – Gearbox lubrication specifications

Image 3-8 – Rossi gear reducer

Image 3-9 – Shimpo gear reducer

Image 3-10 – Sumitomo gear reducer

Image 3-8 shows Rossi gear reducer used on models U1010 through U2412, including oil fill (F), level (L) and drain (D) plugs. See Table 3-5 for oil change frequency, amount and type.

Image 3-9 shows Shimpo gear reducer used on models U3018 through U4718. Reducer is grease-packed at factory and does not require periodic re-greasing.

Image 3-10 shows Sumitomo gear reducer used on models U5024 through U7024, including location of grease zerk (G). Reducer is grease-packed at factory. See Table 3-5 for information on maintaining grease level.

NOTE: All reducers are shown in factory packaging.

Unload Rotor Bearing Lubrication

Image 3-11 shows typical unload rotor bearing used in Sukup tower dryers. Models U1010 and U1510 use bearing J00669 (for 2-7/16” dia. shaft) and all others use bearing J0064 (for 3-1/2” dia. shaft). All bearings are grease-packed at factory with lithium-based grease. On dryers running 8 to 16 hours a day, bearings should be regreased every 12 weeks. On dryers running 24 hours a day, bearings should be regreased every 10 weeks. Use a lithium-based grease. **IMPORTANT:** Do not over-grease bearing. It can break bearing seal. Image 3-11 shows location of grease zerk.

Image 3-11 – Bearing used on unload rotor

Burner Maintenance Instructions

Maxon Corporation provides the following information

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

Inspect burner at least once a year. Previous experience is the best guide in determining frequency of inspection. As a minimum, the following procedure should be followed:

1. Shut system down totally. Disconnect or lock out power supply so there can be no accidental start-up during inspection.
2. Inspect 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 mixing plates should be removed with a wire brush. Check visually that no holes in mixing plates are blocked.

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

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

Inspection and Maintenance of Gas Ports

- Conduct initial inspection within first month after commissioning. Visually check 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 initial piping debris is removed. Operating conditions of burner will determine how frequently maintenance is required.
- Use of an electric drill is not suggested unless both pin vise and drill can be chucked up in a variable-speed drill unit. **CAUTION:** It is easy to snap bits off in a port when using a drill motor, and removal of broken bits from gas ports is difficult.

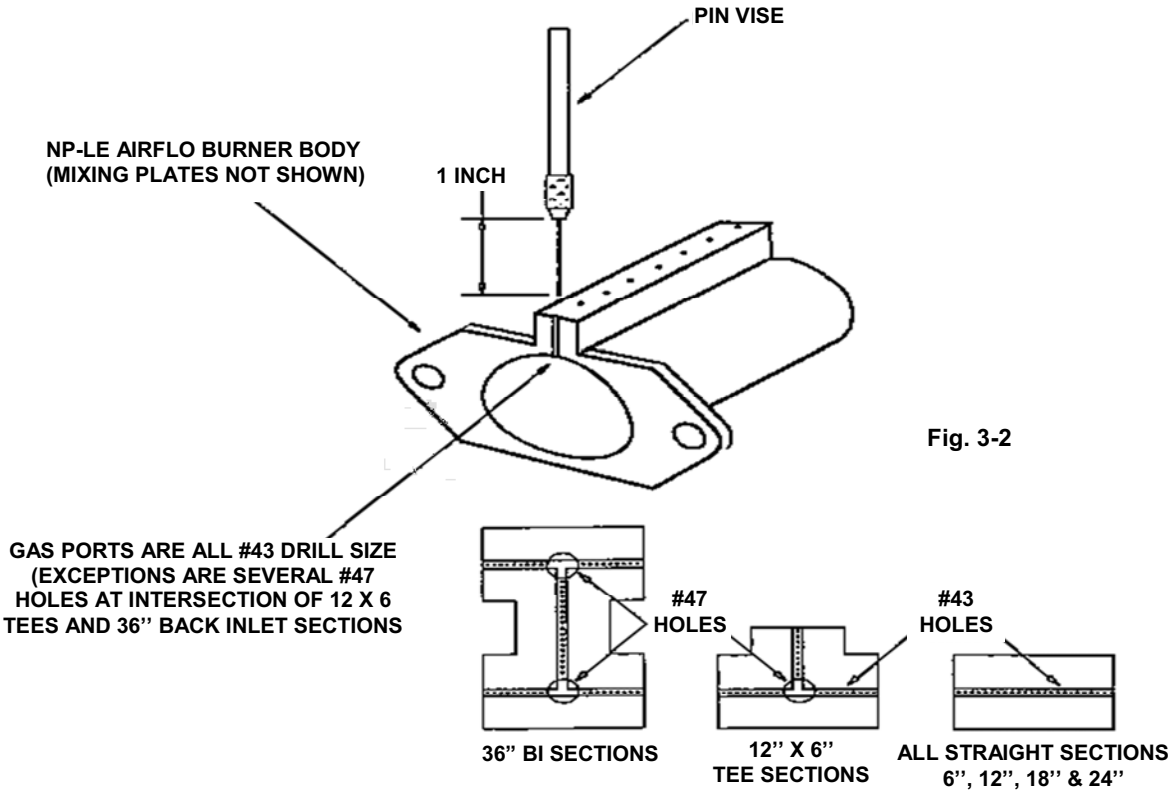


Fig. 3-2

Troubleshooting Guide

Table of Contents

See table below for quick-reference guide to troubleshooting.

See following pages for help in troubleshooting problems with specific components of dryer.

See Tower Dryer Sensor Locations pages in Component Identification Section of this manual.

Problem/Fault	Possible Cause or Solution
Pilot flame does not light	• Make sure low-fire position switch by valve is closed. • Make sure both pilot solenoid valves are opening. • Make sure spark transformer is receiving power. • Make sure spark plug is clean. • Check for blockages in the pilot gas line.
Pilot flame of flame is not sensed	• Visually inspect to make sure pilot flame is lighting. If not, see above problem. • At burner, check that flame rod is clean and not touching something. • Check connection of flame rod at burner and back to control box terminal. • Make sure ground wire is attached to burner and to ground terminal in control box. Also make sure there is a ground wire between power box and control box.
Burner is not reaching setpoint	• Ensure there is no obstruction of fuel to burner. • Gas pressure may need to be increased to reach high temperatures. • If not reaching in the lower set points, the lower fire positions of the valve may need to be decreased.
No grain unloading out of dryer	• Check unload motor wires in power box and at motor on dryer. • Ensure 24VDC run signal is going to frequency drive. • Ensure that reference voltage is going to drive unit. • If drive is receiving run signal and reference voltage, display on unit should be showing a number. This is the frequency sent to unload motor. Ensure unload rotor is turning and rotor arms are not hitting on floor or on side of dryer. Drive unit will cut voltage to motor if it starts drawing higher amps than motor will allow (current limiting).
Upper column high limit fault	• The 240-degree switch is located in a copper tube on top of first perforated sheet on outside of dryer. • Dryer plenum temperature may be set too high. • If grain level dropped below sensor, hot air will start blowing on sensor, causing it to trip. • Wet grain level in storage bin may be getting too low. • Dryer is unloading faster than fill system can fill dryer, causing grain to drop below sensor.
No grain column temperature	• Take a voltage reading between DC COM (#95) and signal wire (#70). This should be between 1 – 5 VDC. Take reading to control box. • If voltage is not present between #95 and #70, voltages and resistance need to be checked on sensor. • At transmitter, disconnect wires coming from sensor and take a resistance reading from yellow wire to each white wire. If a resistance is present, sensor is OK. • At transmitter, check voltage between +24VDC terminal and COM. This should read 24VDC. If 24VDC is present, reconnect sensor wires and check output signal at transmitter. This should be the same as before (1-5VDC). • If still no voltage on output, transmitter needs to be replaced.
Moisture sensor not working	• Take sensor out of tube and visually inspect it for damage to copper tube or flag. Also make sure that it is clean and free of debris. Any kind of buildup on sensor will cause inaccurate moisture readings. • Check that ground strap is attached from sensor to sample tube. • Take a voltage reading on moisture sensor wire and terminals in power box and control box: Green = common, Red = 24VDC supply to sensor, Blue = 0-3V (return voltage for temperature), Black = 0-10VDC (return voltage for moisture). • On moisture sensor 0V = 50%, 10V = 0%.

Rotary Fill Switch

Image 4-1 – Upper rotary fill switch

Locations of rotary fill switches are shown in Fig. 3. They are used to indicate when dryer is full or running low on grain. A fault will be displayed when this occurs.

Fault Condition
10-Minute Load Attempt Timeout

All dryer models use wire #44

1. Is wet bin out of grain?
   If this is last load of season, press Reset and Start →Final Dry.
2. Has an auxiliary load malfunctioned?
   Repair cause of load failure and press Reset.
3. If wet grain is available and load auxiliaries are functioning, is fill switch bound up?
   If so, free the fill switch and repair cause.
4. Are both PLC input lights off? (Both lights should be off when dryer is calling for grain.)
   Are both PLC input lights on? (Both lights should be on when dryer is full.)
   If not, remove cover from fill switch and visually check sensors for proper placement in their respective holders. See Fig. 4-1.
5. Check PLC input lights (# 44-Lower; # 53-Upper) while someone stops fill switch.
   Lower-Input 1.1.1; **Upper-Input 1.2.3**
   If either PLC input light does not turn on, check for 24VDC on wire # 18 to ground. (Touch black probe from meter to dryer frame.)
6. If 24VDC is detected on wire # 18, check for 24VDC on other wire going to sensor.
   a. With fill switch not spinning, 24VDC should be detected on wire # 44 or # 53.
   b. If not, replace respective sensor and recheck for voltage.
7. If 24VDC is detected at power box terminal strip and PLC input lights are not on, PLC may be malfunctioning.

Images 4-2, 4-3 – Upper rotary fill switch, fill sensor

Vapor Over Temperature Switch

Image 4-4 – Vapor over-temp switch

On an LP dryer, vapor over-temp switch is located on pipe train. Its purpose is to detect gas that is overheating and prevent damage to heater components. See Image 4-4.

Fault Condition
Vapor Over-Temp

All dryer models use wire #37

1. This fault indicates when output of vaporizer coil has become too hot (above 140 F).
a. Tubing near fault device should be fairly warm to touch, but not hot.
b. Check fuel supply. Is tank low on fuel?
c. Check for air inlet obstruction. Clear any debris.
2. Has vaporizer coil had sufficient time to cool down?
   Device will automatically reset when it has cooled down.
3. Is PLC input light on?
   a. After device has cooled down and reset, PLC input light should be ON.
   b. If not, follow wiring from coil to heater box and check for 24VDC on wire # 18.
4. If 24VDC is not found on wire # 18, go to power box and check for 24VDC on terminal strip.
   If 24VDC is found on wire # 18 on power box terminal strip, check wiring connections from heater box to power box.
5. With 24VDC being found on wire # 18 on one wire of vaporizer O/T switch, and after device has cooled down to ambient temperature, check for 24VDC on other wire (not # 18) coming from O/T switch.
   a. If 24VDC is NOT found on other wire, O/T switch is bad.
   b. If 24VDC is found on other wire coming from O/T switch, take note of wire number and go to power box and check for 24VDC on terminal strip.
   c. If 24VDC is NOT found on power box terminal strip, check wiring connections between power box and heater box.
   d. If 24VDC is found on input terminal, and input light is NOT on, and fault message is still being displayed (after pressing RESET), then PLC is malfunctioning.

Access Door Switches

Image 4-5 – Access door switch

Access door switches, also called key switches, are located on each door on dryer. The switches are used to keep dryer from running when a door is open and a person may be inside of tower dryer.

Fault Condition
Door is Open

All dryer models use wire #36.

1. Check doors to be sure no one is inside and doors are closed.
2. If both doors are closed, check that PLC input light is ON. If light is **not** ON, go to junction box that contains wire from switches. Remove cover and check for 24VDC on input wire.

NOTE: On ALL dryers, wire # 18 feeds into door switches. Switches are connected in series and route back to PLC input.

3. If 24VDC is not present on input wire, check that 24VDC is present on wire #18.
   a. If 24VDC is present on input wire, but PLC input light is not ON, check for 24VDC returning from both switches. Generally, each additional door switch adds a letter to wire number after coming out each successive key switch: 36, 36A.
   b. If 24VDC is not returned from door switches, a voltage check on wire coming from each switch may be required.
4. If 24VDC is being returned from last switch, check for 24VDC on appropriate wire on power box terminal strip.
   a. If 24VDC is not found on power box terminal strip, check wiring connections between junction box and power box.
   b. If 24VDC is found on power box terminal strip, check #36 on PLC for 24VDC
5. If 24VDC is present on PLC input terminal but input light is not on and there is a door fault, PLC is malfunctioning.

Grain Column Over Temperature Switch

Image 4-6 – Grain column over-temp switch

There are two or three grain column over-temperature switches on dryer (two on modular, three on regular). See locations in Fig. 3 and Table 1. These sensors monitor temperature in grain. Switch will turn dryer off if temperature reaches 240℉.

Fault Condition
Column Over-Temp

Upper switch uses wires 84 & 85
Middle switch uses wires 82 & 83
Lower switch uses wires 80 & 81

Check all grain columns for obstructions that would prevent grain from flowing through. If an obstruction is found, do not restart dryer until it has been cleared.

NOTE: To check for an obstruction, go to Manual operation and turn unload to ON. Run unload long enough for grain level in columns to drop at least 1 foot. Stand back from dryer and look through screens to observe grain level in each column. Any column with an obstruction will be readily visible.

1. If no obstructions are found and grain is flowing freely through each column, plenum temperature may need to be reduced.
2. If column temperature has cooled down and RESET button has been pressed on touch screen and fault message is still being displayed, remove junction box cover and check for 24VDC on wire # 18.
3. Allow time for columns to cool down.
4. At this point, 24VDC should be present on wire # 18 at O/T sensor. Check for 24VDC on other wire (not # 18) coming from sensor.

a. If 24VDC is NOT detected, O/T sensor is defective.
b. If 24VDC is found on wire coming from O/T sensor but PLC input light is NOT on, note number of wire and go to power box and check for 24VDC on terminal strip.
c. If 24VDC is NOT found on terminal strip in power box, check wiring connections between junction box and power box.
d. If 24VDC is detected on terminal strip in power box, go to PLC and check for 24VDC on input terminal.
e. If 24VDC is detected on PLC input terminal, and input light is not on and fault message is still displayed (after pressing RESET), then PLC is malfunctioning.

Blower Air Switch

Image 4-7 – Blower air switch (shown before sensor tube connected)

Air switch sensor monitors air flow at inlet of blower. Single-blower dryers have one air switch; three-blower dryers have three. Device will shut down dryer if there is not enough air flow. See Images 4 and 5 for location of switches in power box, and Fig. 3 and Table 1 for location of sensor(s) on dryer.

Fault Condition
No Static Air Pressure

Blower 1 uses wire # 143
Blower # 2 uses wire # 243
Blower # 3 uses wire # 343

1. For monitoring adequate air flow, blower(s) must be turned on.
2. Using Tools → Manual Operation, turn blower(s) ON. Check for proper operation and airflow.
3. If a fault message is displayed, switch may not be adjusted correctly.
   a. Open power box.
   b. With blower switch turned to ON, check PLC input light. It should be ON.
   c. If input light is NOT on, check tubing for kinking and to ensure it is positioned to sense air flow into blower. Also check fittings on switch in power box to ensure tight connection. If fan is on and input light is still not on, use a straight screwdriver to turn adjustment screw counterclockwise until screw is up against c-ring.
   d. Once input light is on, turn blower(s) off and observe PLC input light. Light should turn OFF as blower(s) slows down.
   e. If light remains ON after blower(s) slow or stop, switch should be replaced and checked again.
   f. While watching PLC input, turn blower(s) ON and then OFF, ensuring input light is turning on and off with fan.
4. If, after going through above procedure, PLC input light remains in either ON or OFF position without changing, voltage measurements will be necessary.
   a. Locate wire # 18 in junction box and check for 24VDC.
   b. If 24VDC is NOT found, go to power box and check for 24VDC on terminal strip.
   c. If 24VDC is found on terminal strip, go to PLC and check for 24VDC.
   d. If 24VDC is found on this wire, use a small screwdriver and turn screw clockwise until 24VDC is not present.
   e. If turning adjustment screw clockwise fails to turn air switch OFF, then switch is defective.
   f. If 24VDC is NOT found on wire coming from switch, use a small screwdriver to turn screw counterclockwise until 24VDC is detected.
   g. If turning adjustment screw counterclockwise fails to turn air switch ON, then switch is defective.
5. After replacing blower switch, follow previous instructions on switch adjustment for proper operation.
   a. If PLC input light is not turning on when switch is on, check voltage.
   b. Adjust switch to ON position. Check for 24VDC on wire coming from switch.
   c. Take note of wire number and go to power box. Check for 24VDC on terminal strip.
   d. If 24VDC is NOT found on terminal strip, check wiring connections between junction box and power box terminal strip.
   e. If 24VDC is found on terminal strip, go to PLC input terminal and check for 24VDC.
   f. If 24VDC is NOT found on input terminal, check wiring connections between terminal strip and PLC.
   g. If 24VDC is found on PLC input terminal but input light is not on and fault message is still being displayed after pressing RESET, PLC is malfunctioning.

Plenum Over Temperature Switch

Image 4-8 – Plenum over-temp switch.

Plenum over-temp switch is located inside plenum of dryer. See Fig. 3 and Table 1 for location(s). It is provided to protect plenum from over-heating.

Fault Condition
Plenum Over-Temp

Switch uses wire # 39

1. With dryer shut down, open door and inspect plenum for any problems.
2. After plenum has cooled down, press RESET and fault should be cleared. **NOTE:** Switch will reset automatically when temperature drops below 325°.
3. If fault has not cleared, remove cover from junction box containing plenum O/T switch and check for 24VDC on wire # 18.
4. If 24VDC is NOT detected, check connection with terminal 18 in power box.
5. Check for 24VDC on other side of switch.
   a. If O/T switch has cooled down below 325° and 24V DC is NOT found on other wire, then switch is defective.
   b. If 24VDC is found on other wire coming from switch, go to PLC and check input light. If input light is ON, press RESET and fault should clear.
   c. If input light is not ON, take note of number of wire coming out of O/T switch. Go to power box and check for 24VDC on terminal strip.
   d. If 24VDC is NOT found on power box terminal strip, check wiring connections between junction box and power box.
   e. If 24VDC is found on power box terminal strip, check for 24VDC on PLC input terminal.
   f. If 24VDC is found on PLC terminal and input light is OFF and fault message is still displayed, PLC is malfunctioning.

Incoming/Discharge Moisture Sensors

Image 4-9 – Incoming moisture sensor

See Fig. 3 and Table 1 for locations of incoming and discharge moisture sensors. They monitor moisture and temperature of grain as it enters and is discharged from dryer.

Input Sensor Not Found

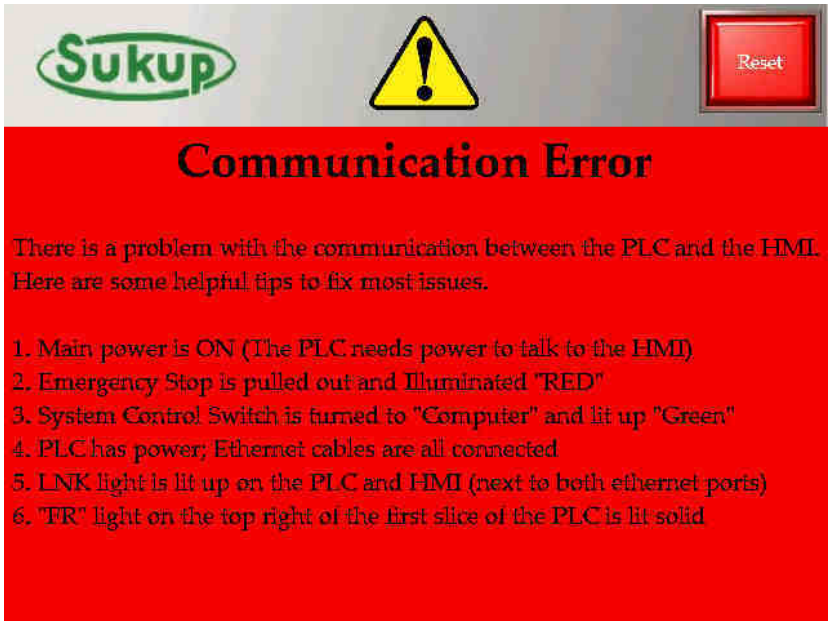
If red “Input Sensor Not Found” screen appears, it means that at least one analog input sensor is missing from PLC. Follow steps below.

1. Using a screwdriver, remove cover on junction box.
2. Find the four (4) wires used by moisture sensor. They are red, blue, black, green + shield.
3. Using a voltage meter, check for 24VDC voltage between red and green + shield. If 0VDC is found, check connection between power box and junction box.
4. Assuming red wire has 24VDC, check for DC voltage between black and green + shield wires. Something between 1 and 10VDC should be detected. If so, check connection between junction box and power box. Black wire is labeled D3/D5 (D3 for incoming moisture, D5 for discharge moisture) on power box terminal strip. If 0VDC is found, sensor is malfunctioning and must be replaced.
5. If same voltage is found on D3/D5 terminal in power box as back in junction box, check between D3/D5 terminal on PLC and 95. If 0VDC is found, there is a connection problem between power box terminal strip and PLC. If same voltage (1-10VDC) is present on PLC D3/D5 input as junction box, the green analog input PLC card may be malfunctioning.
6. Blue wire is labeled D4 on power box terminal strip. If voltage between 0VDC to 3.0VDC is not found, sensor is malfunctioning and must be replaced (0.70 = 70°F.)

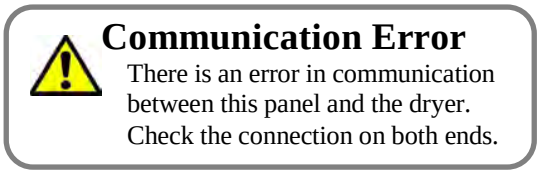
Image 4-10 – Discharge moisture sensor in static sample box

QuadraTouch™ Controller

If connection between QuadraTouch™ panel and PLC is lost, Communication Error screen shown below will appear. Screen may include a gray, horizontal error bar on bottom.



Fixing a Communication Error



1. Make sure power to both the QuadraTouch™ and PLC are ON. Ensure Emergency Stop switch is pulled out to its normal operating position and that system control switch is in “COMPUTER” position. Also, green rocker switch on QuadraTouch™ controller needs to be ON.
   a. When both devices are turned on, QuadraTouch™ will boot up slightly faster than PLC. Main screen with gray, horizontal error bar on bottom of screen will most likely appear. It will take up to 15-20 seconds before both devices realize they are linked. Gray, horizontal error bar will disappear when communication error has cleared.
   b. When gray, horizontal error bar disappears, press Reset. System will go to main screen.

2. If both devices have power and communication error still exists, there are a few things that need to be checked.
   a. Make sure Ethernet cable is securely fastened into side of QuadraTouch™ controller → Ethernet coupler in box → Ethernet coupler in Power Box → PLC. Ethernet port of PLC should have LNK light lit up when both devices are turned on and cables are connected.
   b. If LNK light is not lit up, connect Ethernet cable directly between QuadraTouch™ controller and PLC, thus eliminating couplers.
   c. If LNK light still does not come on, there is most likely a problem with Ethernet port on touch panel or with PLC.
   d. Assuming LNK light is now lit up, make sure FR light on top right of first slice of PLC (black power slice) is lit solidly. If light is blinking after more than 1 minute of boot time, it may be necessary to reload software and/or call your dealer.

Plenum/Grain Column Temperature Sensor RTD and Transmitter

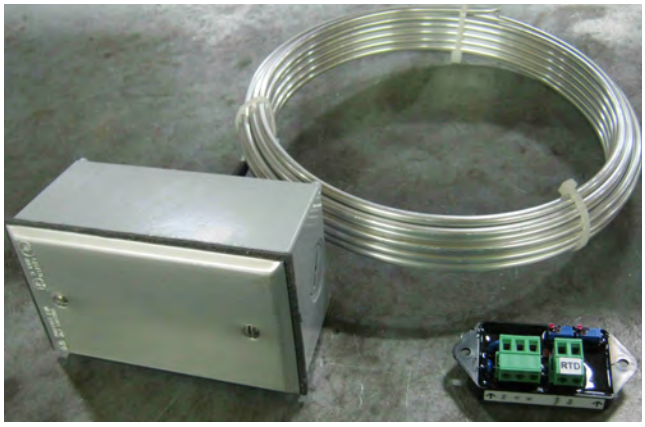


Image 4-11 – Plenum temperature sensor RTD and transmitter

Plenum and grain column temperature sensors consist of RTD (Resistance Temperature Detector) and transmitter. See Fig. 3 and Table 1 for locations of plenum and column temperature sensors.

RTD measures average resistance over length of tube. Dryers use 24' or 28' tube lengths, and one single-point RTD.

RTD is used with a transmitter that converts resistance into a 1 to 5 VDC signal. This voltage is then fed into PLC and displayed on QuadraTouch™ screen.

If RTD is in question, a voltage and resistance comparison can be made to determine if unit is defective.

1. Begin by locating RTD transmitter. A white label should be attached to transmitter. Also, two terminal strips, each with three terminals, are located on top of transmitter. Next to terminal strips are two small adjustment screws. NEVER adjust either of these screws. They are calibration adjustments and once moved, transmitter will not work correctly until a factory calibration is performed.
2. Locate terminal strip with output, +, and – connections. Check for 24VDC on terminal # 2 and # 3.
3. If 24VDC is not present, note wire numbers and go to power box and check for voltage on terminal strip.
4. With 24VDC present at transmitter, check output voltage (# 1 and # 3). Voltage between 1.0VDC and 5.0VDC should be found.

Image 4-12 – Single-point grain column temperature sensor

5. With 24VDC on terminals # 2 and # 3 but no voltage between terminals # 1 and # 3, transmitter is defective.
6. If voltage is detected, use table on next page to determine if equivalent temperature is reasonable.
7. If voltage is detected between terminals # 1 and # 3, go to other terminal strip and remove two wires coming from RTD (red and yellow).
8. A jumper should be connected between terminals # 2 and # 3.
9. Take a resistance reading with meter. Resistance of RTD is directly related to temperature of RTD.

NOTE: This reading should be taken with dryer cooled down and at ambient temperature.

Plenum/Column Temperature Sensor RTD and Transmitter (continued)

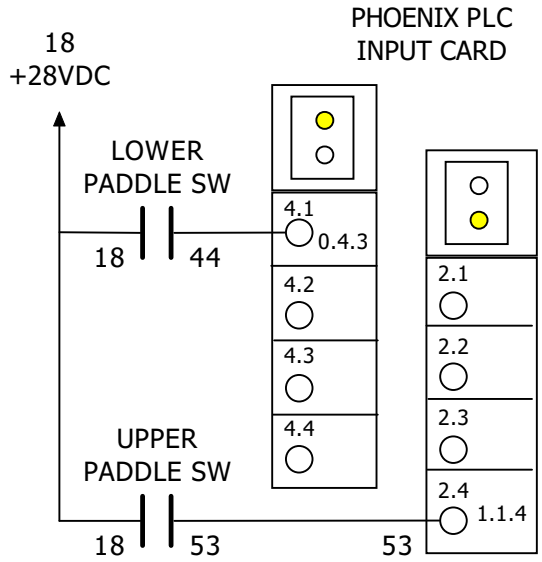
10. If reading shows infinite (open) resistance, RTD is defective. Compare resistance reading to table below to determine if resistance is reasonable.
11. If resistance compares to ambient temperature around dryer, and voltage on output wire is close to ambient temperature, then transmitter and RTD are functioning correctly.

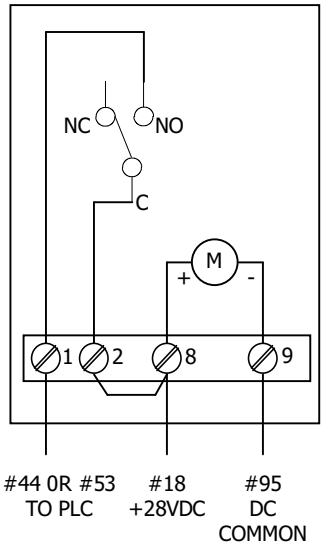
Temperature (℉)	Resistance (1,000 ohm) of Plenum RTD	Resistance (100 ohm) of Single-point RTD	Voltage
10	952	95.2	1.16
15	963	96.3	1.24
20	974	97.4	1.32
25	984	98.4	1.40
30	995	99.5	1.48
35	1006	100.6	1.56
40	1017	101.7	1.64
45	1028	102.8	1.72
50	1039	103.9	1.80
55	1049	104.9	1.88
60	1060	106.0	1.96
65	1071	107.1	2.04
70	1082	108.2	2.12
75	1093	109.3	2.20
80	1103	110.3	2.28
85	1114	111.4	2.36
90	1125	112.5	2.44
95	1136	113.6	2.52
100	1146	114.6	2.60
105	1157	115.7	2.68
110	1168	116.8	2.76
115	1178	117.8	2.84
120	1189	118.9	2.92
125	1200	120.0	3.00
130	1211	121.1	3.08
135	1221	122.1	3.16
140	1232	123.2	3.24
145	1243	124.3	3.32
150	1253	125.3	3.40
155	1264	126.4	3.48
160	1275	127.5	3.56
165	1285	128.5	3.64
170	1296	129.6	3.72
175	1306	130.6	3.80
180	1317	131.7	3.88
185	1328	132.8	3.96
190	1338	133.8	4.04
195	1349	134.9	4.12
200	1359	135.9	4.20
205	1370	137.0	4.28
210	1380	138.0	4.36
215	1391	139.1	4.44
220	1402	140.2	4.52
225	1412	141.2	4.60
230	1422	142.2	4.68
235	1433	143.3	4.76
240	1443	144.3	4.84
245	1454	145.4	4.92
250	1464	146.4	5.00

ROTARY FILL SWITCH WIRING & 10-MIN "OUT OF WET GRAIN" FAULT.

TOWER DRYER

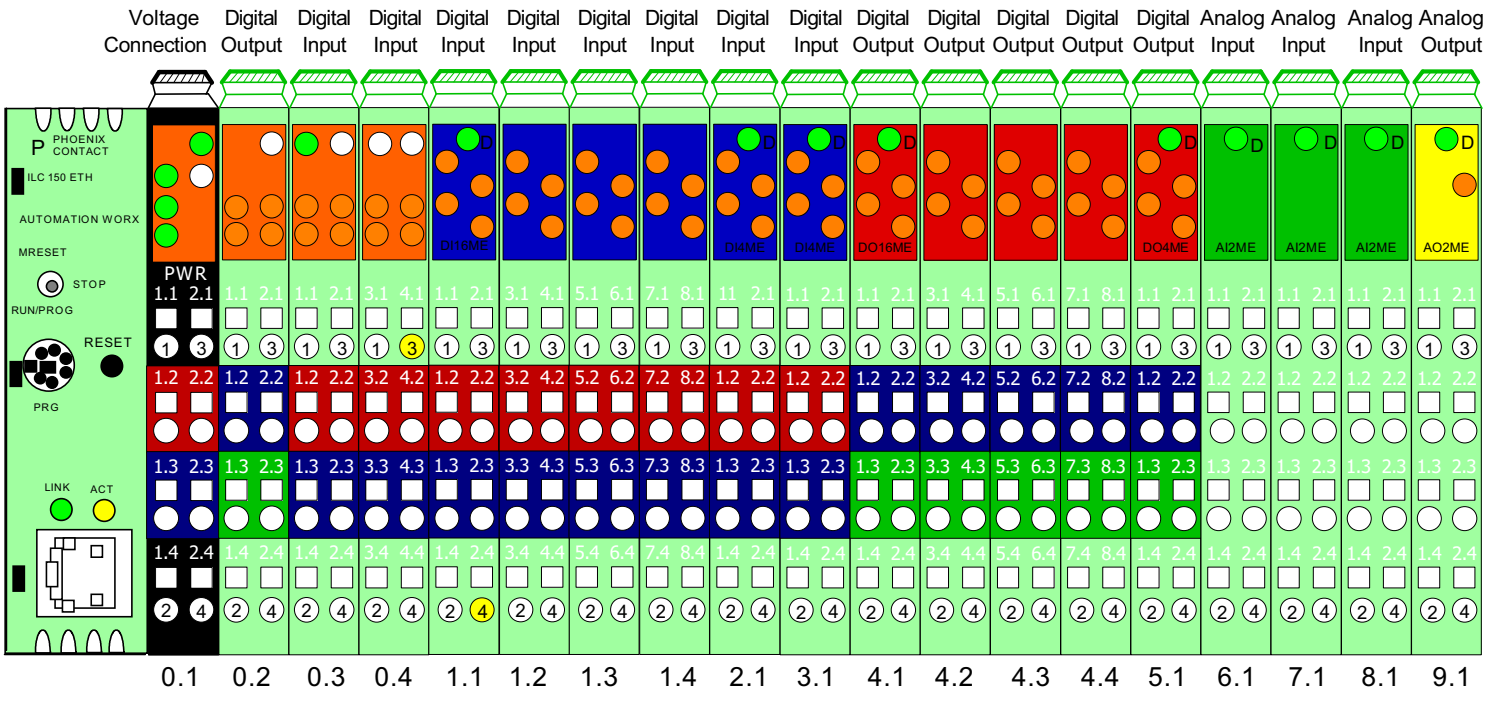
Rotary switches are used to control the load system in filling the dryer. There are two rotary fill switches located on dryer, upper, or roof, and lower, or sidewall. By using two switches, the load system cycling time can be controlled. When rotating, or off, the PLC control will turn on the load system. If the lower fill switch input is off for more than 10 minutes, a 10 minute "out of wet grain" fault will occur.





Fault Condition

10-Minute Load Attempt Timeout

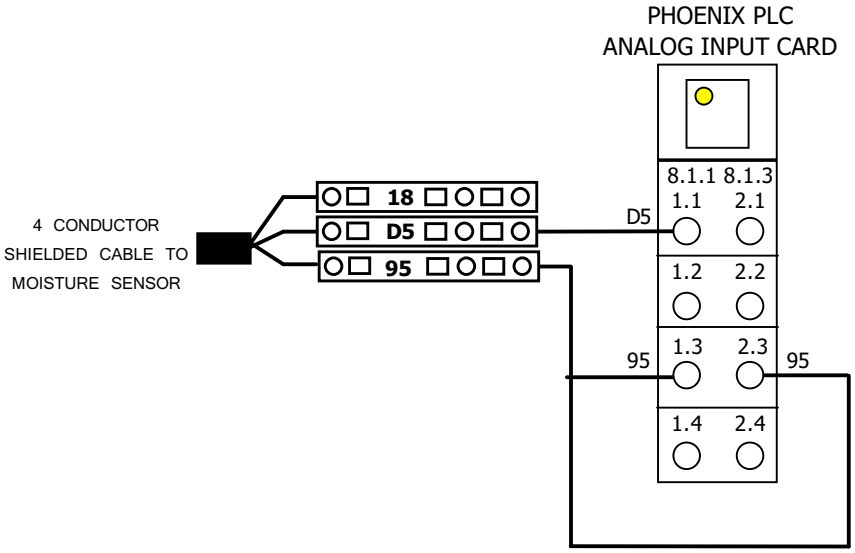


Yellow circles show connection points for lower and upper fill switches.

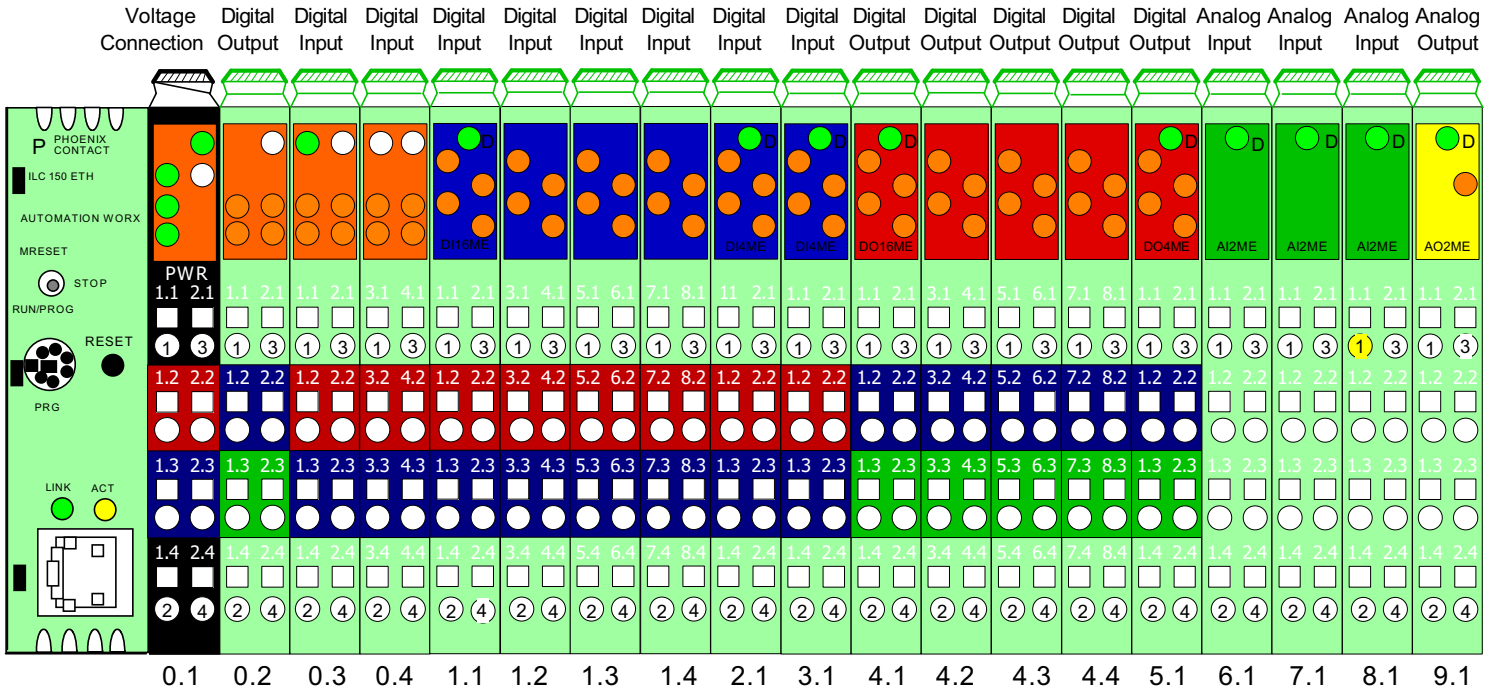
Title: TOWER DRYER: FILL SWITCHES & 10 MIN OUT OF WET GRAIN FAULT	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

INCOMING MOISTURE SENSOR

Incoming moisture sensor is located at top of dryer on one of the upper solid sheets. This sensor will read moisture and work with the discharge moisture sensor in controlling the unload rate of the dryer in automatic mode using moisture-based control. 0% = 9.98VDC 48% = 0VDC



WIRE NUMBERS AND VOLTAGES:
#18: +24VDC
#95: 0VDC - DC COMMON
MOISTURE SENSOR CABLE VOLTAGES
RED: +24VDC - MAY ALSO BE LABELED 18
BLACK:1 - 9.97VDC - VARIABLE: DEPENDS ON GRAIN MOISTURE, MAY ALSO BE LABELED D5
GREEN & SHIELD: 0VDC - DC COMMON MAY BE LABELED 95



Yellow circle shows connection point for incoming moisture sensor.

Title: TOWER DRYER: INCOMING MOISTURE SENSOR	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

GRAIN COLUMN OVER TEMPERATURE SENSOR

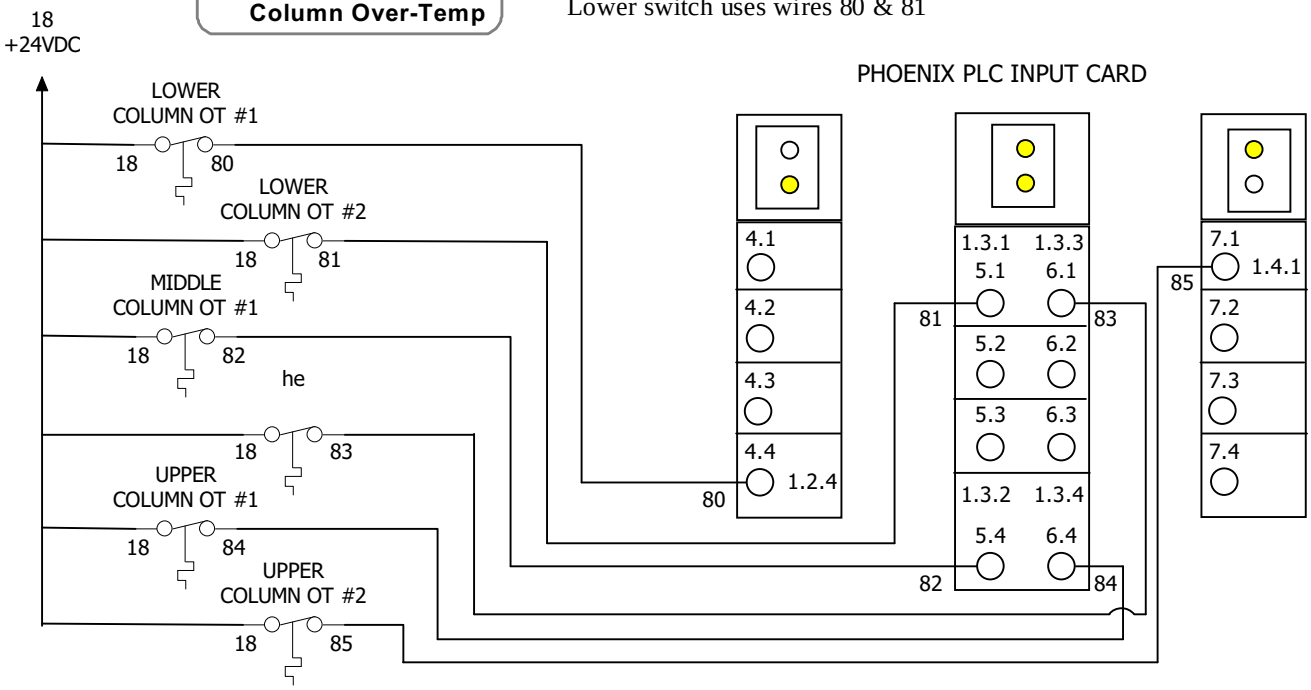
TOWER DRYER

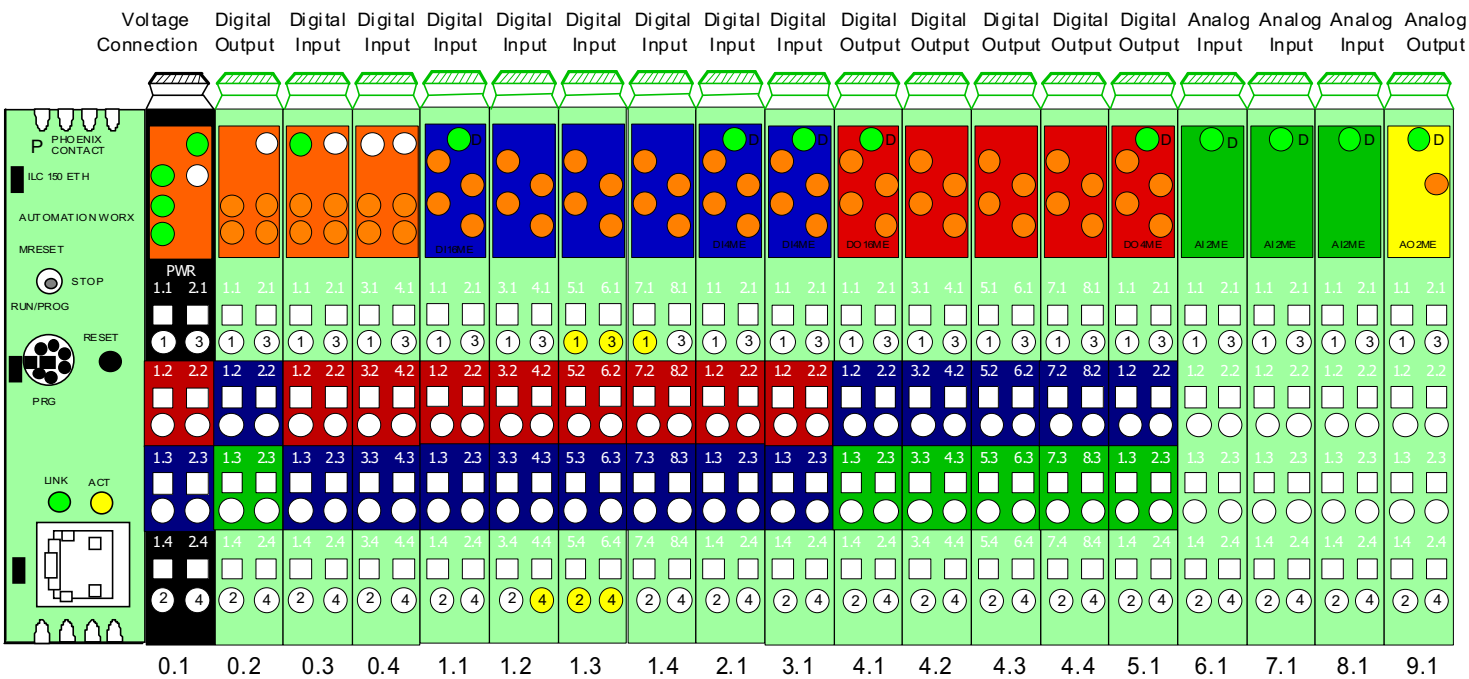
Grain column O/T sensors are located at three levels on dryer. There are two individual sensors at each level fastened to exterior. Upper and middle sets extend around the dryer. The lower set is fastened around the interior of dryer in the cooling chamber. The upper set is located at top of the first perforated sheet. Middle set is located by grain exchangers. They are used to monitor grain temperature. They will open at 240 F.

Fault Condition

Column Over-Temp

Upper switch uses wires 84 & 85
Middle switch uses wires 82 & 83
Lower switch uses wires 80 & 81





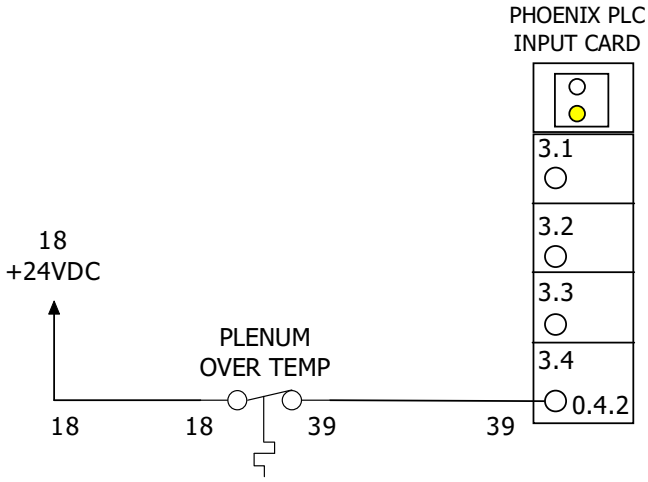
Yellow circles show connection points for the column O/T switches.

Title: TOWER DRYER: GRAIN COLUMN O/T SENSORS	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYERS

PLENUM OVER TEMPERATURE SWITCH

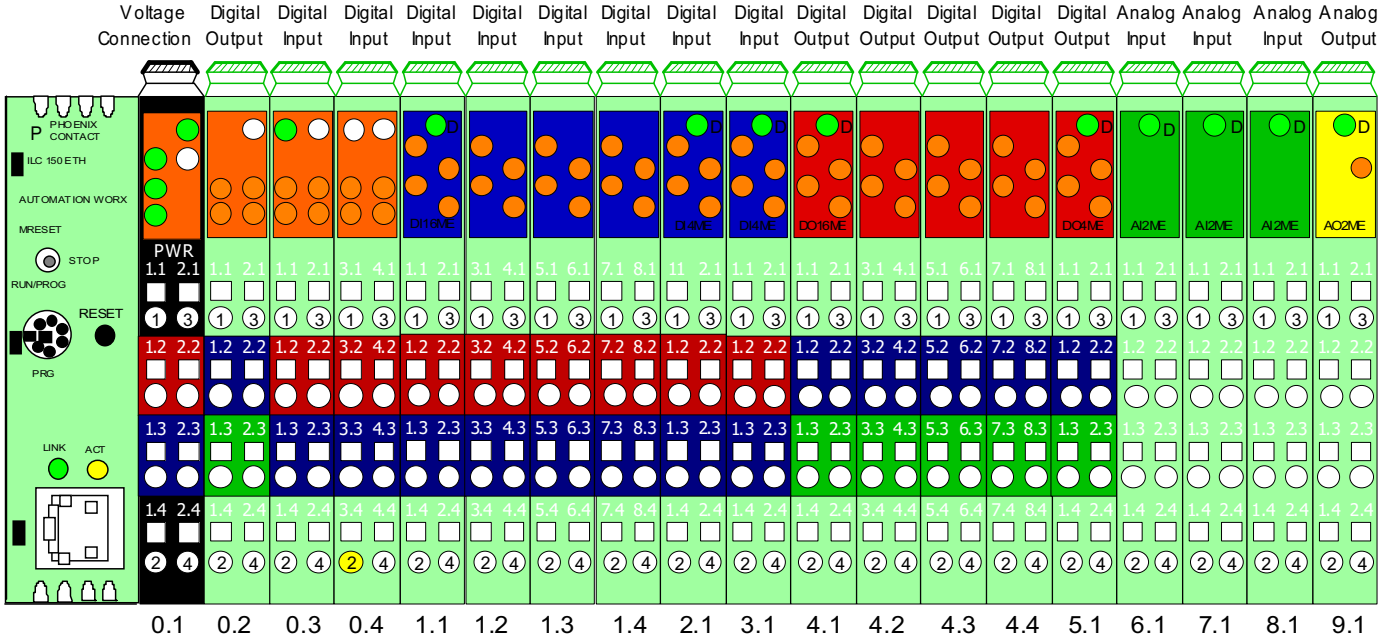
Sensor for over temperature switch is used to monitor temperature inside plenum. A sensor runs around inside of the plenum, 1 to 2 ft. below the top of the burner barrel. If temperature reaches 325 F, the switch will open and display a fault.



Fault Condition

Plenum Over-Temp

Switch uses wire # 39

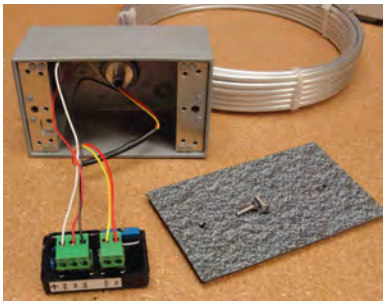


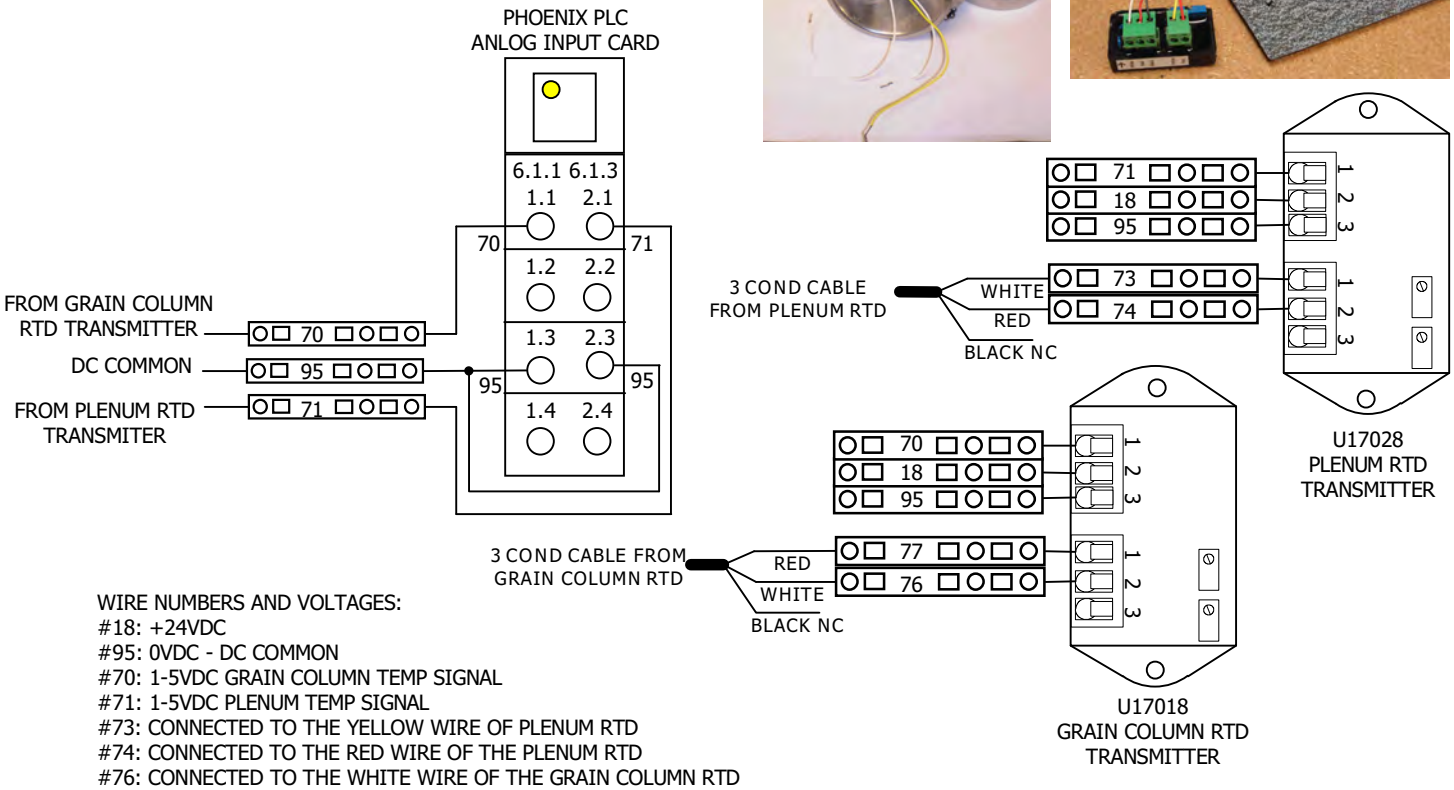
Yellow circle shows connection point for plenum O/T switch.

Title: TOWER DRYER: PLENUM O/T FAULT	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

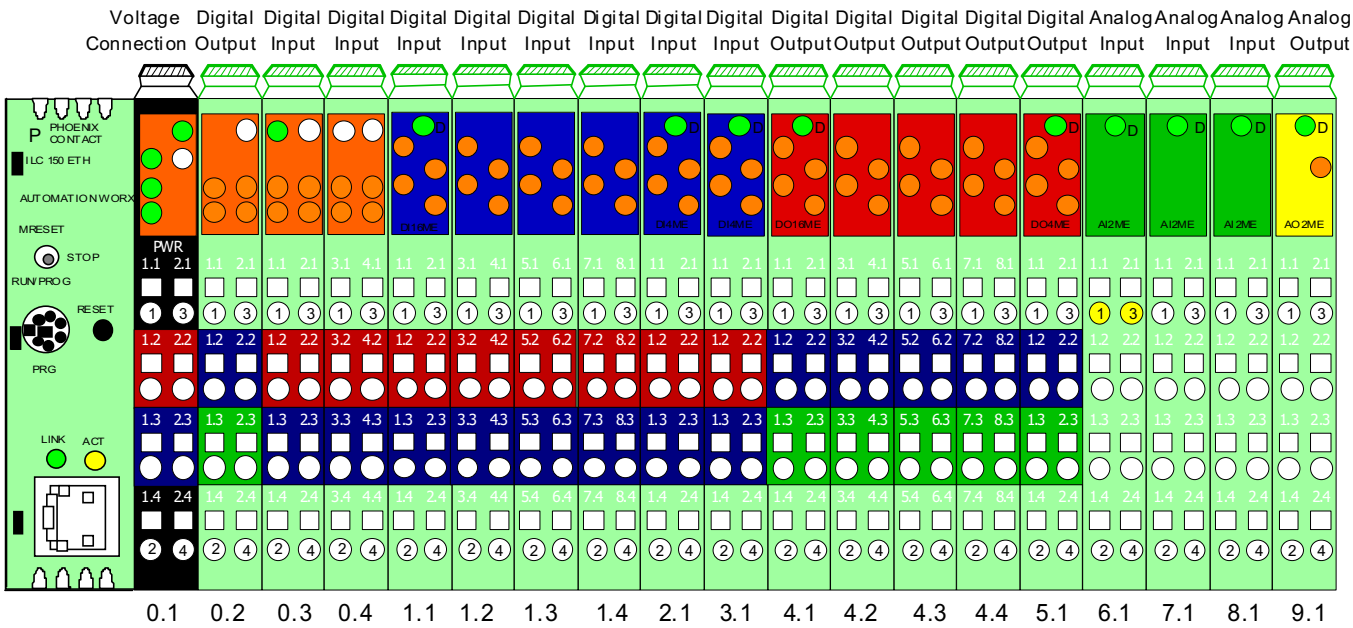
RTD SENSOR & TRANSMITTER WIRING

Two types of RTD sensor & transmitter are used. The single-point sensor is used to monitor temperature of grain column and the averaging sensor is used in plenum. Both sensors have transmitters that convert resistance to voltage. Both transmitters are located in power box.





WIRE NUMBERS AND VOLTAGES:
#18: +24VDC
#95: 0VDC - DC COMMON
#70: 1-5VDC GRAIN COLUMN TEMP SIGNAL
#71: 1-5VDC PLENUM TEMP SIGNAL
#73: CONNECTED TO THE YELLOW WIRE OF PLENUM RTD
#74: CONNECTED TO THE RED WIRE OF THE PLENUM RTD
#76: CONNECTED TO THE WHITE WIRE OF THE GRAIN COLUMN RTD
#77: CONNECTED TO THE YELLOW WIRE OF THE GRAIN COLUMN RTD



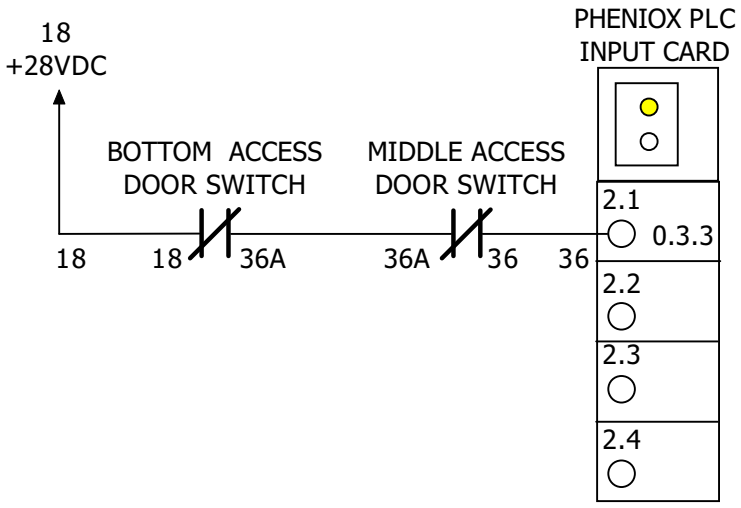
Yellow circles show the connection points for temperature signals from RTD transmitters.

Title: TOWER DRYER: GRAIN COLUMN AND PLENUM RTD	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYER

ACCESS DOOR SWITCHES

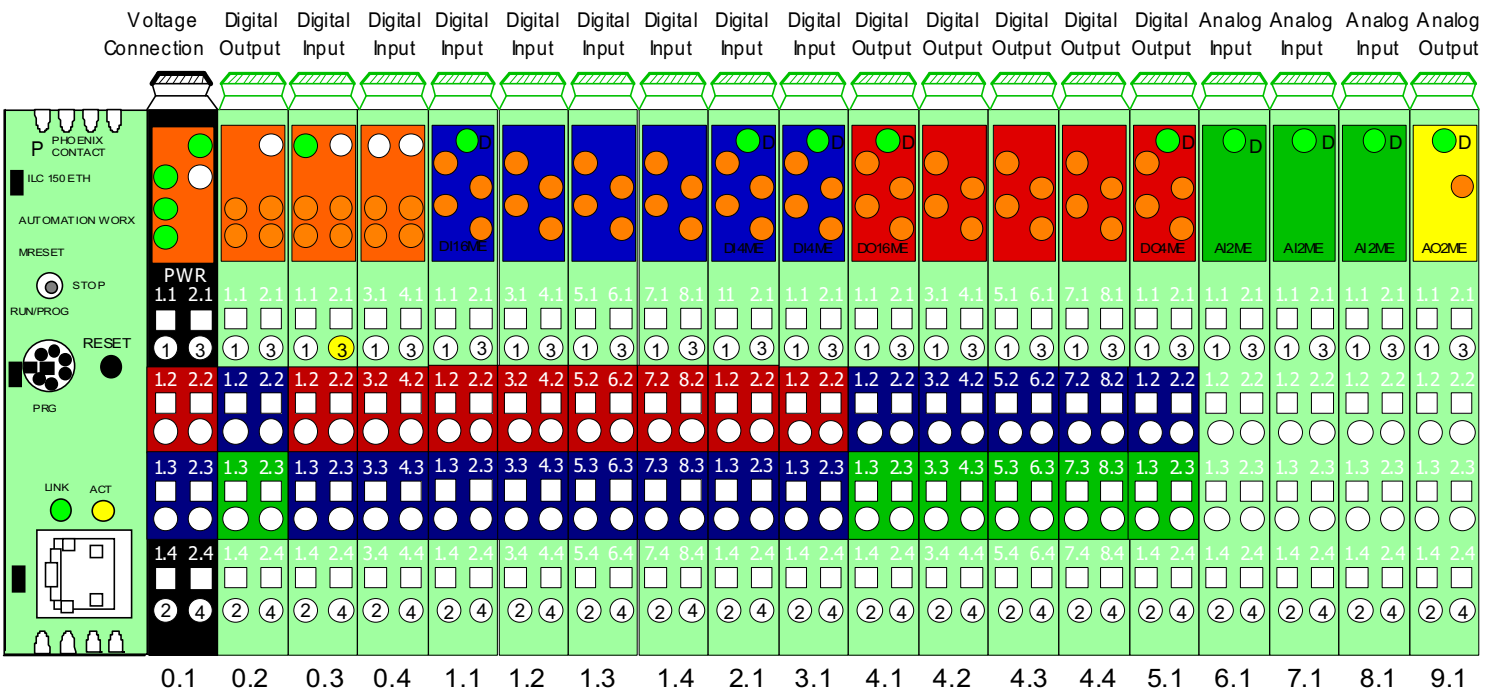
Two door switches are used on each tower dryer. The first switch is located at the bottom of the dryer, or cooling chamber. The second switch is located in the middle, or plenum chamber. The main body of the switch is mounted next to the door, with a chain and key attached to the door. The key must be removed from the switch before the door may be opened. If the key has been removed from the switch, a fault will be displayed and the dryer will not start. The door switches are wired in series.



J4487

Fault Condition
Input Sensor Not Found

All dryer models use wire # 36



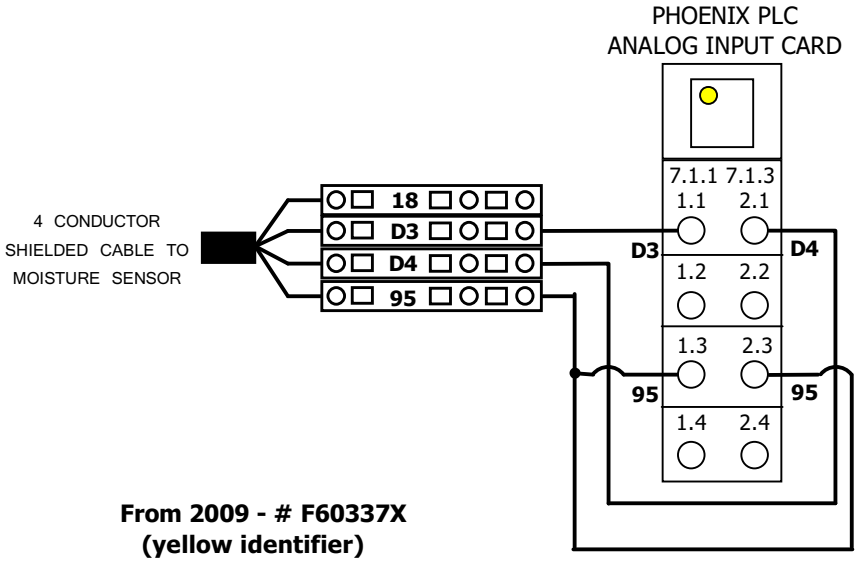
Yellow circle shows connection point for door switches.

Title: TOWER DRYER: ACCESS DOOR SWITCH ES	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYER

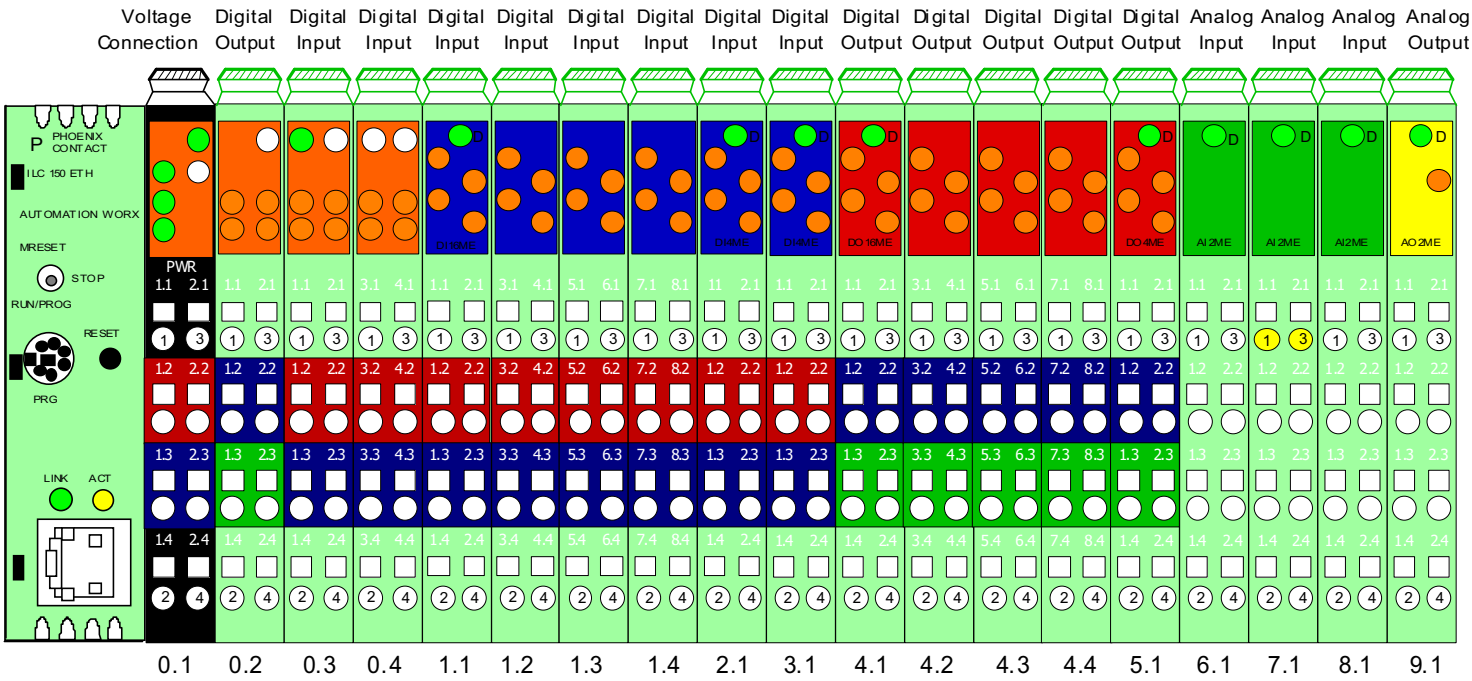
DISCHARGE MOISTURE SENSOR

Discharge moisture sensor is located on bottom of dryer in static sample box. The grain sample around the sensor flag is replaced each minute. This allows for good samples of grain necessary to achieve accurate readings of moisture and temperature. 0% = 9.98VDC 48% = 0VDC



From 2009 - # F60337X
(yellow identifier)

WIRE NUMBERS AND VOLTAGES:
#18: +24VDC
#95: 0VDC - DC COMMON
MOISTURE SENSOR CABLE VOLTAGES
RED: +24VDC - MAY ALSO BE LABELED 18
BLUE: 0 - 3VDC - VARIABLE: DEPENDS ON GRAIN TEMPERATURE, MAY ALSO BE LABELED D4
BLACK:1 - 9.97VDC - VARIABLE: DEPENDS ON GRAIN MOISTURE, MAY ALSO BE LABELED D3
GREEN & SHIELD: 0VDC - DC COMMON MAY BE LABELED 95



Yellow or shaded circles show the connection points for the grain discharge temperature and moisture inputs.

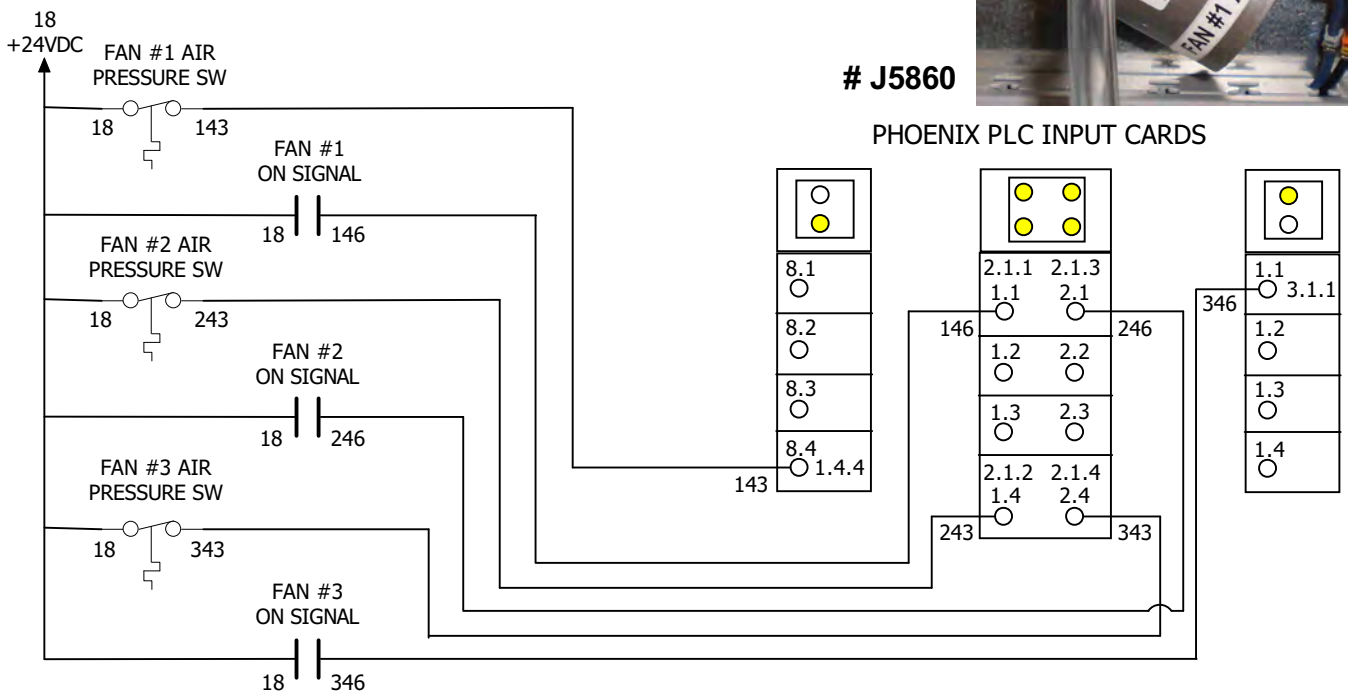
Title: TOWER DRYER: DISCHARGE MOISTURE SENSOR	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRA TOUCH

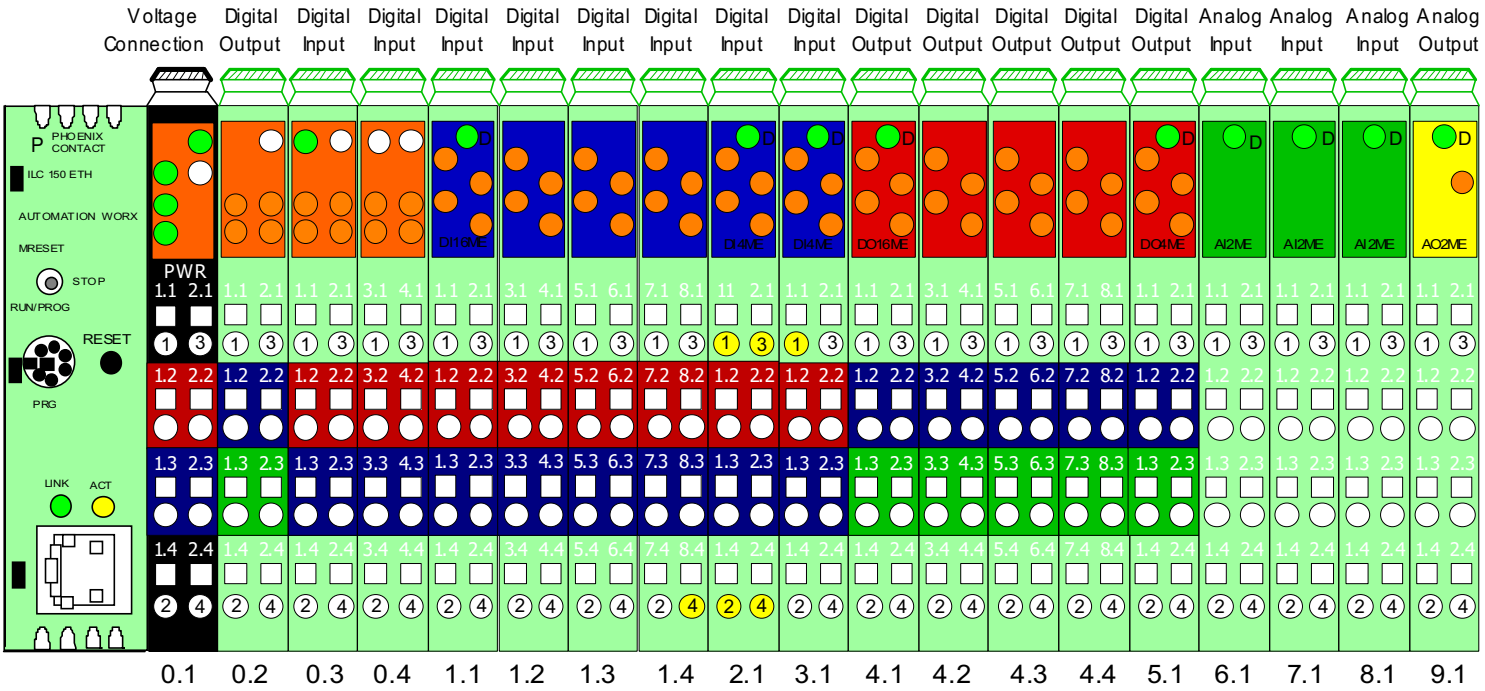
BLOWER AIR SWITCH

TOWER DRYER

This differential switch is used to monitor air pressure in the cooling chamber. The switch is mounted in the power box with a tube running from the outside of the power box up to the inlet side of the blower. There are two ports on the air switch, low and high pressure. The air tube is connected to the low pressure port of the switch. If the pressure switch opens while the burner is trying to light, or is running, the burner control unit will lose power and shut down the burner. The adjustment screw for this switch is located under the red cap. Turning the screw clockwise will increase the pressure needed to close the switch. The "Fan On" signal originates from an auxiliary contact on the fan blower contactor, or from the soft start drive unit.

 # J5860





Yellow circles show connection points for fan differential air switches and "fan on" signal connections.

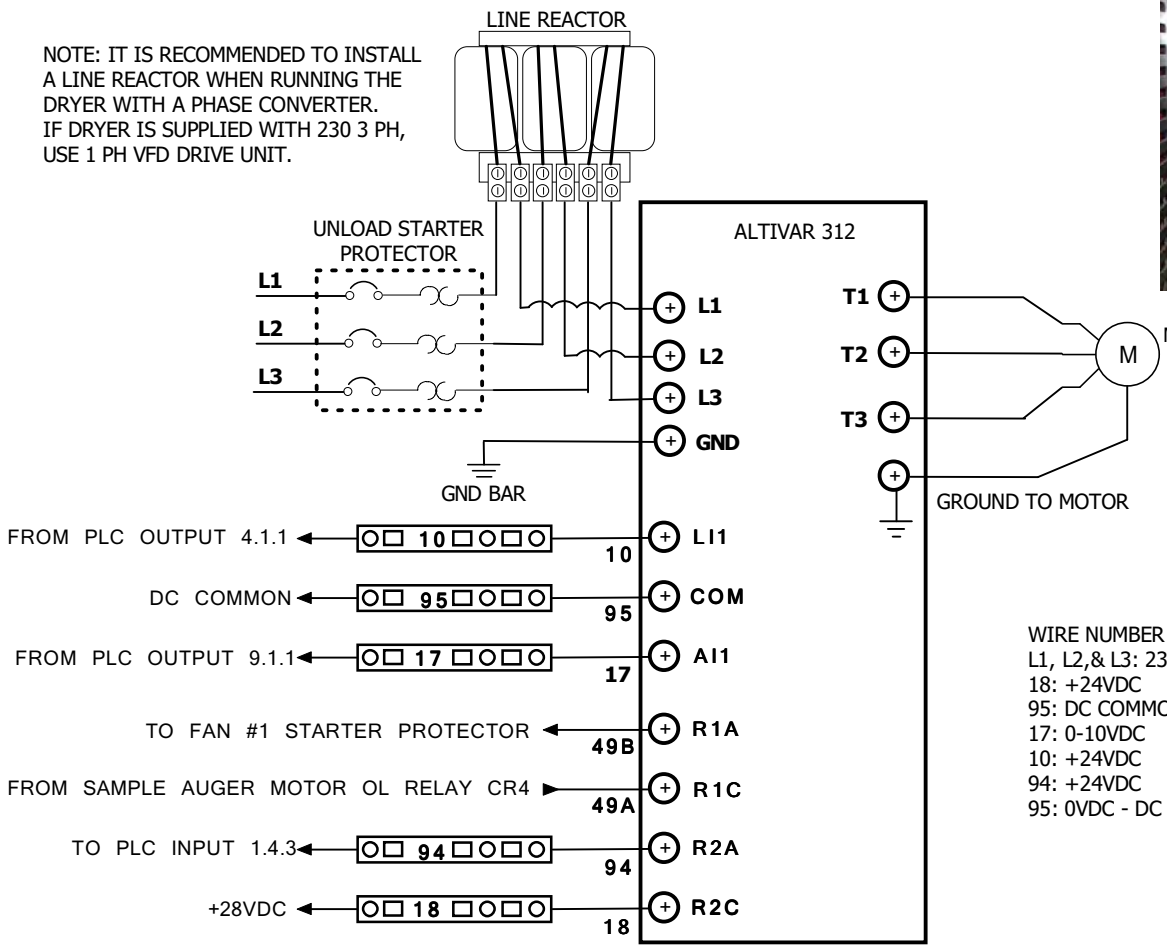
Title: TOWER DRYER: BLOWER AIR SWITCH AND "FAN ON" SIGNAL	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYER

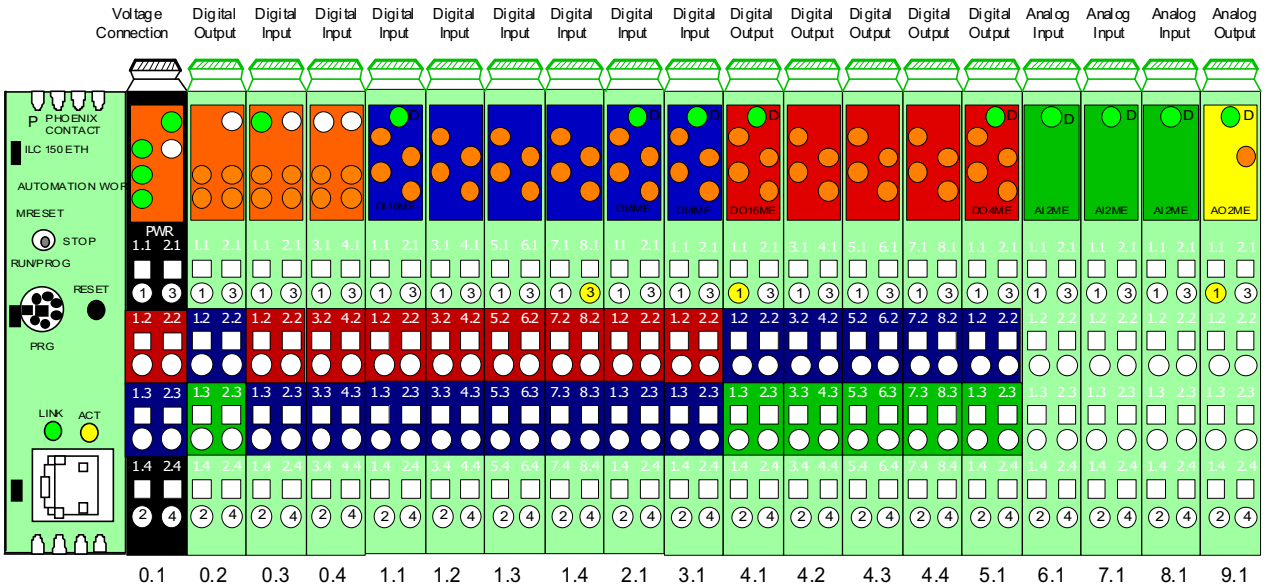
UNLOAD MOTOR VARIABLE FREQUENCY DRIVE

This drawing shows wiring connections for the frequency drive that controls the unload motor. A change to the reference voltage will cause the unload motor speed to increase or decrease. The reference voltage comes from one of the analog output cards of PLC.

NOTE: IT IS RECOMMENDED TO INSTALL A LINE REACTOR WHEN RUNNING THE DRYER WITH A PHASE CONVERTER. IF DRYER IS SUPPLIED WITH 230 3 PH, USE 1 PH VFD DRIVE UNIT.



WIRE NUMBER AND VOLTAGES.
L1, L2,& L3: 230V,460V, 3PH OR 1PH
18: +24VDC
95: DC COMMON
17: 0-10VDC
10: +24VDC
94: +24VDC
95: 0VDC - DC COMMON



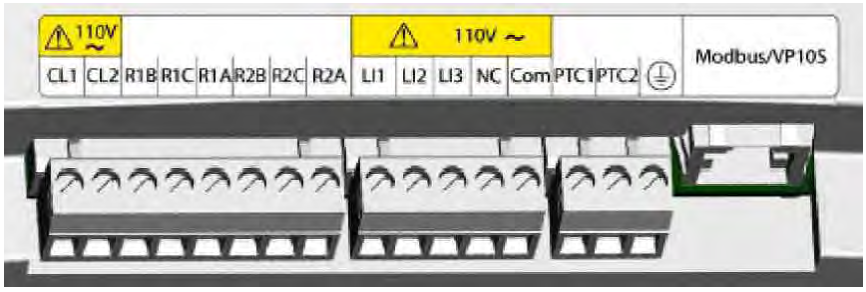
Yellow circles show connection points for wires 10, 17, & 94.

Title: TOWER DRYER: AC FREQUENCY DRIVE	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYER

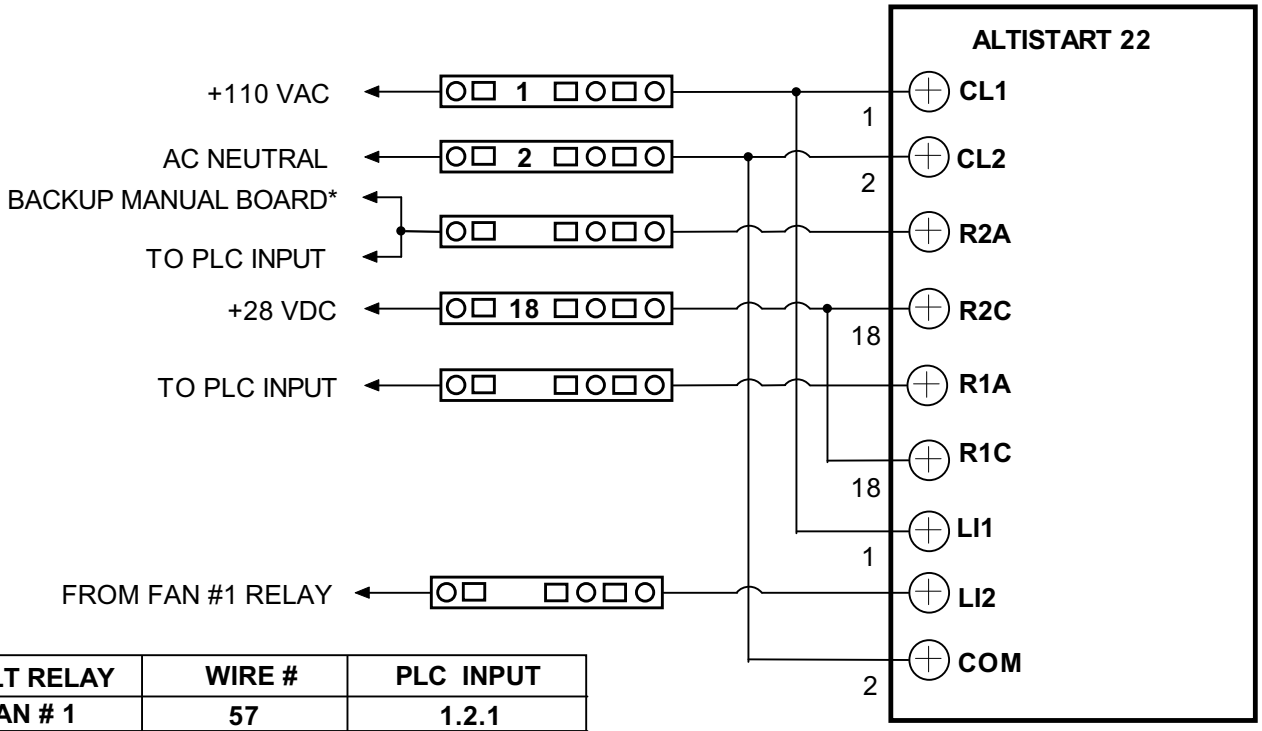
SOFT START CONTROL

This drawing shows the wiring of the control terminals for the Altistart 22 soft start drive unit. The Altistart 22 units replaced the Altistart 48. Unlike the ATS48 units, the shorting contactor is contained inside the ATS22 soft start. 120 VAC is connected to terminals CL1 and CL2. This will power the display. Relay R1 uses R1A & R1C for the drive fault relay. During a fault, these contacts will open. Relay R2 uses normally open contacts R2A & R2C. This contact will close when the blower has reached full speed. 28 VDC will then be sent to the PLC input module. L2 is the control signal input. When 120 VAC is applied to this terminal, the drive unit will start the blower. The chart at bottom of page shows the wire # and inputs for each blower.



ALTISTART 22 CONTROL TERMINALS

SOFT START CONTROL WIRING



FAULT RELAY	WIRE #	PLC INPUT
FAN # 1	57	1.2.1
FAN # 2	58	1.2.2
FAN # 3	59	1.2.3

RUN RELAY	WIRE #	PLC INPUT
FAN # 1	46	2.1.1
FAN # 2	246	2.1.3
FAN # 3	346	3.1.1

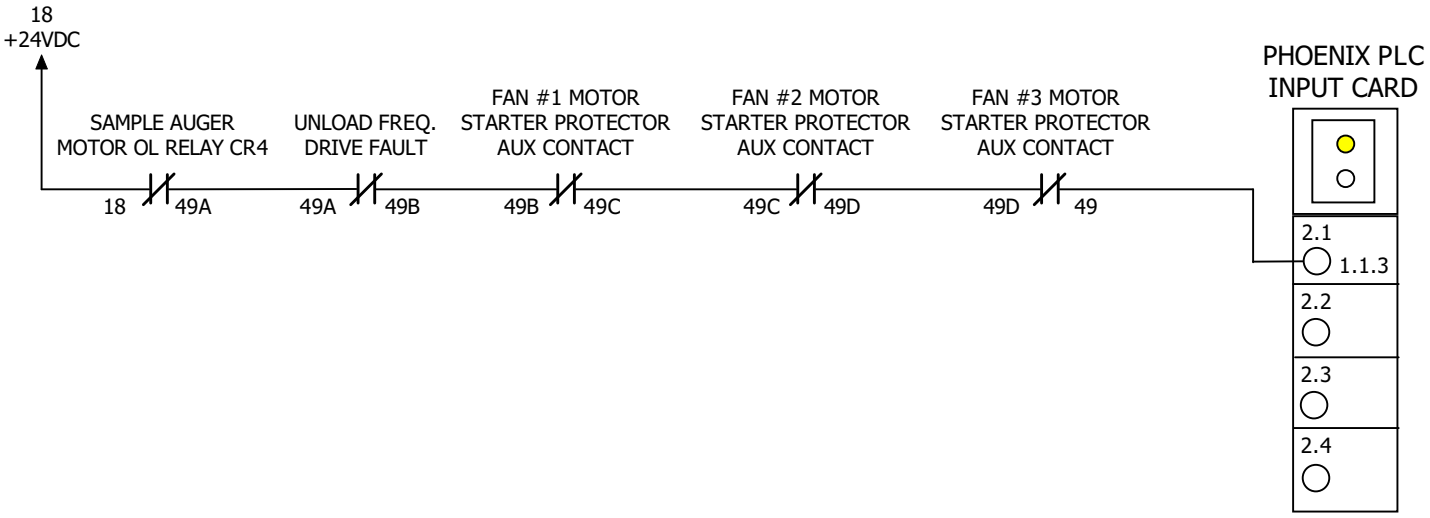
CONTROL INPUT	WIRE #	CONTROL RELAY
FAN # 1	110	K2A
FAN # 2	210	K3
FAN # 3	310	K4

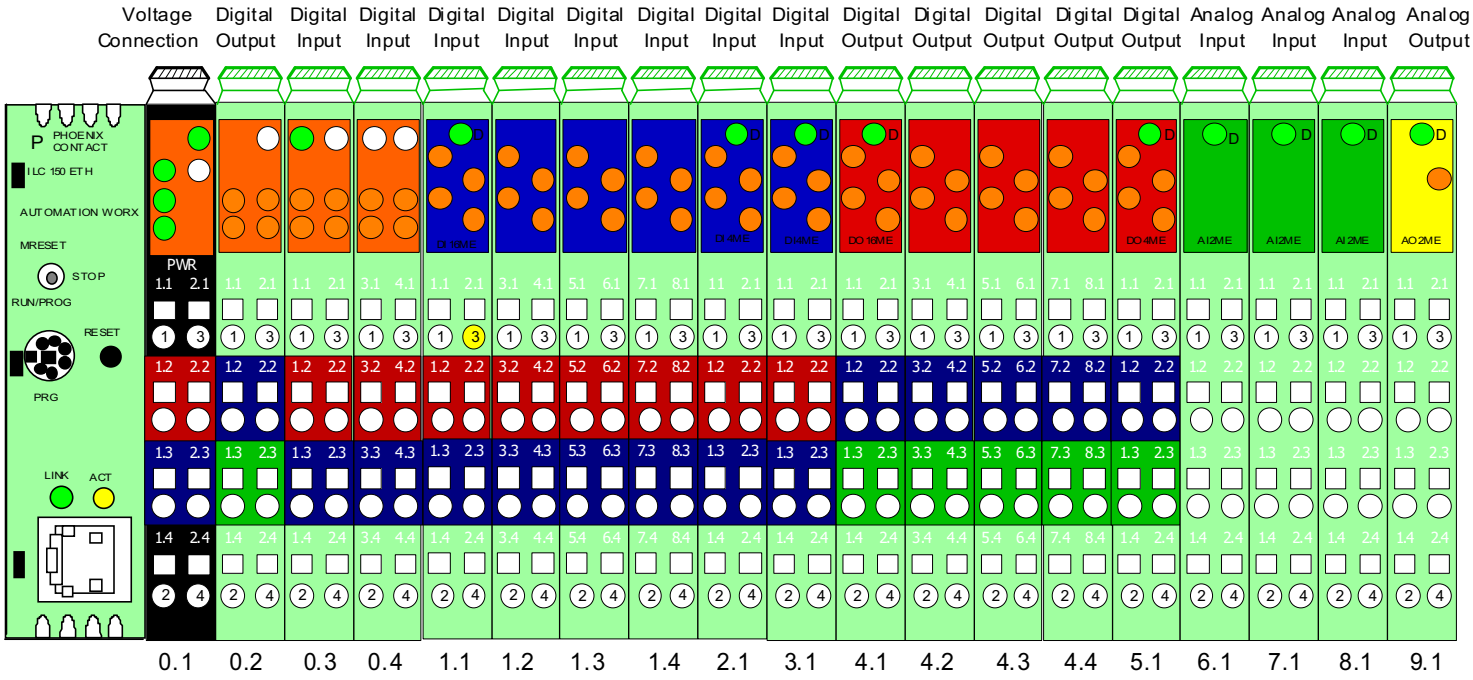
Title: TOWER DRYER: ALTISTART 22 SOFT START CONTROL WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

MOTOR OVERLOAD FAULT

Motor overload fault on dryer is a series circuit which includes an auxiliary contact mounted to each starter protector and a contact on the unload motor variable frequency drive. A fault will occur if one of the following events take place: motor is using more current than the starter protector will allow, which will trip and open a contact; when unload frequency drive goes into a fault condition, which will open a contact. When a fault occurs, each device will need to be checked.

Fault Condition
Motor Overload



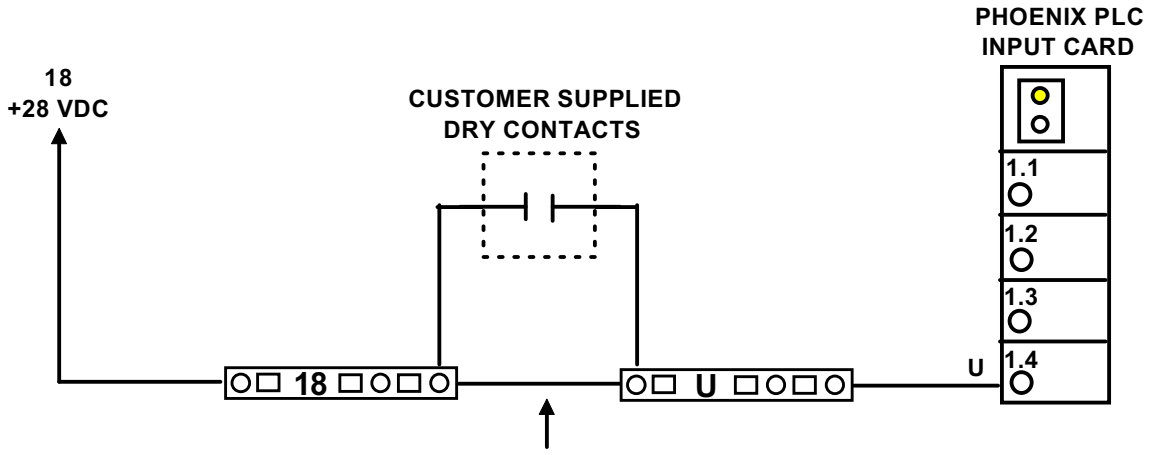


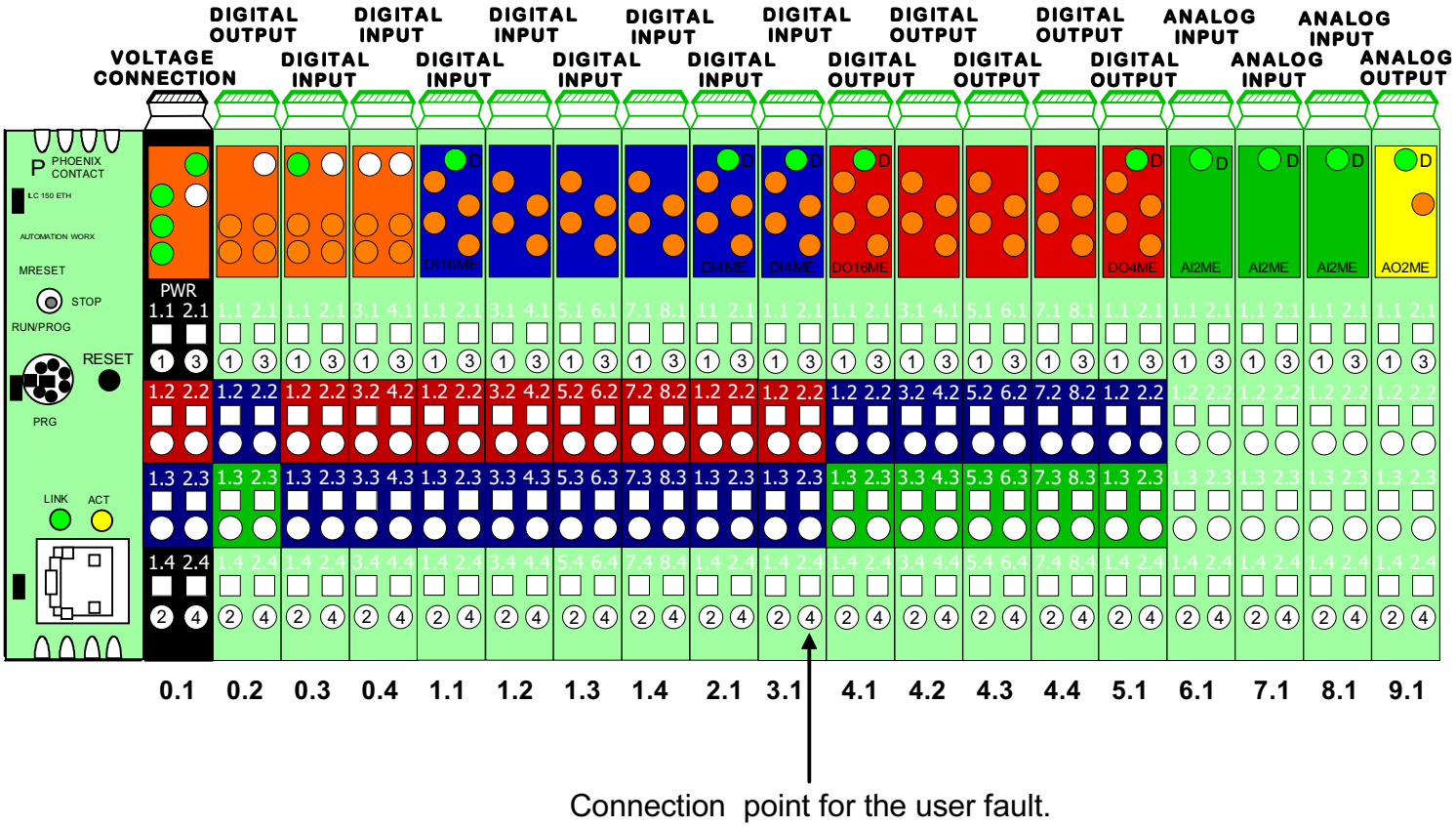
Yellow circle shows connection point for motor overload fault.

Title: TOWER DRYER: MOTOR OVERLOAD FAULT	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

USER FAULT

User fault input allows the end user to wire in auxiliary switches or inputs which can prevent the dryer from becoming operational. A switch or overload contact may be wired into this circuit. Until auxiliary equipment has been turned on, or an overload reset, dryer will not start. The user input requires 28 VDC to prevent a fault condition. Drawing below shows power box terminals and factory installed jumper which must be removed to utilize user fault input.

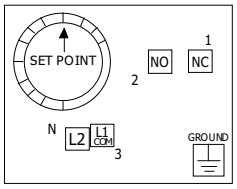


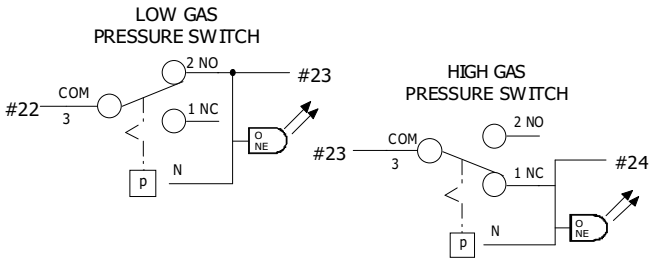


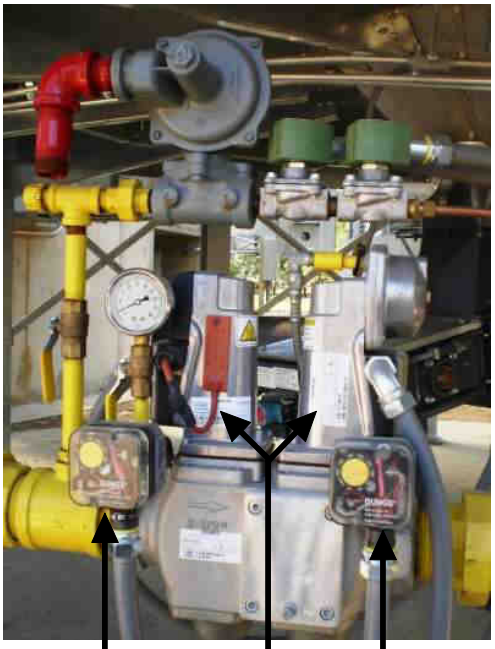
Title: TOWER DRYER: USER FAULT	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

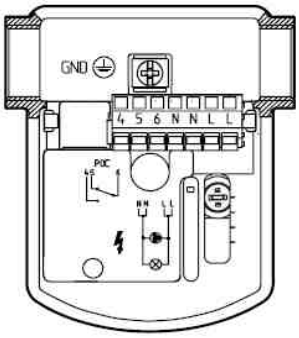
PIPE TRAIN CONTROLS

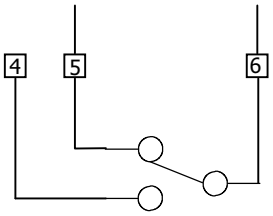
Various pipe train switches are used to monitor gas flow. These include circuit breaker, low/high pressure switches, proof of closure, and low fire position switches.



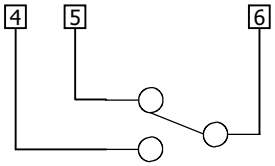




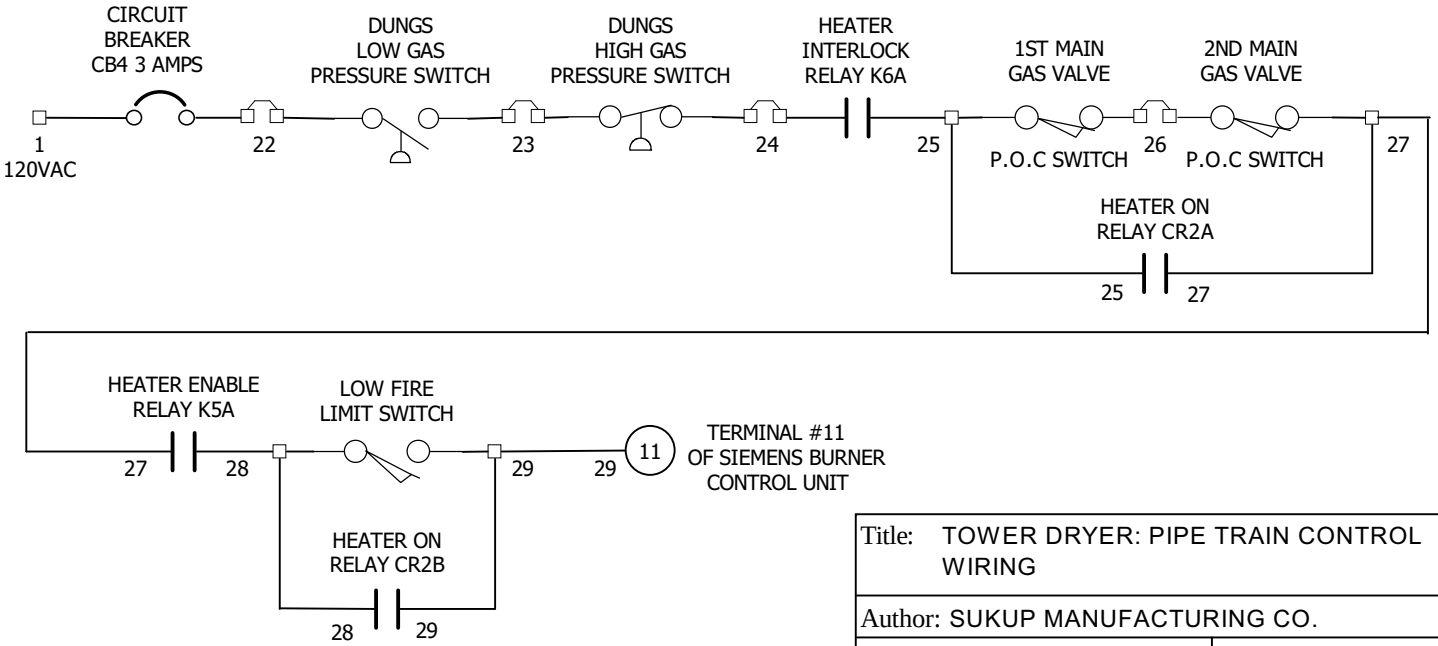




1ST MAIN GAS
VALVE P.O.C SWITCH
(PROOF OF CLOSURE)



2ND MAIN GAS
VALVE P.O.C SWITCH
(PROOF OF CLOSURE)



Title: TOWER DRYER: PIPE TRAIN CONTROL WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 10 - 12	Sheet:
Revision: 4/14	QUADRATOUCH

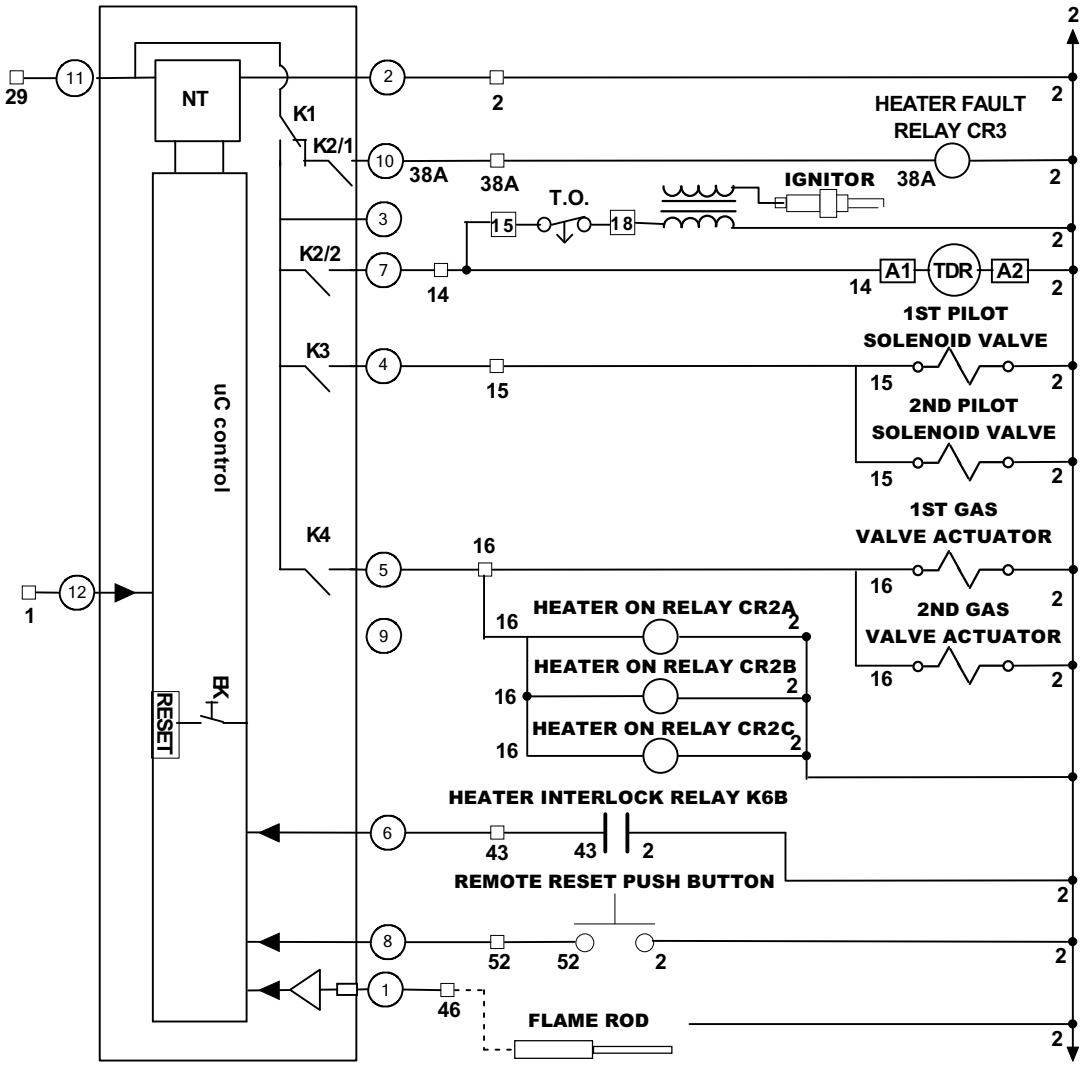
TOWER DRYER

BURNER CONTROL UNIT

Located on front of burner control unit is a round, plastic push button. This button functions as a burner reset and a troubleshooting light. After power is applied to both terminals # 11 and # 12, the indicating light will turn on "orange" indicating the unit is going through the purge cycle. After purging, the orange will begin to flash. After three flashes, the ignition transformer is energized along with the two pilot solenoids, allowing gas to flow through the copper pilot line to the burner. If after 10 seconds the flame rod has not sensed flame, the burner control unit will shut off the pilot solenoids and ignition transformer and go into a lockout condition. The indicating light will turn solid red. Fault relay CR3 will be energized, sending a fault signal to the PLC.To exit lockout condition, press the reset button and hold for one second then release. Red light should turn off. If flame is sensed, the indicating light will turn solid green and the two main gas valve actuators will energize. Yellow indicating lights on the actuators will turn on. Relays CR2A, CR2B and CR2C will also be energized.

SIEMENS - LME69 - # J5713

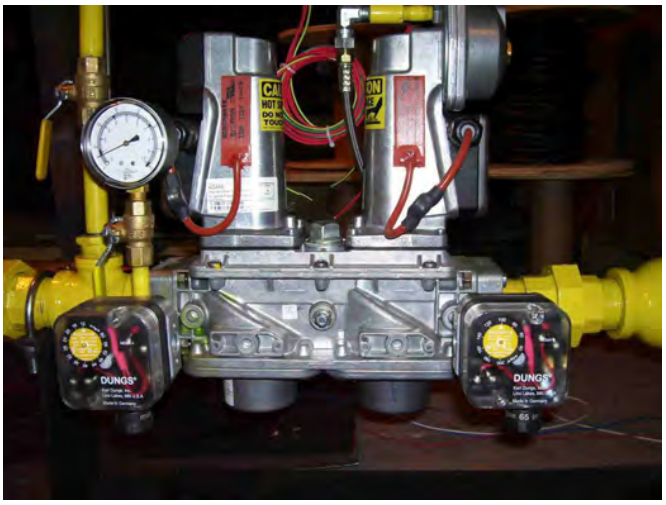
RESET BUTTON & TROUBLE SHOOTING LIGHT



Title: TOWER DRYER: BURNER CONTROL UNIT	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

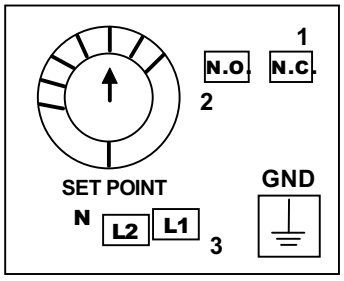
LOW/HIGH PRESSURE SWITCHES

DUNGS LOW/HIGH PRESSURE SWITCH - J4427



LOW GAS PRESSURE SWITCH

HIGH GAS PRESSURE SWITCH

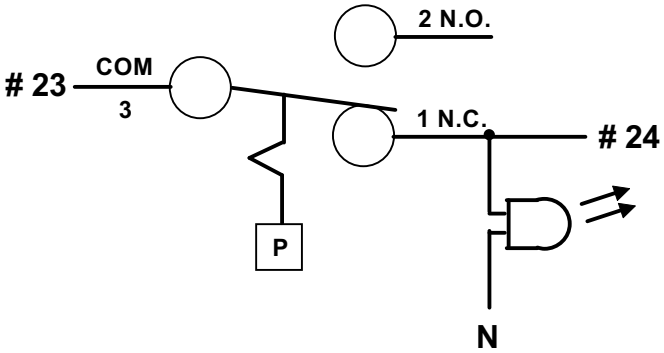


Arrow at top of dial indicates the setpoint.

Switches are adjustable between 40 and 200 inches of water column. The low pressure switch is set to 40 inches and the high pressure switch is set to 100 inches.

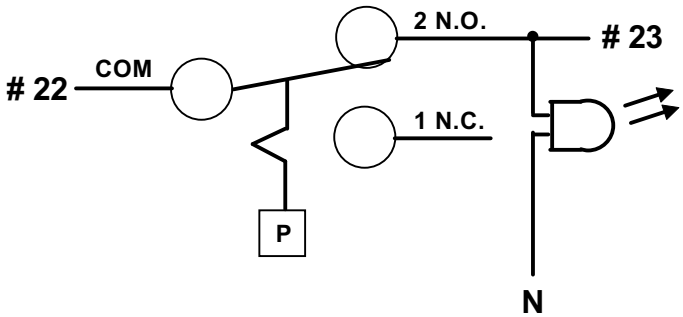
1 PSI = 27.7 inches of wc

HIGH GAS PRESSURE SWITCH



High gas pressure switch is wired to the N.C. contacts. When the gas pressure rises above 100" wc, the switch will open and the light will turn off.

LOW GAS PRESSURE SWITCH



Low gas pressure switch is wired to the N.O. contacts. When the gas pressure drops below 40" wc, the switch will open and the light will turn off.

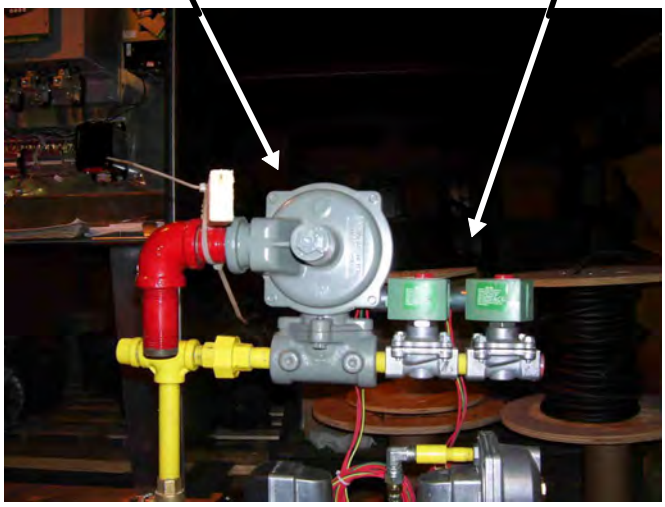
Title: TOWER DRYER: PIPE TRAIN LOW-HIGH PRESSURE SWITCH	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

PILOT REGULATOR AND SOLENOID VALVES

This page shows some of the gas pipe train components along with the wiring of the gas valve actuators and the heater strip on each actuator.

PILOT REGULATOR

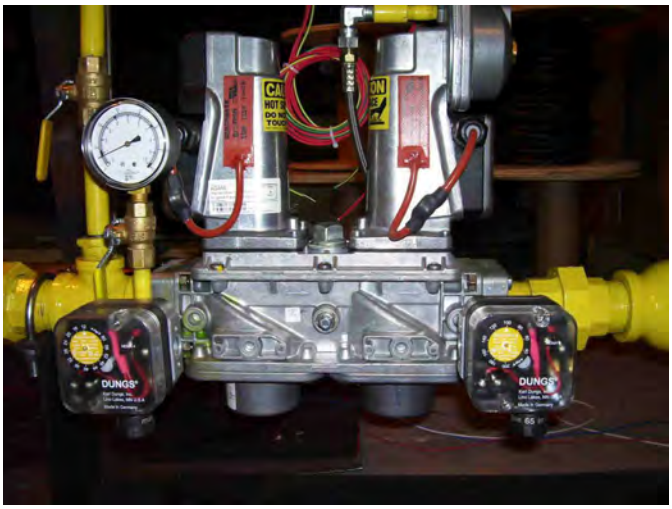
PILOT SOLENOID VALVES (2)

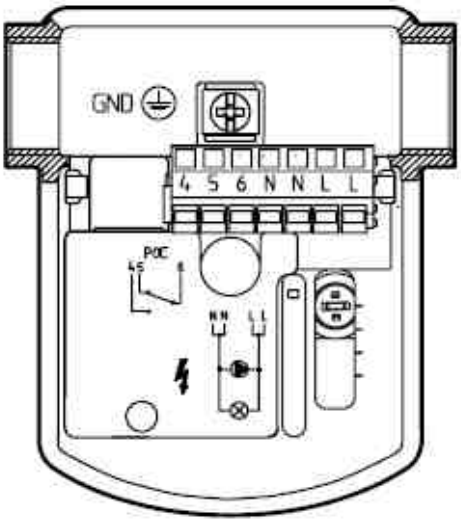


2ND GAS VALVE ACTUATOR WITH REGULATOR

1ST GAS VALVE ACTUATOR WITH HEATER STRIP

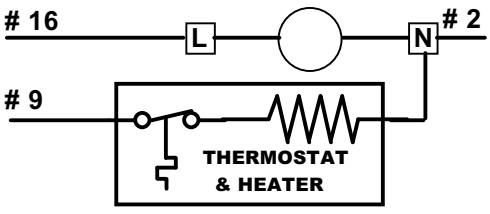
2ND GAS VALVE ACTUATOR & REGULATOR WITH HEATER STRIP





CONNECTION TERMINALS FOR BOTH GAS VALVE ACTUATORS

GAS VALVE ACTUATOR



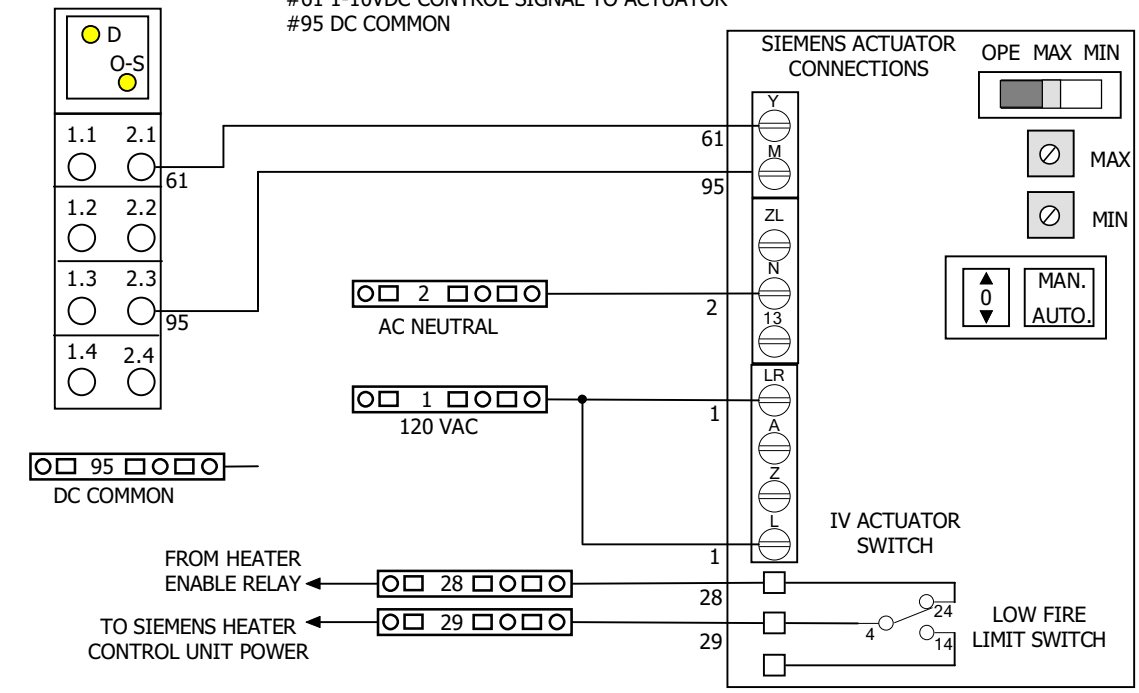
Title: TOWER DRYER: PIPE TRAIN COMPONENTS	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

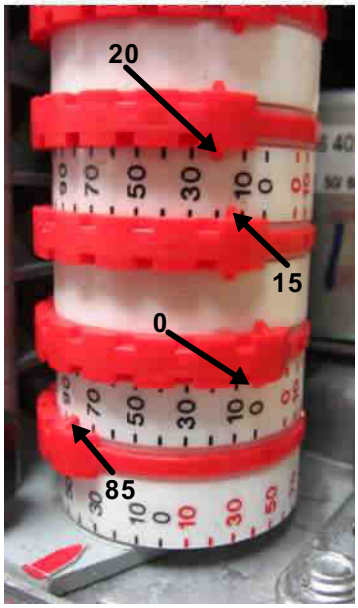
SQM50 ACTUATOR

TOWER DRYER

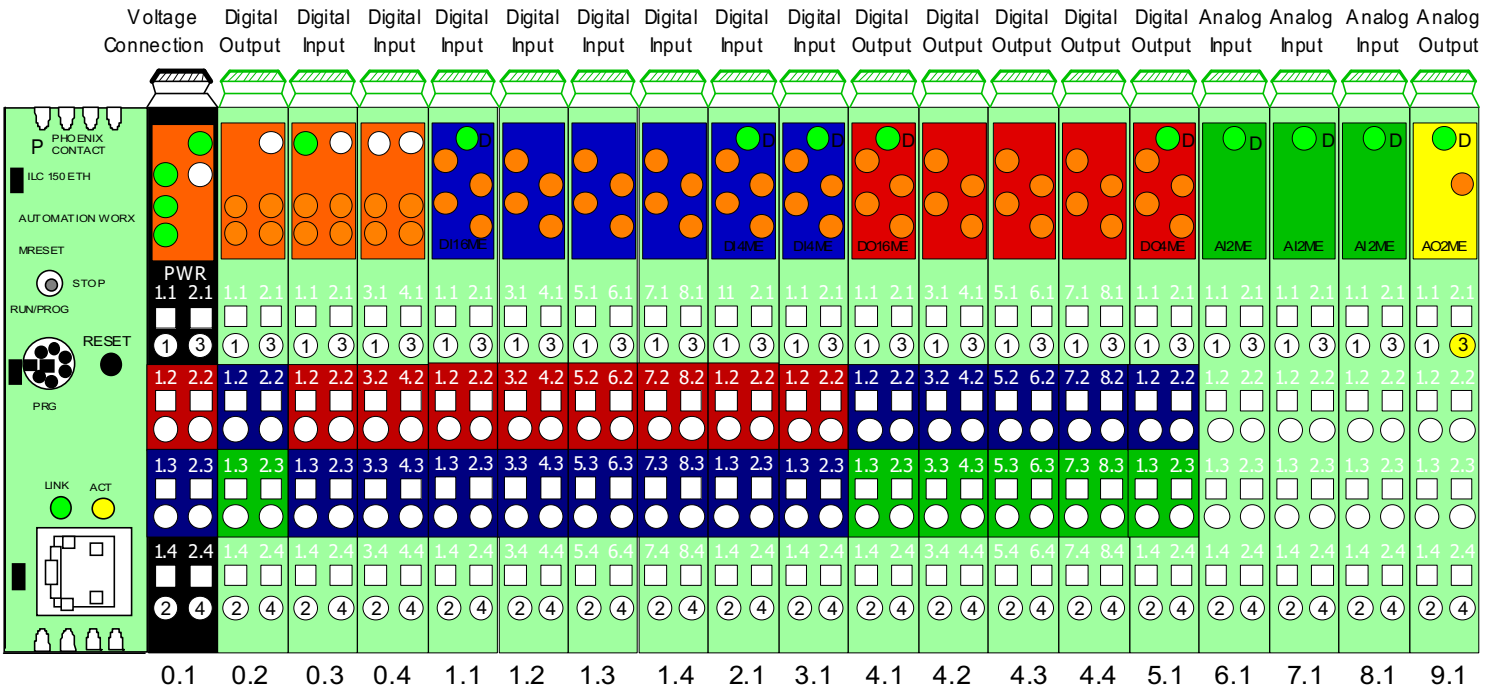
Siemens actuator is the motor that is connected to the butterfly valve that controls the gas pressure to burner. Photos show the actuator (top) and the cams (bottom). for setting minimum, maximum and low fire position.

WIRE NUMBERS & VOLTAGES
#1 120VAC
#2 AC NEUTRAL
#28 120VAC FROM THE HEATER ENABLE RELAY
#29 120VAC POWER TO THE BURNER CONTROL UNIT
#61 1-10VDC CONTROL SIGNAL TO ACTUATOR
#95 DC COMMON





USE BLACK NUMBERS



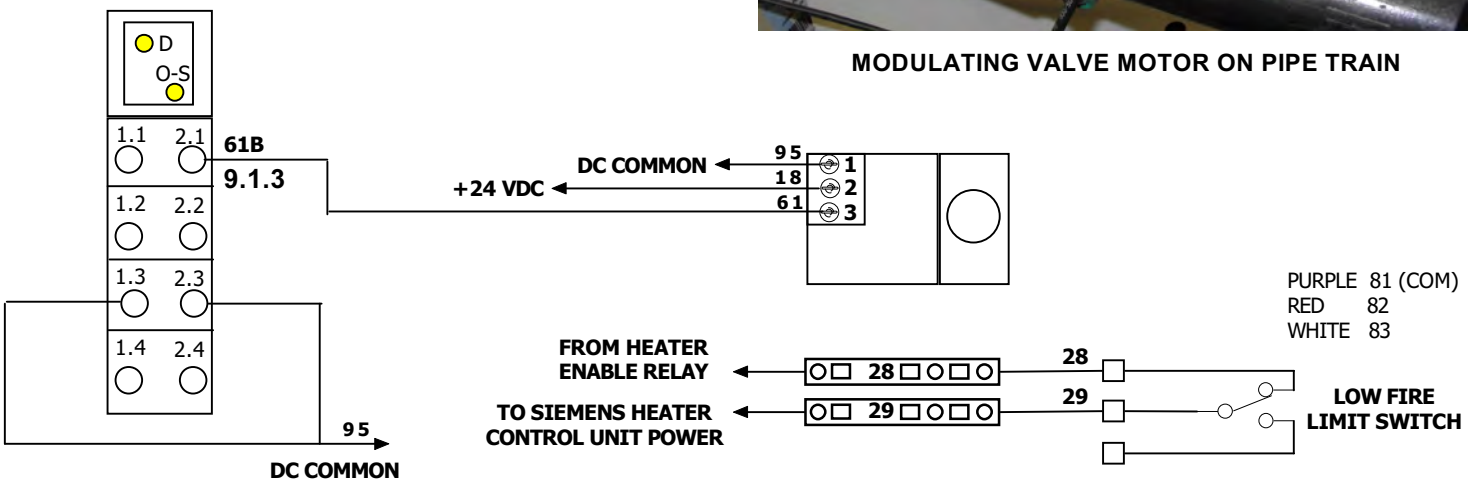
Yellow circle shows connection point for electronic modulating valve actuator.

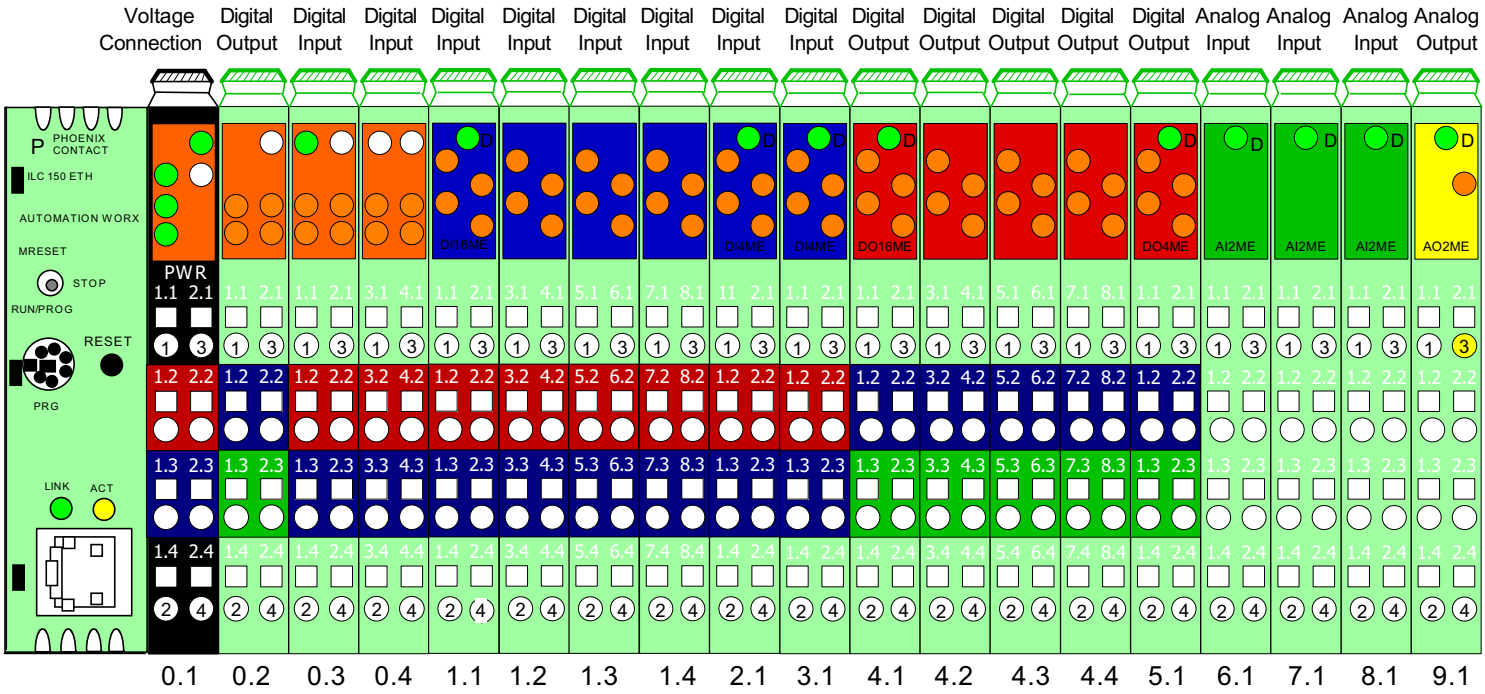
Title: TOWER DRYER: ELECTRONIC MOD VALVE ACTUATOR	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

BELIMO ACTUATOR

Belimo actuator is used on the modular tower only. It is a combination of a butterfly valve with an electric motor (actuator) connected to the shaft of the butterfly valve. Plenum temperature is automatically controlled to the desired setpoint. The plenum temperature RTD signal voltage is connected to a PLC analog input card and compares this signal with the plenum temperature setpoint. The PLC will change the voltage sent to the actuator to either open or close the valve. The actuator reference voltage is 2 - 10 VDC. The actuator also requires a 24 VDC supply voltage to operate. A low fire contact module is attached to the top of the actuator.

MODULATING VALVE MOTOR ON PIPE TRAIN





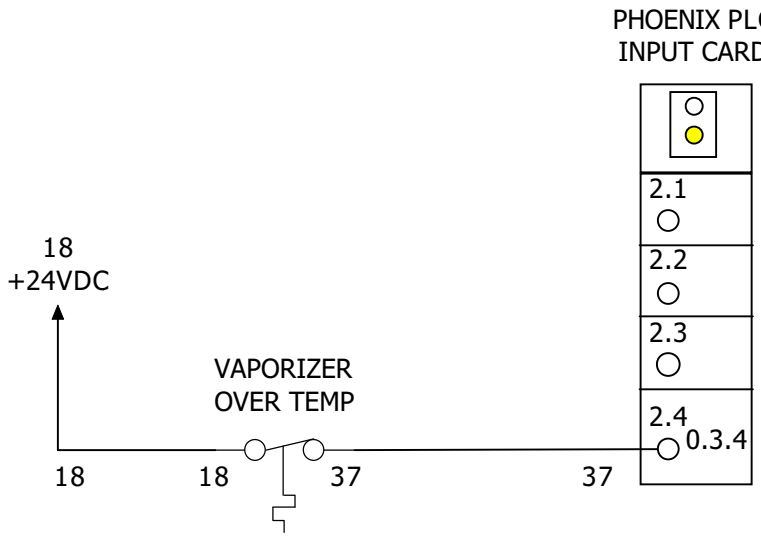
Yellow circle shows connection point for electronic modulating valve.

Title: TOWER DRYER: ELECTRONIC MODULATING VALVE	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

TOWER DRYER

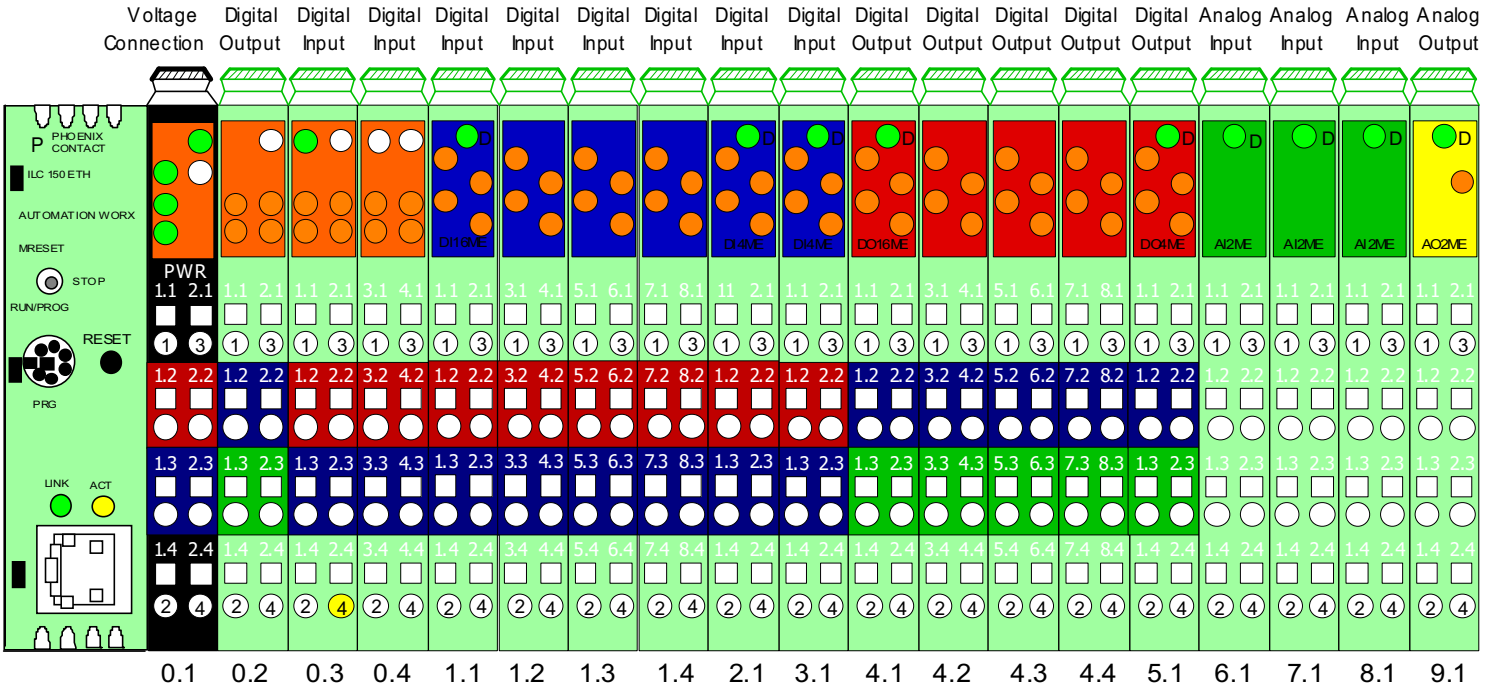
VAPOR OVER-TEMPERATURE SWITCH

Vaporizer over temperature switch is used to monitor temperature of gas flowing through pipe coming from vapor coil. Sensor is attached to pipe at bottom of dryer before the Siemens pipe train. Should the temperature reach 140°F the switch will open and display a fault. This sensor is only found on 12' dryers with internal vaporizers.



Fault Condition

Vapor Over-Temp



Yellow circle shows connection point for vaporizer over temperature switch.

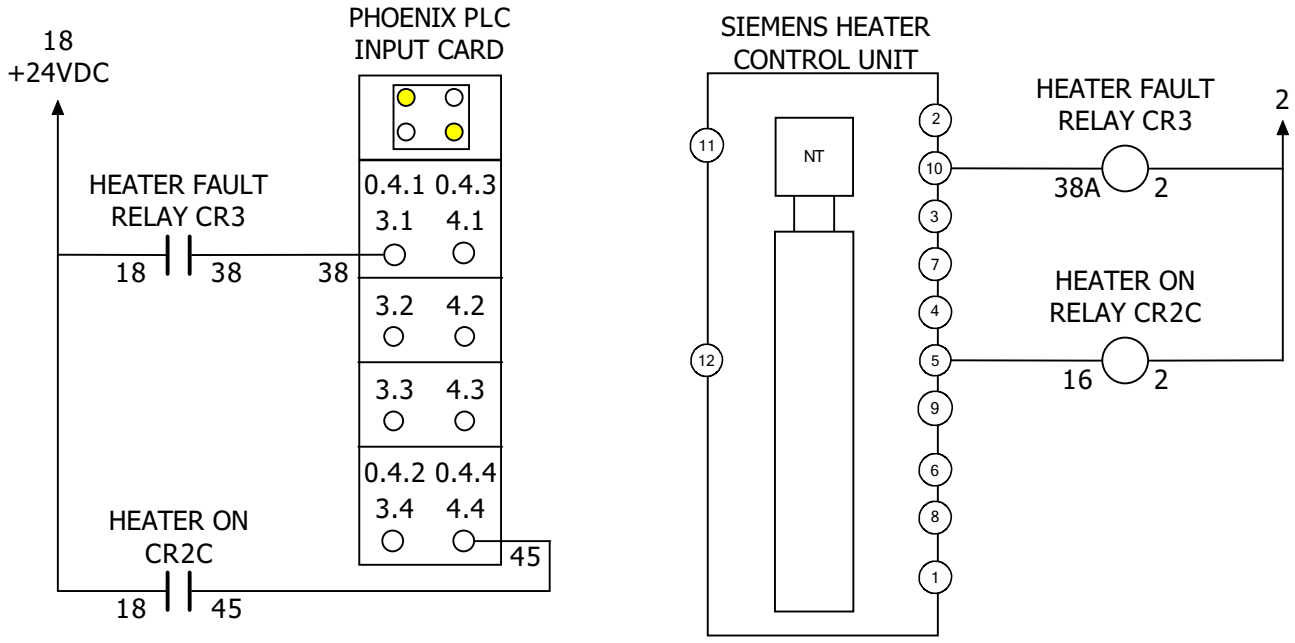
Title: TOWER DRYER: VAPOR OVER-TEMPETRATURE FAULT	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

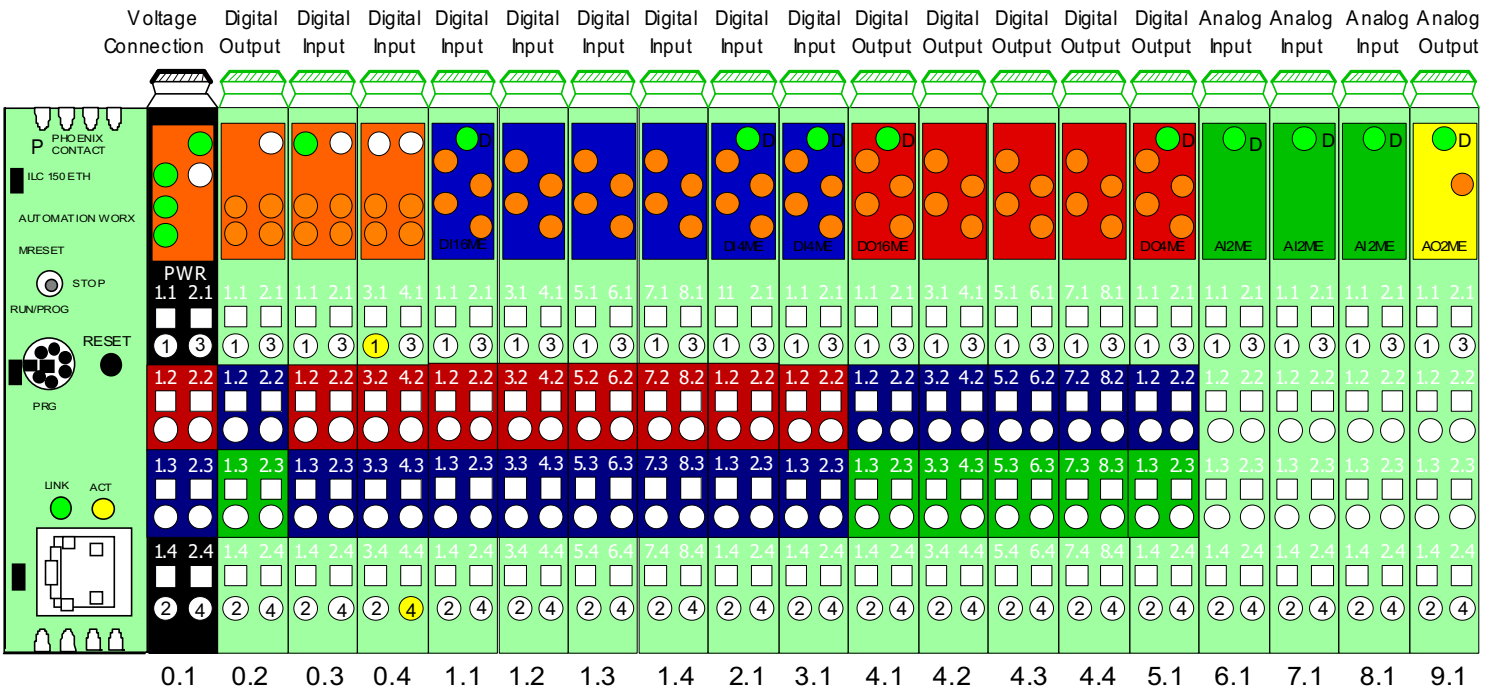
TOWER DRYER

HEAT "ON" & HEATER FAULT

After sensing flame, the BCU - Burner Control Unit (LME69) energizes relay CR2. This is the "HEAT ON" signal. A contact on relay CR2A jumps around proof of closure switches on the actuating valves. Relay CR2B jumps around the low fire contact on the modulating valve. If flame sense is lost, the BCU energizes fault relay CR3, which sends a signal to the PLC.

Fault Condition
No Flame Detected



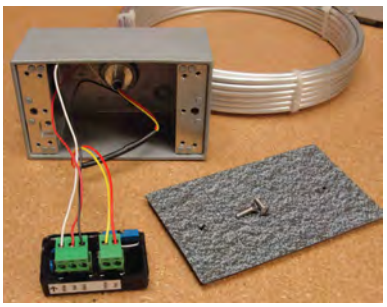


Yellow circles show the connection points for the heat ON - CR2C, and the heater control unit failure - CR3.

Title: TOWER DRYER: HEAT ON & HEATER FAULT RELAY	
Author: SUKUP MANUFACTURING CO.	
Date: 6/11	Sheet:
Revision: 4/14	QUADRATOUCH

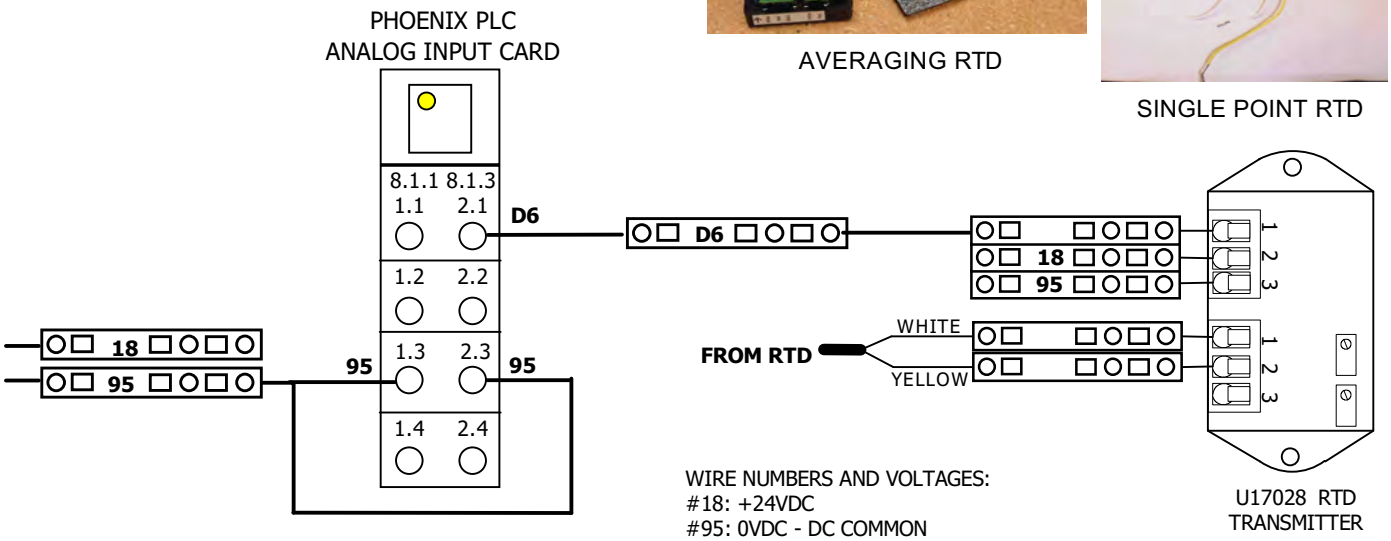
AUXILIARY TEMPERATURE RTD

Input 8.1.3 may be used as a connection point for an auxiliary temperature RTD. Either type shown on right can be added if additional temperature monitoring is desired. Averaging RTD might be added to measure temperature in another location in the plenum. Single-point RTD could be added to monitor grain temperature in other grain columns on dryer. Each RTD requires a transmitter. Averaging: U17028 Single-Point: U17018



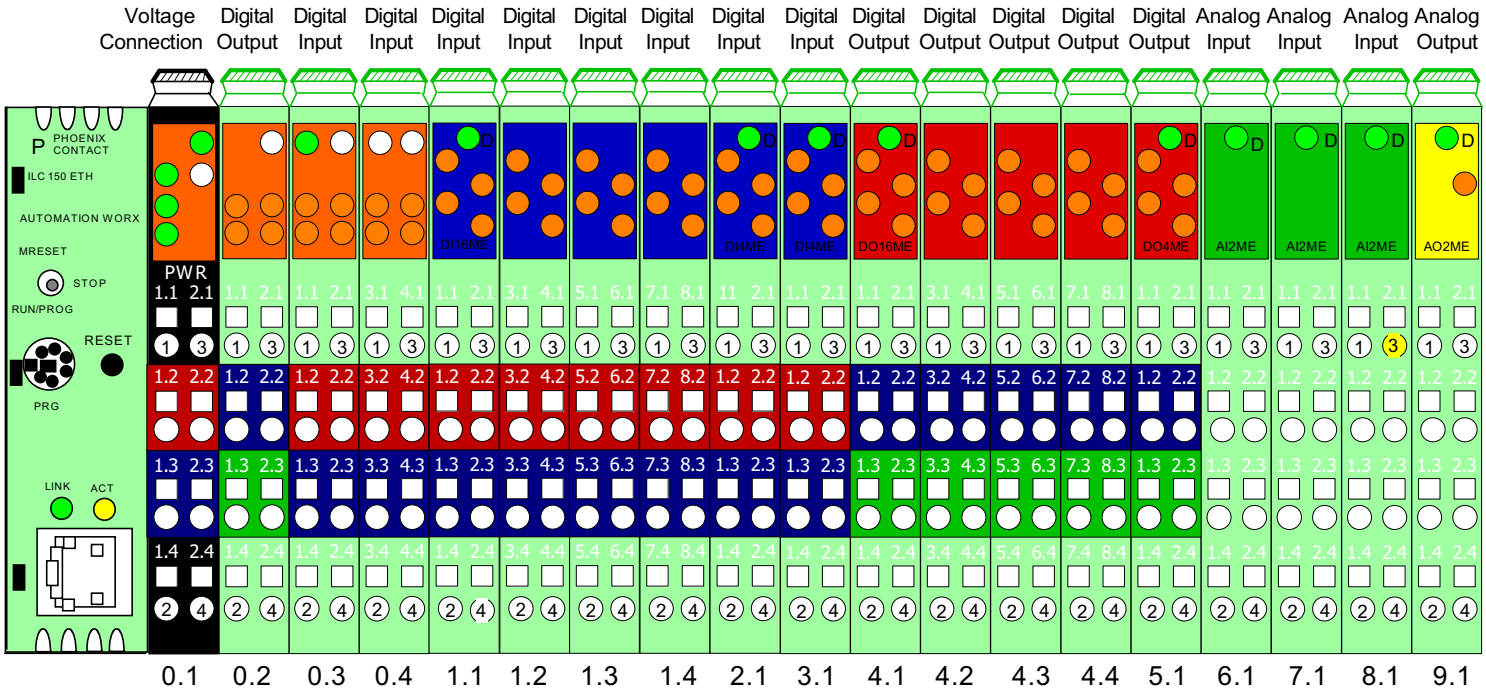
AVERAGING RTD

SINGLE POINT RTD



U17028 RTD TRANSMITTER

WIRE NUMBERS AND VOLTAGES:
#18: +24VDC
#95: 0VDC - DC COMMON
WHITE: 1 - 5VDC - VARIABLE: DEPENDS ON GRAIN TEMPERATURE, MAY ALSO BE LABELED D6
GREEN & SHIELD: 0VDC - DC COMMON MAY BE LABELED 95



Yellow circle shows connection point that can be used for auxiliary RTD.

Title: TOWER DRYER: AUXILIARY TEMPERATURE RTD	
Author: SUKUP MANUFACTURING CO.	
Date: 5/11	Sheet:
Revision: 4/14	QUADRATOUCH

QuadraTouch™

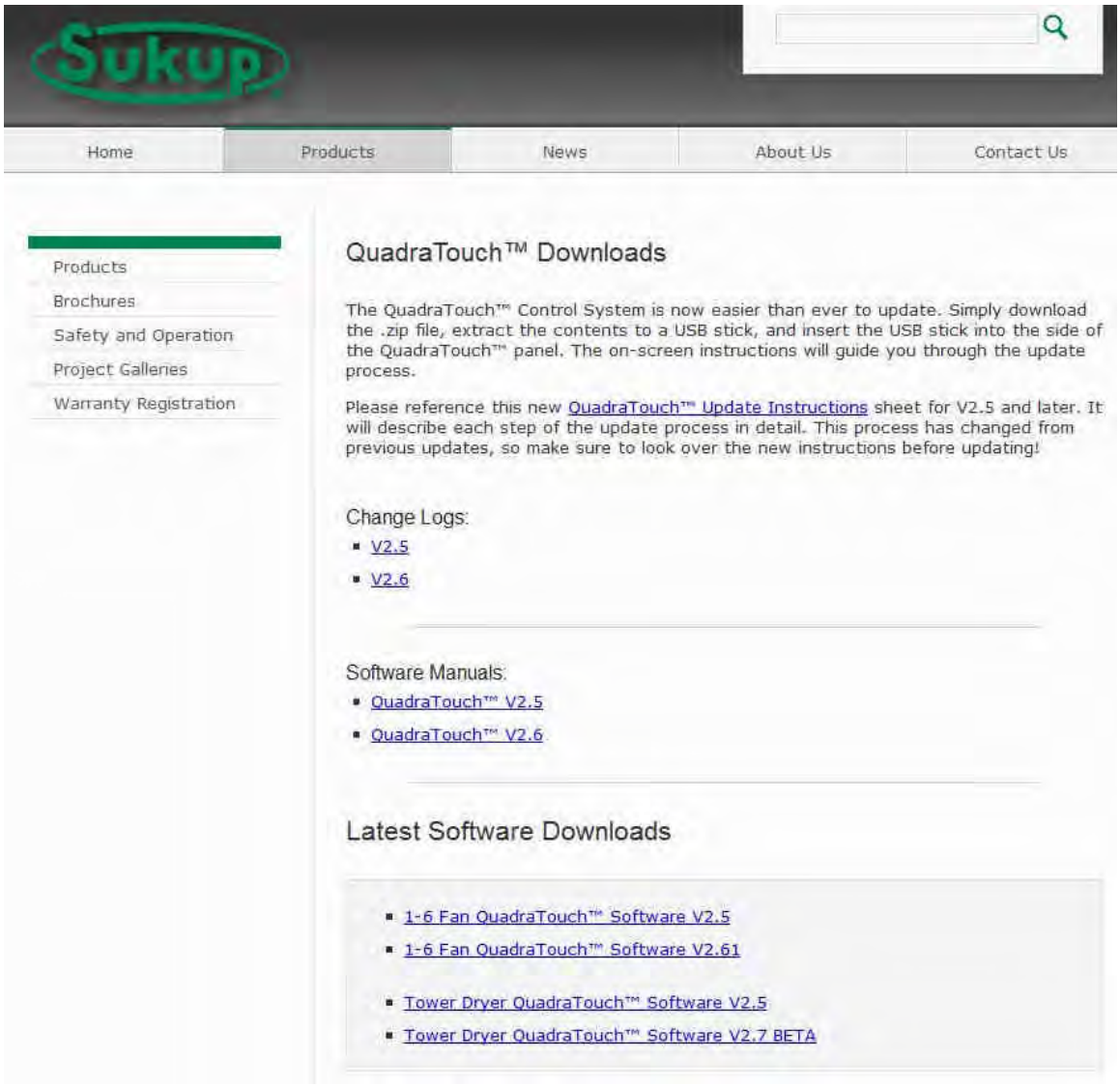
Download & Installation Instructions

V2.5 and later

The QuadraTouch™ Control System is now easier than ever to update. Simply go to http://www.sukup.com/Products/QuadraTouch and download the newest software for your grain dryer. It's fast, easy, and it comes at no charge for our customers.

Downloading Instructions:

1. Go to www.sukup.com/Products/QuadraTouch

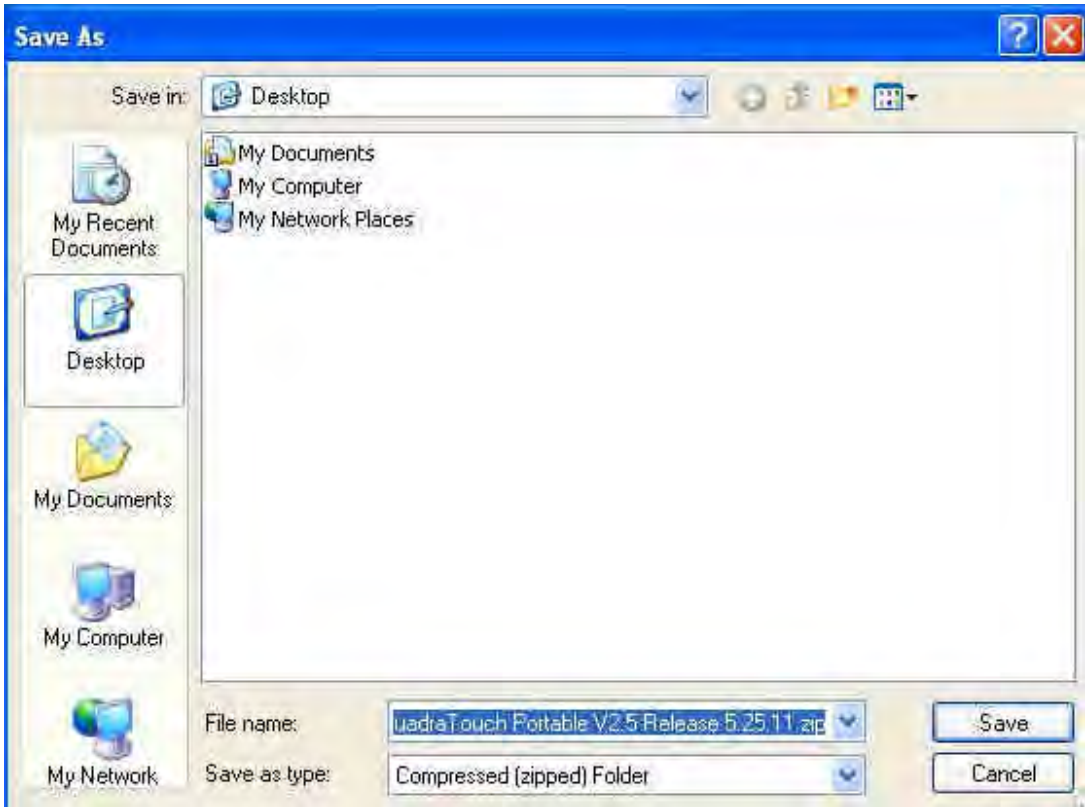


2. Select the newest Portable/Stack or Tower Dryer program for your dryer.

A dialog box will appear. Select "Save"

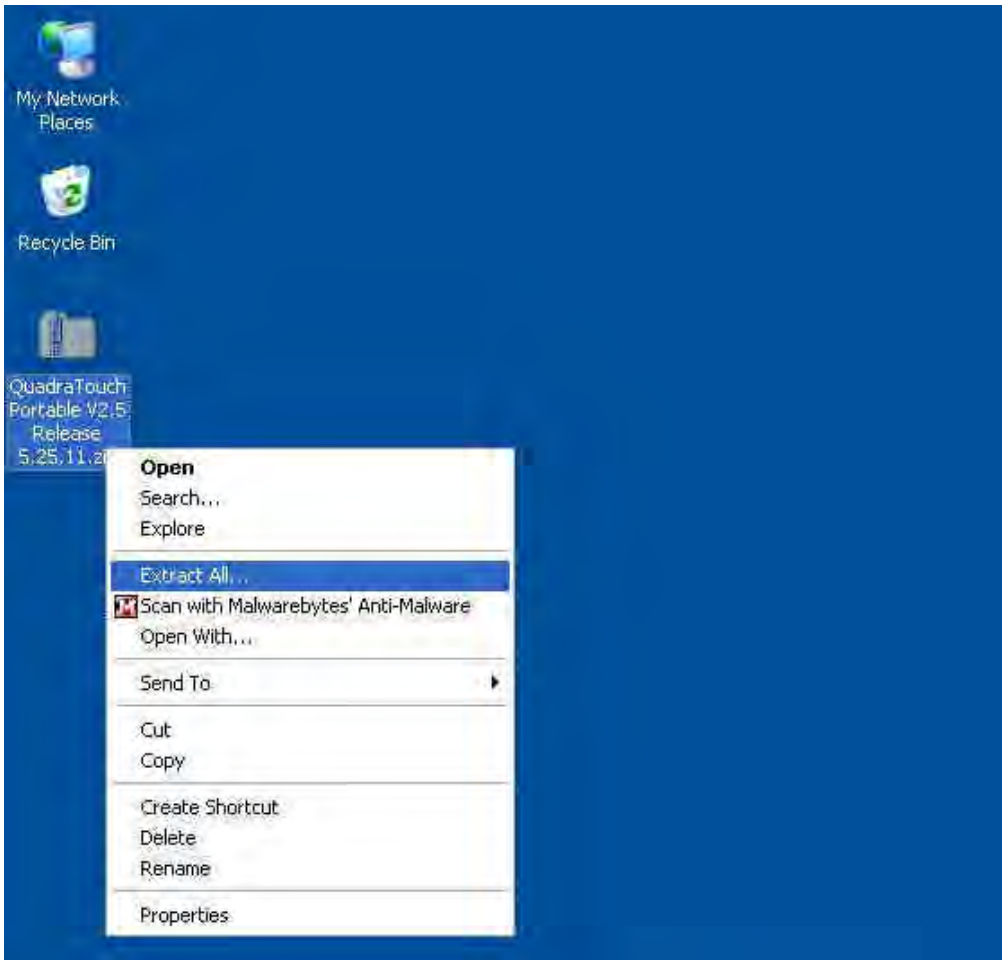
3. Next, another dialog box will appear. This time, it will ask you where you'd like to save the file. Typically "Desktop" is the easiest and preferred selection.

Locate "Desktop" in the Save in: dropdown menu or quick links on the left side of the screen. Then click "Save"



The download is about 16-20mb. It should take less than a minute on a high-speed connection.

4. After the download finishes, it will appear on your desktop (or wherever you choose to save it).



5. "Right Click" on the new program .zip file and select "Extract All"

Windows Vista and 7 users skip to step 8

A dialog wizard will pop up.

Select "Next"

6. The next page will ask you where you'd like to extract the files. It will automatically choose the directory you're currently working out of. In this case, it's the desktop.

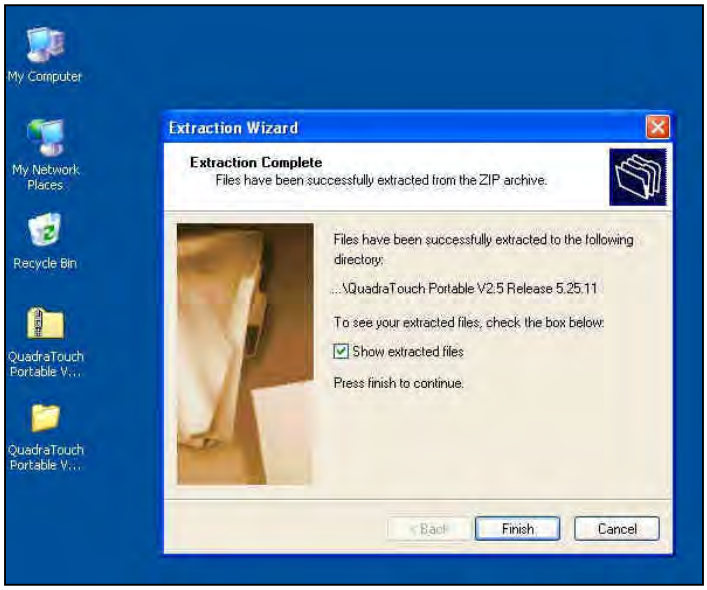
Select "Next"

7. You'll notice a folder has been created on the desktop.

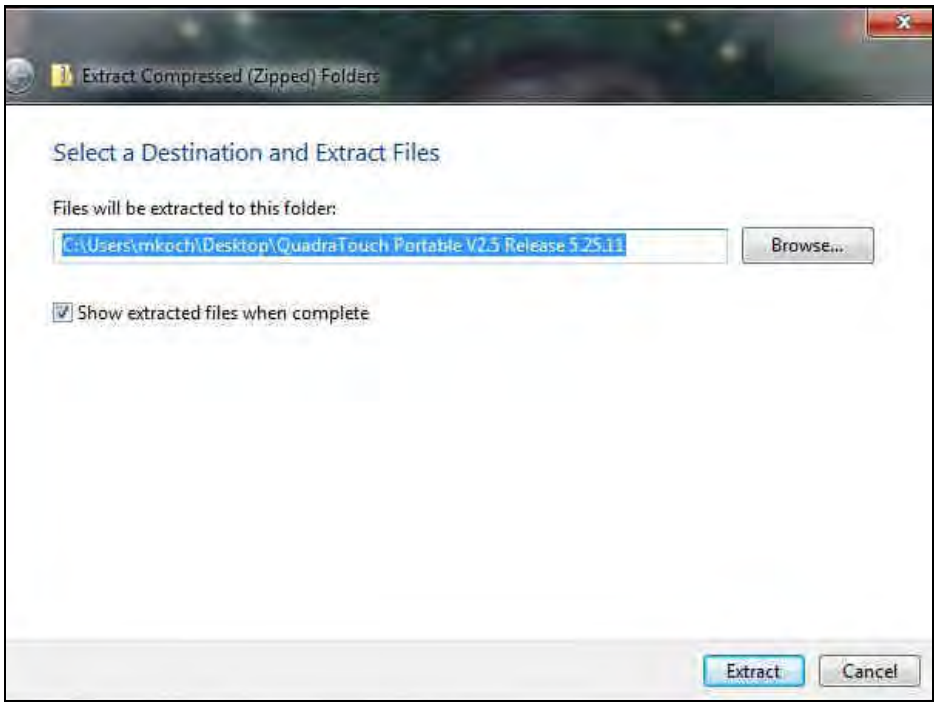
Select the check box for "Show the extracted files"

Select "Finish"

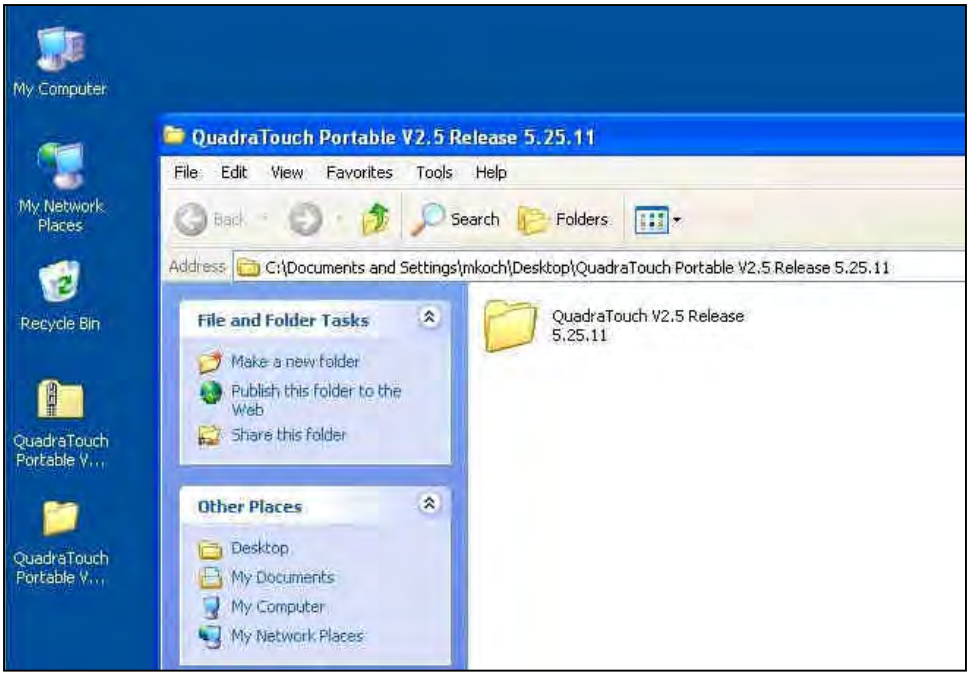
A window will open with the contents of the newly extracted files.



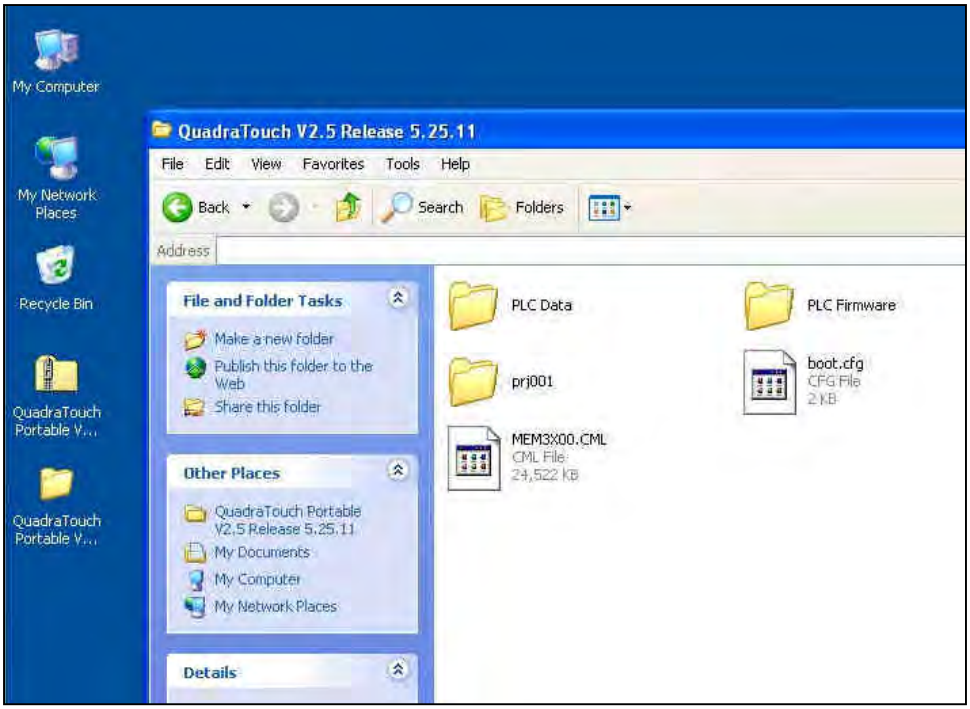
8. Windows Vista and 7 users will see something slightly different, pictured here. Simply choose the "Extract" option.



9. “Double-Click” the folder, and it’s contents will be opened in another window.

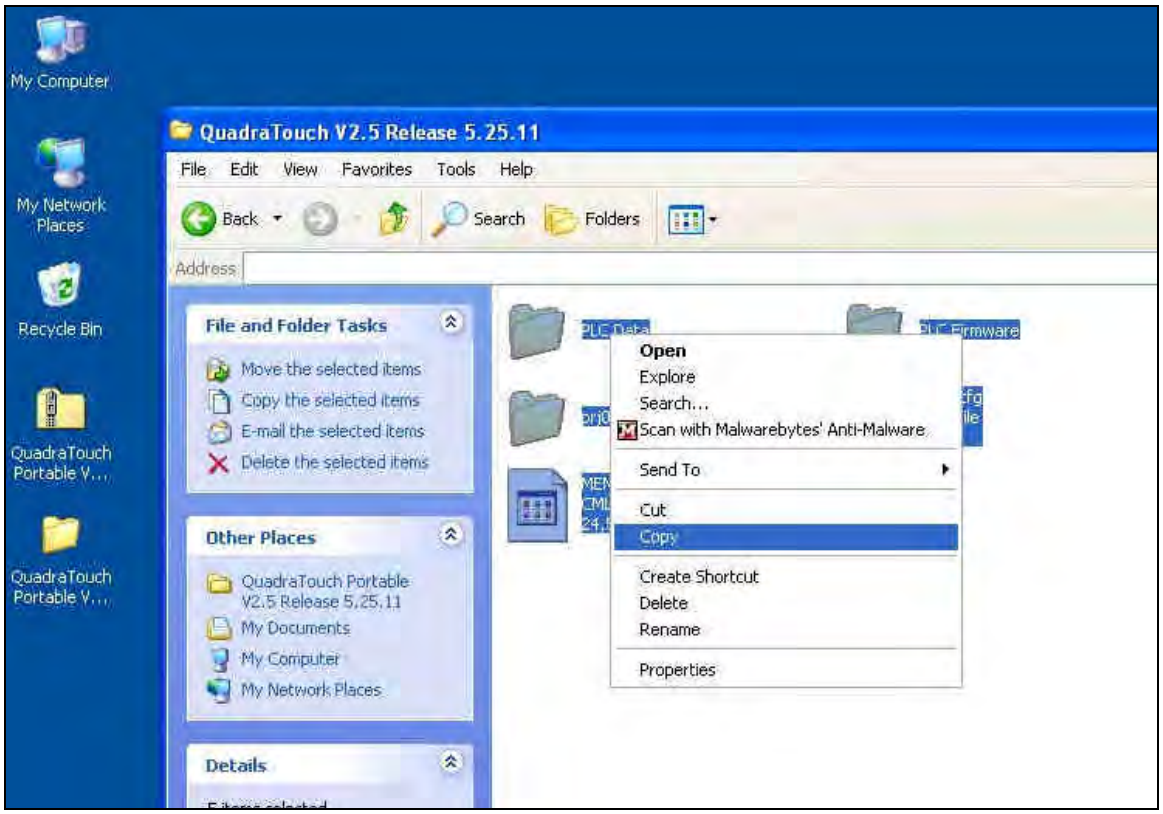


10. You will see this:



11. Highlight the contents of the folder by either holding the left mouse key down and dragging over the files or pressing Ctrl+A on you keyboard.

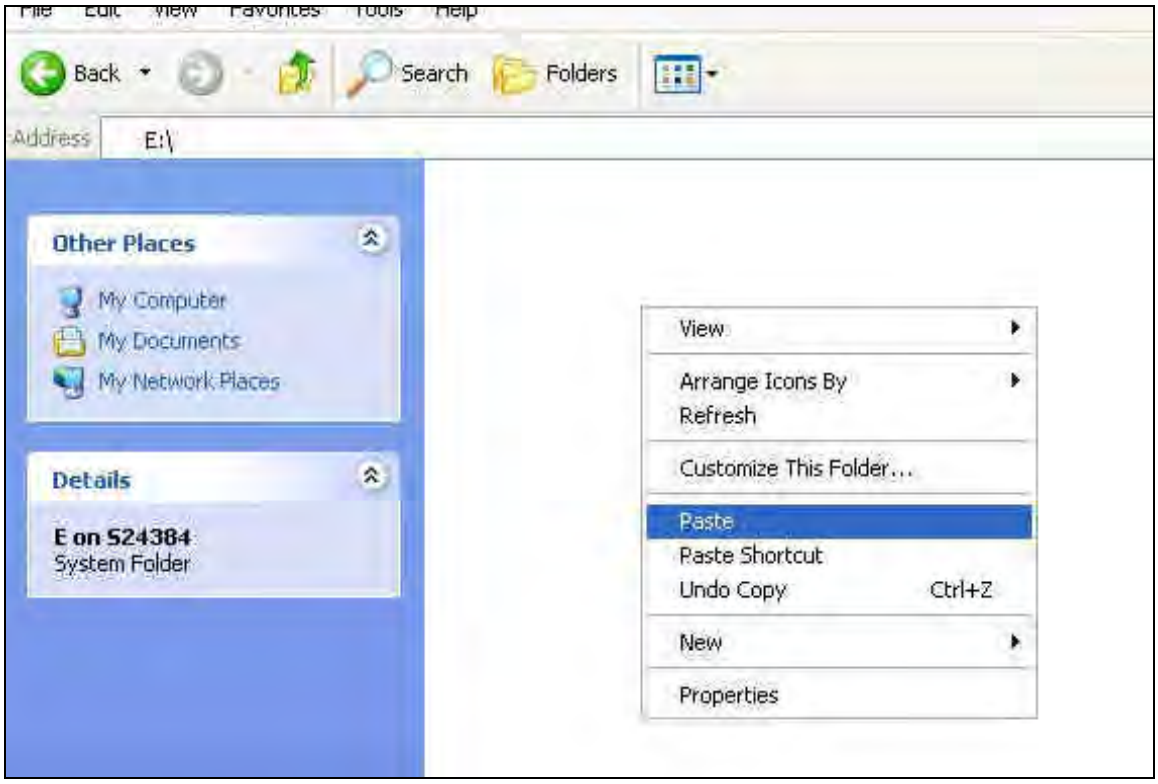
"Right-Click" any one of the selected files and select "Copy"



12. Insert a USB stick into the computer. A dialog window may open automatically, or a quick launch menu may appear. If not, you'll need to manually open the contents of the USB stick by opening the "My Computer" or "Computer" icon and locating the USB stick.

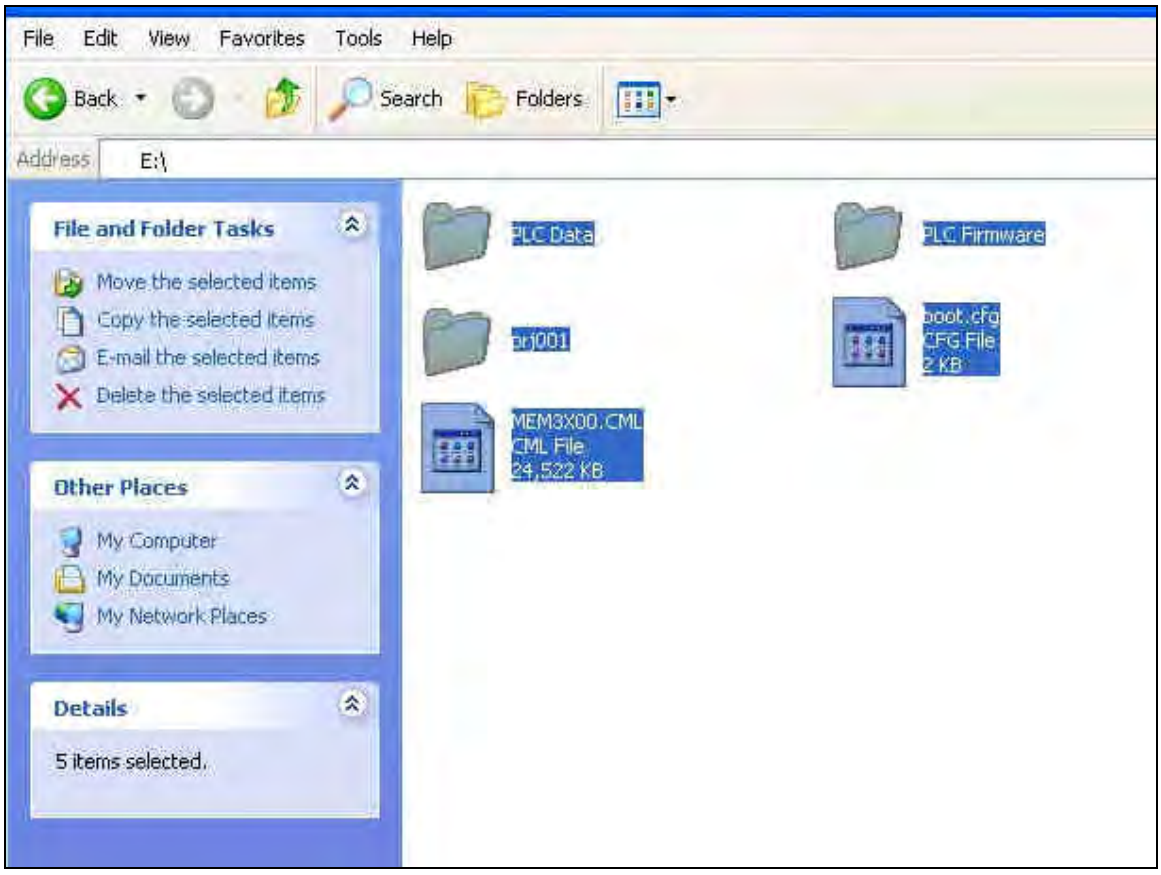
Once the USB stick has been opened, "Right-Click" in the "white, empty folder area and select "Paste"

The files will begin to copy onto your USB stick.



It's important that the files be placed on the root directory of the USB stick and NOT in another Sub-Folder. The touchpanel will not be able to read the contents otherwise. Notice in the "Address" bar, it says: "E:\"

13. **If everything has been done according to these instructions, the contents of the file downloaded from the Internet should now be successfully on the USB stick as shown below.**



QuadraTouch™ V2.5 HMI Update Instructions

Loading the QuadraTouch™ with new software takes about 5 minutes. Follow the step-by-step instructions listed below.

1. Power Up the QuadraTouch™ controller. Do not power on the dryer. If the dryer has power, turn the main disconnect switch to the "OFF" position.
2. Insert the USB stick (prepared in the previous instructions) into the side of the QuadraTouch™ controller. There are 2 USB ports on the side of the panel. Either one will work.
3. When the gray error bar appears at the bottom of the screen, select the black button (Left-most button of the group of 3 buttons on the right side of the gray error bar)
4. Select CF/USB
5. Select USB_Starting (If there is a problem here, it's because the files weren't placed correctly on the USB stick)
6. The panel will automatically reboot.
7. Upon Reboot, select "English" as the language
8. Select the button to the right: Download USB → Display
9. Select "Start"
10. Select "Yes"
11. When the process finishes, hit the back button twice, and then exit. Then select "Yes" you want to restart. (or simply turn power off and back on again)

DO NOT POWER THE UNIT DOWN DURING PROGRAMMING. THIS WILL CAUSE THE UNIT TO FAIL, AND IT WILL NEED TO COME BACK TO SUKUP MANUFACTURING FOR REPAIR.

QuadraTouch™ V2.5 PLC Update Instructions

After updating your HMI program to V2.5 or greater, you will have the option to load the PLC program directly from the HMI without the use of a computer. All necessary files are included with your program download.

To get to this screen (if not automatically prompted) Choose the "Tools" → "System Tools" → "QuadraTouch Update"

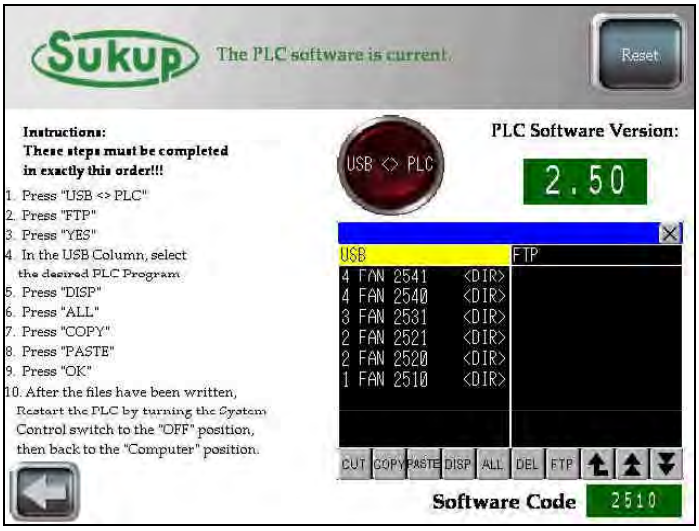
Nicely enough, the directions are right on screen with you, so performing this task should be relatively painless.

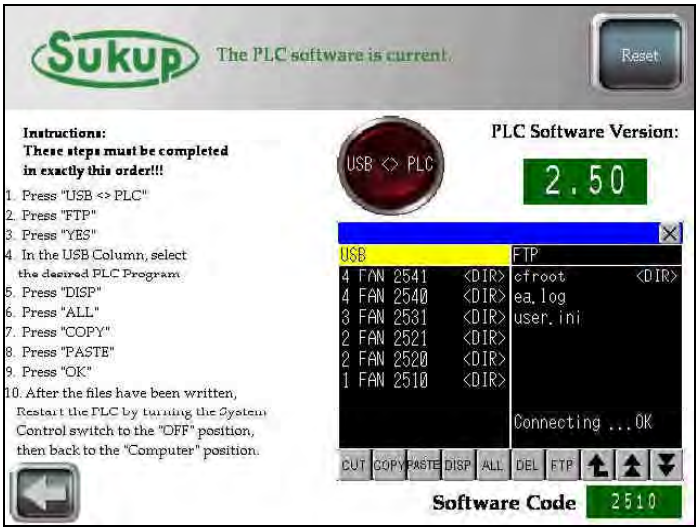
First, touch the black, circular "USB<>PLC" button. A rectangular USB/FTP box will appear in the lower-right corner of the screen (shown in the picture to the right).

Next, press "FTP", and a dialog box will pop up. Select "YES"

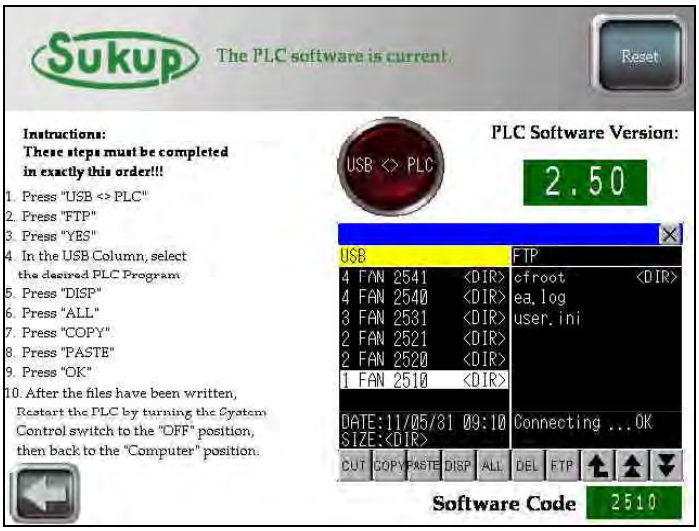
After selecting "YES", the FTP column will show the PLC's contents.

All V2.5 and later software releases will contain all the portable dryer programs. After updating to V2.5, there will also be a software code that appears in the lower-right corner of the screen. The code 2510 means V2.5 software, single-fan program, and no incoming moisture sensor. Similarly, a code of 2521 would mean, V2.5 software, two-fan program, and an incoming moisture sensor.

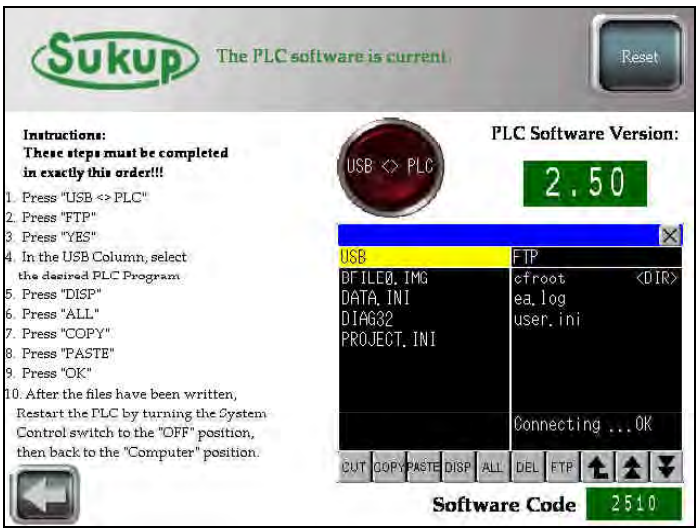




In the USB column, select the appropriate fan setup. As was just mentioned, after updating to V2.5, you'll have a software code to help you in choosing the right PLC folder. Don't worry though, if something goes wrong, you can always start the process over! Here, we are updating a single fan model. Touch the desired PLC folder in the USB column to highlight the desired folder.



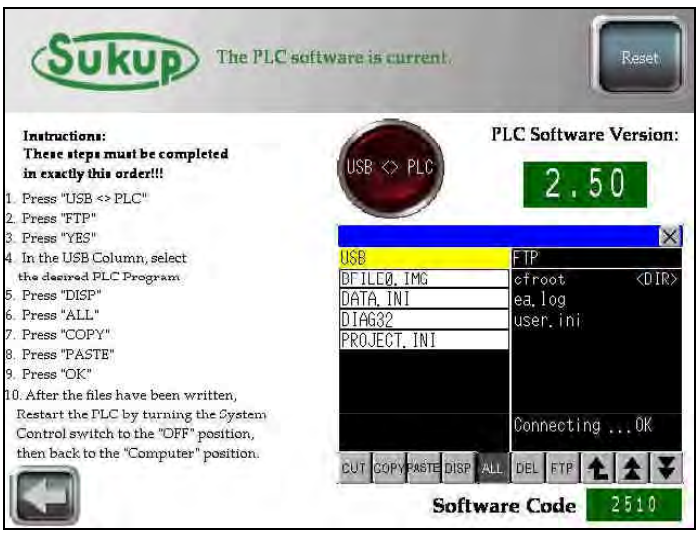
Touch the "DISP" button. The contents of the selected folder will then be displayed in the USB column.



Next, touch the "ALL" button. This will highlight all the files in the USB column.

Select "COPY"

Select "PASTE"



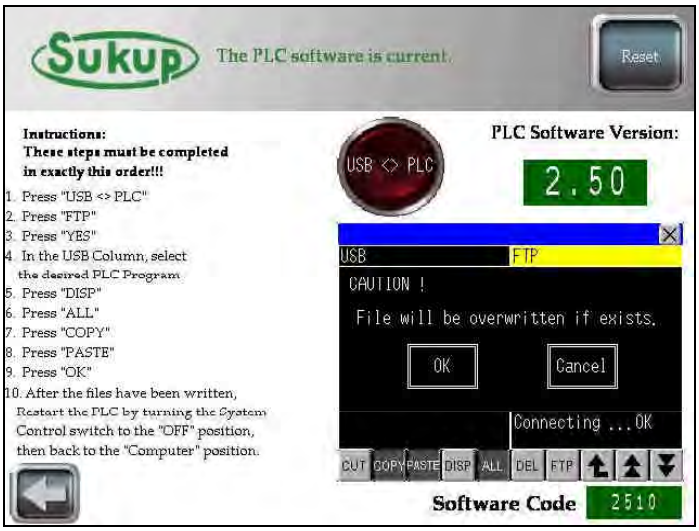
A dialog window will appear. Select “OK”

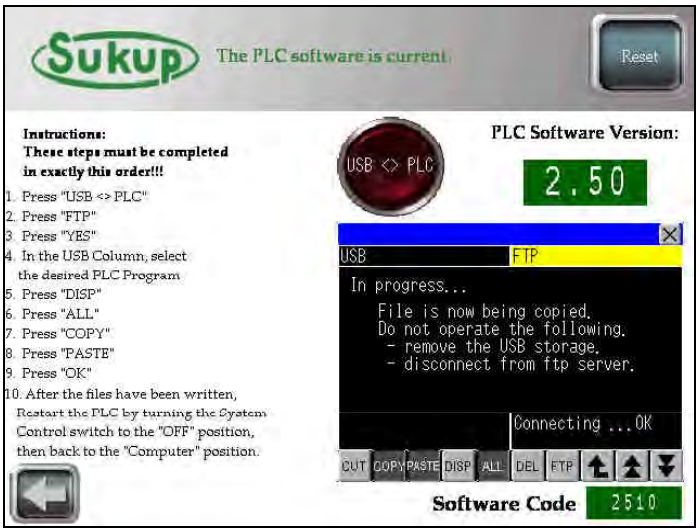
Finally, the HMI will send the files over to the PLC for programming.

A progress box will open with “In progress” blinking.

Do not power off either device during programming!

When the file transfer is complete, the “In progress” dialog will disappear, and the process is finished. For the new program to take effect, the PLC will need to be restarted. As shown in step 10 of the on-screen instructions, simply turn the system control switch, located on the side of the power box, to the “OFF” position, then back to the “Computer” position.





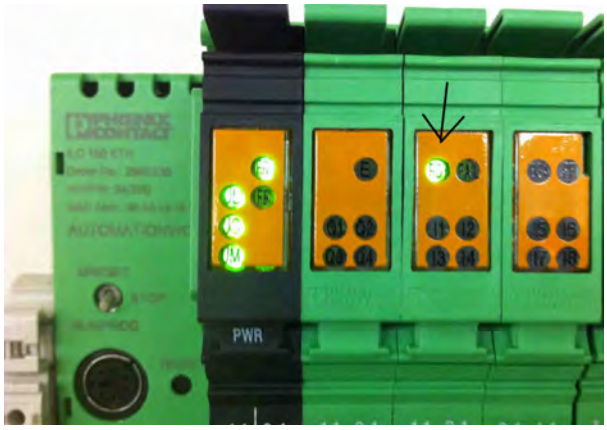
IMPORTANT!!!

After completing step 10, the PLC will be loaded with the new software. However, if the PLC doesn’t reconnect with the touchpanel and show the new version of software, the 7-step procedure will be required on the next page.

****** IMPORTANT INFORMATION ******
PLC's with HW/FW 04/205, 04/220, and select 04/354
(found on the left side of the PLC, third line of text)
Model Year '08, '09, early part of '10

After updating the PLC software to V2.50:

The PLC will boot the new program, and the RDY light (shown in the picture to the right with the arrow) will stop blinking and be constantly lit "ON". All other lights on the green slices should also stop blinking.



If the FR light is still blinking (the top-right light on the black power slice) when the RDY light is solid, you will need to perform the following steps:

This procedure is time sensitive. If you think you may have deviated from the instructions, turn the power off, then on again, and start the process over. The whole procedure only takes about 8 seconds to accomplish, so read these instructions BEFORE ATTEMPTING!!!

1. Find the small gray toggle switch on the left side of the PLC (shown in picture to the right). It's currently in the "RUN/PROG" position.

2. Hold the switch in the "MRESET" position. The "FR" light will stop blinking and immediately turn "ON" solid. Continue holding it up until the "FR" light turns "OFF". This usually takes about 3 seconds.

3. When the "FR" light turns "OFF", let the switch fall down into the "STOP" position. The "FR" and "FF" lights will begin to blink together.

4. As soon as the lights begin to blink together, hold the switch up in the "MRESET" position again. The "FR" and "FF" lights will continue to blink together, but the "FF" light will stop blinking in about 3 seconds. When the "FF" light stops blinking with the "FR" light, release the switch. It will fall back down into the "STOP" position.

5. Cycle the PLC power (turn power off, then back on again).

6. After the RDY light has stopped blinking and goes solid "ON", flip the gray toggle switch to the RUN/PROG position and the FR light should stop blinking and turn solid "ON".

7. ALL DONE! The HMI will now prompt you to update the firmware on the PLC. Follow the on screen instructions.

QuadraTouch™ Firmware Update

In order for your PLC to take advantage of the newest features offered in the most recent QuadraTouch™ software release, it's sometimes necessary to update the PLC's firmware in addition to the PLC's program you've just updated.

Make sure the USB programming stick is still inserted into the QuadraTouch™ panel.

The QuadraTouch™ panel will automatically prompt you to complete a firmware update procedure if necessary. If the screen doesn't come up, your system is already up-to-date with the latest firmware.

The firmware update is accomplished in much the same way the PLC program update is performed. The instructions are on-screen, so they are very easy to follow along.

In step 9, you'll be asked to press and hold the "Update FW" button. After pressing that button, the gray error bar will appear on the QuadraTouch panel, and the PLC will perform a system reset, then reboot. During this process, the PLC will be installing its new firmware.

THE RESET/REBOOT SEQUENCE TAKES ABOUT 1 MINUTE. AFTER THE "RDY" LIGHT TURNS "ON" SOLID, THE "FR" LIGHT MAY STILL BE BLINKING— AS IN THE PREVIOUS PAGE'S INSTRUCTIONS.

TO GET THE "FR" LIGHT TO STOP BLINKING –

1. **PUT THE SMALL GRAY TOGGLE SWITCH IN THE "STOP" POSITION.**
2. **PUT THE SMALL GRAY TOGGLE SWITCH BACK INTO THE "RUN/PROG" POSITION.**
3. **THE "FR" LIGHT WILL TURN "ON" SOLID. ALL DONE!**

Software Manual

V2.6 QuadraTouch™ Dryer Control System

Look for the newest updates on www.sukup.com/Products/QuadraTouch

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Website: www.sukup.com **E-mail: info@sukup.com**

Manual L141038
07.2012

TABLE OF CONTENTS

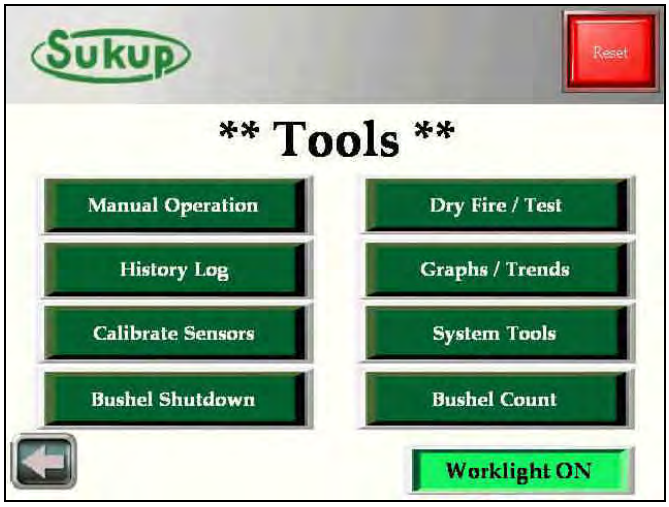
“Main Screen”

Located to the right is the main screen. If all faults are clear, and all system inputs are functional, this screen will appear on startup. There are four (4) buttons located at the top of screen. In addition, the version number and fan setup are listed on the bottom right hand portion of screen.

(You will see this header with the Sukup logo and any number of buttons throughout entire program.)

The “Tools” and “Settings” menus will be explained first.

“Tools” Menu



Pressing the “Tools” button will change screens to this one located at right. (“Bushel Shutdown” and “Bushel Count” will not appear until after bushel counter has been calibrated under “Calibrate Sensors” menu).

Manual Operation and Dry Fire modes are available in the tools menu.

The History Log keeps track of all fault occurrences and past dryer operations. It shows the date and time when each event happens.

The “Graphs / Trends” button will display a color graph of the discharge moisture, plenum temperature, and meter roll speed.

The “Calibrate Sensors” button will allow you to adjust your moisture sensor and plenum RTD to better reflect exact values.

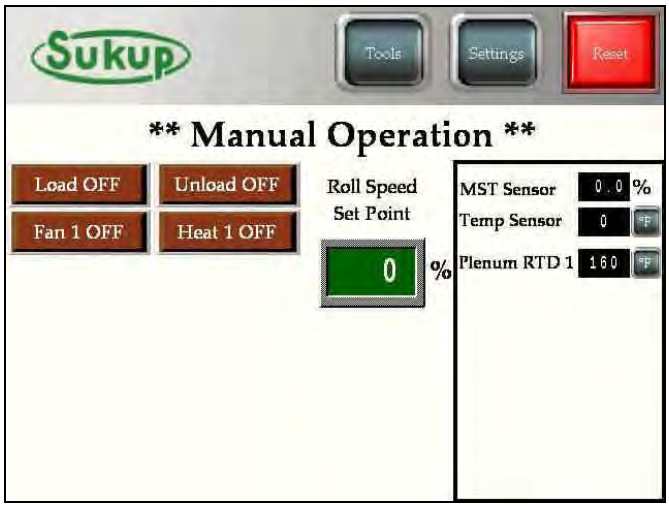
There is also a helpful system tools menu that will be explained in the “System Tools” Section.

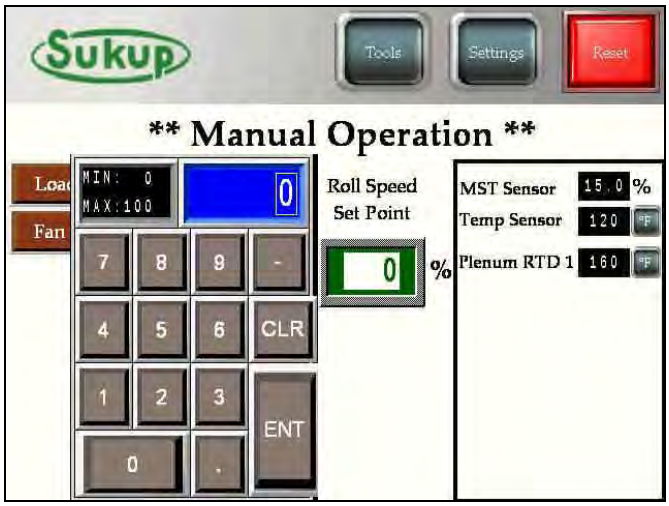
Tools → Manual Operation

The first option on the "Tools" menu is the "Manual Operation" button. In manual mode, the user is completely in charge of fan/heater operation as well as load and unload operations. User is also able to specify a desired meter roll speed. The "Heater" function is interlocked with the "Fan" button. If fan is not running, the heater will not be able to be turned on.

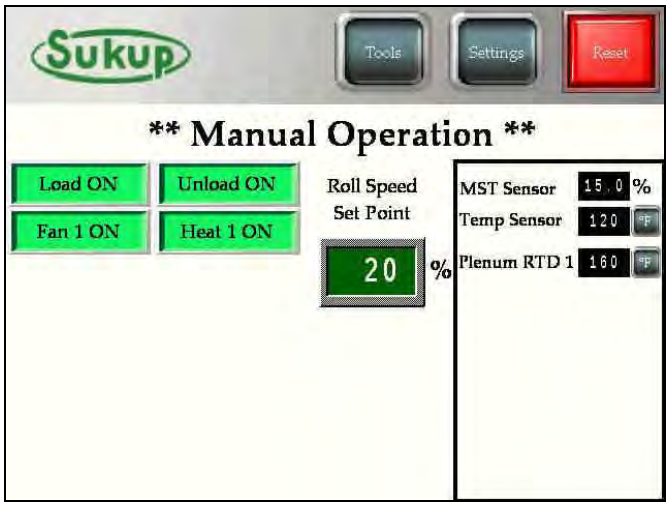
After about 90 seconds, a push-and-hold button will appear on the screen. "Go To Auto Control" will take the user from manual operation to automatic operation seamlessly without the need to shutdown and restart.

Any number display on the touch-panel that appears like the "Roll Speed Set Point" is an adjustable value. Simply touch the number and specify a value using the pop-up keypad.





****Special NOTE:**
All buttons that appear BURGUNDY in color (like the load, unload, fan, and heater buttons in the first image) require you to press and hold that button for a full second before the button's action will be processed. When these buttons are activated, the button will appear in an "On" state denoted by depressed button style and a light NEON-GREEN color (as in the image at right).



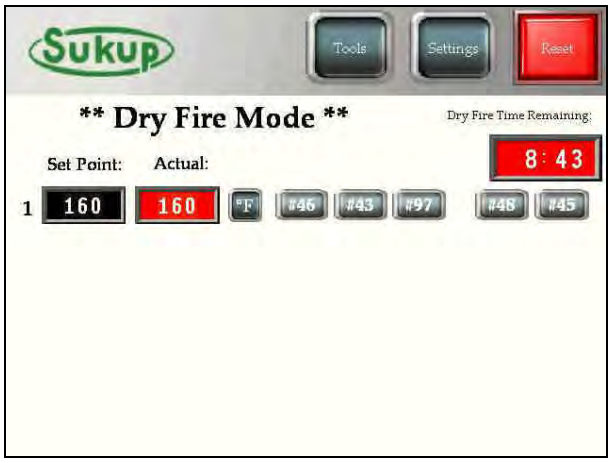
Tools → Dry Fire Mode

In addition to "Manual Operation", "Dry Fire" can also be accessed from the Tools Menu.

This mode is used to test the dryer's fan(s) and heater(s). It's a good idea to dry fire the dryer before each drying season to ensure quality operation.

The user will start by selecting "HEAT" or "COOL" operation, and then press the "OK" button that appears.

The screen will display a 10-minute running timer while showing the operation type and plenum temperature(s). The signals for Fan On, Air Switch, Differential Air Switch, Heat On, and Flame Detection will appear next to each plenum. This can be a very helpful diagnostic tool.



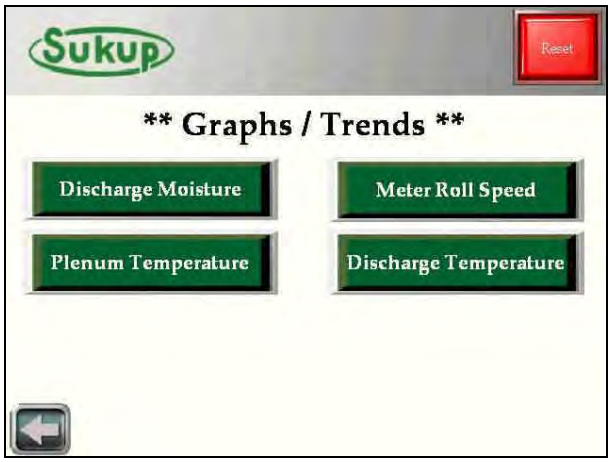
Lastly, "Dry Fire" will conclude after timer has expired, and the fans and heaters will automatically turn off.

Tools → History Log

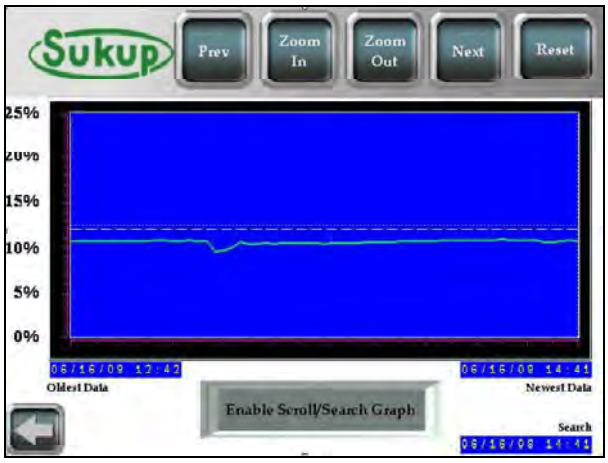
The “History Log” displays events like faults or mode operations, always showing the latest event on top.

To navigate through the history log, touch the “Enable Scroll” button, and the first entry will become highlighted. Select the “Scroll Up” / “Scroll Down” buttons to move highlighted entry up or down.

Tools → Graphs / Trends



The "Graphs / Trends" button gives you the ability to visualize the progress/performance of the dryer. User can have a visual representation of moisture, plenum temperature, roll speed, and discharge temperature. Each of these graphs is stored independently on the Panel's Compact Flash card. These features are explained in the "CSV Data Transfer" section.



The graph is searchable/scrollable after selecting the "Enable Scroll/Search Graph" button located at the bottom-center of the screen. After pressing that button, crosshairs will appear on screen, and buttons located in the header will be functional.

Each graph will display time and date of the oldest and newest data on the left and right of the x-axis.

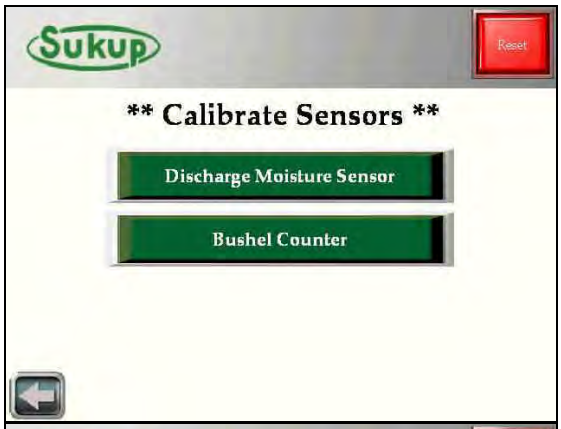
The buttons on the header (except Reset) will be inactive until the "Enable Scroll/Search Graph" button is pressed.

The graph is also searchable by time/date by pressing the BLUE area under "Search" on bottom-right of the screen.

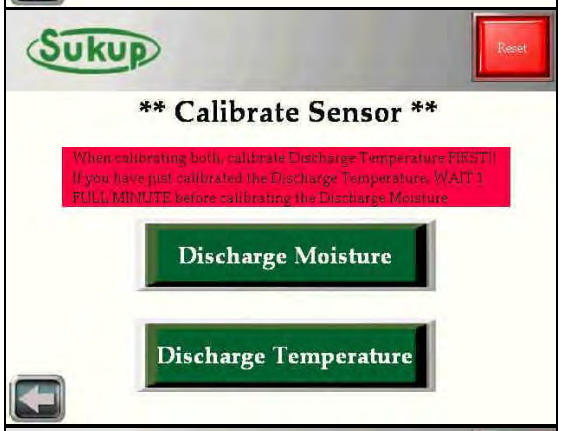
Tools → Calibrate Sensors

By selecting the "Calibrate Sensors" button, the user can put offsets on the analog inputs of the system. These include moisture sensor, bushel counter, and input moisture sensor (if applicable).

NOTE: Read the RED-colored box on the top of each page very carefully.



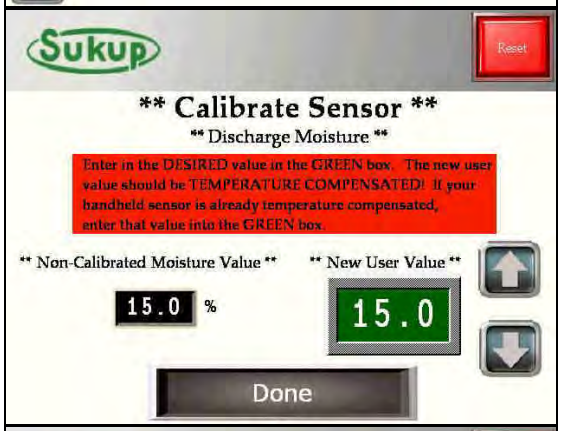
Tools → Calibrate Sensors
MOISTURE SENSOR

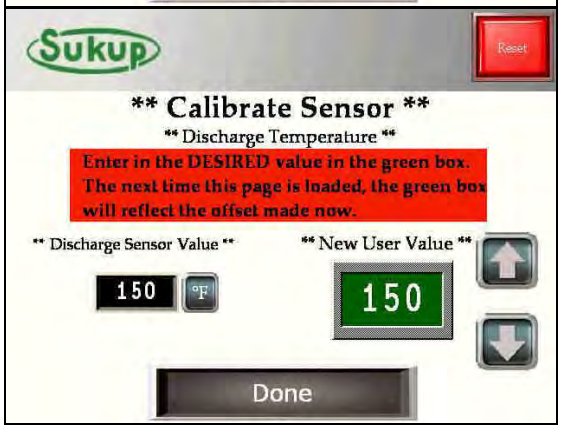


This screen shows the calibration for the moisture sensor. The numbers in BLACK are actual, unadjusted values. The offset is determined by the difference in the GREEN box minus the BLACK box.

If both values are going to be adjusted, adjust the temperature first, press "Done", and return to this same menu to change moisture calibration. This is because moisture is a function of temperature.

Example: The BLACK box displays 120°F as the recorded temperature. Its value plus the offset is loaded into the GREEN box when this screen is loaded. Since the current offset is zero (0), 120°F is also displayed in the GREEN box. If the number in the GREEN box were changed to 110°F, the offset would be (-10°). Thus, the next time this screen is loaded, the number in BLACK will remain 120°F, but the value in the GREEN box will be 120°F + the offset of (-10°) which gives 110°F.





Tools → Calibrate Sensors
BUSHEL COUNTER

The bushel counter is configurable in two ways – automatic and manual. Read the instructions in RED at the top of the screen.

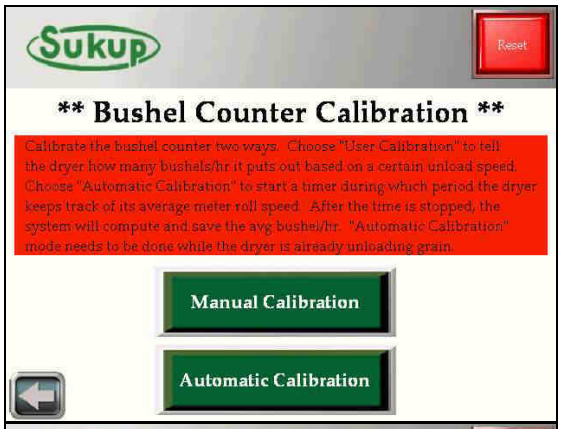
The automatic calibration is shown here. For the calibration to work, the user will need to know how much grain (in bushels) has been discharged from the dryer. A grain cart equipped with a scale works well.

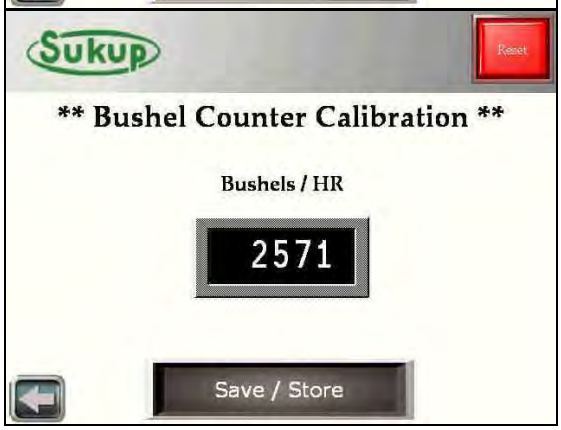
To do the automatic calibration correctly, dryer **MUST BE UNLOADING GRAIN**.

Simply start the timer, then after a period of time, stop timer and enter number of bushels discharged. The dryer will keep track of the unload speed during unload process, and then compute a bushel/hr rating.

User must then select "Save/Store" to store that value. The dryer will then begin to keep track of the amount of grain being discharged from dryer.

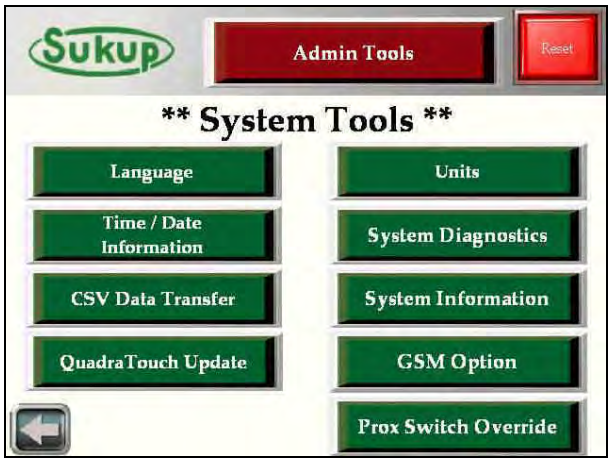
After calibration is completed, options for "Bushel Shutdown" and "Bushel Counter" will appear in the "Tools" menu.





Tools → System Tools

The "System Tools" menu allows user to visualize and adjust main system settings as well as offer some great diagnostic tools.



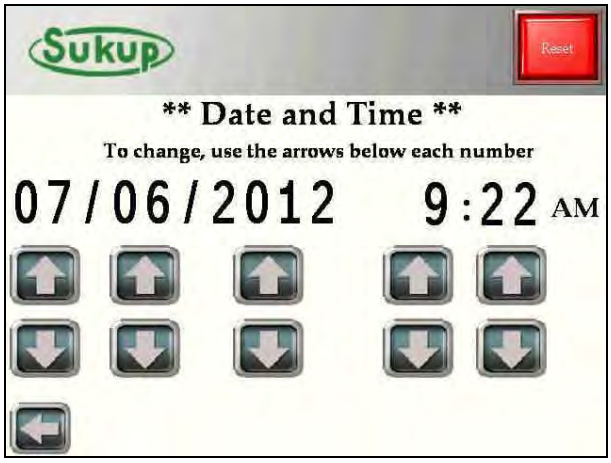
Tools →System Tools →Language

Select a system language. V2.6 will have different languages in 2 different program selections. English, Danish, Russian, Spanish, and French are in the primary release.

Hungarian and Romanian will be in a separate release.

Tools → System Tools →Time/Date

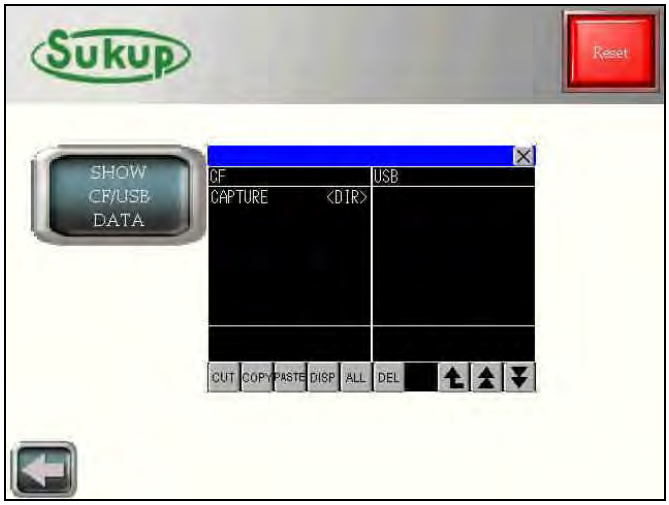
Change Date and Time using the arrow keys.



Tools - System Tools – CSV Data Transfer

Selecting the “SHOW CF/USB DATA” displays the BLACK directory window. This window shows all the folders and files available on the Compact Flash Card and USB storage devices plugged into the panel.

NOTE: If user already has a CF card reader for their computer, they can simply remove the CF card from the back of the touch-panel and insert it into their card reader.
If user has no CF card reader, the data can be transferred over to a USB flash drive using this feature.



In this image (right), the panel has a Compact Flash card inserted in the back of the panel, and the CF card has one folder called “Capture”. The USB device is either not inserted or empty. To transfer files between the two cards, simply touch the file or folder you want, and then select the “Cut”, “Copy, “Paste”, “Disp”, “All”, or “Del”. These buttons are relatively self-explanatory.

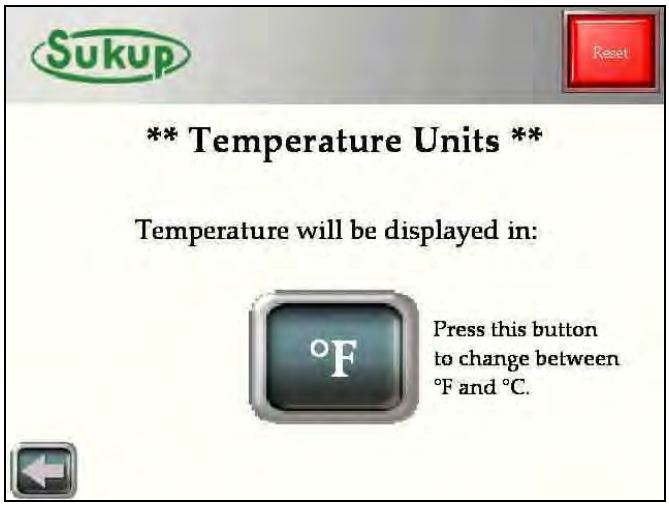
Each Touch-Panel comes with a factory-supplied Compact Flash card. All data that is collected in the drying process will be stored to this card. A person would use this feature to copy data from the card for backup purposes and/or to graph the data on a computer.

Tools → System Tools → Units

Change between Fahrenheit and Celsius.

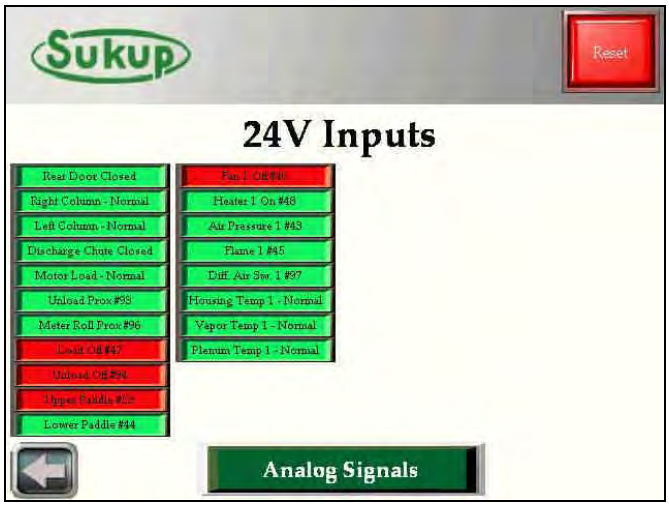
This page allows user to press the button and change units from °F to °C or vice versa.

On other screens where this same image is displayed (but smaller, generally always next to a temperature value), the user is also able to press and hold that button, and the units will change as well.

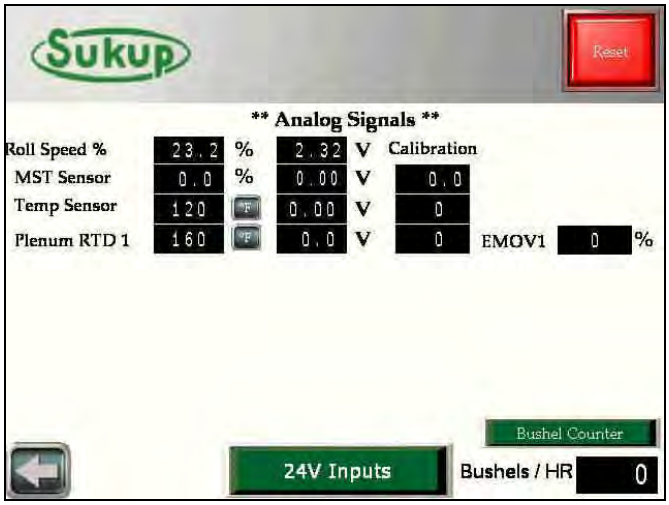


Tools → System Tools → System Diagnostics

The "System Diagnostics" feature is a very useful tool. The image at right shows the system's 24VDC input. It is an up-to-the-second, visual representation of the PLC's discrete inputs and outputs. When the input is triggered or 24VDC is present, the "lamp" will appear GREEN in color. When not energized, it will appear RED.



By selecting the "Analog Signals" button, the user will be able to see the voltages and interpreted values of all analog inputs and outputs. These are especially helpful when troubleshooting problems.



SPECIAL NOTE!!!! Pressing and holding the SUKUP logo on the top left of every screen will take user to this analog signals page.

Tools → System Tools → System Information

In the system information page, the PLC and HMI software versions are displayed. Check http://www.sukup.com/Products/QuadraTouch to make sure your dryer has the latest software updates.

Tools → System Tools → GSM Option

If equipped with the T24999 GSM kit, the dryer will automatically contact the programmed number on the GSM Option page in the event of a fault condition. Press and Hold "International Dialing" if the number you want to notify is outside the +1 country code.

For more information, see the L24999 GSM modem operating instructions at the end of this Software Manual section.

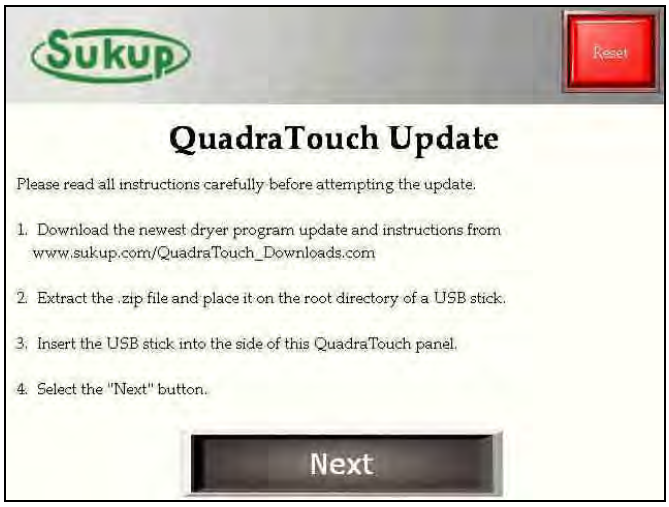
If dialing outside of North America, you may need to change the band setting of the GSM modem. Touch the "Help" button to show band setting options.

Tools → System Tools → Prox Switch Override

Sometimes it may become necessary to ignore the system's two (2) proximity switches. These switches are intended to verify auger rotation, and this override should only be used in extreme cases. If the switch is malfunctioning, a replacement switch should be ordered immediately! Should you choose to continue dryer operation in the event of a missing or failed switch, this override can be used to bypass the proximity switch failure fault. The override will last for 24 hours, and then the override will be cancelled automatically.

Tools → System Tools → QuadraTouch Update

Please refer to the QuadraTouch™ Update instructions sheet for more information.

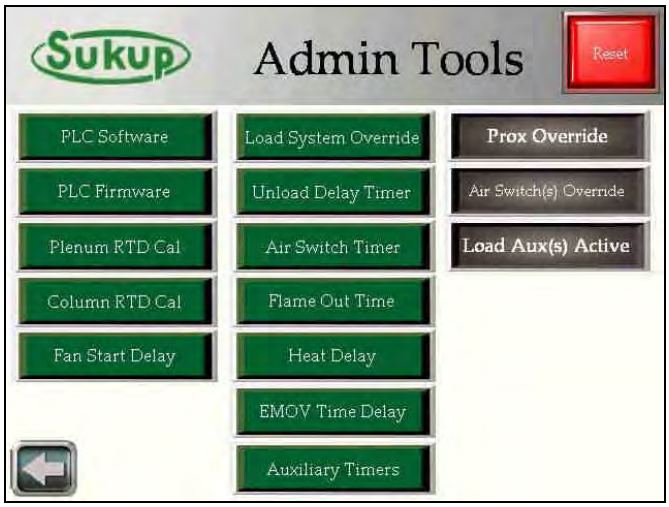


Tools → System Tools → Admin Tools

The Admin Tools menu allows you to customize your dryer in order to better suit your operating conditions**. HOWEVER: Some options will allow you to seriously change the way the dryer operates. In some cases, serious and permanent damage may occur to the dryer if the settings are used improperly.**

SUKUP MANUFACTURING DOES NOT RECOMMEND BYPASSING SAFETY CIRCUITS AND SENSORS FOR ANY PERIOD OF TIME. USE THESE SETTINGS ONLY IF ABSOLUTELY NECESSARY.

To the right is the admin tools section. You will always see the RED warning screen when trying to access this menu.



Tools → System Tools →
Admin Tools → Load System Override

The load system override function allows you to turn on the load motor and either auxiliary motor in any order regardless of the paddle switch position.

Serious and/or permanent damage can occur if the load system is used improperly.

Tools → System Tools →
Admin Tools → Unload Delay Timer

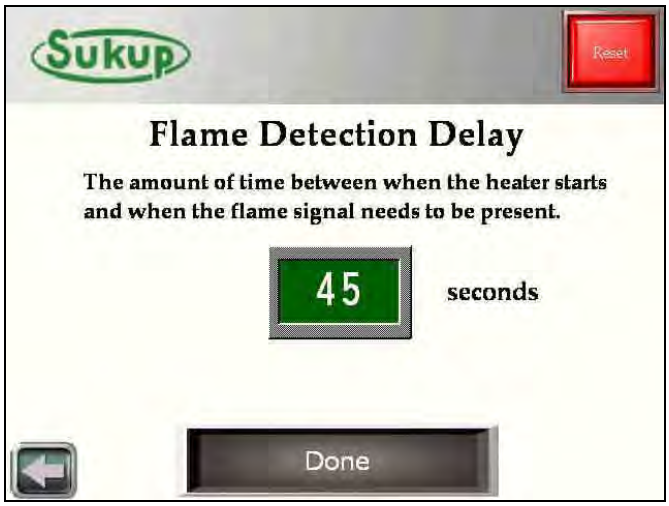
The Unload Delay Timer can be used to stop the unload auger from running during automatic operation. This value is user-selectable from one to five (1-5) minutes.

Tools → System Tools →
Admin Tools → Air Switch Fault Timer

In **RARE** cases, the Air Switch Timer may not close before calling for heat. This function gives you the ability to extend the air switch closing time for up to 20 seconds. This may be applicable in Soft Start Applications. However, it's highly recommended to use the **HEAT DELAY** function if possible.

Tools → System Tools → Admin Tools → Flame Out Time

In RARE cases, it may be necessary to extend the Flame Detection Timer. This timer may be extended up to 90 seconds.



Tools → System Tools → Admin Tools → Heat Delay

In Soft Start Applications (or any application for that matter) where it takes an extra couple of seconds for the fan to build enough pressure to close the air switch, the Heat Delay function is very useful. You can tell the dryer to wait a certain period of time between when the fan starts and when power is applied to the heater relay. This reduces the chance of a start-up flame-out fault.

Tools → System Tools → Admin Tools → EMOV Delay

Should the Electronic Mod Valve (EMOV) butterfly valve stem ever need to be adjusted, this is a convenient way to do it. This function allows you to lock the EMOV stem in its low-fire position for up to four (4) minutes. At factory settings, the EMOV will open to 25%, which should read 5-lbs of pressure on the pipe train. Fire the burner in dry fire mode with this setting to adjust the stem position of the butterfly valve to 5-lbs of pressure. After the Timer delay, the valve will start actuating like normal.

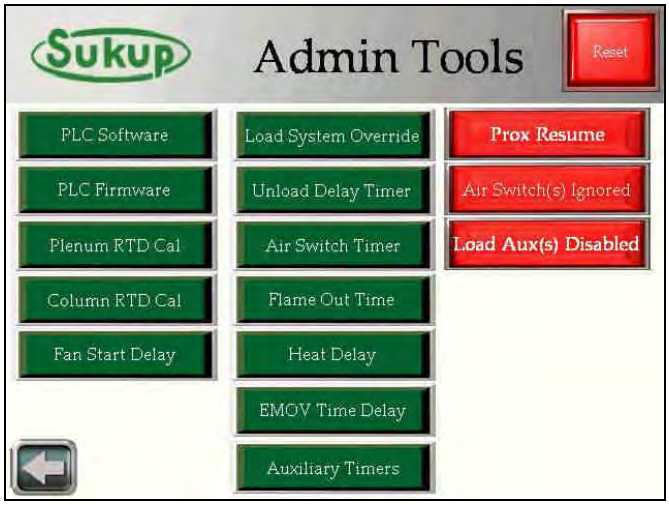
Tools → System Tools → Admin Tools → Aux Timers

Because everyone's dryer setup is different, it may be necessary or helpful to change the factory delay settings on the auxiliary load devices. This will allow a longer or shorter delay between when the load auger, auxiliary 1, and auxiliary 2 start.

Tools → System Tools → Admin Tools → Overrides

In **RARE** cases, it may be necessary to use the override functions. These overrides, shown in RED on the right-hand part of the screen, should only be used for short periods of time until the dryer can be serviced. These overrides allow the program to disregard the proximity switches and air switches for a period of 24 hours.

The program also gives you the option to BYPASS the Auxiliary Load devices. This can be a nice feature when you are transferring grain through the dryer and bypassing the wet bin.



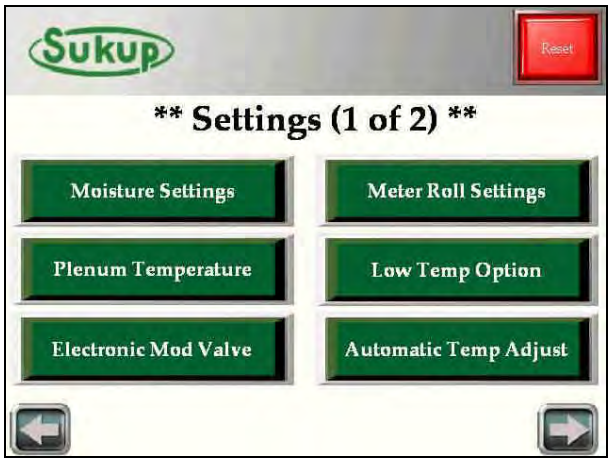
"Settings" Menu

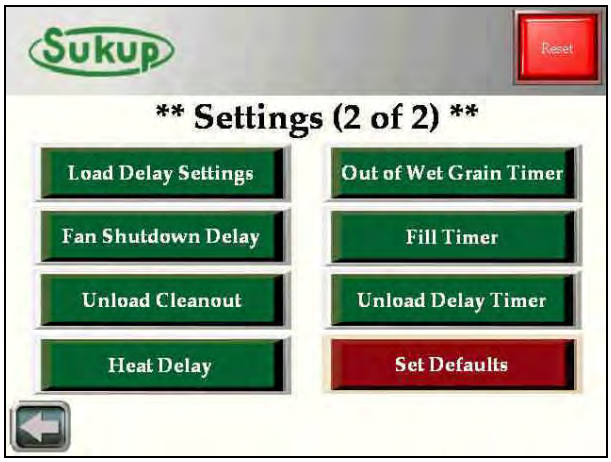
The "Settings" menu allows the operator to specify optimal settings for grain drying.

The "Settings" menu is broken up into two (2) pages. The first page includes settings that have to do with drying operation such as moisture and plenum temperature set points. The second page includes mainly delay timer settings. There is also a button to reset factory defaults.

NOTE: As before, the BURGUNDY and light NEON-GREEN buttons have press and hold features.

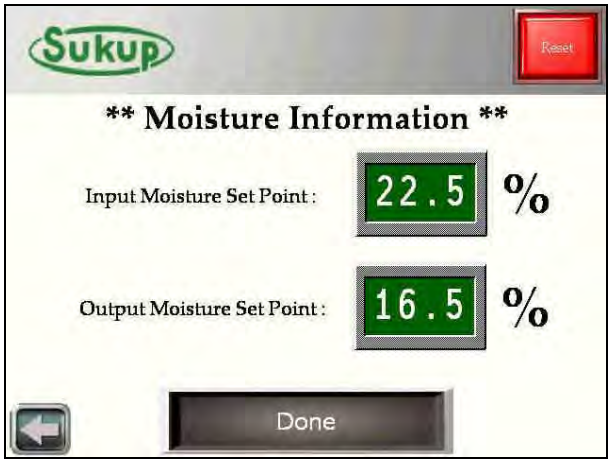
Each button opens a new screen where user will specify their desired values. Each setting is factory set before the unit leaves Sukup Manufacturing Co.





Settings (1 of 2)→ Moisture Settings

Specify the input and desired output set points.



Settings (1 of 2)→ Meter Roll Settings

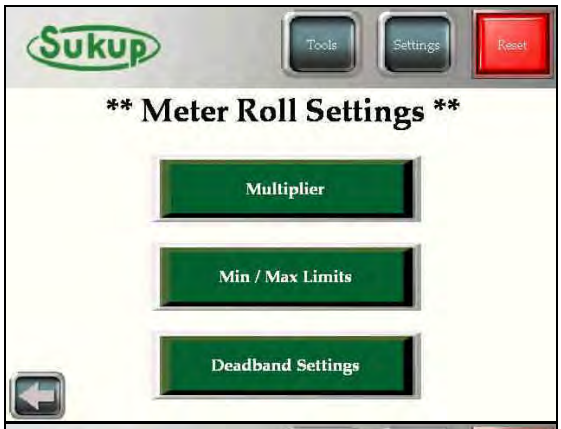
User may specify the high and low limits of the meter roll speed. It is also possible to adjust how fast the meter rolls react to changing output moisture using the "Meter Roll Gain" feature. Use the Deadband zone to freeze meter roll speed around the discharge moisture set point.

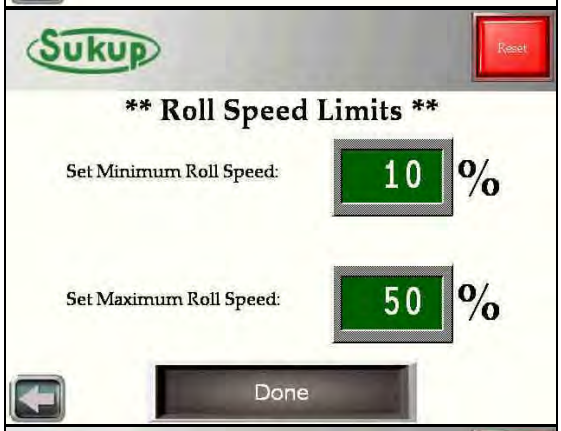
The default setting for the "Meter Roll Gain" is "2." The scale goes from 1 to 10 where "2" is normal reacting and "10" is very fast reacting.

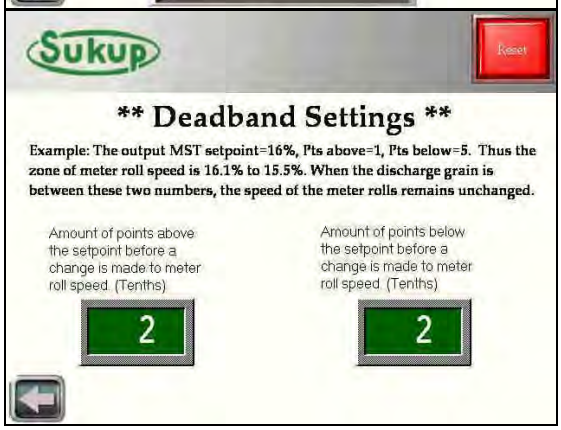
A setting higher than "4" will rarely ever need to be used.

The minimum and maximum metering roll speeds can be set with this screen.

The deadband zone is a great feature to keep the dryer from swinging around a set point. The deadband settings can be changed according to user preference. With a default setting of 2 (tenths) above and 2 (tenths) below, the meter roll speed will stay at a constant speed while the discharge moisture remains between 2 (tenths) above and 2 (tenths) below the set point.

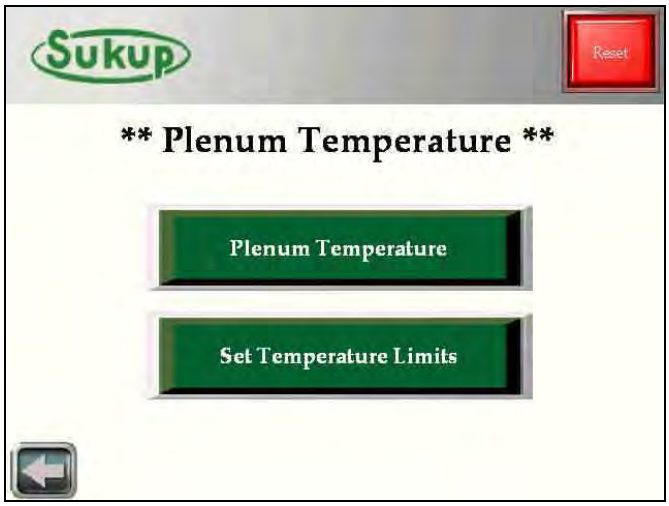


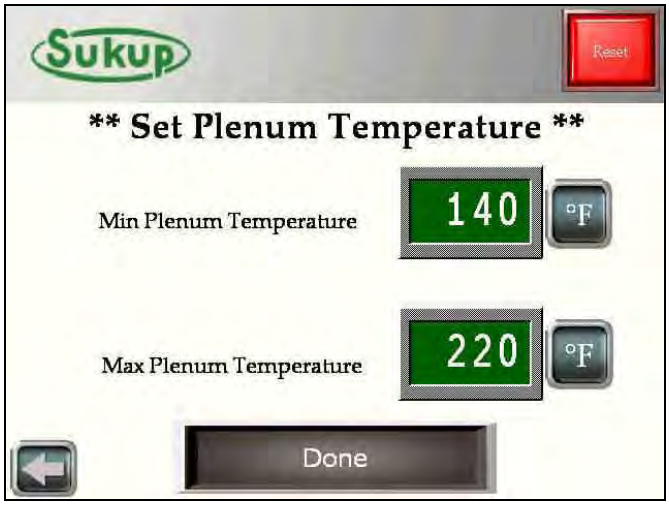




Settings (1 of 2)→ Plenum Temperature

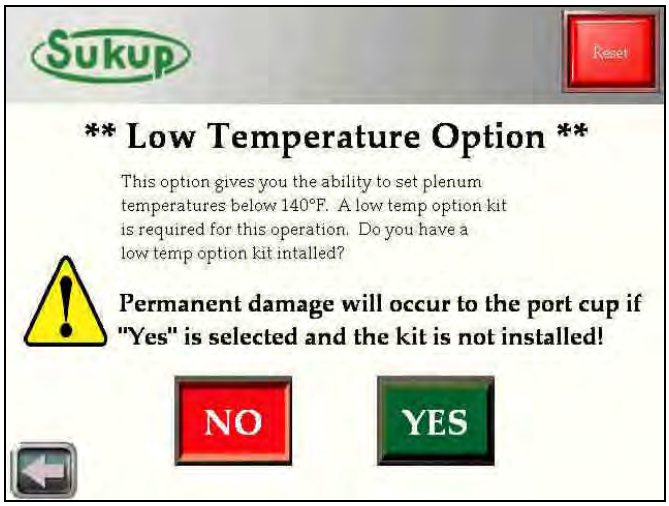
A user can also specify the **RANGE** in which the plenum temperature may be set. Use the "Set Temperature Limits" button to control the temperature range, and use the "Set Plenum Temperature" button to set a specific temperature.





Settings (1 of 2)→ Low Temp Option

The "Low Temp Option" page has a good description on it, but its key feature is to decrease the plenum temperature low limit down to 120°F.



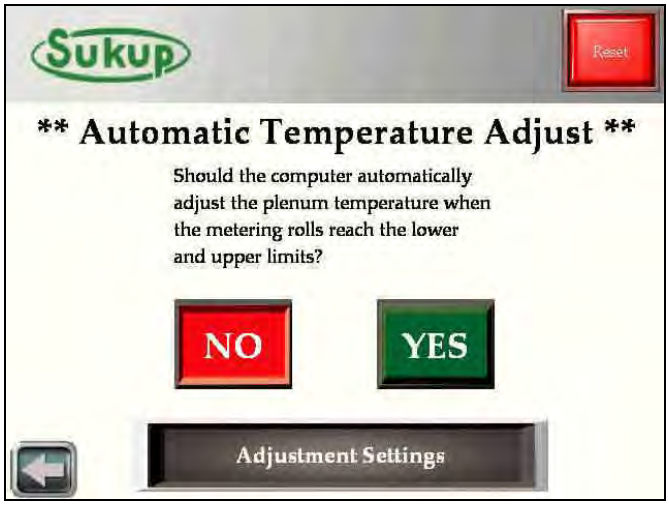
Settings (1 of 2)→ Automatic Temp Adjust

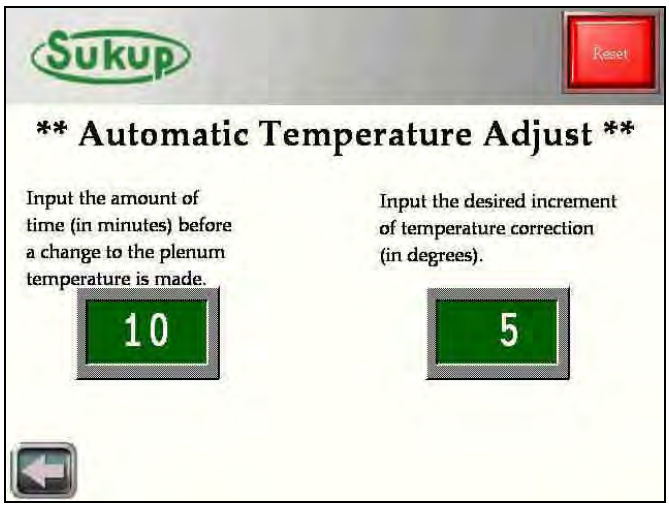
The "Automatic Temperature Adjust" feature allows the computer to automatically change the plenum temperature up and down based upon metering roll speed. (Factory Default is OFF.)

The user is able to set the specific amount of time in minutes before a change is made, as well as the increment of change itself. Both of these changes can be made after pressing the "Yes" button or the "Adjustment Settings" button.

This function will increase the plenum temperature up or down if the meter rolls are running at their minimum or maximum speeds respectively.

When the metering rolls are no longer running on their minimum or maximum speed, the plenum temperature will return to its original set point in the increments in which it was increased or decreased. These increments or decrements will occur in the reverse order using the same time and temperature corrections.





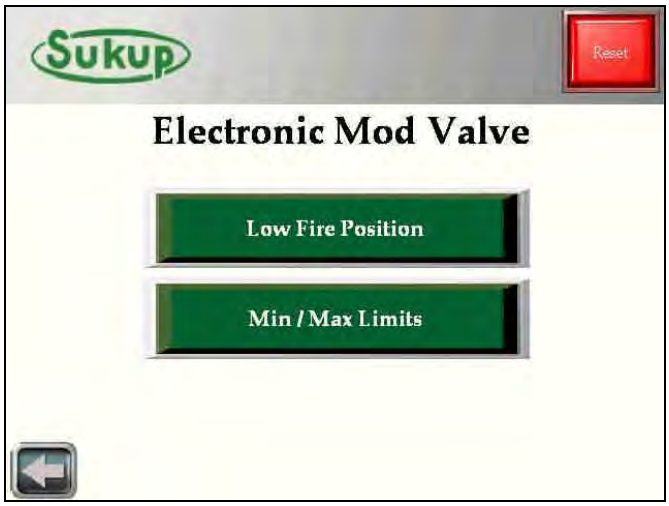
Settings (1 of 2)→ Electronic Mod Valve

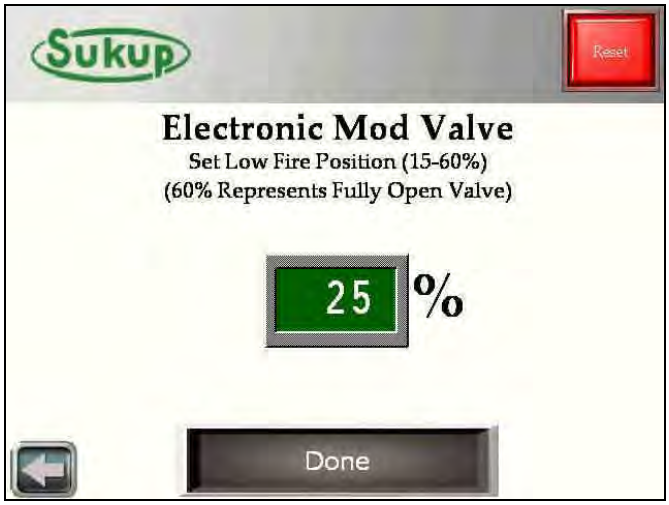
This menu gives the user the option to specify a low fire position (the position to which the valve is opened for ignition) as well as setting the minimum and maximum valve opening position.

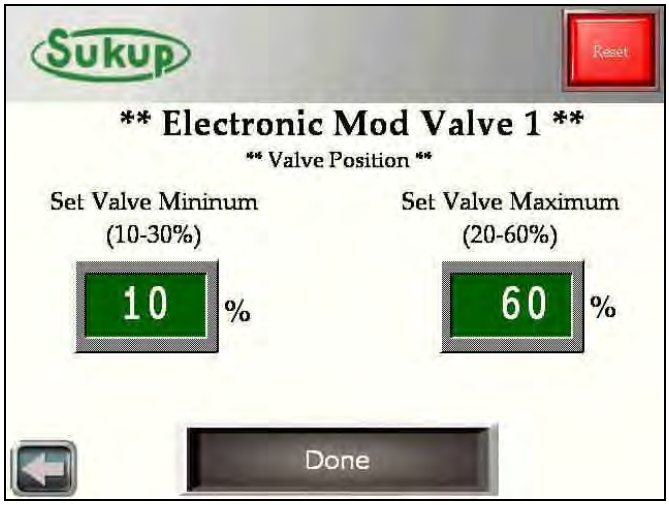
The control loop used to control plenum temperature is very accurate. Users will seldom need to make changes in this area. The default setting for low fire position is 25% max valve opening.

Sukup Manufacturing Co. finds that at 25% opening, the pressure gauge should read 5-lbs. of pressure (+ or – ½ lb.). To check if this setting is correct, select "Valve Settings" and decrease the max valve opening setting down to 25% and increase the min valve opening to 25%.

Special NOTE:
The actuating time of the butterfly valve is very fast, which gives better control of plenum temperature. If for some reason the valve is opening too fast, and the temperature is rising too quickly, reduce the valve maximum setting from 60% down to 40% and re-evaluate.

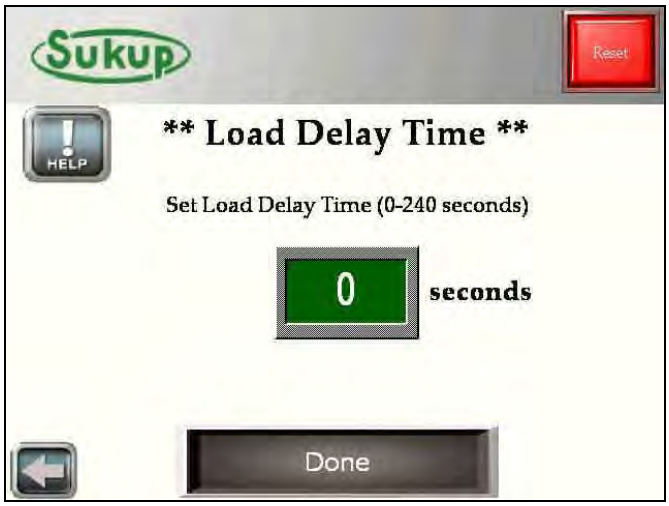






Settings (2 of 2)→ Delay Settings

The Load Delay Settings menu will give user the option of waiting a set period of time (0-240 seconds) in addition to the five- and ten- (5 and 10) second timers before the auxiliary load motors start. This is especially helpful when the loading system is oversized for the dryer it is attached to. Having a constant on/off situation is tough on motors. Putting a delay in allows time for the dryer to unload slightly more than usual and allows the auxiliary load motors to stay on for longer periods of time. The default setting is zero (0) seconds.



The Fan Delay timer allows the fan to run for up to ten (10) minutes after the dryer is shut down.

However, the fan will not always run upon a fault condition. If the fault that stopped the dryer is unrelated to heat/over-temp alarms, the fan will be allowed to run.

The Unload Cleanout Time allows the unload auger to run for up to 60 seconds after the dryer has been shut down.

Just like the Fan Delay, the unload auger will not run during an unloading related fault.

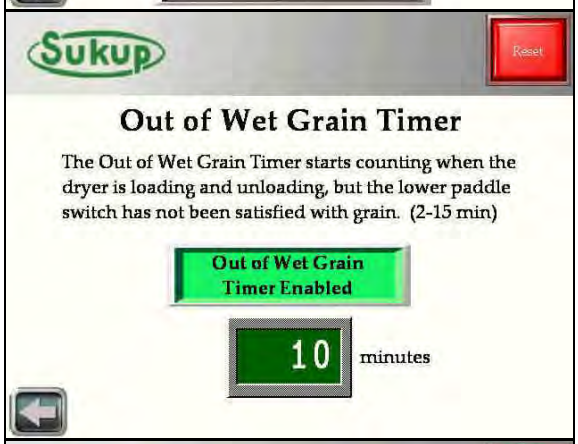
Settings (2 of 2)→ Delay Settings

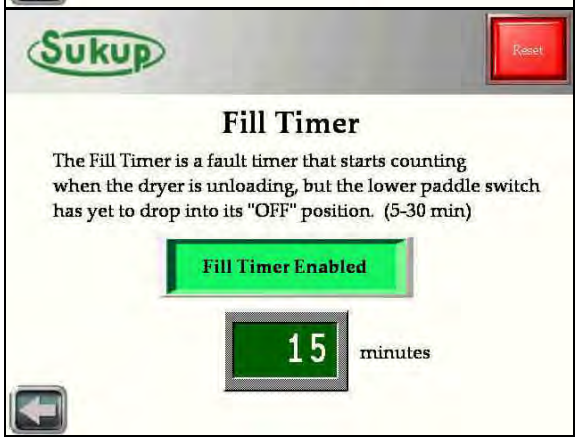
The Heat Delay setting is the delay time between when the fan relay closes and when power is applied to the heat relay. This setting is helpful when supply power to the dryer is unstable or inadequate.

The Unload Delay Timer allows the unload auger to be paused for up to five (5) minutes during a run cycle. This may be helpful when changing a distributor on your air system or managing your auxiliary take-away system during operation.

The Out of Wet Grain Timer is user settable from two (2) to 15 minutes. Its default value is ten (10) minutes. While unloading, if the dryer hasn't been filled (meaning the lower paddle switch hasn't been satisfied) for the timer duration, it will shut down with an out of wet grain fault.

Similarly, the Fill Timer is also user adjustable from five (5) to 30 minutes. Its default value is 15 minutes. During the unloading process, the dryer has between five (5) and 30 minutes to call for grain. If the paddle switch hasn't been released during that time period, it will shut down with a fill timer fault.





BASIC OPERATION

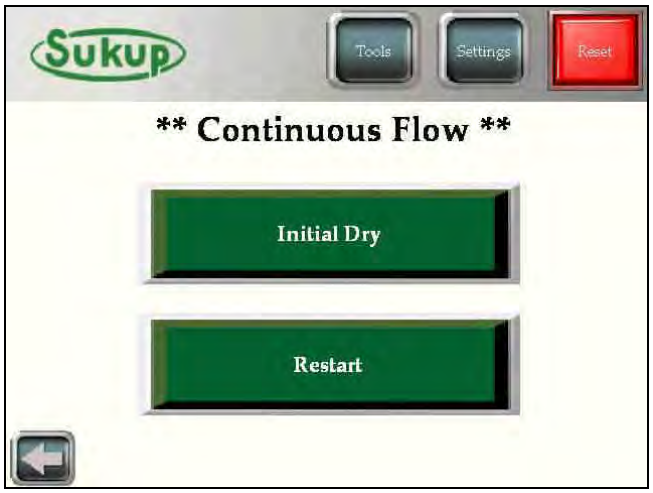
From the “Main Screen” touch the “Start” button.

The “Choose Operation” menu will come up.

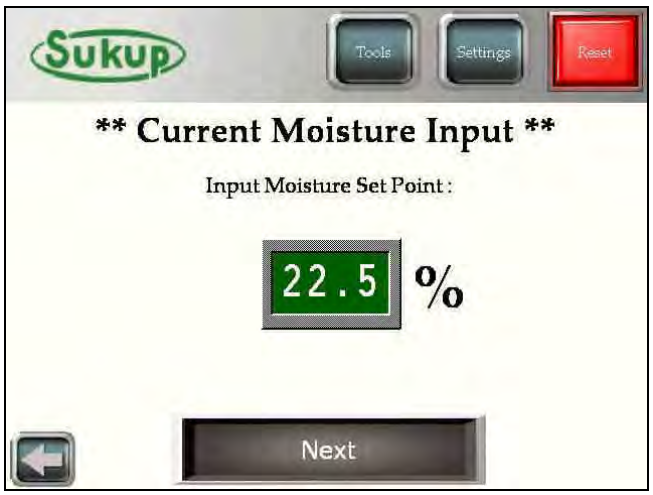
There are four (4) automatic modes in which the dryer can operate. Each operation sequence will be shown below.

Continuous Flow Mode
→ Initial Dry

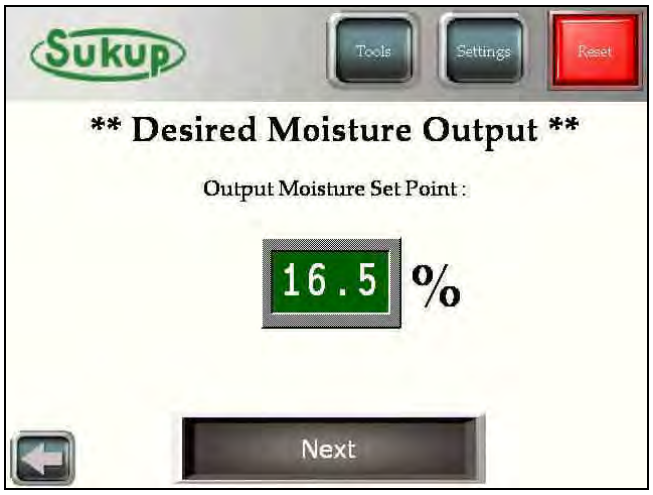
After selecting “Continuous Flow” from the “Select Operation” menu, choose the “Initial Dry” option.



The next screen to appear is the “Current Moisture Input” screen. Using the pop-up keypad, enter the moisture content of the incoming grain.



After the input moisture has been entered, specify the desired output moisture.



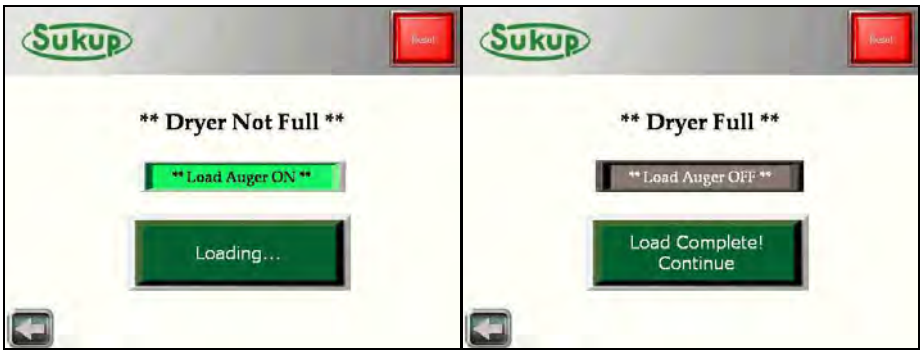
Lastly, set your desired minimum and maximum roll speeds.

Special NOTE:
This system uses a Variable Frequency Drive to control the speed of the metering rolls. Set points are exact, and there is no need to calibrate this device.

When "Next" is pressed, the "Loading Sequence" begins.

Loading Sequence

The dryer will check its paddle switches to determine if the columns are full of grain. After a short delay (when the main button flashes “Please Wait…”), the dryer will give the option of “Start Loading” or “Load Complete! Continue”

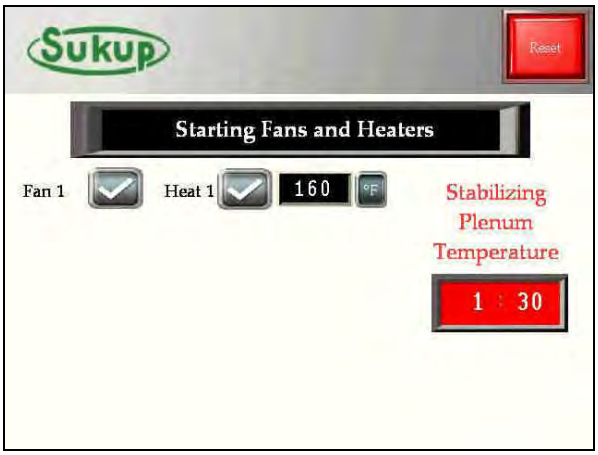


Firing Sequence

After loading has finished, the dryer will now start its fans and heaters. The fan(s) and heater(s) will start from the top down.

Example: A two-fan dryer will start its upper fan first.

After each device is started, a check mark will appear when operation has been confirmed. When all heaters are started, a 90-second, plenum stabilization timer will begin.

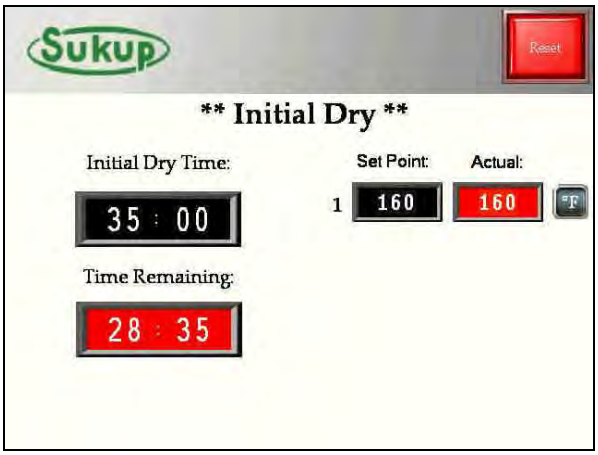


INITIAL DRY

After the fans and heaters have been started, the "Initial Dry" timer will begin.

Initial Dry Time is determined by 6 min/pt (+) or (–) 1 min/pt per 20°F difference from 160°F

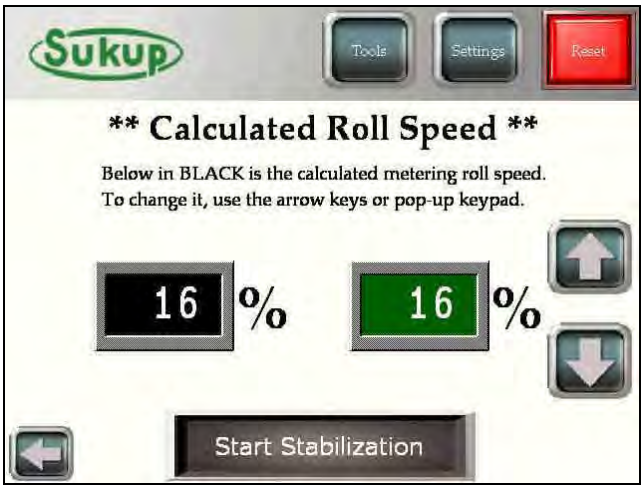
Example: Input MST =22%, Desired MST = 16% → 6 pt removal. 6 min/pt at 6 pts @160°F = 36 min.



After the "Initial Dry" timer has expired, the operator will have the opportunity to specify a stabilization temperature and the computer will determine and unload rate based upon that temperature.

If the dryer has been run previously, the user will be prompted to resume a previous stabilization period or calculate a new one.

The computer will determine a "Calculated Roll Speed" based upon the temperature desired for "Stabilization" mode. This calculated number is displayed in BLACK on the left. This value is automatically loaded into the GREEN box on the right. This value is adjustable. If the calculated speed is outside the user's predetermined minimum and maximum meter roll speeds, and error message will pop up and give you the option to change the plenum temperature.



STABILIZATION

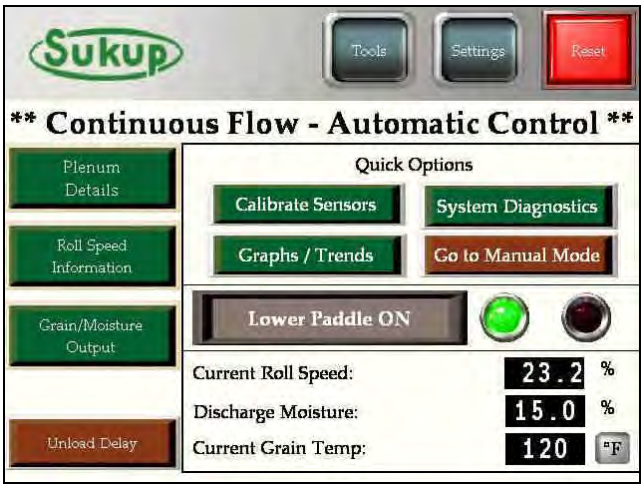
After the user has selected "Start Stabilization", the computer will determine a dry time based on the roll speed and the amount of moisture to be taken out of grain.

Ten seconds after the "Stabilization" mode has started, the unload process will begin.

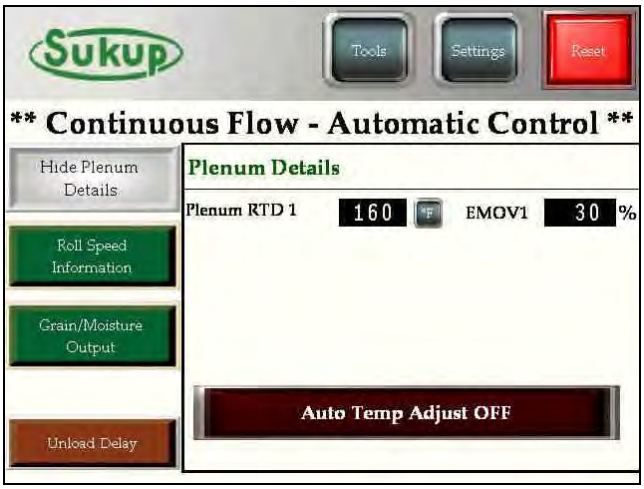
Continuous Flow

After the “Stabilization” timer ends, the “Continuous Flow” mode begins. During this mode, the dryer constantly monitors the outgoing moisture and makes corrections to roll speed and plenum temperature (optional). The buttons along the left side of the screen allow the user to keep track of all relevant drying information.

The paddle switches are also visually represented by the two lamps next to the Load Auger status.

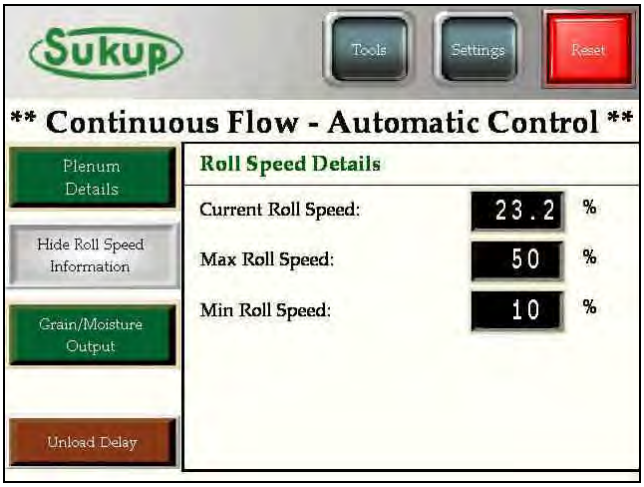


Pop-up menu for “Plenum Details”
This will show plenum temperature(s) and corresponding electronic mod valve position(s).

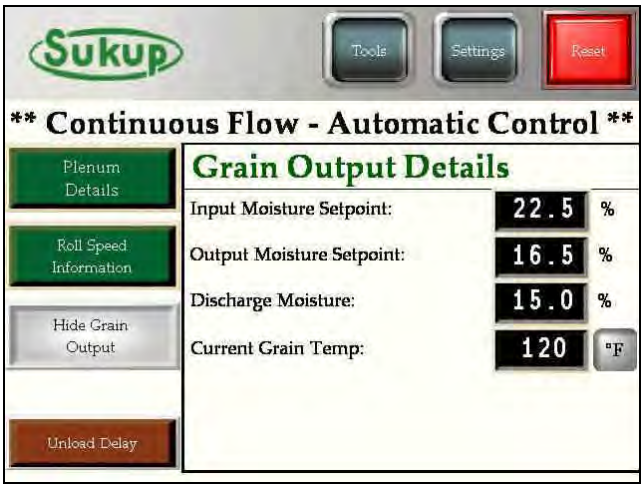


Pop-up menu for “Roll Speed Information” will show all the corresponding unload speeds and their limits.

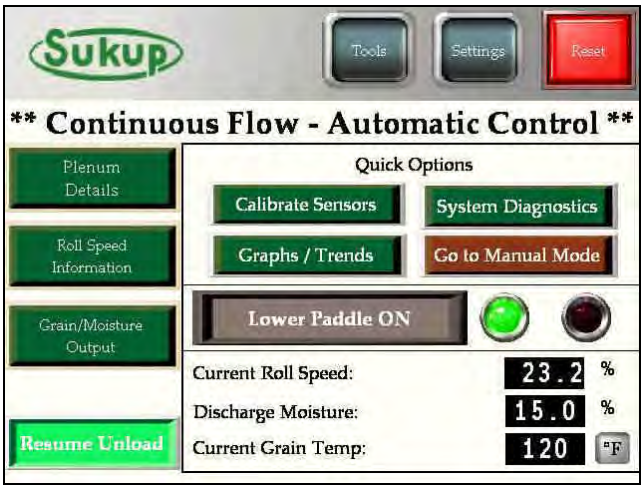
After the bushel counter has been calibrated, it will show up on this menu as well.



Pop-up menu for “Grain/Moisture Output”
This menu will show all the set points and actual moisture levels of the grain.

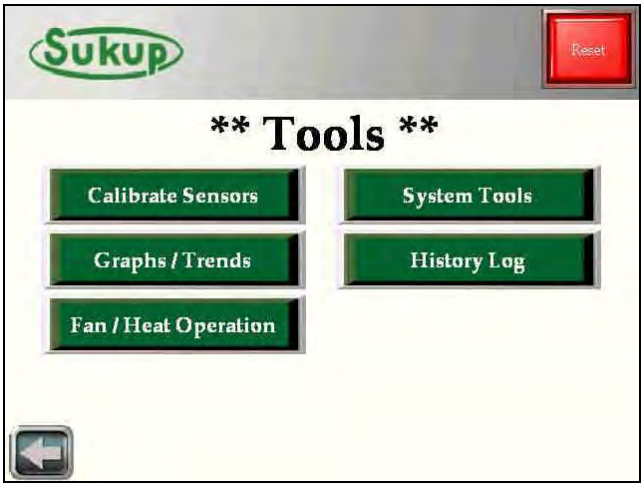


During operation, it sometimes becomes necessary to stop the unloading process for a brief period to clean the sensor or switch storage bins. Using the press-and-hold “2 Minute Unload Delay,” the dryer will stop its unloading system for two (2) minutes. The system will not re-engage the unload system unless the button is pressed and held again. The dryer will shut itself down with a fault condition if the unload system is not re-engaged by the user within two (2) minutes.



During normal, automatic operations, a limited “Tools” menu will be available for use.

The Fan/Heat Operation option will come up during automatic modes. This will allow you to turn fan(s) and heater(s) on and off during continuous flow.

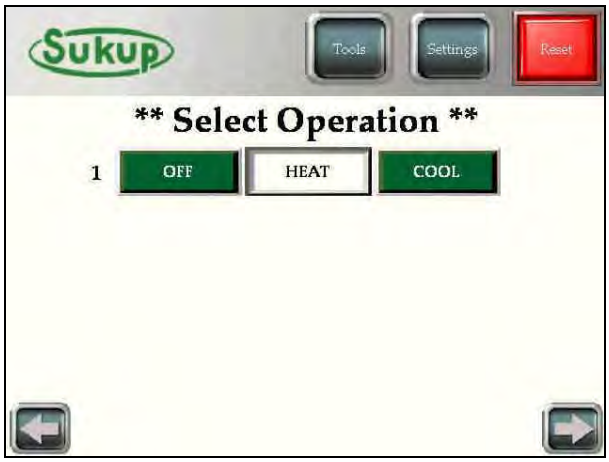


Continuous Flow → Restart Menu

If the dryer has already completed its "Initial Dry" and/or the user is restarting the dryer after a shutdown, the "Restart" option is a great way to pick up where the dryer left off. If the dryer shut down is due to a fault condition, the time and date will be stored and displayed on the screen.

Choose either "Restart With Stabilization" or "Restart Without Stabilization"

Choose your Fan/Heat Operation.
The "Heat" option will engage the fan and heater. The "Cool" option will engage only the fan.

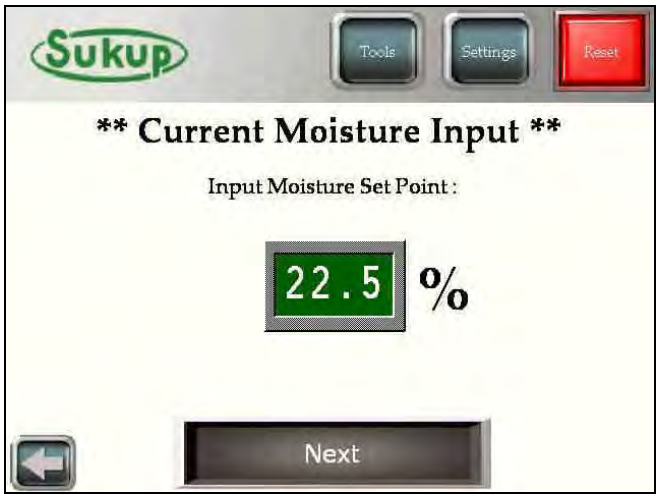


"Restart w/ Stabilization" will put the dryer through its "Stabilization" process of calculating dry time based on temperature, incoming moisture, and meter roll speed.
"Restart w/o Stabilization" will take you directly into "Continuous Flow" computer controlled mode.

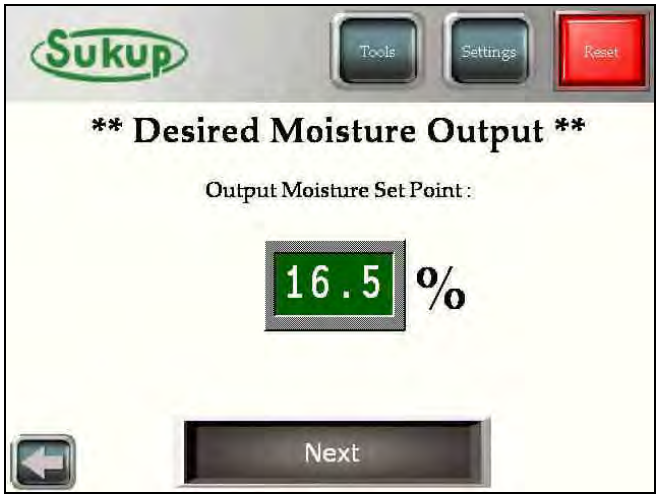
“Autobatch” Mode

In the event of extremely high moisture grain, it may be necessary to run the dryer in “Autobatch” mode. This mode allows the user to dry grain in batches with the option of computer-controlled adjustments.

The system will prompt the user for some set points to make dry-time and unload time calculations.



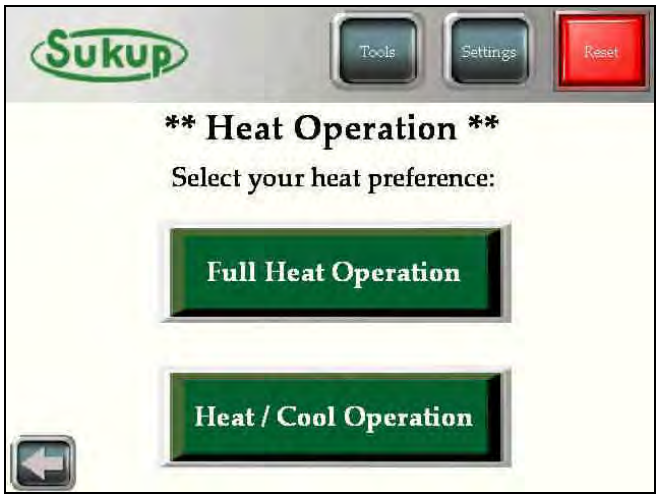
The user will enter input and output moisture as well as the maximum unloading capacity.



After the user has selected desired set points, it's time to select a fan/heat operation.

"Full Heat Operation" runs the fan(s) and heater(s) during the "Dry Cycle", and the "Cool Cycle" is omitted.

"Heat/Cool Operation" runs the fan(s) and heater(s) during the "Dry Cycle" and shuts off the heater(s) for the "Cool Cycle"



If the user is resuming a previous batch, the "Resume" button will start the batch immediately using the past temperature and timer set points.

The batch number is incremented each time a load is discharged.

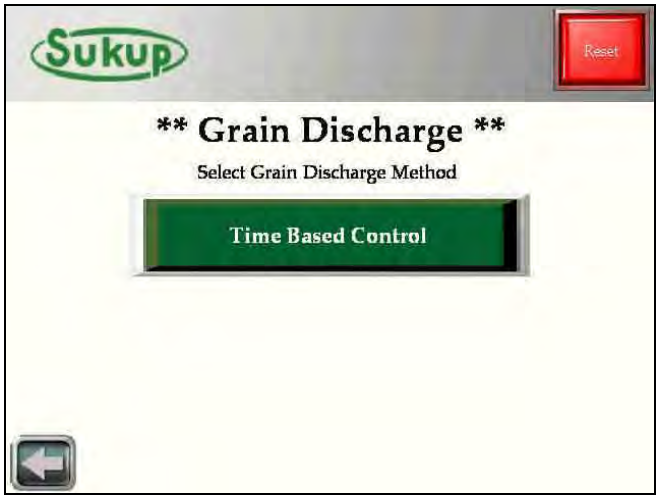
If a new batch is desired, the "New Batch" button is offered, and the user will be able to set drying temperature and dry cycle timers.

After pressing "New Batch" the user will select a drying temperature.

After selecting a drying temperature, the system will offer to automatically adjust the batch dry time based on outgoing moisture after the batch has been dried.

Next, the user will decide on the method of grain discharge. In most cases, time discharge will be the only option.

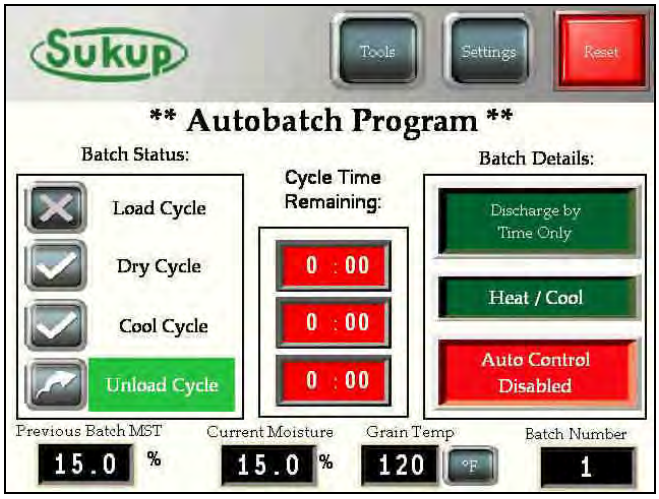
If the dryer has a Column RTD option installed in it, there will be two (2) more discharge options on this page (Temp Based and Time and Temp Based Control)



After selecting "Time Based Control" the computer will calculate a recommended dry time based upon the user's set points. That number is placed in the BLACK box. It is automatically loaded into the GREEN box, which is user selectable.

Similar to the batch dry time, the batch unload time is also calculated and placed into the BLACK box.

After all set points and timers have been decided, the "Autobatch" program can begin. Each step of the process (under "Batch Status") is highlighted in GREEN. The middle of the screen displays time remaining in each highlighted section, and the "Batch Details" section shows batch information.

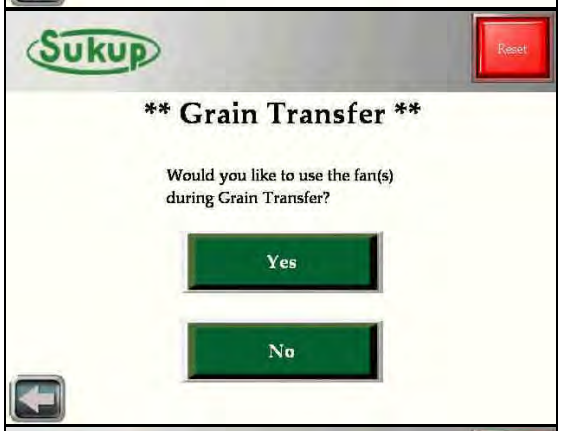


“Grain Transfer” Mode

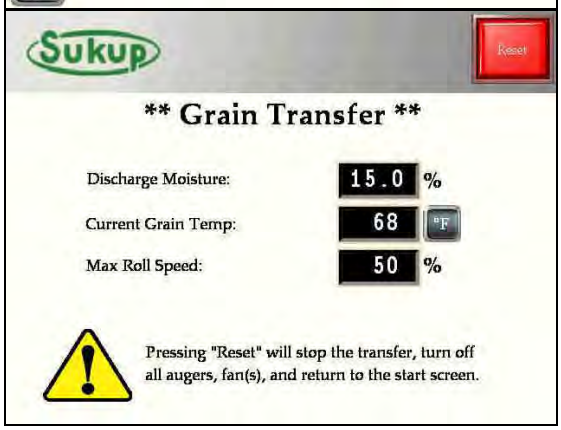
The first step after selecting “Grain Transfer” is to specify a Maximum Roll Speed. This tells the dryer’s control system how fast the unload system is capable of taking grain away from the dryer. During “Grain Transfer” the dryer’s unload system will always run at the maximum roll speed.

After a speed is selected, the user will have opportunity to use an Out of Wet Grain timer. This timer will start after both paddle switches are in their respective “off” positions. If the lower switch hasn’t been made in 30 minutes, the dryer will automatically stop with a 30-minute Out of Wet Grain fault timeout.

New in V2.6, Grain Transfer gives you the option to use the fans during transfer operation.



This screen will show up for the entire “Grain Transfer” process. It shows the discharge moisture, grain temp, and your unloading speed.



“Final Dry” Mode

After selecting “Final Dry” from the “Start” menu, the user will specify current moisture of remaining grain in the dryer. This mode allows remaining grain to be dried and unloaded without dryer being completely full.

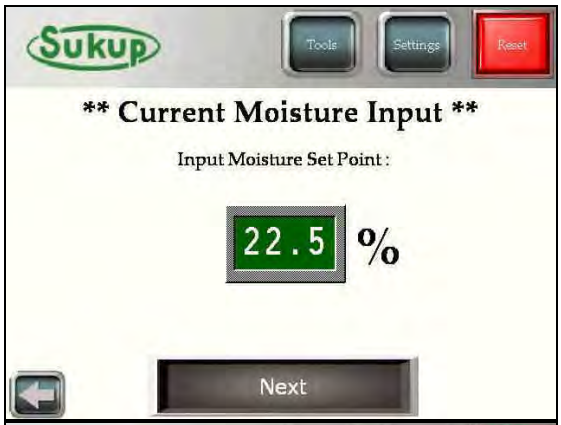
After the moisture content has been entered, the system calculates a recommended dry-time for the user. Pressing “Start Final Dry” will start the fan(s) and heater(s), and ignition sequence will begin.

Because the batch remaining is already partially dried, a calculation of 3 min/pt @ 140°F is used.

After the 90-sec. plenum stabilization timer expires, this screen will appear.

After the “Dry Time Remaining” timer has expired the fans and heaters will turn off. The unload auger will run for the length of the “Unload Time Remaining” timer. This value is calculated off the system’s maximum roll speed.

When “Final Dry” mode finishes, this screen will appear. The screen also tells the user to use the manual operation feature to unload any grain still remaining in the dryer.



Fault Screens and Error Messages

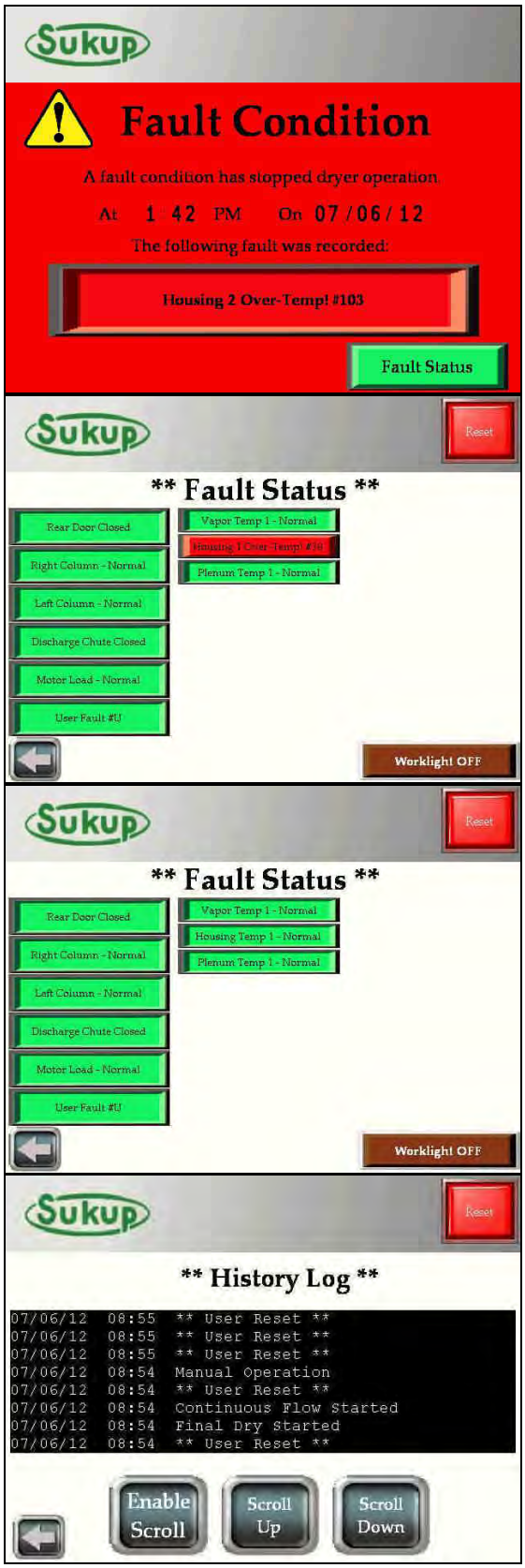
There are many safety switches and relays on the dryer that are constantly monitored. Sukup Manufacturing Co. uses these fault devices to ensure the safety of our customers and the product.

The dryer has an intelligent system that monitors all faults. If at any time a 24 VDC signal is lost through a safety circuit, a fault is triggered and the PLC shuts down all dryer function. It also contains the wire number of the fault in question.

The set of images to the right show an example of the Housing #1 Over-Temp safety circuit. When the fault occurs, the PLC immediately shuts down the dryer and records the date and time of the fault. It shows the fault on the screen that shut the dryer down, and it will remain on the screen until someone checks its status. The only button available to press on the screen is the "Fault Status" button located in the lower right-hand corner of the "Fault Condition" screen.

When the "Fault Status" button is pressed, the faults that still exist will be displayed in RED. The faults that are cleared will be displayed in GREEN. When a fault condition exists, the worklight will automatically turn off. If the user needs to turn on the worklight to work on the dryer, it's possible to turn it on from this screen. (This is a press and hold button located on the lower right-hand corner of the screen.)

When a fault occurs or a drying mode is selected, it is recorded in the "History Log"



The dryer also has some special sensing features.

Each analog input sensor of the dryer is constantly monitored as well. In the event of a missing or inoperative sensor, the messages located to the right will appear.

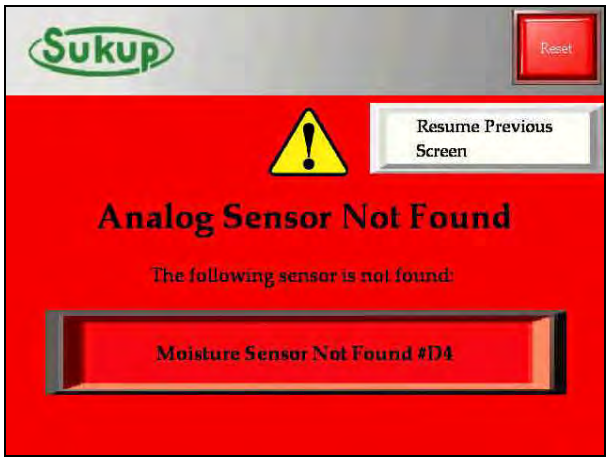
Examples are errors from a Single Fan Dryer. More error messages are possible in multiple fan models.

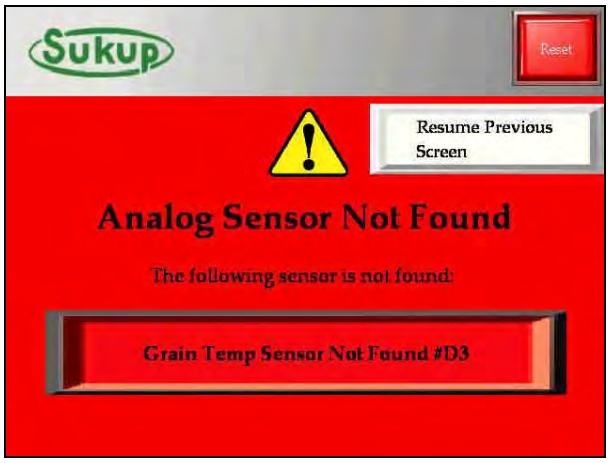
Each fan and heater has its own Plenum RTD sensor. Therefore, a Two Fan Dryer will have an additional Plenum RTD error message.

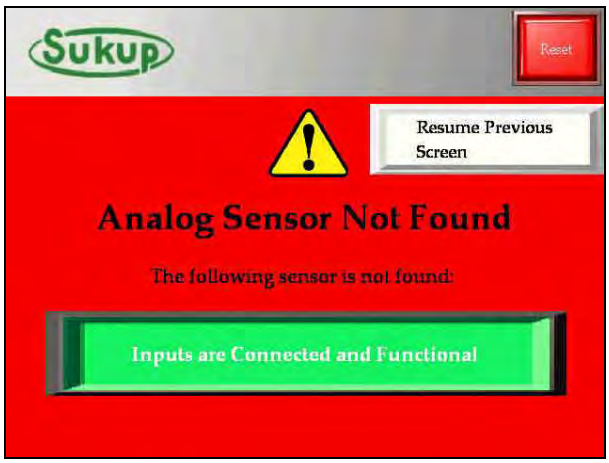
Diagnosing a Problem:
Each sensor is monitored for voltage. If less than .05VDC is read by the PLC, this error will appear. This either means that the individual sensor is bad, or the connection between the PLC and the sensor needs to be checked. Use a voltmeter to check for voltage and continuity between the PLC, the connection terminals, and the device itself.

SPECIAL NOTE!!!
This error message is NOT a FAULT. Dryer will NOT shut down unless the Reset key is pressed.

Pressing the "Resume Previous Screen" button will allow user to continue using the dryer. This screen will appear every 30 seconds until the sensor has been re-connected.







BASIC OPERATION TIPS

All screens are touch-navigable using the buttons provided on page. When a screen has a GREEN box with a grey border, it indicates that that value is user-selectable.

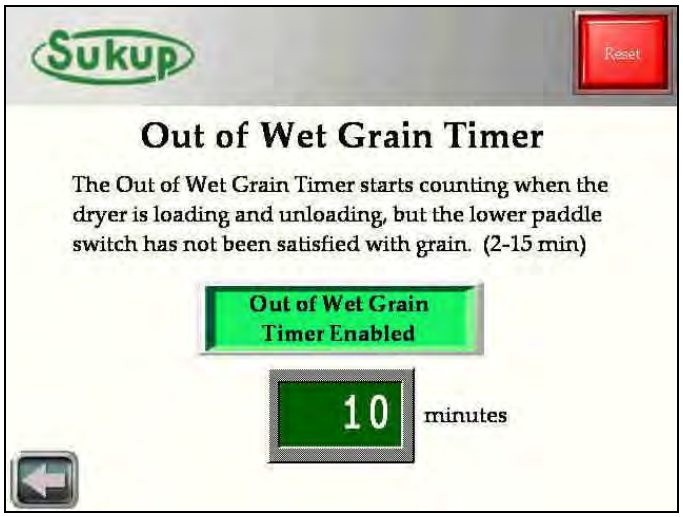
Also available on each screen is a ***RESET*** key located in the top right-hand corner. If the ***RESET*** key is pressed at any time, the dryer will shut down all fans, heaters, and augers and return to the main screen. **The *RESET* key is never used for program navigation.**

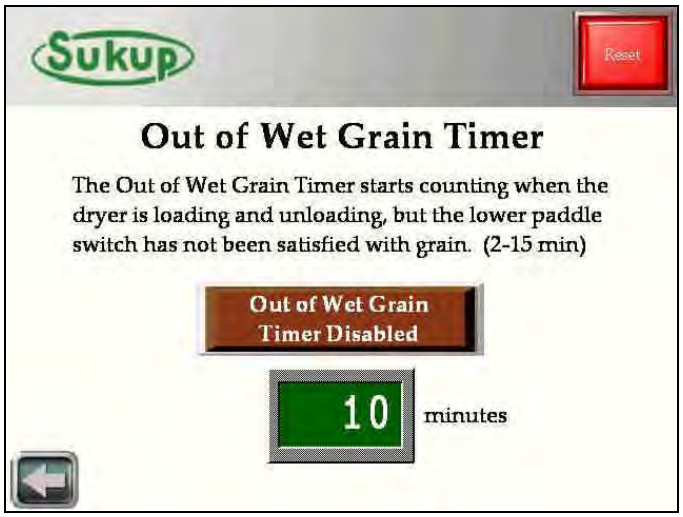
If the user is able to return to the previous screen, a back arrow is placed in lower left-hand part of the screen. If the user is deep into a menu, it may be necessary to press the back arrow multiple times to return to the desired screen.

Press-and-Hold Buttons

All buttons that appear BURGUNDY ("OFF" state) in color require you to press and hold that button for a full second before the button's action will be processed. When these buttons are activated, the button will appear in an "ON" state denoted by depressed button style and a light NEON-GREEN color (like this image to the right).

The Fill Timer and the Out of Wet Grain Timer are both factory-enabled. To turn them off, press and hold the NEON-GREEN button, and they will turn BURGUNDY in color (their "OFF" state as in the image to the right). If user wishes to turn them on, press and hold the BURGUNDY button until it becomes NEON-GREEN in color.





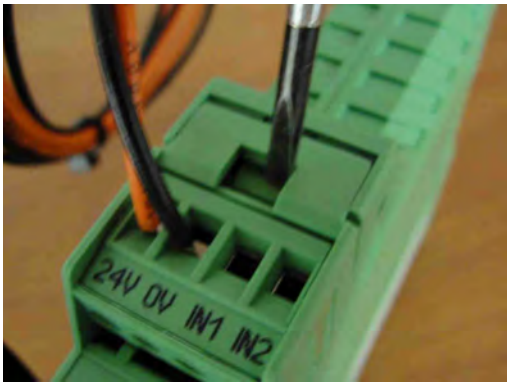
T24999 Kit Install Instructions

IMPORTANT!!!!!

To make this modem work, the software version must be V2.02 or greater on both the PLC and HMI. Without this, the modem will not function properly. To get the latest dryer updates, go to http://www.sukup.com/Products/QuadraTouch. It's highly recommended to get the latest software to ensure the most current functionality.

1. Check for GSM coverage in your area. AT&T, T-Mobile, and I-Wireless are popular GSM providers, and each offer prepaid plans. Check each one for the best coverage plan.
    a. You will need to know the 20 digit ICCID# on the provided card
    b. You may need the 15 digit IMEI# found on the sticker on the side of the side of the GSM modem.
    c. Activating your SIM card online is usually the easiest, but if you do call, talking to a real person is generally the next best option.
    d. Prepaid is usually the easiest way to go. Each company has different plans to accommodate your situation. The GSM modem operates with text messages over the ***VOICE NETWORK***. **Do not get a data plan**. **DON'T ADD A LINE if it's not necessary! It will be much less expensive to use the prepaid option.**

   The SIM card comes pre-installed into the GSM modem. If for some reason you need to change SIM cards (like in step 7) or need the IMEI#, you may open the modem by pressing in the green tabs with a small screwdriver on top and bottom of the modem. The piece will slide freely outwards as shown.



2. Mount the GSM modem onto the Din Rail. The modem should be mounted in the power box or the auxiliary box.

3. Connect the GSM modem's power wires to terminals 18 (orange) and 95 (black) located at the bottom of the power box.

4. Connect the GSM modem to the PLC with the Serial Interface Cable as shown.

5. To mount the antenna, you'll need to make a 5/8" hole. The hole should go in the top of the power box or the top of the auxiliary box (**typically gives the best reception**), depending of course where you mounted the modem.

6. Mount the antenna, and connect the other end to the GSM modem as shown

7. You are finished. When you power up, you will see the VCC light flashing. After it has started up, the modem will search for a GSM signal. If it finds a signal, you will see a steady flashing or solid light on the NET light (after a couple of minutes). If the NET light is not lit, the SIM card was not properly activated, or there is no GSM signal. You may have to try a different GSM provider if this is the case.

IMPORTANT REMINDER!!!!

To make this modem work, the software version must be V2.02 or greater on both the PLC and HMI. Without this, the modem will not function properly. To get the latest dryer updates, go to http://www.sukup.com/Products/QuadraTouch

L24999
2/13/2012

OPERATION INSTRUCTIONS

The GSM Modem interacts with the PLC by relaying text messages to a preprogrammed number in the touch-panel. In the event of a fault condition, the system will automatically text message that preprogrammed number one time a minute for 10 minutes. It will include the reason for the fault as well as a wire number if applicable.

If you have received the fault message, and do not wish to keep receiving the same message for the next ten minutes, simply send a text response of "00" to the GSM modem.

In addition to receiving text alerts in fault conditions, you can also query the dryer for it's running status. Text message the GSM modem with "1234" and the modem will respond with the dryer's running status including time remaining (if applicable), plenum temperatures, moisture content, grain temperature, and roll speed.

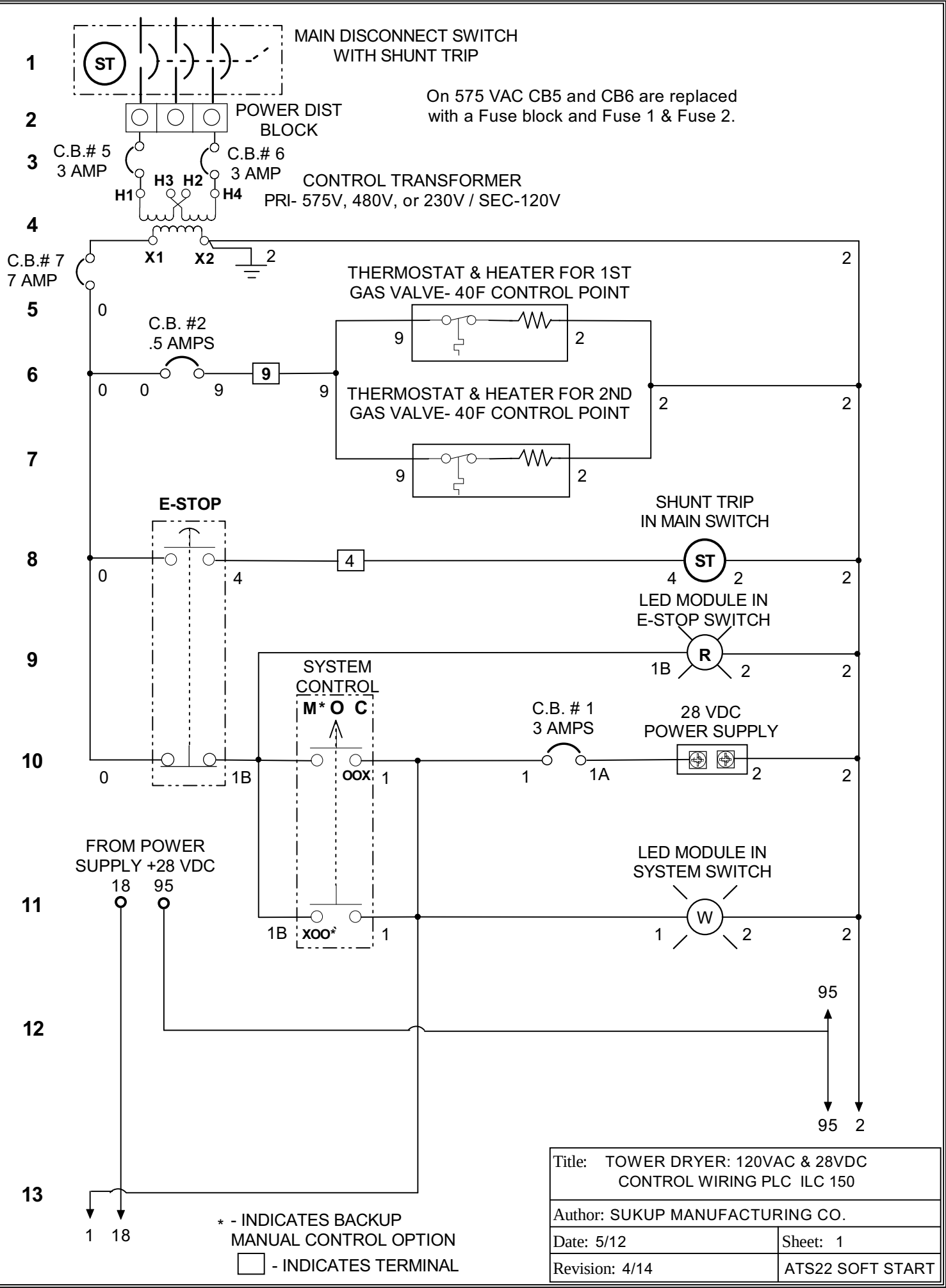
If for some reason you wish to shut the dryer down without being there, we also offer a remote shutdown feature. Text message the GSM modem with "8888" to shut the dryer down remotely. You will not, however, be able to remote start the dryer.

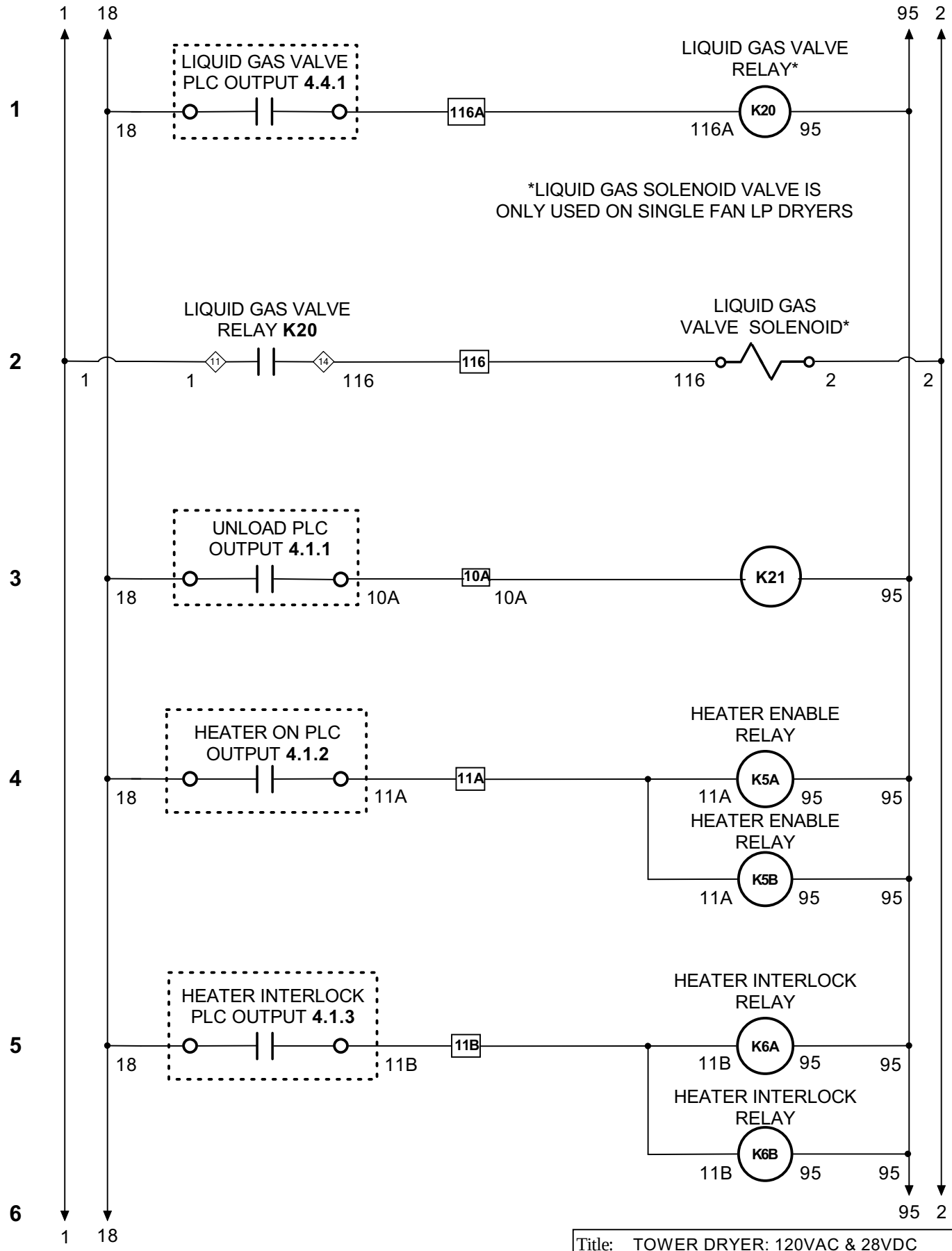
V2.6 software updates allow you to change the plenum temperature setpoint(s) and the discharge moisture setpoint.

Text "P#XXX" to give the dryer a new plenum temperature setpoint.
Example: "P1220" would give plenum 1 (lowest plenum) a new setpoint of 220°.
This command ***is not*** case sensitive. "P" or "p" will work.
This command will receive an acknowledgement after it has been changed.

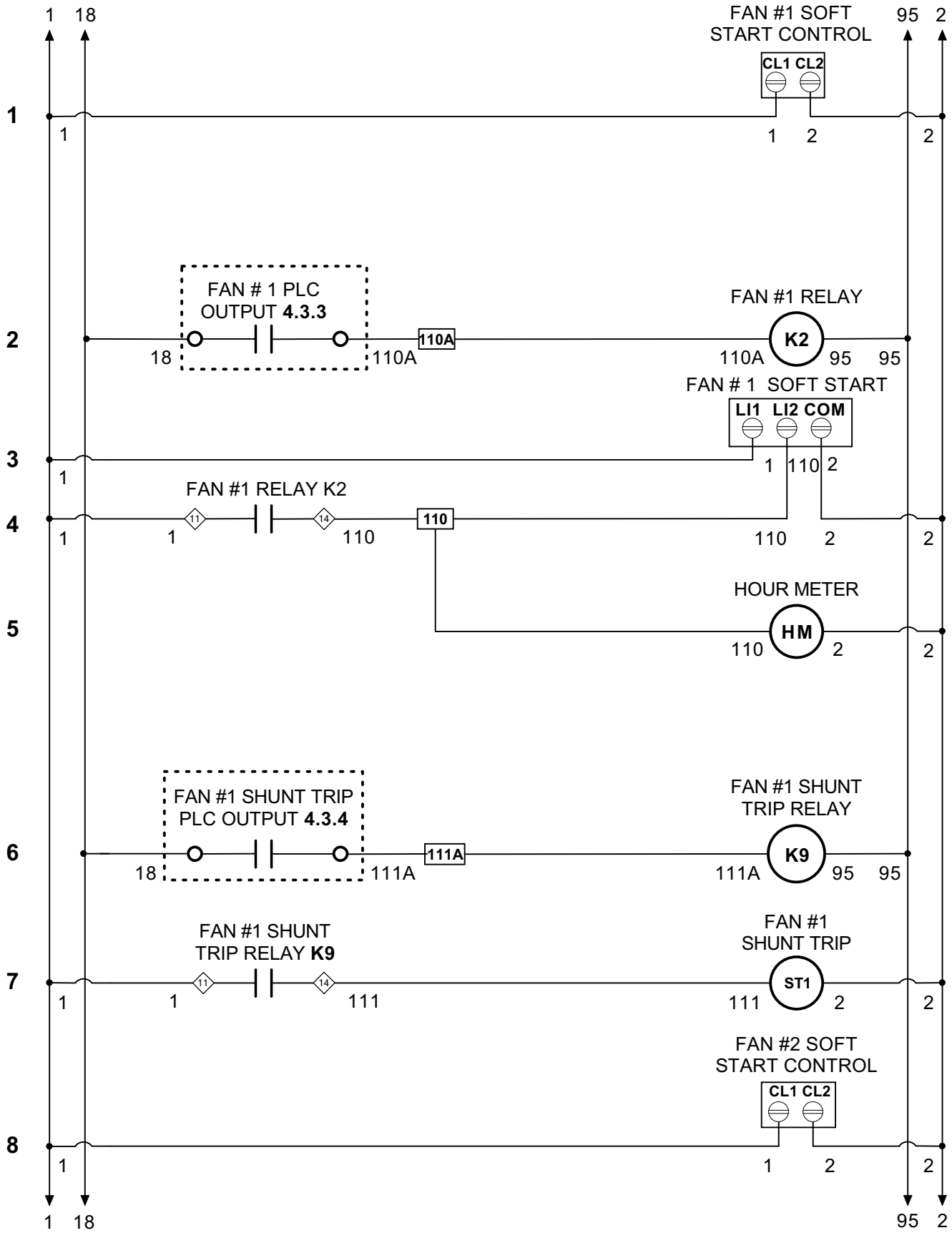
Text "MSTXXX" to give the dryer a new discharge moisture setpoint.
Example: "MST145" would give the dryer a new setpoint of 14.5%.
This command ***is slightly*** case sensitive. "MST", "Mst", and "mst" will work.
This command will receive an acknowledgement after it has been changed.

Keep in mind, you can text the dryer from ANY phone with the messages "00" "1234" or "8888" or "P#XXX" or "MSTXXX". However, only the preprogrammed number in the touch-panel will receive fault condition text message alerts.


MAIN DISCONNECT SWITCH
WITH SHUNT TRIP
ST
On 575 VAC CB5 and CB6 are replaced
with a Fuse block and Fuse 1 & Fuse 2.
POWER DIST
BLOCK
C.B.# 5
3 AMP
C.B.# 6
3 AMP
H1
H3
H2
H4
CONTROL TRANSFORMER
PRI- 575V, 480V, or 230V / SEC-120V
X1
X2
C.B.# 7
7 AMP
THERMOSTAT & HEATER FOR 1ST
GAS VALVE- 40F CONTROL POINT
C.B. #2
.5 AMPS
THERMOSTAT & HEATER FOR 2ND
GAS VALVE- 40F CONTROL POINT
E-STOP
SHUNT TRIP
IN MAIN SWITCH
LED MODULE IN
E-STOP SWITCH
R
SYSTEM
CONTROL
M* O C
OOX
C.B. # 1
3 AMPS
28 VDC
POWER SUPPLY
FROM POWER
SUPPLY +28 VDC
LED MODULE IN
SYSTEM SWITCH
W
XOO*
* - INDICATES BACKUP
MANUAL CONTROL OPTION
- INDICATES TERMINAL
Title: TOWER DRYER: 120VAC & 28VDC
CONTROL WIRING PLC ILC 150
Author: SUKUP MANUFACTURING CO.
Date: 5/12
Sheet: 1
Revision: 4/14
ATS22 SOFT START



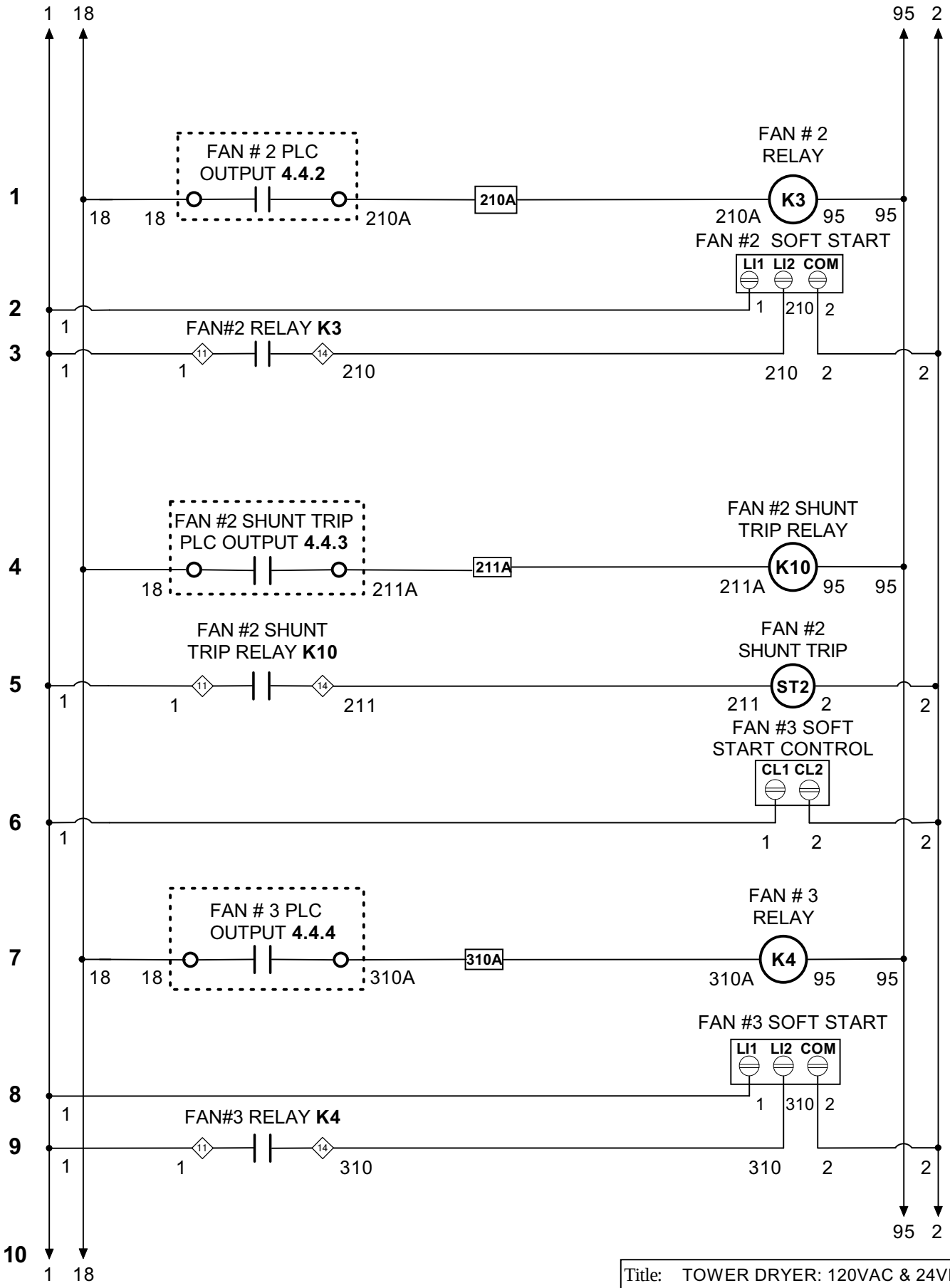
Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 2
Revision: 4/14	ATS22 SOFT START



◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

▭ - INDICATES TERMINAL AND WIRE NUMBER

Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 3
Revision: 4/14	ATS22 SOFT START

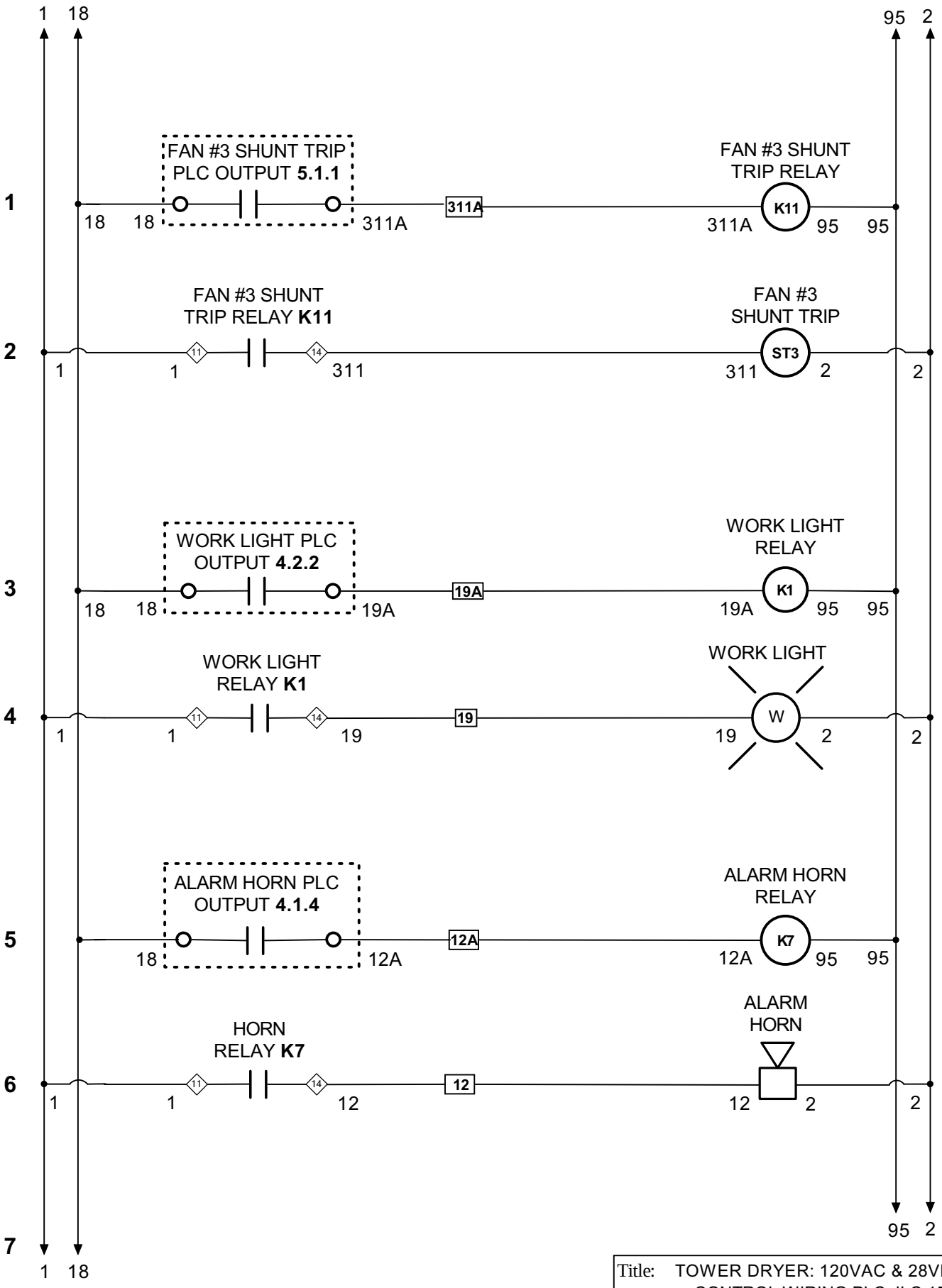


◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

▭ - INDICATES TERMINAL AND WIRE NUMBER

* - INDICATES BACKUP MANUAL CONTROL OPTION

Title: TOWER DRYER: 120VAC & 24VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 4
Revision: 4/14	ATS22 SOFT START

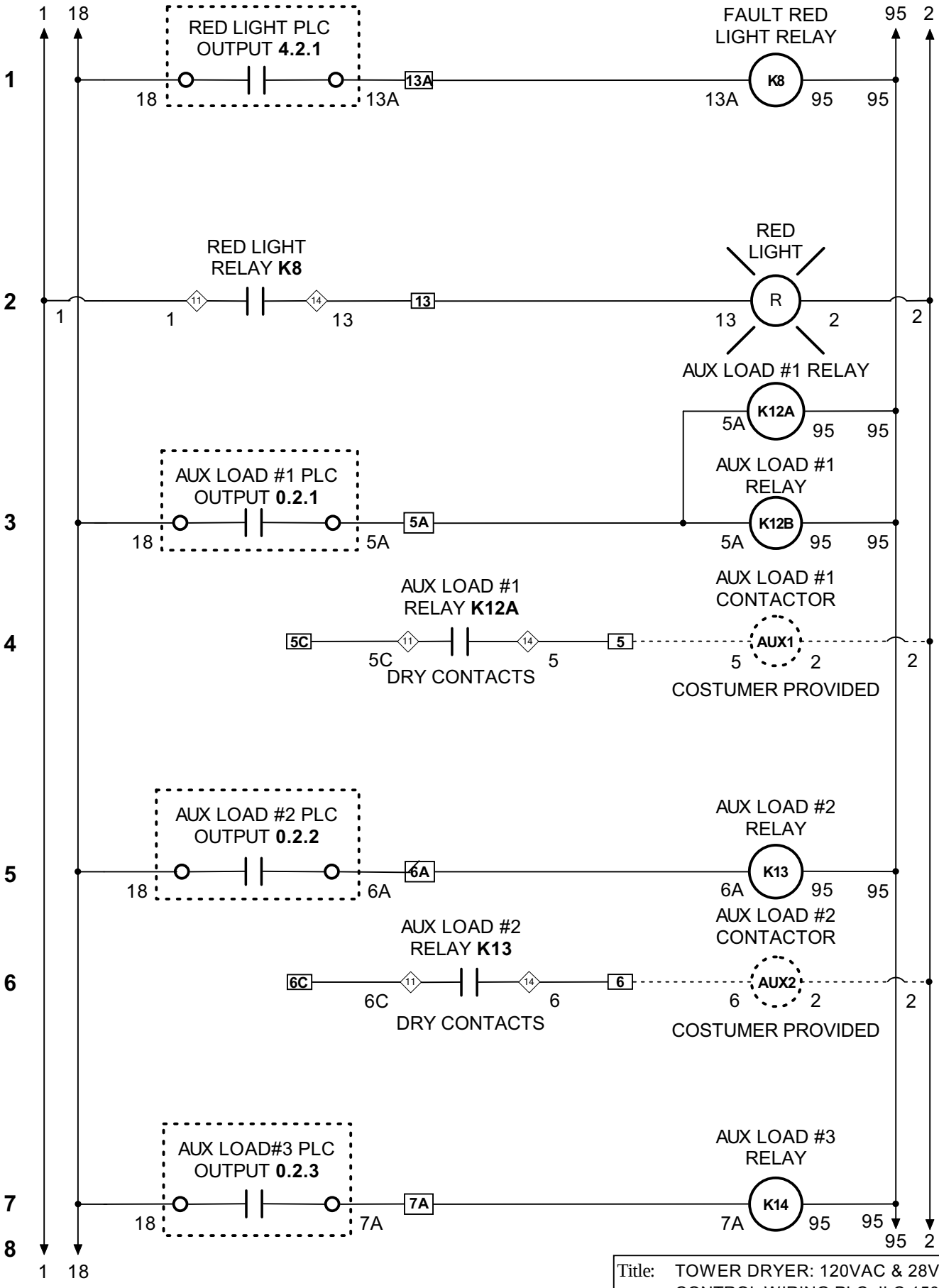


◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

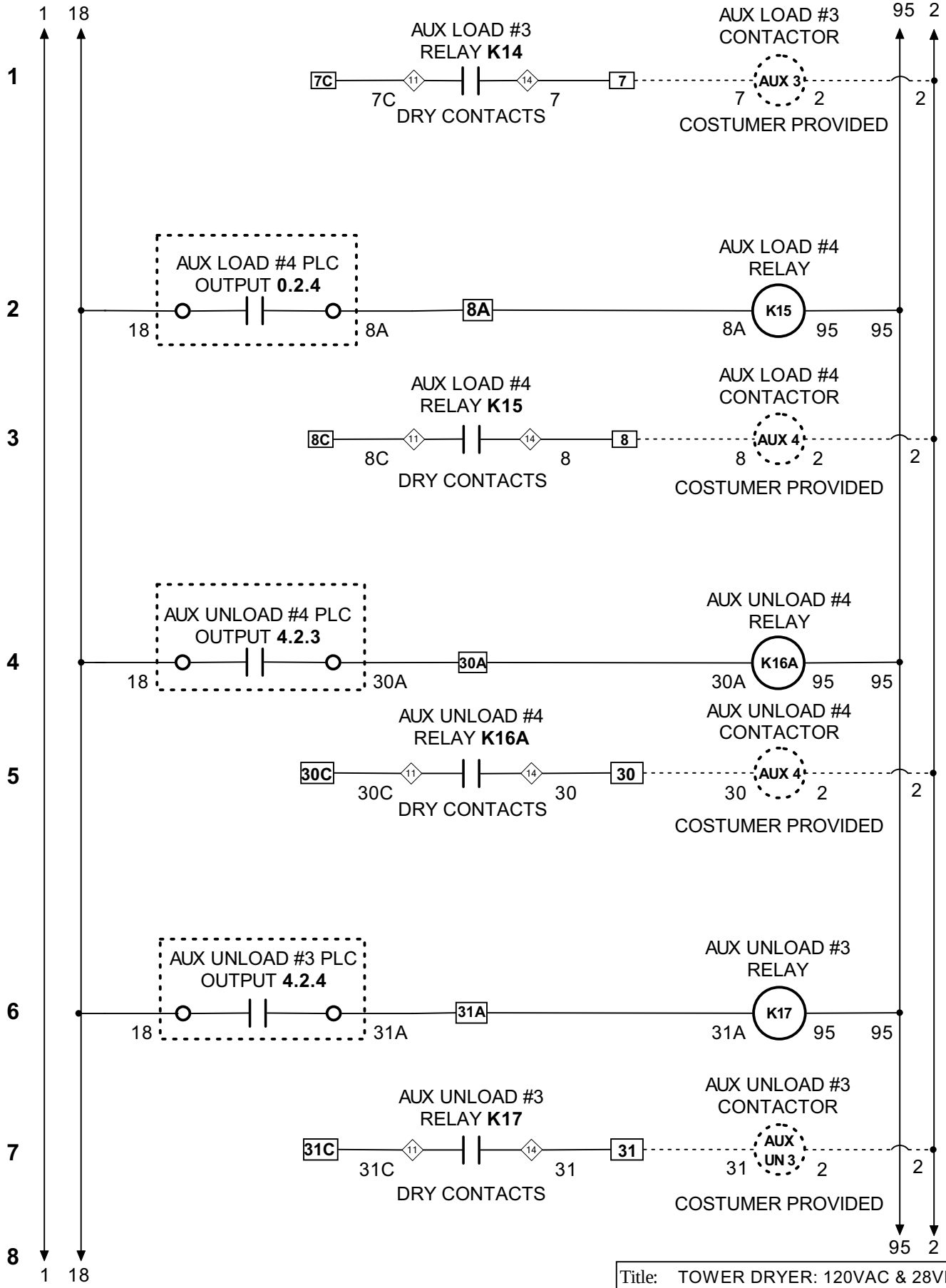
▭ - INDICATES TERMINAL AND WIRE NUMBER

* - INDICATES BACKUP MANUAL CONTROL OPTION

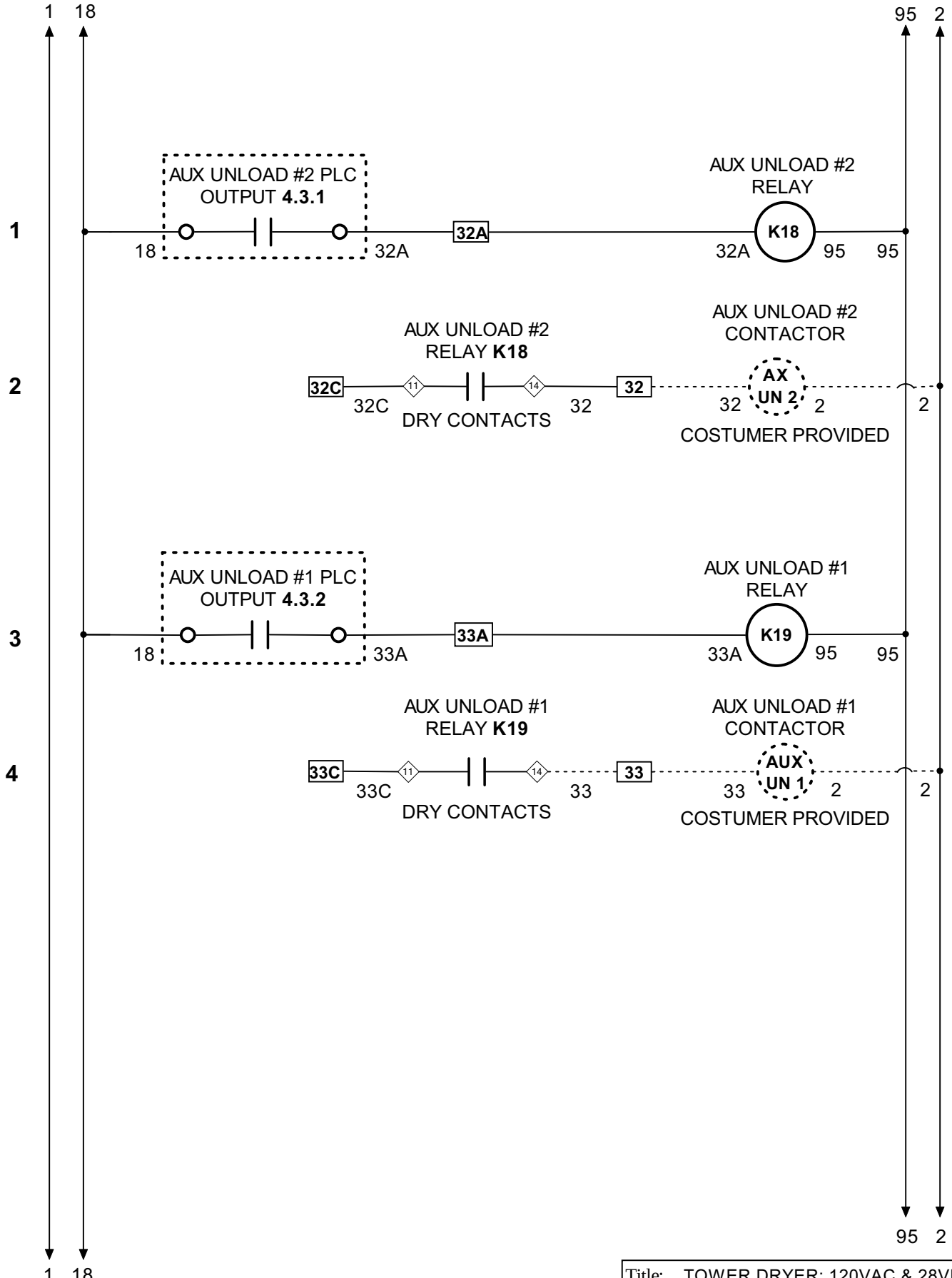
Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 5
Revision: 4/14	ATS22 SOFT START



Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 6
Revision: 4/14	ATS22 SOFT START



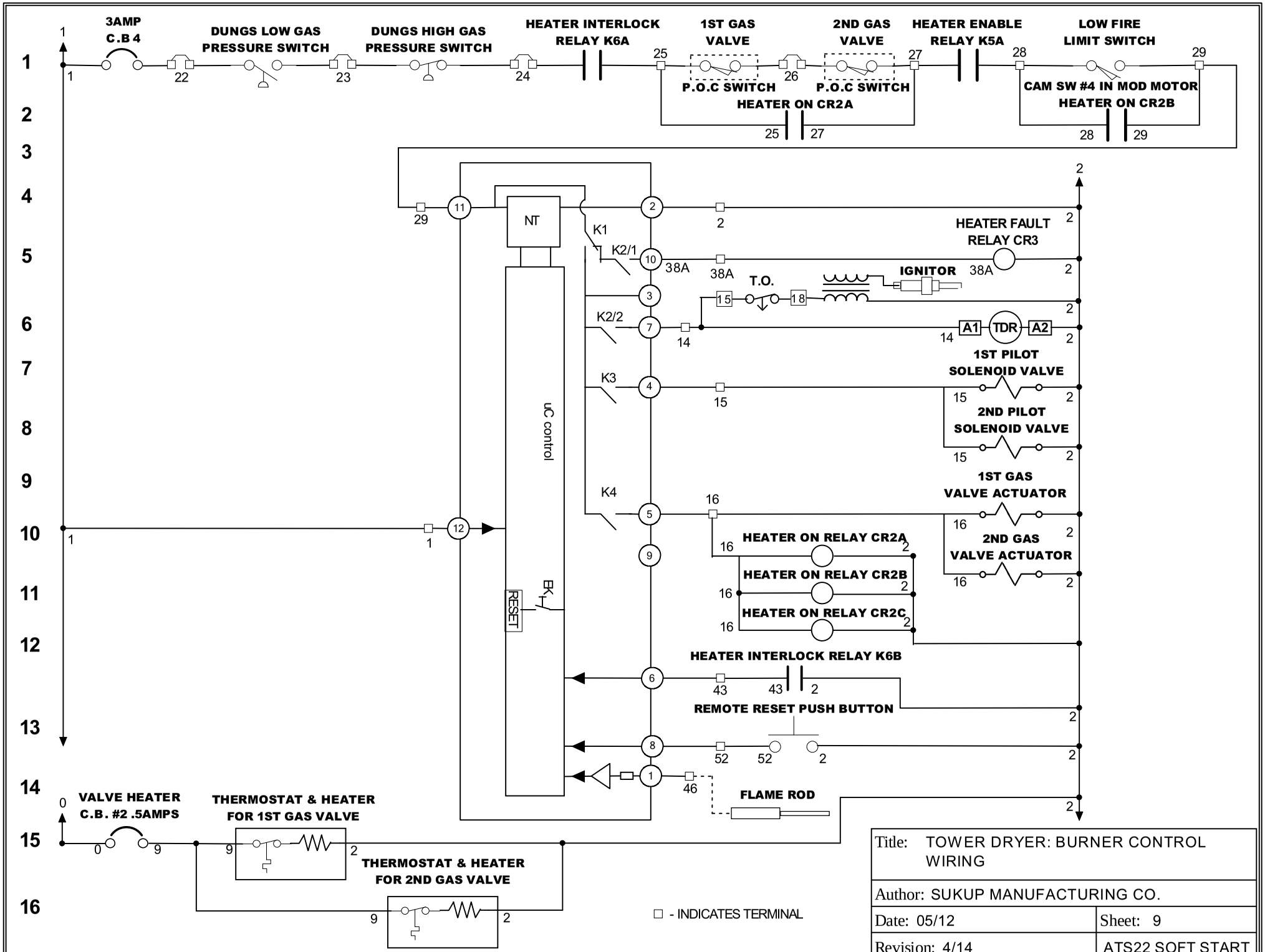
Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 7
Revision: 4/14	ATS22 SOFT START



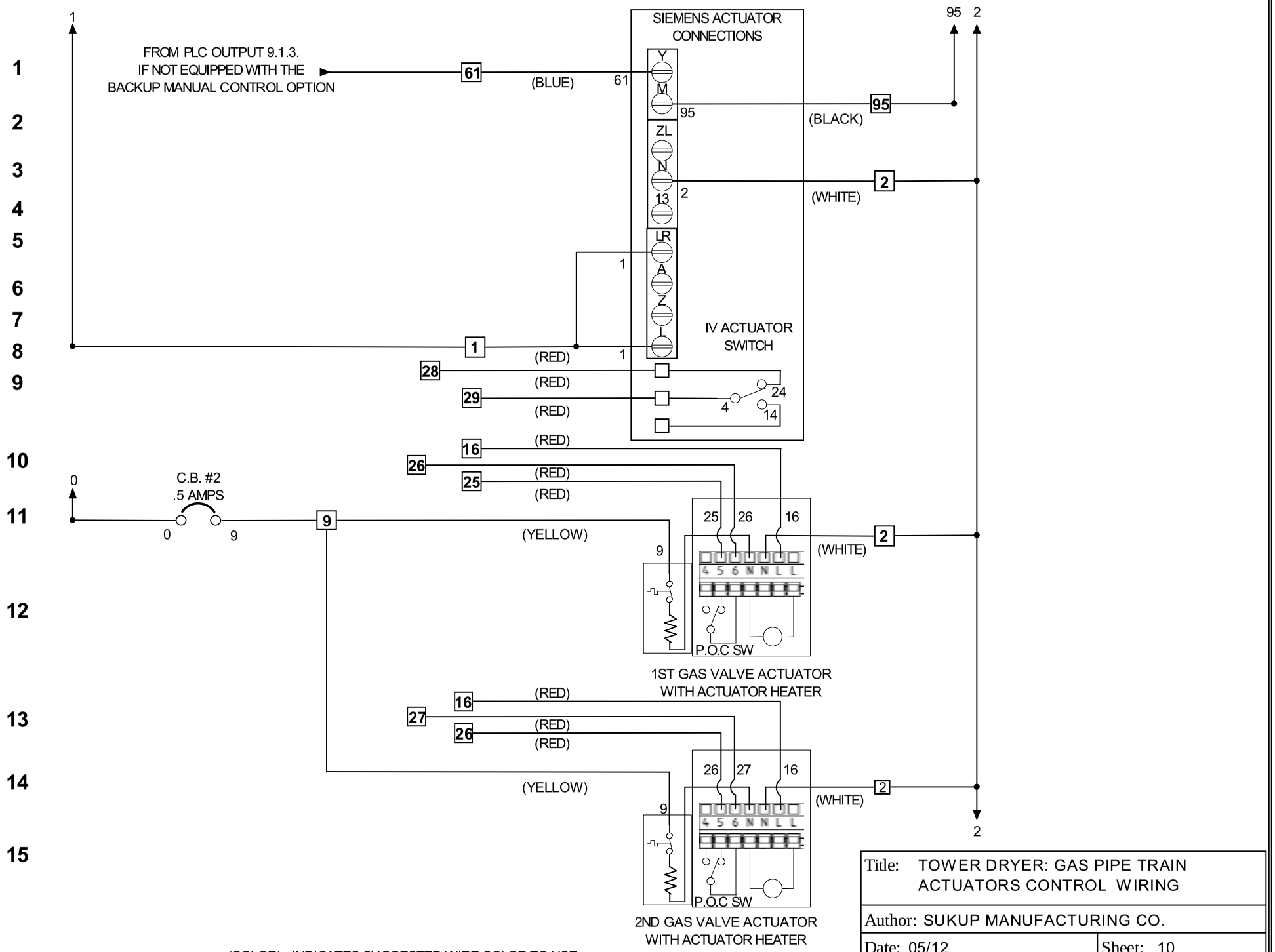
◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

▭ - INDICATES TERMINAL AND WIRE NUMBER

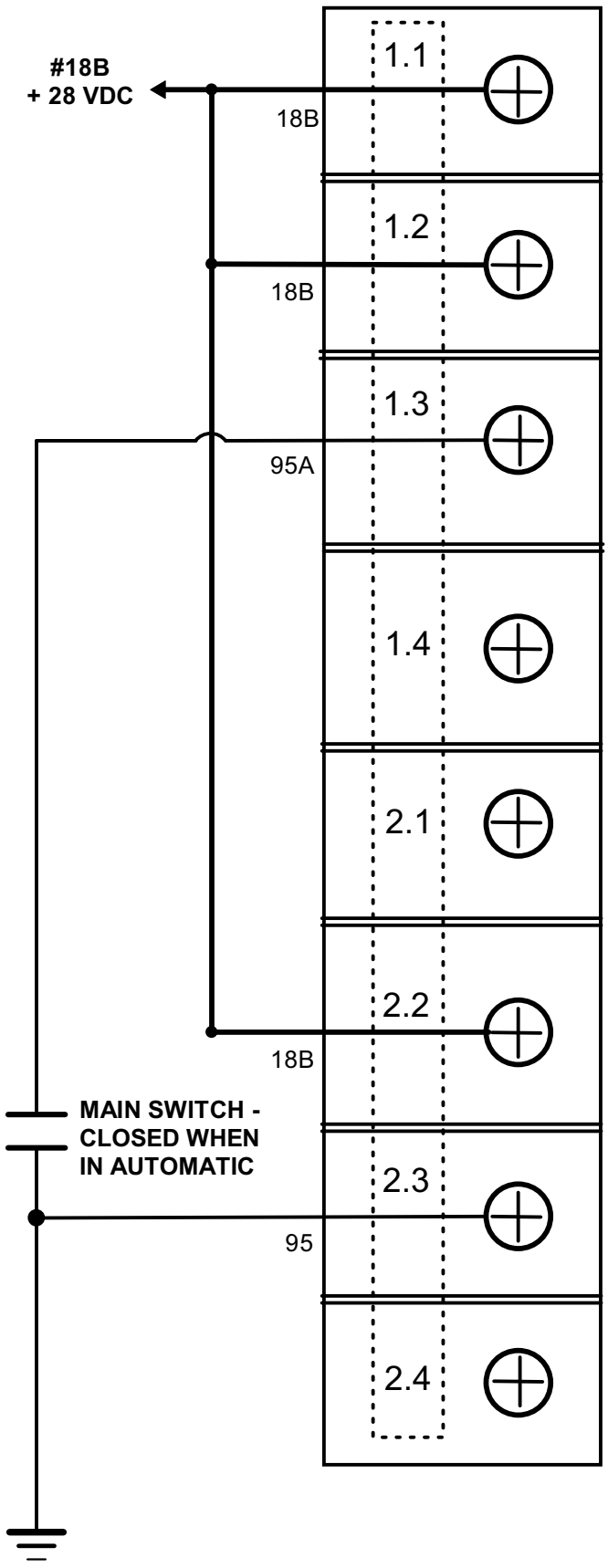
Title: TOWER DRYER: 120VAC & 28VDC CONTROL WIRING PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 8
Revision: 4/14	ATS22 SOFT START



Title: TOWER DRYER: BURNER CONTROL WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 9
Revision: 4/14	ATS22 SOFT START


SIEMENS ACTUATOR CONNECTIONS
FROM PLC OUTPUT 9.1.3.
IF NOT EQUIPPED WITH THE
BACKUP MANUAL CONTROL OPTION
61
(BLUE)
Y
M
95
(BLACK)
95
2
ZL
N
13
2
(WHITE)
LR
A
Z
L
IV ACTUATOR
SWITCH
1
(RED)
28
(RED)
29
(RED)
24
4
14
16
(RED)
26
(RED)
25
(RED)
C.B. #2
.5 AMPS
0
9
(YELLOW)
25
26
16
4 5 6 N N L L
P.O.C SW
1ST GAS VALVE ACTUATOR
WITH ACTUATOR HEATER
27
26
26
27
16
2ND GAS VALVE ACTUATOR
WITH ACTUATOR HEATER
(COLOR) - INDICATES SUGGESTED WIRE COLOR TO USE
Title: TOWER DRYER: GAS PIPE TRAIN
ACTUATORS CONTROL WIRING
Author: SUKUP MANUFACTURING CO.
Date: 05/12
Sheet: 10
Revision: 4/14
ATS22 SOFT START

28 VDC WIRING ARM - 0.1



28 VDC Supply for Segments US

28 VDC Analog and Local Bus UL

LGND Logic ground (Communications)

FE Functional Earth Ground

28 VDC Main Supply Voltage UM

28 VDC Main Supply Voltage UM

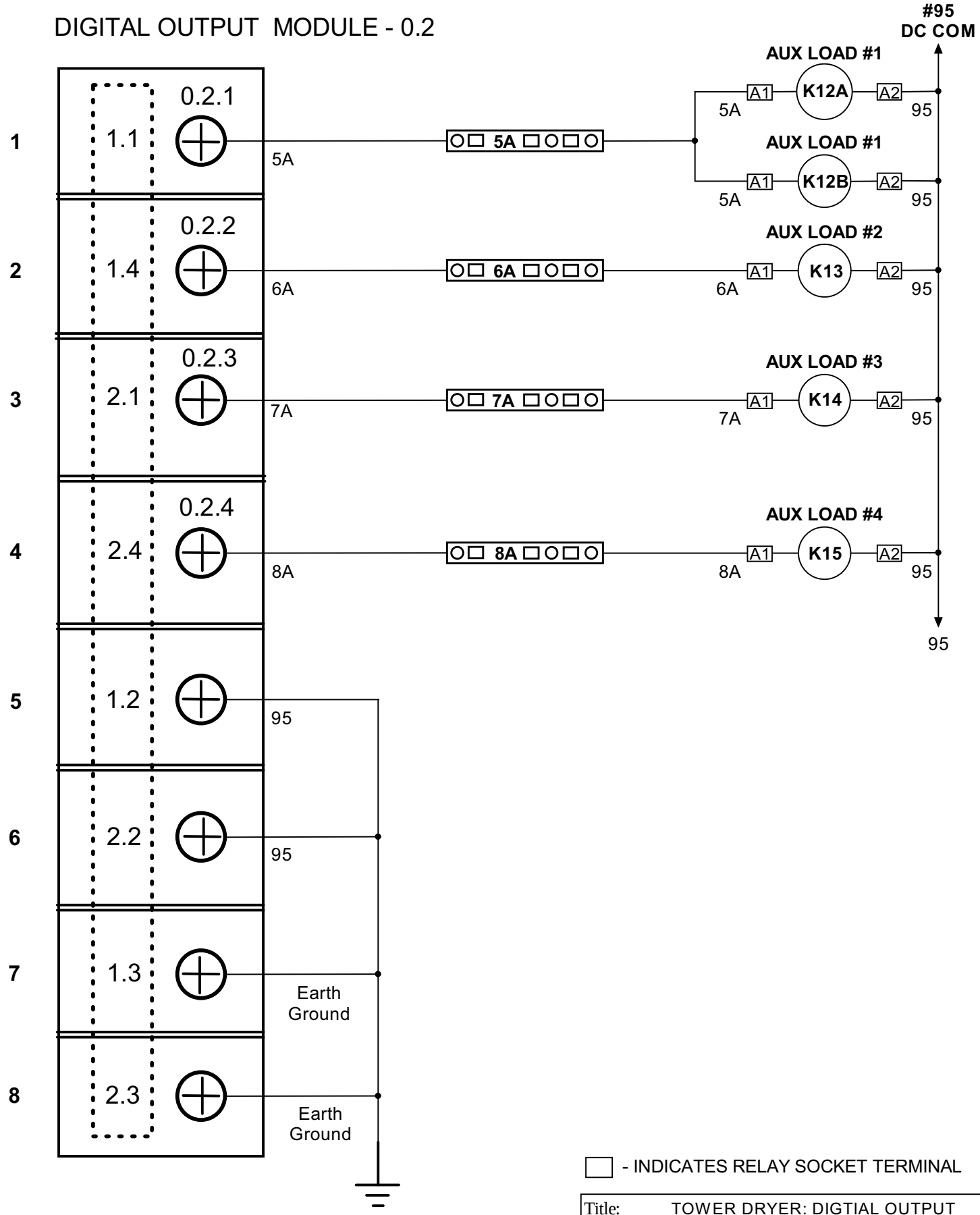
SGND - Segment Ground

FE Functional Earth Ground

NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: 28VDC WIRING ARM - 0.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 11
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE - 0.2

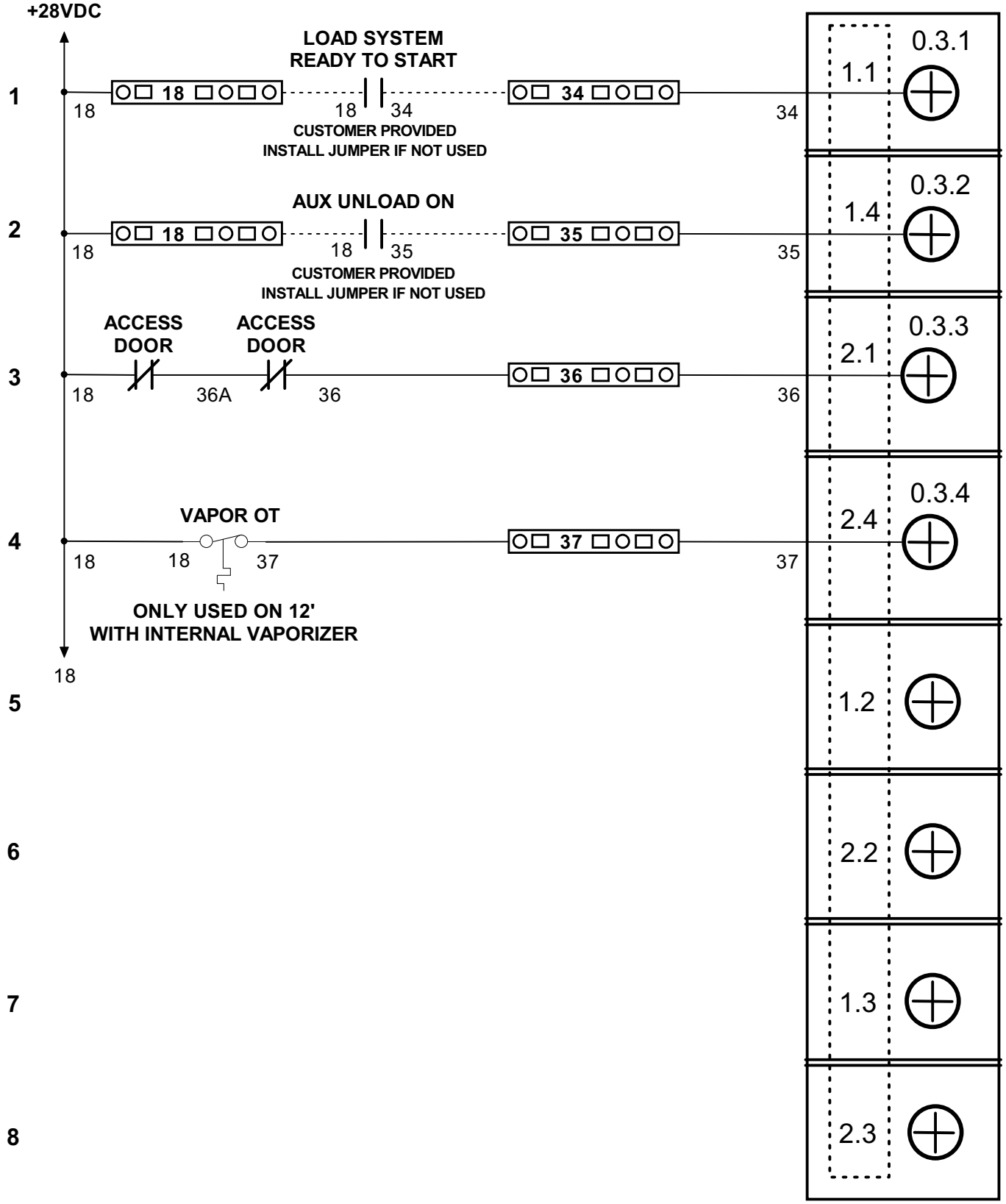


NOTE: Numbers inside of the box are terminal designators printed on the module.

☐ - INDICATES RELAY SOCKET TERMINAL

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 0.2 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 12
Revision: 4/14	ATS22 SOFT START

DIGITAL INPUT MODULE - 0.3

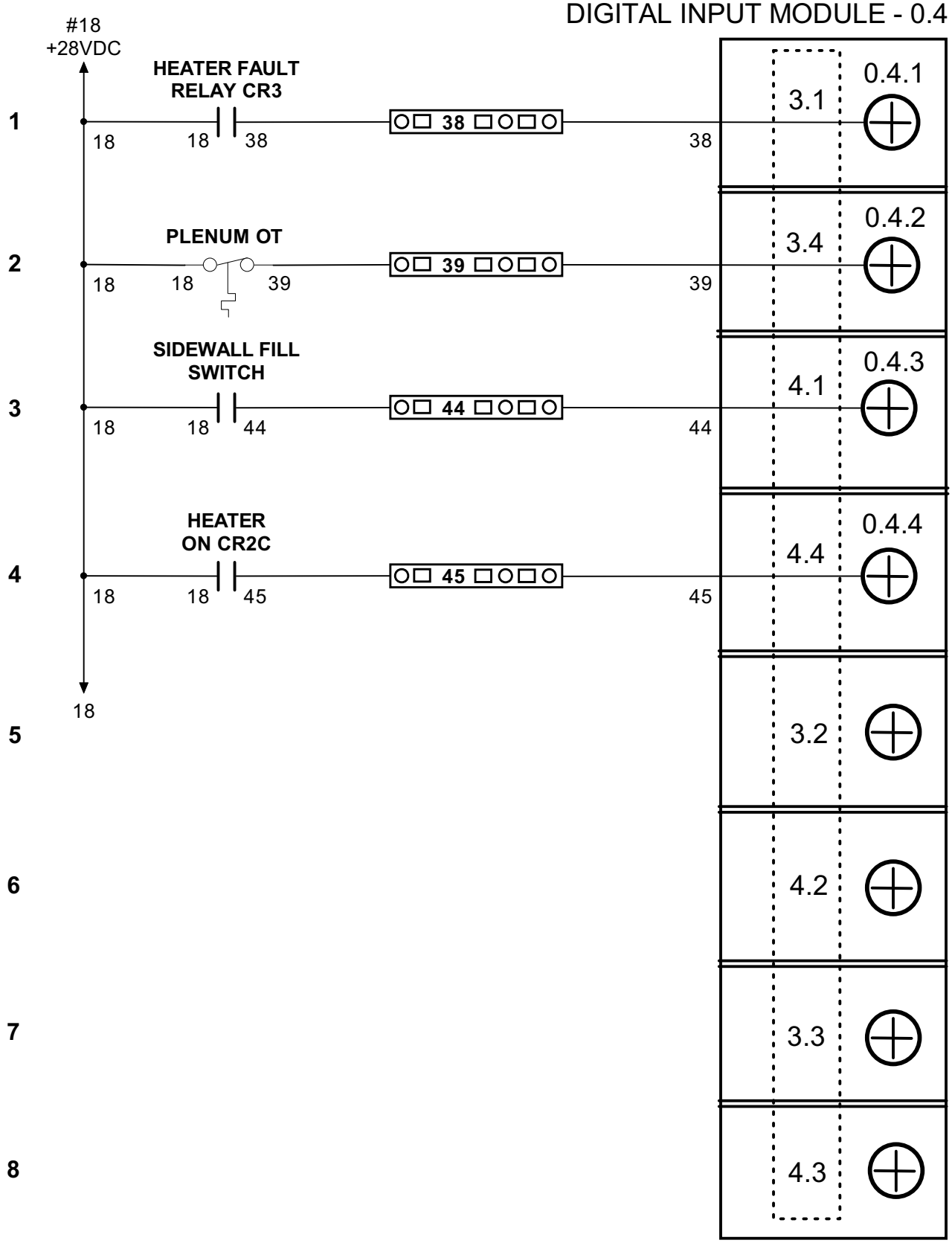


* - INDICATES BACKUP MANUAL CONTROL OPTION

NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 0.3 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 13
Revision: 4/14	ATS22 SOFT START

DIGITAL INPUT MODULE - 0.4

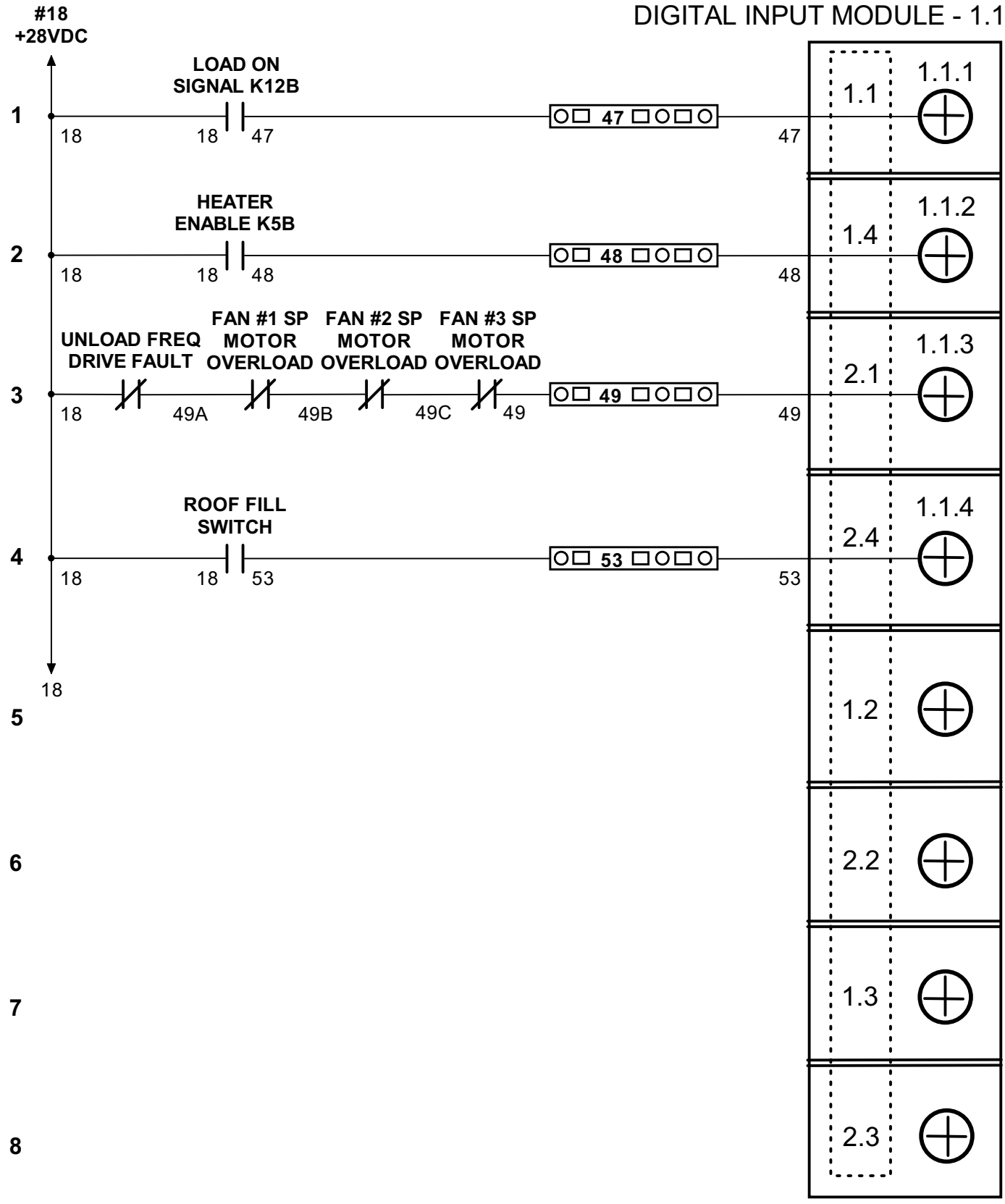


* - INDICATES BACKUP MANUAL CONTROL OPTION

NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 0.4 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 14
Revision: 4/14	ATS22 SOFT START

DIGITAL INPUT MODULE - 1.1

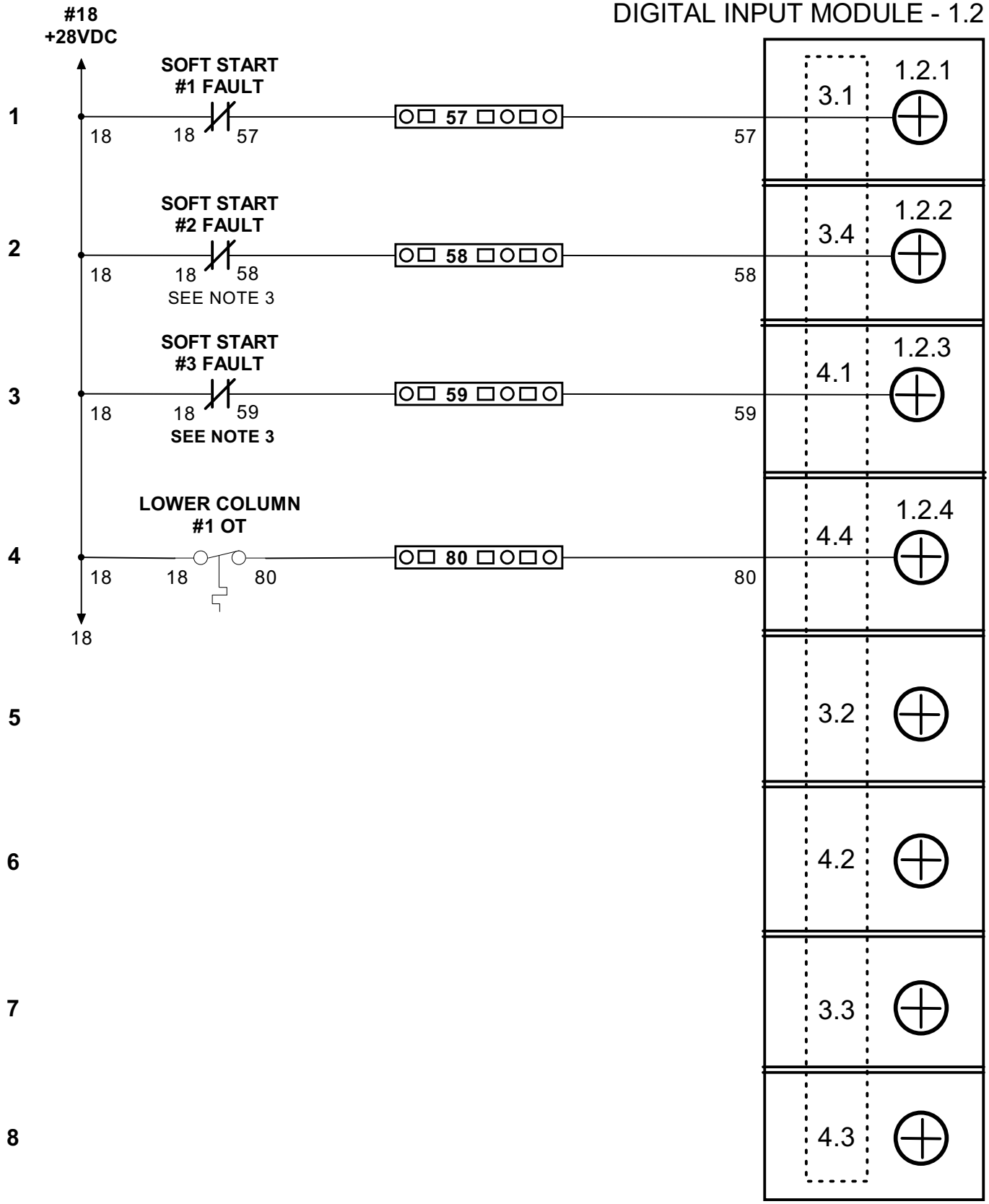


* - INDICATES BACKUP MANUAL CONTROL OPTION

NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 1.1 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 15
Revision: 4/14	ATS22 SOFT START

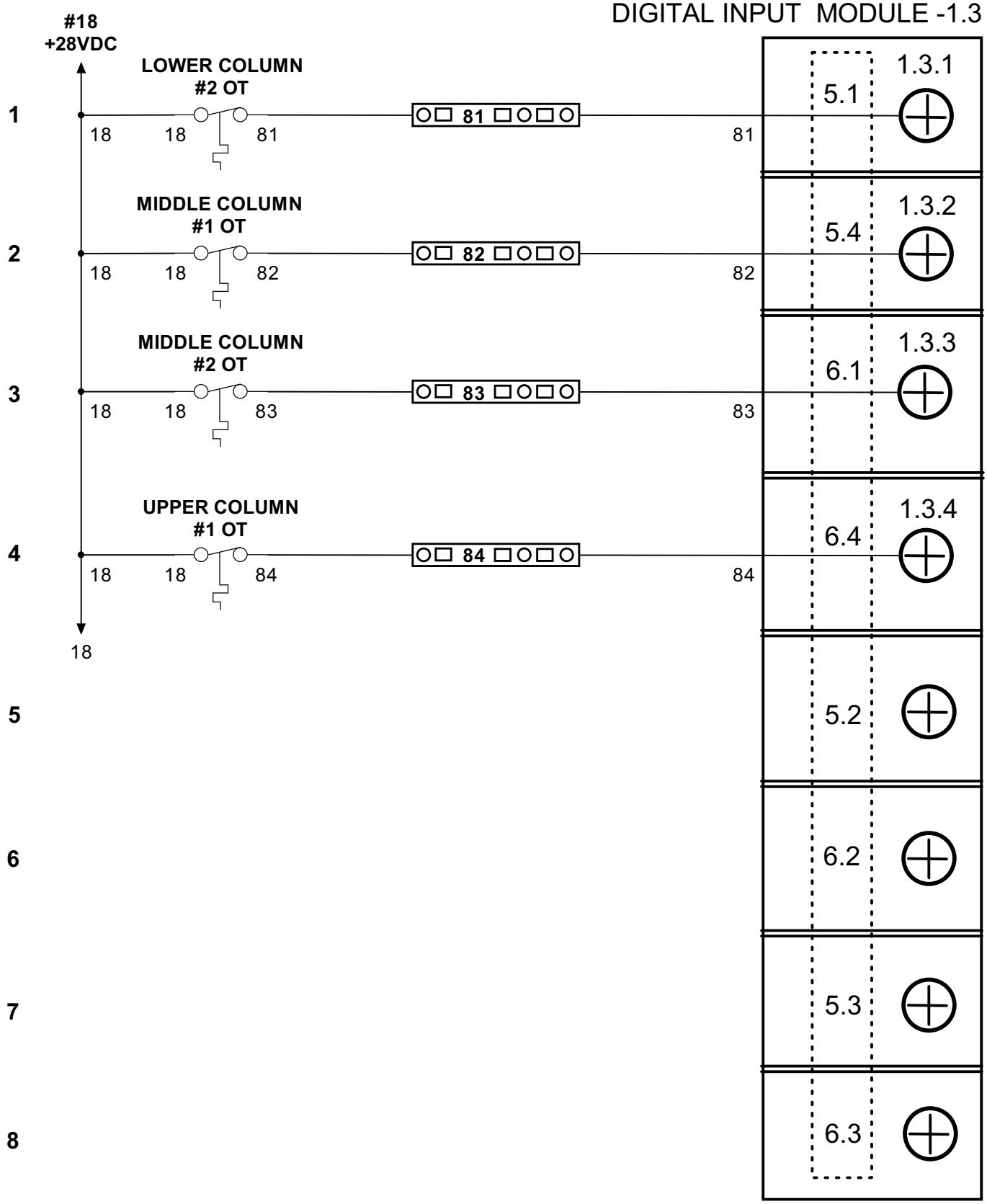
DIGITAL INPUT MODULE - 1.2



NOTE: Numbers inside of the box are terminal designators printed on the module.
NOTE 3: On a single fan dryer Soft Start #2 and #3 fault are connected to wire #18 +28VDC.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 1.2 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 16
Revision: 4/14	ATS22 SOFT START

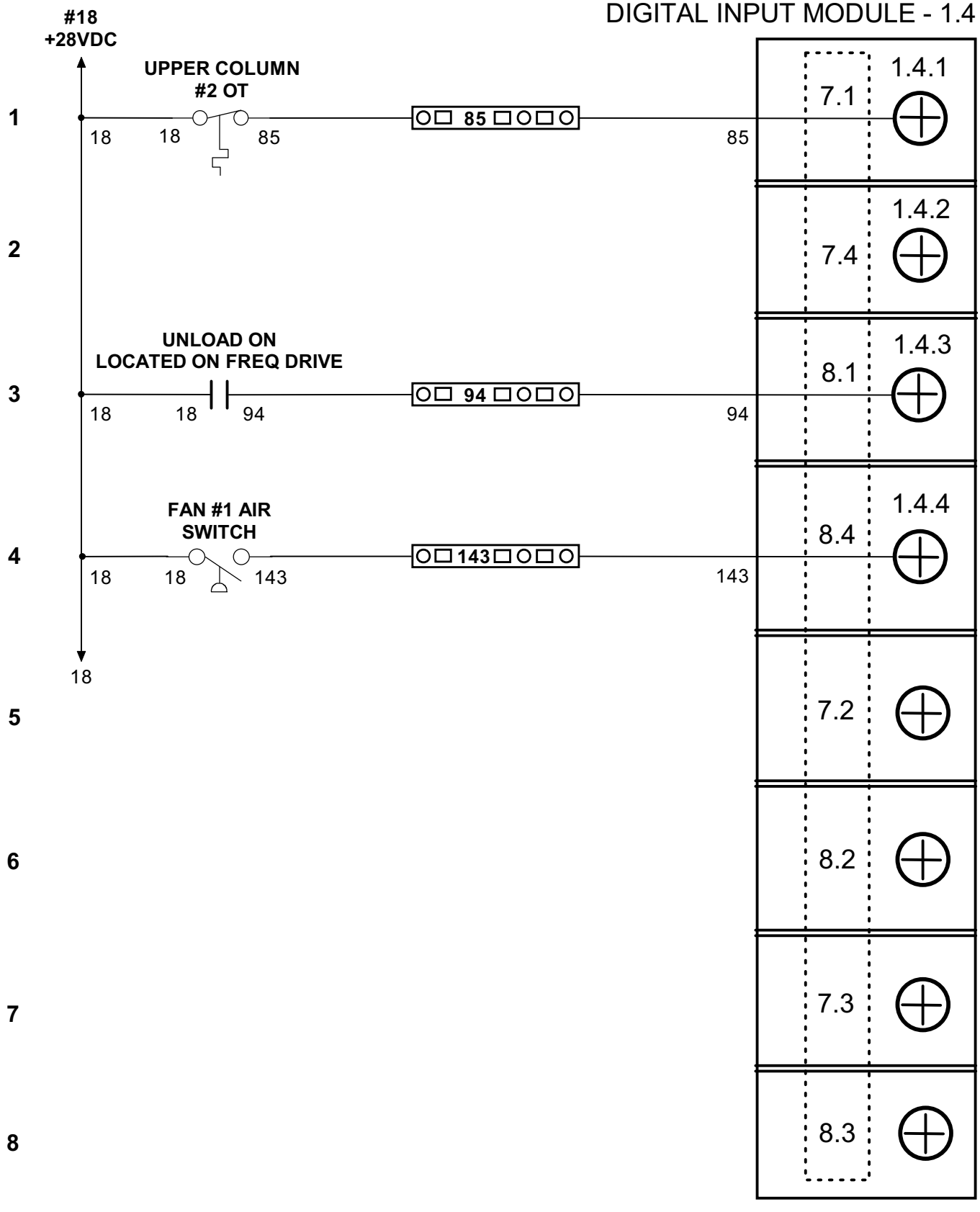
DIGITAL INPUT MODULE -1.3



NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 1.3 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 17
Revision: 4/14	ATS 22 SOFT START

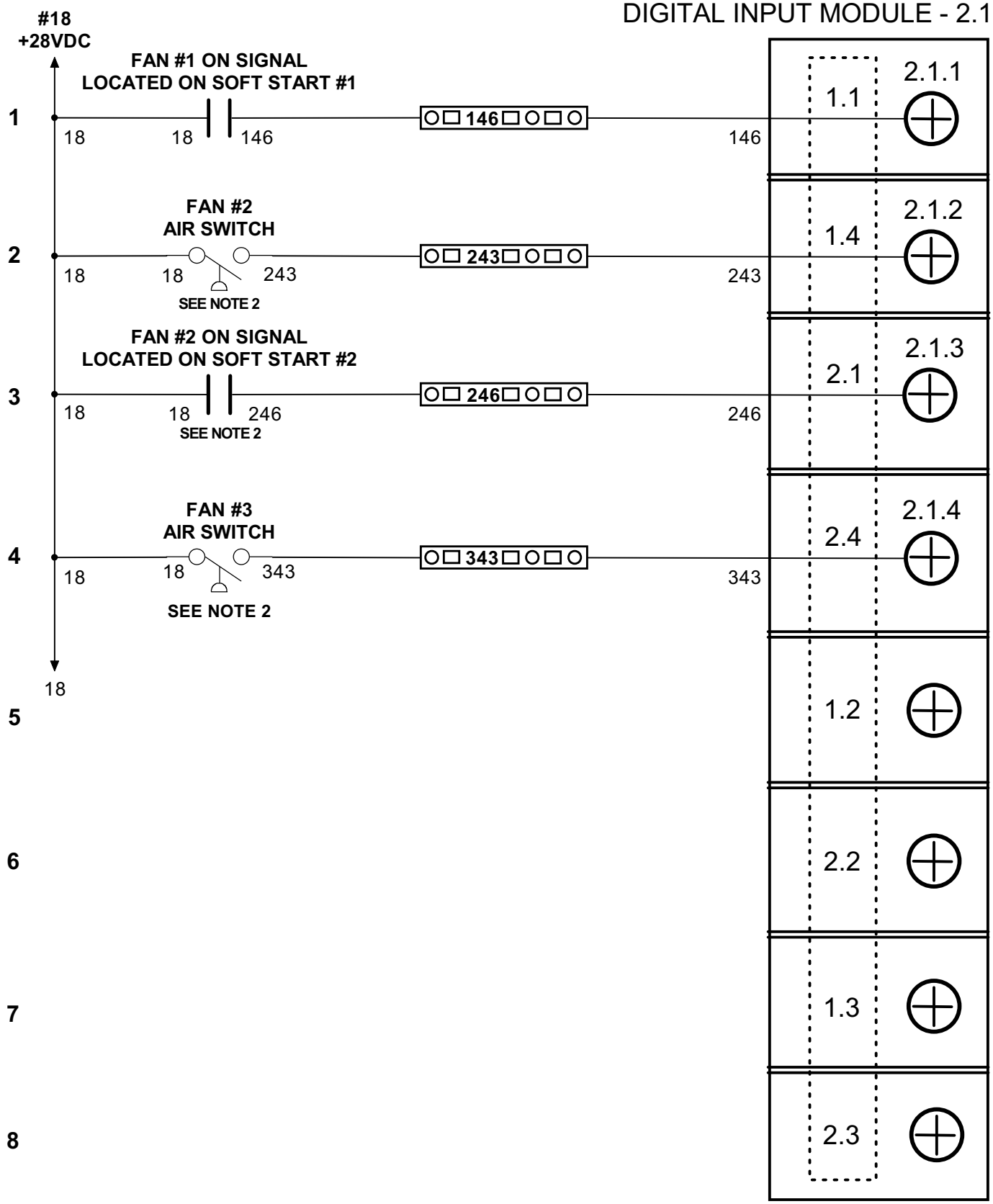
DIGITAL INPUT MODULE - 1.4



NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 1.4 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 18
Revision: 4/14	ATS22 SOFT START

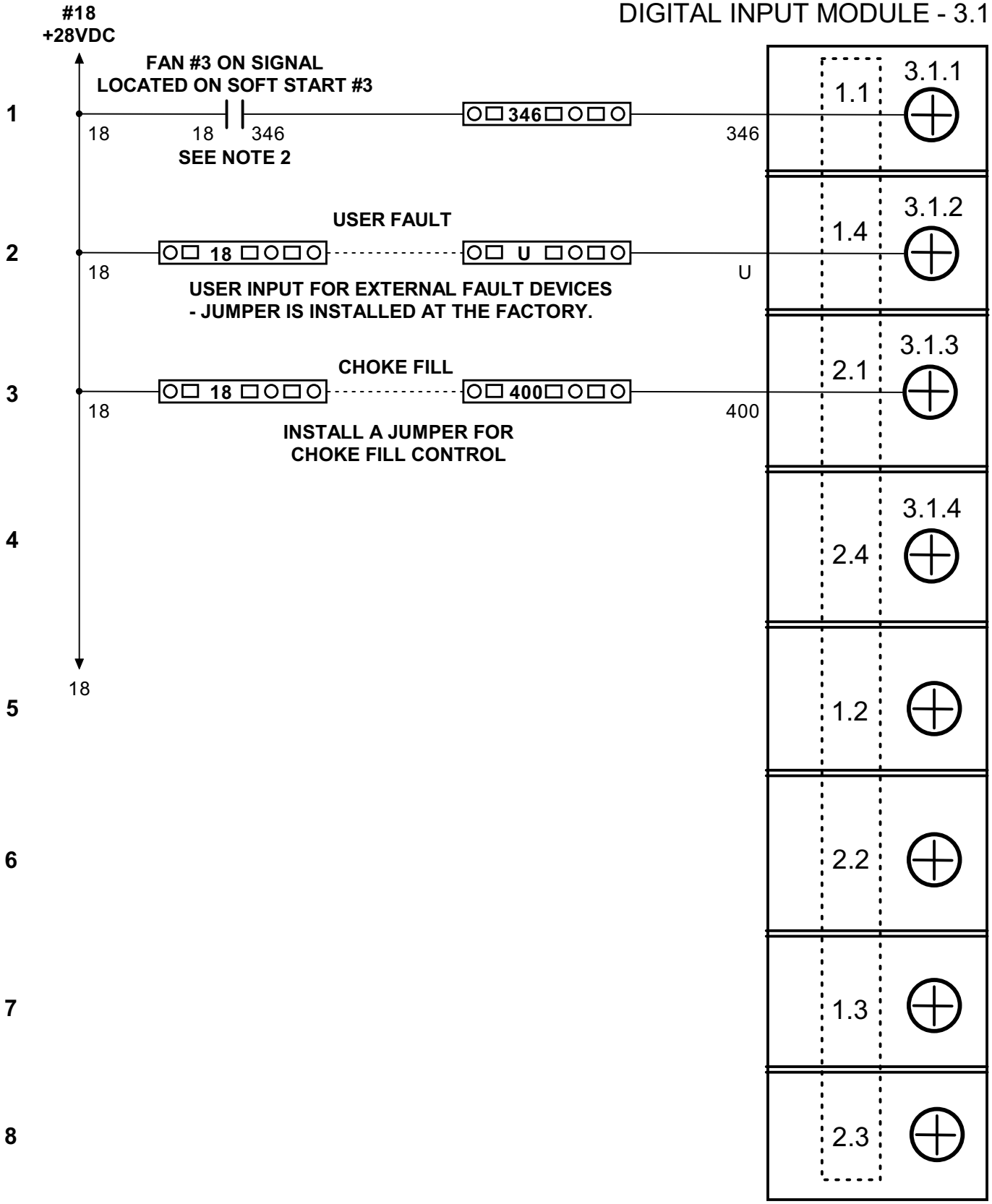
DIGITAL INPUT MODULE - 2.1



NOTE: Numbers inside of the box are terminal designators printed on the module.
NOTE 2. On a single fan dryer. Fan #2 & #3 inputs are connected to there corresponding output.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 2.1 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 19
Revision: 4/14	ATS22 SOFT START

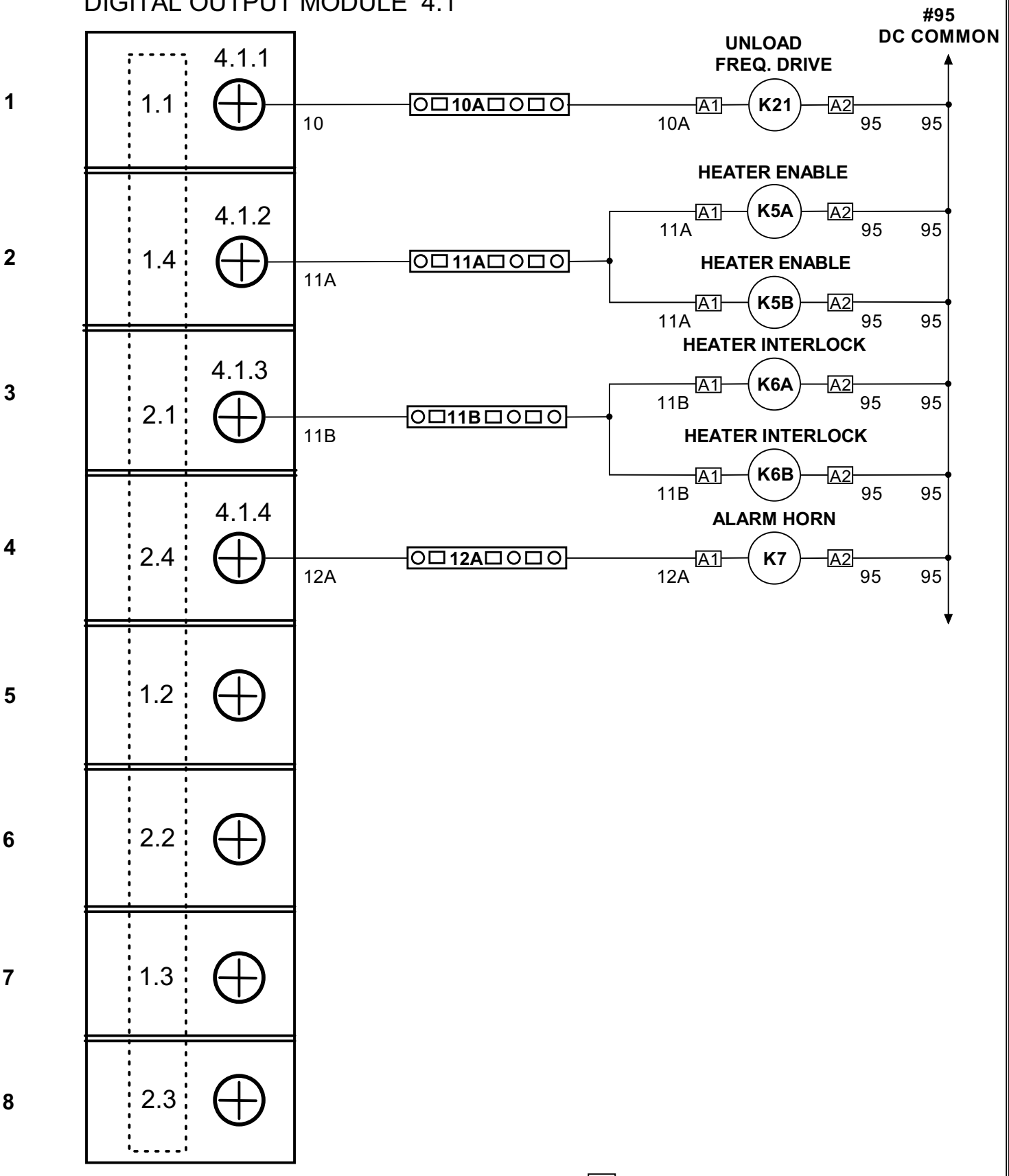
DIGITAL INPUT MODULE - 3.1



NOTE: Numbers inside of the box are terminal designators printed on the module.
NOTE 2. On a single fan dryer. Fan #2 & #3 inputs are connected to their corresponding output.

Title: TOWER DRYER: DIGITAL INPUT MODULE - 3.1 PLC ILC 150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 20
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE 4.1

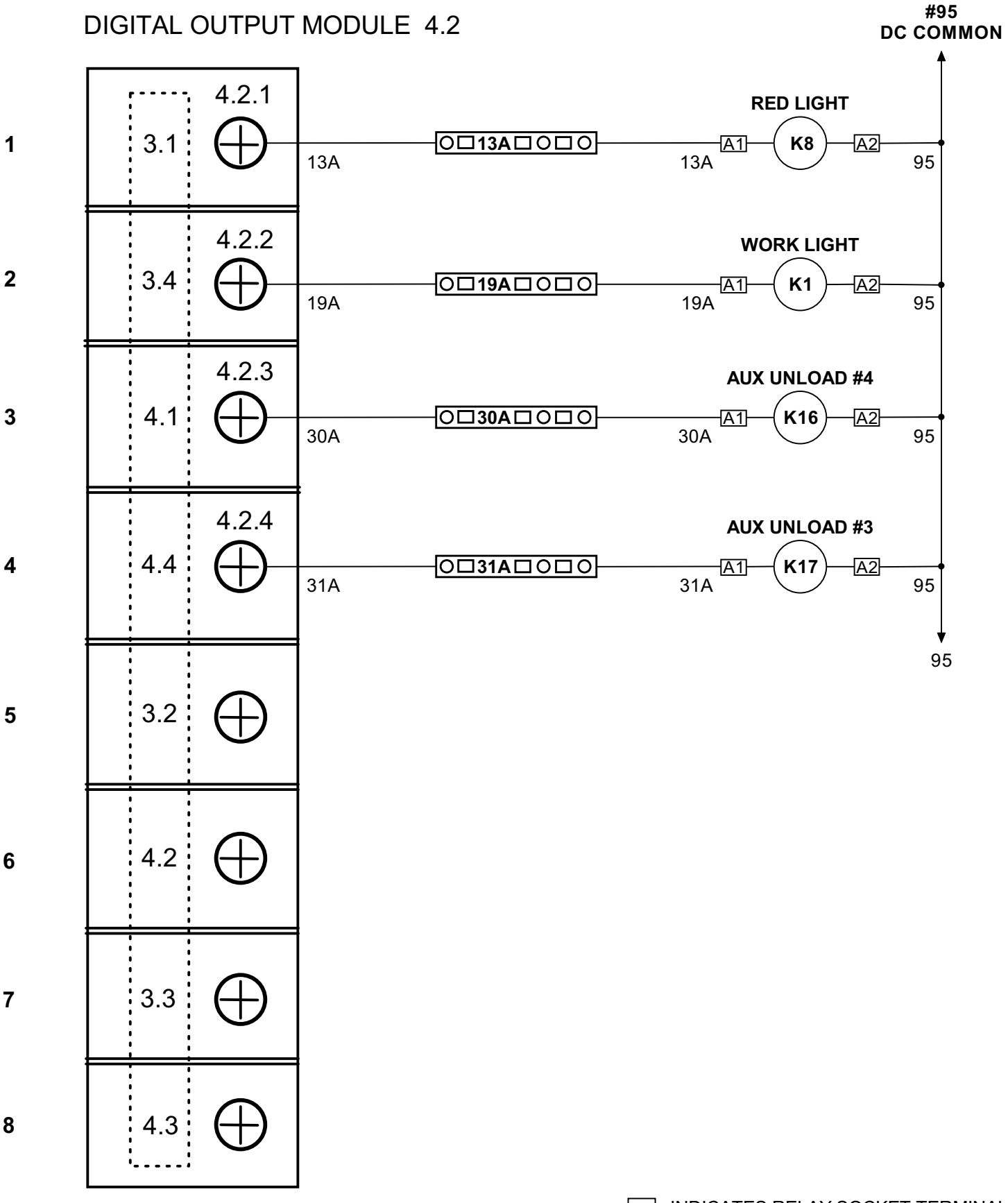


NOTE: Numbers inside of the box are terminal designators printed on the module.

□ - INDICATES RELAY SOCKET TERMINAL

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 4.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 21
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE 4.2

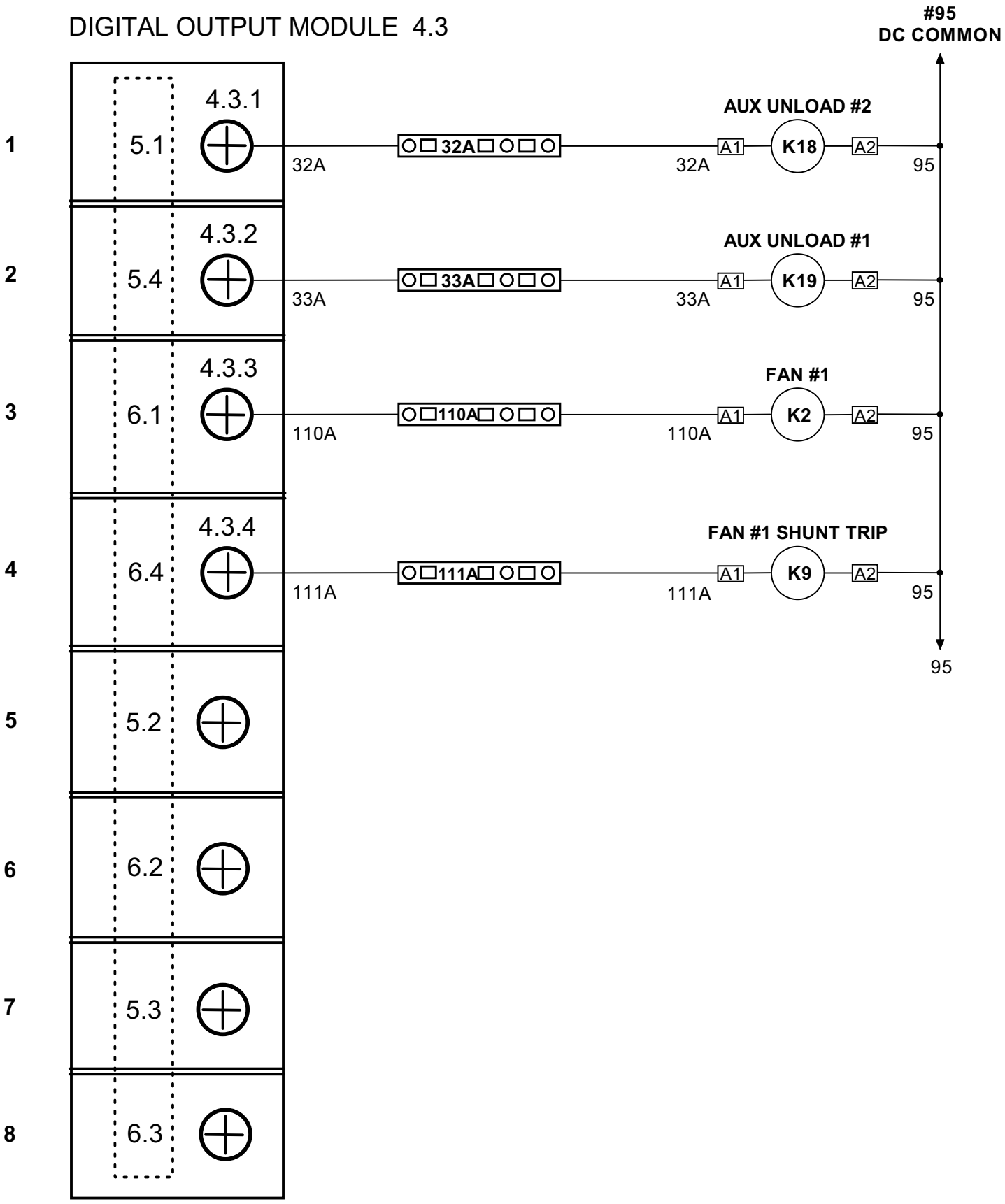


NOTE: Numbers inside of the box are terminal designators printed on the module.

- INDICATES RELAY SOCKET TERMINAL

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 4.2 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 22
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE 4.3



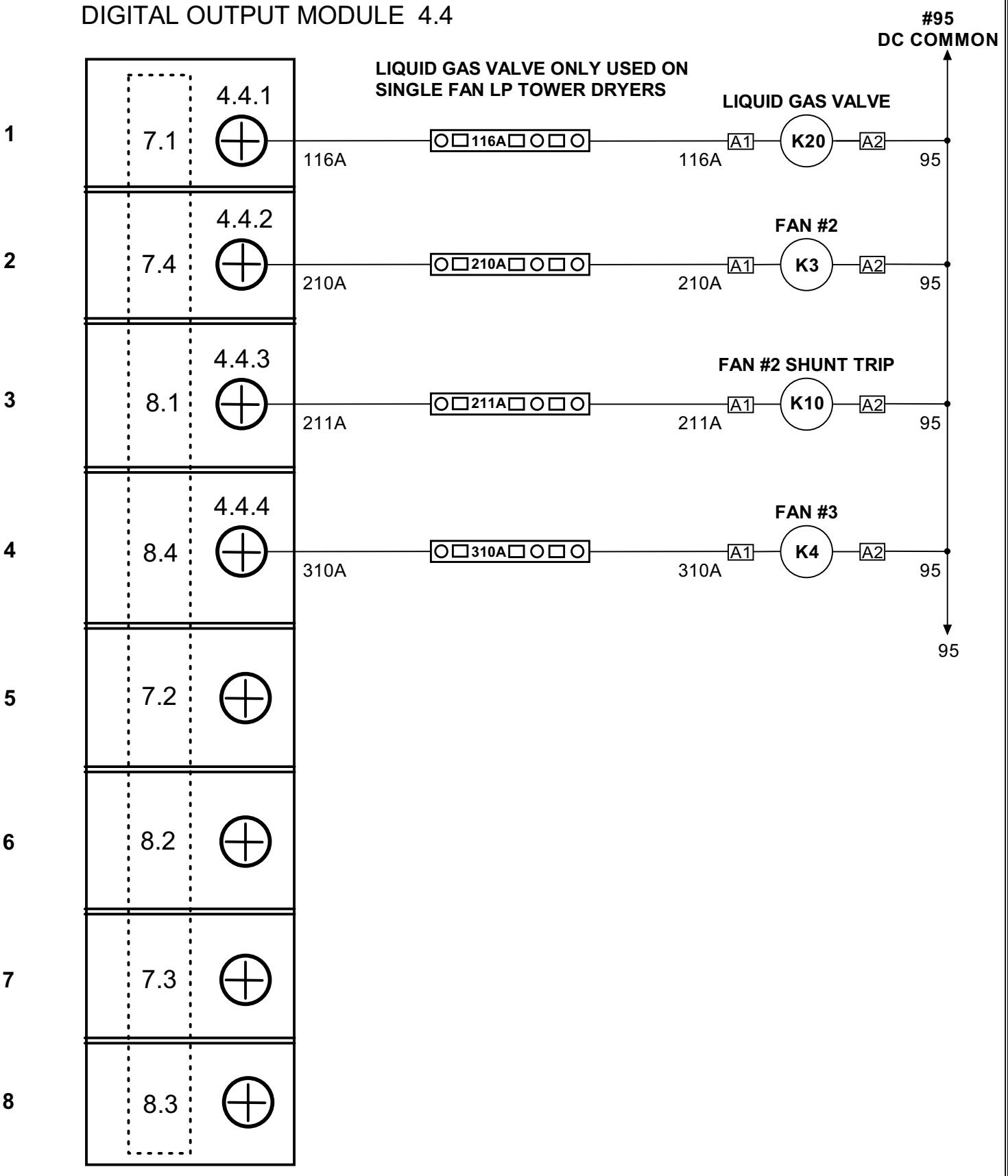
- INDICATES RELAY SOCKET TERMINAL

* - INDICATES BACKUP MANUAL CONTROL OPTION

NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 4.3 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 23
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE 4.4

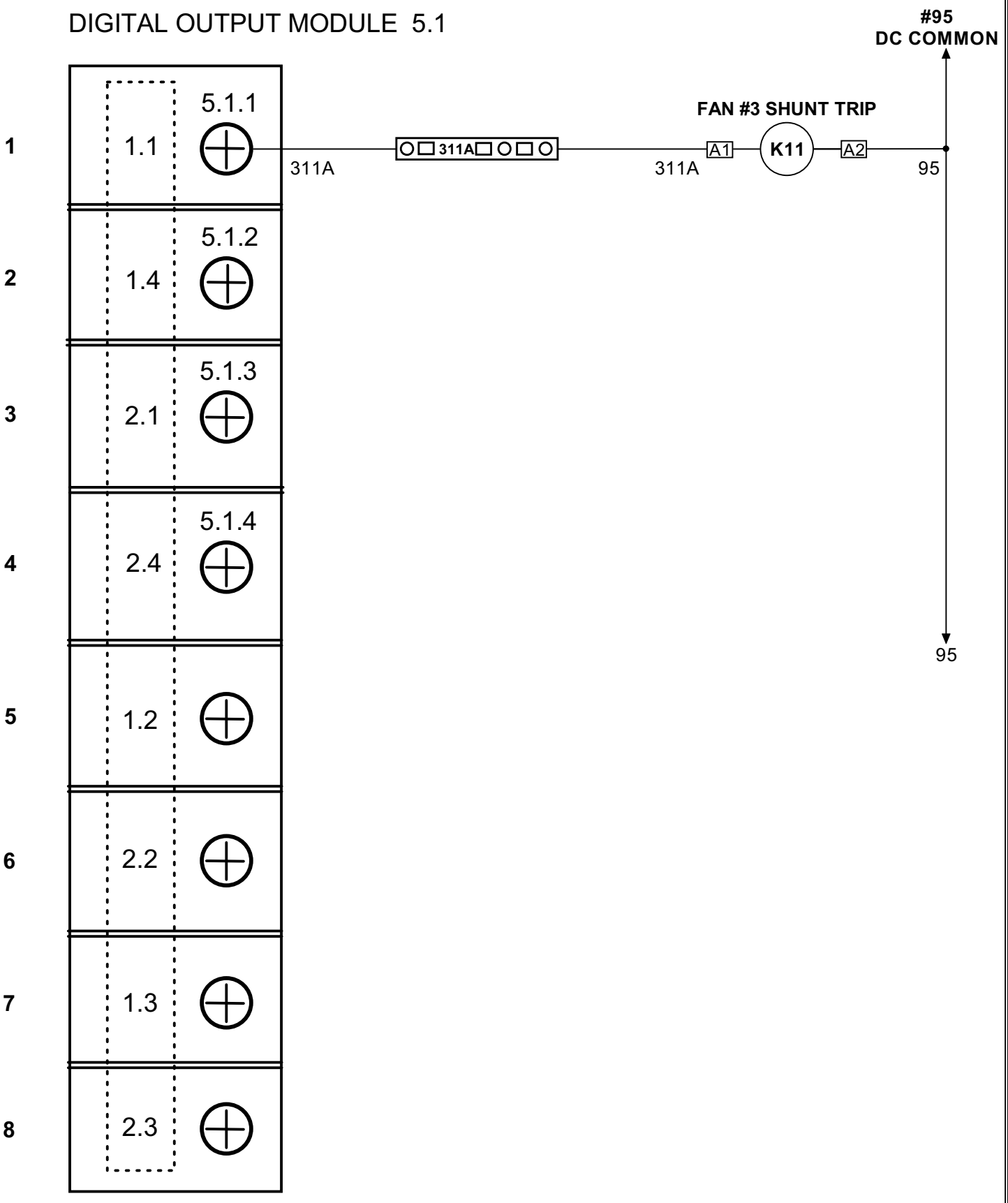


NOTE: Numbers inside of the box are terminal designators printed on the module.

☐ - INDICATES RELAY SOCKET TERMINAL

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 4.4 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 24
Revision: 4/14	ATS22 SOFT START

DIGITAL OUTPUT MODULE 5.1

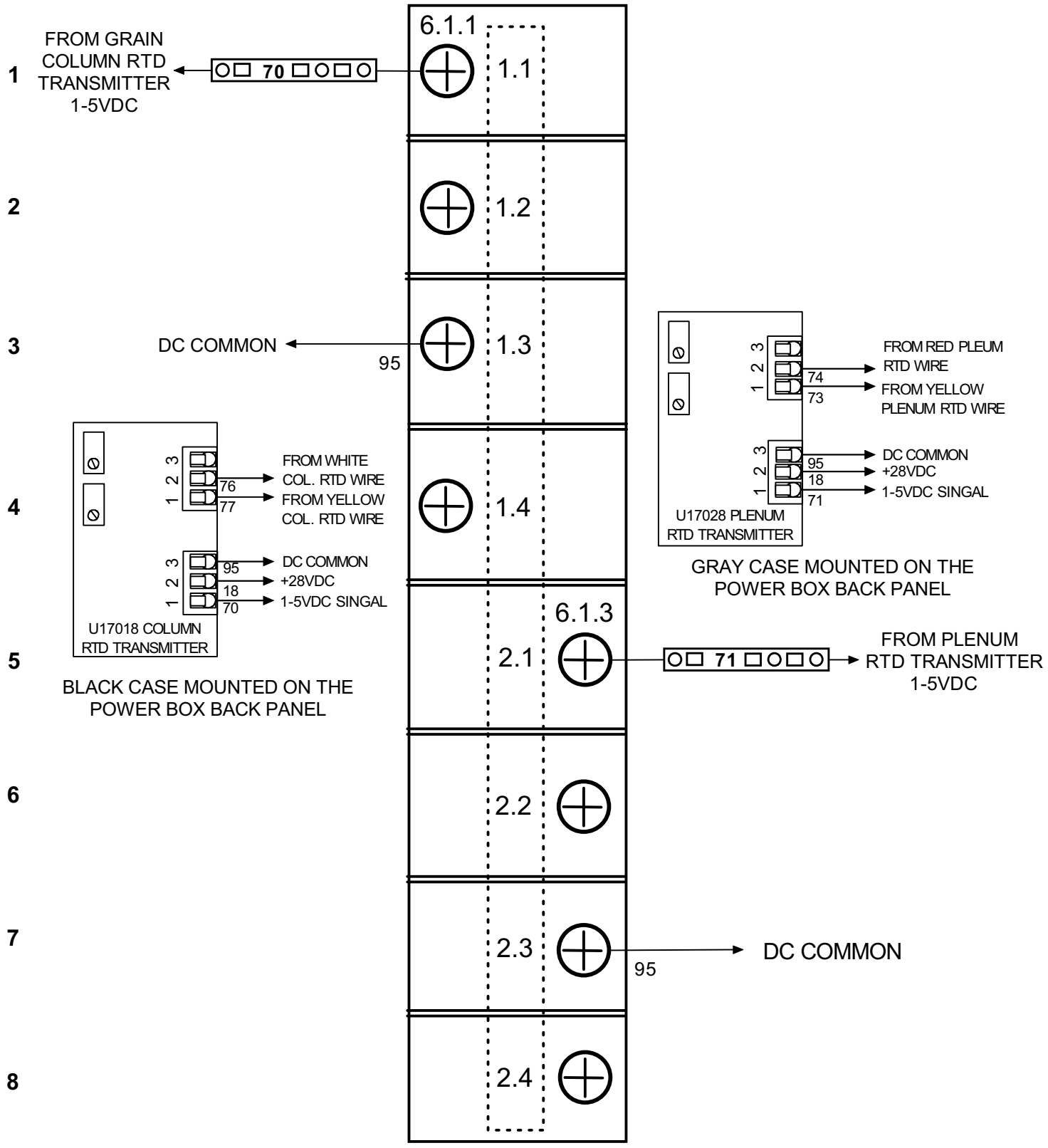


NOTE: Numbers inside of the box are terminal designators printed on the module.

☐ - INDICATES RELAY SOCKET TERMINAL

Title: TOWER DRYER: DIGTIAL OUTPUT MODULE - 5.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 25
Revision: 4/14	ATS22 SOFT START

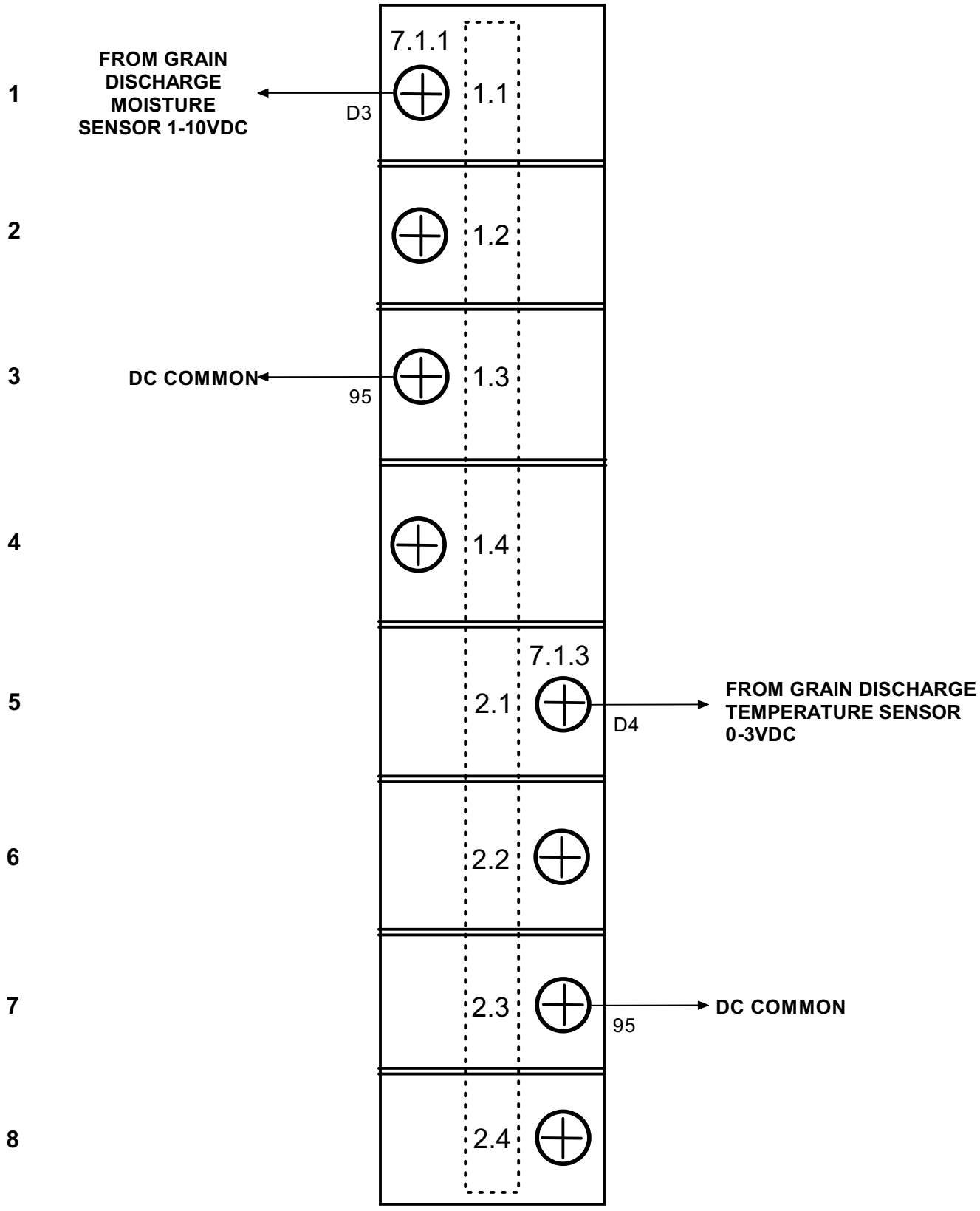
ANALOG INPUT MODULE - 6.1



NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: ANALOG INPUT MODULE - 6.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 26
Revision: 4/14	ATS22 SOFT START

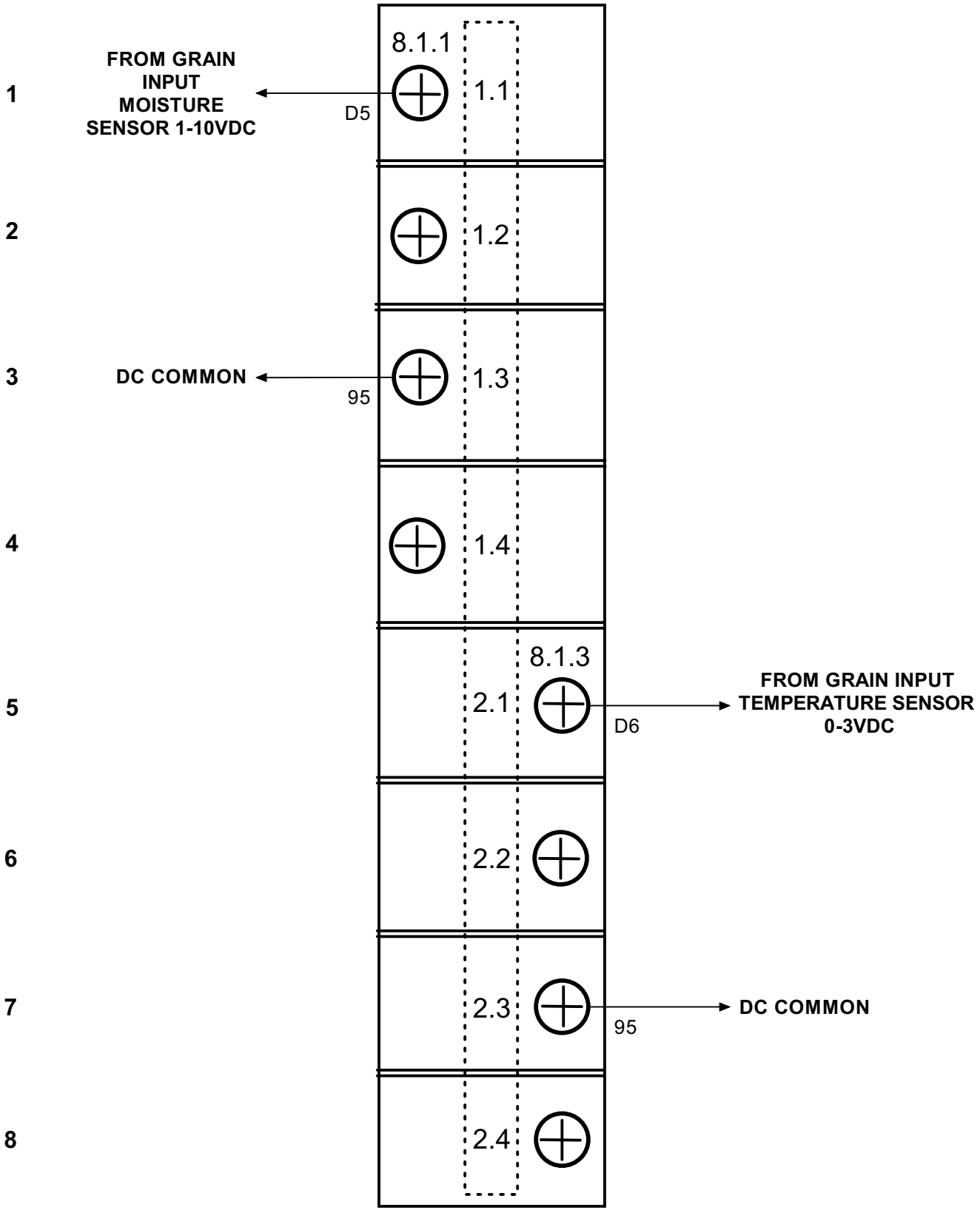
ANALOG INPUT MODULE - 7.1



NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: TOWER DRYER: ANALOG INPUT MODULE - 7.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 27
Revision: 4/14	ATS22 SOFT START

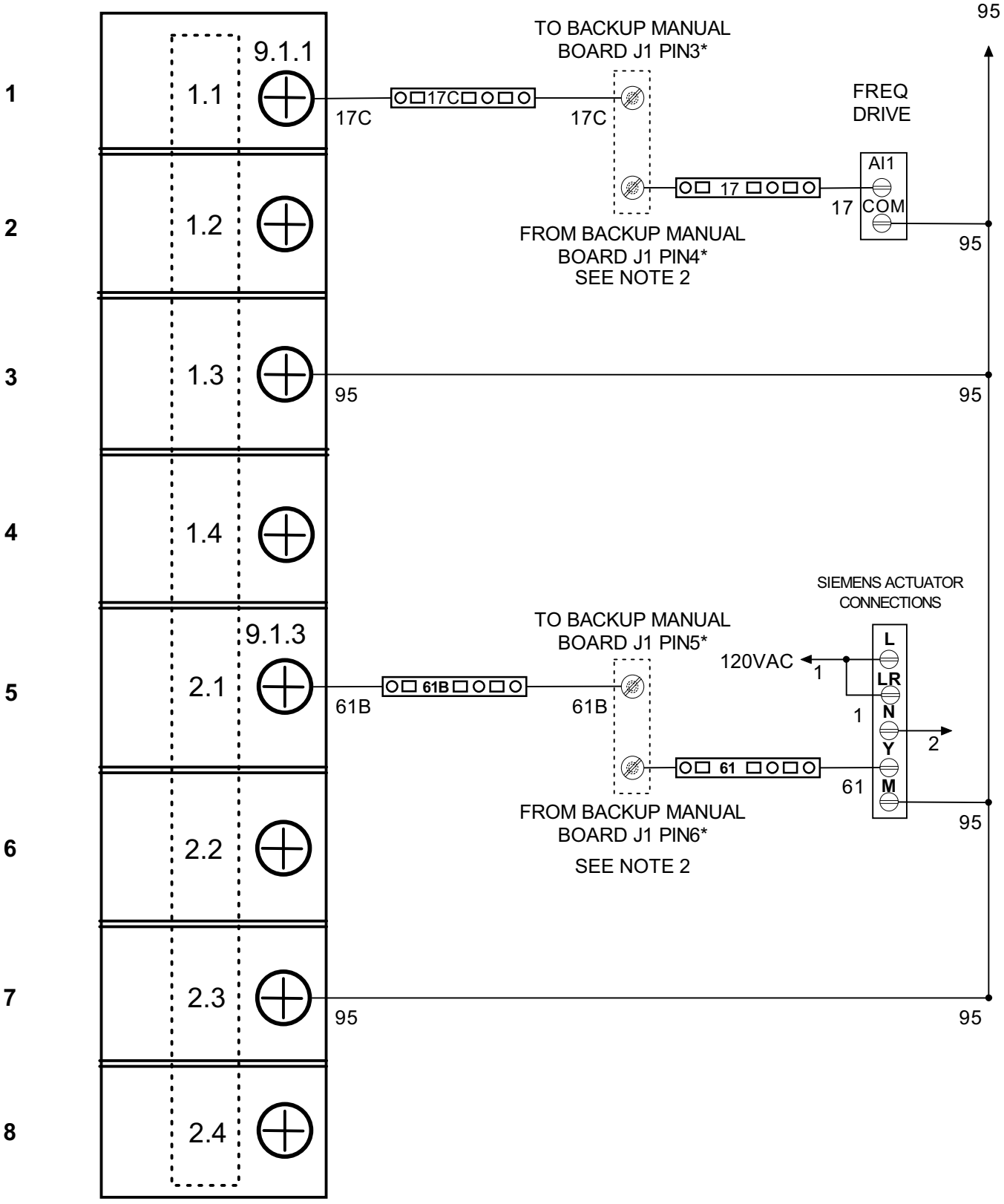
ANALOG INPUT MODULE - 8.1



NOTE: Numbers inside of the box are terminal designators printed on the module.

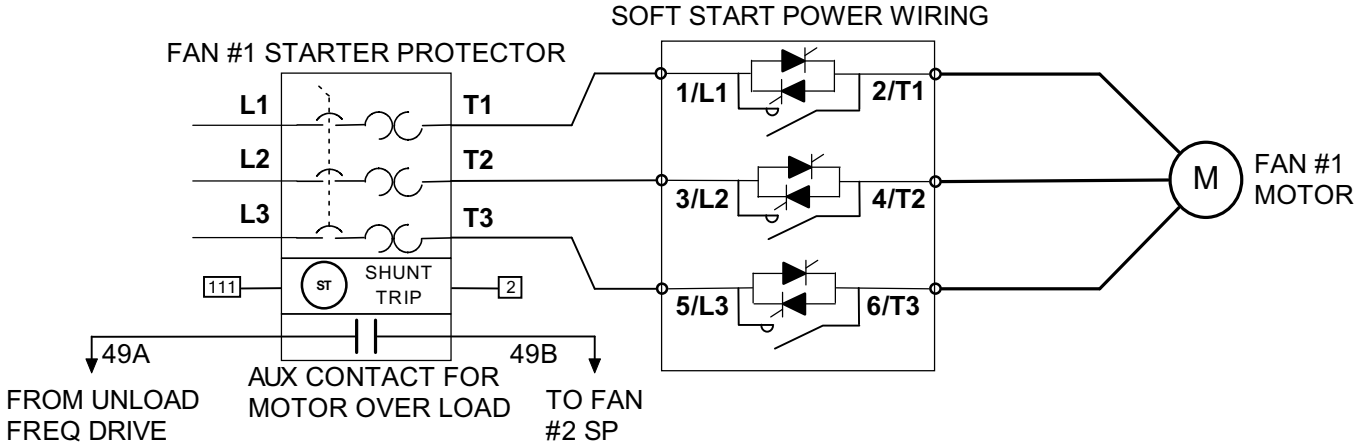
Title: TOWER DRYER: ANALOG INPUT MODULE - 8.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 28
Revision: 4/14	ATS22 SOFT START

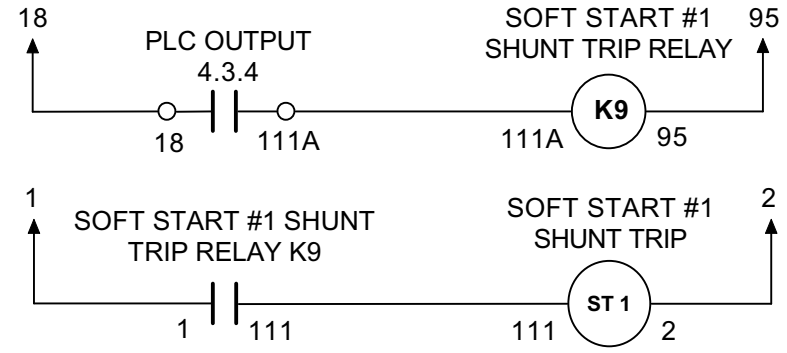
ANALOG OUTPUT MODULE - 9.1
1-10VDC

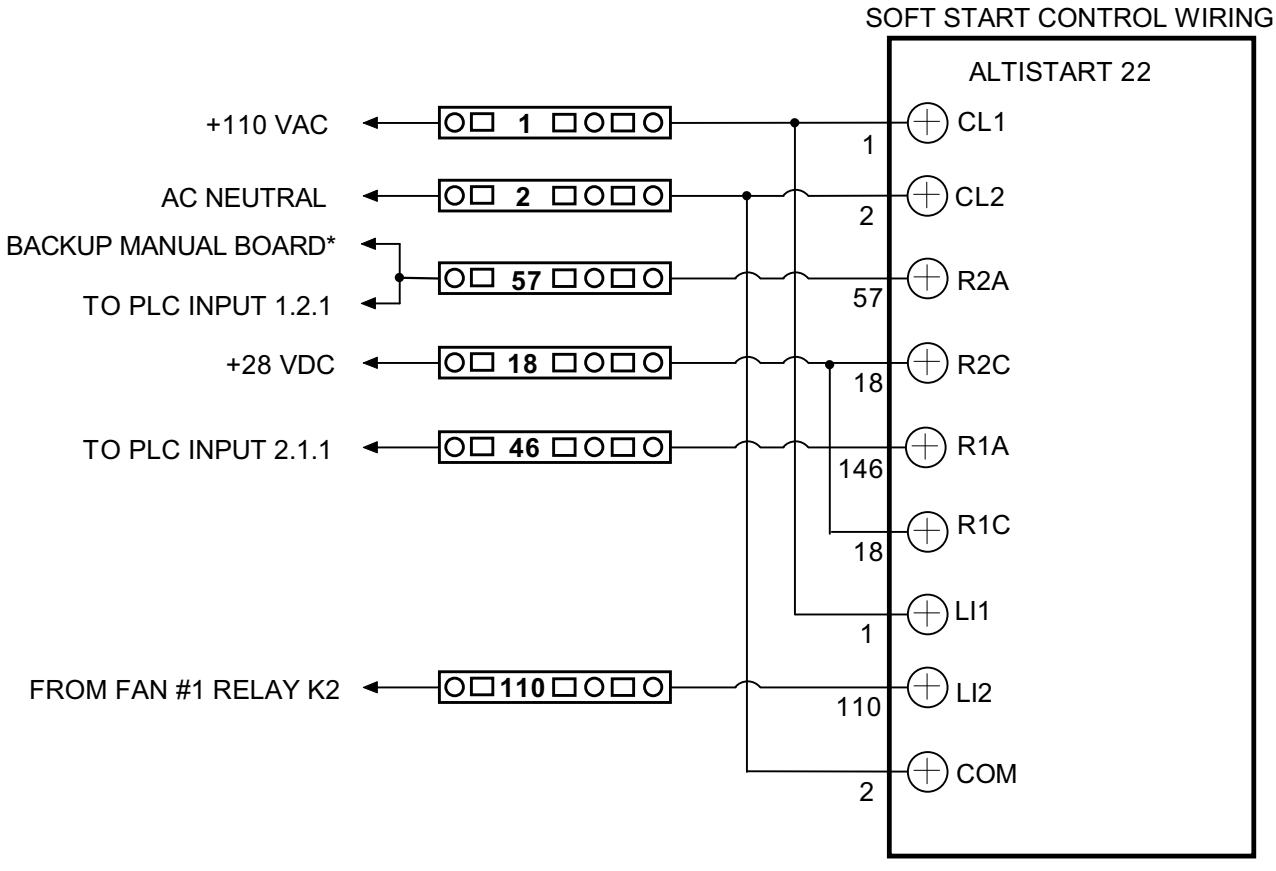


NOTE: Numbers inside of the box are terminal designators printed on the module.
NOTE 2: If Backup Manual Option not installed. A jumpers wire is installed between 17C to 17 and 61B to 61 terminals

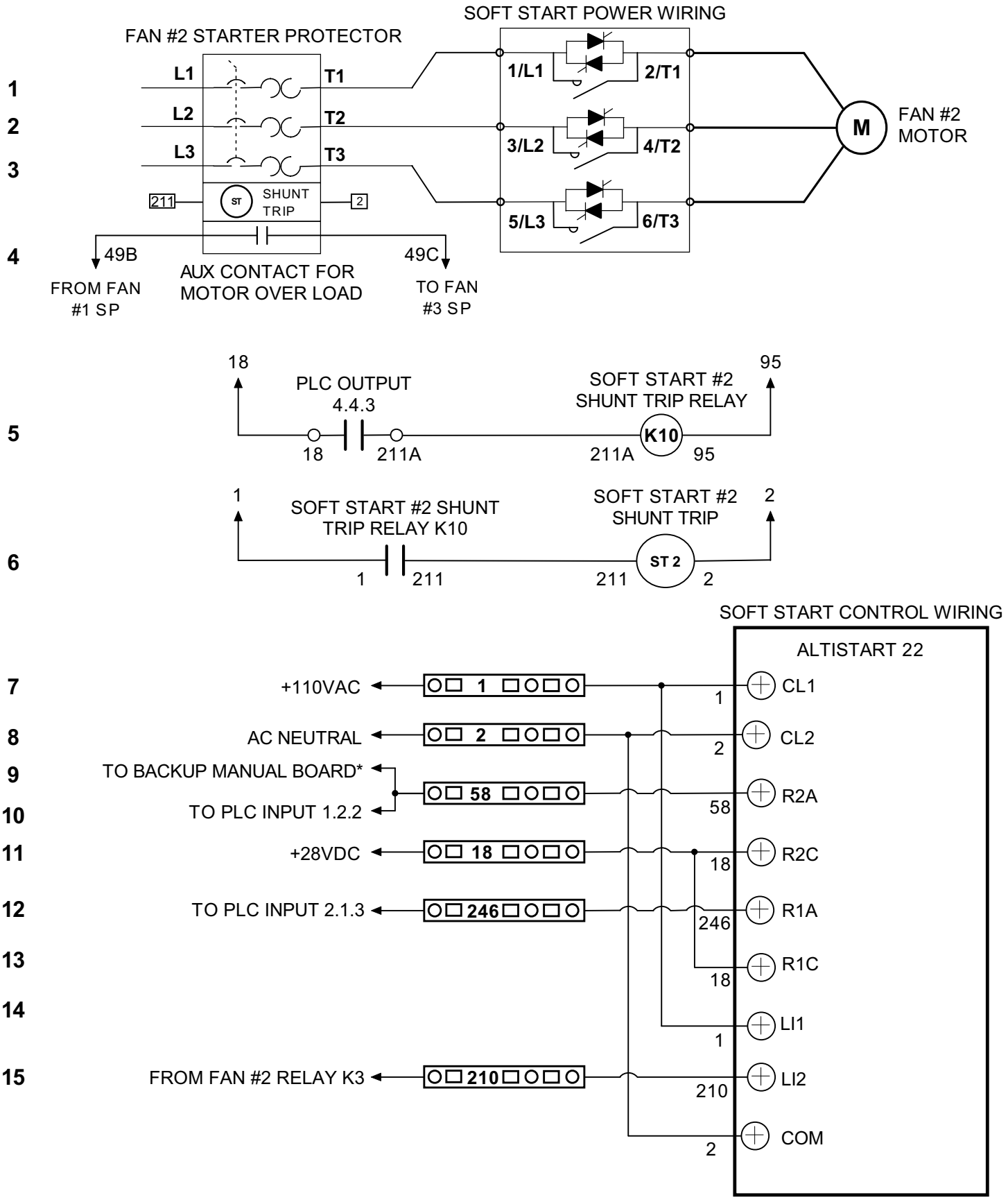
Title: TOWER DRYER: ANALOG OUTPUT MODULE - 9.1 PLC ILC150	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 29
Revision: 4/14	ATS22 SOFT START



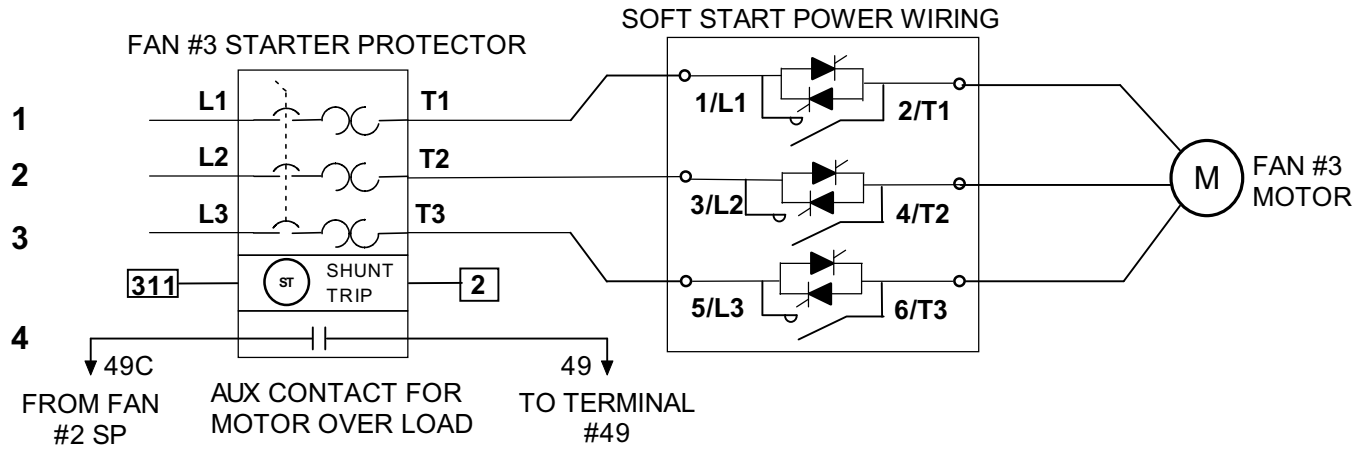


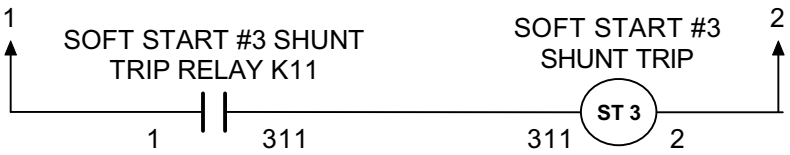


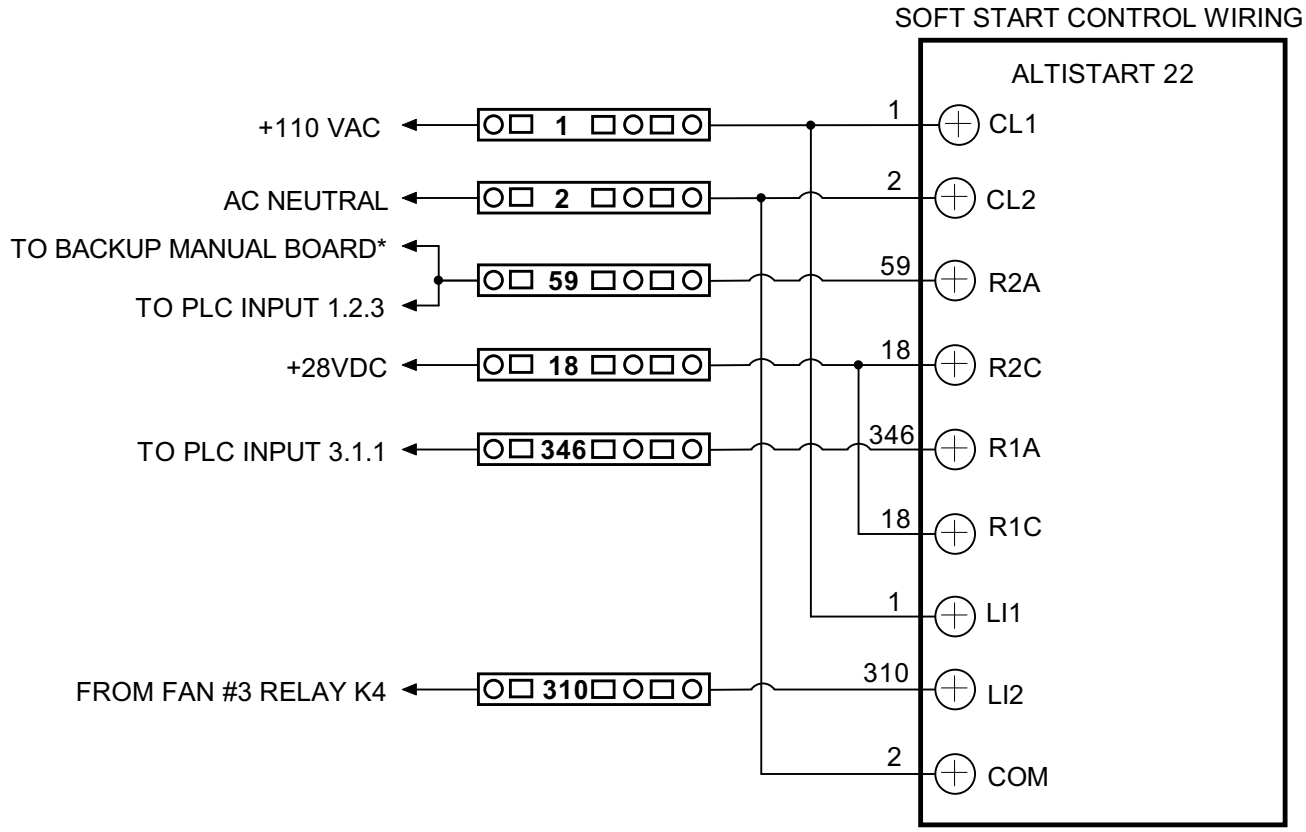
Title: TOWER DRYER: FAN #1 SOFT START WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 30
Revision: 4/14	ATS22 SOFT START



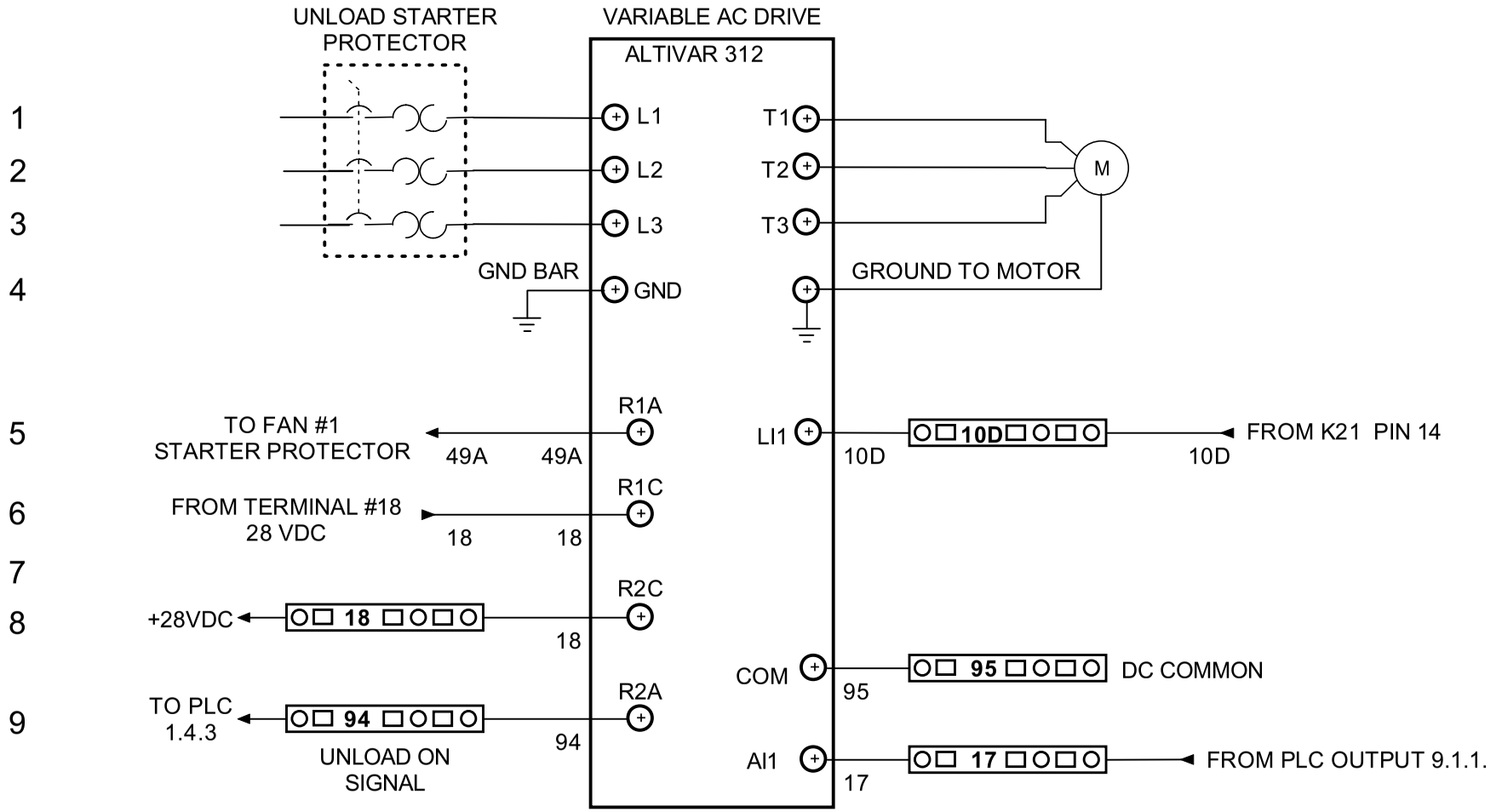
Title: TOWER DRYER:FAN #2 SOFT START WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 31
Revision: 4/14	ATS22 SOFT START





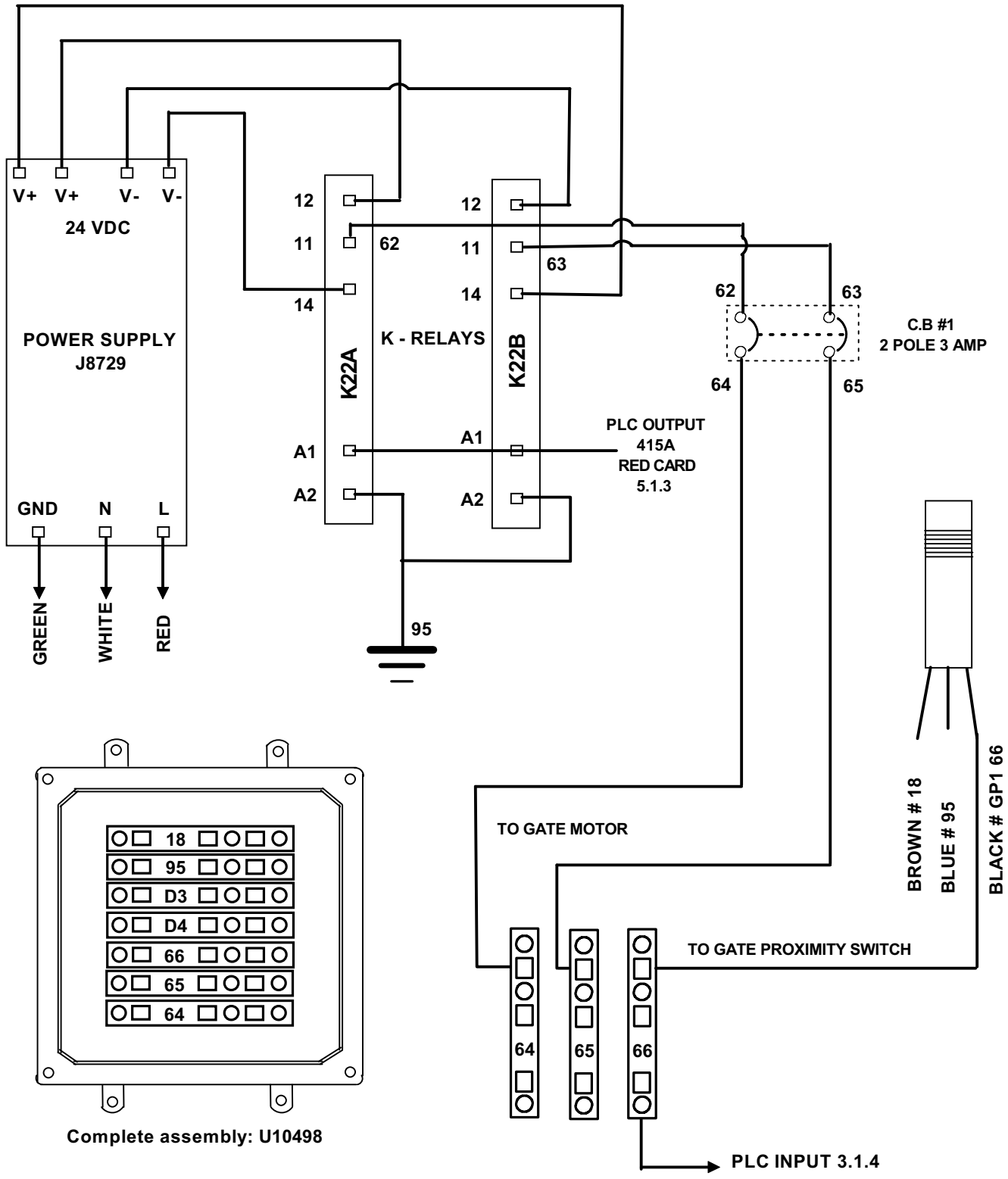


Title: TOWER DRYER: FAN #3 SOFT START WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 32
Revision: 4/14	ATS22 SOFT START



Title: TOWER DRYER: FREQUENCY DRIVE POWER & CONTROL WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 33
Revision: 4/14	ATS22 SOFT START

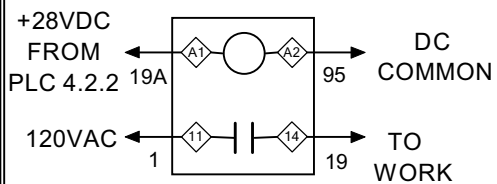
TOWER - STATIC MOISTURE SAMPLE



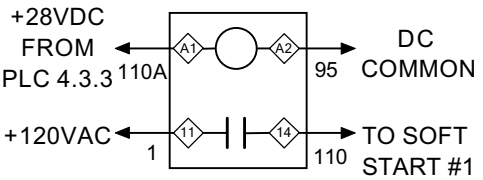
Complete assembly: U10498

Title: TOWER - STATIC MOISTURE SAMPLE	
Author: SUKUP MANUFACTURING CO.	
Date: 3/3/13 Revision:5/14	Sheet: 34

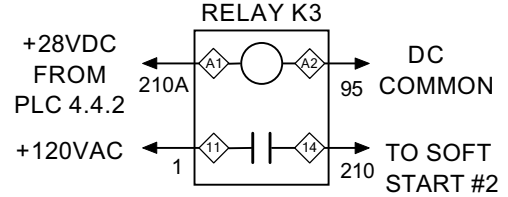
WORK LIGHT
RELAY K1



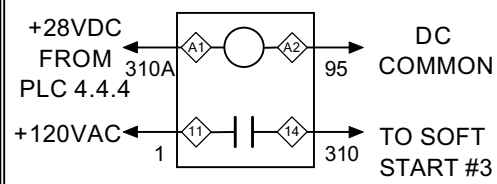
FAN #1
RELAY K2



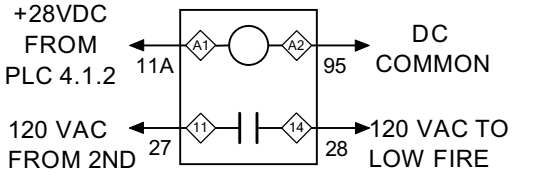
FAN #2
RELAY K3



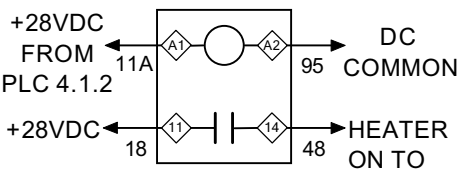
FAN #3
RELAY K4



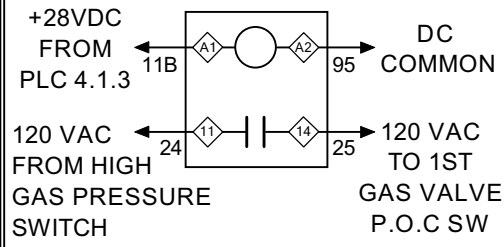
HEATER ENABLE
RELAY K5A



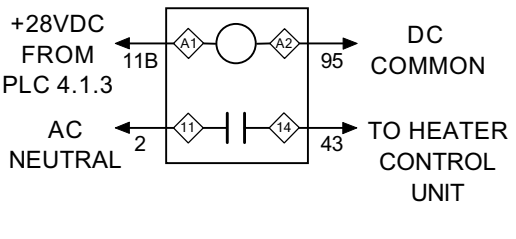
HEATER ENABLE
RELAY K5B



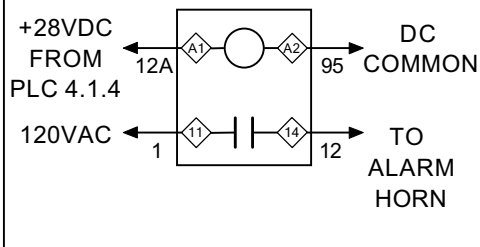
HEATER INTERLOCK
RELAY K6A



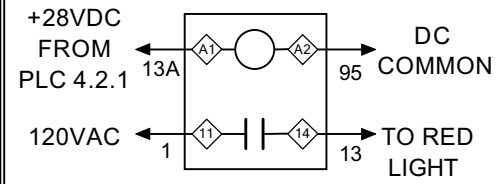
HEATER INTERLOCK
RELAY K6B



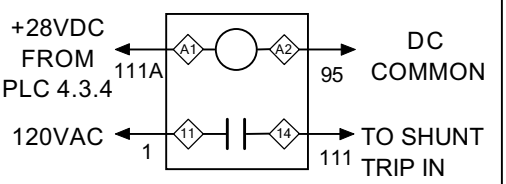
ALARM HORN
RELAY K7



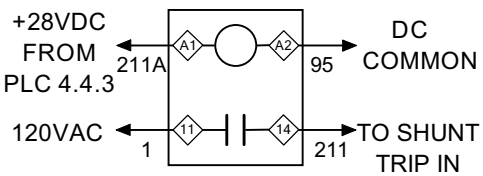
RED LIGHT
RELAY K8



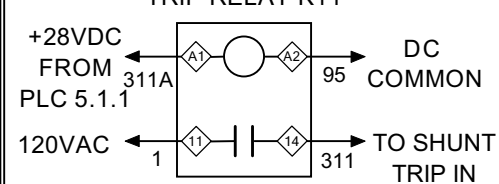
FAN #1 SHUNT
TRIP RELAY K9



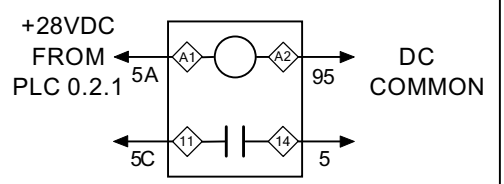
FAN #2 SHUNT
TRIP RELAY K10



FAN #3 SHUNT
TRIP RELAY K11

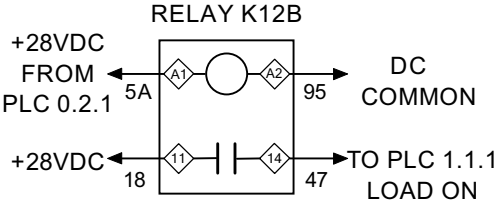


AUX LOAD #1
RELAY K12A



DRY CONTACTS FOR AUX LOAD #1

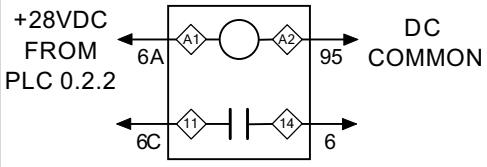
AUX LOAD #1
RELAY K12B



◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

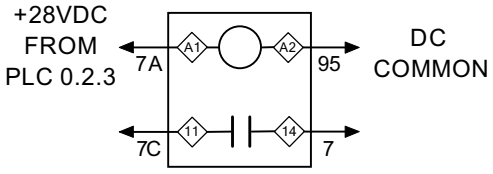
Title: TOWER DRYER: RELAY AND CONTACTS WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 35
Revision: 4/14	ATS22 SOFT START

AUX LOAD #2
RELAY K13



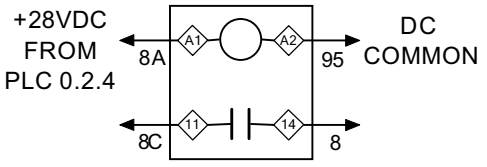
DRY CONTACTS
FOR AUX LOAD #2

AUX LOAD #3
RELAY K14



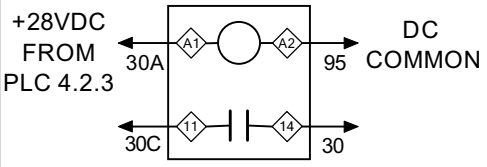
DRY CONTACTS
FOR AUX LOAD #3

AUX LOAD #4
RELAY K15



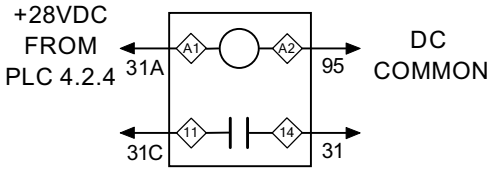
DRY CONTACTS
FOR AUX LOAD#4

AUX UNLOAD #4
RELAY K16



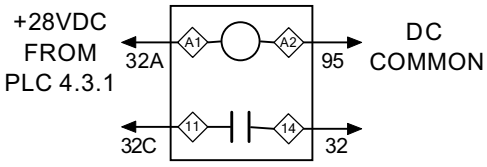
DRY CONTACTS
FOR AUX UNLOAD #4

AUX UNLOAD #3
RELAY K17



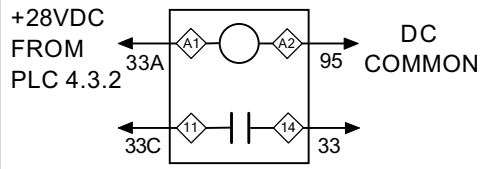
DRY CONTACTS
FOR AUX UNLOAD #3

AUX UNLOAD #2
RELAY K18



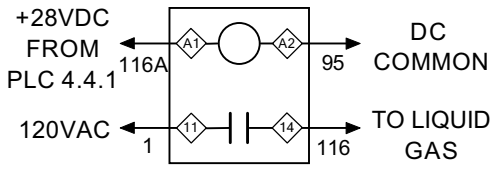
DRY CONTACTS
FOR AUX UNLOAD #2

AUX UNLOAD #1
RELAY K19



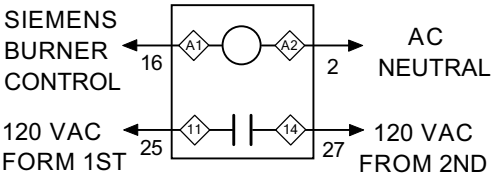
DRY CONTACTS
FOR AUX UNLOAD #1

LIQUID GAS SOLENOID
RELAY K20

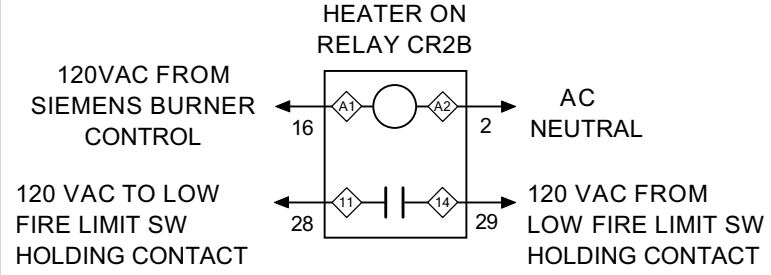


ONLY USED ON 12' DRYER
WITH INTERNAL VAPORIZERS

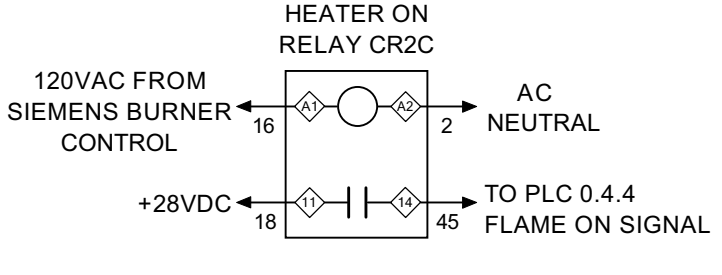
HEATER ON
RELAY CR2A



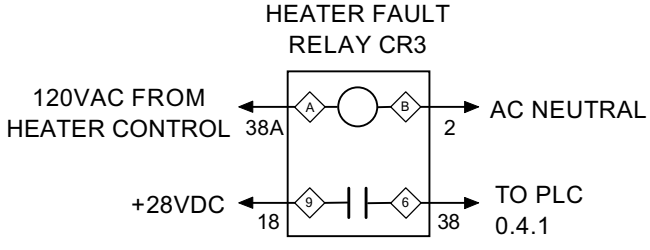
HEATER ON
RELAY CR2B



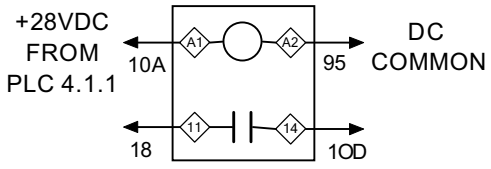
HEATER ON
RELAY CR2C



HEATER FAULT
RELAY CR3

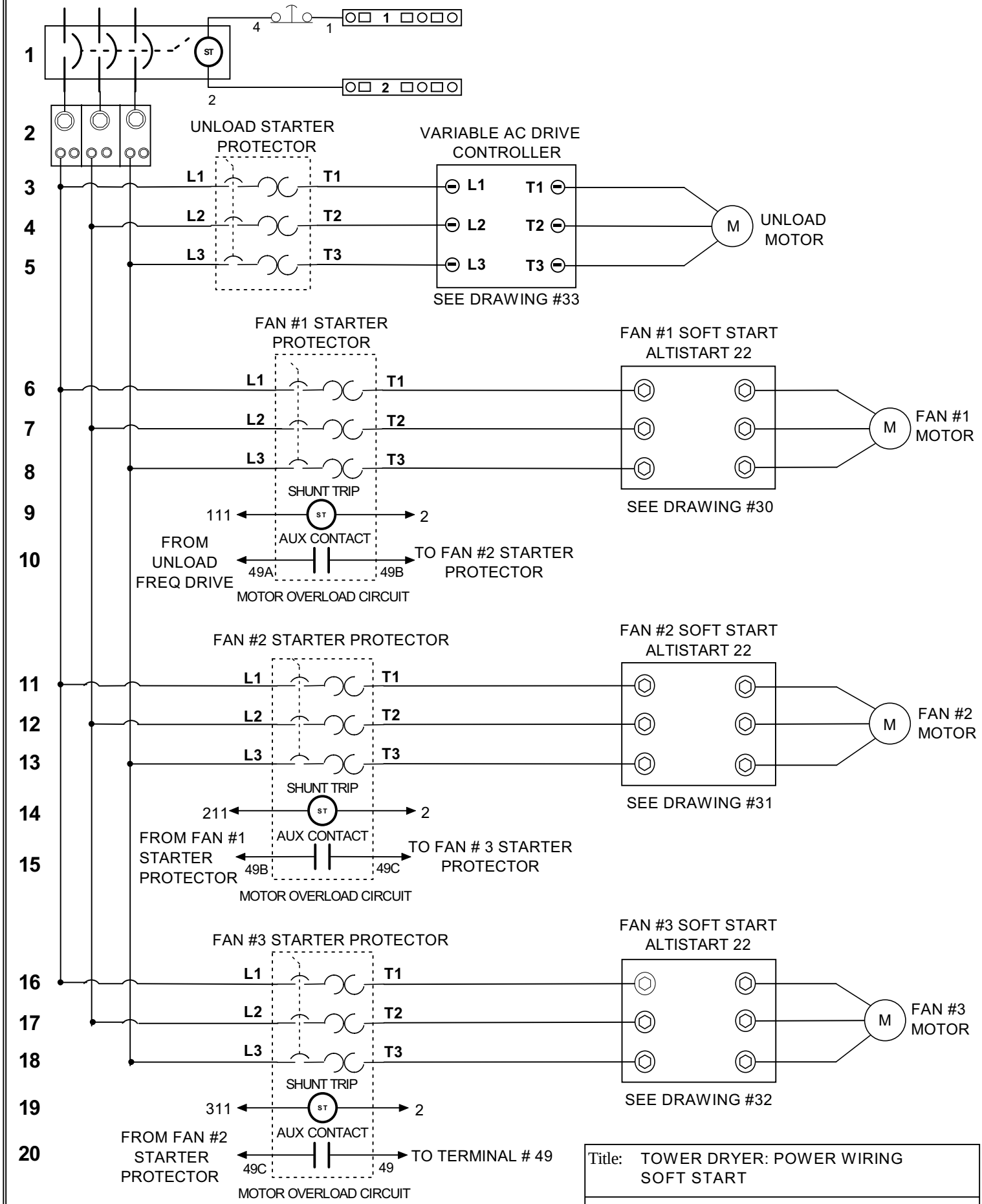


K21 UNLOAD
FREQ. DRIVE

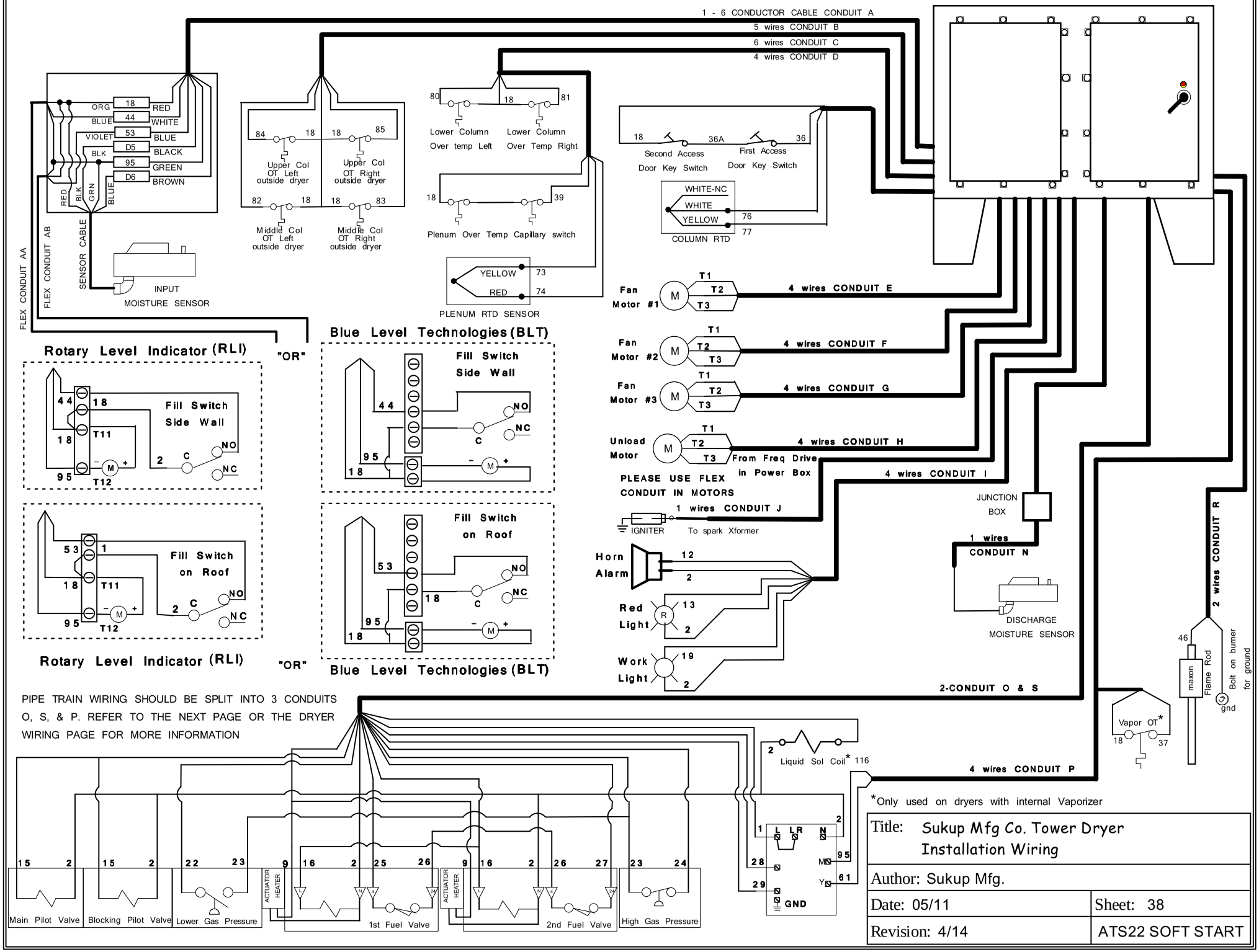


◇ - INDICATES THE TERMINAL POINT ON THE SOCKET

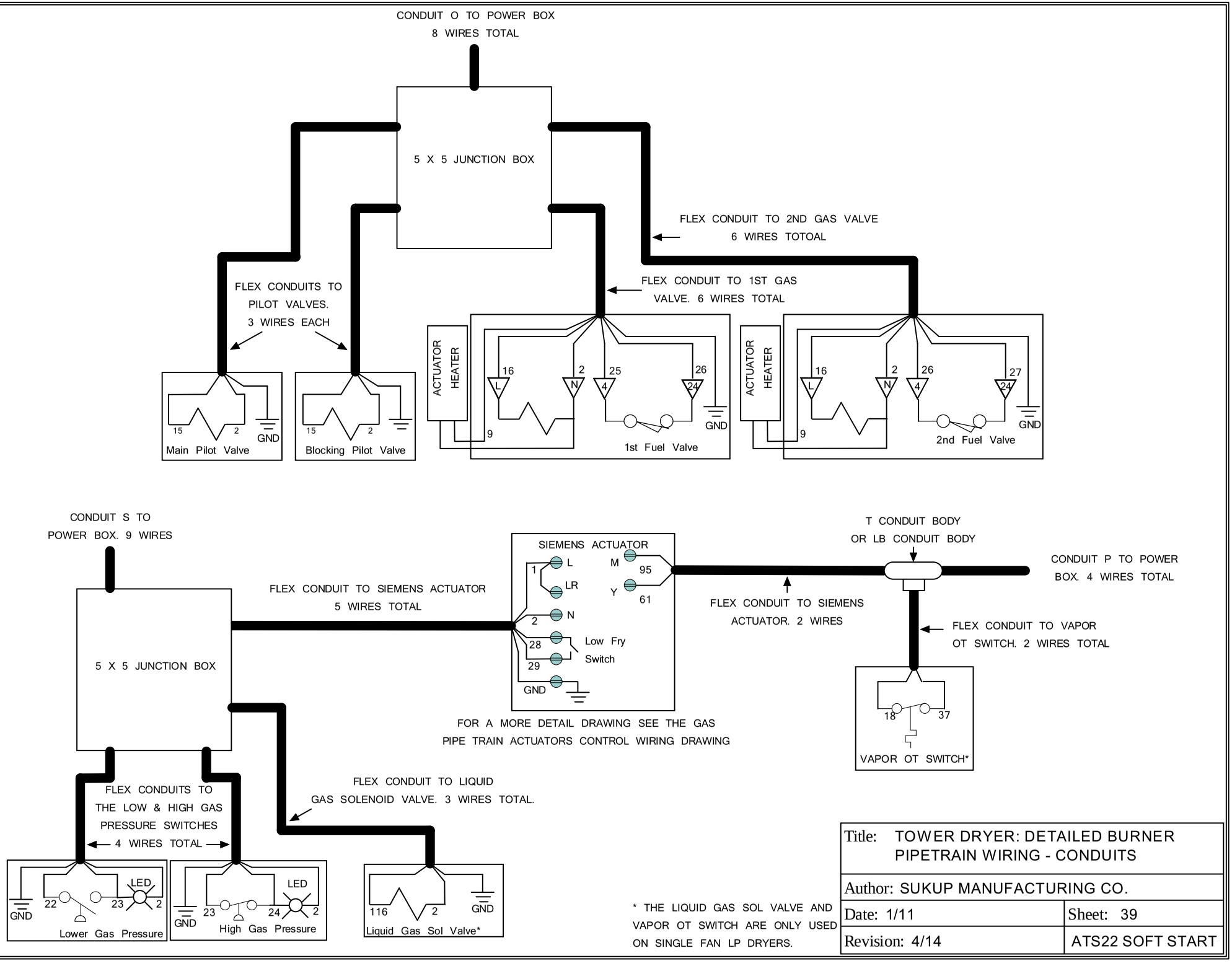
Title: TOWER DRYER: RELAY AND CONTACTS WIRING	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 36
Revision: 4/14	ATS22 SOFT START



Title: TOWER DRYER: POWER WIRING SOFT START	
Author: SUKUP MANUFACTURING CO.	
Date: 05/12	Sheet: 37
Revision: 4/14	ATS22 SOFT START



Title: Sukup Mfg Co. Tower Dryer Installation Wiring	
Author: Sukup Mfg.	
Date: 05/11	Sheet: 38
Revision: 4/14	ATS22 SOFT START



* THE LIQUID GAS SOL VALVE AND VAPOR OT SWITCH ARE ONLY USED ON SINGLE FAN LP DRYERS.

Title: TOWER DRYER: DETAILED BURNER PIPETRAIN WIRING - CONDUITS	
Author: SUKUP MANUFACTURING CO.	
Date: 1/11	Sheet: 39
Revision: 4/14	ATS22 SOFT START

Tower Dryer

With QuadraTouch™ Dryer Control System

Appendices

TABLE OF CONTENTS

Appendix A

Foundations

Modular Tower Dryers

Stick-built Tower Dryers

Foundation

Drawings in this section show minimum foundation requirements or each type of Sukup Tower Dryer. Actual foundation must be designed by a professional engineer. The following conditions apply to all:

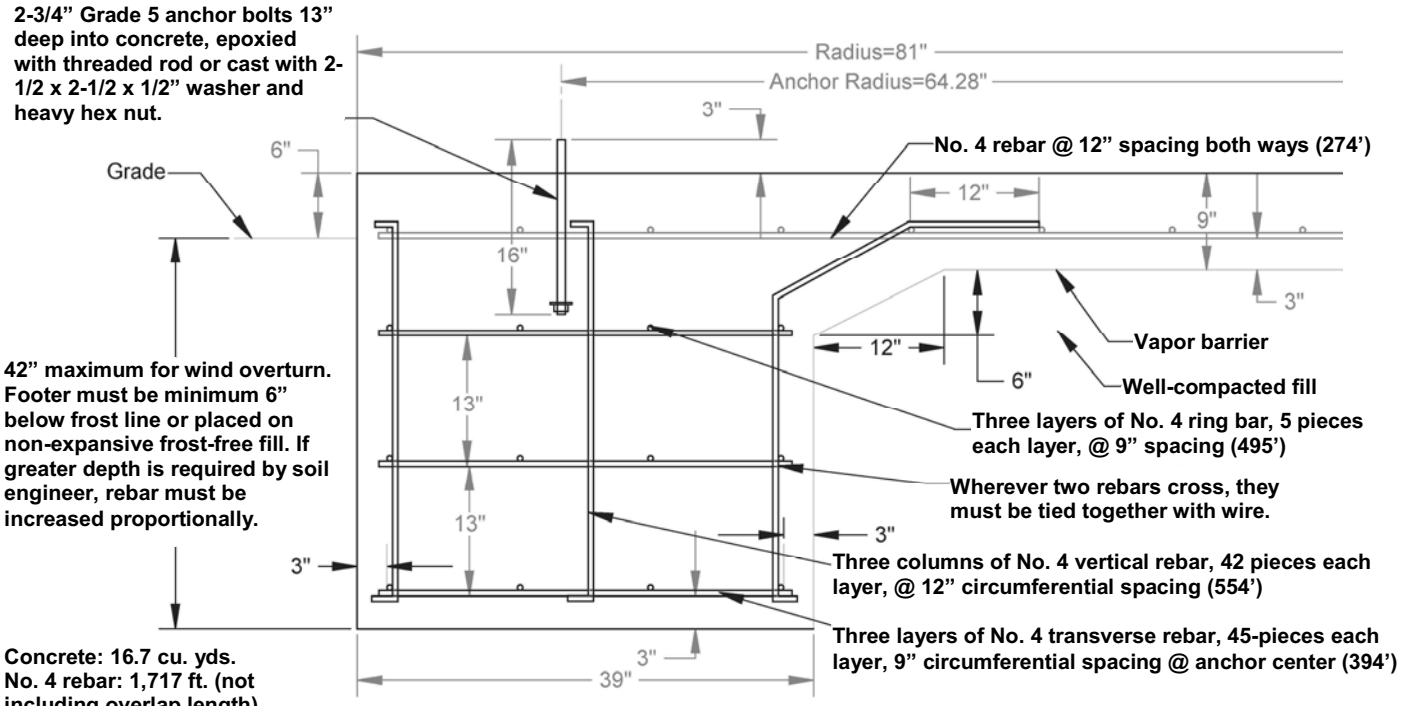
Soil must be able to support 3,000 pounds per square foot. Concrete minimum compression strength at 28 days must be 3,000 pounds per square inch with grade 60 rebar.

All material used for backfill on inside of ring wall should be clean, well-graded crushed stone or sand/gravel mixture. Backfill should be placed in 6” layers and well compacted.

All sections of rebar that overlap must be connected together by wire.

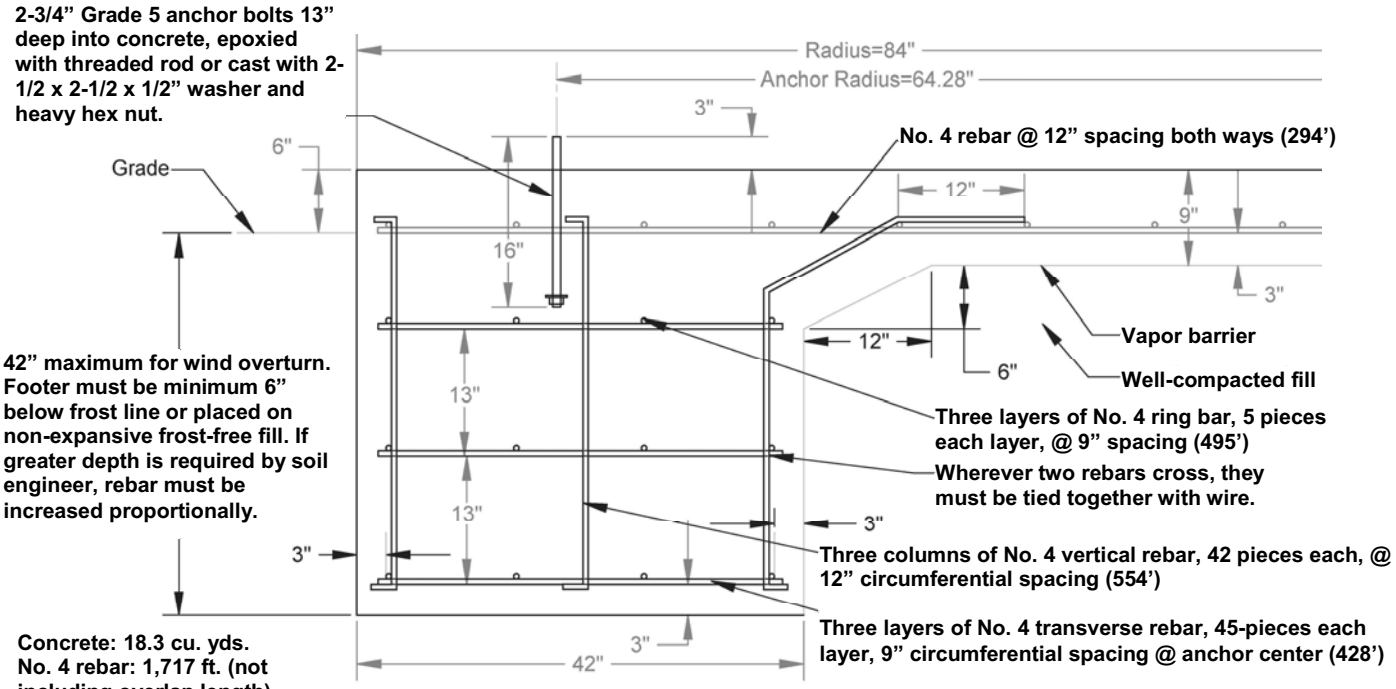
For some soil types, bottom of footing must be below frost line. Consult with local soil engineer.

IMPORTANT: Foundation must be designed by a qualified engineer based on soil conditions at site. The following figures are for illustration and quoting purposes only. Soil boring test must be done by a competent engineering firm, and foundation construction must be done by a qualified concrete contractor. Sukup Manufacturing Co. is not liable for problems arising from inadequate foundation design or construction.



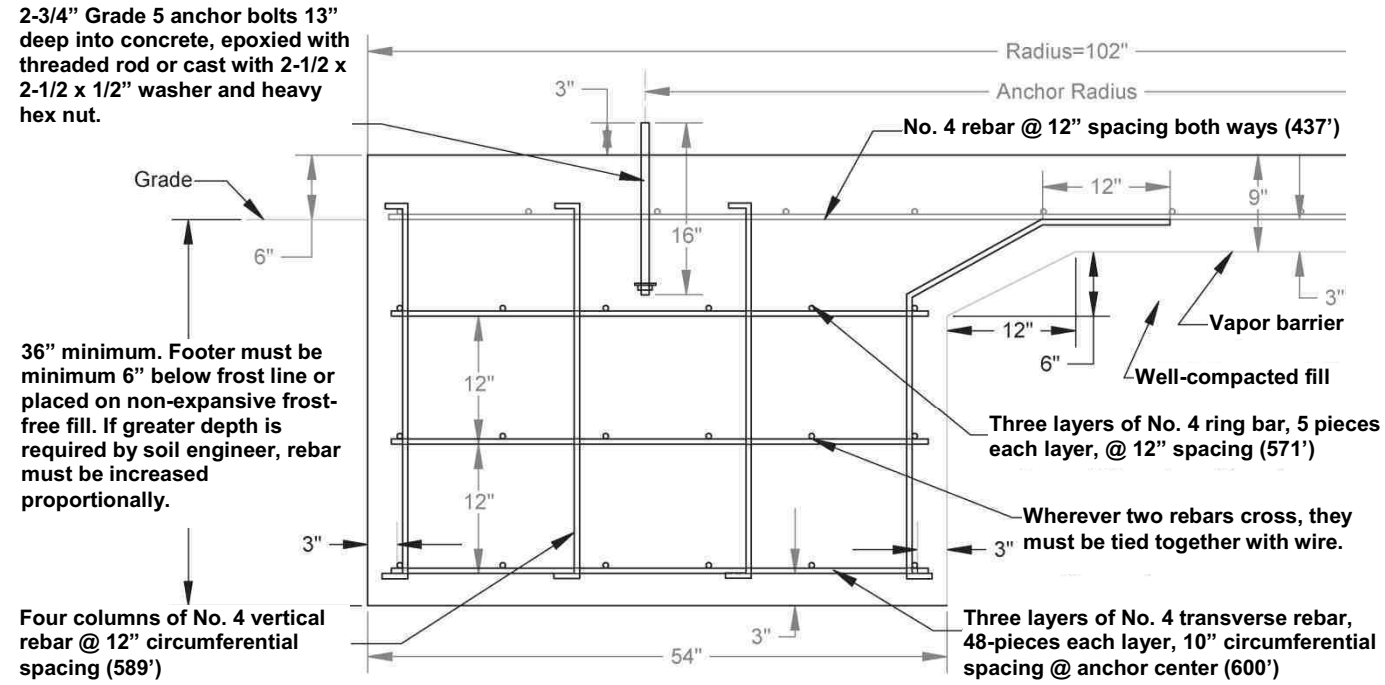
For ASCE7-05-defined 90 mph wind zone and seismic category A only!

Model U1010



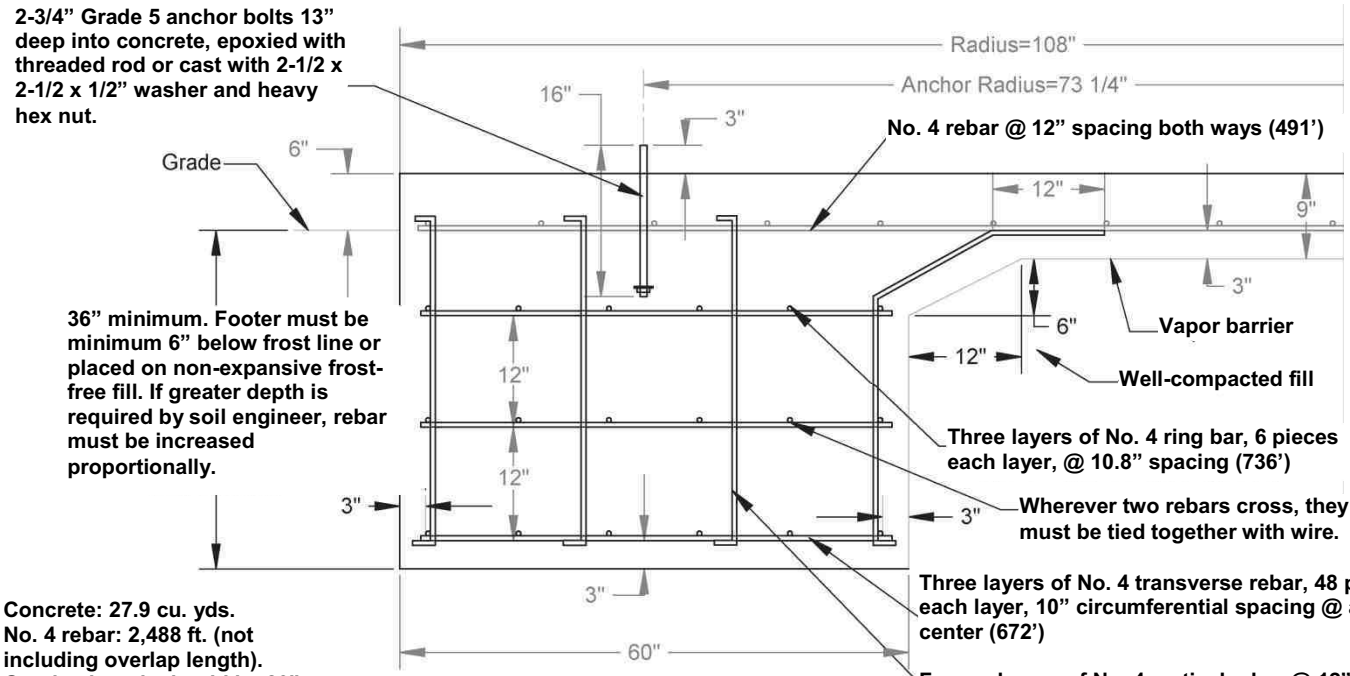
For ASCE7-05-defined 90 mph wind zone and seismic category A only!

Model U1510

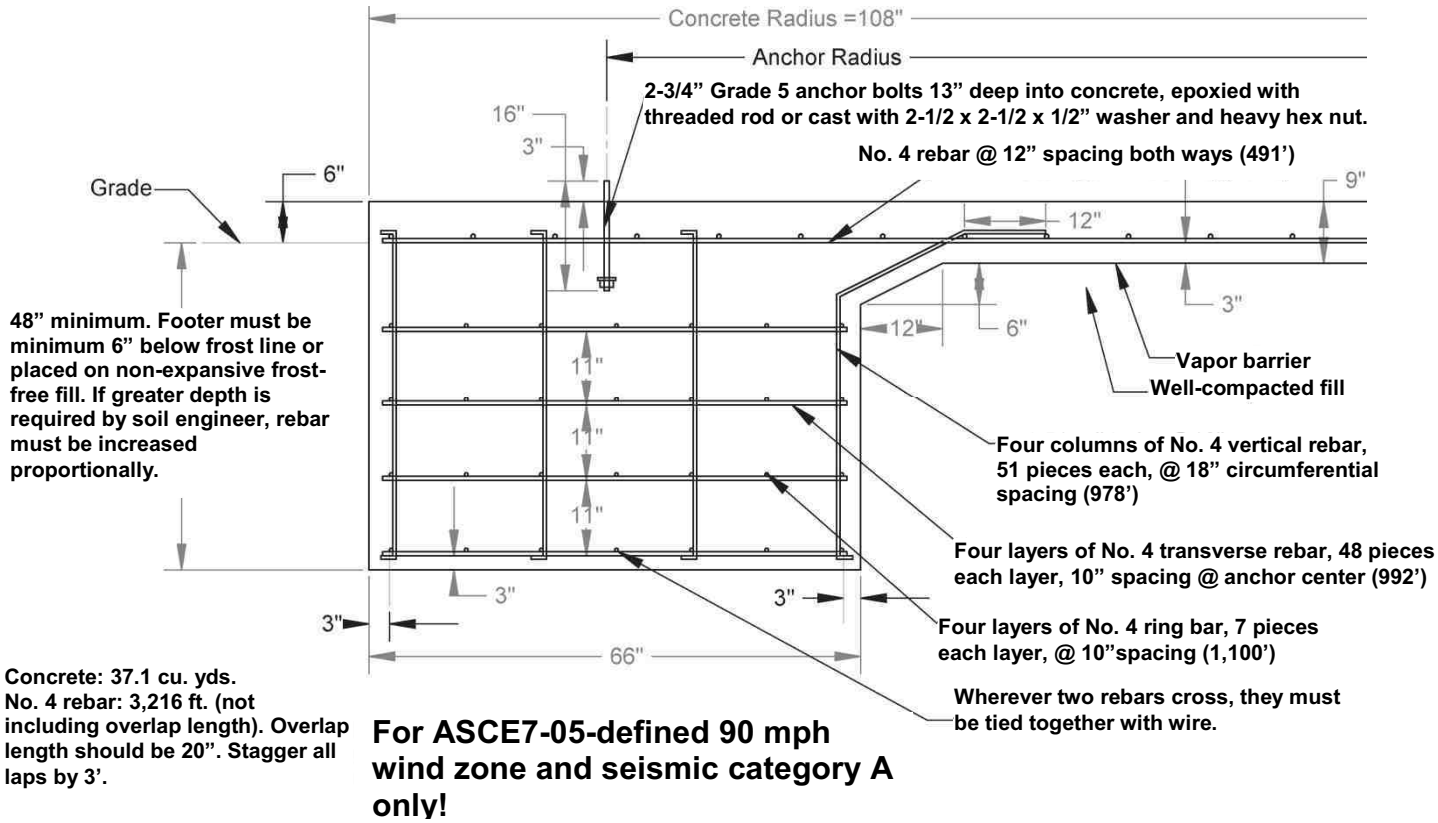


For ASCE7-05-defined 90 mph wind zone and seismic category A only!

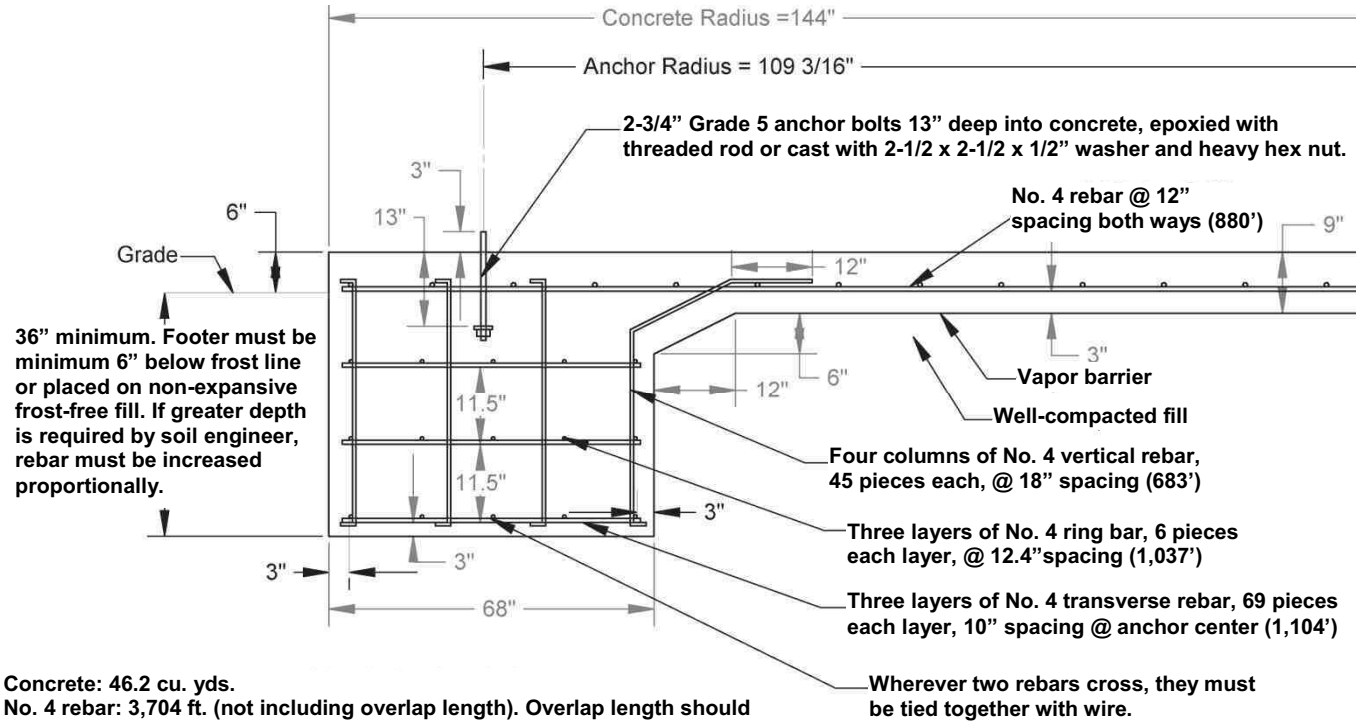
Model U1812



Model U2012



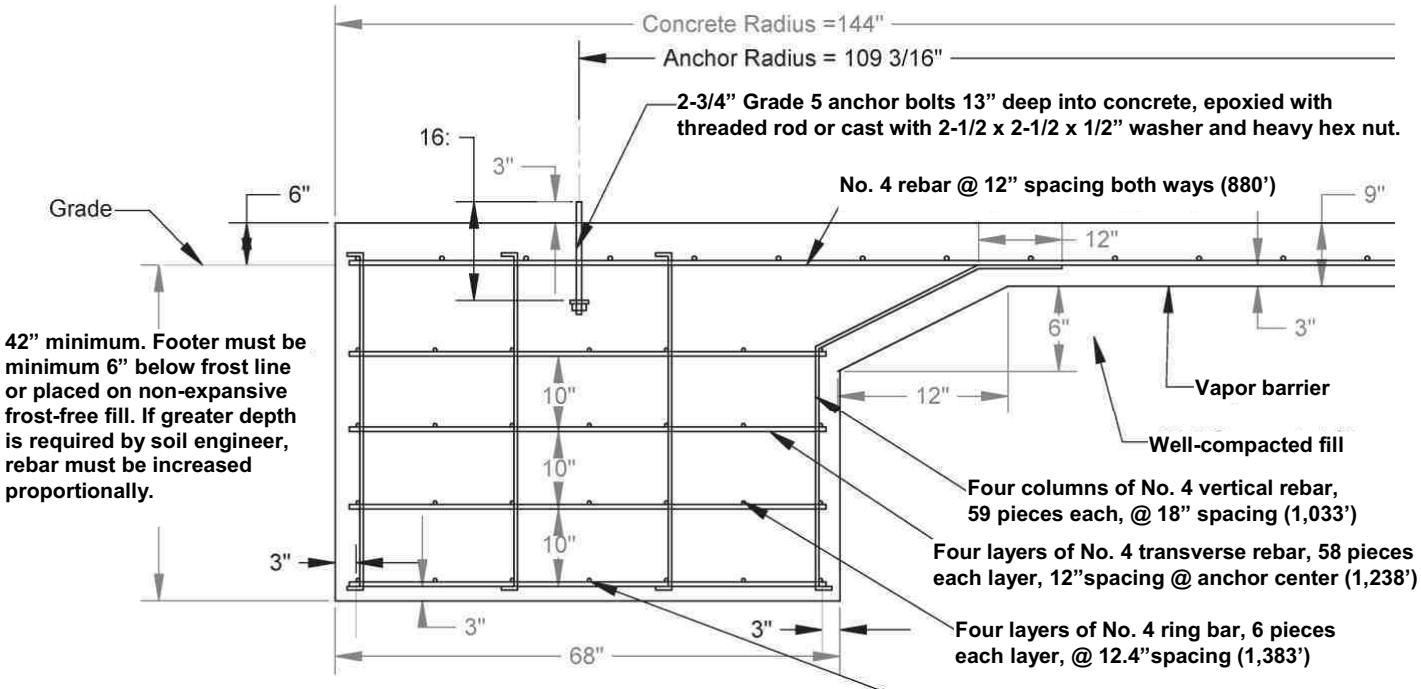
Model U2412



Concrete: 46.2 cu. yds.
No. 4 rebar: 3,704 ft. (not including overlap length). Overlap length should be 20". Stagger all laps by 3'.

For ASCE7-05-defined 90 mph wind zone and seismic category A only!

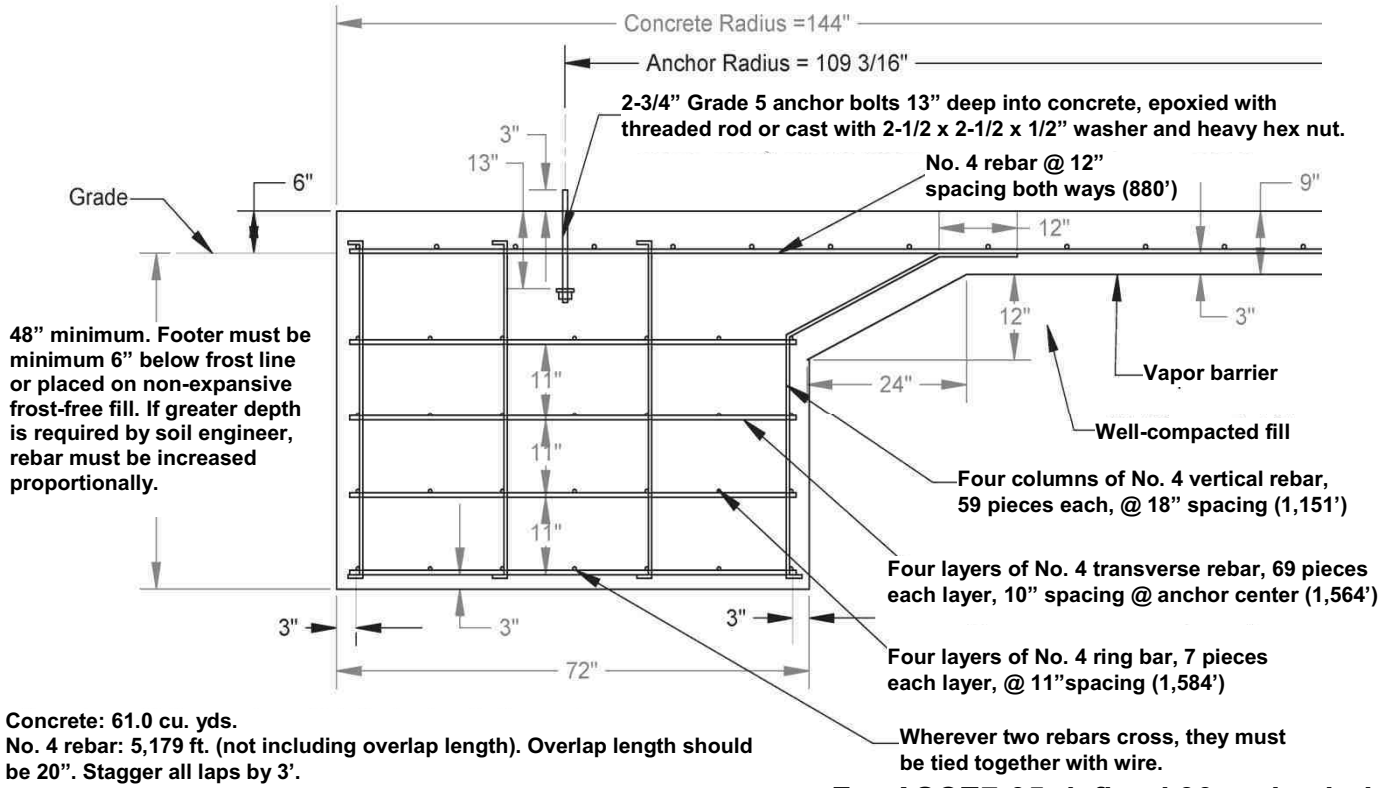
Model U3018



Concrete: 52.5 cu. yds.
No. 4 rebar: 4,534 ft. (not including overlap length). Overlap length should be 20". Stagger all laps by 3'.

For ASCE7-05-defined 90 mph wind zone and seismic category A only!

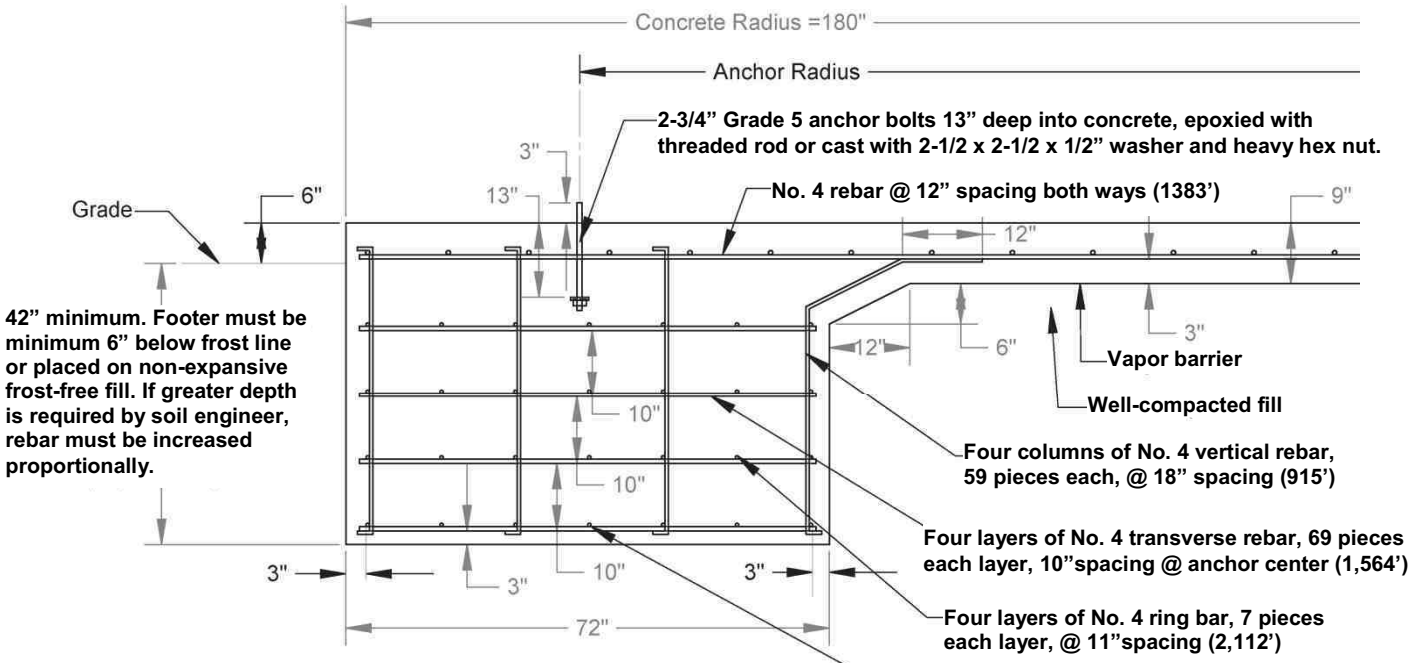
Models U3518 and U4018



Concrete: 61.0 cu. yds.
No. 4 rebar: 5,179 ft. (not including overlap length). Overlap length should be 20". Stagger all laps by 3'.

For ASCE7-05-defined 90 mph wind zone and seismic category A only!

Model U4718



Concrete: 74.6 cu. yds.
No. 4 rebar: 5,974 ft. (not including overlap length). Overlap length should be 20". Stagger all laps by 3'.

For ASCE7-05-defined 90 mph wind zone and seismic category A only!

Models U5024, U6024 and U7024

Appendix B

Specifications

Specification Tables

Unload Rates

Gas Consumption

Tower Dryer Specifications

Bushels per hour estimates in tables below are based on wet No. 2 shelled yellow corn at listed moisture content and are based on drying principles, field results and/or computer simulation at 50°F ambient temperature and 60% humidity at 220°F aver age plenum temperature.

Factors such as grain variety, maturity levels, grain cleanliness, weather conditions and operation/management can affect performance of tower dryer. Results may vary. This information is calculated and is not a guarantee of product or performance. These specifications should only be used as estimates and not as a warranty, express or implied, of how a particular Sukup unit will perform under your operating conditions. Because products are continually improved, changes may have occurred that are not reflected in these specifications.

Model #	U1010	U1510
Bu/hr. 20-15% corn	1,000	1,500
Bu/hr. 25-15% corn	600	900
Heat holding bushels	670	924
Cool holding bushels	219	308
Total holding bushels	1,208	1,551
Drying CFM	48,000	67,000
Cooling CFM	24,000	33,500
Overall height (ft.)	50’ 2”	63’ 7”
Tower diameter	10’ 6”	10’ 6”
Max dia. with catwalks	17’ 10”	17’ 10”
Max. burner BTU/hr.	10,000,000	15,000,000
Avg. burner BTU/hr.	6,300,000	9,400,000
Blower horsepower	50	75
Outer platforms	2	2
Full load amp. (230v/460v)	142/71	204/102
Foundation (cubic yds.)	18	18

Model #	U1812	U2012	U2412	U3018	U3518	U4018	U4718	U5024	U6024	U7024
Bu/hr 20-15% corn	1800	2000	2400	3000	3500	4000	4700	5000	6000	7000
Bu/hr 25-15% corn	1080	1200	1440	1800	2100	2400	2820	3000	3600	4200
Heat holding bushels	1113	1275	1521	1925	2208	2642	2941	3469	4026	4436
Cool holding bushels	400	434	481	642	812	831	1136	1238	1295	1499
Total holding bushels	1982	2178	2471	3543	3996	4449	5053	6336	6950	7564
Drying airflow (CFM)	85,600	94,600	110,300	148,200	174,300	206,400	226,200	275,100	296,100	343,500
Burner cap. (BTUx1000)	18,490	20,434	23,825	32,011	37,649	44,582	48,859	59,422	63,958	74,196
Avg. heat (BTUx1000)	10,632	11,749	13,699	18,406	21,648	25,635	28,094	34,167	36,776	42,663
Blower hp	75	100	100	(3) 50	(3) 60	(3) 75	(3) 75	(3) 100	(3) 100	(3) 125
AC drive metering hp	1-1/2	1-1/2	1-1/2	2	2	2	2	3	3	3
Grain column	12.75”	12.75”	12.75”	12.75”	12.75”	12.75”	12.75”	12.75”	12.75”	12.75”
Tower diameter	12’	12’	12’	18’	18’	18’	18’	24’	24’	24’
Overall height	69’	76’	86’	76’	86’	96’	109’	100’	110’	120’

Unload Rates

Tables below show approximate unload rates for Sukup Tower Dryers. They are approximate and can vary due to flow gate and paddle arm settings, varieties of grain, and amount of fines. For an accurate rate, an actual flow test should be done on site.

10' Tower Dryer										
Speed (%)	10	20	30	40	50	60	70	80	90	100
RPM	0.22	0.45	0.67	0.90	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*	210	420	630	840	1050	1260	1470	1680	1890	2100

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*	300	600	900	1200	1500	1800	2100	2400	2700	3000

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*	550	1100	1650	2200	2750	3300	3850	4400	4950	5500

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*	800	1600	2400	2800	4000	4800	5600	6400	7200	8000

Fuel Consumption

Gas pressure supplied to dryer must be 6 to 9 psi.

- For natural gas dryers, if gas supply is above 9 psi, end user must provide regulator.
- For vaporized propane dryers, end user must provide external vaporizer and regulator between LP tank and dryer.
- For liquid propane dryers, internal vaporizer and regulator are included with dryer (available in domestic models U1010-U2412 only).

All work needs to be in accordance with local, state and national standards.

Table below shows maximum fuel consumption rate per hour for each model of dryer.

Model	Max Btu/hr.	LP gal/hr.	NG $ft.^3$/hr.
U1010	10,000,000	108.7	10,000
U1510	15,000,000	163.0	15,000
U1812	18,490,000	201.0	18,490
U2012	20,434,000	222.1	20,434
U2412	23,825,000	259.0	23,825
U3018	32,011,000	347.9	32,011
U3518	37,649,000	409.2	37,649
U4018	44,582,000	484.6	44,582
U4718	48,859,000	531.1	48,859
U5024	59,422,000	645.9	59,422
U6024	63,958,000	695.2	63,958
U7024	74,196,000	806.5	74,196

Table shows maximum fuel consumption at a 200℉ ple num temperature rise, without heat recovery factored in.
Actual consumption will typically be less than amounts stated.

Heating capacity of fuel used

Natural gas: 1,000 Btu/$ft.^3$
Vaporized propane: 2,500 Btu/$ft.^3$
Liquid propane: 92,000 Btu/gal.

Table below shows average fuel consumption rate per hour for each model of dryer.

Model	Avg. Btu/hr.	LP gal/hr.	NG ft^3/hr.
U1010	6,300,000	68.5	6,300
U1510	9,400,000	102.2	9,400
U1812	10,632,000	115.6	10,632
U2012	11,749,000	127.7	11,749
U2412	13,699,000	148.9	13,699
U3018	18,406,000	201.0	18,406
U3518	21,648,000	235.3	21,648
U4018	25,635,000	278.6	25,635
U4718	28,094,000	305.4	28,094
U5024	34,167,000	371.4	34,167
U6024	36,776,000	399.7	36,776
U7024	42,663,000	463.7	42,663

Table shows average fuel consumption at a 115℉ ple num temperature rise, without heat recovery factored in.

Appendix C

Electrical Requirements

Single-fan Dryers

Three-fan Dryers

Electrical Requirements

NOTE: A service-rated, fused disconnect needs to be installed ahead of grain dryer power distribution box. This disconnect is not included with dryer and should be installed by a qualified electrician.

CAUTION: The only device connected to this disconnect should be the grain dryer.

NOTE: Incoming Current (Amps) shows the total current required (with Service Factor) to **continuously** operate a dryer's fan motor(s), unload motor and control circuitry. **During fan startup,** the Soft Start will limit fan motor(s) amp draw to 350% of nameplate FLA. If this 350% inrush current cannot be provided by main transformer, motor may not get up to speed before a fault condition occurs, especially in cold weather. Changing Soft Start settings and timing may be required to start fan. Consult Sukup dealer before making any settings adjustments. If motors still will not start after adjustments, a larger transformer or a different starting method (VFD) may be needed.

The following tables provide information for the electrician wiring the grain dryer. It is recommended that the local power company be contacted to have a representative inspect installation to ensure wiring is compatible with their system, and that sufficient power is supplied to dryer.

Standard electrical safety practices and codes should be used. Refer to the National Electrical Code Standard Handbook by the National Fire Protection Association.

All electrical work should be completed by a qualified electrician.

SINGLE-FAN MODELS

	U1010	U1510	U1812	U2012	U2412
Fan HP	50	75	75	100	100
Unload HP	1.5	1.5	1.5	1.5	1.5
230V 1-PH Incoming Current (Amps)	287	NA	NA	NA	NA
230V 1-PH Main Switch Current Rating (Amps)	400	NA	NA	NA	NA
208V 3-PH Incoming Current (Amps)	165	243	243	327	327
208V 3-PH Main Switch Current Rating (Amps)	250	400	400	400	400
230V 3-PH Incoming Current (Amps)	155	223	223	290	290
230V 3-PH Main Switch Current Rating (Amps)	250	400	400	400	400
460V 3-PH Incoming Current (Amps)	80	114	114	147	147
460V 3-PH Main Switch Current Rating (Amps)	250	250	250	250	250
575V 3-PH Incoming Current (Amps)	NA	91	91	121	121
575V 3-PH Main Switch Current Rating (Amps)	NA	250	250	250	250
380V 3-PH 50Hz Incoming Current (Amps)	77	111	111	133	133
380V 3-PH 50Hz Main Switch Current Rating (Amps)	250	250	250	250	250

THREE-FAN MODELS

	U3018	U3518	U4018	U4718	U5024	U6024	U7024
Fan HP	50	60	75	75	100	100	125
Unload HP	2	2	2	2	3	3	3
208V 3-PH Incoming Current (Amps)	417	488	618	618	839	839	NA
208V 3-PH Main Switch Current Rating (Amps)	600	600	800	800	NA	NA	NA
230V 3-PH Incoming Current (Amps)	390	462	566	566	743	743	NA
230V 3-PH Main Switch Current Rating (Amps)	600	600	800	800	NA	NA	NA
460V 3-PH Incoming Current (Amps)	196	233	285	285	374	374	455
460V 3-PH Main Switch Current Rating (Amps)	400	400	400	400	600	600	600
575V 3-PH Incoming Current (Amps)	NA	184	227	227	305	305	NA
575V 3-PH Main Switch Current Rating (Amps)	NA	400	400	400	600	600	NA
380V 3-PH 50Hz Incoming Current (Amps)	191	237	279	279	337	337	442
380V 3-PH 50Hz Main Switch Current Rating (Amps)	400	400	600	600	600	600	600

Appendix D

Drying Rate Tables

Modular Tower Dryers

Stick-built Tower Dryers

Drying Rate Tables

Following are tables showing suggested unloading (drying) rates based on plenum temperatures and amount of moisture to be removed. **Example:** On a U2412 dryer, to remove 5 points of moisture with a plenum temperature of 170 degrees, unload rate should be set to 59%. Use “Manual Mode” on QuadraTouch™ controller and adjust Unload Speed Set Point to 59%.

Numbers in charts are a good **starting point** when running in Manual. Final running speed may differ from charts as user may adjust speed as dryer runs. Distance between bottom of flow gate and unload table should be 5-1/2 inches.

These suggested rates are not guaranteed, nor should they be used as a capacity rating. Many factors such as flow gate setting, grain hybrid, fines, weather conditions, etc. may affect drying rate.

MODEL U1010 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	40	30	18
150	45	33	20
160	49	37	22
170	54	40	23
180	58	43	25
190	63	46	26
200	68	49	28
210	73	52	29
220	78	55	30

MODEL U1510 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	55	42	25
150	61	46	28
160	68	51	31
170	74	55	33
180	81	59	35
190	87	64	38
200	94	68	41
210	100	72	43
220	---	76	46

MODEL U1812 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	37	32	19
150	42	36	22
160	47	40	24
170	51	44	27
180	56	48	29
190	61	53	32
200	66	57	34
210	71	61	37
220	75	65	39

MODEL U2012 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	41	35	21
150	46	40	24
160	52	44	27
170	57	49	29
180	62	54	32
190	68	58	35
200	73	63	38
210	78	67	40
220	84	72	43

MODEL U2412 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	49	43	26
150	56	48	29
160	62	54	32
170	69	59	36
180	75	65	39
190	82	70	42
200	88	76	46
210	95	81	49
220	99	87	52

MODEL U3018 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	32	27	16
150	36	31	19
160	40	35	21
170	44	38	23
180	48	42	25
190	53	45	27
200	57	49	29
210	61	52	31
220	65	56	34

MODEL U3518 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	37	32	19
150	42	36	22
160	47	40	24
170	51	44	27
180	56	48	29
190	61	53	32
200	66	57	34
210	71	61	37
220	75	65	39

MODEL U4018 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	42	36	22
150	48	41	25
160	53	46	27
170	59	50	30
180	64	55	33
190	69	60	36
200	75	65	39
210	80	69	42
220	86	74	44

MODEL U4718 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	49	43	26
150	56	48	29
160	62	54	32
170	69	59	36
180	75	65	39
190	82	70	42
200	88	76	46
210	95	81	49
220	99	87	52

MODEL U5024 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	36	31	19
150	40	35	21
160	45	39	23
170	50	43	26
180	54	47	28
190	59	51	31
200	64	55	33
210	68	59	35
220	73	63	38

MODEL U6024 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	43	37	22
150	48	42	25
160	54	46	28
170	59	51	31
180	65	56	34
190	70	61	36
200	76	65	39
210	81	70	42
220	87	75	45

MODEL U7024 Unload Rate % at Listed Moisture Removal			
PLENUM TEMP (F)	18 – 15 %	20 – 15 %	25 – 15 %
140	50	43	26
150	57	49	29
160	63	54	33
170	70	60	36
180	76	66	39
190	83	71	43
200	89	77	46
210	96	82	49
220	99	88	53

Appendix E

Setting Unload System

Setting Unload System

This should be done before/during first time dryer is used, and checked yearly.

It is critical that unload system of dryer is set properly so all grain columns will flow at same rate. If a column flows much slower than others, grain will be over-dried. If a column flows much faster than others, grain will be under-dried. Uneven drying is energy-inefficient, reduces dryer capacity, and reduces quality of grain.

To get columns to discharge a consistent amount of grain, first make sure that scraper blades on unload rotor are parallel with grain floor. If scrapers are nearly touching the floor on one side of dryer and are 2” above floor on other side, dryer will discharge grain unevenly. If grain floor is not perfectly level, then rotor shaft and scraper blades will need to be adjusted. Once rotor is parallel to grain floor, flow gates on each column are used to fine-tune discharge rate. **See Fig. E-1 for component identification and follow steps 1-7 to set unload system.**

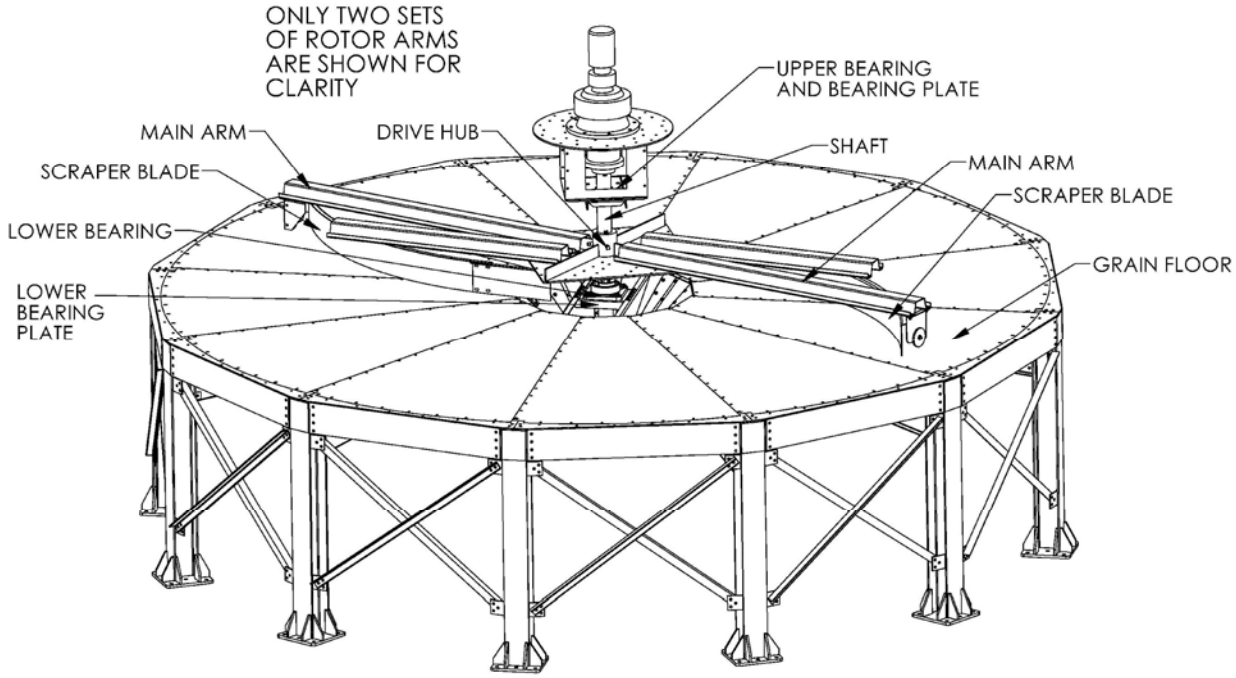


Fig. E-1 – Unload system components

1. **Make sure bottom of scraper blades are parallel to grain floor**. Choose one scraper blade and measure distance from bottom of blade to grain floor. See Fig. E-2. Run unload rotor and stop it every 90° to check the same measurement. If measurements vary by more than 1/2”, adjust angle of rotor and shaft.

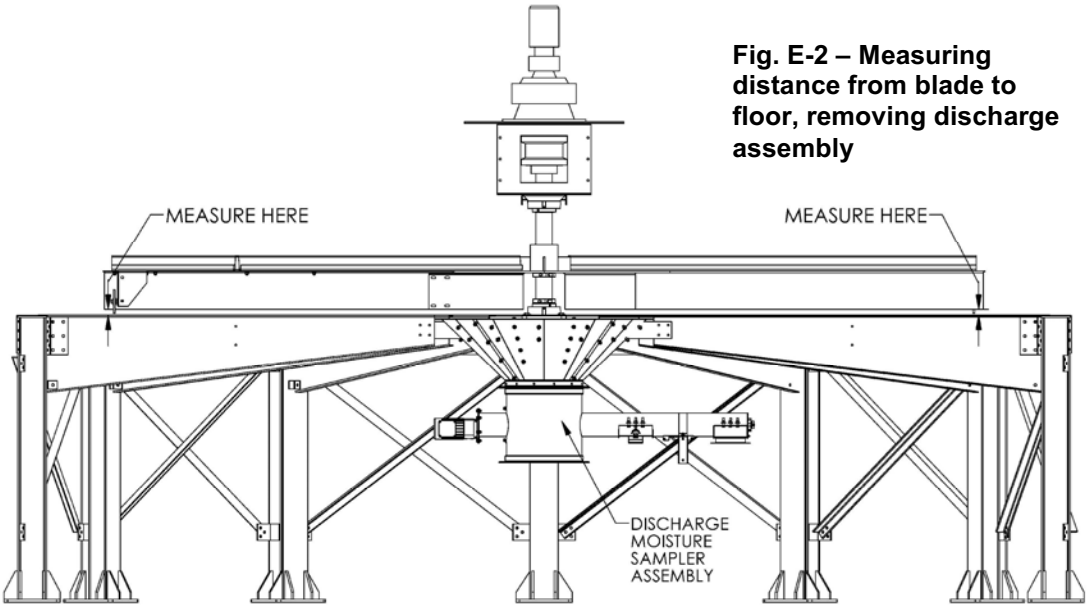


Fig. E-2 – Measuring distance from blade to floor, removing discharge assembly

2. **Adjust rotor/shaft angle to grain floor.** Start by loosening four bolts for upper bearing, but do not remove bolts. Next, remove discharge moisture sampler assembly. See Fig. E-2. This will provide access to lower bearing bolts and bottom of rotor shaft. Loosen four bolts on lower bearing and 10 bolts on lower bearing plate, but do not remove bolts. Lower bearing bolts are in slots in one direction and bolts holding bearing plate in are slotted in other direction. See Fig. E-3. Using a pry bar from under dryer, push rotor shaft in direction needed to equalize measurements taken in Step 1. **NOTE:** On some tower dryers there may not be slots in lower bearing plate. If necessary, use a grinder to make slots or use slightly smaller bolts for lower bearing. Retighten all bolts once shaft has been adjusted.

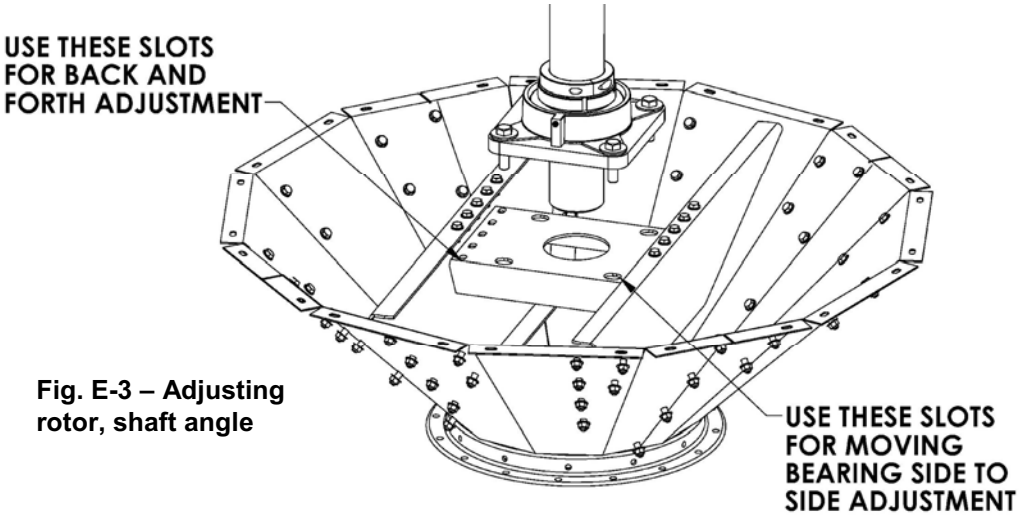


Fig. E-3 – Adjusting rotor, shaft angle

3. **Set height of rotor on shaft.** Scraper blades should be as close to grain floor as possible without touching it. Make sure all washers/spacers are removed between drive hub and main arms. Raise (or lower) drive hub until scraper blades are just higher than highest point of grain floor. To raise rotor, loosen setscrews on drive hub and use a bottle jack between drive hub and lower bearing support plate. See Fig. E-4. Two jacks may be needed if hub binds on shaft.

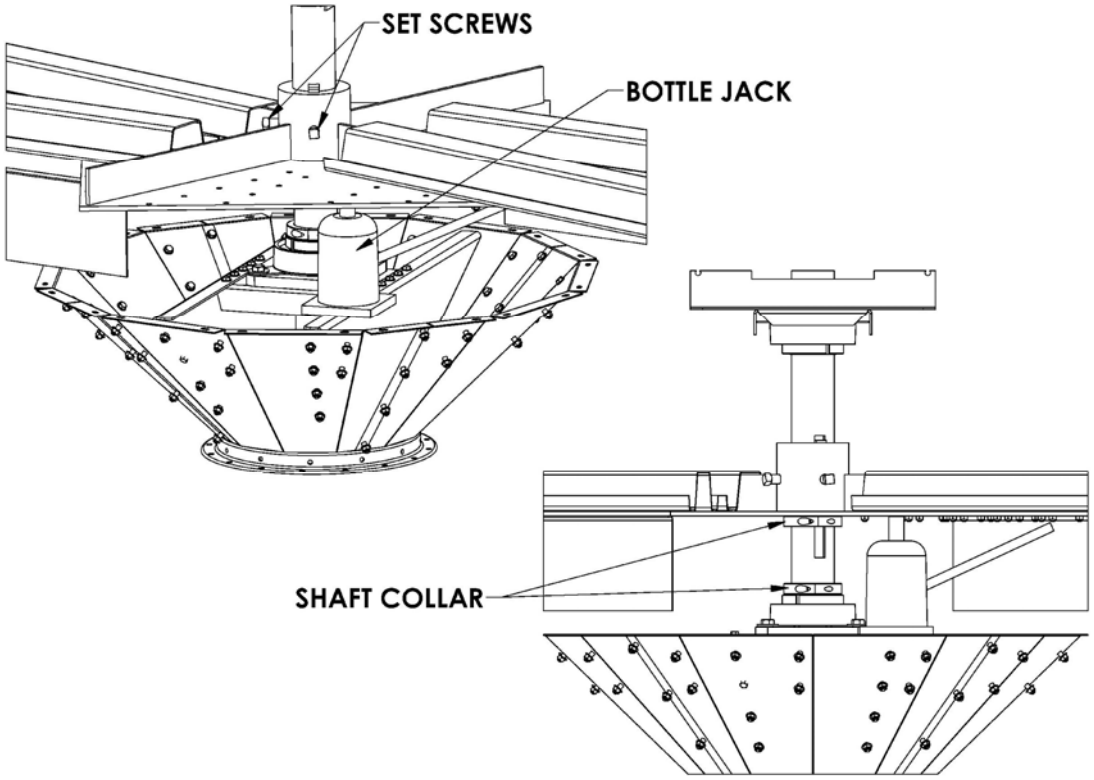


Fig. E-4 – Securing rotor height with shaft collars

After drive hub is raised up on shaft, tighten setscrews and position two shaft collars between bottom of drive hub and top of lower bearing as shown in Fig. E-4.This keeps shaft and drive hub from slipping down.

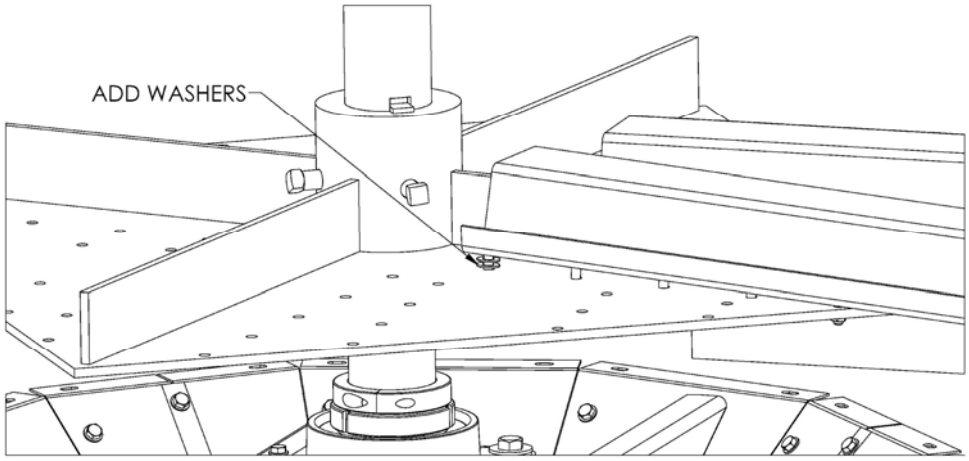


Fig. E-5 – Using shims to position scraper blades

4. **Shim main arms so scraper blades are as close to grain floor as possible without touching it.** Use washers as shims between each main arm and drive hub. See Fig. E-5. Shim washers should go only on bolts closest to center. If scraper blade needs to be higher on outside, entire drive hub should be jacked up higher. Run rotor a full revolution and make sure scraper blades do not touch grain floor. Adjust white poly wheels so they barely touch grain floor.

5. **Adjust flow gates**. Each column of tower dryer has its own independently adjustable flow gate. Check that each flow gate is set at distance of 5-1/2” from grain floor. **Tip:** Use two blocks of wood 5-1/2” in height as gauges on each side of gate. **NOTE:** When dryer is full of grain, it is easier to raise flow gates than lower them.

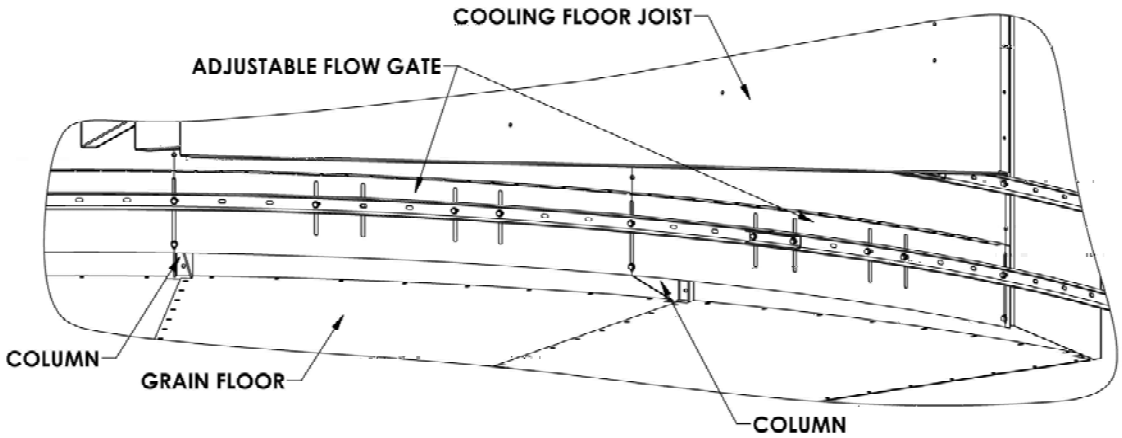


Fig. E-6 – Adjusting flow gates

6. **Check grain levels.** Fill dryer with grain and then turn **load** system off. Run **unload** system for 10-20 minutes. Check level of grain in each column. Raising flow gates makes grain flow down columns faster; lowering flow gates makes grain flow down columns slower. Scraper blades should be full of grain to top of scraper, with just a little flowing over, to get maximum capacity. If scrapers are not full of grain, raise flow gates 1/4” to 1/2” on columns with more grain in them. If a lot of grain is flowing over scrapers, lower flow gates 1/4” to 1/2” on columns with less grain in them.

7. **Fine-tune flow rates.** Repeat Step 6 until grain flows are consistent in all columns. **NOTE:** Columns with pass-thru doors into dryer will flow faster than other columns because there is less grain in them. Flow gate settings will likely have to be higher than those for other columns.

Appendix F

Adjusting Grain Flow Tube

Adjusting Grain Flow Tube

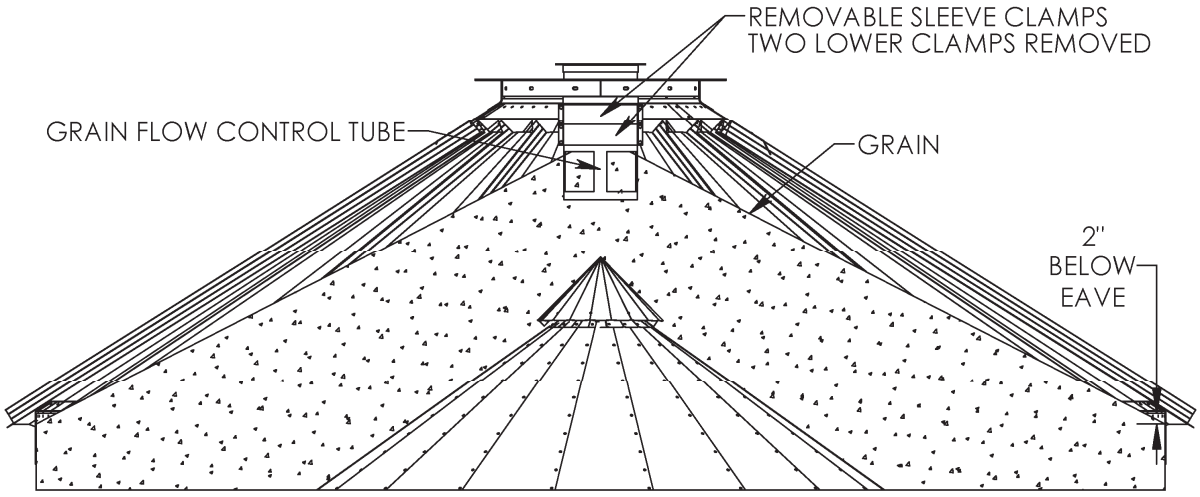


Fig. F-1 – Adjusting grain flow tube

Grain flow control tube near top of dryer is adjustable. See Fig. F-1. Sleeve clamps can be removed or added as needed to ensure grain does not press against roof of dryer. As shown in Fig. F-1, grain should be no higher than 2 inches below eave of tower roof.

Appendix G

Altistart 22 Soft Start

Programming ATS22 Soft Start

Motor Full-load Amps

Troubleshooting ATS22

Programming ATS22 Soft Start for Tower Dryers (Revised 02/2014)

The following information is needed from motor nameplate before programming.

Motor Voltage: _____ **(Step 5)**

Motor Horsepower: _____

Motor Full Load Amps: _____ **(Step 10)**

1. Press the down arrow until **conF (Configuration Menu)** is shown on screen.
2. Press Enter.
3. Press the down arrow until **UIn (Line Voltage)** is shown on screen.
4. Press Enter.
5. Press the up or down arrow until display shows the line voltage of dryer. If dryer is **230VAC**, set it to **240**. If dryer is **380VAC**, set it to **400**. If dryer is **460VAC**, set it to **480**. If dryer is **575VAC**, set it to **600**.
6. Press Enter. Display should blink, indicating that the new value is set into memory.
7. Press Escape.
8. Press the down arrow until **In (Motor Rated Current)** is shown.
9. Press Enter.
10. Press the up or down arrows to find motor current stated on the chart.
11. Press Enter. Display should blink, indicating that the new value is set into memory.
12. Press Escape.
13. Press the down arrow until **LAC (Advanced Mode)** is shown on screen.
14. Press Enter
15. Press the down or up arrow until **on** is shown on screen.
16. Press Enter. Display should blink, indicating that the new value is set into memory.
17. Press Escape.
18. Press Escape again. Display should show **ConF**.
19. Press the down arrow until **SEt (Settings Menu)** is shown on screen.
20. Press Enter. Display should show **t90 (Inital voltage).** If not, press the down arrow button until it appears.
21. Press Enter.
22. Press the down or up arrow until **50** is displayed on screen.
23. Press Enter. Display should blink, indicating that the new value is set into memory.
24. Press Escape.
25. Press the down arrow until **tLS (Max Start Time)** is shown on screen.
26. Press Enter.
27. Press the down or up button until **50** is displayed.
28. Press Enter. Display should blink, indicating that the new value is set into memory.
29. Press Escape.
30. Press the down arrow until **ACC (Acceleration time)** is displayed on screen.
31. Press Enter.
32. Press the down or up arrow until **12** is displayed on screen.
33. Press Enter. Display should blink, indicating that the new value is set into memory.
34. Press Escape.
35. Press the down arrow until **tHP (Motor Thermal Protection Menu)** appears on screen.
36. Press Enter.
37. Press the down or up arrow until **20** appears on screen.
38. Press Enter. Display should blink, indicating that the new value is set into memory.
39. Press Escape.
40. Press Esacpe again. Display should show **SEt**.

41. Press the down arrow until **ADJ (Advanced Adjustments Menu)** appears on screen.
42. Press Enter.
43. Press the down arrow until **SSC (Start-stop control)** appears on screen.
44. Press Enter.
45. Press the down or up arrow until **oFF** appears on display.
46. Press Enter. Display should blink, indicating that the new value is set into memory.
47. Press Escape.
48. Press Escape again. Display should show **ADJ.**
49. Press the down arrow until **PrO (Advanced Protections Menu)** appears on display.
50. Press Enter.
51. Press the down arrow until **Ith(Overload Protection)** appears on display.
52. Press Enter.
53. Press the down arrow until **Erun** appears on screen.
54. Press Enter. Display should blink, indicating that the new value is set into memory.
55. Press Escape.
56. Press Escape again. Display should show **PrO**.
57. Press the down arrow until **IO (Advanced Input/Output Menu)** appears on screen.
58. Press Enter.
59. Press the down arrow until **r1 (Relay 1)** appears on screen.
60. Press Enter.
61. Press the down or up arrow until **Tr Ip** appears on screen.
62. Press Enter. Display should blink, indicating that the new value is set into memory.
63. Press the down arrow until **r2 (Relay 2)** appears on screen.
64. Press Enter.
65. Press the down or up arrow unitl **rUn** appears on screen.
66. Press Enter. Display should blink, indicating that the new value is set into memory.
67. Press Escape until **rdY** appears on screen.

This concludes programming.

Motor Full Load Amps

Motor	Voltage	Full Load Amps	SF Amps	Comp. #	Soft Start	ATS #
50HP	208VAC	125	144	J6870	170A	ATS22C17S6U
	230VAC	117	135	J6870	170A	ATS22C17S6U
	380VAC	56	64.4	J6866	75A	ATS22D75S6U
	460VAC	58	66.7	J6866	75A	ATS22D75S6U
	575VAC	52		J6866	75A	
60HP	208VAC	147	169	J6871	210A	ATS22C21S6U
	230VAC	139	160	J6871	210A	ATS22C21S6U
	380VAC	70	80.5	J6868	110A	ATS22D11S6U
	460VAC	70	80	J6868	110A	ATS22C11S6U
	575VAC	54.8	63	J6866	75A	ATS22D75S6U
75HP	208VAC	187	215	J6872	250A	ATS22C22S6U
	230VAC	171	196	J6872	250A	ATS22C22S6U
	380VAC	83	95.4	J6868	110A	ATS22C11S6U
	460VAC	86	98.3	J6868	110A	ATS22C11S6U
	575VAC	68	78.2	J6867	88A	ATS22C88S6U
100HP	208VAC	254	292	J6873	320A	ATS22C32S6U
	230VAC	225	259	J6873	320A	ATS22C32S6U
	380VAC	101	116	J6869	140A	ATS22C14S6U
	460VAC	113	129	J6870	170A	ATS22C17S6U
	575VAC	91.7	105	J6869	140A	ATS22C14S6U
125HP	208VAC					
	230VAC					
	380VAC	133	166	J6871	210A	ATS22C21S6U
	460VAC	138	172	J6871	210A	ATS22C21S6U
	575VAC					

Troubleshooting ATS22 Soft Start for Towers

NOTE: The following pages are from Altistart 22 Soft Start manual, dated 01/2014.

Soft starter does not start, no trip code displayed

- No display:
  - check that the line supply is present on the control supply CL1/CL2,
  - check if a short circuit is not existing on the Modbus network cable (especially between RJ45 pin 7 and RJ45 pin3 or pin8. See pages 35 and 36).
- Check that the code displayed does not correspond to the normal state of the soft starter (see page 46).
- Check for the presence of the RUN/STOP commands (see page 37).

Soft starter does not start, trip code displayed

- Trip code flashes on the display.
- Storing of the last 7 trips, visible with SoMove software workshop.
- The soft starter locks and the motor stop with to freewheel mode.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in "Before you begin" chapter, before performing any procedure in this section.

Failure to follow these instructions will result in death or serious injury.

Trip code displayed	Name	Remedy
bPF	Bypass contactor detected fault	• Switch-off the soft starter and contact Schneider Electric services.
CFF	Invalid configuration on power-up	• Revert to the factory setting in the soft starter UtIL menu • Reconfigure the soft starter
EtF	External detected fault	• Clear the cause of the detected fault
GrdF	Ground leakage current detected fault	• Check the electrical insulation of the motor • Check the installation • Check the values of Grdd, Grdt parameters in PrO menu page 57
InF	Internal detected fault	• Disconnect and reconnect the control supply. If the detected fault persists, contact Schneider Electric product support
OCF	Motor overcurrent	• Check the values of OId and OIt parameters in PrO menu page 56
OHF	Over heat detected fault Low temperature detected fault	• Check the sizing of the soft starter in relation to the motor and the mechanical requirement • Check the operation of the fan (if the Altistart 22 used has one), ensuring that the air passage is not obstructed in any way and the heatsink is clean. Ensure that the mounting recommendations are observed • Wait for the Altistart 22 cooling before restarting.
OLF	Overload motor	• Check the mechanism (wear, mechanical play, lubrication, blockages, etc.) • Check the sizing of the soft starter motor in relation to the mechanical requirement • Check the value of tHP parameter in SEt menu page 52 and In parameter in conF menu page 50 • Wait for the motor to cool before restarting, keeping the starter powered on.
OSF	Overvoltage	• Check ULn parameter in conF menu • Check the power supply circuit and voltage • Check OSd and OSt parameters in PrO menu
OtF	Motor Over Temperature • Motor thermal trip detected by the PTC probes	• Check the mechanism (wear, mechanical play, lubrication, blockages, etc.) • Check the sizing of the soft starter motor in relation to the mechanical requirement • Check the value of PtC setting in PrO menu page 59 • Wait for the motor to cool before restarting

Trip code displayed	Name	Remedy
PHbd	Phase unbalance	• Check the line voltage. • Check the values of Ubd, Ubt parameters in PrO menu page 57.
PHF	Loss of a line phase	• Check the line voltage, the connection to the soft starter and any isolating devices located between the line and the soft starter (contactors, fuses, circuit breakers, etc.). • Check the motor connection and any isolating devices located between the soft starter and the motor (contactors, circuit breakers, etc.). • Check the motor state.
	Line frequency, out of tolerance This detected fault can be configured in PrO menu	• Check the line frequency. • Check the configuration of PHL.
PIF	Phase inversion Line phase inversion does not conform to the selection made by PHr in PrO menu	• Invert two lines phases or set PHr = oFF.
trAP	Trap code	• Disconnect and reconnect the control supply. If the detected fault persists, contact Schneider Electric support.
SCF	Short circuit: • short-circuit on soft starter output	• Switch-off the soft starter. • Check the motor connections and the motor insulation. • If connections and insulation are OK, contact Schneider Electric services.
SLF	Modbus Time Out	• Serial link detected fault. Check the RS485 connection.
SnbF	Too many starts	• The number of soft starts has exceeded the maximum allowed by Snb in SLG period. See Snb page 53.
SSCr	Shorted thyristor or wrong connection	• Switch-off the soft starter. • Check the motor connections and the motor insulation. • If connections and insulation are OK, contact Schneider Electric services.
StF	Starting time detected fault • Too long start time	• Check the mechanism (wear, mechanical play, lubrication, blockages, etc.) • Check that tLS (Max start time) is bigger than ACC (Acceleration time). See SEt menu page 51. • Check the sizing of the soft starter motor in relation to the mechanical requirement • Check ILt value : if the value is too low, the motor may not reach acceleration and full speed.
tbS	Too many starts	• Wait 5 minutes for frame size A. • Wait 15 minutes for frame sizes B, C, D and E. tbS appears after SnbF trip message, when trying to reset the soft starter before end of the timer.
UCF	Motor underload (undercurrent)	• Check the values of UId and UIt parameters in PrO menu page 57.
USF	Under voltage or no voltage	• Check UIn, USd and USt parameters in PrO menu • Check line voltage.

Remote keypad messages

Display		Message	Description
InIt		On initializing itself	Microcontroller initializing. Communication configuration searching.
COnE	flashing	Communication interruption	It has 50 ms time out. This message is shown after 20 times retrying.
A-17	flashing	Key alarm	• Key has been held consecutively more than 10 seconds. • Membrane switch disconnected. • Keypad waked up while a key is holding.
CLr	flashing	Confirm trip reset	This is shown when : First time STOP key has been pressed while the soft starter has tripped in detected fault.
dEUE	flashing	Soft starter mismatch	Soft starter type (brand) did not match with keypad type (brand).
rOnE	flashing	ROM trip	Keypad ROM detected fault.
rAnE	flashing	RAM trip	Keypad RAM detected fault.
CPUE	flashing	CPU trip	Keypad CPU detected fault.

Appendix H

Altivar 312 Variable Frequency Drive

Programming ATV 312
VFD Starter Protector Settings
Fault Management

Programming ATV 312 for Tower Dryers (Revised 02/2014)

Jog dial: Used for navigation by turning clockwise or counterclockwise. Pressing jog dial enables user to make a selection or confirm information.

STOP/RESET button: Enables detected fault to be reset; can be used to control motor stopping.

RUN button: Controls powering up of motor for forward running in LOCAL configuration and in REMOTE configuration if the [2/3 wire control] (tCC) parameter in [INPUTS /OUTPUTS CFG] (I-O-) menu is set to [Local] (LOC).

MODE button: 3-second press of MODE button switches between REMOTE and LOCAL configurations.

ESC button: Used to quit a menu or parameter or to clear value displayed in order to revert to value in memory. In LOCAL configuration, 2-second press of ESC button switches between Control and Programming modes.

Settings for 230V 3HP

ITH	(Motor thermal current)	8A
SDC2	(Auto DC injection level 2)	5.5A
CLI	(Internal current limit)	12A
BFR	(Std. motor frequency)	60Hz NEMA
R2	(Relay output 2 assignment)	Drv. running
BRL	(Brake release frequency)	2.8Hz
IBR	(Brake release current)	8.8A

Settings for 380V 3HP 50HZ

ITH	5.4A	
CLI	8.1A	
NCR	(Nominal motor current)	5.4A
R2	Drv. running	

Settings for 460V 3HP

ITH	4A
SDC2	2.7A
CLI	6A
BFR	60Hz NEMA
R2	Drv. running
BRL	2.8Hz
IBR	5.1A

Settings for 230V 1PH

ITH	8A
SDC2	5.5A
CLI	12A
BFR	60Hz NEMA
R2	Drv. running
BRL	2.8Hz

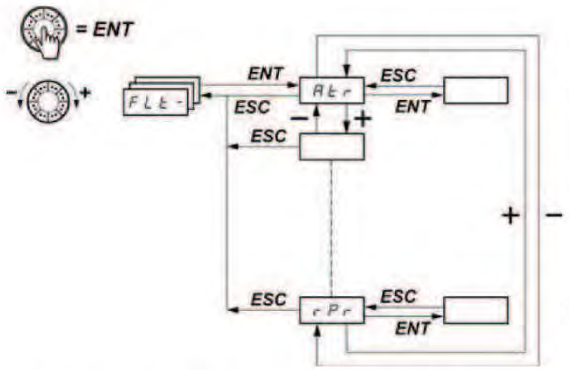
Variable Frequency Drive Starter Protector Settings for Tower Dryers

3/4HP through 3HP, add 1.15 Service Factor to Starter Protector Settings

Motor Horsepower		Voltage	Method of Starting	Starter Protector Setting	Comp. #	Motor Chart Setting
¾HP	10' Tower	208VAC	ALL	4.3AMP	J5234	3.7AMP
		230VAC		3.7AMP	J5234	3.2AMP
		460VAC		1.8AMP	J5233	1.6AMP
		575VAC		1.5AMP	J5233	1.3AMP
1-½HP	12' Tower	208VAC	ALL	7.9AMP	J5236	6.9AMP
		230VAC		6.9AMP	J5236	6.0AMP
		380VAC		4.1AMP	J5234	3.6AMP
		460VAC		3.5AMP	J5234	3.0AMP
		575VAC		2.8AMP	J5233	2.4AMP
2HP	18' Tower	208VAC	ALL	9.0AMP	J5236	7.8AMP
		230VAC		7.8AMP	J5236	6.8AMP
		380VAC		6.7AMP	J5236	5.8AMP
		460VAC		3.9AMP	J5234	3.4AMP
		575VAC		3.1AMP	J5234	2.7AMP
3HP	24' Tower	380VAC	ALL	6.7AMP	J5236	5.8AMP
		460VAC		5.5AMP	J5234	4.8AMP
		575VAC		4.5AMP	J5234	3.9AMP

NOTE: The following pages are from Altivar 312 Variable Speed Drives manual, dated 06/2010.

[FAULT MANAGEMENT] (FLt-) menu



rEF-
SEt-
drC-
I-O-
CtL-
FUn-
FLt-
COM-
SUP-

The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote display terminal, this menu can be accessed with the switch in the position.

Code	Description	Adjustment range	Factory setting
Atr	❑ [Automatic restart]		[No] (nO)

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- The automatic restart can only be used on machines or installations which do not pose any danger to either personnel or equipment.
- If the automatic restart is activated, R1 will only indicate a fault has been detected once the time-out period for the restart sequence has expired.
- The equipment must be used in compliance with national and regional safety regulations.

Failure to follow these instructions will result in death or serious injury.

The motor's automatic restart function will only be active in 2-wire level control ([2/3 wire control] (tCC) = [2 wire] (2C), and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO)).

nO ☐ [No] (nO): Function inactive

YES ☐ [Yes] (YES): Automatic restart if the fault has been cleared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 min for subsequent ones.
If the restart has not taken place once the [Max. restart time] (tAr) configurable time has elapsed, the procedure is aborted and the drive remains locked until it is turned off and then on again.
This function is possible with the following conditions:
[NETWORK FAULT] (CnF): Communication detected fault on the communication card
[CANopen com.] (COF): CANopen communication detected fault
[External] (EPF): External fault
[4-20mA] (LFF): 4-20 mA loss
[Overbraking] (ObF): DC bus overvoltage
[Drive overheat] (OHF): Drive overheating
[Motor overload] (OLF): Motor overload
[Mot. phase] (OPF): Motor phase loss
[Mains overvoltage] (OSF): Line supply overvoltage
[Mains phase loss] (PHF): Line phase loss
[MODBUS FAULT] (SLF): Modbus communication

Relay R1 remains activated if this function is active. The speed reference and the operating direction must be maintained.

[FAULT MANAGEMENT] (FLt-) menu

rEF-
SEt-
drC-
I-O-
CtL-
FUn-
FLt-
COM-
SUP-

Code	Description	Adjustment range	Factory setting
tAr ★ 5 10 30 1h 2h 3h Ct	❑ **[Max. restart time]** Parameter is only visible if [Automatic restart] (Atr) = [Yes] (YES). It can be used to limit the number of consecutive restarts in the event of a recurrent detected fault. ☐ [5 min] (5): 5 minutes ☐ [10 min] (10): 10 minutes ☐ [30 min] (30): 30 minutes ☐ [1 hour] (1h): 1 hour ☐ [2 hours] (2h): 2 hours ☐ [3 hours] (3h): 3 hours ☐ [Unlimited] (Ct): Unlimited (except for [MOTOR PHASE LOSS] (OPF) and [INPUT PHASE LOSS] (PHF); the max. duration of the restart process is limited to 3 hours)		[5 min] (5)
rSF nO LI1 LI2 LI3 LI4 LI5 LI6	❑ **[Fault reset]** ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6		[No] (nO)

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[FAULT MANAGEMENT] (FLt-) menu

Code	Description	Adjustment range	Factory setting
FLr	**❑ [Catch on the fly]** Used to enable a smooth restart if the run command is maintained after the following events: - Loss of line supply or simple power off - Reset of current drive or automatic restart - Freewheel stop The speed given by the drive resumes from the estimated speed of the motor at the time of the restart, then follows the ramp to the reference speed. This function requires 2-wire control ([2/3 wire control] (tCC) = [2 wire] (2C)) with [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). nO ☐ [No] (nO): Function inactive YES ☐ [Yes] (YES): Function active When the function is operational, it activates at each run command, resulting in a slight delay (1 second max.). [Catch on the fly] (FLr) is forced to [No] (nO) if brake control [Brake assignment] (bLC) is assigned, page 85.		[No] (nO)
EtF	**❑ [External fault ass.]** nO ☐ [No] (nO): Not assigned LI1 ☐ [LI1] (LI1): Logic input LI1 LI2 ☐ [LI2] (LI2): Logic input LI2 LI3 ☐ [LI3] (LI3): Logic input LI3 LI4 ☐ [LI4] (LI4): Logic input LI4 LI5 ☐ [LI5] (LI5): Logic input LI5 LI6 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: CD11 ☐ [CD11] (CD11): Bit 11 of the control word from a communication network CD12 ☐ [CD12] (CD12): Bit 12 of the control word from a communication network CD13 ☐ [CD13] (CD13): Bit 13 of the control word from a communication network CD14 ☐ [CD14] (CD14): Bit 14 of the control word from a communication network CD15 ☐ [CD15] (CD15): Bit 15 of the control word from a communication network		[No] (nO)
LEt	**❑ [External fault config]** LO ☐ [Active low] (LO): The external fault is detected when the logic input assigned to [External fault ass.] (EtF) changes to state 0. **Note:** In this case, [External fault ass.] (EtF) cannot be assigned to a control word bit from a communication network. HIG ☐ [Active high] (HIG): The external fault is detected when the logic input or the bit assigned to [External fault ass.] (EtF) changes to state 1. **Note:** Where [External fault config] (LEt) = [Active high] (HIG), [External fault ass.] (EtF) is assigned to a control word bit from a communication network, and where there is no [External fault ass.] (EtF) fault detection, switching to [External fault config] (LEt) = [Active low] (LO) triggers [External fault ass.] (EtF) fault detection. In this case, it is necessary to turn the drive off and then back on again.		[Active high] (HIG)
EPL	**❑ [External fault mgt]** nO ☐ [Ignore] (nO): Ignore YES ☐ [Freewheel] (YES): Detected fault management with freewheel stop rMP ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp FSt ☐ [Fast stop] (FSt): Detected fault management with fast stop		[Freewheel] (YES)

[FAULT MANAGEMENT] (FLt-) menu

rEF-
SEt-
drC-
I-O-
CtL-
FUn-
FLt-
CON-
SUP-

Code	Description	Adjustment range	Factory setting
OPL	❑ [Output Phase Loss]		[Yes] (YES)

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

If **[Output Phase Loss] (OPL)** is set to **nO** loss of cable is not detected
- Check this action will not endanger personnel or equipment in any way

Failure to follow these instructions will result in death or serious injury.

- nO ☐ [No] (nO): Function inactive
- YES ☐ [Yes] (YES): Tripping on the [MOTOR PHASE LOSS] (OPF)
- OAC ☐ [Output cut] (OAC): No tripping on a [MOTOR PHASE LOSS] (OPF), but management of the output voltage in order to avoid an overcurrent when the link with the motor is re-established and catch on the fly performed even if [Catch on the fly] (FLr) = [No] (nO). To be used with output contactor.
  [Output Phase Loss] (OPL) is forced to [Yes] (YES) if [Brake assignment] (bLC) is not set to [No] (nO), page 85.

IPL	❑ [Input phase loss]		[Yes] (YES)

This parameter is only accessible on 3-phase drives.
- nO ☐ [No] (nO): Ignore
- YES ☐ [Yes] (YES): Detected fault management with fast stop

OHL	❑ [Overtemp fault mgt]		[Freewheel] (YES)

CAUTION

RISK OF DAMAGE TO THE MOTOR

Inhibiting drive overheating fault detection results in the drive not being protected. This invalidates the warranty.
- Check that the possible consequences do not present any risk.

Failure to follow these instructions can result in equipment damage.

- nO ☐ [Ignore] (nO): Ignore
- YES ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- rMP ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- FSt ☐ [Fast stop] (FSt): Detected fault management with fast stop

OLL	❑ [Overload fault mgt]		[Freewheel] (YES)

CAUTION

RISK OF DAMAGE TO THE MOTOR

If **[Overload fault mgt]** is set to **nO**, motor thermal protection is no longuer provided by the drive. Provide an alternative means of thermal protection.

Failure to follow these instructions can result in equipment damage.

- nO ☐ [Ignore] (nO): Ignore
- YES ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- rMP ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- FSt ☐ [Fast stop] (FSt): Detected fault management with fast stop

[FAULT MANAGEMENT] (FLt-) menu

Code	Description	Adjustment range	Factory setting
SLL	❑ **[Modbus fault mgt]**		[Fast stop] (FSt)

⚠ WARNING

LOSS OF CONTROL

If **[Modbus fault mgt] (SLL)** = **[Ignore] (n0)**, communication control will be inhibited. For safety reasons, inhibiting the communication fault detection should be restricted to the debug phase or to special applications.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

nO
YES
rMP
FSt
- ☐ [Ignore] (nO): Ignore
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

This parameter does not apply to PowerSuite and SoMove software.

COL	❑ **[CANopen fault mgt]**		[Fast stop] (FSt)

⚠ WARNING

LOSS OF CONTROL

If **[CANopen fault mgt] (COL)** = **[Ignore] (n0)**, communication control will be inhibited. For safety reasons, inhibiting the communication fault detection should be restricted to the debug phase or to special applications.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

nO
YES
rMP
FSt
- ☐ [Ignore] (nO): Ignore
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

tnL	❑ **[Autotune fault mgt]**		[Yes] (YES)

This parameter can be used to manage drive behavior in the event that auto-tuning is unsuccessful [AUTO TUNING FAULT] (tnF)

nO
YES
- ☐ [No] (nO): Ignored (the drive reverts to the factory settings)
- ☐ [Yes] (YES): Detected fault management with drive locked

If [Cold stator resist.] (rSC), page 42, is not set to [No] (nO), [Autotune fault mgt] (tnL) is forced to [Yes] (YES).

LFL	❑ **[4-20mA loss]**		[Freewheel] (YES)

nO
YES
LFF
rLS
rMP
FSt
- ☐ [Ignore] (nO): Ignored (only possible value if [AI3 min. value] (CrL3) ≤ 3 mA, page 48)
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [fallback spd] (LFF): The drive switches to the fallback speed ([fallback spd] (LFF) parameter).
- ☐ [Spd maint.] (rLS): The drive maintains the speed at which it was operating when the loss was detected. This speed is saved and stored as a reference until the fault has disappeared.
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

Note: Before setting [4-20mA loss] (LFL) to [fallback spd] (LFF) check the connection of input AI3.
If [4-20mA loss] (LFL) = [fallback spd] (LFF) or [Spd maint.] (rLS), no code is displayed.

LFF	❑ **[Fallback speed]**	0 to 500 Hz	10 Hz

Fallback speed setting in the event of a [4-20mA loss] (LFL).

[FAULT MANAGEMENT] (FLt-) menu

rEF-
SEt-
drC-
I-O-
CtL-
FUn-
FLt-
CON-
SUP-

Code	Description	Adjustment range	Factory setting
drn	**[Derated operation]** Lowers the tripping threshold of [Undervoltage] (USF): in order to operate on line supplies with 50% voltage drops. 2 s nO [No] (nO): Function inactive YES [Yes] (YES): Function active In this case, drive performance is derated. **CAUTION** **RISK OF DAMAGE TO DRIVE** When **[Derated operation] (drn)** = **[Yes] (YES)**, use a line choke (see catalog). **Failure to follow these instructions can result in equipment damage.**		[No] (nO)
StP	**[UnderV. prevention]** This function can be used to control the type of stop where there is a loss of line supply. nO [No] (nO): Locking of the drive and freewheel stopping of the motor MMS [DC Maintain] (MMS): This stop mode uses the inertia to maintain the drive power supply as long as possible. rMP [Ramp stop] (rMP): Stop according to the valid ramp ([Deceleration] (dEC) or [Deceleration 2] (dE2)) FSt [Fast stop] (FSt): Fast stop, the stopping time depends on the inertia and the braking ability of the drive.		[No] (nO)
InH	**[Fault inhibit assign.]** **DANGER** **LOSS OF PERSONNEL AND EQUIPMENT PROTECTION** • Enabling the fault inhibition parameter **[Fault inhibit assign.] (inH)** will disable the drive controller protection features. • InH should not be enabled for typical applications of this equipment. • InH should be enabled only in extraordinary situations where a thorough risk analysis demonstrates that the presence of adjustable speed drive protection poses a greater risk than personnel injury or equipment damage. **Failure to follow these instructions will result in death or serious injury.** 2 s This function disables drive protection for the following detected faults: SLF, CnF, EPF, CrF, LFF, OHF, OBF, OLF, OSF, OPF, PHF, SOF, tnF, COF, bLF nO [No] (nO): Not assigned LI1 [LI1] (LI1): Logic input LI1 LI2 [LI2] (LI2): Logic input LI2 LI3 [LI3] (LI3): Logic input LI3 LI4 [LI4] (LI4): Logic input LI4 LI5 [LI5] (LI5): Logic input LI5 LI6 [LI6] (LI6): Logic input LI6 The logic inputs are active in the high state.		[No] (nO)

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[FAULT MANAGEMENT] (FLt-) menu

Code	Description	Adjustment range	Factory setting
rPr nO rtH	❑ [Operating t. reset] ☐ [No] (nO): No ☐ [rst. runtime] (rtH): Operating time reset to zero The [Operating t. reset] (rPr) parameter automatically returns to [No] (nO) after resetting to 0		[No] (nO)
rP 2 s nO YES	❑ [Product reset] **⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** You are going to reset the drive. • Check this action will not endanger personnel or equipment in any way. **Failure to follow these instructions will result in death or serious injury.** ☐ [No] (nO): No ☐ [Yes] (YES): Yes		[No] (nO)

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

Appendix I

GSM Modem (Optional)

Installation

Operation

T24999 GSM Modem Kit Installation and Operation Instructions

IMPORTANT: For modem to work properly, software on both PLC and HMI must be version 2.02 or greater. To get latest dryer updates, go to http://www.sukup.com/Products/QuadraTouch.

1. Check for GSM coverage in your area. AT&T, T-Mobile, and iWireless are popular GSM providers and all offer prepaid plans. Check each one for the best coverage plan.
    a. You will need to know the 20-digit ICCID# on the card provided.
    b. You may need the 15-digit IMEI# found on the sticker on side of GSM modem.
    c. Activating your SIM card online is usually easiest, but if you do call, talking to a real person is generally the next best option.
    d. Prepaid is usually the easiest way to go. Each company has different plans to accommodate your situation. GSM modem operates with text messages over VOICE NETWORKS. **Do not get a data plan or add a line if it's not necessary. It will be much less expensive to use the prepaid option.**

    SIM card comes pre-installed into GSM modem. If for some reason you need to change SIM cards (like in Step 7) or need the IMEI#, you may open the modem by pressing in the green tabs with a small screwdriver on top and bottom of modem. See Image 1. The piece will slide outward as shown in Image 2.

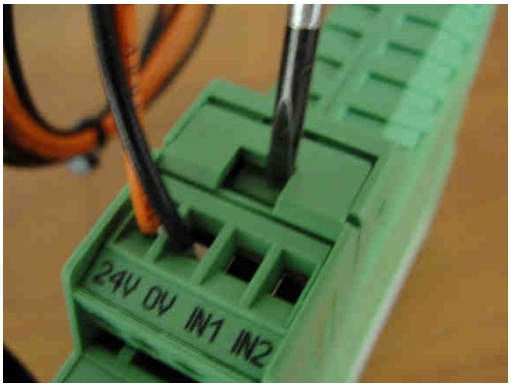


Image 1 – Pressing tab

Image 2 – Opening modem

2. Mount GSM modem onto DIN rail. Modem should be mounted in power box or auxiliary box.

3. Connect GSM modem's power wires (See Image 3) to terminals 18 (orange) and 95 (black) located at bottom of power box.

Image 3 – GSM modem power wires

4. Connect GSM modem to PLC with Serial Interface Cable as shown in Images 4 and 5.

Images 4 and 5 – Connecting modem to PLC

5. To mount antenna, you'll need to make a 5/8" hole in top of power box or in top of auxiliary box (typically provides best reception), depending on where modem was mounted.

6. Mount the antenna, and connect other end to GSM modem as shown in Image 6.

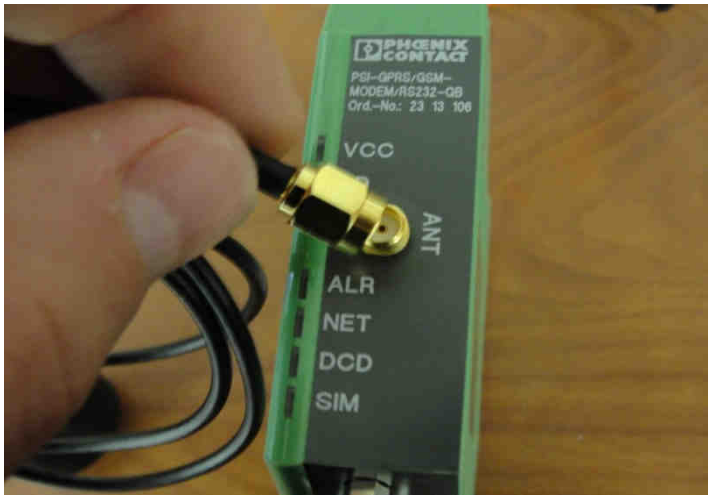


Image 6 – Plugging in antenna

7. You are finished. When powering up you will see VCC light flashing. After it has started, modem will search for a GSM signal. If it finds a signal, you will see a steady flashing or solid light on the NET light (after a couple of minutes). If NET light is not lit, SIM card was not properly activated or there is no GSM signal. You may have to try a different GSM provider if this is the case.

Operating Instructions

GSM Modem interacts with PLC by relaying text messages to a preprogrammed number in touch panel. In case of a fault condition, the system will automatically text message that preprogrammed number once a minute for 10 minutes. It will include the reason for the fault as well as a wire number if applicable.

If you have received the fault message and do not wish to keep receiving the same message for the next 10 minutes, simply send a text response of “00” to GSM modem.

In addition to receiving text alerts in fault conditions, you can also query the dryer for its running status. Text message GSM modem with “1234” and modem will respond with dryer’s running status including time remaining (if applicable), plenum temperatures, moisture content, grain temperature and unload speed.

If for some reason you wish to shut dryer down without being there, use the remote shutdown feature. Text message GSM modem with “8888” to shut dryer down. You will not, however, be able to start dryer remotely.

V2.6 software updates allow you to change plenum temperature setpoint(s) and discharge moisture setpoint.

Text “P#XXX” to give dryer a new plenum temperature setpoint.
Example: “P1220” would give plenum 1 (lowest plenum) a new setpoint of 220°.
This command is **not** case sensitive. “P” or “p” will work.
This command will receive an acknowledgment after it has been changed.

Text “MSTXXX” to give dryer a new discharge moisture setpoint.
Example: “MST145” would give dryer a new setpoint of 14.5 percent.
This command is **slightly** case sensitive. “MST,” “Mst”, and “mst” will work.
This command will receive an acknowledgment after it has been changed.

Keep in mind that you can text dryer from ANY phone with the messages “00”, “1234”, “8888”, “P#XXX” or “MSTXXX”. However, only the preprogrammed number in the touch panel will receive fault condition text message alerts.