



AUTOMATIC GRAIN DRYER

**Continuous Flow / Automatic Batch
QuadraTouch™ Dryer Control System**



Owner's Operation Manual (CE)

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Table of Contents

Limited Warranty.....	1
Emergency Shutdown Locations	11
Power Box Component Location	13
Control Box Components Location.....	14
Dryer Installation.....	15
Gas and Electric Hook-up.....	15
Heater Operation	15
Air Proving Switch	17
Low Temperature vs. High Temperature Kit	17
Dry Fire / Test.....	18
Maintenance and Service	21
General Dryer Operation	29
Continuous Flow	29
Automatic Batch	29
Grain Transfer.....	30
Manual	30
Dryer Operation	34
Continuous Flow.....	34
Functional Maintenance Requirements.....	35
Shutdown Faults.....	41
Appendix A – Auxiliary Motor Operation and Installation	49
Appendix B – Tonnes per Hour Information (Corn).....	53
Appendix C – Dryer Startup Checklist.....	54
Appendix D – Heater Operations (CE)	56
Appendix E – Heater Troubleshooting Guide	58
Appendix F – Explanation of Heater Box Components.....	60

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Limited Warranty

Congratulations on your purchase of a new Sukup Automatic Dryer! We're pleased to add your name to the growing list of Sukup Dryer customers. Your Sukup Automatic Dryer offers the most advanced automatic operation of any dryer on today's market. You can feel confident that you have purchased your Dryer from a company committed to serving farmers for years to come. Sukup Manufacturing is one of the few family-owned companies in an era of corporate mergers. Our family has more than 45 years of grain drying and handling experience and an excellent reputation for standing behind our products - we appreciate your purchase. You can look forward to many years of superior performance from your Sukup Automatic Dryer!

Grain Dryer Limited Warranty

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

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

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

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. ITEMS NOT MANUFACTURED BY SUKUP (i.e. Tires, Belts, Motors, etc.) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY.

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

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

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

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

WARRANTY CERTIFICATION - Warranty registration card should be mailed within two weeks 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.

©4/23/08



General Safety Practices

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

Safety Signal Words

On safety decals, three signal words are used with corresponding colors of red, orange, and yellow to indicate hazard intensity. Definitions are as follows:



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



(ORANGE) indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

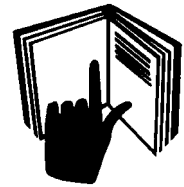


(YELLOW) indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Pictorials are used to warn of hazard.

Follow Manual Instructions and Safety Decal Messages

Observe safe operating practices. Carefully read this manual and all safety decals on your equipment. Decals must be kept in good condition. Replace missing or damaged safety decals or shields free of charge by contacting Sukup Manufacturing Co. by mail at PO Box 677, Sheffield, Iowa USA 50475-0677; by phone at 641-892-4222; or by e-mail at info@sukup.com.



It is the responsibility of the owner/operator to know what specific requirements, precautions, and work hazards exist. It is also the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of the hazards and safety precautions that need to be taken to avoid personal injury or death. **An example training register is printed in this section to assist in that process.**

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. Do not modify or redesign equipment without first obtaining written approval from Sukup Manufacturing Co. Unauthorized modifications to the equipment may impair the function and/or safety and affect machine life.
4. Periodically check all mechanical and electrical components. Keep unit in good working condition.
5. Handle equipment and parts with care. **Wear protective clothing** to avoid injury from sharp metal edges.
6. Wear Personal Protective Equipment (PPE) such as safety glasses, gloves, hardhat, steel-toed boots, ear protection and dust mask as required.

Keep unit well maintained according to the procedures in the maintenance section beginning on page 1-19 of this Owner's Operation Manual.

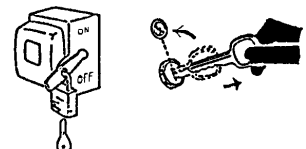


CAUTION: To avoid electrocution, all equipment must be properly wired and grounded according to electrical codes. Have unit wired by qualified electrician.

IMPORTANT: Supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of BS EN 60202-1.

Mains Isolater must be located outside of bin. It must be easily accessible from ground level and must be lockable in off position. Mark clearly as to equipment it operates. See Mains Isolater decal placement information later in this section.

Always LOCK OUT main power switch (Mains Isolater) whenever equipment is not in use or when servicing unit. Check with voltage meter before servicing unit.



TRANSPORT SAFETY WARNING: TRUCKER-TRANSPORTER IS TO PROVIDE APPROVED SAFETY CHAIN WHEN TOWING DRYER.



WARNING: Transporting this equipment on farm sites requires precautionary measures in order to prevent serious injury or death. If transport is required it is essential that all of the following procedures be adhered to:

- Read and understand operator's manual.
- Check and comply with state & local regulations.
- Use required emblems or lights.
- Keep away from overhead electrical lines.
- Reduce speed and/or use lower gear on rough ground or slopes.
- Stop gradually.
- Use mirrors. Have extended rear angle mirrors on vehicles.
- Signal & check behind you when turning.
- Use safety chain when towing dryer.
- Use break-away kit (available from Sukup Mfg Co - Computer #T4366).
- Be sure to have clear visibility
- Use signal lights

Failure to heed these warnings may result in serious injury or death. Use good judgment when transporting. Maintain complete control of unit at all times. **Comply with state and local regulations.** Read safety procedures before moving units. Always strive to prevent accidents! Watch out for other vehicles.



WARNING: TO PREVENT EXPLOSION OR FIRE



- Carefully review operator's manual, **including all safety instruction.**
- 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 inspection door open.

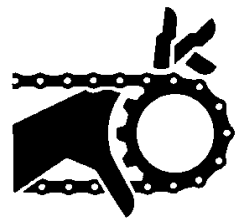
Failure to heed these warnings may cause serious injury or death.

Please refer to applicable sections of this operation manual for detailed instruction.



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 the above precautions may cause serious injury or death.

EMERGENCIES - KNOW WHAT TO DO

Have telephone numbers and written directions to your location near your telephone in the event of emergency. A place to record information is provided here.

Emergency Information

Ambulance: _____

Fire: _____

Address of work site: _____

Directions to your location: _____

Risk reduction for servicing inside dryer plenum

IMPORTANT: Conditions inside dryer plenum may vary greatly from the ambient conditions.

Please follow the safety guidelines before entering the plenum:

- Appoint a responsible individual to oversee the task and remain outside the dryer while servicing.
- Ensure the dryer is isolated and all fuel and power is disabled to the unit.
- Operator is in good physical condition and at low risk of medical problems such as asthma and cardiac problems.
- Unit is empty of grain; avoid entry when unit is full.
- Do not close doors while inside the unit, to ensure proper airflow and vent toxic gasses.
- Have immediate and close access to a lifting device, which can reach the dryer platforms in the event of emergency.
- Have adequate tools on hand for quick removal of the ladder in the event of an emergency.
- Carry a communication device to use in the event of an emergency and ensure proper signal is available (mobile phone with adequate signal).
- Wear personal protection equipment such as safety glasses, gloves, dust mask, steel-toed boots, ear protectors and hardhat as required.
- Consider additional risks when performing maintenance that includes cutting or welding (fire, fumes and dust). Ensure quick access to an ABC (dry chemical) fire extinguisher.
- Assess the climatic conditions: If the weather is undesirable (icy platforms, extreme heat) reduce risk by servicing when the climate improves.

In the event of minor injury (minor cuts and scrapes):

- Ensure a first aid kit is available on site and workers are trained in first aid to treat minor injury.
- Avoid first aid on the platforms due to low available workspace and height.
- Contact emergency services if the injury prevents descending from the dryer platforms.

In the event of serious injury (loss of consciousness or serious cut):

- Contact emergency services immediately.
- In the event of rescue from inside the plenum the ladder may hinder rescue. **The ladder may be removed by cutting or unbolting the bracing brackets from the unit.**

Safety Section

To prevent serious injury or death to you or your family, it is essential that these safety decals be mounted on your dryer.

Check that all safety decals are in place according to the decal placement drawing and in good legible condition 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.

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



2. Decal L02741 - DANGER: Keep away from any electrical lines, especially when moving unit.



3. Decal L0234 - WARNING: Door interlock switch. Switch resets when door is closed.



4. Decal L0166 - WARNING: Guards & screens in place. Disconnect electricity. Check fan blade.



5. Decal L0271 - DANGER: Shield missing, do not operate.



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



7. Decal L0285 - CAUTION: Not intended for use on public roads. If transporting is required:



Safety Section

8. Decal L02831 – WARNING: Lower and secure parking stands before unhitching unit.



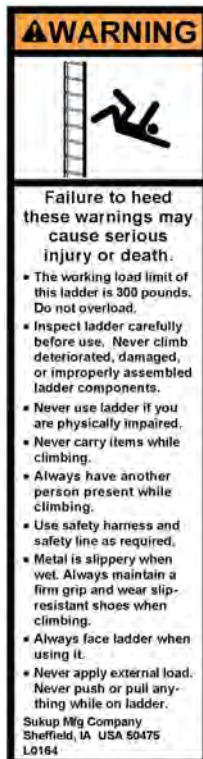
9. Decal L03061 - DANGER: Keep away when auger is running! Entanglement will cause serious injury or death!



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



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



12. Decal L0512 – WARNING: Use safety chain when towing unit to eliminate detachment hazard.



13. Decal L0062 – DANGER: Never run fan without screen guard; Stay clear from front of fan; Follow correct procedure when installing fan blade.



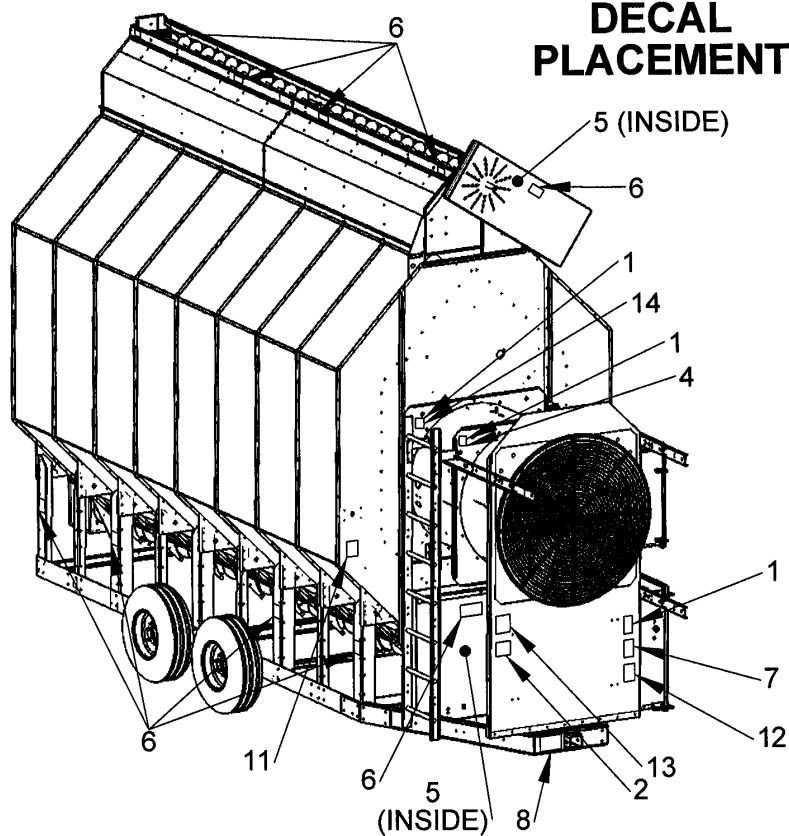
14. Decal L0165 - WARNING: Disconnect Electricity; Bleed gas; etc.



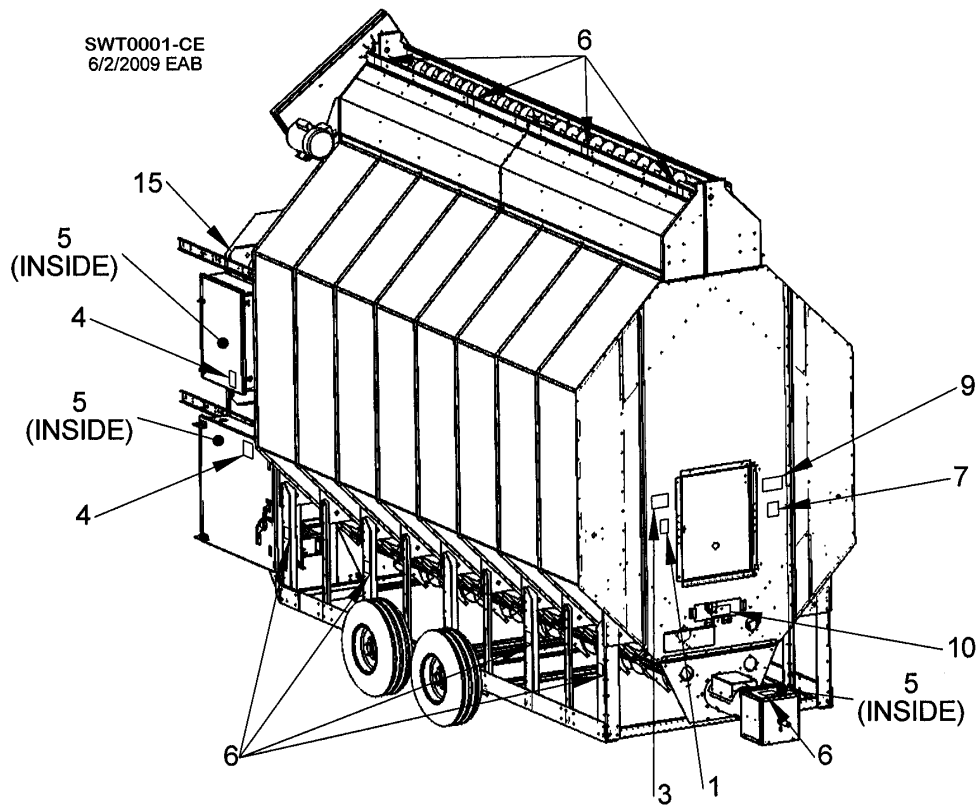
15. Decal L0204 - DANGER: Do not operate with service door removed.



DECAL PLACEMENT



SWT0001-CE
6/2/2009 EAB



CE SAFETY LABELS

To prevent serious injury or death to you or your family, it is essential that these safety decals be mounted on your dryer.

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.



L5100 Sukup Manufacturing Co. Sheffield, IA USA

Label #L5100 – Place inside power box of dryer and on dryer where electrical precautions are needed.



L5101



Sukup Manufacturing Company Sheffield, IA USA

Label #L5101 – Place near power disconnect of dryer.



L5102



Sukup Manufacturing Company Sheffield, IA USA

Label #L5102 – Place near main power source of dryer.



L5103



Sukup Manufacturing Company Sheffield, IA USA

Label #L5103 – Place near main power source of dryer.



L5104

Sukup Manufacturing Co Sheffield, IA USA

Label #L5104 - Place at dryer rear access door (entrance to plenum).



L5105

Sukup Manufacturing Co Sheffield, IA USA

Label #L5105 – Place at dryer rear access door (entrance to plenum).



L5106



Sukup Manufacturing Company Sheffield, IA USA

Label #L5106 – Place near shut off to power source.



Label #L5107 – Place near main power shut off.



Label #L5109 – Place near main power panel.



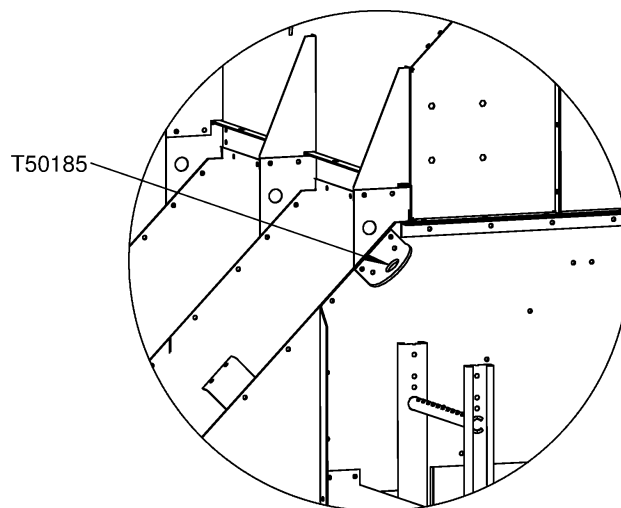
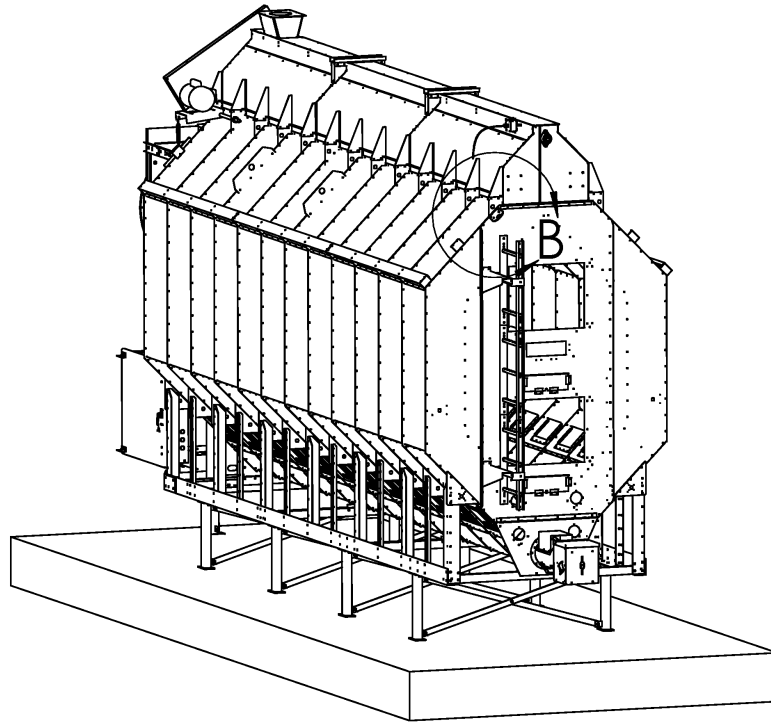
Label #L5108 - Placed on axial fans.



Label #L5111- Place at dryer rear access door (entrance to plenum).

NOTE: See harness anchor point bracket placement drawing on next page.

HARNESS ANCHOR POINT BRACKET PLACEMENT



INSTALLATION SHOWN
ON SINGLE MODULE
DRYER.

DETAIL B
SCALE 1 : 15

SWCD0077
12/16/2011MCM

Training Register – Continuous Flow Grain Dryer

Training on operation of a Sukup Grain Dryer and related equipment is paramount to ensuring safe and successful use of the dryer.

This training register is to be used in conjunction with the general operation and maintenance instructions to emphasize the importance of safety. Use additional spaces for elements unique to your dryer.

NOTE: It is the owner's responsibility to give adequate training to employees and to assess their ability to safely use the equipment.

Element	Date	Comments
Check unit prior to start-up		
Power shut off Fuel system shut off		
Action in event of emergency/fire		Use of ABC (dry chemical) fire extinguisher
PPE (Personal Protective Equipment)		
Cleaning/maintenance and safe access to plenum		
Entry into confined spaces Authorized personnel only Safe practice and access		
Maintenance of the dryer - Safe isolation - Problem solving - Authorized personnel only to work on gas train/electrical		
Best practices for grain drying		Sunflower seeds require a low temperature setting

Emergency Shutdown Locations

Emergency Shutdown Locations

The power distribution box is located at the front left of the dryer. It contains all of the main power distribution components.

On the outside of the power distribution box, the front door has two latches mounted to it.

The door lock handle secures the door and can be locked with a key.

The main disconnect mechanism prevents the opening of the power box while power is present in the system.



Caution:

Power is still present at the lower side of the main switch when the power box is open.

The picture at right shows the main disconnect in the "on" position, power is present in the system.

Located on the side of the power distribution box, is the Emergency Stop switch. During operation, the switch is pulled out and is illuminated in red. - Shown below

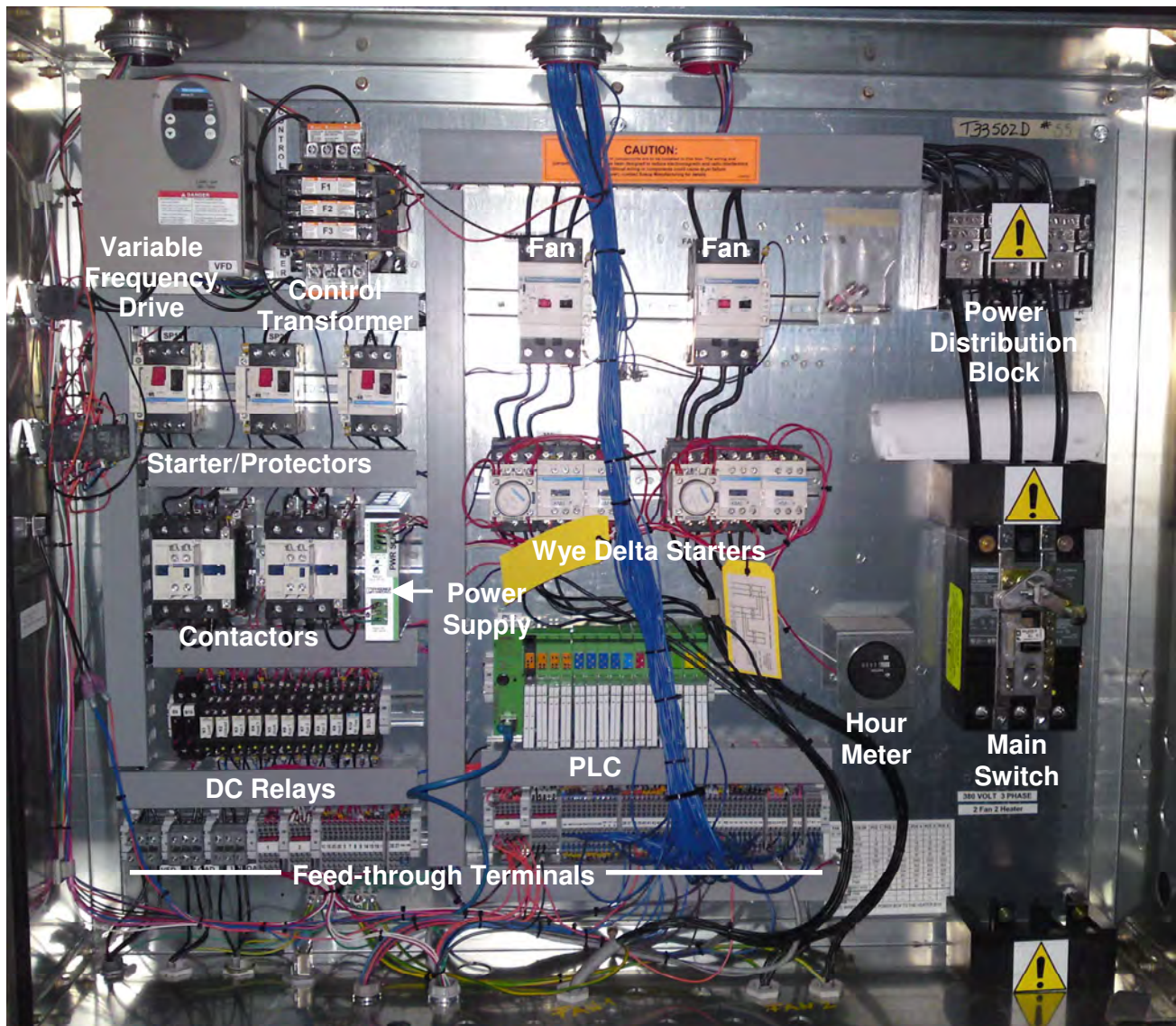


Pressing the Emergency Stop Switch or switching the system control switch to the "OFF" position will shut down power to the PLC and the backup control system. Main power is still present inside the box.

Power Box Component Location

Power Box Component Location

The picture below displays the power box and identifies all of the major components.



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

Control Box Components Location

Control Box Components Location

QuadraTouch™ Controller

The control box is now mounted away from the dryer and connected by industrial, direct bury Ethernet cable. This cable is available in 50', 100', 150', and 200' lengths (J8720-J8723). The panel needs its own, independent 100VAC – 240VAC power supply.



The main power switch is on the bottom, right-hand portion of the box. When switched "ON" the switch will illuminate to a green color. The panel will boot up in a very short time and connect with the PLC inside the power box.



To connect, main power must also be supplied to the dryer and the system control switch should be in the "COMPUTER" position.



By removing the screws on the bottom left and right-hand corners of the swing panel, the back of the panel becomes accessible.

After removing the screws, the panel may be lifted up to find the Compact Flash Type II card located on the rear of the panel. The door lifts up and swings back. All data logged during dryer operation is stored on this 1 GB compact flash card. Each QuadraTouch™ controller includes this card. Reference the software manual on accessing the CF card's memory.



Heater

Dryer Installation Gas and Electric Hook-up

Initial gas hookups should only be performed by qualified gas service technicians in accordance with all applicable code requirements. In conditions of a threaded pipe train, a regulator **must** be installed on the gas tank and limit the pressure to 72 psi (5 bars). **IMPORTANT: Regulator must be in accordance with standard BS EN 88 or BS EN 334.**

Initial electric hookups should only be performed by qualified electrical service technicians in accordance with **all applicable code requirements**.

Supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of **BS EN 60204-1**.

Heater Operation

The heater will operate only when its corresponding fan is running. The user will control heater function in all manual/test, "Stabilization", and "Continuous Flow" modes. During "Initial Dry" mode, the heater(s) will automatically fire after the fan(s) has/have started.

Purge

After the heater is switched on, an automatic 30-second purge cycle commences. During this cycle, with the fan operating, any residual gas is cleared. The ignition board controls heater startup sequences. The ignition board is located in the heater control box.

Air Pressure Check

If operating in manual or automatic control, the dryer must be filled with grain. If without grain, insufficient air pressure will cause a dryer shutdown in 5 seconds due to a low static air pressure fault. If operating in the "Dry Fire" mode, the air pressure sensor is disabled. No gas is being supplied during the 30 second purge cycle due to the gas solenoids being closed.

Ignition

After the 20-30 second purge delay, the liquid and the vapor solenoids are opened and a 10-second ignition attempt occurs. (See picture on page 23).

Operation

The red power light on the heater box's right side should be on at this time. If a flame is not sensed, after 45 seconds, the dryer will shutdown indicating that no flame was sensed or a flame timeout occurred.

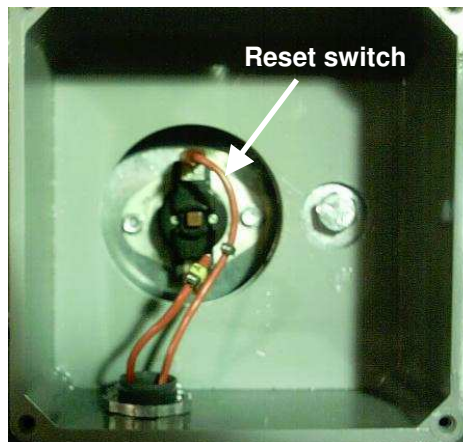
Plenum Temperature Adjustment Liquid Propane systems

To adjust the plenum temperature using the QuadraTouch™ controller, go to the settings menu and choose plenum temperature. Refer to the Software Manual tabbed section for further instruction.

Heater Housing Over Temp

The heater housing high limit switch detects excessive temperatures inside the heater housing. It is rated to open above 200 °F (94 °C). If this trips, the QuadraTouch™ will display a Housing Over-temp fault on the screen.

The heater housing high limit switch must be manually reset. The reset switch, located in the heater box, is shown right.



Caution

Vaporizer Over-Temp

High voltage in heater box! Care must be taken when resetting the switch.

The heater's vaporizer serves to convert the liquid propane into vapor propane by using heat from the burner. A vapor high limit fault will shut the dryer down if the vapor fault exceeds 140 °F (60°C). The dryer will lock out the system and display a Vapor Over-temp alarm. The limit switch is self-resetting once the vapor temperature drops. The QuadraTouch™ controller will display the fault and will require the operator to acknowledge the fault by pressing Fault Status and then the "Reset" button.



The vaporizer should be adjusted before operating. Normally, the vaporizer outlet hose should be very warm to the touch but not so hot that it can't be held. To adjust the vaporizer, refer to the next section, [Dry Fire / Test](#).



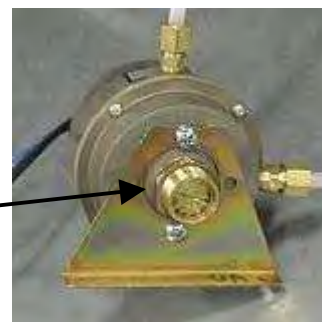
Caution

Vaporizer may be hot, use extreme caution when handling.

Heater

Air Proving Switch

Velocity and pressure of the airflow is measured by two tubes, 90° from each other. The air proving switch then analyzes the airflow. If airflow is not present, the switch will turn off the heater(s). This switch is located inside the heater box. To adjust the air-proving switch, turn the end of the inner screws with a flat head screwdriver. To decrease the amount of airflow detected, turn the screw counter-clockwise. To increase the amount of airflow detected, turn the screw clockwise. Never loosen retaining nut.



Heater Operation at Low Plenum Temperatures

Operating the dryer at low temperatures (approximately less than 27°C above ambient temperature) requires low temperature heater kit. This kit is automatically installed on all CE dryers. A symptom of operating at temperatures with high temperature equipment is a rumbling sound. This symptom occurs when the gas pressure is low and the flame is burning back into the port cup. Contact your Sukup dealer to purchase replacement parts.

Caution

Operating the dryer with too low of gas pressure will damage the port cup. Contact dealer if symptoms occur.

Low Temperature vs. High Temperature Kit

At 10°C (50°F) ambient temperature

Plenum Temp	60°C (140°F)	80°C (176°F)	99°C (210°F)
Canola	Low Temp	Low Temp	NR
Wheat	Low Temp	Low Temp	High Temp
Corn	Low Temp	High Temp	High Temp

NOTE: Sunflower seeds require use of **low temperature ONLY**.

Heaters for CE Belt Drive (Recommendations only)

DRYER ORIFICE SIZE

Dryer	Fan Size	LP High Temp		LP Low Temp		NG High Temp		NG Low Temp	
		Size (IN)	Part #	Size (IN)	Part #	Size (IN)	Part #	Size (IN)	Part #
TE283	28"	15/64	D7111	13/64	D7110	25/64	D71125	19/64	D7112
TE163	28"	13/64	D7110	11/64	D7125	25/64	D71125	19/64	D7112
TE163,TE121	38"	19/64	D7112	13/64	D7110	1/2	D71124	23/64	D71131
TE283	44"	23/64	D7113	19/64	D7112	9/16	D71127	7/16	D71129

DRYER PORT CUP SIZE

Dryer	Fan Size	LP High Temp		LP Low Temp		NG High Temp		NG Low Temp	
		Size (IN)	Part #	Size (IN)	Part #	Size (IN)	Part #	Size (IN)	Part #
TE283	28"	9/16	D4027	3/8	D4025	9/16	D4027	3/8	D4025
TE163	28"	9/16	D4027	3/8	D4025	9/16	D4027	3/8	D4025
TE163,TE121	38"	3/4	D4044	9/16	D40443	3/4	D4044	9/16	D40443
TE283	44"	3/4	D4044	9/16	D40443	3/4	D4044	9/16	D40443

38" and 44" High Temp LP units also use flame deflector T16204

Dry Fire / Test Introduction

The “Dry Fire” mode of operation enables the operator a means of running the dryer when there is no grain. This provides a great way of testing the dryer before seasonal operation.

To operate the dryer in “Dry Fire/Test” mode, ensure the red emergency stop button is pulled out and main power is ON. The emergency stop button should illuminate red, indicating control power is available. In addition to the main power switch and the emergency stop button, there is a System Control Switch. This switch should be turned to “COMPUTER” when using the QuadraTouch™ controller. It will illuminate green when in the “Manual” or “Computer” position.



Caution

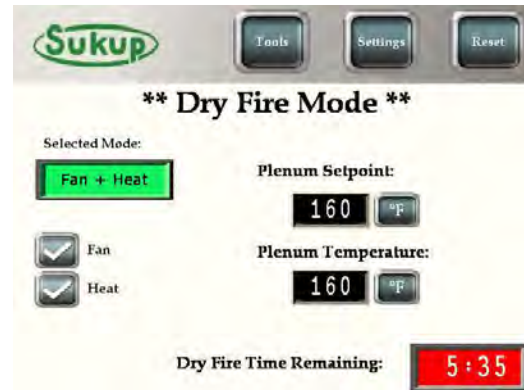
While the dryer is running, excessive audible noise is present.



Hearing protection is strongly recommended.

Dry Fire / Test

To access the Dry Fire / Test mode, touch “Tools” from the main screen and select “Dry Fire / Test”. The following screens will come up:



Fan Only

Selecting “COOL” at the prompt will energize the fan(s) only. The static air pressure switch is disabled during this test. All other monitored safeties are operational at this time.

Fan and Heater

Selecting “HEAT” will apply power to the fan and heater. First the fan will come on, followed by the heater after a 20-30 second delay. The static air pressure switch will be ignored, but the flame sensor will still be active.

Selecting “COOL” or “HEAT” will commence a 10 minute timer countdown followed by the fan and if selected, the heater startup. At the end of the 10-minute period, the fan and heater will turn off automatically giving the option of returning to the main menu. The heater(s) may not be started independent of the fan(s) being started.

Note:

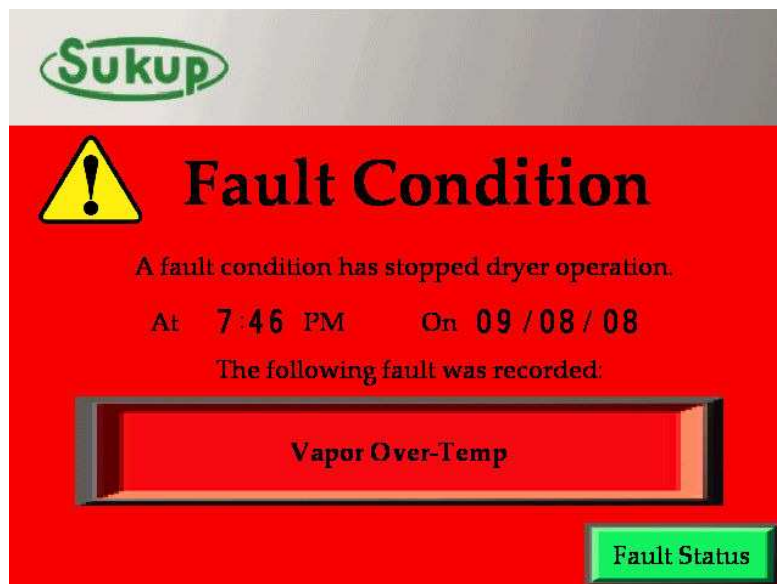
For multiple fan dryers, there will be a “COOL” and “HEAT” option for each fan/burner. There is a 5 second delay between fan startups. They will start top to bottom.

Vaporizer Coil Adjustment (LP Models Only, Not Applicable to Natural Gas)**Adjusting the Heater: Vaporizer Coil****Caution****If vaporizer is not adjusted correctly, piping could be hot!**

Selecting the Dry Fire / Test Mode is required to operate the dryer's fan and heater when there is no grain in the dryer. After the dryer has been allowed to run and the plenum temperature has stabilized, the vaporizer outlet (top) should be warm but not hot to the touch. If the vapor side of the pipe train is hot, or if the dryer has shut down due to a "VAPOR OVERTEMP" alarm. The vaporizer may need to be adjusted out (away from the flame). To adjust the vaporizer



loosen the 2 pivot bolts (1 top, 1 bottom) of the vaporizer adjustment bracket and then pivot the vaporizer either in or out of the flame as necessary to regulate the temperature at the vaporizer outlet. The U-Bolts mounting the vaporizer to the adjustment bracket can also be loosened and vaporizer can be moved in and out to adjust. Viewing hole is present to watch vaporizer adjustment.



Maintenance and Service Preventative

Performing preventative maintenance on your dryer is very important and can help to ensure that the dryer will perform well throughout the drying season. The following guidelines are the minimum recommended procedures to be performed.

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

Important



Caution

Prior to Drying season



Note:

See Parts Assemblies Section for part numbers.

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

Plan well in advance in the event repairs or parts are needed!!

Warning Lock out electrical power before removing any safety shields

When working with the top section of the dryer, a walkway must be installed that meets any applicable standards / codes.

Physical Inspection



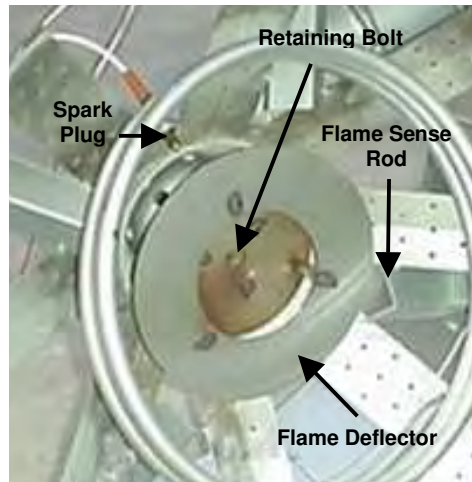
Warning

1. Remove fan inlet screens. Check for foreign material on fan blade. Pay close attention to inside of fan hub. Check that the fan rotates freely and that all blade tip clearances are the same. Check belts for wear.
2. Reinstall fan inlet screens. Check ventilation openings in motor for any blockage.

NEVER run fan without screen guard securely attached to fan housing!

3. Check wiring of fan and heater. Look for loose connections, bare wires or rodent damage. Be sure to check ignition wire and flame sensor wire for damage or short to ground.

4. Examine the flame sense rod (J5747) for cracked porcelain insulation and verify it is not touching any metal burner parts.



5. Examine spark plug (J5739) for proper gap and clean the electrodes if required. The gap should be 1/8" (3.175 mm). Spark plug and flame rod should be examined periodically throughout the drying season.
6. Inspect the port cup for any accumulation of foreign material. Clean if required. Foreign material in the port cup will not burn out, and will impair burner operation, (Port cup located behind Flame Deflector).



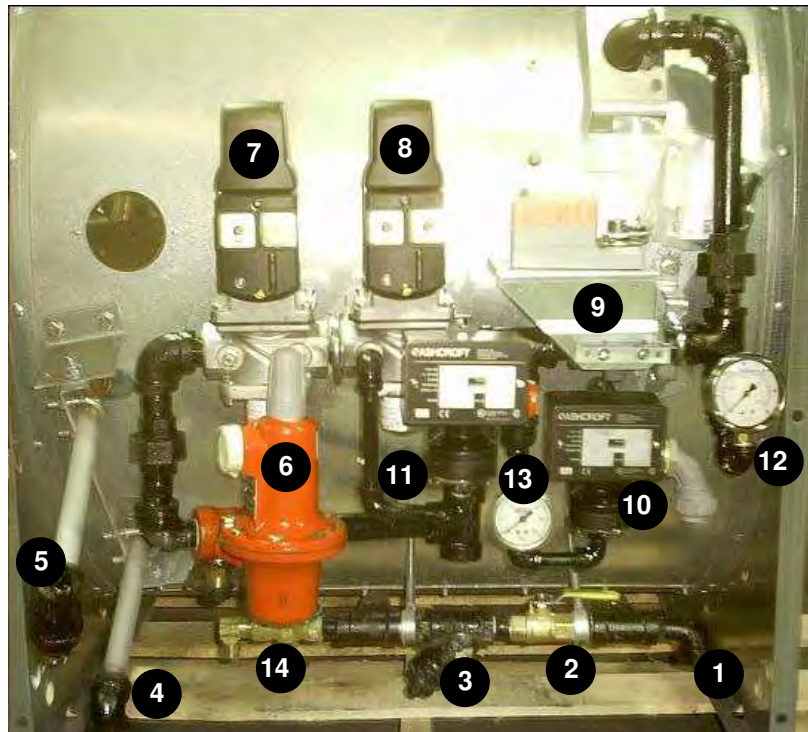
Caution

Inspect Vaporizer, Diffuser, Flame Deflector, and Heater Venturi supply pipe for damage and physical integrity.

One drop of Liquid propane will expand 270 times as it converts to Vapor. It is very dangerous to have the Vaporizer coil develop a leak during heater operation. Be sure to check the vaporizer coil yearly. The Vaporizer should be replaced every 5 years.

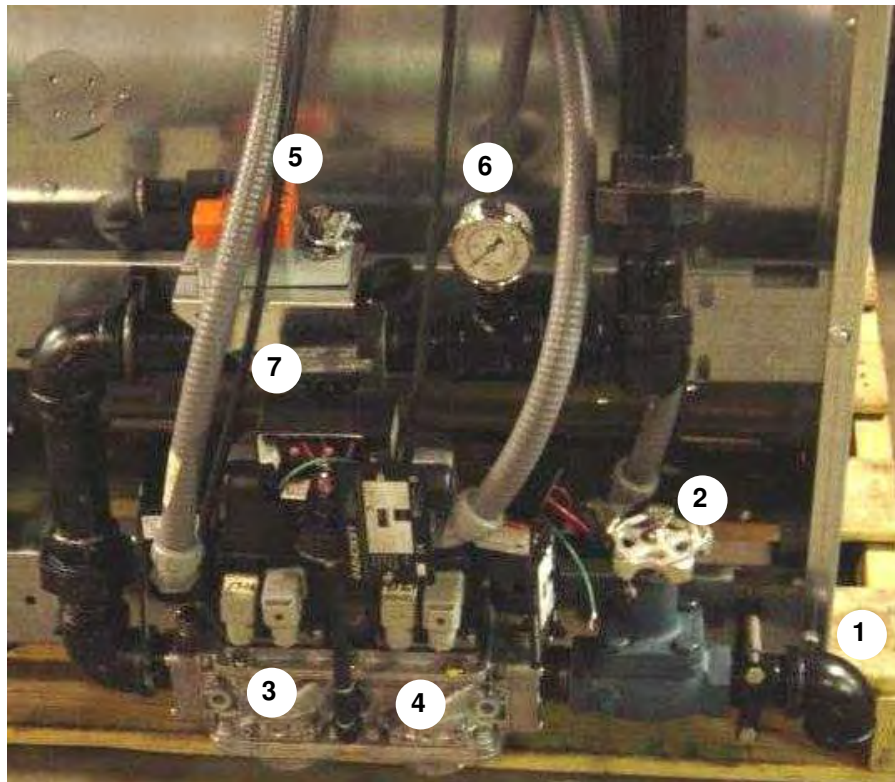
7. Remove and clean the gas strainer.
8. Inspect all valve train components for physical integrity.
9. Inspect all valve train connections for tightness.

Liquid Propane



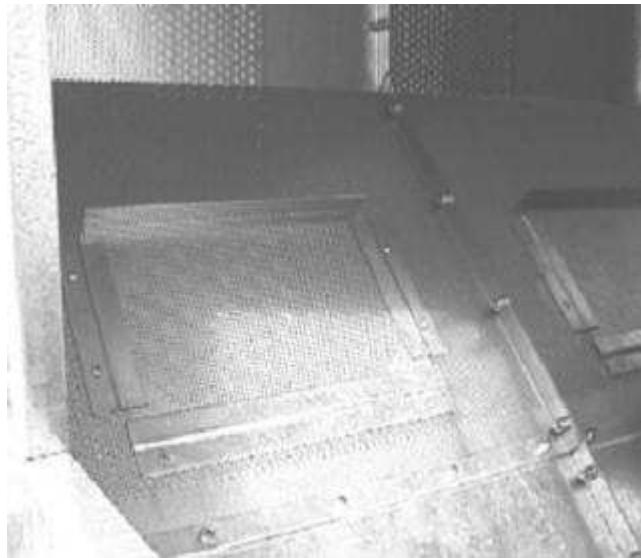
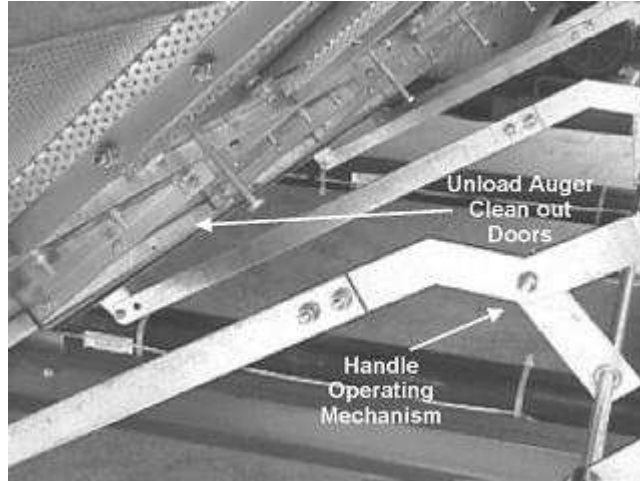
1. NPT LP Inlet Fitting
2. Fuel Shutoff Valve
3. LP Gas Strainer
4. Vaporizer Inlet
5. Vapor Outlet and Pressure Relief Valve (not shown)
6. Pressure Regulator
7. Main (Upstream) Gas Valve and Actuator
8. Blocking (Downstream) Gas Valve and Actuator
9. Electronic Modulating Valve
10. High Pressure Gas Switch
11. Valve Proving Pressure Switch
12. Pressure Gauge
13. Valve Proving Pressure Gauge
14. Pressure Relief Valve (behind regulator)
15. Vapor Pressure Relief (not shown)

Natural Gas



1. Gas Inlet Street Fitting
2. Fuel Shutoff Valve
3. Main (Upstream) Gas Valve and Actuator
4. Blocking (Downstream) Gas Valve and Actuator
5. Electronic Modulating Valve
6. Pressure Gauge
7. High Pressure Switch

10. Open inner and outer unload auger clean out/access doors, and inner and outer column clean out /access doors.





11. Remove any accumulation of fines, dirt or foreign material from the bottom auger trough area, meter rolls and lower column.
12. Inspect unload auger, 1 ¼" (3.175 cm) auger end flange bearings and wooden hanger bearing and flighting for damage and security.
13. Inspect meter rolls for damage and security.
14. Inspect meter roll wood bearings for damage, hole elongation (excessive play), and security.

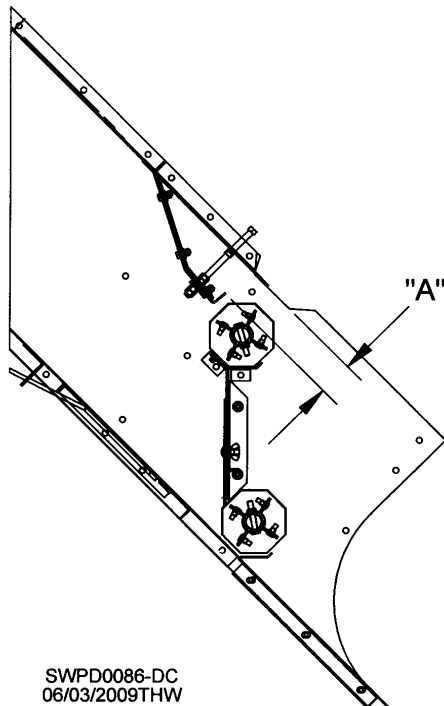
Note

Auger end flange bearings are lifetime lubricated and do not require service lubrication.

Auger wood hanger bearings are oil-impregnated and do not require service lubrication.

Meter roll bearings are oil-impregnated wood and do not require service lubrication.

ANY ADJUSTMENTS MADE TO THESE FLOW GATES ARE THE RESPONSIBILITY OF THE PERSON MAKING THE ADJUSTMENTS. SUKUP MFG. COMPANY WILL NOT BE RESPONSIBLE FOR ANY CIRCUMSTANCE THAT MAY ARISE AS A RESULT OF THESE ADJUSTMENTS.



SWPD0086-DC
06/03/2009THW

Dryer Length	Dimension (Column)	A
12'	Front 4	2"
	Rear 2	1 3/4"
16'	Front 6	2"
	Rear 2	1 3/4"
20'	Front 7	2"
	Rear 3	1 3/4"
24'	Front 9	2"
	Rear 3	1 3/4"
28'	Front 11	2"
	Rear 3	1 3/4"

Note

One full turn of adjustment bolt changes flow gate opening 1/16". Outer flow gate adjustment bolt turns clockwise (CW) to open outer flow gate. Inner flow gate adjustment bolt turns counter clockwise (CCW) to open inner flow gate.



Caution

When inner flow gate adjustment bolt adjustment reaches 3 1/4" a free flow condition may occur. This is when the grain is able to flow freely over metering rolls.

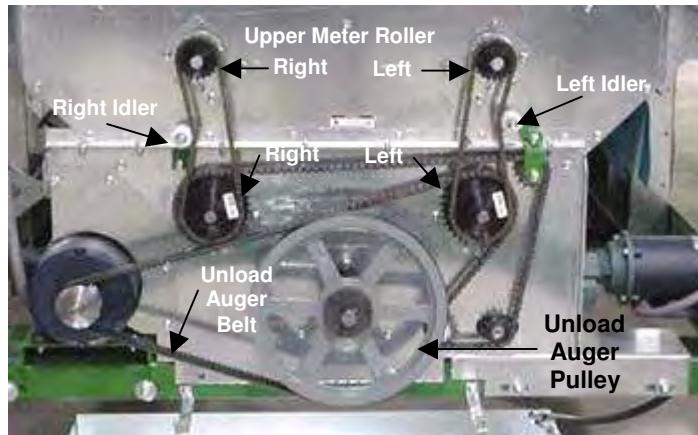
15. Reinstall all clean out / access doors. Close unload auger clean out doors.



Warning

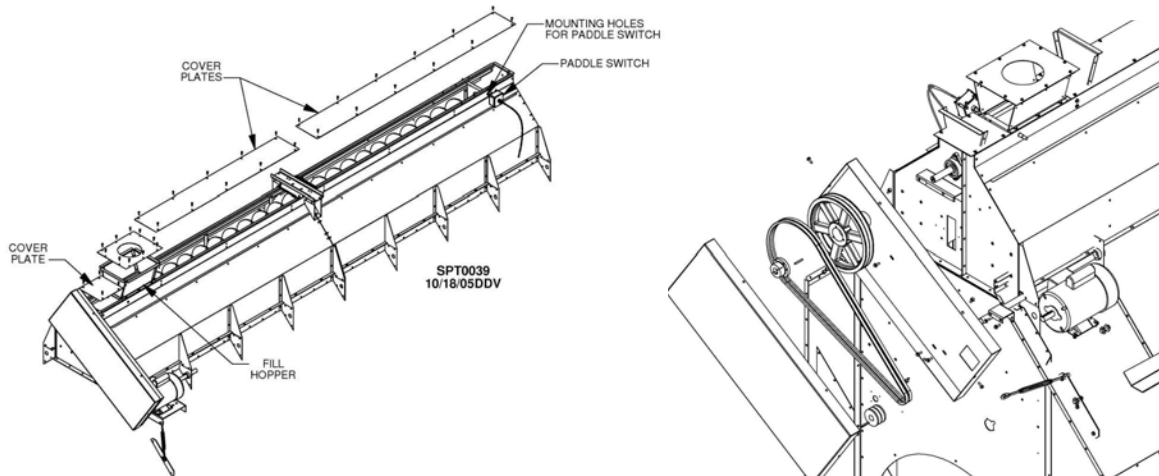
Ensure electrical power is locked out

16. Remove unload auger/meter roll drive train shield.
17. Refer to the pictures below when checking the unload auger / meter roll drive train.



18. Inspect unload auger pulleys and meter roll sprockets for wear or damage.
19. Inspect unload auger belts for cracks or breaks. Check belt tension for proper adjustment. For proper belt tension test, press on the belt mid-way between pulleys. Belt should not deflect more than the distance of one belt width.

20. Inspect the chain belt links, and idler rolls for wear or damage.
21. Check that the idlers are adjusted properly to remove slack in drive chains.
22. Check that the reduction gearbox/AC motor is adjusted outward enough to remove slack on lower drive chain
23. Inspect reduction gearbox for damage and check fluid level.
24. Inspect unload auger motor, AC meter roll motor for damage and security.
25. Reinstall unload auger/ meter roll drive train shield.
26. Remove cover from load auger motor drive and covers from top of wet bin.
(see drawings below)



27. Inspect load auger drive pulleys for damage and security
28. Inspect load auger drive belts for cracks and breaks. Check auger drive belts for proper tension. To test for proper tension, press on each belt at the mid-way point between the two pulleys. Belt should not deflect more than the distance of one belt width. Adjust as necessary.
29. Inspect load auger end flange bearings and mid wood hanger bearing for wear or damage.
30. Inspect flighting for wear or damage.

Note

The load auger bearings are lifetime lubricated and do not require service lubrication.

31. Reinstall all covers and shield.
32. Perform overall inspection of the rest of the dryer looking for loose, missing or damaged parts.

Operational Check

33. Perform pre-season operation test of dryer by performing the Dry Fire / Test mode. While the fan and heater are running, perform a leak test of the heater gas train using a soapy water solution and a squeeze bottle.

General Dryer Operation

This section briefly describes normal dryer operations. To follow the processes step by step, consult the Software Manual tabbed section in this manual.

Continuous Flow

Continuous Flow dryer operation requires creating a gradient of moisture from the top to the bottom of the dryer and is accomplished by three main functions; initial dry, stabilization, and continuous flow. Before the first drying operation is started, the user must enter the incoming moisture and the desired output moisture into the QuadraTouch™ controller. These moistures are used to calculate the time necessary to perform the initial dry at 160°F (71°C). No grain is unloaded from the dryer during initial dry mode. After initial dry is complete, the user will set the desired drying plenum temperatures and the controller calculates a meter roll speed corresponding to the plenum temperatures entered. The dryer then performs a stabilization routine. During stabilization, a gradient of moisture is established in the dryer by drying and unloading one full load of grain without adjusting the meter roll speed. After stabilization has completed, the dryer enters its continuous flow mode. During this operation, the dryer adjusts the meter roll speed for variances seen in the average output moisture compared to the desired output moisture. During continuous flow mode, the QuadraTouch™ controller plots a data point every minute of the average discharge moisture, plenum temperature, and meter roll speed. Each of these graphs can be accessed while the dryer is running. Refer to the Software Manual tab for further instruction.

When the wet bin is empty or the user is ready to dry the final batch of the season, the user simply enters the final dry function and follows the simple instructions listed on the screen of the control panel.

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

Automatic Batch

Automatic batch is a standard feature of the Sukup Automatic Grain Dryer. Batch operations enable operators to dry their grain in a manner that they have become accustomed to, enables them to dry extremely wet grain, allows single fan dryers to be operated in a **heat/cool** manner, and makes it possible to dry grains which require a low plenum temperature.

Two controlling operations of automatic batch have been developed. The first method dries batches according to time entries. The operator enters set times into the control panel during which the dryer will heat, cool, and unload the grain. During unload the dryer calculates the average moisture of each

batch and prints it. The user can then adjust the time entries according to the desired output moisture, or have the control system automatically recalculate the time. The second method of operation requires purchasing the temperature control option. The operator enters a desired dry temperature value into the control panel. When the kernel temperature in the column reaches the set temperature, the dryer proceeds to cool the grain, if necessary, and then unload the grain. The set variables may be changed to the operator's choosing at any time during the batch operation (the new settings take effect the next batch).

Grain Transfer

Increasingly, operators require the dryer to transfer grain through it to reach their storage facilities. Thus, the grain transfer has been developed to simplify this process. The control panel display, steps the user through a simple process to begin and end the procedure through normal startup operation.

Manual

Manual operation serves many purposes. When operators want complete control of their dryer, manual operation fulfills this need. The Sukup QuadraTouch™ controller incorporates a full manual control into its operation. By pressing "Tools" from the main screen, the user can select "Manual Operation" to run the dryer in a manner they choose.

Also incorporated into the dryer is a completely independent, redundant control system, allowing the user to operate the dryer while the dealer meets any necessary service demands. Manual operation is a simple procedure of manually turning on fans, heaters, loads, and unloads. The dryer automatically loads the dryer during manual operation while the user has control of the meter roll speeds.

Grain Dryer Control System Menus

Quick Reference Guide QuadraTouch™ Controller

!!!! SPECIAL NOTE !!!!

READ THE SOFTWARE MANUAL PRIOR TO DRYER OPERATION

The Software Manual has its own tab in this manual.



Located to the left is the main screen that appears after a successful connection to the PLC located inside the power box. The date and time will be shown below the "System Ready" text.

Pressing the "Start" button will bring up the main four modes of operation (refer to the previous section). The "Tools" menu will give the user options on system operation and diagnostics. The "Settings" menu will allow the user to edit system set-points. Finally the "Reset" key will shut everything down and return the user to the main screen.



The menu to the left shows the four main modes of operation. Each mode can be easily accessed by simply touching the button, and the program will guide the user through each setting.

Select "Final Dry" mode when the dryer is not completely full of grain and there is no more grain to be loaded. The static air pressure switch will be ignored during this mode. Refer to the software manual for further information.

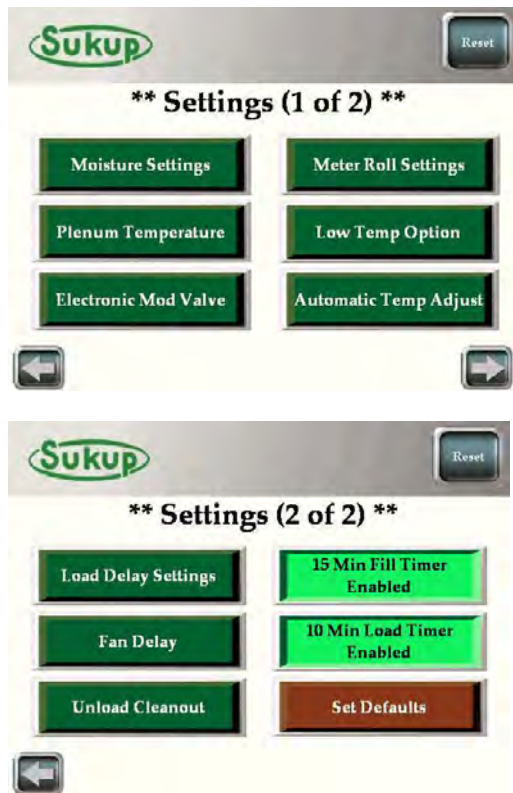


In addition to the "Start" menu, the "Tools" menu can be accessed from the main screen. During a system mode operation such as continuous flow, a limited "Tools" menu may be available.

In this menu, the user can select "Manual Operation" and "Dry Fire / Test" mode.

There are many new features like the "History Log", "Graphs / Trends", and "System Tools". Each tool is very helpful in simplifying operation and troubleshooting. All of these tools are explained in the software manual.

NOTE: The worklight may be toggled on/off from this menu.



The "Settings" menu is a two-page menu containing all of the system set points and operational information.

Each setting can be changed to better meet the needs of the user. Read about each setting in the software manual. Understanding each setting will help tremendously during the drying process.

The second page of the settings menu contains system timer set points.

Another function given in the "Settings" menu is the option to set the factory defaults. The last button on this page allows the user to restore the factory settings and eliminate all user calibrations to sensors and start over from square one. This is helpful if multiple users run the dryer during the same season or if the user wishes to start over from the beginning.

Before Loading or Starting the Dryer

Caution Ensure that all safety shields are in place. Ensure that outside access covers on both sides of Dryer are secured and latched.

Dryer Startup Preliminary Steps

1. Prior to starting the dryer, turn the Main Disconnect on the front of the power box to "OFF".
2. Open the front panel of the power box by turning the chrome cabinet latch 1/4 turn (see below).
3. Ensure that all circuit breakers and/or starter/protectors in the power box are turned ON for dryer operation.



4. Close the power box front panel and latch by turning the chrome cabinet latch 1/4 turn.
5. Engage the main disconnect, by turning the lever 45° clockwise indicating "ON". The main disconnect lever must appear as shown for dryer operation. On the left front side of the power box, pull the red "Emergency Stop" button out. The "Emergency Stop" button illuminates RED when pulled out with the main disconnect "ON".



Dryer Operation

Four automatic operations have been designed to operate the Sukup QuadraTouch™ Dryer.

1. Continuous Flow
2. Autobatch
3. Grain Transfer
4. Final Dry

In addition to drying in automatic modes, the QuadraTouch™ allows the user to use a “Manual Operation” mode inside the “Tools” menu. This gives the user full control over the fan(s), heater(s), load, and unload.

As an option, the QuadraTouch™ dryer is also equipped with a manual backup system. Located just above the power box (on axial fan units, different location on centrifugal models), this box allows the user to manually turn on the fan(s), heater(s), etc using switches.

To operate the dryer in any automatic mode including the “Manual Operation” mode on the QuadraTouch™ controller, select the “COMPUTER” position of the system control switch on the side of the power box – below the Emergency Stop.

Operating the dryer using the manual backup system mode requires turning the system control switch to the “MANUAL” position.

In manual mode (from the QuadraTouch™ controller or backup system), when turning the switches to the on position, this will start the corresponding device ***immediately***.

Continuous Flow

Two options exist to begin the operation of continuous flow: Initial Dry and Restart. If Restart is chosen, the user will have the option of restarting ***with or without*** Stabilization. The table below details the starting scenarios to choose the correct method to start the dryer.

Start/Restart Scenario	Initial Dry w/ Stabilization	Restart with Stabilization	Restart without Stabilization
All wet grain, No gradient established	Yes	No	No
Shutdown greater than 1 Hour, gradient established, grain cool	No	Yes	No
Shutdown less than 1 Hour, gradient established	No	No	Yes

Functional Maintenance Requirements

Functional Maintenance Requirements

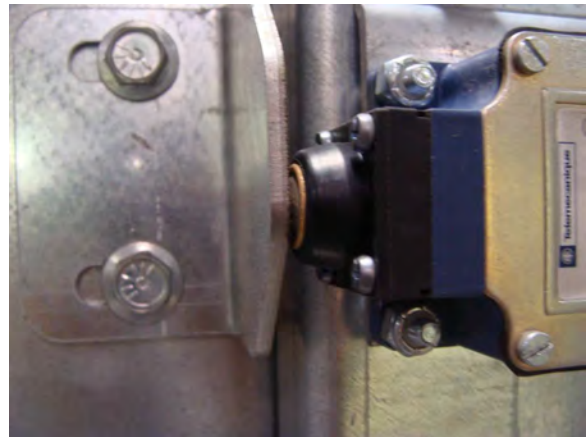
Start of Drying Season Requirements

At the start of every drying season, the Trantorque bushing on each fan(s) must be checked for proper torque. See Appendix A in the Installation tab of this manual for more information.

Daily Maintenance Requirements

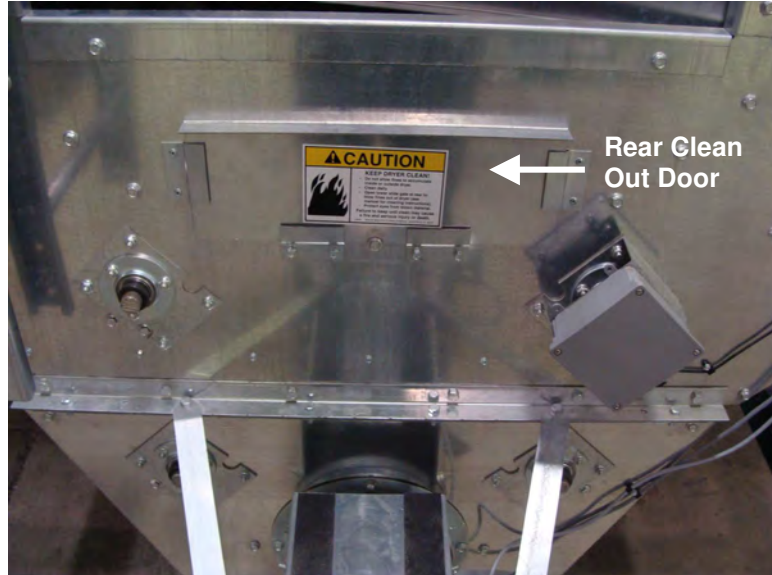
This assumes 24-hour day operation during harvest.

1. Clean foreign material from fan air inlet screen.
2. Sweep off top of exhaust slope where fines may have accumulated on the outer perforated skins.
3. Visually inspect for an even grain movement along all perforated panels of the lower outer grain column slope. If grain in one section is not moving, or it is moving slowly, check for obstructions in the flow gate area or columns. Pay particular attention to the area directly under the wet holding portion of the dryer where excessive amounts of fines and foreign material can accumulate.
4. Perform plenum cleanout where fines and foreign material may have accumulated. **Shut the Dryer down.** Open rear access door. Sweep all fines and debris from front of plenum area to the rear plenum area. Close rear access door and the rear door switch will depress as shown here:

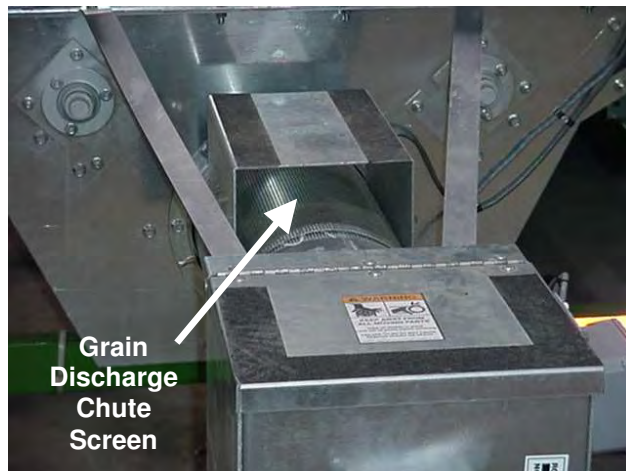


Functional Maintenance Requirements

5. Open rear clean out door

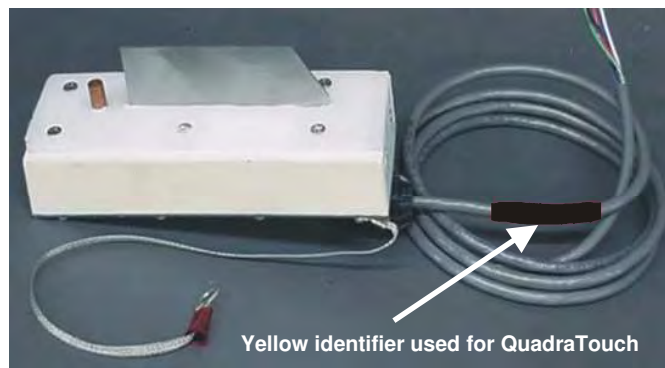
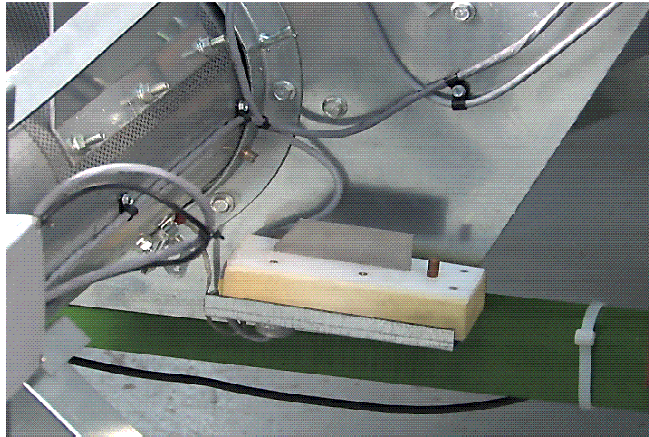


6. Operate the fan only by either running it in the Dry Fire mode or in the manual mode. Continue running the fan until no more fines / debris come out of the rear clean out.
7. Turn fan off.
8. Reinstall rear clean out door.
9. Sweep fines / debris off discharge chute screen.



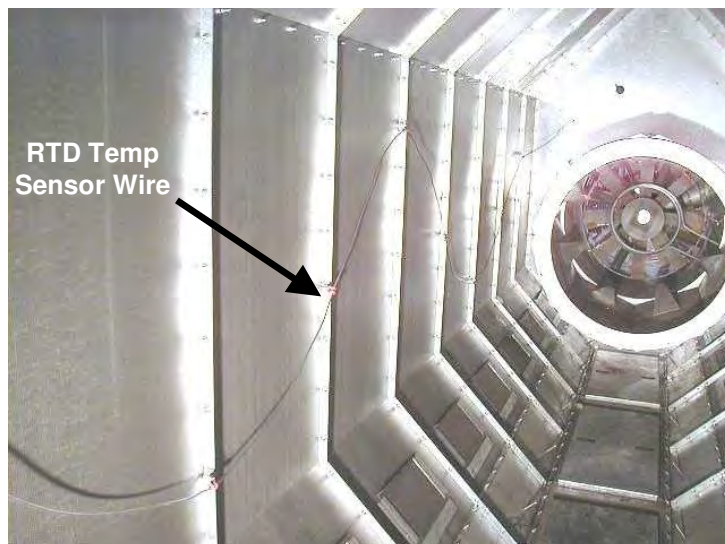
Functional Maintenance Requirements

10. Remove discharge moisture sensor and clean sensor flag and copper tube.



Reinstall moisture sensor.

11. Inspect temperature sensor wire (RTD). Clean if necessary.

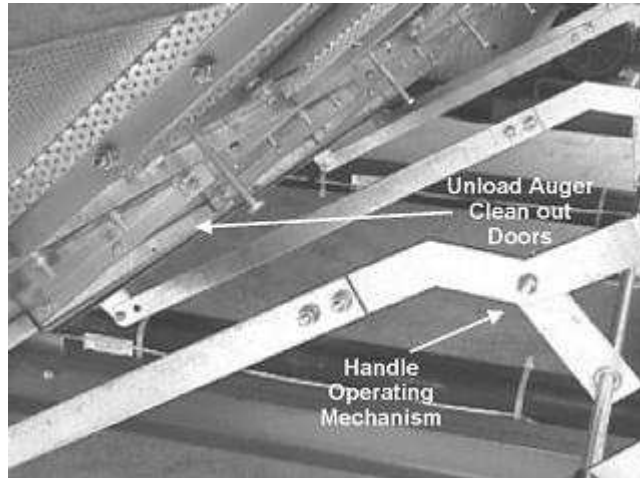


12. Restart dryer operation per automatic control or per manual control

Functional Maintenance Requirements

Semi-weekly Maintenance requirements

1. Perform all steps of daily maintenance requirements as listed in previous section, except step 12, restarting dryer.
2. Open inner and outer unload auger clean out / access doors.



3. Inspect unload auger area and meter roll area for obstructions, fines, and debris. Clean as necessary. Close inner and outer unload auger cleanout / access doors.
4. Restart dryer operation per automatic control or per manual control.

Functional Maintenance Requirements

Weekly Maintenance requirements

1. Unload grain from dryer by performing Final Dry in automatic.
2. Perform all steps from the Daily and Semi-weekly requirements except for restarting dryer.
3. Thoroughly inspect grain columns for accumulation of trash and fines, at peak of inner perforated grain walls, and above meter roll flow gates.
4. Check tension of load and unload auger drive belts.
5. Restart the dryer per automatic control (Initial Load, Initial Dry).

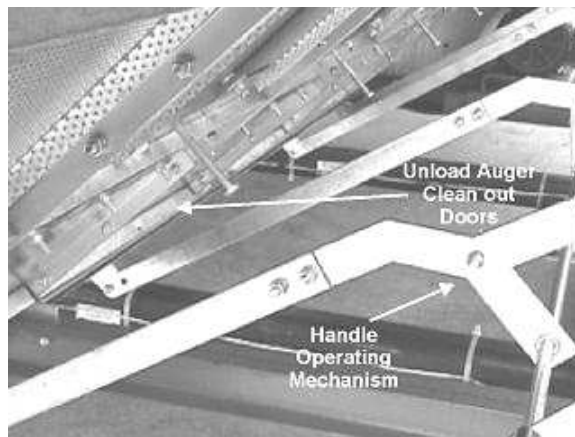
End of Season Maintenance requirements

1. After dryer is unloaded for the last time, open all access doors and panels. Thoroughly clean the entire dryer by sweeping and using both compressed air and vacuuming. Ensure cleaning of the wet bin trash pan.

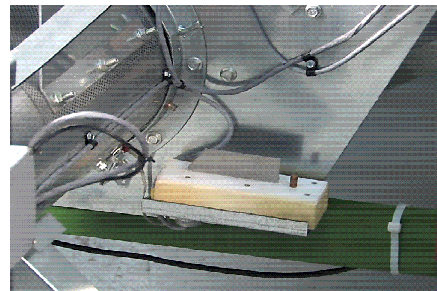
Caution

Do not blow compressed air directly into static air pressure switch.

2. Perform all steps listed in prior to season maintenance inspection.
3. **Leave the Unload Auger clean out doors open for water drainage.**



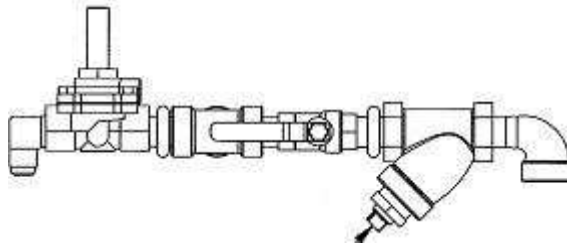
4. Lock out electrical power.
5. Install a cover on fan inlet screen to keep debris from entering the fan and to keep the fan from windmilling. Never place obstacles in the way of the fan to stop rotation.
6. Remove discharge moisture sensor from grain discharge chute and put into sensor holder (sensor could be damaged by standing water if left inside tube).



Functional Maintenance Requirements

Pre-Season Maintenance requirements

1. Remove fan inlet cover and control box cover. Make sure fans are free and clear to rotate. Apply electrical power.
2. Operate the fan, load auger, unload auger and meter rolls for 10 minutes using the **Dry Fire / Test** mode ([see page 15](#)). This will redistribute the grease in the motor bearings, auger bearings, reduction gearbox and meter roll drive train.
3. Remove and lock out electrical power, reinstall covers.
4. Remove Wye strainer on the Liquid pipe train (see picture below) and clean out all fines. Replace strainer.



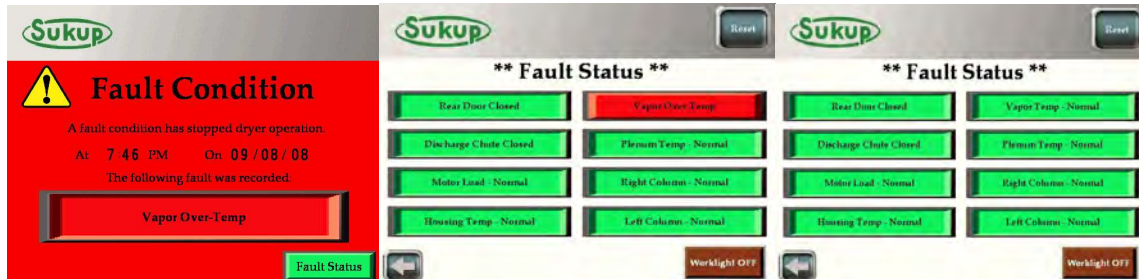
Wye Strainer/filter
remove at hex nut

Shutdown Faults

Shutdown Faults

In the event of a fault, the system will automatically shut down all fans, heaters, load, unload, and auxiliary devices. Each time a fault occurs, the system will display a red screen with the time, date, and cause of shutdown.

When a fault occurs, the user will have the option to touch the “Fault Status” button on the bottom, right-hand portion of the screen. This will show the user if a fault still exists in the system. It will be denoted by a red color. When the fault is cleared, it will turn from red to green.



! Warning

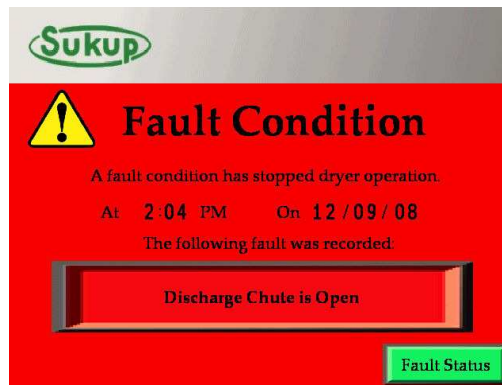
If necessary, when a fault occurs, power must be disconnected from the dryer and gas must be turned off before correcting the fault. If at all unsure, contact your Sukup dealer. Be cautious of other people or objects around the dryer.

If delay timers are programmed under the second page of the settings menu, the fan/unload motors may continue to run after some fault conditions.

Example: In the second page of the settings menu, there is a Fan Delay Option. This option allows the fan to run in the event of a user shutdown or a fault shutdown that isn't related to the fan. This is also true of the unload cleanout timer setting.

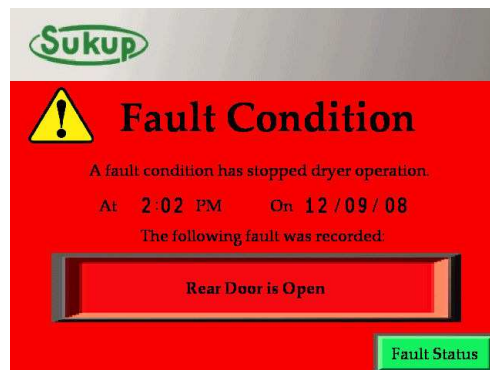
All fault messages are latched, meaning that they will remain on screen until the operator acknowledges the message by pressing the “Fault Status” button followed by the “Reset” button. This is useful in the event of a nuisance trip that may have otherwise reset by the time the operator realizes that the dryer has shut down. The following pages show the system shutdown faults as well as give a description of possible problems and their solutions.

Grain Discharge Chute / Unload Auger Warning



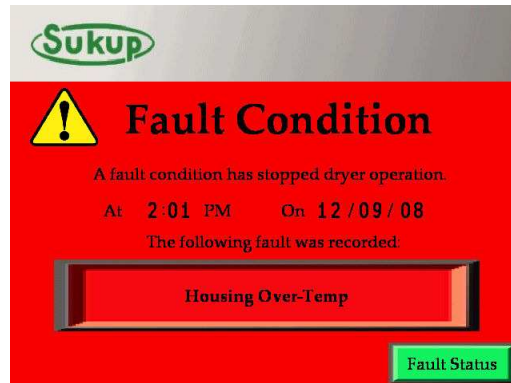
Possible Problems	Possible Solutions
Grain Discharge lid opened	✓ Return lid to a closed position
Grain overflow of discharge	✓ Slow maximum roll speed. (Grain may over dry) ✓ Ensure that take-away system is operating properly. ✓ Lower plenum temperature, (if necessary) to prevent grain from over drying. Maximum roll speed is indicated by an asterisk on screen following roll order %.
Broken or jammed unload auger	✓ Check unload auger for broken flighting or foreign material. ✓ Check motor and belts.

Rear Access Door Open



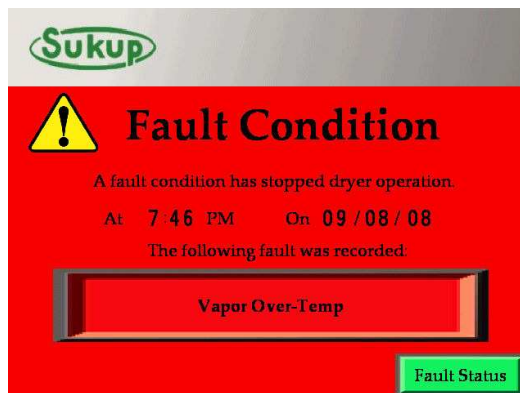
Possible Problems	Possible Solutions
Rear door is open or push-button switch is not being depressed.	✓ Check rear door for door/switch contact.

Housing High Temperature Alarm



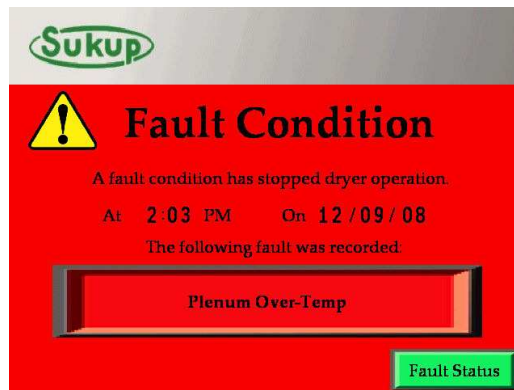
Possible Problems	Possible Solutions
Housing temperature has exceeded 200°F	✓ Manually reset switch on top of fan barrel of proper heater after temperature has gone down. Refer to heater operation section. ✓ Check condition of fan blade and for proper rotation. ✓ Check for plugged fan grill. ✓ Check for defective MOD valve.

Vaporizer High Temperature Alarm



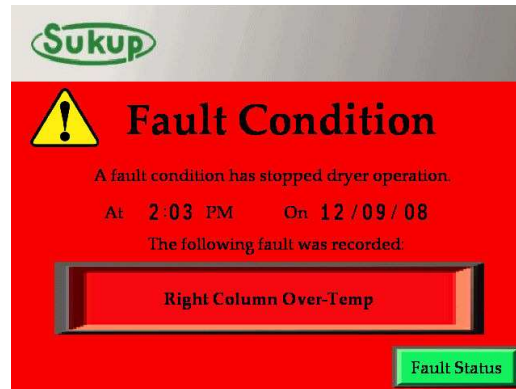
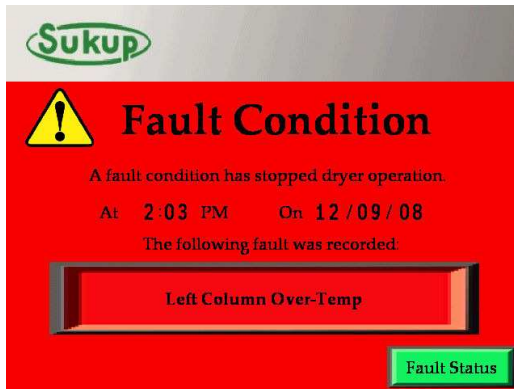
Possible Problems	Possible Solutions
Vapor coil exceeded 140°F	✓ Supply tank may be low. Fill tank ✓ Vaporizer misadjusted, readjust, and refer to the heater operation section. ✓ Fan airflow obstructed. Check for obstructions.

Plenum High Temperature Alarm



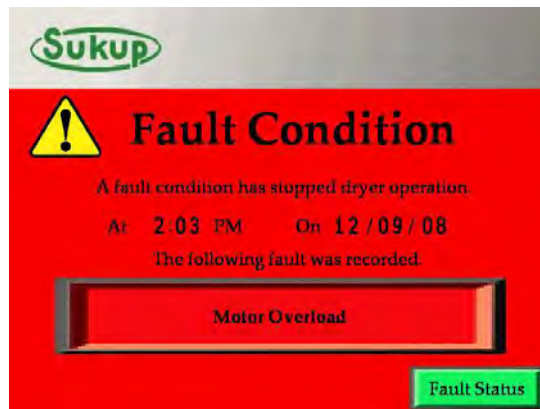
Possible Problems	Possible Solutions
Temperature exceeded 325°F for capillary	✓ Check plenum by placing back of hand near rear door, checking for heat. If ok, enter the plenum and assess problem. ✓ Plenum temperature set too high (adjust setting). ✓ The electronic mod valve malfunctioned and/or needs to be re-adjusted.

Grain Column High Temperature Alarms



Possible Problems	Possible Solutions
Column temperature exceeds 210°F	✓ Check for stagnant column that has overheated. Unplug if necessary. ✓ Lower the plenum temperature if no columns are plugged. ✓ Unload dryer and check for restrictions, plugging, or slow columns.

Motor Thermal Overload Alarm



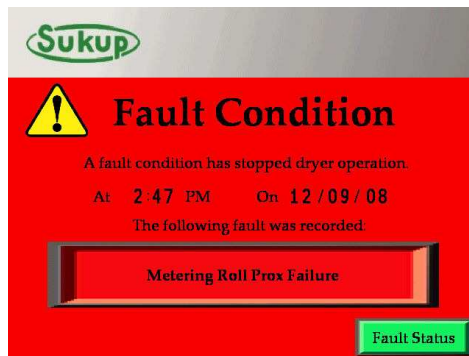
Possible Problems	Possible Solutions
Motor overload occurred for fan, load or unload auger, or auxiliary device.	✓ Check starter protectors, breakers and thermal overloads in power and auxiliary box for a trip. Check faulted device for possible overheating conditions caused by an obstruction in the auger or a bad bearing in the motor or auger.

Analog Sensor Not Found



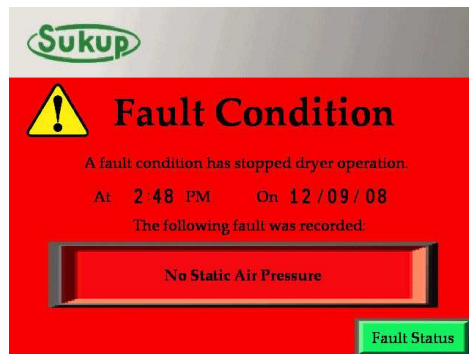
Possible Problems	Possible Solutions
The analog sensors (Moisture Sensor and Plenum RTD transmitters) are not transmitting the correct voltages back to the PLC.	✓ This means a break in the connection between the device and the PLC. To correct the problem, start near the device with a voltmeter and check each connection down the line. If a "Grain Temp Sensor Not Found" occurs, check the junction box at the rear of the dryer for voltage between 95 (ground) and D3 (blue wire). The voltage will read from 0-3Vdc. 1 VDC = 100 °F ✓ Check if sensor is placed in operating position.

Meter Roll Failure



Possible Problems	Possible Solutions
Meter rolls have stopped turning	✓ Check for obstruction in meter rolls. ✓ Check chain linkage for broken chain. ✓ Check proximity switch adjustment. ✓ Check for motor rotation or voltage.

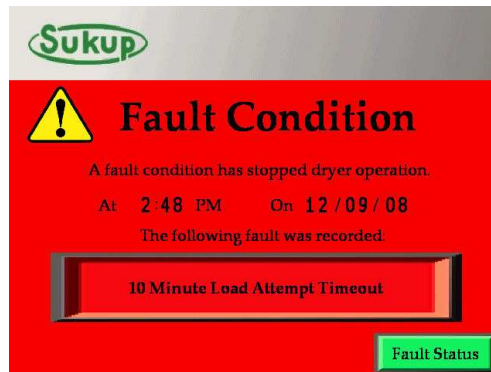
Low / No Static Air Pressure



Possible Problems	Possible Solutions
Internal plenum pressure could not be reached upon start-up.	✓ Dryer is not filling. Check load auger for proper operation.
Internal plenum pressure was lost during operation. This will occur when the fan is started and static air pressure is not detected within 5 seconds.	✓ Wet bin has run out of grain and allowed the plenum to release air pressure before out of wet grain timeout occurs.
Air switch out of calibration	✓ Refer to the Service Manual 3-15 for calibration.

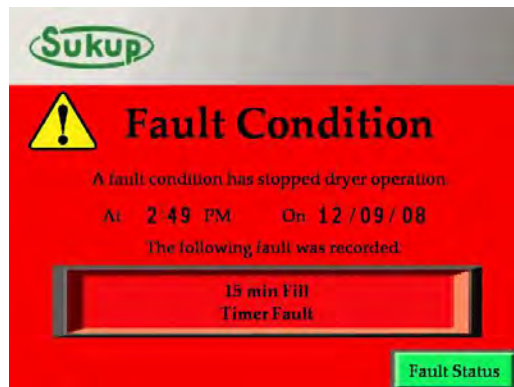
Shutdown Faults

10 Minute Out of Wet Grain – (Dryer is not full)



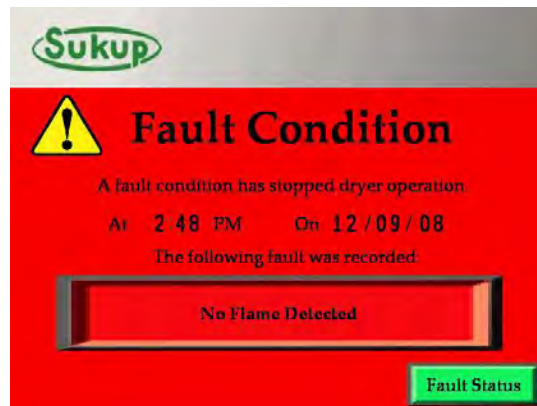
Possible Problems	Possible Solutions
Paddle switch not satisfied in under 10 minutes	✓ Supply more grain to dryer.
Wet bin has been emptied	✓ Run Final Dry if end of season
Fill device has failed	✓ Check all fill devices
Dryer unloading faster than filling	✓ Make sure the load delay setting is set to "0" seconds.

15 Minutes (Without) Fill Timer Fault— (Dryer is full)



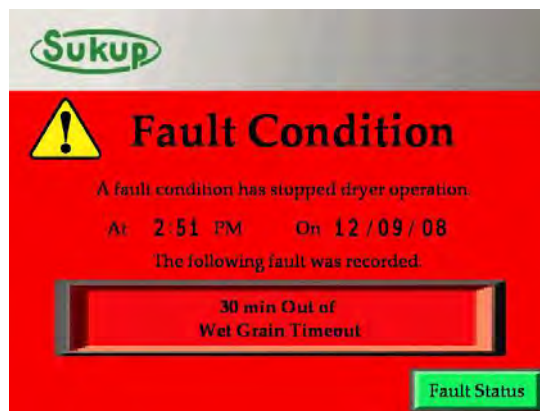
Possible Problems	Possible Solutions
Dryer must fill at least once every 15 minutes when unloading for Continuous Flow. The paddle switches contained in the grain level switch are stuck in the "On" position.	✓ Broken unload auger/belt or meter roll chain. ✓ Make sure the grain level indicator can move freely.

Heater Fault



This will occur if the flame rod does not sense flame within 45 seconds of heater ignition.

30 minute Out of Wet Grain timeout



During Grain Transfer mode, if the paddle switches are not satisfied in 30 minutes, a fault shutdown is initiated.

Appendix A – Auxiliary Motor Operation and Installation

Auxiliary controls can be set up in a number of configurations. Three control circuits exist, one for the auxiliary unload and two for the auxiliary fill.

For the unload system, a single control circuit is used to start and stop an external unload device at the **same time** as the unload auger of the dryer.

The auxiliary fill operations have **two** control circuits. When commencing the load sequence, there is a **delay of 5 seconds** between the start of the load motor and the first auxiliary. After the first auxiliary has started, there is an **additional 5-second delay** before the second auxiliary is started.

The fill paddle will send a signal to the control system that the dryer is nearly full, a switch is triggered to turn the second auxiliary load off. When the second switch is triggered, the first auxiliary and the load auger are shut off. The dryer will not call for grain again until both paddle switches are in their respective “OFF” (down) positions.

Caution

Auxiliary components should not be installed in the power box, only in auxiliary box located above the power box.

Installing the components

When installing the components into the box, the starter/protector is mounted on the top DIN rail and the contactor is mounted on the middle DIN rail directly below.

If the components kits are purchased from Sukup Mfg. Co., the starter/protector and contactors will be pre-wired together.



Wiring the components

Wiring the auxiliaries:

1. Terminal Assignments (Dry Contacts—Potential Free):
 - a. 5 & 7 Load Auxiliary 1 (i.e. Incline)
 - b. 8 & 9 Load Auxiliary 2 (i.e. Horizontal)
 - c. 14 & 15 Unload Auxiliary

IMPORTANT!!!! Terminals 5 & 7, 8 & 9, and 14 & 15 are all potential free contacts. This means that there is no voltage present on these terminals when it leaves the factory. If the auxiliary contactors use a 110VAC coil voltage, supply terminals 5 and 8 with 110VAC via a jumper wire from 1. Therefore, 7 and 9 will be the coil voltages for Load Auxiliaries 1 and 2 respectively.

Special NOTE

If the contactors being used are not purchased from Sukup Manufacturing Company **AND** use a coil voltage other than 115VAC, **DO NOT** jumper 1 to 5 & 8. Supply terminals 5 & 8 with the correct coil voltage.

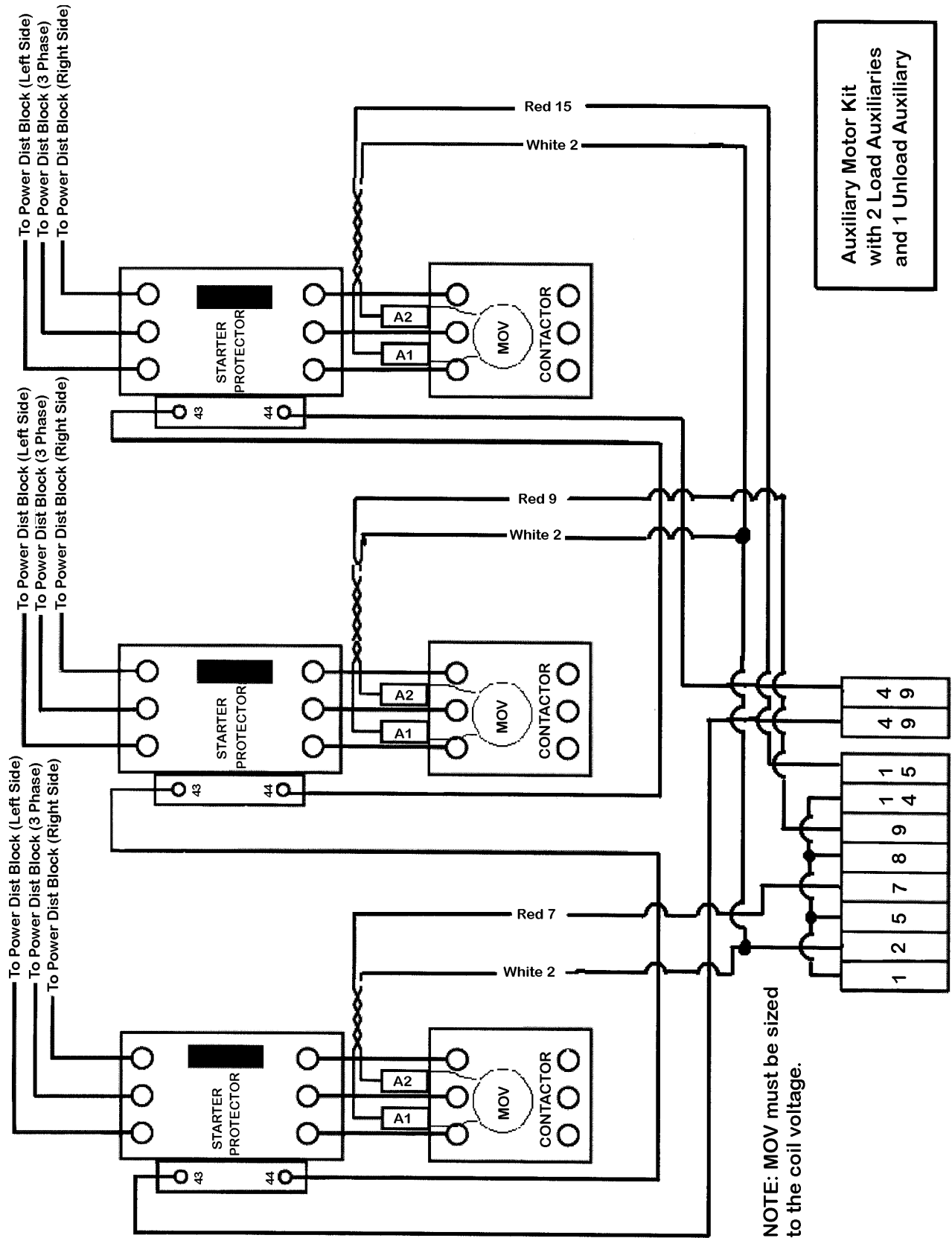
2. Fault protection wiring
 - Wire 49D – Fed from terminal into first auxiliary N/O contact (will be closed during normal operation)
 - All contacts are then wired in series
 - Wire 49E – Taken from last contact to terminal strip
3. Power wiring
 - Installed similar to those located in power box
 - Direct wire leaving space from transformer as it heats up slightly during operation.

Caution

If contacts installed are not purchased from Sukup Manufacturing, fault protection must be installed. Contact Sukup Manufacturing to purchase these components.

NOTE: On three-phase systems, wild leg should always be connected to the <u>center</u> terminal of the Main Disconnect Switch.
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Appendix B

Appendix B – Tonnes per Hour Information (Corn)

Approximate Tonnes per Hour Information for each Module

% METER ROLL	DRYER									
	12-ft. 1 Module	16-ft. 1 Module	20-ft. 1 Module	24-ft. 1 Module	28-ft. 1 Module	16-ft. 2 Module	20-ft. 2 Module	24-ft. 2 Module	20-ft. 3 Module	24-ft. 3 Module
10%	3	4	5	6	7	6	7.6	9	7.6	9
20%	6	8	10	12	14	12	15	18	15	18
30%	9	12	15	18	21	18	23	27	23	27
40%	12	16	20	24	28	24	30	36.6	30	36.6
50%	15	20	25	30	35.6	30	38	45.7	38	45.7
60%	18	24	30	36.6	42.7	36.6	45.7	55	45.7	55
70%	21	28	35.6	42.7	50	42.7	53	64	53	64
80%	24	32.5	40.6	49	57	49	61	73	61	73
90%	27	36.6	45.7	55	64	55	68.6	82	68.6	82
100%	30	40.6	51	61	71	61	76	91	76	91

The above chart is an *approximation* only!

Appendix C – Dryer Startup Checklist

Following are the minimum operator actions required to successfully start the Dryer

Warning

Augers, fans, and heaters will start with out warning at the appropriate times. Please use caution around dryer.

1. Open the power box and ensure that all internal breakers and starter protectors are turned on. Close the door to the power box, close the latch, and turn the master disconnect "ON".
2. On the power box, pull the Emergency Stop button out. It should illuminate red. If using the QuadraTouch™ controller, the System Control Switch needs to be turned to the "COMPUTER" position. If using the manual backup system, "MANUAL" needs to be selected.
3. The Display should show "System Ready". All faults must be cleared before the dryer can start. Press "Start" to choose an operation.
4. The display will give the options of selecting Continuous Flow, Autobatch, rain Transfer, and Final Dry. Press "Reset" to abort dryer startup.

For Continuous Flow

- Operator must select Initial Dry, Restart & Stabilization, or Restart without Stabilization.

Initial Dry

- Input Moisture Set, Output Moisture Set, Maximum Roller Speed, Minimum Roller Speed must be accepted or changed.
- A 160°F (71°C) plenum temperature is required for an Initial Dry
- It is **HIGHLY RECOMMENDED** that the operator is at the dryer to verify the grain moisture accuracy once sampling has started and calibrate if necessary.
- If an output sensor moisture or temperature calibration adjustment is necessary, while the dryer is sampling, press "Tools" and select "Calibrate Sensors" to change the moisture or temperature. Once the required calibration adjust has been entered, the dryer will recommence with the moisture sampling. Allow 30 minutes for the dryer to stabilize before repeating this procedure.

Restart & Stabilization

- Input Moisture Set, Output Moisture Set, Maximum Roller Speed, Minimum Roller Speed must be accepted or changed.
- Plenum temperatures and meter roll speed must be accepted or changed.
- Dryer will run through stabilization. This choice is **recommended** if dryer has been off for longer than three (3) hours and the grain in the dryer is partially dry.

Restart without Stabilization

- If dryer has been off for less than 1 hour and the grain has retained some heat from the last drying sequence, it is **recommended** that this option be used.
- If dryer is off for more than one (1) hour, the operator can choose to use stabilization or can skip that option.

For Automatic Batch

- If user has the “Temperature Option”, the user must choose if the dryer will run in Time Setting or Temperature Setting.
- When the Time Option is chosen, user must decide the times for heating and cooling of the grain.
- If the Temperature Option is present and chosen, user must decide the temperature for heating and time for cooling the grain.
- When the dryer unloads the grain, the meter rolls will run at the maximum meter roll setting given by the operator.

For Grain Transfer

- Dryer operator must decide the maximum meter roll speed for this option.
- **Do not** exceed unload system capability.

Appendix D – Heater Operations (CE)**3-Wire Air Switch without Low Pressure Switch**

The following parts will be found on either the gas pipe train or in the heater box.

- Automatic Valve Proving Control – LDU11 – heater box
- Valve Proving Pressure Switch – low and high – between the upstream and downstream valves on the pipe train
- CE Gas Burner Control – LME21.350A1 – heater box
- High Pressure Switch – pipe train – after downstream valve
- Housing High Temperature Switch – 5 x 5 box on fan barrel
- Differential Air Switch – heater box
- Vapor Over-Temp Switch (on LP systems) – pipe train
- Ignition Transformer – heater box
- Main – Upstream Gas Valve – pipe train
- Blocking – Downstream Gas Valve – pipe train
- Electronic Modulating Gas Valve (EMOV) – pipe train

Burner Operation

On heaters *not* requiring the LDU11 valve proving control (28" heater), once the burner control relay is energized, 120VAC must flow through the housing O/T, and the high-pressure switch, before being applied to the CE heater control unit (LME21.350A1).

On heaters requiring the LDU11 (valve proving control), once the main power is being supplied to the dryer, 120 VAC is supplied directly to the LDU11.

The LDU11 valve proving control goes through two valve tests. During TEST 1, the **downstream** valve is energized for 4 seconds, evacuating all of the gas pressure between the upstream and the downstream valves. This test is used to determine if an increase in pressure is detected between the two valves by the valve proving pressure switch. If an increase in pressure is detected, TEST 1 will FAIL, and lockout will occur. The valve proving control can be reset by pressing the clear plastic on top of the unit, or by pressing the reset button on the side of the power box. During TEST 1, a voltage is output from terminal 15 of the LDU11. If no leaks are present, pressure will remain low and the voltage will pass through the N.C. contacts and be present on terminal 16 of the LDU11. If TEST 1 has not failed, TEST 2 will begin.

In TEST 2, the **upstream** valve is energized for 4 seconds, which pressurizes the piping between the two valves. If a decrease in pressure is detected by the valve-proving pressure switch, TEST 2 will fail and lockout will occur. The valve proving control can be reset by pressing the clear plastic on top of the unit, or by pressing the reset button on the side of the power box. During TEST 2, a voltage is again output from terminal 15 of the LDU11. If no leaks are present, pressure will remain high and the voltage will be present on terminal 17 of the LDU11. The valve-proving test will be initiated each time main power is supplied to the dryer (not when turning the control system on and off, or going between automatic and manual).

If both test 1 and 2 pass, 120 VAC is output from terminal # 6 of the LDU11. If no faults have been detected by the dryer control system, then, at the proper time, the control system will call for burner operation by closing a set of N.O. contacts. This voltage must flow through the housing high temperature switch, and the high-pressure gas switch.

This voltage is then supplied to terminal # 12 of the CE Burner Control Unit (LME21.350A1).

Upon supplying voltage to the CEBC, the following ignition sequence takes place.

Ignition Sequence

1. 120 VAC is supplied to terminal # 12 of the LME21.350A1 (CEBC).
2. A 2.5 second wait time begins.
3. The fan ON control signal is enabled. This voltage is output on terminal # 3 of the LME21.350A1, which checks for this same voltage on terminal # 6, which comes from a N.C. contact in the differential air switch. This verifies that the fan is off and no airflow is being detected.
4. Within 5 seconds of the fan ON signal being enabled, the differential air switch must close a set of N.O. contacts, which applies this same voltage to terminal # 11. This indicates that air movement has been detected. If this signal is not detected, the unit will go into a fault mode.
5. Upon receiving a voltage on terminal #11, the unit goes into a 30 second pre-purge time delay.
6. Following the purge time, the ignition transformer is energized. After a 2 second pre-ignition time, the fuel valve is opened.
7. The ignition transformer remains energized for an additional 4 seconds. (total of 6 sec.)
8. Flame must be detected within 5 seconds, or the unit will go into a fault mode.
9. The flame signal must be maintained for an additional 10 seconds before opening other fuel valves.

Loss of flame will cause the CEBC to lockout. The unit may be reset by pressing the small clear plastic button on the front of the unit for approximately 2 seconds, or the reset button may be pressed on the side of the power box. 3 attempts will be allowed for burner ignition. On the 4th attempt, the unit will be locked out and power must then be cycled to the unit before the ignition sequence may be re-initiated.

The electronic modulating valve is in the low fire position for the ignition sequence. After flame has been established, the main control system on the dryer will send a control signal to the valve, which will open or close the valve to maintain a desired temperature set point, which is set by the user.

Note

CEBC = CE Burner Control Unit

This is a general description of burner operation. For specific details of the LME21.350A1, please refer to the Siemens bulletin # CC1N7101en.

Appendix E – Heater Troubleshooting Guide**38" / 44" – Fan / Heater**

1. Turn on the main power. The LDU11 (valve proving) should begin rotating.
2. Test 1 releases pressure between the upstream (main) valve and the downstream (blocking) valve.
3. During test 1, the yellow light on the downstream (blocking) actuator will turn on for 4 seconds.
If the test fails, the orange light on the front of the LDU11 will turn on. The test failure is most likely due to a leak. If a leak is not found, a pressure gauge may need to be installed to verify. After being repaired, press the clear plastic window on the front of the LDU11, or press the reset button on the side of the power box, and the next test will begin after rotating to the test 1 starting position.
4. Test 2 pressurizes the piping between the upstream (main) and the downstream (blocking) valve.
5. During test 2, the yellow light on the upstream (main) valve will turn on for 4 seconds. The liquid valve will also be energized at this time. If the test fails, the orange light on the front of the LDU11 will turn on. The test failure is probably due to a leak. If a leak is not found, a pressure gauge may need to be installed to verify. After being repaired, press the clear plastic window on the front of the LDU11, or press the reset button on the side of the power box, and the next test will begin after rotating to the test 1 starting position.
6. If the valve proving test was successful, 120 VAC should now be present on terminal # 6 of the valve proving unit. On the 38" / 44" heaters, this wire number will be 1E. (28" heaters do not use the valve proving unit)

All Burners**NOTE:**

If this is a 38" / 44", the LDU11 valve proving - test 1 & 2 - must have been successfully completed before proceeding.

1. Wire numbers for both the 28" heater, and the 38" / 44" heater are listed in the following paragraphs.
2. If the CE burner control unit (LME21) does not display an orange or red light, measure for 120 VAC at the housing O/T switch on terminal #1 (if 28"), or terminal # A (if 38" / 44"). An orange light indicates the burner sequence has begun – red indicates a fault condition.
3. If 120 VAC is not present, measure both sides of the housing O/T switch. Wires 1 and A (on 28"), A and B (on 38" / 44"). If voltage is present on one side of the housing O/T switch, but not the other side, the housing O/T switch is tripped out or defective. Try pushing the reset button and re-check for voltage.
4. Once 120 VAC is present on both sides of the housing O/T switch, measure wire # A (on 28") or B (on 38" / 44") at the high pressure switch. If 120 VAC is not present, check the

wiring between the housing O/T switch and the high pressure switch. If 120 VAC is present on wire # A (on 28") or B (on 38" / 44"), measure wire B (on 28") or C (on 38" / 44") for 120 VAC. If voltage is not present, the high pressure switch is not adjusted properly or is defective (the contact remains closed, unless the gas pressure exceeds the setting of the pressure switch).

5. If 120 VAC is measured on B (on 28") or C (on 38" or 44"), but not measured on wire # C (on 28") or D (on 38" / 44"), go to the power box and check the heater control relay (CR3 – Lower CR6 - Upper) and the circuit breaker for 120 VAC through both components. Be sure that the control system is calling for heat, and the circuit breaker has not tripped.
6. If voltage is measured on terminal # D (on 28"), or E (on 38" / 44"), the LED on the front of the CE burner control unit will turn on. If the unit had not previously locked out, then the LED should be orange in color. If the indicating light is red, press the clear plastic reset button on the front of the unit (for 2 seconds) or press the reset button on the side of the power box. The red light will go out for a few seconds and come back on with an orange color.
7. The fan should be running at this time.
8. When the orange light comes ON, use a voltmeter to measure 120 VAC on terminal #3 (FO) of the LME21 burner control unit.
9. If 120 VAC is present on terminal # FO, both air switch solenoids should energize. If the air switch solenoids do not energize, and the light on the front of the LME21 burner control unit is orange, the most likely cause would be the differential air switch contact not being in the closed position when the air switch solenoids were first energized.
10. Shortly after both air switch solenoids energize, the 120 VAC will shift (on the air switch contacts) from terminal # 6 to terminal # 11. After the air switch contact has closed, measure for 120 VAC on terminal # 11. If no voltage is present and the fan is running, the venturi is connected backwards, or the air switch needs to be adjusted (turn the adjustment screw all of the way out and turn back in 1 full turn).
11. The yellow light will remain ON (steady) while waiting for the air switch to activate. After approximately 20 seconds, the light will change to red and will not attempt burner ignition. If the air switch did close the contact, 120 VAC can be measured on terminal # 11.
12. After a short purge time (and after 120 VAC was measured on terminal # 11), the yellow light will now begin to flash. At this time, the ignition transformer will energize, followed by the gas valve. Within 1 – 2 seconds, if flame is sensed, the LED will turn green and remain ON.
13. If flame is not detected, check for ignition, and gas supply to the burner. Also, a bad ground will prevent flame from being detected.

Appendix F – Explanation of Heater Box Components

Components:

1. 1 ea LME.21 - CE BURNER CONTROL UNIT
2. 1 ea LDU11 - CE VALVE PROVING UNIT
3. 2 ea ASCO SOLENOIDS (2 ea - used with the differential air switch)
4. 3 ea ICE CUBE RELAYS - RR, IR, FSR
5. 1 ea CE DIFFERENTIAL AIR SWITCH - 3 – WIRE
6. 1 ea IGNITION TRANSFORMER (controlled directly by the LME.21)
7. 1 ea RED INDICATING LIGHT

Reset Relay – (RR) CONTACTS: RR1 & RR2

RR1 – Resets the LME.21 (heater control unit) - Terminal #8 (wire #52) is connected to terminal #2).

RR2 - **28"** (RR2A, RR2B) When the RESET button is pressed on the keypad, the liquid valve opens to pressurize the pipe train in the event that a low pressure switch is included on the pipe train.

RR2 - **38" / 44"** - Resets the LDU11 (valve proving unit) by applying 120 VAC to terminal #18 (wire #65).

Isolation Relay – (IR) CONTACTS: IR1 & IR2

IR1 – **28"** IR1 is closed when the main and blocking gas valves are energized, allowing the flame sense signal back to the dryer control system. The FSR interrupts the signal if no flame is sensed.

IR1 - **38" / 44"** Separates the LDU11 from the reset signal, if the valve proving unit test 1 and 2 were successful.

IR2 - Separates the LDU11 alarm output from the LME.21 alarm output.

Flame Sense Relay - (FSR) CONTACT: FSR1

FSR1 - If this N.C. contact opens (during burner operation), the flame sense signal is lost, and a fault will be detected by the dryer control system and the dryer will be shut down (the burner would already be shut down by the LME.21 Burner Control Unit).

Burner On Relay – (BO)

Prevents the EMOV from opening until burner is lit.

Air Switch

The air switch has 3 colored wires attached to an internal set of contacts. BLUE, RED, and BLACK.

The RED # 6 wire is connected to the N.C. contact.

The BLACK # 11 wire is connected to the N.O. contact.

The BLUE # FO wire is the common connection for the N.O. and N.C contacts.

Red Indicating Light

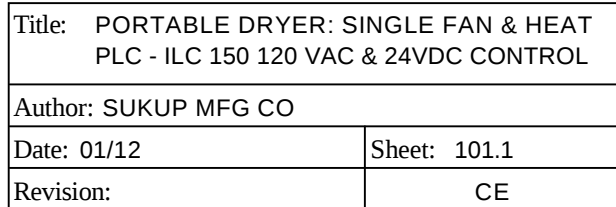
The RED indicating light will illuminate when the gas valves are energized.

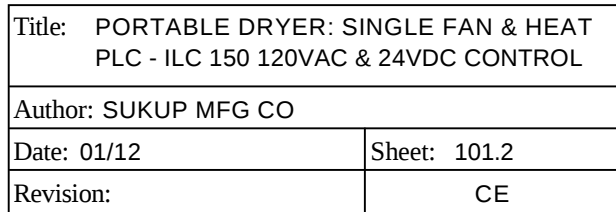
ASCO Solenoid Valves (2 ea)

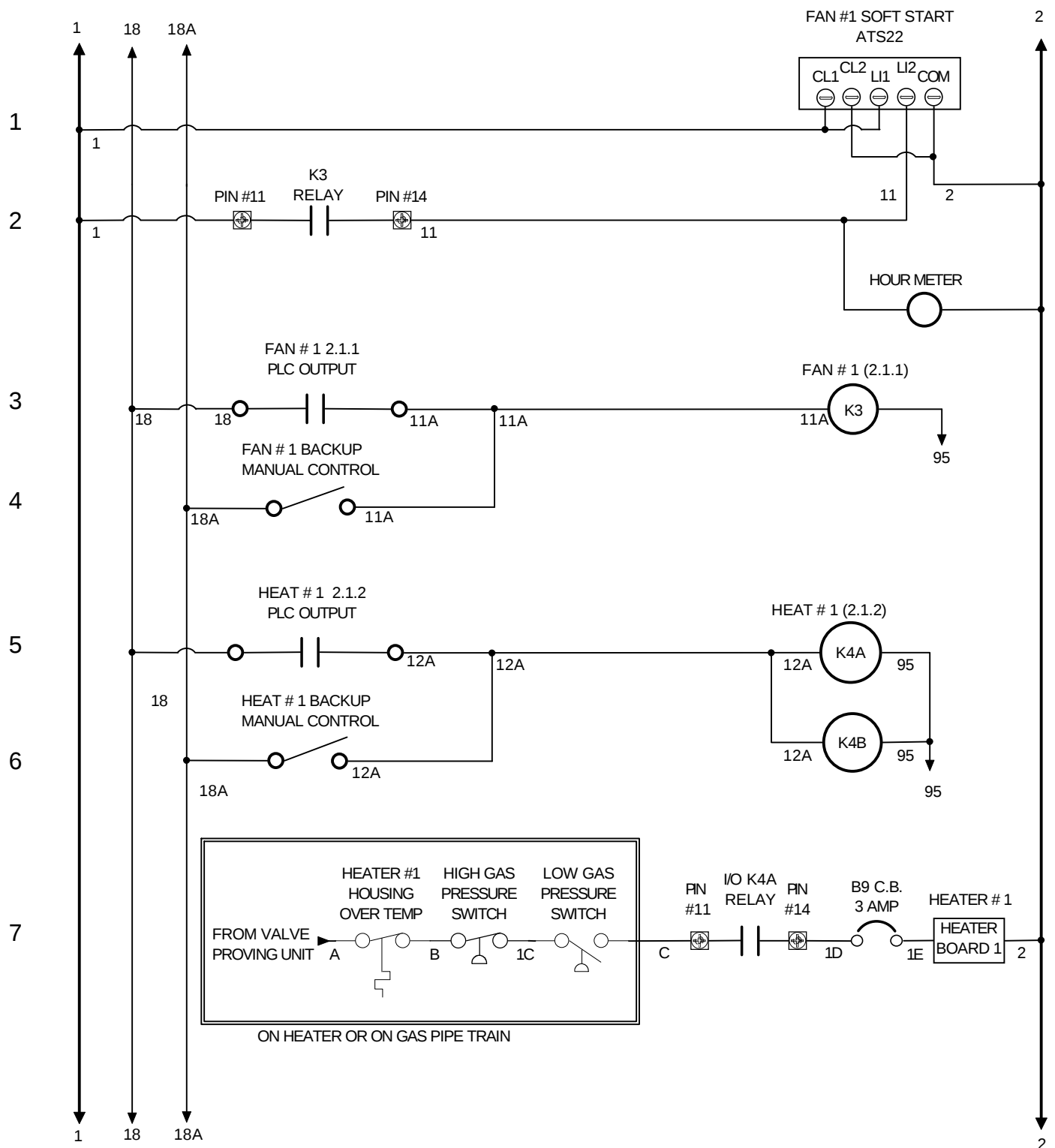
The solenoid valves are energized when the FAN ON signal is present on terminal #3, (wire #FO) of the burner control unit (LME.21). The solenoid valves prevent the differential air flow switch from sensing air flow, except, when the fan is turned on by the LME.21 Burner Control Unit.

Appendix G
Single Fan Electrical Drawings

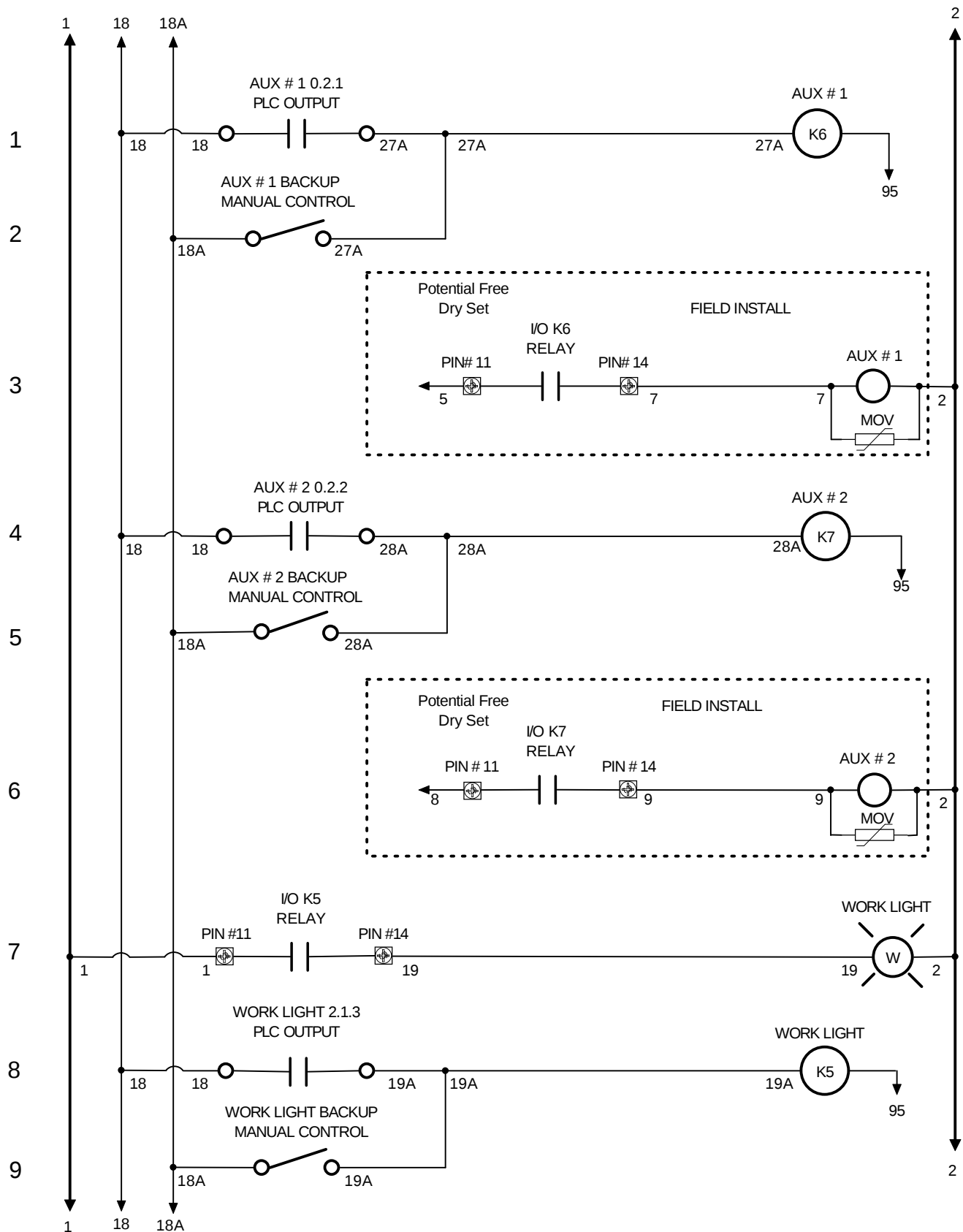
2012
ELECTRICAL DRAWINGS
CE SINGLE FAN & HEAT







Title: PORTABLE DRYER: SINGLE FAN & HEAT PLC - ILC 150 120VAC & 24VDC CONTROL	
Author: SUKUP MFGCO	
Date: 01/12	Sheet: 101.3
Revision:	CE



Title: PORTABLE DRYER: SINGLE FAN & HEAT
PLC - ILC 150 120VAC & 24 VDC CAONTROL

Author: SUKUP MFG CO

Date: 01/12

Sheet: 101.4

Revision:

CE

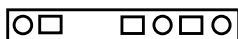
NOTE PAGE

1. The following note applies to MANUAL operation only.

This contact is located on fault relay RL4. The relay is physically mounted on the manual control board. The contact is closed if no faults are present. Check LED # 57 (NO Fault) on the manual control board. This LED should be ON if no faults are present. (Load, Unload, and all Fan switches need to be in the OFF position before the NO Fault LED will turn ON - assuming no other faults are present)

If a fault condition was present, the manual reset (located on the manual control board - upper left corner) will need to be pressed to clear the fault. If the fault condition *has not* been corrected, the RED LED associated with that fault will go out when the reset has been pushed, but will turn ON again within a few seconds, after the faults are scanned.

2. The X indicates the switch position. An X to the left, indicates the switch is in the Manual position, and an X to the right indicates the switch is in the Automatic position.

 - Indicates a power box connection terminal.

WIRES FROM POWER BOX TO HEATER CONTROL BOXES

FAN	WIRE COLOR	POS. 1
38/44	RED	1
	WHITE	2
	ORANGE	18
	BLUE	52
	BLACK	95
	GREEN	GND
	PURPLE	37
	BROWN	45
	GRAY	61
	PINK	1C
	BROWN/WHT	1E

HEATER BOX TERMINALS

POSITION 38"/44"	Emov	HOUSING O/T	HIGH PRESSURE	HEAT ON
# 1	61	A & B	B & C	E

Title: PORTABLE DRYER: SINGLE FAN & HEAT
PLC - ILC 150 NOTE PAGE

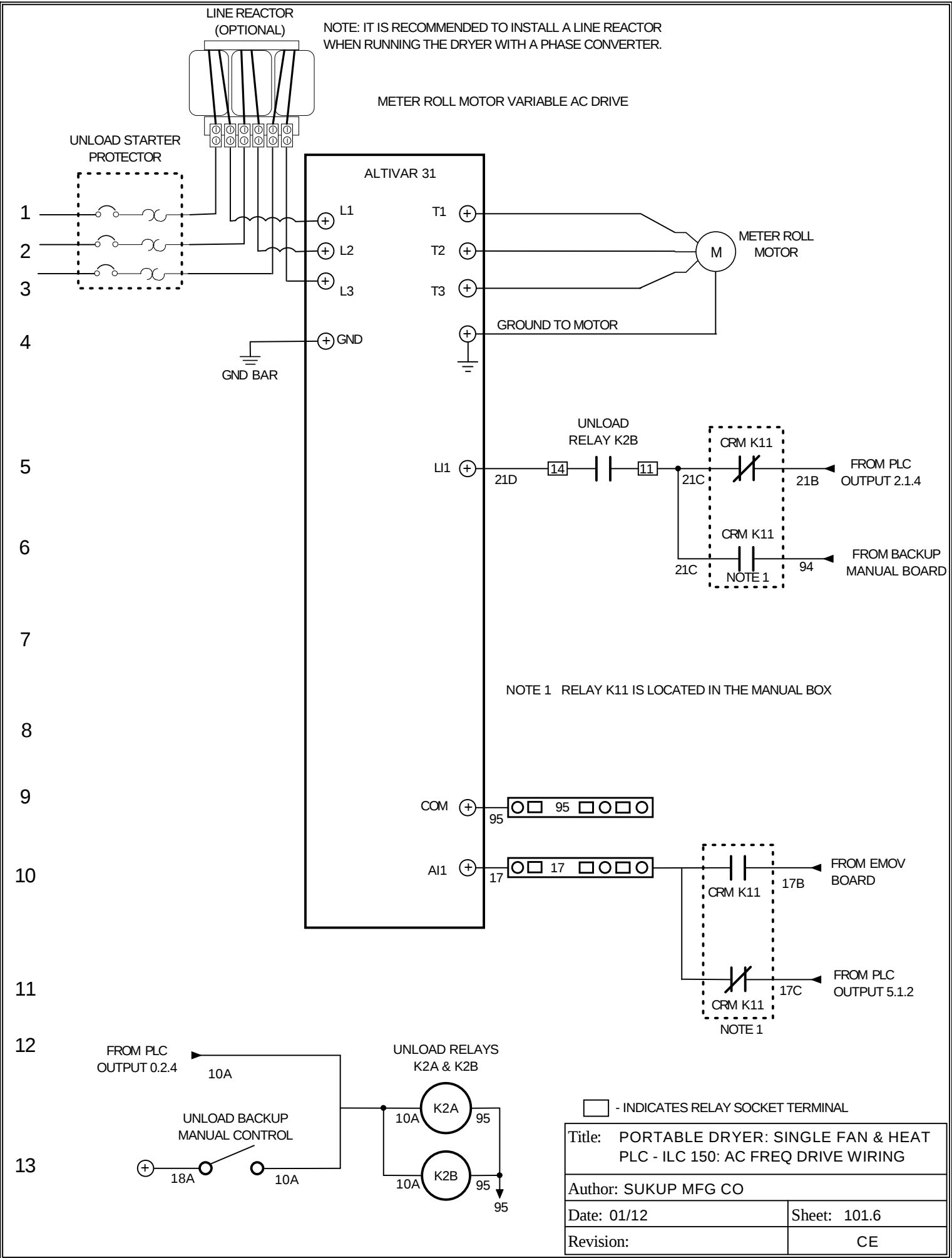
Author: SUKUP MFG CO

Date: 01/10

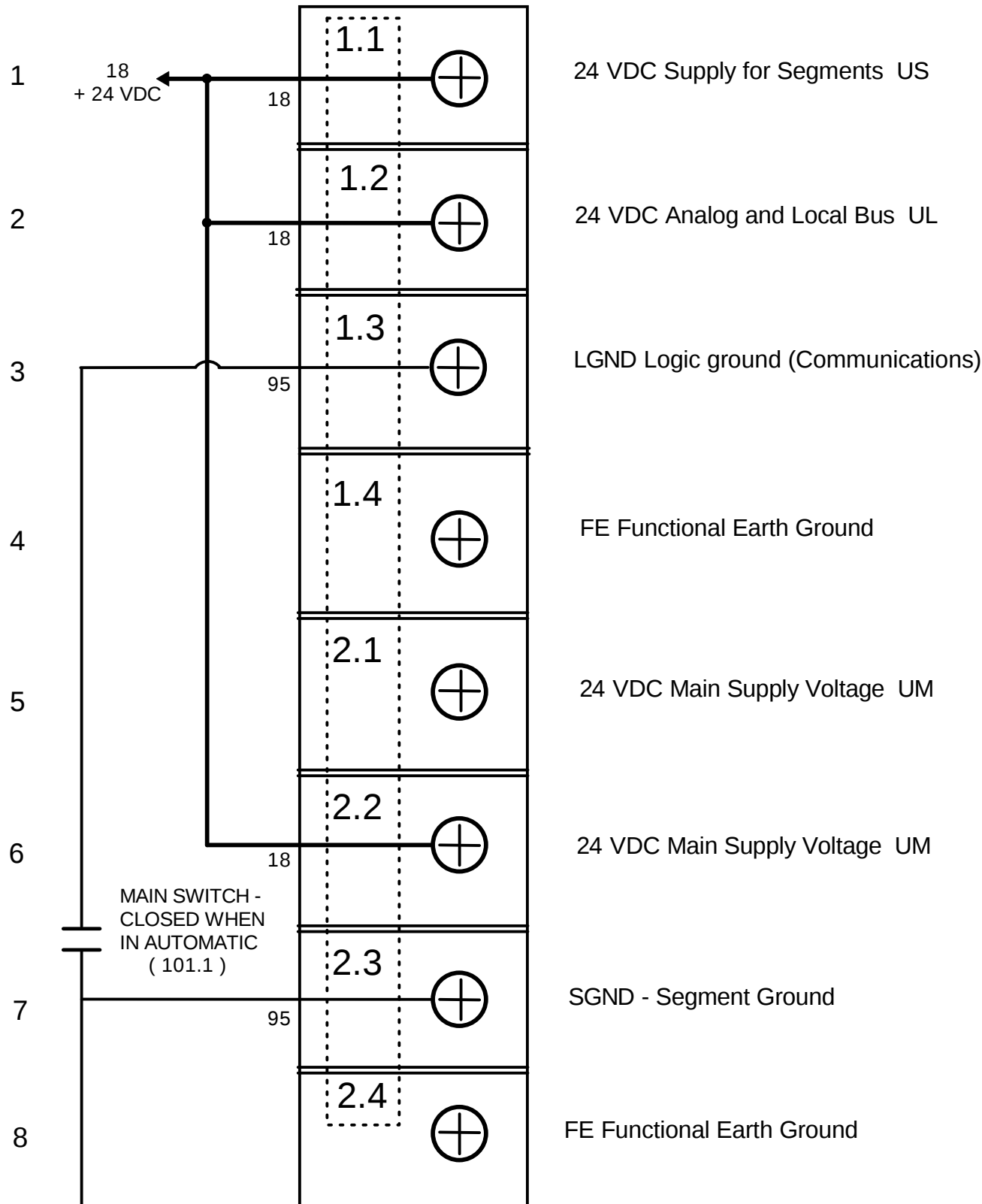
Sheet: 101.5

Revision:

CE



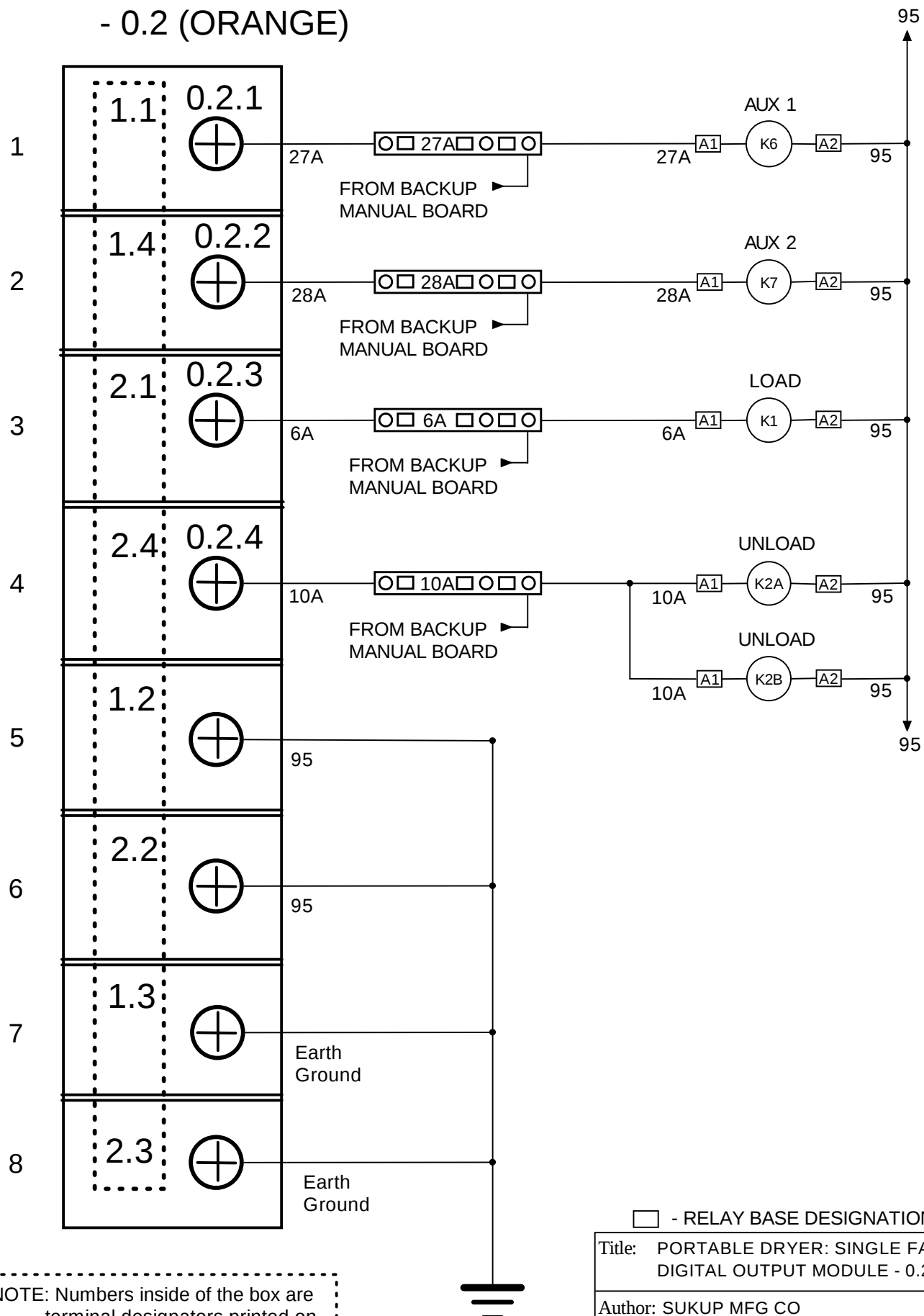
24 VDC POWER SUPPLY MODULE - 0.1 (ORANGE)



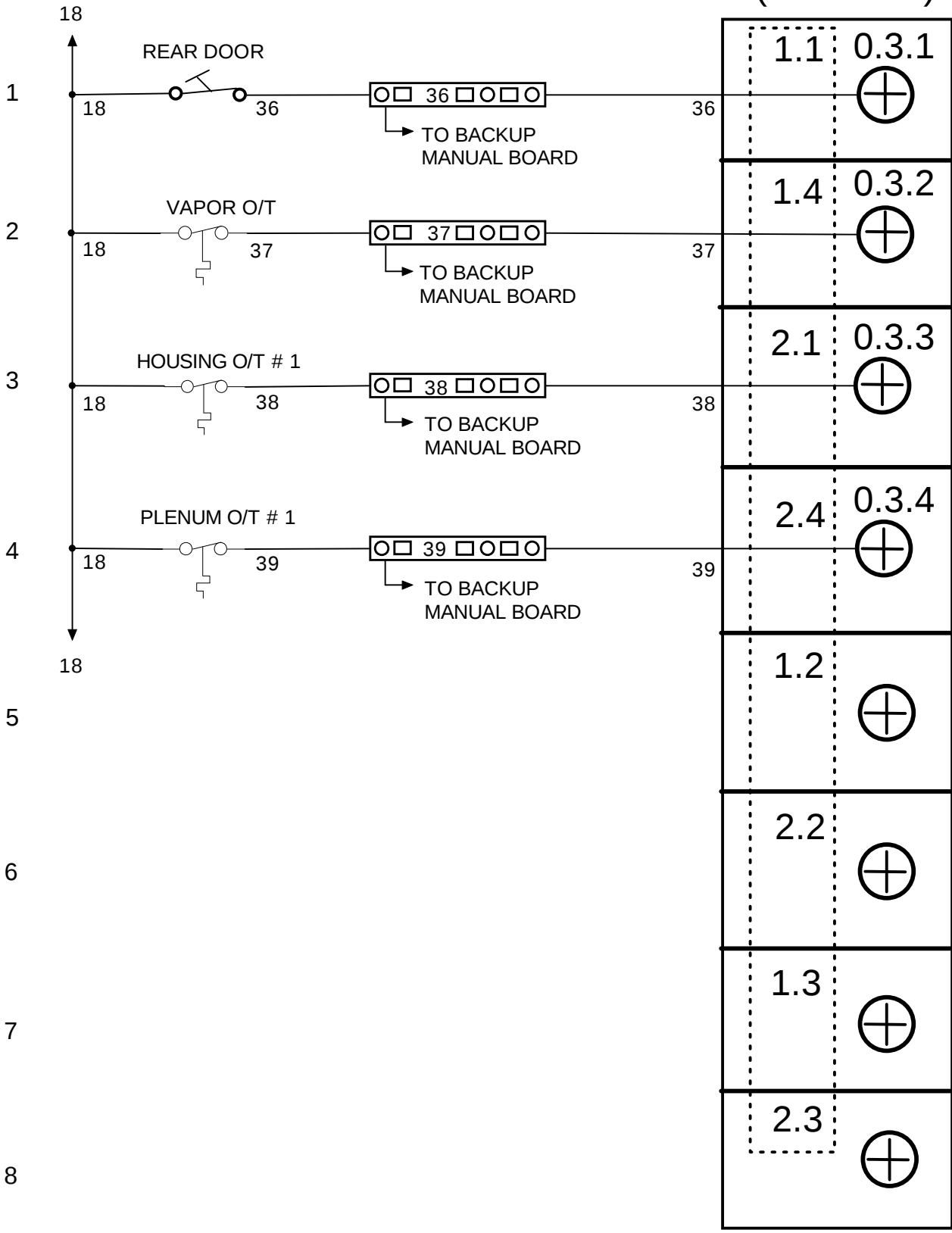
NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: PORTABLE DRYER: SINGLE FAN & HEAT PLC - ILC150, 24VDC POWER SUPPLY	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.7
Revision:	CE

DIGITAL OUTPUT MODULE - 0.2 (ORANGE)



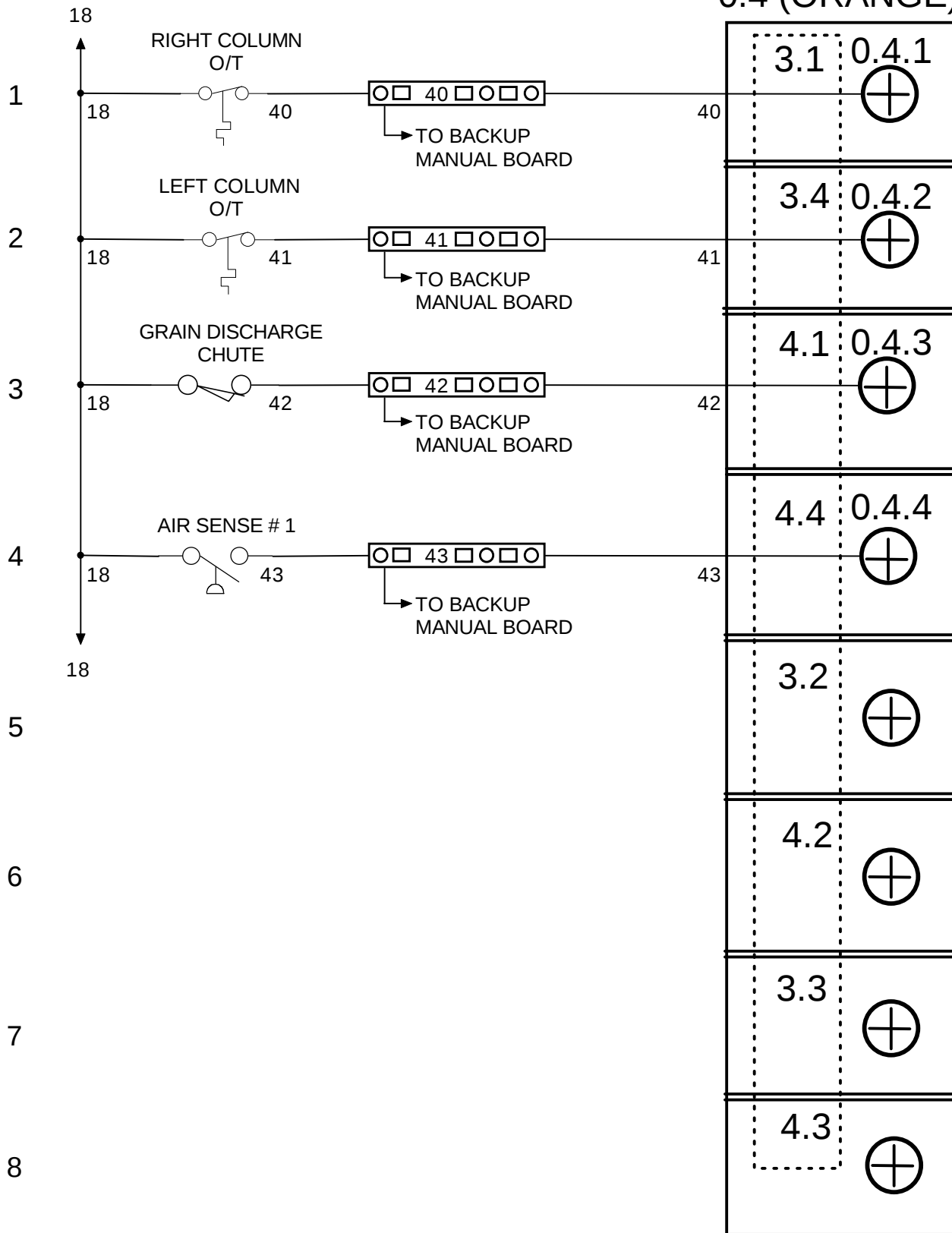
DIGITAL INPUT MODULE
- 0.3 (ORANGE)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE - 0.4	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.9
Revision:	CE

DIGITAL INPUT MODULE - 0.4 (ORANGE)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT
DIGITAL INPUTMODULE - 0.4

Author: SUKUP MFG CO

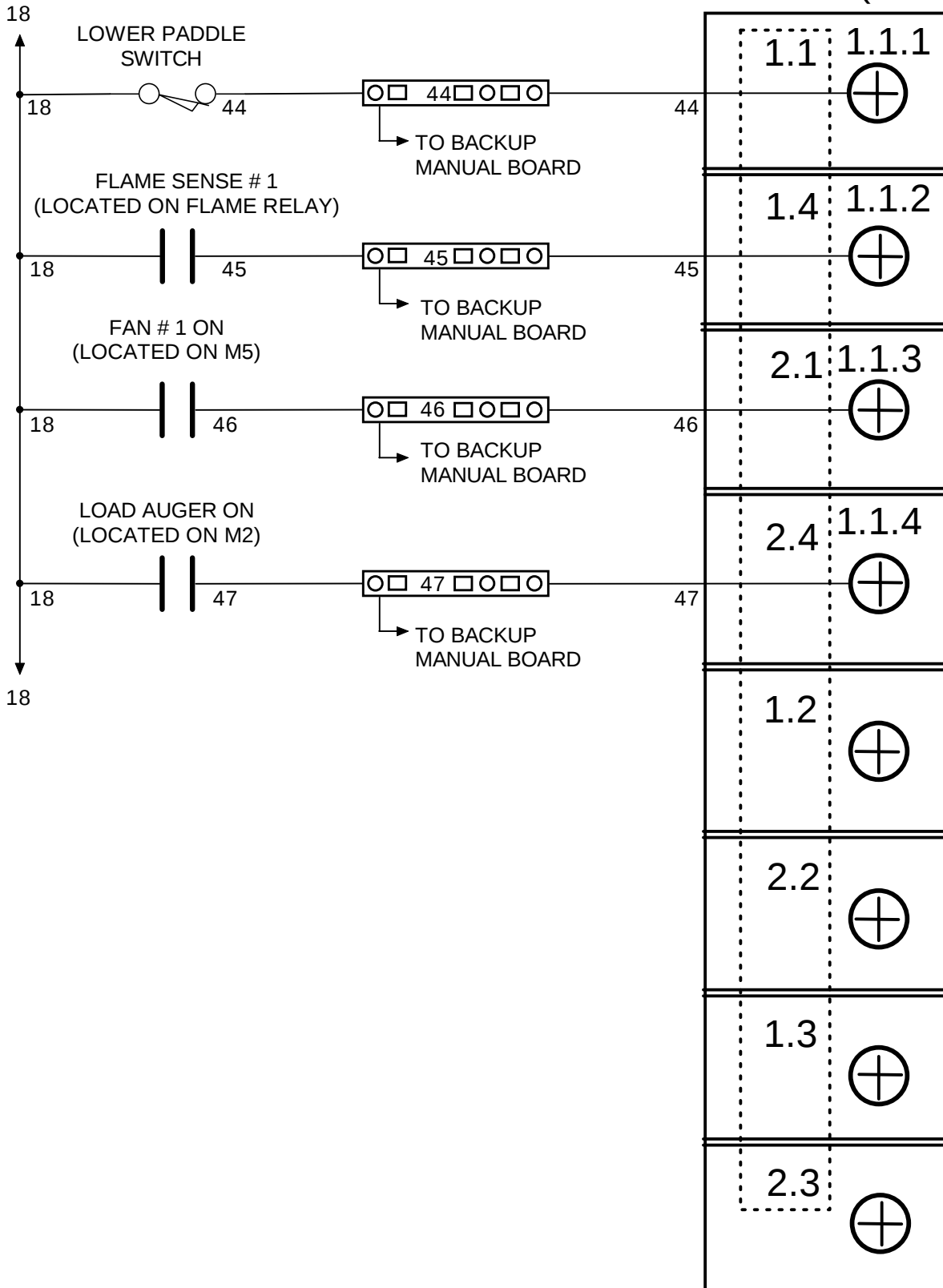
Date: 01/12

Sheet: 101.10

Revision:

CE

- 1.1 of 4 (BLUE)

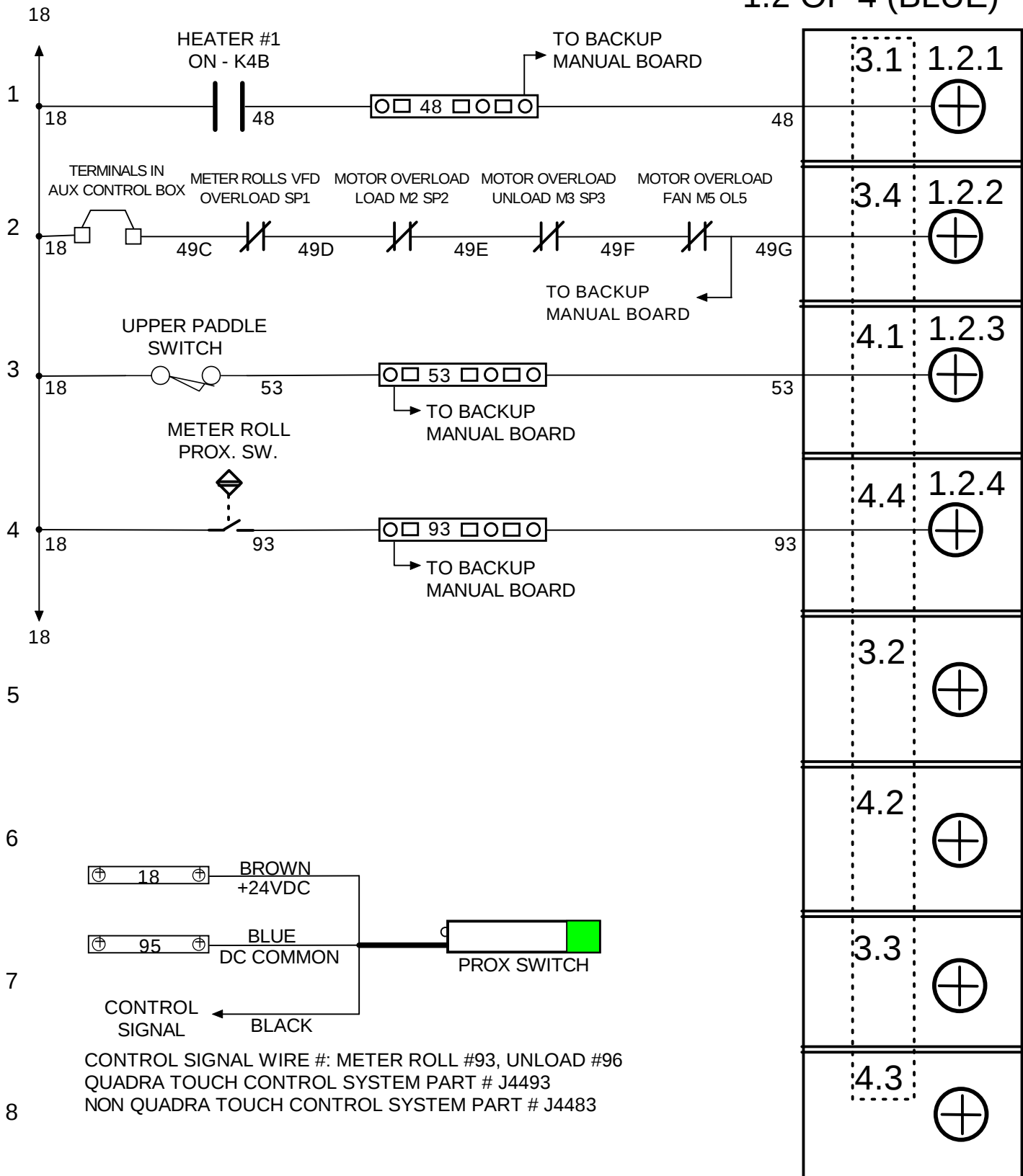


NOTE: Numbers inside of the box are terminal designators printed on the module.

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE - 1.1	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.11
Revision:	CE

DIGITAL INPUT MODULE

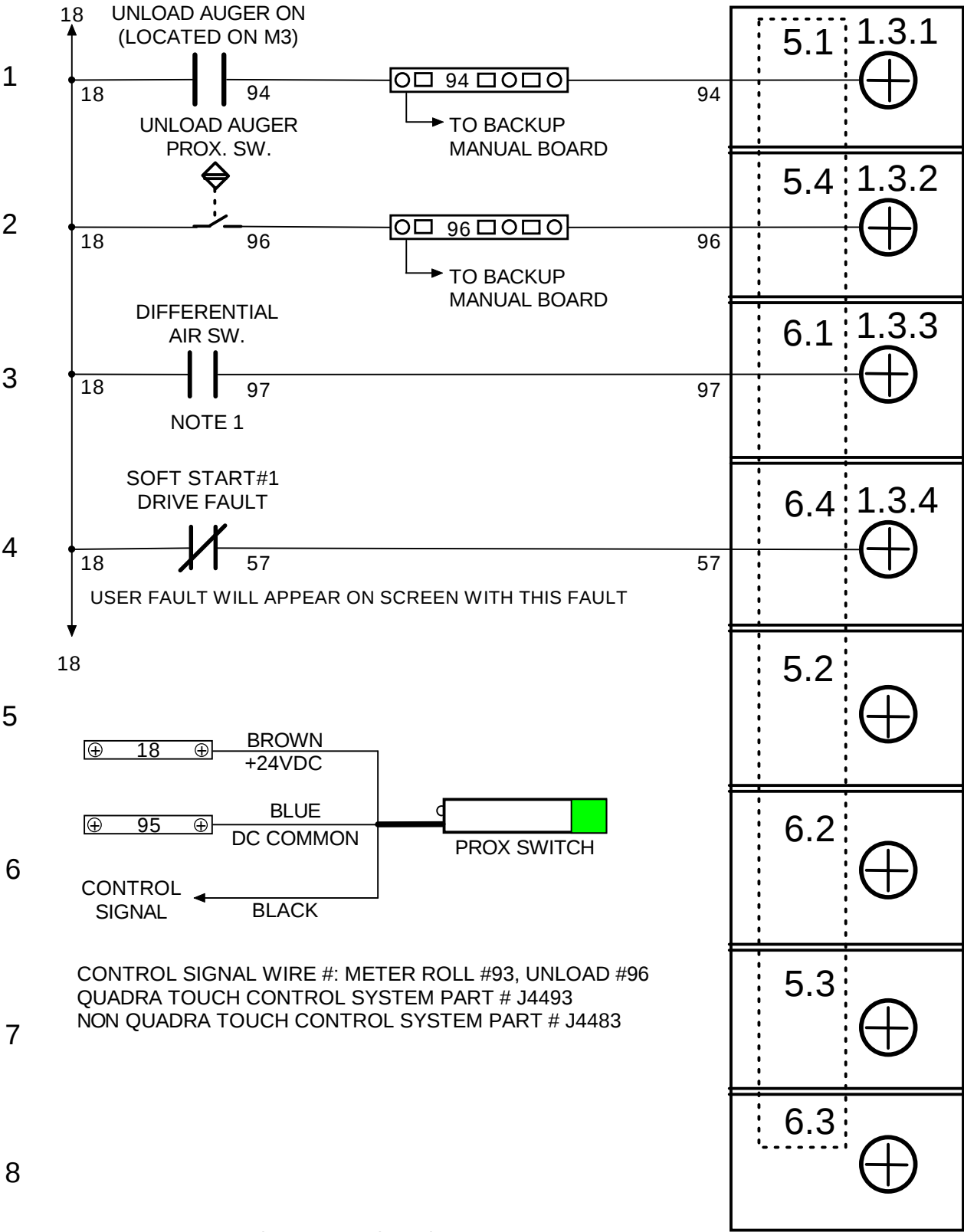
- 1.2 OF 4 (BLUE)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE - 1.2	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.12
Revision:	CE

DIGITAL INPUT MODULE
- 1.3 OF 4 (BLUE)

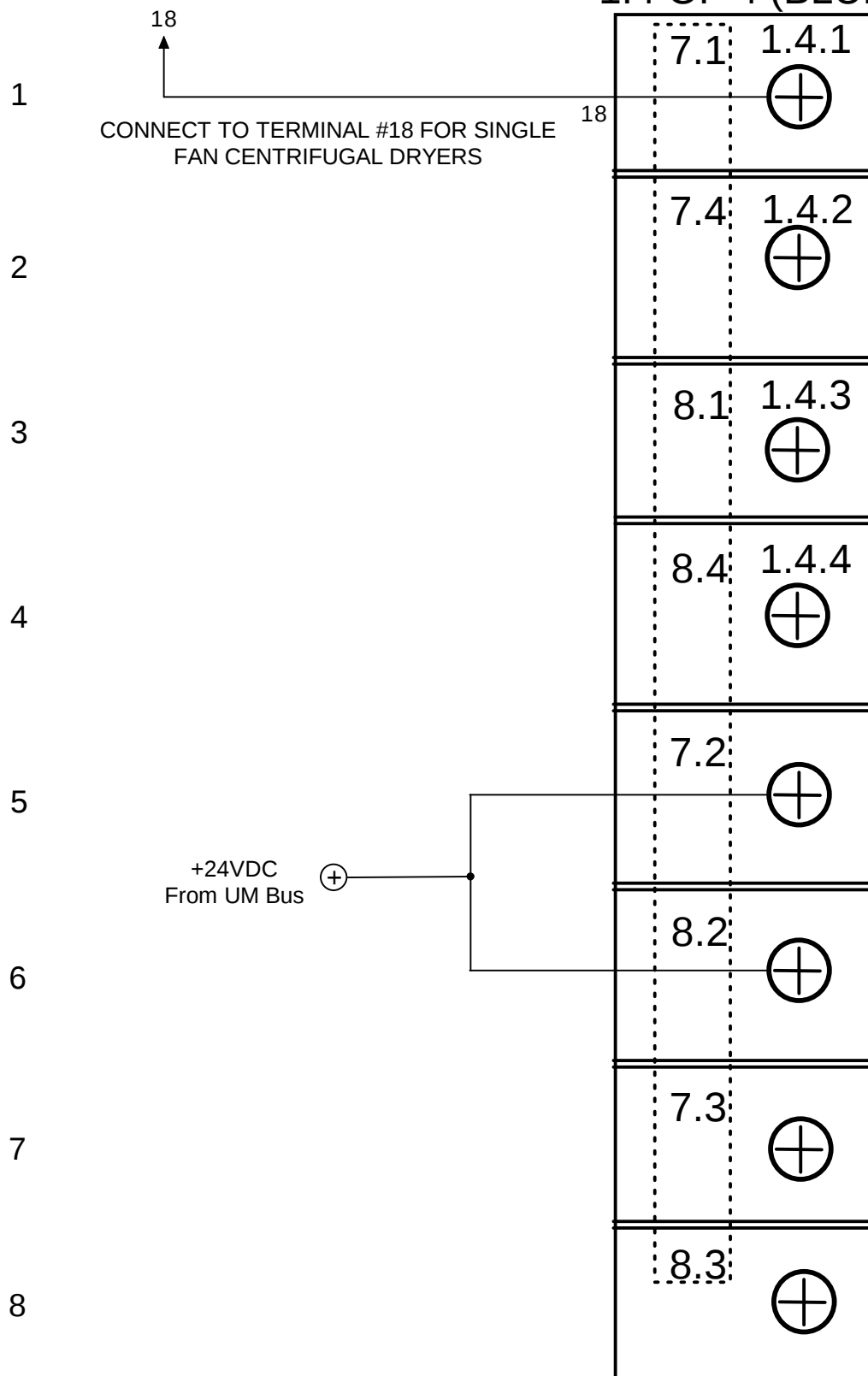


NOTE 1 : Used on CSA and CE dryers.
A jumper is installed on domestic dryers.

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

Title: PROTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE - 1.3	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.13
Revision:	CE

DIGITAL INPUT MODULE - 1.4 OF 4 (BLUE)



Title: PORTABLE DRYER: SINGLE FAN & HEAT
DIGITAL INPUT MODULE - 1.4

Author: SUKUP MFG CO

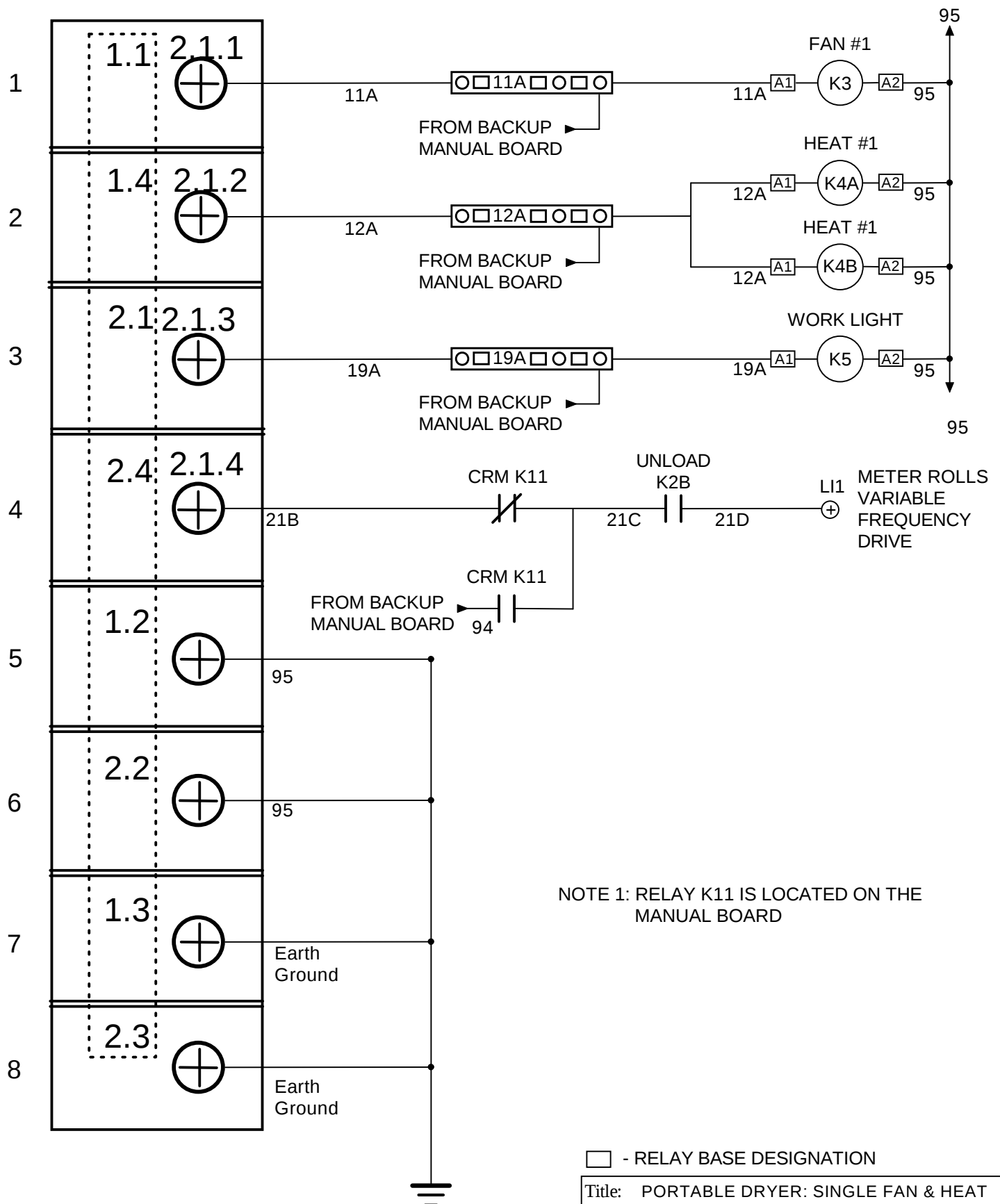
Date: 01/12

Sheet: 101.14

Revision:

CE

DIGITAL OUTPUT MODULE 2.1 (RED)



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

□ - RELAY BASE DESIGNATION

Title: PORTABLE DRYER: SINGLE FAN & HEAT
DIGITAL OUTPUT MODULE - 2.1

Author: SUKUP MFG CO

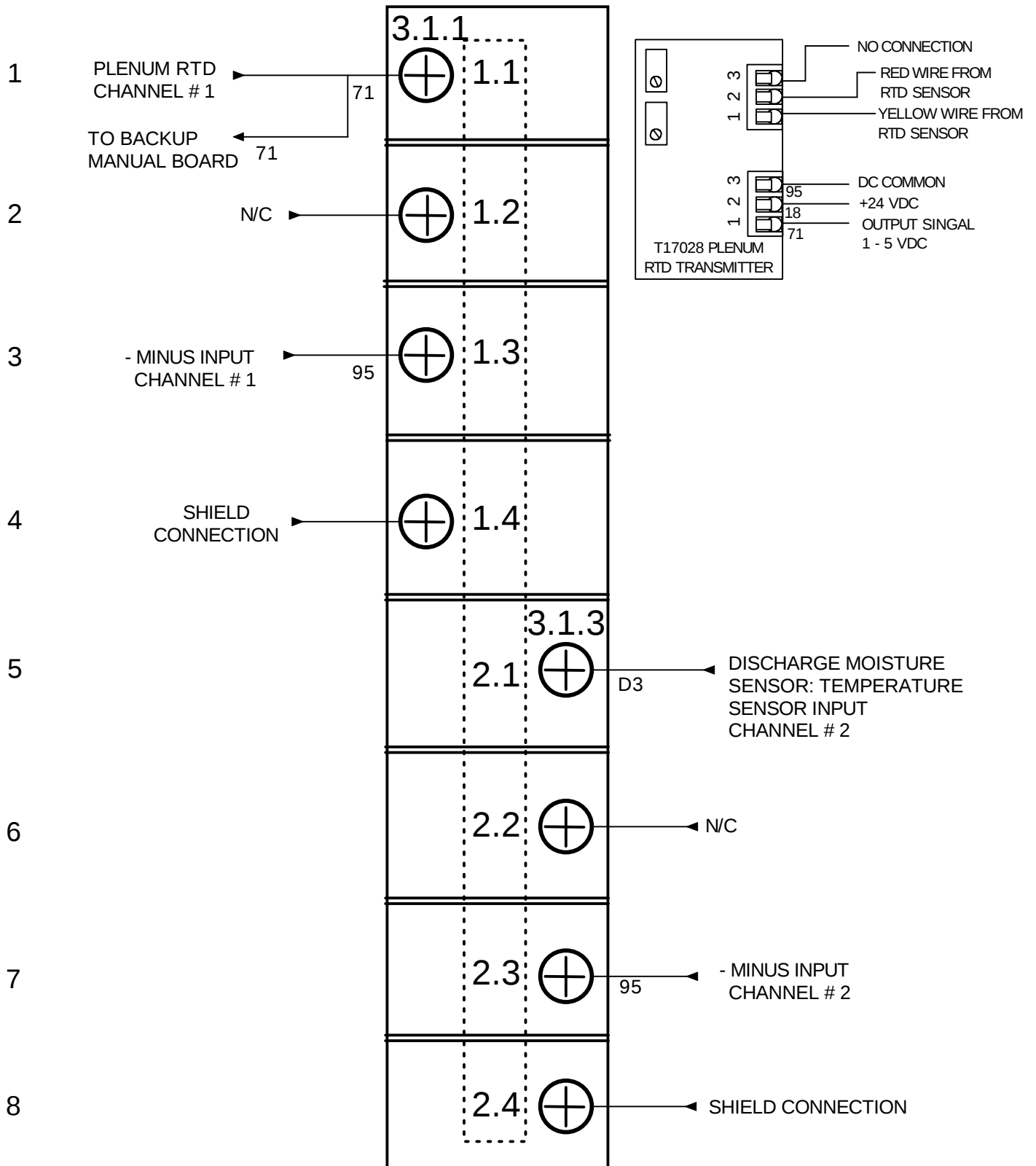
Date: 01/12

Sheet: 101.15

Revision:

CE

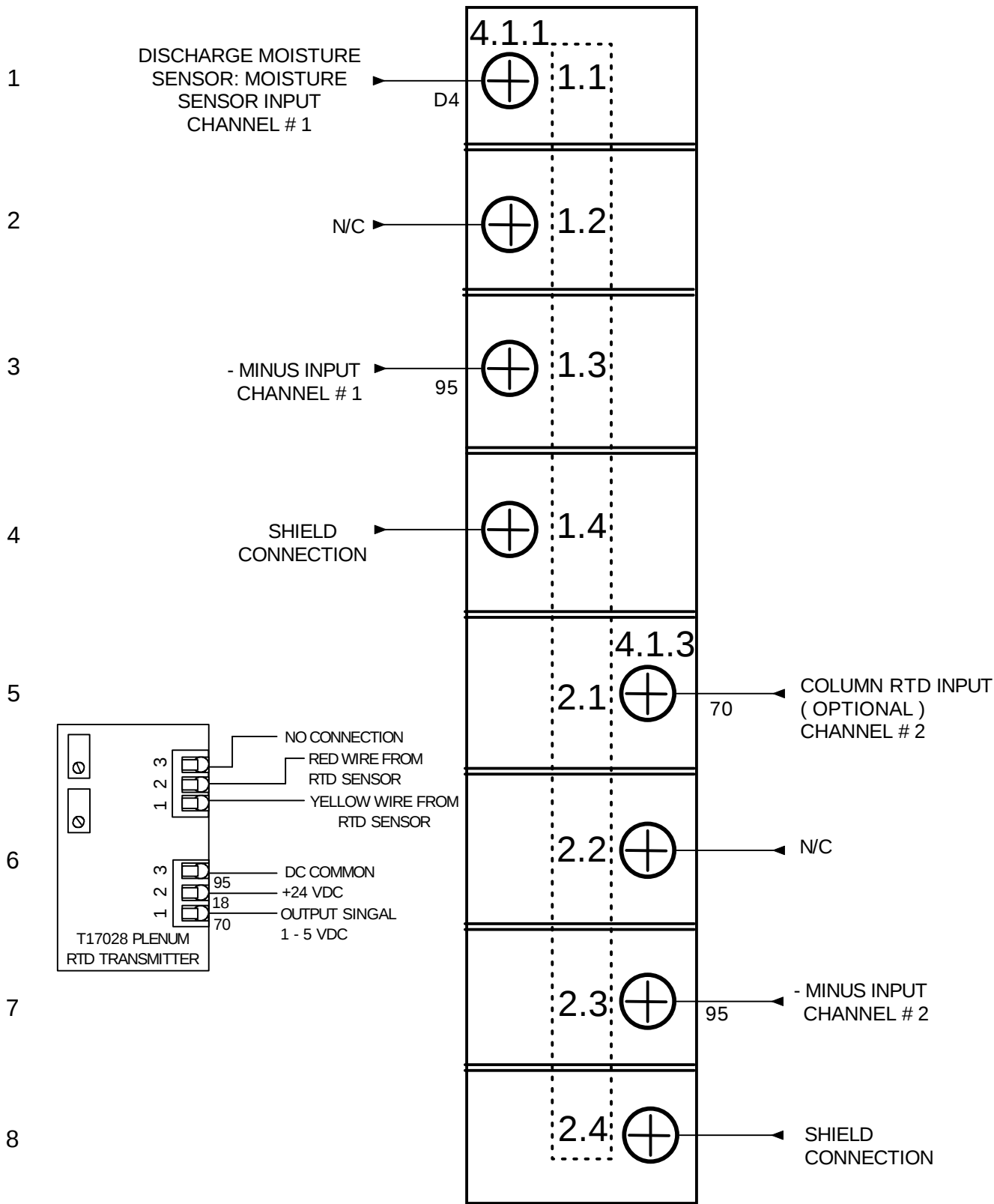
ANALOG INPUT MODULE - 3.1 (GREEN)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT ANALOG INPUT MODULE - 3.1	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.16
Revision:	CE

ANALOG INPUT MODULE - 4.1 (GREEN)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT ANALOG INPUT MODULE - 4.1

Author: SUKUP MFG CO

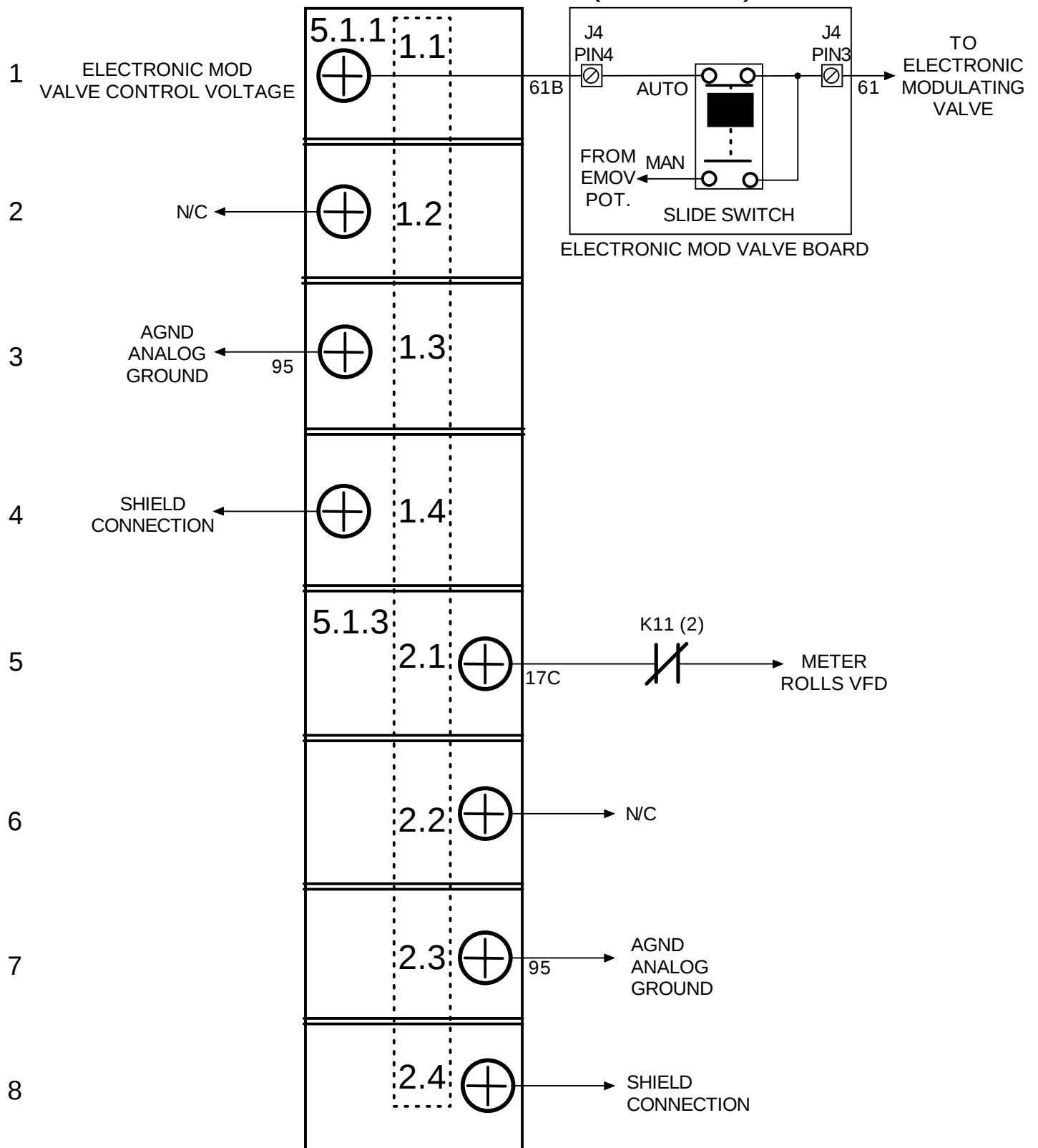
Date: 01/12

Sheet: 101.17

Revision:

CE

ANALOG OUTPUT MODULE 5.1 (YELLOW)



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

Title: PORTABLE DRYER: SINGLE FAN & HEAT ANALOG OUTPUT MODULE - 5.1

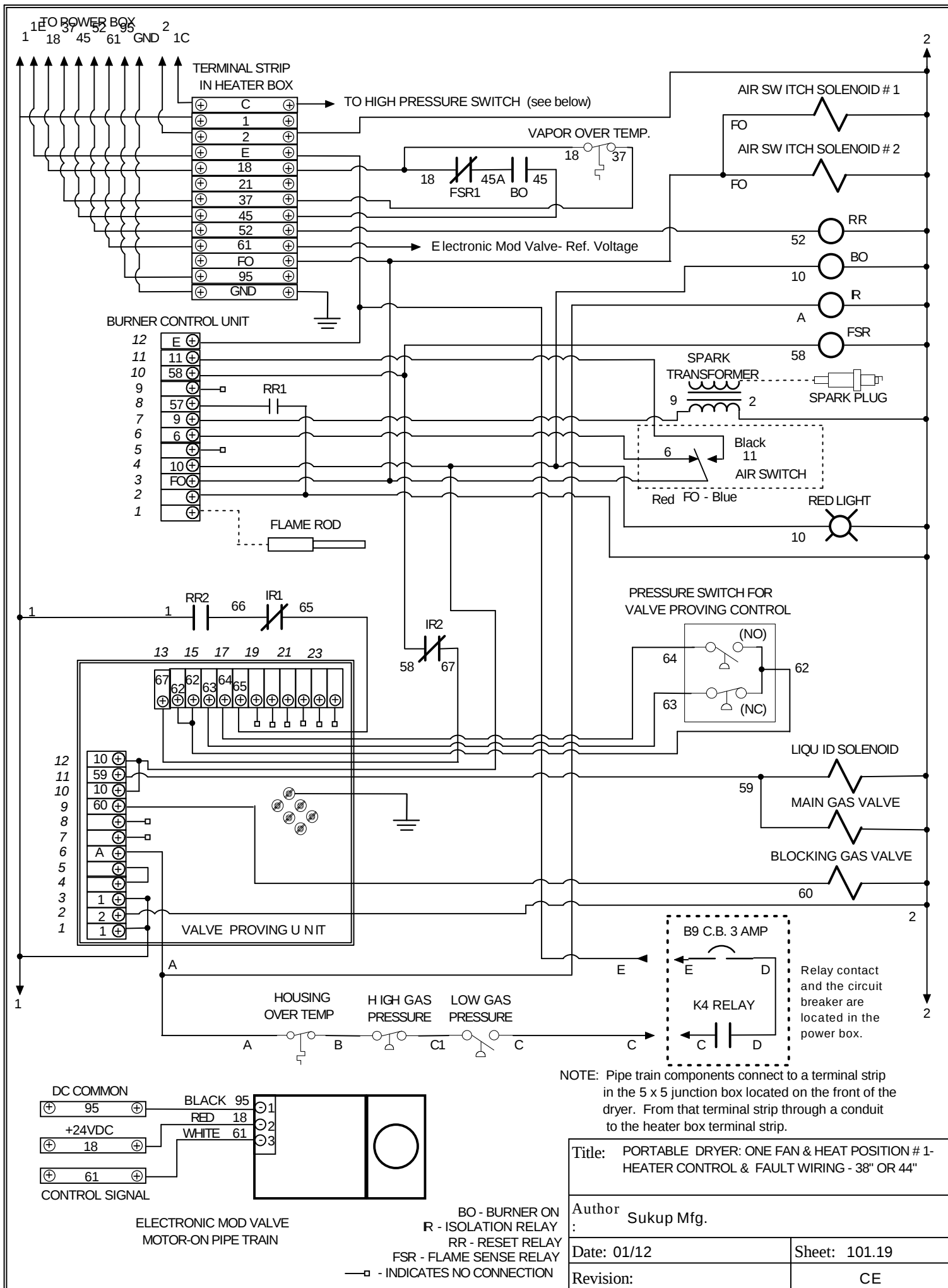
Author: SUKUP MFG CO

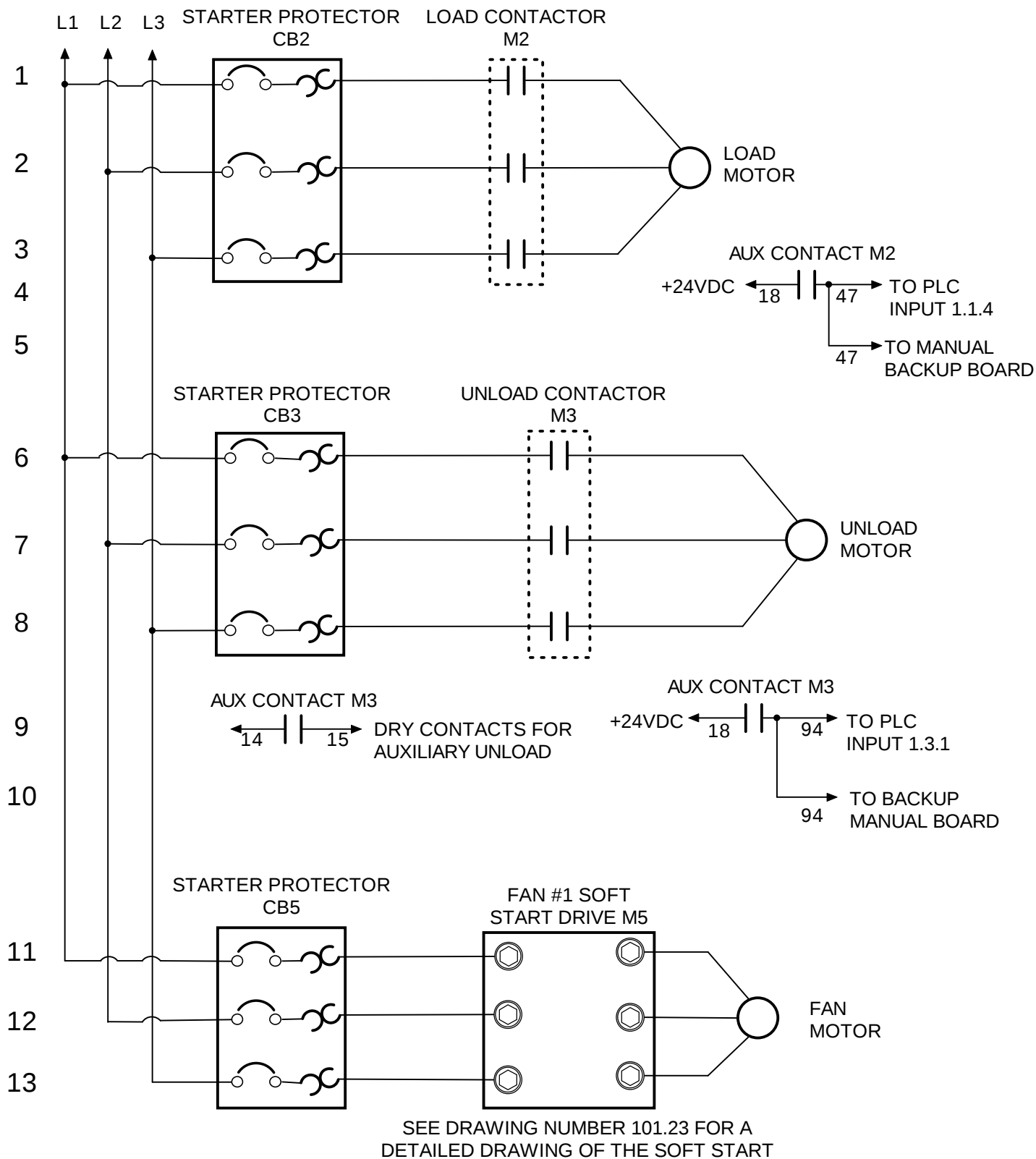
Date: 01/12

Sheet: 101.18

Revision:

CE





Title: PORTABLE DRYER:SINGLE FAN & HEAT MOTOR CONTACTOR & RELAY WIRING

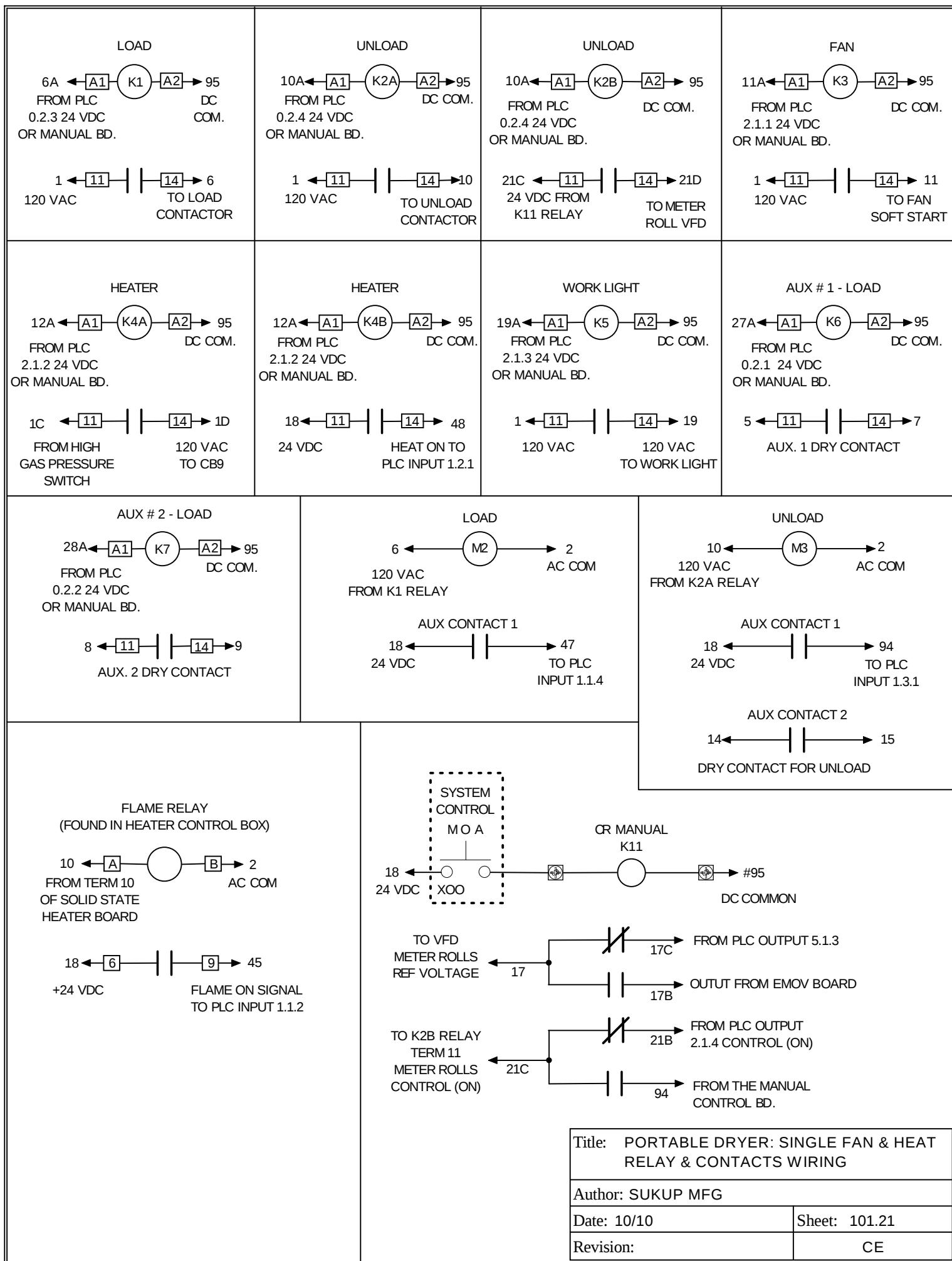
Author: SUKUP MFG CO

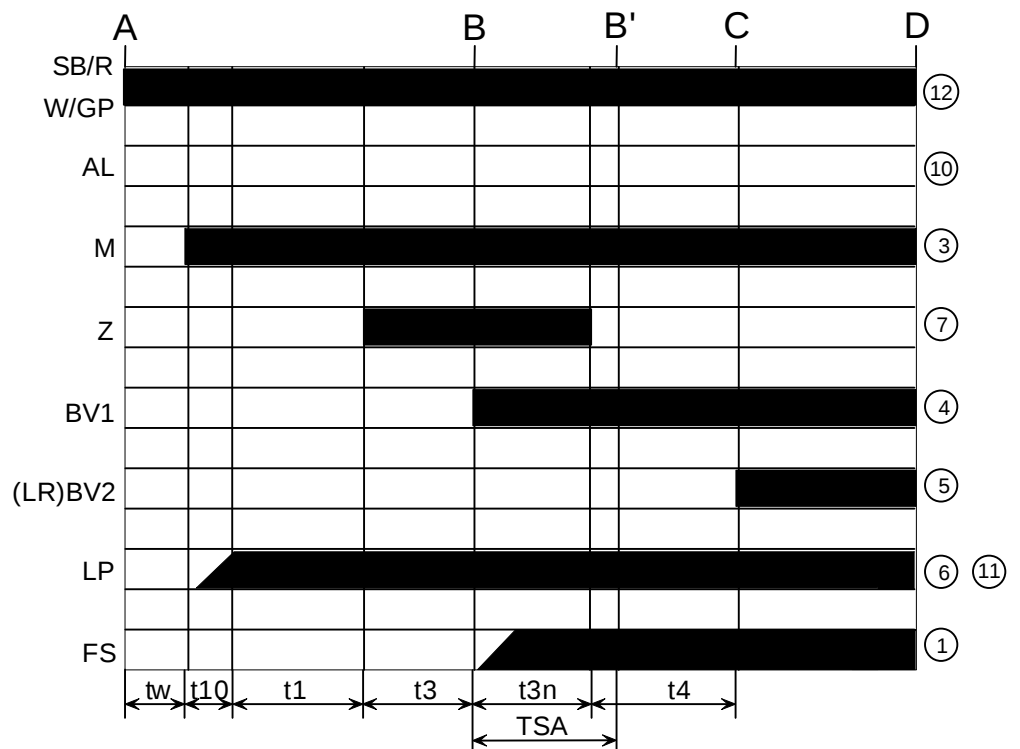
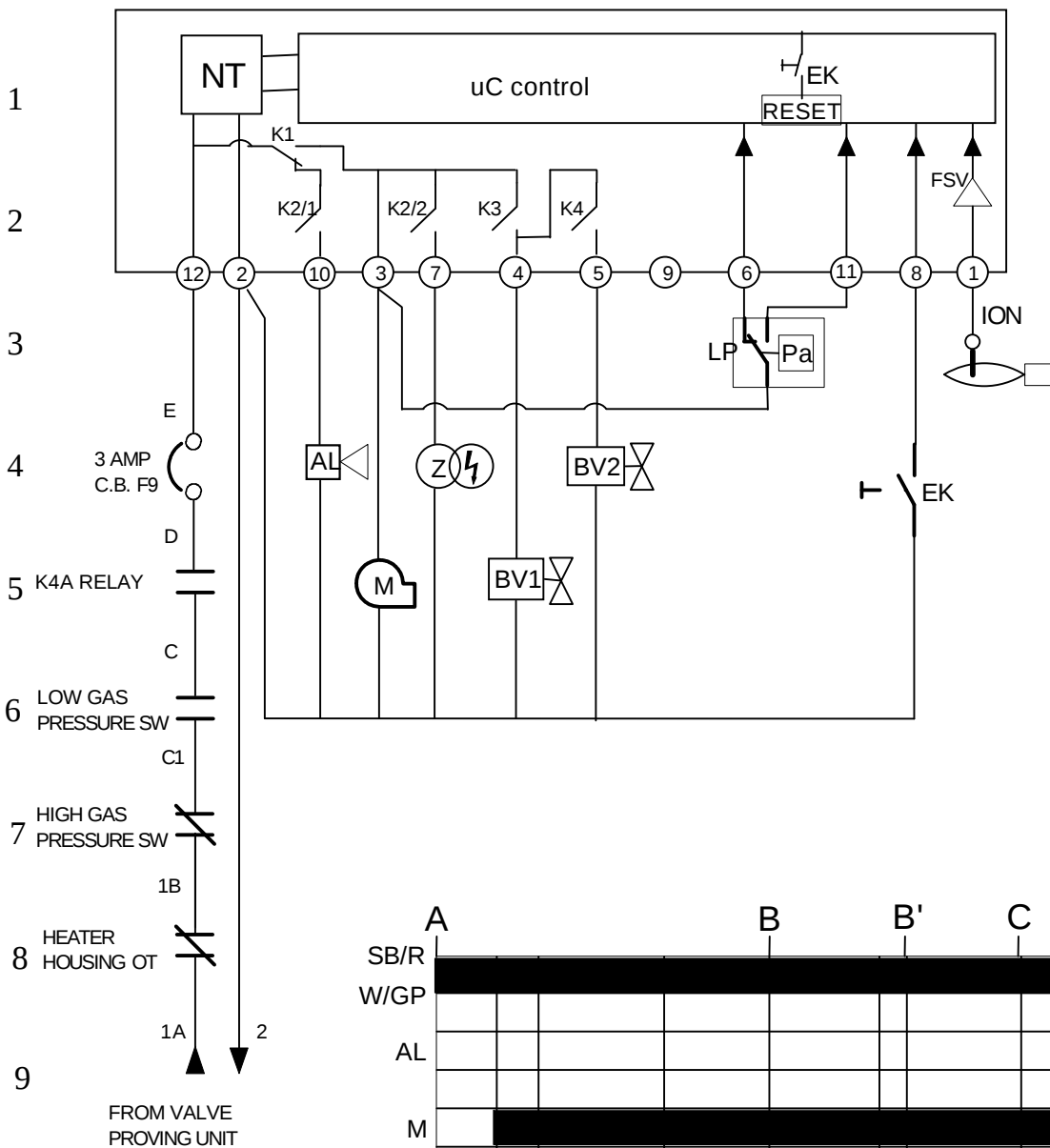
Date: 01/12

Sheet: 101.20

Revision:

CE





AL = Alarm
 BV1 = Fuel Valve # 1
 BV2 = Fuel Valve # 2
 FS = Flame Signal
 GP = Gas Pressure Switch
 LP = Air Pressure Switch
 LR = Load Controller
 M = Fan Motor
 R = Control Thermostat
 SB = Safety Limit Thermostat
 W = Limit Thermostat / Pressure Sw.

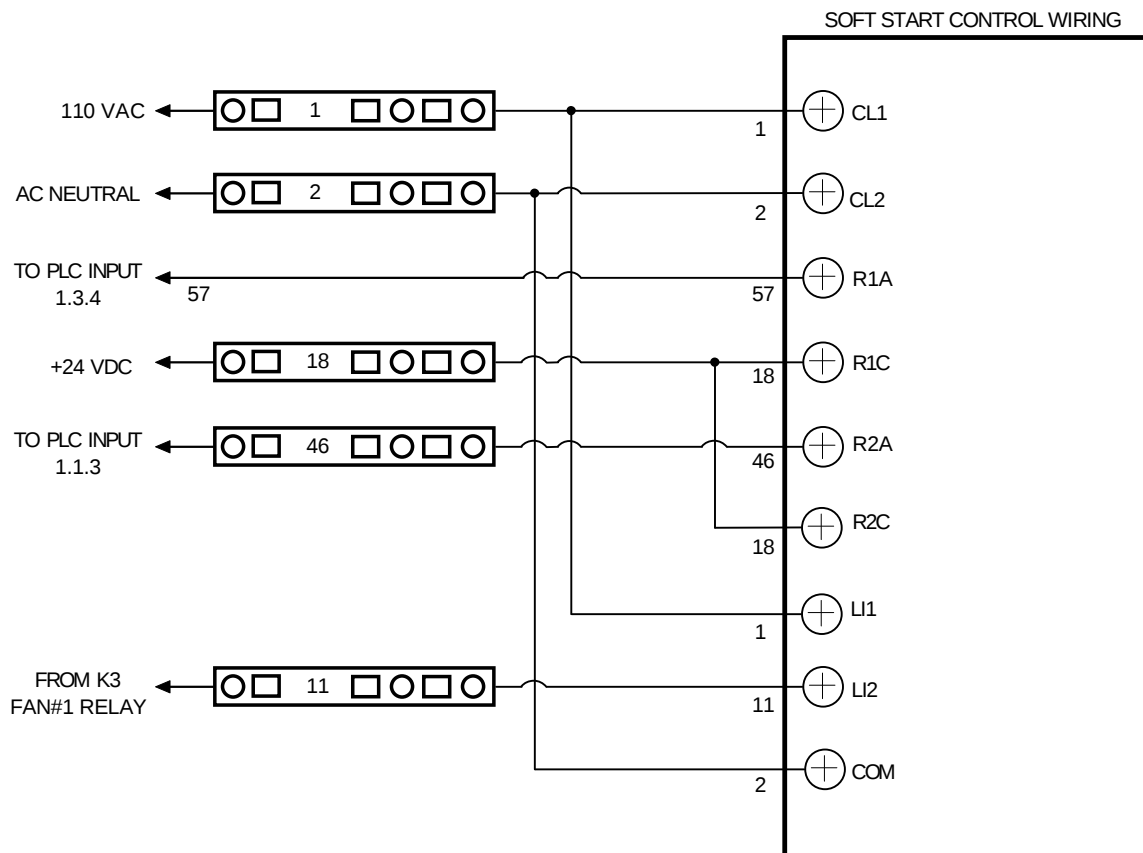
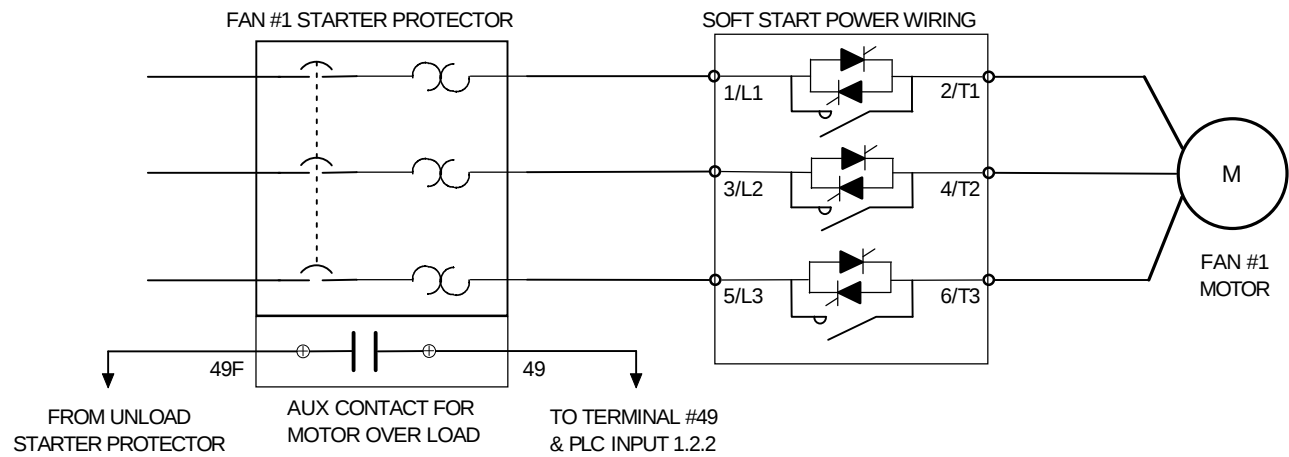
Title: PORTABLE DRYER : CE SINGLE FAN &
 HEAT: BURNER CONTROL

Author: Sukup Mfg.

Date: 01/12

Sheet: 101.22

Revision:



Title: PORTABLE DRYER: SINGLE FAN & HEAT FAN #1 SOFT START WIRING

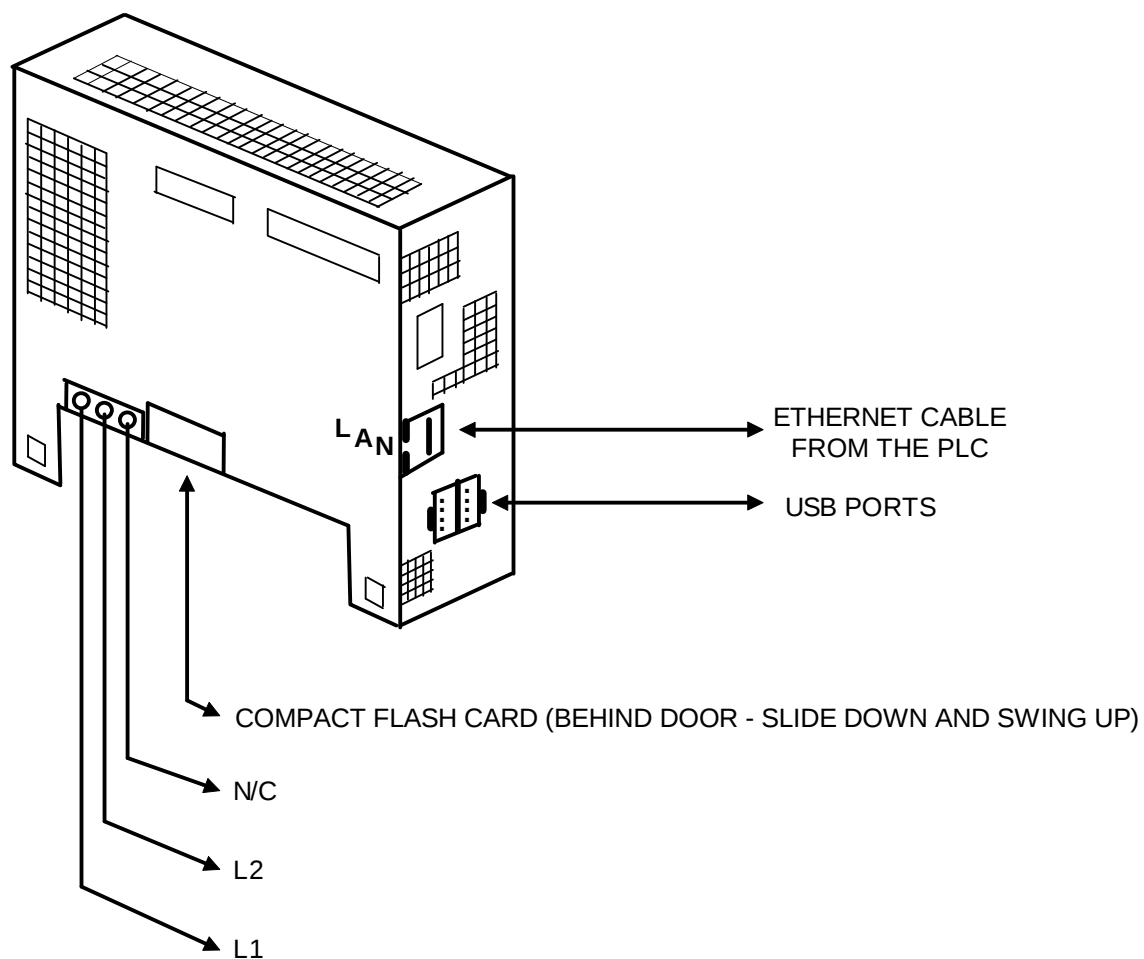
Author: SUKUP MFG CO

Date: 01/12

Sheet: 101.23

Revision:

CE



Title: PORTABLE DRYER: SINGLE FAN & HEAT
HMI - TOUCH SCREEN

Author: SUKUP MFG CO

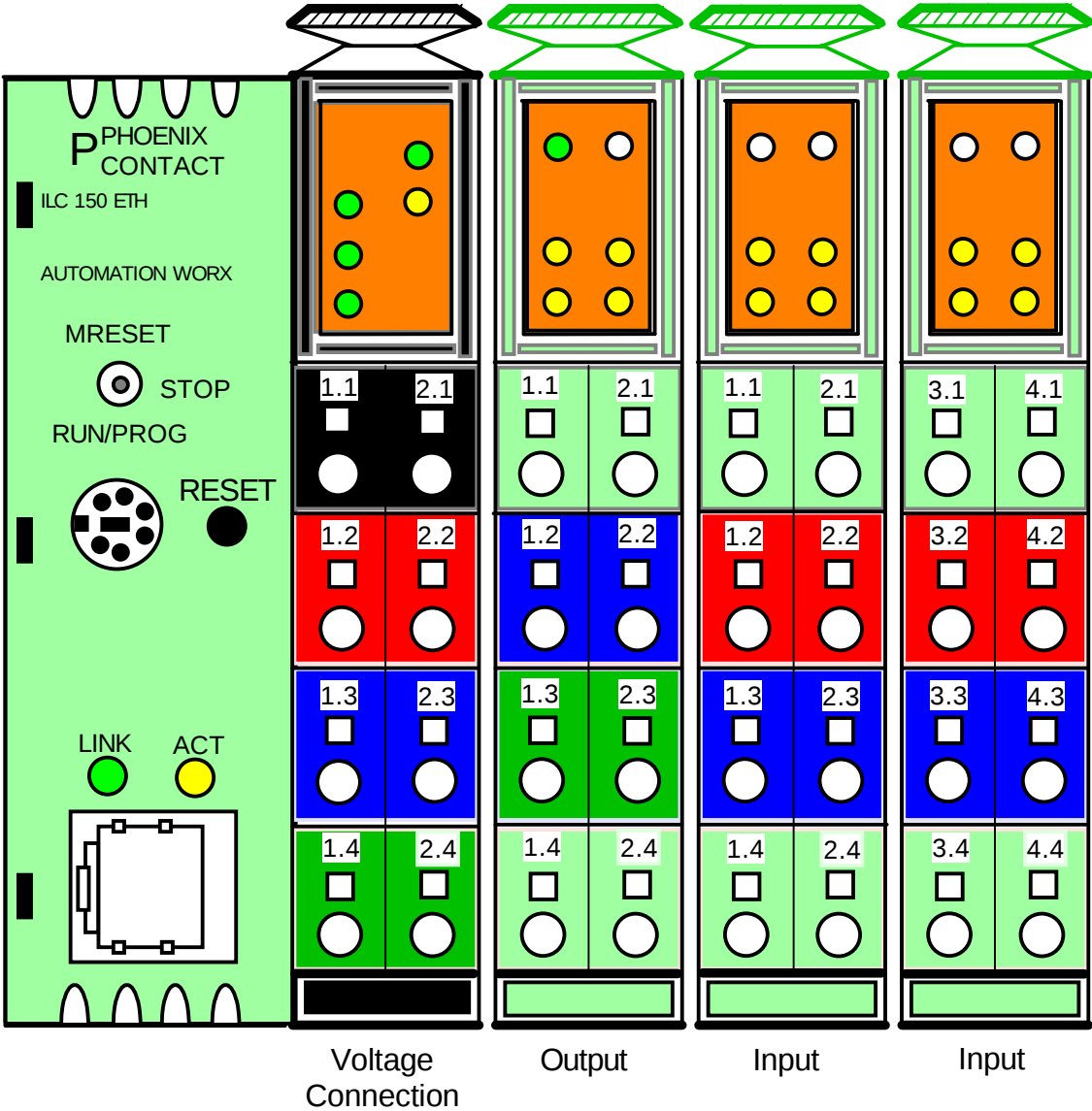
Date: 01/12

Sheet: 101.24

Revision:

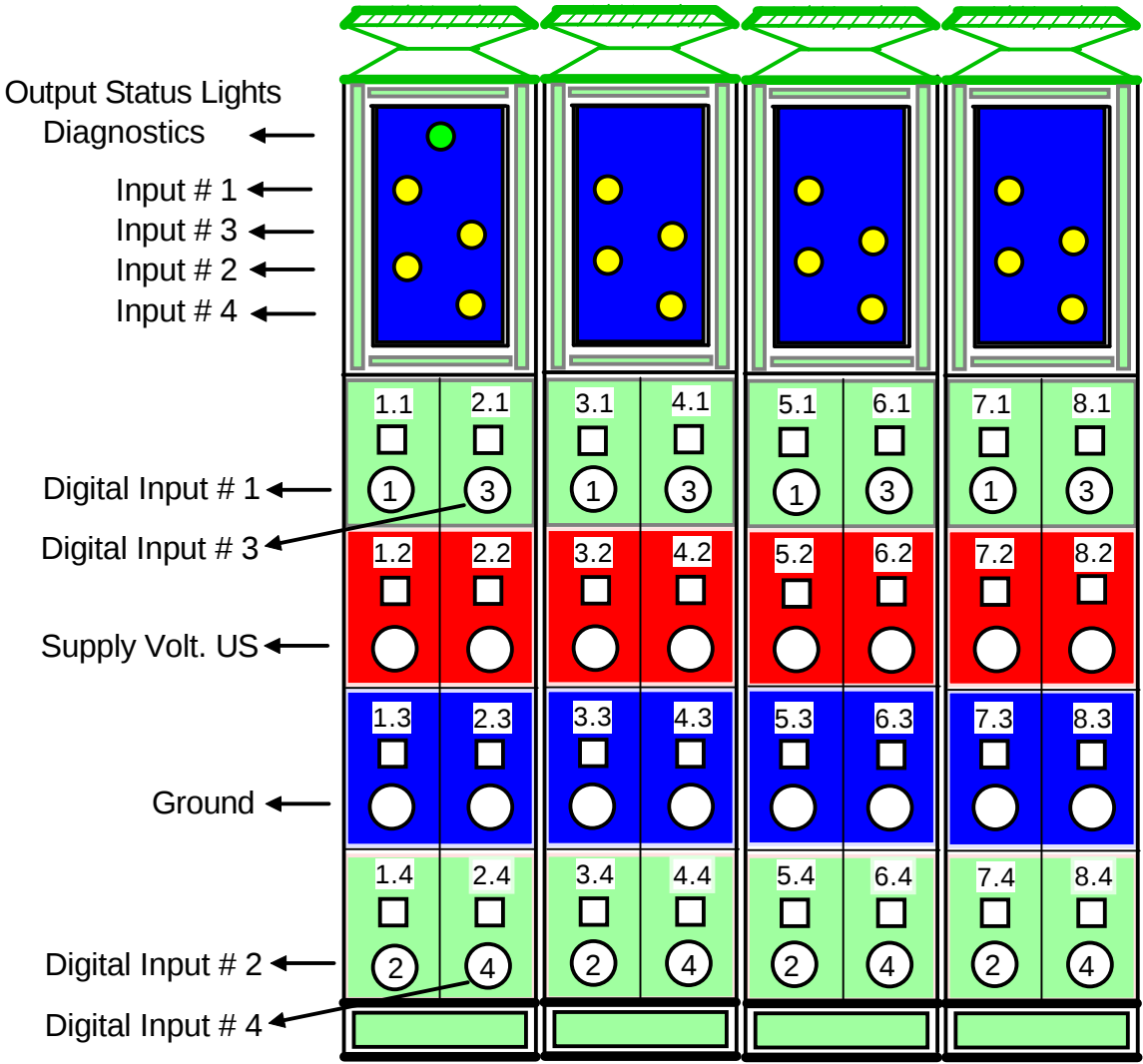
CE

PHOENIX CONTACT PLC MODULE ILC 150 (ORANGE)



Title: PORTABLE DRYER: SINGLE FAN & HEAT PHOENIX CONTACT PLC -ILC 150	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.25
Revision:	CE

DIGITAL INPUT MODULE - ILC 150 (BLUE)

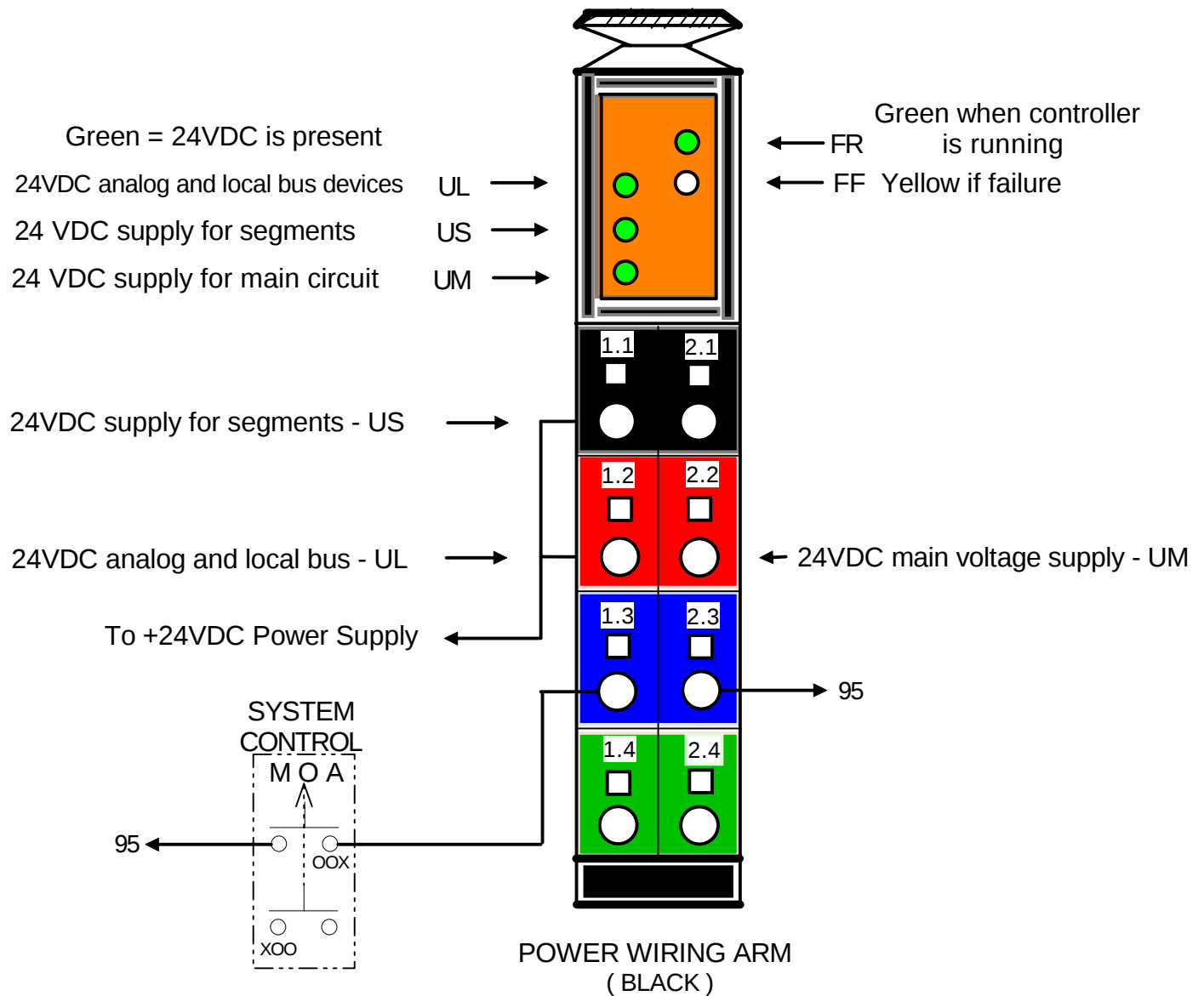


DIGITAL OUTPUT MODULE - 16 INPUTS

- Diagnostics:
- 1) Green - OK
 - 2) Flashing 0.5 Hz - communications power UL available but buss not active
 - 3) Flashing 2 Hz - peripheral fault
 - 4) Flashing 4 Hz - local bus error

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE - 16 INPUTS	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.26
Revision:	CE

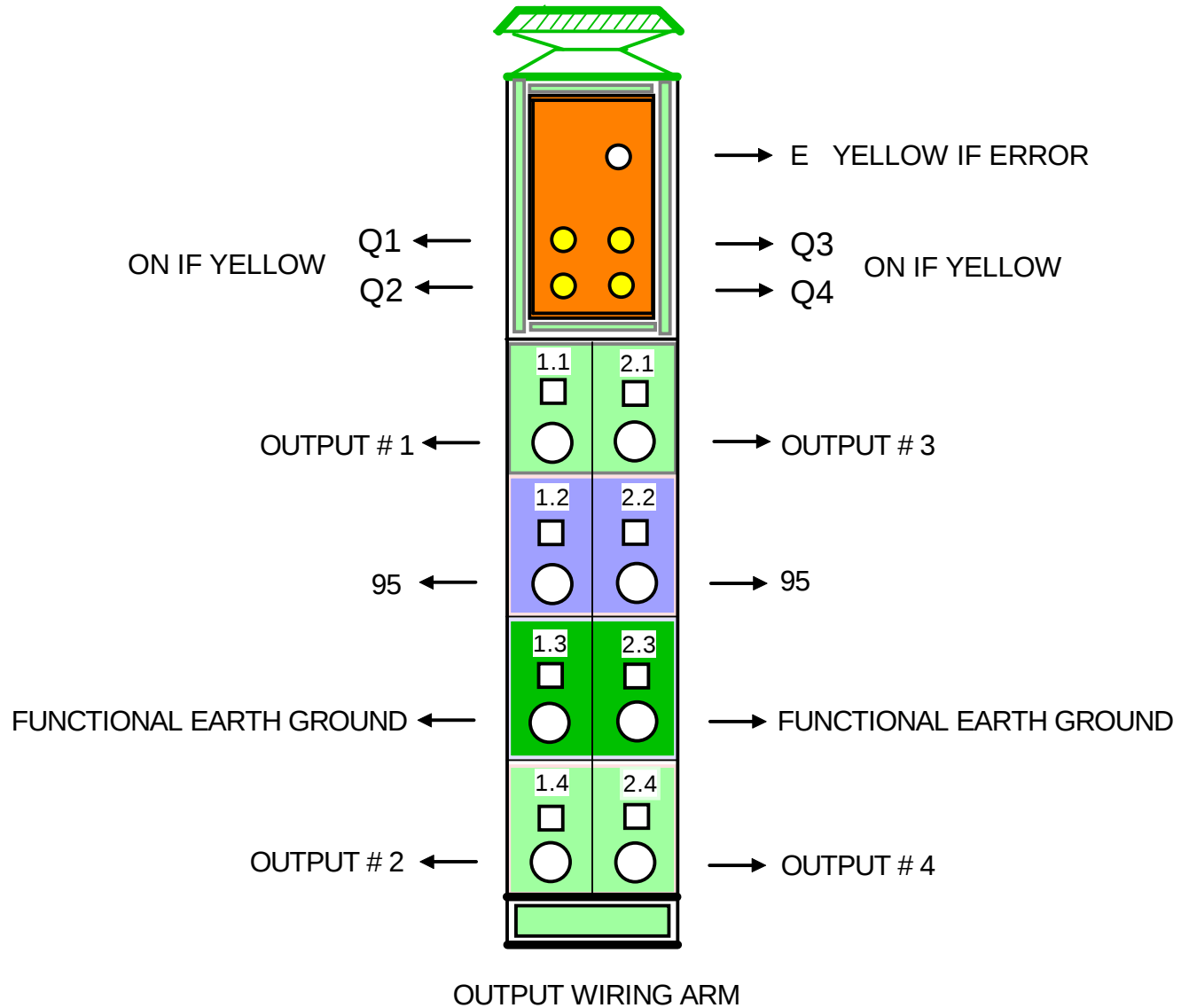
POWER SUPPLY CONNECTION FOR THE ILC 150 (ORANGE)



NOTE: This wiring arm is not a power supply. 24VDC is provided by an independent power supply and connected to this arm, which then supplies the PLC and modules.

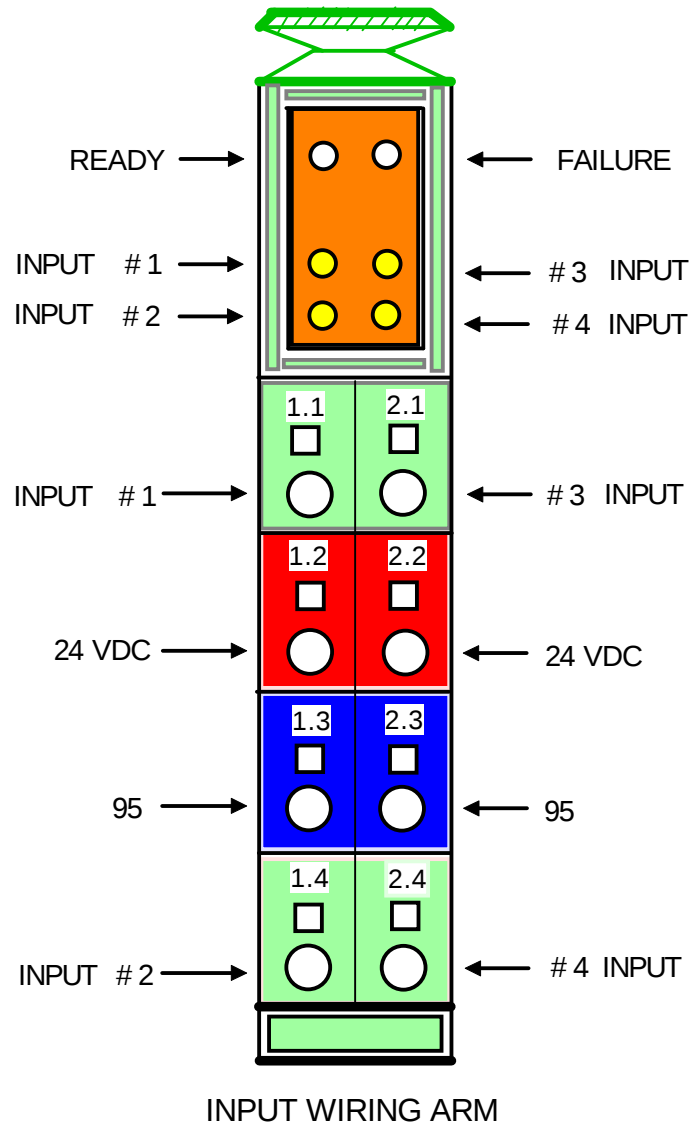
Title: PORTABLE DRYER: SINGLE FAN & HEAT POWER SUPPLY MODULE 24VDC	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.27
Revision:	CE

OUTPUT WIRING ARM - ILC 150 (ORANGE)



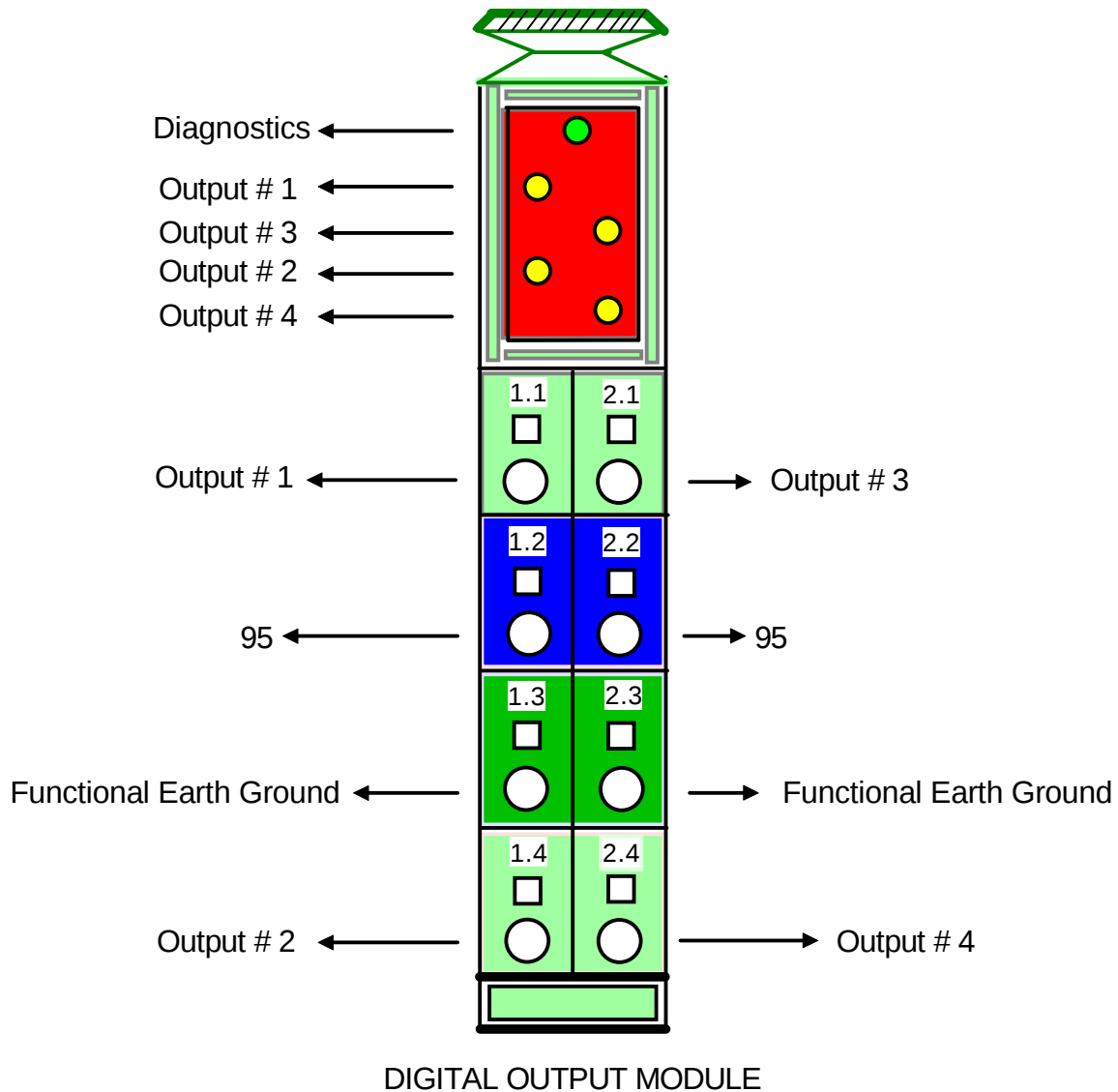
Title: PORTABLE DRYER: SINGLE FAN & HEAT OUTPUT MODULE 4 - OUTPUT	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.28
Revision:	CE

INPUT WIRING ARM - ILC 150 (ORANGE)



Title: PORTABLE DRYER: SINGLE FAN & HEAT INPUT MODULE - 4 INPUTS	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.29
Revision:	CE

DIGITAL OUTPUT MODULE PLC - ILC 150 (RED)

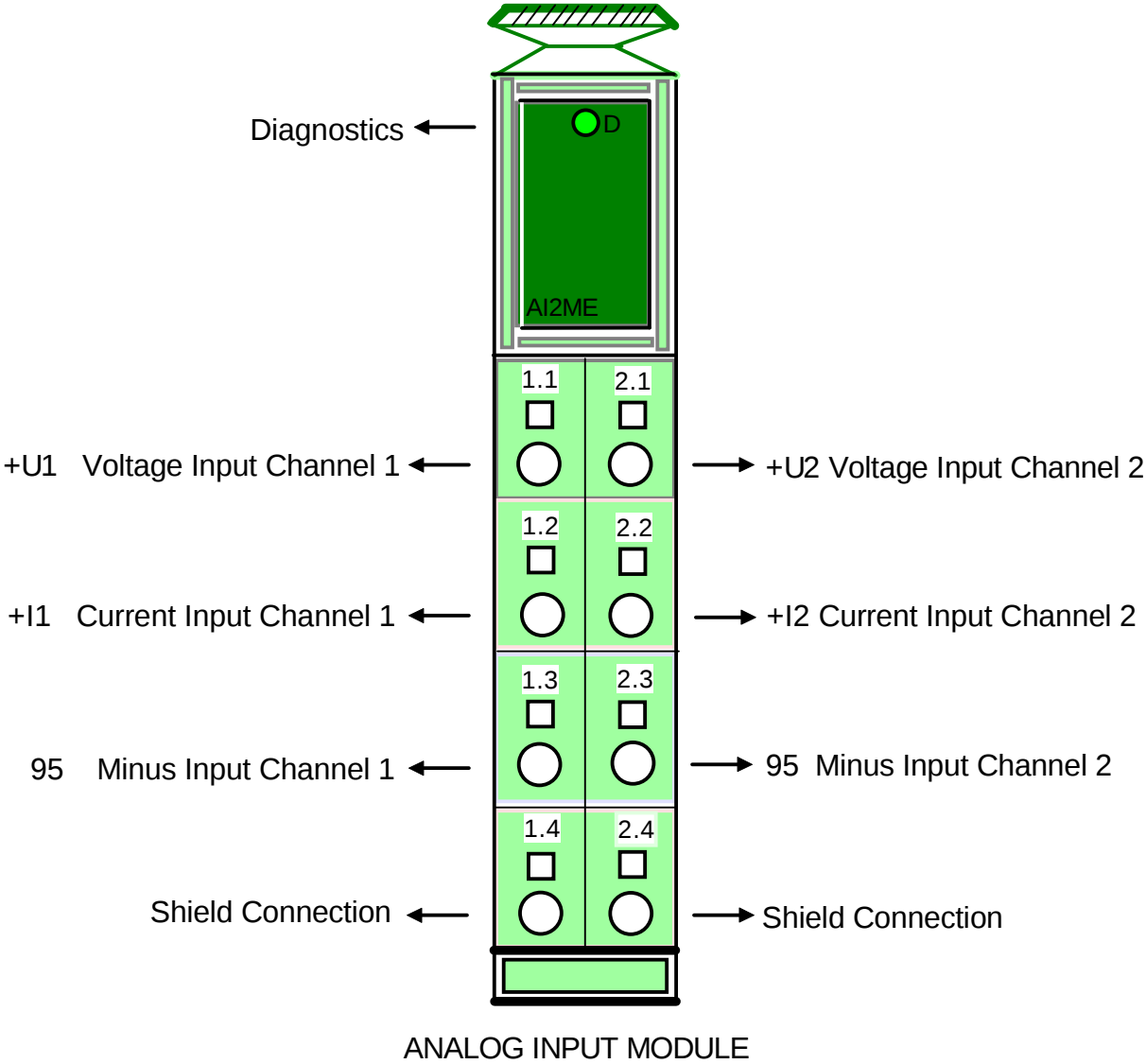


Diagnostics:

- 1) Green - OK - Bus Active
- 2) Flashing @ 0.5 HZ - Communications power UL available, bus not active
- 3) Flashing @ 2 HZ - Peripheral fault
- 4) Flashing @ 4 HZ - Local bus error

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL OUTPUT MODULE - 4 OUTPUTS	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.30
Revision:	CE

ANALOG INPUT MODULE
PLC - ILC 150 (GREEN)



Title: PORTABLE DRYER: SINGLE FAN & HEAT
ANALOG INPUT MODULE 0 - 10 VDC

Author: SUKUP MFG CO

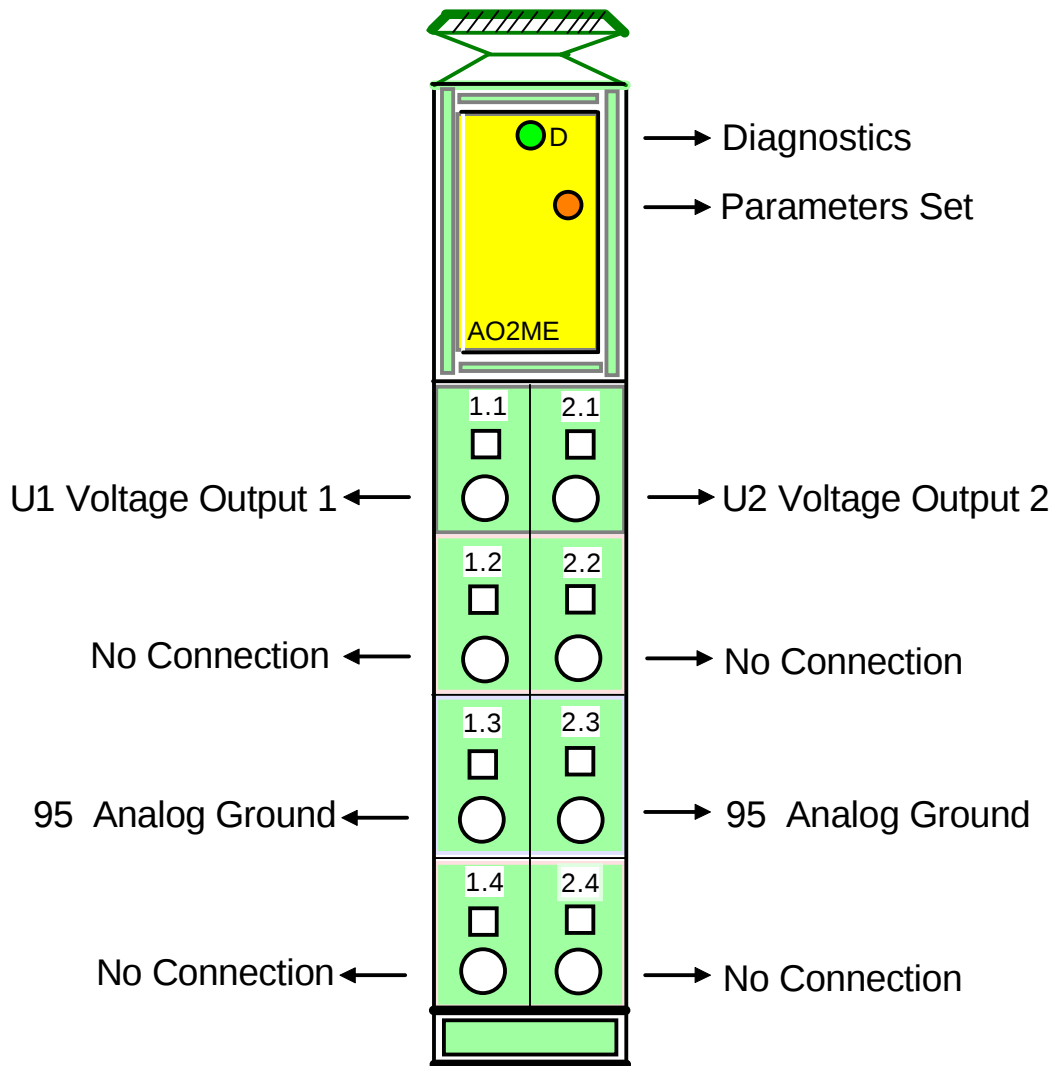
Date: 01/12

Sheet: 101.31

Revision:

CE

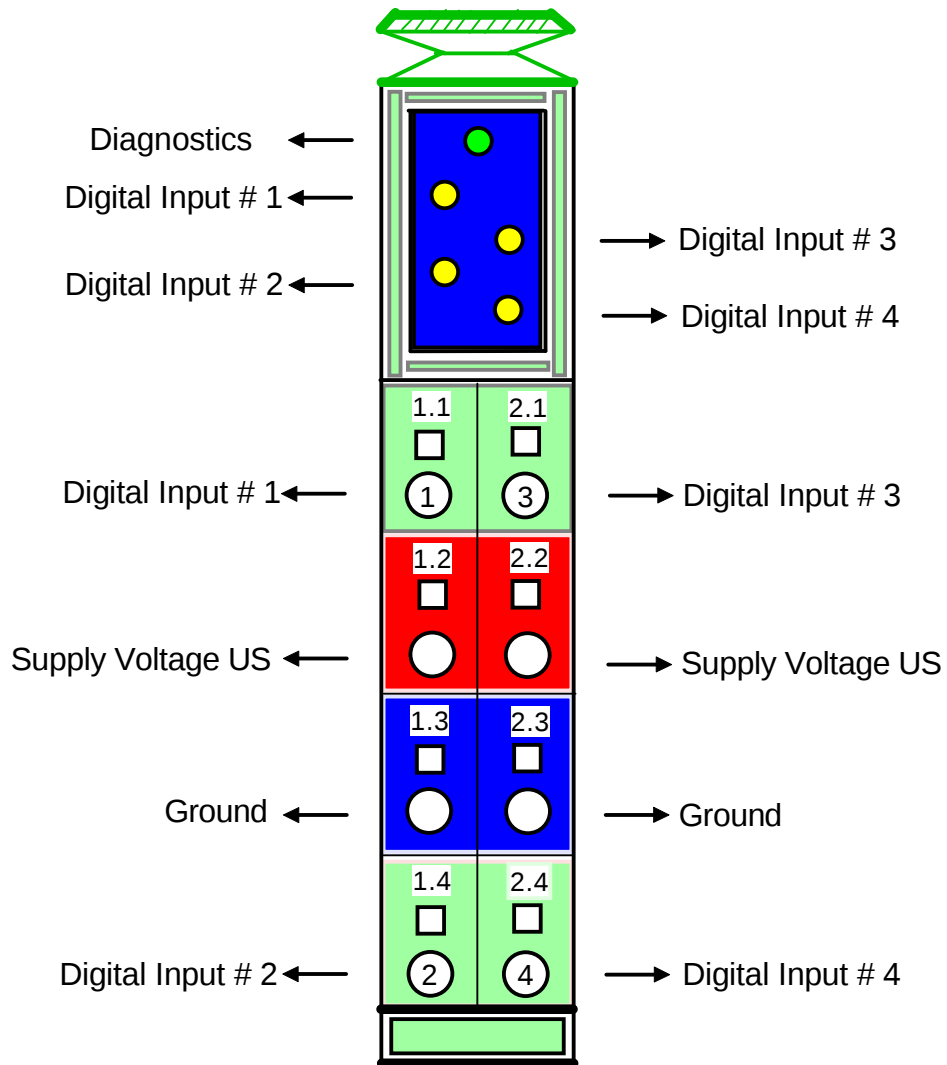
ANALOG OUTPUT MODULE PLC- ILC 150 (YELLOW)



ANALOG OUTPUT MODULE

Title: PORTABLE DRYER: SINGLE FAN & HEAT ANALOG OUTPUT MODULE0 - 10 VDC	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.32
Revision:	CE

DIGITAL INPUT MODULE - 4 INPUTS
PLC - ILC - 150, 24 VDC (BLUE)



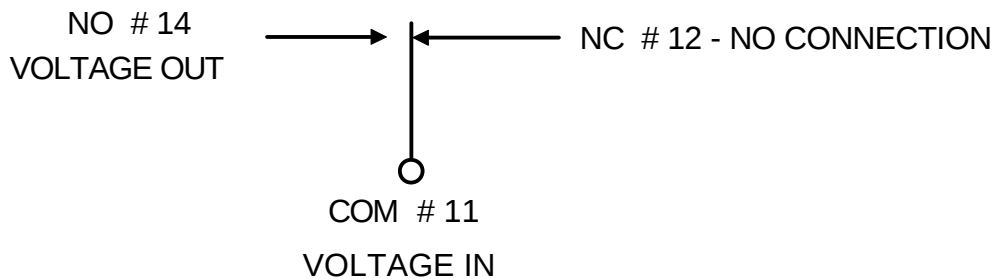
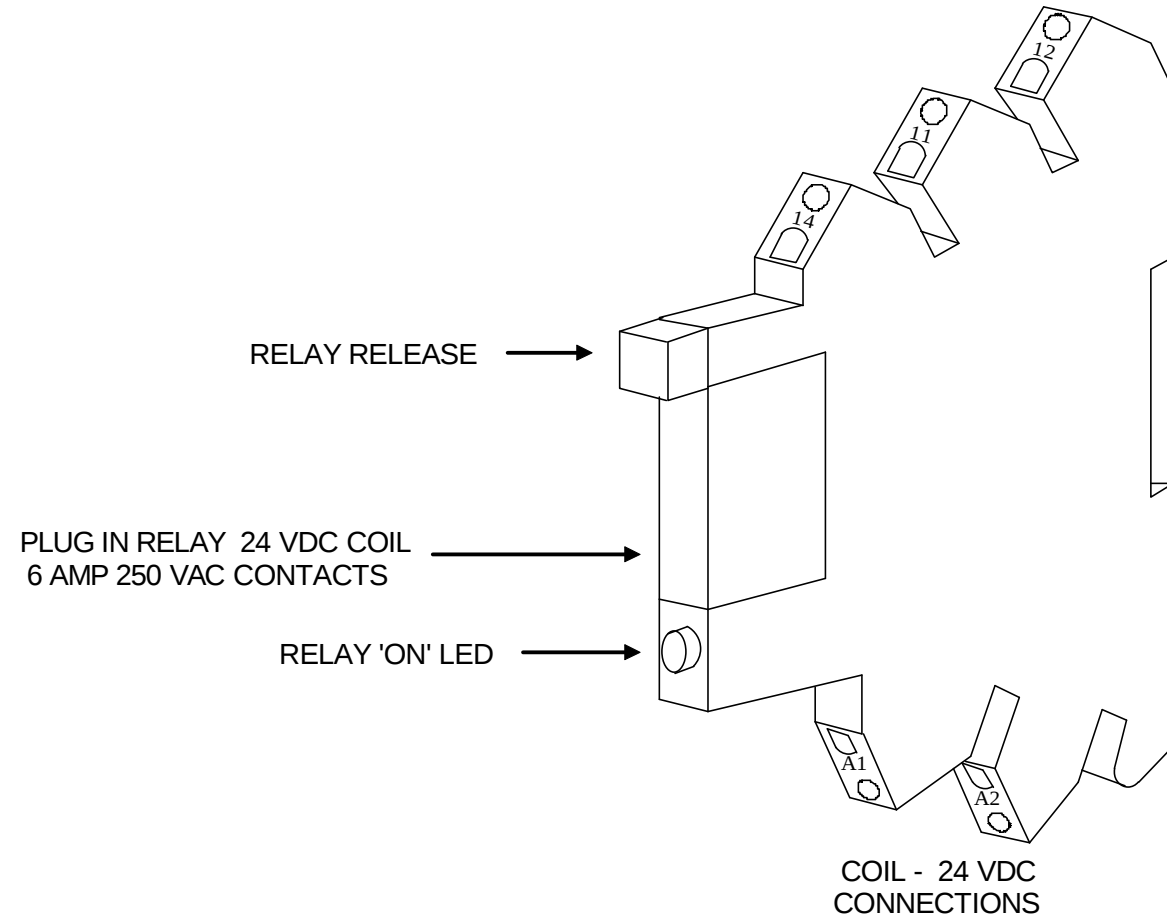
DIGITAL INPUT MODULE

Diagnostics:

- 1) Green - OK
- 2) Flashing 0.5 Hz - communications power UL available but buss not active
- 3) Flashing 2 Hz - peripheral fault
- 4) Flashing 4 Hz - local bus error

Title: PORTABLE DRYER: SINGLE FAN & HEAT DIGITAL INPUT MODULE 4 INPUTS	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.33
Revision:	CE

RELAY MODULE - 1 POLE



Title: PORTABEL DRYER: SINGLE FAN & HEAT
RELAY MODULE 24V COIL, 1POLE

Author: SUKUP MFG CO

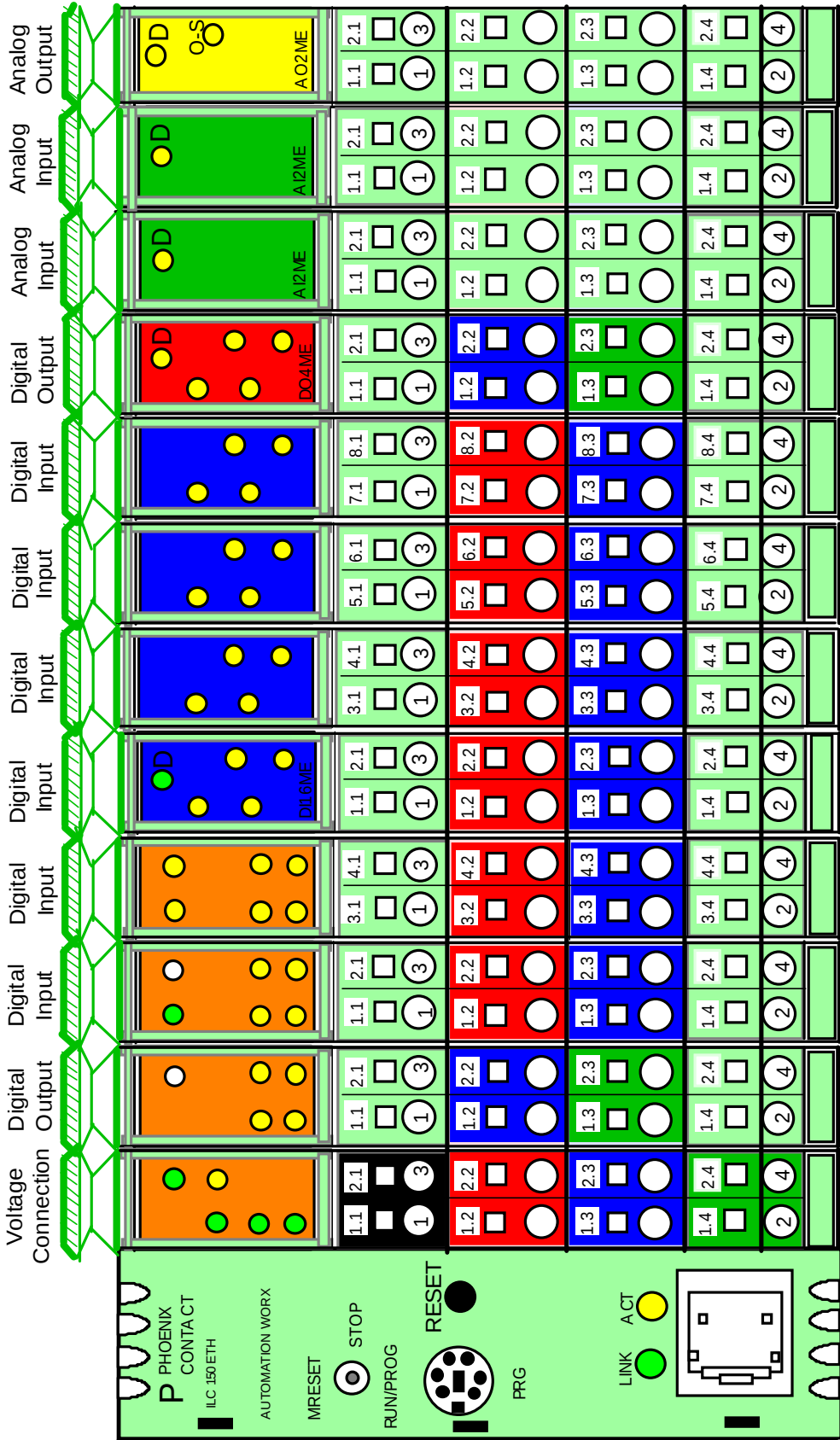
Date: 01/12

Sheet: 101.34

Revision:

CE

BASE NUMBERING - SINGLE FAN PLC



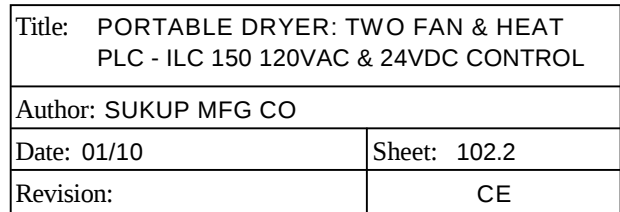
NOTE: 1st number = module # 2nd number = segment # in that module 3rd number = I/O # on that segment

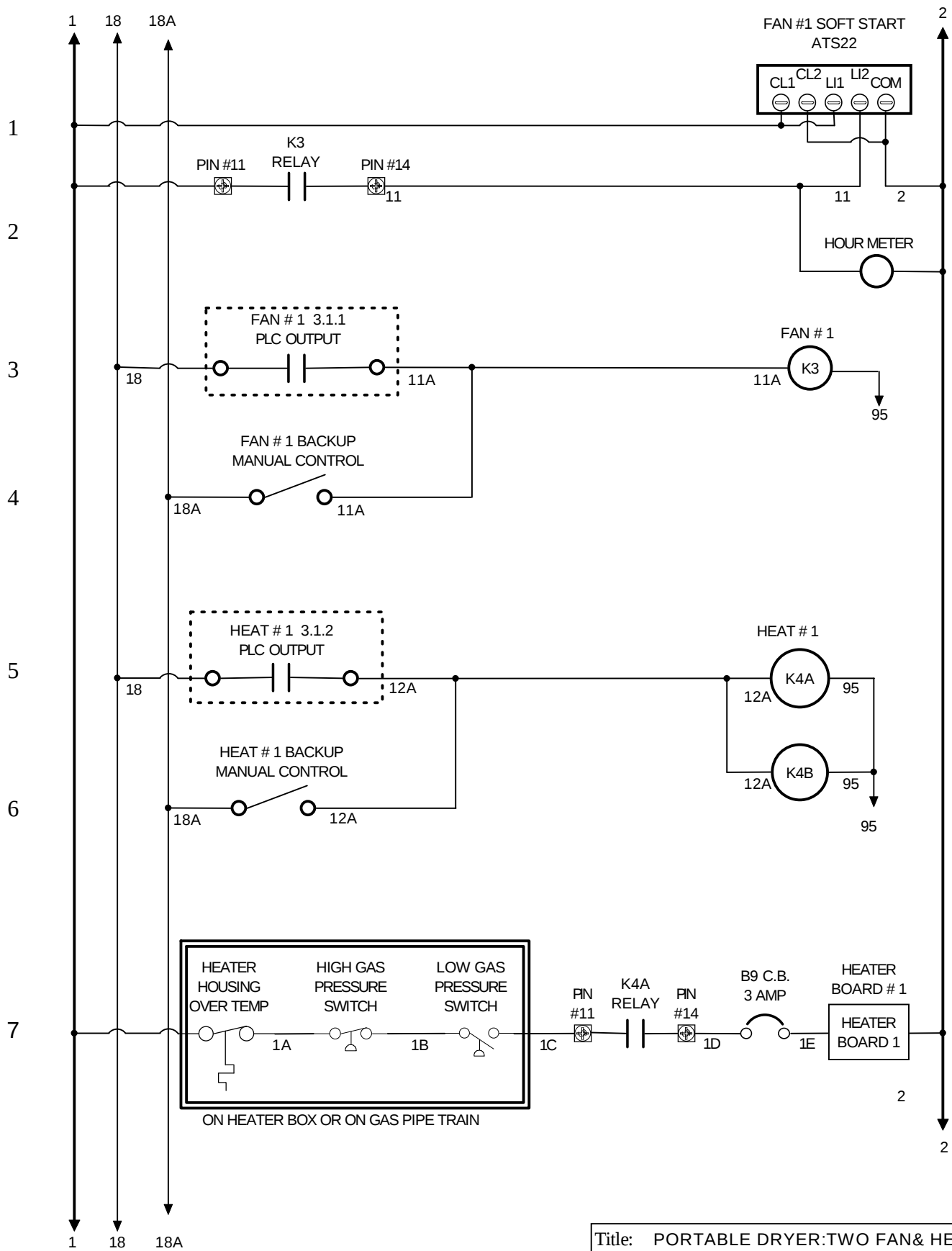
Title: PORTABLE DRYER: SINGLE FAN & HEAT PLC MODULE BASE NUMBERING	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 101.35
Revision: CE	

Appendix G
Two Fan Electrical Drawings

2012
ELECTRICAL DRAWINGS
CE TWO FAN & HEAT







Title: PORTABLE DRYER:TWO FAN& HEAT PLC
ILC 150 120VAC & 24 VDC CONTROL

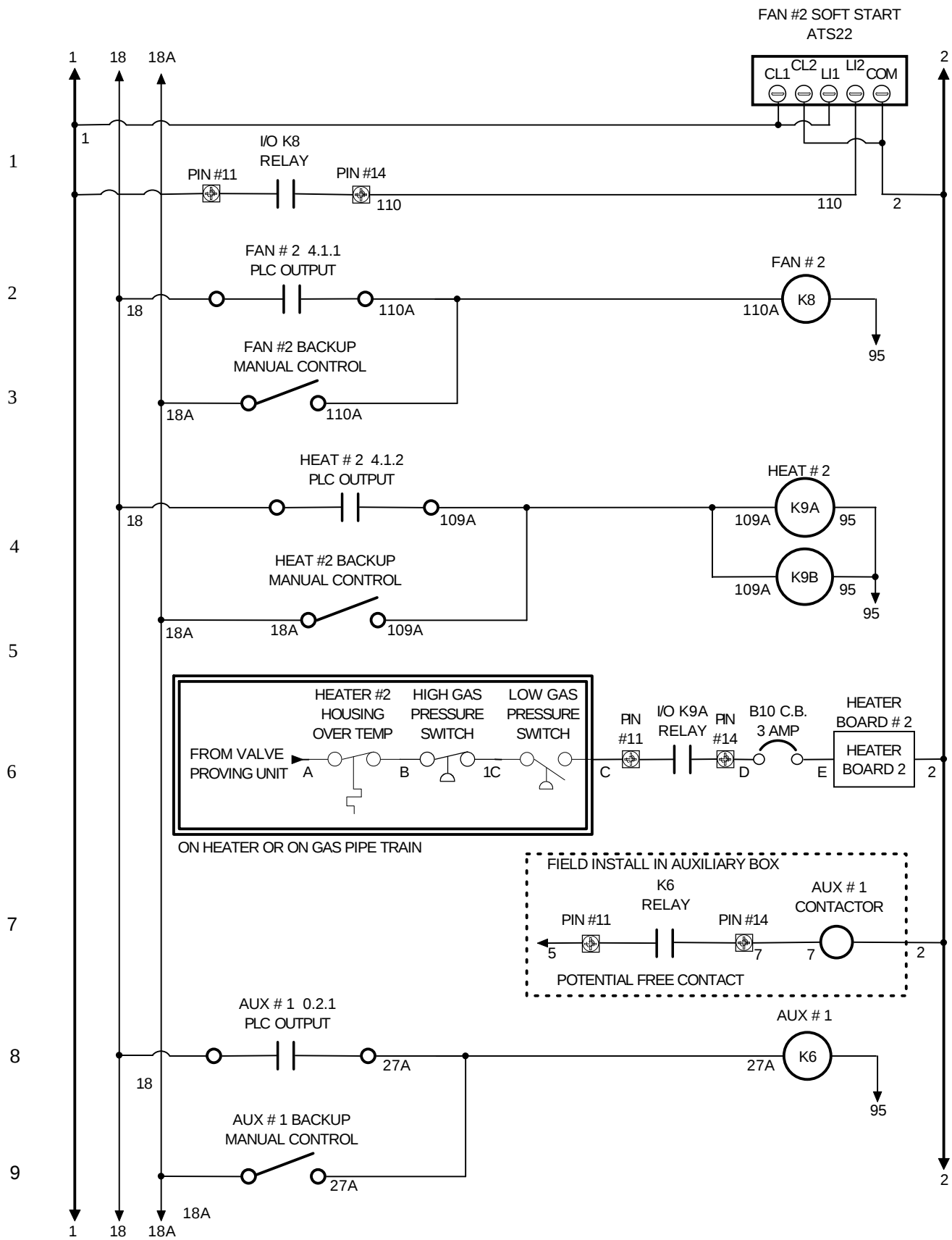
Author: SUKUP MFG CO

Date: 01/12

Sheet: 102.3

Revision:

CE



Title: PORTABLE DRYER: TWO FAN & HEAT
PLC ILC 150 120VAC & 24VDC CONTROL

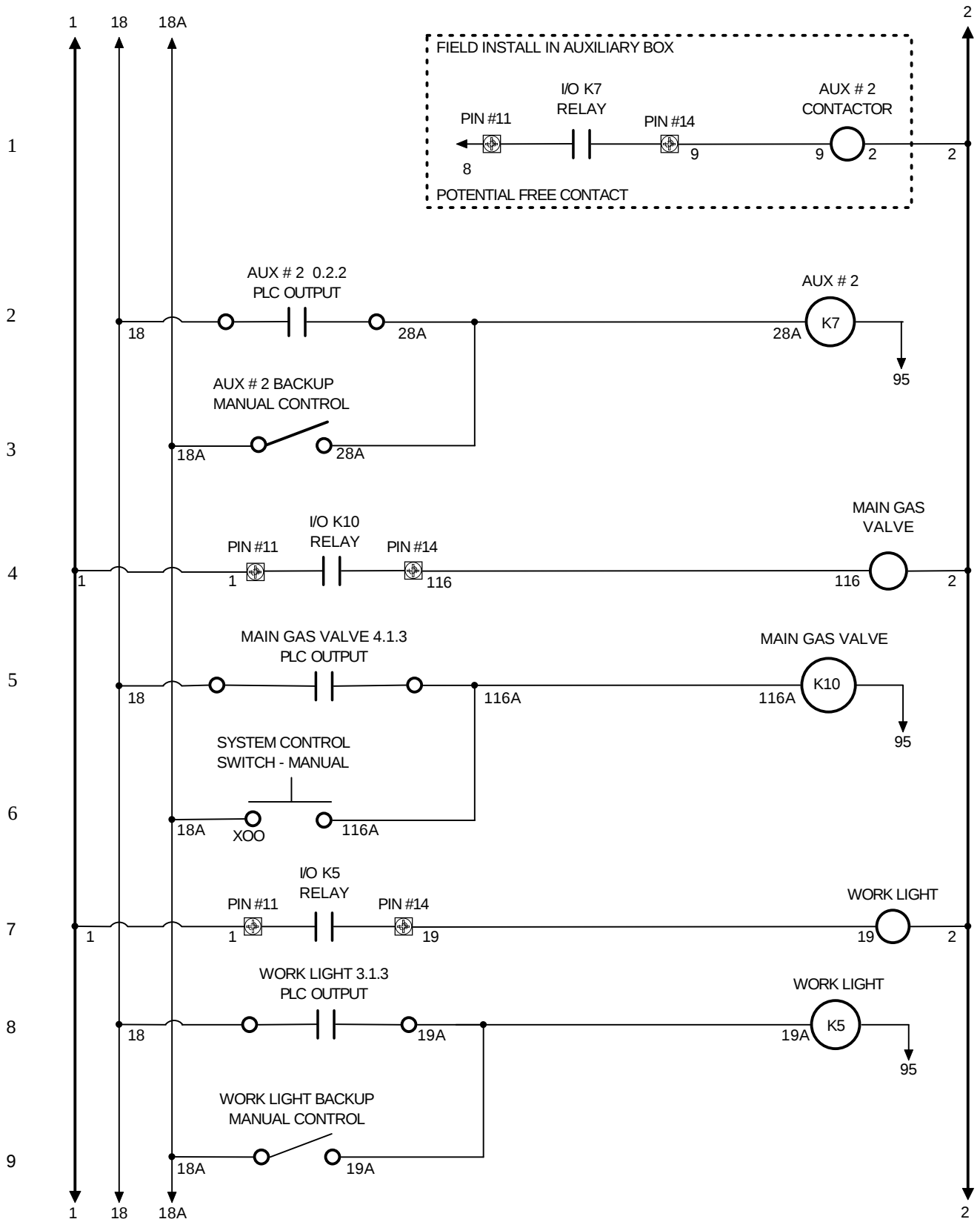
Author: SUKUP MFG CO

Date: 01/12

Sheet: 102.4

Revision:

CE



Title: PORTABLE DRYER: TWO FAN & HEAT PLC ILC 150 120VAC & 24VDC CONTROL	
Author: SUKUP MFG CO	
Date: 01/10	Sheet: 102.5
Revision:	CE

NOTE PAGE

1. The following note applies to MANUAL operation only.

This contact is located on fault relay RL4. The relay is physically mounted on the manual control board. The contact is closed if no faults are present. Check LED # 57 (NO Fault) on the manual control board. This LED should be ON if no faults are present. (Load, Unload, and all Fan switches need to be in the OFF position before the NO Fault LED will turn ON - assuming no other faults are present)

If a fault condition was present, the manual reset (located on the manual control board - upper left corner) will need to be pressed to clear the fault. If the fault condition *has not* been corrected, the RED LED associated with that fault will go out when the reset has been pushed, but will turn ON again within a few seconds, after the faults are scanned.

2. The X indicates the switch position. An X to the left, indicates the switch is in the Manual position, and an X to the right indicates the switch is in the Automatic position.
3. If auxiliary contactors are used, the overloads are wired in series and connected to these terminals. If auxiliary contactors are not used, a jumper is required between these two terminals, or an overload fault will occur.

□ □ □ ○ □ ○ - Indicates a power box connection terminal.

CE WIRES FROM THE POWER BOX TO THE HEATER BOX

FAN	WIRE COLOR	POS.1	POS. 2
38/44"	RED	1	1
	WHITE	2	2
	ORANGE	18	18
	BLUE	52	52
	BLACK	95	95
	GREEN	GND	GND
	PURPLE	37	102
	BROWN	45	106
	GRAY	61	161
	PINK	1C	2C
	BROWN/WHT	1E	2E
28"	PINK	1B	---
	BROWN/WHT	1C	---

HEATER BOX TERMINALS

POSITION 38" / 44"	Emov	Housing Of	High Pressure	Heat On
#2	161	A & B	B & C	E
#1	61	A & B	B & C	E
28"				
#1	61	1 & A	A & B	D

Title: PORTABLE DRYER: TWO FAN & HEAT
NOTES PAGE

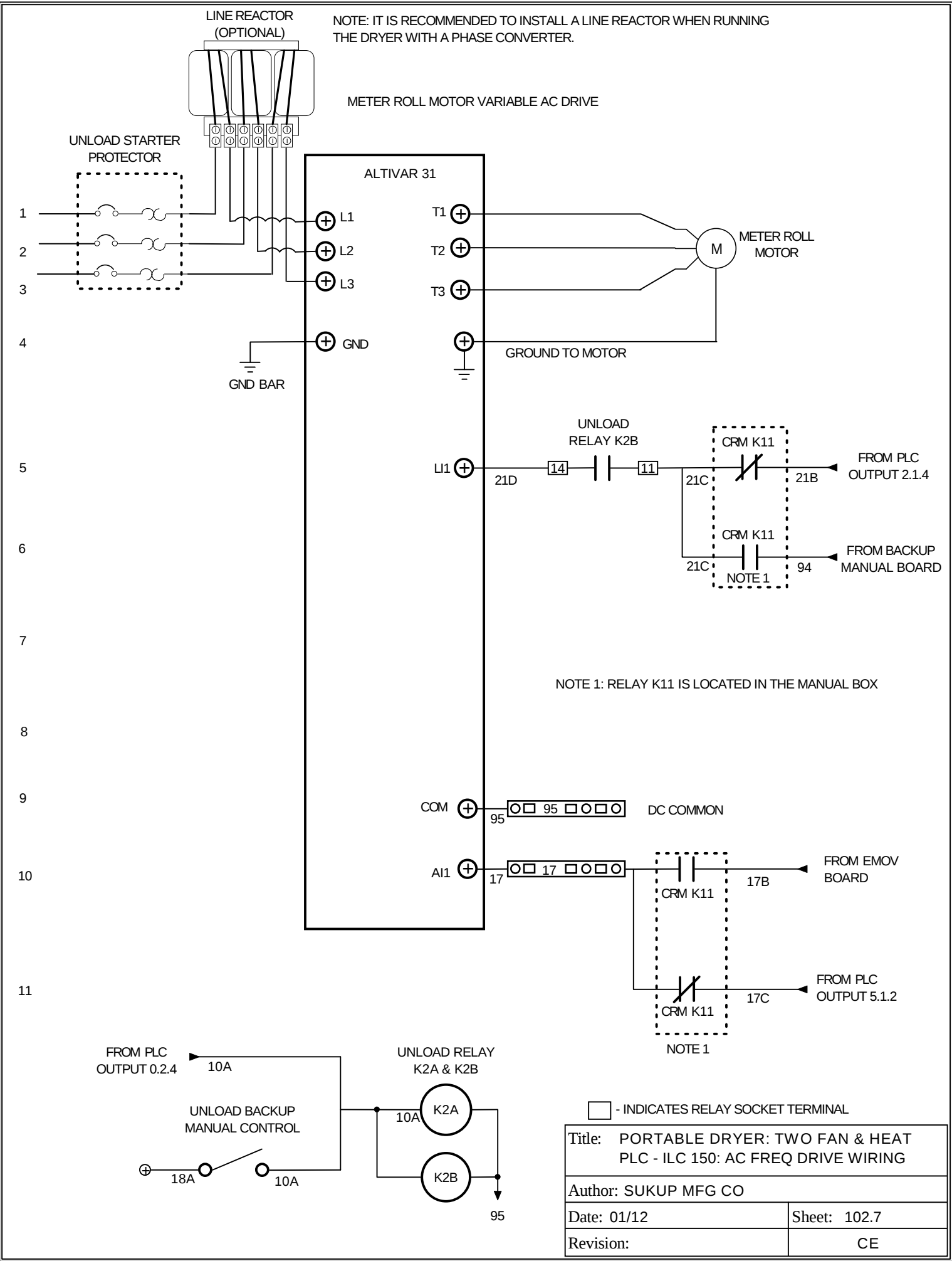
Author: SUKUP MFG CO

Date: 03/11

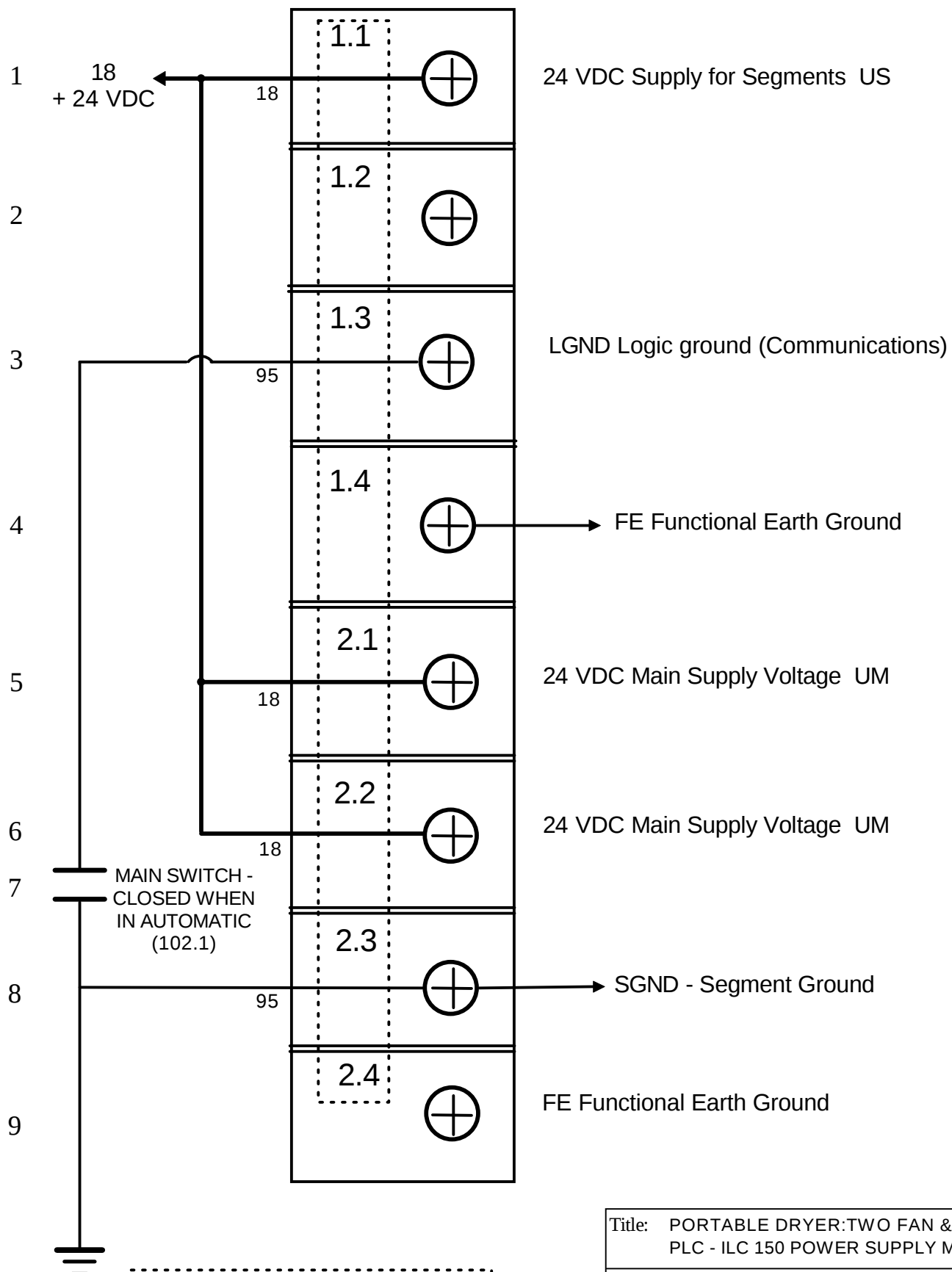
Sheet: 102.6

Revision:

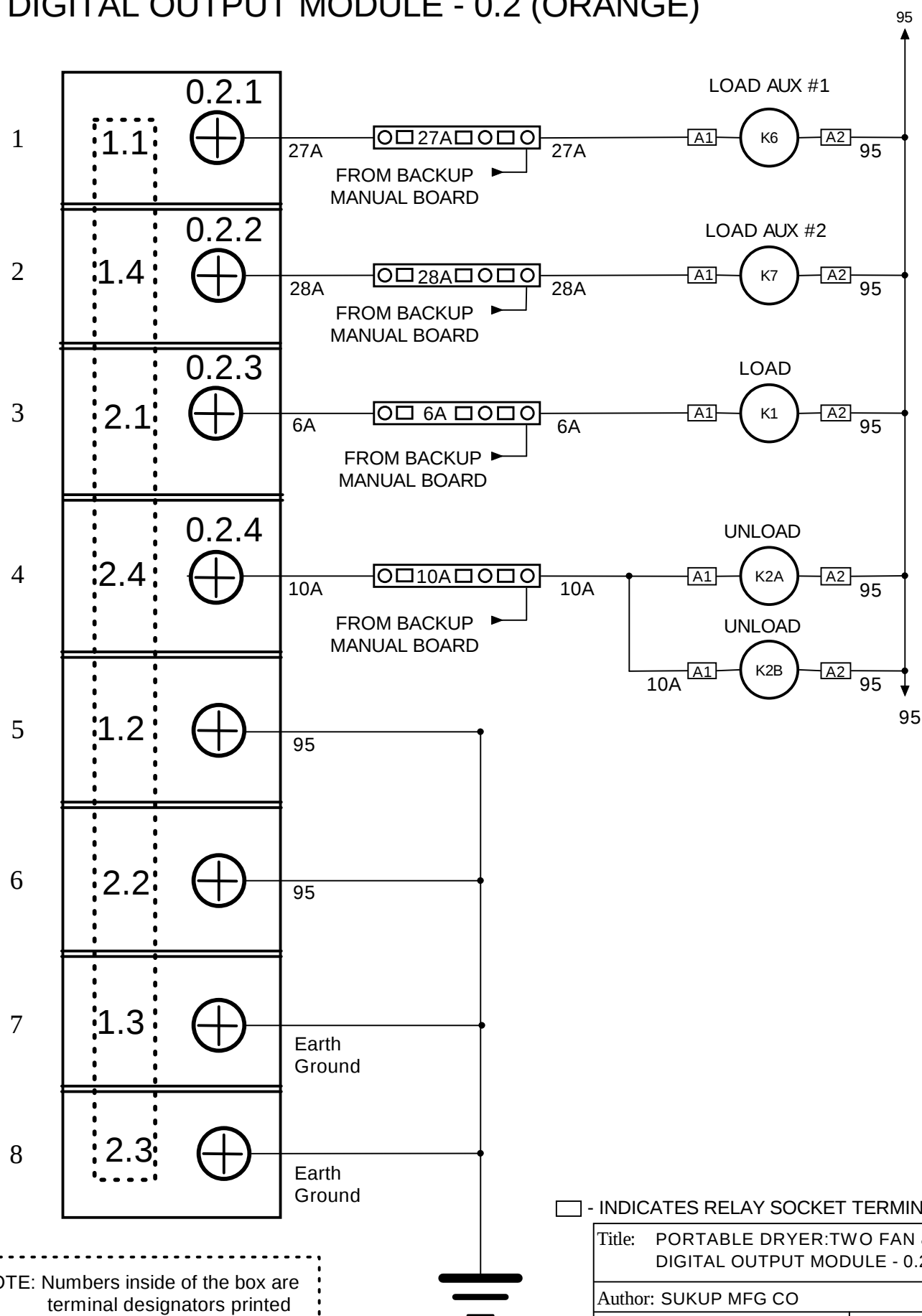
CE



24 VDC WIRING ARM - 0.1 (ORANGE)



DIGITAL OUTPUT MODULE - 0.2 (ORANGE)



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

Title: PORTABLE DRYER:TWO FAN &HEAT
DIGITAL OUTPUT MODULE - 0.2

Author: SUKUP MFG CO

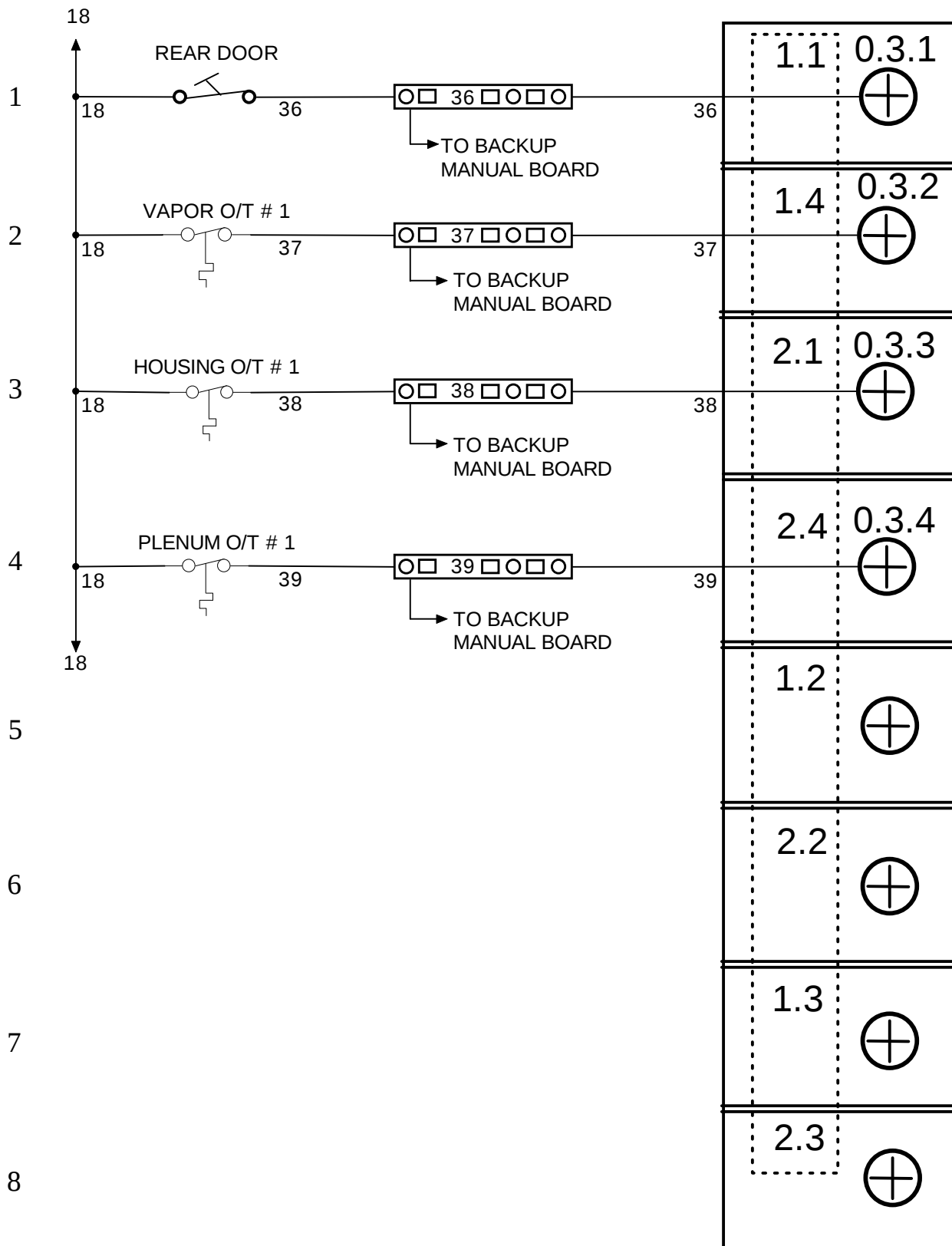
Date: 01/12

Sheet: 102.9

Revision:

CE

DIGITAL INPUT MODULE - 0.3 (ORANGE)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 0.3

Author: SUKUP MFG CO

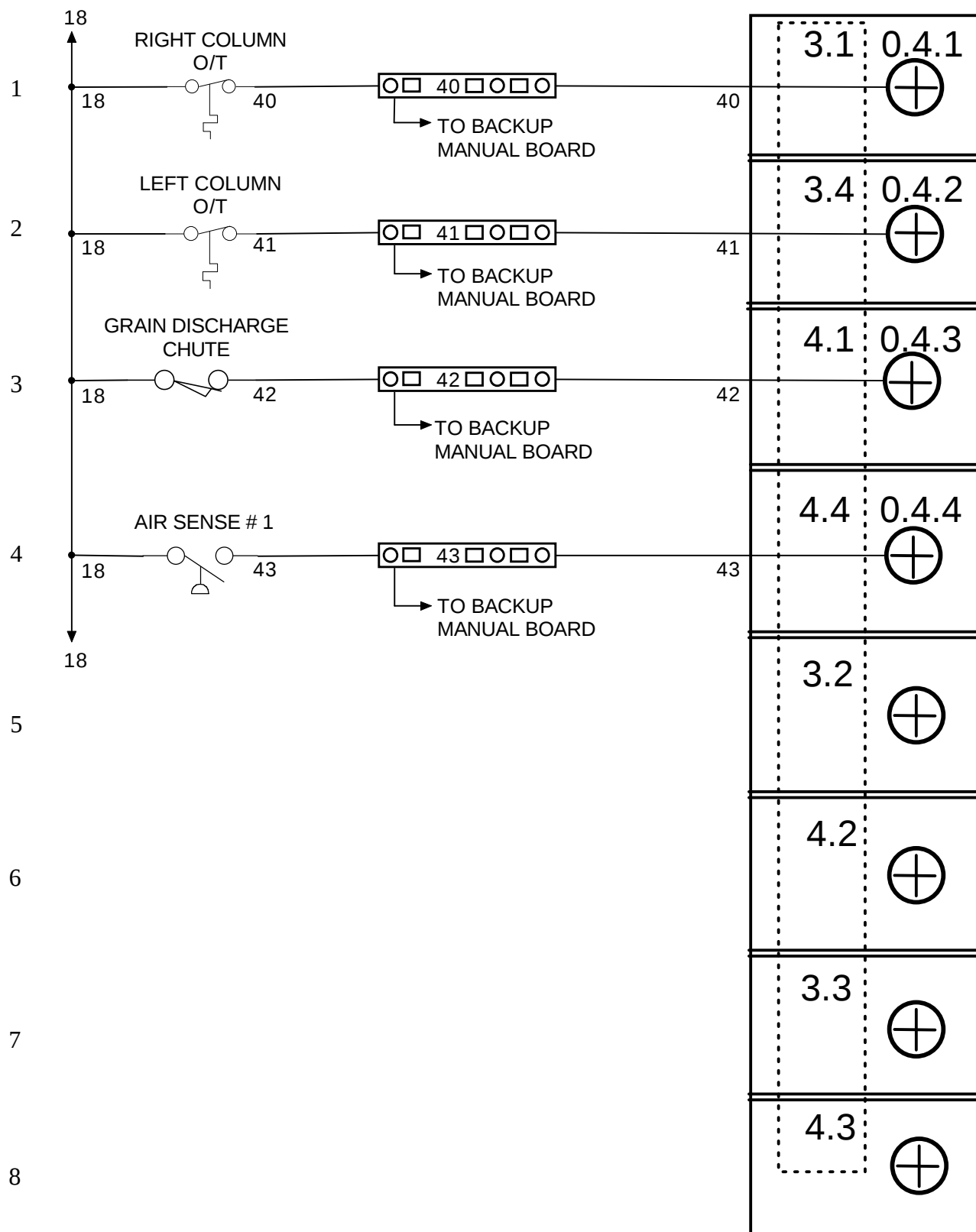
Date: 01/12

Sheet: 102.10

Revision:

CE

DIGITAL INPUT MODULE - 0.4 (ORANGE)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 0.4

Author: SUKUP MFG CO

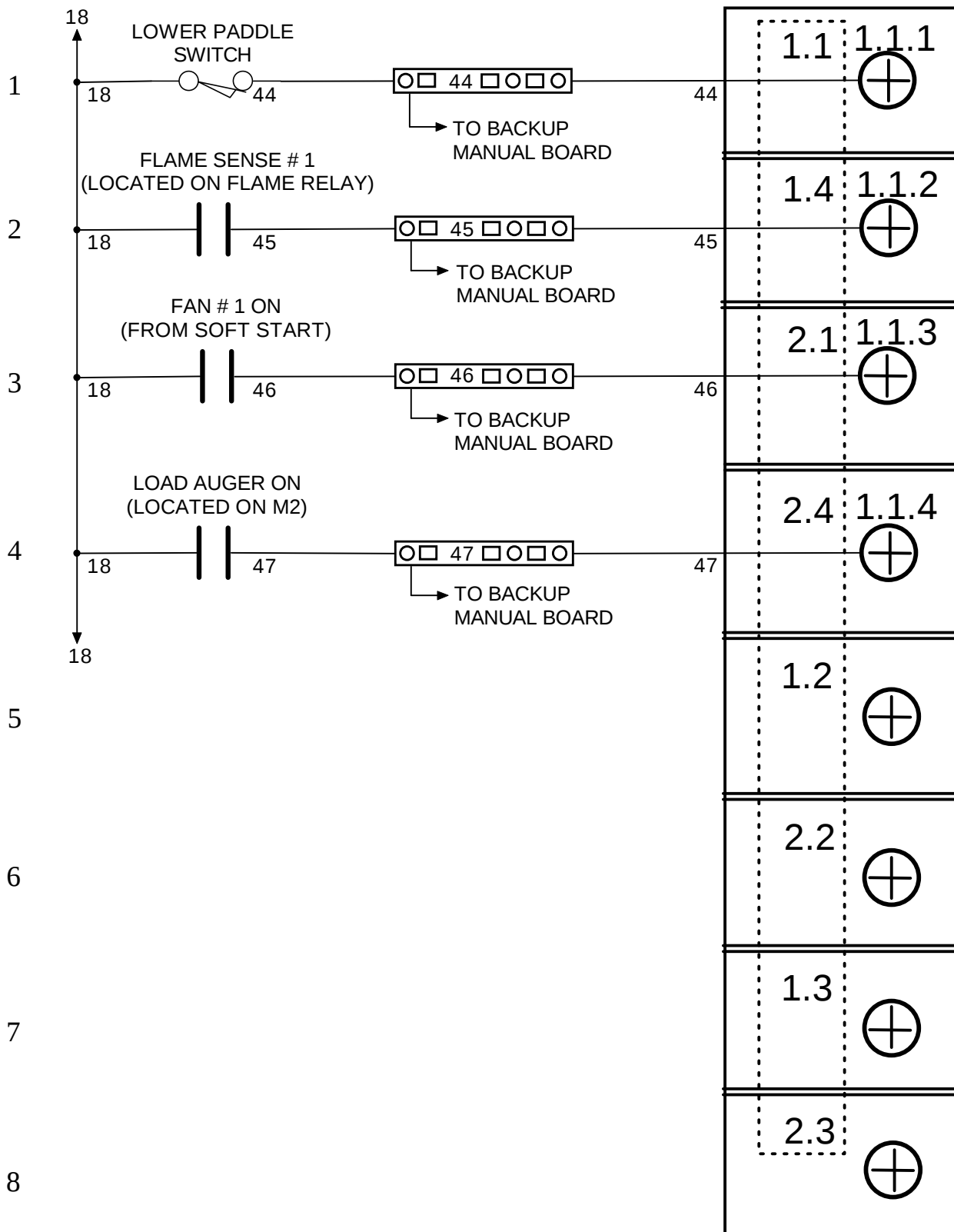
Date: 01/12

Sheet: 102.11

Revision:

CE

DIGITAL INPUT MODULE - 1.1 OF 4 (BLUE)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 1.1

Author: SUKUP MFG CO

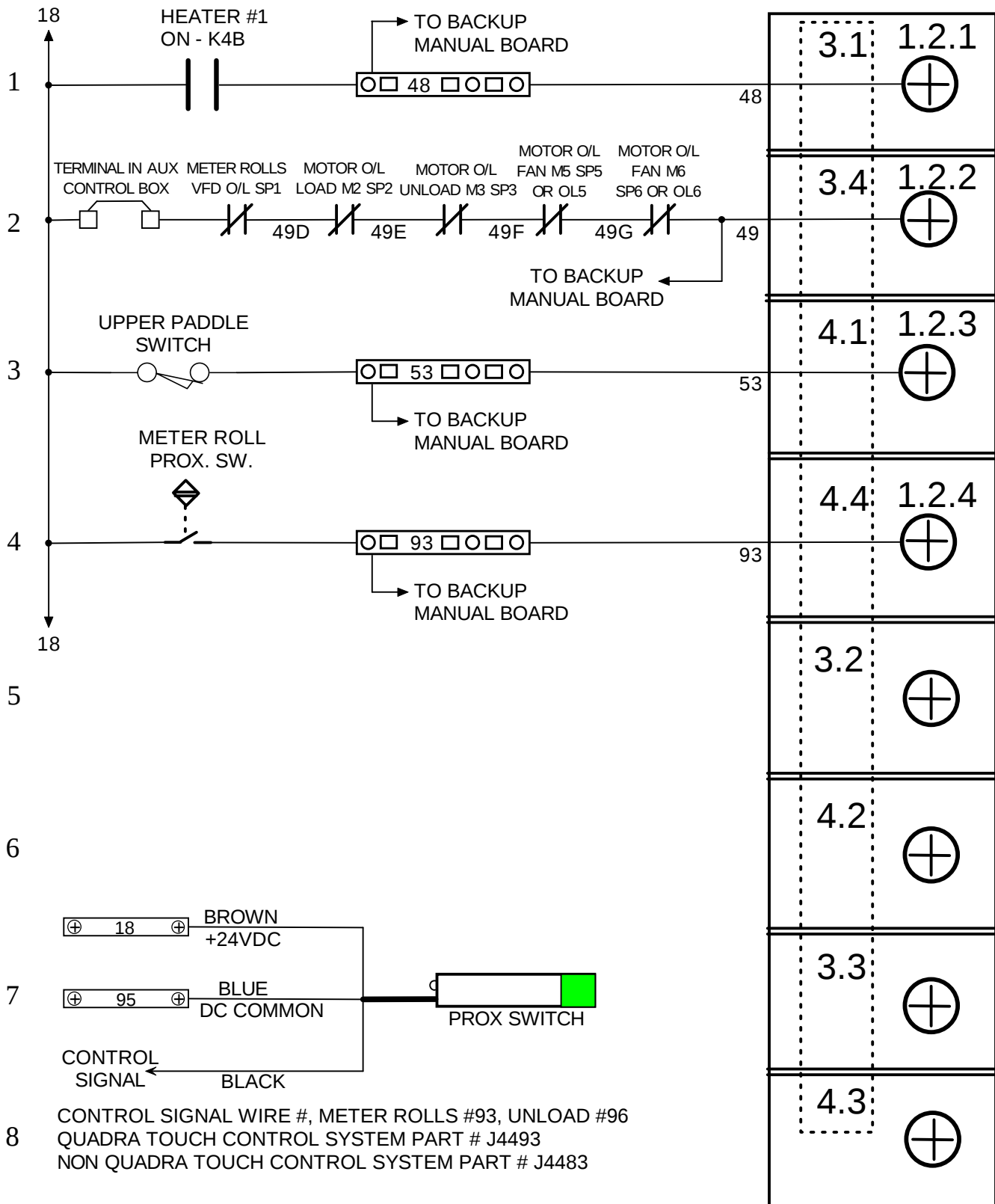
Date: 01/12

Sheet: 102.12

Revision:

CE

DIGITAL INPUT MODULE - 1.2 OF 4 (BLUE)



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

Title: PORTABEL DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 1.2

Author: SUKUP MFG CO

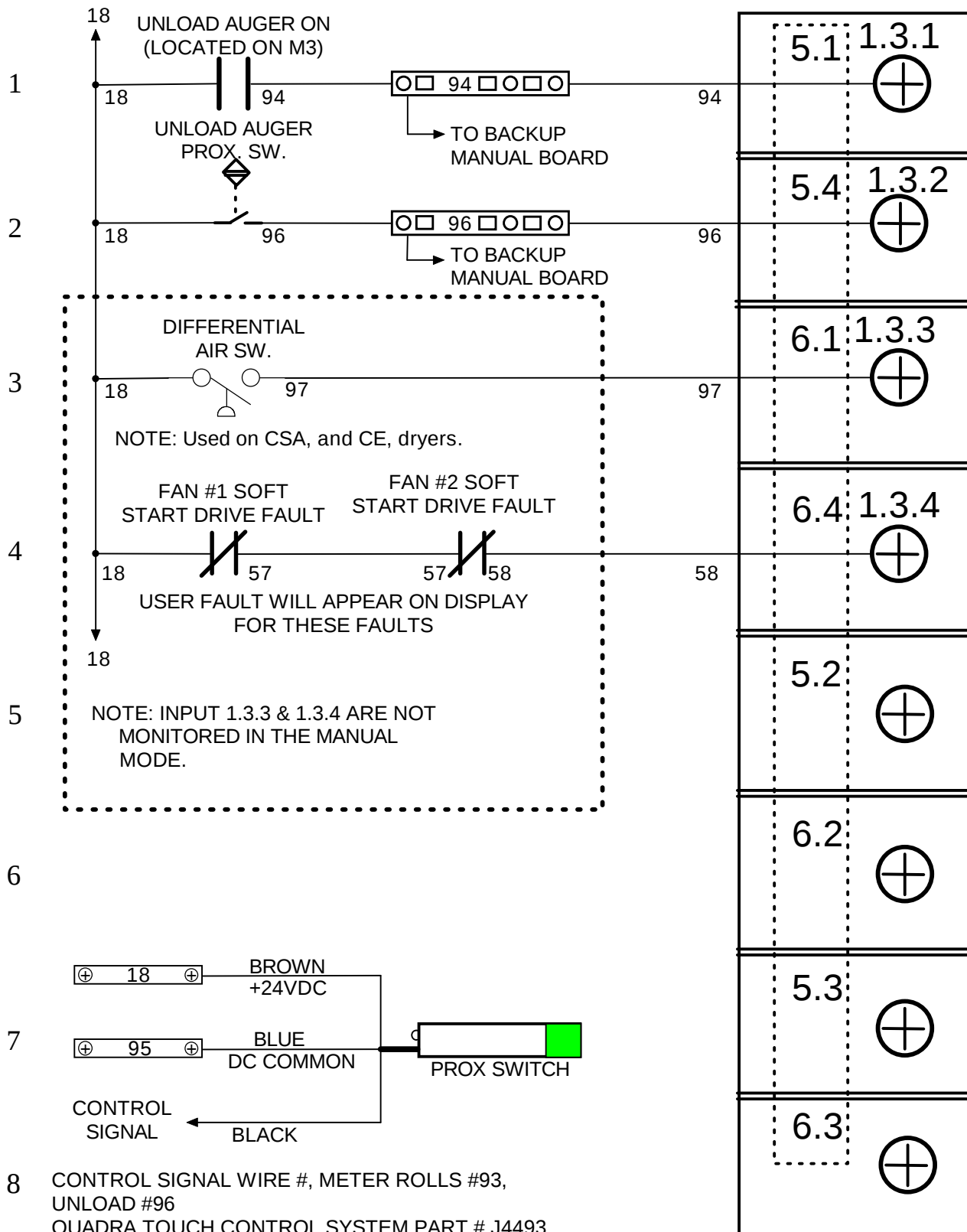
Date: 01/12

Sheet: 102.13

Revision:

CE

DIGITAL INPUT MODULE -1.3 OF 4 (BLUE)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 1.3

Author: SUKUP MFG CO

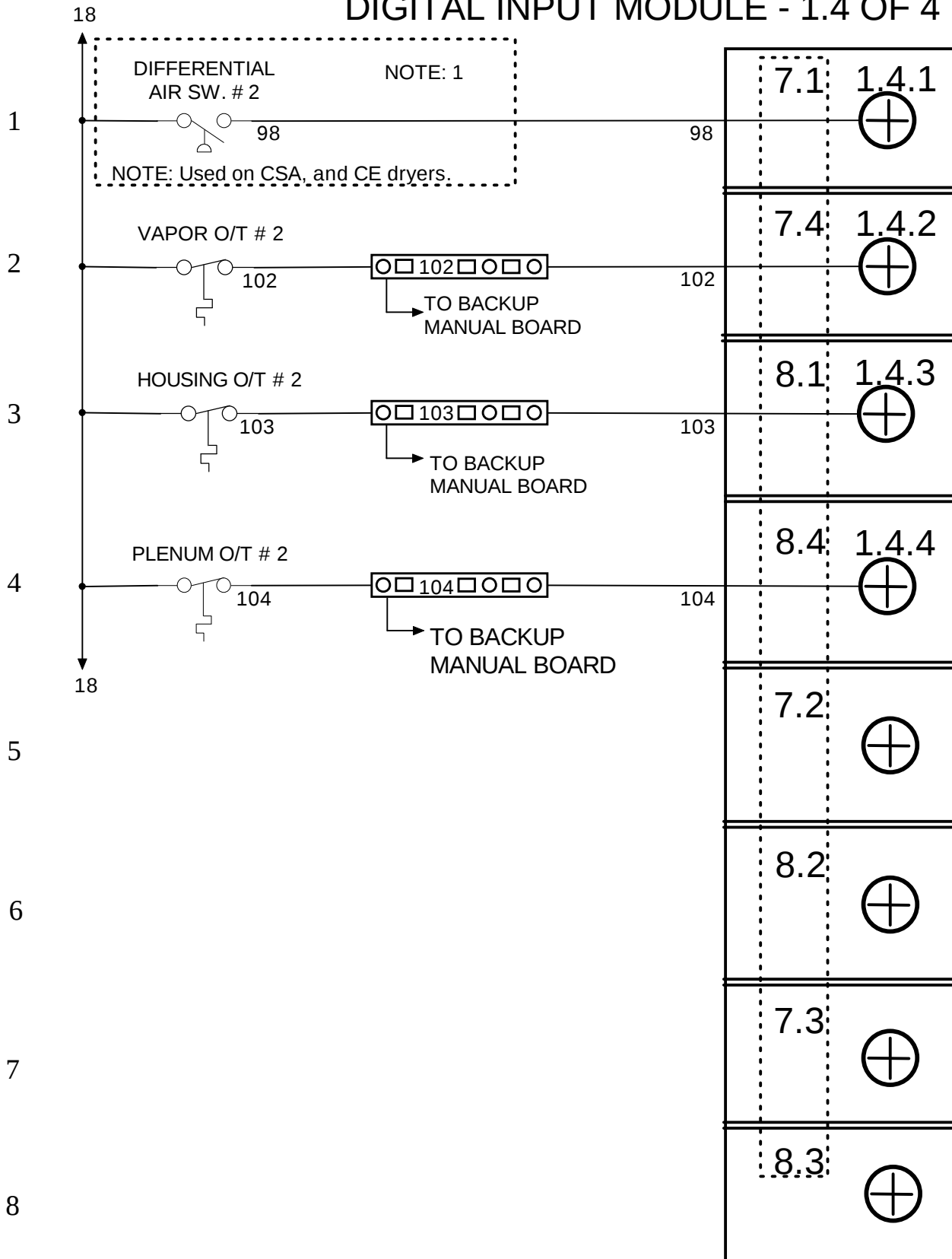
Date: 01/12

Sheet: 102.14

Revision:

CE

DIGITAL INPUT MODULE - 1.4 OF 4 (BLUE)



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

NOTE : 1 INPUT 1.4.1 IS NOT MONITORED IN THE MANUAL MODE

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 1.4

Author: SUKUP MFG CO

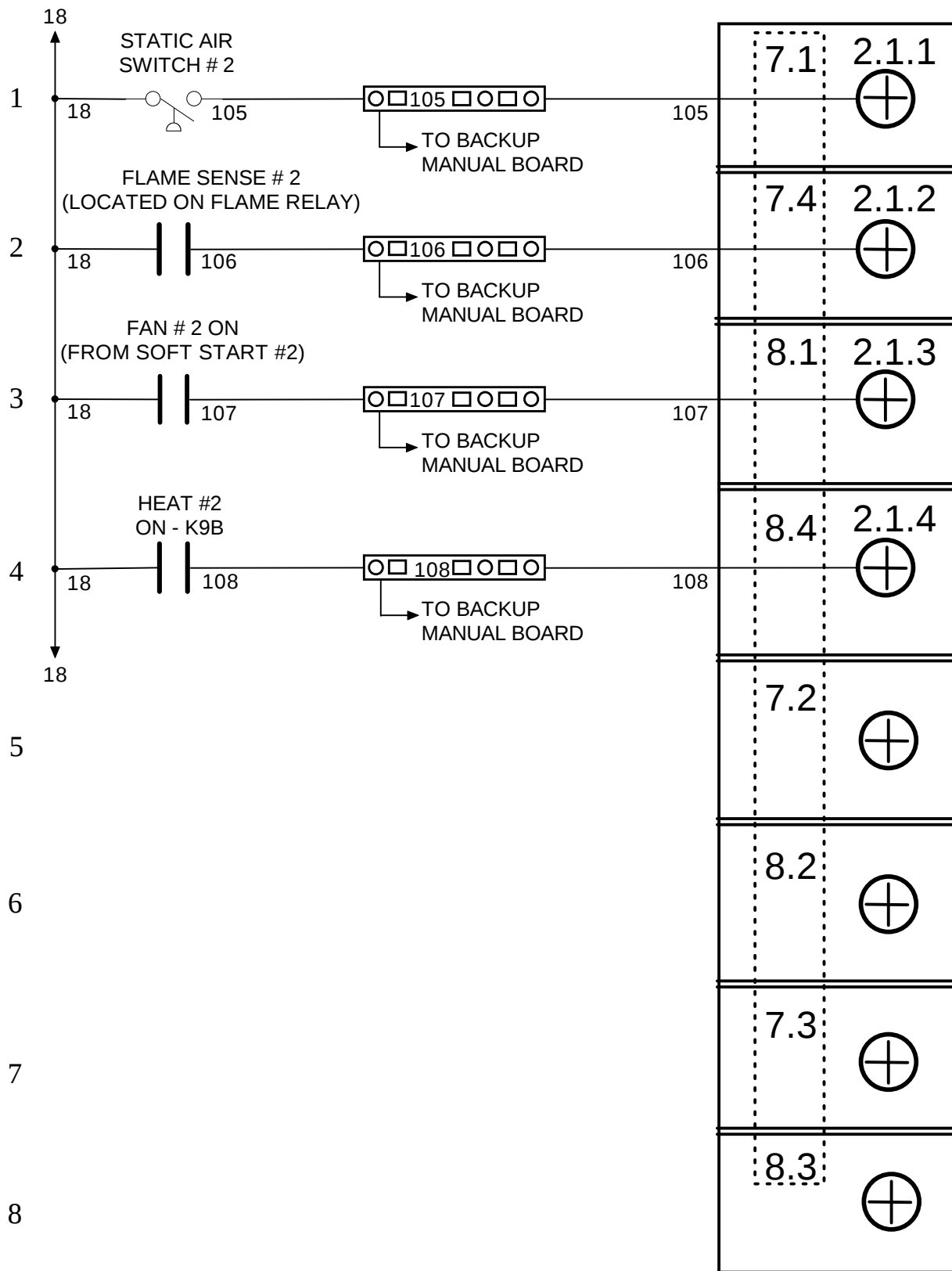
Date: 01/12

Sheet: 102.15

Revision:

CE

DIGITAL INPUT MODULE - 2.1 (BLUE)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE - 2.1

Author: SUKUP MFG CO

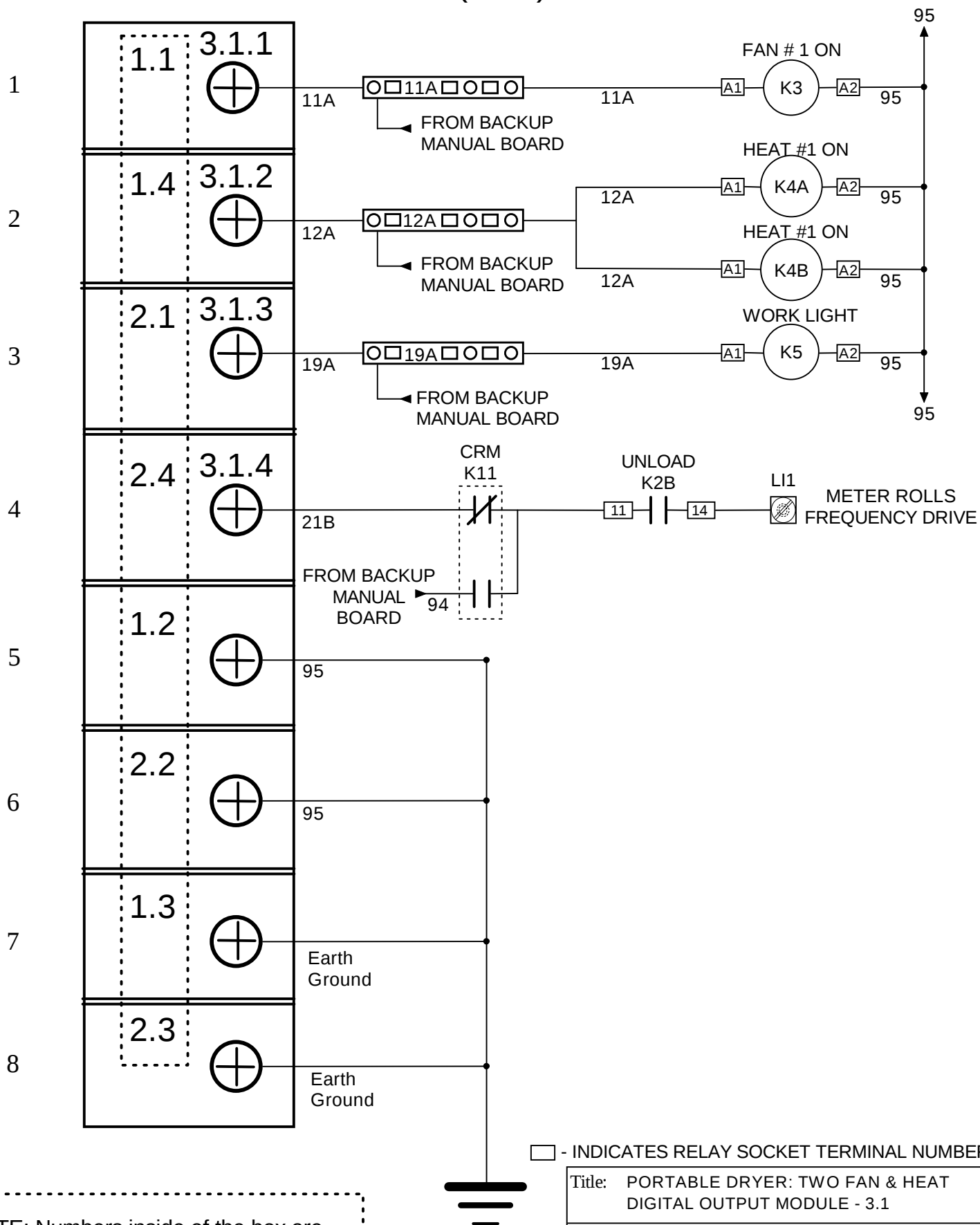
Date: 01/12

Sheet: 102.16

Revision:

CE

DIGITAL OUTPUT MODULE 3.1 (RED)



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

□ - INDICATES RELAY SOCKET TERMINAL NUMBER

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL OUTPUT MODULE - 3.1

Author: SUKUP MFG CO

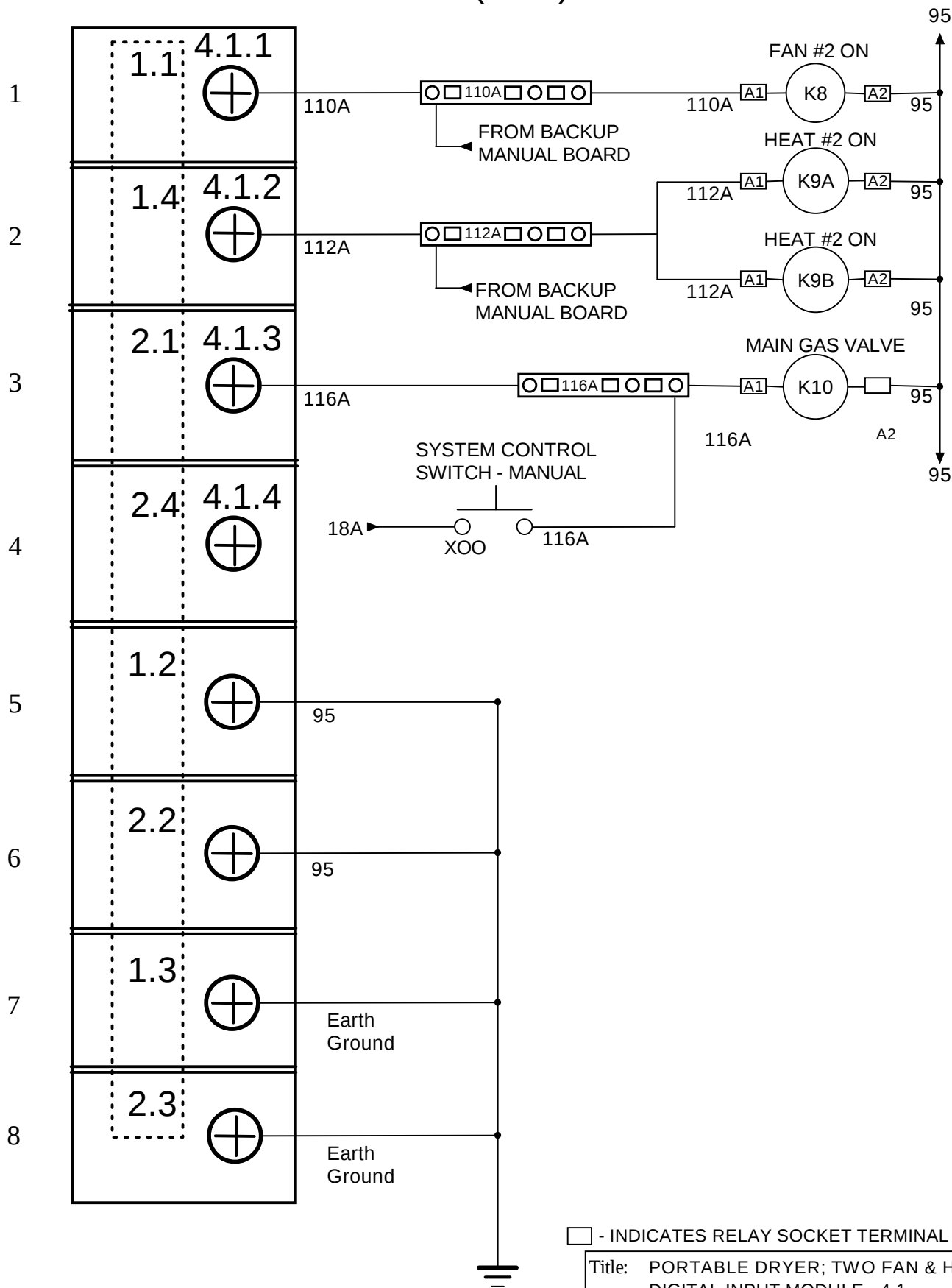
Date: 01/12

Sheet: 102.17

Revision:

CE

DIGITAL OUTPUT MODULE 4.1 (RED)

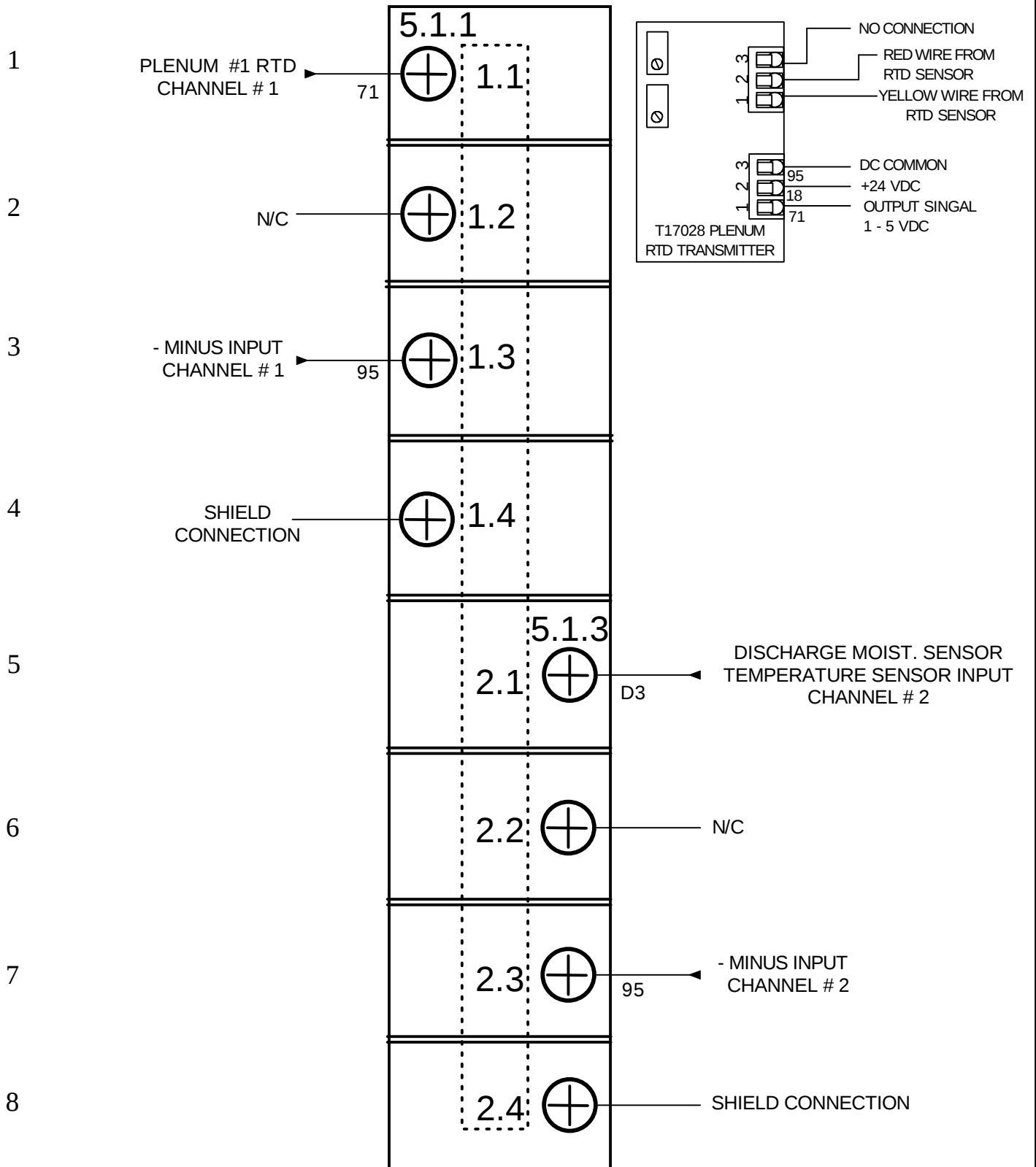


NOTE: Numbers inside of the box are terminal designators printed on the module.

□ - INDICATES RELAY SOCKET TERMINAL NUMBER

Title: PORTABLE DRYER; TWO FAN & HEAT DIGITAL INPUT MODULE - 4.1	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.18
Revision:	CE

ANALOG INPUT MODULE - 5.1 (GREEN)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
ANALOG INPUT MODULE - 5.1

Author: SUKUP MFG CO

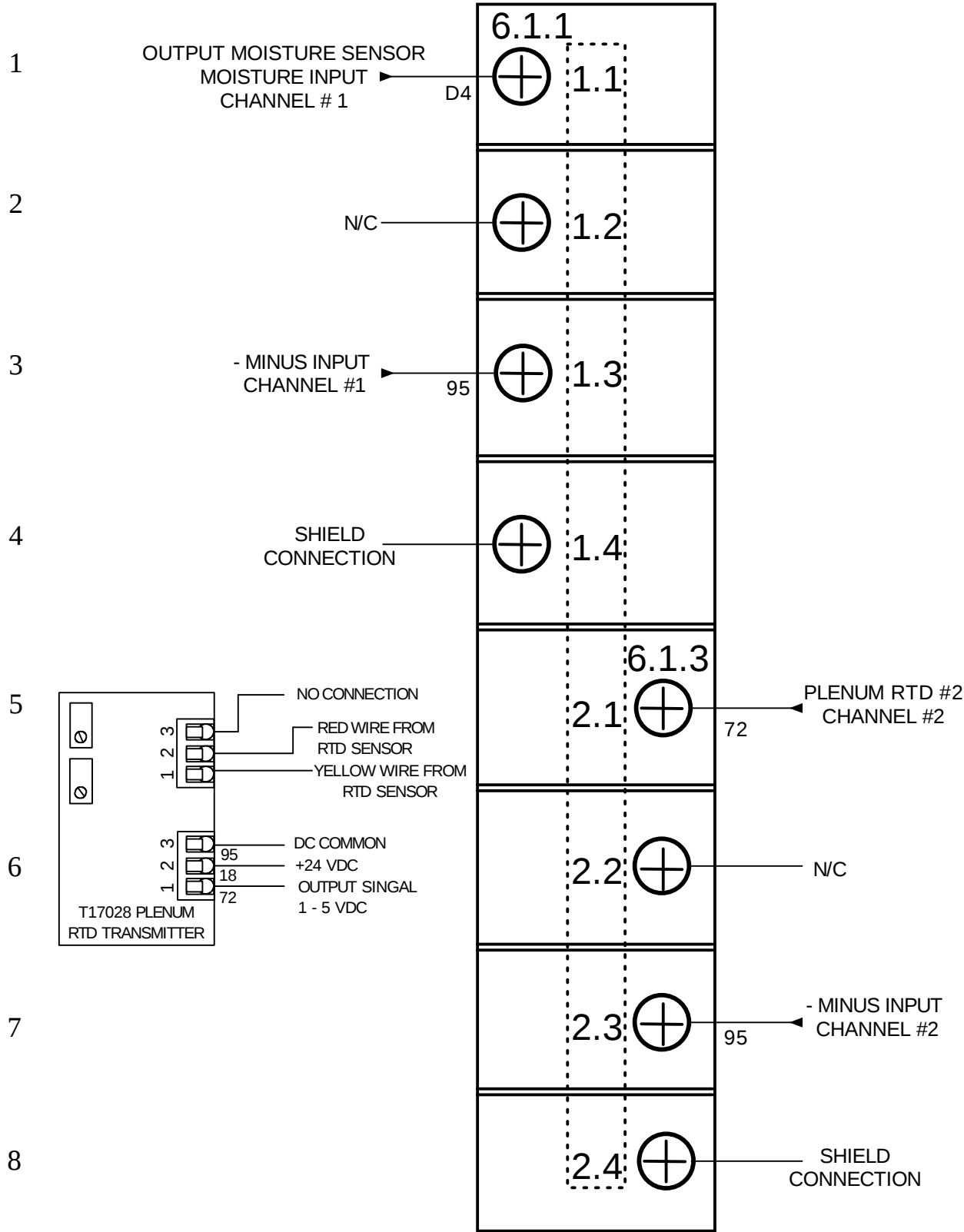
Date: 01/12

Sheet: 102.19

Revision:

CE

ANALOG INPUT MODULE - 6.1 (GREEN)



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

Title: PORTABLE DRYER: TWO FAN & HEAT
ANALOG INPUT MODULE - 6.1

Author: SUKUP MFG CO

Date: 12/11

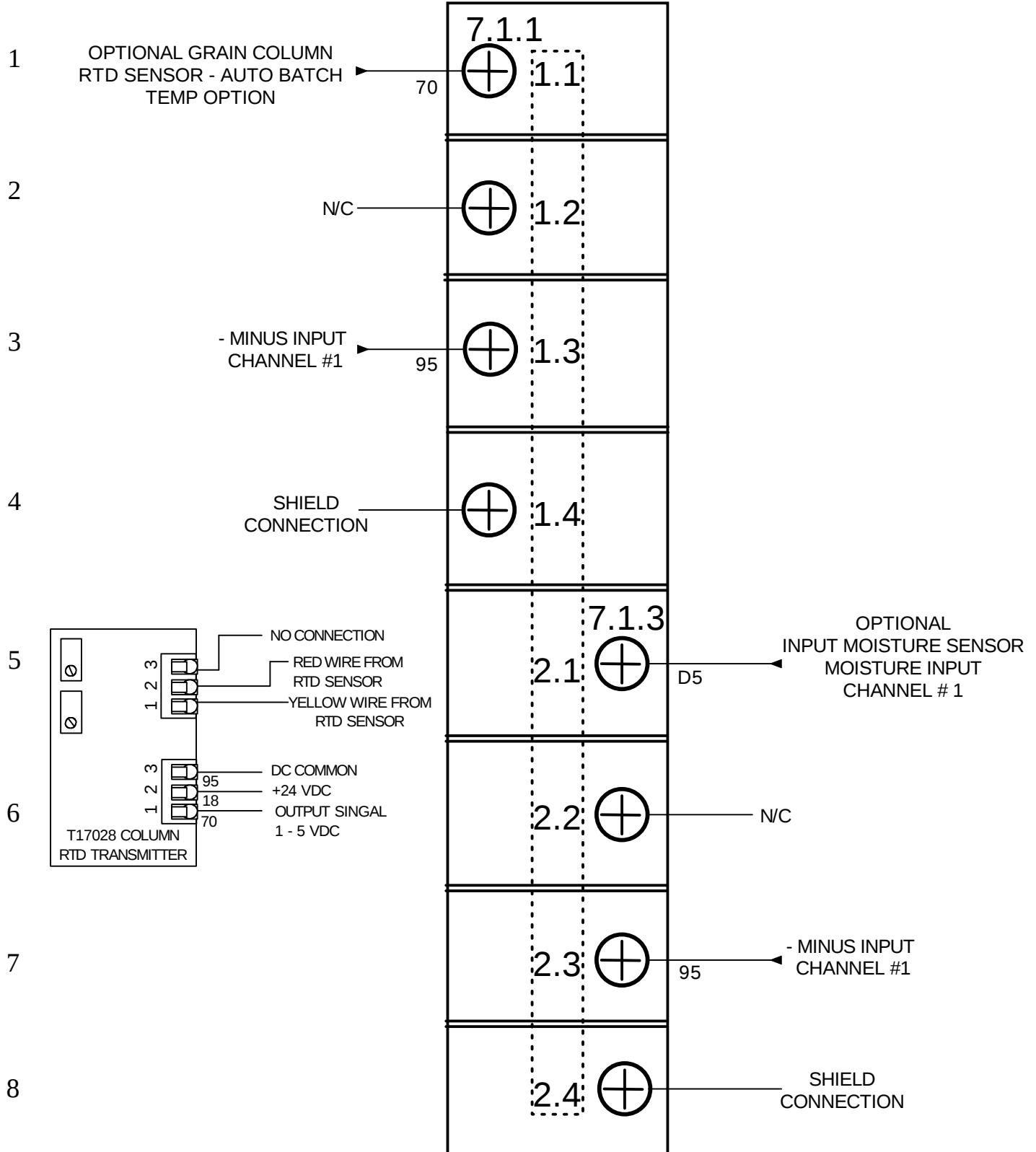
Sheet: 102.20

Revision:

CE

ANALOG INPUT MODULE - 7.1 (GREEN)

TWO FAN WITH INPUT MOISTURE SENSOR & GRAIN COLUMN RTD OPTIONS



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

Title: PORTABLE DRYER: TWO FAN & HEAT STACK ANALOG INPUT MODULE - 7.1

Author: SUKUP MFG CO

Date: 01/12

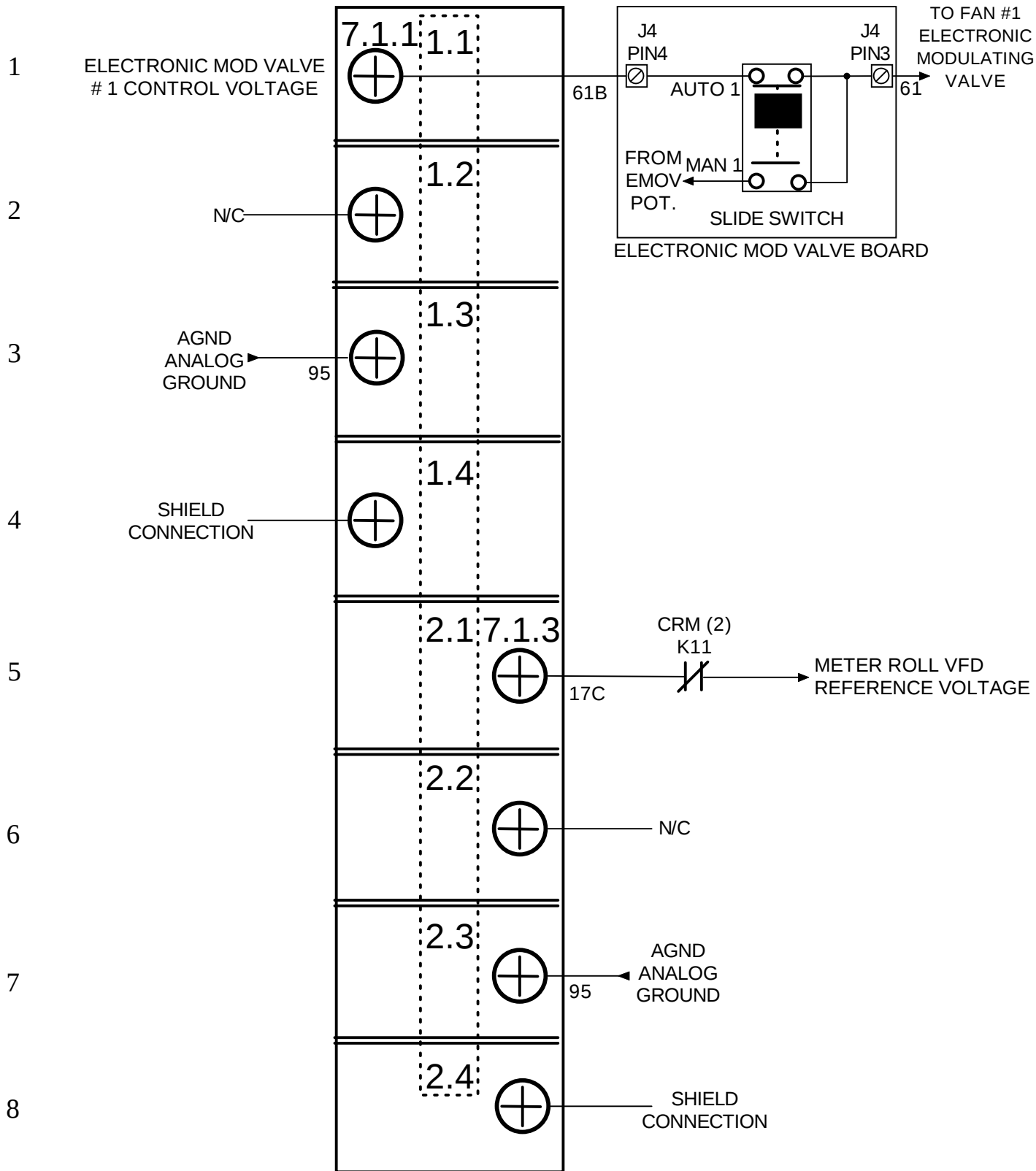
Sheet: 102.21

Revision:

CE

ANALOG OUTPUT MODULE (0-10 VDC) 7.1 (YELLOW)

THIS CARD IS 8.1 ON A TWO FAN STACK DRYER OR WHEN EQUIPPED WITH A INPUT MOISTURE SENSOR OR A GRAIN COLUMN TEMPERATURE SENSOR.



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

Title: PORTABLE DRYER: TWO FAN & HEAT
ANALOG OUTPUT MODULE - 8.1

Author: SUKUP MFG CO

Date: 01/12

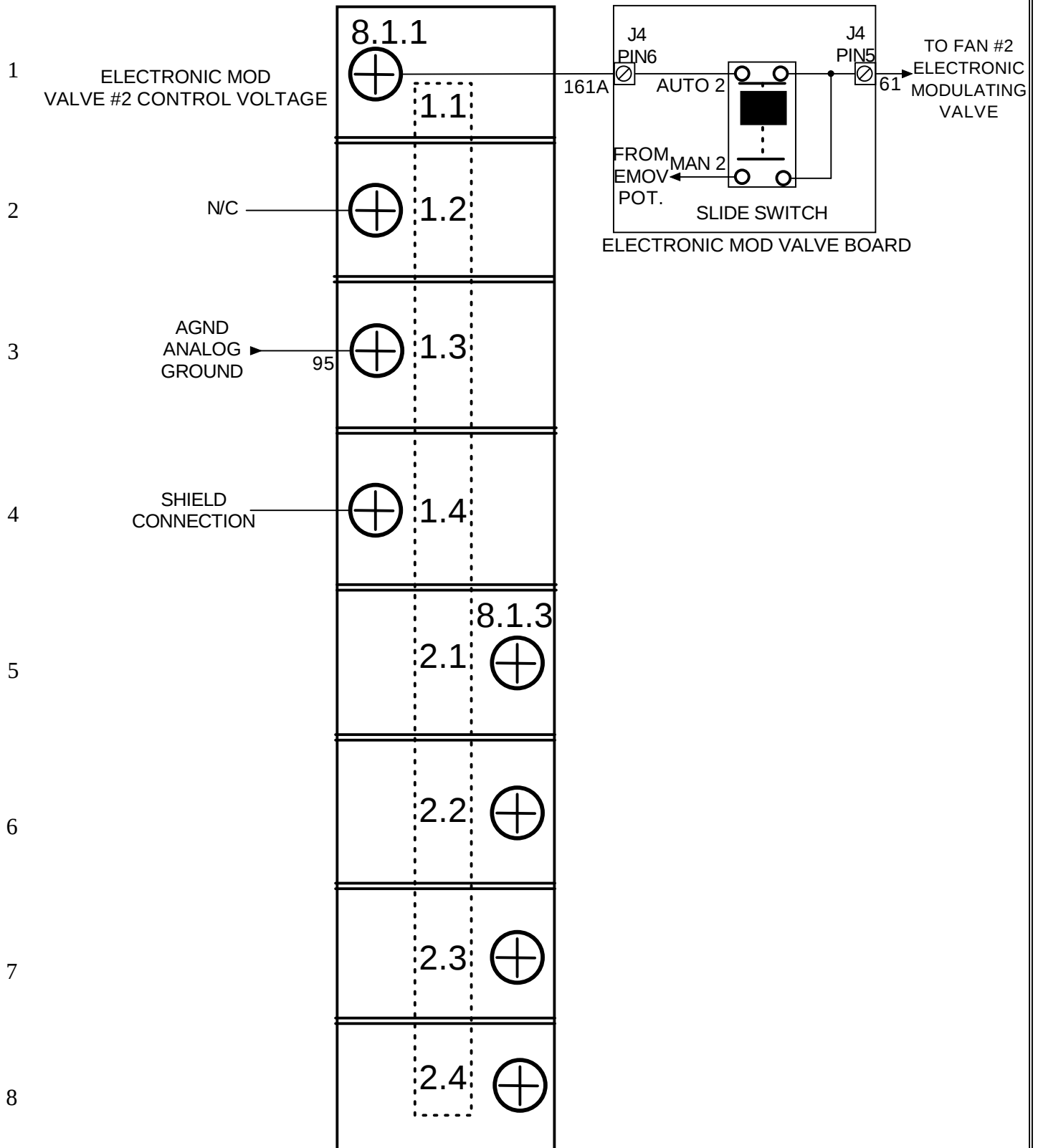
Sheet: 102.22

Revision:

CE

ANALOG OUTPUT MODULE 8.1 (YELLOW)

THIS CARD IS 9.1 ON A TWO FAN STACK DRYER OR WHEN EQUIPPED WITH A INPUT MOISTURE SENSOR
OR A GRAIN COLUMN TEMPERATURE SENSOR



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

Title: PORTABLE DRYER: TWO FAN & HEAT
ANALOG OUTPUT MODULE - 8.1

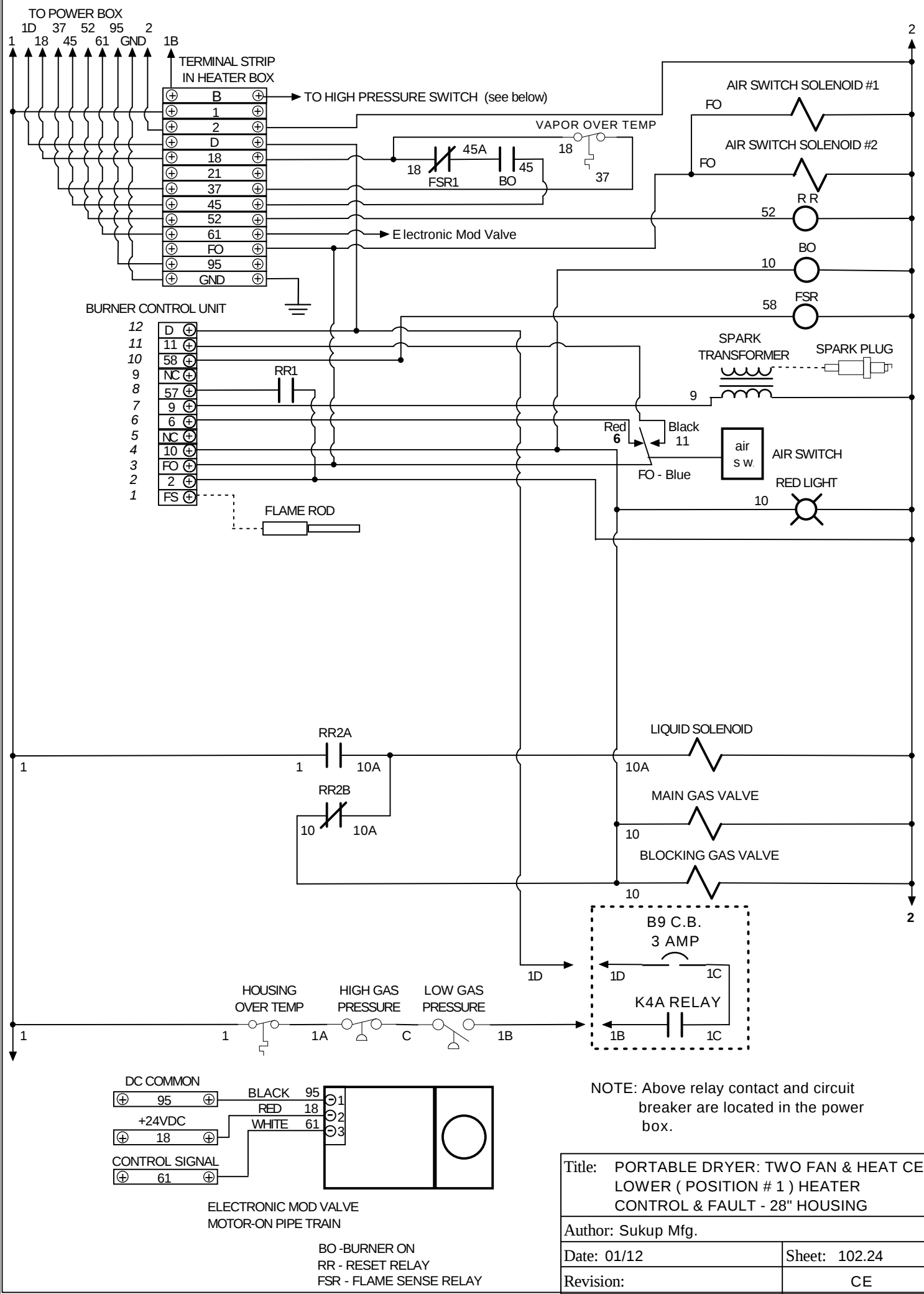
Author: SUKUP MFG CO

Date: 01/12

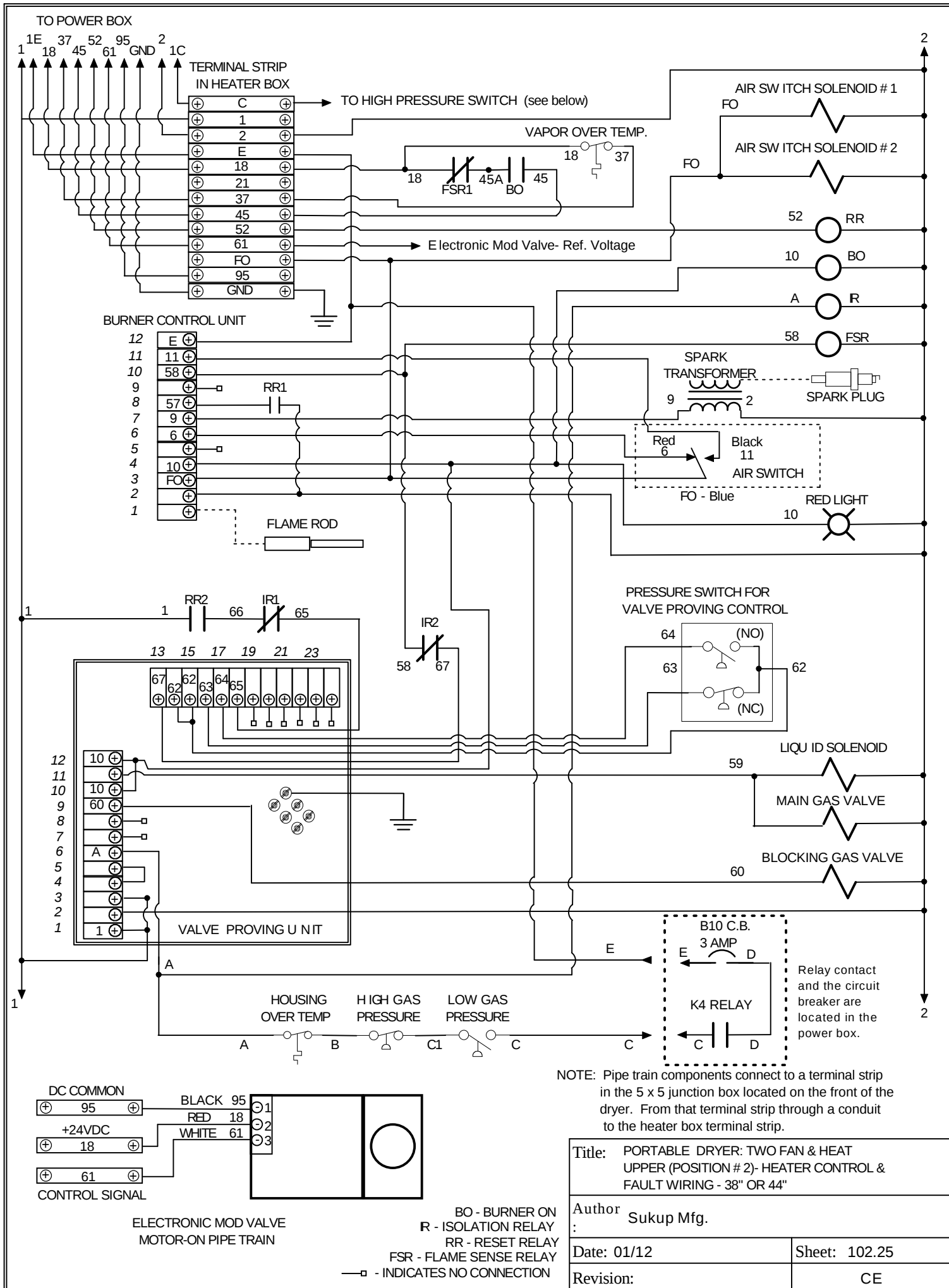
Sheet: 102.23

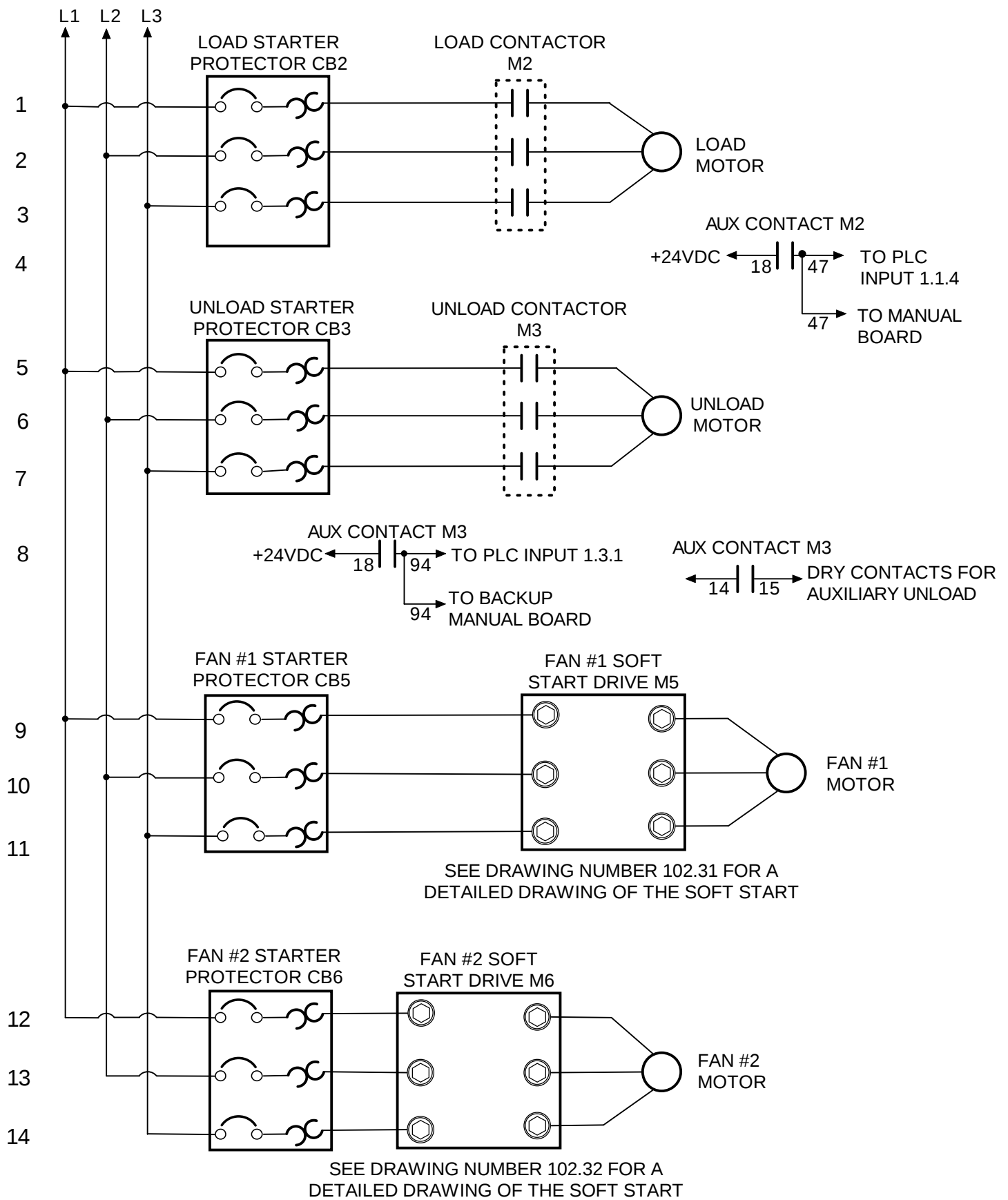
Revision:

CE



Title: PORTABLE DRYER: TWO FAN & HEAT CE LOWER (POSITION # 1) HEATER CONTROL & FAULT - 28" HOUSING	
Author: Sukup Mfg.	
Date: 01/12	Sheet: 102.24
Revision:	CE





Title: PORTABLE DRYER: TWO FAN & HEAT MOTOR CONTACTOR & RELAY WIRING

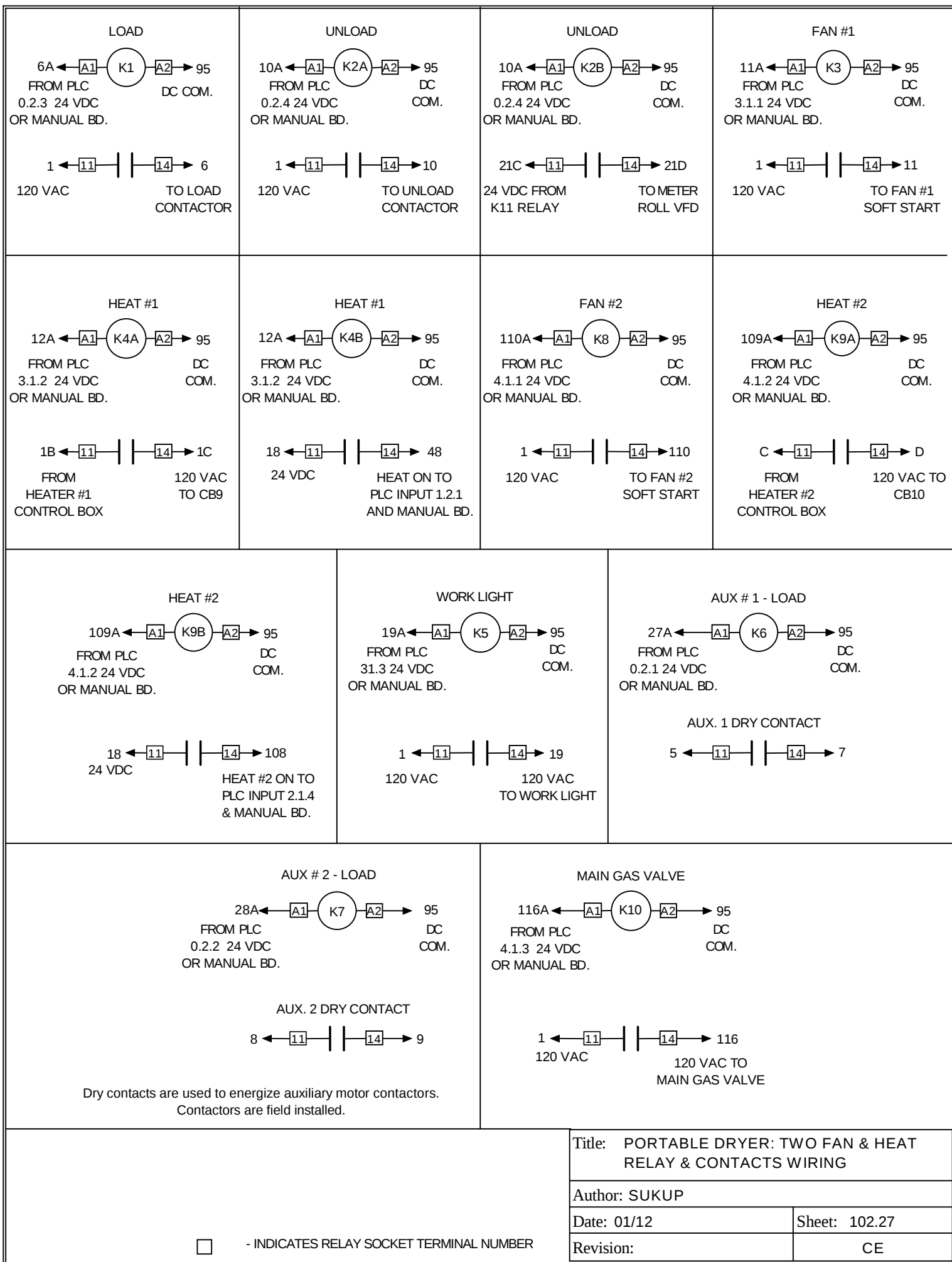
Author: SUKUP MFG

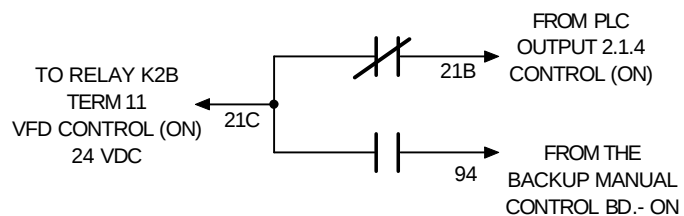
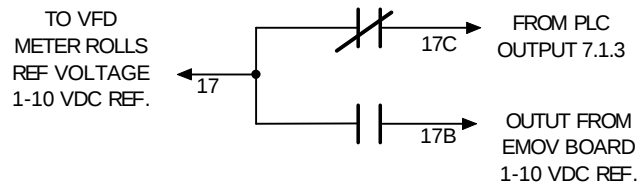
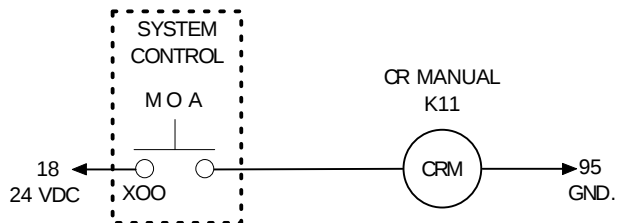
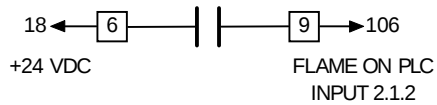
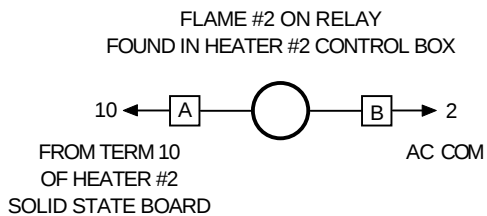
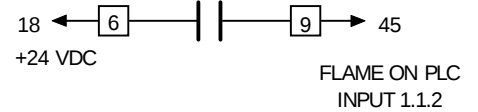
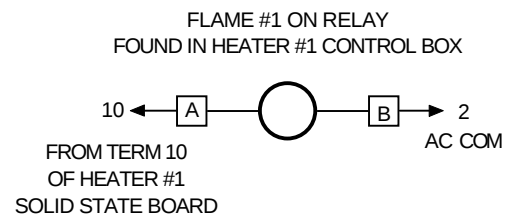
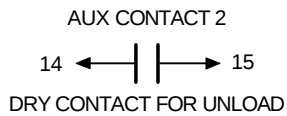
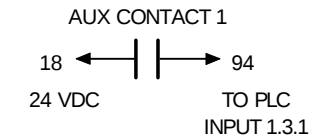
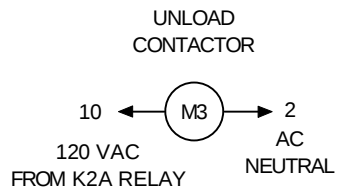
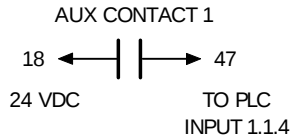
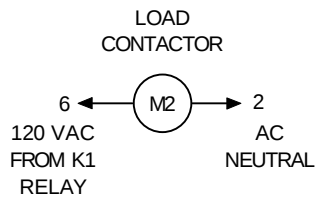
Date: 01/12

Sheet: 102.26

Revision:

CE





□ - INDICATES RELAY SOCKET TERMINAL NUMBER

Title: PORTABLE DRYER: TWO FAN & HEAT RELAY & CONTACTS WIRING

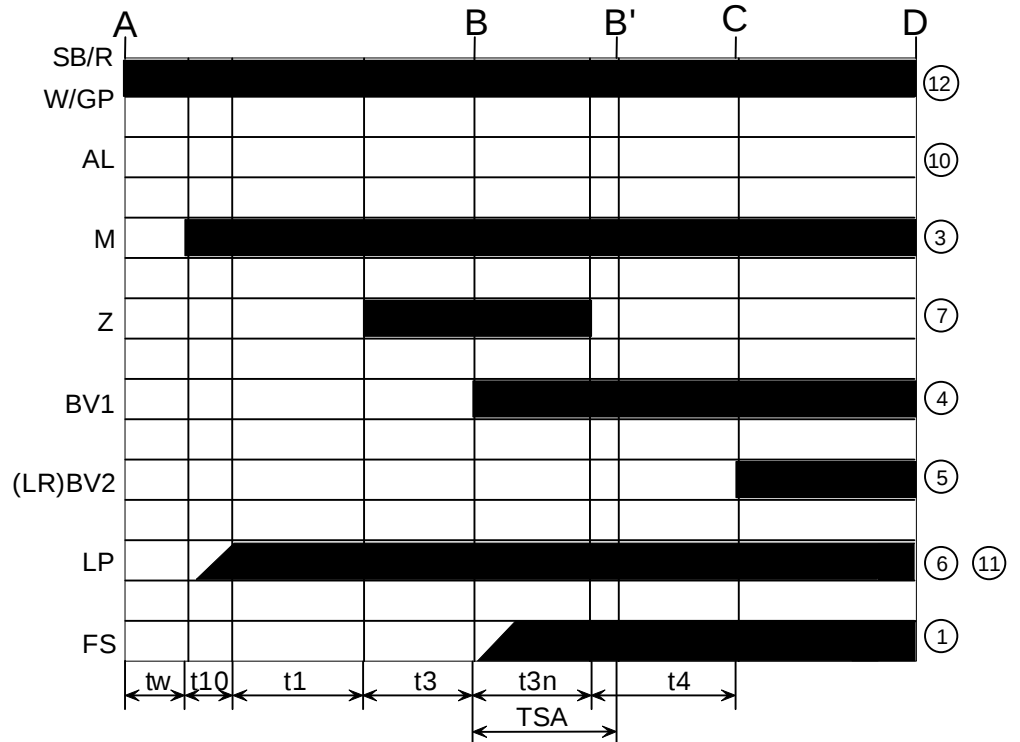
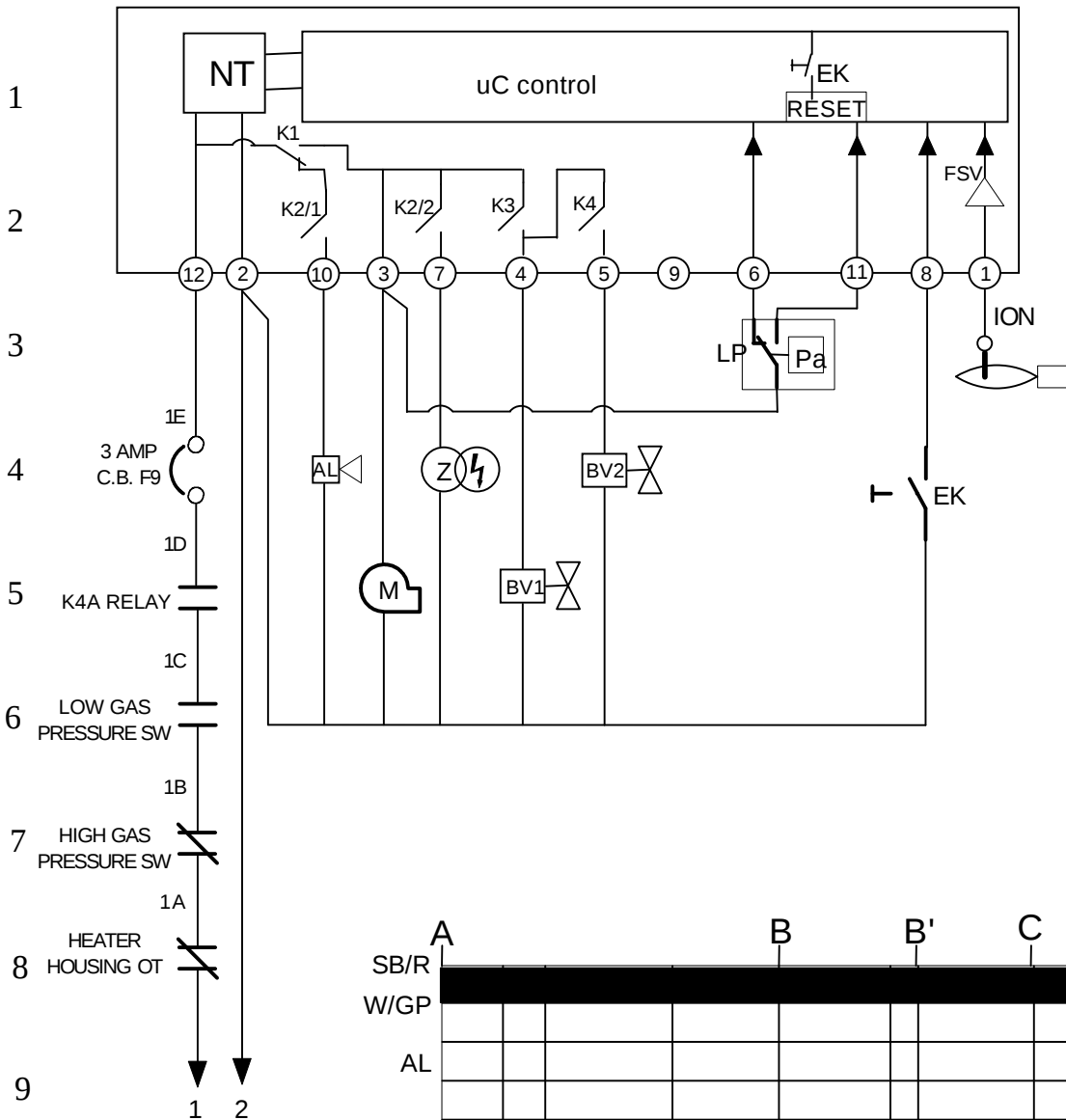
Author: SUKUP MFG

Date: 01/12

Sheet: 102.28

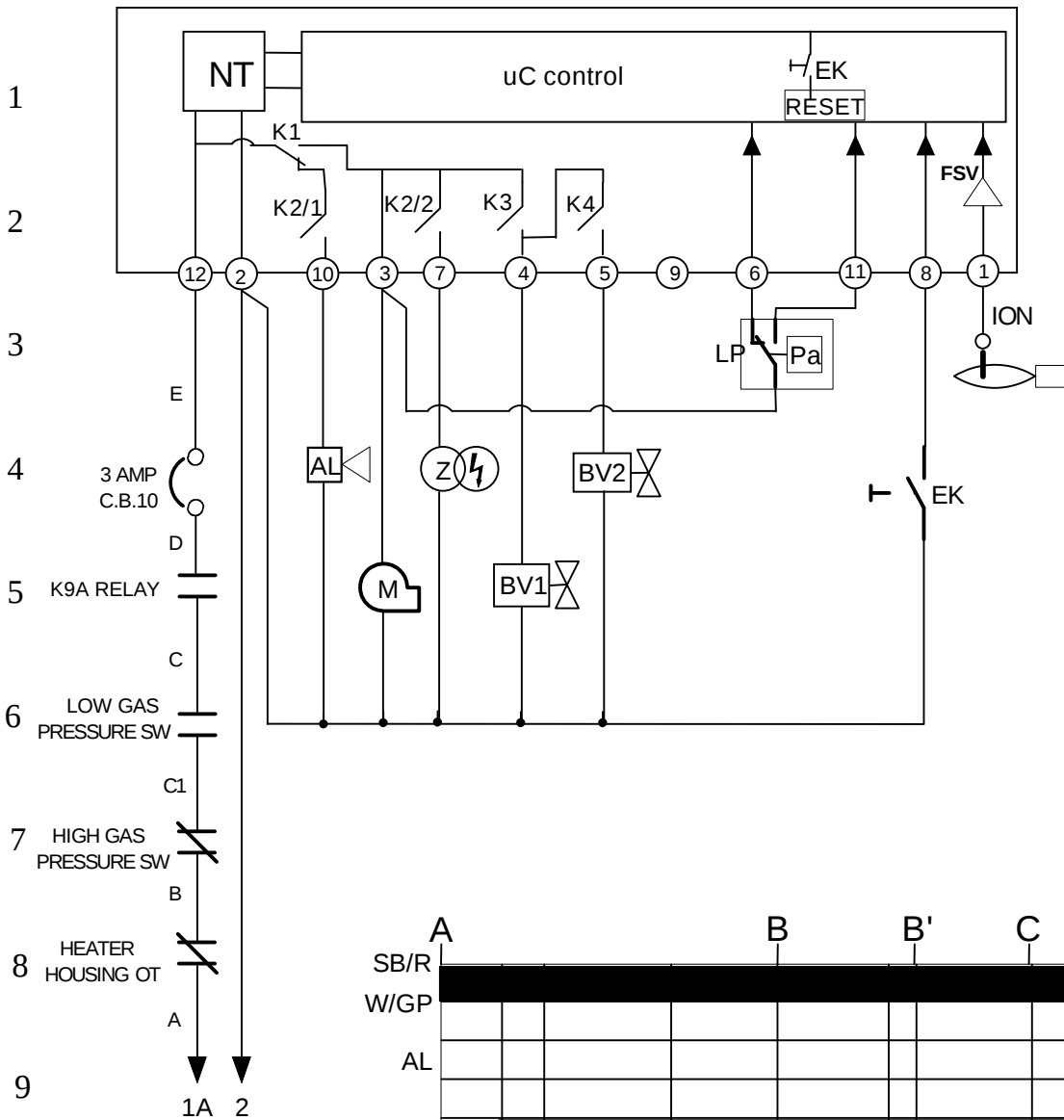
Revision:

CE

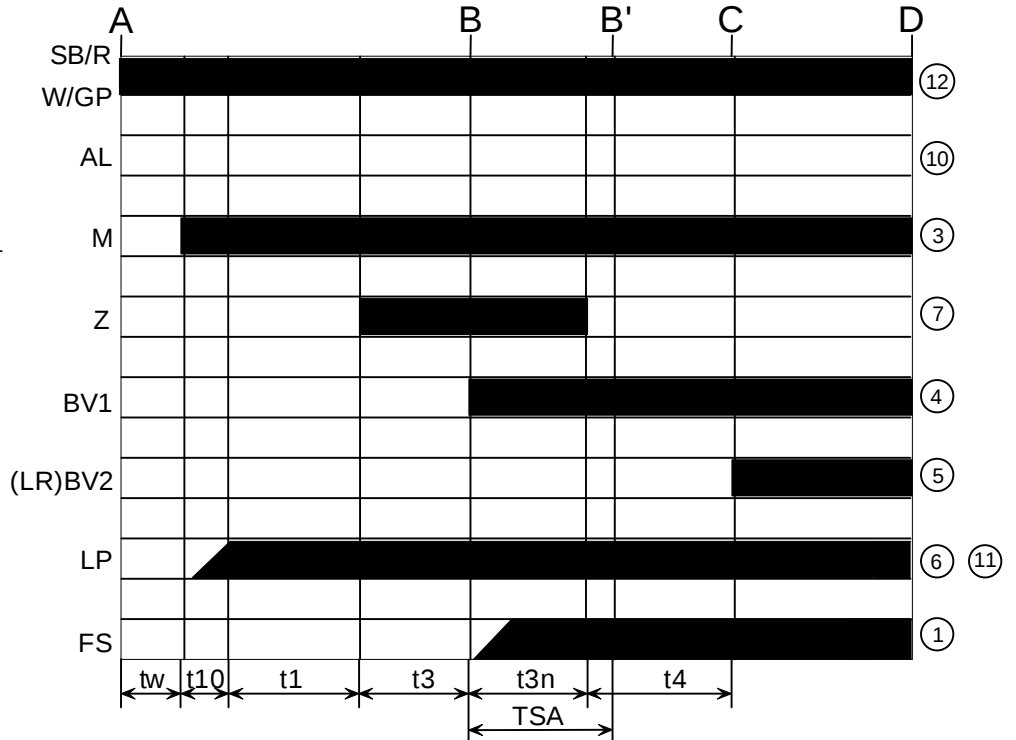


AL = Alarm
 BV1 = Fuel Valve # 1
 BV2 = Fuel Valve # 2
 FS = Flame Signal
 GP = Gas Pressure Switch
 LP = Air Pressure Switch
 LR = Load Controller
 M = Fan Motor
 R = Control Thermostat
 SB = Safety Limit Thermostat
 W = Limit Thermostat / Pressure Sw.

Title: PORTABLE DRYER: CE TWO FAN & HEAT #1 FAN & HEAT: BURNER CONTROL	
Author: Sukup Mfg.	
Date: 01/12	Sheet: 102.29
Revision:	CE



NOTE: 1A COMES FROM TERMINAL #6 OF THE VALVE PROVING UNIT



AL = Alarm
 BV1 = Fuel Valve # 1
 BV2 = Fuel Valve # 2
 FS = Flame Signal
 GP = Gas Pressure Switch
 LP = Air Pressure Switch
 LR = Load Controller
 M = Fan Motor
 R = Control Thermostat
 SB = Safety Limit Thermostat
 W = Limit Thermostat / Pressure Sw.

Title: PORTABLE DRYER: CE TWO FAN & HEAT:
 #2 FAN & HEAT BURNER CONTROLLER

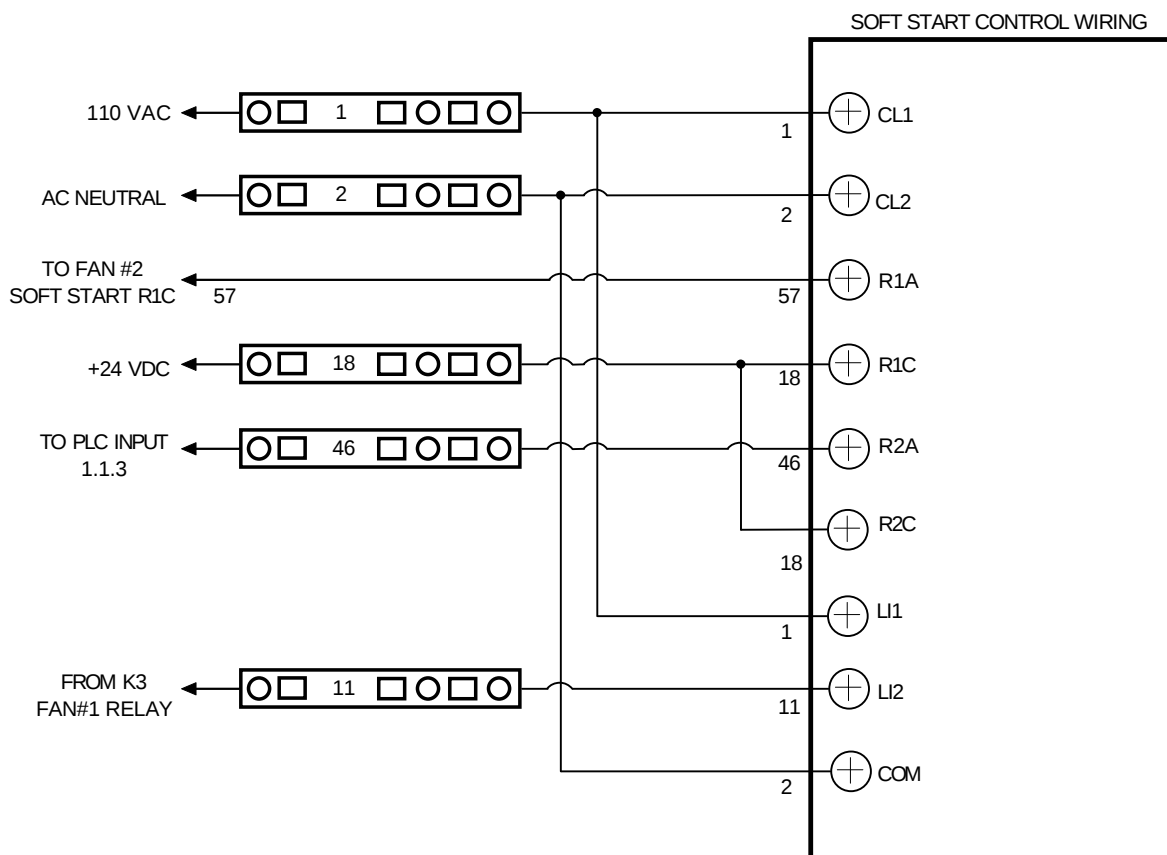
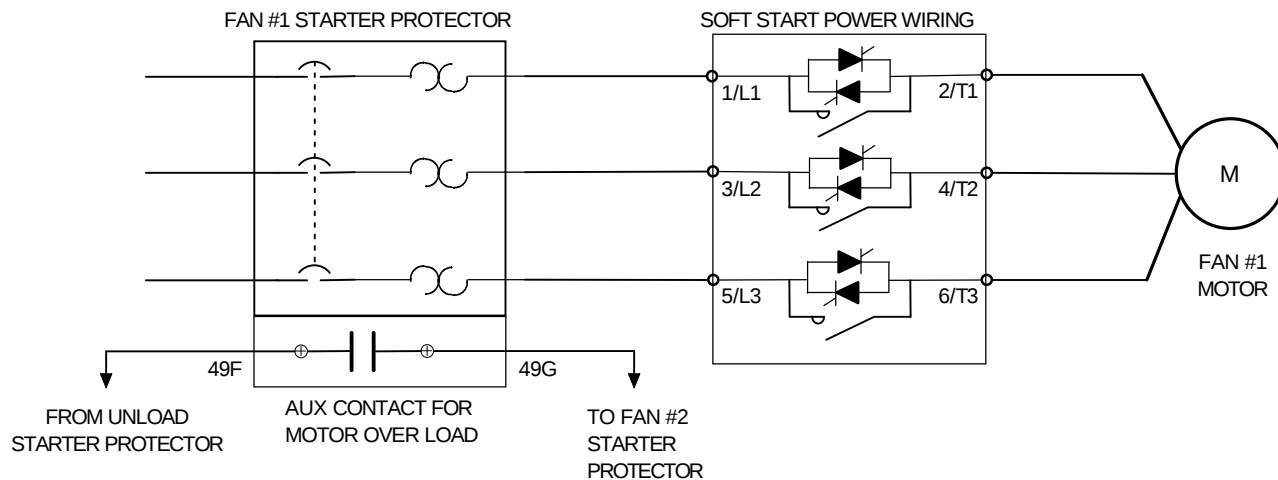
Author: CSP

Date: 01/12

Sheet: 102.30

Revision:

CE



Title: PORTABLE DRYER: TWO FAN & HEAT FAN #1 SOFT START WIRING

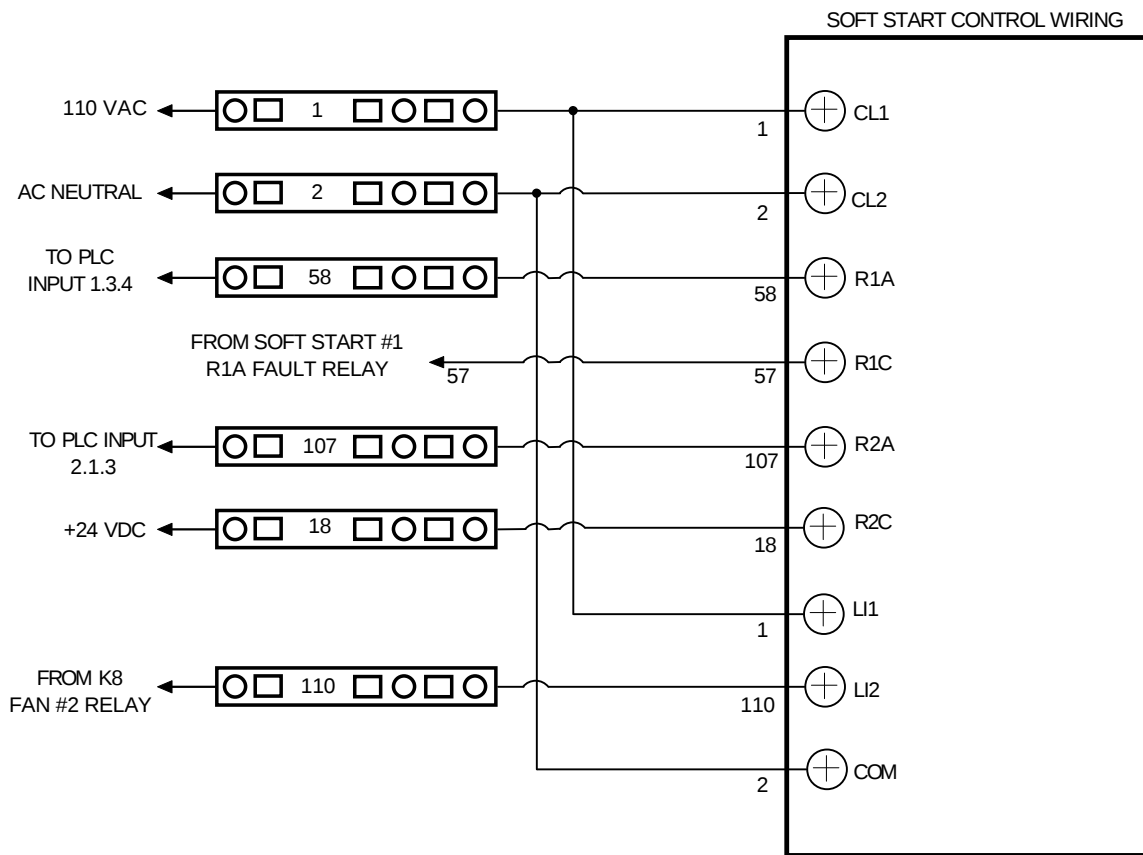
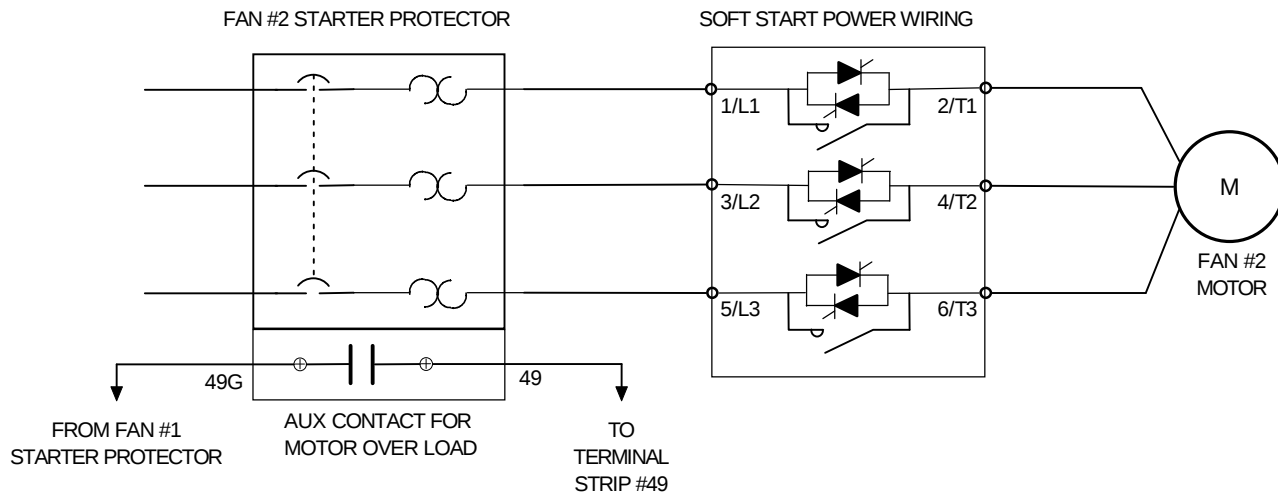
Author: SUKUP MFG CO

Date: 01/12

Sheet: 102.31

Revision:

CE



Title: PORTABLE DRYER: CE: TWO FAN & HEAT FAN #2 SOFT START WIRING

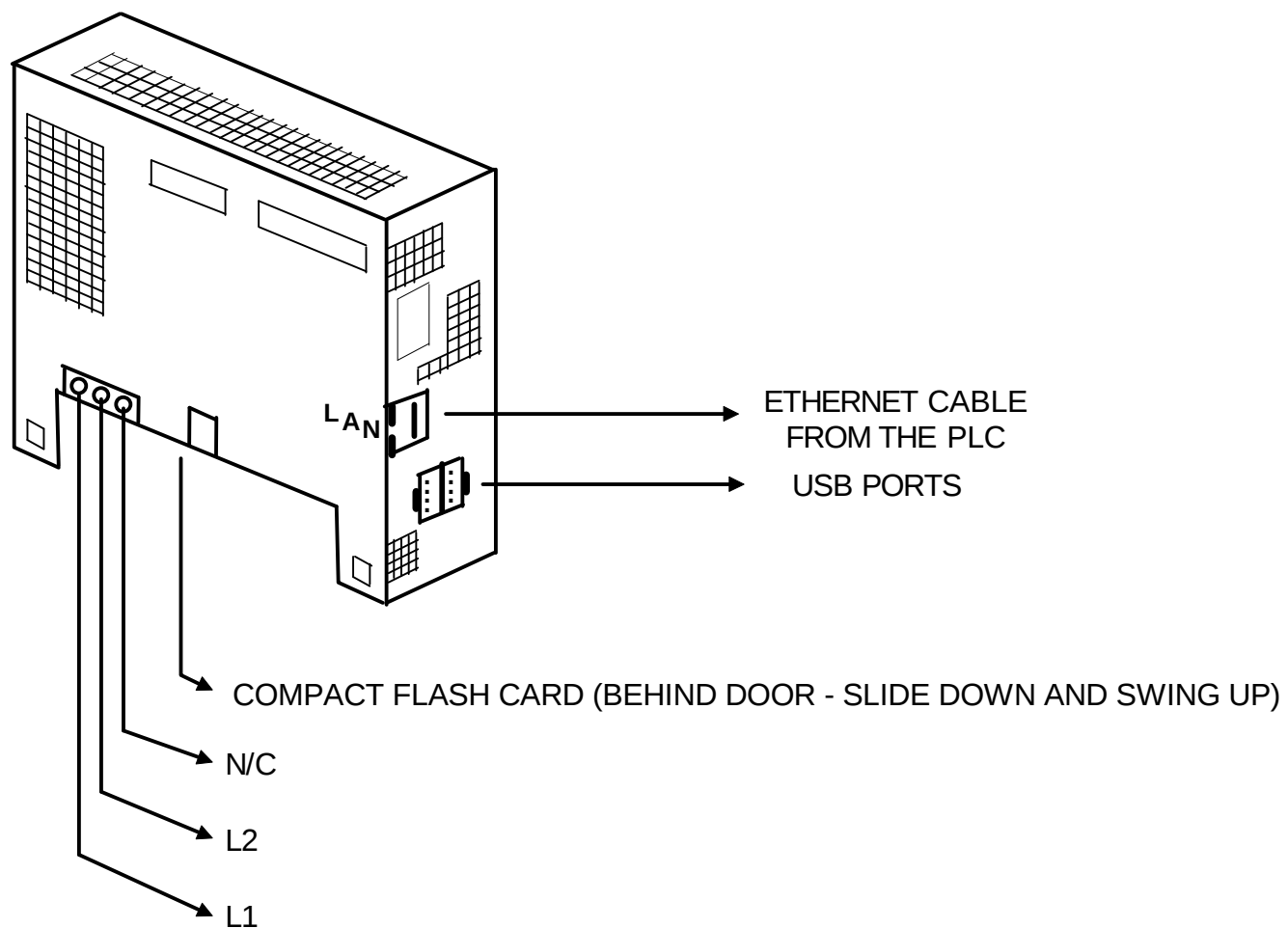
Author: SUKUP MFG CO

Date: 01/12

Sheet: 102.32

Revision:

CE



Title: PORTABLE DRYER: TWO FAN & HEAT
HMI - TOUCHSCREEN

Author: SUKUP MFG CO

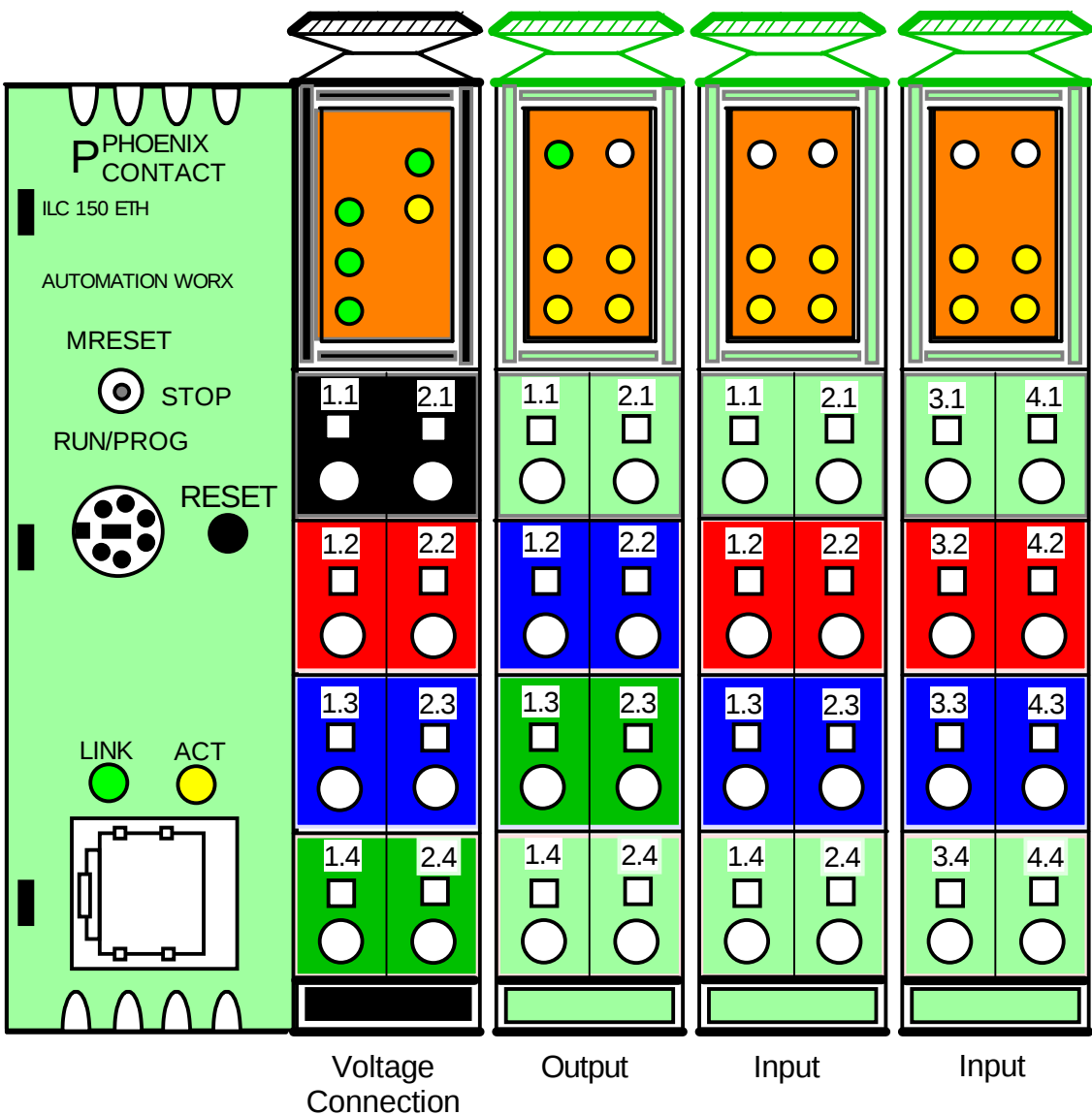
Date: 01/12

Sheet: 102.33

Revision:

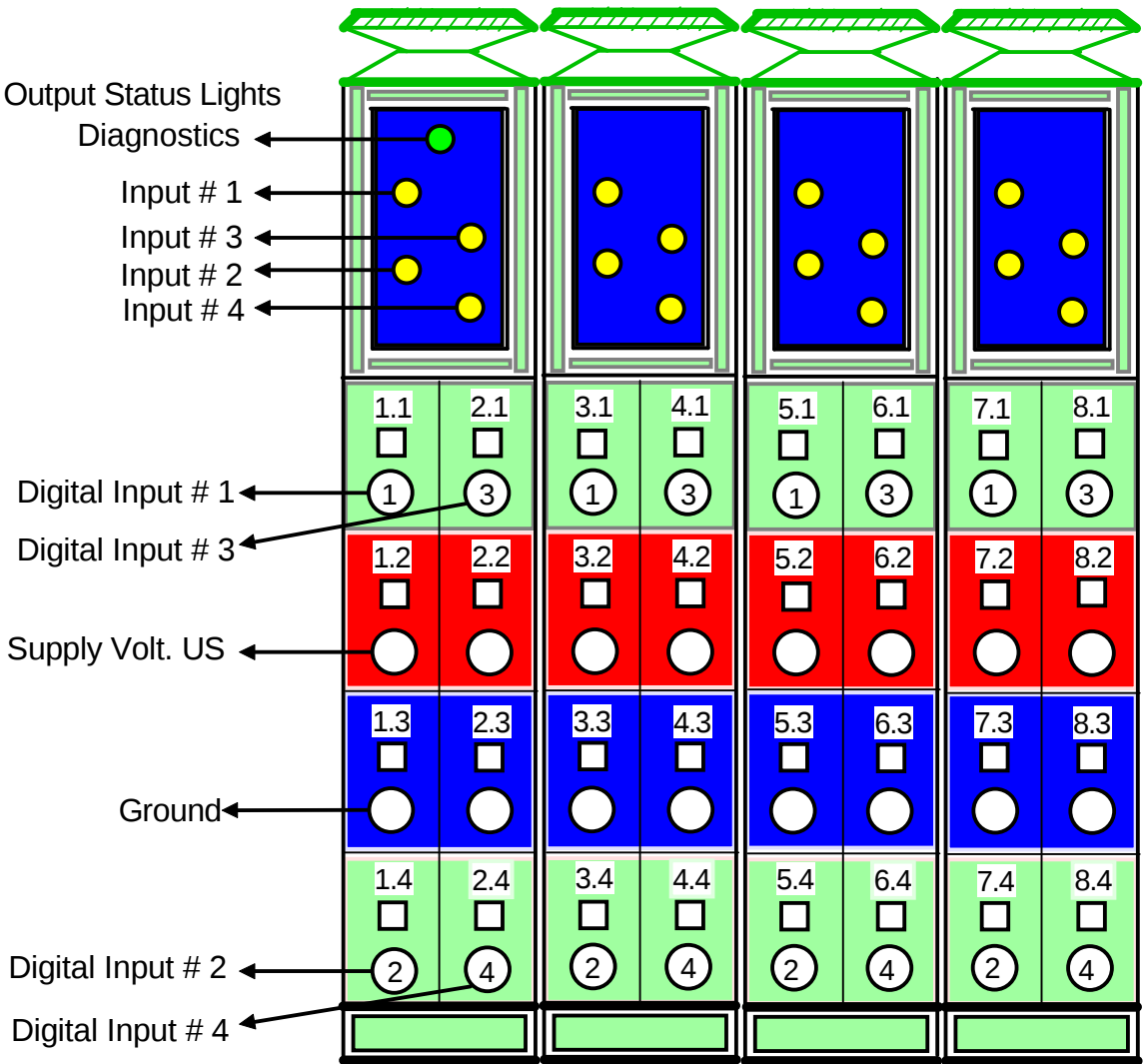
CE

PHOENIX CONTACT PLC MODULE ILC 150 (ORANGE)



Title: PORTABLE DRYER: TWO FAN & HEAT PHOENIX CONTACT PLC - ILC150	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.34
Revision:	CE

DIGITAL INPUT MODULE - ILC 150 (BLUE)



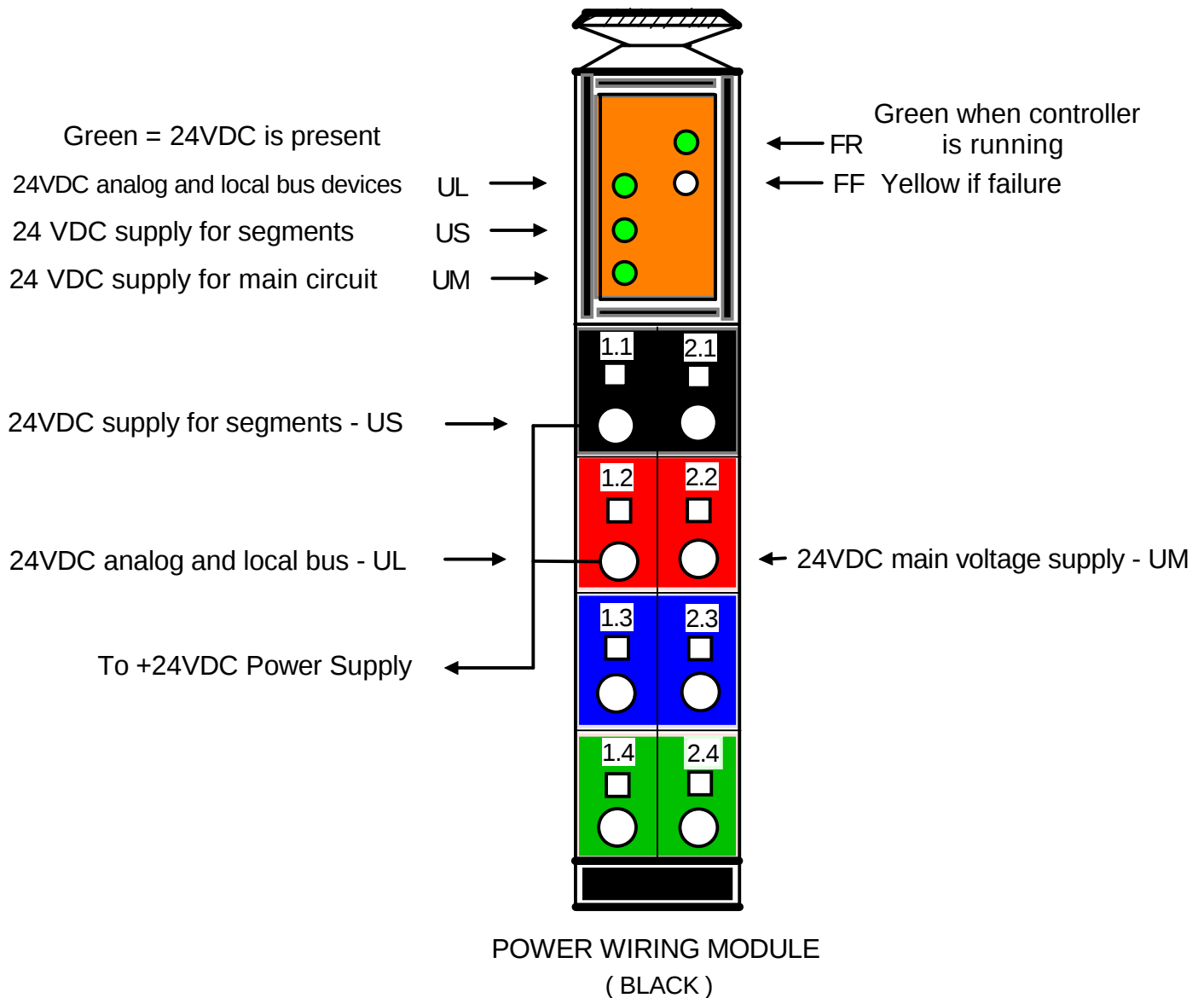
DIGITAL OUTPUT MODULE - 16 INPUTS

Diagnostics:

- 1) Green - OK
- 2) Flashing 0.5 Hz - communications power UL available but buss not active
- 3) Flashing 2 Hz - peripheral fault
- 4) Flashing 4 Hz - local bus error

Title: PORTABLE DRYER: TWO FAN & HEAT DIGITAL INPUT MODULE - 16 INPUTS	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.35
Revision:	CE

POWER SUPPLY CONNECTION FOR THE ILC 150 (ORANGE)



NOTE: This wiring module is not a power supply. 24VDC is provided by an independent power supply and connected to this arm, which then supplies the PLC and modules.

Title: PORTABLE DRYER: TWO FAN & HEAT
PLC POWER WIRING MODULE 24VDC

Author: SUKUP MFG CO

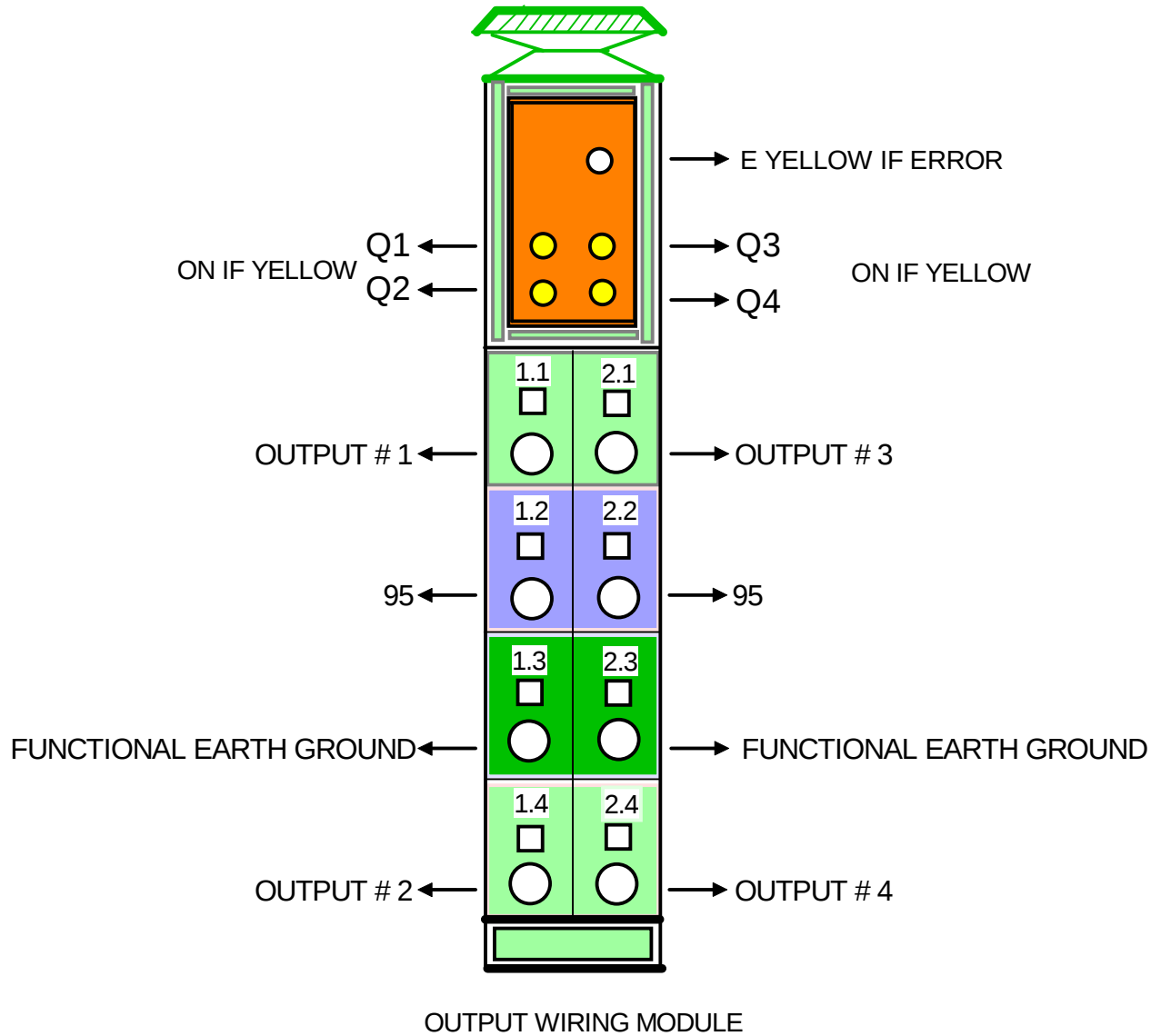
Date: 01/12

Sheet: 102.36

Revision:

CE

OUTPUT WIRING ARM - ILC 150 (ORANGE)



Title: PORTABLE DRYER: TWO FAN & HEAT
OUTPUT WIRING MODULE

Author: SUKUP MFG CO

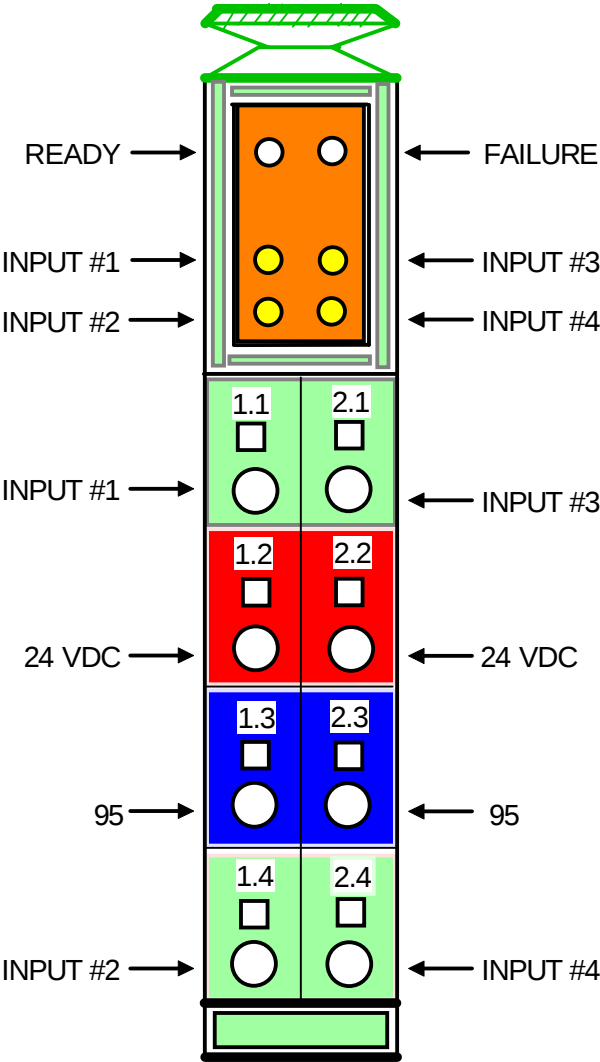
Date: 01/12

Sheet: 102.37

Revision:

CE

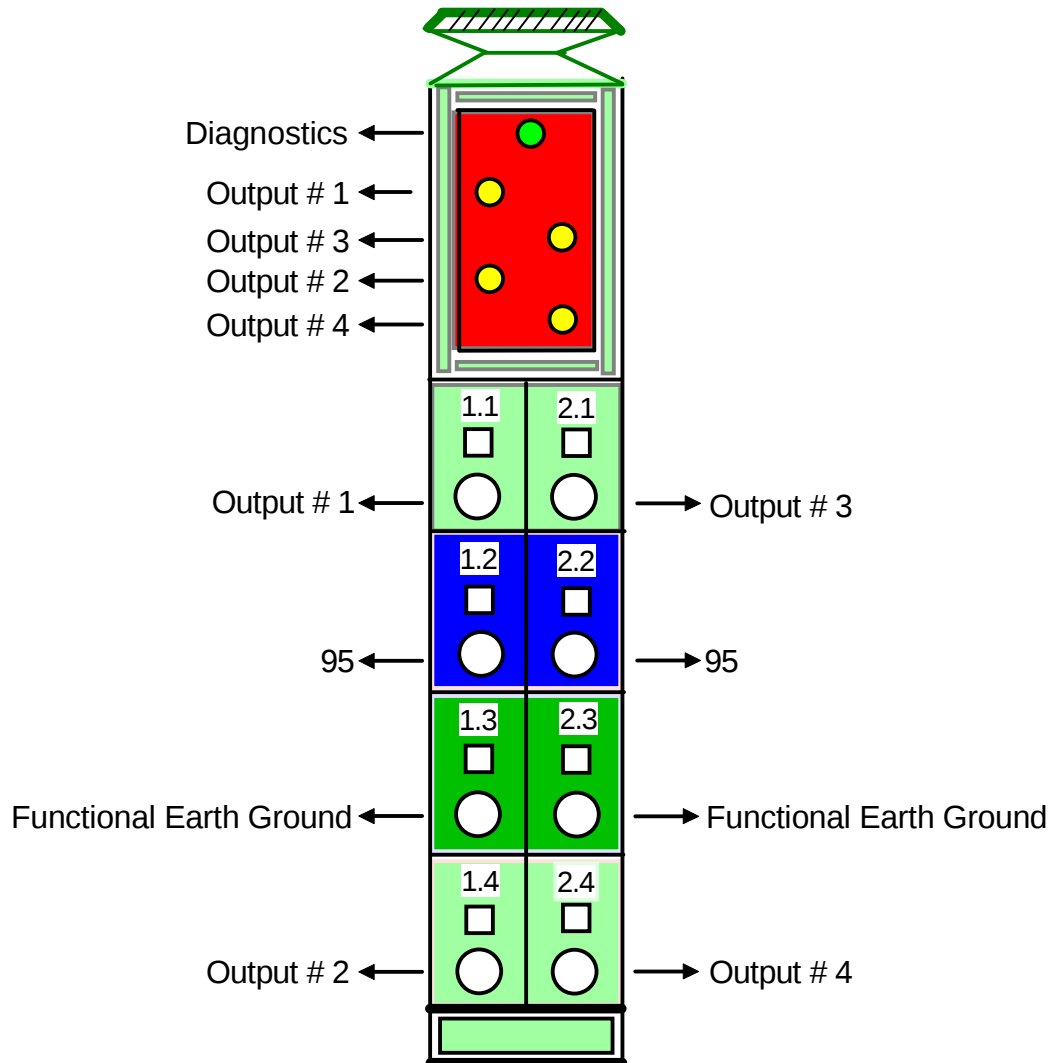
INPUT WIRING ARM - ILC 150 (ORANGE)



INPUT WIRING MODULE

Title: PORTABLE DRYER: TWO FAN & HEAT INPUT WIRING MODULE	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.38
Revision:	CE

DIGITAL OUTPUT MODULE PLC - ILC - 150 (RED)



DIGITAL OUTPUT MODULE

Diagnostics:

- 1) Green - OK - Bus Active
- 2) Flashing @ 0.5 HZ - Communications power UL available, bus not active
- 3) Flashing @ 2 HZ - Peripheral fault
- 4) Flashing @ 4 HZ - Local bus error

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL OUTPUT MODULE

Author: SUKUP MFG CO

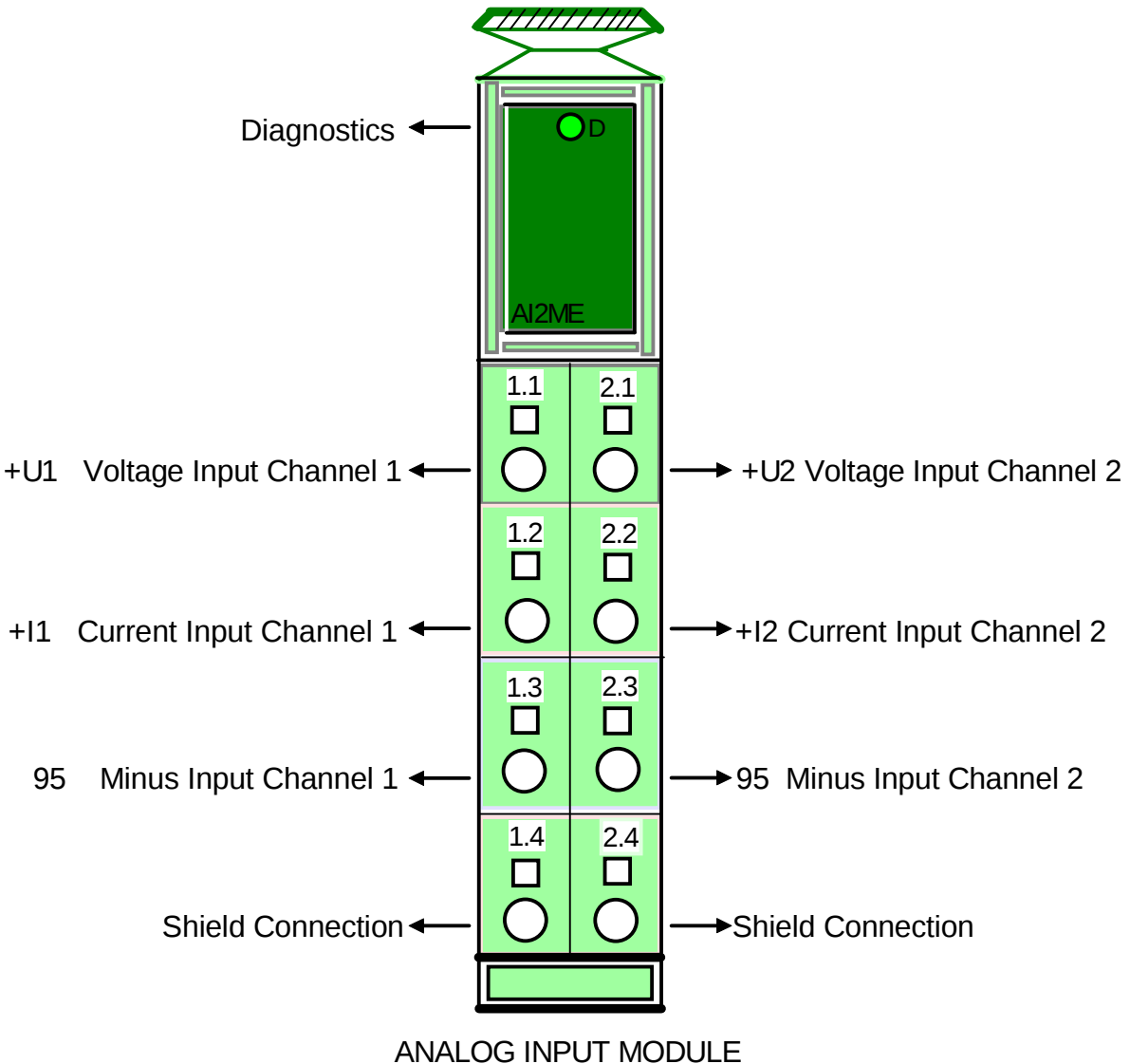
Date: 01/12

Sheet: 102.39

Revision:

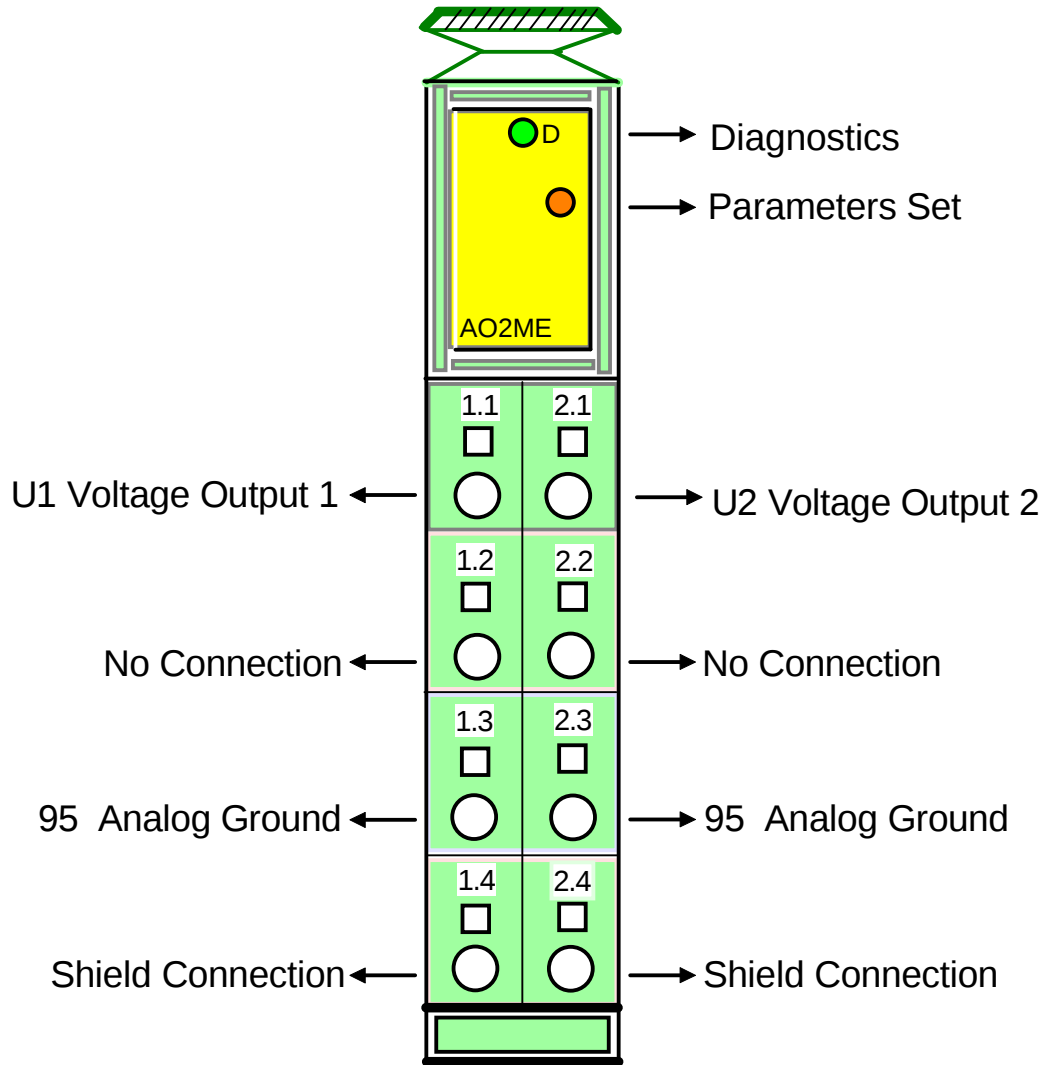
CE

ANALOG INPUT MODULE
PLC - ILC 150 (GREEN)



Title: PORTABLE DRYER: TWO FAN & HEAT ANALOG INPUT MODULE	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.40
Revision:	CE

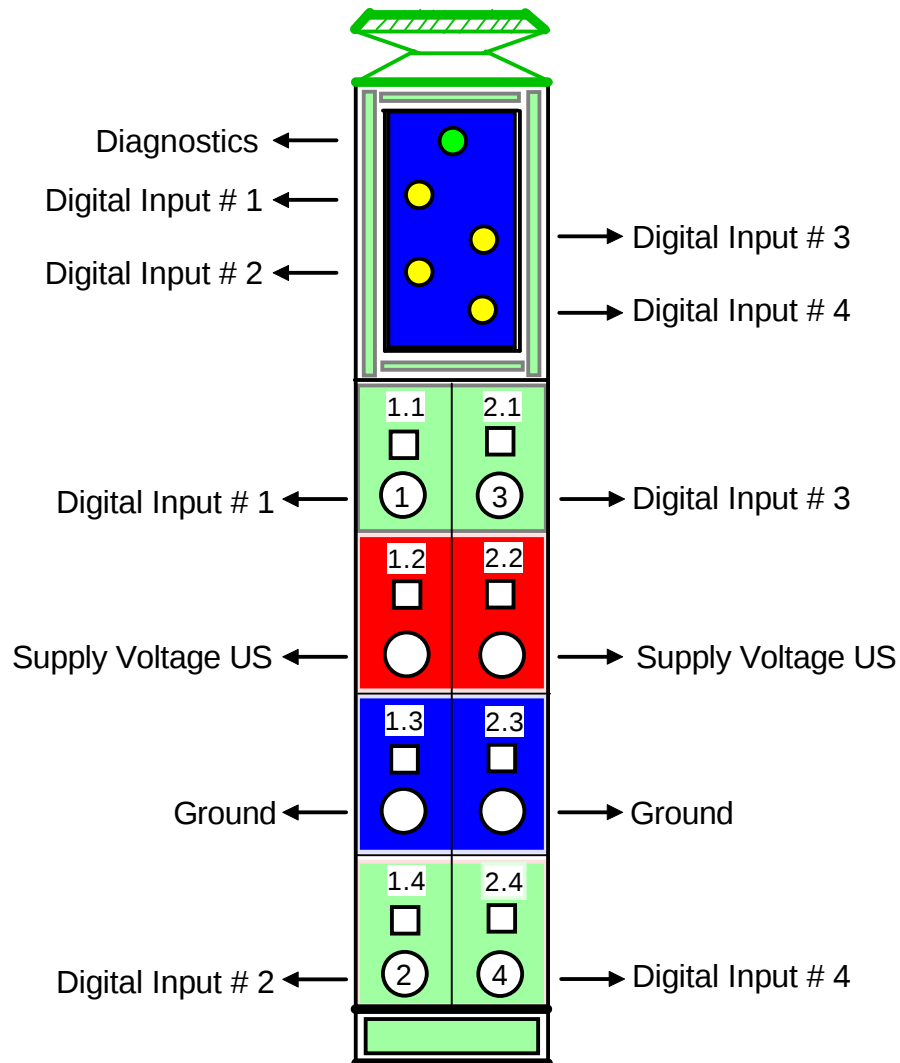
ANALOG OUTPUT MODULE
PLC - ILC 150 (YELLOW)



ANALOG OUTPUT MODULE

Title: PORTABLE DRYER: TWO FAN & HEAT ANALOG OUTPUT MODULE	
Author: SUKUP MFG CO	
Date: 01/12	Sheet: 102.41
Revision:	CE

DIGITAL INPUT MODULE - 4 INPUTS
PLC - ILC - 150 24 VDC (BLUE)



DIGITAL INPUT MODULE

Diagnostics:

- 1) Green - OK
- 2) Flashing 0.5 Hz - communications power UL available but buss not active
- 3) Flashing 2 Hz - peripheral fault
- 4) Flashing 4 Hz - local bus error

Title: PORTABLE DRYER: TWO FAN & HEAT
DIGITAL INPUT MODULE

Author: SUKUP MFG CO

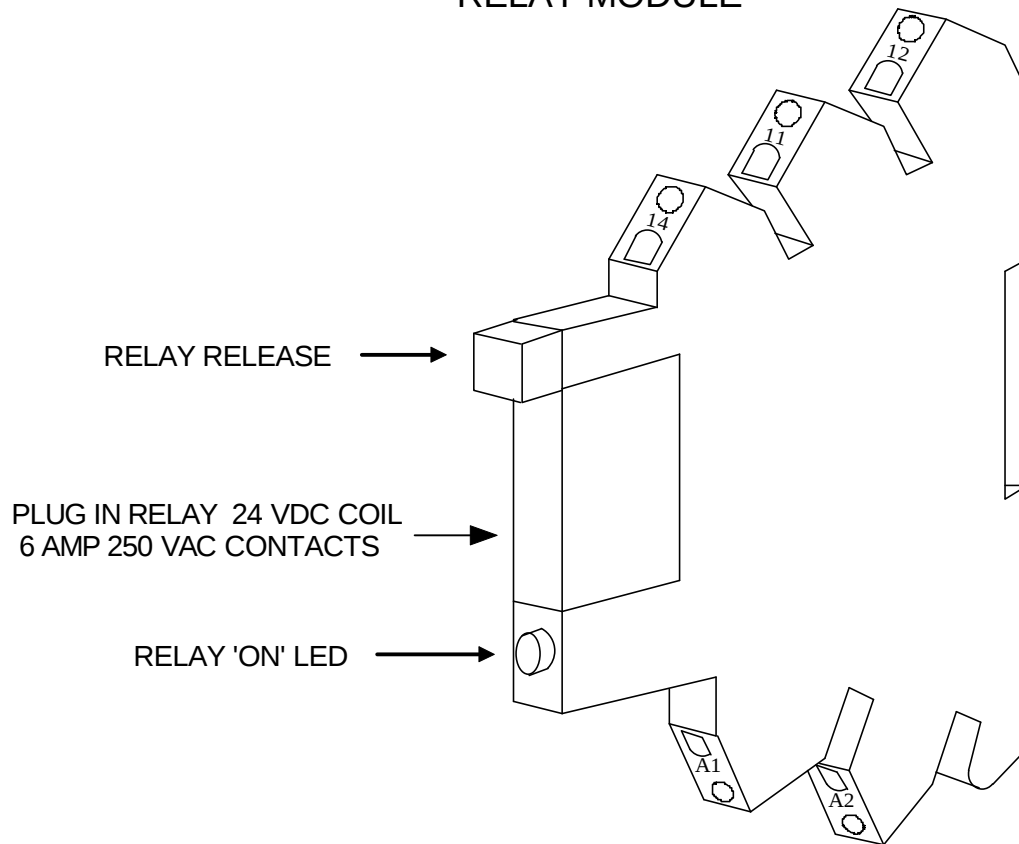
Date: 01/10

Sheet: 102.42

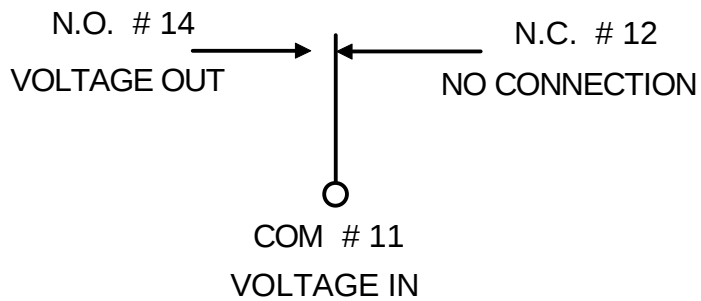
Revision:

CE

RELAY MODULE



COIL - 24 VDC
CONNECTIONS



Title: PORTABLE DRYER: TWO FAN & HEAT
RELAY 24V COIL, SINGLE POLE

Author: SUKUP MFG CO

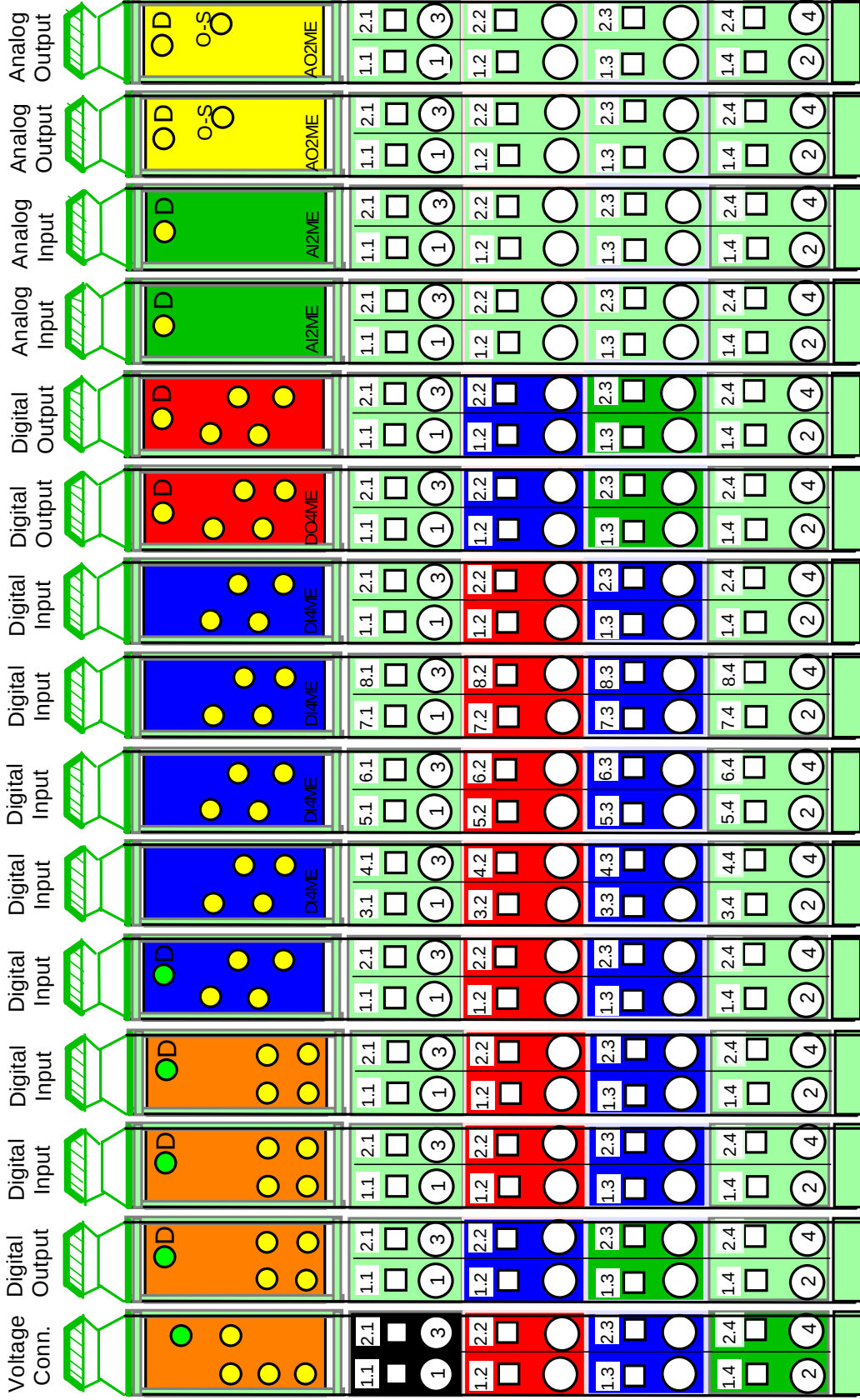
Date: 01/12

Sheet: 102.43

Revision:

CE

BASE NUMBERING - TWO FAN PLC



0.1	0.2	0.3	0.4	1.1	1.2	1.3	1.4	2.1	3.1	4.1	5.1	6.1	7.1	8.1
0.1.1	0.2.1	0.3.1	0.4.1	1.1.1	1.2.1	1.3.1	1.4.1	2.1.1	3.1.1	4.1.1	5.1.1	6.1.1	7.1.1	8.1.1
0.1.2	0.2.2	0.3.2	0.4.2	1.1.2	1.2.2	1.3.2	1.4.2	2.1.2	3.1.2	4.1.2	5.1.2	6.1.2	7.1.2	8.1.2
0.1.3	0.2.3	0.3.3	0.4.3	1.1.3	1.2.3	1.3.3	1.4.3	2.1.3	3.1.3	4.1.3	5.1.3	6.1.3	7.1.3	8.1.3
0.1.4	0.2.4	0.3.4	0.4.4	1.1.4	1.2.4	1.3.4	1.4.4	2.1.4	3.1.4	4.1.4	5.1.4	6.1.4	7.1.4	8.1.4

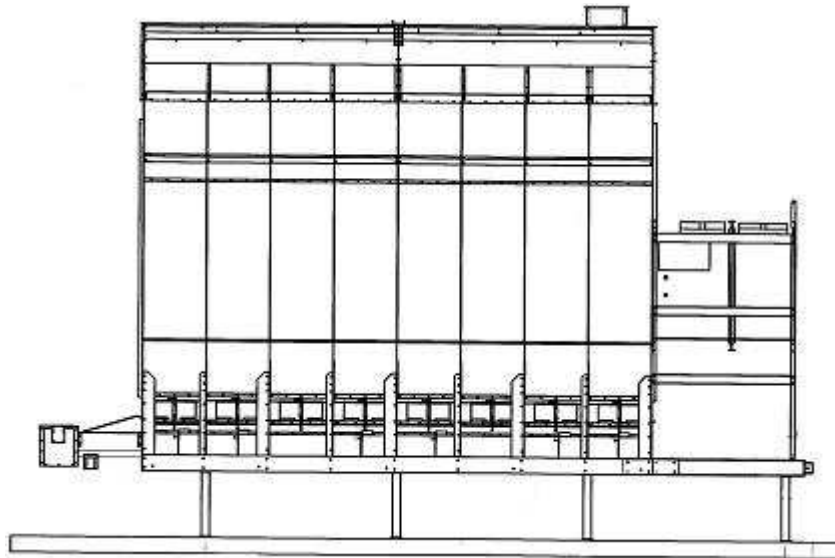
NOTE: 1st number = module #, 2nd number = segment # in that module, 3rd number = I/O # on that segment



AUTOMATIC GRAIN DRYER

Continuous Flow / Automatic Batch

Installation Manual



Sukup Manufacturing Company

1555 – 255th Street, Box 677

Sheffield, Iowa USA 50475

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

E-mail: info@sukup.com

TABLE OF CONTENTS

Installation and Pre-operational Check out 3

 Dryer set up / supports..... 3

 Cross support braces and Front stand 7

 Lift Bracket (Comp. #T16532) Locations 8

 Wet Bin Assembly 11

 Top Load Auger Motor and Shields 13

 Dryer Hitch with 24" Extension..... 16

 Safety shields / Access doors and covers 17

 Ground Rod Installation 22

QuadraTouch™ Controller Installation 23

Installation and Pre-operational Check out**Dryer set up / supports****Warning**

The wheel transport kit is for transport only and is NOT to be used when operating the dryer. The dryer MUST be mounted and supported in an approved manner.

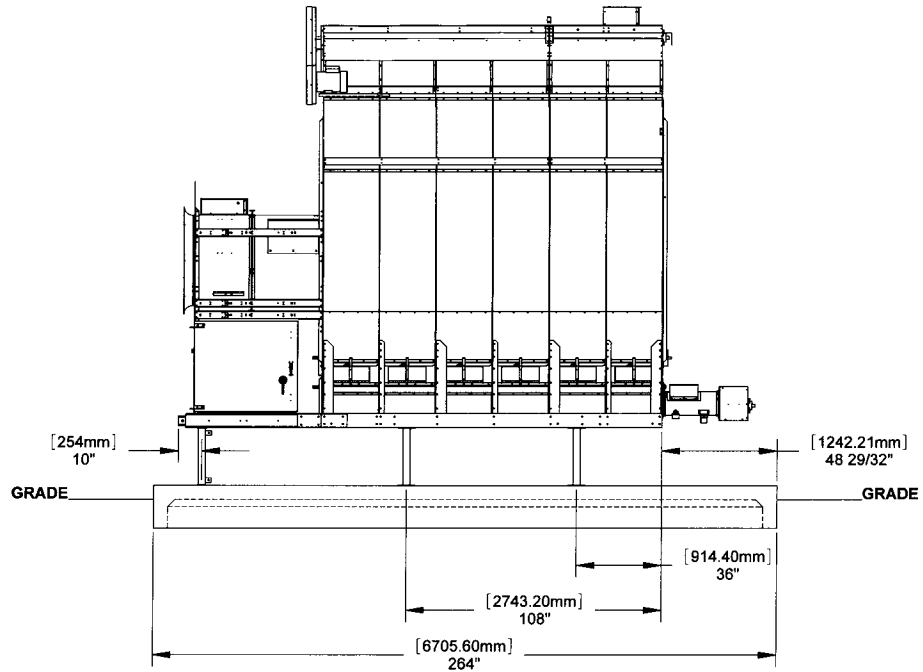
The dryer must be mounted a minimum of 406.4 mm above the surface to allow for clean out.

Optional dryer supports are available from Sukup Mfg. in 0.61M, 0.91M, and 1.22M lengths. The support kits come with the necessary hardware needed to attach the supports to the dryer frame. The customer must supply the hardware necessary for attachment to the concrete pad. (Required minimum sizes are 1/2" or 5/8" hardware).

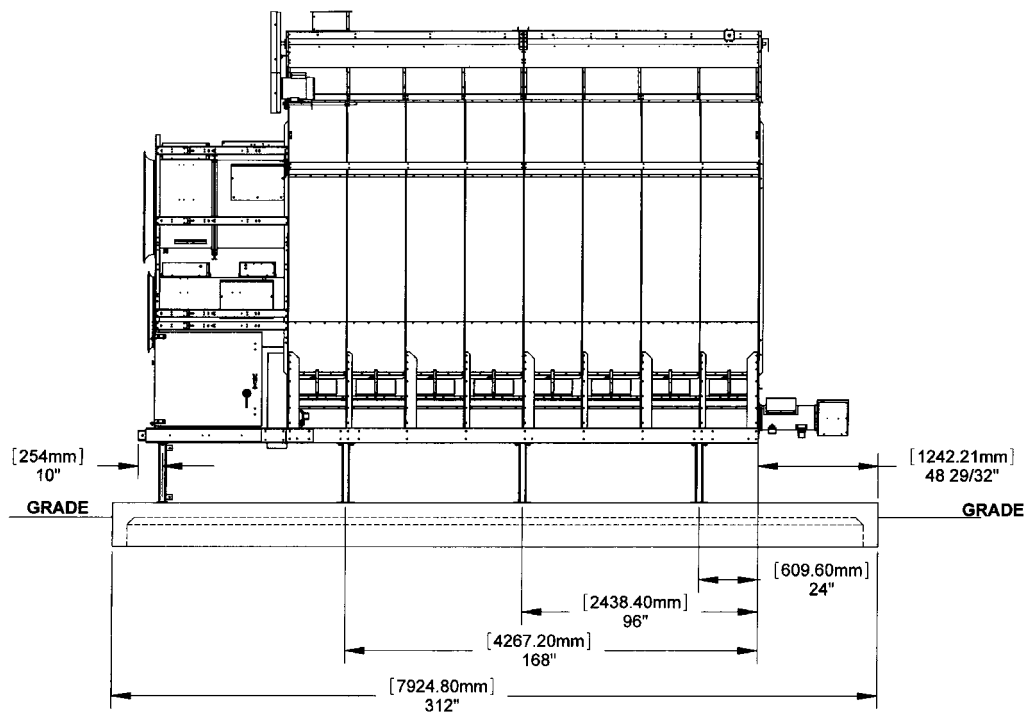
Ladder extensions are included with the 0.91M & 1.22M leg extension kit. The same length of ladder extension is supplied with the 1.22M kit as the 0.91M kit. For the 0.91M kit, cut off excess ladder length for your application.

Contact your Sukup Dealer to order either the supports and / or extra ladder extensions.

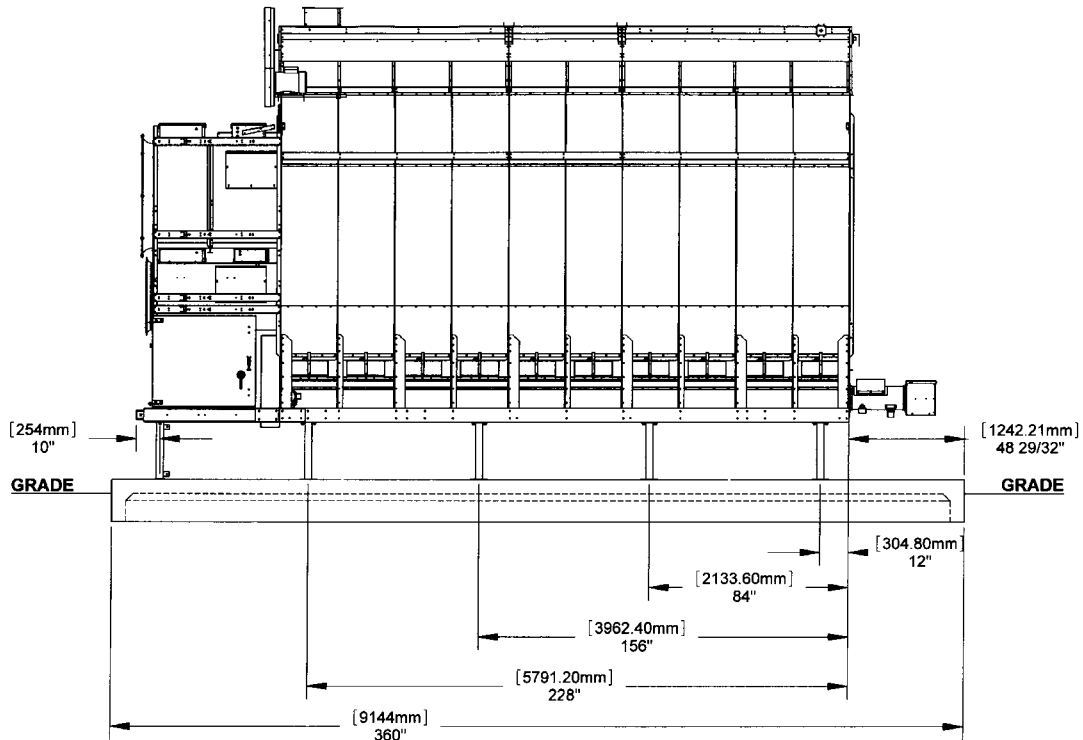
The following five drawings show proper support leg locations for 12, 16, 20, 24 and 28-foot dryers. Lift ONLY with Sukup lift bracket or equivalent.



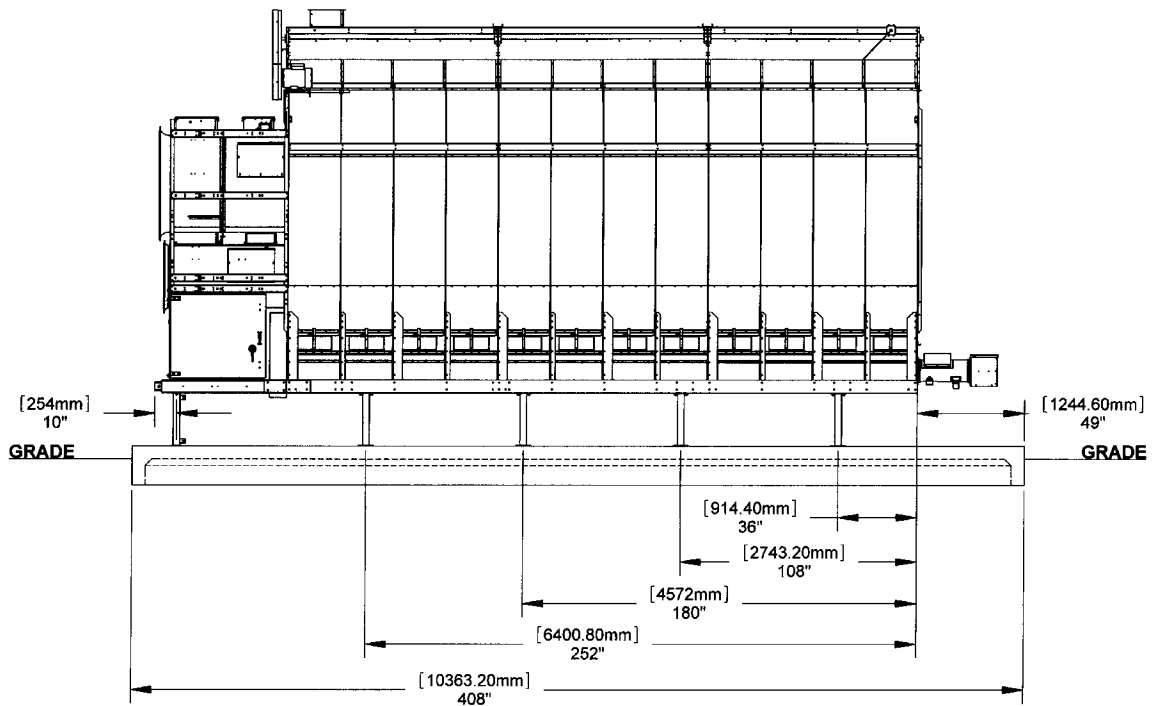
SPT0049
10/18/05DDV
12 Foot Dryer



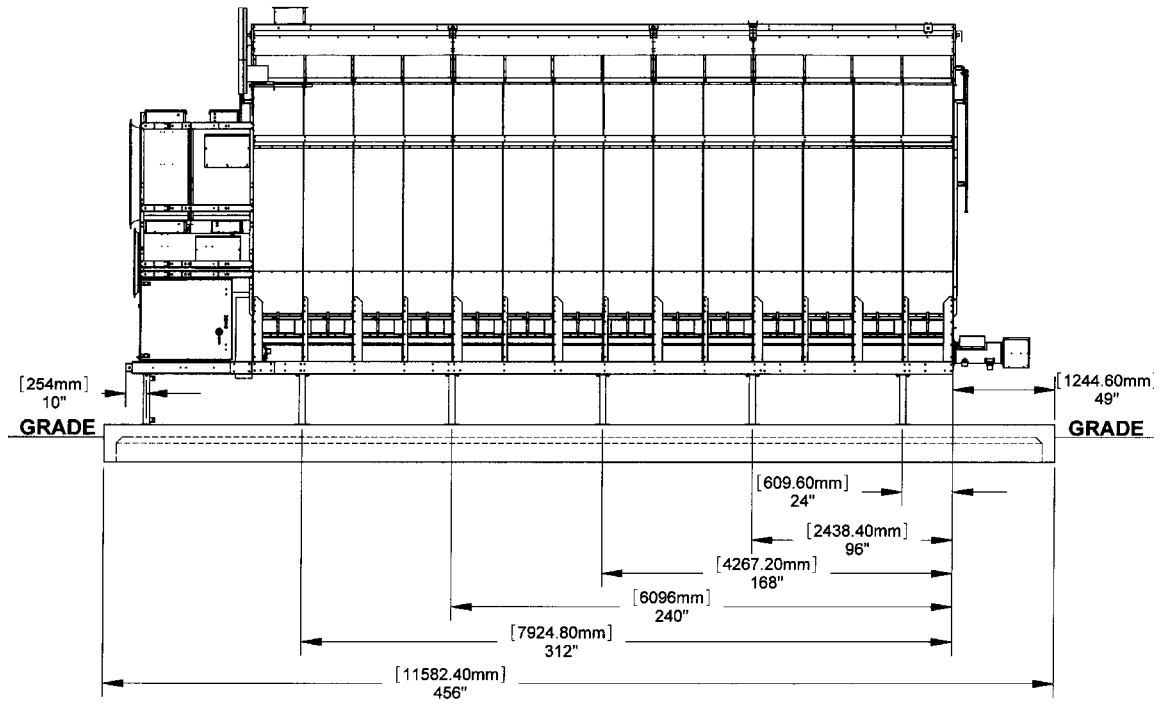
SPT0050
10/18/05DDV
16 Foot Dryer



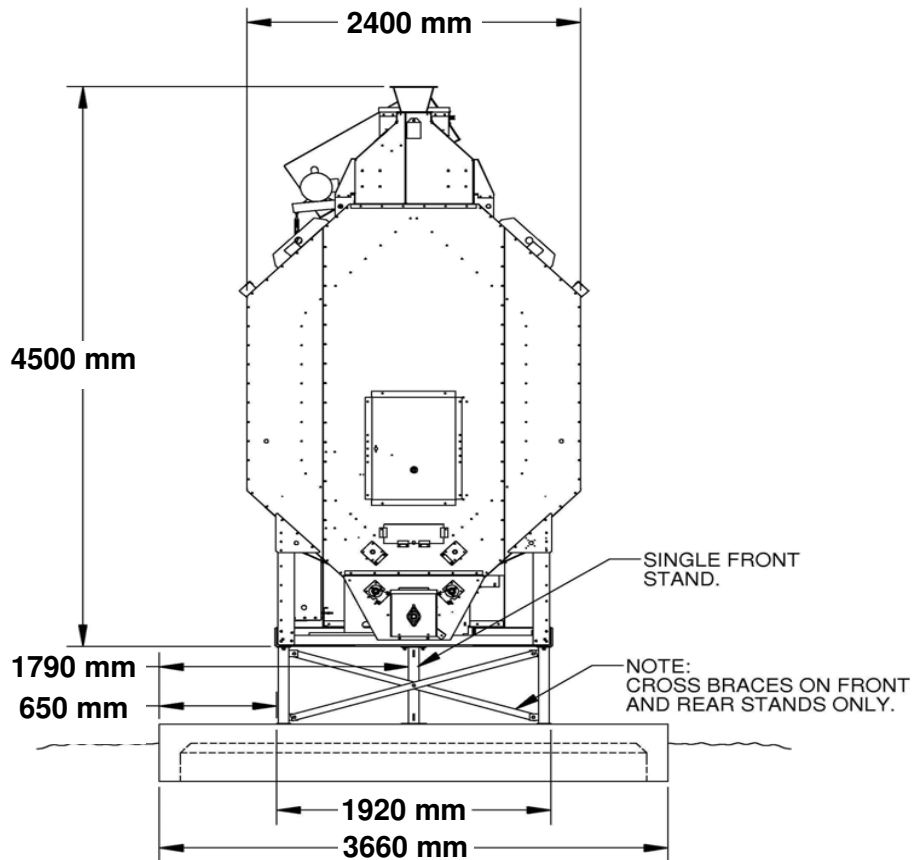
SPT0051
10/18/05DDV
20 Foot Dryer



SPT0052
10/19/05DDV
24 Foot Dryer



SPT0053
10/27/05DDV
28 Foot Dryer

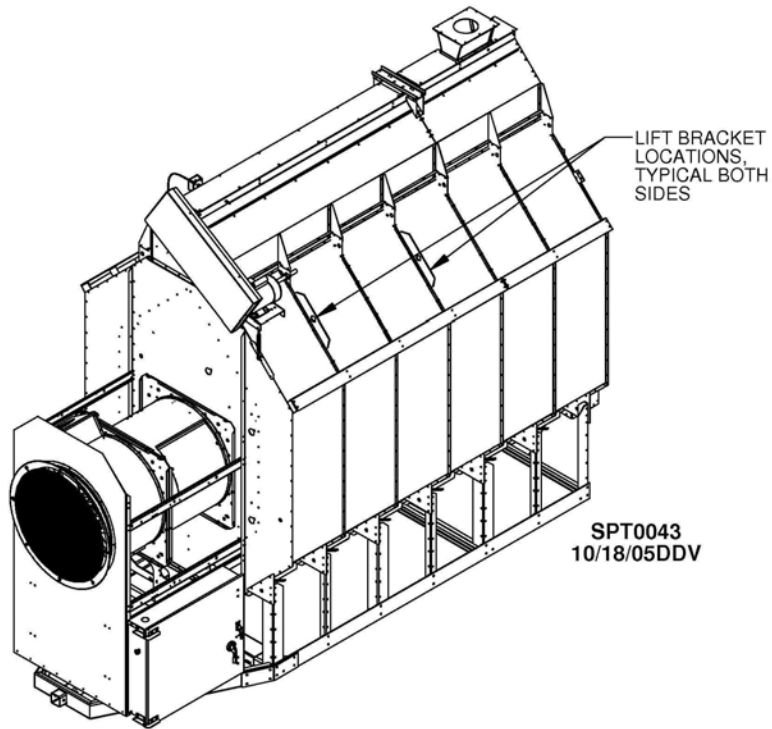


Cross support braces and Front stand

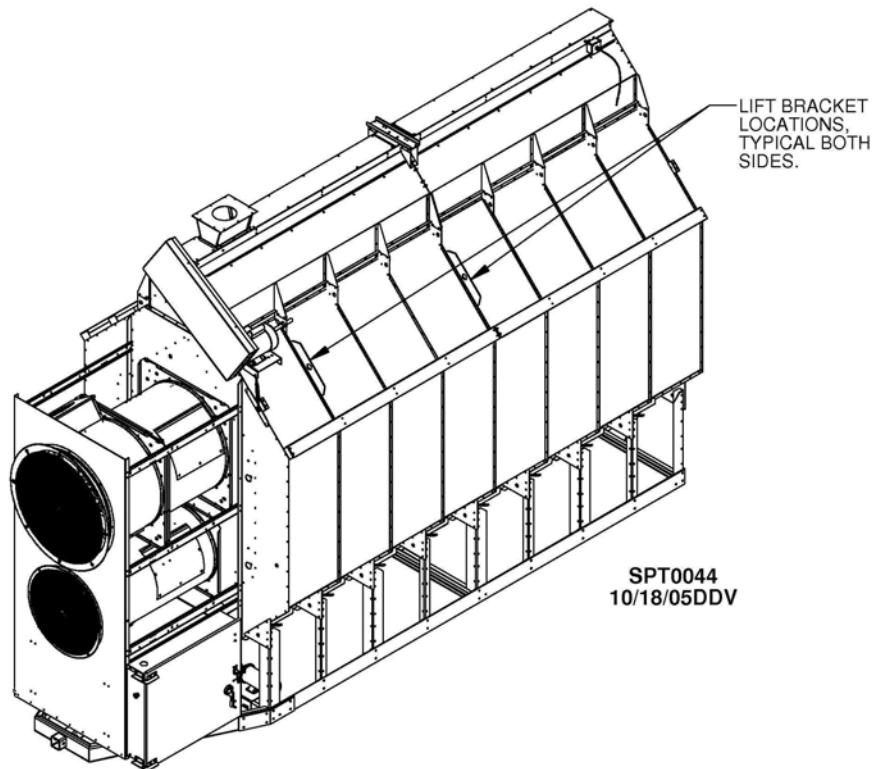
If the dryer is not mounted using Sukup Mfg supports, the following guidelines must be followed:

- Supports under grain columns must be at least every 6 feet (1828.8 mm).
- Support under front hitch
- Fasten dryer down to foundation using brackets or turnbuckles.

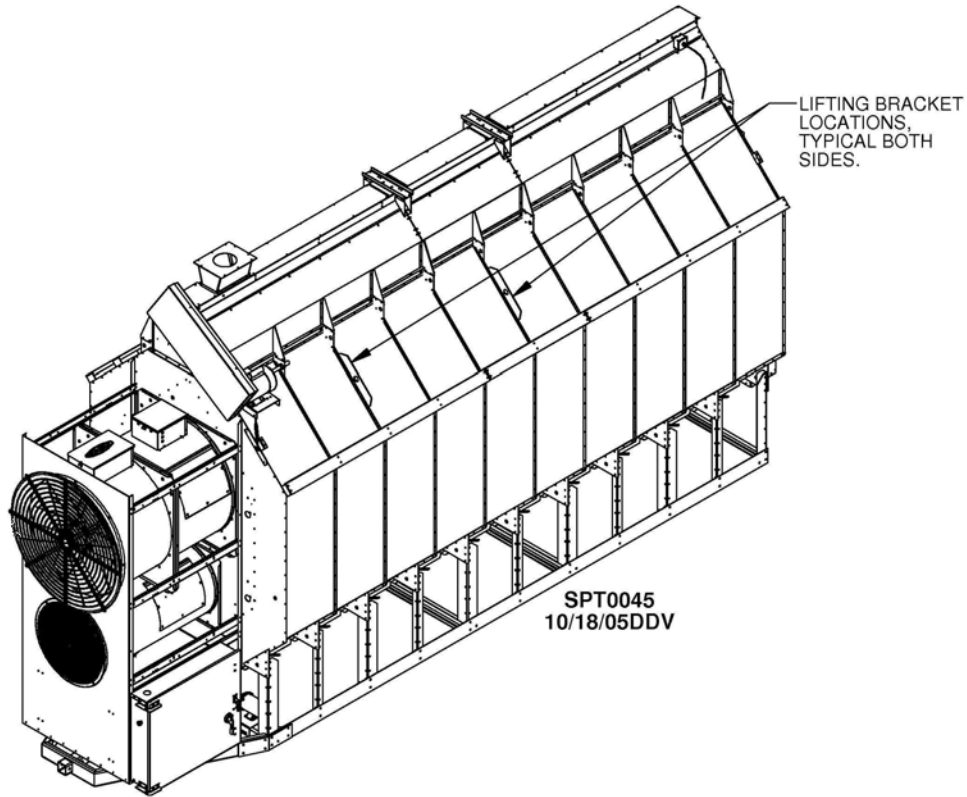
Lift Bracket (Comp. #T16532) Locations



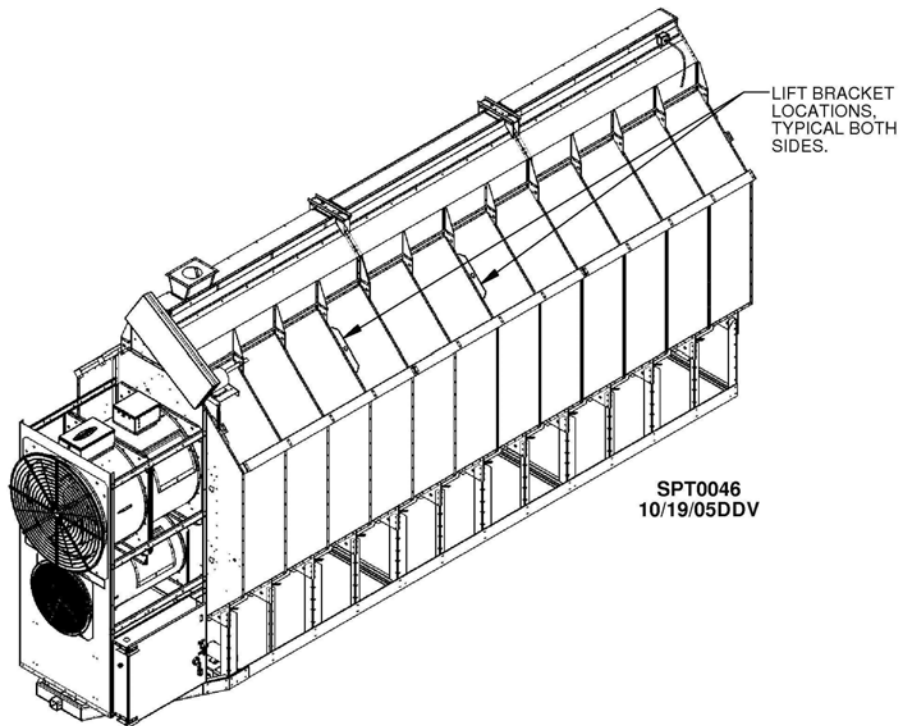
12 Foot Dryer Lift Points



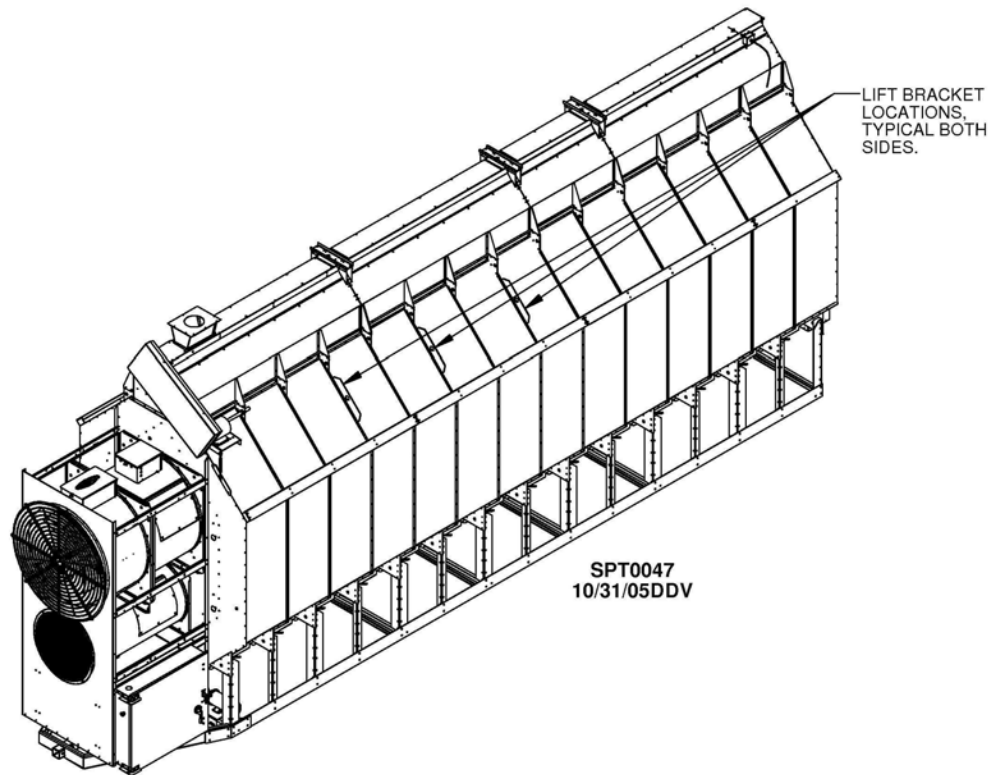
16 Foot Dryer Lift Points
(Approx. dryer weight: 9,000 lbs.)



20 Foot Dryer Lift Points
(Approx. dryer weight: 12,000 lbs.)



24 Foot Dryer Lift Points
(Approx. dryer weight: 14,000 lbs.)



28 Foot Dryer Lift Points
6 lift points are required.
(Approx. dryer weight: 16,000 lbs.)

Wet Bin Assembly

Wet Bin Folding Kits (T17699) are available to aid in lifting the wet bin.

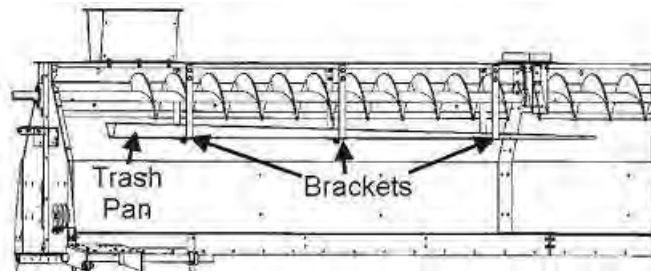


Figure SPT0036

1. Bolt the trash pan brackets into the wet bin on filling end of dryer. Bolt the trash pan to the trash pan brackets. Refer to Figure SPT0036.
2. Position the half of the wet bin without the auger into the upright position first, then pivot the side with the auger into the upright position. Bolt the wet bin together at the end plate seams, side seams, pivot seams, and top hanger support.
3. Attach the fill auger paddle switch assembly. Locate the holes for the paddle switch in the wet bin on the end opposite the filling end.

Note

Holes are pre-punched for mounting at either end. Remove desired plastic plugs. Leave plugs in end not being used. Fill remaining holes with bolts and nuts.

4. Slide a plastic bushing on each side of wet bin from inside out. Slide the shaft with the tilt switch box through the bushing on one side of the wet bin. Position the paddle weldment inside of the wet bin, and slide the shaft through the pipe of paddle weldment. Slide the shaft through the bushing on the other side of the wet bin. Tighten setscrews of paddle weldment onto shaft, making sure the paddle and box on shaft are square, and paddle can pivot freely. Refer to Figure SPT0054

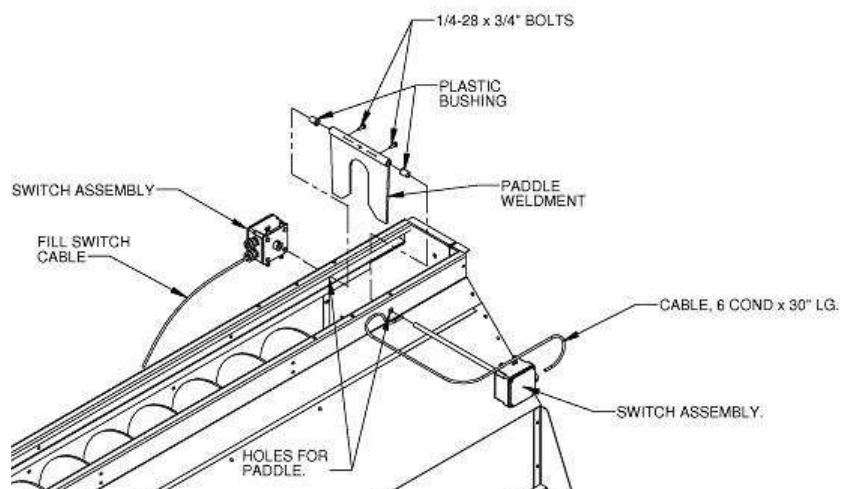


Figure SPT0054

Wet Bin Assembly (Continued)

5. Bolt the top fill hopper to the top of the wet bin on the filling end of the dryer. Place the cover plates on top and attach with $\frac{1}{4}$ x 1" self drill screws. Refer to Figure SPT0039 for Front fill and Figure SPT0041 for Rear fill dryers. (16' dryer is shown in drawings below.)

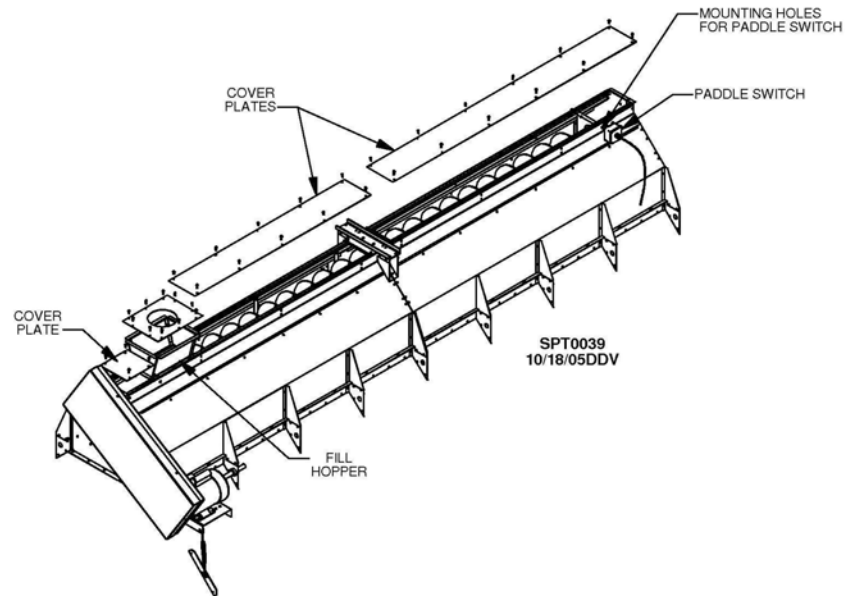


Figure SPT0039

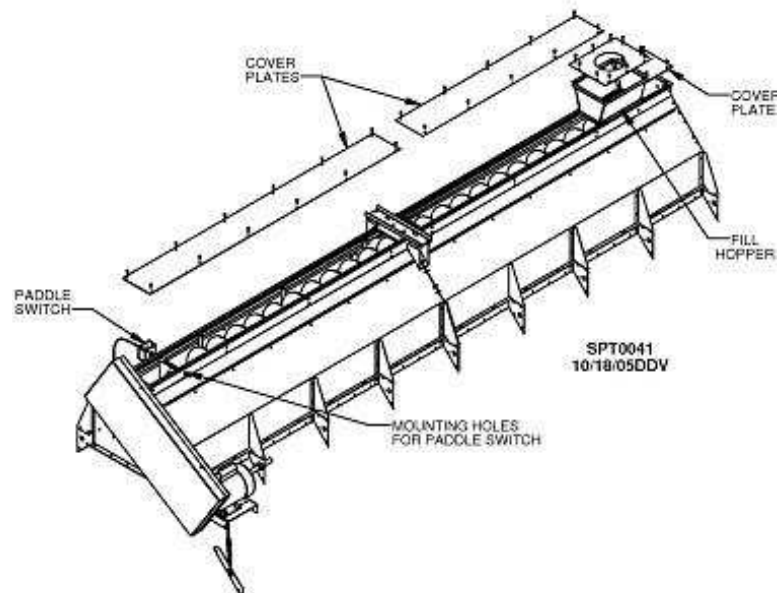


Figure SPT0041

Top Load Auger Motor and Shields

1. Bolt the lower shield bracket to the end of the dryer, using 5/16 x 1" bolts and 5/16 nuts. Refer to Figure SPT0031.

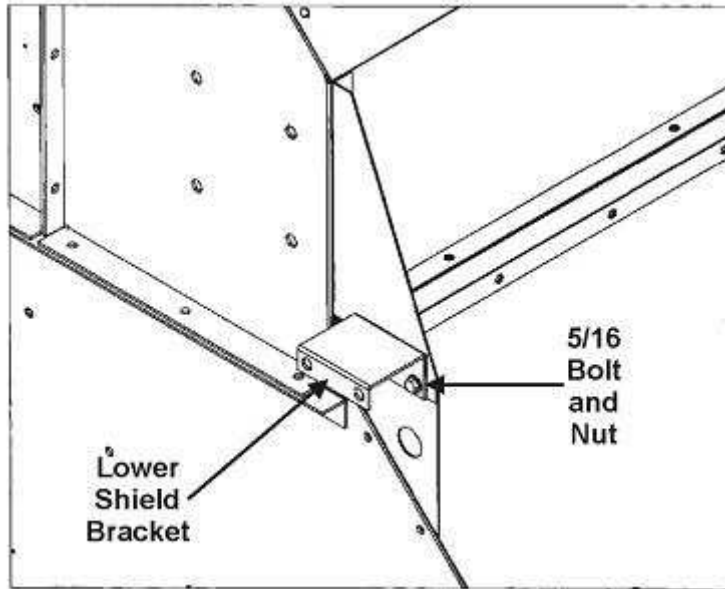


Figure SPT0031

2. Hold the motor mount up to the holes on the side of the wet holding bin. Slide a 1" conduit tube through the motor plate holes of the dryer. Refer to Figure SPT0034.

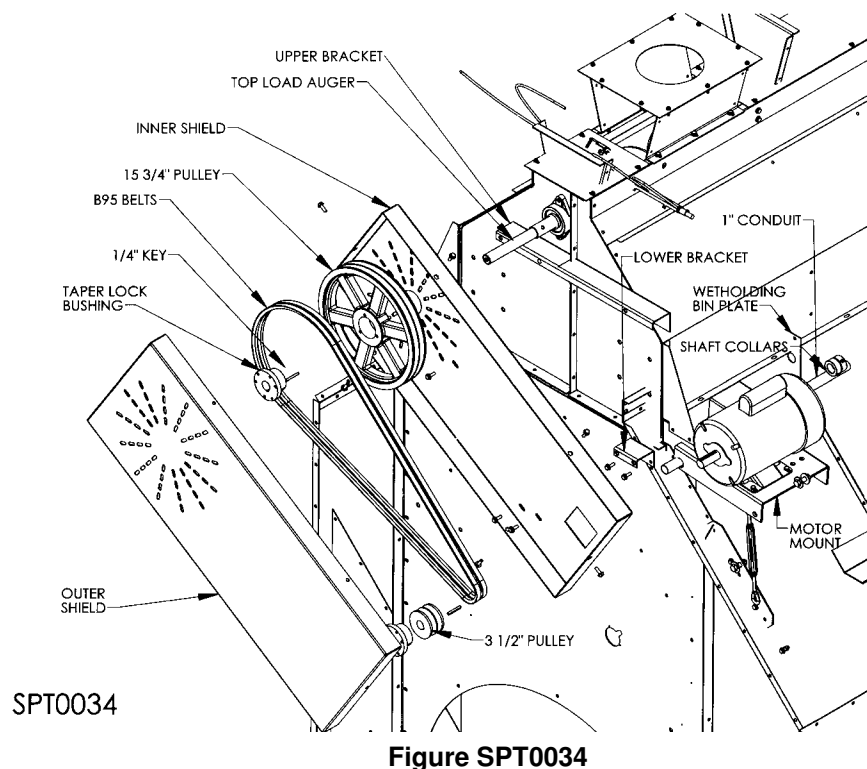


Figure SPT0034

Top Load Auger Motor and Shields (Continued)

3. Slide the shaft collars on each side of the wet holding bin plate. Refer to Figure SPT0035.

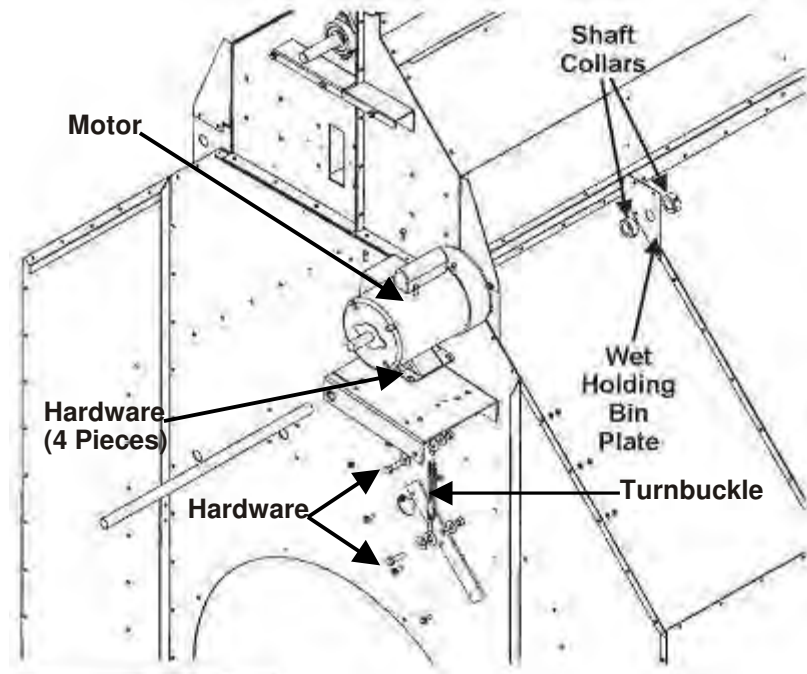
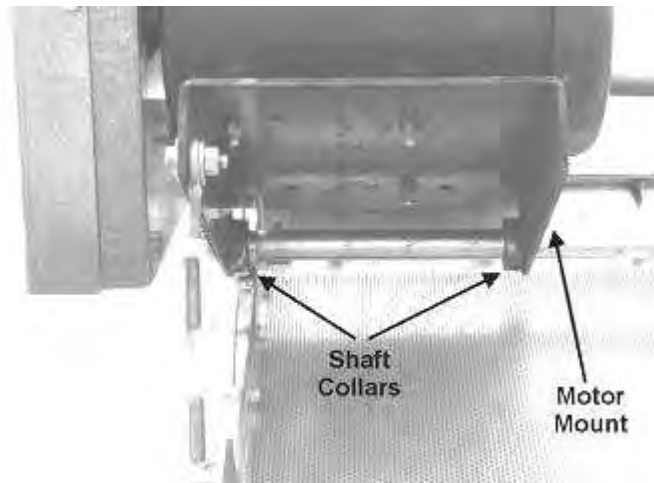


Figure SPT0035

4. Tighten the shaft collars under the motor mount and on each side of the wet holding bin plate. Make sure the motor mount can pivot. Refer to picture below.



Top Load Auger Motor and Shields (Continued)

5. Bolt the turnbuckle plate to the side of the dryer. Refer to Figure SPT0034.
6. Bolt the turnbuckle between the motor mount and the turnbuckle plate using $\frac{1}{2} \times 1 \frac{3}{4}$ " bolts and $\frac{1}{2}$ " flat washers and $\frac{1}{2}$ " lock nuts. Refer to Figure SPT0035.
7. Bolt the motor to the motor mount using $\frac{5}{16} \times 1$ " bolts and $\frac{5}{16}$ " nuts and washers. Refer to Figure SPT0034.
8. Bolt the inner shield to the upper and lower brackets using $\frac{5}{16}$ " bolts, washers, and nuts. Refer to Figure SPT0034.
9. Attach a 10.8 cm O.D. pulley to the motor shaft with a key and attach the 40 cm O.D. pulley to the top load auger with a taper lock bushing. Use suitable straight edge to align pulleys. Attach two B95 belts between the auger pulley and the motor pulley. Tighten the turnbuckle to tighten the belts. Refer to Figure SPT0034.
10. The final assembly should appear as below. (Shown without front shield.)

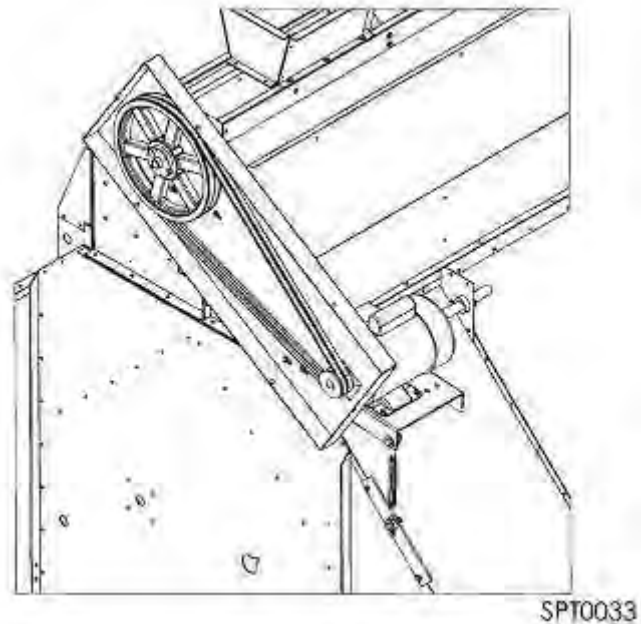


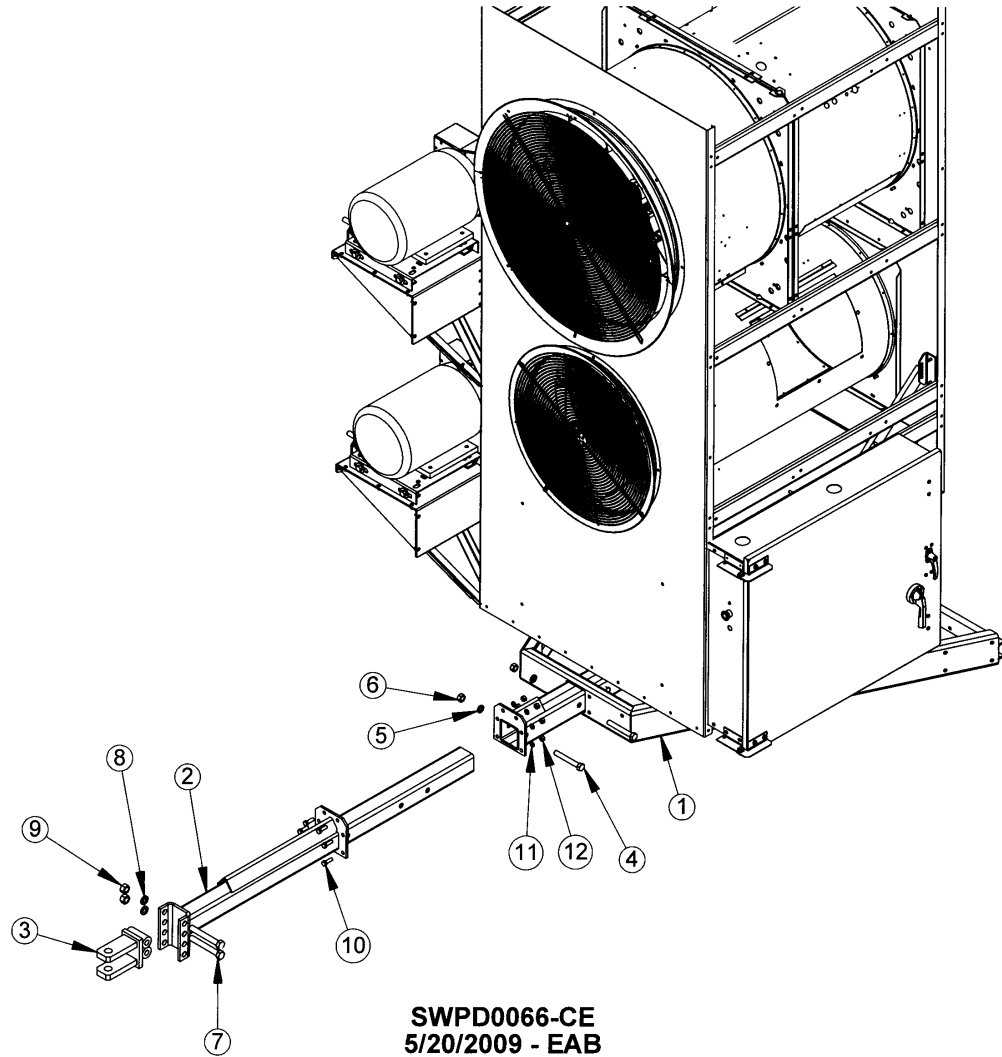
Figure SPT0033

11. Slide the outer shield around the outside of the inner shield and attach with 6 – $\frac{5}{16} \times 1$ " bolts.

Refer to Figure SPT0034.

Dryer Hitch with 24" Extension

Dryers have an extension to compensate for the belt drive distance for easier transport. See below for part descriptions of this extension.



SWPD0066-CE
5/20/2009 - EAB

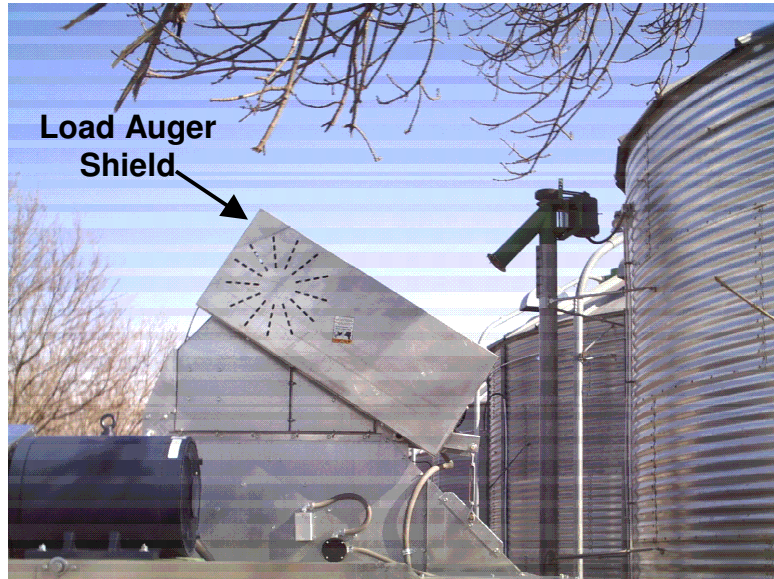
ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	T16310D	HITCH RECEIVER WELDMT, JACK
2	1	T43711	HITCH INSERT WELD, 24" EXT
3	1	T4372	CLEVIS WELD
4	3	J0822	SCREW, 3/4"-10 X 5" LG.
5	3	J1220	3/4" LOCKWASHER
6	3	J1051	3/4-10 HEX NUT
7	2	J08361	BOLT, 7/8-9 X 6 1/2" LG
8	2	J1222	7/8" LOCKWASHER
9	2	J1059	7/8-9 HEX NUT
10	6	J0730	SCREW, 1/2 -13, 1.50,PLT,GR5,HHCS
11	6	J1215	1/2" LOCKWASHER,PLT,SPLIT
12	6	J1040	NUT, 1/2 - 13,PLT,GD5,HEX

Safety shields / Access doors and covers

Warning

It is extremely important to operate the dryer with all safety shields installed.

1. Safety Shields

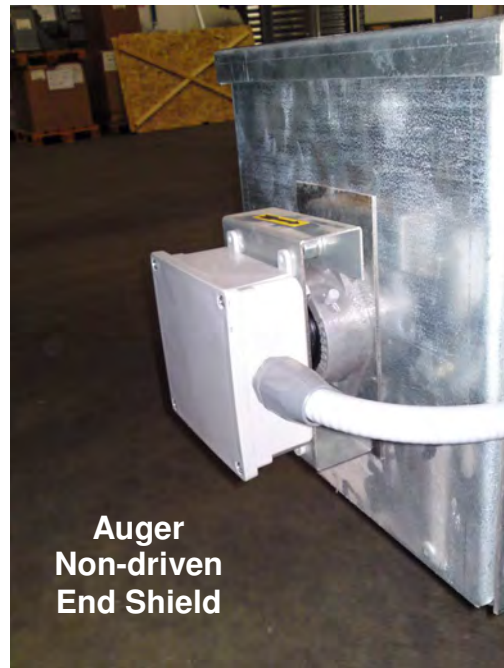


The load auger safety shield is located on the top of the Dryer and it functions to cover the load auger drive pulleys, motor, and belts.

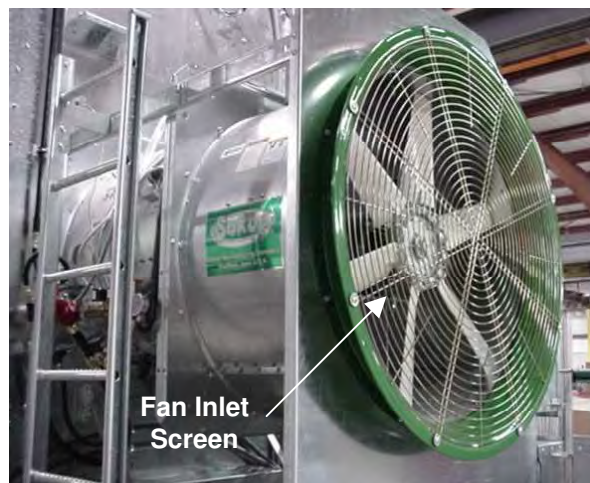


The unload auger and meter roll drive safety shield is located on the front of the dryer and functions to cover the unload auger motor, pulleys and belts. It also covers the meter roll sprockets and drive chains.

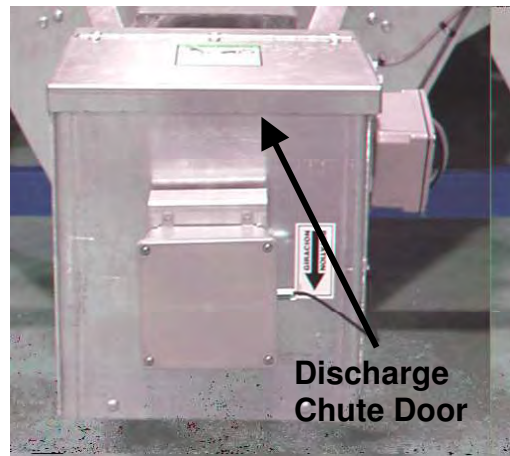
The non-driven end of the unload auger has a safety shield and is located at the rear of the dryer. The shield also serves as a mount for the unload proximity junction box.



The fan inlet screen is located at the intake of the fan. It prevents foreign material from being drawn into the fan. Keep clean with periodic maintenance.

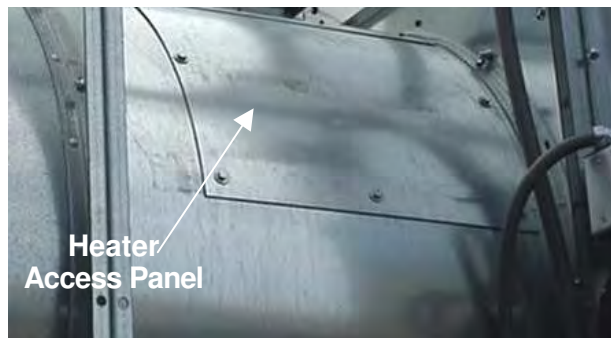


The grain discharge chute door is located at the rear of the dryer, on the top of the grain discharge chute. It prevents access to the unload auger while dryer is in operation and opens on grain overflow if the takeaway system fails.

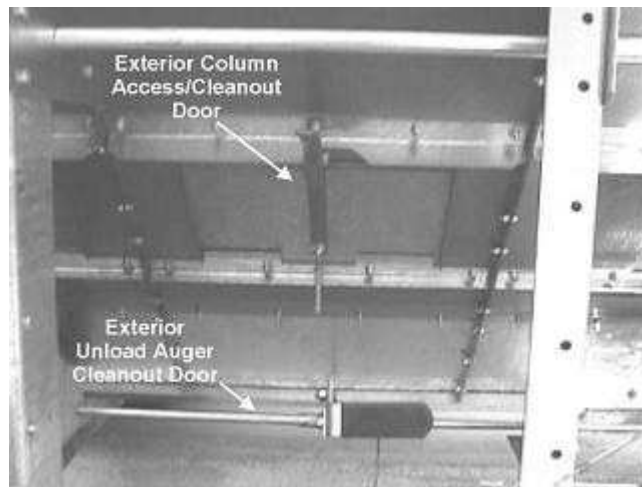


2. Access doors/covers

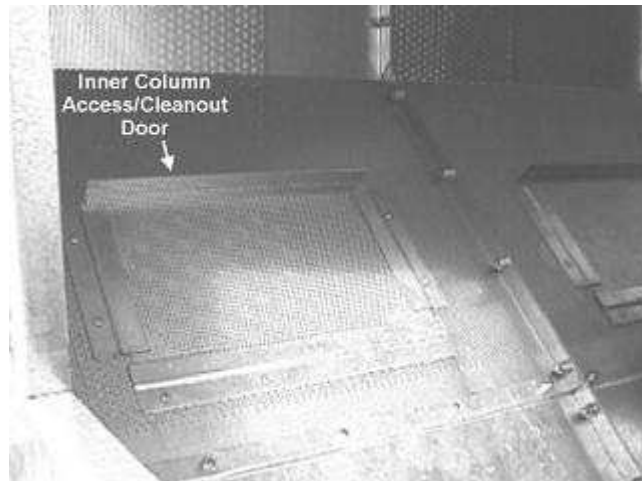
The heater access panel is located on the upper left side of the heater and allows access to the inside of the heater barrel.



The exterior grain column access and cleanout doors and the exterior unload auger access and cleanout doors are located on the bottom portion of the dryer.



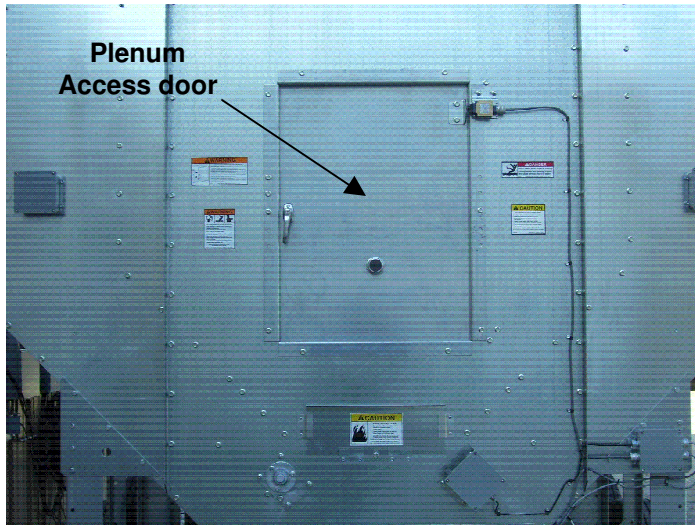
The inner grain column access doors are located in the plenum area on each column, both sides.



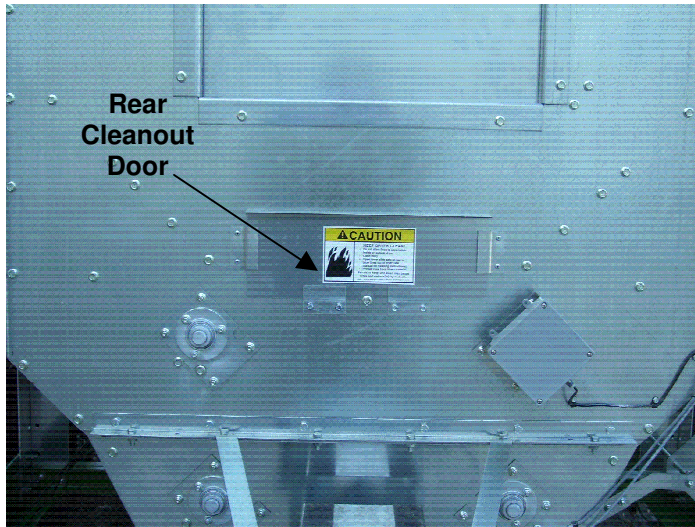
The unload auger inner access panels are located in the plenum, on the floor.



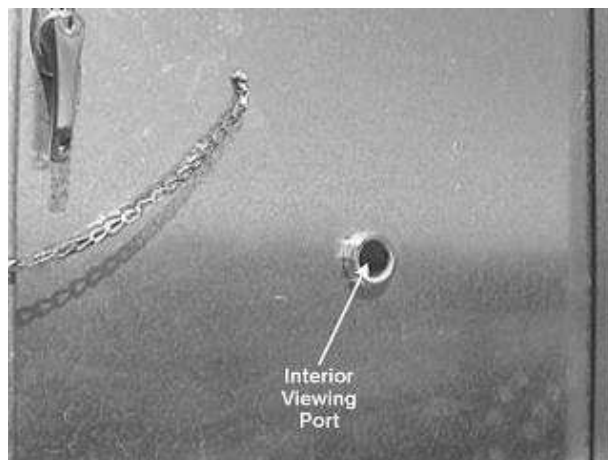
The plenum access door is located at the rear of the dryer.



The clean out door is located at the rear of the dryer just below the plenum access door. It is used to clean out the plenum. With the fan running and standing to the side, lift the door and fines and debris will be blown out.



The rear viewing port is located in the plenum access door and is used to view the interior of the dryer during operation.



Ground Rod Installation



A system ground rod (J5722) and clamp (J5723) are supplied with the dryer and can be found in the rear of the dryer. The rod is copper-coated, 8 feet (2.44 m) long, and ½ inch diameter.

1. The installation of the ground rod and ground wire must conform to National Electrical Code Handbook procedures.
2. Bury the ground rod (top of rod must be flush with ground) within 8 feet (2.44 m) of the dryer and attach it to the power distribution box ground lug located in the lower right corner. The ground rod located at the power pole will **NOT** provide sufficient grounding for the dryer.
3. The proper grounding will provide added safety in case of any short or lightening strike.
4. **Ground rod MUST** be installed to validate the dryer warranty!

Dryer Installation Gas and Electric Hook-up

Initial gas hookups should only be performed by qualified gas service technicians in accordance with all applicable code requirements. In conditions of a threaded pipe train, a regulator **must** be installed on the gas tank and limit the pressure to 72 psi (5 bars). **IMPORTANT: Regulator must be in accordance with standard BS EN 88 or BS EN 334.**

Initial electric hookups should only be performed by qualified electrical service technicians in accordance with **all applicable code requirements.**

Supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of **BS EN 60204-1.**

QuadraTouch™ Controller Installation

The design of the QuadraTouch™ controller allows for easy installation. However, there are a few things to keep in mind when choosing an installation location:

1. The QuadraTouch™ controller will need its own 100 – 240VAC power source. Choose a location where electricity can be easily accessed. @120VAC, the unit pulls less than 1A. Using an appropriate extension cord is acceptable, as long as standard electrical codes are followed.
2. The industrial Ethernet cable that is ordered with the dryer is available in 4 lengths:

Cable Length	Comp #
50'	J8720
100'	J8721
150'	J8722
200'	J8723

The cable length determines how far away the controller can be mounted from the dryer. 200 feet is the longest, standard length.

3. Although the QuadraTouch™ controller is contained in a sealed enclosure, it's a good idea to mount the controller in a shed or place of shelter. This is easier for everyone involved in the process.

The QuadraTouch™ controller has an operating temperature of 10°F to 135°F (-12°C. to 57°C) and a storage temperature of -4°F to 150°F (-20°C. to 66°C). Therefore, outdoor placement is acceptable in most locations, however, it is recommended that it be placed indoors during the winter months when not in use.

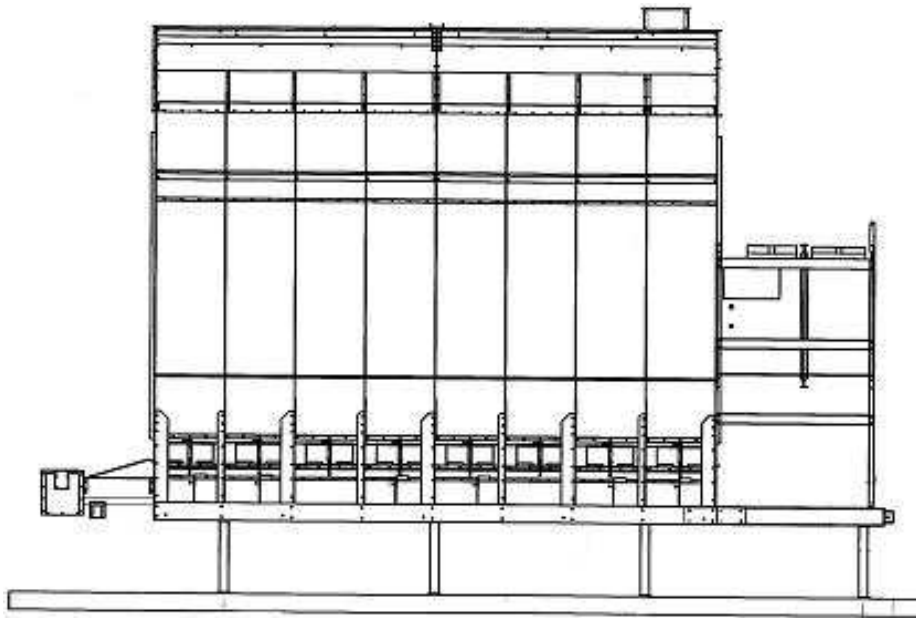
4. The QuadraTouch™ controller comes with pre-installed mounting brackets. These allow the controller to be mounted directly onto the wall or bench using 4 screws.

NOTE: If the location where the controller is mounted is not heated, it is recommended that the unit be taken indoors during the winter months or anytime the controller would be exposed to temperatures outside its temperature limits.



AUTOMATIC GRAIN DRYER

**Continuous Flow / Automatic Batch
QuadraTouch™ Dryer Control System**



SERVICE MANUAL

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TABLE OF CONTENTS

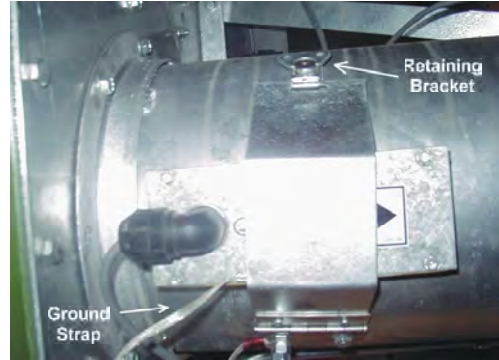
Sensor Installation and Removal Instructions	3
Discharge Moisture Sensor	3
Grain Discharge Chute Sensor	4
Grain Level Sensor	5
Unload Auger Sensor	6
Vaporizer Over-Temperature Switch	7
Rear Door Interlock Switch	8
Grain column over temperature sensors.....	9
Heater Housing Hi-Limit Switch	10
Plenum Temperature Sensor (RTD).....	11
Metering Roll Proximity Switch	12
Static Air Pressure Sensor.....	13
Plenum Over Temperature Sensor	14
Component Calibration.....	15
Moisture Sensor Calibration.....	15
Air Switch Adjustment Calibration	15
Differential Air Switch Calibration	16
Proximity Switch Adjustment.....	17
Rear Discharge Chute Switch Adjustment	18
Heater operation at low plenum temperatures	19
Appendix A – Fan Blade Replacement	22

Sensor Installation and Removal Instructions**A. Discharge Moisture Sensor****F60337X** (with yellow identifier)

This sensor is used to monitor the grain's moisture as it exits the dryer.

Removal:

1. Turn power off at the power box.
2. Locate the discharge moisture sensor on the bottom of the grain discharge chute.
3. Disconnect the sensor ground strap connected to the dryer with a regular nut.
4. Release the sensor-retaining clamp and remove the sensor from the discharge tube.
5. Remove the wire cable retaining clips fastening the wire to the dryer all the way back to the junction box located at the right rear of the dryer.

**Remove the junction box cover by removing the four screws.**

6. Disconnect the sensor wires from the dryer wiring.

Installation:

1. Obtain a new moisture sensor and place it into the grain discharge tube. Secure the sensor by tightening the holding clamp.
2. Connect the ground strap to the dryer frame, and tighten the nut.
3. Route the wire cable to the junction box using the cable clamps to secure the cable to the dryer.
4. Connect the sensor wiring to the dryer wiring. Red to Red. Blue to Blue. Black to Black. Green to Green. Shield to Shield.
5. Install junction box cover by tightening four screws.
6. Tighten strain relief.



**B. Grain Discharge Chute Sensor
T17988**

This switch is used to detect a plugged take-away system. Should the take-away system malfunction, the grain would push up the discharge chute door, causing a fault condition.

Removal

1. Turn the power off at the power box.
2. Locate the grain discharge chute switch junction box.
3. Remove the cover by removing the four screws.
4. Disconnect the two switch wires from the dryer wiring.
5. Remove the switch.

**Installation**

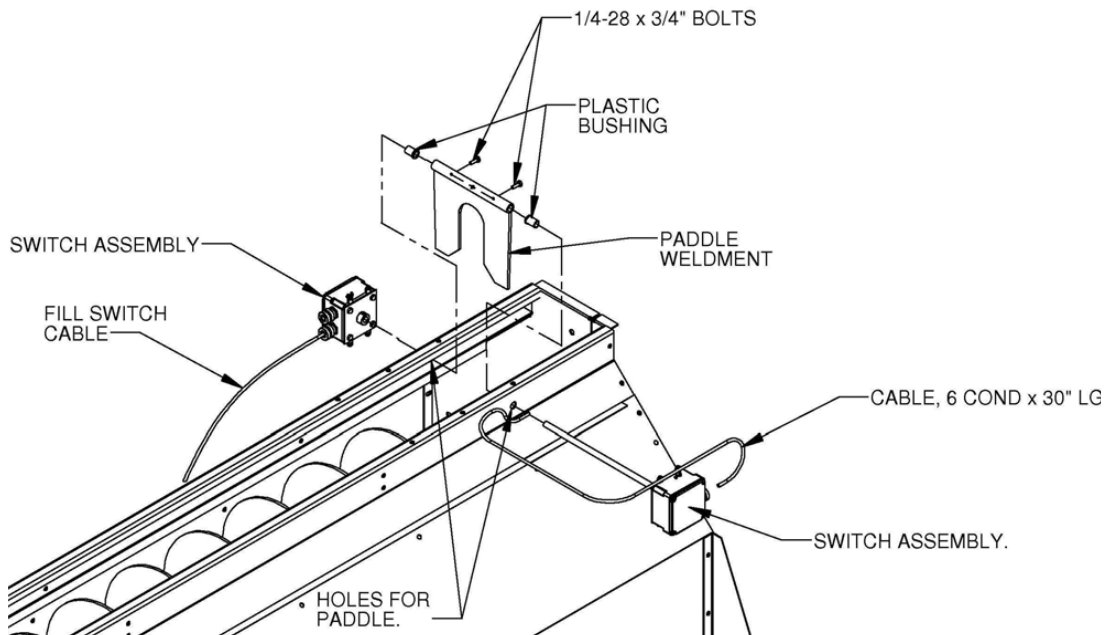
1. Obtain a new switch and install onto dryer.
2. Connect the two switch wires to the dryer wiring. (Wire #18 and wire #42)
3. Reinstall cover when finished. (See Rear Discharge Chute Switch Adjustment in the Component Calibration section to calibrate.)

C. Grain Level Sensor**Fill Switches (Upper – T162441; Lower – T162442)**

Used to detect when the dryer is full of grain.

Removal

1. Turn power off at the power box.
2. Locate the grain level switch junction box. Found on the right side of the wet bin, opposite the fill end.
3. Remove the four screws holding the sensor to the dryer.
4. Disconnect the four wires (red, black, white, and green) from the dryer wiring.
5. Remove the switch from the dryer by sliding it out of the wet bin.

**Installation**

1. Obtain a new switch and insert into the wet bin.
2. Connect the wires in the following manner – Red to red, black to black for power, white to white, and green to green for ground.
3. When finished, reinstall the switch by tightening the four screws holding it to the dryer.

D. Unload Auger Sensor J4493

This sensor monitors the rotation of the unload auger. Should the unload auger stop turning for 5 seconds, a fault condition will occur.

Removal

1. Turn the main power off at the power box.
2. Locate the unload auger sensor on the end of the grain discharge chute.
3. Remove the cover by removing four screws.
4. Loosen and remove the inside lock nut and remove the proximity switch from the box.
5. Follow the wiring to the junction box located on the side of the grain discharge chute and remove the cover by removing four screws.
6. Disconnect the sensor wires from the dryer wiring.



Installation

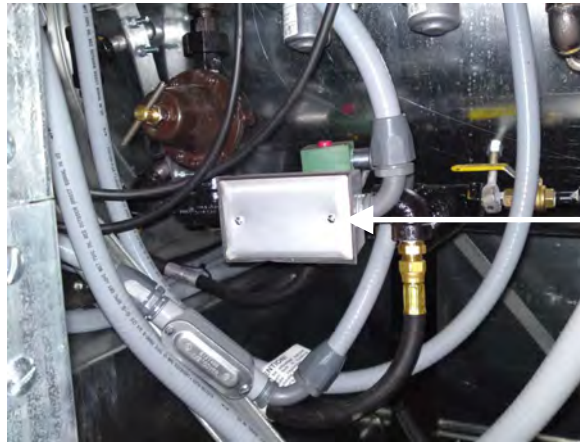
1. Obtain a new sensor and remove the first locknut. Slide the sensor into the hole and secure with the locknut just removed.
2. **IMPORTANT:** The gap between the tip of the rotating target and the proximity sensor must be no greater than 1.6mm +/- 10% (use a coin like a Kroner or a Euro for an **approximate** distance).
3. Route the wiring in the same manner as before and connect the sensor wires to the dryer wiring. Blue to #95 Black. Brown to #18 Orange. Black to #96 Red.
4. Turn power on at the power box and turn the system control switch to COMPUTER. Go to Tools → Manual Operation, and press and hold the Unload button. Unload auger should now be turning. If installation was NOT successful, a fault message will appear on the screen within 5 seconds and the unload auger will shut down. See photo of Grain Discharge Chute Sensor, page 3.
5. Reinstall the cover by tightening the four screws.

**E. Vaporizer Over-Temperature Switch
J5901**

This sensor monitors the vapor temperature as it exits the vaporizer coil. Should the temperature exceed 140°F, the sensor opens the circuit, causing a fault condition.

Removal

1. Turn the power off at the power box.
2. Locate the vaporizer over-temperature switch on the heater pipe train, on the vaporizer coil.
3. Loosen the U-bolt and screws holding the switch in position.
4. Follow the wiring to the heater box and remove cover. See photo in Section H, Heater High Limit.
5. Disconnect the red #18 wire attached to the housing high limit switch. A new crimp terminal end should be used.
6. Disconnect the red #37 wire, which is also attached to a blue #37 wire by removing the blue wire nut.



**Vaporizer Over-
Temperature Sensor**

Installation

1. Obtain a new over-temperature switch and position the new switch in the same position as the old switch and secure by tightening the switch screws and U-bolt nuts.. Do not over tighten U-bolts, or switch damage may occur!
2. Route the new switch wiring to the heater control box.
3. Attach the red #18 wire to the housing high-temperature switch where #18 blue connects.
4. Attach the red #37 wire to the blue #37 wire using a wire nut.

**F. Rear Door Interlock Switch
J44872**

If the door is opened, a fault will be detected.

Removal

1. Turn the power off on the front of the power box.
2. Locate the rear door at the back of the dryer.
3. Loosen the strain relief using an adjustable wrench.
4. Remove the four (4) small screws holding the bronze plate onto the switch. There will be two (2) wires, red and black, on the normally open (NO) set of contacts (13 and 14).
5. Loosen and remove the two (2) wires.
6. Remove 2 small bolts and 2 nuts holding the door switch in place.
7. Remove the switch from the dryer.

**Installation**

1. Turn off power to the dryer (main disconnect switch on power box).
2. Using a flathead screwdriver, remove the 4 screws holding the bronze colored plate.
3. With the strain relief loosened, insert the two wires (red and black) into the right side of the switch.
4. Connect the red and black leads to the normally open set of contacts (13 and 14).
5. Put the bronze colored plate back on the switch.
6. Bolt the new switch back on the dryer in the same place as the old one.
7. Make sure the door contacts and depresses the metal switch down when the door is closed. Adjust if necessary.

G. Grain column over temperature sensors
T17289 – 16', T17290 – 24', T17288 – 28'

The removal and installation procedure is identical for both grain column over-temperature sensors. Refer to the photos below.

Removal:

1. Remove the junction box cover for the appropriate sensor.
2. Locate the sensor wires and remove the blue wire nuts connecting the sensor to the dryer wiring.
3. Remove the sensor by removing the 5/16" nuts holding the sensor to the junction box, see photo for details.
4. While removing the sensor, coil the small copper tube for easy handling.



Installation:

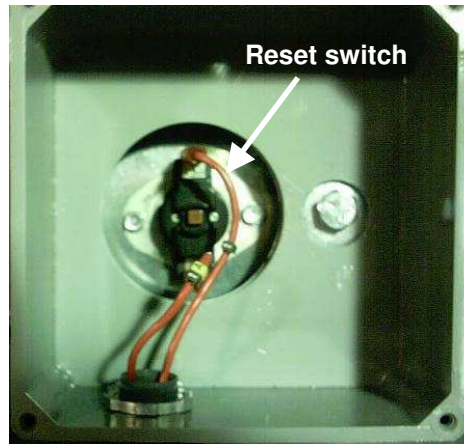
1. Install the new sensor by carefully uncoiling the small copper tube into the conduit inside the junction box. Be very careful not to kink the copper tube.
2. Using extreme care not to bend the copper tube. Attach the switch to the back of the junction box using the 5/16" nuts.
3. Reconnect the wires. There should be orange #18 and blue #40 or blue #41 depending upon side of the dryer.
4. Reinstall the junction box cover when completed.
5. Excess capillary tube is coiled and left in the rear junction box.

H. Heater Housing Hi-Limit Switch J5772

The heater housing hi-limit switch is located inside the heater box. The switch is mounted on the housing between the spark transformer and the terminal block and monitors the temperature of the heater housing.

Removal:

1. Open the heater box cover by removing four screws and remove plastic cover.
2. Locate the housing high limit switch.
3. Remove the wires from the switch by pulling on the crimped connectors.
4. Remove the two hold down screws.
5. Remove the switch.



Installation:

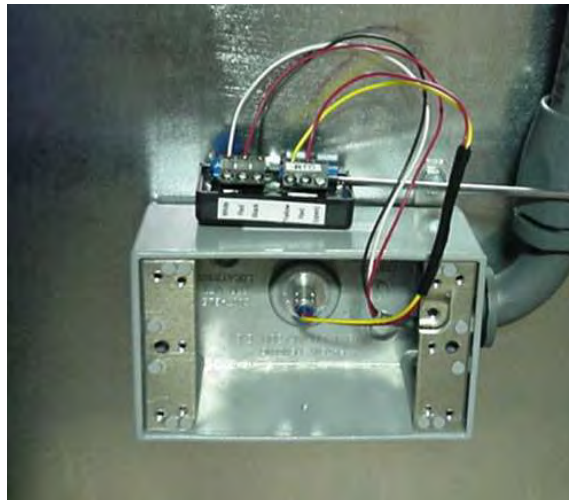
1. Insert the new switch into position and secure with two hold down screws.
2. Attach the crimped connectors to the tabs on the switch. There should be a blue #38 to one side and a red #18 and blue #18 to the other side of the housing high limit switch.
3. Reinstall the heater box cover when complete.

I. Plenum Temperature Sensor (RTD)**J5645 – 12', J5642 – 16', J5646 – 20', J5643 – 24', J5648 – 28'**

This sensor monitors the temperature of the plenum area. If the temperature exceeds a value determined by the sensor used a fault condition will exist.

Removal:

1. Turn control switch on control box to OFF.
2. Locate the sensor junction box mounted to the front of the plenum area on the front of the dryer.
3. Open the junction box and disconnect the wires from the transmitter (T17028).
4. Remove the two self-tapping screws on the two tabs holding the junction box to the dryer.
5. Remove the conduit fittings from the ends of the junction box.
6. Remove the clips holding the sensor tube to the inside wall of the plenum area. Gently set aside the plenum over temperature capillary.
7. Pull the sensor out leaving the grommet on the dryer and coil the tube from the sensor for ease of removal.

**Installation:**

1. Uncoil the new sensor carefully. Any kinks will damage the new sensor.
2. Feed the sensor into the plenum.
3. Attach the sensor tube to the inside wall of the plenum area similar as removal.
4. Attach the junction box to the outside of the dryer after reattaching the conduit.
5. Reusing the clips from the inside of the dryer install the new sensor tube to the inside wall of the plenum area. During installation of sensor tube, reinstall the plenum over temperature capillary. The over temperature capillary and the plenum temperature sensor are designed to be mounted to the same clip inside the plenum area.
6. Wire the transmitter (T17028) to the wires from the conduits and install the junction box cover. Make sure to cut off braided shield wires.



J. Metering Roll Proximity Switch J4483

This sensor monitors the rotation of the meter rolls. During operation the light on the proximity switch and the #93 input on the PLC will flash indicating rotation. Due to the slow rotation of the meter rolls, the lights might flash slowly. If removal of the target is necessary, install using fresh anti-seize compound.

Removal:

1. Remove the cover to the metering roll junction box at the rear of the dryer.
2. Remove the inner lock nut on the proximity switch.
3. Remove the switch from the box.
4. Remove the hold-down clamps for the wires and remove the cover to the right rear junction box.
5. Disconnect the wiring from the right rear junction box.
6. Loosen the liquid tight strain relief collar connector freeing the wires
7. Remove the wires from the junction box.



Installation:

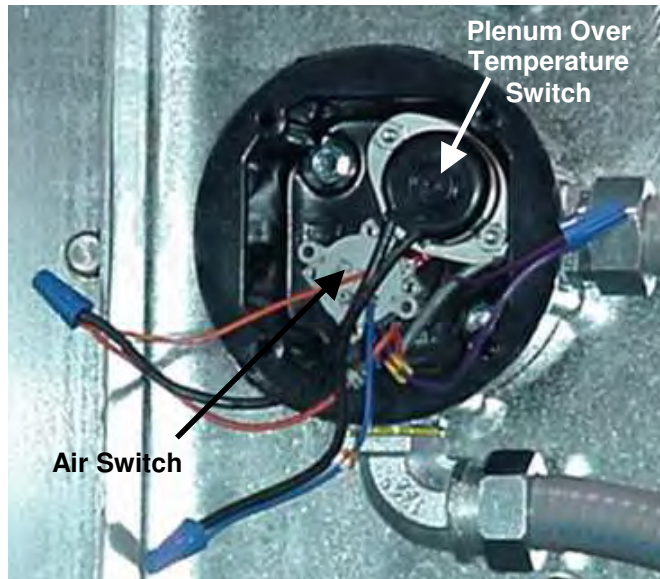
1. Installation of the new proximity switch is opposite to that of removal.
2. **Caution:** Adjustment of the proximity switch is critical. See Proximity Switch Calibration in the Component Calibration section to calibrate. The gap from the tip of the switch to the rotating target MUST be no greater than 1.6mm +/- 10% (use a coin like a Kroner or a Euro for an **approximate** distance) - see the above photo.
3. Reinstall the covers.

**K. Static Air Pressure Sensor
J5862 & J6019**

The static air pressure sensor detects that, during operation, there is enough static air pressure within the plenum area to dry properly and safely use the heater.

Removal:

1. Locate the junction box on the front plenum area.
2. Remove the cover and disconnect the orange and purple wires from the switch by removing the spade terminals at the switch.
3. Remove the screen filter (J6019) from the backside of the switch (J5862) from inside the plenum area of the dryer.
4. Remove the air switch.

**Installation:**

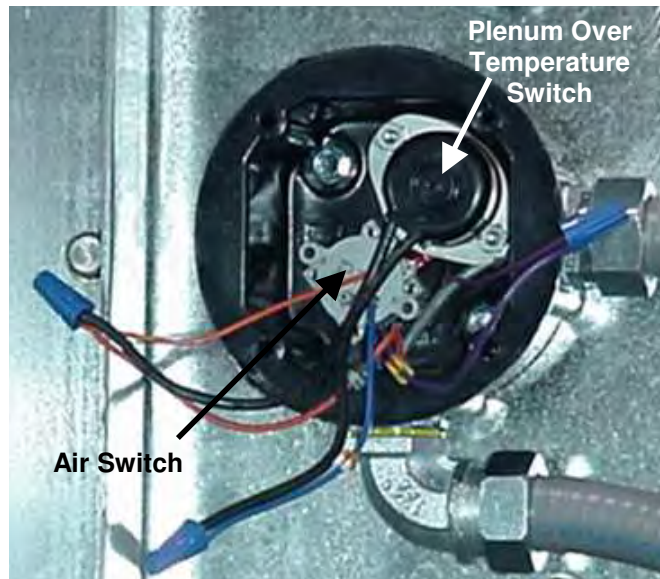
1. Installation of the switch is the reverse of the removal procedure.
2. New switches should be pre-calibrated and ready for installation.
3. After switch installation, reinstall wires, screen filter, and the junction box cover.

L. Plenum Over Temperature Sensor
12'&16'-J6795; 24'-J6796; 28'-J67961

The plenum over temperature sensor trips when the temperature of the plenum area rises above a temperature determined by the sensor. Removal of the plenum over temperature sensor is similar to the removal of the plenum RTD.

Removal:

1. Locate the sensor junction box mounted to the front of the plenum area on the front of the dryer.
2. Open the junction box and disconnect the blue and orange wires from the sensor.
3. Remove the clips holding the sensor capillary to the inside wall of the plenum area. Gently set aside the plenum temperature indicator tube.
4. Pull the sensor free and coil the copper capillary from the sensor for ease of removal.

**Installation:**

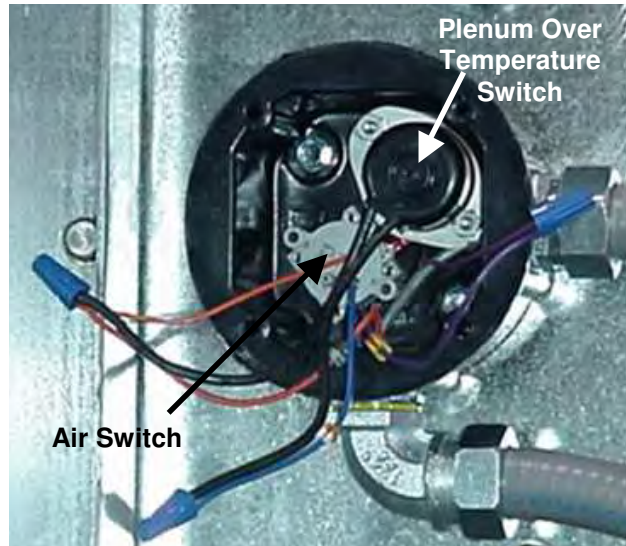
1. Uncoil the new sensor carefully. Kinks may damage the sensor.
2. Feed the new copper capillary through the junction box into the plenum.
3. Attach the sensor capillary to the inside wall of the plenum area similar to removal.
4. Reusing the clips from the inside of the dryer, install the new sensor capillary to the inside wall of the plenum area. The over temperature capillary and the plenum temperature sensor are designed to be mounted to the same clip inside the plenum area.
5. Re-connect blue and orange wires.

Component Calibration

A. Moisture Sensor Calibration

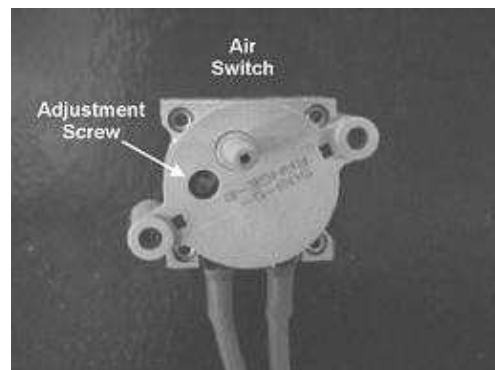
See Software Manual (tabbed divider of this manual).

B. Air Switch Adjustment Calibration (J5862 & J6019)



It may become necessary to adjust the static air pressure switch. Follow these instructions:

- Find the switch located on the upper front plenum in a 4" black, round junction box (see above).
- The switch is adjustable between 0 to 3 inches of static pressure. Factory set to 0.5" of water column pressure. It is a normally open switch that closes when the set pressure is reached.
- To increase the pressure set point, turn the adjustment screw **counter-clockwise** (see below).
- To decrease the pressure set point, turn the adjustment screw **clockwise** (see right).



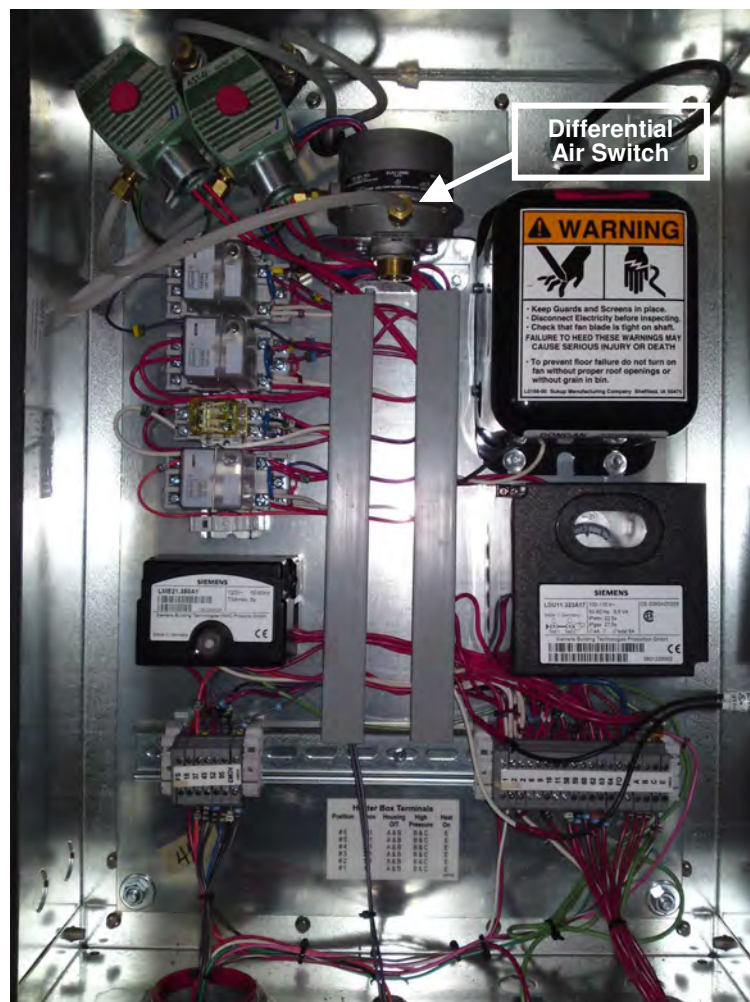
J5862 – Air Switch

C. Differential Air Switch Calibration

This switch is adjusted to maximum sensitivity by turning the screw counter-clockwise.



J5863 - Differential Air Switch



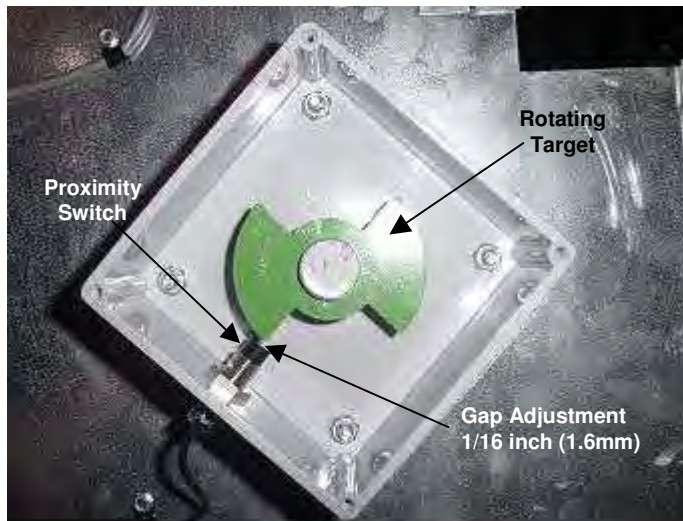
D. Proximity Switch Adjustment

When adjusting the proximity switch (J4483), a measuring device, or a coin such as a Kroner or Euro can be used.

- a. Locate the box at the end of the discharge chute on the dryer. The proximity switch and rotating target will be located inside this box. See below:



- b. Once the box is opened, a rotating target and the proximity switch can be found inside.
- c. To calibrate the proximity switch, loosen the locking nut on the switch.

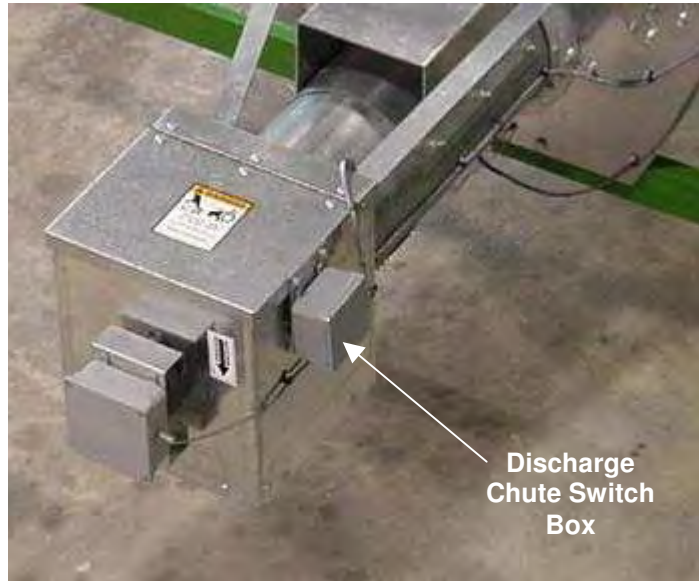


- d. Using the measuring device, or coin as mentioned above, shift the switch so that it is 1/16", or 1.6mm from target (approximately the thickness of a Kroner or Euro). This measurement is important for reliable sensing. The switch must be this distance so that it can sense the target as it rotates.
- e. Once the switch is in place, tighten the locking nut and replace the cover on the box. Make sure the target will not strike or contact the end of the proximity switch!

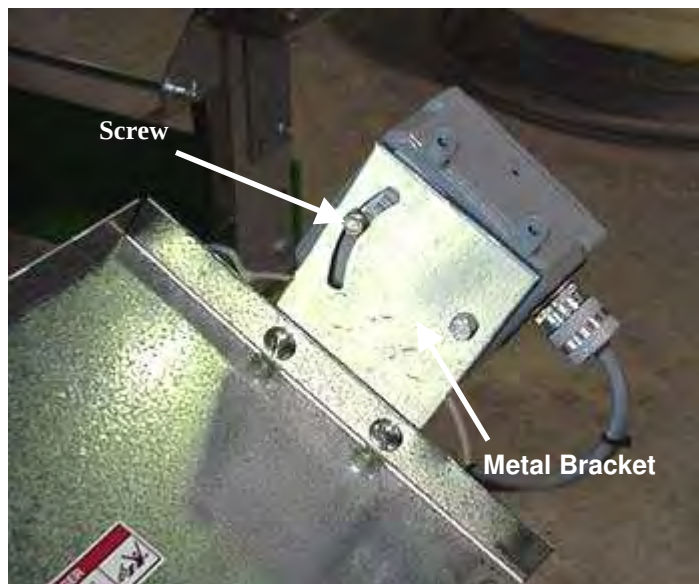
E. Rear Discharge Chute Switch Adjustment

When adjusting the Rear Discharge Chute switch, a 7/16 socket wrench will be needed.

- a. Locate the box on the discharge chute at the rear of the dryer and open the discharge chute lid. Remove the cover. See below:



- b. Attached to the lid of the discharge chute is a metal bracket with the box fastened to it. Using a 7/16 socket wrench, loosen the screw holding the box in place. See below:



- c. Adjust the box so that when the discharge chute lid is opened 2"-3", a fault occurs. The box can be adjusted by rotating it. Once the position has been found, tighten the screw to hold the box in place.
- d.

Heater operation at low plenum temperatures

Operating the dryer at low temperatures (approximately less than 27°C above ambient temperature) requires a low temperature heater kit. This kit is automatically installed on all CE dryers. A symptom of operating at temperatures with high temperature equipment is a rumbling sound. This symptom occurs when the gas pressure is low and the flame is burning back into the port cup. Contact your Sukup dealer to purchase replacement parts.

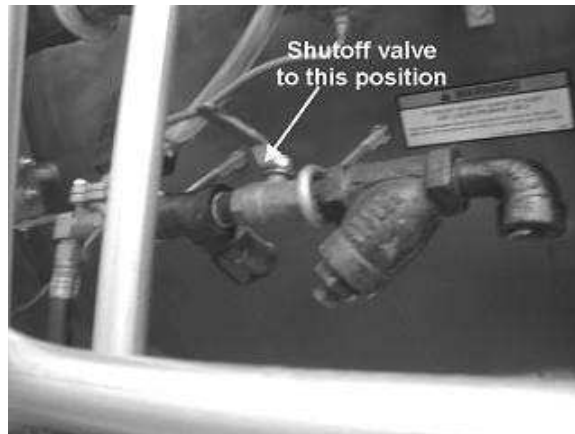
Caution

The following procedure is to be performed by *qualified* service personnel only.

The following procedure is a modification of the heater that involves changing the gas line orifice and the port cup.

Step 1. Operate the dryer fan and heater. While heater is running turn the fuel shutoff lever to the off position. (See figure below) Allow heater to flame out (purge gas lines).

Step 2. Lock out all electrical power and gas lines



(Continued on next page.)

Step 3. Locate the orifice pipe train assembly (refer to picture at right)

Step 4. Loosen the union located at the bottom of the orifice pipe train assembly (refer to picture at right)

Step 5. Remove the bracket located at the top of the orifice pipe train assembly. (refer to picture at right)



Step 6. Remove the orifice pipe train assembly by lifting out and up at the bottom of the assembly, and pulling the top of the assembly straight out of the heater housing.

Step 7. With orifice pipe train removed from heater housing, locate the threaded orifice (refer to picture below).



Step 8. Remove the threaded orifice by rotating it CCW.

Note

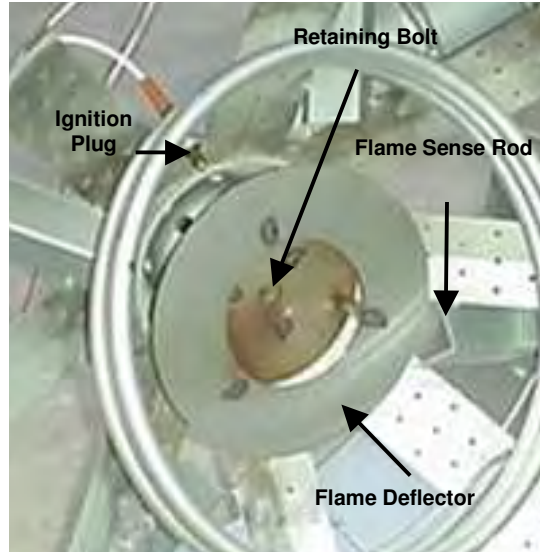
For replacement parts, refer to chart on 1-13 in Operation Manual tabbed section.

Step 9. Re-install orifice pipe train assembly into heater housing by reversing steps 4 through 6 above.

Caution

Ensure that the union is re-tightened properly to prevent gas leaks

Step 10. Access the dryer heater housing area by entering through the rear door. Locate the heater burner assembly. Remove the flame deflector by removing the 3/8" bolt located in the center of the deflector.
(Refer to picture below)



Step 12. Note mounting position of flame sense rod (for re-installation). Remove flame sense rod from the mounting bracket. Then, remove the two port cup retention bolts. Remove port cup. (refer to picture above)

Step 13. Install new port cup by reversing the items in Step 10.

Important

When re-installing the top bolt be sure to re-attach the heater harness bracket, located at the rear of the burner assembly.

Important

When re-installing the flame sense rod, ensure that the rod is not grounded out and that the rod is in the flame path.

Note

Do NOT re- install the flame deflector as it is not needed in lower temperature applications.

Step 14. Restore electrical power to the dryer and open the fuel valves.

Step 15. Start fan and heater. When heater turns on, inspect for gas leaks around the union area using soapy water.

Step 16. Re-adjust the vaporizer coil as needed.

Step 17. Inspect heater flame. Look for nice clean flame, blue in color. Minor yellow coloring at the tips of the flame is acceptable.

The dryer can now be returned to service.

Note: For replacement part numbers, refer to chart on 1-15 in Operation Manual tabbed section.

Appendix A

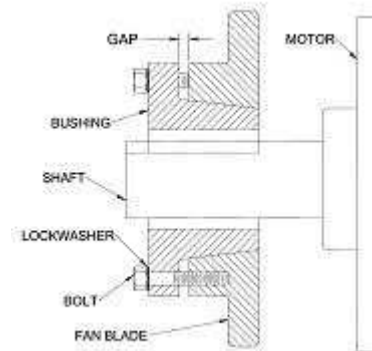
Appendix A – Fan Blade Replacement

Fan torque specifications (For Trantorque specifications, see next page)

Follow these instructions when replacing the blade on the fan of the dryer and maintaining the blade at the start of the drying season.

Failure to properly tighten blade may cause serious injury or death:

- **USE TORQUE WRENCH** with settings capable of attaining the correct torque specifications.
- There **MUST** be a gap between the bushing and the blade to insure a tight fit.
- **DO NOT** over-tighten. May cause hub to crack and threads to strip.
- **NEVER** run fan without screen guard installed.
- **DO NOT** stand in front of fan when running.



Procedure to Install Axial Fan Blade with Taper-lock Bushing:

1. Put blade on motor shaft.
2. Position bushing on motor shaft and tighten setscrew (if applicable).
3. Insert bolts with lockwashers through the unthreaded holes in the bushing into the threaded holes on the blade.
4. Tighten bolts evenly to draw the fan blade onto the bushing. Using a torque wrench, tighten bolts to $\frac{3}{4}$ of the recommended torque, then continue to alternately tighten them until they remain at their full torque rating specified below.
5. Install screen guard and run for a minute. **DO NOT STAND IN FRONT OF FAN.**
6. Recheck bolt torque. Continue this process until bolts maintain specified torque after fan has been run.

Fan Torque Specifications – Prior to 2006

PART #	FAN SIZE	HP	BUSHING	BORE SIZE	BUSHING BOLT	TORQUE FT-LBS	TORQUE Nm
J0426	28"	15	P1	1.125	5/16"	13	17.6
J04265	28"	20	SDS	1.375	1/4"	9	12.2
J0424	38"	10	P1	1.375	5/16"	13	17.6
J04286	44"	15	SK	1.625	5/16"	15	20.3
J04285	44"	30	SD	1.875	1/4"	9	12.2
J0432	44"	40	SK	2.125	5/16"	15	20.3

Trantorque GT Bushing specifications

A Trantorque GT Keyless Bushing offers flexible and easy installation while providing exceptional holding power. To ensure a Trantorque GT unit performs as specified, it must be installed properly.

⚠ WARNING: Do not lubricate the Trantorque GT bushing or shaft. The use of any lubricant on the contact surfaces could result in bushing failure and will void all warranties.

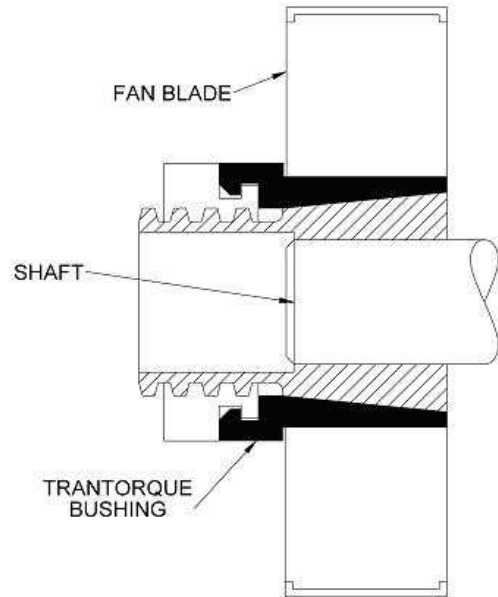
1. Insert the Trantorque GT unit into the component to be mounted, making sure the mating hub is flush against the shoulder at the hex flats.

2. Position the assembly at the desired location on the shaft and hand-tighten the nut (clockwise), until the assembly becomes snug on the shaft.

⚠ WARNING: Do not hammer or use any type of impact to force the Trantorque GT assembly along the shaft.

⚠ WARNING: The shaft must fully engage the shaft gripping area of the Trantorque GT unit.

3. Using a torque wrench, tighten the nut to the proper installation torque. The hex flats on the outer ring are provided for counter-torque, eliminating the need to hold the component or shaft, while applying installation torque.



NOTE: At full installation torque, the assembly will have moved approximately 1.6mm (1/16") axially along the shaft away from the nut. If axial position is critical, it may be necessary to loosen the nut and reposition the assembly.

⚠ WARNING: Over-tightening the nut could damage the Trantorque GT unit and/or the mounted component.

Trantorque Bushings

PART #	FAN SIZE	HP	BUSHING	BORE SIZE	NUT SIZE	TORQUE FT-LBS	TORQUE Nm
J0436	28"	15	TRANTORQUE	1.125	1.75"	165	224
J0437	28"	20	TRANTORQUE	1.375	2"	190	258
J0437	38"	10	TRANTORQUE	1.375	2"	190	258
J0435	38"	15	TRANTORQUE	1.625	2.25"	230	312
J0435	38"	20	TRANTORQUE	1.625	2.25"	230	312
J0435	44"	15	TRANTORQUE	1.625	2.25"	230	312
J04371	44"	30	TRANTORQUE	1.875	2.5"	400	542
J04372	44"	40	TRANTORQUE	2.125	2.75"	440	597



Instructional Decal located on Fan Blade

QuadraTouch™

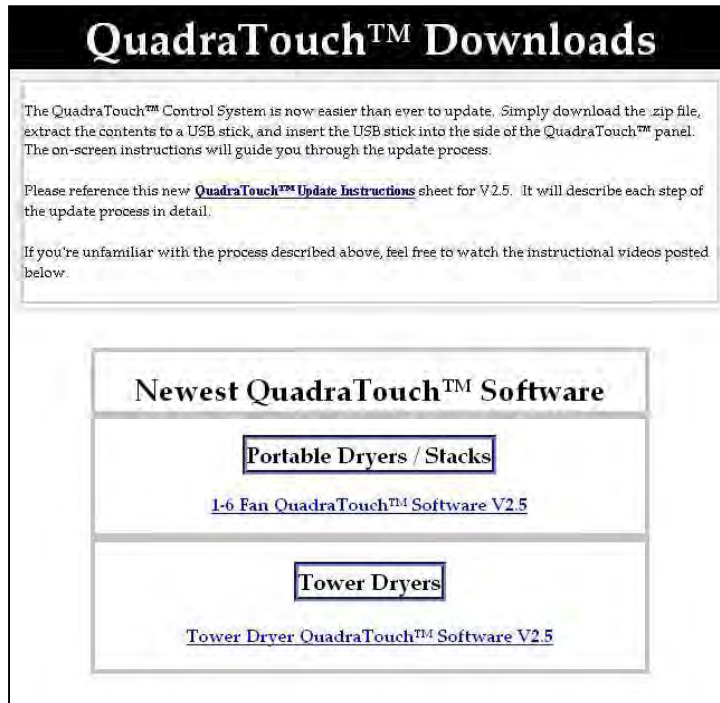


Download & Installation Instructions V2.5 and later

The QuadraTouch™ Control System is now easier than ever to update. Simply go to www.sukup.com/QuadraTouch_Downloads.aspx 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/QuadraTouch_Downloads.aspx



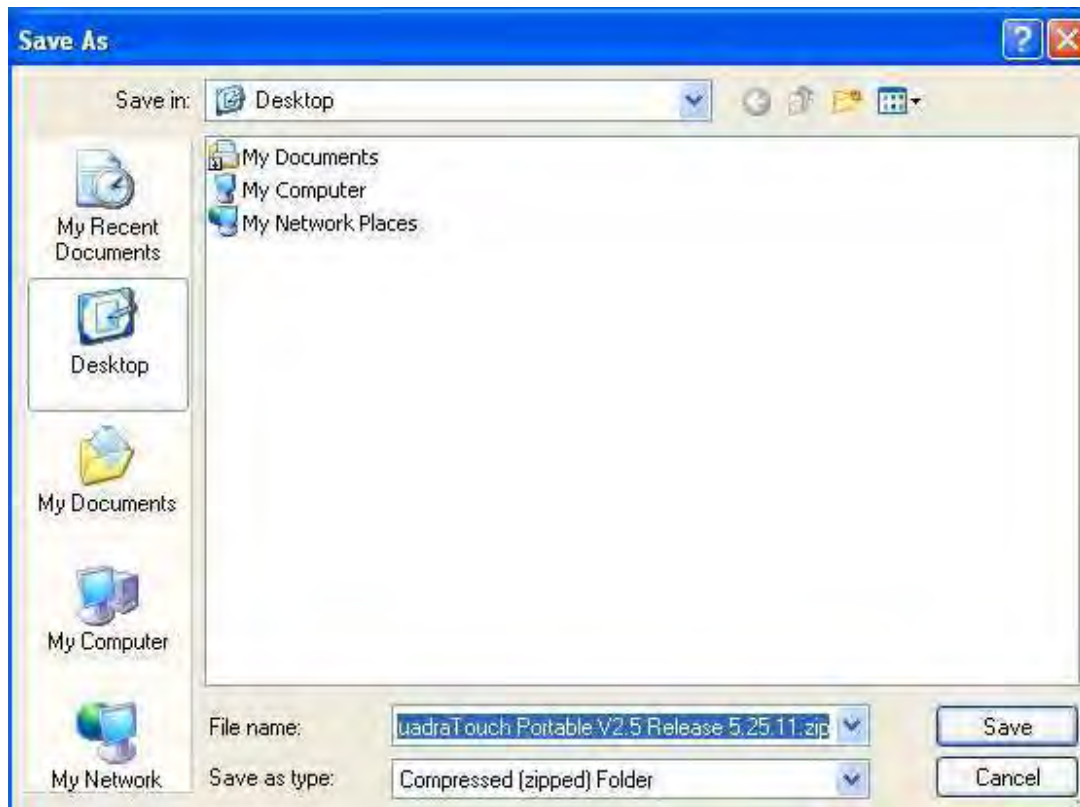
2. Select the newest Portable/Stack or Tower Dryer program for your dryer.

A dialog box will appear. Select "Save"



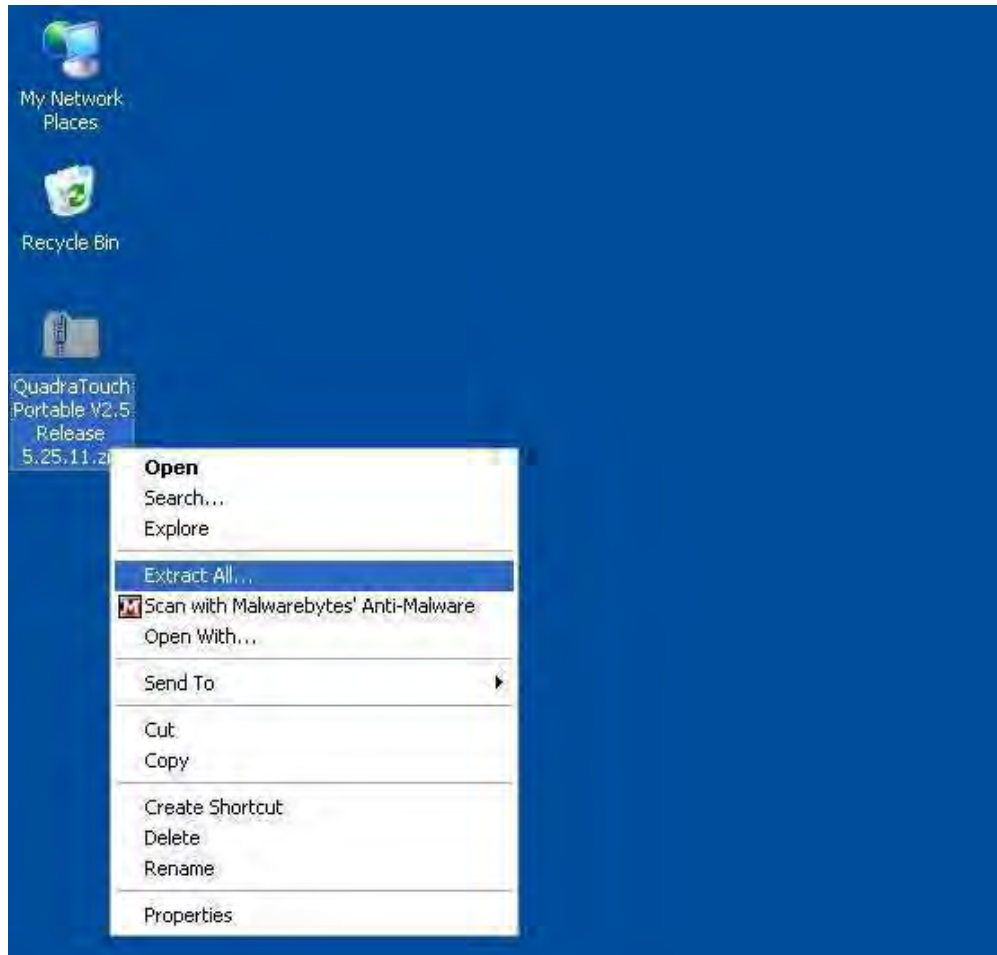
3. Next, another dialog box will appear. This time, it will ask you where you'd like to save the file. Typically "Desktop" is the easiest and preferred selection.

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 will take around 1-2 minutes 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

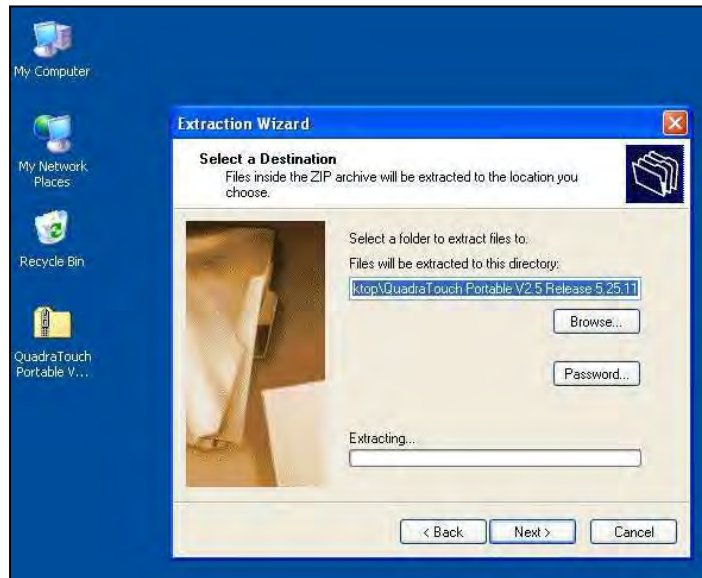
A dialog wizard will pop up.



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”

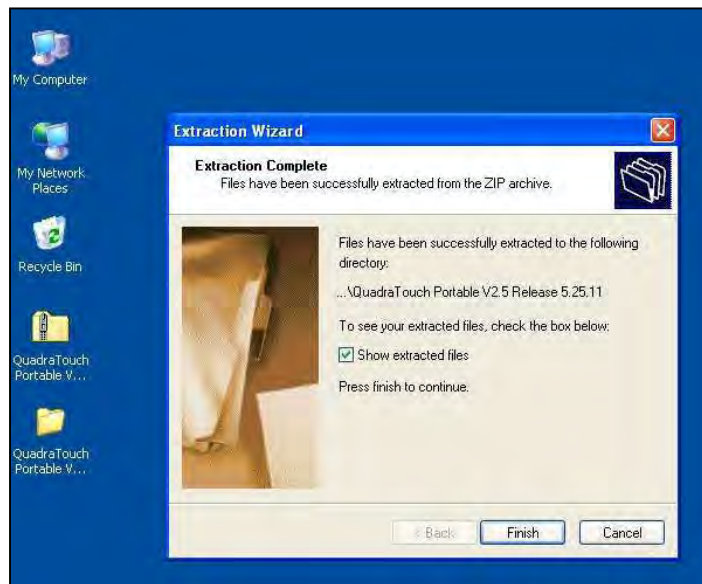


7. You’ll notice a folder has been created on the desktop.

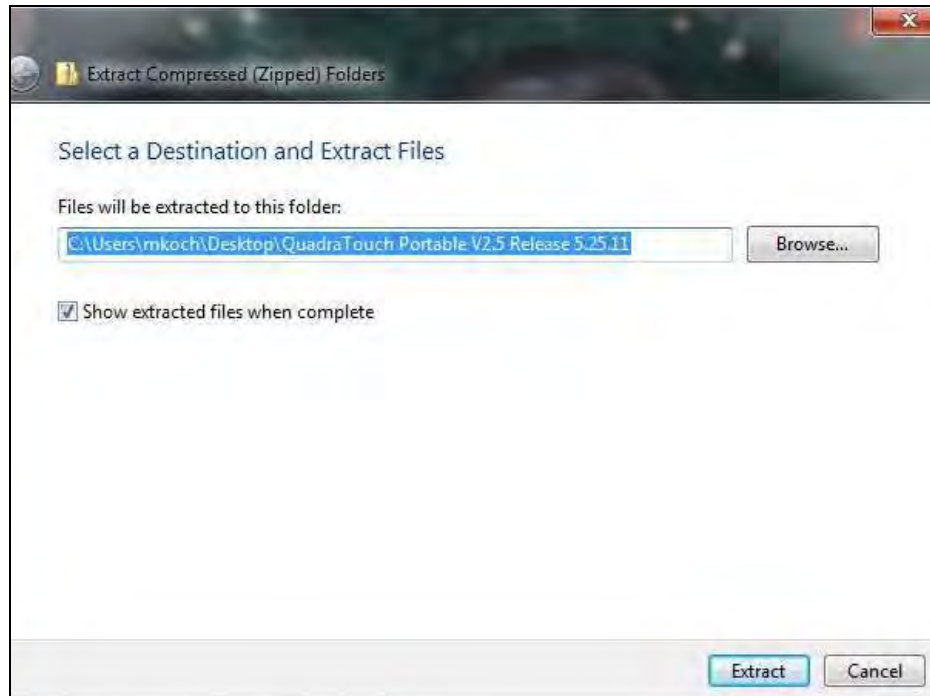
Select the check box for “Show the extracted files”

Select “Finish”

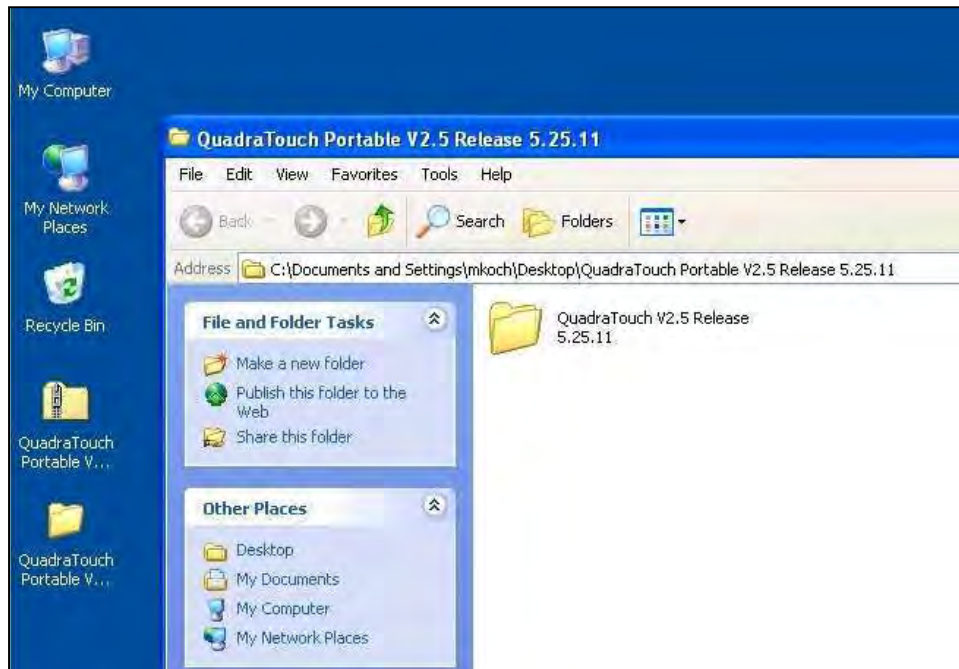
A window will open with the contents of the newly extracted files.



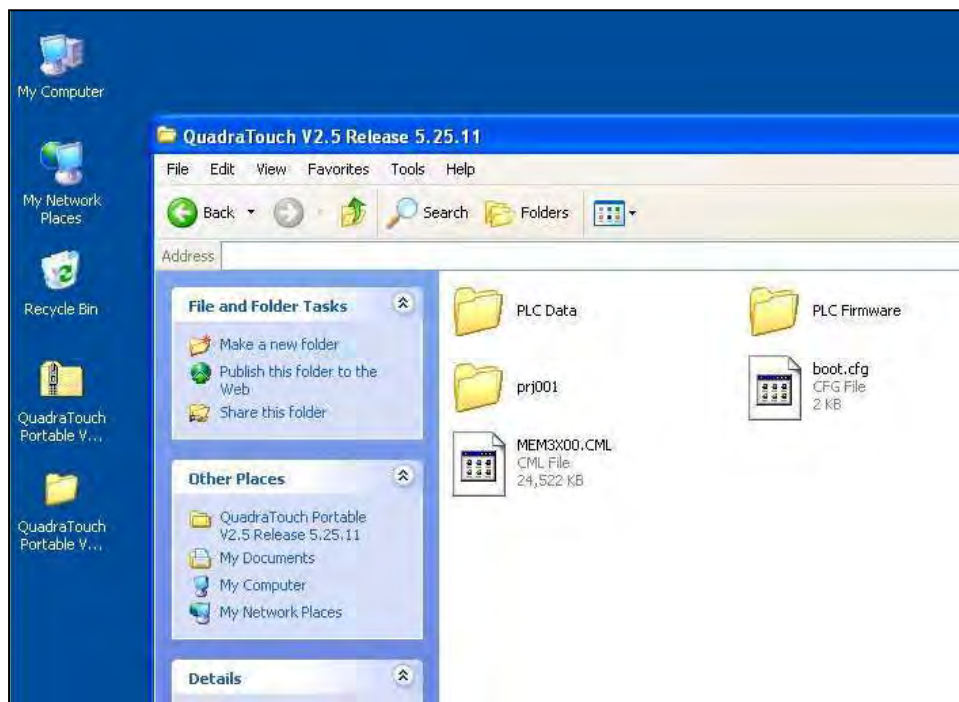
8. Windows Vista and 7 users will see something slightly different, pictured here. Simply choose the “Extract” option.



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

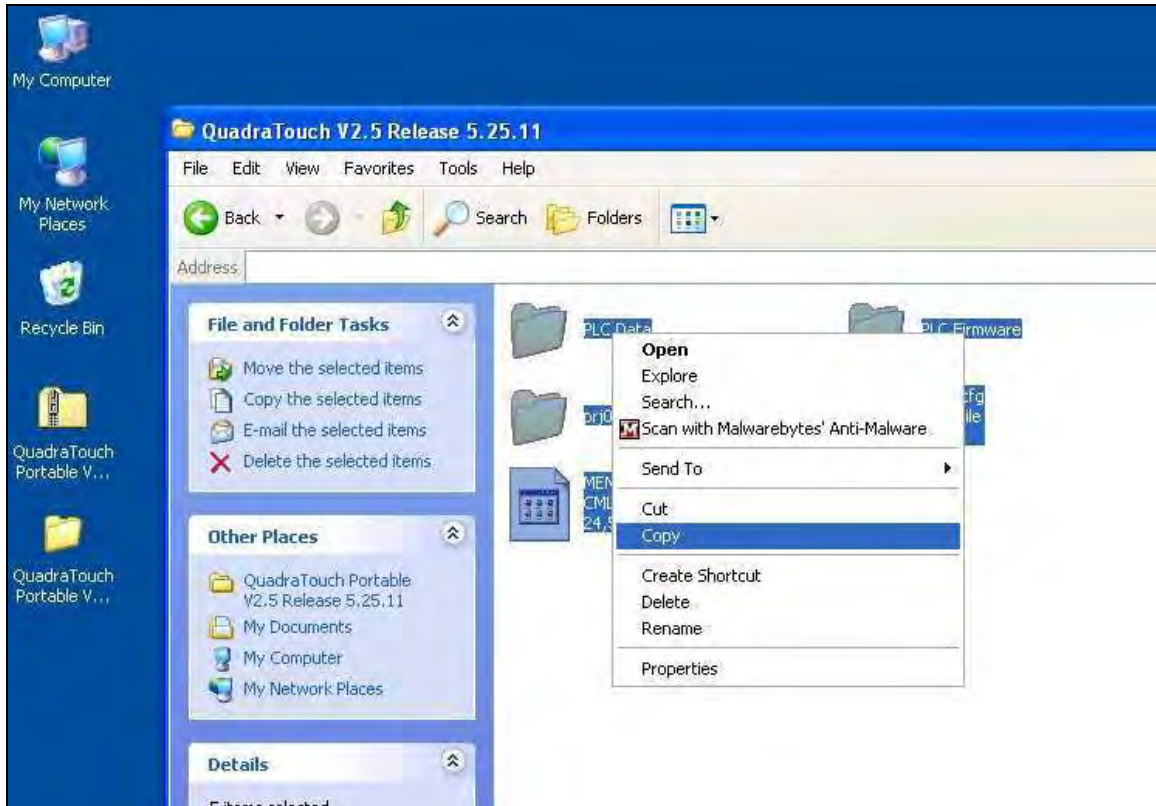


10. You will see this:



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.

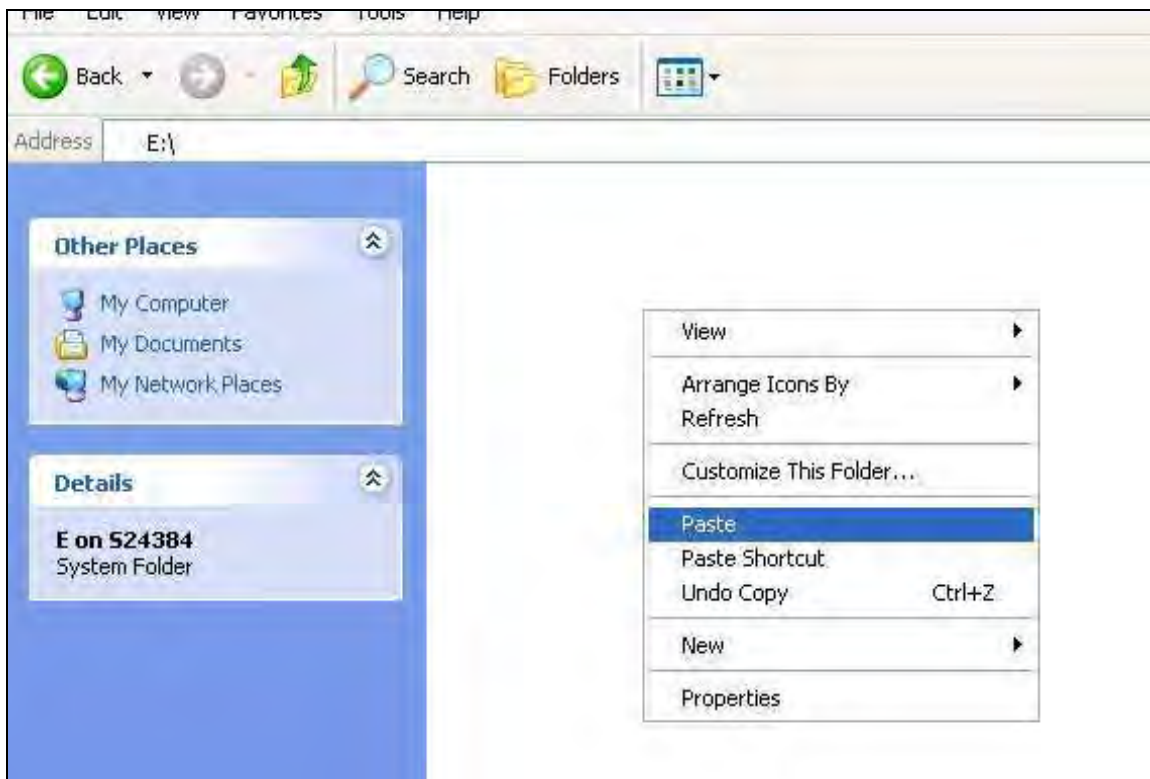
“Right-Click” any one of the selected files and select “Copy”



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.

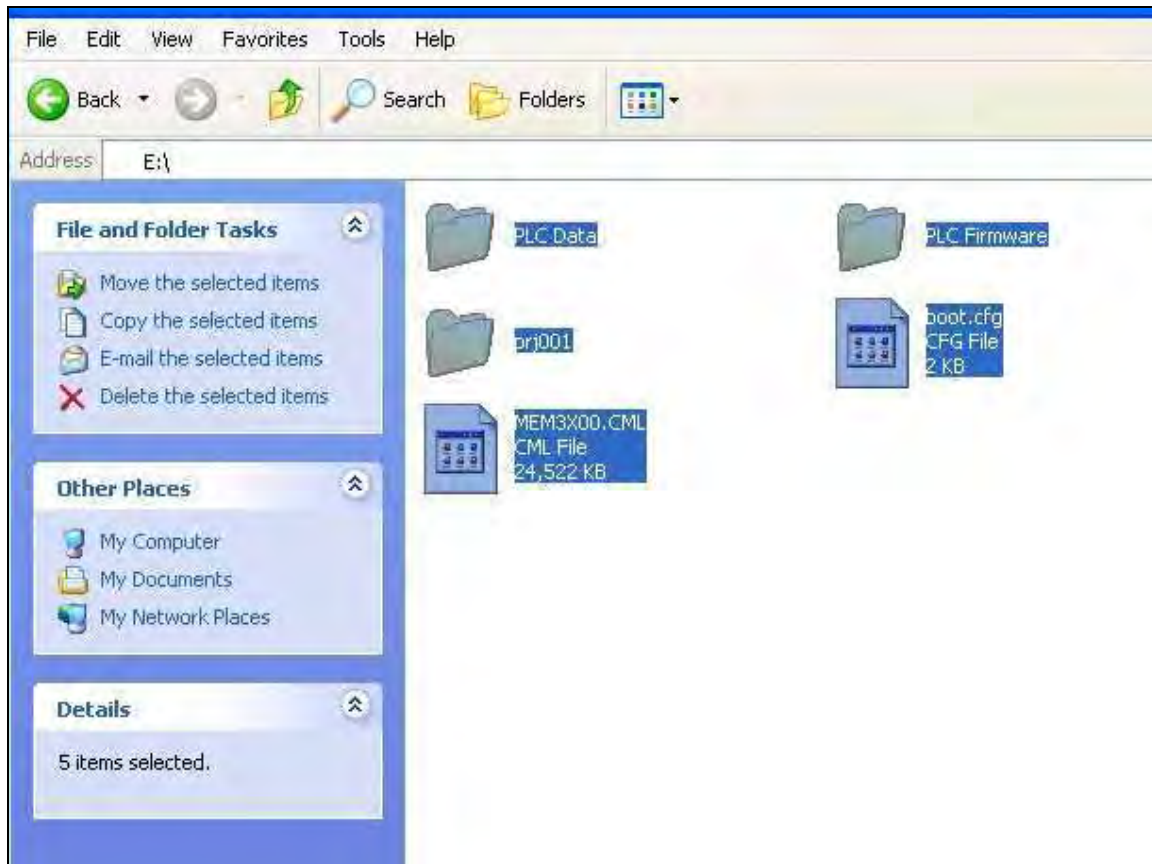
Once the USB stick has been opened, "Right-Click" in the "white, empty folder area and select "Paste"

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 PLC 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.
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”

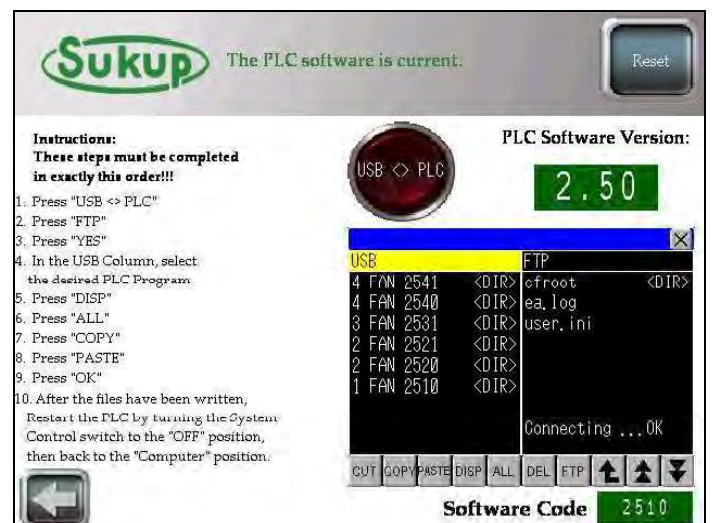
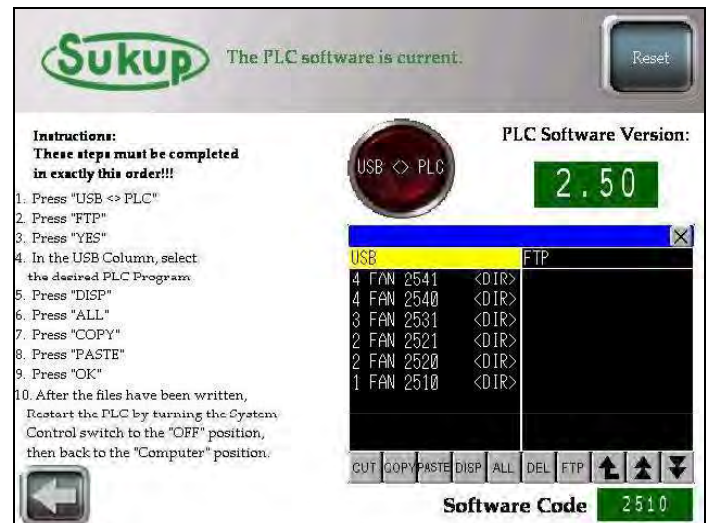
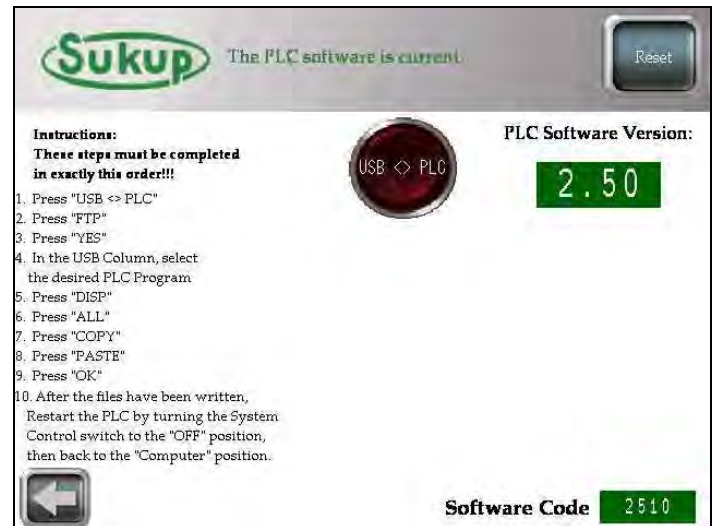
Nicely enough, the directions are right on screen with you, so performing this task should be relatively painless.

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).

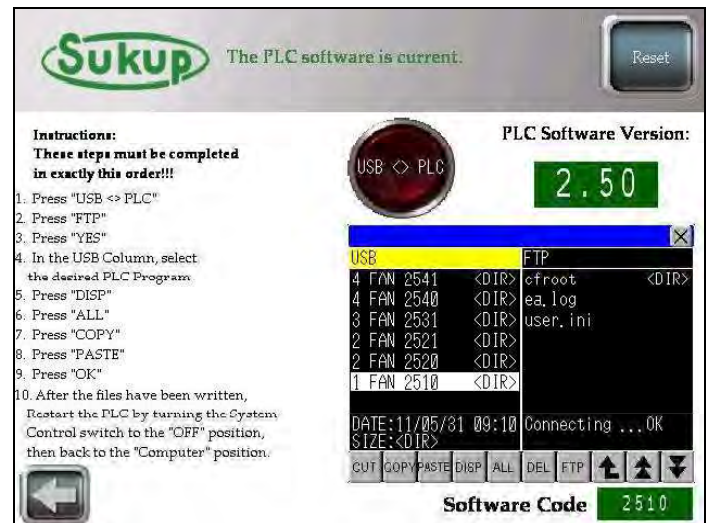
Next, press “FTP”, and a dialog box will pop up. Select “YES”

After selecting “YES”, the FTP column will show the PLC’s contents.

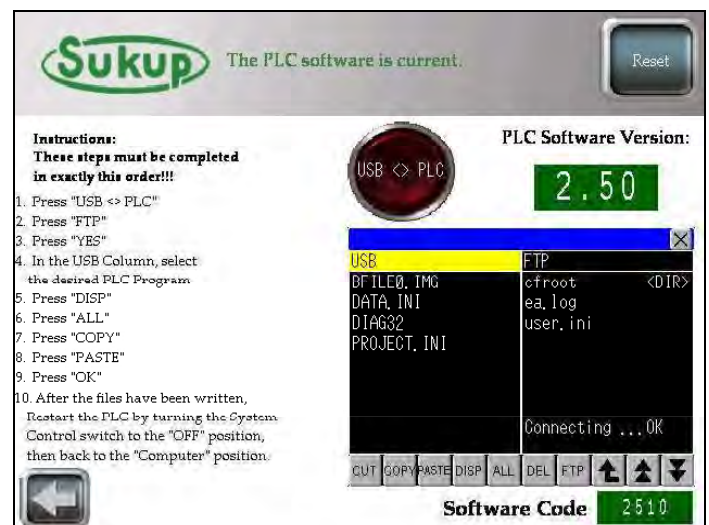
All V2.5 and later software releases will contain all the portable dryer programs. After updating to V2.5, there will also be a software code that appears in the lower-right corner of the screen. The code 2510 means V2.5 software, single-fan program, and no incoming moisture sensor. Similarly, a code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



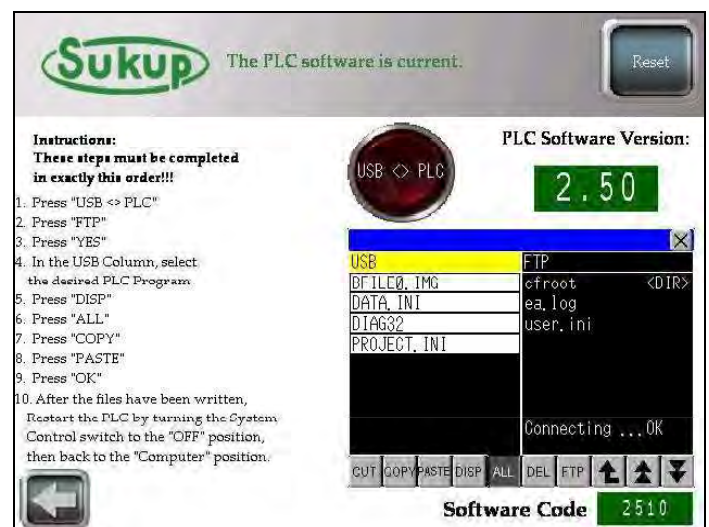
Touch the "DISP" button. The contents of the selected folder will then be displayed in the USB column.



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.

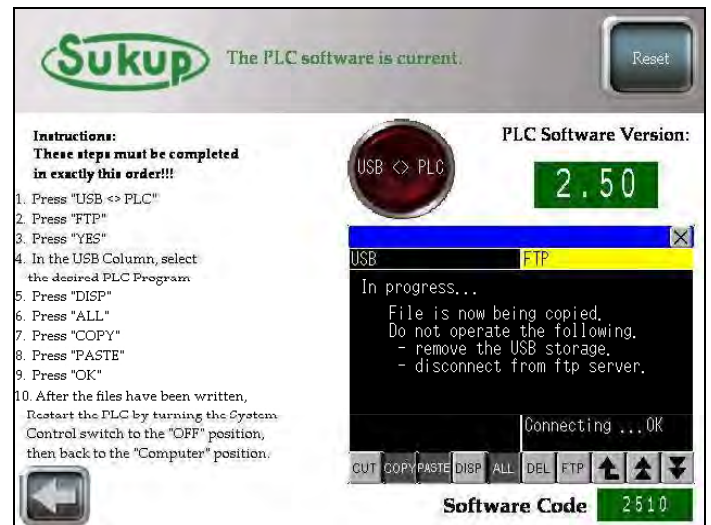
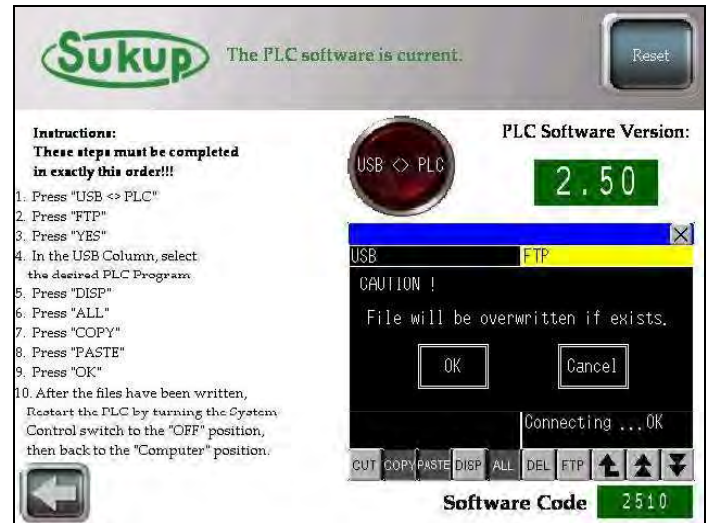
A progress box will open with “In progress” blinking.

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.

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 touch the "Update FW" button. After pressing that button, the PLC will perform a system reset, then a reboot. You'll immediately see a connection error on the touchpanel. This is normal. 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

V2.5 QuadraTouch™ Dryer Control System



“Main Screen”

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

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

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



“Tools” Menu

Pressing the “Tools” button will change screens to this one located to the right. (“Bushel Shutdown” and “Bushel Count” will not appear until after the bushel counter has been calibrated under the “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 nice system tools menu which will be explained in the “System Tools” Section.



Tools → Manual Operation

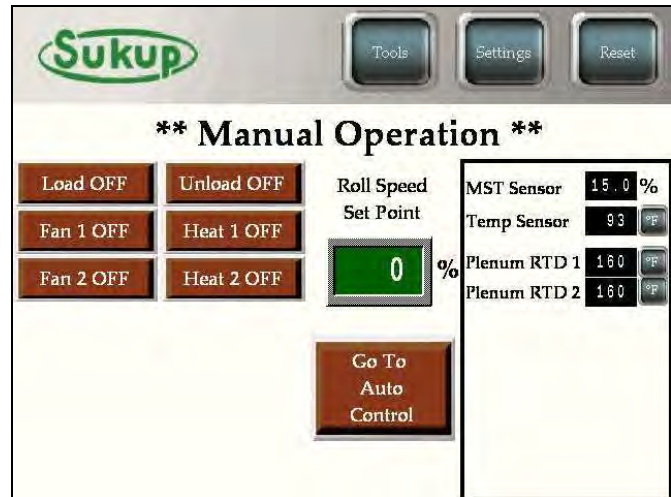
The first option on the “Tools” menu is the “Manual Operation” button. In manual mode, the user is completely in charge of fan/heater operation as well as load and unload operations. The user is also able to specify a desired meter roll speed. The “Heater” function is interlocked with the “Fan” button.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

After about 1 minute and 30 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 (like in the second image).



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.

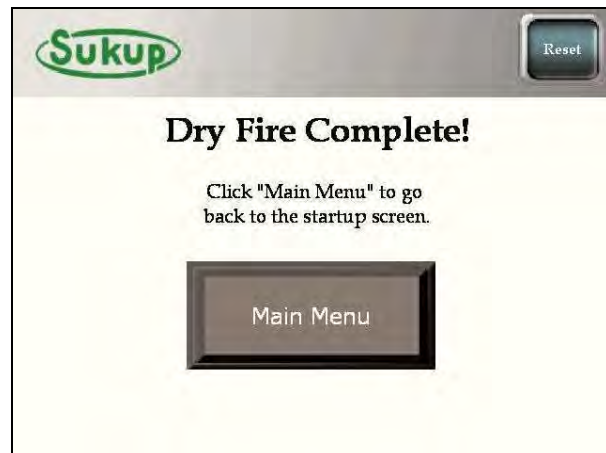
The user will start by selecting “HEAT” or “COOL” operation, and then press the “OK” button that appears.



The screen will display a 10- minute running timer while showing the operation type and plenum temperature(s).



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



Tools → History Log

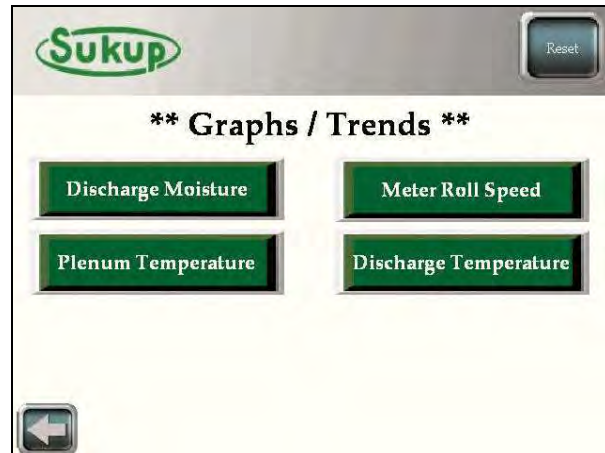
The “History Log” displays events like faults or mode operations. It always shows the latest event on top.

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 the highlighted entry up or down.



Tools → Graphs / Trends

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

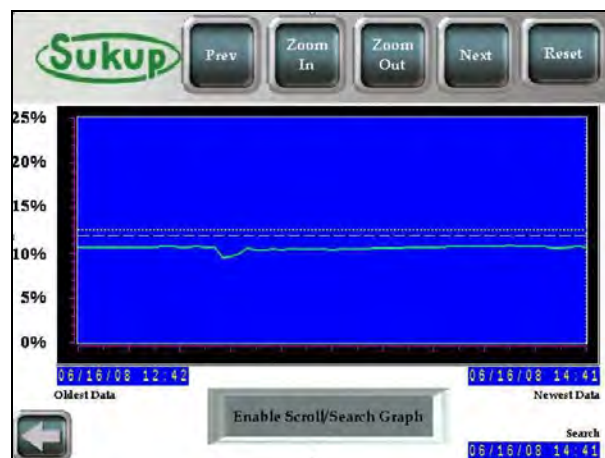


The graph is searchable/scrollable after selecting the “Enable Scroll/Search Graph” button located at the bottom-center of the screen. After pressing that button, crosshairs will appear on the screen, and the buttons located in the header will be functional.

Each graph will display the 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 the 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 the moisture sensor, bushel counter, and input moisture sensor (if applicable).

NOTE: Read the “Red” 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 the 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.

The image displays four sequential screenshots of the Sukup calibration interface, showing the process of calibrating moisture and temperature sensors.

Screenshot 1: Main Calibration Menu
The interface shows the Sukup logo and a "Reset" button. The title is "** Calibrate Sensors **". Two buttons are visible: "Discharge Moisture Sensor" and "Bushel Counter".

Screenshot 2: Discharge Moisture Sensor Calibration
The title is "** Calibrate Sensor **". A red instruction box states: "When calibrating both, calibrate Discharge Temperature FIRST! If you have just calibrated the Discharge Temperature, WAIT 1 FULL MINUTE before calibrating the Discharge Moisture". Two buttons are visible: "Discharge Moisture" and "Discharge Temperature".

Screenshot 3: Discharge Moisture Sensor Calibration (Input)
The title is "** Calibrate Sensor **" with the subtitle "** Discharge Moisture **". A red instruction box states: "Enter in the DESIRED value in the GREEN box. The new user value should be TEMPERATURE COMPENSATED! If your handheld sensor is already temperature compensated, enter that value into the GREEN box." Below this, there are two input fields: "** Non-Calibrated Moisture Value **" (displaying 15.0 %) and "** New User Value **" (displaying 15.0). A "Done" button is at the bottom.

Screenshot 4: Discharge Temperature Calibration
The title is "** Calibrate Sensor **" with the subtitle "** Discharge Temperature **". A red instruction box states: "Enter in the DESIRED value in the green box. The next time this page is loaded, the green box will reflect the offset made now." Below this, there are two input fields: "** Discharge Sensor Value **" (displaying 120 °F) and "** New User Value **" (displaying 120). A "Done" button is at the bottom.

Tools → Calibrate Sensors BUSHEL COUNTER

The bushel counter is configurable in two ways – automatic and manual. Read the instructions in red on 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, the dryer **MUST BE UNLOADING GRAIN**.

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

The 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 the dryer.

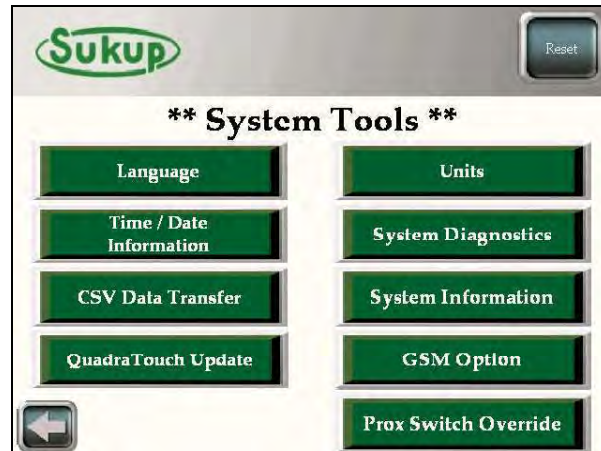
After calibration is completed, the options for “Bushel Shutdown” and “Bushel Counter” will appear in the “Tools” menu.

The interface consists of four sequential screens for the Sukup Bushel Counter Calibration process:

- Screen 1:** Displays the Sukup logo, a "Reset" button, and the title "** Bushel Counter Calibration **". A red instruction box states: "Calibrate the bushel counter two ways: Choose 'User Calibration' to tell the dryer how many bushels/hr it puts out based on a certain unload speed. Choose 'Automatic Calibration' to start a timer during which period the dryer keeps track of its average meter roll speed. After the time is stopped, the system will compute and save the avg bushel/hr. 'Automatic Calibration' mode needs to be done while the dryer is already unloading grain." Below this are two buttons: "Manual Calibration" and "Automatic Calibration".
- Screen 2:** Displays the Sukup logo, a "Reset" button, and the title "** Bushel Counter Calibration **". It features a "Start / Stop the Calibration Timer" section with "Timer Started" and "Stop Timer" buttons. To the right is a "Number of Bushels Discharged" display showing "0". A "Compute" button is at the bottom.
- Screen 3:** Displays the Sukup logo, a "Reset" button, and the title "** Bushel Counter Calibration **". It features a "Start / Stop the Calibration Timer" section with "Start Timer" and "Timer Stopped" buttons. To the right is a "Number of Bushels Discharged" display showing "0". A "Compute" button is at the bottom.
- Screen 4:** Displays the Sukup logo, a "Reset" button, and the title "** Bushel Counter Calibration **". It shows the final result: "Bushels / HR" with a display showing "360". A "Save / Store" button is at the bottom.

Tools → System Tools

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



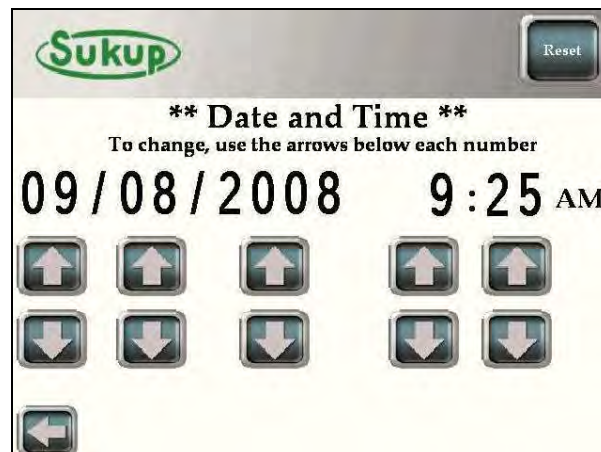
Tools → System Tools → Language

Select a system language.



Tools → System Tools → Time/Date

Change Date and Time using the arrow keys.



Tools - System Tools – CSV Data Transfer

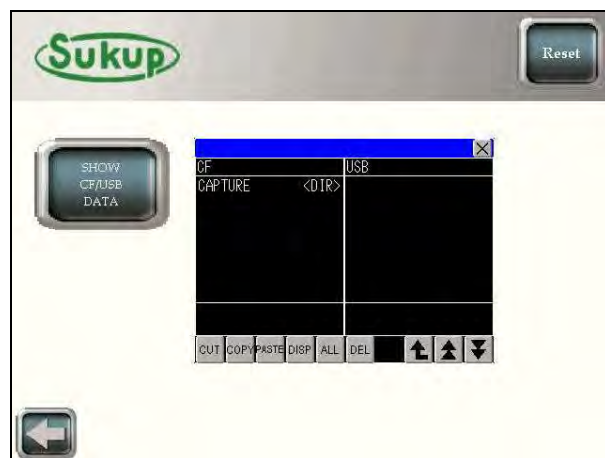
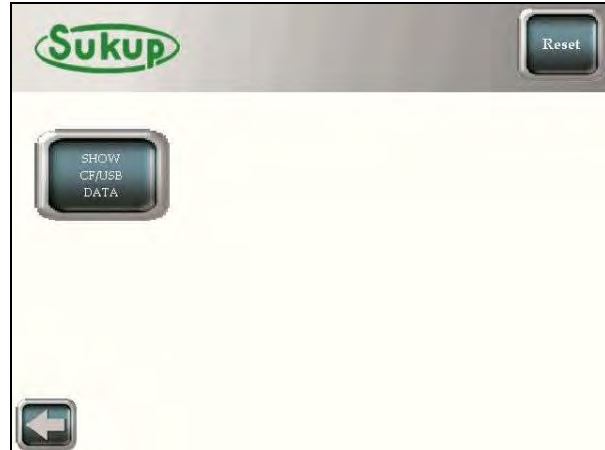
Selecting the “SHOW CF/USB DATA” displays the black directory window. This window shows all the folders and files available on the Compact Flash Card and USB storage devices plugged into the panel.

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.

***It wouldn't be necessary to use this feature if the user already has a CF card reader for their computer. They could just remove the CF card from the back of the touch-panel and insert it into their card reader.

If not, the data must be transferred over to a USB flash drive, using this function.

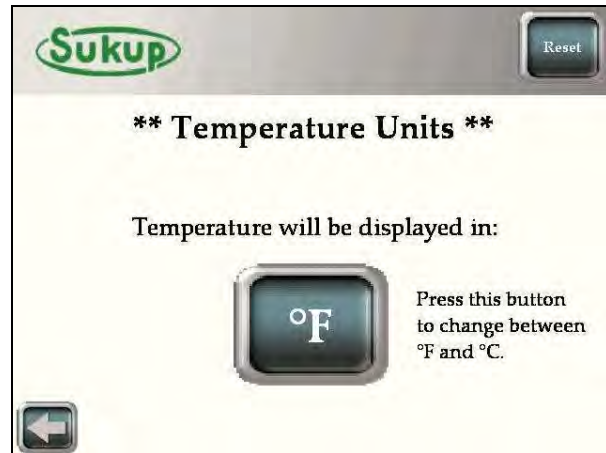


Tools → System Tools → Units

Change between Fahrenheit and Celsius.

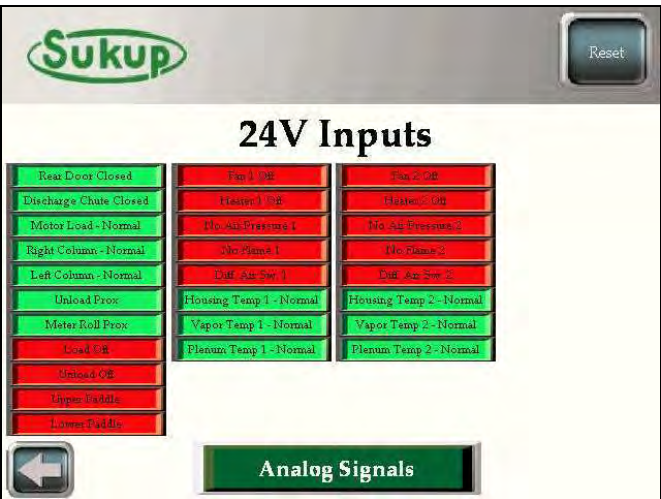
This page allows the user to press the button and the units will change from °F to °C or vice-versa.

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.



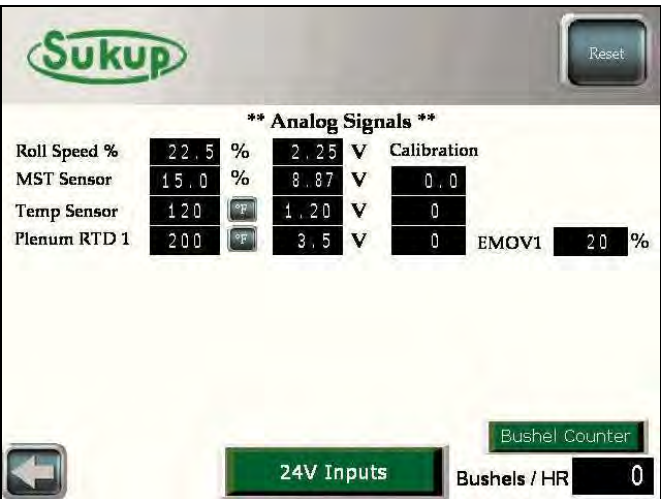
Tools → System Tools → System Diagnostics

The “System Diagnostics” feature is very nice to have. Locate to the right is a picture of 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 the 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 get to this analog signals page.



Tools → System Tools → System Information

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

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The title is '** System Information **'. Below this, the 'PLC Software Version' is displayed as '2.00' in a green box. The 'HMI Software Version' is displayed as 'V2.0 BUILD 6/15/2010'. The 'Fan Setup' section shows '2 Fan' and '2/3 - 1/3' in a grey box. At the bottom, there is a 'Fan Selection' button and a back arrow button.

Tools → System Tools → GSM Option

If equipped with the T24999 GSM kit, the dryer will automatically contact the programmed number on this 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.

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The title is 'GSM Option'. Below the title, a message states: 'The GSM modem will text message this number in the event of a fault condition. Enter the 10 digit mobile number below.' There are three green input boxes containing '000', '000', and '0000' separated by hyphens. At the bottom, there is an 'International Dialing' button and a back arrow button.

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The title is 'GSM Option'. Below the title, there are three fields: 'Country Code' with a '+' sign and a green box containing '1'; 'Total Number of Phone Digits NOT including Country Code' with a green box containing '10'; and 'Phone Number' with a row of ten green boxes, each containing a '0'. Below these fields, there is a 'Preview' section with a '+' sign and a green box containing '1' followed by nine green boxes, each containing a '0'. At the bottom, there is a 'North America Dialing' button and a back arrow button.

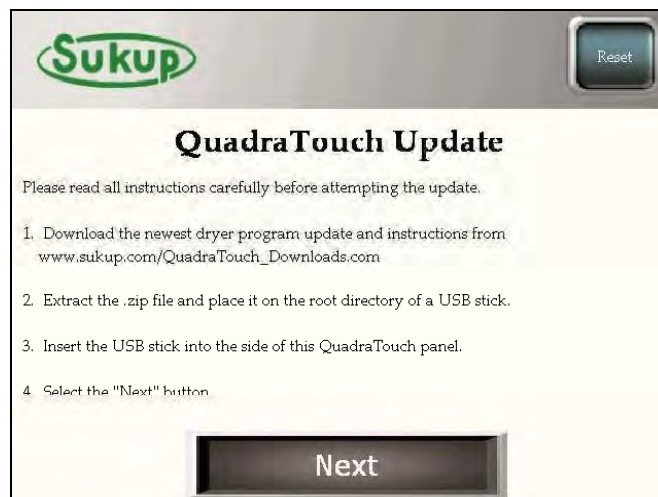
Tools → System Tools → Prox Switch Override

Sometimes it may become necessary to ignore the system's 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.



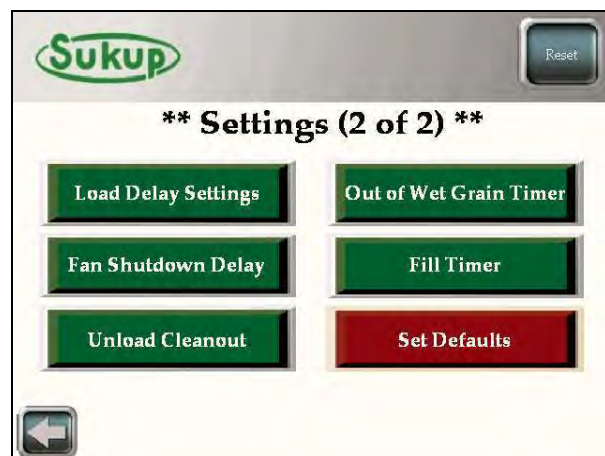
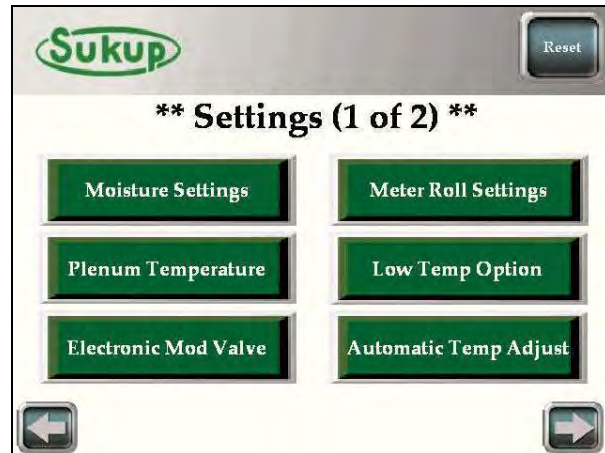
“Settings” Menu

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

The “Settings” menu is broken up into two 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.

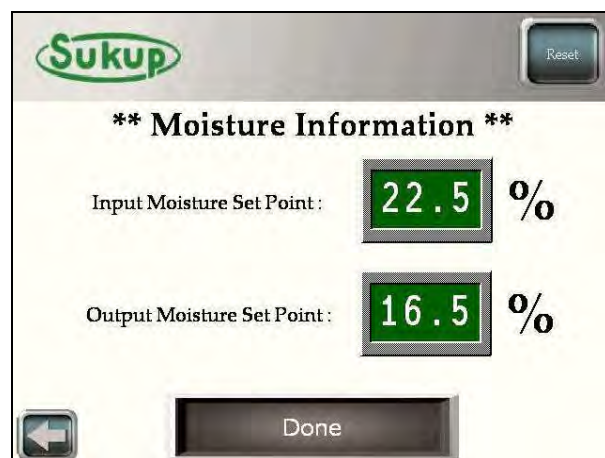
**As before, the burgundy and light, neon-green buttons have press and hold features.

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



Settings (1 of 2)→ Moisture Settings

Specify the input and desired output set points.



Settings (1 of 2)→ Meter Roll Settings

A 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 setpoint.

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 help 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.

The image displays four sequential screenshots of the Sukup control interface, each showing a different settings screen. The interface has a consistent header with the 'Sukup' logo and three buttons: 'Tools', 'Settings', and 'Reset'. A back arrow is present in the bottom left of each screen.

- Screen 1: ** Meter Roll Settings ****
This screen contains three large green buttons: 'Multiplier', 'Min / Max Limits', and 'Deadband Settings'.
- Screen 2: ** Meter Roll Gain ****
This screen prompts the user to 'Select the desired Meter Roll Gain (1=Slowest, 10= Fastest)'. A large green button displays the value '2'.
- Screen 3: ** Roll Speed Limits ****
This screen allows setting 'Set Minimum Roll Speed' and 'Set Maximum Roll Speed'. The minimum is set to '10 %' and the maximum to '50 %'. A 'Done' button is at the bottom.
- Screen 4: ** Deadband Settings ****
This screen provides an example: 'Example: The output MST setpoint=16%, Pts above=1, Pts below=5. Thus zone of meter roll speed is 16.1% to 15.5%. When the discharge grain is between these two numbers, the speed of the meter rolls remains unchanged.' It then has two fields: 'Amount of points above the setpoint before a change is made to meter roll speed. (Tenths)' and 'Amount of points below the setpoint before a change is made to meter roll speed. (Tenths)'. Both fields have green buttons displaying the value '2'.

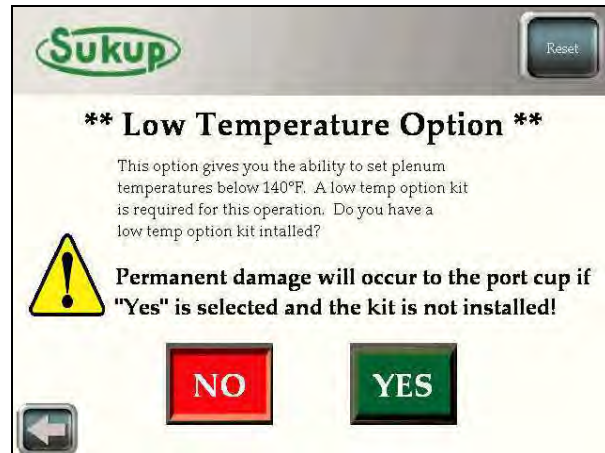
Settings (1 of 2) → Plenum Temperature

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.



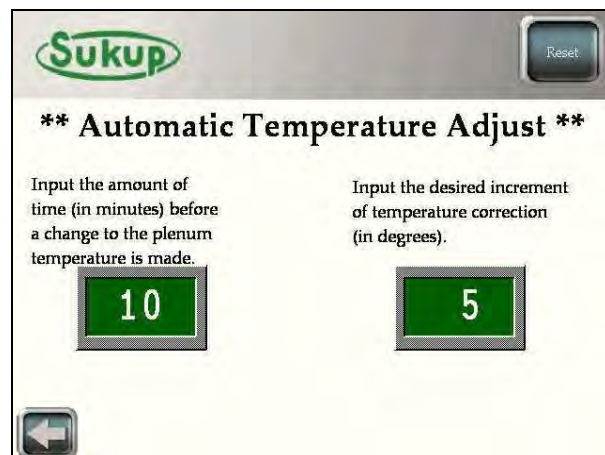
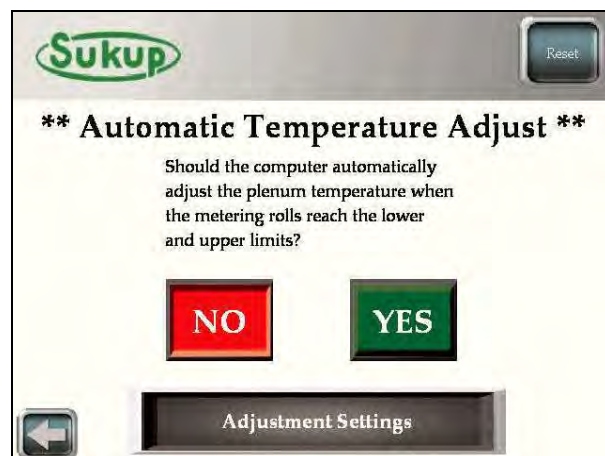
Settings (1 of 2)→ Automatic Temp Adjust

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 setpoint 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

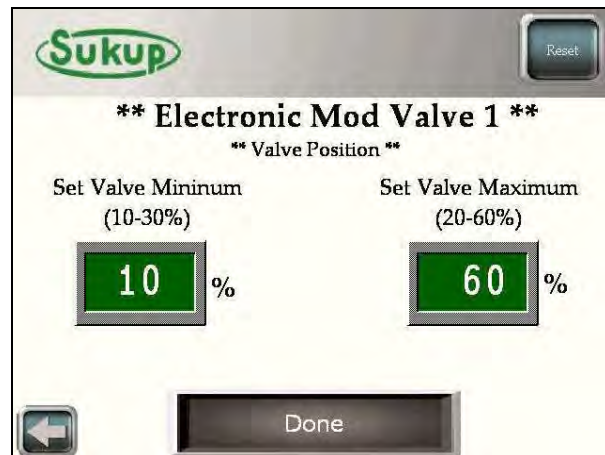
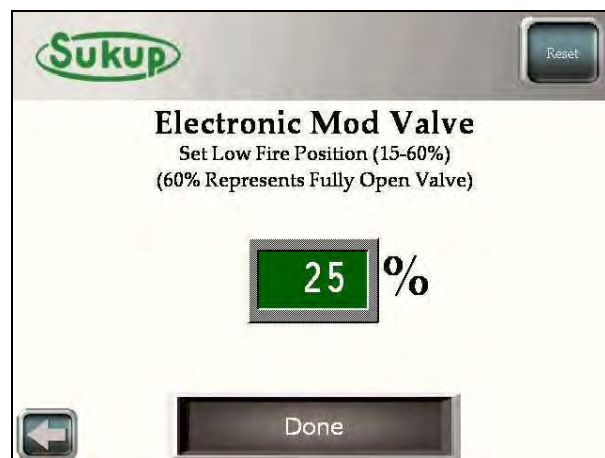
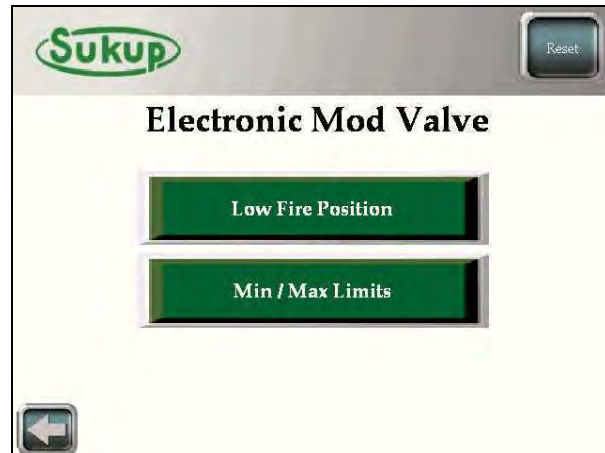
This menu gives the user the option to specify a low fire position (the position the valve is opened to for ignition) as well as setting the minimum and maximum valve opening position.

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 Company finds that at 25% opening, the pressure gauge should read 5lbs. 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%.

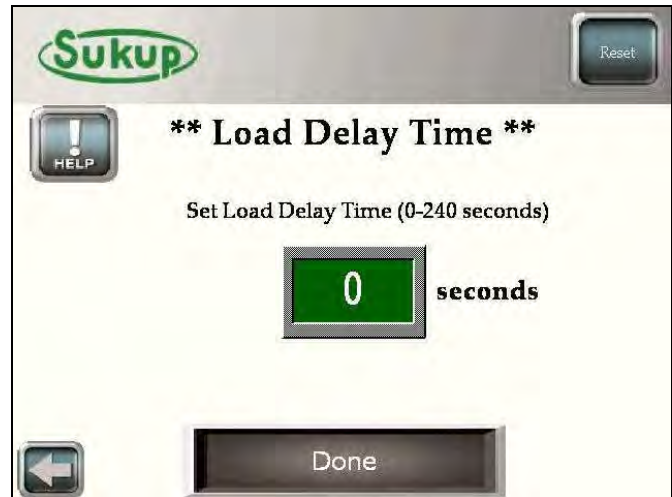
***Special NOTE:

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.



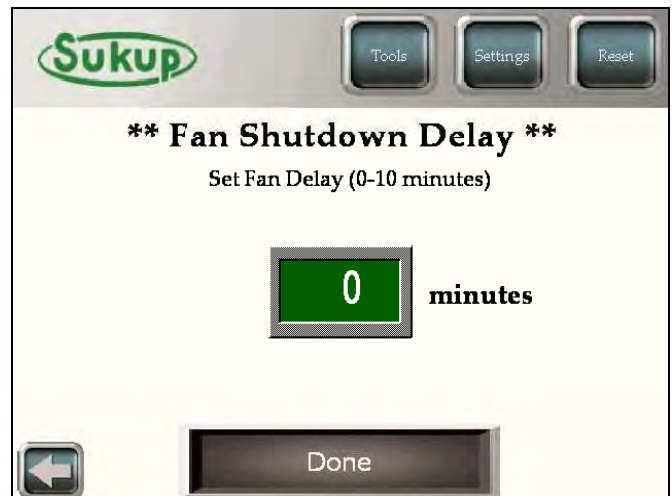
Settings (2 of 2)→ Delay Settings

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



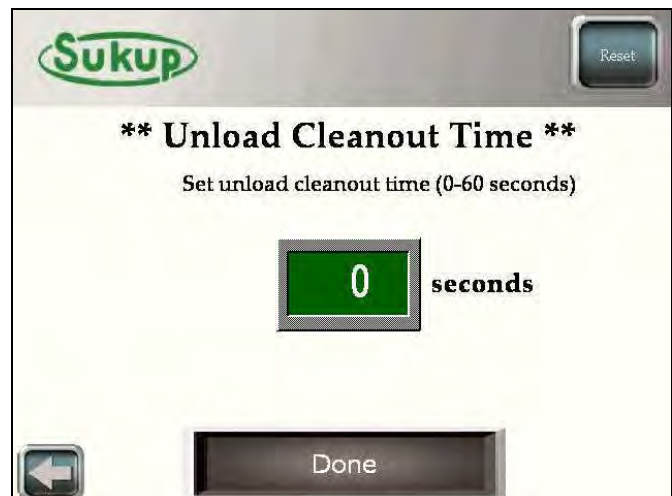
The Fan Delay timer allows the fan to run for up to 10 minutes after the dryer is shut down.

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 Timer allows the unload auger to run for up to 60 seconds after the dryer has been shut down.

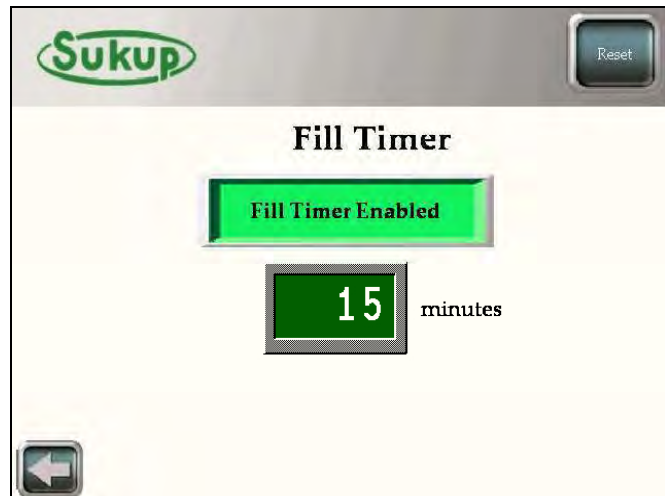
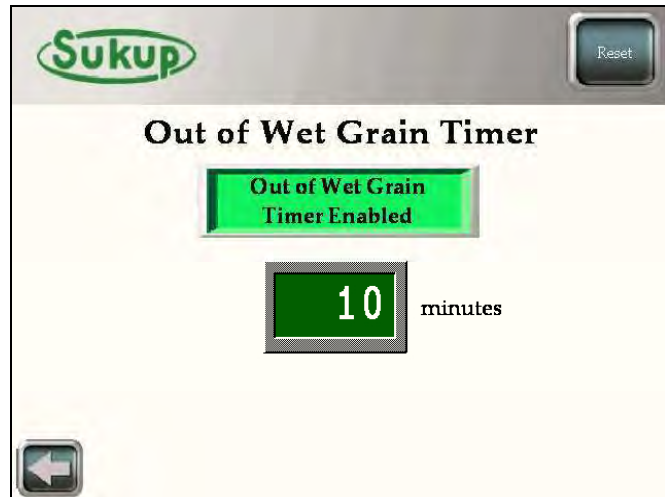
Just like the Fan Delay, the unload auger will not run during an unloading related fault.



Settings (2 of 2)→ Delay Settings

The Out-of-Wet Grain timer is user settable from 2-15 minutes. Its default value is 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 5-30 minutes. Its default value is 15 minutes. During the unloading process, the dryer has between 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 4 automatic modes in which the dryer can operate. Each operation sequence will be shown below.



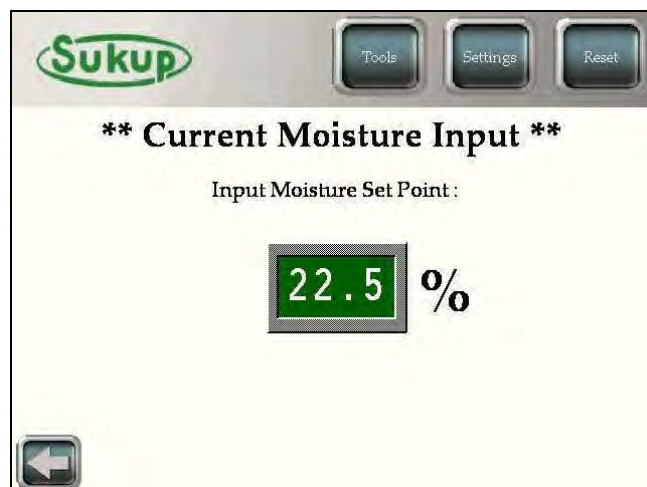
Continuous Flow Mode

→ Initial Dry

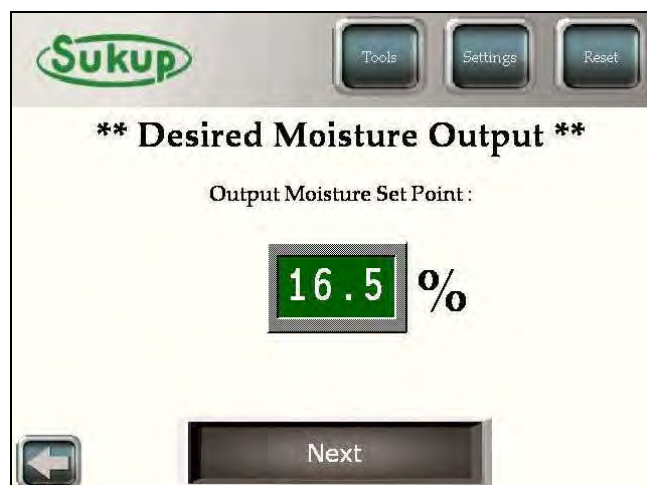
After selecting “Continuous Flow” from the “Select Operation” menu, choose the “Initial Dry” option.



The next screen to appear is the “Current Moisture Input” screen. Using the pop-up key pad, 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:

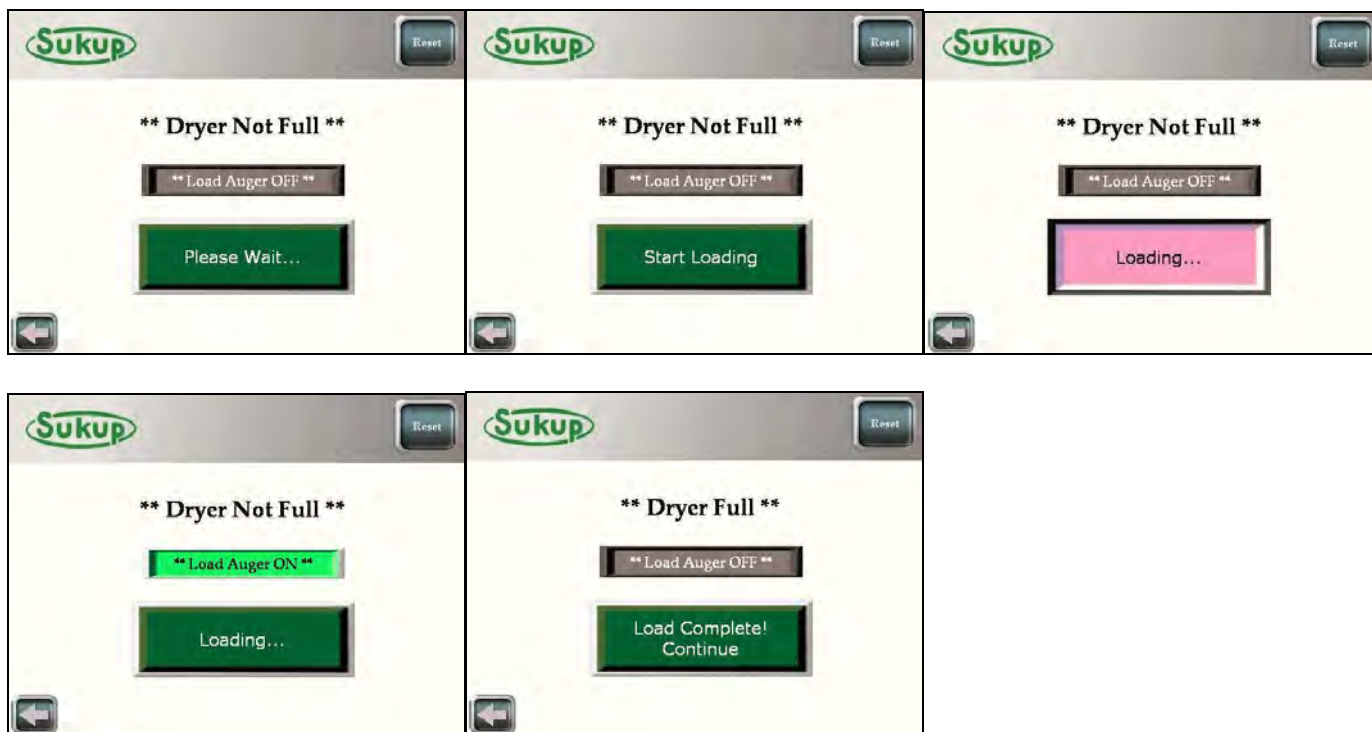
This system uses a Variable Frequency Drive to control the speed of the metering rolls. Set points are exact, and there is no need to calibrate this device.



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.

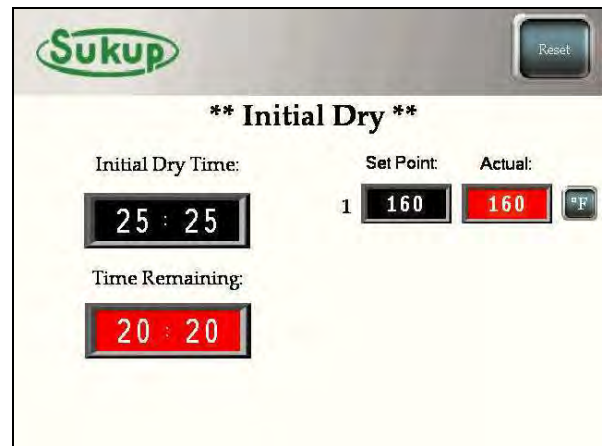


INITIAL DRY

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

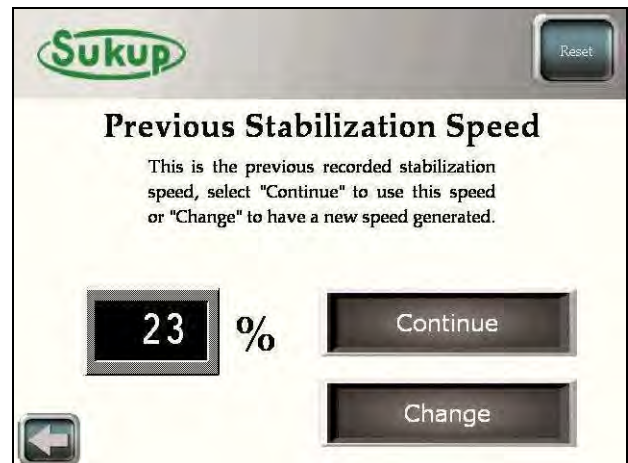
Example: Input MST =22%, Desired MST = 16% → 6 pt removal. 6 min/pt at 6 pts @160°F = 36 min.



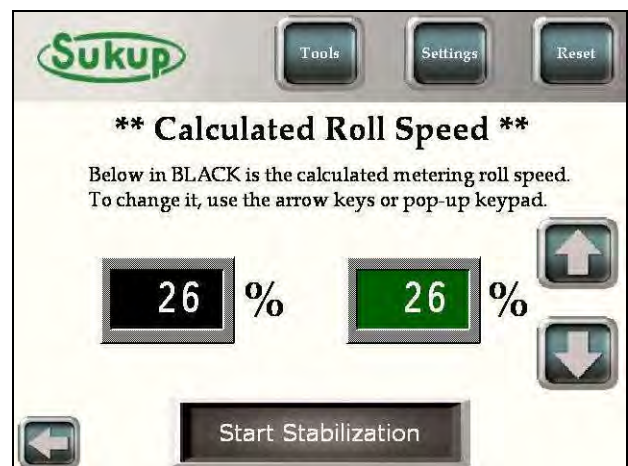
After the “Initial Dry” timer has expired, the operator will have the opportunity to specify a stabilization temperature and the computer will determine and unload rate based upon that temperature.



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 the grain.

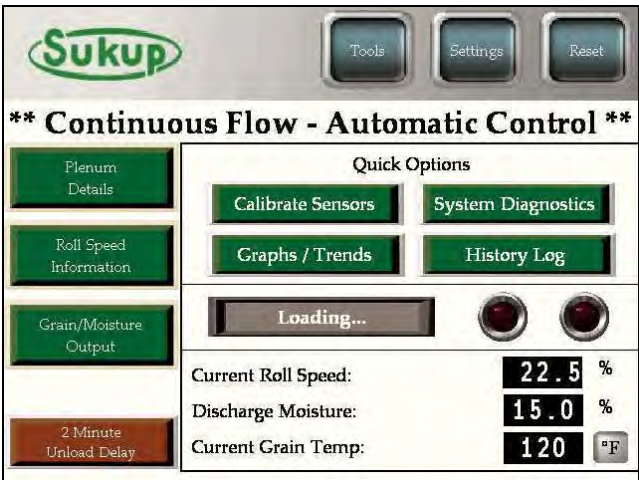
Ten seconds after the "Stabilization" mode has started, the unload process will begin.



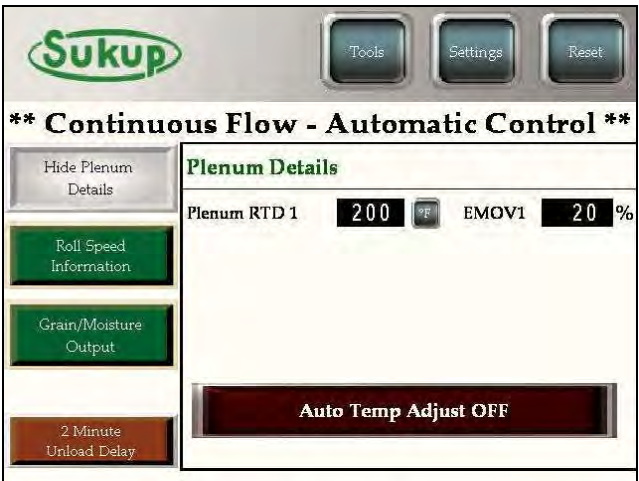
Continuous Flow

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.

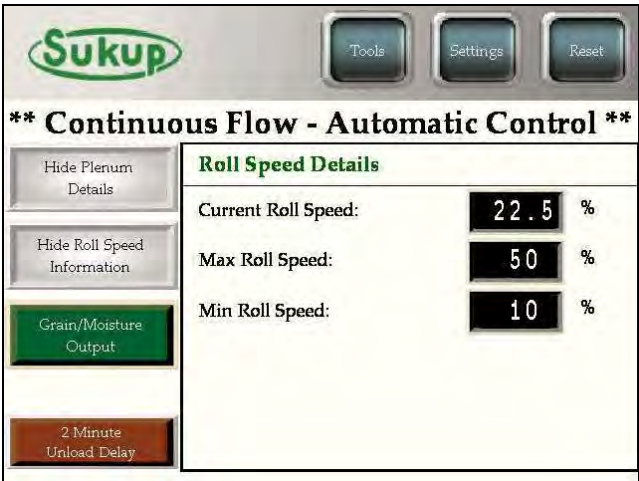
The paddle switches are also visually represented by the two lamps next to the Load Auger status.



Pop-up menu for “Plenum Details”



Pop-up menu for “Roll Speed Information”



Pop-up menu for “Grain/Moisture Output”

The screenshot shows the Sukup Continuous Flow - Automatic Control interface. At the top, there is a header with the Sukup logo and three buttons: Tools, Settings, and Reset. Below the header, the title "** Continuous Flow - Automatic Control **" is displayed. On the left side, there is a vertical menu with four options: "Hide Plenum Details", "Hide Roll Speed Information", "Hide Grain Output", and "2 Minute Unload Delay". The "Hide Grain Output" option is currently selected, and the main display area shows the "Grain Output Details" section. This section contains four rows of data: "Input Moisture Setpoint: 22.5 %", "Output Moisture Setpoint: 16.5 %", "Discharge Moisture: 15.0 %", and "Current Grain Temp: 120 °F".

Grain Output Details	
Input Moisture Setpoint:	22.5 %
Output Moisture Setpoint:	16.5 %
Discharge Moisture:	15.0 %
Current Grain Temp:	120 °F

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 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 2 minutes.

The screenshot shows the Sukup Continuous Flow - Automatic Control interface. At the top, there is a header with the Sukup logo and three buttons: Tools, Settings, and Reset. Below the header, the title "** Continuous Flow - Automatic Control **" is displayed. On the left side, there is a vertical menu with four options: "Plenum Details", "Roll Speed Information", "Grain/Moisture Output", and "Resume Unload". The "Grain/Moisture Output" option is currently selected, and the main display area shows the "Quick Options" section. This section contains four buttons: "Calibrate Sensors", "System Diagnostics", "Graphs / Trends", and "History Log". Below these buttons, there is a "Lower Paddle ON" button with a green indicator light. At the bottom, there are three rows of data: "Current Roll Speed: 20.0 %", "Discharge Moisture: 15.0 %", and "Current Grain Temp: 120 °F".

Quick Options	
Calibrate Sensors	System Diagnostics
Graphs / Trends	History Log
Lower Paddle ON	
Current Roll Speed:	20.0 %
Discharge Moisture:	15.0 %
Current Grain Temp:	120 °F

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

The screenshot shows the Sukup Tools menu. At the top, there is a header with the Sukup logo and a "Reset" button. Below the header, the title "** Tools **" is displayed. The main display area contains four buttons arranged in a 2x2 grid: "Calibrate Sensors", "System Tools", "Graphs / Trends", and "History Log". At the bottom left, there is a back arrow button.

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 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”

“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.

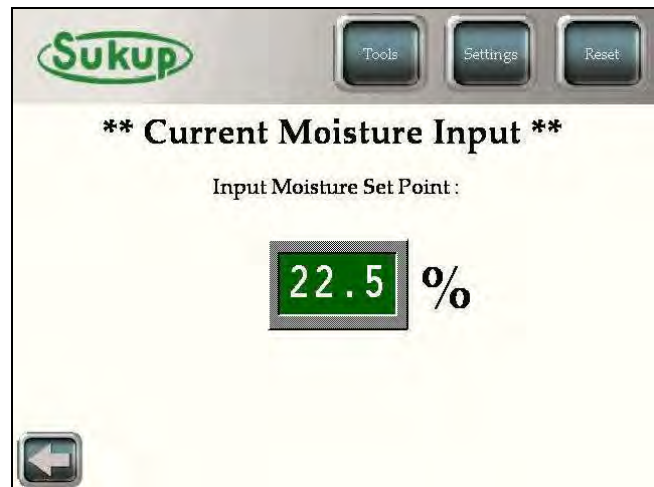


“Autobatch” Mode

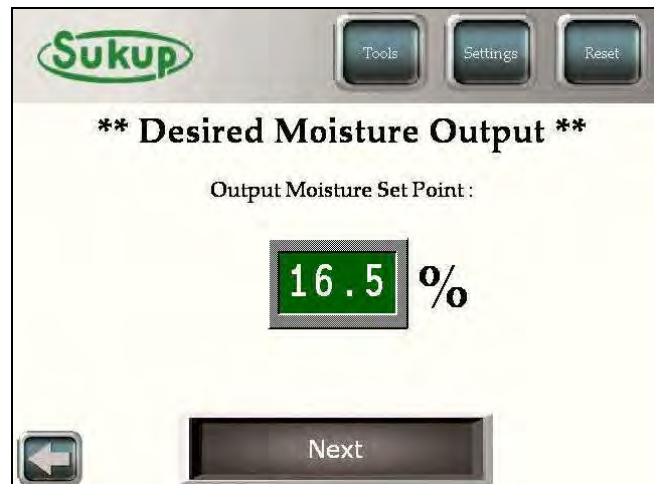
In the event of extreme high moisture grain, it may be necessary to run the dryer in “Autobatch” mode. This mode allows the user to dry grain in batches with the option of computer-controlled adjustments.

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.



The screenshot shows the 'Sukup' logo at the top left. To the right are three buttons: 'Tools', 'Settings', and 'Reset'. The main title is '** Current Moisture Input **'. Below it is the label 'Input Moisture Set Point :'. A large green digital display shows '22.5' followed by a '%' symbol. At the bottom left is a square button with a left-pointing arrow.



The screenshot shows the 'Sukup' logo at the top left. To the right are three buttons: 'Tools', 'Settings', and 'Reset'. The main title is '** Desired Moisture Output **'. Below it is the label 'Output Moisture Set Point :'. A large green digital display shows '16.5' followed by a '%' symbol. At the bottom left is a square button with a left-pointing arrow. At the bottom right is a rectangular button labeled 'Next'.



The screenshot shows the 'Sukup' logo at the top left. To the right are three buttons: 'Tools', 'Settings', and 'Reset'. The main title is '** Maximum Roll Speed **'. Below it is the label 'Maximum Roll Speed Set Point:'. A large green digital display shows '50' followed by a '%' symbol. At the bottom left is a square button with a left-pointing arrow.

After the user has selected the 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.

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The main title is '** Autobatch Computer Control **'. Below it, the text asks: 'Should the computer automatically recalculate drytime based on previous batch average moisture?'. There are two large buttons: a red 'NO' button and a green 'YES' button. At the bottom left is a back arrow button, and at the bottom right is a 'Next' button.

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

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The main title is '** Grain Discharge **'. Below it, the text says: 'Select Grain Discharge Method'. There is a single green button labeled 'Time Based Control'. Below this button, the text reads: 'No Column Sensor Installed'. At the bottom left is a back arrow button.

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 place in the BLACK box. It is automatically loaded into the GREEN box, which is user selectable.

The screenshot shows the 'Sukup' logo at the top left and a 'Reset' button at the top right. The main title is '** Batch Dry Time **'. Below it, the text says: 'Below in BLACK is the recommended dry time. To change it, use the arrows or pop-up keypad.' There are two boxes, each labeled 'minutes': a black box containing the number '54' and a green box containing the number '54'. To the right of the green box are two arrow buttons (up and down). At the bottom left is a back arrow button, and at the bottom right is a 'Next' button.

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 the time remaining in each highlighted section, and the “Batch Details” section shows the batch information.

During the “Unload Cycle” the “Batch Details” section changes to show discharge moisture and grain temperature. The discharge moisture is an average of the entire batch.

After the “Unload Cycle” is finished, the “Load Cycle” will complete, and the batch number will be incremented.

“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 the 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.

Pressing “Yes” or “No” will take you to the loading page, after pressing the “Load Complete! Continue” button, this screen will appear.

Press the “Start Unloading” flashing button to start the unloading process.

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

The image displays four sequential screenshots of the Sukup Grain Transfer control interface, each with a 'Sukup' logo and a 'Reset' button in the top right corner.

Screen 1: Maximum Roll Speed
Title: **** Maximum Roll Speed ****
Text: Maximum Roll Speed Set Point:
Value: **50 %**
A back arrow button is located at the bottom left.

Screen 2: Grain Transfer
Title: **** Grain Transfer ****
Text: Would you like to use a 30 min out of wet grain timeout?
Buttons: **Yes** and **No**
A back arrow button is located at the bottom left.

Screen 3: Grain Transfer
Title: **** Grain Transfer ****
Text: Loading Complete! Press "Start Unloading" to start the unload auger.
Button: **Start Unloading**

Screen 4: Grain Transfer
Title: **** Grain Transfer ****
Data:
Discharge Moisture: **16.5 %**
Current Grain Temp: **90 °F**
Max Roll Speed: **50 %**
Warning:  Pressing "Reset" will stop the transfer, turn off all augers, and return to the start screen.

“Final Dry” Mode

After selecting “Final Dry” from the “Start” menu, the user will specify the current moisture of the remaining grain in the dryer. This mode allows the remaining grain to dried and unloaded without the 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 the 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 user the manual operation feature to unload any grain still remaining in the dryer.

The image displays four sequential screenshots of the Sukup Final Dry mode interface, showing the progression from moisture input to completion.

Screenshot 1: ** Current Moisture Input **
Input Moisture Set Point :
22.5 %

Screenshot 2: ** Final Dry Time **
Below in BLACK is the recommended Final Dry time.
To change it, use the arrow keys or pop-up keypad.
18 minutes 18 minutes
Start Final Dry

Screenshot 3: ** Final Dry **
Dry Time Remaining:
17 : 52
Unload Time Remaining:
18 : 00
Plenum Details Roll Speed Information Grain/Moisture Output

Screenshot 4: Final Dry Complete!
If grain is still inside the dryer, use the manual unload feature to unload it.
Main Menu

Fault Screens and Error Messages

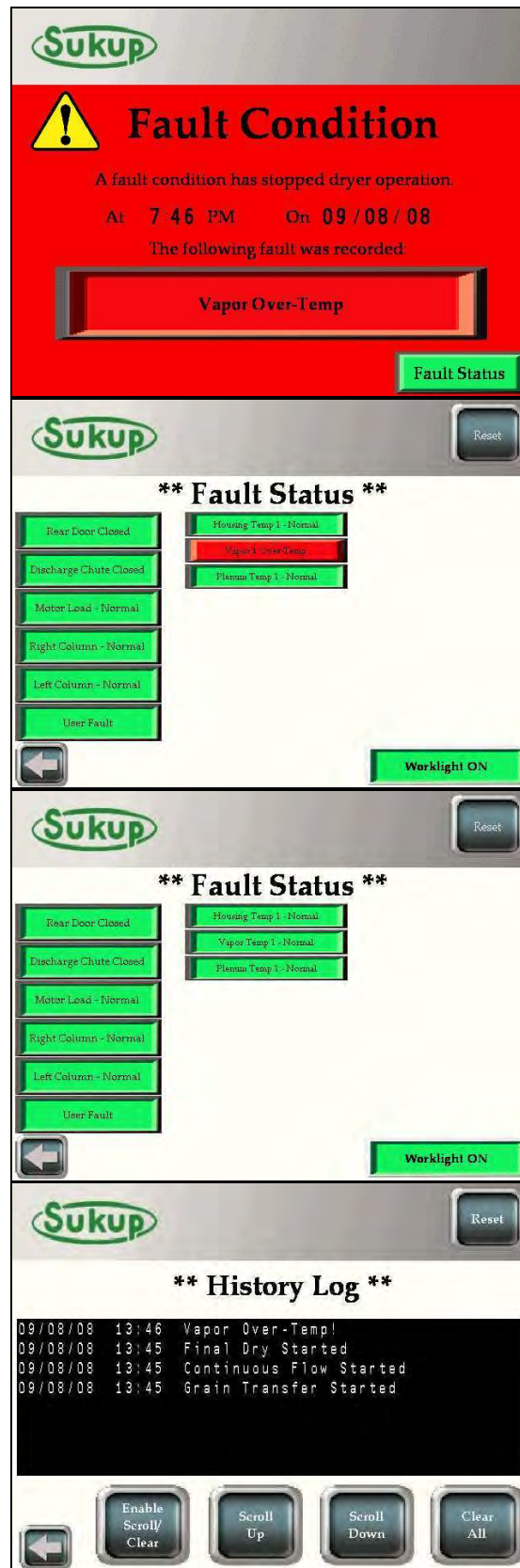
There are many safety switches and relays that are constantly being monitored on the dryer. Sukup Manufacturing Company uses these fault devices to ensure the safety of the product and our customers.

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 all dryer function down.

The set of images to the right shows an example of the Vapor Over-Temp safely circuit. When the fault occurs, the dryer 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 the worklight on 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, these messages located to the right will appear.

****These 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 come up. 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 is NOT a FAULT. The dryer will not shut down unless the Reset key is pressed.

Pressing the “Resume Previous Screen” button will allow the 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.

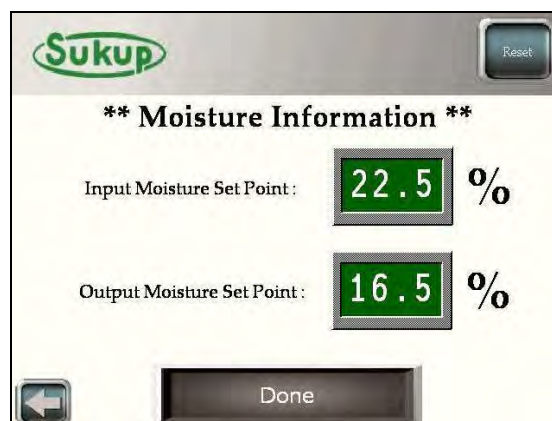
Also available on each screen is a **RESET** key located in the top right-hand corner. If the **RESET** key is pressed at any time, the dryer will shut down all fans, heaters, and augers and return to the main screen. The **RESET** key is never used for program navigation.

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 first image).

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 picture to the right). If the user wishes to turn them on, press and hold the burgundy button until it becomes neon-green in color.

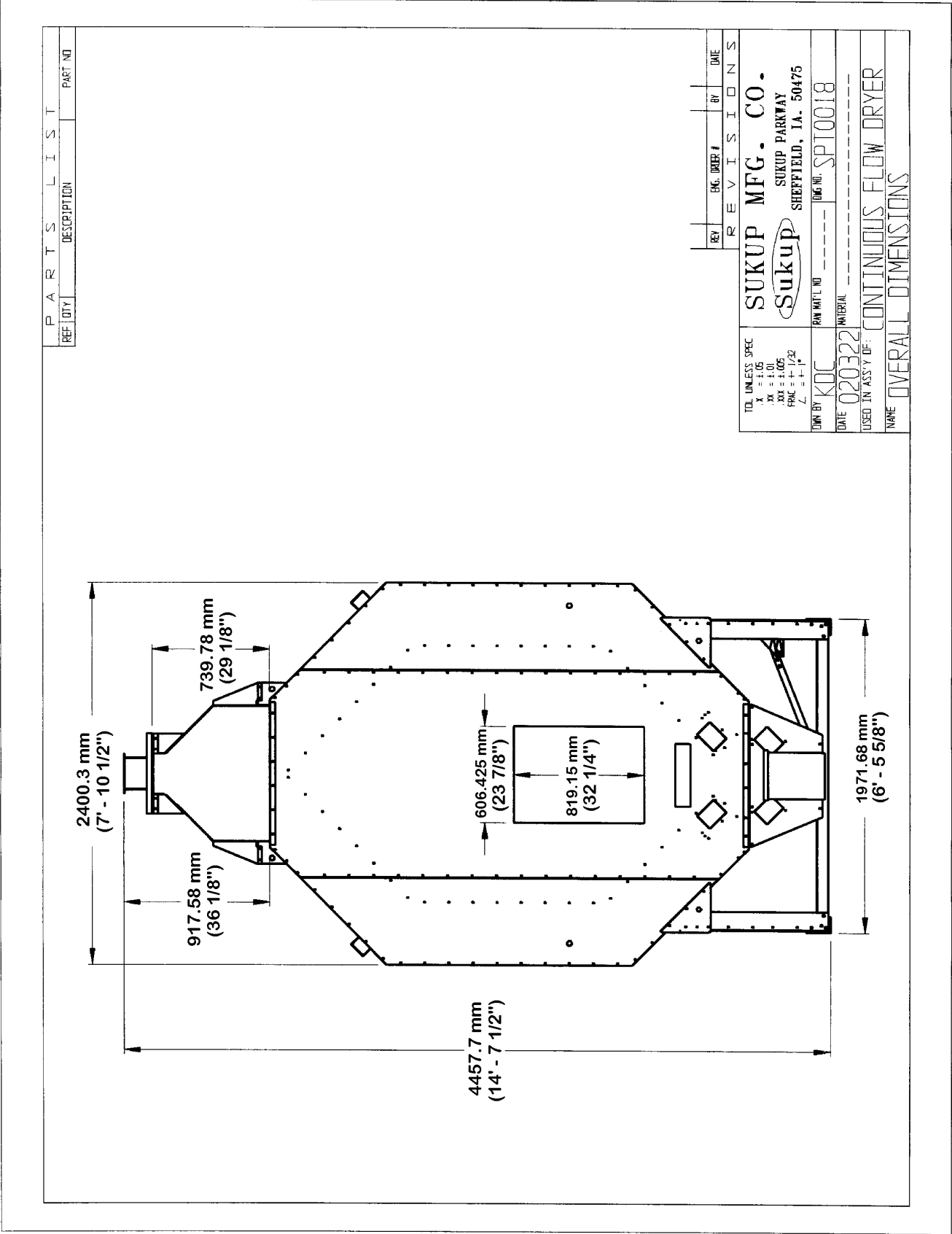


SUKUP DRYER CATALOG TECHNICAL DATA (CE)

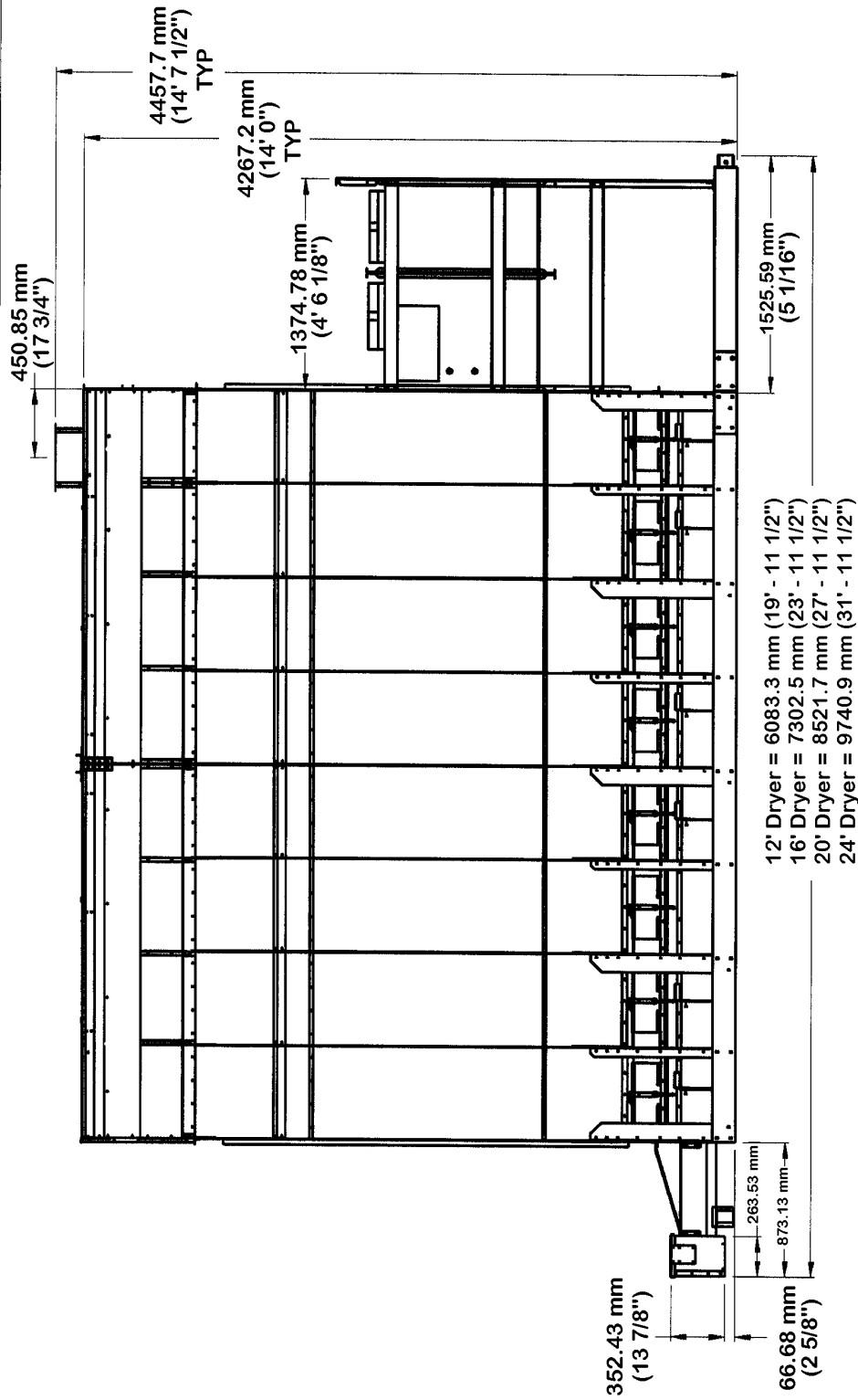
TABLE OF CONTENTS

Dimensional Drawings	2
Dryer Specifications	4
Pre-Installation Requirements	6
Electrical Load Requirements	7
Auxiliary Load and Unload Kit Options	8
Fuel Information	9
Fuel System Recommendations	9
Dryer Installation Information	11
Installation of Customer Sign	12
General Dryer Operation	13
Heater Wiring	15
Appendix A: Estimated Tonnes Per Hour Information Per Module	16

Dimensional Drawings



P A R T S L I S T		
REF	QTY	DESCRIPTION



TOL. UNLESS SPEC $X = \pm .05$ $XX = \pm .015$ $XXX = \pm .010$ $RFC = \pm .002$ $Z = \pm .1$	SUKUP MFG. CO.  SUKUP PARKWAY STEEPLAND, IA. 50475	
	Q20322 USED IN ASSY OF:	DATE 020322 TIME 020322 USED IN ASSY OF:
NAME OVERALL DIMENSIONS	CONTINUOUS FLOW DRYER	SPT0017

REV	ENG. ORDER #	BY	DATE



SUKUP CE GRAIN DRYER SPECIFICATIONS

SINGLE FAN MODELS - FOR CORN ONLY

PART #	HP	FAN DIAMETER	FUEL	VOLT	PH	PLENUM	10 PT FULL HEAT-MT/HR (BU/HR)	5 PT FULL HEAT-MT/HR (BU/HR)	HOLD CAPACITY METRIC TON	BTU/HR	LOAD HP	UNLOAD HP	MAX. AMPS
TE1211D	10-15	38"	LP	380	3	Single	8.8 (345)	14.2 (560)	8.5	5 mill	3	3	41
TE1212D	10-15	38"	NG	380	3	Single	8.8 (345)	14.2 (560)	8.5	5 mill	3	3	41
TE1611D	10-15	44"	LP	380	3	Single	11.2 (440)	18.0 (710)	11	6 mill	3	3	41
TE1612D	10-15	44"	NG	380	3	Single	11.2 (440)	18.0 (710)	11	6 mill	3	3	41
TE2011D	30	44"	LP	380	3	Single	14.2 (560)	23.0 (905)	14	7 mill	5	5	60.6
TE2012D	30	44"	NG	380	3	Single	14.2 (560)	23.0 (905)	14	7 mill	5	5	70

TWO FAN MODELS - FOR CORN ONLY

PART #	HP	FAN DIAMETER	FUEL	VOLT	PH	PLENUM	10 PT FULL HEAT-MT/HR (BU/HR)	5 PT FULL HEAT-MT/HR (BU/HR)	10 PT COOL-MT/HR (BU/HR)	5 PT COOL-MT/HR (BU/HR)	HOLD CAPACITY METRIC TON	BTU/HR	LOAD HP	UNLOAD HP	MAX. AMPS
TE1631D	(1) 15hp-38", (1) 15hp-28"		LP	380	3	2/3, 1/3	12.7 (500)	20.8 (820)	7.9 (310)	12.4 (490)	11	5 / 3 mill	3	3	68
TE1632D	(1) 15hp-38", (1) 15hp-28"		NG	380	3	2/3, 1/3	12.7 (500)	20.8 (820)	7.9 (310)	12.4 (490)	11	5 / 3 mill	3	3	68
TE2031D	(1) 15hp-44", (1) 15hp-28"		LP	380	3	2/3, 1/3	15.2 (600)	24.6 (970)	9.0 (355)	14.7 (580)	14	6 / 3 mill	5	5	68
TE2032D	(1) 15hp-44", (1) 15hp-28"		NG	380	3	2/3, 1/3	15.2 (600)	24.6 (970)	9.0 (355)	14.7 (580)	14	6 / 3 mill	5	5	68
TE2431D	(1) 30hp-38", (1) 15hp-28"		LP	380	3	2/3, 1/3	18.0 (710)	26.0 (1025)	11.0 (435)	19.5 (690)	16.8	7 / 3 mill	5	5	84
TE2432D	(1) 30hp-38", (1) 15hp-28"		NG	380	3	2/3, 1/3	18.0 (710)	26.0 (1025)	11.0 (435)	19.5 (690)	16.8	7 / 3 mill	5	5	97

The above drying capacities are estimates based on drying principles, field results, and computer simulations.

Variances may occur due to grain physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.



SUKUP CE GRAIN DRYER SPECIFICATIONS

SINGLE FAN MODELS - FOR WHEAT ONLY

PART #	HP	FAN DIAMETER	FUEL	VOLT	PH	PLENUM	5 PT FULL HEAT-MT/HR (BU/HR)	5 PT HEAT/ COOL- MT/HR (BU/HR)	HOLD CAPACITY METRIC TON	BTU/HR	LOAD HP	UNLOAD HP	MAX. AMPS
TE1211D	10-15	38"	LP	380	3	Single	9.1 (336)	---	9	5 mill	3	3	41
TE1212D	10-15	38"	NG	380	3	Single	9.1 (336)	---	9	5 mill	3	3	41
TE1611D	10-15	44"	LP	380	3	Single	11.6 (426)	---	12	6 mill	3	3	41
TE1612D	10-15	44"	NG	380	3	Single	11.6 (426)	---	12	6 mill	3	3	41
TE2011D	30	44"	LP	380	3	Single	14.8 (543)	---	15	7 mill	5	5	60.6
TE2012D	30	44"	NG	380	3	Single	14.8 (543)	---	15	7 mill	5	5	70

TWO FAN MODELS - FOR WHEAT ONLY

PART #	HP	FAN DIAMETER	FUEL	VOLT	PH	PLENUM	5 PT FULL HEAT-MT/HR (BU/HR)	5 PT HEAT/ COOL- MT/HR (BU/HR)	HOLD CAPACITY METRIC TON	BTU/HR	LOAD HP	UNLOAD HP	MAX. AMPS
TE1631D	(1) 15hp-38", (1) 15hp-28"	(1) 15hp-28"	LP	380	3	2/3, 1/3	13.4 (492)	8.0 (294)	12	5 / 3 mill	3	3	68
TE1632D	(1) 15hp-38", (1) 15hp-28"	(1) 15hp-28"	NG	380	3	2/3, 1/3	13.4 (492)	8.0 (294)	12	5 / 3 mill	3	3	68
TE2031D	(1) 15hp-44", (1) 15hp-28"	(1) 15hp-28"	LP	380	3	2/3, 1/3	15.8 (582)	9.5 (348)	15	6 / 3 mill	5	5	68
TE2032D	(1) 15hp-44", (1) 15hp-28"	(1) 15hp-28"	NG	380	3	2/3, 1/3	15.8 (582)	9.5 (348)	15	6 / 3 mill	5	5	68
TE2431D	(1) 30hp-38", (1) 15hp-28"	(1) 15hp-28"	LP	380	3	2/3, 1/3	16.7 (615)	11.3 (414)	18	7 / 3 mill	5	5	84
TE2432D	(1) 30hp-38", (1) 15hp-28"	(1) 15hp-28"	NG	380	3	2/3, 1/3	16.7 (615)	11.3 (414)	18	7 / 3 mill	5	5	97

The above drying capacities are estimates based on drying principles, field results, and computer simulations.

Variances may occur due to grain physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, weather conditions, etc.

Pre-Installation Requirements

Location:

Location of the dryer is a very important decision to make. Numerous factors should be taken into consideration when determining where to install the Dryer. Factors to consider when selecting your site are:

1. Wet grain supply
2. Dry grain discharge
3. Location of storage bins
4. Other grain handling equipment
5. Minimum of 3 feet (914.4 mm) clearance from other structures on the side of the Dryer and 5 feet (1524 mm) minimum clearance from other structures at the fan inlet.
6. Minimize handling distances of load and unload systems
7. Locate Dryer and storage bins in a well drained area
8. Electrical requirements

Warning: Do not install the dryer inside a building or any other area where fuel installation regulations, and or electrical codes, and or insurance requirements do not allow.



Warning: Do not operate the dryer in an area where combustible material can be drawn into the Fan, or where load and unload augers can come in contact with power lines.



Foundation:

A reinforced concrete pad is recommended for dryer stability.

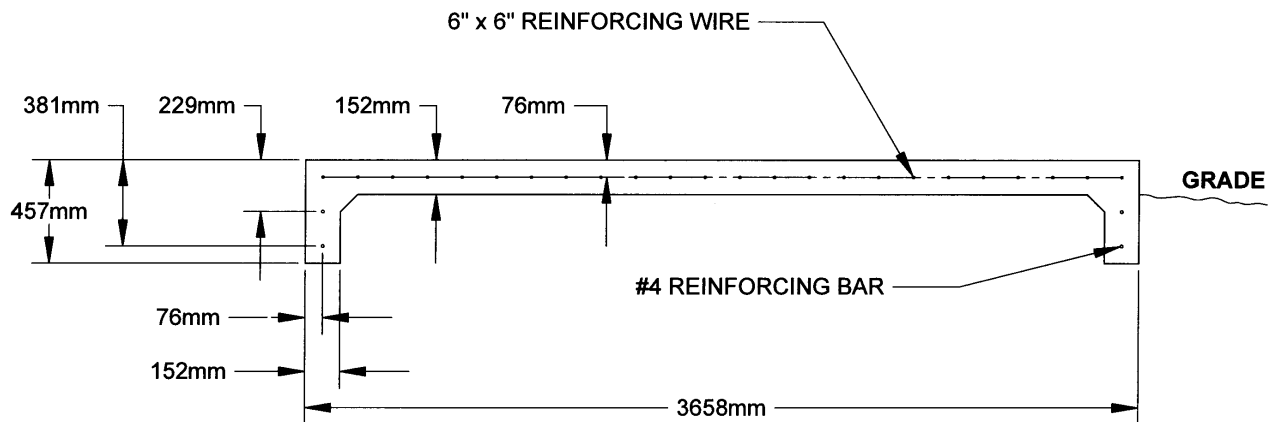
The following table is a basic guideline for materials required for each size dryer pad.

	Concrete Pad Size	Meters (Yards) of Concrete
12 Foot Dryer	1.12 m x 2 m (12' x 22')	6.5 (7.1)
16 Foot Dryer	1.12 m x 2.42 m (12' x 26')	7.6 (8.3)
20 Foot Dryer	1.12 m x 2.79 m (12' x 30')	8.7 (9.5)
24 Foot Dryer	1.12 m x 3.16 m (12' x 34')	9.8 (10.7)
28 Foot Dryer	1.12 m x 12 m (12' x 38')	10.9 (11.9)

Quantities are approximate and requirements may vary due to site elevations

See the Installation and Pre-operational check out section in the Installation-Service part of the manual for the proper support leg locations for 12, 16, 20, 24, and 28-foot dryers.

Foundation:



SPT0055
8/10/06DDV

Electrical Load Requirements

Note: A Service-Rated, Fused Disconnect needs to be installed ahead of the Dryer power distribution box. This disconnect is not included with the dryer and should be installed by a qualified electrician in accordance with local and national standards.

Caution: The only device connected to this disconnect should be your Grain Dryer.

Note: All current specifications include the Service Factor.

The following charts provide information for the electrician wiring the Grain Dryer. It is recommended that you contact your local Power Company and have a representative inspect the installation to see that your wiring is compatible with their system, and that sufficient power is supplied to your dryer.

Standard electrical safety practices and codes should be used. **IMPORTANT: Any supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of BS EN 60204-1.**

All electrical work should be completed by a qualified electrician.

Dryer Electrical Specifications:

SINGLE FAN MODELS

TE1211D - 12 Foot Dryer - Single Fan/Heater - 380 Volt - 3 Phase - 50HZ - LP
Main Switch = 250 Amps

	Top Auger	Bottom Auger	Fan 38"	Minimum Amps	Maximum Amps
Motor/Wire	3 Kw/#14 5 FLA	3 Kw/#14 5 FLA	15 Kw/#10 28 FLA	38 Amps	250 Amps

** See Auxiliary Kits section for options

TWO FAN MODELS

TE1631D - 16 Foot Dryer - 2 Fan / 2 Heater 2/3 - 1/3, 380V - 3 Phase – 50 Hz
Main Switch = 250 Amps

	Top Auger	Bottom Auger	Upper Fan 38"	Lower Fan 28"	Minimum Amps	Maximum Amps
Motor/Wire	3 Kw/#14 5 FLA	3 Kw/#14 5 FLA	15 Kw/#10 28 FLA	15 Kw/#10 28 FLA	66 Amps	250 Amps

** See Auxiliary Kits section for options

TE2831D - 28 Foot Dryer - 2 Fan / 2 Heater 2/3 - 1/3 - 380 Volt - 3 Phase - 50 Hz - LP
Main Switch = 250 Amps

	Top Auger	Bottom Auger	Upper Fan 44"	Lower Fan 28"	Minimum Amps	Maximum Amps
Motor/Wire	5.5 Kw/#10 11.1 FLA	5.5 Kw/#10 11.1 FLA	30 Kw/#3 55 FLA	18.5 Kw/#4 35 FLA	112 Amps	250 Amps

** See Auxiliary Kits section for options

PLEASE NOTE: Electrical load requirements for centrifugal dryers may be found in the Centrifugal Dryer Parts Assembly, #L141032, which accompanies this operator's manual.

Auxiliary Load and Unload Kit Options

**** Dryers may be equipped with auxiliary load and or unload motor starters / overloads. These can only be field installed.**

Auxiliary Load and Unload kit specifications:

IMPORTANT: Any supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of BS EN 60204-1.

Dryers have been pre-configured to handle up to 2 (two) 10 HP kits on **single** module dryers.

NOTE: If additional auxiliaries are required, the Dealer is responsible to determine if the dryer can handle the additional load. If the dryer is not able to handle the extra load, the auxiliary must have its own power source independent of the dryer.

Temperature Compensated Overloads, 3 Phase Units:

All Dryers manufactured as three phase units are equipped with temperature compensated overloads. If installing auxiliary load and unload kits NOT purchased from Sukup Manufacturing Company, it is recommended that **temperature compensated units** be used.

Fuel Information

LIQUID PROPANE

Sukup dryers for liquid propane use must be connected to a supply tank to draw liquid from the bottom of the tank. The tank should be 1,000 gallons or larger, and have a regulator mounted to it with a maximum 5 bars (72 psi). The connection to the dryer should be with a flexible hose designed for LP gas. Have your LP gas supplier make proper connections and safety controls. **IMPORTANT: Regulator must be in accordance with standard BS EN 88 or BS EN 334.**

Do not use tanks that have previously been used for ammonia or fertilizer solutions. These substances are extremely corrosive and can damage fuel supply and burner parts.

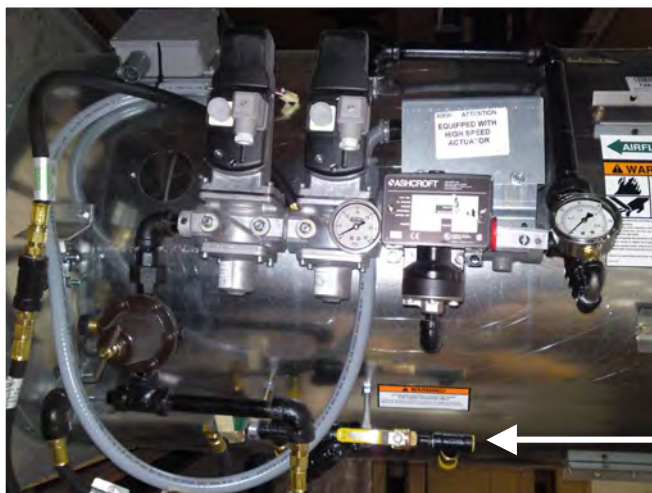
Water in the supply tank may freeze in the pipe train or controls, causing damage. To ensure the tank is free of moisture, the best precaution is to purge with methanol. Check with the gas supplier if this needs to be done. Do not use tanks with an accumulation of oil or heavy hydrocarbons from long use on a vapor withdrawal system.

If more than one tank is needed to supply liquid propane to the dryer, the vapor sides of the tanks must be connected together to equalize the pressure from each tank. Have your LP gas supplier make proper connections and install safety controls to meet local codes and national fire protection standards.

Fuel System Recommendations

LIQUID PROPANE

DRYER SIZE	MAXIMUM HEAT CAPACITY (BTU/HR)	MAXIMUM FUEL FLOW L/HR (GAL/HR)	FUEL LINE SIZE (MINIMUM UP TO 100') MM (IN)
8 FT, SINGLE HEATER	3,000,000	124.9 (33)	3 / 8"
12 FT, SINGLE HEATER	5,000,000	204.4 (54)	12.7 (1 / 2")
16 FT, SINGLE HEATER	6,000,000	246 (65)	12.7 (1 / 2")
16 FT, 2 MODULE	13,000,000	537.5 (142)	19.05 (3 / 4")
16 FT, 3 MODULE	20,000,000	825.2 (218)	25.4 (1")
20 FT, SINGLE HEATER	7,000,000	287.7 (76)	12.7 (1 / 2")
20 FT, DUAL HEATER	9,000,000	371 (98)	19.05 (3 / 4")
20 FT, 2 MODULE	16,500,000	681.4 (180)	19.05 (3 / 4")
20 FT, 3 MODULE	25,000,000	1030 (272)	25.4 (1")
24 FT, DUAL HEATER	10,000,000	412.6 (109)	19.05 (3 / 4")
24 FT, 2 MODULE	20,000,000	825.2 (218)	25.4 (1")
24 FT, 3 MODULE	30,000,000	1234 (326)	25.4 (1")
28 FT, DUAL HEATER	11,000,000	454.2 (120)	19.05 (3 / 4")



1. See fuel specification chart above for recommended line size.
2. Use a pressure regulator at the supply tank.
3. Open LP shut-off valves slowly to prevent inadvertent closing of excess flow valves.

Connection to liquid manifold on Dryer

NATURAL GAS

Sukup dryers for natural gas use are designed to function at a heat value of approximately 1000 BTU per cubic foot. A regulated pressure of 1 bar (15 PSI) must be provided for connection to the dryer. **IMPORTANT: Regulator must be in accordance with standard BS EN 88 or BS EN 334.** Ensure also that sufficient volume is maintained for the correct operating pressure.

NATURAL GAS

DRYER SIZE	MAXIMUM HEAT CAPACITY (BTU/HR)	MAXIMUM FUEL FLOW L/HR (CUBIC FEET/HR)	FUEL LINE SIZE (MINIMUM UP TO 100') MM (IN)
8 FT, SINGLE HEATER	3,000,000	84,951 (3000)	31.75 (1 1 / 4")
12 FT, SINGLE HEATER	5,000,000	141,584.2 (5000)	38.1 (1 1 / 2")
16 FT, SINGLE HEATER	6,000,000	169,901.1 (6000)	38.1 (1 1 / 2")
16 FT, 2 MODULE	13,000,000	368,119 (13,000)	63.5 (2 1 / 2")
16 FT, 3 MODULE	20,000,000	566,336.9 (20,000)	63.5 (2 1 / 2")
20 FT, SINGLE HEATER	7,000,000	198,218 (7000)	50.8 (2")
20 FT, DUAL HEATER	9,000,000	254,851.6 (9000)	50.8 (2")
20 FT, 2 MODULE	16,500,000	467,228 (16,500)	63.5 (2 1 / 2")
20 FT, 3 MODULE	25,000,000	707,921.2 (25,000)	76.2 (3")
24 FT, DUAL HEATER	10,000,000	283,168.5 (10,000)	50.8 (2")
24 FT, 2 MODULE	20,000,000	566,336.9 (20,000)	63.5 (2 1 / 2")
24 FT, 3 MODULE	30,000,000	849,505.4 (30,000)	76.2 (3")
28 FT, 2 DUAL HEATER	11,000,000	311,485 (11,000)	50.8 (2")

1. See fuel specification chart above for recommended line size.



Connection to natural gas manifold on dryer

2 fan/heater natural gas dryer

Dryer Installation Information

Dryer set up / supports:

Warning: The wheel transport kit is for transport only and is NOT to be used when operating the dryer. The dryer MUST be mounted and supported in an approved manner.

The dryer must be mounted a minimum of 406.4 mm (16 in) above the surface to allow for clean out.

Optional dryer supports are available from Sukup Mfg. in 2-foot, 3-foot, and 4-foot lengths.

The support kits come with attaching hardware to attach the supports to the dryer frame. Customer must supply hardware for attachment to concrete pad (Recommend ½" or 5/8" hardware).

Optional Dryer ladder extensions are available from Sukup Mfg. in 2-foot, 3-foot and 4-foot lengths.

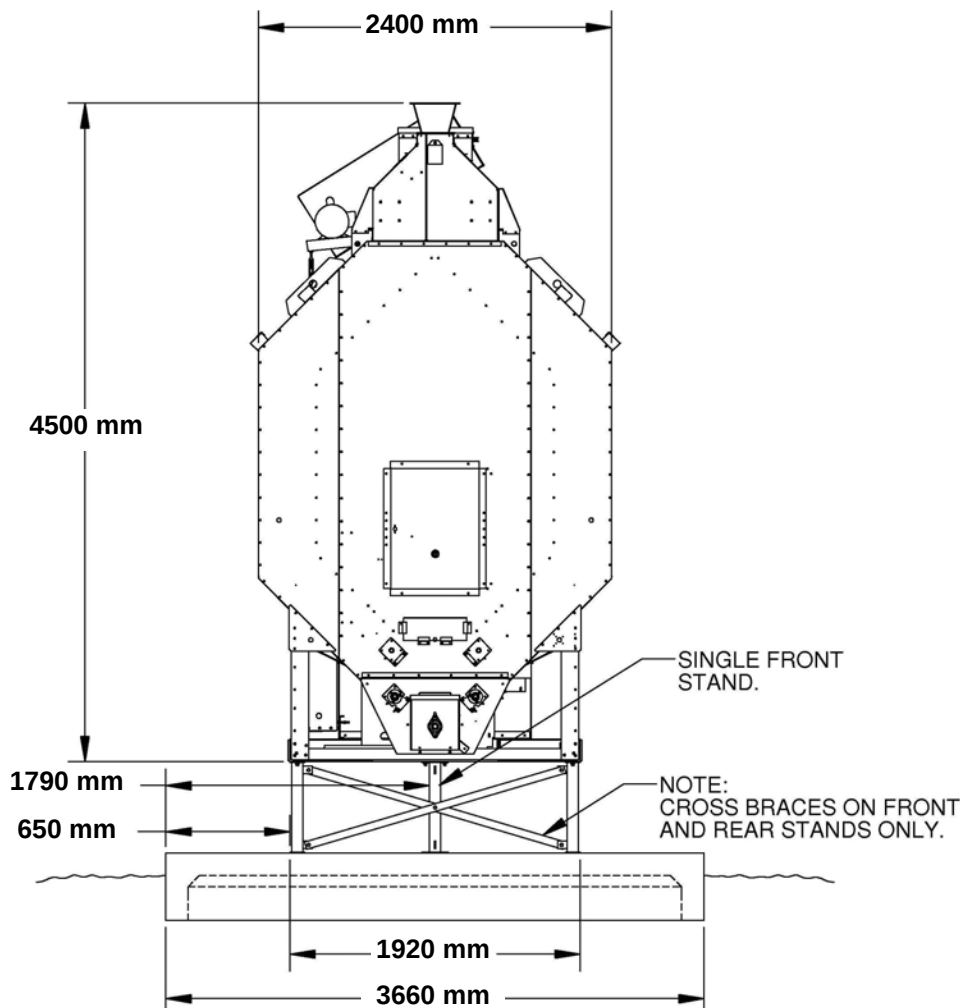
Contact your Sukup Dealer to order either the supports and / or ladder extensions.

See the Installation and Pre-operational check out section in the Installation-Service part of the manual for the proper support leg locations for 12, 16, 20, and 24 foot dryers.

Cross support braces and Front stand

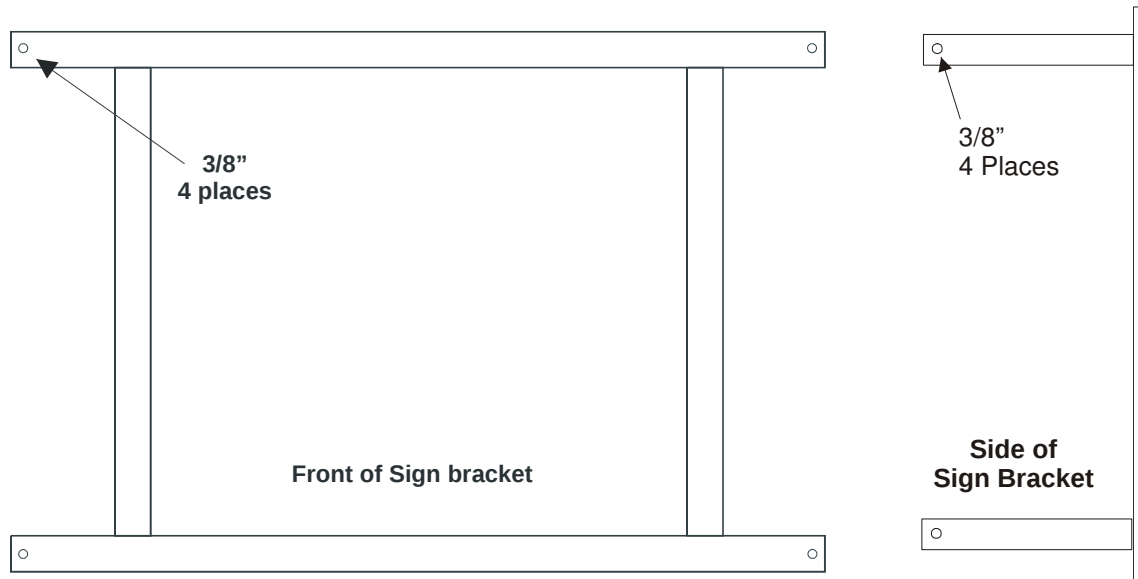
If the dryer is not mounted using Sukup Mfg supports, the following guidelines must be followed:

- Supports under grain columns must be at least every 1828.8 mm (6 feet)
- Support under front hitch
- Tie down dryer to foundation



Installation of Customer Sign

A sign, showing customer name or farm name and / or dealer name, is provided at no additional charge by Sukup Manufacturing. The dealer will order the sign, specifying the appropriate information to be printed on it.



The bracket pictured above can be mounted to the outside of the dryer, on any two-foot grain column section. The sign is then mounted to the bracket. It can also be mounted under the fan(s) on a sheet metal support.



General Dryer Operation

Continuous Flow:

Continuous Flow dryer operation requires creating a gradient of moisture from the top to the bottom of the dryer and is accomplished by three main functions; initial dry, stabilization, and continuous flow. Before the first drying operation is started, the user must enter the incoming moisture and the desired output moisture into the control panel. These moistures are used to calculate the time necessary to perform the initial dry at a set temperature, during which no grain is unloaded from the dryer. After initial dry is complete, the user will set the desired drying plenum temperatures and the controller calculates a meter roll speed corresponding to the input plenum temperatures. The dryer then performs a stabilization routine. During stabilization, a gradient of moisture is established in the dryer by drying and unloading one full load of corn without adjusting the meter roll speed. After stabilization has completed, the dryer enters continuous flow operation. During this operation, the dryer adjusts the meter roll speed for variances seen in the actual output moisture compared to the desired output moisture. When the final dry of the season is achieved, the user simply enters the final dry function and follows the simple instructions listed on the screen of the control panel.

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

Automatic Batch:

Automatic batch is a standard feature of the Sukup Continuous Flow Grain Dryer. Batch operations enable operators to dry their grain in a manner they have become accustomed to, enables them to dry extremely wet grain, and allows single fan dryers to be operated in a heat cool manner.

Two controlling operations of automatic batch have been developed. The first method dries batches according to time entries. The operator enters set times into the control panel during which the dryer will heat, cool, and unload the grain. During unload the dryer calculates the average moisture of each batch and prints it. The user can then adjust the time entries according to the desired output moisture. The second method of operation requires purchasing the temperature control option. The operator enters a desired dry temperature value into the control panel. When the kernel temperature in the column reaches the set temperature, the dryer proceeds to the next operation.

The set variables may be changed to the operator's choosing at anytime during the batch operation.

Grain Transfer:

Increasingly, operators require the dryer to transfer grain through it to reach their storage facilities. A mode of grain transfer has been developed to simplify this process. The control panel display steps the user through a simple process to begin and end the procedure through normal startup operation.

Manual:

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

Auxiliary Operation:

Auxiliary controls can be setup in a number of configurations. Three control channels exist, one for the auxiliary unload and two for the auxiliary fill. For the unload, a single control channel is used to start an external unload device at the same time as the unload of the dryer. The auxiliary fill operations have two control channels. When turning the fill of the dryer on, a delay of 5 seconds exists between the start of each motor, the dryer fill motor, the first auxiliary load, and the second auxiliary load. The fill paddle will send a signal to the controls that the dryer is nearly full, a switch is triggered to turn the second auxiliary load off. This operation can be delayed by up to 20 seconds with a simple setting on the PLC, explained in detail in the manual. Upon the signal that the dryer is completely full, all auxiliary motors are shut off. If the second auxiliary is within its delay period, it will shut off when the dryer is full.

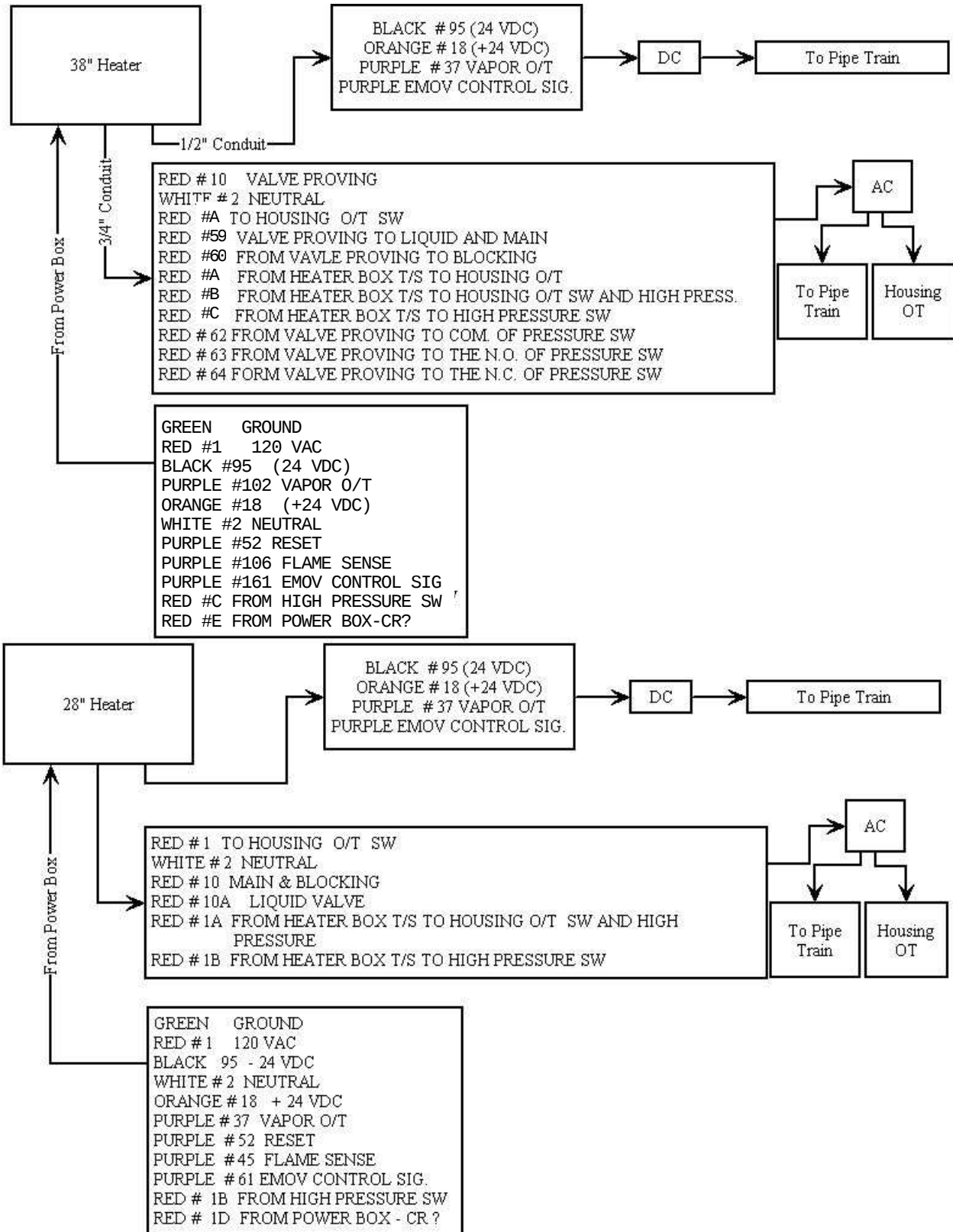
Time delay off:

A time delay off has been included with the dryer to allow up to a 60 second clean out of the dryer to be performed upon shut down. The instructions to set-up this operation are listed in the manual.

Optional Phone Modem:

An optional phone modem, purchased separately, can be used to contact the operator of the dryer upon shutdown.

Heater Wiring



Appendix A: Estimated Tonnes Per Hour Information Per Module

This chart is only an approximation!

Estimated Tonnes Per Hour						
	Dryer Length and Module					
	8 Foot 1 Module	12 Foot 1 Module	16 Foot 1 Module	20 Foot 1 Module	24 Foot 1 Module	28 Foot 1 Module
10% Meter Roll	2	3	4	5	6	7
20% Meter Roll	4	6	8	10	12	14
30% Meter Roll	6	9	12	15	18	21
40% Meter Roll	8	12	16	20	24	28.5
50% Meter Roll	10	15	20	25	30.5	35.6
60% Meter Roll	12	18	24	30.5	36.6	42.7
70% Meter Roll	14	21	28.5	35.6	42.7	50
80% Meter Roll	16	24	32.5	40.6	49	57
90% Meter Roll	18	27	36.6	45.7	55	64
100% Meter Roll	20	30.5	40.6	51	61	71



AUTOMATIC DRYER PARTS ASSEMBLIES (CE)



Sukup Manufacturing Company

1555 255th Street, Box 677
Sheffield, Iowa, USA 50475-0677

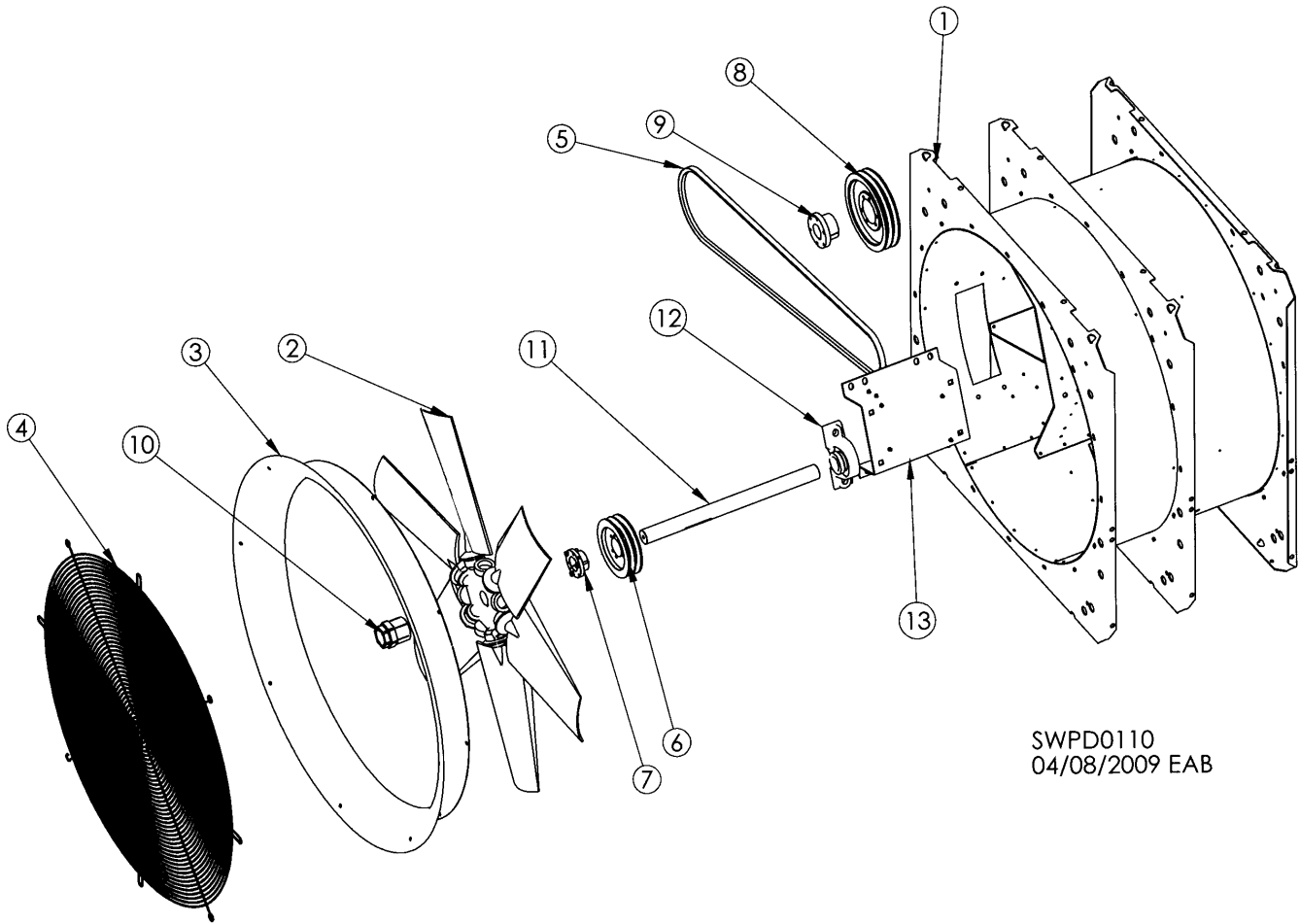
Phone: 641-892-4222
Website: www.sukup.com

Fax: 641-892-4629
E-mail: info@sukup.com

TABLE OF CONTENTS

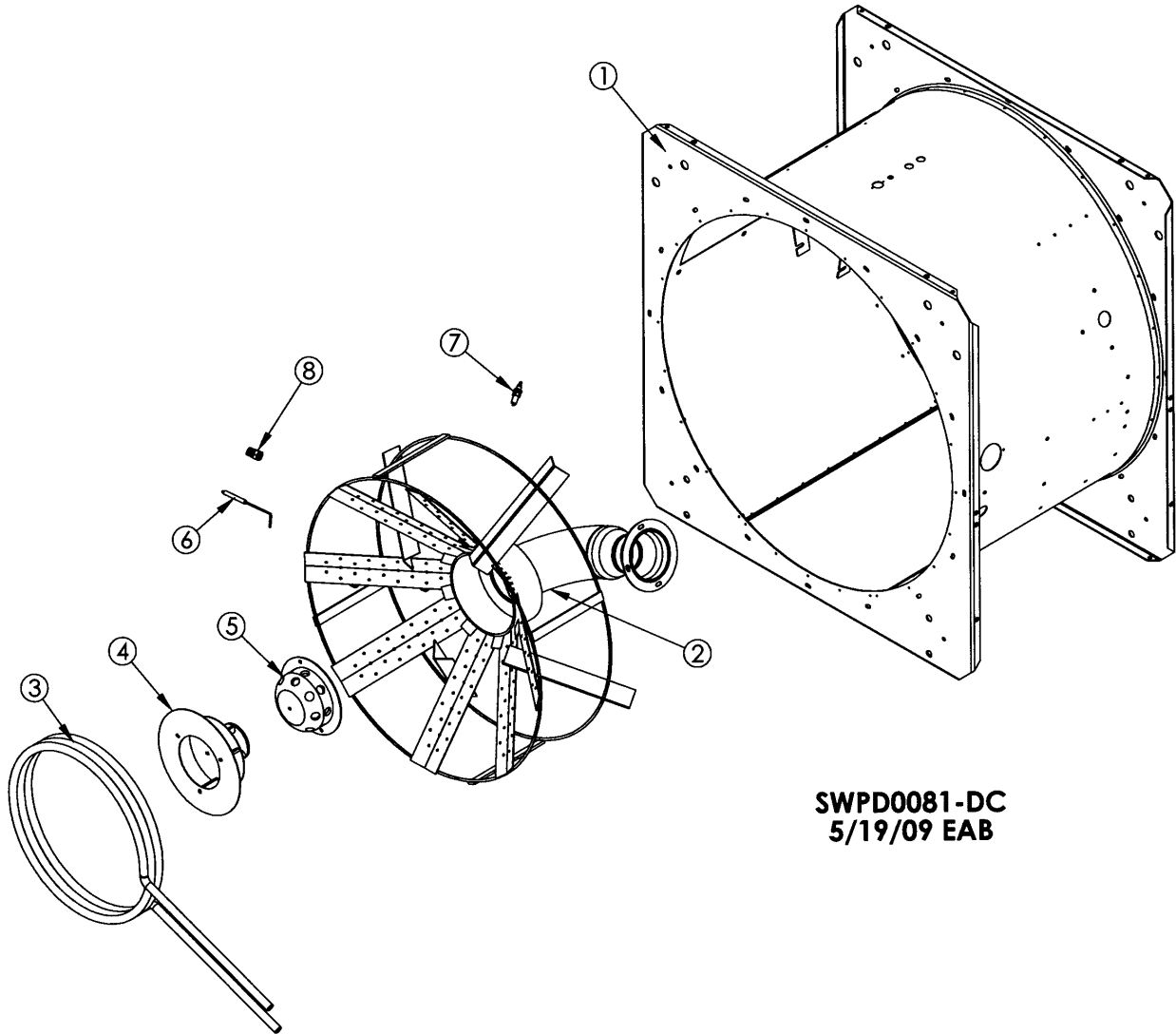
DRYER FAN PARTS	3
DRYER HEATER PARTS.....	4
MOTOR MOUNT ASSEMBLIES	5
PIPE TRAIN, EL MOD VALVE 1/2", 28" FAN-HEATER.....	8
PIPE TRAIN, EL MOD VALVE 1/2", 28" FAN-HEATER.....	9
PIPE TRAIN, EL MOD VALVE 1/2", 38" FAN-HEATER.....	10
PIPE TRAIN, EL MOD VALVE 3/4", NG, 28" FAN-HEATER	11
PIPE TRAIN, EL MOD VALVE 3/4", 38" & 44" FAN-HEATER	12
NOTES.....	13
12' WET BIN	18
16' WET BIN	20
20' WET BIN	22
24' WET BIN	24
28' WET BIN	26
METERING ROLLS & UNLOAD AUGER DRIVES	28
DRIVE END OF DRYERS, SINGLE FAN - BACK END	30
SINGLE FAN - BACK END	31
COLUMN PARTS	32
FLOW GATE WITH ANGLE FLOW GATE SEAL.....	33
BACK METERING ROLLS	34
12' CAM LOCK ASSEMBLY	35
16' CAM LOCK ASSEMBLY	36
20' CAM LOCK ASSEMBLY	37
24' CAM LOCK ASSEMBLY	38
28' CAM LOCK ASSEMBLY	39
FRAME FOR BOTH STANDARD & STACKED DRYERS	40
12' BOTTOM AUGER	41
16' BOTTOM AUGER	42
20' BOTTOM AUGER	43
24' BOTTOM AUGER	44
28' BOTTOM AUGER	45
DRYER HITCH WITH 24" EXTENSION	46

DRYER FAN PARTS



REF#	DESCRIPTION	28" 20HP 50Hz	28" 25HP 50Hz	38" 20HP 50Hz	38" 25HP 50Hz	44" 40HP 50Hz
1	Housing	T28551	T28551	T12986	T12986	T20980-50
2	Blade	J3058	J3059	J3050	J3048	J3067
3	Venturi	J3080	J3080	J3085	J3085	J3090
4	Inlet Screen	D3824	D3824	J3132	J3132	J2957
5	Belt	J02521 (B X 94)	J02521 (B X 94)	J02521 (B X 94)	J02521 (B X 94)	J02560 (B X 96)
6	Fan Pulley	J03381	J03381	J03457	J03457	J03493
7	Fan Bushing	J04241	J04241	J04253	J04253	J04285
8	Motor Pulley	J0358	J0358	J0358	J0358	J0356
9	Motor Pulley Bushing	J04273	J04274	J04273	J04274	J04277
10	Blade Bushing	J0436	J0436	J0435	J0435	J04371
11	Shaft	T21062	T21062	T21063	T21063	T21064
12	Shaft Bearing w/Housing	J0008	J0008	J00471	J00471	J0047
13	Shaft Support	T21070	T21070	T21071	T21071	T21072
	Complete Fan	T25230D	T25231D	T17184E	T24289E	T20178E

DRYER HEATER PARTS



SWPD0081-DC
5/19/09 EAB

REF. #	DESCRIPTION	28" LP	38" LP	44" LP 30HP
1	Housing	T28551	T12990	T16990
2	Burner	D4017	T12196	T16201
3	Vaporizer	D70321	D7034	T16194
4	Flame Deflector	-----	T16204	T16204
5	Port Cup	D4025	D40443	D40443
6	Flame Sensor	J5747	J5747	J5747
7	Spark Plug	J5739	J5739	J5739
8	Compression Set for Flame Sensor	J5748	J5748	J5748

MOTOR MOUNT ASSEMBLIES

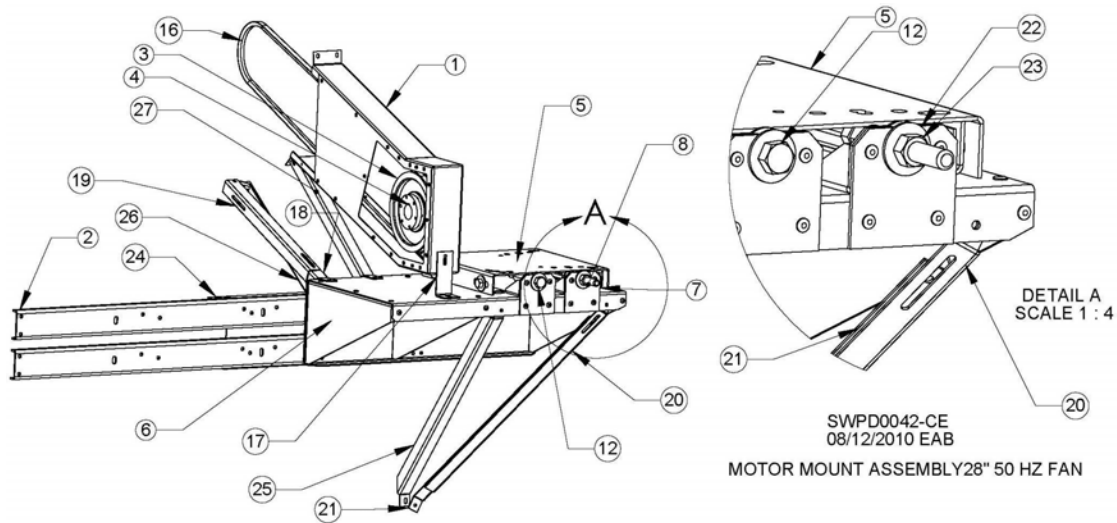


Figure 8.10: Motor Mount Assembly (28", 50 HZ)

Parts for Figure 8.10			
REF #	DESCRIPTION	QTY	COMP #
1	BELT SHIELD ASSY-28	1	T21058
2	BRACE,PANEL FRNT FAN SUPT,50HZ	2	T17661-50
3	PULLEY, 8.95 OD	1	J0358
4	BUSHING, 42MM, SK	1	J04273
5	PLATE,MTR MT WELDMENT, METRIC&NEMA	1	T21029
6	MOTOR MOUNT,50HZ	1	T21007
7	ANGLE, MOTOR MOUNT	2	N5416
8	ANGLE, NUT RETAINER, MOTOR MOUNT	2	N5416-01
9	WASHER, FLAT, 5/8	4	J1127
10	SCREW 5/8-11 X 1.5	4	J0781
11	NUT, 5/8-11	4	J1046
12	BOLT WELDMENT, MOTOR TIGHT	1	N5418
13	SCREW, 1/2-13, 1.25,PLT	4	J0728
14	WASHER, LOCK, 1/2, PLT	4	J1215
15	NUT, HEX, 1/2-13, PLT	4	J1040
16	BELT, BX96 (Not shown)	1	J02560
17	BRACKET, SHIELD SUPT.	1	T21028
18	BRACE, LOWER, 28" FAN MOTOR MT	1	T21033
19	BRACE, UPPER, 28" FAN MOTOR MT	1	T21036
20	BRACE, MOTOR MT CORNER – OUTSIDE	1	T21043
21	BRACE, MOTOR MT CORNER – INSIDE	1	T21042
22	WASHER, FLAT, 3/4	2	J1130
23	NUT 3/4-10, PLT	2	J1051
24	BRACKET, FAN SUPPORT	1	T21056
25	BRACE, REAR MOTOR MT	1	T21057
26	BRACE, LOWER 28" ANGLE	1	T21060
27	BRACE, MTR MT TO END PLATE, 28"		T21068

MOTOR MOUNT ASSEMBLIES

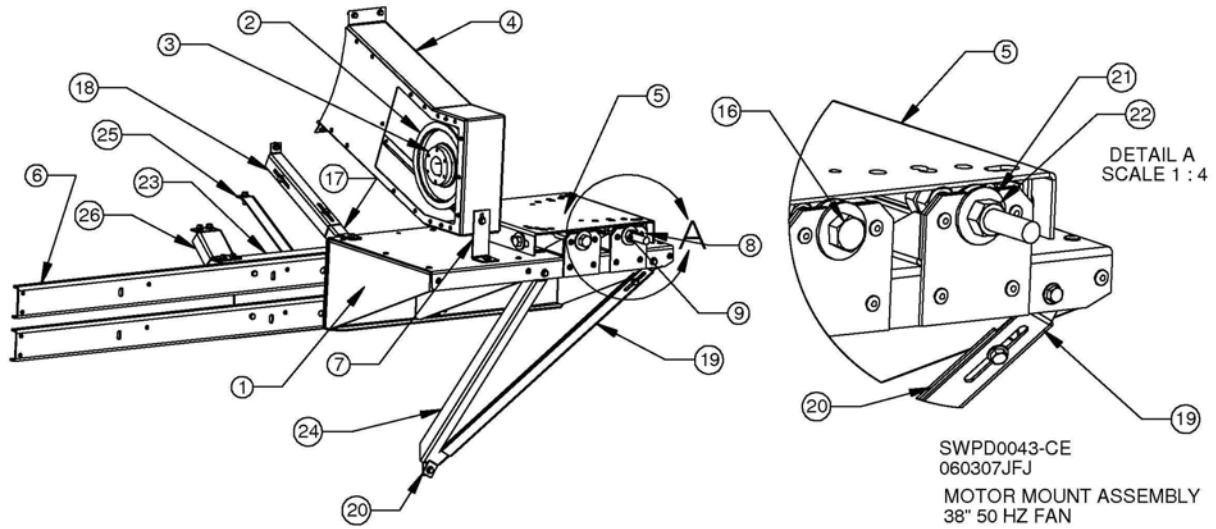


Figure 8.11: Motor Mount Assembly (38", 50HZ)

Parts for Figure 8.11							
REF #	DESCRIPTION	QTY	COMP #	REF #	DESCRIPTION	QTY	COMP #
1	MOTOR MOUNT, 50HZ	1	T21007	16	BOLT WELDMENT	1	N5418
2	PULLEY, 8.95 OD	1	J0358	17	BRACE, LOWER, 38"	1	T21034
3	BUSHING, 48MM, SK	1	J04274	18	BRACE, UPPER, 38"	1	T21035
4	BELT SHIELD ASSY-38	1	T21021	19	BRACE, MOTOR MT	1	T21043
5	PLATE, MTR MT	1	T21029	20	BRACE, MOTOR MT	1	T21042
6	BRACE, PANEL FRNT	2	T17661-50	21	WASHER, FLAT, 3/4	2	J1130
7	BRACKET, SHIELD SUPT.	1	T21028	22	NUT 3/4-10, PLT	2	J1051
8	ANGLE, MOTOR MOUNT	2	N5416	23	BRACKET, FAN SUP	1	T21056
9	ANGLE, NUT RETAIN, MTR MT	2	N5416-01	24	BRACE, REAR MTR MT	1	T21057
10	SCREW, 1/2-13, 1.25, PLT	4	J0728	25	BRACE, LOWER 38"	1	T21067
11	WASHER, LOCK, 1/2, PLT	4	J1215	26	BRACE, 38" MIDDLE	1	T21073
12	NUT, HEX, 1/2-13, PLT	4	J1040	27	BOLT, 5/16-18, 1, BIN	19	J0537
13	WASHER, FLAT, 5/8	4	J1127	28	NUT, WHIZ, 5/16-18	42	J1110
14	SCREW 5/8-11 X 1.5	4	J0781	29	SCREW, 5/16 - 18	8	J0584
15	NUT, 5/8-11	4	J1046	30	SCREW, 1/4-20 X 1 HEX	4	J05082

MOTOR MOUNT ASSEMBLIES

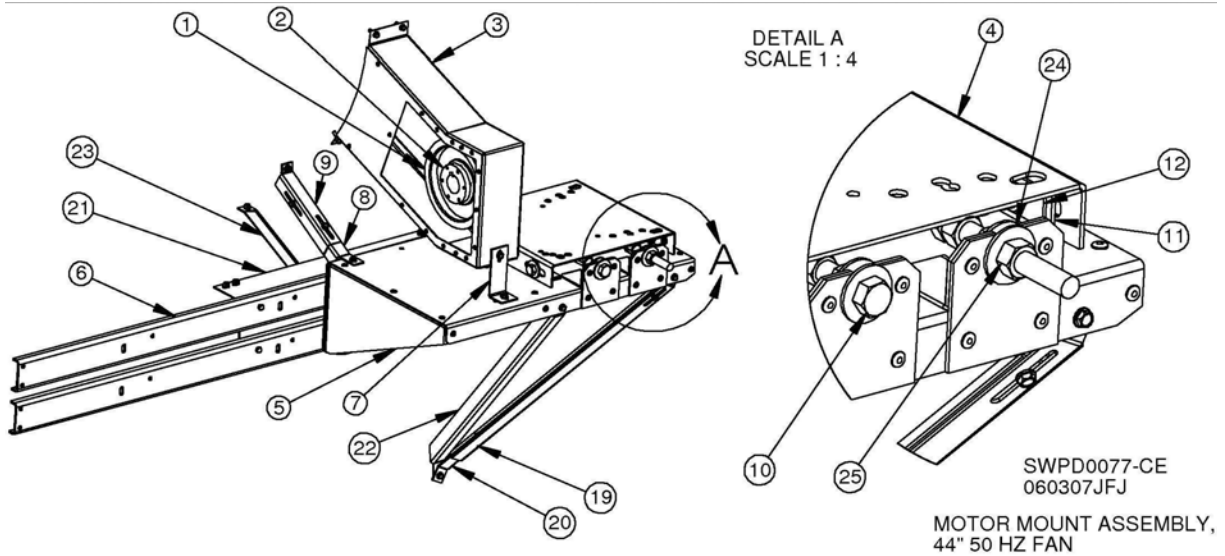
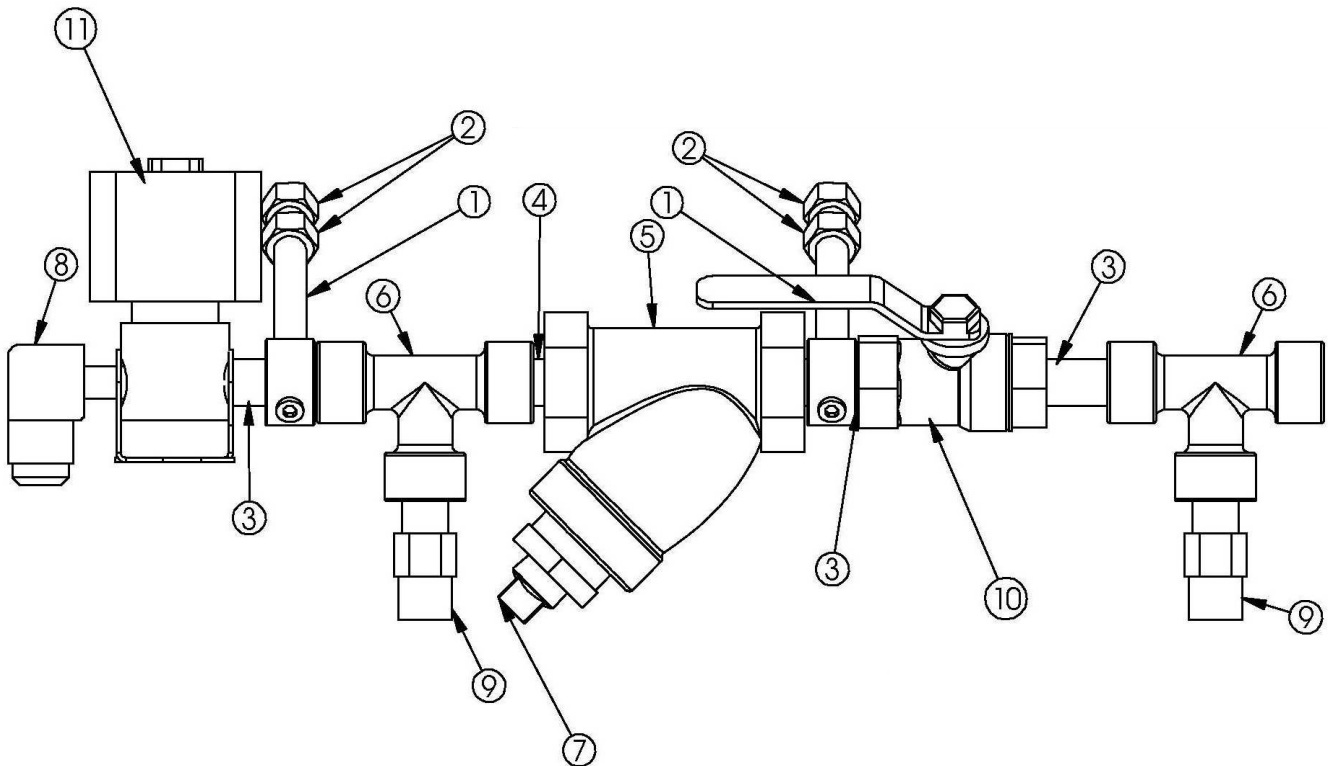


Figure 8.12: Motor Mount Assembly (44", 50 HZ)

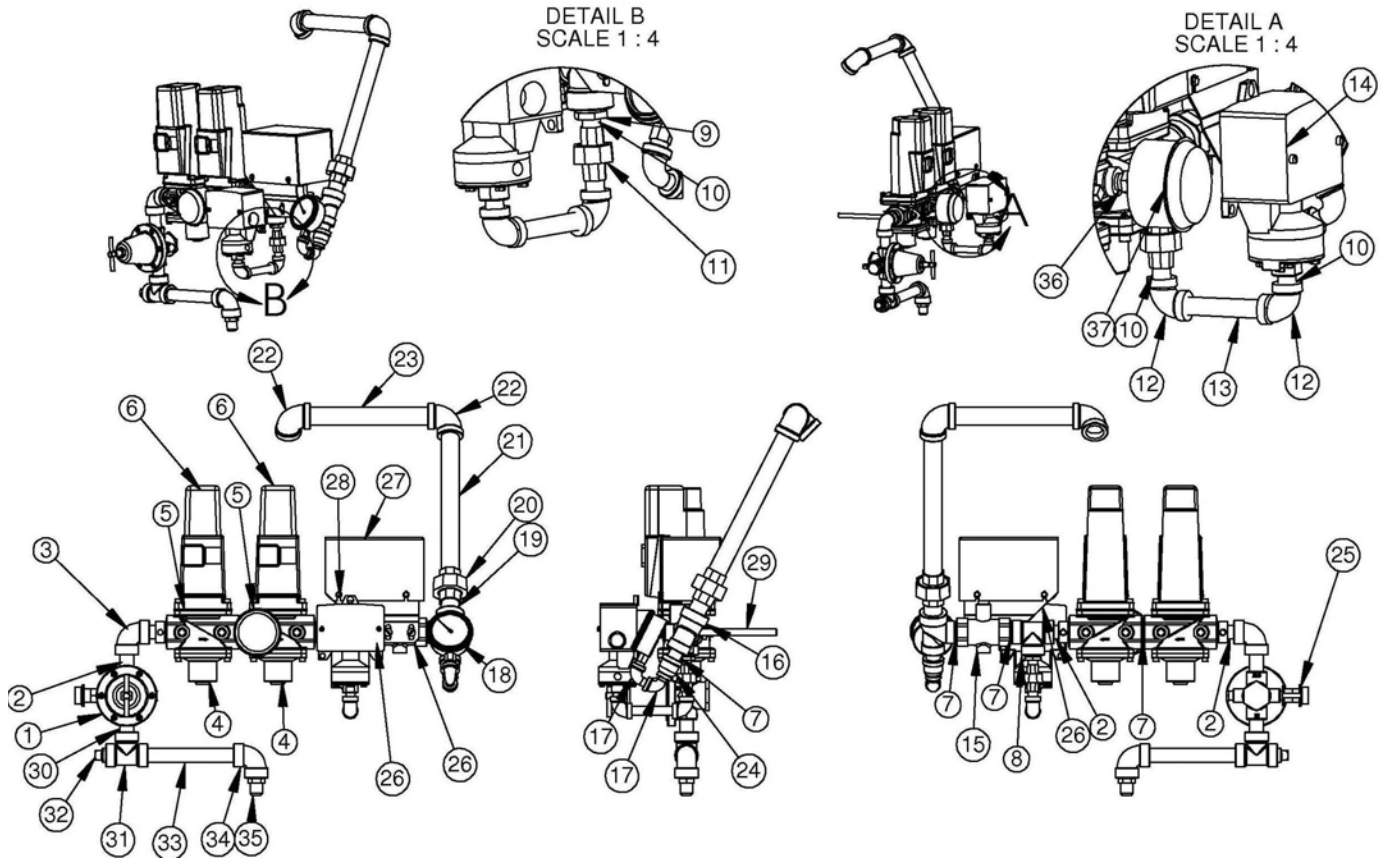
Parts for Figure 8.12								
REF #	DESCRIPTION	QTY	COMP #		REF #	DESCRIPTION	QTY	COMP #
1	PULLEY	1	J0356		16	SCREW, 1/2-13, 1.25	4	J0728
2	BUSHING, 1 7/8"	1	J04285		17	WASHER, LOCK, 1/2	4	J1215
3	BELT SHIELD ASSY	1	T21012		18	NUT, HEX, 1/2-13	4	J1040
4	PLATE, MOTOR MT WELD	1	T21029		19	BRACE, MTR MT, OUT	1	T21043
5	MOTOR MOUNT	1	T21007		20	BRACE, MTR MT, IN	1	T21042
6	BRACE, PANEL FRONT	2	T17661-50		21	BRACKET, FAN SUPP	1	T21056
7	BRACKET, SHIELD SUPT	1	T21028		22	BRACE, REAR MTR MT	1	T21057
8	BRACE, LOWER, 44"	1	T21037		23	BRACE, LOWER 44"	1	T21061
9	BRACE, UPPER, 44"	1	T21038		24	WASHER, FLAT 3/4	2	J1130
10	BOLT WELDMENT	1	N5418		25	NUT, 3/4-10	2	J1051
11	ANGLE, MTR MOUNT	2	N5416		26	SCREW 1/4-20X1 HEX	4	J05082
12	ANGLE, NUT RETAINER	2	N5416-01		27	SCREW, 5/16-18	8	J0584
13	NUT, 5/8-11	4	J1046		28	NUT, WHIZ 5/16	42	J1110
14	WASHER, FLAT, 5/8	4	J1127		29	BOLT, 5/16-18	2	J0537
15	SCREW, 5/8-11X1.5	4	J0781		30	BOLT,5/16-18 X 3/4" HEX	17	J0536

**PIPE TRAIN, EL MOD VALVE 1/2", 28" FAN-HEATER
LP MODEL – T20200D**



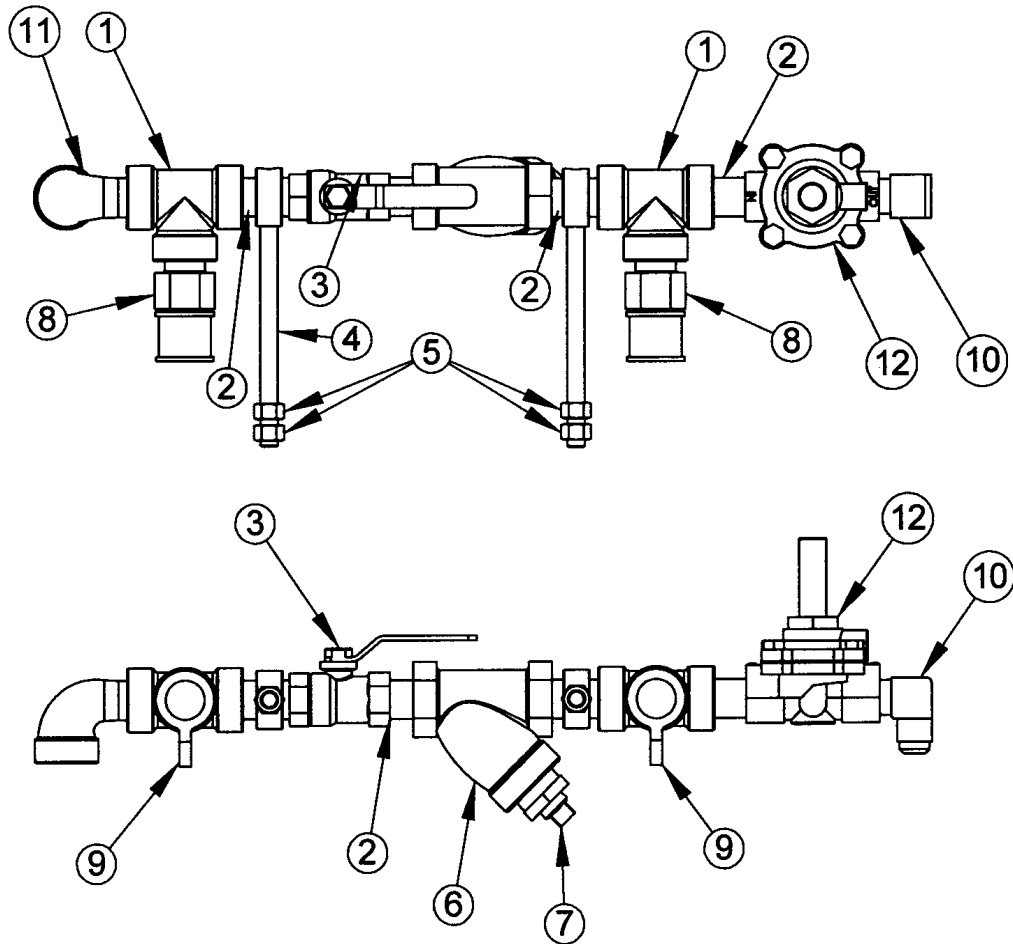
REF. #	DESCRIPTION	QTY	COMP. #
1	EYEBOLT,PIPE TRAIN,5/8"COLLAR	2	D71162
2	NUT,HEX,3/8-16,PLT	4	J1020
3	NIPPLE,1/4X1 1/2,BLKPIPE,SCH 80	3	J2400
4	NIPPLE,1/4 X CL,SCH 80	1	J24003
5	STRAINER,LIQ,1/4"	1	J5990
6	TEE,1/4X1/4X1/4,SCH 80	2	J2470
7	PLUG,3/8,PIPE,BLACK	1	J2610
8	ELBOW,3/8FLX1/4MIP,90 DEG,E1-6B	1	J2740
9	VALVE,1/4",RELIEF,3865-250	2	J6050
10	VALVE,1/4 ,LP BALL	1	J6080
11	CONDUIT,LIQ VLV ACT 28",ASSY	1	T17092
	HOSE TO VAPORIZER (Not shown)	1	J5937

PIPE TRAIN, EL MOD VALVE 1/2", 28" FAN-HEATER LP MODEL – T18810D



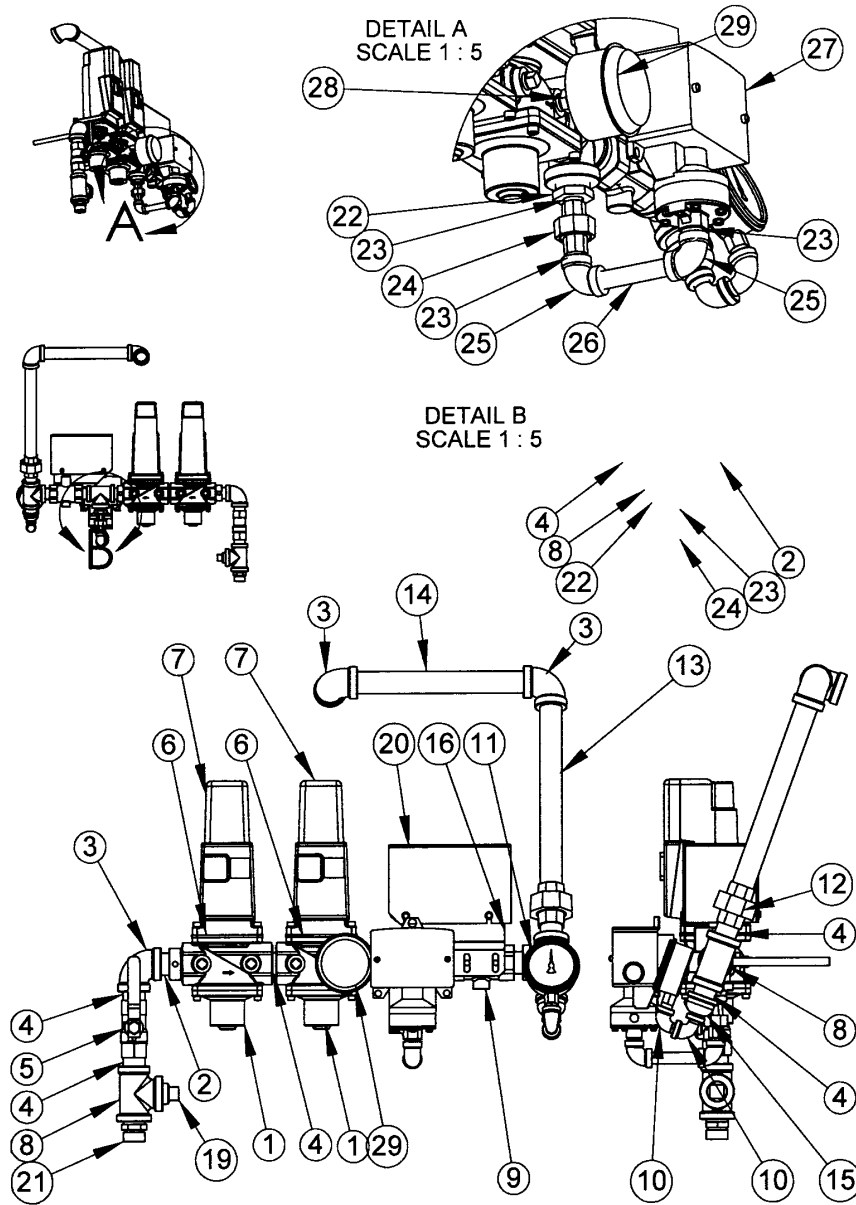
REF#	DESCRIPTION	QTY	COMP#	REF#	DESCRIPTION	QTY	COMP#
1	REGULATOR, 1/2"X1584MN, CGA ONLY	1	J6110	20	UNION, 3/4, BLACK, #150	1	J2710
2	NIPPLE, 1/2X2, SCH 40	3	J24061	21	NIPPLE, 3/4 X 10" SCH 80	1	J2429
3	ELBOW, 1/2, 90 DEGREE, SCH 40	1	J2522	22	ELBOW, 3/4, 90 DEGREE, SCH 40	2	J2525
4	VALVE, GAS, 1/2", VGG10.154U	2	J6235	23	NIPPLE, 3/4 X 8, SCH 40	1	J2418
5	KIT, NEMA 4, AGA66	2	J6241	24	COUPLING, REDUCING, 1/2X1/4, SC40	1	J2572
6	ACTUATOR, SKP15.001E1	2	J6240	25	VALVE, 1/4", RELIEF, A1325, H120	1	J6171
7	NIPPLE, 1/2 X CLOSE, SCH 40	4	J2405	26	BRACKET, ELECTRONIC MOD VALVE	1	T161935
8	TEE, 1/2X1/2X1/2, SCH 40	1	J2471	27	COVER, ELECTRONIC VALVE	1	T26902
9	BUSHING, REDUCING, 1/2X1/4, MAL	1	J2569	28	SCREW, #10-16, 3/4, PLT, SELFDRILL	4	J0469
10	NIPPLE, 1/4 X CL, SCH 80	3	J24003	29	EYEBOLT, PIPE TRAIN, 7/8" COLLAR	2	D71161
11	UNION, 1/4", SCH 40	1	J2703	30	NIPPLE, 1/2X1 1/2, SCH 80	1	J2406
12	ELBOW, 1/4 X 90, SCH 40	2	J2526	31	TEE, 1/2X1/2X1/2, SCH 80	1	J2472
13	NIPPLE, 1/4X3, SCH 40	1	J2411	32	PLUG, 1/2, SQ HD, BLACK PIPE	1	J2617
14	SWITCH, HIGH PRES, ASHCROFT	1	J4432	33	NIPPLE, 1/2 X 6, SCH 80	1	J24093
15	VALVE, BUTTERFLY L/ACTUATOR, 1/2	1	J6125	34	ELBOW, 1/2, 90 DEGREE, SCH 80	1	J2523
16	TEE, REDUCING, 3/4X1/2X1/2, SCH 40	1	J2481	35	UNION, 1/2FLX1/2MIP, U1-8D	1	J2840
17	ELBOW, STREET, 1/4, 90 DEG, SCH 40	2	J2517	36	BUSHING, REDUCING, 1/4X1/8	1	J2560
18	GAUGE, PRES, 0-30, LIQ, 1/4" BTM MT	1	J5960	37	GAUGE, PRES, 30PSI, 01B XUC, PM	1	J5959
19	NIPPLE, 3/4 X CLOSE, SCH 40	1	J2410		HOSE FROM VAPORIZER (Not shown)	1	J5938

**PIPE TRAIN, EL MOD VALVE 1/2", 38" FAN-HEATER
LP MODEL – T161872D**



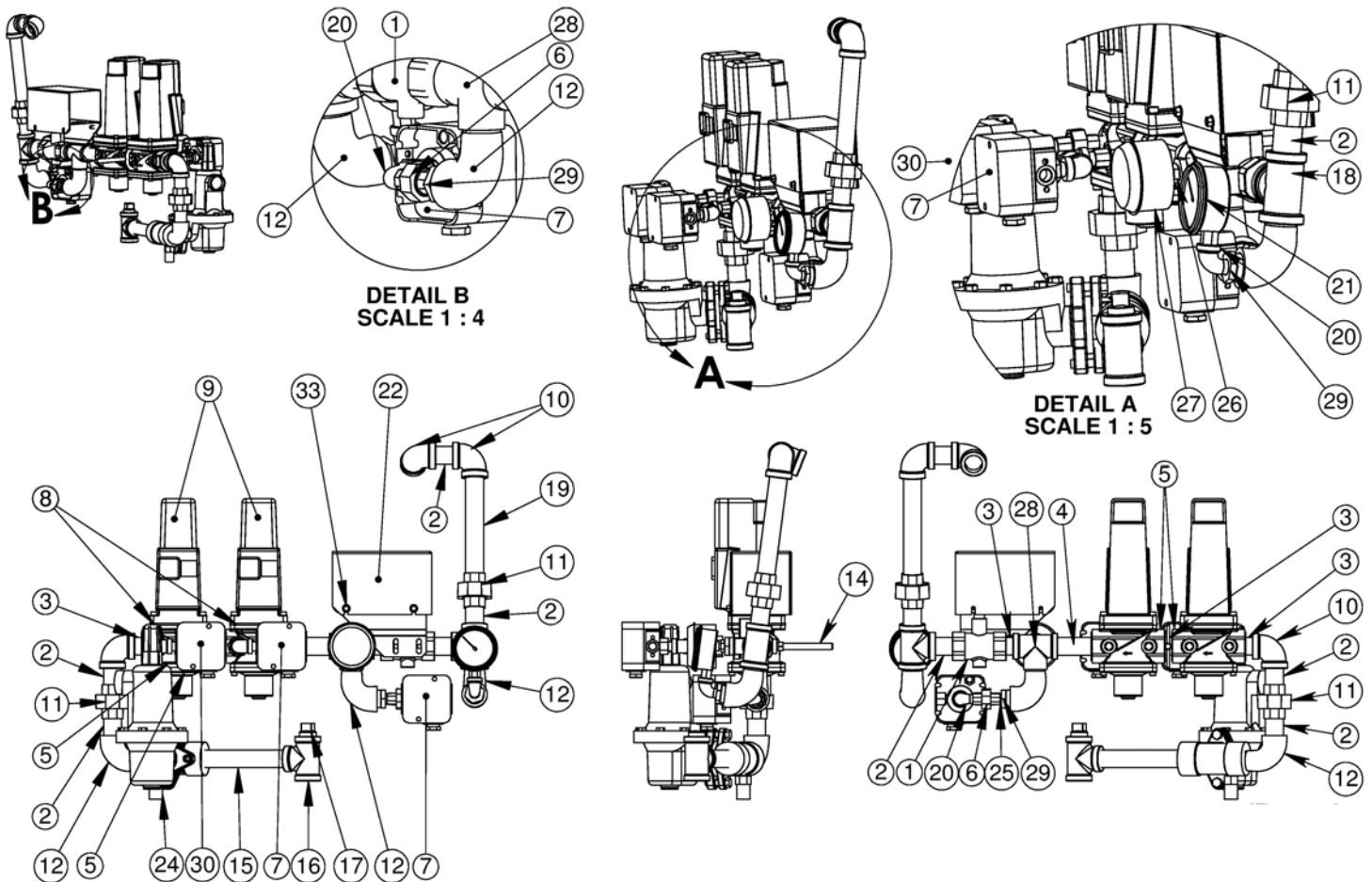
REF. #	DESCRIPTION	QTY	COMP. #
1	TEE, 1/2X1/2X1/2, SCH 80	2	J2472
2	NIPPLE, 1/2X1 1/2, SCH 40	4	J2406
3	VALVE, 1/2", BALL, ITT 1550	1	J6082
4	EYEBOLT, PIPE TRAIN, 7/8" COLLAR	2	D71161
5	NUT, HEX, 3/8-16, PLT	4	J1020
6	STRAINER, WYE, 1/2", 20 MESH	1	J5992
7	PLUG, 3/8, PIPE, BLACK	1	J2610
8	VALVE, 1/2", RELIEF, 3129G, H135-2	2	J6170
9	RAIN CAP, 7545-10	2	J6200
10	ELBOW, 1/2FLX1/2MIP, 90DE, E1-8D	1	J2745
11	ELBOW, STREET, 1/2, 90 DEG, SCH 80	1	J2519
12	CONDUIT W/J6257 SOLENOID, LIQ, W/WRS, D-C	1	T17097
	HOSE TO VAPORIZER (Not shown)	1	J5938

PIPE TRAIN, EL MOD VALVE 3/4", NG, 28" FAN-HEATER CE MODEL – T18811D



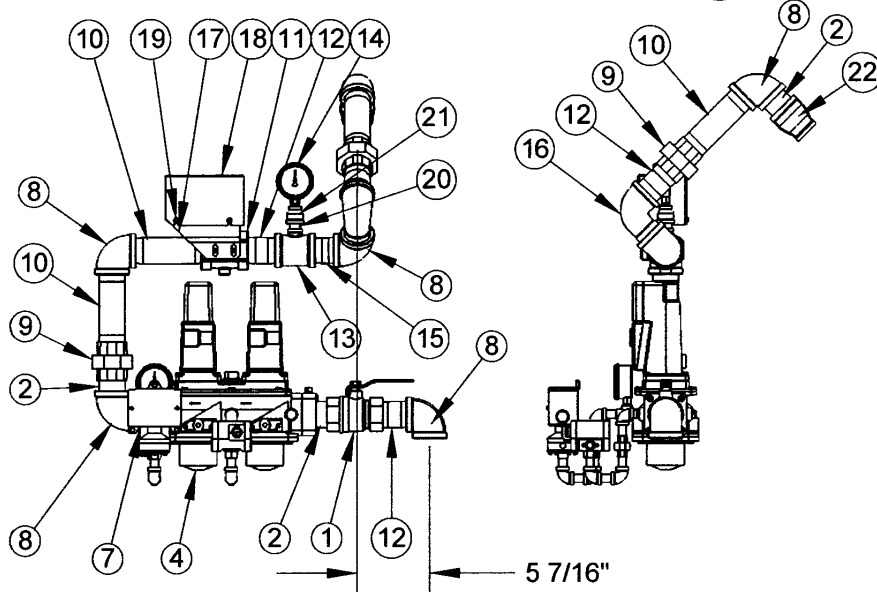
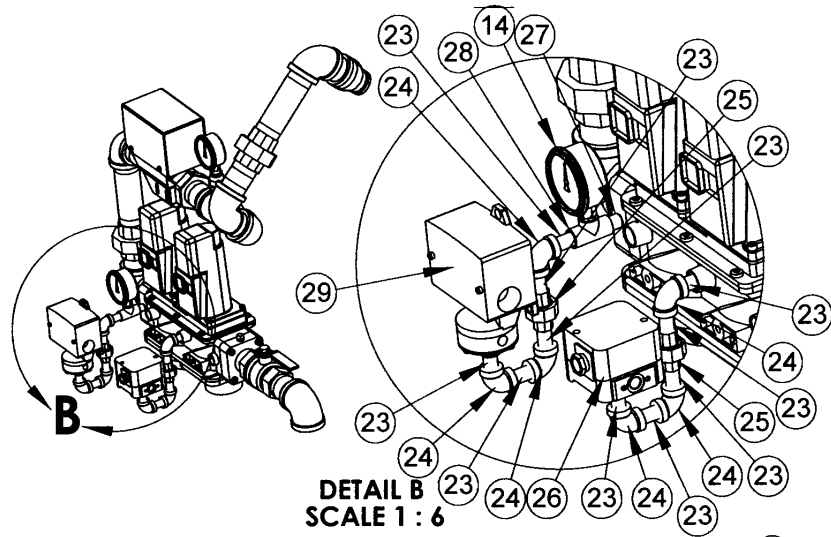
REF#	DESCRIPTION	QTY	COMP#	REF#	DESCRIPTION	QTY	COMP#
1	Valve, Gas, 3/4" Single, VGG10.2044	2	J6236	16	Bracket, Electronic Mod Valve	1	T161935
2	Nipple, 3/4 x 2, SCH 40	2	J2420	17	Screw, #10-16, 3/4, PLT, Self-drill	4	J0469
3	Elbow, 3/4, 90 deg., SCH 40	3	J2525	18	Eyebolt, Pipe Trn, 1-1/16" Sft Collar	2	T18810
4	Nipple, 3/4 x Close, SCH 40	7	J2410	19	Plug, 3/4, Pipe	1	J2620
5	Valve, 3/4, Ball	1	J6083	20	Cover, Elect. Valve, 5.625 x 3.5	1	T26902
6	Kit, NEMA 4, AGA66	2	J6241	21	Nipple, 3/4 x CLS, BRS, Hex	1	J2416
7	Actuator, SKP15.001E1	2	J6240	22	Bushing, Reducing, 3/4 x 1/4, SCH 40	1	J2570
8	Tee, 3/4 x 3/4 x 3/4, SCH 40	3	J2485	23	Nipple, 1/4" x 7/8", SCH 40	3	J24003
9	Valve, Butterfly, L/Act., 3/4, Maxon	1	J6126	24	Union, 1/4", SCH 40	1	J2703
10	Elbow, Street, 1/4, 90 deg., SCH 40	2	J2517	25	Elbow, 1/4 x 90, SCH 40	2	J2526
11	Gauge, Press., 0-15, Liq, 1/4" BTM, MT	1	J5967	26	Nipple, 1/4" x 7/8", SCH 40	1	J2411
12	Union, 3/4, Black, #150	1	J2710	27	Switch, High Pressure, 30-60 psi	1	J4432
13	Pipe, 3/4 x 10, SCH 40	1	J2429	28	Bushing, Reducing, 1/4 x 1/8	1	J2560
14	Pipe, 3/4 x 9, SCH 40	1	J24181	29	Gauge, Press., 15 psi Liquid-filled	1	J5965
15	Coupling, Reducing, 3/4 x 1/4 SC40	1	J2574		Hose from manifold (Not shown)	1	J5928

PIPE TRAIN, EL MOD VALVE 3/4", 38" & 44" FAN-HEATER LP MODEL – T18812D



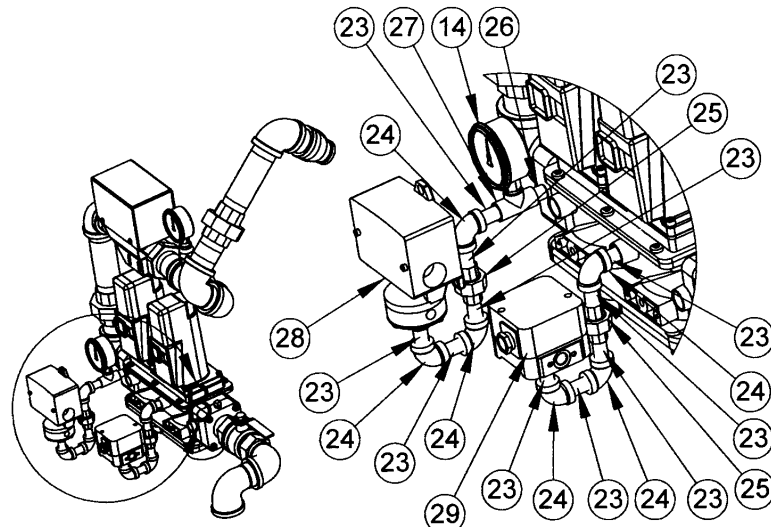
REF. #	DESCRIPTION	QTY	COMP. #	REF. #	DESCRIPTION	QTY	COMP. #
1	VLVE,BTRFL L/ACTUATOR,3/4 MAXON	1	J6126	21	GAUGE,PRES,0-30,LIQ,1/4"BTM,MT	1	J5960
2	NIPPLE,3/4 X 2,SCH 40	5	J2420	22	COVER,ELECTR VLVE, 5.625X3.5	1	T26902
3	NIPPLE,3/4 X CLOSE,SCH 40	3	J2410	23	BRACKET,ELECTRONIC MOD VALVE	1	T161935
4	NIPPLE,3/4" X 3"	1	J2423	24	VALVE,1/4", RELIEF,A1325,H120	1	J6171
5	VALVE,GAS,3/4"SNGL,VGG10.2044	2	J6236	25	NIPPLE,1/4 X 7/8",SCH 40	8	J24003
6	UNION,1/4",SCH 40	3	J2703	26	BUSHING,REDUCING,1/4X1/8	1	J2560
7	SWITCH,PRESS.,DUNGS, GW6000 A4H	2	J4443	27	GAUGE,PRES,30PSI,T6BU-1/8,PM	1	J5959
8	KIT,NEMA 4,AGA66	2	J6241	28	TEE,SIDE OUTLET, 3/4 BLACK	1	J2490
9	ACTUATOR,SKP15.001E1	2	J6240	29	BUSHING,REDUCING,3/4 x 1/4, SCH40	3	J2570
10	ELBOW,3/4,90 DEGREE,SCH 40	3	J2525	30	SWITCH,PRESS.,DUNGS, GW6000 A4	1	J4437
11	UNION,3/4,BLACK,#150	2	J2710	31	ELBOW,1/4 X 90,SCH 40	4	J2526
12	ELBOW,STREET,3/4,90 DEG,SCH 40	3	J2530	32	NIPPLE,1/4 X 2,SCH 40	2	J24001
13	REGLTR,3/4",DRILL'D+TAPP'D, 1/4" NPT	1	T19015	33	SCREW,1/4-20, 3/4 PLT, SELFDRILL	2	J0496
14	EYEBOLT,PIPE TRAIN,HEATER	1	T16224	34	STUD,WELD,RTANGLE,10-24 x 1/2" LG	1	J0975
15	NIPPLE, 3/4 X 6, SCH 80	1	J2428	35	NUT, #10-24, WING	1	J0976
16	TEE,3/4X3/4X3/4,SCH 80	1	J2491	36	NUT, HEX, 3/8-16,PLT	2	J1020
17	PLUG,3/4, PIPE	1	J2620	37	RAIN CAP, 7545-10	1	J6200
18	TEE,3/4X3/4X3/4,SCH 40	1	J2485	38	SHIM	1	T10150
19	NIPPLE, 3/4 X 6-1/2, SCH 80	1	J2427	39	CONN, DIN, ACCUATOR (SWITCH) AGA65	2	J6229
20	ELBOW,STREET,1/4,90 DEG,SCH 40	2	J2517				

PIPE TRAIN, EL MOD VALVE 1-1/2", 38" FAN-HEATER NG MODEL – T18813D

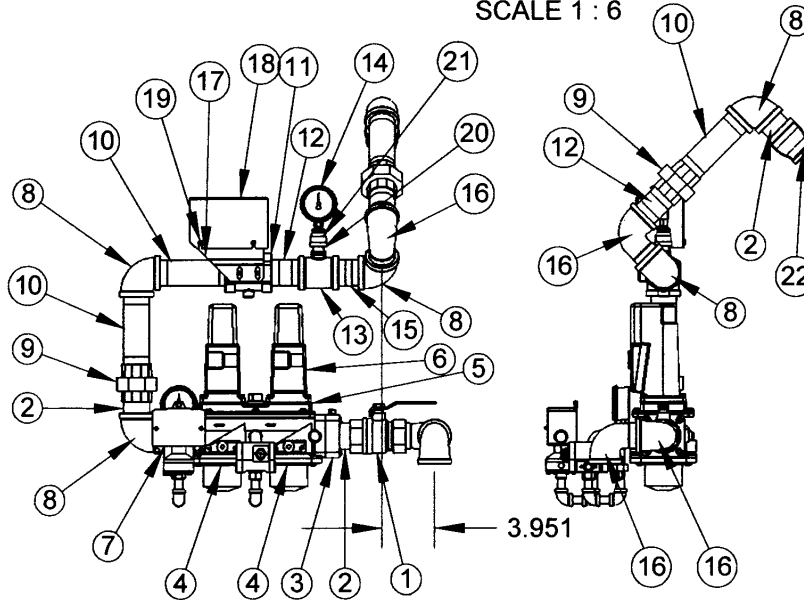


REF #	DESCRIPTION	QTY	COMP #	REF #	DESCRIPTION	QTY	COMP #
1	VALVE, 1 1/2", BALL (FIREING)	1	J6087	16	ELBOW, STREET, 1.5", 90 DEG, SCH 40	1	J2542
2	NIPPLE, 1.5 X CLOSE, SCH 40	3	J2431	17	BRACKET, ELECTRONIC MOD VALVE	1	T161935
3	FLANGE SET, 1 1/2" NPT, AGA4U	2	J6239	18	COVER, ELECT VLV, 5.625 X 3.5	1	T26902
4	VALVE, GAS, 1 1/2", DBL, VGD20.403	1	J6237	19	SCREW, #10-16, 3/4, PLT, SELFDRILL	4	J0469
5	KIT, NEMA 4, AGA66	2	J6241	20	NIPPLE, 1/2 X CLOSE, SCH 40	1	J2405
6	ACTUATOR, SKP15.001E1	2	J6240	21	COUPLNG, REDUCING, 1/2X1/4, SCH 40	1	J2572
7	NIPPLE, 1 1/2 X 2, SCH 40	1	J2432	22	COUPLING, REDUCING, 1 1/2 X 1, SCH 40	1	J2553
8	ELBOW, 1 1/2", 90 DEG, SCH 40	5	J2541	23	NIPPLE, 1/4 X 1 1/2, SCH 40	10	J24001
9	UNION, 1 1/2", SCH 40	2	J2707	24	ELBOW, 1/4X90, SCH 40	6	J2526
10	NIPPLE, 1.5 X 6", SCH 40	3	J2437	25	UNION, 1/4", SCH 40	2	J2703
11	VLV, BUTTERFLY L/ACT, 1 1/2", MAXON	1	J6127	26	SWITCH, PRESS, DUNGS, GW2000 A4	1	J4437
12	NIPPLE, 1.5 X 3", SCH 40	3	J2433	27	NIPPLE, 1/4 X 7/8, SCH 40	1	J24003
13	TEE, REDUCE, 1 1/2 X 1 1/2 X 1/2	1	J2479	28	TEE, 1/4X1/4X1/4, SCH 40	1	J2469
14	GAUGE, PRESS, 0-15, LIQ, 1/4" BTM, MT	2	J5967	29	SWITCH, HIGH PRESSURE, 30-60 PSI	1	J4432
15	NIPPLE, 1 1/2 X 2 1/2, SCH 40	1	J24084				

PIPE TRAIN, EL MOD VALVE 1-1/2", 44" FAN-HEATER NG MODEL – T18814D

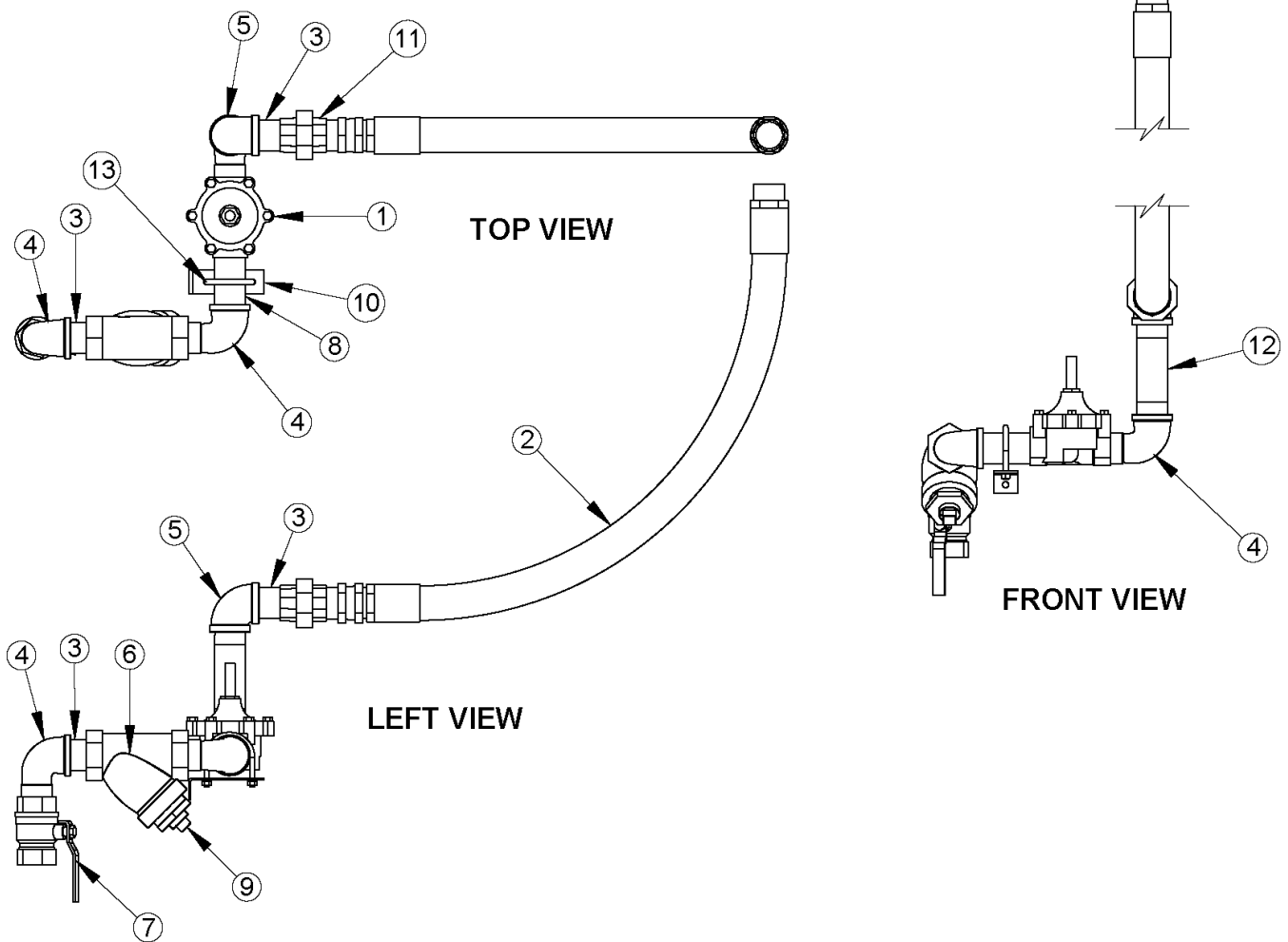


**DETAIL B
SCALE 1 : 6**



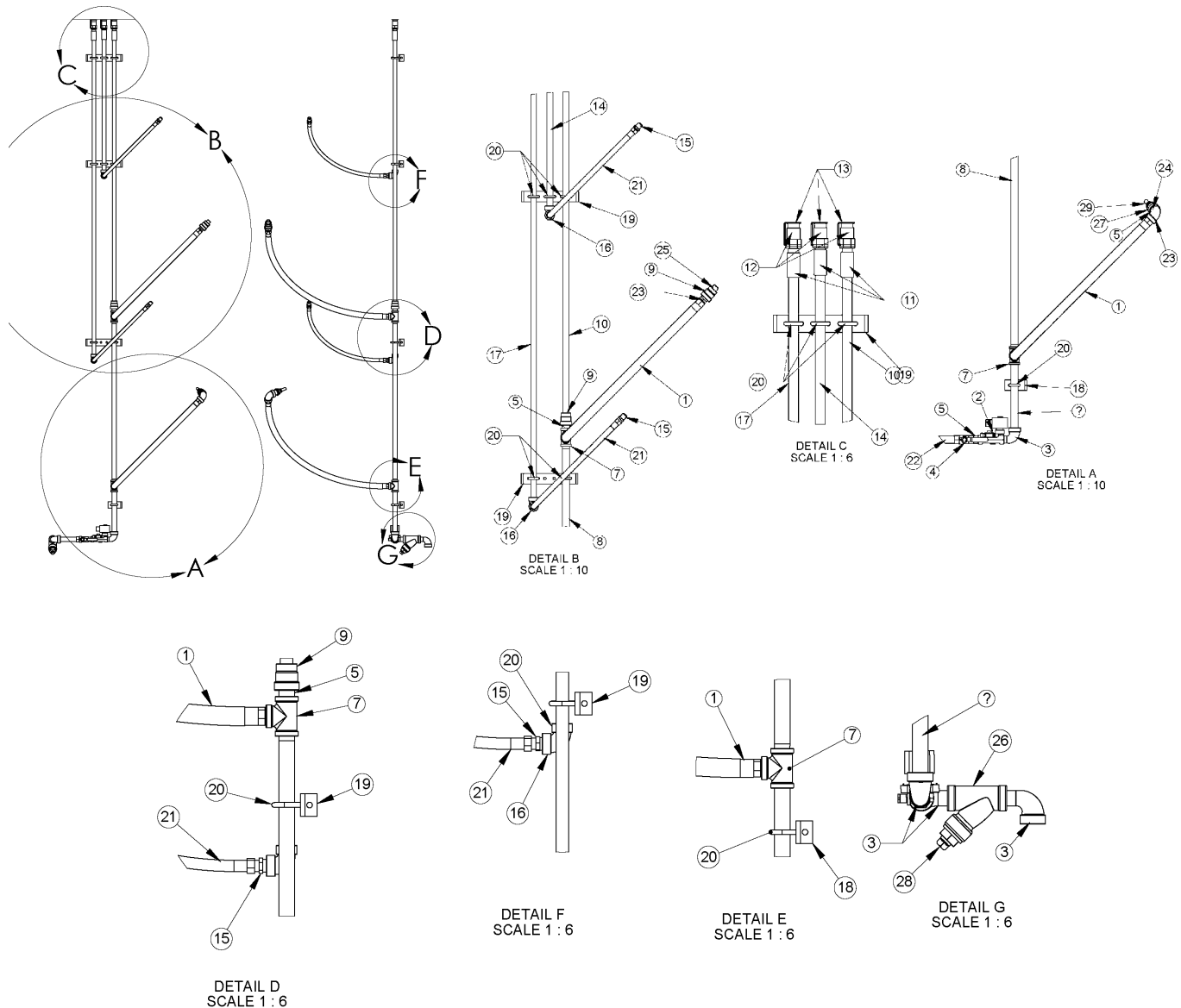
REF #	DESCRIPTION	QTY	COMP #	REF #	DESCRIPTION	QTY	COMP #
1	VALVE, 1 1/2", BALL (FIREING)	1	J6087	16	ELBOW, STREET, 1.5", 90 DEG, SCH 40	3	J2542
2	NIPPLE, 1.5 X CLOSE, SCH 40	3	J2431	17	BRACKET, ELECTRONIC MOD VALVE	1	T161935
3	FLANGE SET, 1 1/2" NPT, AGA4U	2	J6239	18	COVER, ELECTRONIC VLV, 5.625 X 3.5	1	T26902
4	VALVE, GAS, 1 1/2", DBL, VGD20.403	1	J6237	19	SCREW, #10-16, 3/4, PLT, SELFDRILL	4	J0469
5	KIT, NEMA 4, AGA66	2	J6241	20	NIPPLE, 1/2 X CLOSE, SCH 40	1	J2405
6	ACTUATOR, SKP15.001E1	2	J6240	21	COUPLING, REDUCING, 1/2X1/4, SC40	1	J2572
7	NIPPLE, 1 1/2 X 2, SCH 40	1	J2432	22	COUPLING, REDUCING, 1 1/2 X 1, SC40	1	J2553
8	ELBOW, 1 1/2", 90 DEG, SCH 40	4	J2541	23	NIPPLE, 1/4 X 1 1/2, SCH 40	10	J24001
9	UNION, 1 1/2", SCH 40	2	J2707	24	ELBOW, 1/4X90, SCH 40	6	J2526
10	NIPPLE, 1.5 X 6", SCH 40	3	J2437	25	UNION, 1/4", SCH 40	2	J2703
11	VLV, BUTTERFLY L/ACT, 1 1/2", MAXON	1	J6127	26	NIPPLE, 1/4 X 7/8, SCH 40	1	J24003
12	NIPPLE, 1.5 X 3", SCH 40	2	J2433	27	TEE, 1/4X1/4X1/4, SCH 40	1	J2469
13	TEE, REDUCE, 1 1/2 X 1 1/2 X 1/2	1	J2479	28	SWITCH, HIGH PRESSURE, 30-60 PSI	1	J4432
14	GAUGE, PRESS, 0-15, LIQ, 1/4" BTM, MT	2	J5967	29	SWITCH, PRESS, DUNGS, GW2000 A4	1	J4437
15	NIPPLE, 1 1/2 X 2 1/2, SCH 40	1	J24084				

Manifold, 12', 1 1/2", NG T25158



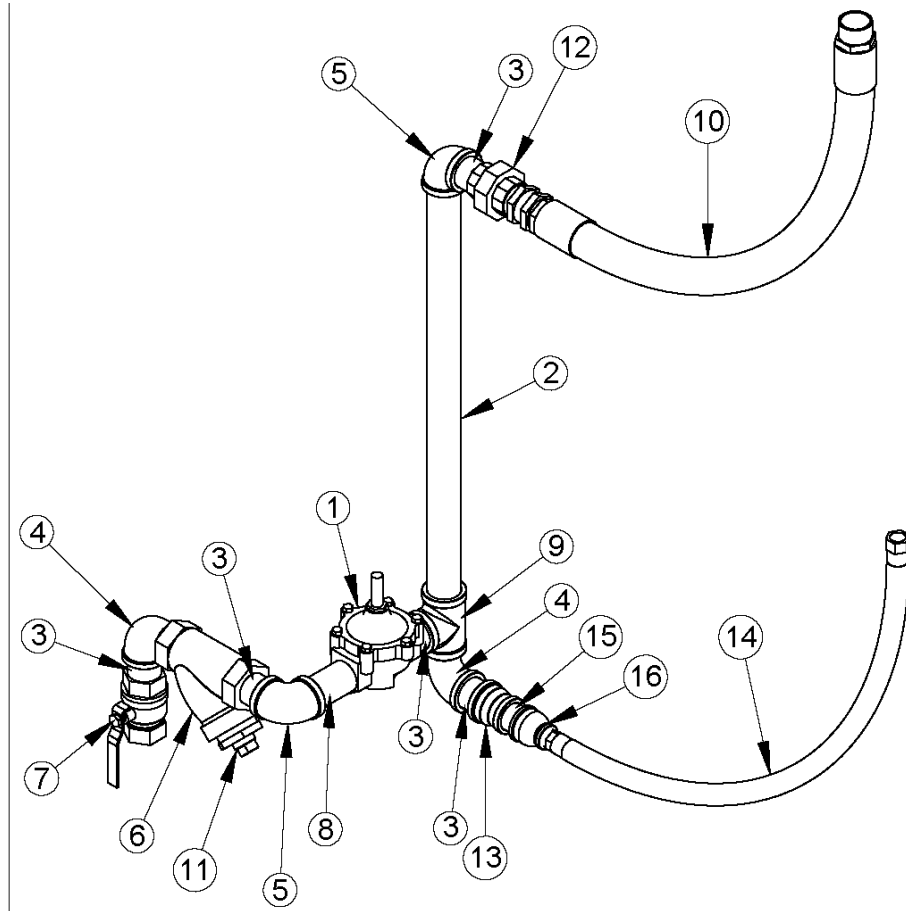
REF #	DESCRIPTION	QTY	COMP #
1	SOLENOID ASSY, NG, 1 1/2"	1	T25163
2	HOSE, NG, 1 1/2 X 36"	1	J5935
3	NIPPLE, 1.5 X CLOSE, SCH 40	2	J2431
4	ELBOW, STREET, 1.5", 90 DEG, SCH 40	3	J2542
5	ELBOW, 1 1/2", 90 DEG, SCH 40	1	J2541
6	STRAINER, 1 1/2"	1	J6232
7	VALVE, 1 1/2", BALL (FIREING)	1	J6087
8	NIPPLE, 1.5 X 4, SCH 40	1	J2436
9	PLUG, 1"	1	J2625
10	BRACKET, MANIFOLD, NG	1	T24183
11	UNION, 1 1/2", SCH 40	1	J2707
12	NIPPLE, 1.5 X 6", SCH 40	1	J2437
13	U-BOLT, 5/16-18 X 2 9/16 ID, 2 7/8 D	1	J08101

Manifold, 16' and 28' Dryer, 2/3-1/3, LP T24159C



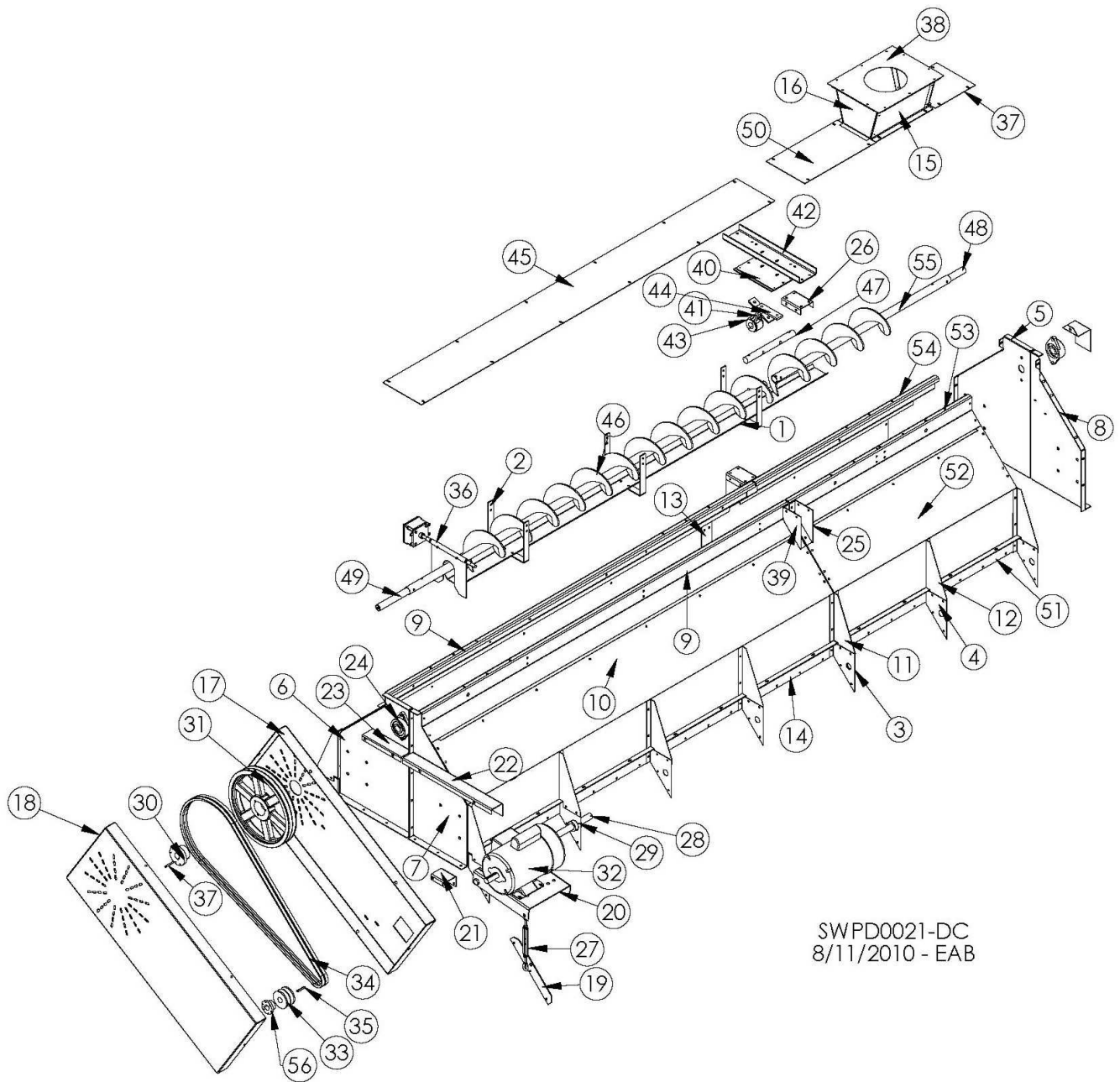
REF #	DESCRIPTION	QTY	COMP #	REF #	DESCRIPTION	QTY	COMP #
1	HOSE, HIGH PRESSURE, 3/4" X 48"	2	J5928	16	ELBOW, 1/2" X 90 DEG, SCH 80	2	J2523
2	SOLENOID ASSY, LP, 3/4", MANIFLD	1	T24166C	17	PIPE, 1/2" X 6", SCH 80	1	T24163
3	ELBOW, STREET, 3/4", 90 DEG, EX HVY	3	J2532	18	BRACKET, SHORT, MANIFOLD, LP	1	T24184
4	VALVE, 3/4", BALL	1	J6083	19	BRACKET, LONG, MANIFOLD, LP	3	T24185
5	NIPPLE, 3/4 X CLOSE, SCH 80	3	J2415	20	U-BOLT, 5/16-18, 1 1/16" ID, 1.75D	9	J0810
6	PIPE, 3/4 X 10, SCH 40	1	J2429	21	HOSE, CGA X 28 1/2", 7000808-886	2	J5938
7	TEE, 3/4X3/4X3/4, SCH 80	2	J2491	22	PIPE, 3/4 X 4 1/2, SCH 80	1	J24251
8	PIPE, THREADED, 3/4" ID, 36.75" LG	1	QS23970	23	NIPPLE, 3/4 X CLS, BRS, HEX	2	J2416
9	COUPLING, REDUC, 3/4X1/2, SCH 80	2	J25751	24	ELBOW, 3/4, 90 DEG, SCH 80	1	J2531
10	PIPE, 1/2" X 5', SCH 80	1	T24162	25	NIPPLE, 1/2" X CLOSE, SCH 80	1	J2407
11	COUPLING, 1/2", SCH 80	3	J2577	26	STRAINER, 3/4"	1	J6230
12	VALVE, 1/2", RELIEF, 3129G, H135-2	3	J6170	27	COUPLING, REDUCING, 3/4 X 1/4, SC80	1	J25741
13	RAIN CAP, 7545-10	3	J6200	28	PLUG, 1/2, SQ HD, BLACK	1	J2617
14	PIPE, 1/2" X 2 1/2', SCH 80	1	T24161	29	NIPPLE, 1/4 X 1 1/2", BLK PIPE SCH 80	1	J2400
15	UNION, 1/2 FL X 1/2 NIP	4	J2840				

**Manifold, 16' and 28' Dryer, 1 ½", 38" or 44",
2/3-1/3, NG - T25168S**



REF #	DESCRIPTION	QTY	COMP #
1	SOLENOID ASSY, NG, 1 ½", MANIFOLD	1	T25163S
2	PIPE, 1 ½ X 29", SCH 40	1	T25164
3	NIPPLE, 1.5 X CLOSE, SCH 40	5	J2431
4	ELBOW, STREET, 1.5", 90 DEG, SCH 40	2	J2542
5	ELBOW, 1 ½", 90 DEG, SCH 40	2	J2541
6	STRAINER, 1 ½"	1	J6232
7	VALVE, 1 ½", BALL (FIREING)	1	J6087
8	NIPPLE, 1.5 X 4" SCH 40	1	J2436
9	TEE, 1 ½ X 1 ½ X 1 ½, SCH 40	1	J2476
10	HOSE, NG, 1 ½ X 36"	1	J5935
11	PLUG, 1"	1	J2625
12	UNION, 1 ½", SCH 40	1	J2707
13	COUPLING, REDUCE, 1 ½ X 1 ¼	1	J2555
14	HOSE, HIGH PRESSURE, ¾" X 48"	1	J5928
15	NIPPLE, 1.25 X CLOSE	1	J2500
16	COUPLING, REDUCING, 1 ¼ X ¾ SCH 40	1	J2576

12' WET BIN

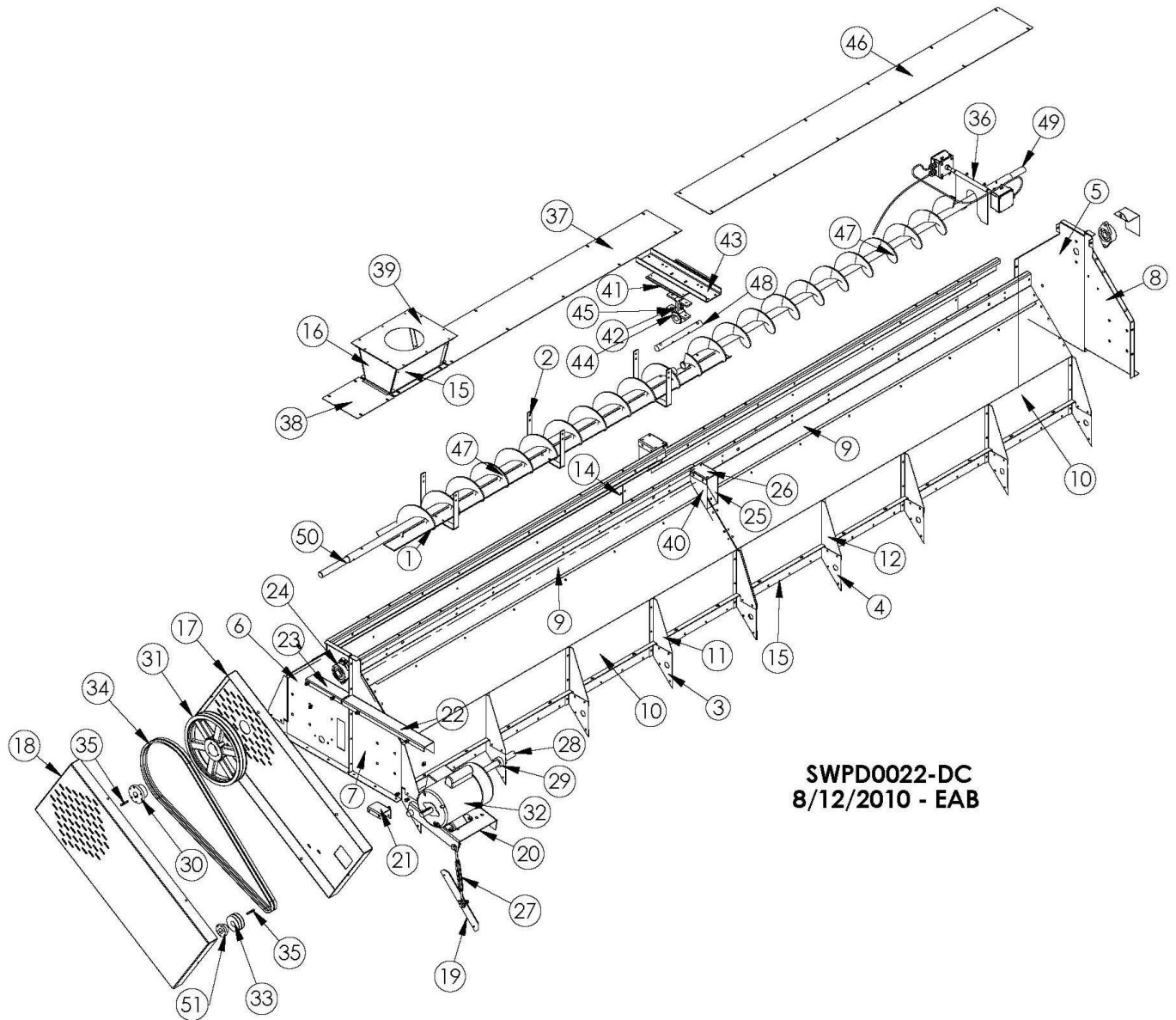


SWPD0021-DC
8/11/2010 - EAB

12' WET BIN

REF. #	DESCRIPTION	QTY	COMP. #
1	Trash Pan	1	T16235
2	Support, Trash Pan	3	T16236
3	Left Support Gusset	8	T16117
4	Right Support Gusset	8	T16118
5	RR Wet Bin End Plate	1	T17401
6	RF Wet Bin End Plate	1	T17400
7	LF Wet Bin End Plate	1	T17402
8	LR Wet Bin End Plate	1	T17403
9	Top 8' Panel Fill Switch	2	T17457
10	Wet Bin Side (Stainless, Perf)	2	T17450S
	Wet Bin Side (.094, Galvanized, Perf)	2	T17450
	Wet Bin Side (.063, Galvanized, Perf)	2	T17441W
11	LT Pivot Brace Wet Bin	10	T17410
12	RT Pivot Brace Wet Bin	6	T17411
13	Splice, Wet Bin Side	2	T17412
14	Bolt Down Lip 8' 2000	2	T17453
15	Hopper Side	2	T17935
16	Hopper End	2	T17936
17	Top Auger Shield (Inner)	1	T16256
18	Top Auger Shield (Outer)	1	T16255
19	Plate, Turnbuckle, Connector	1	T16283
20	Top Motor Mount	1	T16277
21	Top Shield Brace	1	T16258
22	Bracket, LF Top Auger Shield	1	T16861
23	Bracket, RF Top Auger Shield	1	T16860
24	Bearing, 1.25, FLG, W/LC, HCFTS207-20	2	J0010
25	Splice Gusset Right	2	T16145
26	Splice Channel Short	2	T16146
27	Turnbuckle, 3/8" x 6"	1	J0904
28	Pivot, Motor Mount, Top	1	T18150
29	Collar, Shaft, 1-3/16"	2	J1338
30	Bushing, 1.25, SK	1	J0410
31	Pulley, 15.75 OD, DBL "B" Gr, SK	1	J03992
32	Motor (US only)	-	-
33	Pulley, 4.15 OD, DBL, B, Cast	1	J03352
34	Belt, B95	2	J0252
35	Key, 1/4 x 1/4 x 2"	2	F4499
36	Paddle, Assembly, D-C	1	T18262E
37	Lid, Extension, Wet Bin	1	T16159
38	Cover, Hopper	1	T17937
39	Splice Gusset Left	2	T16144
40	Crimp Plate	1	T16142
41	Hanger, Auger, T, 6CH2203	1	J0097
42	Splice Channel	1	T16143
43	Bushing, Wood, 1.25" ID	1	J0096
44	Spacer, T-Hanger, Top Auger	1	T16096
45	Lid, Wet Holding Bin	1	T16158
46	Top Auger	1	T16428
47	Stub Shaft	1	F4720
48	Bottom Auger Shaft	1	G73291
49	Auger Shaft, Top Front	1	T16436
50	Lid, Bin, Wet HLD. 12"	1	T12519
51	Bolt Down Lip, 4'	2	T12524
52	Side, Wet Bin, 4' (Galvanized, Perf)	2	T12525
	Side, Wet Bin, 4' (Stainless, Perf)	2	T12525S
	Side, Wet Bin, 4' (.063, Galvanized, Perf)	2	T12536W
53	Top 4' Panel (LR) 12'	1	T12526
54	Top 4' Panel (RR) 12'	1	T12527
55	4' Rear, Top Auger	1	T12503
56	Bushing, 28 mm	1	J04275

16' WET BIN

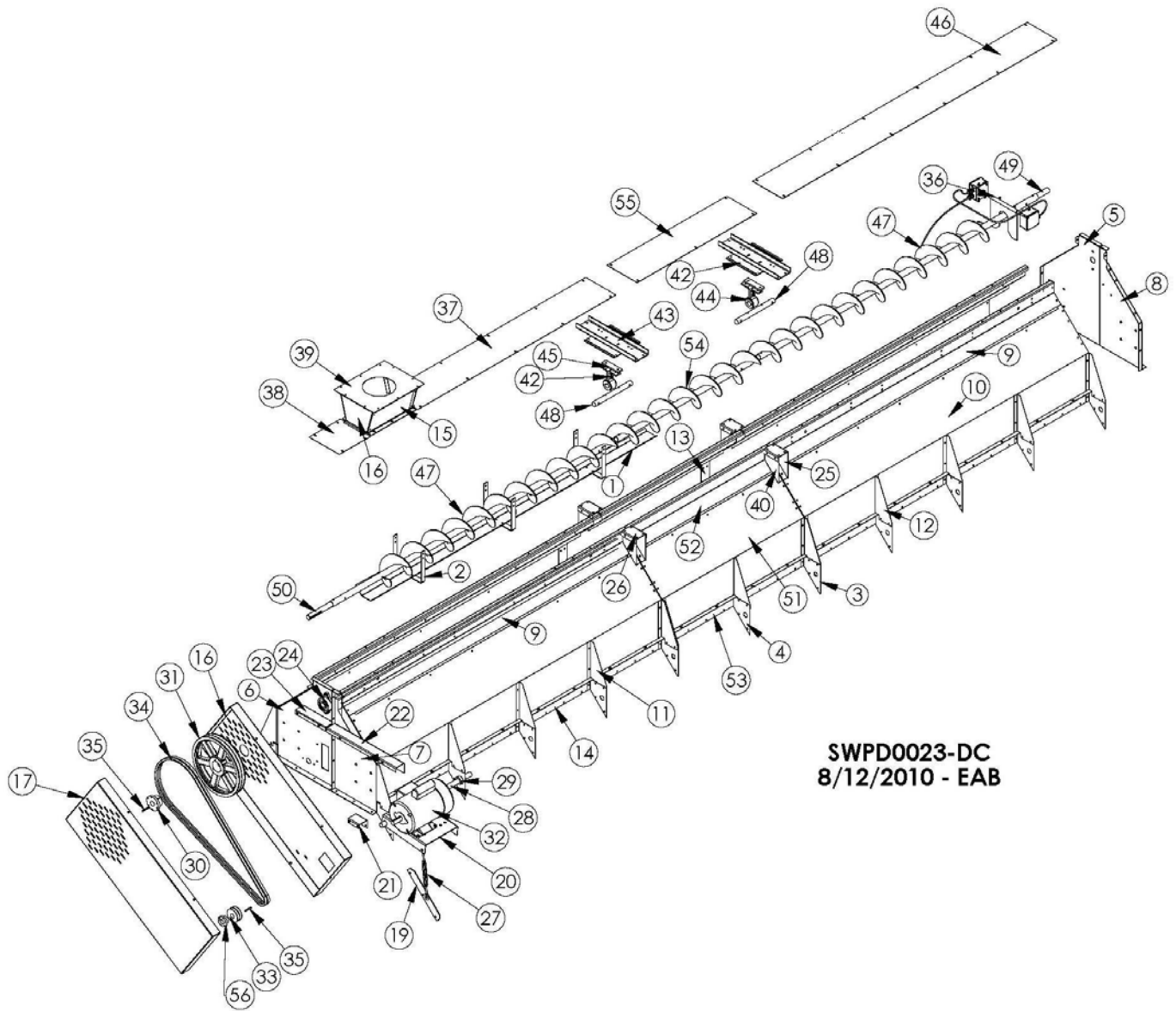


SWPD0022-DC
8/12/2010 - EAB

16' WET BIN

REF. #	DESCRIPTION	QTY	COMP. #
1	Trash Pan	1	T16235
2	Support, Trash Pan	3	T16236
3	Left Support Gusset	12	T16117
4	Right Support Gusset	8	T16118
5	RR Wet Bin End Plate	1	T17401
6	RF Wet Bin End Plate	1	T17400
7	LF Wet Bin End Plate	1	T17402
8	LR Wet Bin End Plate	1	T17403
9	Top 8' Panel Fill Switch	4	T17457
10	Wet Bin Side (Stainless, Perf)	4	T17450S
	Wet Bin Side (.094, Galvanized, Perf)	4	T17450
	Wet Bin Side (.063, Galvanized, Perf)	4	T17441W
11	LT Pivot Brace Wet Bin	12	T17410
12	RT Pivot Brace Wet Bin	8	T17411
13	Splice, Wet Bin Side	2	T17412
14	Bolt Down Lip 8', 2000	4	T17453
15	Hopper Side	2	T17935
16	Hopper End	2	T17936
17	Top Auger Shield (Inner)	1	T16256
18	Top Auger Shield (Outer)	1	T16255
19	Plate, Turnbuckle, Connector	1	T16283
20	Top Motor Mount	1	T16277
21	Top Shield Brace	1	T16258
22	Bracket, LF Top Auger Shield	1	T16861
23	Bracket, RF Top Auger Shield	1	T16860
24	Bearing, 1.25, FLG, W/LC, HCFTS207 - 20	2	J0010
25	Splice Gusset Right	2	T16145
26	Channel, Splice, Short	2	T16146
27	Turnbuckle, 3/8" x 6"	1	J0904
28	Pivot, Motor Mount, Top	1	T18150
29	Collar, Shaft, 1-3/16"	2	J1338
30	Bushing, 1.25 SK	1	J0410
31	Pulley, 15.75OD, Double "B" Gr. SK	1	J03992
32	Motor (US only)	-	-
33	Pulley, 4.15 OD, Double, B, Cast	1	J03352
34	Belt, B95	2	J0252
35	Key, 1/4 x 1/4 x 2	2	F4499
36	Paddle, Assembly, D-C	1	T18262E
37	Lid, Wet Holding Bin	1	T16157
38	Lid, 10.5", Extension, Wet Bin	1	T16159
39	Cover, Hopper	1	T17937
40	Splice Gusset Left	2	T16144
41	Crimp Plate	1	T16142
42	Hanger, Auger, T, 6CH2203	1	J0097
43	Splice Channel	1	T16143
44	Bushing, Wood, 1.25" ID	1	J0096
45	Spacer, T-Hanger, Top auger	1	T16096
46	Lid, 92-1/2" Wet Holding Bin	1	T16158
47	Top Auger	2	T16428
48	Shaft, 8' Hanger Bearing	1	F4720
49	Shaft, 1.25" x 9"	1	G73291
50	Shaft, Top Front, 12-3/4"	1	T16436
51	Bushing, 28 mm	1	J04275

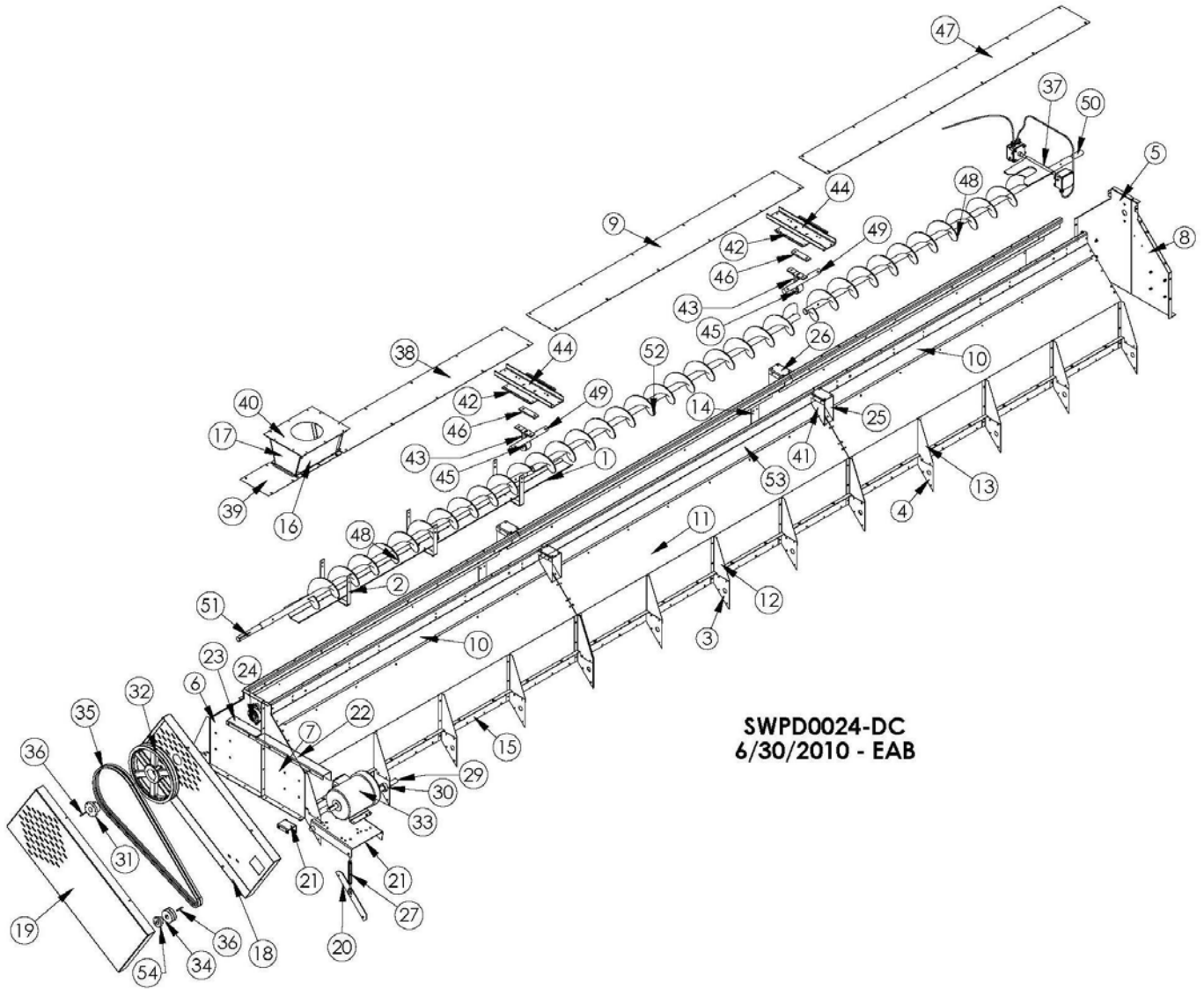
20' WET BIN



20' WET BIN

REF. #	DESCRIPTION	QTY	COMP. #
1	Trash Pan	1	T16235
2	Support, Trash Pan	3	T16236
3	Left Support Gusset	16	T16117
4	Right Support Gusset	10	T16118
5	RR Wet Bin End Plate	1	T17401
6	RF Wet Bin End Plate	1	T17400
7	LF Wet Bin End Plate	1	T17402
8	LR Wet Bin End Plate	1	T17403
9	Top 8' Panel Fill Switch	4	T17457
10	Wet Bin Side (Stainless, Perf)	4	T17450S
	Wet Bin Side (.094, Galvanized, Perf)	4	T17450
	Wet Bin Side (.063, Galvanized, Perf)	4	T17441W
11	LT Pivot Brace Wet Bin	12	T17410
12	RT Pivot Brace Wet Bin	8	T17411
13	Splice, Wet Bin Side	2	T17412
14	Bolt Down Lip 8', 2000	4	T17453
15	Hopper Side	2	T17935
16	Hopper End	2	T17936
17	Top Auger Shield (Inner)	1	T16256
18	Top Auger Shield (Outer)	1	T16255
19	Plate, Turnbuckle, Connector	1	T16283
20	Top Motor Mount	1	T16277
21	Top Shield Brace	1	T16258
22	Bracket, LF Top Auger Shield	1	T16861
23	Bracket, RF Top Auger Shield	1	T16860
24	Bearing, 1.25, FLG, W/LC, HCFTS207 - 20	2	J0010
25	Splice Gusset Right	2	T16145
26	Channel, Splice, Short	2	T16146
27	Turnbuckle, 3/8" x 6"	1	J0904
28	Pivot, Motor Mount, Top	1	T18150
29	Collar, Shaft, 1-3/16"	2	J1338
30	Bushing, 1.25 SK	1	J0410
31	Pulley, 15.75OD, Double "B" Gr. SK	1	J03992
32	Motor (US only)	-	-
33	Pulley, 4.15 OD, Double, B, Cast	1	J03352
34	Belt, B95	2	J0252
35	Key, 1/4 x 1/4 x 2	2	F4499
36	Paddle, Assembly, D-C	1	T18262E
37	Lid, Wet Holding Bin	1	T16157
38	Lid, 10.5", Extension, Wet Bin	1	T16159
39	Cover, Hopper	1	T17937
40	Splice Gusset Left	2	T16144
41	Crimp Plate	1	T16142
42	Hanger, Auger, T, 6CH2203	1	J0097
43	Splice Channel	1	T16143
44	Bushing, Wood, 1.25" ID	1	J0096
45	Spacer, T-Hanger, Top auger	1	T16096
46	Lid, 92-1/2" Wet Holding Bin	1	T16158
47	Top Auger	2	T16428
48	Shaft, 8' Hanger Bearing	2	F4720
49	Shaft, 1.25" x 9"	1	G73291
50	Shaft, Top Front, 12-3/4"	1	T16436
51	Side, Wet Bin, 4', 2000	2	T12525
	Side, Wet Bin, 4' (.063, Galvanized, Perf)	2	T12536W
52	Top 4' Panel (LR) 12'	2	T20526
53	Bolt Down Lip, 4'	2	T12524
54	Top Middle Auger 20'	1	T16427
55	Lid, Wet Holding Bin 20'	1	T20158
56	Bushing, 28 mm	1	J04275

24' WET BIN

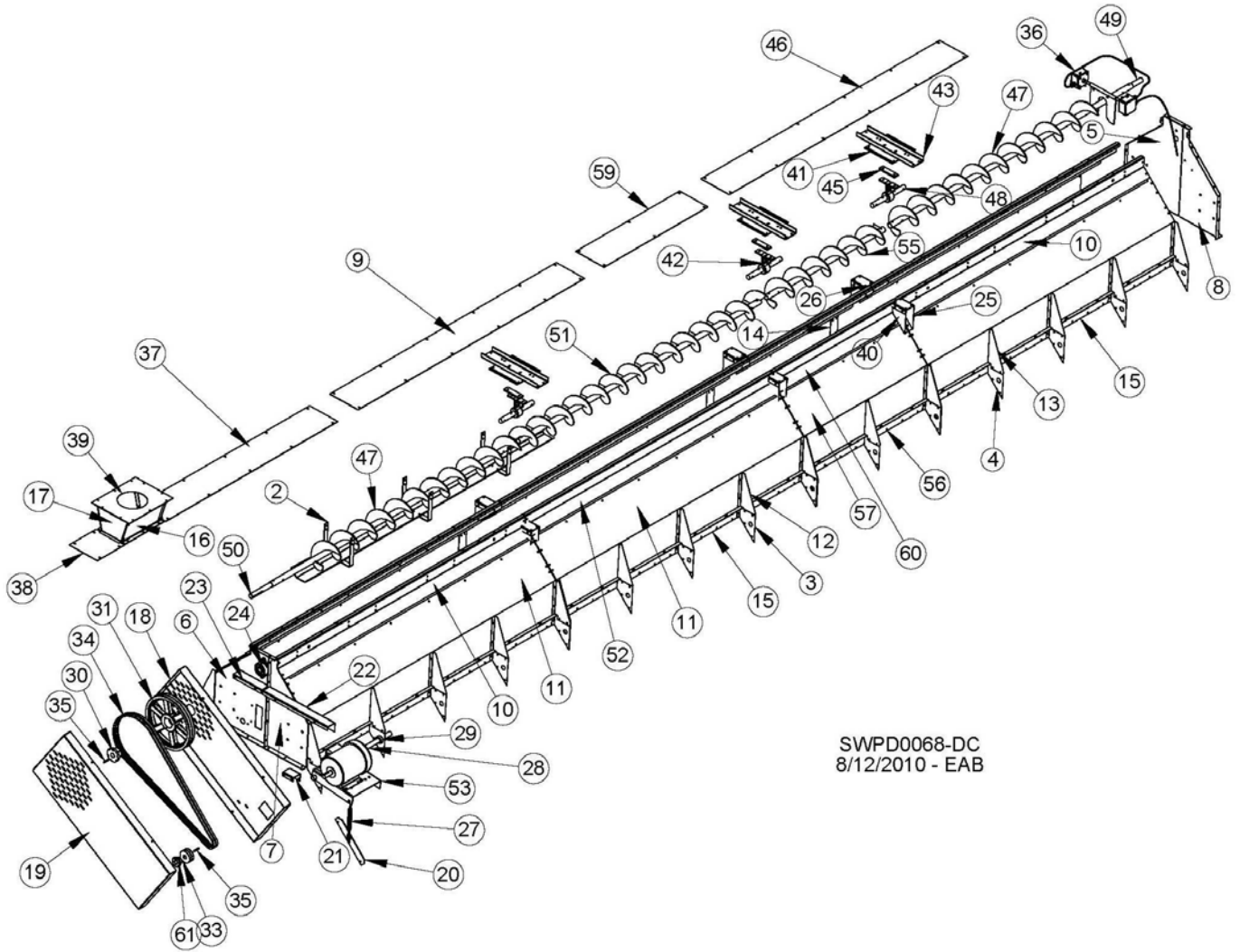


SWPD0024-DC
6/30/2010 - EAB

24' WET BIN

REF. #	DESCRIPTION	QTY	COMP. #
1	Trash Pan	1	T16235
2	Support, Trash Pan	3	T16236
3	Left Support Gusset	18	T16117
4	Right Support Gusset	12	T16118
5	RR Wet Bin End Plate	1	T17401
6	RF Wet Bin End Plate	1	T17400
7	LF Wet Bin End Plate	1	T17402
8	LR Wet Bin End Plate	1	T17403
9	Lid, 87-3/4" Wet Holding Bin	1	T16167
10	Top 8' Panel Fill Switch	4	T17457
11	Wet Bin Side (Stainless, Perf)	6	T17450S
	Wet Bin Side (.094, Galvanized, Perf)	6	T17450
	Wet Bin Side (.063, Galvanized, Perf)	6	T17441W
12	LT Pivot Brace Wet Bin	18	T17410
13	RT Pivot Brace Wet Bin	12	T17411
14	Splice, Wet Bin Side	4	T17412
15	Bolt Down Lip 8', 2000	6	T17453
16	Hopper Side	2	T17935
17	Hopper End	2	T17936
18	Top Auger Shield (Inner)	1	T16256
19	Top Auger Shield (Outer)	1	T16255
20	Plate, Turnbuckle, Connector	1	T16283
21	Top Motor Mount	1	T16277
22	Top Shield Brace	1	T16258
23	Bracket, LF Top Auger Shield	1	T16861
24	Bracket, RF Top Auger Shield	1	T16860
25	Bearing, 1.25, FLG, W/LC, HCFTS207 - 20	2	J0010
26	Splice Gusset Right	4	T16145
27	Channel, Splice, Short	4	T16146
28	Turnbuckle, 3/8" x 6"	1	J0904
29	Pivot, Motor Mount, Top	1	T18150
30	Collar, Shaft, 1-3/16"	2	J1338
31	Bushing, 1.25 SK	1	J0410
32	Pulley, 15.75OD, Double "B" Gr. SK	1	J03992
33	Motor (US only)	-	-
34	Pulley, 4.15 OD, Double, B, Cast	1	J03352
35	Belt, B95	2	J0252
36	Key, 1/4 x 1/4 x 2	2	F4499
37	Paddle, Assembly, D-C	1	T18262E
38	Lid, Wet Holding Bin	1	T16157
39	Lid, 10.5", Extension, Wet Bin	1	T16159
40	Cover, Hopper	1	T17937
41	Splice Gusset Left	4	T16144
42	Crimp Plate	2	T16142
43	Hanger, Auger, T, 6CH2203	2	J0097
44	Splice Channel	2	T16143
45	Bushing, Wood, 1.25" ID	2	J0096
46	Spacer, T-Hanger, Top auger	2	T16096
47	Lid, 92-1/2" Wet Holding Bin	1	T16158
48	Top Auger	2	T16428
49	Shaft, 8' Hanger Bearing	2	F4720
50	Shaft, 1.25" x 9"	1	G73291
51	Shaft, Top Front, 12-3/4"	1	T16436
52	Auger, Bottom Front, 93-1/2"	1	T16430
53	Top 8' Panel (LR&RF) 2000	2	T24451
54	Bushing, 28 mm	1	J04275

28' WET BIN

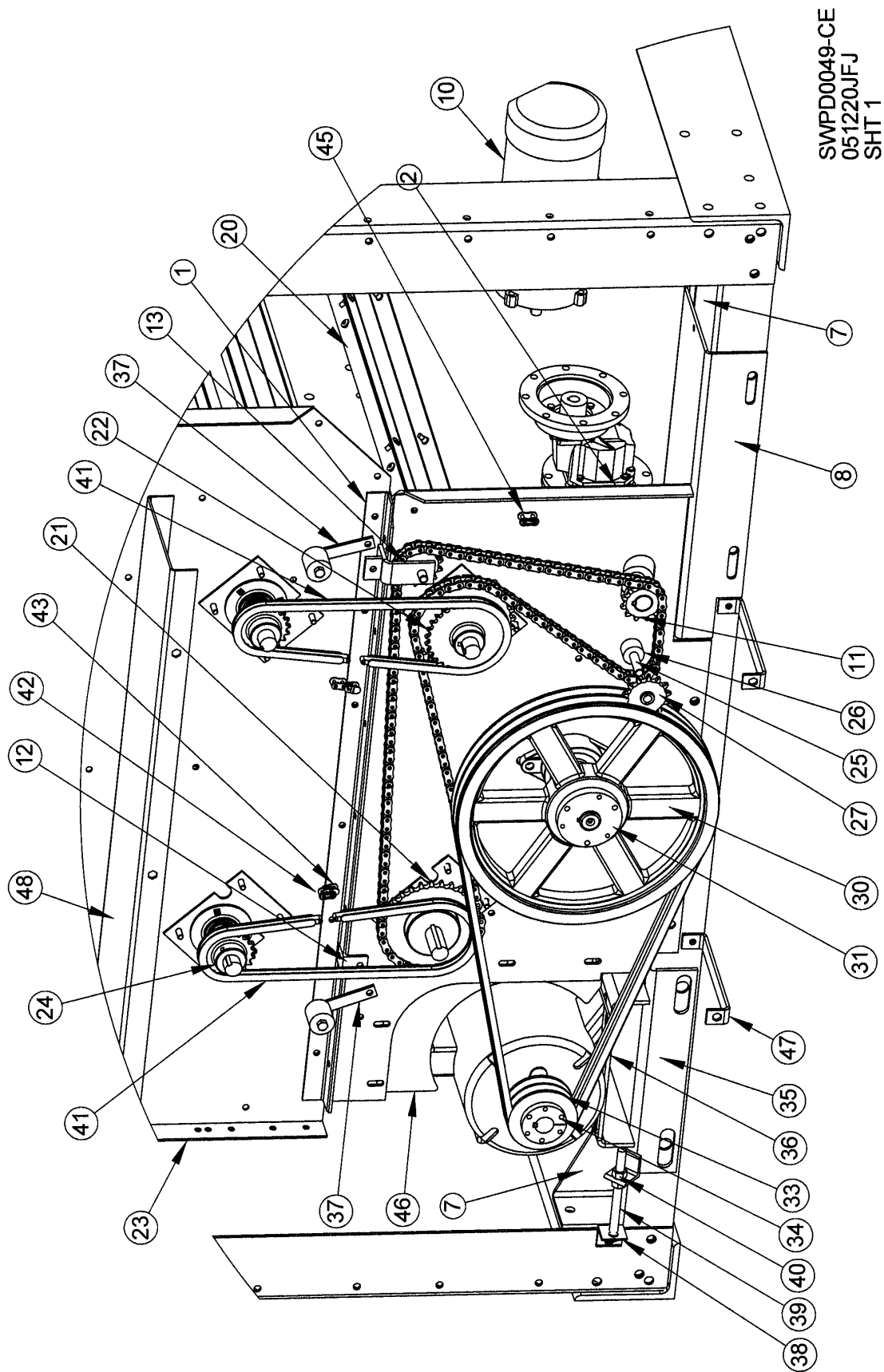


SWPD0068-DC
8/12/2010 - EAB

28' WET BIN

REF #	DESCRIPTION	QTY	COMP #
1	TRASH PAN	1	T16235
2	SUPPORT, TRASH PAN	3	T16236
3	LEFT SUPPORT GUSSET	20	T16117
4	RIGHT SUPPORT GUSSET	16	T16118
5	RR WET BIN END PLATE	1	T17401
6	RF WET BIN END PLATE	1	T17400
7	LF WET BIN END PLATE	1	T17402
8	LR WET BIN END PLATE	1	T17403
9	LID 87-3/4" WET HOLDING BIN	1	T16167
10	TOP 8' PANEL	4	T17457
11	WET BIN SIDE PERF, 2000	6	T17450S
	WET BIN SIDE (.063, GALV, PERF)	6	T17441W
12	LT PIVOR BRACE WET BIN	20	T17410
13	RT PIVOR BRACE WET BIN	16	T17411
14	SPLICE, WET BIN SIDE	6	T17412
15	BOLT DOWN LIP 8' 2000	6	T1745.
16	HOPPER SIDE	2	T17935
17	HOPPER END	2	T17936
18	TOP AUGER SHIELD (INNER)	1	T16256
19	TOP AUGER SHIELD (OUTER)	1	T16255
20	PLATE, TURNBUCKLE, MTR MNT	11	T16283
21	TOP SHIELD BRACE	1	T16258
22	BRACKET, LF TOP AUGER SHIELD	1	T16861
23	BRACKET, LF TOP AUGER SHIELD	1	T16860
24	BRACKET, RF TOP AUGER SHIELD	2	J0010
25	SPLICE GUSSET RIGHT	6	T16145
26	CHANNEL, SPLICE, SHORT	6	T16146
27	TURNBUCKLE, 3/8" X 6"	1	J0904
28	PIVOT, MOTOR MOUNT, TOP	1	T18150
29	COLLAR, SHAFT, 1 3/16"	2	J1338
30	BUSHING, 1 1/4" SK	1	J0410
31	PULLEY, 15.75OD, DBL "B" GR, SK	1	J03992
32	Motor (US only)	-	-
33	PULLEY, 4.15 OD, DBL, B, CAST	1	J03352
34	BELT, B95	2	J0252
35	KEY, 1/4 X 1/4 X 2	2	F4499
36	PADDLE, ASSY, D-C	1	T18262E
37	LID, WET HOLDING BIN	1	T16157
38	LID, 10.5", EXTENSION, WET BIN	1	T16159
39	COVER, HOPPER	1	T17937
40	SPLICE GUSSET LEFT	6	T16144
41	CRIMP PLATE	3	T16142
42	HANGER, AUGER, T, 6CH2203	3	J0097
43	SPLICE CHANNEL	3	T16143
44	BUSHING, WOOD, 1.25" I.D.	3	J0096
45	SPACER, T-HANGER, TOP AUGER	3	T16096
46	LID 92 1/2" WET HOLDING BIN	2	T16158
47	TOP AUGER	2	T16428
48	SHAFT, 8" HANGER BEARING	3	F4720
49	SHAFT, 1.25" X 9"	1	G73291
50	SHAFT, TOP FRONT, 12 3/4"	1	T16436
51	AUGER, BOTTOM FRONT, 93 1/2"	1	T16430
52	TOP 8' PANEL	2	T24451
53	MOTOR MOUNT, TOP LOAD	1	T16277
54	PLATE, COVER RF GARNER END	1	T17415
55	TOP MIDDLE AUGER (20 FT)	1	T16427
56	BOLT DOWN LIP, 4 FT 2000	2	T12524
57	SIDE, WET BIN, 4FT 2000	2	T12525
	SIDE, WET BIN, 4' (.063, GALV, PERF)	2	T12536W
58	PLATE, SHORT SPLICE	6	T16141
59	LID, WET HOLD BIN 40.25"	1	T20158
60	TOP 4' PANEL (LR) 12FT 2000	2	T20526
61	BUSHING, 28 mm	1	J04275

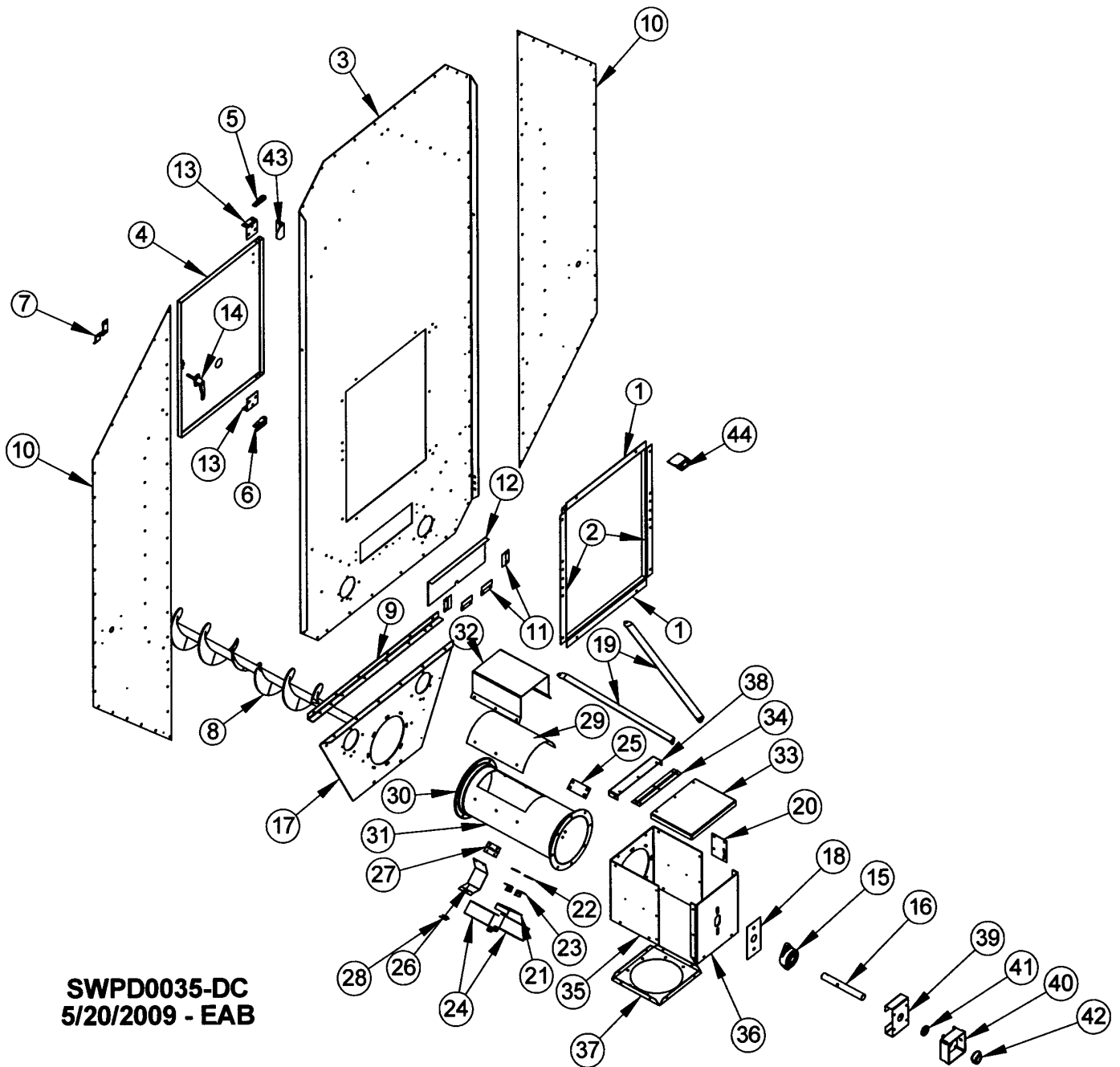
METERING ROLLS & UNLOAD AUGER DRIVES



METERING ROLLS & UNLOAD AUGER DRIVES

REF#	DESCRIPTION	QTY	COMP#	REF#	DESCRIPTION	QTY	COMP#
1	Splice, Bottom Angle (2005)	1	T17964	26	Spacer, Sprocket	2	T16282
2	Plate, Bottom Front End (2005)	1	T17963	27	Sprocket, Idler, 50-13	2	J1685
3	Front Cross Channel	1	T16326	28	Shaft, Top Front, 12-3/4"	1	T16436
4	Wide Vertical Support	2	T16322	29	Bearing, 1.25, FLG, W/LC, HCFTS207-20	1	J0010
5	Left Frame Angle, Jacks	1	T12518	30	Pulley, 15.75OD, Dbl "B" GR, SK	1	J03992
6	Right Frame Angle, Jacks	1	T12517	31	Bushing, 1-1/4" SK	1	J0410
7	DC Motor Brace	2	T16328	33	Pulley, 4.15"OD, 2B38SH	1	J03352
8	Mount, Motor DC (2005)	1	T17284	34	Bushing, 28MM SH	1	J04275
9	Reducer, Speed, 150:1 (2005)	1	J3682	35	Unload Motor Mount Weldment	2	T16290
10	Motor, 1 HP, 230V AC, 1750 RPM TEFC	1	H1143	36	Belt, B x 73, (15.75 x 4.15) 28'	2	J02392
11	Sprocket, 50B12, 1.125" BR	1	J16612		Belt, 12' + 16'	2	J0246
12	Chain Tightener Bracket	1	T16274	37	Chain Tightener	2	T7367
13	Bracket Weldment, Idler Sprocket	1	T17965	38	Tightener Angle	1	T16329
14	Meter Plate	4	T17920	39	Bolt, 1/2-13 x 6, PLT, GR5, TAP	1	J0765
15	Bolt, 5/16-18, 1.00, PLT, G5, HHWZ	16	J0537	40	Nut, Hex, 1/2-13, PLT	2	J1040
16	Nut, Tinnernan, 5/16-18	16	J1009	41	Chain, #40, 73 Links	2	T16800
17	Flangette, 3-hole, for 205 Brg. (BRH52MS)	8	J0098	42	Chain, Link, #40 Connector	2	J1745
18	Brg., 1", Center, FH205-16, W/L CLR	4	J0005	43	Chain, Link, #40 Offset, 1/2 Link	2	J1750
19	Front Shaft, Meter Roll	4	T16266	44	Chain, #50, 157 Links, 2005	1	T16803
20	Metering Roll Assy. 8', Galv.	4	T16297	45	Chain, Link, #50 Connector	1	J1760
21	Sprocket, 50B30, 1.000" BR	2	J1678	46	Shield, Motor, 7-1/2 Hp, 28'	1	T17970
22	Sprocket, 40B, 30-Tooth, 1" Bore, Keyed	2	J1649		Shield, 12' + 16'	1	T17928
23	Panel, Front End, 2/3-1/3, 38"-28"	1	T24820	47	Brace, Front Shield	2	T16412
24	Sprocket, 40B, 20-Tooth, 1" Bore, Keyed	2	J16487	48	Front Shield Mounting Bracket	1	T16411
25	Screw, 1/2-13, 3, 6PLT, GR5, HHCS	2	J0750	49	Front Chain Shield	1	T16410

DRIVE END OF DRYERS, SINGLE FAN - BACK END

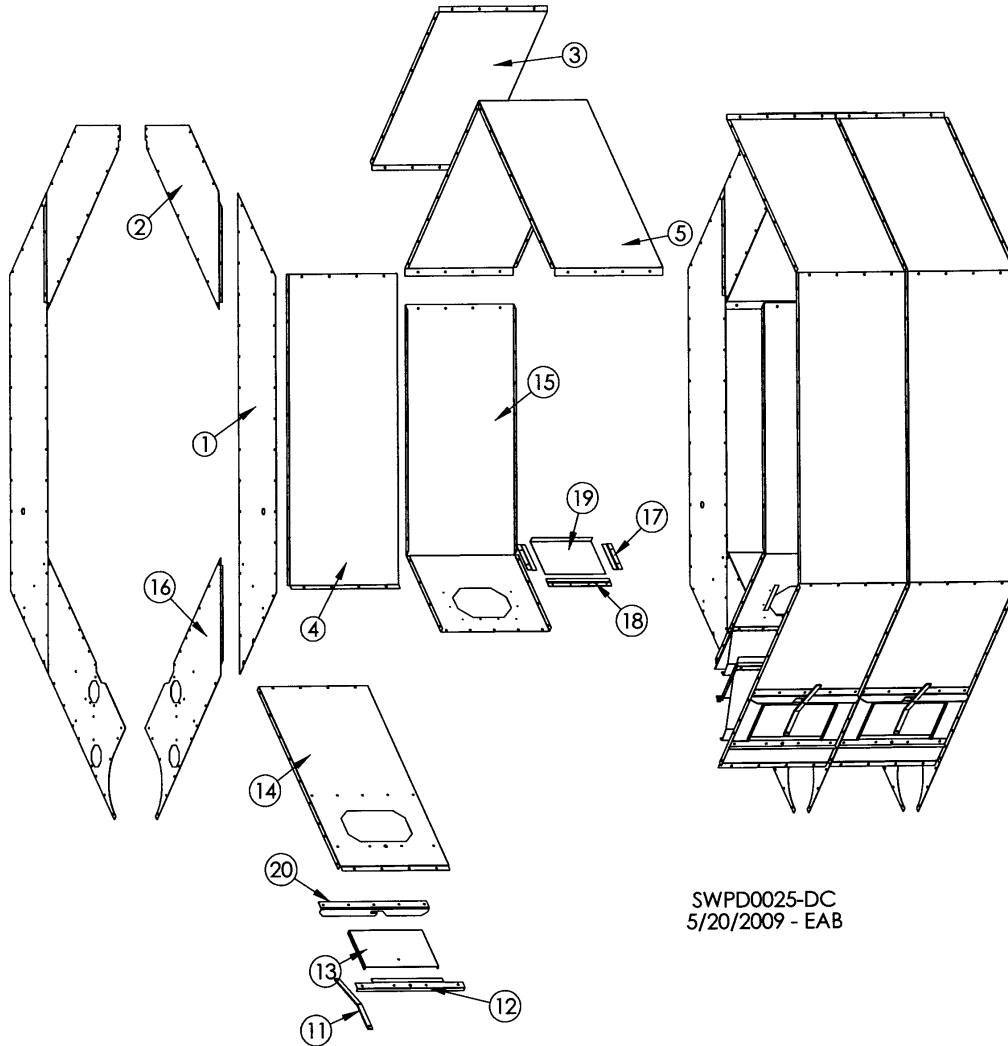


SWPD0035-DC
5/20/2009 - EAB

SINGLE FAN - BACK END

COMP. #	DESCRIPTION	QTY	COMP. #
1	Edging Top & Bottom, Door	2	T16136
2	Edging Sides, Back Door	2	T16137
3	Back End Plate	1	T17916
4	Access Door	1	T16147
5	Top Hinge, Access Door	1	T16149
6	Bottom Hinge, Access Door	1	T16150
7	Catch, Rear Access Door	1	T16151
8	Bottom Back Auger	1	T16431
9	Bottom Angle Splice	1	T17925
10	Side End Plate	2	T16101
11	Side Rail, Blowout Door	4	T16154
12	Blowout Door	1	T17658
13	Hinge Bracket	2	T16148
14	Handle, Locking, #GD303	1	J2313
15	Bearing, 1.25, Flange, W/LC, HCFTS207-20	1	J0010
16	Bottom Auger Shaft, 1, 1.25" x 10"	1	T17251
17	Back Bottom End Plate	1	T25521
18	Bearing Shim Plate	1	T25682
19	Brace for Unload Auger	2	T25681
20	Mercury Switch Plate	1	T16358
21	Gate, Sample Spout	1	T17652
22	Spacer, Sample Spout	2	T17653
23	Sample Spout Angle	2	T17651
24	Spout, Sample	2	T17655
25	Cover, Sample Spout, (Unload)	1	T17663
26	Strap, Moisture Sensor - Back	1	T17850
27	Hinge, Moisture Sensor- Back	1	T17851
28	Latch, 3-10 LL, 2-57-1625-07-00	1	J2310
29	Cover, Tube, Rear Discharge	1	T25679
30	Ring, 10" Flange	2	J6610
31	Tube, Discharge	1	T25677
32	Step, Unload Tub	1	T25678
33	Lid, Sump Box	1	T25672
34	Hinge, Sump Box	1	T25676
35	Front-Sides, Sump box	1	T25670
36	Back Plate, Sump Box	1	T25671
37	Bottom, Sump Box	1	T25674
38	Lid Hinge Side, Sump Box	1	T25675
39	Bracket, Prox. Switch, Unload Auger	1	T17252
40	Box, Prox. Switch, Unload Auger	1	T17263
41	Seal, 2" OD, 1-1/4" ID, CR #12481	1	J7023
42	Target, Prox. Switch, Unload Auger	1	T17256
43	Angle, Switch Accuation	1	T80216
44	Bracket, Switch Mounting	1	T80215

COLUMN PARTS



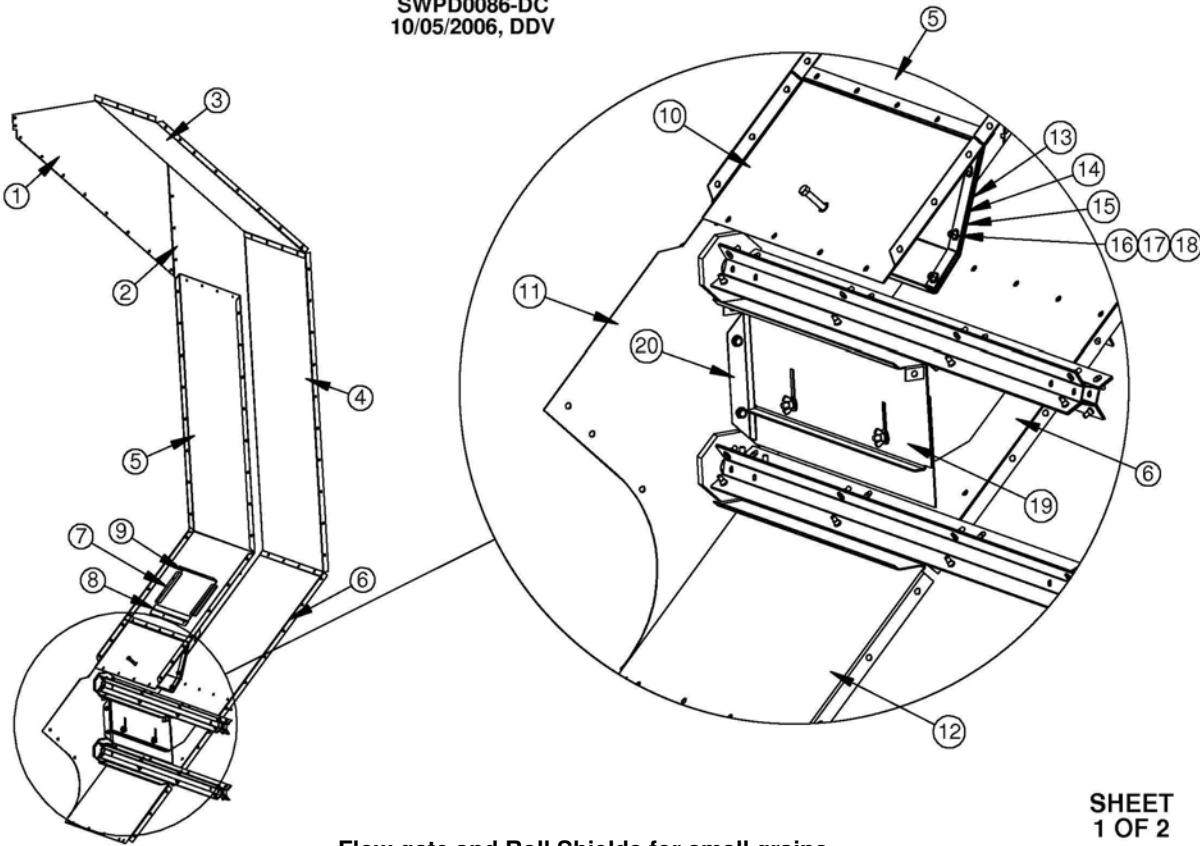
SWPD0025-DC
5/20/2009 - EAB

REF#	DESCRIPTION	12'		16'		20'		24'		28'	
		QTY	COMP#	QTY	COMP#	QTY	COMP#	QTY	COMP#	QTY	COMP#
1	Side Divider	10	T16110	14	T16110	18	T16110	22	T16110	26	T16110
2	Upper Divider	10	T16111	14	T16111	18	T16111	22	T16111	26	T16111
3	Outer Top Perf Panel (Ss)	12	T16105S	16	T16105S	20	T16105S	24	T16105S	28	T16105S
	Outer Top Perf Panel (Galv)	12	T16105	16	T16105	20	T16105	24	T16105	28	T16105
	Outer Top Perf Panel (.063 Galv)	12	T17503W	16	T17503W	20	T17503W	24	T17503W	28	T17503W
4	Outside Mid Perf Panel (SS)	12	T16104S	16	T16104S	20	T16104S	24	T16104S	28	T16104S
	Outside Mid Perf Panel (Galv.)	12	T16104	16	T16104	20	T16104	24	T16104	28	T16104
	Outsd Mid Perf Panel (.063 Galv)	12	T17504W	16	T17504W	20	T17504W	24	T17504W	28	T17504W
5	Top Inner Perforated Panel	6	T16114	8	T16114	10	T16114	12	T16114	14	T16114
	Top Inner Perf Panel (.063 Galv)	6	T17414W	8	T17414W	10	T17414W	12	T17414W	14	T17414W
11	Latch	12	T17906	16	T17906	20	T17906	24	T17906	28	T17906
12	Support Latch Strap	12	T17907	16	T17907	20	T17907	24	T17907	28	T17907
13	Outer Cleanout Door	12	T17908	16	T17908	20	T17908	24	T17908	28	T17908
	Outer Cleanout Door (.063 Galv)	12	T17913W	16	T17913W	20	T17913W	24	T17913W	28	T17913W
14	Bottom Outer Perf Panel (SS)	12	T17909S	16	T17909S	20	T17909S	24	T17909S	28	T17909S
	Btm Outer Perf Panel (Galv.)	12	T17909	16	T17909	20	T17909	24	T17909	28	T17909
	Btm Outer Perf Panel (.063 Galv)	12	T17919W	16	T17919W	20	T17919W	24	T17919W	28	T17919W
15	Inner Side Perforated Panel	12	T17910	16	T17910	20	T17910	24	T17910	28	T17910
	Inner Side Perf Panel (.063 Galv)	12	T17510WAM	16	T17510WAM	20	T17510WAM	24	T17510WAM	28	T17510WAM
16	Lower Divider	10	T17924	14	T17924	18	T17924	22	T17924	28	T17924
17	Side Rail, Inner Access	24	T16219	32	T16219	40	T16219	48	T16219	56	T16219
18	Bottom Rail, Inner Access	12	T16220	16	T16220	20	T16220	24	T16220	28	T16220
19	Inner Access Door	12	T16221	16	T16221	20	T16221	24	T16221	28	T16221
	Inner Access Door (.063 Galv)	12	T16225W	16	T16225W	20	T16225W	24	T16225W	28	T16225W
20	Door Latch Bracket	12	T17657	16	T17657	20	T17657	24	T17657	28	T17657

FLOW GATE WITH ANGLE FLOW GATE SEAL

FLOW GATE WITH ANGLE FLOW GATE SEAL

SWPD0086-DC
10/05/2006, DDV

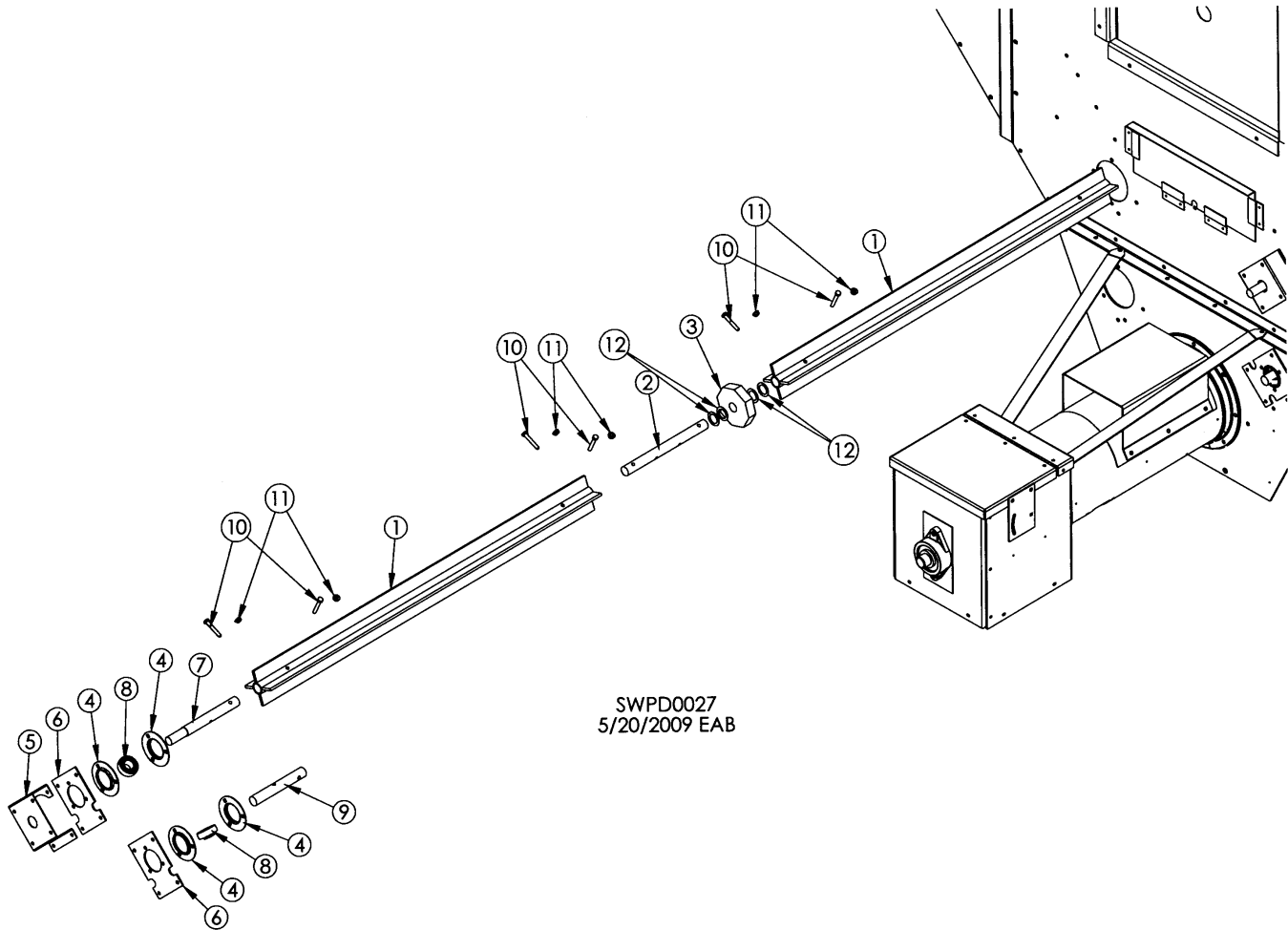


SHEET
1 OF 2

Flow gate and Roll Shields for small grains

Item No.	Part No.	Description
1	T16111	UPPER DIVIDER
2	T16110	DIVIDER, SIDE
3	T16105S	PANEL, OUTSIDE TOP PERF, SS
4	T16104S	PANEL, OUTSIDE MIDDLE PERF, SS
5	T17910	INNER SIDE PERF SHEET
6	T17909S	BOTTOM OUTER PANEL
7	T16219	ACCESS, INNER, SIDE RAIL
8	T16220	BOTTOM RAIL, INNER ACCESS
9	T16221	INNER ACCESS DOOR
10	T17903	RIGID ADJUSTMENT PLATE
11	T17924K	LOWER DIVIDER
12	T17904	DOOR, BOTTOM RIGID
13	T17902D	TOP FLOW CONTROL GATE, SMALL GRAIN
14	T17898	STRIP, BACKUP, TOP FLOW GATE
15	T17899	SEAL, TOP FLOW CONTROL GATE
16	J1105	WASHER, FLAT, 1/4, PLT
17	J0992	NUT, LOCK, 1/4-20, PLT
18	J0505	BOLT, 1/4-20 X 3/4
19	T17880K	GATE, FLOW CONTROL, ASSY-DC-ARK
20	T17886	ANGLE, FLOWGATE SEAL

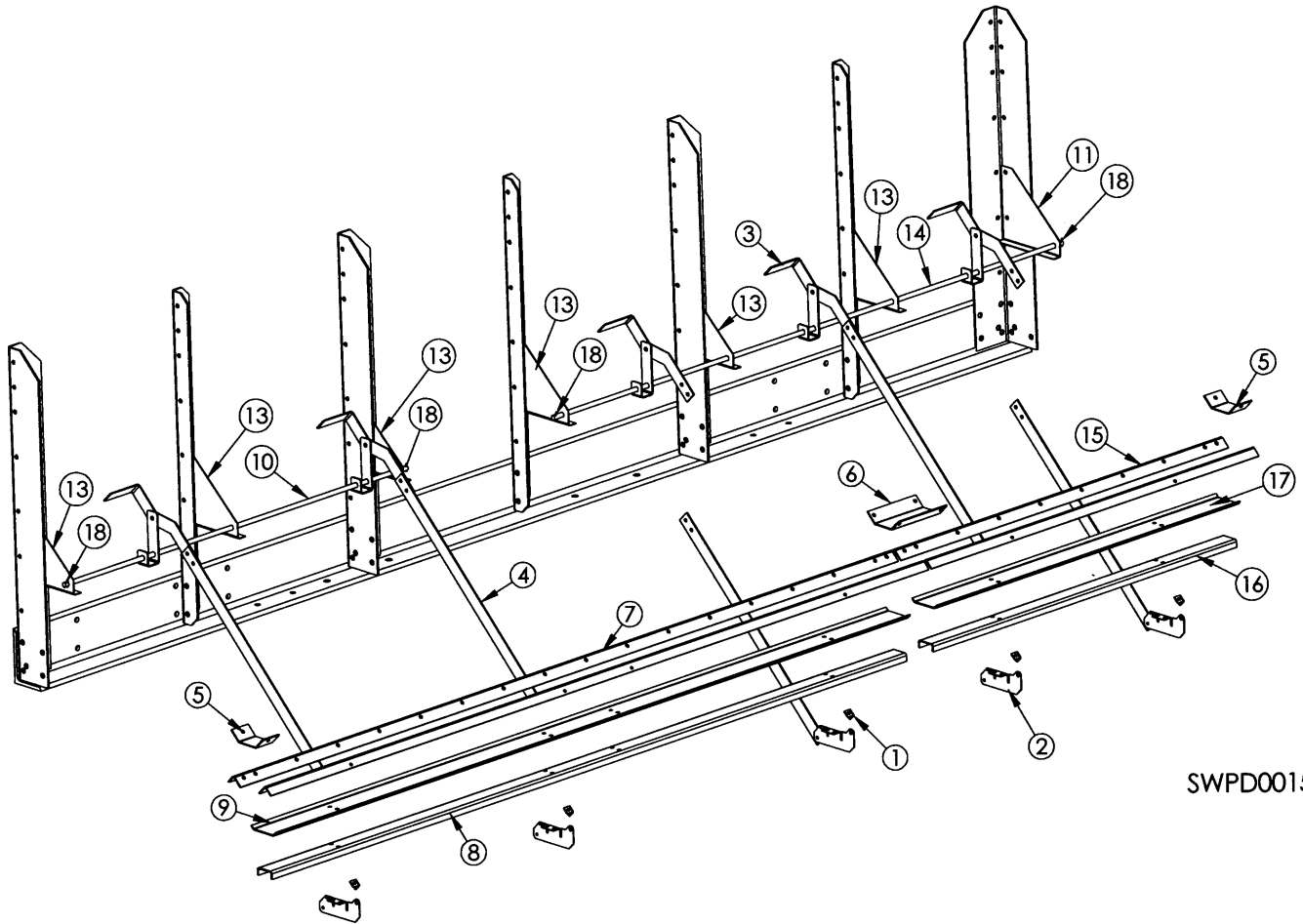
BACK METERING ROLLS



SWPD0027
5/20/2009 EAB

REF. #	DESCRIPTION	COMP. #
1	Metering Roll Assembly, 8'	T16297
	Metering Roll Assembly, 4'	T16298
2	Connecting Shaft, Meter Roll	T16269
3	Bushing, Wooden, Octagon, 1" ID	J1245
4	Flangette, for 205 Bearing	J0098
5	Encoder Bracket	T17921
6	Meter plate	T17920
7	Top Back Shaft, Meter Roll	T16267
8	Bearing, 1", Center, FH205-16, W/L CLR	J0005
9	Bottom Back Shaft, Meter Roll	T16268
10	Screw, 5/16-18, 2, PLT, G5, HHCS	J0585
11	Nut, 5/16-18, PLT, HHWZ	J1110
12	Bushing, Mach, 1-18GA	J1266

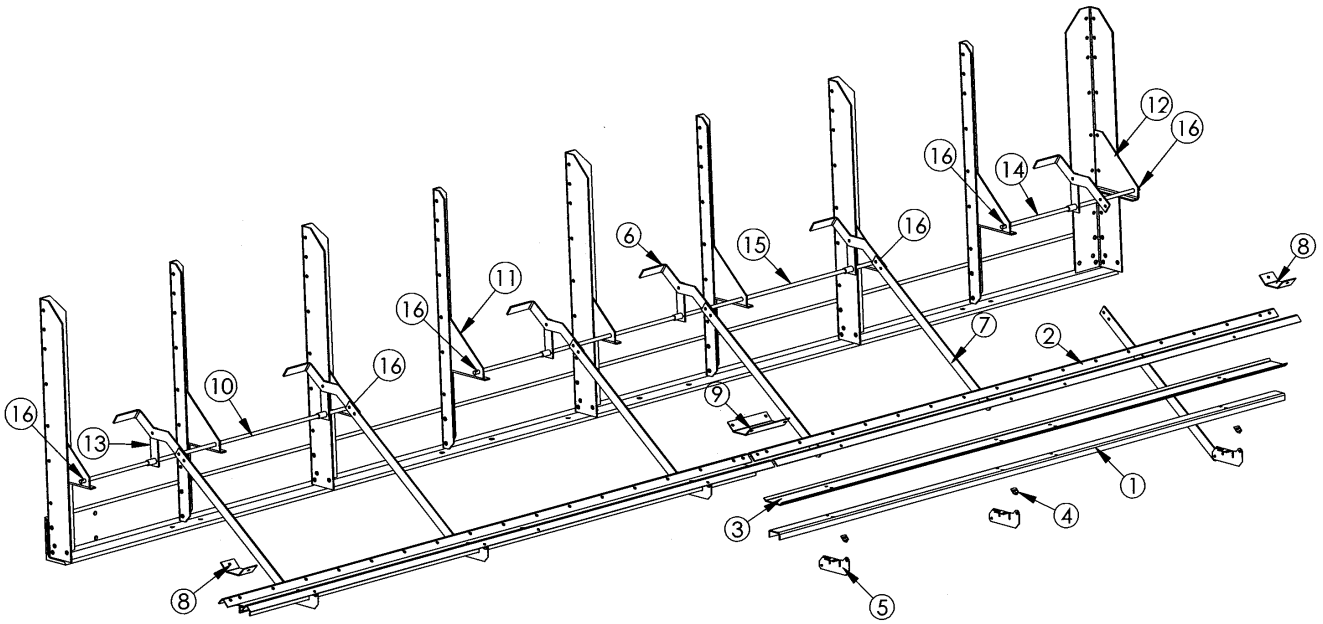
12' CAM LOCK ASSEMBLY



SWPD0015

REF. #	DESCRIPTION	QTY	COMP. #
1	Pivot Bracket	5	T16393
2	Hinge, Bottom Door, Cam Lock	5	T16387
3	Handle	5	T16382
4	Extension Arm, Cam Lock	5	T16386
5	Seal Plate, End, Cam Lock	2	T16386
6	Seal Plate, Mid, Cam Lock	1	T16390
7	8' Angle, Cam Lock	2	T17456
8	8' Door Support, Cam Lock	1	T17454
9	8' Door, Cam Lock	1	T17455
10	Shaft, 49-3/4", Cam Lock	1	T16400
11	Gusset, Rear, Cam Lock	1	T16381
12	Pivot Arm Weldment, Cam Lock	5	T16383
13	Gusset, Front, Cam Lock	6	T16380
14	Shaft, 74", Cam Lock	1	T12516
15	Angle, Cam Lock, 4'	2	T12529
16	Door Support, Cam Lock, 4'	1	T12530
17	Door, Cam Lock, 4"	1	T12528
18	Pin, Cotter, 1/8, 1, PLT	4	J1420

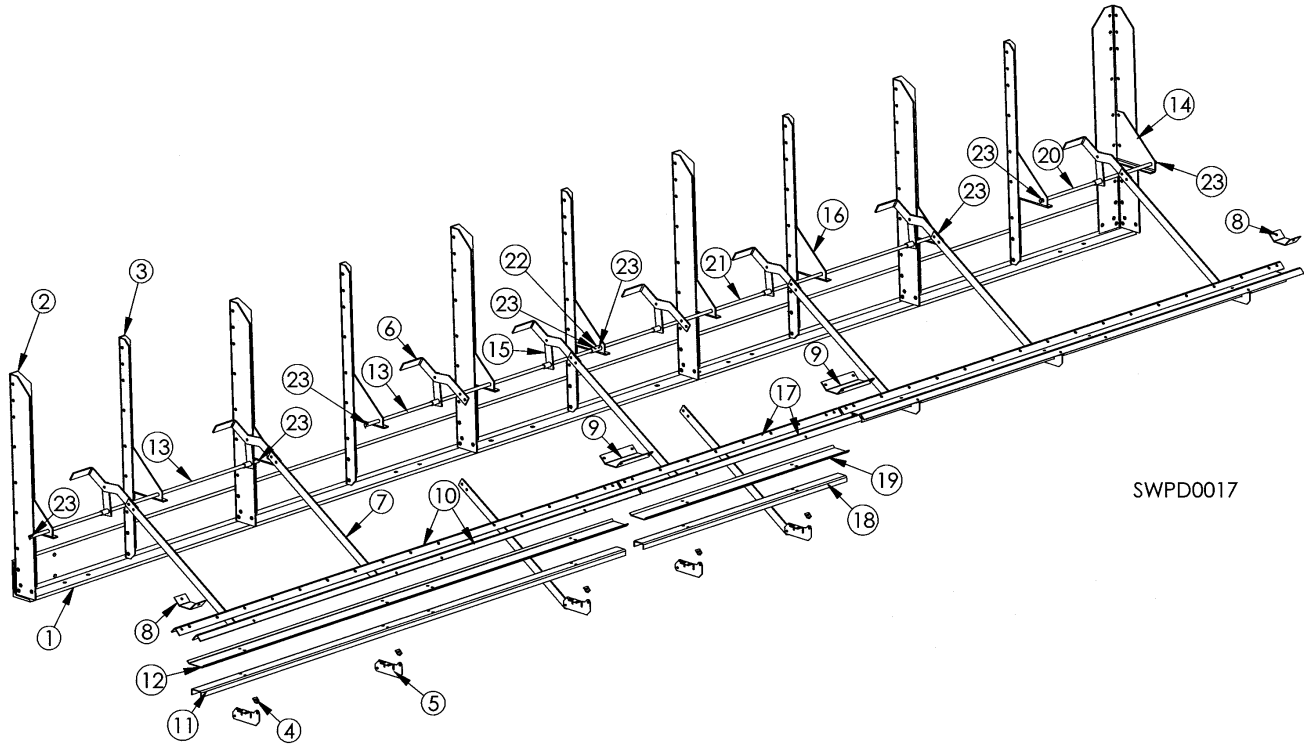
16' CAM LOCK ASSEMBLY



SWPD0016

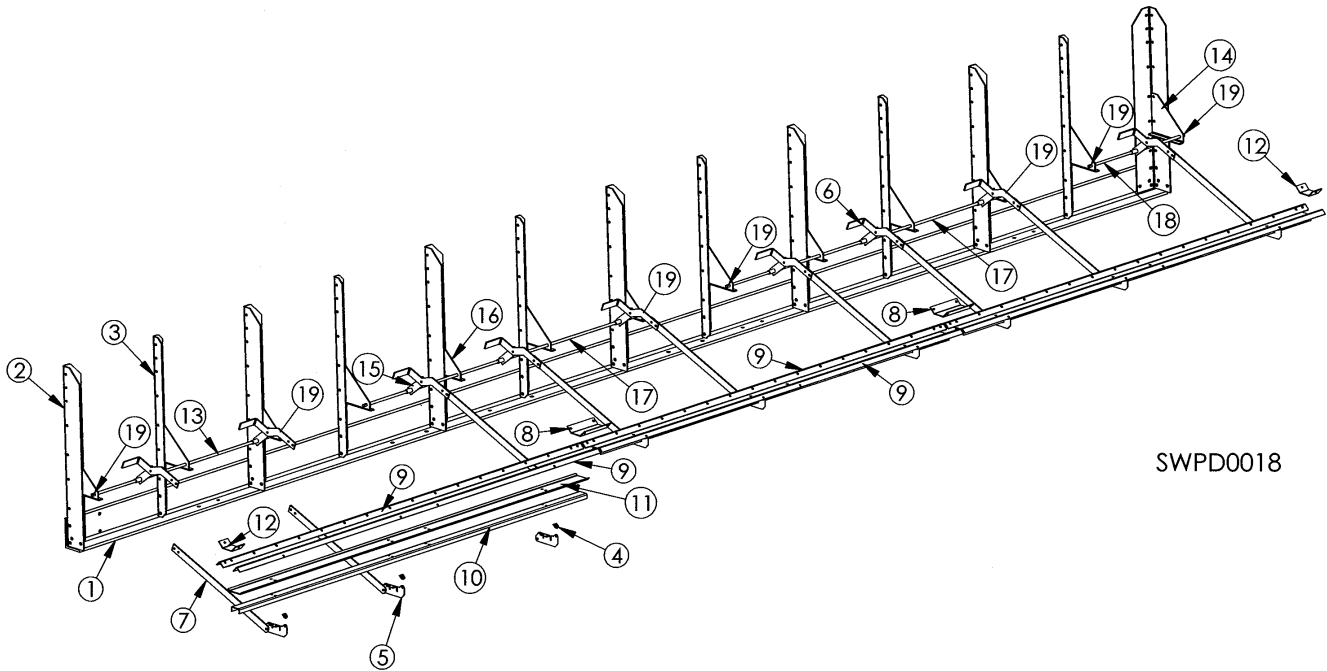
REF. #	DESCRIPTION	QTY	COMP. #
1	8' Door Support, Cam Lock	2	T17454
2	8' Angle, Cam Lock	4	T17456
3	8' Door, Cam Lock	2	T17455
4	Pivot Bracket	6	T16393
5	Hinge, Bottom Door, Cam Lock	6	T16387
6	Handle, Cam Lock	6	T16382
7	Extension Arm, Cam Lock	6	T16386
8	Seal Plate, End, Cam Lock	2	T16398
9	Seal Plate, Mid, Cam Lock	1	T16390
10	Shaft, 49.75", Cam Lock	1	T16400
11	Gusset, Front, Cam Lock	8	T16380
12	Gusset, Rear, Cam Lock	1	T16381
13	Pivot Arm Weldment, Cam Lock	6	T16383
14	Shaft, 25", Cam Lock	1	T20401
15	Shaft, Cam Lock, 74"	1	T12516
16	Pin, Cotter, 1/8", 1, PLT	6	J1420

20' CAM LOCK ASSEMBLY



REF. #	DESCRIPTION	QTY	COMP. #
1	Right Frame Angle	1	T20319
2	Wide Vertical Support	6	T16322
3	Narrow Vertical Support	5	T16323
4	Pivot Bracket	8	T16393
5	Hinge Bottom Door Cam Lock	8	T16387
6	Handle Cam Lock	8	T16382
7	Extension Arm, Cam Lock	8	T16386
8	Seal Plate, End, Cam Lock	2	T16398
9	Seal Plate, Mid, Cam Lock	2	T16390
10	8' Angle, Cam Lock	4	T17456
11	8' Door Support, Cam Lock	2	T17454
12	8' Door, Cam Lock	2	T17455
13	Shaft, 49.75", Cam Lock	2	T16400
14	Gusset, Rear, Cam Lock	1	T16381
15	Pivot Arm Weldment, Cam Lock	8	T16383
16	Gusset, Front, Cam Lock	10	T16380
17	Angle, Cam Lock 4'	2	T12529
18	Door Support, Cam Lock 4'	1	T12530
19	Door, Cam Lock 4'	1	T12528
20	Shaft, 25", Cam Lock	1	T20401
21	Shaft, Cam Lock, 74"	1	T12516
22	Connector, Shaft	1	T20403
23	Pin, Cotter, 1/8, 1, PLT	8	J1420

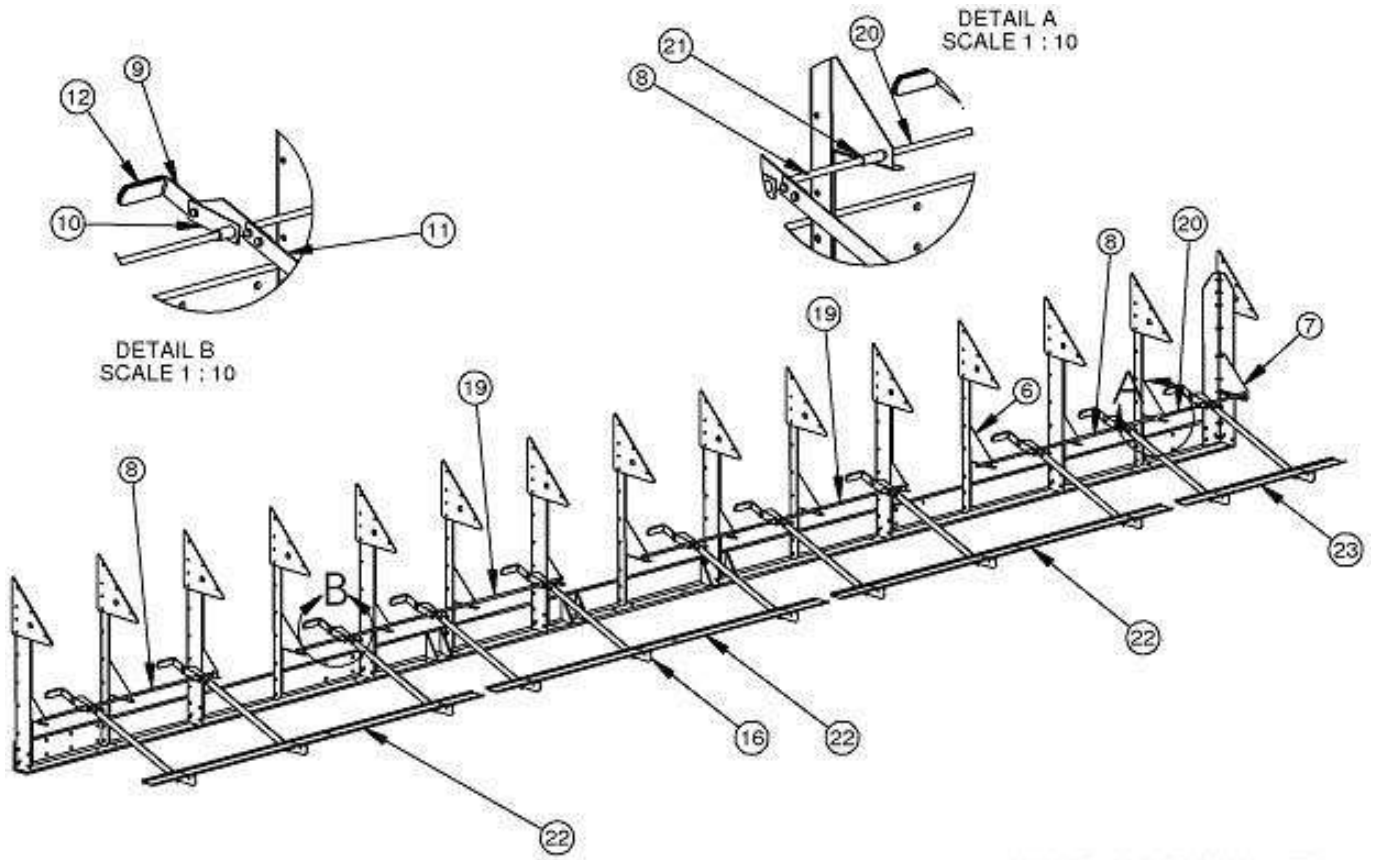
24' CAM LOCK ASSEMBLY



SWPD0018

REF. #	DESCRIPTION	QTY	COMP. #
1	Right Frame Angle	1	T24319
2	Wide Vertical Support	7	T16322
3	Narrow Vertical Support	8	T16323
4	Pivot Bracket	9	T16393
5	Hinge, Bottom Door, Cam Lock	9	T16387
6	Handle, Cam Lock	9	T16382
7	Extension Arm, Cam Lock	9	T16386
8	Seal Plate, Mid, Cam Lock	2	T16390
9	8' Angle, Cam Lock	6	T17456
10	8' Door Support	3	T17454
11	8' Door, Cam Lock	3	T17455
12	Seal Plate, End, Cam Lock	2	T16398
13	Shaft, Cam Lock, 49.75"	1	T16400
14	Gusset, Rear	1	T16381
15	Pivot Arm Weldment	9	T16383
16	Gusset, Front	12	T16380
17	Shaft, Cam Lock, 74"	2	T12516
18	Shaft, Cam Lock, 25"	1	T20401
19	Pin, Cotter, 1/8, 1, PLT	8	J1420

28' CAM LOCK ASSEMBLY



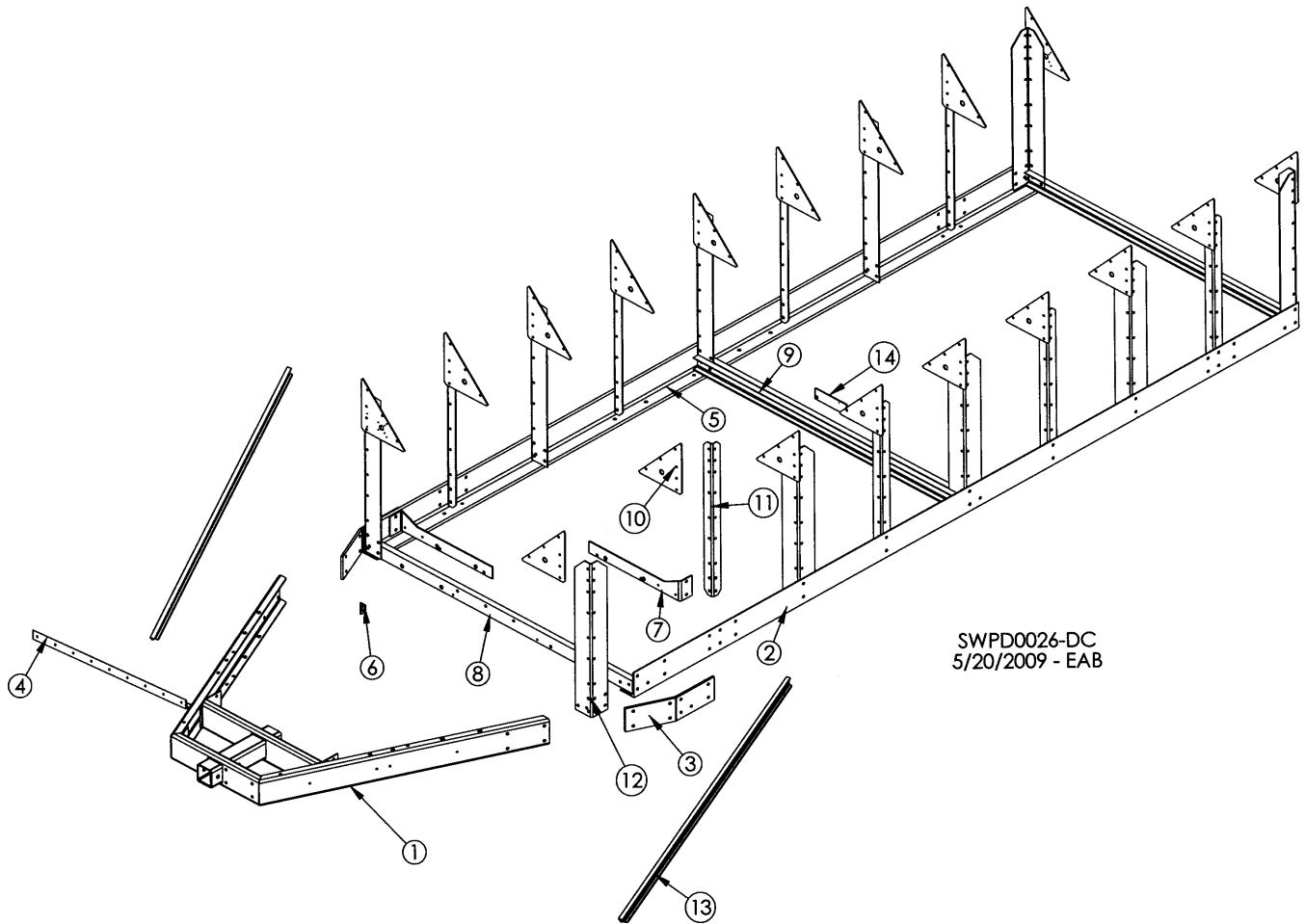
CAMLOCK ASSEMBLY, 28 FT
SHEET 1 OF 2

SWPD0067-CE
051128JFJ

REF. #	DESCRIPTION	QTY	COMP. #
1	RIGHT FRAME ANGLE WELD	1	T28318
2	WIDE VERTICAL SUPPORT	8	T16322
3	PLATE, MAIN CONNECTOR, BOX, CONDUIT	2	T16331
4	NARROW VERTICAL SUPPORT	7	T16323
5	MAIN CONNECTOR PLATE	13	T16324
6	GUSSET, FRONT, CAM LOCK	14	T16380
7	GUSSET, REAR CAM LOCK	1	T16381
8	SHAFT, LONG CAN-LOCK	2	T16400
9	HANDLE, CAM-LOCK	11	T16382
10	PIVOT ARM WELD, CAM-LOCK	11	T16383
11	EXTENSION ARM, CAM LOCK	11	T16386
12	COVER, PLASTIC, HANGLE, 1 1.2 X 4 LG	11	J23182
13	SCREW, 3/8 -16 X 1, JS500, GD 5	33	J06063
14	NUT, WHIZLOCK, 3/8-16	22	B5962
15	NUT, HEX, 3/8-16, PLT LOCK	11	J1025
16	HINGE, BOTTOM DOOR, CAM LOCK	11	T16387
17	BOLT, 5/16-18 X 3/4" GR 5, HEX WASHER HD, JS500	9	J0536
18	NUT, LOCK, 5/16-18, PLT	11	J1010
19	SHAFT, CAM-LOCK, LONG, 12' '99	2	T12516
20	SHAFT, SHORT, CAM LOCK	1	T20401
21	CONNECTOR, SHAFT	1	T20403
22	8' DOOR, CAM-LOCK 2000	3	T17455
23	DOOR, CAM-LOCK 4' 2000	1	T12528

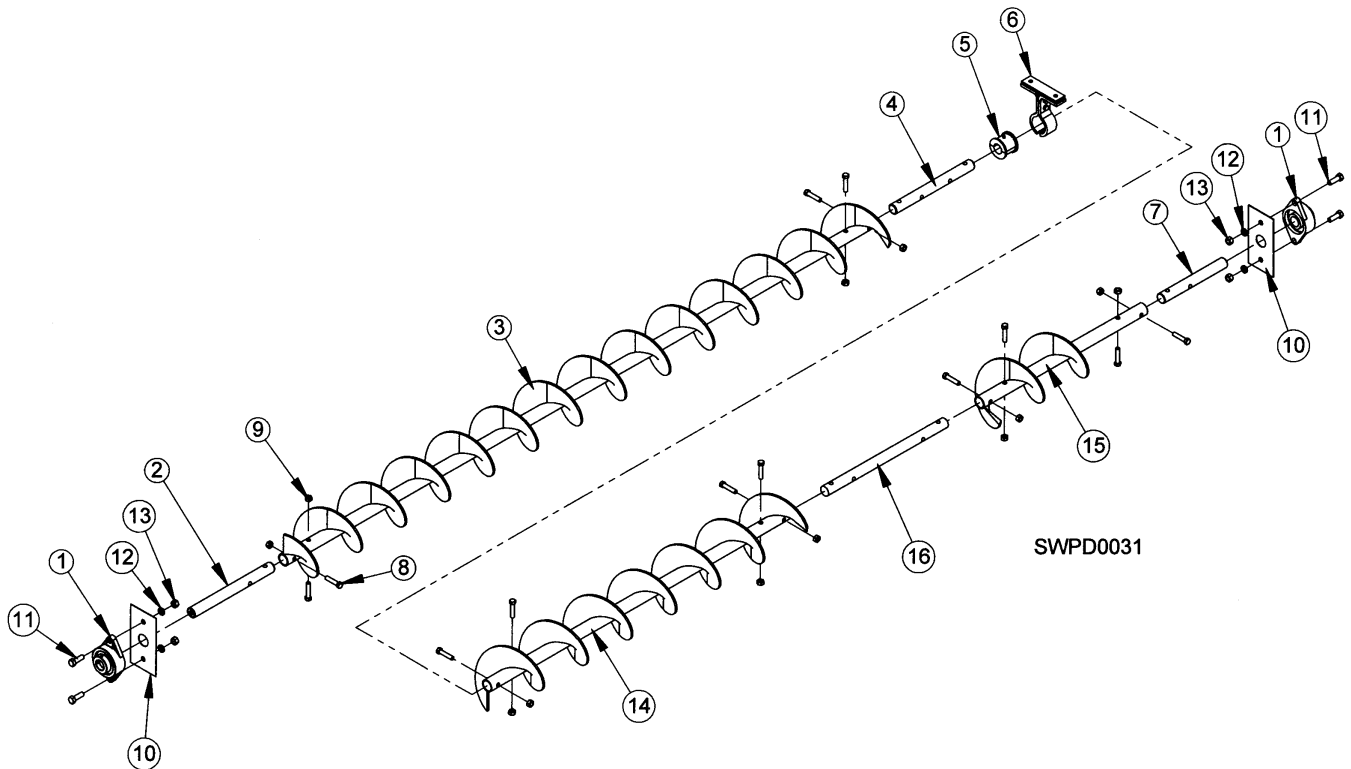
FRAME FOR BOTH STANDARD & STACKED DRYERS

12', 16', 20', 24', & 28'



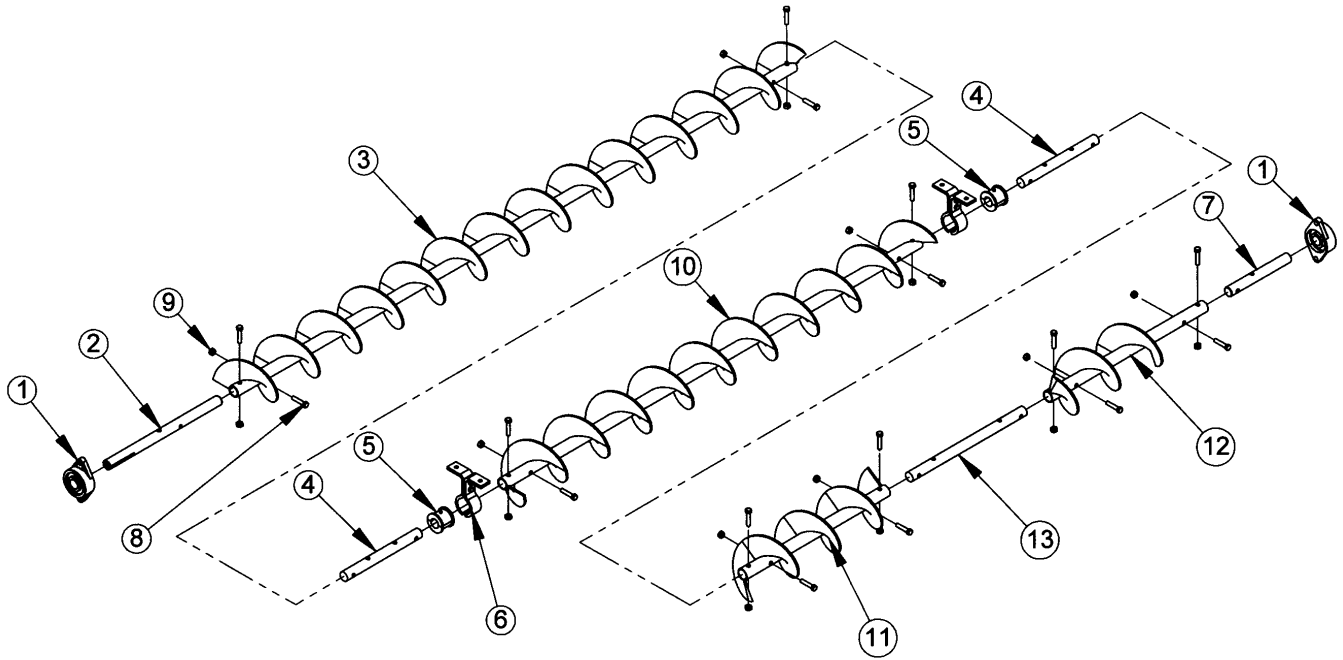
REF#	DESCRIPTION	12'		16'		20'		24'		28'	
		QTY	PT #	QTY	PT #	QTY	PT #	QTY	PT #	QTY	PT #
1	Hitch Receiver Weldmnt	1	T16310D	1	T16310D	1	T16310D	1	T16310D	1	T16310D
2	Left Frame Angle	1	T12518	1	T16319	1	T20320	1	T24320	1	T28320
3	Connector Plate	2	T16321D	2	T16321D	2	T16321D	2	T16321D	2	T16321D
4	Angle (Fan Support)	1	T16176	1	T16176	1	T16176	1	T16176	1	T16176
5	Right Frame Angle	1	T12517	1	T16320	1	T20319	1	T24319	1	T28319
6	Tightener Angle	1	T16329	1	T16329	1	T16329	1	T16329	1	T16329
7	DC Motor Brace	2	T16328	2	T16328	2	T16328	2	T16328	2	T16328
8	Front Cross Channel	1	T16326	1	T16326	1	T16326	1	T16326	1	T16326
9	Cross Channel	3	T16325	3	T16325	5	T16325	5	T16325	7	T16325
10	Main Connector Plate	14	T16324	18	T16324	22	T16324	26	T16324	28	T16324
11	Narrow Vertical Support	6	T16323	8	T16323	8	T16323	12	T16323	14	T16323
12	Wide Vertical Support	8	T16322	10	T16322	12	T16322	14	T16322	16	T16322
13	Channel Brace, Frame	2	T12327	2	T12327	2	T12327	2	T12327	2	T12327
14	Vert. Support, Camlock	1	T16389	1	T16389	2	T16389	2	T16389	3	T16389

12' BOTTOM AUGER



REF. #	DESCRIPTION	QTY	COMP. #
1	Bearing, 1.25, Flange, W/LC, HCFTS207-20	2	J0010
2	Shaft, Top Front, 12-3/4"	1	T16436
3	Auger, Bottom Front, 93-1/2"	1	T16430
4	Shaft, Stub	1	F4720
5	Bushing, Wood, 1.25", I.D.	1	J0096
6	Hanger, Auger, T, 6CH2203	1	J0097
7	Shaft, 1.25" x 10", Bottom Auger	1	T17251
8	Screw, 7/16-14, 2, PLT	12	J0718
9	Nut, Lock, 7/16"-14, PLT	12	J1034
10	Bearing Shim Plate	2	T25682
11	Screw, 1/2-13, 1.5, GR 5 HHCS	4	J0730
12	Washer, Lock, 1/2, PLT	4	J1215
13	Nut, Hex, 1/2-13, PLT	4	J1040
14	Auger, Bottom, Rear, 47.50"	1	T12492
15	Auger, Bottom, Std Unld Ext	1	T12493
16	Shaft, Auger, Moisture Sensor	1	F4723

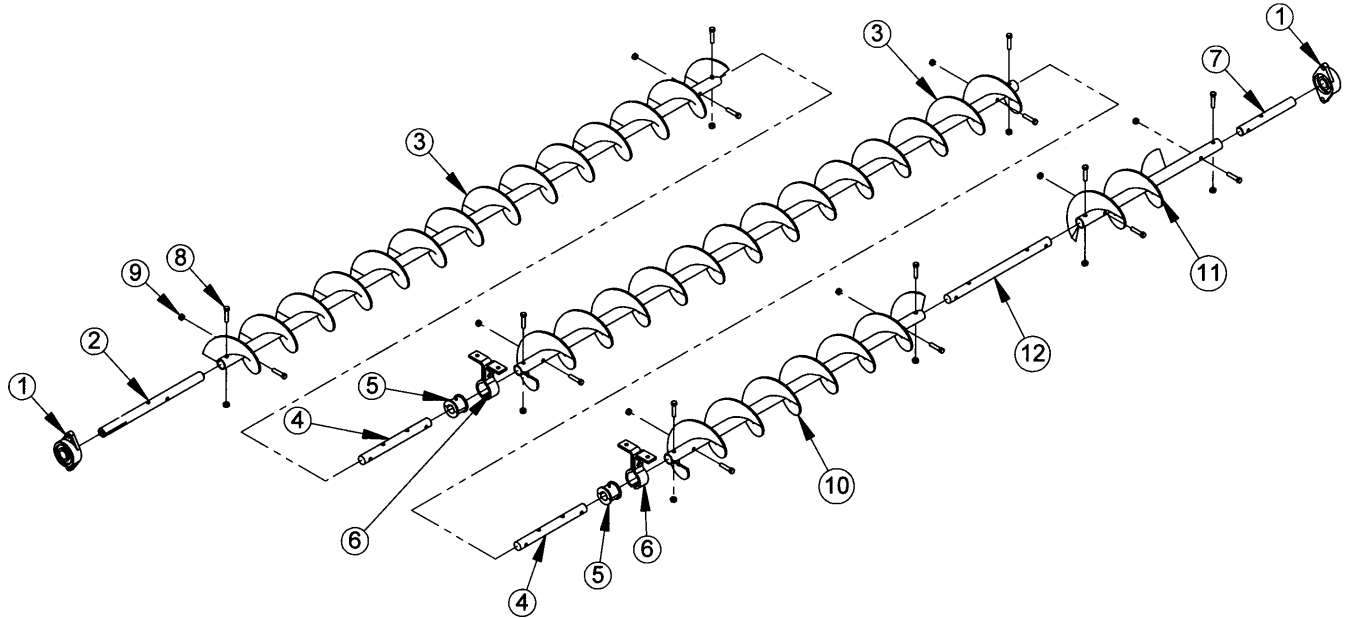
16' BOTTOM AUGER



SWPD0032

REF. #	DESCRIPTION	QTY	COMP. #
1	Bearing, 1.25, Flange, W/LC, HCFTS207-20	2	J0010
2	Shaft, Top Front, 12-3/4"	1	T16436
3	Auger, Bottom Front, 93-1/2"	1	T16430
4	Shaft, 8", Hanger Bearing	2	F4720
5	Bushing, Wood, 1.25", I.D.	2	J0096
6	Hanger, Auger, T, 6CH2203	2	J0097
7	Shaft, 1.25" x 10"	1	T17251
8	Screw, 7/16-14, 2, PLT	16	J0718
9	Nut, Lock, 7/16-14, PLT	16	J1034
10	Auger, Bottom Middle, 69-1/2"	1	T16432
11	Auger, Bottom Rear, 24"	1	T12498
12	Auger, Bottom, Std Unld Ext	1	T12493
13	Shaft, Auger, Moisture Sensor	1	F4723

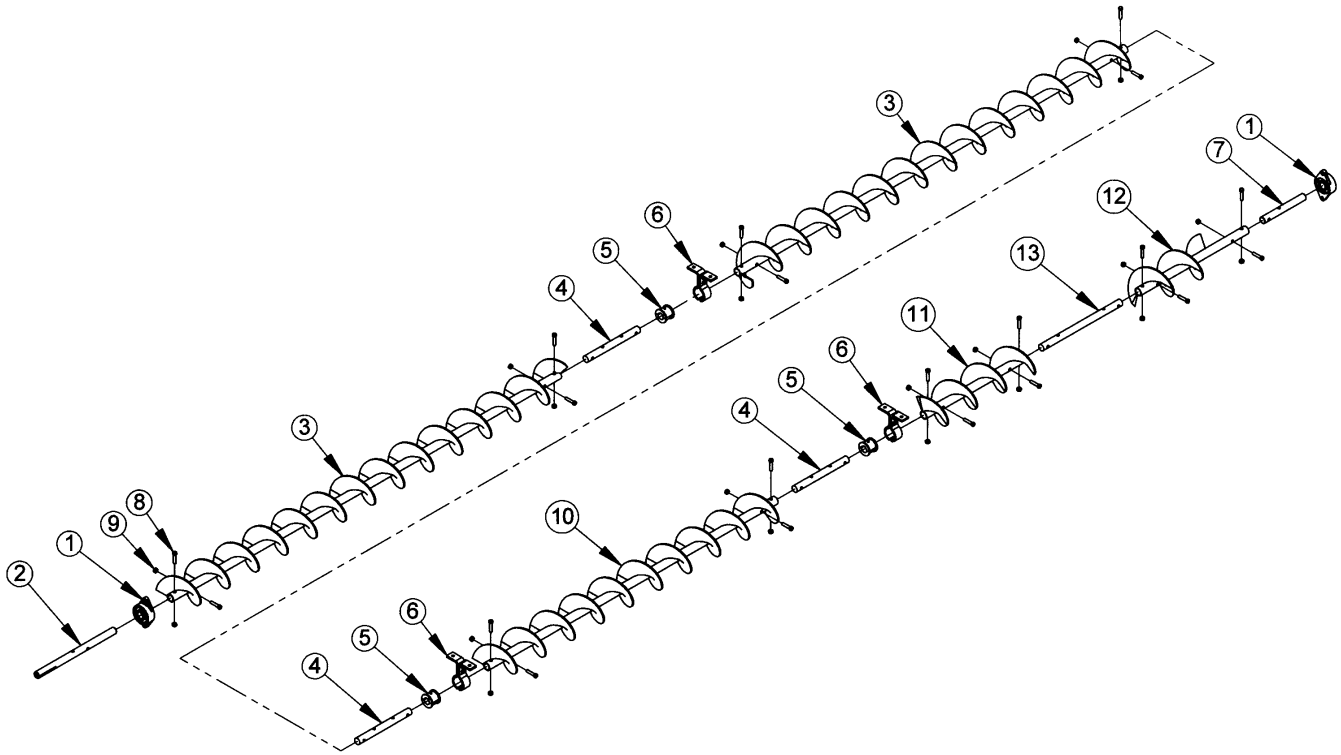
20' BOTTOM AUGER



SWPD0033

REF. #	DESCRIPTION	QTY	COMP. #
1	Bearing, 1.25, Flange W/LC, HCFTS207-20	2	J0010
2	Shaft, Top Front, 12-3/4"	1	T16436
3	Auger, Bottom Front, 93-1/2"	2	T16430
4	Shaft, 8" Hanger Bearing	2	F4720
5	Bushing, Wood, 1.25" I.D.	2	J0096
6	Hanger, Auger, T, 6CH2203	2	J0097
7	Shaft, 1.25" x 10", Bottom Auger	1	T17251
8	Screw, 7/16-14, 2, PLT	16	J0718
9	Nut, Lock, 7/16-14, PLT	16	J1034
10	Auger, Bottom Rear, 47.50"	1	T12492
11	Auger, Bottom, Std Unld Ext	1	T12493
12	Shaft, Auger, Moisture Sensor	1	F4723

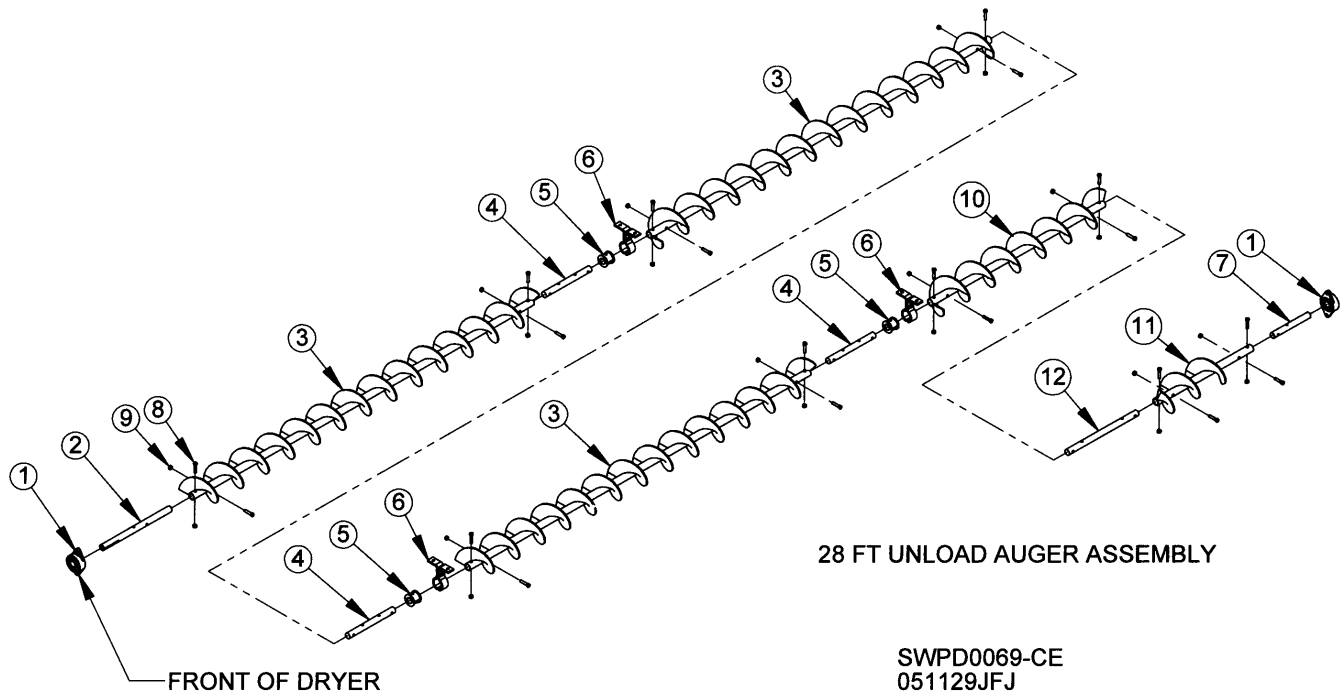
24' BOTTOM AUGER



SWPD0034

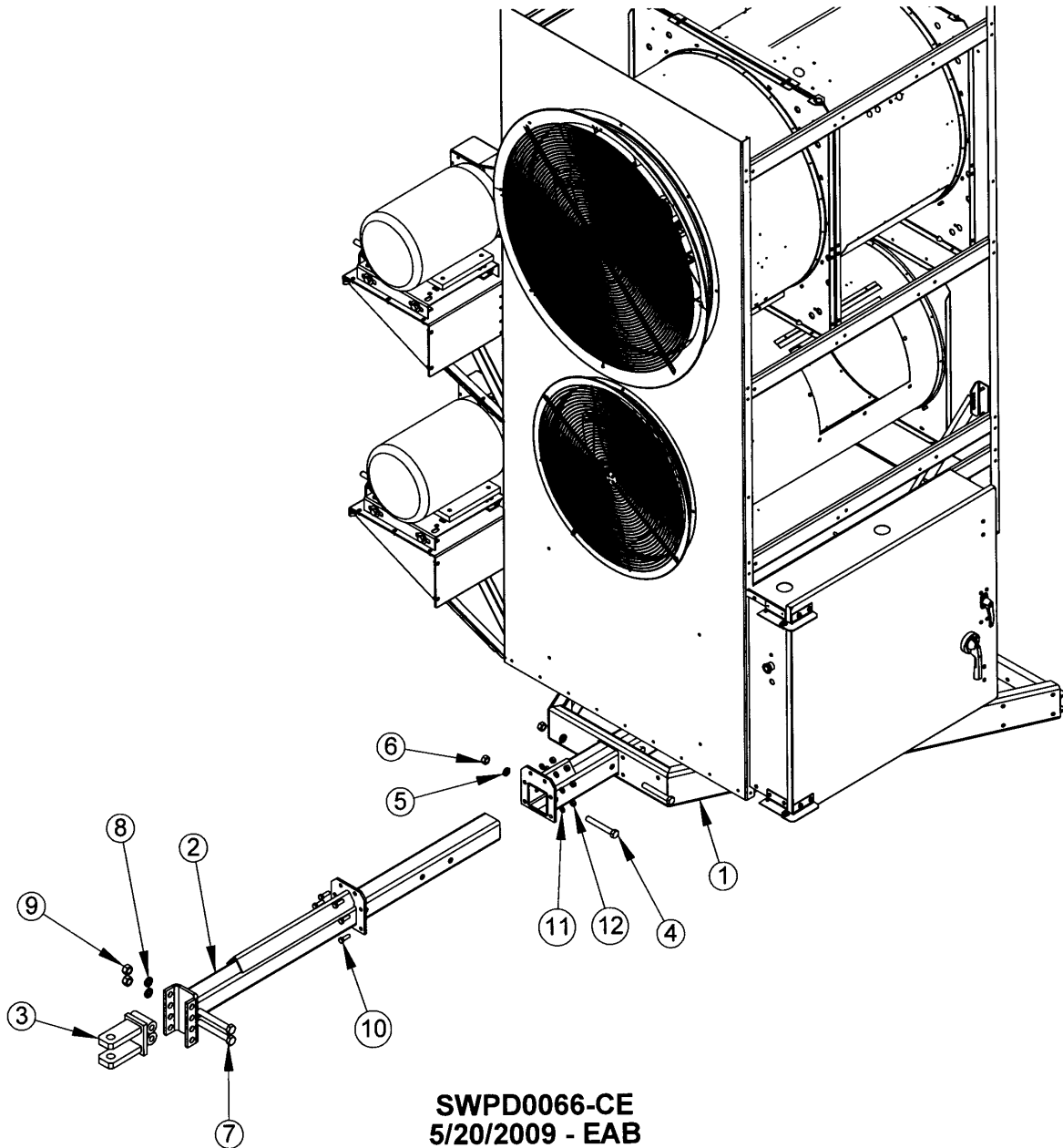
REF. #	DESCRIPTION	QTY	COMP. #
1	Bearing, 1.25, Flange, W/LC, HCFTS207-20	2	J0010
2	Shaft, Top Front, 12-3/4"	1	T16436
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4	Shaft, 8" Hanger Bearing	3	F4720
5	Bushing, Wood, 1.25" I.D.	3	J0096
6	Hanger Auger, T, 6CH2203	3	J0097
7	Shaft, 1.25" x 10", Bottom Auger	1	T17251
8	Screw, 7/16-14, 2, PLT	20	J0718
9	Nut, Lock, 7/16-14, PLT	20	J1034
10	Auger, Bottom Middle, 69-1/2"	1	T16432
11	Auger, Bottom Rear, 24"	1	T12498
12	Auger, Bottom, Std Unld Ext	1	T12493
13	Shaft, Auger, Moisture Sensor	1	F4723

28' BOTTOM AUGER



REF. #	DESCRIPTION	QTY	COMP. #
1	Bearing, 1.25, Flange, W/LC, HCFTS207-20	2	J0010
2	Shaft, Top Front, 12-3/4"	1	T16436
3	Auger, Bottom Front, 93-1/2"	3	T16430
4	Shaft, 8" Hanger Bearing	3	F4720
5	Bushing, Wood, 1.25" I.D.	3	J0096
6	Hanger Auger, T, 6CH2203	3	J0097
7	Shaft, 1.25" x 10", Bottom Auger	1	T17251
8	Screw, 7/16-14, 2, PLT	20	J0718
9	Nut, Lock, 7/16-14, PLT	20	J1034
10	Auger, Bottom Rear, 47.50"	1	T12492
11	Auger, Bottom, Std Unld Ext	1	T12493
12	Shaft, Auger, Moisture Sensor	1	F4723

DRYER HITCH WITH 24" EXTENSION



SWPD0066-CE
5/20/2009 - EAB

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	T16310D	HITCH RECEIVER WELDMT, JACK
2	1	T43711	HITCH INSERT WELD, 24" EXT
3	1	T4372	CLEVIS WELD
4	3	J0822	SCREW, 3/4"-10 X 5" LG.
5	3	J1220	3/4" LOCKWASHER
6	3	J1051	3/4-10 HEX NUT
7	2	J08361	BOLT, 7/8-9 X 6 1/2" LG
8	2	J1222	7/8" LOCKWASHER
9	2	J1059	7/8-9 HEX NUT
10	6	J0730	SCREW, 1/2 -13, 1.50,PLT,GR5,HHCS
11	6	J1215	1/2" LOCKWASHER,PLT,SPLIT
12	6	J1040	NUT, 1/2 - 13,PLT,GD5,HEX



Sukup Automatic Grain Dryer



Troubleshooting Guide (CE)

Sukup Manufacturing Company

1555 – 255th Street, Box 677

Sheffield, Iowa USA 50475

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

E-mail: info@sukup.com

TABLE OF CONTENTS

Fault Troubleshooting	12
Grain Discharge Chute Sensor	12
Grain Level Ball Switch	13
Unload Auger Proximity Sensor	15
Vapor Over-Temperature Switch	17
Grain Column Over-Temperature Sensor	21
Heater Housing Hi-Limit Switch	24
Metering Roll Proximity Switch	26
Static Air Pressure Sensor	28
Plenum Over-Temperature Sensor	32
Device Troubleshooting	34
Discharge Moisture Sensor	34
QuadraTouch™ Controller	36
Plenum Temperature Sensor (RTD)	37
Burner Operations	39
CE Heater Troubleshooting Guide	41
All Burners	41
Electronic MOD Valve	44
Wire Numbers and their uses	46
CE Conduit Wiring	50
Auxiliary Load and Unload Terminals	51



General Safety Practices

This safety alert symbol means “ATTENTION! Be Alert! Your personal safety is involved.” This symbol draws your attention to important instructions concerning your personal safety. Read the messages carefully to avoid personal injury or death.

Safety Signal Words

On safety decals, three signal words are used with corresponding colors of red, orange, and yellow to indicate hazard intensity. Definitions are as follows:



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



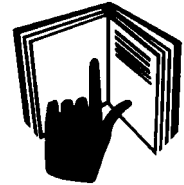
(ORANGE) indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.



(YELLOW) indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. In addition to the signal words and colors, pictorials are used to warn of hazard.

Follow Manual Instructions and Safety Decal Messages

Observe safe operating practices. Carefully read this manual and all safety decals on your equipment. Decals must be kept in good condition. Replace missing or damaged safety decals or shields free of charge by contacting Sukup Manufacturing Co. by mail at PO Box 677, Sheffield, Iowa USA 50475-0677; by phone at 641-892-4222; or by e-mail at info@sukup.com.



It is the responsibility of the owner/operator to know what specific requirements, precautions, and work hazards exist. It is also the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of the hazards and safety precautions that need to be taken to avoid personal injury or death. **An example training register is printed in this section to assist in that process.**

Basic Safety Rules

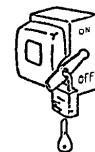
1. Learn how to use controls and operate equipment.
2. Do not let anyone operate unit without thorough training of basic operating and safety procedures. **Always follow a proper lockout procedure.**
3. Do not modify or redesign equipment without first obtaining written approval from Sukup Manufacturing Co. Unauthorized modifications to the equipment may impair the function and/or safety and affect machine life.
4. Periodically check all mechanical and electrical components. Keep unit in good working condition.
5. Handle equipment and parts with care. **Wear protective clothing** to avoid injury from sharp metal edges.
6. Wear Personal Protective Equipment (PPE) such as safety glasses, gloves, hardhat, steel-toed boots, ear protection and dust mask as required.

Keep unit well maintained according to the procedures in the maintenance section beginning on page 1-19 of this Owner's Operation Manual.



CAUTION: To avoid electrocution, all equipment must be properly wired and grounded according to electrical codes. Have unit wired by qualified electrician.

IMPORTANT: Supporting electrical panels or combinations of electrical components supplied by the end user must be compliant with current editions of BS EN 60202-1.



Mains Isolater must be located outside of bin. It must be easily accessible from ground level and must be lockable in off position. Mark clearly as to equipment it operates. See Mains Isolater decal placement information later in this section.

Always LOCK OUT main power switch (Mains Isolater) whenever equipment is not in use or when servicing unit. Check with voltage meter before servicing unit.

TRANSPORT SAFETY WARNING: TRUCKER-TRANSPORTER IS TO PROVIDE APPROVED SAFETY CHAIN WHEN TOWING DRYER.



WARNING: Transporting this equipment on farm sites requires precautionary measures in order to prevent serious injury or death. If transport is required it is essential that all of the following procedures be adhered to:

- Read and understand operator's manual.
- Check and comply with state & local regulations.
- Use required emblems or lights.
- Keep away from overhead electrical lines.
- Reduce speed and/or use lower gear on rough ground or slopes.
- Stop gradually.
- Use mirrors. Have extended rear angle mirrors on vehicles.
- Signal & check behind you when turning.
- Use safety chain when towing dryer.
- Use break-away kit (available from Sukup Mfg Co - Computer #T4366).
- Be sure to have clear visibility
- Use signal lights

Failure to heed these warnings may result in serious injury or death. Use good judgment when transporting. Maintain complete control of unit at all times. **Comply with state and local regulations.** Read safety procedures before moving units. Always strive to prevent accidents! Watch out for other vehicles.



WARNING: TO PREVENT EXPLOSION OR FIRE



- Carefully review operator's manual, **including all safety instruction.**
- 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 inspection door open.

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

Please refer to applicable sections of this operation manual for detailed instruction.



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 the above precautions may cause serious injury or death.

EMERGENCIES - KNOW WHAT TO DO

Have telephone numbers and written directions to your location near your telephone in the event of emergency. A place to record information is provided here.

Emergency Information

Ambulance: _____

Fire: _____

Address of work site: _____

Directions to your location: _____

Risk reduction for servicing inside dryer plenum

IMPORTANT: Conditions inside dryer plenum may vary greatly from the ambient conditions.

Please follow the safety guidelines before entering the plenum:

- Appoint a responsible individual to oversee the task and remain outside the dryer while servicing.
- Ensure the dryer is isolated and all fuel and power is disabled to the unit.
- Operator is in good physical condition and at low risk of medical problems such as asthma and cardiac problems.
- Unit is empty of grain; avoid entry when unit is full.
- Do not close doors while inside the unit, to ensure proper airflow and vent toxic gasses.
- Have immediate and close access to a lifting device, which can reach the dryer platforms in the event of emergency.
- Have adequate tools on hand for quick removal of the ladder in the event of an emergency.
- Carry a communication device to use in the event of an emergency and ensure proper signal is available (mobile phone with adequate signal).
- Wear personal protection equipment such as safety glasses, gloves, dust mask, steel-toed boots, ear protectors and hardhat as required.
- Consider additional risks when performing maintenance that includes cutting or welding (fire, fumes and dust). Ensure quick access to an ABC (dry chemical) fire extinguisher.
- Assess the climatic conditions: If the weather is undesirable (icy platforms, extreme heat) reduce risk by servicing when the climate improves.

In the event of minor injury (minor cuts and scrapes):

- Ensure a first aid kit is available on site and workers are trained in first aid to treat minor injury.
- Avoid first aid on the platforms due to low available workspace and height.
- Contact emergency services if the injury prevents descending from the dryer platforms.

In the event of serious injury (loss of consciousness or serious cut):

- Contact emergency services immediately.
- In the event of rescue from inside the plenum the ladder may hinder rescue. **The ladder may be removed by cutting or unbolting the bracing brackets from the unit.**

To prevent serious injury or death to you or your family, it is essential that these safety decals be mounted on your dryer.

Check that all safety decals are in place according to the decal placement drawing and in good legible condition 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.

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



2. Decal L02741 - DANGER: Keep away from any electrical lines, especially when moving unit.



3. Decal L0234 - WARNING: Door interlock switch. Switch resets when door is closed.



4. Decal L0166 - WARNING: Guards & screens in place. Disconnect electricity. Check fan blade.



5. Decal L0271 - DANGER: Shield missing, do not operate.



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



7. Decal L0285 - CAUTION: Not intended for use on public roads. If transporting is required:



Safety Section

8. Decal L02831 – WARNING: Lower and secure parking stands before unhitching unit.



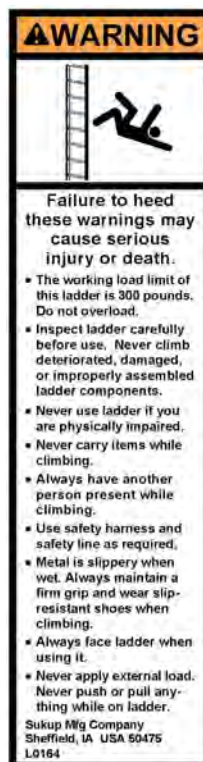
9. Decal L03061 - DANGER: Keep away when auger is running! Entanglement will cause serious injury or death!



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



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



12. Decal L0512 – WARNING: Use safety chain when towing unit to eliminate detachment hazard.



13. Decal L0062 – DANGER: Never run fan without screen guard; Stay clear from front of fan; Follow correct procedure when installing fan blade.



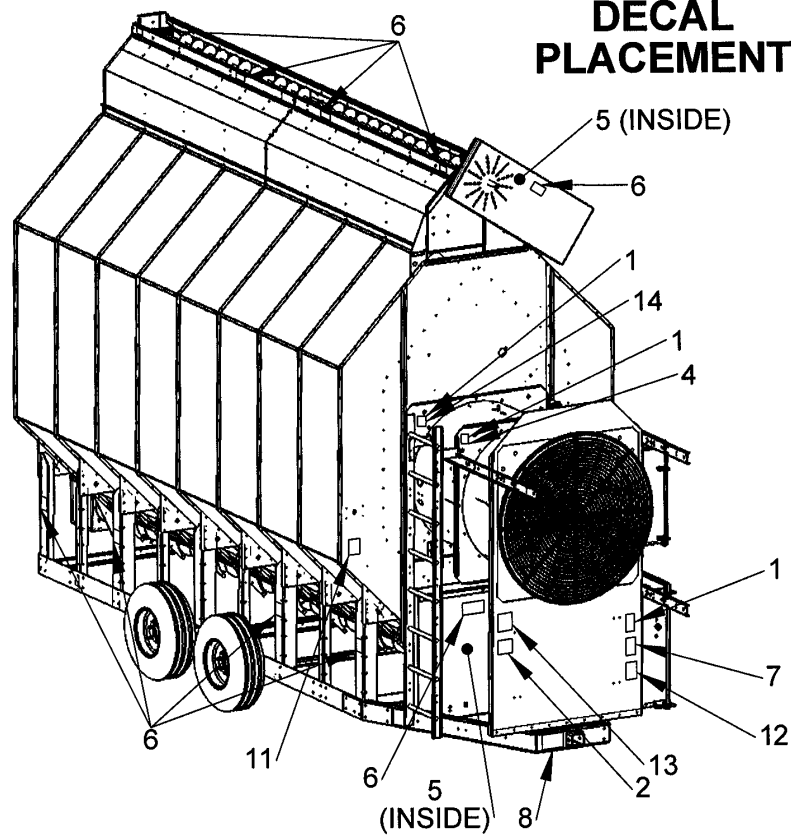
14. Decal L0165 - WARNING: Disconnect Electricity; Bleed gas; etc.



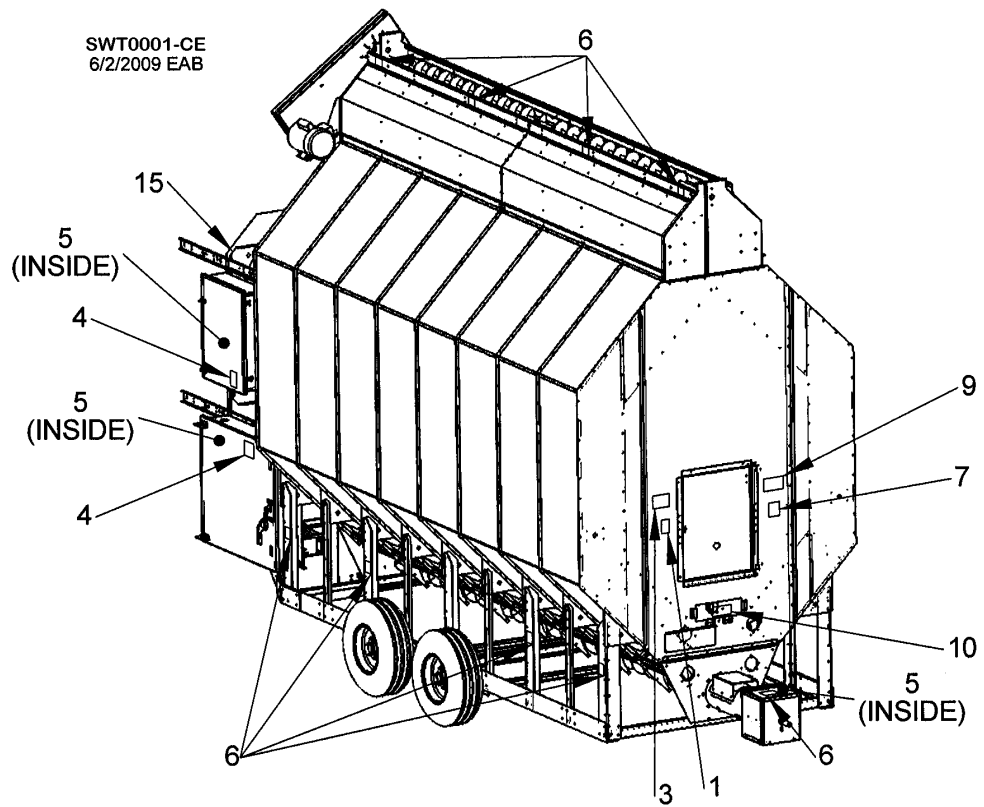
15. Decal L0204 - DANGER: Do not operate with service door removed.



DECAL PLACEMENT



SWT0001-CE
6/2/2009 EAB



CE SAFETY LABELS

To prevent serious injury or death to you or your family, it is essential that these safety decals be mounted on your dryer.

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.



L5100 Sukup Manufacturing Co. Sheffield, IA USA

Label #L5100 – Place inside power box of dryer and on dryer where electrical precautions are needed.



L5101



Sukup Manufacturing Company Sheffield, IA USA

Label #L5101 – Place near power disconnect of dryer.



L5102



Sukup Manufacturing Company Sheffield, IA USA

Label #L5102 – Place near main power source of dryer.



L5103



Sukup Manufacturing Company Sheffield, IA USA

Label #L5103 – Place near main power source of dryer.



L5104

Sukup Manufacturing Co. Sheffield, IA USA

Label #L5104 - Place at dryer rear access door (entrance to plenum).



L5105 Sukup Manufacturing Co. Sheffield, IA USA

Label #L5105 – Place at dryer rear access door (entrance to plenum).



L5106

Sukup Manufacturing Company Sheffield, IA USA



Label #L5106 – Place near shut off to power source.



Label #L5107 – Place near main power shut off.



Label #L5109 – Place near main power panel.



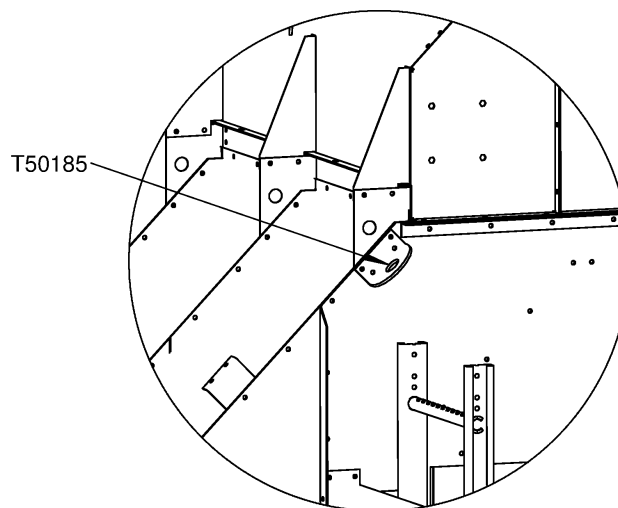
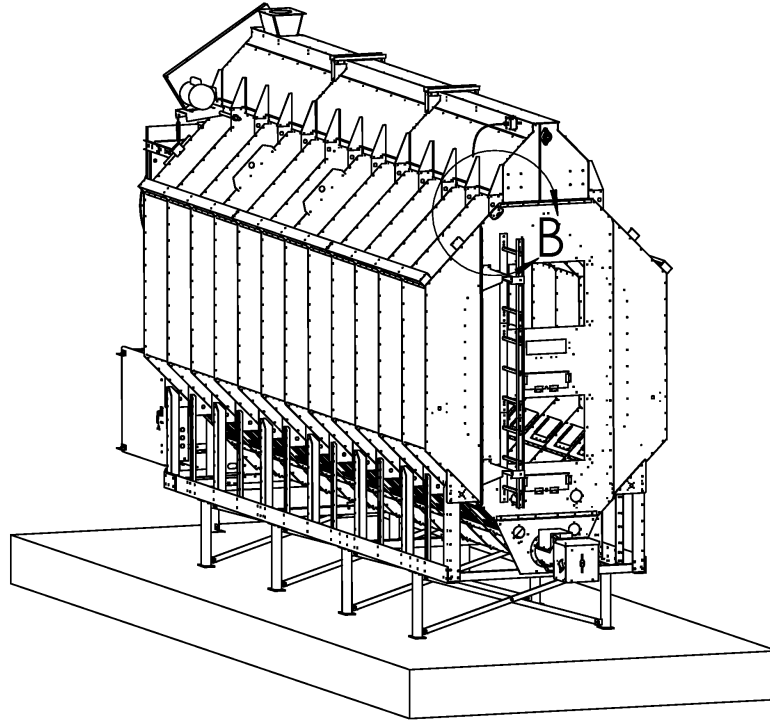
Label #L5108 - Placed on axial fans.



Label #L5111- Place at dryer rear access door (entrance to plenum).

NOTE: See harness anchor point bracket placement drawing on next page.

HARNESS ANCHOR POINT BRACKET PLACEMENT



INSTALLATION SHOWN
ON SINGLE MODULE
DRYER.

DETAIL B
SCALE 1 : 15

SWCD0077
12/16/2011MCM

Fault Troubleshooting

Grain Discharge Chute Sensor

The Grain Discharge Chute Sensor is present on the dryer to detect the Discharge Chute opening during operation. This fault usually indicates a problem with the take-away system.

Model	Wire #
1 Fan Portable Dryer	42
2 Fan Portable Dryer	42
2 Module Stack Dryer	42
3 Module Stack Dryer	42

placing the door at the height you wish the fault to occur. The PLC input light turns off when a fault occurs.

3. If unable to adjust the sensor and turn on the PLC input light, a voltmeter will be used to determine if the sensor is malfunctioning.
4. At the Discharge Chute, find the junction box fastened to the lid. This box contains the sensor.

Remove the cover and locate the two wires coming from the sensor. One of the wires should be labeled # 18. Measure for 24VDC from wire #18 to ground. (On older dryers, a jumper may need to be installed in the control box from wire # 95, found on the PLC, to the ground bar at the bottom of the control box).

5. If 24VDC is measured on wire # 18, check for voltage on wire # 42. If 24VDC is not present, tilting the sensor may be necessary to allow the mercury to make contact with the switch contacts. If unable to measure 24VDC on wire # 42, the sensor is bad and must be replaced.
6. If 24VDC is present on wire # 42, but the PLC input light is still off, proceed to the Power Box and measure terminal # 42 for 24VDC. If unable to measure 24VDC on terminal # 42, check connections between the Discharge Chute Sensor and the Power Box.
7. If 24VDC was measured on terminal # 42 in the Power Box, measure the PLC input where 42 goes into the PLC. If 24VDC is present on the input on the PLC but the light is OFF, the PLC is malfunctioning.

1. Is the Discharge Chute open?

Determine the cause of the door being opened and return the door to the closed position.

2. Is the sensor out of adjustment?

This can be determined by watching the input light on the PLC or by observing the System Diagnostics screen in the Tools Menu. Adjust the angle of the switch after

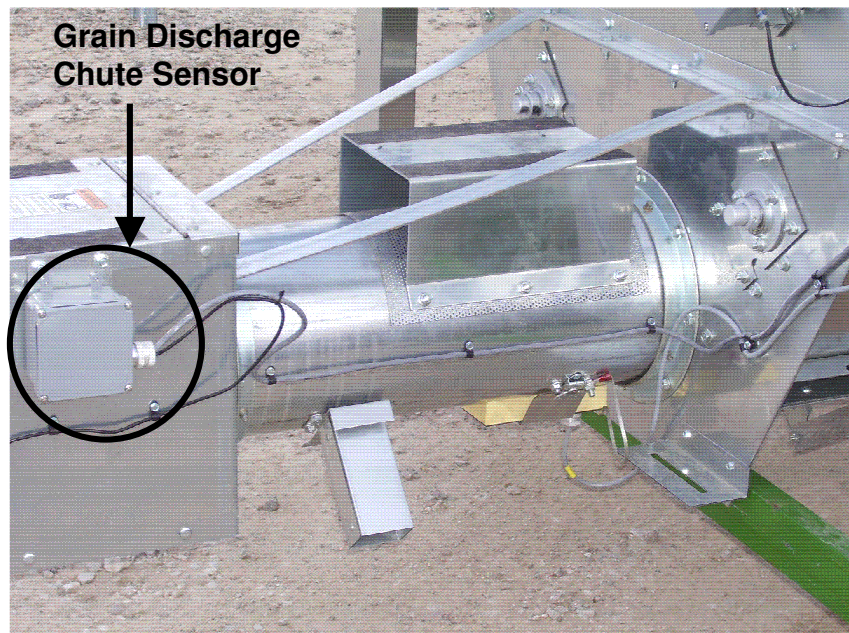
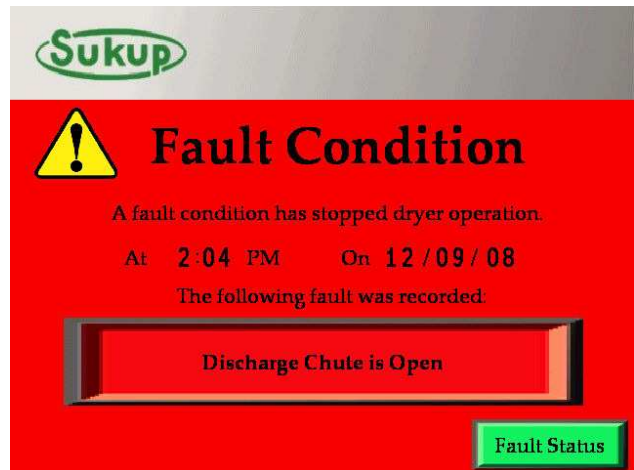


Figure 1.1c: Placement of sensor on dryer

Grain Level Ball Switch

The Grain Level Ball Switch is located on the side of the dryer connected to the paddle switch. This is used to indicate when the dryer is running low or out of grain. A fault will be displayed when this occurs.

Model	Wire #
1 Fan Portable Dryer	44
2 Fan Portable Dryer	44
2 Module Stack Dryer	44
3 Module Stack Dryer	44

1. Is the wet bin out of grain?
If this is the last load for the season, press Reset and Start → Final Dry.
2. Has an auxiliary load malfunctioned?
Repair the cause of the load failure and press Reset.
3. If wet grain is available and the load auxiliaries are functioning, is the paddle switch bound up?
If so, free the paddle switch and repair the cause.
4. Are both PLC input lights off? (Both lights should be off when the dryer is calling for grain – paddle down)
Are both PLC input lights on? (Both lights should be on when the dryer is full – paddle up)
If not, remove the cover from the junction box on the paddle switch assembly and visually check sensors for proper placement in their respective holders.
5. Observe the PLC input lights (#44-Lower; #53-Upper) while someone moves the paddle switch from the down position to the up position.

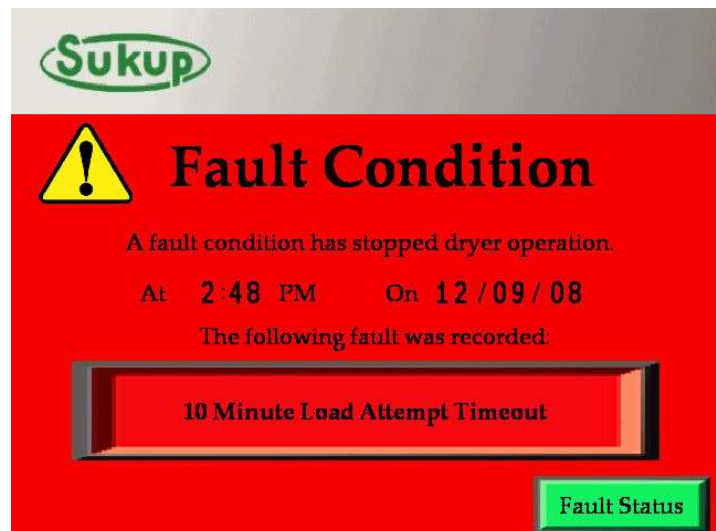
Lower-Input 1.1.1; Upper-Input 1.2.3

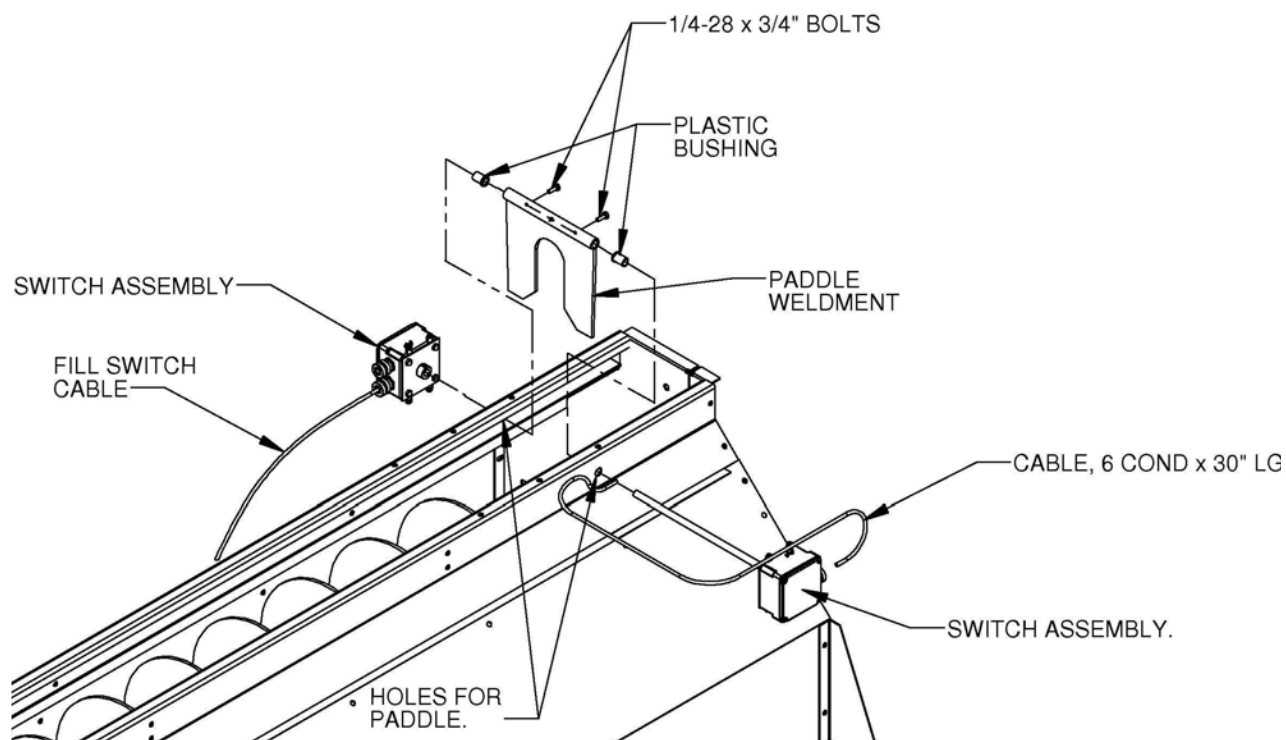
If either PLC input light does not turn on, measure for 24VDC on wire #18 to ground. (Touch the black probe from the meter to the dryer frame.)

6. If 24VDC is measured on wire #18, measure for 24VDC on the other wire going to the sensor.
 - a. With the paddle switch in the up position, 24VDC should be measured on wire #44 and #53.
 - b. If not, replace the respective sensor and recheck for voltage.
7. If the paddle switch is in the up position and 24VDC is present on both sensors, but one or both of the PLC input lights are off, voltage will need to be measured on the respective terminal on the Power Box terminal strip.
If 24VDC is not measured on the respective terminal, check the wiring connections between the Paddle Switch junction box and the Power Box terminal strip.
8. If 24VDC is measured at the Power Box terminal strip and the PLC input lights are not on, the PLC may be malfunctioning.



Figure 1:2b: Grain Level Ball Switch





Grain Level Ball Switch positioned on dryer

Unload Auger Proximity Sensor

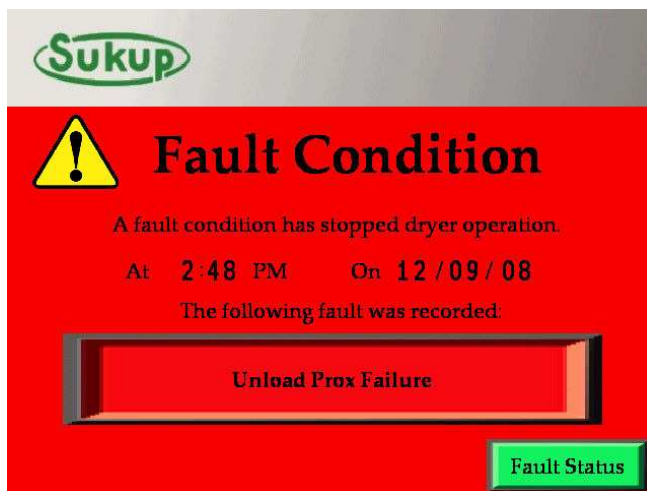
The Unload Auger sensor is located on the discharge bin on the end of the unload auger. This sensor monitors the unload auger and will give a fault and stop the dryer if the unload auger stops turning.

Model	Wire #
1 Fan Portable Dryer	96
2 Fan Portable Dryer	96
2 Module Stack Dryer	96
3 Module Stack Dryer	96



Figure 1.3b: Unload Auger Proximity Sensor

1. Visually inspect the load auger for a problem.
 - a. Are the belts tight and in good condition?
 - b. Does the motor smell or feel hot?
 - c. Is a Motor Overload fault being displayed along with the Unload Auger fault? If so, do not restart the Unload motor until a definite cause for the overload has been determined. After repairing the cause of the fault, reset the motor overload. Then press RESET on the keypad.
2. If no fault is being displayed, go to Manual and turn on the Unload and check for rotation.
 - a. While the auger is rotating, check the PLC Input light, this light should be flashing at a regular rate, indicating rotation. **Input-1.3.2**
 - b. If the PLC Input light is not flashing, check auger for rotation. If the auger is not rotating, find the cause and repair.
3. If rotating, look at the back of the sensor itself. A small, orange light should be visible and flashing on and off.
4. If the light on the back of the sensor is not flashing, find the junction box attached to the discharge chute and remove the cover.
 - a. Locate the Brown, Black, and Blue wires coming from the Unload Auger Sensor. Measure for 24VDC on wire # 18 (brown), with respect to wire # 95 (blue).
 - b. If 24VDC is not measured on wire # 18, go to the Power Box terminal strip and measure for 24VDC on the bottom terminal strip.
 - c. If 24VDC is not measured on wire # 18 in the Power Box, go to the Control Box and measure for 24VDC on the terminal strip.
 - d. If 24VDC is not measured on wire # 18 in the control box, go to the PLC and measure for 24VDC on the topside of the PLC.
5. If possible, position the flag over the sensor so that the sensor will be in the ON condition.



Unload Auger Proximity Sensor (continued)

- a. With the sensor in the ON condition, the light on the back of the sensor should be on. Measure for 24VDC on the output wire (black).
If the light is on but 24VDC is not measured on the output (black) sensor wire, the sensor is malfunctioning.
- b. If 24VDC is measured on the output (black) sensor wire, go to the PLC in the Power Box and check the PLC Input light. This light should be on when the sensor is in the ON condition.
- c. If 24VDC is measured on the output (black) sensor wire but the PLC input light is not on, measure for 24VDC on the Power Box terminal strip. If 24VDC is not measured, in the Power Box, check wiring connections between the junction box and the Power Box.



Figure 1.3c: Unload Auger Proximity Sensor Installed on Dryer

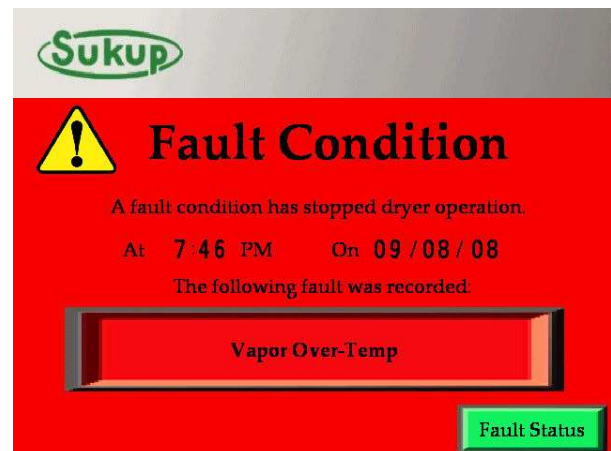
Vapor Over-Temperature Switch

The Vapor Over-Temperature Switch is located on the pipe train for the heater(s). It is provided to prevent the gas from over heating the vaporizer and causing vapor to vaporize.



Figure 1.4b: Vapor Over-Temperature Switch

Model	Wire #
1 Fan Portable Dryer	37
2 Fan Portable Dryer (Lower)	37
2 Fan Portable Dryer (Upper)	102
2 Module Stack Dryer (#1)	37
2 Module Stack Dryer (#2)	102
2 Module Stack Dryer (#3)	202
2 Module Stack Dryer (#4)	302
3 Module Stack Dryer (#1)	37
3 Module Stack Dryer (#2)	102
3 Module Stack Dryer (#3)	202
3 Module Stack Dryer (#4)	302
3 Module Stack Dryer (#5)	402
3 Module Stack Dryer (#6)	502



- This fault indicates when the output of the vaporizer coil has become too hot (above 60 C.).
 - The tubing near the fault device should be fairly warm to the touch but not hot.
 - Check the fuel supply - is the tank low on fuel?
 - Air inlet obstruction – clean debris from the fan grill.
 - Vaporizer coil is too close to the flame. – Adjust vaporizer coil.
- Has the Vaporizer Coil had sufficient time to cool down?
This device will automatically reset when the device has cooled down.
- Is the PLC Input light on?
 - After the device has cooled down and reset, the PLC Input light should now be ON.
 - If not, follow the wiring from the coil to the heater box and measure for 24VDC on wire # 18.
- If 24VDC is not measured on wire # 18, go to the Power Box and measure 24VDC on the terminal strip.
If 24VDC is measured on wire # 18 on the Power Box terminal strip, check the wiring connections from the Heater Box to the Power Box.
- With 24VDC now being measured on wire # 18 on one wire of the vaporizer O/T switch, and the device has cooled down to ambient temperature, measure for 24VDC on the other wire (not # 18) coming from the O/T switch.
 - If 24VDC is NOT measured on the other wire, the O/T switch is bad.
 - If 24VDC is measured on the other wire coming from the O/T switch, take note of the wire number and go to the Power Box and measure for 24VDC on the terminal strip.
 - If 24VDC is NOT measured on the Power Box terminal strip, check the wiring connections between the Power Box and the Heater Box.
 - If 24VDC is measured on the Input terminal, and the Input light is NOT on, and the fault message is still being displayed (after pressing RESET), the PLC is malfunctioning.

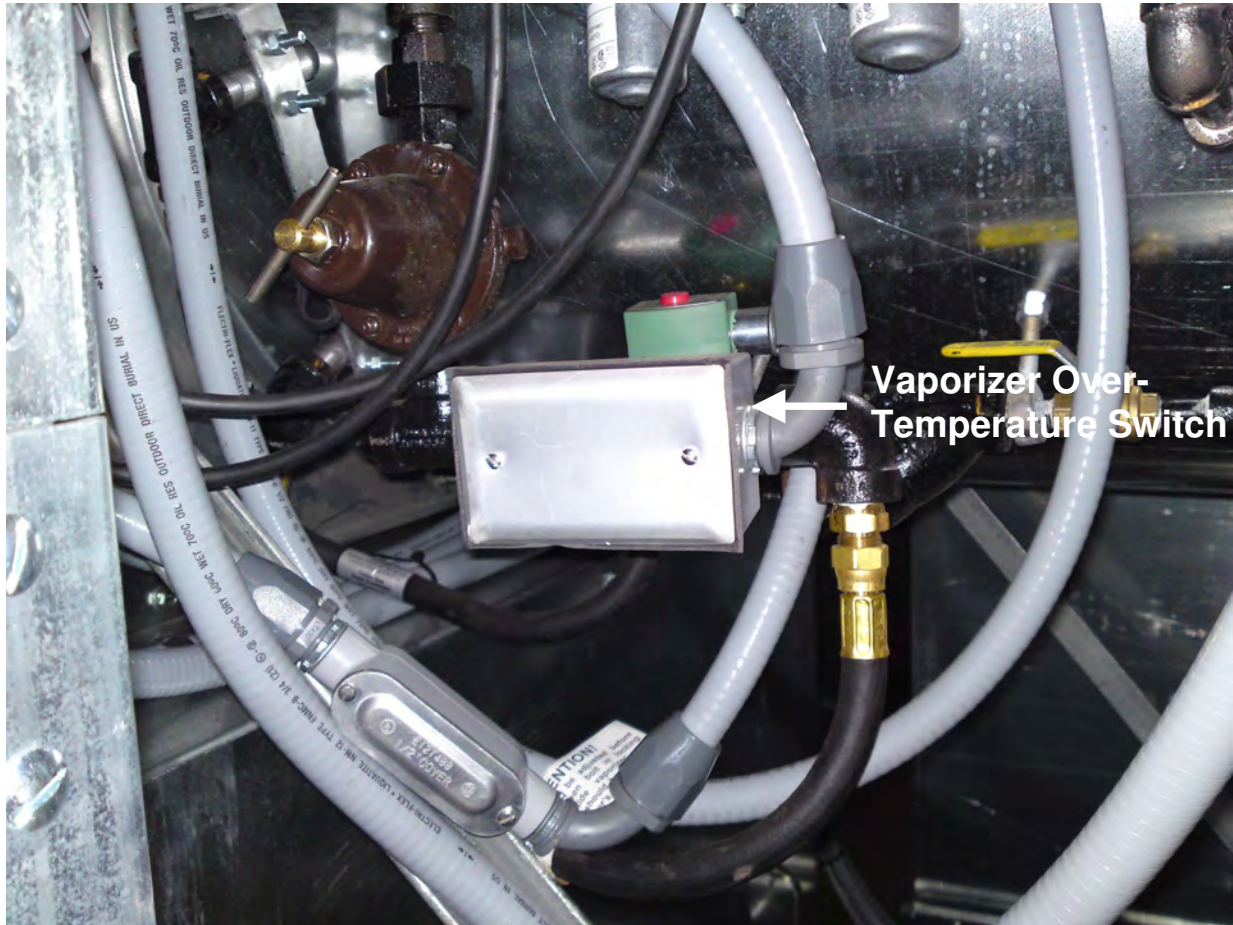


Figure 1.4c: Vapor Over-Temperature Switch Installed on Dryer

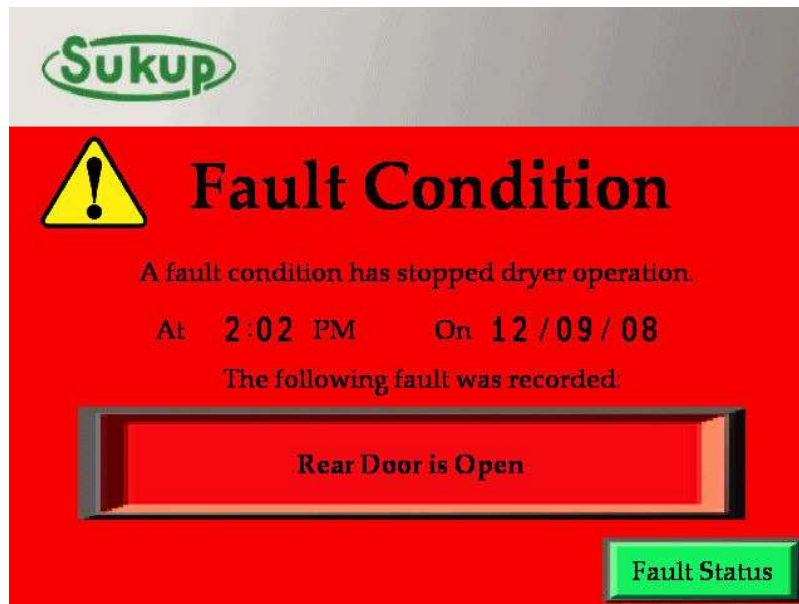
Rear Door Interlock Switch

The Rear Door Interlock Switch is located to the left of each rear door on the dryer. This device is used to keep the dryer from running when the rear door is open and a person may be in the plenum of the dryer.

Model	Wire #
1 Fan Portable Dryer	36
2 Fan Portable Dryer	36
2 Module Stack Dryer	36A-D
3 Module Stack Dryer	36



Figure 1.5b: Rear Door Switch



1. Check the rear door or doors to be sure that the doors are closed.
2. If all doors are closed, check that the PLC input light is ON.
If the light is not ON, go to the junction box on the back of the dryer containing the wire from the switches. Remove the cover and locate and measure 24VDC on input wire.
NOTE: On ALL dryers, wire # 18 feeds into the door switch and out of the push-button switch. If more than one plenum, the switches are connected in series and then routes back to the PLC input.
3. If 24VDC is not present on input wire, check that 24VDC is measured on wire #18.
 - a. If 24VDC is present on input wire, but the PLC input light is not ON, check for 24VDC returning from all the switches. Generally, each additional door switch adds a letter to the wire number after coming out each successive key switch. 36 – 36A – 36B – etc.
 - b. If 24VDC is not returned from the door switches, a voltage check on the wire coming from each switch may be required. (Rear Door key switches are in SERIES)
4. If 24VDC is being returned from the last switch, measure for 24VDC on the appropriate wire on the Power Box terminal strip.
 - a. If 24VDC is not measured on the Power Box terminal strip, check the wiring connections between the junction box and the Power Box.
 - b. If 24VDC is measured on the Power Box terminal strip, check #36 on the PLC for 24VDC
5. If 24VDC is measured on the PLC input terminal but the input light is not on, and you have a Rear Door fault, the PLC is malfunctioning.

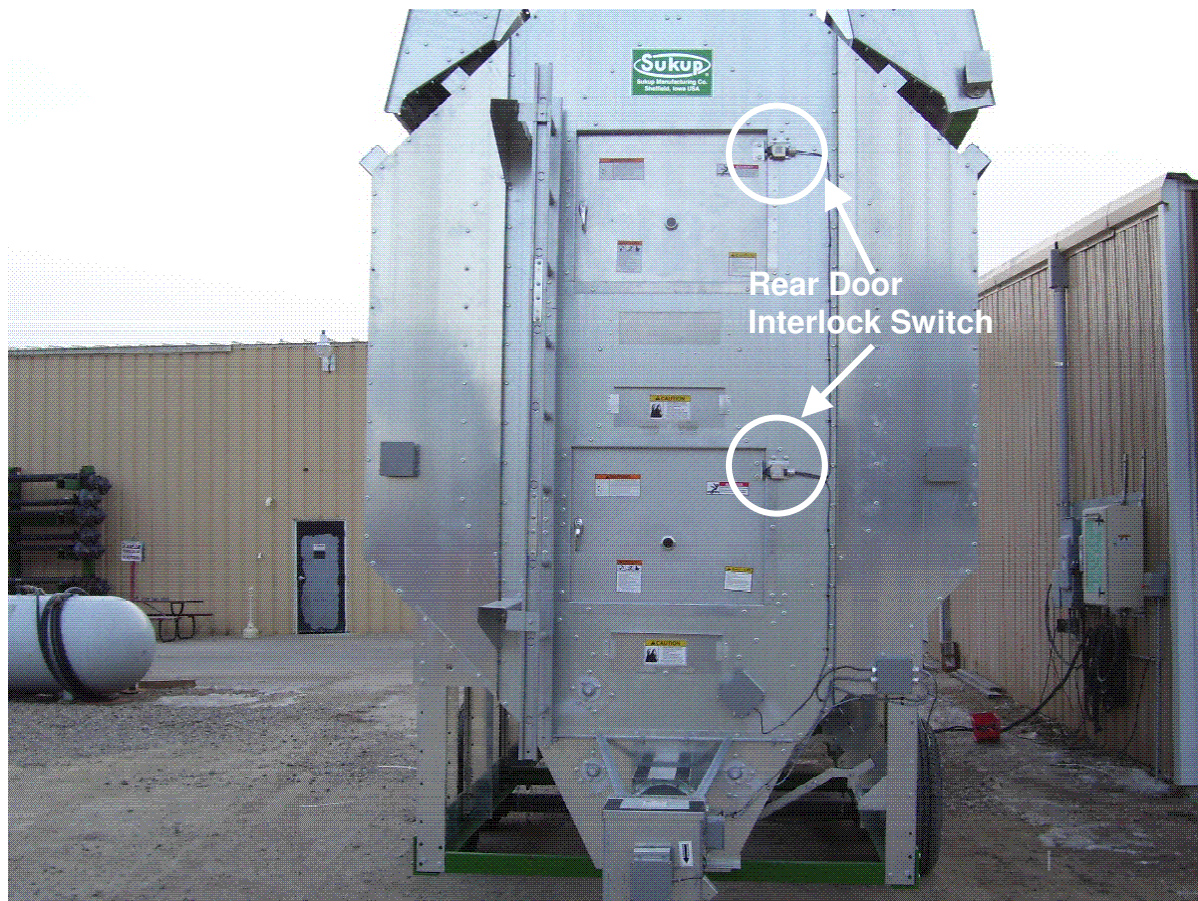


Figure 1.5c: Rear Door Interlock Switch Installed on Dryer

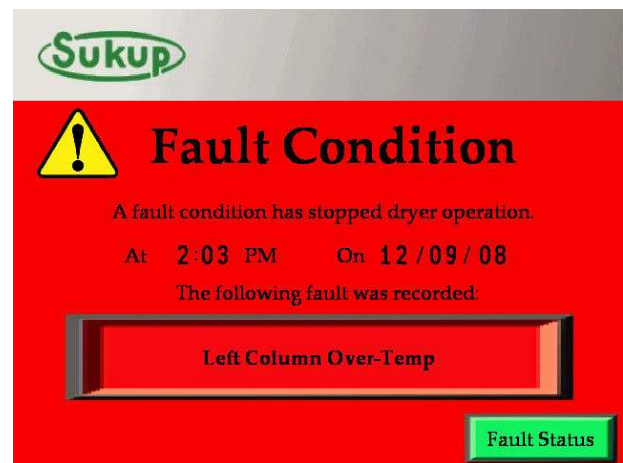
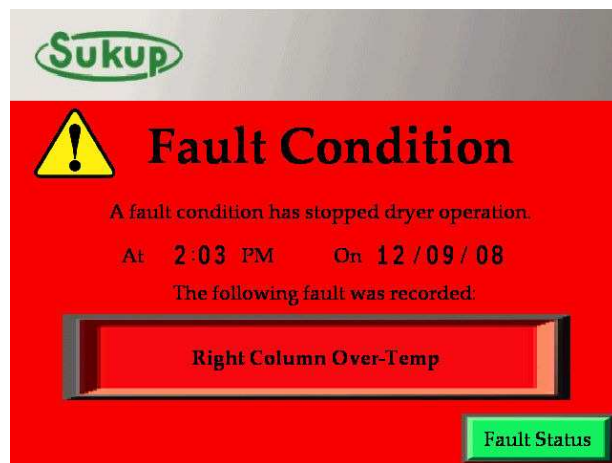
Grain Column Over-Temperature Sensor

The Grain Column Over-Temp sensor is located in conduit running through the grain columns horizontally. This device is used to monitor the temperature of the columns and will turn the dryer off if the columns reach 149°C.

Model	Wire #
1 Fan Portable Dryer (Right)	40
1 Fan Portable Dryer (Left)	41
2 Fan Portable Dryer (Right)	40
2 Fan Portable Dryer (Left)	41
2 Module Stack Dryer (Right)	40
2 Module Stack Dryer (Left)	41
3 Module Stack Dryer (Right)	40
3 Module Stack Dryer (Left)	41



Figure 1.6b: Grain Column Over-Temperature Sensor



1. Check all of the grain columns for an obstruction, which would prevent the grain from flowing through the grain column.
If an obstruction is found, do not restart the dryer until the obstruction has been cleared.
2. If no obstruction is found and grain is flowing freely through each column, the plenum temperature may need to be reduced.

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

3. If the column temperature has cooled down and the RESET button has been pressed on the keypad, and the fault message is still being displayed, remove the junction box cover and measure for 24VDC on wire # 18.
4. Allow time for the Columns to cool down.
5. At this point, 24VDC should be measured on wire # 18 at the O/T sensor.
Measure for 24VDC on the other wire (not # 18) coming from the sensor.
 - a. If 24VDC is NOT measured, the O/T sensor is defective.
 - b. If 24VDC is measured on the wire coming from the O/T sensor but
The PLC Input light is NOT on, note the wire number and go to
The Power Box and measure for 24VDC on the terminal strip.
 - c. If 24VDC is NOT measured on the terminal strip in the Power Box, check the wiring connections between
the junction box and the Power Box.

Fault Troubleshooting

- d. If 24VDC is measured on the terminal strip in the Power Box, go to the PLC and measure for 24VDC on the Input terminal.
- e. If 24VDC is measured on the PLC Input terminal, the Input light is not on, and the fault message is still being presented (after pressing RESET), the PLC is malfunctioning.

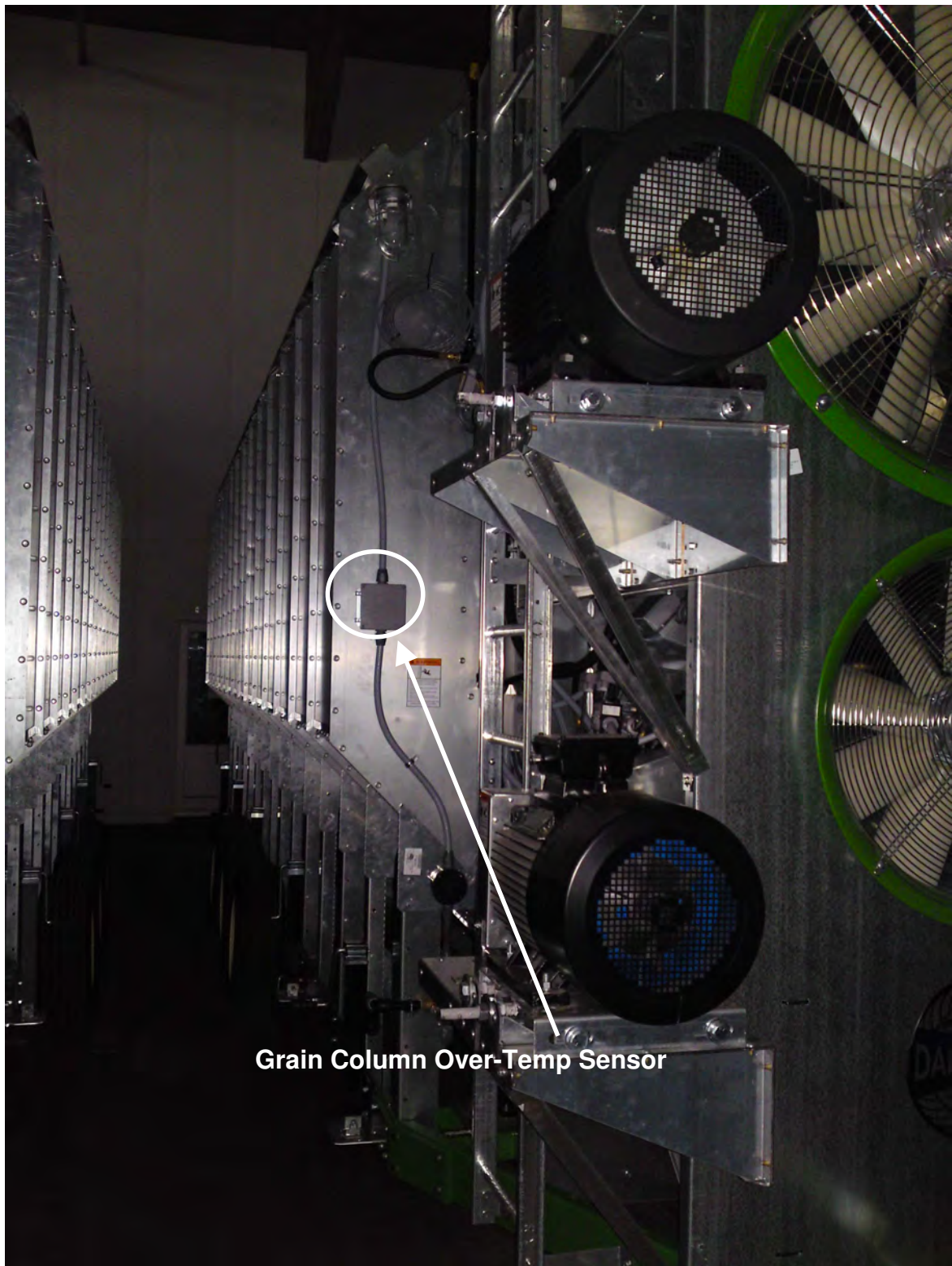


Figure 1.6c: Grain Column Over-Temperature Sensor Installed on Dryer



Figure 1.6d: Grain Column Over-Temperature Sensor Installed on Dryer

Fault Troubleshooting

Heater Housing Hi-Limit Switch

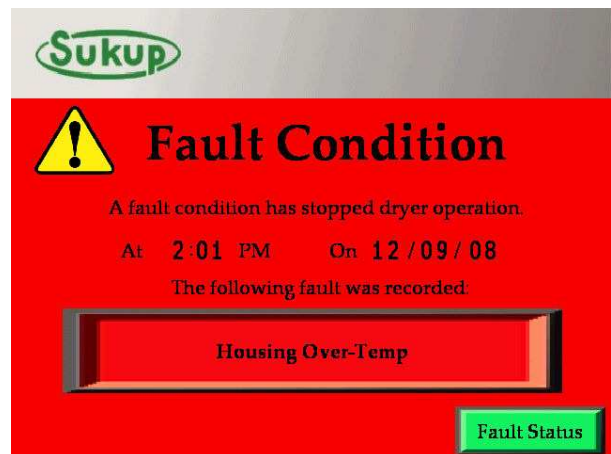
Heater Housing Hi-Limit switch is the reset button located in the 5x5 box mounted on the top side of the fan barrel. This switch trips when the heater reaches a temperature of 93°C.

Model	Wire #
1 Fan Portable Dryer	38
2 Fan Portable Dryer (Lower)	38
2 Fan Portable Dryer (Upper)	103
2 Module Stack Dryer (#1)	38
2 Module Stack Dryer (#2)	103
2 Module Stack Dryer (#3)	203
2 Module Stack Dryer (#4)	303
3 Module Stack Dryer (#)	38
3 Module Stack Dryer (#)	103
3 Module Stack Dryer (#)	203
3 Module Stack Dryer (#)	303
3 Module Stack Dryer (#)	403
3 Module Stack Dryer (#)	503



Figure 1.7b: Heater Housing Hi-Limit Switch

1. Check for proper fan operation and airflow.
 - a. Check the ignition harness for burned wires. Replace is necessary.
 - b. Check for a plugged fan grill and remove any debris.
 - c. Remove the cover from the faulted Heater Box and push the RED reset button located at the center of the Heater Box.
 - d. Go to manual and turn on the fan. Insure that the fan is running at the proper speed.
 - e. Turn the burner switch to ON and observe the burner for proper operation.
2. After allowing time enough to cool, the RED reset button on the hi-limit switch should push in and latch.
 - a. If the reset button will not latch, the hi-limit switch is defective.
 - b. If the reset button will latch but the fault remains after RESET is pressed, voltage measurements will need to be taken.
3. Locate the two wires plugged in to the hi-limit switch. Measure for 24VDC on wire # 18.
 - a. If 24VDC is not present on wire # 18, go to the Power Box and check for 24VDC on the terminal strip.
 - b. If 24VDC is measured on the terminal strip, check wiring connections between the Heater Box and the Power Box.
4. At this point, 24VDC should be measured on wire # 18 at the hi-limit switch.
 - a. Measure for 24VDC on the other wire connected to the hi-limit switch. With the RED reset button latched in, 24VDC should be present.
 - b. If 24VDC is NOT measured, the hi-limit switch is defective.
 - c. If 24VDC is measured but the PLC Input light is not ON, take note of the wire number and go to the Power Box and measure for 24VDC on the terminal strip.
 - d. If 24VDC is NOT measured on the terminal strip, check the wiring connections between the Heater Box and the Power Box.
 - e. If 24VDC is measured on the Power Box terminal strip, go to the PLC Input terminal and measure for 24VDC.
 - f. If 24VDC is NOT measured on the PLC input terminal, check the wiring connections from the PLC Input terminal to the Power Box terminal strip.
 - g. If 24VDC is measured on the input terminal on the PLC but the input light is NOT on, and the fault message is still being displayed after pressing RESET on the keypad, the PLC is malfunctioning.



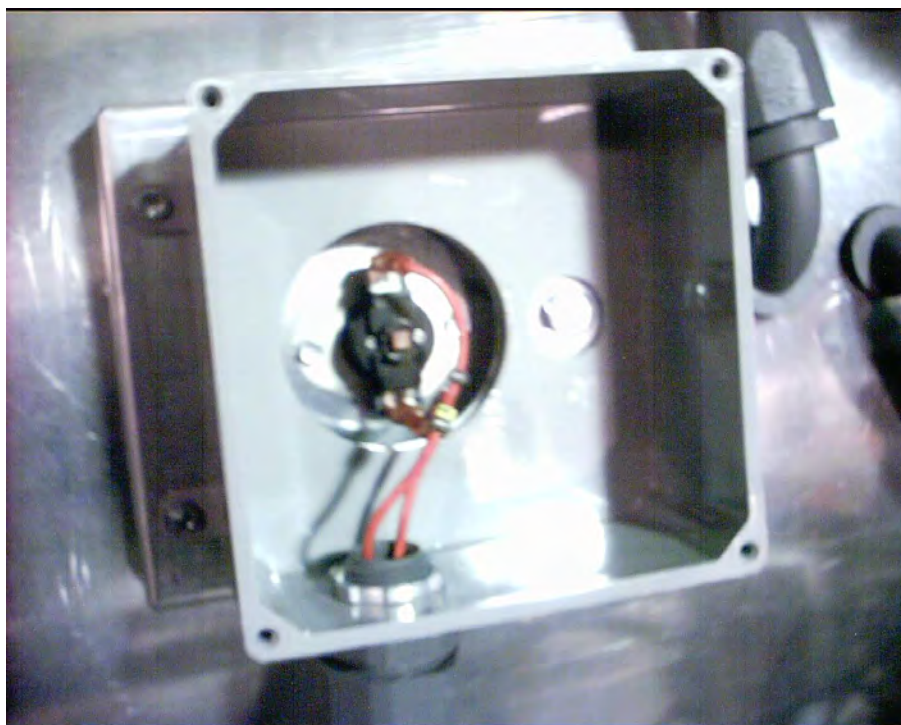


Figure 1.7c: Heater Housing Hi-Limit Switch Installed on Top of Fan Barrel

Metering Roll Proximity Switch

The Metering Roll Proximity Switch is located in junction box at the back of the dryer. This device is used to monitor the metering rolls for rotation. If the rolls cease to turn, the fault will be displayed and the dryer will shut down.

Model	Wire #
1 Fan Portable Dryer	93
2 Fan Portable Dryer	93
2 Module Stack Dryer	93
3 Module Stack Dryer	93



Figure 1.8b: Metering Roll Proximity Switch

- Go to Tools → Manual Operation.
- Turn the manual Meter Roll Speed control to 15%.
- Press and Hold the Unload OFF button until it turns bright green and the unload starts.
- Observe the chain on the Meter Rolls DC Motor for movement.
 - If the chain is moving than check to see if the Meter Rolls are turning.
 - If the Meter Rolls are not turning, check for a broken chain.
- If the Meter Rolls are turning, go to the back of the dryer and look at the back of the Meter Roll sensor for the light turning on and off.
 - Check PLC Input for the light turning on and off.
 - After determining which Meter Roll Input signal is missing, go to that Meter Roll box which houses the proximity switch and remove the cover. Make sure that the flag is within 1/8" of the sensor head when passing over the sensor. If not, this adjustment will need to be made before proceeding. Turn the Unload OFF at a point where the Meter Roll flag is positioned above the proximity sensor. The orange light on the back of the proximity sensor should now be on.
 - If the orange light is not on, follow the wire from the proximity sensor to the junction box. Remove the junction box cover.
 - Measure for 24VDC on wire # 18.
 - If 24VDC is not measured on wire # 18 go to the Power Box and measure for 24VDC on the terminal strip.
 - If 24VDC is measured on the Power Box terminal strip, check the wiring connections between the junction box and the Power box.
- At this point, 24VDC should be present on wire # 18 in the junction box on the back of the dryer (brown sensor wire). This voltage is referenced to ground (blue sensor wire).
- Make sure the flag is over the proximity sensor head and adjusted to 1/8th inch or less.
- The light on the back of the proximity sensor should be on, and 24VDC should be measured on the output (black sensor wire). If not, the sensor is defective.
- If 24VDC is measured on the output (black) wire, go to the Power Box and check the PLC Input light. The input light should be ON when the sensor is in the ON condition.



Fault Troubleshooting

- a. If 24VDC is measured on the black sensor wire but the PLC Input light is not ON, take note of the wire number and go to the Power Box terminal strip and measure for 24VDC.
- b. If 24VDC is NOT measured on the Power Box terminal strip, check the wiring connections between the junction box and the Power Box.
- c. If 24VDC is measured on the Power Box terminal strip, go to the PLC and measure for 24VDC on the PLC Input terminal.
- d. If 24VDC is measured on the PLC Input terminal but the light is NOT ON, the PLC is malfunctioning.

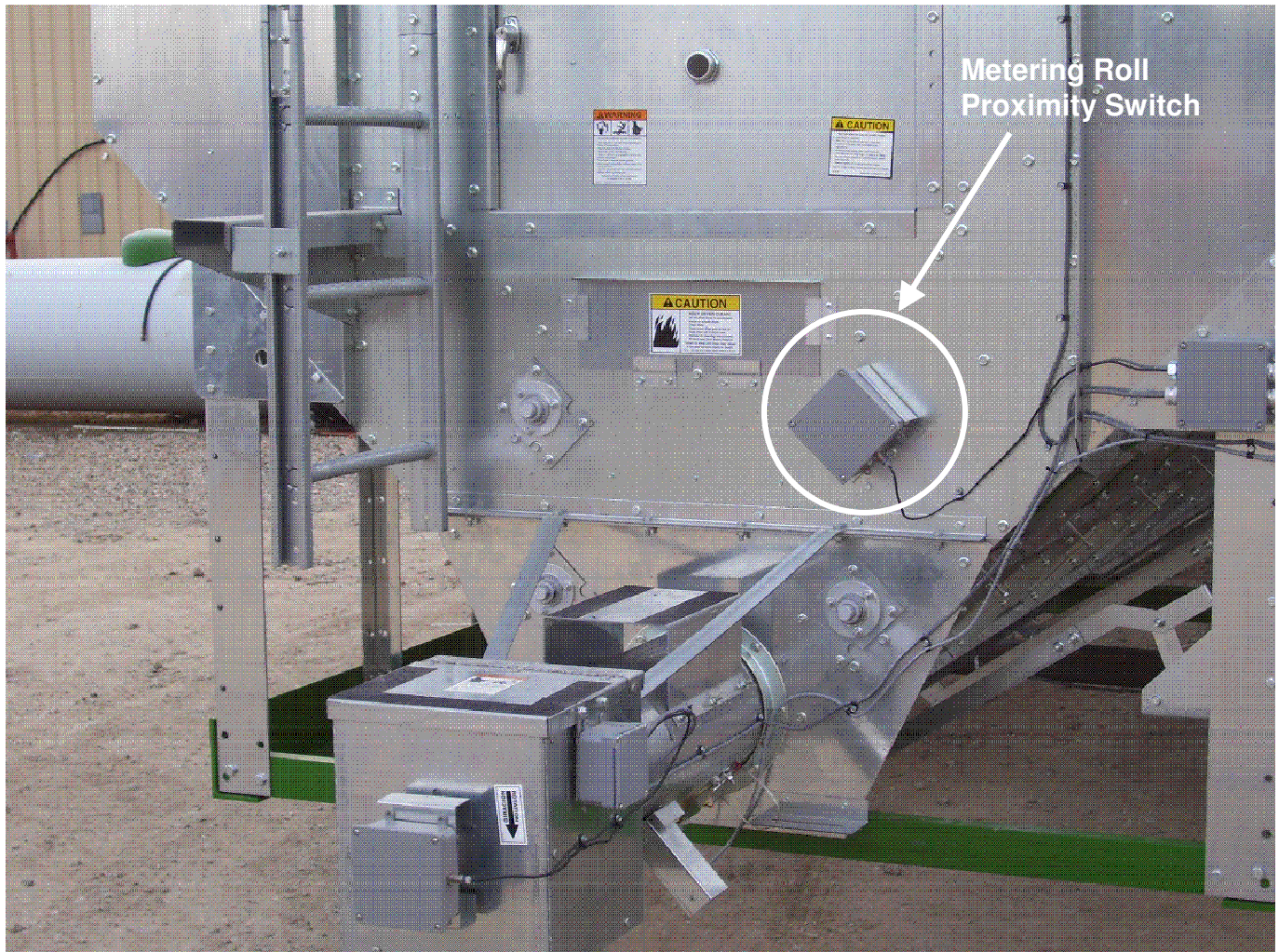


Figure 1.8c: Metering Roll Proximity Switch Installed on Dryer

Static Air Pressure Sensor

The Static Air Pressure sensor is located in the junction box with the air switch (see below). It monitors the amount of static pressure in the plenum and will shut down the dryer if there is not enough present.

Dryer must be full of grain to satisfy this sensor!!!



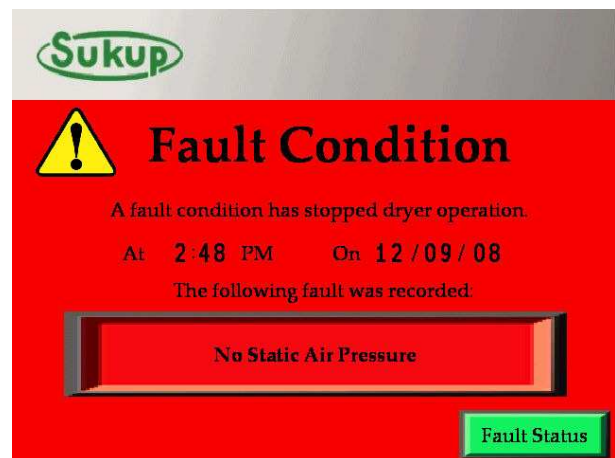
Figure 1.9b: Static Air Pressure Sensor Apart

Model	Wire #
1 Fan Portable Dryer	43
2 Fan Portable Dryer (Lower)	43
2 Fan Portable Dryer (Upper)	105
2 Module Stack Dryer (#1)	43
2 Module Stack Dryer (#2)	105
2 Module Stack Dryer (#3)	205
2 Module Stack Dryer (#4)	305
3 Module Stack Dryer (#1)	43
3 Module Stack Dryer (#2)	105
3 Module Stack Dryer (#3)	205
3 Module Stack Dryer (#4)	305
3 Module Stack Dryer (#5)	405
3 Module Stack Dryer (#6)	505



Figure 1.9c: Differential Air Switch
(Located in Heater Box)

- To develop static air pressure in the plenum, the dryer must be full of grain. Check the grain level in the columns.
If columns are not full, check for the out of wet grain cause, and correct.
- Using Tools → Manual Operation, turn the Fan ON.
Check the fan for proper operation and airflow.
- If a fault message is displayed, the air switch may not be adjusted correctly.
 - Remove the junction box cover containing the air switch.
 - With the dryer full of grain, and the fan switch turned to ON, check the PLC Input light. The input light should be ON at this time.
 - If the input light is NOT on, using a small straight screwdriver, turn the adjustment screw counter-clockwise until the input light turns on.
 - Once the input light is on, turn the fan off and observe the PLC Input light. The light should turn OFF as the fan slows down.
 - If the light remains ON after the fan has slowed, turn the adjustment screw clockwise very slowly until the input light turns off.
 - While watching the PLC Input, turn the fan ON and then OFF, making sure that the input light is turning on and off with the fan.
- If, after going through the above procedure, the PLC Input light remains in either the on or the off position without changing, voltage measurements will be necessary.
 - Locate wire # 18 in the junction box and measure for 24VDC.
 - If 24VDC is NOT measured, go to the Power Box and measure for 24VDC on the terminal strip.



- c. If 24VDC is measured on the terminal strip, go to the PLC and measure for 24VDC.
 - d. If 24VDC is measured on this wire, use a small screwdriver and turn the adjustment clockwise until the 24VDC is no longer present.
 - e. If turning the adjustment screw clockwise fails to turn OFF the Air Switch, the switch is defective.
 - f. If 24VDC is NOT measured on the wire coming from the Air Switch, use a small screwdriver and turn the adjustment screw counter-clockwise until 24VDC is measured.
 - g. If turning the adjustment screw counter-clockwise fails to turn ON the Air Switch, the switch is defective.
5. After replacing the Air Switch, follow the previous instructions on switch adjustment for proper operation.
- a. If the PLC Input light is not turning on when the Air Switch is on, voltage measurements will need to be taken.
 - b. Adjust the Air Switch to the ON position. Measure for 24VDC on the wire coming from the Air Switch.
 - c. Take note of the wire number and go to the Power Box and measure for 24VDC on the terminal strip.
 - d. If 24VDC is NOT measured on the terminal strip, check the wiring connections between the junction box and the Power Box terminal strip.
 - e. If 24VDC IS measured on the terminal strip, go to the PLC Input terminal and measure for 24VDC.
 - f. If 24VDC is NOT measured on the input terminal, check wiring connections between the terminal strip and the PLC.
 - g. If 24VDC is measured on the PLC Input terminal but the input light is not on, but the fault message is still being displayed after pressing RESET, the PLC is malfunctioning.

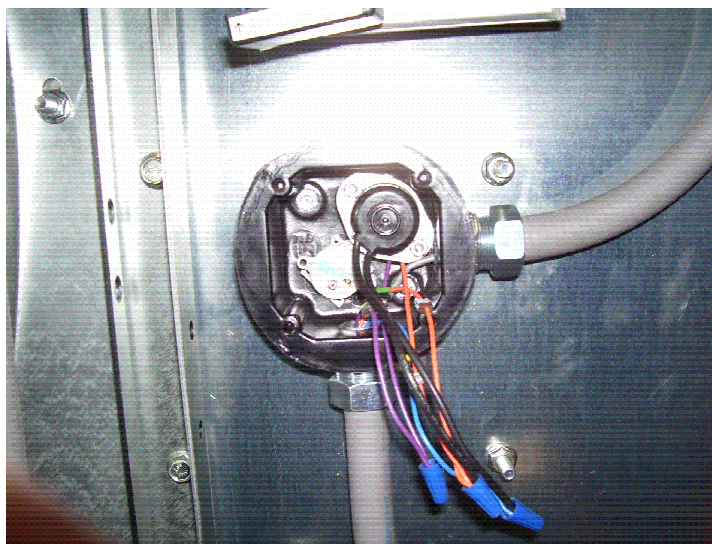


Figure 1.9c: Static Air Pressure Sensor



Figure 1.9d: Static Air Pressure Sensors Installed on Dryer
(Located in same box as Plenum Over-Temp Sensor.)

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Plenum Over-Temperature Sensor

The Plenum Over-Temperature Sensor is located inside the plenum of the dryer. It is provided to protect from the plenum over heating.

Model	Wire #
1 Fan Portable Dryer	39
2 Fan Portable Dryer (Lower)	39
2 Fan Portable Dryer (Upper)	104
2 Module Stack Dryer (#1)	39
2 Module Stack Dryer (#2)	104
2 Module Stack Dryer (#3)	204
2 Module Stack Dryer (#4)	304
3 Module Stack Dryer (#1)	39
3 Module Stack Dryer (#2)	104
3 Module Stack Dryer (#3)	204
3 Module Stack Dryer (#4)	304
3 Module Stack Dryer (#5)	404
3 Module Stack Dryer (#6)	504



Figure 1.10b: Plenum Over-Temperature Sensor

1. Check the fan grill for obstruction and remove any accumulated debris.

2. With the dryer shut down, remove the key from the key-lock switch at the plenum access door. Open the door and inspect the plenum for any problems.

3. After the plenum has cooled down, press the RESET, and the fault should be cleared.

4. If the fault has not cleared, remove the cover from the junction box containing the Plenum O/T sensor and measure for 24VDC on wire # 18.

If 24VDC is NOT measured, check the connection with the bank of terminal 18 in the Power Box.

5. At this point, 24VDC should be measured on wire # 18 on the Plenum O/T switch.

6. Measure for 24VDC on the other side of the switch.

a. If the O/T switch is cooled down and 24VDC is NOT measured on the other wire, the sensor is defective.

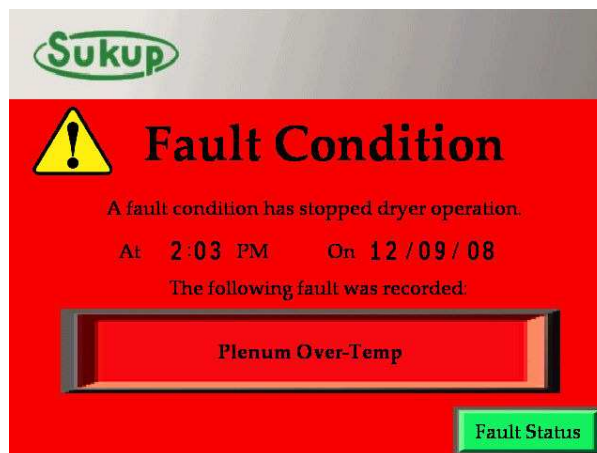
b. If 24VDC is measured on the other wire coming from the sensor, Go to the PLC and check the input light. If the input light is ON, press RESET, and the fault should clear.

c. If the input light is not ON, take note of the wire number coming out of the O/T sensor and go to the Power Box and measure for 24VDC on the terminal strip.

d. If 24VDC is NOT measured on the Power Box terminal strip, check the wiring connections between the junction box and the Power Box.

e. If 24VDC is measured on the Power Box terminal strip, measure for 24VDC on the PLC Input terminal.

f. If 24VDC is measured on the PLC terminal, and the input light is OFF, but the fault message is still being displayed, the PLC is malfunctioning.





**Figure 1.10c: Plenum Over-Temperature Sensors Installed on Dryer
(Located in same box as Static Air Pressure Sensor.)**

Device Troubleshooting

Discharge Moisture Sensor

The Discharge Moisture sensor is found under the discharge chute at the rear of the dryer. It is used to calculate the moisture and temperature of the grain as it is discharged from the dryer.



Figure 2.1b: Discharge Moisture Sensor

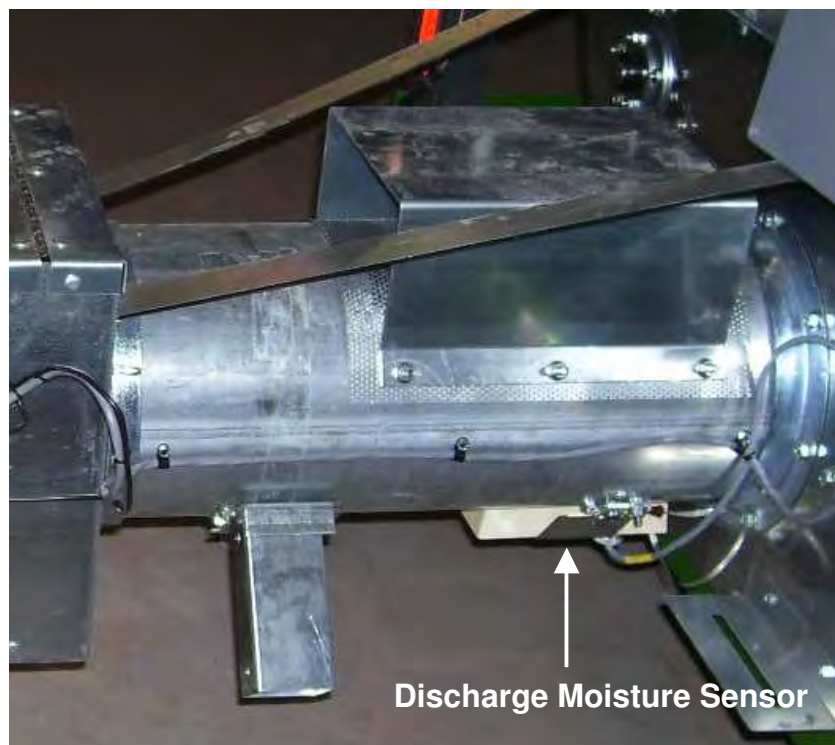
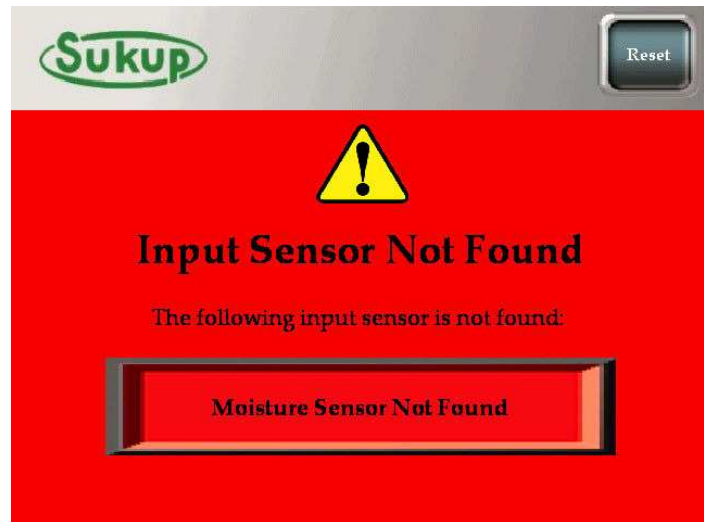


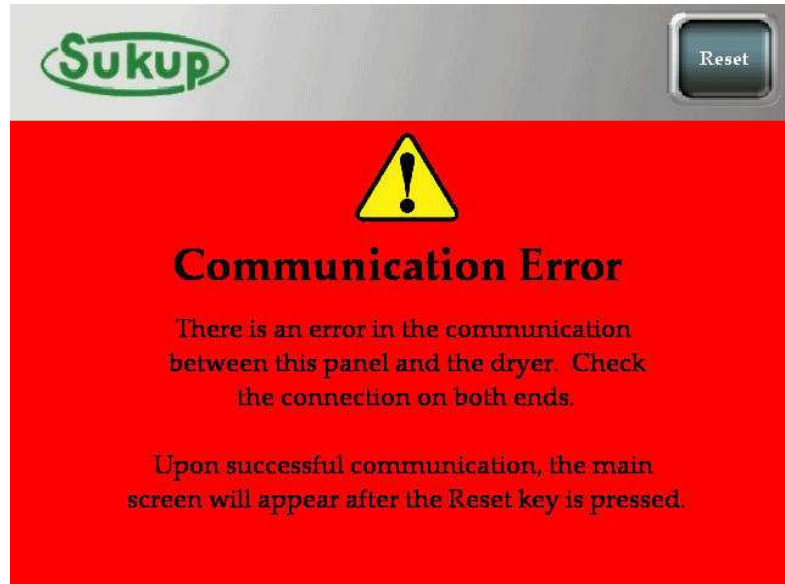
Figure 2.1c: Discharge Moisture Sensor Installed on Dryer

Discharge Moisture Sensor (continued)

1. If you see the red "Input Sensor Not Found" screen, it means that at least one analog input sensor is missing from the PLC. In this case we'll describe the "Moisture Sensor Not Found" error.
 - a. Using a screwdriver, remove the cover on the junction box on the rear of the dryer.
 - b. Find the four (4) wires used by the moisture sensor. They are red, blue, black, green + shield.
 - c. Using a voltmeter, measure for DC voltage between the red and green + shield. Confirm 24VDC. If 0VDC is measured, check the connection between the power box and the junction box.
 - d. Assuming the red wire has 24VDC on it, measure for DC voltage between the black and green + shield wires. You should measure something between 1 and 10VDC. If you measure this voltage, check the connection between the junction box and the power box. The black wire is labeled D4 on the power box terminal strip. If 0VDC is measured, the sensor is malfunctioning and will need to be replaced.
 - e. If you measure the same voltage on the D4 terminal in the power box as back in the junction box, measure between the D4 terminal on the PLC and 95. If 0VDC is found, there is a connection problem between the power box terminal strip and the PLC. If the same voltage (1-10VDC) is present on the PLC D4 input as the junction box at the rear of the dryer, the green analog input PLC card may be malfunctioning.

QuadraTouch™ Controller

In the event that the connection between the QuadraTouch™ controller and the PLC is lost, the following screen will come up. Depending on where you are in the program, this screen may be coupled with a gray, horizontal error bar on the bottom of the screen. It describes for the user that it can no longer find the IP address of the PLC and it's unable to communicate.



Fixing a Communication Error

1. Make sure power is ON to both the QuadraTouch™ controller and the PLC. This means making sure the Emergency Stop switch is pulled out to it's normal operating position, and the system control switch is in the "COMPUTER" position. Also, the green rocker switch on the QuadraTouch™ controller needs to be ON.
 - a. If you turn both devices on at the same time, the QuadraTouch™ controller will boot up slightly faster than the PLC. You will most likely see the main screen with the gray, horizontal error bar on the bottom of the screen. It will take a brief period (up to 15-20 seconds) before both realize that they are talking to each other. You will know when you've cleared this error because the gray, horizontal error bar will disappear.
 - b. When you see this screen without the gray, horizontal error bar, simply press reset, and the system will take you to the main screen.
2. If both devices have power, then the problem lies in the connection cable.
 - a. Make sure the cable is securely fastened into the side of the QuadraTouch™ controller → Ethernet coupler in the box → Ethernet coupler in the Power Box → PLC
 - b. If you want to make sure the connection is available, connect the Ethernet cable directly between the QuadraTouch™ controller and the PLC. Thus eliminating the couplers.

Plenum Temperature Sensor (RTD)

Averaging RTD – Resistive Temperature Device

The averaging RTD is a device, which measures the average resistance over the length of the tube. The dryer commonly uses 16ft. and 24ft. lengths.

The RTD is used in conjunction with a transmitter which converts the resistance into a 1.0VDC – 5.0VDC signal.

This voltage is then fed into the Plenum Temperature Display, which will be located on the Control Panel and near the pipe train of each heater.

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



Figure 2.3b: Plenum Temperature Sensor & RTD

1. Begin by locating the junction box containing the RTD transmitter. This is a rectangular box approximately 4in. by 2 1/2in. The transmitter is attached to the inside of the cover.
2. A white label should be attached to the transmitter. Also, two terminal strips, each with three terminals will be located on the top of the transmitter.
3. Next to the terminal strips is a small adjustment screw. NEVER adjust either of these screws. These are calibration adjustments and once moved, the transmitter will not work correctly until a factory calibration is performed.
4. Locate the terminal strip with the output, +, and – connections. Measure for 24VDC on terminal #2 and #3.
5. If 24VDC is not present, note the wire numbers and go to the Power Box and check for voltage on the terminal strip.
6. With 24VDC present at the transmitter, measure the output voltage (#1 and #3). A voltage between 1.0VDC and 5.0VDC should be measured.
7. With 24VDC present on terminals #2 and #3 but no voltage is measured between terminals #1 and #3, the transmitter is defective.
8. If a voltage is measured, use the chart on the next page to determine if the voltage is reasonable.
9. If a voltage is measured between terminals #1 and #3, go to the other terminal strip and remove the two wires coming from the RTD (red and yellow).
10. A jumper should be connected between terminals #2 and #3.
11. Take a resistance reading with the meter. The resistance of the RTD is directly related to the temperature of the RTD.

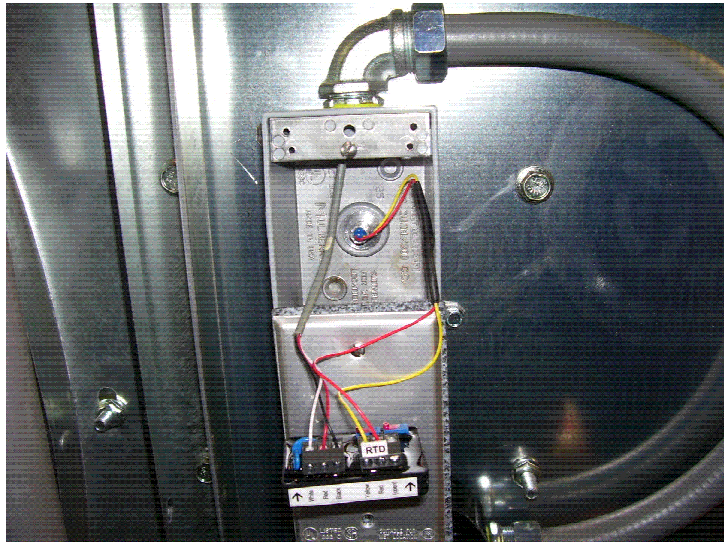


Figure 2.3c: Plenum Temperature Sensor Installed

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

Fault Troubleshooting

Plenum Temperature Sensor (RTD) (continued)

12. If the reading shows infinite (open) resistance, the RTD is defective. Compare the resistance reading to the following table to determine if the resistance is reasonable.

Temperature	Resistance	Voltage
10F (-12C)	952	1.16
15F (-9C)	963	1.24
20F (-7C)	974	1.32
25F (-4C)	984	1.40
30F (-1C)	995	1.48
35F (2C)	1006	1.56
40F (4C)	1017	1.64
45F (7C)	1028	1.72
50F (10C)	1039	1.80
55F (13C)	1049	1.88
60F (16C)	1060	1.96
65F (18C)	1071	2.04
70F (21C)	1082	2.12
75F (24C)	1093	2.20
80F (27C)	1103	2.28
85F (29C)	1114	2.36
90F (32C)	1125	2.44
95F (35C)	1136	2.52
100F (38C)	1146	2.60
105F (41C)	1157	2.68
110F (43C)	1168	2.76
115F (46C)	1178	2.84
120F (49C)	1189	2.92
125F (52C)	1200	3.00
130F (54C)	1211	3.08
135F (57C)	1221	3.16
140F (60C)	1232	3.24
145F (63C)	1243	3.32
150F (66C)	1253	3.40
155F (68C)	1264	3.48
160F (71C)	1275	3.56
165F (74C)	1285	3.64
170F (77C)	1296	3.72
175F (79C)	1306	3.80
180F (82C)	1317	3.88
185F (85C)	1328	3.96
190F (88C)	1338	4.04
195F (91C)	1349	4.12
200F (93C)	1359	4.20
205F (96C)	1370	4.28
210F (99C)	1380	4.36
215F (102C)	1391	4.44
220F (104C)	1402	4.52
225F (107C)	1412	4.60
230F (110C)	1422	4.68
235F (113C)	1433	4.76
240F (116C)	1443	4.84
245F (118C)	1454	4.92
250F (121C)	1464	5.00

13. If the resistance compares to the ambient temperature around the dryer, and the voltage on the output wire is close to the ambient temperature, then the transmitter and the RTD are functioning correctly.

Go to the Plenum Temperature Display troubleshooting page to continue.

Burner Operations**3 Wire Air Switch without Low Pressure Switch**

The following parts will be found on either the gas pipe train or in the heater box.

- Automatic Valve Proving Control – LDU11 – heater box
- Valve Proving Pressure Switch – low and high – between the upstream and downstream valves on the pipe train
- CE Gas Burner Control – LME21.350A1 – heater box
- High Pressure Switch – pipe train – after downstream valve
- Housing High Temperature Switch – 5 x 5 box on fan barrel
- Differential Air Switch – heater box
- Vapor Over-Temp Switch (on LP systems) – pipe train
- Ignition Transformer – heater box
- Main – Upstream Gas Valve – pipe train
- Blocking – Downstream Gas Valve – pipe train
- Electronic Modulating Gas Valve (EMOV) – pipe train

Burner Operation

On heaters *not* requiring the LDU11 valve proving control (28" heater), once the burner control relay is energized, 120VAC must flow through the housing O/T, and the high-pressure switch, before being applied to the CE heater control unit (LME21.350A1).

On heaters requiring the LDU11 (valve proving control), once the main power is being supplied to the dryer, 120 VAC is supplied directly to the LDU11.

The LDU11 valve proving control goes through two valve tests. During TEST 1, the **downstream** valve is energized for 4 seconds, evacuating all of the gas pressure between the upstream and the downstream valves. This test is used to determine if an increase in pressure is detected between the two valves by the valve proving pressure switch. If an increase in pressure is detected, TEST 1 will FAIL, and lockout will occur. The valve proving control can be reset by pressing the clear plastic on top of the unit, or by pressing the reset button on the control box keypad. During TEST 1, a voltage is output from terminal 15 of the LDU11. If no leaks are present, pressure will remain low and the voltage will pass through the N.C. contacts and be present on terminal 16 of the LDU11. If TEST 1 has not failed, TEST 2 will begin.

In TEST 2, the **upstream** valve is energized for 4 seconds, which pressurizes the piping between the two valves. If a decrease in pressure is detected by the valve-proving pressure switch, TEST 2 will fail and lockout will occur. The valve proving control can be reset by pressing the clear plastic on top of the unit, or by pressing the reset button on the control box keypad. During TEST 2, a voltage is again output from terminal 15 of the LDU11. If no leaks are present, pressure will remain high and the voltage will be present on terminal 17 of the LDU11. The valve-proving test will be initiated each time main power is supplied to the dryer (not when turning the control system on and off, or going between automatic and manual).

If both test 1 and 2 pass, 120 VAC is output from terminal # 6 of the LDU11. If no faults have been detected by the dryer control system, then, at the proper time, the control system will call for burner operation by closing a set of N.O. contacts. This voltage must flow through the housing high temperature switch, and the high-pressure gas switch.

This voltage is then supplied to terminal # 12 of the CE Burner Control Unit (LME21.350A1).

Upon supplying voltage to the CEBC, the following ignition sequence takes place.

Ignition Sequence

- 1) 120 VAC is supplied to terminal # 12 of the LME21.350A1 (CEBC).
- 2) A 2.5 second wait time begins.
- 3) The fan ON control signal is enabled. This voltage is output on terminal # 3 of the LME21.350A1, which checks for this same voltage on terminal # 6, which comes from a N.C. contact in the differential air switch. This verifies that the fan is off and no airflow is being detected.
- 4) Within 5 seconds of the fan ON signal being enabled, the differential air switch must close a set of N.O. contacts, which applies this same voltage to terminal # 11. This indicates that air movement has been detected. If this signal is not detected, the unit will go into a fault mode.
- 5) Upon receiving a voltage on terminal #11, the unit goes into a 30 second pre-purge time delay.
- 6) Following the purge time, the ignition transformer is energized. After a 2 second pre-ignition time, the fuel valve is opened.
- 7) The ignition transformer remains energized for an additional 4 seconds. (total of 6 sec.)
- 8) Flame must be detected within 5 seconds, or the unit will go into a fault mode.
- 9) The flame signal must be maintained for an additional 10 seconds before opening other fuel valves.

Loss of flame will cause the CEBC to lockout. The unit may be reset by pressing the small clear plastic button on the front of the unit for approximately 2 seconds, or the reset button may be pressed on the side of the power box. 3 attempts will be allowed for burner ignition. On the 4th attempt, the unit will be locked out and power must then be cycled to the unit before the ignition sequence may be re-initiated.

The electronic modulating valve is in the low fire position for the ignition sequence. After flame has been established, the main control system on the dryer will send a control signal to the valve, which will open or close the valve to maintain a desired temperature set point, which is set by the user.

Note

CEBC = CE Burner Control Unit

This is a general description of burner operation. For specific details of the LME21.350A1, please refer to the Siemens bulletin # CC1N7101en.

CE Heater Troubleshooting Guide

38" / 44" Heaters

- 1) Turn on the main power. The LDU11 (valve proving) should begin rotating.
- 2) Test 1 releases pressure between the upstream (main) valve and the downstream (blocking) valve.
- 3) During test 1, the yellow light on the downstream (blocking) actuator will turn on for 4 seconds. If the test fails, the orange light on the front of the LDU11 will turn on. The test failure is most likely due to a leak. If a leak is not found, a pressure gauge may need to be installed to verify. After being repaired, press the clear plastic window on the front of the LDU11, or press reset button on the side of the power box, and the next test will begin after rotating to the test 1 starting position.
- 4) Test 2 pressurizes the piping between the upstream (main) and the downstream (blocking) valve.
- 5) During test 2, the yellow light on the upstream (main) valve will turn on for 4 seconds. The liquid valve will also be energized at this time. If the test fails, the orange light on the front of the LDU11 will turn on. The test failure is probably due to a leak. If a leak is not found, a pressure gauge may need to be installed to verify. After being repaired, press the clear plastic window on the front of the LDU11, or press reset button on the side of the power box, and the next test will begin after rotating to the test 1 starting position.
- 6) If the valve proving test was successful, 120 VAC should now be present on terminal # 6 of the valve proving unit. On the 38" / 44" heaters, this wire number will be 1E. (28" heaters do not use the valve proving unit)

All Burners

Notes

- If this is a 38" / 44", the LDU11 valve proving - test 1 & 2 - must have been successfully completed before proceeding.
 - Wire numbers for both the 28" heater, and the 38" / 44" heater are listed in the following paragraphs.
- 1) If the CE burner control unit (LME21) does not display an orange or red light, measure for 120 VAC at the housing O/T switch on terminal #1 (if 28"), or terminal # A (if 38" / 44"). An orange light indicates the burner sequence has begun – red indicates a fault condition.
 - 2) If 120 VAC is not present, measure both sides of the housing O/T switch. Wires 1 and A (on 28"), A and B (on 38" / 44"). If voltage is present on one side of the housing O/T switch, but not the other side, the housing O/T switch is tripped out or defective. Try pushing the reset button and re-check for voltage.
 - 3) Once 120 VAC is present on both sides of the housing O/T switch, measure wire # A (on 28") or B (on 38" / 44") at the high pressure switch. If 120 VAC is not present, check the wiring between the housing O/T switch and the high pressure switch. If 120 VAC is present on wire # A (on 28") or B (on 38" / 44"), measure wire B (on 28") or C (on 38" / 44") for 120 VAC. If voltage is not present, the high pressure switch is not adjusted properly or is defective. (the contact remains closed, unless the gas pressure exceeds the setting of the pressure switch).
 - 4) If 120 VAC is measured on B (on 28") or C (on 38" or 44"), but not measured on wire # C (on 28") or D (on 38" / 44"), go to the power box and check the heater control relay (CR3 – Lower CR6 - Upper) and the circuit breaker for 120 VAC through both components. Be sure that the control system is calling for heat, and the circuit breaker has not tripped.

All Burners (continued)

- 5) If voltage is measured on terminal # D (on 28"), or E (on 38" / 44"), the LED on the front of the CE burner control unit will turn on. If the unit had not previously locked out, then the LED should be orange in color. If the indicating light is red, press the clear plastic reset button on the front of the unit (for 2 seconds) or press the reset button on the side of the power box. The red light will go out for a few seconds and come back on with an orange color.
- 6) The fan should be running at this time.
- 7) When the orange light comes ON, use a voltmeter to measure 120 VAC on terminal #3 (FO) of the LME21 burner control unit.
- 8) If 120 VAC is present on terminal # FO, both air switch solenoids should energize. If the air switch solenoids do not energize, and the light on the front of the LME21 burner control unit is orange, the most likely cause would be the differential air switch contact not being in the closed position when the air switch solenoids were first energized.
- 9) Shortly after both air switch solenoids energize, the 120 VAC will shift (on the air switch contacts) from terminal # 6 to terminal # 11. After the air switch contact has closed, measure for 120 VAC on terminal # 11. If no voltage is present and the fan is running, the venturi is connected backwards, or the air switch needs to be adjusted. (turn the adjustment screw all of the way out – counter-clockwise)
- 10) The yellow light will remain ON (steady) while waiting for the air switch to activate. After approximately 20 seconds, the light will change to red and will not attempt burner ignition. If the air switch did close the contact, 120 VAC can be measured on terminal # 11.
- 11) After a short purge time (and after 120 VAC was measured on terminal # 11), the yellow light will now begin to flash. At this time, the ignition transformer will energize, followed by the gas valve. Within 1 – 2 seconds, if flame is sensed, the LED will turn green and remain ON.
- 12) If flame is not detected, check for ignition, and gas supply to the burner. Also, a bad ground will prevent flame from being detected.



Burner Control Panel for a 38"/44" heater. Components for a 28" heater are the same minus the LDU11 flame proving unit.

Ref #	Description	Comp #
1	CE Burner Control Unit – LME21	J57131
2	Flame Safe Relay – FSR	J3880
3	Reset Relay – RR	J38806
4	Isolation Relay – IR	J3880
5	Air Switch Solenoid	J6032
6	3 - Wire Air Switch	J5863
7	Ignition Transformer	J5710

Electronic MOD Valve

General Information

1. A plenum RTD and Transmitter are required. The transmitter generates a 1 – 5 VDC signal that is sent to the processor board and the EMOV board.
2. A Belimo actuator is connected to a butterfly valve, which opens or closes to control the temperature of the plenum. The Belimo actuator requires a 24 VDC power source and accepts a 2 – 10VDC control signal. This signal comes from the PLC or backup system (via the EMOV board).
3. Trouble shooting the Belimo valve requires a familiarity with the software being used to control the valve. The following covers software information:

QUICK REFERENCE:

a. SETTING ELECTRONIC MOD VALVE POSITION



1. Press Settings → Electronic Mod Valve
2. Select Valve Settings
3. Make both numbers 25 % and select Done
4. Press the back arrow or press Reset to return to the main screen.
5. Press Tools → Dry Fire / Test and select HEAT for each fan available.
6. Upon heater ignition, verify that each heater is operating at a pressure of 4 – 5 PSI. If the pressure is less than 4 PSI, or exceeds 5 PSI, loosen the nuts on the u-bolt that connect the actuator to the butterfly valve shaft and rotate the valve shaft until the gas pressure is reading between 4 – 5 PSI.
7. When finished adjusting all valves, press Reset to turn off all fans and heaters and return to the main screen.

Fault Troubleshooting

1. The first step in troubleshooting an EMOV problem is to determine whether or not the problem is with just one heater or with all of the heaters.
2. If the problem is with all of the heaters, check for 24 VDC coming from the power supply. This is the supply voltage to all of the Belimo actuators.
3. If the 24 VDC is present, check for a voltage on each actuator's signal wire. If the actuator is not receiving a 2-10VDC volt reference signal, go to the power box.
4. Measure the DC voltage on the power box terminals, (between GND - #95) and the signal wire going to that actuator (61, 161, 261, 361, 461, or 561). The low fire position of the electronic mod valve is factory defaulted at 4.0VDC. This gives the valve position of 25% open. The terminals 61, 161, etc, should all have 4.0VDC (if the low fire position is set to 25%) on them when the burners are OFF. Thus the PLC is operating correctly. Check your connection between the power box terminals and the actuators themselves. If there is 0VDC on the terminals 61, 161, etc, then there may be a problem with the PLC or its Yellow Analog Output Card.
5. If the burner fires and the electronic mod valve does not open, it's more than likely that there is a problem with the flame sense circuit on the heater board. The FLAME ON signal (#45, #106, etc) tells the PLC to start controlling the plenum temperature by adjusting the EMOV. If this signal doesn't come back from the heater box, the valve will not operate.
6. If a reference voltage (2-10VDC) is measured at the valve, but the valve did not open or close, re-confirm the presence of 24 VDC to the valve. If 24 VDC is present, the valve is probably defective, or the u-bolt, which mechanically connects the valve to the butterfly shaft is loose and needs to be tightened.

Wire Numbers and their uses

Wire #	Description	Use
0	110VAC supply from transformer	Conductor between transformer and E-Stop
1	110VAC supply after E-Stop	Emergency Switched Control Supply
2	Neutral Wire	Provides Return for 110V circuits
4	110VAC heater power ON (pos. #1)	110V present heater circuit will begin firing sequence
5	5 second load auxiliary 1 – Supply Side	Voltage supplied to 5 will relay to 7 upon K6 PLC relay being activated (27A).
6	110V load contactor	110V present energizes load contactor
6A	24VDC K1 PLC Load Relay Coil	24VDC present energizes PLC Load Relay K1
7	5 second load auxiliary 1 – Coil Side	Connect 7 to the coil on load auxiliary 1 contactor.
8	10 second load auxiliary 2 – Supply Side	Voltage supplied to 8 will relay to 9 upon K7 PLC relay being activated (28A).
9	10 second load auxiliary 2 – Coil Side	Connect 9 to the coil on load auxiliary 2 contactor.
10	110V unload power ON	110V present energizes unload contactor
10A	24VDC K2 PLC Unload Relay Coil	24VDC present energizes PLC Unload Relay K2
11	110V fan power ON (pos. #1)	110V present energizes fan (pos. #1) contactor
11A	24VDC K3 PLC Fan Relay Coil	24VDC present energizes PLC Fan Relay K3
12	110V heater switch leg (pos. #1)	110V present; power available for heater pending upon fan on/off
12A	24VDC K4 PLC Heater Relay Coil	24VDC present energizes PLC Heater Relay K4
14	Dry Contact Unload Auxiliary – Supply Side	Voltage supplied to 14 will relay to 15 upon Load contactor being energized.
15	Dry Contact Unload Auxiliary – Coil Side	Connect auxiliary device to 15 and voltage from 14 will pass to 15 when unload coil is energized.
17	Meter roll reference voltage	0 to 10 volt reference for AC Drive, 1V=10% meter roll, 10V=100% meter roll
17B	Manual Backup Reference AC Drive Voltage	0 to 10 volt reference for AC Drive, 1V=10% meter roll, 10V=100% meter roll
17C	PLC Reference AC Drive Voltage	0 to 10 volt reference for AC Drive, 1V=10% meter roll, 10V=100% meter roll
18	24V supply	Powered from PLC DC supply, provides voltage for sensors
19	110V switch leg for worklight	Provides switched 110V for worklight (110V present, worklight ON)
19A	24VDC K5 PLC Worklight Relay Coil	24VDC present energizes PLC Worklight Relay K5
21B	PLC AC Drive ON signal	24VDC present tells AC Drive to turn meter rolls in forward direction.
21C	Manual Backup AC Drive ON signal	24VDC present tells AC Drive to turn meter rolls in forward direction.
21D	AC Drive ON signal	24VDC present tells AC Drive to turn meter rolls in forward direction.
27A	24VDC K6 PLC Load Aux 1 Relay Coil	24VDC present energizes PLC Load Aux 1 Relay K6
28A	24VDC K7 PLC Load Aux 2 Relay Coil	24VDC present energizes PLC Load Aux 2 Relay K7
30	Special Aux Unload – Supply Side	Potential Free Contact with 31
31	Special Aux Unload – Coil Side	Potential Free Contact with 30
32	Special Aux Unload – Supply Side	24VDC supplied to 32 and Factory Jumper between 32 & 33.
33	Special Aux Unload – Coil Side	33 carries 24VDC and goes through the Special Aux Unload Relay and energizes K2 unload relay
36	Rear door signal wire	24V present = Door closed, provides voltage at PLC for rear door status (Doors are in series)
37	Vapor high limit switch (pos. #1)	Reference voltage for the EMOV
38	Housing high limit switch (pos. #1)	24V present = status ok, provides voltage at PLC for heater housing high temperature status
39	Plenum over-temperature switch (pos. #1)	24V present = status ok, provides voltage at PLC for plenum high temperature status

Wire Numbers and their uses (continued)

Wire #	Description	Use
40	Right grain column over-temperature	24V present = status ok, provides voltage at PLC for plenum high temperature status
41	Left grain column over-temperature	24V present = status ok, provides voltage at PLC for plenum high temperature status
42	Grain discharge chute	24V present = status ok, provides voltage back to PLC for grain discharge chute status
43	Plenum static air switch (pos. #1)	24V present = status ok, provides voltage back to PLC for static air status
44	Lower Grain paddle switch	24V present = status grain not empty, lower grain switch
45	Heater flame sense (pos. #1)	Reference voltage for the EMOV
46	PLC fan ON input (pos. #1)	24V present = fan ON, provides PLC with status of fan operation
47	PLC load ON input	24V present = load auger ON, provides PLC with status of load operation (on or off)
48	Heater ON relay signal to PLC 24V = ON (pos. #1)	24V present = ON, Tells the PLC the system is calling for the heater to turn on
49&49 A-49L	Motor overload switches	24V present = status ok, provides voltage back to PLC for overload status. All wired in SERIES.
53	Upper Grain paddle switch	24V present = Status Dryer FULL
61	EMOV (0-10V) (pos. #1)	Reference voltage for the EMOV
70	Automatic batch RTD signal wire	Provides signal to processor for autobatch temperature drying, 0 – 5 volt DC reference
71	RTD Signal wire fan (pos. #1 - lowest)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
72	RTD Signal wire fan (pos. #2)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
73	RTD Signal wire fan (pos. #3)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
74	RTD Signal wire fan (pos. #4)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
75	RTD Signal wire fan (pos. #5)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
76	RTD Signal wire fan (pos. #6)	Provides control system with 0 – 5 volt DC reference for plenum temperature indication
93	Meter Roll Proximity Signal Wire	24VDC oscillating square wave = meter roll rotation confirmed.
94	Unload ON signal	24VDC = Unload Coil has been energized.
95	Common reference on PLC for 24V supply	All items referenced to this terminal
96	Unload Auger Proximity Signal Wire	24VDC oscillating square wave = unload auger rotation confirmed.
97	Differential Air Switch 1 (CSA & CE Only)	24VDC = Air Pressure Confirmed
98	Differential Air Switch 2 (CSA & CE Only)	24VDC = Air Pressure Confirmed
99	Differential Air Switch 3 (CSA & CE Only)	24VDC = Air Pressure Confirmed
100	Differential Air Switch 4 (CSA & CE Only)	24VDC = Air Pressure Confirmed
U	User Fault Circuit	24VDC = User Fault OK – Jumped out from the factory.
D1	Moisture sensor red, 24VDC moisture sensor circuit supply	Supply voltage for the moisture sensor circuit
D3	Moisture sensor blue, 0V to 3VDC temperature signal to the PLC	Provides the processor with a voltage signal corresponding to temperature
D4	Moisture sensor black, 0 to 10VDC moisture signal to the PLC	Provides the processor with a voltage signal corresponding to moisture

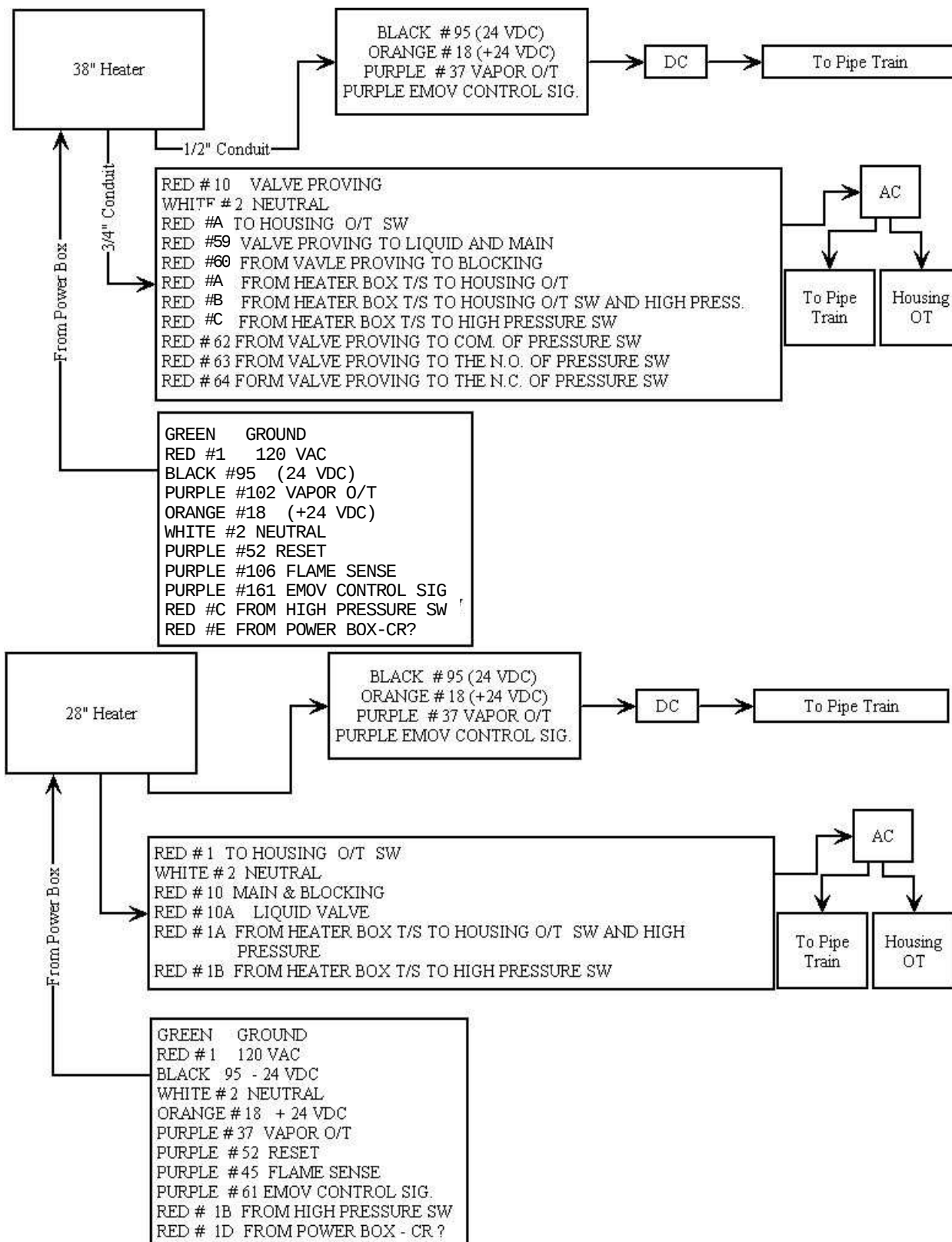
Wire Numbers and their uses (continued)

Wire #	Description	Use
D6	Moisture sensor green, ground	Ground
D7	Moisture sensor grounding braid (shielded ground)	Grounds the shielding for noise purposes
102	Vapor high limit switch (pos. #2)	Reference voltage for the EMOV
103	Housing high limit switch (pos. #2)	24V = status ok, provides voltage at PLC for heater housing high temperature
104	Plenum over-temp switch (pos. #2)	24V = status ok, provides voltage at PLC for plenum high temperature status
105	Plenum static air switch (pos. #2)	24V present = status ok, provides voltage back to PLC for static air status
106	Heater flame sense (pos. #2)	Reference voltage for the EMOV
107	PLC fan ON input (pos. #2)	24V present = fan ON, provides PLC with status of fan operation
108	PLC heat ON input (pos. #2)	24V present = ON, tells the PLC the system is calling for the heater to turn on
109A	110V heater switch leg (pos. #2)	110V present; power available for heater pending upon fan on/off
110A	110V fan power ON (pos. #2)	110V present energizes lower fan (pos. #2) contactor
111	110V power CR6 relay (lower) heat turn on safety due to fan failure	110V present energizes CR3 relay, system calls for heat. Wired to aux. contact or relay to provide protection due to fan not running while contactor energized
112	110V heater power ON (pos. #2)	110V present heater circuit will begin firing sequence
116	110V Main Gas Valve ON	110V present energizes Main Gas Valve (2 Fan & up)
116A	24VDC K10 PLC Main Gas Valve Relay	24VDC present energizes PLC Main Gas Valve Relay K10
161	EMOV (0-10V) (pos. #2)	Reference voltage for the EMOV
202	Vapor high limit switch (pos. #3)	Reference voltage for the EMOV
203	Housing high limit switch (pos. #3)	24V = status ok, provides voltage at PLC for heater housing high temperature
204	Plenum-over-temp switch (pos. #3)	24V = status ok, provides voltage at PLC for plenum high temperature status
205	Plenum static air switch (pos. #3)	24V present = status ok, provides voltage back to PLC for static air status
206	Heater flame sense (pos. #3)	Reference voltage for the EMOV
207	PLC fan ON input (pos. #3)	24V present = fan ON, provides PLC with status of fan operation
208	PLC heat ON input (pos. #3)	24V present = ON, tells the PLC the system is calling for the heater to turn on
209A	110V heater switch leg (pos. #3)	110V present; power available for heater pending upon fan on/off
210A	110V fan power ON (pos. #3)	110V present energizes lower fan (pos. #3) contactor
261	EMOV (0-10V) (pos. #3)	Reference voltage for the EMOV
302	Vapor high limit switch (pos. #4)	Reference voltage for the EMOV
303	Housing high limit switch (pos. #4)	24V = status ok, provides voltage at PLC for heater housing high temperature
304	Plenum over-temp switch (pos. #4)	24V = status ok, provides voltage at PLC for plenum high temperature status
305	Plenum static air switch (pos. #4)	24V present = status ok, provides voltage back to PLC for static air status
306	Heater flame sense (pos. #4)	Reference voltage for the EMOV

Wire Numbers and their uses (continued)

Wire #	Description	Use
307	PLC fan ON input (pos. #4)	24V present = fan ON, provides PLC with status of fan operation
308	PLC heat ON input (pos. #4)	24V present = ON, tells the PLC the system is calling for the heater to turn on
309A	110V heater switch leg (pos. #4)	110V present; power available for heater pending upon fan on/off
310A	110V fan power ON (pos. #4)	110V present energizes lower fan (pos. #4) contactor
361	EMOV (0-10V) (pos. #4)	Reference voltage for the EMOV
402	Vapor high limit switch (pos. #5)	Reference voltage for the EMOV
403	Housing high limit switch (pos. #5)	24V = status ok, provides voltage at PLC for heater housing high temperature
404	Plenum over-temp switch (pos. #5)	24V = status ok, provides voltage at PLC for plenum high temperature status
405	Plenum static air switch (pos. #5)	24V present = status ok, provides voltage back to PLC for static air status
406	Heater flame sense (pos. #5)	Reference voltage for the EMOV
407	PLC fan ON input (pos. #5)	24V present = fan ON, provides PLC with status of fan operation
408	PLC heat ON input (pos. #5)	24V present = ON, tells the PLC the system is calling for the heater to turn on
409A	110V heater switch leg (pos. #5)	110V present; power available for heater pending upon fan on/off
410A	110V fan power ON (pos. #5)	110V present energizes lower fan (pos. #4) contactor
461	EMOV (0-10V) (pos. #5)	Reference voltage for the EMOV
502	Vapor high limit switch (pos. #6)	Reference voltage for the EMOV
503	Housing high limit switch (pos. #6)	24V = status ok, provides voltage at PLC for heater housing high temperature
504	Plenum over-temp switch (pos. #6)	24V = status ok, provides voltage at PLC for plenum high temperature status
505	Plenum static air switch (pos. #6)	24V present = status ok, provides voltage back to PLC for static air status
506	Heater flame sense (pos. #6)	Reference voltage for the EMOV
507	PLC fan ON input (pos. #6)	24V present = fan ON, provides PLC with status of fan operation
508	PLC heat ON input (pos. #6)	24V present = ON, tells the PLC the system is calling for the heater to turn on
509A	110V heater switch leg (pos. #6)	110V present; power available for heater pending upon fan on/off
510A	110V fan power ON (pos. #6)	110V present energizes lower fan (pos. #4) contactor
561	EMOV (0-10V) (pos. #6)	Reference voltage for the EMOV

CE Conduit Wiring



Auxiliary Load and Unload Terminals

Note: Terminals 5 & 7, 8 & 9, and 14 & 15 can be used as either dry contacts or 115VAC by using Terminals 1 (115VAC) and 2 (Neutral)

<table><tr><td>1</td><td>2</td></tr></table>	1	2	115VAC	Neutral				
1	2							
<table><tr><td>5</td><td>7</td></tr></table>	5	7		1 st Aux Load 5 Sec. Delay On				
5	7							
<table><tr><td>8</td><td>9</td></tr></table>	8	9		2 nd Aux Load 10 Sec. Delay On				
8	9							
<table><tr><td>14</td><td>15</td></tr></table>	14	15		Aux Unload				
14	15							
<table><tr><td>49D</td><td>49E</td></tr></table>	49D	49E		Motor Overload Safety Circuit				
49D	49E							