



Air System Controls

With PLC, Dynamic Bleed Valve & Optional VFD

For Retrofit on



Sukup Manufacturing Co.

1555 255th Street, Box 677

Sheffield, Iowa, USA 50475-0677

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

E-mail: info@sukup.com

<u>DATE</u>	<u>REVISION</u>	<u>PAGE</u>
07/13/2023	Updated warranty-----	3
	Updated warning on avoiding unload equipment-----	4
	Updated instructions for adjusting current sensing settings-----	13
	Updated enclosure box part number for electrical panel N343120-----	37
05/10/2023	Updated VFD settings table & electrical requirements table-----	13 & 37
	Updated Contact Information page & added QR code for product registration-----	38
02/10/2023	Updated instructions for mounting main power box & touch screen controller-----	7-9
	Updated dynamic bleed valve installation instructions-----	10-11
	Updated VFD wiring instructions for 3-phase systems-----	12
	Updated PLC overview drawing-----	25
	Added instructions for wire 31 if using Mitsubishi VFD-----	28
	Added instructions for monitoring Mitsubishi F800 inverter status-----	36
09/21/2022	Updated statements on tightening wires & minimizing electromagnetic interference-----	6
	Added Mitsubishi VFD settings-----	13
	Added troubleshooting guidance-----	16
	Updated Altivar 320 & Mitsubishi F800 programming instructions-----	33 & 35
	Updated references to Altivar 320 & 630 programming manuals-----	33 & 34

Introduction

This manual provides instructions for retrofitting a Cyclone Pneumatic Air System with upgrades including Programmable Logic Controls (PLC), Dynamic Bleed Valve (DBV) and optional Variable Frequency Drive (VFD). This system is designed to be controlled by QuadraTouch Pro grain dryer console or by an add-on touch screen, N23476. Instructions for both are provided.

This manual includes information relating to safety, installation and operation, and should be read thoroughly prior to installation.

Receiving and Inspection

Carefully inspect shipment as soon as it is received for any damage. Verify that quantity of parts and/or packages received corresponds to quantity shown on packing slip. Report any damage or shortage to delivery carrier as soon as possible. Sukup Manufacturing Co.'s responsibility for damage to equipment ended with acceptance by delivery carrier. Refer to bill of lading. Save all paperwork and documentation furnished with the stir delay system.

Table of Contents

Limited Warranty -----	3
Safety -----	4
Power Box Component Identification-----	6
Installation -----	7
Operation -----	14
Troubleshooting -----	16
Software Manual -----	17
Wiring Diagrams-----	24
Variable Frequency Drive Programming-----	33
Electrical Requirements -----	37
Contact Information-----	38



Sukup Manufacturing Co.

PO Box 677 Sheffield, IA USA 50475

Phone: 641-892-4222 Fax: 641-892-4629

E-mail: Info@sukup.com Visit us at: www.sukup.com

GRAIN HANDLING & MATERIAL HANDLING LIMITED WARRANTY

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

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

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

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. ITEMS NOT MANUFACTURED BY SUKUP (e.g. tires, belts, motors) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY. Since the stirring down augers are so critical to the successful operation of the stirring machine, Sukup Manufacturing Co. will not warranty any machines unless they are equipped with Sukup down augers. SUKUP MANUFACTURING CO. MAKES NO WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO DOWN AUGERS LONGER THAN 20', INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

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

BASIC WARRANTY - All Sukup manufactured products are warranted for one year from date of purchase. Part(s) must be returned to Sukup within 30 days in event of failure.

EXTENDED STIRRING MACHINE WARRANTY - Sukup warrants stirring machines for two years from date of purchase.

EXTENDED STIRRING AUGER WARRANTY - Sukup warrants stirring down augers for two years from date of purchase. Must return top 18" of down auger to obtain credit.

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

EXTENDED HEATER CIRCUIT BOARD WARRANTY - Sukup warrants heater circuit boards for three years from date of purchase. Rebuilt circuit boards are warranted for one year from date of purchase.

EXTENDED MATERIAL HANDLING WARRANTY - Sukup warrants Material Handling equipment, excluding structural support systems, for two years from date of purchase.

REPLACEMENT PARTS WARRANTY PERIOD - Sukup warrants replacement parts (e.g. belts, sensors, rotating contacts, gearmotors, switches) purchased from Sukup for one (1) full drying season following purchase.

ELECTRIC MOTOR WARRANTY - Manufacturers of electric motors warranty them for at least 1 year from installation date or 2 years from motor manufacture date. Process for repairing or replacing motor depends on motor manufacturer and horsepower. Contact motor manufacturer for terms. If motor warranty is refused, use the following procedure: Have motor repair shop fill out the warranty report form as if they were providing warranty service. State on report reason for refusal. Send report, motor nameplate, and proof of purchase date (invoice from Sukup and invoice for your customer) to Sukup. Sukup will attempt to obtain warranty from motor manufacturer. Any credit obtained will be passed on. Warranty may also be obtained by returning motor to Sukup Manufacturing Co. or Distribution Center with prior authorization. **NOTE:** Sukup will not be responsible for unauthorized motor replacement or repair. Labor for removal of motor not included.

WARRANTY CERTIFICATION - Warranty must be registered within one month of product shipment from Sukup facility or customer pickup from the facility to certify warranty coverage. See QR code on back page of product manual for details.

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

07/13/23

Safety



Read manual before installing or using product. Failure to follow instructions and safety precautions in manual can result in death or serious injury. Keep manual in a safe location for future reference.



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



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



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



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



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

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

FOLLOW MANUAL & SAFETY DECAL MESSAGES

Carefully read this manual and all safety decals on your equipment.

Safety decals must be kept in good condition. Replace missing or damaged safety decals by contacting Sukup Manufacturing Co. via mail at PO Box 677, Sheffield, Iowa USA, 50475; 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 hazards and safety precautions that need to be taken to avoid personal injury or death. Always keep children away from bins and vehicles with flowing grain.

Make no unauthorized modifications to machine. Modifications may endanger function and/or safety of unit. Keep unit in good working condition. Keep shields in place. Replace worn or missing shields free of charge by contacting Sukup Manufacturing Co.

GRAIN BIN SAFETY

Owners/operators are responsible for developing site-specific confined space entry procedures. OSHA's confined space entry procedures (29CFR 1910.146) can be found at www.osha.gov.

If you must enter bin for repair or maintenance:

- Use a safety harness, safety line and respirator
- Station another person outside of bin
- Avoid the center of the bin
- Wear appropriate personal protective equipment
- Keep clear of all augers and moving parts



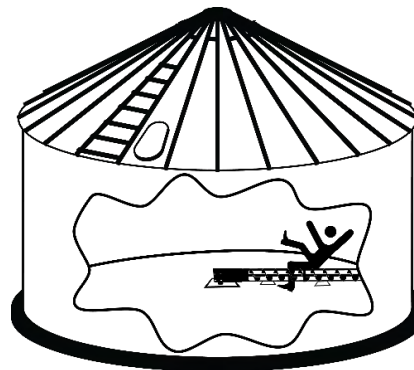
DANGER: Never enter bin unless all power is locked out and another person is present.



Unload equipment can kill or dismember!

NEVER enter bin when sweep is running!

When bin is nearly empty, sweep will travel at an increasingly fast speed. Keep away from sweep and sumps to avoid entanglement.



Failure to follow precautions above will result in death or serious injury.



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



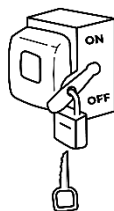
Failure to heed this warning will result in death or serious injury.

Safety

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



Have an electrician install a main power disconnect switch capable of being locked only in OFF



position. Mark disconnect clearly as to equipment it operates. Always lock out main power disconnect switch whenever equipment is not in use.

WARNING: When servicing equipment, never enter bin unless all power is locked out and another person is present. Automatic equipment can start at any time. Always LOCK OUT all power and always check with voltage meter before servicing. Frequently inspect all mechanical and electrical components. Repair and/or replace worn parts. Be sure all electrical wires are in good condition.

Failure to do so could result in death or serious injury.

NOTE: Refer to OSHA's typical minimal lockout procedures (29CFR 1910.147 App A) at www.osha.gov to establish a written plan for your work site.

WARNING: KEEP CLEAR OF ALL MOVING PARTS.

Keep people (ESPECIALLY YOUTH) away from equipment, particularly during operation.



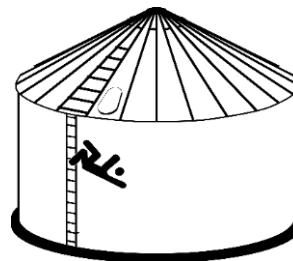
Keep away from all moving parts. Keep all shields in place. **SHUT OFF AND LOCK OUT** all power before servicing.

Failure to follow precautions above could result in death or serious injury.

WARNING: Tubing or surface may be hot! **DO NOT TOUCH.** Failure to heed this warning may cause serious burns.



WARNING: Metal is slippery when wet. To avoid falls, never carry items if climbing on bin. Maintain secure hand and foothold if climbing on bin. Failure to do so could result in death or serious injury.



CAUTION: Metal edges are sharp. To avoid injury, wear protective clothing and handle equipment and parts with care.

Failure to do so may result in minor or moderate injury.

PERSONAL PROTECTIVE EQUIPMENT



Owners/Operators are responsible for developing site-specific personal protective equipment standards. OSHA's personal protective equipment standards (29CFR 1910.132) can be found at www.osha.gov.

EMERGENCIES – KNOW WHAT TO DO

Have emergency numbers and written directions to work site readily available in case of emergency. An area for emergency phone numbers to be recorded is provided below and at end of this manual.

Ambulance • Fire • Police: 9-1-1

Bin rescue team: _____

Emergency medical squad: _____

Address of work site: _____

Directions to work site: _____

Power Box Component Identification

Power Box Component Identification

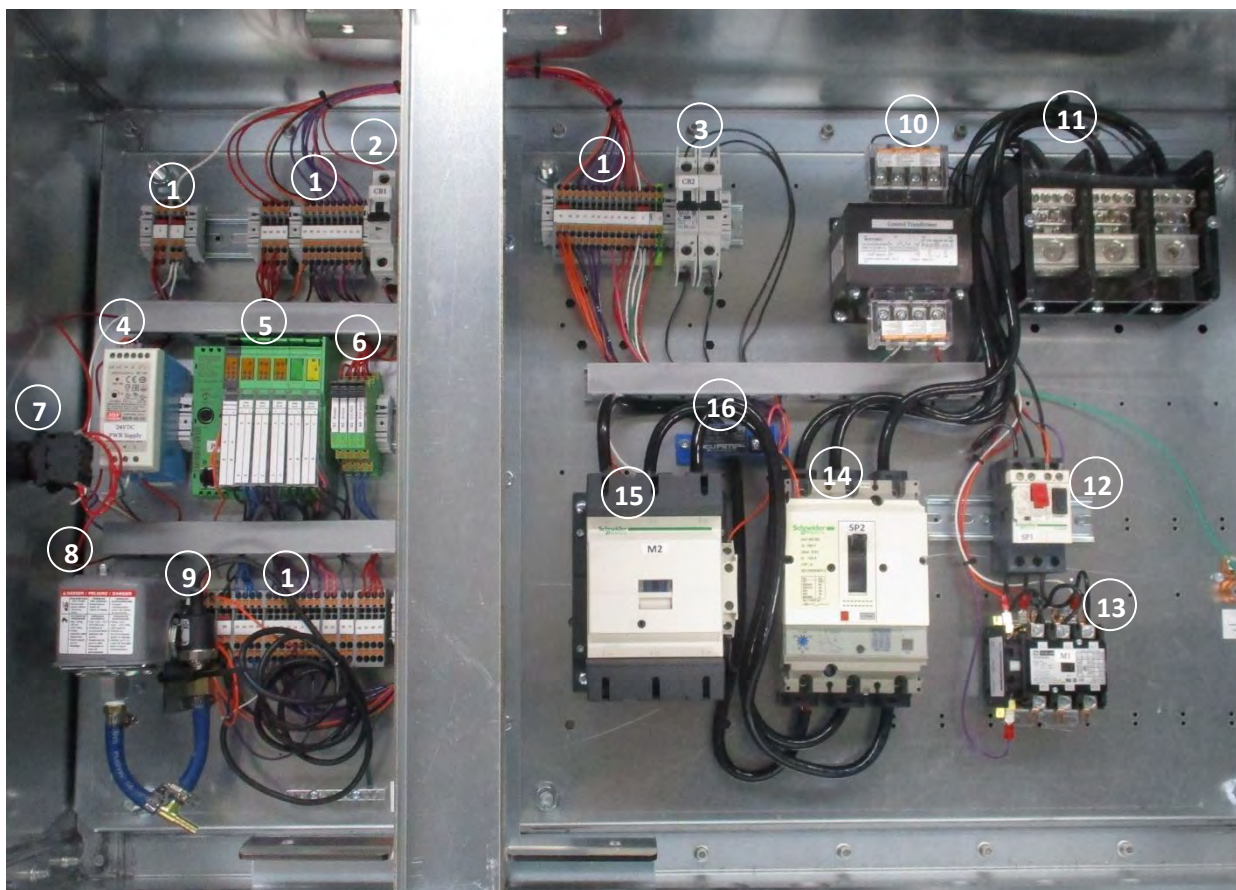


Image 1 – Power box components (prior to completion of wiring)

- | | |
|-------------------------------------|-------------------------------|
| 1. Terminals | 9. Air pressure transducer |
| 2. Secondary side circuit breaker | 10. Control transformer |
| 3. Primary side circuit breaker | 11. Power distribution block |
| 4. 24 VDC Power supply | 12. Airlock starter protector |
| 5. Programmable logic control (PLC) | 13. Airlock contactor |
| 6. Relays | 14. Blower starter protector |
| 7. Emergency Stop switch | 15. Blower contactor* |
| 8. High air pressure switch | 16. Current transducer** |

*Depending on air system, blower contactor could be line start (shown), soft start or variable-frequency drive.

**Used on line-start and soft-start systems.

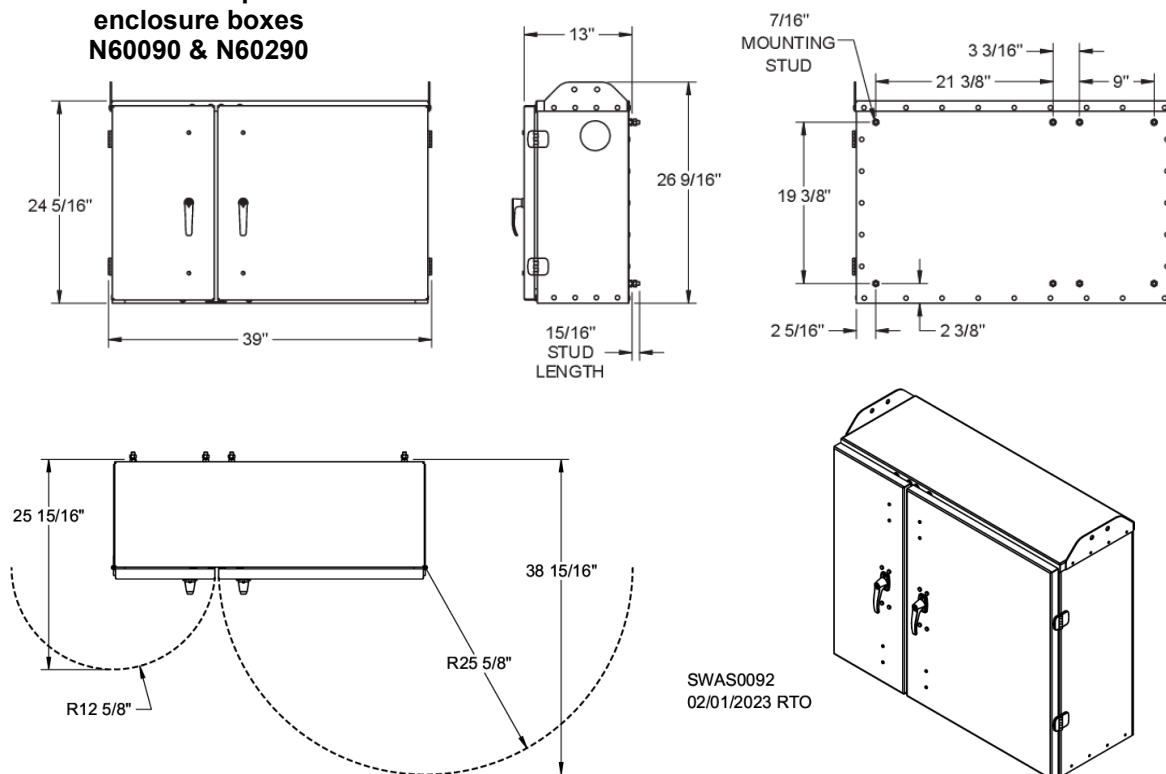
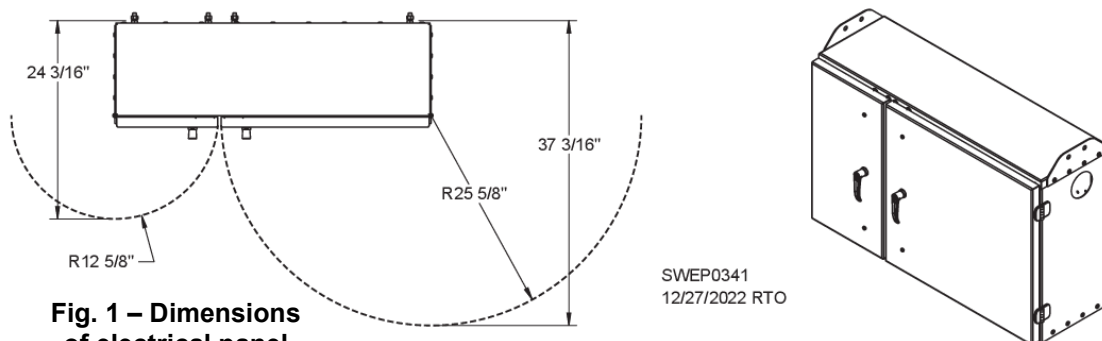
IMPORTANT: During initial setup, ALL main power wiring connections should be inspected. Wires are tightened at factory; but connections should be checked after transport and retightened as needed.

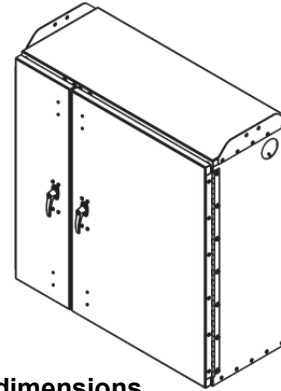
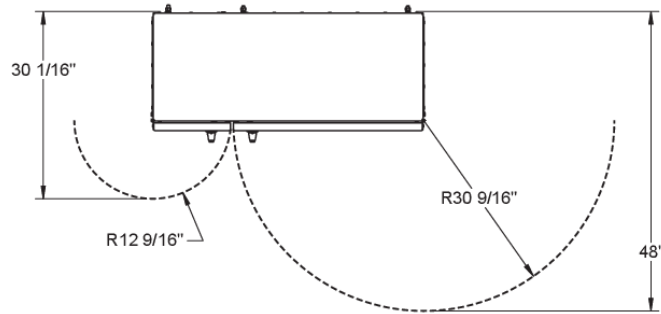
NOTICE: Low-voltage components (left side) are separated from high-voltage (right side) in power box to minimize electromagnetic interference on left side. Always maintain high/low voltage and AC/DC separation and practice good wire maintenance.

Installation

Main Power Box Installation

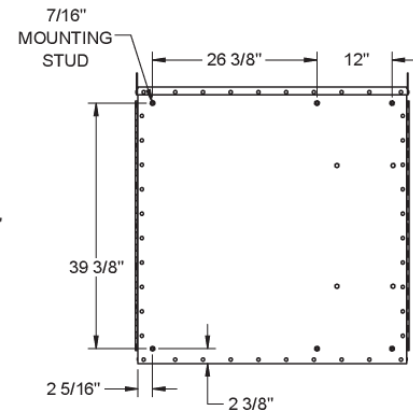
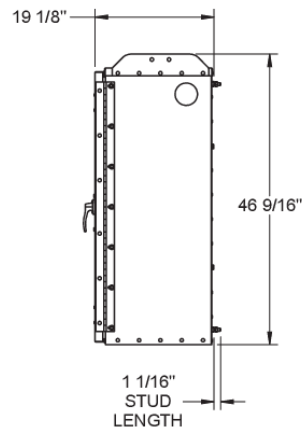
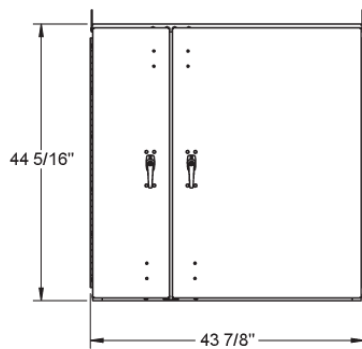
Disconnect and remove old Cyclone control box and attach new power box to a sturdy stand. Use mounting studs on back of box and C-channels (not provided). Figs. 1-3 show dimensions of boxes. Table on Page 37 shows box used for each electrical panel. Approximate weight of main power box, including components, is 225 pounds for N60090 or N60290, 325 pounds for N60091, and 400 pounds for N6019.





SWEP0340
12/27/2022 RTO

Fig. 3 – Electrical panel enclosure N6019 dimensions



Installation

Touch Screen Control Panel Installation

If air system will not be controlled by QuadraTouch Pro dryer console, a touch screen control panel must be installed. Image 2 shows touch screen. Fig. 4 shows dimensions of protective box for touch screen.

Use hardware provided to attach mounting bracket shown in Fig. 4 to touch screen box.

Mount touch screen box to a sturdy stand at a convenient location near air system. Mount box so it can be easily removed for storage when not in use.

NOTICE: Ambient air temperature range for operating touch screen is 32°F to 122°F, and storage temperature range is -13°F to 158°F. Store touch screen control panel in a temperature- and weather-controlled environment when not in use.



Image 2 – Touch screen panel (N23476)

Connect Ethernet cable from bottom of touch screen panel to bottom of main power box so it will link with cable shown in Image 4. If controlling air system via dryer with QuadraTouch Pro, connect Ethernet cable from air system power box to Ethernet switch in dryer's main power box. See wiring diagram on Page 29.

APPROXIMATE WEIGHT: 20 LB

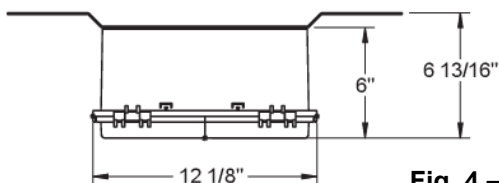
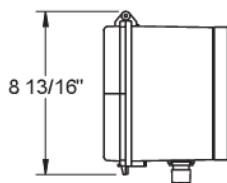
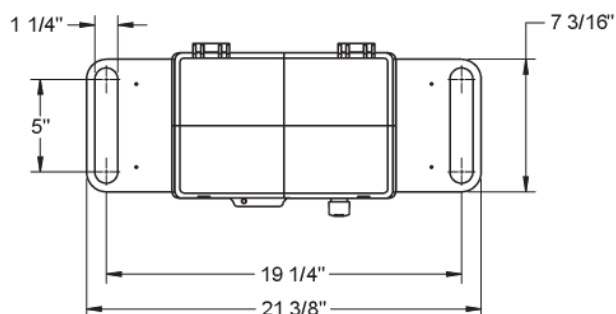
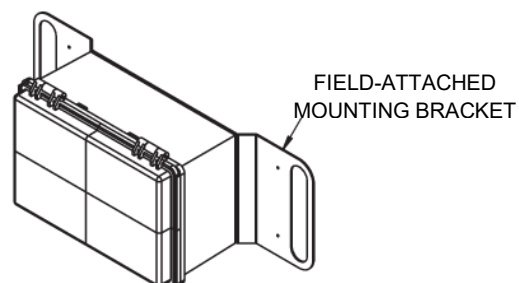
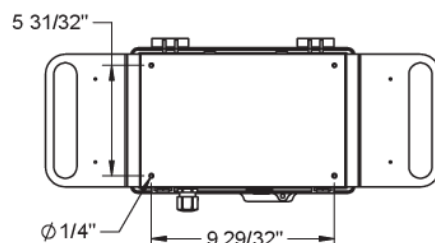


Fig. 4 – Touch screen box



SWEP0343
12/02/2022 RTO



Dynamic Bleed Valve Installation

Attach air pressure sensor hose to blower as shown in Image 3 using clamp provided. Insert other end through bottom of power box using watertight fitting. Clamp hose to nozzle shown in Image 4.



Image 3 – Air pressure sensor hose connected to blower outlet

If not done already, connect wires from dynamic bleed valve actuator to wires from conduit (See Image 5) according to wiring diagram on Page 29.

Ensure power box is wired according to applicable wiring decal(s) on inside of door(s). See decal(s) on Pages 30-32.

Plug power box into electrical service.

Plug in and turn on touch screen or QuadraTouch Pro console and navigate to Air System 1. Press Enter. See Software Manual beginning on Page 17.

In Settings:

- Enter amperage using Service Factor Amps (FLA x SF) found on motor nameplate.
- Enter desired air pressure. Start at 3 psi. Remember, higher pressure equals lower grain velocity. Set pressure to ensure system will not plug.
- Enter voltage of electrical service.



Image 4 – Air hose nozzle in power box



Image 5 –Dynamic bleed valve

Installation

To calibrate dynamic bleed valve, go to Manual Operation. Make sure DBV is set at 0%.

Loosen collar on butterfly valve stem so that stem can be rotated manually. See Image 6.

Use screwdriver to turn stem to 0%. See Images 7 and 8.

Retighten collar on butterfly valve stem.

IMPORTANT: PLC-based system eliminates need for velocity compensating valve and surge tank. Remove them from original air system if present.

NOTE: Valve and tee assembly (J7552) supplied with Sukup air systems can be installed and used with dynamic bleed valve.



Image 6– Loosening butterfly valve collar



Image 7 – Setting valve to 0% open

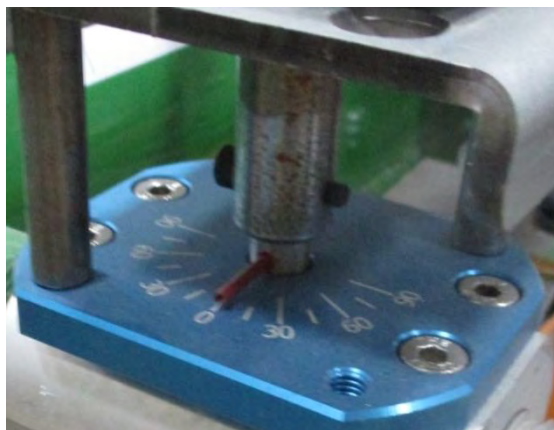


Image 8 –Dynamic bleed valve set at 0%

Wiring VFD for 3ph Power

Image 9 shows Schneider variable frequency drive wiring for air system using 3-phase power. Connect violet wire #10B to terminal R1A, violet #10 to R1C, violet #11 to R2A, orange #18 to R2C, pink #21 to AQ1, blue STF to DI1, gray #31 to AI1, and black #95 to COM. **NOTE:** Terminals may look different depending on size of VFD, but will be numbered the same as in Image 9.

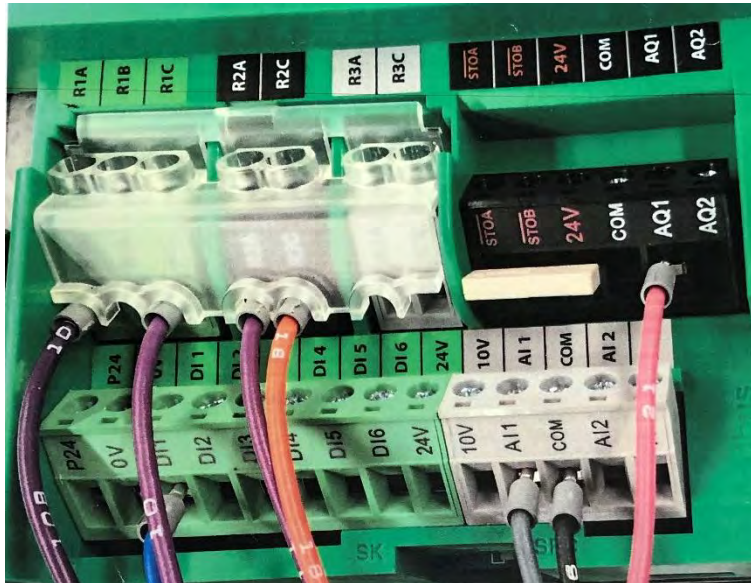


Image 9 – Wiring Schneider VFD for 3ph air system

Image 10 shows Mitsubishi variable frequency drive wiring for air system using 3-phase power. Connect pink #21 wire to AM terminal, gray #31 wire to terminal 1, violet #10 to A1, violet #10B to C1, orange #18 to A2, violet #11 to C2, black #95 to SD, and blue #3C to STF. Use black jumper from terminal 5 to terminal SD, and white jumpers as follows: from SD to SIC, from S1 to PC and from S2 to PC. Also install hard black jumper over Source pins as shown in circle.

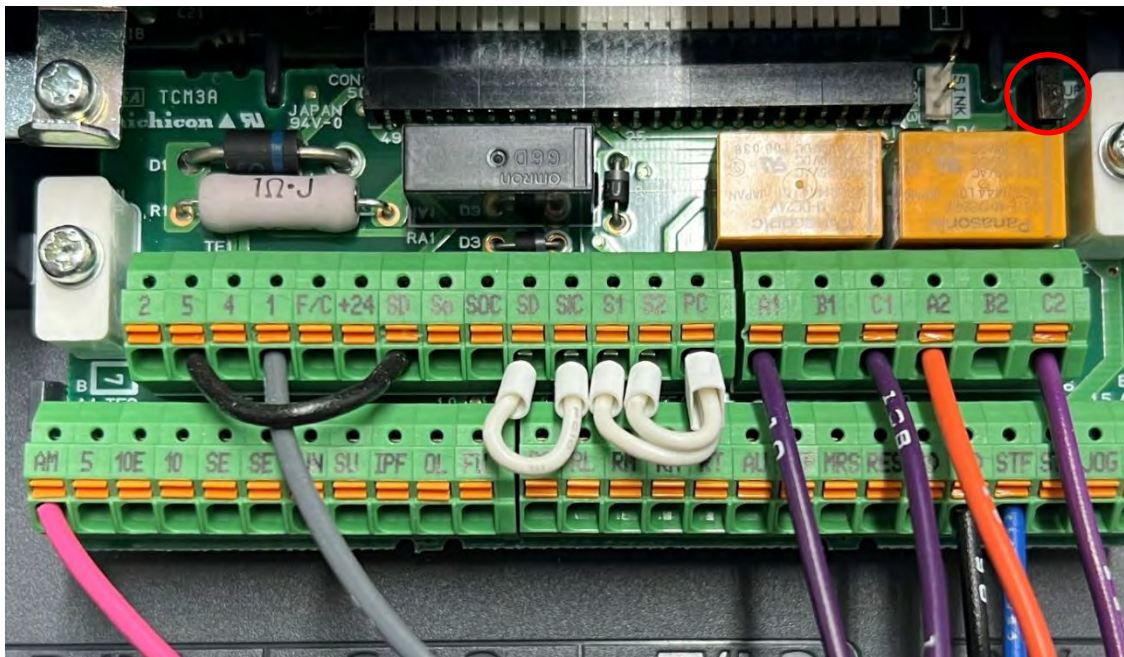


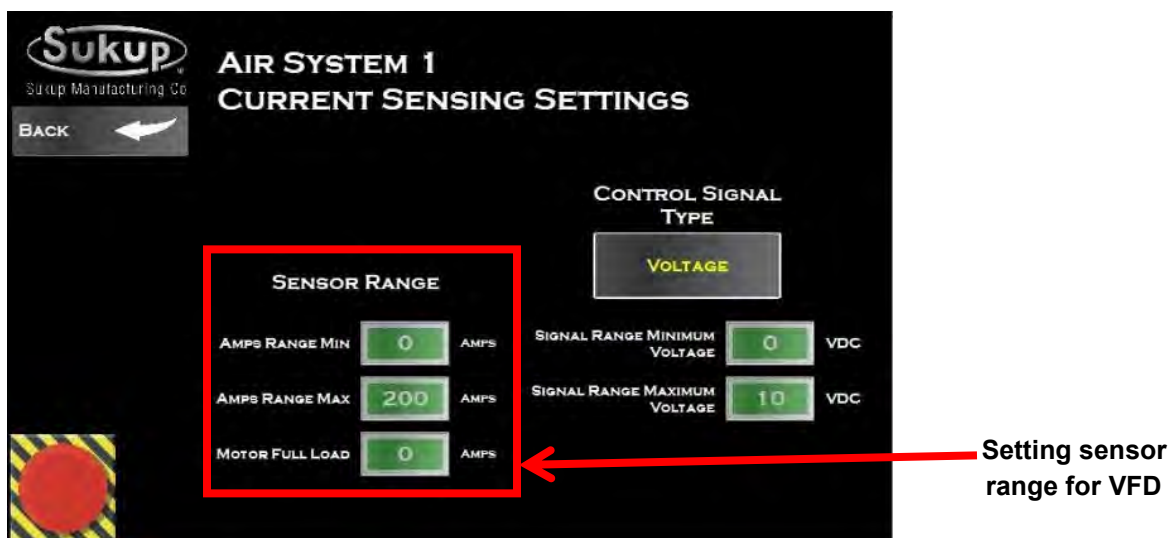
Image 10 – Wiring Mitsubishi VFD for 3ph air system

Adjusting Air System Current Sensing Settings

Before running air system for first time, adjust current sensing settings using table below. Settings depend on VFD number. Minimum current setting is 0 for all VFDs. Pathway to screen shown below is: Settings → Advanced Settings → Current Sensing Settings.

IMPORTANT: Sensor range settings affect how PLC scales VFD current signal. Proper adjustment will ensure PLC reads correct amp draw. Proper adjustment will also ensure touch screen displays correct current draw.

NOTE: Sensor range will not need to be re-adjusted after initial setting.



	POWER BOX #	MOTOR HP	SCHNEIDER VFD		MITSUBISHI VFD		MOTOR FULL LOAD AMPS SETTING
			PART #	AMPS RANGE MAX SETTING	PART #	AMPS RANGE MAX SETTING	
230V	N123120	20	---	---	FR-F820-00930-E3N6	200	*
	N123130	30	---	---	FR-F820-01540-E360	200	*
	N123140	40	---	---	FR-F820-01870-E360	200	*
	N123150	50	---	---	FR-F820-02330-E360	200	*
	N323120	20	ATV320D15M3C	132	FR-F820-00630-E3N6	200	*
	N323130	30	ATV630D22M3	186	FR-F820-00930-E3N6	200	*
	N323140	40	ATV630D30M3	246	FR-F820-01250-E3N6	200	*
	N323150	50	ATV630D37M3	298	FR-F820-01540-E360	200	*
	N323160	60	ATV630D45M3	352	FR-F820-01870-E360	200	*
460V	N323175	75	ATV630D55M3	422	FR-F820-02330-E360	200	*
	N343120	20	ATV320D15N4B	66	FR-F840-00310-E3N6	200	*
	N343130	30	ATV630D22N4	93	FR-F840-00470-E3N6	200	*
	N343140	40	ATV630D30N4	123	FR-F840-00620-E3N6	200	*
	N343150	50	ATV630D37N4	149	FR-F840-00770-E360	200	*
	N343160	60	ATV630D45N4	176	FR-F840-00930-E360	200	*
575V	N343175	75	ATV630D55N4	212	FR-F840-01160-E360	200	*
	N353120	20	ATV630D15Y6	36	FR-F840-00320-E3N6	200	*
	N353130	30	ATV630D22Y6	58	FR-F860-00450-E3N6	200	*
	N353140	40	ATV630D30Y6	68	FR-F860-00450-E3N6	200	*
	N353150	50	ATV630D37Y6	90	FR-F860-00680-E360	200	*
	N353160	60	ATV630D45Y6	110	FR-F860-00680-E360	200	*
	N353175	75	ATV630D55Y6	132	FR-A60-01080-E160	200	*

*See FLA rating on motor nameplate

Operation

IMPORTANT: Emergency Stop Button is located on left side of main power box. Red light on button will come on as soon as incoming power is supplied to power box. Motors will turn off immediately if button is pressed. Light will turn off when “E-Stop” button is pushed.

Prior to first run of blower and airlock motors, check rotation of shafts.

IMPORTANT: Read all steps before proceeding.



WARNING: Lock out power before performing any adjustment. Contact with moving parts could cause death or serious injury.

1. Go to Manual Control page on touch screen. See Software Manual.
2. Start blower motor by pressing “Start”, then immediately press E-Stop button on bottom left of screen to stop motor and prevent Off Delay timer from running.
3. Check rotation while shaft is slowing down.
 - a. See Image 11 for rotation sticker location. **NOTE:** Duroflow blowers rotate counterclockwise.
4. After checking/adjusting rotation, press E-Stop button on bottom left of screen, then press Reset E-Stop.
5. Start airlock motor by pressing “Start”.
 - a. Check shaft rotation while motor it is running. **NOTE:** Airlock has a grain sheer protection plate to prevent shearing of grain by airlock vanes. Motor should be wired to turn clockwise (as viewed looking at end of shaft). This will turn airlock vanes into rubber wiper. Check rotation of airlock to ensure it matches with rotation tag on airlock. See Image 12.
6. Click “Stop” on touch screen and fix rotation if required.



Image 11 – Blower rotation sticker location



Image 12 – Airlock rotation tag location

Operation

Air system can be operated manually or automatically using Dynamic Bleed Valve (DBV). System can also be operated manually or automatically using optional Variable Frequency Drive (VFD). No matter which method is used, be aware of quality of grain that is entering and leaving air system. **Any pneumatic system can cause damage unless care is taken to minimize velocity of grain as it travels through tubing to storage.** Excessive grain velocity causes grain damage. Grain velocity decreases as air pressure in system increases, so a system should be adjusted to run with as much line pressure as possible.

Manual Operation

1. Adjust feed rate until blower motor is running at full load (Match displayed amperage with amperage rating on motor nameplate).
2. If feed rate cannot be adjusted, then air pressure can be increased (and grain slowed) by opening Dynamic Bleed Valve or by reducing motor speed using VFD. Whichever method is used, it should be done very slowly:
 - a. Open DBV a small amount or lower VFD frequency a small amount. Wait for system to respond to the change before making another adjustment.
 - b. Monitor pressure readout on touch screen. Pressure should increase slightly after each adjustment.
 - c. Continue opening DBV or lowering VFD frequency until grain starts to “surge” through tubing. At this point, close DBV 5% or increase frequency on VFD by 3-5Hz (or 5%). This should be an optimum setting for this feed rate and tubing layout.
3. If an airlock is being fed by a continuous-flow dryer that is discharging grain at differing rates, then DBV or VFD should be set to provide enough air for the highest discharge rate to avoid plugging. **A rule of thumb is to always have at least 3 psi of line pressure when dryer is discharging at a low rate.**

IMPORTANT: After DBV or VFD has been adjusted, check quality of grain being discharged by air system.

4. Monitor air filter restriction indicator located at blower inlet. Clean out both outer pre-filter and element or replace them to ensure an unrestricted air supply to blower.
5. Monitor operating pressure. Pressure lower than 2 or 3 psi is an indication that grain velocity is too fast and that damage may be occurring. Check quality of grain in storage bins if low operating pressures are used.

NOTE: Decreasing amount of air in system by opening DBV or by slowing motor using VFD will slow grain down and cause system pressure to increase.

NOTE: Typical operating pressures should be from 3 to 8 psi depending on blower motor horsepower and size of system.

Automatic Operation using DBV or VFD

1. Set Pressure Setpoint on Auto Control Mode screen. This should be done very slowly.
 - a. To increase speed of grain, lower the pressure setpoint.
 - b. To decrease speed of grain, raise the pressure setpoint.

PLC will automatically control DBV or VFD in order to maintain set pressure.

IMPORTANT: After pressure setpoint has been adjusted, check quality of grain being discharged by air system and adjust as necessary.

See Steps 4 and 5 and subsequent notes above.

Troubleshooting

Following are steps to check first if system is not operating properly.

- Ensure power box, touch screen and dynamic bleed valve are installed as shown on Pages 7-11.
- Check/adjust air system current sensing settings. See instructions on Page 13.
- Ensure main power box is wired properly. See applicable wiring diagrams, which begin on Page 30.
- If there is a variable frequency drive (VFD) in main power box, confirm that it is programmed correctly. See 3ph VFD wiring instructions on Page 12, and VFD settings on Pages 33-35.
- Links to VFD troubleshooting information can be found on Pages 33-34.
- Use this link to view a video on optimal settings for a Sukup Air System:
<https://www.youtube.com/watch?v=WVDEqTlfvHM>

Manual Tube Clean-out (Unplugging) Procedure

1. Clear applicable faults (Overloads if tripped)
2. Go to Manual Operation
3. Set DBV to 100% open.
4. Set VFD (if equipped) to Maximum Hertz or 100%
5. Start blower
6. Slowly close DBV.
 - a. Be mindful of Motor Full Load amps and try not to trip motor overload. It is OK to stay at full load amps to allow some grain to flow out of tube.



CAUTION: Stand clear of airstream at bleed valve until grain in tube begins to clear tube of grain. Contact with high-velocity air and/or debris may result in minor or moderate injury.

7. If this procedure does not unplug tube, tube will have to be taken apart and cleaned manually.

Blower Overload – This light will be on only when blower overload has tripped.

1. Reset Blower Overload.
2. Reset System.
3. Check Blower motor current.
4. Lower the feed rate to airlock if excessive current.

Airlock Overload – This light will be on only when airlock overload has tripped.

1. Reset Airlock Overload.
2. Reset System.
3. Check Airlock motor current.

High-Pressure Shut-off Switch

Located at bottom left of main power box (See Image 1), high-pressure shut-off switch is factory-set to shut system down when operating pressures exceed 12-13 psi. Switch can be adjusted by removing cover of switch and turning nut on adjustment screw. Turn nut counterclockwise to lower pressure limit and clockwise to increase limit. Do not set pressure limit above 15 psi.

Software Manual

Sukup Automation Solutions™

Cyclone™ Air System



Touching main page will bring up “Connected Air Systems” page. Each panel is capable of running five air systems from one display.

Select desired system. Manual Control page will appear.

Manual Mode



Manual Mode enables independent control of each part of the air system. VFD (if equipped) can run at whatever speed is desired. Dynamic Bleed Valve (DBV) controls how much air is blown through the tube. DBV automatically increases or decreases air pressure by oscillating its control valve.

At lower right of screen, real-time pressure and current usage of air system are displayed.



On left side of screen is a link to Settings page. On top right of page is a shortcut to Automatic Control.

Settings

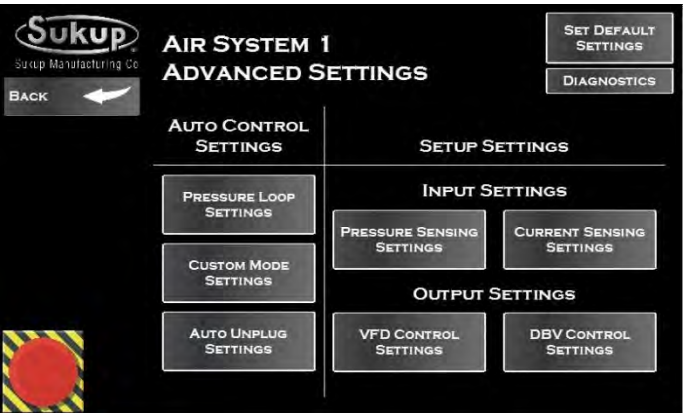


Settings menu shows basic timers that are typically used. Blower Off Delay has a factory-set 30-second delay to clear tube after grain discharge into air system has stopped.

There is also an Auto Adjust Delay Timer. It sets the amount of time that system will run at 100% capacity before trying to automatically use DBV or VFD to maintain a specified air pressure.

Auto Unplug can be enabled on this page as well.

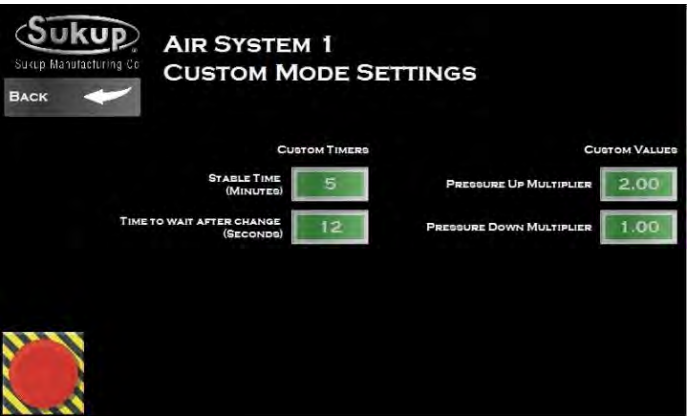
Advanced Settings



This page is accessed by touching Advanced Settings button (shown on previous screen). Loop settings are on left, and sensor settings on right.



Loop Settings are shown on screen at left. Do not change any of these settings without help from a Sukup dealer or from Sukup Manufacturing Co. Basically, these settings change the way that the system reacts to controlling pressure in Automatic Mode.



Auto Unplug Settings



Sukup
Sukup Manufacturing Co.

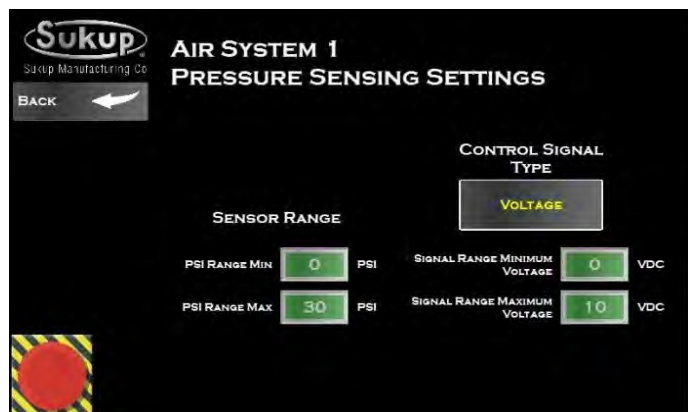
BACK

AIR SYSTEM 1 AUTO UNPLUG SETTINGS

UNPLUG TIMERS		UNPLUG VALUES	
FULL CURRENT RUN TIME (SECONDS)	30	DBV UNPLUG START POSITION	100
OSCILLATE TIME (SECONDS)	30	UNPLUG PRESSURE	6
		OSCILLATE OPEN AMOUNT	2
		OSCILLATE CLOSE AMOUNT	5

DO NOT CHANGE THESE VALUES UNLESS YOU HAVE BEEN INSTRUCTED BY SUKUP MANUFACTURING PERSONNEL. CHANGING THESE VALUES CAN DRAMATICALLY CHANGE THE WAY YOUR AUTO UNPLUG FEATURE WORKS AND MAY CAUSE DAMAGE TO YOUR AIR SYSTEM.

Auto Unplug feature allows air system to automatically clear a plug should one occur. Dynamic bleed valve forces more and more air into system, increasing pressure while making sure not to overload the motor. Settings can be changed to make unplug feature more or less aggressive.



Sukup
Sukup Manufacturing Co.

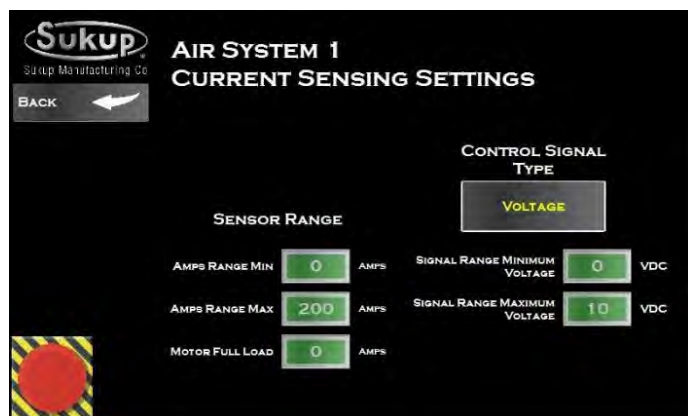
BACK

AIR SYSTEM 1 PRESSURE SENSING SETTINGS

SENSOR RANGE		CONTROL SIGNAL TYPE	
PSI RANGE MIN	0	VOLTAGE	
PSI RANGE MAX	30		

SIGNAL RANGE	
SIGNAL RANGE MINIMUM VOLTAGE	0 VDC
SIGNAL RANGE MAXIMUM VOLTAGE	10 VDC

Pressure and Current Settings are shown in screens at left. Motor Full Load Amps settings must be entered for some of the automation features to work properly. Set this value using the FLA setting on blower motor.



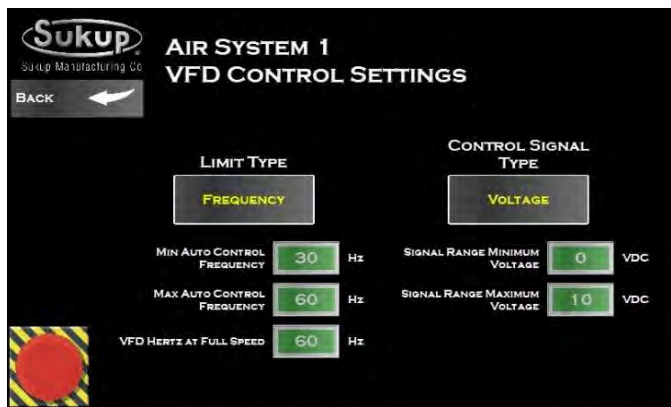
Sukup
Sukup Manufacturing Co.

BACK

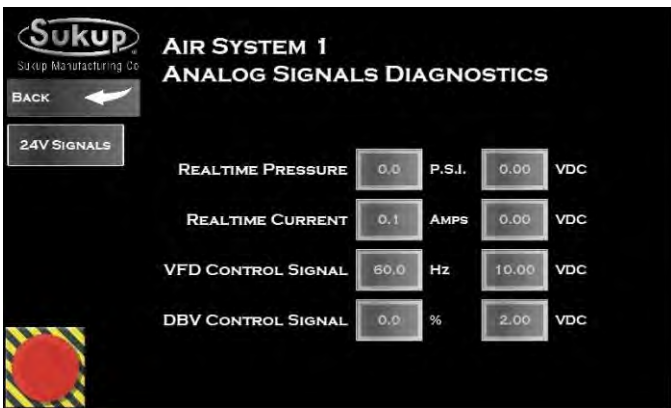
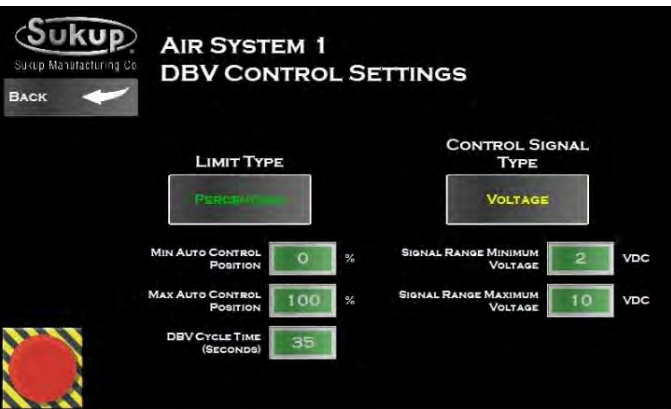
AIR SYSTEM 1 CURRENT SENSING SETTINGS

SENSOR RANGE		CONTROL SIGNAL TYPE	
AMPS RANGE MIN	0	VOLTAGE	
AMPS RANGE MAX	200		
MOTOR FULL LOAD	0		

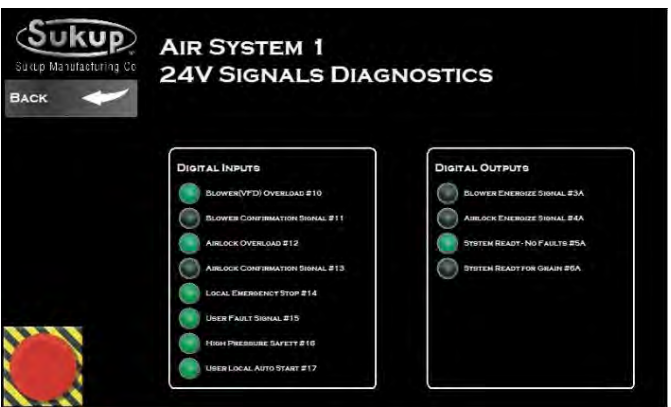
SIGNAL RANGE	
SIGNAL RANGE MINIMUM VOLTAGE	0 VDC
SIGNAL RANGE MAXIMUM VOLTAGE	10 VDC



Control parameters for VFD (if so equipped) and DBV are shown at left. These are basic operating limits of these devices.



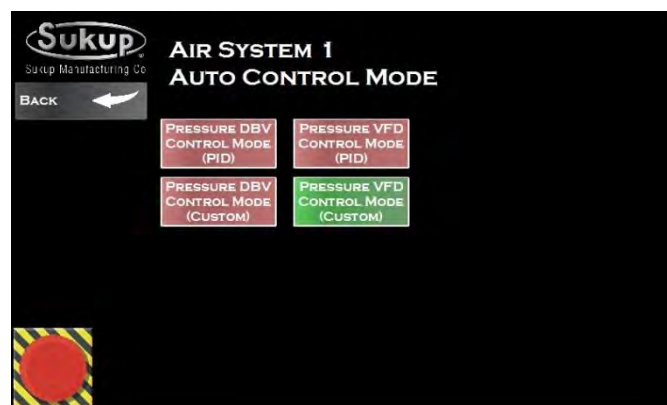
Touch Sukup Logo at upper left at any time to reach diagnostics pages. All system values such as real-time analog and digital statuses can be displayed.



Automatic Control



Automatic Control mode will allow user to specify operating pressure. PLC will control pressure using either VFD (if equipped) or DBV. Auto control type needs to be specified by user. Pressure DBV is default control type (PID) on all systems.



Screen at left will appear after touching Auto Control Type button. User can select a loop control. **IMPORTANT:** If system is not equipped with a VFD, do not select VFD as an option or DBV will automatically close and air system will run at 100% without changing.



Each air system is equipped with a DBV, which can be used to control system pressure by bleeding off a precise amount of air from control valve. If system is also equipped with a VFD, then DBV will not be used to control system pressure except during auto unplugging. VFD will be used to control blower speed, thus system pressure.

During operation, PLC is monitoring real-time current consumption of blower motor. This allows system to manage its feasible pressure limits. If a system pressure is selected that seems to be unreachable because of motor load, the system won't try to overload itself, which would likely result in a plug. Upon selection of any new pressure setpoint, the system will ramp itself to 100% and then wait for the user-selected Auto Adjust Delay time before decreasing VFD speed or opening DBV to start bleeding air from system.

When used with a QuadraTouch Pro dryer, air system will automatically start and come up to speed before dryer unload is allowed to operate.

Emergency Stop



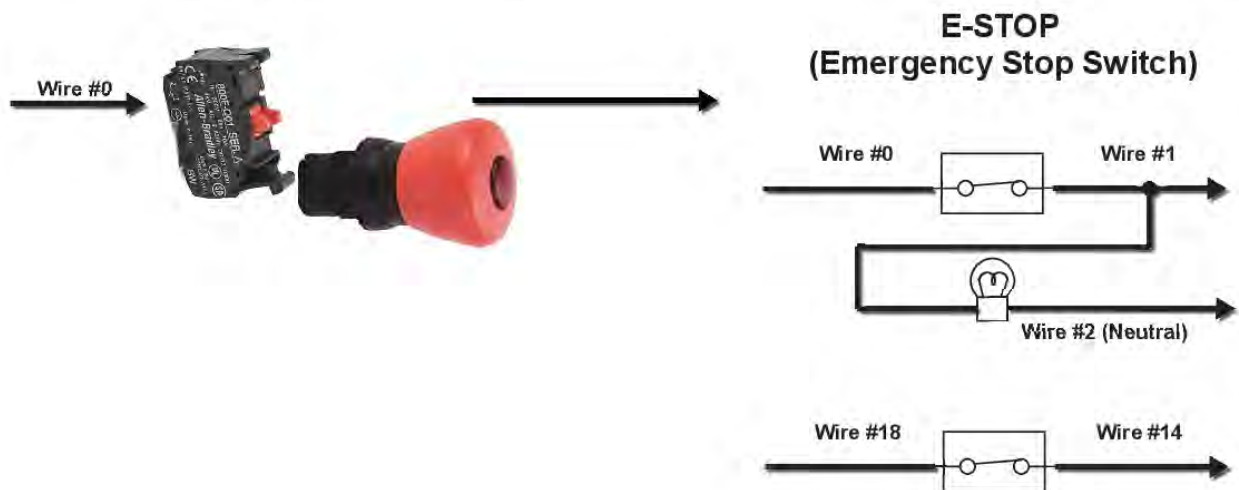
E-Stop button is located at bottom left of all screens. Touching it will shut down air system and send a signal to other Sukup Automation Solutions™ equipment to inform them of shutdown.

IMPORTANT: E-STOP button on side of control cabinet will interrupt all 120V control voltage, but will not interrupt DC control voltage, so PLC and touch panel will stay on.

Emergency Stop and System Control Switch Wiring



NOTE: 575VAC is Fused
Instead of 2 Pole breaker shown



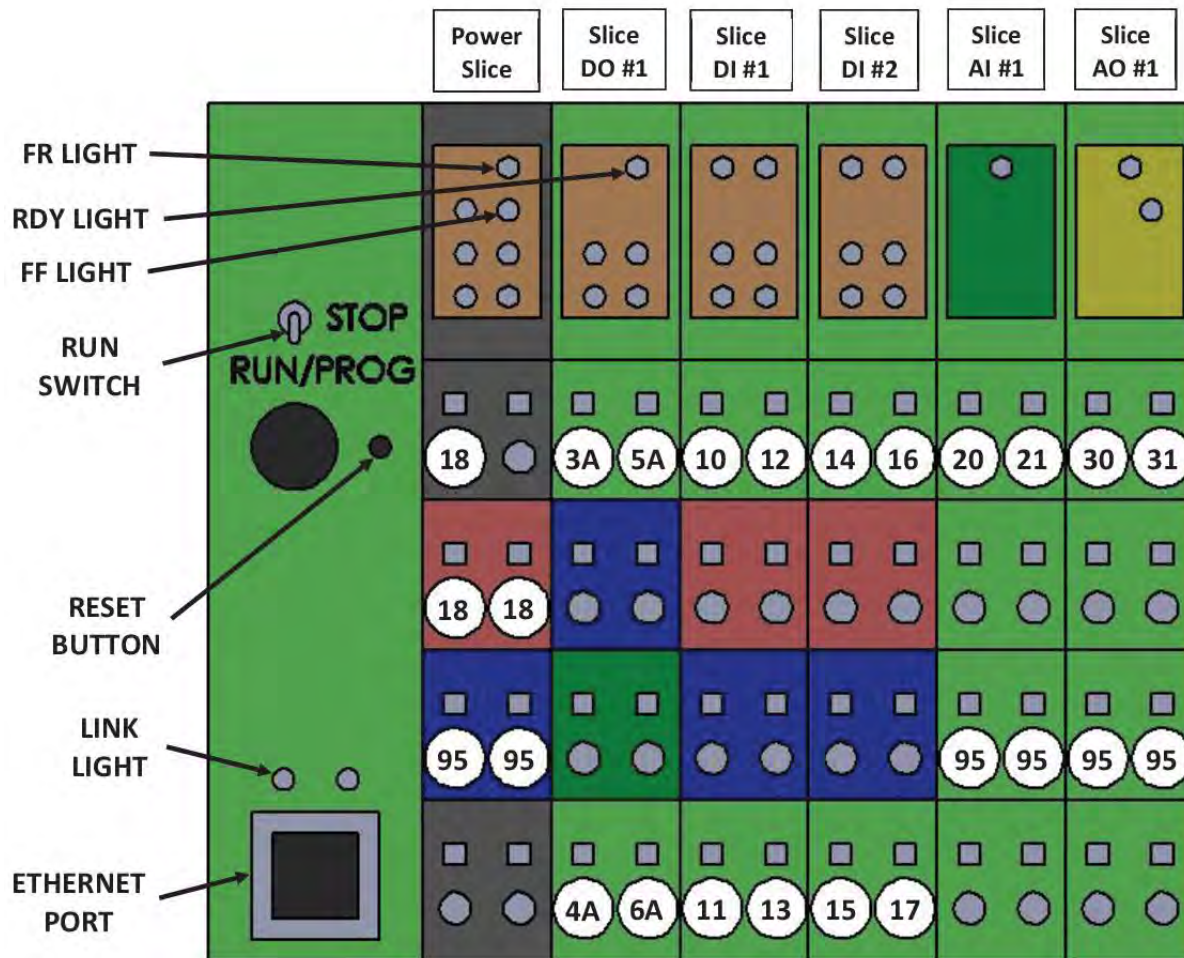
Note: Emergency Stop interrupts 120VAC from control circuitry. DC Power Supply is still active when E-STOP (Emergency Stop Switch) is engaged. PLC logic is active during shutdown.

Title: Air System: Emergency Stop Circuit	
Author: SUKUP MFG CO - MRK	
Date: 03/19	Sheet: 110.6
Revision:	

Wiring Diagrams

See diagram below for overview of Programmable Logic Controller (PLC) in main power box.

Cyclone Air system PLC Overview



POWER

#18: 24V DC +

#95: 24V DC -

DIGITAL OUTPUTS

#3A: BLOWER RUN SIGNAL

#4A: AIRLOCK RUN SIGNAL

#5A: SYSTEM READY SIGNAL

#6A: GRAIN READY SIGNAL

DIGITAL INPUTS

#10: BLOWER O/L OR FAULT

#11: BLOWER MOTOR RUNNING SIGNAL

#12: AIRLOCK O/L OR FAULT

#13: AIRLOCK MOTOR RUNNING SIGNAL

#14: LOCAL E-STOP

#15: USER FAULT INTERLOCK

#16: HIGH PRESSURE FAULT

#17: CUSTOMER INTERLOCK

ANALOG INPUTS

#20: PRESSURE TRANSDUCER REFERENCE

#21: BLOWER CURRENT REFERENCE

ANALOG OUTPUTS

#30: DYNAMIC BLEED VALVE REFERENCE

#31: BLOWER VFD SPEED REFERENCE

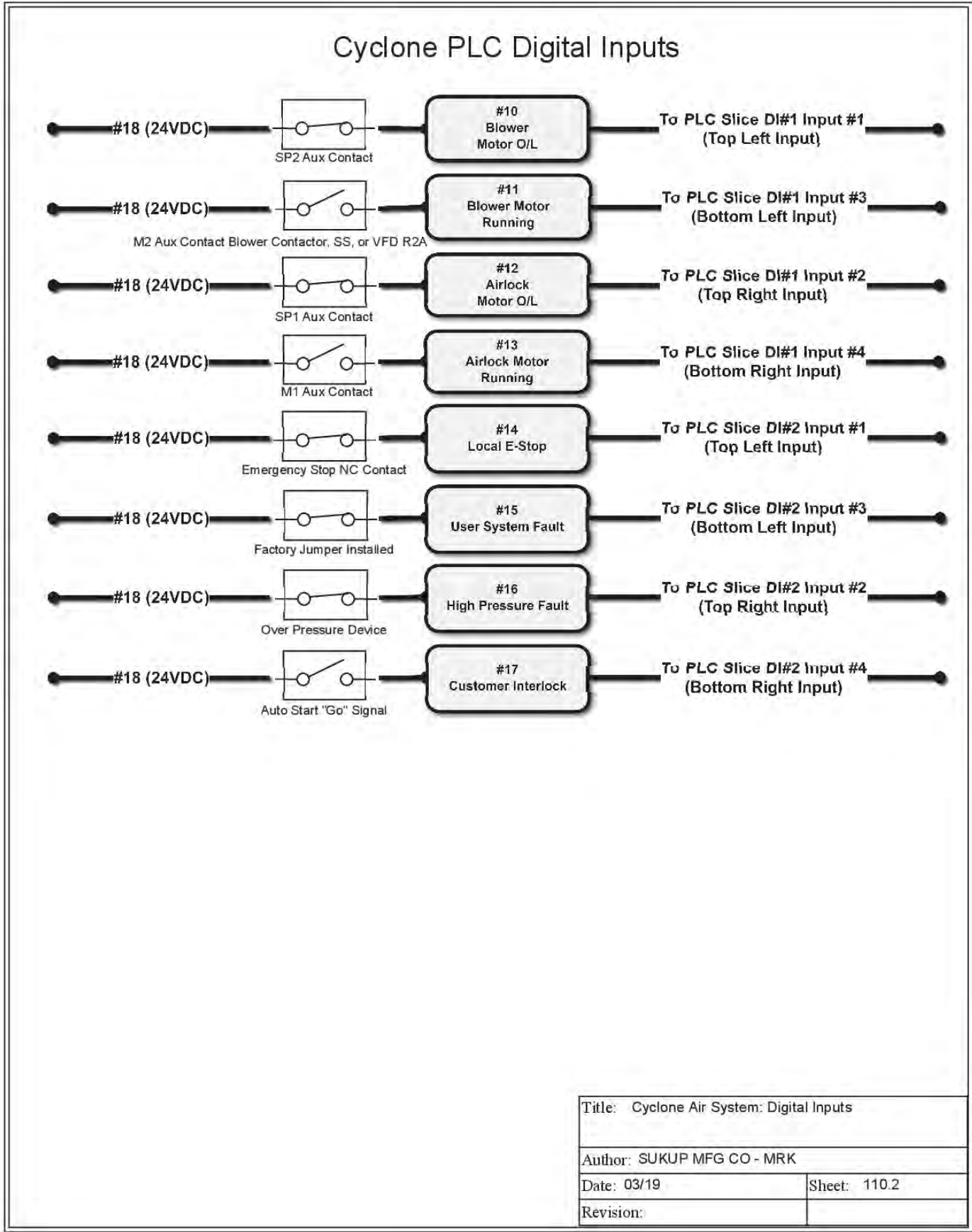
Title: Cyclone Air System PLC Overview

Author: SUKUP MFG CO - RTO

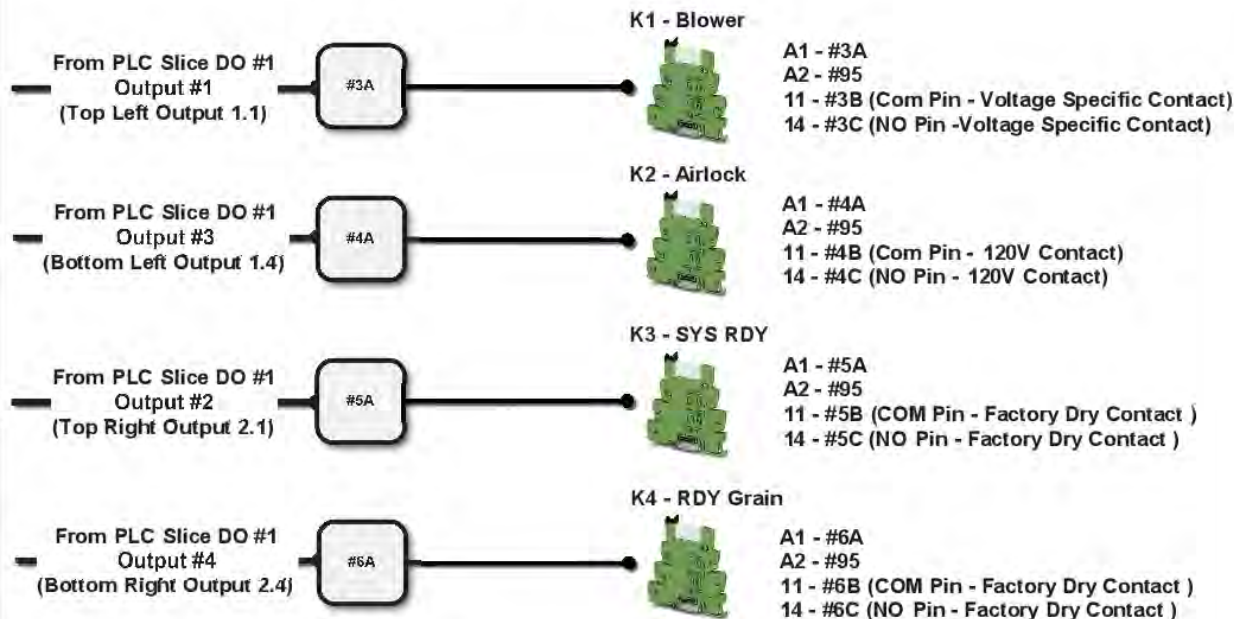
Date: 12/2022

Sheet: 110.7

Revision:



Cyclone PLC Relay Wiring Digital Outputs



The K1 relay is a part-specific voltage contact. If the blower uses a factory installed soft start or contactor for its starting method, the contact will utilize 120VAC for its voltage on #3B and #3C. However, if the blower is equipped with a VFD for its starting method, the contact will utilize 24vdc for its voltage on #3B and #3C.

Title: Cyclone Air System: PLC Relay Wiring Digital Outputs

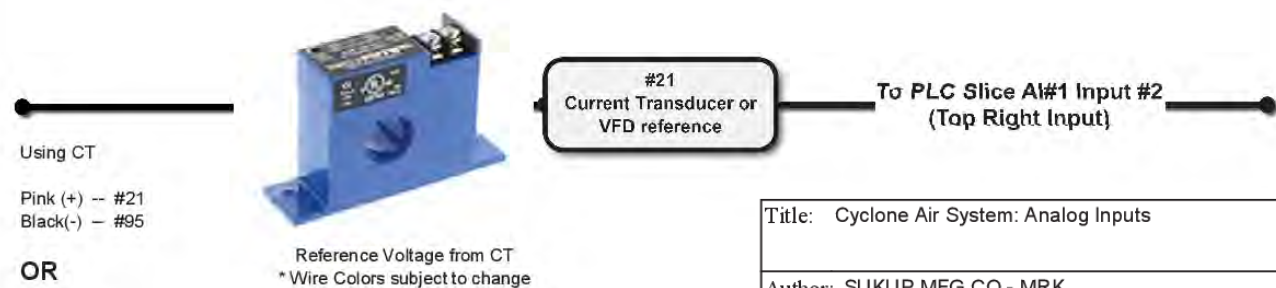
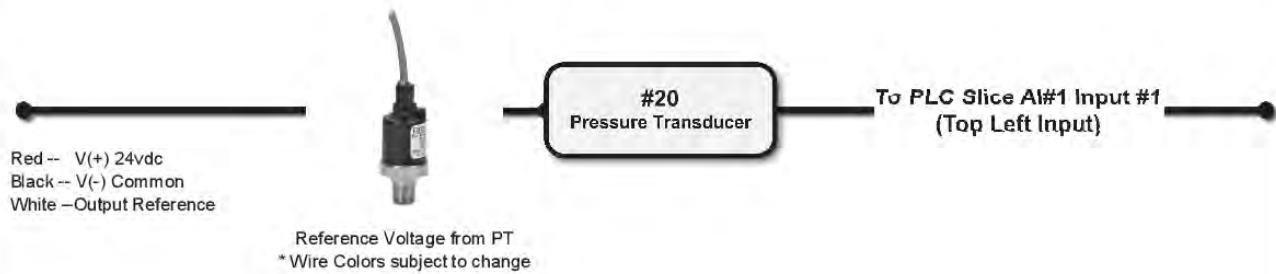
Author: SUKUP MFG CO - MRK

Date: 3/19

Sheet: 110.1

Revision:

Cyclone PLC Analog Inputs



OR

Using VFD

Pink AO1 -- #21

Title: Cyclone Air System: Analog Inputs

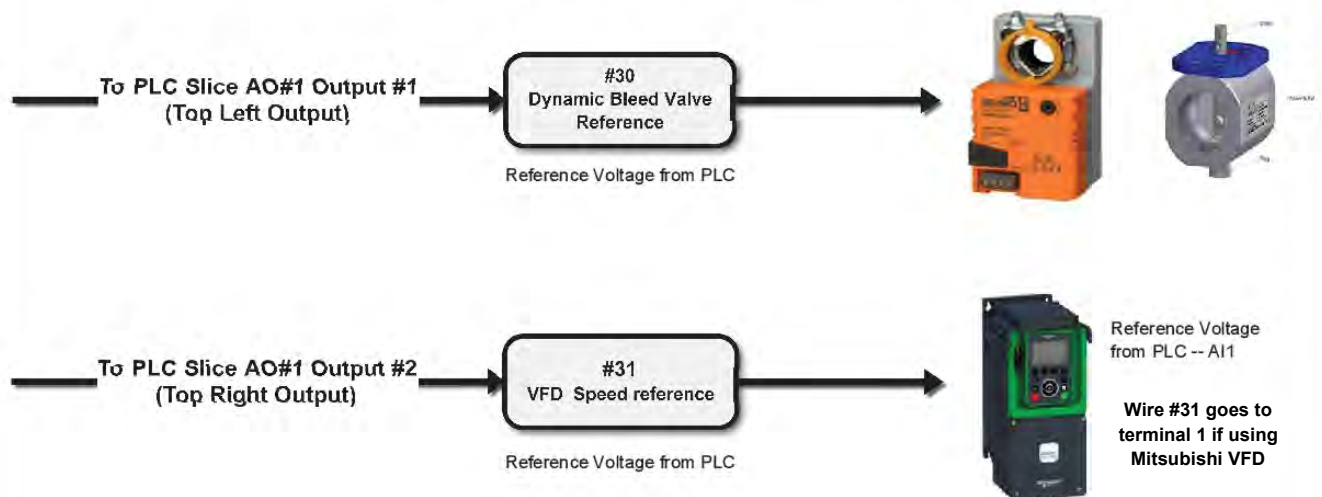
Author: SUKUP MFG CO - MRK

Date: 03/19

Sheet: 110.3

Revision:

Cyclone PLC Analog Outputs



Title: Cyclone Air System: Analog Outputs

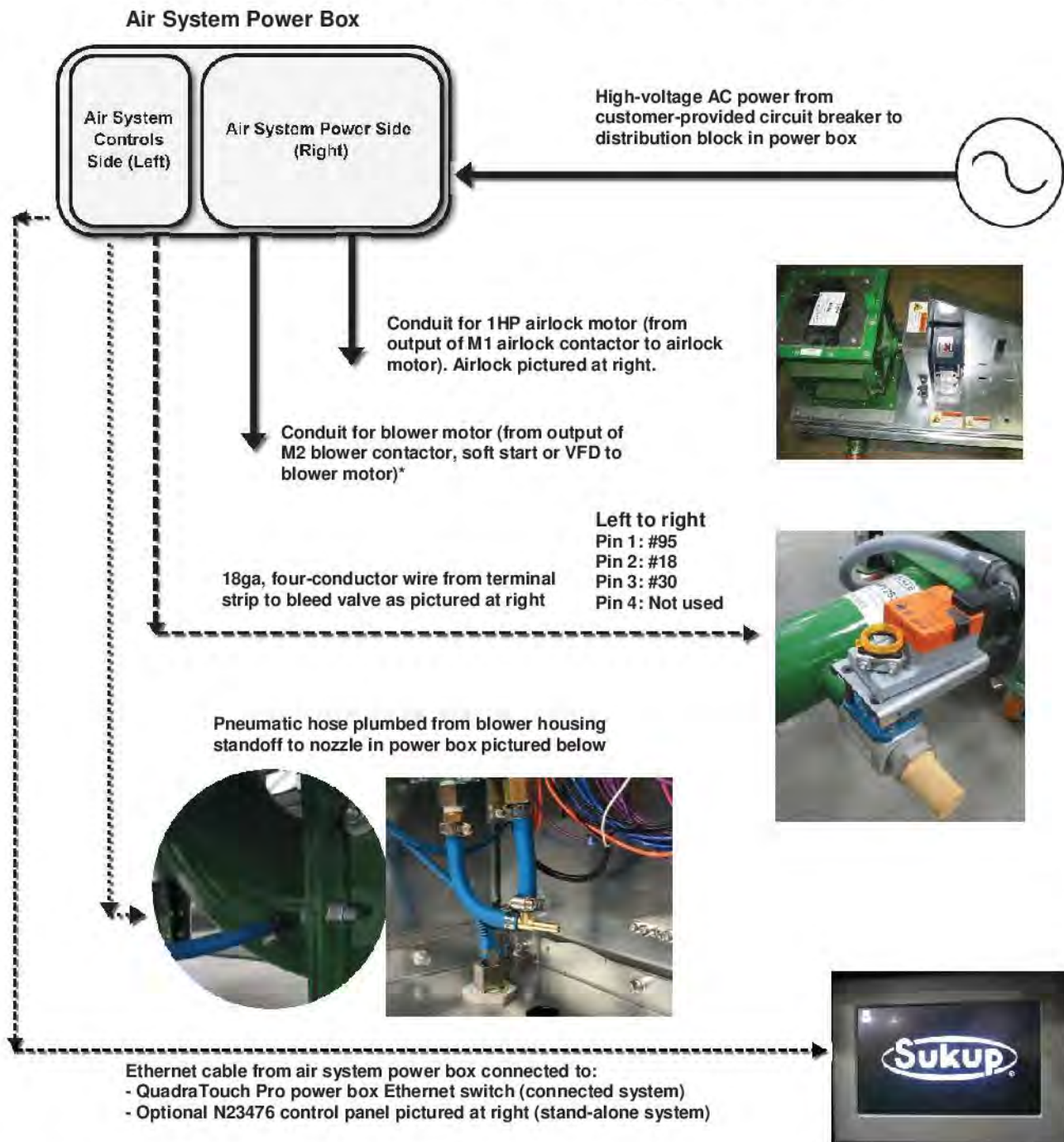
Author: SUKUP MFG CO - MRK

Date: 03/19

Sheet: 110.4

Revision:

Cyclone Air System Wiring Overview



*In some single-phase 230VAC systems, two blower motors are used. There are two breakers, two contactors and two motors for these systems. Either motor can be wired to either contactor.

Title: Cyclone Air System Wiring Overview

Author: SUKUP MFG CO - MRK

Date: 08/19

Sheet: 110.6

Revision:

Wiring Diagrams

Cyclone Power Box Wiring Decals

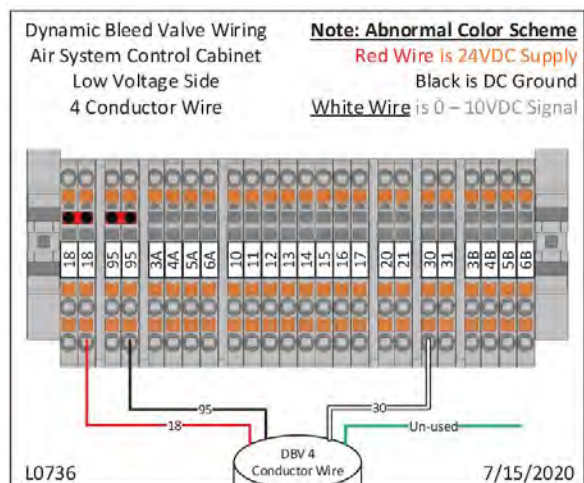
Cyclone wiring decals are mounted at factory. Yearly and prior to equipment use, ensure that all decals are in legible condition and in place according to these instructions. Replace missing or damaged decals free of charge by contacting Sukup Manufacturing Co. by mail at Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com.

If decal replacement is necessary, ensure areas of placement are clean. Remove backing from decal and apply to inside of door.

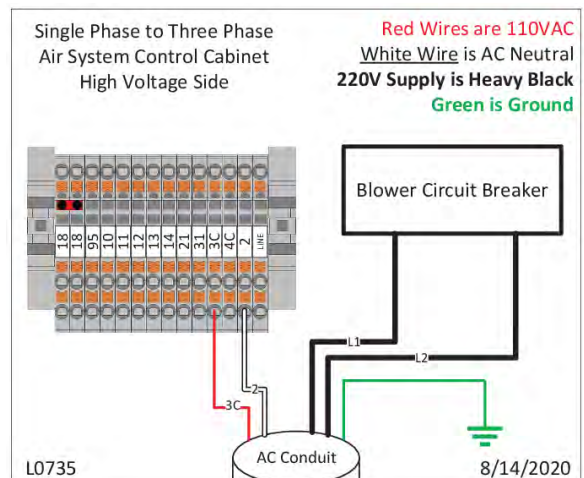
Decal 1 is for all power boxes. Decals 2-4 are only for those with single- to three-phase power converters.

Images 13-15 show decal locations. All go on inside of door. Decals 1 & 3 go inside left door. See Image 14. Decal 2 goes inside right door. See Image 15. Decal 4 goes inside door of single- to three-phase power converter box (Not shown).

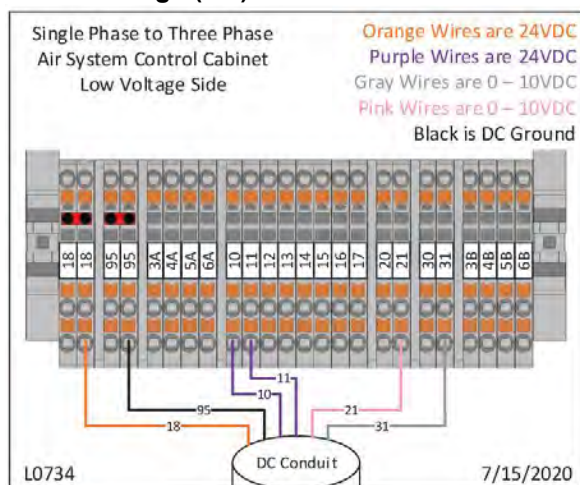
1. Decal L0736 – Dynamic Bleed Valve Wiring.



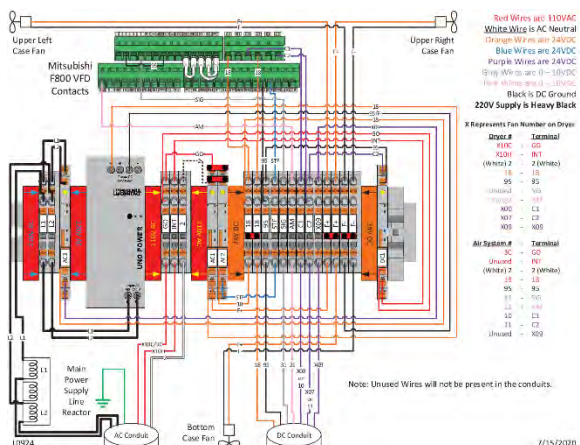
2. Decal L0735 – Single Phase to Three Phase, High Voltage (AC)



3. Decal L0734 – Single Phase to Three Phase, Low Voltage (DC)



4. Decal L0924 – Single Phase to Three Phase Power Converter Wiring

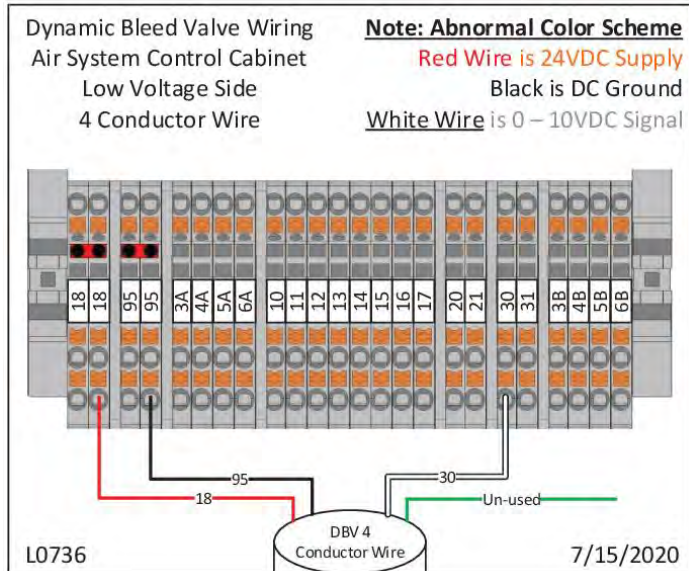


Images 13-15 –
Power box wiring
decal locations

#1 & #3 at lower left;
#2 at lower right

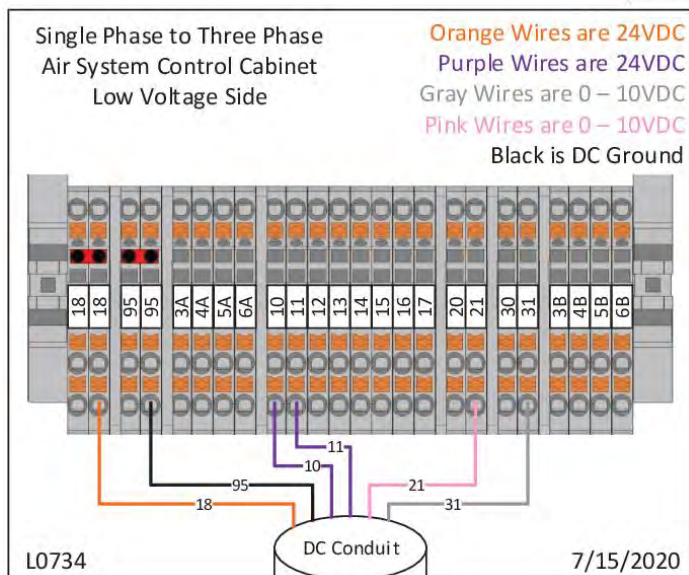
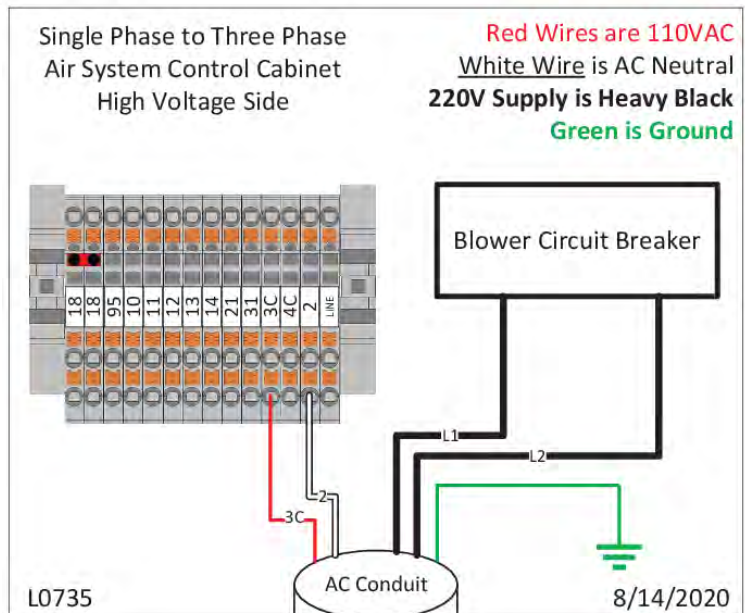


Wiring Diagrams



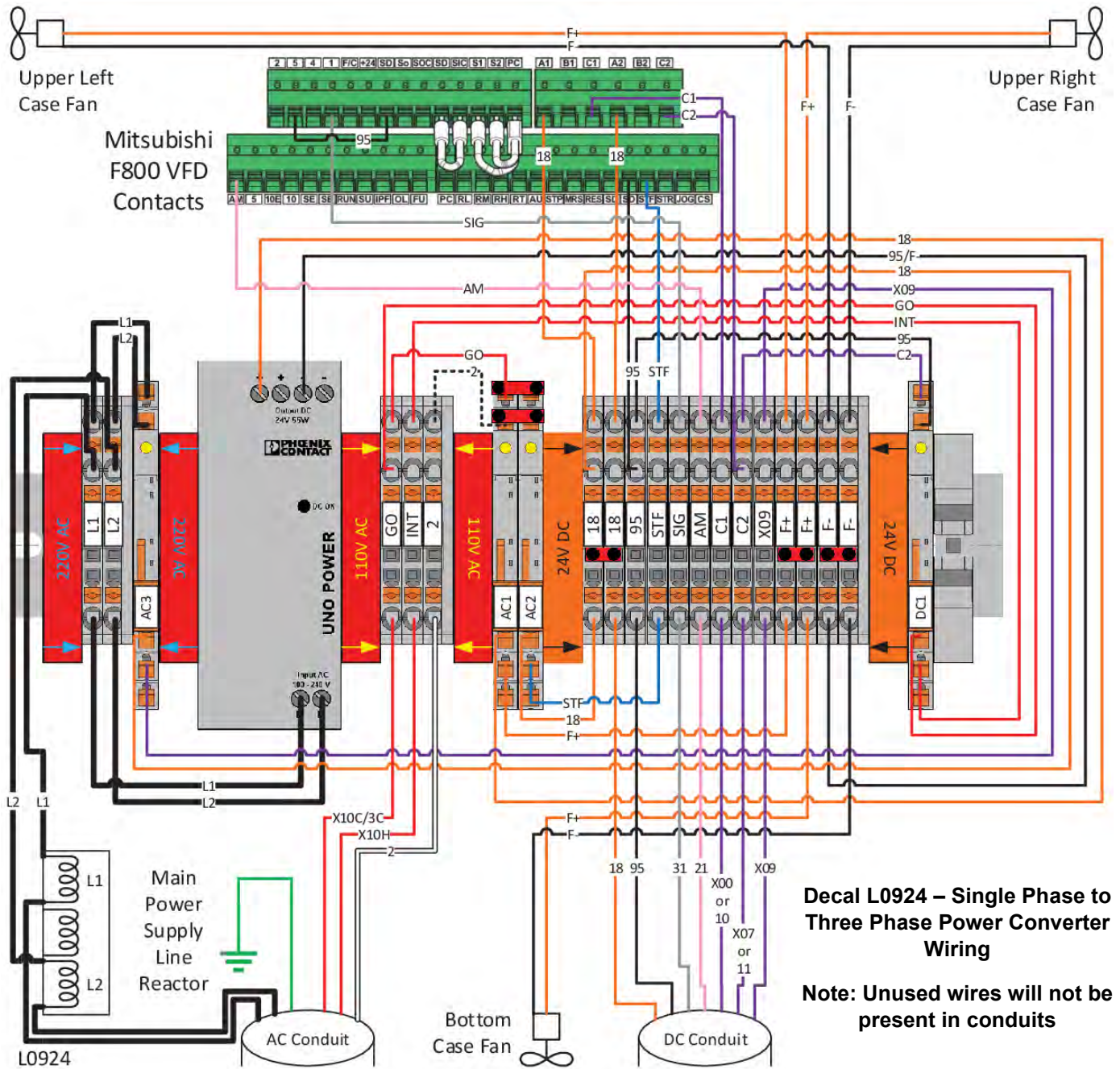
Decal L0736 – Dynamic Bleed Valve Wiring

Decal L0735 – Single- to three-phase power converter, High Voltage (AC)



Decal L0734 – Single Phase to Three Phase, Low Voltage (DC)

Wiring Diagrams



Red Wires are 110VAC
White Wire is AC Neutral
 Orange Wires are 24VDC
 Blue Wires are 24VDC
 Purple Wires are 24VDC
 Gray Wires are 0 – 10VDC
 Pink Wires are 0 – 10VDC
 Black is DC Ground
220V Supply is Heavy Black

X Represents Fan Number on Dryer

<u>Dryer #</u>	-	<u>Terminal</u>
X10C	-	GO
X10H	-	INT
(White) 2	-	2 (White)
18	-	18
95	-	95
Unused	-	SIG
Unused	-	AM
X00	-	C1
X07	-	C2
X09	-	X09

Air System # - Terminal

3C	-	GO
Unused	-	INT
(White) 2	-	2 (White)
18	-	18
95	-	95
31	-	SIG
21	-	AM
10	-	C1
11	-	C2
Unused	-	X09

VFD Programming

See applicable instructions below or on following page to program Variable Frequency Drive depending on model used in power box.

Programming ATV 61 or ATV 71

1. Push gray dial to get into menu system.
2. Navigate to [1.1 Simply Start], [1.5 Inputs / Outputs CFG] or [1.7 Application Function] depending on parameter to be set.
3. Enter each setting by following applicable pathway shown below. Press dial after each entry.



PATHWAY		PARAMETER	SETTING
[1.1 SIMPLY START]		[Standard mot. freq]	60
[1.1 SIMPLY START]		[Rated motor volt.]	240 or 480*
[1.1 SIMPLY START]		[Acceleration]	10.0
[1.5 INPUTS / OUTPUTS CFG]	[R1 configuration]	[R1 Assignment]	[No drive flt]
[1.5 INPUTS / OUTPUTS CFG]	[R1 configuration]	[R2 Assignment]	[Drv running]
[1.5 INPUTS / OUTPUTS CFG]	[AO1 configuration]	[AO1 Assignment]	[I motor]
[1.5 INPUTS / OUTPUTS CFG]	[AO1 configuration]	[AO1 Type]	[Voltage]
[1.7 APPLICATION FUNCT.]	[STOP CONFIGURATION]	[Type of Stop]	[Freewheel]

*Based on site & drive

Troubleshooting Altivar 61

A complete copy of Altivar 61 Variable Speed Drives Programming Manual, 1760649, dated 02/2014, can be found at www.schneider-electric.com

Troubleshooting Altivar 71

A complete copy of Altivar 71 Variable Speed Drives Programming Manual, 1755855, dated 02/2016, can be found at www.schneider-electric.com

Programming ATV 320

1. Push green dial to get into menu system.
2. Turn dial to ConF; push dial to enter menu.
3. Enter each setting by following applicable pathway shown below. Press dial after each entry, then ESC until get back to ConF.

PATHWAY		PARAMETER		SETTING
ConF	FuLL	SiN-	bFr	60
ConF	FuLL	SiN-	unS	240/480*
ConF	FuLL	SiN-	ACC	10.0
ConF	FuLL	i_o-	r1- r1	FLt
ConF	FuLL	i_o-	r2- r2	run
ConF	FuLL	i_o-	Ao1- Ao1	oCr
ConF	FuLL	i_o-	Ao1- Ao1t	10v
ConF	FuLL	DrC-	Ctt	Std
ConF	FuLL	Fun-	Stt- Stt	nSt

*Based on site & drive



Troubleshooting Altivar 320

A complete copy of Altivar Machine ATV320 Variable Frequency Drives Programming Manual, NVE41295, dated 09/2021, can be found on Sukup website and at www.schneider-electric.com

Programming ATV 630

1. Push OK button with directional arrows to get into menu system.
2. Navigate to [Simply Start] or [Complete settings] depending on parameter to be set.
3. Enter each setting by following applicable pathway shown below. Press OK after each entry.



PATHWAY				PARAMETER	SETTING
[Simply Start]				[Motor Standard]	60
[Simply Start]				[Nom Motor Voltage]	240 or 480*
[Simply Start]				[Acceleration]	10.0
[Complete settings]	[Input/Output]	[Relay]	[R1 configuration]	[R1 Assignment]	[Operating State Fault]
[Complete settings]	[Input/Output]	[Relay]	[R2 configuration]	[R2 Assignment]	[Drive Running]
[Complete settings]	[Input/Output]	[AI/AQ]	[AQ1 configuration]	[AQ1 Assignment]	[Motor Current]
[Complete settings]	[Input/Output]	[AI/AQ]	[AQ1 configuration]	[AQ1 Type]	[Voltage]
[Complete settings]	[Motor parameters]			[Motor Control Type]	[U/F VC Standard]
[Complete settings]	[Generic functions]			[Type of Stop]	[Freewheel]

*Based on site & drive

Troubleshooting Altivar 630

See Diagnostics and Troubleshooting section of Altivar Process ATV600 Variable Speed Drives Programming Manual, EAV64318, dated 06/2021, available at www.schneider-electric.com

Programming Mitsubishi F800:

Follow steps below to set parameters as shown on next page.

1. Press MODE button one time.
2. Turn dial to get to desired parameter.
3. Press SET button to enter parameter menu.
4. Turn dial to get to desired setting.
5. Press SET button to store desired setting.
6. Turn dial to get to next parameter.
7. Repeat Steps 4 through 6 until all parameters are set.
8. When done programming, return to main screen by pressing MODE button three times.



Troubleshooting Mitsubishi F800

A copy of Mitsubishi F800 Protective Functions chapter can be found on Sukup website at this location: https://www.sukup.com/assets/general-docs/Mitsubishi_F800_Protective_Functions_6.pdf

VFD Programming

Sukup Manufacturing Mitsubishi F800 Series Programming Settings

Customer: Sukup
 Job: Air System Blower / Sweep System
 PO: NA
 VFD: F800

Date: 1/5/2022
 Contact:
 Programmer: Dan

Program Parameters in this order

Parameters	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
P 77	Parameter write selection	0 to 2	1	0	2
This allows you to program in any mode and while it's running.					
P 1	Maximum frequency	0 to 120	0.01Hz	120	60
Drive will not exceed this speed.					
P 2	Minimum frequency	0 to 120	0.01Hz	0	0
Drive will not run below this speed except on start.					
P 7	Acceleration time	0 to 3600	0.1s	15	10
Time in seconds from 0 - 60 Hz.					
P 9	Electronic thermal O/L relay/Rated motor current	0 to 500	0.01A	Drive Specific	Motor OL Amps
Motor OL. Usually FLA x S.F.					
P14	Load pattern selection	0,1,12 to 15	1	1	0
Variable Torque(1) vs. Constant Torque(0)					
P 56	Current monitoring reference	0 to 500	0.01A	Drive Specific	200
Current Scale 0 - 10 vdc, Max Current					
P 57	Restart coasting time	0,0.1 to 30,9999	0.1s	9999	2
Wait time for the inverter to perform a restart while rolling.					
P 158	AM terminal function selection	1 to 3,5 to 8,10 to 14,17,18,21,24,34,50,52 to 54,61,6	1	1	2
Select Output Current for Analog Output Terminal (AM)					
P 162	Automatic restart after instantaneous power failure	0 to 3,10 to 13	1	0	13
Frequency search at every start (reduced impact restart)					
P 195	ABC1 terminal function selection	0 to 5,8,10 to 19,25,26,35,39,40 to 42,45 to 54,57,64	1	99	199
Fault Condition or Power Loss breaks the connection between Terminals A1 and C1. When powered up and no Fault, A1 and C1 are connected.					
P 196	ABC2 terminal function selection	0 to 5,8,10 to 19,25,26,35,39,40 to 42,45 to 54,57,64	1	9999	1
When the Drive is at speed, Terminals A1 and C1 are connected. When drive is not at speed, Terminals A1 and C1 are disconnected					
P 250	Stop selection	0 to 100,1000 to 1100,8888,9999	0.1s	9999	0
This causes the drive to coast to stop. It disables the deceleration timer.					
P 882	Regeneration avoidance operation selection	0 to 2	1	0	1
Helps prevent Over Voltage Faults caused by Regen from motor.					

NOTE: Information below is from Mitsubishi Electric Inverter FR-F800 Instruction Manual.

Monitoring Inverter Status

Monitoring of Output Current & Output Voltage

NOTE: Pressing SET in Monitor mode switches monitored item to Output Frequency, Output Current and then to Output Voltage.

1. Press MODE during operation to monitor output frequency. [Hz] indicator turns ON.
2. Press SET to monitor output current. This operation is valid during running or stopping under any operation mode. [A] appears.
3. Press SET to monitor output voltage. [V] appears.

NOTE: Other monitored items, such as Output Voltage and Set Frequency, are also available. Use Pr.52 to change setting.

First Monitored Item

The first monitored item to be displayed in Monitor mode is selectable. To set a monitored item as the first monitored item, display a monitored item then press SET for a while.

Example: Set Output Current as first monitored item.

1. Select Monitor mode, then select Output Current.
2. Press SET for about one second. Output Current is set as first monitored item.
3. When Monitor mode is selected next time, Output Current is monitored first.

NOTE: Use Pr.774 Operation panel monitor selection 1 to change monitored item.

Electrical Requirements

See table below for electrical requirements based on electrical panel number. Panel number is found on white sticker inside of power box. Far right column identifies panel enclosure box. See Pages 8-9 for box dimensions.

Electrical Panel #	Start Method	Panel Voltage	Phase	Blower Wire Ga	Blower HP	Blower Motor	Airlock Wire Ga	Airlock Motor #	Blower Amp Setting	Airlock Amp Setting	Total Panel Amps	Panel Enclosure Box #
N121115	LS	230	1	4	15	H6030	14	H1100	62.0	8.1	70.1	N60090
N123120	VFD	230	1	2	20	H6610T	14	H1100	99.6	8.1	107.6	N60090
N123130	VFD	230	1	2/0	30	H7126	14	H1100	145.4	8.1	153.5	N60090
N123140	VFD	230	1	4/0	40	H7200T	14	H1100	191.2	8.1	199.3	N60090
N123150	VFD	230	1	250*	50	H7210	14	H1100	233.0	8.1	241.1	N60090
N321115	LS	230	3	8	15	H6110T	14	H1150	43.7	4.0	47.7	N60090
N321120	LS	230	3	6	20	H6610T	14	H1150	57.5	4.0	61.5	N60090
N321130	LS	230	3	2	30	H7126	14	H1150	84.0	4.0	88.0	N60090
N321140	LS	230	3	1	40	H7200T	14	H1150	110.4	4.0	114.4	N60090
N321150	LS	230	3	1/0	50	H7210	14	H1150	134.6	4.0	138.6	N60090
N321160	LS	230	3	2/0	60	H7260	14	H1150	158.7	4.0	162.7	N60090
N322120	SS	230	3	6	20	H6610T	14	H1150	57.5	4.0	61.5	N60091
N322130	SS	230	3	2	30	H7126	14	H1150	84.0	4.0	88.0	N60091
N322140	SS	230	3	1	40	H7200T	14	H1150	110.4	4.0	114.4	N60091
N322150	SS	230	3	1/0	50	H7210	14	H1150	134.6	4.0	138.6	N60091
N322160	SS	230	3	2/0	60	H7260	14	H1150	158.7	4.0	162.7	N60091
N323120	VFD	230	3	6	20	H6610T	14	H1150	57.5	4.0	61.5	N6019
N323130	VFD	230	3	2	30	H7126	14	H1150	84.0	4.0	88.0	N6019
N323140	VFD	230	3	1	40	H7200T	14	H1150	110.4	4.0	114.4	N6019
N323150	VFD	230	3	1/0	50	H7210	14	H1150	134.6	4.0	138.6	N6019
N323160	VFD	230	3	2/0	60	H7260	14	H1150	158.7	4.0	162.7	N6019
N323175	VFD	230	3	4/0	75	H7275T	14	H1150	195.5	4.0	199.5	N6019
N341120	LS	460	3	8	20	H6610T	14	H1150	28.8	2.0	30.8	N60090
N341130	LS	460	3	8	30	H7126	14	H1150	42.0	2.0	44.0	N60090
N341140	LS	460	3	6	40	H7200T	14	H1150	55.2	2.0	57.2	N60090
N341150	LS	460	3	4	50	H7210	14	H1150	67.3	2.0	69.3	N60090
N341160	LS	460	3	2	60	H7260	14	H1150	79.4	2.0	81.4	N60090
N341175	LS	460	3	2	75	H7275T	14	H1150	97.8	2.0	99.8	N60090
N342120	SS	460	3	8	20	H6610T	14	H1150	28.8	2.0	30.8	N60091
N342130	SS	460	3	8	30	H7126	14	H1150	42.0	2.0	44.0	N60091
N342140	SS	460	3	6	40	H7200T	14	H1150	55.2	2.0	57.2	N60091
N342150	SS	460	3	4	50	H7210	14	H1150	67.3	2.0	69.3	N60091
N342160	SS	460	3	2	60	H7260	14	H1150	79.4	2.0	81.4	N60091
N342175	SS	460	3	2	75	H7275T	14	H1150	97.8	2.0	99.8	N60091
N343120	VFD	460	3	8	20	H6610T	14	H1150	28.8	2.0	30.8	N6019
N343130	VFD	460	3	8	30	H7126	14	H1150	42.0	2.0	44.0	N6019
N343140	VFD	460	3	6	40	H7200T	14	H1150	55.2	2.0	57.2	N6019
N343150	VFD	460	3	4	50	H7210	14	H1150	67.3	2.0	69.3	N6019
N343160	VFD	460	3	2	60	H7260	14	H1150	79.4	2.0	81.4	N6019
N343175	VFD	460	3	2	75	H7275T	14	H1150	97.8	2.0	99.8	N6019
N351120	LS	575	3	10	20	H7050	14	H1110	21.9	1.5	23.4	N60091
N351130	LS	575	3	8	30	H7127	14	H1110	32.2	1.5	33.7	N60091
N351140	LS	575	3	8	40	H7179	14	H1110	42.3	1.5	43.8	N60091
N351150	LS	575	3	6	50	H7230	14	H1110	52.9	1.5	54.4	N6019
N351160	LS	575	3	4	60	H7262	14	H1110	63.3	1.5	64.8	N6019
N351175	LS	575	3	2	75	H7503	14	H1110	79.0	1.5	80.5	N6019
N352120	SS	575	3	10	20	H7050	14	H1110	21.9	1.5	23.4	N60091
N352130	SS	575	3	8	30	H7127	14	H1110	32.2	1.5	33.7	N60091
N352140	SS	575	3	8	40	H7179	14	H1110	42.3	1.5	43.8	N60091
N352150	SS	575	3	6	50	H7230	14	H1110	52.9	1.5	54.4	N6019
N352160	SS	575	3	4	60	H7262	14	H1110	63.3	1.5	64.8	N6019
N352175	SS	575	3	2	75	H7503	14	H1110	79.0	1.5	80.5	N6019
N353120	VFD	575	3	10	20	H7050	14	H1110	21.9	1.5	23.4	N60091
N353130	VFD	575	3	8	30	H7127	14	H1110	32.2	1.5	33.7	N60091
N353140	VFD	575	3	8	40	H7179	14	H1110	42.3	1.5	43.8	N60091
N353150	VFD	575	3	6	50	H7230	14	H1110	52.9	1.5	54.4	N6019
N353160	VFD	575	3	4	60	H7262	14	H1110	63.3	1.5	64.8	N6019
N353175	VFD	575	3	2	75	H7503	14	H1110	79.0	1.5	80.5	N6019

***Measured in MCM vs. AWG**
Electrical requirements by panel number

CONTACT INFORMATION

Sukup Dealer Information

Dealer name:	_____
Address:	_____
Cell phone:	_____
Office phone:	_____
Fax:	_____

In Case of Emergency

Have emergency numbers and written directions to your location near a phone.
Arrange and practice a safety plan.

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

PRODUCT WARRANTY REGISTRATION

Please scan QR code
to register online.



Sukup Manufacturing Co.

1555 255th Street, Box 677

Sheffield, Iowa, USA 50475-0677

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

Email: info@sukup.com