Excel Series
Porcelain Enamel
Powder Coating System

Customer Product Manual
Part 1107779_02
Issued 7/12

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Notice

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Section 1
Safety

Introduction

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to all persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

All phases of equipment installation must comply with all federal, state, and local codes.

Personal Safety

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing any moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.

- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Grounding

WARNING: Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

All work conducted inside the spray booth or within 1 m (3 ft) of booth openings is considered within a Class 2, Division 1 or 2 Hazardous location and must comply with NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

Section 2
Description

Introduction

This manual covers the Excel Porcelain Enamel powder coating system. It includes system operation, maintenance, and troubleshooting procedures. Spray booth repair procedures and parts lists are also included. Review this manual and the manuals for the other components of your system before operating your Nordson powder coating system.

System Configuration

A complete powder coating system consists of powder application equipment and powder recovery/reclaim equipment. Since powder coating systems are designed to each customer's requirements, each system will have a different combination of equipment. This manual describes a typical system. Your system may have equipment not described in this manual. Before operating your system, please read the manuals for all equipment not covered in this manual.

The system can be fixed or roll-on/roll off. Fixed systems are permanently located under the conveyor. Roll on/roll off systems are mounted on casters and rails so they can be moved off-line for powder changes or maintenance. The illustrations in this section show a fixed system.

System Operation

See Figure 2-1.

Powder Application

The primary feed hopper (12) supplies powder to the spray guns. A porous fluidizing plate in the bottom of the feed hopper diffuses low-pressure compressed air into the powder supply. For some applications, a heater is installed to heat the fluidizing air and keep the powder dry.

The powder pumps (13) draw the powder out of the hopper, mix it with a high-velocity stream of air, and force it through feed hoses (16) to the powder spray guns (1). The spray guns electrostatically charge the powder and spray it onto the workpieces (3) passing through the booth. The charged powder sticks to the grounded workpieces.

If a satellite feed hopper is used to feed the spray guns on the opposite side of the booth, a transfer pump is installed on the primary hopper and a level sensor is installed on the satellite hopper. The level sensor controls the transfer pump, pumping powder from the primary hopper to the satellite hopper as needed.

Fluidizing Air Heater

Depending on the powder and the application, many porcelain enamel systems use an air heater to heat and dry the feed hopper fluidizing air. The heater is located in the air line ahead of the feed hopper. Two RTD temperature sensors are installed in the feed hopper; one in the hopper plenum below the fluidizing plate, and one in the feed hopper above the fluidizing plate. A temperature controller and temperature monitor are installed in the Motor Starter Panel.

The feed hopper RTD is connected to the temperature monitor, which continuously displays the temperature of the fluidized powder. The plenum RTD is connected to the temperature controller, which compares the fluidizing air temperature with the temperature setpoint and turns the heater on and off as needed to maintain the correct temperature.

Powder Recovery and Reclaim

An exhaust fan (5) pulls spray-room air into the canopy (2), through the cartridge filters (4) and color module, and into the fan section (6). The air flow prevents sprayed powder from escaping from the booth. The air is returned to the spray room through the final filters (8), free of all powder.

The oversprayed powder falls into reclaim hoppers in the booth base. Any powder suspended in the air flowing into the color module collects on the external surfaces of the cartridge filters. At timed intervals, the pulse valves (9) release large volumes of air through the centers of the cartridge filters. The air pulse blows the powder off the filters. The powder falls into the color module hoppers, where it is fluidized.

The primary feed hopper is equipped with a level sensor, which controls the transfer pumps (17) on the color module and base modules The level sensor turns the pumps on and off as needed to maintain the powder level in the primary feed hopper. The reclaimed powder flows from the transfer pumps through the transfer hoses (15) to the accumulator (10) on top of the sieve (11).

The rotary air lock (7) then transfers the powder into the sieve. The air lock controls the amount of powder flowing into the sieve to prevent overloading, and isolates the sieve from the air pressure in the accumulator.

The sieve screens the reclaimed powder and discharges particles and clumps too large to pass through the sieve screen into a scrap bucket (14). The screened powder falls into the feed hopper.

To maintain a neutral air pressure within the accumulator and feed hopper, they are vented into the color module. This keeps powder inside the system and aids in powder transfer.

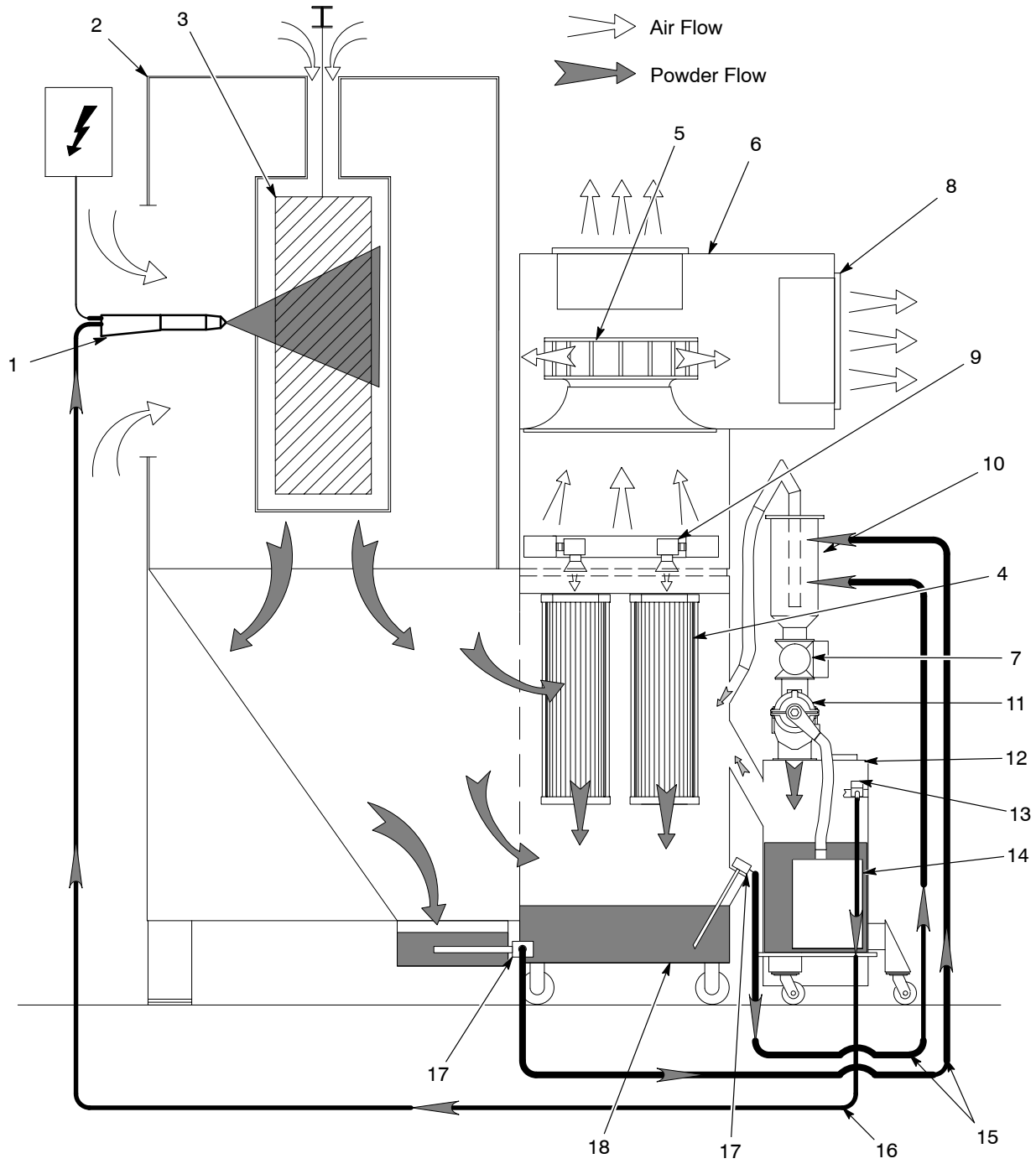


Figure 2-1 System Operation – Simplified View of Booth

1. Powder spray gun
2. Enclosure
3. Workpiece
4. Cartridge filters
5. Exhaust fan
6. Fan section
7. Rotary airlock
8. Final filters
9. Pulse valves
10. Accumulator
11. Sieve
12. Feed hopper
13. Powder pumps
14. Scrap bucket
15. Transfer hoses
16. Feed hoses
17. Transfer pumps
18. Color module

Virgin Powder Supply

A bulk unloader is typically used to pump virgin powder from a drum or other type of container to the sieve accumulator, or directly into the primary feed hopper. The bulk unloader transfer pump can be controlled by the primary feed hopper level sensor or operated manually.

System Equipment

Refer to Table 2-1 and Figure 2-2.

Table 2-1 Recovery and Reclaim Equipment

Item	Equipment	Description
1	Booth enclosure (canopy)	Contains the sprayed powder within the booth. Can be made of polypropylene or stainless steel.
2	Fan section	Houses the exhaust fan, motor, cartridge filter pulse valves and manifold, and final filters. A pneumatic seal on the bottom of the fan section provides an air-tight seal between the fan section and the color module.
3	Color module	Houses cartridge filters, fluidizing hoppers, and transfer pumps. Oversprayed powder is pumped out of the hoppers back to the feed hoppers.
4	Accumulator	Collects reclaimed powder from the color module and base modules, plus virgin powder, and directs the powder into the rotary air lock. The powder conveying air is vented into the color module, preventing pressurization of the sieve and contamination of the spray room with fine dust.
5	Rotary air lock	Transfers powder from the accumulator to the sieve and prevents conveying air from pressurizing the sieve. Also prevents too much powder from entering the sieve all at once and clogging the screen.
6	Rotary sieve	Screens reclaimed and virgin powder and delivers it to the feed hopper. Powder particles and clumps too large to pass through the sieve screen are dumped into a scrap container.
7	Primary feed hopper	Holds and fluidizes the spray gun powder supply. Feed pumps mounted on the hopper pump the powder to the spray guns. The hopper is bolted to and vented directly into the color module. Satellite hoppers are vented into the color module through flexible hose.
8	Feed hopper level sensor	The level sensor controls the level of powder in the feed hopper. If the powder level falls below the level sensor, the transfer pumps on a bulk unloader automatically turn on and replenish the powder supply.
Not Shown	Fluidizing air heater	Installed in the air line ahead of the feed hopper to heat the fluidizing air. Optional equipment.
9	Transfer pumps	Convey the reclaimed powder from the color module and base modules to the accumulator. Switches on the system motor starter panel control pump operation.

Continued...

Item	Equipment	Description
10	Base modules	Support the canopy and collect oversprayed powder in fluidized hoppers in the bases, which is pumped back to the accumulator to be sieved and resprayed. Systems are available with 1, 2, or 3 base modules.
11	Operator Platform	Allows manual spray gun operators access to the booth. Manual spray gun controls are typically mounted on the platform railing.

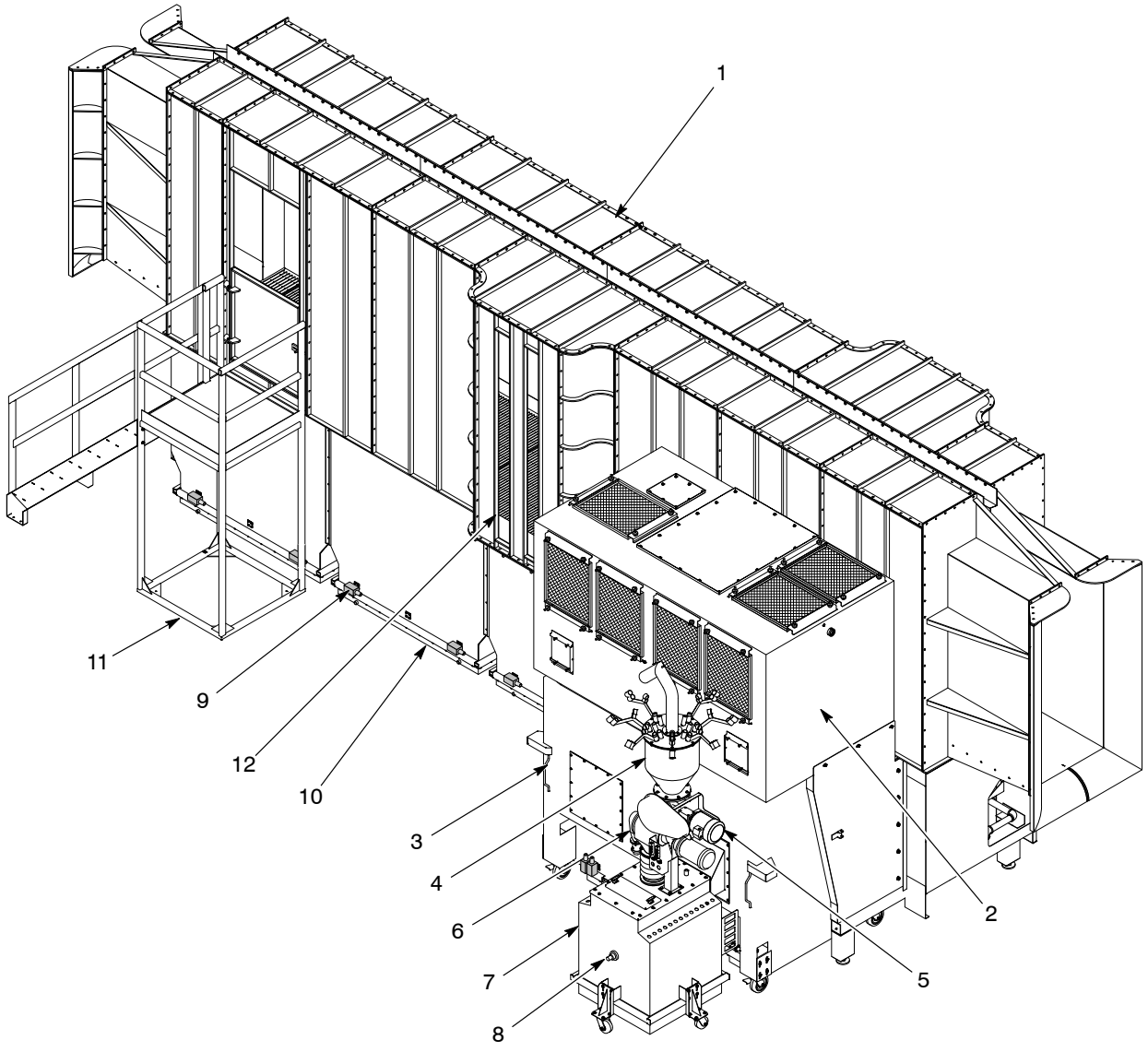


Figure 2-2 System Components

1. Canopy
2. Fan section
3. Color module
4. Accumulator
5. Rotary air lock
6. Sieve
7. Feed hopper
8. Level sensor
9. Transfer pumps
10. Base and fluidizing hoppers
11. Operator platform
12. Automatic gun slots

Fan Section Components

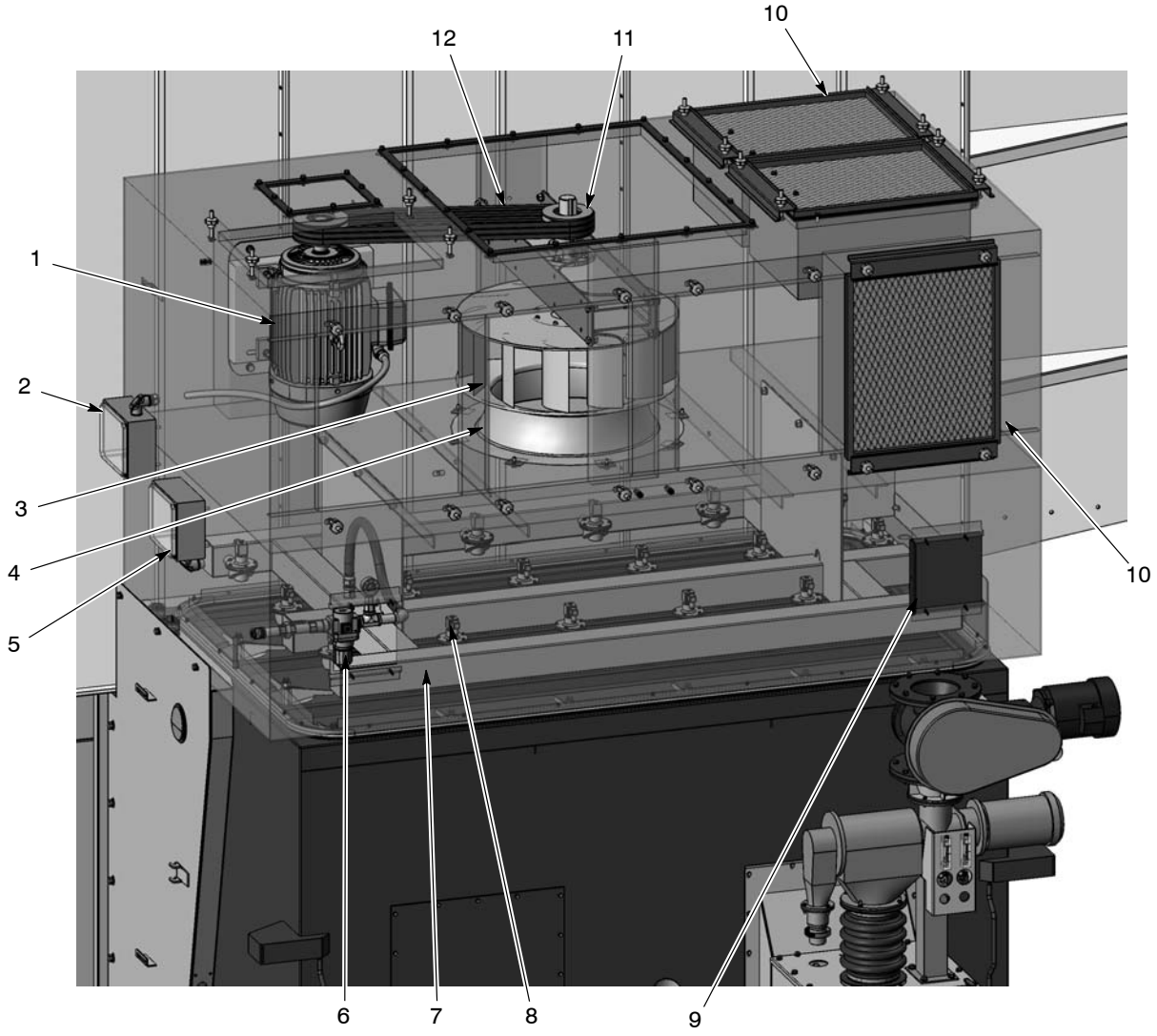


Figure 2-3 Fan Section Components

1. Fan motor
2. Motor junction box
3. Fan wheel
4. Fan cone
5. Pulse valve timer box
6. Pulse air regulator
7. Pulse air manifold
8. Pulse valves
9. Slide gate
10. Final filters
11. Pulley, shaft, and bearings
12. Fan belt

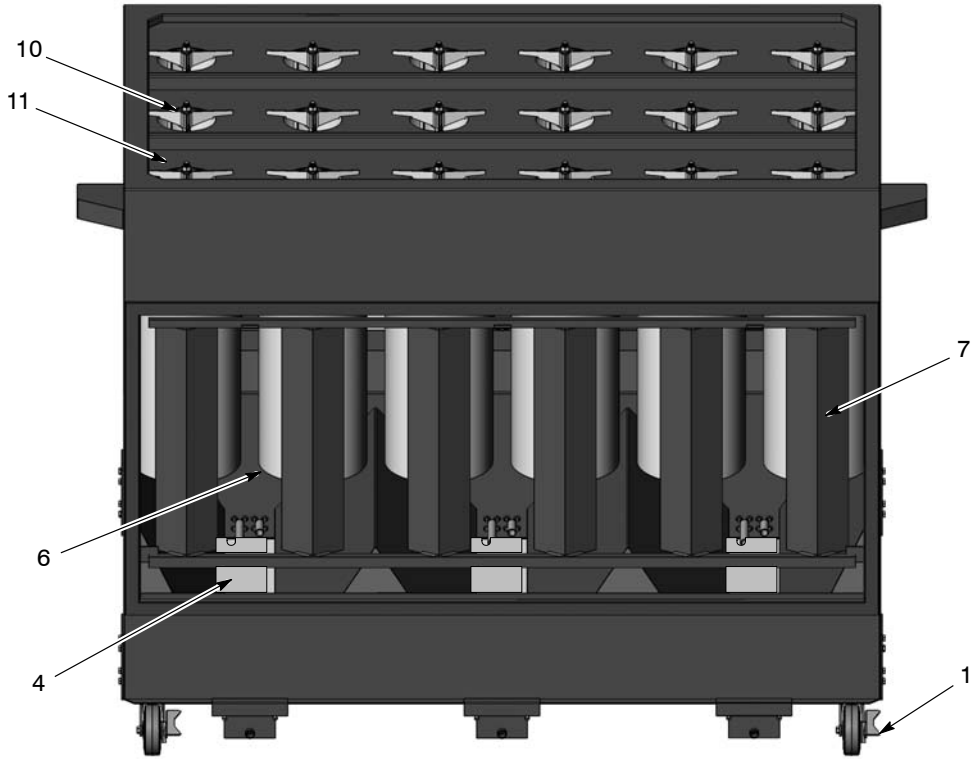
Color Module Components

Table 2-2 and Figure 2-4 describe a typical color module.

Table 2-2 Color Module Components

Item	Equipment	Description
1	Adjustable casters	Allow for easy leveling of the color module, and to match and seal the color module to the booth.
2	Hoppers	Collect the reclaimed powder that falls from the cartridge filters when they are reverse-pulsed with air.
3	Plenums	House the fluidizing plates. Plenums bolt up to the hoppers. Compressed air at low pressure is supplied to the plenums.
4	Fluidizing Plates	Fluidize the powder in the hoppers so it can be pumped by the transfer pumps.
5	Transfer pumps	Convey the reclaimed powder from the color module hoppers to the feed hopper accumulator. Two transfer pumps can be mounted on each module hopper.
6	Cartridge filters	Filter the oversprayed powder from the air before the air returns to the spray area.
7	Baffle	Hangs from the mouth of the color module, deflects the air and powder being pulled into the module to more evenly distribute powder amongst the cartridge filters, and to prevent overloading the front of the first row of filters.
8	Cover plates	Can be removed to service the color module. Removed to connect a feed hopper direct-vent adapter to the color module.
9	Vent stub	Provides a connection point for flexible tubing venting the sieve accumulator into the color module. Vent-assist air tubing can also be connected to the vent stub, to aid in venting fine powder dust and conveying air out of the accumulator to prevent pressurization of the accumulator.
10	Cartridge filter mounting hardware	Suspends the cartridge filter from the tube sheet and allows the filter gasket to be compressed against the tube sheet so that powder does not leak into the fan section.
11	Tube sheet	Mounting surface for the cartridge filters.

Color Module Components *(contd)*



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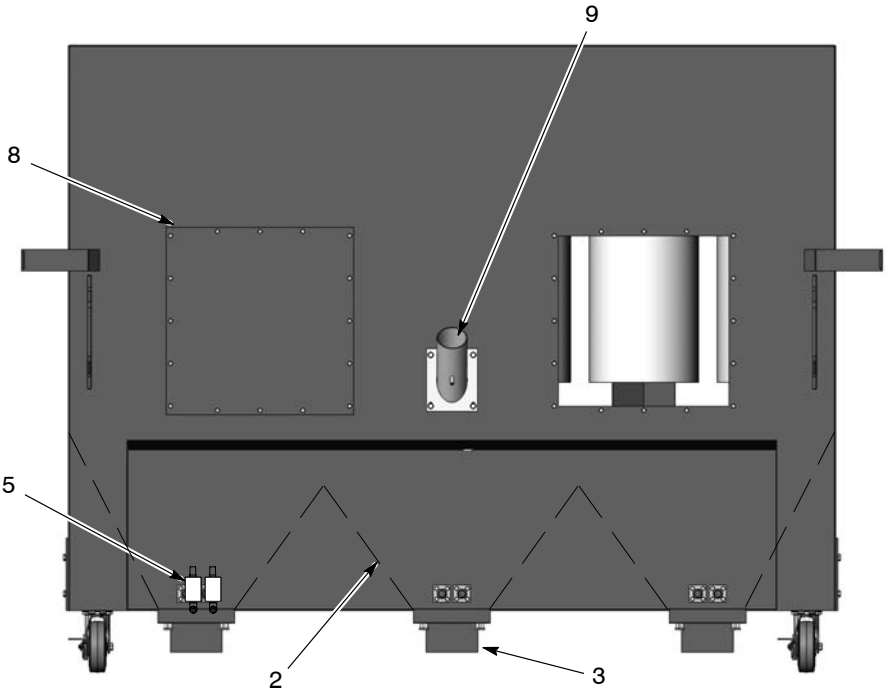


Figure 2-4 Color Module Components

Fluidizing Air Heater System

Table 2-3 Fluidizing Air Heater System Components

Item	Equipment	Description
1	Temperature Controller	Turns heater on/off depending on fluidizing air temperature measured at hopper plenum by controller RTD.
2	Temperature Indicator	Displays temperature of fluidized powder inside hopper measured by indicator RTD.
3	Indicator RTD	Reads the temperature of the fluidized powder inside the hopper.
4	Controller RTD	Reads the temperature of the fluidizing air entering the hopper plenum.
5	Heater	1.5 KW stainless steel air heater.
6	Pilot Valve	Opened by air pressure from solenoid 500 in the motor starter panel when the exhaust fan is turned on.
7	Regulator and Gauge	Controls and indicates fluidizing air pressure. Set pressure to 5–10 psi.
8	Feed Hopper Plenum	Entry point for fluidizing air, which flows into the hopper through the fluidizing plate between the hopper and the plenum.

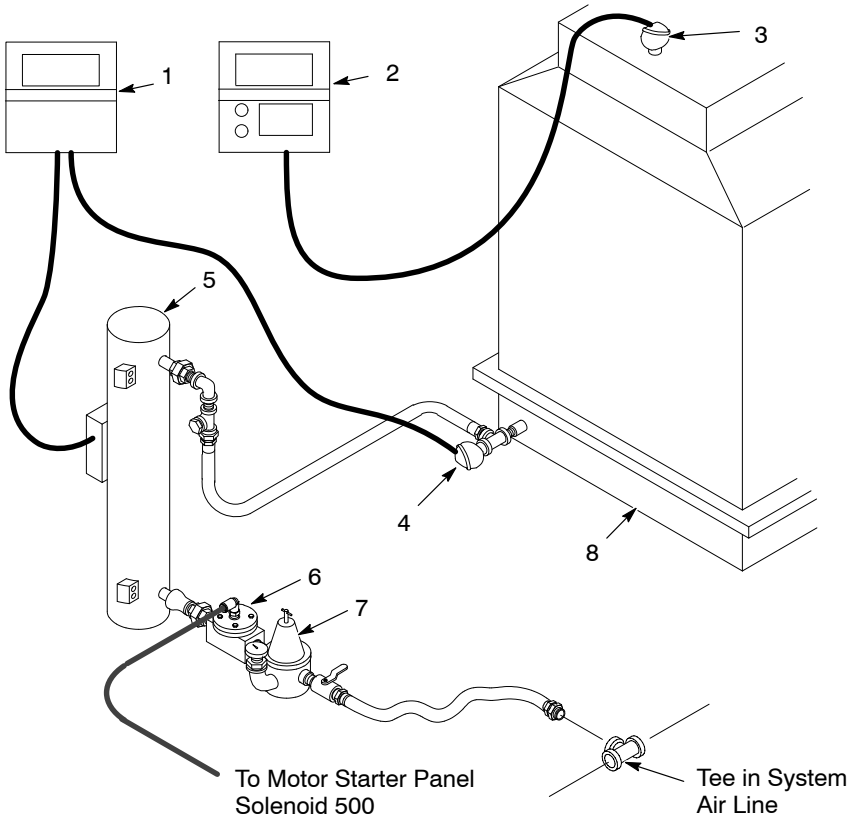


Figure 2-5 Fluidizing Air Heater System

Application Equipment

Application equipment is optional and configured for the system, powder, and products being coated.

Table 2-4 Application Equipment

Equipment	Description
Automatic spray guns	Electrostatically charge powder particles and spray them toward the grounded workpieces.
iControl automatic spray gun controller	Controls gun triggering, part ID, powder feed pumps, and spray gun electrostatic output. Also controls gun positioner or reciprocator movement.
Positioners, manual or automatic	Move the guns in and out of the booth, adjust the gun to part distance. Positioners can be horizontal or vertical, depending on the application.
Oscillators	Move the guns up and down in a fixed pattern. Stroke length and speed is adjustable.
Reciprocators	Move the guns up and down in a programmed or part-dependent pattern.
Manual powder spray guns	Used by operators for touch-up following coating with automatic guns.
Manual spray gun controllers	Used by operators to control powder feed pumps and spray gun electrostatic output.
Powder pumps	Supply spray guns with powder from the feed hopper. One pump is used for each spray gun.
Feed hoppers	Refer to Table 2-1 and Figure 2-2.

Typical System Options

Contact your Nordson Corporation representative for further information on these and other options.

Table 2-5 Typical System Options

Equipment	Description
Air dryer	Removes moisture from the system air supply. Most systems use regenerative-desiccant or refrigerated air dryers.
Bulk unloaders	Transfer virgin powder to feed hoppers.
Quick color change equipment	Consists of additional color modules, feed hoppers, and sieves containing different color powders for quick changes.
Load chute	Allows virgin powder to be loaded into the color module instead of the feed hopper.
Roll on/roll-off equipment	Move the booth and attached equipment on and off the conveyor line. Manual and powered equipment movers are available.
Air management system	Automatically controls air flow through the booth, using a variable-speed motor control and pressure sensors.
NS: Not Shown	

System Controls

System control panel locations can vary depending on the system and application. See Figure 2-6 for numbered items.

Table 2-6 System Controls

Item	Equipment	Description
–	Motor Starter Panel	Houses system disconnect switch, motor starters and overload protectors; transformers; relays and contactors; solenoid valves for the color module and satellite transfer pumps and fluidizing air, final filter differential-pressure switch; and operator pushbuttons, switches, fluidizing air heater controls, and indicator lights. A programmable controller can be installed in the panel.
–	Pneumatic panels	House air pressure regulators and gauges for the feed hopper, color module, transfer pumps, and other pneumatic equipment.
1	Fan dampers	Manually operated, open or close to increase or decrease fan air draw through the canopy and cartridge filters.
2	Pulse air controls	Regulate the pulse air pressure and volume. Controls include a regulator, pressure gauge, and gate valve.
3	Differential pressure gauge	Monitors the air pressure drop across the cartridge filters.
4	Pulse-valve timer panel	Houses the pulse-valve timer circuit board. Trim potentiometers on the board adjust pulse delay and duration. LEDs on the board light as each valve is triggered.
–	Pneumatic seal control valve	Inflates and deflates the seal between the color module and the fan section. The seal prevents powder from escaping into the spray room. Typically mounted on the side of the fan section support.

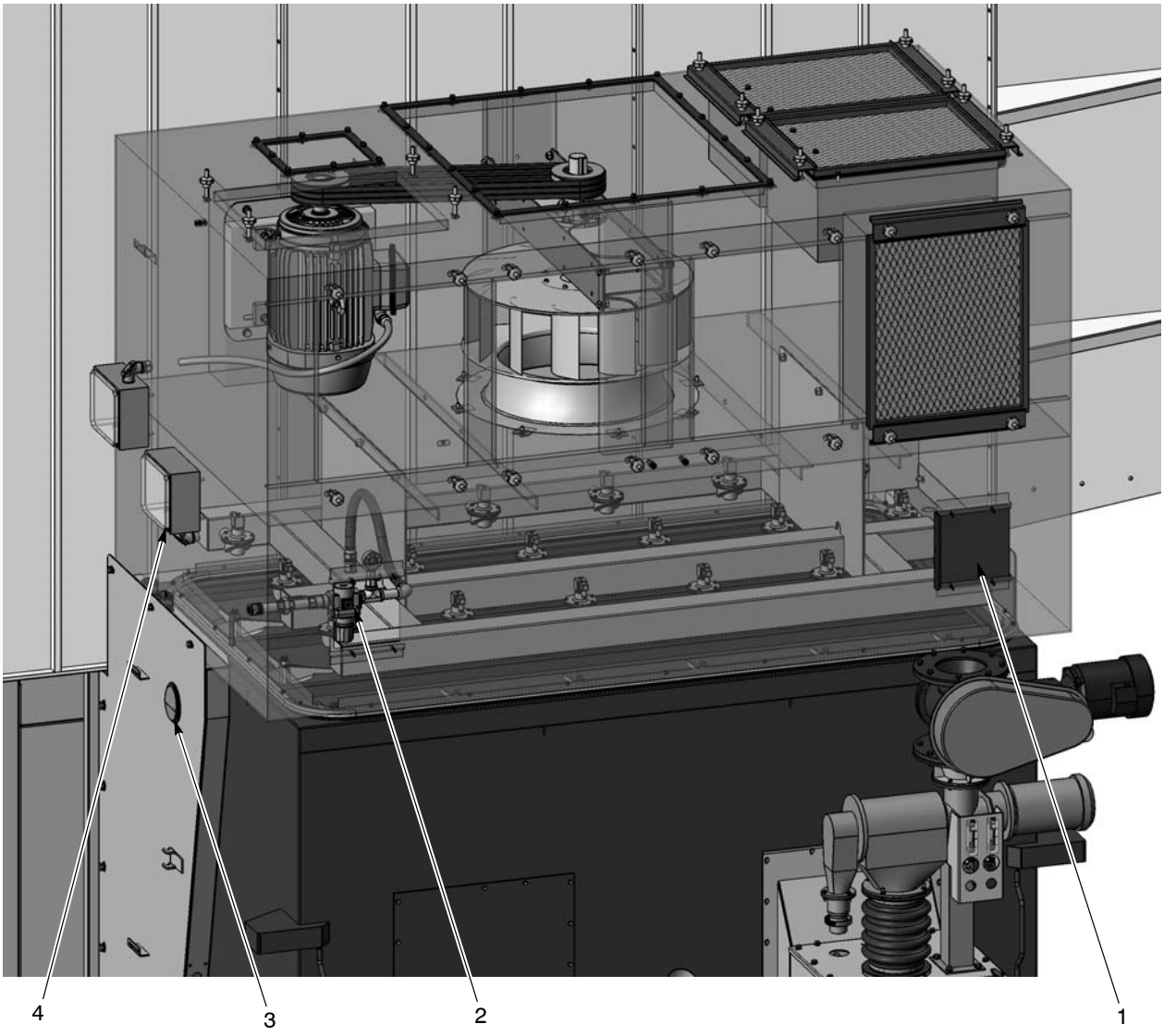


Figure 2-6 System Controls on Fan Section

Operator Controls on Motor Starter Panel

See Figure 2-7.

Control	Function
System Ready Light (Green)	Lights when system is ready to start. Color module must be strapped up against booth mouth and limit switch at mouth must be closed.
Final Filter Warning (Red)	Pressure drop across final filters has reach 2.5 in. w.c. Final filters are clogging.
Sieve On Light (Amber)	Sieve is running. Sieve turns on when exhauster is started.
Exhauster Start Button/Light (Amber)	Push to start exhaust fan, sieve, and rotary air lock. Note that sieve interlock switches must be closed before sieve will start.
Transfer Pump Manual/Off/Auto Switch	In Auto mode, transfer pumps are turned on and off by level sensors in feed hoppers. In Manual mode, transfer pumps are turned on and stay on until switch is turned off. This switch must be placed in the off position to run the transfer pumps if a sieve and rotary airlock are not used.
Non-Reclaim Transfer Pushbutton/Light (Amber)	Starts transfer pumps when no sieve and rotary airlock is used. Use when pumping powder into waste containers.
Exhauster Stop Pushbutton	Stops exhaust fan, sieve, and rotary air lock.
Transfer Pump On Light (Amber)	Lights when the transfer pumps are turned on in either Manual or Auto mode.
Exhauster Speed Potentiometer	Increases and decreases exhaust fan speed. Only used if system includes a Variable Frequency Drive controller.
Booth Lights Switch	Turns booth lights on and off.
Osc #1 Start Pushbutton/Light (Amber)	Starts oscillator #1.
Osc #2 Start Pushbutton/Light (Amber)	Starts oscillator #2.
Heater On Light (Amber)	Lights when the fluidizing air heater is turned on.
Osc #1 Stop Pushbutton	Stops oscillator #1.
Osc #2 Stop Pushbutton	Stops oscillator #2.
Heater Switch	Turns fluidizing air heater on or off.
Satellite Transfer Pump Switch	Turns satellite feed hopper transfer pump on or off. In Auto mode, transfer pumps are turned on and off by level sensors in feed hoppers. In Manual mode, transfer pumps are turned on and stay on until switch is turned off.
Satellite Transfer Pump Light	Lights when satellite transfer pump is running.
Heater Temp Controller	Use to set desired air temperature. Temperature is read by an RTD in the feed hopper plenum.
Heater Temp Indicator	Displays feed hopper plenum air temperature and powder temperature.

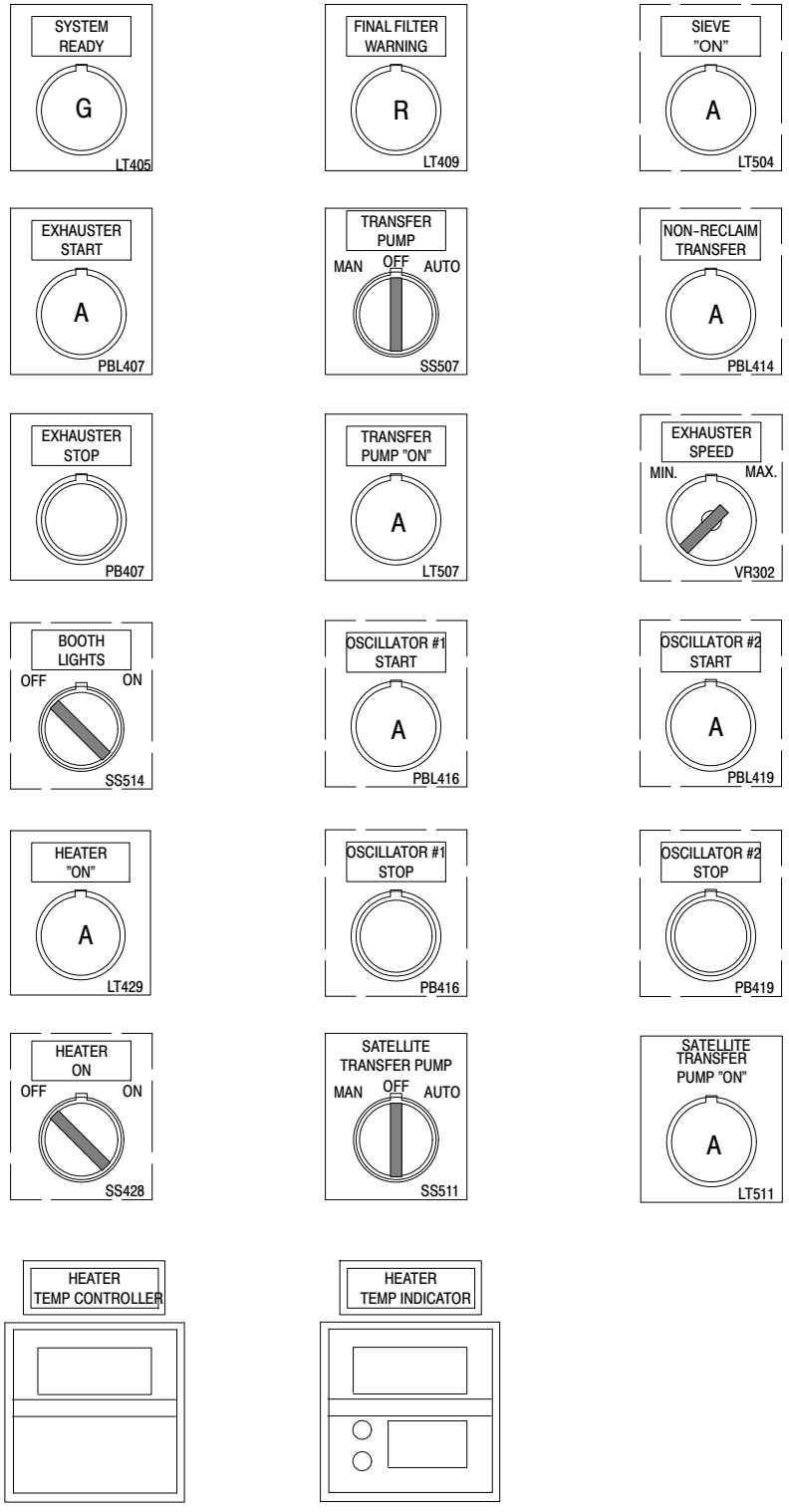


Figure 2-7 Operator Controls on Motor Starter Panel

Pulse Valve Timer Box

Refer to Table 2-7 and Figure 2-8. The pulse valve timer box houses the timer circuit board. The box is usually mounted on the fan section. The timer board is wired to the motor starter panel and the pulse valves inside the fan section. The timer board triggers the pulse valves, which open to release large volumes of air into the center of the cartridge filters, blowing off the powder on the outside of the cartridge filters.

Table 2-7 Pulse Valve Timer Box

Item	Equipment	Description
1	Pulse valve LEDs (red)	Indicate, when lit, which pulse valves are activated.
2	Electrical power LED	Indicates that electrical power is applied to the board.
3	Pulse valve on timer	Sets the time that the pulse valves remain open after triggering. The adjustment range is 0.05–0.5 sec.
4	Pulse valve off timer	Sets the time between cartridge filter pulses. The adjustment range is 8–180 sec.

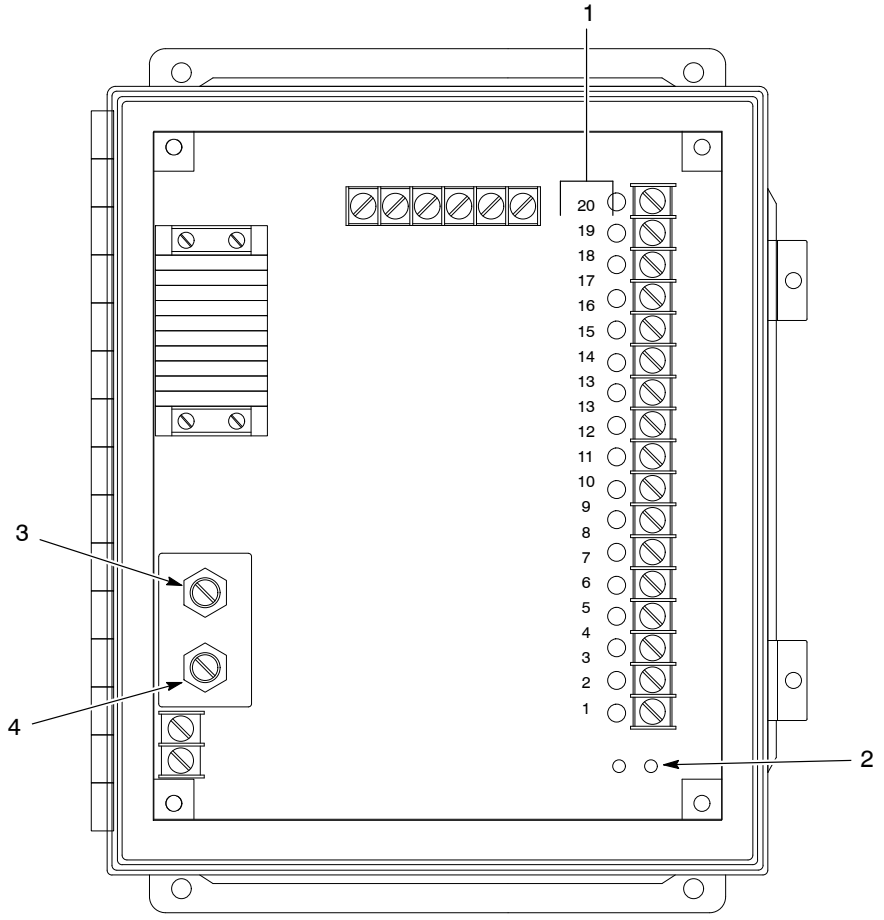


Figure 2-8 Pulse-Valve Timer Panel

1. Pulse-valve LEDs
2. Electrical power LED
3. Pulse valve on timer
4. Pulse valve off timer

System Pneumatic Panel

Table 2-8 and Figure 2-9 describe a typical 12-function pneumatic panel. Functions can change depending on the pneumatic equipment used in the system and the system configuration (reclaim or non-reclaim).

Regulators and gauges are labeled according to their use. Their assignment may vary from the example in Figure 2-9.

Table 2-8 System Pneumatic Panel

Regulators and Guages	Function
–	Feed hopper fluidizing air
–	Accumulator vent-assist air
–	Satellite hopper fluidizing air
–	Satellite hopper vent-assist air
–	Transfer pump air – Feed hopper
–	Transfer pump air – Satellite feed hopper
–	Fluidizing air – Base module hoppers
–	Transfer pump air – Base modules
14	Cartridge filter differential pressure gauge. **NOTE:** The gauge should read 4–6-in. w.c. The gauge reading increases as the filters load up with powder.
15	Final filter pressure gauge **NOTE:** The gauge should read 1–2.5-in. w.c. The gauge reading increases as the filters clog. At 3.0-in. wc, the system automatically shuts down.

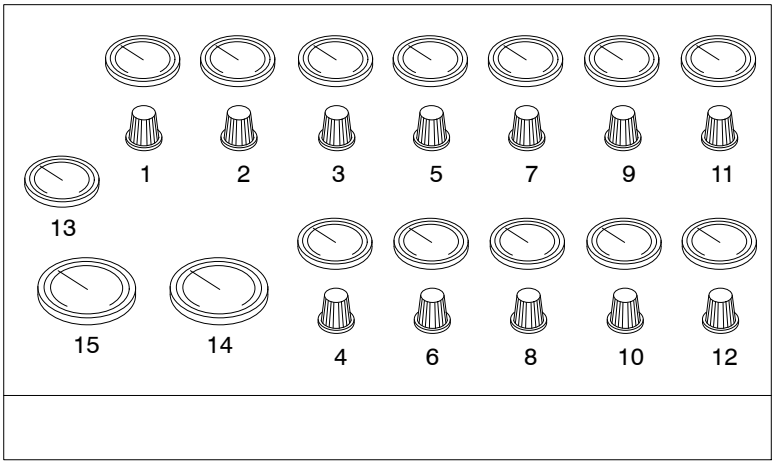


Figure 2-9 Typical System Pneumatic Panel

Rotary Sieve Control Panel

See Figure 2-10. This pneumatic panel is used with Nordson and AZO rotary sieves.

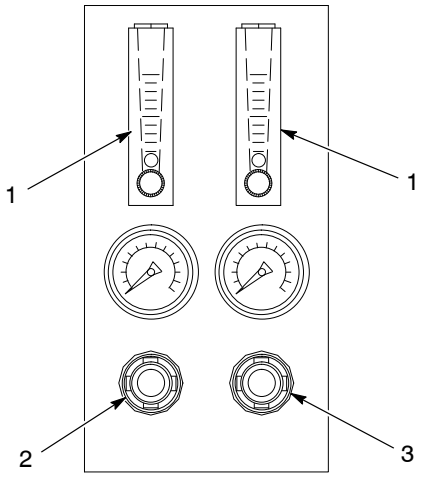


Figure 2-10 Rotary Sieve Pneumatic Panel

1. Flow meters
2. Vent-assist air regulator
3. Bearing air seal regulator

Section 3
Operation

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

New System Startup

Use these procedures to prepare your Excel powder coating system for production operations. Refer to the appropriate manuals for instructions on your powder application and control systems.

Your Nordson Corporation representative will help you set up your application equipment and adjust your system control settings before you start powder coating your products. Record your system settings for future reference.

NOTE: Since powder coating systems are custom-designed to each customer's requirements, each system will have a different combination of equipment. Your system may have equipment not described in this manual.

WARNING: Even with the motor starter panel disconnect switch in the off position, the input terminals at the top of the switch are still live. Do not touch them. Disconnect and lock out power to the motor starter panel before opening the panel door. Failure to observe this warning could result in serious injury or death.

Color Module Positioning and Leveling

1. Move the color module into position under the fan section.
2. See Figure 3-1. Hook the cinch straps (7) to the color module (2). Tighten the ratchets to pull the color module against the stops and compress the D-gasket (4) evenly against the inlet frame. This must also close the limit switch on the inlet frame.
3. Loosen the lock nuts (5) and use the leveling screws (6) to adjust the color module height and level it as necessary.

   Leave a 9–16 mm (0.375–0.625 in.) gap, equal on all sides, between the bottom of the pneumatic seal track (3) and the top of the color module (2). The gap allows the seal to expand when it is inflated. Powder will escape into the spray room if the gap is wider than 16 mm (0.625 in.).

4. Inflate the pneumatic seal between the color module and the fan section. Make sure it is sealing correctly.

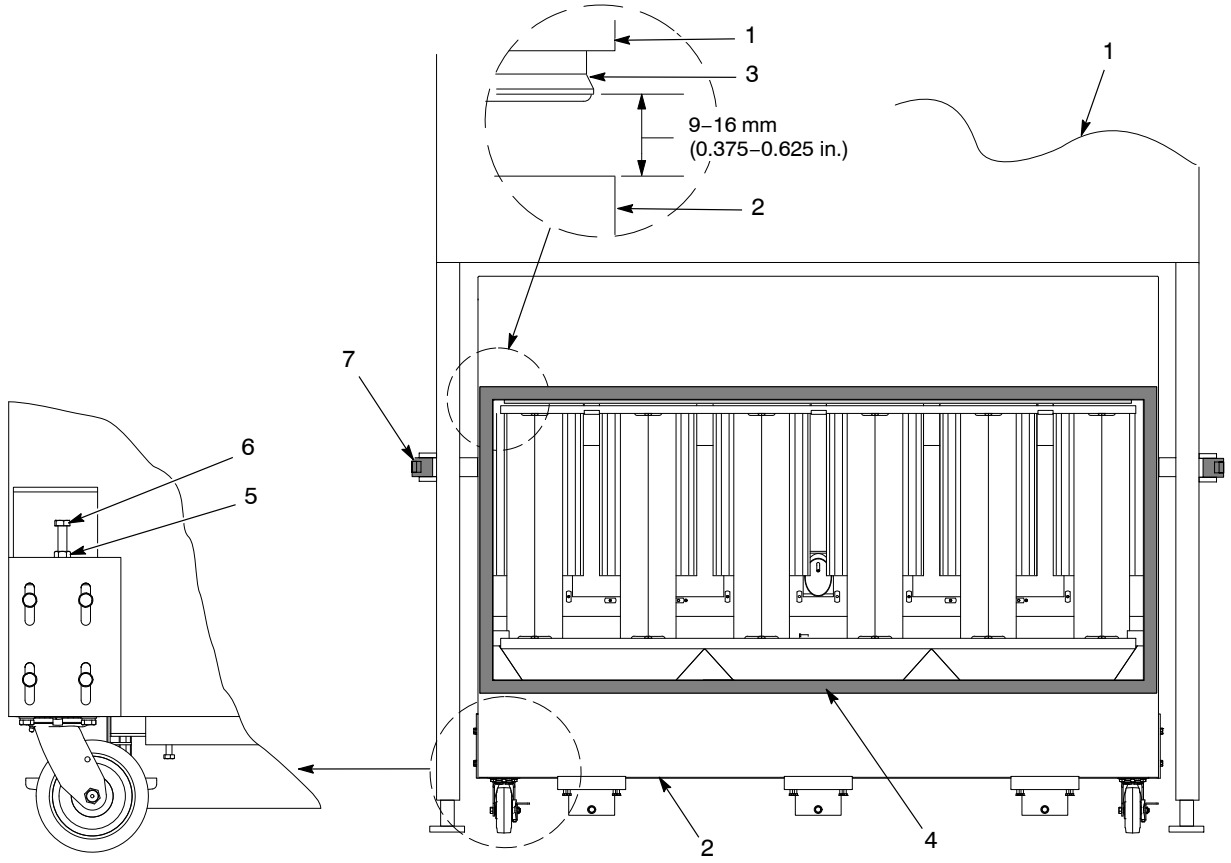


Figure 3-1 Positioning and Leveling the Color Module

1. Fan section
2. Color module
3. Pneumatic seal track
4. D-gasket
5. Lock nuts
6. Leveling screws
7. Clamping straps

5. Connect the following to the color module components:
   - Transfer hoses (3) from the base hopper and color module transfer pumps (2) to the accumulator (6).
   - Feed hoses (4) from the spray guns to the feed pumps on the feed hopper.
   - Transfer hoses from the feed hopper to the satellite hopper, if used.
   - Fluidizing air from the air heater (if used) to the feed hopper plenum.
   - Electrical cords from the junction boxes to the sieve and rotary air lock motors (5, 7).
   - Air lines to the sieve pneumatic panel, feed pumps, and color module transfer pumps.

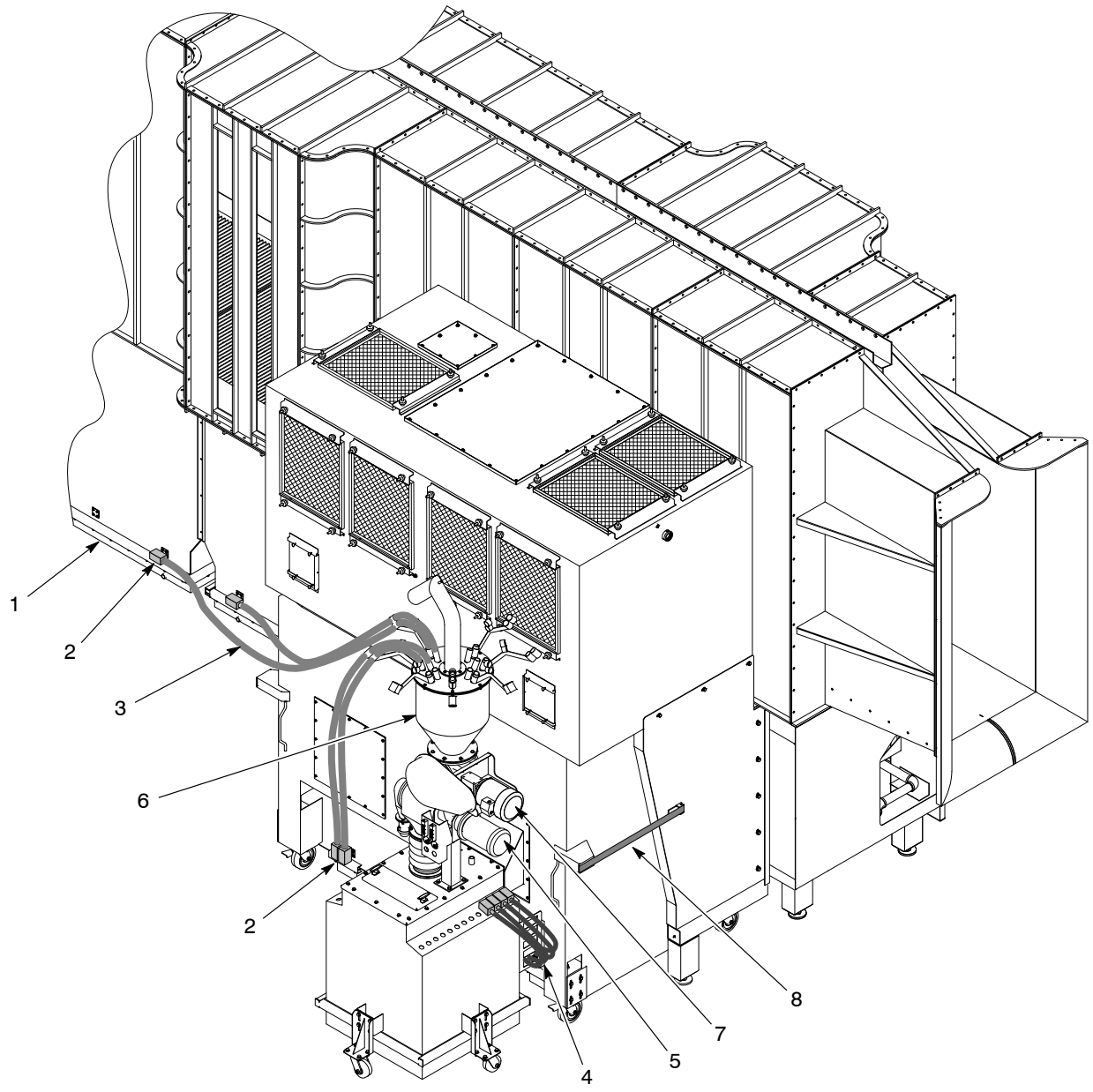


Figure 3-2 Color Change

1. Base hoppers
2. Transfer pumps
3. Transfer hoses
4. Feed hoses
5. Sieve motor
6. Accumulator
7. Rotary air lock motor
8. Cinch straps

Setting Transfer Pump Delay Timers

1. Disconnect system electrical power and open the system motor starter panel.
2. See Figure 3-3. Set the transfer-pump delay timers TDR508 (feed hopper) and TDR512 (satellite hopper) as follows:

   Range: 6–60 seconds
   Function: A
   Delay: 45 seconds

   This delay starts the transfer pumps for 45 seconds after the hopper level sensor detects no powder. It prevents rapid cycling of the pumps.
3. Close and latch the motor starter panel door.

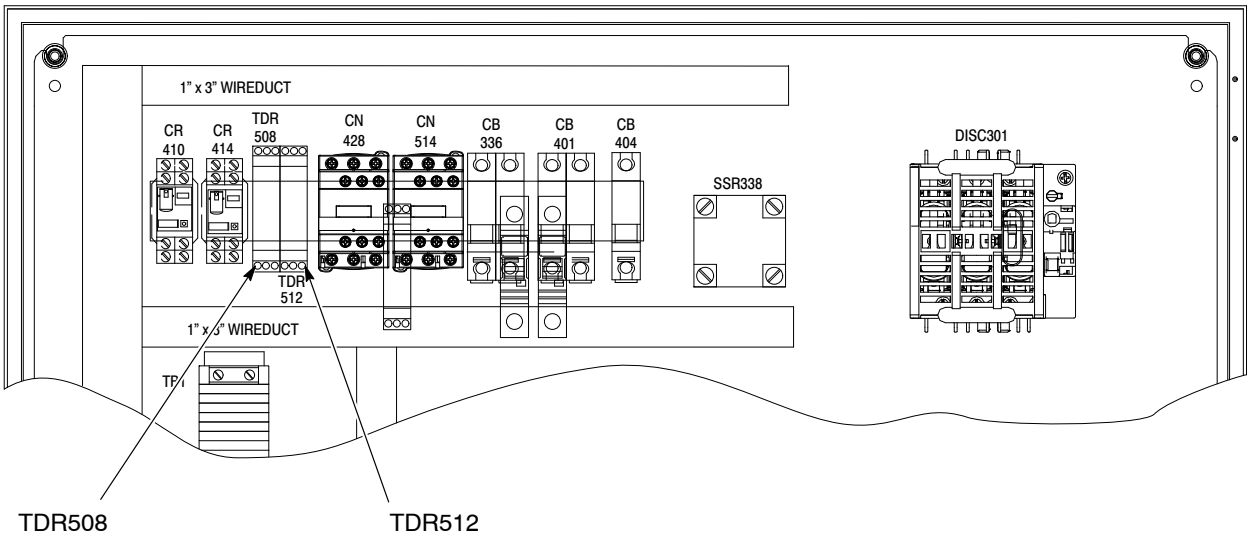


Figure 3-3 System Motor Starter Panel – Transfer Pump Delay Timers

Setting Pulse Valve Timers

1. Open the pulse-valve timer panel on the side of the left fan section support.
2. Set the pulse-valve Off timer to 15 seconds and the pulse valve On timer to 0.07 seconds . Close and latch the timer panel door.

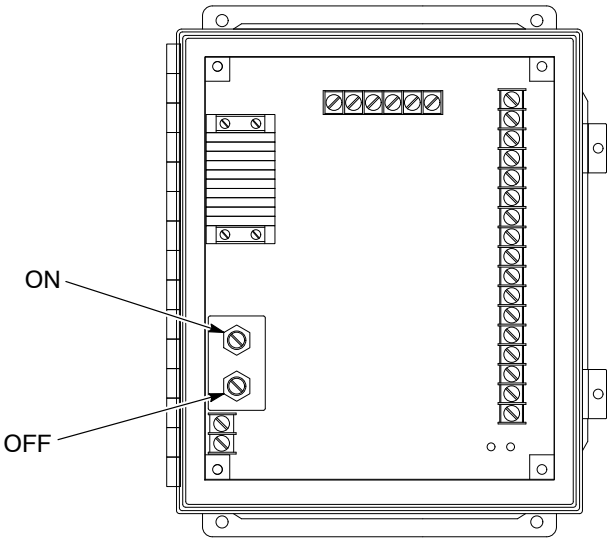


Figure 3-4 Pulse Valve Timer Panel – On and Off Timer Settings

Setting Air Pressures

1. Set all air pressure regulators on the pneumatic panel (3) to zero.
2. Turn on the compressed air supply. Adjust the system air pressure to 5.5 bar (80 psi).
3. Turn on the system electrical power.
4. Use the seal control valve on the side of the fan section support to inflate the pneumatic seal between the color module and the fan section. Make sure the seal is pressing against the top of color module equally on all four sides.
5. Open the left-hand slide gate on the fan section and set the pulse air pressure to 3.5–4.1 bar (50–60 psi).
6. Turn on the exhaust fan. If your system includes a variable speed fan drive you can adjust the fan speed once you start spraying powder.

WARNING: Wear a NIOSH-approved respirator or dust mask and safety glasses or goggles when handling powder. Avoid getting powder on your skin. Wash powder off with soap and water only.

7. Fill the feed hopper $^{2}/_{3}$ full of powder.
8. Set the feed hopper fluidizing air pressure to 0.7 bar (10 psi). Adjust the pressure until you see the powder gently boiling. Allow 10–15 minutes for the powder to fluidize before spraying.
9. Set the color module and base module fluidizing air pressure to 0.7 bar (10 psi). When powder covers the fluidizing plates in the bottom of the color module hoppers, adjust the pressure. You should see the powder gently boiling.

Equipment	Recommended Initial Settings	Final Setting	Changes
Primary Air Pressure (plant air)	6.8 bar (100 psi)		
Color Module and Base Module			
Fluidizing	0.7 bar (10 psi)		
Transfer pumps	1.7 bar (25 psi)		
Feed Hopper			
Fluidizing	0.7 bar (10 psi)		
Vent-assist	2.8 bar (40 psi)		
Pulse Manifold			
Air pressure	3.5–4.1 bar (50–60 psi)		
Pulse Timer			
Delay (OFF) time	15.0 sec		
Duration (ON) time	0.07 sec		
Filter Pressure Drop Maximum Readings			
Cartridge filters	6 in. w.c.		
Final filters	3 in. w.c.		

Setting Rotary Sieve Air Pressure and Flows

At the rotary sieve, set the bearing air seal pressure and flow as recommended in the sieve manual.

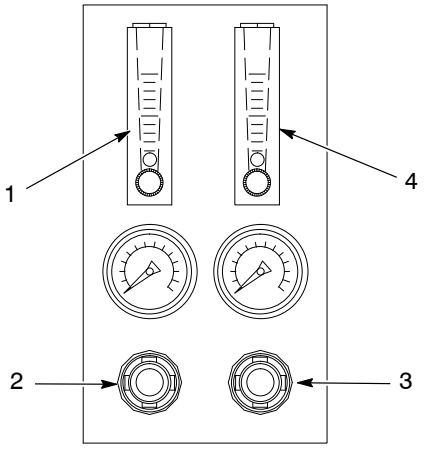


Figure 3-5 Rotary Sieve Pneumatic Panel

1. Accumulator vent-assist flow meter
2. Accumulator vent-assist regulator
3. Bearing air seal regulator
4. Bearing air seal flowmeter

Vent-Assist Air Pressure Adjustment

The compressed air used to convey the reclaimed powder to the accumulator is vented into the color module. Vent-assist air is directed through the accumulator vent tube, toward the color module, to create low pressure in the tube and increase the air flow into the color module.

See Figure 3-5. Adjust the vent-assist air pressure and flow to just enough to help pull the fine dust and excess air from the accumulator without also conveying powder back into the color module.

Setting Fluidizing Air Heater Controls

When a fluidizing air heater is used, the motor starter panel is equipped with a temperature controller and a temperature monitor. Two RTDs are installed in the feed hopper, one in the fluidizing air plenum to detect the air temperature, and the other in the feed hopper proper to detect the powder temperature. The controller reads the plenum temperature and turns the heater on and off to maintain the temperature setpoint. The monitor reads the powder temperature and continuously displays it.

Typical fluidizing air temperature setting is 37.7–48.8 °C (100–120 °F). Consult your powder manufacturer for the correct temperature setting for the powder used.

Your Nordson application engineer will configure the temperature controller and monitor for you. Refer to the controller manual or quick start guide for information on menu navigation, configuration settings, and temperature setpoints.

NOTE: Put the controller in Standby mode before making any configuration changes. In Standby mode all outputs are disabled.

The following are the typical configuration settings required:

Controller and Monitor

Input:

Input Type: RTD
RTD Type: 385.3
RTD Value: 100 Ohm

Reading Config:

Decimal Point: FFF.F
Temp Unit: °F or °C (user choice)
Filter: 8

Controller Only

Output 1:

Control Type: On/Off
Action Type: Reverse
Dead Band: 010

Final Startup Steps

1. Press the EXHAUSTER START button to turn on the exhaust fan.
2. Turn ON the BOOTH LIGHTS.
3. If there is no powder in the feed hopper or base hoppers, install a drum of virgin powder in the bulk unloader and prepare it for operation. Refer to Bulk Unloader Operation.
4. Set the transfer-pump air pressure to 1.0 bar (15 psi). Set the transfer-pump switch to AUTO. The feed hopper level sensor controls transfer pump operation and turns the sieve and rotary air lock on whenever it turns on the base, color module, and bulk unloader transfer pumps.
5. If you have a satellite hopper, set the satellite transfer pump air pressure to 1.0 bar (15 psi). Set the satellite transfer pump switch to AUTO. The satellite hopper level sensor controls transfer pump operation and pumps powder from the primary feed hopper into the satellite hopper as needed.
6. Adjust the pulse-valve air pressure and volume.
   a. Open the left-hand slide gate on the front of the fan section to access the pulse valve air controls (8). Set the pulse valve regulator to 3.5–4.1 bar (50–60 psi). Watch the pressure gauge. The pressure will drop when the valves open.
   b. Adjust the gate valve so the air pressure returns to 3.5–4.1 bar (50–60 psi) just before the next pulse.
7. Turn ON the HEATER (if used) and set the heater temperature to the recommended setting.

Bulk Unloader Operation

See Figure 3-6. The bulk unloader consists of a drum carrier/rotator and a drum hopper assembly equipped with two PE transfer pumps. The drum carrier is equipped with a pilot operated 5-function pneumatic panel that controls transfer pump and fluidizing air.

The air panel valve is connected to a solenoid valve in the motor starter panel. When the feed hopper level sensor calls for powder, the solenoid valve opens and starts the bulk unloader fluidizing air and transfer pumps.

1. Move a new drum of PE powder onto the hopper assembly base.
2. Remove the drum shipping lid.
3. Invert the hopper and install it on top of the drum.
4. Clamp the hopper to the base.
5. Open the carrier clamps and move the drum onto the carrier platform. Clamp the drum into the carrier.
6. Lock the carrier so it does not move during the lift and rotate operation.
7. Lift the drum, then unlock the rotator and rotate the drum 180 degrees.
8. Lower the drum to the floor.
9. Connect the transfer hoses to the pump hose adapters.
10. Connect 10-mm air tubing from the 5-function air panel to the pump valves and the fluidizing air fitting.
11. Set the fluidizing air regulator to 0.7 bar (10 psi).
12. Open the ball valves at the transfer pumps, then set the pump air pressures to 2.8–4.1 bar (40–60 psi).

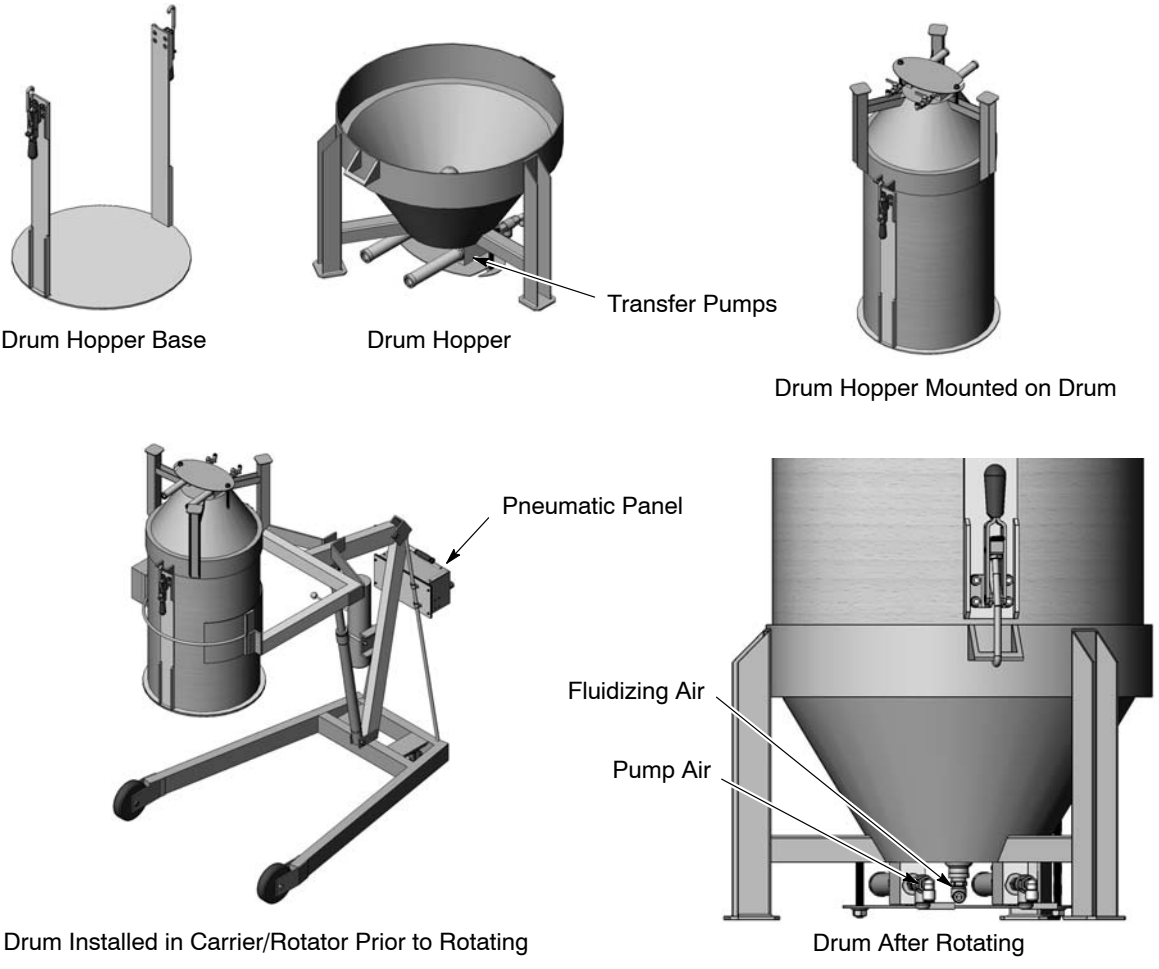


Figure 3-6 Bulk Unloader Operation

Daily Startup and Shutdown Procedures

Use these procedures for routine operation of your system.

Startup

1. Turn on the system electrical power and compressed air supply.
2. Turn on the exhaust fan.
3. Inflate the pneumatic seal between the color module and the fan section. Make sure it is sealing correctly.
4. Turn on the exhaust fan at the electrical panel.
5. Walk around the booth. Make sure the application equipment power and air is on. Make sure the transfer and feed hoses are connected to the pumps, accumulators, hoppers, and spray guns.
6. Check all equipment ground connections.
7. Turn on the application equipment controllers, if not already on.
8. Adjust the kV settings and the powder-pump air pressures, if necessary. Refer to your spray gun and control unit manuals.
9. Check the levels of powder in the feed hopper, satellite hopper, and bulk unloader. Install a new drum of powder in the bulk unloader if necessary.
10. Start the conveyor and start spraying workpieces.
11. Measure the air flow velocity at the vestibules with a velometer. The velocity should be 30.5–36.6 m/min (100–120 ft/min). Make sure the sprayed powder is not being pulled from the spray guns and workpieces, and that the powder is not escaping from the enclosure openings. Adjust the fan speed as needed to maintain the proper air flow.

Shutdown

1. Start the transfer pumps and sieves. Pump the reclaimed powder from the color module hoppers back into the feed hopper.
2. Turn off the application equipment.
3. Perform the daily maintenance procedures described in the *Maintenance* section. Clean the powder pumps and spray guns as described in their manuals. Perform daily maintenance procedures for other system equipment, as described in their manuals.
4. Turn off the exhaust fan. Shut off the system electrical power and compressed air supply.

Section 4
Maintenance

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Daily Maintenance

Perform these procedures daily to keep your system clean and functioning properly.

Cleaning

Perform this procedure daily and when changing powder color or type.

WARNING: Wear an approved respirator and safety glasses or goggles when handling powder, operating spray equipment, or performing maintenance or cleaning operations. Obtain and read Material Safety Data Sheets for each powder used.

1. Turn off the spray guns.
2. Keep the exhaust fan on.
3. Disconnect the powder-feed hoses from the powder pumps. Blow the powder out of the hoses and spray guns with compressed air.
4. Ground the gun electrodes and clean the spray guns according to the instructions in the gun manuals.
5. Clean the canopy roof and walls with a rubber squeegee. Push the collected powder into the color module or base hoppers.
6. Remove the remaining powder residue from the canopy with an air-powered vacuum and a soft brush attachment. Wipe down all surfaces with a damp, lint-free cloth (do not use tack cloths). If you remove the color module, clean the inlet frame and surrounding area.
7. Turn off the exhaust fan.
8. Clean the operator platforms and the floor around the booth.

Daily Equipment Maintenance

Equipment	Procedure
Filters — Check the differential pressure gauges.	1. Check the final filter differential pressure gauge. It should read between 1 and 2 in. of water (wc). Make sure no powder is leaking from around the filter gasket or face. 2. Check the cartridge filter differential pressure gauge. It should read between 4 and 6 in. of water (wc). Check the pulse valve timing.
Rotary Sieves — Clean	1. Empty the scrap pail. 2. Open the sieve housing and clean the rotor and screen with a soft brush. Replace the screen if it is damaged. 3. Check the seal air pressure and flow rate. Check the vent-assist air pressure. Refer to your sieve manual for more information.
Transfer Pumps	1. Disconnect the transfer hoses from the pumps. Blow the powder out of the hoses with compressed air. 2. If the pumps are installed horizontally, place a small container under the transfer pumps to catch spilled powder. Remove the pumps from the adapters. Blow out the adapters. 3. Disassemble the pumps. Clean the parts with a low-pressure air gun and a clean cloth. Replace any worn or damaged parts.
Fan Section	1. Remove the final filters and inspect the fan compartment. Vacuum out any powder. 2. Inspect the pulse-valve compartment. Vacuum out any powder. If significant amounts of powder have accumulated in the fan or pulse-valve compartment, the cartridge filters may be leaking. Refer to the *Troubleshooting* section for instructions. 3. Inspect the V-belts. Replace cracked or worn belts.
Powder Spray Guns	Disassemble and clean the spray guns according to the instructions in their manuals.
Powder Feed Pumps	Disassemble and clean the pumps according to the instructions in their manuals. Replace worn parts.
Compressed Air Supply	Hold a clean, white cloth under the drop leg and open the drop-leg drain valve. Water, oil, or other contaminants will stain the cloth. Eliminate any source of contamination. Drain the filters and separators and check the filter elements. Check all air pressure regulator settings. **NOTE:** The air dryer should remain on at all times to prevent moisture from accumulating in the compressed air system.

Continued...

Equipment	Procedure
Air Dryers	Refer to your air dryer manual for maintenance procedures and schedules.
Gun Movers (Oscillators and Reciprocators)	Each shift, make sure the gun movers are stroking smoothly and at the proper speed. Make repairs and adjustments if necessary. Lubricate the spray gun movers as described in their manuals.
Accumulators and Vent Hoses	Vacuum out the accumulators and blow the powder out of the vent hoses with compressed air.
Workpiece and Conveyor Grounds	**WARNING:** An ungrounded or poorly grounded workpiece, hanger, or conveyor can cause electrical arcing. If arcing is observed, shut down the system immediately. Correct the cause before resuming operations. Failure to observe this warning could result in a fire or explosion, causing property damage and possible personal injury or death. Make sure all workpieces are grounded through the hangers and conveyor. The resistance between the workpieces and the hangers, and the hangers and ground, must be less than 1 megohm. You will get better transfer efficiency and workpiece coverage at 500 ohms or less. Clean or strip the hangers regularly.

Weekly Maintenance

Equipment	Procedure
Booth Enclosure	Turn on the exhaust fan and vacuum the enclosure roof, walls, and floor with a soft brush attachment. Wipe down the enclosure with damp, lint-free cloths. Clean the booth exterior, all attached equipment, and the spray room.
Powder Spray Guns and Cables	Clean the spray guns. Perform electrostatic resistance checks as described in the spray gun and gun control unit (electrostatic power supply) manuals.
Powder Pumps and Feed Hoses	Disassemble the pumps and clean them according to the instructions in their manuals. Replace any worn or damaged parts. Blow out the feed hoses with compressed air. Replace damaged hoses.
Feed Hoppers	Remove the powder from the hopper. Vacuum the interior. Check the fluidizing plate. If the plate is stained, the air supply could be contaminated by oil or moisture. Check the air dryer and air filters. Replace the fluidizing plate if it is contaminated. Lubricate the casters with a lithium grease.
Color Module	Start the exhaust fan and activate the pulse valves to blow off as much powder as possible off the cartridge filters. Do not vacuum the cartridge filters. Inspect the filter media and gaskets. Replace the filters if they are damaged. Pump the powder out of the color module. Disconnect the hoses from the transfer pumps. Blow the powder out of the hoses with compressed air. Remove the transfer pumps and clean them as described in their manuals. Vacuum the color module and base module hoppers.. Check the hopper fluidizing plates. If they are stained, the air supply could be contaminated by oil or moisture. Check the air dryer and air filters. Replace the fluidizing plates if they are contaminated. Check the pneumatic seal. Make sure it seals correctly when inflated. Lubricate the casters with a lithium grease.

Periodic Maintenance

Equipment	Procedure
Electrical Connections	Check all terminal blocks, and junction boxes for loose wires. Tighten any loose connections and inspect all wiring for damaged insulation. Replace the wiring if the insulation is damaged.
Guns and Cables	Perform electrostatic resistance checks as described in the spray gun and gun control unit manuals.
Air Dryer	Check the air dryer operation. Refer to your air dryer manual for maintenance procedures and schedules.
Gaskets	Inspect all gaskets and seals for damage. Replace them if they are damaged.
Exhaust Fan V-belts	Every six months, adjust the tension of the exhaust fan V-belts. You should not be able to deflect the belts more than 19 mm (0.75 in.) (one belt diameter).
Fan Shaft Bearings	Every two months, lubricate the fan shaft bearings with two shots of #2 lithium complex grease. The grease fittings are on the front face of the fan section.
Motor Bearings	Every six months, lubricate the motor bearings with two shots of lithium or polyurea grease.
AZO Rotary Sieve	Every three months, lubricate the lip seals with white lithium grease as described in your AZO sieve manual.
Differential Pressure Gauges	Observe and record the differential pressure gauges. Readings greater than the following mean that the filters are clogged and must be replaced. Correct the cause of the clogging before resuming operations. Pressure drop across cartridge filters: 4–6 in. wc. Pressure drop across final filters: 2 in. wc.
Powder Feed Hoses	Disconnect the powder feed hoses from the powder pumps. Blow the powder out of the hoses with compressed air. Never blow air through the hoses toward the pumps. Replace the hoses if they are clogged with impact-fused powder.

Maintenance Check List

Activity	Each Shift	Daily	Weekly	Monthly	Color Change
Cleaning					
Accumulator		✓			
Booth enclosure		✓	✓		✓
Color module			✓		✓
Fan and pulse-valve compartments			✓		✓
Feed hoses and transfer hoses	✓				✓
Gun pumps	✓	✓	✓		✓
Guns	✓		✓		✓
Rotary sieve		✓			✓
Transfer pumps	✓	✓			✓
Vent hoses		✓			✓
Resistance Checks—Guns and Cables			✓		
Visual Checks					
Air supply drop leg		✓			
Air dryer		✓			
Cartridge filter differential-pressure gauge	✓				
Electrical connections			✓		
Exhaust fan V-belts				✓	
Final filter differential-pressure gauge	✓				
Gaskets			✓		
Gun movers	✓				
Workpiece clearance ◕	✓				
Workpiece grounding	✓				✓
Powder levels	✓				
Lubrication					
AZO rotary-sieve lip seals ■				✓	
Fan bearings ★				✓	
Motor bearings ◆				✓	

◕ Clearances should be monitored continuously.
■ Every 3 months.
★ Every 2 months.
◆ Every 6 months.

Section 5
Troubleshooting

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Introduction

These procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Nordson representative for help.

Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
1. Spray guns are surging or spitting; powder flow is inadequate or intermittent	Powder in feed hopper inadequately fluidized	Adjust the fluidizing air pressure. The powder should be gently boiling. Refer to problem 4.
	Low powder level in feed hopper	Add powder to the feed hopper. Refer to problem 3.
	Powder pump venturi nozzles or throats worn; adapter O-rings leaking; pump or pickup tube clogged	Clean the pump and pickup tube. Replace any worn parts. Replace the adapter O-rings if they are damaged.
	Obstruction in powder-feed hose	Disconnect the feed hose from the pump. Blow the powder out of the hose with compressed air. Make sure the hose is clear. Eliminate kinks or severe bends in the hose. The hose should be no longer than 7.6 m (25 ft) with a maximum 2.7-m (9-ft) vertical rise.
	Severe tribo-charging in powder feed hose	Contact your Nordson Corporation representative for a suitable hose material. Contact your powder supplier.
	Obstruction in spray gun	Clean the spray gun. If you are using conical nozzles, make sure there is a 3-mm (0.125-in.) or larger gap between the deflector and the nozzle.
	Flow rate or atomizing air pressure incorrect	Refer to the spray gun and control unit manuals for recommended air pressures and ratios.
2. Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses	Poor workpiece grounding	Resistance from workpiece to ground must be less than 1 megohm. For best results, resistance should not be more than 500 ohms. Clean the workpiece hangers, fixtures, and hooks if necessary. Check the conveyor ground.
	Gun placement incorrect	Position the spray guns 25.4–35.6 cm (10–14 in.) from the workpieces. Stagger the spray guns 30.5 cm (12 in.) apart vertically and 53.3 cm (21 in.) apart horizontally to avoid fan pattern and electrostatic field overlap. Contact your Nordson Corporation representative.

Continued...

Problem	Possible Cause	Corrective Action
2. Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses *(contd)*	Fan damper open too far, powder being pulled away from workpieces	Close damper to decrease air flow through booth. Refer to *Fan Damper Adjustment* in the *Operation* section.
	Powder pump flow rate and atomizing air pressure incorrect	Refer to the spray gun and control unit manuals for the recommended air pressures and ratios.
	Electrostatic voltage (kV) or AFC setting incorrect for workpieces being coated	Adjust the voltage to 90–100 kV for large flat surfaces and 60–75 kV for recesses. Never set the voltage below 60 kV. Refer to the spray gun and control unit manuals for the recommended voltage, AFC, and air pressure settings and ratios.
	Wrong nozzles being used	Use flat-spray nozzles for large regular-shaped workpieces. Use conical nozzles for deep recesses and most manual touch-ups.
	Powder feed problems	Refer to problem 1.
3. Powder not transferring from color module to feed hopper	Transfer pump air pressure too low	Increase the air pressure.
	Transfer pump clogged or venturi nozzle or throat worn	Clean the pump and replace worn parts.
	Transfer hose plugged	Blow the powder out of the hose with compressed air.
	Sieve screens clogged, or motor running in wrong direction	Clean the sieve screens. Refer to the *Reversing Motor Direction* procedure in this section.
	Accumulator plugged	Clean out the inlet ports. Clean the accumulator interior.
	Accumulator vent-assist air pressure too high	Reduce the vent-assist air pressure.
	Powder in color module not fluidized. Deep hole in powder around pickup tube	Increase the fluidizing pressure. If the problem continues, go to the next cause.
	Powder damp or contaminated; cannot be fluidized or pumped	Refer to problem 4.

Continued...

Troubleshooting Procedures *(contd)*

Problem	Possible Cause	Corrective Action
4. Powder not fluidizing, or clouds of powder erupting from surface	Fluidizing pressure too low or too high	Check the powder in the hoppers. Increase the fluidizing air pressure until the powder is gently boiling. Decrease the pressure if clouds of powder are erupting from the surface.
	Moist or oil-contaminated powder	Open the drain valve at the air-supply drop leg and check the air supply for water or oil. Check the filters, separators, and air dryer. Replace the powder in the hoppers. Refer to the next cause.
	Air leaking from fluidizing pan gasket instead of diffusing through fluidizing plate, or contaminated air plugging pores in fluidizing plates	Check for air leaks around the fluidizing pan gaskets. If leaks are found, remove the pan and replace the gasket. If fluidizing air pressure increases or decreases abruptly, remove the powder from the hoppers and inspect the fluidizing plates for stains, discoloration, or polished surfaces. Replace the fluidizing plates if they are contaminated or plugged.
	Transfer pumps or hoses plugged, or fluidizing plate in color module or feed hopper cracked	Clean the transfer pumps and replace worn parts. Blow the powder out of the transfer hoses with compressed air. Make sure the hoses are clear. Check the fluidizing plate and replace it if it is cracked.
	Uneven distribution of powder in hopper	Increase the fluidizing pressure. Check the powder and the fluidizing plate for contamination as previously described.
5. Final filters clogged; powder in fan compartment	Leaking cartridge filter gaskets, or hole in filter media	Make sure the gaskets are sealing correctly. If you can slip a 0.4-mm (0.015 in.) feeler gauge between the gasket and the sealing surface, tighten the draw-rod nut to compress the gaskets. If the gaskets continue to leak, remove the cartridges. Clean and inspect the gaskets, sealing surfaces, and filter media. Replace the cartridges if the gaskets or filter media are damaged. Refer to the *Repair* section. Replace clogged final filters.
	Leak in color module cartridge filter mounting plate	Locate and seal leak with RTV sealant.

Continued...

Problem	Possible Cause	Corrective Action
6. Cartridge filters clogged	Pulse air pressure inadequate	Increase the pulse air pressure or volume. Decrease the pulse timer delay (off time).
	Powder too fine or contaminated	Reduce the ratio of reclaim-to-new powder. Check the powder particle size. Replace contaminated powder and fix the source of contamination.
	Pulse valves out of position	Position the valves as described in the *Repair* section.
	Timer board settings incorrect	Adjust the timer board settings as described in the *Operation* section.
	Pulse valve or solenoid valves clogged or malfunctioning	Open the pulse valve timer panel. If you do not hear a pulse each time an LED lights, the solenoid valve or the pulse valve connected to that LED may be clogged or failed. Check the wiring to the solenoid valve before opening the solenoid box and replacing the solenoid valve.
7. System shuts down or will not start	Final filters clogged	Locate the source of powder leakage and correct the problem. Refer to problem 5.
	Color module not activating limit switch	Tighten the color module clamping straps, or reposition the limit switch arm. If the problem continues, replace the limit switch.
	Final filter pressure switch failed	Replace the switch.
	Fuse(s) blown	Check the fuses in the system electrical panel. Replace the blown fuse(s). If the fuses continue to blow, fix the electrical problem.
	Electrical failure	Trace the circuits and correct the problem.
8. Sieve not screening powder	Screen clogged or damaged	Clean or replace the screen.
9. Sieve scrap bucket filling up with powder	Scrap bucket lid not sealed	The lid must be air-tight. Tighten the lid. Check the scrap hose connections.
	Screen clogged	Clean or replace the screen.

Continued...

Troubleshooting Procedures *(contd)*

Problem	Possible Cause	Corrective Action
10. Powder escaping from booth openings	Cartridge filters clogged	If the differential pressure gauge shows more than 6 in. wc, refer to problem 6.
	Cross drafts interfering with exhaust fan draw	Check for cross drafts at all of the enclosure openings. Eliminate or divert any drafts.
	Workpieces entering booth are too hot	Cool the workpieces before moving them into the booth. The workpiece temperature should not exceed 49 °C (120 °F).
	Powder spray gun output exceeds booth containment capability	Reduce the powder flow and/or the number of the spray guns.
	Booth openings too large	Close or decrease the size of the openings.
	Fan section slide dampers open	Close the two slide dampers on the front of the fan section.
	Workpieces too large for booth	Contact your Nordson Corporation representative.
	Spray guns too close to entrance and exit vestibules or openings	Move the spray guns farther away from the vestibules or openings.
	Fan rotation backward	Reverse the rotation of the motor. Refer to *Reversing Motor Direction* in this section.
	Air leaks around color module	Inspect the D-gasket and replace it if it is damaged. Tighten the clamping straps to compress the D-gasket. Check the pneumatic seal. Make sure it is inflated, and sealing properly around all four sides. Refer to *Installing a New Color Module and Feed Hopper* in the *Operation* section. Replace the seal if it is damaged.

Reversing Motor Direction

Improperly connecting the exhaust fan and sieve motor starters will cause them to rotate in the wrong direction. If the exhaust fan is rotating in the wrong direction, powder will be blown out of the enclosure. If the sieve rotates in the wrong direction, powder will back up in the accumulator. Use the following procedures to check and correct, if necessary, the exhaust fan and sieve motor rotation direction.

Exhaust Fan Motor

1. Turn on system electrical power.
2. Start the exhaust fan motor.
3. Observe the direction of fan rotation. The fan should rotate in the direction indicated by the yellow arrow on the front of the fan section. The fan shaft should rotate clockwise when viewed from the sheave (pulley) end (from above the fan). If the rotation is backward, go to the next step.

WARNING: Even with the electrical panel disconnect in the off position, the input terminals at the top of the switch are still live. Do not touch them. Failure to observe this warning could result in serious injury or death.

4. Shut off system electrical power. Open the electrical panel door and reverse any two wires (L1, L2, or L3) connected to the fan motor starter (M407). Close the electrical panel door.
5. Turn on electrical power. Start the fan and check the rotation direction.

Sieve Motor

1. Check your sieve manual for the proper motor rotation direction. If it is rotating in the wrong direction, perform the next step.

WARNING: Even with the electrical panel disconnect in the off position, the input terminals at the top of the switch are still live. Do not touch them. Failure to observe this warning could result in serious injury or death.

2. Shut off system electrical power. Open the electrical panel door. Reverse any two wires (L1, L2, or L3) connected to the sieve motor starter (M412). Close the electrical panel door.
3. Restore system electrical power. Start the sieve and check the rotation direction.

Section 6
Repair

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

NOTE: The Excel Series powder coating systems are FM (Factory Mutual) approved. Use only approved Nordson Corporation replacement parts. Using unapproved parts may void FM approval of your system. Contact your Nordson Corporation representative for more information.

Final Filter Replacement

WARNING: Before performing this procedure, shut off electrical power at the system electrical panel. Lock and tag the switch. Failure to observe this warning could result in personal injury or death.

1. Shut off the exhaust fan. Shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.
2. See Figure 6-1. Unscrew and remove the threaded knobs (3) and brackets (2) securing the final filters (1) to the fan section. The filters will stay in place.
3. Remove the old filters and discard them.
4. Check the interior of the fan housing. If you see large amounts of powder inside the housing, powder is leaking through the cartridge filters or tube sheet. Fix the leak before starting the system.

   NOTE: Do not use damaged filters.
5. Remove the new filters from their cartons. Inspect the filter housings, gaskets, and media for damage. Do not use damaged filters.
6. Insert the new filters into the openings.
7. Install the brackets over the threaded studs. Thread the knobs onto the studs.

Final Filter Replacement *(contd)*

8. Tighten the knobs to compress the filter gaskets slightly. Do not overtighten the knobs.
9. Restore system electrical power. Start the exhaust fan and check for leaks around the filter gaskets.

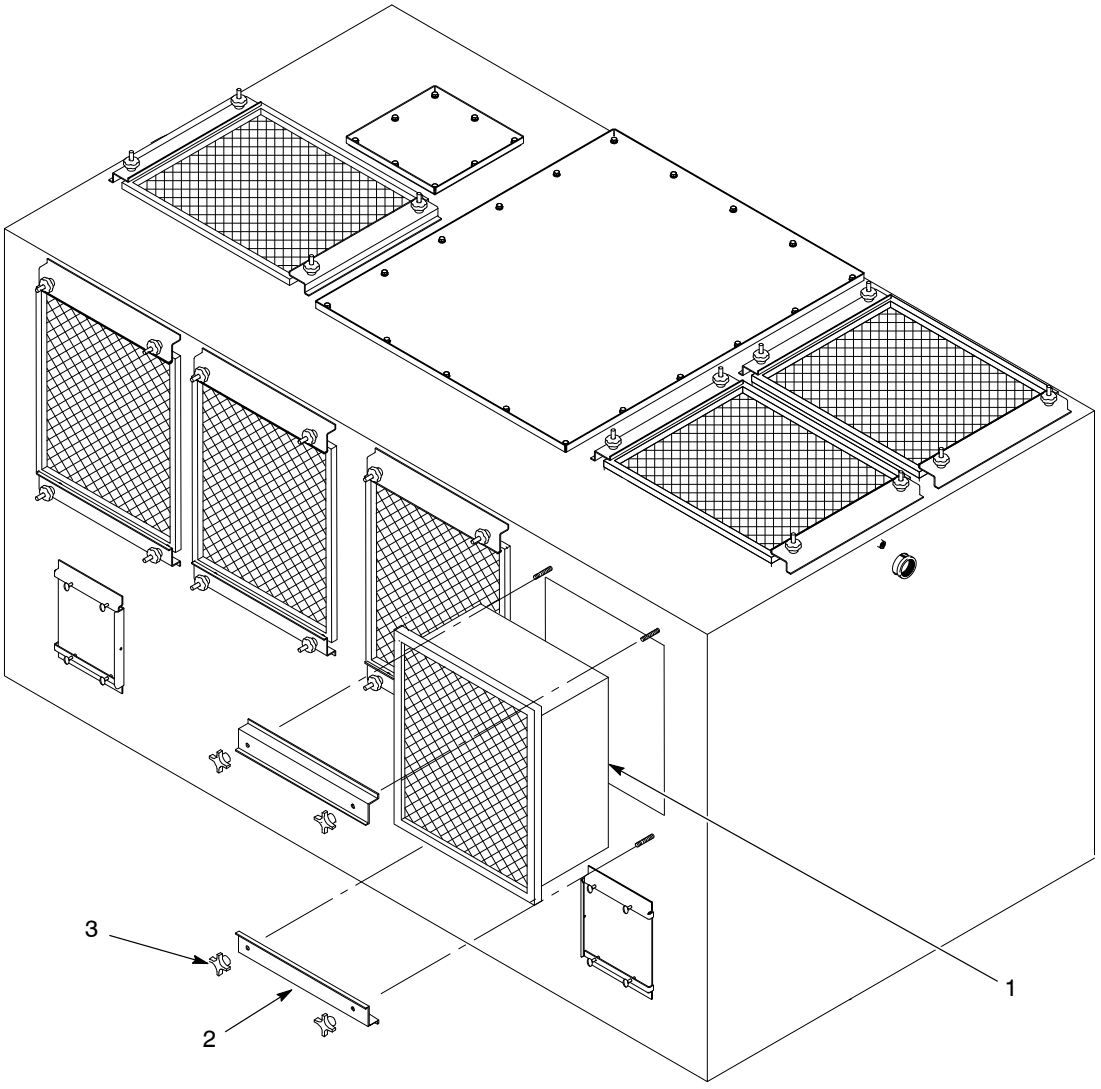


Figure 6-1 Final Filter Replacement

1. Final filter
2. Brackets
3. Threaded knobs

Cartridge Filter Replacement

Cartridge Filter Removal

1. See Figure 6-2. Remove the color module from under the fan section.
2. Remove the baffle (10) to access the cartridge filters (8).
3. Pull up on the T-handles on the draw rods (6) to hold the cartridge filters against the tube sheet (1).
4. Remove the nuts (2), lock washers (3), flat washers (4), and filter mounts (5) from the draw rods. Save the removed parts.
5. Remove the cartridge filters from the color module.
6. Unscrew the draw rods from the cartridge filter bosses and remove the filter centering brackets (7) and draw rods from the cartridge filters. Save the draw rods and centering brackets for reuse.

Cartridge Filter Installation

CAUTION: Do not use any cartridge filters other than those specified for your system. Using unapproved cartridge filters could seriously affect the operation and performance of your system, as well as void FM approvals. Do not use damaged filters.

Carefully inspect the new cartridge filters for

- cuts or other damage to the rubber gaskets
- bent or dented end caps
- holes or other damage to the filter media

1. See Figure 6-2. Thoroughly clean the sealing surfaces on the underside of the tube sheet (1). Dirty surfaces will prevent the cartridge filter gaskets from sealing properly.
2. Insert the threaded end of the draw rods (6) through the centering brackets (7).
3. Install the draw rods and centering brackets in the new cartridge filters (8). Screw the draw rods into the filter bosses and tighten by hand.
4. Center the cartridge filters under the filter openings in the tube sheet. Hold the cartridge filters up against the tube sheet.
5. Use the T-handles to pull the cartridge filters up against the filter mounting plates. Install the filter mounts (5) on the draw rods, making sure the slots in the filter mounts slip over the T-handles.
6. Install the flat washers (4), lock washers (3), and nuts (2) on the draw rods.
7. Slip the ends of the filter mounts into the locating slots in the tube sheet, around the openings.

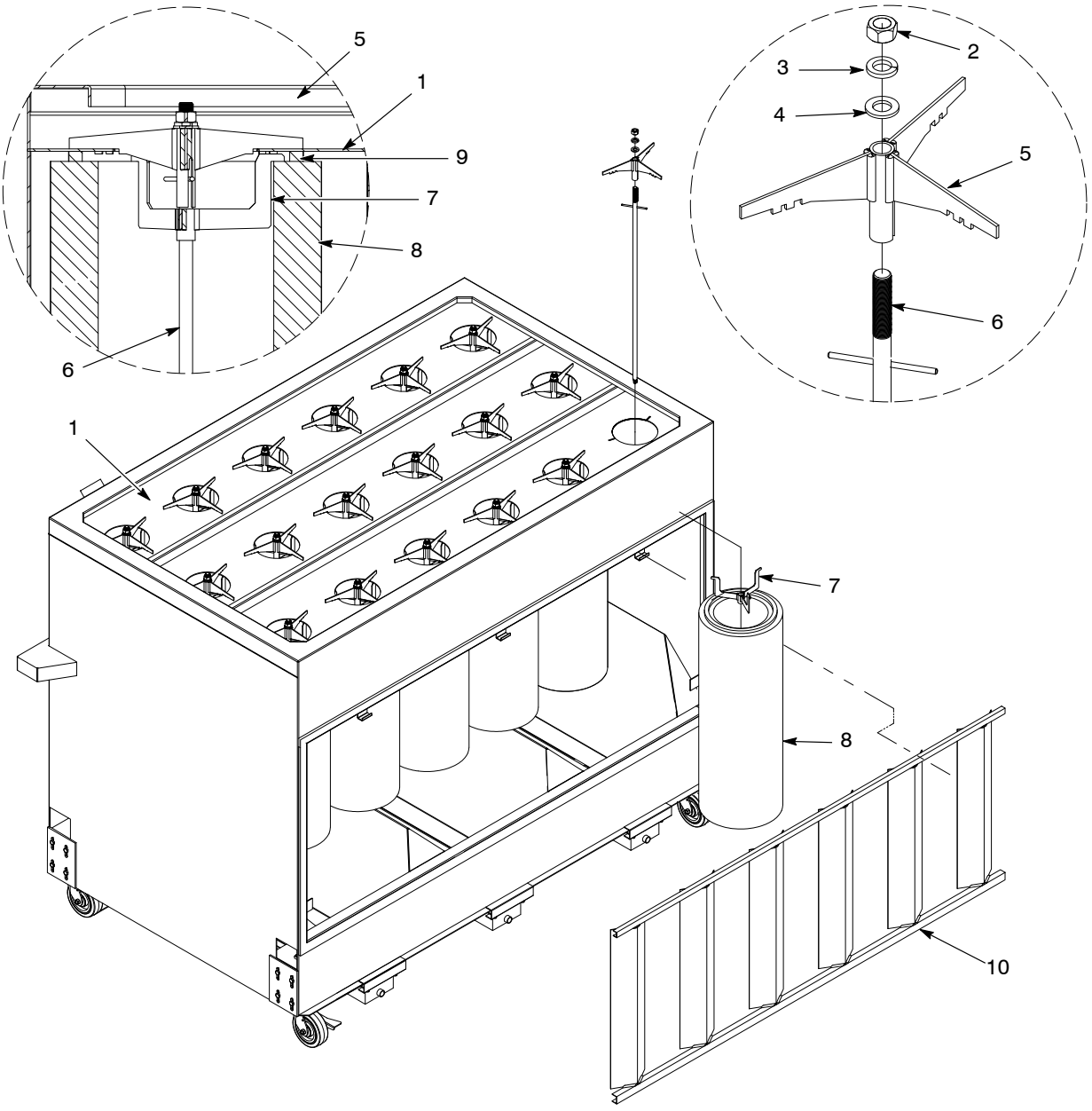


Figure 6-2 Cartridge Filter Replacement

1. Tube sheet
2. Nuts
3. Lockwashers
4. Flat washers
5. Filter mounts
6. Draw rods
7. Centering brackets
8. Cartridge filters
9. Filter gaskets
10. Baffle

CAUTION: Do not overtighten the nuts, or you may damage the cartridge filters.

8. Tighten the nuts until the filter mounts and centering brackets are touching. This will compress the filter gaskets (9) and seal the cartridges against the tube sheet.
9. Install the color module back under the fan section.

Color Module Fluidizing Plate Replacement

Fluidizing plate replacement is typically only necessary if the plates are contaminated or damaged.

Preparation

1. Start the transfer pumps and pump as much as possible of the powder in the color module hoppers back into the feed hopper. If the powder is contaminated, pump it into a scrap bucket.
2. Remove the color module from under the fan section.
3. Remove the baffle, transfer pumps, and cartridge filters from the color module.
4. Remove all the powder from the color module hoppers. Vacuum the hoppers and fluidizing plates and wipe them clean with damp, lint-free cloths. Do not use tack cloths.

Replacement

1. See Figure 6-3. Unscrew the plenum clamp screws (5) about 6–10 mm (0.25–0.375 in.) to clear the fluidizing plate gaskets (2). Remove the plenum clamp (4).
2. Slide the fluidizing plenums (3), fluidizing plates (1) and gaskets (2) out from under the color module.
3. Separate the old fluidizing plates (1) and gaskets. Discard the old fluidizing plates.
4. Clean the plenums and hopper flanges.
5. Assemble the fluidizing plenums, gaskets, and fluidizing plates.
6. Slide the plenum assembly into the slot under the color module.
7. Install the plenum clamp over the fluidizing plenums and hopper flanges. Align the plenum and hopper flanges on both ends of the assembly.
8. Tighten the plenum clamp screws with a torque wrench to 2.8 N•m (25 in.-lb) beginning with the outside screws and work toward the center of the clamp. This will prevent flange distortion and fluidizing plate damage.
9. Install the cartridge filters, transfer pumps, and baffle. Roll the color module into position under the fan section. Connect the hoses, quick disconnects, tubing, power cords, and level sensor.

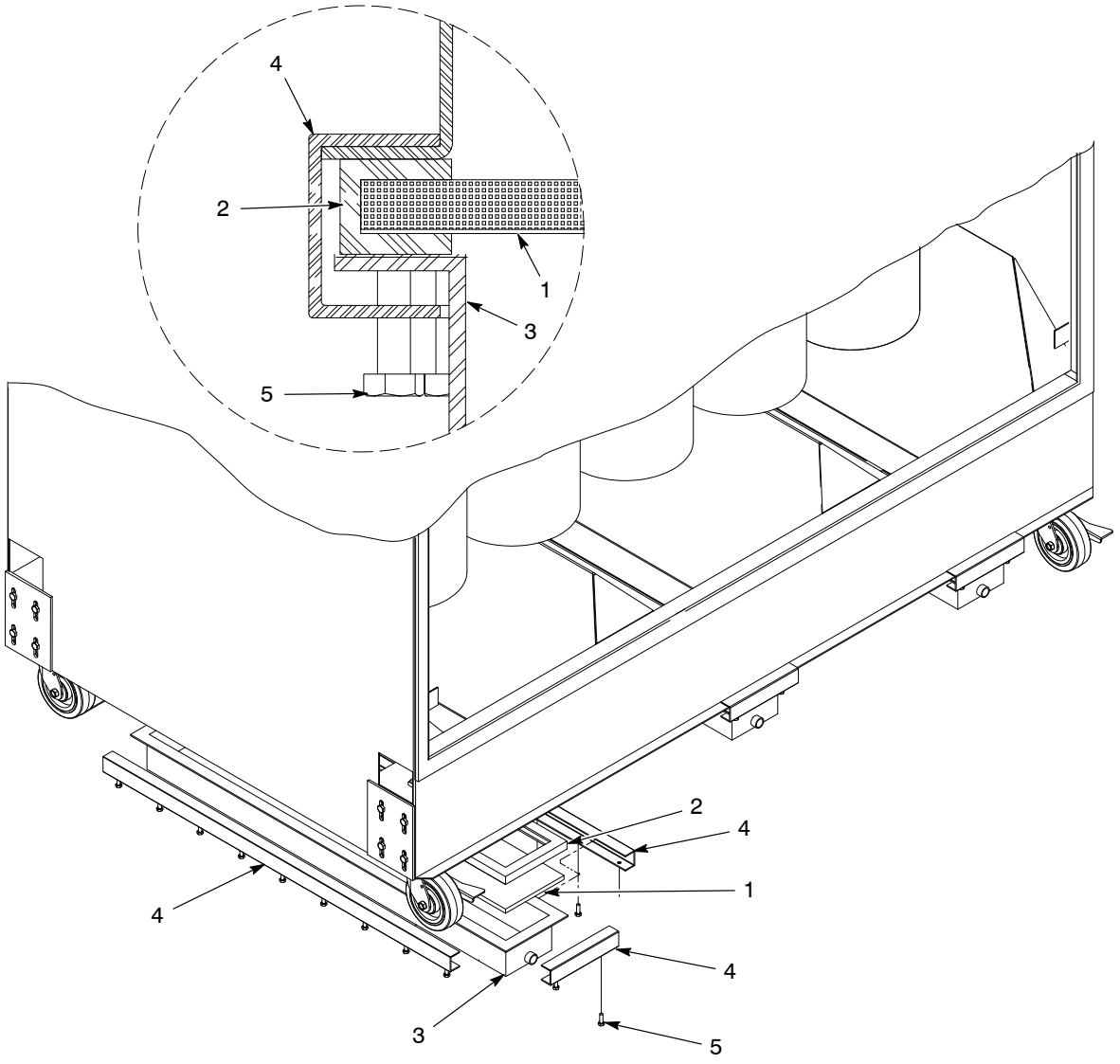


Figure 6-3 Color Module Fluidizing Plate Replacement

1. Fluidizing plates
2. Fluidizing plate gaskets
3. Fluidizing plenums
4. Clamping channels
5. Clamping-channel screws

Feed Hopper Fluidizing Plate Replacement

Preparation

1. Pump as much powder as you can from the feed hopper. Disconnect the powder feed hoses, transfer hoses, accumulator vent hose, and air tubing from the feed hopper, powder pumps, and accumulator.
2. Disconnect the level sensor.
3. Unplug the sieve and rotary air lock power cords. Disconnect the feed-hopper ground wire.
4. Remove the powder from the hopper and thoroughly clean the hopper, accumulator, and sieve.
5. Remove the feed hopper from the color module and roll it to a clean work area.

Replacement

1. See Figure 6-4. Block up the plenum (5) so the plenum and feed hopper flanges will not bend when you start removing the clamping channels (3).
2. Loosen screws (4) about 6–10 mm (0.25–0.375 in.) to clear the gasket (2). Remove the clamping channels.
3. Remove the plenum and the fluidizing plate (1) from under the feed hopper. Remove the U-gasket from the fluidizing plate and inspect it. If it is not damaged, worn, or cracked, it can be re-used.
4. Clean the plenum interior and the plenum and feed hopper flanges.
5. Install the U-gasket on the new fluidizing plate, then position the new fluidizing plate and gasket on the plenum.
6. Slide the plenum and fluidizing plate under the hopper. Align the edges of the feed hopper flange, gasket, and plenum flange evenly on all sides. Block the plenum to hold it in position.
7. Install the clamping channels over the plenum and hopper flanges. Tighten the clamping-channel screws with a torque wrench to 2.8 N•m (25 in.-lb) in a criss-cross pattern. This prevents flange distortion and fluidizing plate damage.
8. Attach the feed hopper to the color module. Connect the hoses, air tubing, power cords, level sensor cable, and ground wires.

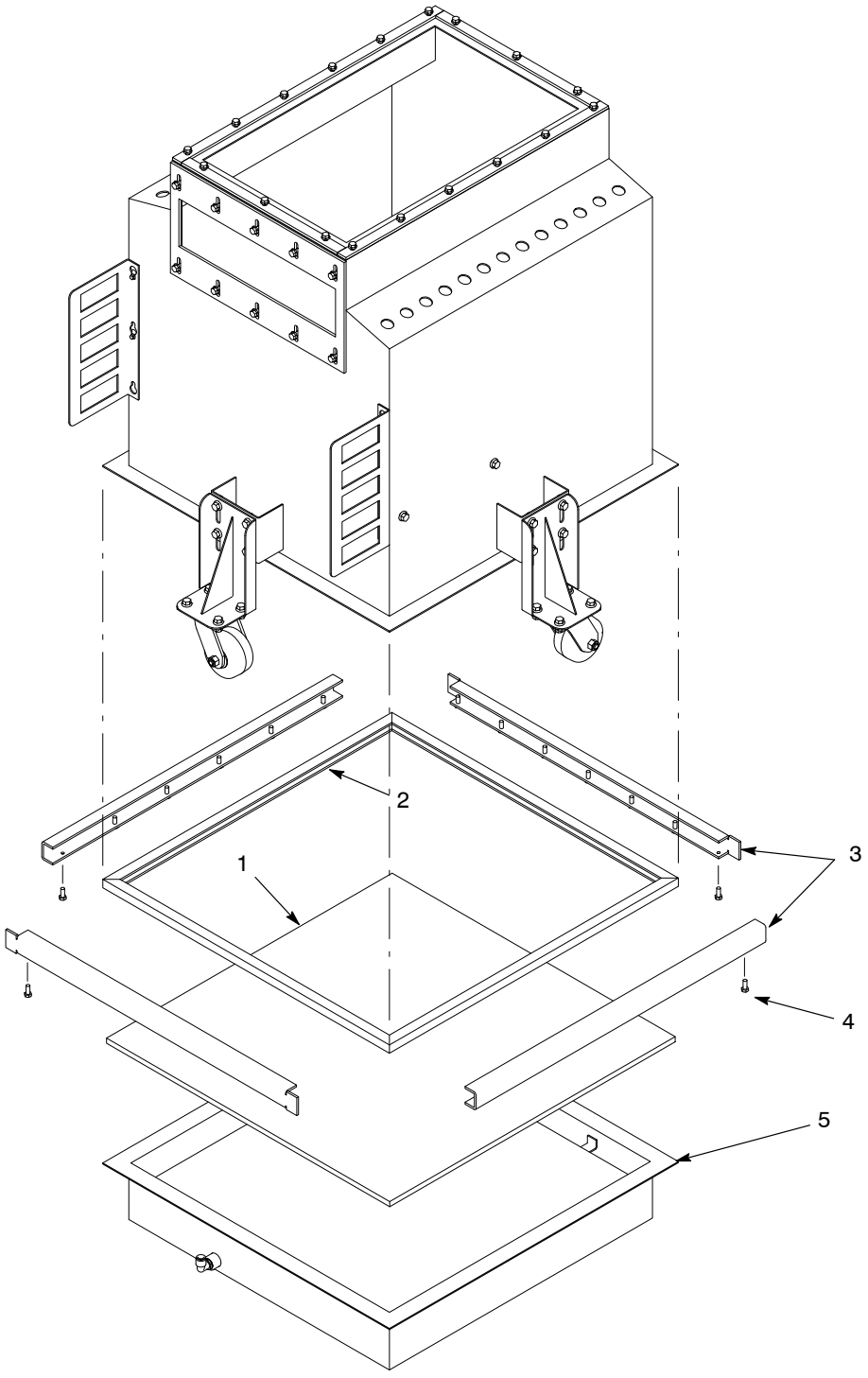


Figure 6-4 Feed Hopper Fluidizing Plate Replacement – HTM-16 and HTM-26 Hoppers, shown without lid

1. Fluidizing plate
2. U-Gasket
3. Clamping channels
4. Screws
5. Plenum

Pulse Valve Replacement

The pulse valves are plumbed directly to the air manifold in the open bottom of the fan section. The valve solenoids are wired to the terminal strip on the timer board in the electrical enclosure on the side of the fan section. The solenoids operate on 24VDC.

See Figure 6-5 for the pulse valve connections. The sequence number is the number of the timer board terminal that the valve is connected to. To avoid connecting the valve solenoids to the wrong cables, remove and replace one valve at a time. Incorrect connections will cause the valves to open in the wrong sequence.

WARNING: Before performing the following procedure, shut off the system compressed-air supply and relieve the system air pressure. Shut off electrical power at a disconnect switch ahead of the system electrical panel. Lock and tag the disconnect switch.

1. Remove the color module from under the fan section.
2. See Figure 6-5. Disconnect the cable (1) from the pulse valve solenoid.
3. Unscrew the pulse valve (2) from the manifold nipple (3).
4. Clean the threads of the manifold nipple, then wrap PTFE tape around the threads. Do not use paste or pipe thread adhesive.
5. Screw the new valve onto the nipple. Position the valve so the final adjustment will tighten the threads and form an air-tight seal.
6. Adjust the valve so that it is vertically plumb.
7. Connect the cable to the valve solenoid.

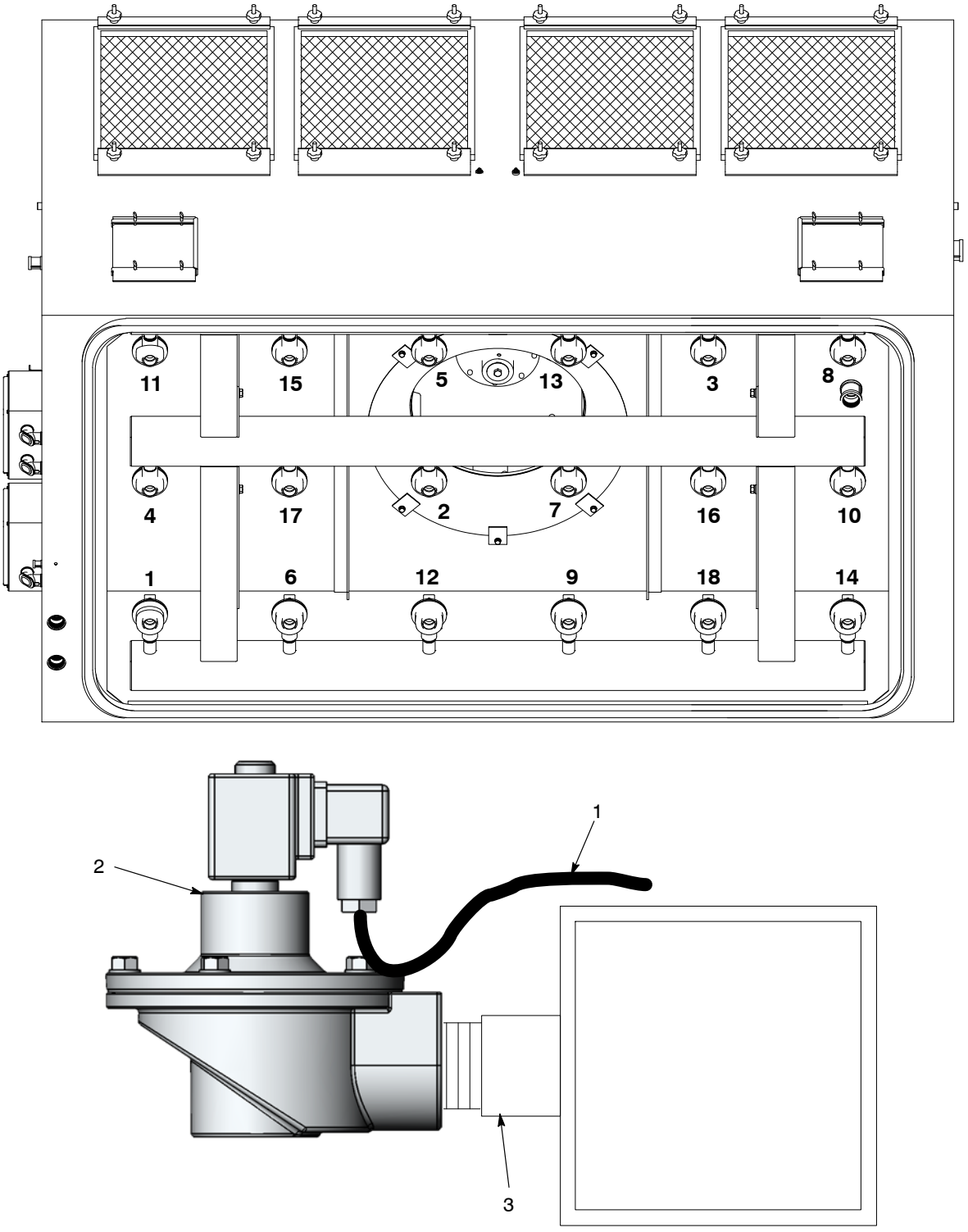


Figure 6-5 Pulse Valve Replacement and Pulse Sequence

1. Cable
2. Pulse valve
3. Manifold nipple

V-Belt Replacement

WARNING: Before performing the following procedures, shut off electrical power at a disconnect switch ahead of the system electrical panel. Lock and tag the disconnect switch.

1. Remove the cover plates from the top of the fan section. Remove the top-left final filter for better access to the motor mount.
2. See Figure 6-6. Unscrew the tension bolt (4) on the side of the motor mount (1). This will allow you to slide the motor toward the fan and loosen the V-belts (3).
3. Rotate the motor or fan by hand and roll the V-belts off the sheaves (2).
4. Roll the new belts onto the sheaves, making sure the V-sections are seated in the grooves. Use only properly sized, matched belts.
5. Tighten the belts by screwing the tension bolt into the motor mount. This will slide the motor away from the fan.
6. Check the belt tension by pressing on the belts midway between the sheaves. The belts should have less than 10 mm of play (or one belt thickness).

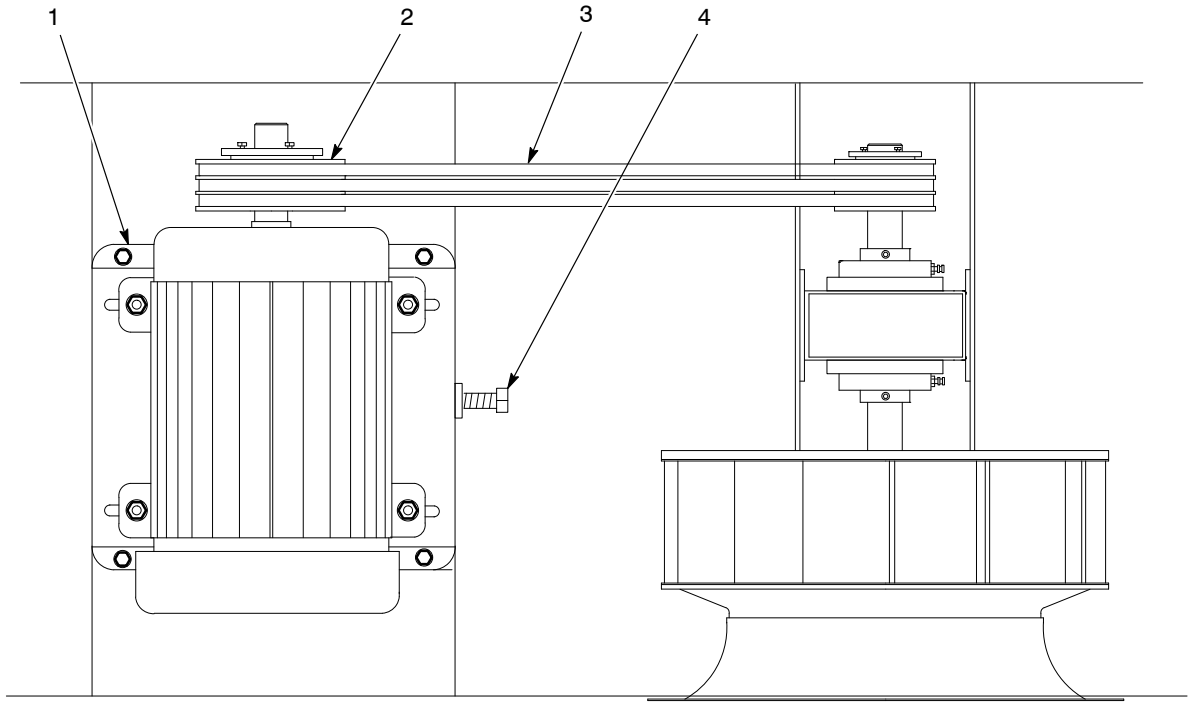


Figure 6-6 V-Belt Replacement

1. Motor mount
2. Sheave
3. V-belts
4. Tension bolt

Motor and Motor Sheave Replacement

WARNING: Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.

WARNING: Heavy equipment. Use approved, inspected lifting equipment and tackle. Make sure the capacity of the lifting equipment and tackle exceeds the weight of the equipment being lifted.

Motor Replacement

NOTE: You do not have to remove the motor from the fan section to replace the motor sheave. Refer to the *Motor Sheave Replacement* procedure.

Motor Removal

1. See Figure 6-7. Remove the motor access plates and left final filter.
2. Remove the V-belts from the motor sheave (1), as described in the *V-Belt Replacement* procedure on page 6-11.
3. Remove the cover from the motor junction box (3). Tag and disconnect the wiring from the motor leads. Disconnect the close pipe nipple (4) from the junction box.
4. Secure a heavy-duty sling or chains around the motor (2). Attach the sling or chains to a chain hoist or to the forks of a lift truck. Take up the slack in the sling or chains.
5. Remove the nuts (11) and washers (10, 9) securing the motor to the motor mount (15).
6. Lift the motor and guide it out of the compartment. Move the motor to a clean work area.
7. Remove the motor sheave as described in the *Motor Sheave Replacement* procedure on page 6-14.

Motor Installation

1. Install the motor sheave as described in the *Motor Sheave Replacement* procedure on page 6-14.
2. Lift and install the new motor on the motor mount with the nuts, lock washers, and flat washers.
3. Install the V-belts on the sheave and adjust the belt tension as described in the *V-Belt Replacement* procedure on page 6-11.
4. Remove the cover from the motor junction box. Connect the conduit to the motor junction box and the wiring to the motor leads. Install the cover.
5. Turn on the system electrical power and start the exhaust fan. Make sure the fan is rotating in the correct direction, drawing air into the fan section. Refer to *Reversing Motor Direction* in the *Troubleshooting* section to change the direction.
6. Install the motor access plates and final filter.

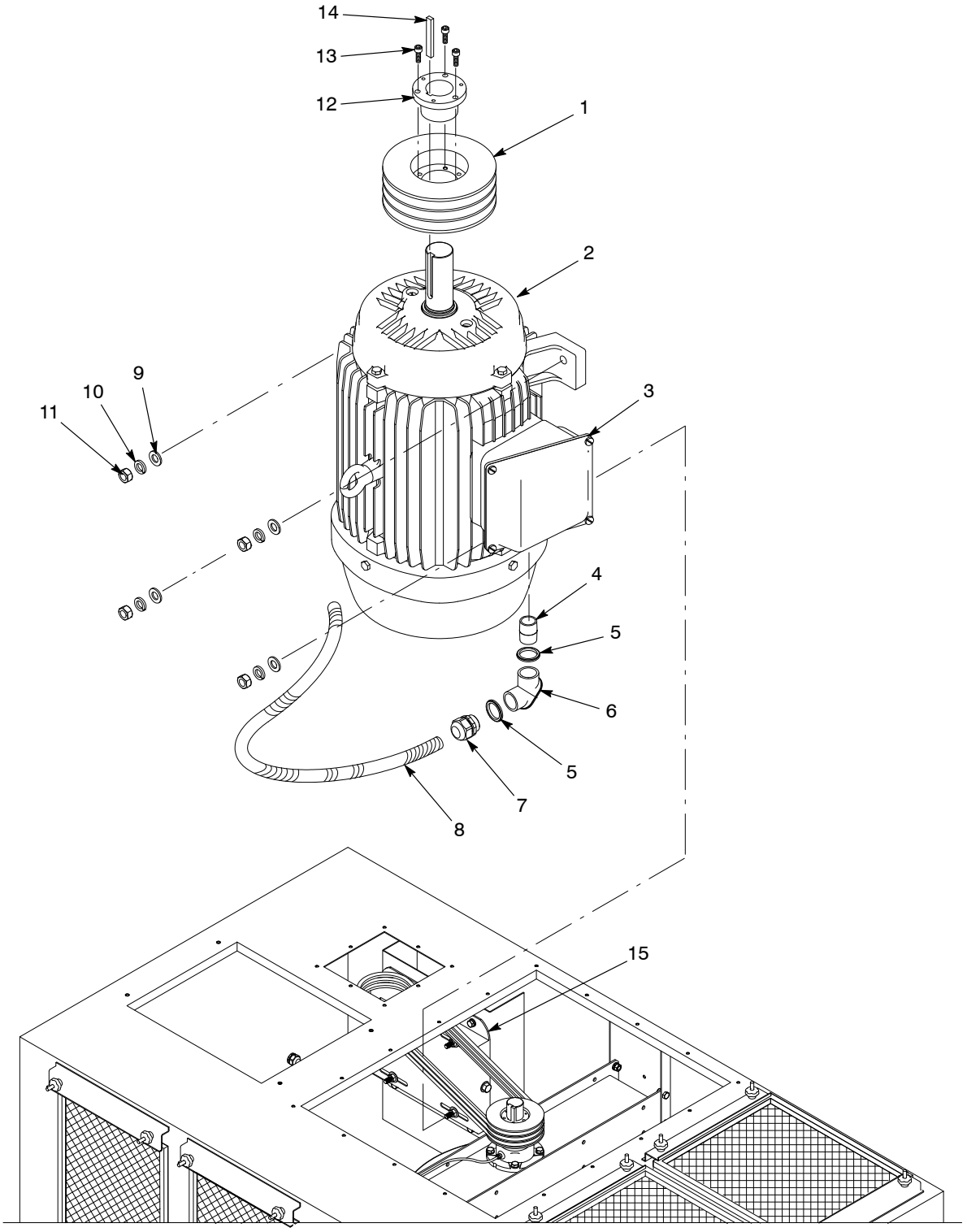


Figure 6-7 Motor and Motor Sheave Replacement

1. Motor sheave
2. Motor
3. Motor junction box
4. Pipe nipple, ¾ BSPT, close
5. Sealing washers
6. Elbow, ¾ conduit
7. Connector, ¾ conduit
8. Conduit, ¾
9. Flat washer
10. Lock washer
11. Nut
12. Bushing, motor
13. Screws
14. Key
15. Motor mount

Motor Sheave Replacement

Motor Sheave Removal

1. Remove the motor from the fan section.

   NOTE: The cap screws shipped with the bushing are hardened. Do not use softer-grade screws to break the bushing loose from the sheave. The ends of the screws will be flattened, and you will be unable to remove them from the bushing.

2. See Figure 6-8. Unscrew the three cap screws (1) and remove them from the drilled holes in the bushing (2). Thread the screws through the threaded holes in the bushing until they bottom out on the sheave (3) hub.

3. Tighten the screws evenly, a quarter turn at a time, until the bushing breaks loose from the sheave.

   NOTE: Do not lubricate the sheave, bushing, or motor shaft.

4. Pull the sheave and bushing off the motor shaft. Remove the screws from the bushing. Inspect the sheave, bushing, and key (4), and replace them if they are damaged. Clean the parts that will be reused.

Motor Sheave Installation

1. Install the sheave (3) and bushing (2) on the motor shaft (5). Line up the drilled holes in the bushing with the threaded holes in the sheave, and the keyway in the bushing with the keyway in the shaft.

2. Install the three cap screws (1) through the drilled holes in the bushing and thread them into the sheave.

3. Install the key (4) into the keyway.

4. Install the motor into the fan section and mount it on the motor mount.

5. Place a level across the top of the fan and motor sheaves. Slide the motor sheave and bushing up the shaft until both sheaves are level with each other. If they are not level, the belts will wear prematurely.

   NOTE: Do not overtighten the cap screws. You could crack the sheave hub, or break off the screws. If the sheave pulls up against the bushing flange, the shaft diameter is too small.

6. Tighten the cap screws evenly, a quarter turn at a time, to 12.2 N•m (9 ft-lb). This will pull the sheave and bushing together. Maintain a gap of 3–6 mm (0.125–0.25 in.) between the bushing flange and the sheave.

7. Make sure the motor and fan sheaves are level with each other. If they are not, separate the bushing and sheave and repeat the installation steps.

8. Install the V-belts on the sheave and adjust the belt tension as described in the *V-Belt Replacement* procedure on page 6-11.

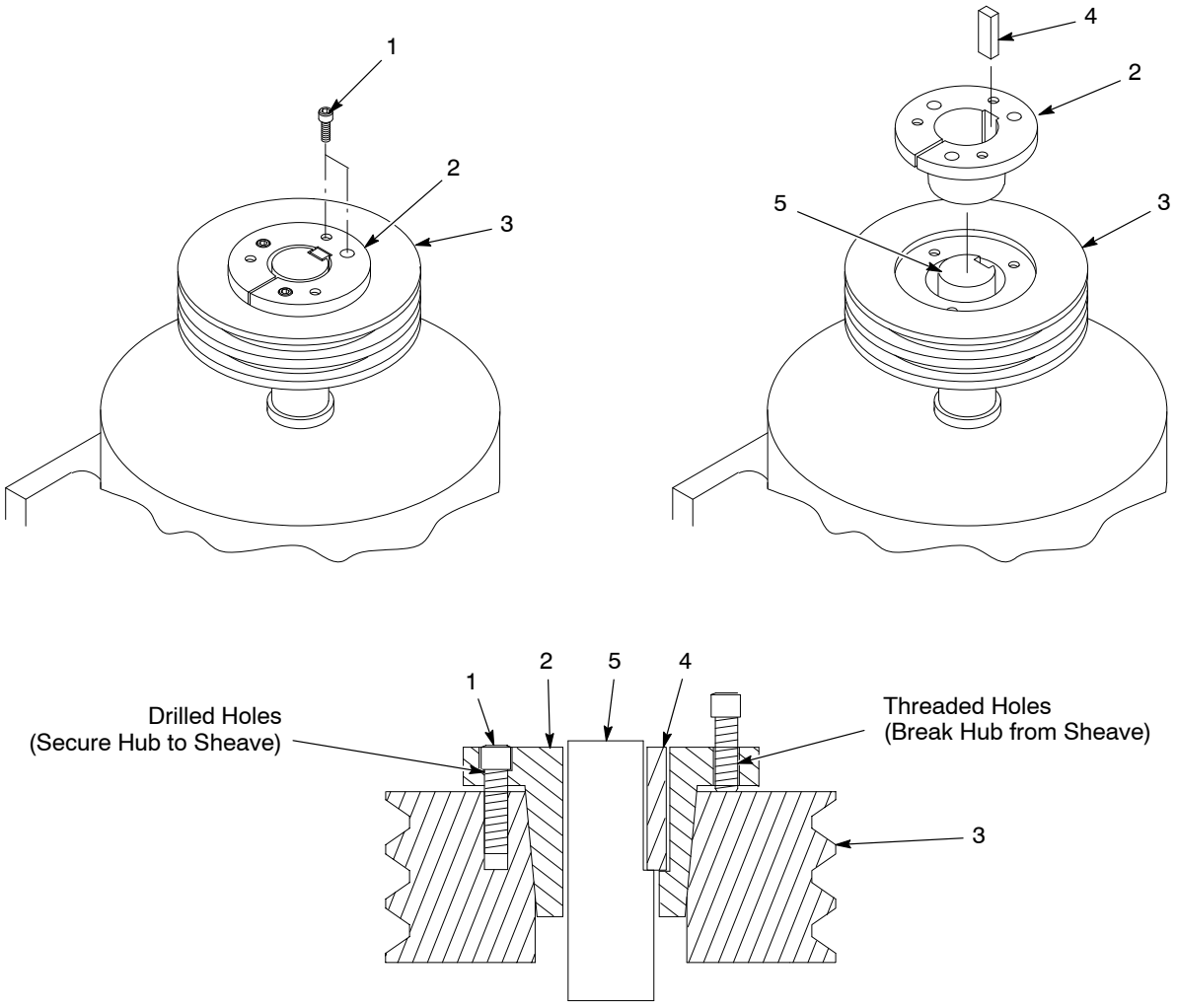


Figure 6-8 Motor Sheave Replacement

1. Cap screws (3)
2. Bushing
3. Sheave
4. Key
5. Motor shaft

Fan Sheave Replacement

WARNING: Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.

Fan Sheave Removal

1. Remove the V-belts from the fan sheave, as described in *V-Belt Replacement* on page 6-11.

   NOTE: The cap screws shipped with the bushing are hardened. Do not use softer-grade screws to break the bushing loose from the sheave. The ends of the screws will be flattened, and you will be unable to remove them from the bushing.

Fan Sheave Removal *(contd)*

2. See Figure 6-9. Unscrew the three cap screws (1) from the drilled holes in the bushing (3). Thread the screws through the threaded holes in the bushing until they bottom out on the sheave (4) hub.
3. Tighten the screws evenly, a quarter turn at a time, until the bushing breaks loose from the sheave.
4. Pull the sheave, bushing, and key (2) off the fan shaft. Remove the screws from the bushing.

   NOTE: Do not lubricate the sheave, bushing, or fan shaft.

5. Inspect the sheave, bushing, and key. Replace them if they are damaged. Clean the parts that will be reused.

Fan Sheave Installation

1. Install the sheave and bushing on the fan shaft. Line up the drilled holes in the bushing with the threaded holes in the sheave, and the keyway in the bushing with the keyway in the shaft.
2. Install the three cap screws through the drilled holes in the bushing and thread them into the sheave. Do not tighten the screws.
3. Install the key into the keyway.
4. See Figure 6-10. Place a level across the top of the fan and motor sheaves. Slide the fan sheave and bushing up the shaft until both sheaves are level with each other and at the specified height from the bottom of the fan section. If they are not level, the belts will wear prematurely.

NOTE: Do not overtighten the screws. You could crack the sheave hub, or break off the screws. If the sheave pulls up against the bushing flange, the shaft diameter is too small.

5. Tighten the cap screws evenly, a quarter turn at a time, to force the tapered bushing into the sheave. Tighten the screws to 12 N•m (9 ft-lb).
6. Make sure the motor and fan sheaves are level with each other. If they are not, separate the bushing and sheave and repeat the installation steps.
7. Install the V-belts on the sheave and adjust the belt tension as described in the *V-Belt Replacement* procedure on page 6-11.

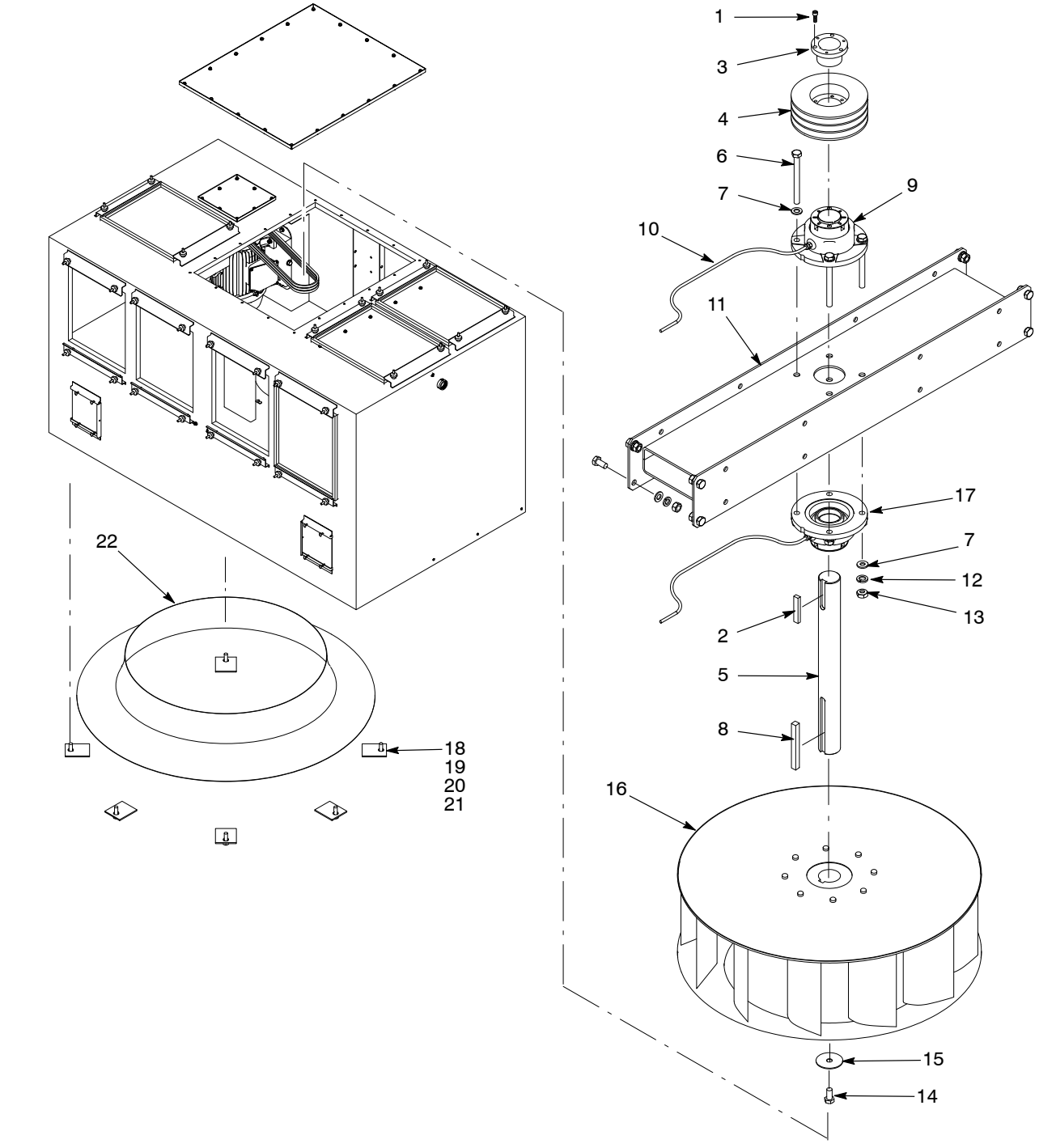
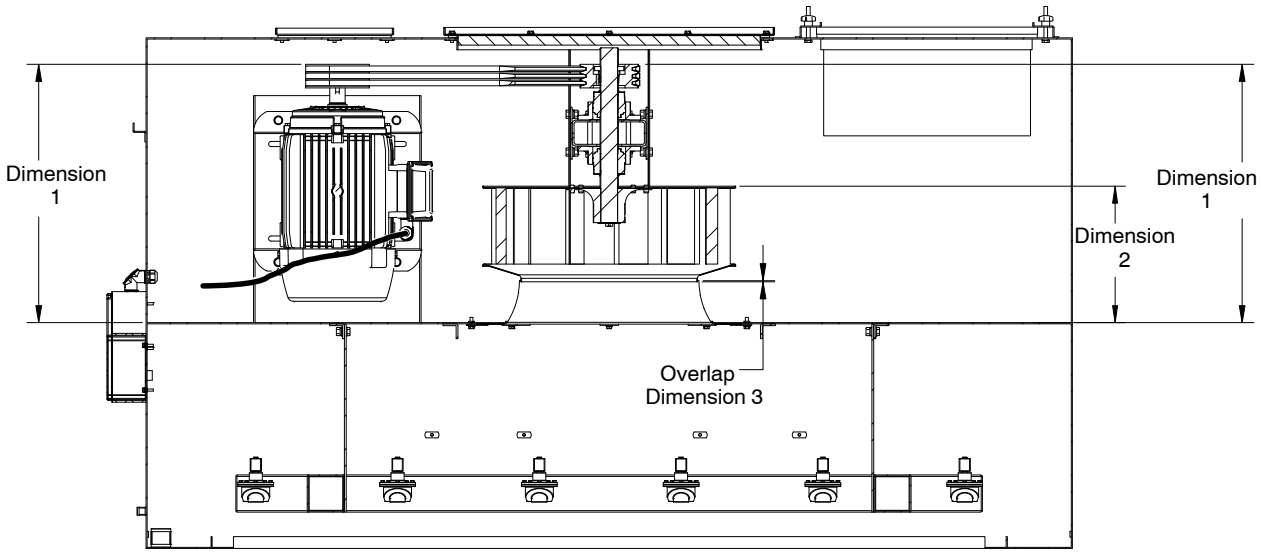


Figure 6-9 Fan and Bearing Replacement

1. Cap screws (3)
2. Key
3. Bushing
4. Sheave
5. Shaft
6. Screws (4)
7. Flat washers (8)
8. Key
9. Upper bearing
10. Tube fittings and tubing
11. Support
12. Lock washers (4)
13. Nuts (4)
14. Screw (1)
15. Retainer washer (1)
16. Fan
17. Lower bearing
18. Retainers (8)
19. Flat washers (8)
20. Lock washers (8)
21. Screws (8)
22. Inlet cone



Dimension Chart for Excel 2001 and Excel 2002

Dimension 1:
Excel 2001 – 647.7 mm (25.50 in)
Excel 2002 – 694 mm (27.32 in)

Dimension 2:
Excel 2001 – 302 mm (11.89 in)
Excel 2002 – 366 mm (14.44 in)

Dimension 3:
Excel 2001 and Excel 2002 – 3–6 mm (0.11–0.23 in)

Figure 6-10 Fan and Motor Sheave and Fan Mounting Dimensions

Fan Replacement

WARNING: Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.

Fan Removal

1. Remove the color module from under the fan section as described in the *Operation* section.
2. See Figure 6-9. Support the inlet cone (22) while you remove the screws (21), washers (19, 20), and retainers (18). Lower the inlet cone and remove it from the fan section.
3. Loosen the key and shaft setscrews in the hub of the fan (16) with a long hex wrench.
4. Place boards between the fan and the bottom plate to block up the fan. Remove the screw (14) and retainer washer (15) from the bottom of the shaft (5).
5. Support the fan while removing the boards. Remove the fan and key (8) from the fan section.

Fan Installation

1. Install the new fan on the shaft, line up the keyways, and install the key. Block up the fan to hold it up.
2. Tighten the key and shaft setscrews in the fan hub to hold the fan in place. Torque the setscrews to 3.5 N•m (30.9 in.-lb).

3. Install the retainer washer and screw onto the end of the shaft. Remove the fan blocks.
4. Install the inlet cone in the fan section with the retainers, washers, and screws. Do not tighten the screws.

   NOTE: You will tighten the screws during the *Fan Adjustment* procedure.

Fan Adjustment

1. See Figure 6-10. The bottom of the fan should sit down inside the cone (overlap) 3–6 mm (0.125–0.25 in.). Loosen the shaft setscrew in the fan hub to adjust the position of the fan on the shaft, then tighten the shaft setscrew.
2. Adjust the inlet cone so the gap between the fan and the cone is the same all the way around. Use your finger to check the gap.
3. Tighten the screws securing the inlet cone to the fan section and recheck the gap. Rotate the fan and make sure it does not rub against the cone.
4. Start the exhaust fan and make sure the fan does not rub against the inlet cone.

Fan Shaft and Bearing Replacement

WARNING: Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.

Fan Shaft and Bearing Removal

1. Remove the inlet cone and fan as described in the *Fan Replacement* procedure on page 6-18.
2. Remove the V-belt as described in *V-Belt Replacement* on page 6-11.
3. See Figure 6-11. For both upper and lower bearings, remove the screws securing the lock plates (23), remove the lock plates, then turn the lock nuts (24) counterclockwise until the shaft slides easily out of the bearings.
4. If you are replacing the shaft, remove the fan sheave (4), bushing (3), and key (2) from the shaft as described in the *Fan Sheave Replacement* procedure on page 6-16.
5. If you are replacing the bearings, disconnect the grease tubing from the tube fittings (10). Remove the screws (6), washers (7, 12), and nuts (13) securing the bearings to the support (11).

   NOTE: Replace the bearings with the ones listed in the *Parts* section only. Do not use unapproved bearings.

6. Remove the tube fittings from the old bearings and install them in the new bearings in place of the grease fittings.

Fan Shaft and Bearing Installation

See Figure 6-11.

1. Remove the screws (1) and lock plates (2) from the new bearings. Loosen the lock nuts (3) counterclockwise until the shaft slides easily into the bearing.

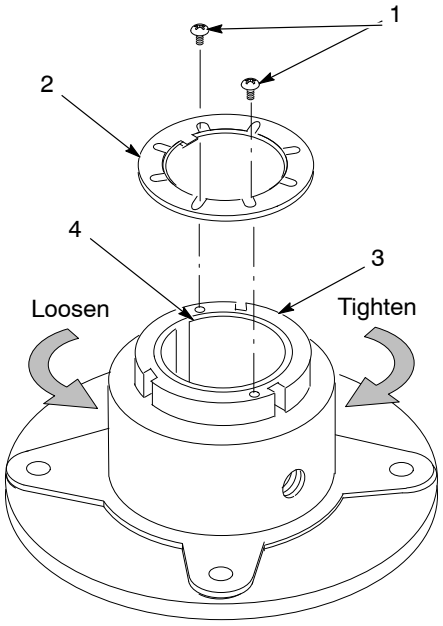


Figure 6-11 Bearings

1. Screws Lock plate
2. Lock plate
3. Lock nut
4. Adapter sleeve

2. Convert the lower bearing into a expansion bearing:
   a. Remove the snap ring (on the side of the bearing opposite the lock plate) from the innermost groove on the bearing.
   b. Install the snap ring into the outermost groove on the bearing.

NOTE: When you install the expansion bearing, make sure its inner bearing race is pushed as far as possible toward the upper, non-expansion bearing.

3. Install the bearings on the support with the screws (6), washers (7, 12), and nuts (13). Do not tighten the fasteners.
4. Apply a coating of light oil to the shaft (5) where it will go through the bearings.
5. Install the shaft through the bearing. Loosen the bearing lock nuts if you have trouble installing the shaft.

6. Level the shaft and square it with the support.
7. Install the bearing lock plates over the shaft ends and onto the bearings.
8. If removed, install the fan sheave, bushing, and key on the shaft. Tighten the bushing cap screws enough to hold the sheave on the shaft. Refer to the *Sheave Replacement* procedure.
9. Place a level across the motor and fan sheaves. Adjust the fan shaft up or down until the sheaves are level. This is a rough adjustment and will have to be repeated later.
10. See Figure 6-9. Install the fan (16) and key (8) on the shaft (5). Tighten the key setscrew in the fan hub to hold the fan in place. Install the retainer washer (15) and screw (14) on the end of the shaft.
11. Block up the fan to remove all weight from the bearings.
12. Tighten the upper bearing lock nut:
    a. See Figure 6-11. Turn the lock nut (3) by hand as tightly as possible. Wear gloves while tightening the lock nut.
    b. Scribe a line through the lock nut face and the adapter face. The line will serve as the reference point as you tighten the lock nut.
    c. Using a spanner wrench or drift and hammer, tighten the lock nut 3/4 to one complete turn.
    d. Install the lock plate (2) on the bearing with the tang of the lock plate in the slot in the adapter plate, then and secure it with the screws (1).

    NOTE: If the holes on the lock nut do not line up with the holes in the lock plate, tighten the lock nut until the holes line up.
13. Push the insert of the lower bearing up toward the upper bearing as far as it will go, then repeat steps 12a—d to tighten the lower bearing lock nut.
14. Tighten the bearing mounting bolts to 67.8 N•m (600 in.-lb).
15. Rotate the shaft by hand. You should not feel any binding or excessive drag.
16. Install the inlet cone (22) and adjust the fan overlap as described in the *Fan Replacement* procedure on page 6-18.
17. Tighten the fan sheave bushing screws (1) to the torque values in the *Fan Sheave Replacement* procedure on page 6-16. Make sure the sheaves are parallel.
18. Install the V-belts on the sheaves and adjust the belt tension as described in *V-Belt Replacement* on page 6-11.
19. Connect the grease tubing to the bearing fittings. Give each bearing two shots of a #2 lithium complex grease.
20. Turn on the system electrical power and start the exhaust fan. Make sure the fan is not rubbing against the inlet cone. If you hear a rumbling noise coming from the bearings, stop the fan, lock out power to the system, and check the fan shaft alignment.

Section 7
Parts

Introduction

To order parts, call the Nordson Industrial Coating Systems Customer Support Center at (800) 433-9319 or your local Nordson representative.

Motor Starter Panel Parts

Refer to the Motor Starter Panel drawings included with this manual for panel parts.

Fan Section Parts

Fan and Fan Drive Parts

See Figure 7-1.

Item	Part	Part	Description	Quantity	Note
	Excel 2001	Excel 2002			
1	–	174736	WHEEL, fan, Excel 2002, 518	1	
1	174735	–	WHEEL, fan, Excel 2001, 512	1	
2	1102723	1102723	KEY, fan sheave, 12.7 x 8.0 x 69.1	1	
3	–	183906	BEARING, flange	2	
3	174795	–	UPPER/LOW BEARING, 518/524/XL	2	
4	1102559	1102559	SHAFT, fan, 49.18 x 470	1	
5	–	174787	SHEAVE, fan, 3A5.4B5.8, Excel 2002	1	
5	174774	–	SHEAVE, fan, 2A4.2B4.6, Excel 2001	1	
6	–	174781	BUSHING, fan, XL 2002/518	1	
6	174780	–	BUSHING, fan, SDS	1	
7	–	174779	BUSHING, motor, SD	1	
7	174778	–	MOTOR, bushing, SDS	1	
8	–	174786	SHEAVE, motor, 3A6.0B6.4, Excel 2002/3	1	
8	174775	–	SHEAVE, motor, 2A6.4B6.8	1	
9	174772	174772	BELT, drive, Excel 2001, 2002	3	
10	–	174755	MOTOR, 20 HP, 460 V, 3PH TEFC	1	
10	1601309	–	MOTOR, fan, 15HP, 200/380/415V 50Hz, TEFC	1	
11	1102722	1102722	KEY, fan, 12.7 x 12.7 x 121.7	1	
12	778728	778728	SCREW, cap, hex head, M12 x 130, steel, zinc	4	
13	983194	983194	WASHER, flat, M12, steel, zinc	4	
14	983406	983406	LOCKWASHER, split, M12, steel, zinc	16	
15	779991	779991	NUT, hex, M12 x 1.25	12	
16	345420	345420	SCREW, hex, M12 x 25, steel, zinc	12	
17	–	174750	CONE, inlet, 72%, Excel 2002	1	
17	174749	–	CONE, inlet, 72%, Excel 2001	1	
18	982106	982106	SCREW, hex, M8 x 25, steel, zinc	6	
19	983404	983404	WASHER, lock, split, M8, steel, zinc	6	
20	983013	983013	WASHER, flat, regular, M8, zinc	6	
21	1102549	1102549	RETAINER, inlet cone, Excel series, metric	6	
22	1102547	1102547	SCREW, thumb, M6 x 20	8	

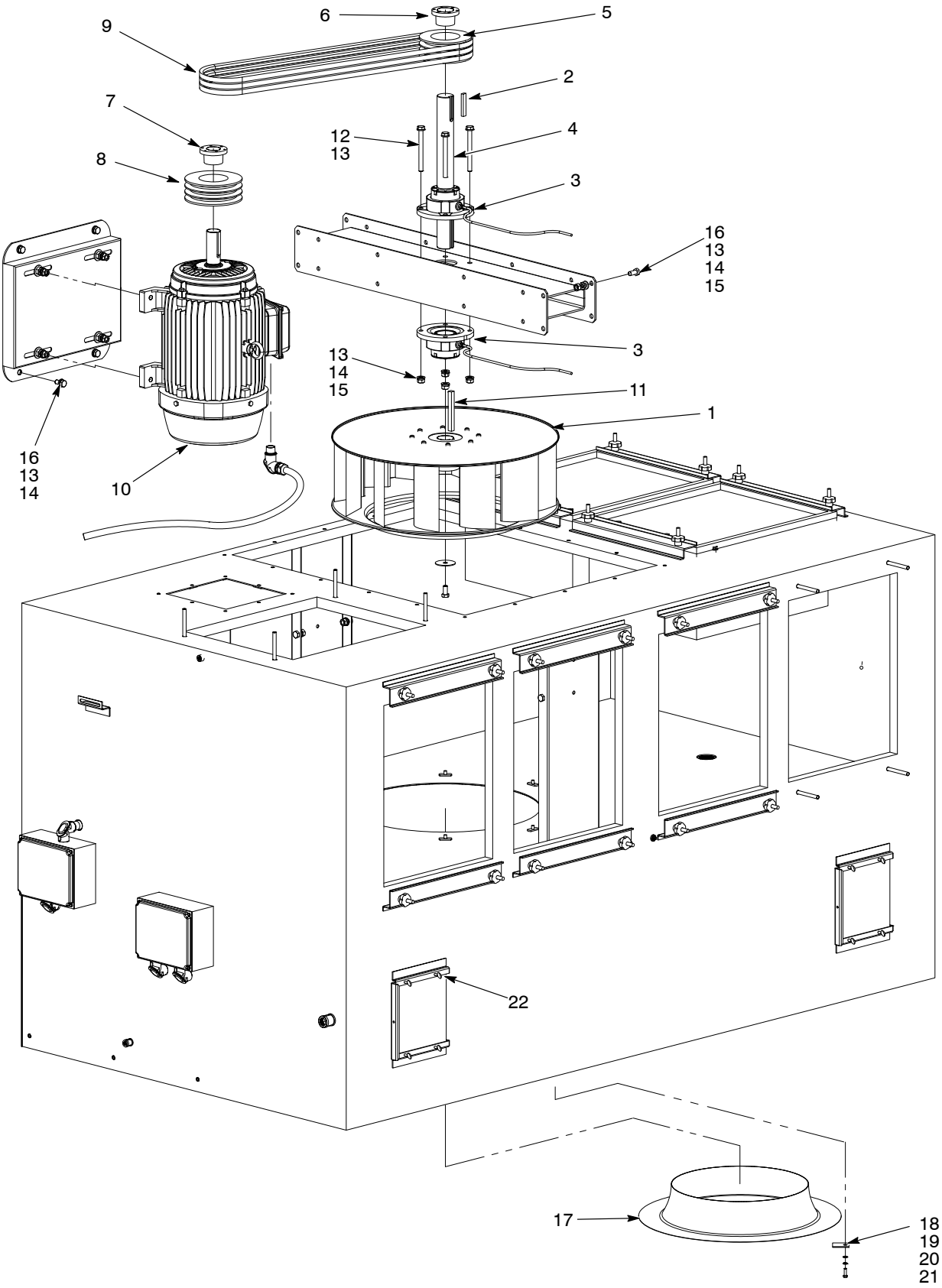


Figure 7-1 Fan and Fan Drive Parts

Final Filters, Pulse Valves, and Miscellaneous Parts

See Figure 7-2.

Item	Part	Description	Quantity Excel 2001	Quantity Excel 2002	Note
1	156995	FILTER, final, 20 x 24, internal	5	7	
2	1101898	CLAMP, final filter, 18.5 x 2.75 in.	10	14	
3	1101899	KNOB, final filter, M10	20	28	
4	1094018	BOARD, timer, pulse, 22 output	1	1	
5	777733	VALVE, pulse, 1 in. NPT in, 1 in. NPT out	12	18	
6	1102550	REGULATOR, 8–125 PSI, ¾ R	1	1	
7	1102595	GAUGE, 0–100 PSI, 0–700 kPa, ¼ BSPT	1	1	
8	1102568	FITTING, grease, straight, ⅛ in. NPT	2	2	

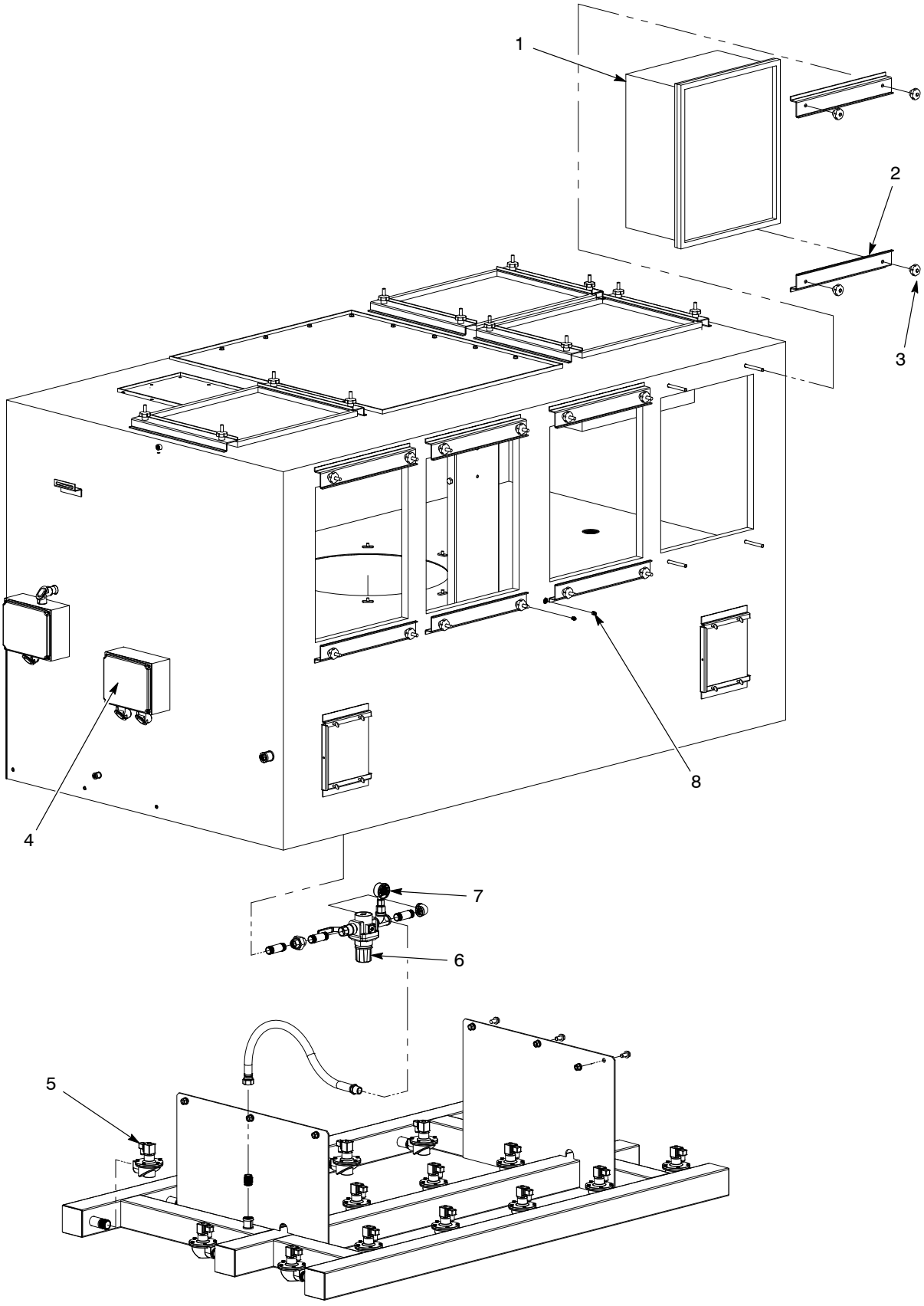


Figure 7-2 Final Filter, Pulse Valves, and Miscellaneous Parts

Color Module Parts

Cartridge Filters and Fluidizing Plates

See Figure 7-3.

Item	Part	Description	Quantity Excel 2001	Quantity Excel 2002	Note
1	984716	NUT, hex, M16, steel, zinc	12	18	
2	983419	WASHER, lock, split, M16, steel, zinc	12	18	
3	983019	WASHER, flat, regulator, M16, steel, zinc	12	18	
4	778549	SUPPORT, hanger top, filter	12	18	
5	778547	SUPPORT BAR, filter	12	18	
6	778548	PIN, 5 x 100	12	18	
7	778550	SUPPORT, hanger bottom, filter	12	18	
8	156996	FILTER, 36 in., PowderGrid Plus, center-mount	12	18	
9	779235	GASKET, rubber, EDPM, 40 mm x 12 meter	AR	AR	B
10	1102656	KIT, C-clamp, color module, PE booth	–	3	
10	1106330	KIT, C-clamp, Excel 2001, China	3	–	
11	1102613	PLATE, fluidizing, 12 x 1250.9 x 196.8 mm	–	3	
11	1106317	PLATE, fluidzing, 12 x 794 x 197, Excel 2001	3	–	
12	779237	GASKET, U, rubber, fluid plate	AR	AR	A
13	1102857	CASTER, 150 mm x 50 mm, swivel	4	4	

NOTE A: Order length required in meters. Total length required per color module is 9 meters.
B: Order length required in meters. Total length required per color module is 7 meters.
AR: As Required

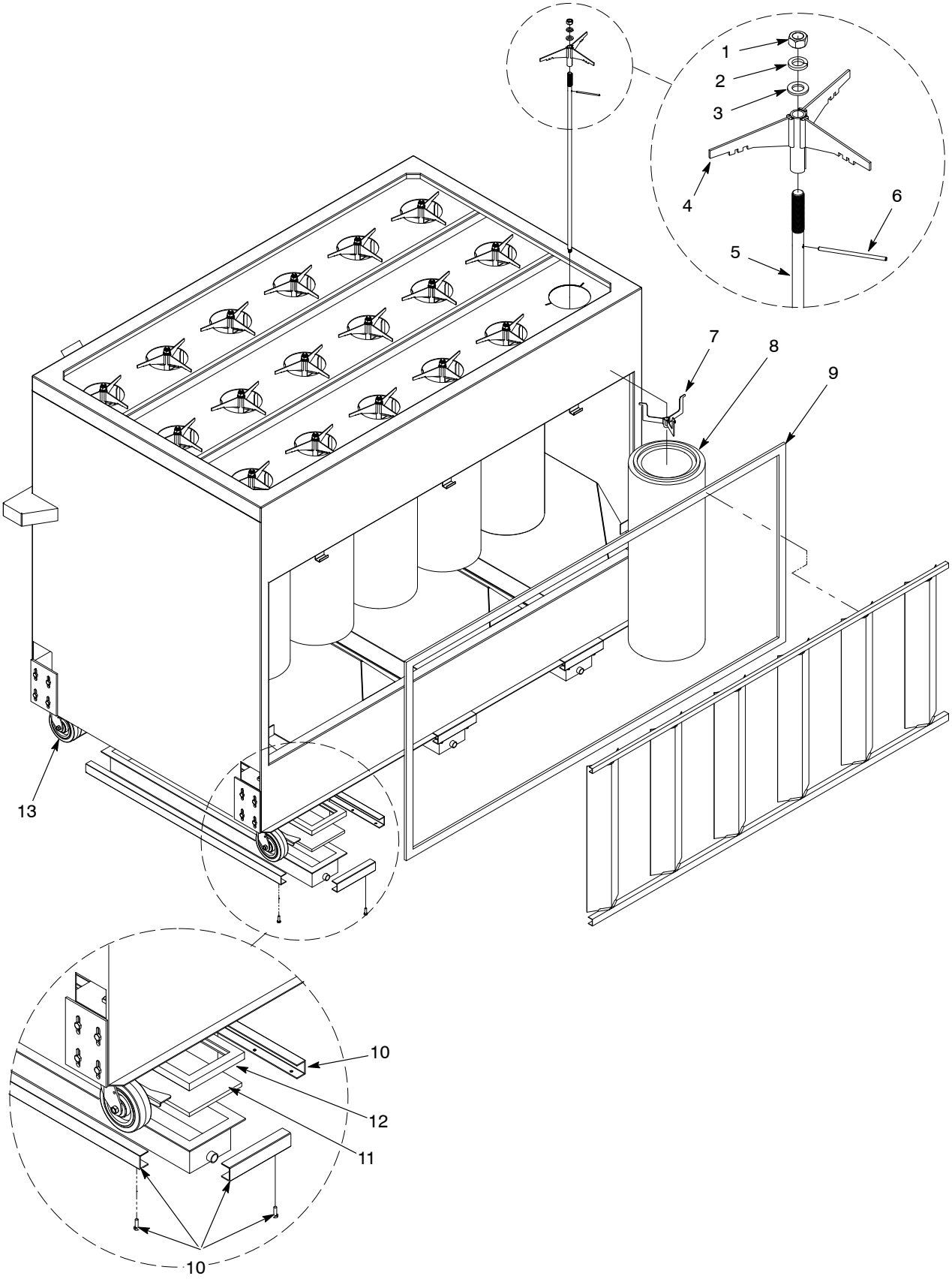


Figure 7-3 Color Module Cartridge Filters and Fluidizing Plates

Color Module Covers, Gaskets, and Transfer Pump Mountings

See Figure 7-4.

Item	Part	Description	Quantity	Note
1	779258	GASKET, Poron, 20 mm x 3.18 mm	AR	A
2	11027734	PLATE, module option, PE booth	1	
3	1102924	VENT, assist, 90 mm, flange mount	1	
4	983029	WASHER, flat, regular, M6, steel, zinc	AR	
5	777823	BOLT, hex, M6 x 25, steel, zinc	AR	
6	1102860	TUBE, fluidizing, PE booth, 190.5 mm	3	
7	1102819	TUBE, fluidizing, PE booth, 114 mm	3	
8	345430	SCREW, hex head, M12 x 75, steel, zinc	4	
9	------	NUT, hex, M12	4	
10	345400	SCREW, hex head, M10 x 25, steel, zinc	AR	
11	983192	WASHER, flat, regular, M10, steel, zinc	AR	
12	226708	PUMP, powder transfer, porcelain	AR	

NOTE A: Order length required in meters.

AR: As Required

NS: Not Shown

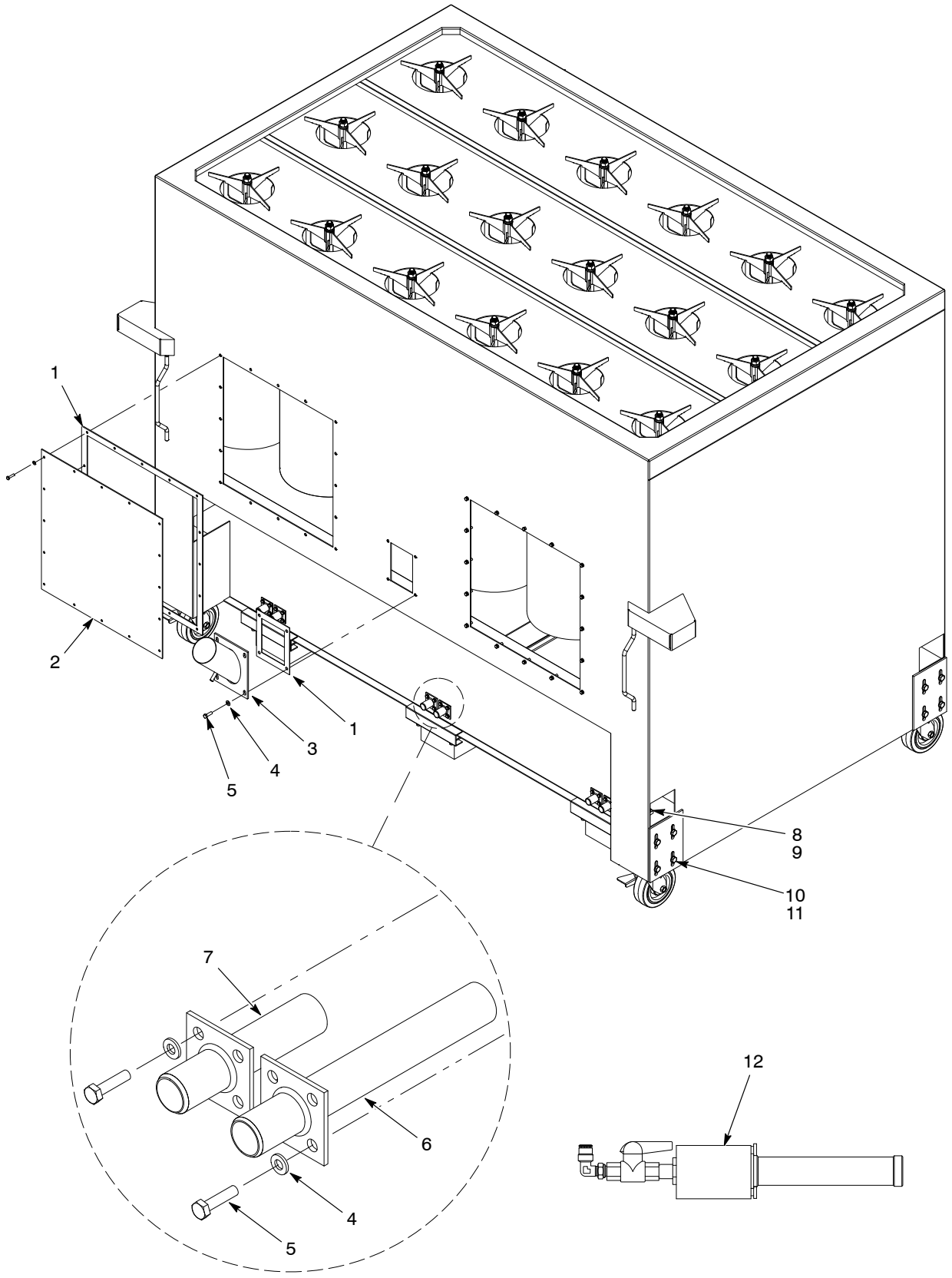


Figure 7-4 Color Module Cartridge Filters and Fluidizing Plates

Fan Section Supports and Miscellaneous Parts

See Figure 7-5.

Item	Part	Description	Quantity	Note
1	174766	RETAINER, inflatable seal, 2002	1	
1	174764	RETAINER, inflatable, seal, 2001	1	
2	174765	SEAL, inflatable, fan section, 2002	1	
2	174763	SEAL, inflatable, fan section, 2001	1	
3	------	SUPPORT, fan, collector	1	
4	176300	GAUGE, Magnehelic	1	
5	1102632	RAIL, guide, color module, metric	2	
6	346171	SCREW, socket, M8 x 35	AR	
7	983414	WASHER, flat, narrow, M8, steel, zinc	AR	
8	983404	WASHER, lock, split, M8, steel, zinc	AR	
9	984707	NUT, hex, M8, steel, zinc	AR	
10	344689	SCREW, flat, recessed, M5 x 12, zinc	AR	
11	983035	WASHER, flat, regular, M5 steel, zinc	AR	
12	983401	WASHER, lock, split, M5, steel, zinc	AR	
13	984706	NUT, hex, M5, steel, zinc	AR	
14	345400	SCREW, hex, M10 x 25, zinc	AR	
15	983192	WASHER, flat, regular, M10, steel, zinc	AR	
16	7404108	WASHER, lock, split, M10, zinc	AR	
17	345420	SCREW, hex, M12 x 25, steel, zinc	AR	
18	983194	WASHER, flat, regular, M12, zinc	AR	
19	983406	WASHER, lock, split, M12, steel, zinc	AR	
20	984703	NUT, hex, M6, steel, zinc	2	
21	1103759	SCREW, hex, serrated, M6 x 25, steel, zinc	2	
22	------	ANGLE, limit switch mount	1	
23	305645	SWITCH, limit	1	
24	1085192	SCREW, button head, socket, M5 x 60, stainless	4	
AR: As Required				

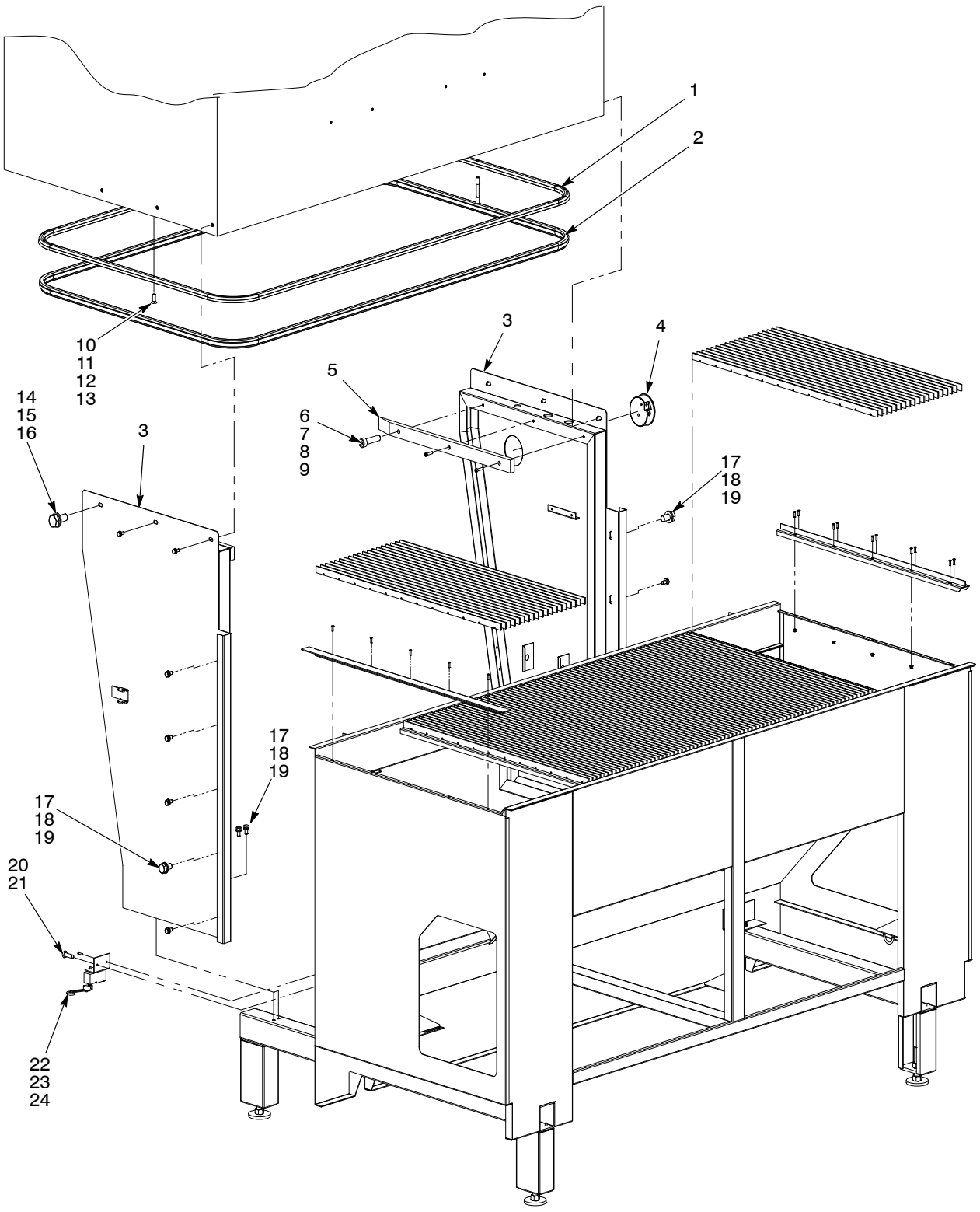


Figure 7-5 Fan Section Supports and Miscellaneous Parts

Base Assembly Parts

See Figure 7-6.

Item	Part	Description	Quantity	Note
1	------	BASE ASSEMBLY, color module, PE, metric	1	A
2	------	BASE, assembly, 1 module, PE booth, Excel	AR	A
NS	------	BASE, assembly, 2 module, PE booth, Excel	AR	A
NS	------	BASE, assembly, 3 module, PE booth, Excel	AR	A
3	1103287	PAD, leveling, PE booth, metric (M24 x 140 mm)	AR	
4	1103272	KIT, C-clamp, fluidizing, PE booth base	AR	
5	779237	GASKET, U, rubber, fluid plate	AR	
6	1103270	PLATE, fluidizing, PE booth base	AR	
7	1102819	TUBE, fluidizing, PE booth, 114 mm	AR	
8	777823	BOLT, hex, M6 x 25, steel, zinc	AR	
9	983029	WASHER, flat, regular, M6, steel, zinc	AR	
10	226708	PUMP, powder transfer, porcelain	AR	

NOTE A: A PE booth always includes a color module base assembly and a 1, 2, or 3 module base assembly.

AR: As Required

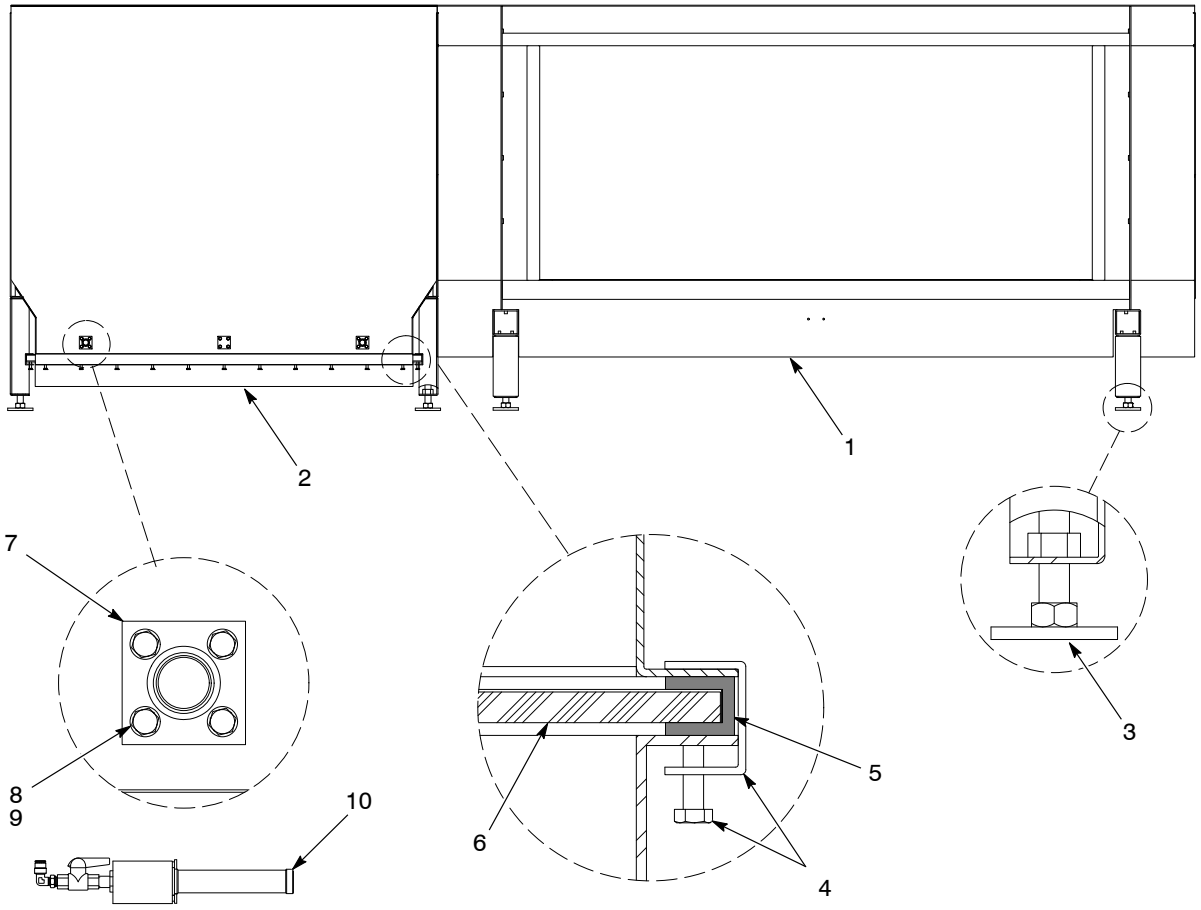


Figure 7-6 Base Assembly Parts

Pneumatic Control Panel

See to Figure 7-7.

Item	Part	Description	Quantity	Note
—	174834	ASSEMBLY, pneumatic panel, 12 function	1	
1	972659	• CONNECTOR, female, 1/4 in. tube x 1/8 in. NPT	13	
2	226715	• GAUGE, air, 0–100 psi, 0–7 bar, kPa	7	
3	226714	• GAUGE, air, 0–30 psi, 0–2 bar, kPa	6	
4	981229	• SCREW, hex, 1/4–20 x 2.00 in., cap, zinc	2	
5	983504	• WASHER, flat, E, 0.281 x 0.734 x 0.063 in., zinc	6	
6	981230	• SCREW, socket head, 1/4–20 x 2.25 in., zinc	4	
7	983140	• WASHER, lock, E, split, 1/4 in., steel, nickel	8	
8	183988	• GAUGE, minihelic, 0–5 in. scale	1	
9	176331	• GAUGE, minihelic, 0–10 in. scale	1	
10	- - - - - -	• HOUSING, pneumatic panel	1	
11	973442	• PLUG, pipe, socket, standard, 3/4 in., zinc	4	
12	973422	• PLUG, pipe, 3/8 in. NPT flush	3	
13	184017	• MANIFOLD, pilot valve	2	
14	972122	• ELBOW, male, 1/2 in. tube x 3/8 in. NPT	30	
15	973513	• NIPPLE, double male, 1/2 x 3/4 in., zinc	1	
16	973648	• ELBOW, pipe, 90°, street, 1/2 in., plain	1	
17	973399	• BUSHING, pipe reducing, 3/4 x 1/2 in. NPT	1	
18	972119	• ELBOW, male, 1/4 in. tube x 1/8 in. NPT	14	
19	184021	• VALVE, pilot, remote, 3/4 in. NPT port	1	
20	984210	• NUT, hex, jam, 1/4–20 in., steel, zinc	6	
21	184018	• FITTING, barbed, 1/2 in. NPT x 1/2 in., brass	2	
22	972775	• CONNECTOR, male, 37° flare, 1 in. tube x 1 in. NPT	1	
23	973103	• NIPPLE, steel, schedule 40, 3/4, 1.37	2	
24	973629	• ELBOW, pipe, 90°, street, 3/4 in., plain	1	
25	184020	• VALVE, pilot, 2 way, 3/4 in. NPT, port	1	
26	972192	• ELBOW, 1/2 in. tube x 1/4 in. NPT	6	
27	184016	• REGULATOR, 1/8 in., 3/8 in. NPT, 0–30 psi	6	
28	184015	• REGULATOR, 1/8 in., 1/4 in. NPT, 7–125 psi	6	
29	972183	• ELBOW, male, 3/8 in. tube x 1/4 in. NPT	6	
30	973402	• PLUG, pipe, socket, flush, 1/8 in., zinc	16	
31	973431	• PLUG, pipe, socket, standard, 1/2 in., zinc	1	
NS	900513	• TUBING, polyethylene, 0.505 x 0.640 in.	AR	A
NS	900511	• TUBING, polyethylene, 3/8 in. OD	AR	A
NS	900509	• TUBING, polyethylene, 0.250 x 0.040 in.	AR	A

NOTE A: Order in one-foot increments.

AR: As Required

NS: Not Shown

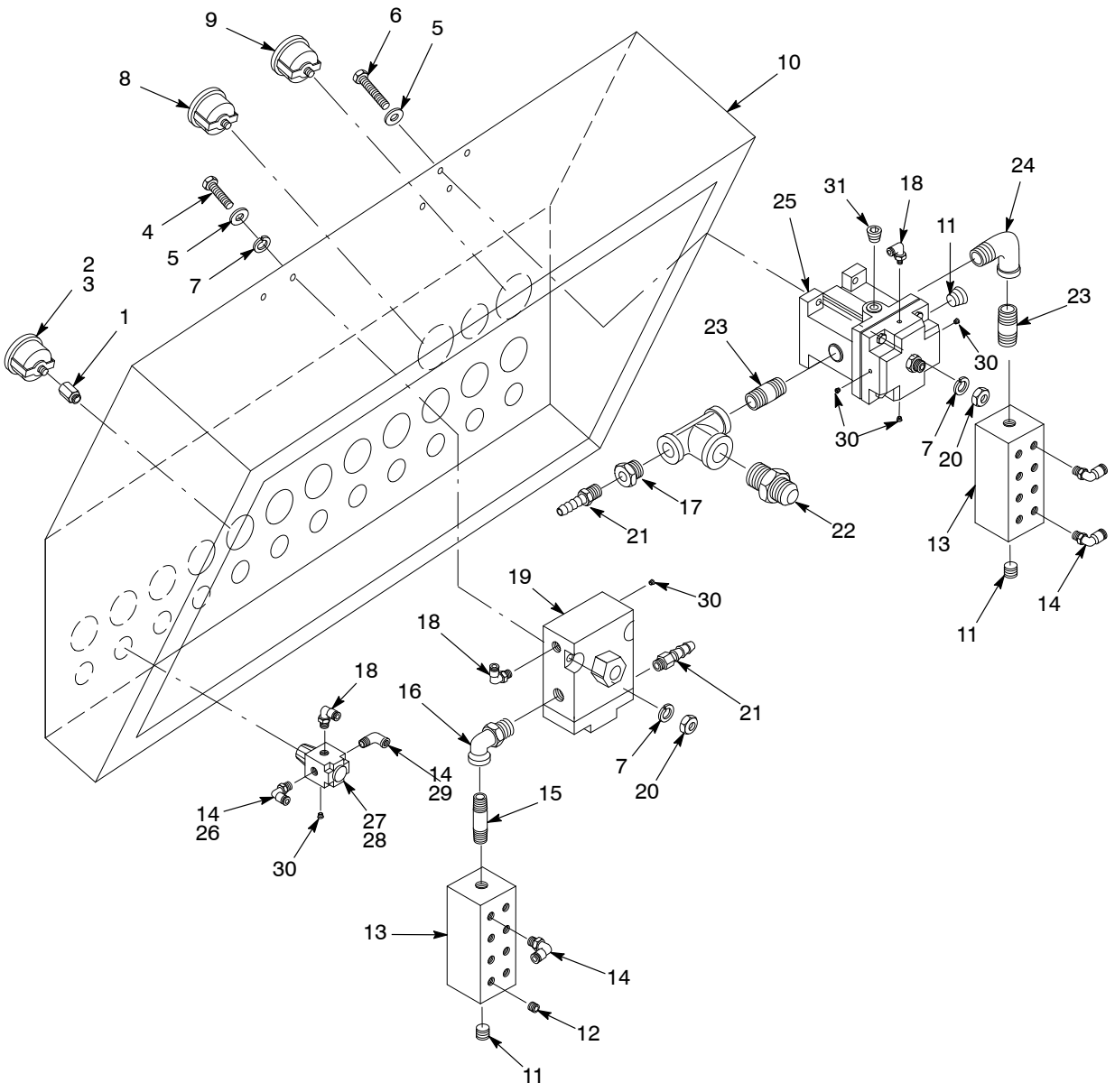


Figure 7-7 Pneumatic Control Panel

Feed Hopper Parts

Primary Feed Hopper with Air Lock and Sieve

See Figures 7-8 and 7-9.

Item	Part	Description	Quantity	Note
1	1102873	COVER, access, HTM–16, metric	1	
2	1018902	GRATE, tramp iron, 3 tube, 8.5 x 6	1	
3	1018903	GRATE, tramp iron, 4 tube, 8.5 x 6	1	
4	1103115	SCREW, hex, serrated, M8 x 16 mm, zinc	28	
5	779258	GASKET, Poron, 20 x 3.18 mm	2.5 M	A
6	1103179	RING, adapter, AZO, metric	2	
7	1101169	GASKET, direct vent	1	
8	1101165	CASTER, 4 in. swivel	4	
9	779237	GASKET, U, rubber, 2 x 20 mm	3.5 M	A
10	982106	SCREW, hex, cap, M8 x 25, zinc	26	
11	1102965	PLATE, fluidizing, 13 x 802 x 825, HTM26	1	
12	972240	CONNECTOR, male, elbow, 12 mm tube x ½ in. unithread	1	
13	1092184	SCREW, hex, machine, serrated, M10 x 20	34	
14	1058085	NUT, hex, flanged, serrated, M10	16	
15	1103212	SEPARATOR assembly, 16 inlet	1	
16	982049	• SCREW, he, cap, M8 x 25	12	
17	983404	• WASHER, lock, split, M8, steel, zinc	12	
18	984707	• NUT, hex, M8, steel, zinc	12	
19	1101477	• GASKET, vent tube, separator	1	
20	1101447	• GASKET, separator, 16 inlet	1	
21	1101331	BRACKET, support, transfer hose	8	
22	1099641	SCREW, hex, serrated, M8 x 35, zinc	16	
23	1091006	NUTE, hex, flanged, serrated, M8	16	
24	1103453	GASKET, sieve adapter, upper	2	
25	1103780	AIR LOCK, rotary, 430B-658 SD	1	
26	1101449	ADAPTER, air lock, AZO, 240/360	1	
27	1103759	SCREW, hex, serrated, M6 x 25 zinc	15	
28	1097321	NUT, hex, flanged, serrated, M6	15	
29	1103454	GASKET, sieve adapter, lower	1	
30	226703	SERVICE KIT, air volume control	1	
31	779261	SIEVE, rotary, AZO, E240B1-AP mount, metric	1	
32	1103758	SCREW, hex, serrated, M10 x 25 mm, steel, zinc	8	
33	1058085	NUT, hex, flanged, serrated, M10	8	
34	970968	CLAMP, hose, 6 in. diameter	2	
35	245718	CONNECTOR, spout	1	
36	1103177	ADAPTER, hose, 50 mm diameter	1	
37	970970	CLAMP, hose, No. 52	2	
NOTE A: Order in increments of one foot or one meter.				

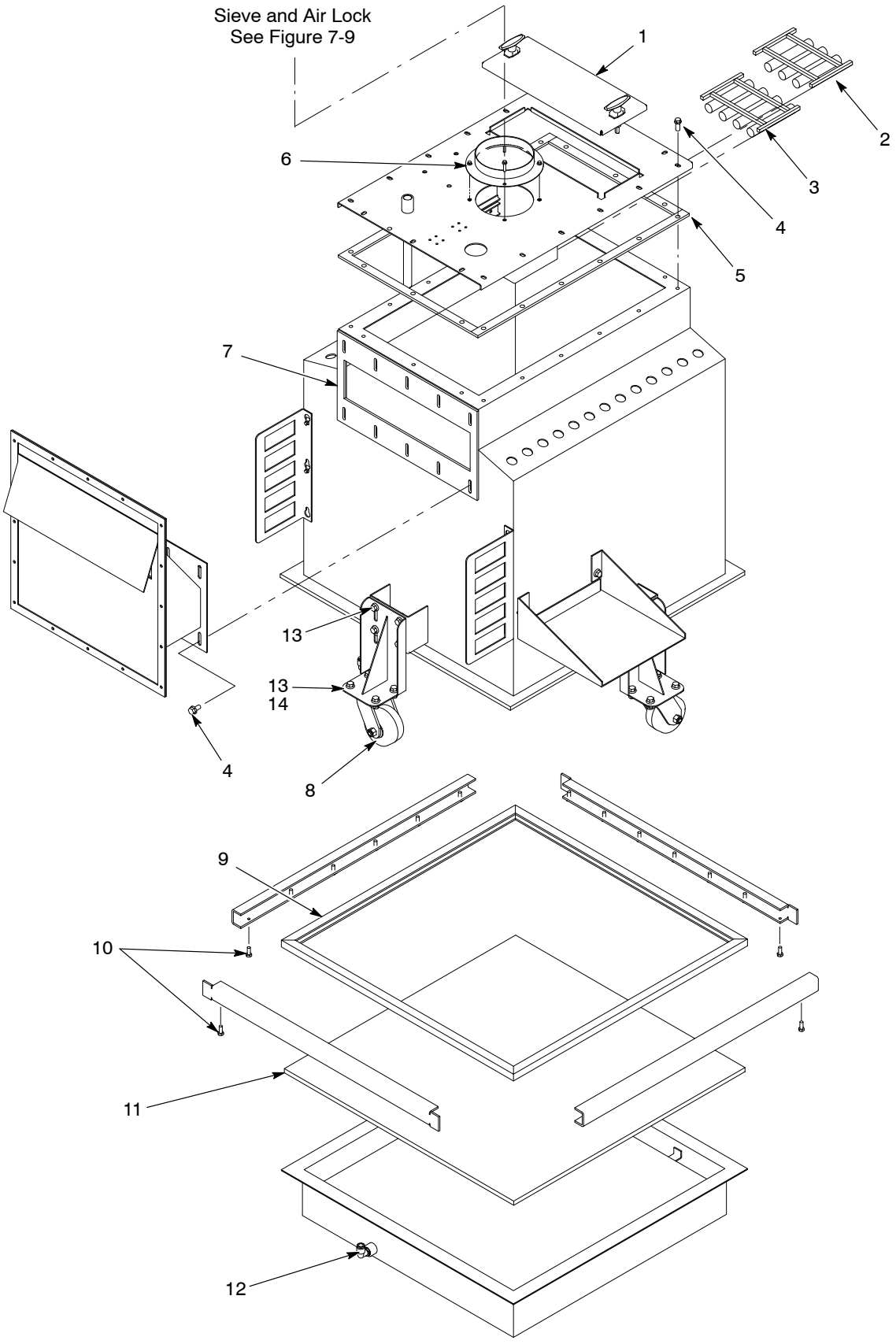


Figure 7-8 Primary Feed Hopper

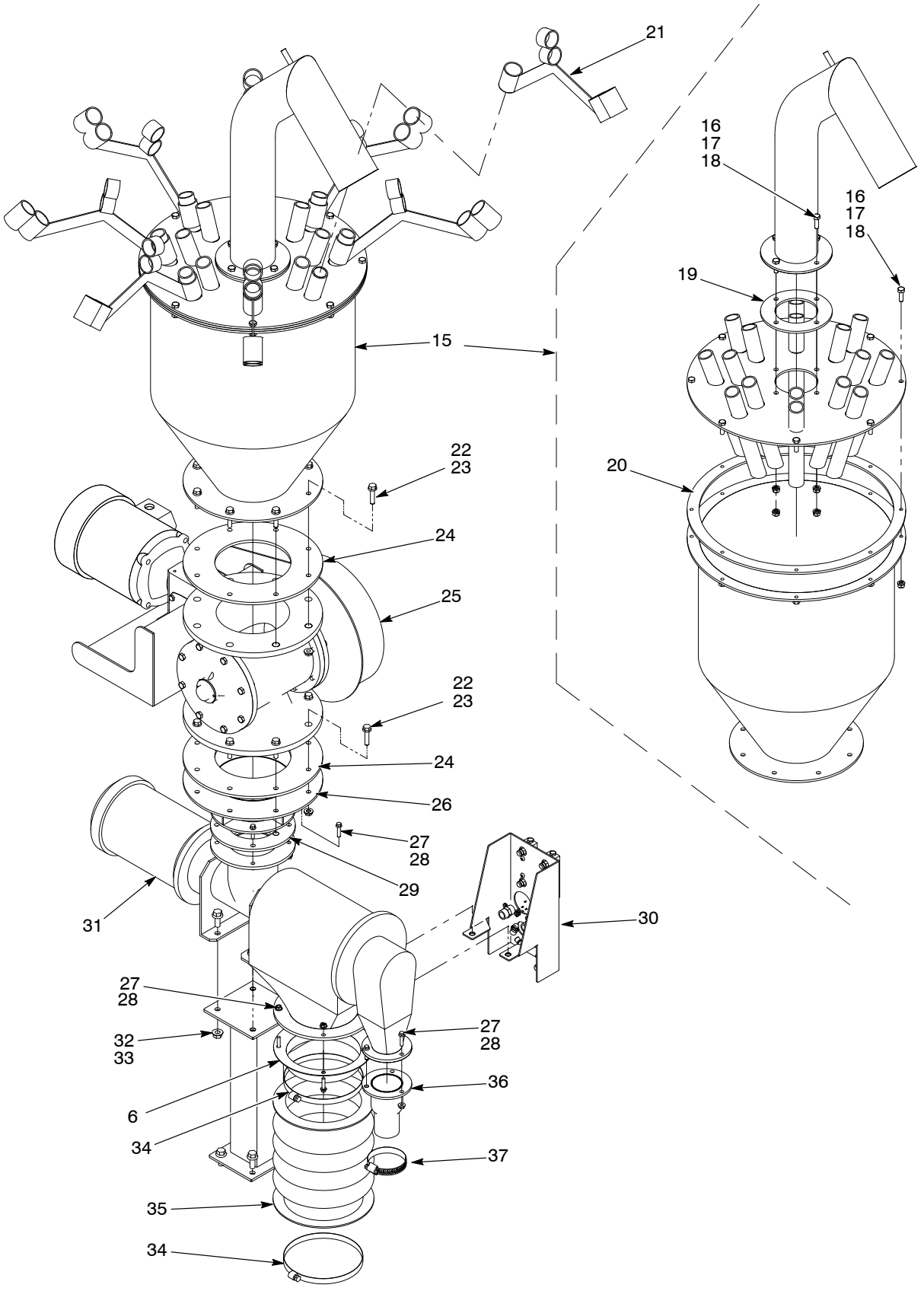


Figure 7-9 Sieve and Air Lock Parts

Satellite Feed Hopper

See Figure 7-10.

Item	Part	Description	Quantity	Note
1	1102873	COVER, access, HTM-16, metric	1	
2	1103115	SCREW, hex, serrated, M8 x 16, zinc	24	
3	1102840	TUBE, return, 2 inlet, metric	2	
4	779258	GASKET, Poron, 20 x 3.18 mm	2 M	A
5	110169	GASKET, direct vent	1	
6	1092184	SCREW, hex, machine, serrated, M10 x 20	34	
7	1058085	NUT, hex, flanged, serrated, M10	16	
8	1101165	CASTER, swivel, 100 mm	4	
9	972240	CONNECTOR, male, elbow, 12 mm tube x ½ in. unithread	1	
10	982106	SCREW, hex, cap, M8 x 25, zinc	22	
11	1101181	PLATE, fluidizing, 13 x 520 x 825 mm	1	
12	779237	GASKET, U, rubber, 2 x 20 mm	3 M	A
NOTE A: Order in increments of one foot or one meter.				

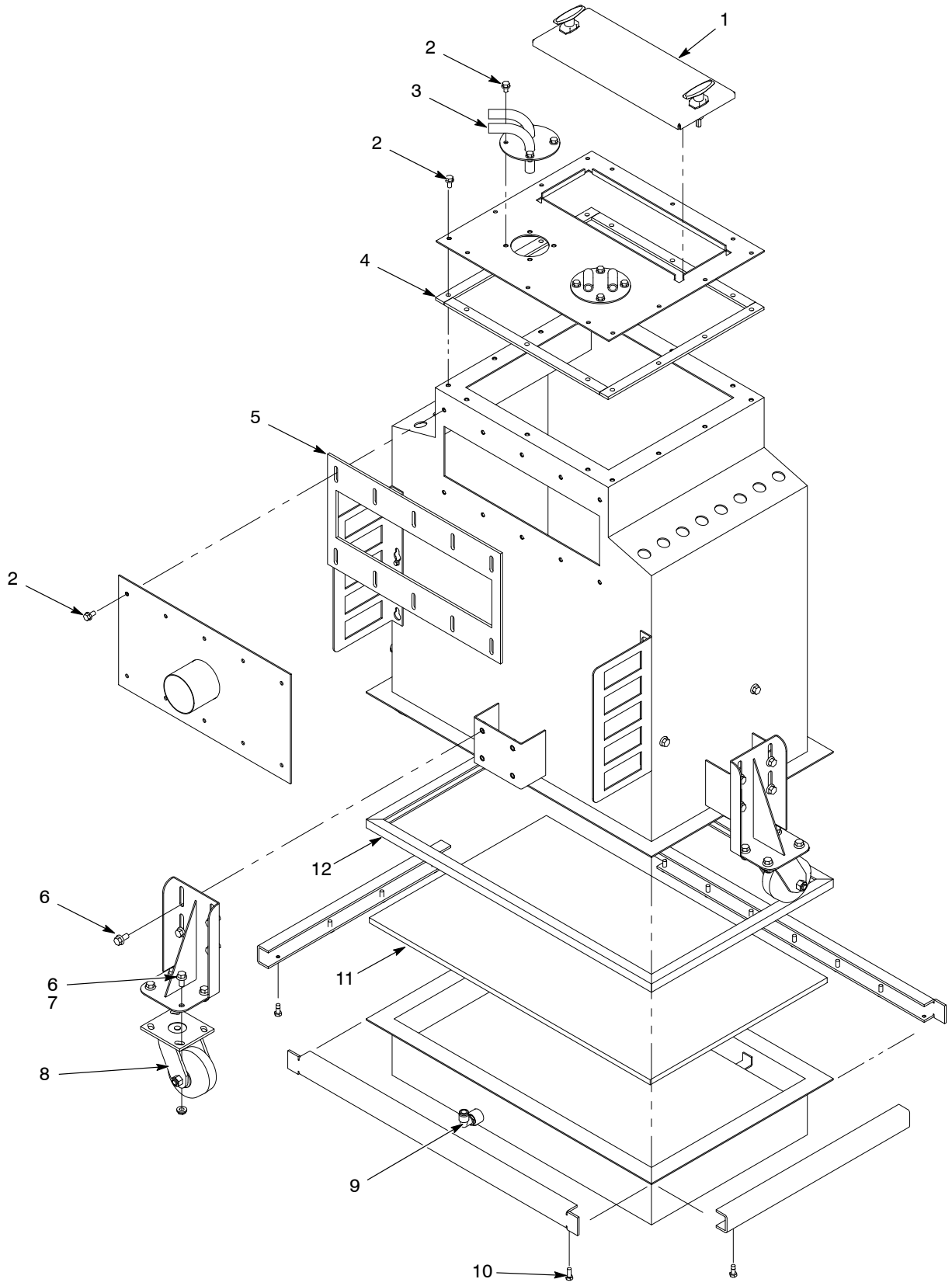


Figure 7-10 Satellite Feed Hopper

Bulk Unloader Parts

See Figure 7-11.

Item	Part	Description	Quantity	Note
1	231197	MANIFOLD, air, panel mounted, metric	1	A
2	226708	PUMP, powder transfer, porcelain	2	A
3	1103483	FITTING, rotary, one-touch, ½ in. NPT x 10 mm tube	1	
NOTE A: Refer to manual 104651 for parts. B: Refer to manual 229784 for parts and service information.				

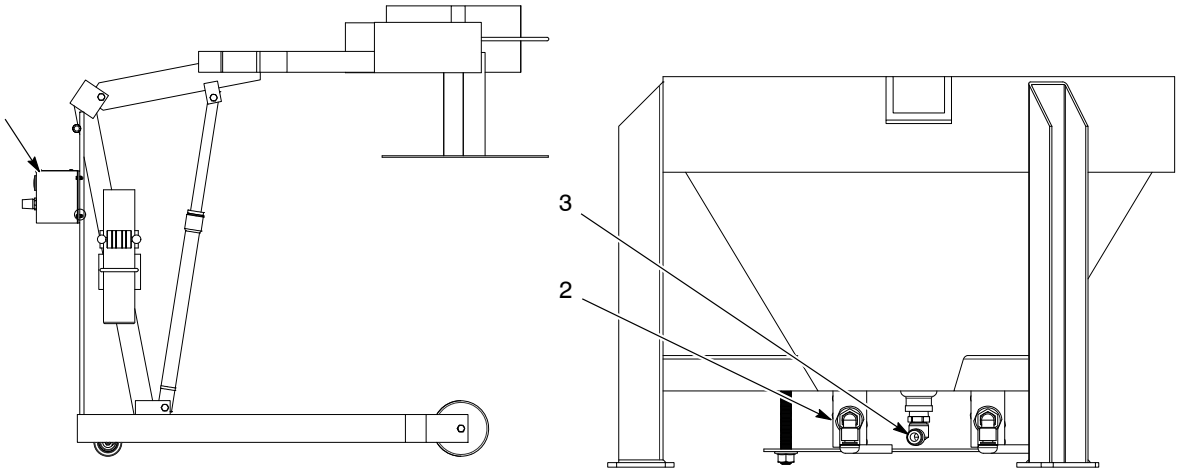


Figure 7-11 Bulk Unloader

Fluidizing Air Heater System Parts

See Figure 7-12. The parts shown here are for a typical 1.5 KW heater installation. Your system may be configured differently.

Item	Description	Quantity
1	HEATER, 1.5 KW	1
2	HOSE, braided steel, 3/8 in. I.D., 1/2 in. swivel ends	1
3	UNION, 3/4 in. NPT.	1
4	NIPPLE, close, 3/4 in. NPT	2
5	ELBOW, 90 degree, 3/4 in. NPT	1
6	TEE, 3/4 in. NPT	1
7	BUSHING, reducing, hex, 3/4 in. x 1/2 in. NPT	1
8	NIPPLE, close, 1/2 in. NPT	5
9	PLUG, 3/4 in. NPT	1
10	TEE, 1/2 in. NPT	1
11	COUPLING, reducing, 3/4 in. x 1/2 in. NPT	1
12	UNION, 1/2 in. NPT	1
13	REGULATOR, 1/2 in. NPT	1
14	PILOT VALVE, 1/2 in. NPT	1
15	VALVE, ball, 1/2 in. NPT	1
16	BRACKET, mounting, steel, 11 gauge	1
17	FITTING, barbed, 1/2 in. x 1/2 in. NPT	1
18	HOSE, 1/2 in. I.D., black	AR
19	CLAMP, hose, 3/4 in.	2
20	BUSHING, 1/2 in. x 1-1/2 in. NPT	1
21	COUPLING, 3/8 in. X 1/2–14 NPT female	1
22	NIPPLE, 3/8 in x 1/4–14 NPT male	1
23	ELBOW, street, 1/4 in.	1
24	BUSHING, reducing, 1/4 x 1/8 in.	1
25	GAUGE, 0–30 psi, 1/8 in.	1
26	ELBOW, 1/4 in. NPT x 6 mm tubing	1
27	TUBING, 6 mm poly	AR
28	RTD temperature sensor, 24 in.	1
29	RTD temperature sensor, 12 in.	1
AR: As Required		

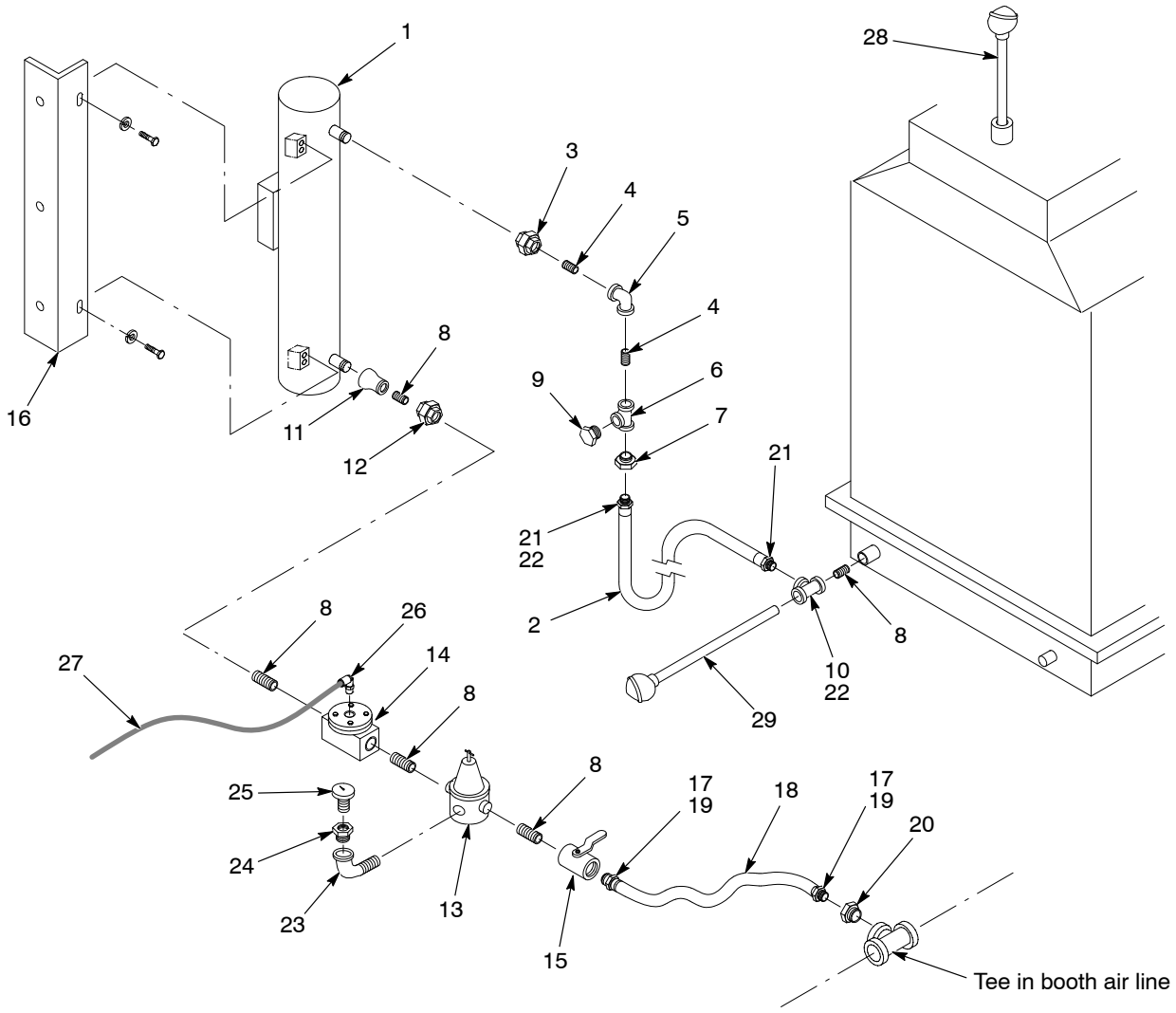


Figure 7-12 Typical 1.5 KW Heater Installation

Section 8
Specifications

NOTE: Equipment specifications are subject to change without notice due to continuing technological and quality improvements.

Operating Environment

Locate your powder coating system in a proper environment. If temperature and humidity in the spray room exceed the following ranges, you must install air conditioning equipment.

Temperature	21–27 °C (70–80 °F)
Humidity	45–55% RH

Utilities

Primary Electrical Service:
380 V, 3 phase, 50/60 Hz
200 V, 3 phase, 50/60 Hz
415 V, 3 phase, 50 Hz

The customer must install a fused disconnect switch with lock-out capability, wired in accordance with the National Electric Code, NFPA-70.

Compressed Air Supply: The air supply line must be 38-mm (1.5-in.) ID minimum. Supply air pressure must be 5.5–6.9 bar (80–100 psi). The air must be clean and dry.

Normal Design Standards

Systems are custom-designed to each customer's requirements, so some may deviate from these design standards. Contact your Nordson representative if you need more information about the design of your booth.

End Openings: 15.2 cm (6 in.) clearance on all four sides of the largest part.

Part Hanger Keyhole Slot: 45.7 cm (18 in.) high.

Cross Drafts: No more than 18.3 m/min (60 FPM).

Normal Design Standards *(contd)*

Average Face Velocity: No less than 30.5 m/min (100 FPM) through all openings in the booth enclosure.

Temperature of Parts Entering Booth: No more than 49 °C (120 °F).

Powder: Use commercially available powder coatings. Note that the characteristics and properties of a powder coating can affect system operation. Powder coatings generally have an average particle size of 25–35 microns, with no more than 10% of the total being less than 15 microns. When the percentage of particles less than 15 microns exceeds 10% of the total, the filter media can get clogged.

Cartridge Filters: Cartridge filters are considered wear items. The variables affecting the life expectancy of a cartridge filter include

- type of coating material
- particle size distribution
- humidity and temperature of the spray room air
- hours of operation
- dew point and cleanliness of the compressed air supply
- pressure and frequency of air pulses used to clean the filters

Compressed Air Supply: The air must be conditioned by a dedicated, refrigerated or regenerative-desiccant air dryer that can produce a 3 °C (38 °F) or lower dewpoint at 6.9 bar (100 psi).

Section 9

Pneumatic and Wiring Diagrams

PANEL,SYS CONTROL,PE BOOTH, 380V / 415V

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
1		777220	ENCLOSURE,1000 X 800 X 250		NORDSON	-----	1
2	DISC301	1104942	DISCONNECT SWITCH	Main Disconnect	SCHNEIDER	NSX100FTMD	1
3	DISC301	778264	HANDLE	Main Disconnect	SCHNEIDER	LV429338	1
4							
5	CB401	1104943	2 POLE, CIRCUIT BREAKER		SCHNEIDER	917215 C65N 2P B68A	1
6	T402	1104944	TRANSFORMER, 2KVA		SOLA HD	CE2000MH	1
7	CB404	1104945	CIRCUIT BREAKER	SYSTEM	SCHNEIDER	917202 C65N IP B63A	1
8	M407	777103	CONTACTER, IEC,3-P,N-REV,120V	EXHAUSTER STARTER	NORDSON	-----	1
9	M407	1104946	AUXILIARY CONTACT, 2NO TOP	EXHAUSTER STARTER	SCHNEIDER	LADN20C	1
10	OL407	1104947	OVERLOAD,IEC,3-P,FXD HTR	EXHAUSTER STARTER	SCHNEIDER	LRD32C	1
11	CR410	1104948	RELAY,CONTROL,10A,120V,DPDT	EXHAUSTER RUNNING	SCHNEIDER	RXM2AB1F7	1
12	CR410	1104949	RELAY BASE	EXHAUSTER RUNNING	SCHNEIDER	RXZE2M114	1
13	TRD508,512	1104950	RELAY, TIMER DELAY,8A,120V,MULTI	TRANSFER PUMP	SCHNEIDER	RE11LAMW	2
14	FU401,CB404,CR410,TDR 508	777232	DIN RAIL	TRANSFER PUMP	NORDSON	-----	0.5M
15	LT405	1104951	LIGHT, INDICATING,GREEN	SYSTEM READY	SCHNEIDER	XB4BV63	1
16	LT409	1104952	LIGHT, INDICATING,RED	FINAL FILTER WARNING	SCHNEIDER	XB4BV34	1
17	LT507,LT511	1104953	LIGHT,INDICATING,AMBER	TRANSFER PUMP "ON"	SCHNEIDER	XB4BV35	2
18	PBL407	1104954	PUSH, BUTTON,ILLUM,N.O. AMBER	EXHAUSTER "START"	SCHNEIDER	XB4BW3M1	1
19	PB407	1104955	PUSHBUTTON, N.C.,RED	EXHAUSTER "STOP"	SCHNEIDER	XB4BA42	1
20	SS505,511	1104956	SELECTOR SWITCH 3-POS	TRANS PUMP "MAN-OFF-AUTO"	SCHNEIDER	XB4BD33	2
21	PS407A/B	1104957	PRESSURE,SWITCH, DUAL SETPOINT	FINAL FILTER WARNING	SCHNEIDER	XMLB035A2S11	1
22	LT405,409,507;PB407;PBL407;SS507	1104958	NAMEPLATE HOLDER		ASI	GM34103	6
23	LT405,409,507;PB407;PBL407;SS508	1104959	NAMEPLATE(WHITE)		ASI	GM37091-2	6
24	SOL500,SOL506,510	1104960	VALVE SOLENOID	FLUIDAIR,TRAN PUMP,SAT TRAN	SMC	VQZ115-3L1-C6-PR	3
25	SOL500,SOL506,510	1104961	3 STATION CIRCUIT BAR	FLUIDAIR,TRAN PUMP,SAT TRAN	SMC	VV3QZ12-03C	1
26	SOL500,SOL506,510	1104963	MALE ELBOW	FLUIDAIR,TRAN PUMP,SAT TRAN	SMC	KQ2L06-01S	4
27	PS407;SOL500, 506 SOL,510	971778	BULKHEAD UNION		SMC	KQ2E06-00	5
28	PS407;SOL500, 506	900742	6MM POLY TUBING		SMC	TU0604	A/R
29		1104964	BREATHER VENT		SMC	AH103-01	1
30		777469	GROUND TERMINAL STRIP		NORDSON	-----	1
31	TB1	777232	DIN RAIL		NORDSON	-----	1.0M
32	TB1	777474	END ANCHOR		NORDSON	-----	2
33	TB1	777467	END SECTION		NORDSON	-----	1
34	TB1	777463	CONTROL, TERMINAL BLOCK 30A		SCHNEIDER	AB1AB8M35	44
35	TB1	777716	JUMPER, 2-POS		SCHNEIDER	AB1ALN42	
36	TB1	1104965	JUMPER, 10-POS		SCHNEIDER	AB1ALN410	
37		7400799	WIREDUCT 1.5" X 3" W/COVER		NORDSON		
38		7400801	WIREDUCT 1" X 3" W/COVER		NORDSON		
39		226710	LABEL,CAUTION,CONTROL PANEL		NORDSON		
40		246950	DECAL,NORDSON TRADEMARK		NORDSON		
41		226709	LABEL,WARNING,CONTROL PANEL		NORDSON		
42		1105958	LABEL SET,CHINA,SYS CONTR PANEL,PE BOOTH		NORDSON		

1104451 KIT, SIEVE

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
141	M412	777714	CONTACTOR,IEC,3-P,N-REV,120V	SIEVE "START"	NORDSON	-----	1
142	MCB309	777281	CIRCUIT BREAKER		NORDSON	-----	1
143	MCB309	777301	AUXILIARY CONTACT		NORDSON	-----	1
144	LT413	1104953	LIGHT,INDICATING,AMBER	SIEVE "ON"	SCHNEIDER	XB4BV35	1
145	PBL414	1104954	PUSHBUTTON,ILLUM,N.O., AMBER	NON-RECLAIM TRANS "ENABLE"	SCHNEIDER	XB4BWSM1	1
146	LT413,PBL414	1104958	NAMEPLATE HOLDER		SCHNEIDER	GM34103	2
147	LT413,PBL414	1104959	NAMEPLATE (WHITE)		SCHNEIDER	GM37091-2	2
148	CR414	1104948	RELAY,CONTROL,10A,120V,DPDT	NON-RECLAIM TRANSFER "ON"	SCHNEIDER	RXZE2M114	1
149	CR414	1104949	RELAY BASE		SCHNEIDER	RE11RMMU	1

1104449 KIT, EXHAUSTER w/o VFD

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
101	MCB306	780427	CIRCUIT BREAKER,GV3,65AMP	EXHAUSTER w/o VFD	SCHNEIDER	GV3ME65	1
102	OL407	1104947	OVERLOAD,IEC,3-P,FXD HTR		SCHNEIDER	LRD32C	1

1104450 KIT, EXHAUSTER with VFD

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
121	MCB306	780427	CIRCUIT BREAKER,GV3,65AMP		SCHNEIDER	GV3ME65	1
122	VR302	1104968	POTENTIOMETER	MOTOR SPEED CONTROL	SCHNEIDER	ZB4BD912	1
123	VR302	1104958	NAMEPLATE HOLDER		ASI	GM34103	1
124	VR302	1104959	NAMEPLATE (WHITE)		ASI	GM37091-2	1

1104452 KIT, ROTARY AIR LOCK

ITEM NO.	REF	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
171	M411	777714	CONTATCTOR,IEC,3-P,N-REV,120V,7A	ROTARY AIR LOCK	SCHNEIDER	LC1D09F7C	1
172	MCB330	777298	CIRCUIT BREAKER		SCHNEIDER	GV2ME04	1
173	MCB330	777301	AUXILIARY CONTACT		SCHNEIDER	GVAD0110	1

1104453 KIT, OSCILLATOR #1 & #2 - 3PH

ITEM NO.	REF	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
191	M416,M419	777714	CONTACTOR,IEC,3-P,N-REV,120V	OSCILLATOR 1 & 2	SCHNEIDER	LC1D09F7C	2
192	OL416,OL419	1104947	OVERLOAD,IEC,3-P,FXD HTR		SCHNEIDER	GV2ME10C	2
193	PBL416,PBL419	1104954	PUSHBUTTON,ILLUM,N.O., AMBER		SCHNEIDER	XB2BW3*M1C	2
194	PB416,PB419	1104955	PUSH BUTTON, N.C. RED		SCHNEIDER	XB2BA*2C	2
195	PBL416,PBL419	1104958	NAMEPLATE HOLDER		SCHNEIDER	ZB2BZ33	2
196	PB416,PB419	1104959	NAMEPLATE (WHITE)		SCHNEIDER	ZB2BZ34	2

1104455 KIT, FLUIDIZING BED HEATER

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
221	CB336	1104945	CIRCUIT BREAKER	AIR HEATER	SCHNEIDER	917215 C65N 2P B63A	1
222	CN428	777103	CONTACTOR,IEC,3-P,N-REV,120V		SCHNEIDER	LC1K0910G7	1
223	LT429	1104953	LIGHT,INDICATING,AMBER		SCHNEIDER	XB4BV35	1
224	SS428	1104970	SELCTOR SWITCH,2 POS,1 NO		SCHNEIDER	XB4BZ21	1
225	LT429,SS428	1104958	NAMEPLATE HOLDER		GENERAL MARKING	GM34103	2
226	LT429,SS428	1104959	NAMEPLATE (WHITE)		GENERAL MARKING	GM37091-2	2
227	TB1	777463	CONTROL TERMINAL BLOCK, 30A		SCHNEIDER	AB1AB8M35	10
228	TC430	1104979	TEMPERATURE CONTROLLER		OMEGA	CNi1642	1
229	TI430	1105000	TEMPERATURE INDICATOR		OMEGA	DPi16	1
230	SSR336	1105001	SOLID STATE RELAY		CRYDOM	D4825	1

1104456 KIT, RTD JUNCTION BOX

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
251		1104971	6 X 4 X3 ENCLOSURE WITH SUB-PANEL	RTD JUNCTION BOX	SCHNEIDER	NBI15158S	1
252	TB1	777463	CONTROL TERMINAL BLOCK,30A		SCHNEIDER	AB1AB8M35	8
253	TB1	777474	END PLATE		SCHNEIDER	AB1AC24	1
254	TB1	777467	END STOP		SCHNEIDER	AB1W435U	2
255	TB1	777232	DIN RAIL		SCHNEIDER	AM1DP200	0.15M
256	RTD433	1104972	PLUG,TWIST LOCK		HUBBELL	7432	1
257	RTD433	1104973	FLANGED RECEPTICAL,TWIST LOCK		HUBBELL	7487	1
258	RTD438	1104974	CONNECTOR BODY,TWIST LOCK		HUBBELL	7433	1
259	RTD438	1104975	FLANGED INLET,TWIST LOCK		HUBBELL	7486	1
260	RTD433	1104977	RTD TEMPERATURE SENSOR, 12"		OMEGA	PR14-2-100-12-1/4-E	1
261	TRD438	1104978	RTD TEMPERATURE SENSOR, 24"		OMEGA	PR14-2-100-24-1/4-E	1

1104454 KIT, BOOTH LIGHTS

ITEM NO.	REF.	NORDSON P/N	DESCRIPTION	FUNCTION	MANUFACTURER	MANUFACTURER PART NUMBER	QTY
201	CN514	777103	CONTACTOR,3POLE,12A,110-127V	BOOTH LIGHTS	SCHNEIDER	LC1K0910G7	1
202	SS514	1104969	SELCTOR SWITCH,3 POS,2 NO		SCHNEIDER	XB4BD33	1
203	SS514	1104958	NAMEPLATE HOLDER		ASI	GM34103	1
204	SS514	1104959	NAMEPLATE (WHITE)		ASI	GM37091-2	1

SYSTEM INFORMATION			
VOLTS: 380	AMPS: 39.0	S.O.:	-

	ITEM	HP/KVA
X	EXHAUSTER	20 HP
X	SIEVE	1 HP
X	OSCILLATOR	1.5 HP
X	ROTARY AIR LOCK	.33 HP
	BED HEATER	1.5 KW
X	TRANSFORMER	2 KVA

TOTAL CURRENT CALC. CHART		
	380V	
1/6 HP	.6	①
1/2 HP	1.5	
1 1/2 HP	4.3	①
X QTY		
3 HP (504)	5.8	
15 HP (XL2001)	29.4	
20 HP (XL2002)	37.8	
25 HP (XL2003)	47.6	
30 HP (XL2003)	-	
2.0KVA TRANX	5.2	①
= TOTAL CURRENT		

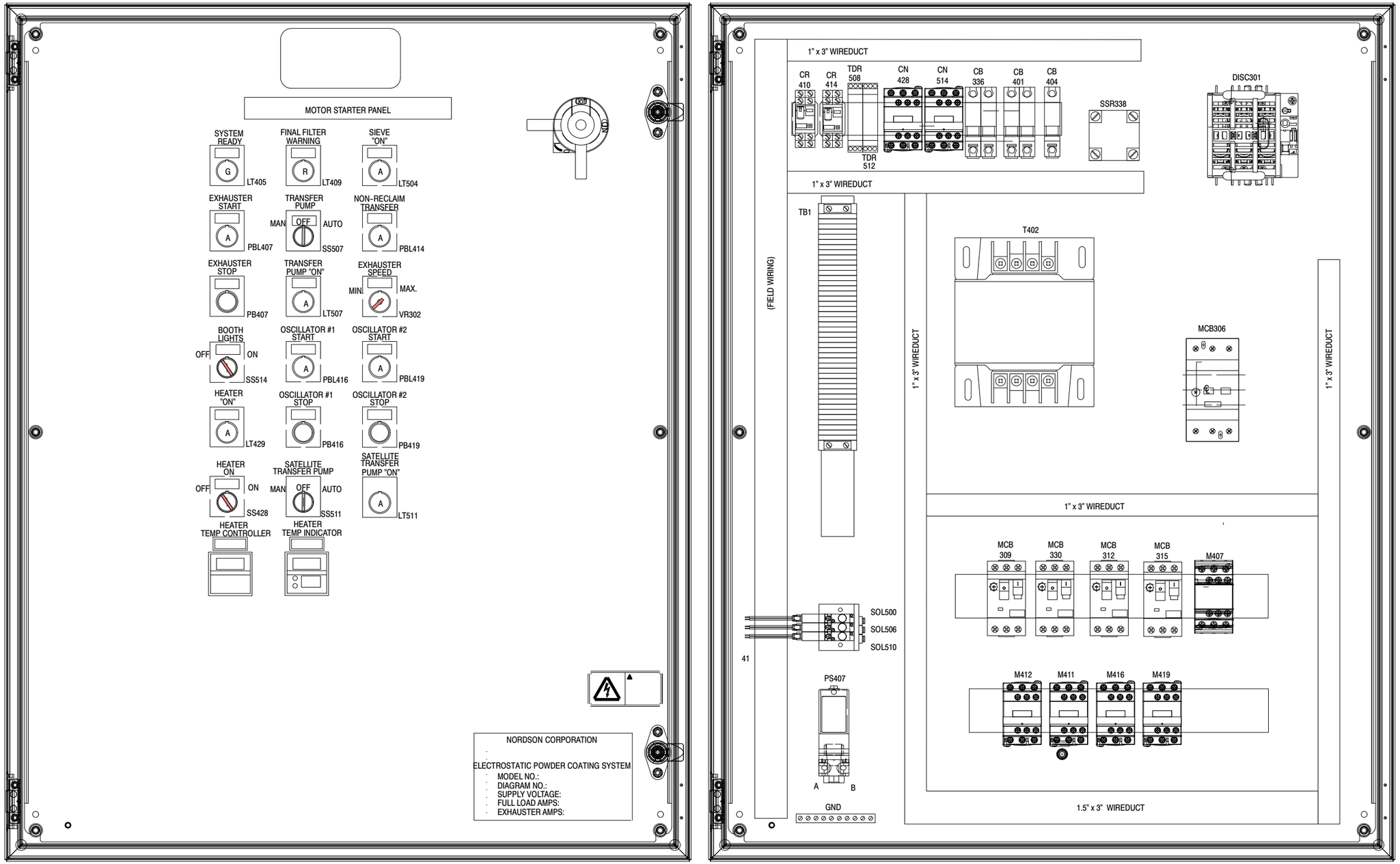
NOTES:

① INDICATES OPTIONAL EQUIPMENT

② ALL PHASES OF INSTALLATION MUST COMPLY WITH ALL FEDERAL, STATE AND LOCAL CODES. ALL WORK LOCATED IN CLASS 2, DIVISIONS 1 AND 2 HAZARDOUS LOCATIONS MUST COMPLY WITH NFPA CODE 33 AND NFPA CODE 70, ESPECIALLY ARTICLES 500, 502 AND 516, LATEST EDITIONS.

③ UL 508

Figure 9-1 Motor Starter Control Panel (1 of 7)



TERMINAL BLOCK LAYOUT

TB1

3020
3021
3022
SHLD
4031
4031
4031
4031
4031
4031
4050
4051
4052
4053
4054
4055
4073
4080
4080
4080
4080
4100
4101
4121
4280
4281
4330
4331
4340
GRD
4380
4381
4390
5060
5061
5080
5100
5101
5120
5121
5161
5161
5250
BLANK

Figure 9-2 Motor Starter Control Panel (2 of 7)

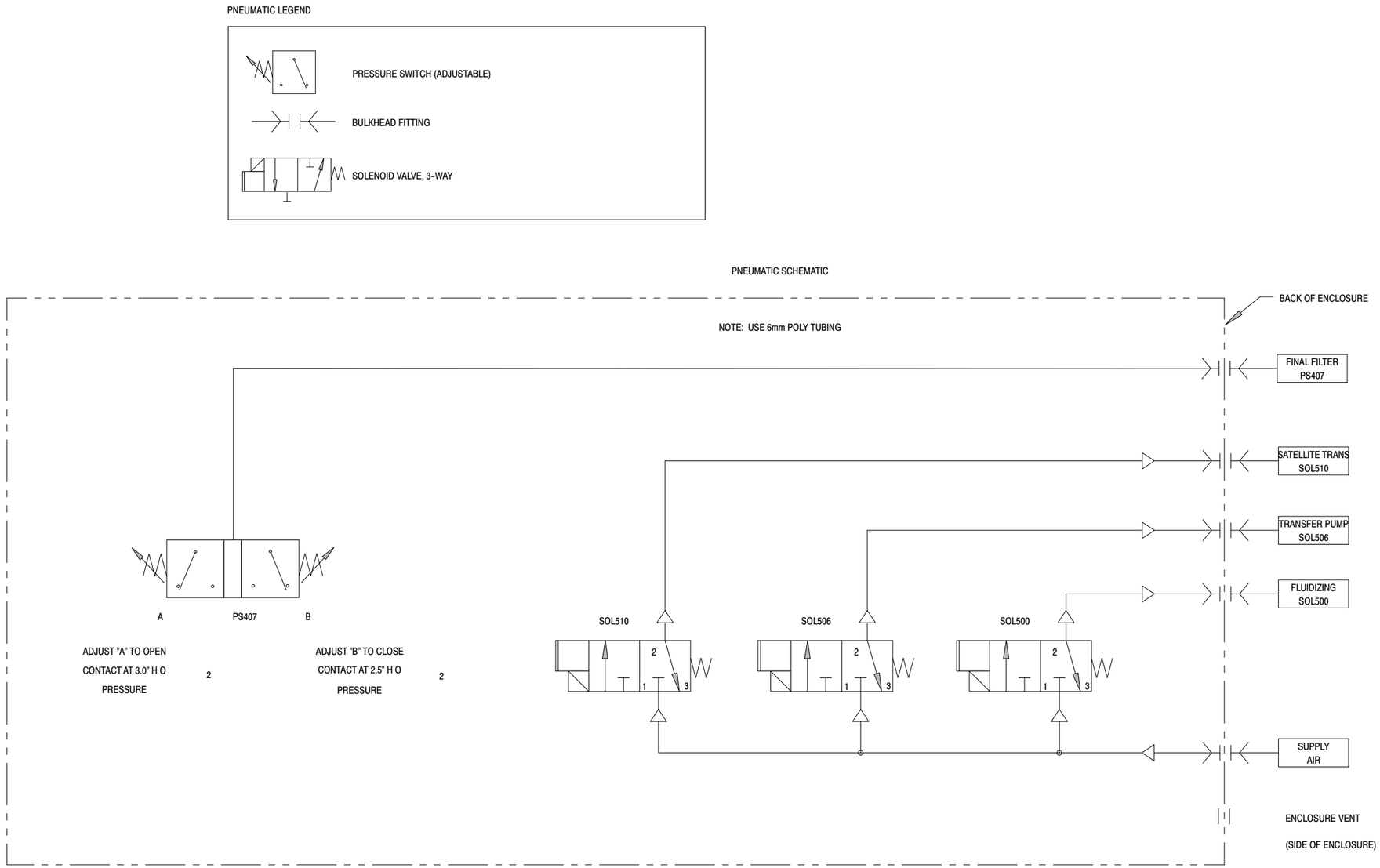


Figure 9-3 Motor Starter Control Panel (3 of 7)

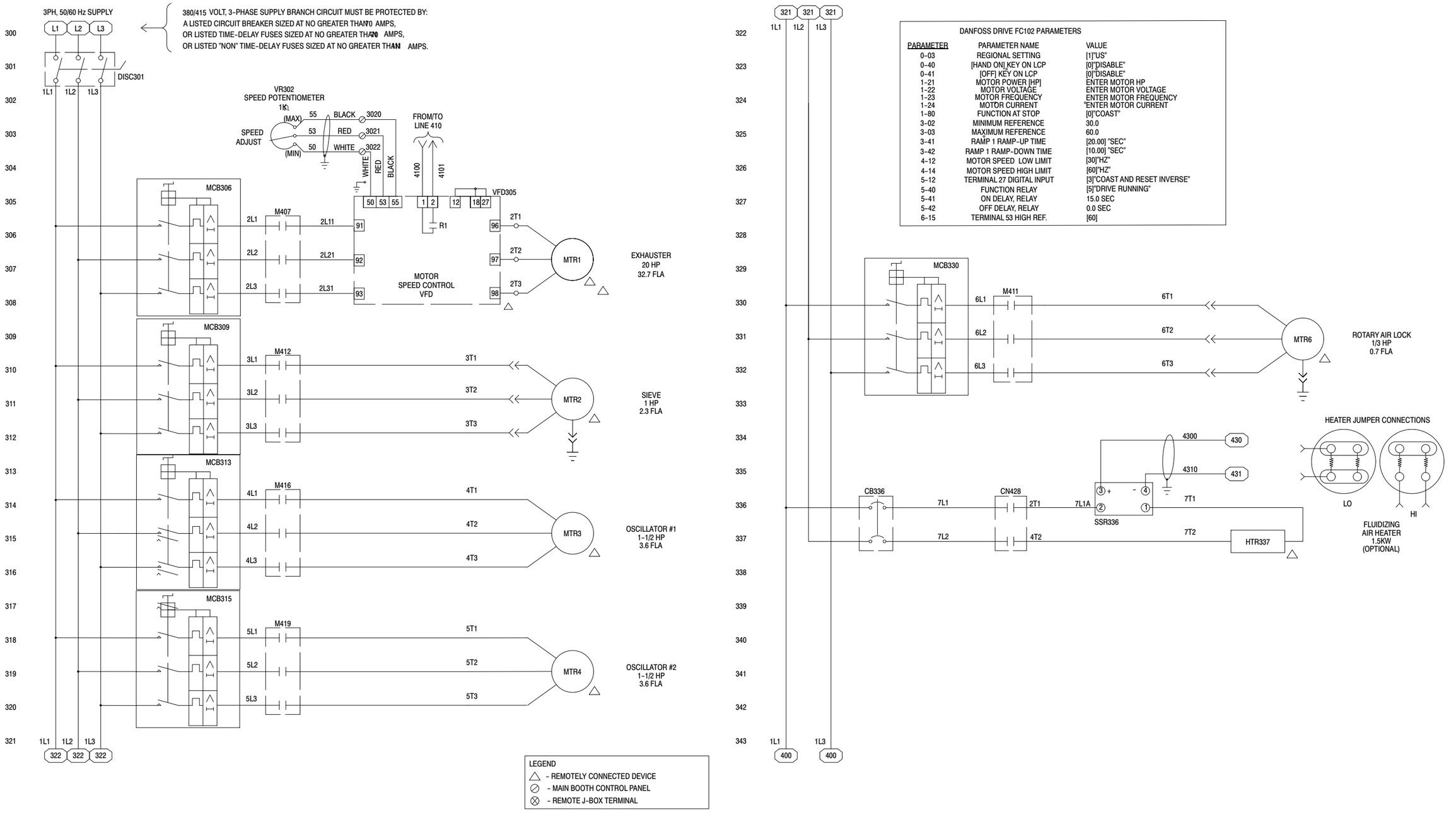
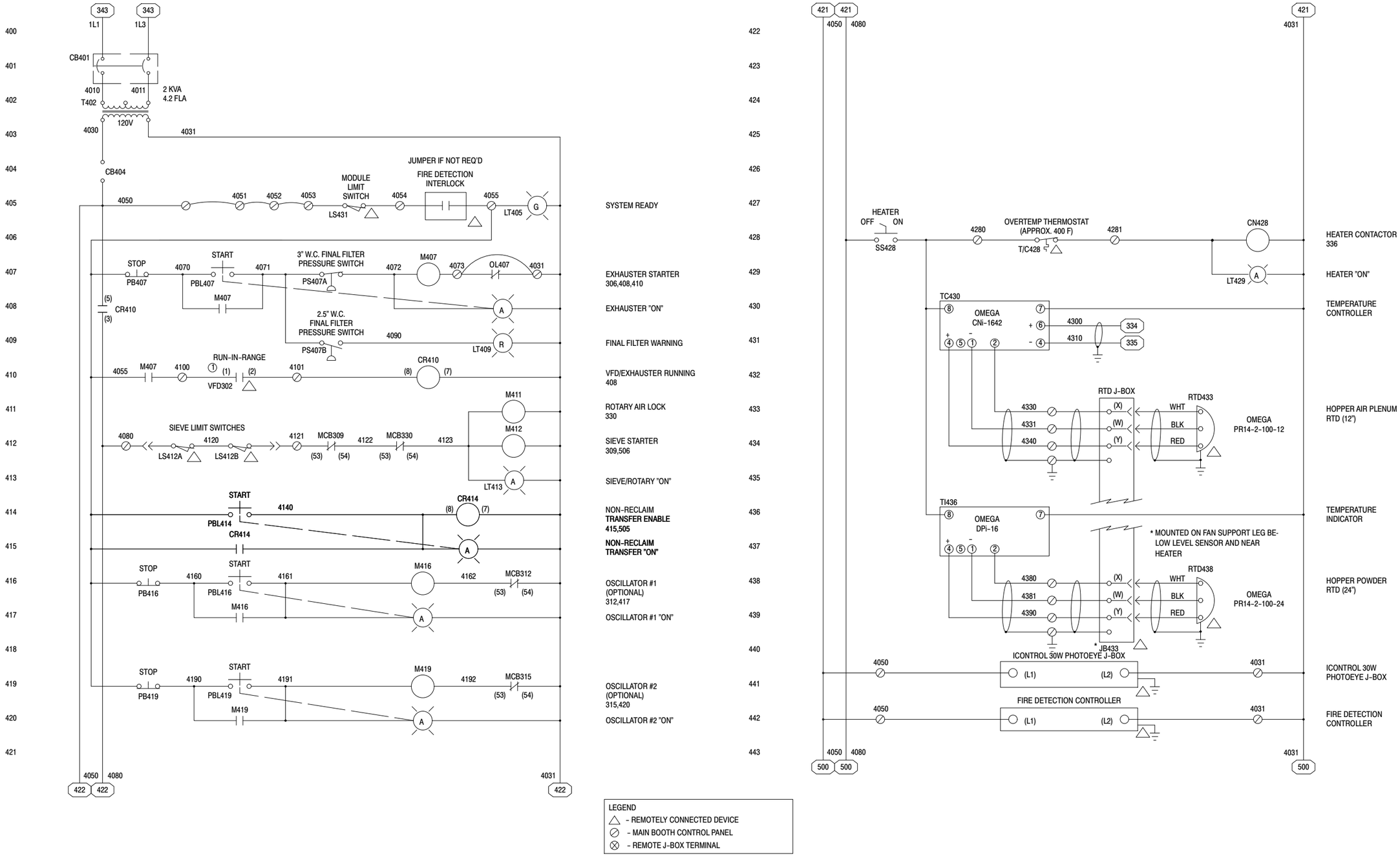


Figure 9-4 Motor Starter Control Panel (4 of 7)



LEGEND
△ - REMOTELY CONNECTED DEVICE
⊘ - MAIN BOOTH CONTROL PANEL
⊗ - REMOTE J-BOX TERMINAL

Figure 9-5 Motor Starter Control Panel (5 of 7)

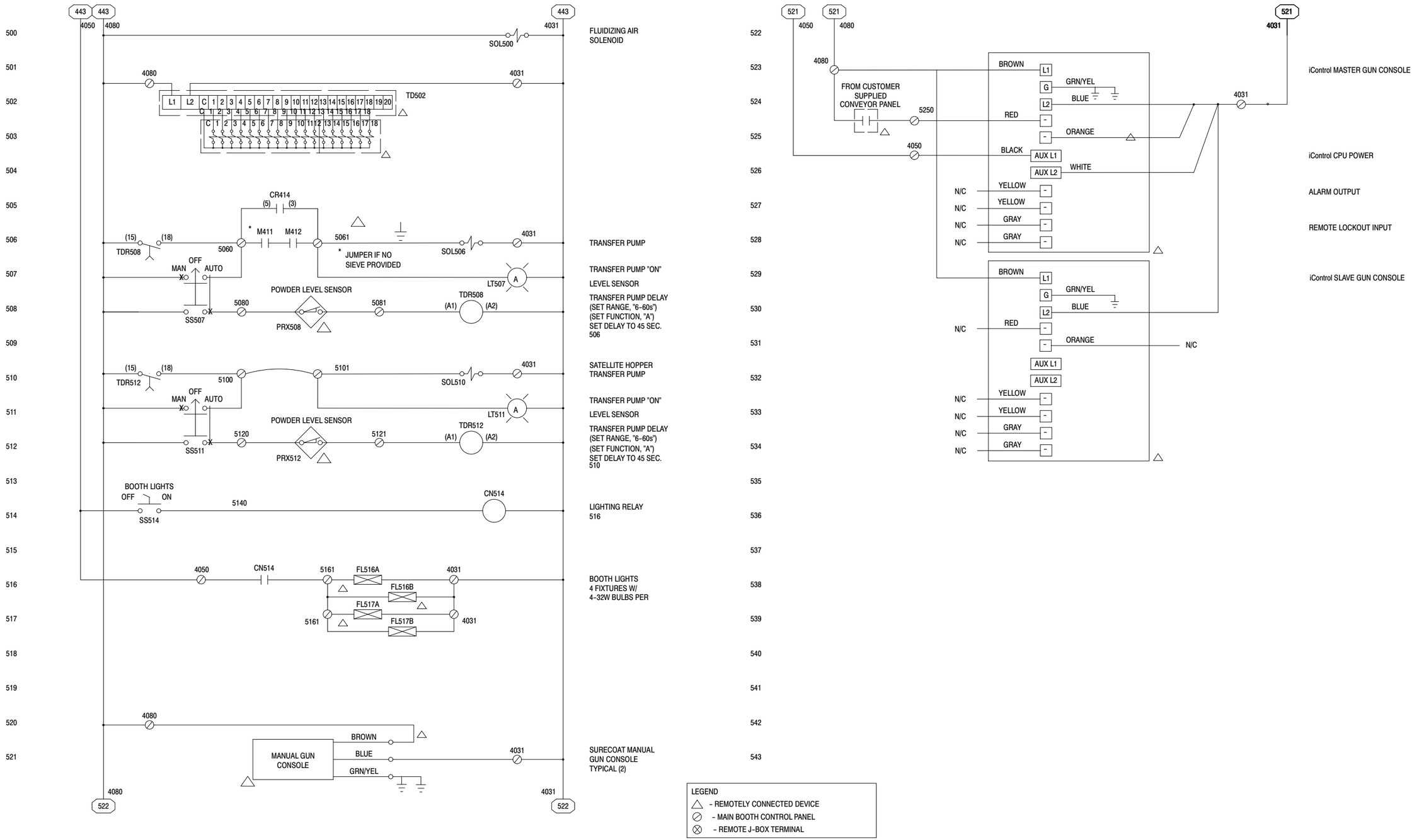
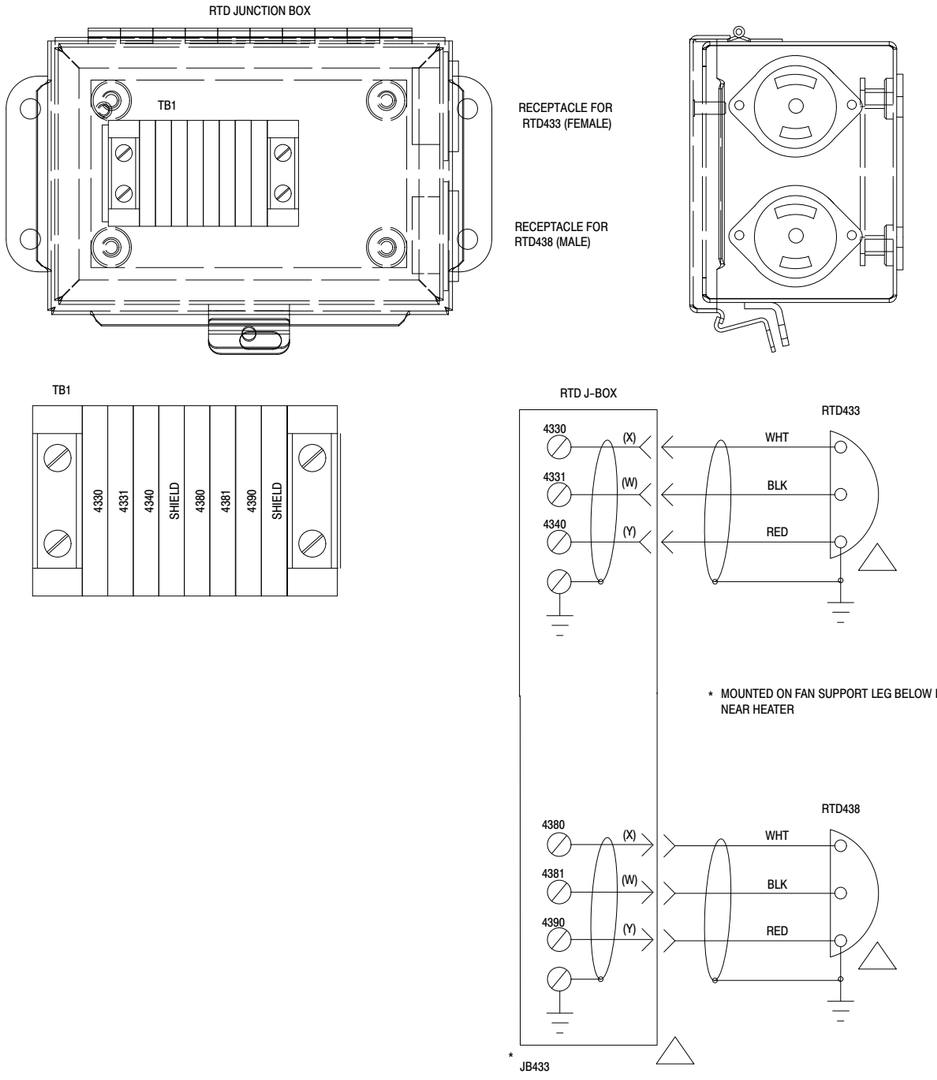


Figure 9-6 Motor Starter Control Panel (6 of 7)



RTD JUNCTION BOX				
	1	6 X 4 X 3 ENCLOSURE W/ SUB-PANEL	NBI15158S	SCHNEIDER
TB1	8	CONTROL TERMINAL BLOCK, 30A	AB1AB8M35	SCHNEIDER
TB1	1	END SECTION	AB1AC24	SCHNEIDER
TB1	2	END ANCHOR	AB1W435U	SCHNEIDER
TB1	.15M	DIN RAIL	AM1DP200	SCHNEIDER
RTD433	1	TWISTLOC CONNECTOR	7432	HUBBELL
RTD433	1	TWISTLOC RECEPTACLE	7487	HUBBELL
RTD438	1	TWISTLOC CONNECTOR	7433	HUBBELL
RTD438	1	TWISTLOC RECEPTACLE	7486	HUBBELL
RTD433	1	RTD TEMPERATURE SENSOR, 12"	PR14-2-100-12-1/4-E	OMEGA
RTD438	1	RTD TEMPERATURE SENSOR, 24"	PR14-2-100-24-1/4-E	OMEGA

Figure 9-7 Motor Starter Control Panel (7 of 7)