

# Excel 2000<sup>®</sup> Series Powder Coating System

Customer Product Manual

Part 106641H03

Issued 4/09

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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 Excel 2001, 2002, and 2003 powder coating systems. 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.

**NOTE:** For systems manufactured after 2003, refer to the supplement included with this manual for information on updates to the electrical panel, wiring diagrams, and color module.

## 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 basic, manually operated system. Your system may have equipment not described in this manual, such as automatic gun triggering and air management systems. Before operating your system, please read the manuals for all equipment not covered in this manual.

The system can be permanently located under the conveyor, or mounted on casters and rails (roll-on/roll-off system). A roll-on/roll-off system has rails and casters added, to allow it to be moved off-line for powder changes or maintenance. The illustrations in this section show a roll-on/roll-off system.

Figure 2-1 illustrates the operation of the typical system. Figures 2-2, 2-4, and 2-5 shows the locations of the components in a typical system.

## System Operation

See Figure 2-1.

### ***Powder Application***

A porous fluidizing plate in the bottom of the feed hopper (12) diffuses low-pressure compressed air into the powder supply. The air fluidizes the powder so it can be pumped to the spray guns. The fluidizing air flows into the color module (18) through a vent duct. In the color module, the cartridge filters separate powder dust from the fluidizing air.

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.

### ***Powder Recovery and Reclaim***

An exhaust fan (5) pulls spray-room air into the enclosure (2), through the cartridge filters (4) and color module, and into the fan section (6). The air returns to the spray room through the final filters (8), free of all powder. The fan damper (7) controls the volume of air flowing through the booth.

Most of the oversprayed powder remains suspended in the air flowing through the enclosure to the cartridge filters. The powder 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 transfer pumps (17) pump the reclaimed powder through the transfer hoses (15) to the accumulator (10) on top of the sieve (11). 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 rest of the reclaimed powder falls into the feed hopper. A vent tube connects the accumulator to the color module. Venting prevents the transfer pump air from blowing the powder through the sieve screen and into the scrap bucket.

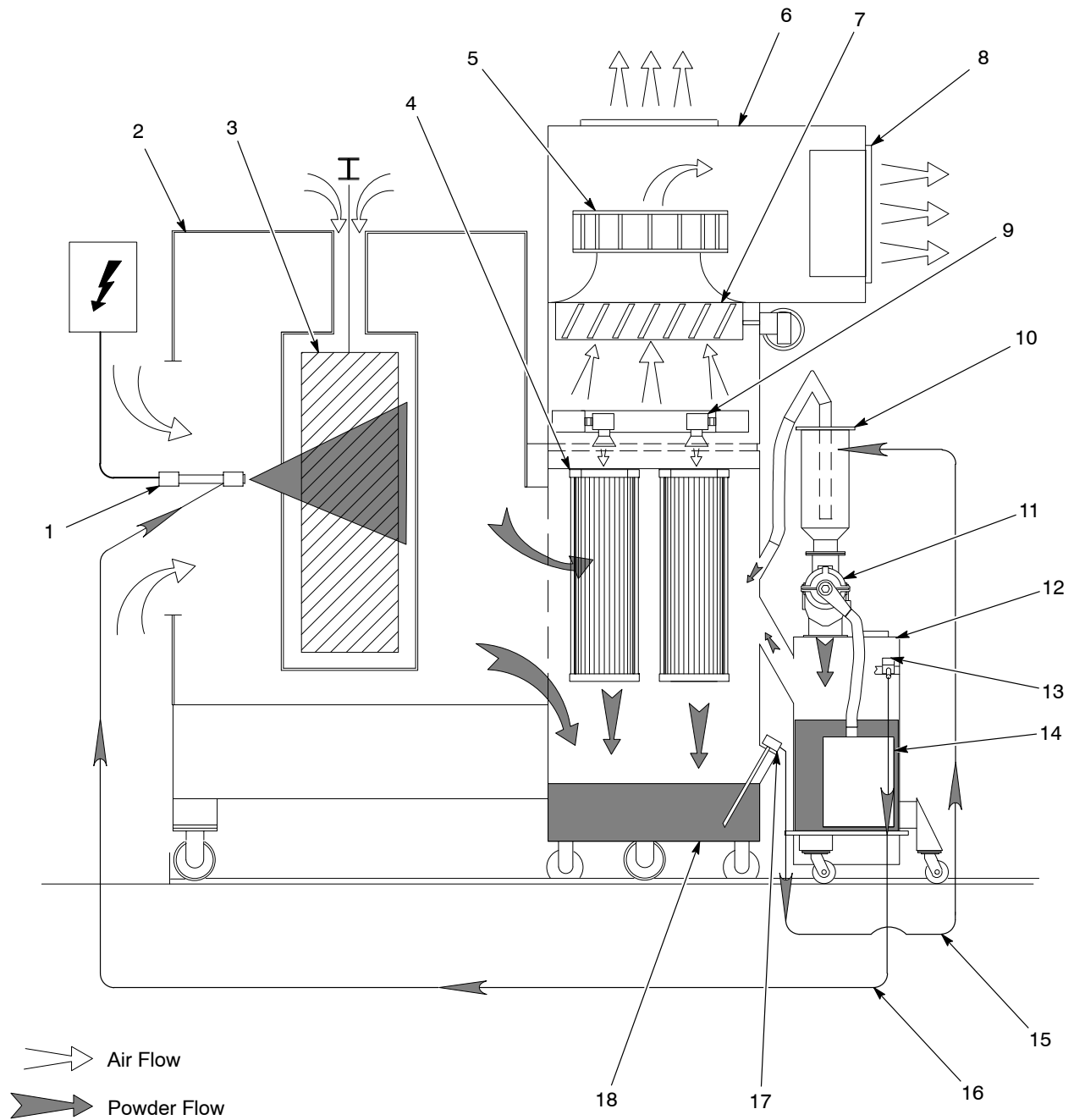


Figure 2-1 System Operation

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

# System Equipment

## *Recovery and Reclaim 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. It has a conveyor slot in the roof; exit and entry vestibules; slots for automatic spray guns; and openings and doors in the sides for manual spray gun operators. The color module is attached to a large opening in one side.
2	Fan section	Houses the exhaust fan, motor, and optional fan damper; cartridge filter pulse valves and manifold; and final filters. A pneumatic seal provides an air-tight seal between the fan section and the color module.
3	Color module	Houses cartridge filters; fluidizing plates and plenums; and transfer pumps. Oversprayed powder accumulates in hoppers in the bottom of the module.
4	Accumulator and sieve	Collect and screen the powder returned to the feed hopper from the color module. Powder particles and clumps too large to pass through the sieve screen are discarded. A vent tube and hose connect the accumulator to the color module.
5	Transfer pumps	Convey the reclaimed powder from the color module hoppers to the accumulator. A switch on the electrical panel controls pump operation.
NS	Booth base	Supports the enclosure and provides mounting points for the powder inlet frame, fan section support legs, operator platform, and other equipment. The base houses most of the system's electrical wiring and pneumatic plumbing.
NS: Not Shown		

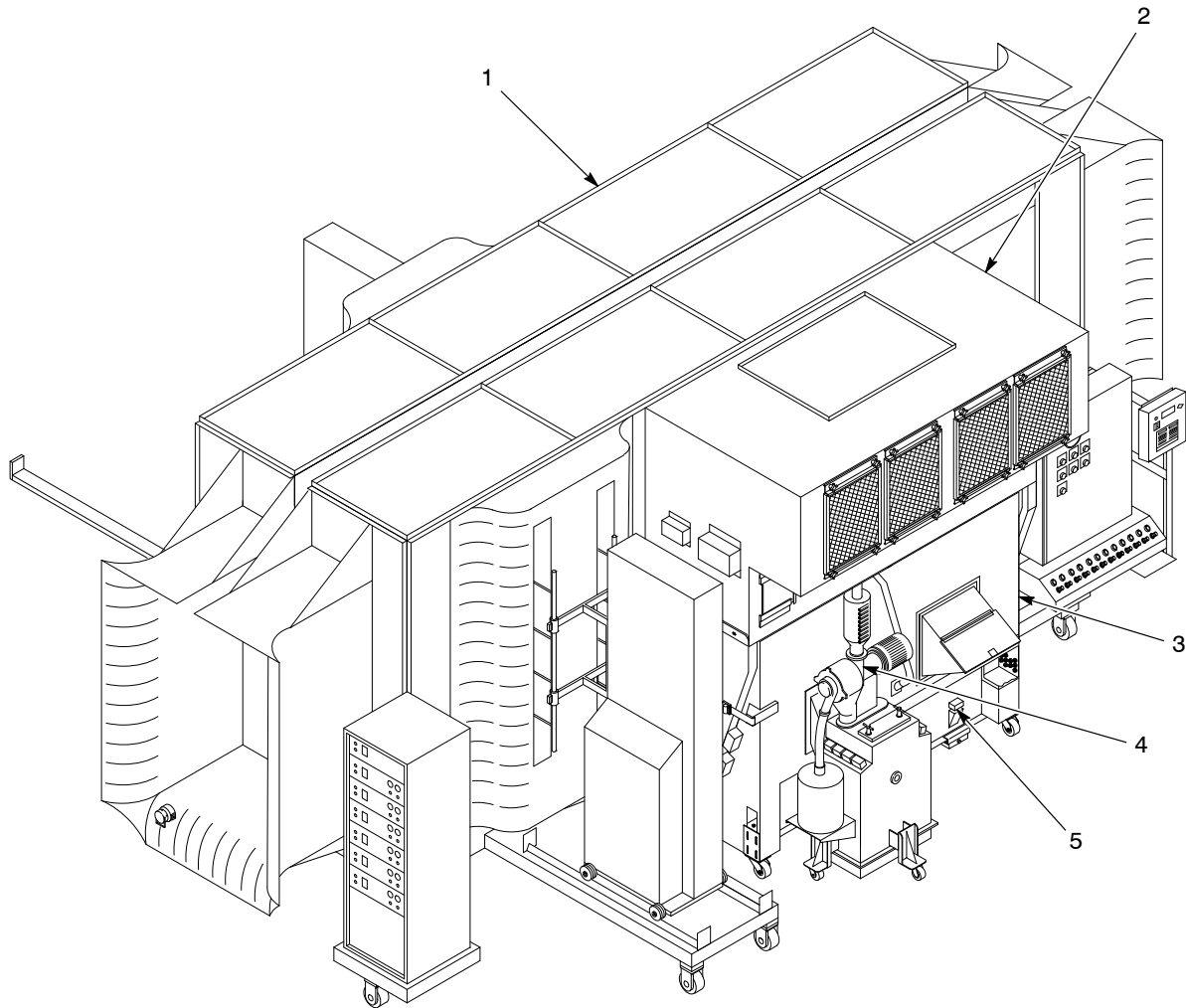


Figure 2-2 Recovery and Reclaim Equipment

1. Booth enclosure  
2. Fan section

3. Color module  
4. Accumulator and sieve

5. Transfer pumps

## Color Module

Table 2-2 and Figure 2-3 describe a typical color module.

Table 2-2 Color Module Components

Item	Equipment	Description
1	Color module	Houses cartridge filters; fluidizing plates and plenums; and transfer pumps. Oversprayed powder accumulates in hoppers in the bottom of the module.
2	Feed Hopper	Stores and fluidizes the powder supply for automatic and manual spray guns.
3	Load Chute (Optional)	Allows virgin powder to be loaded into the color module instead of the feed hopper.
4	Quick Disconnect Plates	Allow for quick connection of tube fittings to the compressed air supply.
5	Adjustable Casters	Allow for easy leveling of the module.
6	Accumulator and sieve	Collect and screen the powder returned to the feed hopper from the color module. Powder particles and clumps too large to pass through the sieve screen are discarded. A vent tube and hose connect the accumulator to the color module.
7	Transfer pumps	Convey the reclaimed powder from the color module hoppers to the accumulator. A switch on the electrical panel controls pump operation. A maximum of two transfer pumps are included on the color module.
8	Cartridge Filters	Filter the oversprayed powder from the air before the air returns to the spray area.
9	Fluidizing Plate	Fluidizes the powder at the bottom of the color module so it can be pumped back to the feed hopper or to scrap.



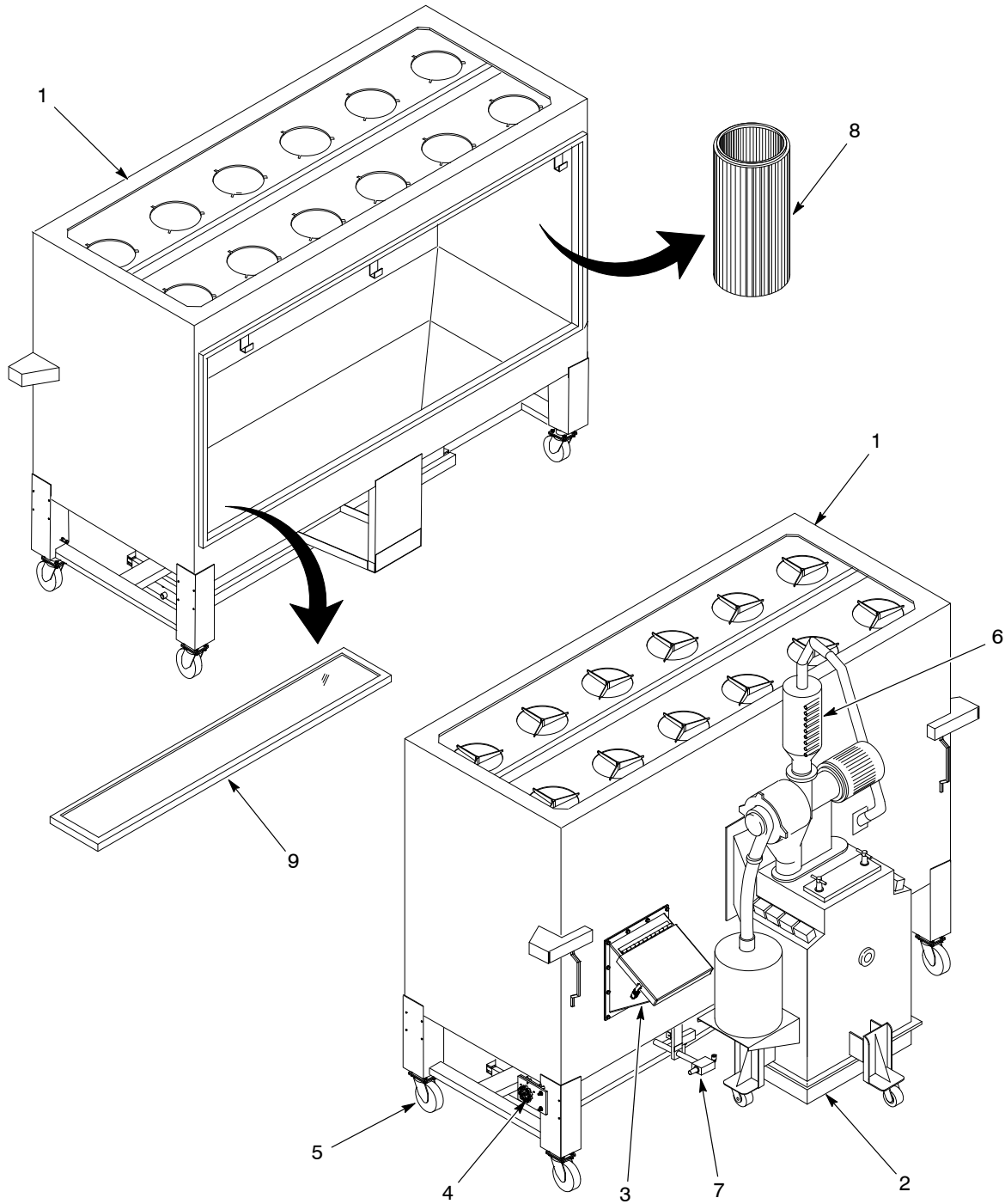


Figure 2-3 Color Module Components

## System Controls

Refer to Table 2-3 and Figure 2-4.

Table 2-3 System Controls

Item	Equipment	Description
1	Flame detector indicator/relay panel	Provides visible and audible fault and fire alarms and process shutdown relays. If a detector senses a flame, the interlock relays shut down the conveyor, booth exhaust fan, compressed air, and electrical power to the spray guns. ANSI/NFPA-33 standards require flame detectors in all systems equipped with automatic spray guns.
2	Motor Starter Panel	Houses motor starters and overload protectors; transformers; interlock relays; the final filter differential-pressure switches; and basic system controls and indicator lights. A programmable controller can be installed in the panel.
3	Pneumatic panel	Houses air-pressure regulators and gauges for the feed hopper, color module, transfer pumps, and other pneumatic equipment.
4	Fan damper control	Adjusts the fan damper to control air flow through the enclosure.
5	Pulse air controls	Regulate the pulse air pressure and volume. Controls include a regulator, pressure gauge, and gate valve.
6	Differential pressure gauge	Monitors the air pressure drop across the cartridge filters. A warning light on the electrical control panel will light when the filters start to clog. The system will shut down when the clogging reaches a critical level.
7	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.
8	Flame detectors	Monitor the enclosure (booth) interior for flames. The detectors use IR sensing technology and provide through-the-lens self test to check for powder build-up.
9	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.

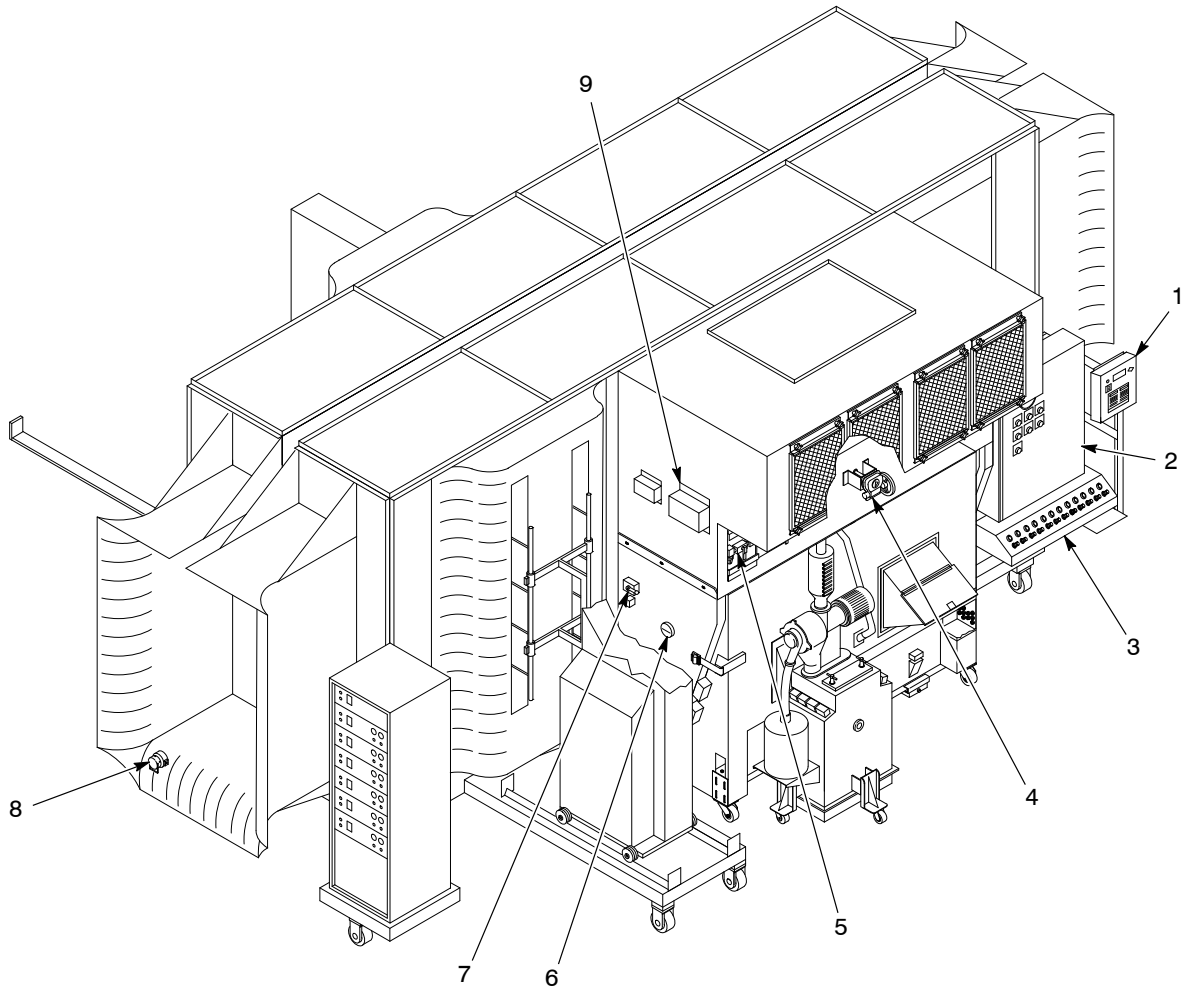


Figure 2-4 System Controls

- |   |                                |                                 |
|---|--------------------------------|---------------------------------|
| 1. Flame detector indicator/relay panel | 4. Fan damper control          | 7. Pneumatic seal control valve |
| 2. Electrical panel                     | 5. Pulse air controls          | 8. Flame detectors              |
| 3. Pneumatic panel                      | 6. Differential pressure gauge | 9. Pulse valve timer panel      |

## Application Equipment

Refer to Table 2-4 and Figure 2-5.

Table 2-4 Application Equipment

Item	Equipment	Description
1	Automatic spray guns	Electrostatically charge powder particles and spray them toward the grounded workpieces.
2	Automatic gun control units	Control air pressure to the powder pumps and generate or control the electrostatic voltage. One gun control unit is required for each spray gun. Cabinets house gun control units, a master control unit, and air supply controls.
3	Powder pumps	Supply spray guns with powder from the feed hopper. One pump is used for each spray gun.
4	Feed hoppers	Store and fluidize the powder supply for automatic and manual spray guns.
5	Feed-hopper level sensor	Monitors the level of powder in the feed hopper. When transfer pump controls are set to AUTO, the level sensor will turn on the transfer pumps when the level of powder falls below the sensor.

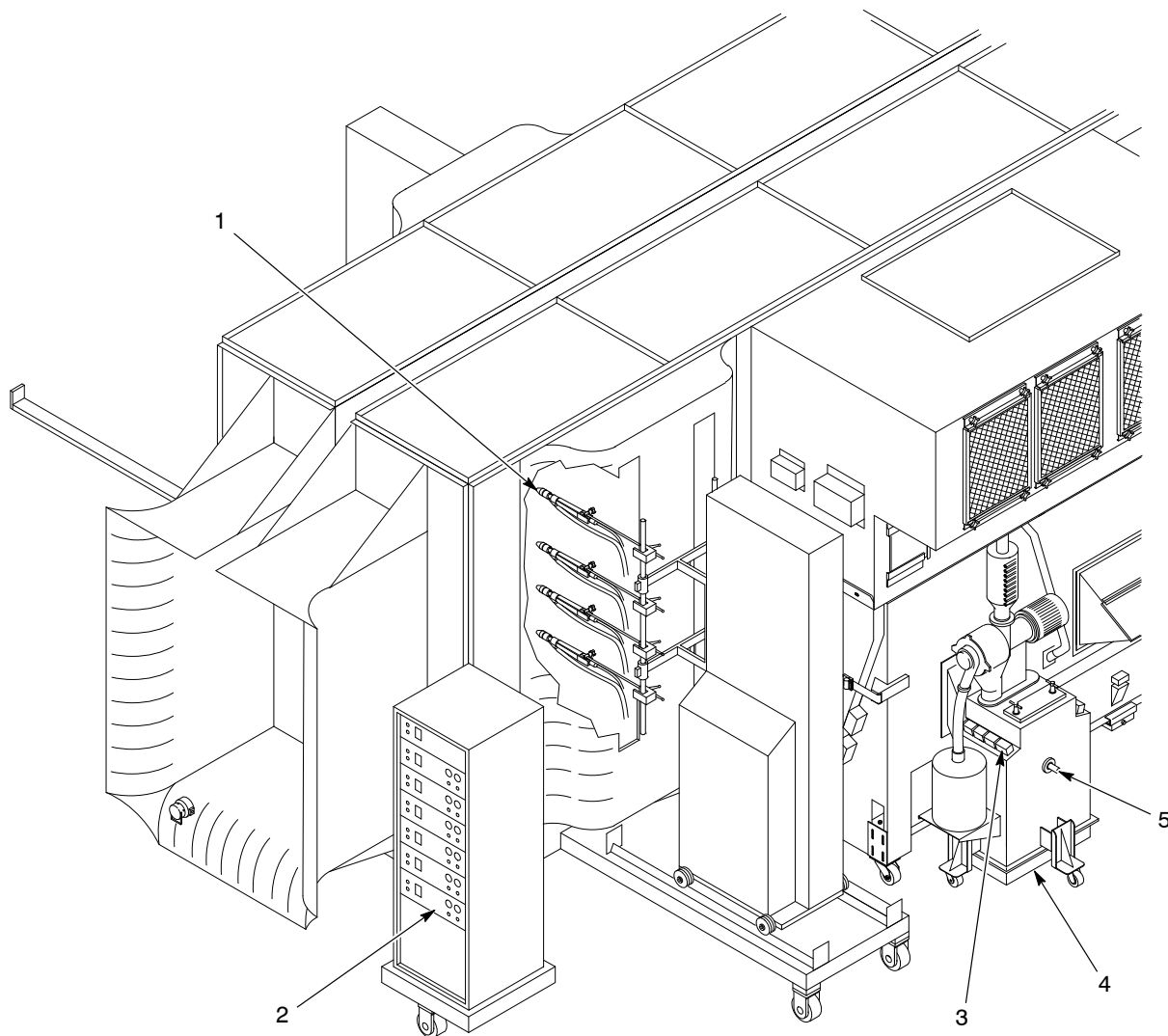


Figure 2-5 Application Equipment

- |                                |                 |                             |
|--------------------------------|-----------------|-----------------------------|
| 1. Automatic spray guns        | 3. Powder pumps | 5. Feed-hopper level sensor |
| 2. Automatic gun control units | 4. Feed hoppers |                             |

## Typical System Options

Refer to Table 2-5 and Figure 2-6. Contact your Nordson Corporation representative for further information on these and other options.

Table 2-5 Typical System Options

Item	Equipment	Description
1	Air dryer	Removes moisture from the system air supply. Most systems use regenerative-desiccant or refrigerated air dryers.
2	Gun mover	Uses oscillators or reciprocators to move automatic spray guns in a repetitive pattern for better workpiece coverage.
3	Powder drum unloaders	Transfer powder from drums to feed hoppers or color modules.
4	Quick color change equipment	Consists of additional color modules; feed hoppers; sieves and accumulators. These contain different powders for quick changes.
5	Load chute	Allows virgin powder to be loaded into the color module instead of the feed hopper.
NS	Roll on/roll-off equipment	Move the booth and attached equipment on and off the conveyor line. Manual and powered equipment movers are available.
NS	Automation systems	Identify and track parts on the conveyor line; and control automatic-spray gun movement, triggering, air pressure, and voltage. These systems gather data on system operation and malfunctions and generate reports.
NS	Air management system	Automatically controls air flow through the booth, using a variable-speed motor control and pressure sensors.
NS: Not Shown		

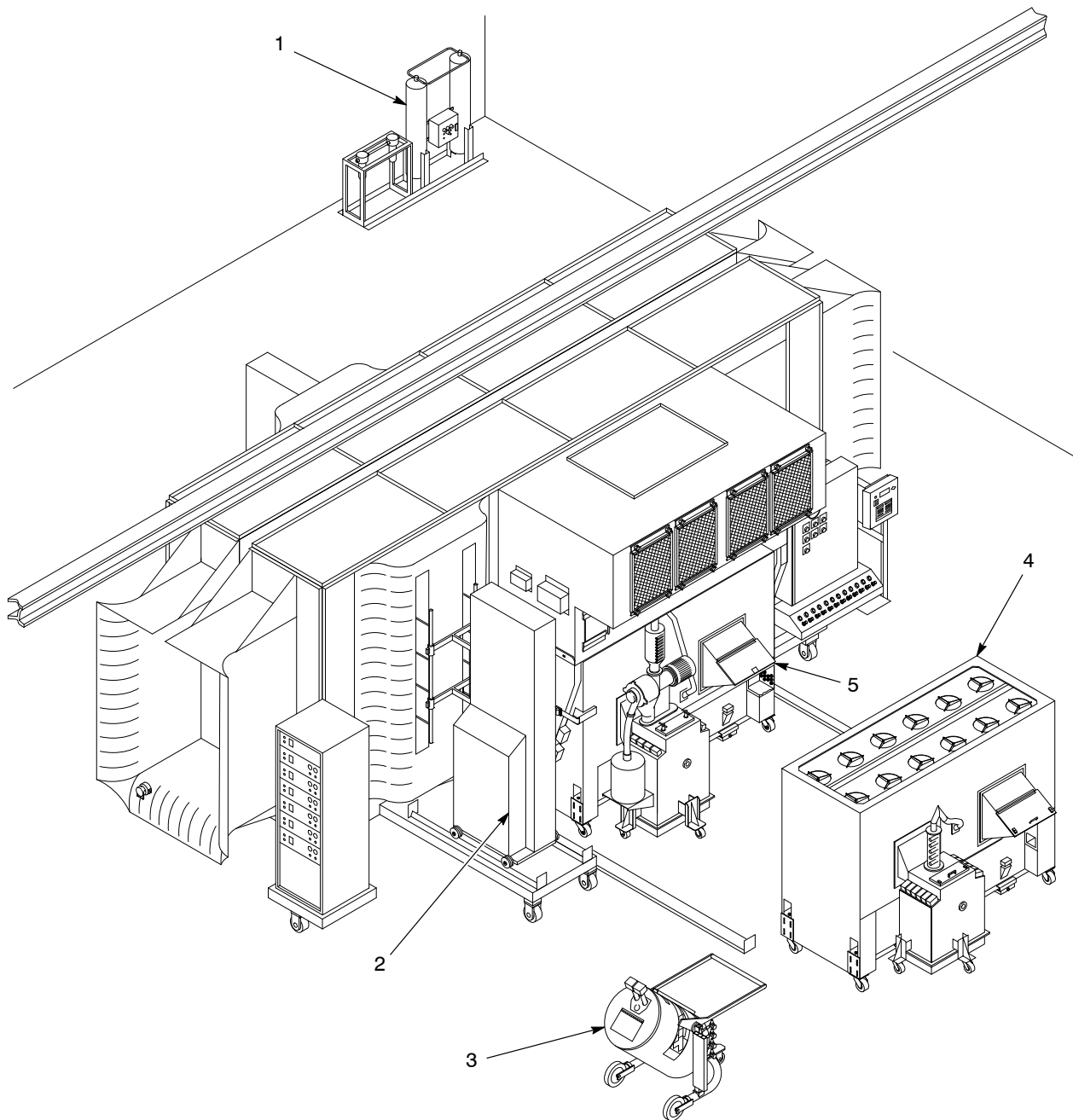


Figure 2-6 Typical System Options

- |              |                                 |               |
|--------------|---------------------------------|---------------|
| 1. Air dryer | 3. Powder drum unloader         | 5. Load chute |
| 2. Gun mover | 4. Quick color-change equipment |               |

## System Electrical and Pneumatic Controls

Basic system controls consist of an electrical panel, a pulse-valve timer box, and a pneumatic panel. Additional optional controls are covered in separate manuals.

### System Electrical Panel

Refer to Table 2-6 and Figures 2-7 (systems made in 2003 and later) and 2-8 (pre-2003 systems). Your system electrical panel may be different.

Table 2-6 System Electrical Panel

Item	Equipment	Description
1, 5	Booth lights selector (5)	<b>NOTE:</b> Power to the lights must be supplied by the customer. Activates the lighting contactor (1) for interior booth lights.
2, 3, 11	Final filter pressure switch	Preset to activate contacts on increasing pressure across the final filters. At 2.5-in. w.c., the final filter warning pressure switch contact (3) closes and activates the final filter warning indicator light (11). At 3-in. w.c., the final filter pressure switch contact (2) opens and automatically shuts down the system.
4, 14, 16	Booth mover enable pushbutton (14)	Activates the booth mover time delay relay (16). During the timer delay, the booth mover alarm buzzer (4) sounds, and the system can be moved online or offline.
6	Exhauster speed control	Used with the variable frequency drive to adjust the exhauster fan speed.
7	Exhauster stop pushbutton	<b>NOTE:</b> This pushbutton does not shut down power to the panel. Shuts down the exhauster fan and system.
8, 17	Transfer pump selector and indicator light (8)	Selects the transfer pump operation. When set to manual, the transfer pumps run continuously. When set to auto feed, the hopper level sensor and time delay relay (17) control the pump operation.
9	Exhauster start pushbutton/indicator light	Starts the exhauster fan and indicates that system power is on.
10	System ready indicator light	Indicates, when lit, that the fire detection module limit switch and air dryer interlocks are closed and that the system is ready to start.
12	Main disconnect switch	Turns the motor starter panel electrical power on or off.
13	Sieve and non-reclaim transfer enable indicator lights	The sieve light indicates that the sieve is in place and running. The non-reclaim enabled transfer light indicates that the system can transfer powder without the sieve in place.
15	Oscillator 1 and 2 pushbuttons/indicator lights	Turn the oscillators on or off.



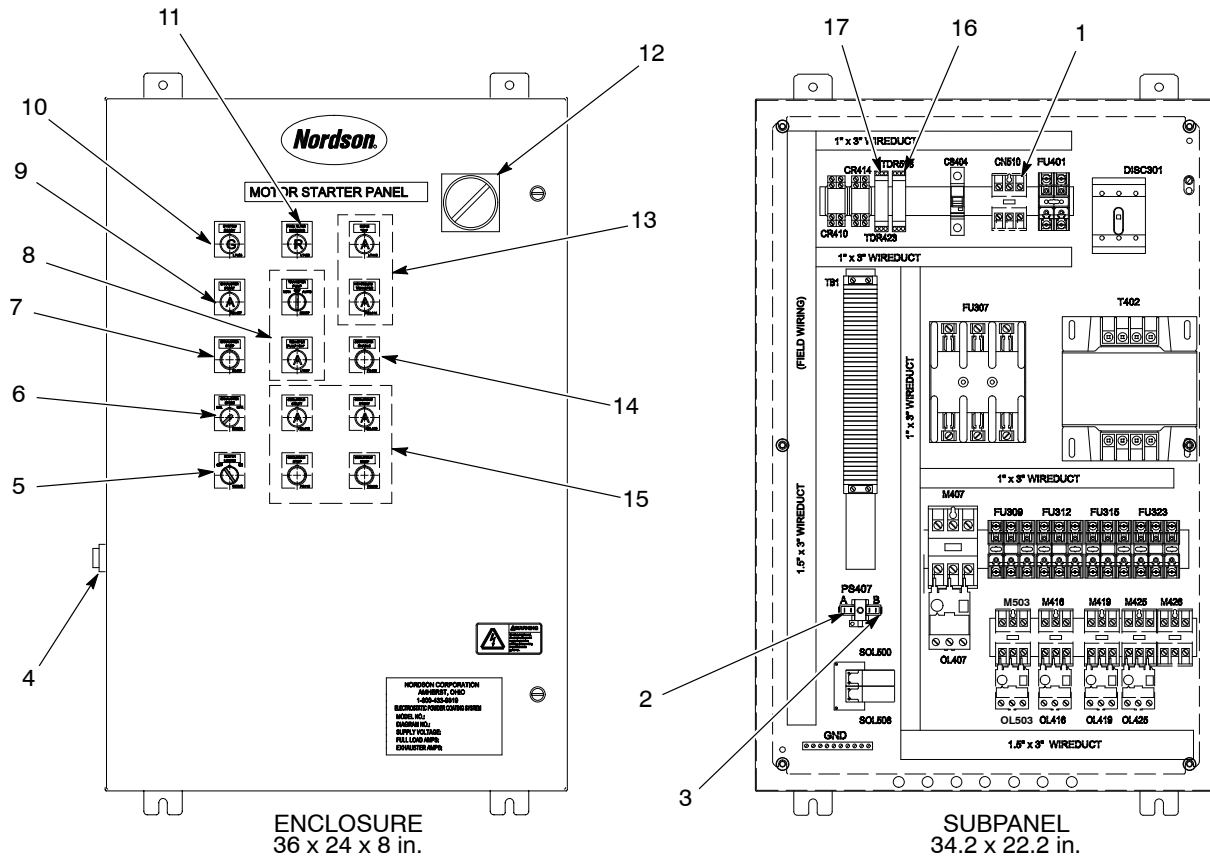


Figure 2-7 Electrical Panel Controls and Indicators (Systems Manufactured in 2003 or Later)

- |   |   |  |
|---|---|--|
| 1. Lighting contactor                             | 8. Transfer pump selector and indicator light | 13. Sieve and non-reclaim transfer enable indicator lights |
| 2. Final filter pressure switch, shutdown contact | 9. Exhauster start pushbutton/indicator light | 14. Booth mover enable pushbutton                          |
| 3. Final filter pressure switch, warning contact  | 10. System ready indicator light              | 15. Oscillator 1 and 2 pushbutton/indicator lights         |
| 4. Booth mover alarm buzzer                       | 11. Final filter warning indicator light      | 16. Booth mover time delay relay                           |
| 5. Booth lights selector                          | 12. Main disconnect switch                    | 17. Transfer pump time delay relay                         |
| 6. Exhauster speed control                        |   |  |
| 7. Exhauster stop pushbutton                      |   |  |

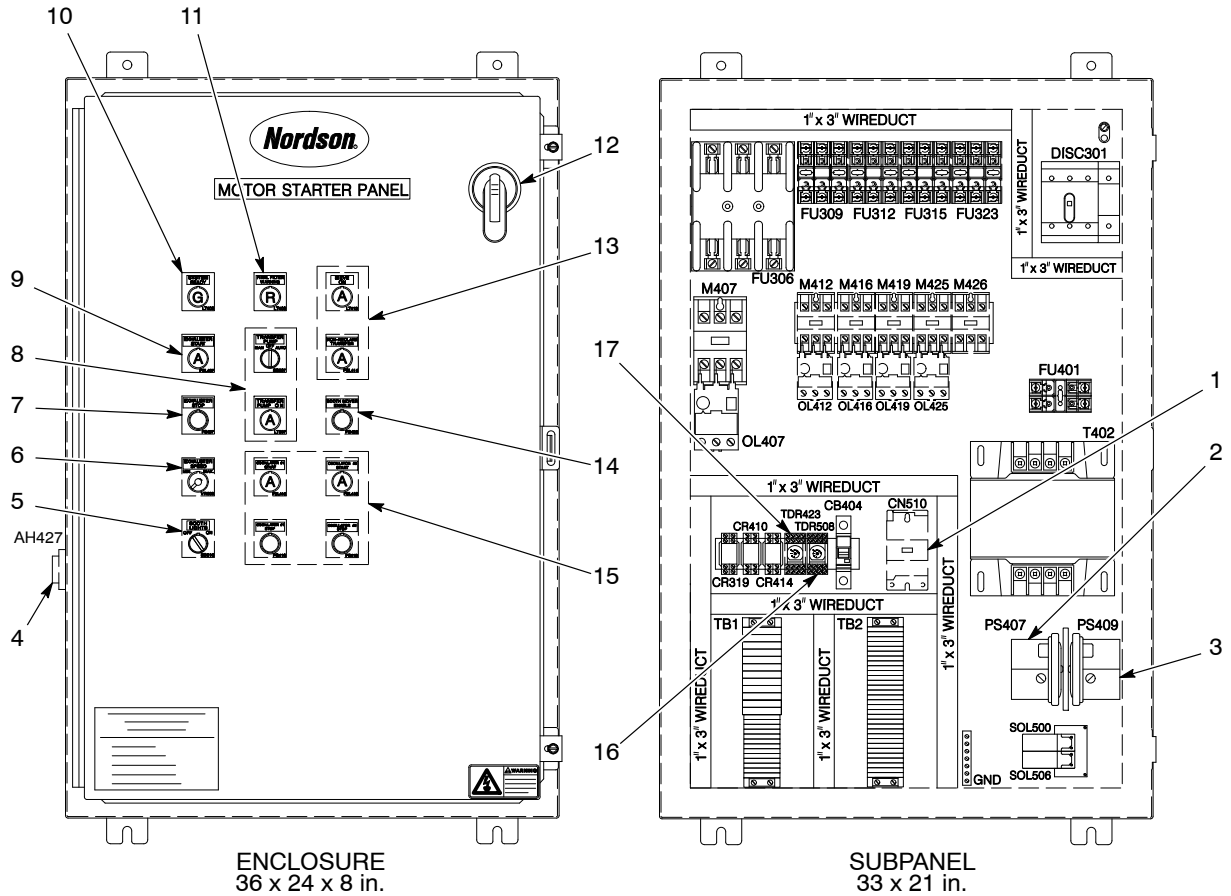


Figure 2-8 Electrical Panel Controls and Indicators (Pre-2003)

- |   |   |  |
|---|---|--|
| 1. Lighting contactor                   | 8. Transfer pump selector and indicator light | 13. Sieve and non-reclaim transfer enable indicator lights |
| 2. Final filter pressure switch         | 9. Exhauster start pushbutton/indicator light | 14. Booth mover enable pushbutton                          |
| 3. Final filter warning pressure switch | 10. System ready indicator light              | 15. Oscillator 1 and 2 pushbuttons/indicator lights        |
| 4. Booth mover alarm buzzer             | 11. Final filter warning indicator light      | 16. Booth mover time delay relay                           |
| 5. Booth lights selector                | 12. Main disconnect switch                    | 17. Transfer pump time delay relay                         |
| 6. Exhauster speed control              |   |  |
| 7. Exhauster stop pushbutton            |   |  |

## Pulse-Valve Timer Box

Refer to Table 2-7 and Figure 2-9. The pulse-valve timer panel houses the timer circuit board. The panel is usually mounted on the fan section. The timer board is wired to the electrical panel and the pulse-valve solenoid enclosure(s) inside the fan section.

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.

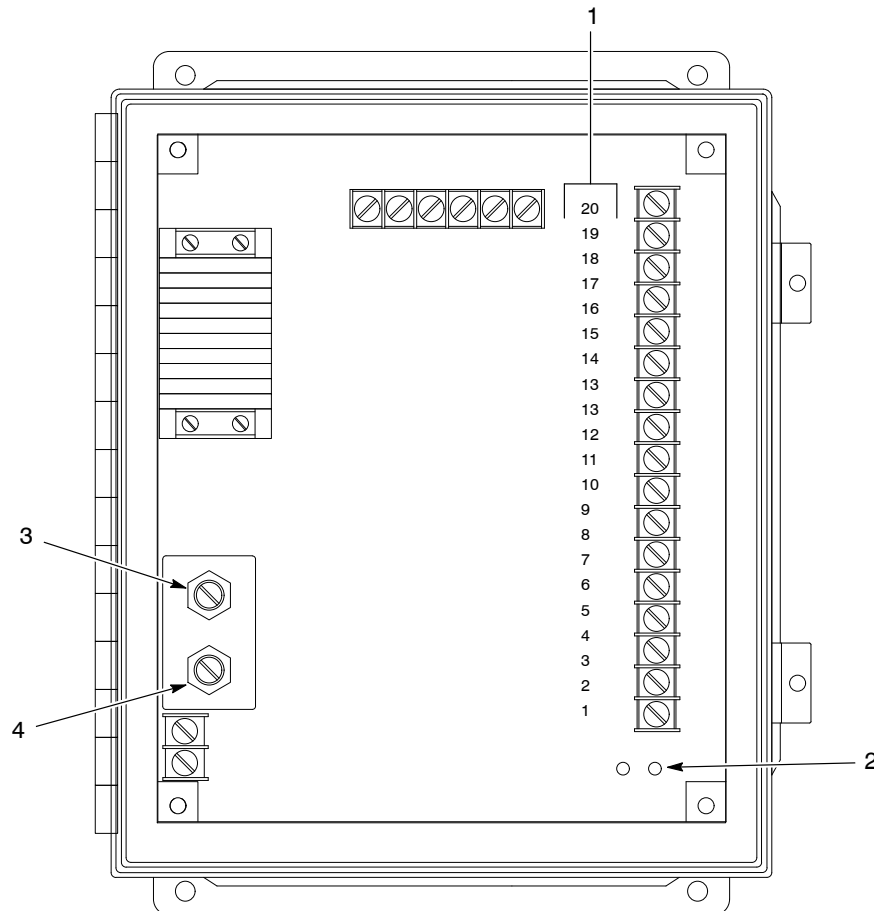


Figure 2-9 Pulse-Valve Timer Panel

- 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 2-10 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 2-10.

Table 2-8 System Pneumatic Panel

Regulators and Gauges	Function
1	Feed hopper fluidizing air
2	Feed hopper vent-assist air
3	Satellite hopper fluidizing air/spare scrap drum lid
4	Satellite hopper vent-assist air/spare scrap drum lid
5	Fluidizing air #1
6	Transfer pump air #1
7	Fluidizing air #2
8	Transfer pump air #2
9	Fluidizing air #3
10	Transfer pump air #3
11	Fluidizing air #4
12	Transfer pump air #4
13	Blowdown filter pressure gauge (shows pulse-air pressure)
14	Cartridge filter pressure gauge (shows air pressure drop across the cartridge filters in w.c.)  <b>NOTE:</b> 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  <b>NOTE:</b> 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.

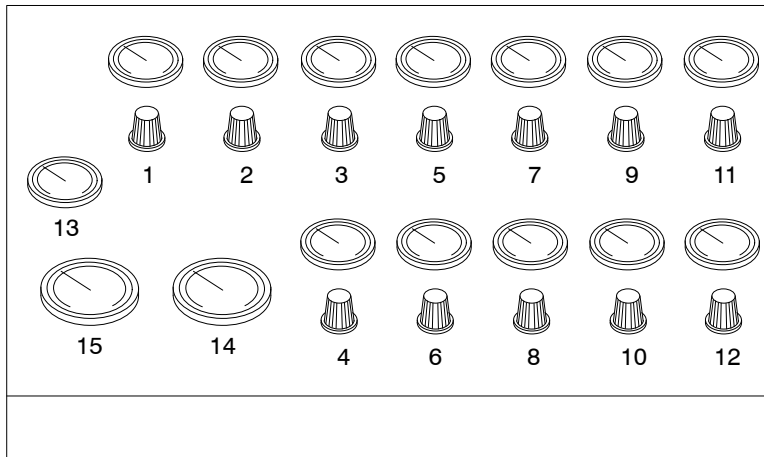
**PNEUMATIC PANEL**

Figure 2-10 System Pneumatic Panel

***Rotary Sieve Control Panel***

See Figure 2-11. This pneumatic panel is used with Nordson NRPS-100 and AZO rotary sieves. Older Nordson rotary sieves did not have a pneumatic panel.

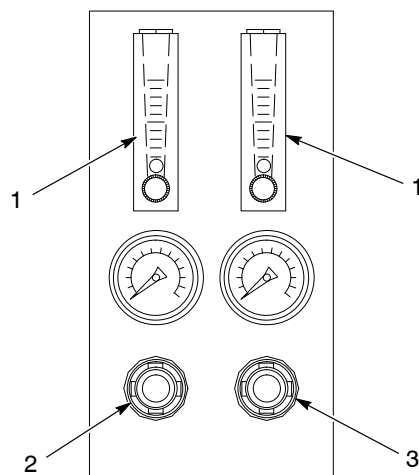


Figure 2-11 Rotary Sieve Pneumatic Panel

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 2000 powder coating system for production operations. Refer to the appropriate manuals for instructions if your system is equipped with a Smart-Spray or Smart-Coat system, or another type of automation system.

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 the system settings on the charts provided at the end of this section. Make extra copies of the charts as needed.

**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, such as automatic gun-triggering and air-management systems.



**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.

See Figure 3-1.

## Set the Timers

1. Disconnect the system electrical power and open the system electrical panel (2).
2. Set the transfer-pump delay to 60 seconds (see Figure 2-8, (17)). Close the electrical panel.
3. Open the pulse-valve timer panel (9). Set the pulse-valve off timer (see Figure 2-9, (4)) to 15 seconds and the pulse valve on timer (see Figure 2-9, (3)) to duration to 0.07 seconds. Close the timer panel.

## Set the 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 (7) 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. Turn on the exhaust fan (see Figure 2-8, (9)).



**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.

6. Open the feed hopper access door (6). Fill the hopper  $\frac{2}{3}$  full of powder.
7. Calibrate the feed hopper level sensor. Refer to *Feed Hopper Level Sensor Calibration* in this section.
8. Set the feed hopper fluidizing air pressure to 0.6 bar (8 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 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.

## Rotary Sieve Settings

**NOTE:** Sieve operation depends on system configuration. In some systems, the sieve turns on when the exhaust fan is started. In other systems the feed hopper level-sensor signal turns on the sieve.

1. If your system uses a rotary sieve equipped with a pneumatic panel, set the bearing air seal air pressure to 1.7 bar (25 psi) and the flowmeters to 100 SCFH. See Figure 2-11.
2. If your system uses a vibratory sieve, set the air pressure to 3.5 bar (50 psi). Adjust the pressure up or down to maintain the flow of powder through the sieve.



## ***Final Startup Steps***

1. Set the accumulator vent-assist air pressure. Refer to *Vent-Assist Air Pressure Adjustment* in this section.

**NOTE:** When the switch is set to AUTO, the feed-hopper level sensor turns the transfer pumps on and off.

2. Set the transfer-pump air pressure to 1.0 bar (15 psi). Set the transfer-pump selector switch to AUTO.
3. 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. This adjustment will prevent the powder pumps from being deprived of air during pulses.

## New System Startup *(contd)*

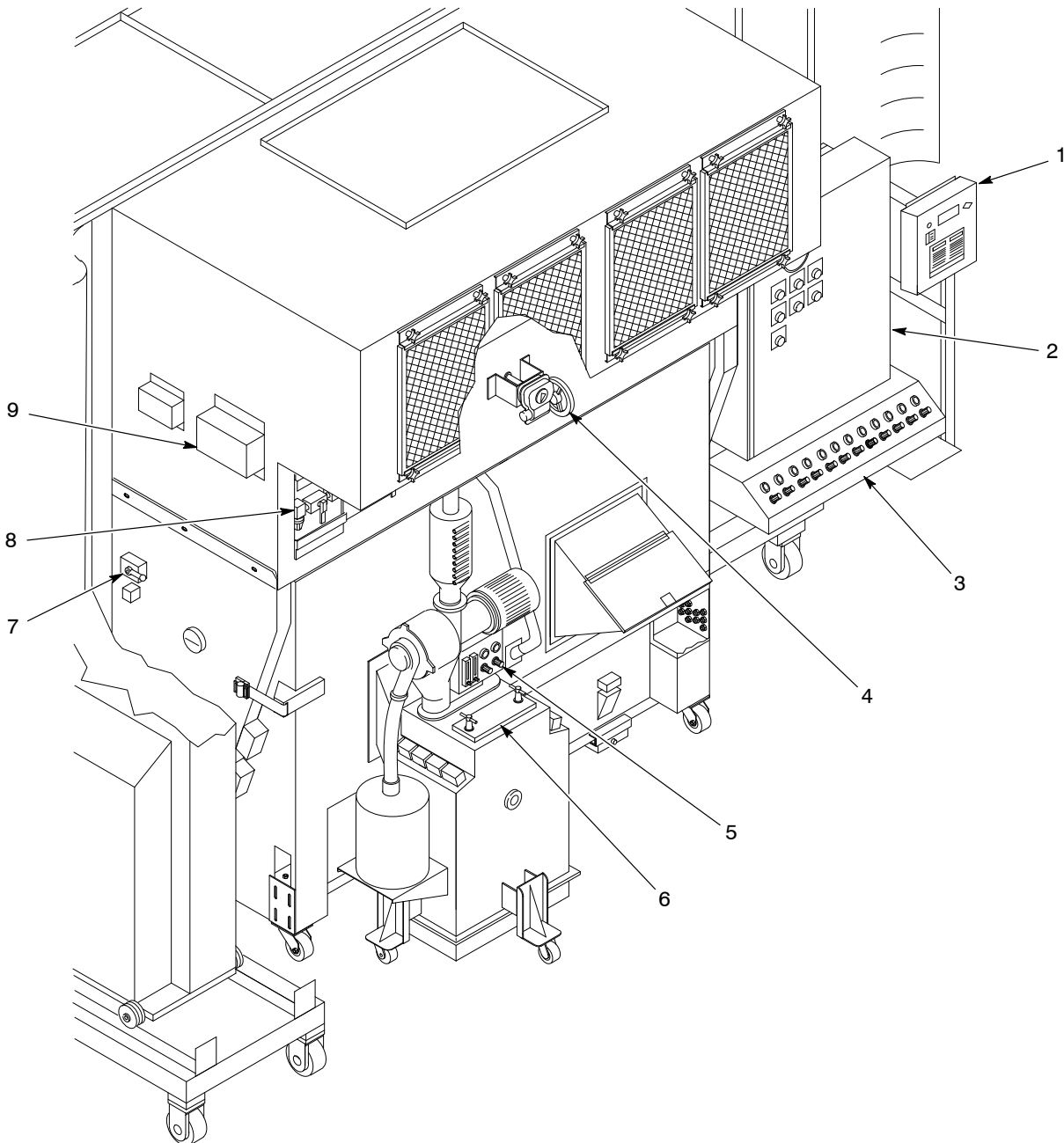


Figure 3-1 New System Startup (Pre-2003 System Shown)

- |   |                            |                             |
|---|----------------------------|-----------------------------|
| 1. Flame detector indicator/relay panel | 4. Fan damper hand wheel   | 7. Seal control valve       |
| 2. Motor starter panel                  | 5. Sieve pneumatic panel   | 8. Pulse-valve air controls |
| 3. Pneumatic panel                      | 6. Feed hopper access door | 9. Pulse-valve timer panel  |

## Fan Damper Adjustment

You must adjust the fan damper to obtain the proper air flow through the enclosure before you begin to spray powder. Use the hand wheel (see Figure 3-1, (4)) on the front of the fan section to make the adjustment.

To increase the air flow (open the damper), turn the wheel counterclockwise. To decrease the flow (close the damper), turn the wheel clockwise. Six full turns of the wheel move the damper from fully open to fully closed.

1. Turn on the exhaust fan.
2. Turn the hand wheel counterclockwise until the damper is fully open.
3. Measure the air velocity at the entry and exit vestibules with a velometer. The velocity should be 30.5–36.6 m/min (100–120 ft/min).
4. If the air velocity is too fast, turn the hand wheel one full turn clockwise. Measure the air velocity again. Continue closing the damper opening until the velocity is 30.5–36.6 m/min (100–120 ft/min).
5. Test spray a few workpieces and watch the powder spray pattern. Watch for powder escaping from the enclosure openings.
  - a. If the sprayed powder is being pulled from the guns and workpieces by the air flow through the enclosure, close the damper.
  - b. If powder is escaping from the enclosure, open the damper.

**NOTE:** As powder collects on the cartridge filters, the air flow through the enclosure decreases. When the powder is blown off the cartridge filters by the pulse valves, the air flow increases. The air flow through the filters decreases with use. Check the air velocity at the enclosure openings and adjust the fan damper to compensate.

6. Adjust the damper until the air flow through the enclosure is fast enough to contain the powder within the enclosure without pulling the sprayed powder away from the guns and workpieces.

## Vent-Assist Air Pressure Adjustment

To maintain a neutral air pressure in the sieve so it can function properly, 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 vent tube, toward the color module, to create low pressure in the tube and increase the air flow. Use the following procedure to adjust the vent-assist air pressure.

1. Disconnect the scrap hose from the sieve.
2. Secure a paper or plastic bag to the scrap port with a worm clamp, cable tie, or rubber band.
3. Start the exhaust fan, sieve, and transfer pumps.
4. Watch the bag. If it inflates, increase the vent-assist air pressure. If it deflates, decrease the vent-assist air pressure.

**NOTE:** Depending on the sieve used, the vent-assist air pressure regulator is located either on the sieve pneumatic panel or on the system pneumatic panel.

## Feed Hopper Level Sensor Calibration

The level sensor is a capacitive proximity switch. For it to function properly, you must calibrate it. This procedure must be done when you start up a new system and also when you replace a sensor.

1. See Figure 3-2. Insert the level sensor into the plastic mounting well (1) in the side of the feed hopper until it bottoms out, then tighten the plastic screws on the side of the well to hold the sensor securely.
2. Make sure system power is on and the exhaust fan is running.
3. Open the feed hopper lid and fill the hopper  $\frac{2}{3}$  full of powder.
4. Increase the hopper fluidizing air pressure to 0.6–0.7 bar (8–10 psi). The powder level should rise above the top of the mounting well as the powder fluidizes. Add powder to the hopper if it does not.
5. Shut off the fluidizing air. The mounting well should now be coated with a film of powder.
6. If the sensor LED (3) is on, slowly turn the sensor potentiometer (2) clockwise until it goes off. If the LED is off, slowly turn the potentiometer counterclockwise until it lights, then clockwise until it goes off.
7. Increase the fluidizing pressure until the powder level rises above the mounting well. The LED should be off.
8. Turn the potentiometer counterclockwise, counting the number of turns you make, until the LED lights.

**NOTE:** Replacement sensors are shipped configured as normally closed (N.C.) switches.

9. Turn the potentiometer clockwise for  $\frac{1}{2}$  the number of turns you counted in step 8. The LED will go off. The sensor is now set in the midpoint of its sensitivity range.

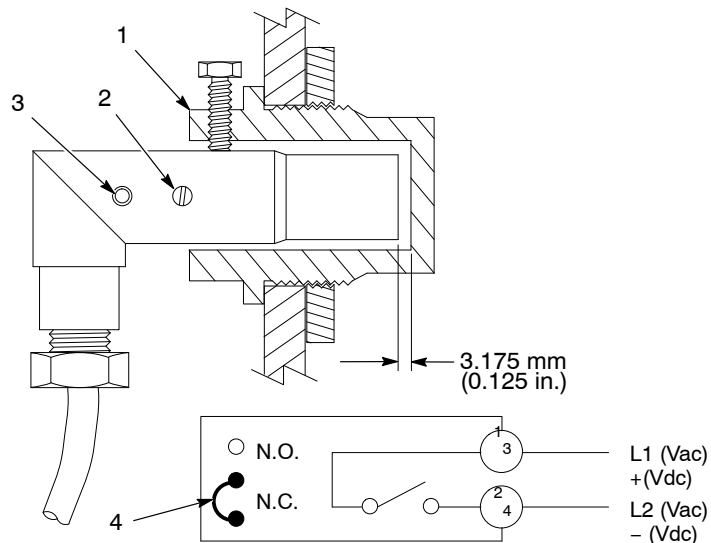


Figure 3-2 Feed Hopper Level Sensor Calibration

- |                  |                       |
|------------------|-----------------------|
| 1. Mounting well | 3. LED                |
| 2. Potentiometer | 4. Bridge jumper wire |

---

# 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. Inflate the pneumatic seal between the color module and the fan section. Make sure it is sealing correctly.
3. Turn on the exhaust fan at the electrical panel.
4. 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, and spray guns.
5. Check all equipment ground connections.
6. Make sure the flame detector system is functioning correctly.
7. Turn on the automatic-gun master control unit and the manual-gun control units.
8. Adjust the kV settings and the powder-pump air pressures, if necessary. Refer to your spray gun and control unit manuals.
9. Start the conveyor and start spraying workpieces.
10. 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 damper 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 automatic-gun master control unit and the manual-gun control units.
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.

## Changing Colors

The following procedures describe powder color-change procedures. Use the reclaim to non-reclaim procedure if you will not be reclaiming and reusing the new powder.

**NOTE:** In 2003 the Excel Powder Coating Systems were redesigned. The following procedures are labeled depending on when the system was manufactured.

### ***Color Change: Reclaim-to-Reclaim***

These instructions describe color-change procedures for reclaim systems that use a separate color module with attached feed hopper and sieve for each color.

#### **Removing the Color Module and Feed Hopper**

1. Clean the enclosure as described in the *Daily Maintenance* procedures in the *Maintenance* section of the main manual. Clean the spray guns and feed hoses as described in the spray gun manuals.
2. Shut off the system electrical power and compressed air supply. Relieve the system air pressure.
3. See Figure 3-3. Remove the color module quick-disconnect plates (1). Uncouple the 10-tube connectors (3) from the feed hopper receptacles.
4. If you are using a rotary sieve, disconnect the sieve electrical cables from the junction boxes (6) on the fan section supports (5).
5. Rotate the level sensor (4) to unlock it from its mounting in the side of the feed hopper. Remove the sensor and store it on one of the fan supports.
6. Disconnect the feed hoses (7) from the powder pumps.
7. Disconnect the ground strap, if used, from the color module.
8. Use the seal control valve (10) to release the air pressure from the pneumatic seal (2). Make sure the seal deflates.
9. Release the clamping-strap ratchets (9) on the sides of the fan section. Disconnect the clamping straps (8) from the color module.
10. Roll the color module, feed hopper, and sieve from under the fan section. Move them to a storage area.
11. Install a storage cover on top of the color module.

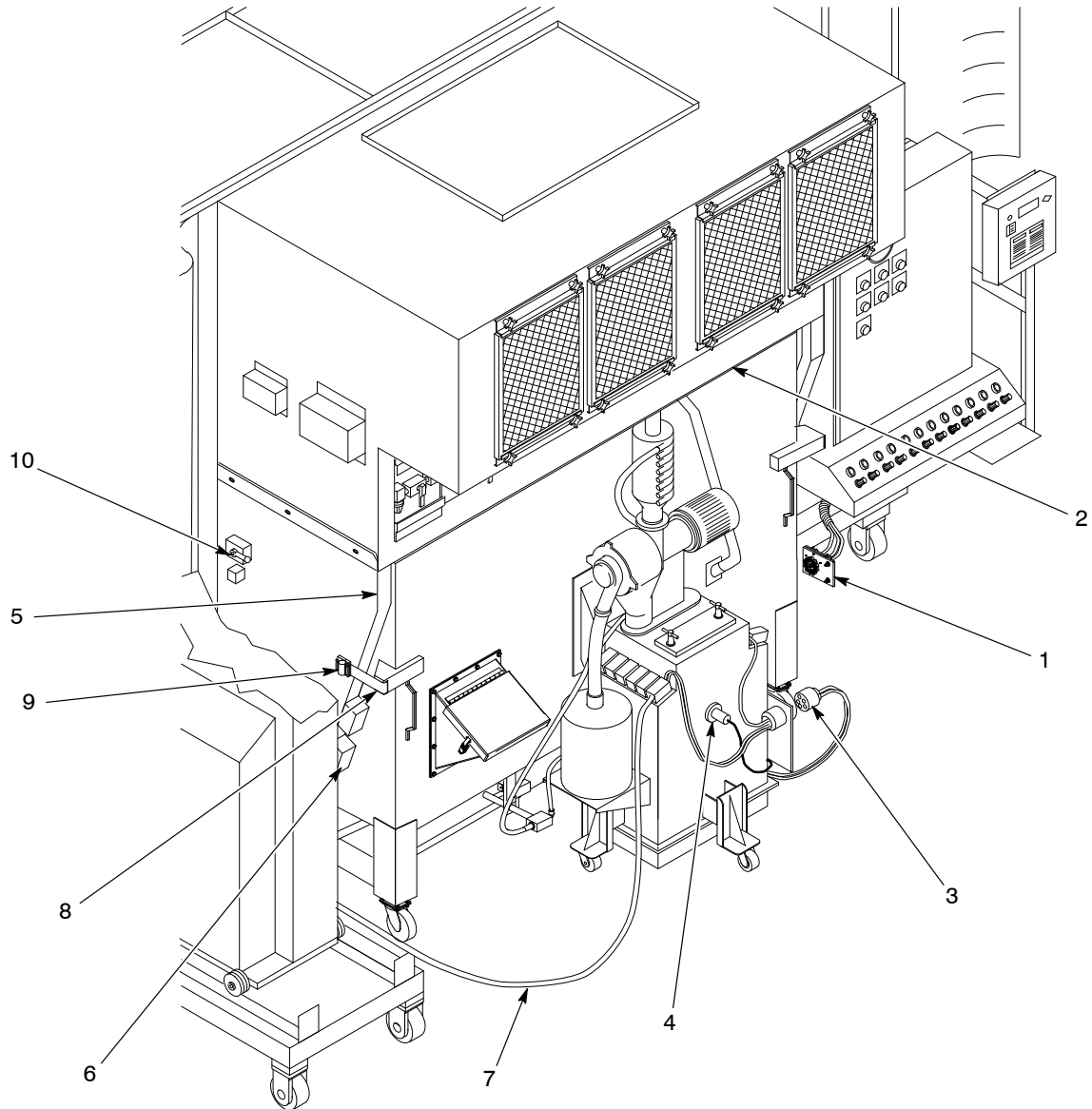


Figure 3-3 Removing the Color Module and Feed Hopper (2003 and Later System Shown)

- |                            |                         |                            |
|----------------------------|-------------------------|----------------------------|
| 1. Quick-disconnect plates | 5. Fan section supports | 8. Clamping straps         |
| 2. Pneumatic seal          | 6. Junction boxes       | 9. Clamping strap ratchets |
| 3. 10-tube connectors      | 7. Feed hoses           | 10. Seal control valve     |
| 4. Level sensor            |                         |                            |

## Installing a New Color Module and Feed Hopper

1. See Figure 3-5. Thoroughly clean the powder off the inlet frame (3) and surrounding area.

**NOTE:** If you find large amounts of powder in the fan and pulse valve compartments, the cartridge filters are leaking. Fix the problem before proceeding. Refer to the *Troubleshooting* and *Repair* sections in the main manual for instructions.

2. Inspect and clean the interior of the fan section (1). Check the pneumatic seal (5), and replace it if it is damaged.
3. Remove the storage cover from the new color module (2). Inspect the module D-gasket (6) and replace it if it is damaged.
4. Position the new color module under the fan section, against the inlet frame stops.

**NOTE:** If the limit switch is not closed, you will not be able to start the system. Adjust the limit switch position as necessary by loosening the mounting screws and sliding the switch forward or back.

5. 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 (4) 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.).

### For Systems Manufactured in 2003 or Later:

- a. See Figure 3-4. Loosen the set screw (1) on the inside of each color module leg.
- b. Turn the caster mount (2). One complete turn of the caster mount will raise or lower the caster by approximately 3.2 mm (0.125 in.).
- c. Tighten the set screw (1).

### For Systems Manufactured Before 2003:

See Figure 3-4. Use the four leveling screws (4) on the sides of the color module to adjust its height and level it.

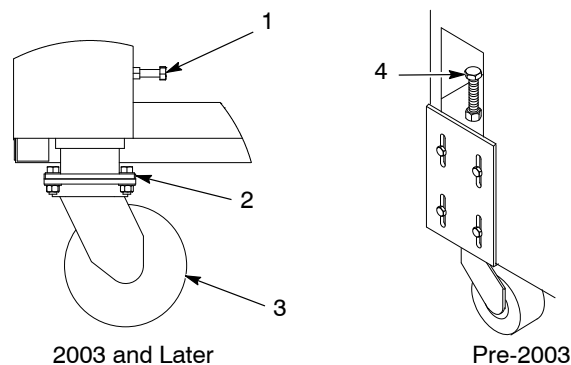


Figure 3-4 Adjustable Casters

- |                 |                    |
|-----------------|--------------------|
| 1. Set screw    | 3. Caster          |
| 2. Caster mount | 4. Leveling screws |



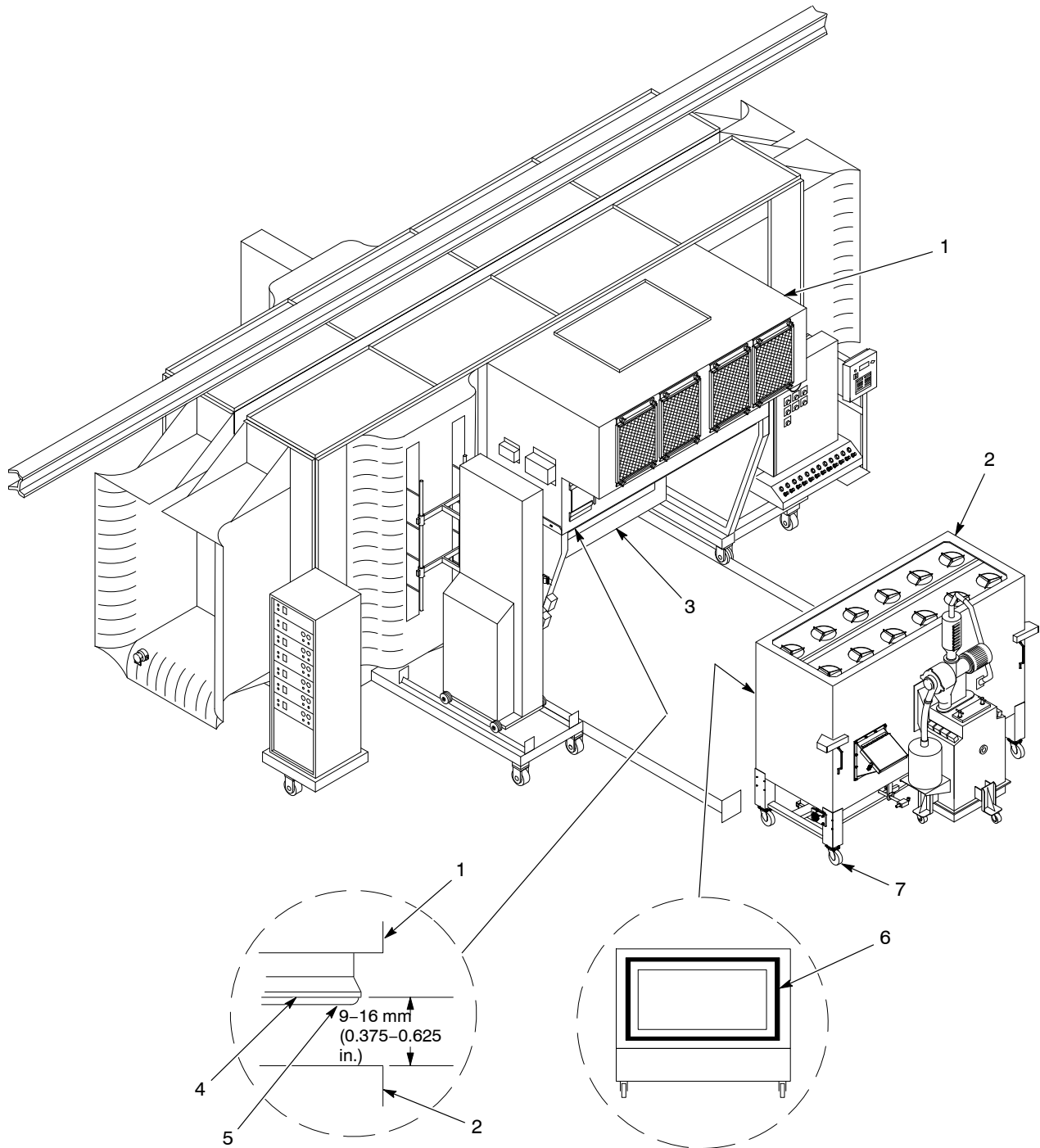


Figure 3-5 Installing a New Color Module and Feed Hopper; Steps 1-5 (2003 and later system shown)

- |                     |                         |                       |
|---------------------|-------------------------|-----------------------|
| 1. Fan section      | 4. Pneumatic seal track | 6. D-gasket           |
| 2. New color module | 5. Pneumatic seal       | 7. Adjustable casters |
| 3. Inlet frame      |                         |                       |

### **Installing a New Color Module and Feed Hopper** (contd)

6. See Figure 3-5. Hook the clamping straps (14) to the color module (3). Tighten the ratchets (15) to pull the color module against the stops and compress the D-gasket against the inlet frame. This must also close the limit switch on the inlet frame.
7. Use the seal control valve (16) to inflate the pneumatic seal (1). Make sure it is sealing on all four sides of the color module.
8. Connect the quick-disconnect plates (2) to the color module.
9. Connect the 10-tube connectors (8) to the receptacles on the feed hopper.
10. Install the level sensor (9) into the mounting on the feed hopper.
11. Make sure the accumulator (4) vent hose is connected to the vent-assist plate (6), and that the vent-assist air tubing is connected to the tube fitting.
12. Connect the sieve electrical cables to the junction boxes (12) on the fan section support.
13. Disconnect the old feed hoses (13) from the guns. Install new feed hoses between the powder pumps (10) and the guns, or use hoses that have already been used with the new color.
14. Make sure the transfer hoses (7) are connected to the accumulator and transfer pumps (5).
15. Connect all equipment ground straps and wiring.
16. Perform the *Startup after Color Change* procedures on page 3-15.

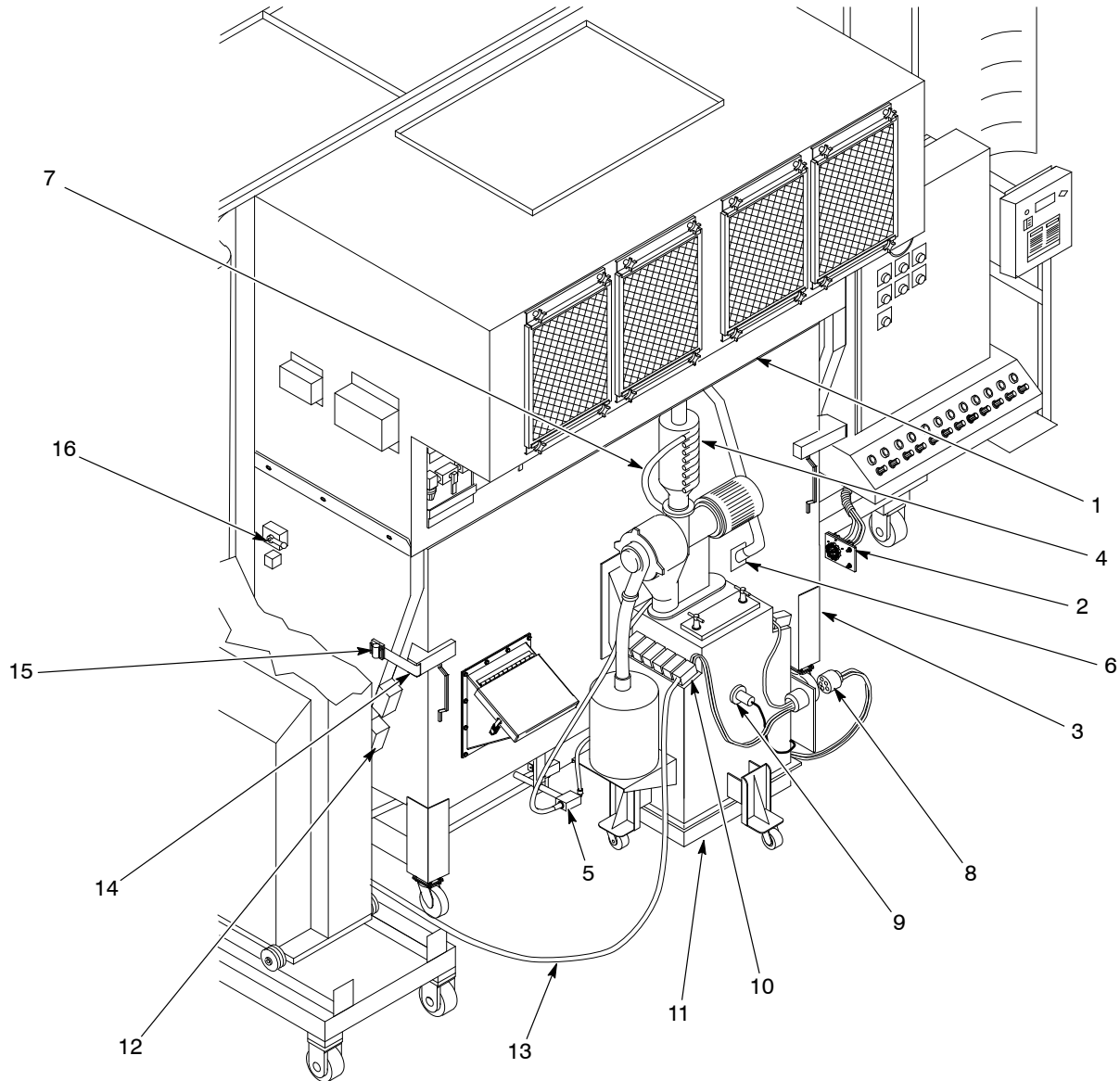


Figure 3-6 Installing a New Color Module and Feed Hopper; Steps 6–15 (2003 and later system shown)

- |                            |                       |                             |
|----------------------------|-----------------------|-----------------------------|
| 1. Pneumatic seal          | 7. Transfer hoses     | 12. Junction boxes          |
| 2. Quick-disconnect plates | 8. 10-tube connectors | 13. Feed hoses              |
| 3. Color module            | 9. Level sensor       | 14. Clamping straps         |
| 4. Accumulator             | 10. Powder pumps      | 15. Clamping strap ratchets |
| 5. Transfer pumps          | 11. Feed hopper       | 16. Seal control valve      |
| 6. Vent-assist plate       |                       |                             |

## **Color Change: Reclaim to Non-Reclaim**

When you change to a powder you will not reclaim, the new powder will be collected in a new color module and pumped by the transfer pumps into a scrap drum. To supply powder to the spray guns, use a feed hopper attached to the color module, or an unattached, portable feed hopper.

Systems designed to use portable feed hoppers for non-reclaimed powders have a quick-disconnect plate mounted on a fan section support instead of on the color module. The air tubing for the feed hopper and the powder pumps are terminated in one or more 10-tube connectors.

### **New Color Module with Attached Feed Hopper**

- Complete all the steps under *Removing the Color Module and Feed Hopper* on page 3-8.
- Perform steps 1 through 9 under *Installing a New Color Module and Feed Hopper* on page 3-10.
- Perform steps 4 through 9 under *New Color Module with Portable Feed Hopper* on page 3-14.

**NOTE:** If the attached feed hopper is equipped with a sieve, accumulator, and level sensor, plug the ports in the accumulator after disconnecting the transfer hoses (see Figure 3-6, item 7). Plug the level sensor mounting hole.

### **New Color Module with Portable Feed Hopper**

- Complete all the steps under *Removing Color Module and Feed Hopper* on page 3-8.
- Perform steps 1 through 8 under *Installing a New Color Module and Feed Hopper* on page 3-10.
- Perform the following steps.
  1. Block the feed-hopper vent port in the color module with a gasketed cover plate.
  2. See Figure 3-6. Position the portable feed hopper so the feed hoses (13) from the powder pumps can be connected to the guns.
  3. Install a vent hose between the vent on the feed hopper lid and the vent-assist plate (6) on the color module. Clamp the hose to the hopper vent and the vent-assist plate.
  4. Connect air tubing to the tubing connector on the vent-assist plate.
  5. Connect the 10-tube connectors to the receptacles on the fan section support.
  6. Install new feed hoses (13) between the pumps and the guns. Use hoses that have already been used with the new color, if possible.
  7. Install a scrap drum lid on a 55-gallon drum.
  8. Connect the transfer hoses (7) from the transfer pumps (5) to the scrap drum lid.

9. Connect the portable feed-hopper ground strap to a ground connection, such as the booth base. Make sure all other equipment ground straps are connected.
10. Set the transfer-pump selector switch to MANUAL or OFF.
  - a. Set the switch to MANUAL to continuously pump the collected powder from the color module to the scrap drum.
  - b. Set the switch to OFF if you want to wait until you are done spraying before you pump the powder into the scrap drum.
11. Perform the *Startup after Color Change* procedure.

## **Startup after Color Change**

Before starting the system, make sure all tubing, hoses, electrical cables, and ground straps have been reconnected.

1. Turn on the system electrical power and compressed air supply.
2. Rotate the seal control valve to inflate the seal. Make sure the seal is pressing against the color module equally on all four sides. Adjust the height of the color module and level it to correct any sealing problems.
3. Start the exhaust fan.
4. Fill the feed hopper  $\frac{2}{3}$  full of powder. Adjust the hopper fluidizing-air regulator until the powder boils gently. Wait 5–10 minutes for the powder to fluidize.
5. Start spraying parts.
6. Adjust the powder-pump air pressures and gun voltages, if necessary. (Different colors or powders may require different settings.)

<b>Equipment</b>	<b>Recommended Initial Settings</b>	<b>Final Setting</b>	<b>Changes</b>
<b>Primary Air Pressure</b> (plant air)	5.5 bar (80 psi)		
<b>Collector Module</b>			
#1 Fluidizing	0.7 bar (10 psi)		
#2 Fluidizing	0.7 bar (10 psi)		
#3 Fluidizing (pre-2003)	0.7 bar (10 psi)		
#4 Fluidizing (pre-2003)	0.7 bar (10 psi)		
#1 Transfer pump	1.7 bar (25 psi)		
#2 Transfer pump	1.7 bar (25 psi)		
#3 Transfer pump (pre-2003)	1.7 bar (25 psi)		
#4 Transfer pump (pre-2003)	1.7 bar (25 psi)		
<b>Feed Hopper — Reclaim</b>			
Fluidizing	0.5 bar (8 psi)		
Vent-assist	2.8 bar (40 psi)		
<i>Continued...</i>			

Equipment	Recommended Initial Settings	Final Setting	Changes
<b>Feed Hopper — Non-Reclaim</b>			
#1 Fluidizing	0.5 bar (8 psi)		
#2 Fluidizing	0.5 bar (8 psi)		
#3 Fluidizing	0.5 bar (8 psi)		
Vent-assist	0.5 bar (8 psi)		
<b>Pulse Manifold</b>			
Air pressure	3.5–4.1 bar (50–60 psi)		
<b>Nordson NFS-1000 Fire Detector</b>			
Air pressure	0.7 bar (10 psi) (preset)		
<b>Nordson NRPS-200 Rotary Sieve</b>			
Flowmeter #1	2.5 m <sup>3</sup> /h (90 SCFH)		
Flowmeter #2	2.5 m <sup>3</sup> /h (90 SCFH)		
Seal air pressure	0.35 bar (5 psi)		
Vent-assist air pressure	0.5 bar (8 psi)		
<b>Rotary Sieve – Other</b>			
Flowmeter #1	2.8 m <sup>3</sup> /h (100 SCFH)		
Flowmeter #2	2.8 m <sup>3</sup> /h (100 SCFH)		
Seal air pressure	1.7 bar (25 psi)		
Vent-assist air pressure	0.5 bar (8 psi)		
<b>Vibratory Sieve</b>			
Air pressure	3.5 bar (50 psi)		
<b>Pulse Timer</b>			
Delay (OFF) time	15.0 sec		
Duration (ON) time	0.07 sec		
<b>Filter Pressure Drop Maximum Readings</b>			
Cartridge filters	4–6 in. w.c.		
Final filters	2 in. w.c.		

## 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 automatic-gun master-control unit(s) and manual-gun control units.
2. Turn on the exhaust fan.
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 enclosure roof, walls, and floor with a rubber squeegee. Push the collected powder into the color module.
6. Remove the remaining powder residue from the enclosure 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's platform and the floor around the booth.

## Daily Equipment Maintenance

Equipment	Procedure
<b>Filters</b> — Check the differential pressure gauges.	<ol style="list-style-type: none"> <li>1. Check the final filter differential pressure gauge. It should read between 1 and 2.5 in. of water (wc). Make sure no powder is leaking from around the filter gasket or face.</li> <li>2. Check the cartridge filter differential pressure gauge. It should read between 4 and 6 in. of water (wc). Check the pulse valve timing.</li> </ol>
<b>Vibratory Sieve</b>	Open the hopper lid and remove the screen from the sieve. Clean the screen and replace it if it is damaged. Reconnect the ground clip to the screen after reinstalling it.
<b>Rotary Sieves</b> — Clean	<ol style="list-style-type: none"> <li>1. Empty the scrap pail.</li> <li>2. Open the sieve housing and clean the rotor and screen with a soft brush. Replace the screen if it is damaged.</li> <li>3. Check the seal air pressure and flow rate. Check the vent-assist air pressure. Refer to your sieve manual for more information.</li> </ol>
<b>Transfer Pumps</b>	<ol style="list-style-type: none"> <li>1. Disconnect the transfer hoses from the pumps. Blow the powder out of the hoses with compressed air.</li> <li>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.</li> <li>3. Disassemble the pumps. Clean the parts with a low-pressure air gun and a clean cloth. Replace any worn or damaged parts.</li> </ol>
<b>Fan Section</b>	<ol style="list-style-type: none"> <li>1. Remove the final filters and inspect the fan compartment. Vacuum out any powder.</li> <li>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 <i>Troubleshooting</i> section for instructions.</li> <li>3. Inspect the V-belts. Replace cracked or worn belts.</li> </ol>
<b>Powder Spray Guns</b>	Disassemble and clean the spray guns according to the instructions in their manuals.
<b>Powder Pumps</b>	Disassemble and clean the pumps according to the instructions in their manuals. Replace worn parts.
<b>Flame Detector System</b>	Check the detector sensors every four hours and clean the lenses, if necessary. Make sure air is being supplied to the sensors. Make sure the detector system is operating properly.
<b>Compressed Air Supply</b>	<p>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.</p> <p><b>NOTE:</b> The air dryer should remain on at all times to prevent moisture from accumulating in the compressed air system.</p>

Continued...



Equipment	Procedure
<b>Air Dryers</b>	Refer to your air dryer manual for maintenance procedures and schedules.
<b>Gun Movers</b> (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.
<b>Accumulators and Vent Hoses</b>	Vacuum out the accumulators and blow the powder out of the vent hoses with compressed air.
<b>Workpiece and Conveyor Grounds</b>	<p><b>WARNING:</b> 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.</p> <p>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.</p>

## Weekly Maintenance

Equipment	Procedure
<b>Booth Enclosure</b>	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.
<b>Powder Spray Guns and Cables</b>	Clean the spray guns. Perform electrostatic resistance checks as described in the spray gun and gun control unit (electrostatic power supply) manuals.
<b>Powder Pumps and Feed Hoses</b>	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.
<b>Feed Hoppers</b>	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.
<b>Color Module</b>	<p>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. Remove the cartridge filters and inspect the filter media and gaskets. Replace the filters if they are damaged.</p> <p>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.</p> <p>Vacuum the color module interior. Check the color module 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.</p> <p>Check the pneumatic seal. Make sure it seals correctly when inflated.</p> <p>Lubricate the casters with a lithium grease.</p>

## Periodic Maintenance

Equipment	Procedure
<b>Electrical Connections</b>	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.
<b>Guns and Cables</b>	Perform electrostatic resistance checks as described in the spray gun and gun control unit manuals.
<b>Air Dryer</b>	Check the air dryer operation. Refer to your air dryer manual for maintenance procedures and schedules.
<b>Gaskets</b>	Inspect all gaskets and seals for damage. Replace them if they are damaged.
<b>Exhaust Fan V-belts</b>	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).
<b>Bearings</b>	Every six months, lubricate the fan shaft and motor bearings with two shots of lithium or polyurea grease from a grease gun. The grease fittings are on the front face of the fan section.
<b>AZO Rotary Sieve</b>	Every three months, lubricate the lip seals with a white lithium grease as described in your AZO sieve manual.
<b>Differential Pressure Gauges</b>	<p>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.</p> <p>Pressure drop across cartridge filters: 4–6 in. wc.</p> <p>Pressure drop across final filters: 2 in. wc.</p>
<b>Powder Feed Hoses</b>	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
<b>Cleaning</b>					
Accumulator		✓			
Booth enclosure		✓	✓		✓
Color module			✓		✓
Fan and pulse-valve compartments			✓		✓
Feed hoses and transfer hoses	✓				✓
Fire detector head lenses*	✓				✓
Gun pumps	✓	✓	✓		✓
Guns	✓		✓		✓
Rotary sieve		✓			✓
Transfer pumps	✓	✓			✓
Vent hoses		✓			✓
Vibratory sieve	✓				✓
<b>Resistance Checks—Guns and Cables</b>			✓		
<b>Visual Checks</b>					
Air supply drop leg		✓			
Air dryer		✓			
Cartridge filter differential-pressure gauge	✓				
Electrical connections			✓		
Exhaust fan V-belts				✓	
Final filter differential-pressure gauge	✓				
Fire detector sensors	✓				✓
Gaskets			✓		
Gun movers	✓				
Workpiece clearance**	✓				
Workpiece grounding	✓				✓
Powder levels	✓				
<b>Lubrication</b>					
AZO rotary-sieve lip seals***				✓	
Fan bearings				✓	
Motor bearings				✓	
* Every 4 hours.					
** Clearances should be monitored continuously.					
*** Every 3 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.

No.	Problem	Page
1.	Spray guns are surging or spitting; powder flow is inadequate or intermittent	5-2
2.	Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses	5-2
3.	Powder not transferring from color module to feed hopper	5-3
4.	Powder not fluidizing, or clouds of powder erupting from surface	5-4
5.	Final filters clogged; powder in fan compartment	5-4
6.	Cartridge filters clogged	5-5
7.	System shuts down or will not start	5-5
8.	Sieve not screening powder	5-5
9.	Sieve scrap bucket filling up with powder	5-6
10.	Powder escaping from booth openings	5-6

## Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
<b>1. Spray guns are surging or spitting; powder flow is inadequate or intermittent</b>	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.
<b>2. Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses</b>	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
<b>2. Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses</b> <i>(contd)</i>	Fan damper open too far, powder being pulled away from workpieces	Close damper to decrease air flow through booth. Refer to <i>Fan Damper Adjustment</i> in the <i>Operation</i> 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.
<b>3. Powder not transferring from color module to feed hopper</b>	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 <i>Reversing Motor Direction</i> 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.
<i>Continued...</i>		

## Troubleshooting Procedures *(contd)*

Problem	Possible Cause	Corrective Action
<b>4. Powder not fluidizing, or clouds of powder erupting from surface</b>	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.
<b>5. Final filters clogged; powder in fan compartment</b>	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 <i>Repair</i> 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
<b>6. Cartridge filters clogged</b>	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 <i>Repair</i> section.
	Timer board settings incorrect	Adjust the timer board settings as described in the <i>Operation</i> 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.
<b>7. System shuts down or will not start</b>	Flame detector system sees a flame or spark, or is malfunctioning	Check the inside of the enclosure and color module, the detector head aim, and the workpiece and conveyor grounds.  Follow the troubleshooting procedures in the flame detector system manual.
	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.
	Air dryer not operating, or interlock not activated	Start the air dryer. Follow the troubleshooting procedures in the dryer manual. Check the interlock circuit. (Air dryer interlock not used after April 2003.)
	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.
<b>8. Sieve not screening powder</b>	Screen clogged or damaged	Clean or replace the screen.

*Continued...*

## Troubleshooting Procedures *(contd)*

Problem	Possible Cause	Corrective Action
<b>9. Sieve scrap bucket filling up with powder</b>	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.
<b>10. Powder escaping from booth openings</b>	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.
	Fan damper closed too far	Open fan damper to increase air flow through enclosure. Refer to <i>Fan Damper Adjustment</i> in the <i>Operation</i> section.
	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 <i>Reversing Motor Direction</i> 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 <i>Installing a New Color Module and Feed Hopper</i> in the <i>Operation</i> 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.

# System Schematics (Systems Made in 2003 and Later)

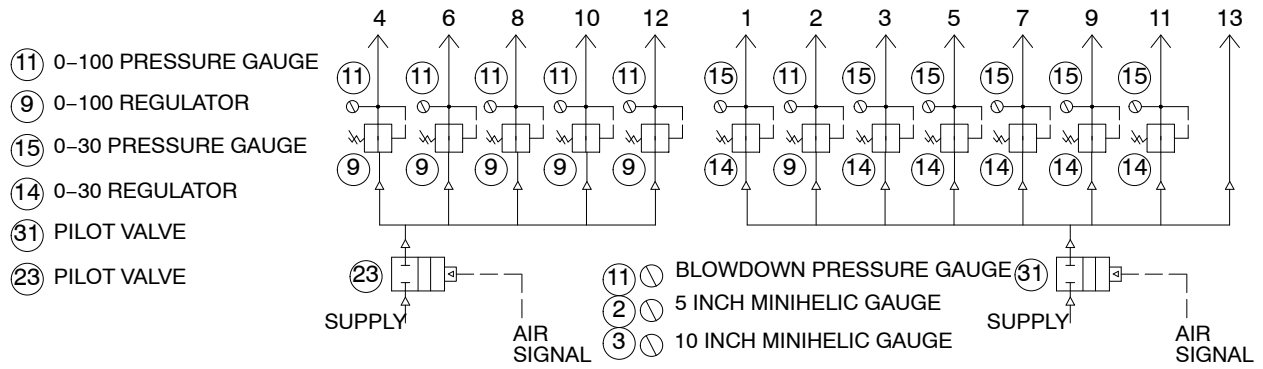


Figure 5-7 Pneumatic Schematic (2003 and Later)

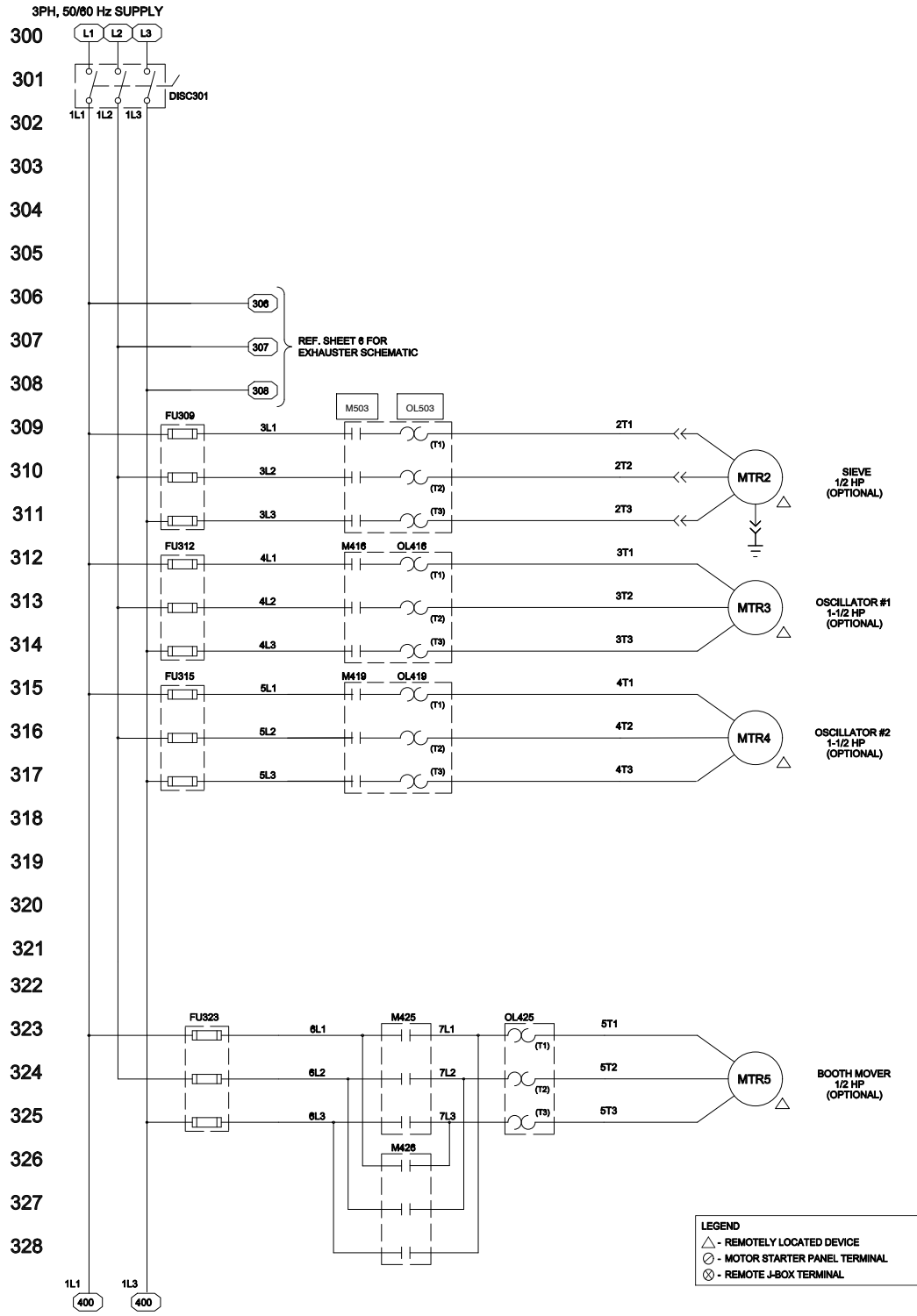
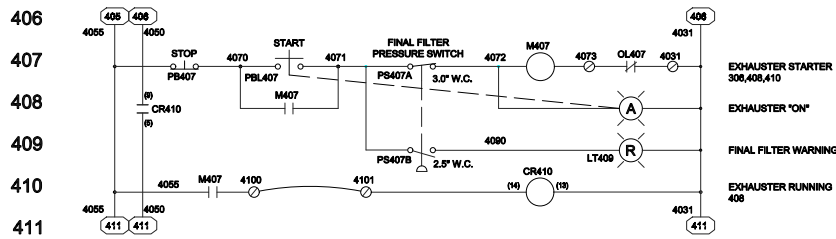
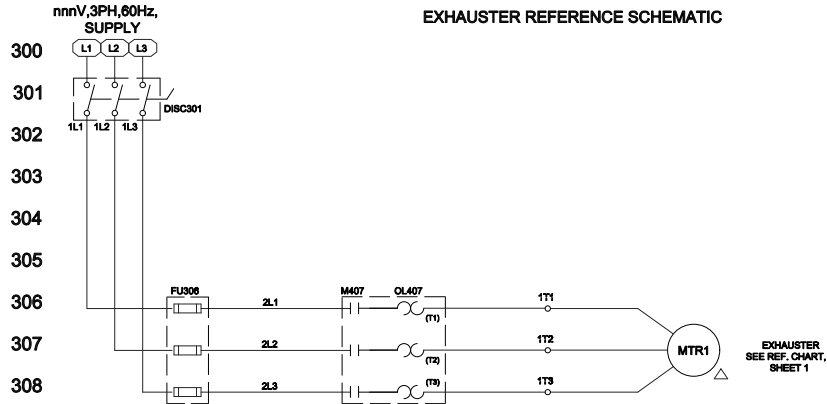
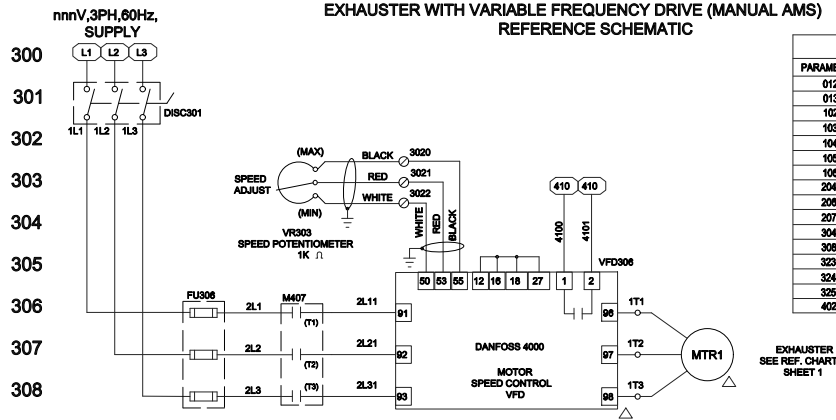


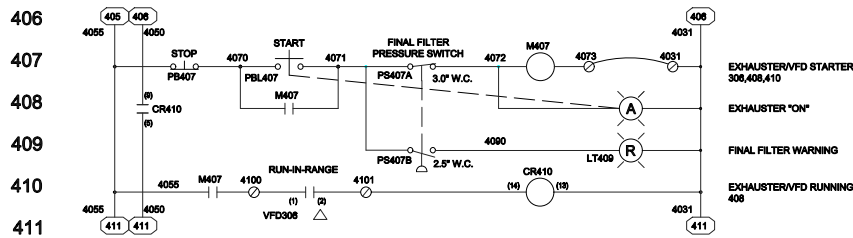
Figure 5-8 System Schematic (1 of 5) (2003 and Later)



**EXHAUSTER WITH VARIABLE FREQUENCY DRIVE (MANUAL AMS) REFERENCE SCHEMATIC**



DANFOSS 4000 DRIVE PARAMETERS		
PARAMETER	SETTING	DESCRIPTION
012	DISABLE	HAND START ON LCP
013	DISABLE	OFFSTOP ON LCP
102	XXXV	MOTOR POWER
103	XXXV	MOTOR VOLTAGE
104	XXXHz	MOTOR FREQUENCY
105	XXA	MOTOR CURRENT
106	XXXXRPM	RATED MOTOR SPEED
204	30Hz	MINIMUM REFERENCE
206	20 SEC	RAMP-UP-TIME
207	10 SEC	RAMP-DOWN-TIME
304	COAST INVERSE	TERMINAL 27 FUNCTION
308	REFERENCE	TERMINAL 33 ANALOG FUNCTION
323	RUNNING	RELAY 1 OUTPUT FUNCTION
324	15 SEC	RELAY 1 DELAY ON
325	0 SEC	RELAY 1 DELAY OFF
402	DISABLE	FLYING START



**LEGEND**  
 △ - REMOTELY LOCATED DEVICE  
 ○ - MOTOR STARTER PANEL TERMINAL

Figure 5-9 System Schematic (2 of 5) (2003 and Later)

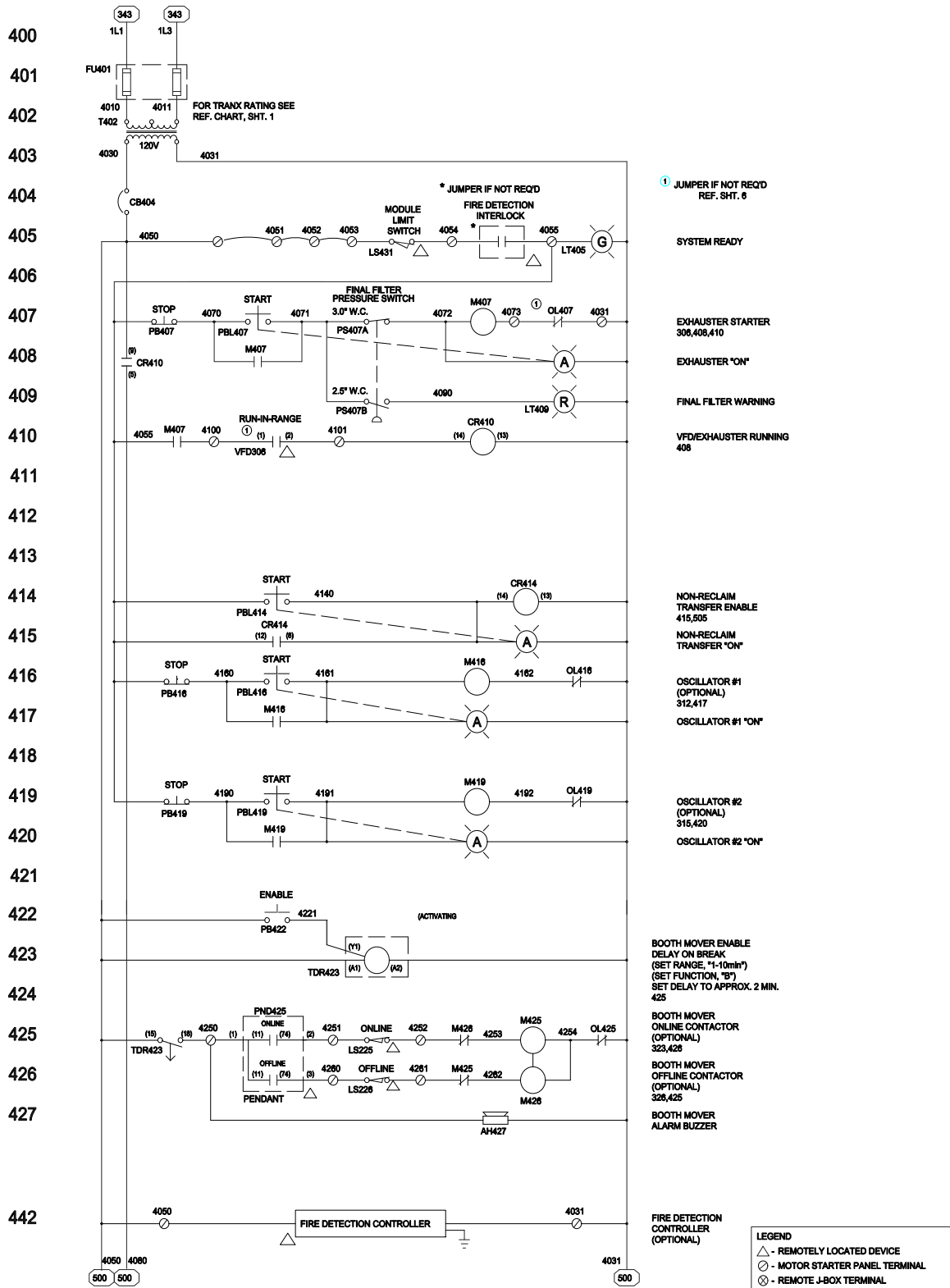


Figure 5-10 System Schematic (3 of 5) (2003 and Later)

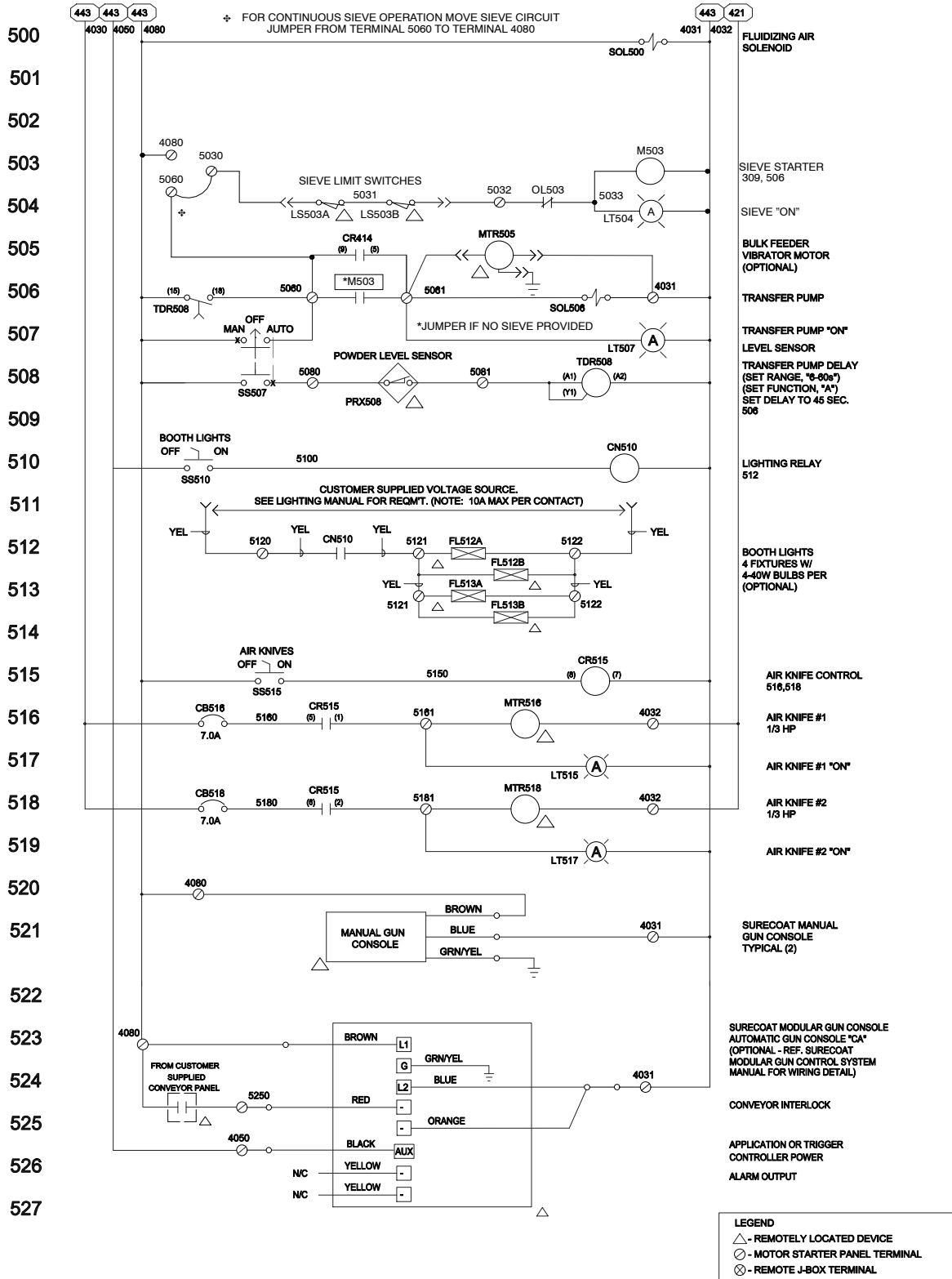


Figure 5-11 System Schematic (4 of 5) (2003 and Later)



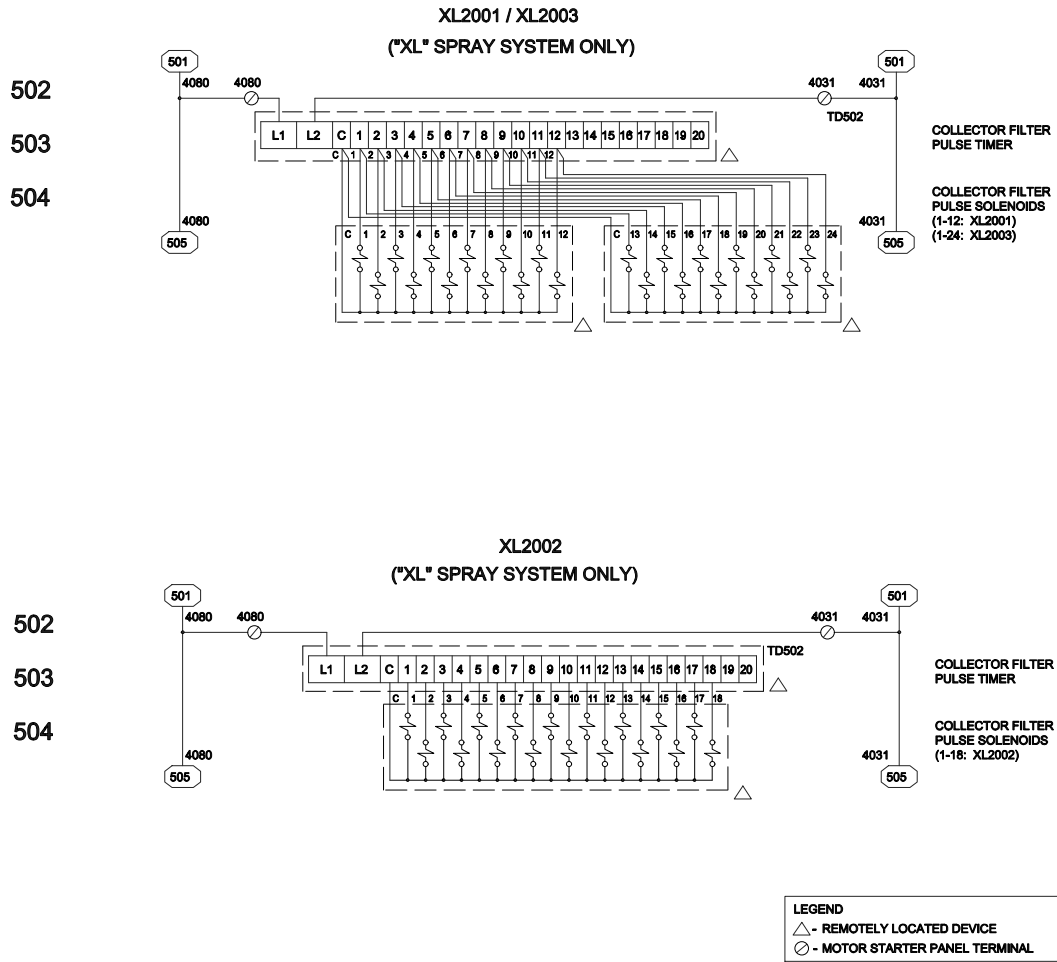


Figure 5-12 System Schematic (5 of 5) (2003 and Later)

# Schematics (Pre-2003 Systems)

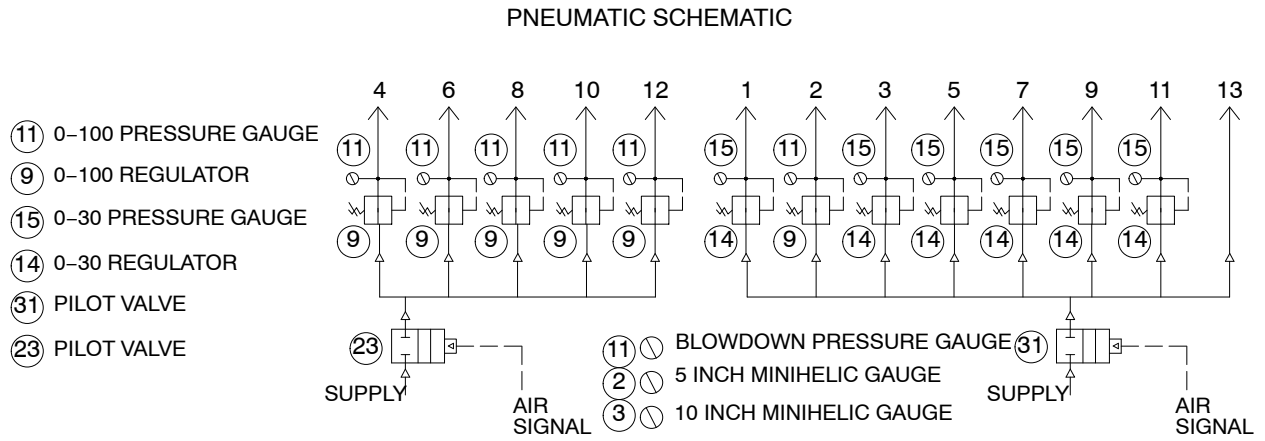


Figure 5-1 Pneumatic Schematic (Pre-2003)

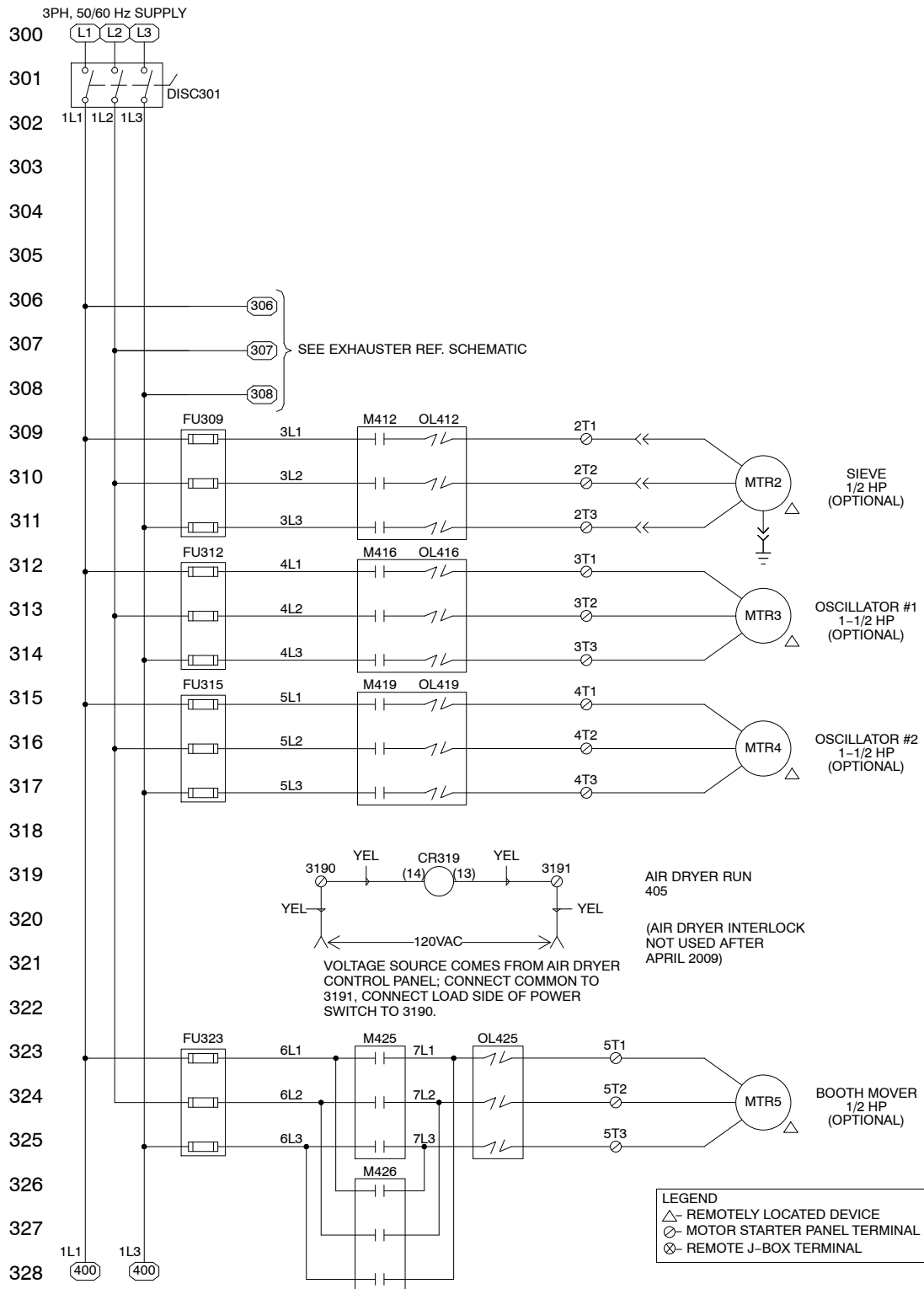


Figure 5-2 System Schematic (1 of 5) (Pre-2003)

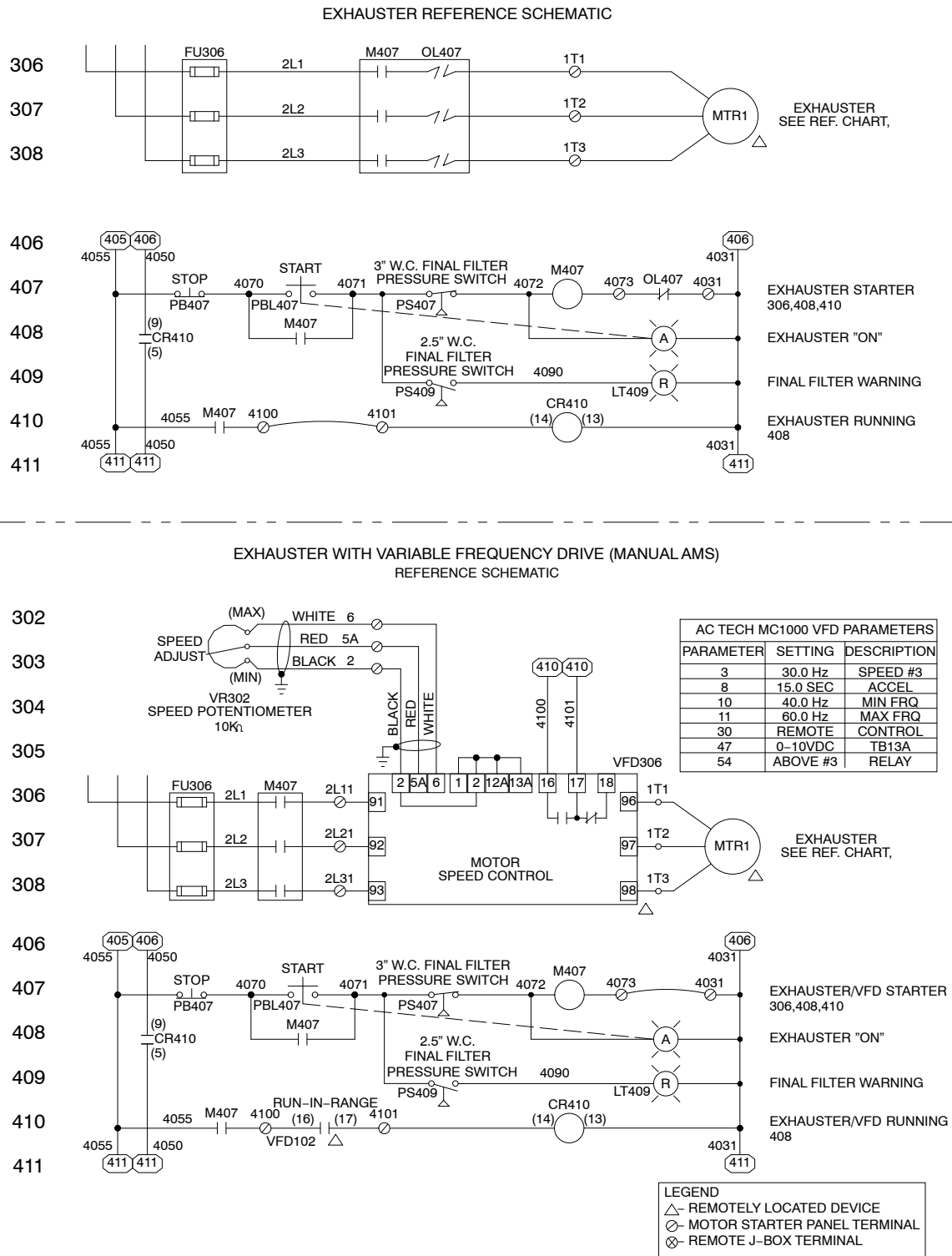


Figure 5-3 System Schematic (2 of 5) (Pre-2003)

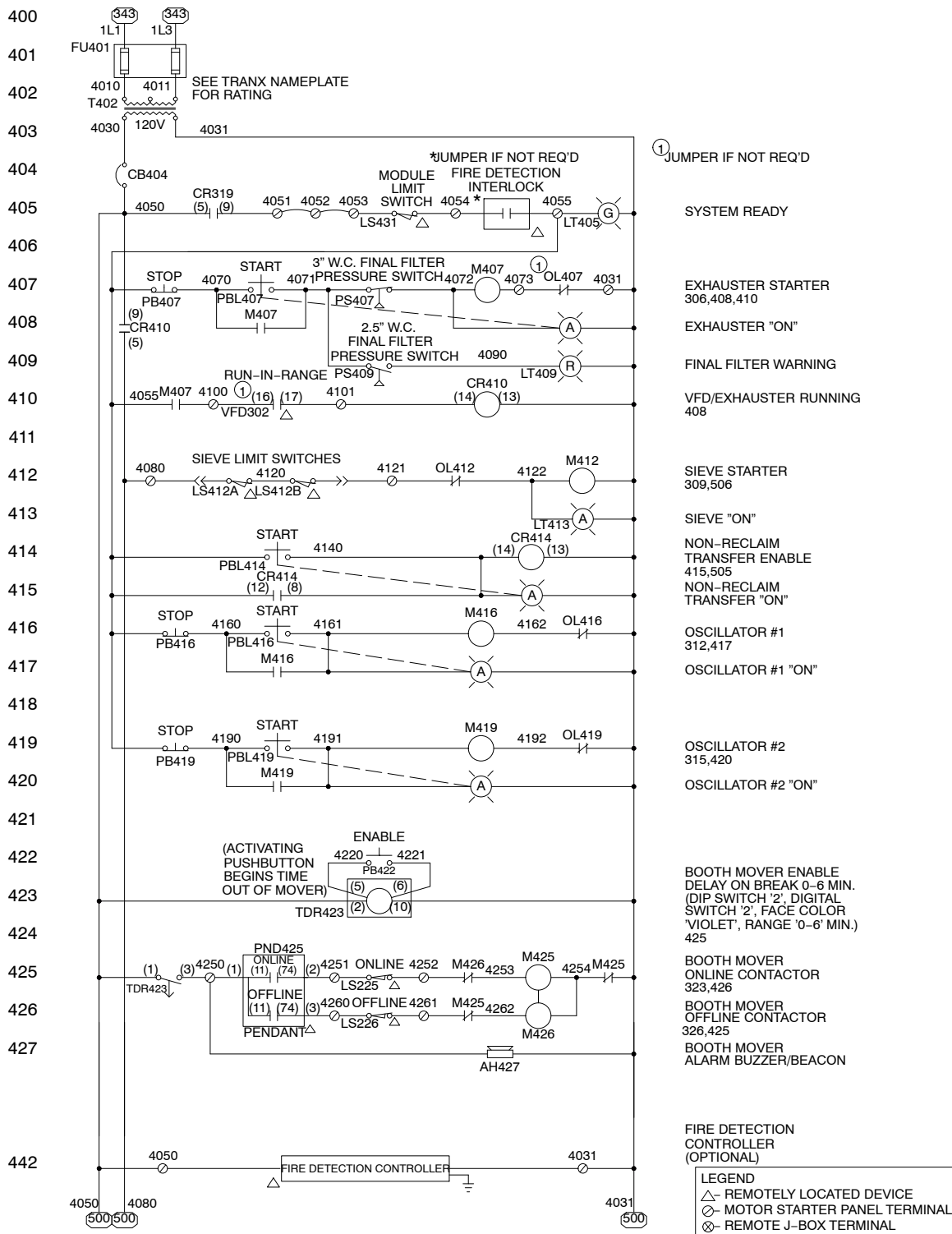


Figure 5-4 System Schematic (3 of 5) (Pre-2003)

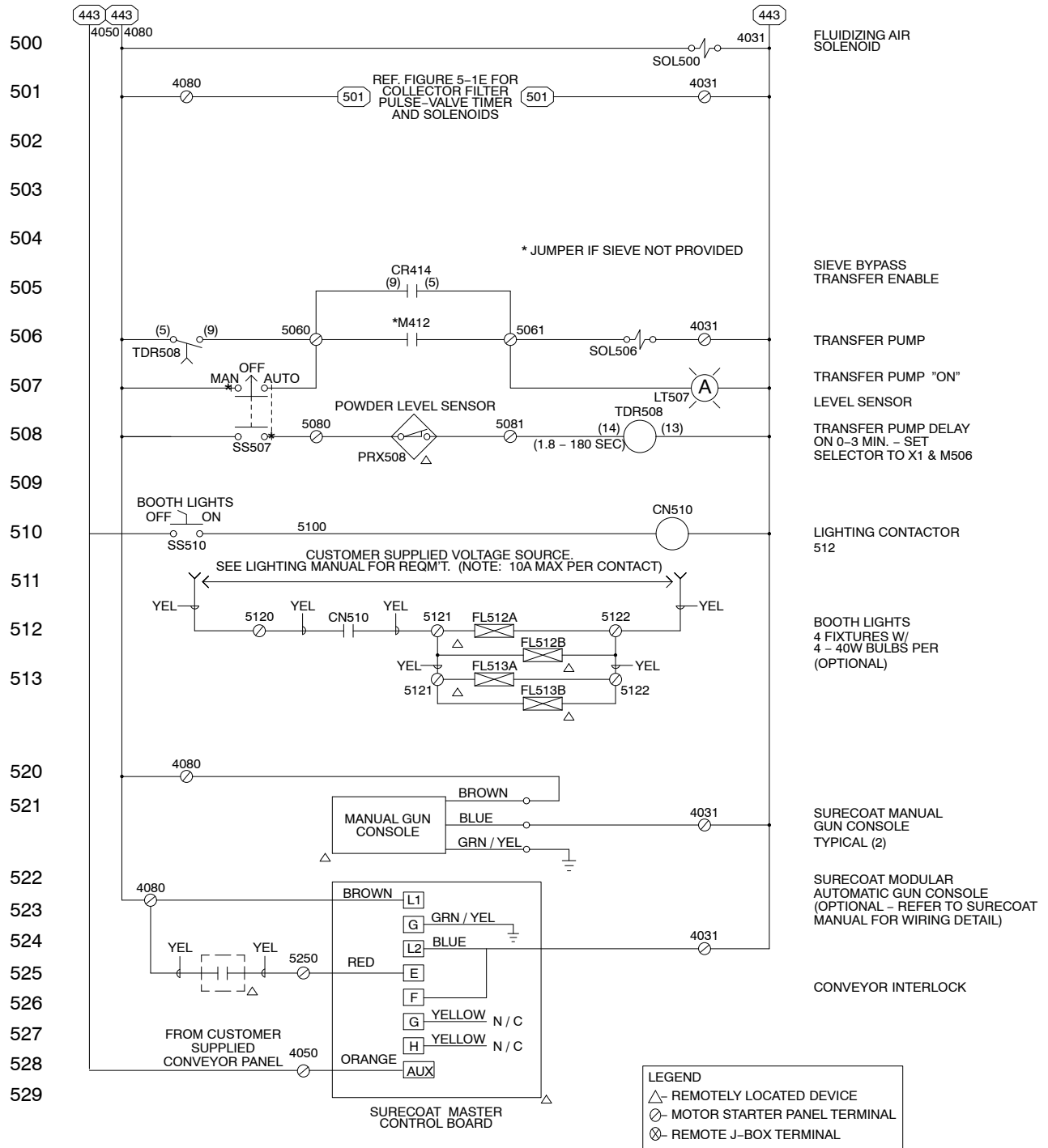


Figure 5-5 System Schematic (4 of 5) (Pre-2003)

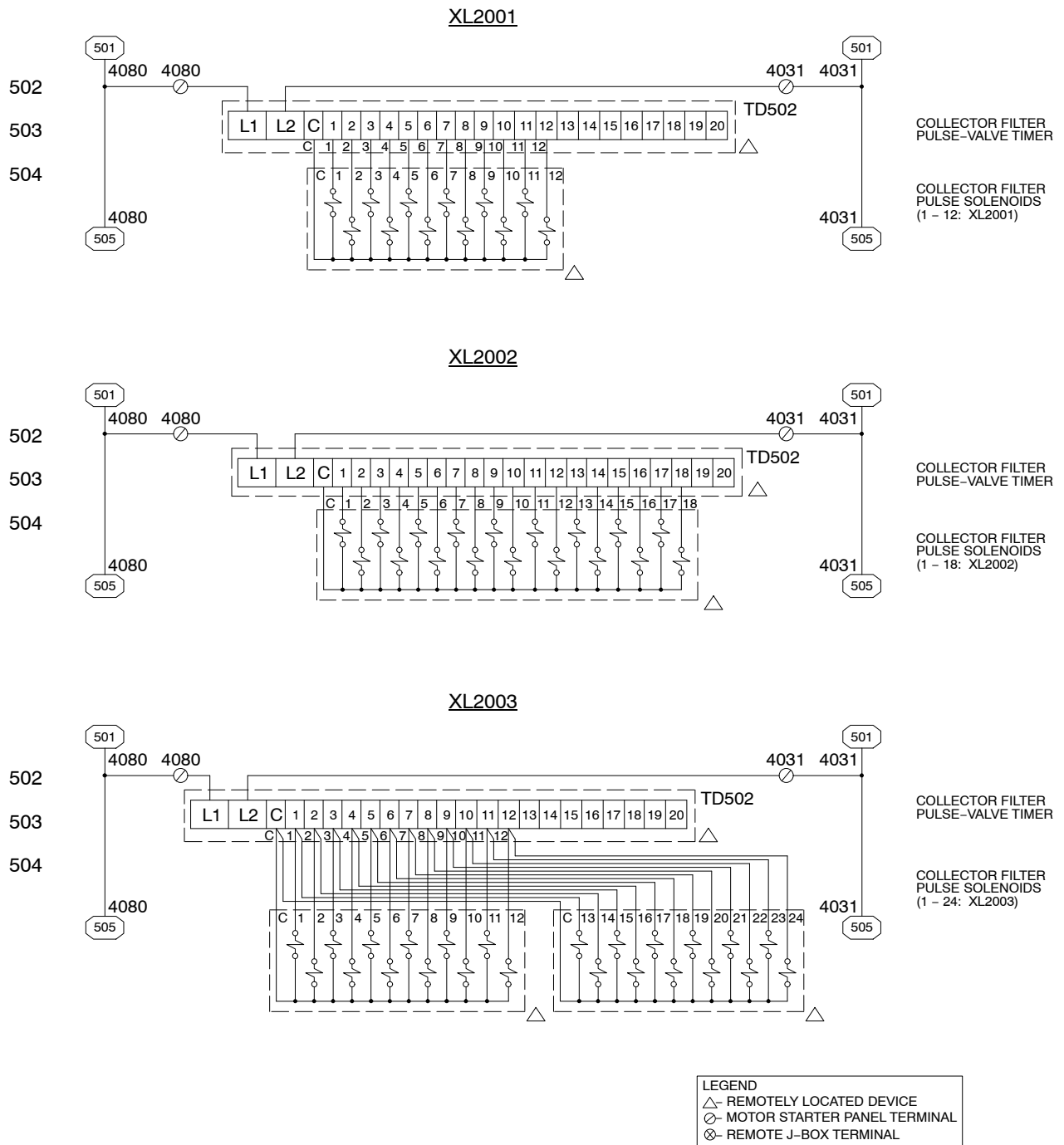


Figure 5-6 System Schematic (5 of 5) (Pre-2003)





## 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 2000 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 mounting plate. 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.
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.

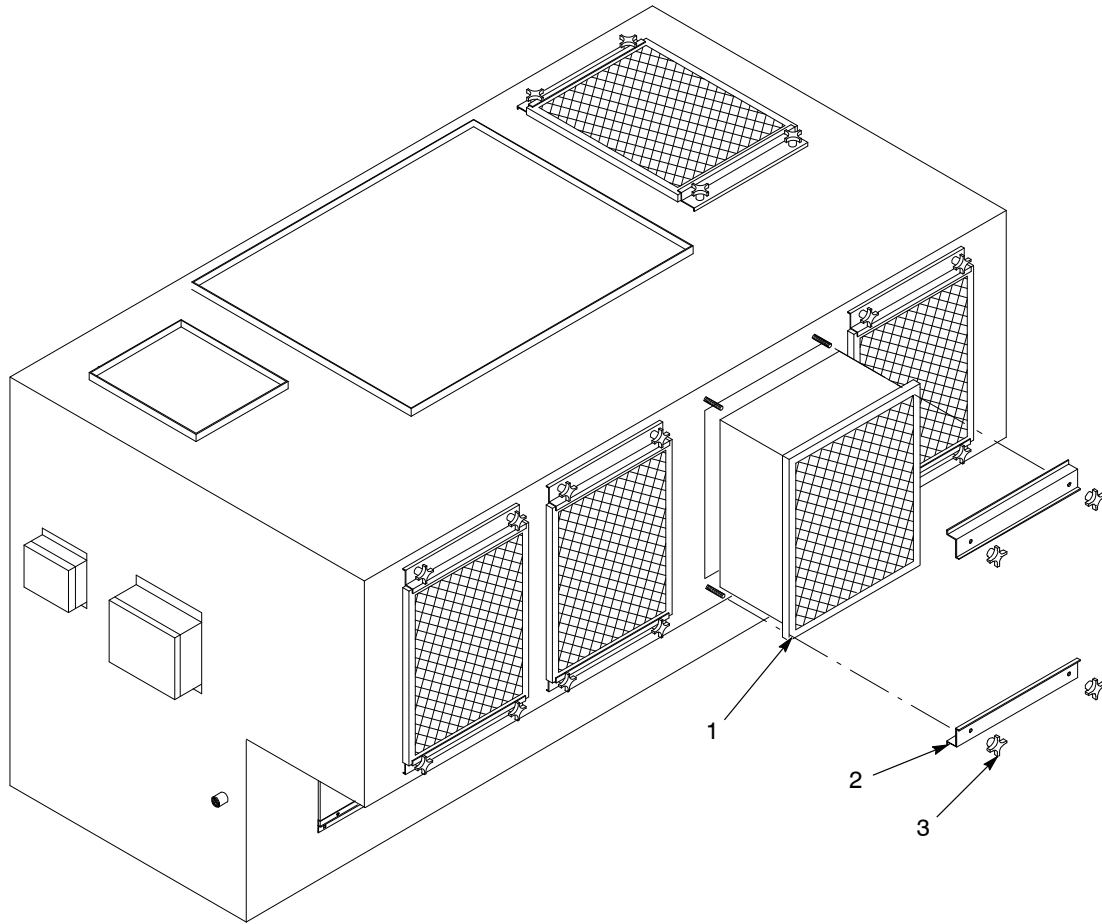


Figure 6-1 Final Filter Replacement

1. Final filter

2. Brackets

3. Threaded knobs

# Cartridge Filter Replacement

## Cartridge Filter Removal

1. Remove the color module from under the fan section as described in the *Reclaim-to-Reclaim Color Change* procedure on page 3-8.
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 mounting plate (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.

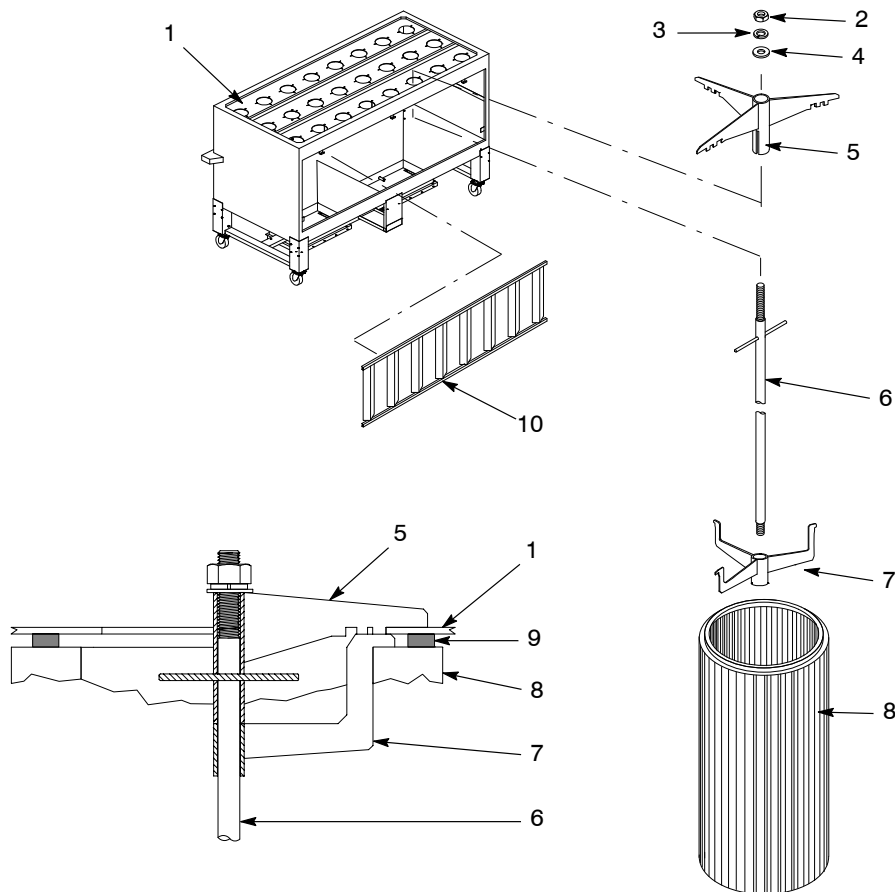


Figure 6-2 Cartridge Filter Replacement

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

## 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 mounting plate (1). Dirty surfaces will prevent the cartridge filter gaskets from sealing properly and allow powder to leak into the fan section.
  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).
  4. Screw the draw rods into the filter bosses. Tighten the draw rods by hand.
  5. Center the cartridge filters under the filter openings in the mounting plate. Hold the cartridge filters up against the mounting plate.
  6. 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.
  7. Install the flat washers (4), lock washers (3), and nuts (2) on the draw rods.
  8. Slip the ends of the filter mounts into the locating slots in the mounting plate, around the openings.



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

9. 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 mounting plate.
10. Install the color module as described in *Installing a New Color Module and Feed Hopper* on page 3-10.

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# Color Module Fluidizing Plate Replacement

## *Systems Made in 2003 or Later*

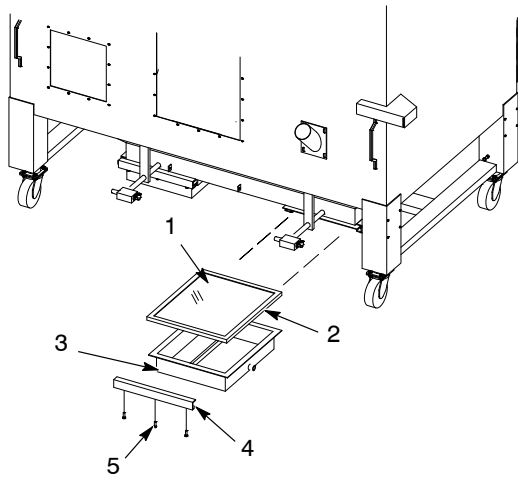
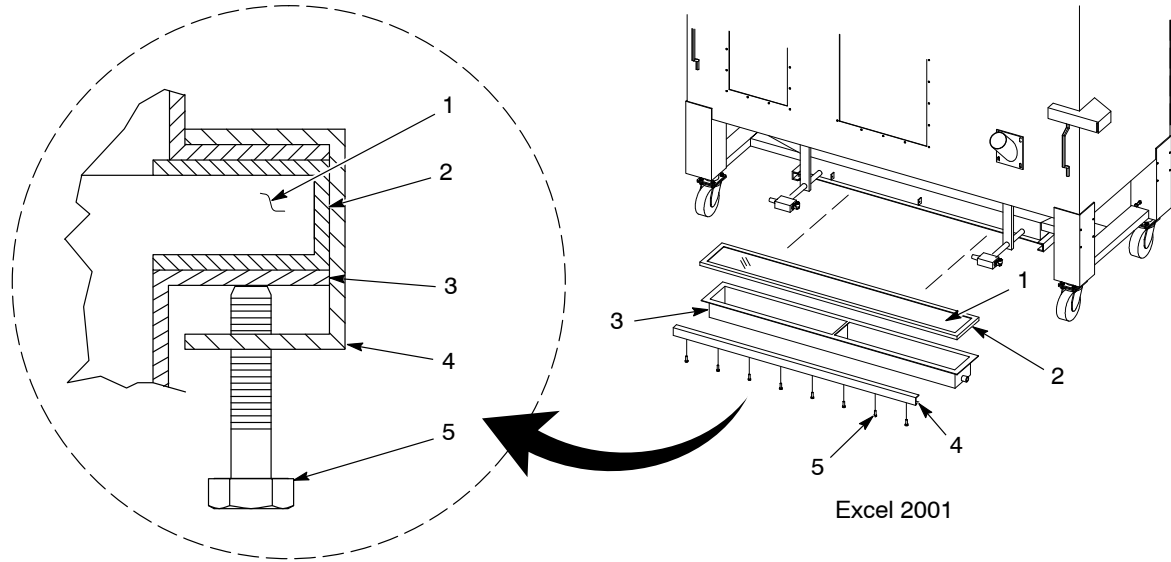
Use this procedure for systems manufactured after 2003. Fluidizing plate replacement will only be necessary if the plates are contaminated or damaged.

### Preparation

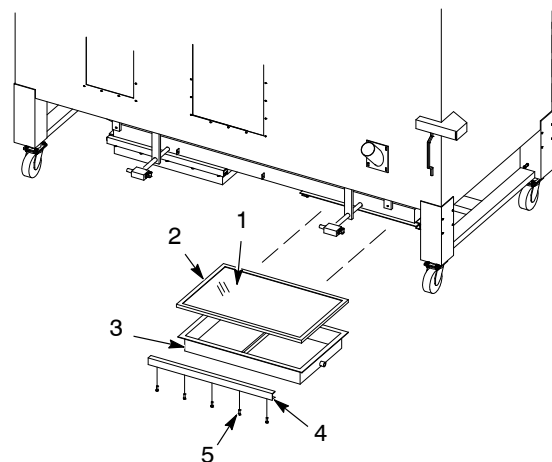
1. Start the transfer pumps and pump as much as possible of the powder in the color module hoppers back into the feed hopper. If the powder is contaminated, pump it into a scrap bucket.
2. Remove the color module from under the fan section as described in the *Reclaim-to-Reclaim Color Change* procedure on page 3-8.
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.



Excel 2002



Excel 2003

Figure 6-3 Color Module Fluidizing Plate Replacement (Systems Made in 2003 and Later)

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

## Systems Made Before 2003

Use this procedure for systems manufactured before 2003. Fluidizing plate replacement will only be 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 as described in the *Reclaim-to-Reclaim Color Change* procedure in the *Operation* 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



**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.

1. Use a forklift truck or suitable jacks to raise the color module several feet off the floor. Install safe, solid, support blocks under the module, then lower the module onto the blocks.
2. See Figure 6-4. Unscrew the clamping-channel screws (6) about 6–10 mm (0.25–0.375 in.) to clear the fluidizing plate gaskets (2). Support the fluidizing plenums (4) and remove the clamping channels (5).
3. Remove the fluidizing plenums from under the color module.
4. Separate the old fluidizing plates (1), gaskets (2), and diffuser plates (3). Discard the old fluidizing plates.
5. Clean the plenums, diffuser plates, and hopper flanges.
6. Assemble the fluidizing plenums, diffuser plates, gaskets, and fluidizing plates, with the diffuser plates between the gaskets and the fluidizing plates.
7. Hold the plenum assemblies in position against the color module hoppers. Install the clamping channels over the fluidizing plenums and hopper flanges. Align the plenum and hopper flanges on all four sides.
8. Tighten the clamping-channel screws with a torque wrench to 2.8 N•m (25 in.-lb) in a criss-cross pattern. This will prevent flange distortion and fluidizing plate damage.
9. Lower the color module to the floor and 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.

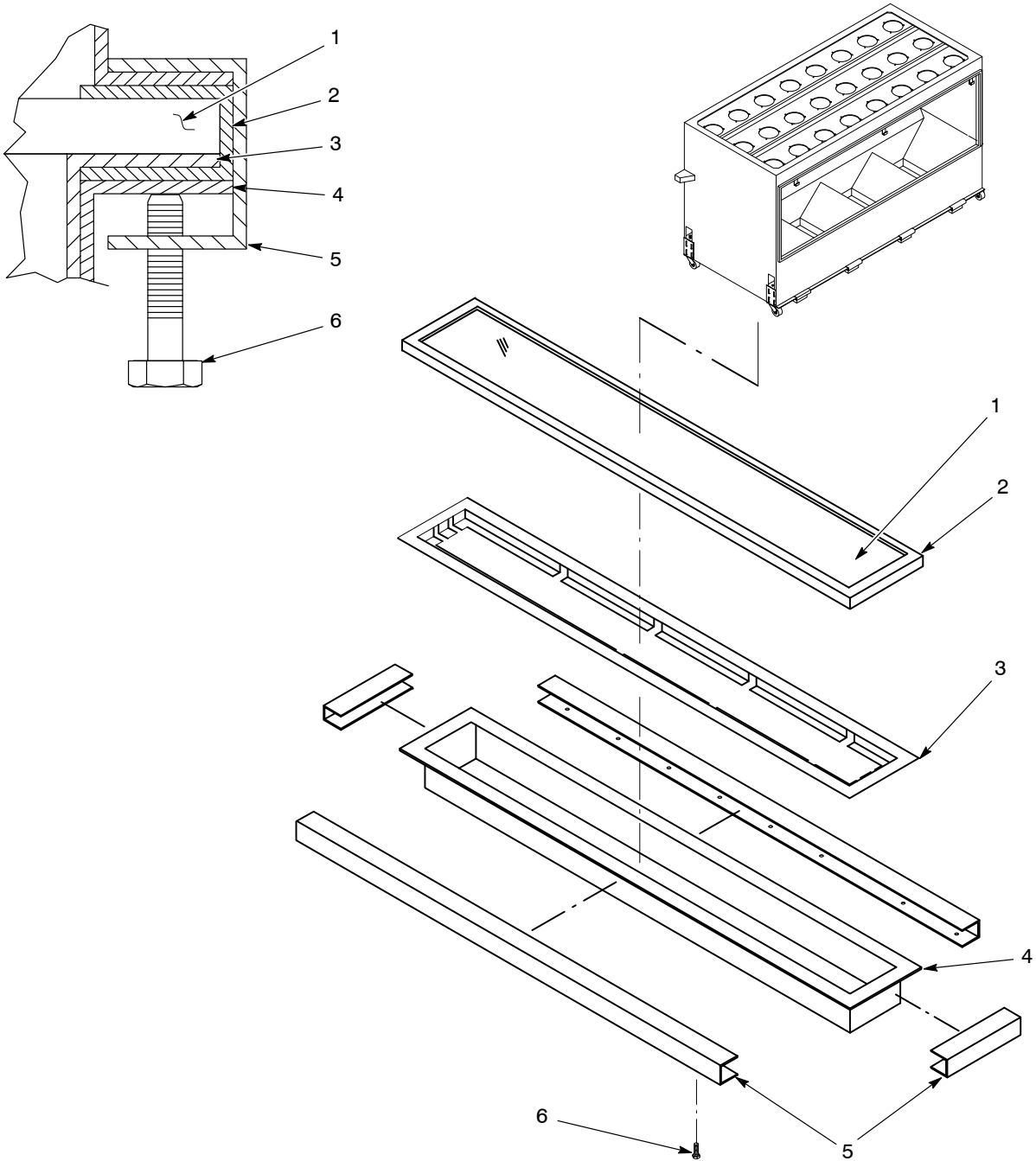


Figure 6-4 Color Module Fluidizing Plate Replacement (Systems Made Before 2003)

- |                             |                       |                            |
|-----------------------------|-----------------------|----------------------------|
| 1. Fluidizing plates        | 3. Diffuser plates    | 5. Clamping channels       |
| 2. Fluidizing plate gaskets | 4. Fluidizing plenums | 6. 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 10-tube quick-disconnects from the feed hopper, powder pumps, and accumulator.
2. Rotate the level sensor and pull it from its mounting in the side of the feed hopper.
3. Unplug the sieve power cords (electrically driven sieves only). Disconnect the feed-hopper ground wire.
4. Remove the feed hopper from the color module and roll it to a clean work area.
5. Remove the powder from the hopper and thoroughly clean the hopper, accumulator, and sieve.

## *Replacement*

1. See Figure 6-5. 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.
4. Clean the plenum interior and the plenum and feed hopper flanges.
5. 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, quick-disconnects, power cords, and ground wires. Install the level sensor in its mounting.

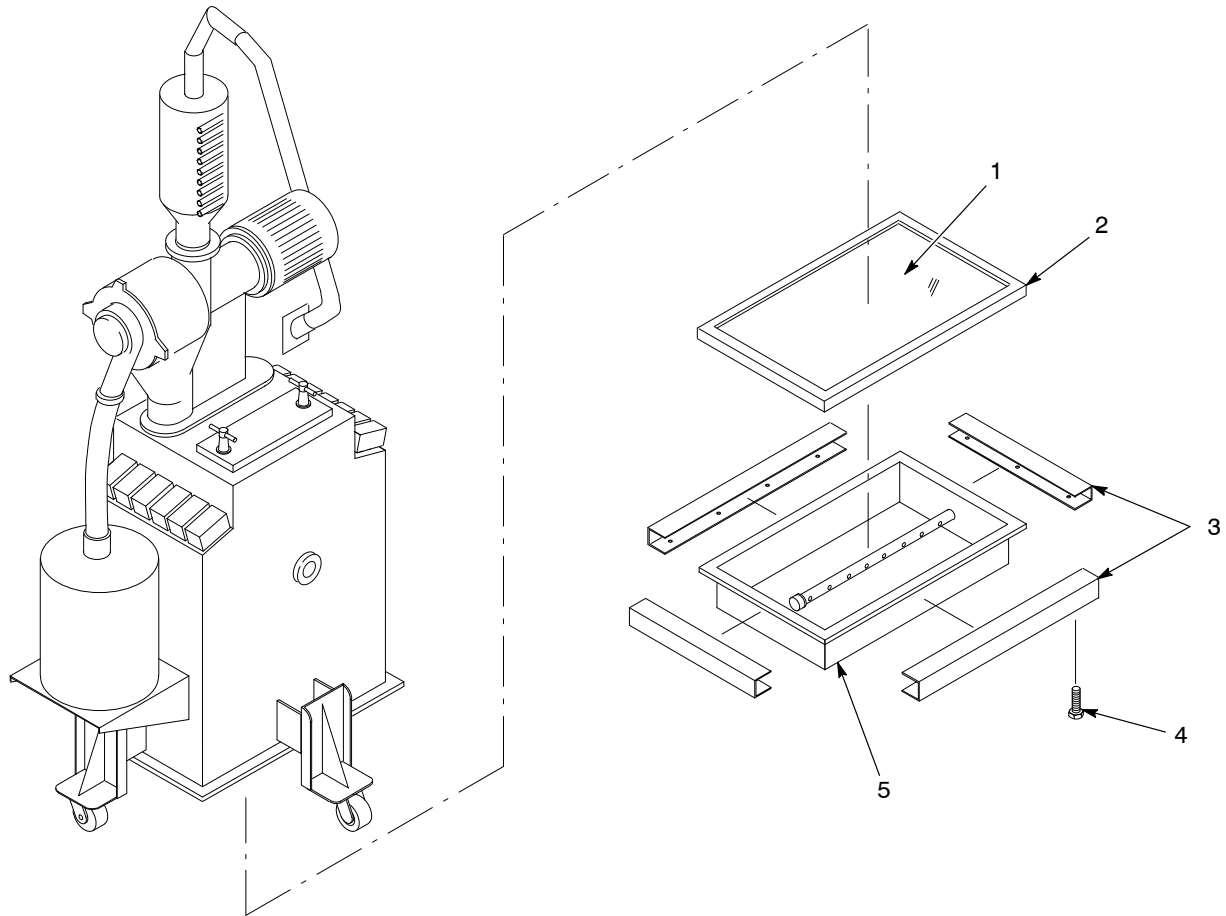


Figure 6-5 Feed Hopper Fluidizing Plate Replacement

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

## Vibratory Sieve Repair

1. Open the feed hopper lid. Reach inside the hopper and disconnect the sieve ground wire.
2. Remove the bolts and washers from the hopper cover.
3. Lift the cover (with the accumulator and sieve attached) off the hopper. Block up the cover to prevent damage to the screen assembly on the underside.
4. Unfasten the two toggle clamps and remove the screen basket. Discard any scrap powder and vacuum out the basket. Replace the basket if it is damaged. If no further disassembly of the sieve is necessary, reattach the basket and disregard steps 5 through 7.
5. To remove the air motor, disconnect the two air lines. Remove the bolt and spacer.

**NOTE:** When you perform step 6, note the position of the screws, washers, nuts, rubber grommets or washers, and gaskets.

6. Remove the accumulator from the sieve, and disassemble the rest of the sieve.
7. Clean powder residue from the accumulator and sieve parts.
8. Assemble the sieve and install it on the hopper. Cap unused accumulator inlet tubes.

## Pulse Valve Replacement

The pulse valves are connected directly to the air manifold in the open bottom of the fan section. To avoid connecting the valves to the wrong solenoids, remove and replace one valve at a time. Incorrect connections will cause the valves to open in the wrong order.

See Figure 6-7 and 6-8 for pulse valve and solenoid connections. Timer board terminal 1 is wired to solenoid 1. Solenoid 1 is connected by air tubing to pulse valve 1. The rest of the solenoids and valves are connected in the same way.



**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 as described in the *Reclaim-to-Reclaim Color Change* procedure in the *Operation* section.
2. See Figure 6-6. Disconnect the pilot air tubing from the pulse valve tube fitting (1).
3. Unscrew the pulse valve (2) from the coupling (4).
4. Remove the tube fitting and nozzle (3) from the old valve. Wrap PTFE tape around the threads of the tube fitting and nozzle. Install the fitting and nozzle into the new valve.
5. Wrap PTFE tape around the threads of the coupling. Screw the new valve onto the coupling. Position the valve so the final adjustment will tighten the threads and form an air-tight seal.
6. Adjust the valve so the nozzle is vertically plumb and 381 mm (15 in.) from the center of the nozzle to the center of the next valve nozzle.
7. Connect the pilot air tubing to the valve.

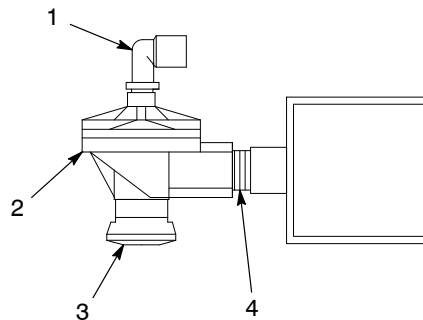


Figure 6-6 Pulse Valve Replacement

- |                 |             |
|-----------------|-------------|
| 1. Tube fitting | 3. Nozzle   |
| 2. Pulse valve  | 4. Coupling |

# Pulse Valve Replacement *(contd)*

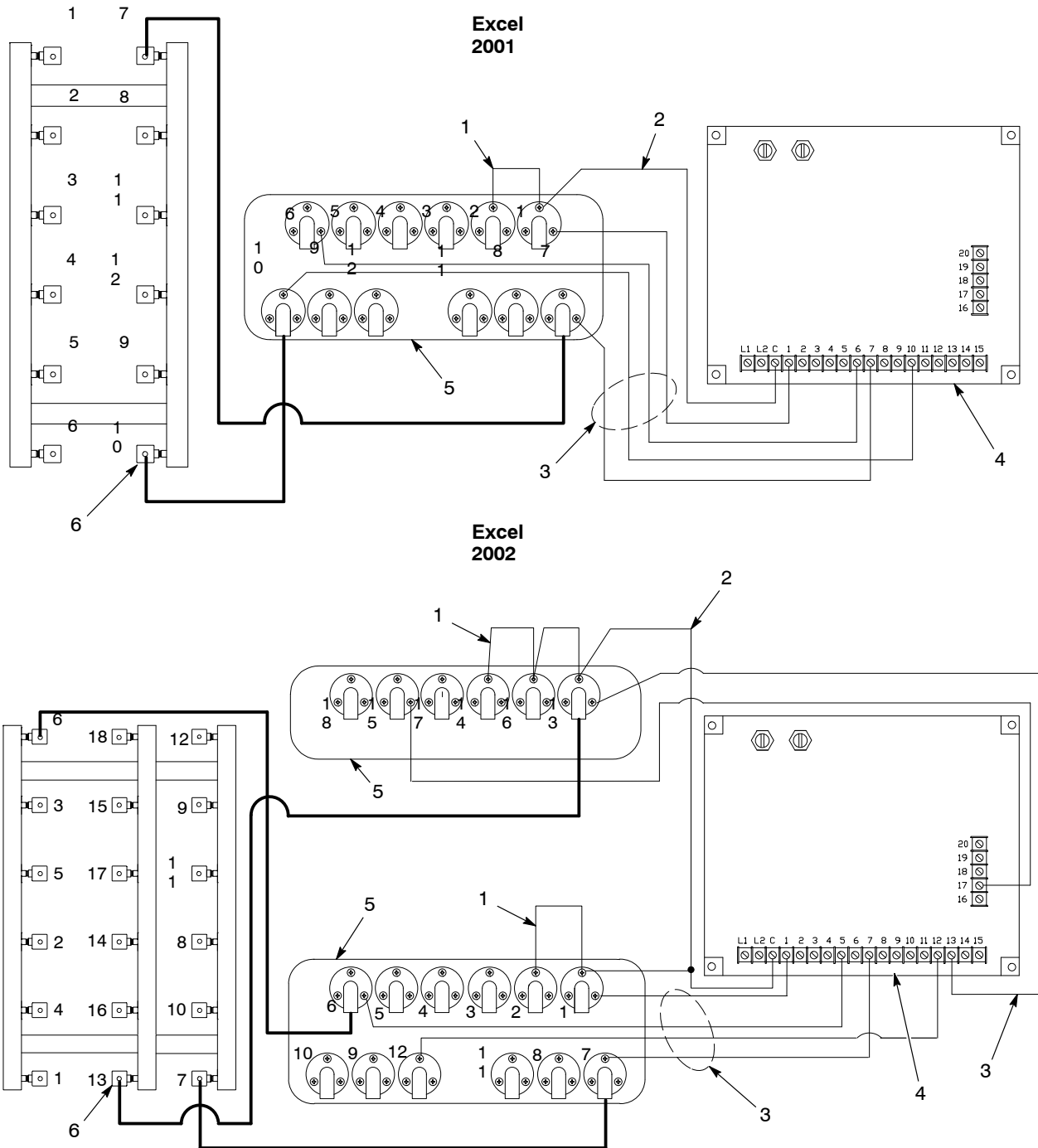


Figure 6-7 Excel 2001 and 2002 Pulse Valve Air Lines and Wiring

- |   |                                 |                        |
|---|---------------------------------|------------------------|
| 1. 14-gauge white jumper to all solenoids | 3. 14-gauge red wire (positive) | 5. Solenoid enclosures |
| 2. 14-gauge white wire (common)           | 4. Timer board                  | 6. Pulse valves        |

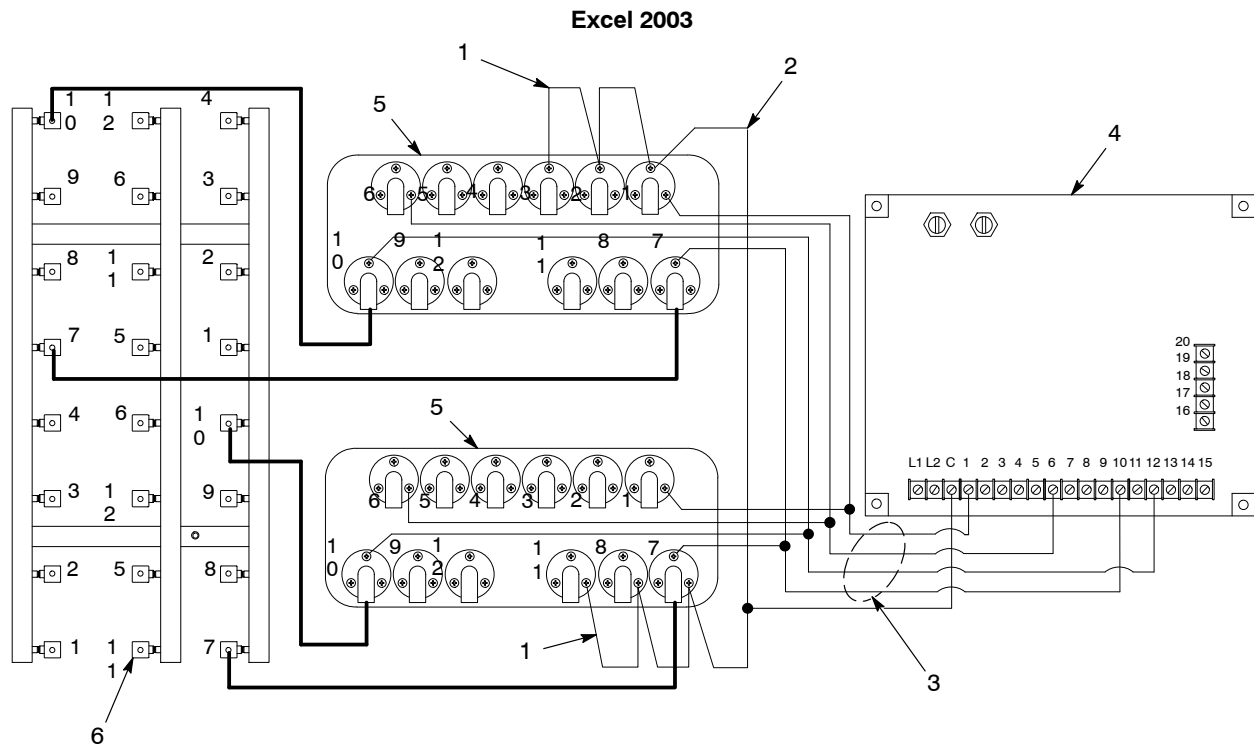


Figure 6-8 Excel 2003 Pulse Valve Air Lines and Wiring

- |   |                                 |                        |
|---|---------------------------------|------------------------|
| 1. 14-gauge white jumper to all solenoids | 3. 14-gauge red wire (positive) | 5. Solenoid enclosures |
| 2. 14-gauge white wire (common)           | 4. Timer board                  | 6. Pulse valves        |

## 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. If you have a 2002 or 2003 system, remove the top-left final filter for better access to the motor mount.
2. See Figure 6-9. Unscrew the tensioning bolts (4) on the side of the motor mount (1). This will allow you to slide the motor and mount 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 tensioning bolts into the motor mount. This will slide the motor and mount away from the fan.
6. Check the belt tension by pressing on the belts midway between the sheaves. You should not be able to deflect the belts more than 13–19 mm (0.5–0.75 in.) (one belt diameter).

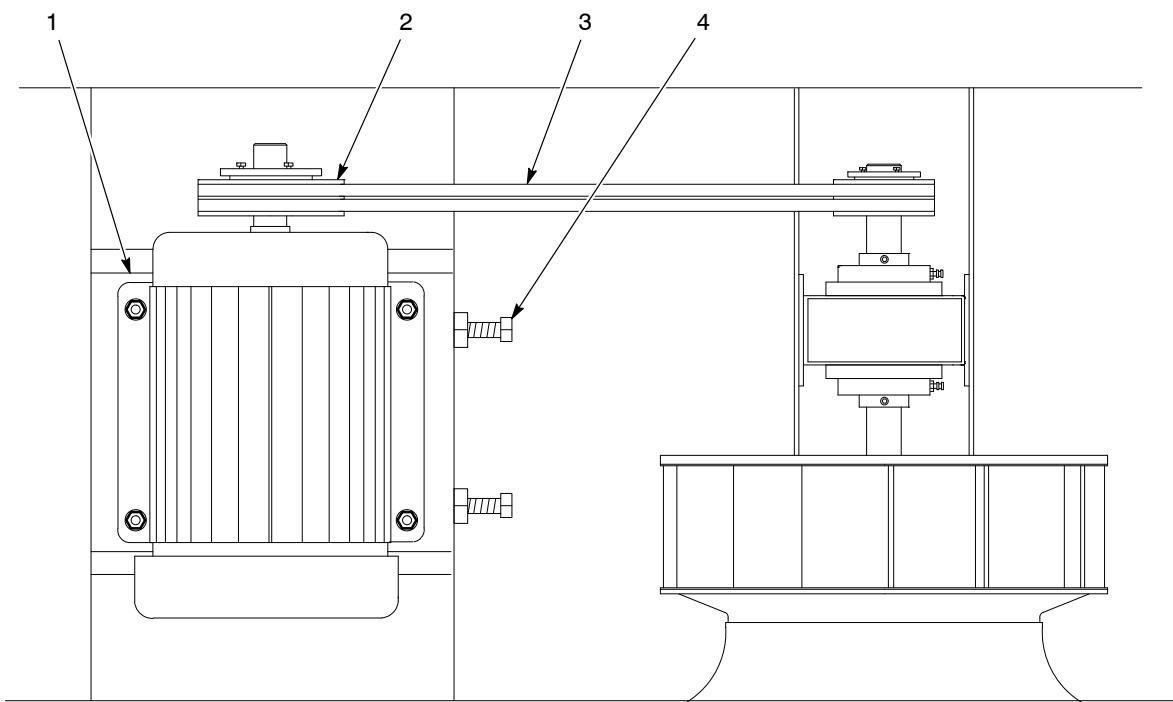


Figure 6-9 V-Belt Replacement (Excel 2001 Shown)

- |                |            |                     |
|----------------|------------|---------------------|
| 1. Motor mount | 3. V-belts | 4. Tensioning bolts |
| 2. Sheave      |            |                     |

## 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. Remove the motor access plate.
2. See Figure 6-10. Remove the cover from the motor junction box (3). Tag and disconnect the wiring from the motor leads. Disconnect the conduit (4) from the junction box.
3. Remove the V-belts, as described in the *V-Belt Replacement* procedure, from the motor sheave (1).
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 (5), lock washers (6), and flat washers (7) securing the motor to the motor mount (8).
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.

#### **Motor Installation**

1. Install the new motor on the motor mount with the nuts, lock washers, and flat washers.
2. Install the motor sheave as described in the *Motor Sheave Replacement* procedure.
3. Install the V-belts on the sheave and adjust the belt tension as described in the *V-Belt Replacement* procedure.
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 rotates in the direction shown by the yellow arrow next to the fan opening on the underside of the fan section. Refer to *Reversing Motor Direction* in the *Troubleshooting* section.
6. Install the motor access plate.



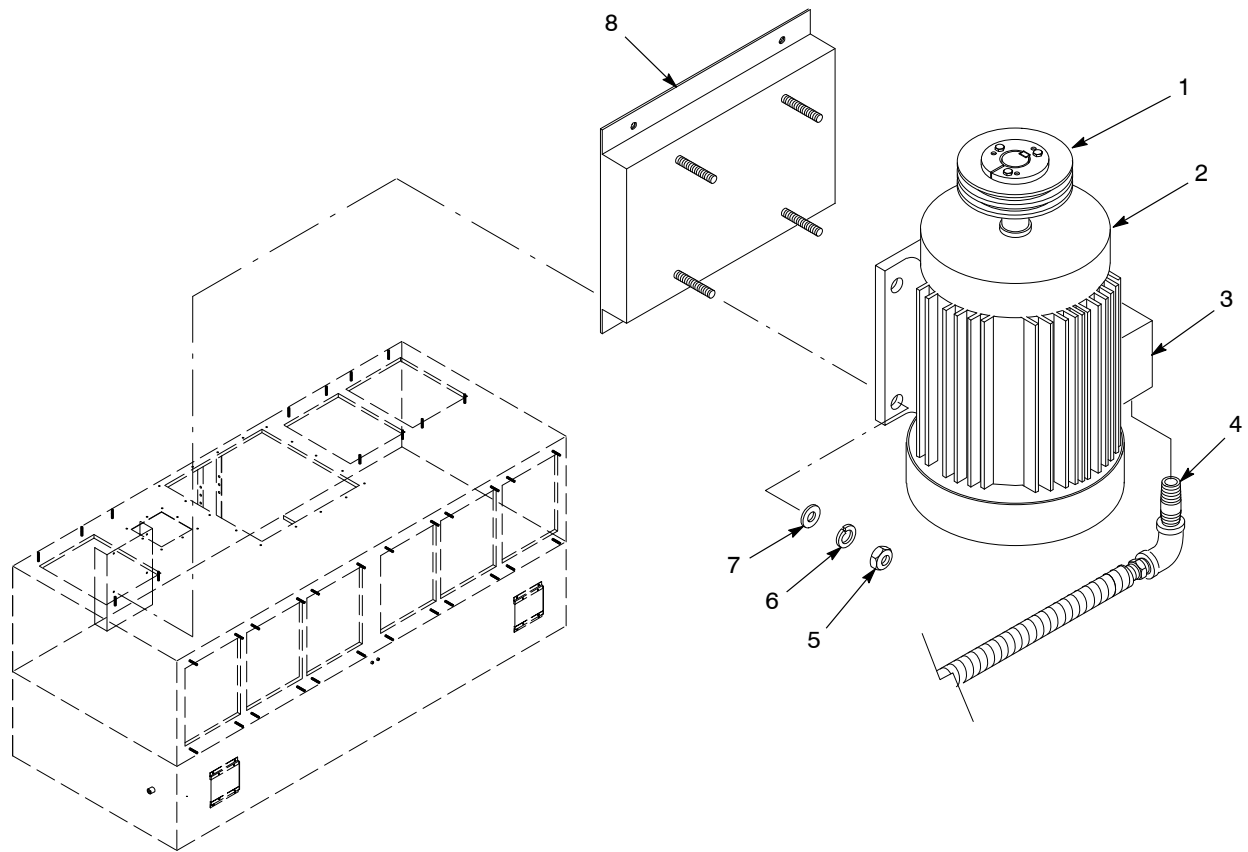


Figure 6-10 Motor Replacement

- |                       |                 |                 |
|-----------------------|-----------------|-----------------|
| 1. Motor sheave       | 4. Conduit      | 7. Flat washers |
| 2. Motor              | 5. Nuts         | 8. Motor mount  |
| 3. Motor junction box | 6. Lock washers |                 |

## Motor Sheave Replacement

### Motor Sheave Removal

1. Remove the motor access plate.
2. Remove the V-belts from the motor sheave as described in the *V-Belt Replacement* procedure.

**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.

3. See Figure 6-11. Unscrew the three cap screws (1) and remove them from the unthreaded holes in the bushing (2). Thread the screws through the threaded holes in the bushing until they bottom out on the sheave (3) hub.
4. 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.

5. 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 and bushing on the motor shaft (5). Line up the unthreaded 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 unthreaded holes in the bushing and thread them into the sheave.
3. Install the key into the keyway.
4. 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.

5. Tighten the cap screws evenly, a quarter turn at a time, to the specifications in Table 6-1. 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.

Table 6-1 Motor Busing Cap Screw and Pull Specifications

Screw Size	Torque, N•m (ft-lb)	Open-end or Socket Wrench Pull, kg (lb)
1/4-20	12.2 (9)	12.2 (27)

6. Use the level to 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.

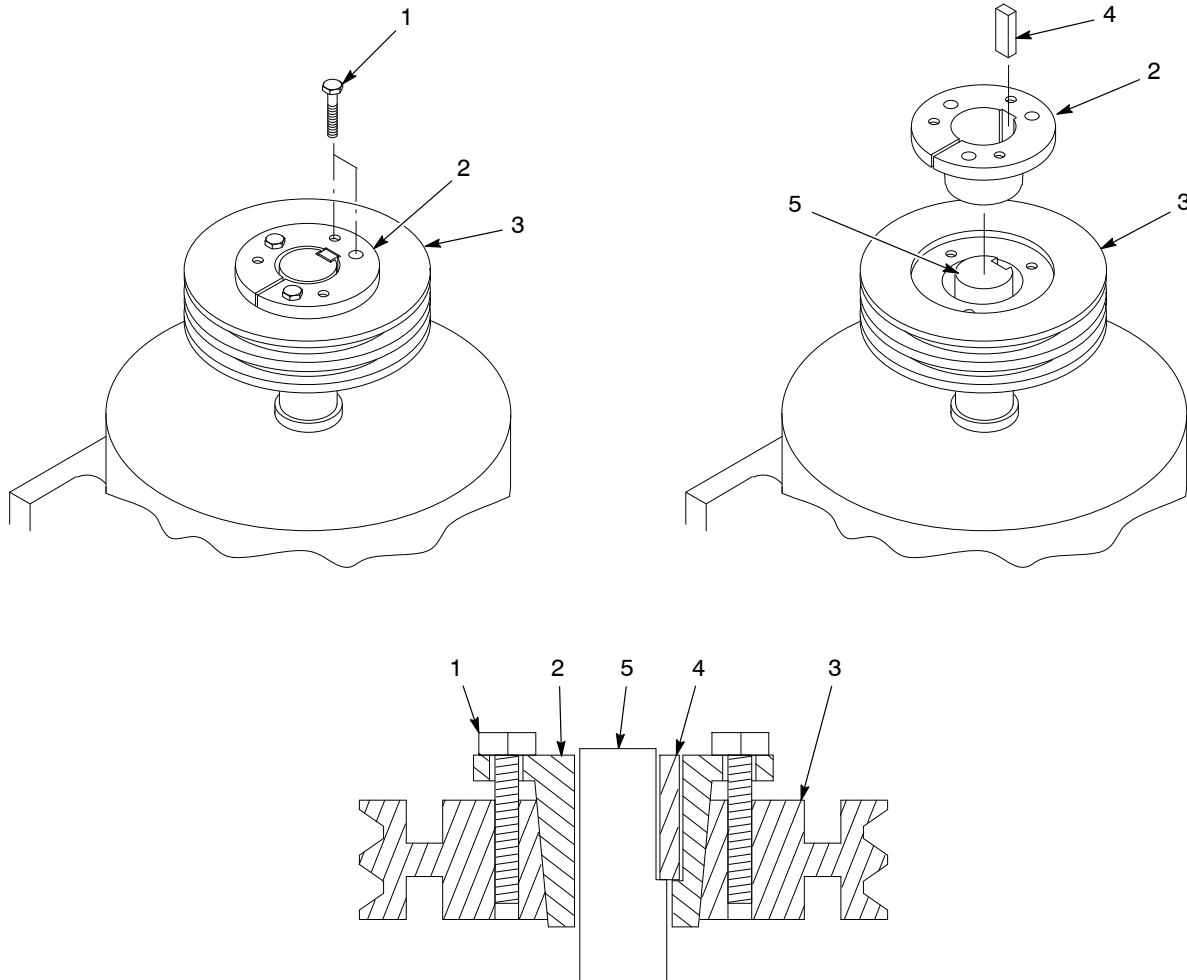


Figure 6-11 Motor Sheave Replacement

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

# 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 6-13. Remove the screws (21), washers (19, 20), retainers (18), and the inlet cone (22) from the fan section.
3. Loosen the key and shaft set screws in the hub of the fan (16).
4. Block up the fan. Remove the screw (14) and retainer washer (15) from the bottom of the shaft (5).
5. Remove the blocks, 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. Slide blocks between the fan and the floor of the fan section to hold the fan up.
2. Tighten the key set screw in the fan hub to hold the fan in place. Torque the set screw to the specification listed in Table 6-2.

Table 6-2 Fan Wheel Torque Specifications

Booth Model	Torque Specification
2001	3.5 N•m (30.9 in.-lb)
2002	3.5 N•m (30.9 in.-lb)
2003	8.5 N•m (75.6 in.-lb)

3. Install the retainer washer and screw it onto the end of the shaft. Remove the 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 6-12 and refer to Table 6-4. Adjust the height of the fan on the shaft. The bottom of the fan should sit inside the cone (overlap) 3–6 mm (0.125–0.25 in.). Tighten the shaft set screw in the fan hub.
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 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, as described in *V-Belt Replacement*, from the fan sheave.

**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 6-13. Unscrew the three cap screws (1) and remove them from the unthreaded 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 unthreaded 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 unthreaded holes in the bushing and thread them into the sheave. Do not tighten the screws.
3. Install the key into the keyway.
4. 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. 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 as specified in Table 6-3. Maintain a gap of 3–6 mm (0.125–0.25 in.) between the bushing flange and the sheave. See Figure 6-12 and Table 6-4.

**Fan Sheave Installation** (contd)

Table 6-3 Fan Bushing Cap Screws Torque and Pull Specifications

Screw Size	Torque, N•m (ft-lb)	Open-End or Socket Wrench Pull, kg (lb)
1/4-20	12 (9)	12 (27)
5/16-18*	20 (15)	14 (30)

\* Used on Excel 2003 low-flow version.

- Use the level to 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.
- Install the V-belts on the sheave and adjust the belt tension as described in the *V-Belt Replacement* procedure.

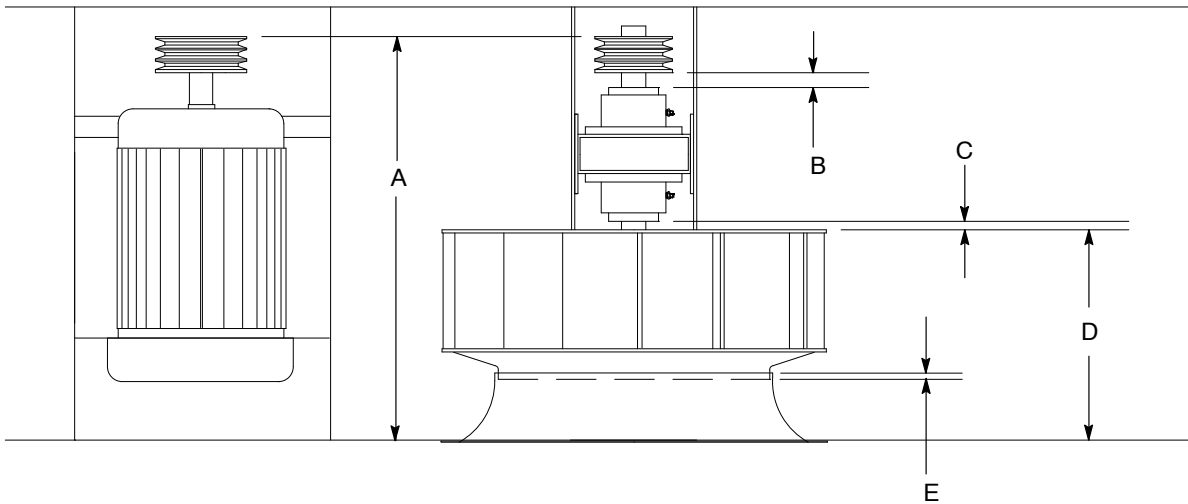


Figure 6-12 Fan and Motor Mounting Dimensions (Refer to Table 6-4)

Table 6-4 Fan and Motor Mounting Dimensions

Measurement	Dimensions		
	Excel 2001	Excel 2002	Excel 2003
A	648 mm (25.50 in.)	711 mm (28.00 in.)	724 mm (28.50 in.)
B	48 mm (1.875 in.)	27 mm (1.05 in.)	13 mm (0.50 in.)
C	60 mm (2.38 in.)	16 mm (0.62 in.)	13 mm (0.50 in.)
D	297 ± 5 mm (11.70 ± 0.20 in.)	363 ± 5 mm (14.30 ± 0.20 in.)	401 ± 5 mm (15.80 ± 0.20 in.)
E (overlap)	3–6 mm (0.125–0.25 in.)	3–6 mm (0.125–0.25 in.)	3–6 mm (0.125–0.25 in.)

# Fan Shaft and Bearing Replacement

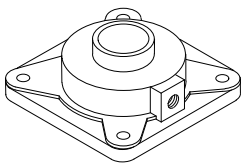
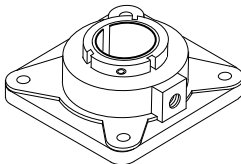
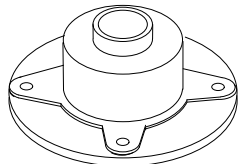
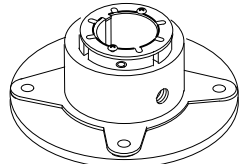


**WARNING:** Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch.

## Bearing Types

The design of the bearings has been updated. Refer to the following table to determine which type of bearings are in your system. If you order new bearings, you will receive the new style.

**NOTE:** The old-style bearings use set screws to hold the inner bearing race to the fan shaft. The new-style bearings use a split adapter sleeve and lock nut to hold the inner bearing race to the fan shaft.

Booth Model	Old Style	New Style
Excel 2001	 <b>Part 177622 Rev A</b>	 <b>Part 177622 Rev B or higher</b>
Excel 2002 and 2003	 <b>Part 183906 Rev A</b>	 <b>Part 183906 Rev B or higher</b>

## Fan Shaft and Bearing Removal

1. Remove the inlet cone and fan as described in the *Fan Replacement* procedure.
2. See Figure 6-13. Loosen the inner bearing races and pull the fan shaft (5) out of the bearings (9, 17).

Bearing Type	Loosening Procedure
Old Style	Loosen the bearing-race set screws
New Style	<p><b>Excel 2001:</b> Loosen the lock nut around the fan shaft.</p> <p><b>Excel 2002 and 2003:</b> Remove the two screws securing the lock plate, then loosen the lock nut around the fan shaft.</p>

### **Fan Shaft and Bearing Removal** (contd)

3. 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.
4. If you are replacing the bearings, disconnect the 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.

5. 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 6-13.

**Excel 2001 New-Style Bearings Only:** Install  $\frac{1}{16}$ -in. shims between the mounting surface and the expansion bearing (17). Do not install shims on the non-expansion bearing (9).

1. Install the new bearings on the supports with the screws (6), washers (7, 12), and nuts (13). Do not tighten the screws. Connect the tubing to the tube fittings (10).
2. Apply a coating of light oil to the shaft (5) where the bearings will be mounted.

**NOTE: Excel 2002 and 2003 New-Style Bearings Only:** Place the lock plate (See Figure 6-15 (1)) on each bearing, but do not install the screws yet.

3. Install the shaft through the bearings. If you have trouble getting the shaft through the bearings,

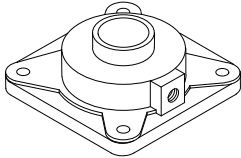
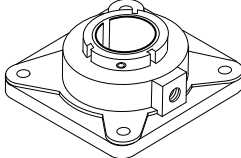
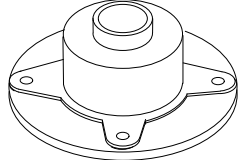
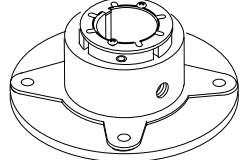
**All New-Style Bearings:** Loosen the lock nut.

**All Old-Style Bearings:** Try one or more of the steps below:

- Loosen the bearing-race set screws.
- Clean the shaft and ID of the bearing inner-race with a clean cloth and a small amount of penetrating oil. Do not get any oil inside the bearing races. The penetrating oil will dissolve the grease needed to lubricate the bearings.
- Gently drive the shaft through the bearings with a soft-faced mallet or a hammer. If you use a hammer, place a block of wood on the end of the shaft and strike the wood, not the shaft.
- Chill the shaft in a freezer or with dry ice and install it through the bearings while it is cold.



4. Level the shaft and square it with the support.
5. 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.
6. Adjust the fan shaft and bearings. Use the following chart to locate the appropriate procedure:

Booth Model	Old Style	New Style
Excel 2001	 <p data-bbox="781 678 1010 741"><b>Part 177622 Rev A</b> Refer to page 6-27</p>	 <p data-bbox="1149 667 1382 751"><b>Part 177622 Rev B or higher</b> Refer to page 6-28</p>
Excel 2002 and 2003	 <p data-bbox="781 966 1010 1029"><b>Part 183906 Rev A</b> Refer to page 6-29</p>	 <p data-bbox="1149 955 1382 1039"><b>Part 183906 Rev B or higher</b> Refer to page 6-30</p>

**Fan Shaft and Bearing Installation** (contd)

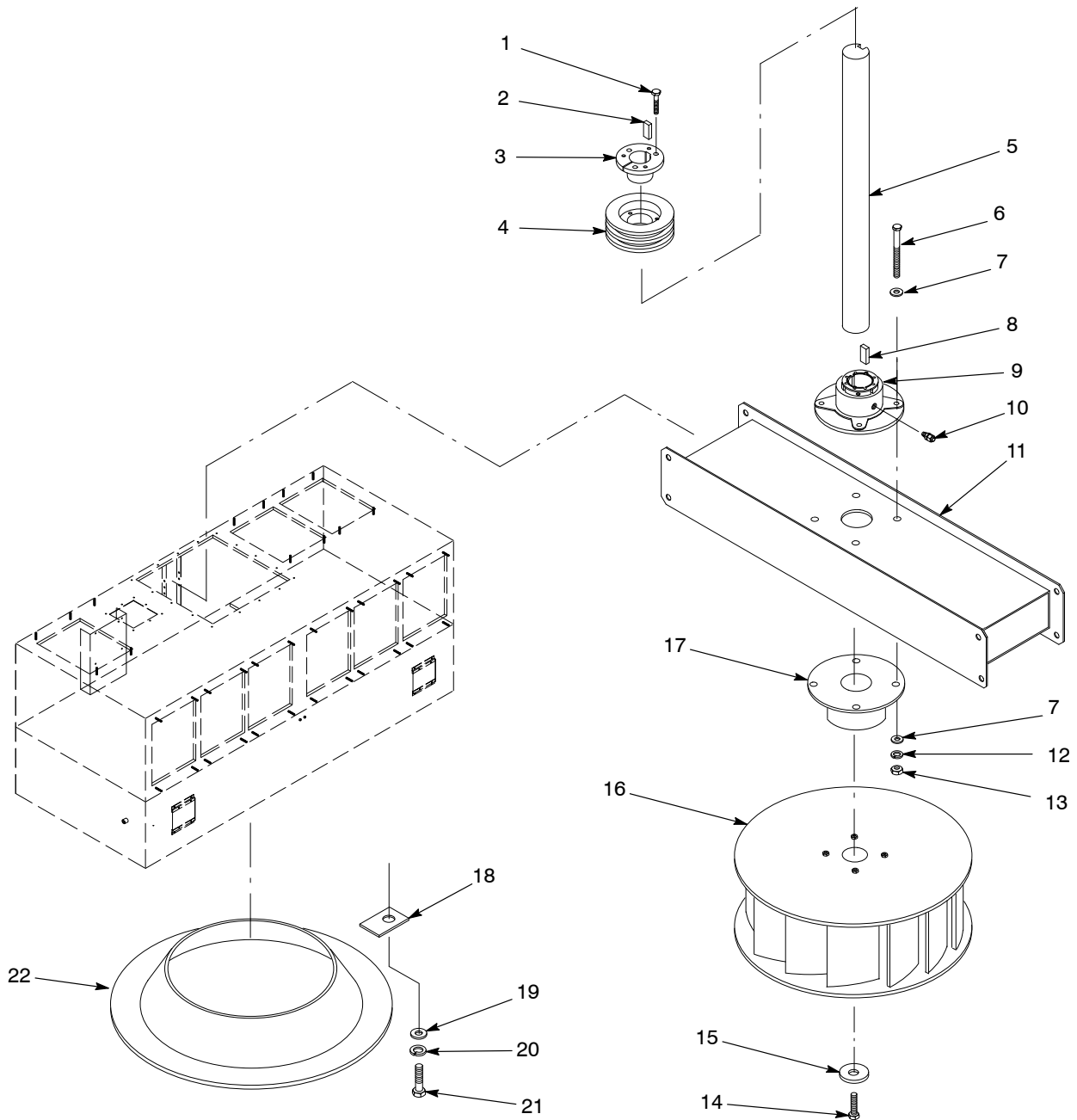
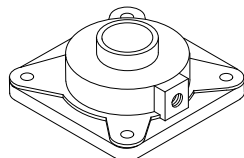


Figure 6-13 Fan, Sheave, Shaft, and Bearing Replacement

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

## Fan Shaft and Bearing Adjustment: Excel 2001

### Old-Style Bearing and Fan Shaft Adjustment: Excel 2001



177622 Rev A

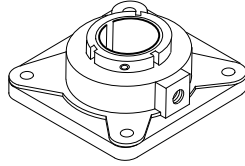
1. See Figure 6-13. Tighten the bearing mounting screws (6) to 68 N•m (600 in.-lb).
2. Place a square across the motor and fan sheaves. Adjust the fan shaft (5) forward or back until the sheaves are parallel. This is a rough adjustment and will have to be repeated later.
3. Install the fan (16) and key (8) on the shaft. Tighten the key set screw in the fan hub to hold the fan in place. Install the retainer washer (15) and screw (14) on the end of the shaft.
4. Square the shaft with the support (11) and tighten the bearing-race set screws. Torque the set screws to the torque values in Table 6-5.

Table 6-5 Recommended Torque Values for Bearing Set Screws

Set Screw Size (in.)	Hex Key Size (in.)	Torque N•m (in.-lb)	
		Standard Ball Bearing	Stainless Steel
#10	$\frac{3}{32}$	3.4 (30)	2.8 (25)
$\frac{1}{4}$	$\frac{1}{8}$	7.9 (70)	6.8 (60)
$\frac{5}{16}$	$\frac{5}{32}$	15.8 (140)	13.2 (117)
$\frac{3}{8}$	$\frac{3}{16}$	24.4 (216)	23.3 (206)

5. Install the inlet cone (22) and adjust the fan overlap as described in the *Fan Replacement* procedures.
6. Tighten the fan sheave bushing screws (1) to the torque values in the *Sheave Replacement* procedure. Use the square to make sure the sheaves are parallel.
7. Install the V-belts on the sheaves and adjust the belt tension as described in *V-Belt Replacement*.
8. 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.

## New-Style Bearing and Fan Shaft Adjustment: Excel 2001



177622 Rev B or Higher

1. Place a square across the motor and fan sheaves. Adjust the fan shaft forward or back until the sheaves are parallel. This is a rough adjustment and will have to be repeated later.
2. See Figure 6-13. Install the fan (16) and key (8) on the shaft (5). Tighten the key set screw in the fan hub to hold the fan in place. Install the retainer washer (15) and screw (14) on the end of the shaft.
3. Remove all weight from the bearings by blocking up the fan wheel to the proper overlap. Secure the fan shaft to prevent rotation during bearing adjustment.
4. Adjust the non-expansion bearing (9), then the expansion bearing (17):

Non-Expansion Bearing (9) Adjustment	Expansion Bearing (17) Adjustment
<ol style="list-style-type: none"> <li>a. See Figure 6-14. Turn the lock nut (3) by hand as tightly as possible. Wear gloves while tightening the lock nut.</li> <li>b. Scribe a line on the lock nut at the adapter slot (1). The line and adapter slot will serve as reference points as you tighten the lock nut.</li> <li>c. Using a spanner wrench, tighten the lock nut <math>\frac{2}{3}</math>-1 turn.</li> <li>d. Tighten the lock nut set screw (2) to 2.8 N•m (25 in.-lb).</li> <li>e. Tighten the bearing mounting bolts to 67.8 N•m (600 in.-lb).</li> </ol>	<ol style="list-style-type: none"> <li>a. With the <math>\frac{1}{16}</math>-in. shims in place, turn the lock nut by hand as tightly as possible. Wear gloves while tightening the lock nut.</li> <li>b. Scribe a line on the lock nut at the adapter slot. The line and adapter slot will serve as references point as you tighten the lock nut.</li> <li>c. Using a spanner wrench, tighten the lock nut <math>\frac{1}{8}</math> turn.</li> <li>d. Remove the <math>\frac{1}{16}</math>-in. shims and, using an alternating pattern, tighten the bearing mounting bolts to 67.8 N•m (600 in.-lb).</li> <li>e. Lock the bearing onto the shaft by turning the lock nut a total of <math>\frac{2}{3}</math>-1 turn.</li> <li>f. Tighten the lock nut set screw to 2.8 N•m (25 in.-lb).</li> </ol>

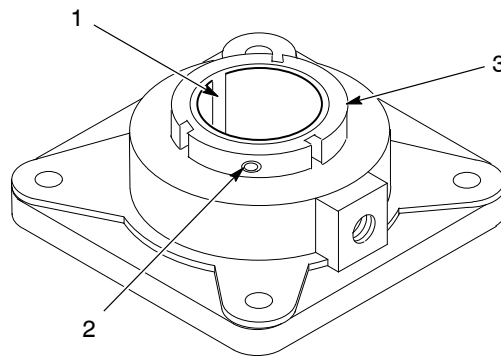


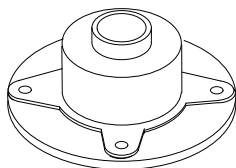
Figure 6-14 Old-Style Bearing (part 17762 rev B or higher)

- |                 |             |
|-----------------|-------------|
| 1. Adapter slot | 3. Lock nut |
| 2. Set screw    |             |

5. Rotate the shaft by hand. You should not feel any binding or excessive drag.
6. Install the inlet cone (22) and adjust the fan overlap as described in the *Fan Replacement* procedures.
7. Tighten the fan sheave bushing screws (1) to the torque values in the *Sheave Replacement* procedure. Make sure the sheaves are parallel.
8. Install the V-belts on the sheaves and adjust the belt tension as described in *V-Belt Replacement*.
9. 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.

### ***Fan Shaft and Bearing Adjustment: Excel 2002 and 2003***

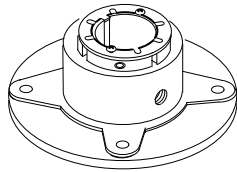
#### **Old-Style Bearing and Fan Shaft Adjustment: Excel 2002 and 2003**



183906 Rev A

1. 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.
2. See Figure 6-13. Torque the lower bearing (17) set screws to 26–31 N•m (19–23 ft-lb).
3. Install the fan (16) and key (8) on the shaft (5). Tighten the key set screw in the fan hub to hold the fan in place. Install the retainer washer (15) and screw (14) on the end of the shaft.
4. Make sure the top bearing (9) set screws are loose. Spin the fan to preload the bottom bearing.
5. Square the shaft with the support (11) and tighten the top bearing set screws. Torque the set screws to 26–31 N•m (19–23 ft-lb).
6. Install the inlet cone (22) and adjust the fan overlap as described in the *Fan Replacement* procedures.
7. Complete the fan sheave installation. Refer to the *Fan Sheave Replacement* procedure.
8. Install the V-belts on the sheave and adjust the belt tension as described in *V-Belt Replacement*.
9. 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.

## New-Style Bearing and Fan Shaft Adjustment: Excel 2002 and 2003



183906 Rev B or Higher

1. 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.
2. See Figure 6-13. Install the fan (16) and key (8) on the shaft (5). Tighten the key set screw in the fan hub to hold the fan in place. Install the retainer washer (15) and screw (14) on the end of the shaft.
3. Block up fan in position to remove all weight from the bearings.
4. Adjust the non-expansion bearing (9):
  - a. See Figure 6-15. Turn the lock nut (4) by hand as tightly as possible. Wear gloves while tightening the lock nut.
  - b. Scribe a line on the lock nut at the adapter slot (2). The line and adapter slot will serve as reference points as you tighten the lock nut.
  - c. Using a spanner wrench, tighten the lock nut one complete turn.
  - d. Install the lock plate (1) on the bearing and secure it with the screws (3).

**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.

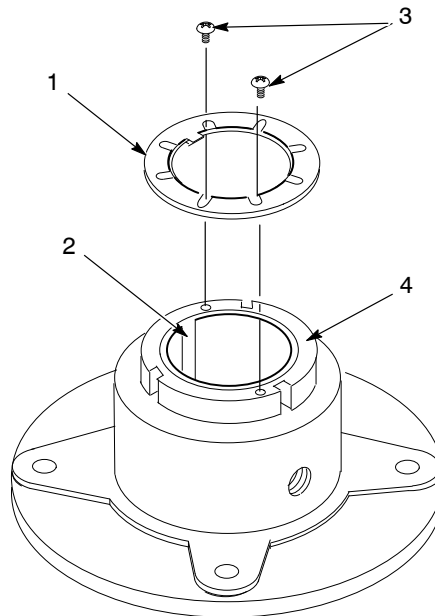


Figure 6-15 New-Style Bearing (part 183906 rev B or higher)

- |                 |             |
|-----------------|-------------|
| 1. Lock plate   | 3. Screws   |
| 2. Adapter slot | 4. Lock nut |

5. See Figure 6-13. Convert the other bearing to a expansion bearing (17):
  - 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 non-expansion bearing (9).

6. Install the expansion bearing (17) using steps 4a–4d.
7. Tighten the bearing mounting bolts to 67.8 N•m (600 in.-lb).
8. Rotate the shaft by hand. You should not feel any binding or excessive drag.
9. Install the inlet cone (22) and adjust the fan overlap as described in the *Fan Replacement* procedures.
10. Tighten the fan sheave bushing screws (1) to the torque values in the *Sheave Replacement* procedure. Make sure the sheaves are parallel.
11. Install the V-belts on the sheaves and adjust the belt tension as described in *V-Belt Replacement*.
12. 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 Finishing Customer Support Center at (800) 433-9319 or your local Nordson representative. Use the illustrations and parts lists to locate and describe parts correctly.

### Electrical Sub-Panel Parts (Systems Made in 2003 and Later)

See Figure 7-1. Refer to Tables 7-8 through 7-11 for cross references listed in the Part column of Table 7-7. Refer to Table 7-12 for total current calculations.

Table 7-1 Electrical Sub-Panel

Item	Part	Descriptions	Quantity
AH427	XB-09-201QM	Alarm	1
CN510	CE12BNC310A	Contactora	1
CR410, CR414	D7PR2A	Relay control	3
FU306	Refer to Table -8	Fuse	3
FU309, FU323	Refer to Table -9	Fuse	6
FU312, FU315	Refer to Table -10	Fuse	6
FU401	Refer to Table -11	Fuse	2
M407	Refer to Table -8	Contactora	1
M503, M425, M426	CE12BNC310A	Contactora	3
M416, M419	CE12BNC310A	Contactora	2
OL407	Refer to Table -8	Overload	1
OL503, OL425	Refer to Table -9	Overload	2
OL416, OL419	Refer to Table -10	Overload	2
TDR423	88 826 105	Time delay relay	1
TDR508	88 826 105	Time delay relay	1

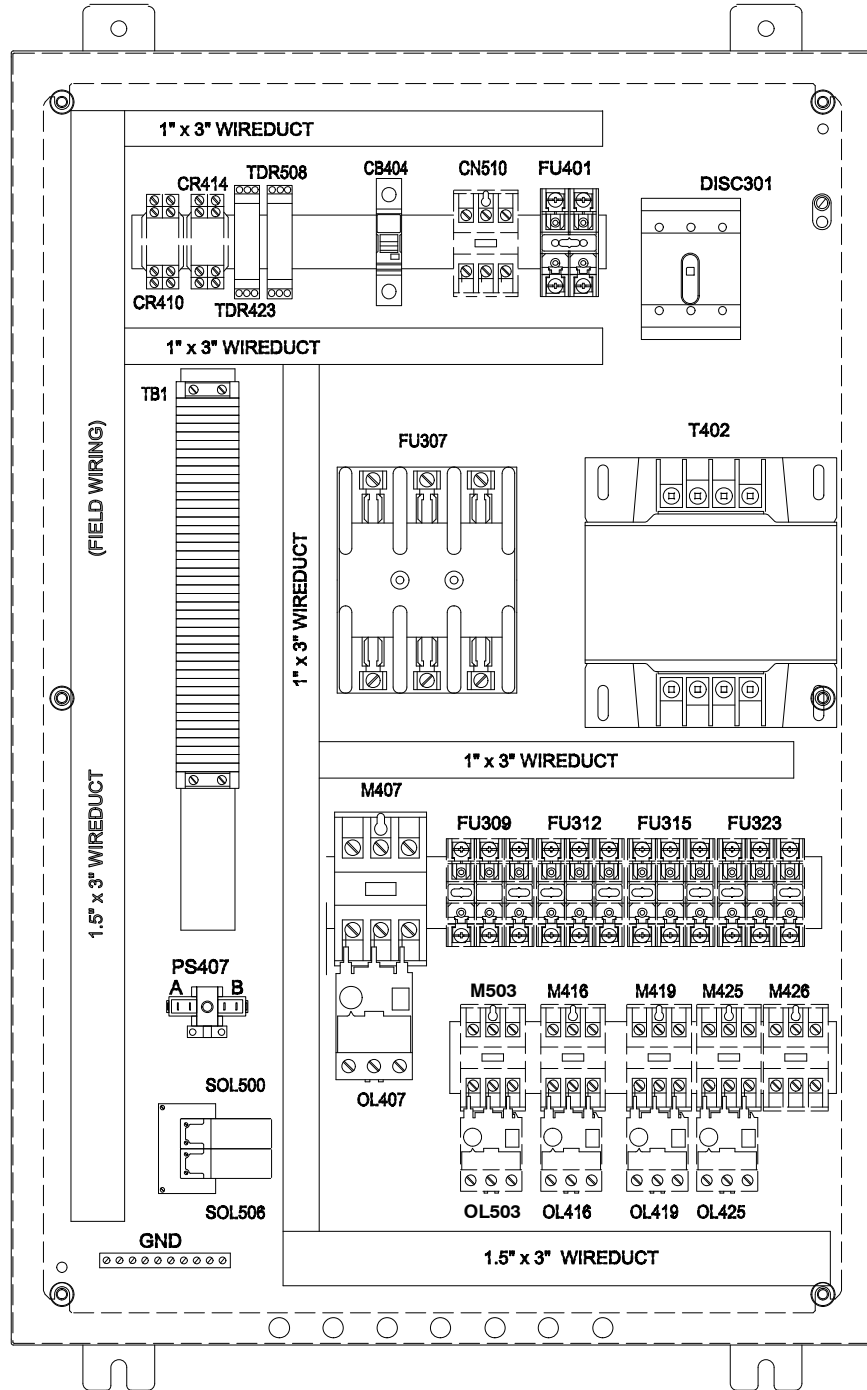


Figure 7-1 Electrical Sub-Panel (2003 and Later)

Table 7-2 Exhauster Parts Cross Reference (2003 and Later)

Excel 2000 — 15 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	CE15JNS3AB	CE15HNS3AB	CE15FNS3AB	CD15FNS3AB	CE15ENS3AB	CE15DNS3AB
OL407	C316KNA3D	C316KNA3D	C316FNA3T	C316FNA3T	C316FNA3S	C316FNA3R
FU306	LPJ-90SP	LPJ-80SP	LPJ-60SP	LPJ-50SP	LPJ-40SP	LPJ-30SP
FUSEBLOCK	J60100-3CR	J60100-3CR	J60060-3CR	J60060-3CR	J60060-3CR	J60030-3CR
Excel 2002 — 20 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	CE15JNS3AB	CE15GNS3AB	CE15FNS3AB	CE15FNS3AB	CE15ENS3AB
OL407	—	C316KNA3E	C316KNA3D	C316FNA3T	C316FNA3T	C316FNA3S
FU306	—	LPJ-100SP	LPJ-70SP	LPJ-60SP	LPJ-50SP	LPJ-40SP
FUSEBLOCK	—	J60100-3CR	J60100-3CR	J60060-3CR	J60060-3CR	J60060-3CR
Excel 2003 — 25 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	—	—	CE15HNS3AB	CE15GNS3AB	CE15FNS3AB
OL407	—	—	—	C316KNA3D	C316KNA3C	C316FNA3T
FU306	—	—	—	LPJ-70SP	LPJ-60SP	LPJ-50SP
FUSEBLOCK	—	—	—	J60100-3CR	J60060-3CR	J60060-3CR
Excel 2003 — 30 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	—	—	—	CE15HNS3AB	CE15GNS3AB
OL407	—	—	—	—	C316KNA3E	C316KNA3C
FU306	—	—	—	—	LPJ-80SP	LPJ-60SP
FUSEBLOCK	—	—	—	—	J60100-3CR	J60060-3CR

Table 7-3 1/2 HP Motor (Booth Mover, Sieve) Cross Reference (2003 and Later)

Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
OL503, OL425	C312AN3G	C312AN3G	C312AN3F	C312AN3F	C312AN3F	C312AN3E
FU309, FU323	LP-CC-8	LP-CC-8	LP-CC-5	LP-CC-4	LP-CC-4	LP-CC-3

Table 7-4 3 PH 1 1/2 HP Oscillator Cross Reference (2003 and Later)

Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
OL416, OL419	C312AN3J	C312AN3J	C312AN3H	C312AN3H	C312AN3H	C312AN3G
FU312, FU315	LP-CC-25	LP-CC-20	LP-CC-15	LP-CC-12	LP-CC-10	LP-CC-8

Table 7-5 Transformer Cross Reference (2003 and Later)

T402	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1.5KVA	PT1500MGJ	PT1500MQMJ	PT500MGJ	PT500MDMX	PT1500MQMJ	PT1500MBMH
FU401	FNQ-R-15	FNQ-R-15	FNQ-R-9	FNQ-R-9	FNQ-R-7 <sup>1</sup> / <sub>2</sub>	FNQ-R-6 <sup>1</sup> / <sub>4</sub>
CB404	AS168X- CB1G080	AS168X- CB1G080	AS168X- CB1G080	AS168X- CB1G080	AS168X- CB1G080	AS168X- CB1G080
2.0 KVA	PT2000MGJ	PT2000MQMJ	PT2000MGJ	PT2000MDMX	PT2000MQMJ	PT2000MBMH
FU401	FNQ-R-20	FNQ-R-20	FNQ-R-12	FNQ-R-12	FNQ-R-10	FNQ-R-8
CB404	AS168X- CB1G120	AS168X- CB1G120	AS168X- CB1G120	AS168X- CB1G120	AS168X- CB1G120	AS168X- CB1G120

Table 7-6 Total Current Calculation Chart

	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1/2 HP	2.5	2.2	1.5	1.3	1.1	0.9
x QTY						
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1 <sup>1</sup> / <sub>2</sub> HP	5.7	5.2	3.1	2.9	2.6	2.1
x QTY						
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
15 HP (Excel 2001)	48.3	42.0	29.4	24.2	21.0	17.0
20 HP (Excel 2002)	-	54.0	37.8	31.1	27.0	22.0
25 HP (Excel 2003)	-	-	47.6	39.1	34.0	27.0
30 HP (Excel 2003)	-	-	-	-	42.0	32.0
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1.5 KVA TRANX	7.2	6.2	3.9	3.6	3.1	2.5
2.0 KVA TRANX	9.6	8.3	5.2	4.8	4.2	3.3
= TOTAL CURRENT						

## Electrical Sub-Panel (Pre-2003 Systems)

See Figure 7-2. Refer to Tables 7-8 through 7-11 for cross references listed in the Part column of Table 7-7. Refer to Table 7-12 for total current calculations.

Table 7-7 Electrical Sub-Panel (Pre-2003)

Item	Part	Descriptions	Quantity
AH427	XB-09-201QM	Alarm	1
CN510	CN35AN2AB	Contactator	1
CR319, CR410, CR414	RH2B-UAC120V	Relay control	3
FU306	Refer to Table 7-8	Fuse	3
FU309, FU323	Refer to Table 7-9	Fuse	6
FU312, FU315	Refer to Table 7-10	Fuse	6
FU401	Refer to Table 7-11	Fuse	2
M407	Refer to Table 7-8	Contactator	1
M412, M425, M426	CE15ANS3AB	Contactator	3
M416, M419	CE15BNS3AB	Contactator	2
OL407	Refer to Table 7-8	Overload	1
OL412, OL425	Refer to Table 7-9	Overload	2
OL416, OL419	Refer to Table 7-10	Overload	2
TDR423	RTE-P22-AC120V	Time delay relay	1
TDR508	GT5Y-2SN1A100	Time delay relay	1
—	28-2468-7	Lamp	AR
AR: As Required. Quantity needed is dependent on controller configuration.			

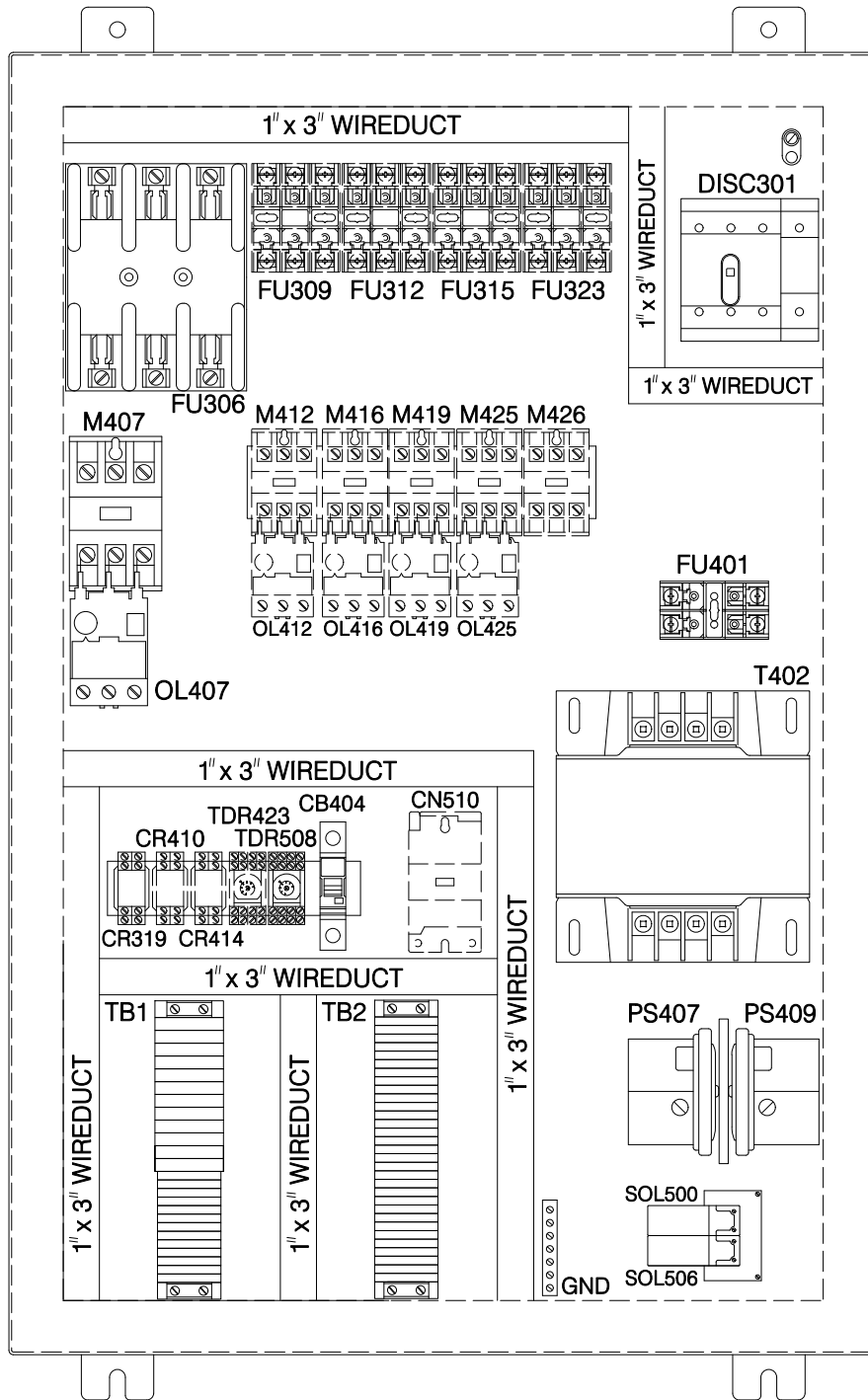


Figure 7-2 Electrical Sub-Panel (Pre-2003)

Table 7-8 Exhauster Parts Cross Reference (Pre-2003)

Excel 2000 — 15 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	CE15JNS3AB	CE15HNS3AB	CE15FNS3AB	CD15FNS3AB	CE15ENS3AB	CE15DNS3AB
OL407	C316KNA3D	C316KNA3D	C316FNA3T	C316FNA3T	C316FNA3S	C316FNA3R
FU306	LPJ-90SP	LPJ-80SP	LPJ-60SP	LPJ-50SP	LPJ-40SP	LPJ-30SP
FUSEBLOCK	J60100-3CR	J60100-3CR	J60060-3CR	J60060-3CR	J60060-3CR	J60030-3CR
Excel 2002 — 20 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	CE15JNS3AB	CE15GNS3AB	CE15FNS3AB	CE15FNS3AB	CE15ENS3AB
OL407	—	C316KNA3E	C316KNA3D	C316FNA3T	C316FNA3T	C316FNA3S
FU306	—	LPJ-100SP	LPJ-70SP	LPJ-60SP	LPJ-50SP	LPJ-40SP
FUSEBLOCK	—	J60100-3CR	J60100-3CR	J60060-3CR	J60060-3CR	J60060-3CR
Excel 2003 — 25 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	—	—	CE15HNS3AB	CE15GNS3AB	CE15FNS3AB
OL407	—	—	—	C316KNA3D	C316KNA3C	C316FNA3T
FU306	—	—	—	LPJ-70SP	LPJ-60SP	LPJ-50SP
FUSEBLOCK	—	—	—	J60100-3CR	J60060-3CR	J60060-3CR
Excel 2003 — 30 HP Motor						
Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
M407	—	—	—	—	CE15HNS3AB	CE15GNS3AB
OL407	—	—	—	—	C316KNA3E	C316KNA3D
FU306	—	—	—	—	LPJ-80SP	LPJ-60SP
FUSEBLOCK	—	—	—	—	J60100-3CR	J60060-3CR

Table 7-9 1/2 HP Motor (Booth Mover, Sieve) Cross Reference (Pre-2003)

Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
OL412, OL425	C316FNA3J	C316FNA3H	C316FNA3G	C316FNA3F	C316FNA3F	C316FNA3E
FU309, FU323	LP-CC-8	LP-CC-8	LP-CC-5	LP-CC-4	LP-CC-4	LP-CC-3

Table 7-10 3 PH 1 1/2 HP Oscillator Cross Reference (Pre-2003)

Item	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
OL416, OL419	C316FNA3N	C316FNA3M	C316FNA3L	C316FNA3L	C316FNA3J	C316FNA3J
FU312, FU315	LP-CC-25	LP-CC-20	LP-CC-15	LP-CC-12	LP-CC-10	LP-CC-8

Table 7-11 Transformer Cross Reference (Pre-2003)

T402	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1.5KVA	PT1500MGJ	PT1500MQMJ	PT500MGJ	PT500MDMX	PT1500MQMJ	PT1500MBMH
FU401	FNQ-R-15	FNQ-R-15	FNQ-R-9	FNQ-R-9	FNQ-R-7 <sup>1</sup> / <sub>2</sub>	FNQ-R-6 <sup>1</sup> / <sub>4</sub>
CB404	SPCL1C16	SPCL1C16	SPCL1C16	SPCL1C16	SPCL1C16	SPCL1C16
2.0 KVA	PT2000MGJ	PT2000MQMJ	PT2000MGJ	PT2000MDMX	PT2000MQMJ	PT2000MBMH
FU401	FNQ-R-20	FNQ-R-20	FNQ-R-12	FNQ-R-12	FNQ-R-10	FNQ-R-8
CB404	SPCL1C20	SPCL1C20	SPCL1C20	SPCL1C20	SPCL1C20	SPCL1C20

Table 7-12 Total Current Calculation Chart (Pre-2003)

	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1/2 HP	2.5	2.2	1.5	1.3	1.1	0.9
x QTY						
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1 1/2 HP	6.9	6.0	4.3	3.6	3.0	2.4
x QTY						
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
15 HP (Excel 2001)	48.3	42.0	29.4	24.2	21.0	17.0
20 HP (Excel 2002)	-	54.0	37.8	31.1	27.0	22.0
15 HP (Excel 2001)	-	-	47.6	39.1	34.0	27.0
	208 Volt	230 Volt	380 Volt	415 Volt	460 Volt	575 Volt
1.5 KVA TRANX	7.2	6.2	3.9	3.6	3.1	2.5
2.0 KVA TRANX	9.6	8.3	5.2	4.8	4.2	3.3
= TOTAL CURRENT						



## Fan Section Supports and Miscellaneous Parts

See Figure 7-3.

**NOTE:** The following parts are used on the Excel 2001, Excel 2002, and the Excel 2003. Differences between the versions are stated in the Note column.

Item	Part	Description	Quantity	Note
1	158638	SUPPORT, collector mouth	1	A
1	158639	SUPPORT, collector mouth	1	B
2	174831	C-CLAMP, 6 in., canopy	AR	
3	981402	SCREW, hex, $\frac{3}{8}$ -16 UNC x 1.00 in., zinc	20	
4	983160	WASHER, lock, E, $\frac{3}{8}$ in., steel, nickel	20	
5	983248	WASHER, flat, E, 0.468 x 0.922 x 0.065 in., zinc	20	
6	900534	TUBING, polyethylene, 0.250 x 0.040 in.	AR	C
7	971519	ELBOW, male, $\frac{1}{8}$ in. tube x $\frac{1}{4}$ in. NPT	1	
8	981315	SCREW, hex, $\frac{5}{16}$ -18 x 1.00 in., cap, zinc	AR	
9	983050	WASHER, flat, E, 0.344 x 0.625 x 0.063 in., zinc	AR	
10	981604	SCREW, hex, $\frac{1}{2}$ -13 x 1.25 in., cap, zinc	AR	
11	983092	WASHER, flat, E, 0.594 x 1.125 x 0.063 in., zinc	AR	
12	983180	WASHER, lock, E, split, $\frac{1}{2}$ in., steel, nickel	AR	
13	984170	NUT, hex, $\frac{1}{2}$ -13 UNC, steel, zinc	AR	
14	176365	RAIL, guide, color module	2	
15	981906	SCREW, socket, $\frac{1}{4}$ -20 x 0.75 in.	AR	
16	983140	WASHER, lock, E, split, $\frac{1}{4}$ in., steel, nickel	AR	
17	983504	WASHER, flat, E, 0.281 x 0.734 x 0.063 in., zinc	AR	
18	984120	NUT, hex, # 10-32, steel, zinc	AR	
19	983150	WASHER, lock, E, split, $\frac{5}{16}$ in., steel, nickel	AR	
20	984140	NUT, hex, reg, $\frac{5}{16}$ -18 in., steel, zinc	AR	
21	174803	CLAMP, ratchet, with 42-in. belt	2	
22	176300	GAUGE, Magnahelic, 0-8 in. scale	1	
23	158666	RAIL, canopy	AR	
24	981342	SCREW, truss, $\frac{5}{16}$ -18 x 0.75 in., steel, zinc	AR	
25	176305	SWITCH, limit	1	
26	176306	LEVER, arm	1	
27	178952	BRACKET, limit switch	1	
28	981559	SCREW, pan, #10-24 x 1.50 in., steel, zinc	4	
29	158656	BLOCK, caster, roller base	4	
30	981611	SCREW, hex, $\frac{1}{2}$ -13 x 1.00 in., cap, zinc	AR	
31	983515	WASHER, flat, E, 0.406 x 1.000. 0.063 in., zinc	AR	
32	174829	PAD, leveling	4	
33	174828	LEG, booth base	4	

NOTE A: Part is used on the Excel 2001 and the Excel 2002.

B: Part is used on the Excel 2003.

C: Order in one-foot increments.

AR: As Required

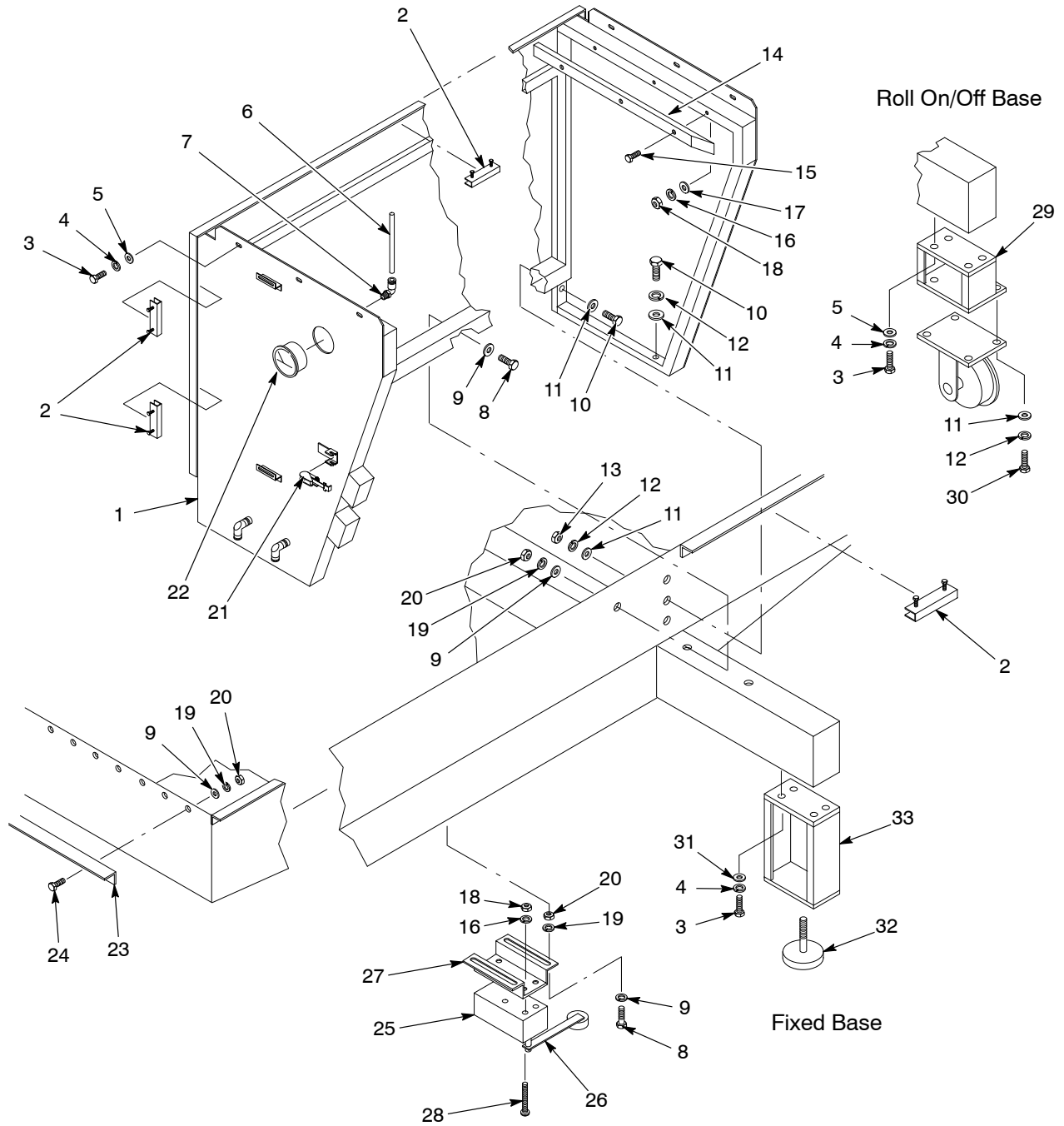


Figure 7-3 Fan Section Supports and Miscellaneous Parts

## Final Filters and Miscellaneous Parts

See Figure 7-4.

**NOTE:** The following parts are used on the Excel 2001, Excel 2002, and the Excel 2003. Differences between the versions are stated in the Note column.

Item	Part	Description	Quantity	Note
1	981462	SCREW, hex, 1/4-20 x 1.00 in., zinc, G5	4	
2	983140	WASHER, lock, E, split, 1/4 in., steel, nickel	4	
3	983504	WASHER, flat, E, 0.281 x 0.734 x 0.063 in., zinc	4	
4	176356	BOX, junction, 6 x 6 x 4 in.	1	A
4	321149	BOX, junction, 8 x 6 x 3.5 in.	1	B
5	183915	WASHER, sealing, conduit, 3/4 in.	AR	
6	973103	NIPPLE, steel, schedule 40, 3/4 in.	AR	
7	183914	ELBOW, 90°, elbow pull, 3/4 in.	AR	
8	897090	GASKET, neoprene, 1 x 1/4 in. thick	AR	
9	158663	PLATE, sheave access	1	
10	983527	WASHER, flat, 0.344 x 1.125 x 0.063 in., zinc	AR	
11	983150	WASHER, lock, E, split, 5/16 in., steel, zinc	AR	
12	981315	SCREW, hex, 5/16-18 x 1.00 in., cap, zinc	AR	
13	174715	INSULATION, sound deaden	AR	
14	900356	ADHESIVE, spray, high tack	AR	
15	158646	PLATE, motor access	1	
16	176367	KNOB, final filter clamp	AR	
17	176366	CLAMP, final filter	AR	
18	156995	FILTER, final, 24 x 20 in., internal	AR	
19	971801	GREASE FITTING, straight, 1/8-in. NPT	2	
20	972716	CONNECTOR, male, 1/4 in. tube x 1/8 in. NPT	AR	
21	900534	TUBING, polyethylene, 0.250 x 0.040 in.	AR	C
22	176308	SLIDE, gate	2	
23	176355	SCREW, thumb, 1/4-20 x 1 in.	8	
24	981540	SCREW, hex, 3/8-16 x 3.00 in., cap, zinc	AR	

NOTE A: Part is used on the Excel 2001.

B: Part is used on the Excel 2002 and the Excel 2003.

C: Order in one-foot increments.

AR: As Required

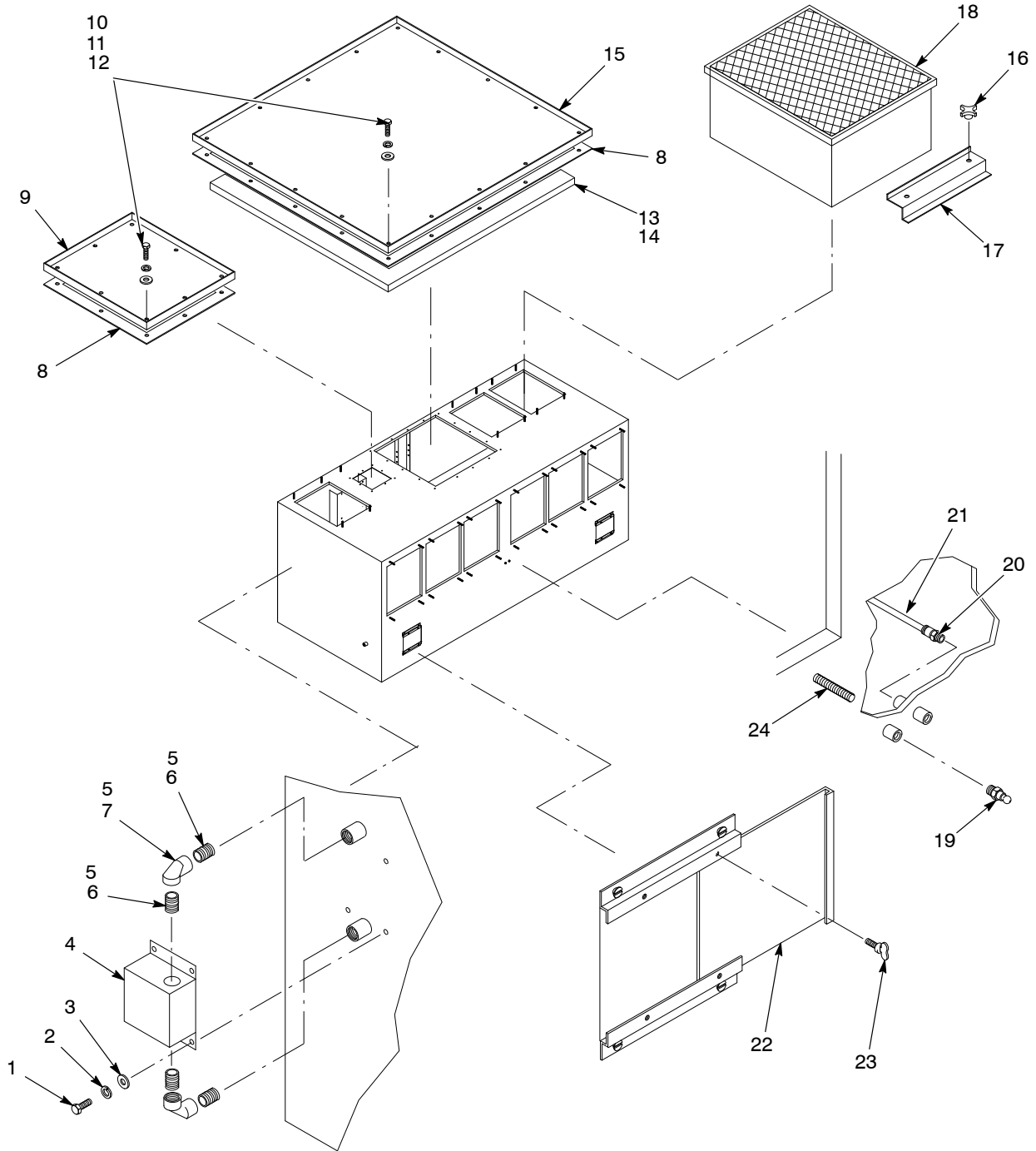


Figure 7-4 Final Filters and Miscellaneous Parts (2003 Fan Section Shown)

## Pulse Valve and Solenoids

See Figure 7-5.

Item	Part	Description	Quantity	Note
1	972119	ELBOW, male, 1/4 in. tube x 1/8 in. NPT	AR	
2	174710	VALVE, pulse, 1 in. NPT ID x 1 in. NPT OD	AR	
3	165726	NOZZLE, cartridge pulse	AR	
4	984152	NUT, hex, 3/8-16 in., steel, plain	AR	
5	983160	WASHER, lock, E, split, 3/8 in., steel, nickel	AR	
6	983255	WASHER, flat, 0.406 x 1.250 x 0.100 in., zinc	AR	
7	981426	SCREW, hex, 3/8-16 x 1.50 in., cap, zinc	AR	
8	-----	MANIFOLD, pulse	1	A
9	176303	ENCLOSURE, pilot valve (6-valve)	1	B
9	176299	ENCLOSURE, pilot valve (12-valve)	1	B
10	981315	SCREW, hex, 5/16-18 x 1.0 in., cap, zinc	AR	
11	983150	WASHER, lock, E, split, 5/16 in., steel, nickel	AR	
12	983527	WASHER, flat, 0.344 x 1.125 x 0.063 in., zinc	AR	
13	176299	ENCLOSURE, pilot valve (12-valve)	1	
14	900534	TUBING, polyethylene, 0.250 x 0.040 in.	AR	C
15	183912	CONNECTOR, straight, 3/4 in., conduit	AR	
16	183913	CONDUIT, metal flex, 3/4 in.	AR	C
17	183914	ELBOW, 90°, elbow pull, 3/4 in.	AR	
18	183915	WASHER, sealing, conduit, 3/4 in.	AR	
19	973103	NIPPLE, steel, schedule 40, 3/4 in. x 1.37 in.	AR	
20	973096	NIPPLE, steel, schedule 40, 3/4 in. x 3.00 in.	3	
21	973632	UNION, pipe, class 150, 3/4 in. galvanized	1	
22	176301	CONTROL, air volume, assembly	1	
23	973228	ELBOW, pipe, 90°, 3/4 in., plain	2	
24	178971	FITTING, barbed, 3/4 in. ID x 3/4 in.	2	
25	183916	HOSE, black, 1 1/2 in. OD x 3/4 in. ID	AR	C
26	970963	CLAMP, tube	2	
27	1099855	KIT, timer board, 22 output	1	D
27	1099856	KIT, timer board, 10 output	1	D
27	1099857	KIT, timer board, 6 output	1	D

NOTE A: Excel 2001 uses part 154121; Excel 2002 uses part 154122; Excel 2003 uses part 154124.  
 B: Item 9 is not used on Excel 2001. In this position, Excel 2002 uses six-valve enclosure part, 176303; Excel 2003 uses 12-valve enclosure, part 176299.  
 C: Order in one-foot increments.  
 D: Order correct timer board kit for your system. Kit does not include enclosure.

AR: As Required

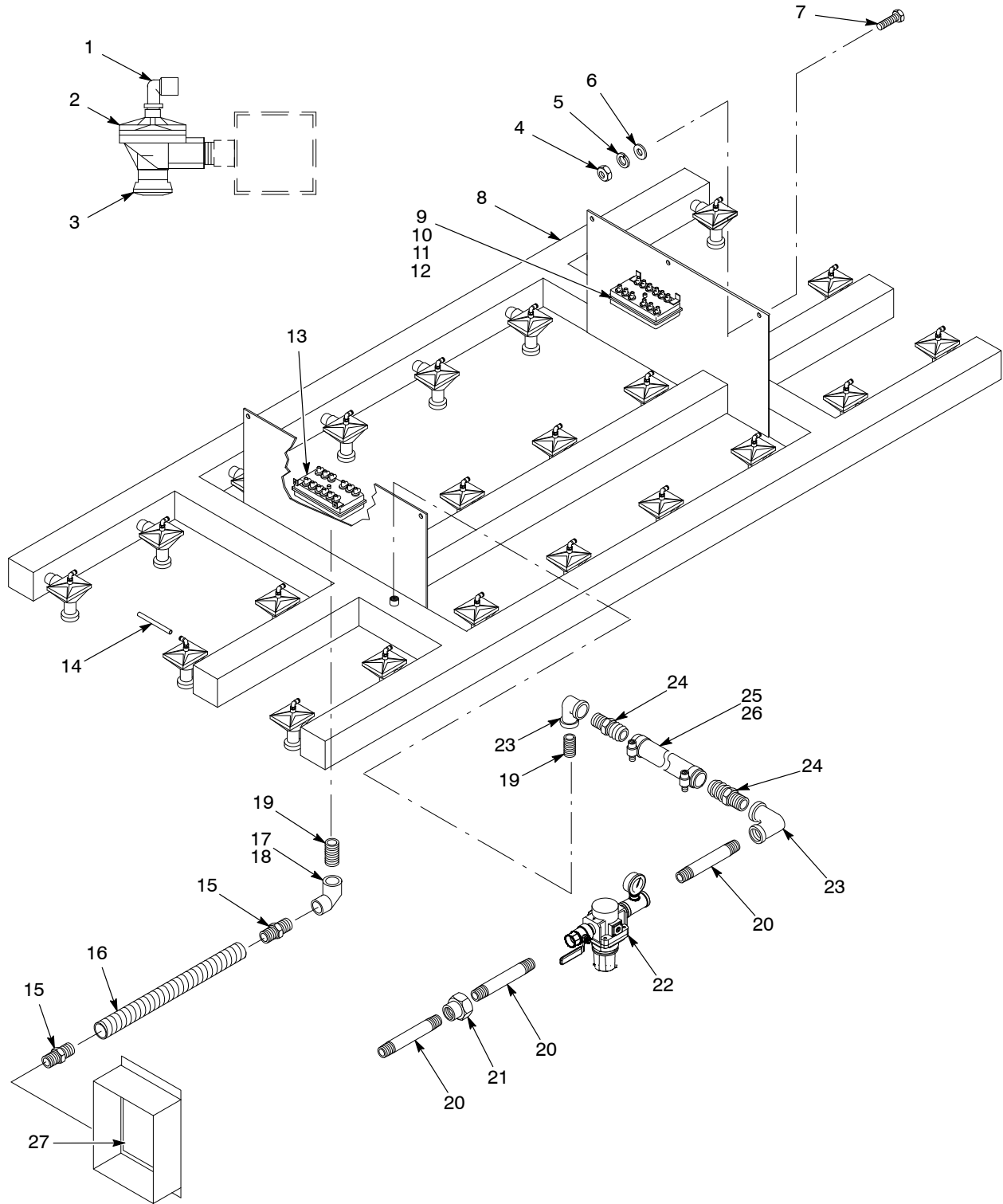


Figure 7-5 Pulse Valve and Solenoids (Excel 2003 Manifold Shown)

## Fan Damper and Manual Control

See Figure 7-6. This equipment is used on Excel booths without automatic air management systems.

Item	Part	Description	Quantity	Note
1	154200	DUCT, air damper (30.5)	1	A
1	154201	DUCT, air damper (34.5)	1	B
1	154202	DUCT, air damper (37.5)	1	C
2	154184	CONTROL UNIT, damper, 2001	1	
2	154187	CONTROL, damper, 2002/2003	1	
3	983527	WASHER, flat, 0.344 x 1.125 x 0.063 in., zinc	AR	
4	983150	WASHER, lock, E, split, $\frac{5}{16}$ in., steel, nickel	AR	
5	981315	SCREW, hex, $\frac{5}{16}$ -18 x 1.0 in., cap, zinc	AR	

NOTE A: Used on Excel 2001 standard- and low-flow fan sections and Excel 2002 low-flow fan section.  
 B: Used on Excel 2002 standard-flow fan section.  
 C: Used on Excel 2003 standard- and low-flow fan sections.  
 AR: As Required

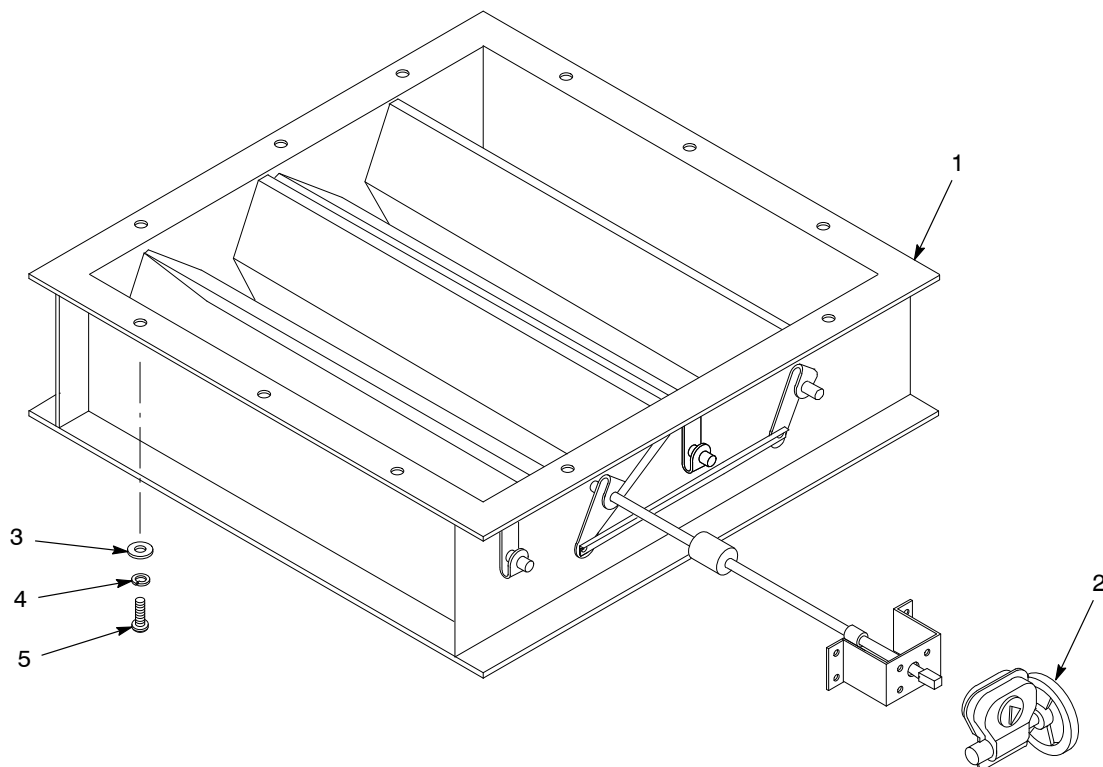


Figure 7-6 Fan Damper and Manual Control

# Pneumatic Seal

See Figure 7-7.

**NOTE:** The following parts are used on the Excel 2001, Excel 2002, and the Excel 2003. Differences between the versions are stated in the Note column.

Item	Part	Description	Quantity	Note
1	174763	SEAL, inflatable, fan section	1	A
1	174765	SEAL, inflatable, fan section	1	B
1	174767	SEAL, inflatable, fan section	1	C
2	174764	RETAINER, inflatable seal	1	A
2	174766	RETAINER, inflatable seal	1	B
2	174768	RETAINER, inflatable seal	1	C
3	971265	CONNECTOR, male, 1/4 in. tube x 1/4 in. NPT	2	
4	900543	TUBING, rubber	AR	
5	972716	CONNECTOR, male, 1/4 in. tube x 1/8 in. NPT	1	
6	984121	NUT, hex, mach, #10-24, steel, zinc	AR	
7	983120	WASHER, lock, E, split, #10, steel, zinc	AR	
8	983123	WASHER, flat, E, 0.219 x 0.500 x 0.049 in., zinc	AR	
9	981465	SCREW, flat, #10-24 x 0.625 in., slotted, zinc	AR	

NOTE A: Part used on Excel 2001.

B: Part used on Excel 2002.

C: Part used on Excel 2003.

AR: As Required

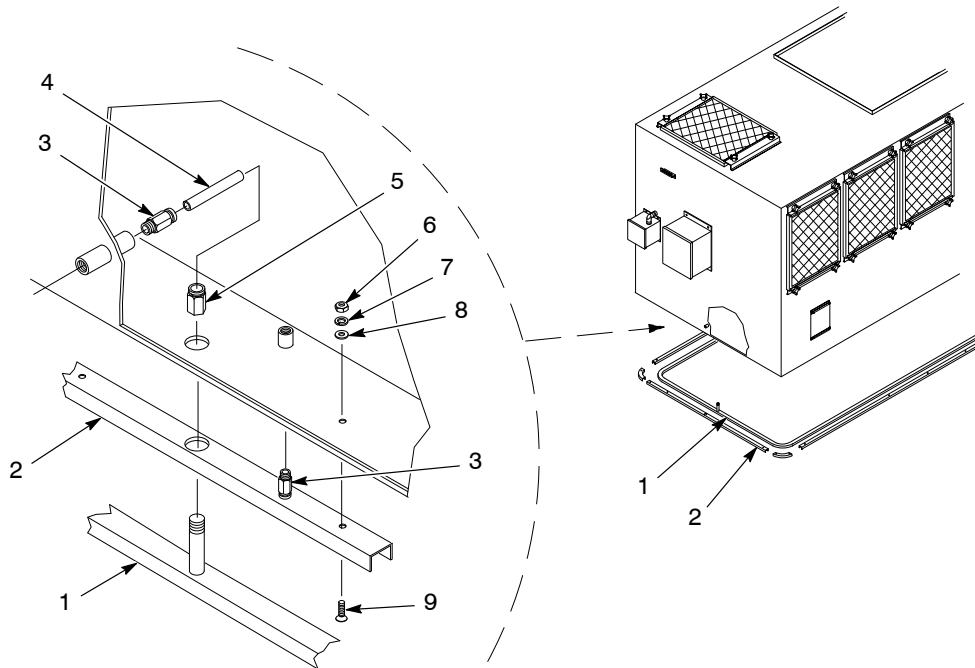


Figure 7-7 Pneumatic Seal (Excel 2003 Fan Section Shown)



## Color Module Cartridge Filters and Fluidizing Plate Parts (Systems Made in 2003 and Later)

See Figure -8.

Item	Excel 2001	Excel 2002	Excel 2003	Description	Quantity
1	176363	176363	176370	BAFFLE (collector mouth)	1
2	176362	176362	176369	SEAL, mouth, D-Style	1
3	900497	900497	900497	ADHESIVE, neoprene contact	AR
4	984178	984178	984178	NUT, hex, $\frac{5}{8}$ -11 in., steel, zinc	AR
5	983440	983440	983440	LOCK WASHER, E, split, $\frac{5}{8}$ in., steel, nickel	AR
6	983090	983090	983090	WASHER, flat, E, 0.656 x 1.312 x 0.095 in., zinc	AR
7	174720	174720	174720	SUPPORT, filter mount	AR
8	174723	174723	174723	ROD, filter mount, 36 in.	AR
9	174722	174722	174722	BRACKET, centering, filter	AR
10	156996	156996	156996	FILTER, 36 in., PowderGrid, center mount	AR
11	981315	981315	981315	SCREW, hex, $\frac{5}{16}$ -18 x 1.00, cap	AR
12	1040115			PLATE, fluid, 57.00 x 8.25 x 0.50 in.	1
12		1040118		PLATE, fluid, 21.25 x 17.75 x 0.50 in.	2
12			1040130	PLATE, fluid, 32.75 x 21.25, 0.50 in.	2
13	1040116			GASKET, fluid, plate, 57.00 x 8.25 x 0.50 in.	1
13		1040119		GASKET, fluid, plate, 21.25, 17.75 x 0.50 in.	2
13			1040131	GASKET, fluid, plate, 32.75 x 21.25 x 0.50 in.	2
14	1040097			PLENUM, fluidizing, assembly	1
14		1040099		PLENUM, fluidizing, assembly	2
14			1040113	PLENUM, fluidizing, assembly	2
15	1040117			KIT, C-clamp, 57.00 in.	1
15		1040132		KIT, C-clamp, 17.75 in.	2
15			1040133	KIT, C-clamp, 32.75 in.	2
AR: As Required					

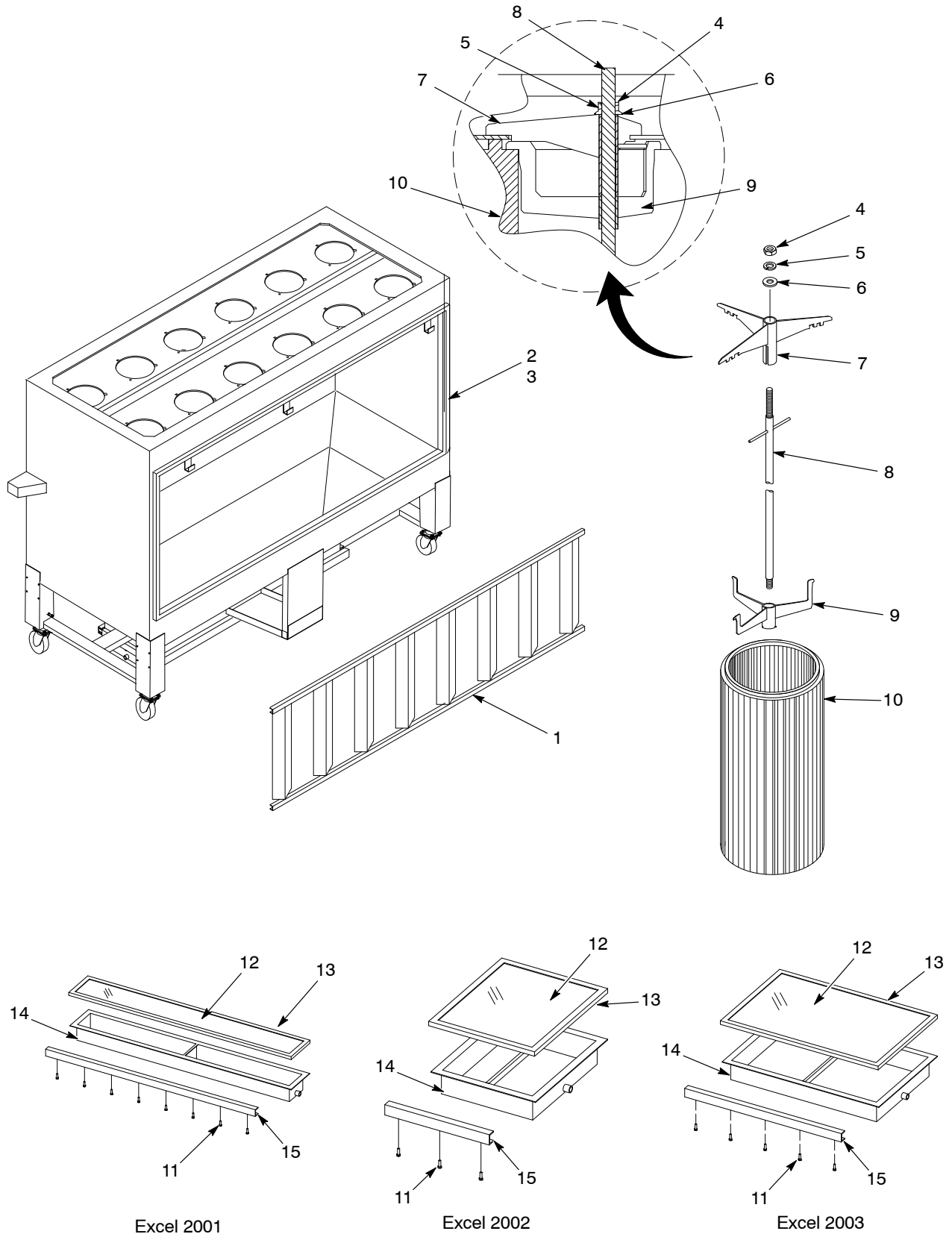


Figure 7-8 Color Module Cartridge Filters and Fluidizing Plates

## Color Module Covers and Caster Parts

See Figure -11.

Item	Part	Description	Quantity	Note
1	1040733	PLATE, cover, 15.5-in. square	1	
2	1040732	CHUTE, powder with gasket	1	A
3	981315	SCREW, hex, serrated head, $\frac{5}{16}$ -18 x 1.0 in., cap, zinc	32	
4	154142	PLATE, cover, 22 in.	1	
5	174549	PLATE, cover, 3.5-in. vent stub	1	
6	174800	VENT STUB, 3.5 in.	1	A
7	1040853	PUMP, powder, transfer, 0.75-in. outlet, metric, with 12-mm tube fitting for supply air	2	B
7	244721	PUMP, powder, transfer, 0.75-in. outlet, with $\frac{1}{2}$ -in. tube fitting for supply air	2	C
8	981407	SCREW, hex, $\frac{3}{8}$ -16 x 2.00 in., cap, zinc	4	
9	1004096	MOUNT, caster, 2.5-in. NPSM	4	
10	- - - - -	SCREW, hex, serrated head, $\frac{3}{8}$ -16 x 1.00, zinc	16	
11	983062	WASHER, flat, E, 0.375 x 0.625 x 0.032 in., zinc	16	
12	984152	NUT, hex, regular, $\frac{3}{8}$ -16, steel, plain	16	
13	174600	CASTER, 6 in., swivel	4	
<p>NOTE A: Optional feature.            B: Standard pump.            C: Optional pump.            AR: As Required            NS: Not Shown</p>				

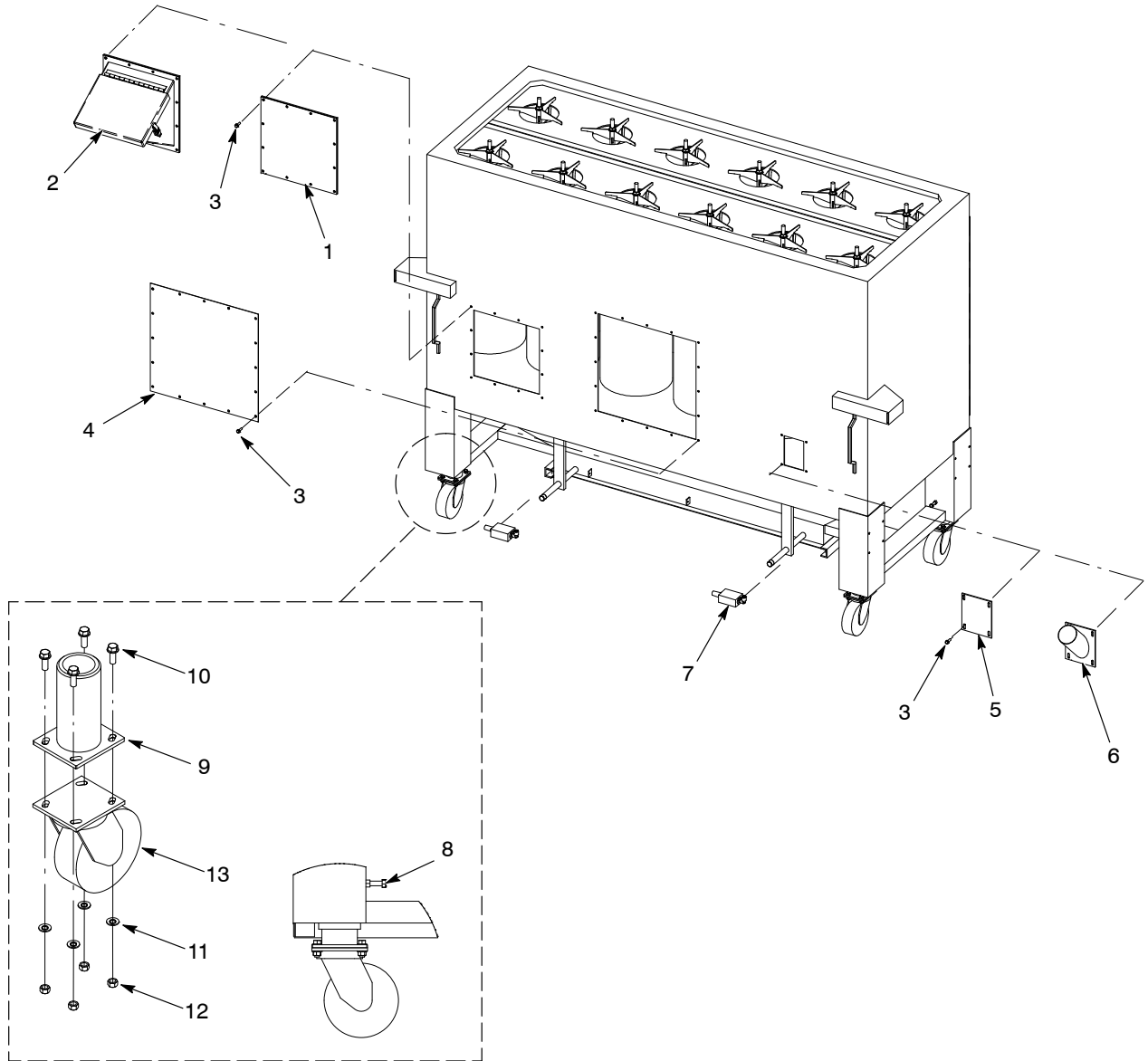


Figure 7-9 Color Module Covers and Casters

## Color Module Cartridge Filters and Fluidizing Plates (Pre-2003 Systems)

See Figure 7-10.

**NOTE:** The following parts are used on the Excel 2001, Excel 2002, and the Excel 2003. Differences between the versions are stated in the Note column.

Item	Part	Description	Quantity	Note
1	176363	BAFFLE (collector mouth)	1	A, B
1	176370	BAFFLE (collector mouth)	1	C
2	984178	NUT, hex, $\frac{5}{8}$ -11 in., steel, zinc	AR	
3	983440	WASHER, lock, E, split, $\frac{5}{8}$ in., steel, nickel	AR	
4	983090	WASHER, flat, E, 0.656 x 1.312 x 0.095 in., zinc	AR	
5	174720	SUPPORT, filter mount	AR	
6	174723	ROD, filter mount, 36 in.	AR	
7	174722	BRACKET, centering, filter	AR	
8	156996	FILTER, 36 in., PowderGrid, center mount	AR	
9	176362	SEAL, mouth, D-Style	1	
9	176369	SEAL, mouth, D-Style	1	
10	900497	ADHESIVE, neoprene contact	AR	
11	179086	PLATE, fluid	AR	A
11	179087	PLATE, fluid	AR	B, C
12	179088	GASKET, fluid, plate	AR	A
12	179089	GASKET, fluid, plate	AR	B, C
13	154209	PLATE, diffuser	AR	A
13	154210	PLATE, diffuser	AR	B, C
14	154211	KIT, C-clamp	AR	A
14	154222	KIT, C-clamp	AR	B, C
15	154188	PLENUM, fluidizing, assembly	AR	A
15	154189	PLENUM, fluidizing, assembly	AR	B, C

NOTE A: Part used with Excel 2001.

B: Part used with Excel 2002.

C: Part used with Excel 2003.

AR: As Required

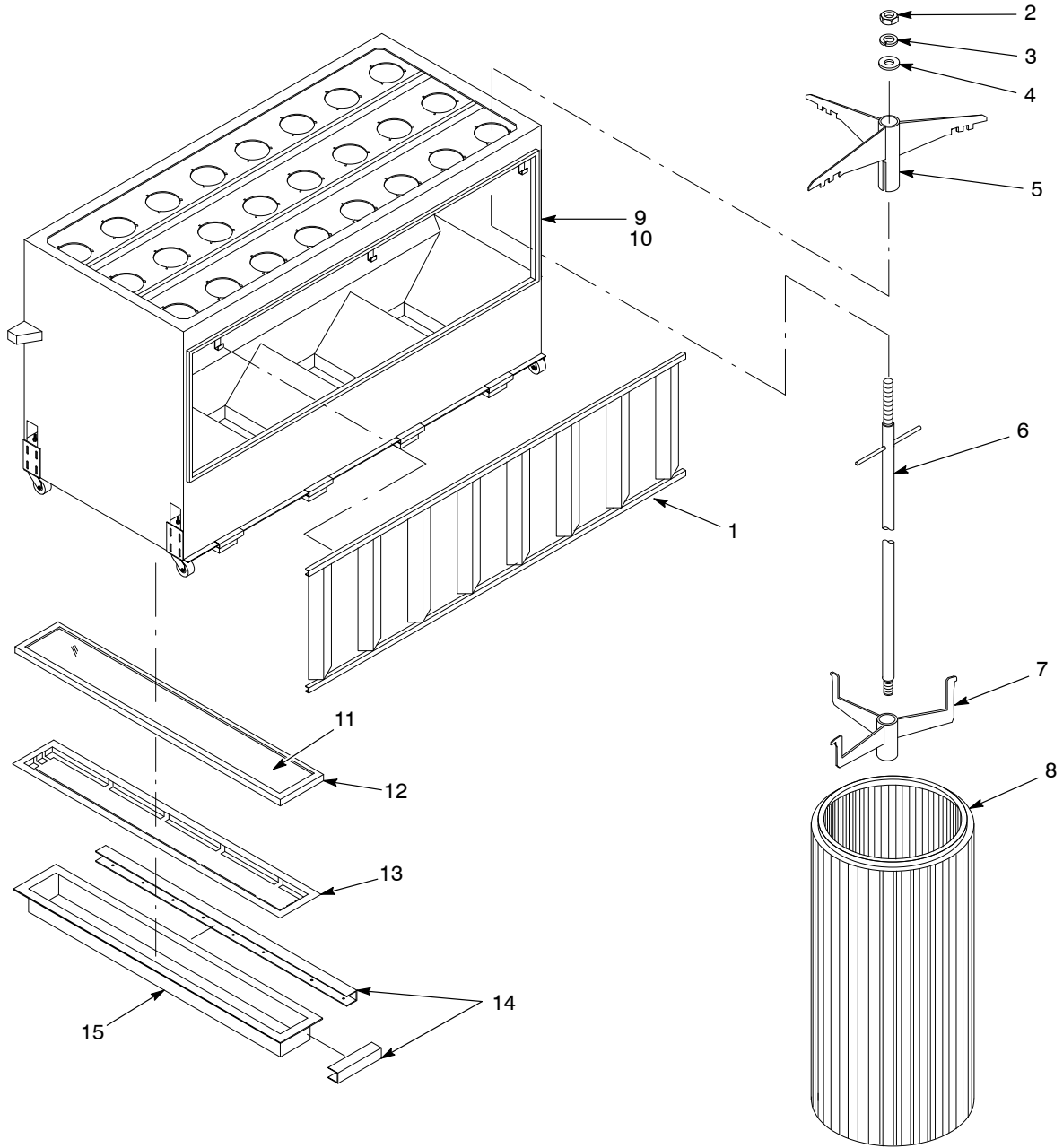


Figure 7-10 Color Module Cartridge Filters and Fluidizing Plates

## Color Module Covers and Casters

See Figure 7-11.

Item	Part	Description	Quantity	Note
1	154118	HANDLE, color module	2	
2	983050	WASHER, flat, E, 0.344 x 0.625 x 0.063 in., zinc	36	
3	981315	SCREW, hex, $\frac{5}{16}$ -18 x 1.0 in., cap, zinc	36	
4	154142	PLATE, module option	2	
5	981622	SCREW, hex, $\frac{1}{2}$ -13 x 3.0 in., cap, zinc	4	
6	984170	NUT, hex, reg, $\frac{1}{2}$ -13 in., steel, zinc	4	
7	158627	BLOCK, caster mount	4	
8	983061	WASHER, flat, E, 0.406 x 0.812 x 0.065 in., zinc	32	
9	981402	SCREW, hex, $\frac{3}{8}$ -16 x 1.0 in., cap, zinc	16	
10	174600	CASTER, 6 in. swivel	4	
11	174549	PLATE, cover, 3.5 in. vent stub	1	
12	-----	COVER, recess	1	A
13	981211	SCREW, hex, $\frac{1}{4}$ -20 x 0.75 in., cap, zinc	6	
14	983140	WASHER, lock, E, split, $\frac{1}{4}$ in., steel, nickel	6	
15	983504	WASHER, flat, E, 0.281 x 0.734 x 0.063 in., zinc	6	
NOTE A: Excel 2001 and Excel 2002 use cover, part 154208; Excel 2003 uses cover, part 154207.				

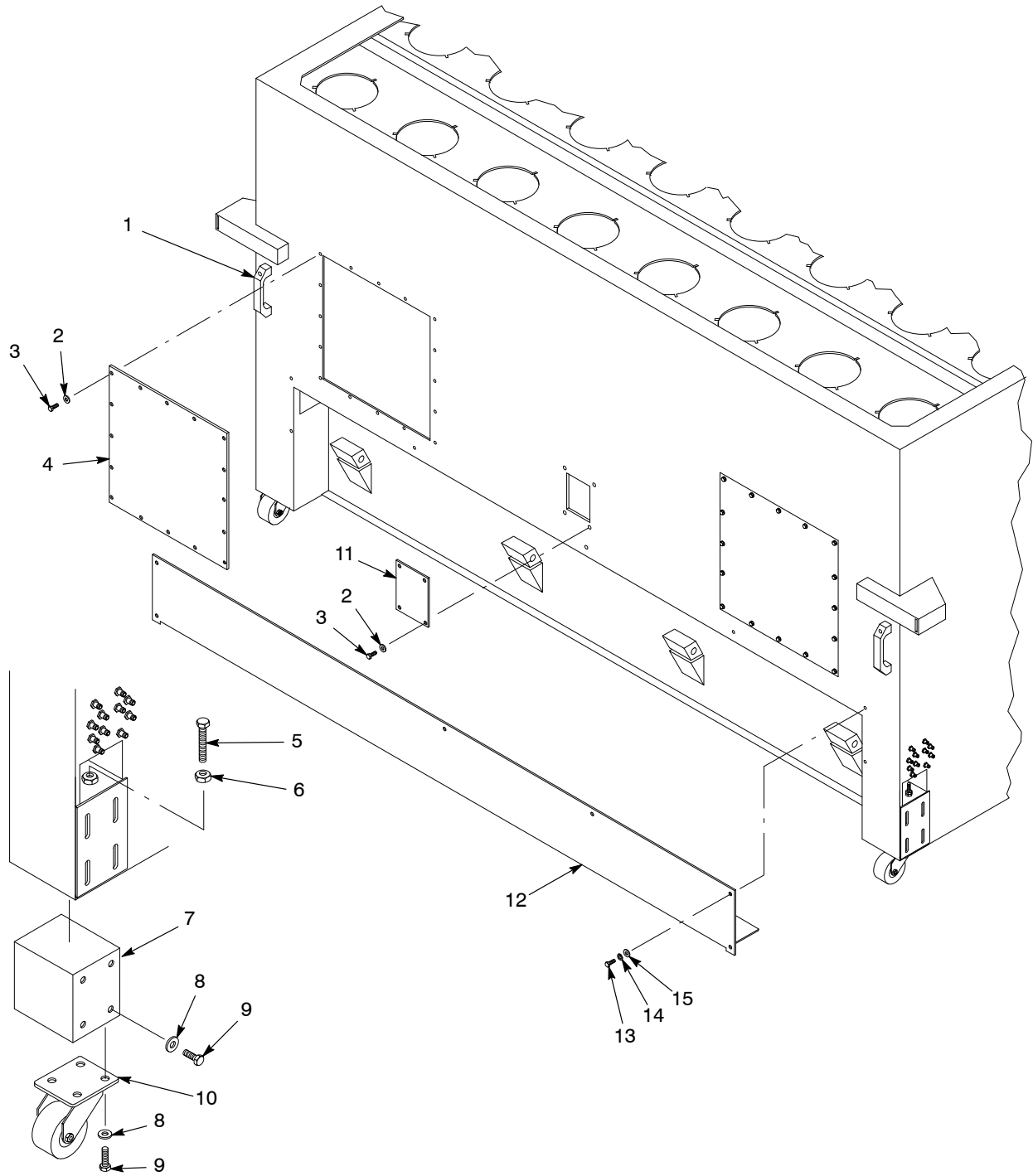


Figure 7-11 Color Module Covers and Casters



# Pneumatic Control Panel

See to Figure 7-12.

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

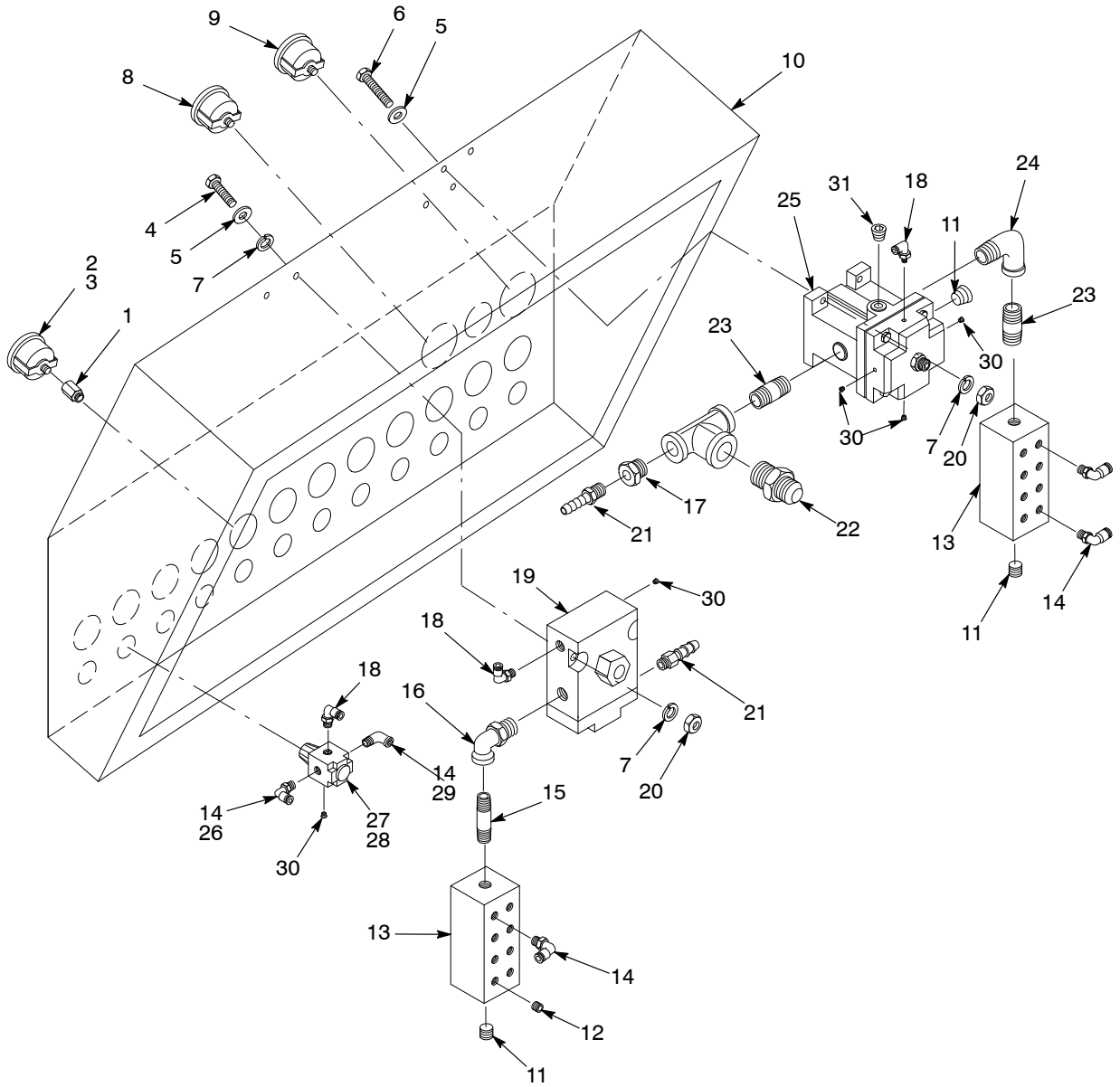


Figure 7-12 Pneumatic Control Panel

# Fan and Fan Drive

See Figure 7-13.

Item	2001 Part	2002 Part	2003 Part	Description	Quantity	Note
1	174810	174810	174810	KEY, fan, sheave, 0.50 x 0.312 x 2.72 in.	1	
2	-----	-----	-----	BUSHING, fan sheave (with hardware)	1	A
3	-----	-----	-----	SHEAVE, fan	1	A
4	176259	176259	176261	SHAFT, fan	1	
5	982842	982842	982842	SCREW, hex, 1/2-13 x 6.50 in., cap, zinc	4	
6	174796	174796	174796	KEY, fan, 0.50 x 0.50 x 4.79 in.	1	
7	177622	183906	183906	BEARING, fan	2	
8	972716	972716	972716	CONNECTOR, male, 1/4 in. tube x 1/8 in. NPT	2	
9	-----	-----	-----	SUPPORT, fan, bearing	1	
10	-----	-----	-----	SCREW, hex, serrated flange, 1/2-13 x 1.00 in., cap, zinc	AR	
11	-----	-----	-----	NUT, hex, serrated flange, reg, 1/2-13 in., steel, zinc	AR	
12	174735	174736	174736	WHEEL, fan	1	
13	178973	178973	178973	WASHER, flat, special	1	
14	-----	-----	-----	SCREW, hex, 1/2-20 x 1.00 in., black, G5	1	
15	174778	174779	174785	BUSHING, motor sheave (with hardware)	1	
16	-----	-----	-----	SHEAVE, motor	1	A
17	174772	174772	174773	BELT, drive	AR	B
18	174756	174757	174762	MOUNT, motor, adjustable	1	
19	174752	174755	174761	MOTOR, fan	1	C
20	973103	973103	973103	NIPPLE, steel, sched 40, 3/4 in. NPT, 1.37 in.	AR	
21	183914	183914	183914	ELBOW, 90°, elbow pull, 3/4 in.	AR	
22	183915	183915	183915	WASHER, sealing, conduit, 3/4 in.	AR	
23	183912	183912	183912	CONNECTOR, straight, 3/4 in., conduit	AR	
24	183913	183913	183913	CONDUIT, metal flex, 3/4 in.	AR	
25	174749	174750	174751	CONE, air inlet	1	
26	158658	158658	158658	RETAINER, inlet cone	8	
27	-----	-----	-----	SCREW, hex, serrated flange, 5/16-18 x 1.00 in., cap, zinc	AR	D

NOTE A: Refer to *Bushing and Sheave Part Numbers* for parts numbers by version.

B: Excel 2001 uses two belts, Excel 2002 and Excel 2003 use three belts.

C: Excel 2001 uses a 15-hp motor; Excel 2002 uses a 20-hp motor; excel 2003 uses a 25-hp motor.

D: Units without a damper require 34 screws; units with a damper require 46 screws.

AR: As Required

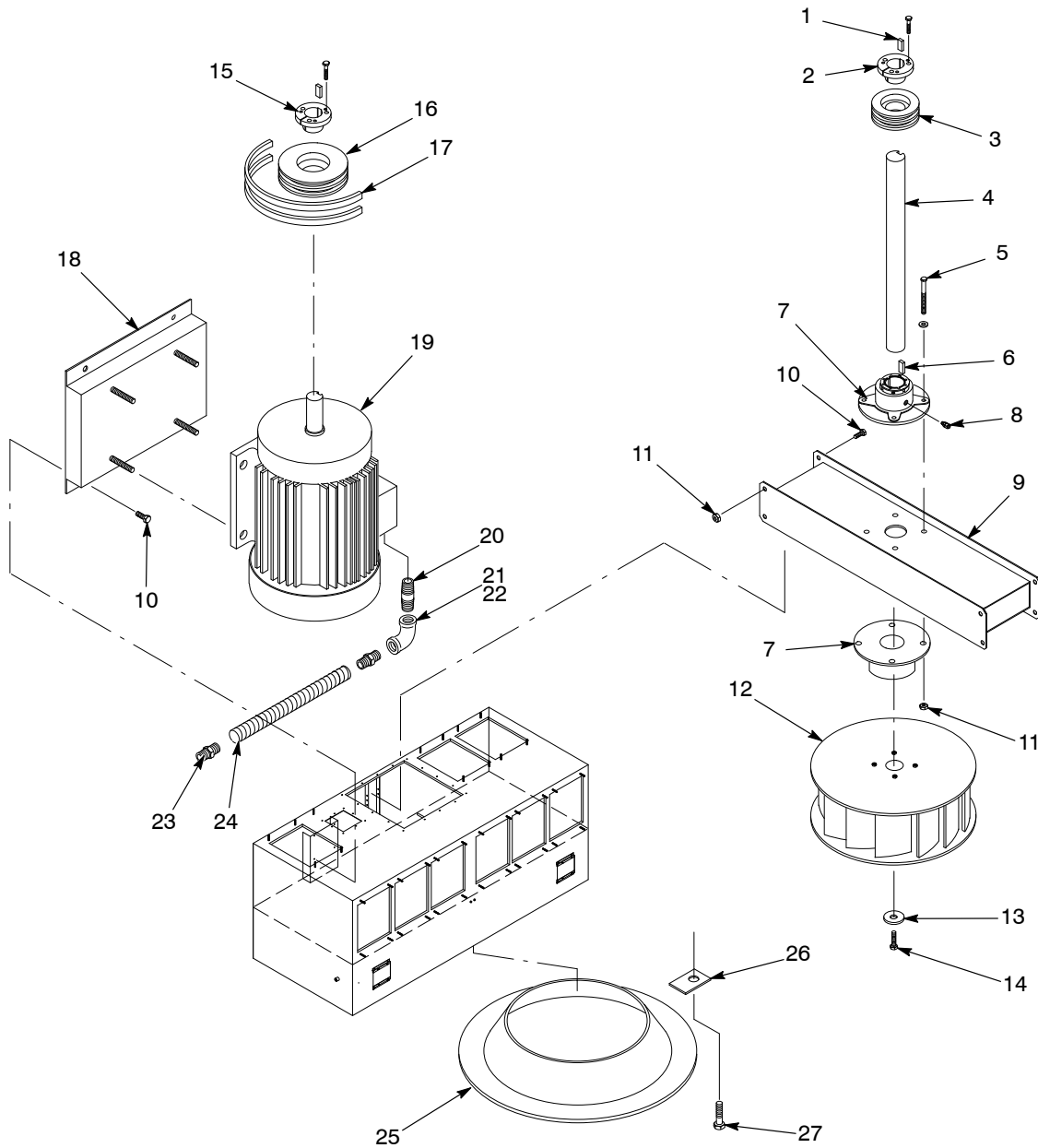


Figure 7-13 Fan and Fan Drive

### Bushing and Sheave Part Numbers

See Figure 7-13.

Item	2001 Standard-Flow	2001 Low-Flow	2002 Standard-Flow	2002 Low-Flow	2003 Standard-Flow	2002 Low-Flow	Description
2	174780	174780	174781	174781	174781	174791	BUSHING, fan sheave
3	174774	174784	174787	174777	174782	174790	SHEAVE, fan
18	174775	174789	174786	174788	174783	174782	SHEAVE, motor

## Section 8

# Specifications

## Dimensions and Capacities

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

Refer to Table 8-1 for a listing of the dimensions and capacities for Excel 2000 Series booths.

Table 8-1 Dimensions and Capacities

Dimensions and Capacities	Excel 2001	Excel 2002	Excel 2003
<b>Base dimensions</b>			
Overall height	775 mm (30.5 in.)	775 mm (30.5 in.)	775 mm (30.5 in.)
Overall width	1.5–1.8 m (5–6 ft)	1.5–1.8 m (5–6 ft)	1.5–1.8 m (5–6 ft)
Overall length	5.9 m (19.5 ft)	5.9 m (19.5 ft)	6.7 m (22 ft)
Air flow at 6 in. wc	204 m <sup>3</sup> /min (7200 cfm)	306 m <sup>3</sup> /min (10800 cfm)	396 m <sup>3</sup> /min (14000 cfm)
Fan rating at 4 in. wc (minimum)	215 m <sup>3</sup> /min (7600 cfm)	354 m <sup>3</sup> /min (12500 cfm)	459 m <sup>3</sup> /min (16200 cfm)
Number of cartridge filters	12	18	24
Number of final filters	5	7	9
Number of pulse valves	12	18	24
Maximum air pressure	6.9 bar (100 psig)	6.9 bar (100 psig)	6.9 bar (100 psig)
Manual/auto gun capacity	4/14	4/22	6/28

## 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:** 230, 460, or 575 Vac. 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).

**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

# Split Support Beam Installation

## Split Support Beam Installation—Fixed Booths

Use these instructions to install beam extensions on 152- and 183-cm (60- and 72-in.) fixed booths shipped with split support beams.

See Figure 9-1.



**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.

1. Raise the booth base several feet off the floor, using a forklift truck, overhead crane, or suitable jack.
2. Install safe and solid support blocks under the booth base. The blocks should support the base 60–90 cm (2–3 ft) off the floor. Lower the booth base onto the blocks.

**NOTE:** Booths are shipped with the right and left support beams (1, 2) installed on the base.

3. Mount the right and left beam extensions (3, 4) to the end faces of the support beams, oriented as shown in Figure 9-1, with eight  $\frac{1}{2}$ -13 UNC cap screws, lock washers, and flat washers (7, 8, 9).
4. Square the beam extensions with the support beam end faces, then tighten the cap screws in a criss-cross pattern.



**WARNING:** Do not lower the base to the floor until all end and middle legs are installed. The weight of the base will not be properly supported unless all legs are installed.

5. Install the end legs (6) and middle legs (5) to the support beams and beam extensions as follows:
  - a. Install the end legs to the ends of the support beams opposite the beam extensions with eight  $\frac{3}{8}$ -16 UNC cap screws, lock washers, and flat washers (10, 11, 12).

## Split Support Beam Installation—Fixed Booths *(contd)*

- b. Install the middle legs (5) to the support beams and beam extensions with twelve  $\frac{1}{2}$ -13 UNC cap screws, lock washers, and flat washers (7, 8, 9).
- c. Install the end legs (6) to the beam extensions with eight  $\frac{3}{8}$ -16 UNC cap screws, lock washers, and flat washers (10, 11, 12).



**WARNING:** Do not lift the base assembly by the beam extensions.

- 6. Lift the base and remove the blocks. Lower the base to the floor. Level the base as required, using the leveling pads (13).

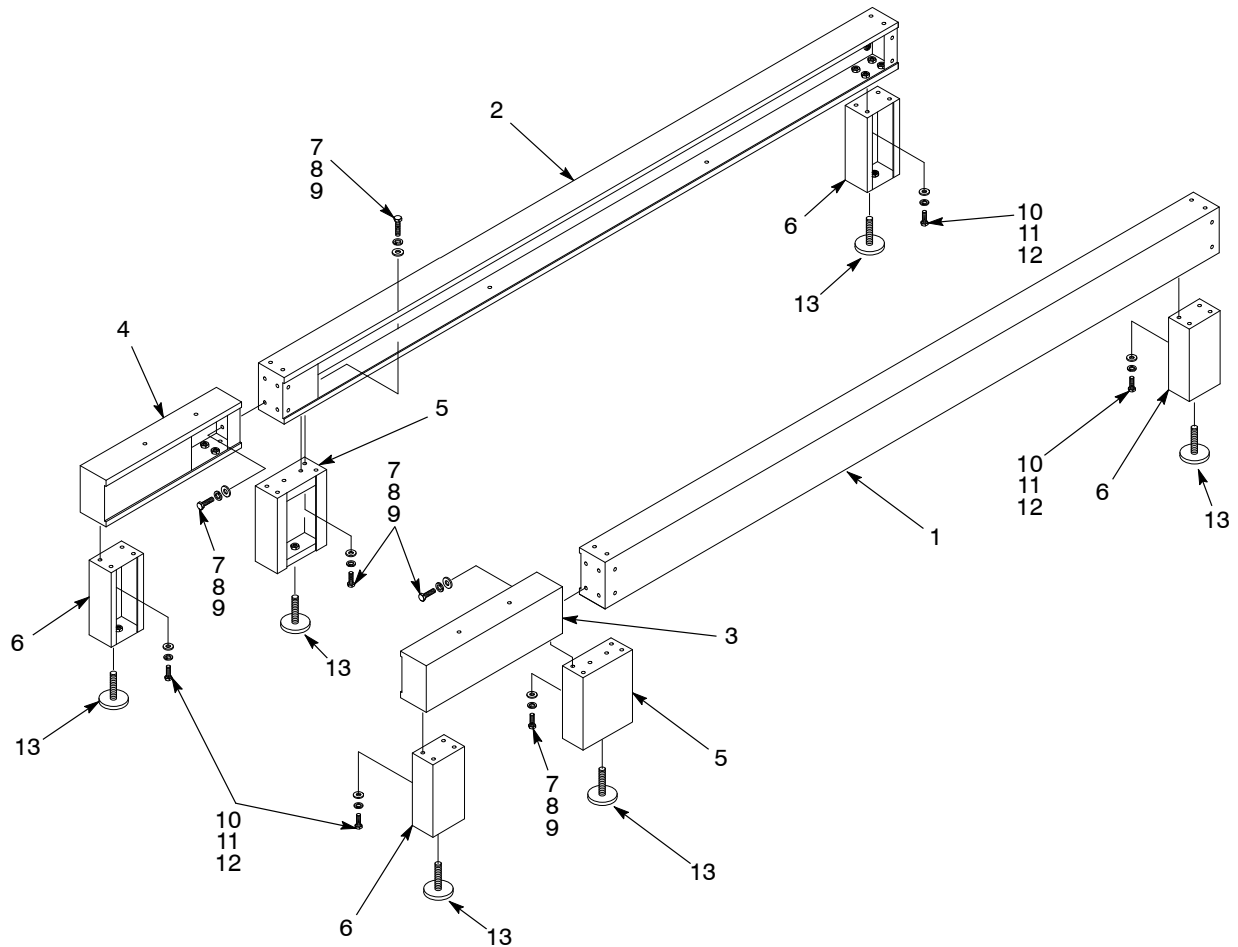


Figure 9-1 Split Support Beam Installation—Fixed Booths

- |                         |                                     |                                      |
|-------------------------|-------------------------------------|--------------------------------------|
| 1. Right support beam   | 6. End legs                         | 10. $\frac{3}{8}$ -16 UNC cap screws |
| 2. Left support beam    | 7. $\frac{1}{2}$ -13 UNC cap screws | 11. $\frac{3}{8}$ -in. lock washers  |
| 3. Right beam extension | 8. $\frac{1}{2}$ -in. lock washers  | 12. $\frac{3}{8}$ -in. flat washers  |
| 4. Left beam extension  | 9. $\frac{1}{2}$ -in. flat washers  | 13. Leveling pads                    |
| 5. Middle legs          |                                     |                                      |



## Split Support Beam Installation— Roll-On/Roll-Off Booths

Use these instructions to install beam extensions on 152- and 183-cm (60- and 72-in.) roll-on/roll-off booths shipped with split support beams.

**NOTE:** If your booth is equipped with an Integral Booth Mover and split support beams, refer to *Split Support Beam Installation—Booths with Integral Booth Mover* for instructions to install split support beams.

See Figure 9-2.



**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.

1. Raise the booth base several feet off the floor, using a forklift truck, overhead crane, or suitable jack.
2. Install safe and solid support blocks under the booth base. The blocks should support the base 60–90 cm (2–3 ft) off the floor. Lower the booth base onto the blocks.

**NOTE:** Booths are shipped with the right and left support beams (1, 2) installed on the base.

3. Mount the right and left beam extensions (3, 4) to the end faces of the support beams, oriented as shown in Figure 9-2, with eight  $1/2$ -13 UNC cap screws, lock washers, and flat washers (7, 8, 9).
4. Square the beam extensions with the support beam end faces, then tighten the cap screws in a criss-cross pattern.

**NOTE:** The casters (6) are shipped installed on the secondary support beams.

5. Install the right and left secondary support beams (5) to the base support beams, oriented as shown in Figure 9-2, with eight  $1/2$ -13 UNC cap screws, lock washers, and flat washers (7, 8, 9).



**WARNING:** Do not lift the booth base by the beam extensions.

6. Lift the base and remove the blocks. Lower the casters onto the roller tracks. Level the base as required.

# Split Support Beam Installation— Roll-On/Roll-Off Booths *(contd)*

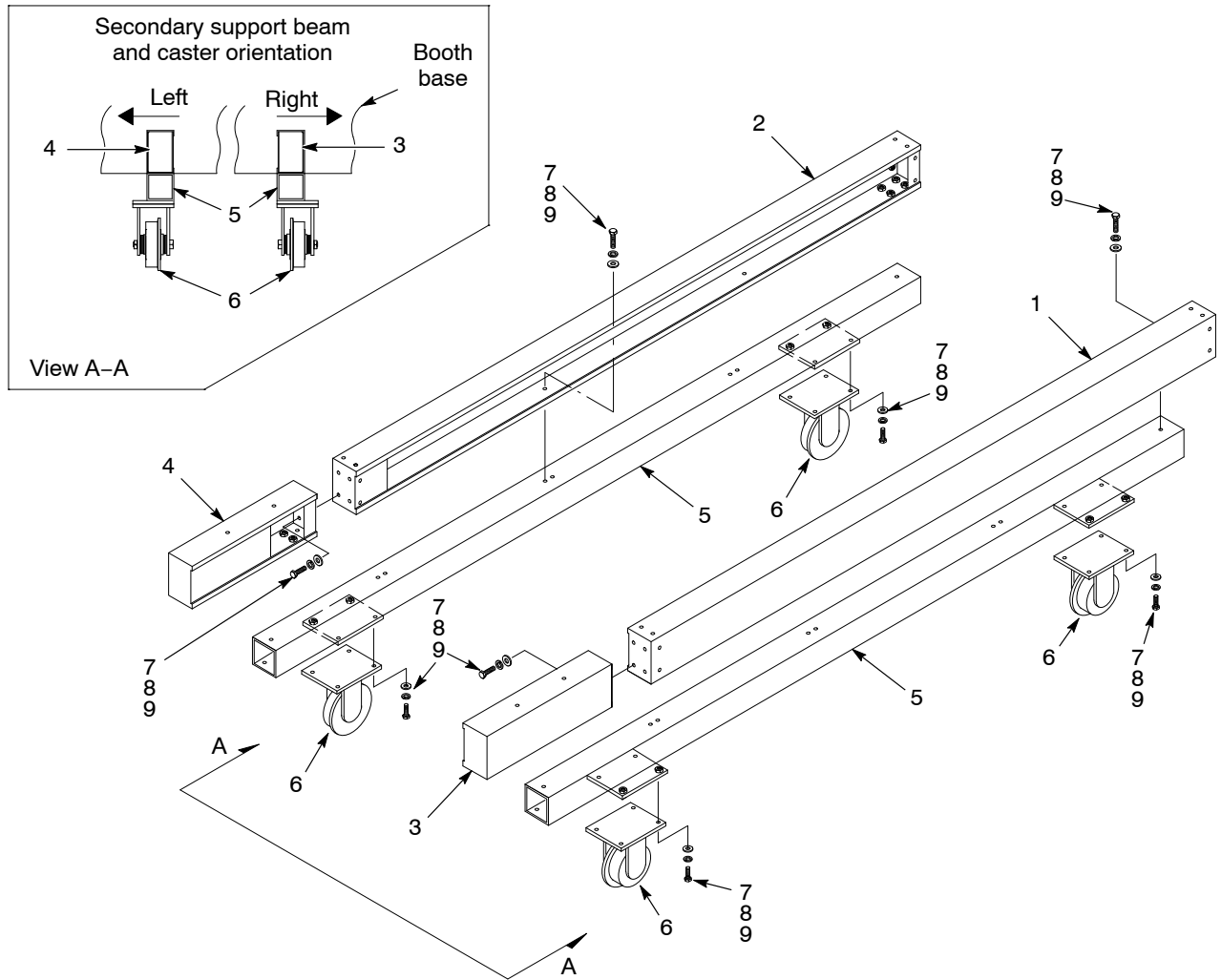


Figure 9-2 Split Support Beam Installation—Roll-On/Roll-Off Booths

- |                            |                            |                          |
|----------------------------|----------------------------|--------------------------|
| 1. Right base support beam | 4. Left beam extension     | 7. 1/2-13 UNC cap screws |
| 2. Left base support beam  | 5. Secondary support beams | 8. 1/2-in. lock washers  |
| 3. Right beam extension    | 6. Casters                 | 9. 1/2-in. flat washers  |

## Split Support Beam Installation– Booths with Integral Booth Mover

Use these instructions to install beam extensions on 152- and 183-cm (60- and 72-in.) booths shipped with an Integral Booth Mover and split support beams.

See Figure 9-3.



**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.

1. Raise the booth base several feet off the floor, using a forklift truck, overhead crane, or suitable jack.
2. Install safe and solid support blocks under the booth base. The blocks should support the base 60–90 cm (2–3 ft) off the floor. Lower the booth base onto the blocks.

**NOTE:** Booths are shipped with the right and left support beams (1, 2) installed on the base.

3. Mount the right and left beam extensions (3, 4) to the end faces of the support beams, oriented as shown in Figure 9-3, with eight  $\frac{1}{2}$ -13 UNC cap screws, lock washers, and flat washers (5, 6, 7).
4. Square the beam extensions with the support beam end faces, then tighten the cap screws in a criss-cross pattern.
5. Install the Integral Booth Mover.



**WARNING:** Do not lift the booth base by the beam extensions.

6. Lift the base and remove the blocks. Lower the casters onto the roller tracks. Level the base as required.

## Split Support Beam Installation– Booths with Integral Booth Mover *(contd)*

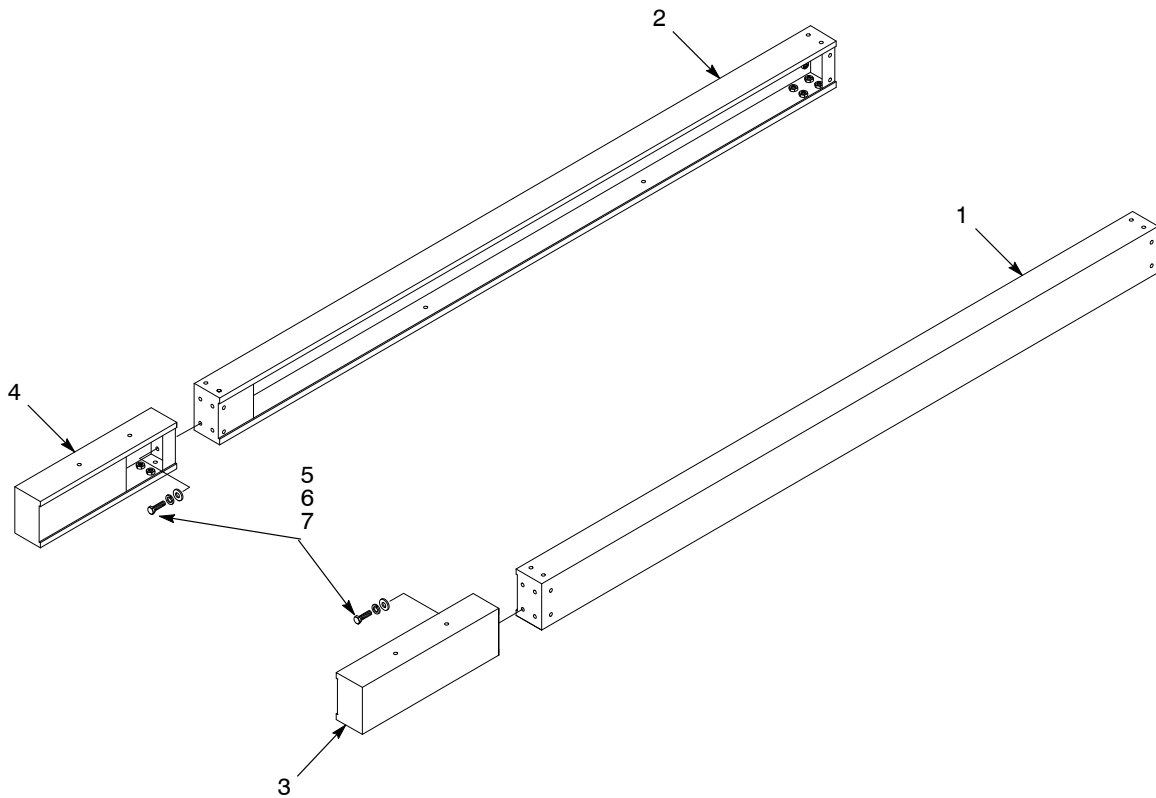


Figure 9-3 Split Support Beam Installation–Booths with Integral Booth Mover

- |                            |                          |                         |
|----------------------------|--------------------------|-------------------------|
| 1. Right base support beam | 4. Left beam extension   | 6. 1/2-in. lock washers |
| 2. Left base support beam  | 5. 1/2-13 UNC cap screws | 7. 1/2-in. flat washers |
| 3. Right beam extension    |                          |                         |