Cyclo-Kinetic® Powder Coating Booths

Customer Product Manual
Part 107115C

NORDSON CORPORATION • AMHERST, OHIO • USA

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Notice

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Section 1

Safety

Section 1
Safety

1. 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.

2. 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.

3. 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

4. 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.

5. 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.

6. 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.

7. Grounding

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's platform, hoppers, photoeye supports, and metal 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 the 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-metal 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.

7. Grounding (contd)

- 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.

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.

8. 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.

9. Disposal

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

Section 2

Description

Section 2
Description

1. Introduction

This manual covers standard Nordson Corporation Cyclo-Kinetic (CK) powder spray booths. Although there are differences in the various models of the CK booth, they are all operated and maintained the same.

The illustrations in this manual show the 03SI model. This model has the exhaust fan and final filters mounted under the booth base, with the separators and filter housing connected to the side of the base.

2. System Components and Operation

See Figure 2-1. The main components of a CK booth consist of a booth base (2), enclosure (1), powder separators (8), and filter housing (5).

The booth base houses a motor and V-belt (17) drive, exhaust fans (18), final filters (19), wiring, and pneumatic plumbing. The base serves as a foundation for the enclosure and provides attaching points for the rest of the booth components.

The exhaust fans pull spray room air into the enclosure through the enclosure openings. The air flows into the powder separators, through the cartridge filters (6), fans, and out of the base through the final filters. The airflow and the enclosure walls prevent sprayed powder from escaping into the spray room.

Powder pumps (13) mounted on the feed hopper (16) pump powder to automatic (11) and manual (4) powder spray guns. The spray guns spray the powder onto the parts passing through the booth. The powder that does not adhere to the parts is drawn by the airflow into the separators. The separators recover most of the powder from the airflow. Transfer pumps (9) attached to the end of the separators pump the recovered powder back to the accumulator (14). The powder passes from the accumulator to the sieve (15), where it is screened before being returned to the feed hopper. The feed hopper can be continuously replenished with new powder from optional bulk feed systems.

2. System Components and Operation (contd)

From the separators, the air flows into the filter housing, where high-efficiency cartridge filters collect the small amount of powder that the separators did not recover. As powder collects on the external surfaces of the filters, the airflow through the filters decreases, increasing the pressure drop across the filter media. When the pressure drop reaches a preset level, a pressure switch opens a series of pulse valves (7).

The pulse valves release large volumes of compressed air through the center of the cartridge filters, blowing the collected powder off the filters. The powder falls into a collection hopper in the bottom of the filter housing. This powder is typically discarded, since it consists mainly of very fine particles that do not fluidize or charge well. Your booth may be equipped with a vibrator and transfer pump to fluidize and pump the powder from the hopper.

The cleaned air flows through the exhaust fans and is returned to the spray room through the final filters.

When cleaning the booth, the powder removed from the walls and floor is swept into a cleanup bin (12) located in the floor of the booth. A manually activated transfer pump mounted on the bin pumps the powder out of the bin.

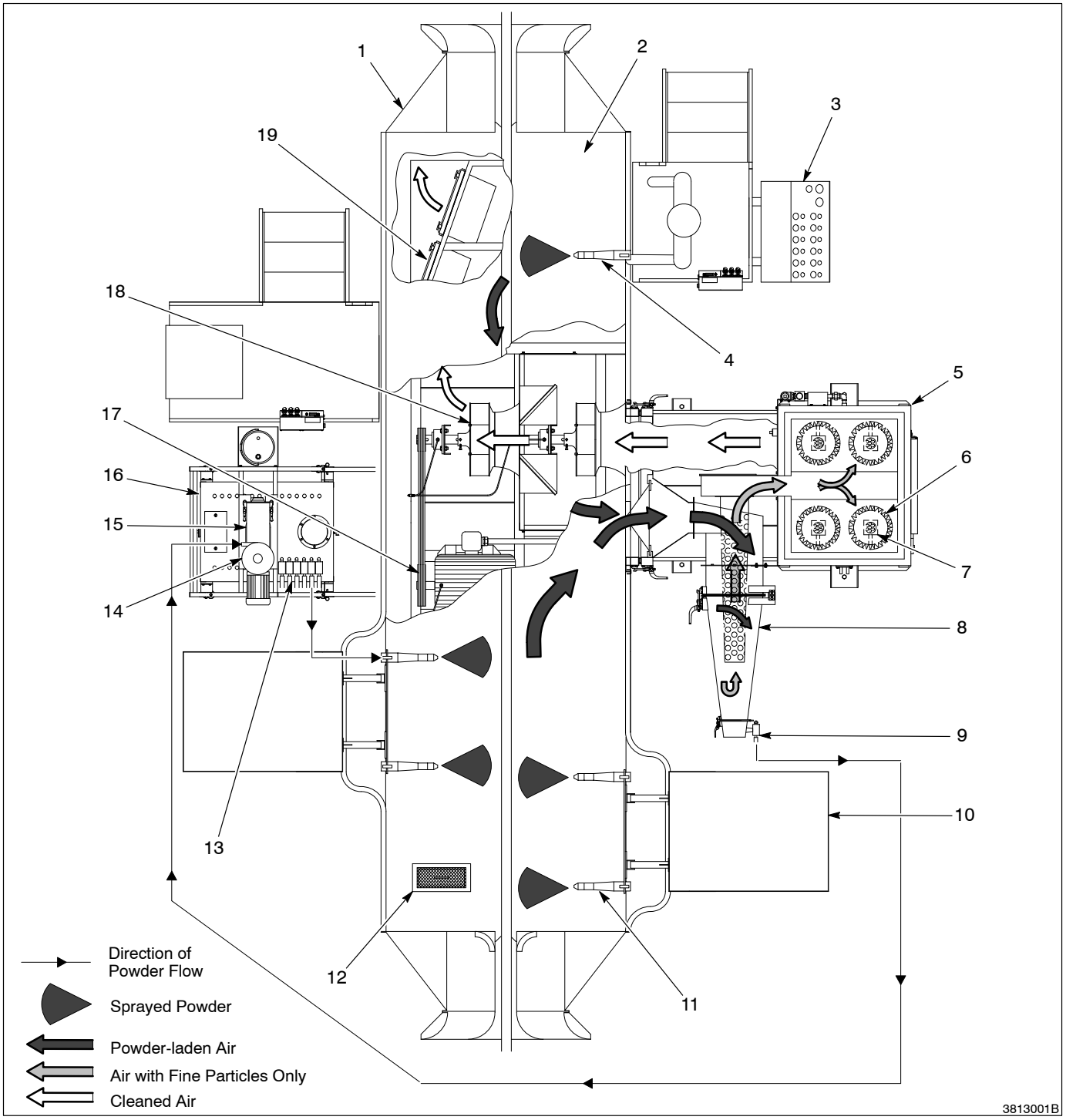

Fig. 2-1 System Components and Operation (Typical)

1. Enclosure
2. Booth base
3. Pneumatic control panel
4. Manual powder spray gun
5. Filter housing
6. Cartridge filters
7. Pulse valves
8. Powder separators
9. Transfer pumps
10. Gun mover
11. Automatic powder spray gun
12. Cleanup bin
13. Powder pumps
14. Accumulator
15. Sieve
16. Feed hopper
17. Motor and V-belts
18. Exhaust fans
19. Final filters

3. Safety Features

ANSI/NFPA standards 33 and 68 apply to this system. A quick-acting automatic flame detector system, interlocked with the system controls, must be installed if your system uses automatic powder spray guns. The flame detector system shuts down the powder application equipment, system air supply, and exhaust fan if it detects a flame or electrical spark inside the enclosure.

If a spark or flame is drawn into the filter housing, it could cause an explosion. To minimize damage and protect personnel, the top of the filter housing is fitted with a deflagration vent. Ductwork must be installed by the customer from the vent to the exterior of the building. The vent and ductwork will direct the force of the explosion outside the building.

The final filters ensure that no powder escapes from the fan compartment into the spray room. A pressure switch monitors the pressure differential between the interior of the fan compartment and the exterior. At 2.5-in. water column (w.c.), an alarm is triggered, warning the operator that the filters are starting to blind (clog). At 3.0-in. w.c., the system will automatically shut down. The filters must be replaced and any powder leaks fixed before restarting the system.

Section 3

Operation

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.

1. Introduction

Operation procedures consist of initial system setup, daily startup, daily shutdown, and color change. Use the initial system setup procedure for new systems.

2. Operating Parameters

Table 3-1 provides the basic operating parameters for the CK03SI, CK04SI, and CK05SL booths.

Table 3-1 Operating Parameters

Item	Parameter
Separator Transfer Pumps	Operation: Start automatically when exhaust fan is started Pressure: 1.4 bar (20 psi) typical 1 bar (15 psi) minimum, 2 bar (30 psi) during cleanup
Cleanup Bin Transfer Pump	Operation: Manually operated; turn on to empty bin Pressure: 0.7 bar (10 psi) 2 bar (30 psi) during cleanup
Cartridge Pulsing	Operation: Pulse on demand when pressure drop exceeds 6.5-in. w.c. Pressure: 4.1–4.5 bar (60–65 psi/410–450 kPa)
Final Filter Monitoring	Operation: Pressure drop warning and shutdown levels Pressure: 2.5-in. w.c. warning 3.0-in. w.c. shutdown

3. Initial System Setup

Use these procedures to prepare your CK powder booth for production. Setup and operation of powder application equipment, gun movers, and advanced control systems, such the Nordson Smart-Coat system, are covered in separate manuals.

Use the charts at the end of this section to record your booth and spray gun settings. Make extra copies of the charts as needed.

WARNING: Even with the electrical-panel disconnect switch in the off position, the 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.

1. Disconnect system electrical power. Open the system electrical panel.

2. Set the pulse valve timers.

NOTE: The timer circuit board is labeled.

Pulse valve off timer:	90 seconds
Pulse valve on timer:	0.07 seconds

3. Close the electrical panel.

4. Turn on the system electrical power.

5. Set all air pressure regulators on the pneumatic control panel to zero.

6. Turn on the system compressed air supply. Adjust the system air pressure to 6.2 bar (90 psi).

7. At the system pneumatic control panel, set the transfer pump pressure to 1.4 bar (20 psi). These pumps turn on automatically when the exhaust fan is started.

8. Set the cleanup bin transfer pump pressure to 0.7 bar (10 psi).

NOTE: This pump is manually operated.

9. Fill the feed hopper $^{2}/_{3}$ full of powder.

10. Calibrate the feed-hopper level sensor. Refer to *Feed Hopper Level Sensor Replacement and Calibration* in the *Repair* section.

11. Set the feed-hopper fluidizing air pressure to 0.7–1 bar (10–15 psi). Adjust the pressure until you see the powder gently boiling. Allow 10–15 minutes for the powder to fluidize before spraying.

12. Start the exhaust fan. This will also start the separator transfer pumps and the rotary sieve.

13. At the sieve pneumatic panel, set the air pressure regulator and flowmeters:

    Air pressure: 1.7 bar (25 psi)
    Flow meters: 2.8 m^3/h (100 SCFH)

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

15. Adjust the pulse-valve air pressure to 4.1–4.5 bar (60–65 psi/410–450 kPa). The air pressure regulator is located on the side of the filter housing. Pulsing will not start until triggered by the pressure switch in the filter housing.

16. Adjust the fan speed control to obtain the proper airflow through all enclosure openings. ANSI/NFPA-33 requires that the face velocity across the booth openings must be capable of containing the sprayed powder within the booth. A minimum of 30 m/min (100 ft/min) is suggested.

17. Season the cartridge filters according to the instructions in *Cartridge Filter Seasoning* in this section. All new cartridge filters should be seasoned for proper operation.

18. Set the conveyor interlock switch to NORM.

WARNING: An ungrounded or poorly grounded workpiece, hanger, or conveyor can cause electrical arcing. If arcing is observed, shut down the system immediately. Correct the cause before resuming operations. Failure to observe this warning could result in a fire or explosion, causing property damage and possible personal injury or death.

19. Start spraying powder. Adjust your application equipment settings to obtain the coverage and film thickness desired.

Vent-Assist Air Pressure Adjustment

To maintain a neutral air pressure in the sieve, the compressed air used to convey the reclaimed powder to the accumulator is vented into the booth. Vent-assist air creates low pressure in the vent tube and increases the airflow. 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: The vent-assist air pressure regulator is located either on the sieve pneumatic panel, or on the system pneumatic panel.

Cartridge Filter Seasoning

See Figure 3-1. Perform this procedure with all new cartridge filters.

1. Remove the final filters.
2. Turn the fan damper control (6) to the fully closed position.
3. Open the filter housing door (3). Secure the door to prevent it from closing.
4. Turn on the exhaust fan.
5. Open the fan damper until the pressure drop across the cartridge filters (1) reaches 2-in. w.c.
6. Measure the initial air velocity at the filter housing door with a hand-held velometer (2).
7. Spray powder from the open end of a transfer hose (7) from a box feeder (5) or other bulk feeder into the filter housing, through the open door. While spraying powder, measure the air velocity at the filter housing door. Maintain the initial air velocity by opening the fan damper in small increments.

8. Continue spraying powder into the filter housing until the pressure drop across the cartridge filters increases to 4–5 in. Stop spraying powder.

9. Adjust the pulse pressure regulator (4) to 2.75 bar (40 psi/275 kPa) and pulse the cartridge filters for a few minutes. Turn off cartridge pulsing.

10. Spray powder into the filter housing until the pressure drop across the cartridge filters increases to 4–5 in. again. Stop spraying powder.

11. Pulse the cartridge filters again for a few minutes.

12. Repeat steps 9 and 10 several times, increasing the pulse pressure 0.35 bar (5 psi/35 kPa) every 10 minutes.

13. When you reach a pulse pressure of 4.1 bar (60 psi/410 kPa), stop spraying powder, turn off the exhaust fan, and close the filter housing door.

14. Set the pulse pressure to 5.5 bar (80 psi/550 kPa). Open the fan damper all the way.

Cartridge Filter Seasoning

(contd)

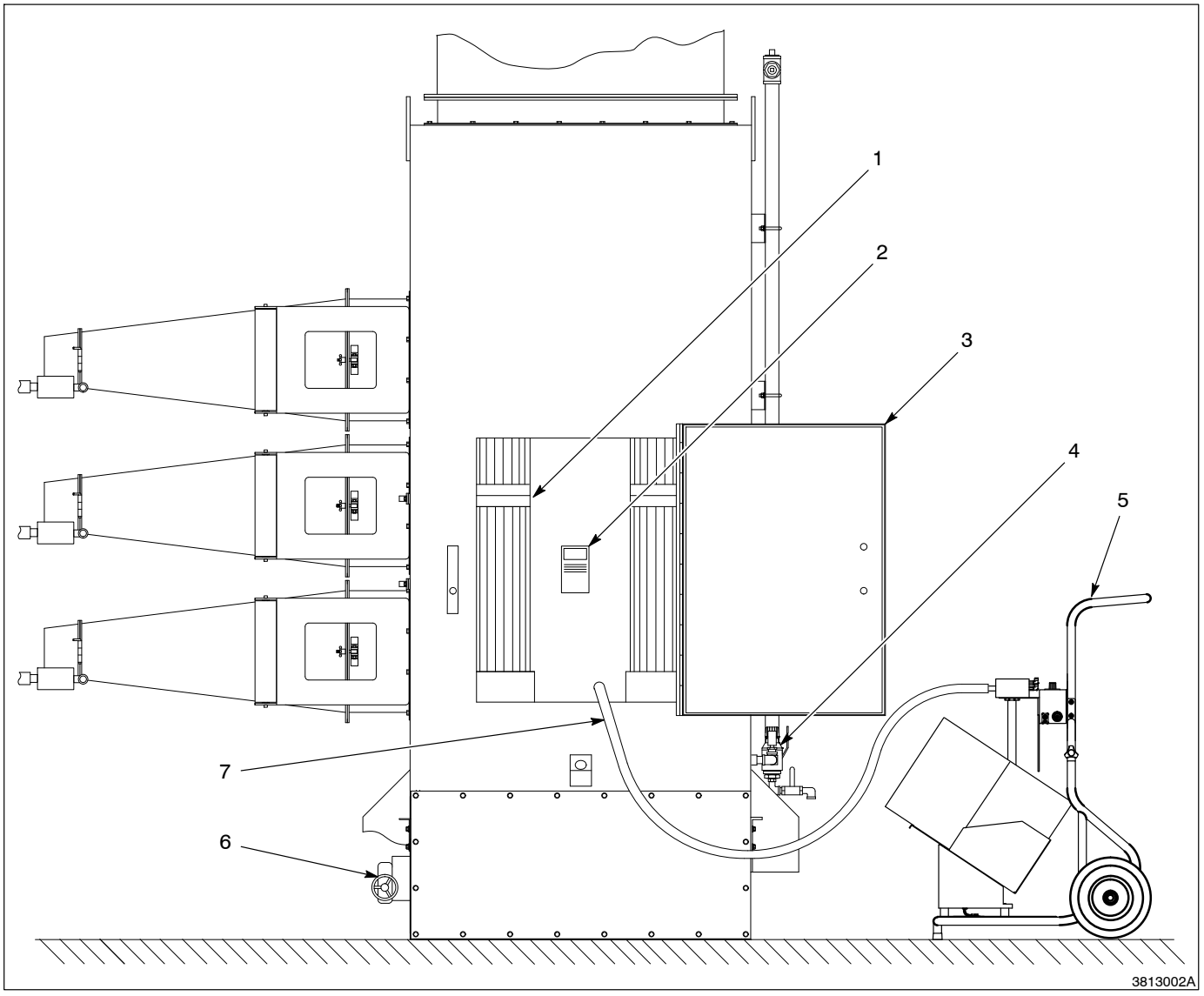

Fig. 3-1 Cartridge Filter Seasoning

1. Cartridge filters
2. Velometer
3. Filter housing door
4. Pulse pressure regulator
5. Box feeder
6. Fan damper control
7. Transfer hose

4. Daily Startup

1. Turn on the system electrical power and compressed air supply.
2. Walk around the booth and verify that the
   - system equipment is connected to ground.
   - flame detector system is on.
   - transfer and feed hoses are connected to the pumps, accumulator, and guns.
   - feed hopper has an adequate supply of powder for production (no more than $^2/_3$ full).
3. Turn on the exhaust fan. Set the conveyor switch to NORM.
4. Turn on the automatic gun master-control unit and the manual gun control units.
5. Adjust the kV settings and the powder pump air pressures, if necessary. Refer to your gun and control unit manuals.

WARNING: An ungrounded or poorly grounded workpiece, hanger, or conveyor can cause electrical arcing. If arcing is observed, shut down the system immediately. Correct the cause before resuming operations. Failure to observe this warning could result in a fire or explosion, causing property damage and possible personal injury or death.

6. Start the conveyor and start spraying workpieces.
7. Check the airflow through the enclosure. Make sure the sprayed powder is not being pulled from the guns and workpieces, or escaping from the enclosure openings. Adjust the fan speed as needed. Airflow through each opening must be maintained at 30 m/min (100 ft/min), minimum.

5. Daily Shutdown

1. Turn off the automatic-gun master control unit and the manual-gun control units.
2. Perform the daily maintenance procedures described in the *Maintenance* section.
3. Turn off the exhaust fan. Shut off the system electrical power and compressed air supply.

6. Color Change

NOTE: Shut off your box feeder or other bulk feed system twenty minutes to an hour before changing colors. This will allow you to use up the powder in the feed hopper.

WARNING: Wear an approved respirator and safety glasses or goggles when performing maintenance or cleaning operations. Follow the personal protection recommendations included in the Material Safety Data Sheets for each powder used.

Stage 1: Gun and Booth Cleaning

1. Shut off the spray guns.
2. Roll the booth offline (if roll on/roll off equipped).
3. Leave the exhaust fan running at the normal operating speed. Leave the separator transfer pumps, sieve, and recovery system running.
4. Disconnect the powder feed hoses from the spray gun pumps on the feed hopper and blow out the hoses and guns, from the pump end of the hose.
5. Clean the spray gun pumps, feed hoses, and spray guns according to the instructions in their manuals. If desired, replace the feed hoses with ones previously used with the new color, or with new hoses.
6. Clean the interior walls and floor of the booth enclosure. Sweep the powder into the cleanup bin or, if the lowest cyclone is fitted with a cleanup hopper, the lowest cyclone inlet.

   NOTE: If you move the feed hopper inside the booth for cleaning, only roughly clean the booth enclosure at this time.

Stage 2: Separator, Cleanup Bin, and Feed Hopper Cleaning

1. Turn the transfer mode switch to the OFF position to turn off the separator transfer pumps. Turn off the fluidizing air to the feed hopper. Turn off the air supply to the sieve and other booth equipment.

WARNING: The sieve runs as long as the exhaust fan is on. Never work on the sieve while it is running. Failure to observe this warning could result in serious personal injury.

2. Turn off electrical power to the sieve and unplug the power cord.

3. Attach a scrap drum vent hose to the vent stub on the filter housing wall.

4. Disconnect the separator transfer pump hoses from the feed hopper accumulator and connect them to the scrap drum, or to hose connector stubs on the filter housing.

5. Turn the transfer mode switch to the CLEANUP position to turn on the separator transfer pumps.

6. Disconnect the bellows hose connecting the sieve to the feed hopper. Empty the powder out of the feed hopper. Clean the accumulator, sieve, and feed hopper. Before cleaning the feed hopper, you may want to move it into the booth.

7. Empty the powder out of the cleanup bin in the booth floor manually, or with the cleanup bin transfer pump. Clean the cleanup bin, transfer pump, and hose.

   NOTE: Some systems do not have a cleanup bin. Instead, the lowest cyclone is fitted with a cleanup hopper. Powder is swept into the lowest cyclone inlet during booth cleaning.

8. 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).

Stage 2: Separator, Cleanup Bin, and Feed Hopper Cleaning *(contd)*

9. Turn the transfer mode switch to the OFF position to turn off the separator transfer pumps.
10. Change the exhaust fan speed to low, or close the fan damper.
11. Remove and clean the separator transfer pumps and transfer hoses.
12. Loosen the separator clamp knobs and swing open the separators. Clean the interiors, including the perforated thimbles.
13. From the booth interior, clean the separator inlets.

Stage 3: Restart with New Color

1. Reinstall all pumps and reconnect all hoses.
2. Fill the feed hopper $^{2}/_{3}$ full with the new color.
3. Turn on the air supply to all booth equipment. Turn the transfer mode switch to RUN to turn on the separator transfer pumps.

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

Section 4

Maintenance

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.

1. Daily Cleaning

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

WARNING: Wear an approved respirator and safety glasses or goggles when performing maintenance or cleaning operations. Follow the personal protection recommendations included in the 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 and separator transfer pumps (turn the transfer mode switch to CLEANUP).
3. Disconnect the powder feed hoses from the powder pumps. Blow the powder out of the hoses and guns with compressed air.
4. Ground the gun electrodes and clean the 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 cleanup bin in the floor or, if the lowest cyclone is fitted with cleanup hopper, into the lowest cyclone inlet.
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). Clean the separator inlets.

1. Daily Cleaning (contd)

7. Empty the cleanup bin by turning on air to the transfer pump. Set the air pressure to 0.7 bar (10 psi). Remove and clean the clean up bin. Blow out the transfer pump and hose with compressed air.

CAUTION: Running the fan at less than half speed for extended periods may shorten the motor life.

8. Slow the exhaust fan to half speed (set VFD to 30 Hz).
9. Disconnect the separator transfer pumps from the separators. Blow out the pumps and hoses with compressed air.
10. Open the separators and clean the interiors, including the perforated thimbles.
11. Turn off the exhaust fan.
12. Clean the operator's platform and the floor around the booth.

2. Daily Maintenance

Perform these procedures daily to keep your system running efficiently and safely.

Daily Maintenance	Procedure
Air Velocity	Measure the air velocity at all enclosure openings with a velometer. Minimum velocity is 30 m/min (100 fpm).
Filters	Check the final-filter differential pressure gauge. It should read less than 2 in. If it is between 2 and 3 in., check for powder leaks around the cartridge filter gaskets or for damage to the filter media. Make sure no powder is leaking from around the final filter gaskets or through the media. Check the cartridge-filter differential pressure gauge. It should read between 4 and 10 in. Pulsing should start automatically at 5 in. Check the pulse valve timing. **NOTE:** Some applications will require a static pressure gauge with a range of 0–20 in. The system will operate with differential pressures across the cartridges in excess of 12 in. with certain powders containing a high percentage of fine particles.

Daily Maintenance	Procedure
Rotary Sieve	 **WARNING:** Always disconnect power before working on the sieve. Failure to observe this warning could result in personal injury. Shut off the exhaust fan. Unplug the sieve electrical powder cord. Empty the scrap pail. Open the sieve housing and clean the rotor and screen with a soft brush. Replace the screen if it is damaged. Check the bearing air pressure and flow rate. Check the vent-assist air pressure. Refer to your sieve manual for more information.
Powder Guns	Disassemble and clean the guns according to the instructions in their manuals.
Powder Pumps	Disassemble and clean the pumps according to the instructions in their manuals. Replace worn parts.
Flame Detector System	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.
Compressed Air Supply	Check for contaminants by holding a clean white cloth under the drop leg while opening the drop-leg drain valve. Water, oil, or other contaminants will stain the cloth. Eliminate any source of contamination. Drain the filters and separators and check the filter elements. Check all air pressure regulator settings. **NOTE:** The air dryer should remain on at all times to prevent moisture from accumulating in the compressed air system.
Air Dryers	Refer to your air dryer manual for maintenance procedures and schedules.
Gun Movers (Oscillators and Reciprocators)	Each shift, make sure the gun movers are stroking smoothly and at the proper speed. Make repairs and adjustments if necessary. Lubricate the gun movers as described in their manuals.
Accumulator and Vent Hose	Vacuum out the accumulators and blow the powder out of the vent hoses with compressed air.

2. Daily Maintenance (contd)

Daily Maintenance	Procedure
Workpiece and Conveyor Grounds	 **WARNING:** An ungrounded or poorly grounded workpiece, hanger, or conveyor can cause electrical arcing. If arcing is observed, shut down the system immediately. Correct the cause before resuming operations. Failure to observe this warning could result in a fire or explosion, causing property damage and possible personal injury or death. Make sure all workpieces are grounded through the hangers and conveyor. The resistance between the workpieces and the hangers, and the hangers and ground, must be less than 1 megohm. Use a megohm meter (Nordson part 172 872) to check resistances. Better transfer efficiency and workpiece coverage is obtained at 500 ohms or less. Clean the hangers regularly.

3. Weekly Maintenance

Perform these procedures weekly to keep your system running efficiently and safely.

Weekly Maintenance	Procedure
Enclosure	Turn on the exhaust fans 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.
Filter House Hopper	 **CAUTION:** Running the fan at less than half speed for extended periods may shorten the motor life. Open the filter housing access door and check the level of scrap powder in the hopper. If the level is close to the bottom of the cartridge filters, slow the exhaust fan to half speed (set VFD to 30 Hz,) and remove the powder. Do not let the powder level rise above the bottom of the filters.

Weekly Maintenance	Procedure
Fan Compartment	Remove the final filters and inspect the fan compartment. Vacuum out any powder. If significant amounts of powder have accumulated in the fan compartment, the cartridge filters may be leaking. Refer to the *Troubleshooting* and *Repair* sections for instructions.
Cartridge Filters	If you find significant amounts of powder in the fan compartment, inspect the cartridge filter media and gaskets. Check the interior of the cartridges for powder. Powder inside the cartridges indicates leaking. Contamination of the media indicates problems with the air filters or dryer. Replace the filters if they are leaking or contaminated. Do not vacuum the cartridge filters.
Transfer Pumps	Disassemble the pumps and clean them according to the instructions in their manuals. Replace any worn or damaged parts. Blow out the transfer hoses with compressed air. Replace damaged or clogged hoses.
Powder Spray Guns and Cables	Clean the guns. Perform electrostatic resistance checks as described in the gun and gun control unit manuals. Check the cables for wear or damage, replace if necessary.
Powder Pumps and Feed Hoses	Disassemble the pumps and clean them according to the instructions in their manuals. Replace any worn or damaged parts. Blow out the feed hoses with compressed air. Replace damaged or clogged hoses.
Feed Hoppers	Remove the powder from the hopper. Vacuum the interior. Check the fluidizing plate. If the plate is stained, the air supply could be contaminated by oil or moisture. Check the air dryer and air filters. Replace the fluidizing plate if it is contaminated.
Optional Air Knife Blower	Inspect and clean the air intake screen.
Booth Enclosure	Check the panels for cracks, damage and dirt. Clean dirt and powder from the exterior. Seal any cracks or replace the panels. Make sure the roof supports are secure.

4. Periodic Maintenance

Perform these procedures monthly or as indicated to keep your system running efficiently and safely.

Periodic Maintenance	Procedure
Electrical Connections	Check all terminal blocks and junction boxes for loose wires. Tighten any loose connections and inspect the system wiring. Replace any wires with damaged insulation.
Spray Guns	Perform electrostatic resistance checks as described in the gun manuals.
Air Dryers	Check operation. Refer to your air dryer manuals for maintenance procedures and schedules.
Gaskets	Inspect all gaskets and seals for damage. Replace them if they are damaged.
Exhaust Fan V-Belts	Check the V-belts monthly. Replace cracked or worn belts. Check the belt tension. You should not be able to deflect the belts more than 13–19 mm (0.50–0.75 in.) (one belt diameter).
Exhaust Fan Bearings	Every 80 to 112 hours of operation, lubricate each fan shaft bearing with 4.2 grams (0.15 oz) of No. 2 lithium grease. Grease fittings are on the front of the fan section, between the final filters. Every six months, lubricate the motor bearings with 4.2 grams (0.15 oz) of No. 2 lithium grease.
Rotary Sieve	AZO sieves: Every three months, lubricate the lip seals with white lithium grease as described in your AZO sieve manuals. Nordson sieves: Refer to your sieve manual for instructions.

Periodic Maintenance	Procedure
Filters	Observe and record the differential pressure gauge readings. Cyclone separators direct a stream of fine particles to the cartridge filters. Moderate powder loading will result in higher static pressures than standard separation systems. In some cases, systems are provided with static pressure gauges that measure up to 20-in. w.c. Monitor the differential pressure to determine when it is appropriate to replace the cartridges. If you record a dramatic increase in differential pressure that cannot be reduced by pulsing the cartridges, replace them. If the pressure drop across the final filters exceeds 3 in., the system will shut down. If this happens, powder is probably leaking into the fan compartment and clogging the final filters. Find and fix the leak before replacing the filters and resuming operation.
Powder Feed and Transfer Hoses	Disconnect the hoses from the 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.
Wheels and Casters	Lubricate the casters and flanged wheel bearings (roll/on-roll/off booths) with two shots of white lithium grease from a grease gun every six months.

5. Maintenance Check List

Copy this list and post it near your system for reference.

Activity	Each Shift	Daily	Weekly	Monthly	Color Change
Cleaning					
Accumulator		√			
Booth enclosure		√	√		√
Fan compartment			√		√
Feed and transfer hoses	√				√
Feed hoppers			√		√
Fire detector head lenses*	√				√
Gun pumps	√	√	√		√
Guns	√		√		√
Rotary sieve	√	√			√
Transfer pumps	√	√			√
Vent hoses		√			√
Spray Gun Resistance Checks			√		
Visual Checks					
Air dryer drain		√			
Air dryers				√	
Air supply drop leg		√			
Cartridge filter differential-pressure gauge	√				
Electrical connections			√		
Exhaust fan bearings			√	√	
Exhaust fan V-belts				√	
Filter housing powder level			√		
Final filter differential-pressure gauge	√				
Fire detector sensors	√				√
Gaskets			√		√
Gun movers	√				
Powder levels	√				
Workpiece clearance**	√				
Workpiece grounding	√				√

* Every 4 hours.
** Clearances should be monitored continuously.

Lubrication	Every 80–112 hours	Every 3 months	Every 6 months
Fan shaft bearings (0.15-oz No. 2 lithium grease)	√		
AZO rotary-sieve lip seals (white lithium grease)		√	
Motor bearings (0.15-oz No. 2 lithium grease)			√

Section 5

Troubleshooting

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.

1. Introduction

This section contains troubleshooting procedures. 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.

	Problem	Page
1.	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	5-3
3.	Powder not transferring from separators to feed hopper	5-4
4.	Powder in feed hopper not fluidizing, or clouds of powder erupting from surface	5-4
5.	Final filters blinded (clogged), powder in fan compartment	5-5
6.	Cartridge filters blinded (clogged)	5-5
7.	System shuts down or will not start	5-6
8.	Sieve not screening powder	5-7
9.	Sieve scrap bucket filling up with powder	5-7
10.	Powder escaping from enclosure openings	5-7

2. Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
1. Guns are surging or spitting; powder flow is inadequate or intermittent	Powder in feed hopper inadequately fluidized	Adjust the fluidizing air pressure. The powder should be gently boiling. If this does not fix the problem, 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 the 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 gun	Clean the gun. If you are using conical nozzles, make sure there is a 3-mm (0.12-in.) or larger gap between the deflector and the nozzle.
	Flow-rate or atomizing air pressure incorrect	Refer to the gun and control unit manuals for recommended air pressures and ratios.

Problem	Possible Cause	Corrective Action
2. Problems with coating uniformity, edge coverage, film build, wrap, or penetration into recesses	Poor workpiece grounding	Resistance from the workpiece to the ground must be less than 1 megohm as measured with an instrument that applies 500 V to the circuit. Clean the workpiece hangers, fixtures, and hooks if necessary. Check the conveyor ground.
	Gun placement incorrect	Position the guns 254–355 mm (10–14 in.) from the workpieces. Stagger the guns 304 mm (12 in.) apart vertically and 381 mm (15 in.) apart horizontally to avoid a fan pattern and electrostatic field overlap. Contact your Nordson Corporation representative for advice.
	Powder being pulled away from workpieces by high air flow or incorrect placement of guns.	Slow the fan to decrease airflow through booth. Do not decrease the airflow to less than 30 m/min (100 ft/min) If the guns are too close to separator inlets, move the guns or consult your Nordson Corporation representative.
	Powder pump flow-rate and atomizing air pressure incorrect	Refer to the 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 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.

2. Troubleshooting Procedures (contd)

Problem	Possible Cause	Corrective Action
3. Powder not transferring from separators to feed hopper	Transfer pump air pressure too low	Increase the air pressure to 1.4 bar (20 psi).
	Transfer pump venturi nozzle clogged or throat worn	Clean the pump and replace worn parts.
	Transfer hose plugged	Blow the powder out of the hose with compressed air.
	Transfer pump inlet clogged	Remove the transfer pump and clean the inlet.
	Sieve screens clogged, or motor running in wrong direction	Clean the sieve screens. Refer to the *Reversing Motor Direction* procedure in this section.
	Accumulator plugged	Clean out the inlet ports. Clean the accumulator interior.
	Accumulator vent-assist air pressure too high	Reduce the vent-assist air pressure.
	Solenoid valve failed.	Check the transfer pump air solenoid valve.
4. Powder in feed hopper not fluidizing, or clouds of powder erupting from surface	Fluidizing pressure too low or too high	Check the powder in the hoppers. Increase the fluidizing air pressure until the powder is gently boiling. Decrease the pressure if clouds of powder are erupting from the surface.
	Moist or oil-contaminated powder	Open the drain valve at the air-supply drop leg and check the air supply for water or oil. Check the filters, separators, and air dryer. Replace the powder in the hoppers. Refer to the next cause.

Problem	Possible Cause	Corrective Action
4. Powder in feed hopper not fluidizing, or clouds of powder erupting from surface *(contd.)*	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.
	Fluidizing plate is cracked	Check the fluidizing plate and replace it if it is cracked.
	Incorrect ratio of reclaimed-to-new powder	Change the bulk feeder transfer-pump air pressure to increase or decrease the transfer rate. Add new powder to the hopper. The powder supply should be no more than 3 parts reclaim-to-1 part new powder.
	Uneven distribution of powder in hopper	Increase the fluidizing pressure. Check the powder and the fluidizing plate for contamination as previously described.
5. Final filters blinded (clogged), powder in fan compartment	Cartridge gaskets not compressed enough to form a good seal, or gaskets are leaking, or filter media is damaged	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 crank handles to compress the gaskets further. Refer to the *Repair* section for instructions. If the gaskets continue to leak, remove the cartridges. Clean and inspect the gaskets, sealing surfaces, and filter media. Replace the cartridges if the gaskets or filter media are damaged. Refer to the *Repair* section. Replace clogged final filters.
6. Cartridge filters blinded (clogged)	Pulse air pressure inadequate	Increase the pulse air pressure or volume. Decrease the pulse timer delay (off time).
	Powder contaminated	Replace contaminated powder and fix the source of contamination.

2. Troubleshooting Procedures (contd)

Problem	Possible Cause	Corrective Action
6. Cartridge filters blinded (clogged) *(contd.)*	Pulse valves out of position	Position the valves as described in the *Repair* section.
	Timer board settings incorrect	Adjust the timer board settings as described in the *Operation* section.
	High concentration of fine particles have clogged cartridge filter media	Replace cartridge filters.
	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.
	Powder in filter housing hopper above bottom of cartridge filters	The powder level must not be higher than bottom of cartridges. Remove the powder from hopper.
7. System shuts down or will not start	Flame detector system sees a flame or spark, or is malfunctioning	Check the inside of the enclosure and the color module; the detector head aim; and the workpiece and conveyor grounds. Follow the troubleshooting procedures in the flame detector system manual.
	Final filters blinded (clogged)	Locate the source of powder leakage and correct the problem. Refer to problem 5.
	Final filter pressure switch failed	Adjust the setting, or 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.

Problem	Possible Cause	Corrective Action
7. System shuts down or will not start *(contd.)*	Fuse(s) blown	Check the fuses in the system electrical panel. Correct the electrical problem and replace the fuses.
	Electrical failure	Trace the circuits and correct the problem.
8. Sieve not screening powder	Screen clogged or damaged	Clean or replace the screen.
	Positive air pressure in feed hopper and sieve preventing powder from flowing into sieve	Adjust the vent-assist air pressure. Refer to *Vent-Assist Air Pressure Adjustment* in the *Operation* section.
9. Sieve scrap bucket filling up with powder	Scrap bucket lid not sealed	Lid must be airtight. Tighten lid. Check scrap hose connections.
	Screen clogged	Clean or replace screen.
	Hopper or accumulator vents clogged or hose kinked	Clean vents, checks hoses.
	Vent-assist air pressure too low.	Increase vent-assist air pressure. Refer to *Vent-Assist Air Pressure Adjustment* in the *Operation* section.
10. Powder escaping from enclosure openings	Cartridge filters clogged	If the differential pressure gauge shows more than 6-in., refer to problem 6.
	Cross drafts in enclosure interfering with exhaust fan draw	Check for cross drafts at all enclosure openings. Eliminate or divert the drafts.
	Fan speed too slow	Increase the fan speed.
	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).

2. Troubleshooting Procedures (contd)

Problem	Possible Cause	Corrective Action
10. Powder escaping from enclosure openings *(contd.)*	Powder gun output exceeds booth containment capability	Reduce the powder flow and/or the number of the guns.
	Booth openings too large	Close or decrease the size of the openings.
	Workpieces too large for booth	Contact your Nordson Corporation representative.
	Guns too close to entrance and exit vestibules or openings	Move the guns farther away from the vestibules or openings.
	Fan rotation backward	Reverse the rotation of the motor. Refer to *Reversing Motor Direction* in this section.

3. Reversing Motor Direction

Improperly connecting the exhaust fan and sieve motor starters will cause them to rotate in the wrong direction. Use the following procedures to check and correct, if necessary, fan and sieve rotation.

Exhaust Fan Motor

1. When the exhaust fans are running, air should be flowing out of the final filters. If air is being pulled into the filters, the motor is running in the wrong direction.

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

2. 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 (M133). Close the electrical panel door.

3. 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 disconnect switch in the off position, the terminals at the top of the switch are still live. Do not touch them. Turn off power at a breaker or disconnect switch ahead of the electrical panel. 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 (M141). Close the electrical panel door.

3. Restore system electrical power. Start the sieve and check the rotation direction.

Section 6

Repair

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.

1. Final Filter Replacement

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 knobs (3) and brackets (2) securing the final filters (1) to the fan compartment.
3. Remove the old filters and discard them.
4. Check the interior of the fan compartment. If you see large amounts of powder inside the compartment, then powder is leaking through the cartridge filter gaskets or media. Clean the fan compartment and fix the leak before starting the system.
5. Remove the new filters from their cartons. Inspect the filter housings, gaskets, and media for damage.

   NOTE: Do not use damaged filters.

6. Insert the new filters into the openings.
7. Install the brackets over the threaded studs. Thread the knobs onto the studs.
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.

1. Final Filter Replacement
(contd)

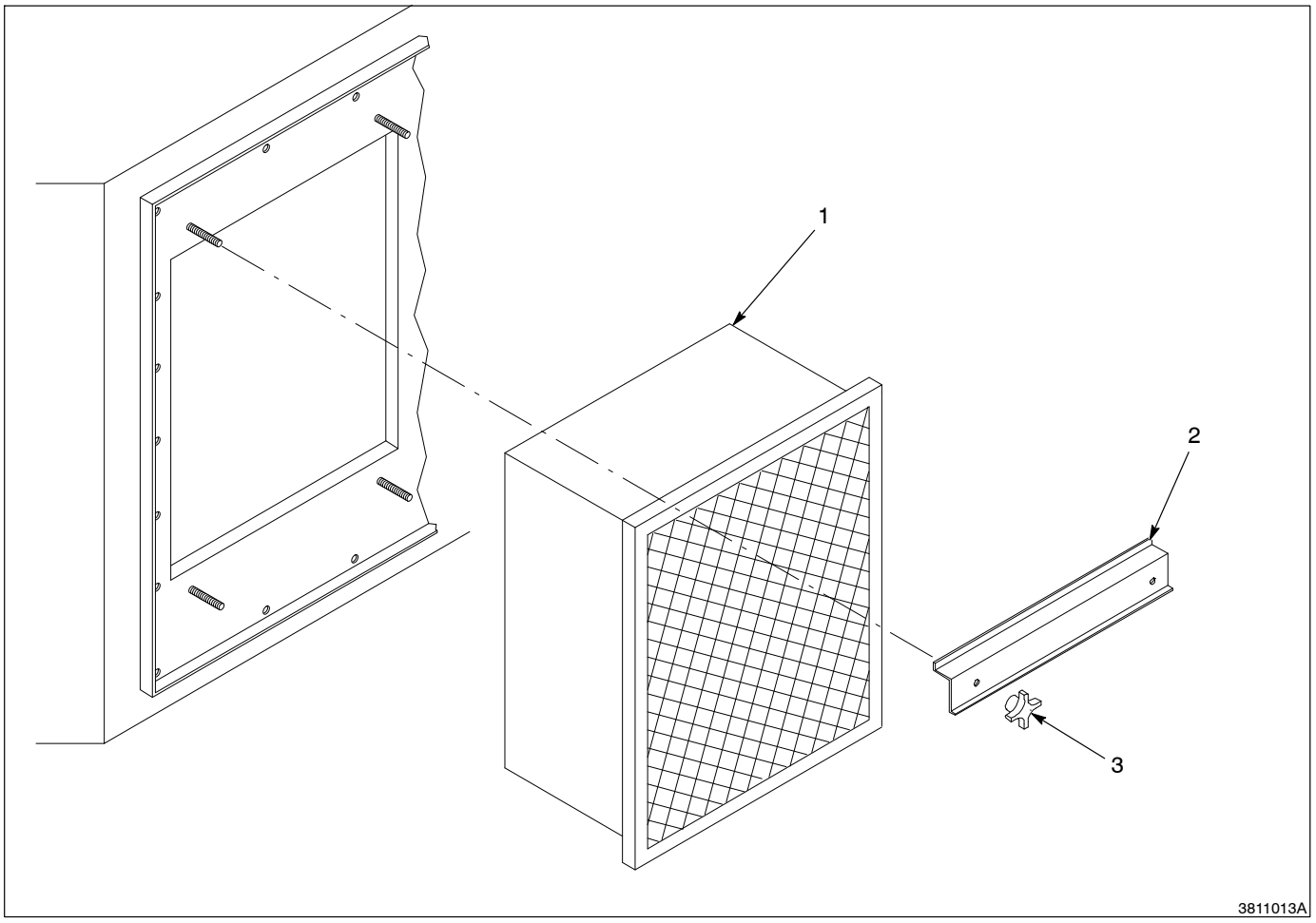

Fig. 6-1 Final Filter Replacement

1. Final filter
2. Brackets
3. Knobs

2. Cartridge Filter Replacement

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

1. See Figure 6-2. Pulse the cartridge filters to remove as much powder as possible from the filters.
2. Shut off system power. Lock out and tag the disconnect switch.
3. Open the filter-house access door.
4. Empty the powder out of the hopper (6).
5. Turn the crank handle (1) on top of the cartridge filters (3, 4) until the push plate (2) is backed off enough to remove the filters.
6. Remove the cartridge filters. Note that the closed end filter is on top.
7. Clean the interior of the filter housing, including the push plates and the sealing surface on the cartridge mountings (5).

   NOTE: 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 agency approvals. Do not use damaged filters.

8. Remove the new closed-end and open-end cartridge filters from the shipping boxes. Do not use filters that have
   - cuts or other damage to the gaskets
   - bent or dented end caps
   - holes or other damage to the filter media
9. Place the open-end cartridge filters over the round outlet holes on the cartridge mounting.
10. Place the closed-end cartridge filters on top of the open-end filters, with the closed end up.

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

11. Tighten the crank handles to compress the cartridge gaskets to approximately 11-mm (0.43-in.) thick.
12. Close the filter-house access door. Season the new cartridge filters as described in the *Operation* section.

2. Cartridge Filter Replacement (contd)

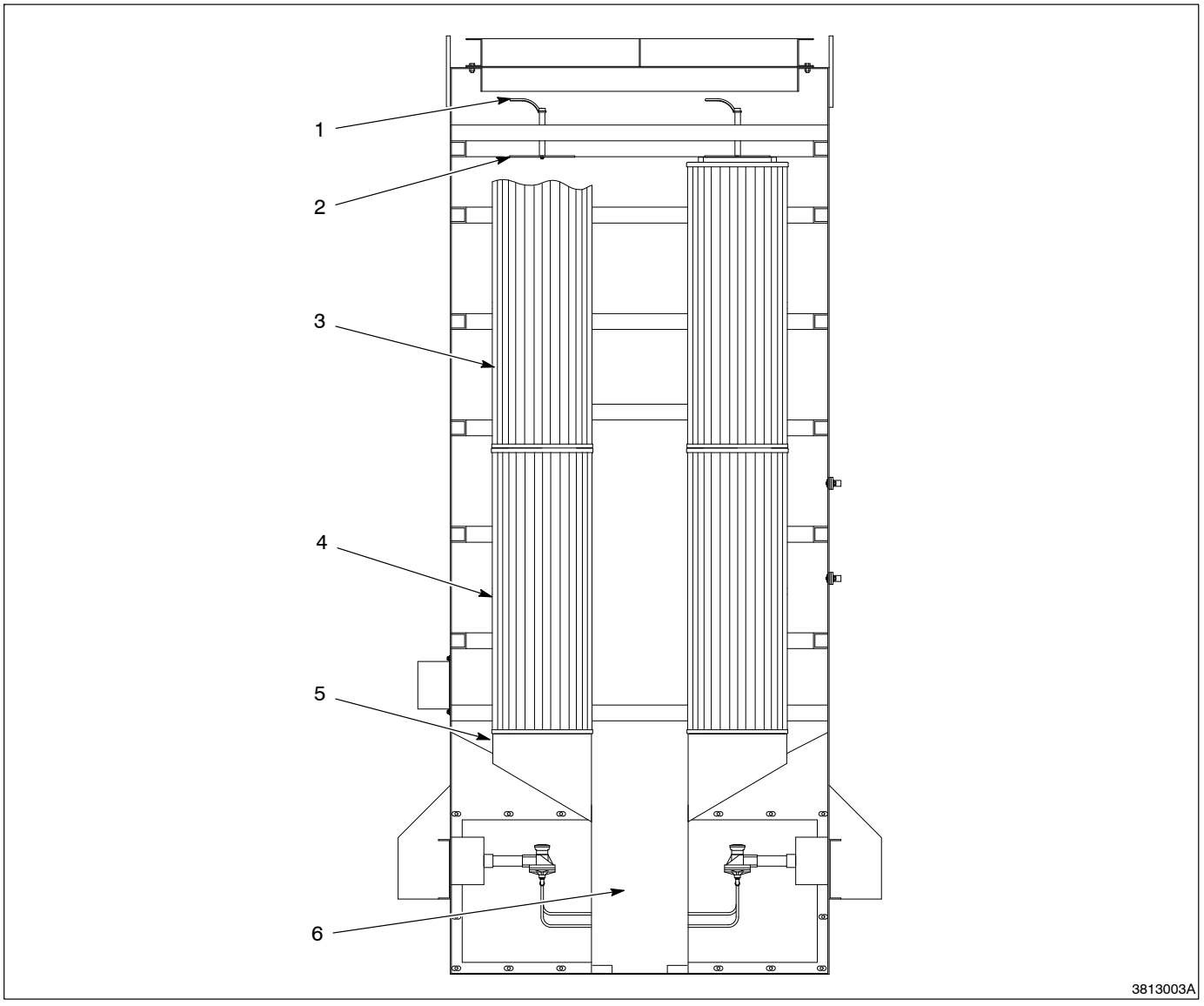

Fig. 6-2 Cartridge Filter Replacement

1. Crank handle
2. Push plate
3. Closed-end filter
4. Open-end filter
5. Cartridge mounting
6. Hopper

3. Feed Hopper Level Sensor Replacement and Calibration

The level sensor is a capacitive proximity switch. New switches must be calibrated.

1. See Figure 6-3. Replacement sensors are shipped configured as normally closed (N.C.) switches.

2. Insert the level sensor into the plastic mounting well (1) in the side of the feed hopper until it bottoms out, then pull it back about 3 mm (0.12 in.). Tighten the plastic screws on the side of the well to hold the sensor securely.

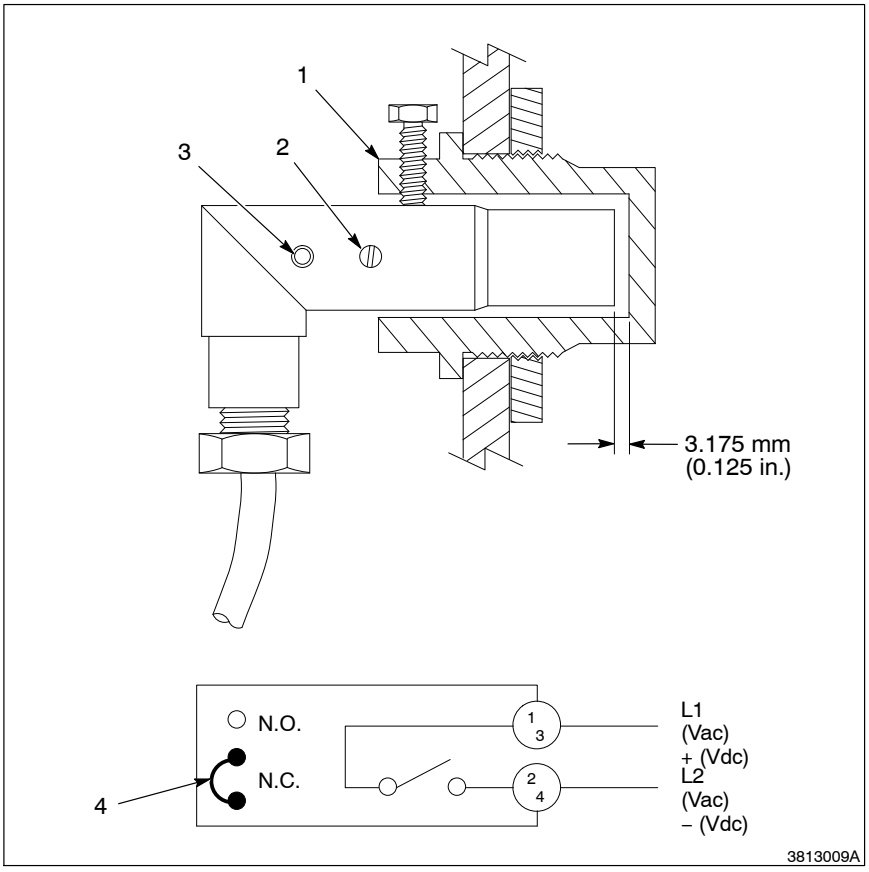

Fig. 6-3 Feed Hopper Level Sensor Calibration

1. Mounting well
2. Potentiometer
3. LED
4. Hopper wall
5. Bridge jumper

3. Feed Hopper Level Sensor Replacement and Calibration (contd)

3. Make sure system power is on and the exhaust fan is running.
4. Open the feed hopper lid and fill the hopper $^2/_3$ full of powder.
5. Increase the hopper fluidizing air pressure to 0.7–1 bar (10–15 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.
6. Shut off the fluidizing air. The mounting well should be coated with a film of powder.
7. 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.
8. Increase the fluidizing pressure until the powder level rises above the mounting well. The LED should be off.
9. Turn the potentiometer counterclockwise, counting the number of turns you make, until the LED lights.
10. Turn the potentiometer clockwise for $^1/_2$ 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.

4. Pulse Valve Replacement

The pulse valves connect directly to the air manifold. 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.

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

1. Remove the access plate at the bottom front of the filter housing.
2. See Figure 6-4. Disconnect the air tubing (5) from the tube fitting (4).
3. Unscrew the pulse valve (3) from the manifold nipple (2).
4. Remove the tube fitting and nozzle (1) 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 manifold nipple. Screw the new valve onto the nipple. Position the valve so the final adjustment will tighten the threads and form an airtight seal.

6. Adjust the valve so the centerline through the nozzle and valve is perpendicular (90°) to the manifold centerline.

7. Connect the air tubing to the tube fitting.

8. Reinstall the access plate. Make sure the gasket is not damaged.

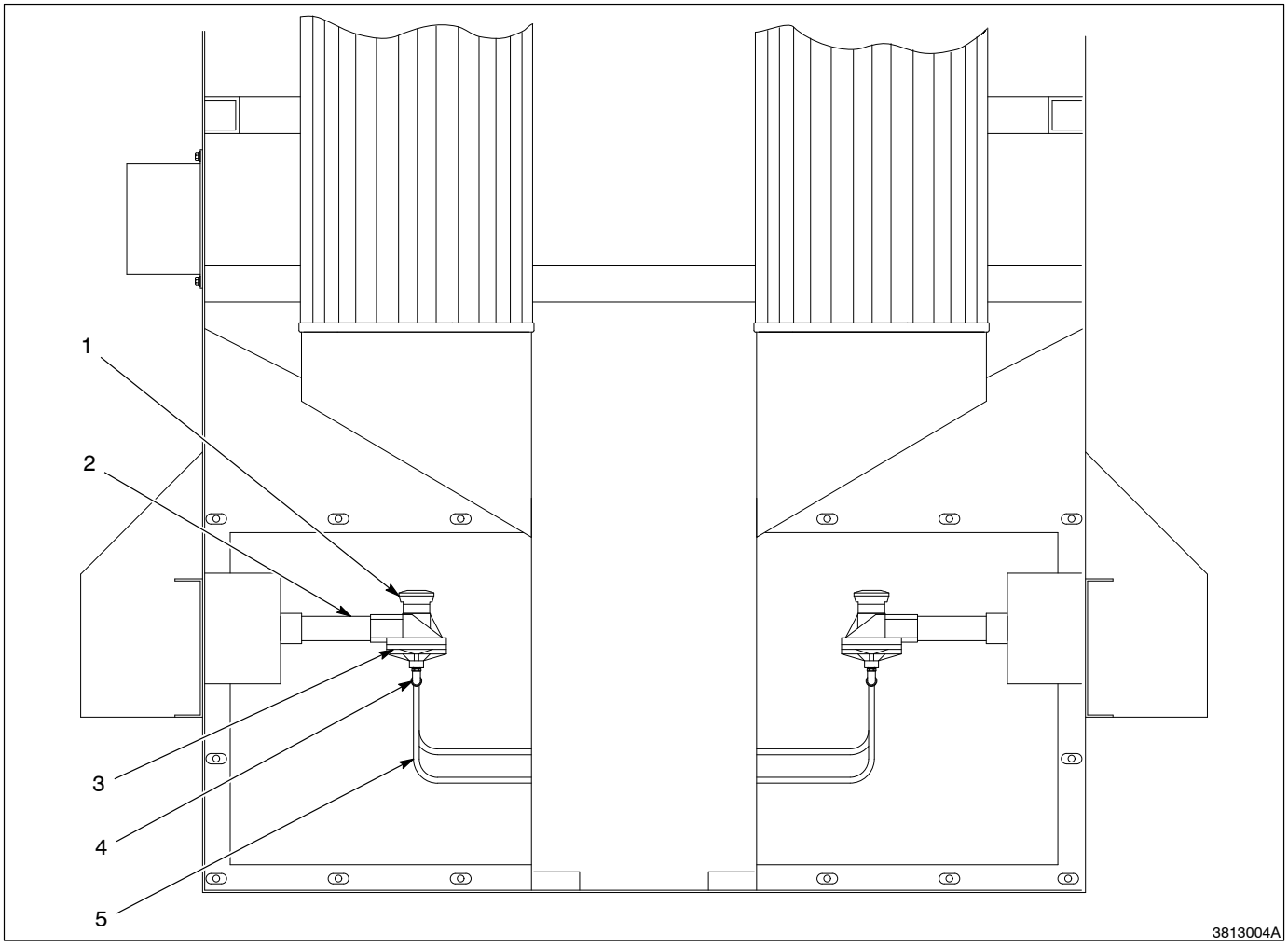

Fig. 6-4 Pulse Valve Replacement

1. Cartridge pulse nozzle
2. Manifold nipple
3. Cartridge pulse valve
4. Tube fitting
5. Air tubing

5. Fan Drive Repair

These procedures cover the replacement of the following components:

- V-belt
- Sheaves and bushings
- Motor
- Fan
- Fan shaft and bearings

V-Belt Replacement

WARNING: Before performing the following procedures, shut off electrical power at the system electrical panel. Lock and tag the disconnect switch. Failure to perform these procedures could result in personal injury.

1. See Figure 6-5. Remove the two access panels (1, 8) from the side of the booth base.
2. Loosen the four screws (6) securing the motor mounting plate (4) to the booth base.
3. Turn the tension screws (7) to move the motor toward the fan and loosen the V-belts (3).
4. Rotate the motor and roll the V-belts off the fan and motor sheaves (2, 5).
5. Roll the new belts onto the sheaves and seat the V-sections in the grooves. Use only properly sized, matched belts.
6. Turn the tension screw to move the motor away from the fan and tension the belts.
7. 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 to19 mm (0.50 to 0.75 in.), or one belt diameter.
8. Tighten the four screws to secure the motor base.
9. Reinstall the access panels. Make sure the gaskets are not damaged.

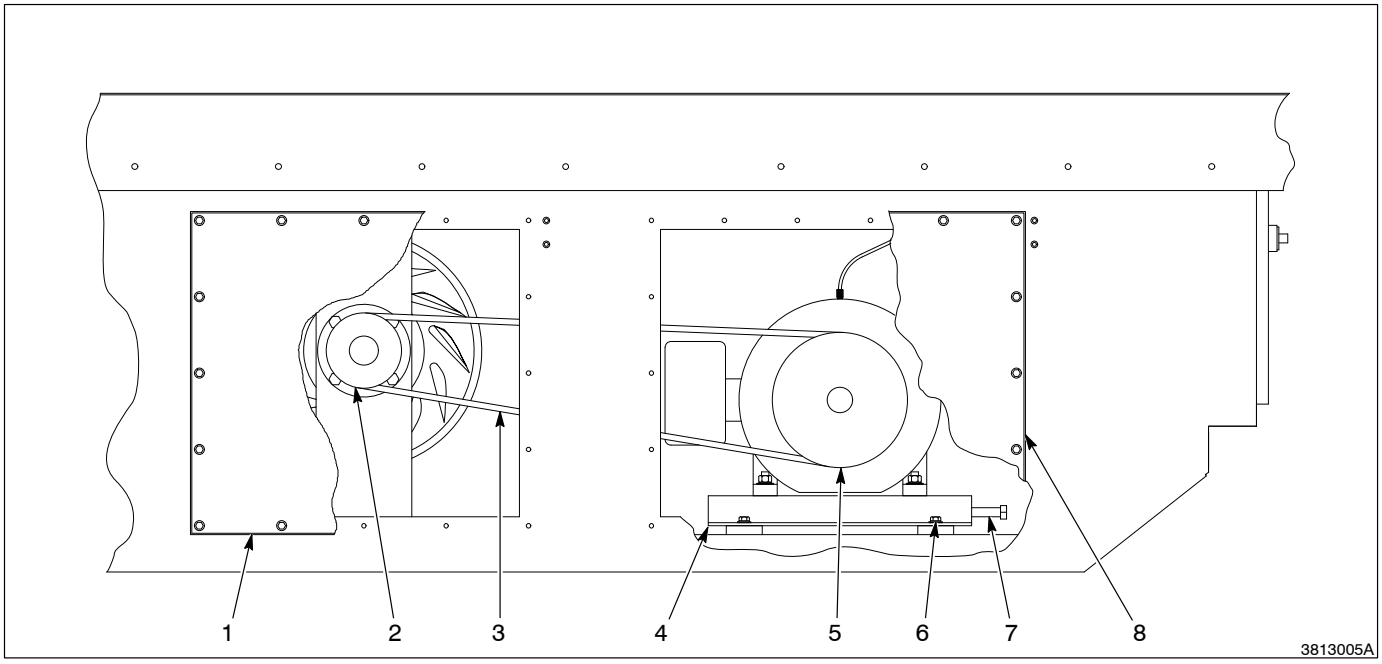

Fig. 6-5 V-Belt Replacement

1. Access panel
2. Fan sheave
3. V-belts
4. Motor mounting plate
5. Motor sheave
6. Screws
7. Tension screws
8. Access panel

Sheave Replacement

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

1. Remove the V-belts as described in *V-Belt Replacement*.

2. See Figure 6-6. Unscrew the three cap screws (6) from the sheave (1) and remove them from the unthreaded holes (7) in the bushing (2). Thread the screws through the threaded holes (3) in the bushing until they bottom out on the sheave hub.

3. Tighten the screws evenly, a quarter turn at a time, until the bushing breaks loose from the 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 flatten, preventing you from removing them from the bushing.

Sheave Replacement *(contd)*

4. Pull the sheave and bushing off the shaft (5). 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.

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

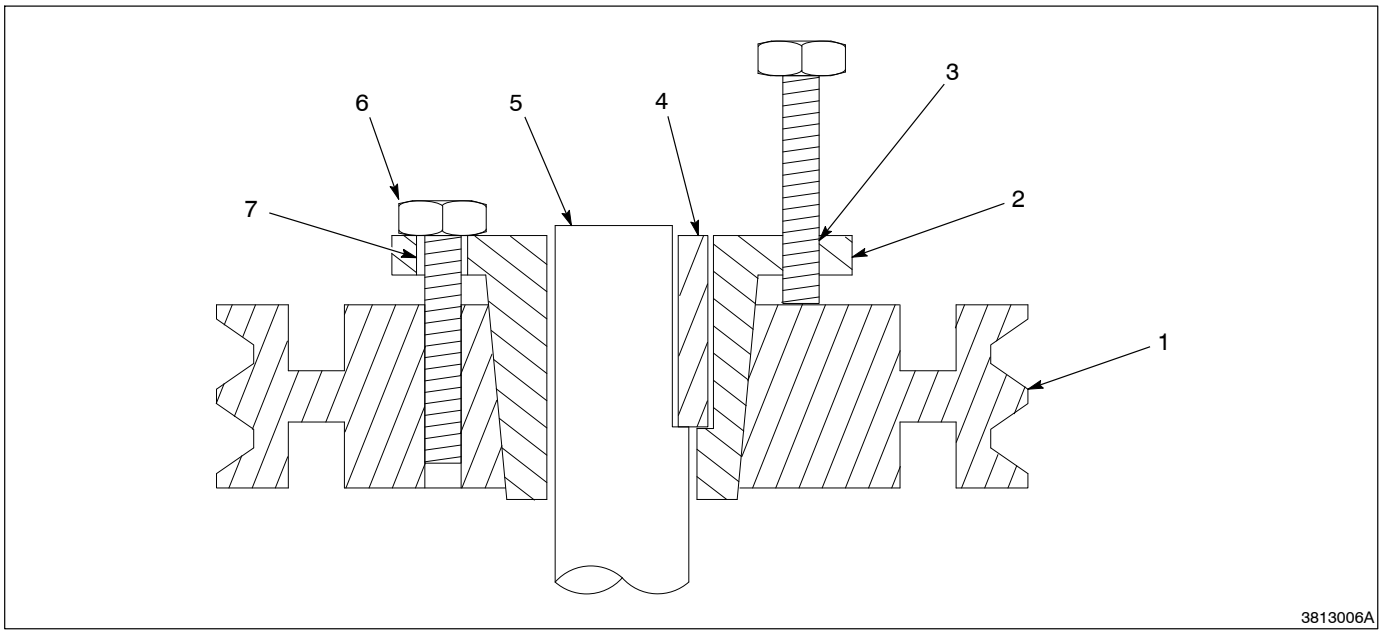

Fig. 6-6 Sheave Replacement

1. Sheave
2. Bushing
3. Threaded holes
4. Key
5. Shaft
6. Cap screws
7. Unthreaded holes

5. Install the sheave and bushing on the 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.

6. Install the key into the keyways.

7. Install the three cap screws through the unthreaded holes in the bushing and thread them into the sheave.

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

9. 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 (0.12–0.25 in.) between the bushing flange and the sheave.

Table 6-1 Motor-Bushing Cap-Screw Torque and Pull Specifications

Screw Size (in.)	**Torque N•m (ft-lbs)**	**Open-End or Socket Wrench**	
		Pull Length in mm (in.)	**Pull in kg (lbs)**
1/4	12 (9)	102 (4)	12 (27)
5/16	20 (15)	152 (6)	14 (30)
3/8	40 (30)	152 (6)	27 (60)

CAUTION: 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.

10. Check again to make sure the motor and fan sheaves are parallel with each other. If they are not, separate the bushing and sheave and repeat the installation steps.

11. Install the V-belts as described in *V-Belt Replacement*.

Motor Replacement

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

1. See Figure 6-7. Remove the access panels from the fan compartment.
2. Remove the cover from the junction box (3). Tag and disconnect the wiring from the motor leads. Disconnect the electrical conduit (2) from the motor junction box.
3. Disconnect the lubrication tubing (1) from the motor fittings.
4. Remove the V-belts, as described in *V-Belt Replacement*, from the motor sheave.
5. Remove the nuts and washers (5) securing the motor (4) to the base.
6. Remove the motor from the fan compartment and move it to a clean work area.
7. Remove the motor sheave and bushing from the motor as described in *Sheave Replacement*.
8. Remove the lubrication tubing fittings (1) from the old motor and install them on the new motor.
9. Install the new motor on the base with the nuts and washers. Do not tighten the nuts until you install and tension the V-belts.
10. Install the motor sheave and bushing on the motor shaft as described in *Sheave Replacement*.
11. Install the V-belts on the sheave and adjust the belt tension as described in *V-Belt Replacement*.
12. Connect the lubrication tubing to the fittings.
13. Connect the conduit to the motor junction box and the wiring to the motor leads. Reinstall the cover.
14. Turn on the system electrical power and start the exhaust fan. Check the direction of airflow through the final filters. If air is being pulled into the final filters, the motor is rotating in the wrong direction. Refer to *Reversing Motor Direction* in the *Troubleshooting* section.

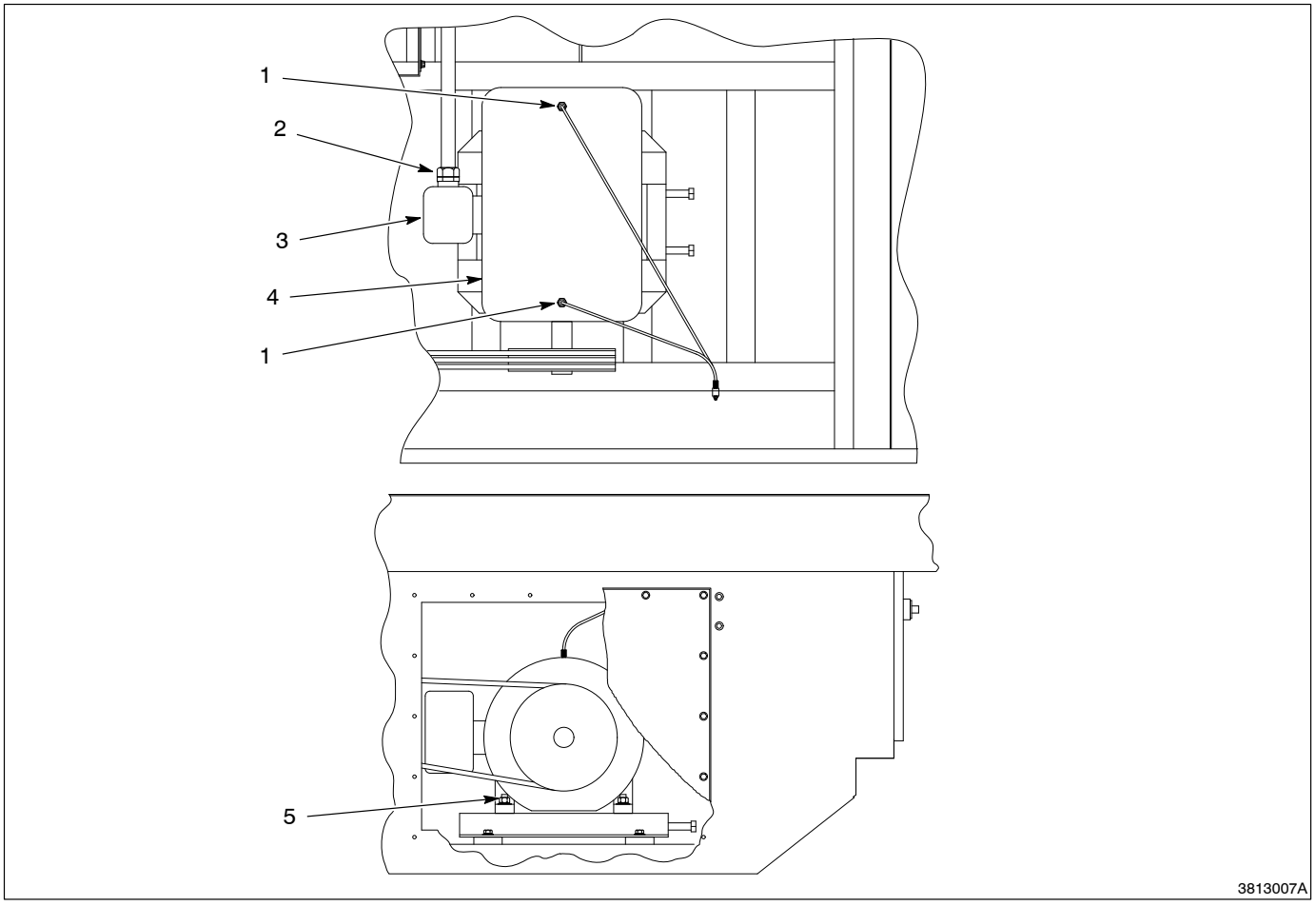

Fig. 6-7 Motor Replacement

1. Lubrication tubing and fitting
2. Electrical conduit
3. Junction box
4. Motor
5. Nuts and washers

6. Fan, 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.

Removal

1. See Figure 6-8. Remove the V-belts as described in *V-Belt Replacement* .
2. Remove the front access panel (1). Remove the fan shaft sheave (2) as described in *Sheave Replacement*
3. Unclamp the recovery module from the booth base. Move it away from the base to gain access to the rear inlet cone (12), mounted in the base wall (13).
4. Remove the outer ring of bolts, washers, and nuts that secure the cone adapter (14) to the base wall. To remove the nuts, you may have to remove the access panels (8) inside the base. Those access panels are on the box enclosing the rear fan (11) and rear inlet cone.
5. Remove the rear inlet cone and its adapter as an assembly from the base.
6. Loosen the key and shaft setscrews in the front and rear fan hubs (5).
7. Loosen the bearing (4, 9) setscrews.
8. Support the rear fan (11). From the sheave end of the shaft, pull the fan shaft (10) out of the bearings until you can work the rear fan off the shaft. Save the key for reuse.
9. Support the front fan (6). Continue to pull the shaft out of the bearings until you can work the front fan off the shaft. Save the key for reuse.
10. Pull the fan shaft completely out of the front bearing (4).
11. If replacing the bearings, disconnect the lubrication tubing (3) from the fittings in the bearing housings. Remove the screws, washers, and nuts securing the bearings to the supports. Remove the tube fittings from the bearing housings. Save the tube fittings and fasteners for reuse.

Replacement

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

1. See Figure 6-8. If you are replacing the bearings (4, 9), install the tube fittings (3) from the old bearings on the new bearings.

2. Install the new bearings on the supports. Do not tighten the fasteners. Connect the lubrication tubing to the fittings.

3. Loosen the bearing-race setscrews and install the shaft through the front bearing (4). If necessary, gently drive the shaft through the bearings with a soft-faced mallet. If you use a hard-faced hammer, place a block of wood on the end of the shaft and strike the wood, not the shaft.

   NOTE: If you have trouble getting the shaft through the bearings, try one or more of the steps below:

   a. 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 used to lubricate the bearings.

   b. Chill the shaft in a freezer or with dry ice and install it through the bearings while it is cold.

4. Install the front fan (6) on the shaft.

5. Install the shaft through the rear bearing (9). While doing so, line up the keyways in the shaft and front fan hub and install the key in the keyways.

6. Install the rear fan (11) on the shaft, line up the keyways in the fan hub and shaft, and install the key in the keyways.

7. Tighten the fan hub setscrews just enough to secure the fans on the shaft.

Replacement *(contd)*

8. Level the shaft again and square it with the supports. Tighten the screws securing the bearing housings to the supports to the torque values in Table 6-2. Do not tighten the bearing race setscrews.

Table 6-2 Bearing Mounting Screw Torque Values

Screw Size (in.)	Torque N•m (ft-lbs)
3/8–16	27 (20)
1/2–13	64 (47)
5/8–11	130 (96)
3/4–10	210 (155)
7/8–9	279 (206)

9. Install the fan shaft sheave (2), bushing, and key on the shaft. Tighten the bushing cap screws enough to hold the sheave on the shaft. Refer to *Sheave Replacement*.

10. 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.

11. Square the shaft with the supports and tighten the bearing-race setscrews. Torque the setscrews to the torque values in Table 6-3.

Table 6-3 Recommended Torque Values For Bearing Setscrews

Setscrew Size (in.)	Hex Key Size (in.)	Torque N•m (in.-lbs)	
		Std. Ball Bearing	Stainless Steel
#10	3/32	3.4 (30)	2.8 (25)
1/4	1/8	7.9 (70)	6.8 (60)
5/16	5/32	15.8 (140)	13.2 (117)
3/8	3/16	24.4 (216)	23.3 (206)

12. Tighten the fan sheave bushing screws to the torque values in *Sheave Replacement*. Use the square to make sure the sheaves are parallel.

13. Install the rear inlet cone (12) and cone adapter (14) as an assembly.

14. Adjust the position of the fans on the shaft. The fans should sit inside the cones with a 3- to 6-mm (0.12- to 0.25-in.) overlap. Tighten the setscrews in the fan hubs to 3.5 N•m (30.9 in.-lbs).

15. Use your finger to make sure the gap between the cones and the fan is equal around the entire circumference of the cones. If necessary, adjust the fan or inlet cone position.

16. Rotate the fans and make sure they do not rub against the cones.

17. Install the V-belts as described in *V-Belt Replacement*. Install the front access panel (1).

18. Start the exhaust fans. If the fans rub against the cones, stop the fans. Readjust the cone position.

19. 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.

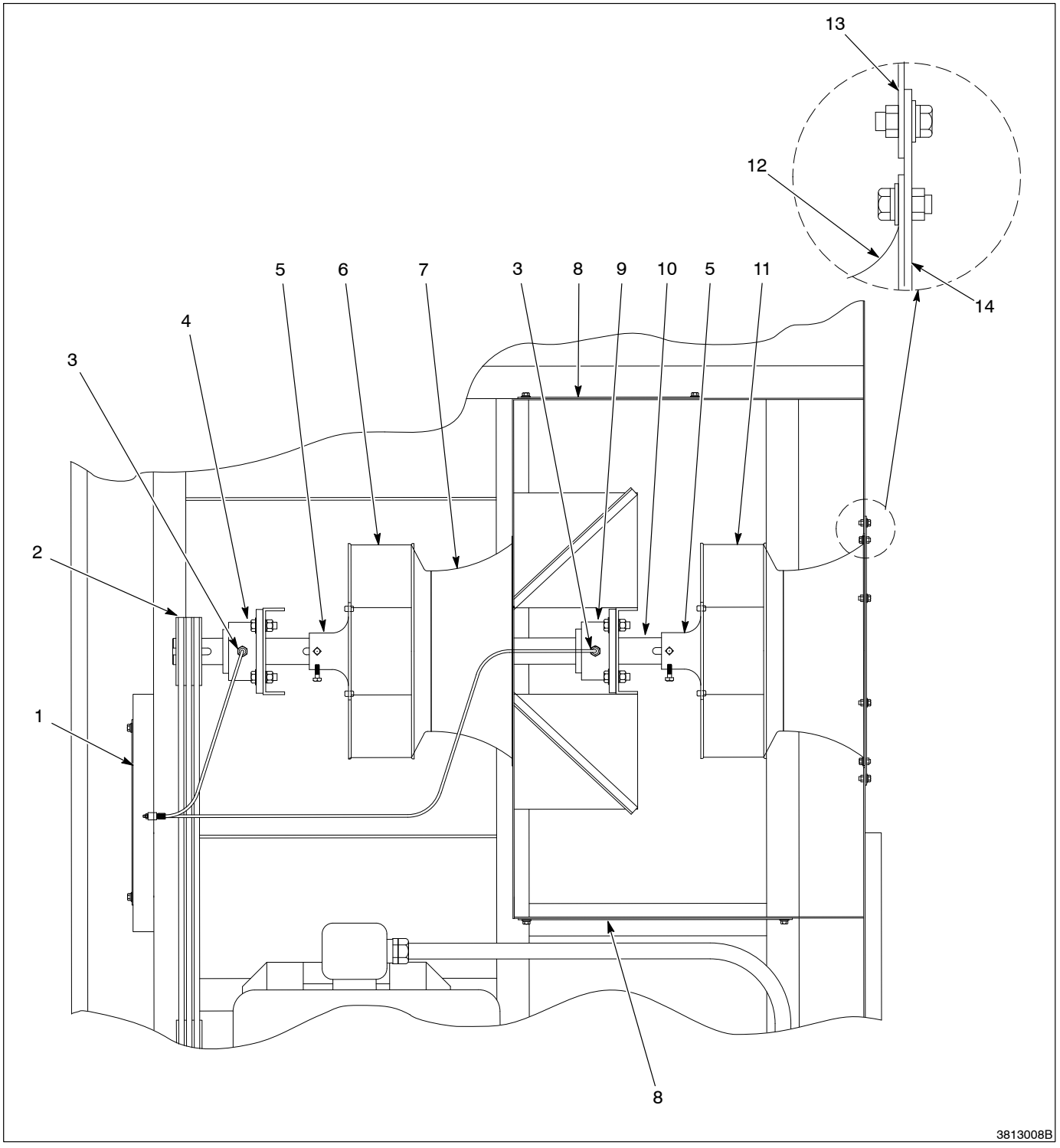

Fig. 6-8 Fan, Fan Shaft, and Bearing Replacement

1. Front access panel
2. Fan shaft sheave
3. Lubrication tubing and fittings
4. Front bearing
5. Fan hubs
6. Front fan
7. Front inlet cone
8. Rear fan box access panels
9. Rear bearing
10. Fan shaft
11. Rear fan
12. Rear inlet cone
13. Base wall
14. Cone adapter

Section 7

Parts

Section 7
Parts

1. Introduction

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

Using the Illustrated Parts List

Numbers in the Item column correspond to numbers that identify parts in illustrations following each parts list. The code NS (not shown) indicates that a listed part is not illustrated. A dash (—) is used when the part number applies to all parts in the illustration.

The six-digit number in the Part column is the Nordson Corporation part number. A series of dashes in this column (- - - - - -) means the part cannot be ordered separately.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentions show the relationships between assemblies, subassemblies, and parts.

Item	Part	Description	Quantity	Note
—	000 000	Assembly	1	
1	000 000	• Subassembly	2	A
2	000 000	• • Part	1	

- If you order the assembly, items 1 and 2 will be included.
- If you order item 1, item 2 will be included.
- If you order item 2, you will receive item 2 only.

The number in the Quantity column is the quantity required per unit, assembly, or subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

Letters in the Note column refer to notes at the end of each parts list. Notes contain important information about usage and ordering. Special attention should be given to notes.

2. Parts

NOTE: The parts listed here are common wear items. To order other parts for your booth, contact your Nordson representative.

Part	Description	Note
151 086	Filter, 36 in., PowderGrid, closed end	
151 085	Filter, 36 in., PowderGrid, open end	
165 726	Nozzle, cartridge pulse	
174 710	Valve, pulse, 1 in. NPT in x 1 in. NPT out	
176 301	Air volume control	
156 995	Filter, final, 20 x 24 in. internal	
176 367	Knob, final filter	

Section 8

Specifications

Section 8
Specifications

1. Dimensions and Capacities

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

Dimensions and Capacities	CK03SI	CK04SI	CK05SL
Base dimensions			
Overall height	1.07 m (3 ft 6 in.)	1.07 m (3 ft 6 in.)	0.77 m (2 ft 6.5 in.)
Overall Width	1.90 m (6 ft 3 in.)	1.90 m (6 ft 3 in.)	1.90 m (6 ft 3 in.)
Overall length	6.17 m (20 ft 3 in.)	6.17 m (20 ft 3 in.)	6.78 m (22 ft 3 in.)
Fan rating at 2.0-in. w.c. (cartridge filters)	153 m^3/min (5400 cfm)	204 m^3/min (7200 cfm)	255 m^3/min (9000 cfm)
Airflow at 10-in. w.c. (cartridge filters)	127 m^3/min (4470 cfm)	167 m^3/min (5900 cfm)	210 m^3/min (7400 cfm)
Number of cartridge filters	8	12	14
Number of final filters	4	4	6
Number of pulse valves	4	6	7
Maximum air pressure	6.9 bar (100 psig)	6.9 bar (100 psig)	6.9 bar (100 psig)
Manual/automatic spray gun capacity	4/14	4/22	6/28

2. 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

3. 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 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.

4. Normal Design Standards

Systems are custom-designed to each customer's requirements, so some may deviate from these design standards. Contact your Nordson Corporation 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 60 FPM (18.3 m/min).

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

Temperature of Parts Entering Booth: No more than 48.8 °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 3.3 °C (38 °F) or lower dewpoint at 6.9 bar (100 psi).

Section 9

Options

Section 9
Options

Customer _____

Date _____

System No. _____

This section lists manuals for optional equipment that may be included with your Nordson Corporation powder coating system. Special drawings are listed after the manuals.

1. Nordson Corporation Product Manuals

Write in manuals not on this list.

	Manual	Part	Description
	31-13	108 129	Versa-Spray Cable-Fed Automatic Electrostatic Powder Spray Gun
	31-16	108 131	Versa-Spray Cable-Fed Manual Powder Spray Gun
	31-17	108 132	Versa-Spray IPS Manual Electrostatic Powder Spray Gun
	31-21	108 250	Versa-Spray IPS Automatic Electrostatic Powder Spray Gun
	31-22	108 385	Versa-Spray IPS PRX Automatic Electrostatic Powder Spray Gun
	31-23	106 584	Versa-Spray IPS Automatic Electrostatic Porcelain Enamel Powder Spray Gun
	31-25	106 586	Versa-Spray IPS Manual Electrostatic Porcelain Enamel Powder Spray Gun
	31-26	107 016	Versa-Spray II IPS Automatic Powder Spray Gun
	31-27	107 017	Versa-Spray II IPS Manual Powder Spray Gun
	31-28	107 015	Versa-Spray II IPS PRX Automatic Powder Spray Gun
	32-12	106 699	Metric Standard and Low-Flow Powder Feed Pumps
	32-14	106 702	Metric Powder Transfer Pump

1. Nordson Corporation Product Manuals (contd)

	Manual	Part	Description
	32-17	108 117	Powder Transfer Pump (part 244 721)
	32-18	108 118	Porcelain Transfer Powder Pump
	32-22	108 608	HR-1-4 Hopper (4 lb)
	32-26	106 714	HR-X-X Feed Hoppers (50 and 80 lb)
	32-30	108 654	55 Gallon Powder Drum Truck
	32-31	108 655	Standard Powder Transfer Pump Kit (part 248 681)
	32-32	108 656	P.E. Powder Transfer Pump Kit (part 248 683)
	32-34	106 539	Vibratory Box Feeder (VBF-1)
	32-35	106 813	Metric Porcelain Enamel Powder Pump
	32-37	106 977	HR-16-150 Powder Feed Hopper (150 lb)
	33-10	108 192	MC-3 Master Control (Versa-Spray)
	33-15	106 716	Versa-Spray IPS Three-Gauge Control Unit
	33-16	106 715	Versa-Spray EXP-100M Electrostatic Power Unit
	33-18	106 990	Versa-Spray II Three-Gauge Control Unit
	33-19	106 991	Versa-Spray II IPS 2-Gauge Control Unit
	34-13	104 651	Panel Mounted Air Manifold (pneumatic 5-function box)
	34-21	107 950	230 Vac Rotary Sieve — Nordson
	34-22	108 051	NFS-1000 Flame Detector System
	34-23	108 167	110 Vac Rotary Sieve — Nordson
	34-24	108 590	Versa-Spray Gun Mounting Bar
	34-26	106 585	Versa-Screen Workstation
	34-28	106 565	Versa-Spray Purge Adapter Kits
	34-36	107 004	Non-Loading kV Meter Kit

	Manual	Part	Description
	34-37	107 131	NRPS-100 Rotary Sieve
	34-48	334 599	Optional Fixed Gun Rod Wiper Service Kit
	35-14	108 820	Airflow Management System
	35-15	107 000	Smart-Coat Controller
	37-12	108 184	Tribomatic 14 Gun Master Control Module
	37-18	106 569	Tribomatic II Two-Gauge Control Unit
	37-19	106 570	Tribomatic II Powder Pump
	37-20	106 571	Tribomatic II Automatic Powder Spray Gun
	37-21	106 694	Tribomatic II Manual Powder Spray Gun

Other Equipment Manuals

	Manual No.	Description
	E240	Rotary Sieve (AZO)
	801	Detector Electronics
		Deimco Reciprocator
		Nutro Oscillator
	LSM 1700	Endress & Hauser Level Control
		Proximity Switch and/or Level Control

2. Special Drawings

Drawing	Description