

**Prodigy™
HDLV™ Pump
Manifold and Circuit Board**

Customer Product Manual

Part 1062382B02

Issued 05/08

**For parts and technical support, call the
Finishing Customer Support Center at (800) 433-9319.**

This document is available on the Internet at <http://emanuals.nordson.com/finishing>



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Prodigy HDLV Pump Manifold and Circuit Board

Safety

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.

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- 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.

Grounding inside and around the booth openings must comply with NFPA requirements for Class II, Division 1 or 2 Hazardous Locations. Refer to 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.

Description

See Figure 1. The Prodigy High-Density powder, Low-Volume air (HDLV) powder feed pump transports precise amounts of powder from a feed source to a powder spray gun. The pump control manifold controls the air flow in and out of the pump.

Manifold Components

See Figure 1.

Item	Description	Function
1	Solenoid Valves	Control the air flow to the pump during operation. NOTE: Refer to <i>Solenoid and Control Valve Functions</i> on page 12 to identify each valve's specific function.
2	Pattern Air Flow Control Valve	Regulates the air pressure to the spray gun's nozzle, which shapes the powder spray pattern.
3	Pump Air Flow Control Valve	Regulates the positive air pressure to the fluidizing tubes, which dispenses the powder out of the tubes.
4	Vacuum Air Solenoid	Turns the airflow through the vacuum generator on or off.
5	Vacuum Generator	Works on the venturi principle to generate the negative air pressure required to draw powder into the fluidizing tubes.
—	Solenoid Wiring Harness	Connects the manifold solenoids to the circuit board.
—	Circuit Board (Not Shown)	Contains the hardware and software that controls the timing of the solenoid and flow control valves. NOTE: The circuit board provides control for up to two pump control manifolds.

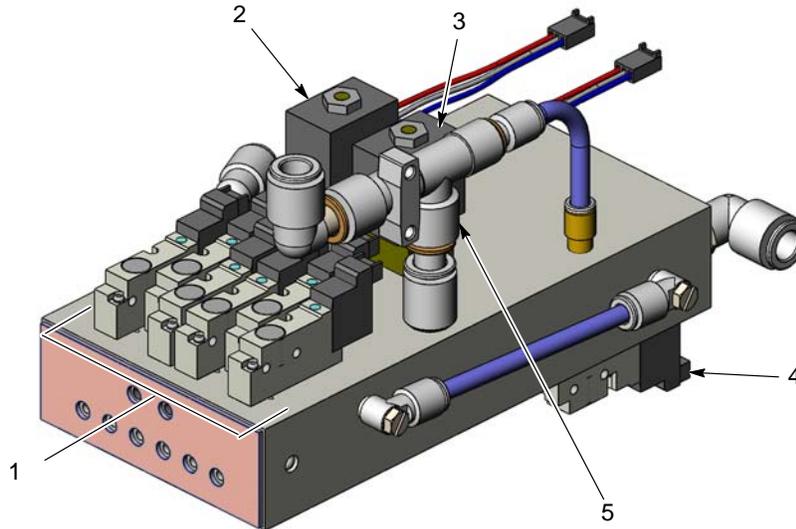


Figure 1 Prodigy HDLV Pump Control Manifold

Note: Manifold solenoid wiring harness and circuit board not shown.

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Specifications

Output (Maximum)	27 kg (60 lb) per hour
Air Consumption	
Conveying Air	21-35 l/min (0.75-1.25 scfm)
Gun Pattern Air	6-57 l/min (0.2-2.0 scfm)
Total Consumption	85-170 l/min (3-6 scfm)
Operating Air Pressures	
Pinch Valves	2.4-2.75 bar (35-40 psi)
Flow Control (to air cap/pump assist)	5.9 bar (85 psi)
Vacuum Generator	3.5 bar (50 psi)

Installation

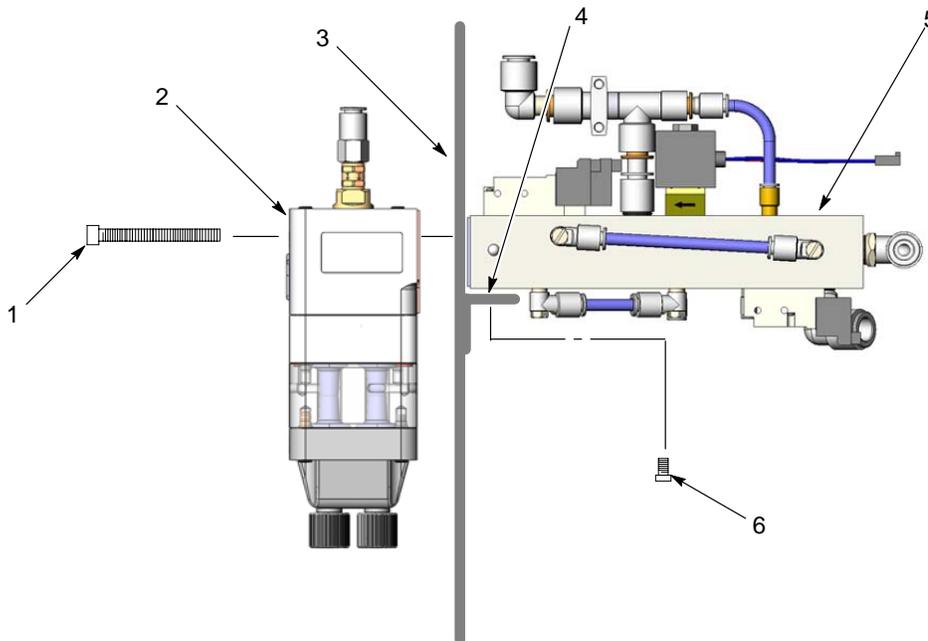


WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Pump and Manifold Installation

Follow these instructions to install a pump and manifold into an existing pump panel.

1. See Figure 2. Make sure that the gaskets on the pump (2) and manifold (5) are not damaged. If the gaskets are damaged, replace them.
2. Set the manifold onto the appropriate mounting bracket (4) against the pump panel wall (3). Secure the manifold with the mounting screws (6), but do not tighten the screws.
3. Secure the pump to the pump panel and manifold using the pump mounting screws (1). Tighten the pump mounting screws securely.
4. Tighten the manifold mounting screws securely.



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Figure 2 Pump and Manifold Installation

- | | | |
|------------------------|------------------------------|---------------------------------|
| 1. Mounting screws (2) | 3. Pump panel wall | 5. Manifold |
| 2. Pump | 4. Manifold mounting bracket | 6. Manifold mounting screws (2) |

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Circuit Board Installation



CAUTION: The circuit board is an electrostatic sensitive device. To prevent damage to the board while handling it, wear a grounding wrist strap connected to the pump panel or other ground.

Refer to your pump panel manual for the mounting location of the HDLV pump circuit board.

Electrical and Pneumatic Connections

See Figure 3 and refer to the following table for a description of the appropriate connections on the circuit board.

NOTE: Each circuit board may control up to two pumps. The pump-specific connections on the circuit board are identified as Pump 1 and Pump 2.

Item	Description
XDCR1	Pump 1 Pattern Air Pressure Transducer In/Out
XDCR2	Pump 1 Flow Air Pressure Transducer In/Out
XDCR3	Pump 2 Pattern Air Pressure Transducer In/Out
XDCR4	Pump 2 Flow Air Pressure Transducer In/Out
J1	Pump 1 Pattern Air Flow Control Valve
J2	Pump 1 Pump Air Flow Control Valve
J3	Pump 2 Pattern Air Flow Control Valve
J4	Pump 2 Pump Air Flow Control Valve
J5	JTAG Programming/Debug Connector
P1	Pump 1 Solenoid I/O Harness
P2	Pump 2 Solenoid I/O Harness
P3	DC Power In
P4	Purge Connector
P5	CAN Out Connector
P6	CAN In Connector
W1	CAN Network Termination Header

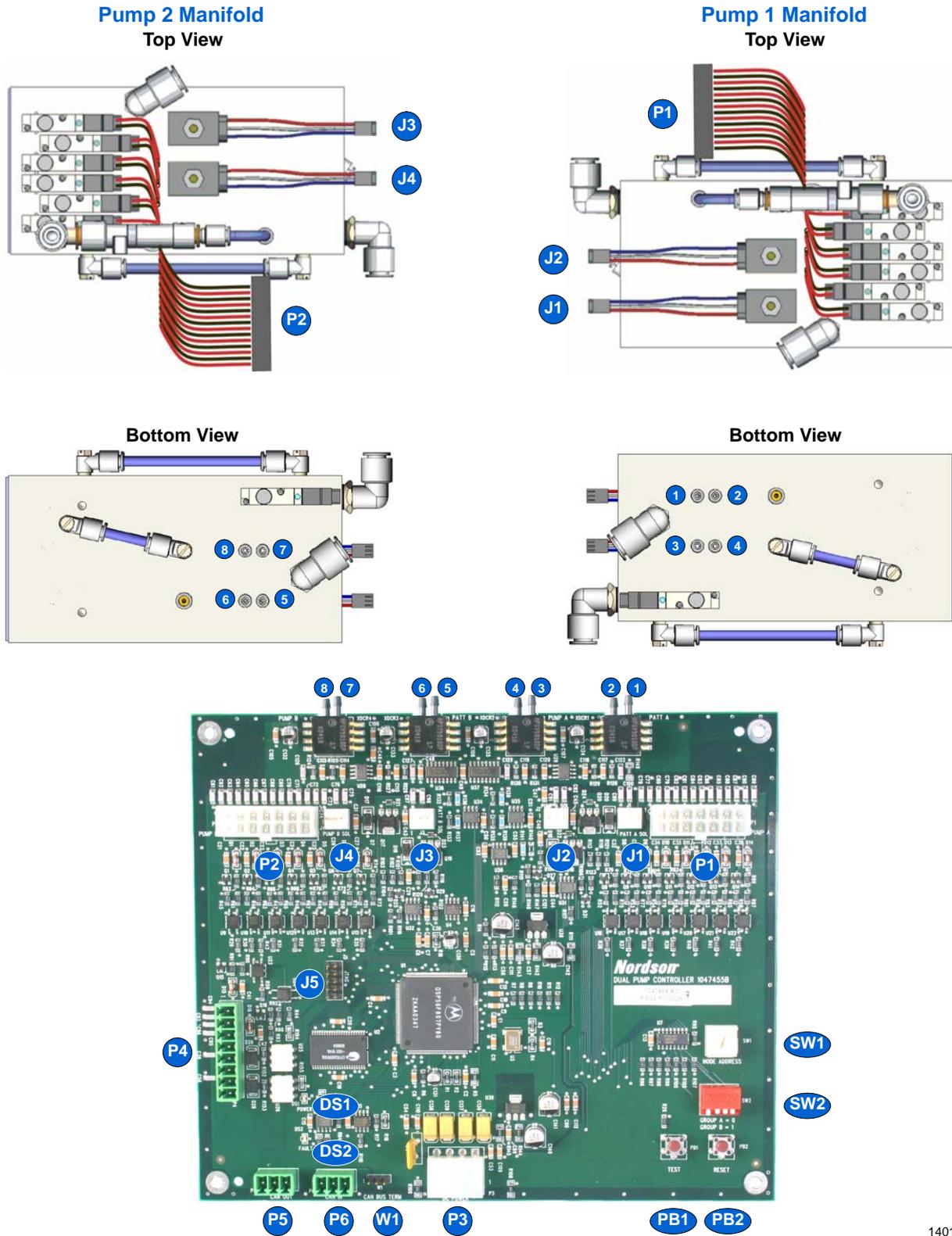
Switches and Indicators

See Figure 3 and refer to the following table for a description of the switches and indicators on the circuit board.

Item	Description
SW1	Node Address Switch
SW2	Console Address/Gun Type Switch
PB1	Test Mode Switch (used for calibration)
PB2	Reset Switch
DS1	Power Indicator
DS2	Fault Indicator

P1 and P2 Pinouts

Pin	Function
1	+24 Vdc
2	+24 Vdc
3	+24 Vdc
4	+24 Vdc
5	+24 Vdc
6	+24 Vdc
7	+24 Vdc
8	Delivery 2 - Solenoid 6
9	Pressure 2 - Solenoid 5
10	Suction 2 - Solenoid 4
11	Suction 1 - Solenoid 3
12	Pressure 1 - Solenoid 2
13	Delivery 1 - Solenoid 1
14	Vacuum - Solenoid 7



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Figure 3 Circuit Board Connections

Note: The circuit board is shipped with air tubing labeled from 8-1 installed in the XDCR fittings. Connect the tubing to the appropriate fittings on the manifolds as illustrated.

Configuring the Circuit Board

See Figure 4. Make sure that SW1 and SW2 are set as illustrated.



Figure 4 SW1 and SW2 Settings for a Manual Powder Spray Systems

Terminating the Prodigy Network at the Circuit Board

See Figure 5. The circuit board is shipped with a jumper across pins 2 and 3 of the CAN BUS TERM terminals. Depending on how many pumps are in your pump panel, you may have to move the jumper to pins 1 and 2.

Two Pump System:

Leave jumper across pins 2 and 3.

One Pump System:

Move jumper to pins 1 and 2.

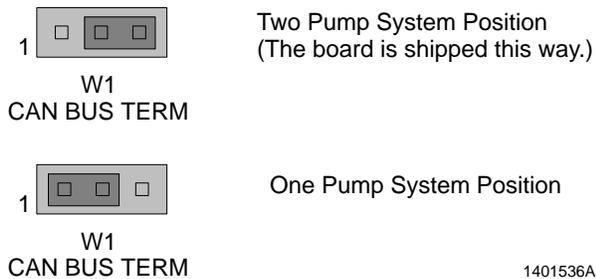


Figure 5 CAN BUS TERM Jumper Settings for Manual Powder Spray Systems

Calibrating the Circuit Board

NOTE: If you have a two-gun system, be sure to perform this procedure on both Prodigy Manual Gun Controllers.

When you install a new circuit board, use this procedure to calibrate it to the manifold.

1. Turn off the Prodigy Manual Gun Controller.
2. Press and hold the Nordson key, then turn on power to the Prodigy Manual Gun Controller. The Configuration screen appears.



Figure 6 Configuration Screen

3. Using the arrow keys or rotary dial, point to the CALIBRATION selection. Press the \downarrow key. The Calibration screen appears.

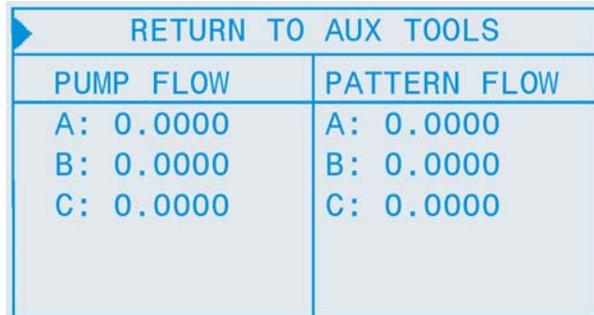


Figure 7 Calibration Screen

NOTE: Use the arrow keys or rotary dial to move the cursor to the appropriate setting, then press the \downarrow key to select it. Use the arrow keys or rotary dial to change that value, then press the \downarrow key to accept the new value and select a new setting.

4. Enter the PUMP FLOW and PATTERN FLOW A, B, and C calibration numbers from the sticker on the pump control manifold.

Air and Powder Tubing Connections

See Figure 8 for a description of the air and powder tubing connections for the pump and manifold.

NOTE: One circuit board may control up to two pumps. The transducer air fittings on the circuit board are pump-specific: XDCR1 and XDCR2 are for pump 1; XDCR3 and XDCR4 are for pump 2.

Item	Tubing	Function	Item	Tubing	Function
A	10 mm Blue	From Purge Air Source (Line Air Pressure)	G	10 mm Blue	Pump Assist/Pattern Air Flow Control 5.9 bar (85 psi)
B	8 mm Clear	Powder Delivery to Spray Gun	H	6 mm Blue	Spray Gun Pattern Air Flow Control (out to gun)
C	8 mm Clear	Powder Suction from Feed Source	1 - 2	4 mm Clear	Pump 1 Pattern Air Pressure Transducer
D	8 mm Clear	Pinch Valve Air Pressure 2.0-2.75 bar (30-40 psi)	3 - 4	4 mm Clear	Pump 2 Flow Air Pressure Transducer
E	10 mm Blue	Vacuum Air Generator Supply 3.45 bar (50 psi)	5 - 6	4 mm Clear	Pump 2 Pattern Air Pressure Transducer
F	10 mm Blue	Vacuum Generator Vent	7 - 8	4 mm Clear	Pump 2 Flow Air Pressure Transducer

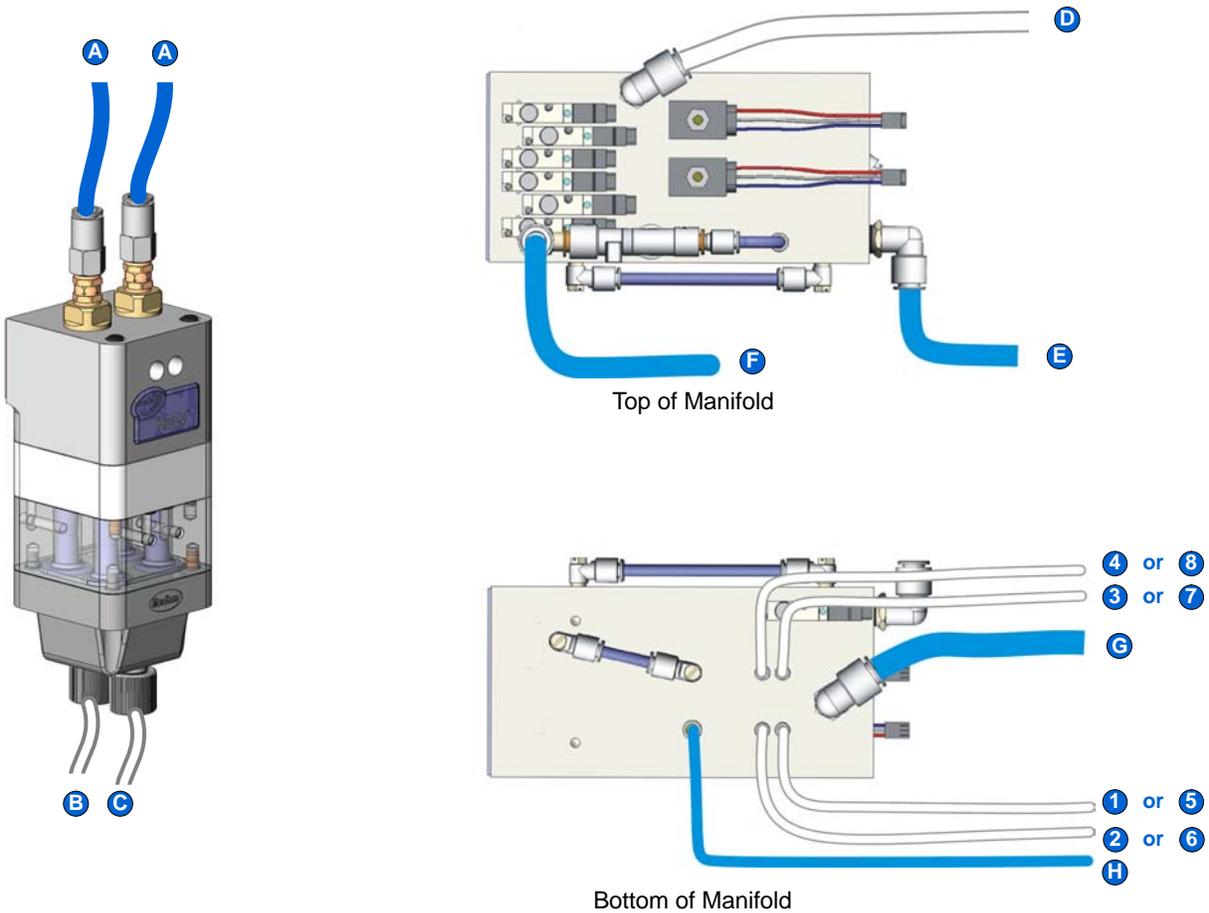


Figure 8 Powder and Air Tubing Connections

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Operation



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



CAUTION: Do not adjust the regulators inside the pump cabinet. The regulators are factory set and should not be adjusted without guidance from your Nordson representative.

Pump operation is controlled through the gun controller. Refer to the *Operation* section of the *Prodigy Manual Gun Controller* manual for specific instructions.

Pump operation is controlled by specifying a setpoint from 0-100 (which translates to a percent of flow) at the gun controller. At the pump, each setpoint results in a predefined cycle rate. Increasing the cycle rate increases the powder delivery rate. Decreasing the cycle rate decreases the powder delivery rate.

The Prodigy HDLV pump manifold also has a gun pattern air flow control valve. Gun pattern air is controlled by setting the flow rate (in either scfm or m³/hr) at the gun control unit.

NOTE: When the fluidizing tubes become clogged with powder, the powder delivery rate will decrease. The gun controller will generate a fault to indicate this condition and notify you that it is time to replace the fluidizing tubes.

Troubleshooting



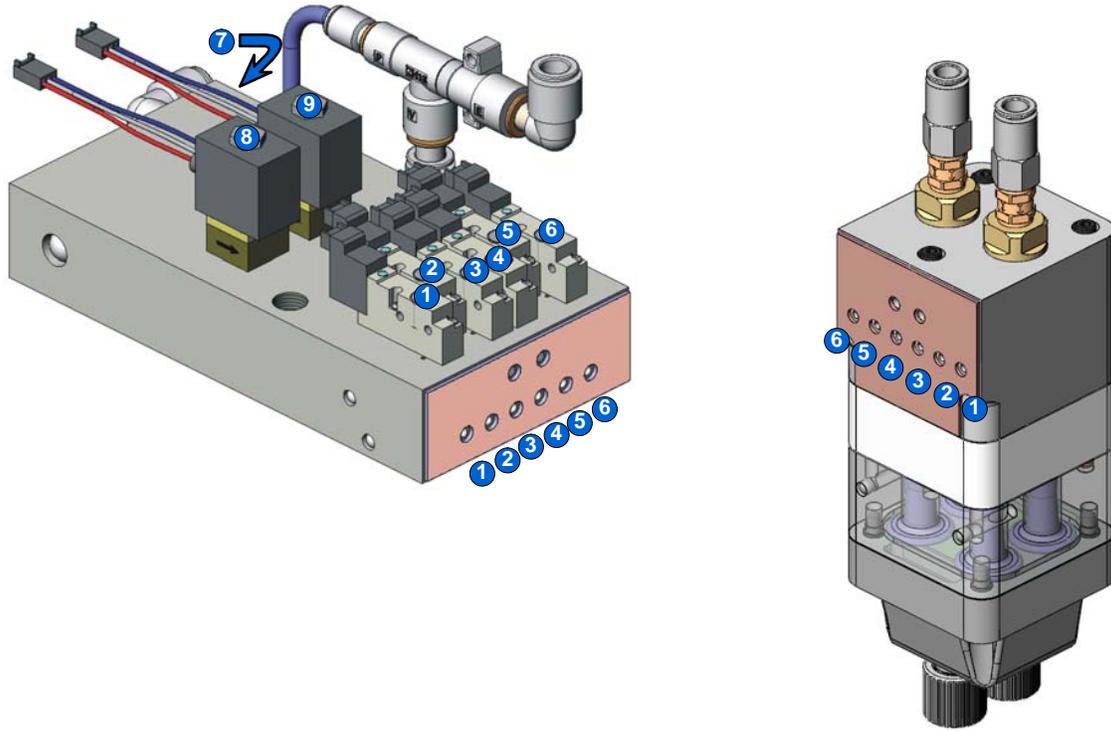
WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

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	Possible Cause	Corrective Action
1. Reduced powder output (pinch valves are opening and closing)	Blockage in the powder tubing to the spray gun Defective pump air flow control valve Defective pump check valve	Check the tubing for blockages. Purge the pump and spray gun. Clean the pump air flow control valve. Refer to <i>Flow Control Valve Cleaning</i> on page 13 for instructions. If the problem persists, replace the pump air flow control valve. Refer to <i>Flow Control Valve Replacement</i> on page 15 for instructions. Replace the check valves.
2. Reduced powder output (pinch valves are not opening and closing)	Defective pinch valve Defective solenoid valve Defective pump check valve	Replace the pinch valves and filter discs. Replace the solenoid valve. Refer to <i>Solenoid and Flow Control Valve Functions</i> on page 12 to determine which solenoid valve controls the affected pinch valve. Replace the check valves.
3. Reduced powder input (loss of suction from feed source)	Blockage in the powder tubing from the feed source Loss of vacuum at the vacuum generator Defective pump air flow control valve	Check the tubing for blockages. Purge the pump and spray gun. Check the vacuum generator for contamination. Check the pump panel exhaust muffler. If the exhaust muffler appears to be plugged, replace it. Clean the pump air flow control valve. Refer to <i>Flow Control Valve Cleaning</i> on page 13 for instructions. If the problem persists, replace the pump air flow control valve. Refer to <i>Flow Control Valve Replacement</i> on page 15 for instructions.
4. Spray gun fan pattern changes	Defective pattern air flow control valve	Clean the pattern air flow control valve. Refer to <i>Flow Control Valve Cleaning</i> on page 13 for instructions. If the problem persists, replace the pattern air flow control valve. Refer to <i>Flow Control Valve Replacement</i> on page 15 for instructions.

Solenoid and Flow Control Valve Functions

Figure 9 identifies the solenoid and flow control valve functions and the corresponding ports on the pump and manifold.



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Figure 9 Solenoid and Flow Control Valve Functions

Item	Function	Item	Function
1	Left Side Delivery Pinch Valve	6	Right Side Delivery Pinch Valve
2	Left Side Fluidizing Tube	7	Vacuum Air (on bottom of manifold)
3	Left Side Suction Pinch Valve	8	Pattern Air Flow Control
4	Right Side Suction Pinch Valve	9	Pump Air Flow Control
5	Right Side Fluidizing Tube		

Repair



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

To reduce downtime, keep a spare manifold in stock to install in place of one being repaired. Refer to *Manifold Parts* on page 16 for ordering information.

Repair of the manifold is limited to

- cleaning or replacing the flow control valves
- replacing the solenoid valves

Field replacement of other parts is not possible, due to the need to calibrate the manifold at the factory using equipment not available in the field.

Preparation



WARNING: Shut off and relieve system air pressure before performing the following tasks. Failure to relieve air pressure may result in personal injury.



WARNING: Shut off and lock out system electrical power before performing the following tasks. Failure to observe this warning may result in personal injury.

NOTE: Tag all air tubing and wiring harnesses before disconnecting them from the manifold.



CAUTION: Do not disconnect the transducer air tubing from the circuit board. The transducers are very delicate and will break if the air tubing is removed.

1. Disconnect all air tubing from the manifold.



CAUTION: The circuit board is an electrostatic sensitive device (ESD). To prevent damage to the board while handling it, wear a grounding wrist strap connected to the pump panel or other ground.

2. Disconnect the flow control valve and solenoid valve wiring harnesses from the circuit board below the manifold.
3. Remove the pump from the pump panel.
4. Remove the two screws securing the manifold to the mounting bracket. Take the manifold assembly to a clean work surface.

Flow Control Valve Cleaning

A dirty air supply can cause the flow control valves to malfunction. Follow these instructions to disassemble and clean the flow control valves.

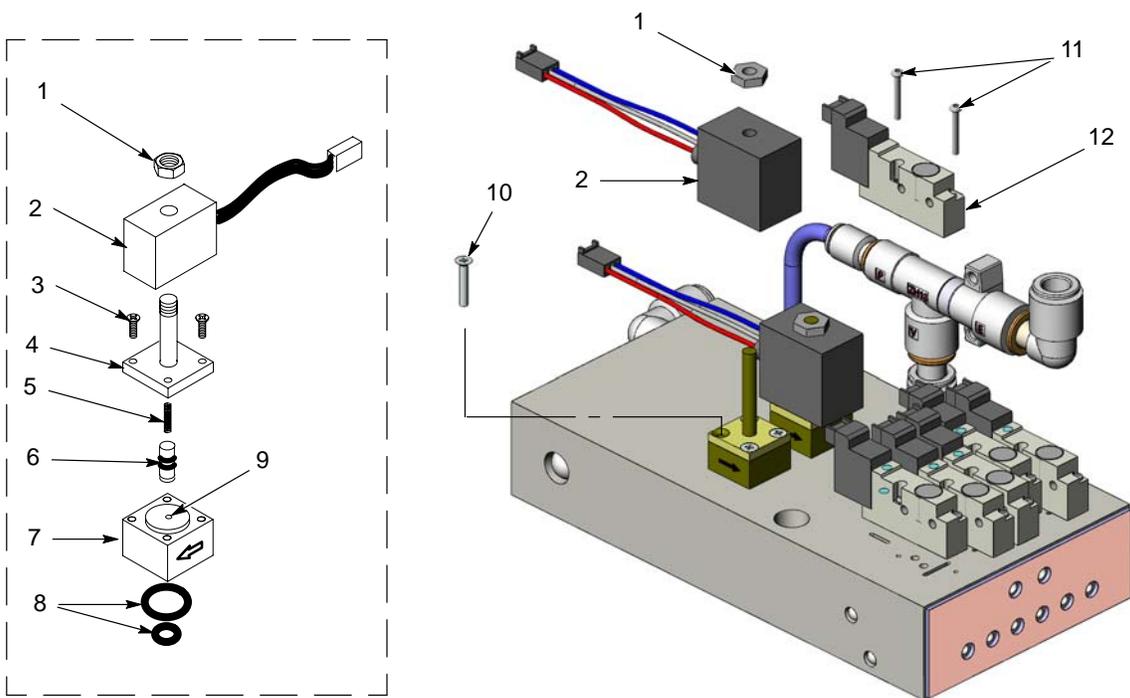
1. See Figure 10. Remove the nut (1) and coil (2) from the flow control valve.
2. Remove the two long screws (10) to remove the flow control valve from the manifold.



CAUTION: The valve parts are very small. Be careful not to lose any parts. Do not mix the springs from one valve with those from another. The valves are individually calibrated with the springs installed.

3. Remove the two short screws (3), then remove the valve stem (4) from the valve body (7).
4. Remove the valve cartridge (6) and spring (5) from the stem.
5. Clean the cartridge seat and seals, and the orifice (9) in the valve body. Use low-pressure, compressed air. Do not use sharp metal tools to clean the cartridge or valve body.
6. Install the spring and then the cartridge in the stem, with the plastic seat on the end facing out.
7. Make sure the O-rings furnished with the valve are in place on the bottom of the valve body.
8. Secure the valve body to the manifold with the long screws, making sure the arrow on the valve body points toward the solenoid valves.
9. Install the coil on the stem, with the coil wiring pointing away from the solenoid valves. Secure the coil with the nut.

Flow Control Valve Cleaning (contd)



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Figure 10 Manifold Repair

- | | | |
|---------------------|----------------|---------------------|
| 1. Nut | 5. Spring | 9. Orifice |
| 2. Coil | 6. Cartridge | 10. Long screws (2) |
| 3. Short screws (2) | 7. Valve body | 11. Screws (2) |
| 4. Valve stem | 8. O-rings (2) | 12. Solenoid valve |

Flow Control Valve Replacement

If cleaning the flow control valve does not correct the flow problem, replace the flow control valve.

See Figure 10. Remove the valve by removing the nut (1), coil (2), and long screws (10).

Before installing a new valve, remove the protective cover from the bottom of the valve body (7). Be careful not to lose the O-rings (8) under the cover.

Solenoid Valve Replacement

See Figure 10. To remove the solenoid valves, remove the two screws (11) in the valve body and lift the solenoid valve (12) off the manifold.

Make sure the gasket furnished with the new solenoid valve are in place before installing it on the manifold.

Manifold Installation

Refer to *Installation* on page 4 for instructions for installing the manifold and pump into the pump panel.

Circuit Board Replacement



CAUTION: Observe the following cautions when removing or installing the circuit board. Failure to observe these cautions may result in equipment damage.

- The circuit board is an electrostatic sensitive device (ESD). Wear a grounding wrist strap connected to the pump panel or other ground.
- Turn off and relieve air pressure to the pumps before removing the circuit board.
- Do not disconnect the air tubing from the circuit board. The transducers are very delicate and will break if the air tubing is removed.

The circuit board replacement kit comes with detailed removal, installation, and calibration instructions. Follow the instructions carefully to avoid damaging the circuit board.

Parts

To order parts, call the Nordson Customer Support Center or your local Nordson representative.

Manifold Parts

See Figure 11.

Item	Part	Description	Quantity	Note
—	1052915	MANIFOLD ASSEMBLY, HDLV pump control	1	
1	1088149	• GASKET, face, HDLV pump control manifold	1	
2	-----	• MANIFOLD, HDLV pump control	1	
3	1027412	• VALVE, solenoid, 3 way, with connector	7	
4	972277	• CONNECTOR, male, elbow, 8 mm x 1/4 in. universal	1	
5	1052893	• ELBOW, plug in, 10 mm tube x 10 mm stem, plastic	1	
6	1052920	• PUMP, vacuum generator	1	
7	972286	• REDUCER, 8 mm stem x 6 mm tube	1	
8	900742	• TUBING, polyurethane, 6 mm OD x 4 mm ID, blue	AR	
9	1027547	• VALVE, proportional, solenoid, sub base	2	
10	1052894	• NIPPLE, push in, 10 mm tube x 10 mm tube, plastic	1	
11	328524	• CONNECTOR, male, with internal hex, 6 mm tube x M5	2	
12	972283	• CONNECTOR, male, with internal hex, 10 mm tube x 1/4 in. universal	1	
13	-----	• ORIFICE	2	A
14	972125	• CONNECTOR, male, elbow, 10 mm tube x 1/4 in. universal	1	
15	972310	• CONNECTOR, male, universal elbow, 6 mm tube x M5	4	
16	-----	• FILTER, 0.168 dia x 0.240 in. long, 20 micron	4	
17	972125	• CONNECTOR, male, elbow, 10 mm tube x 1/4 in. universal	1	
18	1062009	• CONNECTOR, male, with internal hex, oval collar, 4 mm tube x M5	4	

NOTE A: These are not serviceable parts. Do not remove these from the manifold.

AR: As Required

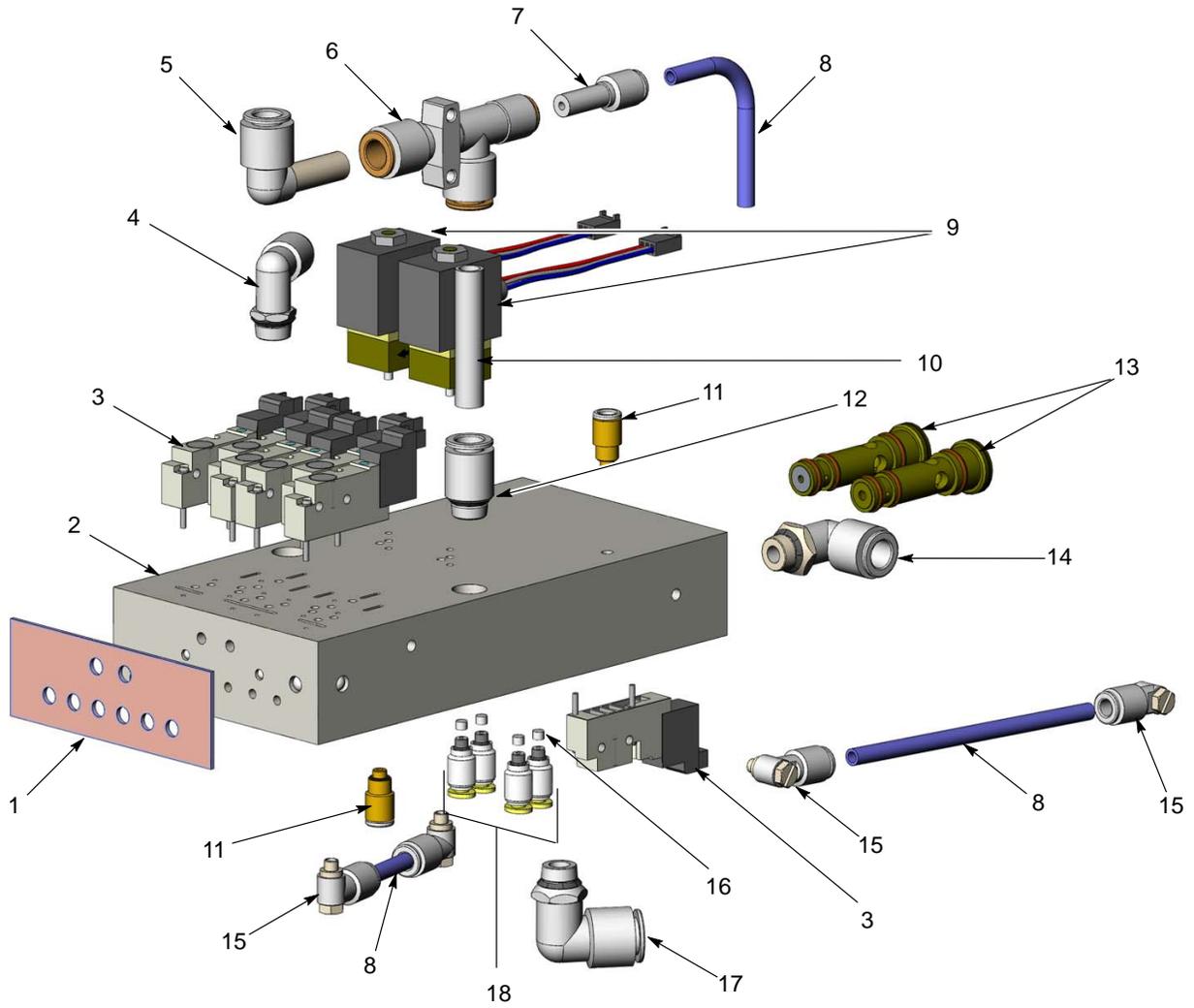
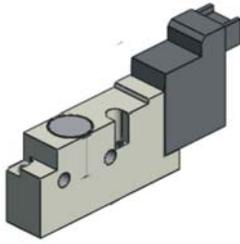


Figure 11 Manifold Parts

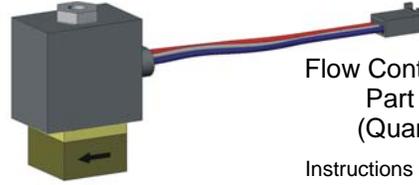
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Spare Parts

Keep one of each of these assemblies in stock for each pump in your system.



Solenoid Valve
Part 1027412
(Quantity of 1)
Instructions on page 15

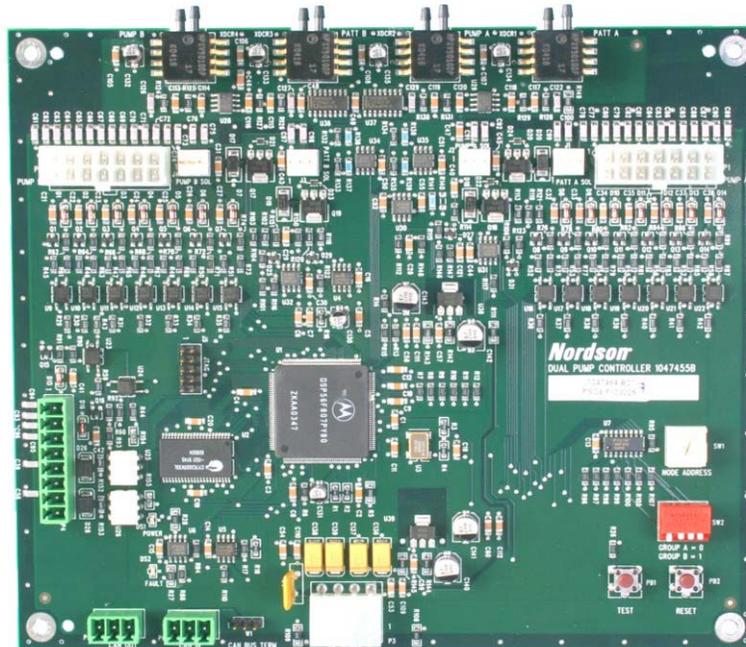


Flow Control Valve
Part 1027547
(Quantity of 1)
Instructions on page 15

PCA Replacement Kit

This kit comes with the 4-mm air tubing already installed into the pressure transducer fittings.

Part	Description	Note
1057815	KIT, PCA replacement, Prodigy pump control	



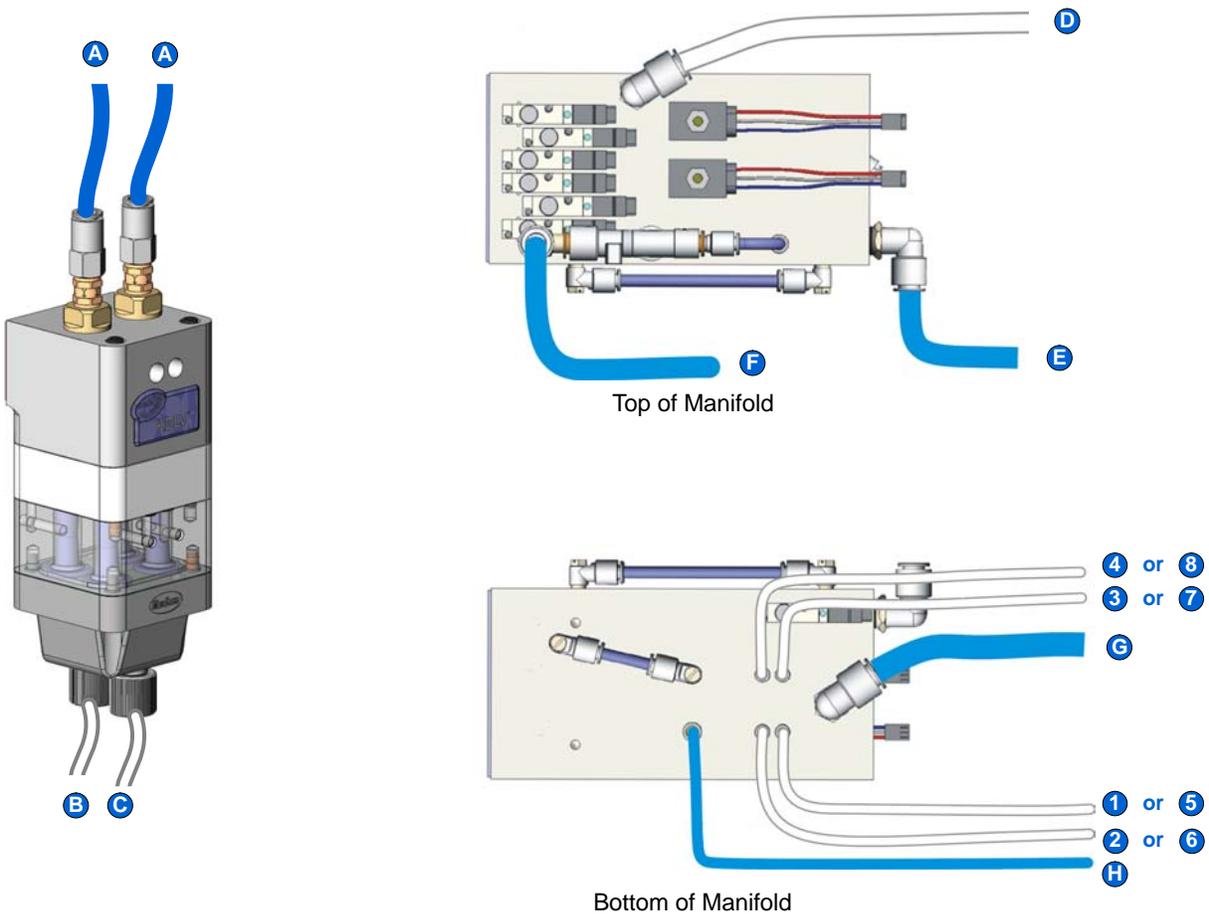
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Figure 12 PCA Replacement Kit

Air and Powder Tubing Part Numbers

See Figure 13.

Item	Part	Description	Item	Part	Description
A	900740	10 mm Blue polyurethane	F	900740	10 mm Blue polyurethane
B	173101	8 mm Clear polyethylene	G	900740	10 mm Blue polyurethane
C	173101	8 mm Clear polyethylene	H	900742	6 mm Blue polyurethane
D	173101	8 mm Clear polyethylene	1 - 8	900617	4 mm Clear polyurethane
E	900740	10 mm Blue polyurethane			



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Figure 13 Air and Powder Tubing Part Numbers

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