hDR Pump

Customer Product Manual
Part 1609677–10
Issued 7/20

For parts and technical support, call the Industrial Coating Systems Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

This document is subject to change without notice.
Check http://emanuals.nordson.com for the latest version.

CE

Nordson

NORDSON CORPORATION • AMHERST, OHIO • USA

Contact Us

Nordson Corporation welcomes requests for information, comments, and inquiries about its products. General information about Nordson can be found on the Internet using the following address: http://www.nordson.com.

Address all correspondence to:

Nordson Corporation
Attn: Customer Service
555 Jackson Street
Amherst, OH 44001

Table of Contents

Change Record

Revision	Date	Change
01	8/16	Released.
02	1/17	Added lubricant to parts section.
03	4/17	Updated elbow part number 971605.
04	4/17	Added adapter kit part number 1611121.
05	5/17	Added regulator cover part number 1611468.
06	2/18	Updated elbow.
07	7/18	Update cover part number for regulator. Updated *Hydraulic Packing Replacement*.
08	3/19	Administrative update.
09	7/19	Updated glide ring in assemblies.
10	7/20	Administrative update.

Section 1
Safety

Introduction

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

Make sure all equipment documentation, including these instructions, is accessible to 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.

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 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.
- While operating manual spray guns, make sure you are grounded. Wear electrically conductive gloves or a grounding strap connected to the gun handle or other true earth ground. Do not wear or carry metallic objects such as jewelry or tools.
- If you receive even a slight electrical shock, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.
- Obtain and read Safety Data Sheets (SDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- Make sure the spray area is adequately ventilated.
- 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.

High-Pressure Fluids

High-pressure fluids, unless they are safely contained, are extremely hazardous. Always relieve fluid pressure before adjusting or servicing high pressure equipment. A jet of high-pressure fluid can cut like a knife and cause serious bodily injury, amputation, or death. Fluids penetrating the skin can also cause toxic poisoning.

If you suffer a fluid injection injury, seek medical care immediately. If possible, provide a copy of the SDS for the injected fluid to the health care provider.

The National Spray Equipment Manufacturers Association has created a wallet card that you should carry when you are operating high-pressure spray equipment. These cards are supplied with your equipment. The following is the text of this card:

WARNING: Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor that you suspect an injection injury.
- Show him this card
- Tell him what kind of material you were spraying

MEDICAL ALERT—AIRLESS SPRAY WOUNDS: NOTE TO PHYSICIAN

Injection in the skin is a serious traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream.

Consultation with a plastic surgeon or a reconstructive hand surgeon may be advisable.

The seriousness of the wound depends on where the injury is on the body, whether the substance hit something on its way in and deflected causing more damage, and many other variables including skin microflora residing in the paint or gun which are blasted into the wound. If the injected paint contains acrylic latex and titanium dioxide that damage the tissue's resistance to infection, bacterial growth will flourish. The treatment that doctors recommend for an injection injury to the hand includes immediate decompression of the closed vascular compartments of the hand to release the underlying tissue distended by the injected paint, judicious wound debridement, and immediate antibiotic treatment.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Ground all conductive equipment. Use only grounded air and fluid hoses. Check equipment and workpiece grounding devices regularly. Resistance to ground must not exceed one megohm.
- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.

Fire Safety *(contd)*

- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material SDS for guidance.
- Do not disconnect live electrical circuits when 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.
- Shut off electrostatic power and ground the charging system before adjusting, cleaning, or repairing electrostatic equipment.
- 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.

Halogenated Hydrocarbon Solvent Hazards

Do not use halogenated hydrocarbon solvents in a pressurized system that contains aluminum components. Under pressure, these solvents can react with aluminum and explode, causing injury, death, or property damage. Halogenated hydrocarbon solvents contain one or more of the following elements:

Element	Symbol	Prefix
Fluorine	F	“Fluoro-”
Chlorine	Cl	“Chloro-”
Bromine	Br	“Bromo-”
Iodine	I	“Iodo-”

Check your material SDS or contact your material supplier for more information. If you must use halogenated hydrocarbon solvents, contact your Nordson representative for information about compatible Nordson components.

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 system electrical power. Close hydraulic and pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the system.

Disposal

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

Safety Labels

Table 1-1 contains the text of the safety labels on this equipment. See Figure 1-1 for their locations. The safety labels are provided to help you operate and maintain your equipment safely.

Table 1-1 Safety Labels

Item	Part	Description
1	600179	 **WARNING**  • HIGH PRESSURE DEVICE Read instruction manual before operation and observe all warnings.  • INJECTION HAZARD Airless spray painting equipment can cause serious injury if the spray penetrates the skin. Do not point the gun at anyone or any part of the body. In case of penetration, adequate medical aid must be immediately obtained.  • COMPONENT RUPTURE This system is capable of producing high pressure. Please refer to the data plate on the hydraulic section. To avoid rupture and injury, do not operate this pump at a pressure higher than the rated maximum working pressure of any component in the system (including but not limited to spray guns, hose, hose connections and heaters).  • FIRE Static voltage is developed by airless spraying. The pump, associated system, and object being sprayed must be grounded to prevent static discharge sparks which could start a fire. • SERVICING Before servicing, cleaning, or removal of any part, set trigger lock on gun, and always shut off power source; then carefully release pressure in fluid portions of the system.
2	246890	 Do not use halogenated hydrocarbon solvents in this system, it contains aluminum parts and may explode. Cleaning agents, coatings, paints or adhesives may contain halogenated hydrocarbon solvents. Don't take chances, consult your material supplier to be sure.

…Continued

Item	Part	Description
3	------	**WARNING** • AIR MOTOR Air motor section contains spring-loaded pistons. Refer to manual for disassembly instructions.
NS	------	MAXIMUM OPERATING PRESSURE 83 BAR (1500 PSI)
NS	------	MAXIMUM INPUT 5.52 BAR (80 PSI)

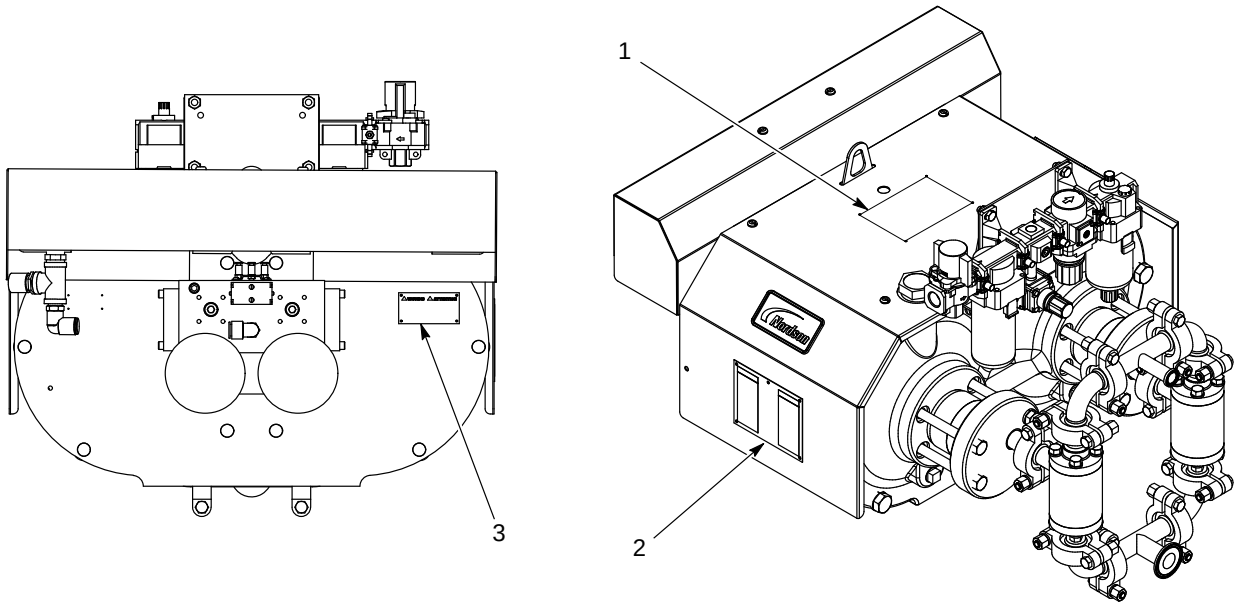


Figure 1-1 Safety Label Locations

Section 2
Description

Introduction

See Figure 2-1.

The hDR pump is an air-powered, positive displacement, demand-type, reciprocating dual piston pump designed for food or edible coating applications. The pump is designed to be mounted horizontally.

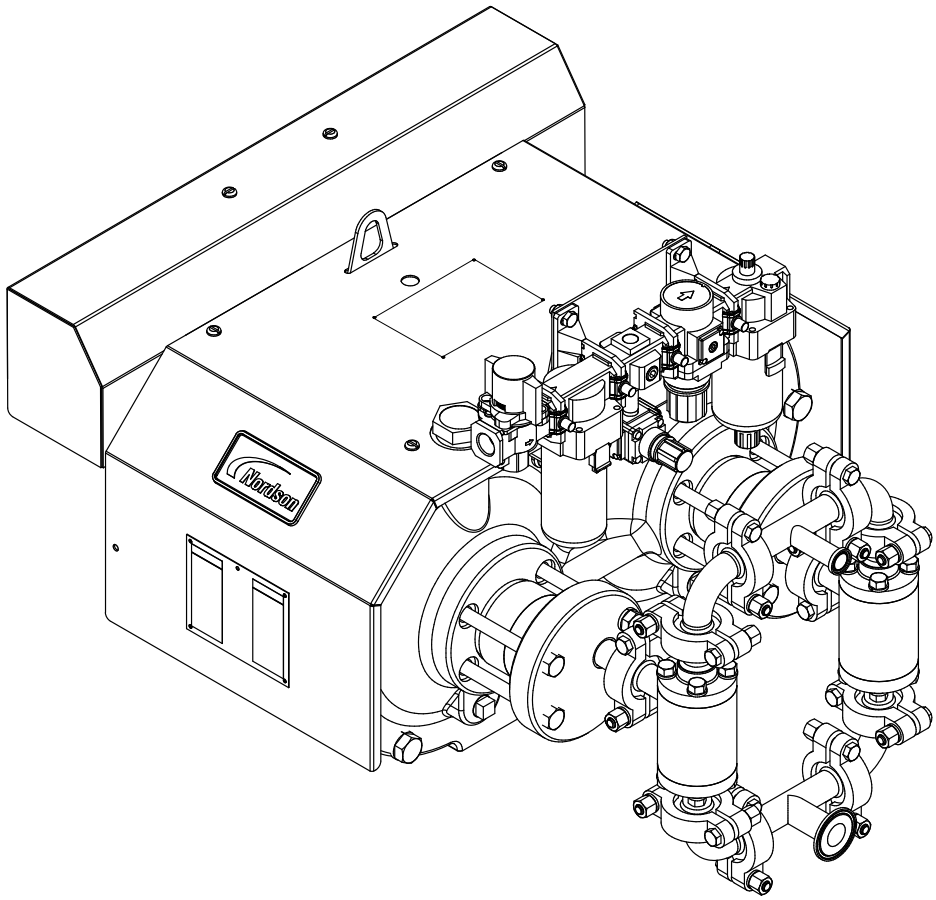


Figure 2-1 hDR pump

Specifications

Dimensions and Weight	
Height	469.9 mm (18.5 in.)
Width	610 mm (24 in.)
Depth	787.4 mm (31 in.)
Weight	93.5 kg (206 lb)
Inputs and Outputs	
Input air pressure (maximum)	5.33 bar (80 psi)
Air supply hose (minimum ID)	6 mm ($^1/_2$ in.)
Hydraulic fluid pressure output (maximum)	83 bar (1200 psi)
Hydraulic fluid delivery capacity (maximum)	7.6 lpm (2 gpm)
Pressure feed (maximum)	1.3 bar (20 psi)
Hydraulic fluid hose (ID)*	13 mm ($^1/_4$ in.)
Siphon hose (minimum ID)	13 mm ($^1/_2$ in.)
* Use only Nordson hoses or equivalent reinforced PTFE hoses with electrical continuity between fittings. All hoses must be capable of withstanding 207 bar (3000 psi).	

Air Consumption

Air Pressure Setting bar (psi)	Air Consumption m^3/min (ft^3/min)		
	@ 25 strokes/minute	@ 35 strokes/minute	@ 45 strokes/minute
6.5 (95)	0.5 (17)	0.7 (24)	0.9 (31)
5.2 (75)	0.4 (14)	0.6 (19)	0.7 (25)
3.5 (50)	0.3 (10)	0.4 (14)	0.5 (18)
1.7 (25)	0.2 (6.4)	0.2 (8)	0.3 (10)

Operating Sound Levels

Air Pressure bar (psi)	Sound Level dB A	Sound Level dB C
2.8 (40)	83	85
5.6 (80)	87	89
6.5 (95)	89	91

Major Pump Components

See Figure 2.

The pump consists of air control components (1), an air motor section (2), and a hydraulic section (3).

Air Control Components

The air control components (1) include a filter/regulator/lubricator module (11), an accumulator (10), an air valve (8), a double pilot valve (9), and four roller valves.

Filter/Regulator—The filter/regulator module (11) filters the incoming shop air and regulates its pressure to the set operating pressure.

Accumulator—The accumulator (10) stores working air and adds to the flow of air to the cylinders to eliminate pressure fluctuations, or winking.

Air Valve—The air valve (8) is an open-center type valve. It controls the flow of working air to the cylinders and exhaust air from the cylinders. The air valve spool is shifted by pilot air from the double pilot valve.

Double Pilot Valve—The double pilot valve (9) shifts the air valve in response to pilot air signals from the roller valves. The roller valves are actuated by lands on the piston shafts.

Air Motor Section

The air motor section (2) consists of two cylinders, spring-returned pistons, and a solvent chamber (7). Solvent in the solvent chamber lubricates the hydraulic plungers to minimize wear on the packings located in the hydraulic section (3).

Hydraulic Section

The hydraulic section (3) consists of a siphon manifold (5) and a pressure manifold (4). Four ball check valves direct the flow of coating material in and out of the pump.

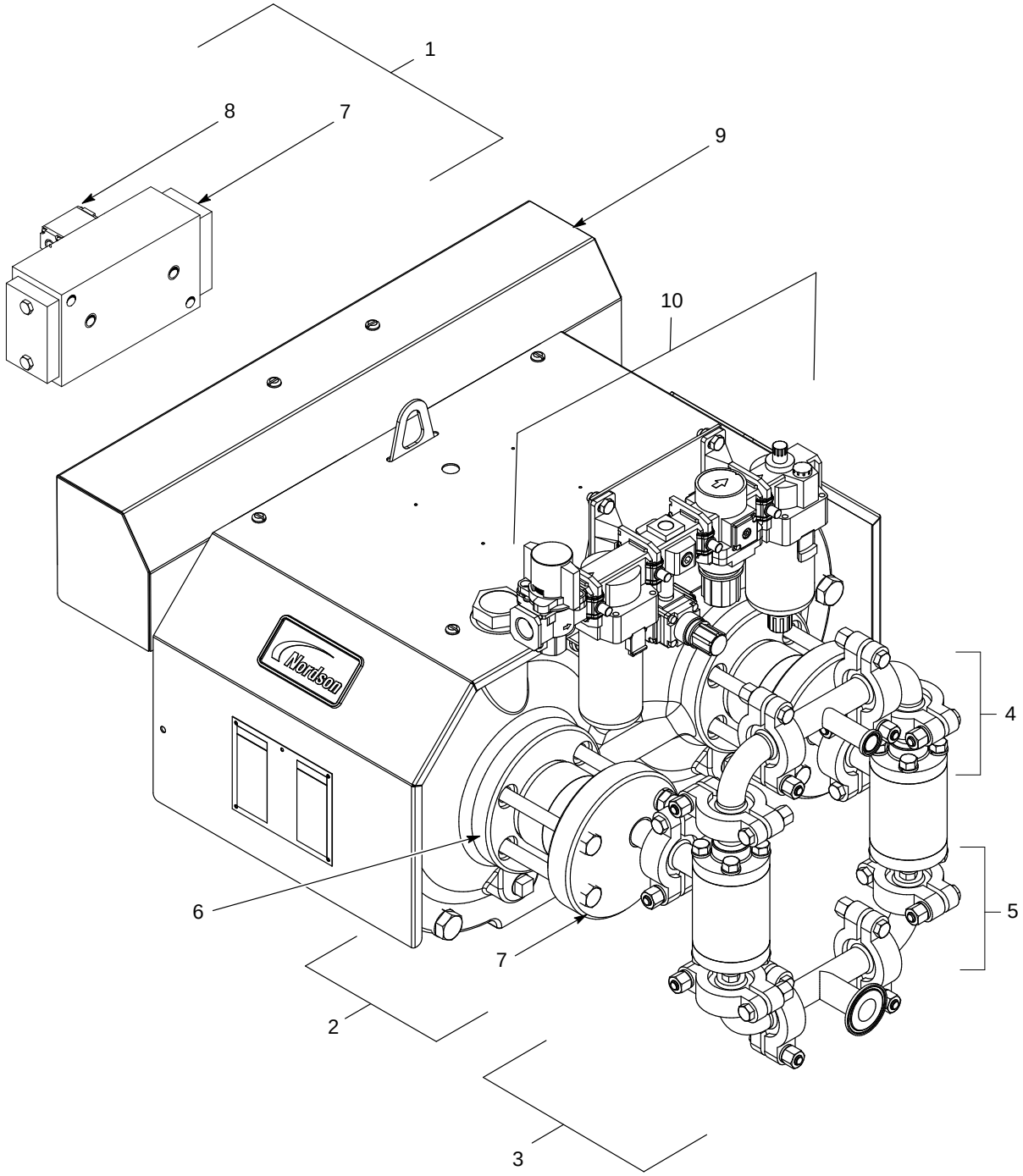


Figure 2-2 hDR Pump Components

1. Air control components
2. Air motor section
3. Hydraulic section
4. Pressure manifold
5. Siphon manifold
6. Solvent chamber
7. Air valve
8. Double pilot valve
9. Accumulator cover
10. Filter/regulator module

Theory of Operation

See Figure 2-3.

Supply air enters the pump at the shut-off valve before the filter. The air is filtered and passes into a manifold block. From the manifold block, supply air:

- flows through line 3 to the double pilot valve. The double pilot valve uses this air to shift the air valve spool.
- flows through a small preset regulator which reduces the air pressure to 4.1 bar (60 psi) before it flows through lines 4 and 5 to the lower roller valves, through lines 6 and 7 to the upper roller valves, and lines 8 and 9 to the double pilot valve. This air is used to shift the double pilot valve spool.
- flows through the adjustable regulator before flowing through line 2 into the accumulator, line 1 to the air valve, and into the cylinders to operate the pump.

The position of the double pilot valve spool determines which piston/plunger begins its downward (pressure) stroke first when the pump is started. The strokes of the pistons overlap and keep the fluid pressure constant in the delivery lines to the spray guns.

Left Piston Down, Right Piston Up

While the left air motor piston is forced down by working air from the air valve, the right air motor piston is being forced upwards by the return spring, exhausting the air out of the right cylinder through the air valve. The left hydraulic plunger pressurizes the coating material in the hydraulic section and forces it out of the pump through a ball check valve, through the pressure manifold, and into the fluid lines to the spray guns.

Just before the left plunger reaches the bottom of its stroke, the lower left roller valve is actuated by the chamfered land on the air piston shaft. Air flows through line 5, the lower left roller valve, line 6 to the upper right roller valve, and line 9 into the double pilot valve.

The double pilot valve spool shifts, directing pilot air from line 3 to the air valve, shifting the air valve spool and directing air from line 1 to the right cylinder.

Left Piston Up, Right Piston Down

When the air valve spool shifts it allows air above the left piston to exhaust through the air valve as the piston is forced up by the return spring. The left hydraulic plunger is drawn out of the hydraulic section, siphoning coating material into the pump, where it is retained by a ball check until the next pressure stroke.

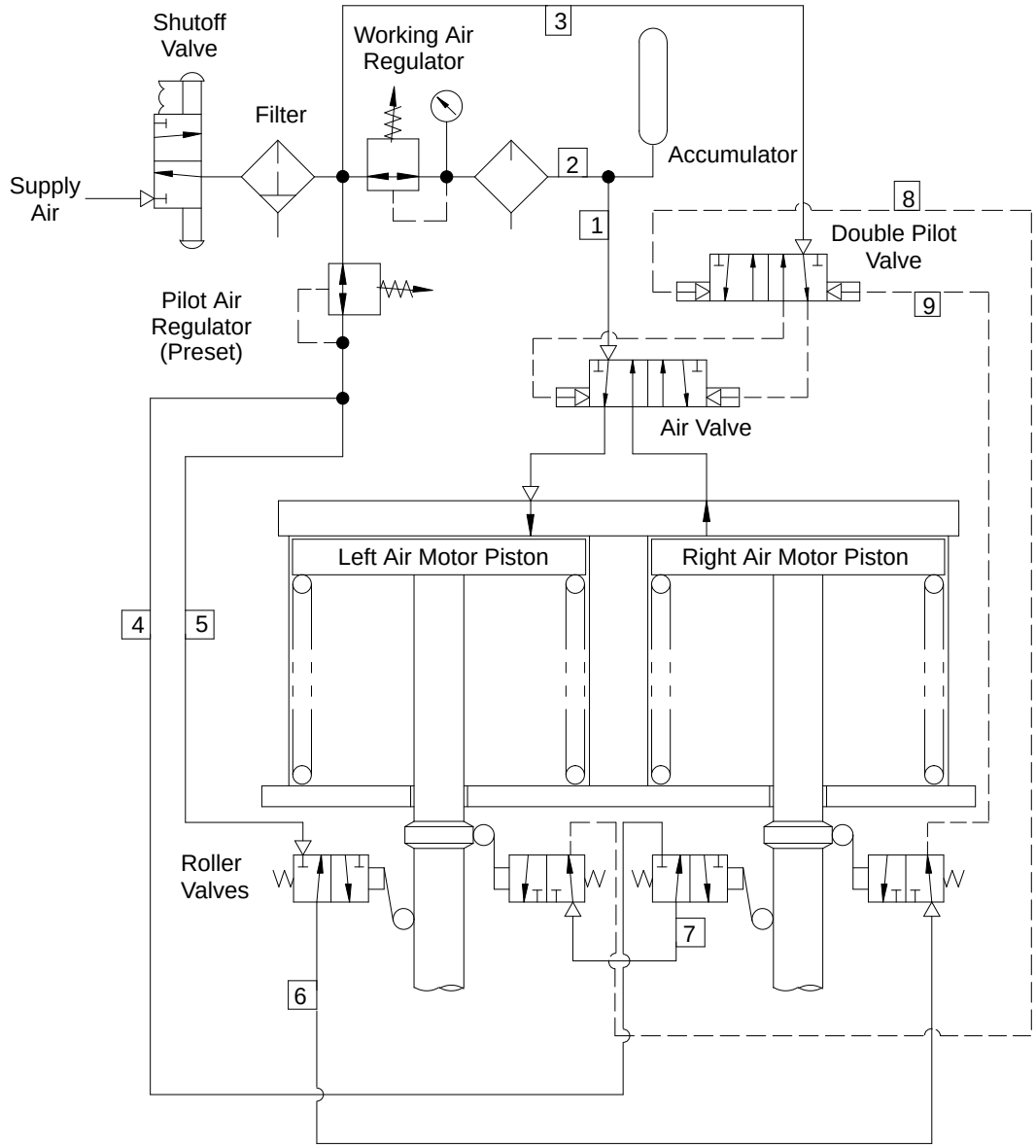


Figure 2-3 Pump Operation

Section 3
Installation

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

Suitable for installation in Zone 1, Zone 2, or normal usage areas.

Mounting

See Figure 3-1.

Install the pump on a horizontal surface, in an area accessible for operation and maintenance. Use three $^1/_2$–13 bolts, washers, and lockwashers to mount the pump.

Install one bolt into the mounting slot (2) on the solvent chamber (1). Install the two remaining bolts into the threaded mounting holes located on the bottom surface of the upper head (3).

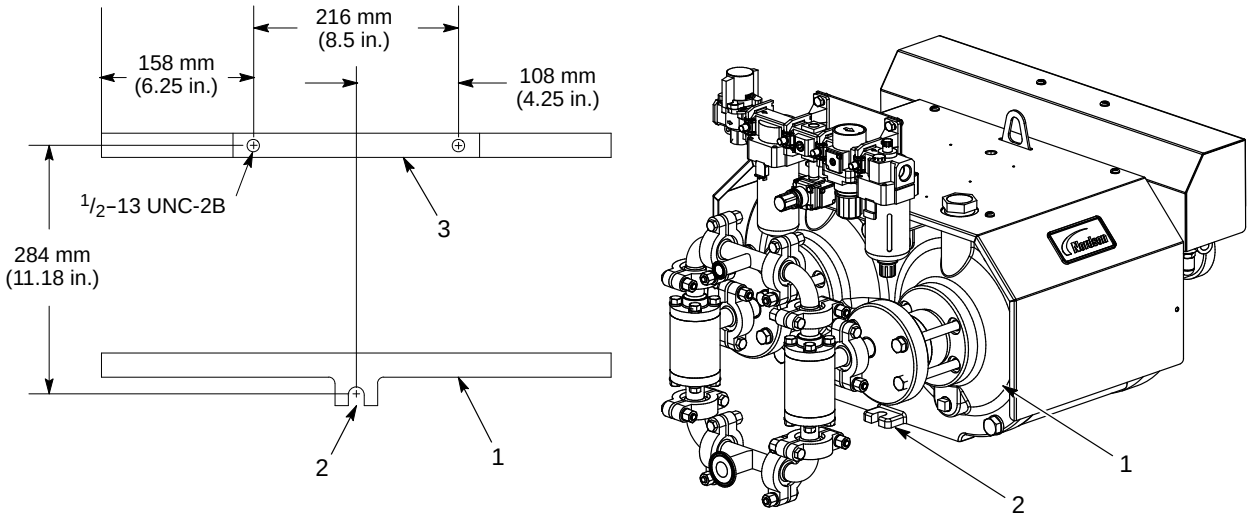


Figure 3-1 Pump Mounting

1. Solvent chamber
2. Mounting slot
3. Upper head

Air Supply Connection

Refer to *Specifications* on page 2-2 for air supply requirements and air hose sizing.

See Figure 3-2.

Use a flexible air hose at least 305-mm (12-in.) long with $^1/_2$-in. NPT fittings to supply air to the pump. The flexible hose will serve as a vibration damper. Do not use rigid tubing. Refer to *Pump Air Tubing* on page 7-14.

Purge the air supply line and hose of all contaminants. Make sure that the shutoff valve is off and the regulator (5) is backed all the way out.

Connect the air hose to the shutoff valve (2).

NOTE: If operating in a humid environment the muffler and air valve can freeze up. To prevent this from happening, install a heater in the air line ahead of the pump. Nordson NH-4 heaters are typically used for this purpose. Contact a local Nordson representative for additional information.

Siphon and High Pressure Fluid Hose Connection

Refer to *Specifications* on page 2-2 for additional specifications and hose sizing.

NOTE: Use only stainless steel tri-clamp fittings. Tighten all fittings securely to eliminate siphoning of air.

NOTE: Connect a high-pressure fluid hose that is at least 305-mm (12-in.) long to the pump outlet to serve as a vibration damper. If the rest of the installation is to be hard plumbed, use only 10-mm ($^3/_8$-in.) ID seamless stainless steel tubing.

See Figure 3-2.

1. Connect the siphon system, using the parts (items 7–11) shipped with the pump, to the siphon manifold (4).
2. Connect a high-pressure, reinforced PTFE, 6-mm ($^1/_4$-in.) ID fluid hose (7) to the pressure manifold (6) and heater inlet (if used).

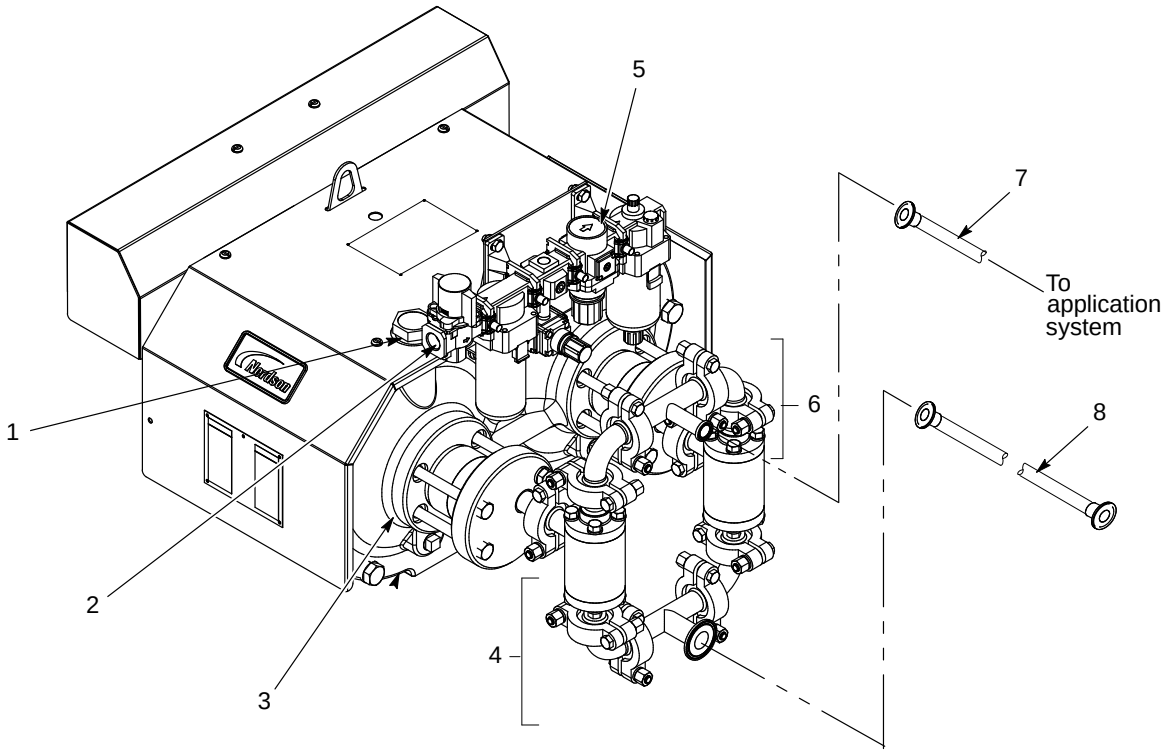


Figure 3-2 Air, Siphon, and High-Pressure Fluid Hose Connections, Solvent Chamber and Lubricator Fill

1. Solvent chamber cap (air filter)
2. Shutoff valve
3. Solvent chamber
4. Siphon manifold
5. Regulator
6. Pressure manifold
7. Fluid hose
8. Siphon hose

Optional Pressure Feed Siphon Installation

Coating material can be supplied to the pump by gravity pressure or pressure-fed from a pressure reservoir. Maximum feed pressure is 1.4 bar (20 psi). Install a shut-off valve in the pressure feed line ahead of the pump. Do not install a check valve or fluid regulator in the pressure feed line.

Section 4
Operation

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

Before Startup

WARNING: To prevent static electricity build-up, ground the pump and all system components, including the coating supply and waste container. Ungrounded components can cause a fire or explosion.

Before starting the pump, make sure that

- all fittings and connections are tightened securely;
- the shut-off valve, circulation valve(s), and drain-off valve(s) (if used) are closed and that the air regulator is backed all the way out;
- the system components (heater, filter, etc.) have been installed according to the instructions in their respective manuals;
- the proper fluid filter screen is installed and that the filter housing is secure;
- the coating material is at the ambient temperature; and,
- all safety covers are in place, and that all personnel have read and understand the safety precautions in the *Safety* section.

Flushing the Pump

Flush the pump before putting a new pump into service, before rebuilding the hydraulic section, and when changing coating materials.

NOTE: The flush material can be a solvent material or soapy water.

See Figure 4-1.

1. Remove the applicator nozzle.
2. Insert the siphon rod into a container of a suitable flush material. If a pressure feed system is used, pressurize the system with flush material.

   NOTE: Make sure that you back the air regulator out completely. The pump will run erratically if started at full pressure without fluid in the lines.

3. Pressurize the air supply line.
4. Open the air shutoff valve (1).
5. Adjust the air regulator (2) until the pump strokes 20 strokes per minute. If using a non-circulating system, trigger the applicator(s) to allow the pump to operate.
6. Observe the material flowing from the applicator or drain valve. Run the pump until the material flows without air bubbles.
7. Reduce the air pressure to zero to stop the pump.
8. Remove the siphon rod from the flush material. If the pump is pressure-fed, shut off the pressure feed.
9. Start the pump and discharge the flush material into a waste container. If using a non-circulating system, trigger the applicator(s) until all flush material has been pumped out of the system.
10. Reduce the air pressure to zero.
11. Close the air shutoff valve (1).
12. Open the fluid filter drain and clean the filter screen.

Normal Operation

See Figure 4-1.

1. Place the siphon rod into the coating material. If a pressurized system is used, pressurize the feed line.
2. Open the air shutoff valve (1) and adjust the air regulator (2) until the pump begins to stroke slowly.
3. Allow coating material to flow out of the filter drain. Close the drain.
4. Adjust the air regulator to the required pressure. Adjust the circulation valve, if used, until the pump is stroking 8–10 times per minute.

The system is now ready to start production.

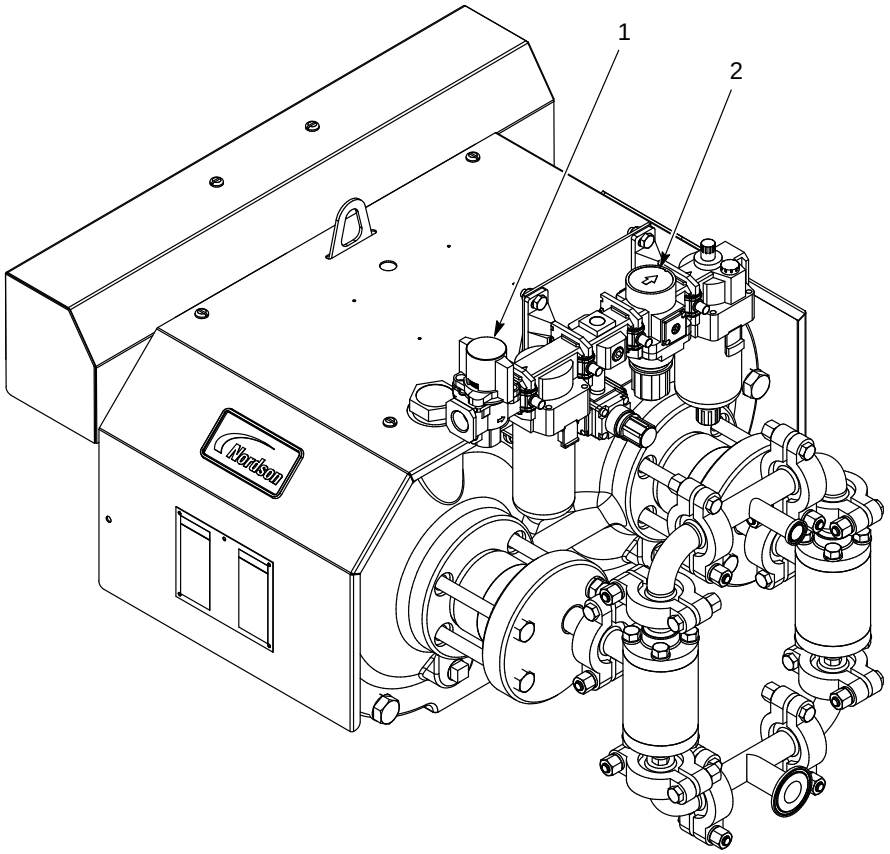


Figure 4-1 Pump Controls and Adjustments

1. Air shutoff valve
2. Air regulator

Daily Maintenance

WARNING: Make sure that all system components are grounded. Ungrounded components can cause electrical sparking, fire, or explosion.

1. Place a clean, spare screen in the fluid filter and soak the dirty screen in a solvent that is compatible with your coating material.
2. Inspect the filter screen and discard it if ruptured or distorted.

Air Filter Components

1. Drain the air filter, remove the air filter bowl, dump out any remaining water and remove the air filter element. This may be done less frequently if experience indicates that less-frequent cleaning would be adequate.
2. Wash the parts in soapy water, rinse, dry, and reuse. Replace the filter element if damaged.

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.

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.

Use the *Air Tubing Diagram* on page 5-7 and the *Pneumatic Schematic* on page 5-8 to help you diagnose pump operation problems or replace air components.

Troubleshooting Charts

Problem	Possible Cause	Corrective Action
1. Pump fails to start	Air supply input not present or inadequate	Check for adequate air volume and pressure in the supply line. Make sure that the air supply and pump shutoff valves are turned on. **NOTE:** Refer to *Specifications* on page 2-2 for air supply specifications.
	Improperly adjusted air regulator, blocked air filter element, or faulty air regulator	Check the air pressure gauge. The pump requires at least 1.4 bar (20 psi) to start. Increase the pressure if below the minimum. If increasing the pressure does not start the pump, remove and clean the air filter element. If the pump still does not start, disconnect line 2 at the lubricator and check for air flow. If no air flows out of the tubing, replace the air regulator.
	Blocked hydraulic system **NOTE:** If both circulation and drain valves are closed, the pump will not start. Closing both while the pump is operating will stop the pump.	**WARNING**: Always relieve fluid pressure before disconnecting any fittings or components in the fluid system. High-pressure fluids are dangerous and can cause serious injury. If sufficient air pressure is available to operate the pump, check for pressure in the fluid system. If fluid pressure is maintained, the condition is outside the pump. Close the drain valve and open the circulation valve. If the pump fails to start, check for a faulty circulation valve. Refer to Problem 6. Check for a clogged applicator nozzle, fluid filter screen, or siphon strainer.
	Improper air line routing	Use Figures 5-1 and 5-2 to check the pump air line routing. If all connections are correct and the pump still will not start, then the double pilot valve or the roller valves are faulty.

Continued...

Problem	Possible Cause	Corrective Action
1. Pump fails to start *(contd)*	Faulty lower roller valves	Perform the following procedures to check the two lower roller valves: 1. Disconnect tube 6 from the roller valve on the lower left side of the pump. Air should flow when the valve is actuated and stop when released. 2. Disconnect tube 7 from the roller valve on the lower right side of the pump. Air should flow when the valve is actuated and stop when released.
	Faulty upper roller valves	Check the two upper roller valves by releasing the actuator (which is normally depressed when installed) while both air pistons are in their full returned position. 1. Remove the two retaining screws that secure the roller valve assembly to the lower head casting. 2. Disconnect tube 8 on the upper left valve assembly. 3. Activate the upper left roller valve. Air should not flow. 4. Activate the upper right roller valve. Air should not flow. 5. Activate the lower right and upper left roller valves together. Air should flow. Repeat the test by removing tube 9 and activating the lower left and upper right valves. Air should flow only when both valves are activated together and should stop when released.
	Faulty pilot valve	Replace the pilot valve if the roller valves are functioning properly (as determined in the procedures above).
2. Pump stops during operation	Blocked hydraulic system	Refer to *Blocked hydraulic system* in Problem 1.

Continued...

Problem	Possible Cause	Corrective Action
3. Pump strokes irregularly or fluid pressure fluctuates	Air leak in the siphon circuit	Leaks in the siphon system may be checked by placing the drain rod in water. Close the circulation valve, open the drain valve, and operate the pump while watching for bubbles in the water. If bubbles occur, air is entering the pump through the siphon system. These are the possible leak locations: • Connections in the pressure feed system or siphon hose/rod assembly may be leaking. Tighten all fittings including those at the siphon manifold. • The siphon hose may have a small hole or crack in it. Replace the hose. • The two O-rings between the siphon manifold and the check housings may be leaking. Replace the O-rings.
	Leaks in the pneumatic system	See Figures 5-1 and 5-2 for the tube routing and pneumatic system schematic. Listen for continuous air leaks from partially opened valves or tube connections. Check for pinched tubing. Check the air filter screen for clogging. Replace any faulty parts and clean the air filter element, if necessary.
	Faulty air valve	If the pump continuously double strokes, the air valve is faulty. Rebuild or replace the air valve.
	Leaky siphon or high-pressure ball check valves	If the pump continuously double strokes, close both the circulation and drain-off valves, if used, or shut off the applicator. Both plungers should stop. Quickly open and close the drain-off valve (open for one half second or less), or trigger the applicator. If one plunger does not stop each time the valve is closed, or trigger released, but runs its full stroke and returns, the fault lies in the siphon ball check valve on that side of the pump or the high-pressure ball check valve on the opposite side. Rebuild or replace the faulty component.
	Out of coating material	Refill the coating material supply.

Continued...

Problem	Possible Cause	Corrective Action
4. Gradual loss of fluid pressure while air supply pressure remains constant	Worn hydraulic packings	Replace the hydraulic packings.
5. Coating material mixing with solvent chamber fluid	Worn hydraulic packings	Replace the hydraulic packings.
6. Pump strokes when circulation and drain-off valves are closed	Leaks in high-pressure fluid system	Look for leaks throughout the high-pressure fluid system and repair them.
	Faulty drain valve	If fluid leaks out of drain rod when the drain valve is closed, repair or replace the drain valve.
	Faulty circulation valve	Close the circulation and drain valves. Disconnect the return hose at the circulation valve and blow compressed air into the valve through the open fitting. If air escapes from the siphon rod when both the circulation and drain valves are closed, the circulation valve is faulty. Rebuild or replace the circulation valve.
	Faulty siphon and high pressure ball check valves	Refer to *Leaky siphon or high pressure ball check valves* in Problem 3.
7. Fluid pressure drops when applicators are triggered	Insufficient air supply	Refer to *Specifications* on page 2-2 for air supply specifications.
	Heavy viscous material causing inadequate flow rate	Correct the flow rate by pressure feeding (not siphoning) the coating material. The pressure feed should not exceed 1.4 bar (20 psi).
	Partially blocked fluid lines or filter screen	Check and clean the filter screen. Flush all of the fluid lines.
	Nozzle not installed or nozzle nut leaking	Install nozzle, or tighten nozzle nut.
8. Fading or narrowing of spray pattern after applicator is triggered	Inadequate air supply	Refer to *Specifications* on page 2-2 for air supply specifications.
9. Applicator nozzle plugging	Inadequate filter screen size or ruptured filter screen	Check the filter screen for proper size and for rupture or damage. Refer to the manuals provided with your filters and applicators.
	Contaminants in hoses	Check the hoses. Dirty or cured coating materials may be breaking away from the inner hose wall and plugging the nozzle.

Continued...

Problem	Possible Cause	Corrective Action
10. Tails appearing in a spray pattern that was normal **NOTE:** Tails are streams of unatomized coating material at the outer edges of the spray pattern	Inadequate circulation rate allowing coating material to cool at the spray device	Increase the circulation rate by opening the circulation valve. Contact your Nordson representative for help in determining the proper circulation rate for your system.
	Partially blocked fluid filter screen	Clean the fluid filter screen. Refer to the filter manual.
	Change in coating material viscosity	Check for a change of viscosity. If necessary, add solvent to the material, or change to a new material.
	Inadequate fluid pressure or air pressure to the pump.	Increase the fluid pressure to the applicator. Increase pump air pressure, make sure supply air is to specifications.
11. Temperature drops after applicators are triggered	Inadequate heater capacity	Make sure the heater capacity is adequate and that the heaters are functioning correctly. Refer to the heater manual.
	Changes to the system	Changing to larger flow-rate nozzles or adding more spray guns to the system may require adding more fluid heaters.

Air Tubing Diagram

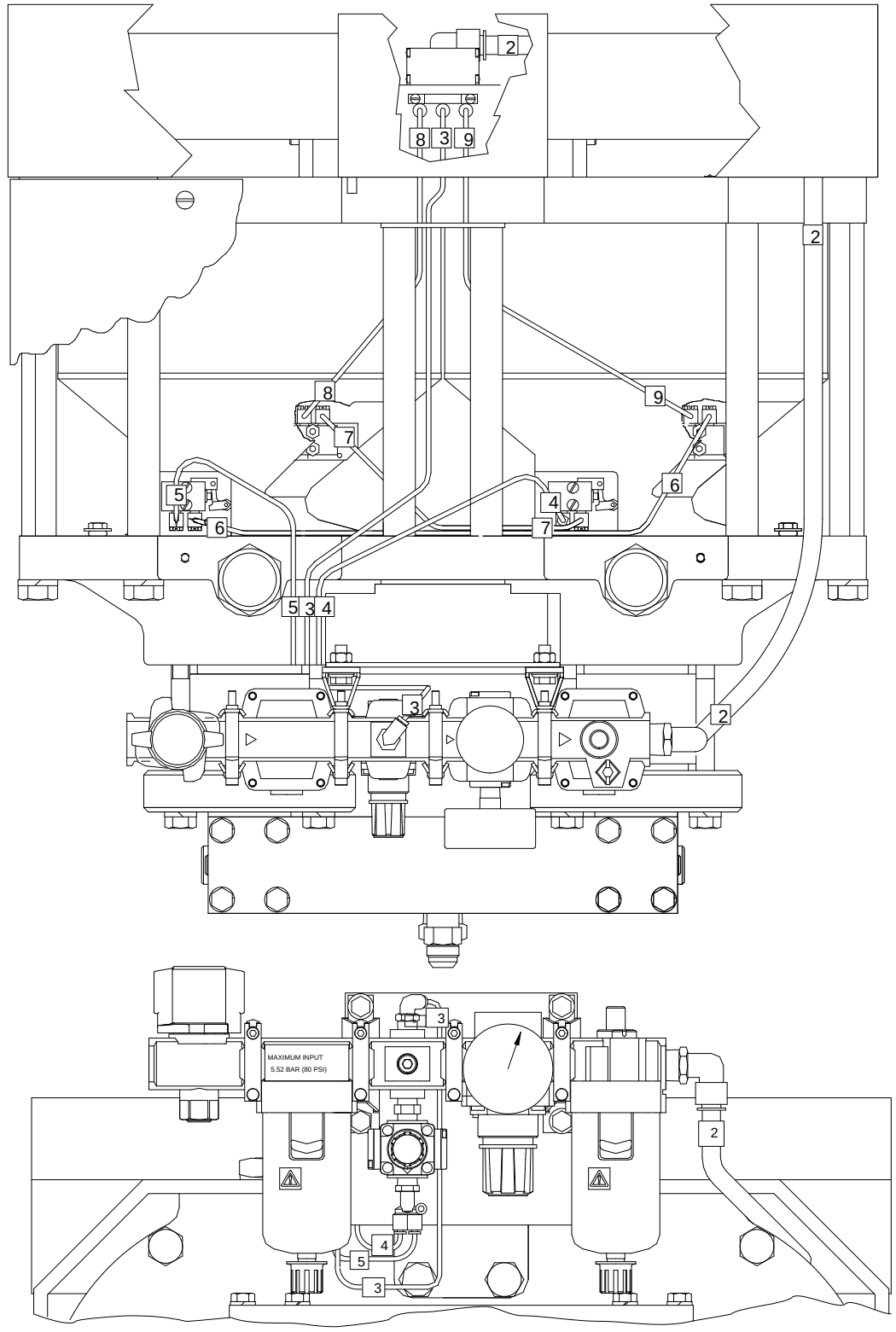


Figure 5-1 Tubing Diagram

Pneumatic Schematic

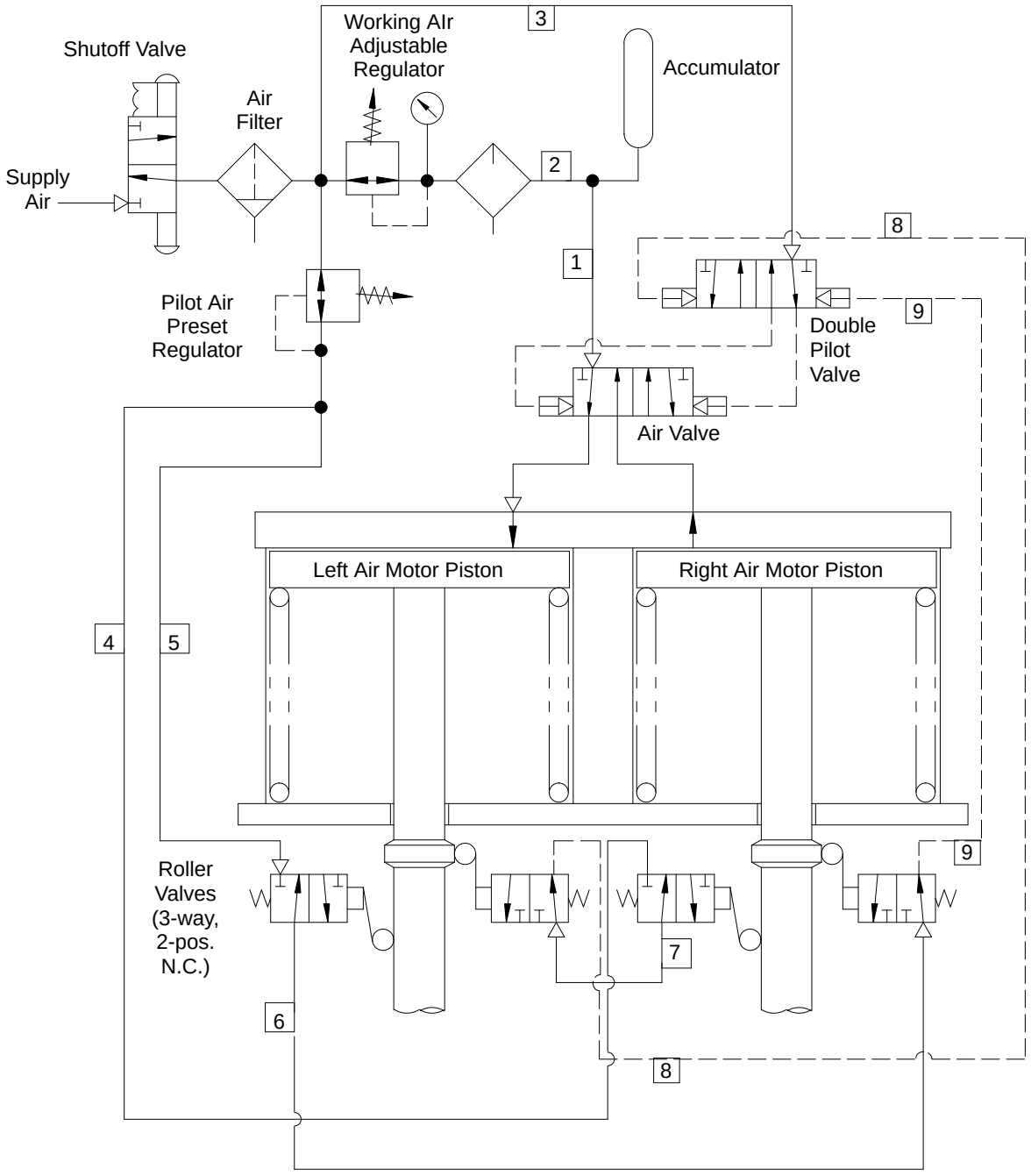


Figure 5-2 Pneumatic Schematic

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.

Introduction

WARNING: To prevent personal injury or equipment damage, shut off the pump air supply and relieve the system fluid pressure. Shut off the pressure feed system, if used. Relieve the pressure feed system pressure.

Hydraulic Section Repair

Use the following to repair the hydraulic section:

- Hydraulic section repair kit
- Hydraulic packing service kit
- High-pressure ball check kit
- Siphon ball check kit
- O-ring lubricant (H1-grade or other food-safe lubricant must be used)

Refer to the *Parts* section for kit parts lists and illustrations. Have the parts needed on hand before beginning repairs.

Hydraulic Section Removal

See Figure 6-1.

1. Remove the screws (1) and lock washers (2) that secure the hydraulic section to the pump.
2. Remove the high-pressure cylinders (4). Remove the O-rings (3) from the cylinders.

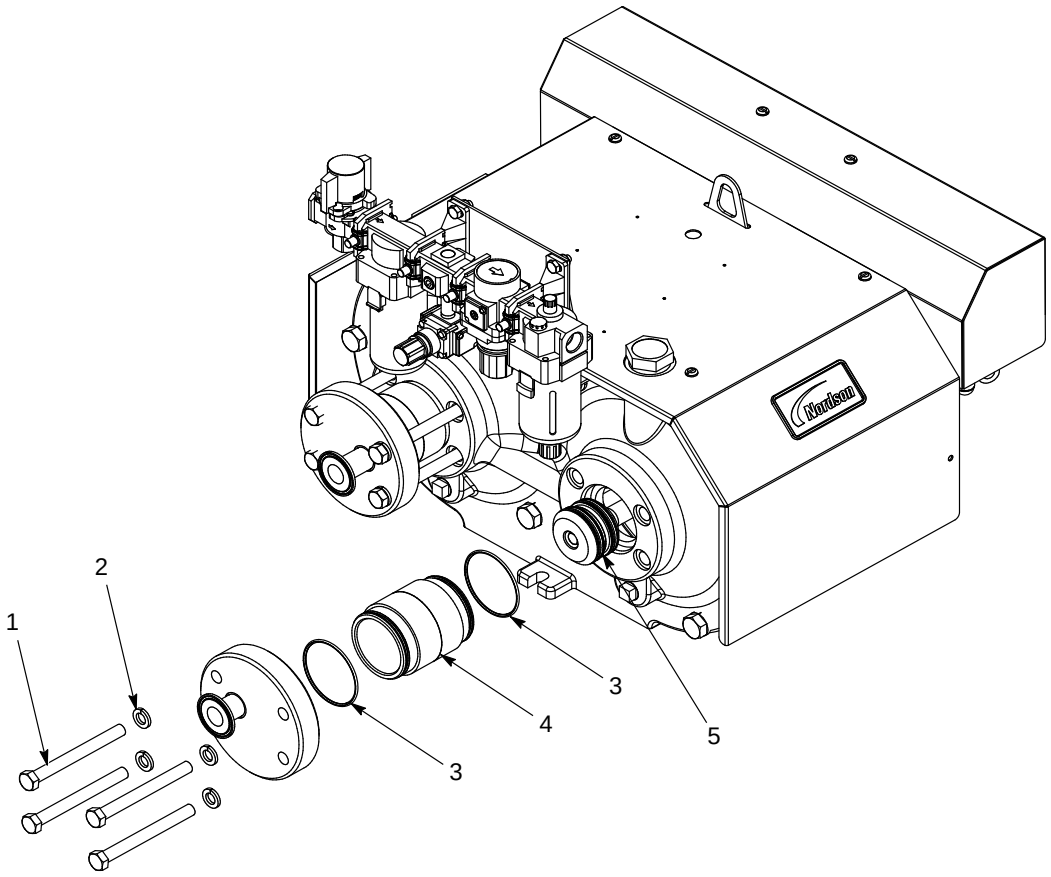


Figure 6-1 Hydraulic Section Removal

NOTE: For clarity, the hydraulic manifold is not shown.

1. Screw
2. Lock washer
3. O-ring
4. High pressure cylinder
5. Plunger assembly

Hydraulic Packing Replacement

See Figure 6-2. The Hydraulic Packing Service Kit contains items 2, 4, 5, 7, and 8, plus the high-pressure cylinder O-rings.

NOTE: Coat all O-rings, U-cups, and backup rings with H1-grade or other food-safe O-ring lubricant before installing.

1. Remove the hex-head screws (1) and pressure sealing washer (2). Pull the plunger assemblies off the piston shafts (9).

   NOTE: The pressure sealing washer (2) cannot be reused.

2. Separate the hydraulic seal retainers (3) and hydraulic seal holder (6).
3. Remove and replace the O-rings (4, 7), U-cups (5), and backup rings (8).
4. Install the plunger assemblies onto the piston shafts, with the open end of the U-cups facing away from the air motor.
5. Apply medium strength threadlock adhesive (1A) (removable) to screws (1). Install the new pressure sealing washer (2) and screws (1) and tighten to 34–41 N•m (25–35 ft-lb).

If no other repairs are being made to the hydraulic section, reinstall it as described in *Hydraulic Section Installation* on page 6-8.

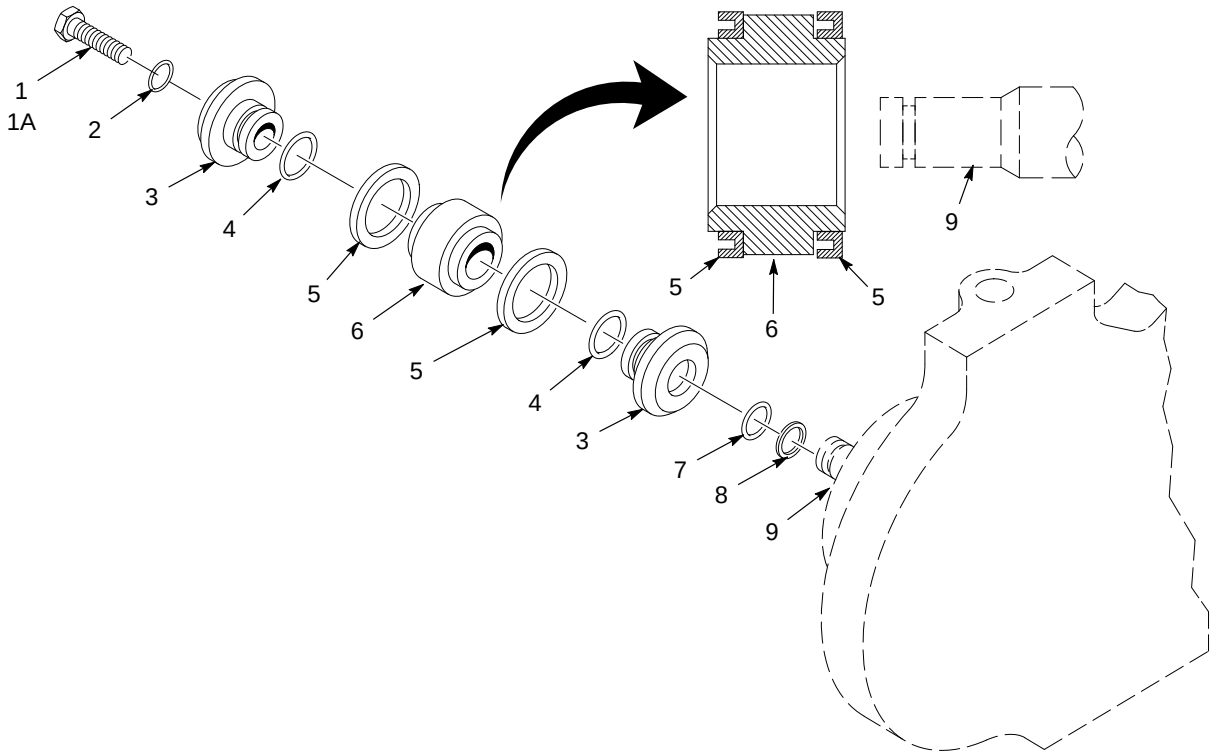


Figure 6-2 Hydraulic Packing Replacement

1. Screw (2)
1A. Threadlock adhesive
2. Pressure sealing washer (2)
3. Hydraulic seal retainer (4)
4. O-ring (4)
5. U-cup (4)
6. Hydraulic seal holder (2)
7. O-ring (2)
8. Back-up ring (2)
9. Piston shaft (2)

High-Pressure Check Rebuild

See Figure 6-3.

Use the Pressure Ball Check Service Kit to rebuild the pressure ball checks. One kit will rebuild both pressure ball checks. The kit contains items 4, 5, 6, 7, and 8.

NOTE: Coat the O-rings with H1-grade or other food-safe O-ring lubricant before installing.

1. Remove the clamps (3) that secure the hydraulic manifold to the check housings (9).
2. Remove four screws (1) and washers (2) from the top of the check housing (9).
3. Remove and replace the ball cages (4), balls (5), O-rings (6, 8), and ball seats (7).

   NOTE: Do not tighten the siphon manifold screws until the hydraulic section is installed on the solvent chamber to allow for proper alignment of the hydraulic section and solvent chamber. Do not tighten the solvent chamber until the clamps are tight.

4. Install the hydraulic manifold on the check housing (9).
5. If the siphon ball checks are not being rebuilt, install the hydraulic section on the air motor. Refer to the *Hydraulic Section Installation* on page 6-8.

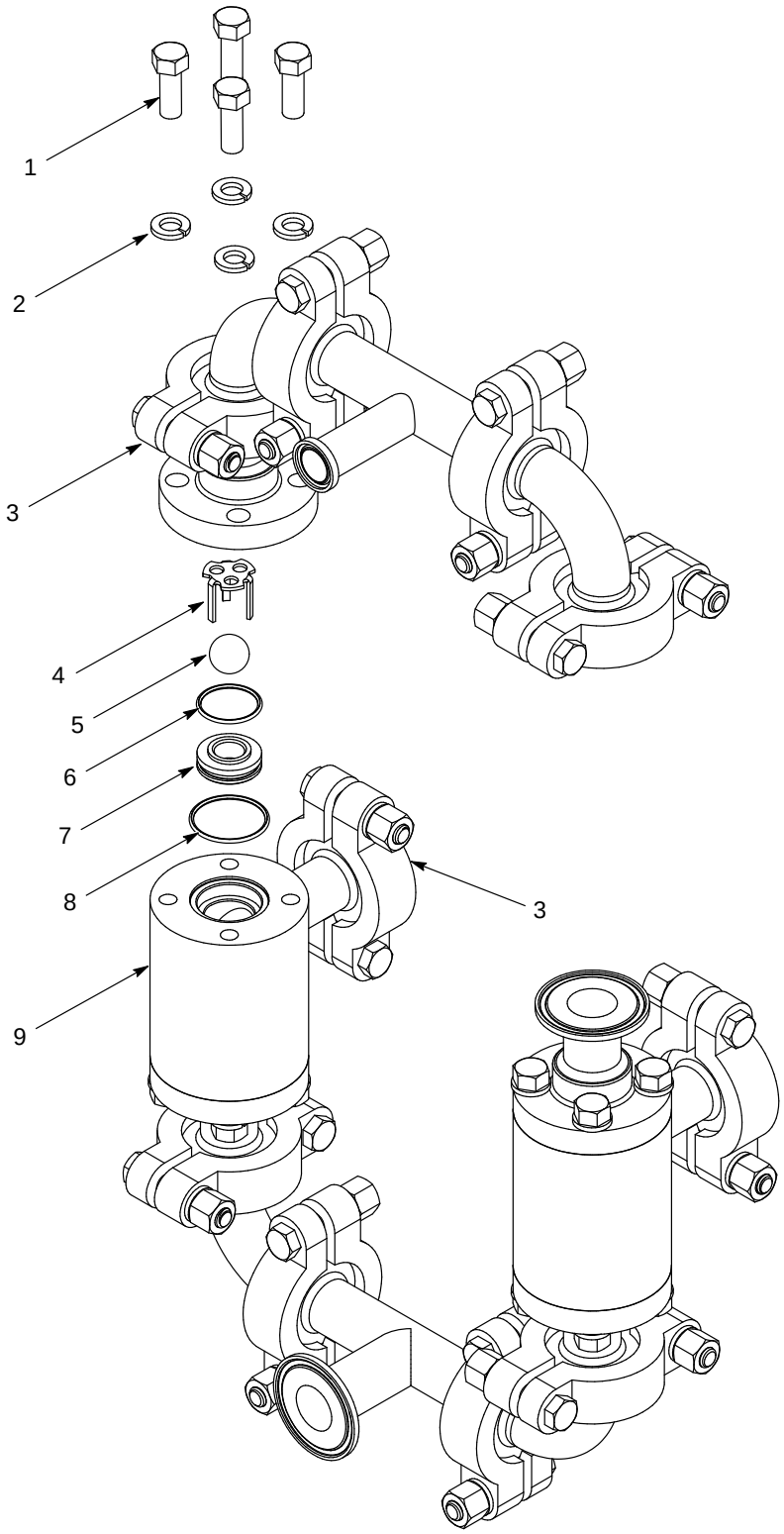


Figure 6-3 High-Pressure Check Rebuild

1. Screw
2. Lock washer
3. Clamp
4. Ball cage
5. Balls
6. Ball seat O-ring
7. Ball seat
8. Check house O-ring
9. Check housing

Siphon Check Rebuild

See Figure 6-4.

Use the Siphon Ball Check Service Kit to rebuild the siphon ball checks. One kit will rebuild both siphon ball checks. The kit contains items 4, 5, 6, and 7.

NOTE: Coat the O-rings with H1-grade or other food-safe O-ring lubricant before installing.

1. Remove the clamps (11) that secure the siphon manifold (8) to the check housings (1).
2. Remove and replace the O-rings (5, 7) ball seats (6), and balls (4). Do not lose the ball guide pins (3).

   NOTE: Do not tighten the manifold screws until the hydraulic section is installed on the solvent chamber. Keep the manifold screws loose to allow for proper alignment of the hydraulic section to the solvent chamber.

3. Install the check housings (1) on the siphon manifold (8) with the clamps (11). Tighten clamps to finger tight.
4. Install the hydraulic section on the air motor. Refer to the *Hydraulic Section Installation* on page 6-8

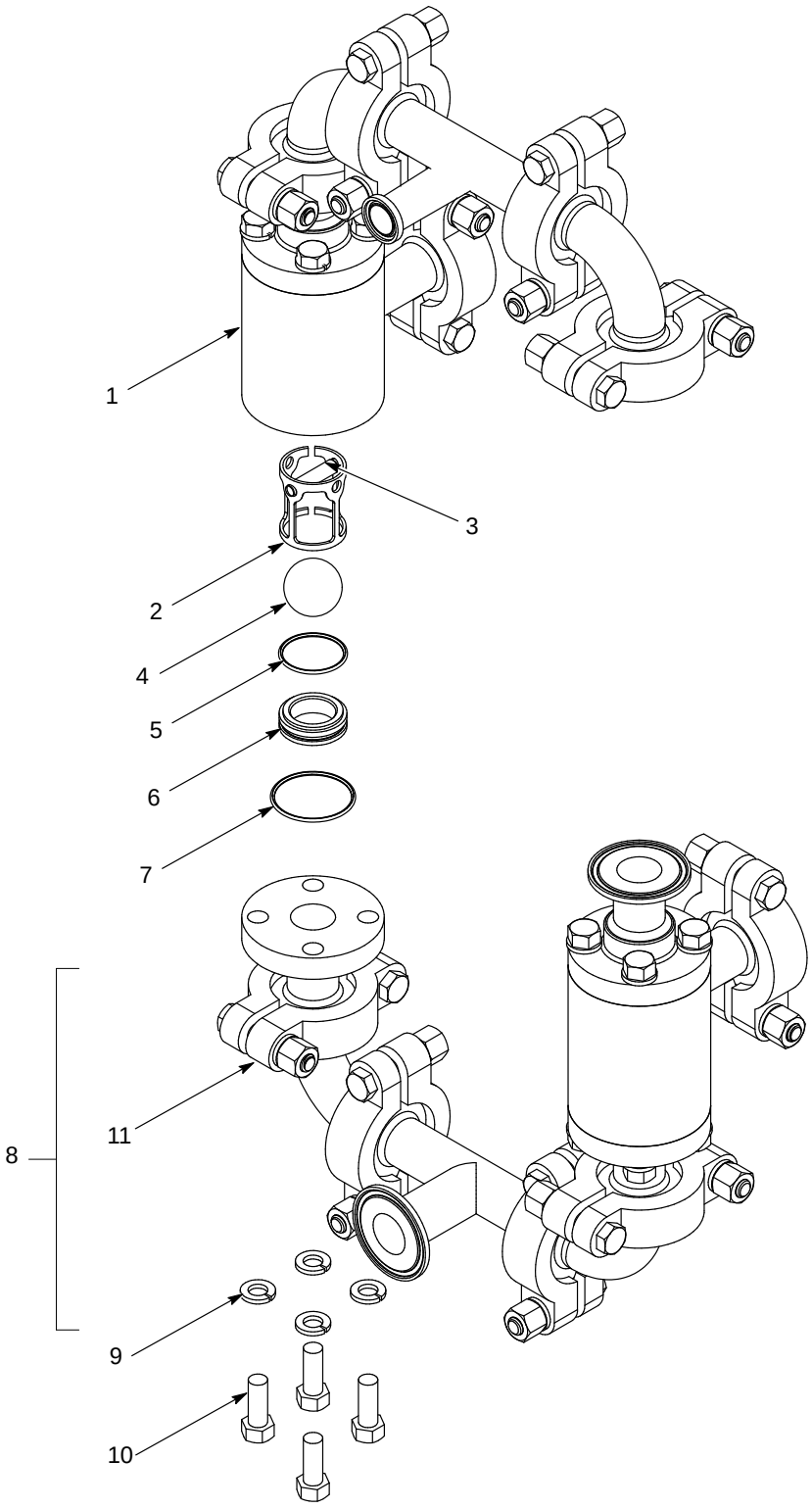


Figure 6-4 Siphon Check Rebuild

1. Check housing
2. Ball guide
3. Pin
4. Ball
5. Ball seat O-ring
6. Ball seat
7. Check housing O-ring
8. Siphon manifold
9. Lock washer
10. Screw
11. Clamp

Hydraulic Section Installation

See Figure 6-5.

1. Thoroughly coat new O-rings (4) with H1-grade or other food-safe O-ring lubricant and install them onto the high-pressure cylinders (5). New O-rings are included in the hydraulic packing service kit and in the hydraulic section repair kit.
2. Install the high-pressure cylinders (5) over the plunger assembly (6) and into the solvent chamber.
3. Ensure all clamps on the hydraulic manifold are tightened to 25 ft-lb before installing on the hydraulic section.
4. Install the flange (3) on the high-pressure cylinders (5). Install the lock washers (2) and screws (1) and tighten to finger tight.
5. Clamp the hydraulic manifold to the hydraulic section to 25 ft-lb.
6. Tighten the screws (1) and lock washers (2) on the hydraulic flange to 30–35 ft-lb.

   NOTE: Outlets on the hydraulic flange should be oriented so they are closest to the inside top bolt.

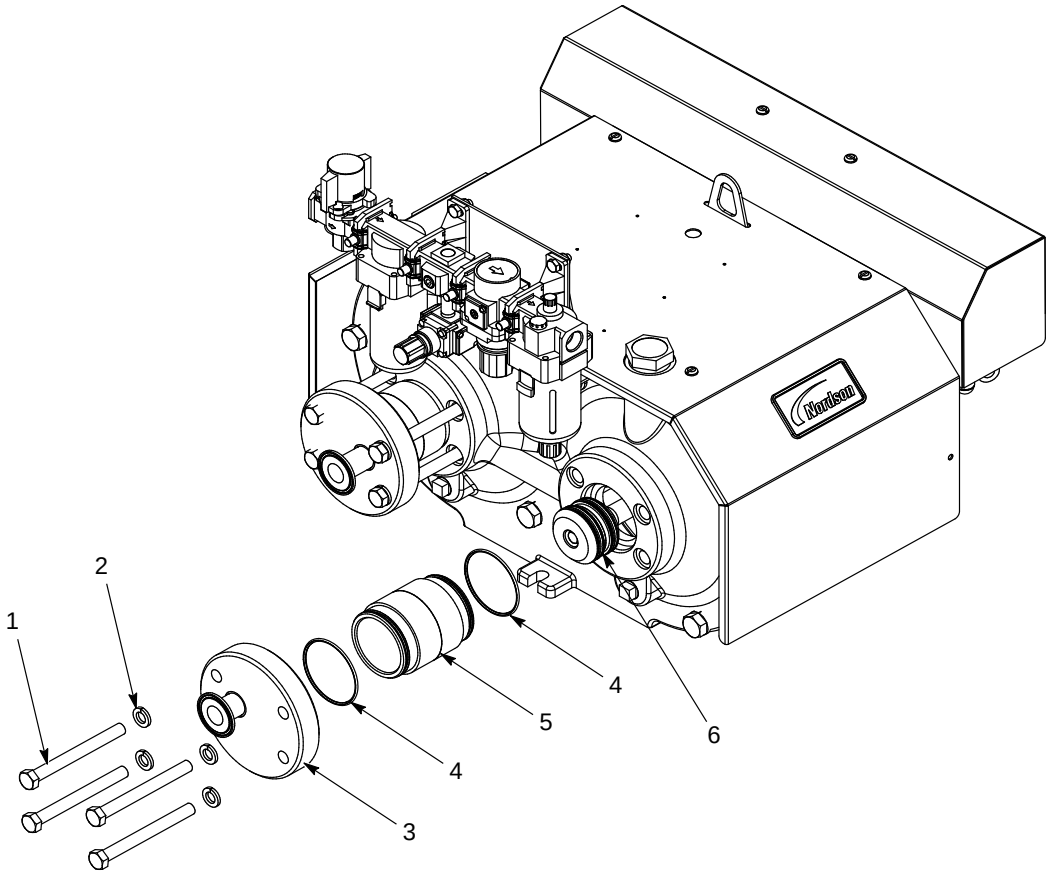


Figure 6-5 Hydraulic Section Installation

1. Screw
2. Lock washer
3. Flange
4. O-ring
5. High-pressure cylinder
6. Plunger assembly

Air Motor Repair

Use the following to repair the air motor:

- Air motor repair kit
- Solvent seal service kit
- Low-temperature lithium grease

It will be necessary to disconnect the air tubing from the valves to repair the air motor and air valve. Refer to the air tubing diagram on page 5-7 in the *Troubleshooting* section when reconnecting the tubing.

Air Motor Disassembly

See Figure 6-6.

1. Remove the screws (1, 3) that secure the cover plate (4) and accumulator cover (2) to the pump. Remove the two side covers (6, 14).
2. Remove the hydraulic section and plunger assembly. Refer to *Hydraulic Section Removal* on page 6-2.

WARNING: The air motor springs are under tension. To prevent personal injury and equipment damage, perform the following steps exactly as numbered.

3. Remove two screws and lock washers (7, 8) from the solvent chamber (12), as illustrated. Do not remove the remaining screws at this time.
4. Thread the spring removal studs and flat washers (10, 11) through the solvent chamber (12) and into the upper head (5). Tighten the nuts (9) until snug.
5. Remove the remaining screws and lock washers that secure the solvent chamber (12) to the upper head (5)
6. Carefully back off the spring removal stud nuts (9), in alternating turns, until the tension in the air motor springs is released.

Air Motor Disassembly *(contd)*

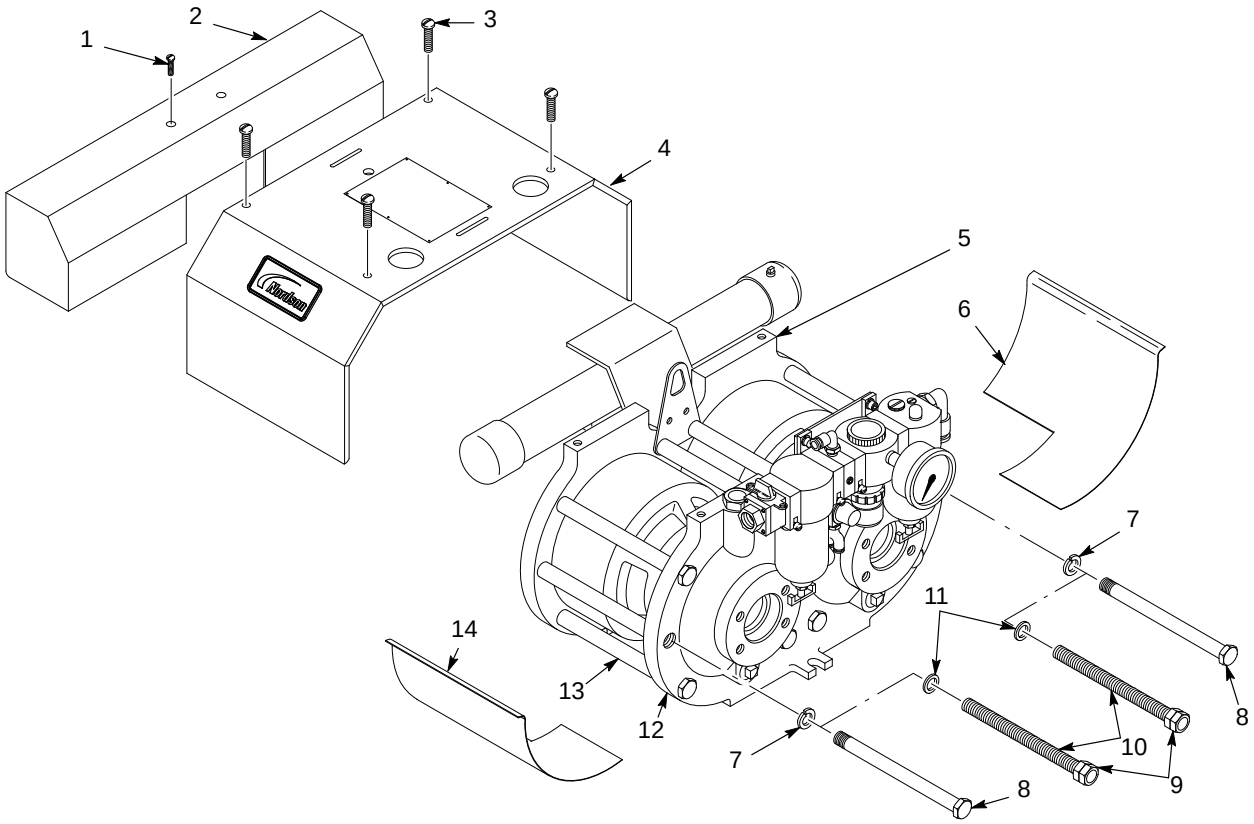


Figure 6-6 Air Motor Disassembly – Removing Covers and Releasing Spring Tension

1. Accumulator cover screws
2. Accumulator cover
3. Cover plate screws
4. Cover plate
5. Upper head
6. Side guard
7. Lock washers
8. Screws
9. Nuts
10. Spring removal studs
11. Flat washers
12. Solvent chamber
13. Spacers
14. Side guard

7. See Figure 6-7. Remove the upper head (8), air motor springs (3), air cylinders (9), and piston assemblies (2).
8. Remove the screws, flat washers, and nylon washers (10, 11, 12) that secure the lower heads (13) to the solvent chamber (1).
9. Remove the solvent seal packing glands (15) from the lower heads.

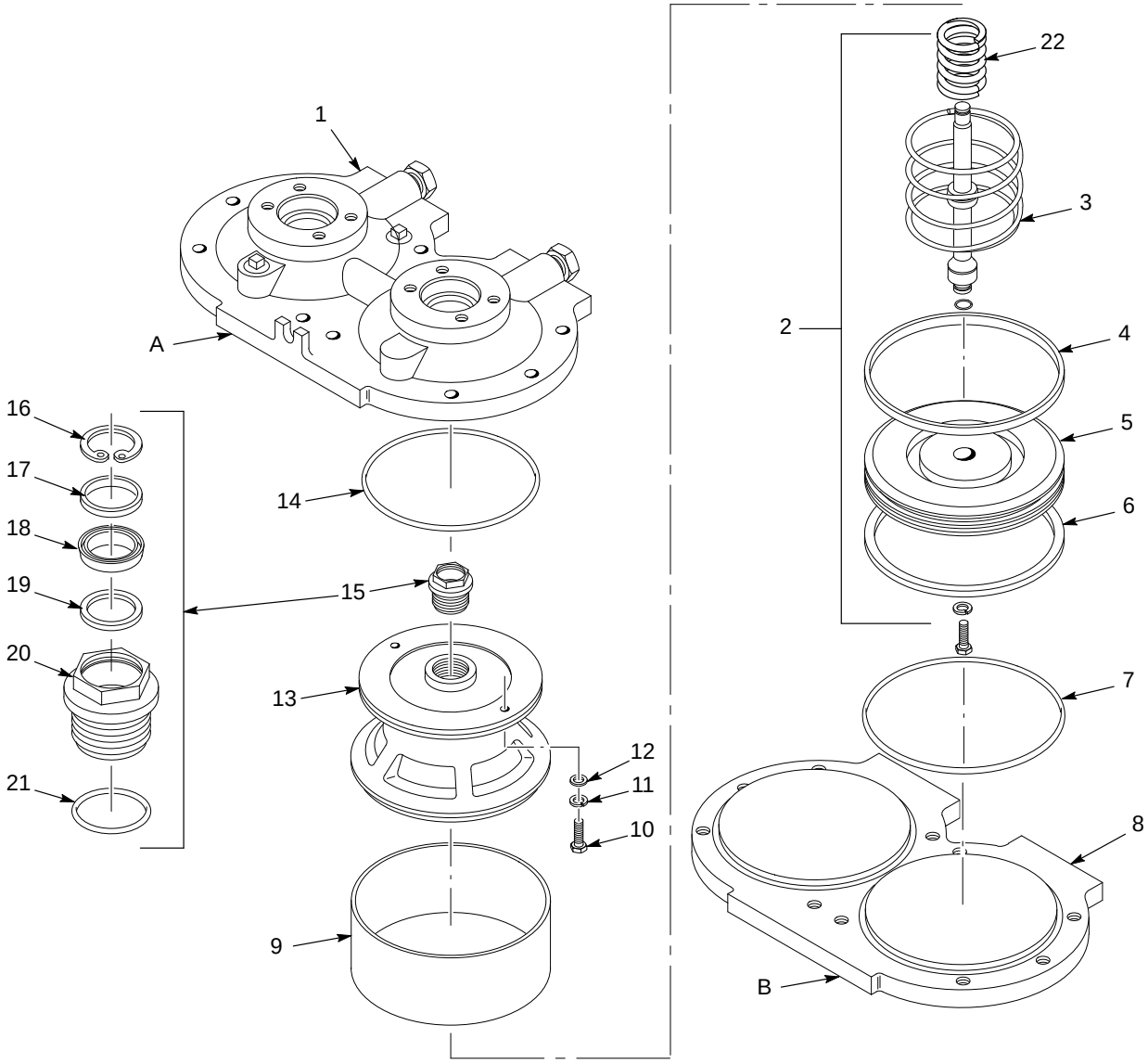


Figure 6-7 Air Motor Disassembly

1. Solvent chamber
2. Piston assemblies
3. Air motor springs
4. Glide rings
5. Pistons
6. U-cups
7. Upper head O-rings
8. Upper head
9. Air cylinders
10. Screws
11. Flat washers
12. Nylon washers
13. Lower heads
14. Lower head O-rings
15. Solvent seal packing glands
16. Retaining ring
17. Spacer
18. U-cup
19. Bearing
20. Housing
21. O-ring
22. Inner air motor spring

Air Motor Assembly

See Figure 6-7.

Lay the pump on its side with surfaces A and B flat against a horizontal plane during assembly. This will help you to properly align the upper head with the solvent chamber.

1. Inspect the following parts for damage and replace as necessary:
   - U-cups (6), glide rings (4), and pistons (5)
   - lower head O-rings (14) and upper head O-rings (7)
   - solvent seal packing glands (15)—replace or rebuild
   - air cylinders (9)—no scratches on the inside walls of the cylinder are permissible

   NOTE: Coat all O-rings, U-cups, and glide rings with low-temperature lithium grease before installation.
2. Install the solvent seal packing glands (15) and O-rings (14) into the lower heads (13).
3. Install the lower heads on the solvent chamber (1) with the screws (10), flat washers (11), and nylon washers (12). Tighten the screws securely.
4. Install the O-rings (7) into the grooves in the upper head.
5. Coat the inside walls of the air cylinders (9) with low-temperature lithium grease. Install the air cylinders into the grooves in the upper head (8).
6. Install the pistons into the air cylinders (9).
7. Install the air motor springs (3, 22) onto the pistons.
8. Install the lower heads onto the air cylinders (9), carefully guiding the ends of the piston shafts through the solvent seal packing glands.
9. See Figure 6-6 on page 6-11. Install two spacers and the spring removal studs as illustrated. Turn down the stud nuts until they are snug against the solvent chamber.
10. Tighten the stud nuts evenly by alternating turns to draw the upper head and solvent chamber together until you can thread the screws (8) into the upper head.
11. Install the rest of the spacers, plus eight lock washers and screws (7, 8). Thread the screws into the upper head until they are up against the solvent chamber. Do not tighten the screws at this time.
12. Remove the spring removal studs (10) and install the remaining two lock washers and screws.
13. See Figure 6-8 on page 6-14 for the torquing pattern. Tighten all screws to 41–47 N•m (30–35 ft-lb).
14. See Figure 6-6 on page 6-11. Install the cover plate (4), accumulator cover (2) and side guards (6, 14) onto the air motor.
15. Install the plunger assembly and hydraulic section. Refer to *Plunger Assembly Rebuild* on page 6-3 and *Hydraulic Section Installation* on page 6-8.

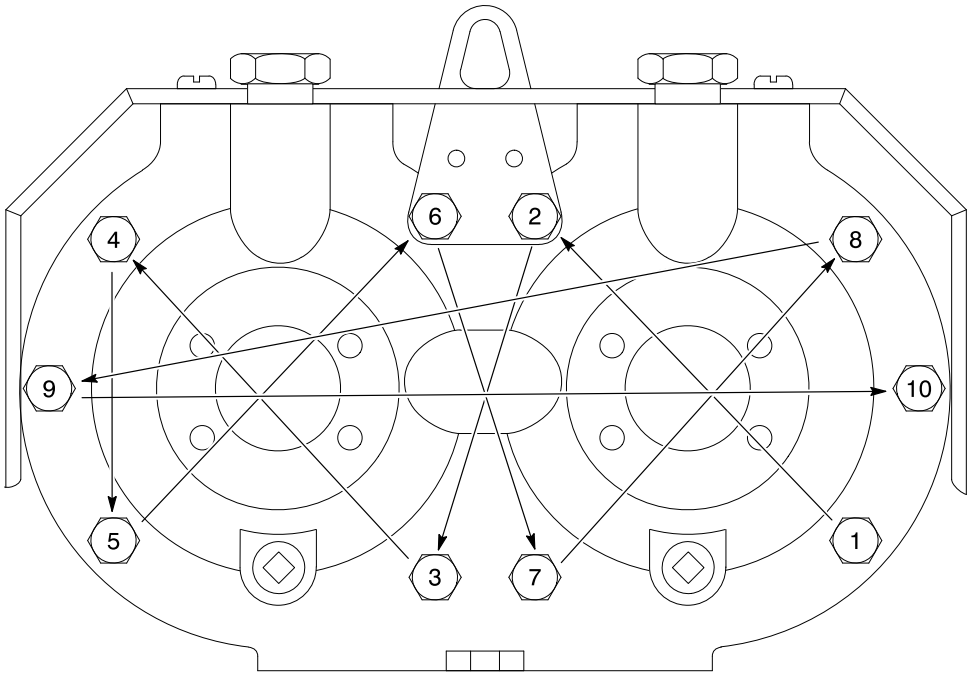


Figure 6-8 Air Motor Screw Torquing Pattern

Air Valve Repair

See Figure 6-9.

Use the Air Valve Repair Service Kit to replace items 1, 5, 10, and 12. Other parts can be ordered separately, as needed.

Air Valve Disassembly

1. Disconnect the tubing from the connectors (2).
2. Remove the screws (1). Remove the air valve from the air motor.
3. Remove the valve mounting O-rings (12).
4. Remove the screws (3), end plates (4), and O-rings (5).
5. Carefully push out the spool (11) out of the valve body.
6. Remove the spacers (6, 7, 8, 9) and O-rings (10). Discard the O-rings.
7. Inspect the spool (11) and valve spacers (6, 7, 8, 9) for wear or damage. Replace if necessary.

Air Valve Assembly

NOTE: Coat the valve bore, O-rings, and spool with low-temperature lithium grease before installation.

1. Insert the spacers (7, 8, 9) and O-rings (10) into the valve body as illustrated. Install the red exhaust spacers (7) with the ID holes out.
2. Install the spool (11) through the spacers and O-rings.
3. Insert the end spacers (6) with the chamfered edge pointing out, as illustrated.

Air Valve Assembly *(contd)*

4. Install the end plate O-rings (5) into the groove formed by the end spacer and body chamfers.
5. Install the end plates (4) and screws (3). Tighten the screws securely.
6. Install the mounting O-rings (12) in the valve body.
7. Install the air valve on the upper head. Tighten the screws (1) securely.
8. Connect the air tubing to the connectors (2).

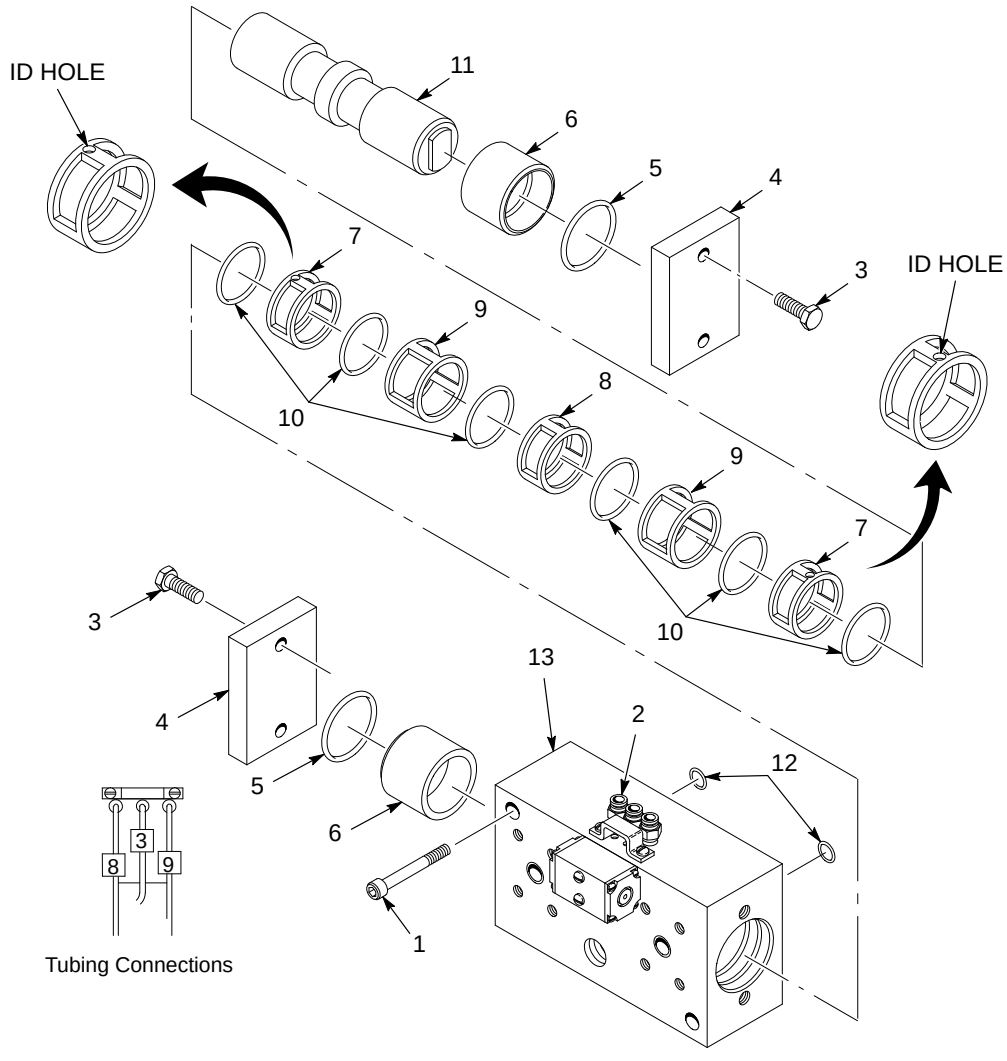


Figure 6-9 Air Valve Repair

1. Mounting screws
2. Tubing connectors
3. End plate screws
4. End plates
5. End plate O-rings
6. End spacers
7. Exhaust spacers (red)
8. Middle spacer (aluminum, narrow)
9. Spacers (aluminum, wide)
10. O-rings
11. Spool
12. Valve mounting O-rings

Section 7
Parts

Introduction

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

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 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.

- 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.

Item	Part	Description	Quantity	Note
—	0000000	Assembly	1	
1	000000	• Subassembly	2	A
2	000000	• • Part	1	

Parts Lists Table of Contents

Quick Reference Lists

Assembly Part Numbers

Part	Description	Note
1609629	Pump, hDR	
139461	Valve, air	A
139477	Gland, packing, solvent seal	

NOTE A: Air valve only. Does not include mounting screws or O-rings between valve and upper head. Refer to *Service Kits* for air valve assembly that includes valve and mounting parts.

Service Kit List

Refer to the appropriate page for kit contents.

Part	Description	Page
141435	Service kit, repair, air valve	7-15
1616434	Service kit, repair, air motor, green	7-15
141436	Service kit, repair, air motor	7-15
1609656	Service kit, solvent seal	7-16
1609657	Service kit, hydraulic packing	7-16
1609658	Service kit, high pressure check	7-17
1609659	Service kit, siphon check	7-17
1609660	Service kit, repair, hydraulic section	7-18
1611121	Service kit, NPT conversion	7-18

Hydraulic Section Parts

See Figure 7-1.

Item	Part	Description	Quantity	Note
—	------	HYDRAULIC SECTION, hDR	1	
1	981402	• SCREW, hex, ⅜–16 x 1.00, cap, Zinc	16	
2	983160	• WASHER, lock, E, SPT, ⅜, steel, NI	16	
3	------	• TEE, reducing, hygienic, 1 in. to ¾	1	
4	------	• ELBOW, hygienic, 1 in.	4	
5	------	• CLAMP, high pressure, hygienic, 1–1 ½ in.	10	
6	------	• CAP, housing, check, upper, hDR	2	
7	503574	• CAGE, ball	2	D
8	------	• BALL, 316 stainless steel, .688, 100	2	D
9	------	• O-RING, –022, FDA grade FKM, 60 duro	2	D, F
10	------	• SEAT, ball, .688 diameter, hDR	2	D
11	------	• O-RING, –026, FDA grade FKM, 60 duro	2	D, F
12	------	• HOUSING, check assembly, hDR	2	
13	------	• TEE, hygienic, 1 in.	1	
14	------	• PIN, ball guide, pump	2	
15	503596	• GUIDE, ball	2	
16	------	• BALL, 316 stainless steel, 1.125, 100	2	E
17	------	• O-RING, –025, FDA grade FKM, 60 duro	2	E, F
18	------	• SEAT, ball, 1.125 diameter, hDR	2	E
19	------	• O-RING, –029, FDA grade FKM, 60 duro	2	E, F
20	------	• CAP, housing, check, lower, hDR	2	
21	------	• FLANGE, mounting, check, hDR, right, assembly	1	
NS	------	• FLANGE, mounting, check, hDR, left, assembly	1	
22	------	• O-RING, –149, FDA grade FKM, 60 duro	4	B, C, F
23	------	• CYLINDER, high pressure, hDR	2	
24	981549	• SCREW, hex head, 5/16 in., stainless steel	2	
25	------	• WASHER, screw seal, stainless steel, 5/16	2	B, C, F
26	------	• RETAINER, hydraulic seal	4	
27	------	• O-RING, –028, FDA grade FKM, 60 duro	4	B, C, F
28	------	• SEAL, spring, 2 3/16 x 2 ½ x 3/6, UHMW–PE	4	C
29	------	• HOLDER, hydraulic seal, hDR	2	
30	------	• O-RING, –016, FDA grade FKM, 60 duro	2	B, C, F
31	954045	• BACK-UP RING, single, ⅝ x ¾ in.	2	A, B, C, F
NS	------	• GASKET, buna–N, 1.00	10	C, D, E, F
NS	------	• LUBRICANT, O-ring, NSF–H1, food grade, 4L	AR	

NOTE A: Noted parts included in Air Motor Repair Kit, part 141436. Refer to page 7-15.

B: Noted parts included in Solvent Seal Packing Gland Service Kit, part 1609656. Refer to page 7-16.

C: Noted parts included in Hydraulic Packing Service Kit, part 1609657. Refer to page 7-16.

D: Noted parts included in High-Pressure Check Service Kit, part 1609658. Refer to page 7-16.

E: Noted parts included in Siphon Check Service Kit, part 1609659. Refer to page 7-17.

F: Noted parts included in Hydraulic Section Repair Kit, part 1609660. Refer to page 7-18.

AR: As Required

NS: Not Shown

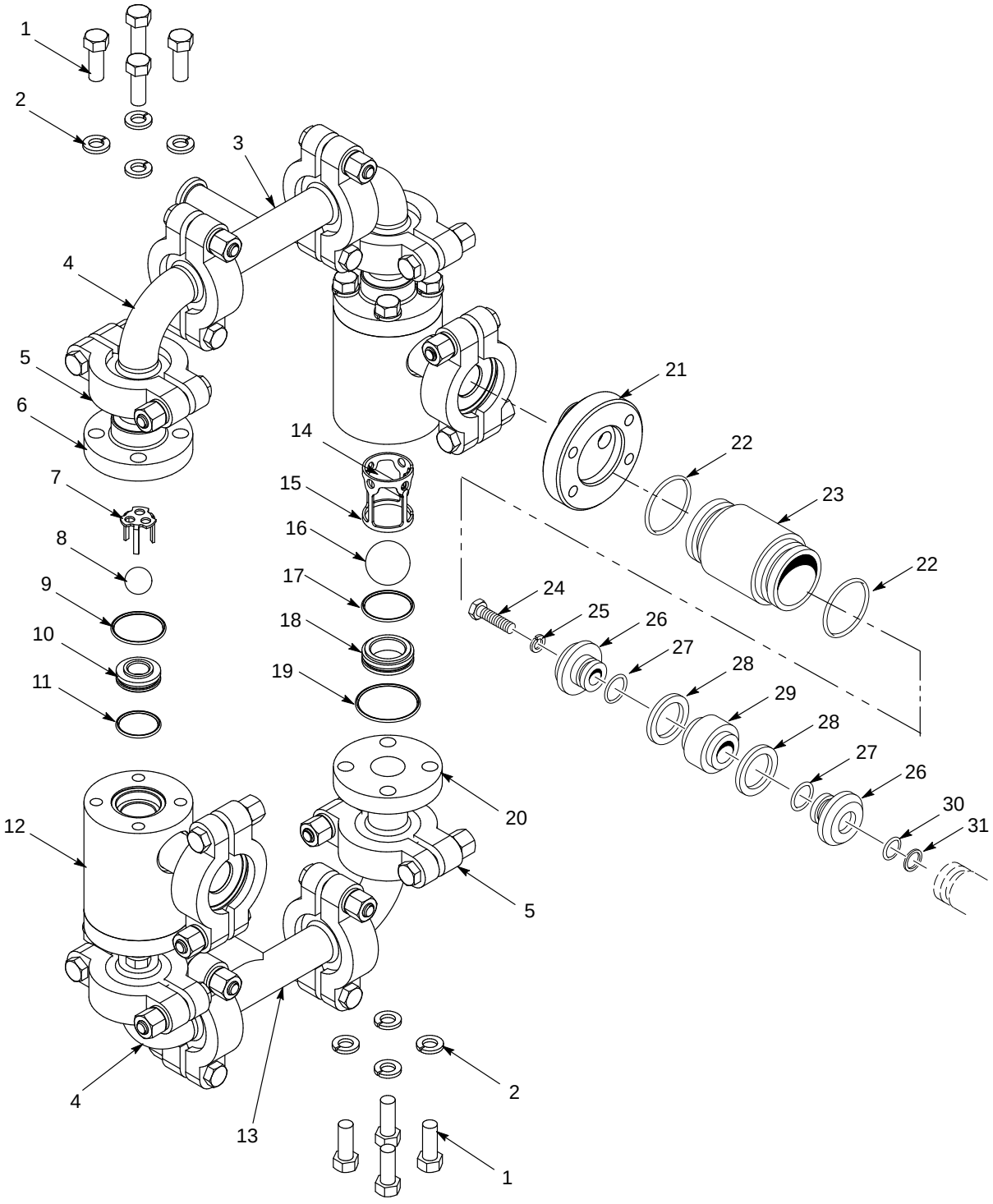


Figure 7-1 Hydraulic Section Parts

Air Motor Parts

See Figure 7-2.

Item	Part	Description	Quantity	Note
—	------	MOTOR, air	2	
1	119876	• CYLINDER, air, glass	2	
2	139492	• HEAD, lower	2	
3	139477	• GLAND, packing, solvent seal	2	
4	986917	• • RETAINING RING, internal, #112, invert	1	B
5	139480	• • SPACER, solvent seal	1	B
6	139493	• • U-CUP, polyurethane, $^{7}/_{8}$ x 1 $^{2}/_{8}$ x $^{1}/_{4}$ in.	1	B
7	139481	• • BEARING, shaft, solvent seal	1	B
8	139478	• • HOUSING, packing gland	1	
9	945081	• • O-RING, 1 $^{1}/_{4}$-in. tube	1	A, B, F
10	942711	• O-RING, 9.25 x 9.50 x 0.125 in.	2	A
11	139479	• SPACER	10	
12	983440	• WASHER, lock, split, $^{5}/_{8}$ in., steel, nickel	8	
13	981473	• SCREW, hex head, $^{5}/_{8}$-18 x 11.00 in., zinc, G8	10	
14	973434	• PLUG, pipe, square, $^{1}/_{2}$ in., stainless steel	2	
15	139489	• CHAMBER, solvent	1	
16	119872	• FILTER, air	2	
17	139459	• SHAFT, piston	2	
18	139486	• SPRING, compression, 10.25 x 5.938 OD x 0.33 in.	2	
19	940205	• O-RING, Buna-N, 0.875 x 1.00 x 0.063 in.	2	A
20	1616180	• RING, glide, green, cut	2	A
21	139460	• PISTON	2	
22	119857	• U-CUP, 9 $^{5}/_{16}$ x 10.00 x $^{11}/_{32}$ in.	2	A
23	983007	• WASHER, flat, 0.531 x 1.00 x 0.063 in., zinc	2	
24	981470	• SCREW, socket $^{1}/_{2}$-.13 x 1.25 in., zinc, Nylok	2	
25	942742	• O-RING, Buna-N, 10.00 x 10.25 in.	2	A
26	139470	• HEAD, upper	1	
27	139497	• WASHER, Nylon, self-sealing	4	A
28	983504	• WASHER, flat, 0.281 x 0.734 x 0.063 in., zinc	4	
29	981472	• SCREW, hex head, $^{1}/_{4}$-20 x 1.00 in., stainless steel, G8	4	
30	981770	• SCREW, fillister head, with lock washer, #8–32 x 0.50 in., zinc	2	
31	165745	• ADAPTER, roller valve	2	
32	164419	• VALVE, roller operated	4	
33	981469	• SCREW, flat, #8-32 x 1.00 in., steel, zinc	4	
34	984112	• NUT, hex, lock, thin, #8-32 UNJC-3B	4	
35	971605	• ELBOW, universal	8	
36	981063	• SCREW, fillister head, with lock washer, #8–32 x 0.875 in., zinc	4	
37	167480	• RING, lift	2	
38	------	• SPRING, inner	1	

NOTE A: Noted parts included in Air Motor Repair Kit, part 1616434. Refer to page 7-15.
B: Noted parts included in Solvent Seal Packing Gland Service Kit, part 1609656. Refer to page 7-16.
F: Noted parts included in Hydraulic Section Repair Kit, part 1609660. Refer to page 7-18.

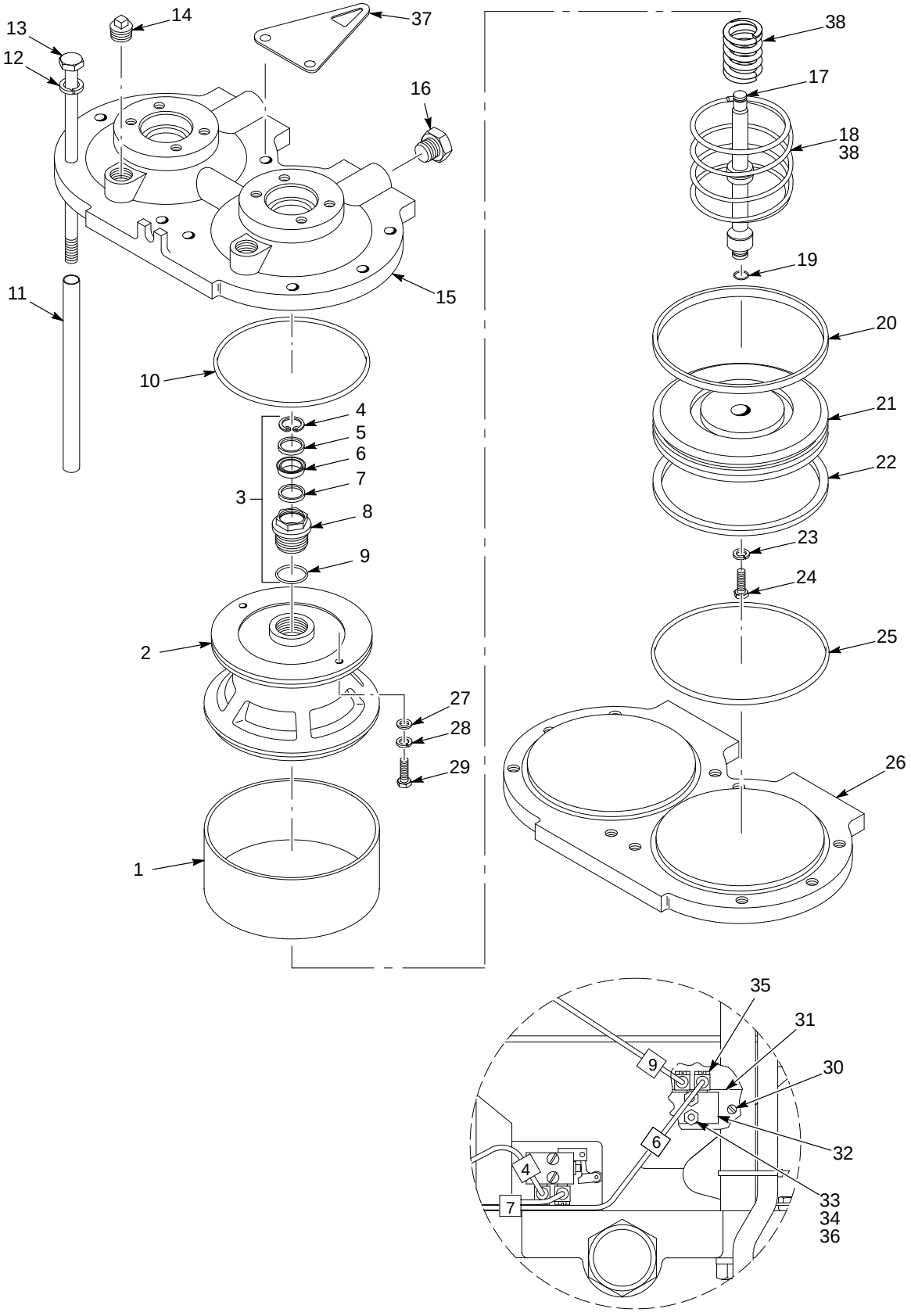


Figure 7-2 Air Motor Parts

Air Valve Parts

See Figure 7-3.

Item	Part	Description	Quantity	Note
—	139461	VALVE, air	1	
1	139462	• BODY, air valve	1	
2	973422	• PLUG, pipe, socket, flush, $^{3}/_{8}$ in., zinc	4	
3	901166	• VALVE, 2 position, 4-way, air pilot	1	
4	981233	• SCREW, socket, $^{1}/_{4}$–20 x 1.00 in., zinc	4	
5	139469	• PLATE, end	2	
6	940311	• O-RING, Buna-N, 1.75 x 1.875 x 0.063 in.	2	A
7	139465	• SPACER, end	2	
8	981039	• SCREW, pan head, #6–32 x 0.312 in., steel, zinc	2	
9	249317	• DEFLECTOR	1	
10	972185	• CONNECTOR, male, $^{1}/_{8}$ in. tube x #10–32	3	
11	942206	• O-RING	6	A
12	139466	• SPACER, exhaust (red, narrow)	2	
13	139467	• SPACER (aluminum, wide)	2	
14	139468	• SPACER, middle (aluminum, narrow)	1	
15	165731	• SPOOL, air valve	1	
16	139464	• BUMPER, spool	2	
17	940164	O-RING, Buna-N, 0.625 x 0.75 x 0.063 in.	2	A
18	981475	SCREW, socket, $^{5}/_{16}$–18 x 2.75 in., zinc	2	A

NOTE A: Included in Air Valve Repair Service Kit, part 141435. Refer to page 7-15.

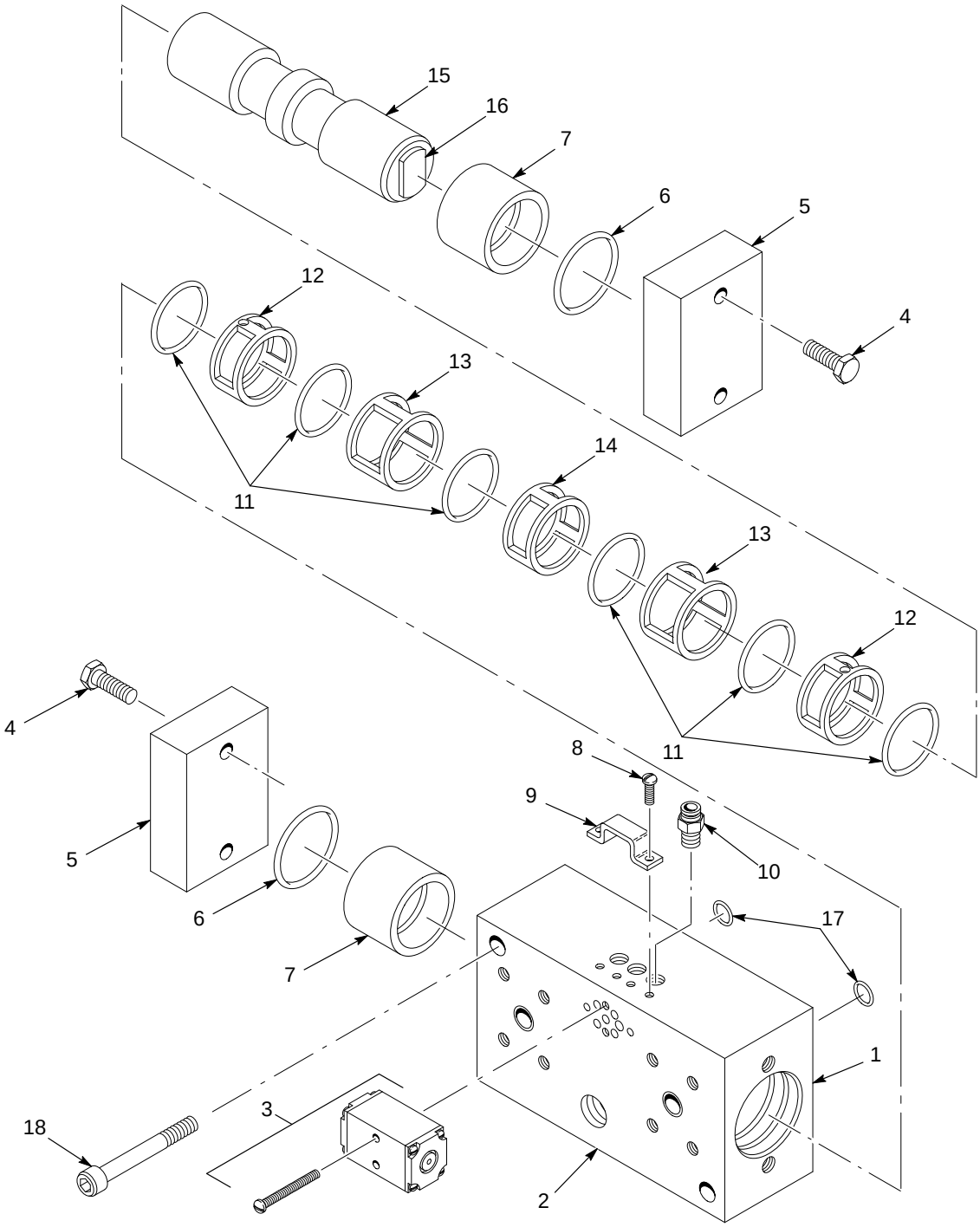


Figure 7-3 Air Valve Parts

Miscellaneous Pump Parts

See Figure 7-4.

Item	Part	Description	Quantity	Note
1	------	COVER, accumulator, hDR pump	1	
2	981565	SCREW, pan head, $^1/_4$–20 x 0.50 in., steel, zinc	2	
3	------	COVER, pump, hDR	1	
4	------	GUARD, pump, right	1	
5	------	GUARD, pump, left	1	

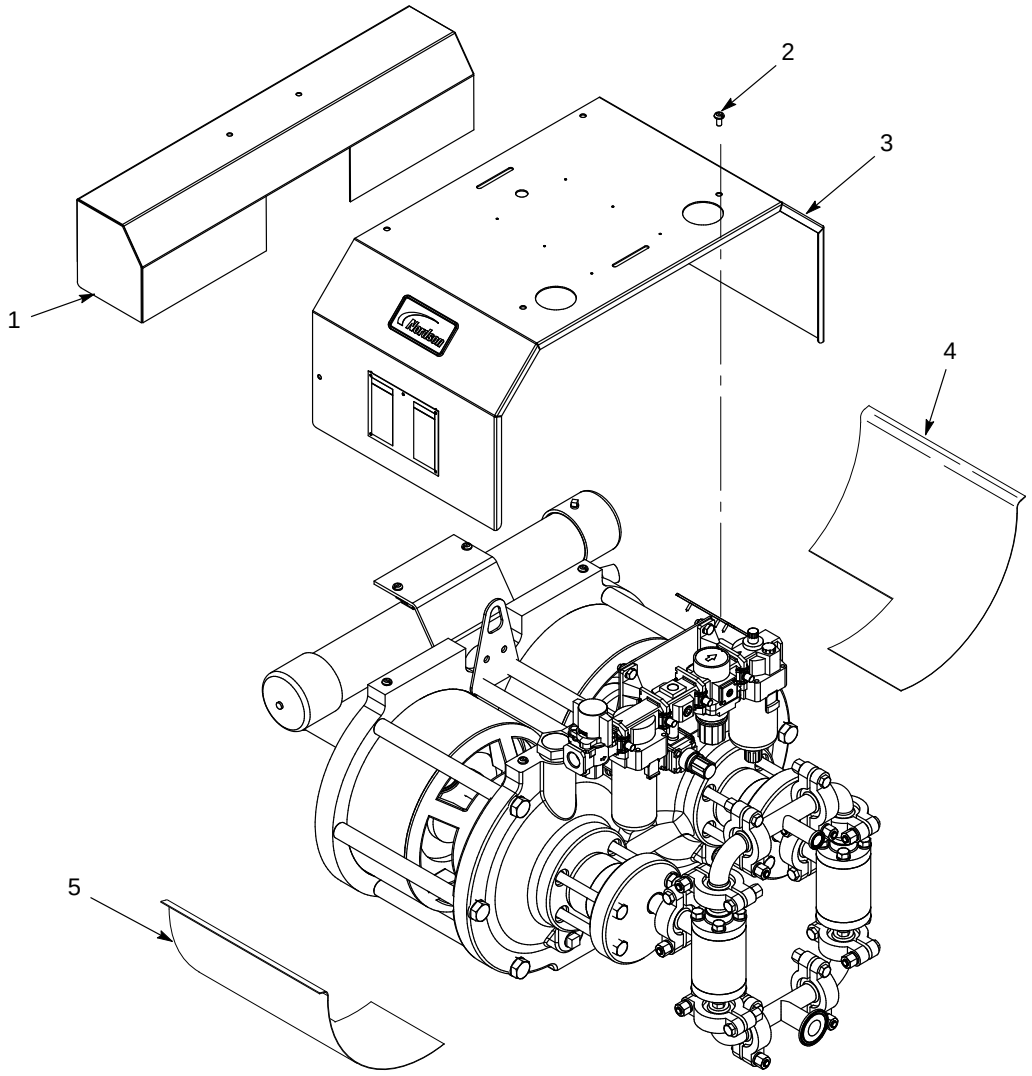


Figure 7-4 Miscellaneous Pump Parts (1 of 4)

Miscellaneous Pump Parts *(contd)*

See Figure 7-5.

Item	Part	Description	Quantity	Note
6	------	RETAINER, wire	1	
7	240976	CLAMP, ground with wire	1	
8	132154	STUD, ground	1	
9	983140	WASHER, lock, split, $^1/_4$ in., steel, nickel	3	
10	240674	TAG, ground	1	
11	1069272	BRACKET, accumulator	1	
12	970970	CLAMP, hose, No. 52	2	
13	139474	ACCUMULATOR	1	
14	981211	SCREW, hex, $^1/_4$–20 x 0.75 in. zinc	2	
15	------	WASHER, flat, regular, $^1/_4$ in., zinc	2	

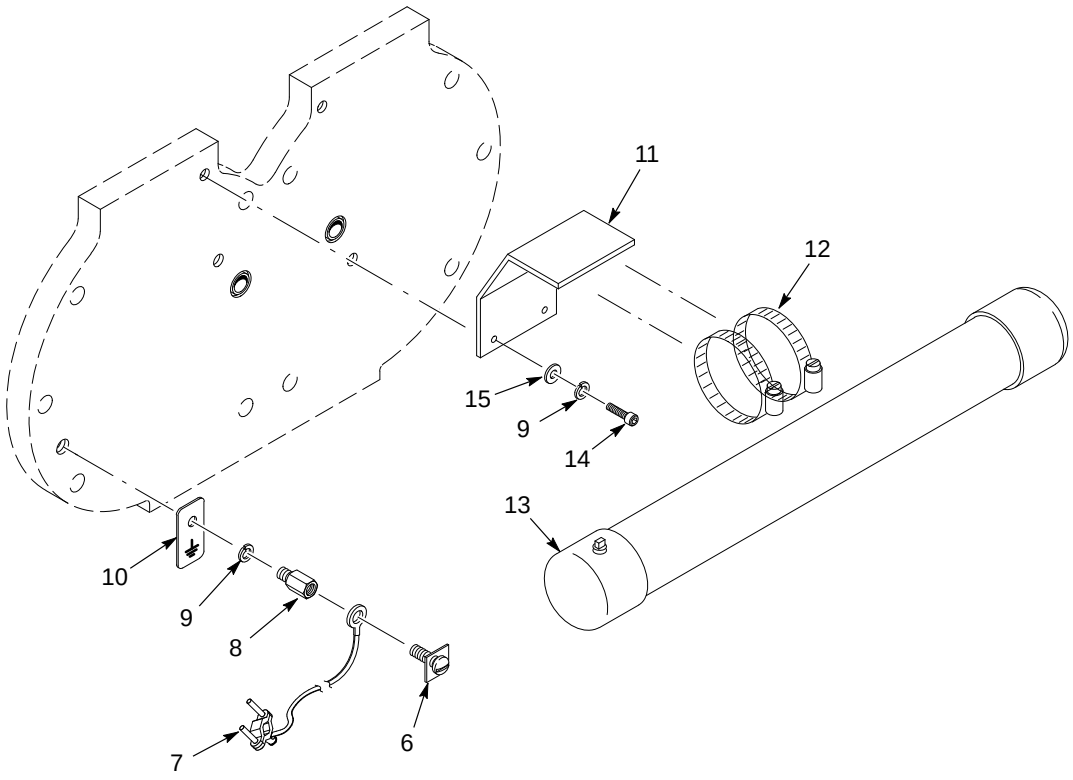


Figure 7-5 Miscellaneous Pump Parts (2 of 4)

Miscellaneous Pump Parts *(contd)*

See Figure 7-6.

Item	Part	Description	Quantity	Note
17	973073	NIPPLE, hex, $^3/_8$ x $^3/_8$ x 1.45, steel, elbow	1	
18	973272	TEE, pipe, class 150, $^3/_8$-in. NPT, steel, zinc	1	
19	971659	CONNECTOR, male, $^1/_2$ tube x $^3/_8$-in. NPT	1	
20	972122	ELBOW, male, $^1/_2$ tube x $^3/_8$-in. NPT	2	
21	------	PLUG, pipe, socket, standard, 1 $^1/_4$ in., zinc	2	
22	249963	MANIFOLD, muffler	1	
23	1079957	MUFFLER, 1 $^1/_4$-in. NPT	2	
24	973411	PLUG, pipe, socket, flush, $^1/_4$ in., zinc	1	
25	982292	SCREW, socket, M6 X 55, black	3	

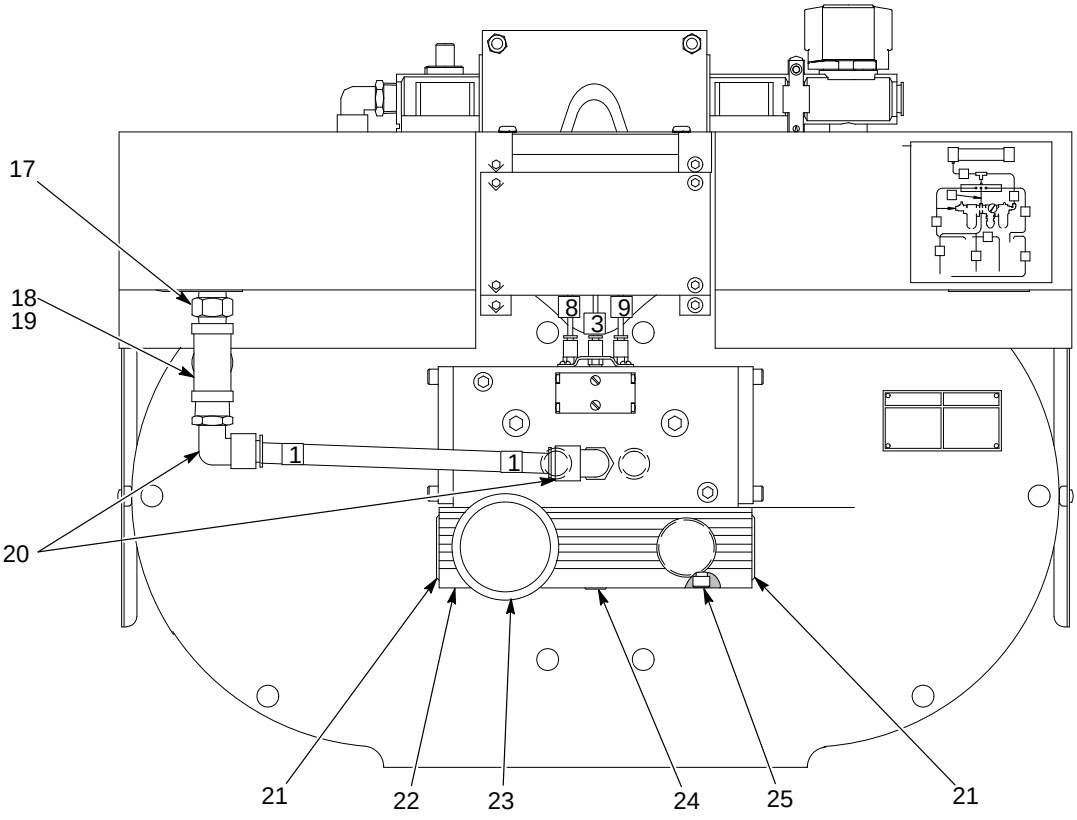


Figure 7-6 Miscellaneous Pump Parts (3 of 4)

Miscellaneous Pump Parts *(contd)*

See Figure 7-7. Filter regulator lubricator (FRL) module shown.

Item	Part	Description	Quantity	Note
26	1068742	MODULE, filter, regulator, lubricator, $^1/_2$-in. NPT	1	
27	971519	ELBOW, male, $^1/_8$ in. tube x $^1/_4$-in. NPT	1	
28	901236	GAUGE, air, 0–7 bar, 0–100 psi	1	
30	------	NUT, hex, regular, $^5/_{16}$–18, G8, zinc	4	
31	336282	SCREW, hex, serrated, $^5/_{16}$–18 x 0.75 in., zinc	4	
32	972184	ELBOW, male, $^1/_2$-in. tube x $^1/_2$-in. NPT	1	
33	1611659	ELBOW, universal branch, ⅛ T x ⅛ NPT, with seal	1	
34	1613132	COVER, regulator, lockout, AR20 series	1	

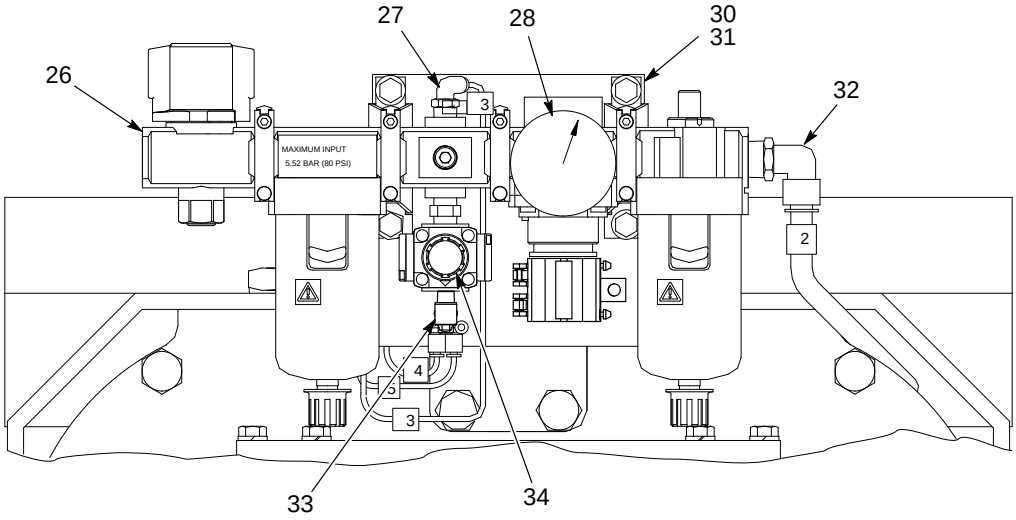


Figure 7-7 Miscellaneous Pump Parts (FRL module shown) (4 of 4)

Pump Air Tubing

Tube No.	Part	Size OD (in.)	Length (+/– 1/16 in.)
1	900610	1/2	8 3/4
2	900610	1/2	22 1/2
3	900609	1/8	25 1/2
4	900609	1/8	10 5/8
5	900609	1/8	15 1/4
6	900609	1/8	19
7	900609	1/8	10
8	900609	1/8	15
9	900609	1/8	20

Pump Accessories

These accessories are shipped with new pumps.

Item	Part	Description	Quantity	Note
—	1609775	ACCESSORY GROUP, hDR	1	
1	------	• CLAMP, high pressure, hygienic, 1 to 1 ½ in.	1	
2	------	• GASKET, buna–N, 1.00	1	
3	------	• CLAMP, high pressure, hygienic, ½–¾ in.	1	
4	------	• GASKET, tri-clamp, buna–N, 3/4	1	
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

Service Kits

Air Valve Repair Kit

See Figure 7-3 for component location.

Item	Part	Description	Quantity	Note
—	141435	SERVICE KIT, repair, air valve	1	
6	940311	• O-RING, Buna-N, 1.75 x 1.875 x 0.063 in.	2	
11	942206	• O-RING	6	
18	981475	• SCREW, socket, $^{5}/_{16}$–18 x 2.75 in., zinc	2	
17	940164	• O-RING, Buna-N, 0.625 x 0.75 x 0.063 in.	2	
NS	900337	• GREASE, lithium, low temperature, 1.75 oz	1	

NS: Not Shown

Air Motor Repair Kit

Kit repairs both air cylinders. See Figures 7-1 and 7-2 for component location.

Item	Part	Description	Quantity	Note
—	1616434	KIT, repair, air motor, green	1	
—	141436	SERVICE KIT, repair, air motor	1	
22	------	• O-RING, –149, FDA grade FKM, 60 duro	4	A
27	------	• O-RING, –028, FDA grade FKM, 60 duro	4	A
30	------	• O-RING, –016, FDA grade FKM, 60 duro	2	A
31	954045	• BACK-UP RING, single, $^{5}/_{8}$ x $^{3}/_{4}$ in.	2	A
9	945081	• O-RING, 1 $^{1}/_{4}$-in. OD tube	2	B
10	942711	• O-RING, 9.25 x 9.50 x 0.125 in.	2	B
19	940205	• O-RING, Buna-N, 0.875 x 1.00 x 0.063 in.	2	B
20	1616180	• RING, glide, green, cut	2	B, C
	119858	• RING, glide	2	B, D
22	119857	• U-CUP, 9 $^{5}/_{16}$ x 10.00 x $^{11}/_{32}$ in.	2	B
25	942742	• O-RING, Buna-N, 10.00 x 10.25 in.	2	B
27	139497	• WASHER, nylon self-sealing	4	B
NS	900337	• GREASE, lithium, low temperature, 1.75 oz	1	

NOTE A: See Figure 7-1, Hydraulic Section Parts, for component location.
B: See Figure 7-2, Air Motor Parts, for component location.
C: Part of service kit 1616434.
D: Part of service kit 141436.
NS: Not Shown

Solvent Seal Packing Gland Service Kit

Kit rebuilds both solvent seal packing glands. See Figures 7-1 and 7-2 for component location.

Item	Part	Description	Quantity	Note
—	1609656	SERVICE KIT, solvent seal	1	
22	------	• O-RING, –149, FDA grade FKM, 60 duro	4	A
25	------	• WASHER, screw seal, stainless steel, 5/16	2	A
27	------	• O-RING, –028, FDA grade FKM, 60 duro	4	A
30	------	• O-RING, –016, FDA grade FKM, 60 duro	2	A
31	945045	• BACK-UP RING, single, ⅝ x ¾	2	A
4	986917	• RETAINING RING, int, 112, invert	2	B
5	139480	• SPACER, solvent seal	2	B
6	139493	• U-CUP, polyurethane, ⅞ x 1 ⅛ x ¼	2	B
7	139481	• BEARING, shaft, solvent seal	2	B
9	945081	• O-RING, 1 ¼ tube	2	B
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

NOTE A: See Figure 7-1, Hydraulic Parts, for component location.

B: See Figure 7-2, Air Motor Parts, for component location.

NS: Not Shown

Hydraulic Packing Service Kit

Kit rebuilds both plunger assemblies. See Figure 7-1 for component location.

Item	Part	Description	Quantity	Note
—	1609657	SERVICE KIT, hydraulic packing	1	
22	------	• O-RING, –149, FDA grade FKM, 60 duro	4	A
25	------	• WASHER, screw seal, stainless steel, 5/16	2	A
27	------	• O-RING, –028, FDA grade FKM, 60 duro	4	A
28	------	• SEAL, SPR, 2 3/6 X 2 ½ X 3/6, UHMW–PE	4	A
30	------	• O-RING, –016, FDA grade FKM, 60 duro	2	A
31	945045	• BACK-UP RING, single, ⅝ x ¾	2	A
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

NOTE A: See Figure 7-1, Hydraulic Parts, for component location.

NS: Not Shown

High-Pressure Check Service Kit

Kit rebuilds both high-pressure check valves. See Figure 7-1 for component location.

Item	Part	Description	Quantity	Note
—	1609658	SERVICE KIT, high-pressure check	1	
7	503574	• Cage, BALL	2	A
8	------	• BALL, 316 stainless steel, .688, 100	2	A
9	------	• O-RING, –022, FDA grade FKM, 60 duro	2	A
10	------	• SEAT, ball, .688 diameter, hDR	2	A
11	------	• O-RING, –026, FDA grade FKM, 60 duro	2	A
NS	------	• Gasket, Buna–N, 1.00	4	A
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

NOTE A: See Figure 7-1, Hydraulic Parts, for component location.

NS: Not Shown

Siphon Check Service Kit

Kit rebuilds both siphon check valves. See Figure 7-1 for component location.

Item	Part	Description	Quantity	Note
—	1609659	SERVICE KIT, siphon check	1	
16	------	• BALL, 316 stainless steel, 1.125, 100	2	A
17	------	• O-RING, –025, FDA grade FKM, 60 duro	2	A
18	------	• SEAT, ball, 1.125 diameter, hDR	2	A
19	------	• O-RING, –029, FDA grade FKM, 60 duro	2	A
NS	------	• GASKET, Buna–N, 1.00	4	A
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

NOTE A: See Figure 7-1, Hydraulic Parts, for component location.

NS: Not Shown

Hydraulic Section Repair Kit

See Figures 7-1 and 7-2 for component location.

Item	Part	Description	Quantity	Note
—	1609660	SERVICE KIT, repair, hydraulic section	1	
9	------	• O-RING, –022, FDA grade FKM, 60 duro	2	A
11	------	• O-RING, –026, FDA grade FKM, 60 duro	2	A
17	------	• O-RING, –025, FDA grade FKM, 60 duro	2	A
19	------	• O-RING, –029, FDA grade FKM, 60 duro	2	A
22	------	• O-RING, –149, FDA grade FKM, 60 duro	4	A
25	------	• WASHER, screw seal, stainless steel, 5/16	2	A
27	------	• O-RING, –028, FDA grade FKM, 60 duro	4	A
30	------	• O-RING, –016, FDA grade FKM, 60 duro	2	A
31	954045	• BACK-UP RING, single, ⅝ x ¾	2	A
NS	------	• GASKET, Buna–N, 100	10	A
9	945081	• O-RING, hot paint, 1 ¼ tube	2	B
NS	1120290	• LUBRICANT, high-temp, NSF–H1, 1-ounce bottle	AR	

NOTE A: See Figure 7-1, Hydraulic Parts, for component location.

B: See Figure 7-2, Air Motor Parts, for component location.

NS: Not Shown

NPT Conversion Kit

Optional kit to utilize standard-threaded tubing.

Item	Part	Description	Quantity	Note
—	1611121	SERVICE KIT, pipe to NPT adapter, hDR	1	
NS	1611112	• GASKET, Buna–N, ¾ inch	1	
NS	------	• CLAMP, high pressure, hygienic, ¾ inch	1	
NS	------	• ADAPTER, ¾-inch pipe to ½-inch NPT	1	

NS: Not Shown

EU DECLARATION of Conformity

Product: Dual Piston Pump

Models: hDR Pump

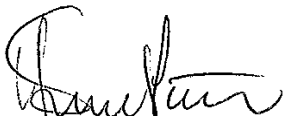
Description: This is an air operated, horizontally mounted, dual piston liquid pump for high speed operations. This has been designed for use in the food industry.

Applicable Directives:
2006/42/EC - Machinery Directive

Standards Used for Compliance:
EN/ISO12100
EN809
EN12621

Principles:
This product has been manufactured according to good engineering practice.
The product specified conforms to the directive and standards described above.
All food contact materials are FDA compliant and meet US Code of Regulations CFR Title 21, Section 177 or are made of acceptable grades of Stainless Steel.

Quality System
DNV - ISO9001



Date : 05Aug2016

Hallie Smith - Petee
Engineering Manager
Industrial Coating Systems
Amherst, Ohio, USA

Nordson Authorized Representative in the EU
Person authorized to compile the relevant technical data.
Contact: Operations Manager
Industrial Coating Systems
Nordson Deutschland GmbH
Heinrich-Hertz-StraBe 42-44
D-40699 Erkrath

hDR Pump Service Kits

Refer to the hDR manual 1609677 for complete service and parts information.

Hydraulic and Air Section Service Kits

See Figures 1, 2, 3 and the following table.

Section	Item	Kit	Part Number	Note
Hydraulic Section	A	Hydraulic Section Repair Kit	1609660	A
	B	High-Pressure Check Service Kit	1609658	A
	C	Siphon Check Service Kit	1609659	
	D	Hydraulic Packing Service Kit	1609657	
	E	Solvent Seal Packing Gland Service Kit	1609656	
Air Motor Section	F	Air Motor Repair Kit, green, cut	1616434	
		Air Motor Repair Kit	141436	
Air Valve Section	G	Air Valve Repair Kit	141435	
NOTE A: Kit also contains gasket (Nordson part number 1619674), not shown.				

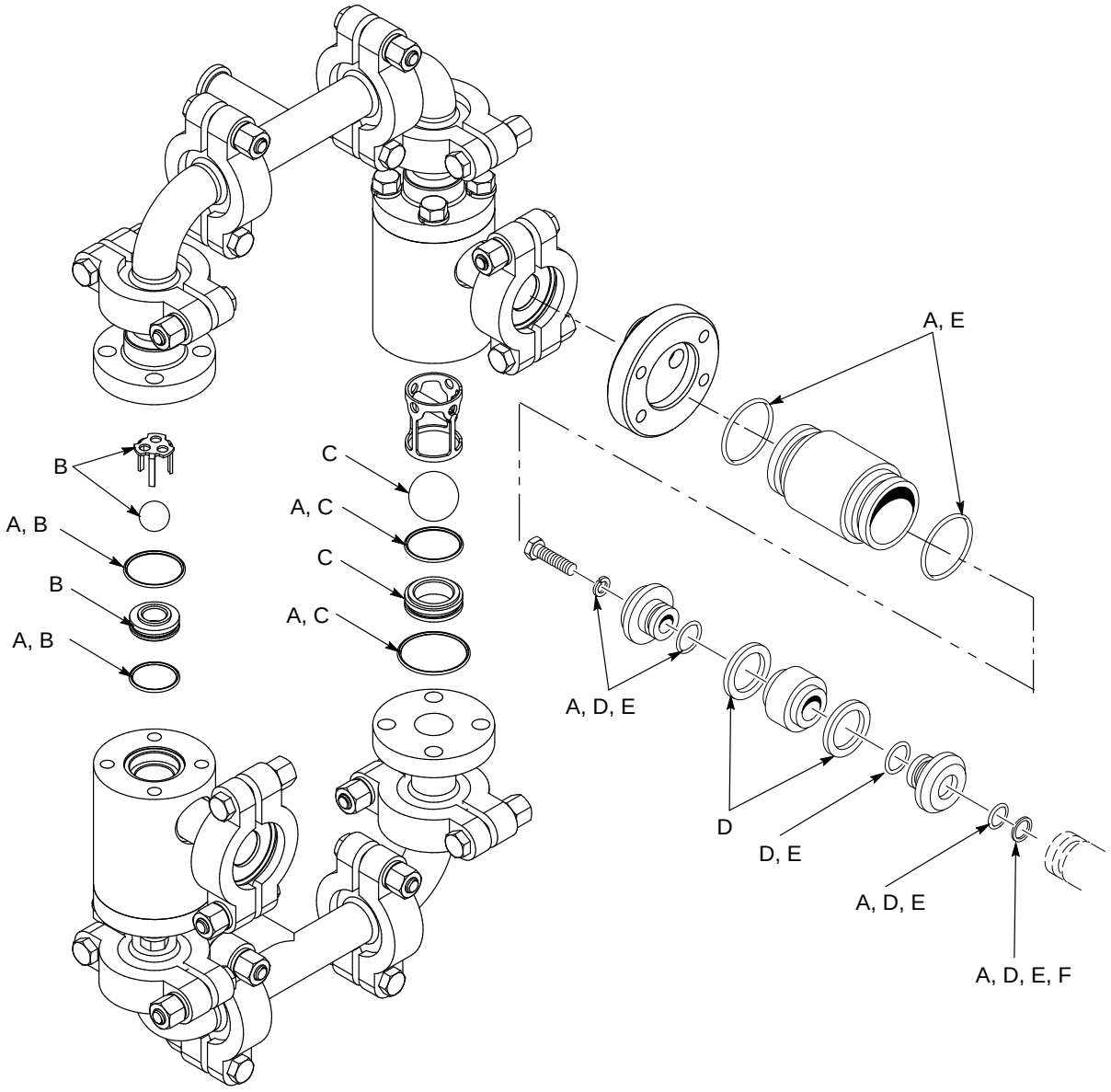


Figure 1 Hydraulic Section

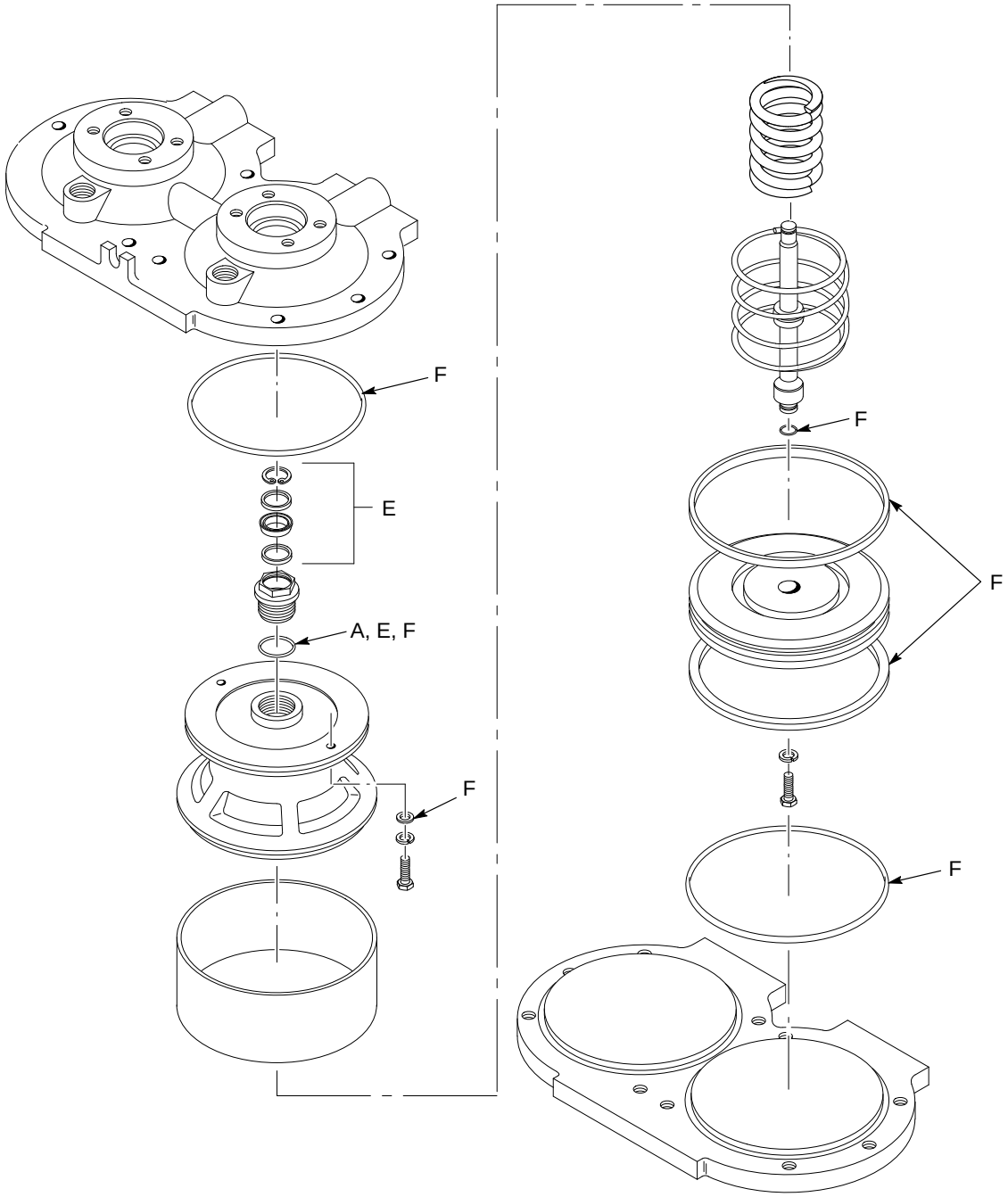


Figure 2 Air Motor Section

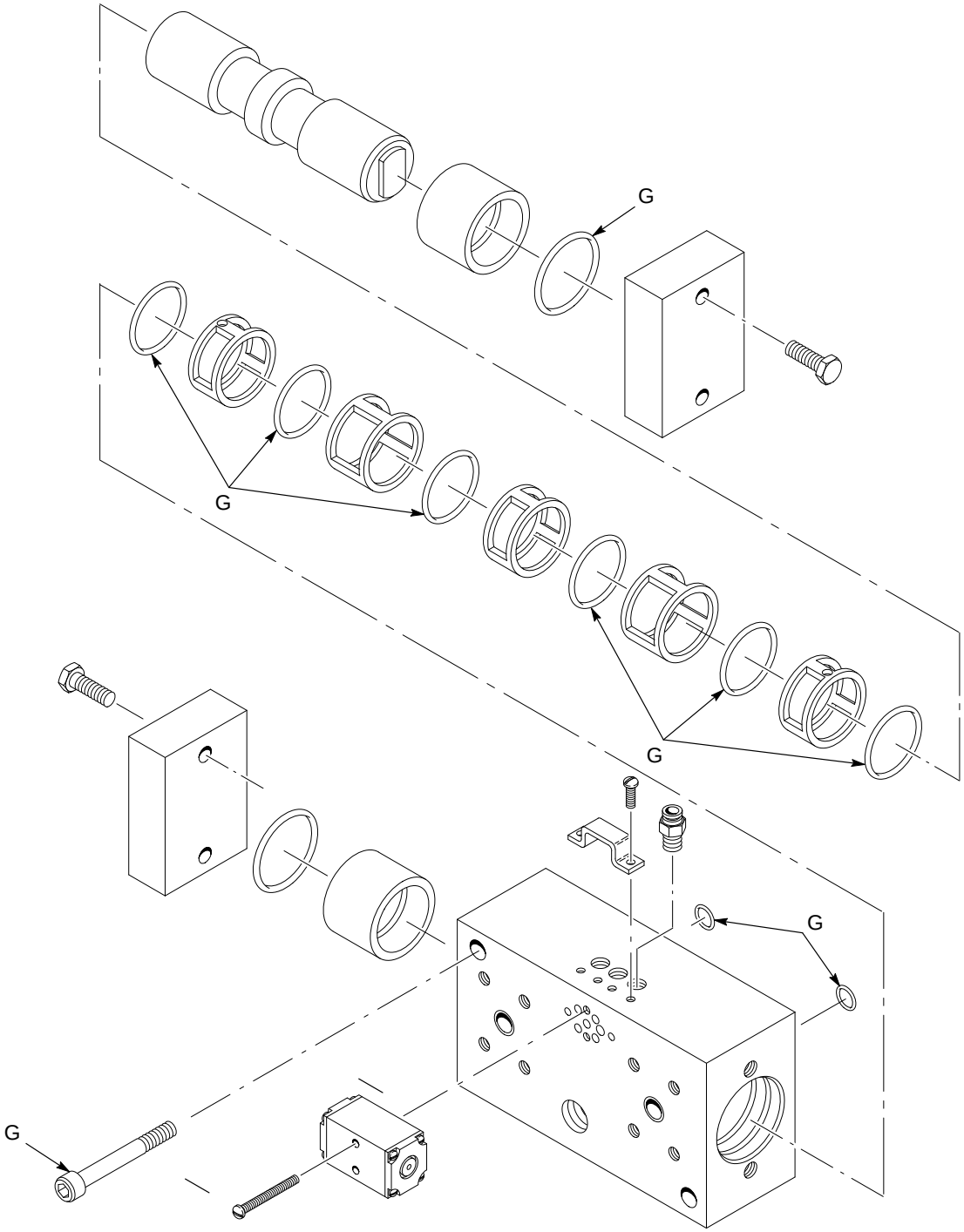


Figure 3 Air Valve Section

Issued 07/20