Rhino® XD3
Pneumatic Unloader

Customer Product Manual

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

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1625613-01

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Change Record

Revision	Date	Change
01	05/24	Initial Release

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 them this card
- Tell them 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.
- 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.

Water Requirements for Temperature Conditioning

The temperature conditioning section is constructed of the following materials. Always refer to this list if different water, corrosion inhibitors or biocides other than those listed in the following sections are used.

Black Iron Pipe	Stainless Steel	Nylon
Brass	PVC Plastic	Copper
Buna Rubber	Aluminum	Polyurethane
Steel	Viton®	PTFE

Water Types

To minimize the introduction of contaminants that may degrade system components, review these guidelines before selecting the type of water to use.

NOTE: Water types are listed in order of preference.

Table 1-1 Water Types

Water	Description
1. Distilled	No minerals and chemicals Lacks the nutrients necessary to support biological growth and the minerals that wear away at system components Neutral nature reduces interaction with additives used to protect the system **NOTE:** Distilled water is the best choice for use in the temperature conditioning section.
2. Well	Contains an abundance of minerals that can support plant and animal life Contains minerals like calcium and iron that are abrasive; accelerates wear and tear on components **NOTE:** If well water is the only option available, it must be softened to reduce the mineral content.
3. City	Contains chlorine that can degrade all metals including stainless steel Hard on most non−metals Usually contains an abundance of minerals that are capable of supporting plant and animal life; accelerates wear on components
4. Weld (Tower)	Often heavily treated both for bacterial suppression and to make it more compatible with the welding and cooling tower processes Treatment process usually involves some aggressive chemicals that can degrade metals, plastics and other materials Usually contains an abundance of metals and other contaminants picked up from the welding and cooling tower processes that can interfere with the components of the temperature control system
5. DI	**CAUTION:** Do not use DI water in this system. DI water draws free electrons from metal to normalize ion levels. This process causes degradation of metals.

Corrosion Levels

To maintain proper performance, minimum levels of corrosion to aluminum and copper must be maintained. To maintain safe operation keep the corrosion levels of

- aluminum at or below 3 mil/year (0.003 in./yr).
- copper at or below 1 mil/year (0.001 in./yr).

When adding water to the system, corrosion inhibitor must be added.

CorrShield MD405 corrosion inhibitor is shipped with temperature-conditioned systems. This is a Molybdate-based corrosion inhibitor that contains an Azole additive to protect copper and is used in the concentration of 1.5 ounces per gallon of water to maintain a concentration of 250−350 ppm.

The Ford Tox number for CorrShield MD 405 is 149163.

The GM FID number for CorrShield MD 405 is 225484.

Biocide Water Treatment

Do not use the following Biocides:

- oxidizers, such as chlorine, bromine, hydrogen peroxide, iodine, ozone, etc.
- cationic, or positively charged biocides.

Biocides for use with CorrShield MD405 are BetzDearborn Spectrus NX114. The recommended concentration of Spectrus NX114 is 150−PPM which is 0.017 oz./gal (0.5 ml/gal).

The Ford Tox Number for Spectrus NX114 is 148270.

Safety Labels

NOTE: Applicable to electrically heated hydraulic sections only.

Table 1-2 lists the safety labels on this equipment. The safety labels are provided to help you operate and maintain this equipment safely. See Figure 1 Safety Labels for the location of the safety labels.

Table 1-2

Item	Label	Description
1		**WARNING:** Electrical hazard
2		**WARNING:** Hot surface hazard

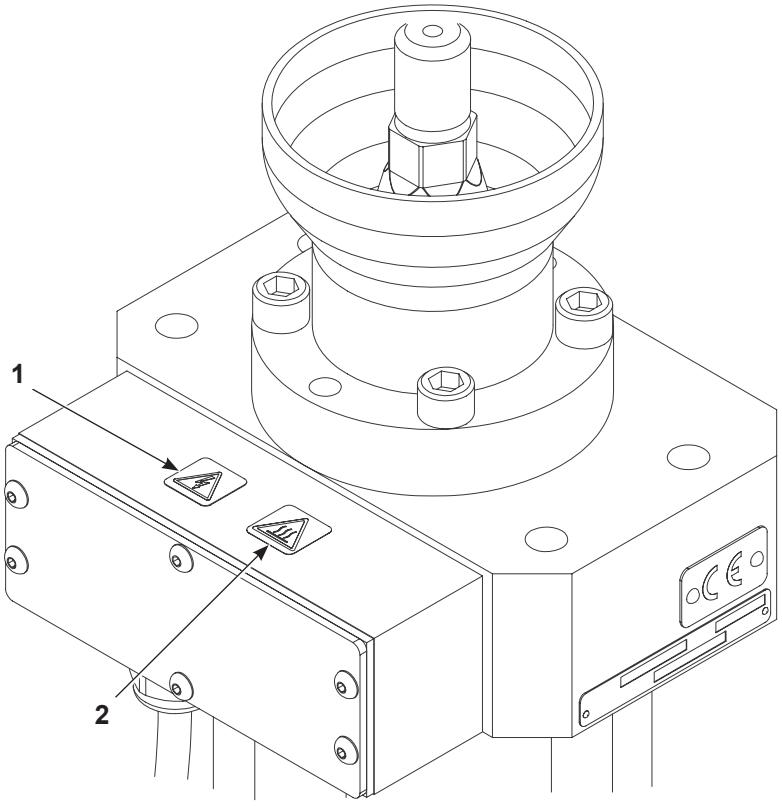

Figure 1-1 Safety Labels

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Section 2
Overview

Air Motor

See Figure 2-1 and refer to Table 2-1 for a description of Rhino air motor components.

Theory of Operation

The air motor drives the hydraulic section. A five-port, three-position main air control valve controls the direction of the air motor shaft movement.

When the air motor piston moves up and down, the proximity sensor detects a magnet on the piston. The proximity sensor sends momentary signals to the pilot valve. The pilot valve then sends a positive continuous signal to the main air motor control valve for each direction of travel.

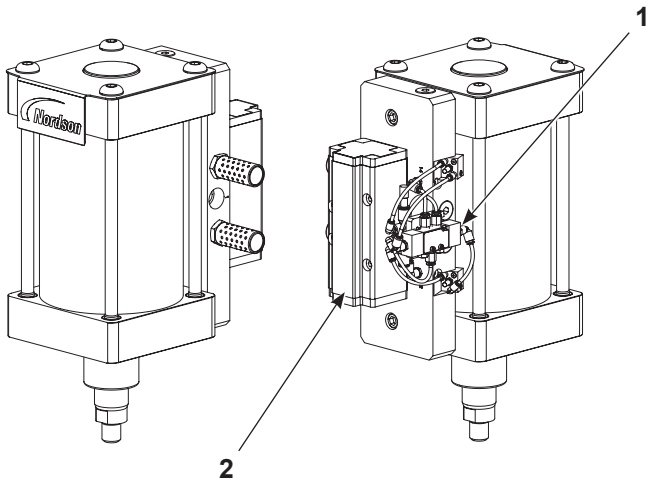


Figure 2-1 Air Motor Components

Table 2-1 Air Motor Components

Item	Component	Description
1.	Pilot valve	Controls the direction of the air motor shaft.
2.	Main air control valve	Controls the air motor shaft movement by shifting a spool; the spool exhausts air on one side of the piston and directs air pressure to the opposite side of the piston.

Pump

Hydraulic Section

See Figure 2-2. Refer to Table 2-2 and Table 2-3 for a description of Rhino pump hydraulic section assembly components.

NOTE: Installation and operation are dependent on the unloader and application. Refer to system documentation for detailed information.

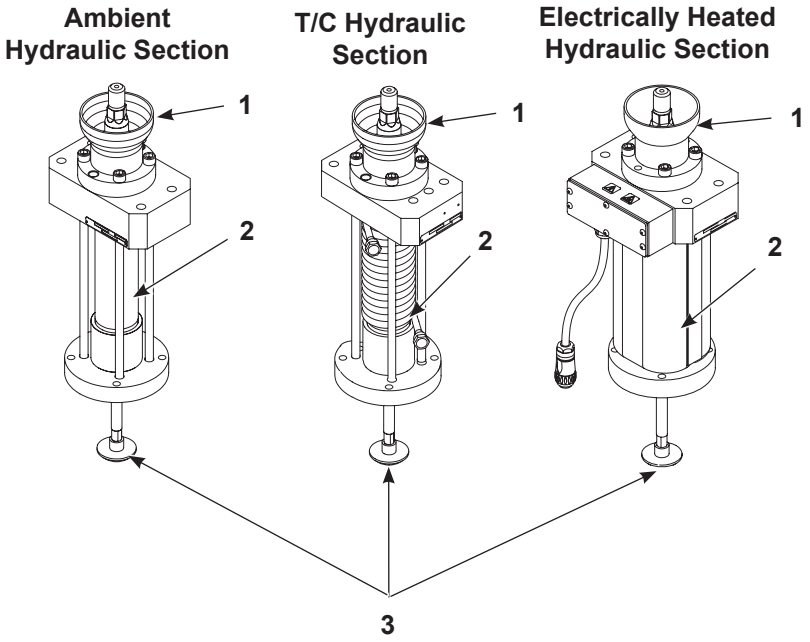


Figure 2-2 Hydraulic Sections

Table 2-2 Hydraulic Section

Item		Description
1.	Solvent chamber	Contains fluid to lubricate the plunger and packing gland seals; prevents material from hardening on the plunger rod.
2.	Hydraulic section	The 190 cc hydraulic section pressurizes the material and forces it out of the pump.
3.	Shovel	Forces material into the hydraulic section.

Table 2-3 Hydraulic Section Assembly Components

Version	Description
CS	Extreme duty - carbon steel
SS	Extreme duty - stainless steel
ARW	Extreme duty - stainless steel (includes ARW packing gland)
CE	CE compliant
LW	Standard wattage

Theory of Operation

Standard Hydraulic Section

See Figure 2-3.

The standard hydraulic section has a shovel attached to the end of the hydraulic plunger that projects into the center of the follower plate. The shovel moves up and down with the plunger, helping to force material into the hydraulic section. The hydraulic section pressurizes the material and forces it out of the pump.

When the plunger strokes downward, the piston/upper check valve opens and the lower check valve closes. Material between the upper and lower check valves is forced upward through the piston. The material above the upper check valve pressurizes and flows out of the material output port.

During the upward pump stroke, the plunger and shovel are pulled upward and the piston/upper check valve closes. The lower check valve opens and allows material to pass into the lower pump chamber below the upper check valve. As the plunger and piston move upward, material from the upper pump chamber is forced out of the material outlet port.

The solvent chamber surrounds the plunger. The chamber contains solvent chamber fluid that lubricates the plunger and packing gland seals. This fluid keeps material from hardening on the plunger and minimizes wear on the packing gland seals. The ball valve is used to bleed air from the pump.

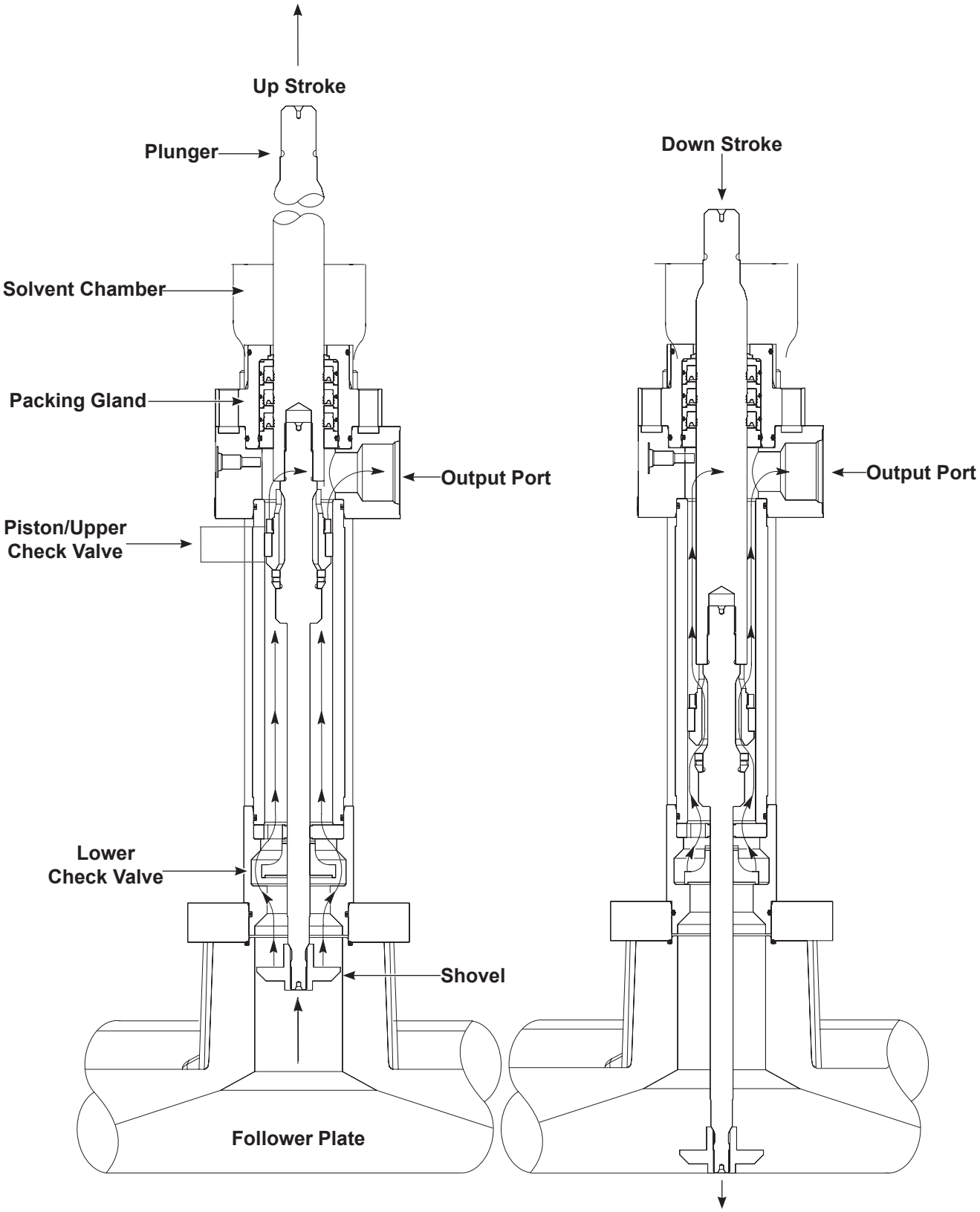


Figure 2-3 Standard Hydraulic Section

Single Acting Hydraulic Section

See Figure 2-4.

The single acting hydraulic section has a shovel attached to the end of the hydraulic plunger that projects into the center of the follower plate. The shovel moves up and down with the plunger, helping to force material into the hydraulic section. The hydraulic section pressurizes the material and forces it out of the pump. When the plunger strokes downward, the lower check valve closes. Material above the lower check valve is pressurized, forced upward, and flows out of the material output port. During the upward pump stroke, the plunger and shovel are pulled upward. The lower check valve opens and allows material to pass into the upper pump chamber above the lower check valve. The solvent chamber surrounds the plunger. The chamber contains solvent chamber fluid that lubricates the plunger and packing gland seals.

This fluid keeps material from hardening on the plunger and minimizes wear on the packing gland seals. The bleed valve is used to bleed air from the pump.

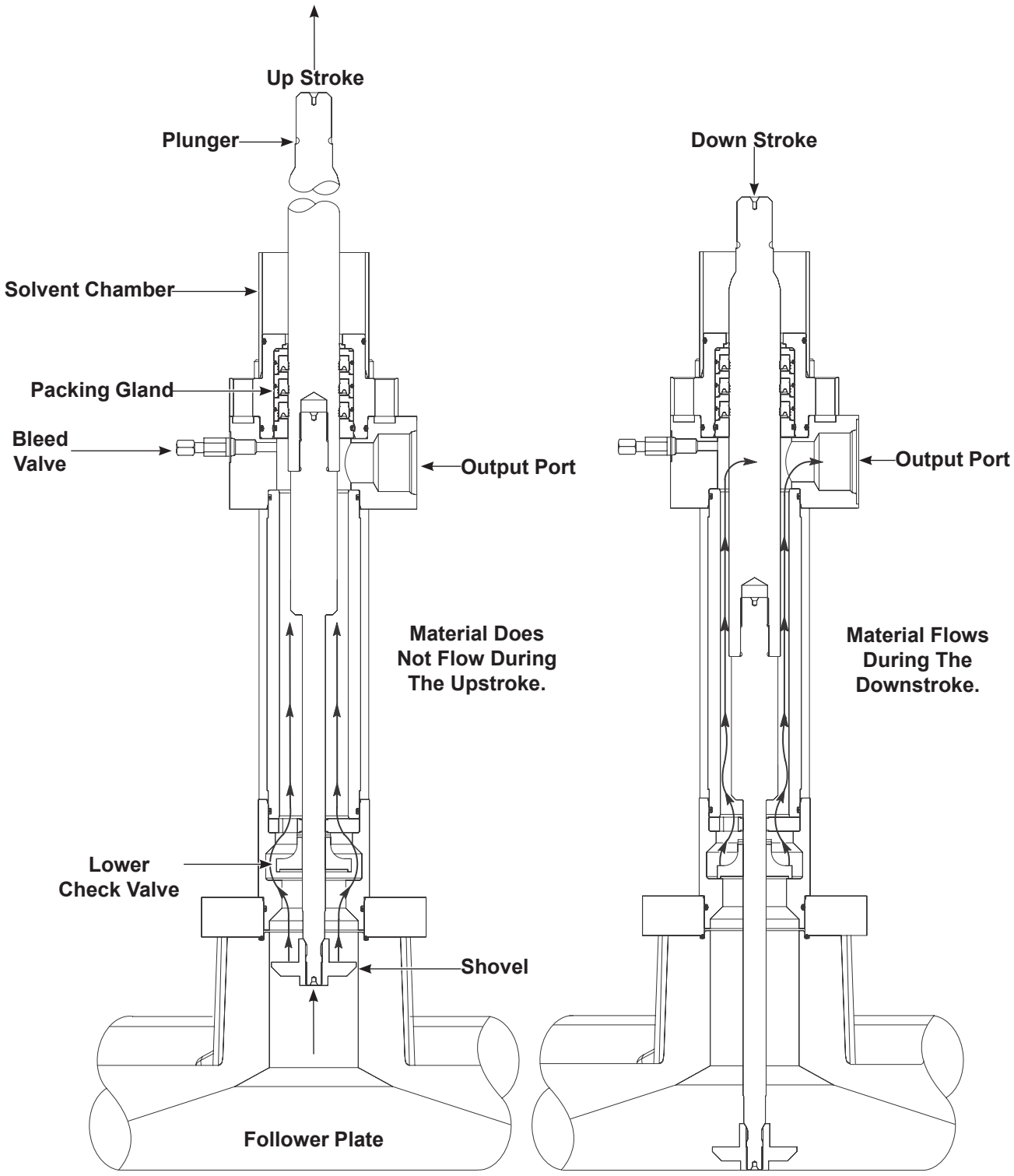


Figure 2-4 Single Acting Hydraulic Section

Hydraulic Section Pump Outlet Manifold

See Figure 2-5.

Heated and unheated; carbon steel and stainless steel hydraulic section pump outlet manifolds are available.

The pump outlet manifold with the ball check valve is typically used in dual unloader systems where the unloader cannot sense back pressure from the other unloader during operation.

The pump outlet manifold serves as a mounting location for the material outlet hose, bleeder valve assembly, and other optional functions which are contained in the ball check valve manifold.

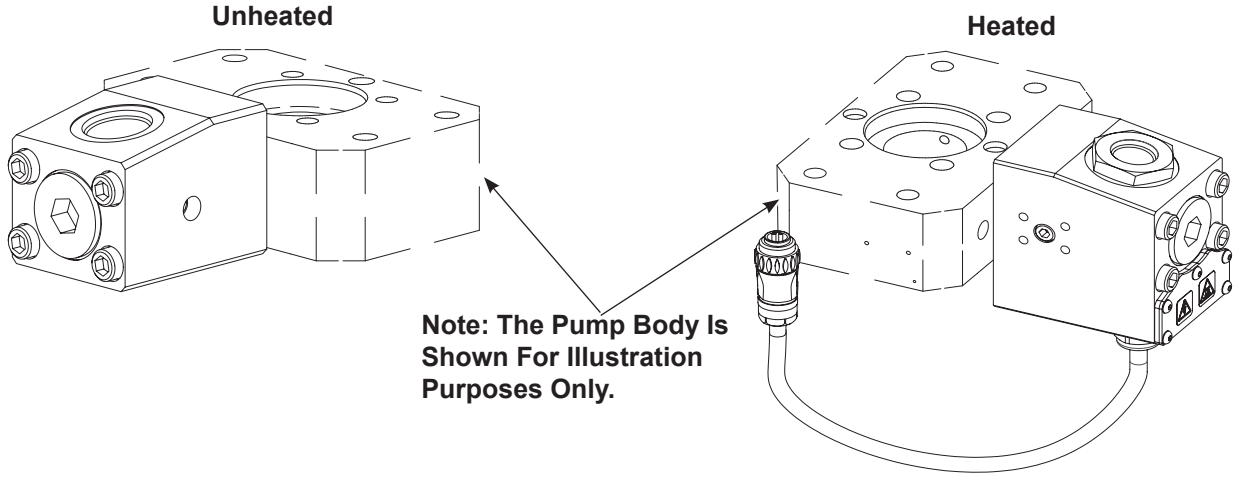


Figure 2-5 Hydraulic Section Pump Outlet Manifold

Frame

See Figure 2-6.

The frame provides the downforce force required to supply the pump with material. The following components are mounted on a dual post frame:

- Air motor
- Hydraulic section
- Electric controls

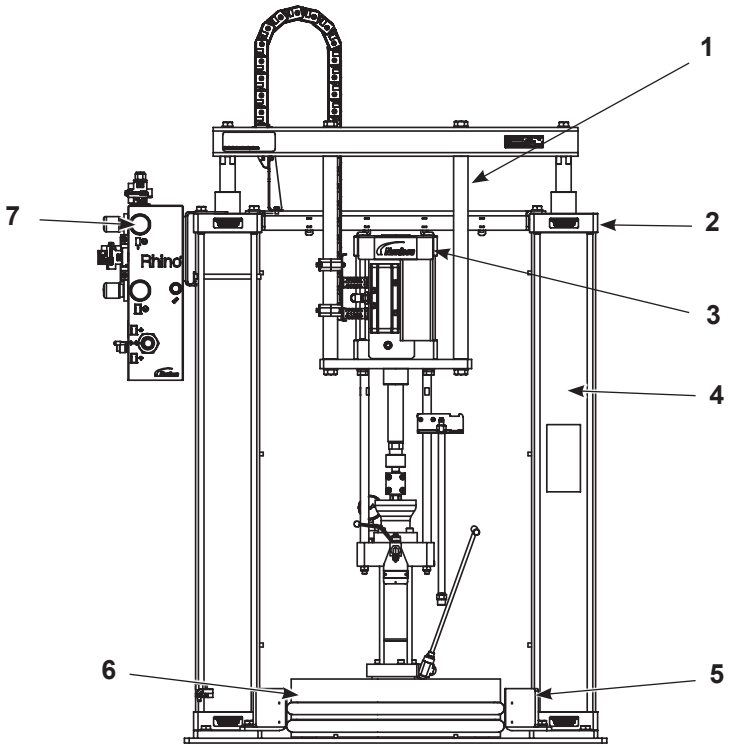


Figure 2-6 Dual Post Frame and Components

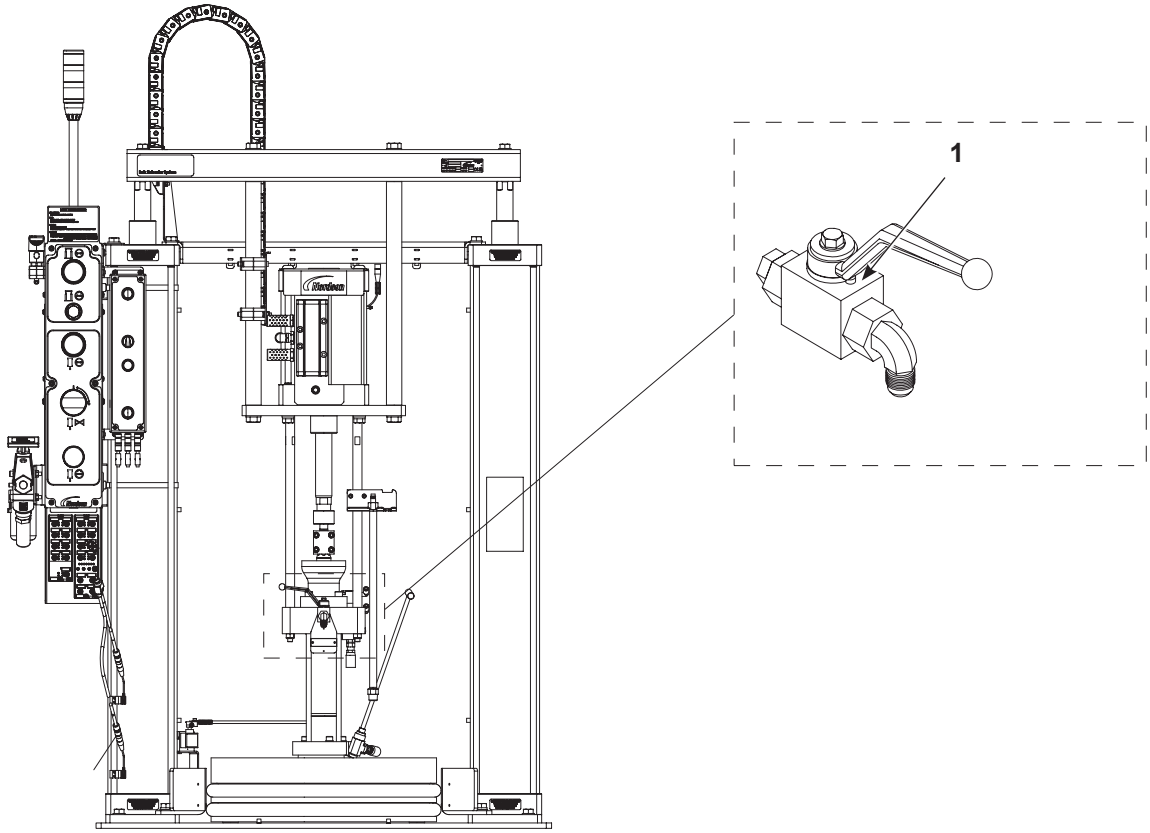
1. Tie-rod
2. Frame cylinder head
3. Air motor
4. Frame cylinder
5. Guide
6. Follower plate
7. Control module

Subcomponents

Ball Valve

See Figure 2-7.

The ball valve is used to relieve material pressure and purge air from the system during pump priming. The valve is located on the hydraulic section near the material outlet.



Electric Unloader Shown For Illustrative Purposes Only.

Figure 2-7 Ball Valve

1. Ball valve

Container Level Sensors

See Figure 2-8.

The pneumatic container level detector module uses magnetic sensors to monitor the distance between the bottom of the follower plate and the base surface of the unloader frame.

The low level sensor sends a signal to the pneumatic controls when the magnet on the frame piston moves in front of the low level sensor. The empty level sensor sends a signal to the pneumatic controls when the magnet on the frame piston moves in front of the empty level sensor.

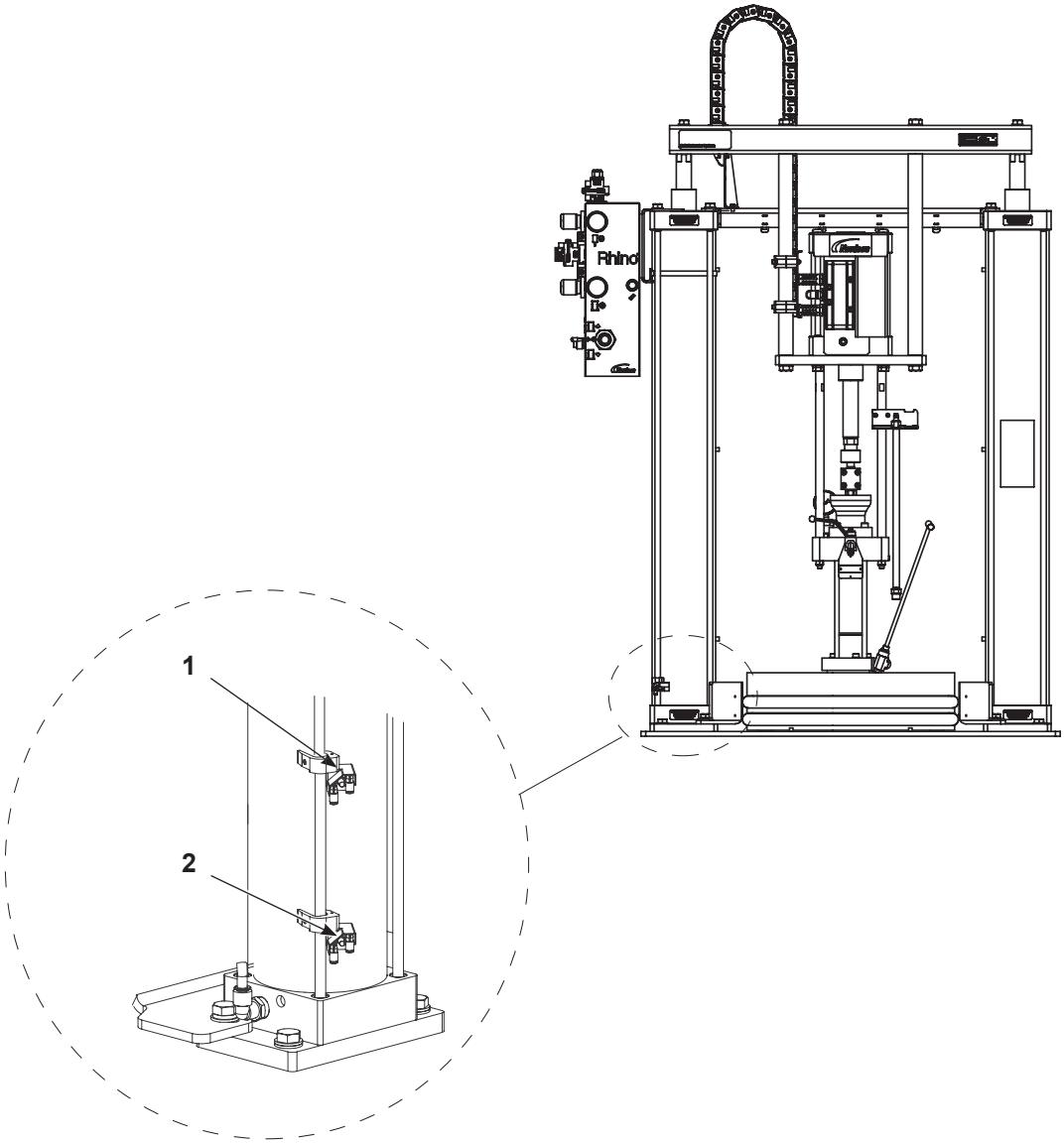


Figure 2-8 Container Level Sensors

1. Magnetic sensor (lower)
2. Magnetic sensor (upper)

Control Module

See Figure 2-9 and Figure 2-10.

The control module provides the pneumatic operating functions for the unloader. The control module is configured for automatic shutdown (ASD) of the air motor. The control will shut off the air motor when the piston of the cylinder assembly actuates the magnetic sensor on the frame assembly. This will allow the control to shut down the pump when the material container is empty, preventing a pump runaway condition.

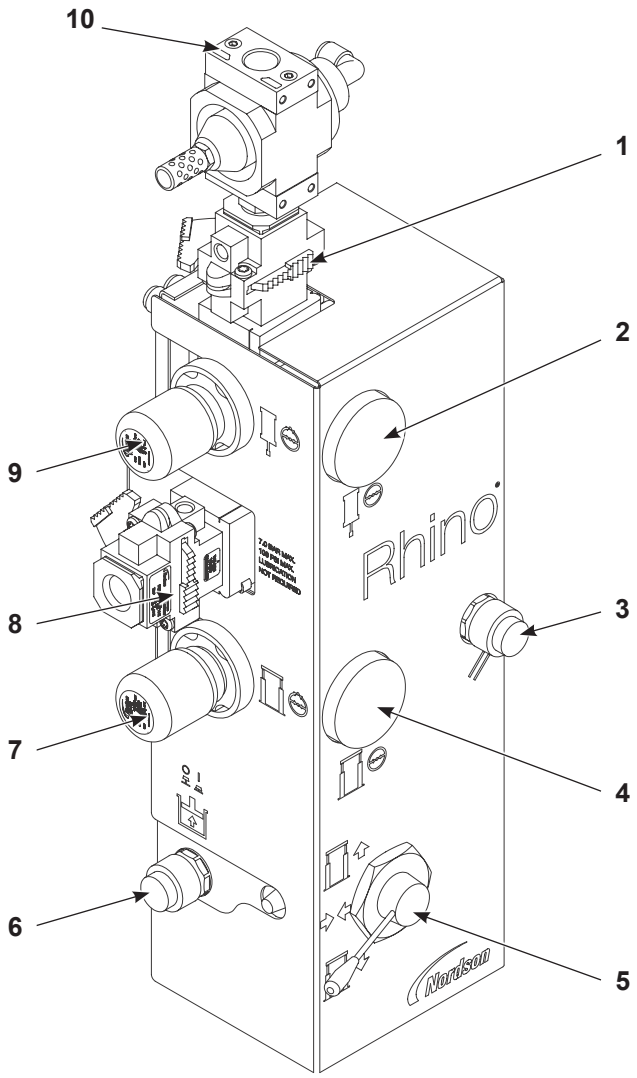


Figure 2-9 Control Module (1 of 2)

1. Air motor lockout valve
2. Air motor pressure gauge
3. Pneumatic reset valve
4. Elevator air pressure gauge
5. Elevator control valve
6. Material container blow-off valve
7. Elevator air regulator
8. Control module lockout valve
9. Air motor regulator
10. Air motor control valve

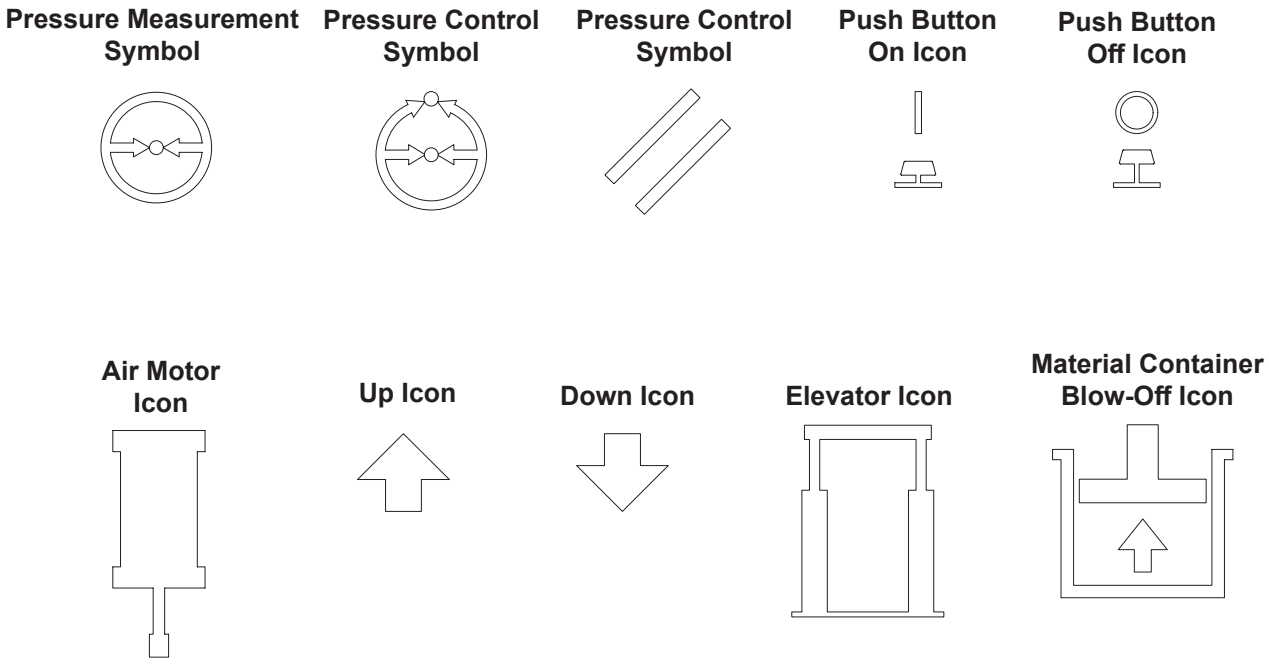


Figure 2-10 Control Module (2 of 2)

Conveyor

See Figure 2-11.

The Rhino conveyor is designed to make container changes easier to perform. The maximum load capacity of the conveyor is 750 lb (340 kg).

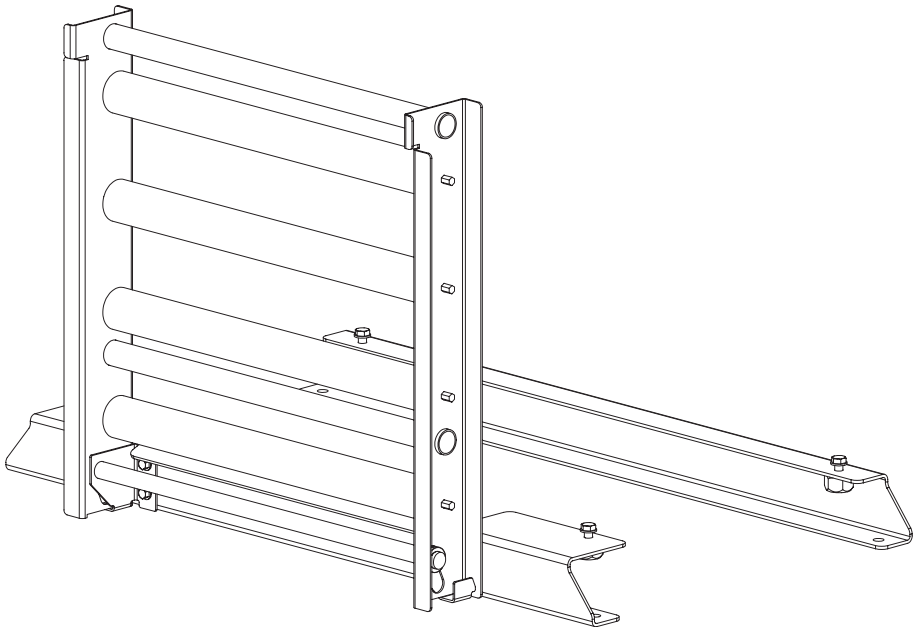


Figure 2-11 Conveyor

Follower Modules

See Figure 2-12 and refer to Table 2-4.

5 Gallon Follower Modules

The follower module attaches to the hydraulic section of the pump (1). It is designed to force material out of straight sided containers. Follower plate modules are available to fit to the following container inside diameters:

Table 2-4 O-ring and Wiper Reference

O-ring	Wiper
280 mm	280-286 mm
286 mm	
305 mm	
310 mm	

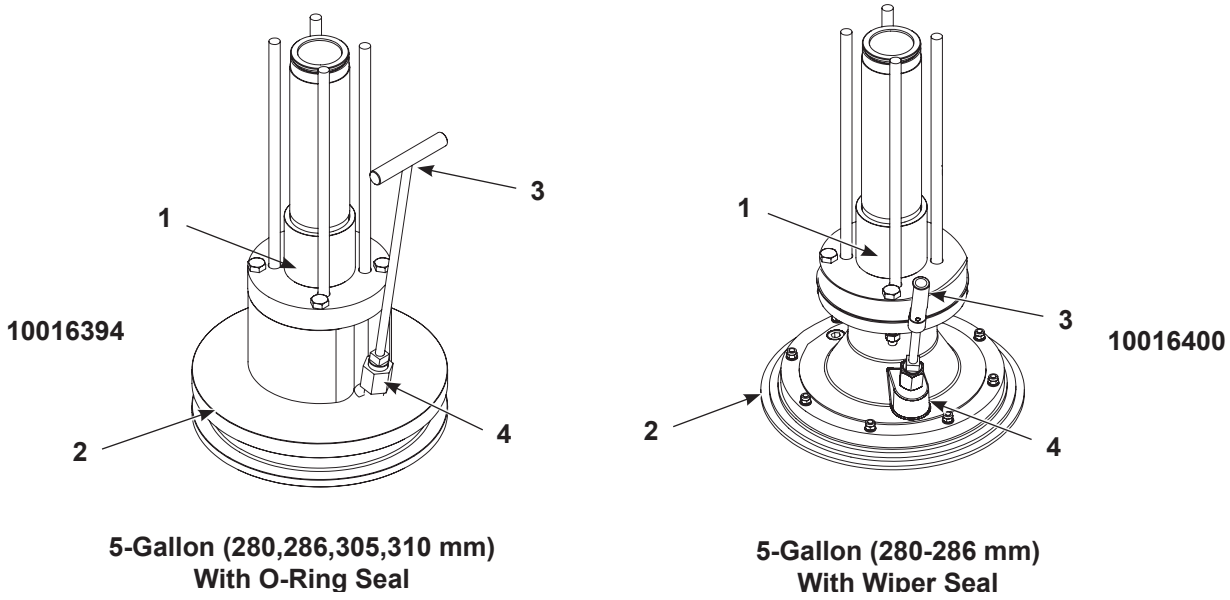


Figure 2-12 5 Gallon Follower Modules (partial pump hydraulic section shown)

1. Pump
2. Follower plate module
3. Bleeder stem
4. Bleeder stem adapter

55 Gallon Follower Modules

See Figure 2-13 through Figure 2-15.

A follower module attaches to the hydraulic section of the pump. It is designed to force material out of containers. PTFE coated follower plate modules are available to fit 55 gallon US standard (572 mm) containers.

Follower plates have two elastomer seals. When the follower plate is lowered into the container, the elastomer seals cause the material to pressurize by creating a tight seal around the inner diameter of the container. When the pump cycles, the follower plate forces the material out of the container and into the pump hydraulic section. The elastomer seals also protect the material from moisture and contamination from the surrounding environment.

A PTFE coated steel ring and/or UHMWPE ring is used along with a standard follower plate for high viscosity urethane materials that are shipped in foil bags. It is sized for a close tolerance fit to the inner diameter of the container. The ring collapses the foil bag to prevent it from getting wedged between the follower plate module and the container wall.

NOTE: The additional NPT port on the bleeder stem adapter on the follower module is used to connect an optional depressurization circuit that vents material.

Lowering the follower plate module into a container will cause air buildup between the bottom of the follower plate and the material. Remove the bleeder stem from the bleeder stem adapter before lowering the follower plate to provide a path for the air to vent.

The blow-off tube allows air to enter the area below the follower plate. When the blow-off tube is installed, the elevator is in the Up position, and the blow-off valve is opened, air flows under the follower plate. This pressure forces the container off the follower plate.

There are three types of follower modules:

- Ambient follower modules
- Temperature conditioned (T/C) follower modules
- Electrically heated follower modules

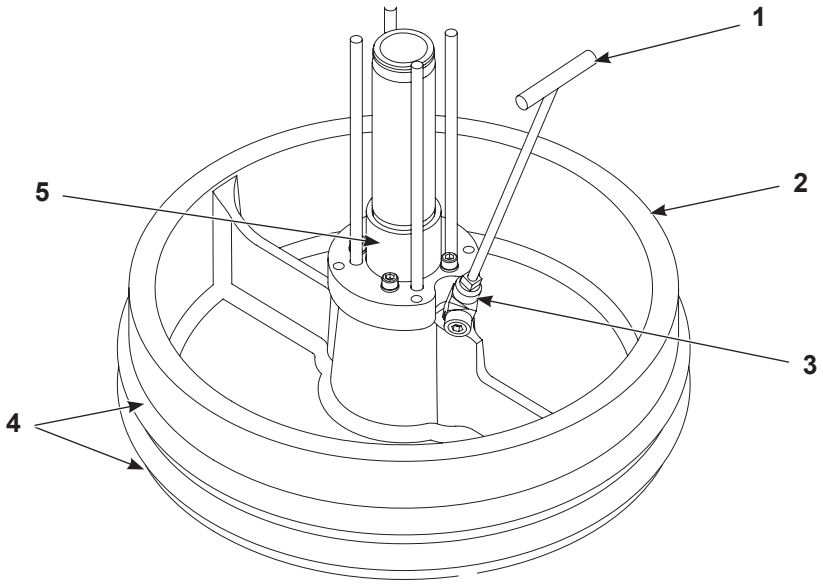


Figure 2-13 55 Gallon Ambient Follower Module

1. Bleeder stem
2. Follower plate
3. Bleeder stem adapter
4. Elastomer seals
5. Hydraulic section

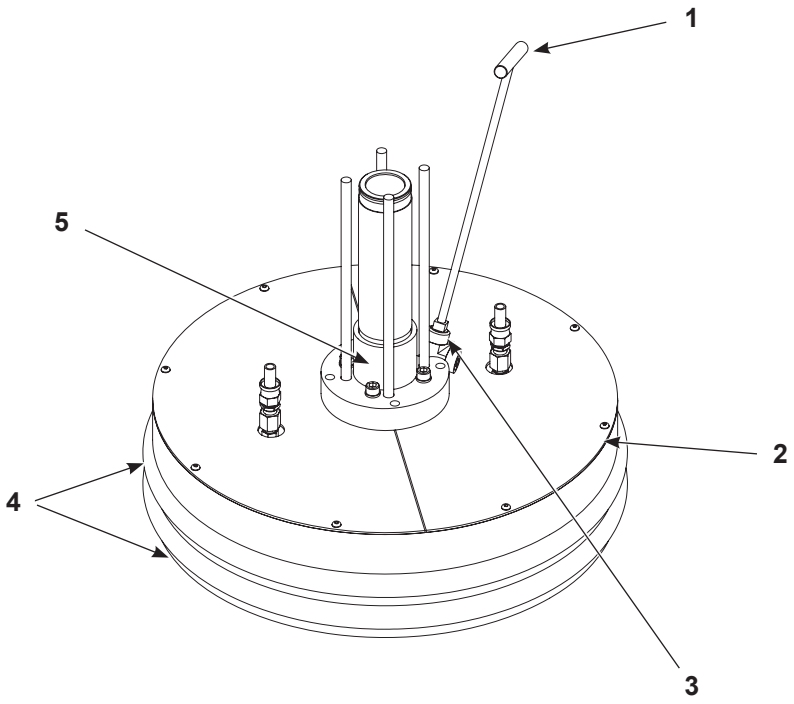


Figure 2-14 55 Gallon T/C Follower Module

1. Bleeder stem
2. Follower plate
3. Bleeder stem adapter
4. Elastomer seals
5. Hydraulic section

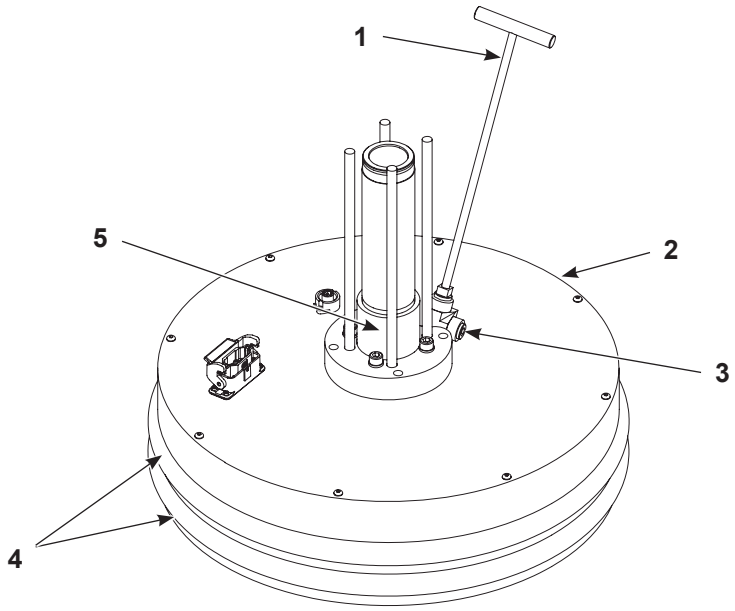


Figure 2-15 55 Gallon Electrically Heated Follower Module

1. Bleeder stem
2. Follower plate
3. Bleeder stem adapter
4. Elastomer seals
5. Hydraulic section

Interconnect Hose Module

See Figure 2-16.

Interconnect hose modules are designed for use on dual post unloader frames configured with 5 and 55 gallon follower plates. Modules are also available for bulk unloaders configured with the depressurization option. Each module consists of hose, tubing, and cables routed through a cable track. For 24 Vdc versions, the cable pump for stroke sensing is also included.

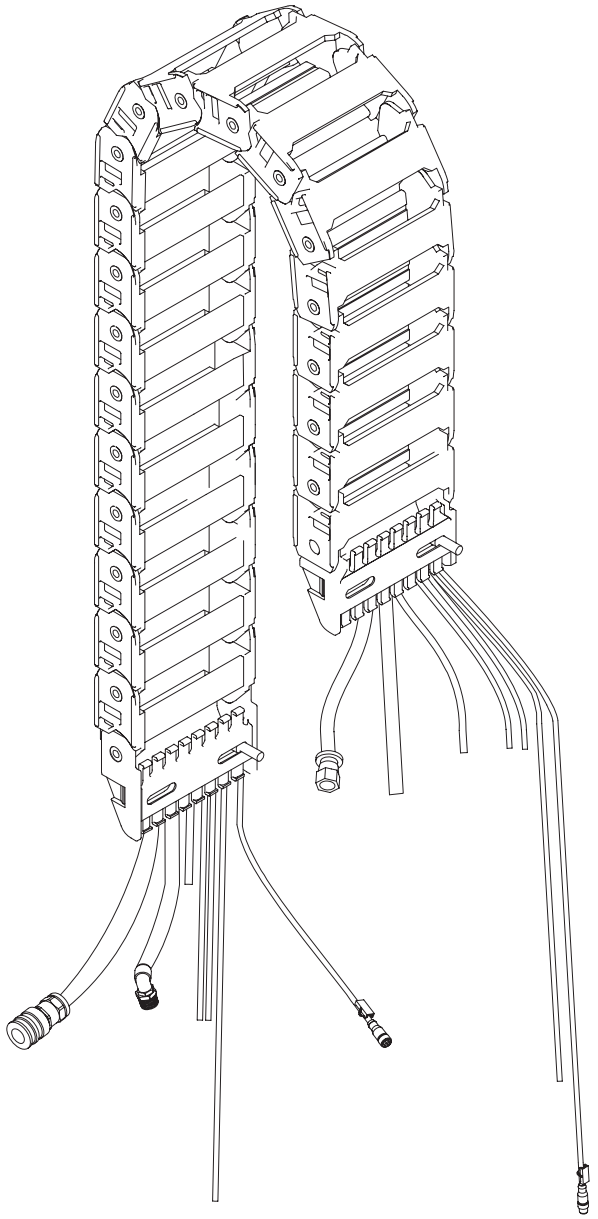


Figure 2-16 Interconnect Hose Module (Typical)

Pressure Relief Valve

See Figure 2-17.

When using a 5-gallon follower on a 55-gallon frame, a Rhino SD3/XD3 pressure relief valve must be installed to limit the amount of air pressure that can be applied to the ram cylinders in the downward direction. The pressure relief valve uses spring force to counteract the air pressure force. When the force created from the air pressure becomes greater than the spring force, the valve pops fully open and vents air to the atmosphere.

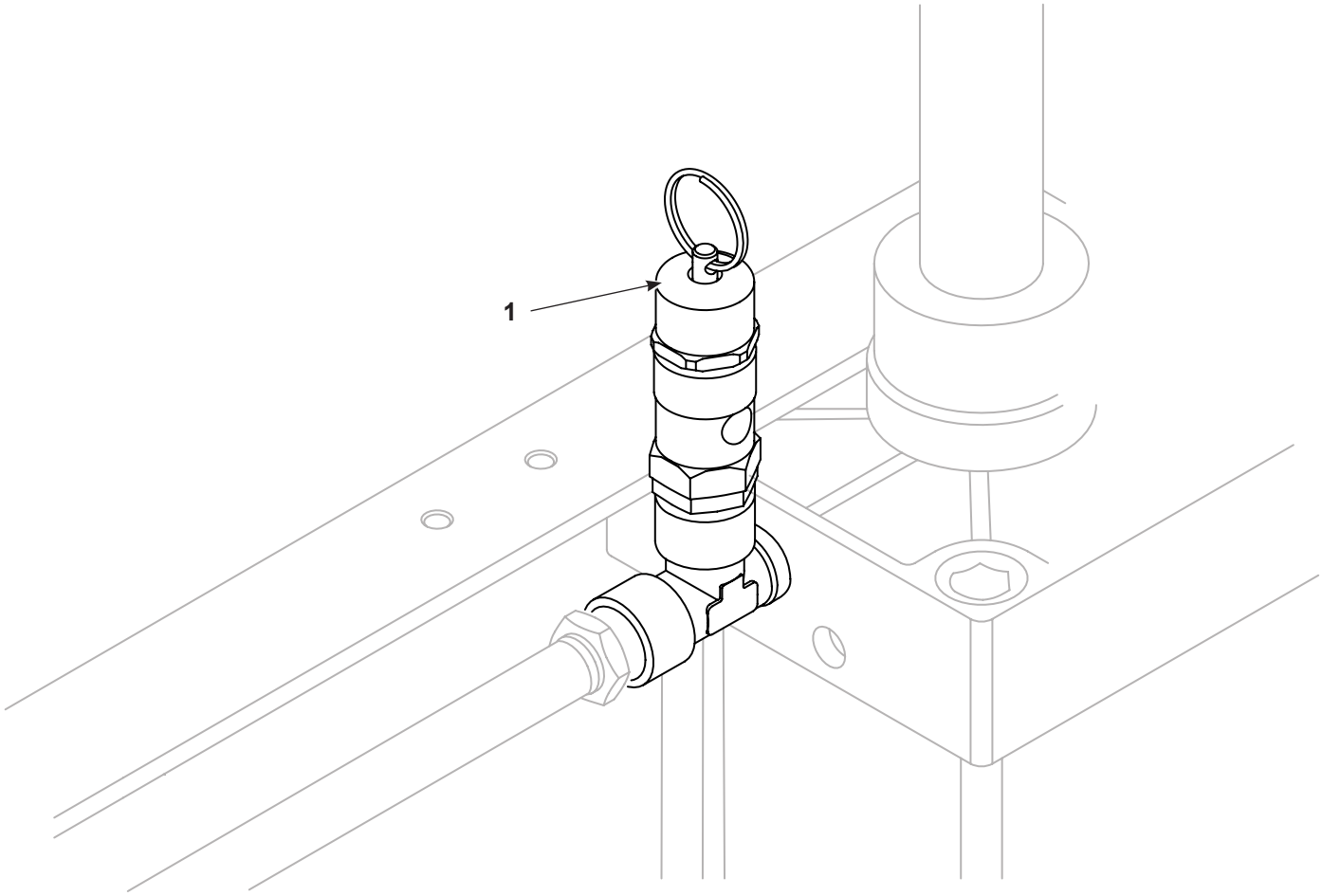


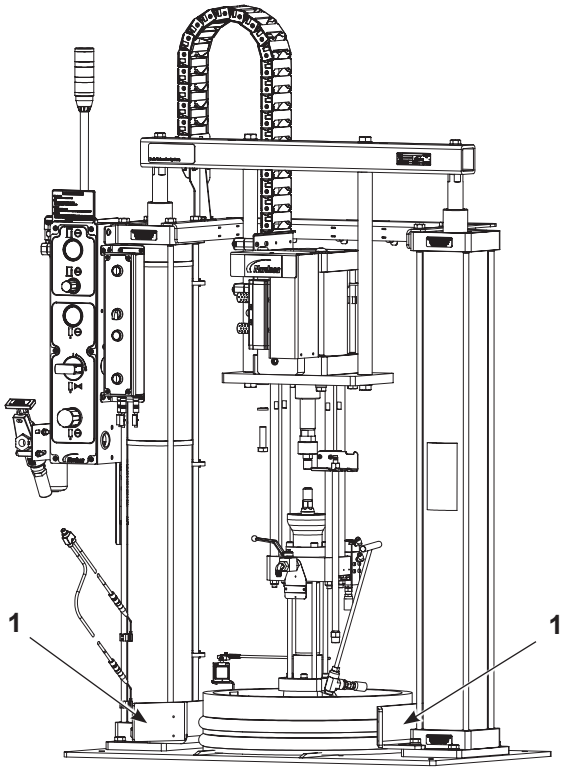
Figure 2-17 Pressure Relief Valve

1. Pressure Relief Valve

Universal Guide Plate

See Figure 2-18.

The universal guide plate is utilized on 55 gallon unloaders to guide and correctly position containers beneath the follower module.



55 Gallon Pump And Ram Shown; 5 Gallon Pump And Ram Similar.
Electric Unloader Shown For Illustrative Purposes Only.

Figure 2-18 Universal Guide Plate

1. Universal Guide Plate

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Section 3
Specifications

WARNING: Use Nordson or equivalent nylon or PTFE fluid hoses with electrical continuity between fittings. Hoses must be capable of withstanding the maximum output pressure of the pump. Use flexible hoses between the pump and the fluid system to dampen vibrations.

Dimensions and Weights

Refer to Table 3-1.

Table 3-1 Dimensions and Weights

Description		Dimensions	Note
5-Gallon			
Height (ram down)		59.5 in. (151.1 cm)	
Depth (front to back)		20.9 in. (53.1 cm)	
Width		33.3 in. (84.6 cm)	
Weight	Shipping weight	250-300 lb (113.4-136.1 kg)	A
	Assembled weight	220-270 lb (99.8-122.5 kg)	A
55-Gallon			
Height (ram down)		78.0 in. (198.1 cm)	
Depth (front to back)		26.9 in. (68.3 cm)	
Width		52.3 in. (132.8 cm)	
Weight	Shipping weight	560-660 lb (254.0-299.4 kg)	A
	Assembled weight	500-600 lb (226.8-272.2 kg)	A
NOTE: A. Weights listed are approximate.			

Connections

Refer to Table 3-2.

Table 3-2 Unloader Connection Specifications

Description	Connection
Air Inlet	½-in. NPT
Material Outlet Size	1-¼ SAE, Dash Size -20 Straight Thread O-Ring Port Per SAE J1926-1 (ISO 11926-1), 1 5/8-12 UN-2B Thread

Air Motor

Air Requirements

CAUTION: The minimum instantaneous flow rate must be at least 175 scfm at 60 psi for rapid air motor direction changes. This flow rate minimizes material pressure loss during pump shifts.

See Figure 3-1 through Figure 3-4.

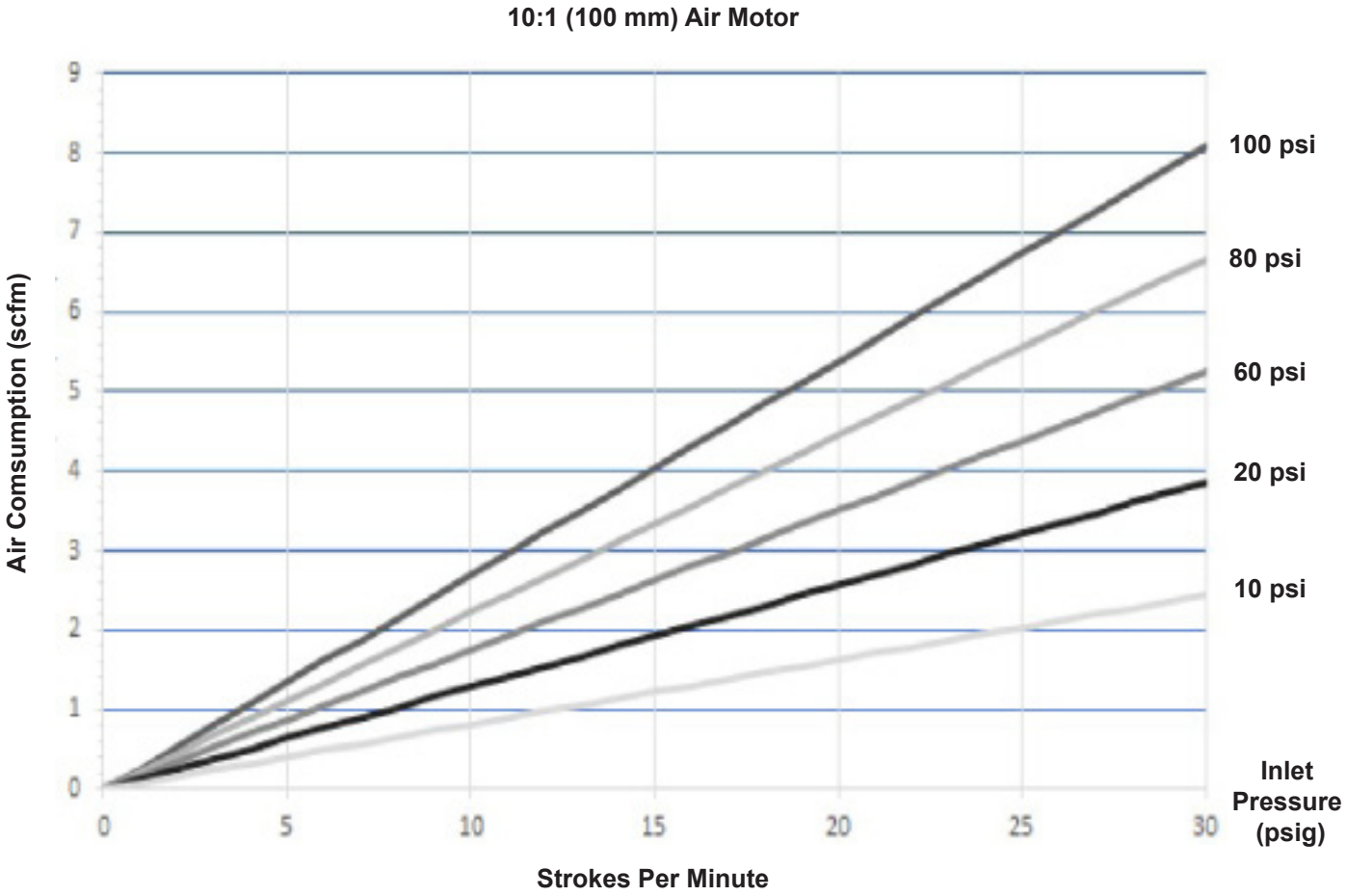

Figure 3-1 10:1 (100mm) Air Motor - Air Requirements

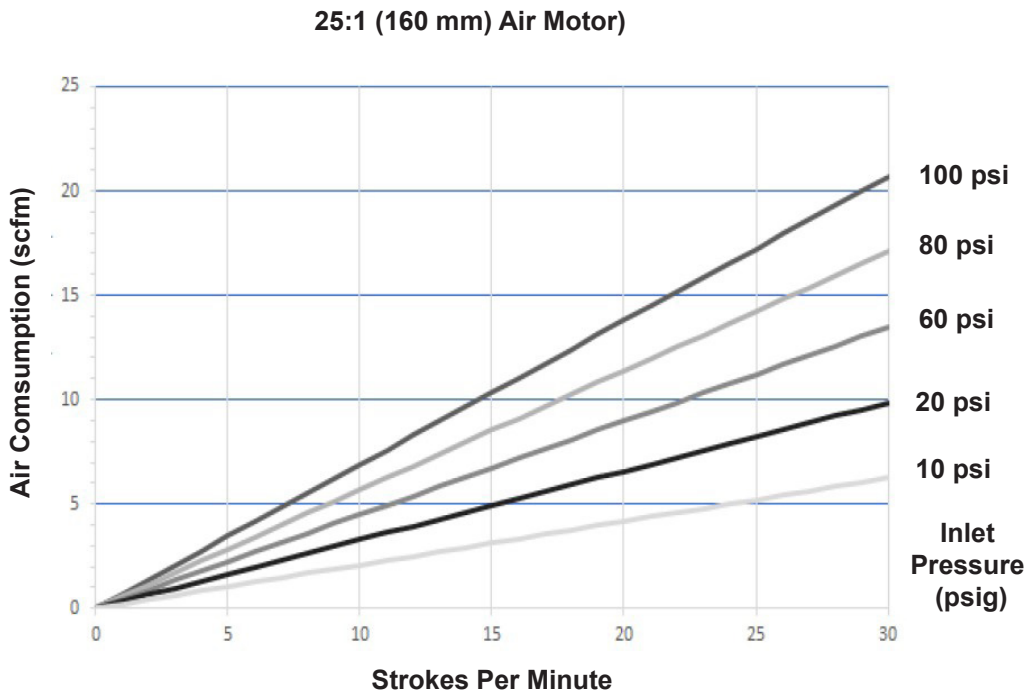

Figure 3-2 25:1 (160 mm) Air Motor - Air Requirements

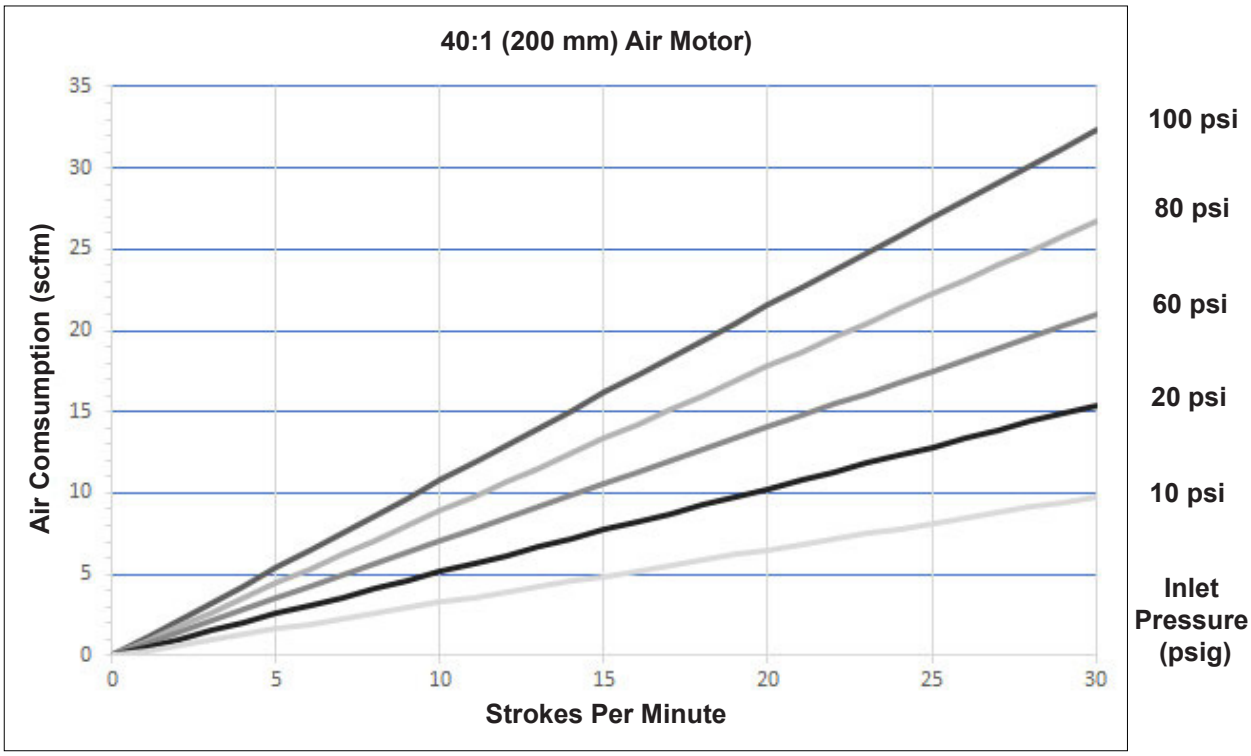

Figure 3-3 40:1 (200 mm) Air Motor - Air Requirements

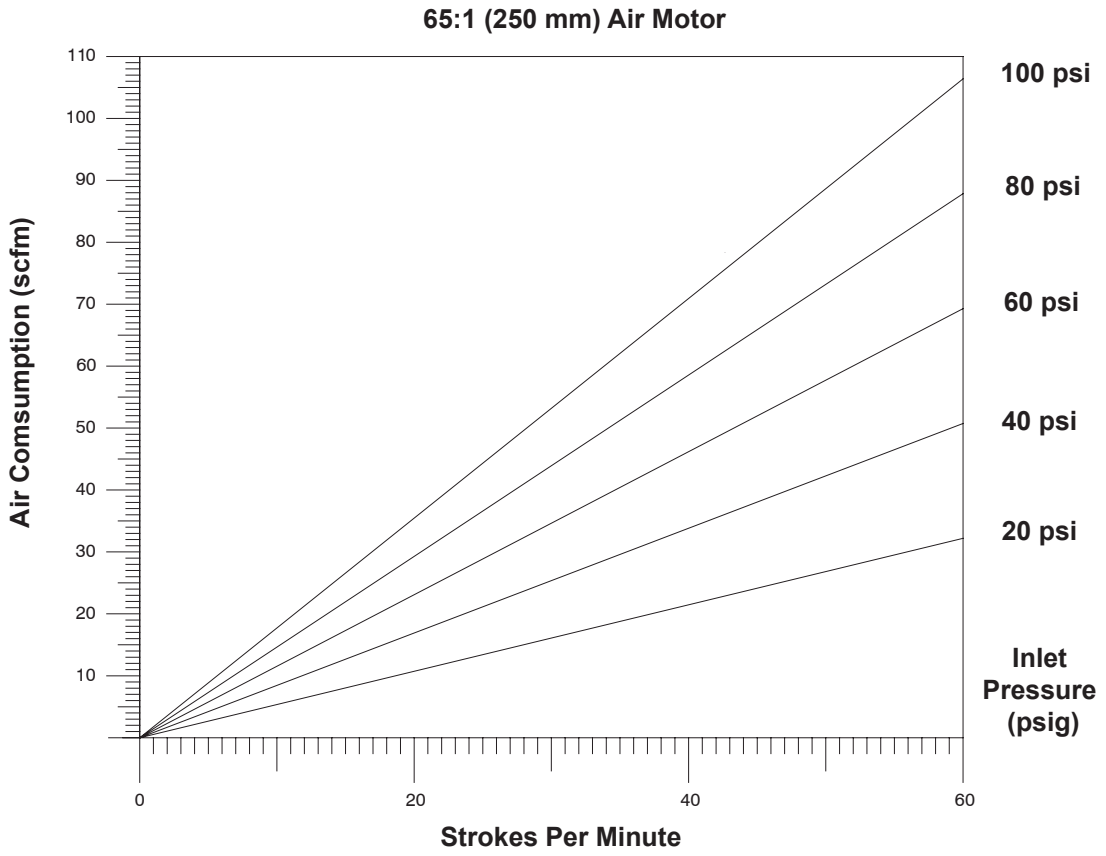

Figure 3-4 65:1 (250 mm) Air Motor - Air Requirements

Unloader Operating Sound Levels

NOTE: These are the sound levels generated by the pump and air motor. Refer to Table 3-3.

Table 3-3 Air Motor Sound Level Specifications

Air Motor Cylinder Size	Air Motor Theoretical Ratio	Air Motor Pressure	Sound Level dBA (Maximum)
100 mm	10:1	100 psi (6.89 bar)	90.2
160 mm	25:1	100 psi (6.89 bar)	90.2
200 mm	40:1	100 psi (6.89 bar)	90.2
250 mm	65:1	100 psi (6.89 bar)	86.6

Pump

Hydraulic Section

Refer to Table 3-4.

Table 3-4 Pump Hydraulic Section Specifications

Item	Description
Maximum Output	174 cu-in./min 2.85 l/min
Maximum Stroke Rate	Intermittent: 1 Stroke per 2 sec (30 strokes/min) Continuous: 1 Stroke per 4 sec (15 strokes/min)
Dynamic Viscosity Range	30,000 - 3 million cps
Wetted Component Materials	Standard Hydraulic Section: Carbon Steel, Stainless Steel, Aluminum, Proprietary Ceramic Coating, Viton™, UHMWPE Stainless Steel Hydraulic Section: Stainless Steel 400 And 300 Series, Proprietary Ceramic Coating, Viton, UHMWPE ARW Stainless Steel Hydraulic Section: Stainless Steel 400 And 300 Series, Proprietary Ceramic Coating, Viton, UHMWPE, Polyester
Voltage/Wattage	Standard Wattage Hydraulic Section 240 V, 500 W

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Section 4
Installation

WARNING:

- Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.
- Wear protective clothing, safety glasses, and gloves when working with this equipment.
- Personnel must know how to safely operate the elevator control valve on the unloader.
- To prevent serious personal injury from material under pressure, always relieve system pressure before breaking any hydraulic connections.
- Be sure to relieve all hydraulic pressure from the hoses at the outlet of the pump and make sure to bleed off the pressure from the pump before repairing this unit. Otherwise, serious injury, death, or equipment damage could result.
- Shut off the customer supplied air source, bleed the air pressure from the unloader, and lock the main air shut-off valve.
- Disconnect and lock out power to the system before performing repairs.

Air Cylinder

100-160 mm Air Cylinder

Removal

See Figure 4-1 through Figure 4-5. Refer to Table 4-1.

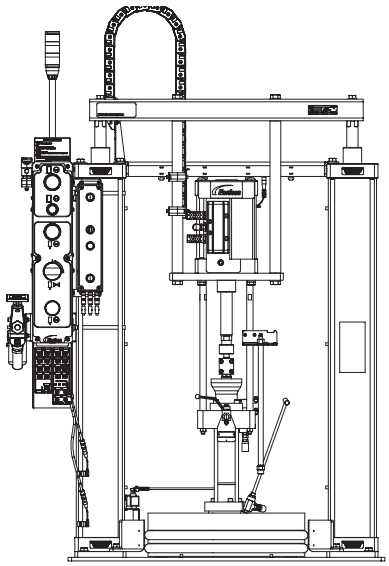
Table 4-1 Air Cylinder-To-Flange Tightening Specifications

Air Motor Cylinder	Tightening Specification
80-100 mm	20 N•m (15 ft lb)
125 mm	27 N•m (20 ft lb)
160-200 mm	54 N•m (40 ft lb)
250 mm	81 N•m (60 ft lb)

1. Remove the container from pump/ram assembly. Refer to the *Rhino® XD3 Electric Unloader Container Change Operator Card* for additional information.
2. See Figure 4-1. Position the ram in its lowest position.

NOTE: When the ram is in its lowest position, the follower module should contact the lower frame.

3. Remove the air supply from the air cylinder.

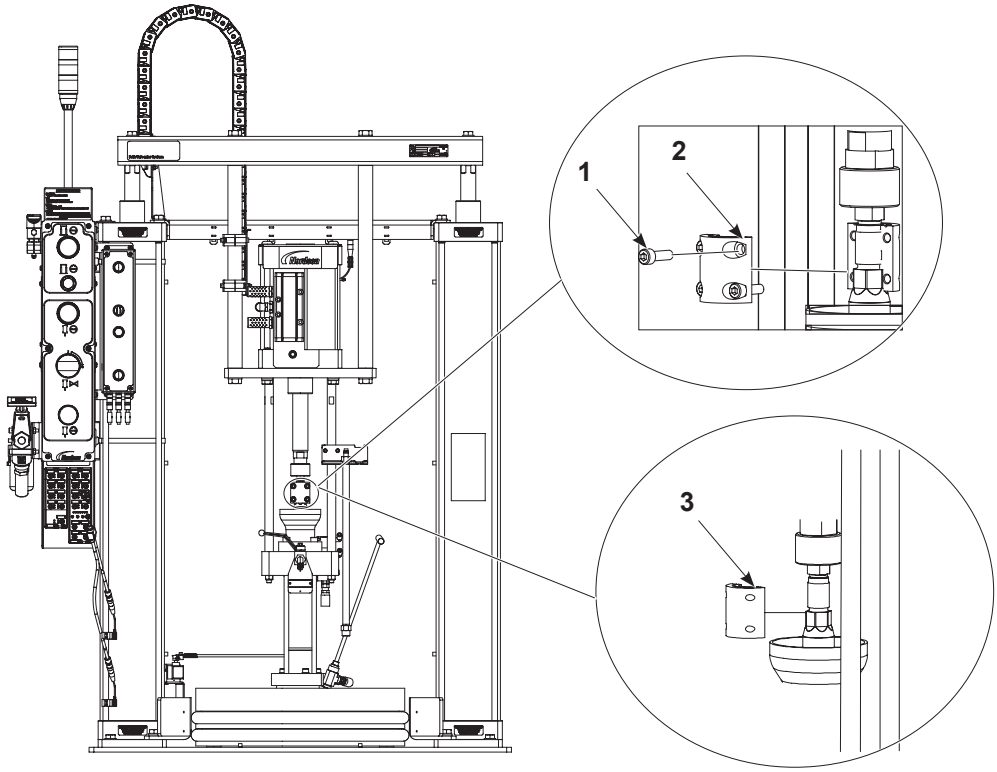


Ram Lowered To Its Lowest Position

55 Gallon Pump/Ram Assembly Shown; 5 Gallon Pump/Ram Assembly Similar. Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-1 Unloader Ram Lowered To Lowest Position

4. See Figure 4-2. Remove the four socket head cap screws (1) securing the coupler to the air cylinder and the pump plunger rod.
5. Remove the front coupler shell (2) from the air cylinder and the pump plunger rod.
6. Remove the rear coupler shell (3) from the air cylinder and the pump plunger rod.
7. Separate the air cylinder shaft from the pump plunger rod.



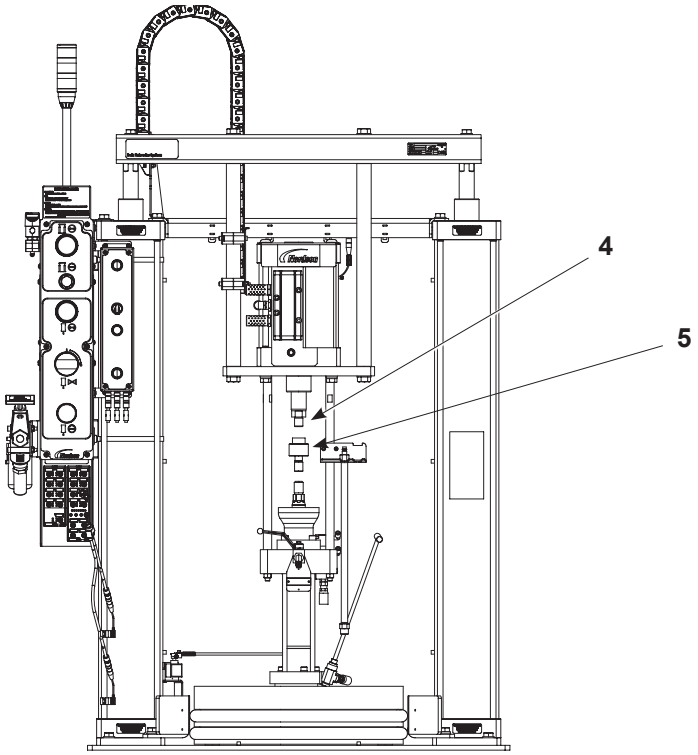
55 Gallon Pump/Ram Assembly Shown; 5 Gallon Pump/Ram Assembly Similar.
Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-2 Remove/Replace Air Cylinder Coupler

1. Socket head cap screw
2. Coupler - front shell
3. Coupler - rear shell

8. See Figure 4-3. Utilizing a wrench or an equivalent tool, remove the floating coupler (5) from the air cylinder shaft (4).

NOTE: To facilitate removal of the floating coupler (5), secure the air cylinder shaft (4) with a wrench or an equivalent tool.



55 Gallon Pump/Ram Shown; 5 Gallon Pump/Ram Assembly Similar.
Electric Unloader Shown For Illustrative Purposes Only.

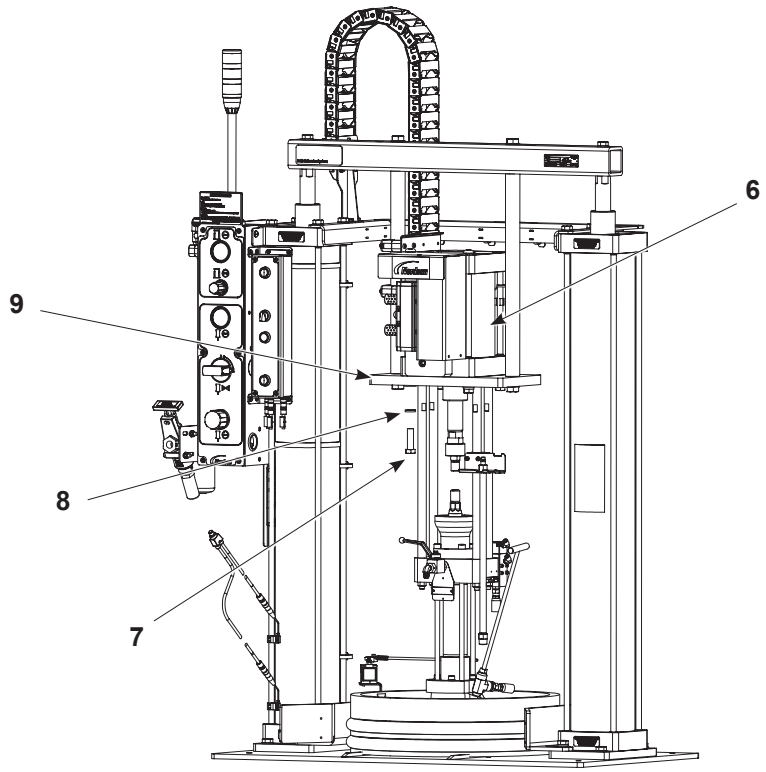
Figure 4-3 Coupler And Air Cylinder Shaft Separation From Pump Hydraulic Section

4. Air cylinder shaft
5. Floating coupler

9. Remove the four bolts (10) and the washers (11) securing the air cylinder (9) to the flange (12).

WARNING: To avoid personal injury or damage to equipment, have an assistant help remove the air cylinder from the pump/ram assembly.

10. Remove the air cylinder from the pump/ram assembly.



55 Gallon Pump/Ram Assembly Less 65:1 Air Cylinder Shown; Other Two Post Pump/Rams Similar. Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-4 Remove/Replace Air Cylinder (100-200 mm)

6. Air cylinder
7. Bolt
8. Washer
9. Flange

Replacement

Coupling Halves

See Figure 4-5.

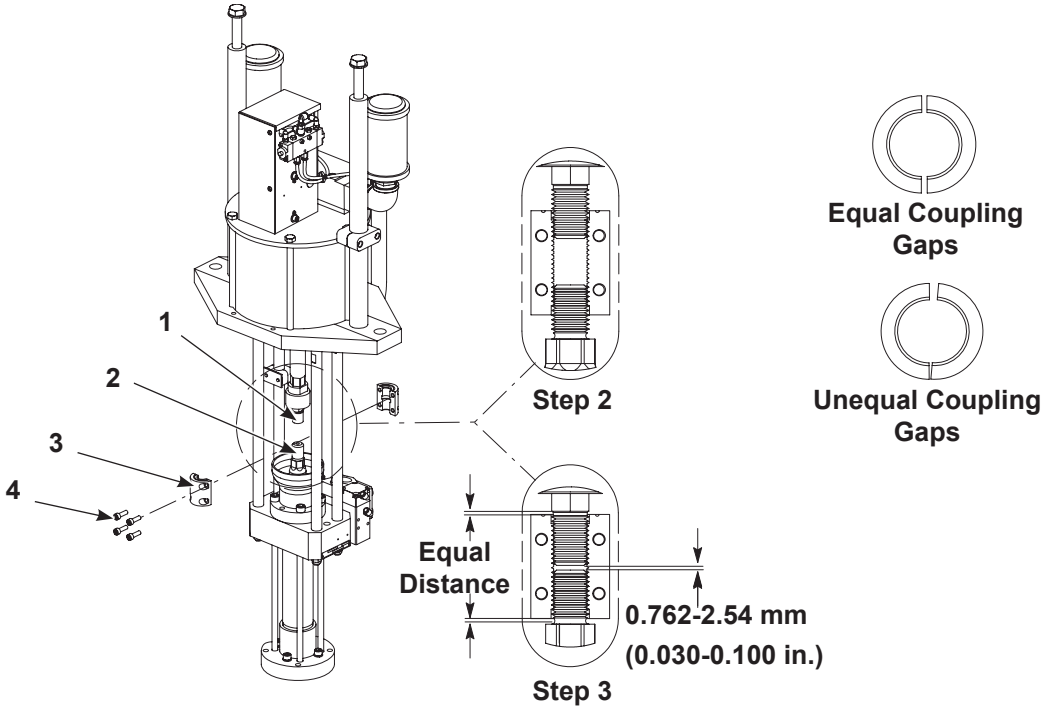
1. Ensure the grooved end of each split coupling half (3) is facing upward.

NOTE:

- Position both split coupling halves (3) over the floating joint coupling shaft (1) and the plunger rod (2).
- The split coupling halves are a matched set. Each half is stamped with the same serial number.

CAUTION: Ensure the bleed valve on the pump body is open and not plugged.

2. Install one split coupling half. Adjust the floating joint coupling shaft position to obtain a 0.76-2.54-mm (0.030-0.100-in.) gap between the floating join coupling and the plunger rod.
3. Install the remaining split coupling half. Ensure the gaps between the sides of the coupling halves are equal.
4. Apply suitable removable threadlocker to the threads of the screws. Install the coupling screws (4) and tighten to 19-21 N•m (14-16 ft-lb).



Hydraulic Section Isolated From Pump/Ram Assembly For Illustration Purposes Only.

Figure 4-5 Split Coupling Halves Replacement

1. Floating joint coupling shaft
2. Plunger rod
3. Split coupling halve
4. Coupling screws

5. Replace the remaining components in the reverse order of removal. Note the following:

- **On models equipped with 7/16 in. air cylinder shafts**, tighten the floating coupler to 68 N•m (50 ft lb).
- **On models equipped with 7/8 in. and M24 air cylinder shafts**, tighten the floating coupler to 136 N•m (100 ft lb).
- Refer to Table 4-1 for the air cylinder-to-flange fastener tightening specifications.

250 mm Air Cylinder

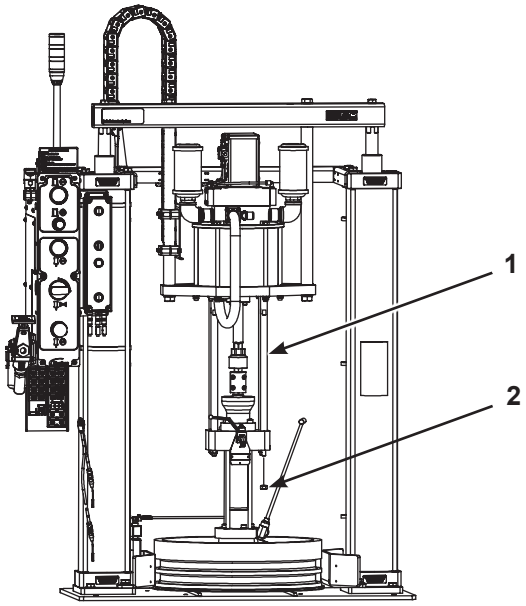
Removal

See Figure 4-6 through Figure 4-8. Refer to Figure 4-1 through Figure 4-3.

1. Remove the container from pump/ram assembly. Refer to the *Rhino® XD3 Electric Unloader Container Change Operator Card* for additional information.
2. Refer to Figure 4-1. Position the ram in its lowest position.

NOTE: When the ram is in its lowest position, the follower module should contact the lower frame.

3. Refer to Figure 4-2. Remove the four socket head cap screws (1) securing the coupler - front shell (2) and coupler - rear shell (3) to the air cylinder shaft and the pump plunger rod.
4. Remove the front coupler - front shell (2) and coupler - rear shell (3) to the air cylinder shaft and the pump plunger rod.
5. Refer to Figure 4-3. Separate the air cylinder shaft from the pump plunger rod.
6. See Figure 4-6. Remove the nuts (2) securing the pump tie-rods (1) to the pump assembly.



Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-6 Remove/Replace Air Cylinder (250 mm) (1 of 3)

1. Pump tie-rod
2. Nut

7. Place the elevator control switch in the *Ram Up* position.

WARNING: Install support blocks between the pump/ram assembly cross member and the top of the frame member on both sides of the pump/ram assembly.

8. See Figure 4-7. Place a 4x4 wood support block between the pump/ram assembly cross member and the top of the frame member.

WARNING: To avoid personal injury, avoid physical contact with the area located between the pump/ram assembly cross member and the top of the frame member. This is the area where the supports have been installed.

9. Place the elevator control switch in the *Neutral* position and allow the cross member to come to a rest on the 4x4 supports.

WARNING:

- Lockout supply air supply.
- To avoid personal injury, avoid physical contact with the area located between the follower module and the floor.

10. Utilizing an adjustable wrench or an equivalent tool, remove the pump tie-rods (4) from the air cylinder flange (3).

NOTE: Utilize the wrench flats located on the pump tie-rods (4) to facilitate removal.

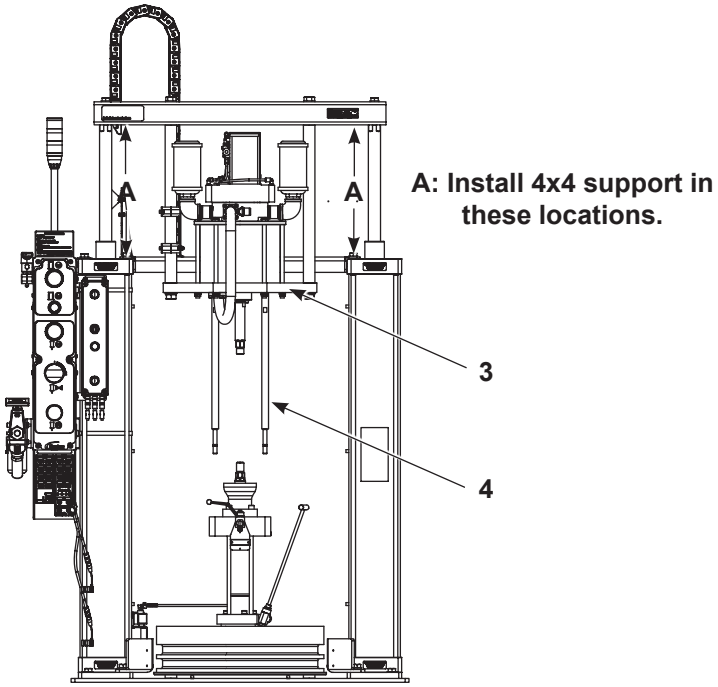


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Figure 4-7 Remove/Replace Air Cylinder (250 mm) (2 of 3)

3. Air cylinder flanger
4. Pump tie-rod

11. Remove the air supply from the air cylinder.

WARNING: To avoid personal injury, avoid physical contact with the area located between the air cylinder and the floor.

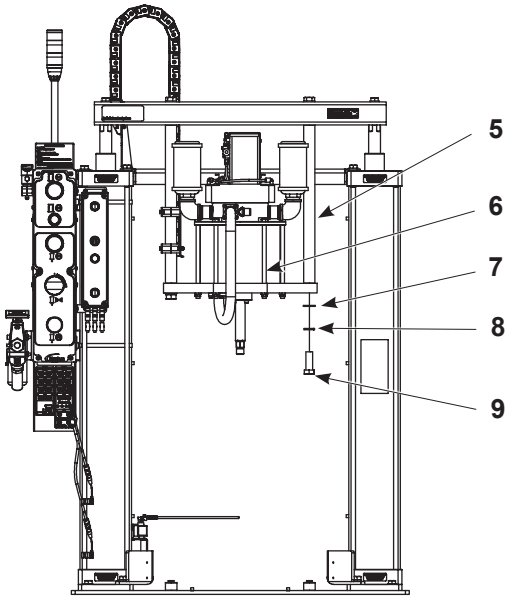
12. With the aid of an assistant, removal the pump and follower plate as an assembly from the unloader.

WARNING: Ensure the lifting fixture is capable of supporting 300 lb (136 kg).

13. See Figure 4-8. Locate a suitable lifting fixture below the air cylinder.
14. Raise the lifting fixture sufficiently to support the weight of the air cylinder.

CAUTION: Arrange support blocks as required on the lifting fixture to avoid damaging the air cylinder shaft.

15. With the air cylinder fully supported, remove the bolts (9), washers (7), and lock washers (8) securing the air cylinder (6) to the air cylinder tie-rods (5).
16. Remove the air cylinder (6) from the unloader.



Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-8 Remove/Replace Air Cylinder (250 mm) (3 of 3)

5. Air cylinder tie-rod
6. Air cylinder
7. Washer
8. Lock washer
9. Bolt

Replacement

Refer to Figure 4-5, Figure 4-6, and Figure 4-8.

Replacement of the air cylinder it in the reverse order of removal. Note the following:

1. Refer to Figure 4-8. Tighten bolts (9) to 530 N•m (398 ft-lb).
2. Refer to Figure 4-5. Install the coupling halves. Refer to *100-160 Air Cylinder, Replacement, Coupling Halves* for additional information.
3. Refer to Figure 4-6. Tighten nuts (2) to 96 N•m (72 ft-lb).

Pump

See Figure 4-9 and Figure 4-10.

1. If installed, remove the material container from the unloader. Refer to *Container Change Operator Card* for additional information.
2. If a container is not present, refer to *Container Change Operator Card* for additional information and perform the following:
   a. Set the air motor lockout valve to the *Off* position.
   b. Place the elevator control switch in the *Neutral* position.
   c. Remove the bleeder stem from the bleeder stem fitting.
   d. Connect the blow-off tube to the bleeder stem fitting.
   e. Connect the blow-off air line to the blow-off tube
   f. Place the elevator control switch in the *Ram Up* position.
3. See Figure 4-9. Raise the ram sufficiently to that space exists between the pump/ram cross member and the top of the frame member,

WARNING: Install support blocks between the pump/ram assembly cross member and the top of the frame member on both sides of the pump/ram assembly.

4. Place a 4x4 wood support block between the pump/ram assembly cross member and the top of the frame member.

WARNING: To avoid personal injury, avoid physical contact with the area located between the pump/ram assembly cross member and the top of the frame member. This is the area where the supports have been installed.

5. Place the elevator control switch in the *Neutral* position and allow the cross member to come to a rest on the 4x4 support.

WARNING: To avoid personal injury avoid physical contact with the area located between the follower module and the floor.

6. Place a jack or equivalent support tool under the raised follower assembly.
7. Remove the follower module from the pump. Refer to *Follower Module* on *page 20* for additional information.

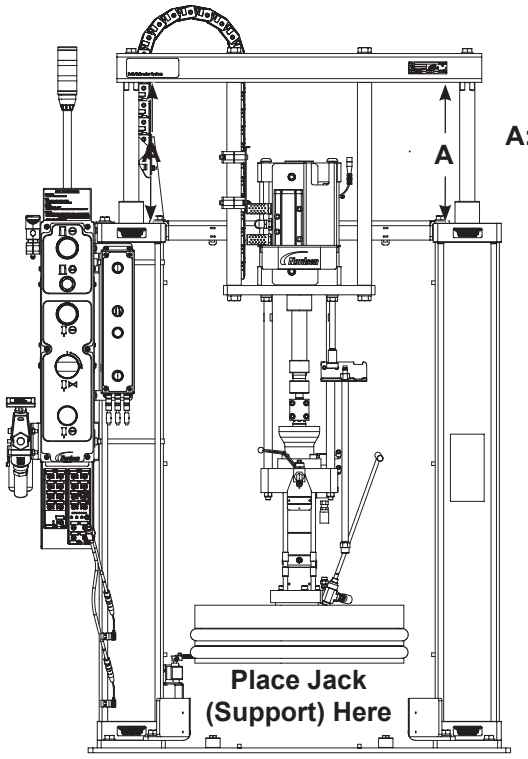


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Figure 4-9 Remove/Replace Pump (1 of 2)

8. See Figure 4-10. Remove the screws (7) securing the coupling halves (3) to the floating coupler (2) and pump plunger rod (4).
9. Remove the nuts (6) securing the pump (5) to the pump tie-rods (8).
10. Remove the pump (5) from the pump/ram assembly.
11. Remove the follower module from the pump, if necessary. Refer to *Follower Module* on page 20 for additional information.
12. Installation of the pump is in the reverse order of removal. Note the following:
    - Tighten nut (6) to 75 N•m (55 ft lb).
    - Tighten the coupler socket head cap screws to 39 N•m (29 ft lb).

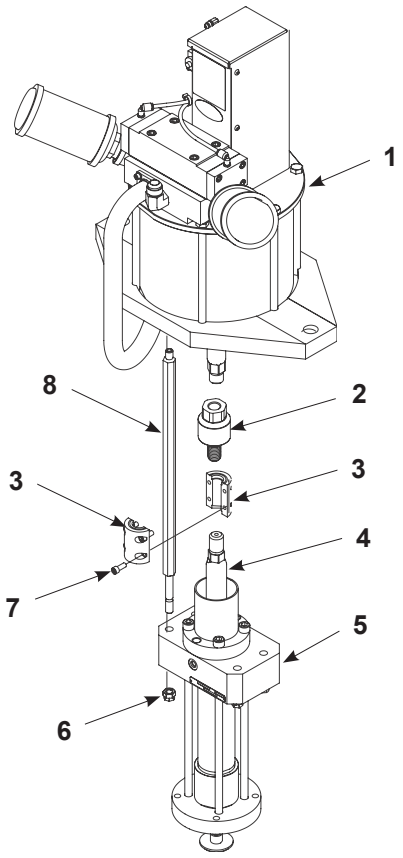

Figure 4-10 Remove/Replace Pump (2 of 2)

1. Air cylinder
2. Floating coupler
3. Coupler shell
4. Pump plunger rod
5. Pump
6. Nut
7. Socket head cap screws
8. Pump Tie-Rod

Subcomponents

Ball Valve Assembly

See Figure 4-11.

1. Utilizing a wrench or an equivalent tool, unscrew the adapter (1) from the pump.

NOTE: The adapter is removed with the ball valve as an assembly.

2. If necessary, remove the label plate (2), ball valve (3), and the elbow (4).
3. Installation of the ball valve assembly is in the opposite of removal. Note the following:

• Apply pipe/thread/hydraulic sealant (PST) to the threads of the adapter and elbow.

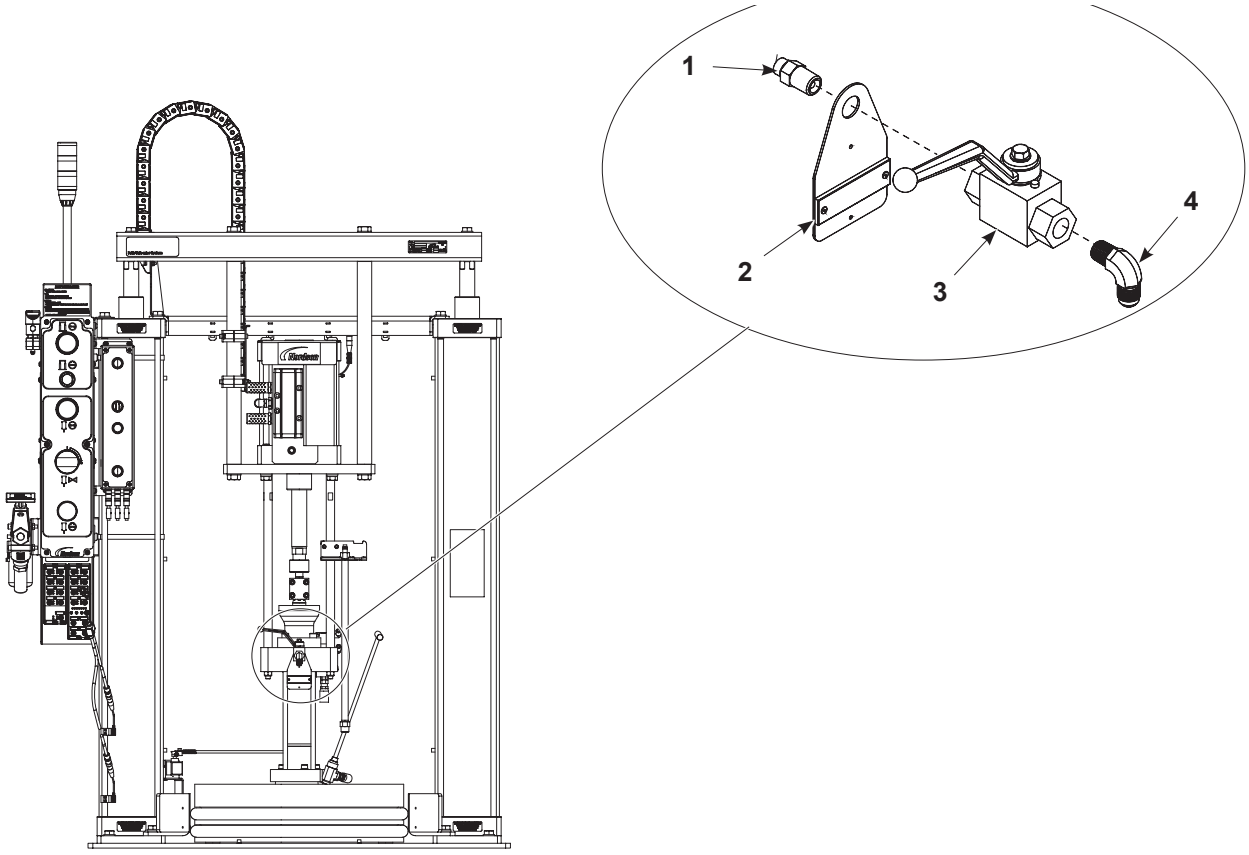

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Figure 4-11 Remove/Replace Ball Valve

1. Adapter
2. Label plate
3. Ball valve
4. Elbow

Control Module

See Figure 4-12.

1. Disconnect the air connections and cables from the control module.
2. Remove the socket head cap screws (1) securing the control module (2) to the control module bracket (3).
3. Remove the control module (2).
4. Installation of the control module is in the opposite of removal. Note the following:

• Tighten socket head cap screws (1) until they are secure.

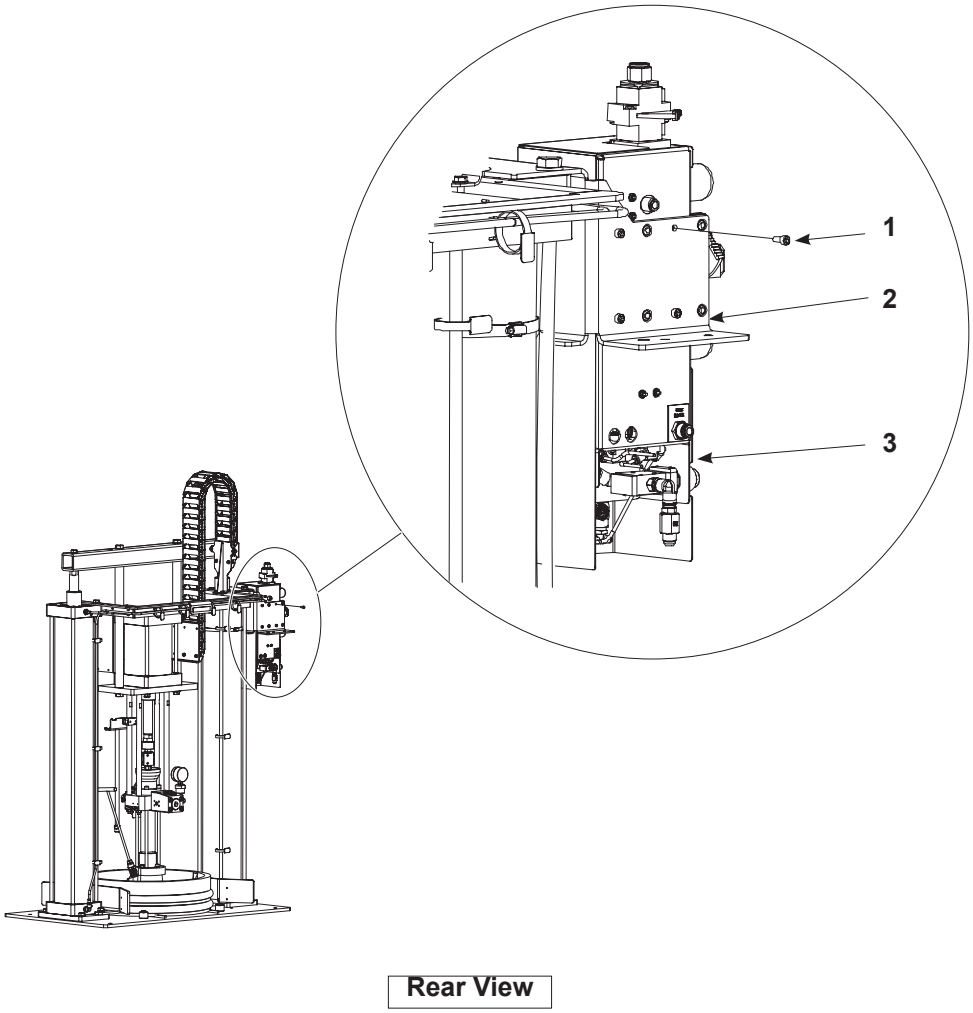


Figure 4-12 Remove/Replace Control Module

1. Socket head cap screw
2. Control module
3. Control module bracket

Conveyor (If Equipped)

Replacement

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

See Figure 4-13.

1. Lift the bulk unloader sufficiently to maneuver the front (4) and back supports (7) under the base plate (1) of the bulk unloader.
2. Apply Loctite® Threadlocker Blue 242® to the threads of the screws (2). Secure the front (4) and back supports (7) to the bulk unloader base plate (1) using the screws, washers (3), lock washers (5), and nuts (6). Tighten the screws to 55 ft-lb (74 N•m).

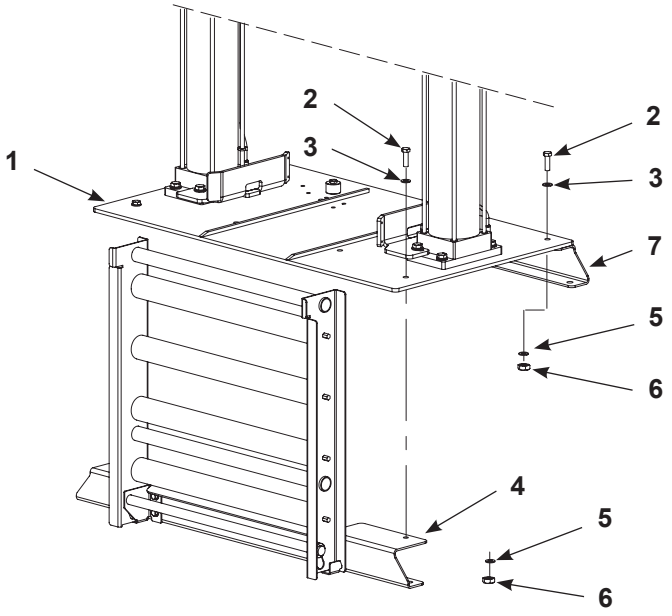


Figure 4-13 Remove/Replace Conveyor

1. Base plate
2. Screw
3. Washer
4. Front support
5. Lock washer
6. Nut
7. Back support

Operating the Conveyor

See Figure 4-14.

NOTE: The maximum load capacity of the conveyor is 750 lb (340 kg).

1. Pull up on the conveyor.
2. Swing the conveyor to the down position.
3. Remove the material container from the bulk unloader and place it onto the conveyor. Use the conveyor to maneuver the material container off the bulk unloader.
4. Place a new material container onto the conveyor. Use the conveyor to maneuver the container into position under the follower on the bulk unloader base plate.
5. Swing the conveyor to the up position.

NOTE: When repositioning the conveyor to the up position, the conveyor will drop slightly and lock in place.

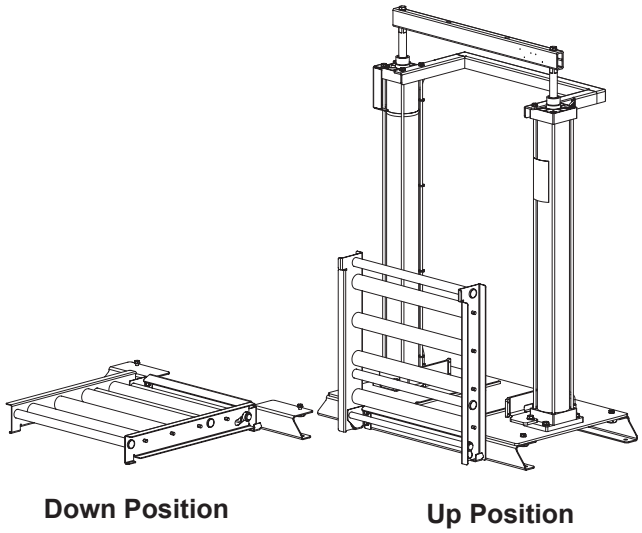


Figure 4-14 Operating the Conveyor

Follower Module

See Figure 4-15.

1. If installed, remove the material container from the unloader. Refer to *Container Change Operator Card* for additional information.
2. If a container is not present, refer to *Container Change Operator Card* and perform the following:
   a. Set the air motor lockout valve to the *Off* position.
   b. Place the elevator control switch in the *Neutral* position.
   c. Remove the bleeder stem (1) from the bleeder stem fitting (2).
   d. Connect the blow-off tube to the bleeder stem fitting (2).
   e. Connect the blow-off air line to the blow-off tube.
   f. Place the elevator control switch in the *Ram Up* position.
3. Refer to Figure 4-9. Raise the ram sufficiently until space exists between the pump/ram assembly cross member and the top of the frame member.

WARNING: Install support blocks between the pump/ram assembly cross member and the top of the frame member on both sides of the pump/ram assembly.

4. Place 4x4 wood support block between the pump/ram assembly cross member and the top of the frame member.

WARNING: To avoid personal injury, avoid physical contact with the area located between the pump/ram assembly cross member and the top of the frame member. This is the area where the supports have been installed.

5. Place the elevator control switch in the *Neutral* position and allow the cross member to come to a rest on the 4x4 support.

WARNING: To avoid personal injury, avoid physical contact with the area located between the pump/ram assembly cross member and the top of the frame member. This is the area where the supports have been installed.

6. Place a jack or an equivalent support tool under the raised follower assembly.
7. Disconnect all the hoses from the follower module.
8. Remove the four socket head cap screws (7) and the lock washers (6) securing the follower module (3) to the pump (5).
9. Remove the follower module O-ring (4).

CAUTION: Do not reuse the follower module O-ring (4).

10. Record the location of the follower module bleeder stem fitting (2).

NOTE: It is important to note the position of the follower module bleeder fitting so the follower module can be installed to the pump in the same orientation.

WARNING: To avoid personal injury and damage to equipment have an assistant help remove the follower module.

11. With the aid of an assistant, remove the follower module (3) from the pump (5).

12. Installation of the follower module is in the reverse order or removal. Note the following:
    - Apply material compatible grease to the follower module O-ring.
    - Tighten the socket head cap screws securing the follower module to the pump to 40 N•m (30 ft lb).

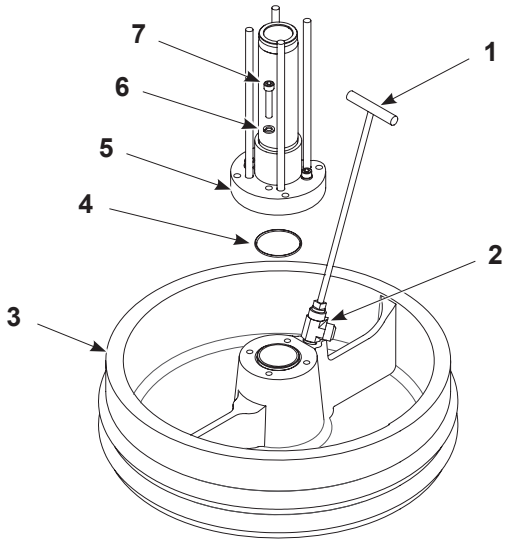


Figure 4-15 Remove/Replace Follower Module

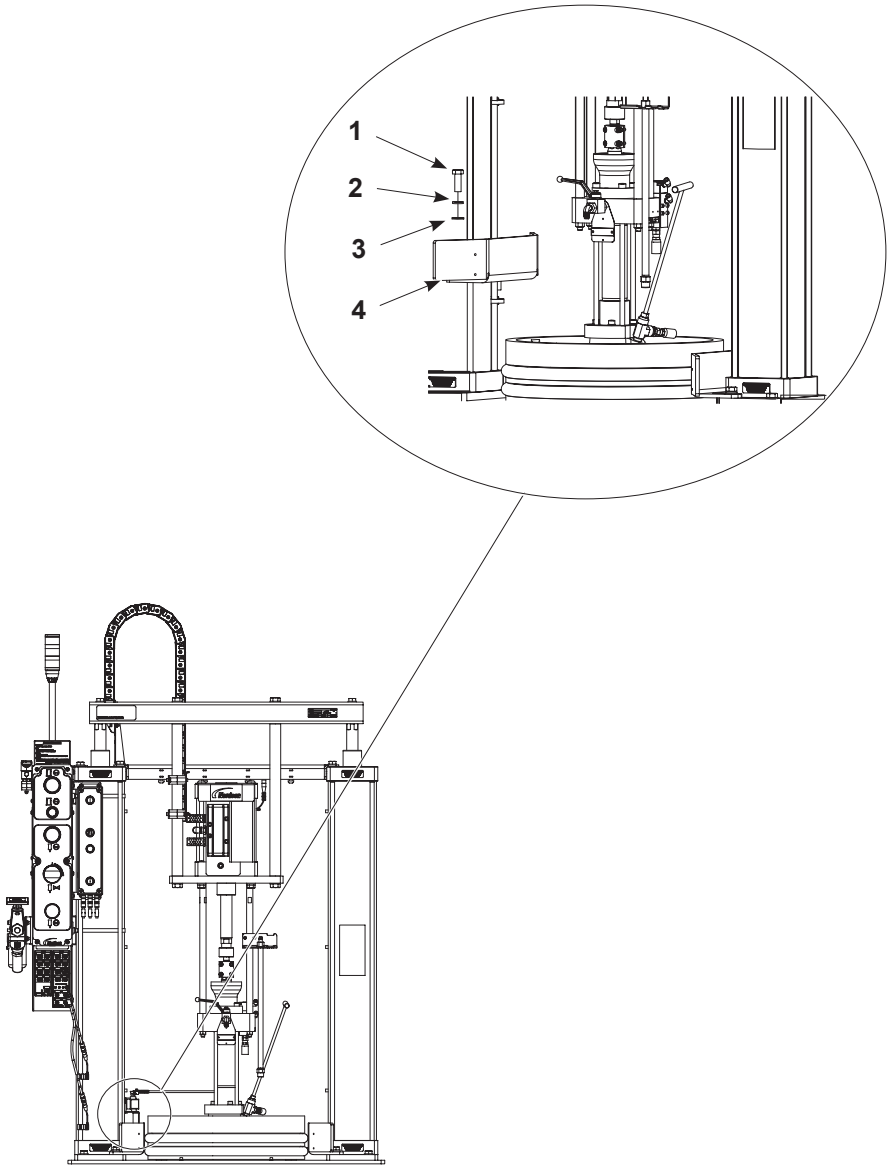
1. Bleeder stem
2. Bleeder stem fitting
3. Follower module
4. Follower module O-ring
5. Pump
6. Washer
7. Socket head cap screw

Guide

See Figure 4-16.

1. Remove the bolts (1), the lock washers (2) and the washers (3) securing the guide (4) to the pump/ram assembly.
2. Remove the guide (4) from the pump/ram assembly.
3. Installation of guide is in the reverse order of removal. Note the following:

• Tighten the bolts (1) to 114 N•m (84 ft lb).



Electric Unloader Shown For Illustrative Purposes Only.

Figure 4-16 Remove/Replace Guide

1. Bolt
2. Lock washer
3. Washer
4. Guide

Magnetic Sensor

See Figure 4-17.

1. Disconnect the tubing from the magnetic sensor (1).
2. Mark the position of the magnetic sensor (1).
3. Remove the set screws securing the magnetic sensor (1) to the frame tie rod.
4. Remove the magnetic sensor (1).
5. Remove the screw and star washer securing the magnetic sensor (1) to the mounting bracket.
6. Remove the fittings from the existing magnetic sensor (1).
7. Install the fittings on the new magnetic sensor (1).
8. Install the new magnetic sensor (1) onto the frame tie rod at the marked position and tighten the two set screws securely.

NOTE: Ensure the magnetic sensor sits against the frame cylinder.

9. Connect the tubing to the magnetic sensor.

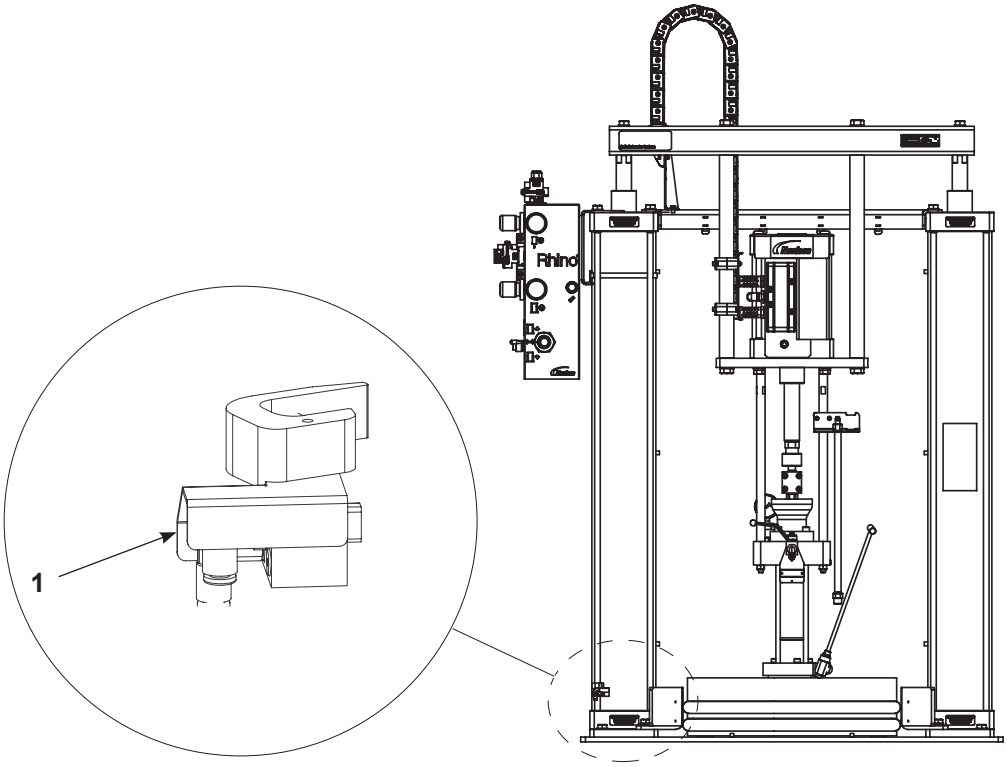


Figure 4-17 Remove/Replace Magnetic Sensor

1. Magnetic sensor (lower)

Set the Low, Empty and Follower-in-Drum Level Signals

Refer to Table 4-2.

Perform the *Change the Factory Settings* procedure below to change the factory settings. Perform the *Reset the Factory Settings* procedure to reset the Follower-in-Drum, Low, and Empty Level signals back to the factory settings.

NOTE: The *Low* and *Empty* Level signals are factory set. If desired, adjust the proximity sensor to change the factory settings.

Table 4-2 Low And Empty Level Signal Factory Settings

Signal	Setting
Low	**5 Gallon Follower Plate:** 4.5 in. (11.4 cm) between the bottom of the follower plate and the frame base plate rails.
	55 Gallon Follower Plate: 7.5 in. (19.1 cm) between the bottom of the follower plate and the frame base plate rails.
Empty	**5 Gallon Follower Plate:** 1.5 in. (3.8 cm) between the bottom of the follower plate and the frame base plate rails.
	55 Gallon Follower Plate: 1.5 in. (3.8 cm) between the bottom of the follower plate and the frame base plate rails.
	Mini-Tote: 2.4 in. (6.1 cm) between the bottom tip of the sensor and the cylinder base.
Follower-in-Drum	**5 Gallon Follower Plate:** ≥ 16.5 in. (41.9 cm) between the bottom of the follower plate and the frame base plate. **NOTE:** The Follower-in-Drum setting must be adjusted in the field due to customer specific drum sizes.
	55 Gallon Follower Plate: ≥ 36.5 in. (92.7 cm) between the bottom of the follower plate and the frame base plate. **NOTE:** The Follower-in-Drum setting must be adjusted in the field due to customer specific drum sizes.

Change the Factory Settings

Refer to Figure 4-18.

NOTE:

- The bottom lip on standard containers can vary and must be taken into consideration when making adjustments to the magnetic sensors.
- Due to the variation of material containers, adjustment of the drum empty sensor by the equipment end user is necessary to achieve minimal material waste.
- These steps are dependent on the system configuration. Not all components, parts, or steps are applicable to all configurations.

1. Loosen the set screws and move the magnetic sensors to the desired positions.
2. Tighten the set screws.

CAUTION: To prevent damage to the magnetic sensors, do not over-tighten the set screws.

3. Repeat step 1 as necessary.
4. Use the elevator control to and lower the follower plate to test the Follower-in-Drum, low, and empty level signals.

Reset the Factory Settings

See Figure 4-18 through Figure 4-20.

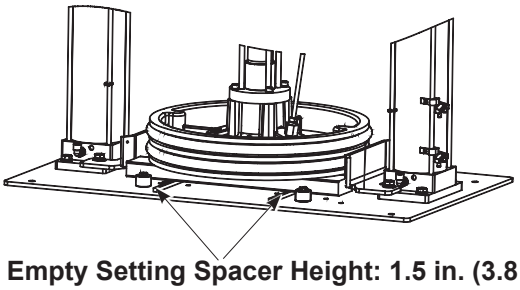
NOTE:

- Have spacers of proper height on hand before performing this procedure.
- Spacers are utilized to reset the factory settings for 55 gallon and 5 gallon configurations only. Mini-tote configurations utilize the distance between the top of the cylinder and the bottom of the sensor to reset factory settings. These steps are dependent on the system configuration.
- Not all components, parts, or steps are applicable to all configurations.

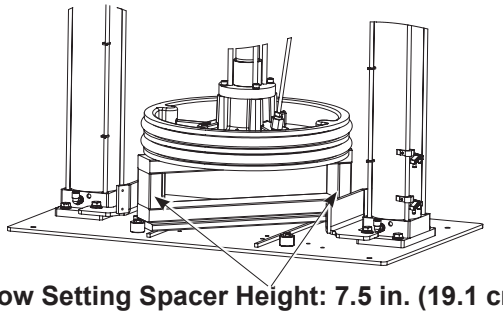
1. Supply power to the sensors.
2. Loosen the set screws on the magnetic sensor. Starting from the bottom of the frame cylinder, move the sensor up until the sensor is activated. Tighten the set screws to secure the magnetic sensor.

CAUTION: To prevent damage to the magnetic sensors, do not over-tighten the set screws.

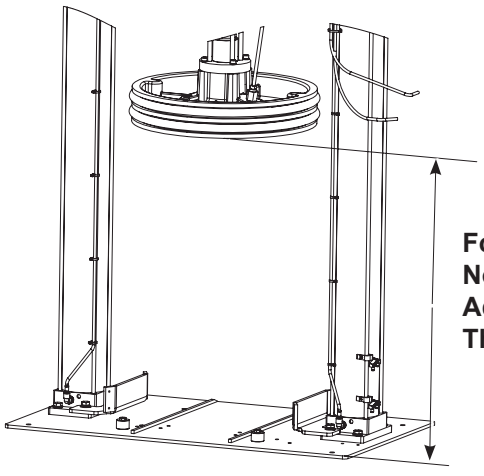
3. Raise the follower plate. Remove the spacers (if used) from the base plate.
4. Repeat steps 1-3 for the remaining magnetic sensors, if necessary.



Empty Setting Spacer Height: 1.5 in. (3.8 cm)
Note: Spacer Is Placed On Top Of Base Plate rails.

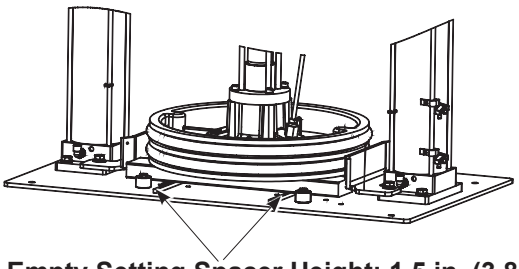


Low Setting Spacer Height: 7.5 in. (19.1 cm)
Note: Spacer Is Placed On Top Of Base Plate Rails.

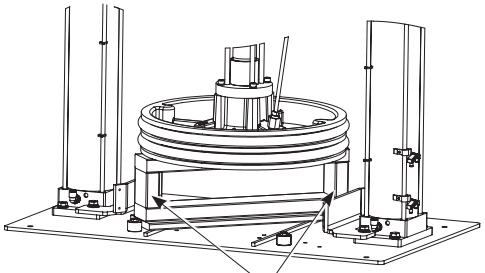


Follower-in-Drum Height:
Note: This Setting Must Be Adjusted In The Field Utilizing The Customer's Container.

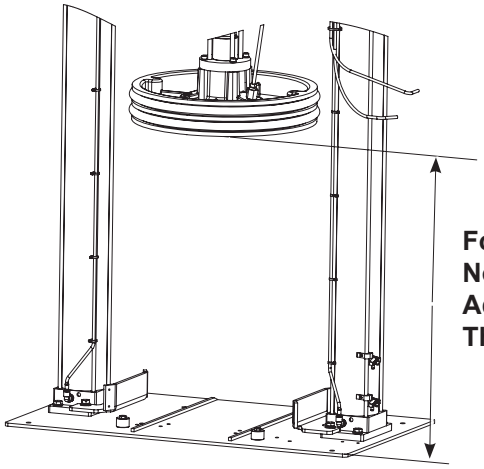
Figure 4-18 Factory Setting for 55 Gallon Follower



Empty Setting Spacer Height: 1.5 in. (3.8 cm)
Note: Spacer Is Placed On Top Of Base Plate Rails.

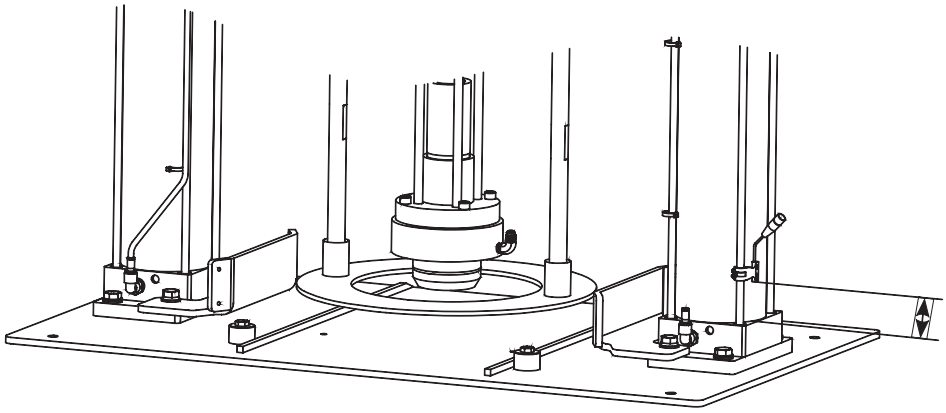


Low Setting Spacer Height: 4.5 in. (11.4 cm)
Note: Spacer Is Placed On Top Of Base Plate Rails.



Follower-in-Drum Height:
Note: This Setting Must Be Adjusted In The Field Utilizing The Customer's Container.

Figure 4-19 Factory Setting for 5 Gallon Follower



Empty Setting Height: 2.4 in. (6.1 cm)
Note: From The Bottom Of The Sensor To The Top Of The Cylinder Base.

Figure 4-20 Factory Setting for Mini-Tote Follower

Pressure Relief Valve (If Equipped)

See Figure 4-21.

1. Disconnect the tubing (1) from the tube fitting (2) on the upper cylinder port (3) on the air cylinder closest to the pneumatic control panel. Remove the tube fitting (2) from the upper cylinder port (3) on the air cylinder closest to the pneumatic control panel.

NOTE: Use thread adhesive on the male pipe threads of the fittings (2 and 4) and pressure relief valve (7).

2. Install the metal T-fitting (4), oriented horizontally, into the cylinder port (3).
3. Reinstall the tube fitting (2) into the port of the metal T-fitting (4) closest to the air motor. Install the adapter fitting (6) and ring seal (5) on the top of the T-fitting (4).
4. Install the pressure relief valve (7) into the adapter fitting (6).
5. Reconnect the tubing (1) to the tube fitting (2).

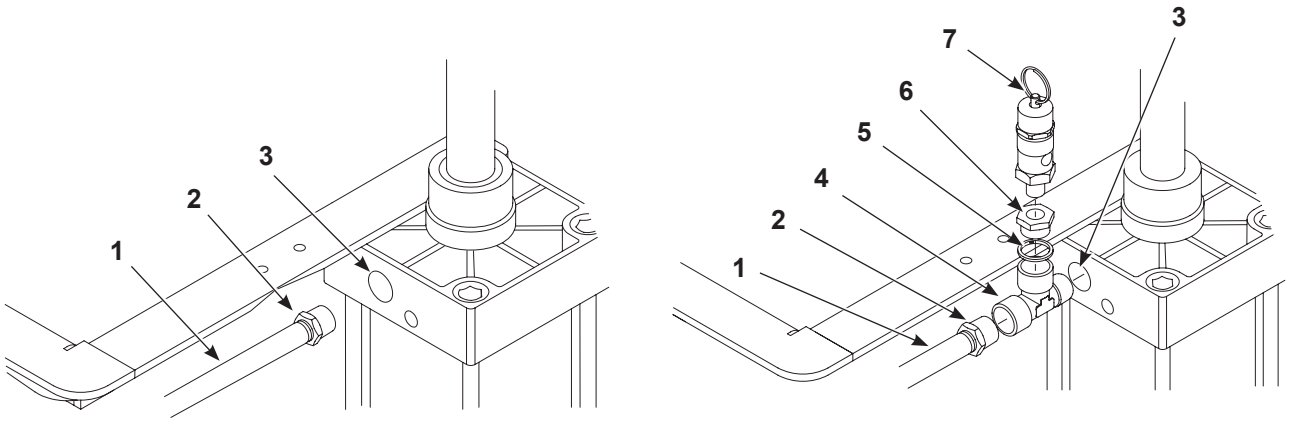


Figure 4-21 Remove/Replace Pressure Relief Valve

1. Tubing
2. Tube fitting
3. Upper cylinder port
4. T-fitting
5. Ring seal
6. Adapter fitting
7. Pressure relief valve

Section 5

Operation

WARNING:

- Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.
- Wear protective clothing, safety glasses, and gloves when working with this equipment.
- Personnel must know how to safely operate the elevator control valve on the unloader.
- When operating the elevator controls, it is important to remember that NEUTRAL is not a locked and secured position. The follower plate may drift downward over time.

CAUTION: To prevent damage to the follower plate and seals, never use a damaged material container.

Control Module

See Figure 5-1. Refer to Table 5-1.

NOTE: The Rhino assembly is rated for a maximum input pressure of 7 bar (100 psi).

The control module is fully pneumatic. Shop air pressure is supplied to the control when the control module lockout valve (8) is opened. Opening this lockout valve allows for operation of the elevator control valve (5) and the material container blow-off valve (6). Air pressure to the air motor regulator (9), as well as the signal valves in the control and air motor, are also activated. Air pressure is only supplied to the air motor when the air motor lockout valve (1) is opened. The air supply to the pilot, intermediate, and material container blow-off valves (6) is at full shop pressure.

The regulated air supply for the elevator cylinder(s) flows to a three-position elevator control valve (5). The valve controls the flow of air to the elevator cylinder(s). The elevator control valve has three positions: Ram Up, Ram Down, and Neutral.

WARNING: The Neutral position is not a locked and secured position. The follower plate may drift downward over time.

The blow-off feature routes air under the follower plate during the removal of an empty container. The material container blow-off valve connects to the follower blow-off port. Pressing and holding the push button on the material container blow-off valve forces air under the follower plate. The air pressure forces the container off of the follower plate.

Following the drum change procedure and loading of the new material container, the pneumatic reset valve (3) must be pressed to reset the air motor's control valves to begin operation of the air motor.

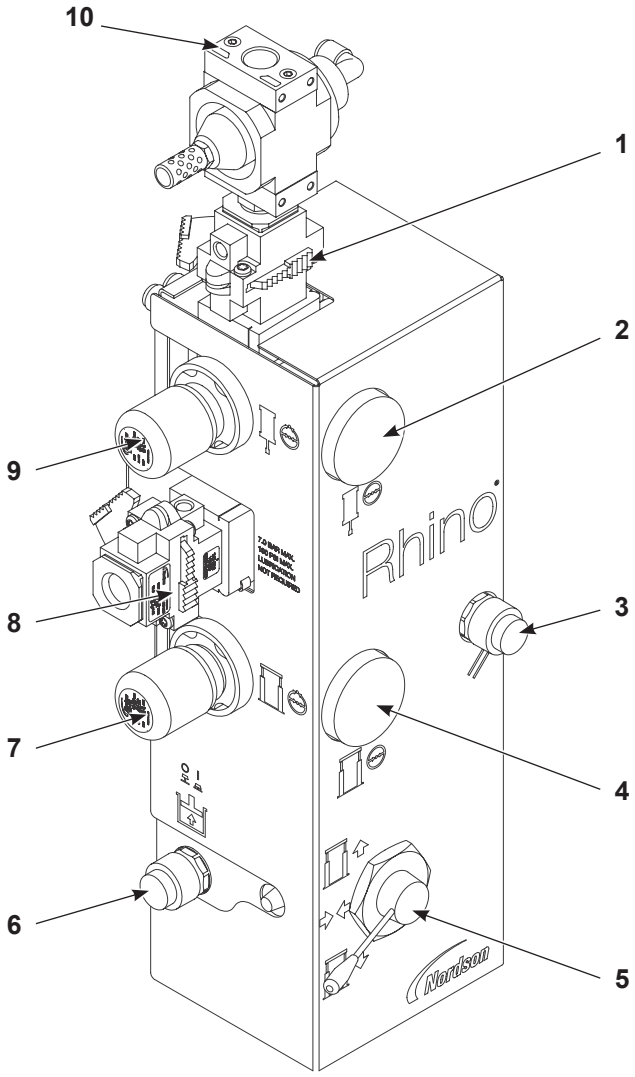


Figure 5-1 Control Module

1. Air motor lockout valve
2. Air motor pressure gauge
3. Pneumatic reset valve
4. Elevator air pressure gauge
5. Elevator control valve
6. Material container blow-off valve
7. Elevator air regulator
8. Control module lockout valve
9. Air motor regulator
10. Air motor control valve

Table 5-1 Control Module Components

Item	Description
1	**Air motor lockout valve:** The air motor lockout valve allows the air motor to be locked out of receiving air pressure from the control module for service.
2	**Air motor pressure gauge:** The air motor pressure gauge displays the pressure to the air motor.
3	**Pneumatic reset valve:** The pneumatic reset valve resets the control module's signal valves when pressed.
4	**Elevator air pressure gauge:** The elevator air pressure gauge displays the pressure to the elevator cylinder.
5	**Elevator control valve:** The elevator control valve initiates ram movement. • RAM UP position raises the elevator and the follower plate. • RAM DOWN position lowers the elevator and follower plate assembly into the material container. • NEUTRAL position stops elevator movement. *Neutral* is not a locked and secured position. The follower plate may drift downward over time.
6	**Material container blow-off valve:** The material container blow-off valve activates the flow of the air to the blow-off check valve located on the follower plate. This forces air beneath the bottom of the follower plate and into the container. The pressure forces the follower out of the container.
7	**Elevator air regulator:** The elevator air regulator controls the air to the elevator cylinder.
8	**Control module lockout valve:** The control module lockout valve allows the control module to be locked out of receiving input air pressure, necessary to service the unloader.
9	**Air motor regulator:** The air motor regulator controls the air to the pump
10	**Air motor control valve:** The air motor control valve controls the air flow to the air motor regulator.

Pump Operation

Refer to Table 5-1.

Basic Operation

A container of adhesive or sealant material is centered between the container guides and under the follower plate. The ram consists of an air-driven piston that lowers the follower plate into the container of material. The seals around the outer edge of the follower plate create an airtight compartment below the follower plate. Downward movement of the follower plate forces material into the hydraulic section of the pump.

When the piston of the ram cylinder activates the magnetic sensor at the bottom of the ram cylinder, the controls will shut off air supply to the air motor, signaling that the material container is empty. Refer to the *Container Change* Operator Card for additional information regarding the container change procedure.

Pneumatic Controls

The operating controls for the unloader are primarily pneumatic. Clean, dry shop air filtered to 5 microns (filter is supplied by the customer) is supplied to three/four pressure regulators (four for systems with ARW): one for the pump air motor, one for the ram down, and one for the ram up/blow-off. The ram up/blow-off pressure is a fixed pressure.

Air Motor Supply

The regulated air supply flows through a shut-off valve before it enters the pump air motor. Unregulated air at full shop pressure is supplied to the pilot valve. This valve supplies pilot air to the main motor control valve. This higher-pressure signal air enables the air motor to make rapid directional changes regardless of the regulated supply air setting.

Ram and Blow-Off Air Supply

The control module is primarily pneumatic. Shop air pressure is supplied to the control when the control module lockout valve is opened. Opening this lockout valve allows for operation of the ram direction control and the material container blow-off valve. Air pressure to the air motor regulator, as well as the signal valves in the control and air motor, are also activated. Air pressure is only supplied to the air motor when the air motor lockout valve is opened. The air supply to the pilot, intermediate, and material container blow-off valves is at full shop pressure.

The regulated air supply for the ram cylinder flows to a three-position elevator control valve. The valve controls the flow of air to the ram cylinder. The ram direction control has three positions: RAM UP, RAM DOWN, and NEUTRAL.

- RAM UP position: Air enters the bottom of the cylinder. Air above the elevator cylinder piston is vented. The air pressure forces the cylinder piston upward, which raises the follower plate and pump.
- RAM DOWN position: Air enters the top of the cylinder. Air below the elevator cylinder piston is vented. The air pressure forces the cylinder piston downward, which lowers the follower plate and pump.
- NEUTRAL position: There is no pressure to the elevator cylinder. The follower plate should remain stationary, since the air pressure to both sides of the piston is sealed.

WARNING: The NEUTRAL position is not a locked and secured position. The follower plate may drift downward over time.

The blow-off feature routes air under the follower plate during the removal of an empty container. The blow-off nipple assembly connects to the follower bleed port. Putting the ram direction control in the RAM UP position while the follower is in the container and pressing and holding the purge button forces air under the follower plate. The air pressure forces the container off of the follower plate.

Control Module Symbols And Icons

See Figure 5-2.

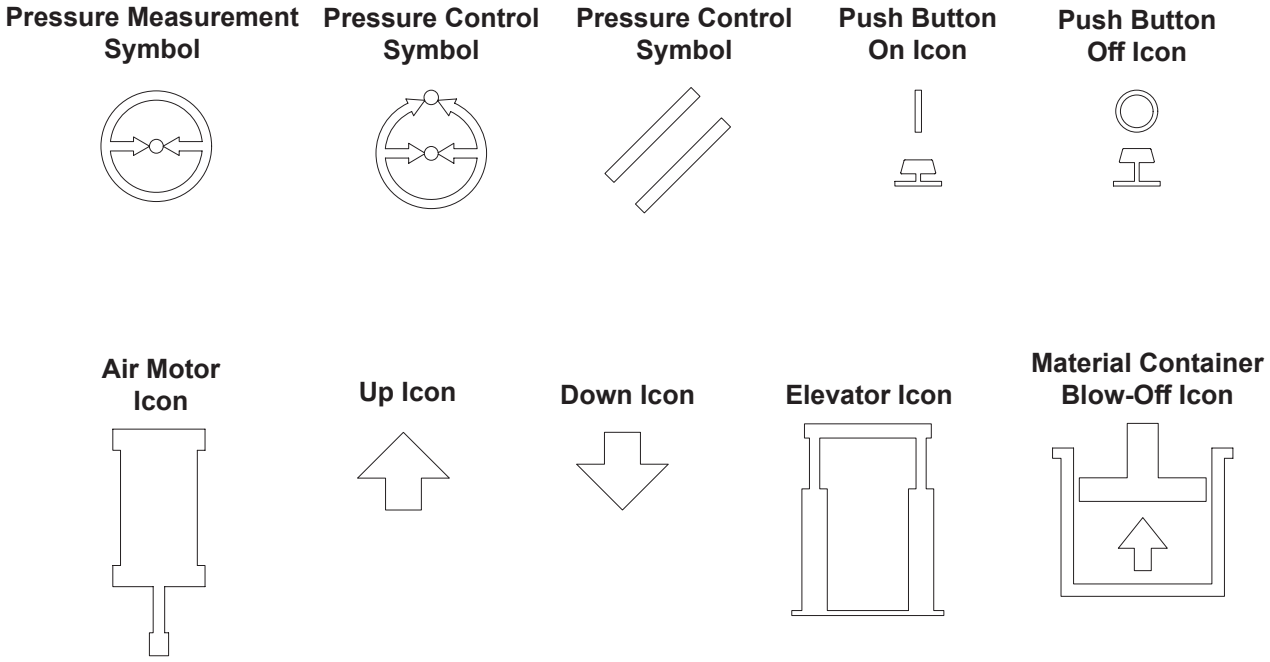


Figure 5-2 Control Module Symbols And Icons

First Time Startup

WARNING:

- Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.
- When operating the elevator controls, it is important to remember that NEUTRAL is not a locked and secured position. The follower plate may drift downward over time.

WARNING: Severe personal injury could result if hands or fingers are caught between the follower plate and container. Keep hands clear of this area.

This procedure applies only to starting up a new system for the first time.

Refer to Figure 5-1 and Table 5-1.

1. Make sure the solvent chamber (6) is properly filled with solvent chamber fluid.
   - Pour the solvent chamber fluid into the solvent chamber (6) until it is within 1.5 in. (38 mm) from the top of the solvent chamber.
2. Place the elevator control valve (5) in the NEUTRAL position.
3. Set the air motor regulator (1) to 0 psi/bar.
4. Set the elevator air regulator (2) to 30 psi (2 bar).
5. Close the air motor control valve (4).
6. Make sure the air hoses and material delivery hose are not kinked or pinched.
7. Place the elevator control valve (5) in the RAM UP position to raise the follower plate (11).
8. Inspect the material container for dents or other damage.

CAUTION: Do not use a damaged container.

9. Coat the follower plate seal (12) with grease compatible with the dispense material.

CAUTION: To prevent damage to the follower plate seal, do not use petroleum-based products; use grease.

10. Place the container of material between the container guides and center it under the follower plate (11) on the unloader frame.
11. Remove the bleeder stem (7) from the bleeder stem fitting (9) to relieve any air trapped under the follower plate (11).

WARNING: Wear protective clothing, gloves, and safety glasses when lowering the follower plate into the container. The expelled air from under the follower plate may contain material.

NOTE: It may be necessary to increase the elevator cylinder pressure when using high-viscosity material to ensure proper operation of the cylinder assembly and to prevent the pump from losing contact with the material. Use the minimum air pres-sure necessary to operate the elevator.

12. Place the elevator control valve (5) in the RAM DOWN position and slowly lower the follower plate (11) into the open container of material. To stop the follower plate, place the elevator control valve (5) in the NEUTRAL position.

13. Perform the following:
    a. When material begins to flow from the bleeder stem fitting (9), place the elevator control valve (5) in the NEUTRAL position.
    a. Install the bleeder stem (7) into the bleeder stem fitting (9) and tighten securely. Use a rag to remove excess material around the bleeder stem fitting.
14. Place the elevator control valve (5) in the RAM DOWN position to force material into the pump.
15. Set the air motor pressure to 0 psi, then open the air motor control valve (4).
16. Bleed the remaining air through the ball valve (8).
17. Press and hold the material container blow-off valve (3).
18. Slowly increase the air motor pressure until material begins to flow from the ball valve (8).
19. Leave the valve open until the material flow is continuous and any trapped air in the hydraulic section vents.
20. Release the material container blow-off valve (3).
21. Close the ball valve (8).
22. Make sure the hose and applicator are secured and the applicator is not pointing at any personnel in the area.
23. Trigger the applicator(s) to bleed off air in the lines.
24. Adjust the air motor regulator (1) to increase pressure until the applicator dispenses material that flows smoothly, continuously, and without air bubbles.

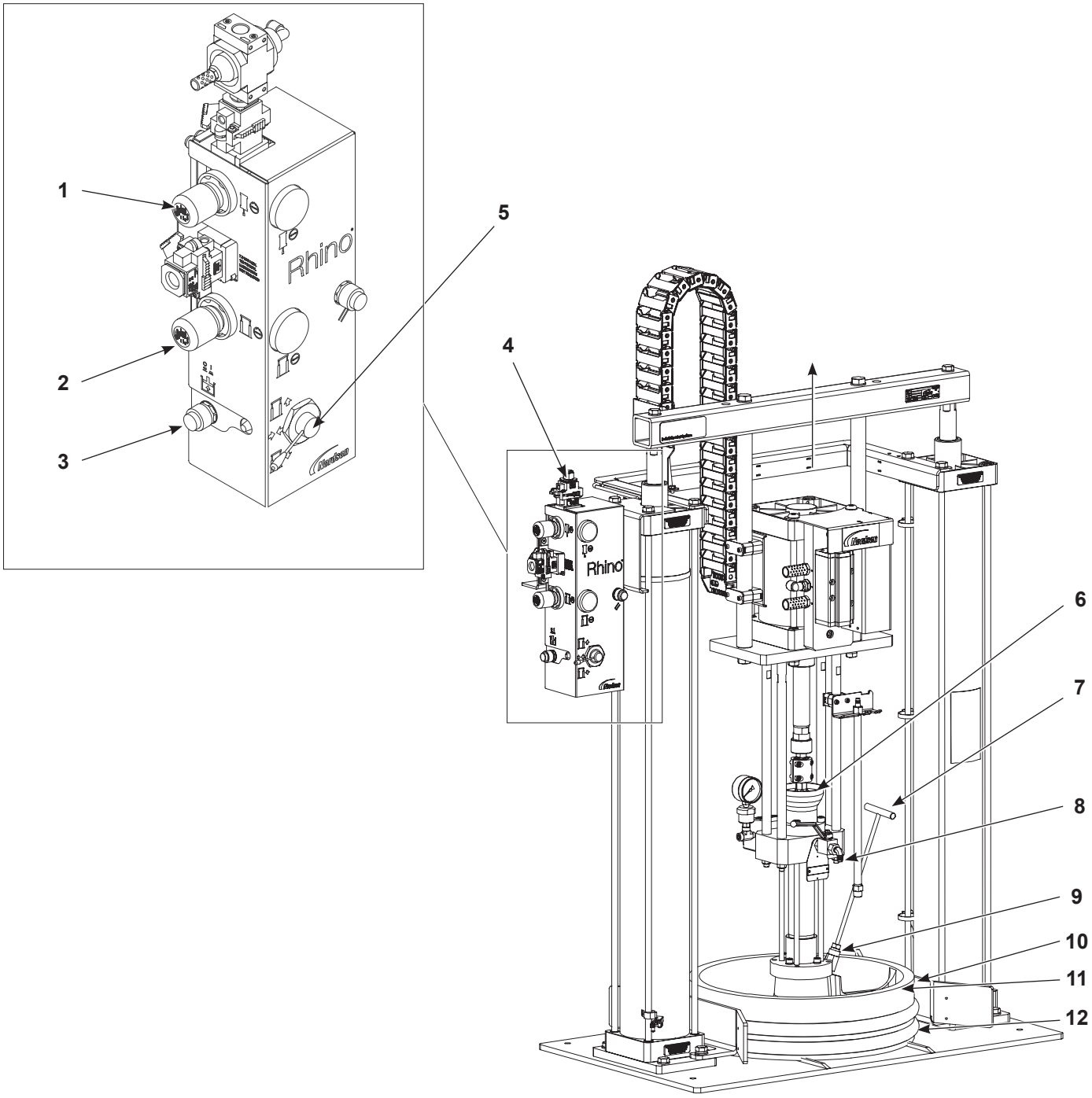


Figure 5-3 First Time Startup

1. Air motor regulator
2. Elevator air regulator
3. Material container blow-off valve
4. Air motor control valve
5. Elevator control valve
6. Solvent chamber
7. Bleeder stem
8. Ball valve
9. Bleeder stem fitting
10. Guide
11. Follower plate
12. Follower seal

Section 6

Maintenance

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

Consumables

Air Motor

Table 6-1 Air Motor Consumable Items

Item	Part	Application
Never-Seez®	900344	Apply to the threads of applicable fasteners.
Suitable removable threadlocker	—	Apply to the threads of applicable fasteners.
Suitable thread sealant	—	Apply to the air pipe/tubing threads.
Compatible grease	—	Apply to the air motor O-rings during assembly.

Control Module

Table 6-2 Control Module Consumable Items

Item	Part	Application
Suitable thread sealant	—	Apply to the air pipe/tubing threads.

Follower Module

Table 6-3 Follower Module Consumable Items

Item	Part	Application	Note
Suitable thread sealant	—	Apply to the air pipe/tubing threads.	
COMPOUND, heat sink, 5 oz tube	900298	Apply to the thermostat, RTD, heater cartridge, and heater plate.	
Material compatible grease	—	Apply to the follower module O-rings.	A
NOTE: A. Customer should ensure that the grease is compatible with the material utilized.			

Interconnect Hose Module

Table 6-4 Interconnect Hose Module Consumable Items

Item	Part	Application
Suitable thread sealant	—	Apply to the air pipe/tubing threads.

Pump Hydraulic Section

Table 6-5 Pump Hydraulic Section Consumable Items

Item	Part	Application	Note
Suitable thread sealant	—	Apply to the air pipe/tubing threads.	
COMPOUND, heat sink, 5 oz tube	900298	Apply to the thermostat, RTD, heater cartridge, and heater plate.	
Suitable removable threadlocker	—	Apply to the threads of applicable fasteners.	
Material compatible grease	—	Apply to the follower module O-rings.	A
Compatible grease	—	Lubricates hydraulic section components.	B
Never-Seez®	900344	Apply to the threads of applicable fasteners.	
Type-k solvent chamber fluid	900255	Fills the solvent chamber.	A
NOTE: A. Customer should ensure that the grease and/or solvent is compatible with the material utilized. B. Minimum specification: NLGI 2 Grade/ISO VG100			

Pump Hydraulic Section Pump Outlet Manifold

Table 6-6 Pump Hydraulic Section Pump Outlet Manifold Consumable Items

Item	Part	Application	Note
Suitable thread sealant	—	Apply to the air pipe/tubing threads.	
COMPOUND, heat sink, 5 oz tube	900298	Applied to the thermostat, RTD, heater cartridge, and heater plate.	
Suitable removable threadlocker	—	Apply to the threads of applicable fasteners.	
Compatible grease	—	Lubricates hydraulic section components.	A
Never-Seez®	900344	Apply to the threads of applicable fasteners.	
NOTE: A. Minimum specification: NLGI 2 Grade/ISO VG100			

Preventative Maintenance

Air Motor

Table 6-7 Air Motor Preventative Maintenance

Item	Task	Time to Complete	Frequency
Air cylinder	Replace	1 hr	8,000,000 pump strokes
Main air motor control valve	Replace	15 min	8,000,000 pump strokes
Pilot valve	Replace	15 min	8,000,000 pump strokes

Pump Hydraulic Section

Table 6-8 Pump Hydraulic Section Preventative Maintenance

Item	Task	Time to Complete	Frequency		
			Daily	Weekly	Pump Strokes
Solvent chamber	Inspect and refill with fluid if necessary.	5 min	x		
Solvent chamber fluid	Replace	5 min		x	
Packing gland	Inspect for leaks and replace if necessary.	2 min		x	
	Replace	30 min			100,000
Plunger rod (chrome)	Replace every other packing change or if damaged or scored.	2 hr			200,000
Plunger rod (Scoreguard®)	Replace every other packing change or if damaged or scored.	2 hr			400,000
Complete drive train assembly	Replace	2 hr			400,000
Heater cartridge	Replace	30 min	Upon failure		
RTD	Replace	30 min	Upon failure		

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Section 7

Troubleshooting

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

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

Follower Module

Table 7-1 Follower Module Troubleshooting

Problem	Possible Cause	Corrective Action
1. Seals between follower and material container are leaking	Improper installation of seals	Verify that the seals are installed in the correct direction. If leaking persists, replace the seals.
2. Setpoint temperature not achieved (electrically heated followers only)	Failed RTD	Verify the RTD is functioning properly by taking a resistance reading across the RTD. It is a 120 Ω Nickel RTD. At 70°F, the resistance reading should be 135.35 Ω. If the facility and RTD are at a different temperature, refer to a 120 Ω Nickel RTD table for the correct resistance value of the RTD at the temperature being evaluated or contact Nordson Technical Customer Service for additional assistance.
	Failed Thermostat	Verify operation of the thermostat. The thermostat is normally closed until it reaches 180°F, then it will open until the temperature goes below 170°F. Verify the follower temperature/ambient temperature then check for continuity.
	Failed heater cartridge	Verify the heater is functioning properly by taking a resistance reading across the heater element. Each cartridge should read 443-603 Ω.
	Failed heater plate	Verify the heater is functioning properly by taking a resistance reading across the heater element. Each cartridge should read 65.1-75.4 Ω.

Pump Hydraulic Section

Table 7-2 Pump Hydraulic Section Troubleshooting

Problem	Possible Cause	Corrective Action
1. Setpoint temperature not achieved (electrically heated hydraulic sections only)	Failed RTD	Verify the RTD is functioning properly by taking a resistance reading across the RTD. It is a 120 Ω Nickel RTD. At 70°F, the resistance reading should be 135.35 Ω. If the facility and RTD are at a different temperature, refer to a 120 Ω Nickel RTD table for the correct resistance value of the RTD at the temperature being evaluated or contact the Nordson Technical Customer Service for additional assistance.
	Failed heater cartridge	Verify the heater is functioning properly by taking a resistance reading across the heater element. Each cartridge should read 177-241 Ω.

Pump Hydraulic Section Outlet Section Manifold

Table 7-3 Pump Hydraulic Section Pump Outlet Manifold Troubleshooting

Problem	Possible Cause	Corrective Action
1. Setpoint temperature not achieved	Failed heater cartridge	Perform a resistance test on the heater cartridge. Replace the heater cartridge if test fails. Each heater cartridge should fall between: 443.2-603.3 Ω.

Unloader

Table 7-4 Unloader Troubleshooting

Problem	Possible Cause	Corrective Action
1. Air motor does not work.	No air supply, inadequate air supply.	Check the air supply and operating pressure.
	Blocked hydraulic system.	Check hoses, applicators, and other components in the hydraulic system.
	Air motor regulator malfunction.	Check the air motor regulator and replace if necessary.
	Magnetic proximity sensor not functioning.	Perform the following: 1. Disconnect the signal and output air lines from the magnetic proximity sensor. 2. Actuate the sensor with a magnet to verify the pneumatic signal is present. Replace the magnetic proximity sensor if the pneumatic signal is not present.
	Pilot valve not functioning.	Perform the following: 1. Lock out the air to the unloader. 2. Disconnect the signal and output air lines from the pilot valve. 3. Connect an air gauge at the end of each output air port. 4. Turn on the air supply to the unloader. Manually actuate each magnetic proximity sensor. 5. Verify the pneumatic signal is alternating between the air gauges. Replace the pilot valve if the pneumatic signal does not alternate between the air gauges.
	Air motor main control valve not functioning.	Check the magnetic proximity sensors and the pilot valve. If the magnetic proximity sensors and the pilot valve are functioning, replace the air motor main control valve.
2. Air motor is leaking excessively or constantly.	Worn cylinder seal.	Listen for air leaking from the seal where the piston rod exits the cylinder head. Replace the cylinder if air leaks are heard.
	Air leaks from the air valve exhaust ports.	Replace the air motor main control valve or the cylinder.
	Worn magnetic proximity sensors or pilot valve.	These valves cannot be repaired and must be replaced. Order new valves.

Continued...

Problem	Possible Cause	Corrective Action
3. Ram down does not work.	Malfunctioning elevator regulator, or damaged elevator control valve. **WARNING!** Block the ram cylinders before performing the corrective action to prevent the follower plate from drifting downward.	Perform the following: 1. Close and lockout the main air shutoff valve. 2. Disconnect the tubing on ports two and four of the ram control solenoid valve. 3. Connect the tubing to port two and four of the ram control solenoid valve. 4. Open the main air supply valve. 5. Operate the ram direction control and look for pressure on the gauge. 6. If there is not an air pressure reading at the gauge, perform the following: a. Shut off the main air supply and remove the gauge. b. Turn on the air supply and check for air flowing from the regulator. If there is no air flow, replace the regulator c. Connect all components.
	Ram air cylinder seals worn or damaged; piston is binding in the cylinder.	If the problem was not solved using the above procedure, replace the air cylinder. Refer to *Repair* section for additional information.

Continued...

Problem	Possible Cause	Corrective Action
4. Ram up/blow-off assembly is not working.	No air supply pressure.	Check the air supply. Make sure that the ram direction control is in the RAM UP position when attempting to operate the blow-off feature.
	Ram down regulator or elevator control valve malfunctioning.	Refer to Problem 3, *Ram down does not work* for the corrective action.
	Blow-off valve malfunctioning. **WARNING!** Block the ram cylinders before performing the corrective action to prevent the follower plate from drifting downward.	Perform the following: 1. Close and lockout the main air shutoff valve. 2. Remove the blow-off tube. 3. Adjust the air pressure to 10 psi (0.7 bar) and look for pressure on the gauge. • If no air is present, replace the blow-off valve. • If air is present, make sure that it is flowing out of the bottom of the follower plate when tubing is reconnected.
	Blow-off check valve or hose clogged with material.	Check the blow-off check valve and tube for clogged material and clean if necessary.
5. Pump is not delivering material.	Insufficient air pressure to the pump air motor.	Use the air motor regulator to increase air pressure.
	Follower plate is not in contact with the material.	Make sure that the elevator is in the RAM DOWN position. Increase ram down pressure if necessary.
	Pump hydraulic section has an air pocket.	Bleed the pump. Refer to *Operation* section for additional information.
	Blockage in the hydraulic system.	Perform the following: 1. Shut down the pump and relieve the system pressure. 2. Remove the applicator from the system. Check the applicator for blockages. 3. Replace or rebuild the applicator if necessary. 4. Disconnect the material hose from the pump. 5. Check the hose for blockages. Clean or replace the hose if necessary. **NOTE:** If these steps do not solve the problem, remove and rebuild the pump. Refer to the *Repair* section for additional information.

Continued...

Problem	Possible Cause	Corrective Action
6. Seals between follower and material container are leaking.	Improper installation of seals.	Verify that the seals are in the correct direction. Refer to the *Repair* section for additional information. If leaking persist, replace the seals.
7. Set-point temperature not achieved (electrically heated systems only)	Failed RTD (hydraulic section and follower)	Verify the RTD is functioning properly by taking a resistance reading across the RTD. It is a 120 Ω Nickel RTD. At 70°F, the resistance reading should be 135.35 Ω. If the facility and RTD are at a different temperature, refer to a 120 Ω Nickel RTD table for the correct resistance value of the RTD at the temperature being evaluated or contact the Nordson Technical Customer Service for additional assistance.
	Failed thermostat (follower only)	Verify operation of the thermostat. The thermostat is normally closed until it reaches 180°F, then it will open until the temperature goes below 170°F. Verify the follower temperature/ ambient temperature then check for continuity.
	Failed heater cartridge (hydraulic section, pump outlet manifold, and follower).	Verify the heater is functioning properly by taking a resistance reading across the heater element. Each cartridge should read 443-603 Ω.
	Failed heater plate (follower only)	Verify the heater is functioning properly by taking a resistance reading across the heater element. Each cartridge should read 65.1-75.4 Ω.

Section 8
Repair

WARNING:

- Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.
- Wear protective clothing, safety glasses, and gloves when working with this equipment.
- Personnel must know how to safely operate the elevator control valve on the unloader.
- To prevent serious personal injury from material under pressure, always relieve system pressure before breaking any hydraulic connections or servicing components.
- Be sure to relieve all hydraulic pressure from the hoses at the outlet of the pump and make sure to bleed off the pressure from the pump before repairing this unit. Otherwise, serious injury, death, or equipment damage could result.
- Shut off the customer supplied air source, bleed the air pressure from the unloader, and lock the main air shut-off valve.
- Disconnect and lock out power to the system before performing repairs.
- It is important to remember that the Neutral setting on the elevator controls is not a locked and secured position. Air pressure remains in the ram cylinders. Small air leaks in the circuit can cause the ram to drift upward or downward. When replacing follower plate O-ring seals or wiper seals, use support blocks to secure the ram.

CAUTION: Some O-ring lubricants may react to certain dispensing materials. Contact your material supplier to determine the appropriate O-ring lubricant.

Air Motor Repair

100, 160, and 200 mm Air Cylinder

Main Air Valve Replacement

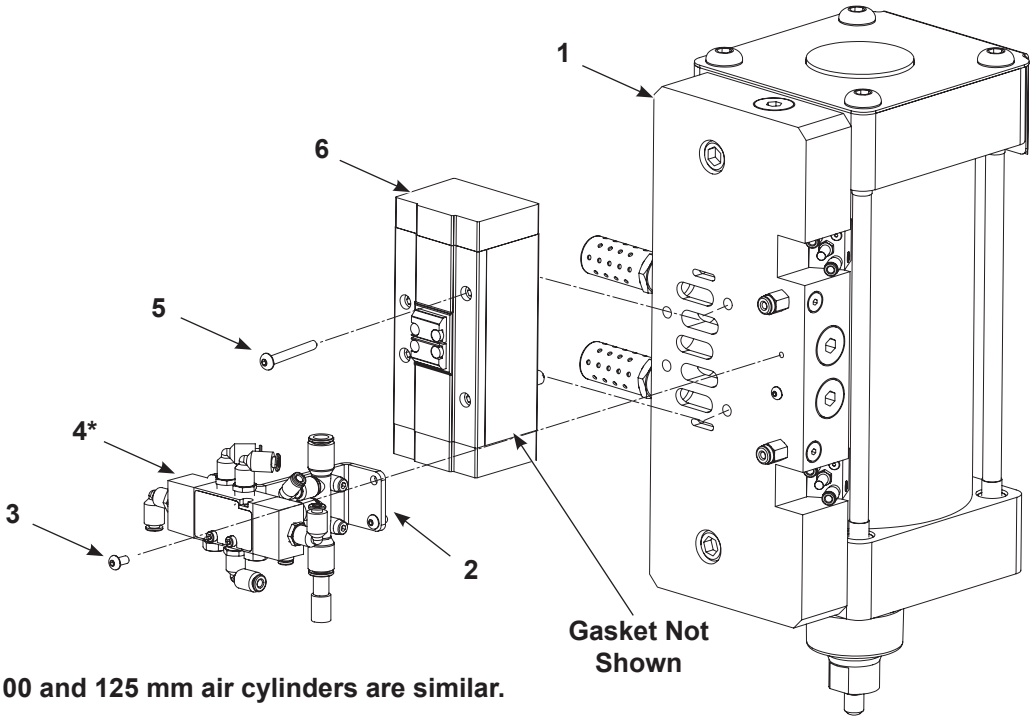
NOTE: The main air valve can be replaced without removing the air motor from the unloader.

See Figure 8-1.

1. Remove the two screws (3) securing the bracket (2) to the manifold (1).

CAUTION: To ensure the tubing stays connected, rotate the bracket (2) and assembly, as if it were on a hinge, just enough to be able to remove the main air valve (6) from the manifold (1).

2. Remove the four screws (5) securing the main air valve (6) to the manifold (1).
3. Remove the main air valve (6) and gasket (not shown).
4. Installation is in the reverse order of removal.



160 mm air cylinder shown; 100 and 125 mm air cylinders are similar.

Figure 8-1 Remove/Replace Main Air Valve (100, 160, and 200 mm Air Cylinders)

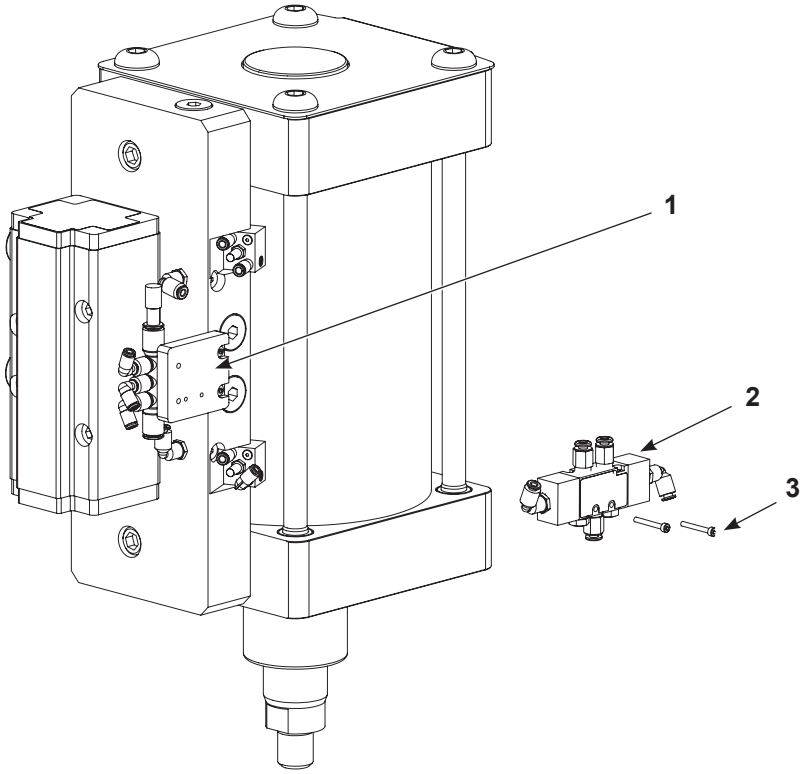
1. Manifold
2. Bracket
3. Screw (M8)
4. Pilot valve
5. Screw (M3)
6. Main air valve

Pilot Valve Replacement

NOTE: The pilot valve can be replaced without removing the air motor from the pump.

See Figure 8-2.

1. Disconnect the tubing from the pilot valve (tubing not shown).
2. Remove the two screws (3) securing the pilot valve (2) to the bracket (1).
3. Installation is in the reverse order of removal.



160 mm air cylinder shown; 100 and 125 mm air cylinders are similar.

Figure 8-2 Remove/Replace Pilot Valve (100, 160, and 200 mm Air Cylinders)

1. Bracket
2. Pilot valve
3. Screw

250 mm Air Cylinder

Trip-Rod U-Cup Replacement

NOTE: The trip-rod U-Cup can be replaced without removing the air motor from the pump.

See Figure 8-3.

1. Remove the screws (2) securing the cover (1) to the trip-rod assembly (6).
2. Remove the screws (5) and washers (4) securing the trip-lever mounting pad (14) to the trip-rod assembly (6).
3. Swing the trip-lever mounting pad (14) away from the seal retainer plate (9).
4. Place a wrench on the flats of the piston rod (11). Remove the nut (7) securing the trip-bar (8) to the piston rod (11).
5. Remove the screws (5) and washers (4) securing the seal retainer plate (9) to the trip-rod retainer (10).

CAUTION: Use a small screwdriver or an O-ring pick in the next step to prevent damage to the U-Cup bore and piston rod.

6. Remove the U-Cup (13) from the trip-rod retainer (10). Discard the U-Cup (13).
7. Lubricate the new U-Cup (13) with a compatible grease (12).
8. Insert the U-Cup (13) into the trip-rod retainer (10).
9. Install the seal retainer plate (9) onto the trip-rod retainer (10) using the screws (5) and washers (4). Tighten the screws to 22-25 ft-lb (30-33 N•m).
10. Place a wrench on the flats of the piston rod (11). Install the trip-bar (8) to the piston rod (11) using the nut (7). Tighten the nut securely.
11. Perform the following:
    a. Make sure that the mounting pad pins (3) protrude through the trip-rod assembly (6).
    b. Secure the trip-lever mounting pad (14) to the trip-rod assembly (6) using the screws (5) and washers (4). Tighten the screws to 22-25 ft-lb (30-33 N•m).
12. Install the cover (1) to the trip-rod assembly (6) using the screws (2). Tighten the screws securely.

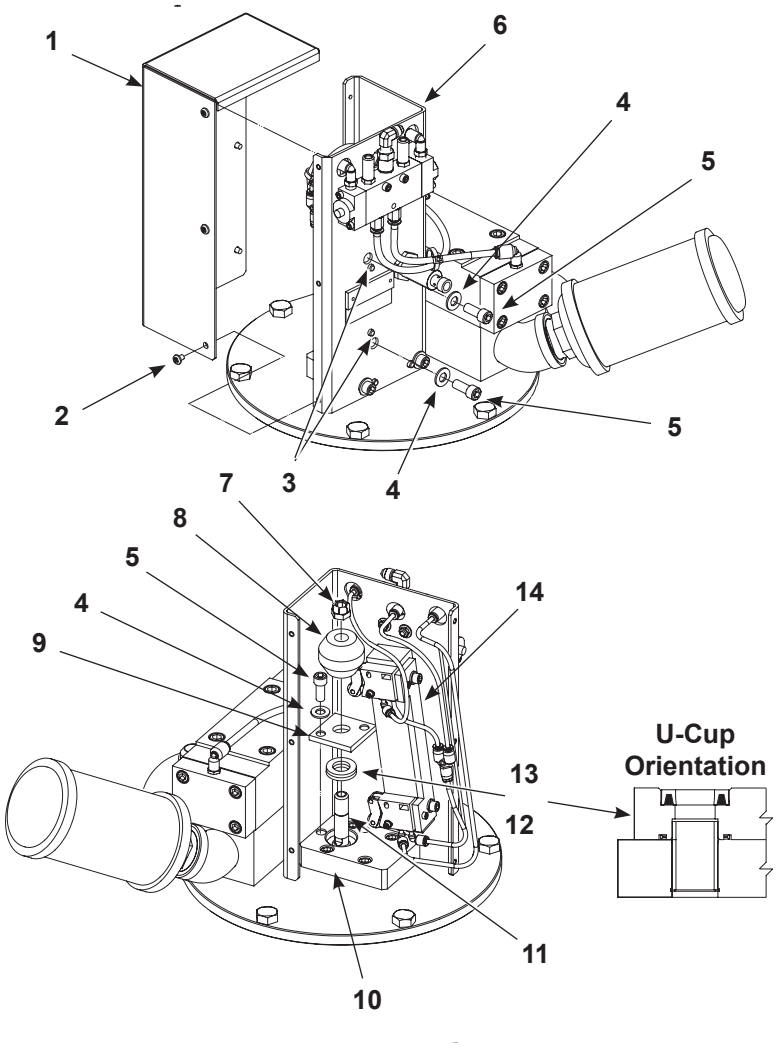


Figure 8-3 Remove/Replace Trip-Rod U-Cup (250 mm Air Cylinder)

1. Cover
2. Screw (10-32)
3. Mounting pad pin
4. Washer
5. Screw (5/16)
6. Trip-rod assembly
7. Nut
8. Trip-bar
9. Seal retainer plate
10. Trip-rod retainer
11. Piston rod
12. Compatible Grease
13. U-Cup
14. Trip-lever mounting pad

Pilot Valve Replacement

NOTE: The pilot valves can be replaced without removing the air motor from the pump.

See Figure 8-4.

1. Remove the screws (1) securing the cover (2) to the trip-rod assembly (3).
2. Disconnect the tubing from the pilot valve (5 or 9).

CAUTION: Note the location of the tubing prior to its removal so it can properly connected.

3. Remove the screws (7) and washers (6) securing the pilot valve (5 or 9) to the mounting pad (4).
4. Install the new pilot valve (5 or 9) to the mounting pad (4) using the washer (6) and screw (7).
5. Thread the screws (7) into the mounting pad (4).

NOTE: Do not tighten the screw at this time.

6. Cycle the air motor as follows:

- Pilot valve (upper) - Cycle the air motor until the trip-bar (8) is fully extended.
- Pilot valve (lower) - Cycle the air motor until the trip-bar (8) is fully retracted.

7. Set the gap between the roller lever on the pilot valve (5 or 9) and the trip-bar (8):
   a. Make sure that pilot valve moves freely and that the roller lever is bottomed out.
   b. Using the adjustment set screw, move the pilot valve in or out to obtain a gap of 0.040-0.070 in. (1.02-1.78 mm) between the roller lever on the pilot valve and the trip-bar. Tighten the hold-down screw securely.
8. Connect the tubing to the pilot valve (5 or 9).
9. Install the cover (2) to the trip-rod assembly (3) using the screws (1). Tighten the screws securely.

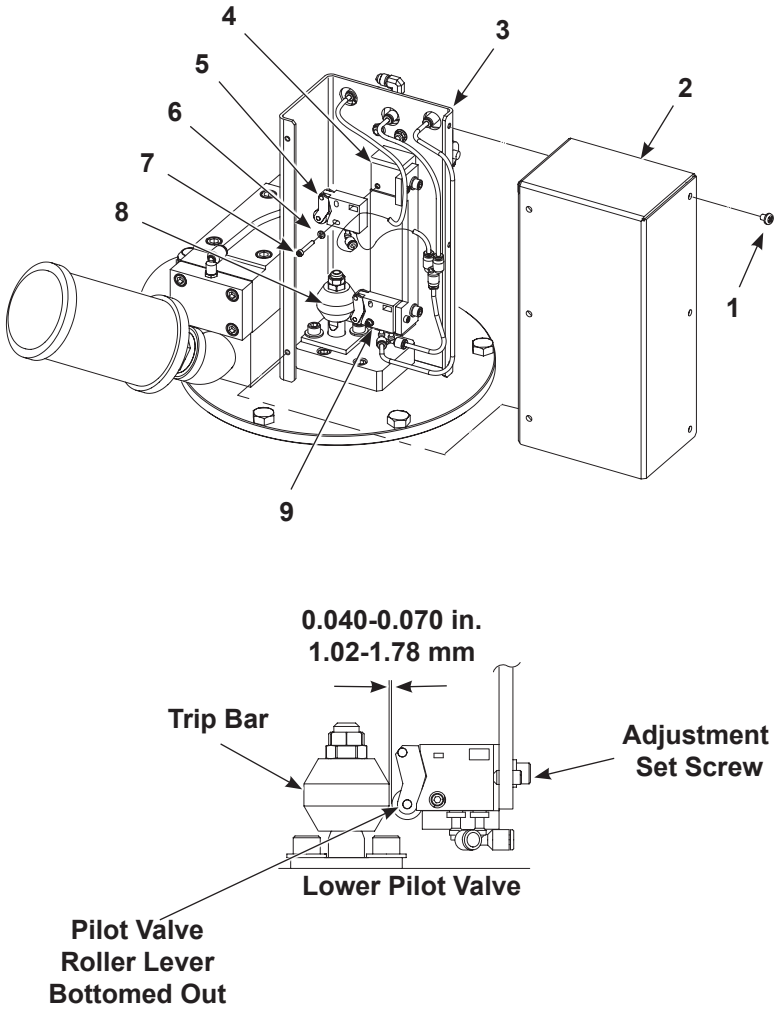


Figure 8-4 Remove/Replace Pilot Valve

1. Screw (10-32)
2. Cover
3. Trip-rod assembly
4. Mounting pad
5. Pilot valve (upper)
6. Washer
7. Screw (6-32)
8. Trip-bar
9. Pilot valve (lower)

Base Plate Repair

NOTE: Base plate repair involves replacing the supply tube quad- and O-rings.

See Figure 8-5.

1. Remove the screws (4) and washers (5) securing the upper supply tube retainer (3) to the air manifold (1).
2. Remove the screws (11) and washers (10) securing the lower supply tube retainer (9) to the base plate (17).
3. Remove the supply tube (6) from the air manifold (1) and base plate (17).
4. Remove the upper and lower supply tube retainers (3, 9) from the supply tube and clean them with a compatible solvent.
5. Remove the O-ring (2) from the air manifold (1).
6. Remove the quad-rings (7) and O-ring (8) from the base plate (17).
7. Discard the quad- and O-rings.
8. Lubricate the Quad-rings (7) and O-rings (8) with a compatible grease.
9. Install new Quad-rings (7) and O-rings (8) into the base plate (17).
10. Install the lower supply tube retainer (9) to the base plate (17) using the washers (10) and screws (11).

NOTE: Only finger tighten the screws at this time.

11. Lubricate the O-ring (2) with a compatible grease and install it into the air manifold (1).
12. Install the upper supply tube retainer (3) onto the supply tube (6).
13. Carefully insert the bottom portion of the supply tube (6) through the lower supply tube retainer (9) and into the base plate (17).
14. Carefully insert the upper portion of the supply tube (6) into the air manifold (1).
15. Secure the upper supply tube retainer (3) to the air manifold (1) using the screws (4) and washers (5).
16. Tighten the screws (4) to 10-12 ft-lb (13-16 N•m).
17. Tighten the lower retainer screws (11) to 10-12 ft-lb (13-16 N•m).

Piston Rod Retainer Repair

NOTE: Piston rod retainer repair involves replacing the U-Cup and O-Ring.

See Figure 8-5.

1. Remove the screws (13) and washers (10) securing the piston rod retainer (14) to the base plate (17).
2. Remove the O-ring (15) and U-Cup (12) from the piston rod retainer (14).
3. Discard the O-ring (15) and U-Cup (12).
4. Lubricate the new O-ring (15) and U-Cup (12) with a compatible grease.
5. Insert the O-ring (15) and U-Cup (12) into the piston rod retainer (14).
6. Install the piston rod retainer (14) onto the piston rod (16) using the screws (13) and washers (10). Tighten the screws (13) to 22-25 ft-lb (30-33 N•m).

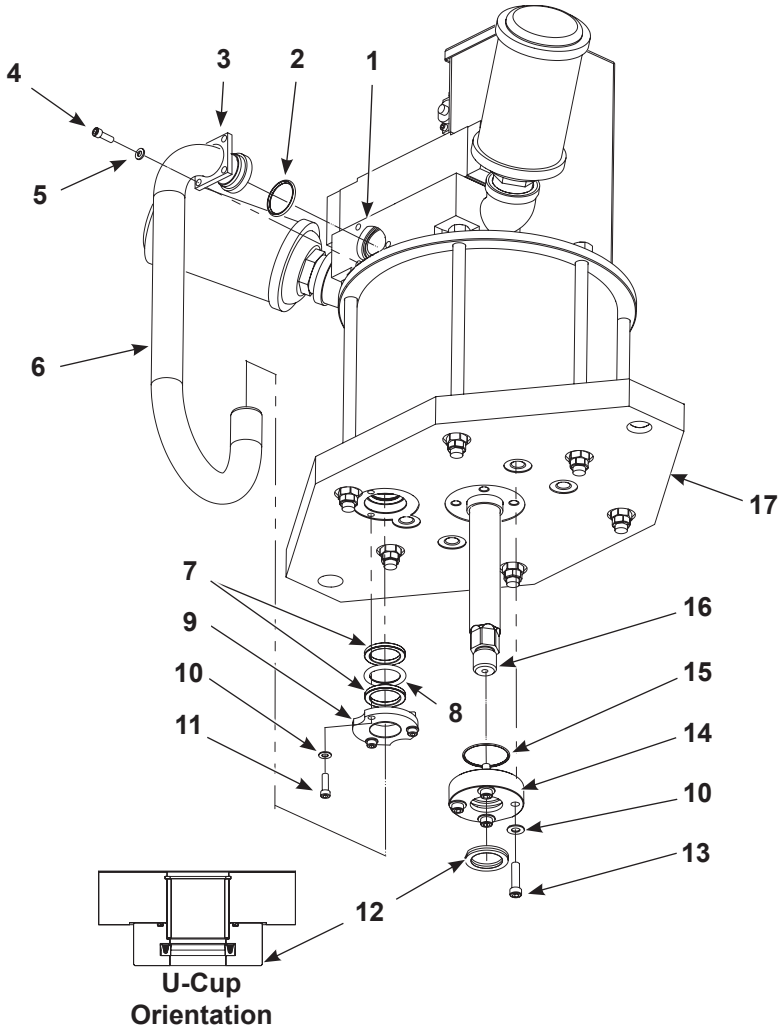


Figure 8-5 Repair Base Plate Seals and Rings

1. Air manifold
2. O-ring (1.250 x 1.438 in.)
3. Supply tube retainer (upper)
4. Screws (1/4-20 x 0.750 in.)
5. Washers (1/4 in.)
6. Supply tube
7. Quad-ring
8. O-ring (1.225 x 0.210 in.)
9. Supply tube retainer (lower)
10. Washers (5/16)
11. Screws (5/16 x 1.000 in.)
12. U-Cup
13. Screws (5/16 x 1.500 in.)
14. Piston rod retainer
15. O-ring (1.000 x 1.188 in.)
16. Piston rod
17. Base plate

Piston Assembly Repair

See Figure 8-6 and Figure 8-7.

1. See Figure 8-6. Remove the screws (1) securing the cover (2).
2. Place a wrench on the flats of the piston rod (5).
3. Remove the nut (3) securing the trip-bar (4) to the piston rod (5).

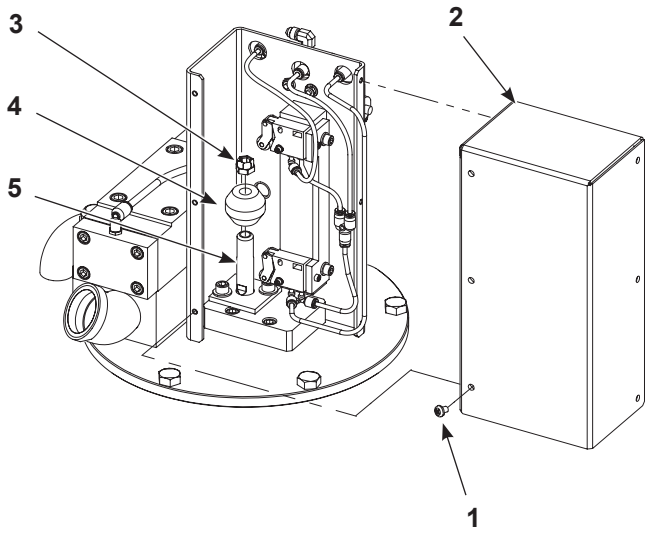


Figure 8-6 Repair Piston Assembly (1 of 2)

1. Screw
2. Cover
3. Nut
4. Trip-bar
5. Piston rod

4. See Figure 8-7. Remove the screws (10) and washers (11) securing the upper supply tube retainer (9) to the air manifold (7).
5. Loosen the lower supply tube retainer screws (13a).
6. Remove the supply tube (12) from the air manifold (7) and base plate (21). Remove and discard the O-ring (8) from the air manifold (7).
7. Remove the screws (17) and washers (18) securing the piston rod retainer (19) to the base plate (21). Remove the O-ring (15) and U-Cup (16).
8. Discard the O-ring (15) and U-Cup (16).
9. Remove the screws (6) and nuts (20) securing the air motor cap (22) to the base plate (21). Use a wrench on the flats of the two screws (6) below the air manifold (7) to remove the nuts (20).
10. Remove the air motor cap (22) and set it on a flat surface. Remove and discard the O-ring (23a).
11. Remove the air cylinder and O-ring (23b) from the base plate (21). Discard the O-ring. Remove the piston assembly from air cylinder.
12. Remove the retainer nut (25) securing the piston (26) to the piston rod (14). Remove the O-ring (27) from the piston rod (14) and discard.

13. Apply a compatible grease to the following parts:
    - inner surface of the air cylinder (24)
    - piston (26)
    - O-rings (8, 15, 23, 27)
    - U-Cup (16)
14. Install the O-ring (27) onto the piston rod (14).
15. Apply suitable removable threadlocker to the upper threads of the piston rod (14). Install the piston (26) onto the piston rod. Install the retainer nut (25) onto the piston rod and tighten to 200-220 ft-lb (271-298 N•m).
16. Assemble the piston assembly and air cylinder (24):
    a. Insert the piston assembly into the air cylinder at a 20-30 degree angle to ensure that there is an equal amount of grease on each side of the piston. When the piston reaches the middle of the air cylinder, rotate it to the proper position.
    b. Apply a compatible grease to the piston rod (14).
17. Install the O-rings (23a, 23b) onto the base plate (21) and air motor cap (22).
18. Install the air cylinder/piston assembly onto the base plate (21).
19. Install the air motor cap (22) onto the air cylinder (24) using the screws (6). Perform the following:
    a. Install the nuts (20) onto the screws.
    b. Hand-tighten two opposing screws at the same time until the air motor cap is secured to the base plate.
    c. After performing step 7b, secure the air motor cap to the base plate by tightening the screws in the sequence shown to 30-35 N•m (41-47 ft-lb).
20. Insert the O-ring (15) and U-Cup (16) into the piston rod retainer (19) as shown.
21. Install the piston rod retainer (19) onto the base plate (21) using the screws (17) and washers (18). Tighten the screws to 22-25 ft-lb (30-33 N•m).
22. Carefully insert the bottom portion of the air supply tube (12) through the lower retainer (13) and into the base plate (21).
23. Carefully insert the upper portion of the air supply tube (12) into the air manifold (7).
24. Secure the upper retainer (9) to the air manifold (7) using the screws (10) and washers (11). Tighten the screws to 10-12 ft-lb (13-16 N•m).
25. Tighten the screws (13a) on the lower retainer (13) to 10-12 ft-lb (13-16 N•m).

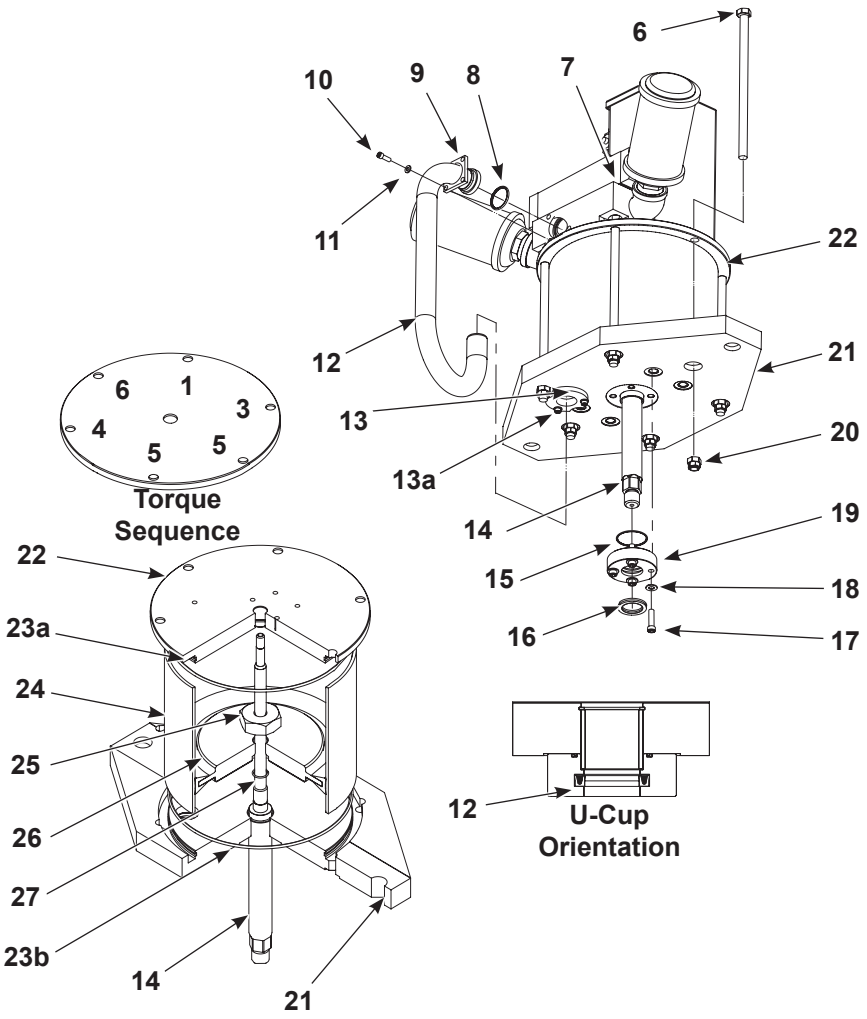


Figure 8-7 Repair Piston Assembly (2 of 2)

6. Screw (1/2-13)
7. Air manifold
8. O-ring (1.250 x 1.438 in.)
9. Supply tube retainer (upper)
10. Screw (1/4-20 x 0.750 in.)
11. Washer (1/2)
12. Supply tube
13. Lower retainer
13a. Screw (5/16 x 1.000 in.)
14. Piston rod
15. O-ring (1.688 x 1.875 in.)
16. U-Cup
17. Screw (5/16 x 1.500 in.)
18. Washer (5/16)
19. Piston rod retainer
20. Nut
21. Base plate
22. Air motor cap
23. O-ring (9.750 x 10.000 in.)
24. Air cylinder
25. Retainer nut
26. Piston
27. O-ring (0.793 x 0.070 in.)

26. Refer to Figure 8-6. Install the trip-bar (4) to the piston rod (5) using the nut (3). Tighten the nut securely.

27. Install the cover (2) to the air motor using the screws (1). Tighten the screws securely.

Control Module Repair

Cover Replacement

See Figure 8-8.

1. Loosen the regulator nuts (4).
2. Remove the elevator control valve handle (3)
3. Remove the elevator control valve nut (2).
4. Remove the cover (1) from the control module.

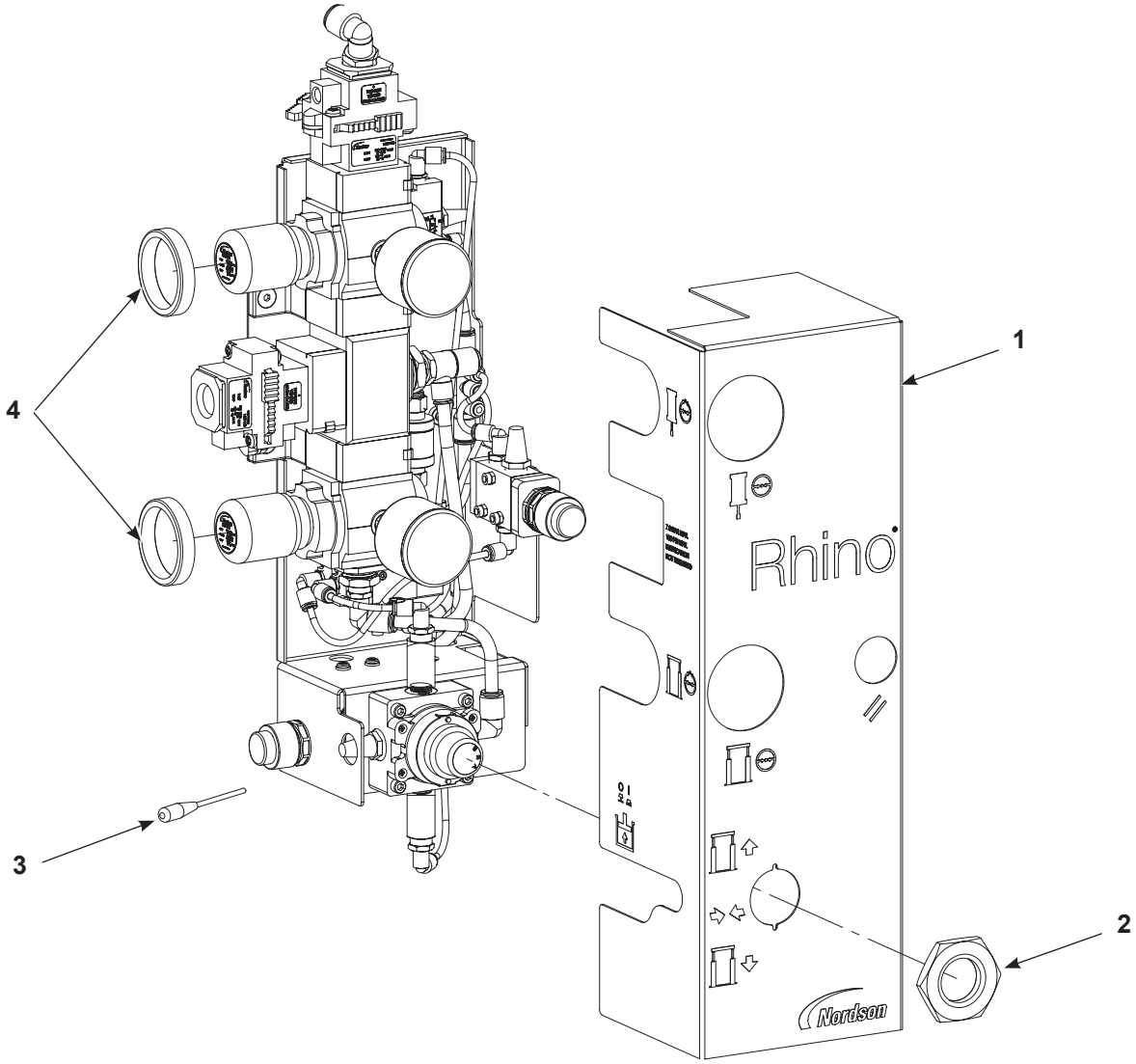


Figure 8-8 Cover Replacement

1. Cover
2. Elevator control valve nut
3. Elevator control valve handle
4. Regulator nut

Component Replacement

ACO Control Valve

See Figure 8-9.

NOTE: The ACO control valve is not saleable as an individual component. However, a service kit is available which includes the valve. Refer to the *Parts Section* for additonal information.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the ACO control valve (16) fittings.
3. Remove the screw (11) securing the ACO control valve (16) to the contol module.
4. Remove the ACO control valve (16).
5. Installation of the ACO control valve (16) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Air Motor Control Valve

See Figure 8-9.

NOTE: The air motor control valve is not saleable as an individual component. However, a service kit is available which includes the valve. Refer to the *Parts Section* for additonal information.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the air motor control valve (14) fitting.
3. Remove screws (not shown) securing the air motor control valve (14) to the air preparation control assembly (13).
4. Remove the air motor control valve (14).
5. Installation of the air motor control valve (14) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Air Preparation Control Assembly

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the air preparation control assembly (13) fittings.
3. Remove screws (12) securing the air preparation control assembly (13) to the control module.
4. Remove the air preparation control assembly (13).
5. Installation of the air preparation control assembly (13) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Blow-Off Control Valve

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the blow-off control valve (10) fittings.
3. Remove the screws (11) securing the blow-off control valve (10) to the control module.
4. Remove the blow-off control valve (10).
5. Installation of the blow-off control valve (10) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Elevator Control Valve Assembly

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the elevator control valve assembly (5) fittings.
3. Remove the screws (5a) securing the elevator control valve assembly (5) to the control module.
4. Remove the elevator control valve assembly (5).
5. Installation of the elevator control valve assembly (5) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Fitting, Filter, and Pneumatic Logic Valve

See Figure 8-9.

NOTE: The fitting (15), filter (8), and pneumatic logic valve (3) are not saleable as individual components. If replacement of these components is necessary, replace the entire control module assembly.

Manual Blow-Off Control Valve

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the manual blow-off control valve (4) fittings.
3. Remove the manual blow-off control valve (4).
4. Installation of the manual blow-off control valve (4) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

Manual Purge Valve

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the manual purge valve (6) fittings.
3. Remove the screws (2) and nuts (7) securing the manual purge valve (6) to the control module.
4. Remove the manual purge valve (6).
5. Installation of the manual purge valve (6) is in the reverse order of removal. Note the following:

• Securely tighten the screws and nuts.

Unregulated Air Motor Control Valve

See Figure 8-9.

1. Remove the control module cover. Refer to *Control Module Replacement, Cover Replacement* for additional information.
2. Remove the tubing from the unregulated air motor control valve (1) fittings.
3. Remove the screws (11) securing the unregulated air motor control valve (1) to the control module.
4. Remove the unregulated air motor control valve (1) .
5. Installation of the unregulated air motor control valve (1) is in the reverse order of removal. Note the following:

• Securely tighten the screws.

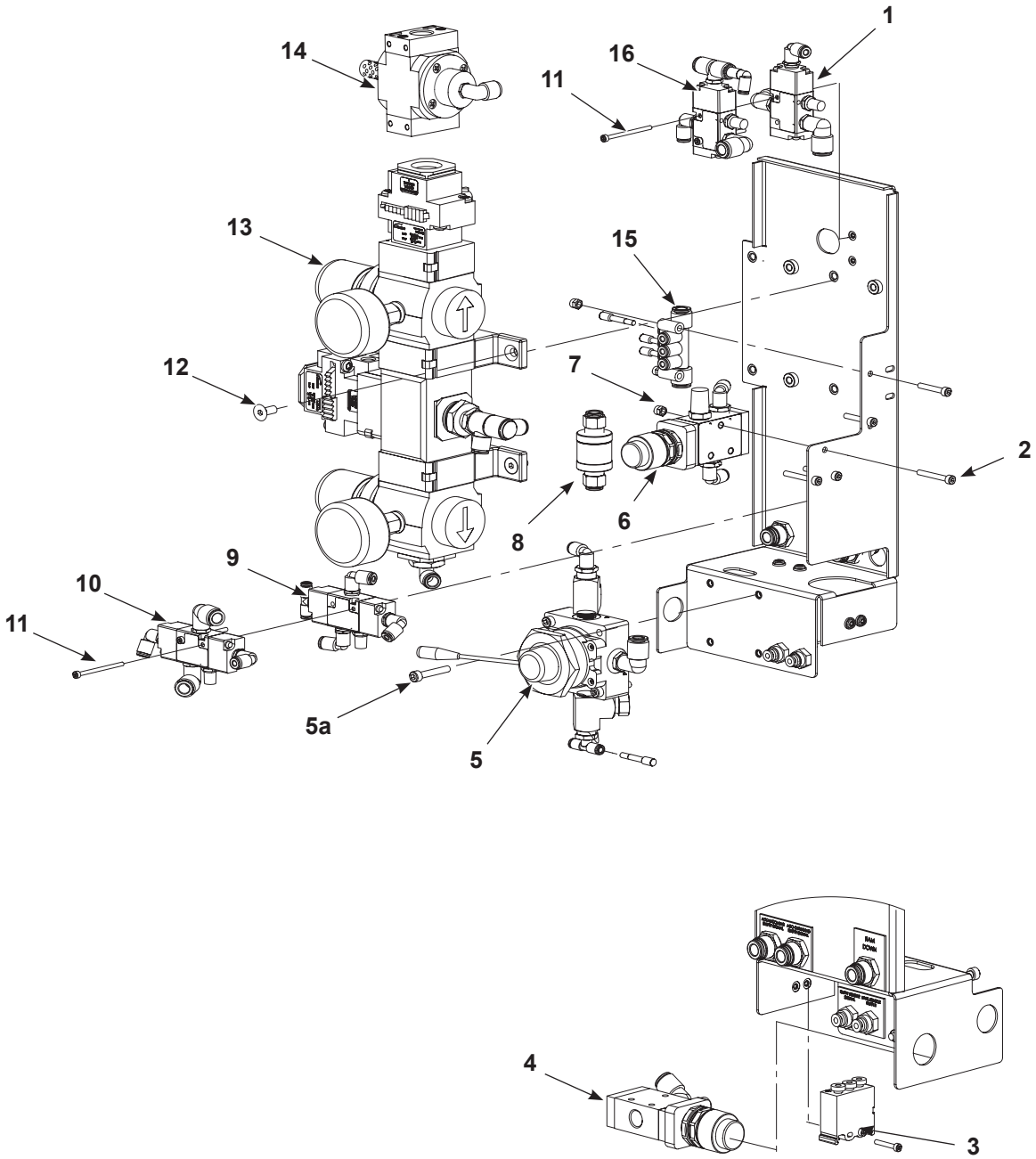


Figure 8-9 Control Module - Component Overview

1. Unregulated air motor control valve
2. Screw (M4 x 30 mm)
3. Pneumatic logic valve
4. Manual blow-off control valve
5. Elevator control valve assembly

5a. Screw

6. Manual purge valve
7. Nut
8. Filter
9. Memory valve
10. Blow-off control valve
11. Screw (M3 x 45 mm)

12. Screw (M6 x 14 mm)
13. Air preparation control assembly
14. Air motor control valve
15. Fitting
16. ACO control valve

Dual Post Frame Repair

WARNING: A 100-lb (45.3-kg) capacity lifting device is required for this procedure. Failure to use this device may lead to personal injury or equipment damage.

See Figure 8-10.

Frame Cylinder Removal

NOTE: Steps 1-3 apply only to the frame cylinder assembly (13) that is connected to the control module assembly. If removing and replacing the frame cylinder assembly that is not connected to the control module assembly, begin procedure at step 4.

1. Measure the location of the proximity sensor(s) (5) mounted to the frame cylinder assembly (13) from the unloader base plate (7) to the bottom of the proximity sensor(s). Record the measurements for use during reassembly.
2. Disconnect all tubing from the control module.
3. Remove control module from frame cylinder. Refer to *Installation, Modules* for additonal information.

NOTE: The control module is only attached to the left hand side frame cylinder.

4. Remove the screws (1) and washers (2) that secure the crossbar (3) to the mounting rods on the side of the cylinder that is being replaced.
5. Remove the screws (17) and washers (9) that secure the crossbar (3) to the frame cylinder shaft (15).
6. Remove pneumatic fittings from the cylinder being replaced.
7. Remove the screws (12) and washers (9) from the frame cylinder head (14).

CAUTION: Note the orientation of the frame cylinder heads (14).

8. Mark the location of the guides (8).
9. Remove the screws (12), lock washers (11), and washers (9) that secure the guide (8) to the unloader base plate (7).
10. Remove the guide (8).
11. Remove the screws (10) and washers (9) from the unloader base plate (7).
12. Remove the frame cylinder assembly (13). An eye bolt with an M16 x 2.0 thread can be installed in the frame cylinder shaft (15) to aid in removal.

NOTE: When removing the frame cylinder assembly (13), the frame cylinder disc (6) stays attached to the unloader base plate (7).

Frame Cylinder Installation

1. Apply pipe/thread/hydraulic sealant (PST) to the pneumatic fitting male threads and install the fittings on the frame cylinder assembly (13).
2. Bolt the frame cylinder assembly (13) to the unloader base plate (7) with screws (10) and washers (9). Do not fully tighten.
3. Bolt the yoke (16) to the frame cylinder head (14) with washers (9) and screws (12). Do not fully tighten.
4. Bolt the crossbar (3) to the frame cylinder shaft (15) using washers (9) and screws (17). Do not fully tighten.
5. Install the guide (8) with screws (12), lock washers (11) and washers (9). Do not fully tighten.
6. Torque all cap screws in the following order:
   a. Crossbar (3): 92 ft-lb (124.7 N●m)
   b. Yoke (16): 29 ft-lb (39.3 N●m)
   c. Frame cylinder assembly (13) to unloader base plate (7): 42 ft-lb (56.9 N●m) for 125mm cylinder, 75 ft-lbs (101.7 N●m) for 160 mm cylinder
   d. Guides (8) to unloader base plate: 60 ft-lb (82 N●m)
7. Reconnect the tubing to the cylinder fittings.

NOTE: Steps 8-12 apply only to the frame cylinder that is connected to the control module and light tower assemblies.

8. Reattach the proximity sensor(s) (5) to the frame cylinder assembly (13) per the measurements recorded in disassembly.
9. Install the control module (4). Refer to *Installation, Modules* for additonal information.

NOTE: The control module is only attached to the left hand side frame cylinder.

10. Reconnect all tubing to control module.

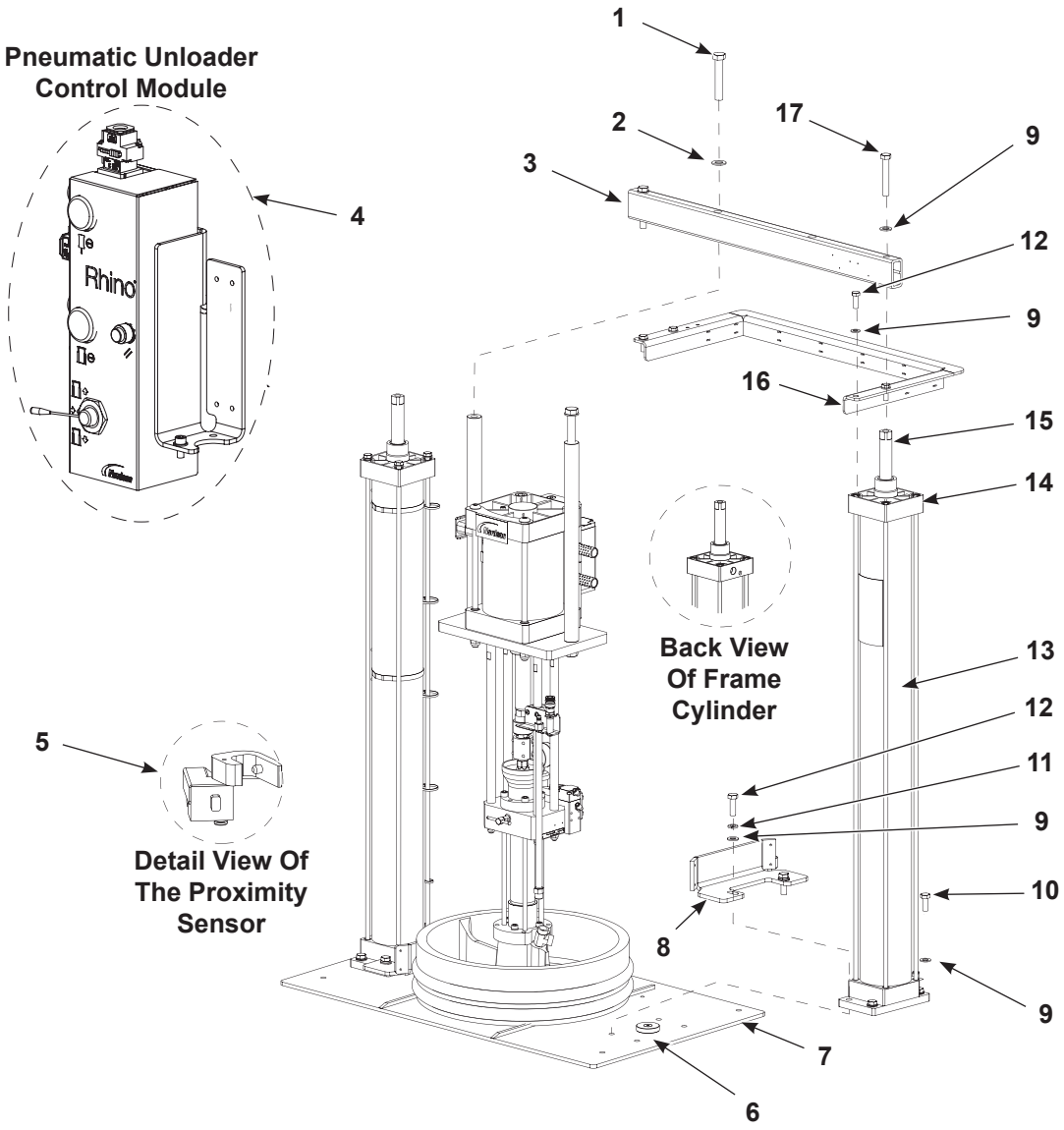


Figure 8-10 Remove/Replace Frame Cylinder - 55 Gallon Dual Post

1. Screw (M20 x 110 mm)
2. Washer (M20)
3. Crossbar
4. Control module
5. Proximity sensor
6. Frame cylinder disc
7. Unloader base plate
8. Guide
9. Washer (M16)
10. Screw (M16 x 45 mm)
11. Lock washer (M16)
12. Screw (M16 x 35 mm)
13. Frame cylinder assembly
14. Frame cylinder head
15. Frame cylinder shaft
16. Yoke
17. Screw (M16 x 100 mm)

Follower Module Repair

Follower Module O-ring Replacement

See Figure 8-11 and Figure 8-12.

1. If installed, remove the material container from the unloader. Refer to the *Operator Card* for additional information.
2. Put the elevator control in neutral.
3. See Figure 8-12. Insert support blocks between the frame crossbar and the top of the ram cylinder.
4. See Figure 8-11. Use either large screwdrivers or pry bars slid in behind the follower plate seals (1) to pry them out of the follower plate grooves (2) and off the follower (3).
5. Clean the follower plate grooves (2) and remove all foreign material.
6. Install the new follower plate seals (1) using either large screwdrivers or tire irons.
7. The positioning of the seals is critical and should be installed with the groove facing downward.
8. Apply material compatible grease to the follower plate seals (1).
9. Put the unloader back into service. Refer to the *Operation* section for additional information.

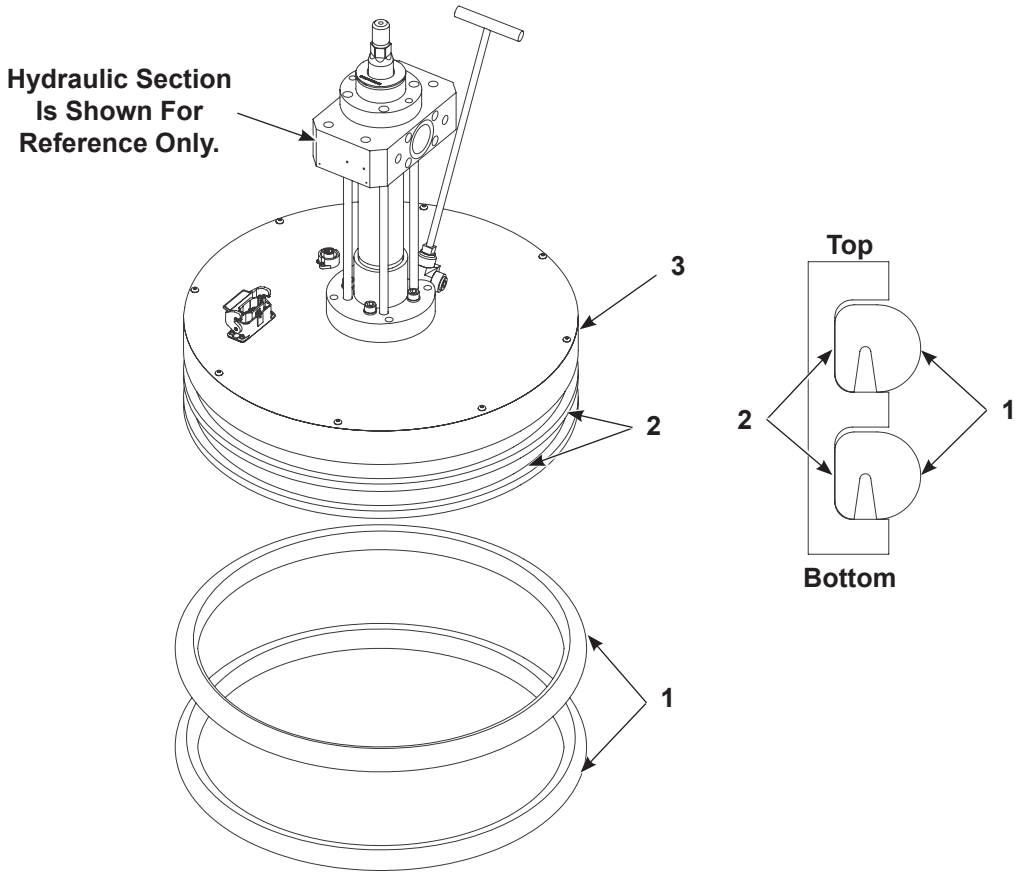


Figure 8-11 Remove/Replace Follower Module O-rings

1. Follower plate seal
2. Follower plate groove
3. Follower

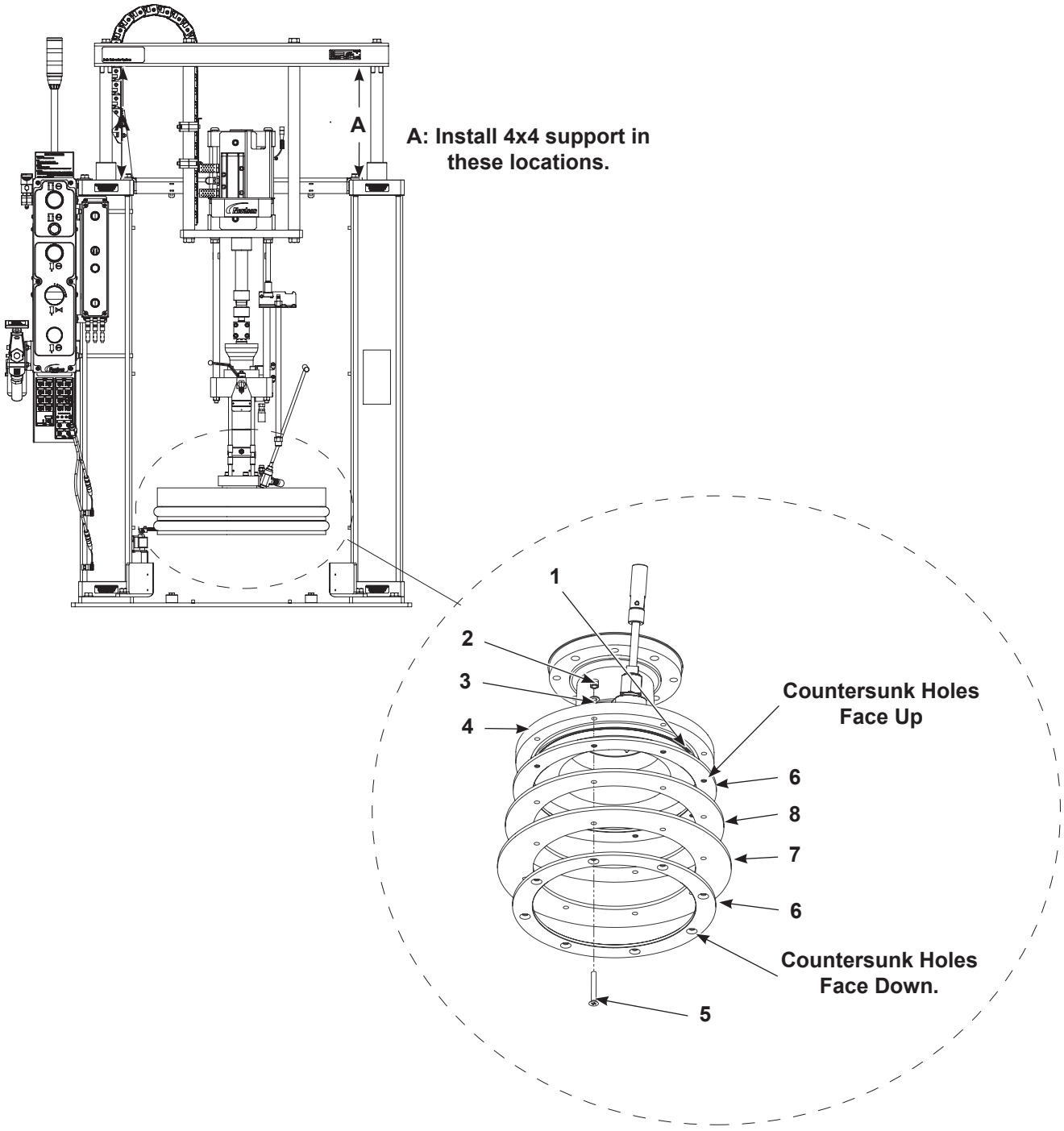
Follower Module Wiper Seal Replacement

See Figure 8-12.

1. If installed, remove the material container from the unloader. Refer to the *Operator Card* for additional information.
2. Insert support blocks between the frame crossbar and the top of the ram cylinder.
3. Remove the screws (5), washers (3), and lock nuts (2) from the follower module (4). Remove the following parts from the follower module:

- Support rings (6)
- Backup ring (8)
- Follower plate wiper seal (7)
- O-ring (1)

4. Discard the follower plate wiper seal (7).
5. Clean the support rings (6) and follower module O-ring groove.
6. Apply material compatible grease to the new O-ring (1) and install it into the groove on the follower module (4).
7. Install the support rings (6), backup ring (8), and new follower plate wiper seal (7) onto the follower module (4) as shown. Secure the parts to the follower module using the screws (5), washers (3), and lock nuts (2). Tighten the screws securely.
8. Remove the support blocks from the unloader.



55 Gallon Pump/Ram Assembly Shown; 5 Gallon Pump/Ram Assembly Similar.
Electric Unloader Shown For Illustrative Purposes Only.

Figure 8-12 Remove/Replace Follower Module Wiper Seals

1. O-ring
2. Lock nut
3. Washer
4. Follower module
5. Screw
6. Support ring
7. Follower plate wiper seal
8. Backup ring

Electrically Heated Follower Module Repair

NOTE: Perform the following steps to access the internal components of the electric heated follower module.

See Figure 8-13.

1. Unplug all the power cords from the follower module.
2. Remove the four screws (5) and four lock washers (4) securing the lower hydraulic section assembly (3) to the follower module and remove the hydraulic section.
3. Remove the thirteen screws (8) securing the cover plate (7) to the follower plate (1). Remove the cover plate (7).
4. If necessary, remove the O-ring (2) from the groove in the follower plate (1).
5. If necessary, remove the cover seal (9) and throat gasket (10) from the follower plate (1).
6. If necessary, remove the four layers of insulation (6) from the follower plate (1).
7. Assembly is in the reverse order of disassembly. Note the following:

• Lubricate the O-ring (2) with material compatible grease.

• Torque the M6 screws (8) to 45-60 in-lb (5.1-6.8 N•m).

• Torque the M10 screws (5) to 25-30 ft-lb (34-40 N•m).

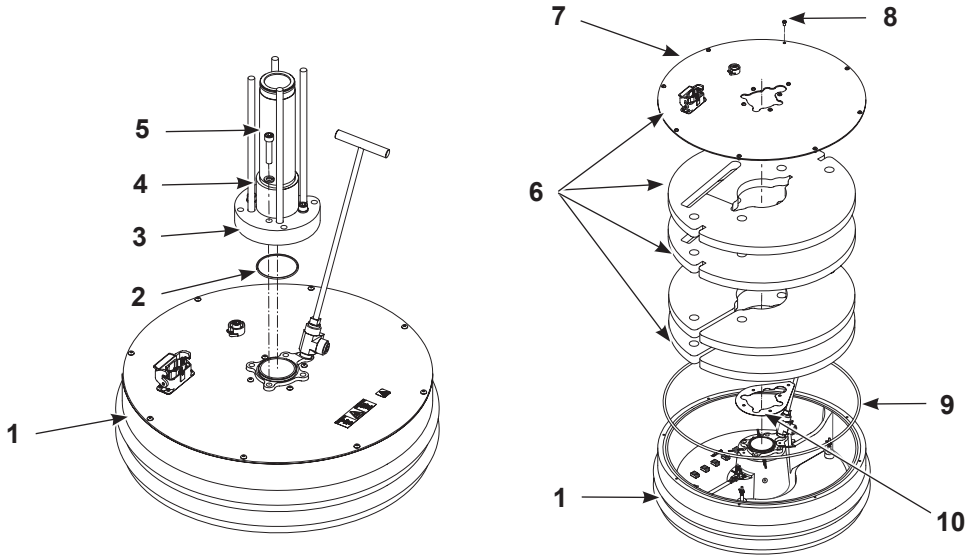


Figure 8-13 Repair Electrically Heated Follower Module

1. Follower plate
2. O-ring
3. Lower hydraulic section assembly
4. Lock washers
5. Screw (M10)
6. Insulation
7. Cover plate
8. Screw (M6)
9. Cover seal
10. Throat seal

Heater Cartridge Replacement

See Figure 8-14.

1. Disassemble the follower module as instructed in the *Electrically Heated Follower Module* section.

NOTE: Only the first two layers of the insulation need to be removed to replace the heater cartridges.

2. Locate the heater cartridges (1) in the center of the follower plate (2).
3. Remove the heater cartridge ring terminals from the two posts (3) on the heater plates.

NOTE: The ring terminals on the two posts (3) are secured with lock washers in between each ring terminal and nuts on the top and bottom of the stack. It is only necessary to remove the top nut to remove the ring terminals.

4. Remove the heater cartridge from the heater cartridge housing. If the heater cartridge cannot be removed by hand, a grease fitting can be installed in the M5 x 0.8 threaded hole (4). The grease gun can then be used to pump out the heater cartridge. Remove the grease fitting when complete.

NOTE: If a grease gun is used to remove the heater cartridge (1), some grease may be pushed out of the M5 x 0.8 threaded hole (4) during the installation of the new heater cartridge. Thoroughly clean the bore and other follower surfaces to remove as much grease as possible prior to installing new heat sink compound and a new heater cartridge (1).

5. Apply heat sink compound to the outside of the new heater cartridges (1) and the inside of the heater cartridge housing. Install the new heater cartridges (1) and connect the ring terminals to the posts (3) on the heater plates.
6. Reassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

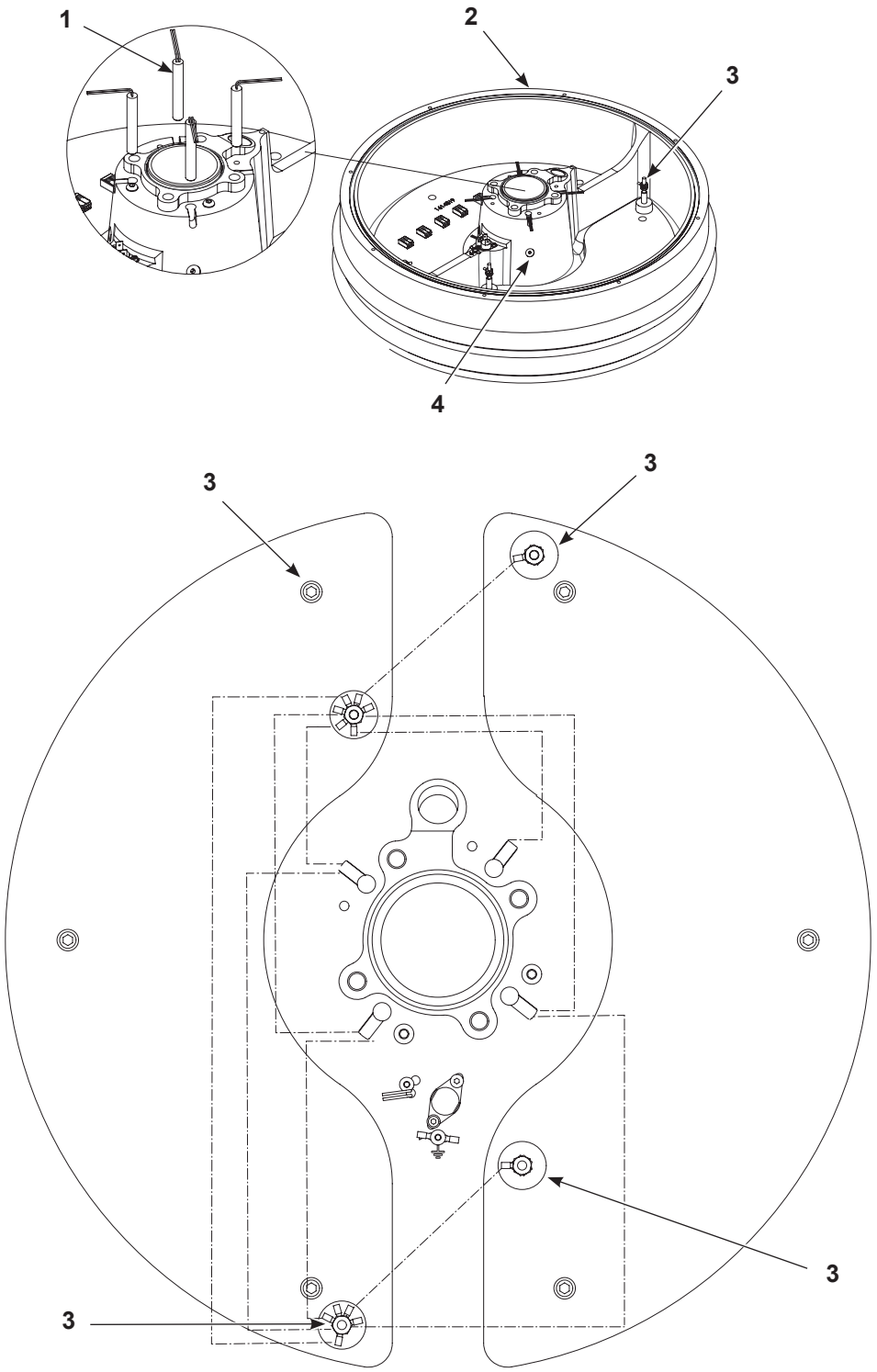


Figure 8-14 Remove/Replace Heater Cartridge

1. Heater cartridge
2. Follower plate
3. Post
4. Threaded hole

Heater Plate Replacement

See Figure 8-15.

1. Disassemble the follower module as instructed in the *Electrically Heated Follower Module* section.
2. Remove the nuts (5) securing the terminals (7) and lock washers (6) to the four posts (4) on the heater plate (1).

NOTE: Note the location of the wires removed to help with reassembly. The ring terminals on the four posts (4) are secured with lock washers (6) in between each ring terminal (7) and nuts (5) on the top and bottom of the stack.

3. Remove the screws (3) that secure the heater plates (1) to the follower plate (8).
4. Remove the heater plates (1).
5. Coat the bottom of the follower plate and the bottom of the heater plate with a thin layer of heat sink compound. Ensure the entire mating area is completely coated prior to installation of the new heater plate.
6. Install the new heater plates (1) with screws (3). Torque the screws (3) to 79-103 in-lb (8.9-11.6 N•m).
7. Replace the first two layers of insulation.
8. Reconnect the wiring to the floating connectors (2) and terminals.
9. Replace the final two layers of insulation.
10. Reassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

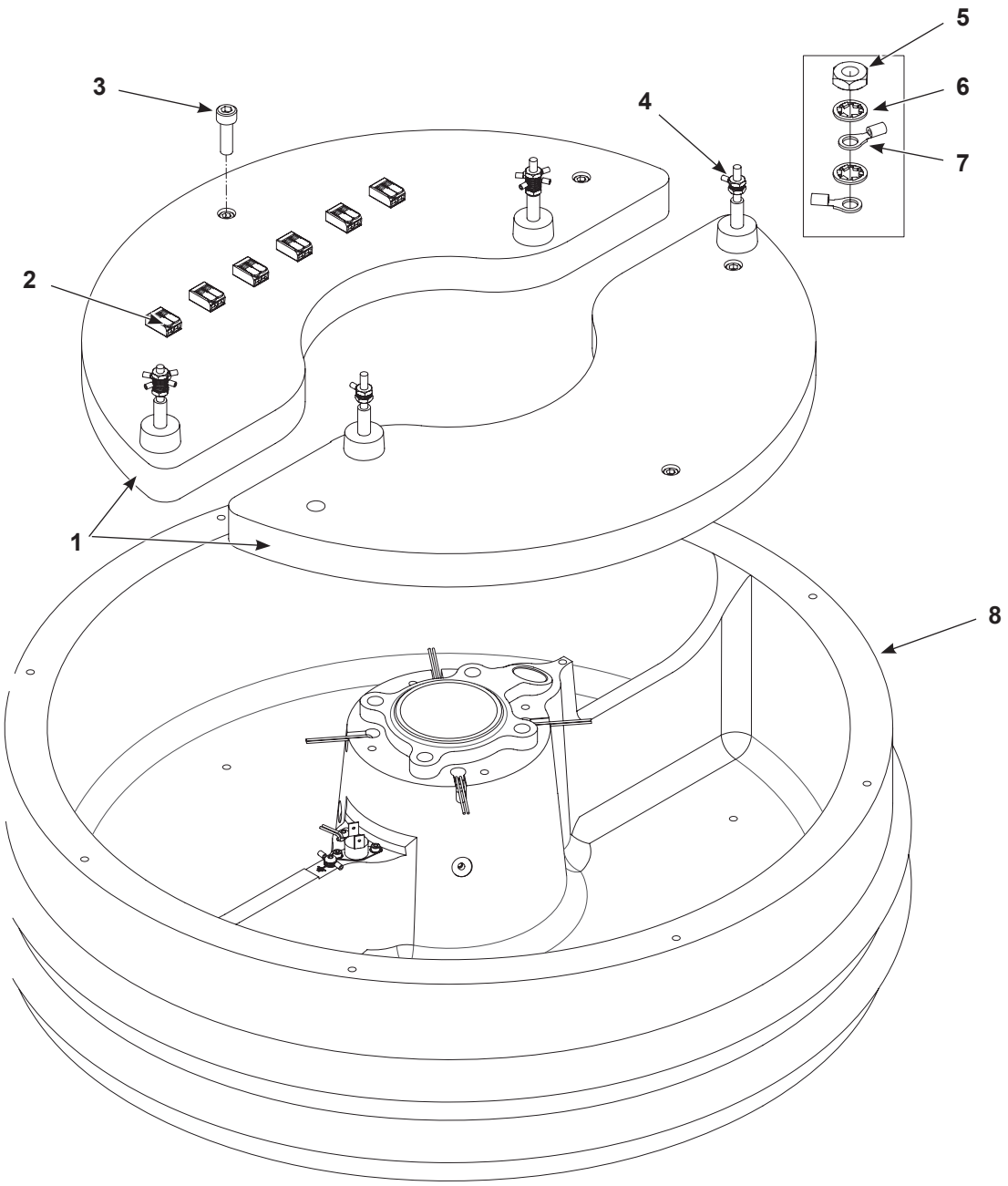


Figure 8-15 Remove/Replace Heater Plate

1. Heater plates
2. Floating connector
3. Socket head cap screws
4. Post
5. Hex nuts
6. Lock washers
7. Terminal
8. Follower plate

Resistance Temperature Detector (RTD) Replacement

See Figure 8-16.

1. Disassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

NOTE: Only the first two layers of the insulation need to be removed to replace the RTD.

2. Locate the RTD (1) near the center of the follower plate (4).
3. Disconnect the RTD (1) wires from its two associated floating connectors (2).
4. Remove the screw (3) securing the RTD (1) in the follower plate (4).
5. Remove the RTD (1).
6. Apply heat sink compound to the outside of the new RTD (1) and the inside of the RTD housing.
7. Install the new RTD (1) and secure it with the screw (3) removed earlier. Torque the button-head screw (3) to 16-21 in-lb (1.8-2.3 N•m).
8. Reconnect the RTD (1) wires into the two floating connectors (2).
9. Reassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

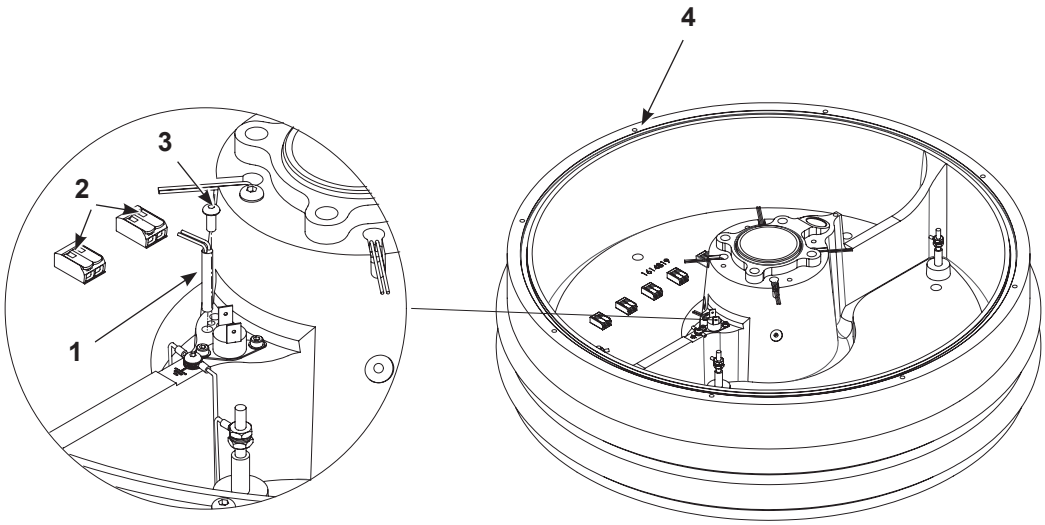


Figure 8-16 Remove/Replace RTD

1. RTD
2. Floating connector
3. Screw
4. Follower plate

Thermostat Replacement

See Figure 8-17.

1. Disassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

NOTE: Only the first two layers of the insulation need to be removed to replace the thermostat.

2. Locate the thermostat (1) near the center of the follower plate (4) and disconnect the two terminals connected to the top of the thermostat (1).
3. Remove the two screws (3) and lock washers (2) securing the thermostat (1) to the follower plate (4).
4. Remove the thermostat (1).
5. Apply heat sink compound on the bottom of the thermostat (1).
6. Install the new thermostat (1) with the screws (3) and lock washers (2) removed earlier.
7. Torque the screws (3) to 8-10 in-lb (0.9-1.1 N•m).
8. Reconnect the two terminals onto the thermostat (1).
9. Reassemble the follower module as instructed in the *Electrically Heat Follower Module* section.

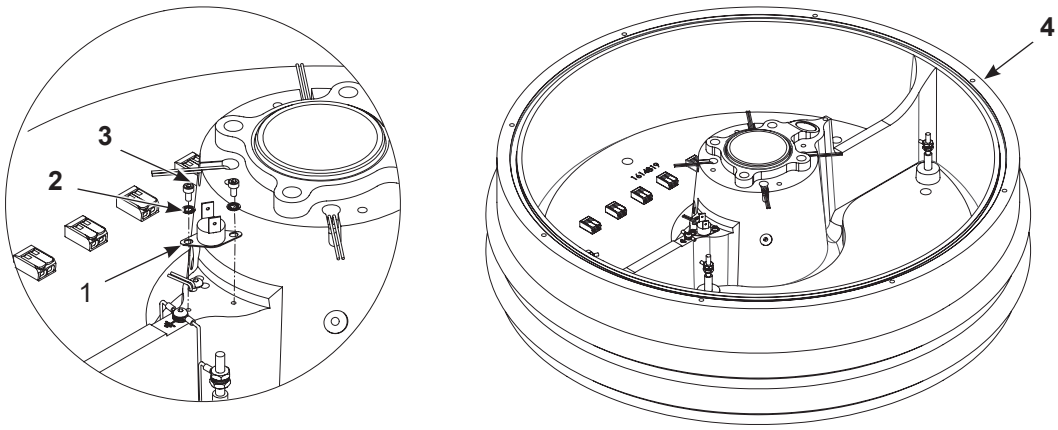


Figure 8-17 Remove/Replace Thermostat

1. Thermostat
2. Lock washer
3. Screw
4. Follower plate

Temperature Conditioned (T/C) Follower Module Repair

See Figure 8-18.

1. Disconnect all hoses from the follower module.
2. Remove the four screws (5) and four lock washers (4) securing the lower hydraulic section assembly (3) to the follower module and remove the hydraulic section.
3. Remove the screws (8) securing the cover plate (7) to the follower plate.
4. Remove the cover plate (7).
5. If necessary, remove the O-ring (2) from the follower plate (1).
6. Remove the four layers of insulation (6) from the follower plate (1).
7. Assembly is in the reverse order of disassembly. Note the following:

- Lubricate the O-ring (2) with material compatible grease.
- Torque the screws (8) to 45-60 in-lb (5.1-6.8 N•m).
- Torque the screws (5) to 25-30 ft-lb (34-40 N•m).

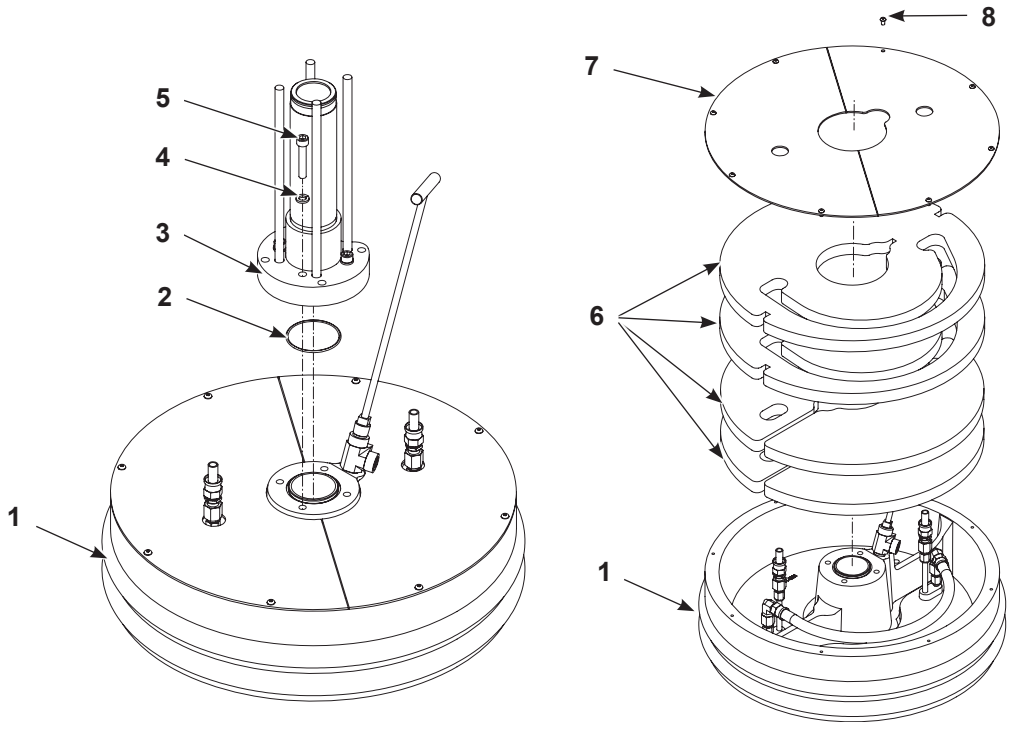


Figure 8-18 Repair T/C Follower Module

1. Follower plate
2. O-ring
3. Lower hydraulic section assembly
4. Lock washer
5. Screw (M10)
6. Insulation
7. Cover plate
8. Screw (M6)

Water Plate Replacement

See Figure 8-19.

1. Disassemble the follower module as instructed in the *T/C Follower Module* section.
2. Remove the T/C hose (5) from the elbow connections (3) on the water plates (2).
3. Remove the six screws (4) that secure the water plates (2) to the follower plate (1).
4. Coat the bottom of the follower plate and the bottom of the water plate with a thin layer of heat sink compound. Ensure the entire mating area is completely coated prior to installation of the new water plate.
5. Install the new water plates (2) with M6 screws (4). Torque the M6 screws to 79-103 in-lb (8.9-11.6 N•m).
6. Reinstall the first two layers of insulation.
7. Reconnect the T/C hose (5) to the elbow connections (3) on the new water plates (2).
8. Reassemble the follower module as instructed in the *T/C Follower Module* section.

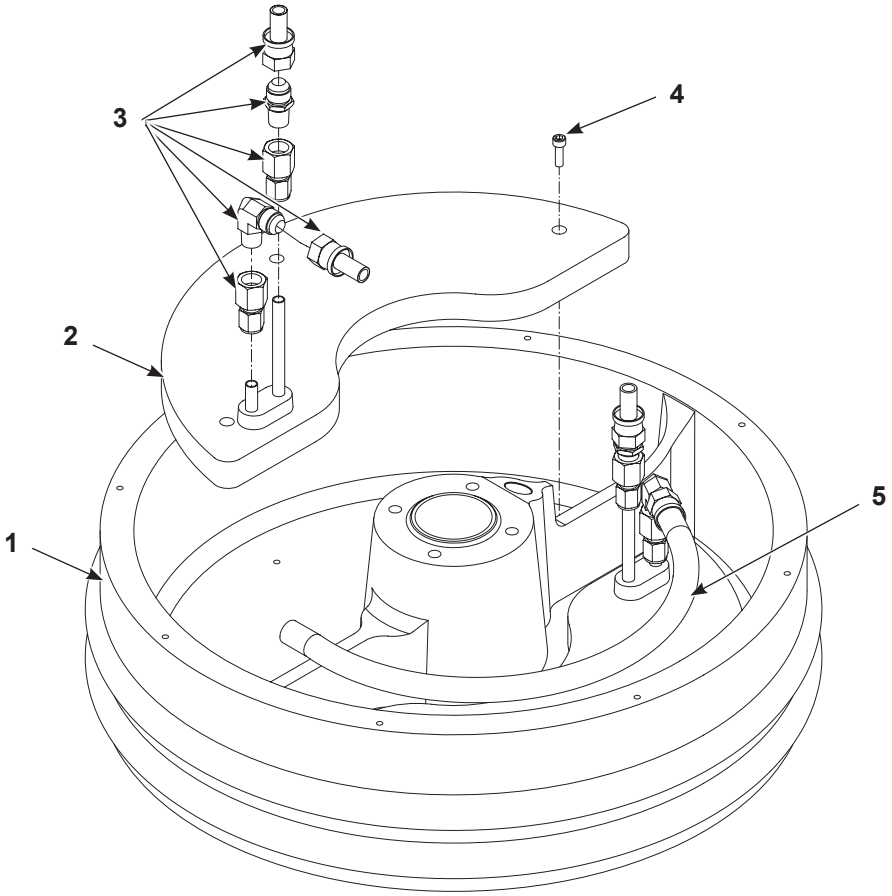


Figure 8-19 Remove/Replace Water Plate

1. Follower plate
2. Water plate
3. Elbow connection
4. Screw
5. T/C hose

Hydraulic Section Repair

See Figure 8-20.

Disassembly

NOTE: The standard hydraulic section includes a one-piece shovel adapter (17b) and the AC hydraulic section includes a two-piece shovel adapter (17a).

1. Remove the insulation wrap (20) if applicable.
2. Remove the solvent chamber (4) and O-ring (5) from the packing gland assembly (2).

NOTE: Discard the O-ring.

3. Perform the following:
   a. Remove the screws (3) from the packing gland assembly (2).
   b. Insert two screws (3) into the threaded holes (6) in the packing gland assembly (2)
   c. Tighten the screws in an alternate pattern to remove the packing gland assembly (2) from the upper pump body (1 a/b).
4. Remove the shovel adapter (17 a/b) from the rod assembly (7).
5. Remove the screws (18) securing the follower plate (16) to the upper pump body (1 a/b).
6. Remove the follower plate (16).

NOTE: Note the orientation of the cutout in the follower plate (16) in relation to the material outlet for re-installation.

7. Remove the bottom housing (14), O-ring (15), lower check plate (13), and shaft support spacer (12).

NOTE: Discard the O-ring (15).

8. Remove the T/C coil (19), if applicable.

NOTE: Take note of the orientation of the T/C coil connectors.

9. Remove the pump housing cylinder (11) from the upper pump body (1 a/b).
10. Remove and discard the O-rings (10) from the pump housing cylinder (11).
11. Using either an arbor press or hydraulic press, push the rod assembly (7), piston assembly (8, if equipped), and plunger rod (9) out of the pump housing cylinder (11).
12. Clamp the rod assembly (7) in a vise on the flats.
13. Use a deep well socket to remove the plunger rod (9) from the rod assembly (7).
14. Remove the piston assembly (8).
15. Clean the parts with a compatible solvent.
16. Inspect parts for nicks, scratches, wear, and damage. Replace parts if necessary.
17. Rebuild the packing gland assembly (2), if necessary. Refer to the *Packing Gland* procedure in this section for instructions.

Assembly

1. Apply compatible grease to the packing gland O-ring (5) and the packing gland assembly inside diameter (21).
2. Install the packing gland assembly (2) onto the upper pump body (1 a/b) and apply Never Seez to the threads of the screws (3).
3. Install the screws (3) into the packing gland assembly (2) and tighten to 102-108 N•m (75-80 ft-lb).
4. Apply compatible grease to the O-rings (10) and inside diameter of the pump housing cylinder (11) and install the O-rings (10) onto the pump housing cylinder (11).
5. Install the pump housing cylinder (11) onto the upper pump body (1 a/b).
6. Assemble the rod assembly (7), piston assembly (8, if equipped), and plunger rod (9):
   a. Clamp the rod assembly (7) in a vise on the flats and install the piston assembly (8, if equipped) onto the rod assembly (7).
   b. Apply Never Seez to the upper threads of the rod assembly (7) and pilot the plunger rod (9) to the threads.
   c. Use a deep well socket to connect the plunger rod (9) to the rod assembly (7) and tighten to 272-298 N•m (200-220 ft-lb).
   d. Apply a thin coat of compatible grease to the plunger rod (9), piston assembly (8, if equipped), and rod assembly (7).
7. Using either an arbor press or hydraulic press, install the rod assembly (7), piston assembly (8, if equipped), and plunger rod (9) through the pump housing cylinder (11) and packing gland assembly (2).
8. Install the shaft support spacer (12) and lower check plate (13) onto the rod assembly (7), piston assembly (8, if equipped), and plunger rod (9).
9. Install the bottom housing (14) onto the pump housing cylinder (11) and apply compatible grease to the O-ring (15) and install it onto the bottom housing (14).
10. Install the follower plate (16) onto the bottom housing (14).

NOTE: The follower plate (16) orientation is critical and should be installed in relation to the material outlet exactly as it was removed.

11. Install the T/C coil (19), if applicable.

NOTE: The orientation of the T/C coil (19) connections is critical.

12. Apply Never Seez to the threads of the screws (18). Perform the following:
    a. Install the screws (18) through the follower plate (16) and into the upper pump body (1 a/b).
    b. Hand-tighten two opposing screws (18) at the same time until the follower plate (16), bottom housing (14), and pump housing cylinder (11) are secured to the upper pump body (1a/b). Hand-tighten the remaining screws (18).
    c. After performing the previous step, simultaneously tighten each screw ⅛ turn at a time in the sequence shown to 102-108 N•m (75-80 ft-lb).
13. Apply threadlock adhesive to the lower threads of the rod assembly (7). Install the shovel adapter (17a/b) to the rod assembly (7) and tighten to 75-81 N•m (55-60 ft-lb).
14. Install the solvent chamber (4) and O-ring (5) onto the packing gland assembly (2).
15. Install the insulation wrap (20) if applicable.

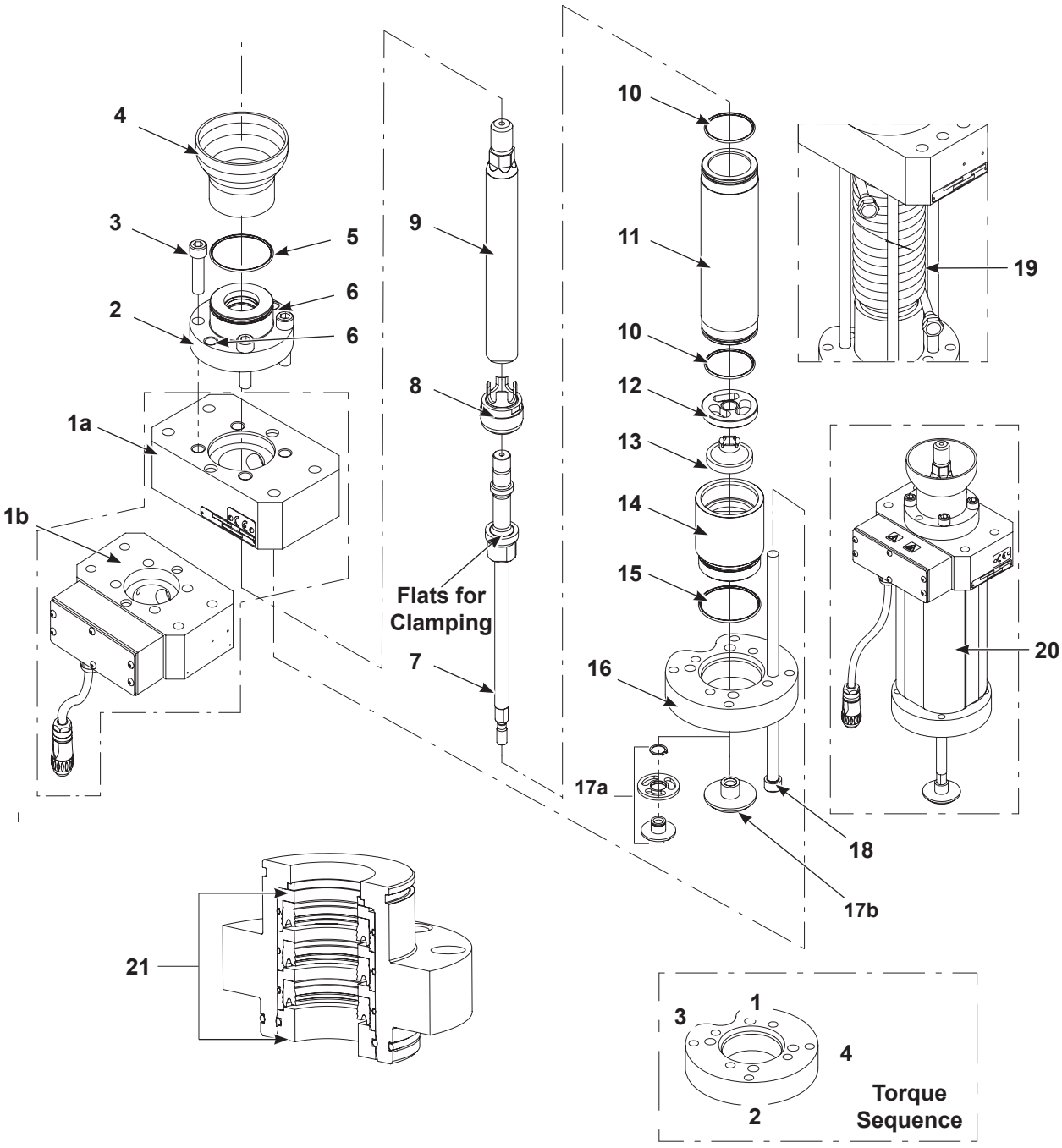


Figure 8-20 Disassembly/Assembly Hydraulic Section

1. Upper pump body
2. Packing gland assembly
3. Screw (M12 x 1.75 x 55 mm)
4. Solvent chamber
5. O-ring (2.56 x 2.750 in.)
6. Threaded hole
7. Rod assembly
8. Piston assembly
9. Plunger rod
10. O-ring (2.237 x 0.103 in.)
11. Pump housing cylinder
12. Shaft support spacer
13. Lower check plate
14. Bottom housing
15. O-ring (2.487 x 0.103 in.)
16. Follower plate
17. Shovel adapter
18. Screw (M12 x 1.75 x 300 mm)
19. T/C coil
20. Insulation wrap
21. Packing gland inside diameter

Heater Cartridge Replacement

NOTE: The heater cartridge is present on electrically heated hydraulic sections only.

See Figure 8-21.

1. Disassemble the hydraulic section as instructed *Hydraulic* section.
2. Remove the six screws (1) securing the cover plate (2) and pump gasket (3) to the connection box (6).
3. Disconnect the heater cartridge (11) wiring from the floating connectors (4) inside the connection box (6).
4. Remove the pipe plug (9) from the rear of the upper pump body (8). Using a punch or rod, push the heater cartridge (11) out from the rear of the upper pump body (8) and remove the heater cartridges (11).
5. Apply heat sink compound to the outside of the new heater cartridge (11) and the inside of the heater cartridge housing. Install the new heater cartridge (11).

NOTE: The heater cartridge (11) must be fully installed in the heater cartridge (11) bore. When the pipe plug (9) is re-installed, trapped air will force the heater cartridge (11) back slightly.

6. Reconnect the heater cartridge (11) wiring to the appropriate floating connectors (4) inside the connection box (6).
7. Reinstall the pump gasket (3) and cover plate (2). Torque the screws (1) to 47-63 in-lb (5.31-7.12 N•m).

Heater Cartridge Resistance Temperature Detector (RTD) Replacement

NOTE: The heater cartridge is present on electrically heated hydraulic sections only.

See Figure 8-21.

1. Disassemble the hydraulic section as instructed in the *Hydraulic* section.
2. Remove the six screws (1) securing the cover plate (2) and pump gasket (3) to the connection box (6).
3. Disconnect the RTD (14) wiring from the floating connectors (10) inside the connection box (6).
4. Remove the screw (12) and RTD retainer (13) that secures the RTD (14) in the upper pump body (8) and remove the RTD (14).
5. Apply heat sink compound to the outside of the new RTD (14) and the inside of the RTD housing. Install the new RTD (14) and secure it in place with the screw (12) and RTD retainer (13) previously removed. Torque the screw (12) to 18-22 in-lb (2.03-2.48 N•m).
6. Reconnect the RTD (14) wiring to the appropriate floating connectors (10) inside the connection box (6).
7. Reinstall the pump gasket (3) and cover plate (2). Torque the button head screws (1) to 47-63 in-lb (5.31-7.12 N•m).

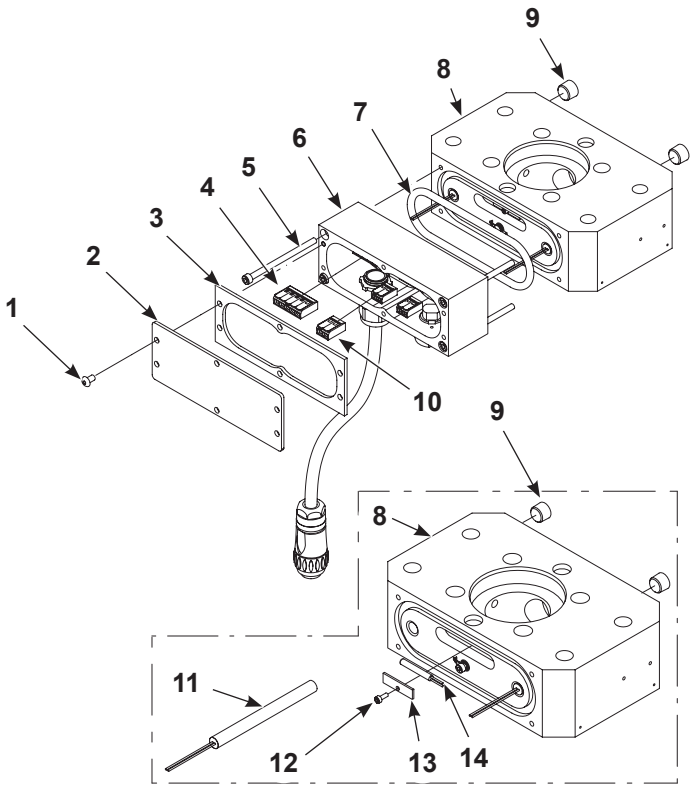


Figure 8-21 Remove/Replace Heater Cartridge and RTD

1. Screw (M5 x 8 mm)
2. Cover plate
3. Pump gasket
4. Floating connector (5-wire)
5. Screw (M5 x 55 mm)
6. Connection box
7. O-ring
8. Upper pump body
9. Pipe plug
10. Floating connector (2-wire)
11. Heater cartridge
12. Screw (M3)
13. RTD retainer
14. RTD

Hydraulic Section Pump Outlet Manifold Repair

See Figure 8-22.

Heater Cartridge Replacement

1. Disconnect the cordset connector (8) from the power source.

NOTE: Check Valve Manifolds Only: When removing a check valve manifold from the hydraulic section, the ball (11) and spring (10) may fall out. Handle with care to prevent damaging these parts.

2. Remove the screws (2) securing the manifold body (1) to the hydraulic section (13).
3. Remove the screws (5) securing the cover plate (4) and gasket (3) to the manifold body (1).

CAUTION: Carefully pull out the floating connectors (7) from the manifold body (1). Disconnect the heater cartridge (6) wires.

4. Remove the pipe plug (9) from the rear of the manifold body (1).
5. Use a punch (12) to push out the heater cartridge (6) from the rear of the manifold body. Remove the heater cartridge.

CAUTION: The heater cartridge must be fully inserted into the heater cartridge bore. When the pipe plug is reinstalled, trapped air will force the heater cartridge slightly back.

6. Installation is in the reverse order or removal. Note the following:

- Apply heat sink compound to the OD of the new heater cartridge (6) and to the ID of the bore. Insert the heater cartridge into the manifold body (1).
- Tighten the screws securing the gasket (3) to the cover plate (4) to 60−75 in.-lb (6.8−8.5 N•m).
- Apply Never-Seez to the threads of the screws (2). Reinstall the manifold body (1) to the hydraulic section using the screws (2). Tighten the screws to 50-55 ft-lb (67.8-74.6 N•m).

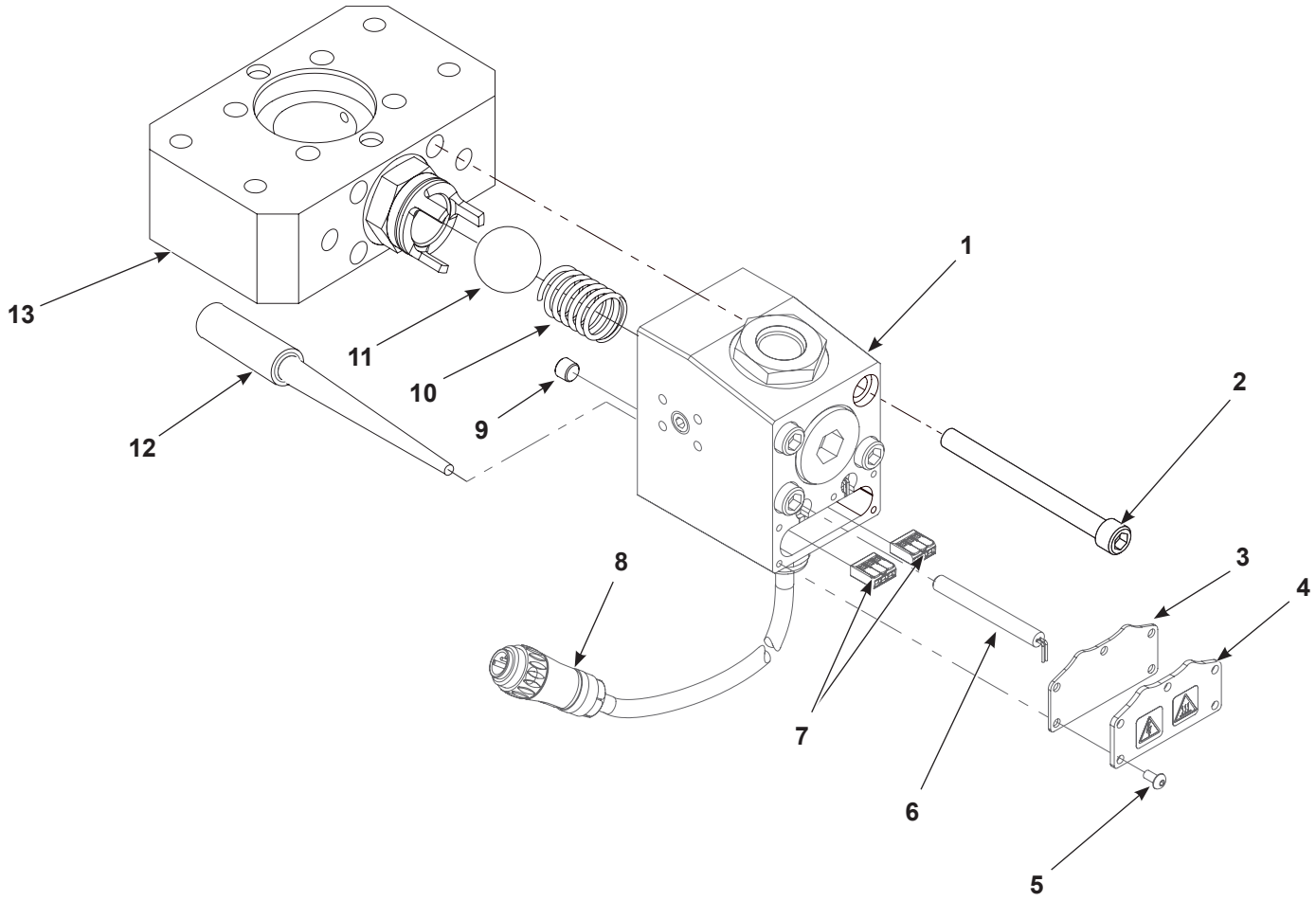


Figure 8-22 Remove/Replace Heater Cartridge

1. Manifold body
2. Screw (M5 x 8 mm)
3. Gasket
4. Cover plate
5. Screw (M5 x 55 mm)
6. Heater cartridge
7. Floating connector
8. Corset connector
9. Pipe plug
10. Spring
11. Ball
12. Punch
13. Hydraulic section

Packing Gland Repair

ARW Type

CAUTION:

- Do not attempt to rebuild ARW packing glands. The internal components are not serviceable.
- Some O-ring lubricants may react to certain dispensing materials. Contact a material supplier to determine the appropriate O-ring lubricant.

See Figure 8-23.

Removal

NOTE: If necessary, remove the container from the unloader before removing the packing gland. Refer to the *Operator Card* for additional information.

1. Set the air motor lockout valve to ON.

NOTE: Refer to the *Operation* section for additional information.

2. Operate the air motor until the split coupling (10) is accessible.
3. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

4. Disconnect the tubing from the supply port (3) and waste port (2).
5. Place the elevator control valve in the neutral position.

NOTE: Refer to the *Operation* section for additional information.

6. Open the ball valve (1).
7. Bleed the hydraulic pressure through the ball valve (1) and dispense gun(s). Leave the ball valve open.
8. Remove the screws (9) securing the split coupling (10) to the plunger rod (12) and floating joint coupling (11).
9. Drain the solvent chamber cup (7).
10. Set the air motor regulator to 0 bar/psi.

NOTE: Refer to the *Operation* section for additional information.

11. Disconnect the output air line from the lower magnetic sensor.
12. Set the air motor lockout valve to ON.

NOTE: Refer to the *Operation* section for additional information.

13. Use a magnet (Nordson part 1609505) to trigger the upper magnetic sensor. This will cycle the air motor and force the plunger rod (12) downward. Use minimal air pressure.
14. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

15. With the air supply off, the plunger rod (12) can be moved by hand. Manually raise the plunger rod.
16. Remove the solvent chamber cup (7) from the packing gland assembly (4).

17. Remove the four screws (5) from the packing gland assembly (4).
18. Insert two of the screws (4) into the threaded holes of the packing gland assembly (4) to serve as jacking screws. Alternate tightening the packing gland screws to remove the packing gland assembly.

Installation

1. Set the air motor lockout valve to OFF.
2. Ensure the packing gland assembly O-ring and the bore of the packing gland are lubricated with compatible grease.
3. Install the packing gland assembly (4) into the plunger rod (8).
4. Install the solvent chamber cup (7) onto the packing gland assembly (4).
5. Place the packing gland assembly insertion tool (Nordson part 1609505) into the top of the solvent chamber cup (7).
6. Set the air motor lockout valve to ON.

NOTE: Refer to the *Operation* section for additional information.

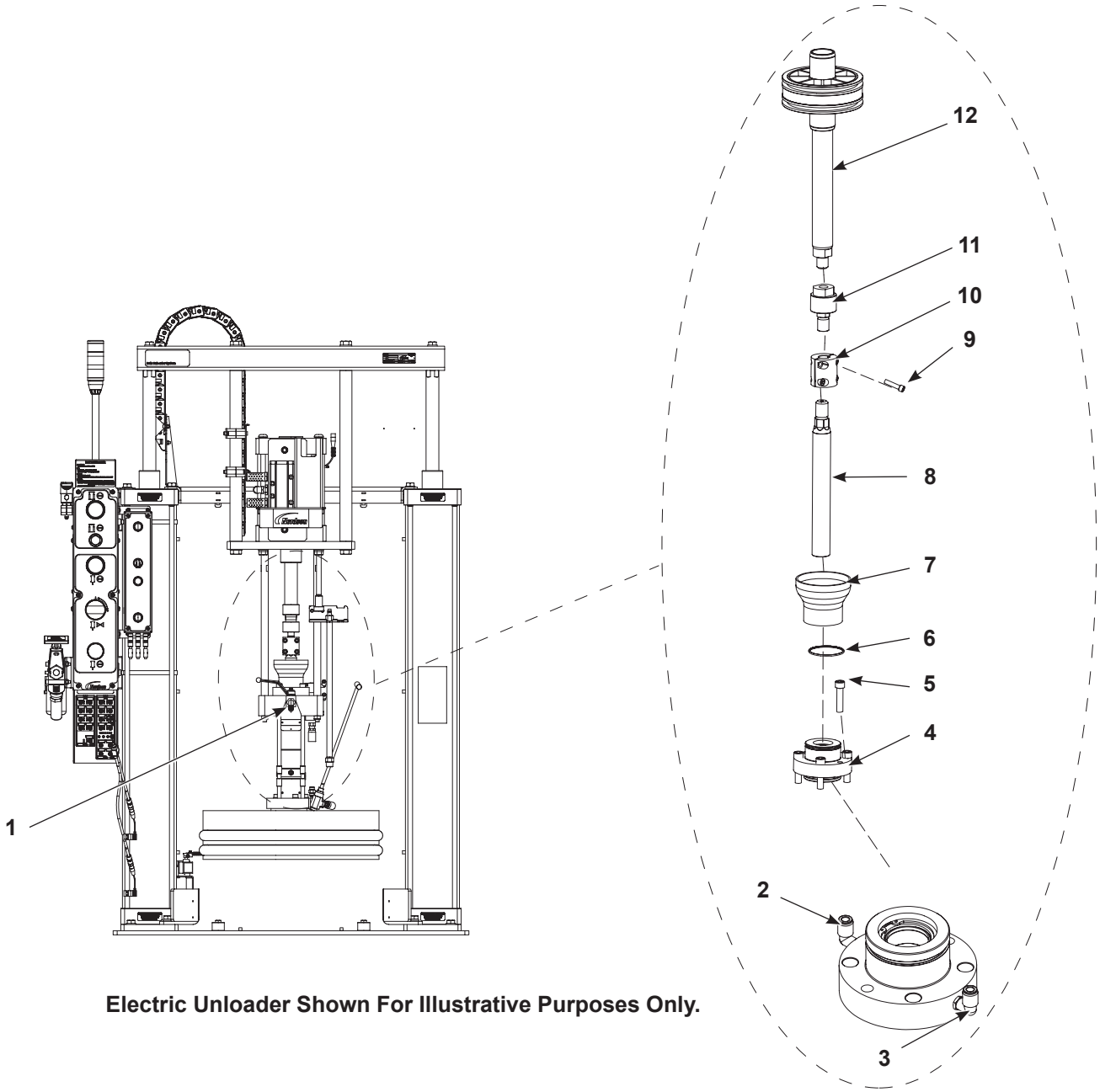
7. Use a magnet (Nordson part 1609505) to trigger the upper magnetic sensor. This will cycle the air motor and force the plunger rod downward. Use minimal air pressure.
8. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

9. Manually adjust the air motor rod to the top of stroke.

NOTE: With the air supply off, the air motor rod can be moved by hand.

10. Remove the packing gland assembly insertion tool (Nordson part 1609505) and the solvent chamber (7).
11. Apply Never-Seez lubricant to the threads of the screws (5). Install the screws (5) into the packing gland assembly and tighten to 75−80 ft-lb (102−108 N•m).
12. Install the split coupling halves. Refer to the *Split Coupling Halves Installation* section of this document to complete the packing gland assembly repair procedure.



Electric Unloader Shown For Illustrative Purposes Only.

Figure 8-23 Repair ARW Type Packing Gland Assembly

1. Ball valve
2. Waste port
3. Supply port
4. Packing gland assembly
5. Screw (M12)
6. O-ring
7. Solvent chamber cup
8. Plunger rod
9. Screw (M8)
10. Split coupling
11. Floating joint coupling
12. Plunger rod

Non-ARW Type

Removal

See Figure 8-24.

NOTE: If necessary, remove the container from the unloader before removing the packing gland assembly. Refer to the *Operator Card* for additional information.

1. Set the air motor lockout valve to ON.

NOTE: Refer to the *Operation* section for additional information.

2. Operate the air motor until the split coupling (7) is accessible. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

3. Place the elevator control valve in the Neutral position and shut off the air motor lockout valve.

NOTE: Refer to the *Operation* section for additional information.

4. Open the ball valve (1).
5. Bleed the hydraulic pressure through the ball valve (1) and dispense gun(s). Leave the ball valve (1) open.
6. Remove the screws (5) securing the split coupling (6) to the plunger rod and floating joint coupling.
7. Drain the solvent chamber cup (4).
8. Set the air motor regulator to 0 bar/psi.

NOTE: Refer to the *Operation* section for additional information.

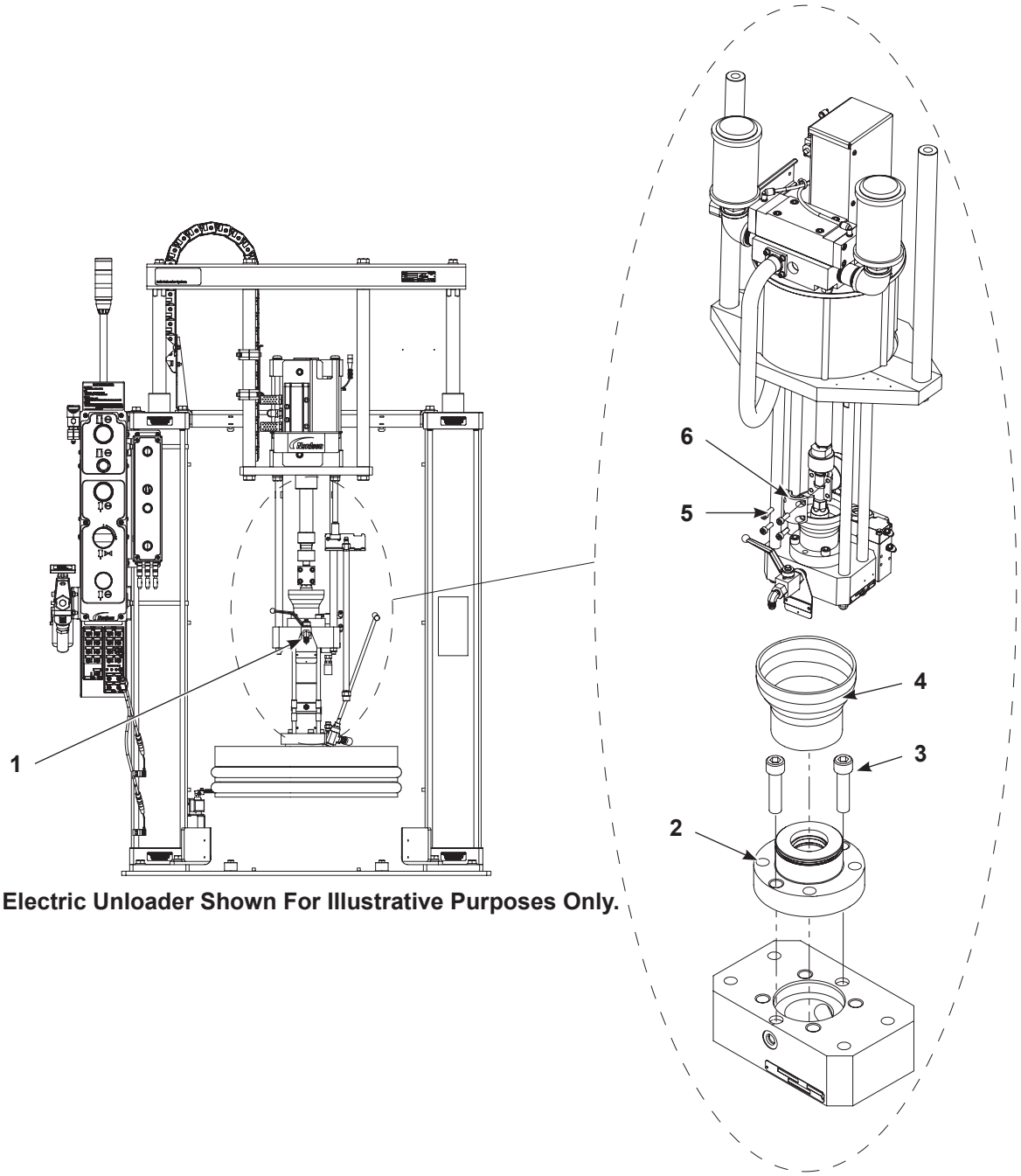
9. Disconnect the output air line from the lower magnetic sensor.
10. Set the air motor lockout valve to ON.

NOTE: Refer to the *Operation* section for additional information.

11. Use a magnet (Nordson part 1609505) to trigger the upper magnetic sensor. This will cycle the air motor and force the plunger rod downward. Use minimal air pressure.
12. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

13. With the air supply off, the air motor rod can be moved by hand. Manually raise the air motor rod.
14. Remove the solvent chamber cup (4) from the packing gland assembly (2).
15. Remove the four screws (3) from the packing gland assembly (2).
16. Insert two of the packing gland screws (3) into the threaded holes of the packing gland assembly (2) to serve as jacking screws. Alternate tightening the packing gland screws to remove the packing gland assembly.



Electric Unloader Shown For Illustrative Purposes Only.

Figure 8-24 Repair Non-ARW Type Packing Gland Assembly

1. Ball valve
2. Packing gland assembly
3. Screw (M12)
4. Solvent chamber cup
5. Screw (M8)
6. Split coupling

Packing Gland Assembly Rebuild

NOTE: This procedure requires use of either a hydraulic press or an arbor press to remove the internal parts of the packing gland.

See Figure 8-25.

1. Place the packing gland assembly (3) on a fixture (5) with the solvent chamber cup end facing up.

NOTE: During the removal of the internal parts, the retainer groove will break the O-ring (1).

2. Insert the removal arbor (2) into the packing gland assembly (3). Using the press, push out the internal glands (4).
3. Thoroughly clean the packing gland housing in a compatible solvent to remove all sealant material and O-ring debris.
4. Coat the bore (6) of the packing gland assembly (3) with compatible grease.
5. Insert the scraper or retaining ring (7), sharp edge down, into the packing gland assembly (3).
6. Using the packing gland assembly insertion tool (Nordson part 1609505), press the new internal glands (4) into the packing gland assembly (3).

CAUTION: Ensure the brass seal retainer or backup washer (8) is flush with or slightly below the packing gland assembly.

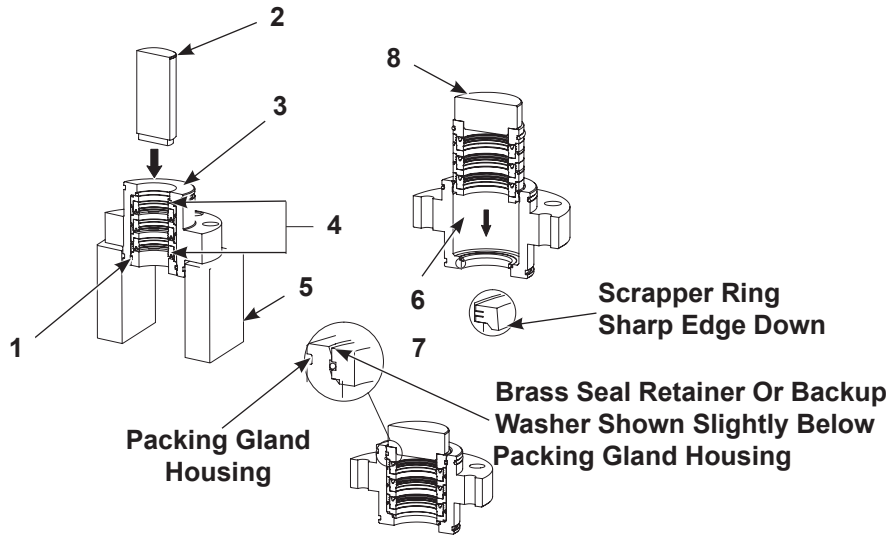


Figure 8-25 Rebuild Packing Gland Assembly

1. O-ring
2. Arbor
3. Packing gland assembly
4. Internal glands
5. Fixture
6. Bore
7. Retaining ring
8. Back-up washer

Installation

See Figure 8-26.

1. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

2. Ensure the O-ring (4) and the bore (5) of the packing gland assembly (2) are lubricated with compatible grease.
3. Install the packing gland assembly (2) into the pump body (1).
4. Install the solvent chamber cup (6) into the packing gland assembly (2).
5. Place the packing gland insertion tool [(Nordson part 1609505)(7)] on top of the solvent chamber cup (6).
6. Set the air motor lockout valve to ON.

NOTE:

- Refer to the *Operation* section for additional information.
- Make sure that the air motor is set to a low pressure and a slow stroke. Using the air motor, push the packing gland assembly (2) onto the plunger rod (3).

7. Using the manual override, raise the air motor shaft to the top of its stroke.

NOTE: Refer to the *Operation* section for additional information.

8. Set the air motor lockout valve to OFF.

NOTE: Refer to the *Operation* section for additional information.

9. Remove the packing gland insertion tool [(Nordson part 1609505)(7)] and the solvent chamber cup (6).
10. Apply Never-Seez lubricant to the threads of the screws (8).
11. Install the screws (8) into the packing gland assembly (2) and tighten to 75-80 ft-lb (102-108 N•m).
12. Install the split coupling halves. Refer to the *Split Coupling Halves Installation* section of this document to complete the packing gland assembly repair procedure.

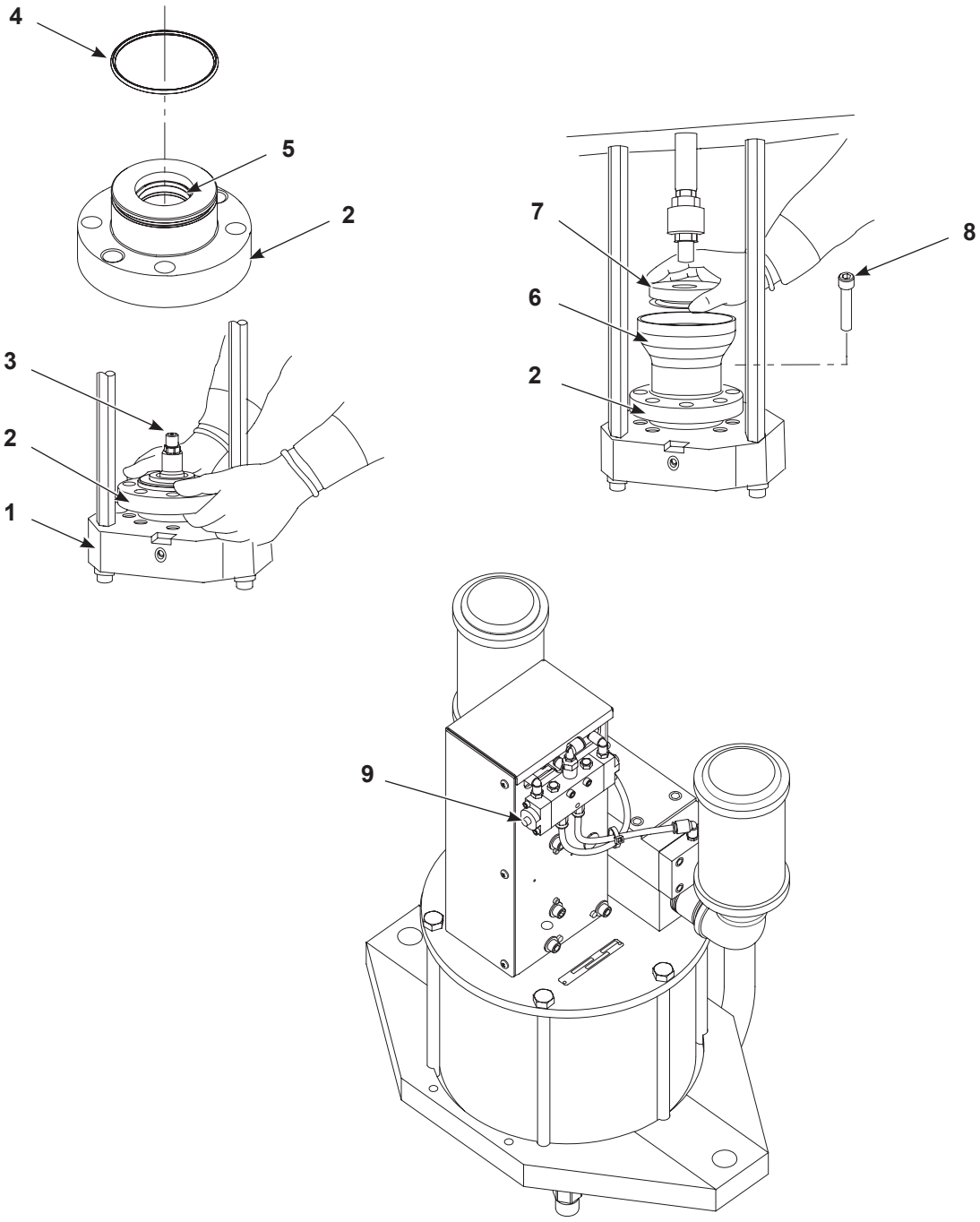


Figure 8-26 Install Packing Gland

1. Pump body
2. Packing gland assembly
3. Plunger rod
4. O-ring
5. Bore
6. Solvent chamber cup
7. Packing gland assembly insertion tool
8. Screw
9. Manual override

Split Coupling Halves Installation

See Figure 8-27.

1. Ensure the grooved end of each split coupling half (3) is facing upward.

NOTE: Position both split coupling halves over the floating joint coupling shaft and the plunger rod. The split coupling halves are a matched set. Each half is stamped with the same serial number.

CAUTION: Ensure the bleed valve on the pump body is open and not plugged.

2. Install the split coupling halves to the floating joint coupling (1) and the plunger rod (2).
3. Adjust the floating joint coupling (1) position to obtain a 0.76−2.54-mm (0.030−0.100-inch) gap between the floating joint coupling (1) and the plunger rod (2).
4. Install the remaining split coupling half (3). Ensure the gaps between the sides of the coupling halves are equal.
5. Apply suitable removable threadlocker to the threads of the screws (4). Install the screws (4) and tighten to 19-21 N•m (14−16 ft-lb).
6. Using the appropriate type of solvent for the application, fill the solvent chamber cup (5) to 0.75 inches (19 mm) from the top.
7. Reconnect the output air line to the lower magnetic sensor.
8. Set the air motor lockout valve to ON.
9. Purge air from the system by cycling the pump until no additional air bubbles come out of the ball valve.
10. Close the ball valve.

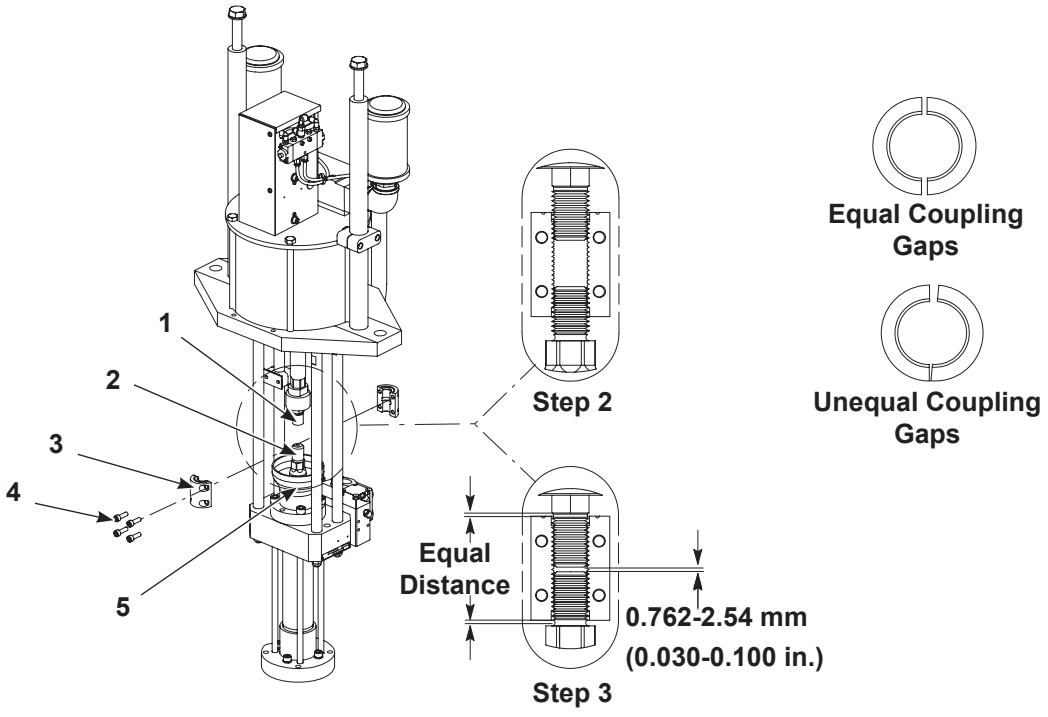


Figure 8-27 Install Split Coupling Halves

1. Floating joint coupling
2. Plunger rod
3. Split coupling
4. Screw
5. Solvent chamber cup

Section 9
Parts

Air Cylinder Module

100 mm Air Cylinder

See Figure 9-1 along with the following parts list.

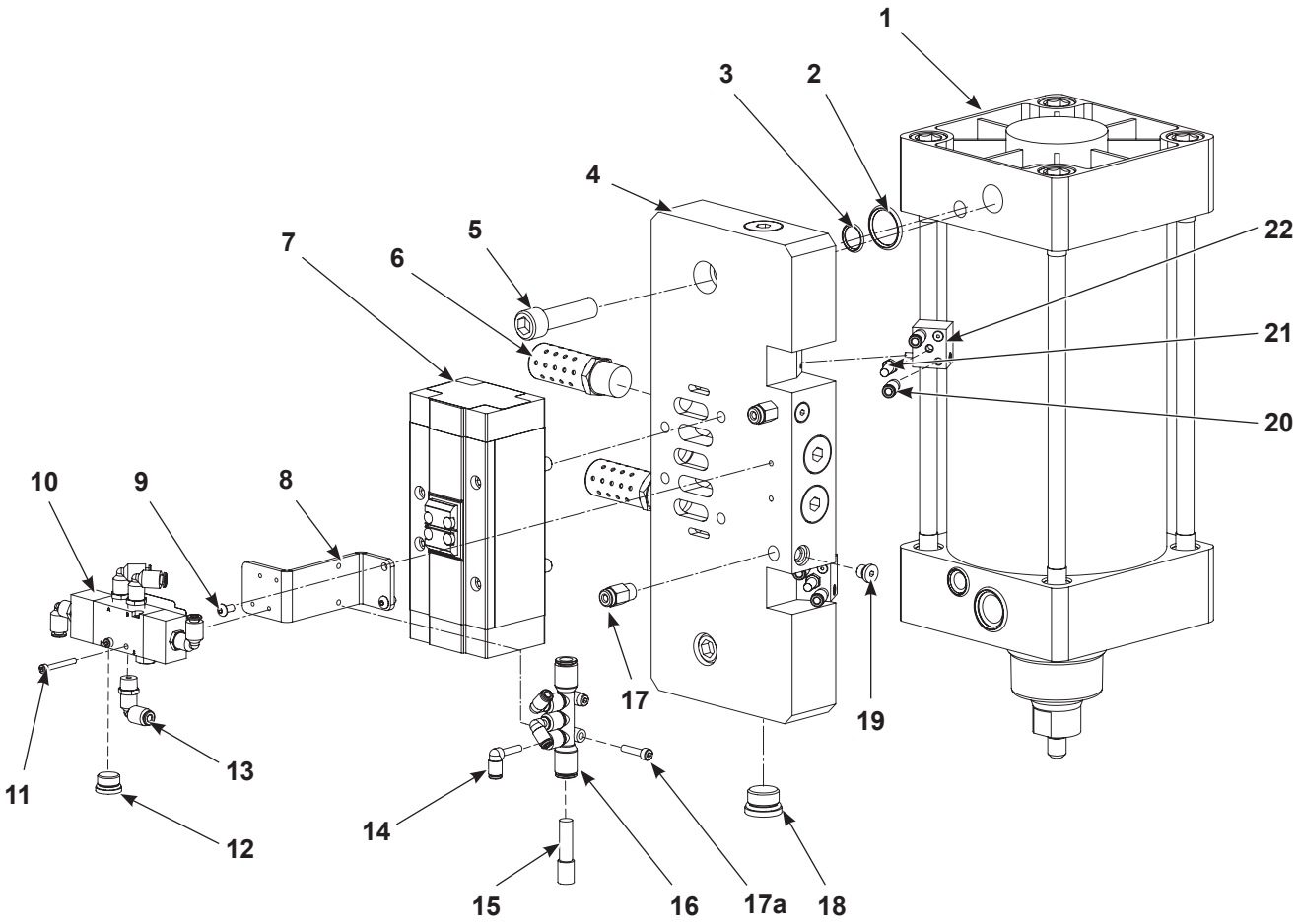


Figure 9-1 100 mm Air Cylinder

100 mm Air Cylinder (cont'd)

Item	Part	Description	Quantity	Note
—	------	MODULE, air motor, 100 mm	1	
1	------	• CYLINDER, air, 100 mm-bore	1	B
2	940024	• O-RING, −118, Viton, 0.862 x 0.103, brown	2	B
3	940151	• O-RING, Viton, 0.563 x 0.688 x 0.63	2	B
4	------	• MANIFOLD, valve, supply, air motor, 100 mm	1	
5	UA	• SCREW, socket, M12 x 1.75 x 40, Class 12.9, per ISO 4762	2	
6	------	• MUFFLER, R ½, 40 dB	2	
7	------	• VALVE, air, 5/3, 2	1	A
8	------	• BRACKET, pilot valve, air motor, 80−125 mm	1	
9	UA	• SCREW, button, socket, M4 x 0.7 x 12, Class 12.9, per ISO 7380	2	
10	------	• VALVE, air, 5/2, ⅛	1	C
11	UA	• SCREW, socket, cap, M3 x 0.5 x 25, Class 12.9, per ISO 4762	2	
12	UA	• VENT, breather, sintered, R ⅛	2	C
13	UA	• ELBOW, male, 4 mm tube x R ⅛	5	C
14	UA	• CONNECTOR, plug-in elbow, 4 mm	3	
15	UA	• PLUG, push-in, 8 mm, plastic	1	
16	------	• MANIFOLD, pneumatic, 3 x 4 mm outside diameter, 2 x 8 outside diameter, tube	1	
17	UA	• CONNECTOR, male, with internal hex, 4 mm T x R ⅛	2	
17a	UA	• SCREW, socket, cap, M4 x 0.7, 18, Class 12.9, per ISO 4762	2	
18	UA	• PLUG, O-ring, straight thread, −6, port per ISO 11926−1	4	
19	UA	• PLUG, O-ring, straight thread, −2, port per ISO 11926−1	2	
20	UA	• CONNECTOR, male, internal hex, 4 mm T x M5	4	
21	UA	• MUFFLER, M5	2	
22	1606903	• SENSOR, proximity, magnetic	2	
NS	UA	• ADHESIVE, Loctite Threadlocker Blue 242, removable, 50 m	AR	
NS	UA	• LUBRICANT, Mobil SHC 634	AR	
NS	900431	• ADHESIVE, pipe/thread/hydraulic sealant	AR	C
NS	UA	• TUBING, polyurethane, 4 mm outside diameter	3.06 ft	

NOTE: A. Included in Air Cylinder Valve Kit 1611751.

B. Included in Air Cylinder Kit 1611767.

C. Included in Pilot Valve Kit 1611754.

AR: As Required

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

160 and 200 mm Air Cylinder

See Figure 9-2 along with the following parts list.

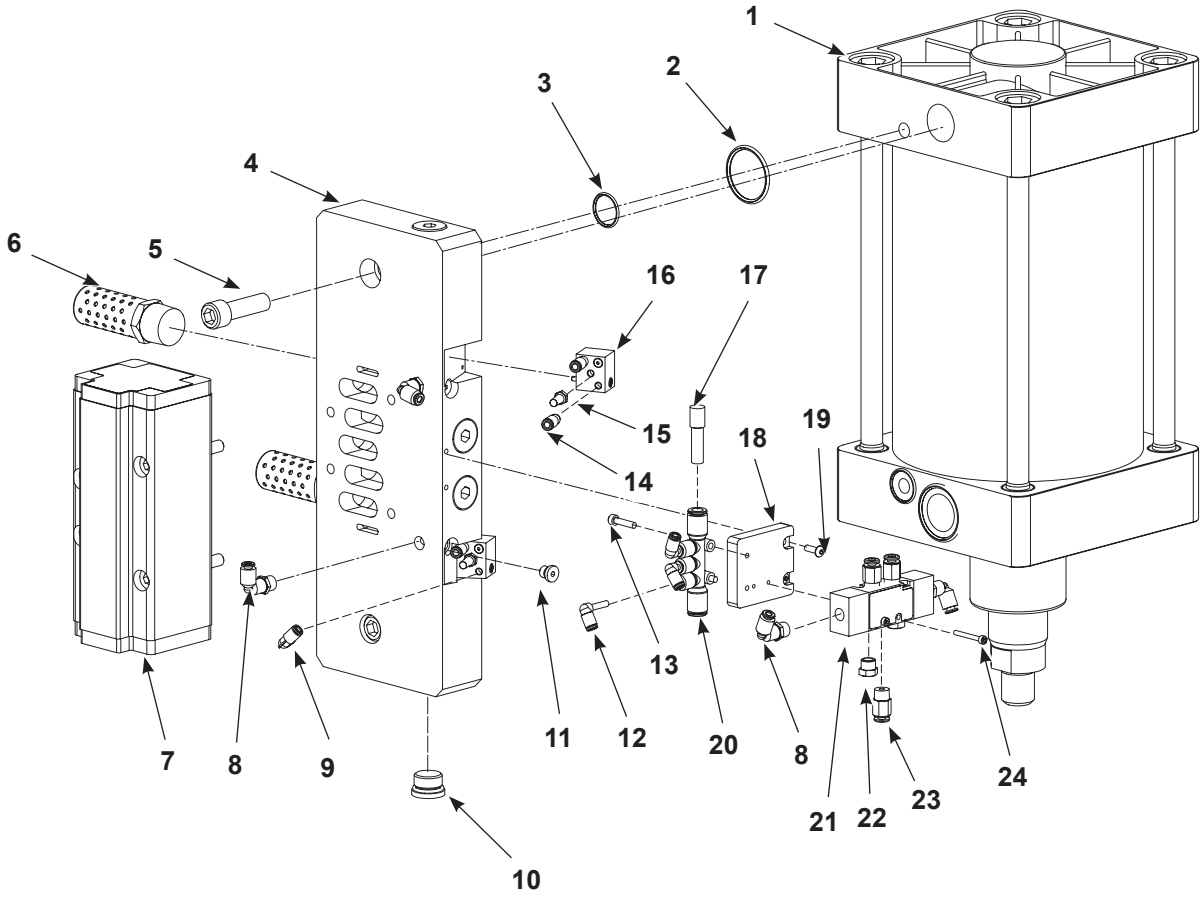


Figure 9-2 160 and 200 mm Air Motor

160 and 200 mm Air Cylinder (cont'd)

Item	Part	Part	Description	Quantity	Note
—	------	—	MODULE, air motor, 160 mm	1	
—	—	------	MODULE, air motor, 200 mm	1	
1	------	—	• CYLINDER, air, 160-mm bore	1	B
	—	------	• CYLINDER, air, 200-mm bore	1	C
2	941261	941261	• O-RING, Viton, 0.750 x 0.938 x 0.094	2	B,C
3	940191	940191	• O-RING, Viton, 0.813 x 0.938 x 0.063	2	B,C
4	------	------	• MANIFOLD, valve, supply, air motor, 160−200 mm	1	
5	UA	UA	• SCREW, socket, M12 x 1.75 x 40, Class 12.9, per ISO 4762	2	
6	UA	UA	• MUFFLER, pneumatic, R ¾, 40 Db	2	
7	------	------	• VALVE, air, 5/3, 4	1	A
8	UA	UA	• ELBOW, male, 4 mm tube x R ⅛	2	D
9	UA	UA	• FITTING, male elbow, 4 mm T x M5	1	
10	UA	UA	• PLUG, O-ring, straight thread,−8, port per ISO 11926−1	4	
11	UA	UA	• PLUG, O-ring, straight thread, −2, port per ISO 11926−1	2	
12	UA	UA	• CONNECTOR, plug-in elbow, 4 mm	3	
13	UA	UA	• SCREW, socket, cap, M4 x 0.7 x 18, Class 12.9, per ISO 4762	2	
14	UA	UA	• CONNECTOR, male, with internal hex, 4 mm T x M5	3	
15	UA	UA	• MUFFLER, M5	2	
16	1606903	1606903	• SENSOR, proximity, magnetic	2	
17	UA	UA	• PLUG, push-in, 8 mm, plastic	1	
18	------	------	• BRACKET, pilot valve, air motor, 160−250 mm	1	
19	UA	UA	• SCREW, button, socket, M4 x 0.7 x 12, Class 12.9, per ISO 7380	2	
20	------	------	• MANIFOLD, pneumatic	1	
21	------	------	• VALVE, air, 5/2, R ⅛	1	D
22	UA	UA	• VENT, breather, sintered R 1/8	2	D
23	UA	UA	• CONNECTOR, male, 4 mm T x R ⅛	3	D
24	UA	UA	• SCREW, socket, cap, M3 x 0.5 x 25, Class 12.9, per ISO 4762	2	
NS	UA	UA	• ADHESIVE, Loctite Threadlocker Blue 242, removable, 50 m	AR	
NS	UA	UA	• LUBRICANT, Mobil SHC 634	AR	
NS	900431	900431	• ADHESIVE, pipe/thread/hydraulic sealant	AR	D
NS	UA	UA	• TUBING, polyurethane, 4 mm outside diameter	2.56 ft	

NOTE: A. Included in Air Cylinder Valve Kit 1611753.

B. Included in Cylinder Kit 1611769.

C. Included in Cylinder Kit 1612224.

D. Included in Pilot Valve Kit 16111755.

AR: As Required

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

250 mm Air Cylinder

See Figure 9-3 along with the following parts list.

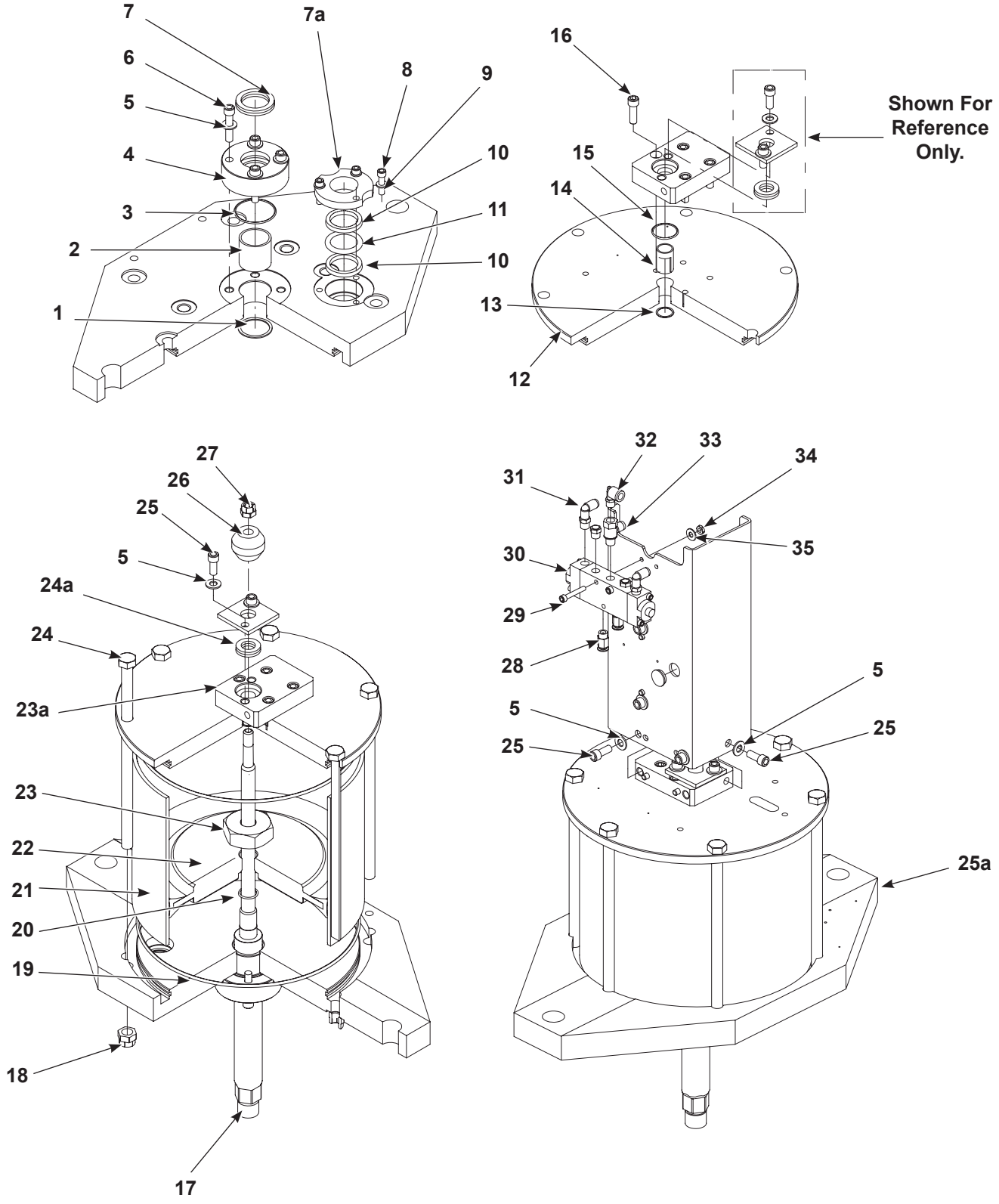


Figure 9-3 250 mm Air Cylinder (1 of 2)

250 mm Air Cylinder (cont'd)

Item	Part	Description	Quantity	Note
—	------	MODULE, air motor, 250 mm	1	
1	------	• RETAINING RING, internal, 143, spiral, heavy, stainless steel	1	
2	------	• BUSHING, 1.258 ID x 1.438 OD x 1.375 long, TFE lined	1	
3	941310	• O-RING, hot-point, 1.688 x 1.875 x 0.094	1	B
4	------	• RETAINER, seal, piston rod, SD2	1	
5	UA	• WASHER, flat, E, 0.344 x 0.625 x 0.063, zinc	11	
6	UA	• SCREW, socket, 5/16-18 x 1.500, black	4	
7	------	• U-CUP, 1.250 x 1.750 x 0.250, carb nitrile	1	B
7A	------	• RETAINER, bushing, supply tube, air motor	1	
8	UA	• SCREW, socket, ¼-20 x 1.000, black	3	
9	UA	• WASHER, flat, M, narrow, M6, steel, zinc	11	
10	------	• QUAD RING, -322, 1.225 ID x 0.210, BUNA	2	B
11	UA	• O-RING, -322, BUNA N, 1.225 ID, 0.210 W, 70 DURO	1	B
12	------	• CAP, air motor, 10 in., SD2	1	
13	------	• RETAINING RING, internal, 75, spiral, heavy, stainless steel	1	
14	------	• BUSHING, 0.625 ID x 0.750 x 1.125 long, TFE lined	1	
15	UA	• O-RING, hot-point, 1.000 x 1.188 x 0.094	1	B
16	UA	• SCREW, socket, 5/16-18 x 1.000, black	4	
17	------	• ROD, piston & trip, air motor, 10 in., SD2	1	
18	------	• ALIGNMENT PLATE	1	A
19	UA	• O-RING, hot-point, 9.750 x 10.00 x 0.125	2	B
20	UA	• O-RING, Viton®, 0.739 ID x 0.070 W, BR, 10418	1	B
21	------	• CYLINDER, air, 10 in. diameter, x 8.108 long, SD2	1	
22	------	• PISTON, 10 in. air motor, SD/SD2	1	
23	------	• RETAINER, piston/trip rod, air motor, SD2	1	
23a	------	• RETAINER, seal cycle rod	1	
24	UA	• SCREW, hex, heavy duty, ½-13 x 10.00, zinc	6	
24a	------	• U-CUP, 0.625 x 1.125, .25,70 DURO	1	B
25	UA	• SCREW, socket, 5/16-18 x 0.750, black	7	
25a	------	• BASE PLATE	1	
26	------	• BAR, trip, air motor, 10 in., SD2	1	
27	UA	• NUT, lock, 7/16-20, nylon insert, zinc	1	
28	------	• CONNECTOR, male, ¼ tube x ⅛ NPT	2	
29	UA	• SCREW, socket, 10-24 x 1.250, black	2	
30	1062002	• VALVE, air, 2-position, 5-port, manual-override	1	
31	UA	• ELBOW, male, 5/32 tube x ⅛ NPT	2	
32	UA	• ELBOW, male, 5/16 tube x ¼ NPT	1	
33	UA	• TEE, run, ⅛ NPT male x ⅛ NPT female, 5/32 T	1	
34	UA	• NUT, hex, machine, #10-24, steel, zinc	2	
35	UA	• WASHER, flat, type A, #10 narrow, zinc	2	

NOTE: A. Included in Air Cylinder Roller Lever Kit 1077510.

B. Included in Air Cylinder Seal Kit 1073577.

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

250 mm Air Cylinder (cont'd)

See Figure 9-4 along with the following parts list.

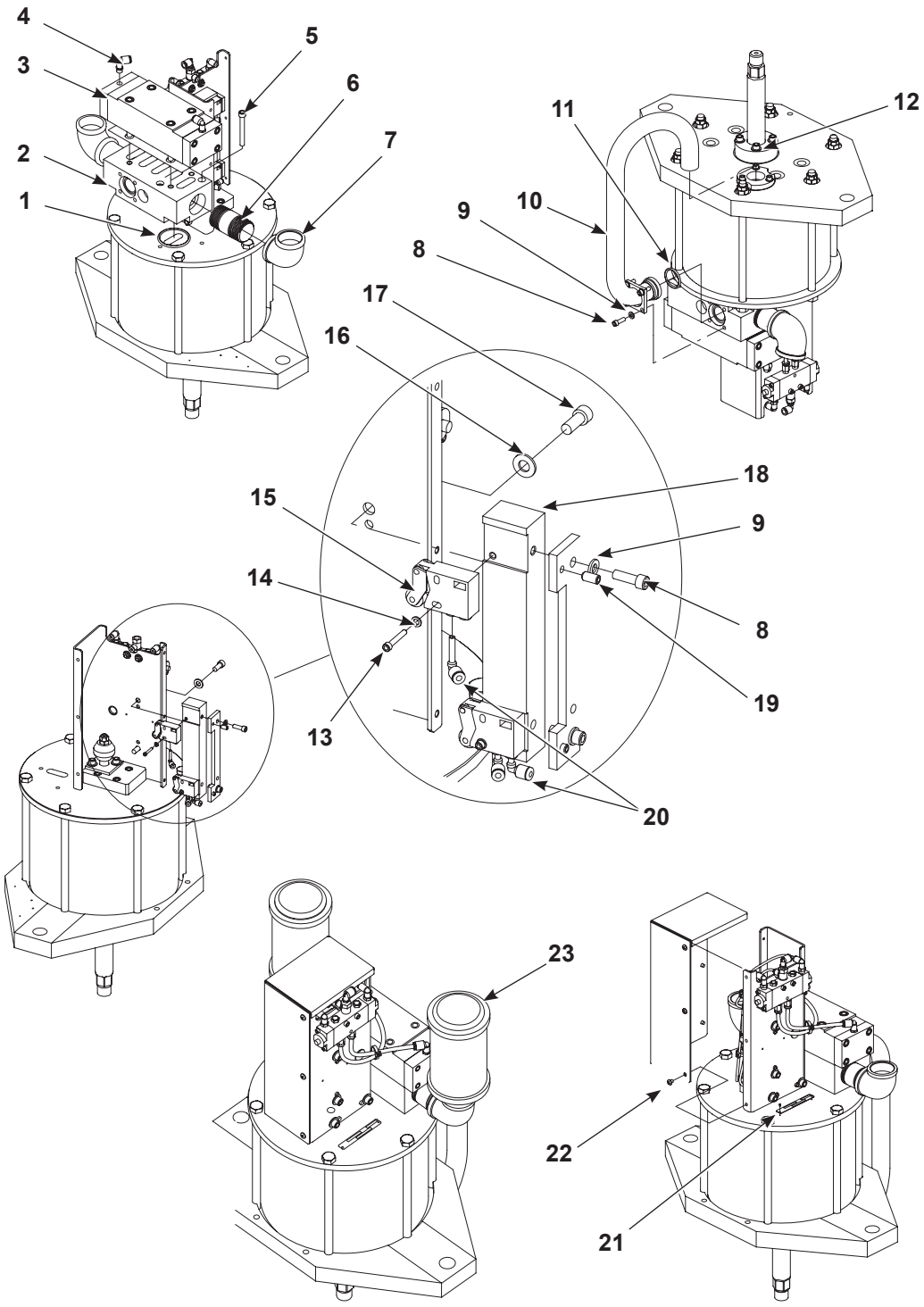


Figure 9-4 250 mm Air Cylinder (2 of 2)

250 mm Air Cylinder (cont'd)

Item	Part	Description	Quantity	Note
1	UA	• O-RING, hot-point, 2.000 x 2.250 x 0.125	1	B
2	------	• MANIFOLD, 10 in. air motor, SD2	1	
3	UA	• VALVE, air pilot, 2-position, 5-port	1	
4	972119	• ELBOW, male, ¼ tube x 1/2 NPT	2	
5	UA	• SCREW, socket, 5/16-18 x 2.5, black	3	
6	UA	• NIPPLE, brass, SCH40, 1-¼ NPT x 3.00 long	2	
7	UA	• ELBOW, pipe, 90, 1.25, brass	2	
8	UA	• SCREW, socket, ¼-20 x 0.750, black	2	A
9	UA	• WASHER, flat, M, narrow, M6, steel, zinc	2	A
10	------	• TUBE, air supply, 10 in. air motor, SD2	1	
11	UA	• O-RING, hot-point, 1.250 x 1.438 x 0.094	1	B
12	UA	• SCREW, socket, ¼-20 x 1.000, black	3	
13	UA	• SCREW, socket, 6−32 x 0.875, black	2	A
14	UA	• WASHER, flat, E, 0.156 x 0.312 x 0.032, zinc, 14456-CA	2	A
15	1077363	• LEVER, roller, pneumatic, limit switch	2	A
16	UA	• WASHER, flat, E, 0.344 x 0.325 x 0.063, zinc	11	
17	UA	• SCREW, socket, 5/16-18 x 0.750, black	7	
18	------	• PAD, mounting, pneumatic trip, air motor, 10 in., SD2	1	A
19	UA	• SCREW, set, socket, flat, ¼-20 x ⅜ long, nylon patch	2	A
20	UA	• CONNECTOR, plug-in elbow, 4 mm	3	A
21	UA	• SCREW, drive, round, 0.187, zinc	2	
22	UA	• SCREW, pan, rec., 10-32 x 0.375, w/ internal lock washer, zinc	6	
23	249144	• MUFFLER, 1-¼ NPT	2	
NS	UA	• TUBING, 4 mm nylon, series n, clear	3.00 ft	
NS	UA	• UNION, Y, 5/32T	1	A
NS	UA	• CABLE TIE, 3.9 in., 185 °F/85 °C, nylon natural	2	A

NOTE: A. Included in Air Cylinder Roller Lever Kit 1077510.

B. Included in Air Cylinder Seal Kit 1073577.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Air Cylinder Kits

100-200 mm Air Cylinders

Air Motor Valve Kits

Part	Description	Air Motor Size
1611751	VALVE KIT	100 mm
1611753	VALVE KIT	160 mm
1611753	VALVE KIT	200 mm

Cylinder Kit

Part	Description	Air Motor Size
1611767	CYLINDER KIT	100 mm
1611769	CYLINDER KIT	160 mm
1612224	CYLINDER KIT	200 mm

Pilot Valve Kit

Part	Description	Air Motor Size
1611754	PILOT VALVE KIT	100 mm
1611755	PILOT VALVE KIT	160, 200

250 mm Air Cylinders

Part	Description
1077510	AIR CYLINDER ROLLER LEVER KIT
1073577	AIR CYLINDER SEAL KIT

Tools

Part	Description
1611971	TOOL, magnet, air motor

Ball Valve Module

See Figure 9-5 along with the following parts list.

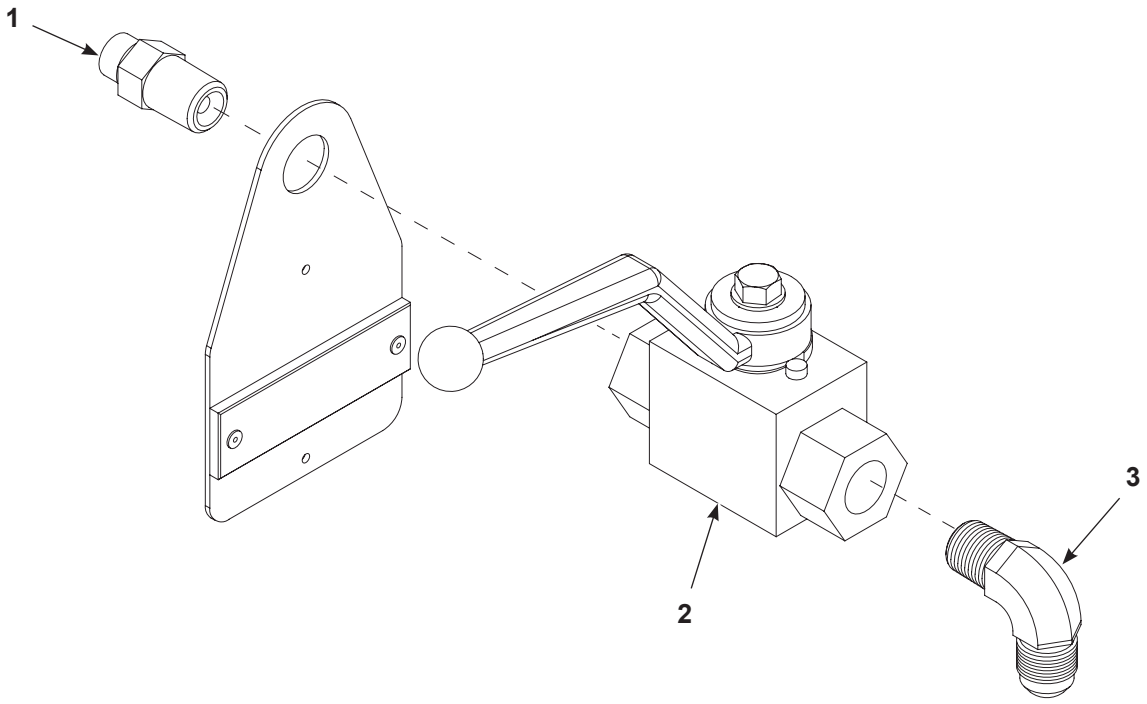


Figure 9-5 Ball Valve

Item	Part	Part	Description	Quantity	Note
—	- - - - - -	—	MODULE, ball valve, Rhino, carbon steel	1	
—	—	- - - - - -	MODULE, ball valve, Rhino, stainless steel	1	
1	UA	—	• NIPPLE, hex, ¼ x ¼ x 1.45, steel, zinc	1	
	—	UA	• NIPPLE, hex, ¼ x ¼ x 1.45, stainless steel	1	
2	146496	—	• VALVE, ball, ¼ NPT, steel	1	
	—	1617469	• VALVE, ball, ¼ NPT, stainless steel	1	
3	UA	—	• ELL, male, 37. 9/16-18 x ¼, steel	1	
	—	UA	• ELL, male, 37. 9/16-18 x ¼, stainless steel	1	
NS	900481	900481	ADHESIVE, pipe/thread/hydraulic sealant (PST)	AR	
NS	UA	UA	CAP, tube, 37, 9/16-15, steel, zinc	AR	A

NOTE: A. Can be used to cap item 3 for moisture cure materials.

AR: As Required

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Control Module

See Figure 9-6 along with the following parts list.

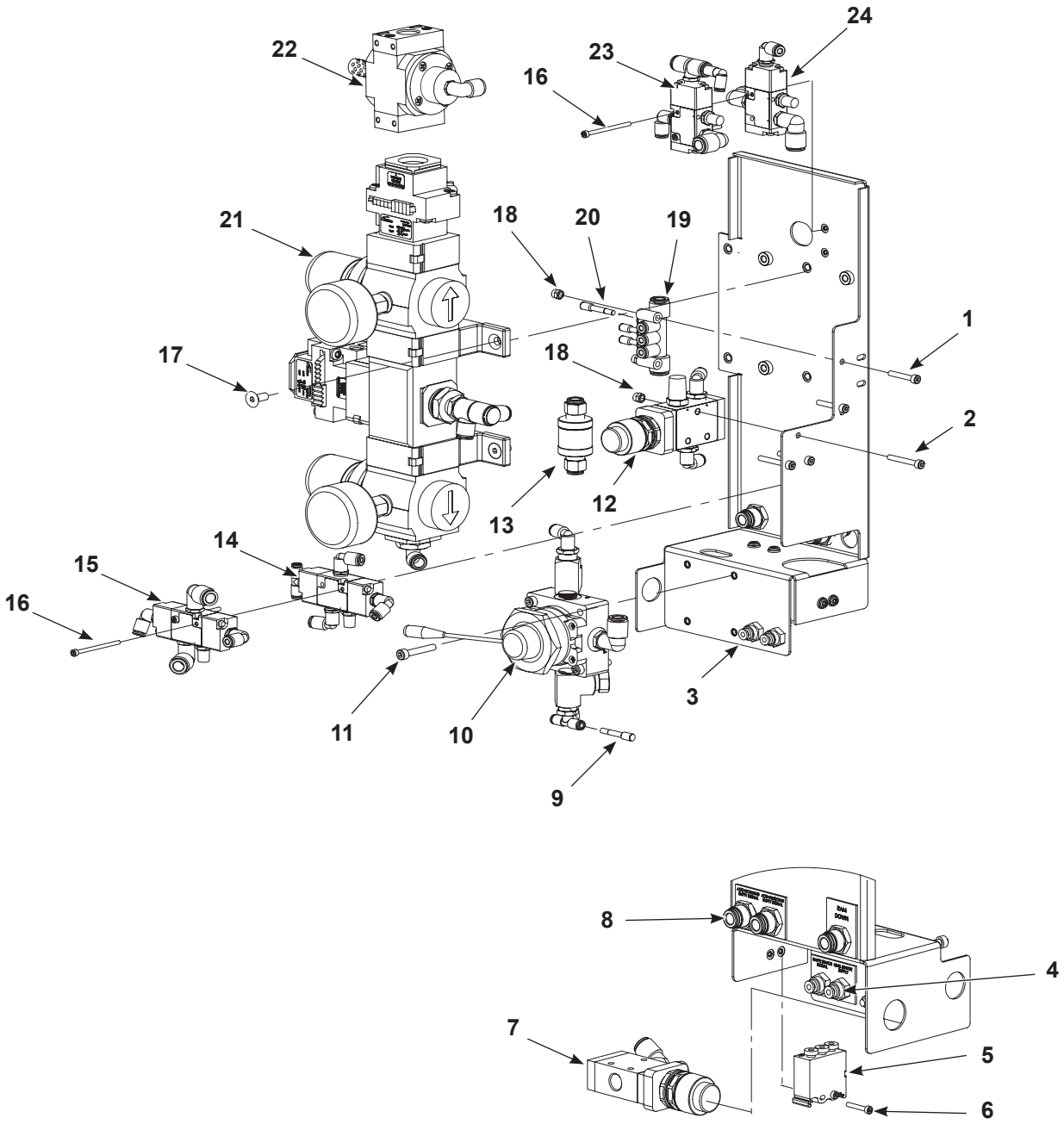


Figure 9-6 Control Module

Control Module (cont'd)

Item	Part	Part	Description	Qty	Note
—	------	—	CONTROL, module, ACO	1	
—	—	------	CONTROL, module, ASD	1	
1	UA	UA	▪ SCREW, socket, cap, M4 x 25, zinc, Class 12.9, per ISO 4762	2	
2	UA	UA	▪ SCREW, socket head, M4 x 7 x 30, zinc, Class 12.9, per ISO 4762	2	
3	------	------	▪ PLATE, mating, control, R73G	2	
4	UA	UA	▪ UNION, bulkhead, 4-mm T x 4-mm T	1	
5	—	------	▪ VALVE, pneumatic, logic, element, 3-port	2	
6	—	------	▪ SCREW, socket head, M3 x 20, zinc, Class 12.9, per ISO 4762	2	
7	------	------	▪ MANUAL BLOW-OFF VALVE	3	I
8	UA	UA	▪ CONNECTOR, bulkhead, 8-mm T x 8-mm T, flame retardant	3	C
9	UA	UA	▪ PLUG, blanking, 4-mm T	4	B
10	1609445	1609445	▪ ELEVATOR CONTROL VALVE ASSEMBLY	1	
11	UA	UA	▪ SCREW, socket, M5 x 30, zinc, Class 12.9, per ISO 4762	4	
12	------	------	▪ MANUAL PURGE/RESET VALVE ASSEMBLY	1	J
13	------	------	▪ FILTER, inline, assembly, 5 micron, 8-mm T	1	
14	------	------	▪ MEMORY VALVE	2	D
15	------	------	▪ BLOW-OFF CONTROL VALVE	2	E
16	UA	UA	▪ SCREW, socket, M3 x 45, Zinc, Class 12.9, per ISO 4762	4	A
17	UA	UA	▪ SCREW, flat, socket, M6 x 14, zinc, Class 12.9, per ISO 10642	4	
18	UA	UA	▪ NUT, nylon, lock, Zinc, M4, per ISO 10511	5	
19	------	------	▪ FITTING, tube, manifold, 2−8-mm x 6x−4-mm	1	
20	UA	UA	▪ PLUG, blanking, 4-mm T	4	B
21	1609441	1609441	▪ CONTROL, air, preparation, assembly	1	
22	1618049	1618049	▪ AIR MOTOR CONTROL VALVE	1	F
23	------	—	▪ ACO CONTROL VALVE	1	G
24	------	------	▪ UNREGULATED AIR MOTOR CONTROL VALVE	1	H

NOTE: A. ACO version has qty 4; ASD version has qty 2.

B. ACO version has qty 4; ASD version has qty 5.

C. ACO version has qty 3; ASD version has qty 1.

D. Included in service kit. Refer to *Valve Service Kits, Memory Valve Kit* for additional information.

E. Included in service kit. Refer to *Valve Service Kits, Blow-Off Control Valve Kit* for additional information.

F. Included in service kit. Refer to *Valve Service Kits, Air Motor Control Valve Kit* for additional information.

G. Included in service kit. Refer to *Valve Service Kits, ACO Control Valve Kit* for additional information.

H. Included in service kit. Refer to *Valve Service Kits, Unregulated Air Motor Control Valve Kit* for additional information.

I. Included in service kit. Refer to *Valve Service Kits, Manual Blow-Off Valve Kit* for additional information.

J. Included in service kit. Refer to *Valve Service Kits, Manual Purge/Reset Valve Valve Kit* for additional information.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Air Preparation Control Valve

See Figure 9-7 and refer to the following parts list.

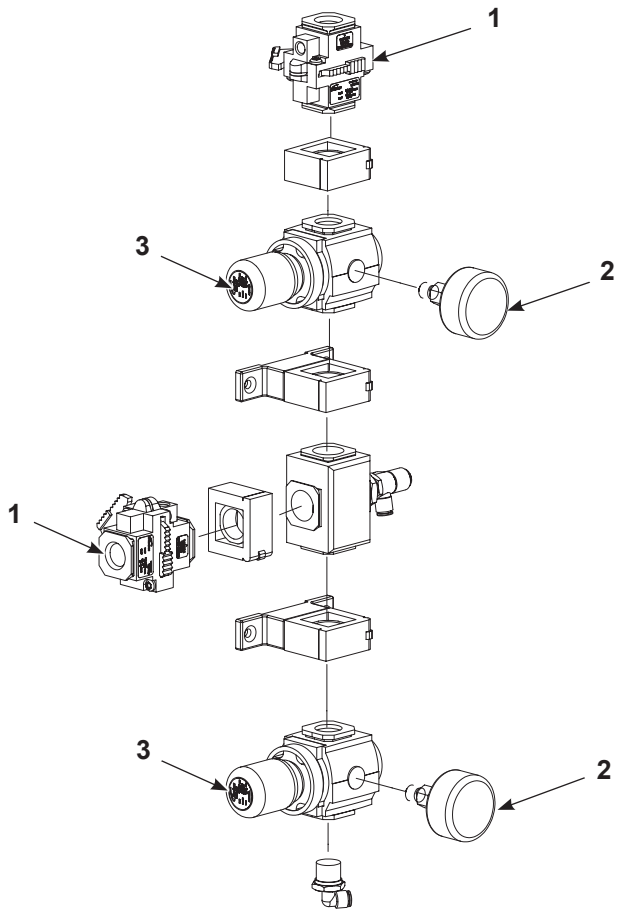


Figure 9-7 Air Preparation Control Valve

Item	Part	Description	Quantity
—	1609441	CONTROL, air, preparation, assembly	1
1	1609443	• VALVE, ½ NPT, swing-gate	2
2	1610188	• GAUGE, 0−160 psi, ¼ NPT, 50 mm	2
3	1609442	• REGULATOR, 5−150 psi	2

Valve Service Kits

ACO Control Valve Kit

See Figure 9-8 and refer to the following parts list.

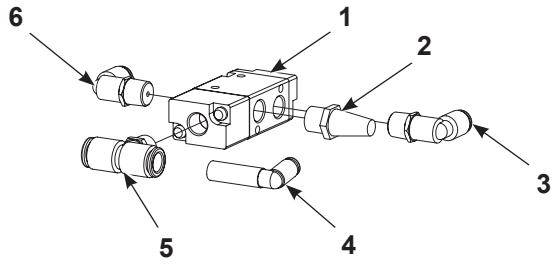


Figure 9-8 ACO Control Valve Kit

Item	Part	Description	Quantity
—	1611691	KIT, assembly, valve, control, ACO	1
1	------	• ACO CONTROL VALVE	1
2	UA	• MUFFLER, air, R ⅛	1
3	UA	• CONNECTOR, male, elbow, 8 mm x R ⅛	1
4	UA	• ELBOW, plug-in 4-mm T x 8-mm stem, plastic	1
5	UA	• TEE, branch, 8-mm T x R ⅛, brass	1
6	UA	• ELBOW, male, 4-mm tube x R ⅛	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Air Motor Control Valve Kit

See Figure 9-9 and refer to the following parts list.

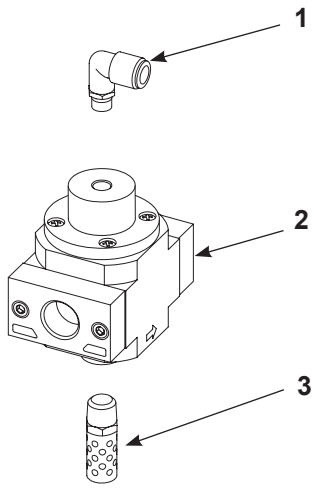


Figure 9-9 Air Motor Control Valve

Item	Part	Description	Quantity
—	1618049	KIT, valve, air motor, pneumatic, 10	1
1	UA	• ELBOW, male, 8 mm tube x R 1/8, FR, white	1
2	------	• AIR MOTOR CONTROL VALVE	1
3	UA	• MUFFLER, pneumatic, R 1/4, zinc	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Blow-Off Control Valve Kit

See Figure 9-10 and refer to the following parts list.

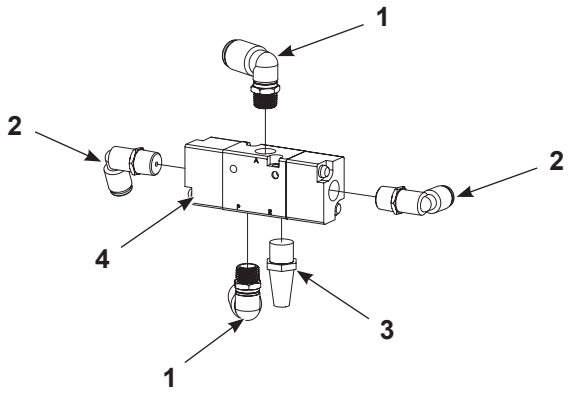


Figure 9-10 Blow-Off Control Valve Kit

Item	Part	Description	Quantity
—	1611688	KIT, assembly, valve, control, blow-off	1
1	UA	• CONNECTOR, male, elbow, 8 mm x R ⅛	2
2	UA	• ELBOW, male, 4-mm tube x R ⅛	2
3	UA	• MUFFLER, air, R ⅛	1
4	------	• BLOW-OFF CONTROL VALVE	1
NS	900481	• ADHESIVE, pipe/thread/hydraulic sealant	AR
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Manual Blow-Off Valve Kit

See Figure 9-11 and refer to the following parts list.

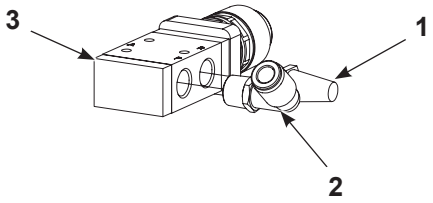


Figure 9-11 Manual Blow-Off Valve Kit

Item	Part	Description	Quantity
—	1611686	KIT, assembly, valve, manual, blow-off	1
1	UA	• MUFFLER, filter, R ¼	1
2	UA	• ELBOW, male, 8-mm T x R ¼	1
3	------	• MANUAL BLOW-OFF VALVE	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Manual Purge/Reset Valve Kit

See Figure 9-12 and refer to the following parts list.

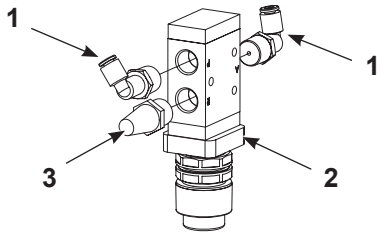


Figure 9-12 Manual Purge/Reset Valve Kit

Item	Part	Description	Quantity
—	1611690	KIT, assembly, valve, manual, purge/reset	1
1	UA	• ELBOW, male, 4-mm T x R ¼, brass	2
2	------	• MANUAL PURGE/RESET VALVE	1
3	UA	• MUFFLER, filter, R ¼	1
NS	900481	• ADHESIVE, pipe/thread/hydraulic sealant	AR
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Memory Valve Kit

See Figure 9-13 and refer to the following parts list.

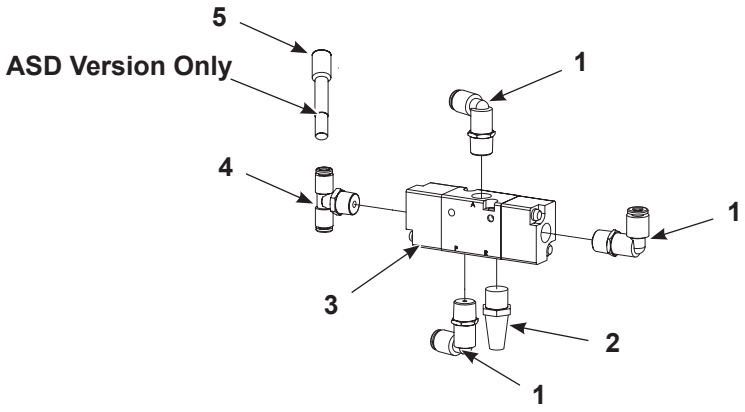


Figure 9-13 Memory Valve Kit

Item	Part	Description	Quantity
—	1611687	KIT, assembly, valve, memory	1
1	UA	• ELBOW, male, 4-mm tube x R ⅛	3
2	UA	• MUFFLER, air, R ⅛	1
3	------	• MEMORY VALVE	1
4	UA	• TEE, branch, 4-mm T x R ⅛, brass	1
5	UA	• PLUG, blanking, 4 mm	1
NS	900481	• ADHESIVE, pipe/thread/hydraulic sealant	AR
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Unregulated Air Motor Control Valve Kit

See Figure 9-14 and refer to the following parts list.

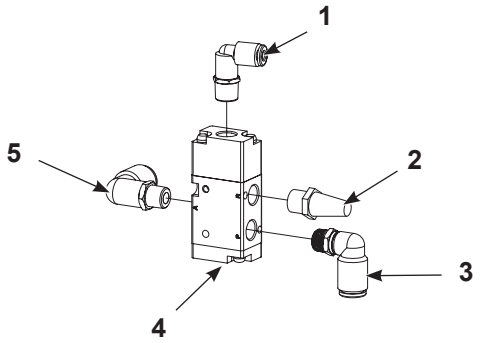


Figure 9-14 Unregulated Air Motor Control Valve Kit

Item	Part	Description	Quantity
—	1611686	KIT, assembly, valve, control, unregulated, air motor	1
1	UA	• ELBOW, male, 4-mm tube x R ⅛	1
2	UA	• MUFFLER, air, R ⅛	1
3	UA	• CONNECTOR, male, elbow, 8 mm x R ⅛	1
4	------	• UNREGULATED AIR MOTOR CONTROL VALVE	1
5	UA	• ELBOW, male, 8-mm tube x R ⅛, flame retardant, white	1
NS	900481	• ADHESIVE, pipe/thread/hydraulic sealant	AR
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

ACO Connection Kit

The ACO to ASD conversion kit converts an unloader from automatic (ACO) controls to automatic shutdown (ASD) controls.

Part	Description
1612243	KIT, connection, pneumatic, ACO

ACO to ASD Conversion Kit

The ACO connection kit contains tubing to connect two ACO capable unloaders to form a dual-pump system.

Part	Description
1613842	KIT, conversion, ACO to ASD control

ASD to ACO Conversion Kit

The ASD to ACO conversion kit converts an unloader from automatic shutdown (ASD) controls to automatic crossover (ACO) controls.

Part	Description
1610290	KIT, conversion, ASD to ACO control

Depressurization Module

See Figure 9-15 along with the following parts list.

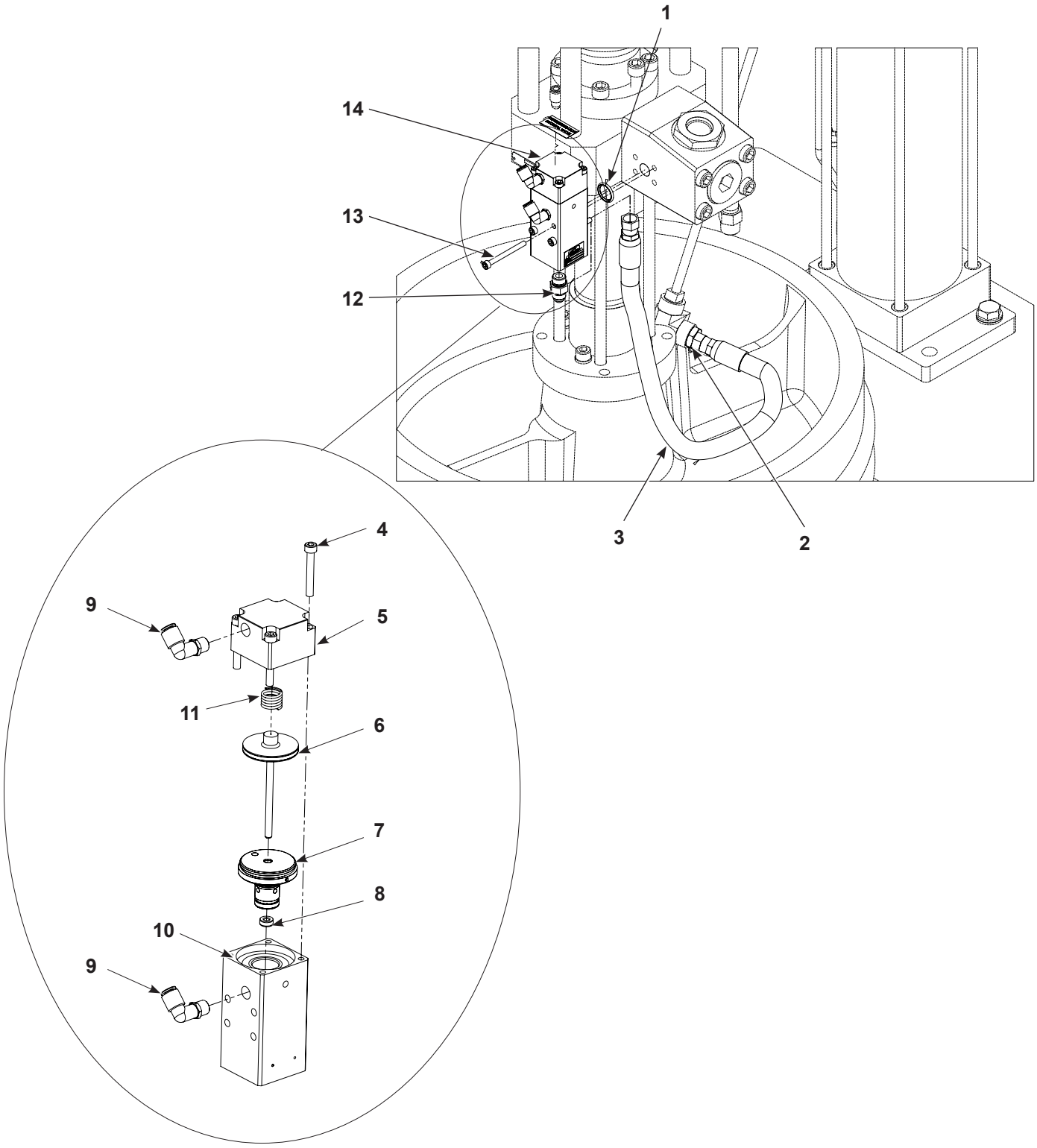


Figure 9-15 Depressurization Valve

Depressurization Module (cont'd)

Item	Part	Description	Quantity	Note
—	------	DEPRESSURIZATION MODULE	1	
1	941151	• O-RING, VITON, 0.688 x 0.875 x 0.094	1	
2	UA	• CONNECTOR, male, 37, 9/16-18 x 1/2, stainless steel	1	
3	329565	• HOSE	1	
4	UA	• SCREW, SOCKET, M5 x 35 mm, zinc	4	
5	- - - - - -	• AIR CAP	1	B
6	- - - - - -	• PISTON ASSEMBLY	1	
7	- - - - - -	• GREASE CARTRIDGE	1	A
8	- - - - - -	• SEAT	1	
9	UA	• ELBOW, male, 6 mm, T X R1/8,FR	2	
10	- - - - - -	• VALVE BODY	1	
11	UA	• SPRING	1	B
NS	UA	• ADHESIVE, loctite 242, blue, removable, 50 ml	AR	
NS	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	

NOTE: A. Included in service kit 1099071.

B. Included in service kit 1102748.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Follower Module

5-Gallon Follower Module

See Figure 9-16 along with the following parts list.

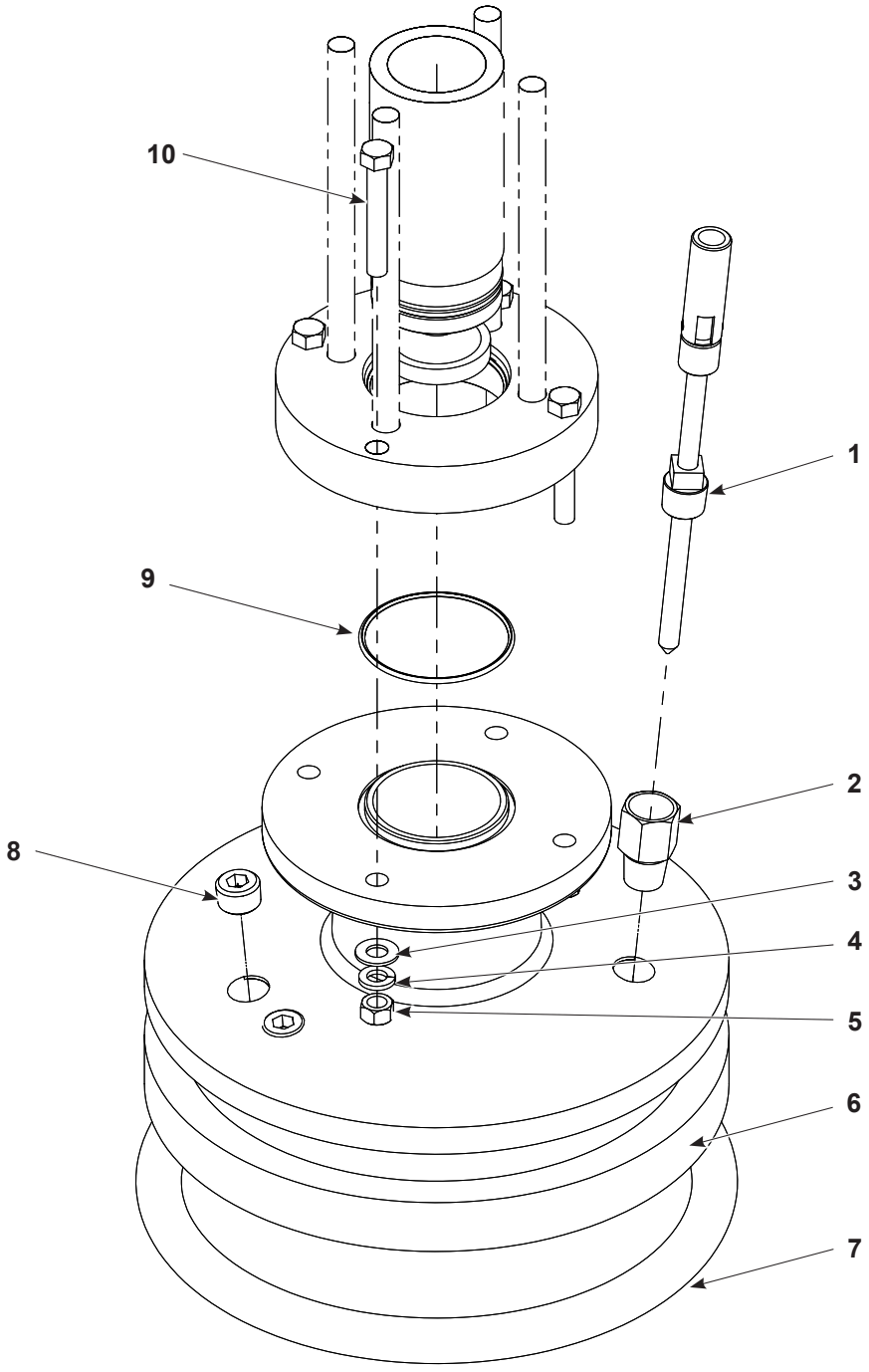


Figure 9-16 5 Gallon Follower Module

5-Gallon Follower Module (cont'd)

Item	Part	Description	Quantity	Note
—	- - - - - -	5-GALLON FOLLOWER MODULE	1	A
1	- - - - - -	• STEM, bleed, wiper seal, follower, 5 gal, stainless steel	1	
2	- - - - - -	• ADAPTER, female,1/2 x 1/2 NPT, stainless steel	1	
3	UA	• WASHER, M12, flat	4	
4	UA	• LOCK WASHER, M12	4	
5	UA	• NUT, M12	4	
6	- - - - - -	• FOLLOWER PLATE	1	
7	- - - - - -	• FOLLOWER SEAL	1	B
8	UA	• PLUG, pipe, socket, standard, 1/2, stainless steel	1	
9	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1	
10	UA	• SCREW, socket, M10 x 55, zinc	4	
NS	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	
NS	UA	• LUBRICANT, NEVER SEEZ, 8 oz can	AR	
NS	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR	

NS: Not Shown

NOTE: A. The module is aso contained in a follower kit. Reference the *Follower Kit Detail* below.

B. The seal is aso contained in a follower seal kit. Reference the *Follower Seal Kit* below.

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Follower Kit Detail

NOTE: The kits reflected below are utilized to service the follower module depicted by Figure 9-16 and the above parts table.

280 mm Follower Module PTFE

Item	Part	Description	Quantity
—	1620273	KIT, follower, 5 gal, 280, PTFE	1
NS	- - - - - -	MODULE, follower, 5 gal, 280, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

286 mm Follower Module PTFE

Item	Part	Description	Quantity
—	1620274	KIT, follower, 5 gal, 286, PTFE	1
NS	- - - - - -	MODULE, follower, 5 gal, 286, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

280-286 mm Follower Module

Item	Part	Description	Quantity
—	1620277	KIT, follower, 5 gal, 280-286	1
NS	- - - - - -	MODULE, follower, 5 gal, 286, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

280-286 mm Follower Module PTFE

Item	Part	Description	Quantity
—	1620278	KIT, follower, 5 gal, 280-286, PTFE	1
NS	- - - - - -	MODULE, follower, 5 gal, 286, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

305 mm Follower Module PTFE

Item	Part	Description	Quantity
—	1620275	KIT, follower, 5 gal, 305, PTFE	1
NS	- - - - - -	MODULE, follower, 5 gal, 305, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

310 mm Follower Module PTFE

Item	Part	Description	Quantity
—	1620276	KIT, follower, 5 gal, 310, PTFE	1
NS	- - - - - -	MODULE, follower, 5 gal, 310, PTFE	1
NS	- - - - - -	LOCATOR, pail, 10.5 mm, mounting	2
NS	- - - - - -	BUSHING, red, R1/4xRc1/8, bronze, nickel plated	2
NS	- - - - - -	ELBOW, male, restricted flow, 8 mmTXR1/8, 1.7 diameter	1
NS	- - - - - -	SCREW, hex cap, m10 x 35, zinc	1

Follower Kits - Overview

Part	Description
1620273	KIT, follower, 5 gal, 280, PTFE
1620274	KIT, follower, 5 gal, 286, PTFE
1620275	KIT, follower, 5 gal, 305, PTFE
1620276	KIT, follower, 5 gal, 310, PTFE
1620277	KIT, follower, 5 gal, wiper, 280-286
1620278	KIT, follower, 5 gal, wiper, 280-286, PTFE

Follower Seal Kits - Overview

Part	Description
1611440	KIT, ring, wiper seal, follower, pail
1611441	KIT, ring, wiper, follower, pail, nitrile
1611442	KIT, seal, o ring, 280 mm follower, EPDM
1611443	KIT, seal, o-ring, 286 mm follower, EPDM
1611444	KIT, seal, o-ring, 305 mm follower, EPDM
1611445	KIT, seal, o ring, 310 mm follower, EPDM
1611446	KIT, seal, o ring, 280 mm follower, nitrile
1611447	KIT, seal, o ring, 286 mm follower, nitrile
1611448	KIT, seal, o ring, 305 mm follower, nitrile
1611449	KIT, seal, o ring, 310 mm follower, nitrile
1625915	KIT, seal, o ring, 286 mm follower, tes
1625916	KIT, seal, o ring, 280 mm follower, tes

55-Gallon Follower Module Equipped With Follower Seals

See Figure 9-17 along with the following parts list.

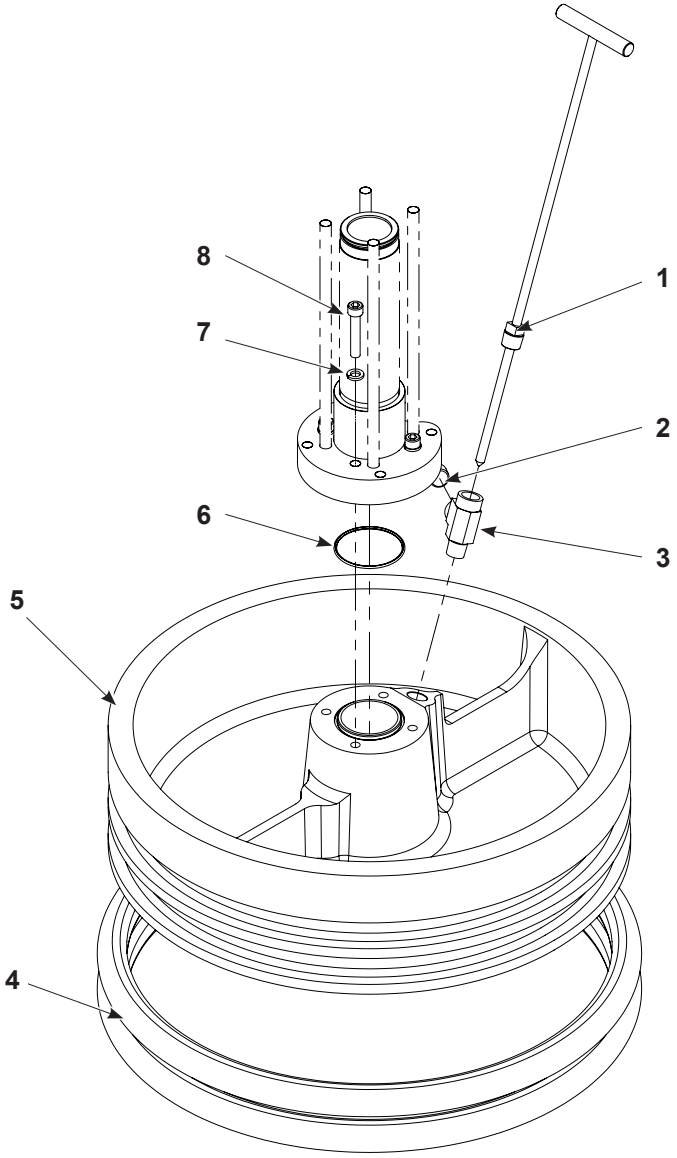


Figure 9-17 55-Gallon Follower Module Equipped With Follower Seals

55-Gallon Follower Module Equipped With Follower Seals (cont'd)

Item	Part	Description	Quantity	Note
—	- - - - - -	55-GALLON FOLLOWER MODULE, SEAL, PTFE	1	
1	- - - - - -	• STEM, bleed, wiper seal, follower, 5 gallon, stainless steel	1	
2	UA	• PLUG, pipe, socket, standard, 1/2 in., stainless steel	1	
3	UA	• TEE, male, 1/2 NPT, stainless steel	1	
4	1615380	• KIT, seal, follower, 55 gal, pac	1	A
5	1616552	• KIT, follower, 55 gal, 190 cc, PTFE	1	B
6	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1	
7	UA	• WASHER, M10, flat	4	
8	UA	• SCREW, socket, M10 x 55, zinc	4	
NS	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	
NS	UA	• LUBRICANT, NEVER SEEZ, 8 oz can	AR	
NS	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR	

NS: Not Shown

NOTE: A. Includes two seals and a tube of grease.

B. Includes items 1-8.

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

55-Gallon Follower Module Equipped With Follower Rings

See Figure 9-18 along with the following parts list.

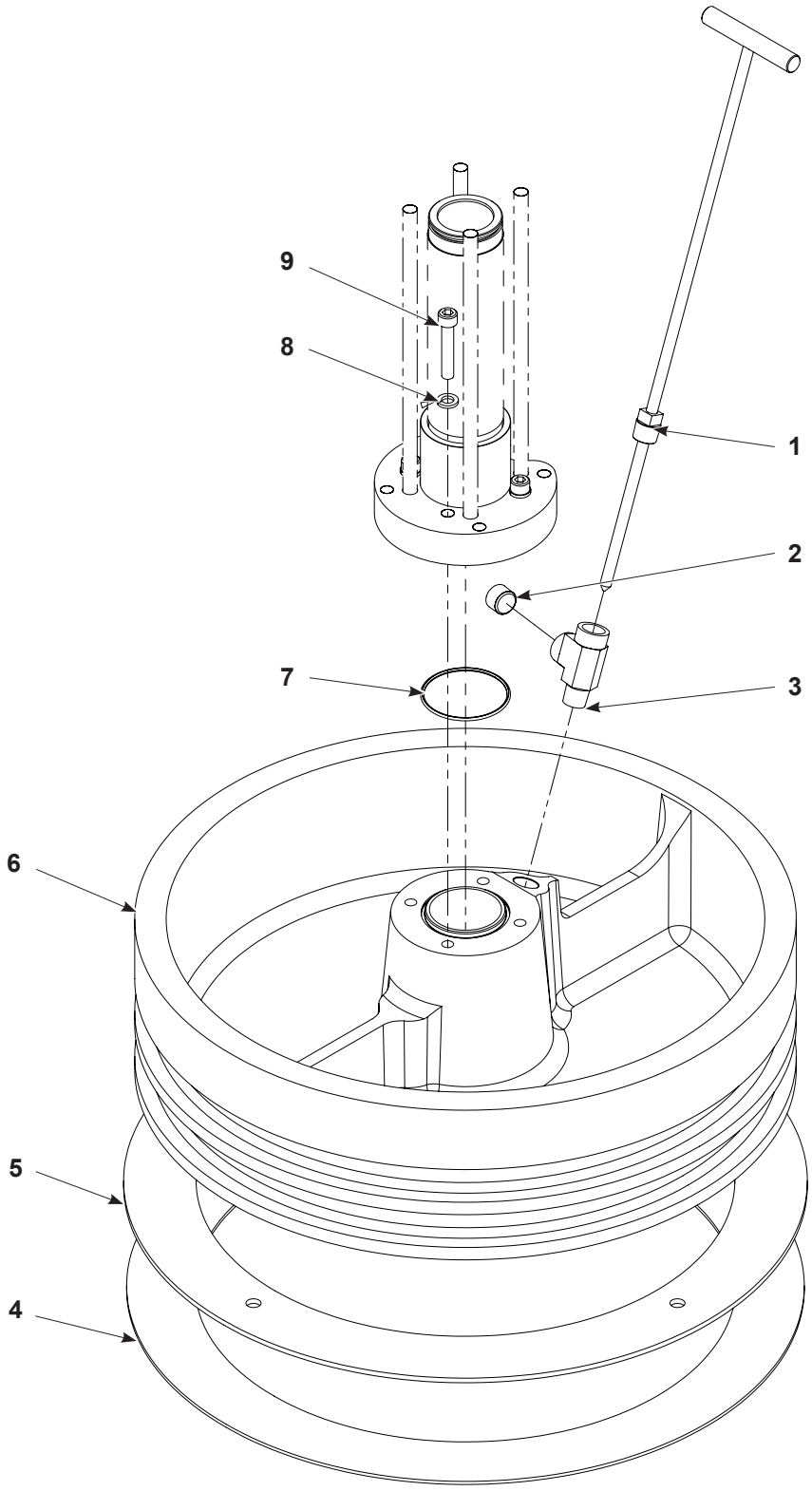


Figure 9-18 55-Gallon Follower Module Equipped With Follower Rings

55-Gallon Follower Module Equipped With Follower Rings (cont'd)

Item	Part	Description	Quantity	Note
—	- - - - - -	55-GALLON FOLLOWER MODULE, RINGS, PTFE		
1	- - - - - -	• STEM, bleed, follower, 55 gallon, stainless steel	1	
2	UA	• PLUG, pipe, socket, standard, 1/2 in., stainless steel	1	
3	UA	• TEE, male, 1/2 NPT, stainless steel	1	
4	282846	• RING, follower plate ,571 mm drum	1	A
5	1088997	• RING, platen, 55 gallon, UHMW PE	1	B
6	1616559	• KIT, follower, 55 gal, 190 cc, ring, PTFE	1	C
7	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1	
8	UA	• WASHER, M10, flat	4	
9	UA	• SCREW, socket, M10 x 55, zinc	4	
NS	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	
NS	UA	• LUBRICANT, NEVER SEEZ, 8 oz can	AR	
NS	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR	

NOTE: A. For use with tined drums.

B. For use with straight sided drums, must use 282846 and 1088997 together.

C. Includes items 1-9.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

55-Gallon Follower Module - Temperature Conditioned

See Figure 9-19 and Figure 9-20 along with the following parts list.

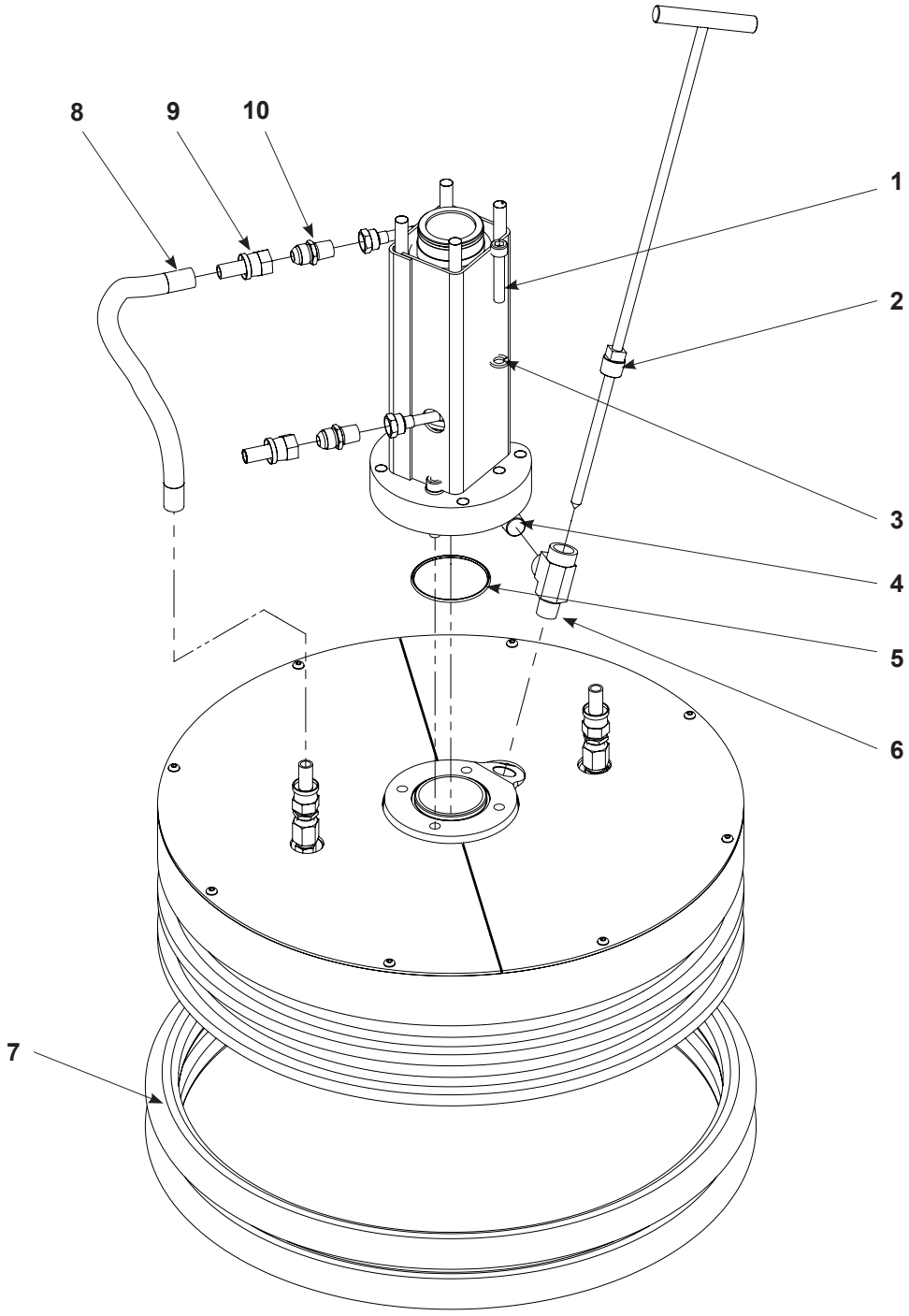


Figure 9-19 55 Gallon Follower Module - Temperature Conditioned (1 of 2)

55-Gallon Follower Module - Temperature Conditioned (cont'd)

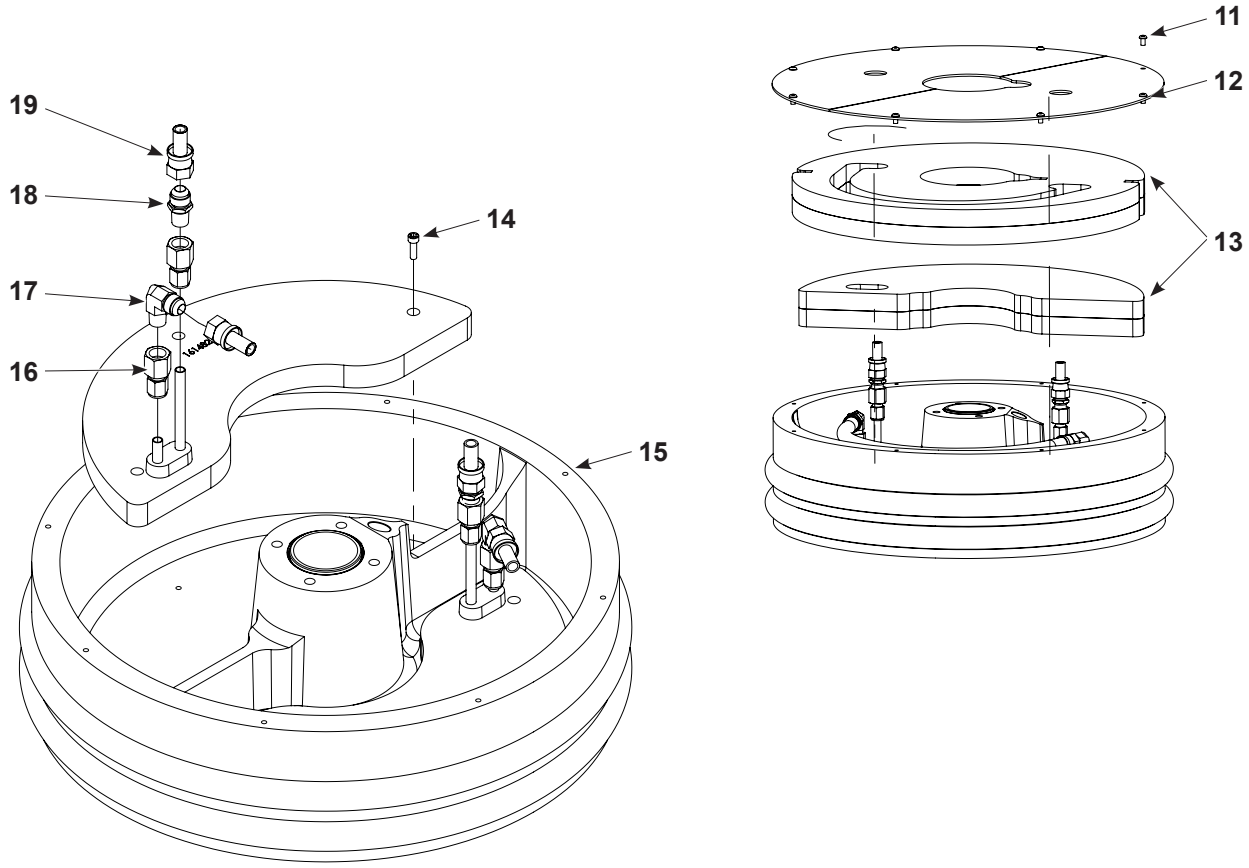


Figure 9-20 55 Gallon Follower Module - Temperature Conditioned (2 of 2)

55-Gallon Follower Module - Temperature Conditioned (cont'd)

Item	Part	Part	Description	Quantity	Note
—	1616553	—	55-GALLON FOLLOWER MODULE, temperature conditioned seal	1	
—	—	1616560	55-GALLON FOLLOWER MODULE, temperature conditioned ring	1	
1	UA	UA	• SCREW, socket, M10 x 55 mm, zinc	4	
2	- - - - - -	- - - - - -	• STEM ASSEMBLY, bleed, follower, stainless steel	1	
3	UA	UA	• WASHER, M10, flat, steel, zinc	4	
4	UA	UA	• PLUG, pipe, socket, standard, 1/2 in., stainless steel	1	
5	941480	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1	
6	UA	UA	• TEE, male, 1/2 NPT, stainless steel	1	
7	1615380	—	• KIT, seal, follower, 55 Gal, PAC	1	A
	—	282846	• RING, follower plate ,571 mm drum	1	B
	—	1088997	• RING, platen, 55 gallon, UHMW PE	1	B
8	1079698	1079698	• HOSE, -08, low pressure, synthetic, fiber	3.5	
9	UA	UA	• CONNECTOR, female,1/2 hose, 3/4-16, barbed	6	
10	UA	UA	• TUBE FITTING, 37d, 1/2t x 3/8 npt, brass	4	
11	UA	UA	• SCREW, button, socket, M6 x 10 mm, zinc	8	
12	- - - - - -	- - - - - -	• FOLLOWER PLATE COVER	1	
13	- - - - - -	- - - - - -	• FOLLOWER INSULATION	1	
14	UA	UA	• SCREW, cap, socket, m6 x 20 mm, steel, zinc	6	
15	- - - - - -	- - - - - -	• FOLLOWER PLATE	1	
16	UA	UA	• CONNECTOR, female, compression, 3/8t x 3/8 NPT, stainless steel	4	
17	UA	UA	• ELBOW, 37 degree, 1/2t x 3/8 NPT, brass	2	
18	UA	UA	• TUBE FITTING, 37d, 1/2t x 3/8 NPT, brass	4	
19	UA	UA	• CONNECTOR, FEMALE, 1/2 HOSE, 3/4-16, BARBED	6	
NS	UA	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	
NS	UA	UA	• LUBRICANT, NEVER SEEZ, 8 oz can	AR	
NS	UA	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR	

NOTE: A. Includes two seals and a tube of grease.

B. For use with straight sided drums, must use 282846 and 1088997 together.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

55-Gallon Follower Module - With Heater Cartridge

See Figure 9-21 through Figure 9-23 along with the following parts list.

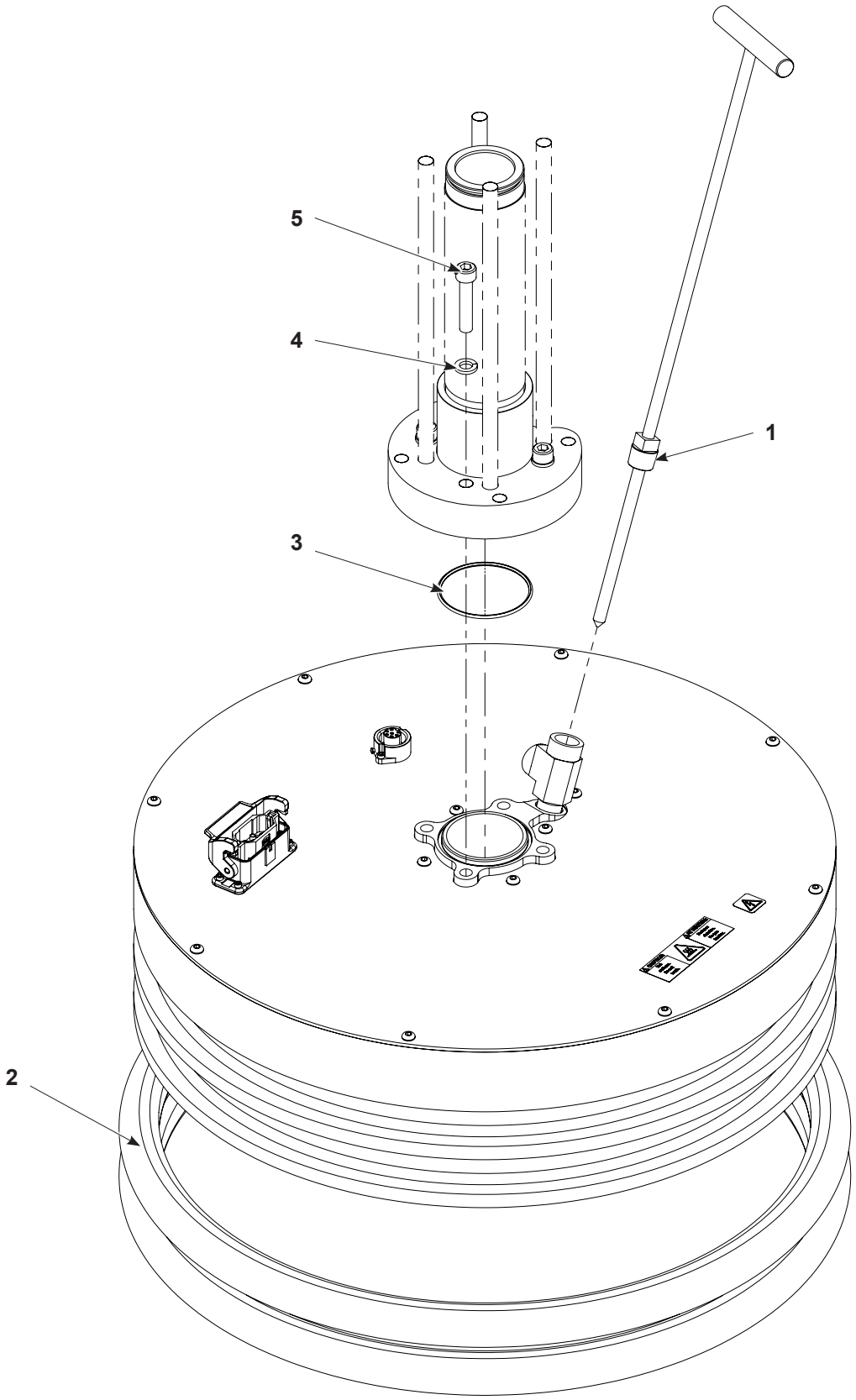


Figure 9-21 55 Gallon Follower Module - Heater Cartridge (1 of 3)

55-Gallon Follower Module - With Heater Cartridge (cont'd)

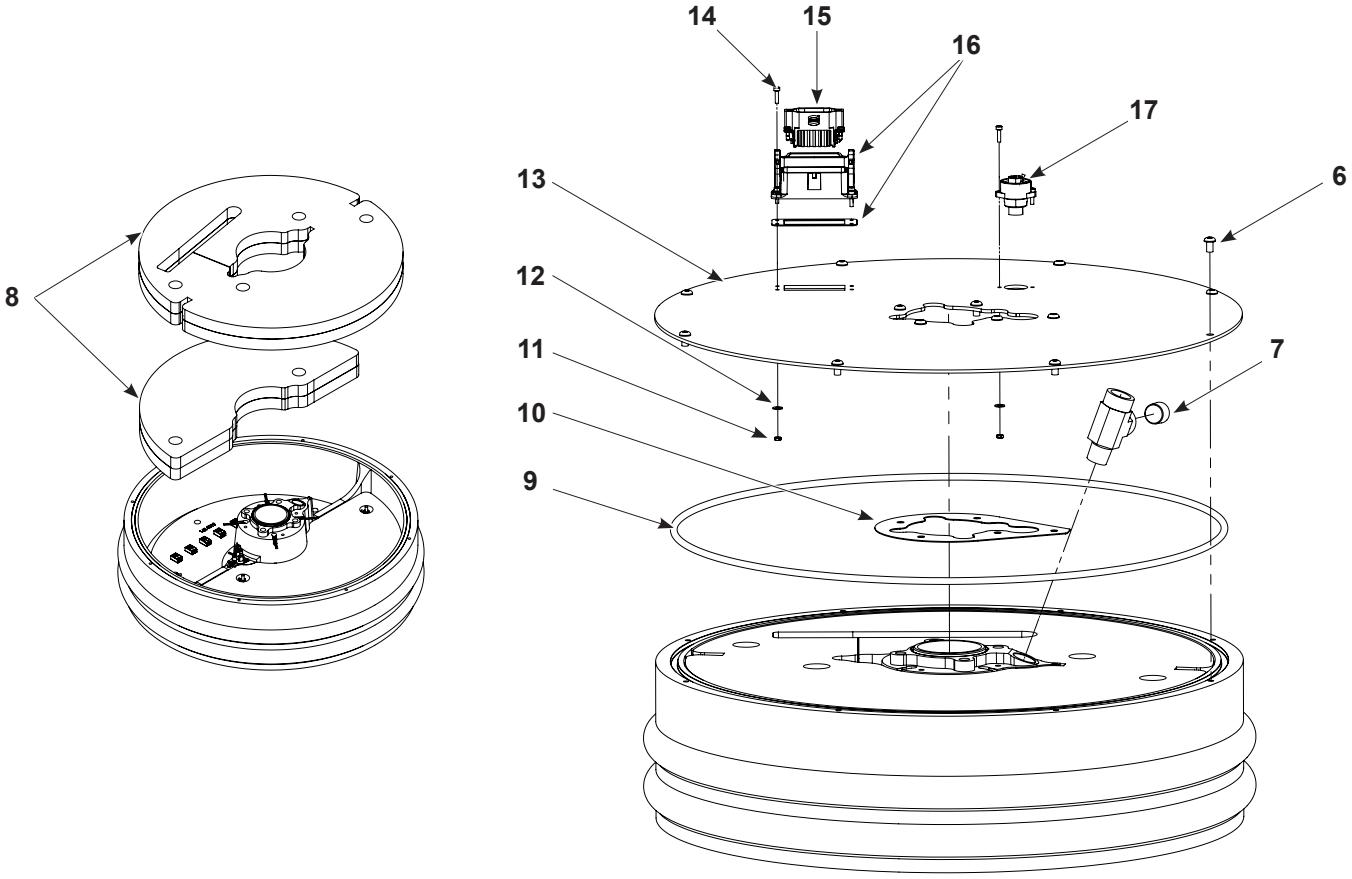


Figure 9-22 55 Gallon Follower Module - Heater Cartridge (2 of 3)

55-Gallon Follower Module - With Heater Cartridge (cont'd)

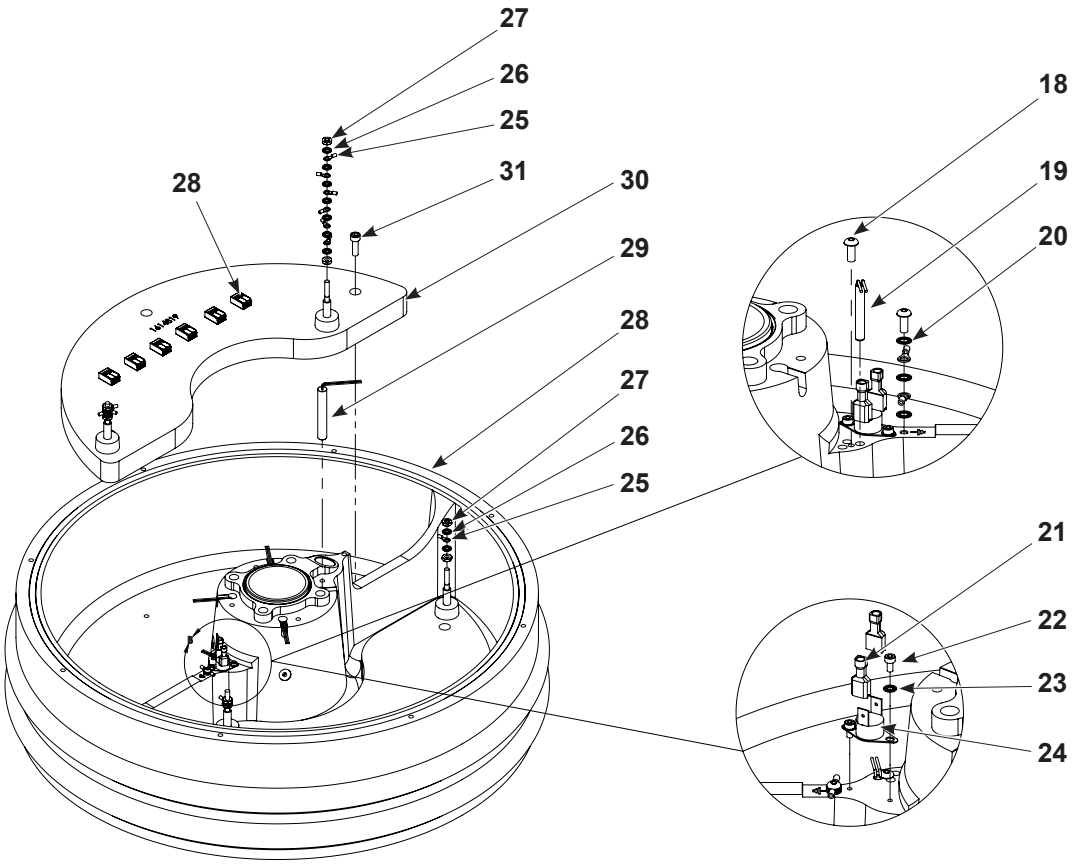


Figure 9-23 55 Gallon Follower Module - Heater Cartridge (3 of 3)

55-Gallon Follower Module - With Heater Cartridge (cont'd)

Item	Part	Part	Description	Quantity	Note
—	1616555	—	KIT, follower, 55 gal,190 cc, seal, 240 V, low wattage, PTFE	1	
	—	1616562	KIT, follower, 55 gal,190 cc, ring, 240 V, low wattage, PTFE	1	
1	- - - - - -	- - - - - -	• STEM ASSEMBLY, bleed, follower, stainless steel	1	
2	1615380	—	• KIT, seal, follower, 55 gal, PAC	1	B
	—	282846	• RING, follower plate ,571 mm drum	1	B
	—	1088997	• RING, platen, 55 gallon, UHMW PE	1	B
3	941480	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1	
4	UA	UA	• WASHER, M10, flat, steel, zinc	4	
5	UA	UA	• SCREW, socket, M10 x 55 mm, zinc	4	
6	UA	UA	• SCREW, button, socket, M6 x 10 mm, zinc	13	
7	UA	UA	• PLUG, pipe, socket, standard, 1/2 in., stainless steel	1	
8	- - - - - -	- - - - - -	• FOLLOWER INSULATION	1	
9	- - - - - -	- - - - - -	• FOLLOWER SEAL COVER	1	
10	- - - - - -	- - - - - -	• FOLLOWER GASKET	1	
11	UA	UA	• NUT, hex, M3, steel, zinc	6	
12	UA	UA	• WASHER, flat, regular, M3, nylon	6	
13	- - - - - -	- - - - - -	• FOLLOWER PLATE COVER	1	
14	UA	UA	• SCREW, socket, M3 x 16, zinc	6	
15	- - - - - -	- - - - - -	• FOLLOWER CORDSET, 15-pin	1	
16	- - - - - -	- - - - - -	• BULKHEAD HOUSING	1	
17	- - - - - -	- - - - - -	• FOLLOWER CORDSET, pump	1	
18	UA	UA	• SCREW, cap, button, socket, m4, 10 mm, steel, zinc	2	
19	- - - - - -	- - - - - -	• SENSOR ASSEMBLY, rtd	1	A
20	UA	UA	• WASHER, lock, internal, M4, steel, zinc	3	
21	UA	UA	• TERMINAL, FEMALE, STRAIGHT, INSULATED, 16-14	1	
22	UA	UA	• SCREW, socket, M3 x 0.5 x 6 mm, zinc	2	
23	UA	UA	• WASHER, lock, male, internal, m4, steel, zinc	3	
24	1614625	1614625	• THERMOSTAT, open on rise, 180 degrees	1	
25	UA	UA	• TERMINAL, ringtong, non, 16-14, 10	5	
26	UA	UA	• WASHER, lock, external, internal, #10, steel, zinc	18	
27	UA	UA	• NUT, hex, machine, #10-32, steel, zinc, 14448-fa	8	
28	- - - - - -	- - - - - -	• CONNECTOR, plastic, 2 position, 12-24 AWG	1	
29	1614841	1614841	• HEATER CARTRIDGE,.38 d x 2.5 long, 240 volts, 100 watts	4	
30	1614819	1614819	• PLATEN PLATE, 240 volts, heated, 55, 800 watts	2	
31	UA	UA	• SCREW, cap, socket, M6 x 20 mm, steel, zinc	6	
NS	UA	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR	
NS	UA	UA	• LUBRICANT, NEVER SEEZ, 8 oz can	AR	
NS	UA	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR	
NS	UA	UA	• COMPOUND,heat sink,5 oz tube,11281	AR	

NS: Not Shown

NOTE: A. Included in service kit 1615383.

B. Includes two seals and a tube of grease.

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Mini-Tote Module

See Figure 9-24 along with the following parts list.

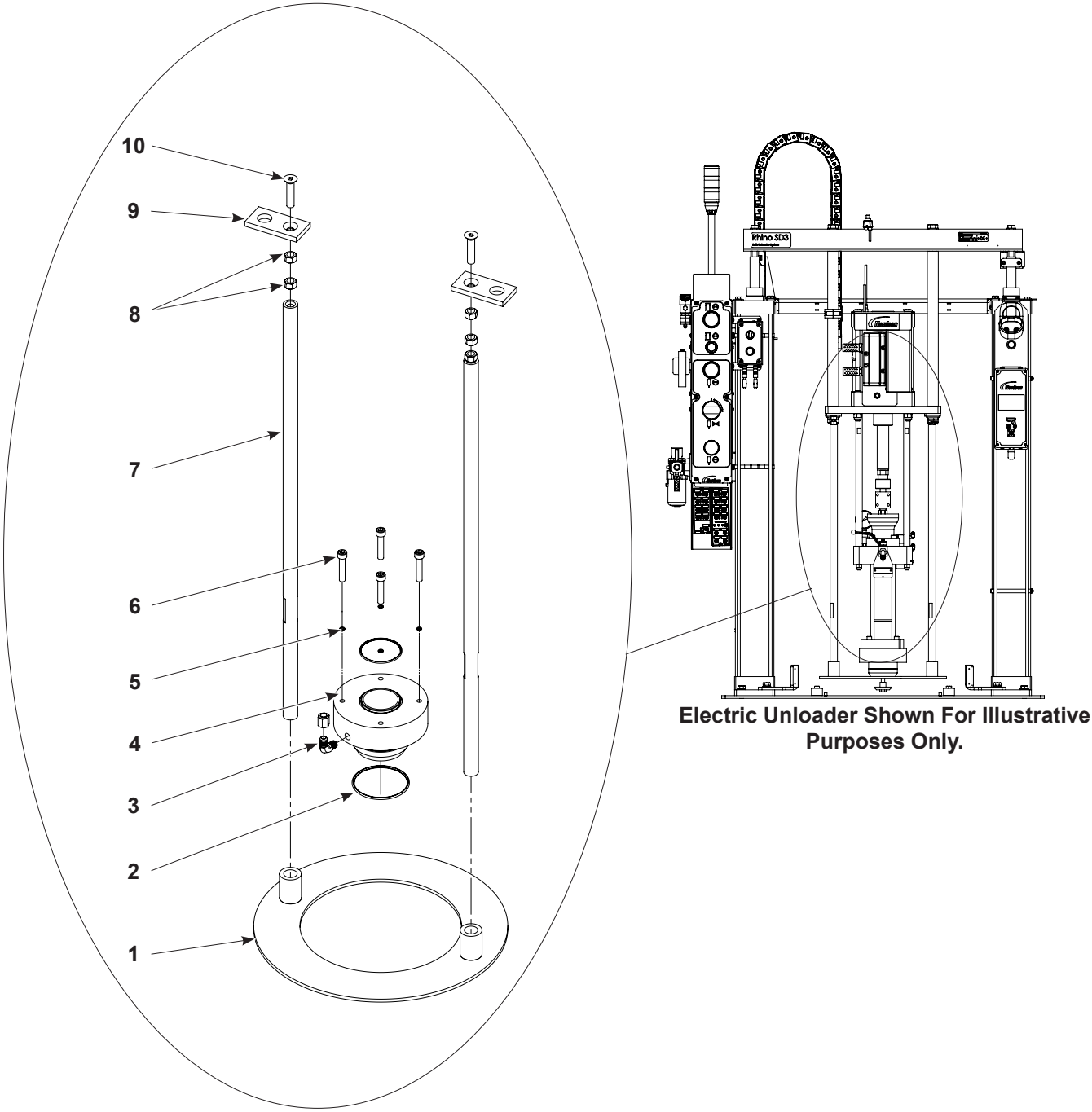


Figure 9-24 Mini-Tote Module

Mini-Tote Module (cont'd)

Item	Part	Description	Quantity
—	1618071	MINI-TOTE MODULE KIT	1
1	- - - - - -	• FOLLOWER PUSH-RING	1
2	942390	• O-RING, VITON, 3.625 x 3.875 x .125	1
3	UA	• ELBOW, male, 37, 9/16-18 x 1/4, steel	1
4	UA	• CAP, tube, 37, 9/16-18, steel, zinc	1
5	- - - - - -	• FOLLOWER PLATE ADAPTER	1
6	941480	• O-RING, VITON, 2.750 x 2.938 x .094	1
7	UA	• LOCK WASHER, M10, steel, zinc	4
8	UA	• SCREW, socket, m10 x 55 mm, steel	4
9	- - - - - -	• CONNECTING ROD	2
10	UA	• NUT, hex, 1/2-13, steel, zinc, 14441-ma	4
11	- - - - - -	• CONNECTING ROD PLATE	2
12	UA	• SCREW, flat, socket, 1/2-13 x 2 1/4, black	2
NS	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR
NS	UA	• LUBRICANT, MOBIL SHC 634, 30122-8	AR

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Frame Module

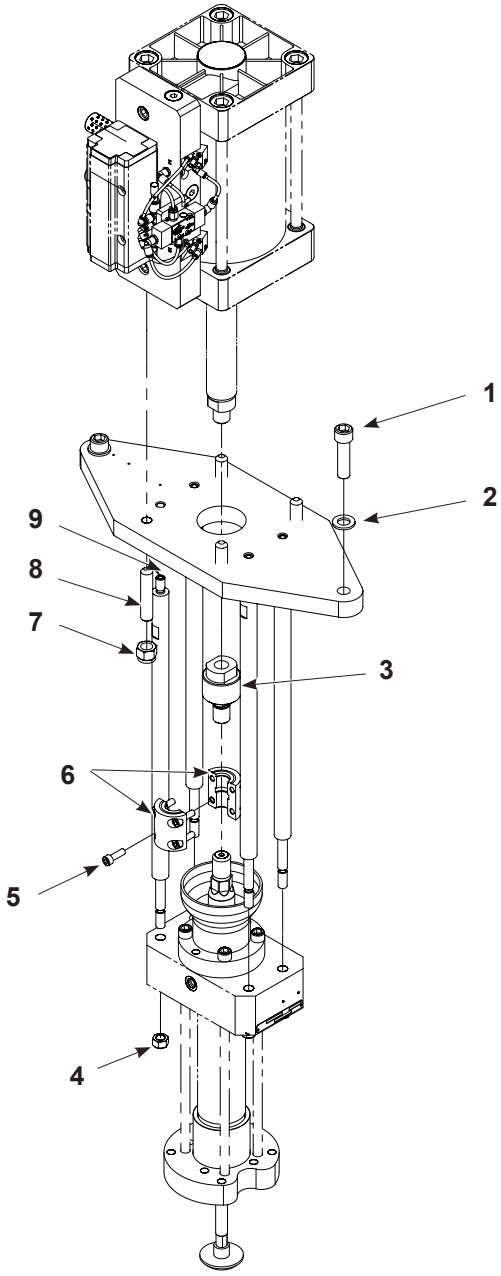
NOTE: The frame module does not contain saleable parts. However, kits are available to service the ram air cylinder assembly. Refer to *Repair, Dual Post Frame* for additional information regarding frame ram cylinder repair.

Part	Description
1618212	KIT, cylinder, ram, rhino, large 160
1613067	KIT, cylinder, ram, dual post

Hydraulic Section

Air Cylinder and Pump Connection

See Figure 9-25 along with the following parts list.



160 mm Air Cylinder Shown; Other Air Cylinders Similar.

Figure 9-25 Air Cylinder and Pump Connection

Air Cylinder and Pump Connection (cont'd)

Item	Part	Part	Part	Description	Quantity
—	- - - - - -	—	—	MODULE, air cylinder and pump connection, 160 mm	1
—	—	- - - - - -	—	MODULE, air cylinder and pump connection, 200 mm	1
—	—	—	- - - - - -	MODULE, air cylinder and pump connection, 250 mm	1
1	UA	UA	UA	• SCREW, socket, cap, M16 x 60 mm, zinc	2
2	UA	UA	UA	• WASHER, flat, M16, zinc, steel	4
3	1607574	1607574	—	• COUPLING SHAFT	2
	—	—	1024870	• COUPLING SHAFT	2
4	UA	UA	—	• NUT, hex, lock, M12 x 1.75 mm, nylon insert, zinc	1
	—	—	UA	• NUT, hex, lock, 1/2-13, UNC-2B	1
5	UA	—	UA	• SCREW, 0.3125-24 UNF X 3/4	4
	—	UA	—	• SCREW, M8 x 25 mm	4
6	1607572	1607572	—	• SPLIT COUPLER	1
	—	—	1024875	• SPLIT COUPLER	1
7			UA	• NUT, hex, lock, 1/2-13, UNC-2B, zinc	4
	UA	UA		• NUT, lock, M16 x 2.0 mm, nylon insert, zinc	4
8	UA	UA	—	• SCREW, set, socket, M16 x 2.0 x 80 mm, cup, zinc	4
9	UA	UA	—	• TIE-ROD	4
	—	—	UA	• TIE-ROD	4
NS	UA	UA	UA	• ADHESIVE, loctite 242, blue, removable, 50 ml	AR
NS	UA	UA	UA	• ADHESIVE, loctite 271, red, hi strength, 50 ml	AR

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Pump Assembly

See Figure 9-26 along with the following parts list.

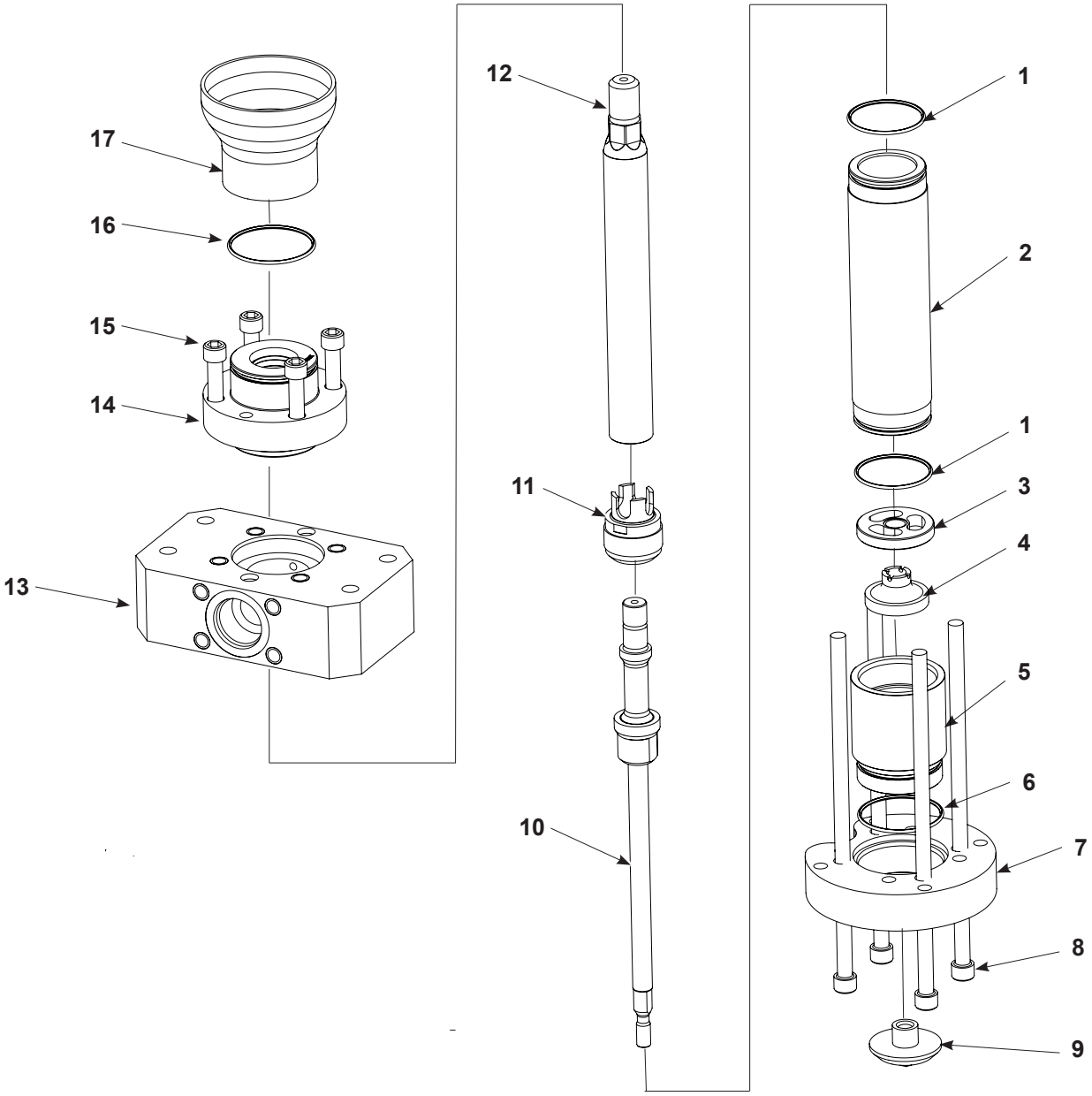


Figure 9-26 Pump Assembly

Pump Assembly (cont'd)

Item	Part	Part	Part	Part	Part	Part	Description	Qty	Note
—	------	—	—	—	—	—	MODULE, pump, stainless steel, CE	1	
—	—	------	—	—	—	—	MODULE, pump, carbon steel, CE	1	
—	—	—	------	—	—	—	MODULE, pump, carbon steel, CE, temperature conditioned	1	
—	—	—	—	------	—	—	MODULE, pump, carbon steel, CE, 240	1	
—	—	—	—	—	------	—	MODULE, pump, stainless steel, CE, temperature conditioned	1	
—	—	—	—	—	—	------	MODULE, pump, stainless steel, CE 240	1	
1	1062623	1062623	1062623	1062623	1062623	1062623	• O-RING, -140, VITON, 2.237 ID, .103 w	1	A, B
2	1611300	—	—	—	1611300	1062623	• CYLINDER PUMP HOUSING, stainless steel	1	
	—	1611471	1611471	1611471	—	1611300	• CYLINDER PUMP HOUSING, carbon steel	1	
3	------	------	------	------	------	—	• SPACER SHAFT SUPPORT	1	A, B
4	1611302	—	—	—	1611302	------	• LOWER CHECK PLATE, stainless steel	1	B
	—	1095969	1095969	1095969	—	1611302	• LOWER CHECK PLATE, carbon steel	1	A
5	1611303	—	—	—	1611303	—	• BOTTOM PUMP HOUSING, stainless steel	1	
	—	1611472	1611472	1611472	—	1611303	• BOTTOM PUMP HOUSING, carbon steel	1	
6	1049516	1049516	1049516	1049516	1049516	—	• O-RING,144, VITON, 2.487 ID, .103w	1	A, B
7	------	—	—	—	------	1049516	• MOUNTING FOLLOWER PLATE, stainless steel	1	
	—	------	------	------	—	------	• MOUNTING FOLLOWER PLATE, carbon steel	1	
8	UA	UA	UA	UA	UA	—	• SCREW, socket, M12 x 1.75 X 300, zinc	4	
9	1617929	1617929	1617929	1617929	1617929	UA	• SPLIT SHOVEL ASSEMBLY, stainless steel	1	
10	1611309	—	—	—	1611309	1617929	• ROD ASSEMBLY, stainless steel	1	B
	—	1101793	1101793	1101793	—	1611309	• ROD ASSEMBLY, carbon steel	1	A
11	1611526	—	—	—	1611526	—	• PISTON ASSEMBLY, stainless steel	1	B
	—	1015667	1015667	1015667	—	1611526	• PISTON ASSEMBLY, carbon steel	1	A
12	1611299	—	—	—	1611299	—	• PLUNGER ROD, stainless steel	1	B
	—	1053015	1053015	1033015	—	1611299	• PLUNGER ROD, carbon steel	1	A

13	------	—	—	—	------	------	• UPPER PUMP BODY, stainless steel	1	
	—	------	------	—	—	—	• UPPER PUMP BODY, carbon steel	1	
	—	—	—	------	—	—	• UPPER PUMP BODY, carbon steel, heated	1	
14	------	—	—	—	------	------	• GLAND ASSEMBLY, stainless steel	1	
	—	------	------	------	—	—	• GLAND ASSEMBLY, carbon steel	1	C
15	UA	UA	UA	UA	UA	UA	• SCREW, socket, M12 x 1.75 x 55 mm, zinc	4	
16	941450	941450	941450	941450	941450	941450	• O-RING, VITON, 2.563 x 2.750 x 0.094	1	C, D
17	1609301	1609301	1609301	1609301	1609301	1609301	• SOLVENT CHAMBER, 2.75 ID	1	
NS	UA	UA	UA	UA	UA	UA	• ADHESIVE, loctite 242, blue, removable	AR	
NS	UA	UA	UA	UA	UA	UA	• ADHESIVE, loctite 271, red, hi strength,	AR	
NS	UA	UA	UA	UA	UA	UA	• LUBRICANT,NEVER SEEZ,8 OZ CAN	AR	

NOTE: A. Included in pump drive train kit 1611628.

B. Included in pump drive train kit 1611629.

C. Included in packing gland service kit 1611624.

D. Included in packing gland internal parts kit 1611626.

NS: Not Shown

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

Kits and Tools

Pump Assembly Kit

Part	Description
1611643	KIT, pump, stainless steel, CE
1611647	KIT, pump, carbon steel, CE
1613523	KIT, pump,carbon steel, temperature conditioned
1615207	KIT, pump, carbon steel, CE
1613527	KIT, pump, stainless steel, CE, temperature conditioned
1615215	KIT, pump, stainless steel, CE 240

Pump Drive Train Kit

Part	Description
1611628	KIT, 190 cc, carbon steel
1611629	KIT, 190 cc, stainless steel

Packing Gland Service Kit

Part	Description
1611624	KIT, 190 cc, stainless steel

Packing Gland Internal Parts Kit

Part	Description
1611626	KIT, 190 cc stainless steel

Tools

Part	Description
1043313	TOOL, holder, insert seal into gland ring
1043314	TOOL, plunger, insert seal into gland ring
1073580	TOOL, gland, packing, removal arbor, 5.8 ci
1081096	TOOL, plunger, 1.375d, seal/ring into gland
1609505	TOOL, installation, gland assy, flared cup

Pump Outlet Manifold Module

See Figure 9-27 along with the following parts list.

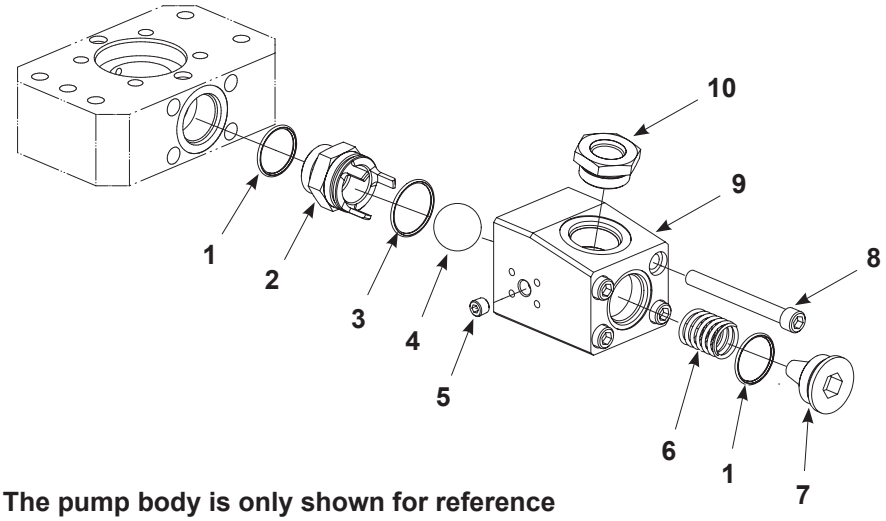


Figure 9-27 Hydraulic Section Pump Outlet Manifold Module

Item	Part	Part	Part	Description	Qty	Note
—	1611506	—	—	MODULE, check valve, large flow, bleed	1	
—	—	1611507	—	MODULE, check valve, large flow, depressurization	1	
—	—	—	1611511	MODULE, check valve, small flow, bleed	1	
1	------	------	------	• O-RING, −920, Viton®, 1.475 ID, 0.118 W	2	A, B
2	------	------	------	• SEAT, ball, check valve, Rhino SD	1	A, B
3	------	------	------	• O-RING, −131, Viton, 1.674 ID, 0.103 W	1	A, B
4	UA	UA	UA	• BALL, 440 stainless steel, 1.500, 100	1	A, B
5	UA	UA	UA	• PLUG, pipe, 1-5/8, standard thread, check valve	1	
6	UA	UA	UA	• SPRING, compression, 2.000 x 1.225 OD x 0.125	1	A, B
7	------	------	------	• PLUG, SAE, 1−5/8−12 straight thread, check valve	1	A, B
8	UA	UA	UA	• SCREW, socket, M12 x 1.75 x 130, zinc, Class 12.9	4	
9	------	------	------	• CHECK VALVE BODY	1	
10	UA	UA	UA	• PLUG, pipe, socket, 1/4NPTF, steel, zinc	1	
NS	UA	UA	UA	• ADHESIVE, pipe/thd/hyd sealant(pst)	AR	
NS	UA	UA	UA	• LUBRICANT, mobil shc 634	AR	
NS	UA	UA	UA	• LUBRICANT, never seez, 8 oz can	AR	
NOTE: A. Included in service kit 1618198. B. Included in service kit 1618199. NS: Not Shown UA: Unavailable for purchase through Nordson. Contact local distributor or local source.						

Interconnect Hose Connect Module

100-200 mm Air Cylinder

See Figure 9-28 along with the following parts list.

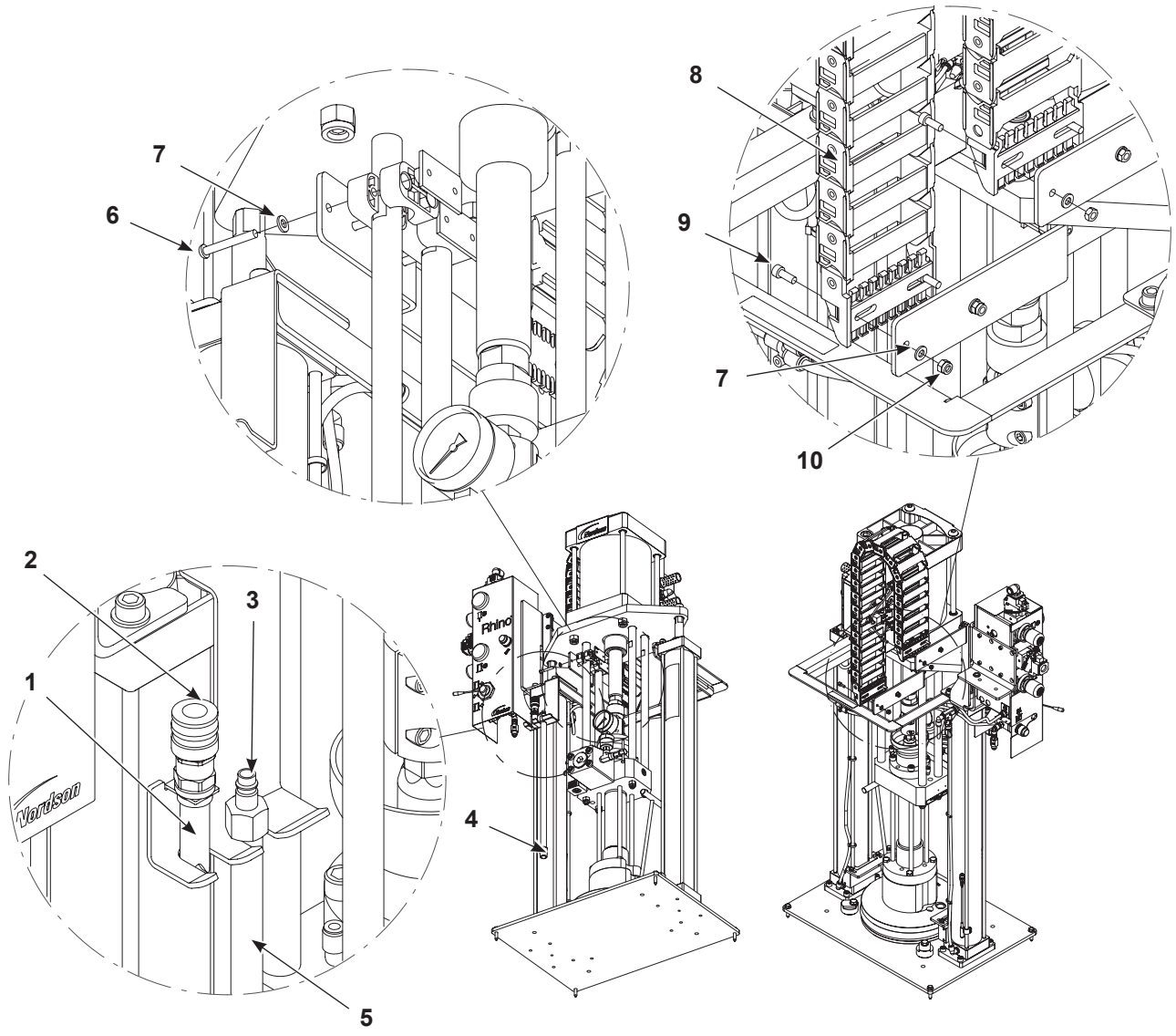


Figure 9-28 Dual Post Frame Interconnect Hose Module (100 - 200 mm) Air Cylinder (1 of 2)

100-200 mm Air cylinder (cont'd)

Item	Part	Description	Quantity
1	UA	HOSE, -06, low pressure, synthetic, fiber, M2 black	6 ft
2	UA	COUPLER, disconnect, barbed, pushlock, ⅜ tube	1
3	UA	NIPPLE, disconnect, ¼ T, ⅜ NPT female	1
4	UA	BUSHING, pipe, hydraulic, ½ x ⅜, steel, zinc	1
5	UA	NIPPLE, pipe, schedule 40, ⅜ NPT, 18 in., galvanized	1
6	UA	SCREW, socket, M6 x 45, class 12.9, per ISO 4762	4
7	UA	WASHER, flat, M, regular, M6, steel, zinc, per ISO 7089	8
8	UA	CHAIN, cable, 3.43 x 1.02, 18 links	1
9	UA	SCREW, socket, M6 x 16, zinc, class 12.9, per ISO 4762	4
10	UA	NUT, lock, nylon, M6, steel, zinc, class 8, per ISO 7040	4
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

100-200 mm Air Cylinder (cont'd)

See Figure 9-29 along with the following parts list.

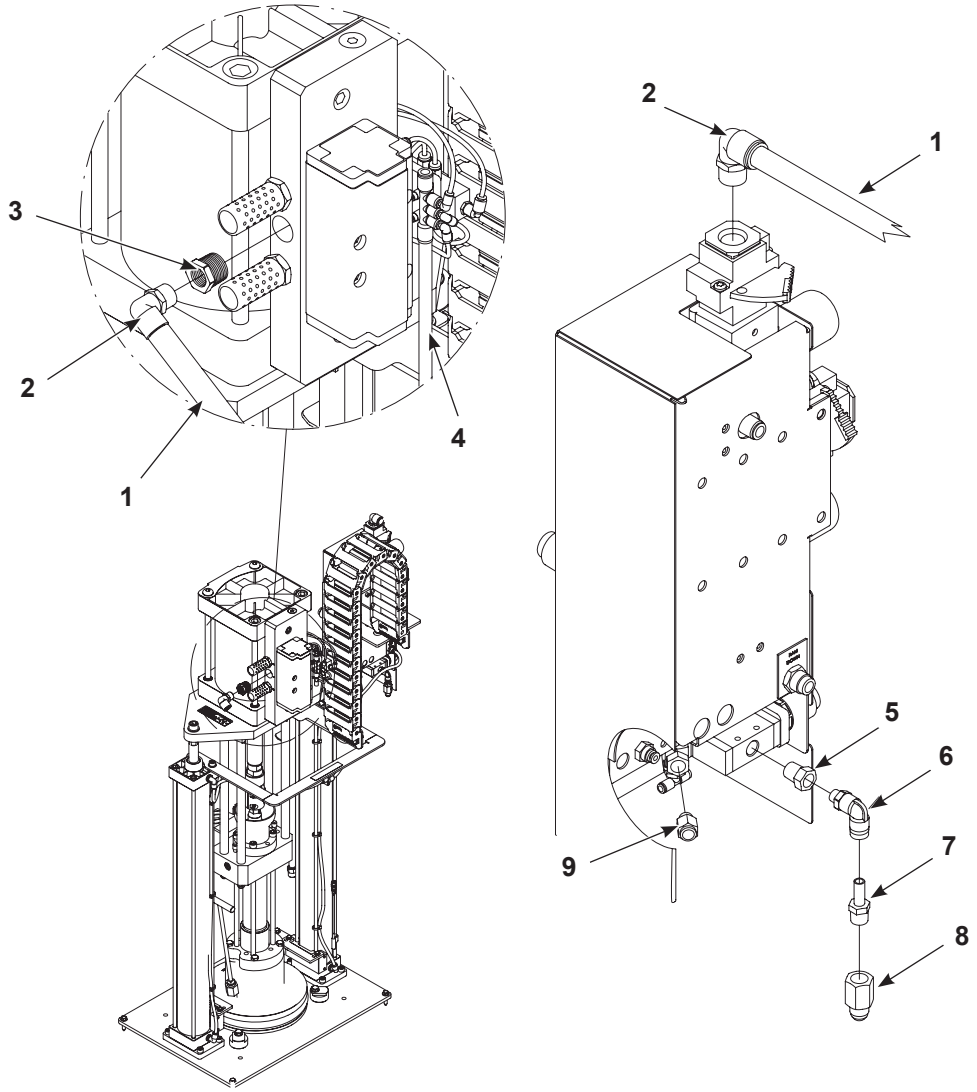


Figure 9-29 Dual Post Frame Interconnect Hose Module (100 - 200 mm) Air Cylinder (2 of 2)

100-200 mm Air Cylinder (cont'd)

Item	Part	Description	Quantity
1	UA	TUBE, 10 mm-OD, polyurethane, fire resistant, black	8 ft
	UA	TUBE, 12 mm-OD, polyurethane, fire resistant, black	8 ft
	UA	TUBE, 16 mm-OD, polyurethane, fire resistant, black	8 ft
2	UA	ELBOW, male, 10 mm T x R ¼, with seal, fire resistant	2
	UA	ELBOW, male, 10 mm T x R ⅜, with seal, fire resistant	2
	UA	ELBOW, male, 12 mm T x R ½, with seal, fire resistant	2
	UA	CONNECTOR, male, elbow, 16 mm T x ½ RPT, with seal	2
3	UA	BUSHING, BSPT pipe, hydraulic, ¾ x ½, steel, zinc	1
4	UA	TUBE, 8 mm-OD, polyurethane, fire resistant, black	8 ft
5	UA	BUSHING, red, R ¼ x RC ⅛, BRS, NP	1
6	UA	ELBOW, male, restrict-flow, 8 mm T x R ⅛, 1.7 diameter	1
7	UA	ADAPTER, 8 mm T x ¼ RPT	1
8	UA	CONNECTOR, male, 37, ⅜ T x G ¼ female, steel	1
9	UA	CONNECTOR, male, restrict-flow, 8 mm T x R ⅛, 1.1 diameter	1

UA: Unavailable for purchase through Nordson. Contact local distributor or local source.

250 mm Air Cylinder

See Figure 9-30 along with the following parts list.

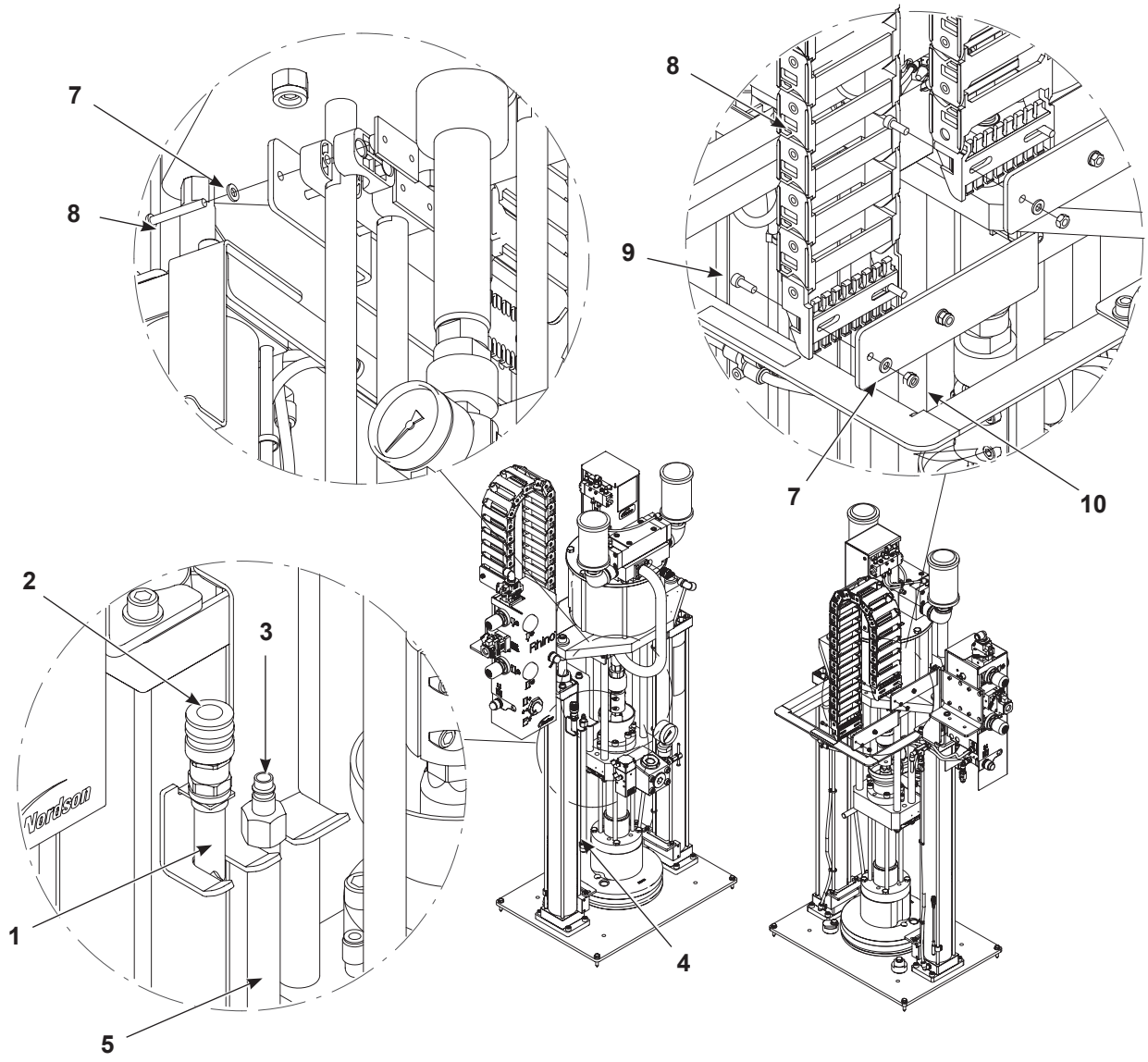


Figure 9-30 Dual Post Frame Interconnect Hose Module (250 mm) Air Cylinder (1 of 2)

250 mm Air Cylinder (cont'd)

Item	Part	Description	Quantity
1	UA	HOSE, -06, low pressure, synthetic, fiber, M2 black	6 ft
2	UA	COUPLER, disconnect, barbed, pushlock, ⅜ tube	1
3	UA	NIPPLE, disconnect, ¼ T, ⅜ NPT female	1
4	UA	BUSHING, pipe, hydraulic, ½ x ⅜, steel, zinc	1
5	UA	NIPPLE, pipe, schedule 40, ⅜ NPT, 18 in., galvanized	1
6	UA	SCREW, socket, M6 x 45, class 12.9, per ISO 4762	4
7	UA	WASHER, flat, M, regular, M6, steel, zinc, per ISO 7089	8
8	UA	CHAIN, cable, 3.43 x 1.02, 18 links	1
9	UA	SCREW, socket, M6 x 16, zinc, class 12.9, per ISO 4762	4
10	UA	NUT, lock, nylon, M6, steel, zinc, class 8, per ISO 7040	4
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

250 mm Air Cylinder (cont'd)

See Figure 9-31 along with the following parts list.

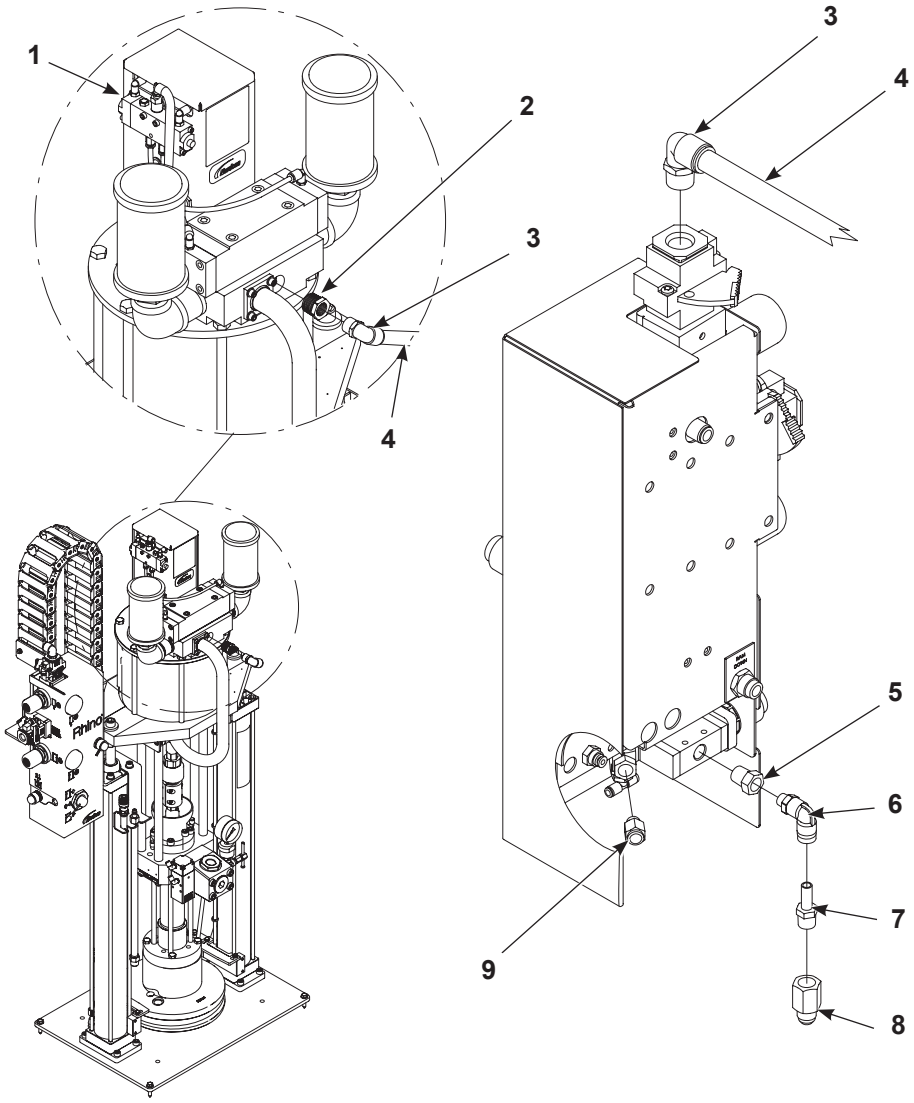


Figure 9-31 Dual Post Frame Interconnect Hose Module (250 mm) Air Cylinder (2 of 2)

Item	Part	Description	Quantity
1	UA	TUBE, 8 mm-OD, polyurethane, fire resistant, black	8 ft
2	UA	BUSHING, BSPT pipe, hydraulic, ¾ x ½, steel, zinc	1
3	UA	ELBOW, male, 10 mm T x R ¼, with seal, fire resistant	2
	UA	ELBOW, male, 10 mm T x R ⅜, with seal, fire resistant	2
	UA	ELBOW, male, 12 mm T x R ½, with seal, fire resistant	2
	UA	CONNECTOR, male, elbow, 16 mm T x ½ RPT, with seal	2
4	UA	TUBE, 10 mm-OD, polyurethane, fire resistant, black	8 ft
	UA	TUBE, 12 mm-OD, polyurethane, fire resistant, black	8 ft
	UA	TUBE, 16 mm-OD, polyurethane, fire resistant, black	8 ft
5	UA	BUSHING, red, R ¼ x RC ⅛, BRS, NP	1
6	UA	ELBOW, male, restrict-flow, 8 mm T x R ⅛, 1.7 diameter	1
7	UA	ADAPTER, 8 mm T x ¼ RPT	1
8	UA	CONNECTOR, male, 37, ⅜ T x G ¼ female, steel	1
9	UA	CONNECTOR, male, restrict-flow, 8 mm T x R ⅛, 1.1 diameter	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Options And Accessories

Conveyor

See Figure 9-32 along with the following parts list.

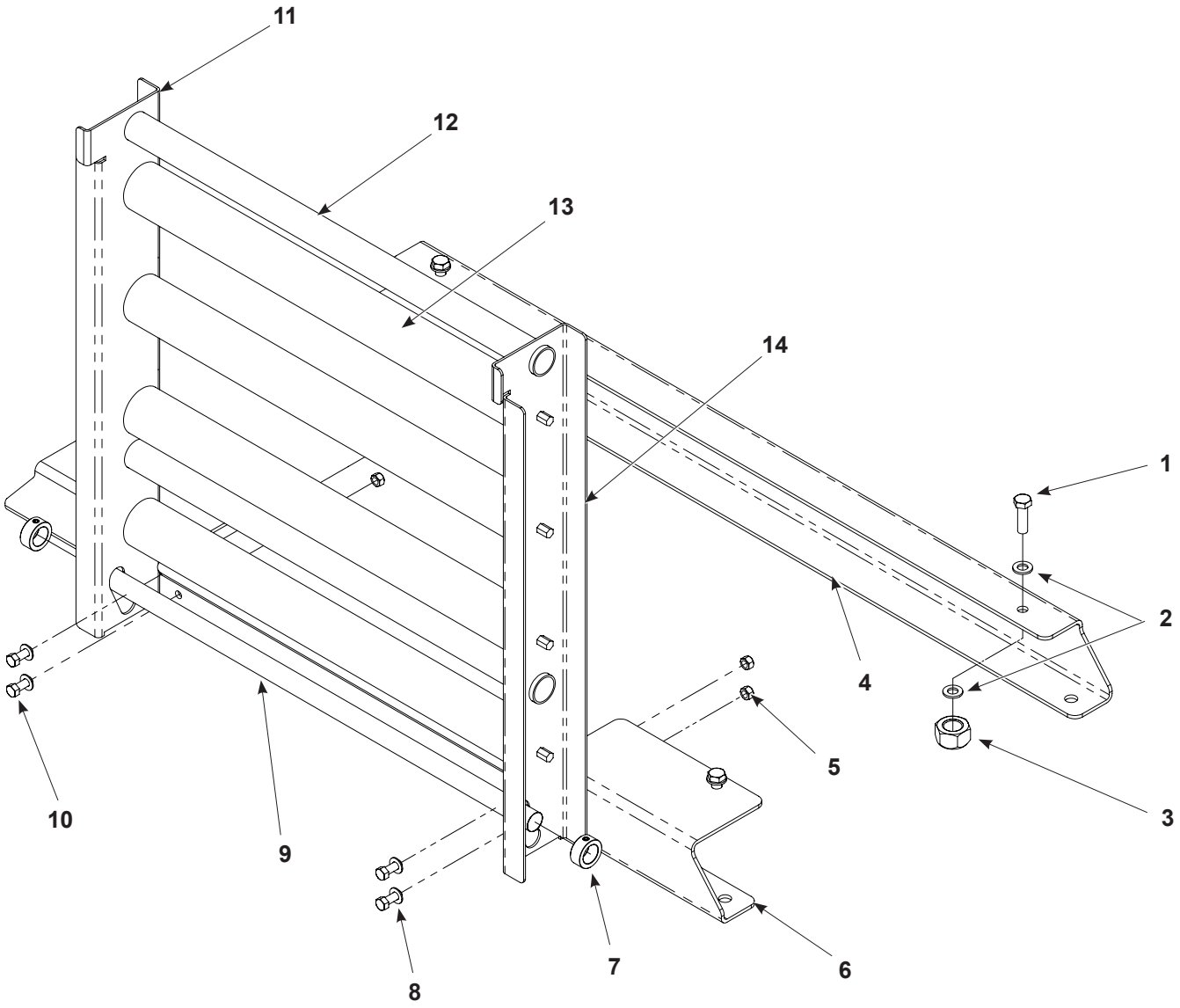


Figure 9-32 Conveyor

Conveyor (cont'd)

Item	Part	Description	Quantity
—	1611701	CONVEYOR, pivot, container, unloader, blue	1
1	UA	• SCREW, M12 x 1.75 x 40 mm, zinc	4
2	UA	• WASHER, flat, M12, zinc	8
3	UA	• NUT, lock, M12 x 1.75 mm, zinc	4
4	------	• FRONT FRAME	1
5	UA	• NUT, hex, 3/8-16, zinc	1
6	------	• REAR FRAME	1
7	------	• SET SCREW SHAFT COLLAR	2
8	UA	• WASHER, flat, 3/8, zinc	4
9	------	• ROD	1
10	UA	• SCREW, hex, 3/8-16 x 1.00 mm zinc	4
11	------	• SIDE FRAME - LEFTHAND	1
12	------	• ROLLER	2
13	------	• ROLLER ASSEMBLY	4
14	------	• SIDE FRAME - RIGHTHAND	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

Low/Empty Sensor Module

See Figure 9-33 along with the following parts list.

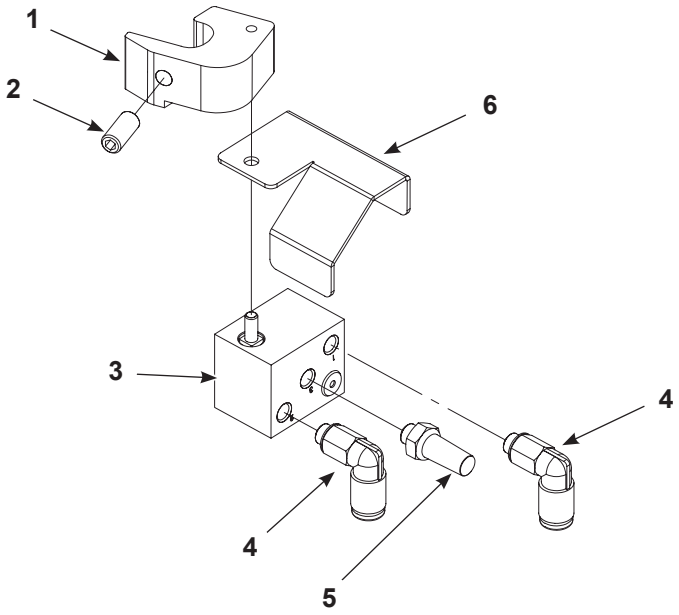


Figure 9-33 Low Empty Sensor

Item	Part	Part	Description	Qty
—	1612646	—	MODULE, sensor, empty, pneumatic, SD3/XD3, single-post/dual-post	1
	—	1613033	MODULE, sensor, low/empty, pneumatic, SD3/XD3, single-post/dual-post	1
1	------	------	▪ BRACKET, magnetic sensor, 80/100 mm	1
	—	—	▪ BRACKET, magnetic sensor, 125/160 mm	1
2	------	------	▪ SCREW, set, M5 x 16, cup, stainless steel, per ISO 4029	1
3	1606903	1606903	▪ SENSOR, proximity, magnet	1
4	1606923	1606923	▪ FITTING, male, elbow, 4-mm T x M5	2
5	1607015	1607015	▪ MUFFLER, M5	1
6	------	------	▪ SHIELD, spark, magnetic sensor	1

Pressure Relief Valve

See Figure 9-34 along with the following parts list.

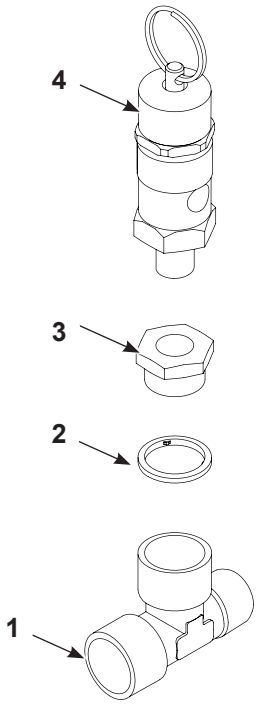


Figure 9-34 Pressure Relief Valve

Item	Part	Description	Quantity
—	1620371	KIT, pressure relief, ram, 160 mm frame	—
1	UA	• TEE, street, R 1/2 M x G 1/2 F, steel	1
2	UA	• SEAL, ring, aluminum, NBR, G 1/2	1
3	UA	• BUSHING, red, G 1/4 F x G 1/2 M, steel	1
4	UA	• VALVE, pressure relief, 1/4 BSPT, male, 25 psi, bronze	1
UA: Unavailable for purchase through Nordson. Contact local distributor or local source.			

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Section 10

Schematics

Air Motor Pneumatic Diagram (100 - 200 mm)

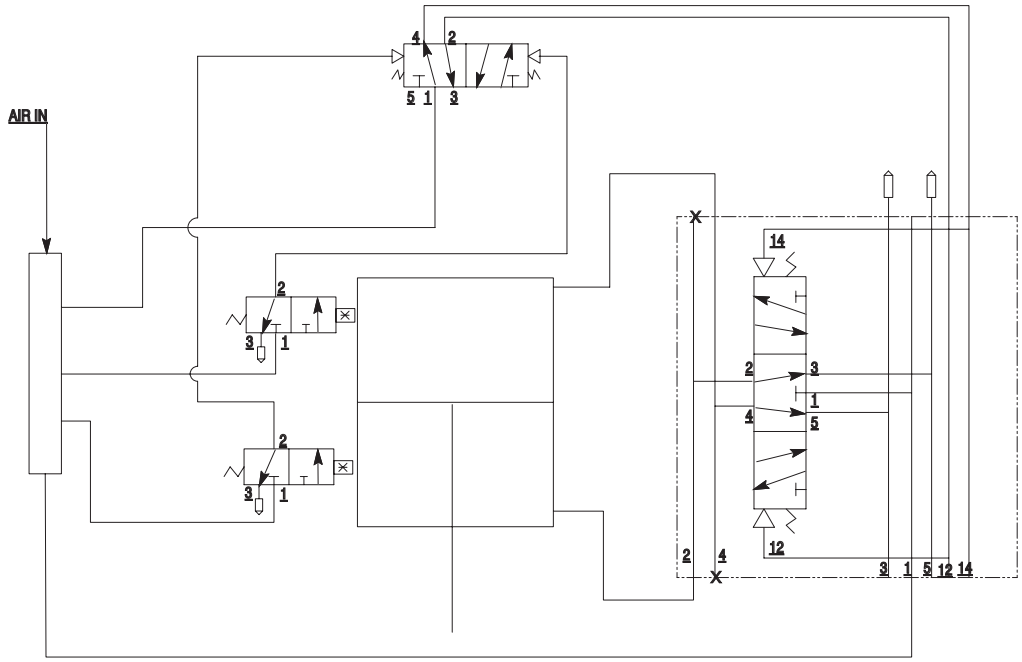

Figure 10-1 Air Motor Schematic (100 - 200 mm)

Air Motor Pneumatic Diagram (250 mm)

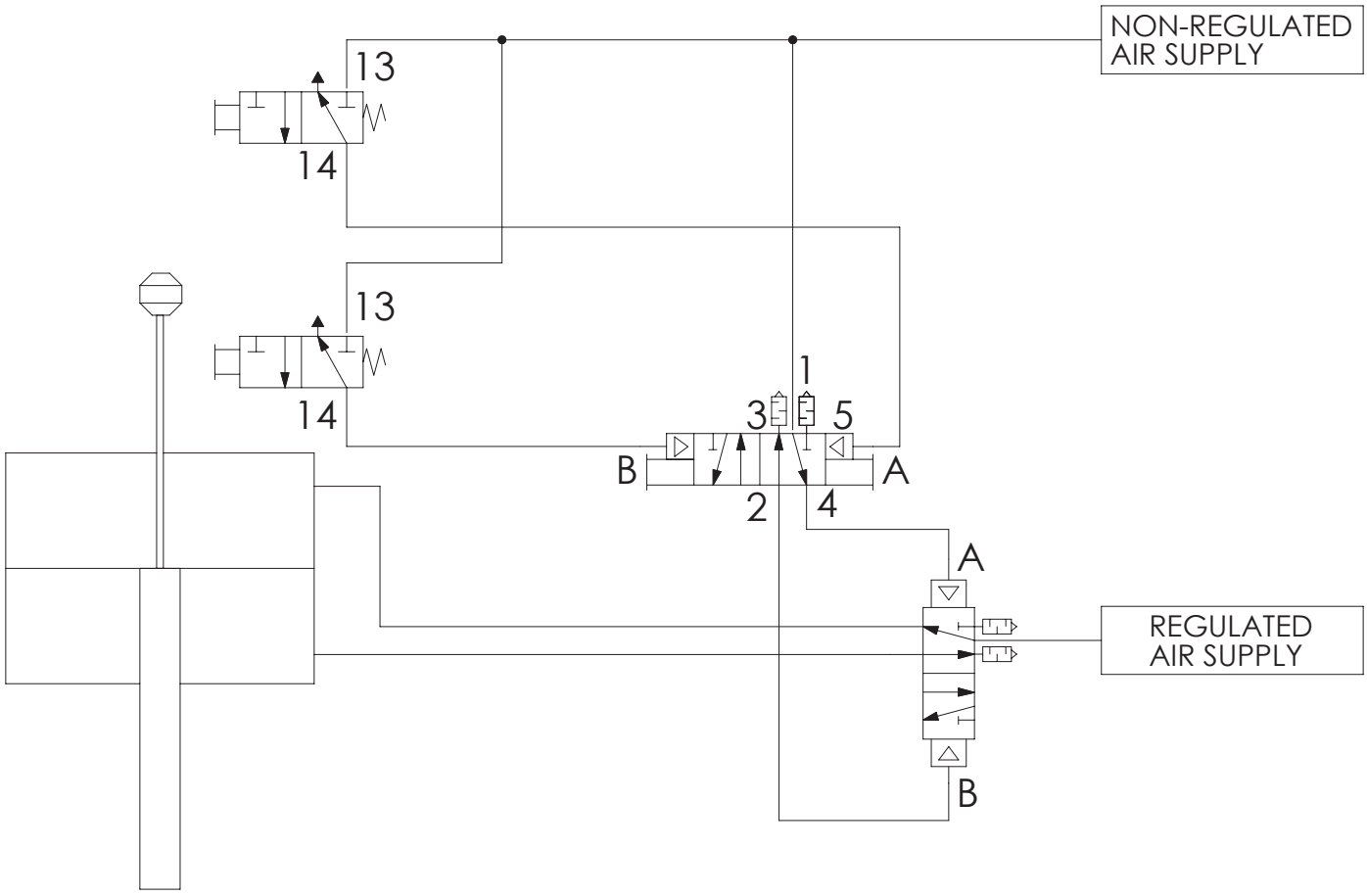

Figure 10-2 Air Motor Pneumatic Schematic (250 mm)

Follower Module (Heated)

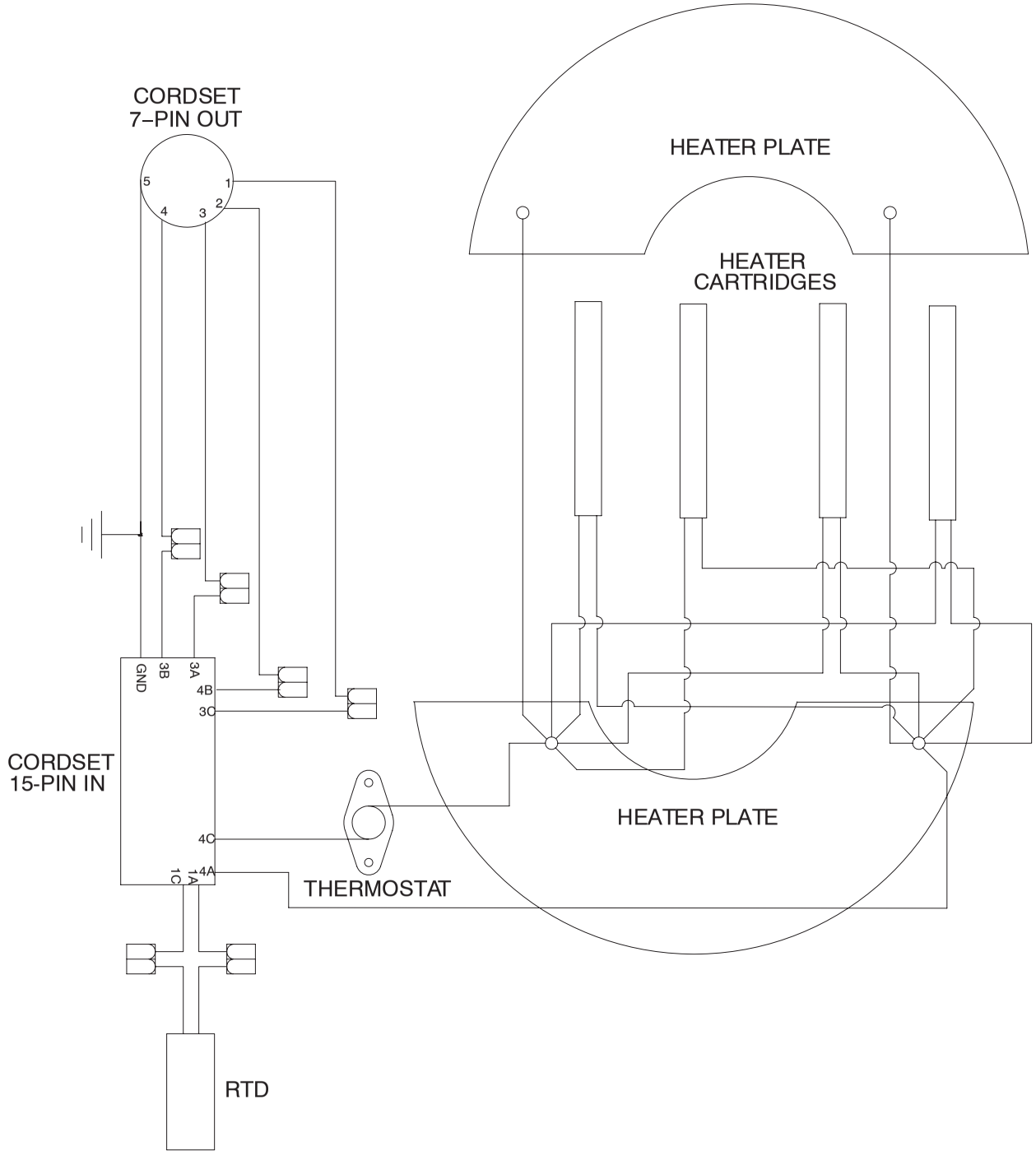

Figure 10-3 Follower Module (Heated) Schematic

Hydraulic Section (Heated)

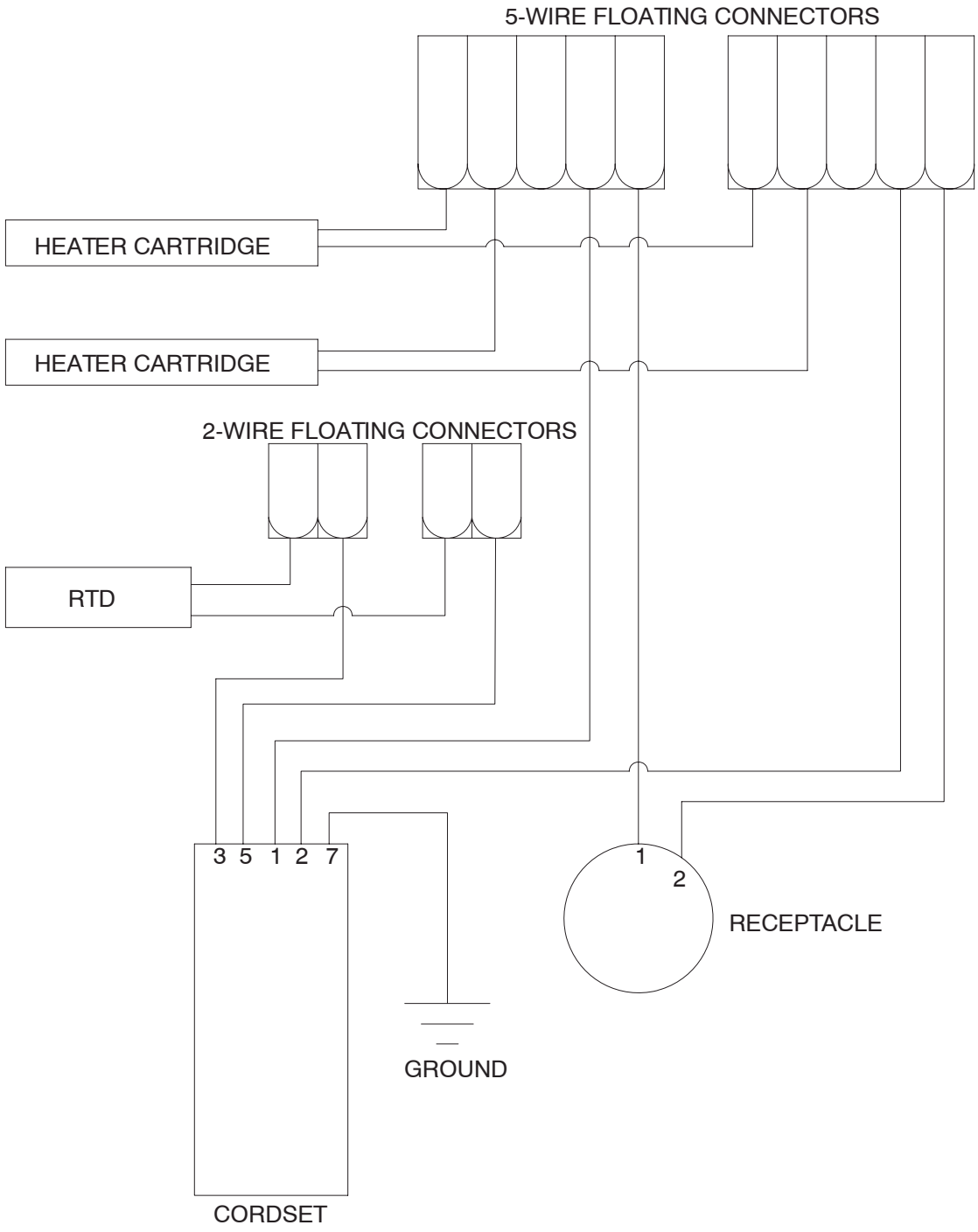

Figure 10-4 Hydrauic Section (Heated) Schematic

Hydraulic Section Pump Oulet Manifold (Heated)

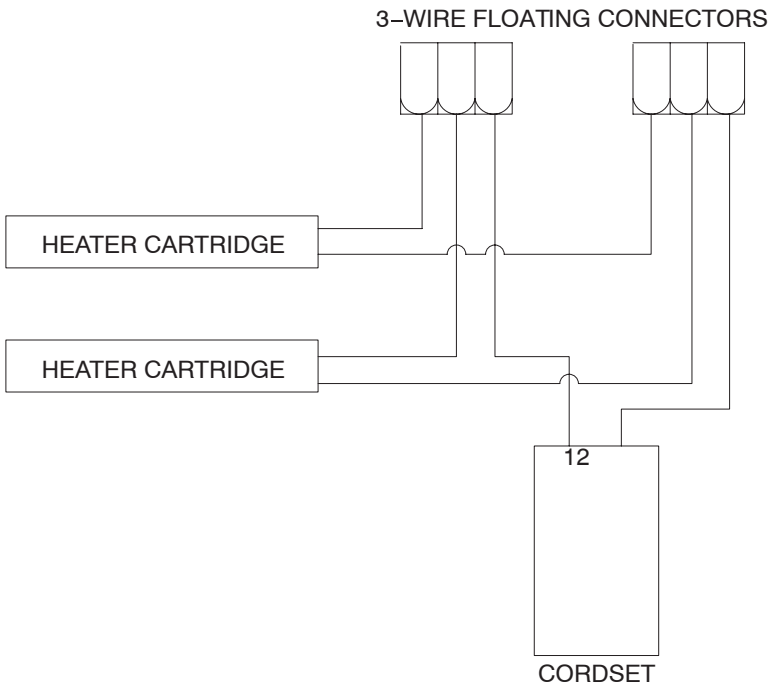

Figure 10-5 Hydraullic Section Pump Outlet Manifold (Heated) Schematic

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DECLARATION of CONFORMITY

This Declaration is issued under the sole responsibility of the manufacture.

Product: Rhino Bulk Unloader

Models: 5G SD3, 55G SD3; 5G XD3, and 55G XD3.

Description: The Rhino Pumps are used for bulk unloading of material into a dispensing system.

Applicable Directives:

2006/42/EC (Machinery Directive)

Standards Used for Compliance:
EN12100 (2010)
EN60204 (2018)
EN809: 1998+A1:2009

Principles:

This product has been manufactured according to good engineering practice.
The product specified conforms to the directive and standards described above.

Quality System DNV – ISO9001 Certified

Date: 17 Oct 2023

Jeremy Krone
Engineering Manager
Industrial Coating Systems
Amherst, Ohio, USA

Nordson Authorized Representative in the EU
Contact: Operations Manager
Industrial Coating Systems
Nordson Deutschland GmbH
Heinrich-Hertz-Straße 42-44
D-40699 Erkrath

UK DECLARATION of CONFORMITY

This Declaration is issued under the sole responsibility of the manufacture.

Product: Rhino Bulk Unloader

Models: 5G SD3, 55G SD3; 5G XD3, and 55G XD3.

Description: The Rhino Pumps are used for bulk unloading of material into a dispensing system.

Applicable UK Regulations:

Supply of Machinery (Safety) Regulations 2008

Standards Used for Compliance:
EN12100 (2010)
EN60204 (2018)
EN809: 1998+A1:2009

Principles:

This product has been manufactured according to good engineering practice.
The product specified conforms to the directive and standards described above.

Quality System DNV – ISO9001 Certified

Date: 17 Oct 2023

Jeremy Krone
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