Standard Ford Rhino®
Bulk Unloader Controls

Customer Product Manual
Part 334694A
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NORDSON CORPORATION • AMHERST, OHIO • USA

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

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Notice

Trademarks

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Standard Ford Rhino Bulk Unloader Controls

Safety

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

Make sure all equipment documentation, including these instructions, is accessible to 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 Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- 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 MSDS for the injected fluid to the health care provider.

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

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

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

MEDICAL ALERT—AIRLESS SPRAY WOUNDS: NOTE TO PHYSICIAN

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

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

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

Fire Safety

To avoid a fire or explosion, follow these instructions.

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

Description

Rhino bulk unloaders are available in a variety of configurations, with various hydraulic sections and controls. Rhino drum unloaders pump Nordson-approved adhesives and sealant materials at room and elevated temperature from various sized containers.

This manual is written to reflect the controls and components of the standard Ford dual Rhino unloaders configuration only. The procedures included are specific to the product configuration. Use this manual to familiarize yourself with the safe and proper operation of standard Ford Rhino bulk unloaders.

WARNING: Do not use this manual when operating unloaders not built to standard Ford specifications. Using this manual when operating unloaders not built to standard Ford specifications could result in serious personal injury.

Contact your Nordson representative if

- you have questions about your unloader configuration
- you require more information about the other Rhino bulk unloader configurations available

CAUTION: If the material is too abrasive or generally not compatible, equipment may wear out prematurely and components may be damaged.

- to verify that the material you wish to pump is compatible with your equipment and setup

General Description

See Figure 1, which shows both primary (A-Unit) and secondary (B-Unit) bulk unloaders as they are built for standard Ford applications. Standard Ford unloaders are available with two different A-Units (55-gallon or 30-gallon) and two different B-Units (55-gallon and 30-gallon).

The 55-gallon units are configured to changeover to each other, as are the 30-gallon units. There is no configuration with a 55-gallon to 30-gallon changeover. They are sold in pump sets, shipped with filter stands or hose stands (14), depending upon customer application.

Standard Ford unloaders are shipped with:

- rotary ram control valve (10)
- 65:1 dual-acting, positive-displacement, demand-type hydraulic section (pump) (5) with 10-inch air motor (13)
- 55-gallon or 30-gallon follower plate (6), as indicated by unloader size
- an electrical junction box (j-box) (3) on the A-Unit

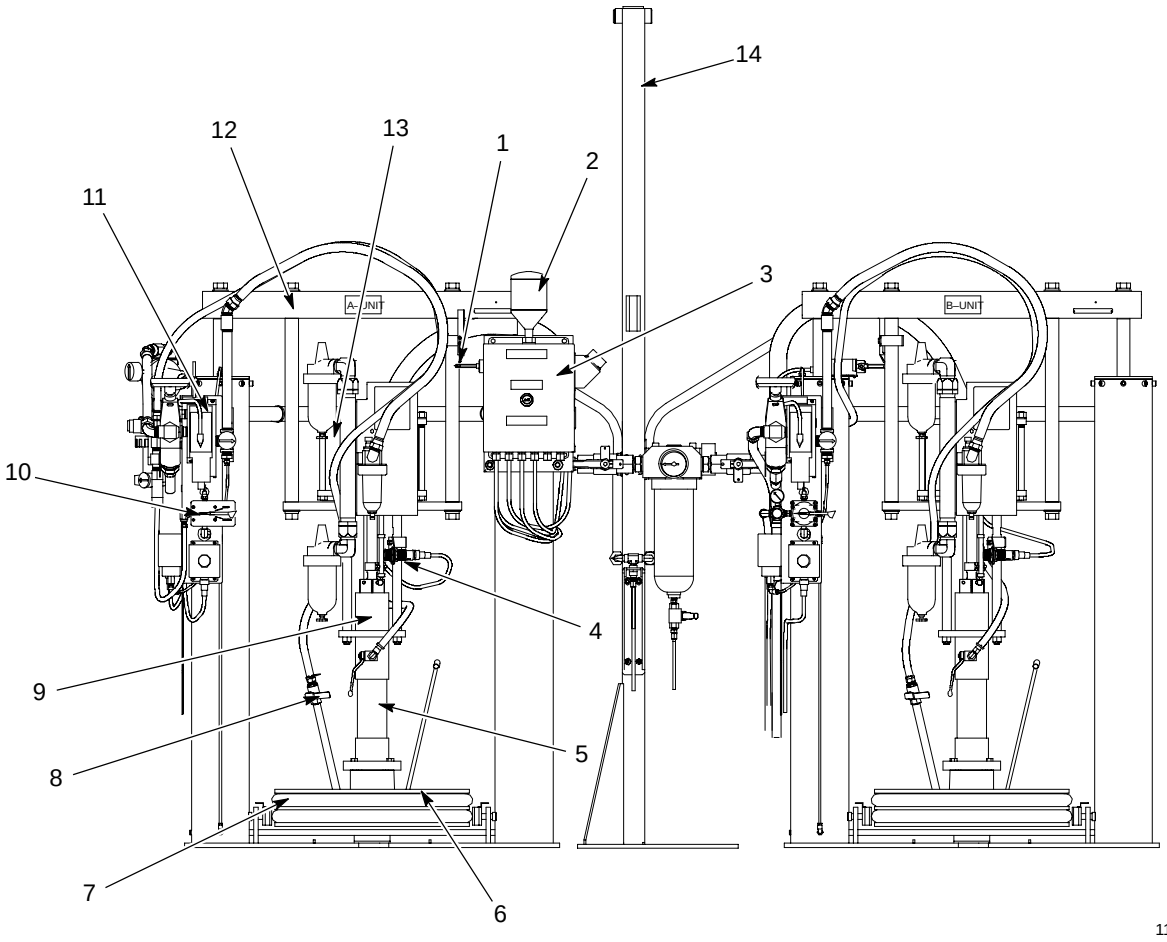

Figure 1 Standard Ford Rhino Bulk Unloaders Basic and Electrical Components

1. Drum-empty limit switch
2. Light tower
3. J-box
4. Pump stroke proximity switch
5. Pump
6. Follower plate
7. Follower plate seals
8. Blow-off ball valve
9. Solvent cup
10. Ram control valve
11. Air solenoid valve
12. Ram
13. Air motor
14. Filter (or hose) stand (varies by application)

Basic Operation

See Figure 1.

To operate the unloader, the operator centers an open, non-tapered, undamaged container of adhesive or sealant material on the unloader frame. The operator then moves the ram control valve (10) to the DOWN position. A pair of air-driven pistons lowers the follower plate (6) and air-operated piston pump into the container of material. Continuous down pressure is exerted by the ram (12).

Standard Ford Rhino unloaders have follower plate seals (7) that are installed on the follower plate. The downward movement of the follower plate and pressure from the follower plate seals compress the material and forces material into the pump (5). Once air pressure to the air motor (13) is turned on, the pump strokes and pumps material from the container.

Standard Ford Rhino unloaders are shipped with the auto-changeover function. With auto-changeover, when two unloaders (an A- and B-Unit) are coupled together, pumping switches automatically from one unit to the other as the material containers are emptied. This feature provides uninterrupted operation, allowing the operator to change the empty container of one unloader while the other unloader is in operation.

While the other unloader is in operation, the operator uses the blow-off ball valve (8) to introduce air pressure under the follower plate. The operator then raises the follower plate from the empty container of material, replaces the empty container with a full one, and lowers the follower plate into the new container. Refer to the *Container Change* procedures in this manual for more information.

Theory of Operation

The following information details the operation of your bulk unloader.

Electrical Components

See Figure 1.

Standard Ford unloaders have an electrical j-box (3) that sends and receives signals to and from the controlling PLC (cell PLC or controls PLC) on a 24-pin connector. All electrical cables from the A- and B-Units are routed to the j-box.

The j-box is pre-wired to provide the following information:

- drum A or B empty status from the drum-empty limit switch (1)
- runaway pump information from the pump stroke proximity switch (4)
- dirty filter, if your pump set has a filter stand (14)
- purge signals
- air motor activated or not (from air motor pressure switch)

When the light tower (2) receives signals, the light will illuminate. Depending on how you configure your PLC logic, the light may illuminate when it receives a drum-empty signal from the PLC.

An electrically-controlled air solenoid valve (11) controls air motor operation. When the A-Unit is in operation, the electric solenoid on the A-Unit allows air to flow from the air supply valve to the air motor. The electric solenoid on the B-Unit stops air from flowing to that unit. When a changeover occurs, the air supply switches from the pump on the A-Unit to the pump on the B-Unit. The electric solenoid at the B-Unit opens and allows air to flow to the B-Unit air motor and the A-Unit's solenoid shuts off the air flow to the air motor.

Pneumatic Components

See Figure 2.

The operating controls for the Rhino unloader are pneumatic. Because of the potential power in a pressurized unloader, an unloader under pressure from the air supply is considered active even if it is not pumping. Only a non-pressurized pump is considered inactive. The unloader frame can stay under pressure even when the unloader is disconnected from the air supply. Be cautious and aware that air remains in the cylinders.

When air enters this pneumatic component:	Function
Master air lockout valve (17)	Supplies air to both the A- and B-Unit. Closing this valve is the only way to shut off ram air to both unloaders.
Filter/separator (16)	Removes most contaminants and moisture from the supply air.
Pump air pressure regulator (19) and gauge (18)	Located on A-Unit, supplies both A- and B-Units. Adjusts to control the air supply to both unloaders.
Air solenoid valve (20)	Receives signals to control air motor operation.
Air pressure switches (10)	On each individual unloader, these non-adjustable switches detect air pressure to the motor and tell the PLC which pump is on and pumping (for example, PUMP A Active).
Air lockout valves (21)	On each individual unloader, these valves lock out air pressure to the individual air motor. They prevent the pump from stroking but do not shut off ram air. You can still raise and lower the follower plate but the air motor will not activate and cause the pump to stroke.
Air motor lubricator (2)	Mixes the air with a small amount of vitalizer oil to minimize wear on the air motor components.
Ram air pressure regulator (14) and gauge (13)	Adjusts to control the air supply to the ram control valve.
Ram control valve (11)	This rotary valve initiates ram movement. Placing the ram control valve in the UP position raises the ram and follower plate. Placing the ram control valve in the DOWN position lowers the ram and follower plate assembly into the material container. Placing the ram control valve in the NEUTRAL position halts ram movement.
Material purge push button (9)	Supplies air to the air motor and allows the pump to purge material or air from the system. Allows you to purge an unloader even if the opposite unloader is active.
Follower plate air blow-off regulator (15)	Has a pre-set 15 psi rating, controls the pressure of the air supplied to the blow-off ball valve.
Follower plate air blow-off pressure relief (12)	If the blow-off air supply raises higher than the pre-set regulator, the air pressure vents through this relief.
Blow-off ball valve (8)	Forces air into the container beneath the follower plate. This relieves any vacuum and helps push the follower plate out of the container.

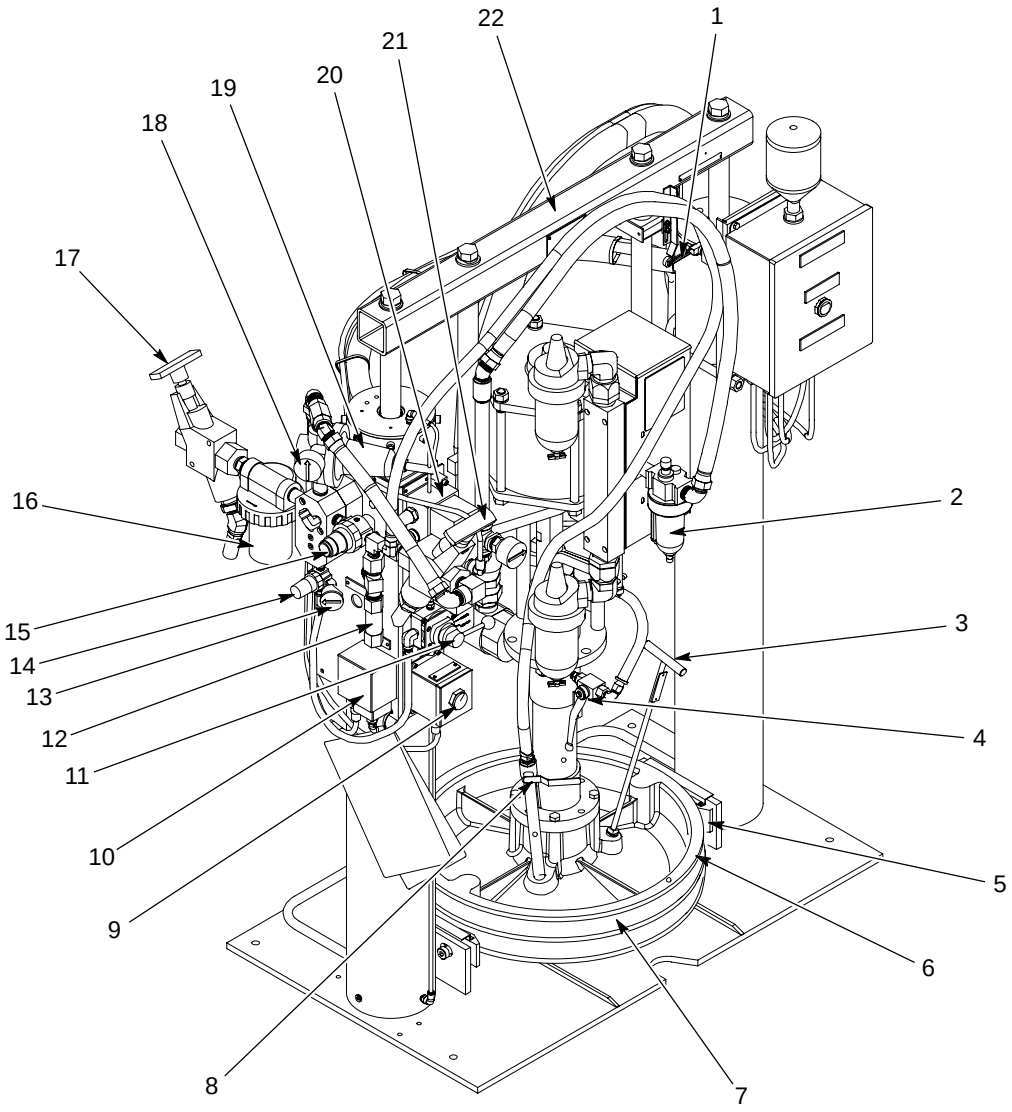

Figure 2 Pneumatic Components

1. Drum-empty limit switch
2. Air motor lubricator
3. Bleeder stem
4. Material bleed ball valve
5. Drum hold down shoes
6. Follower plate
7. Follower plate seals
8. Blow-off ball valve
9. Material purge push button
10. Air pressure switch
11. Ram control valve
12. Follower plate air blow-off pressure relief
13. Ram air pressure gauge
14. Ram air pressure regulator
15. Follower plate air blow-off regulator
16. Filter/separator
17. Master air lockout valve
18. Pump air pressure gauge
19. Pump air pressure regulator
20. Air solenoid valve
21. Air lockout valve
22. Ram

Ram Theory of Operation

See Figure 2.

Air from the ram air pressure regulator (14) flows to the ram control valve (11). The unloader ram has three types of movement: DOWN, UP, and NEUTRAL.

Down

DOWN ram movement is initiated by placing the ram control valve in the DOWN position. Air enters the top of the left cylinder and flows through the upper crossover tube to the top of the right cylinder. Air below the pistons is vented. The air pressure forces the cylinder pistons downward, which lowers the follower plate and pump. Once the follower plate is inside the container, the ram will continue downward and exert force onto the material in the container.

Up

UP ram movement is initiated by placing the ram control valve in the UP position. Air enters the bottom of the left cylinder and flows through the lower crossover tube to the right cylinder. Air above the pistons is vented. The air pressure forces the cylinder pistons upward, which raises the follower plate and pump.

Neutral

WARNING: Do not treat the neutral position as a secure or locked position. Personal injury or equipment damage could result.

An unloader is placed in the NEUTRAL position by placing the ram control valve in the NEUTRAL position. The NEUTRAL position holds the ram in place. In the NEUTRAL position, the frame cylinders do not release pressure. The follower plate should remain stationary, since the air pressure to both sides of the piston is sealed.

Specifications

Following are the specifications for the standard Ford Rhino unloaders.

NOTE: Because of technological or quality improvements, equipment specifications are subject to change without notice.

Air Supply

The customer must supply a single source of 4.8–6.9 bar (70–100 psi) air pressure to power the unloader(s). Contact your Nordson Corporation representative for additional details.

Overall Dimensions

Weight/Mass	US (lb)	Metric (kg)
Weight (approximate)	790	359

Physical Dimensions	US (in.)	Metric (cm)
Height (ram down)	94 with stand	157
Height (ram up)	103	268
Width	56	142
Depth	31	79

Baseplate Mounting Holes (on Center)

Dimensions	US (in.)	Metric (cm)
Width	39	99
Depth	20.5	52

Installation

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

See Figure 3.

Perform the following steps to install the unloaders:

NOTE: If your floor is not level, be sure to level your unloaders before anchoring them to the floor. Operating your unloaders on a surface that is not level can affect ram operation.

1. Position the unloaders to allow access to the controls and follower plate areas. Make sure that the air hoses are protected and can reach between the A-Unit and B-Unit.
2. Anchor the unloaders to the floor.
3. For each unloader:
   a. Close the ram air pressure regulator (14) and the pump air pressure regulator (19). Their gauges (13, 18) should read 0 bar/0 psi. Make sure that the master air lockout valve (17) is closed.
   b. Connect an air supply line to the master air lockout valve ($^{3}/_{4}$-in. NPT inlet valve). Maximum supply air pressure is 7 bar (100 psi). A $^{3}/_{4}$-in. air line with a minimum flow of 175 scfm is required.

CAUTION: Use a hose support to prevent hose damage when the hose is suspended by an overhead tool balancer or similar device. Route the hose in a manner that prevents kinking and abrasion. To prevent kinking, do not bend the hoses more than their minimum bend radius.

   c. The pump outlet fitting is a female $1^{1}/_{4}$ NPTF pipe threads. Connect your material supply hose, using an adapter if necessary, to mate your diameter hose with the pump outlet fitting.
   d. Make sure that the fluid level in the pump solvent chamber cup (See Figure 1, (5)) is 38 mm (1.5 in.) from the top of the chamber. Add K-solvent to the chamber as necessary. Refer to the *Parts* section for K-solvent ordering information.
   e. Fill the air motor lubricator (2) with vitalizer oil. The lubricator capacity is 500 ml (16 fl oz). Refer to the *Parts* section for vitalizer oil ordering information.

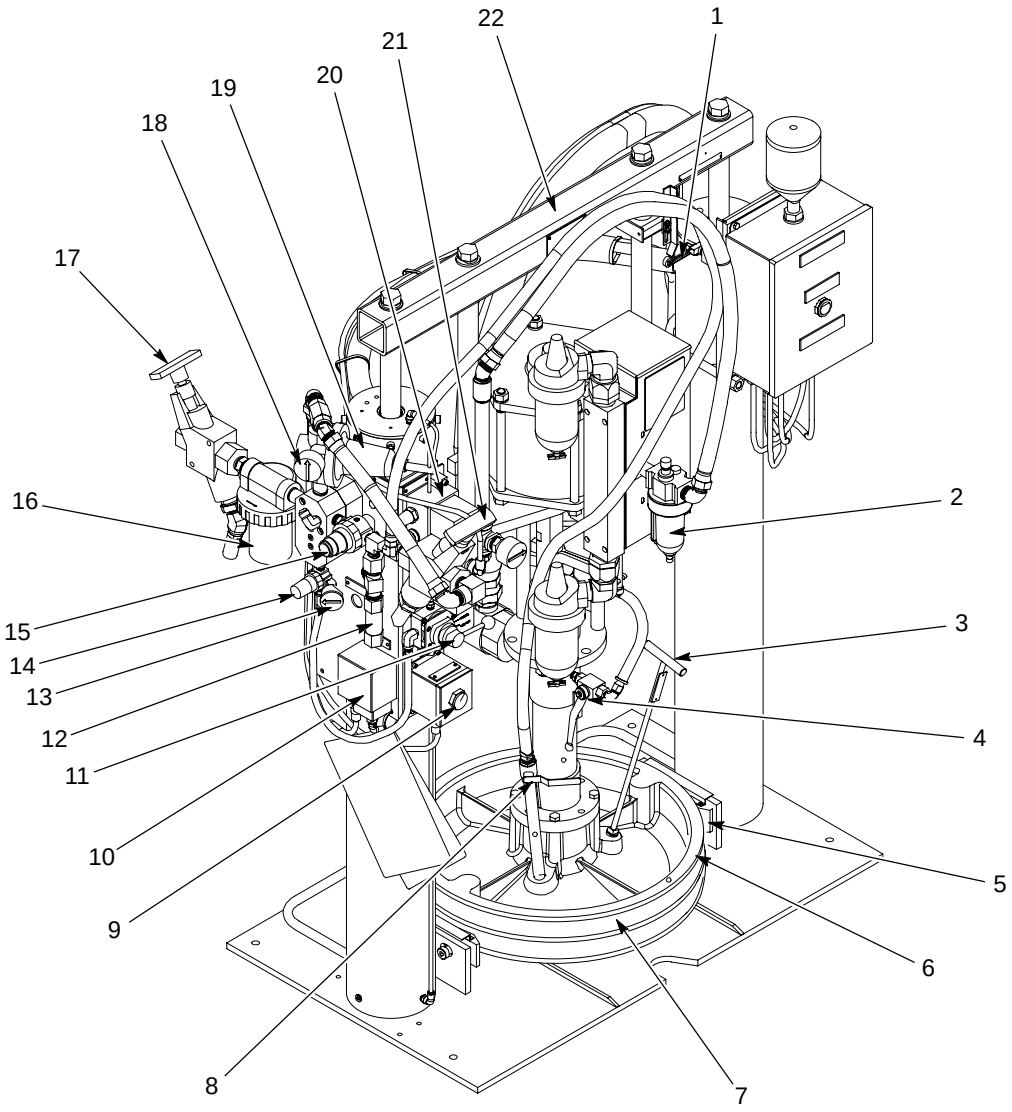

Figure 3 Standard Ford Rhino Components

1. Drum-empty limit switch
2. Air motor lubricator
3. Bleeder stem
4. Material bleed ball valve
5. Drum hold down shoes
6. Follower plate
7. Follower plate seals
8. Blow-off ball valve
9. Material purge push button
10. Air pressure switch
11. Ram control valve
12. Follower plate air blow-off pressure relief
13. Ram air pressure gauge
14. Ram air pressure regulator
15. Follower plate air blow-off regulator
16. Filter/separator
17. Master air lockout valve
18. Pump air pressure gauge
19. Pump air pressure regulator
20. Air solenoid valve
21. Air lockout valve
22. Ram

Auto-Changeover Connections

When two unloaders (an A-Unit and a B-Unit) are used together with an automatic changeover feature, they must be connected together by several air lines and electrical cables. Their hydraulic lines must be attached to the hose/filter stand installed between the A- and B-Units. The primary unit is the A-Unit and the secondary unit is the B-Unit. The main air supply is connected to the A-Unit.

Pneumatic Connections

Pneumatic air lines are factory-installed on the B-Unit and must be connected to the A-Unit. When making the pneumatic connections, match the labels on the air lines to the labels on the fittings.

Refer to the pneumatic schematic provided with your Nordson system documentation or contact your Nordson Corporation representative if you require additional information.

Table 1 Pneumatic Connections

Connect Air Line Marked . . .	To Fitting Marked . . .
BB ($^3/_4$-in. hose for pump air)	BB
Y ($^3/_4$-in. hose for blow-off air)	Y
S ($^1/_2$-in. hose for ram supply air)	S

Electrical Connections

Electrical cables are factory-installed on the A-Unit and must be connected to the B-Unit or filter stand, as specified. When making the electrical connections, match the labels on the cables to the labels on the receptacles.

Table 2 Electrical Connections

Connect Cable Marked . . .	To Connector Marked . . .
B-UNIT LOW/EMPTY	LOW/EMPTY SWITCH (on B-Unit)
B-UNIT PUMP CONTROL VALVE	PUMP CONTROL VALVE (on B-Unit)
B-UNIT PURGE SWITCH	PURGE (on B-Unit)
FILTER	filter connector (on filter stand), if applicable — not marked
B-UNIT PROX. SWITCH	PROX. SWITCH (on B-Unit)
B-UNIT PUMP AIR ON	B-UNIT PUMP AIR ON (on B-Unit pressure switch)

Hydraulic Connections

Hydraulic connections are factory installed on the A-and B-Units and must be connected to the hose/filter stand.

Table 3 Hydraulic Connections

Connect Hose . . .	To . . .
material hoses (installed at A- and B-Unit pump outlets)	fittings on manifold
$^{3}/_{8}$-in. purge hoses (installed on A- and B-Unit bleed valves)	connections on bleeder at hose stand

New Equipment Preparation

NOTE: This procedure applies only to the first-time startup of a new system.

See Figure 3.

1. Verify that all pneumatic connections have been made.
2. Make sure that the air motor lubricator (2) and solvent chamber cup (See Figure 1, (5)) are filled with the proper fluids.
3. Open the master air lockout valve (17).
4. Adjust the pump air pressure regulator (19) setting until the pump air pressure gauge (18) reads 0 bar/psi.
5. Adjust the ram air pressure regulator (14) setting until the ram air pressure gauge (13) reads 1.5–4.0 bar (20–60 psi). You want to adjust the ram air pressure regulator to the minimum air pressure necessary to raise the ram (22). This is achieved by placing the ram control valve (11) in the UP position and turning the ram air pressure regulator until the follower plate (6) starts moving up.

   NOTE: You may need to increase this setting when using high-viscosity material, to apply sufficient down pressure to force material into the pump.
6. Place the ram control valve in the UP position and raise the ram to the top of its travel range.
7. Open the blow-off ball valve (8). Listen for air flow to make sure that the adapter tube is not clogged. Close the valve.
8. Make sure that the air hoses and material delivery hose are not kinked or pinched.
9. Connect your PLC control cable from your system controller to the j-box on the A-Unit.

Adjusting the Drum-Empty Limit Switch

Automatic changeover Rhino bulk unloaders are shipped with the drum-empty limit switch pre-set to stop the follower plate approximately 3.8 cm (1.5 in.) from the bottom of the container of material. The limit switch sends a signal to the PLC, which stops the active unloader and signals the other unloader to begin pumping.

As a safety precaution, verify the drum-empty setting before beginning normal operation of your unloader. You may adjust the drum-empty limit switch setting if the level of material left in an empty container after production is unacceptable (follower stopped too high in the container or stopped too close to the bottom of the container):

WARNING: Use extreme caution if you adjust the drum-empty setting. Follow the procedures and observe the safety precautions in this document. Failure to do so could result in serious personal injury or equipment damage.

See Figure 3.

Locate the drum-empty limit switch (1) to help you locate the areas shown in detail in Figure 4. These areas show the brackets and hardware that are adjusted to make the drum-empty setting.

To move the drum-empty limit switch and adjust the shutdown point:

1. Remove the drum hold down shoes (5).
2. Lower the follower plate (6) to the desired position by using gauge blocks between the base and the bottom of the follower plate.

See Figure 4.

3. Once the follower plate is resting on the gauge blocks at the required height, adjust the drum-empty limit switch (1) so that it is activated at this position:
   a. Loosen the bolts (5) that secure the drum-empty bracket (3) to the pump support rod (4).
   b. Raise the bracket to make the follower plate stop lower in the container. Lower the bracket to make the follower plate stop higher in the container.
   c. Position the wheel on the drum-empty limit switch to be centered on the middle of the angled tip (2) of the drum-empty bracket when the limit switch trips.
   d. Tighten the bolts.

See Figure 3.

4. Raise and lower the follower plate several times to make sure that the drum-empty limit switch is in the proper position. Readjust as necessary.
5. Reinstall the drum hold down shoes.

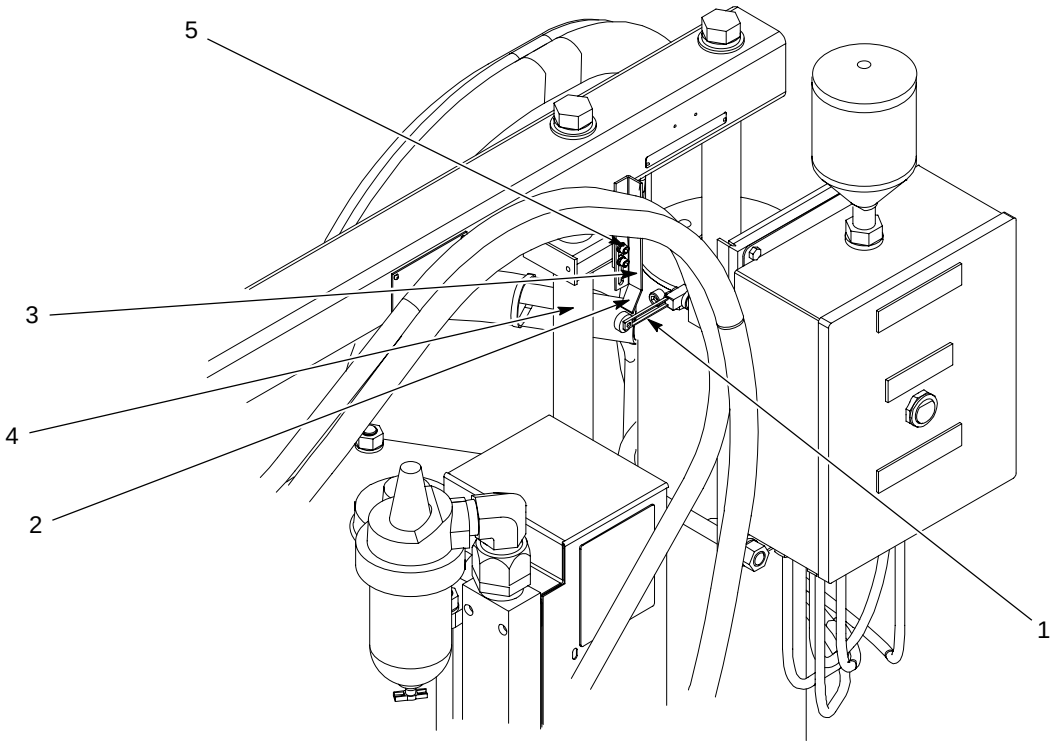

Figure 4 Drum Unloader Settings

1. Drum-empty limit switch
2. Angled tip
3. Drum-empty bracket
4. Pump support rod
5. Bolts

Adjusting the Pump Stroke Proximity Switch

If you have to remove and adjust the placement of the pump stroke proximity switch for any reason, be sure to return the proximity switch to its original position (detecting in the middle of the pump stroke). The top of the proximity switch will be approximately 7 cm (2.75 in.) from the bottom of the air motor mounting plate when properly adjusted.

Operation

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

This section describes new equipment startup, routine operating procedures, and procedures for changing to a different material.

WARNING: Wear protective clothing, goggles, and gloves when operating this equipment.

New Equipment Startup

This procedure applies only to the first-time startup of operation of a new system.

See Figure 5.

1. Load a new container of material. Refer to the *Container Change* procedure in this section or to the operator's card attached to your unit.
2. Make sure that the air lockout valve (21) is open.
3. Make sure that the unloader you are loading with material is active.
   a. At the A-Unit, adjust the pump air pressure regulator (19) until the pump begins to operate. Do not increase pressure beyond the minimum required to cycle the pump. Check the pump air pressure gauge (18) and note the minimum required pressure.
   b. At the unloader you want to operate, the gun must be on and the air lockout valve open.
   c. If the unloader does not begin to operate: At the other unloader, push the drum-empty limit switch (1) to transfer operation back to the inactive unloader.
4. Before continuing, make sure that the hose and gun are secured firmly and that the gun is not pointing at any personnel in the area.
5. Bleed any air from the pump. Follow the procedures in *Bleeding the Pump*, in this section.
6. Bleed all air from the system. Trigger the gun(s) to allow air in the lines to bleed off.

   NOTE: If air is not bled from the gun, the gun may pop and spit when dispensing material.
7. Raise pressure to operating levels. When you reach normal operating pressure, the gun should dispense material smoothly, continuously, and without air bubbles.
8. Adjust the drip rate of the air motor lubricator (2) to one drop of oil for every other pump stroke. Most of the oil that drops in the sight glass returns to the reservoir.

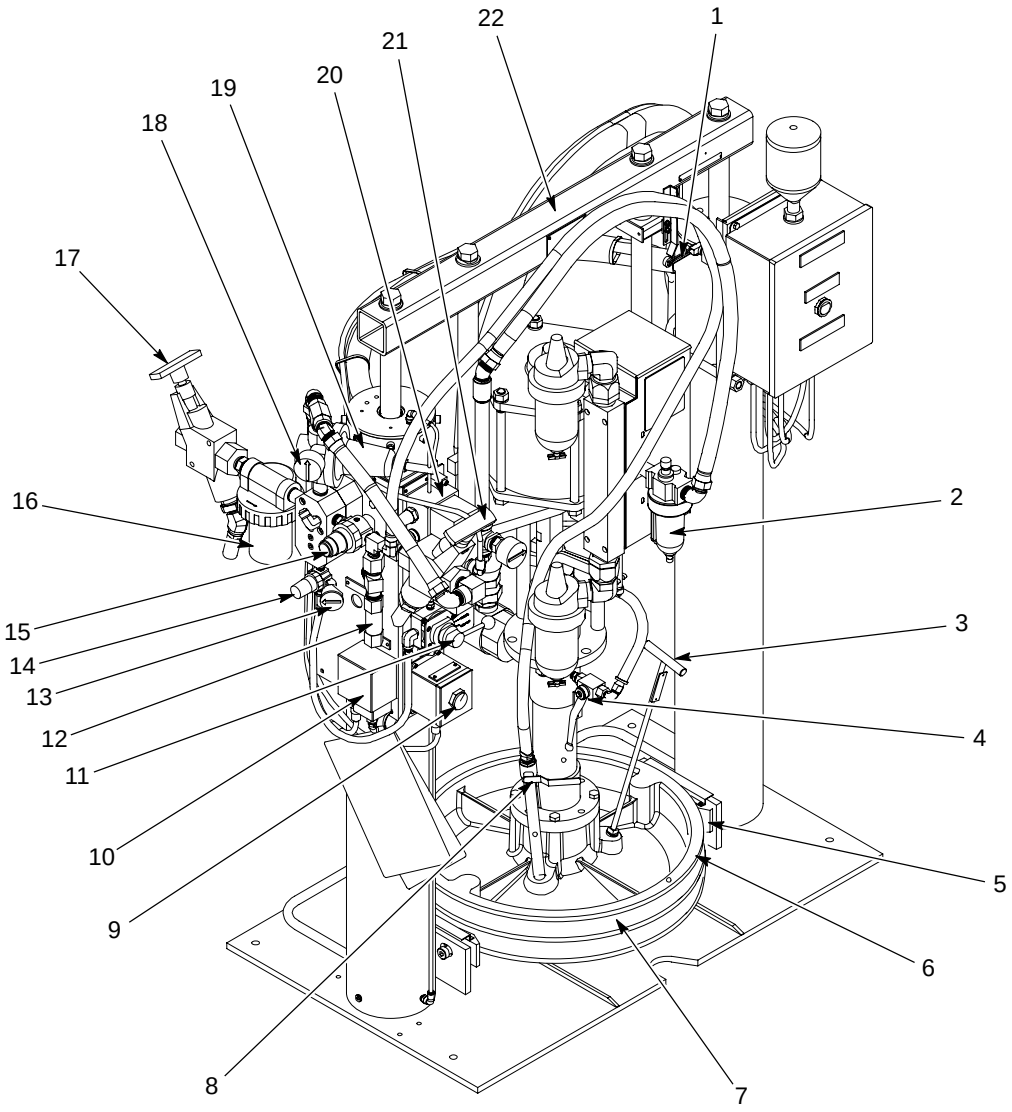

Figure 5 Daily Operation Controls

1. Drum-empty limit switch
2. Air motor lubricator
3. Bleeder stem
4. Material bleed ball valve
5. Drum hold down shoes
6. Follower plate
7. Follower plate seals
8. Blow-off ball valve
9. Material purge push button
10. Air pressure switch
11. Ram control valve
12. Follower plate air blow-off pressure relief
13. Ram air pressure gauge
14. Ram air pressure regulator
15. Follower plate air blow-off regulator
16. Filter/separator
17. Master air lockout valve
18. Pump air pressure gauge
19. Pump air pressure regulator
20. Air solenoid valve
21. Air lockout valve
22. Ram

Routine Operating Procedures

Routine operating procedures include

- ram movement
- daily startup
- forced changeover
- container change
- bleeding the pump
- purging the pump
- shutdown
- restart after shutdown

Ram Movement

See Figure 5 and refer to the following table.

To operate your Rhino bulk unloader, you will initiate UP and DOWN ram movement and place the ram in the NEUTRAL position. The following table provides specific directions for initiating these movements.

WARNING: Do not treat the neutral position as a secure or locked position. Personal injury or equipment damage could result.

To move the ram . . .	Move the ram control valve (11) to the . . .
UP	UP position
DOWN	DOWN position
NEUTRAL	NEUTRAL position

Daily Startup

See Figure 5.

1. Make sure that air pressure to the system is off and that the ram control valve (11) is in the NEUTRAL position.
2. Perform the following steps:
   a. Check for material leaking past the follower plate seals (7). If you see need to replace the seals, refer to the pump manual.
   b. If the container is empty, refer to the *Container Change* procedure in this section.
3. Check the levels of fluid in the solvent chamber cup (See Figure 1, (5)) and air motor lubricator (2). Fill if necessary. Refer to step 6 in the *Installation* section for filling instructions.
4. Verify that the air lockout valve (2) is open.
5. Turn on the master air lockout valve (17) to the unloader.
6. Place the ram control valve in the DOWN position at the designated unit.

   NOTE: If the pump does not pump or the wrong pump is pumping, perform the *Forced Changeover* procedures in this section until the right pump is pumping.
7. Check the air motor lubricator for the desired flow rate (one drop of oil for every other pump stroke). Adjust the drip rate, if necessary.
8. Check the pump operation. Adjust the pump air pressure regulator (19) as necessary for the material you are pumping.
9. Refer to the *Container Change* procedure in this section to replace an empty container with a full one.

Forced Changeover

See Figure 5.

To switch operation from the active unloader when the material container is not empty, perform a forced changeover to start the inactive unloader. The inactive unloader must be ready for operation and the following conditions must be met at the inactive unloader.

The follower plate (6) must be

- in place,
- under downward pressure, and
- in any position other than the drum-empty position.

NOTE: The inactive unloader will not start if in the drum-empty position.

To perform a forced changeover, press down the drum-empty limit switch (1) on the unloader that is pumping. Operation will transfer to the inactive unloader.

Container Change

Not all adhesives and sealants are compatible with each other. Consult the manufacturer of both the old and new materials to determine compatibility. If you are switching from dispensing one material to another, contact your Nordson representative for direction and/or assistance.

Follow these procedures to change a container of material.

Removing the Empty Container

See Figure 5.

1. Close the air lockout valve (21).
2. Place the ram control valve (11) in the NEUTRAL position.
3. Open the blow-off ball valve (8).
4. Place the ram control valve in the UP position. Blow-off air enters below the follower plate (6) and helps you to remove the follower plate from the container.
5. Continue UP ram movement until the follower plate is clear of the container and the ram (22) is raised to its maximum height.

WARNING: Be careful to watch for material spitting from the container when the follower plate is removed from the container. Failure to observe this precaution can result in personal injury.

6. Close the blow-off ball valve.
7. Disengage the drum hold down shoes (5).
8. Remove the empty container from the unloader.
9. Inspect the blow-off port in the bottom of the follower plate and clean as necessary. This is especially important if you use your unloader for urethane applications.

Installing a Full Container of Material

See Figure 5.

CAUTION: Do not use a damaged container. A damaged container can damage the follower plate, follower plate seals, or sealing device when the follower plate is lowered.

1. Carefully inspect the new container for dents or other damage. Do not use a damaged container.
2. Coat the follower plate seals (7) with a lubricant that is compatible both with the seals and with the material being dispensed.

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

3. Place the container of material on the base of the unloader and center it under the follower plate (6).
4. Engage the drum hold down shoes (5).
5. Adjust the ram air pressure regulator (14) until the ram air pressure gauge (13) reads at least 2.1 bar (30 psi).
6. Make sure the blow-off ball valve (8) is closed.
7. Unscrew the bleeder stem (3) from the follower plate to allow any air trapped under the follower plate to escape.

WARNING: Do not lower the follower plate into the container without wearing goggles, gloves, and long sleeved protective clothing. The air expelled when you bleed air from under the follower plate may contain material that could cause injury.

8. Place the ram control valve (11) in the DOWN position and slowly lower the follower plate into the container to force material into the pump section.
9. When you see a continuous flow of material flowing from the bleeder stem fitting, stop DOWN ram movement by placing the ram control valve in the NEUTRAL position.
10. Tighten the bleeder stem securely.
11. Open the air lockout valve (21).

    NOTE: You must bleed the pump every time you change containers.

12. Bleed the pump according to the procedures in *Bleeding the Pump*, in this section.

Bleeding the Pump

See Figure 5.

Material and air are bled from the pump through a hose that is run from the material bleed valve to the filter/hose stand.

NOTE: When the material purge push button is pushed, the pump will stroke but no pump stroke signals will be sent to the 24-pin connector.

NOTE: The bleed stem must be in place when depressurizing the pump.

Perform these steps to bleed the pump:

1. Make sure that a bucket is placed under the bleed tube at the filter/hose stand.
2. Open the material bleed ball valve (4).

NOTE: The material purge push button will activate the pump at any time, even if the opposite unloader is active. When the material purge push button is pushed, the pump will stroke but no pump stroke signals will be sent to the 24-pin connector.

3. Press the material purge push button (9).
4. Leave the material bleed valve open until material flows continuously, without spitting.
5. Close the material bleed ball valve.
6. Further bleed should not be necessary unless the pump is completely empty or at the next container change.

Shutdown

See Figure 5.

1. Place the ram control valve (11) in the NEUTRAL position.

WARNING: When you shut off the air supply valve, the ram is not in a locked state. The ram and follower plate could drift downward and cause personal injury.

2. Turn off the master air lockout valve (17).
3. Relieve material pressure through the material bleed ball valve (4) or by triggering the dispense gun(s).

NOTE: When you shut off the air supply to the unloader, air pressure to the controls is vented to atmosphere. Because of trapped air in the air cylinders, the unloader remains in a neutral and unlocked state and could drift until you turn on the master air lockout valve and deliberately initiate UP or DOWN ram movement.

Restart after Shutdown

To restart operation after a shutdown, perform the *Daily Startup* procedures in this section.

Maintenance

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

Table 4 details the recommended preventive maintenance procedures for the unloader. Additional maintenance procedures are found in the individual component manuals for the pump, air motor, frame, and additional components.

Table 4 Recommended Maintenance Procedures

Frequency	Component	Maintenance Task
Daily	Unloader	Visually inspect the unit. Check all hydraulic and pneumatic connections and tighten them if required. Inspect all pneumatic tubing for bends or kinks.
	Solvent chamber	Check solvent chamber fluid level. Fill if necessary.
	Air motor lubricator	Check air motor lubricator vitalizer oil level. Fill if necessary.
	Electrical junction box light tower	Check for proper bulb operation. The bulb should light when the drum-empty limit switch is tripped.
	Filter/separator (near the air supply inlet)	Drain accumulated water, as required.
	Material filter (on filter stand)	If you have a material filter, check and change the filter element, as needed.
Weekly	Unloader	Inspect the unloader. Clean any material from the top of the follower plate and around the follower plate seals. Clean the top of each unloader cylinder.
	Follower plate seals	Inspect the follower plate seals for damage or signs of excessive material leakage. If you must replace the seals, refer to your pump manual.

Troubleshooting

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

This section contains troubleshooting procedures. These procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Nordson representative for help.

Problem	Possible Cause	Corrective Action
1. Ram not working	Malfunctioning ram air pressure regulator, or damaged ram control valve	Refer to the pneumatic schematics provided in your system documentation. Replace components if necessary.
	Ram air cylinder seals worn or damaged, or piston binding in cylinder	If problem was not solved by your pneumatic troubleshooting with the schematics, rebuild the air cylinders.
2. Blow-off assembly not working	No supply air pressure present	Check air supply. Make sure that the blow-off ball valve is open. Place the ram control valve in the UP position. When the container rises $^1/_2$ inch from the unloader frame, place the ram control valve in the NEUTRAL position so that air can gather under the follower plate.
		If no air flow, proceed to the next step.
	Clogged blow-off adapter tube	Shut off air to the system. Remove blow-off hose and clean adapter tube.
3. Light on tower not lighting when supposed to—at Drum-Empty	Light burned out	Disconnect the leads and apply 24 Vdc to the light. If the light is burned out, replace the light.
	All other problems	Check to see if the drum-empty limit switch is not bent, broken, or out of alignment. If the light is still not lighting, contact your Nordson Corporation representative.

Problem	Possible Cause	Corrective Action
4. Pump not delivering material	Insufficient air pressure to pump	Increase the air pressure to the pump air motor
	Follower plate not in contact with material	Make sure that you have placed the ram control valve in the DOWN position and the ram air pressure regulator is set to its normal operating pressure. The unloader should begin to pump material.
	Air pocket in pump	Carefully bleed the pump. Refer to *Bleeding the Pump* in the *Operation* section.
	Blocked hydraulic system or follower plate	Perform the following steps. 1. Cycle the pump. Open the material bleed valve. If material exits the valve, close the valve and go to step 2. If no material exits the valve, close the valve; shut down the system; relieve system pressure. Remove and rebuild the pump. 2. Shut down the pump. Relieve system pressure. Disconnect the hose from the pump. Check the hose for blockage. If the hose is not blocked, go to step 3. If the hose is blocked, clean or replace the hose. 3. Remove the gun from the hose. Check the gun for blockage. If the gun is blocked, clean it. If the gun is damaged, rebuild or replace the gun as necessary.

Repair

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

This section covers basic procedures for preparing Rhino unloaders for further repair. Refer to the *Operation* section for unloader operating instructions. For dispensing gun, air valve and air motor, pump, and frame repair information, refer to the specific component manuals.

NOTE: Faulty hoses are not field-repairable. You must replace them if they are damaged.

WARNING: Standard Ford Rhino unloaders operate in a dual unloader configuration. You must be aware of the air/hydraulic pressures in both unloaders when servicing. Shut off and lock out various components as directed. Failure to heed this warning may result in serious personal injury or death.

Removing the Hydraulic Section

To perform pump repair procedures (located in the pump manual), you must remove the pump (hydraulic section) from the unloader frame.

Follow these procedures to prepare the system for pump removal:

NOTE: Follow the procedures in the pump manual to remove the follower plate and the hydraulic section from the air motor.

See Figure 6.

1. Bleed the pump to remove material pressure from the pump. Refer to the *Bleeding the Pump* procedure in the *Operation* section.
2. Remove the container of material. Refer to the *Container Change* procedure in the *Operation* section.
3. Place wood blocks on the base of the frame beneath the follower plate (2).
4. Lower the ram until the follower plate makes contact with the wood blocks. Blocks should be high enough to keep the follower plate from contacting the drum hold down shoes (1).
5. Cycle the pump slowly until you can access the air motor to pump coupling.
6. Close the air lockout valve (11).
7. Turn off the master air lockout valve (8).
8. Place and leave the ram control valve (6) in the NEUTRAL position.
9. Refer to your pump manual for further procedures on removing the hydraulic section from the unloader frame.

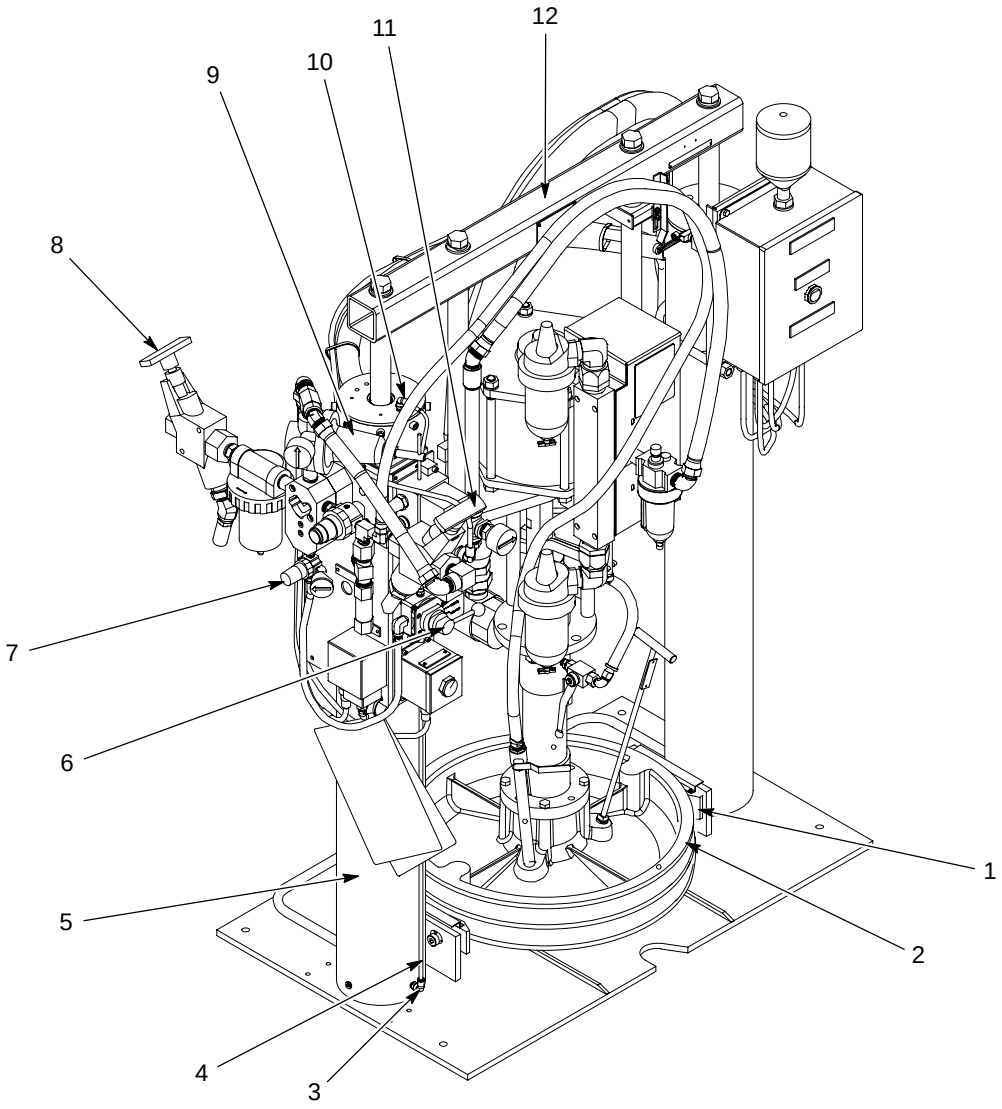

Figure 6 Removing the Hydraulic Section

1. Drum hold down shoes
2. Follower plate
3. Bottom push-lock fitting
4. Air tubing
5. Left air cylinder
6. Ram control valve
7. Ram air pressure regulator
8. Master air lockout valve
9. Pump air pressure regulator
10. Top push-lock fitting
11. Air lockout valve
12. Ram

Bleeding Air Pressure from the Ram Air Cylinders

To prepare the air cylinders for the rebuild procedures located in the frame manual, you must relieve all of the air pressure in the cylinders.

WARNING: The frame air cylinders can stay under pressure even when the unloader is disconnected. Be cautious and aware that air remains in the cylinders. Otherwise, serious personal injury can result.

Follow these procedures to isolate the air cylinders from all air pressure.

See Figure 6.

1. Remove the container of material. Refer to the *Container Change* procedures in the *Operation* section.
2. Place wood blocks on the base of the frame. Refer to steps 3 and 4 of *Removing the Hydraulic Section* for more information.
3. Use the ram control valve (6) to bleed all air from both the top and bottom of the ram pistons. To do this,
   a. Set the ram air pressure regulator (7) and the pump air pressure regulator (9) to 0 bar/psi and disconnect the input air supply from the master air lockout valve (8).

   NOTE: For future reference, note the settings of the ram air pressure regulator and the pump air pressure regulator and the orientation of the cylinder heads.

   b. Place the ram control valve in the UP position until any remaining air bleeds from below the air cylinder piston.
   c. Place the ram control valve in the DOWN position until all air bleeds from above the air cylinder piston.

   NOTE: The ram should not rise at this point when in the UP position.

WARNING: Secure the air tubing when bleeding air. Failure to observe this warning may result in personal injury.

4. One at a time, disconnect the air tubing (4) from the push-lock fittings at the bottom (3) and top (10) of the left cylinder (5). Wait for the air pressure escape.

Reinstating Air Pressure to the Ram Air Cylinders

Follow these procedures to reinstate air pressure to the air cylinders and return your unloader to operation.

See Figure 6.

1. Place the ram control valve (6) in the NEUTRAL position.
2. Connect the air tubing (4) to the top and bottom push-lock fittings (3, 10).

Returning the Unloader to Operation

Follow these procedures to return your unloader to operation.

See Figure 6.

1. Adjust the ram air pressure regulator (7) and the pump air pressure regulator (9) to the settings you noted in step 3 of the *Bleeding Air Pressure from the Ram Air Cylinders* procedure.
2. Reconnect the air supply to the master air lockout valve (8).
3. Remove the wood blocks from beneath the follower plate.
4. Replace the container of material. Refer to the *Container Change* procedures in the *Operation* section.
5. Make sure that the air lockout valve (11) is open.

Parts

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

Using the Illustrated Parts List

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

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

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

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

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

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

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

NOTE: Except for the drum hold down kit, the item numbers in the parts lists and their accompanying illustrations match the item numbers on the system drawings of the A- and B-Unit Rhino bulk unloaders. Rhino bulk unloaders are designed in modules, and the parts list numbering reflects those modules. Contact your Nordson representative if you have any questions.

The following top-level part numbers are documented in this manual:

- 1002937 (A-Unit with 55-Gallon Follower Plate)
- 1002938 (B-Unit with 55-Gallon Follower Plate)
- 1002939 (A-Unit with 30-Gallon Follower Plate)
- 1002951 (B-Unit with 30-Gallon Follower Plate)

Miscellaneous Components

See Figures 8 and 9. Parts are the same for A- and B-Units.

Item	Part	Description	Quantity	Note
1	126726	Hose, high pressure, $^{3}/_{8}$ ID x 12 feet	1	
2	124786	Stem, bleeder, 55-gallon follower	1	A
2	1001827	Stem, bleeder, 30-gallon follower	1	A
NOTE A: Order the appropriate bleeder stem based upon your follower plate size.				

Accessory Kit

This kit is shipped with the unloaders.

Part	Description	Quantity
124747	Accessory group, ship with kit	1
900216	• Oil, vitalizer, 1-gal	1
900256	• Fluid, type K, pump chamber, 1-gal	1
900302	• Grease, high temperature	1

Drum Hold Down Kit

See Figure 7. Drum hold down brackets hold the material container in place during ram UP movement.

Item	Part	Description	Quantity	Note
—	282774	Kit, drum hold down	1	A
1	230607	• Screw, socket head, shoulder	4	B
2	807230	• Spring	4	
3	807231	• Holder, drum	2	
4	807232	• Cover	2	
5	981014	• Screw, pan head, #4-40 x 0.250, steel, zinc	4	
NS	900464	• Adhesive, threadlocking	AR	
6	- - - - - -	Flange, frame assembly	2	C

NOTE A: If your old drum hold down used washers, discard them before installing the new hold down kit.

B: Apply threadlocking adhesive to this part during reassembly.

C: The flanges are part of the frame assembly and are shown for reference purposes only. Only one flange is shown in the figure.

AR: As Required

NS: Not Shown

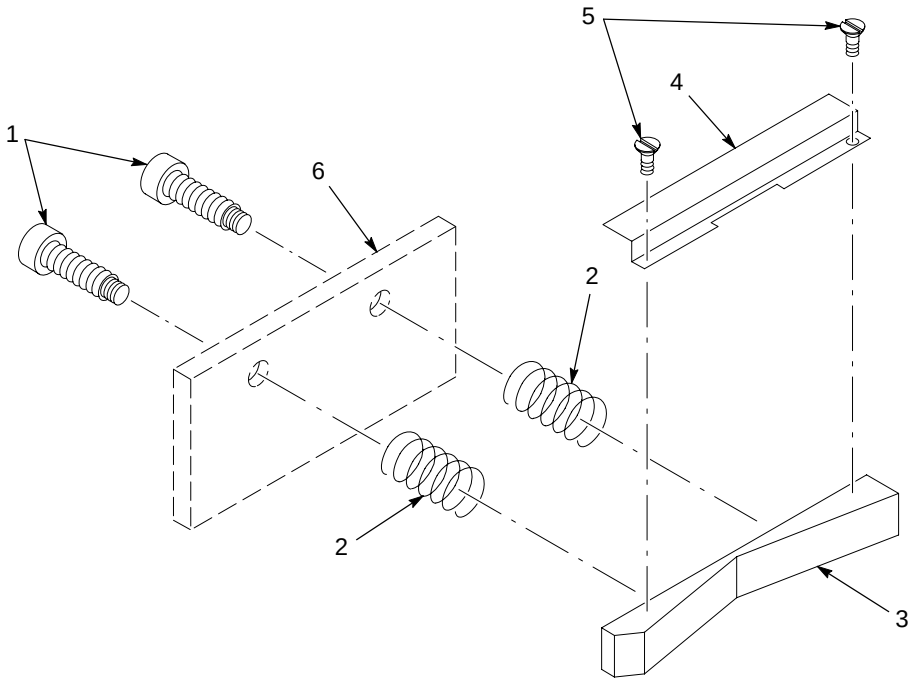

Figure 7 Drum Hold Down Kit

Blow-Off Components

See Figures 8 and 9.

Note that one column lists the A-Unit components and the other column lists the B-Unit components. Quantities of items are the same for both the A- and B-Units unless otherwise noted.

Item	Part	Part	Description	Quantity	Note
—	- - - - - -		Module, blow-off, 15 psi, A-Unit	1	
—		- - - - - -	Module, blow-off, B-Unit	1	
201	973453	973453	• Nipple, steel, schedule 40, 1/2 x 12 long	1	
202	901151	901151	• Valve, ball, 1/2 NPT	1	
203a	972708		• Connector, male, 1/2 hose, 1/2 NPT, barbed	1	
203b		972366	• Adapter, female, 3/4-14 x 1/2-14, zinc	1	
204a	1010727		• Hose, 1/2 in., blue, fire resistant	AR	A
204b		145240	• Hose, 3/4 ID, fire resistant, blue	AR	A
205	973973		• Nipple, hex, 1/2 x 3/8 x 1.625, brass	1	
206	- - - - - -		• Regulator, 15 psi, 3/8 NPT	1	
207	973276		• Tee, pipe, straight, 3/8 x 3/8, brass	1	
208	972255		• Elbow, male, 37, 3/4-16 x 3/8, steel	1	
209	972024		• Connector, female, 1/2 hose, 3/4-16 barbed	1	
210	296406		• Adapter, female, 3/4 NPT x male 3/8 NPT	1	
212	281861		• Tee, pipe, male, 3/4 NPT steel	1	
213	164643		• Valve, relief, 25 psi, 3/4 NPT	1	
218		972852	• Connector, male, 3/4 hose, 3/4 NPT, barbed	1	
219		221926	• Connector, female, SW, 3/4 hose, 3/4 NPS, barbed	1	
NS	900481	900481	• Adhesive, pipe/thread/hydraulic sealant	AR	B

NOTE A: Order the length required for your configuration.

C: Use thread sealant, part 900481, on all pipe threads.

AR: As Required

NS: Not Shown

Pump Control Module Parts

See Figures 8 and 9.

Note that one column lists the A-Unit components and the other column lists the B-Unit components. Quantities of items are the same for both the A- and B-Units unless otherwise noted.

Item	Part	Part	Description	Quantity	Note
—	1003390		Module, pump control, A-unit, 24 V changeover, F	1	
—		1003457	Module, pump control, B-unit, 24 V, changeover, F	1	
304	971265	971265	• Connector, male, $^1/_4$ tube x $^1/_4$ NPT	1	
311	971266	971266	• Elbow, male, $^1/_4$ tube x $^1/_4$ NPT	1	
319	124795	124795	• Fitting, hose, $^3/_4$ barbed x $1^1/_{16}$	3/1	
320	145240	145240	• Hose, $^3/_4$ ID, 200 psi, blue	AR	A
321	972583	972583	• Elbow, male, 37, $1^1/_{16}$-12 x $^3/_4$, steel	1	
322	1003188	1003188	• Valve, pneumatic, 4-way, 24 VDC, $^3/_4$ NPT base	1	
324	973439	973439	• Elbow, male, pipe, hydraulic, $^3/_4$, steel, zinc	1	
325	146223	146223	• Valve, manual lockout	1	
326	973103	973103	• Nipple, steel schedule 40, $^3/_4$, 1.37	1	
329	223481	223481	• Switch, limit	1	
330	981771	981771	• Screw, socket, 10-32 x 1.375, zinc	1	
331	983124	983124	• Washer, lock, e, internal, #10, steel, zinc	4	
332	1003154	1003154	• Switch, purge box, 4-pin Euro, NO, & NC	1	
333	981893	981893	• Screw, socket 10-32 x 0.500, zinc	5	
334	296452		• Controller, J-box, Ford, 24 VDC, SCC	1	
335a	981239		• Screw, hex, $^1/_4$-20 x 0.500, cap, zinc	4	
335b		981906	• Screw, socket, $^1/_4$-20 x 0.750, zinc	2	
336	983141	983141	• Washer, lock, e, internal, $^1/_4$, steel, zinc	8/4	

NOTE A: Order the length required for your configuration.

AR: As Required

Continued...

Item	Part	Part	Description	Quantity	Note
338	984120	984120	• Nut, hex, machined, #10-32, steel, zinc	4	
339	984130	984130	• Nut, hex, heavy, 1/4-20, steel, zinc	8/6	
340	124791	124791	• Gage, 0–160 psig, 1/4 NPT	1	
341	973969	973969	• Cross, pipe, class 150, 3/4, zinc	1	
342	973262	973262	• Bushing, pipe, hydraulic, 3/4 x 1/4, steel, zinc	2	
345	981556	981556	• Screw, socket, 1/4-20 x 1.500, zinc	2	
346	225777	225777	• Switch, pressure, assembly	1	
351	124851	124851	• Muffler, 3/4 NPT, 40 micron	1	
352	973442	973442	• Plug, pipe, socket, flush, 3/4, zinc	2	
355a	1010773		• Hose, 1/4 ID, fire resistant, blue, push-lok	AR	
355b		972254	• Connector, 1/4 x 3/4-16	1	
358	973140	973140	• Elbow, male, 45 d, 3/4 NPT x 1 1/16-12	1	
359	1003452	1003452	• Pipe fitting, schedule 40, nipple, m, 3/4, 12-in. long, steel	1	
360	973541	973541	• Coupling, pipe, hydraulic, 3/4, steel, zinc	1	
361	973407	973407	• Bushing, pipe, hydraulic, 1 1/4 x 3/4, steel	1	
362	- - - - - -	- - - - - -	• Muffler, exhaust, 3/4 NPT	1	
363	973226		• Elbow, pipe, hydraulic, 90, 3/4, steel, zinc	2	
363		186494	• Clamp, hose, 1 ID	2	
364	981989		• Screw, socket, 1/4-20 x 2.375, blue	2	
364		973163	• Elbow, pipe, hydraulic, 45, 3/4 zinc	1	
365		983140	• Washer, lock, e, split, 1/4, steel, nickel	2	
366		973226	• Elbow, pipe, hydraulic, 90, 3/4, steel, zinc	2	
367		981989	• Screw, socket, 1/4-20 x 2.375, blue	2	
NS	900464	900464	• Adhesive, threadlocking	AR	B

NOTE B: Use threadlocking adhesive, part 900464, on all screw threads.

AR: As Required

NS: Not Shown

Ram Control Components

See Figures 8 and 9.

Note that one column lists the A-Unit components and the other column lists the B-Unit components. Quantities of items are the same for both the A- and B-Units unless otherwise noted.

Item	Part	Part	Description	Quantity	Note
—	- - - - - -		Module, ram control, Ford, 24 VDC, A-unit	1	
—		- - - - - -	Module, ram control, Ford, 24 VDC, B-unit	1	
429	973151		• Elbow, pipe, hydraulic, 90, $^1/_4$, steel, zinc	1	
433	971266	971266	• Elbow, male, $^1/_4$ tube x $^1/_4$ NPT	2	
434	981176	981176	• Screw, pan, 10-32 x 1.500, steel, zinc	4	
435	983120	983120	• Washer, lock, e, split, #10, steel, nickel	4	
436	983123	983123	• Washer, flat, e, 0.219 x 0.500, steel, zinc	4	
437	973151	973151	• Elbow, pipe, hydraulic, 90, $^1/_4$, steel, zinc	2	
438	124797	124797	• Valve, rotary, 3-position, $^1/_4$ por	1	
446	984120	984120	• Nut, hex, machined, #10-32, steel, zinc	4	
447	272556	272556	• Muffler, low profile, $^1/_4$ NPT	1	
448	- - - - - -		• Connector, male sw, $^1/_4$ hose, $^1/_4$ NPT, ba	2	
448		973037	• Nipple, hex, $^1/_4$ x $^1/_4$ x 1.45, steel, zinc	1	
NS	900481	900481	• Adhesive, pipe/thread/hydraulic sealant	AR	A

NOTE A: Use thread sealant, part 900481, on all pipe threads.

AR: As Required

NS: Not Shown

Rotary Pneumatics

See Figures 8 and 9.

Note that one column lists the A-Unit components and the other column lists the B-Unit components. Quantities of items are the same for both the A- and B-Units unless otherwise noted.

Item	Part	Part	Description	Quantity	Note
—	- - - - - -		Module, rotary, pneumatic, primary, electric	1	
—		- - - - - -	Module, rotary, pneumatic, secondary, electric	1	
505	973411	973411	• Plug, pipe, socket, flush, $^1/_4$ zinc	5/2	
507	145240	145240	• Hose, $^3/_4$ ID, 200 psi, blue	AR	A
508	124795	124795	• Fitting, hose, $^3/_4$ barbed x $1^1/_{16}$	2	
509	972583	972583	• Elbow, male, 37, $1^1/_{16}$-12 x $^3/_4$, steel	2/1	
510	973109	973109	• Nipple, steel, schedule 40, $^3/_4$, 2.00	3/1	
511	303956	303956	• Lubricator, micro mist, $^3/_4$ NPT	1	
516	971266	971266	• Elbow, male, $^1/_4$ tube x $^1/_4$ NPT	2	
519	973252		• Nipple, hex, $^3/_4$ x $^3/_4$ x 1.96, steel, zinc	1	
520	124798		• Filter, $^3/_4$ NPT, 16-oz, 250 psi	1	
522	282777		• Manifold, air supply	1	
523	124800		• Regulator, $^3/_4$ NPT, 0–125 psi	1	
524	124791		• Gage, 0–160 psig, $^1/_4$ NPT	1	
527	973140		• Elbow, male, 45 d, $^3/_4$ NPT x $1^1/_{16}$-12	1	
529	972255		• Elbow, male, 37, $^3/_4$-16 x $^3/_8$, steel	1	
530	982039		• Screw, socket, M8 x 55, bl	2	
533	973037		• Nipple, hex, $^1/_4$ x $^1/_4$ x 1.45, steel, zinc	1	
534	901245	901245	• Gage, pressure, 0–100 psi, 0–7 bar	1	
534		124790	• Gage, 0–160 psig, $^1/_8$ NPT	1	
NOTE A: Order the length required for your configuration.					

Continued...

Rotary Pneumatics *(contd)*

Item	Part	Part	Description	Quantity	Note
535	973187		• Elbow, pipe, hydraulic, 45, $^1/_8$, zinc	1	
536	126767	126767	• Regulator, air, 0–60, $^1/_4$ NPT	1	
537	982049		• Screw, hex, cap, M8 x 25, bl	2	
538	983013		• Washer, flat, M, reg, 8, steel, zinc	2	
539	282779		• Spacer, manifold	1	
541	238264		• Tee, male, branch, auto, $^3/_4$, steel	1	
542		1010727	• Hose, $^1/_2$ in., blue, fire resistant	AR	A
543		972024	• Connector, female, $^1/_2$ hose, $^3/_4$-16, barbed	2	
555	1010810	1010810	• Tubing, $^1/_4$ OD polyethylene, flame resistant	AR	A
556		186507	• Cover, hose, 8 wide x 9-ft long	1	
558	983404		• Washer, lock, m, split, M8, steel, zinc	2	
NS	900481	900481	• Adhesive, pipe/thread/hydraulic sealant	AR	B
NS	900464	900464	• Adhesive, threadlocking	AR	C

NOTE A: Order the length required for your configuration.

B: Use thread sealant, part 900481, on all pipe threads.

C: Use threadlocking adhesive, part 900464, on all screw threads.

AR: As Required

NS: Not Shown

Drum-Empty Limit Switch

See Figures 8 and 9.

Note that one column lists the A-Unit components and the other column lists the B-Unit components. Quantities of items are the same for both the A- and B-Units.

Item	Part	Part	Description	Quantity	Note
—	- - - - - -		Module, bracket limit, A-unit, electric changeover	1	
—		- - - - - -	Module, bracket limit, B-unit, electric changeover	1	
1401a	296490		• Bracket, limit, J-box, 24 VDC	1	
1401b		296506	• Bracket, limit switch	1	
1402	982035	982035	• Screw, socket, M8 x 16, bl	2	
1403	983013	983013	• Washer, flat, M, reg, 8, steel, zinc	2	
1408	186549	186549	• Stop, empty drum, CE pail	1	
1409	982372	982372	• Screw, socket, M5 x 12, bl	2	
1410	983401	983401	• Washer, lock, M, split, M5, steel, zinc	2	
1411	983035	983035	• Washer, flat, M, reg, 5, steel, zinc	2	
1412	282785	282785	• Clamps, $1^{1}/_{2}$ ID	1	
1413	230566	230566	• Bracket, rotary drum limit switch	1	
1430	981478		• U-bolt, 6-in. pipe, with nuts	1	
1431	983440		• Washer, lock, e, split, $^{5}/_{8}$, steel, nickel	2	
NS	900439	900439	• Adhesive, threadlocking	AR	A

NOTE A: Use threadlocking adhesive, part 900439, on all screw threads.

AR: As Required

NS: Not Shown

Pneumatic Support Modules

See Figures 8 and 9.

The pneumatic support module is identical for both the A- and B-Units.

Item	Part	Description	Quantity	Note
—	1005620	Module, support, pneumatic A, electric	1	
1501	1003187	• Bracket, pneumatic controls, A-unit, Ford	1	
1502	981402	• Screw, hex, $^3/_8$-16 x 1.000, cap, zinc	4	
1503	983061	• Washer, flat, e, 0.406 x 0.812 x 0.065, zinc	4	
1504	983160	• Washer, lock, e, split, $^3/_8$, steel, nickel	4	
NS	900464	• Adhesive, threadlocking	AR	A
NOTE A: Use threadlocking adhesive, part 900464, on all screw threads. AR: As Required NS: Not Shown				

Pneumatic Manual Shut-Off Module

See Figure 8.

This module controls main air supply into the unloaders and is installed on the A-Unit only.

Item	Part	Description	Quantity	Note
—	- - - - - -	Module, pneumatic, shut-off, E-stop	1	
1701	146223	• Valve, manual lockout	1	
1702	973407	• Bushing, pipe, hydraulic, $1^1/_4$ x $^3/_4$, steel	1	
1703	973163	• Elbow, pipe, hydraulic, 45, $^3/_4$, zinc	1	
1704	- - - - - -	• Muffler, exhaust, $^3/_4$ NPT	1	
NS	900481	• Adhesive, pipe/thread/hydraulic sealant	AR	A
NOTE A: Use thread sealant, part 900481, on all pipe threads. AR: As Required NS: Not Shown				

Check Valve

See Figures 8 and 9.

The pump stroke proximity switch module is identical for both the A- and B-Units.

Item	Part	Description	Quantity	Note
—	221941	Module, check valve, $1^1/_4$ NPT	1	
1901	124935	• Valve, check, ball, $1^1/_4$ NPTF	1	
1903	322822	• Pipe fitting, $1^1/_4$ m x $1^1/_4$ f, steel, zinc	1	
NS	900481	• Adhesive, pipe/thread/hydraulic sealant	AR	A
NOTE A: Use thread sealant, part 900481, on all pipe threads. AR: As Required NS: Not Shown				

Pump Stroke Proximity Switch Module

See Figures 8 and 9.

The pump stroke proximity switch module is identical for both the A- and B-Units.

Item	Part	Description	Quantity	Note
—	- - - - - -	Module, pump stroke, sensor, induct	1	
2001	223492	• Switch, proximity, 3-wire, DC	1	
2002	295803	• Clamp, 1-in. tube	1	
2003	296498	• Bracket, sensor pump stroke	1	

Exhaust Components

See Figures 8 and 9.

The exhaust components are identical for both the A- and B-Units. Each unloader has two reclassifier modules installed.

Item	Part	Description	Quantity	Note
—	- - - - - -	Module, exhaust, reclassifier	2	
2101	295796	• Muffler, reclassifier, 1 NPT	1	
2102	295797	• Connector, swivel, $1^1/_4$ FJIC x $1^1/_4$ m	1	
2103	295798	• Elbow, male, 37, $1^5/_8$-12 x 1 NPTF-16	1	

Standard Ford Rhino Bulk Unloaders, A-Units

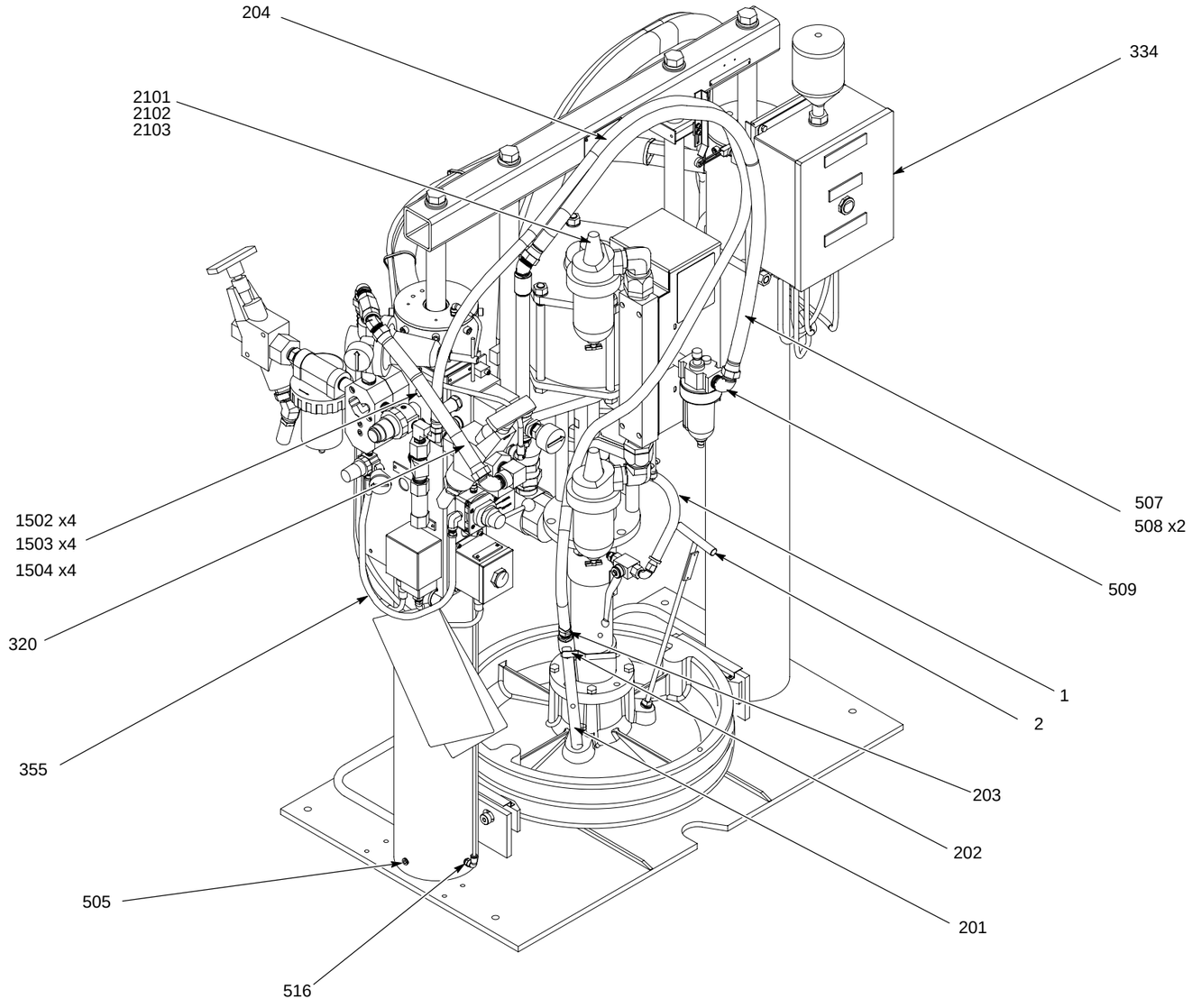

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Figure 8 Standard Ford Rhino Bulk Unloaders, A–Units (1 of 4)

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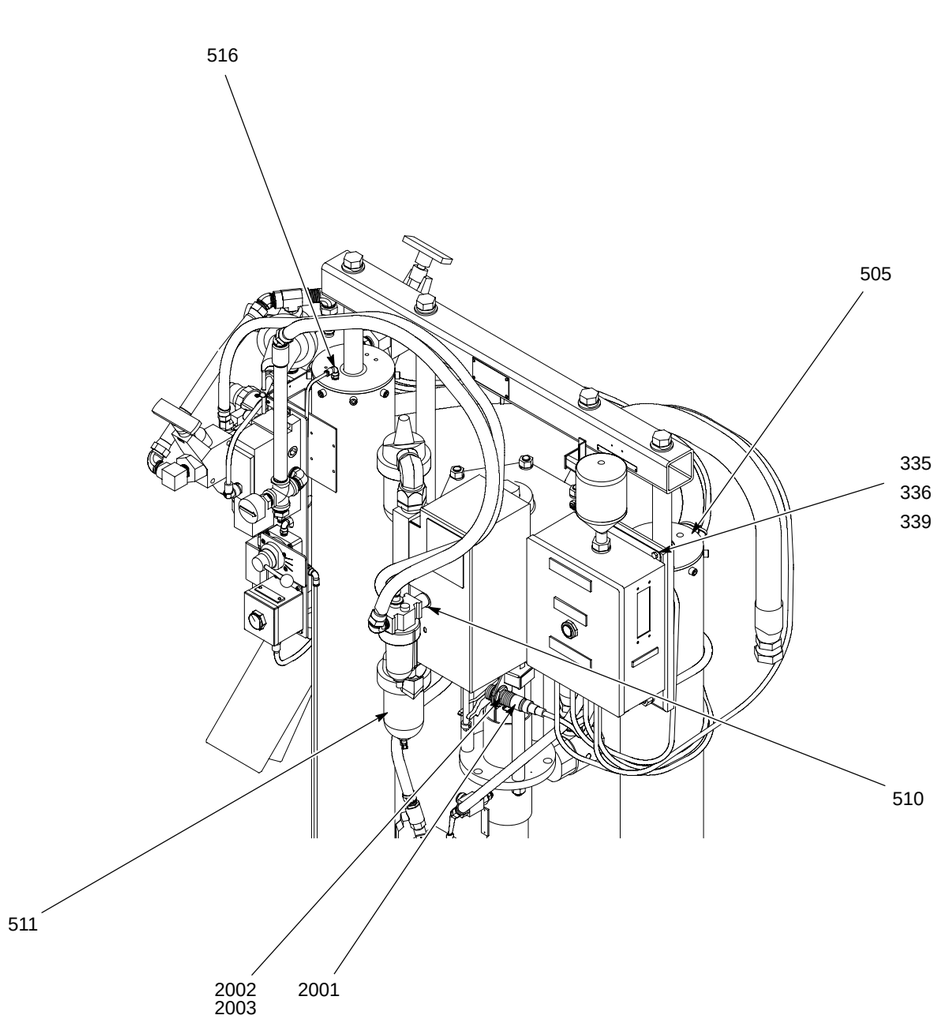
Standard Ford Rhino Bulk Unloaders, A-Units *(contd)*



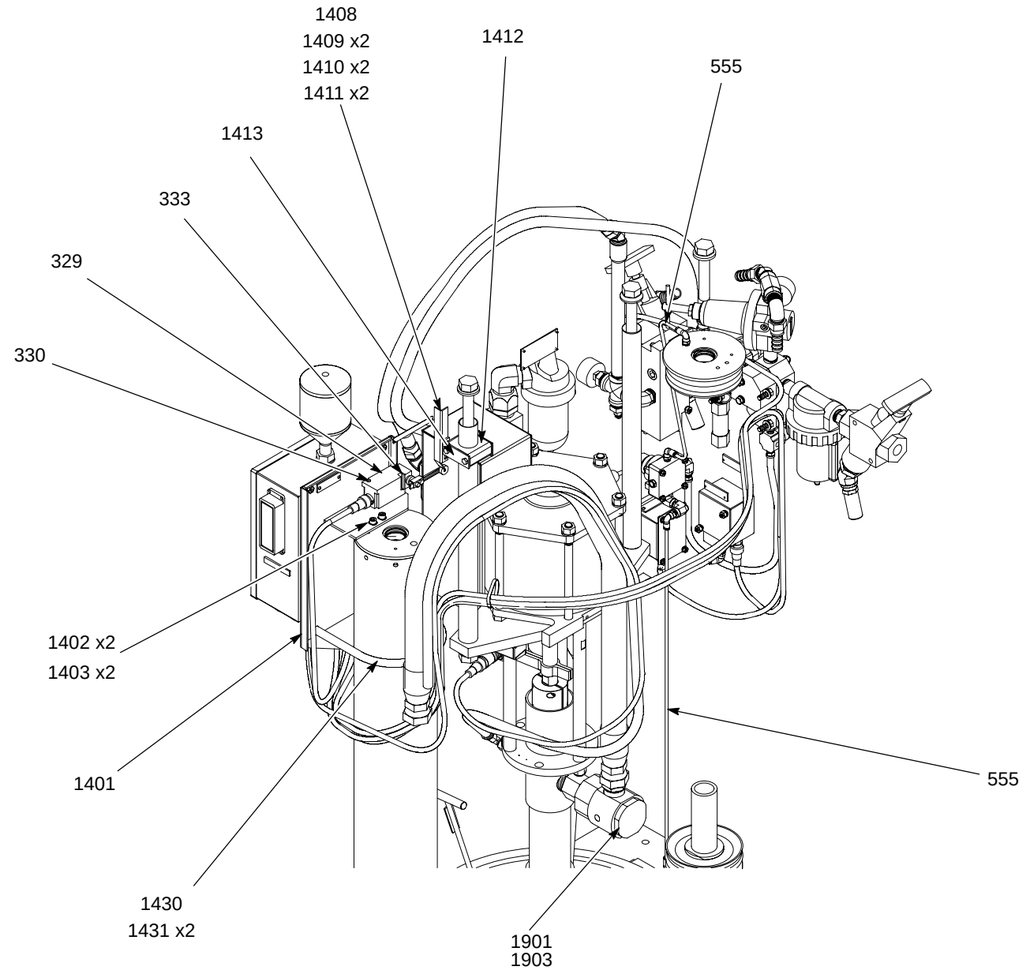


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Figure 8 Standard Ford Rhino Bulk Unloaders, A–Units (2 of 4)

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Standard Ford Rhino Bulk Unloaders, A-Units *(contd)*

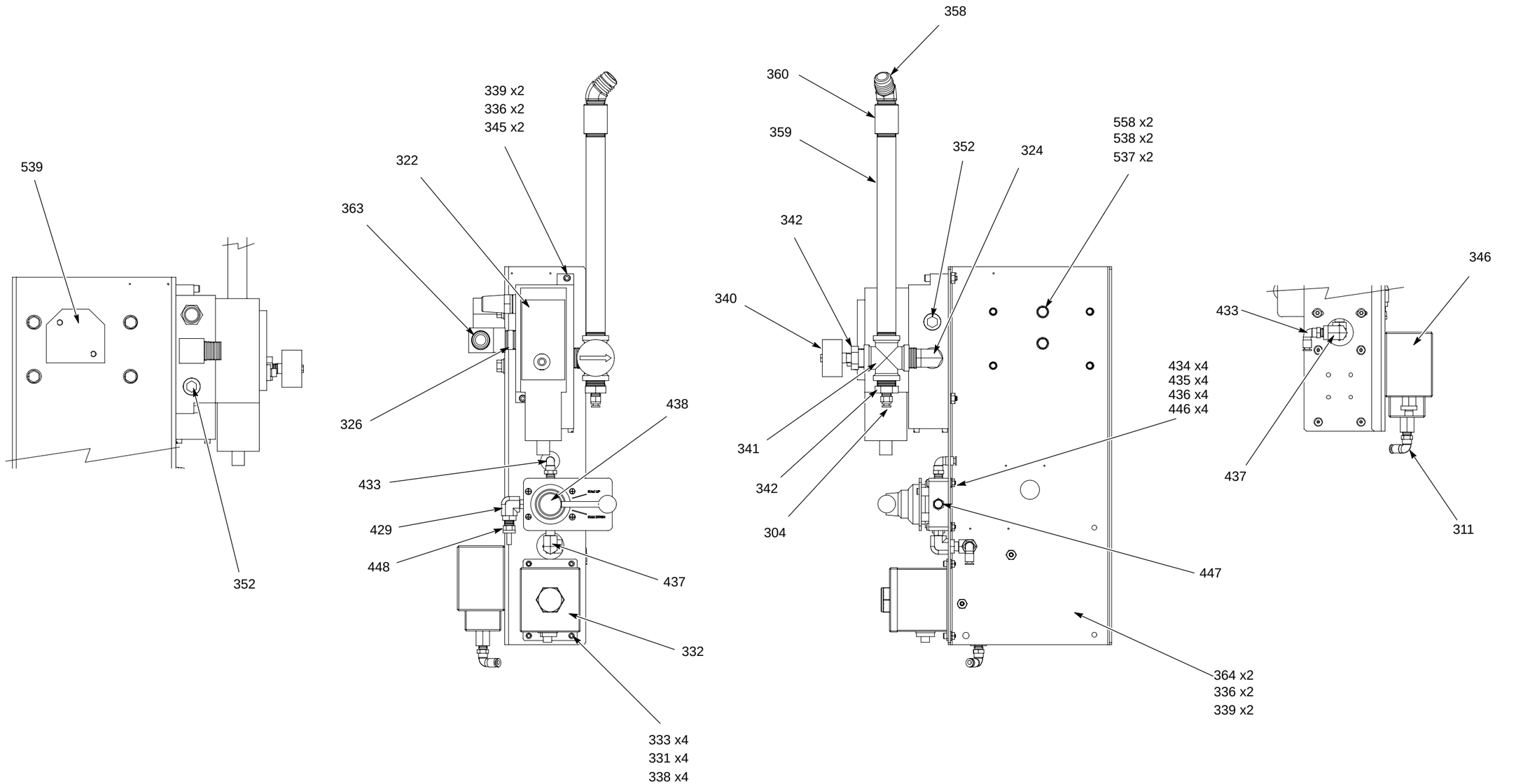

Figure 8 Standard Ford Rhino Bulk Unloaders, A–Units (3 of 4)

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Standard Ford Rhino Bulk Unloaders, A-Units *(contd)*

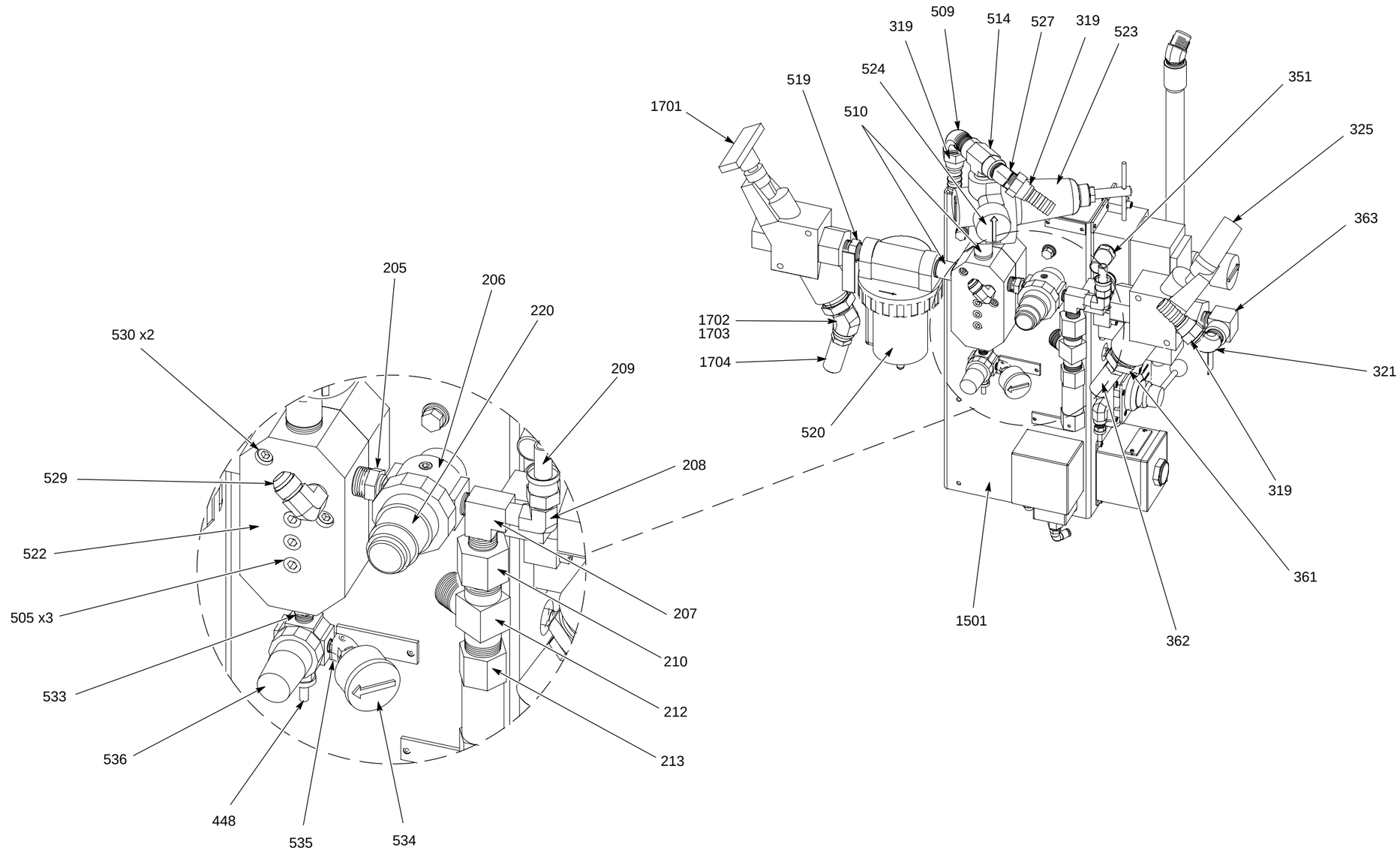

Figure 8 Standard Ford Rhino Bulk Unloaders, A–Units (4 of 4)

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Standard Ford Rhino Bulk Unloaders, B-Units

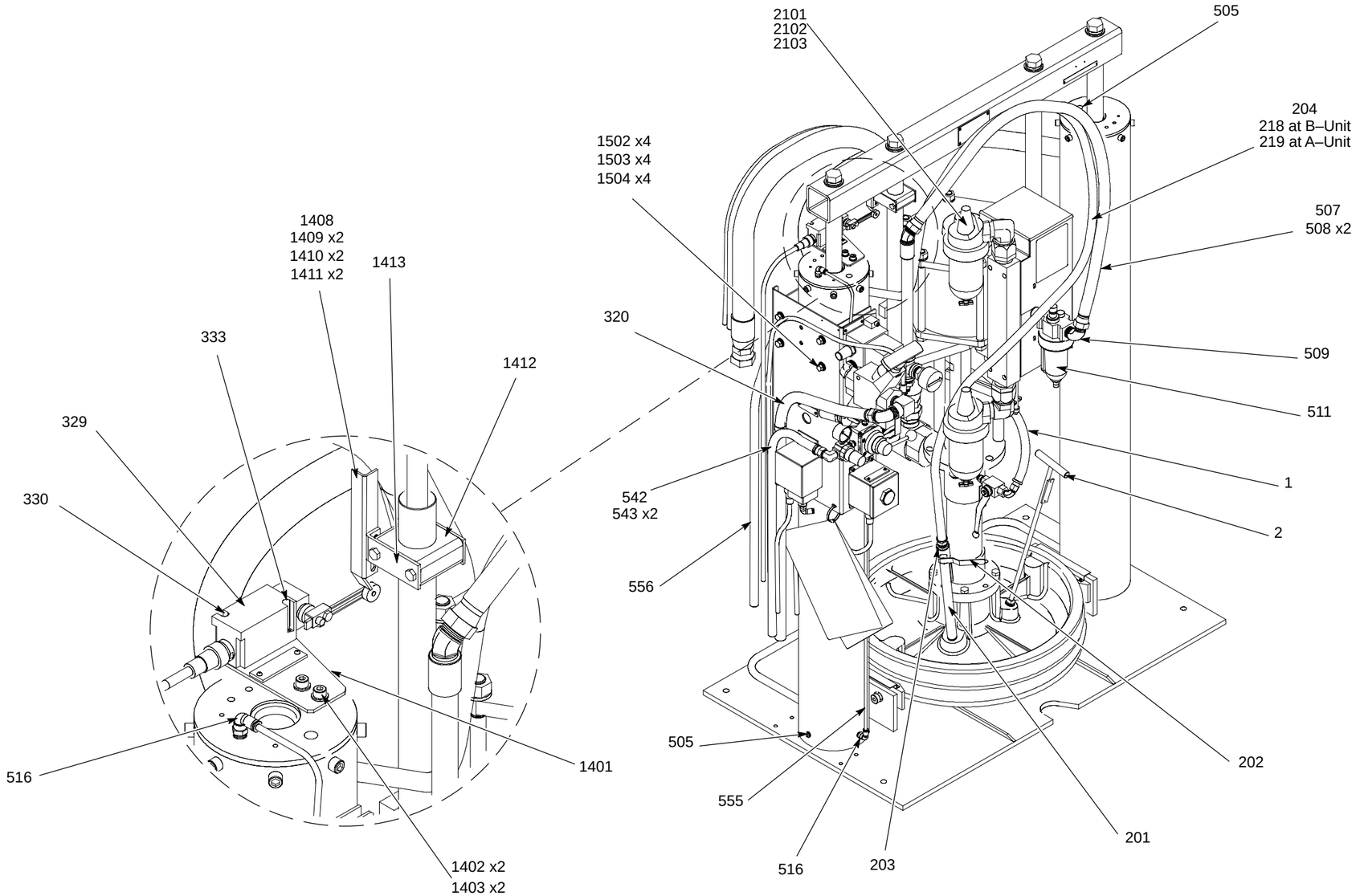

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Figure 9 Standard Ford Rhino Bulk Unloaders, B–Units (1 of 3)

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Standard Ford Rhino Bulk Unloaders, B-Units *(contd)*

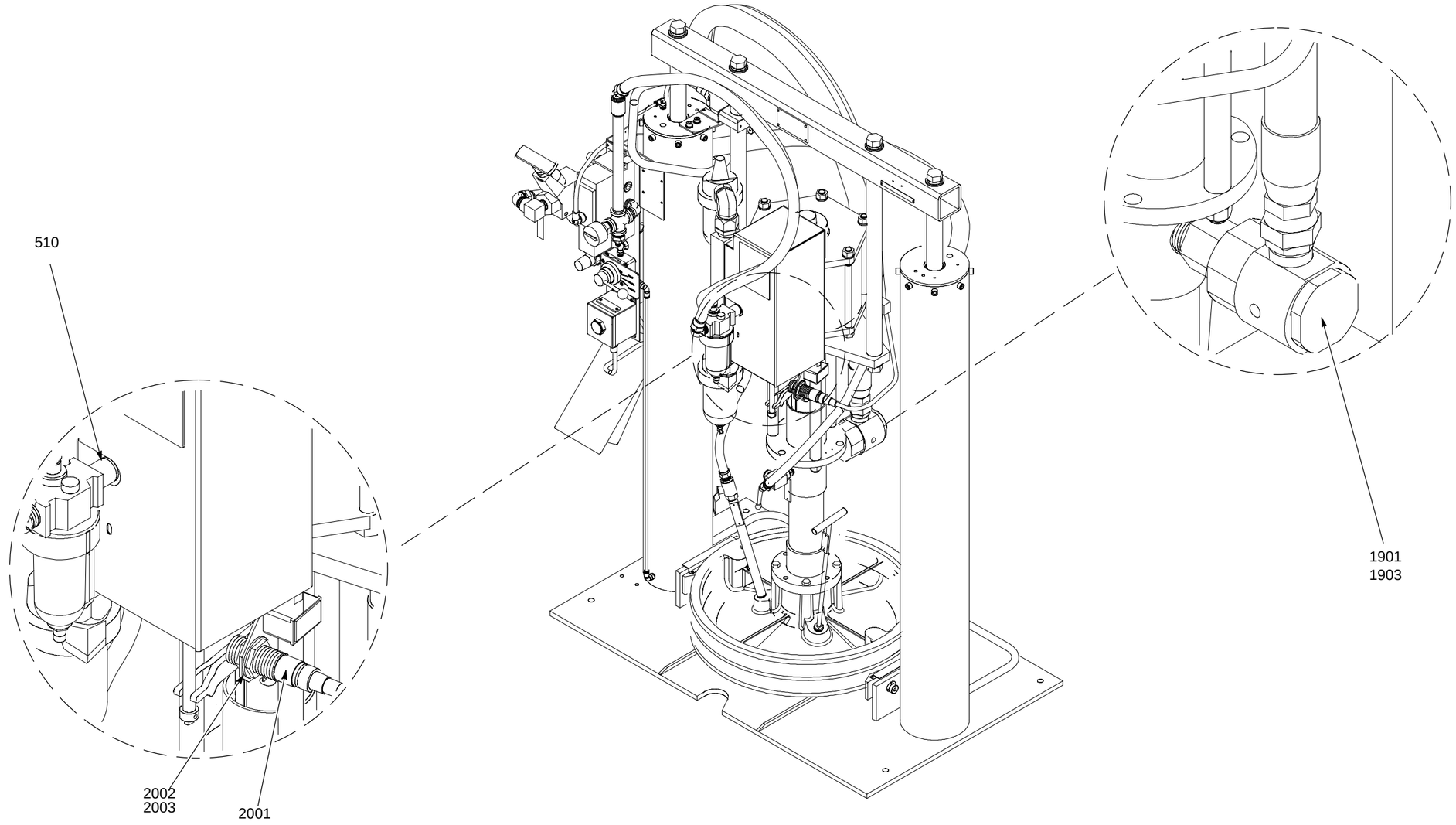

Figure 9 Standard Ford Rhino Bulk Unloaders, B–Units (2 of 3)

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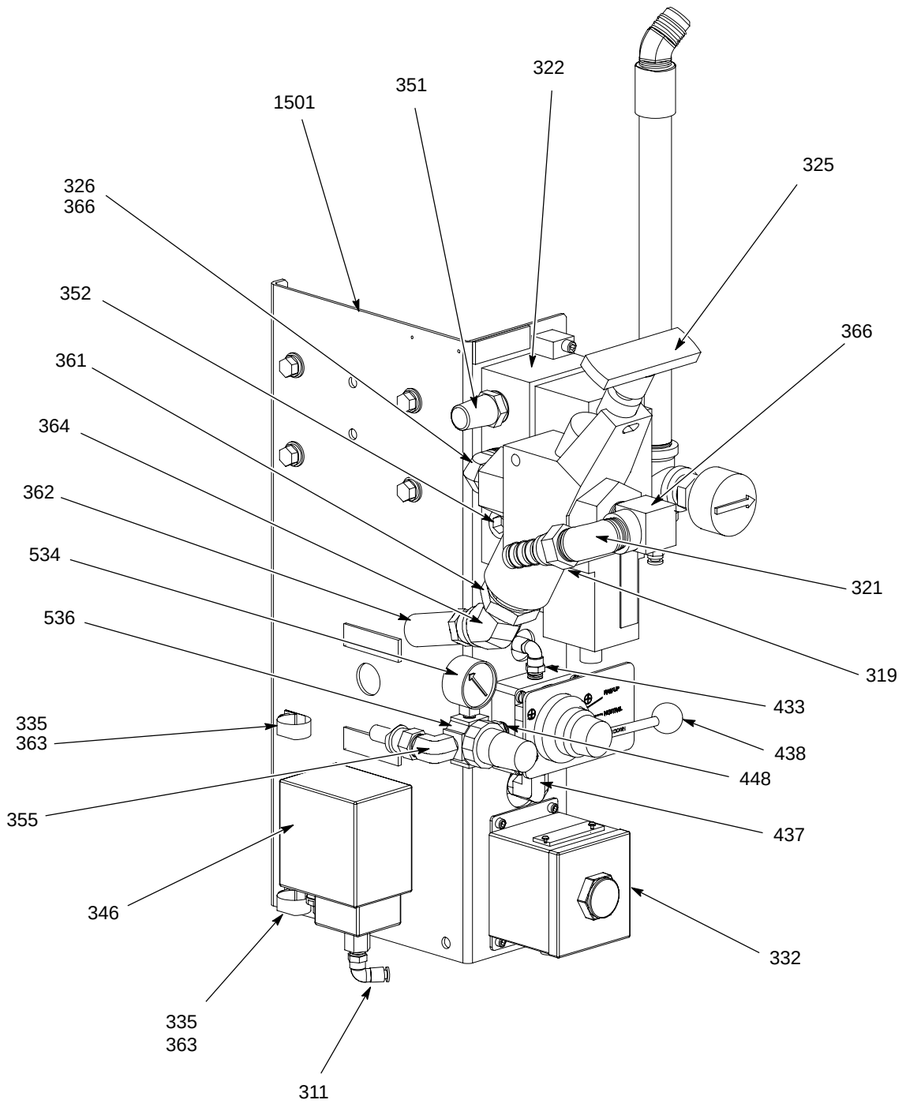
Standard Ford Rhino Bulk Unloaders, B-Units *(contd)*



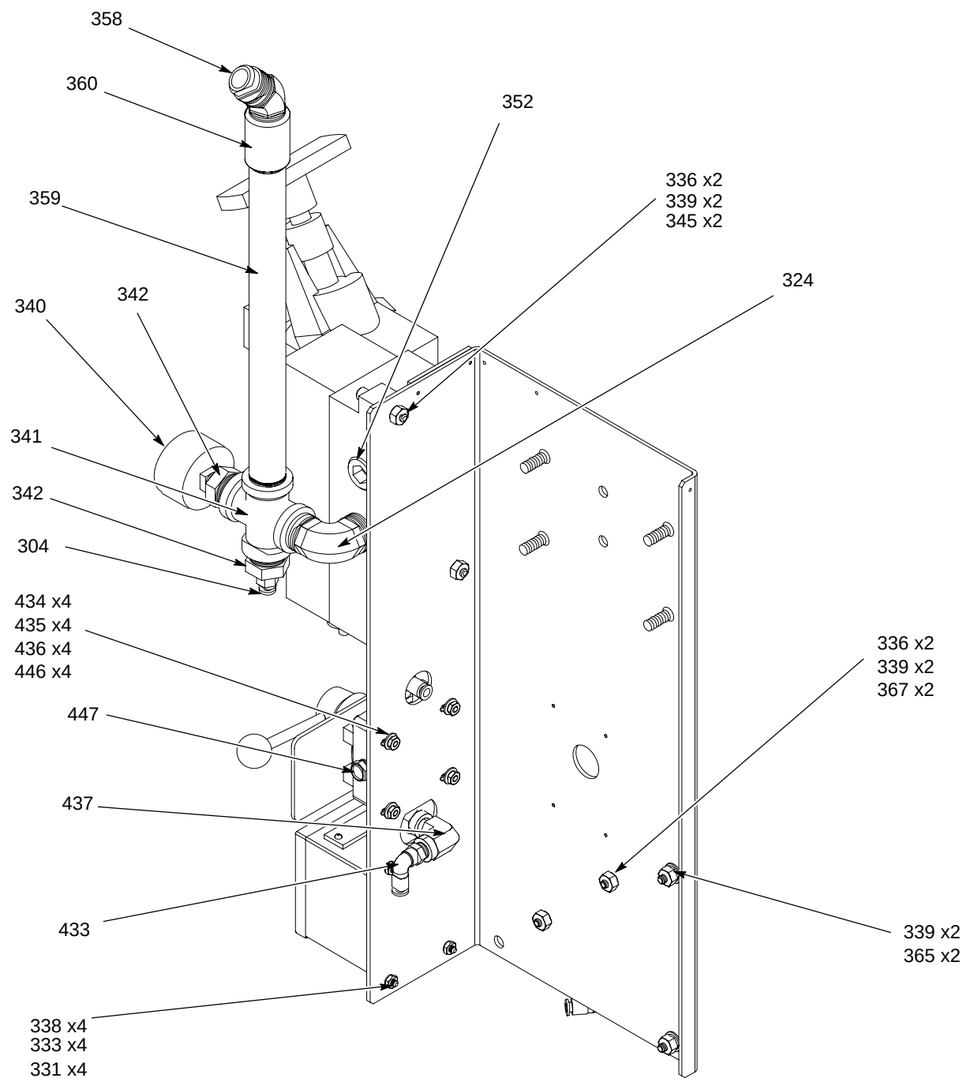


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Figure 9 Standard Ford Rhino Bulk Unloaders, B–Units (3 of 3)

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