

VR60RD/VR72RD/VR96RD Vertical Reciprocators

Customer Product Manual

Part 1070452A02

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**For parts and technical support, call the
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VR60RD/VR72RD/VR96RD

Vertical Reciprocators

Safety

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

Make sure all equipment documentation, including these instructions, is accessible to all persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

All phases of equipment installation must comply with all federal, state, and local codes.

Personal Safety

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing any moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Grounding



WARNING: Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

Grounding inside and around the booth openings must comply with NFPA requirements for Class II Division 1 or 2 Hazardous Locations. Refer to NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

Disposal

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

Description

This manual covers the VRnnRD series of vertical reciprocators. These reciprocators are available with stroke lengths (nn) of 60, 72, and 96 inches (1524, 1829, and 2438 mm).

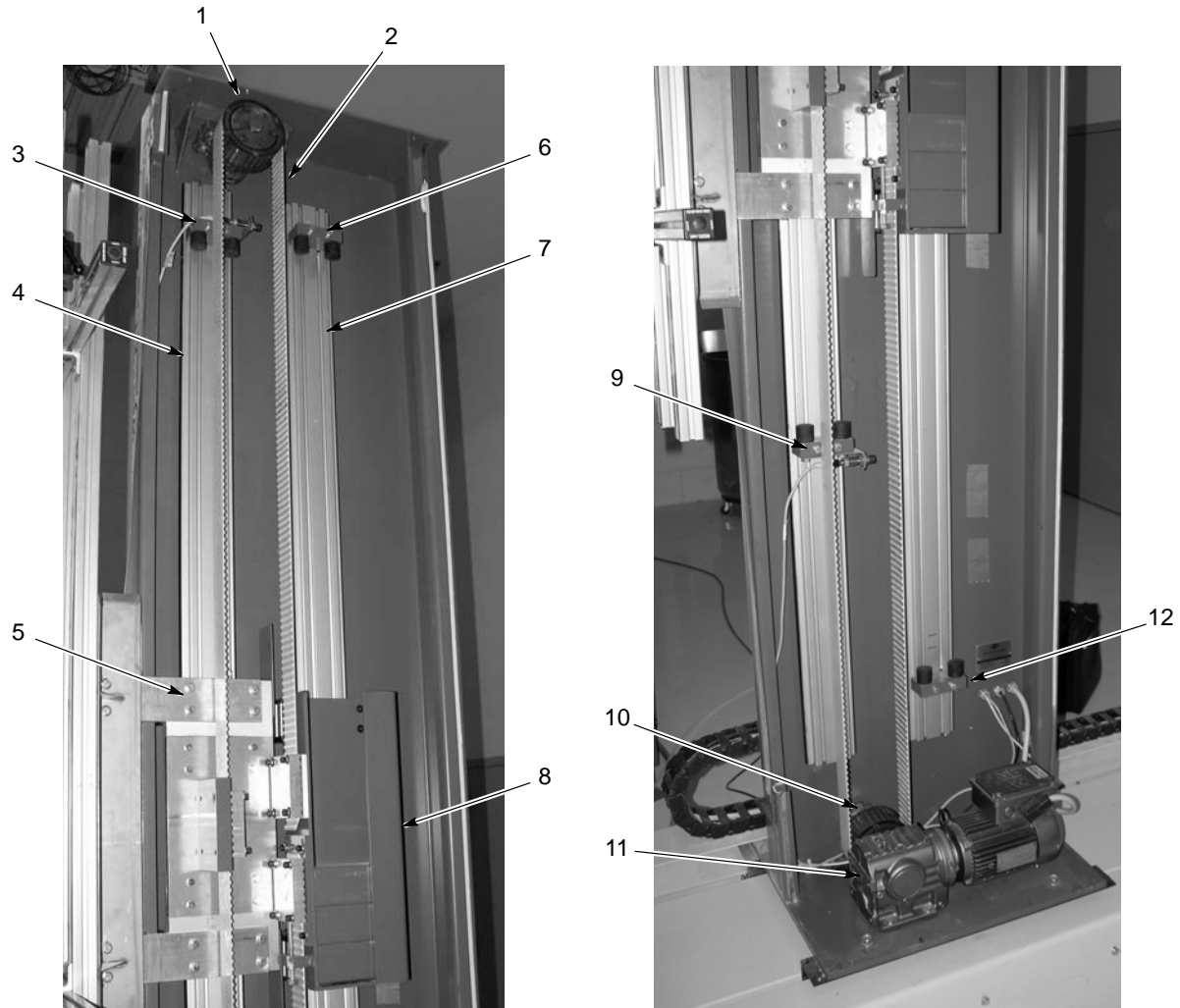


Figure 1 Reciprocator with cover removed, mounted on in/out positioner

- | | | |
|---------------------------------|-----------------------------|------------------------------------|
| 1. Idler pulley | 5. Gun carriage | 9. Bottom carriage bumper assembly |
| 2. Drive belt | 6. Top counterweight bumper | 10. Bottom pulley and encoder |
| 3. Top carriage bumper assembly | 7. Counterweight rail | 11. Gearmotor |
| 4. Carriage rail | 8. Counterweight carrier | 12. Bottom counterweight bumper |

Specifications

Operating voltage:	Customer specific, see motor ID plate.
Operating frequency:	13-70 Hz
Operating speeds:	9.144-50.292 mpm (30-165 fpm)
Maximum load:	54.43 kg at 50.292 mpm (120 lbs at 165 fpm)
Dimensions	
Height:	VR60RD 2636.8 mm (103- ¹³ / ₁₆ in.) VR72RD 2941.6 mm (115- ¹³ / ₁₆ in.) VR96RD 3551.2 mm (139- ¹³ / ₁₆ in.)
Width (column):	1219.2 mm (48 in.)
Width (w/gun arm):	1416 mm (55.75 in.)
Depth:	381 mm (15 in.)
Base (L x W):	609.6 x 508 mm (24 x 20 in.)
Belt Tension:	Deflect 43.9 mm (1.73 inches) under 5.44 kg (12 lbs) of force

Installation



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



WARNING: Reciprocators can weigh as much as 680 kg (1500 lbs). Use appropriate lifting equipment to install the reciprocator. To avoid damaging the reciprocator, use the lifting lugs provided.

Mounting

Reciprocators are typically installed on manual or automatic in/out positioners or bolted to the floor or a fixed stand.

Four mounting holes are provided in the base. Use these holes, or drill new holes if necessary, and use appropriately sized fasteners to securely mount the reciprocator.

Side Cover Removal

Remove the bolts securing the bottom of the side cover to the base. Two pins in the frame flange hold the top of the cover in place. Pull out on the bottom of the cover until the pins clear the holes in the cover and remove the cover from the reciprocator.

Electrical

Remove the cover and check the gearmotor ID plate to ensure that the correct voltage is being supplied to the motor.

Connect the power (gray), encoder (black), and limit switch cables (yellow) to the reciprocator control panel terminal strip. Refer to the control panel drawings shipped with your system manuals for connections.

Use appropriately sized dust-tight or liquid-tight strain reliefs or conduit connectors in all enclosure and control panel knockouts. If the reciprocator is mounted on an in/out positioner, use a flexible cable carrier to protect the cables.

Gearmotor Lubrication

Replace the pipe plug at the top of the housing with the breather plug shipped with the reciprocator. If the plug has a black rubber seal, remove it.

Remove the pipe plug from the side of the gear reducer housing and check the oil level. The oil should be up to the bottom of the tapped fill hole. If it is not, remove the breather plug and fill the housing with the oil specified in Maintenance on page 9. Replace both plugs when done.

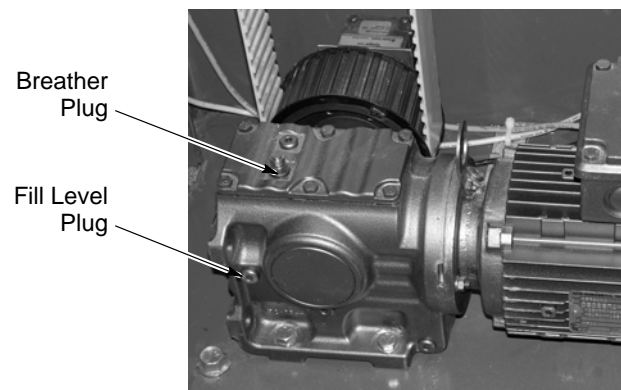


Figure 2 Gearmotor Breather and Fill Level Plugs

Operation Check

Visually inspect the interior of the reciprocator. Remove any foreign objects that would interfere with operation.

Make sure the counterweights are stacked properly in the carrier.

Manually move the gun carriage up and down to ensure that it moves smoothly.

Bumper Positions



WARNING: Make sure power is off before working inside the reciprocator. When moving the gun carriage by hand, keep hands clear of all pinch points and hand traps.

See Figure 1. The gun carriage bumpers are located above and below the gun carriage. Mounted on the carriage bumpers are limit switches (proximity switches). The positions of these bumpers should be adjusted to prevent the spray guns from crashing into the top and bottom of the gun slots, if for some reason the soft limits are not entered properly during iControl reciprocator configuration, or should a proximity switch fail.

NOTE: If the limit switches are tripped they will stop the reciprocator and trigger a fault in the iControl system. The fault must be reset before operation can resume.

See Figure 3. Variables to consider before positioning the carriage bumpers are:

- Gun slot length
- Maximum required stroke length (maximum part height plus desired overtravel)
- Position of parts in relation to gun slots
- Gun positioning on mounting bars

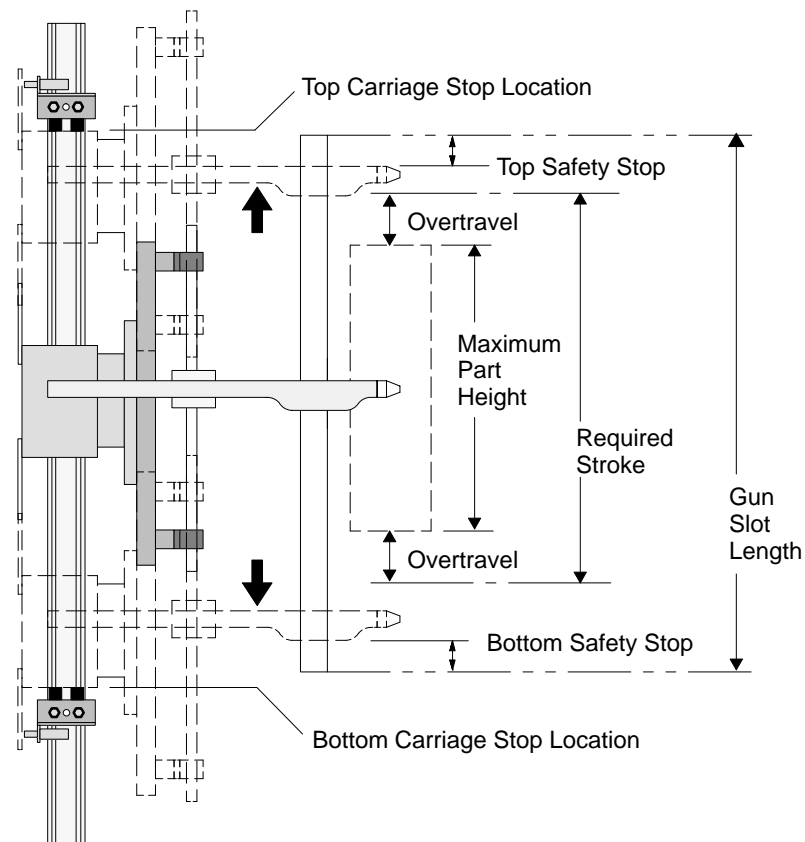


Figure 3 Calculating Carriage Stop Locations

Carriage Bumper Position Adjustment

1. Install the spray guns on the carriage mounting bars. Ensure that the position of the guns on the carriage provides the required stroke length given the position of the parts in relation to the gun slot. Adjust the position of the guns if necessary while performing the following steps.
2. Move the carriage down until the spray guns are no less than 1 inch from the bottom of the gun slots.
3. Loosen the two bolts on the bottom carriage bumper and slide it up until the bumpers contact the carriage. Tighten the bolts securely.
4. Move the carriage up until the spray guns are no less than 1 inch from the top of the gun slots.
5. Loosen the two bolts on the top carriage bumper and slide it down until the bumpers contact the carriage. Tighten the bolts securely.

Counterweight Bumper Position Adjustment

See Figure 1. The counterweight bumpers limit the travel of the counterweight carrier to prevent it from traveling off the linear rail, and also to prevent damage to the top of the reciprocator housing or the gearmotor.

The bumpers are positioned at the factory several inches from the ends of the linear rail. If these positions do not interfere with gun carriage travel then leave them where they are. If necessary, they can be moved by loosening the two bolts and sliding them up or down the rail.

Make sure the bumper bolts are securely tightened before starting up the reciprocator for the first time.

Bumper Anchor Bolt Installation

The center hole in the bumpers is provided for a permanent anchor bolt. After determining where the gun and counterweight carriage bumpers will be permanently located, drill a 7/16 inch hole through the linear rail and reciprocator frame, using the center hole in the bumpers as a drill guide. Anchor the bumpers securely in place with bolts, lockwashers, and nuts.

Counterbalancing Gun Weight

With the guns installed, the gun carriage should not drift up or down when the reciprocator is stopped.

Seven 8.35 kg (18.4 lb) counterweights are provided to balance the weight of the guns. Add or remove counterweights from the carrier by screwing the threaded T-handle into the tapped hole in the counterweights to prevent unwanted motion:

- If the gun carriage drifts up, remove a weight.
- If the gun carriage drifts down, add a weight.

Operation

Operation of the reciprocator is controlled by the iControl system. Refer to the following manuals for instructions on settings and controls:

- iControl Operator Card
- iControl Operator Interface Manual

For reciprocator control troubleshooting refer to

- iControl Standard or Prodigy Console Hardware Manual

Lubrication and Maintenance

Lubricants

Gearmotor	Linear Rail Bearings	Idler Pulley Bearings
Mobilgear 636	Any suitable machine oil	Mobilux #2 Grease

Gearmotor

Normal operating temperature of the gearmotor is less than 93 °C (200 °F). During the initial break-in period the temperature may rise above 200 °F. If it exceeds 200 °F for more than 100 hours contact your Nordson representative.

The gearmotor is shipped with the proper grade and amount of lubricant. The oil level and quality should be checked on frequent intervals, depending on usage.

- **After initial 250 hours of operation, drain, flush, and refill.**
- Every 5,000 hours or every 12 months, drain and refill.

Do not mix types of oils.

Linear Rail Bearings

The gun and counterweight carriages each have 4 linear rail bearings that are equipped with an end cap lubrication system with a spring-loaded felt wiper. The felt is saturated with oil before the reciprocator is shipped. The oil fill holes are located in the top end caps.

- Re-oil the bearings every 1 to 3 months, or as often as needed.

Inspect the linear rail guide rods and bearings periodically for excessive or abnormal wear. Deep grooves in the guide rods or the presence of metal shavings may indicate that the bearings or rails need to be replaced.

Linear Rail Bearings (contd)

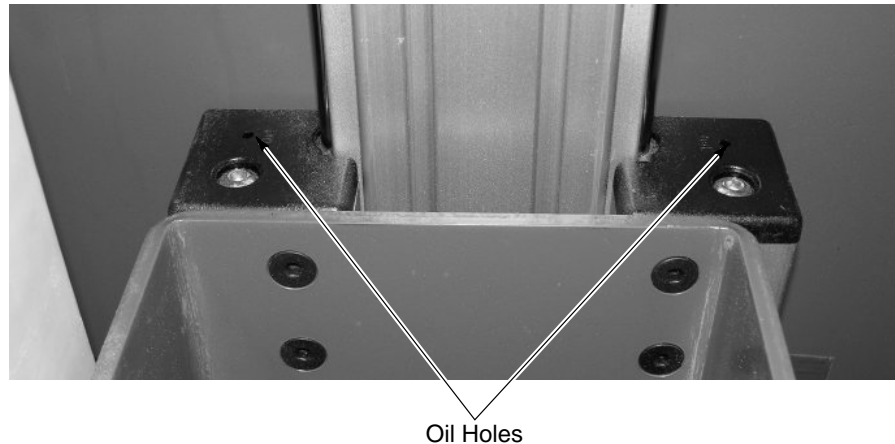


Figure 4 Rail Bearing Lubrication (Top Bearings Shown-4 Bearings per Carriage)

Idler Pulley Bearings

Grease the idler pulley bearings every 1 to 3 months with the recommended grease or equivalent. Use the grease fittings provided in the pillow blocks and fill until grease flows out around the seals.

Periodically check the pulley shaft. If it shows signs of bending, check the tension of the drive belt and reduce the tension if necessary. The belt should deflect 43.9 mm (1.73 inches) under 5.44 kg (12 lbs) of force.

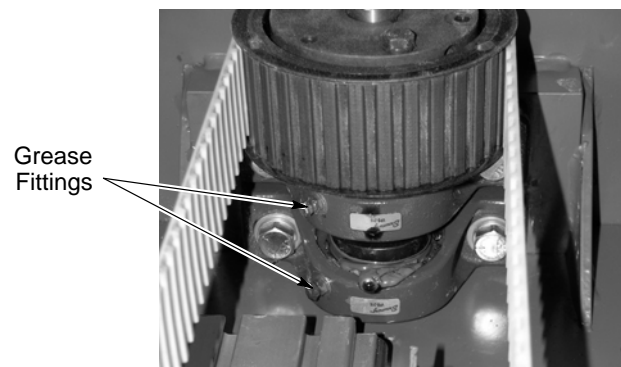


Figure 5 Idler Pulley Lubrication

Cleaning

Accumulations of dust, dirt, or overspray may cause premature wear or failure of moving components. Periodically inspect the interior of the reciprocator. Clean all components and re-lubricate moving components as necessary.

Troubleshooting



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

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. Excessive vibration	Carriage bearing blocks and guide rods	Check for excessive guide rod wear. Replace if necessary. Check the bearing block alignment and adjust if necessary. Lubricate the bearing blocks.
	Gear reducer	Remove breather plug and check oil level. Fill to bottom of tapped hole if necessary.
	Pulleys or belt	Check belt and replace if necessary. Check pulley hub bolts. Make sure pulleys are securely fastened to motor and reducer shafts. Check pulleys. If worn or damaged, replace as needed.
2. Reciprocator will not start	Motor	Make sure proper voltage is being supplied to motor. Check all electrical connections. Check control panel circuit breakers, motor controller, and inverter.
	Excessive load	Make sure load on gun carriage does not exceed maximum load. Refer to specifications.
	Gear reducer	Make sure reducer is operating properly, output shaft is moving freely and not binding.
	Pulleys	Make sure pulleys are moving freely and not binding.

Repair



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



WARNING: Before performing any repair procedures, disconnect and lockout electrical power to the reciprocator.

Drive Belt Replacement

NOTE: Measure the old drive belt before ordering a new belt. When ordering a new belt, specify the length required. The new belt must be the same length as the old belt.

1. Disconnect and lock out power to the reciprocator.



WARNING: Removing the guns will unbalance the weight distribution between gun carriage and counterweight, so the gun carriage may move upward without warning. Secure the carriage before proceeding.

2. Mark the mounting location of the guns on the cover side of the reciprocator, then remove the guns and the reciprocator cover.
3. Remove weights from the counterweight carriage to rebalance the carriages, so they stay in one place when not being moved manually.
4. Manually move the gun carriage to the center of the stroke.



WARNING: Unclamping the belt will allow the carriages to move freely. To prevent damage or injury, you must secure the carriages before proceeding. Failure to secure the carriages could result in personal injury or equipment damage.

5. Install heavy duty clamps on the frame flange under both carriages or prop up the carriages with 2 x 4 beams.
6. Remove the gun carriage clamp (2).
7. Loosen the four slide block (6) screws, then back out the tension screw (7) to remove the tension from the belt.
8. Remove the belt end clamps (4, 5) from the counterweight carriage.
9. Remove the belt.
10. Install the new belt over the idler pulley and under the drive pulley.
11. Clamp the ends of the belt to the counterweight carriage. Make sure the clamps mesh properly with the belt. The belt should fit snugly over the pulleys.
12. Make sure the belt runs on the pulley centerlines. Any deviation will reduce the belt life.

13. Tighten the tension screw to tension the belt. The belt should deflect 43.9 mm (1.73 inches) under 5.44 kg (12 lbs) of force.
14. Clamp the center of the belt to the gun carriage, making sure the clamp meshes properly with the belt.
15. Remove the carriage supports and move the carriages up and down manually to make sure the belt rides evenly on the pulleys.
16. Restore power and start the reciprocator, visually inspecting the path of the belt. Stop the reciprocator and check the belt alignment.
17. Secure the gun carriage from the outside of the reciprocator, then re-install the counterweights you removed previously.
18. Install the cover, then install the guns on the mounting bars.

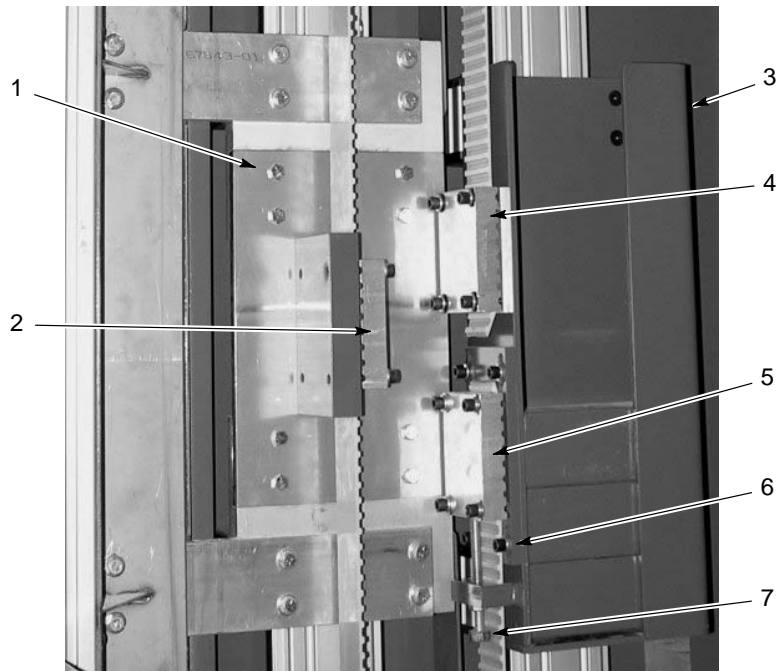


Figure 6 Belt Replacement - Clamp and Tension Bolt Locations.

- | | |
|---------------------------|---------------------|
| 1. Gun carriage | 5. Bottom end clamp |
| 2. Gun carriage clamp | 6. Slide block |
| 3. Counterweight carriage | 7. Tension screw |
| 4. Top end clamp | |

Idler Pulley Replacement

1. Disconnect and lock out power to the reciprocator.



WARNING: Removing the guns will unbalance the weight distribution between gun carriage and counterweight, so the gun carriage may move upward without warning. Secure the carriage before proceeding.

2. Mark the mounting location of the guns on the cover side of the reciprocator, then remove the guns and reciprocator cover.
3. Manually move the gun carriage to the center of the stroke.



WARNING: Unclamping the belt will allow the carriages to move freely. To prevent damage or injury, you must secure the carriages before proceeding. Failure to secure the carriages could result in personal injury.

4. Install heavy duty clamps on the frame flange under both carriages or prop up the carriages with 2 x 4 beams.
5. See Figure 6. Make reference marks on both the slide block (6) and counterweight carriage. These marks will be aligned later to retension the belt.
6. Loosen the four slide block (6) screws, then back out the tension screw (7) to remove the tension from the belt.
7. Raise the counterweight carriage slightly to relieve the tension on the belt section passing over the idler pulley.
8. Mark the belt, then remove the top belt end clamp (4). Remove the belt from the pulley.
9. See Figure 7. Place a straight edge across the surface of the pulley bushing and measure distance **A**, from the back wall of the frame to the outside surface of the pulley bushing.
10. Remove the bolts and lockwashers (5) from the bushing (4).

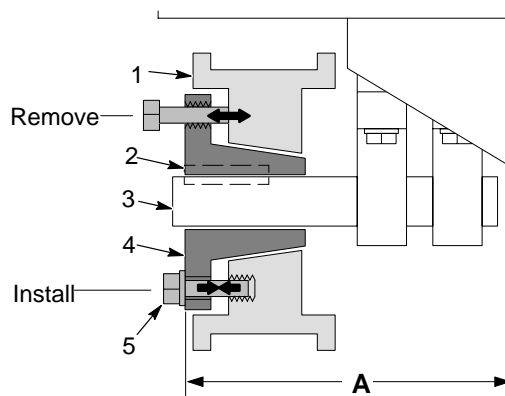


Figure 7 Idler Pulley Replacement (Side View Cutaway)

- | | |
|-----------|---------------------------|
| 1. Pulley | 4. Bushing |
| 2. Key | 5. Bolts and lock washers |
| 3. Shaft | |

11. Install the bolts in the threaded holes in the bushing and tighten them in a criss-cross pattern to break the pulley (1) loose from the bushing.
12. Remove the bushing and pulley from the shaft (3). If the key (2) comes loose, catch it before it falls.
13. Install the key into the shaft keyway, if it came loose.
14. Remove the bolts from the threaded holes in the bushing.
15. Install the new pulley on the shaft then slide the bushing over the key and shaft and into the pulley.
16. Install the lockwashers and bolts through the smooth holes in the bushing and screw them into the threaded holes in the pulley.
17. Place a straight edge across the bushing and measure distances **A1** and **A2**. Position the bushing so that both distances are the same as that measured in step 9, at both ends of the straight edge.

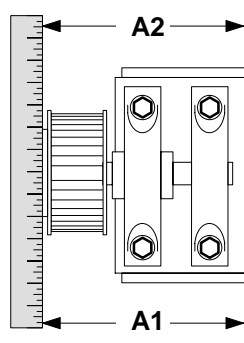


Figure 8 Idler Pulley Replacement - Adjusting Position on Shaft (Bottom View)

18. Tighten the bushing bolts securely to pull the pulley into the bushing.
19. Check the distance from the bushing to the frame wall. If necessary, repeat steps 17 and 18 again until the idler pulley is correctly aligned.
20. Install the belt over the pulley and clamp the end to the counterweight carriage, positioning the belt in the same place as it was previously and making sure the clamp meshes properly with the belt.
21. Tighten the tension screw until the reference marks on the slide block and counterweight carriage are aligned.
22. Remove the carriage supports and move the carriages up and down manually to make sure the belt rides evenly on the pulleys.
23. Restore power and start the reciprocator, visually inspecting the path of the belt. Stop the reciprocator and check the belt alignment. If the pulleys are out of alignment, the belt will wear prematurely.

NOTE: The pulleys are correctly aligned when the distance from the back wall to the inside edge of the belt is the same at both pulleys.

24. Install the cover, then install the guns on the mounting bars.

Idler Bearing Replacement

When replacing idler bearings, it is recommended that you replace both bearings at the same time.

1. Perform steps 1-9 of the *Idler Pulley Replacement Procedure*.
2. Loosen the screws on the two locking collars that secure the shaft in the bearings.

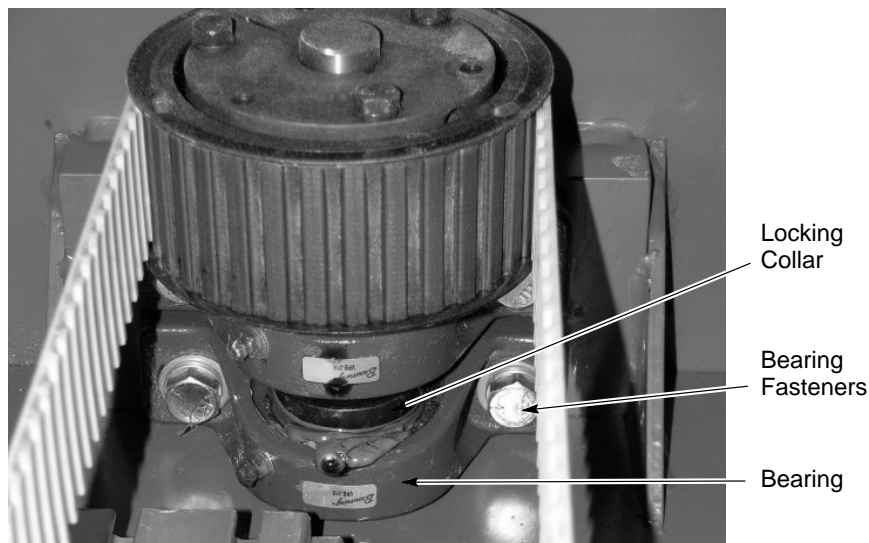


Figure 9 Idler Bearing Replacement

3. Pull the idler pulley and shaft out of the bearings, catching the locking collars before they fall. Save the locking collars for reuse.
4. Remove the bearings. Shims may be installed between the bearing bases and the reciprocator frame. Save the shims for use with the replacement bearings.
5. Install the new bearings, making sure the same shims are installed in the same locations. Tighten the mounting bolts only until snug, so that the bearing positions can be adjusted.

NOTE: The following adjustments are critical to the alignment of the pulley with the belt, to prevent premature wear of the belt.

6. Install the idler pulley and shaft into the new bearings and the locking collars, positioning the locking collars as shown below. Do not tighten the locking collar screws yet.

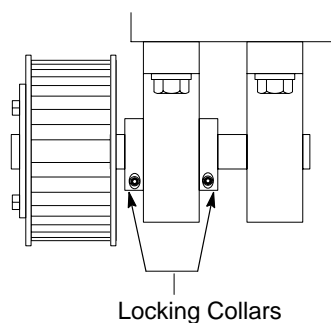


Figure 10 Locking Collar Positioning

7. Place a straight edge horizontally across the bushing as shown in Figure 8 and adjust the pulley and shaft until distances **A1** and **A2** are the same as measured before you removed the pulley and shaft.
8. Tighten the locking collar screws to secure the collars so that the shaft cannot move in or out of the bearings.
9. Repeat step 7 to make sure the pulley is positioned correctly. Loosen the locking collar screws and reposition the pulley if necessary.
10. Tighten the bearing bolts.
11. Position the straight edge as shown below. Distances **B1** and **B2** should be equal. If they are not, then add or remove bearing shims until they are equal. Tighten the bearing bolts and check **B1** and **B2** again.

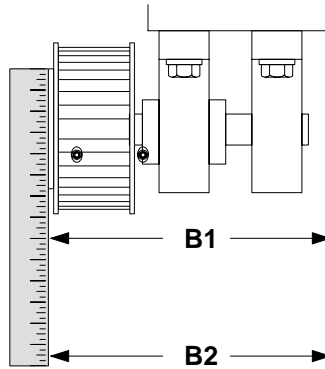


Figure 11 Locking Collar Positioning

12. Position the straight edge horizontally again and make sure the distances from each end of the straight edge to the back wall are as measured before removing the pulley and are equal.
13. Repeat each measurement again and reposition the pulley and shaft, or add and remove shims, as necessary until the pulley is positioned correctly.
14. Grease the bearings as specified on page 10.
15. Perform steps 20-24 of the *Idler Pulley Replacement* procedure to install and tension the belt and test the reciprocator operation.

Gearmotor Replacement

Gearmotor Removal

1. Disconnect and lock out power to the reciprocator.



WARNING: Removing the guns will unbalance the weight distribution between gun carriage and counterweight, so the gun carriage may move upward without warning. Secure the carriage before proceeding.

2. Mark the location of the guns on the cover side of the reciprocator, then remove the guns and reciprocator cover.



WARNING: Unclamping the belt will allow the carriages to move freely. To prevent damage or injury, you must secure the carriages before proceeding. Failure to secure the carriages could result in personal injury.

3. Install heavy duty clamps on the frame flange under both carriages or prop up the carriages with 2 x 4 beams.
4. See Figure 6. Make reference marks on both the slide block (6) and counterweight carriage. These marks will be used to retension the belt.
5. See Figure 6. Loosen the four slide block (6) screws, then back out the the tension screw (7) so that you can remove the pulley.
6. Mark the belt, then remove the bottom end clamp (5). Remove the belt from under the gearmotor pulley.
7. See Figure 12. Remove the bolts (6) securing the encoder bracket to the reciprocator base.
8. Remove the clamps (2) securing the flexible coupling (1) to the encoder and the gearmotor output drive shaft. Remove the coupling, clamps, and encoder and bracket (5).

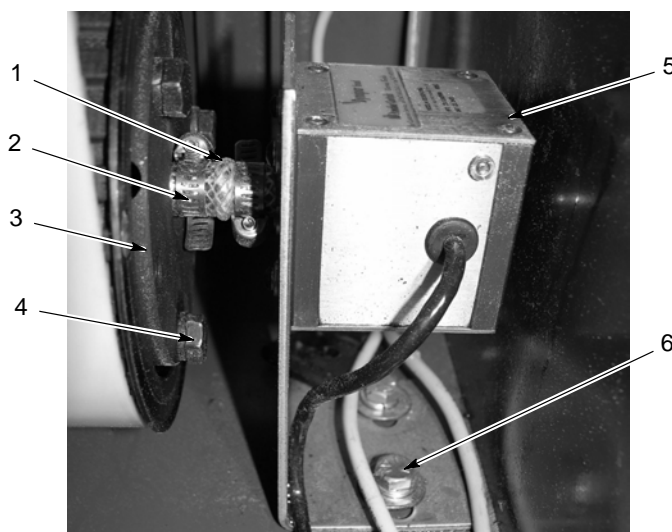


Figure 12 Gearmotor Replacement - Encoder and Pulley Removal

- | | |
|----------------------|------------------------------|
| 1. Flexible coupling | 4. Bushing fasteners |
| 2. Coupling clamps | 5. Encoder |
| 3. Pulley bushing | 6. Encoder bracket fasteners |

9. See Figure 13. Place a straight edge across the surface of the bushing (4) and measure the distance **A** from the back wall of the frame to the outside surface of the bushing.



WARNING: The gearmotor can weigh more than 22.7 kg (50 lbs). Get help if necessary. Use caution when lifting.

10. Remove the bolts securing the gearmotor to the reciprocator base and lift the gear motor off the base.
11. Remove the threaded rod (5) from the gearmotor shaft (3).
12. Remove the three bolts and lockwashers from the bushing (4) and screw the bolts in the threaded holes in the bushing.
13. Tighten the bolts in a criss-cross pattern to break the pulley loose from the bushing, then remove the pulley and bushing from the gearmotor shaft. Save the key (2) for reuse if it falls out of the shaft.

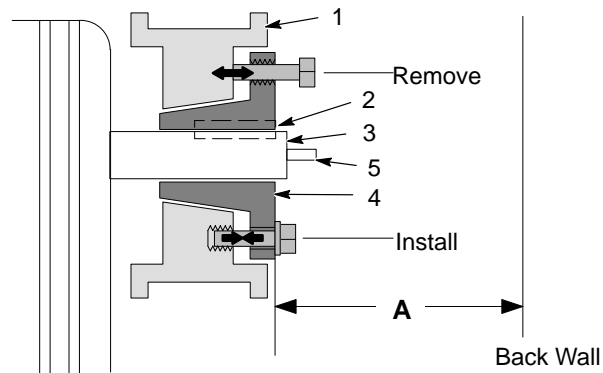


Figure 13 Gear Motor/Pulley Replacement

- | | |
|-----------|-----------------|
| 1. Pulley | 4. Bushing |
| 2. Key | 5. Threaded rod |
| 3. Shaft | |

Gearmotor Installation

1. Remove the bolts from the threaded holes in the bushing.
2. Install the lockwashers and bolts through the smooth holes in the bushing and screw them into the threaded holes in the pulley.
3. Install the new gearmotor on the base. Install the mounting fasteners but do not tighten the mounting bolts.
4. Install the key in the gearmotor output shaft if necessary.
5. Install the pulley and bushing on the new gearmotor shaft. Do not tighten the bushing bolts.
6. See Figure 14. Place a straight edge across the bushing and measure distances **A1** and **A2**. Position the bushing so that distances **A1** and **A2** are the same as that measured before removing the pulley.

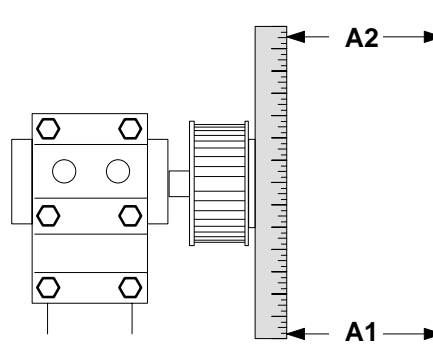


Figure 14 Gearmotor Pulley Replacement - Adjusting Position on Shaft

NOTE: Poor pulley alignment will cause the belt to wear prematurely. The pulleys are correctly aligned when the distance from the back wall to the inside edge of the belt is the same at both pulleys.

7. Tighten the bushing bolts to pull the pulley into the bushing, then tighten the gearmotor mounting bolts.
8. Check the distance from the bushing to the frame wall. If necessary, repeat steps 6 and 7 again until the pulley is correctly aligned.
9. Install the threaded rod into the gear motor shaft.
10. Install the encoder and bracket. Connect the encoder shaft to the threaded shaft with the flexible coupling and clamps.
11. Install the belt under the pulley and clamp the end to the counterweight carriage, positioning the belt in the same place as it was previously and making sure the clamp meshes properly with the belt.
12. Tighten the tension screw until the reference marks on the slide block and counterweight carriage are aligned. The belt is correctly tensioned when it deflects 43.9 mm (1.73 inches) under 5.44 kg (12 lbs) of force.
13. Remove the pipe plugs from the top and sides of the new gear reducer and fill the gearmotor with the oil recommended on page 9 to the bottom of the side plug hole. Install the breather plug in place of the top pipe plug.
14. Remove the carriage supports and move the carriages up and down manually to make sure the belt rides evenly on the pulleys.
15. Restore power and start the reciprocator, visually inspecting the path of the belt. Stop the reciprocator and check the belt alignment. If the pulleys are out of alignment, the belt will wear prematurely.
16. Install the cover, then install the guns on the mounting bars.

Rail Bearing Replacement

Each carriage has four rail bearings mounted in left and right pairs. The bearings ride on the round guide shaft mounted in the edge of the linear rail. The rail bearings can be replaced individually. If changing all the carriage bearings, either replace one bearing pair at a time or remove the carriage and replace all the bearings at once.

The inside bearings on each carriage have adjustable eccentric bolts, while the outside bearings on each carriage have non-adjustable centric bolts. Make sure you replace each with the proper type.

1. Disconnect and lock out power to the reciprocator.



WARNING: Removing the guns will unbalance the weight distribution between gun carriage and counterweight, so the gun carriage may move upward without warning. Secure the carriage before proceeding.

2. Mark the location of the guns on the cover side of the reciprocator, then remove the guns and reciprocator cover.
3. Remove the cover plate on the back side of the reciprocator to expose the eccentric bearing access holes.

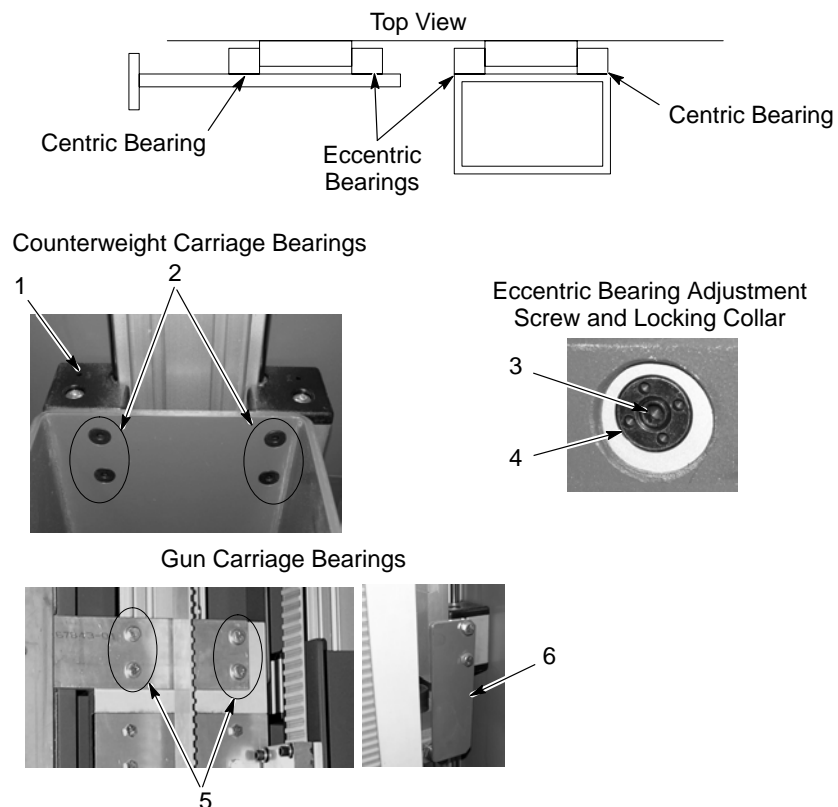


Figure 15 Rail Bearing Replacement

- | | |
|---------------------------------------|--------------------------------|
| 1. Oil fill hole | 4. Locking collar |
| 2. Counterweight bearing screws | 5. Gun carriage bearing screws |
| 3. Eccentric bearing adjustment screw | 6. Proximity switch plates |

4. See Figure 15. Manually move the carriage until the bearing adjustment screw (3) and locking collar (4) is accessible through the hole.
5. Using a bearing pin spanner, turn the locking collar to loosen the bearing locknut, then rotate the adjustment screw with a hex key until there is some play between the centric and eccentric bearings.
6. Remove the fasteners securing the bearings to the carriage and pull the bearings out from behind the carriage. Save the fasteners for re-use.
7. Remove the end caps from the old and new bearings. Remove the T-nuts from the old bearings and install them in the correct slots on the new bearings. If replacing the inside bearings on the gun carriage, install the proximity switch plates on the new bearings.
8. Install the new bearings onto the guide rail and carriage, re-using the fasteners from the old bearings. Make sure you install the eccentric bearings on the inside rails, and the centric bearings on the outside rails.
9. Pull back the spring-loaded felt wipers in the end caps before installing them on the bearings. Secure the end caps in place with the screws.
10. Move the carriage so that the eccentric bearing adjustment screw is accessible through the access hole. Use the pin spanner to unlock the locking collar, then use a hex key to rotate the adjustment screw until there is no play between the pair of bearings.
11. Add oil through the oil hole in the end cap to replace any lost oil. Keep the bearings lubricated with a good machine oil. Refer to Maintenance and Lubrication for more information.

Guide Shaft Replacement

The linear rail is composed of a slotted extrusion, a shaft clamp, and a guide shaft. The shaft is pressed into the clamp, and pinned at one end to prevent linear movement in the clamp.

1. Remove the guns and counterweights from the reciprocator.
2. Secure the carriages and remove the fasteners securing the belt brackets to the carriages. This will leave the belt brackets and clamps fastened to the belt.
3. While holding the carriages, remove the rail bearings as described in *Linear Rail Bearing Replacement*. Remove the carriages from the enclosure.
4. Remove the bumpers from the rail.
5. Remove the screws securing the rail to the reciprocator frame and remove the rail. Move the rail to a convenient location.
6. With a non-marring tool, pry the shaft out of the clamp, starting at one end and working toward the other end.
7. See Figure 16. Before pressing the new shaft into the clamp, use a carbide bit to drill a correctly sized dowel hole the same distance from the end as the old shaft dowel, and install a 6 x 30 DIN6325 dowel in the shaft.

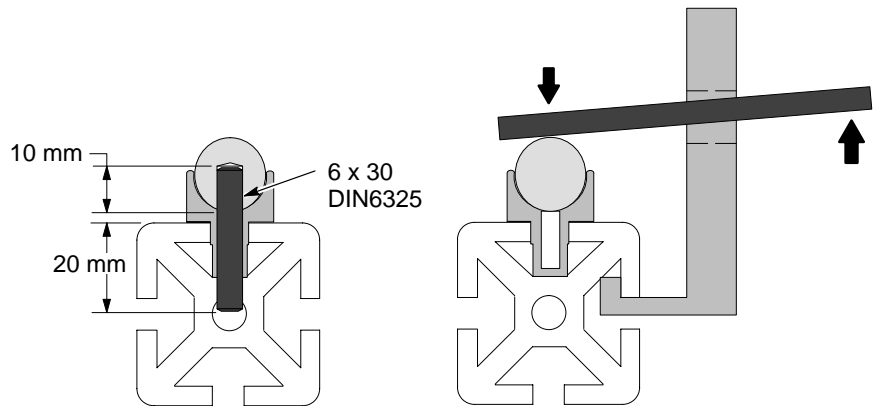


Figure 16 Guide Shaft Replacement

8. Press the shaft into the clamp, using a non-marring tool similar to that shown in Figure 16, making sure the dowel fits into the existing hole in the clamp and extrusion.
9. Measure the screw hole pattern in the frame and position the T-nuts in the slots to match the hole pattern.
10. Re-install the rail on the frame, then re-install the carriages and rail bearings, following the bearing installation instructions.



WARNING: The rail bearings secure the carriages to the rails. To prevent damage or injury, you must support the carriages before removing the bearings. Remove the weights from the counterweight carriage before removing it.

Parts

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

Item	Part	Description	Quantity	Note
-	1070105	RECIPROCATOR, VR60RD-HV, 60 in. stroke	1	
-	1070106	RECIPROCATOR, VR72RD-HV, 72 in. stroke	1	
-	1070107	RECIPROCATOR, VR96RD-HV, 96 in. stroke	1	
1	1071467	• ENCODER, quadrature, 1024 PPR, 24VDC, reciprocator	1	
2	1071461	• BELT, 2 in. wide, reciprocator, per inch	1	A
3	1071460	• PULLEY, 32 T, 1/2 in. pitch, reciprocator	2	
4	1071419	• GEAR MOTOR, 16.47:1, 1 hp, reciprocator	1	
5	1071645	• BEARING, pillow block, reciprocator	2	
6	1071470	• SWITCH, proximity, 24VDC, reciprocator	2	
7	1071468	• RAIL, profile, reciprocator, per inch	4	A
8	1071463	• BEARING, profile, eccentric, reciprocator	4	
9	1071462	• BEARING, profile, centric, reciprocator	4	
NS	1070186	KIT, panel, iControl positioner and reciprocator		B

NOTE A: Specify length needed, in inches. There are 4 rails per reciprocator.
 B: Optional control panel, required for iControl reciprocator control. Not included with reciprocators.
 AR: As Required
 NS: Not Shown

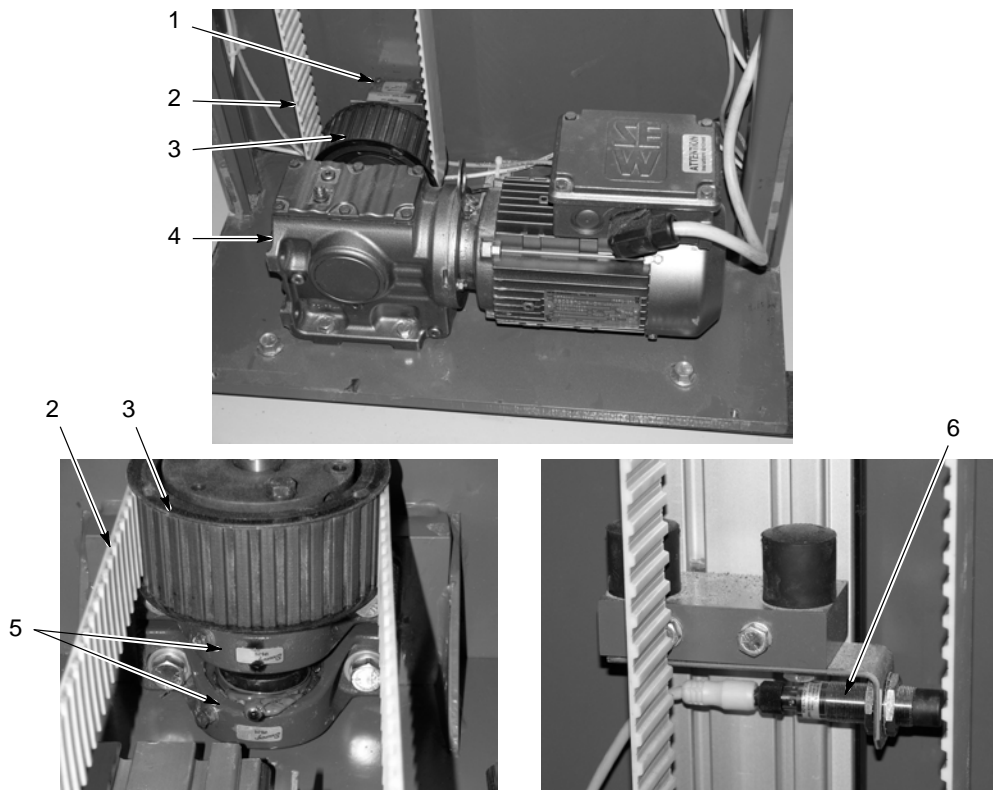


Figure 17 Reciprocator Parts (1 of 2)

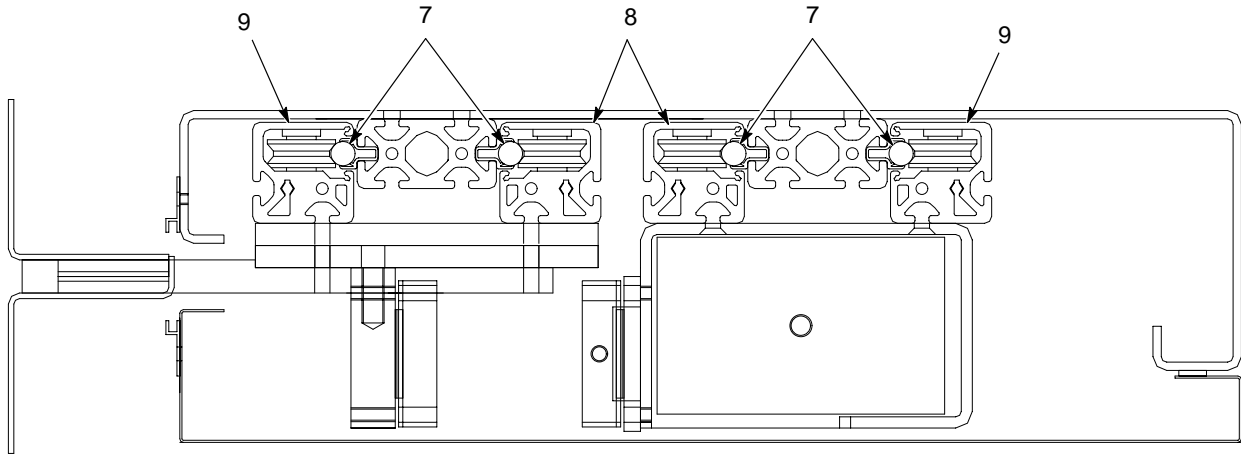


Figure 18 Reciprocator Parts - Rail Bearings and Guide Rails (Top View, 2 of 2)

