NVR-Series
Vertical Reciprocators

Customer Product Manual
Part 1098602–03
Issued 11/16

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

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Change Record

Revision	Date	Change
01	4/11	Released.
03	11/16	Revised wiring diagram.

NVR-Series 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 Safety Data Sheets (SDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- 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 SDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Grounding

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

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

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

Action in the Event of a Malfunction

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

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

Disposal

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

Description

See Figure 1. This manual covers the NVR-Series Vertical reciprocators. The reciprocators are available in 1700 m (66.9 in.), 2200 mm (86.6 in.), 2700 mm (106.3 in.), and 3200 mm (126 in.) stroke lengths. Refer to Table 1 for component descriptions.

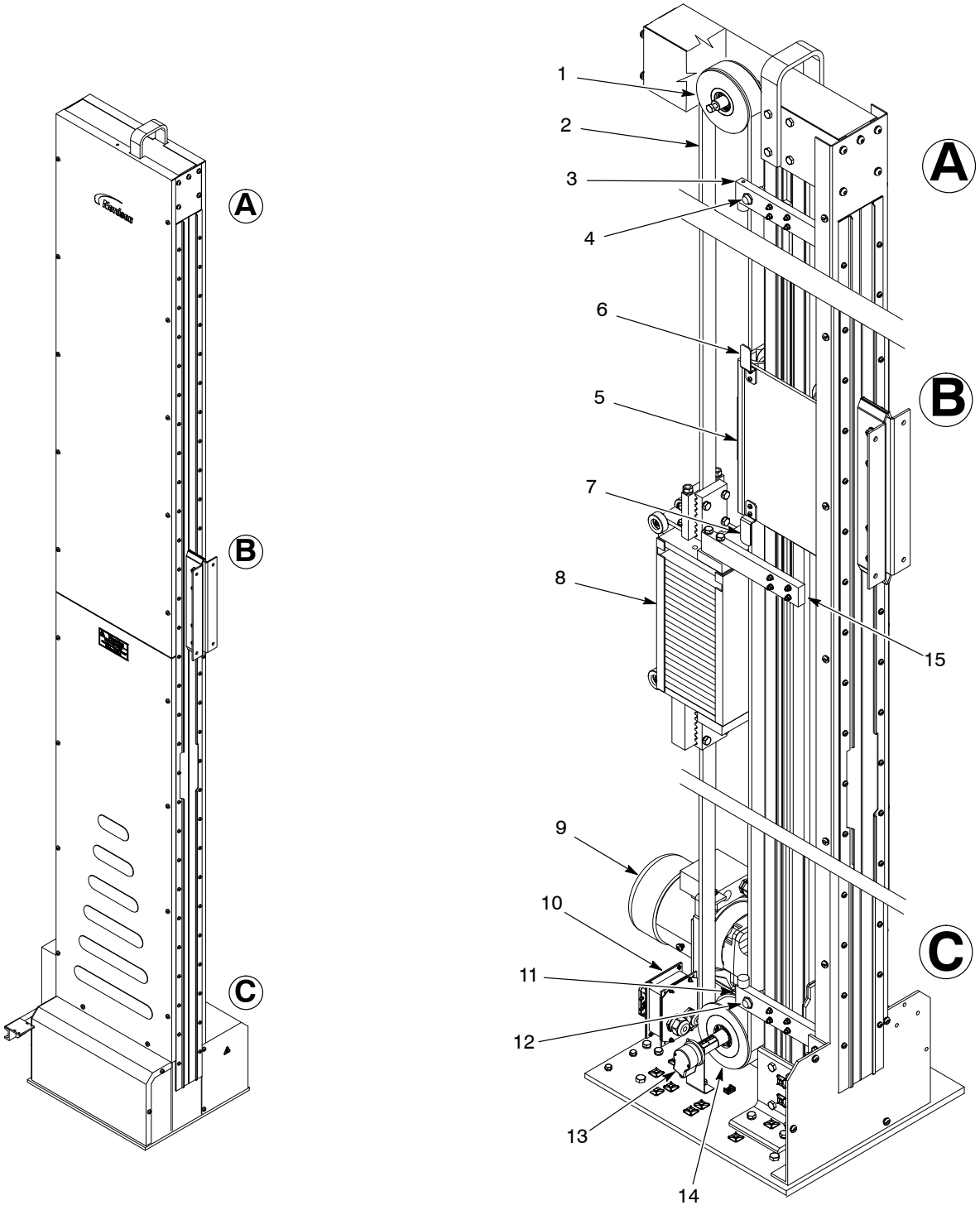

Figure 1 Typical NVR Vertical Reciprocator

Table 1 Component Descriptions

Item	Component	Function
1	Top Pulley	Top belt guide
2	Drive Belt	Provides motion to the gun carriage
3	Top Carriage Bumper Assembly	Prevents the spray guns from crashing into the top of the gun slot
4	Upper Proximity Sensor	Sends a signal to the controller to indicate that the gun carriage has reached the upper limit
5	Gun Carriage	Mounting point for the gun mounts and guns
6	Upper Proximity Target	Activates the upper proximity sensor
7	Lower Proximity Target	Activates the lower proximity sensor
8	Counterweight Carriage	Provides balance to the gun carriage; has 21 3.5 kg (7.61 lb) weights
9	Driver Assembly	Operates the the belt-driven gun carriage assembly
10	Sensor and Motor Junction Box	Electrical interface between the controller and the reciprocator
11	Bottom Carriage Bumper Assembly	Prevents the spray guns from crashing into the bottom of the gun slot
12	Lower Proximity Sensor	Sends a signal to the controller to indicate that the gun carriage has reached the lower limit
13	Encoder Assembly	Monitors the gun carriage position
14	Bottom Pulley	Bottom belt guide
15	Weight Carriage Lock Arm	Only used for shipping, setup, and replacing the belt; Must be removed before putting the reciprocator into service

Specifications

Refer to Table 2 for specifications.

Table 2 Specifications

Item	Specification			
	1700 mm (66.9 in.)	**2200 mm (86.6 in.)**	**2700 mm (106.3 in.)**	**3200 mm (126 in.)**
Operating Voltage/Frequency	Customer-specific. Refer to identification plate on the gear motor.			
Operating Frequency	Refer to Table 3.			
Operating Speed	Up to 50 mpm (164 fpm)			
Maximum Load	80 kg at 50 mpm (176 lb at 164 fpm)			
Height	2942 mm (115.8 in.)	3442 mm (135.5 in.)	3942 mm (155 in.)	4442 mm 175 in.)
Column Length/Depth	620 mm (24.4 in.)			
Column Width	193 mm (7.6 in.)			
Base (L x W)	620 x 548 mm (24.4 x 21.6 in.)			
Encoder Pulse Rate	1.44 pulse/mm (36 pulse/in.)			
Sensor/Encoder Voltage	24 Vdc			

Identification Label

See Figure 2. The Identification label is located on the back of the motor cover and lists the following information:

1. Name of Manufacturer
2. Product Name and Model
3. Product Part Number
4. Serial Number
5. Power Supply Range
6. CE Compliance Mark
7. ATEX Compliance Mark

NOTE: The information on the Identification label shown in Figure 2 is only an example and is not specific to any reciprocator.

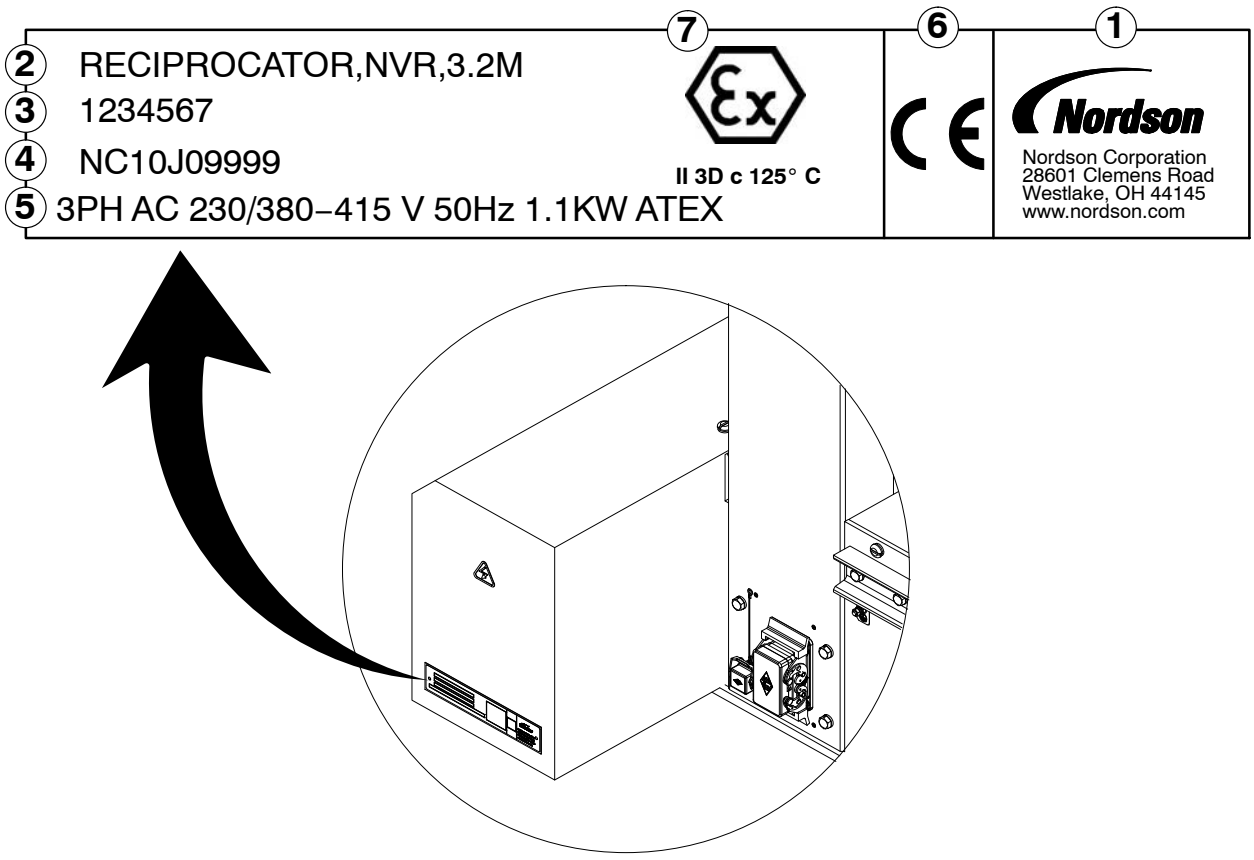

Figure 2 Typical Identification Label

Installation

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

Read and understand the following procedures before installing the reciprocator. Contact a local Nordson representative regarding these procedures if necessary.

Only use lifting equipment that can support the weight of the reciprocator.

Installation consists of the following tasks:

- Remove the Reciprocator from the Shipping Container
- Mount the Reciprocator
- Install the Ship-With Parts
- Install the Gun Mounts and Guns
- Position the top and bottom carriage bumpers
- Counter Balance the Gun Weight
- Electrical
- Functional Check

Remove the Reciprocator from the Shipping Container

WARNING: Only use approved and tested lifting equipment that can lift at least 630 Kg (1400 lb) or more. Lifting straps, ropes, or chains used with the lifting equipment must also be capable of supporting at least 630 Kg (1400 lb) or more. Failure to observe this warning could result in death, injury, or property damage, injury, or death.

See Figure 3.

1. Remove the top (1), cross supports (2), and all of the sides on the shipping container. Remove the support boards (3) at the base of reciprocator.
2. Remove the boards (4) and pads (5) holding the reciprocator onto the 3 padded supports within shipping container.
3. Remove the box of counterweights (6) from the shipping container.

NOTE: Depending on the type of equipment used to remove the reciprocator from the shipping container, perform either step 4 or step 5.

4. Perform the following if using lifting equipment to remove reciprocator from the shipping container:
   a. Attach lifting equipment to the lift bracket (7). Carefully lift the reciprocator upright and off of the shipping container.
   b. Stand the reciprocator upright onto the floor or onto the in/out positioner.

5. Perform the following if using a forklift truck or similar equipment:

   a. Install protective covers on the forks of the forklift truck. Position the spacing of each fork as far as possible on the lift.

CAUTION: Before the reciprocator is lifted off of the shipping container, determine the appropriate lift points where the reciprocator weight is balanced and can be safely lifted.

   b. Position the forks under the determined reciprocator lift points.

   c. Lift the reciprocator off of the shipping container and move it to the installation location. Temporarily set the reciprocator down onto wood blocks.

   d. Attach the lifting equipment to the lift bracket (7). Carefully lift the reciprocator upright.

   e. Stand the reciprocator upright onto the floor or onto the in/out positioner.

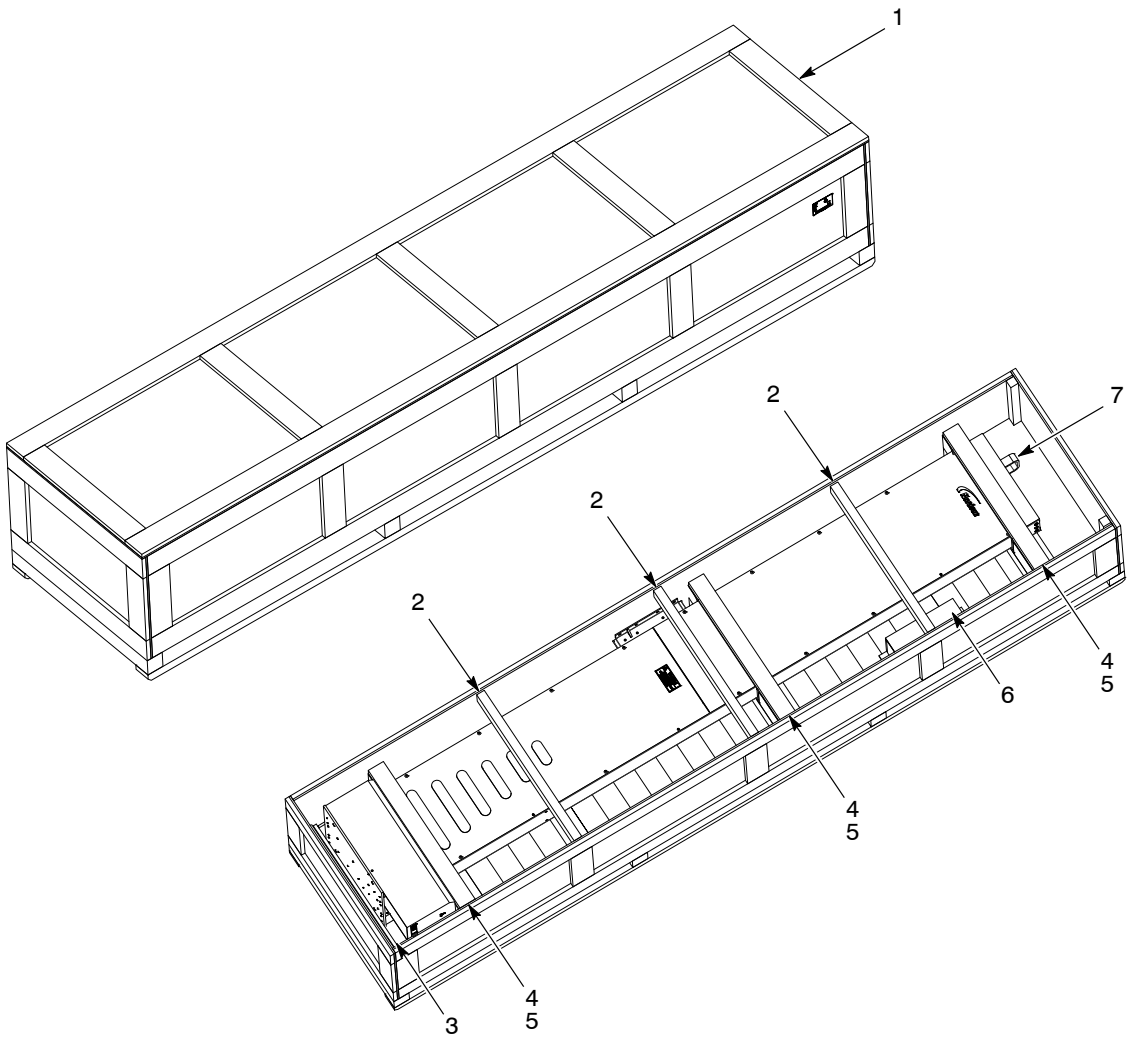

Figure 3 Typical Shipping Container

Mount the Reciprocator

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

1. See Figure 4. Remove the screws (1) and washers (2) securing the side access panels (3, 4) on the encoder side of the reciprocator, the encoder cover (5), and the drive assembly cover (6).

CAUTION: The reciprocator is designed for use with a Nordson in/out positioner. If using another type of in/out positioner, make sure that it can support at least 630 Kg (1400 lb) or more.

NOTE: Nordson in/out positioners ship with fasteners included in a hardware kit for reciprocator installations. Other fasteners may be required if using another type of in/out positioner.

2. Set the reciprocator onto the in/out positioner and secure it to the in/out positioner carraige.
3. If mounting the reciprocator the floor or fixed stand, use the existing four mounting holes (7). If necessary, drill new holes into the base or floor. Use properly sized fasteners to secure the reciprocator.

CAUTION: The vent plug must be installed to prevent over pressurizing the drive assembly and to prevent oil contamination.

4. Remove the plug (9) from the gear motor (8) as shown on Figure 4.
5. Make sure that the gasket (11) is installed onto the vent plug (10). Install the vent plug into the drive assembly and tighten securely.

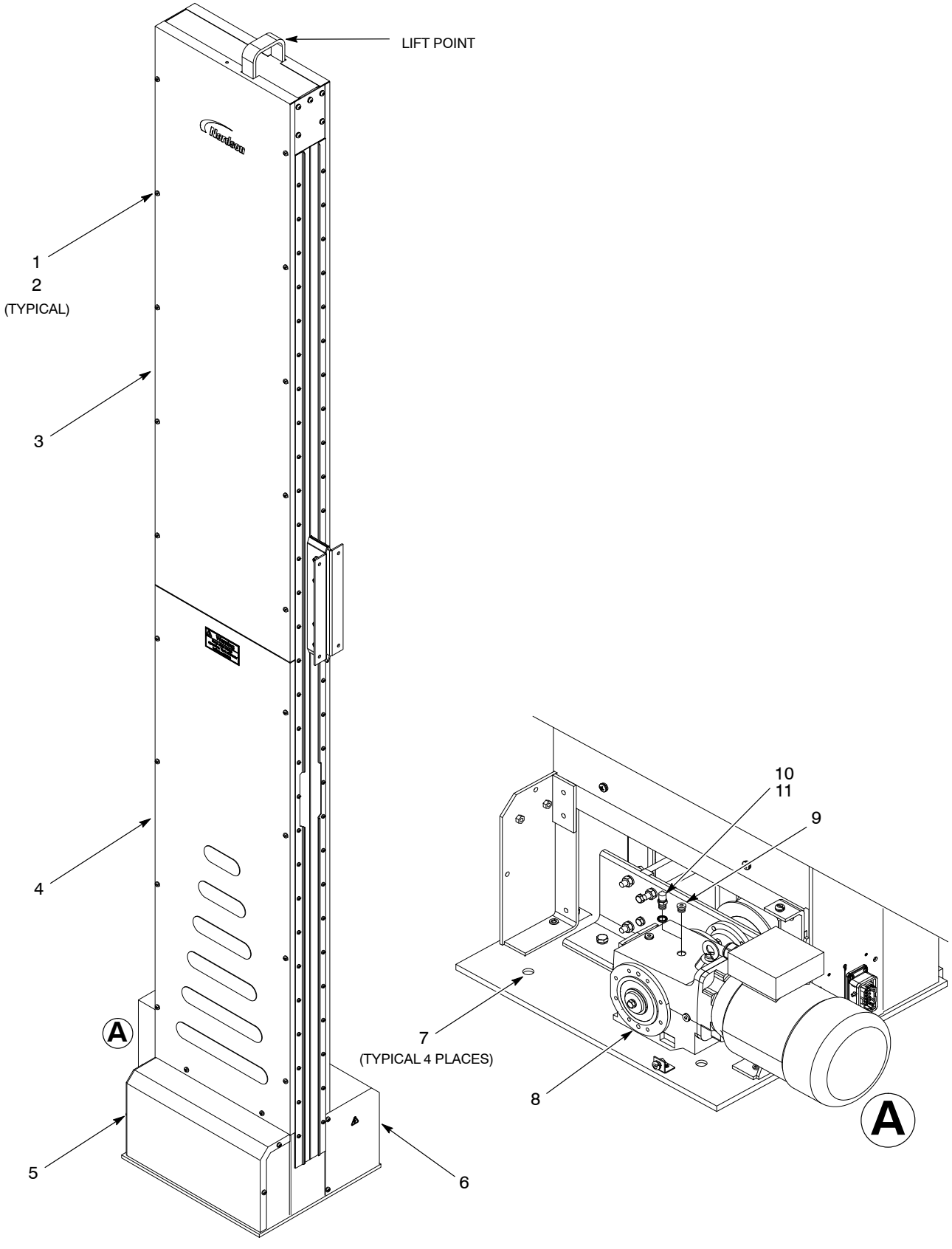

Figure 4 Installation

Install the Ship-With Parts

1. See Figure 5. Remove the screws (1) and lock washers (2) securing the carriage weight lock arm (3) to the counterweight basket (8).

NOTE: Do not discard the carriage weight lock arm. It is used during the belt replacement procedure to secure the counterweight basket and gun carriage assemblies.

2. Remove the nuts (5) and washers (6) from the T−bolts (7). Remove the T-bolts from the gun track (4).
3. Insert the carriage counterweights (12) into the weight basket (8).
4. Install the cable chain bracket (14) to the reciprocator (13) using the screws (15) and washers (16). Tighten the screws securely.

NOTE: If the counterweights are not sufficient to balance the guns and the gun bars, two supplemental counterweights (11) included with the reciprocator can be installed onto the counterweight basket (8). The supplemental weights are required when the gun payload is between 76−80 kg (167.5−176.4 lb)

5. If required, install the supplemental weights (11) onto the counterweight basket (8) using the supplied M8 x 40 screws (9) and washers (10). Tighten the screws securely.

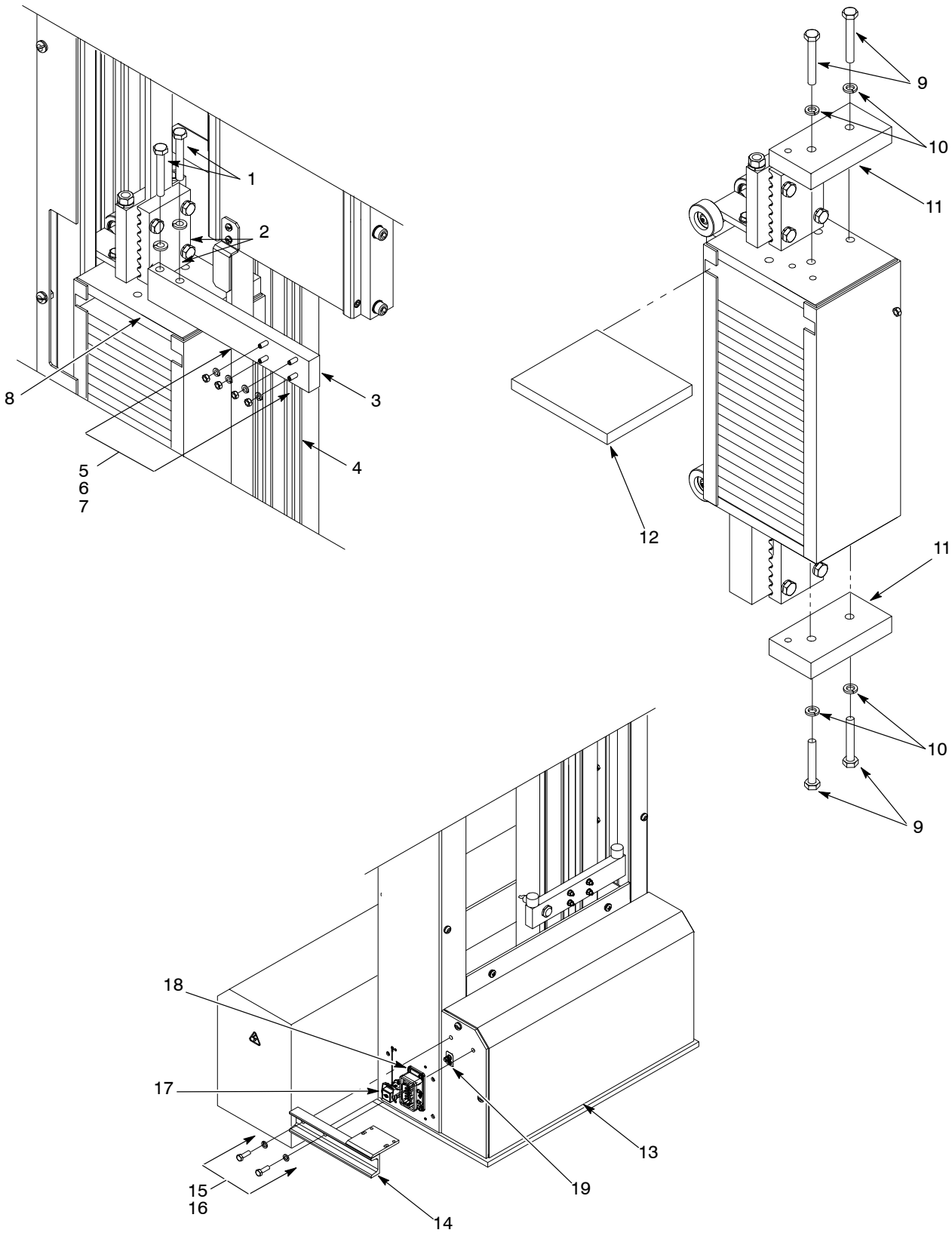

Figure 5 Installing the Ship-With Components

Install the Gun Fixture

See Figure 6. 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.

Position the Top and Bottom Carriage Bumpers

See Figure 6. The gun carriage bumper assemblies are located above and below the gun carriage. Mounted on the carriage bumper assemblies are proximity switches. Adjust the position of the bumpers to prevent the spray guns from crashing into the top and bottom of the gun slots.

NOTE: If the proximity 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.

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

1. Move the carriage down until the spray guns are no less than 25.4 mm (1 in.) from the bottom of the gun slots.
2. Loosen the bottom bumper assembly nuts and slide it up until the bumpers contact the carriage. Tighten the nuts securely.
3. Move the carriage up until the spray guns are no less than 25.4 mm (1 in.) from the top of the gun slots.
4. Loosen the top bumper assembly nuts and slide it down until the bumpers contact the carriage. Tighten the nuts securely.

Counterbalance the Gun Weight

See Figure 6. With the guns installed, the gun carriage should not drift up or down when the reciprocator is stopped. The gun carriage should be balanced so that it takes approximately the same amount of force to move it up and down.

Twenty-one 3.45 kg (7.6 lb) counterweights are provided to balance the weight of the guns. Add or remove counterweights from the weight basket as required. If the gun carriage

- drifts up, remove a weight.
- drifts down, add a weight.

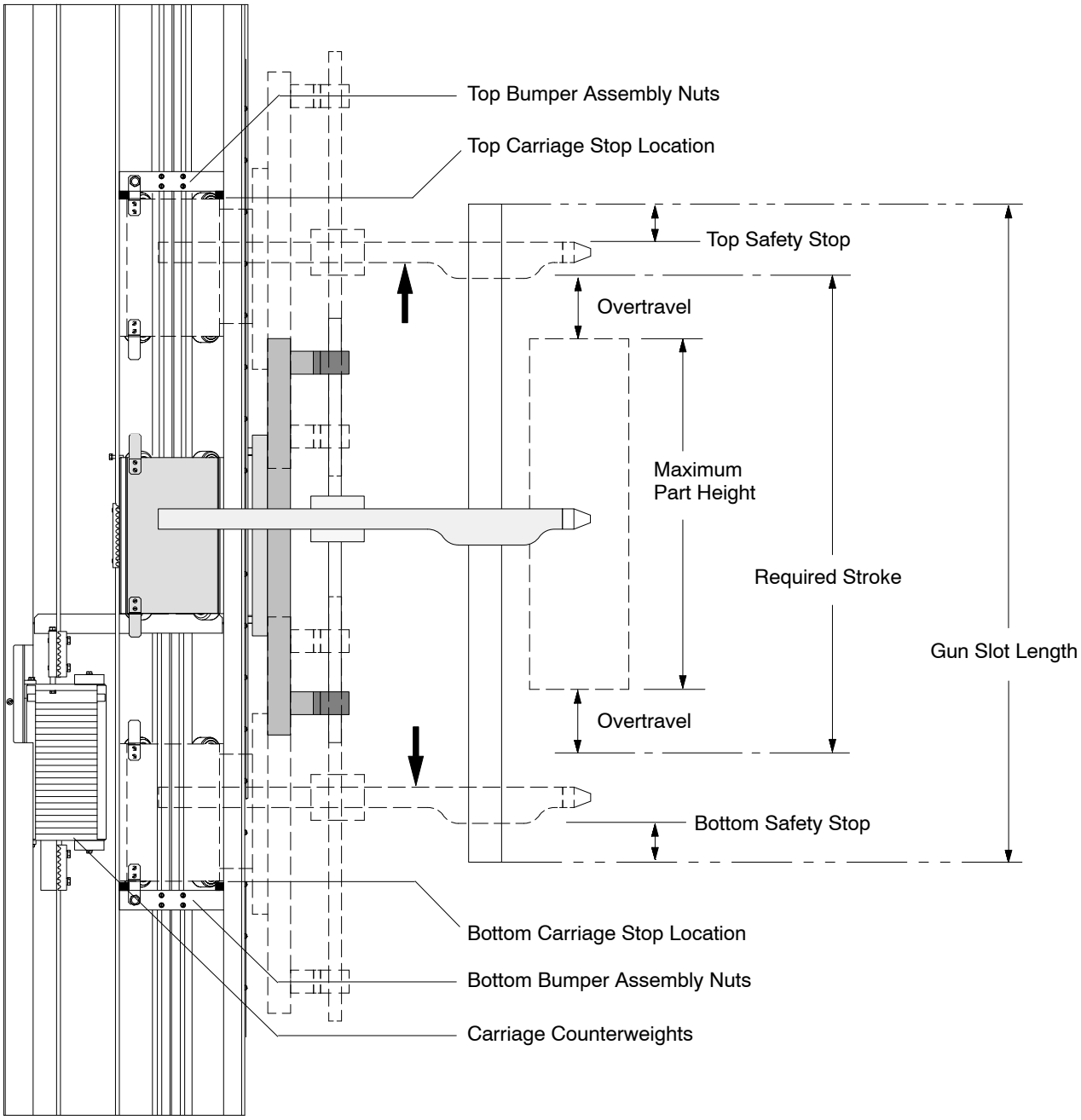

Figure 6 Gun Carriage Setup

Electrical

1. See Figure 7. Remove the screws (1) and washers (2) securing the motor cover (3).
2. Check the gear motor ID plate to ensure that the correct voltage is being supplied to the motor.

NOTE: The reciprocator motor terminal box is wired for high voltage on dual-voltage (230/460 or 230/380–415) models. If using a low-voltage power supply for the reciprocator, rewire the terminal box for low voltage.

3. Remove the screws (5) securing the terminal box cover (6). Change the connection of the terminal jumpers, included with the motor, as shown for low voltage.

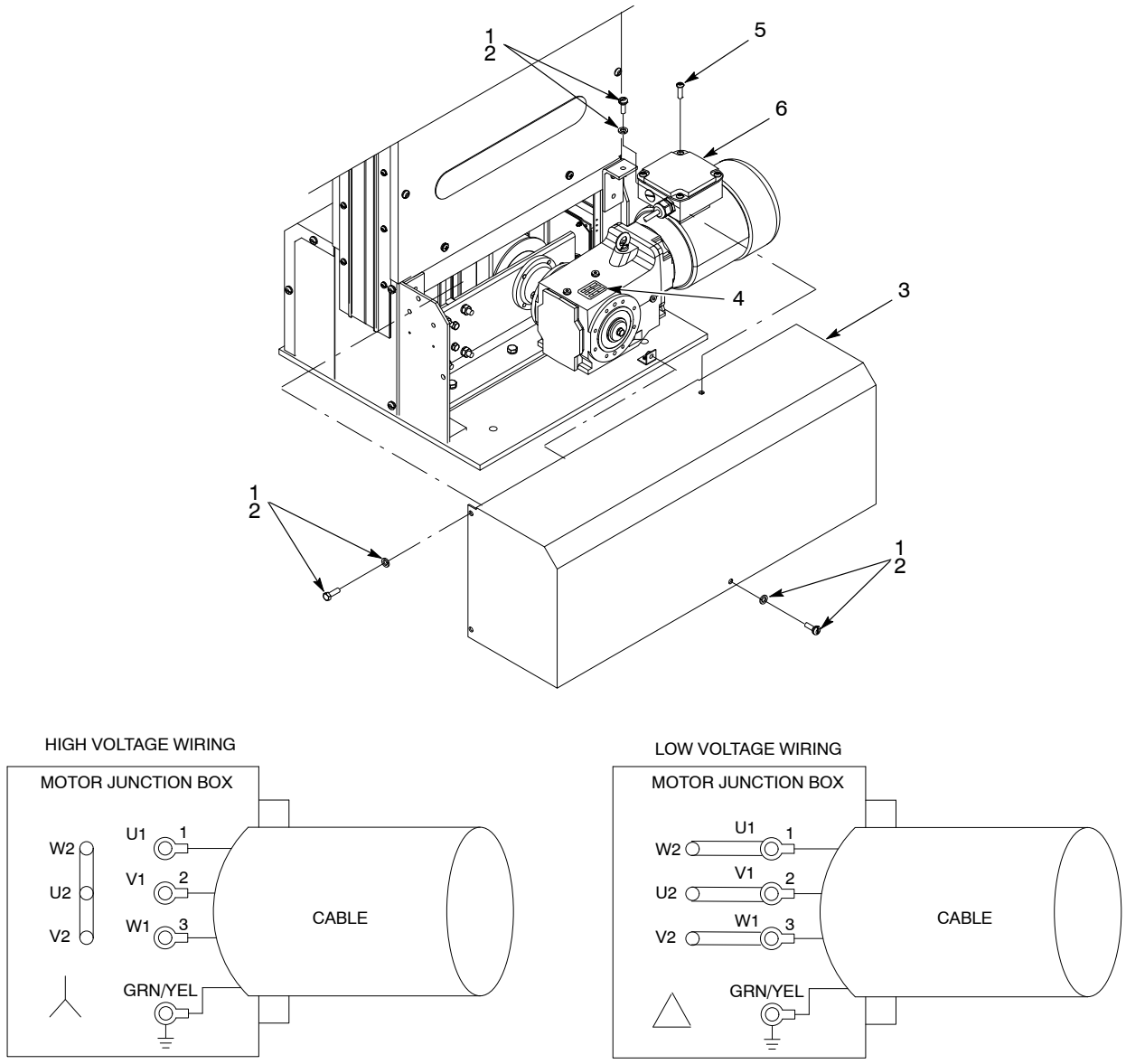

Figure 7 Driver Assembly Motor Wiring

4. See Figure 5. Connect the motor-to-controller cable to the motor connector (17) located on the back of the reciprocator.
5. Connect the sensor/encoder-to-controller interface cable to the sensor connector (18) located on the back of the reciprocator.
6. Connect a ground bonding wire from the spray booth chassis to the ground terminal (19). This ground wire may also be connected to the In/Out Positioner base ground terminal.

The reciprocator gear motor is driven by a variable frequency drive (VFD) unit. Because the reciprocators are available with different voltage ranges, motor speeds (rpm) may differ. The maximum frequency setting for the VFD must be set to the correct frequency, which is dependent on the applicable gear motor.

Refer to Table 3 for the motor voltage/frequency range and the corresponding maximum frequency set point value that each VFD needs to be set. This set point value is entered into VFD as part of initial setup.

Table 3 Component Descriptions

Gear Motor Voltage/Frequency Rating	Main Power Supply Voltage/Frequency	VFD Maximum Frequency Set Point Value
230/460 VAC @ 60 Hz	230/460 VAC – 60Hz	60 Hz
200/400VAC @ 50Hz	200 VAC – 50 Hz	60 Hz
230/380–415VAC @ 50Hz	380 VAC – 50 Hz	60 Hz
	400 VAC – 50 Hz	58 Hz
	415 VAC – 50 Hz	57 Hz
	220/380 VAC – 60 Hz	60 Hz
	230/400 VAC – 50Hz	58 Hz
332/550–600VAC @ 60Hz	575 VAC – 60 Hz	60 Hz
200–208/360VAC @ 60Hz	200 VAC – 60 Hz	60 Hz
	208 VAC – 60 Hz	60 Hz

Functional Check

Perform the following:

- 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.

Operation

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

iControl:
Refer to the iControl Operator Card and the iControl Operator Interface Manual.

Axis Controller:
Refer to the Axis Controller Operator Interface Manual.

Maintenance

Perform preventive maintenance and lubrication procedures according to your plant maintenance schedule or to the following intervals.

Item	Frequency
Cleaning	Periodically inspect the interior of the reciprocator. Accumulations of dust, dirt, or overspray may cause premature wear or failure of moving components. Clean all components and lubricate moving components as necessary.
Gear Motor	Normal operating temperature of the gear motor is less than 93 °C (200 °F). During the initial break-in period the temperature may rise above 93 °C (200 °F). If it exceeds 93 °C (200 °F) for more than 100 hours, contact your Nordson representative. The gear motor is shipped with the proper grade and amount of lubricant. The oil level and quality should be checked on frequent intervals, depending on usage. Drain and refill the gear motor after 10,000 hours of operation or at least once every two years. Refer to the *NORD DRIVESYSTEMS* gear motor manual that is included with the reciprocator for more information.
Belt Tension	Check the belt tension after the first week of cycling. After the first week of cycling, check the belt tension every 6 months.
Gun Carriage Track	Clean the gun carriage track monthly. Use a nonabrasive material.

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. Noise and excessive vibration during stroke	Gun carriage rollers worn	Replace rollers.
	Gun carriage track dirty	Clean carriage track using a nonabrasive material.
	Counterweight guide rollers worn	Replace guide rollers.
	Counterweight guide tracks dirty or there is an accumulation of debris.	Clean guide tracks using a nonabrasive material.
	Gear motor reducer	Check oil level. Fill per the motor manufacturer's service manual.
	Insufficient belt tension	Check belt tension and readjust if necessary.
	Bottom pulley	Check bottom pulley hub bolts. Make sure pulley is securely fastened to gear motor shaft.
	Top or bottom pulley worn	Check pulleys. If worn or damaged, replace as needed.
2. Noise during reversal; 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.

Read and understand these procedures before making repairs to the reciprocator. Contact a local Nordson representative regarding the procedures if necessary.

Some repairs require the use of a ladder. Do not use the reciprocator to support the ladder.

WARNING: Lockout power to this equipment before performing repairs.

Secure the Gun Carriage and Counterweight Basket

Use this procedure when it is necessary to secure the gun carriage and counterweight basket to perform repairs.

WARNING: Removing the gun fixture from the gun mount will unbalance the weight distribution between the gun carriage and the counterweight. Secure the gun carriage to prevent it from moving upward without warning.

1. Disconnect and lock out power to the reciprocator.
2. See Figure 8. Remove the screws (1) and washers (2) securing the side access panels (3A, 4A) on the encoder side of the reciprocator, and the encoder cover (5). If repairing the top pulley or gun carriage rollers, remove the access panels (3B, 4B) on the motor side (6).
3. Perform the following:
   a. Manually move the gun carriage (14) until the bottom surface is positioned slightly above the counterweight basket (7).
   b. Install the T-bolts (12) through the back of the lock arm (9). Install the lock arm to the counterweight basket (7) using the lock washers (15) and screws (16). Tighten the screws securely.
   c. Manually move the gun carriage (14) downward until it makes contact with the top of the lock arm (9).
   d. Insert the T-bolts (12) into the gun carriage track (13). Install the lock washers (11) and nuts (10) onto the T-bolts. Tighten the nuts securely.
4. Mark the position of the gun carriage on the gun carriage track (13).
5. Mark the position of the counterweight basket onto the counterweight basket track (17).

CAUTION: Do not completely remove the gun fixtures from the gun mounting plate until gaining access to the reciprocator. The counterweights need to be removed at the same time the guns and gun mounts are removed.

6. Remove the guns and the gun mount from the gun mounting plate (18).
7. Record the number of counterweights (8) and remove them from the counterweight basket (7).

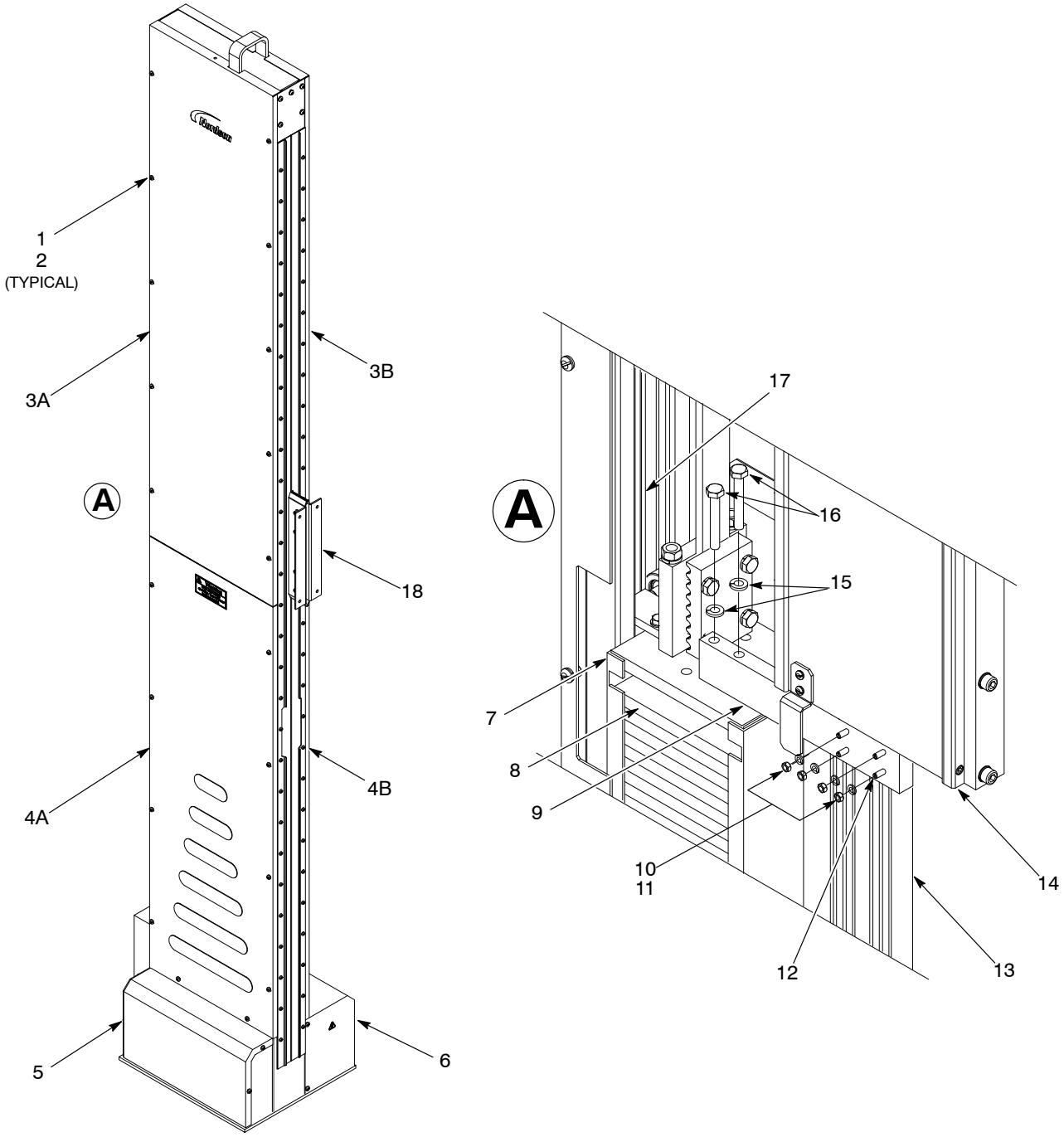

Figure 8 Securing the Gun Carriage and Counterweight Basket

Replace the Belt

Use the following procedure to replace the belt.

Remove the Belt

1. Secure the gun carriage and counterweight basket. Refer to the *Secure the Gun Carriage and Counterweight Basket* procedure.
2. See Figure 9. Mark the belt as follows:
   a. Draw a line on the upper belt retainer (5) and mark the belt TOP.
   b. Draw a line on the lower belt retainer (7) and mark the belt BOTTOM.
   c. Draw two lines on the top and bottom of the gun carriage retainer clamp (12) and mark the belt TOP and BOTTOM.
3. Loosen the tension nuts (3) on top of the pulley belt retainer (13).
4. Loosen the screws (11) securing the belt-clamp retainer (12) to the gun carriage (10).
5. Perform the following:
   a. Loosen the screws (8) securing the belt (2) to the lower belt retainer (7).
   b. Loosen the screws (4) securing the belt to the upper belt retainer (5).
   c. Remove the belt (2) from the belt retainers.
6. Remove the belt (2) from the pulleys (1, 9). Remove the belt from between the gun carriage (10) and the carriage belt-clamp retainer (12).
7. Inspect the top and bottom pulleys (1, 9) for wear or damage. Replace the pulleys if necessary. Refer to the applicable pulley replacement procedure if required.

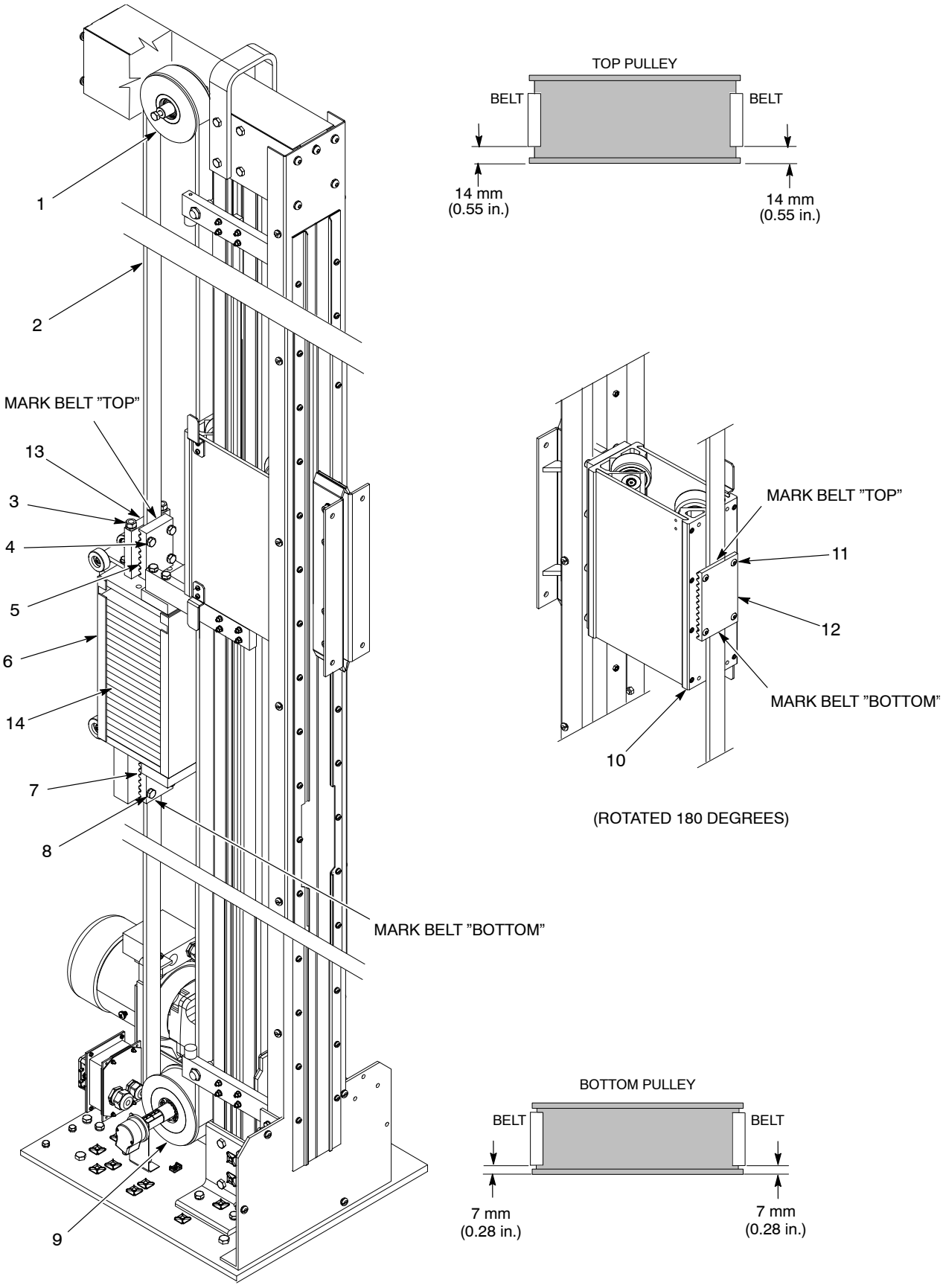

Figure 9 Replacing the Belt

Install the Belt

1. If applicable, place the old belt flat and level on the floor next to the new belt. Transfer the marks from the old belt onto the new belt.
2. See Figure 9. Perform the following:
   a. Insert the belt (2) into the bottom counterweight basket belt retainer (7).
   b. Make sure that the belt is centered side-to-side and engages the 8 teeth in the belt retainer. Make sure that the belt does extend above the top edge of the bottom belt retainer. Tighten the screws (4) to 20 N•m (180 in.-lb).
3. Route the belt (2) around the bottom pulley (9), between the gun carriage (10) and the counterweight carriage belt retainer (12), and around the top pulley (1).
4. Perform the following:
   a. Loosen the tension nuts (3) on top of the counterweight basket (6) until they are even with the top of the threaded rods.
   b. Insert the belt (2) into the top counterweight basket belt retainer (5).
   c. Make sure that the belt (2) is centered side-to-side and engages the 8 teeth in the belt retainer (5). Make sure that the belt does not extend below the bottom edge of the belt retainer. Tighten the screws (4) to 20 N•m (180 in.-lb).
   d. Make sure that the belt is centered side-to-side on the top and bottom pulleys as shown in Figure 9. The belt is centered when the distance from the side of the pulley to the edge of the belt is the same.
5. Adjust the belt tension. Refer to the *Adjust the Belt Tension* procedure.
6. Make sure that the belt is centered side-to-side in the belt retainer (12) on the back of the gun carriage (10). Tighten the belt clamp retaining screws (11) to 14 N•m (120 in.-lb).
7. See Figure 8. Remove the nuts (10) and lock washers (11) from the T-bolts (12).
8. Remove the screws (16) and washers (15) securing the lock arm (9) to the counterweight basket (7).

WARNING: Installing the guns and gun mount will unbalance the weight distribution between the gun carriage and the counterweight. Secure the gun carriage to prevent it from moving downward without warning.

9. Install the gun mount and guns to the gun carriage.
10. Insert the appropriate counterweight plates (8) into the counterweight basket (7) to balance the gun carriage.
11. Install the side access panels (3A, 3B, 4A, 4B) and the encoder cover (5) using the washers (2) and screws (1). Tighten the screws securely.

Adjust the Belt Tension

Check the belt tension using either the Applied Force or Sonic Meter methods. Table 4 lists the necessary data for using the Applied Force method. Table 5 lists the necessary data for using the Sonic Meter method.

1. Check the belt tension using the desired method.
2. See Figure 10. Alternately tighten or loosen the tension nuts (1) on the top of the pulley belt retainer (2) until the proper reading is obtained.

Table 4 Belt Tension for Applied Load Method

Reciprocator	Gun Carriage Position (1)	Load (2)	Maximum Deflection
1.7-M Stroke	1860 mm (73.2 in.)	8 kg (17.6 ib)	17mm (0.67 in.)
2.2-M Stroke	2300 mm (90.6 in.)	8 kg (17.6 ib)	17mm (0.67 in.)
2.7-M Stroke	2300 mm (90.6 in.)	8 kg (17.6 ib)	17mm (0.67 in.)
3.2-M Stroke	2300 mm (90.6 in.)	8 kg (17.6 ib)	17mm (0.67 in.)

1. This is the distance between the bottom of the gun carriage belt retainer and the top of the base plate. To achieve an accurate belt tension reading, make sure that this measurement is accurate.
2. Apply load to the inside face of the belt in the direction toward the back of the reciprocator. Measure deflection in the same direction. Measure the belt tension at the middle of the free length of the belt; approximately 1200 mm (47.3 in.) from the top of the base plate to the middle of the belt.

Table 5 Belt Tension for Sonic Method

Reciprocator	Gun Carriage Position (1)	Static Tension (2)
1.7-M Stroke	1860 mm (73.2 in.)	2900 N (650 lb)
2.2-M Stroke	2300 mm (90.6 in.)	2900 N (650 lb)
2.7-M Stroke	2300 mm (90.6 in.)	2900 N (650 lb)
3.2-M Stroke	2300 mm (90.6 in.)	2900 N (650 lb)

1. This is the distance between the bottom of the gun carriage belt retainer and the top of the base plate. To achieve an accurate belt tension reading, make sure that this measurement is accurate.
2. Refer to the sonic meter operation manual for procedures on measuring static tension. Measure the belt tension at the middle of the free length of the belt; approximately 1200 mm (47.3 in.) from the top of the base plate to the middle of the belt.

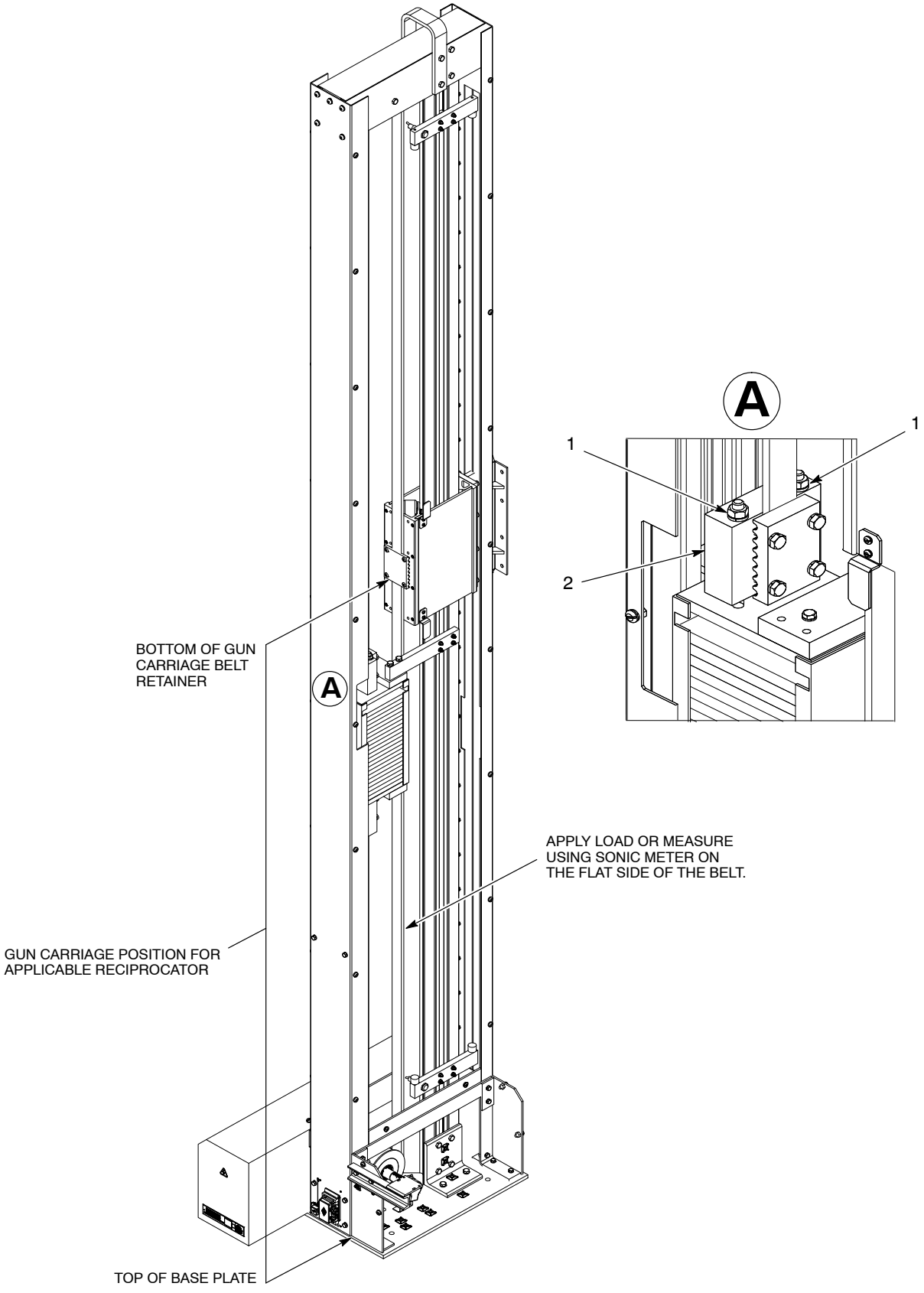

Figure 10 Adjusting Belt Tension

Replace the Top Pulley

Use the following procedures to replace the top pulley.

WARNING: This procedure requires the use of a ladder. Do not use the reciprocator to support the ladder.

Remove the Top Pulley

1. Secure the gun carriage and counterweight basket. Refer to the *Secure the Gun Carriage and Counterweight Basket* procedure.
2. See Figure 9. Loosen the tension nuts (3) on top of the pulley belt retainer (13).
3. Loosen the screws (11) securing the belt-clamp retainer (12) to the gun carriage (10).
4. Loosen the screws (4) securing the belt (2) to the pulley belt retainer (5). Remove the belt (2) from the belt retainer.
5. Remove the belt (2) from the top pulley (1).
6. See Figure 11. Remove the nut (5), lock washer (4), and screw (2) securing the pulley (3) to the reciprocator (1). Remove the pulley from the reciprocator.

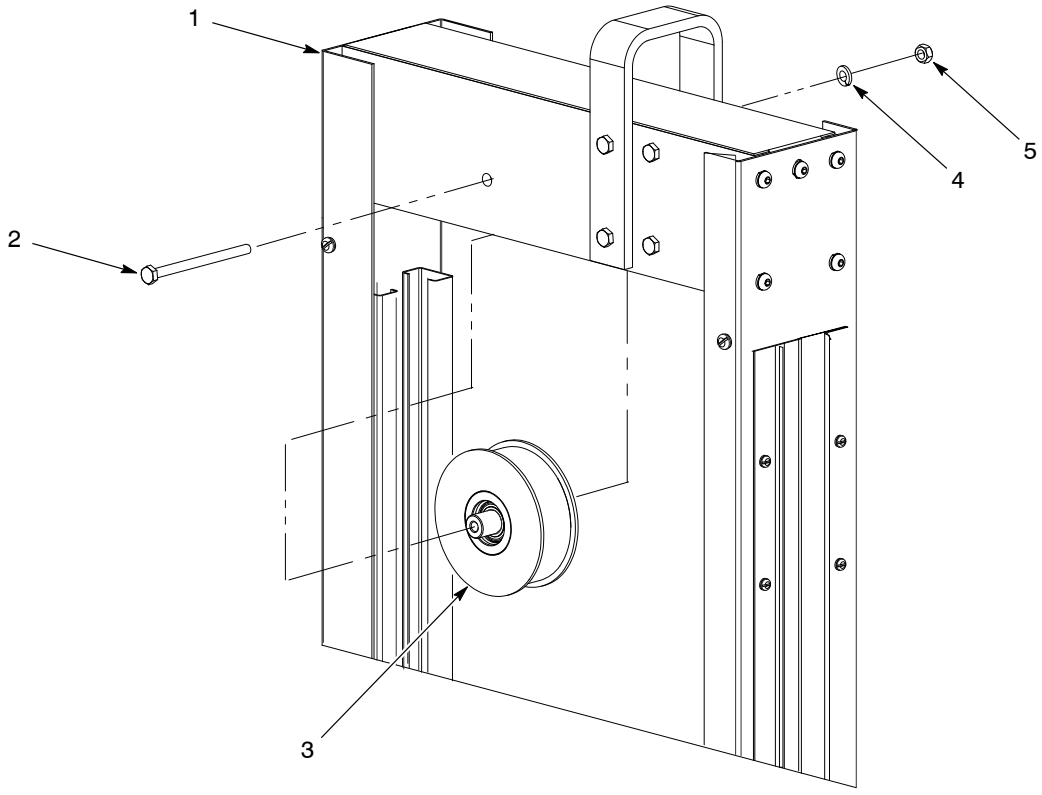

Figure 11 Replacing the Top Pulley

Install the Top Pulley

1. See Figure 11. Install the new pulley (3) into the reciprocator (1) using the screw (2), lock washer (4), and nut (5). Tighten the nut to 57 N•m (42 ft-lb)
2. See Figure 9. Route the belt (2) around the top pulley (1).
3. Perform the following:
   a. Insert the belt (2) into the top counterweight basket belt retainer (13).
   b. Make sure that the belt is centered and engages the 8 teeth in the belt retainer. Tighten the screws (4) to 20 N•m (180 in.-lb).
4. Adjust the belt tension. Refer to the *Adjust the Belt Tension* procedure.
5. Make sure that the belt is centered in the belt retainer (12) on the back of the gun carriage (10). Tighten the belt clamp retaining screws (11) to 14 N•m (120 in.-lb).
6. See Figure 8. Remove the nuts (8) and lock washers (9) from the T-bolts (10).
7. Remove the screws (14) and washers (13) securing the lock arm (7) to the counterweight basket (6).

WARNING: Installing the guns and gun mount will unbalance the weight distribution between the gun carriage and the counterweight. Secure the gun carriage to prevent it from moving downward without warning.

8. Install the gun fixture to the gun carriage.
9. See Figure 9. Insert the appropriate counterweight plates (14) into the counterweight basket (6) to balance the gun carriage.
10. See Figure 8. Install the side access panels (3A, 4A) and encoder cover (5) using the washers (2) and screws (1). Tighten the screws securely.

Replace the Bottom Pulley

Use the following procedures to replace the bottom pulley.

Remove the Bottom Pulley

1. Secure the gun carriage and counterweight basket. Refer to the *Secure the Gun Carriage and Counterweight Basket* procedure.
2. See Figure 9. Loosen the tension nuts (3) on top of the pulley belt retainer (13).
3. Loosen the screws (11) securing the belt-clamp retainer (12) to the gun carriage (10).
4. Loosen the screws (8) securing the belt (2) to the lower belt retainer (13) on the counterweight basket (6). Remove the belt (2) from the bottom belt retainer.
5. Remove the belt (2) from the bottom pulley (9).
6. See Figure 12. Loosen the shaft coupling screws (7) securing the encoder assembly (8) to the drive motor shaft (1).

7. Cut the cable ties, not shown, securing the encoder cable to the base. Loosen the screw (2) securing the encoder assembly (8) to the base (10). Remove the encoder assembly from the base.
8. Perform the following:
   a. Loosen the bushing screws (6).
   b. Install two M6 x 80 screws into the jackscrew holes.
   c. Alternate tightening the screws to remove the bushing (5) and bottom pulley (4) from the driver assembly shaft (1).
9. Remove the washer (3) from the driver assembly shaft (1). Check the washer for wear or damage and replace if necessary.

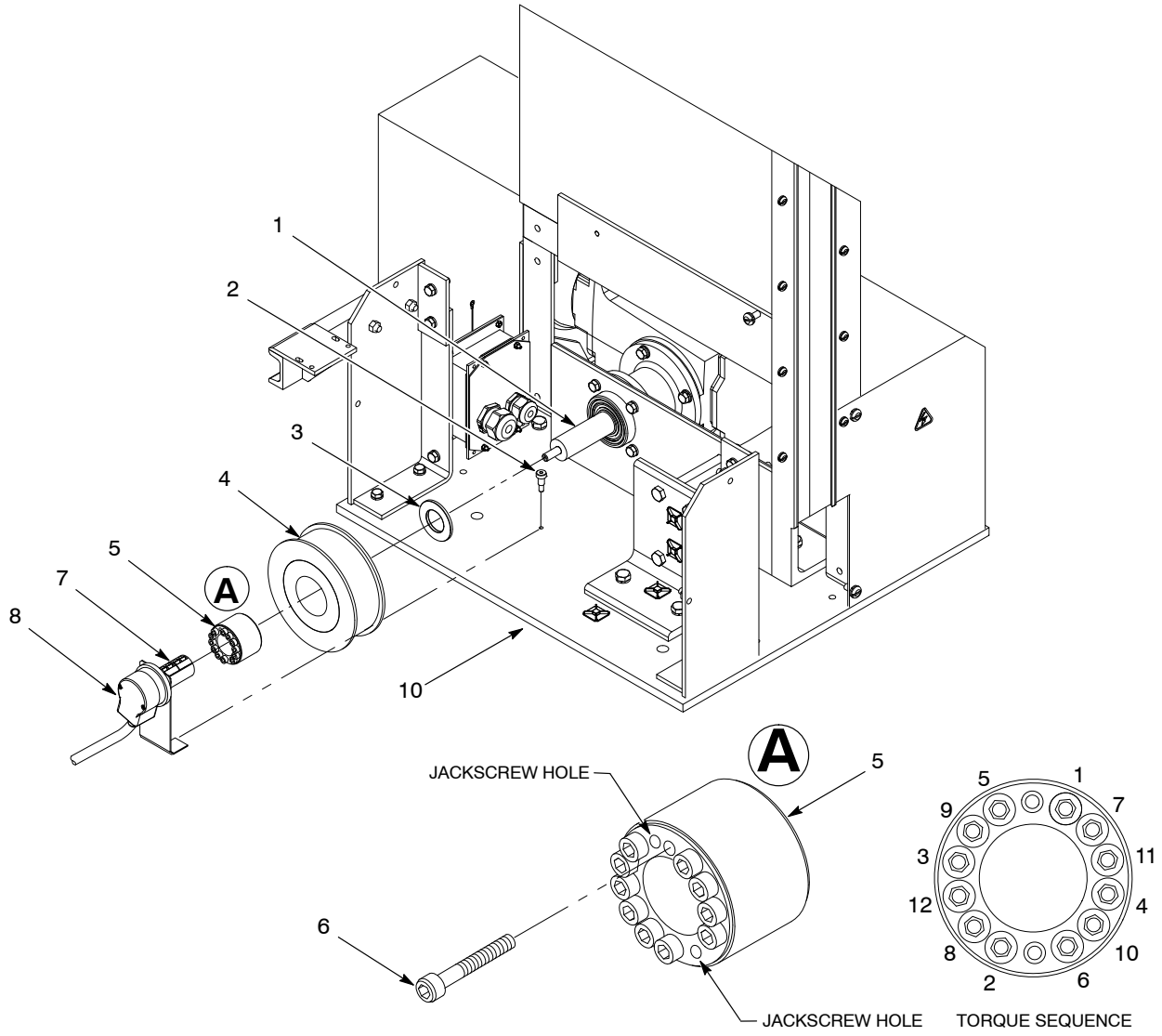

Figure 12 Replacing the Bottom Pulley

Install the Bottom Pulley

1. See Figure 12. Install the washer (3) onto the driver assembly shaft (1).
2. Install the bushing (5) into the bottom pulley (4).
3. Install the bottom pulley onto the driver assembly shaft (1).
4. Use the following method to tighten the bushing screws (6):
   a. Using a torque wrench, thread the screws (6) into the bushing (5) in the sequence shown. Only tighten to 4 N•m (2.3 ft-lb).
   b. Start at TORQUE SEQUENCE 1 and tighten the screws (6) in the sequence shown only to 8 N•m (6 ft-lb).
   c. Finally, start at TORQUE SEQUENCE 1 and tighten the screws in the sequence shown to 15.7 N•m (12 ft-lb).
5. Connect the encoder assembly (8) to the drive motor shaft (1). Tighten the shaft coupling screws (7) to 3.1 N•m (3 ft-lb).
6. Tighten the screw (2) to secure the encoder assembly (8) to the base (10).
7. Install new cable ties onto the encoder assembly cable.
8. See Figure 9. Perform the following:
   a. Insert the belt (2) into the bottom counterweight basket belt retainer (7).
   b. Make sure that the belt is centered and engages the 8 teeth in the belt retainer. Tighten the screws (8) to 20 N•m (15 ft-lb).
9. Adjust the belt tension. Refer to the *Adjust the Belt Tension* procedure.
10. Make sure that the belt is centered in the belt retainer (12) on the back of the gun carriage (10). Tighten the belt clamp retaining screws (11) to 14 N•m (120 in.-lb).
11. See Figure 8. Remove the nuts (8) and lock washers (9) from the T-bolts (10).
12. Remove the screws (14) and washers (13) securing the lock arm (7) to the counterweight basket (6).
13. Install the gun fixture to the gun carriage.

WARNING: Installing the guns and gun mount will unbalance the weight distribution between the gun carriage and the counterweight. Secure the gun carriage to prevent it from moving downward without warning.

14. See Figure 9. Insert the appropriate counterweight plates (14) into the counterweight basket (6) to balance the gun carriage.
15. See Figure 8. Install the side access panels (3A, 4A) and encoder cover (5) using the washers (2) and screws (1). Tighten the screws securely.

Replace the Counterweight Basket Rollers

WARNING: This procedure requires the use of a ladder. Do not use the reciprocator to support the ladder.

Use the following procedure to replace the counterweight basket rollers.

NOTE: The top counterweight basket roller assembly is used as an example in this procedure. The procedure for replacing the bottom counterweight basket roller assembly is typical.

1. Secure the gun carriage and counterweight basket. Refer to the *Secure the Gun Carriage and Counterweight Basket* procedure.
2. Mark the orientation and position of the top counterweight guide on top of the counterweight basket. Repeat this procedure if replacing the bottom counterweight guide.
3. Remove the screws (2) and lock washers (3) securing the roller assembly (4) to the counterweight basket (1).
4. Move the roller assembly (4) upward to remove it from the roller guides (5).
5. Insert the new roller assembly (4) into the roller guides (5).
6. Secure the roller assembly (3) to the counterweight basket (1) using the lock washers (2) and screws (1). Tighten the screws to 25 N•m (18.5 ft-lb).

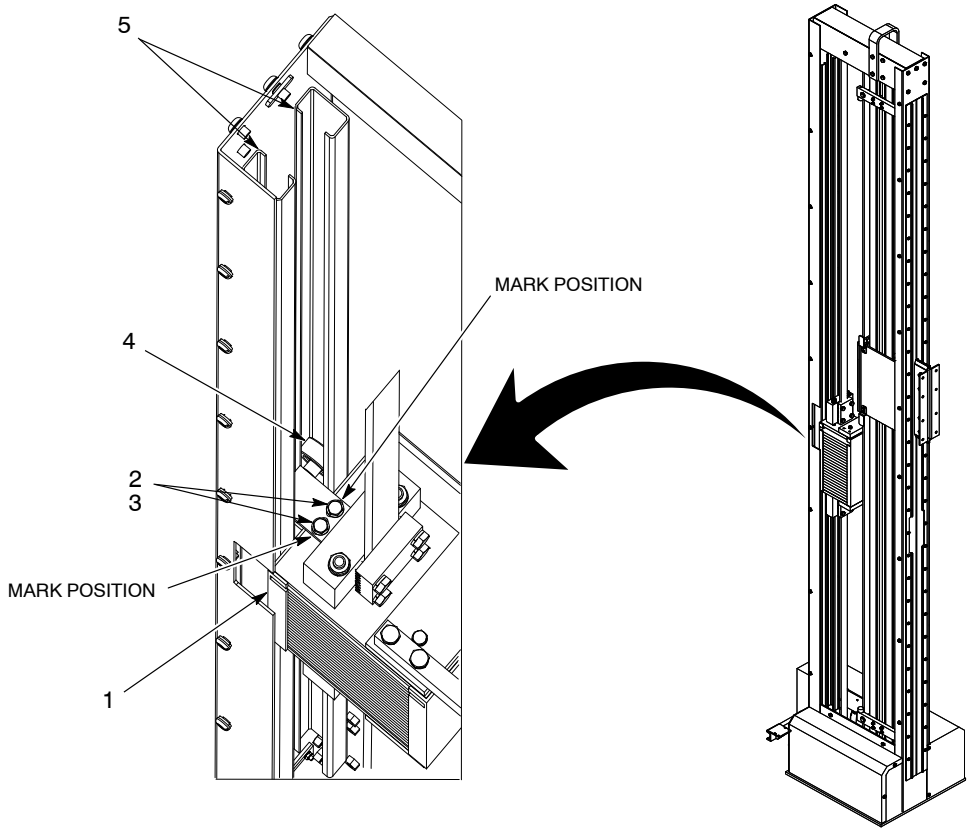

Figure 13 Replacing the Counterweight Basket Roller Assemblies

Replace the Gun Carriage Rollers

NOTE: Replacing the gun carriage rollers requires the use of an assistant.

Remove the Guns and Gun Carriage Mount

1. Disconnect and lock out power to the reciprocator.
2. See Figure 8. Remove the screws (1) and washers (2) securing the side access panels (3A, 3B, 4A, 4B). Remove the screws and washers securing the encoder cover (5) and motor cover (6).
3. Perform the following:
   a. Manually move the gun carriage (14) until the bottom surface is positioned slightly above the counterweight basket (7).
   b. Install the T−bolts (12) through the back of the lock arm (9). Install the lock arm to the counterweight basket (7) using the lock washers (15) and the screws (16). Tighten the screws securely.
   c. Manually move the gun carriage (14) downward until it makes contact with the top of the lock arm (9).
   d. Insert T−bolts (12) into the gun carriage track (13). Install the lock washers (11) and nuts (10) onto the T−bolts. Tighten the nuts securely.
   e. Mark the gun carriage (21) position on the gun carriage track (11).
   f. Mark the counterweight basket (13) position on the counterweight basket track.

CAUTION: Do not completely remove the gun fixtures from the gun carriage mount plate until gaining access to the reciprocator. The counterweights need to be removed at the same time the guns and gun mounts are removed.

4. Remove the guns and the gun bar mount from the gun mount plate (18)
5. Record the number of counterweights (8) and remove them from the counterweight basket (7).
6. See Figure 14. After all guns, gun bar mounts, and counterweights have been removed, perform the following:
   a. Loosen the lock arm (7) nuts (9) until the T-bolts (8) can be rotated 90 degrees and pulled outward from the slots in the carriage track (11). Remove the screws (1) and the lock washers (6) securing the lock arm (7) to the top of the counterweight basket (13). Remove the lock arm (7).
   b. Manually move the gun carriage (21) by the notch (20) in the flap retainer.
7. Remove the cross bolts (27), lock washers (29), washers (28), and nuts (30) securing the gun mount plates (31) to the mounting block (32).
8. Remove the screws (17) and lock washers (18) securing the mounting block (32) to the front of the gun carriage (21).

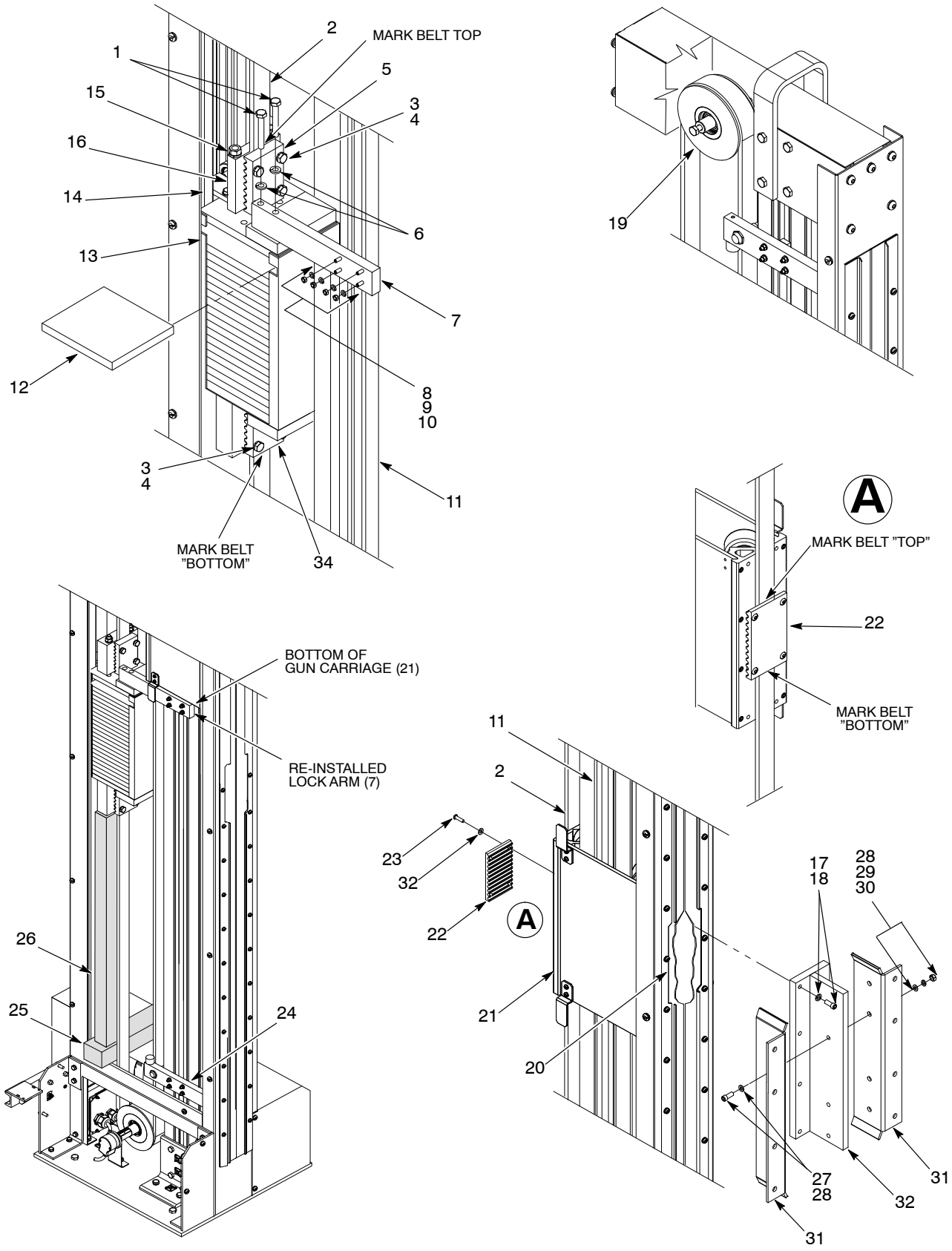

Figure 14 Installing the Gun Carriage Mount

CAUTION: To prevent damage to the bottom pulley assembly, use blocks to support the counterweight basket.

9. Perform the following:
    a. Place a wood block (25) onto the reciprocator cross braces as shown.
    b. Position the gun carriage (21) so it is accessible to service, then block the counterweight basket with a long block (26) to prevent it from moving.
    c. Make sure that the bottom of the gun carriage (21) is above the top of the counterweight basket (13).
10. Reinstall the lock arm (7) onto the carriage track (11) against the bottom edge of the gun carriage (21). Install the T-bolts (8) into the gun carriage and tighten the nuts securely.
11. Loosen the tension nuts (15) on top of the pulley retainer (16) until the nuts are flush with the top of the threaded rod on the counterweight basket (13).
12. Perform the following:
    a. Draw two lines on the top and bottom of the gun carriage retainer clamp (22) as shown. Mark the belt (2) TOP and BOTTOM. These marks will be used during reassembly.
    b. Mark the belt (2) where it contacts the the belt retainer (5) on the top and the belt retainer (34) on the bottom of the counterweight basket (13). Mark TOP just above the top retainer (5). Mark BOTTOM below the bottom retainer (34). These marks will be used during reassembly.
    c. Have an assistant hold the counterweight basket (13).
    d. Remove the screws (23) and lock washers (32) securing the belt retainer to the gun carriage (21). The gun carriage (21) should be resting on top of lock arm (7)
    e. Have an assistant lower the counterweight basket so that it is resting on the blocks (25, 26).
    f. Remove the screws (3) and lock washers (4) securing the belt (2) to the top counterweight basket belt retainers (5) and (34).
    g. Remove the belt (2) from the top pulley (19).

Notes:

Remove the Gun Carriage

NOTE: The procedures in the *Remove the Guns and Gun Carriage Mount* section must be completed before performing the following procedures.

1. See Figure 15. Remove the belt (18) from the top pulley (19)
2. Remove the screws (7) and lock washers (8) securing the top cover (1) to the reciprocator (9).
3. Remove the nut (19), lock washer (20), and screw (21) securing the pulley (18) to the top side plates (4, 22). Remove the pulley assembly from the reciprocator (9).
4. Remove the screws (5) and lock washers (6) securing the side plates (4, 22) to the front and back of the reciprocator (9).
5. Remove the two screws (15), lock washers (3), and nuts (2) securing the U-lift bracket (16) to the gun carriage track (10). Do not remove the other two screws (15) securing top side plates (4, 22) at this time.

WARNING: Support the weight of each side plate when removing the screws to prevent injury to personnel and damage to reciprocator.

6. While supporting the side plate (4), remove the remaining lock washers (3) and nuts (2) from the two screws (15) securing the side plates (4, 22). Remove the side plate (4).
7. While supporting the remaining side plate (22), remove the two screws (15) from the carriage the track (10). Remove the side plate (22).
8. Perform the following:
   a. Mark the position of the top bumper assembly (14) on the gun carriage track (10).
   b. Remove the nuts (11), lock washers (12), and T-bolts (13) securing the top bumper assembly to the gun carriage track (10)

CAUTION: To prevent damage to the proximity sensor on the top bumper assembly, use extreme care when removing the gun carriage.

9. Hold the proximity sensor (14) as shown. Carefully slide the gun carriage (17) up and over the top bumper assembly.

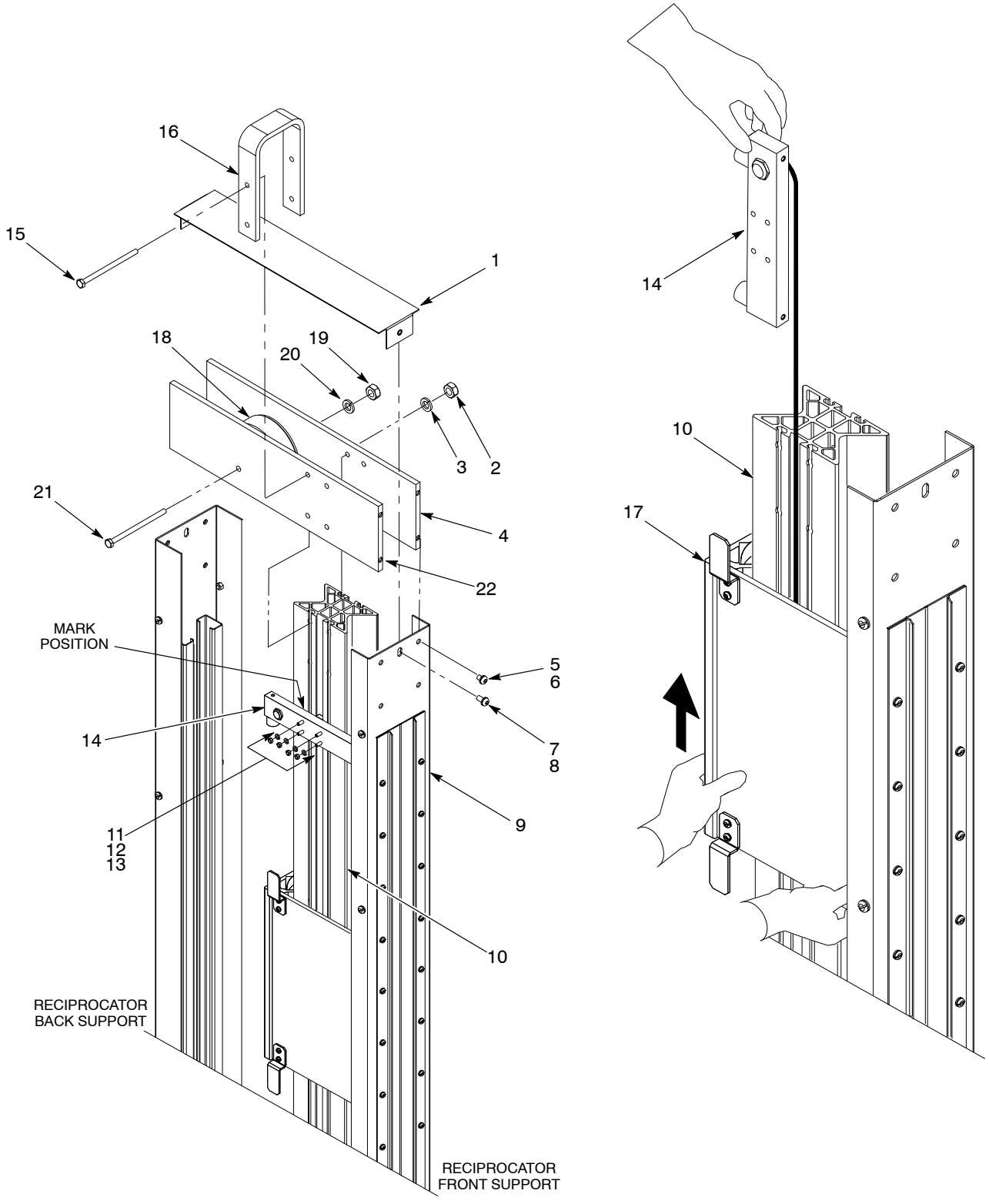

Figure 15 Removing the Gun Carriage Assembly

Replace the Rollers

1. See Figure 16. Remove the screws (1) securing the covers (3, 4) to the roller blocks (2, 5).
2. Slide the covers (3, 4) off of the roller assemblies (2, 5).

NOTE: Install the rollers on each roller assembly as shown.

3. Perform the following to replace a Nylon roller (7):
   a. Remove the screw (9) and short bushing (8) securing the Nylon roller to the roller assembly (2).
   b. Remove the long bushing (6) from the Nylon roller (7). Insert the long bushing into the new Nylon roller.
   c. Apply several drops of Loctite 242 Medium Strength Blue Threadlocker to the internal threads on the roller block.
   d. Insert the Nylon roller (7) into the roller assembly and secure it using the short bushing (8) and screw (9). Tighten the screw to 25 N•m (18.4 ft-lb).
4. Perform the following to replace a Polyurethane roller (7):
   a. Remove the screw (13) and roller bushing (12) securing the Polyurethane roller (11) to the roller block (2).
   b. Remove the conformal axle (10) from the Polyurethane roller (11).
   c. Insert the new conformal axle into the new Polyurethane roller (11).
   d. Apply several drops of Loctite 242 Medium Strength Blue Threadlocker to the internal threads on the roller block.
   e. Insert the Polyurethane roller (11) into the wheel block (2) and secure it using the roller bushing (12) and screw (13). Tighten the screw to 14 N•m (10.3 ft-lb).

NOTE: Make sure that the roller blocks are oriented to the covers as shown.

5. Install the covers (3, 4) onto the wheel blocks (2, 5). Perform the following:
   a. Insert all of the screws (1) into the roller blocks. Alternately hand tighten the screws until the ends of the side plates are fully engaged into both roller blocks.
   b. Tighten the screws to 10.5 N•m (7.8 ft-lb).

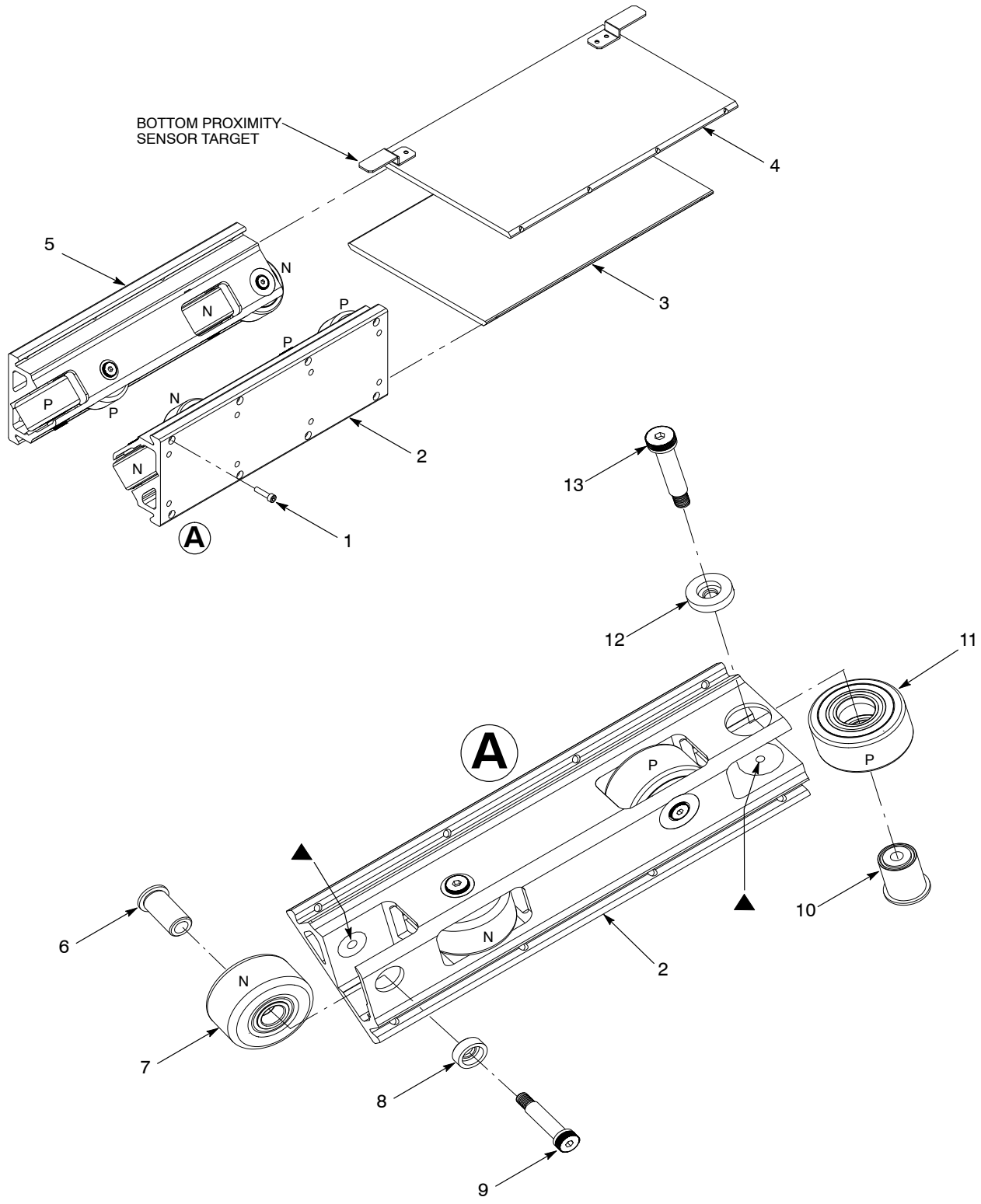

Figure 16 Replacing the Gun Carriage Rollers

Install the Gun Carriage

1. See Figure 17. Hold the the top bumper assembly (14) as shown. Carefully slide the gun carriage (17) over the bumper assembly until it contacts the bottom bumper assembly.
2. Install the top bumper assembly (14):
   a. Insert the T-bolts (13) into the back of the top bumper assembly.
   b. Position the top bumper assembly onto the gun carriage track (10) at the mark that was made prior to removing it.
   c. Insert the T-bolts (13) into the gun carriage track (10). Install the lock washers (12) and nuts (11) onto the T-bolts. Tighten the nuts securely.
   d. Carefully press the top bumper proximity sensor cable into the center groove on the side of the gun carriage track.
3. Install the side plates (4, 22) onto gun carriage track (10) using two screws (15), lock washers (3) and nuts (2). Only hand tighten the screws.
4. Install the U-lift bracket (16) to the side plates (4, 22) using the other two screws (15), lock washers, and nuts (2). Only hand tighten the screws.
5. Install the top pulley assembly (18) in between the side plates (4, 22) using the screw (21), lock washer (20) and nut (20). Tighten the screw securely.
6. Tighten all screws (15), lock washers (3) and nuts (2) to secure the side plates (22, 4) to the gun carriage track (10).
7. Secure the side plates (4, 22) to the front and back support of the reciprocator using the screws (5) and lock washers (6). Tighten the screws securely.
8. Install the top cover (1) onto the reciprocator (9) using the screws (7) and lock washers (8). Tighten the screws securely.

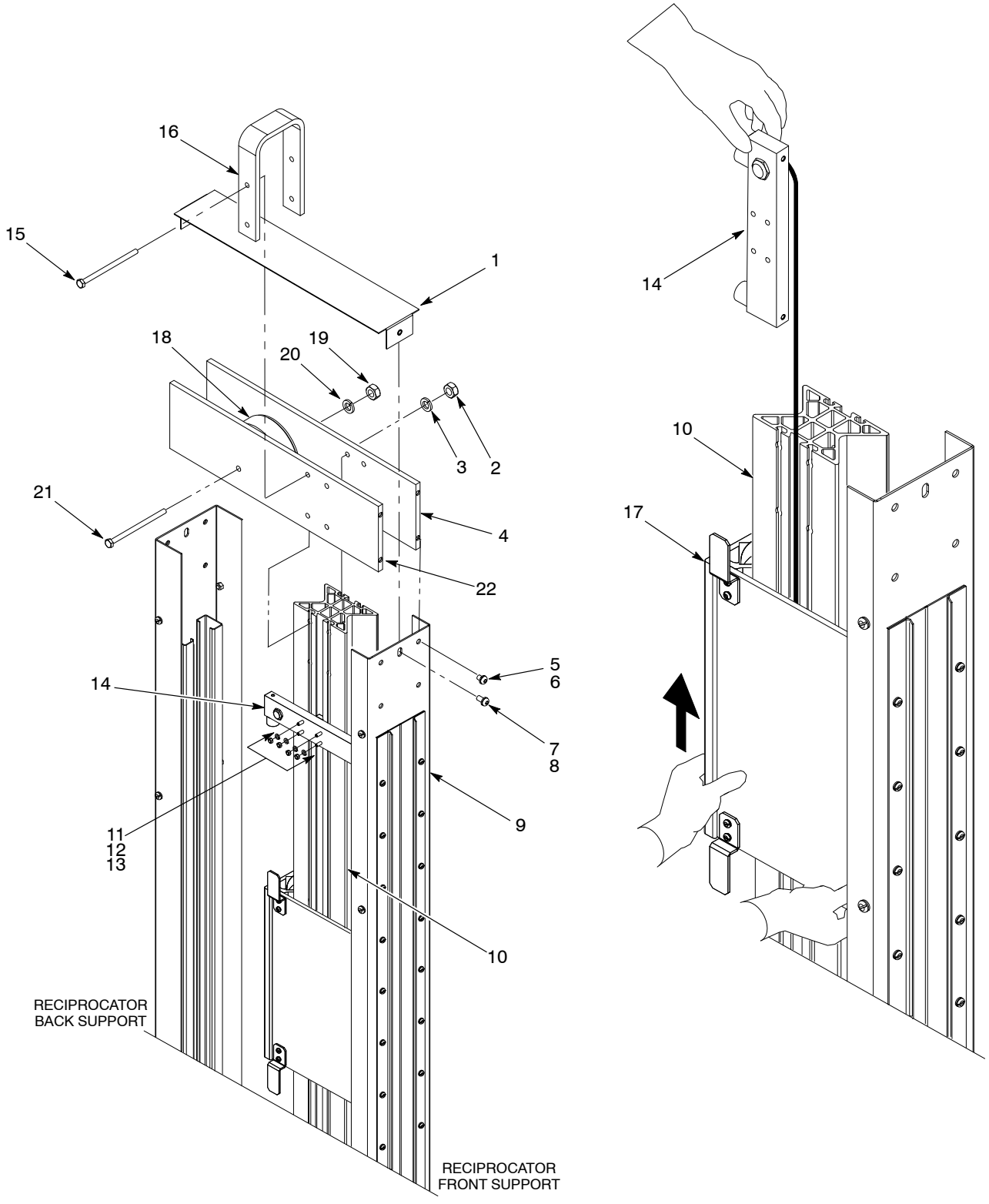

Figure 17 Installing the Gun Carriage Assembly

Install the Gun Carriage Mount

1. See Figure 18. Install the belt:

NOTE: If reinstalling the same belt, use the markings

- made on the belt to identify the installation orientation and location of the belt ends to the top and bottom of counterweight basket.
- to locate the gun carriage retainer attachment location.

If replacing the old belt and it is not broken,

- place the old belt next to the new belt on a level floor and transfer the marks onto the new belt.
- use the old belt check the over length of new belt to determine if it needs to be cut.

   a. Insert the belt (2) into the top and bottom counterweight basket belt retainers (5, 34). Make sure that the belt is centered side-to-side and engages the eight teeth in the belt retainers. Make sure that the belt does not extend below the bottom edge of top retainer (5) or above the top edge of the bottom retainer (35). Secure the belt using the lock washers (4) and screws (3). Tighten the screws to 14 N•m (10.3 ft-lb).

   b. Install the belt retainer (22) onto the back of gun carriage (21) using the screws (23) and lock washers (33). Do not tighten the screws at this time. Make sure that the belt (2) can move freely between the belt retainer and gun carriage.

   c. Have an assistant position the gun carriage (21) so that the top and bottom of the belt retainer (22) aligns with the marks made on the belt (2). Make sure that the belt (2) is centered side-to-side in the belt retainer (22). Secure the belt retainer to gun carriage by tightening the screws (23) to 20 N•m (14.75 ft-lb).

   d. Make sure that the belt is centered side-to-side on the bottom drive pulley (34). The distance from the outer side face of the pulley to the belt is approximately 7 mm (0.28 in.). Reposition the belt if required.

   e. Make sure the belt is centered side-to-side on the top idler pulley (19) by checking that distance from outer side face of pulley to belt is 14 mm (0.55 in.). Reposition the belt if required.

2. Remove the lock arm (7) by loosening the nuts (9) on the T-bolts (8) until the T-bolts can be rotated 90 degrees and can be pulled outward from the slots in carriage track (11).
3. Remove the wood blocks (25, 26) under the counterweight basket (13). Have an assistant manually move the gun carriage (21) by the notch (20) in the flap retainer on the front of the reciprocator.
4. Position the gun carriage mount (32) in front of the gun carriage (21). Install the screws (17) and lock washers (18) that secure the mounting block (33) to gun carriage (21). Do not tighten the screws until all of them are installed. After the screws are installed, tighten them securely.
5. Install the gun mounting plates (31) to the mounting block (32) using the cross bolts (27), lock washers (29), washers (28), and nuts (30). Tighten the nuts securely.
6. Adjust the belt tension. Refer to the *Adjust the Belt Tension* procedure.

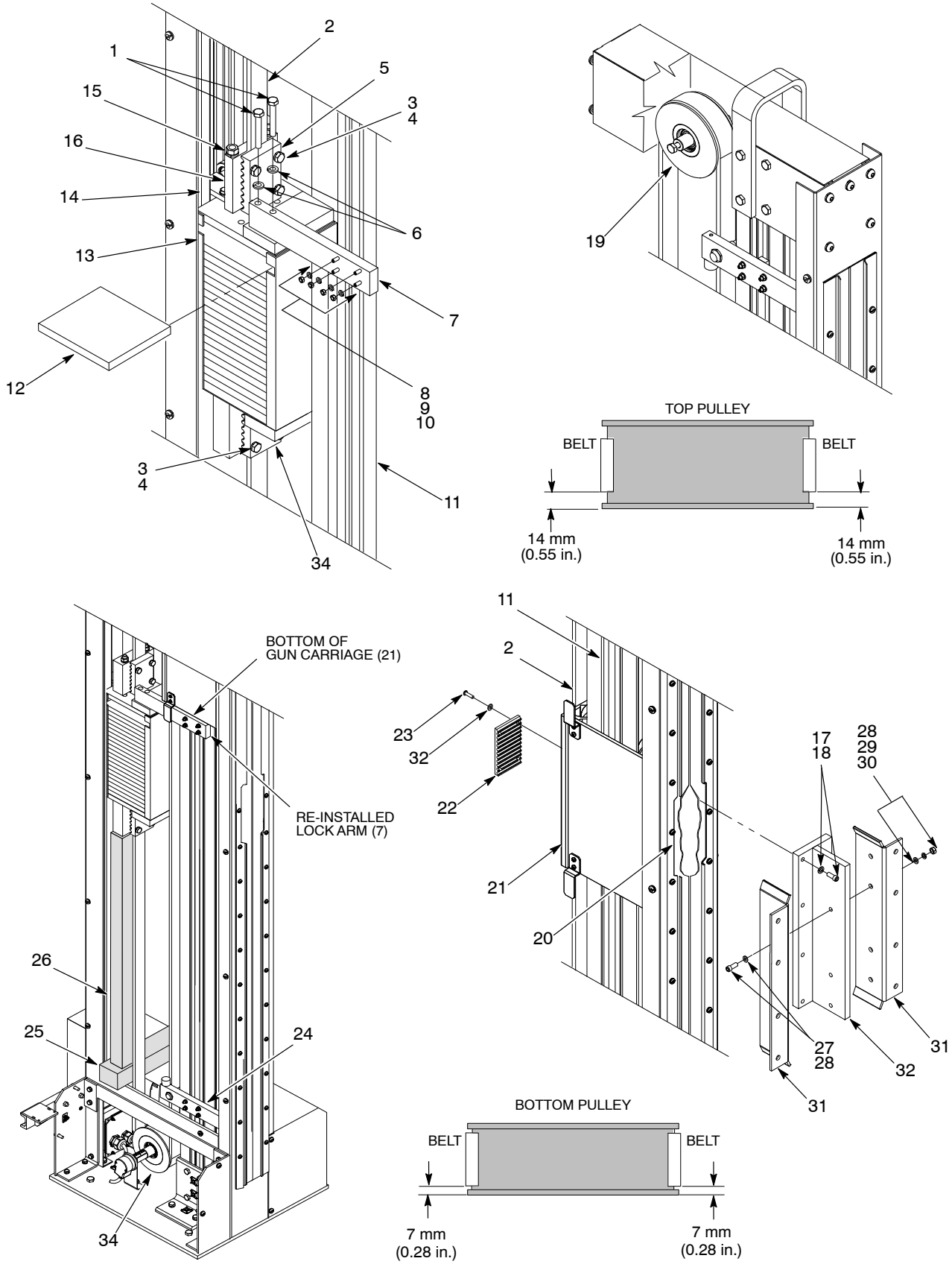

Figure 18 Installing the Gun Carriage Mount

7. Perform the following:
   a. Manually move the gun carriage up and down to ensure that it moves smoothly. The carriage should slide up and down with no resistance. All visible rollers on carriage should make contact with carriage track.
   b. Temporarily remove the lockout tag to enable the equipment to be powered up and tested using the controller.
   c. Refer to the applicable Operator's Card or controls unit manual for startup and run procedure. Start the reciprocator and let it run through several cycles to ensure that it operates properly.
8. Perform the following:
   a. Disconnect and lockout power to the reciprocator. Lock out and tag the main power to the reciprocator before continuing to the next step.
   b. Manually move the gun carriage (21) until the bottom surface is positioned slightly above the counterweight basket (13).
   c. Install the T-bolts (10) through the back of the lock arm (7). Install the lock arm to the counterweight basket (13) using the lock washers (6) and screws (1). Tighten the screws securely.
   d. Manually move the gun carriage (21) downward until it makes contact with the top of the lock arm (7).
   e. Insert the T-bolts (10) into the gun carriage track (11). Install the lock washers (9) and nuts (8) onto the T-bolts. Tighten the nuts securely.
9. Insert the counterweights (12) into the counterweight basket (13).
10. Install the gun mount and guns to the gun carriage.
11. Remove the nuts (8) and lock washers (9) from the T-bolts (10).
12. Remove the screws (1) and washers (6) securing the lock arm (7) to the counterweight basket (13).
13. See Figure 8. Install the side access panels (3A, 3B, 4A, 4B) and encoder cover (5) using the washers (2) and screws (1). Tighten the screws securely.
14. Remove the lockout tag and reconnect power to the reciprocator.

Notes:

Gear Motor

WARNING: Lockout power to the reciprocator before performing repairs.

Remove the Gear Motor

1. See Figure19. Remove the screws (1) and lock washers (2) securing the cover (3) to the reciprocator (20).
2. Perform the following:
   a. Remove the screws (10) securing the cover (11) to the gear motor junction box (12).

NOTE: Make note of the orientation of the terminal jumper connectors in the junction box. Make sure that the terminal jumper connectors on the new gear motor are configured the same way.

   b. Loosen the cable strain relief (9).
   c. Disconnect the cable wires in the junction box (12). Carefully pull the cable (13) out of the junction box (12).
   d. If installed, disconnect the ground cable from the side of the gear motor.
3. Remove the screw (4), lock washer (5), and washer (6) securing the gear motor (8) to the driver assembly shaft (14).
4. Remove the screws (16), lock washers (17), and washers (18) securing the gear motor (8) to the gear motor mount (19).

CAUTION: The gear motor is heavy. Use extreme care when removing it from the reciprocator. Use the lift-lug on the gear motor during removal and installation.

5. Remove the gear motor (8) from the shaft (14). Remove the shaft keys (15) from the driver assembly shaft (14).

Install the Gear Motor

1. See Figure19. Perform the following:
   a. Install the shaft keys (15) onto the driver assembly shaft (14) as shown.
   b. Make sure that the keyway on the gear motor (8) is aligned to the shaft keys (15) on the shaft (14). Slide the gear motor onto the shaft. Make sure that there are no gaps between the face of the gear motor (8) and the gear motor mount (19).
   c. Secure the gear motor (8) to the gear motor mount (19) using the washers (18), lock washers (17), and screws (16). Tighten the screws to 25 N•m (18.5 ft-lb).
   d. Secure the driver assembly shaft (14) to the gear motor (8) using the washer (6), lock washer (5), and screw (4). Tighten the screw to 25 N•m (18.5 ft-lb).

2. Perform the following:

NOTE: Make sure that the terminal jumper connectors in the J-box on the new gear motor are configured the same way as on the old gear motor.

   a. Insert the cable (13) into the cable strain relief (9). Connect the cable wires to the junction box (12) as shown.

   b. Tighten the cable strain relief (9).

   c. Install the cover (11) to the junction box (12) using the screws (10). Tighten the screws securely.

   d. If removed, connect the ground cable to the side of the motor.

3. Install the cover (3) onto the reciprocator (20) using the lock washers (2) and screws (1). Tighten the screws securely.

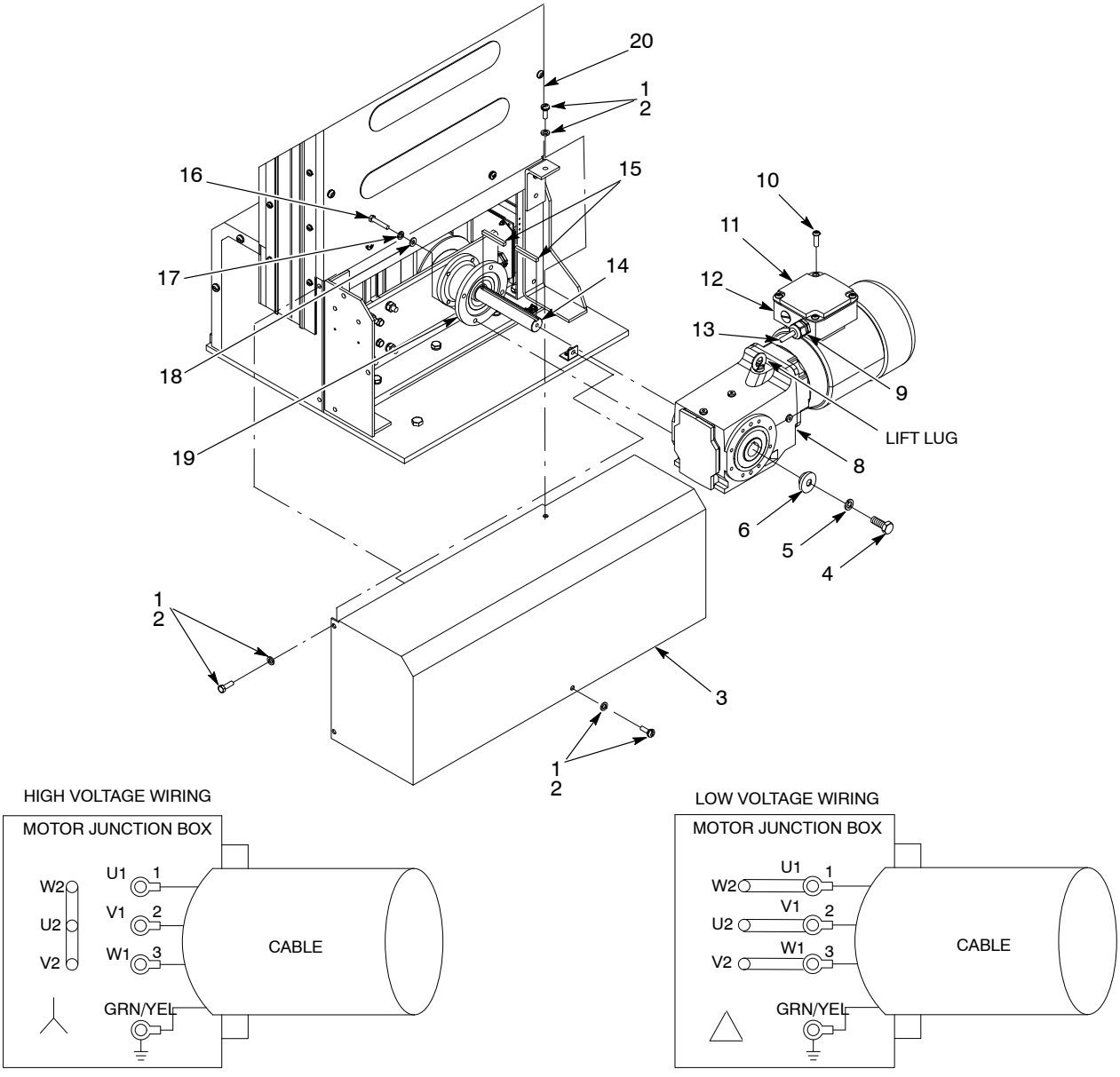

Figure 19 Replacing the Gear Motor Assembly

Replace the Drive Bearing or Drive Motor Shaft

Use the following procedure to replace the drive bearing or drive shaft.

Remove the Drive Bearing and Shaft

1. Remove the Bottom Pulley. Refer to the *Remove the Bottom Pulley* procedure.
2. Remove the gear motor. Refer to the *Remove the Gear Motor* procedure.
3. See Figure 20. Remove the retainer snap ring (1) from the drive motor shaft (3). Remove the drive motor shaft from the adapter (4).
4. Inspect the drive motor shaft (3) for wear or damage and replace if necessary.
5. Remove the bearing (2) from the adapter (4).

Install the Drive Bearing and Shaft

1. Install the bearing (2) into the adapter.
2. Install the drive motor shaft (3) into the bearing (2).
3. Install the gear motor. Refer to the *Install the Gear Motor* procedure.
4. Install the bottom pulley. Refer to the *Install the Bottom Pulley* procedure.

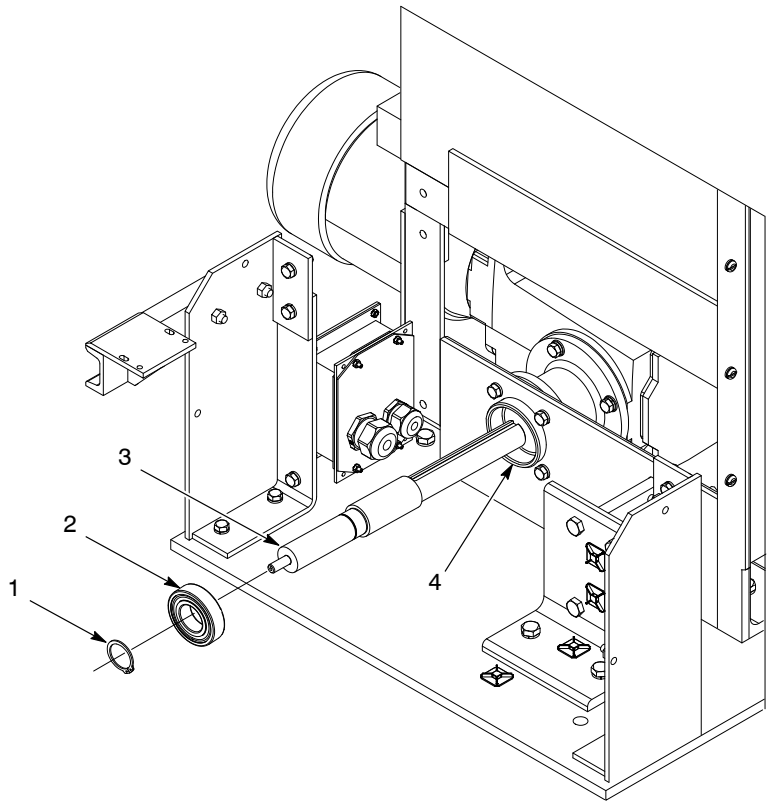

Figure 20 Replacing the Bearing or Gear Motor Shaft

Parts

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

Using the Illustrated Parts List

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

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

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

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

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

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

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

Reciprocator Assemblies

The following reciprocators are available.

Part	Description	Note
1.7-Meter (1700 mm/66.9 in.) Stroke		
1098689	RECIPROCATOR, NVR, 1.7-M, 230/415 AC, 50 Hz, ATEX	
1099502	RECIPROCATOR, NVR, 1.7-M, 230/460 Vac, 60 Hz	
1099503	RECIPROCATOR, NVR, 1.7-M, 200 Vac, 50 Hz	
1099504	RECIPROCATOR, NVR, 1.7-M, 230/380–415 Vac, 50 Hz	
1099505	RECIPROCATOR, NVR, 1.7-M, 575/600 Vac, 60 Hz	
1099506	RECIPROCATOR, NVR, 1.7-M, 208 Vac, 60 Hz	
16000147	RECIPROCATOR, NVR, 1.7-M, 200 Vac, 60 Hz	
2.2-Meter (2200/86.6 in,) Stroke		
1098690	RECIPROCATOR, NVR, 2.2-M, 230/415 AC, 50 Hz, ATEX	
1099497	RECIPROCATOR, NVR, 2.2-M, 230/460 Vac, 60 Hz	
1099498	RECIPROCATOR, NVR, 2.2-M, 200 Vac, 50 Hz	
1099499	RECIPROCATOR, NVR, 2.2-M, 230/380–415 Vac, 50 Hz	
1099500	RECIPROCATOR, NVR, 2.2-M, 575/600 Vac, 60 Hz	
1099501	RECIPROCATOR, NVR, 2.2-M, 208 Vac, 60 Hz	
16000148	RECIPROCATOR, NVR, 2.2-M, 200 Vac, 60 Hz	
2.7-Meter (2700 mm/106.3 in.) Stroke		
1097651	RECIPROCATOR, NVR, 2.7-M, 230/415 AC, 50 Hz, ATEX	
1099489	RECIPROCATOR, NVR, 2.7-M, 230/460 Vac, 60 Hz	
1099490	RECIPROCATOR, NVR, 2.7-M, 200 Vac, 50 Hz	
1099494	RECIPROCATOR, NVR, 2.7-M, 230/380–415 Vac, 50 Hz	
1099495	RECIPROCATOR, NVR, 2.7-M, 575/600 Vac, 60 Hz	
1099496	RECIPROCATOR, NVR, 2.7-M, 208 Vac, 60 Hz	
16000149	RECIPROCATOR, NVR, 2.7-M, 200 Vac, 60 Hz	
3.2-Meter (3200 mm/126 in.) Stroke		
1097650	RECIPROCATOR, NVR, 3.2-M, 230/415 AC, 50 Hz, ATEX	
1099483	RECIPROCATOR, NVR, 3.2-M, 230/460 Vac, 60 Hz	
1099484	RECIPROCATOR, NVR, 3.2-M, 200 Vac, 50 Hz	
1099485	RECIPROCATOR, NVR, 3.2-M, 230/380–415 Vac, 50 Hz	
1099486	RECIPROCATOR, NVR, 3.2-M, 575/600 Vac, 60 Hz	
1099487	RECIPROCATOR, NVR, 3.2-M, 208 Vac, 60 Hz	
16000150	RECIPROCATOR, NVR, 3.2-M, 200 Vac, 60 Hz	

Drive Belts

See Figure 21, Item4.

Part	Description	Note
1104239	KIT, BELT, 1.7 M, 14M–40, 5.26 m length	
1104237	KIT, BELT, 2.2 M, 14M–40, 6.26 m length	
1104219	KIT, BELT, 2.7 M, 14M–40, 7.26 m length	
1104236	KIT, BELT, 3.2 M, 14M–40, 8.26 m length	

Gear Motors

See Figure 21, Item 8.

Part	Description	Note
1098669	GEAR MOTOR, 230/380–415 AC, 50 Hz, ATEX	
1098762	GEAR MOTOR, 230/380–415 AC, 50 Hz, NON-ATEX	
1098763	GEAR MOTOR, 230/460 AC, 60 Hz	
1098764	GEAR MOTOR, 575/600, 60 Hz	
1098765	GEAR MOTOR, 200 AC, 50 Hz	
1098766	GEAR MOTOR, 200–208 AC, 60 Hz	

Common Parts

See Figure 21 and the following parts list. These parts are common to all NVR-Reciprocators, except as noted.

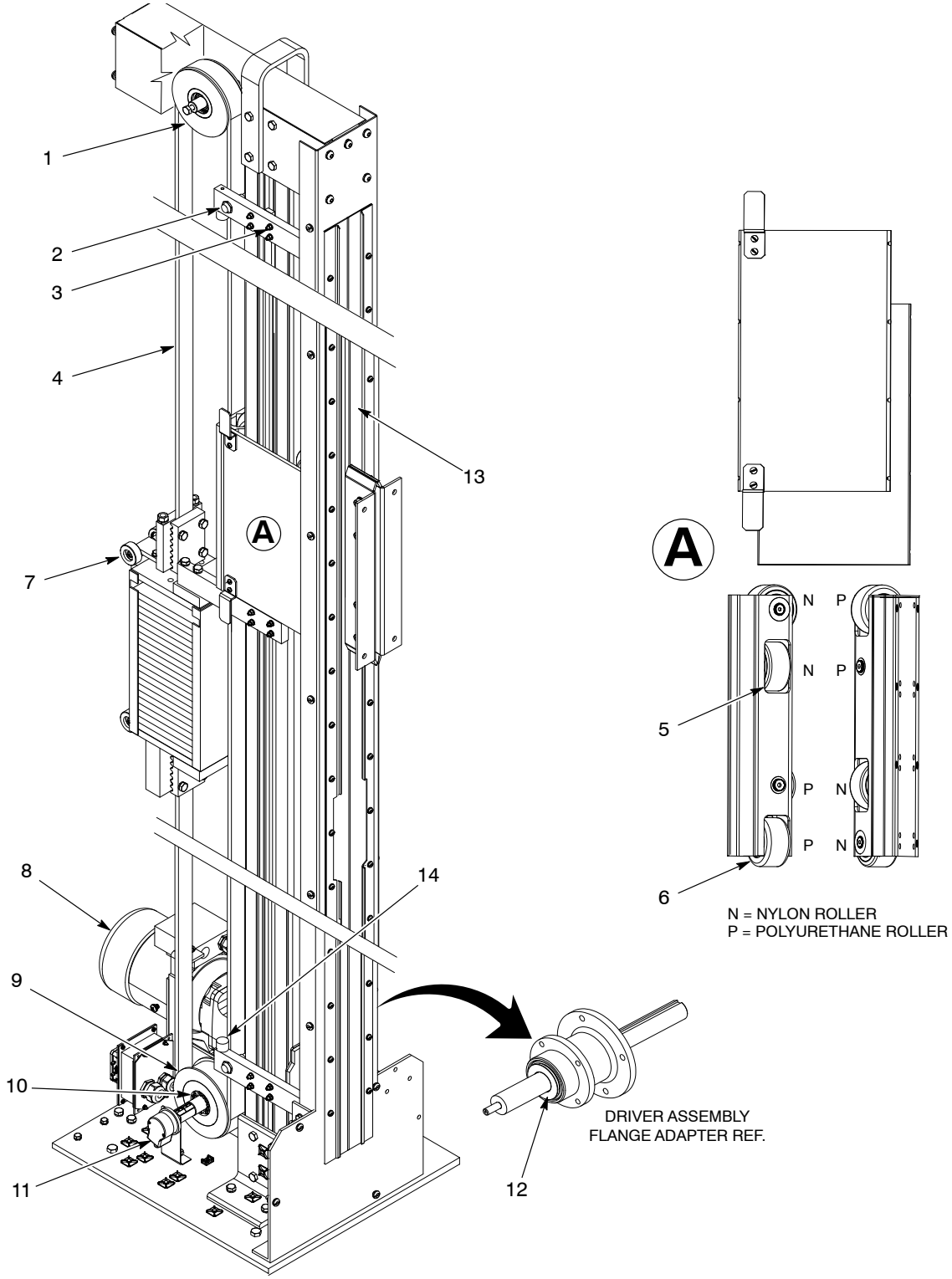

Figure 21 Reciprocator Parts

Item	Part	Description	Quantity	Note
1	1104234	PULLEY, idler, reciprocator, top	1	
2	7750042	SENSOR, proximity, PNP, 5M IN/OUT	2	A, G
	7750053	SENSOR, proximity, NPN, 5M IN/OUT	2	G
3	1104231	T-BOLTS, package of 12, M6 x 35	1	
4	– – – – – –	BELT, reciprocator	1	B, G
5	1104334	ROLLERS, Nylon, gun carriage	4	C
6	1104333	ROLLERS, Polyurethane, gun carriage	4	C
7	1104232	GUIDE, counterweight	1	
8	– – – – – –	GEAR MOTOR	1	D, G
9	1104233	PULLEY, driver, reciprocator, bottom	1	
10	1098620	BUSHING, pulley, reciprocator	1	E
11	7750029	ENCODER, solid, 635 PPR, 5M IN/OUT	1	G
12	7751072	BEARING, 6206–2RS, flange adapter	1	
13	1104230	FLAP, front seal, 8.2 m	1	F
14	1098628	BUMPER, reciprocator	4	

NOTE A: PNP sensors are only used on reciprocators with 200 VAC or 230/380–415 VAC motors. All other reciprocators use NPN sensors.

B: Refer to the *Drive Belts* parts list for ordering information.

C: Refer to the *Carriage Assembly* parts list for ordering information.

D: Refer to the *Gear Motor*s parts list for ordering information.

E: This part is included with the Driver Pulley.

F: The flap seal comes in an 8.2-m roll and must be cut to size.

G: This part is a recommended spare. Keep it on hand to reduce downtime.

Carriage Assembly

See Figure 22 and the following parts list.

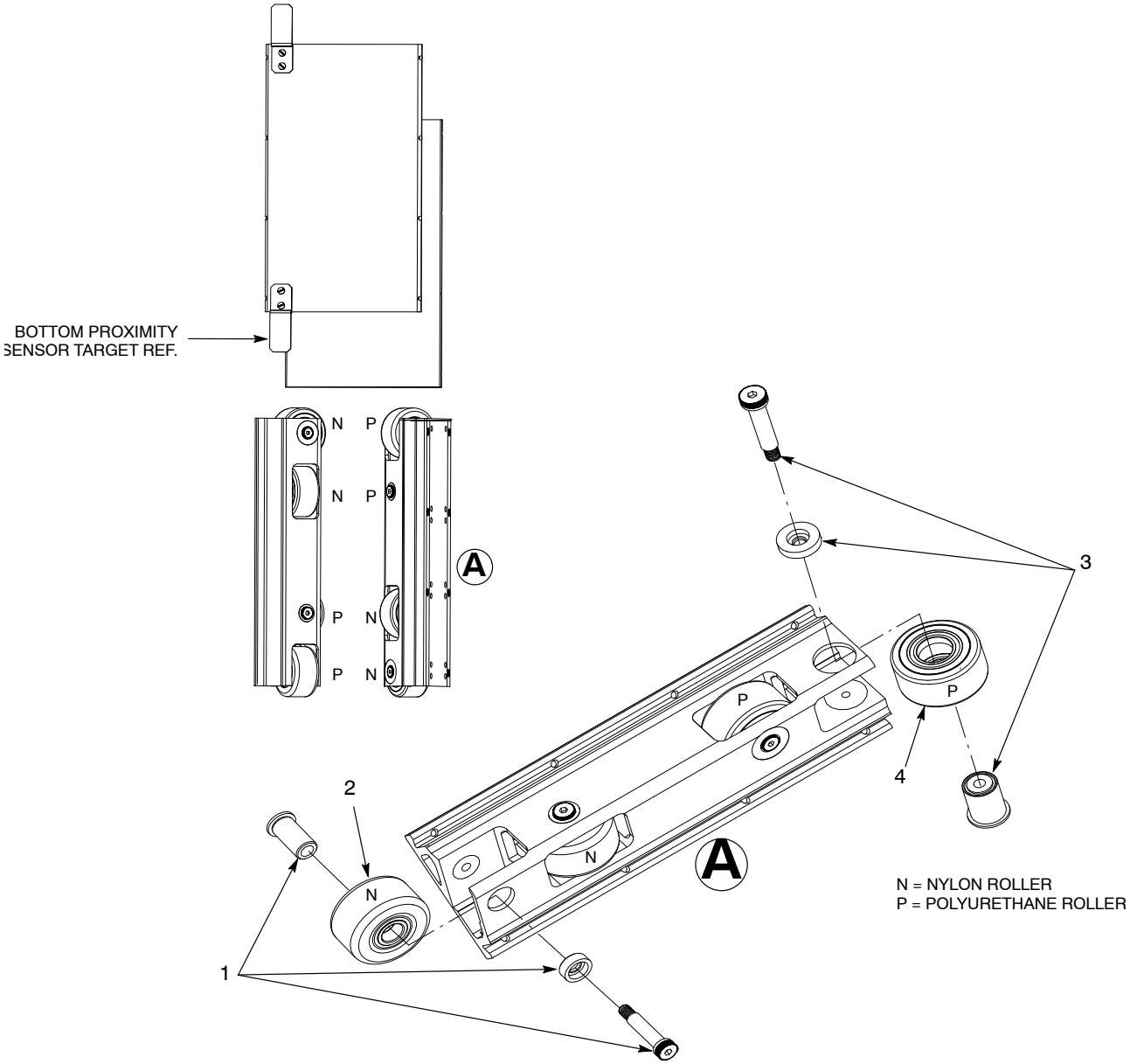

Figure 22 Carriage Assembly

Item	Part	Description	Quantity	Note
1	1104235	AXLE, Nylon roller	2	A, B
2	1104334	ROLLER, nylon	2	A
3	1104330	AXLE, conformal, Polyurethane roller	2	A, B
4	1104333	ROLLER, Polyurethane	2	A

NOTE A: The quantity listed is only for one carriage block assembly. Double the quantity to replace all of the rollers in the gun carriage assembly.

B: Always replace the axles when replacing the rollers.

Cables

NOTE: Each reciprocator assembly requires one motor cable and one sensor cable.

Part	Description	Note
1102278	CABLE, CH7, 12-core assembly, 7 meter, UL	A, C
1102279	CABLE, CH17, 12-core assembly, 17 meter, CE	A, D
1600523	CABLE, CH17, 12 core assembly, single end, 17 meter, CE	A, D, E, F
1102301	CABLE, CG7, 4-core assembly, 7 meter, UL	B, C
1102302	CABLE, CG17, 4-core assembly, 17 meter, CE	B, D
1600026	CABLE, CG17, 4 core assembly, single end, 17 meter, CE	B, D, E, F

NOTE A: Use this cable for sensors and encoder.

B: Use this cable on 3-phase motors

C: Use this cable on reciprocators that have a control box located near or close to the gun mover.

D: Use this cable on reciprocators that have a control box remotely located a long distance from the gun mover.

E: Not for use in North America.

F: This cable has a “flying lead” connector for termination at a remote control box.

Wiring Diagram

See Figure 23.

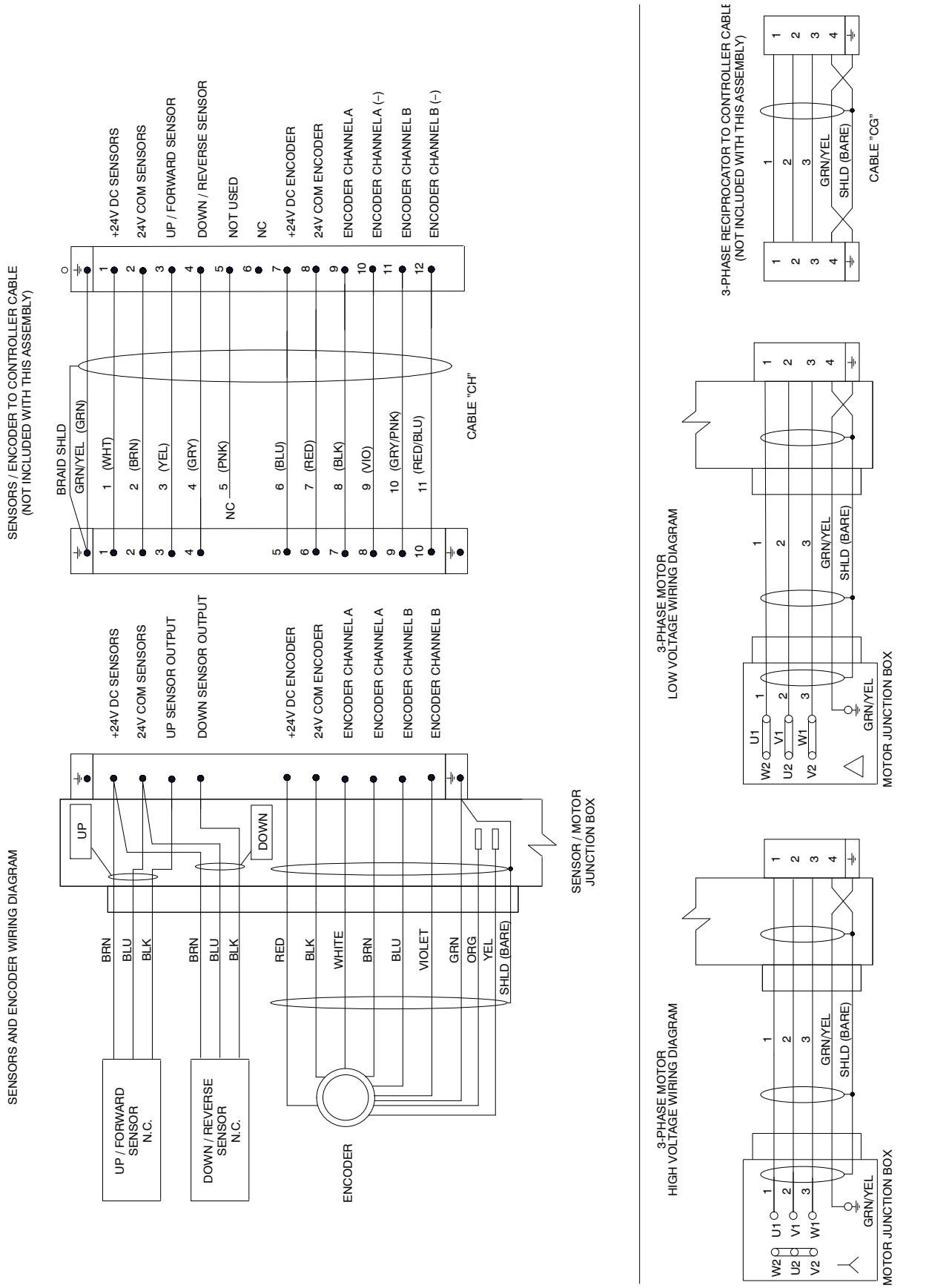

Figure 23 Wiring Diagram