Nordson® NIO2 In/Out Positioner

Customer Product Manual
Part 1603770–02
Issued 5/16

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

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Contact Us

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

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Amherst, OH 44001

Change Record

Revision	Date	Change
02	06/15	Replaced part numbers and removed labels.

Nordson NIO2 Positioner

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 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

The Nordson Chain-Drive Horizontal In/Out Positioner moves powder spray guns horizontally in and out of a powder coating booth. The spray guns are typically mounted on a vertical oscillator, reciprocator, or fixed gun stand, bolted to the positioner.

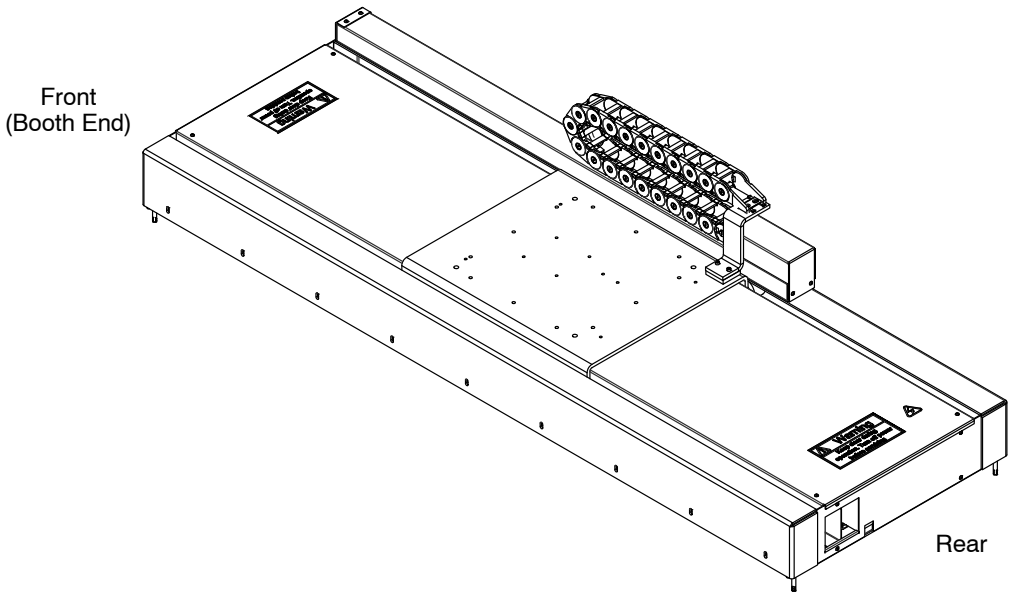


Figure 1 Chain-Drive Horizontal In/Out Positioner

Positioner Models

The positioner is available in three standard travel lengths and four motor voltages. Refer to *Positioner Part Numbers* in the following table for a description of the available configurations.

Part Number	Travel Length	Motor
1603756	0.6M (24 in.)	200 Vac, 50 Hz
1603757	0.6M (24 in.)	230; 380–415 Vac, 50 Hz
1603758	0.6M (24 in)	230; 460 Vac, 60 Hz
1603759	0.6M (24 in.)	575; 600 Vac, 60 Hz
1603760	1.5M (59 in.)	200 Vac, 50 Hz
1603761	1.5M (59 in.)	230; 380–415 Vac, 50 Hz
1603762	1.5M (59 in.)	230; 460 Vac, 60 Hz
1603763	1.5M (59 in.)	575; 600 Vac, 60 Hz
1603764	1M (39 in.)	200 Vac, 50 Hz
1603765	1M (39 in.)	230; 380–415 Vac, 50 Hz
1603766	1M (39 in.)	230; 460 Vac, 60 Hz
1603767	1M (39 in.)	575; 600 Vac, 60 Hz

Positioner Components and Operation

See Figure 2. A vertical oscillator, reciprocator, or fixed gun stand is bolted directly to the carriage (3). The carriage is attached to the chain (7). The gearmotor (1) drives the chain, which moves the spray guns in or out of the booth. The chain is wrapped around the pulleys at each end of the positioner.

Low voltage control and motor power wiring are routed to connectors (4) and (12) from a remotely located position controller. The encoder (5) senses the position of the positioner carriage in relation to the forward and reverse proximity sensors (8, 11), which detect when the positioner carriage reaches the maximum desired travel positions. The color change sensor (13) is used in US powder applications for color change move sequences.

NOTE: The proximity sensors can be positioned where desired in the travel range to adjust carriage travel for the application.

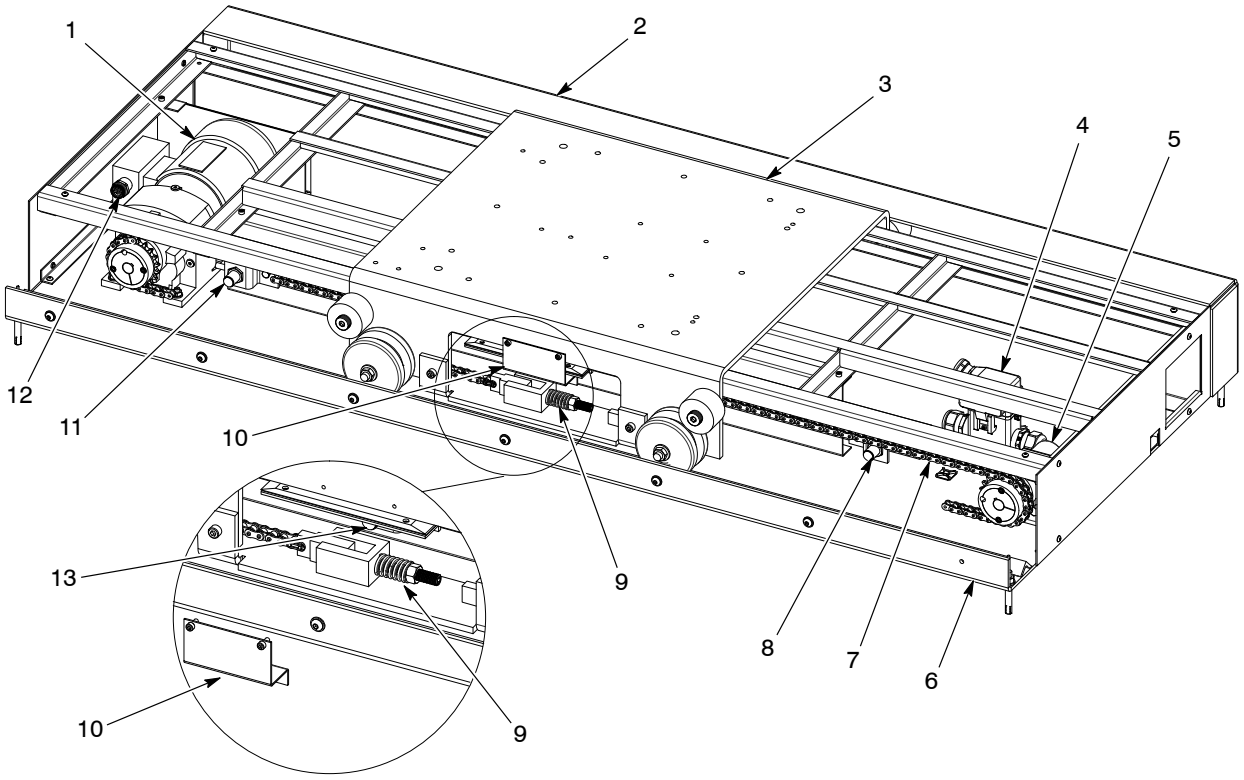


Figure 2 Positioner Components (shown without cable track)

1. Gearmotor
2. Side cover
3. Carriage assembly
4. Sensor/encoder connector
5. Encoder
6. Base
7. Drive chain
8. Forward proximity sensor
9. Chain tensioner
10. Sensor target
11. Reverse proximity sensor
12. Motor connector
13. Color change sensor

Specifications

Motor – 3 Phase	See table on page 5.
Motor Power	0.37 kW (0.5HP)
Max Speed	11 m/min (36 ft/min)
Max Stroke Length	0.6 m (24 in) 1.0 m (39 in) 1.5 m (59 in)
Fwd and Reverse Sensor	N.C. 24 VDC Sourcing (PNP)
Color/Purge Sensor	N.O. 24 VDC Sourcing (PNP)
Encoder	24 VDC, 200 PPR
Encoder Pulse Rate	0.78 pulses/mm 20.0 pulses/in
Positioner Length (L1):	
Max Stroke 1.0 m	1763 mm (69.4 in.)
Max Stroke 1.5 m	2263 mm (89.1 in.)
Max Stroke 0.6 m	1363 mm (53.7 in.)
Anchor Bolt Length Distance (L2):	
1.0 m	1725 mm (67.9 in.)
1.5 m	2225 mm (87.6 in.)
0.6 m	1323 mm (52.2 in.)

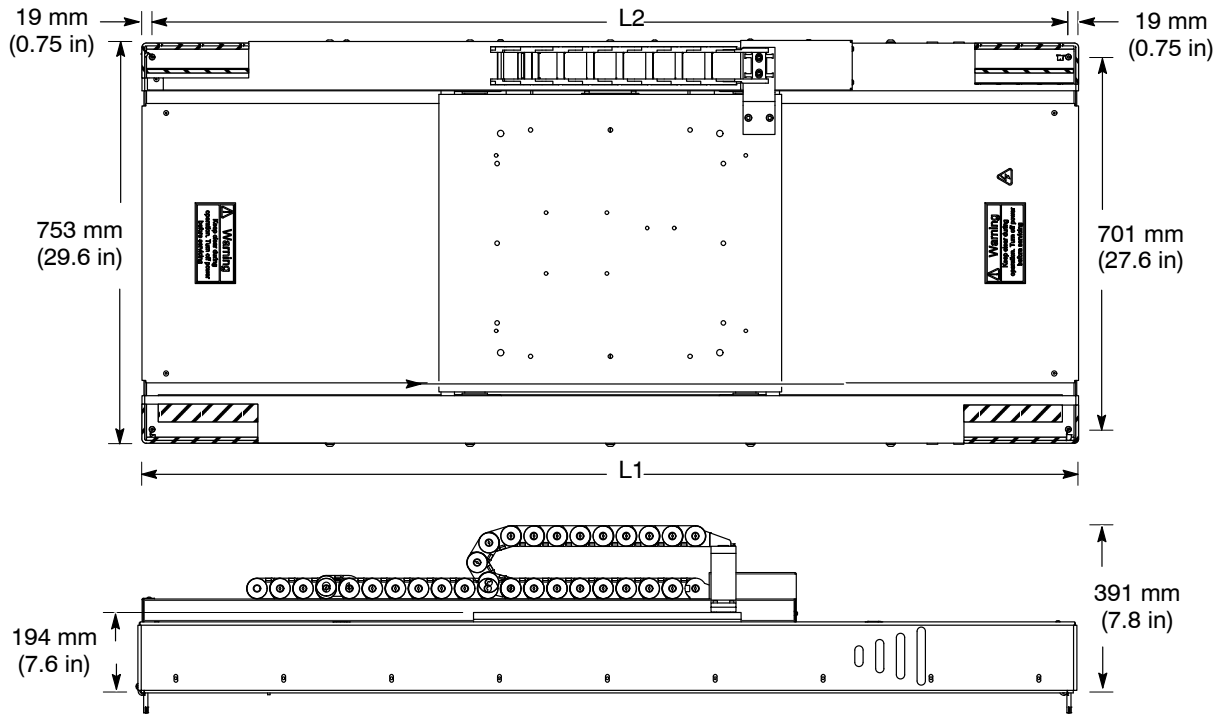


Figure 3 Positioner Dimensions

Installation

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

WARNING: Anytime the side covers are removed from the positioner, the anti-tilt function is disabled.

The installation location must provide the following:

- Level floor, within 0.5 mm (0.02 in.)
- One meter (3 ft) of clearance on sides and rear of positioner

NOTE: The positioner carriage is designed so that Nordson oscillators, reciprocators, and fixed gun stands can be bolted directly to the carriage.

Mounting Gun Stands and Anchoring Base

NOTE: The side covers and hardware shown in Figure 4 may have been removed during unpackaging.

1. Place the positioner in the location indicated on your system plan view drawings, next to the booth base. Do not bolt the positioner to the floor at this time.
2. See Figures 4 and 6. Using appropriate lifting equipment, carefully install the oscillator, reciprocator, or fixed gun stand (1) onto the carriage (3) and bolt it in place to the carriage with appropriately sized hex head screws, lock washers, and flat washers (2). Figure 6 includes the carriage hole patterns for various fixed gun stands, oscillators, and reciprocators.
3. Make any final adjustments in the position of the positioner in relation to the booth gun slots. This may require mounting spray guns in order to align the guns with the slots.

NOTE: If side covers (7) were previously removed during unpackaging, continue on to step 5.

4. Remove the screws (6), washers (5), and side covers (7) from the positioner base (8) to access the anchoring locations.
5. Bolt the positioner base (8) to the floor with anchor bolts (4).
6. Re-install the side covers (7) by loosely screwing in the screws (6) with washers (5). Tightening of the screws will be done at the end of procedure.

NOTE: For the following step, a standard cable tie can be used. Cable ties are also provided in a fastener kit shipped with the equipment.

7. See Figure 5. Lift the side covers by hand and place a cable tie between the inside surface of the side cover and the top of the bumper wheel. This will insure an approximate 1 mm gap between the side cover and the bumper wheel.
8. Tighten all screws (6), and then pull the cable ties out from the side covers and bumper wheels.

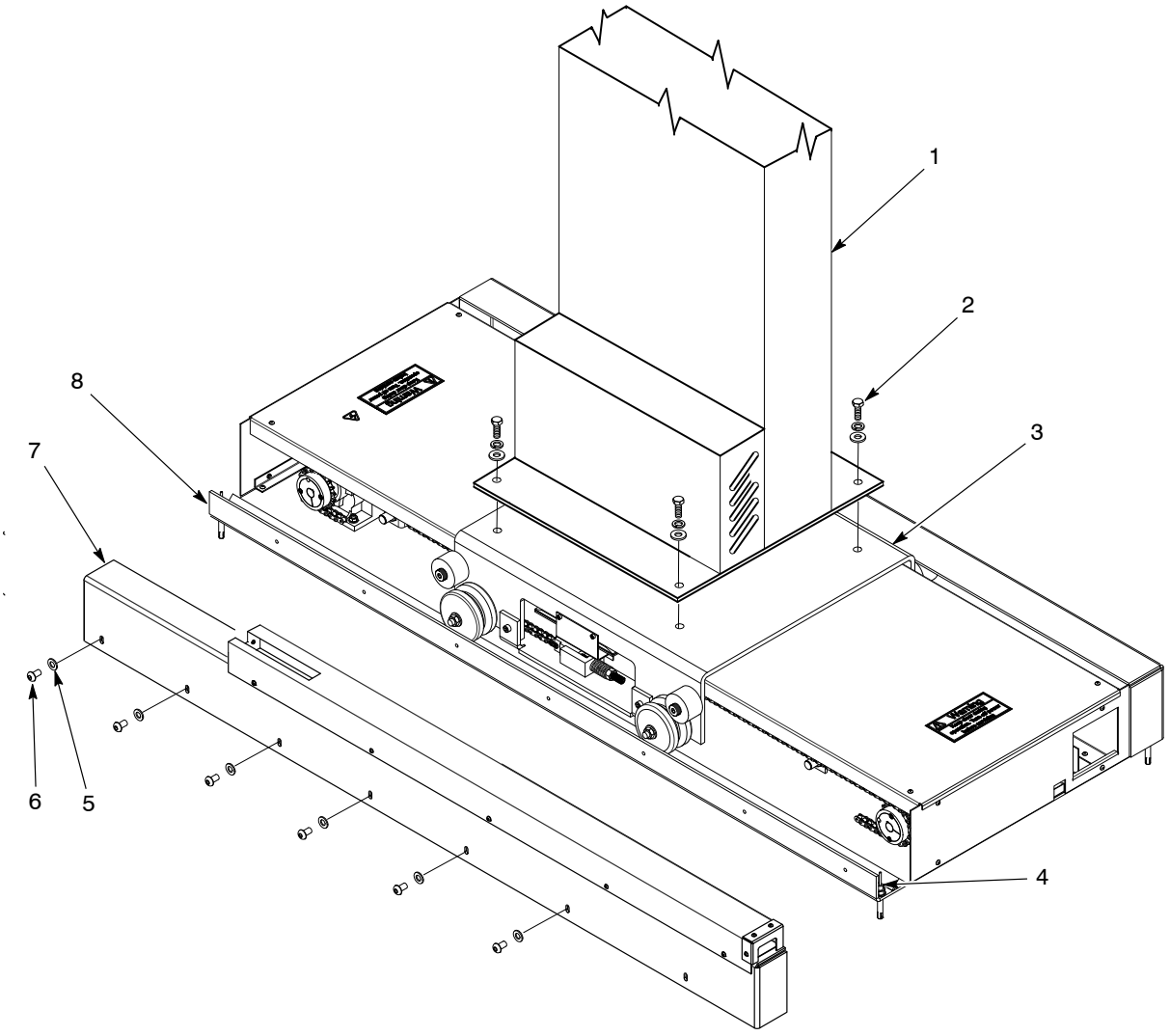


Figure 4 Installation

1. Gun stand
2. Gun stand mounting hardware
3. Carriage
4. Anchor bolts
5. Washer
6. Screw
7. Side covers
8. Positioner base

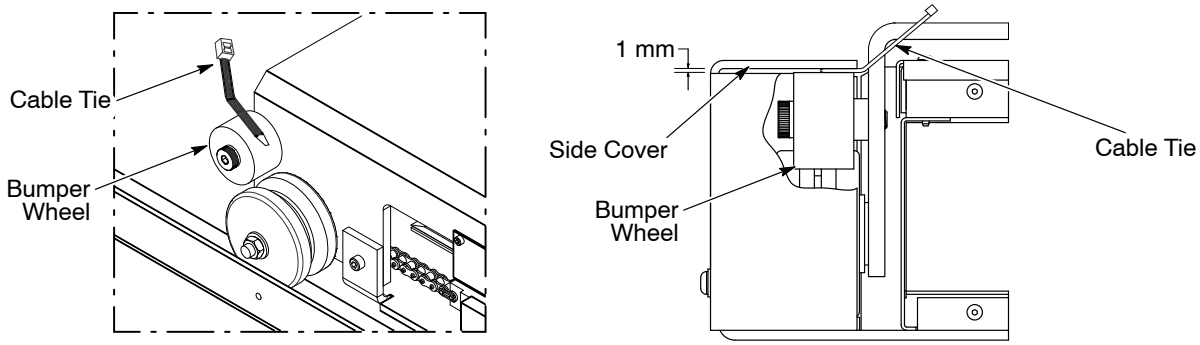


Figure 5 Mounting Side Covers with Spacing

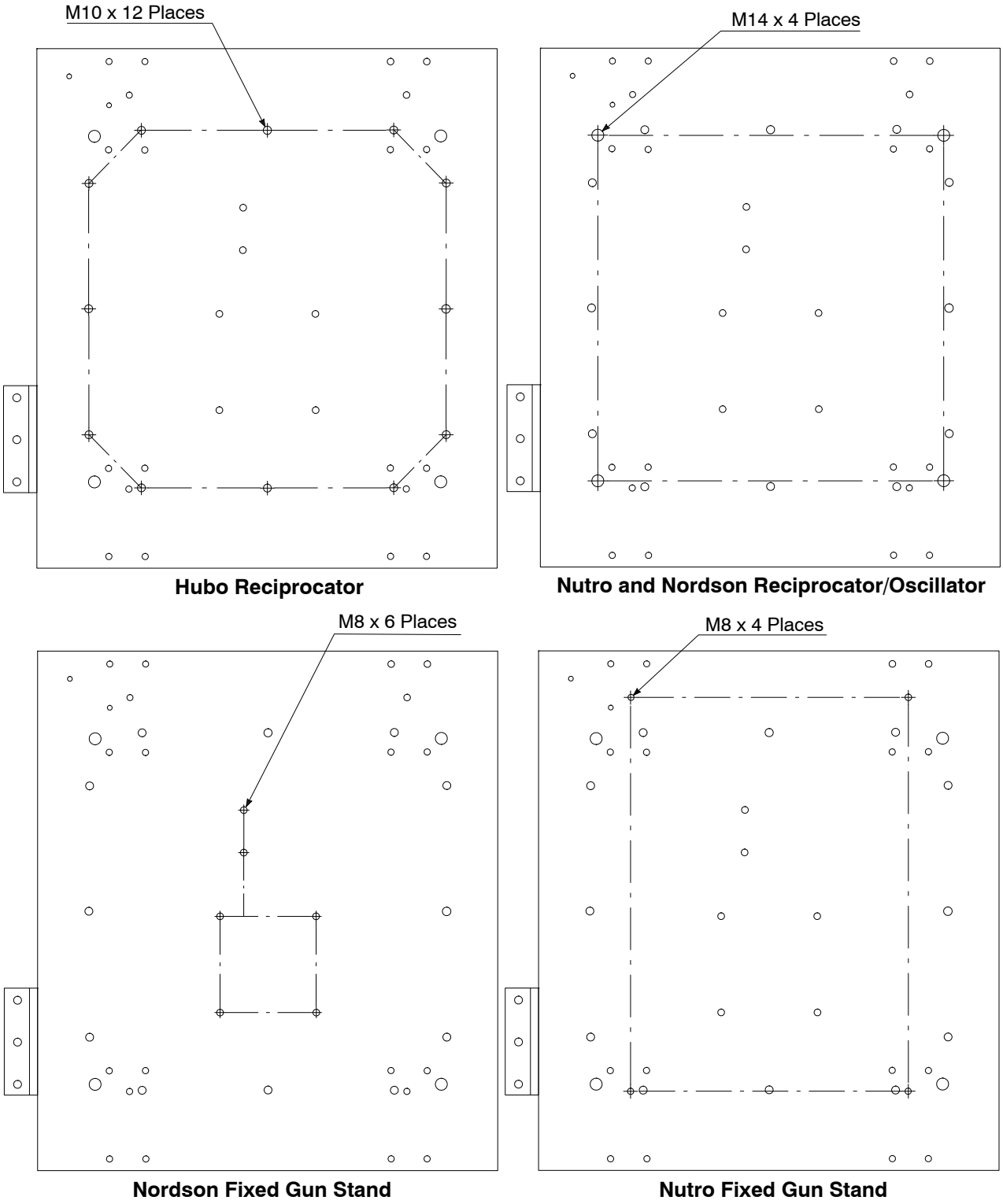


Figure 6 Carriage Hole Patterns

Installing Cable Track and Routing Cables

To provide a protected path for oscillator or reciprocator cables, install the cable chain onto the cable track and route cables through as follows:

1. See Figure 7. Route the cables through the end cover assembly (1) and guide down the length of the cable track (6).

NOTE: If the cables are too big to fit through the end cover assembly (1), the end cover assembly can be removed to allow for more clearance.

2. At the other end of the cable track (6), pull the cables through the opening (5).
3. Lay the cable chain (2) along the cable track (6) and secure the chain (2) with the two screws (3) and washers (4) to the track (6).
4. To run and secure cables along the length of the cable chain (2), open the cable chain links as follows:
   a. See Figure 8. To release the chain link, place the end of a flat head screw driver into the space under the link end, and rotate the head of the screw driver to release the link.
   b. Run cables through chain. Press down on links until they click into place.

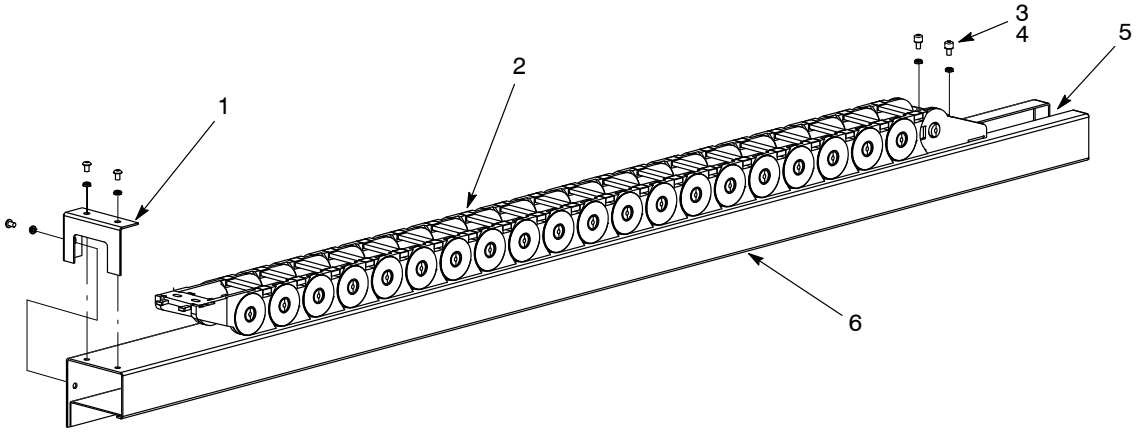


Figure 7 Installing Cables Chain

1. End cover assembly
2. Cable chain
3. Screws
4. Washers
5. Cable opening
6. Cable track

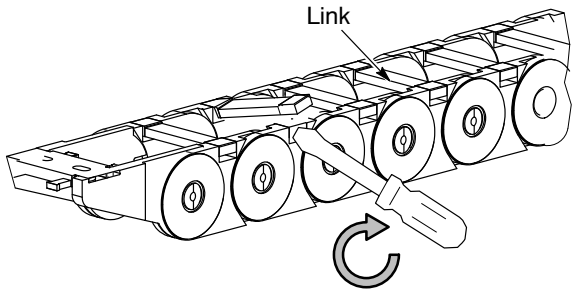


Figure 8 Releasing Link

Installing Cable Track and Routing Cables *(contd)*

5. See Figure 9. Install the Z-bracket (8) to the gun stand and carriage using two screws (8A).

NOTE: A plate adapter (11) is provided with the Z-bracket. The plate adapter is only needed if the base of the gun stand does not fit directly under the Z-bracket when securing it to the carriage.

6. Fold the cable chain (2) and the cables over to connect the other end of cable chain to the top of the Z-bracket (8) with two screws (9) and washers (10).
7. Install the chain end cover (7) using the three button screws (7A).

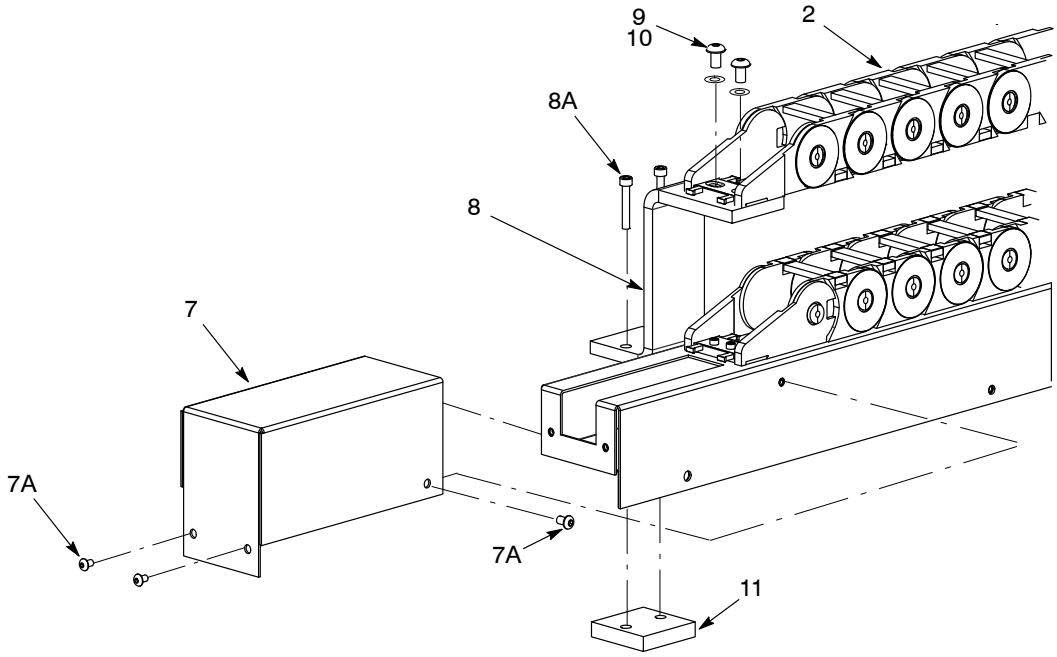


Figure 9 Installing Z-Bracket and Cable Chain Cover

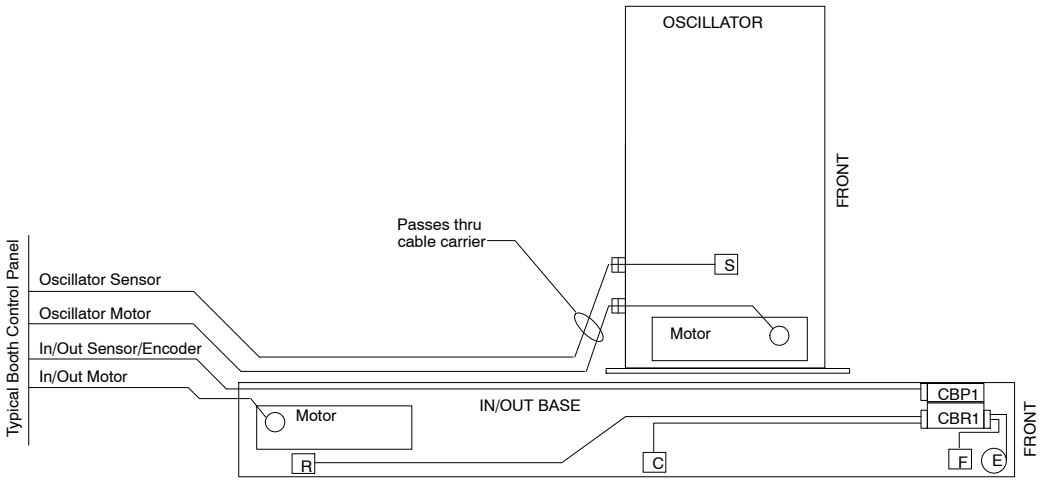
2. Cable chain
7. Cable chain cover
7A. Button screws
8. Z-bracket
8A. Z-bracket screws
9. Screws
10. Washers
11. Plate adapter

Power and Control Cable Connections

Use the following tables with Figures 10, 11, 12, or 13 when routing and connecting the positioner, oscillator, and reciprocator cables.

Code	Function
Note: “n” designates connector number.	
R	Reverse end-of-stroke proximity sensor
F	Forward end-of-stroke proximity sensor
E	Encoder
C	Color change sensor (also known as Purge Location Sensor)
CBRn, CBPn	Sensor/Encoder cable connectors
CHRn, CHPn	Sensor/Encoder cable connectors
CGn	3-Phase AC motor power cable, 4-conductor shielded

NORTH AMERICAN CONFIGURATION – NORDSON POSITIONER, NON-NORDSON OSCILLATOR



NORTH AMERICAN CONFIGURATION – iCONTROL, NORDSON POSITIONER, NON-NORDSON RECIPROCATOR

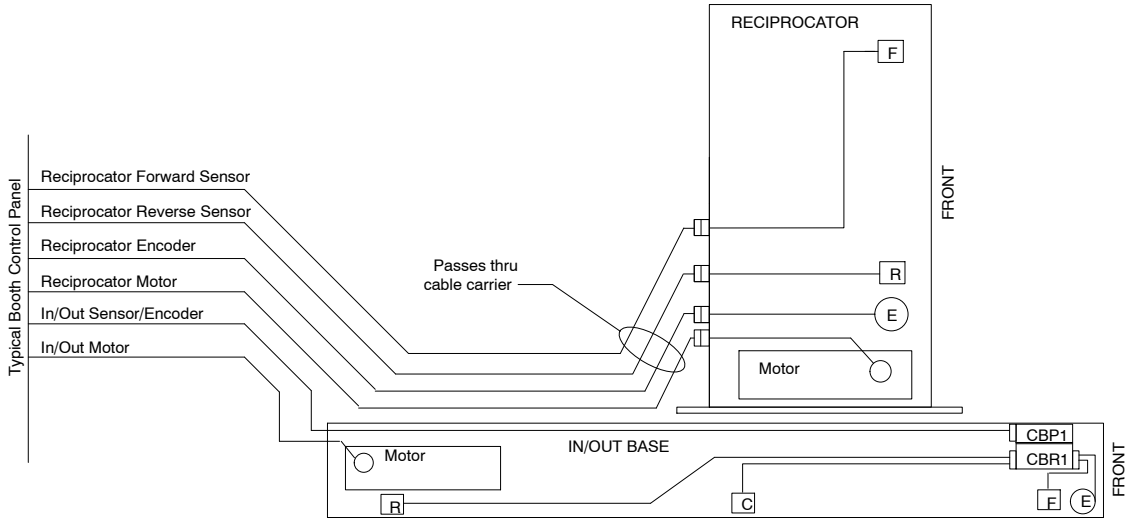


Figure 10 Cabling – Nordson Positioner, Non-Nordson Oscillator or Reciprocator – North American Systems

NORTH AMERICAN CONFIGURATION – iCONTROL, NORDSON POSITIONER AND RECIPROCATOR

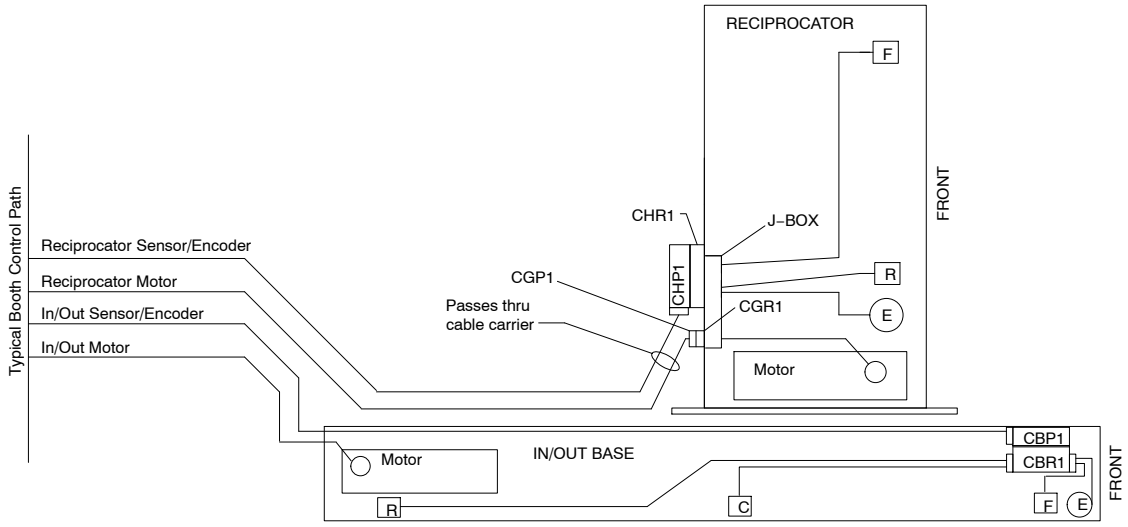
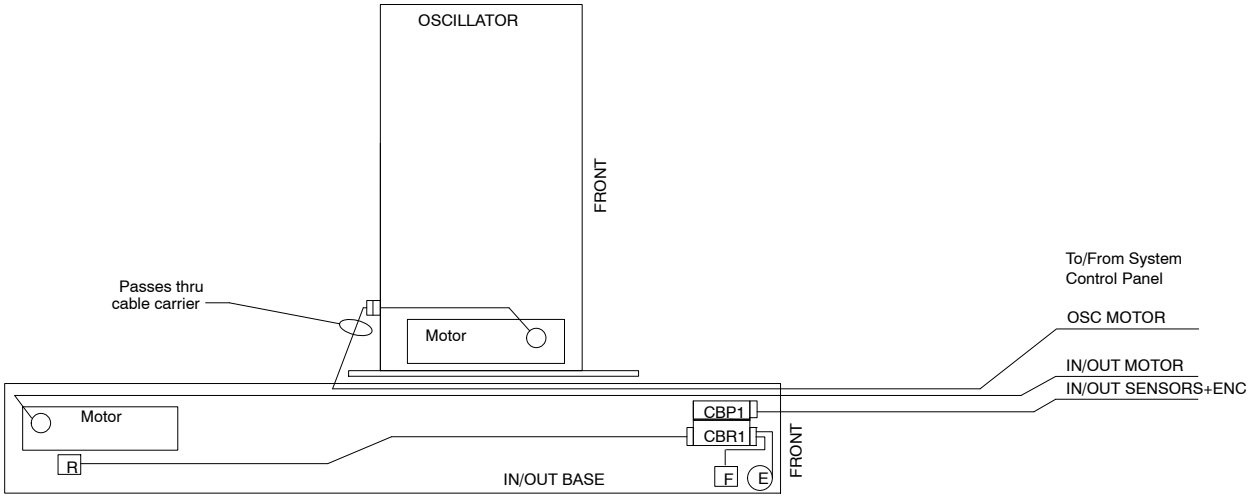


Figure 11 Cabling – Nordson Positioner and Reciprocator – North American Systems

EUROPEAN CONFIGURATION – NORDSON POSITIONER, NON-NORDSON OSCILLATOR



EUROPEAN CONFIGURATION – NORDSON POSITIONER, NON-NORDSON RECIPROCATOR

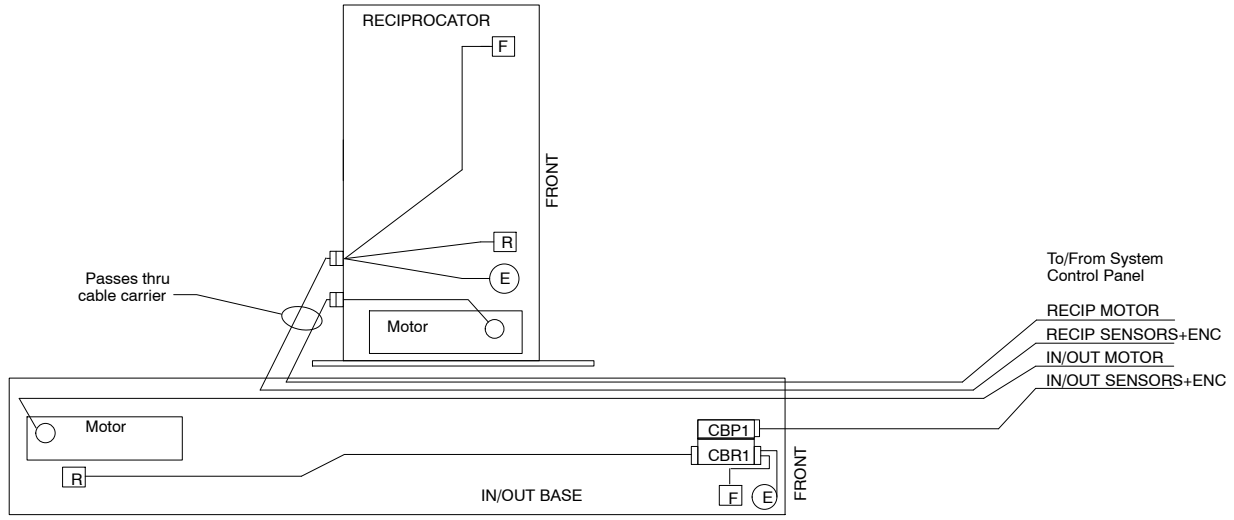


Figure 12 Cabling – Nordson Positioner, Non-Nordson Oscillator or Reciprocator – European Systems

EUROPEAN CONFIGURATION – NORDSON POSITIONER AND RECIPROCATOR

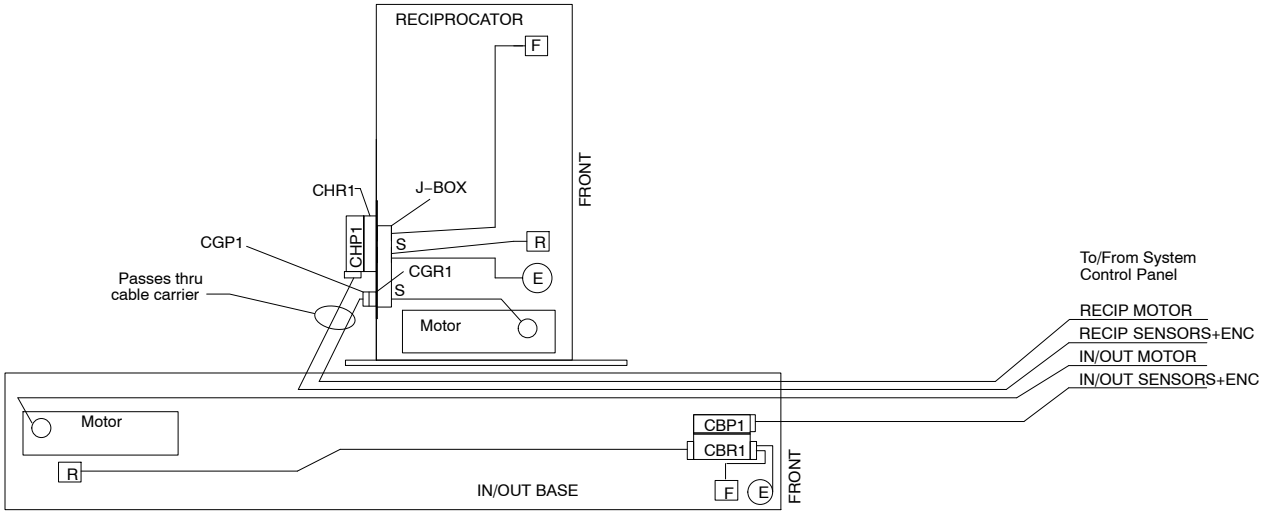


Figure 13 Cabling – Nordson Positioner and Reciprocator – European Systems

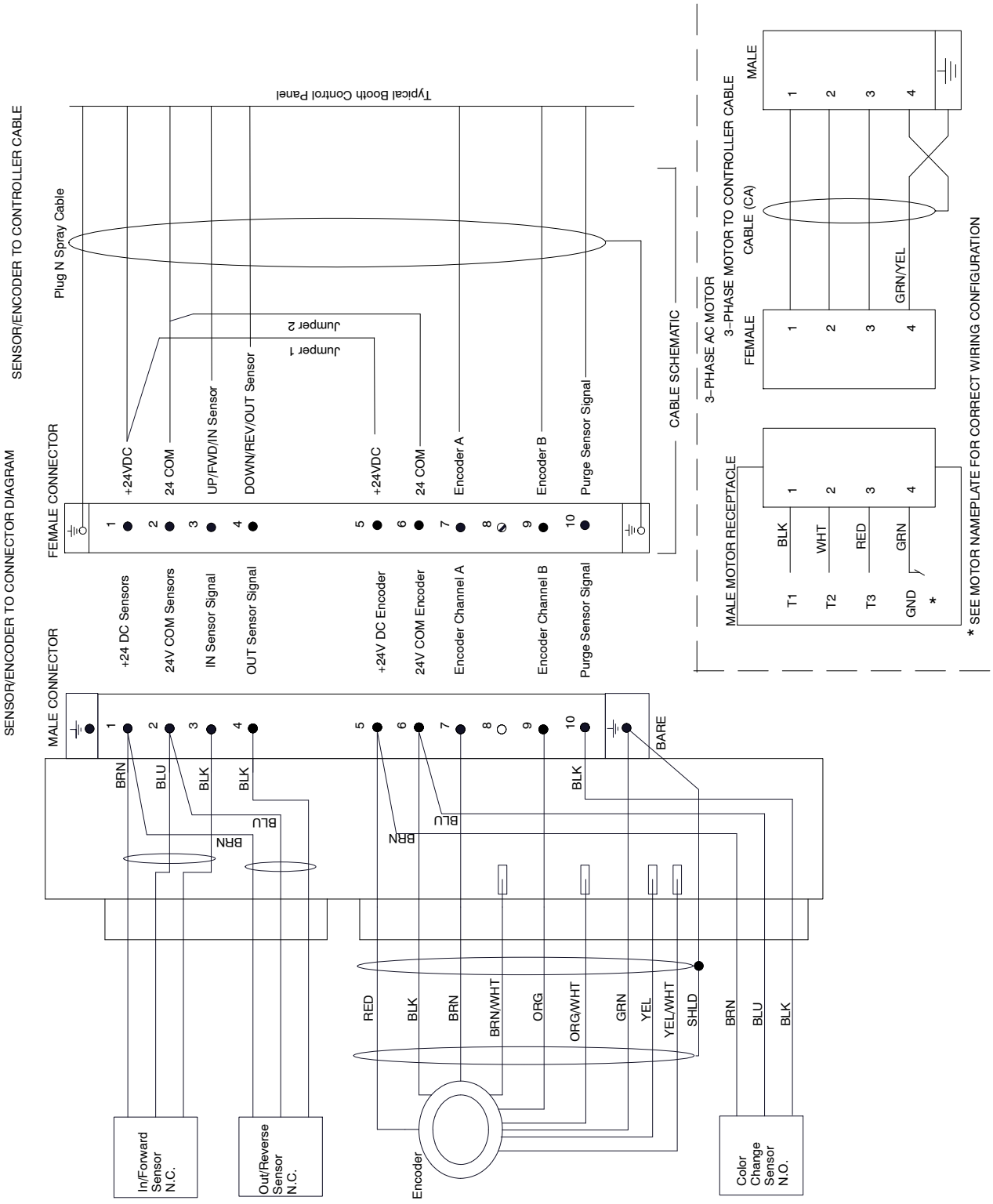


Figure 14 Positioner Wiring Diagram – Encoder, Sensors, Motor

Repair

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

WARNING: Anytime the side covers are removed from the positioner, the anti-tilt function is disabled.

Carriage V-Groove Wheels

1. See Figure 15. Remove the screws (4), washers (5), and side covers (3) from the positioner base (6).
2. Position the carriage (2) with gun stand toward the end of the positioner where wheel is being replaced , aligning the V-groove wheel (1) to a space that allows room to access the inside of the carriage where V-groove wheel flat head screw is located.
3. Use a support block near the V-groove wheel being replaced to slightly lift and support the carriage.

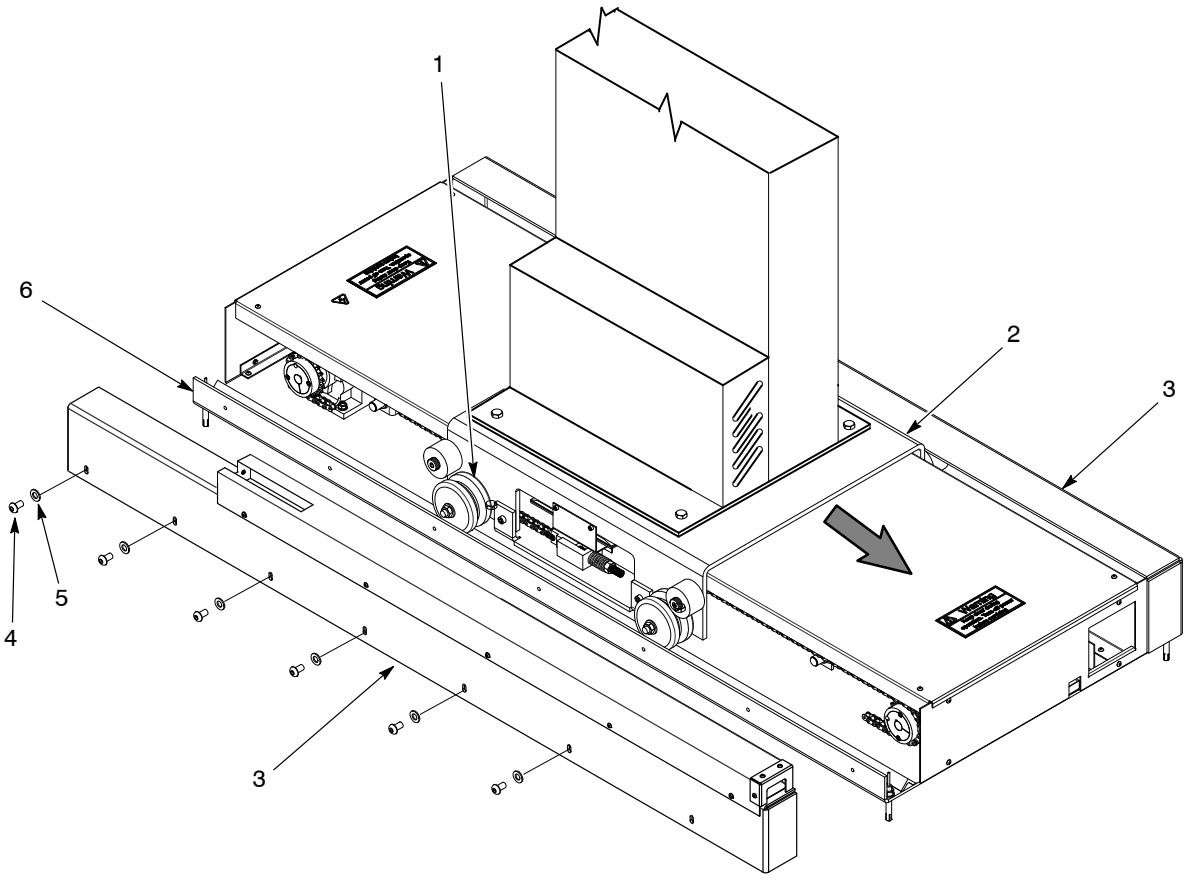


Figure 15 Remove Side Covers from Positioner

1. V-groove wheel
2. Carriage
3. Side cover
4. Screw
5. Washer
6. Positioner base

Carriage V-Groove Wheels *(contd)*

4. See Figure 16. Using an allen wrench, remove the flat head screw, flat washers, and hex nut from the V-groove wheel.
5. Replace the V-grove wheel and install using the flat head screw, flat washers, and hex nut. Torque to 50–55 ft-lbs.

NOTE: Place the same quantity of washers in the same location where they were removed.

6. Remove the support block from the carriage base.
7. Install the side covers with the screws and washers.

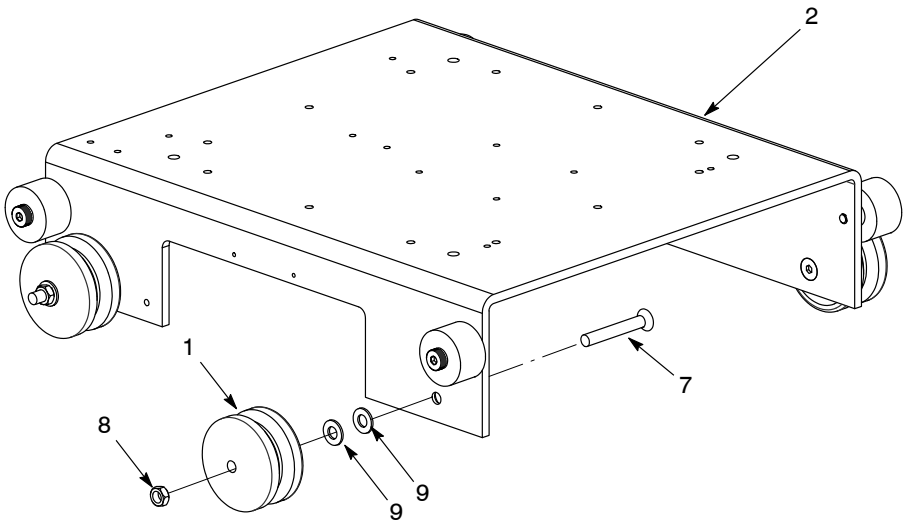


Figure 16 Removing V-Groove Wheel

1. V-groove wheel
2. Carriage
7. Flat screw
8. Hex nut
9. Flat washers

Replacing Drive Chain

NOTE: When replacing the drive chain, it is recommended to also change the sprockets. See page 22 for sprocket replacement.

1. Remove the side covers as shown in Figure 15. Move the carriage as needed to access the drive chain and chain blocks.
2. Remove the nut (5) from the threaded rod (6). The tensioner spring (4) with slide off the threaded rod.
3. Remove the master links (1) from the chain blocks (2).
4. Remove the chain from the sprockets and thread out of the positioner.
5. Thread the new chain into the positioner and over the sprockets.
6. Attach the chain to the chain blocks (2) using the master links (1).
7. Insert the threaded rod (6) through the chain tensioner block (3). Place the tensioner spring (4) on the threaded rod and tighten with the nut (5).

NOTE: The spring should be compressed between 31.75 – 32.51 mm. See Figure22 for drive chain tensioning.

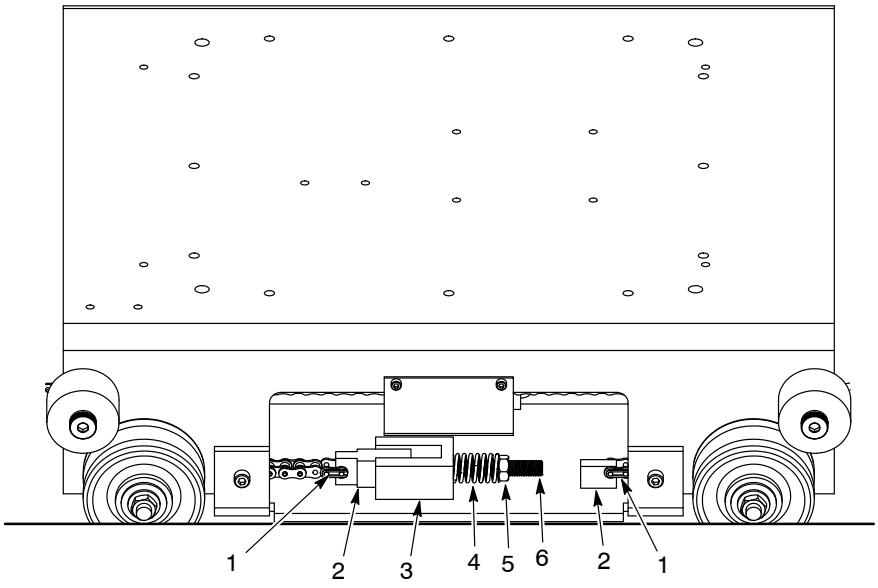


Figure 17 Replacing Drive Chain

1. Master links
2. Chain blocks
3. Chain tensioner block
4. Tensioner spring
5. Nut
6. Threaded rod

Replacing Sprocket

NOTE: Both sprockets should be replaced at the same time.

1. See Figure 15 for removing the side cover to expose the chain sprocket.
2. Follow the instructions in section *Drive Chain Tensioning* on page 26 to loosen the tension in order to remove the chain from the sprocket to be replaced. Remove the spring nut and spring, and loosen the chain.
3. See Figure 18. Using an allen key, remove the two set screws (2) from Location A and B from the bushing (3).

NOTE: Note the axial position of the sprocket and return the new sprocket to the same location.

4. Use one of the set screws to install and tighten into Location C on the bushing (3) to release the sprocket (1) from the bushing.
5. Remove the set screw (2) from Location C and replace the sprocket (1). Use the two set screws at Locations A and B to secure the sprocket to the bushing. Alternate torquing set screws until reaching a torque of 175 in-lbs.
6. Secure the drive chain to sprocket (1), reassemble, and adjust the chain tension using the instructions in section *Drive Chain Tensioning* on page 26.
7. Install the side covers back onto the positioner base.

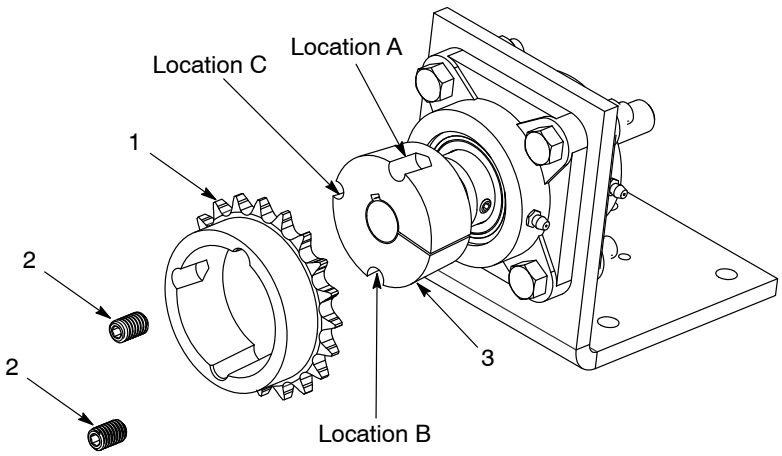


Figure 18 Replacing Sprocket

1. Sprocket
2. Set screws
3. Bushing

Replacing Encoder

See Figure 19.

1. Move the carriage and gun stand away from the rear of the positioner to access the rear platform.
2. Remove the button head screws and top platform at the rear of the positioner.
3. Remove the anti-rotating screw (3) from the sprocket assembly.
4. Loosen the encoder shaft collar screws (2) and remove the encoder (1) and bracket (4) from the sprocket assembly.
5. Remove the four screws (5) securing the encoder to the bracket (4).
6. Terminate the encoder connections at the junction box (6).
7. Install the new encoder using same screws (3,5) and bracket (4). Be sure to tighten the encoder shaft collar screws (2) to secure the encoder to the shaft.

NOTE: When securing the encoder onto the shaft, always orient the encoder cable toward the junction box.

8. Make the encoder wiring connections at the junction box (6).

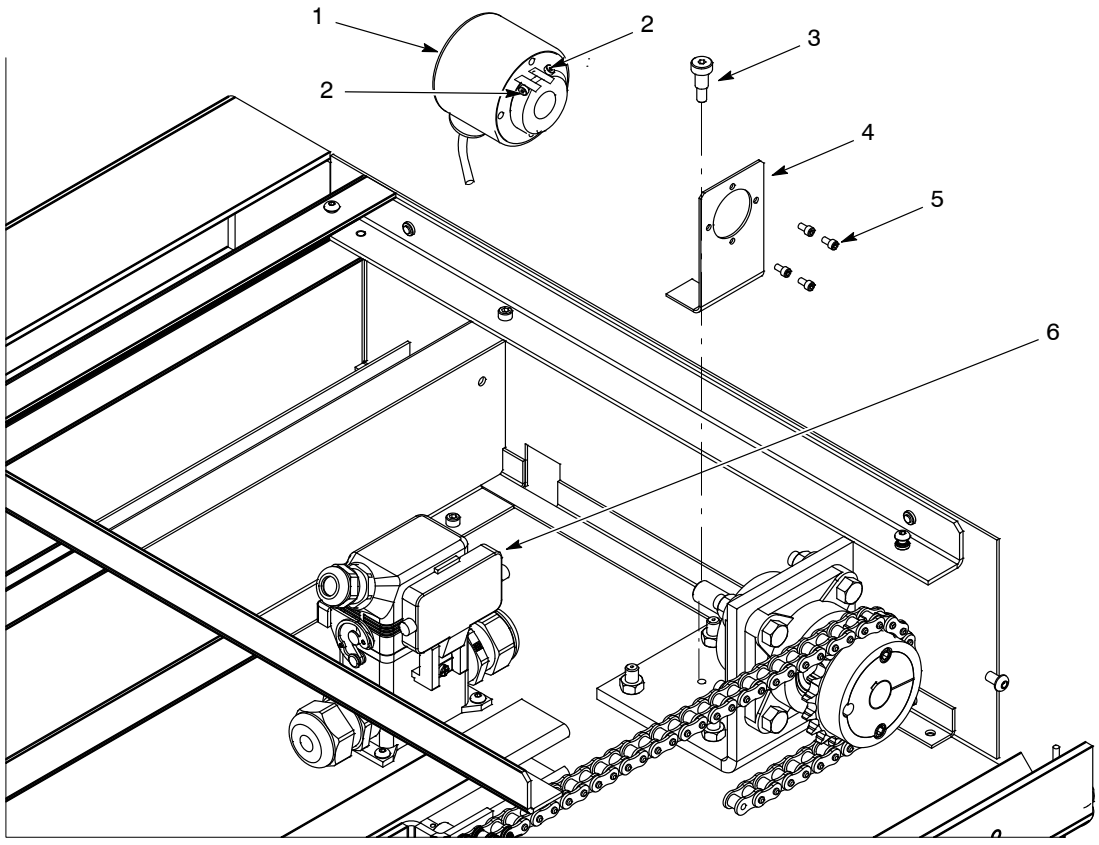


Figure 19 Replacing Encoder

1. Encoder
2. Shaft collar screws
3. Anti-rotate screw
4. Bracket
5. Screws
6. Junction box

Replacing Sensors

See Figure 20.

1. Remove the screws, washers, and side cover from the positioner base (see Figure 4).
2. Manually move the carriage and gun mover to access the applicable sensor.
3. Note the location of the Z-bracket in the channel (6) for reassembly.
4. Remove the bolt (3) connecting the Z-bracket (4) to the captive nut (5) in the frame.

NOTE: See Figure 21. Measure the length from the front side of the Z-bracket to the end of the sensor. During the installation, the sensor has been set to the correct distance from its target plate. By measuring how far the sensor comes out from the Z-bracket, the same measurement can be applied during reassembly to retain the correct distance to the sensor's target plate.

5. Remove the nuts (1) securing the sensor (2) to the Z-bracket.
6. Install the new sensor onto the Z-bracket using the nuts and the measurements taken previous to dis-assembly.
7. Use the bolt to install the Z-bracket and sensor onto the channel at the same noted location before disassembly.

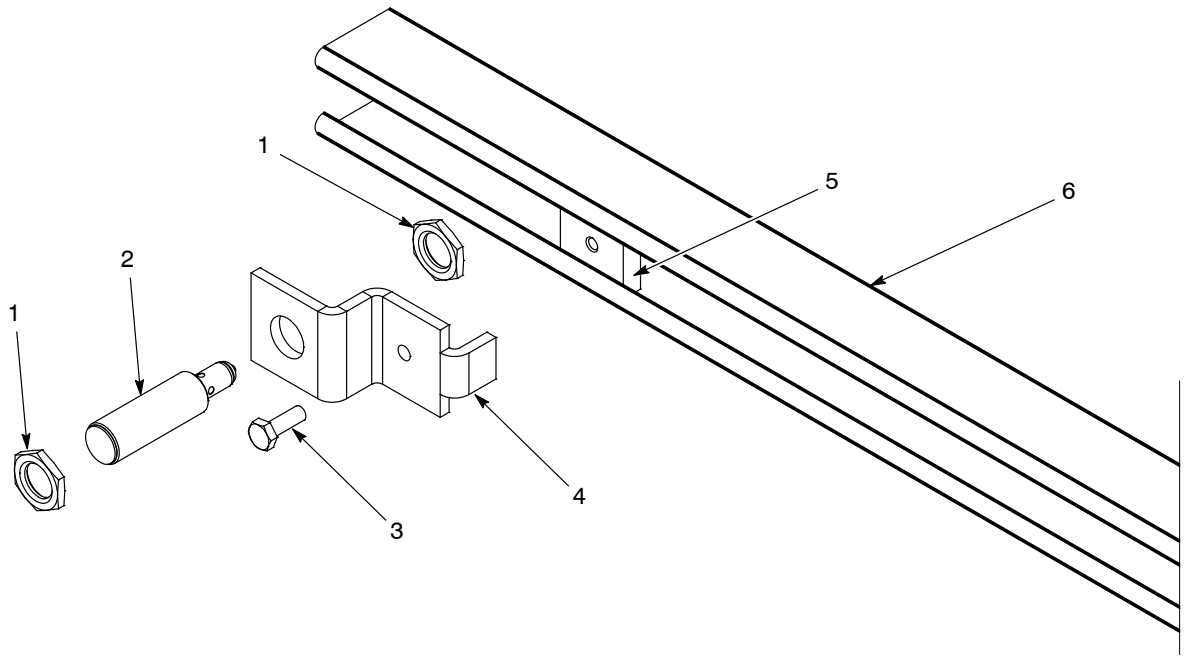


Figure 20 Removing Target Plate

1. Nuts
2. Sensor
3. Bolt
4. Z-bracket
5. Captive nut
6. Channel

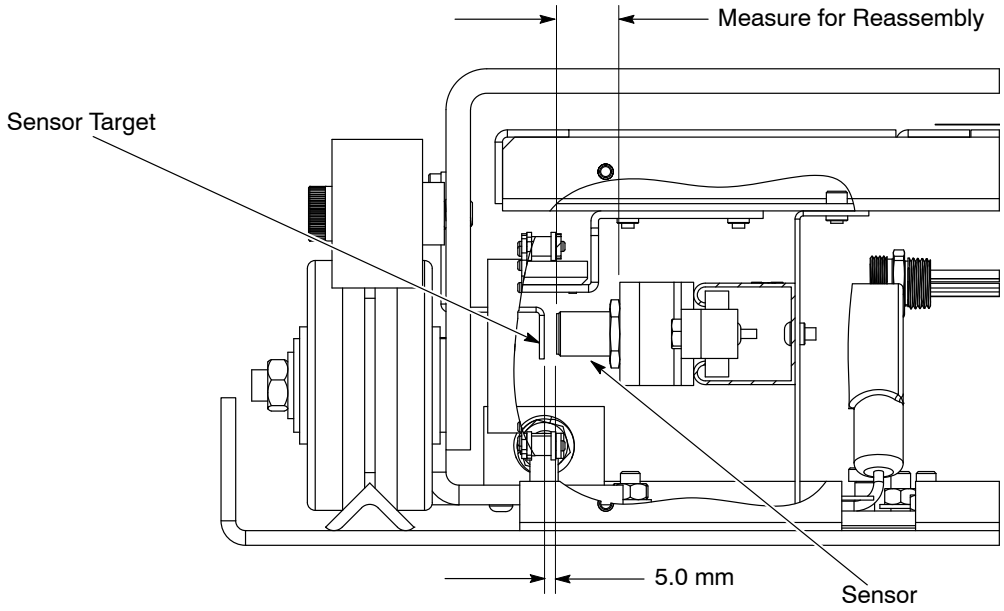


Figure 21 Sensor Measurements

Maintenance

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

Component	Frequency	Procedure
Drive Chain	After the first 80 hours, then monthly	Check the chain tension. Tighten if necessary. Replace parts as necessary. Refer to *Drive Chain Tensioning on page 26*.
		Check the chain pitch length and sprocket tooth wear. Replace parts as necessary. Refer to *Measuring Chain Pitch* on page 27.
Guide Tracks	Every two weeks	Check for contaminants and clean as required.
Positioner interior	Monthly	Remove all debris, dust, powder, etc.

Drive Chain Tensioning

Check the drive chain tension without a load (at rest).

Remove the screws and washers to remove the side cover from the base (see Figure 4).

See Figure 22. The spring should be compressed between 31.75 – 32.51 mm. If the spring goes past 34 mm tighten the spring nut to compress the spring back into the range of 31.75 – 32.51 mm.

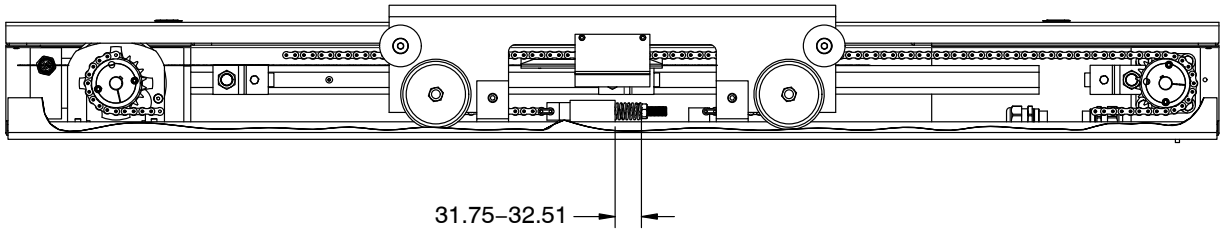


Figure 22 Chain Tensioning

Measuring Drive Chain Pitch

See Figure 23. The distance between 10 drive chain pins should be 5.0 inches. The service limit is 5.15 inches.

For proper measurement, select a pin and then count 10 pins down. Measure the distance. If the measurement exceeds 5.15 inches, replace the chain.

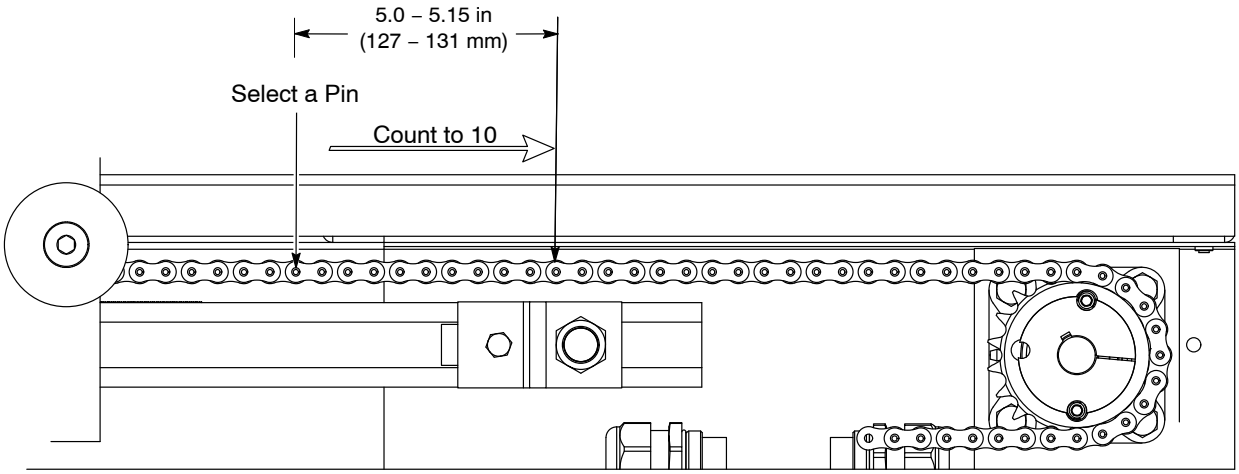


Figure 23 Measuring Chain Pitch

Parts

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

Positioner Assemblies

Part	Description	Note
1603756	IN-OUT MOVER, NIO2, 0.6 meter stroke, 200 Vac, 50 Hz	
1603757	IN-OUT MOVER, NIO2, 0.6 meter stroke, 230; 380-415 Vac, 50 Hz	
1603758	IN-OUT MOVER, NIO2, 0.6 meter stroke, 230; 460 Vac, 60 Hz	
1603759	IN-OUT MOVER, NIO2, 0.6 meter stroke, 575; 600 Vac, 60 Hz	
1603760	IN-OUT MOVER, NIO2, 1.5 meter stroke, 200 Vac, 50 Hz	
1603761	IN-OUT MOVER, NIO2, 1.5 meter stroke, 230; 380-415 Vac, 50 Hz	
1603762	IN-OUT MOVER, NIO2, 1.5 meter stroke, 230; 460 Vac, 60 Hz	
1603763	IN-OUT MOVER, NIO2, 1.5 meter stroke, 575; 600 Vac, 60 Hz	
1603764	IN-OUT MOVER, NIO2, 1.0 meter stroke, 200 Vac, 50 Hz	
1603765	IN-OUT MOVER, NIO2, 1.0 meter stroke, 230; 380-415 Vac, 50 Hz	
1603766	IN-OUT MOVER, NIO2, 1.0 meter stroke, 230; 460 Vac, 60 Hz	
1603767	IN-OUT MOVER, NIO2, 1.0 meter stroke, 575; 600 Vac, 60 Hz	

Drive Chains

See Figure 24, item 4.

NOTE: When replacing the drive chain, it is recommended to also change the sprockets.

Part	Description	Note
1602631	CHAIN, 87.5 in (0.6 meter stroke)	
1602681	CHAIN, 158.5 in (1.5 meter stroke)	
1602513	CHAIN, 119.5 in (1.0 meter stroke)	

Gearmotors

See Figure 24, items 1.

Part	Description	Note
1602508	GEARMOTOR, in-out mover, 230/460 V, 60 Hz	
1602637	GEARMOTOR, in-out mover, 200 V, 50 Hz	
1602638	GEARMOTOR, in-out mover, 230/400 V, 50 Hz	
1602639	GEARMOTOR, in-out mover, 575 V, 60 Hz	

Common Parts

See Figure 24. These parts are common to all Positioner Assemblies, except as noted.

Item	Part	Description	Quantity	Note
1	––––––	GEARMOTOR	1	A
2	1602597	ENCODER, hollow shaft, quad, 200 PPR	1	
3	1602510	SPROCKET, #40 chain, 20 teeth	2	
4	––––––	DRIVE CHAIN	1	B
5	7750042	SENSOR, proximity, PNP, N.C., 18mm	2	
NS	1108645	SENSOR, inductive proximity, 3-wire, NO, PNP, 18mm	1	
6	1603222	SCREW, flat, skt, ½–13 x 3-½, bl	4	
7	1602545	V-GROOVE WHEEL, in/out	4	
8	345906	FLATWASHER	8	
9	984170	NUT, hex	4	
10	1602546	WHEEL, bumper	4	

NOTE A: Refer to *Gearmotors* parts list.

B: Refer to *Drive Chain* parts list.

NS: Not Shown

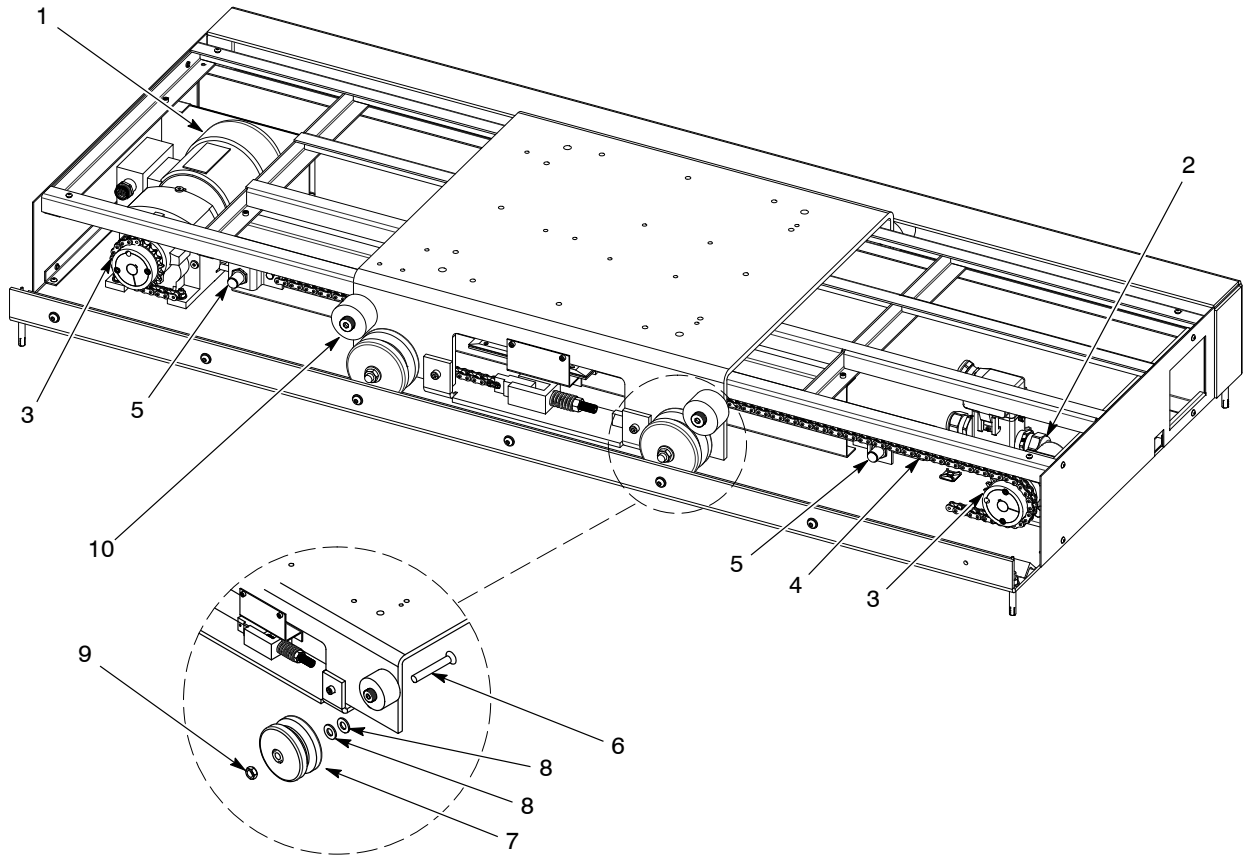


Figure 24 Positioner

NOTES