

Bedford Ring Tyer



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Safety

Read this section before using the equipment. This section contains recommendations and practices applicable to the safe installation, operation, and maintenance of the product described in this document. Additional safety information, in the form of task-specific safety alert messages, appears as appropriate throughout this document.

Be sure the following safety instructions are read, understood, and become a part of daily practice when operating or maintaining the closure equipment.

1. Do not attempt to operate the equipment until you understand its function.
2. Keep all foreign material away from the drive system.
3. Keep fingers and clothes out of the gears and arm area.
4. Disconnect the power cord before making any equipment adjustments or maintenance. All moving parts must be completely stopped before working on the machine.
5. After any adjustment, cycle the equipment by hand to ensure proper adjustment has been made. Immediately cycling under power may damage the unit and/or product.

Responsibilities of the Equipment Owner

Equipment owners are responsible for managing safety information, ensuring that all instructions and regulatory requirements for use of the equipment are met, and for qualifying all potential users.

1.0 Specifications

1.1 Terminology

- A. **Front of machine** – Refers to side containing feed ring and trigger switch (if equip).
- B. **Right side of machine** – Refers to side from which spool is loaded and cabinet access plate.
- C. **Left side of machine** – Refers to side with cabinet access door. Inside this door, electrical cabinet and main drivetrain components can be accessed.
- D. **Rear of machine** – Refers to side of clamped to vertical, support post of frame.
- E. **Twister head** – Rotating section of machine through which tie passes to complete a loop, contains clamps to lock tie ends and rotates to twist tie.
- F. **Tie Guide** – Narrow, rectangular plate attached to feed plate on front side of machine.
- G. **Payout** – Assembly on right side of machine which holds spool in place. Tie is threaded through machine for operation starting at the spool.
- H. **Primary Gripper** – Mechanism that clamps lead end of tie in twister head.
- I. **Secondary Gripper** – Mechanism that clamps tail section of tie in twister head.
- J. **Primary Feed Roller** – Roller that pulls tie up through guide into twister head.
- K. **Secondary Feed Roller** – Roller that pulls tie down through guide to tension loop before twisting.
- L. **Programmable Logic Controller (PLC)** – Electronic unit that controls sequence of events during machine operation. This includes starts, stops and monitoring during normal cycle, String Up & jog mode.

1.2 Machine overview

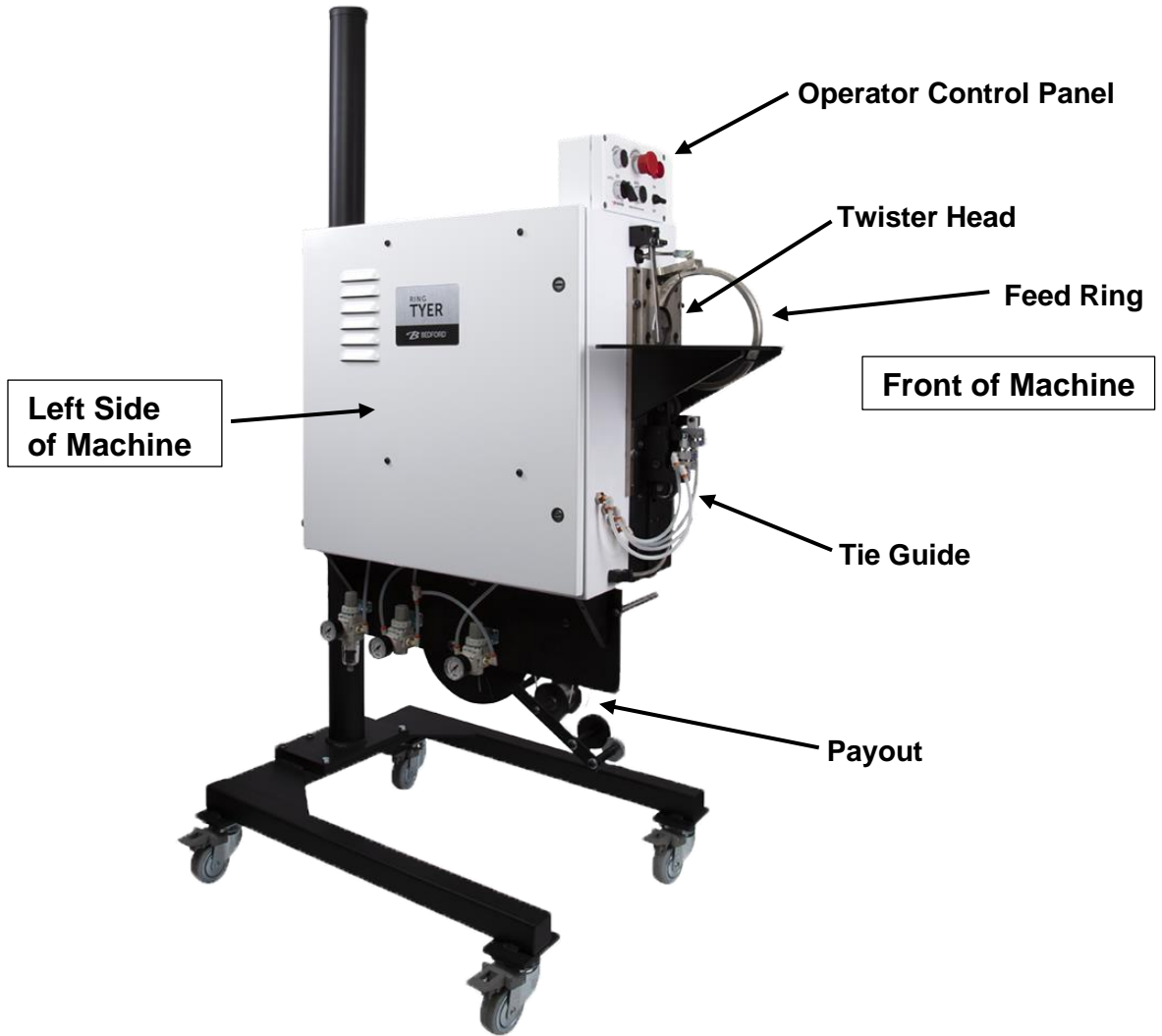


Figure 1.2: View of Bedford Ring Tyer

1. Operator Control Panel

(Reference Figure 1.2.1)

- 1.1 Power Switch – Located lower right-hand corner on panel. Controls main power to machine.
- 1.2 Power Light – Located above power switch. When illuminated, indicated power is energized to machine system.
- 1.3 Emergency Stop (E-Stop) Switch – Located in center of panel. Pressing the E-Stop will de-energize air pressure & electrical power to motor. Power remains for PLC and critical control points. Pressing switch will stop the machine during any point of the twisting cycle.
- 1.4 Reset Button – Located in center of panel. Used for resetting system after power cycle to machine or switching between cycle selection (Auto, Jog, or String Up).

CAUTION: *Keep body parts clear of twister head and ring when pressing the reset switch as head rotates and ring can lift during reset.*

- 1.5 Manual Cut Button – Located top left-hand corner on panel. Triggers the cutting knife near the twisting head. Feature works in both Auto and String Up mode.
- 1.6 Cycle Selector Switch – Located bottom left-hand corner. Three position switch that indicated the selected cycle mode of the machine. Options are Auto, Jog, and String Up.



Figure 1.2.1 Operator Control Panel

2. Machine Cycle Triggers

(Reference Figure 1.2.2.1 & Figure 1.2.2.2)

- 2.1 Foot Switch – Typically placed on floor near operator’s foot on the front side of machine. Machine will cycle once switch is pressed by operator’s foot. Product should be placed against twister head plate before cycling machine.



Figure 1.2.2.1 Foot Switch

- 2.2 Trip Switch – Located to the left of the twister head. The switch contains a bar that moves to activate the switch once product is placed far enough into the ring and against the twister head plate. The machine will cycle once. The switch must be released before it can be activated again.



Figure 1.2.2.2 Trip Switch

3. Machine Sensors

(Reference Figure 1.2.3.1, 1.2.3.2, & Figure 1.2.3.3)

- 3.1 Magnetic Sensor – Attached to feed ring (top half) air cylinder to detect when ring is closed, allowing machine to continue to operate through cycle. If ring is unable to close completely, the machine is prevented from cycling. Refer to section 4.10 Magnetic Sensor (pg. 29) for adjustment.



Figure 1.2.3.1 Magnetic Sensor

- 3.2 Fiber Optic (photo eye) Sensor – Attached to underside of feed ring (bottom half) used to detect tie traveling through ring. Refer to section 2.2 Setting Ring (pg. 14) for adjustment.



Figure 1.2.3.2 Fiber Optic Sensor

- 3.3 Safety Sensor – Machine interlock switch located inside main cabinet door. Prevents machine operation if access door is opened. Machine is still energized, but controls will not allow motor or pneumatic cycling.



Figure 1.2.3.3 Safety Sensor

4. Other Machine Control Points

(Reference Figure 1.2.4.1 , Figure 1.2.4.2 , & Figure 1.2.4.3)

- 4.1 Primary Pressure Regulator – Located on left side of machine. This controls the main compressed air pressure provided to the pneumatic system. Machine air pressure may vary depending on what type of tie is being used & how freely the payout functions. If air cylinders begin to age and become sticky, more air pressure may be needed. The table below lists the recommended start pressure for all regulators.
- 4.2 Payout Pressure Regulator (**Not applicable with HD payout**) – Located on left side of machine. This controls the main compressed air pressure provided to the payout brake tension. The regulator setting should allow payout arm to raise easily when tie is pulled into machine and force arm down easily as tie movement stops. Too much or too little will prevent payout from functioning properly. The table below lists the recommended start pressure for all regulators.
- 4.3 Clutch Pressure Regulator – Located on left side of machine. This controls the main compressed air pressure provided to the drive roller clutch. This regulator controls clutch engagement pressure. The higher the pressure, the stronger the tie will be retracted onto the bundle. The table below lists the recommended start pressure for all regulators.

Table 4.1 Recommended Air Pressures

Air Regulator	Recommended Start Pressure
Primary	65 psig (4.5 bar)
Payout	18-20 psig (1.2-1.4 bar)
Clutch	15-30 psig (2 bar)

Payout Pressure Regulator (**Not applicable with HD payout**)

Primary Pressure Regulator

Clutch Pressure Regulator



Figure 1.2.4.1 Pressure Regulators

- 4.4 Program Selector Switch & Cycle Count– Located on electronic cabinet inside machine cabinet. Program Selector Switch controls tie length travel conditions based on the ring size used. The toggle position should match the ring diameter that is installed on the machine. When switching ring diameters, please reference section 6.1 Feed Ring (pg. 37) for ring replacement instructions. The Cycle Count displays the total machine count.

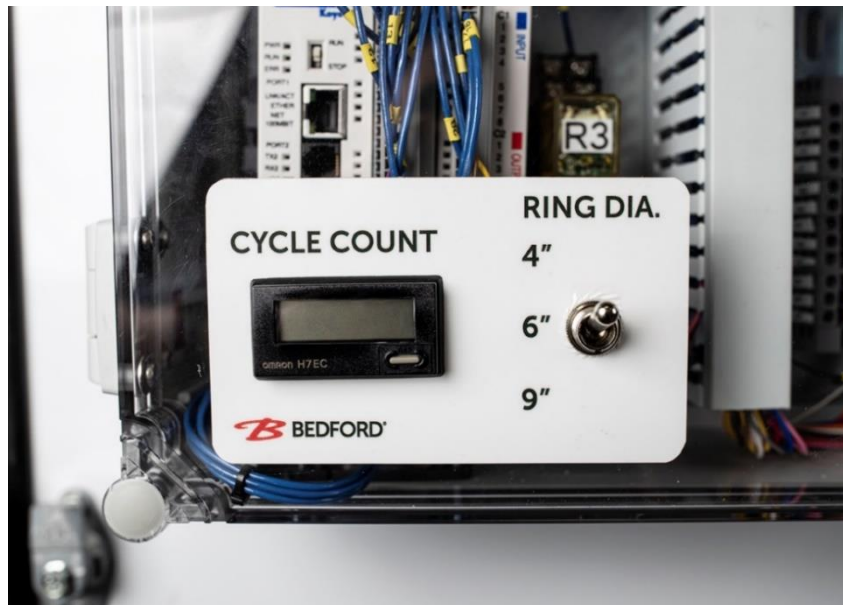


Figure 1.2.4.2 Program Selector Switch & Cycle Count

- 4.5 Motor Drive Breaker – Located in electronic cabinet inside machine cabinet. The Main Breaker provides overload protection for the motor drive system. To reset the breaker, confirm power is disconnected to machine. Next, put the switch in the OFF (down) position and then press firmly into the ON (up) position on the switch.

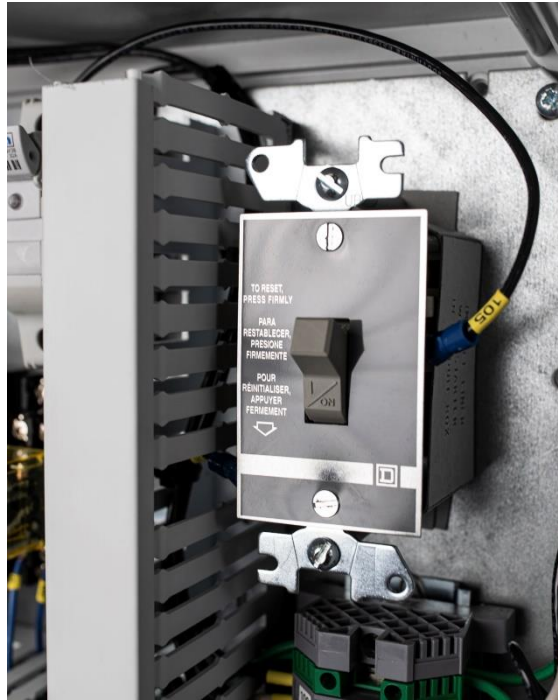


Figure 1.2.4.3 Motor Drive Breaker



2.0 Install & Setup

2.1 Machine Power & Pneumatic Setup

1. Plug power cord connector into 120 VAC (or 230 VAC if equip) wall outlet.
2. Connect compressed air line from system into male, standard ¼ NPT quick connector fitting supplied with machine on the primary regulator located on the payout. If this connector does not fit with your factory connectors, replace as needed with correct connector. Check that Primary Regulator displays correct pressure setting. Reference Table 4.1 in section 1.2.4 Other Machine Control Points for correct pressure.
3. Toggle power switch to on position. Red light should glow, indicating power to the system. At this time, there will not be air present to the lines in the machine as the machine air valve has not yet been energized.

CAUTION: Keep body parts clear of twister head and ring when pressing the reset switch as head rotates and ring can lift during reset.

4. Press the Reset Button. This will energize the main air valve and start the drive motor.
5. Check that secondary regulator displays correct pressure setting. Reference Table 4.1 in section 1.2.4 Other Machine Control Points for correct pressure.
6. Turn Cycle Selector Switch to String Up mode. Machine is now ready for threading tie.

2.2 Setting Ring

1. The ring is mounted to the machine with four flat head screws. The ring cylinder is also fastened to the top portion of the ring with the clevis shown in Figure 2.2.1 below. To attach the clevis, remove one of the retaining clips and place the clevis pin through the ring mount and clevis then reattach the retaining ring.

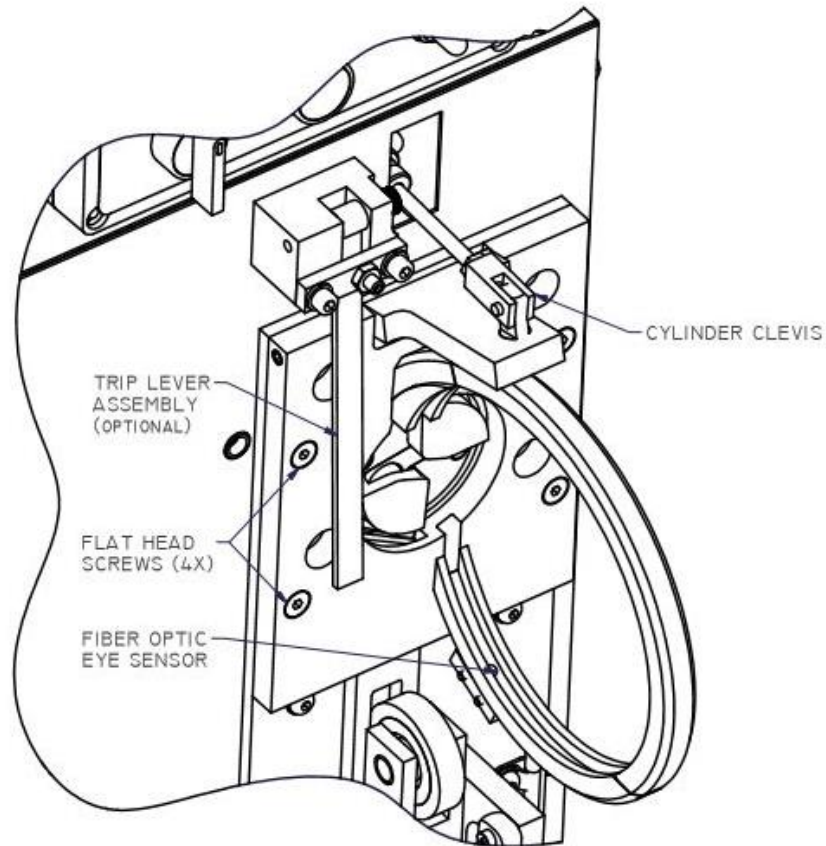


Figure 2.2.1 Ring Mounting Screws and Clevis

- The ring position can be adjusted with the cylinder clevis attached to the top portion of the ring. This is done to prevent the top portion of the ring from hitting the bottom portion too hard when the ring closes during the tying process as well as ensuring the ring closes far enough for the tie to travel through the ring successfully. The ring sections should be about 1/8 inch or 3 mm apart when set properly. Reference Figure 2.2.2 below as a guide to how the ring should look when set correctly.



Figure 2.2.2 Proper Ring Position

- To properly set the ring position, loosen the nut on the ring cylinder rod next to the clevis attached to the ring as shown in Figure 2.2.3. Once loose, turn the rod of the cylinder to move the clevis either farther out (to move the ring clamp closer together) or farther in (to move the ring clamp farther apart) to set the ring position. Once the rod is adjusted to the proper placement, tighten the nut back up to the clevis to prevent the rod from moving during machine operation.

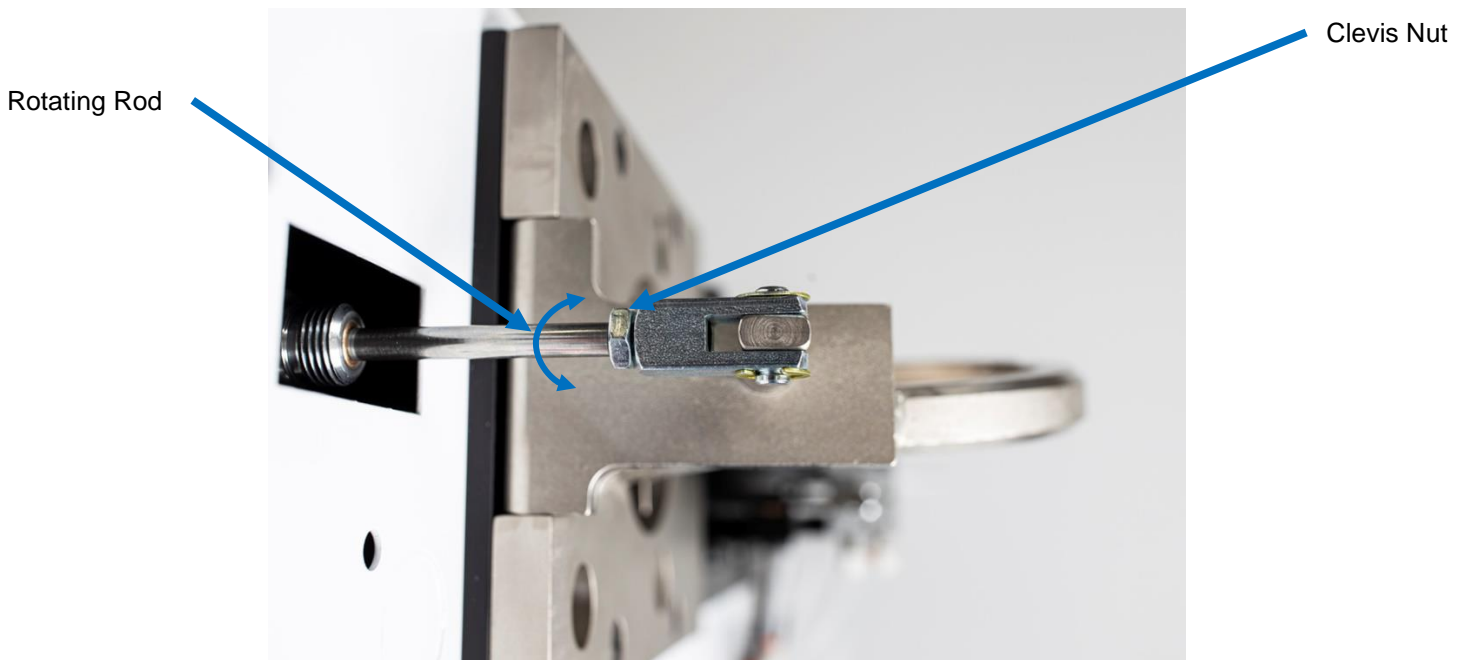


Figure 2.2.3 Setting the Ring Position

- The fiber optic sensor on the bottom of the ring must also be set correctly to ensure the tie is fed the correct amount during the tying process. The sensor should sit flush with the inside tie groove as shown in Figure 2.2.4 below.

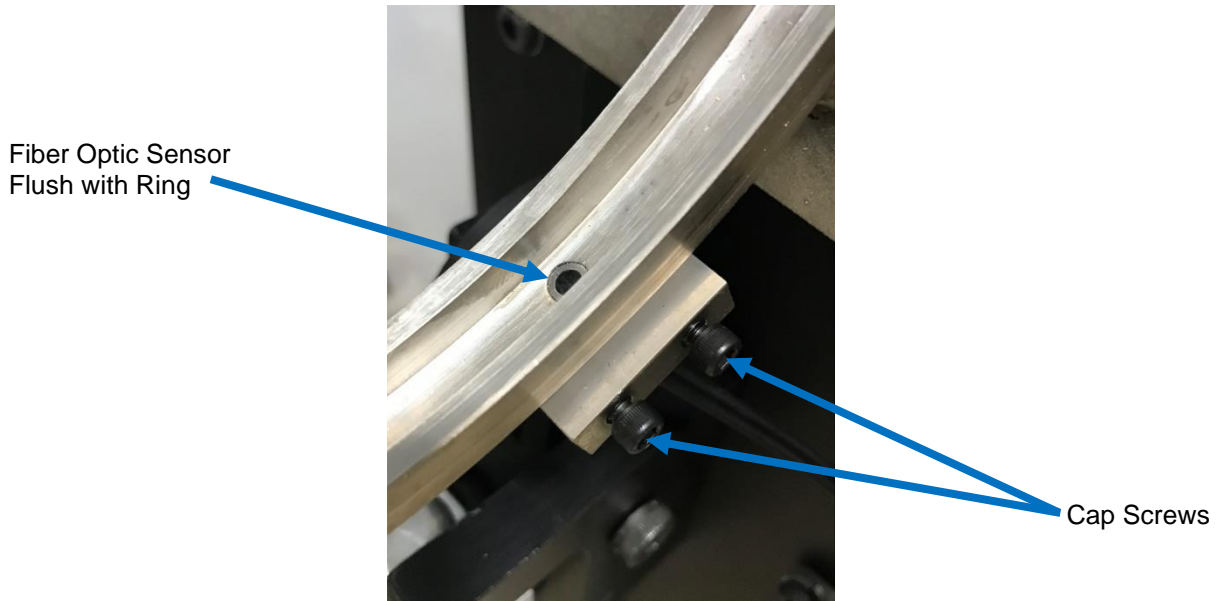


Figure 2.2.4 Proper Placement of Fiber Optic Sensor

- To properly set the fiber optic sensor, loosen the two cap head screws found next to the fiber optic sensor mount until the sensor can be moved freely. Set the sensor so it is flush with the groove then tighten the cap head screws to hold the sensor in place (*Do not overtighten*). A thin tool such as a screwdriver can be used to check that the sensor is flush and does not create a low or high point in the groove that could cause the tie to catch on and jam in the ring. Reference Figure 2.2.5 below.

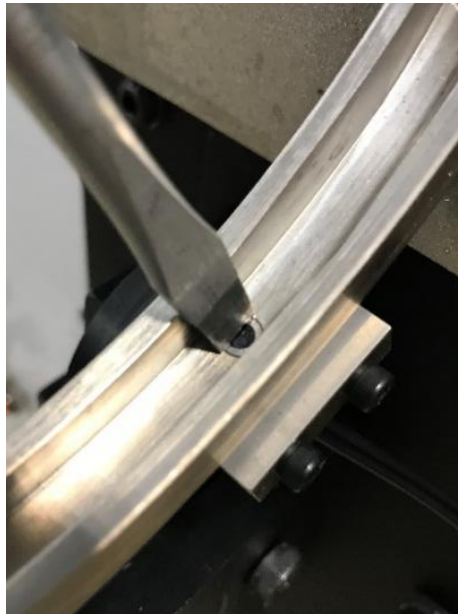
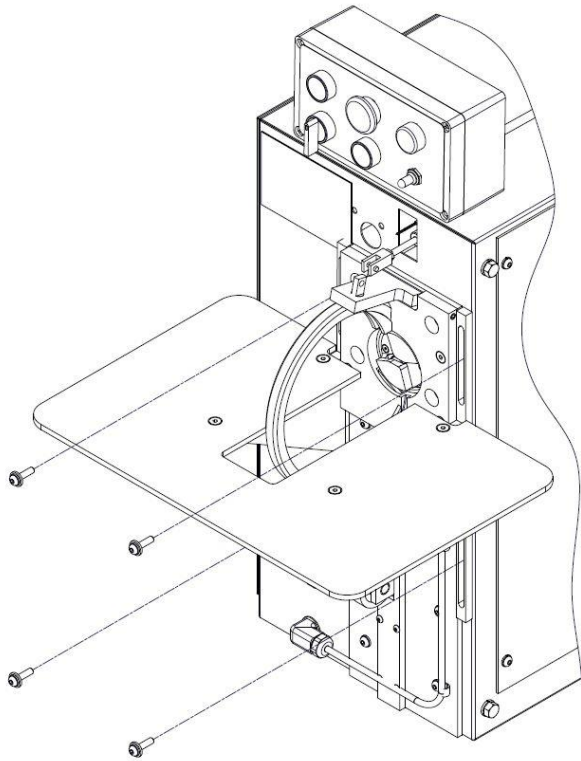


Figure 2.2.5 Setting the Fiber Optic Sensor

2.3 Setting Worktable Position



1. The table position can be adjusted by loosening the four cap screws connecting the table to the main cabinet. Reference Figure 2.3.1.
2. To properly set the position of the table, use the bundle size that is intended to be tied. The centerline of the bundle you are tying must be at least at the same level as the centerline of the twister head. For best repeatability of twist placement, the bundle centerline should be slightly above the centerline of the twister head. Reference Figure 2.3.2.

Figure 2.3.1 Table Positioning

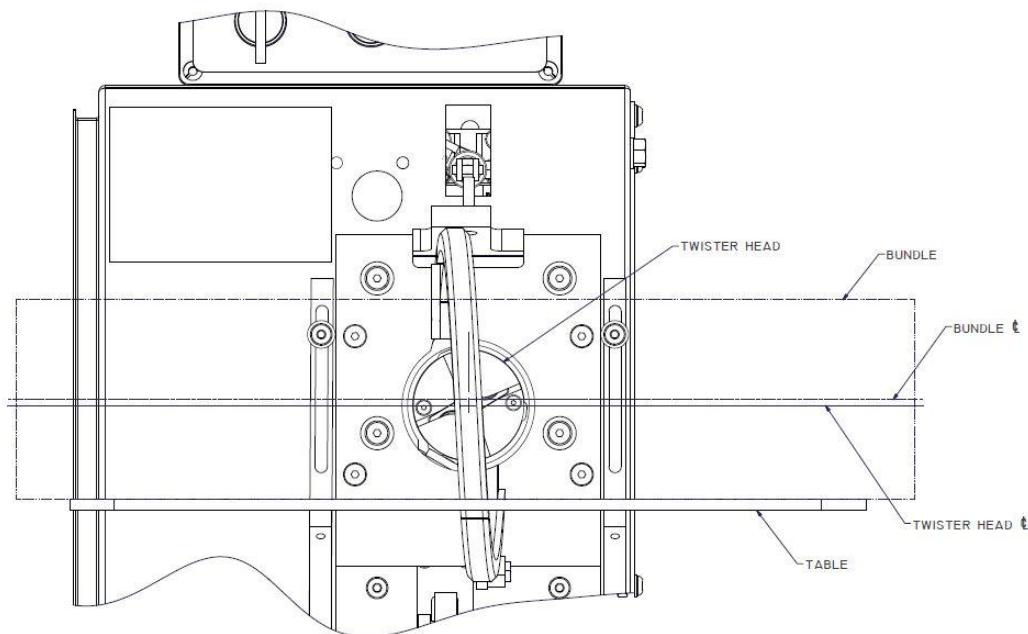
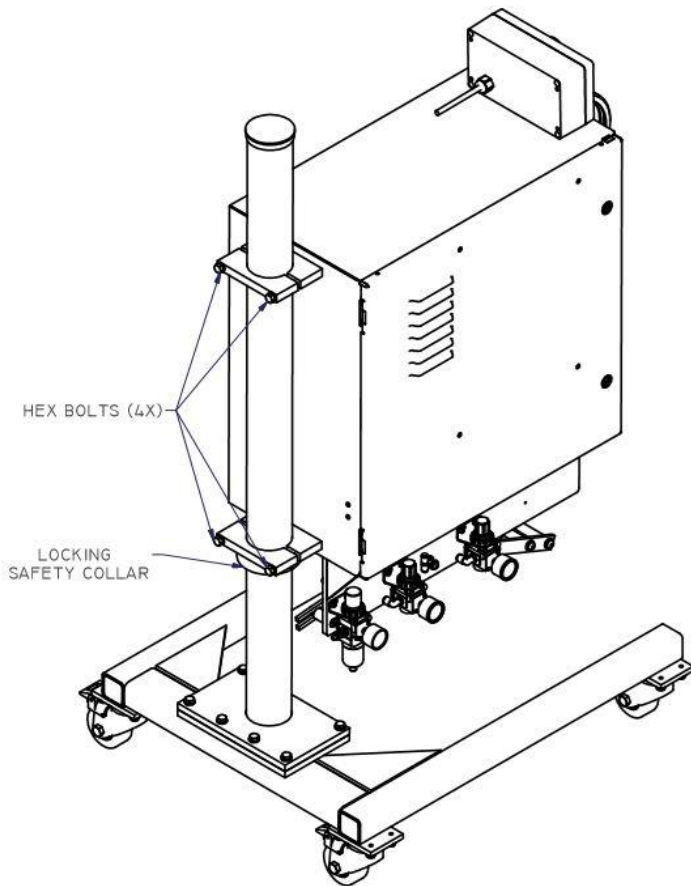


Figure 2.3.2 Proper Height of Table

2.4 Setting Machine Height on Stand

CAUTION: Ensure proper holding and lifting techniques are used anytime the machine height is being adjusted. A minimum of three people may be required to adjust the height safely.

1. If equipped with the adjustable crank stand, turn the crank handle on the back of the machine attached to the post to adjust the height either up or down.
2. If equipped with the standard non-adjustable crank stand, refer to the following steps to adjust the machine up or down.



- 2.1 The weight of the machine is held entirely by the two mounting clamps on the back of machine. When adjusting the height be sure to have a sufficient way to hold the machine up so it does not fall down the stand post as well as enough lifting power to raise the machine if necessary. There is also a locking collar on the post to prevent the machine from moving once the height is desired.
- 2.2 Locate the two mounting clamps on the back of the post of the stand. Reference Figure 2.4.1 for a diagram.
- 2.3 Loosen the four hex bolts located on the clamping mounts to allow the machine to move freely up or down the post. Be sure to loosen both bolts on each clamp evenly.
- 2.4 Once the desired height is achieved, tighten the four hex bolts on the mounting clamps to lock the machine in that position. Be sure to tighten both bolts on each clamp evenly.
- 2.5 Move the locking collar up to the bottom of the lower clamp to ensure the machine does not slide down the post.

Figure 2.4.1 Diagram of Mounting Clamps for Height Adjustment

Note: The machine can also twist around the post when the clamps are loose. Be sure the machine stays in line and parallel with the stand legs to ensure the machine weight is distributed correctly on the stand.

2.5 Threading Tie Ribbon

(Reference Figure 2.5.1, Figure 2.5.2, & Figure 2.5.3)

Locate the payout under the machine. The spool mounts on the right side of the machine. Follow the String Up diagram on the right side of the machine cabinet for threading tie through payout assembly.

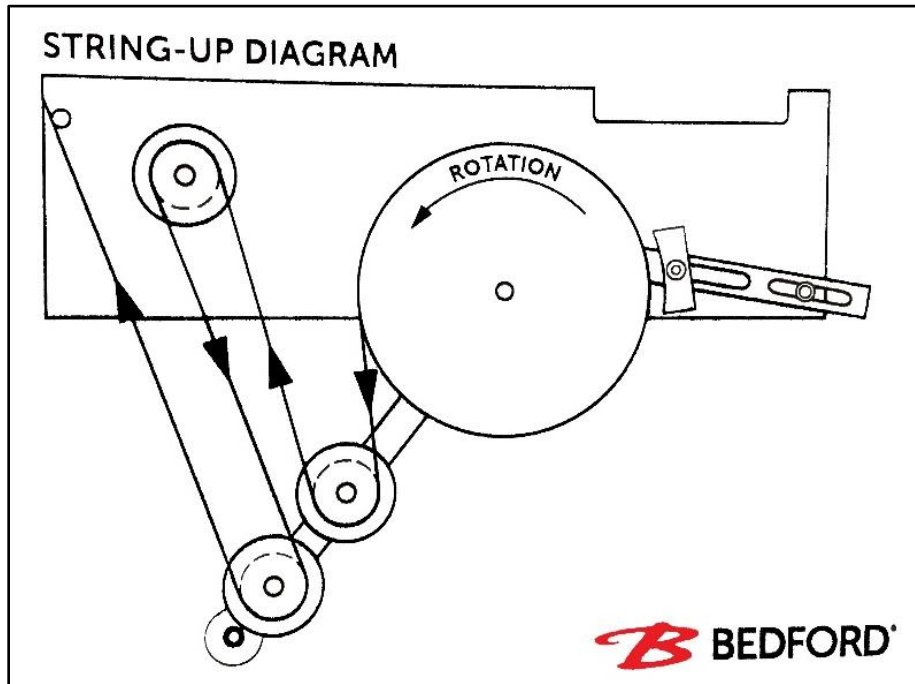


Figure 2.5.1 String Up Diagram

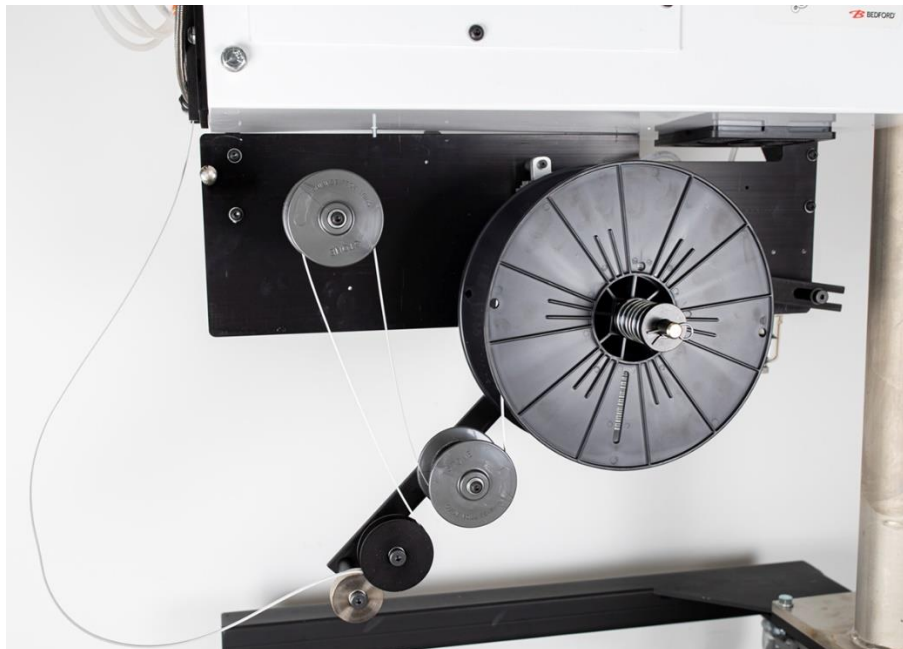


Figure 2.5.2 Standard Payout Shown with Spool

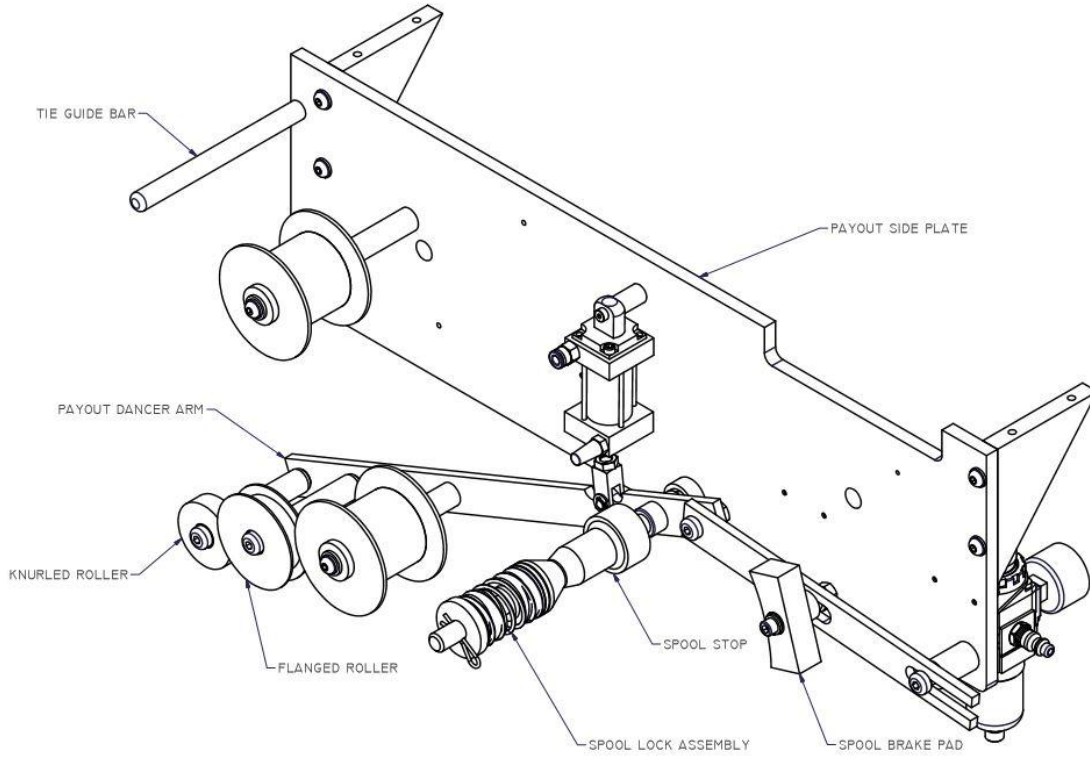


Figure 2.5.3 Standard Payout Diagram

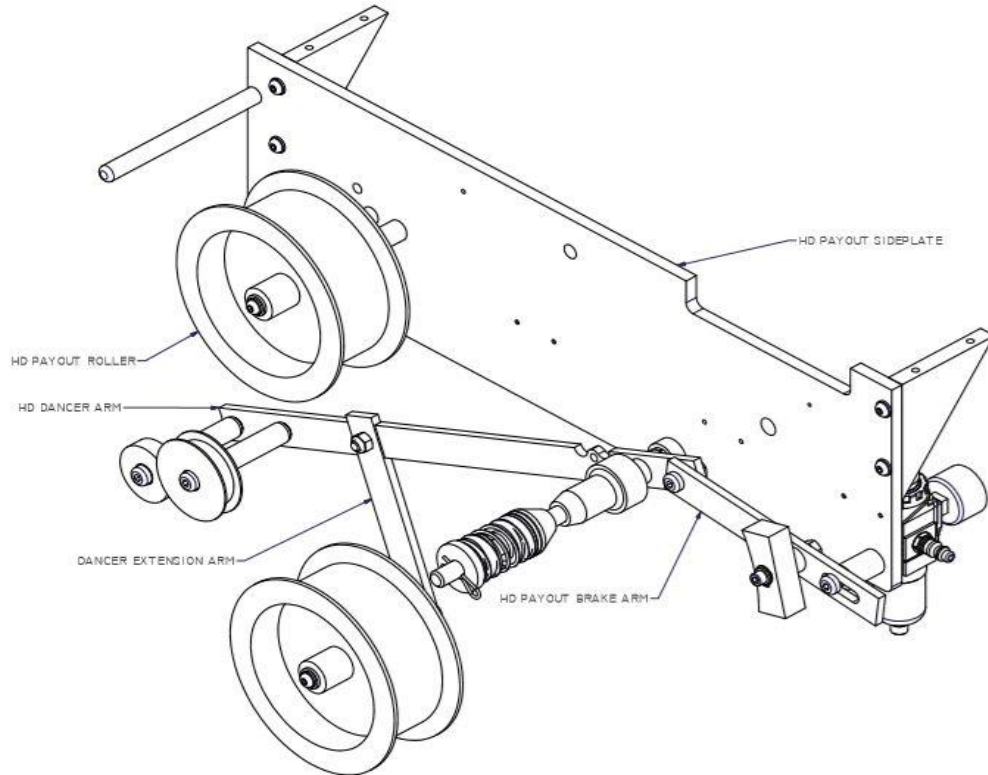


Figure 2.5.4 HD Payout Diagram (Changes Noted)

1. Remove the spool lock assembly from the payout shaft.
2. Remove existing spool, if necessary, from payout shaft. Cut and remove any existing tie from the spool and pull it out of the payout rollers. Note: the knurled and flanged roller has a one-way locking clutch and will only turn one direction. Lift up on the payout dancer arm to release the brake pad from the spool then pull the spool towards you and off the shaft.
3. Place a full spool on the payout shaft such that the tie will come off the top of the spool in the direction towards the front of the machine.
4. Lift the payout dancer arm up until the brake pad will clear the flanged side of the spool.
5. Hold the dancer arm in this position and push the spool onto the shaft until the far side of the spool is firmly up against the spool stop on the payout shaft.
6. Lower the dancer arm and ensure the curved surface of the brake pad engages the outside flange of the spool.
7. Install the spool lock assembly on the payout shaft to hold the spool in place. Ensure the spool is centered on the spool stop as well as the spool lock assembly.
8. Take the free end of tie from the top of the spool and thread down to and under the first lower roller on the dancer arm.
9. Proceed up to and over the single top roller attached to the payout side plate.
10. Continue down and under the second lower roller on the dancer arm. Tie must thread between knurled roller and flanged roller. Note: the knurled and flanged roller contains a one-way locking bearing and will only turn one direction.
11. Position the free end of tie in front of the guide bar and insert the end into the bottom of the tie guide on the feed plate.
12. Make certain there are no twists or kinks in the tie running from the spool to the guide bar.
13. Push the tie upward through the guide and through the twister head until about 2 inches or 50 mm of length have cleared the twister head.
14. Turn the Cycle Selector Switch to Auto.
15. Press Manual Cut button (Do not press Reset).
16. Remove cut length of tie from the twister head. Machine is now ready for operation.

3.0 Operation

3.1 General Operation

1. Ensure the Cycle Selector Switch is set to Auto and that the machine is properly set up for machine operation.
2. Place bundle onto worktable.

CAUTION: Make sure hands are clear of ring and twister head.

3. Move bundle towards twister head and hold bundle against feed ring plate.
4. Press foot switch or engage trip switch (if equipped) to start the machine cycle. Ring will close, machine will cycle and tie the bundle.
5. Tie will automatically pass around ring, grip, pull back to tension, grip, cut & tie.

NOTE: The ring will open as the tie is pulled to tension. If the bundle is not against ring plate, the tension will pull bundle against machine.

6. The grippers release the tie ends when twisting cycle is complete.
7. Remove tied bundle after ring opens and next bundle is ready to be tied.

NOTE: If tie should jam up within guide or twister head, turn Cycle Selector Switch to String Up to release tie clamp and pull tie out of machine from the bottom of guide. Cut off defective length of tie and re-string machine. Refer to section 5 Troubleshooting for more details.

3.2 End of Day/Shift

Before leaving the machine at the end of the work shift, the operator must correctly stop the machine as follows:

1. Push E-Stop button.
2. Turn off the machine using the power toggle located on the operator control panel.
3. Disconnect machine power plug from outlet receptacle and the compressed air line.

4.0 Maintenance

CAUTION: Emergency Stop button should be pressed and power and air should be disconnected before performing any maintenance.

Recommendation: Bedford Industries recommends using an anti-seizing, thread-locking compound when installing fasteners. Listed below is the compound used by Bedford during the assembly process:

CRC Food Grade Anti-Seize & Lubricating Compound. Meets NSF requirements with a H1 grade.

NOTE: If customer has additional facility food safety plan or local law requirements, they will need to confirm oil used meets those requirements.

4.1 Cutting Adjustment

(Reference Figure 4.1.1, Figure 4.1.2, & Figure 4.1.3)

NOTE: Machine must be powered to confirm current setting in evaluation (Step 1 & 2). After which the machine should be disconnected from power and air before adjusting.

1. Check the cut by setting the Cycle Selector Switch to “String Up” mode and using the Manual Cut button to activate the knife cut.
2. Manually push tie through the channel vertically from the bottom in a sufficient length so tie can be removed from the twister head after the cut (about 2 in or 50 mm). The knife should cut through tie cleanly if set correctly. If cut is ragged or not cut cleanly through, anvil adjustment is necessary (continue to Step #3).
3. With the machine disconnected from power and compressed air, complete Steps #4-9.
4. Remove the feed ring assembly from the feed plate. Refer to section 6.1 Feed Ring (pg. 37) for details. The anvil can be seen on feed plate below the twister head. Reference Figure 4.1.1.
5. Loosen (do not remove) the two flat head screws holding anvil in place. Slide anvil away from knife.

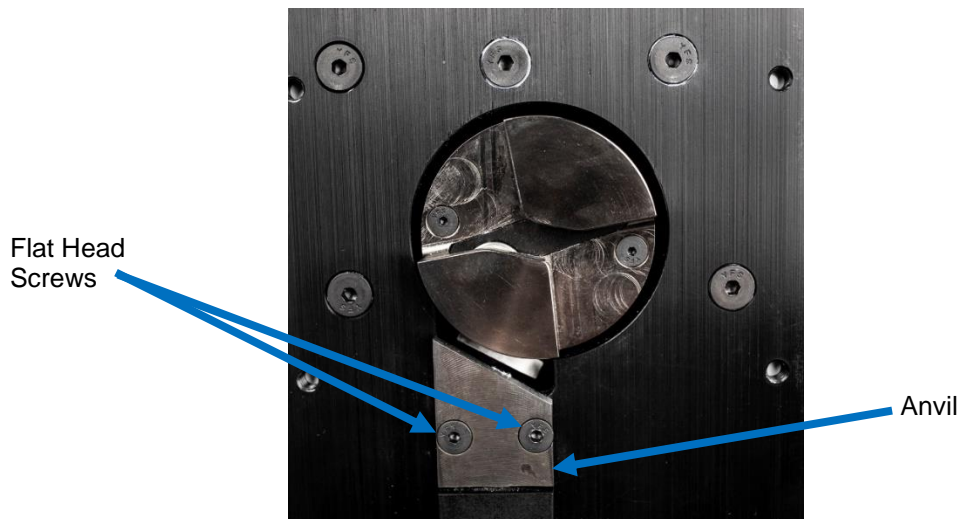


Figure 4.1.1 Anvil on Feed Plate

6. Inside the cabinet, the knife mount can be manually pushed to the cutting position (towards the front of the machine). If the mount is resistant to move, gently pry it away with a flat screwdriver between the mount and cylinder. Once the initial resistance is overcome the mount should move freely by hand.

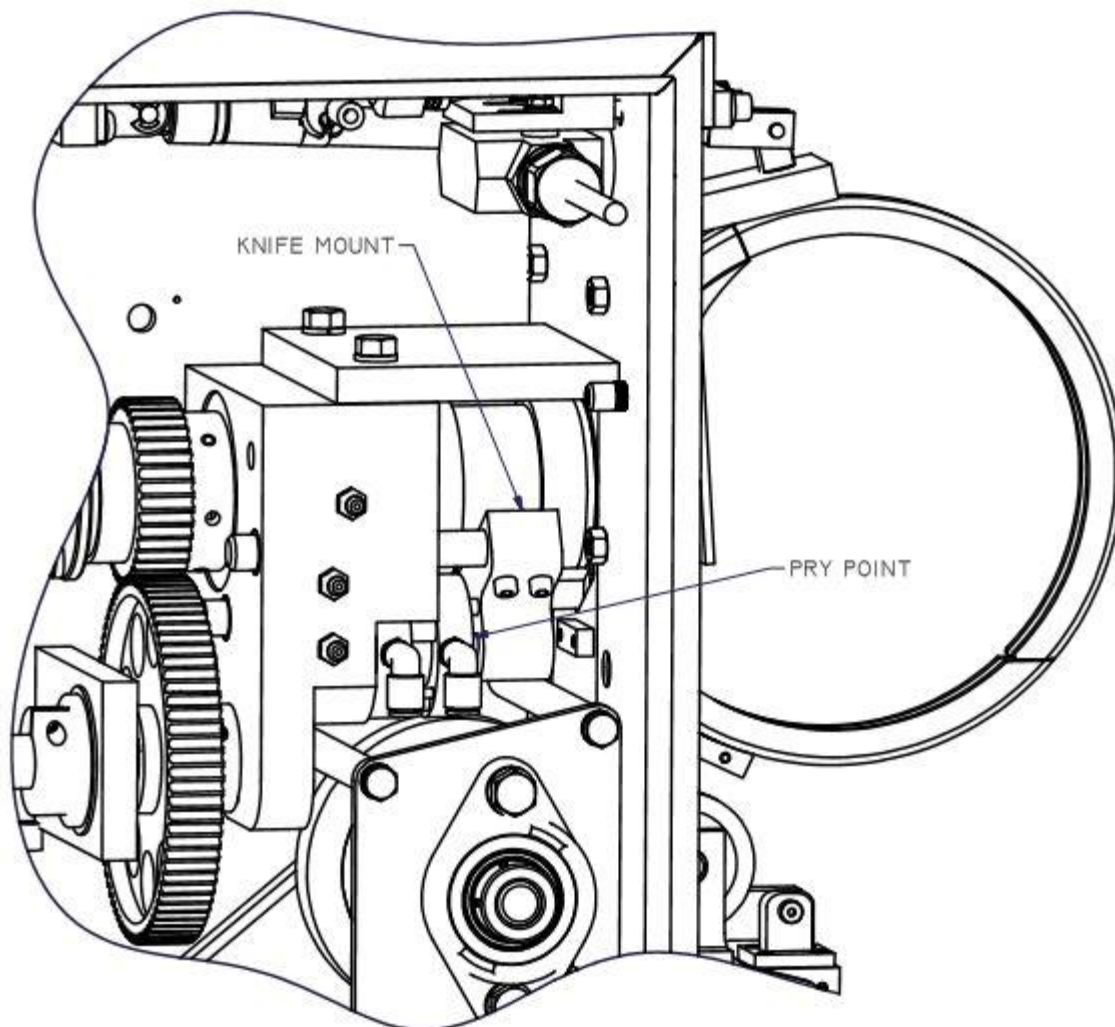


Figure 4.1.2 Knife Mount Location

7. Once the knife is pushed to the cutting position, the anvil can be adjusted up flush to the bottom of the knife as shown in Figure 4.1.3. Do not force anvil up against bottom of the knife as it could cause binding and premature dulling of the knife.



Figure 4.1.3 Anvil Adjusted to Knife

8. The two flat head screws can then be tightened to hold the anvil in its new position and the knife can be adjusted back to the standard position.
9. Connect the machine to power and air and repeat steps 1-2 to ensure the anvil has been set correctly.

4.2 Lubrication Points

(Reference Figure 4.2.1 & Figure 4.2.2)

The following are recommended points of lubrication and frequency for the Bedford Ring Tyer:

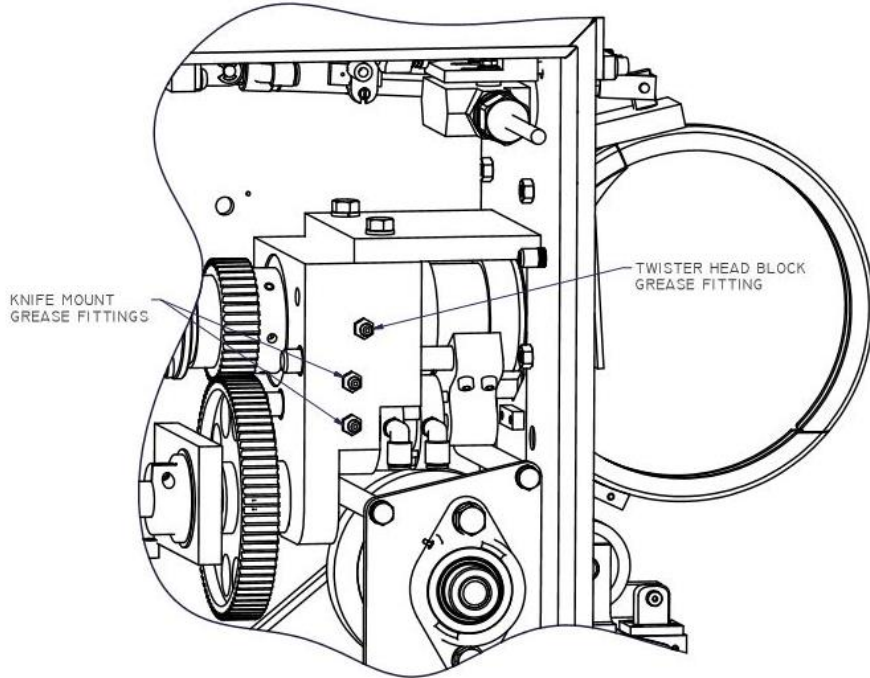


Figure 4.2.1 Twister Head Grease Fittings

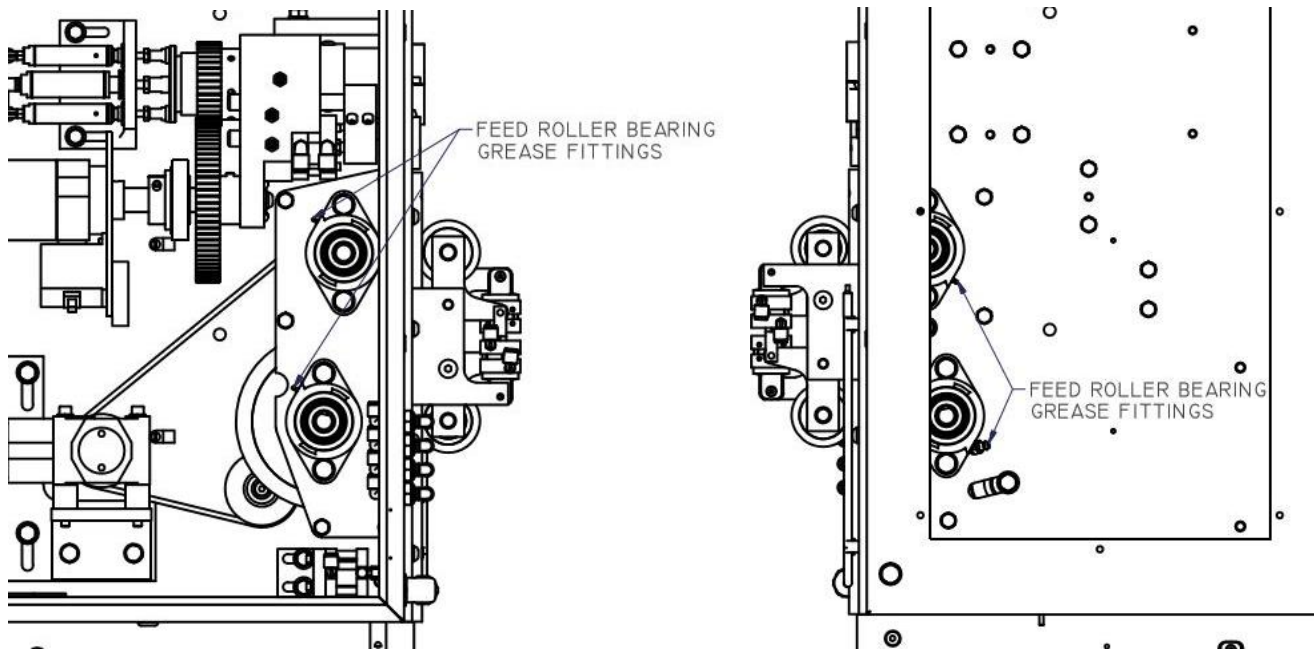


Figure 4.2.2 Feed Roller grease Fittings



1. Twister Head Block: one grease fitting located on twister head block. Power to machine must be off.
 - 1.1 Manually release the CB6 clutch actuator
 - 1.2 Manually turn motor drive shaft slowly to rotate twister head while lubricating (use slow, single pumps on gun). Stop lubricating when resistance is first felt while either rotating the drive shaft or while pumping the lube gun.

NOTE: Not rotating the twister head while lubricating or over lubrication will create enough pressure to lock up twister head.

2. Knife Mount Rails: two grease fittings located on the twister head block
 - 2.1 This is not needed often, and they do not require much grease. Use slow, single pumps on lube gun and stop at the first sign of resistance or if grease is seen coming from rail openings.

NOTE: Do not over lubricate as it can cause pressure buildup that can prohibit movement as well as cause excess grease to ooze out and create a mess.

3. Feed Roller Bearings: four total, two on left side inside cabinet and two on the right side inside the access panel. Should not need re-lubrication when under standard environmental conditions.
4. Gearbox of Bodine Motor: Lubricated from factory with lifetime wear. Does not need re-lubrication.
5. Output/Gear Shaft Bearing: one grease fitting on housing. Re-lubricate every 480 hours.

Location Point	Cycles	Hours
Twister Head Block	100,000	-
Knife Mount Rails	As Needed	As Needed
Feed Roller Bearings	-	-
Gearbox of Bodine Motor	Never	Never
Output/Gear Shaft Bearing	-	480

Use a lightweight food grade mineral oil (NSF registered, H1 grade) or similar. CRC and LPS brands offer a variety of products for facilities with food safety plans.

NOTE: If customer has additional facility food safety plan or local law requirements, they will need to confirm oil used meets those requirements.

4.3 Payout Adjustment

1. Air pressure may need adjustment if tie material is changed to a different type or construction. The brake pad may need adjustment to fit some spool flanges.
2. Pressure is controlled by the secondary pressure regulator (middle regulator) and is preset to indicate 20 psig when the dancer arm is fully lifted. **(Not applicable for HD payout)**
3. If the brake pad is unable to clear spool flange diameter when dancer is lifted.
 - 3.1. Loosen nut on mounting screw through spool brake.
 - 3.2. Slide brake pad in slotted hole to fit larger spool flange diameter.
 - 3.3. Make certain the brake pad will release spool as the dancer arm is lifted.
 - 3.4. Tighten nut on mounting screw.

4.4 Machine Air Pressure

1. Pressure is controlled by primary pressure regulator (left regulator). Machine air pressure must remain at 65 psig to properly cycle. The CFM of a standard Ring Tyer is 0.13.

4.4 Fiber Optic Eye

1. Clamped at underside of feed ring with face of eye flush with inner surface of ring groove. Two cap head screws tighten clamp around eye barrel. Do not overtighten screws as excessive clamping force may damage eye. Optic eye leads terminate at sensor inside machine cabinet. Sensor is set to light operated. Adjustments in gain of sensor should not be necessary for life of optics. Eye may false trigger if debris accumulates in lower part of ring groove.

4.5 Primary Feed Roller and Secondary Feed Roller

1. Primary (upper) and secondary (lower) should be centered in the tie channel opening with clearance on each side for proper alignment. Misalignment can cause wear and machine malfunction.

4.6 Hysteresis Clutch

1. The clutch is part of the secondary feed roller assembly. See Manufacturer's Literature at end of manual.
2. Loosen set screws locking tension adjustment ring (one at each side of clutch body near knurled ring).
3. Hold clutch body and rotate ring to desired tension setting using graduation mark on ring as a guide. Counterclockwise to decrease tension and clockwise to increase tension.
4. Retighten set screws. Clutch tension is factory set at three (midrange) and should suffice for most applications.

4.7 Solenoid Valve

1. Valve assembly must be activated to manually check valves. Depress the small button in center of valve module to manually cycle valve. Machine must be reset first to manually cycle the valves.

4.8 Pressure Regulator Valve/Flow Control Connectors

1. On the SMC valve body assemblies (beige with orange connectors and blue button), the part of the valve body and leads to the feed ring cylinder. It is preset and should not need adjustment. This item controls the air pressure to feed ring cylinder. Pressure required shall be no more than needed to close and hold position of feed ring during machine operation. Excessive pressure may be harmful to personnel and may also damage feed ring, feed ring cylinder, or pivot mechanism by slamming ring closed.
2. On the Nitra valve body assemblies (beige and black with red button), the air lines that connect to the feed ring cylinder contain an adjustable flow control connector. This controls the speed of the air pressure to the feed ring cylinder. Pressure required shall be no more than needed to close and hold position of feed ring during machine operation. Excessive pressure may be harmful to personnel and may also damage feed ring, feed ring cylinder, or pivot mechanism by slamming ring closed.

4.9 Program Selector Switch

1. A three-position switch located on the inside cover of the electronic control panel. This switch selects the correct program for the PLC to use for a corresponding ring diameter size (4", 6", and 9").

4.10 Magnetic Sensor

1. An adjustment may be needed when changing ring sizes or air cylinder because of a change in cylinder stroke. This switch is wired in current sinking mode of operation. Switch is clamped onto body of feed ring air cylinder. Set switch position with power on (air can be off). Close feed ring making sure that cylinder shaft travel allows ring to close fully. Refer to section 2.2 Setting Ring (pg. 14) for details. Loosen clamping screw and slide switch on cylinder body until indicator light glows red. Tighten clamping screw.

4.11 Ring Size Changes

1. Machine quickly changes over to other ring sizes. When changing from one ring size to another make sure of the following:
 - 1.1. The Program Selector Switch is set to the correct position. Refer to 4.9 Program Selector Switch (pg. 29).
 - 1.2. The optic eye has been clamped correctly in the ring. Refer to 2.2 Setting Ring (pg. 14).
 - 1.3. The air cylinder closes ring correctly. Refer to 2.2 Setting Ring (pg. 14).
 - 1.4. The magnetic switch on the ring cylinder indicated when the ring is closed. Refer to 4.10 Magnetic Sensor (pg. 29).

4.12 Belt Tension Adjustment

1. Too much tension on either the main drive belt or the double-sided drive belt can cause extra resistance in the drivetrain and therefore cause a delay in the programmed timing of the tying process. Ensure there is not too much nor too little tension on the belts as well as ensuring there is no twisting or binding caused from misalignment of the pulleys or shafts. Refer to 6.4 Main Drive Belt (pg. 41) and 6.5 Feed Rollers, Hysteresis Clutch, Double Sided Drive Belt, Shafts (pg. 42) for directions and figures regarding belt replacement and adjustment. This problem may be present if any of the following are true:
 - 1.1. The coupled shafts between the motor and gearbox are not aligned straight.
 - 1.1.1. This might require loosening the gearbox fasteners as well as the adjustment plate fasteners to correctly align the shafts.
 - 1.2. The pulleys of the gearbox and clutch/brake are not aligned.
 - 1.3. The pulleys of the gearbox, primary shaft, secondary shaft, or idler pulley assemblies are not aligned.
 - 1.4. Any of the pulleys are not square with the shaft causing the belt to not ride flat and even on the pulley.

5.0 Troubleshooting

(Reference Table 5.1 as a guide for troubleshooting)

Jog Mode

The jog mode will isolate machine operations into separate functions for troubleshooting purposes.

Caution: This procedure should only be done by a competent and trained machine operator or maintenance person.

The machine needs to have power, air supplied, and reset to work in jog mode. It needs to be in the same state as if to run normal machine operation in Auto mode. After the feed ring is closed, separate functions are started by depressing the Reset Switch each time while the Selector Switch is set to jog mode. Jog mode should indicate which functions are performing as intended and can be accomplished with the access door closed. Some of the internal functions can only be viewed when the access door is open. A more detailed verification of functions can be performed by viewing the input/output indicator lights of the PLC inside cabinet. Input and output indicators are referenced by terminal number-PLC unit. Reference Figure 5.1.

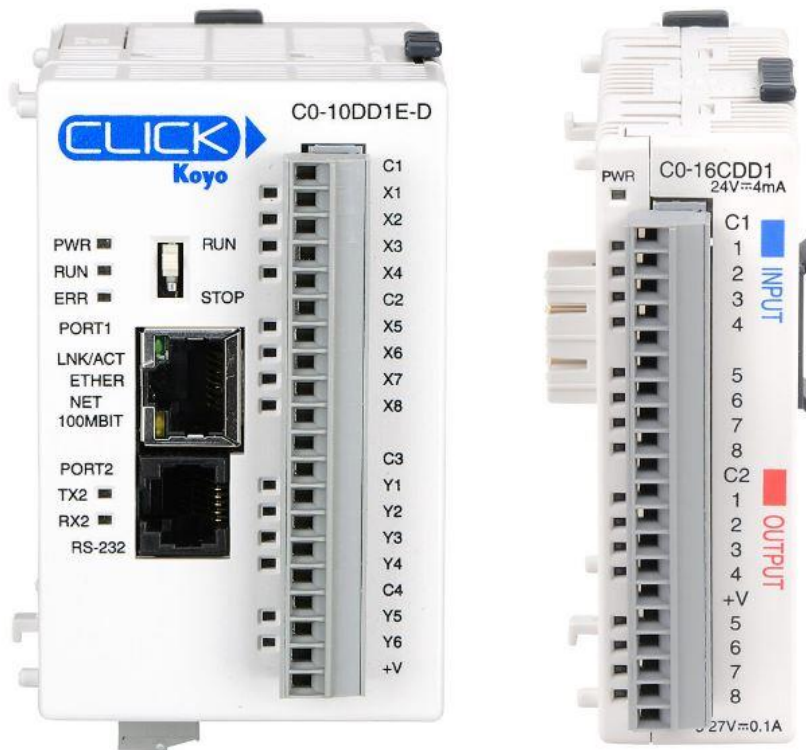


Figure 5.1 PLC Unit (C0-10DD1E-D) and Expansion Unit (C0-16CDD1)

- Input X3:C0-10 ON only with Selector Switch in String Up mode.
- Input X4:C0-10 ON only with Selector Switch in Automatic mode.
- Input X5:C0-10 ON in normal operation/ OFF if E-Stop Switch is pushed.
- Input X6:C0-10 ON whenever optional foot or trip switch activated.
- Input X7:C0-10 ON whenever Reset Switch is pushed.
- Input X8:C0-10 ON whenever Manual cut switch is pushed.



Listed below is the sequence of the Jog function as well as tables to show the actions happening during each sequence and the inputs/outputs that should be on during those actions.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
N/A	X5	1, 3

1. Turn Cycle Selector Switch to Jog and manually close feed ring. Place cardboard tube or other device inside ring to simulate bundle so tie is not pulled completely back in head upon tensioning.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Magnetic Sensor ON	X1, X5	1, 2, 3

2. Press Reset Switch. Tie feeds forward through machine, through ring, and stops with lead edge under primary gripper cover. Ring opens.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X1, X5, X7, Y2 (ON/OFF)	2, 3
Air cylinder extends and retracts pivot roller assembly on primary feed roller (upper)	X1, X5, Y2 (ON/OFF)	2, 3
Tie detected by eye	X1, X2 (flicker), X5, Y2 (ON/OFF)	2, 3
Tie stop cylinder extends and grips tie	X1, X5	1, 2, 3

3. Press Reset Switch. Lead end of tie is clamped.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X1, X5, X7, Y4	1, 3
Primary push rod cylinder extends Primary gripper extends and grips tie	X1, X5, Y4	1, 3
Ring opens	X1, X5, Y4	1, 3

4. Press Reset Switch. Tie is pulled back and tensioned.

Note: Tension function will stay on until reset is pushed twice again. Without a bundle inside the ring, tie may be pulled back inside the twister head and cause a jam. Also, because the tension function is still on the secondary feed roller will continue to spin and try to pull the tie back. This may cause the machine to bog down and could also cause an excess buildup of tie material on the secondary feed roller.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7, Y3, Y4	3
Air cylinder extends pivot roller assembly on secondary feed roller (lower)	X5, Y3, Y4	3



5. Press Reset Switch. Trail section of tie is clamped.

Note: Tension function will stay on until reset is pushed again.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7, Y3, Y4, Y5	3
Secondary push rod cylinder extends Secondary gripper extends and grips tie	X5, Y3, Y4, Y5	3

6. Press Reset Switch. Tension stops.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7, Y4, Y5	1, 3
Air cylinder retracts pivot roller assembly on secondary feed roller (lower)	X5, Y4, Y5	1, 3
Tie stop cylinder extends and grips tie	X5, Y4, Y5	1, 3

7. Press Reset Switch. Tie is cut by knife.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7, Y4, Y5, Y6 (ON/OFF)	1, 3
Knife cylinder extends then retracts	X5, Y4, Y5, Y6 (ON/OFF)	1, 3

8. Press Reset Switch. Twister head rotates two/three times and stops.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7, Y1, Y4, Y5	1, 3
Wrap spring clutch solenoid ON then OFF	X5, Y1, Y4, Y5	1, 3
Secondary gripper releases	X5, Y4	1, 3

9. Press Reset Switch. Tie bundle released.

Action(s)	PLC (C0-10DD1-E) Input(s)/Output(s) ON	Expansion (C0-16CDD1) Output(s) ON
Reset pushed	X5, X7	1, 3
Primary gripper releases tie	X5	1, 3

10. To terminate or quit jog mode: turn Cycle Selector Switch to Auto and press Reset.

11. Jog procedure is repeatable by manually closing the ring if the switch remains in jog mode. Jog mode terminates anytime when the Cycle Selector Switch is set to Auto and Reset is pushed. It is also terminated by pushing the Manual Cut switch at any time.

Table 5.1 Troubleshooting Chart

Problem	Possible Cause	Corrective Action
Power on; Indicator light on, but no motor drive or machine operation	<ol style="list-style-type: none"> 1. Motor overload breaker tripped 2. Machine switched to string up 3. Safety interlock switch inside cabinet not working properly 4. Machine in standby mode 	<ol style="list-style-type: none"> 1. Reset Breaker (<i>Figure 1.2.4.3</i>) 2. Switch Cycle Selector Switch to Auto (<i>Figure 1.2.1</i>) 3. Ensure safety switch is engaging when door closes (<i>Figure 1.2.3.3</i>) 4. Machine will go into standby mode after 5 minutes of no activity, to exit standby mode press the Reset switch
Power on; no indicator light and no motor drive or machine operation	<ol style="list-style-type: none"> 1. 3.2 amp FNQR fuse blown 2. 1.2 amp MDL fuse blown 3. Power supply blown 	<ol style="list-style-type: none"> 1. Replace fuse 2. Replace fuse 3. Consult factory
Ring closes but tie does not feed through twister head, into ring	<ol style="list-style-type: none"> 1. Tie jammed in guide 2. Tie has lost registration in guide 3. Tie jammed in payout 4. Debris in anvil or guide 5. Spool empty 6. Feed ring not indicating closed 7. Pivot roller assembly on front feed plate not functioning properly <ol style="list-style-type: none"> 7.1 Program not reading correctly 7.2 Pivot roller seizing 7.3 Cylinder not working 7.4 Solenoid valve not working 8. Primary feed roller damaged or worn 9. Tie stop at inside lower front of machine not releasing <ol style="list-style-type: none"> 9.1 Cylinder not working 9.2 Solenoid valve not working 	<ol style="list-style-type: none"> 1. Switch to String Up, pull out and cut off defective tie, then restring, cut to registration, and resume operation 2. Switch to String Up, restring tie 3. Free jam, check payout operation by hand. Cut off damage and restring tie through payout and machine 4. Evident if resistance is felt while pushing tie up through guide. Use air to clean anvil or guide path 5. Replace with full spool 6. Check that feed ring closes completely and air cylinder works. Verify that indicator light on magnetic sensor on feed ring cylinder glow red and that Input X1:C0-10 is ON when feed ring is closed completely. Adjust sensor on cylinder if needed. If unable to light indicator, check for loose wire leads, or replace sensor 7. See below <ol style="list-style-type: none"> 7.1 Verify in jog mode Output X2:C0-10 cycles ON then OFF 7.2 Replace pivot roller assembly 7.3 Check air lines. Replace cylinder 7.4 Manually cycle valve. Check for loose wire leads, replace valve if determined faulty 8. Replace feed roller 9. See below <ol style="list-style-type: none"> 9.1 Check air lines. Replace cylinder 9.2 Manually cycle valve. Check for loose wire leads, replace valve if determined faulty

<p>Tie feeds through twister head, into ring, but does not complete loop and a small piece of tie is left in twister head or tie does not enter twister head at all and machine does not tie. This will also happen if tie does not stay inside ring groove during the tie feed function.</p>	<ol style="list-style-type: none"> 1. Optic eye not detecting tie properly <ol style="list-style-type: none"> 1.1 Debris in ring groove false tripping eye 1.2 Photo eye malfunctioning, not detecting tie at all. Fiber optic eye should show a red glow inside groove in bottom of feed ring. 1.3 Program Selector Switch is set incorrectly for ring size being used 2. Tie end catching as it travels through ring 3. Primary gripper not holding tie lead end securely <ol style="list-style-type: none"> 3.1 Program not reading correctly <ol style="list-style-type: none"> 3.1.1 Push rod cylinder(s) not working 3.1.2 Solenoid valve not working 3.2 Activator assembly, push rod, or primary gripper seizing 4. Belts and/or rollers binding or rubbing 5. Feed rollers loose or rubbing on feed plate/tie guide 	<ol style="list-style-type: none"> 1. See below <ol style="list-style-type: none"> 1.1 Clean debris from ring 1.2 Check function by sliding tie over eye manually, verify Input X2:C0-10 ON briefly as tie passes eye. Check position of eye in ring. Check for loose wire leads or replace eye. 1.3 Set switch to correct position 2. Check for nicks or grooves in ring surface which could catch tie end as moving tie manually through ring. Check that fiber optic eye is set flush in groove of feed ring. 3. See below <ol style="list-style-type: none"> 3.1 Verify in jog mode Output X4:C0-10 ON <ol style="list-style-type: none"> 3.1.1 Check airlines for damage. Replace cylinder(s) 3.1.2 Manually cycle valve. Check for loose wire leads, or replace valve 3.2 Check that activator body moves freely in and out at rear of twister head body. Pushing in on surface of activator should move it freely into twister body. Some spring resistance will be felt. This push should result in push rod moving primary gripper out against cover to hold tie. Disassemble to determine if problem is seizing or if extreme resistance is encountered. (Please contact Bedford Industries before disassembling twister head). 4. Ensure timing belts are not too tight and are aligned correctly. <i>(Refer to section 4.12 Belt Tension Adjustment (pg.29))</i> 5. Ensure feed rollers are not loose and not rubbing on the feed plate or tie guide
<p>Tied bundle does not freely release from twister head</p>	<ol style="list-style-type: none"> 1. Knife is not cutting through all of tie material 2. Push rod cylinder(s) are sticking 3. Solenoid valve(s) not working 4. Primary or secondary grippers are not releasing tie ends 	<ol style="list-style-type: none"> 1. Check cut adjustment 2. Cylinders are single action, spring return. Check that cylinders retract freely. Replace cylinder(s) 3. Manually cycle valve. Check for loose wire leads. Replace Valve(s) 4. Verify in jog mode that outputs X4:C0-10 and X5:C0-10 are OFF. Check that activator assembly and secondary push rod button move freely in and out at rear of twister head body. Verify that spring resistance is felt when pushing in and mechanisms return to position when released. Disassembling of twister head is needed to determine problem if seizing. (Please contact Bedford Industries before disassembling twister head).

<p>Twister head partially/slowly rotates or does not rotate at all</p>	<ol style="list-style-type: none"> 1. Gear assembly at rear of twister head is slipping 2. Solenoid or actuator assembly of CB6 clutch not functioning 3. Improper lubrication: Determine if seizing is due to inadequate or improper lubrication (Refer to section 4.2) 	<ol style="list-style-type: none"> 1. Check that three set screws securing gear assembly on rear barrel of twister head are tight. (Set screws on right side of gear as viewed from cabinet door opening). Realign twister head rotation (Refer to section 6.7 Wrap Spring Clutch (pg. 46) and Figure 6.7.1) 2. (See Manufacturer's Literature) Verify Output X1:C0-10 is ON then OFF in jog mode. Check that plunger retracts actuator and actuator releases cam collar when solenoid is activated. Solenoid must be positioned closest to paddle actuator to fully retract. Check for loose wire leads. Contact manufacturer if solenoid is not functioning properly 3. If inadequate lubrication, consult with factory to determine if twister head and/or twister head block assembly need replacement. If twister head assembly was not rotated or too much grease was pumped during lubrication, then twister head assembly must be removed from its mounting assembly. (Please contact Bedford Industries before removing twister head assembly)
<p>Tie not tensioning properly</p>	<ol style="list-style-type: none"> 1. Hysteresis clutch not functioning properly 2. Pivot roller assembly on feed plate not functioning properly <ol style="list-style-type: none"> 2.1 Program not reading correctly 2.2 Cylinder not working 2.3 Solenoid valve not working 2.4 Pivot roller seizing 2.5 Secondary feed roller damaged or worn 3. Program Selector Switch set incorrectly for ring size being used 4. Feed rollers loose or rubbing on feed plate/tie guide 	<ol style="list-style-type: none"> 1. Adjust clutch tension or replace clutch (Refer to section 6.5 Feed Rollers, Hysteresis Clutch, Double Sided Drive Belt, Shafts (pg. 42)) 2. See below <ol style="list-style-type: none"> 2.1 Verify in jog mode Output X3:C0-10 cycles ON then OFF 2.2 Replace cylinder 2.3 Manually cycle valve. Check for loose wire leads or replace valve 2.4 Replace roller assembly 2.5 Replace roller 3. Set Program Selector Switch to correct ring size 4. Ensure feed rollers are not loose and not rubbing on the feed plate or tie guide
<p>Tie pulling back before loop is complete and no small piece of tie remaining in twister head if loop is missed</p>	<ol style="list-style-type: none"> 1. Program Selector Switch set incorrectly for ring size being used 2. Feed rollers loose or rubbing on feed plate/tie guide 	<ol style="list-style-type: none"> 1. Set Program Selector Switch to correct ring size 2. Ensure feed rollers are not loose and not rubbing on the feed plate or tie guide



6.0 Parts

Warning: Remove cord from outlet and disconnect air before attempting any of these procedures. Use proper lock out procedures if machine will be left unattended.

Please contact Bedford Industries for spare parts inquiries.

When ordering parts, locate the machine nameplate (*example shown in Figure 6.1*) and provide the model, model number and serial number with your request for parts. This information will aid in providing quick and accurate service from Bedford Industries.



Figure 6.1 Machine Nameplate

6.1 Feed Ring

(Reference Figure 6.1.1. Please refer to section 2.2 Setting Ring (pg. 14) for further diagrams and instructions for setting the ring)

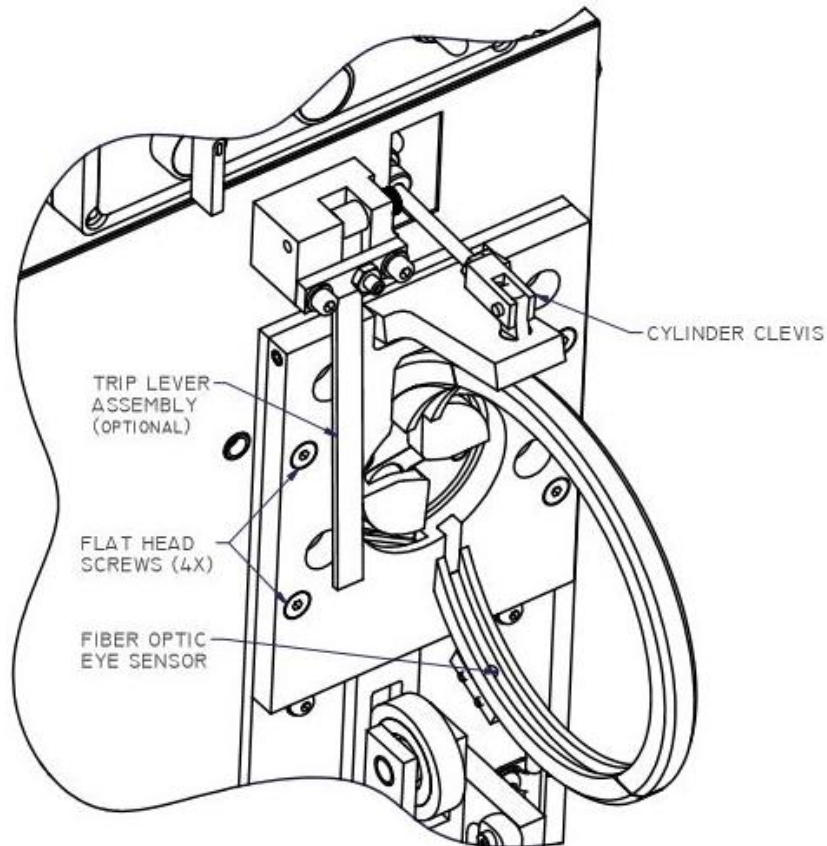


Figure 6.1.1 Ring Diagram

1. Remove retaining clip and clevis pin from cylinder clevis at feed ring attachment.
2. Loosen two screws at side of clamp holding fiber optic eye in lower part of ring and remove eye from ring.
NOTE: Do not pull on wires to remove eye from ring. The sensor is fragile and should be moved carefully as to not bend or break the connecting wires.
3. Remove four flat head screws attaching feed ring assembly to feed plate.
4. Remove feed ring assembly. To install feed ring assembly or different sized ring assembly, replace/tighten four attachment screws.
5. Replace clevis pin and retaining clip in cylinder clevis at feed ring attachment.
6. Install and clamp optic eye flush to inner surface of ring groove.
7. Refer to section 2.2 Setting Ring to ensure the ring has been properly set for machine operation.

6.2 Anvil

(Reference Figure 6.2.1. Refer to section 4.1 Cutting Adjustment (pg. 23) for proper anvil adjustment)

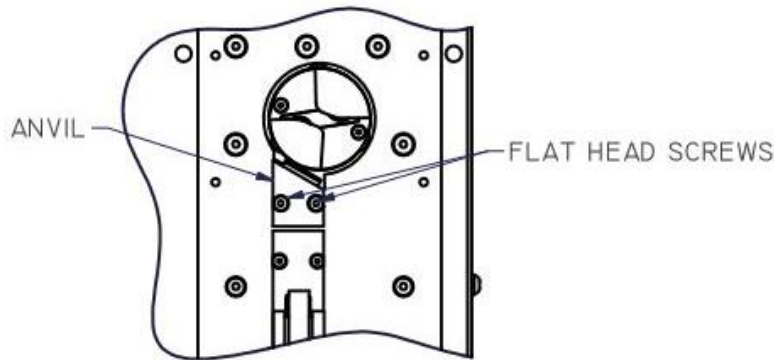


Figure 6.2.1 Anvil on Feed Plate

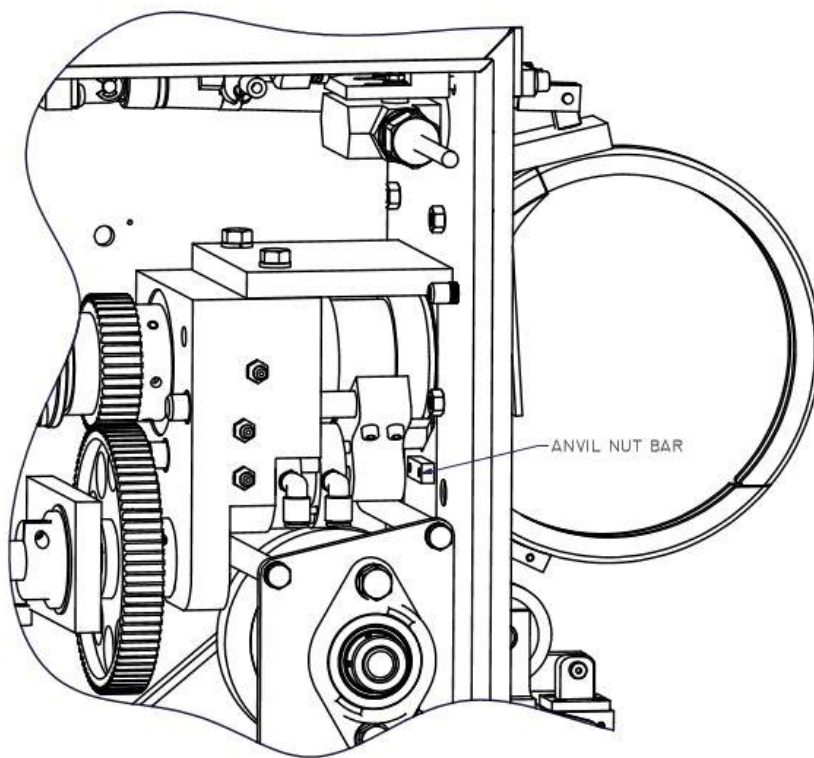


Figure 6.2.2 Anvil Nut Bar Location

1. Remove feed ring assembly from feed plate. Refer to section 6.1 Feed Ring (pg. 37). Anvil can be seen below the twister head.
2. Open the cabinet door. Locate the anvil nut bar. The nut bar is on the upper inside front of the cabinet below the twister. Reference Figure 6.2.2.
3. Use a long nose pliers or vise grip to hold the anvil nut bar.
4. Remove the two flat head screws attaching the anvil to the feed plate.
5. To install a new anvil, hold the nut bar against the inside of the machine cabinet, directly behind the feed plate.
6. Insert and thread far (right) side screw first, through anvil, through cabinet, and into the nut bar.
7. Position the nut bar to insert and thread near (left) side screw.
8. Refer to section 4.1 Cutting Adjustment (pg. 23) to adjust anvil to proper height.
9. Replace ring assembly. Refer to section 6.1 Feed Ring (pg. 37).

6.3 Knife

(Reference Figure 6.3.1, Figure 6.3.2, Figure 6.3.3, & Figure 6.3.4)

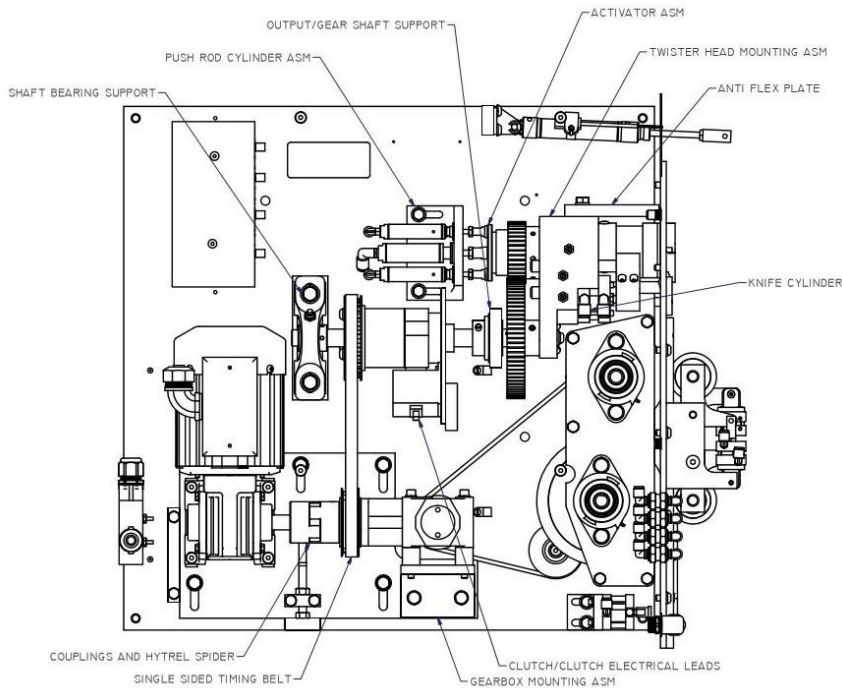


Figure 6.3.1 Diagram inside Cabinet (Left Side of Machine)

1. Remove access plate on the right side and open the access door on the left side of the machine cabinet.
2. Loosen belt tightener/idler of double-sided drive belt.
3. Loosen/remove two screws attaching anti flex plate to the twister head mounting assembly.
4. Loosen/remove two screws, lock and flat washers attaching push rod cylinder assembly to back plate – move cylinder assembly aside.
5. Loosen two screws attaching gear box mounting assembly to back plate.

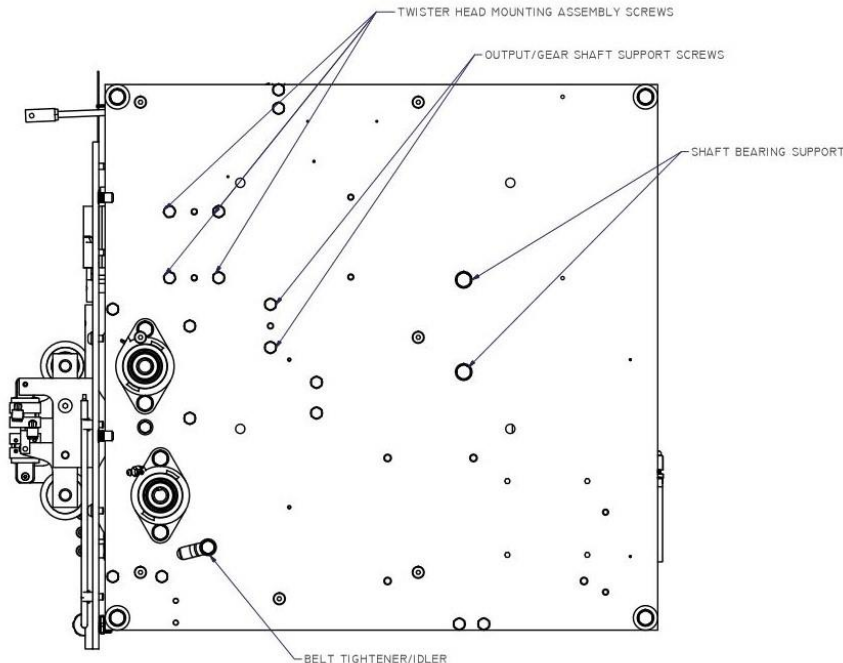


Figure 6.3.2 Diagram inside Cabinet (Right Side of Machine)

- 5.1 Slide gear box up to remove single sided timing belt from gear box drive pulley.
- 5.2 Loosen set screws on drive shaft couplings and slide couplings and Hytrel spider to expose shaft ends.
- 5.3 Remove belt from timing pulleys and slide belt between shaft ends.
6. Disconnect and label airline tubing to knife cylinder fittings.
7. Disconnect electrical leads from solenoid of clutch.
8. At back plate, loosen/remove two screws attaching output/gear shaft support to plate.

9. At back plate, loosen/remove two screws attaching shaft bearing support to plate.

10. Loosen four screws attaching twister head mounting assembly to plate. Twister head mounting

assembly and output/gear shaft support have locator pins extending into back plate.

11. Remove screws attaching twister block and input shaft support to back plate.
12. Support and lift entire assembly (clutch, shafting, gears, and twister head mounting) away from back plate so locator pin clears plate.
13. Move clutch end of assembly away from back plate until shaft end clears coupling.
14. Move entire assembly out of machine cabinet. Take care not to let the activator assembly or push rod button slip out from the rear end of twister head assembly.

WARNING: *Knife edge is extremely sharp. Use care when removing or installing knives.*

15. Set assembly on work area and remove two cap head screws from knife mount to remove knife from its mount. Reference Figure 6.3.3.

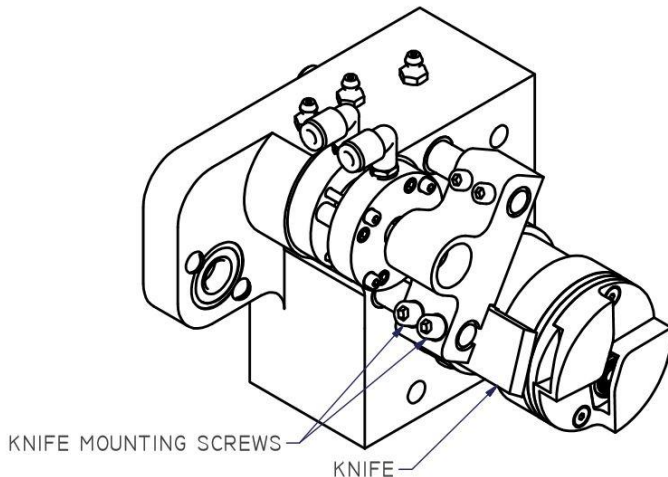


Figure 6.3.3 Knife Mount Diagram

16. Install new knife with longest flat surface facing knife mounting block and use Blue Loc Tite (or similar item) on screw threads. Tighten screws securely before reassembling components back into box.

NOTE: When replacing screws; make certain that screw ends do not protrude beyond surface of knife and that there is adequate clearance between twister head barrel and knife surface.

To replace component assembly in cabinet:

17. Start twister head body in hole in feed plate then move entire assembly into cabinet setting pins of input shaft support and twister head mount into holes in back plate.
18. Install and tighten all attaching screws. Refer to steps 8-9.
19. Place push rod cylinder assembly on back plate, fitting slot in assembly mount over key on back plate.
20. Insert two screws, lock, and flat washers through slotted holes in mount and loosely snug.
 - 20.1 Make certain that actuator assembly is in release position (fully out towards rear of machine).
 - 20.2 Slide push rod cylinder assembly toward rear of twister head until upper and lower push pads engage activator surface firmly.
 - 20.3 Tighten attachment screws. Make certain that the three push pads on the cylinders are equally aligned vertically. The push pads should be very close to the activator surface without touching. Reference Figure 6.3.4.

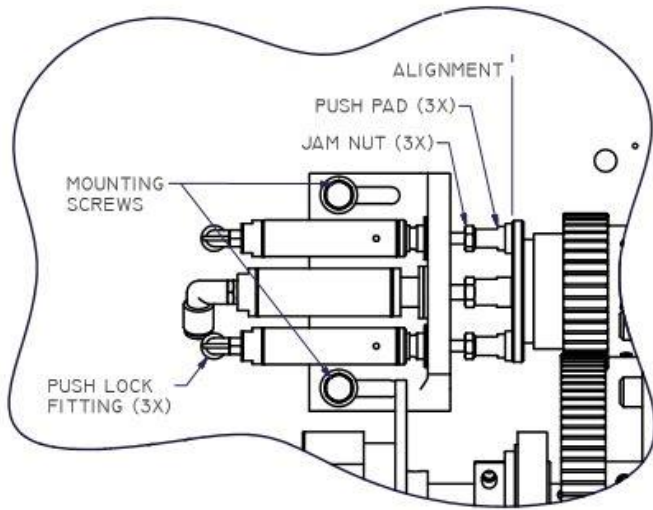


Figure 6.3.4 Push Pad Cylinder Assembly and Alignment

21. Reconnect airlines and wire leads.
22. Install drive belt.
23. Reconnect shaft couplings between motor and clutch drive shafts.
24. Tension drive belt and tighten gear box in place.
25. Check tie cutting of knife manually and readjust anvil position if necessary, before resuming machine operation. Refer to section 4.1 Cutting Adjustment (pg. 23) to adjust the anvil to the proper setting.

6.4 Main Drive Belt

(Reference Figure 6.4.1)

1. Open access door. Loosen belt tensions.
2. Loosen two screws securing gear box mount to back plate and slide gear box upwards.
3. Loosen set screws on shaft couplings, slide coupling halves and Hytrel spider to expose shaft ends.
4. Remove belt from timing pulleys and slide belt between shaft ends to remove.
5. Install new belt.
6. Reposition couplings and Hytrel spider on shaft ends and tighten shaft couplings.
7. Move gear box down to tighten belt. Make certain the lugs of the belt are engaging timing pulley grooves correctly before tensioning belt.
8. Tighten two screws securing gear box mount to back plate.

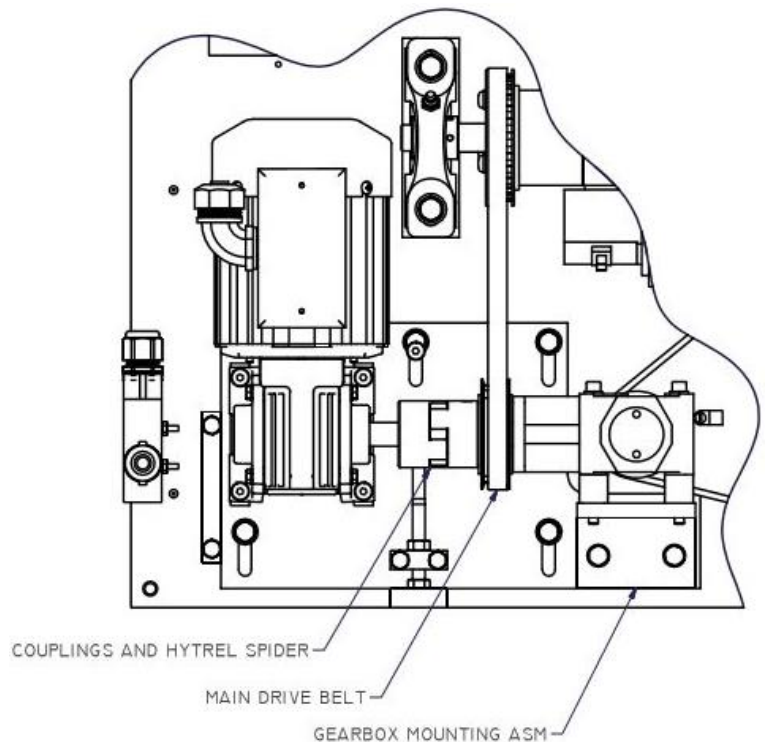


Figure 6.4.1 Main Drive Belt Diagram

6.5 Feed Rollers, Hysteresis Clutch, Double Sided Drive Belt, Shafts

(Reference Figure 6.5.1, Figure 6.5.2, & Figure 6.5.3)

This procedure will be the same whether replacing a shaft, a roller, the hysteresis clutch, or the drive belt.

1. Open access door and remove access panel.
2. Loosen belt tightener pulley assembly (Screw head on back plate access panel side) and slide toward machine rear to loosen drive belt. Reference Figure 6.5.1.

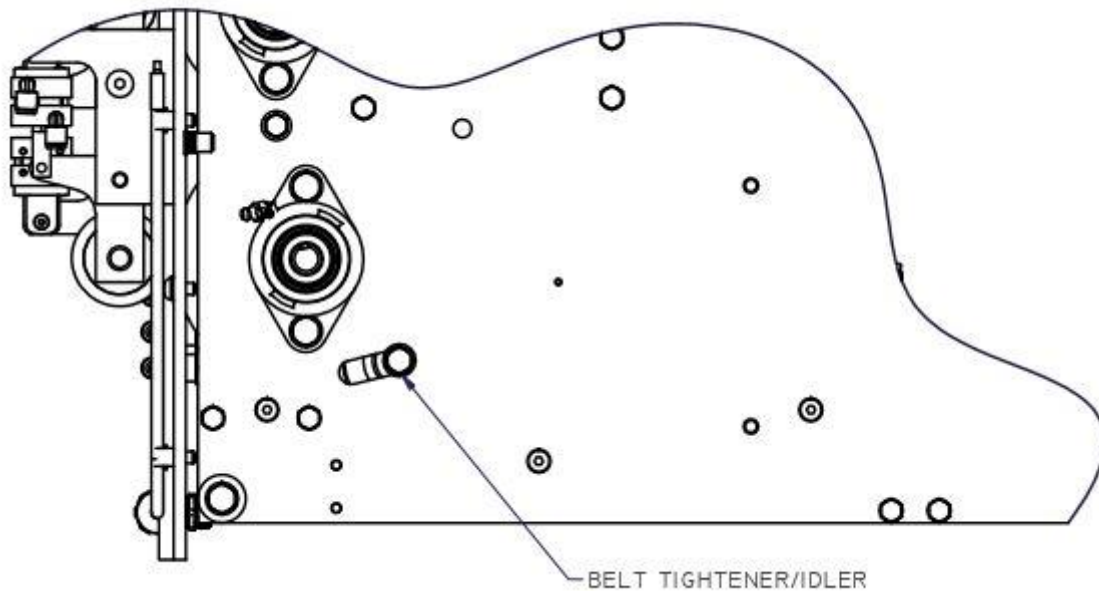


Figure 6.5.1 Belt Tightener Adjustment Diagram

3. Remove double sided drive belt towards back plate from gear drive pulley.
4. Remove belt from fixed idler and from both shaft pulleys.
5. Loosen locking collar of bearing on back plate.
6. Remove five screws attaching side plate to standoffs (do not loosen screws attaching standoffs to back plate).

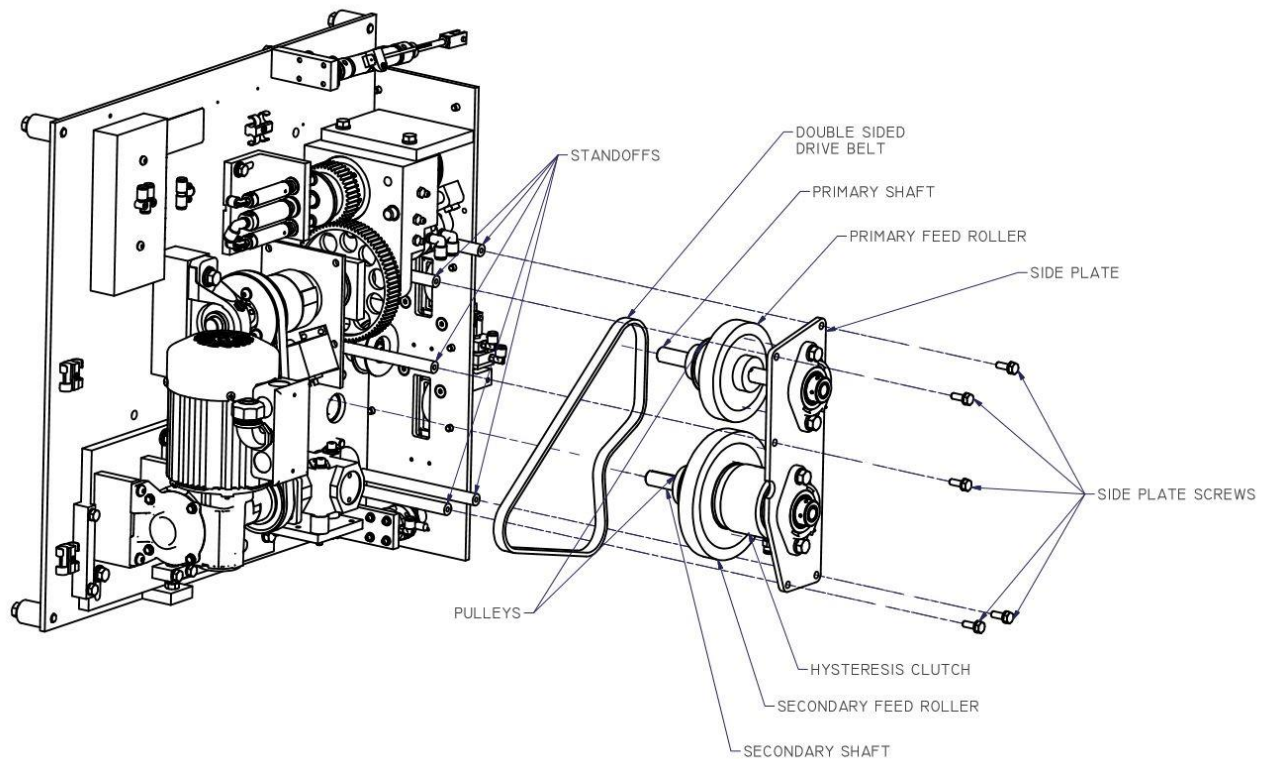


Figure 6.5.2 Exploded View of Rollers, Clutch, Belt, and Shafts

7. Pull side plate away from back plate and away from front of machine.
8. Remove side plate with hysteresis clutch, feed rollers, and pulleys attached to shafts.
To reinstall components:
9. Loosen locking collar of bearings on side plate
10. Remove shafts from side plate bearings.
11. Insert pulley end of shafts into bearings at back plate and snug set screws on locking collars.
12. String timing belt around pulleys following dashed line guide shown on drawing.
13. Position side plate and side plate bearings inside box and slide bearings over shaft ends.
14. Install five screws attaching side plate to standoffs.
15. Loosen set screws on locking collars at back plate and move shafts so ends are flush with locking collars.
16. Tighten set screws on locking collars at back plate.
17. Move belt over flanges of drive pulley, check belt to ensure that lugs are seated in timing pulley grooves and verify that belt travel is correct.
18. Move belt tightener forward to tighten belt and tighten in place.

NOTE: Always check alignment of rollers in opening of feed plate after moving shafts. Check roller alignment by using an inspection mirror inside cabinet to see position of roller in feed plate opening. Feed roller should center in opening and have clearance on both sides. All drive pulleys should align with each other.

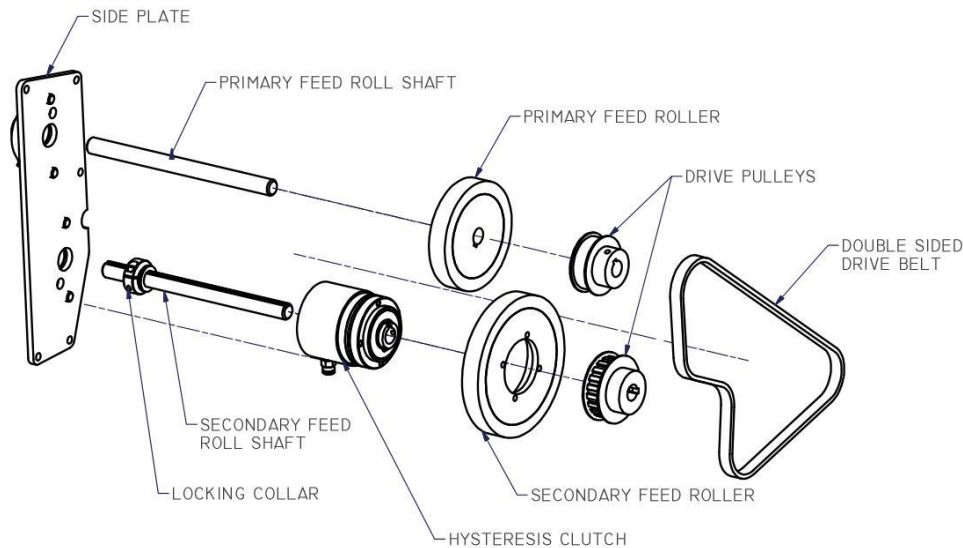


Figure 6.5.3 Exploded View of Rollers, Clutch, Belt, and Shafts

1. **Primary Feed Roller (upper) Assembly:** Primary feed roller attaches to shaft with one set screw on key in keyway. Drive pulley attaches to same shaft with one set screw on separate key in keyway. Align primary feed roller by loosening set screw and moving roller on shaft. Check roller alignment by using an inspection mirror inside cabinet to see position of roller in feed plate opening.
2. **Secondary Feed Roller (lower) Assembly:** Secondary feed roller attaches to back plate end of hysteresis clutch body with three screws through body of roller. When replacing secondary feed roller make certain that enough clearance exists around shaft so shafts can rotate freely when clutch stops. Drive pulley attaches to same shaft with one set screw on separate key in keyway. Align secondary feed roller by loosening two set screws (one over key and one on shaft) on hysteresis clutch shaft collar at side plate end and moving clutch body on shaft. Check roller alignment by using an inspection mirror inside cabinet to see position of roller in feed plate opening.
3. **Hysteresis Clutch:** Attaches to secondary feed roller shaft. Loosen two set screws on clutch locking collar and slide off shaft. Remove feed roller and install on new clutch. If shaft ends at back plate are always set flush with locking collars, alignment of shaft pulleys with idler and tightener pulleys should be maintained when replacing feed rollers or clutch. If drive pulleys or shafts are replaced make certain that pulleys mount on the proper shaft at the same distance from the back plate shaft end that previous units were mounted. The primary feed roll shaft is a different design than the secondary feed roll shaft. Do not interchange shafts.

6.6 Pivot Roller(s) Assembly

1. **Air cylinder Replacement**
(Refer to section 6.9 Air Cylinders)
2. **Pivot Roller Replacement**
(Reference Figure 6.6.1)

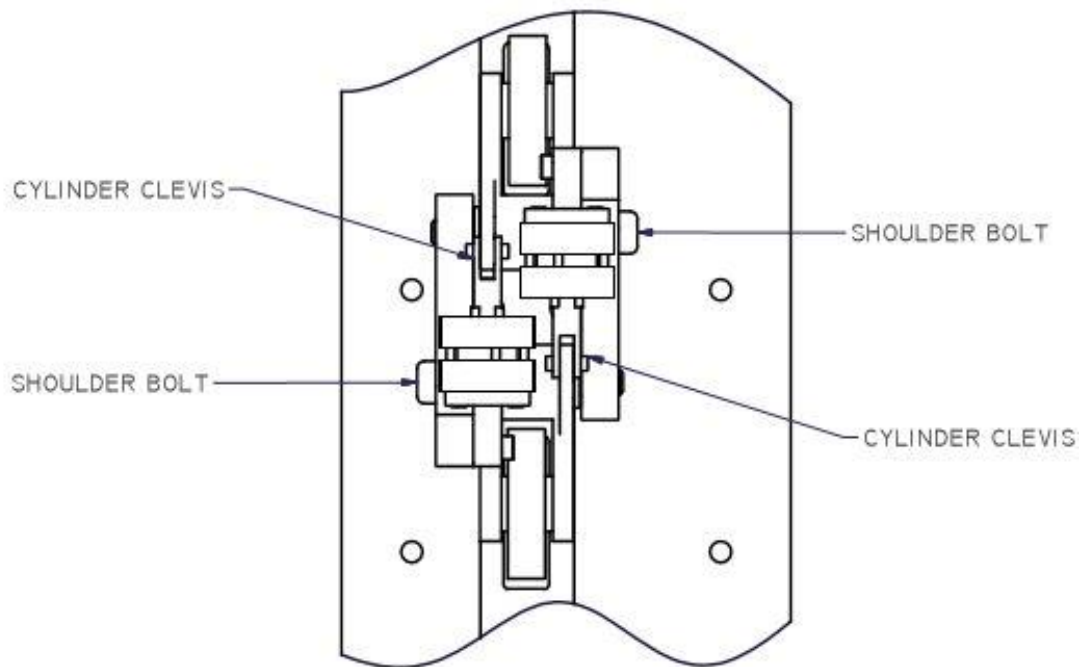


Figure 6.6.1 Pivot Rollers Diagram

- 2.1. Remove retaining clip and clevis pin from clevis at attachment to arm of pivot roller.
- 2.2. Remove shoulder bolt securing pivot roller assembly between mountings.
- 2.3. Remove pivot roller assembly.
- 2.4. Install new pivot roller assembly between mountings on feed plate.
- 2.5. Insert/tighten shoulder bolt.
- 2.6. Install clevis pin with retaining clips in clevis at attachment to arm of roller.

6.7 Wrap Spring Clutch

(Reference Figure 6.7.1)

1. Disconnect electrical leads from solenoid of clutch.
2. Loosen the four hex head bolts attaching the adjustment plate to the back plate.
3. Move the adjustment plate with the motor and gearbox up towards the output/gear shaft assembly to loosen the timing belt on the gearbox and clutch.
4. Remove the timing belt from the clutch pulley.
5. Loosen the output/gear shaft bearing mount locking collar set screws.
6. Loosen/remove the two hex head bolts, lock and flat washers attaching the output/gear shaft bearing mount to the bearing support.
7. Slide the bearing mount off the output/gear shaft.
8. Loosen/remove the three button head screws and lock washers from the pulley attaching it to the clutch and remove it from the clutch.
9. Loosen the locking collar set screws on each side of the CB6 clutch and slide the clutch off the output/gear shaft. NOTE: Be aware not to lose the key that aligns the clutch with the shaft when removing the clutch.
10. Slide the new clutch on the output/gear shaft aligning the rotating body with the key and keyway as well as aligning the slotted hole on the plate of the clutch with the fixed pin in the support block.
11. NOTE: The clutch will need to be positioned in the same location so the timing belt aligns with the gearbox properly. In order to do this, attach the pulley to the clutch and move the clutch so the pulleys are aligned. Then tighten the set screw on the right side of the clutch to hold it in place. Remove the pulley from the clutch and tighten the other set screw on the clutch to finally lock it in the position.
12. Attach the pulley back onto the clutch using the three button head screws and lock washers.
13. Slide the shaft bearing mount onto the output/gear shaft and attach it to the bearing mount support using the two hex head bolts, lock washers, and flat washers.
14. Tighten the two locking collar set screws on the bearing mount.
15. Place the timing belt back on both the clutch and gearbox pulleys making sure the teeth of the belt are aligned with the grooves of the pulley.
16. Move the adjustment plate to the proper location to tension the timing belt between the clutch and gearbox using the adjustment bolt located at the bottom of the plate.
17. Once the belt is tensioned properly, tighten the four hex head bolts that attach the adjustment plate to the back plate.
18. Connect the electrical leads to the clutch.
NOTE: The solenoid must be positioned closest to the paddle actuator to fully release.
NOTE: It will be necessary to adjust the stop position of wrap spring clutch to realign twister head after replacing clutch or removing rear drive gear assembly. See Manufacturer's Literature.
19. Depress actuator lever to free clutch.

20. Slide retaining ring at cam collar towards rear of clutch.
21. Slide cam collar towards rear of clutch and off splines of brake sleeve until collar can rotate. Clutch rotates counterclockwise when looking at the front of machine.
22. To stop sooner, rotate cam collar counterclockwise.
23. Slide cam collar onto splines and install snap ring.
24. Stop position must be checked under power as you cannot generate enough inertia manually to set the brake stop in its correct position.
25. Turn power on and reset machine two to three times in Auto mode to check stop position of head.

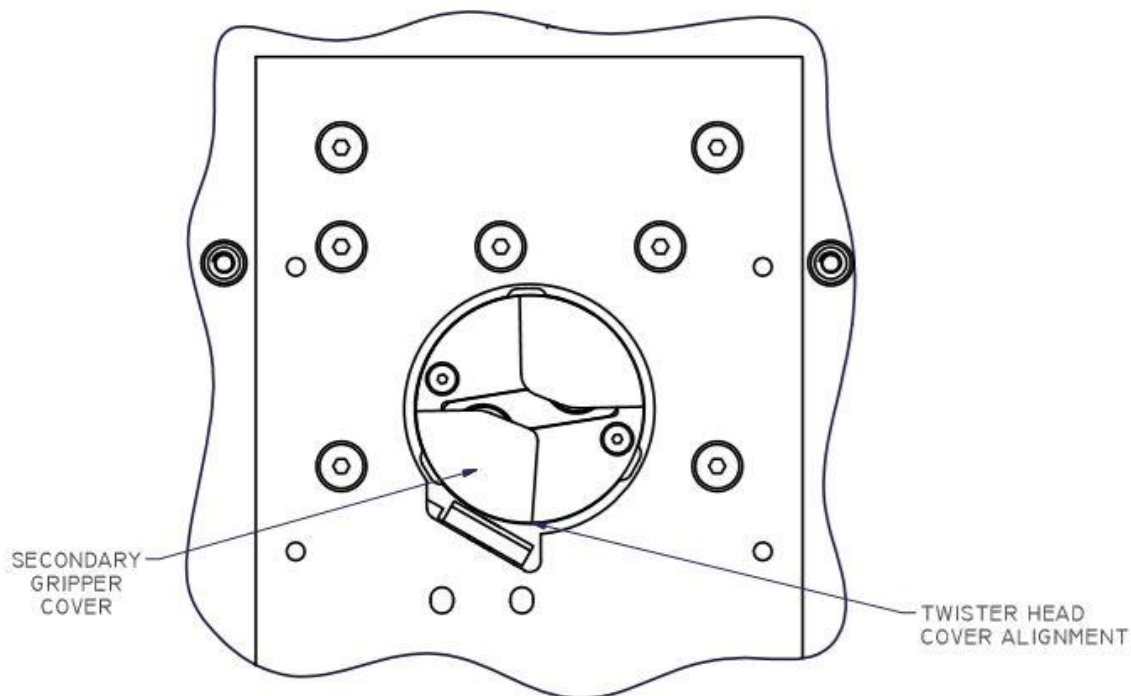


Figure 6.7.1 Twister Head Alignment

6.8 Master Solenoid Valve Assembly

1. Contact Bedford Industries for parts replacement or repair. Ensure to confirm if the machine possesses the SMC valve body (beige with orange connectors and blue button) or the Nitra valve body (beige and black with red button).

6.9 Air Cylinders

Break air line connections at cylinder(s) noting which line connects to which end of cylinder. Miss matching air lines will result in reverse operation.

1. Push Rod Cylinder(s)

(Reference Figure 6.9.1.1. May remove assembly from back plate to facilitate replacement by removing two hex head screws, flat and lock washers from slotted holes. A push lock airline fitting is used on end of cylinder body)

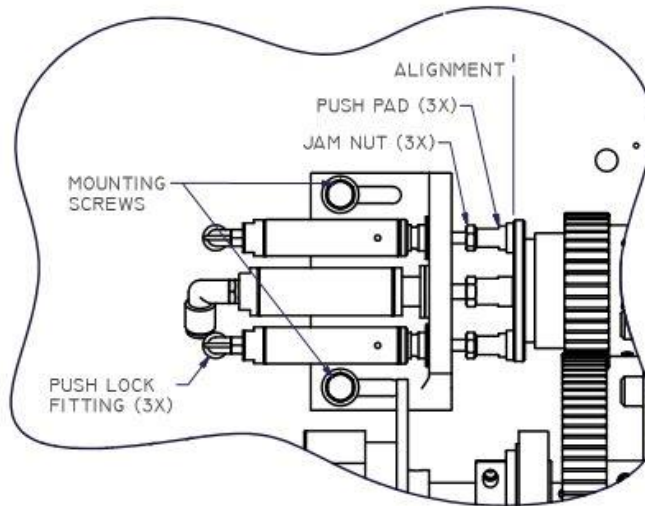


Figure 6.9.1.1 Push Pad Cylinder Assembly Diagram

- 1.1. Push in on the plastic sleeve and pull on the airline to remove from fitting.
- 1.2. Remove old cylinder from the threaded hole in the assembly mount.
- 1.3. Remove push pad and jam nut from old cylinder shaft and install on new cylinder shaft. Use blue Loc Tite (or similar) on threads.
- 1.4. Remove airline fitting from old cylinder end and install on new cylinder end.
- 1.5. Install new cylinder with push pads attached into threaded hole of mount. Make certain that all three push pads align vertically and engage surfaces of activator assembly and secondary push rod button equally.
- 1.6. If push rod cylinder assembly was removed. Place assembly on back plate, fitting slot in mount over key on back plate
 - 1.6.1. Insert two screws, lock washers, and flat washers through slotted holes in mount and loosely snug fasteners.
- 1.7. Make certain that actuator assembly is in release position (fully out towards rear of machine).
- 1.8. Slide push rod cylinder assembly towards rear of twister head until upper and lower push pads engage activator surface firmly.
- 1.9. Tighten attachment screws. Make certain that three push pads on cylinders engage surfaces of activator assembly and secondary push rod button (align vertically).

1.10. Install air lines into airline fittings. Push in firmly until resistance is felt. Pull out airline to engage locking mechanism.

2. Pivot Roller Air Cylinder

(Reference Figure 6.9.1.2. Note location of airlines on old cylinder so reinstallation is in correct manner on replacement cylinder. Connections are push lock type)

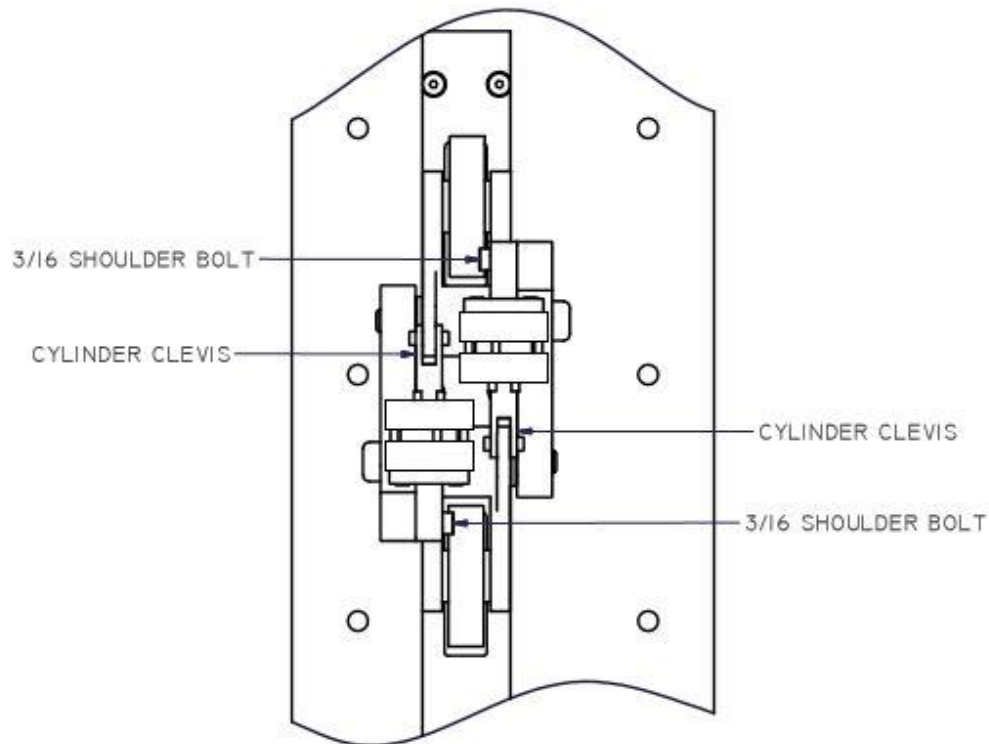


Figure 6.9.1.2 Pivot Roller Cylinder Assembly Diagram

- 1.1. Push in on plastic sleeve to release airline from fitting in cylinder. Remove airlines.
- 1.2. Remove clevis pin from clevis at attachment to arm of pressure roller body.
- 1.3. Remove shoulder bolt from pivot end of cylinder. Remove cylinder from feed plate.
- 1.4. Remove fittings from cylinder and install fittings on new cylinder.
- 1.5. Unscrew clevis from old cylinder shaft and install clevis on new cylinder.
- 1.6. Install cylinder making clevis pin connection and tightening shoulder bolt.
- 1.7. Install air lines into airline fittings. Push in firmly until resistance is felt. Pull out airline to engage locking mechanism.

3. Feed Ring Cylinder

(Reference Figure 6.9.1.3. Airline connections are push lock type)

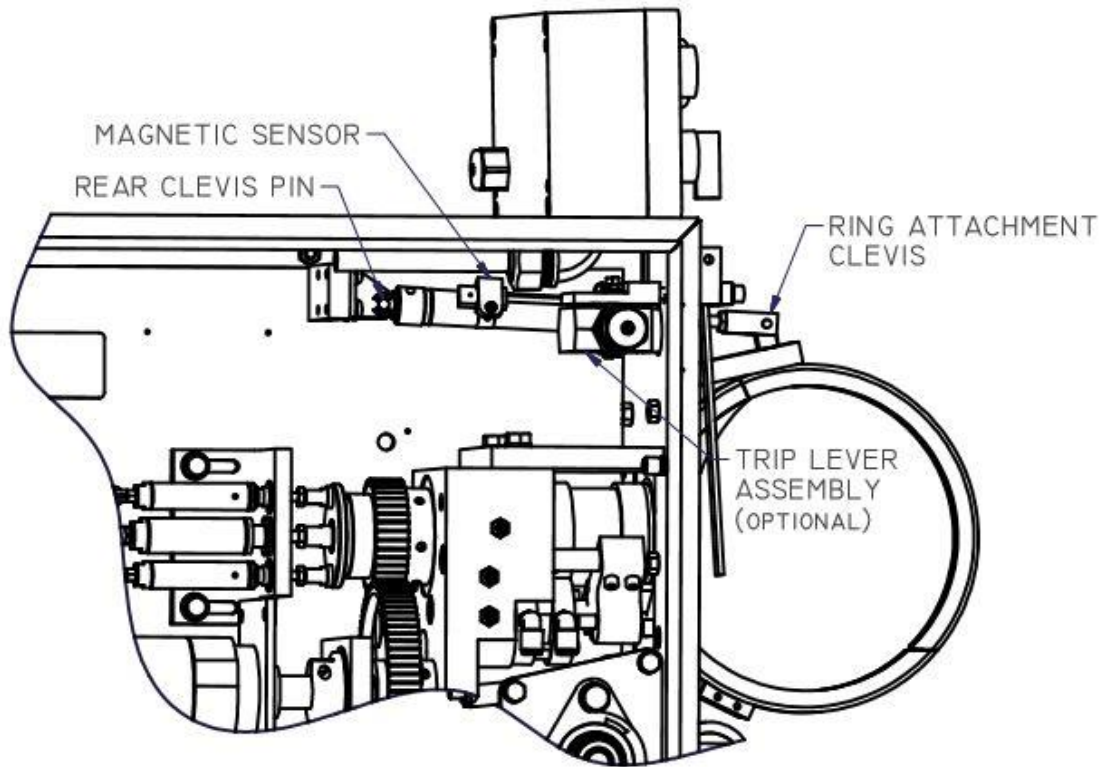


Figure 6.9.1.3 Feed Ring Cylinder Assembly Diagram

- 3.1. Disconnect air lines from airline fittings. Note or mark which airline connects with which fitting.
- 3.2. Remove clevis pin from cylinder clevis at feed ring attachment.
- 3.3. Remove clevis pin from rear pivot end of cylinder and remove cylinder.
- 3.4. Remove airline fittings and valves from old cylinder, install on new cylinder.
- 3.5. Use screwdriver to loosen clamp enough to remove magnetic switch from cylinder and install switch on new cylinder in approximately same location.
- 3.6. Loosen jam nut, remove cylinder shaft clevis, and jam nut then install clevis and jam nut on new cylinder shaft.
- 3.7. Install new cylinder, make clevis pin connections, and make air line connections.
- 3.8. Check that cylinder shaft travel allows feed ring to fully close when shaft extends.

NOTE: Refer to section 2.2 Setting Ring (pg. 14) to ensure the ring position is properly set to avoid unsuccessful feeding of tie and damage to feed ring during machine operation.

- 3.9. Power up machine and check magnetic switch. Refer to section 4.10 Magnetic Sensor for adjustment.

4. Cut Knife Cylinder

(Reference Figure 6.9.1.4. The internal assembly will need to be removed to gain access to screw heads attaching the cylinder to the twister head mounting block. Follow the procedure in section 6.3 Knife (pg. 39) to remove internal components)

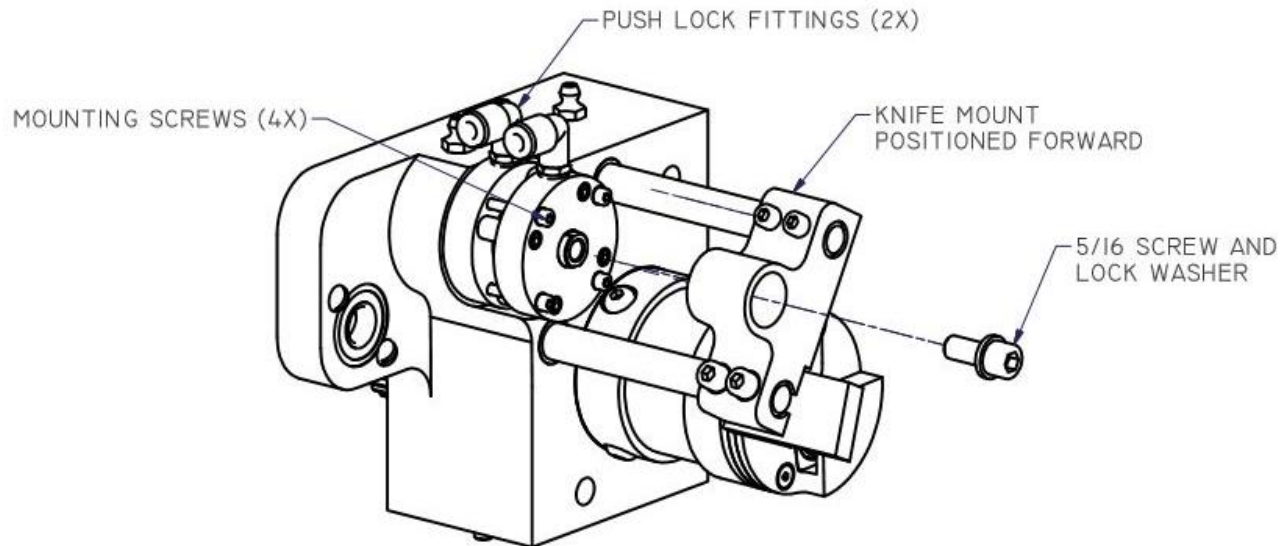


Figure 6.9.1.4 Knife Cylinder Diagram

- 4.1. Disconnect air lines from airline fittings. Note or mark which airline connects with which fitting.
- 4.2. Remove cap head screw and lock washer attaching knife mount to old cylinder shaft.
- 4.3. Slide knife mount away from cylinder shaft and slide knife guide shafts out of twister head block.
- 4.4. Remove four screws attaching cylinder body to twister head block.
- 4.5. Remove cylinder from assembly.
- 4.6. Remove airline fittings and install onto new cylinder body.
- 4.7. Install new cylinder onto twister head block with four screws.
- 4.8. Insert knife guide shafts into twister head block and slide knife mount against new cylinder shaft.
- 4.9. Replace cap head screw and lock washer securing knife mount to cylinder shaft.
- 4.10. Follow procedure in section 6.3 Knife (pg. 39) to replace internal components
- 4.11. Manually check knife cut, readjust anvil if necessary, before resuming machine operation. Refer to section 4.1 Cutting Adjustment (pg. 23).

5. Tie Stop Cylinder

(Reference Figure 6.9.1.5. Assembly at lower front inside cabinet. Airline connects are push lock type)

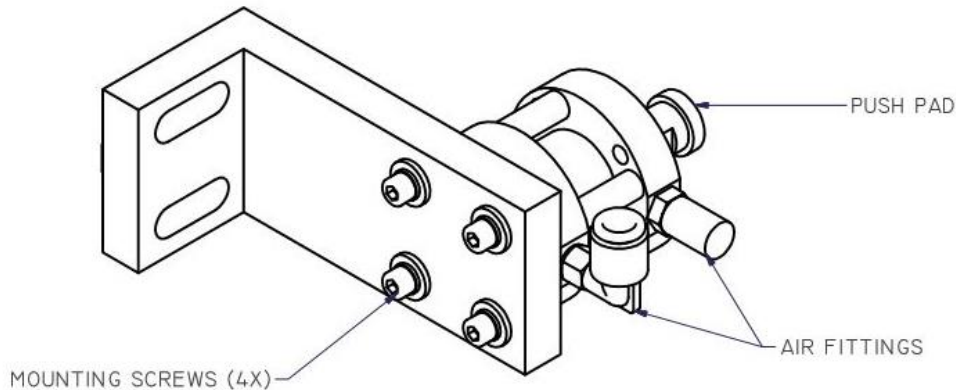


Figure 6.9.1.5 Tie Stop Assembly Diagram

- 1.6 Remove four screws attaching cylinder body to mounting bracket.
- 1.7 Remove cylinder body from bracket.
- 1.8 Remove air lines from airline fittings of cylinder. Remove airline fittings from old cylinder and install on new cylinder.
- 1.8. Install cylinder pad from old shaft onto new cylinder shaft. Install air lines into airline fittings. Push in firmly until resistance is felt. Pull out airline to engage locking mechanism.

6.10 Bodine Gear Motor

1. Ensure machine is disconnected from power and air.
2. Disconnect electrical leads inside terminal box of motor.
3. Loosen set screws on drive shaft couplings.
4. Move couplings and Hytrel spider to expose shaft ends.
5. Remove four screws attaching motor flange to back plate.
6. Lift motor out of cabinet.
7. Remove shaft coupling from motor shaft and install on new motor drive shaft.
8. Remove conduit elbow connection from terminal box and install on new motor.
9. Remove end cap with pipe plug from gear box and install on new motor.
10. Mount motor with screws through motor flange and supports into plate.
11. Align gear drive shaft with clutch input shaft before tightening mounting screws.
12. Move couplings and Hytrel spider together on shafts and tighten set screws.
13. Reconnect electrical leads to motor.

6.11 Feed Plate and Tie Guide

(Reference Figure 6.11.1. Feed plate should be removed when necessary to remove tie guide. Tie guide should only be removed if unable to externally clean it of debris)

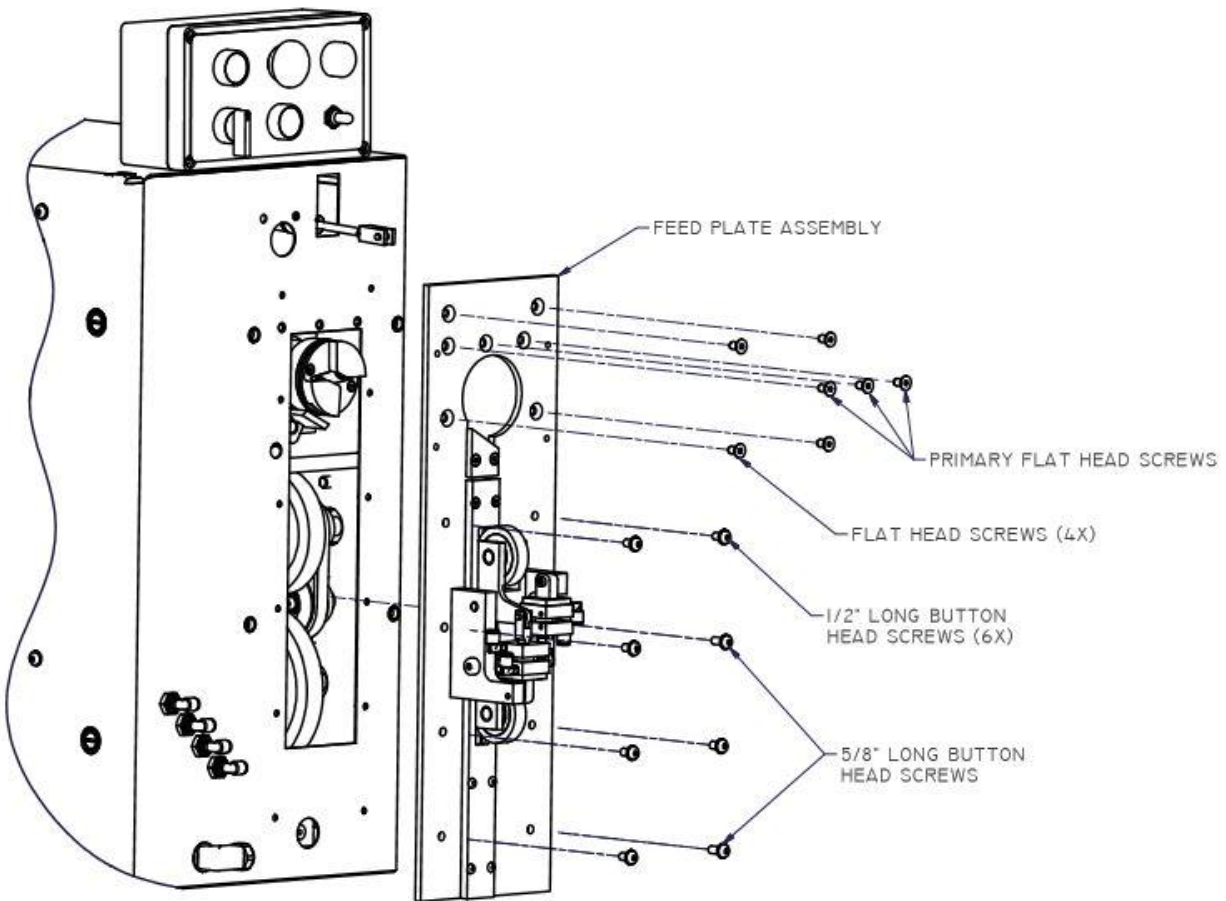


Figure 6.11.1 Feed Plate Assembly Diagram

- 1.1. Remove feed ring assembly. Refer section 6.1 Feed Ring (pg. 37).
- 1.2. Remove Trip Lever, if applicable.
- 1.3. Disconnect air lines from airline fittings. Note or mark which airline connects with which fitting. If the airlines get crossed during replacement, the cylinders will not function properly.
- 1.4. Remove the seven flat head screws at top of feed plate around twister head opening.
- 1.5. Remove the eight screws around lower perimeter of feed plate. Note that two of the eight screws are longer and need to be replaced in their original location.
- 1.6. **Tie Guide Removal:**
 - 1.6.1. Remove two screws from the back side of the feed plate which attach each pivot mount to the feed plate. Reference Figure 6.11.1.1.

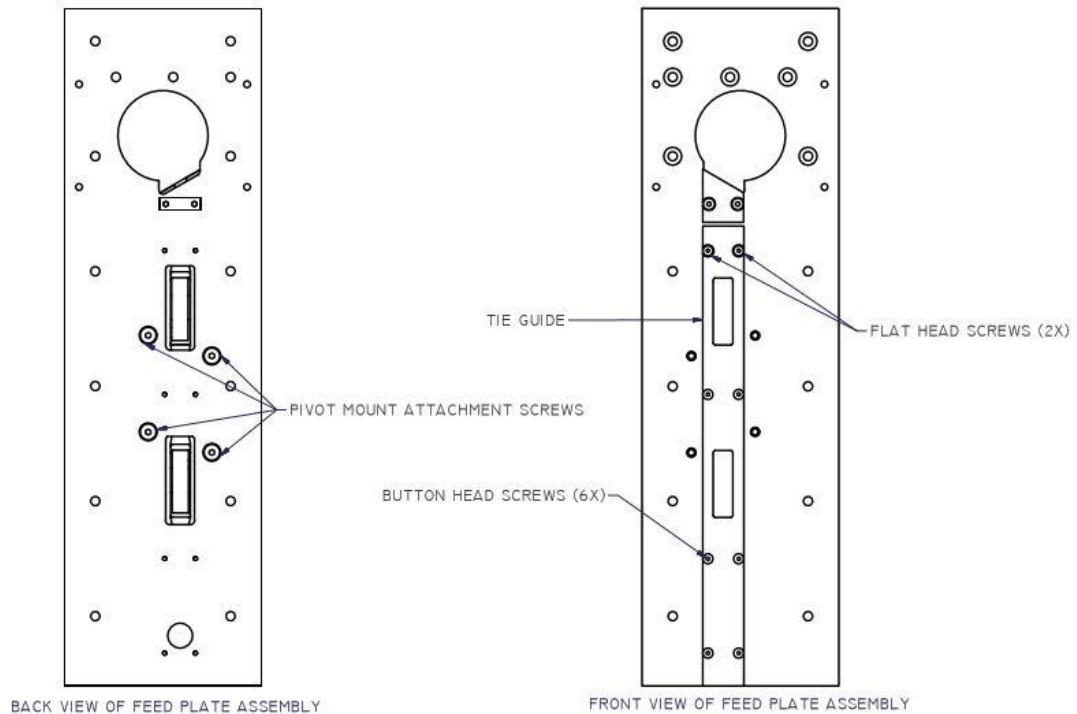


Figure 6.11.1.1 Back of Feed Plate Assembly

- 1.6.2. Remove the two mounts and two pivot roller assemblies as one unit.
- 1.6.3. Remove the six button head and two flat head screws which attach the tie guide to the feed plate.
- 1.6.4. Remove tie guide and clean it of debris.
- 1.6.5. Install tie guide to feed plate with attachment screws.
- 1.6.6. Install pivot roller assemblies and mounts to feed plate.
To install feed plate:
- 1.6.7. Install and snug the seven flat head screws at top of feed plate.
- 1.6.8. Install and snug eight screws around perimeter. Note the location of 5/8" length screws.
- 1.6.9. Tighten the three primary flat head screws, then the remaining four flat head screws, then tighten the eight perimeter screws. This order is necessary to maintain alignment of twister head with feed plate opening.
- 1.6.10. Install the feed ring assembly.
- 1.6.11. Install air lines into airline fittings. Push in firmly until resistance is felt. Pull out airline to engage locking mechanism.



7.0 Wiring Diagram

(Electrical Enclosure rated for 120/230 VAC)

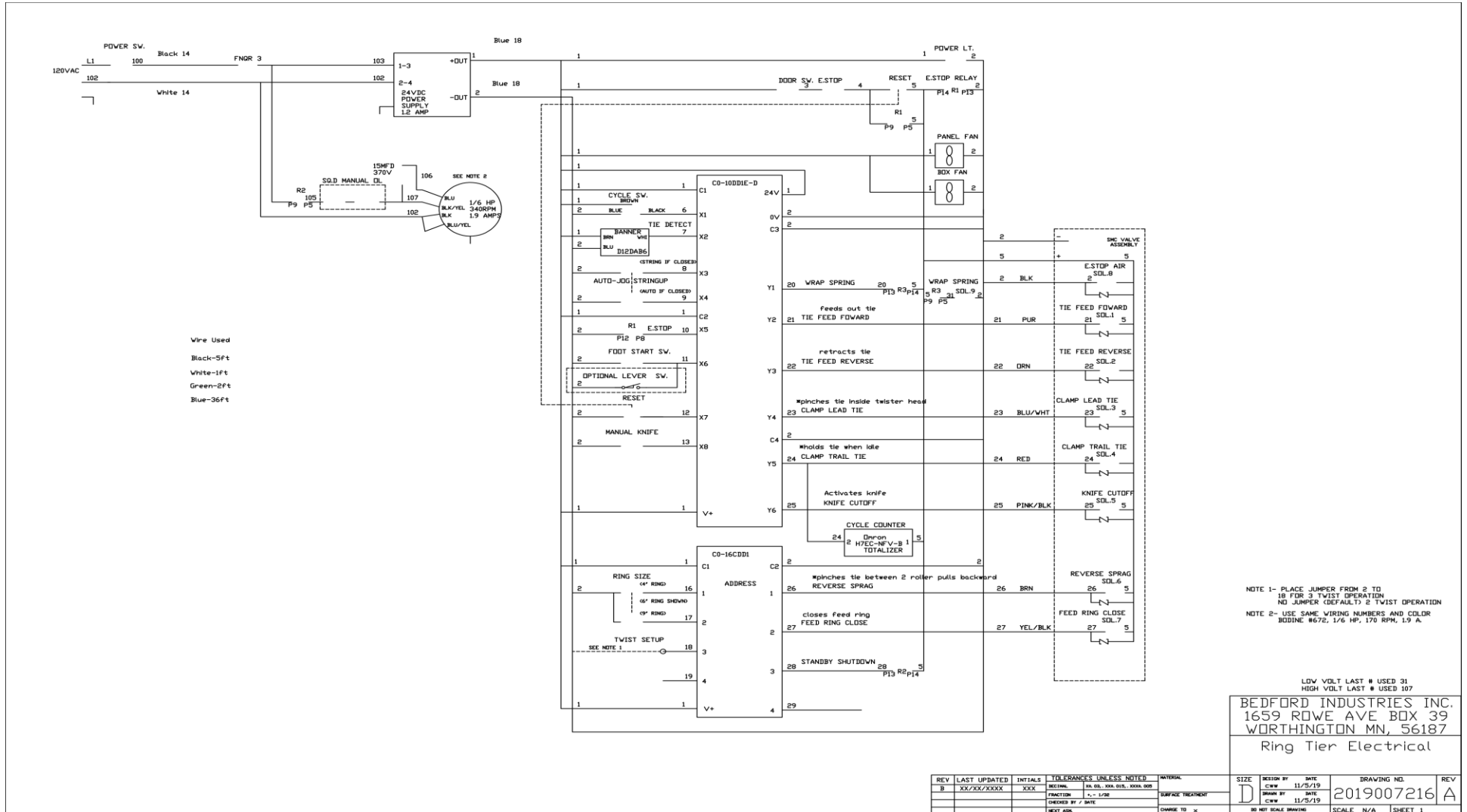


Figure 7.1 Electrical Drawing

8.0 Pneumatic Schematics

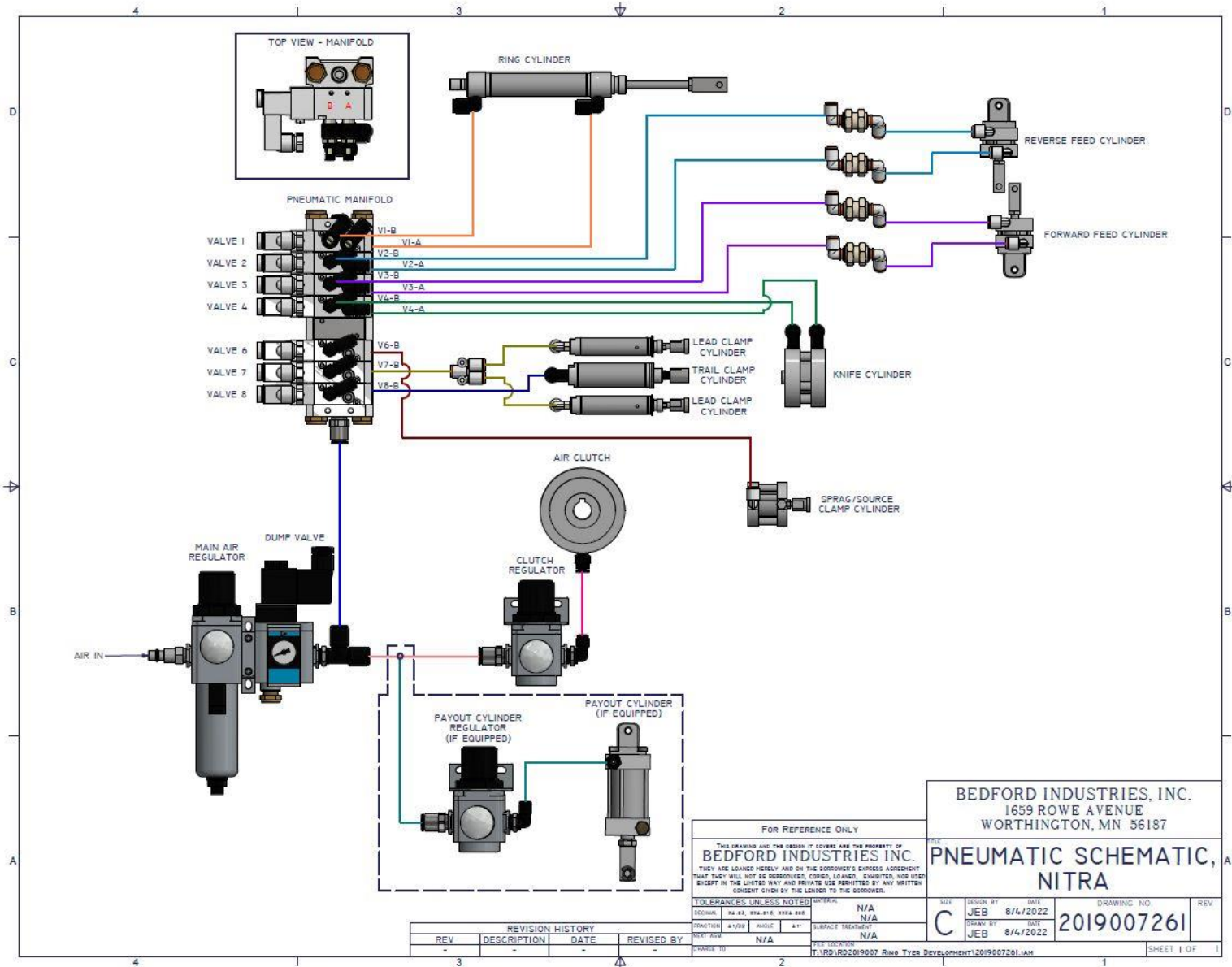


Figure 8.1 Pneumatic Schematic for Nitra Manifold

9.0 Drawings and Parts Lists

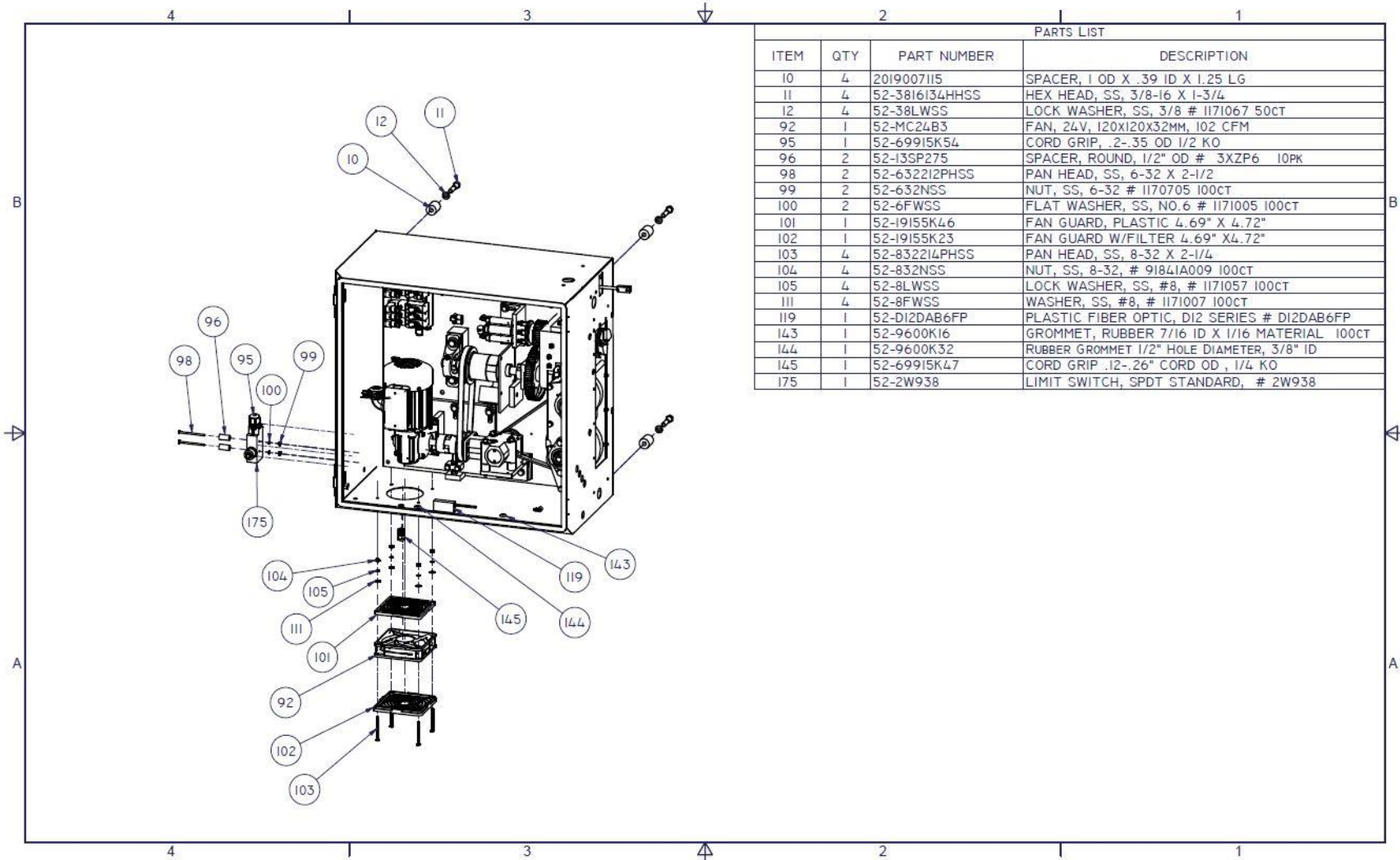


Figure 9.1 Drawing – Fan, Door Switch, and Back Plate Standoffs/Fasteners

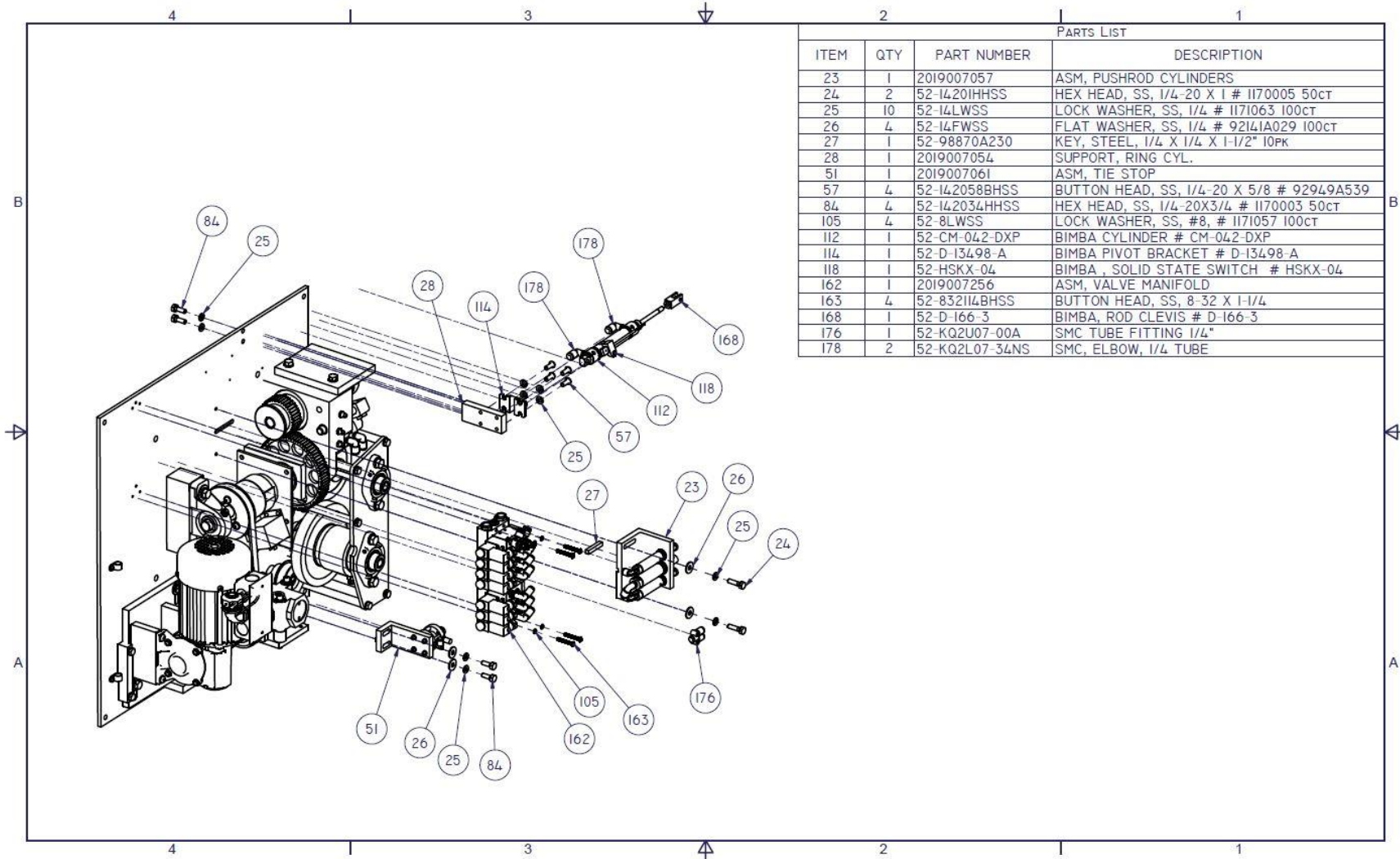


Figure 9.2 Drawing – Pneumatic Components

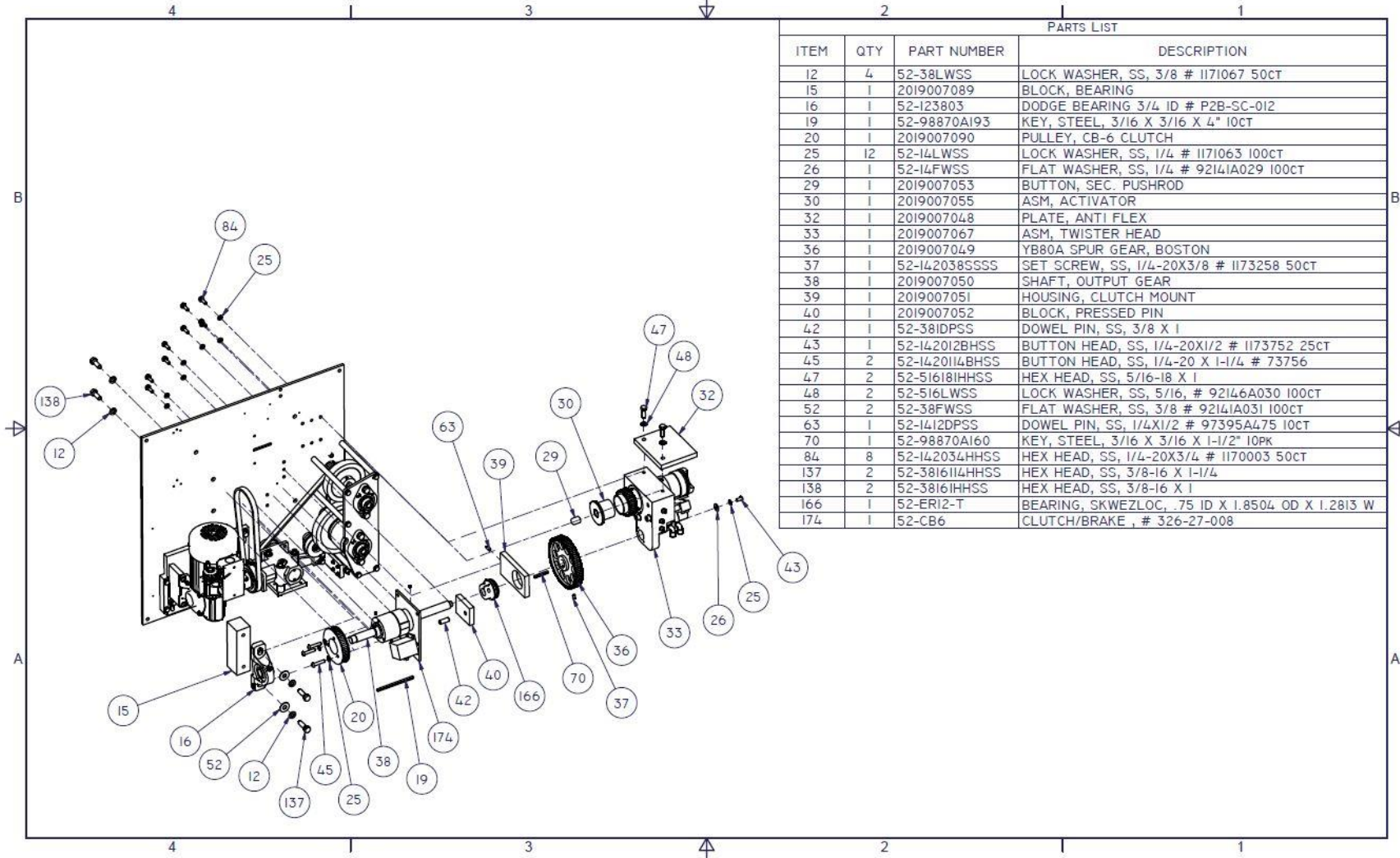


Figure 9.3 Drawing – Clutch/Twister Head Drive Assembly

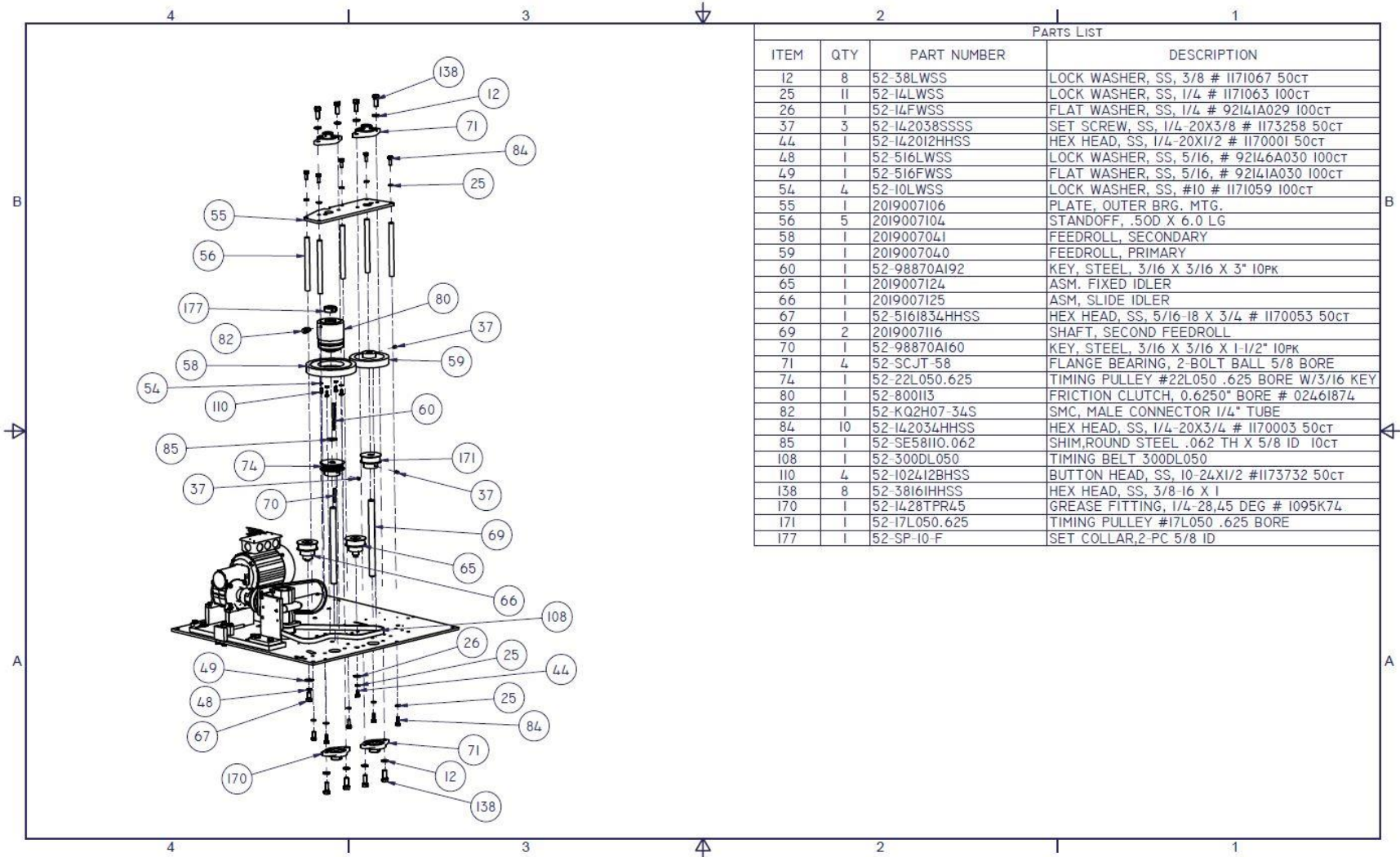


Figure 9.4 Drawing - Feed Rollers and Pulleys Assembly

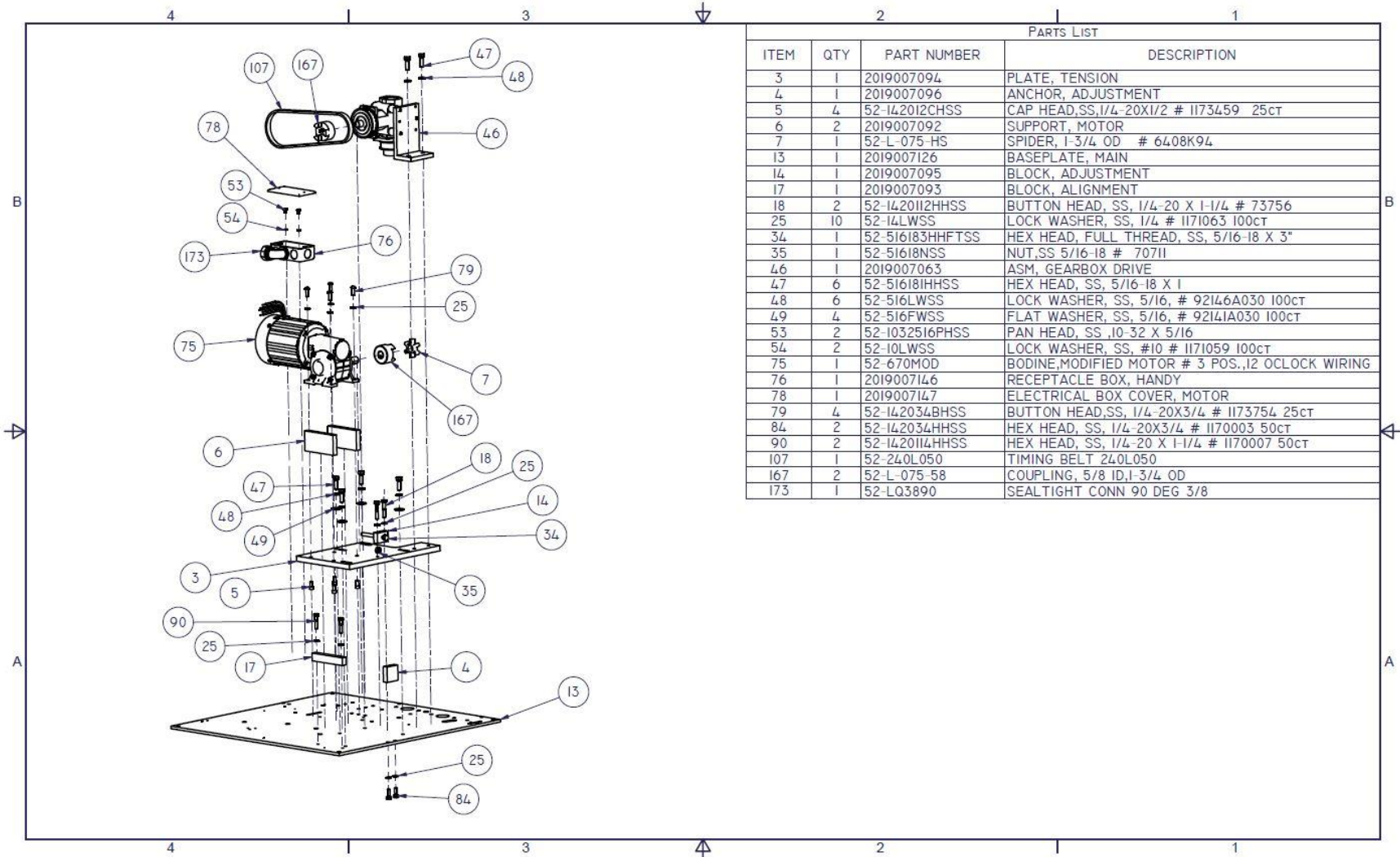


Figure 9.5 Drawing – Motor and Gearbox Assembly

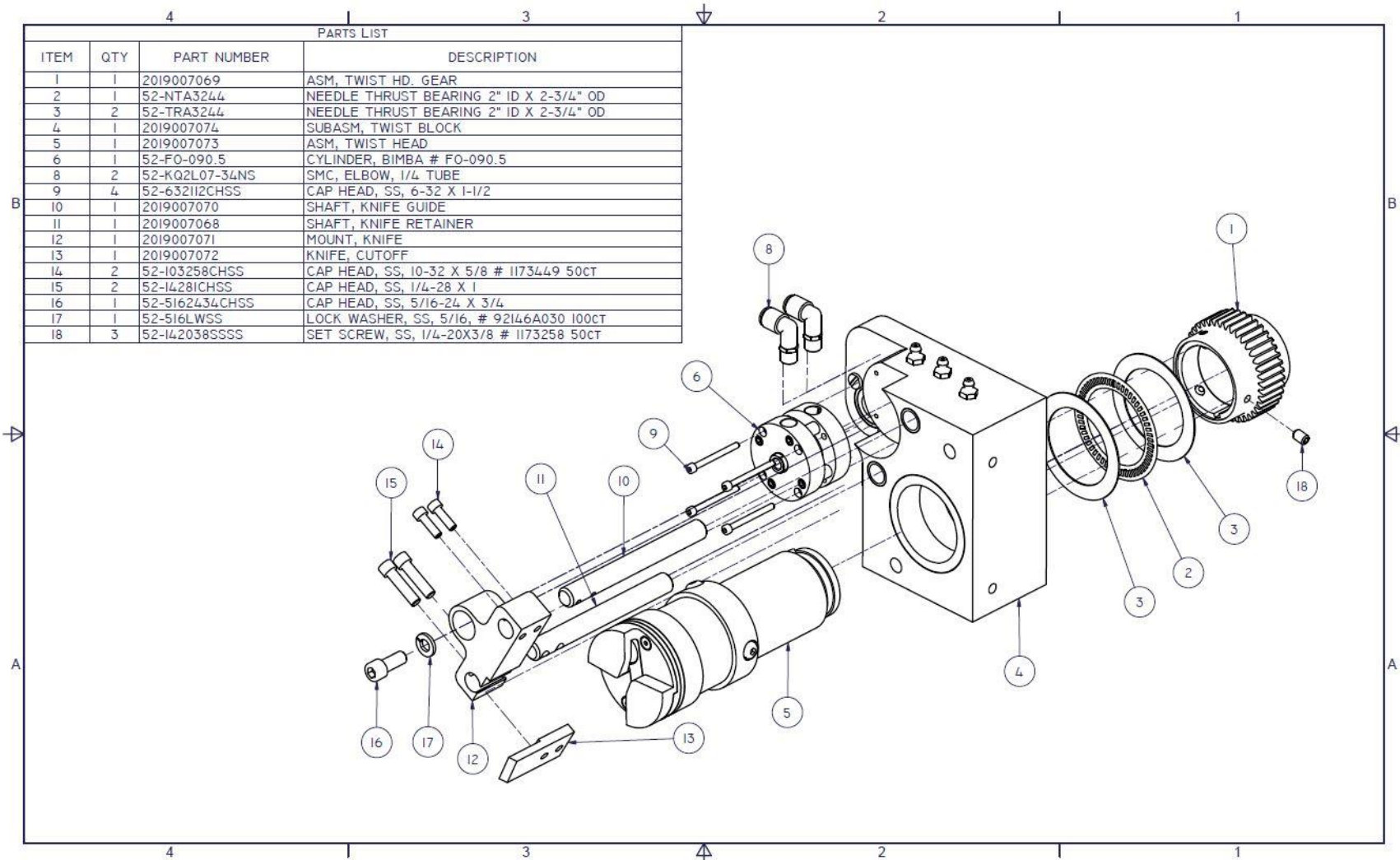


Figure 9.6 Drawing – Twister Head Assembly

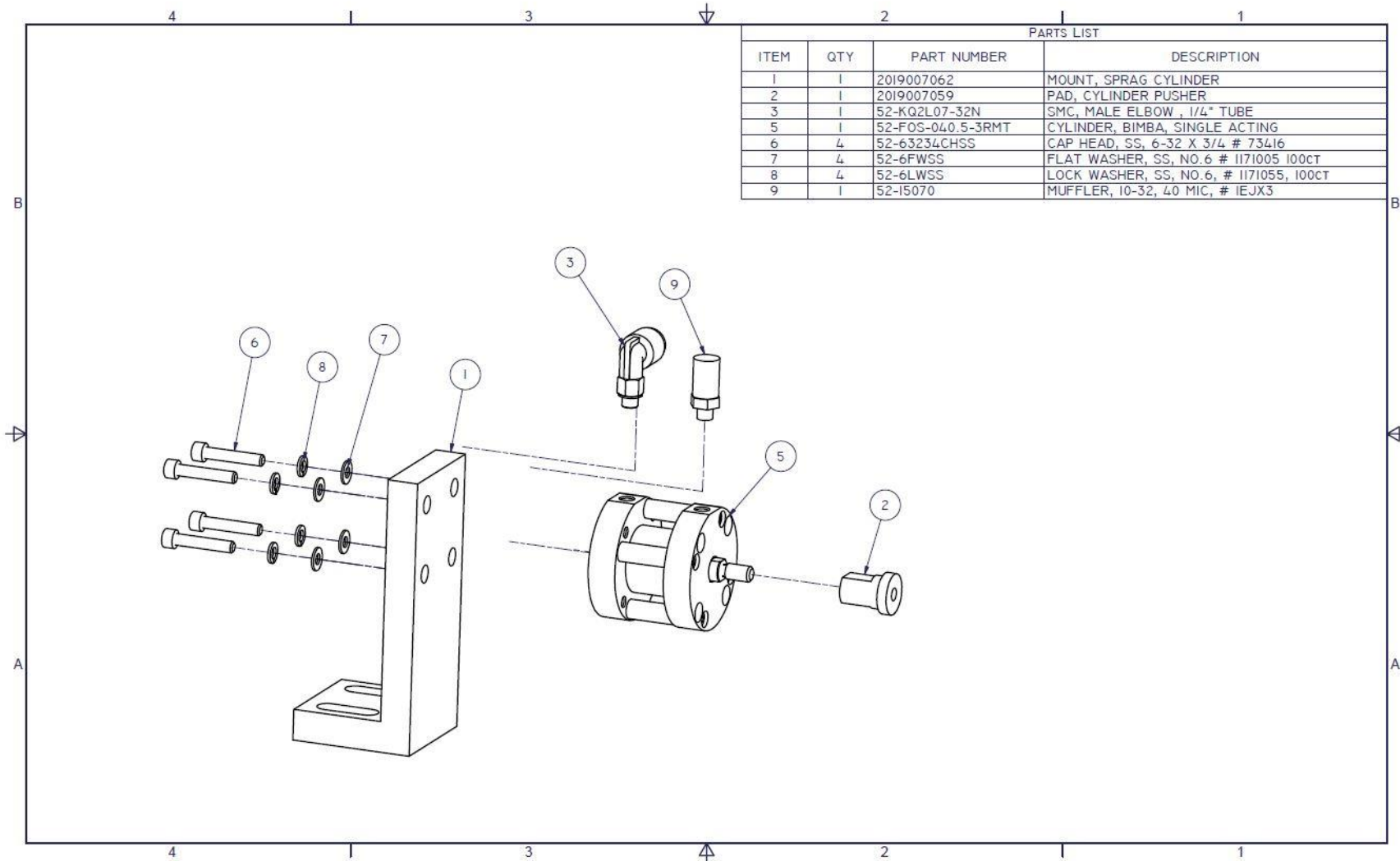


Figure 9.7 Drawing - Tie Stop Assembly

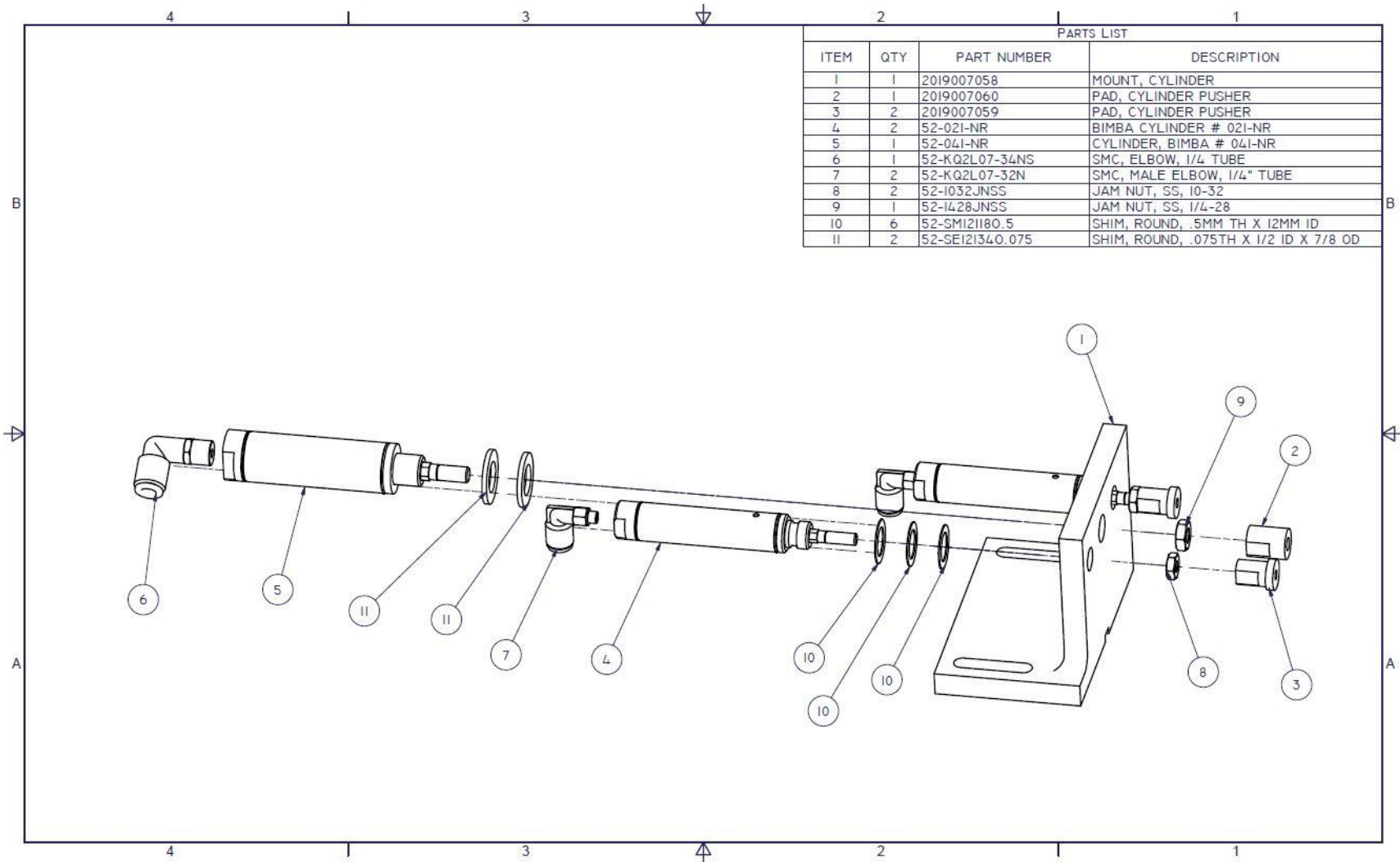


Figure 9.8 Drawing – Pushrod Cylinder Assembly

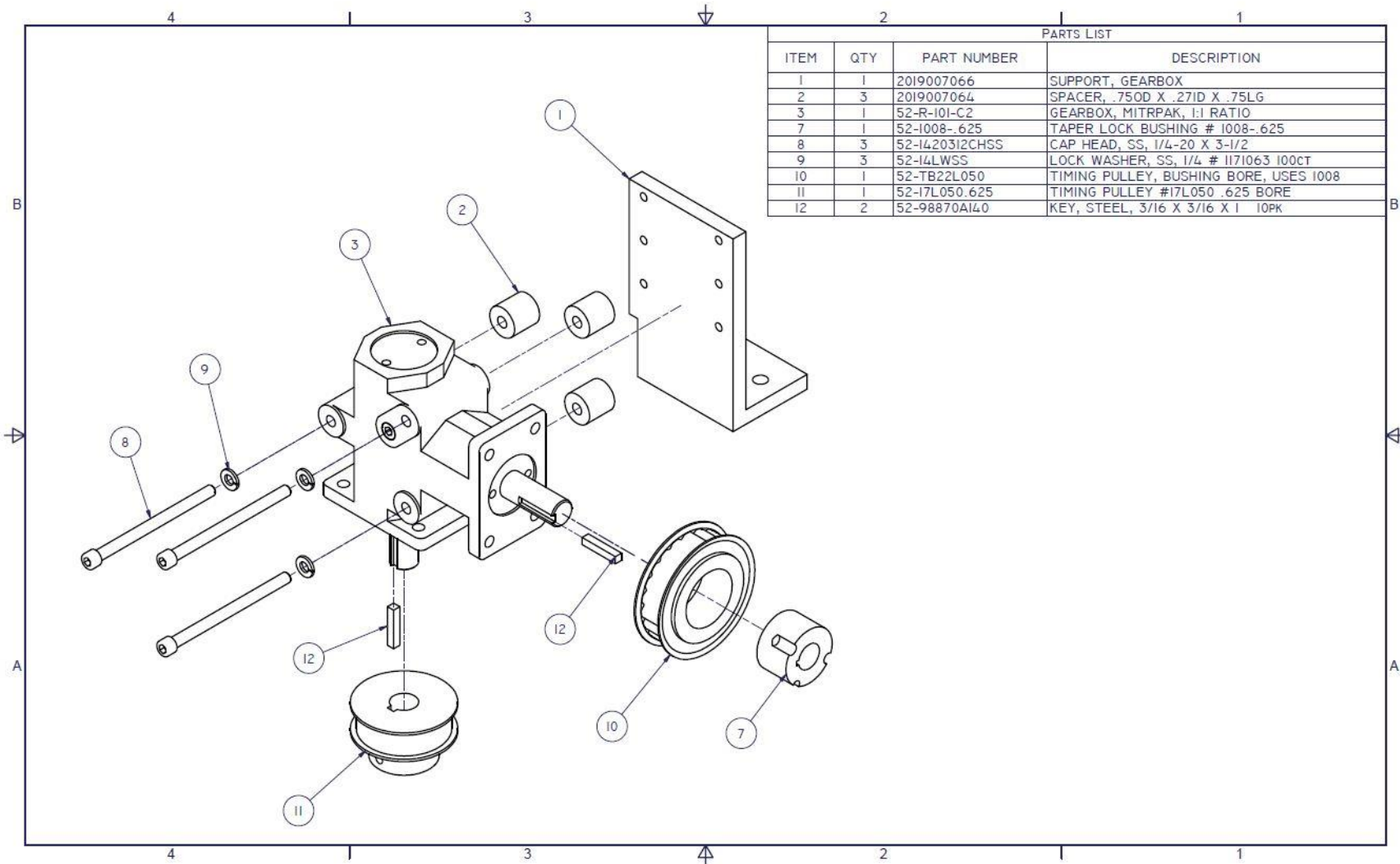


Figure 9.9 Drawing – Gearbox Assembly

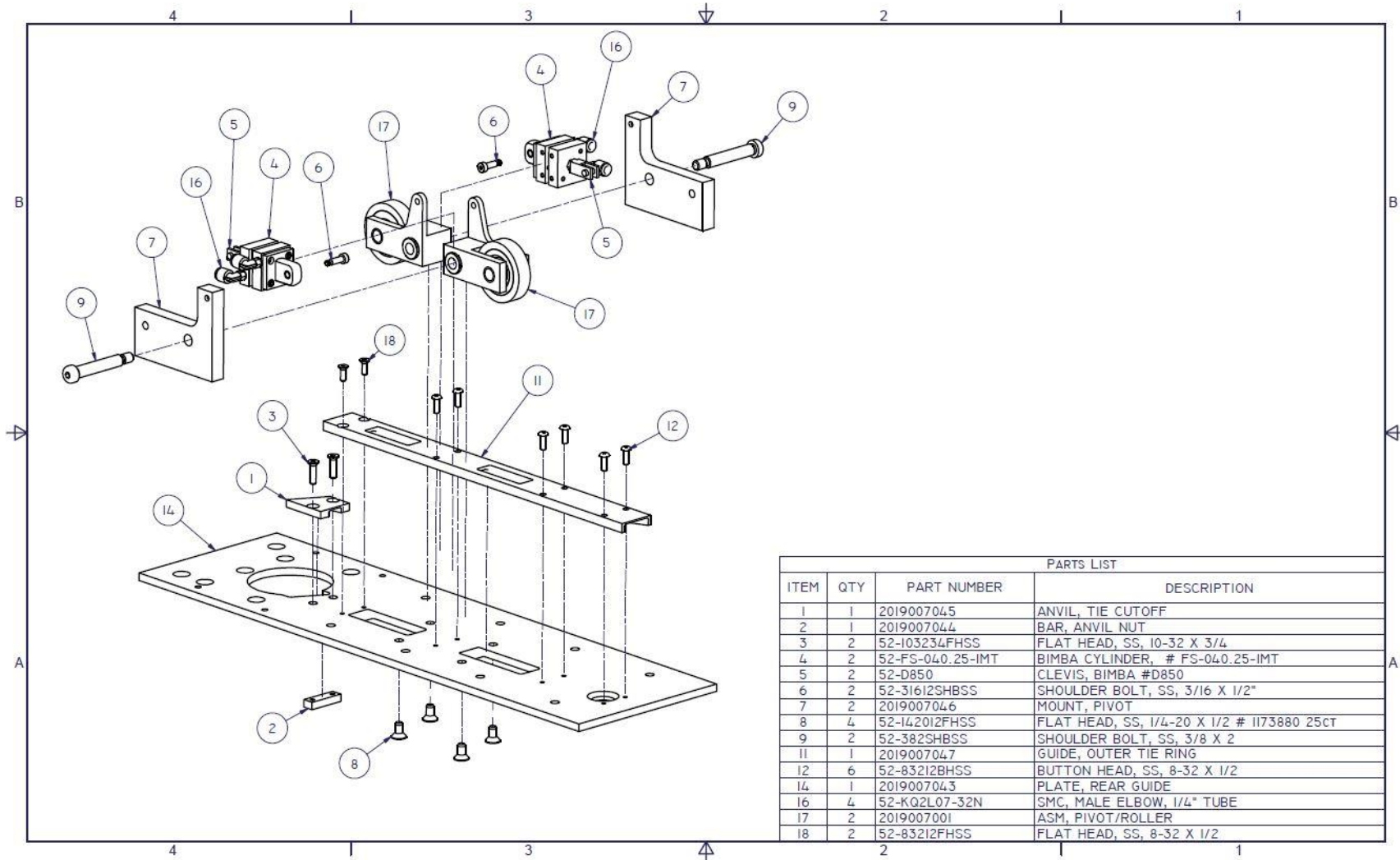


Figure 9.10 Drawing – Feed Plate Assembly

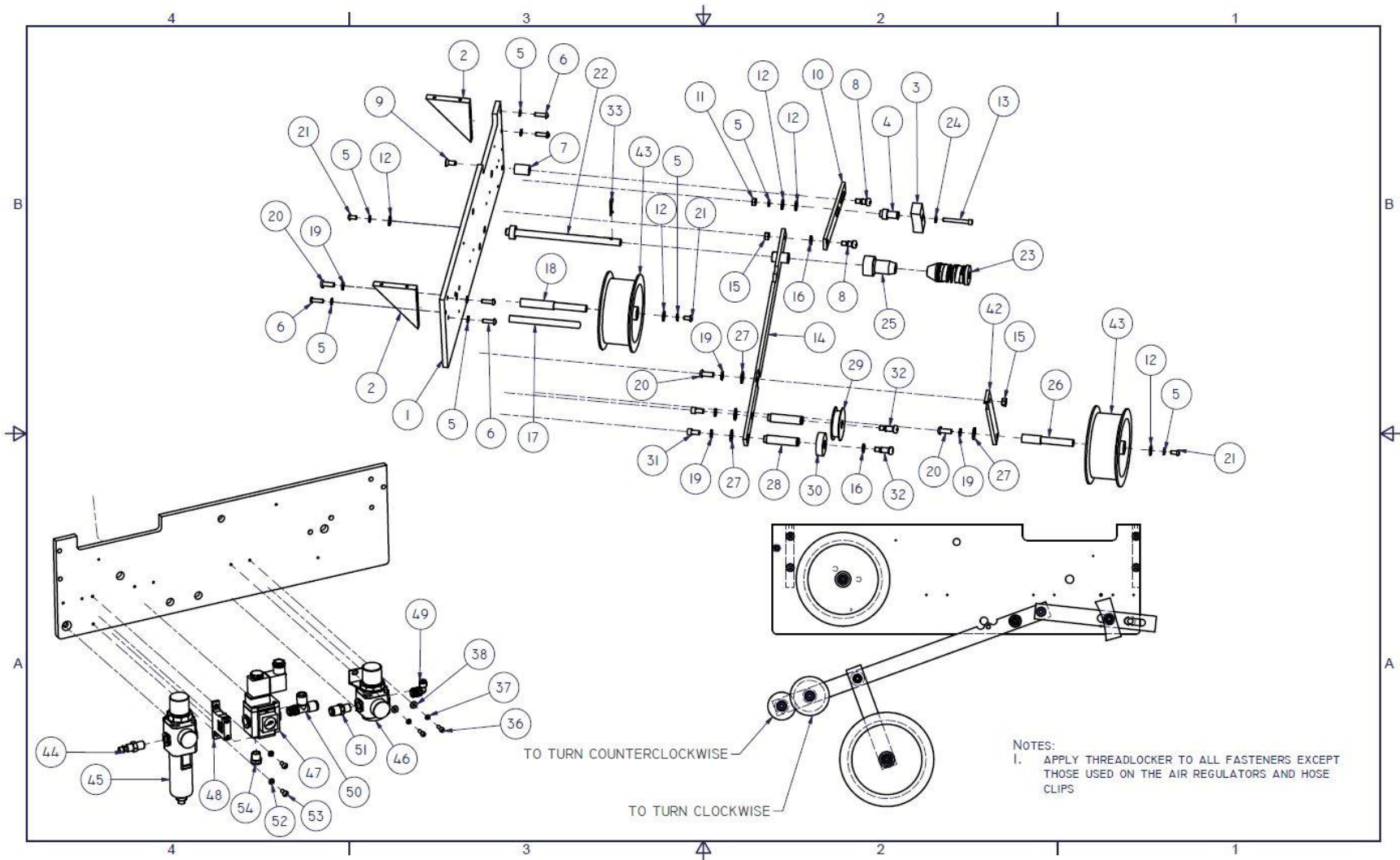


Figure 9.11.1 Drawing – Payout Assembly (HD Payout)



4				3		2		1	
				PARTS LIST					
ITEM	QTY	PART NUMBER	DESCRIPTION						
1	1	2019007011	SIDEPLATE, PAYOUT						
2	2	2019007012	BRACE - SIDEPLATE						
3	1	2019007013	PAD - SPOOL BRAKE						
4	1	2019007014	PIN - PAD PIVOT						
5	9	52-14LWSS	LOCK WASHER, SS, 1/4 # 1171063 100ct						
6	5	52-142078BHSS	BUTTON HEAD,SS, 1/4-20 X 7/8						
7	1	2019007033	STANDOFF, 0.750D X 1.125LG 5/16-18						
8	2	52-3838SHBSS	SHOULDER BOLT , SS , 3/8 X 3/8						
9	1	52-5161834FHSS	FLAT HEAD, SS , 5/16-18 X 3/4						
10	1	2019007236	ARM PAYOUT BRAKE, HD						
11	1	52-1420NSS	NUT, SS , 1/4-20 # 1170710 100ct						
12	5	52-14FWSS	FLAT WASHER, SS, 1/4 # 92141A029 100ct						
13	1	52-14202CHSS	CAP HEAD,SS, 1/4-20 X 2 # 73466						
14	1	2019007234	ASM-DANCER ARM, HD						
15	2	52-51618NSS	NUT,SS 5/16-18 # 70711						
16	2	52-FW375093	WASHER,MIL SPEC, 3/8 SCREW, # 92150A131						
17	1	2019007015	GUIDE - ROD TIE						
18	1	2019007019	SHAFT-STATIONARY ROLLER						
19	5	52-516LWSS	LOCK WASHER, SS, 5/16, # 92146A030 100ct						
20	3	52-5161878BHSS	BUTTON HEAD, SS , 5/16-18 X 7/8						
21	3	52-142012BHSS	BUTTON HEAD, SS, 1/4-20X1/2 # 1173752 25ct						
22	1	2019007036	ASM, SHAFT PAYOUT						
23	1	2019007026	ASM, OUTER SPOOL LOCK						
24	1	52-6100-50	RETAINING RING,EXT.1/2" OD # 97633A200 100ct						
25	1	2019007021	CONE-INNER PILOT						
26	1	2019007024	SHAFT-DANCER ROLLER						
27	4	52-516FWSS	FLAT WASHER, SS, 5/16, # 92141A030 100ct						
28	2	2019007020	STUD-FULLY MTG						
29	1	2019007022	ASM, GUIDE ROLLER						
30	1	2019007037	ASM, ROLLER PRESSURE						
31	2	52-5161858CHSS	CAP HEAD, SS , 5/16-18 X 5/8						
32	2	52-3858SHBSS	SHOULDER BOLT , SS, 3/8 X 5/8						
33	1	52-98335A054	HAIRPIN, 5/16-3/8", .078 WIRE DIA						
36	2	52-83212CHSS	CAP HEAD, SS , 8-32 X 1/2						
37	2	52-8LWSS	LOCK WASHER, SS, #8, # 1171057 100ct						
38	2	52-8FWSS	WASHER, SS, #8, # 1171007 100ct						
42	1	2019007237	DANCER EXTENSION ARM						
43	2	2019007238	ROLLER, PAYOUT HD						
44	1	52-6534K46	COUPLER 6534K46						
45	1	52- AFR2-2233	FILTER REGULATOR 20-130 PSI 1/4 NPT						
46	1	52-AR2-223	REGULATOR, 1/4" IN AND OUT 7-130PSI						
47	1	52-ASD-22-24D	PNEUMATIC SOFT START RELIEF VALVE						
48	1	52-AB-2T	T-BRACKET FOR AX-2 SERIES						
49	1	52-5779K152	PUSH TO CONNECT ELBOW 1/4" TUBE 1/4" NPT						
50	1	52-5779K212	FITTING, TEE 3/8 TUBE X 1/4 NPT						
51	1	52-5779K116	FITTING 3/8 TUBE X 1/4 NPT						
52	2	52-10LWSS	LOCK WASHER, SS, #10 # 1171059 100ct						
53	2	52-102412BHSS	BUTTON HEAD, SS, 10-24X1/2 #1173732 50ct						
54	1	52-SBF-14N	EXHAUST SILENCER 14 NPT						

Figure 9.11.2 Parts List – Payout Assembly (HD Payout)

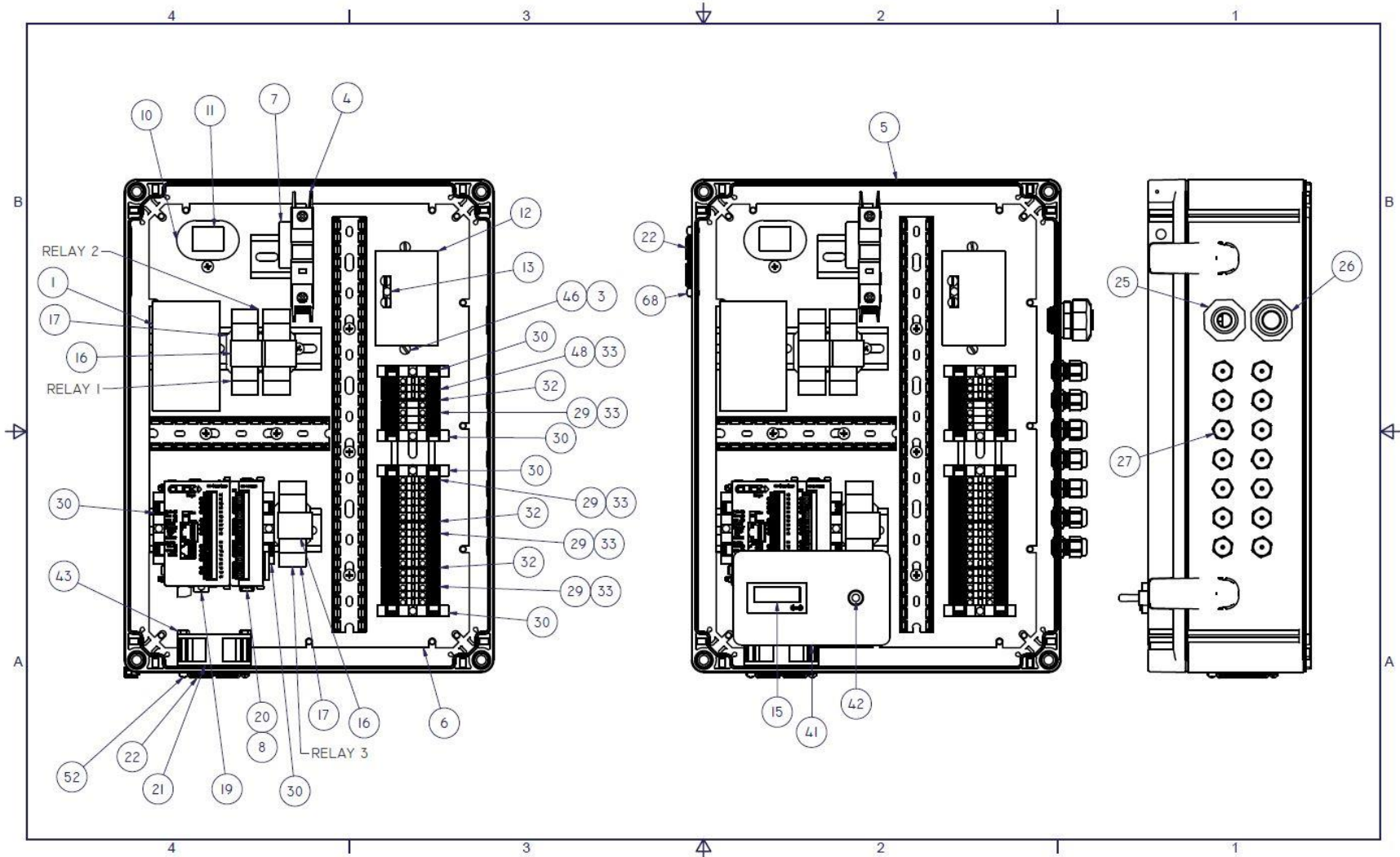


Figure 9.12.1 Drawing – Electrical Cabinet Assembly

		PARTS LIST	
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	52-ELC-PS02	POWER SUPPLY,AC-DC;24V;2A;100-240V
3	4	52-93NI009	SPACER ROUND,PVC, 6.35x25.4 # 93NI009
4	1	52-EHMIDIU-12	FUSE HOLDER 30A 12/PK 600V-IPOLE 12PK
5	1	2019007259	CABINET, CONTROL
6	1	2019007107	PANEL, CONTROL CABINET
7	1	52-FNQR3	FUSE CARTRIDGE 3A 600VAC # 6F116
8	1	52-PII7-ND	BATTERY,LITHIUM,3V, CR2354 # PII7-ND
10	1	52-2MDV9	MOTOR RUN CAPACITOR, 15 MIC,370VAC # 2MDV9
11	1	52-2MEVI	MOUNTING KIT FOR CAPACITOR W/BOOT # 2MEVI
12	1	52-IH392	TOGGLE MANUAL MOTOR STARTER,16A-AC
13	1	52-5B644	THERMAL UNIT,1.80-1.95 FULL LOAD AMPS
15	1	52-H7ECNFVB	PANEL METER,COUNTER, 8 DIG
16	3	52-RH2BUL24VDC	RELAY,IDEC 2 POLE 10 AMP 24VDC
17	3	52-SH2B-05	BASE,IDEC 2 POLE 10 AMP
19	1	52-C0-I0DDIE-D	CLICK ETHERNET BASIC PLC 24VDC
20	1	52-C0-I6CDDI	CLICK DISCRTETE COMBO MODULE 8-POINT 24VDC
21	1	52-OD6020-24HB	FAN AXIAL 60X20MM 24VDC WIRE
22	2	52-I9I55K122	FAN GUARD,SS, 2.36"
25	1	52-LQ38	CONNECTOR, 3/8" STRAIGHT RAC-3401
26	1	52-LQ50	CONNECTOR, 1/2" STRAIGHT RAC-3402
27	14	52-69915K47	CORD GRIP .12-.26" CORD OD , 1/4 KO
29	21	52-DN-T10-A	SNGL LEVEL TERMINAL BLOCK 24-10 AWG GRAY,30A,600V, 100CT
30	6	52-DN-EB35	END BRACKET, #DN-EB35 AUTOMATION DIRECT 50ct
32	3	52-DN-EC1210	END COVER #DN-EC1210 FOR MINI TERMINALS 100ct
33	20	52-DN24J4Y	JUMPER 24-POLE 5 CT BAG # DN-24J4Y , 120PK
41	1	2019007178	LABEL, RING SIZE SWITCH
42	1	52-2FC53-73-TABS	SWITCH TOGGLE SPDT 15A 125V
43	4	52-632NSS	NUT, SS, 6-32 # 1170705 100ct
46	4	52-832214PHSS	PAN HEAD, SS, 8-32 X 2-1/4
48	3	52-DN-T10GRN-A	TERM BLK GRN 30A 24-10AWG 600V , 100ct
52	4	52-632114PHSS	PAN HEAD, SS, 6-32 X 1-1/4
68	4	52-63214PHSS	PAN HEAD, SS, 6-32 X 1/4

Figure 9.12.2 Parts List – Electrical Cabinet Assembly

Wrap Spring Clutches & Brakes CB & Super CB Series

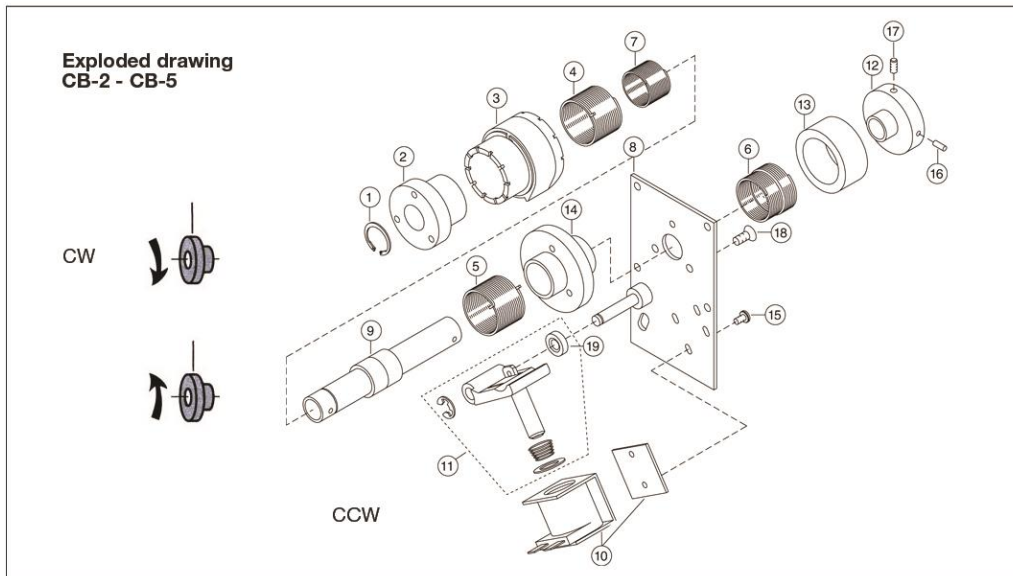
Service Manual

P-2026-WE
SM592-gb-02/08



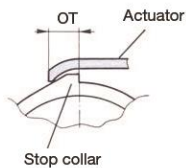
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2	Assembly instructions CB-6 - CB-10	4-5	3.2	Actuator setting	6
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Overtravel **OT**

CB-2: 2,3 - 4,8 mm
 CB-4: 4,8 - 7,8 mm
 CB-5: 3,8 - 6,3 mm



1	Circlip	10	Coil assembly
2	Input hub	11	Actuator assembly
3	Control collar	12	Anti-backup hub
4	Clutch spring	13	Dust cover
5	Brake spring	14	Brake hub
6	Anti-backup spring	15	Screw
7	Anti-overnun spring	16	Spring pin
8	Mounting plate	17	Set screw
9	Shaft assembly	18	Screw

1 **Assembly instructions CB-2 - CB-5**

CB-Products are shipped as complete and pre-set units. Disassembly and assembly is only needed if modifications or repair work is required.

The exploded drawing shows a CB-5 unit. The principle also applies to the CB-2 and CB-4 units.

1.1 DISASSEMBLY

1. Brake engaged, input hub (2) freely rotatable, remove circlip (1).
2. Remove input hub (2) by rotating in the drive direction (remove anti-overrun spring (7), if present).
3. Remove control collar (3), by extracting towards the control tang of clutch spring (4).
4. Remove springs (clutch and brake).
5. If necessary remove anti-backup spring (6), (13), (16). To remove the spring pin (16), special tools are required.

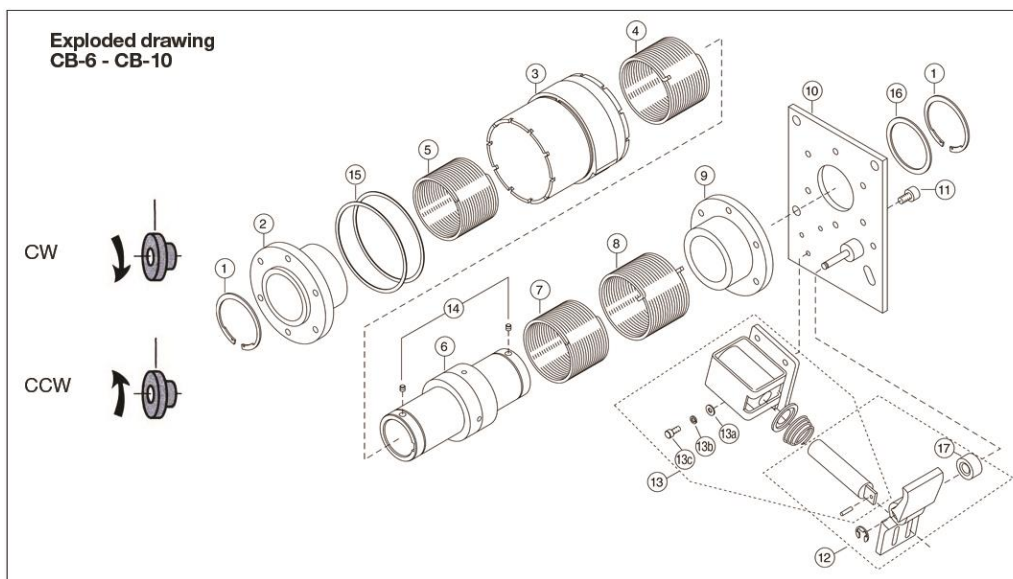
1.2 REMOVAL OF ANTI-OVERRUN SPRING (7)

All CB units are normally equipped with an anti-overrun spring (7). If the anti-overrun is not required, e.g. the input hub (2) must be able to rotate in both directions, execute the following :

1. Mark the spring tang location on control collar (3).
2. Fully wrap down the brake spring (output in stop position).
3. Remove circlip (1) and input hub (2).
4. Remove the anti-overrun spring (7).
5. Assemble the input hub (2) with circlip (1).
6. Check the overtravel specification (OT).

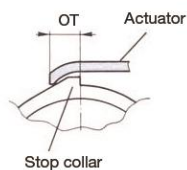
1.3 ASSEMBLY

1. Assemble anti-backup spring (6), dust cover (13) and anti-backup hub (12) (if required).
2. Assemble brake spring (5) and clutch spring (4) on sleeve (9) (output tangs - clutch, brake - in the sleeve).
3. Assemble control collar (3) over clutch spring (4), by extending control tang of the clutch spring by using long nose pliers (put pliers into collar (3) first).
4. The control tang of the brake spring (5) is located in one of the nine slots of the control collar. The control tang of the clutch spring (4) - slightly precharged - lies in one of the ten slots.
5. Rotate output into STOP position. Assemble input hub (2) (not secured).
6. Differential setting of clutch/brake (overtravel OT). Actuator is in contact with stop of control collar (3) Rotate output into STOP position. Pull backwards input hub (2), remove control tang of clutch spring (4) out of slot of control collar. Open clutch spring (4), to obtain distance OT. Push spring and input hub (2) back again. Lift actuator, the control collar (3) should overtravel distance OT. If OT is not reached. put control tang of brake spring(5) in another of the nine slots and repeat procedure until OT is reached.
7. Assemble circlip (1) at input hub (2).
8. If anti-overrun is required : rotate output into STOP position. Remove circlip (1) and input hub (2). Screw carefully anti-overrun spring (7) into output hub. Assemble input hub (2) by rotating in the drive direction. Assemble circlip (1).
9. Check actuator setting (11).



Overtravel OT

CB-6: 4,8 - 9,4 mm
 CB-7: 9,4 - 12,7 mm
 CB-8: 9,4 - 12,7 mm
 CB-10: 15,7 - 19,0 mm



1	Circlip	11	Screw
2	Input hub	12	Actuator assembly
3	Control collar	13	Solenoid assembly
4	Clutch spring	13a	Washer
5	Anti-overrun spring	13b	Lockwasher
6	Shaft assembly	13c	Cap screw
7	Anti-backup spring	14	Cap screw
8	Brake spring	15	Lockwasher
9	Brake hub	16	Set screw
10	Mounting plate	17	Spacer

2 Assembly instructions CB-6 - CB-10

CB-Products are shipped as complete and pre-set units. Disassembly and assembly is only needed if modifications or repair work is required.

The exploded drawing shows a CB-8 unit. The principle also applies to the CB-6 and CB-10 units.

2.1 DISASSEMBLY

1. Brake engaged, input hub (2) freely rotatable, remove circlip (1).
2. Remove input hub (2) by rotating in the drive direction (remove anti-overrun spring (5), if present).
3. Control collar (3), released (actuator not in contact with STOP). Remove circlip (1) at mounting plate (10).
4. Remove output sleeve (6) by rotating in the drive direction.
5. Remove anti-backup spring (7). DO NOT disassemble brake hub (9).
6. Remove control collar (3) by extracting towards the control tang of the brake spring (8).
7. Remove springs (clutch and brake).

2.2 REMOVAL OF ANTI-OVERRUN SPRING (5)

All CB units are normally equipped with an anti-overrun spring (5). If the anti-overrun is not required, e.g. the input hub (2) must be able to rotate in both directions. execute the following :

1. Mark the spring tang location on control collar (3).
2. Fully wrap down the brake spring (output in stop position).
3. Remove circlip (1) and input hub (2).
4. Remove the anti-overrun spring (5).
5. Assemble the input hub (2) with circlip (1).
6. Check the overtravel specification (OT).

2.3 ASSEMBLY

1. Assemble brake spring (8), and clutch spring (4) on sleeve (6) (output tangs - clutch, brake - in the sleeve).
2. Assemble control collar (3) over brake spring (8), by extending control tang of the brake spring by using long nose pliers (put pliers into collar (3) first).
3. The control tang of the brake spring (8) is located in one of the nine slots of the control collar. The control tang of the clutch spring (4) - slightly precharged - lies in one of the ten slots.
4. Assemble anti-backup spring (7) into output hub.
5. Assemble preassembled sleeve (6) into mounting plate (10) with brake hub (9) by rotating in the drive direction and assemble circlip (1) at mounting plate (10).
6. Rotate output into STOP position. Assemble input hub (2) (not secured).
7. Differential setting of clutch/brake (overtravel OT). Actuator is in contact with stop of control collar (3)
Rotate output into STOP position. Pull backwards input hub (2), remove control tang of clutch spring (4) out of slot of control collar. Open clutch spring (4), to obtain distance OT. Push spring and input hub (2) back again. Lift actuator, the control collar (3) should overtravel distance OT. If OT is not reached, put control tang of brake spring (8) in another of the nine slots and repeat procedure until OT is reached.

8. Assemble circlip (1) at input hub (2).
9. If anti-overrun is required : rotate output into STOP position. Remove circlip (1) and input hub (2). Screw carefully anti-overrun spring (5) into output hub. Assemble input hub (2) by rotating in the direction of operation. Assemble circlip (1).
10. Check actuator setting (12)

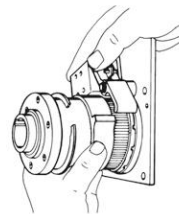
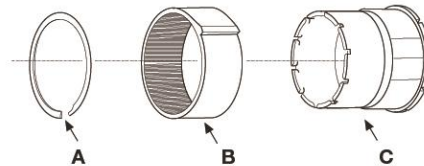
3 SERVICE INFORMATION

3.1 ADJUSTMENT OF THE CONTROL COLLAR

1. Work retaining ring (A) out of groove and slide forward on sleeve (C).
2. Slide stop collar (B) off splines, rotate to desired stop position and slide back on splines. The actuator pawl will have to be held clear during this operation.
3. Slide retaining ring back (A) into groove.

Note : make sure brake is locked up before proceeding to ensure proper stop position.

Smallest adjustable angle:
 CB-2 : 2,8° CB-6 : 1,8° CB-10 : 1,5°
 CB-4 : 2,4° CB-7 : 1,6°
 CB-5 : 1,8° CB-8 : 1,6°



3.2 ACTUATOR SETTING

1. Loosen the solenoid adapter plate such that the solenoid can be easily repositioned
2. If the clutch is equipped with an actuator limit stop, loosen it and move it out of the way.
3. Energize the solenoid.
4. Align the cam face and actuator tip as shown in Figure 1.
5. Push the collar as indicated by the arrow in Figure 1 to take up the free collar play.
6. Check to ensure that the plunger is properly seated.
7. Using a shim between the actuator tip and cam face, set the collar actuator clearance between 0,25 and 0,76 mm by repositioning the solenoid assembly.
8. Tighten the solenoid adapter plate screws.
9. De-energize the solenoid and repeat steps 2 through 5 if necessary.
10. If equipped with an actuator limit stop, re-energize the coil and set the limit stop as follows:
DC Coils :
 Set the limit stop so it just contacts the actuator.
AC Coils :
 Set the actuator-limit stop clearance of 0,12 and 0,50 mm at the closest point.

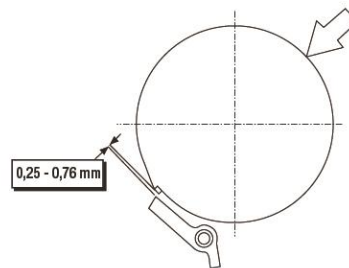


Figure 1

4 LUBRICATION

All standard clutches and clutch brakes are manufactured from sintered metal components, which have been impregnated with bearing infusion oil for permanent lubrication. In cases where there is severe duty or the environment is such that oil may “wickout” or foreign materials have got into the unit, the unit may be re-oiled or flushed out with minimal or no disassembly by using Shell Bearing infusion Oil 33.

If disassembly of the unit is necessary, follow the detailed disassembly instructions to the point needed, flush and wipe parts in the oil to be used for re-lubrication. **DO NOT USE SOLVENT** to clean sintered metal parts. To get more cleaning action from the oil, it may be heated while cleaning the components. Parts must be brought back to ambient temperature by submerging in cool oil.

Warranty

Warner Electric LLC warrants that it will repair or replace (whichever it deems advisable) any product manufactured and sold by it which proves to be defective in material or workmanship within a period of one (1) year from the date of original purchase for consumer, commercial or industrial use.

This warranty extends only to the original purchaser and is not transferable or assignable without Warner Electric LLC's prior consent.

Warranty service can be obtained in the U.S.A. by returning any defective product, transportation charges prepaid, to the appropriate Warner Electric LLC factory. Additional warranty information may be obtained by writing the Customer Satisfaction Department, Warner Electric LLC, 449 Gardner Street, South Beloit, Illinois 61080, or by calling 815-389-3771.

A purchase receipt or other proof of original purchase will be required before warranty service is rendered. If found defective under the terms of this warranty, repair or replacement will be made, without charge, together with a refund for transportation costs. If found not to be defective, you will be notified and, with your consent, the item will be repaired or replaced and returned to you at your expense.

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Warner Electric Europe
7 rue Champfleu, B.P. 20095, St Barthelemy d'Anjou - France
+33 (0)2 41 21 24 24 • Fax: +33 (0)2 41 21 24 70
www.warnerelectric.com



BW Clutch or Brake
Sheave, Pilot and Coupling Mount






FORM NO. L-20002-V-0414

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900

www.nexengroup.com

	<p style="text-align: center;"> DANGER</p> <p>Read this manual carefully before installation and operation. Follow Nexen's instructions and integrate this unit into your system with care. This unit should be installed, operated and maintained by qualified personnel ONLY. Improper installation can damage your system, cause injury or death. Comply with all applicable codes.</p>	
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This document is the original, non-translated, version.

Conformity Declaration: In accordance with Appendix II B of CE Machinery Directive (2006/42/EC):

A Declaration of Incorporation of Partly Completed Machinery evaluation for the applicable EU directives was carried out for this product in accordance with the Machinery Directive. The declaration of incorporation is set out in writing in a separate document and can be requested if required.

This machinery is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the applicable provisions of the Directive.

Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, Minnesota 55127

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FORM NO. L-20002-V-0414

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GENERAL SPECIFICATIONS


Specifications:	
Torque	Up to 11.3 Nm (100 in-lbs)
Actuation Pressure	1 - 5.5 bar (14.5 - 80 psi)
Service Temperature	4.5 - 104 C (40 - 220 F)
Approximate Weight	Up to 1.8 kg (4 lbs)

GENERAL SAFETY PRECAUTIONS




CAUTION

Use appropriate guarding for moving components. Failure to guard could result in serious bodily injury.




WARNING

Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 "Occupational Safety and Health Hazards."



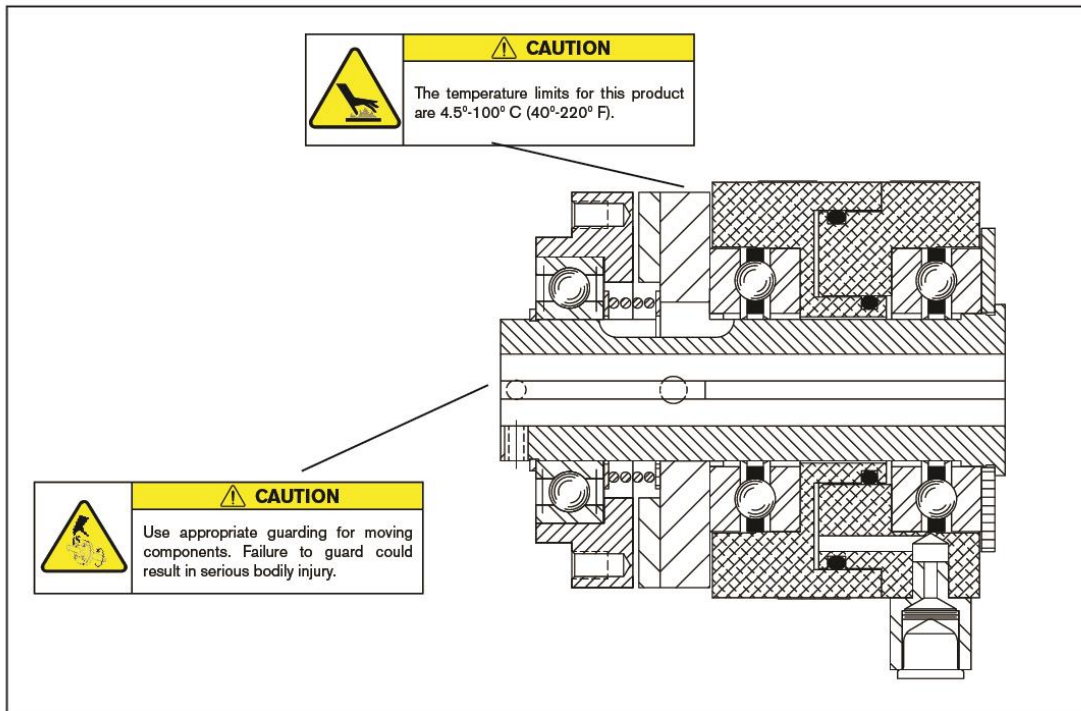
CAUTION

Watch for sharp features when interacting with this product. The parts have complex shapes and machined edges.



WARNING

This product is capable of emitting a spark if misused, therefore is not recommended for use in any explosive environment.



CAUTION

The temperature limits for this product are 4.5°-100° C (40°-220° F).

CAUTION

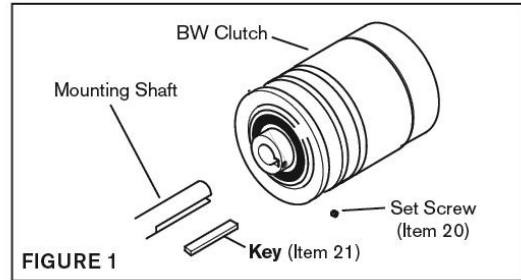
Use appropriate guarding for moving components. Failure to guard could result in serious bodily injury.

INSTALLATION

SHEAVE AND PILOT MOUNTING

REFER TO FIGURE 1.

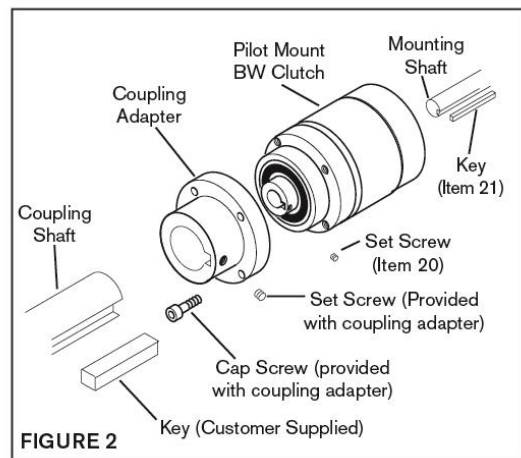
1. Insert the Key (Item 21) into the keyway of the mounting shaft.
2. Slide the BW Clutch onto the mounting shaft until the Key (Item 21) is seated in the BW Clutch.
3. Insert and tighten the two Set Screws (Item 20).



COUPLING MOUNTING

REFER TO FIGURE 2.

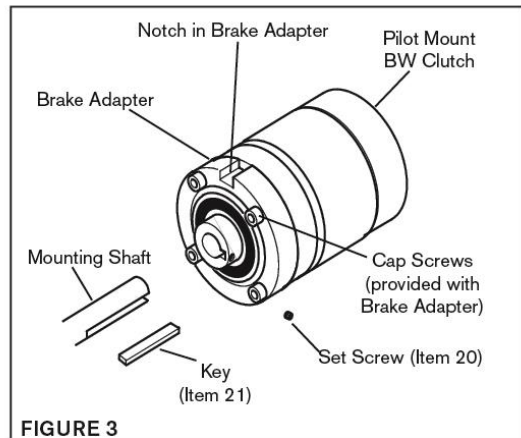
1. Insert the Key (Item 21) into the keyway of the mounting shaft.
2. Slide the Pilot Mount BW Clutch onto the mounting shaft until the Key (Item 21) is seated in the Pilot Mount BW Clutch.
3. Insert and tighten the two Set Screws (Item 20).
4. Insert the customer supplied key into the coupling shaft.
5. Slide the Coupling Adapter onto the coupling shaft.
6. Using the Cap Screws provided with the Coupling Adapter, secure the Coupling Adapter to the Pilot Mount BW Clutch.
7. Insert and tighten the Set Screws provided with the Coupling Adapter.



BRAKE MOUNTING

REFER TO FIGURE 3.

1. Using the Cap Screws provided with the Brake Adapter, secure the Brake Adapter to the Pilot Mount BW Clutch.
2. Insert the Key (Item 21) into the keyway of the mounting shaft.
3. Slide the Pilot Mount BW Clutch with the Brake Adapter onto the mounting shaft and Key.
4. Align the notch in the Brake Adapter with a torque pin or stop on the machine.
5. Insert and tighten the two Set Screws (Item 20).



LUBRICATION

NOTE

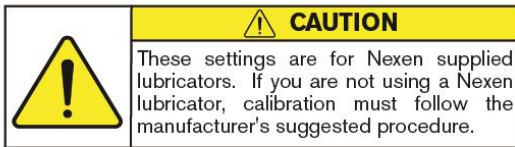
Nexen pneumatically actuated devices require clean, pressure regulated air for maximum performance and life. All seals in Nexen Pneumatically operated devices are lubricated for life and do not require additional lubrication.

However, some customers prefer to use an air line lubricator, which injects oil into the pressurized air, forcing an oil mist into the air chamber. This is acceptable, but care must be taken to ensure once an air mist lubrication system is used, it is continually used over the life of the product as the oil mist may wash free the factory installed lubrication.

Locate the lubricator above and within ten feet of the product, and use low viscosity oil such as SAE-10.

Synthetic lubricants are not recommended.

Nexen product's bearings are shielded and pre-lubricated, and require no further lubrication.



LUBRICATOR DRIP RATE SETTINGS

1. Close and disconnect the air line from the unit.
2. Turn the Lubricator Adjustment Knob counterclockwise three complete turns.
3. Open the air line.
4. Close the air line to the unit when a drop of oil forms in the Lubricator Sight Gage.
5. Connect the air line to the unit.
6. Turn the Lubricator Adjustment Knob clockwise until closed.
7. Turn the Lubricator Adjustment Knob counterclockwise one-third turn.
8. Open the air line to the unit.

AIR CONNECTIONS

A 1/8 NPT female Air Inlet Fitting (Item 18) is provided in the Piston (Item 13) for the air line connection. The Air Hose Assembly (Item 19) must be used so that no side forces are introduced to the air chamber-piston assembly.

Bearing drag on the hose during operation may be relieved by securing the hose to a support.

All Nexen pneumatically actuated devices require clean and dry air, which meets or exceeds ISO 8573.1:2001 Class 4.4.3 quality.

NOTE

For quick response, Nexen recommends a quick exhaust valve and short air lines between the Control Valves and the unit. Align the air inlet ports to a down position to allow condensation to drain out of the air chambers of the product.



CAUTION

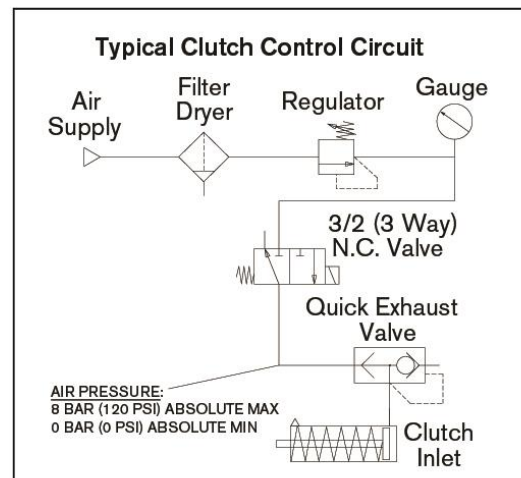
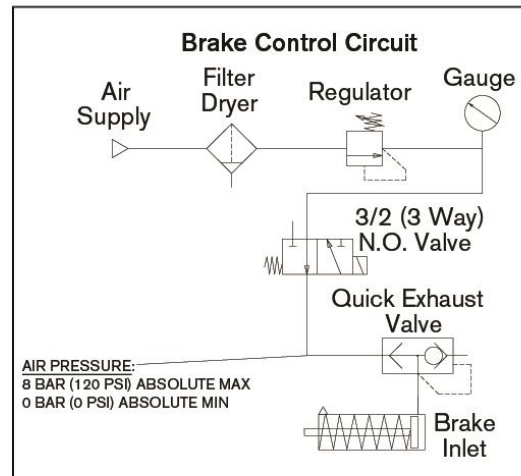
Low air pressure will cause slippage and overheating. Excessive air pressure will cause abrupt starts and stops, reducing product life.



CAUTION

The use of rigid pipe or tubing when connected directly to the BW Clutch will prevent proper actuation of the BW Clutch.

The following is a common air supply scheme used with this product. This is an example and not an all-inclusive list. All air circuits to be used with this product must be designed following ISO-4414 guidelines.




OPERATION




WARNING

Never exceed maximum operating speeds listed for your product (See Table 1).




CAUTION

The temperature limits for this product line are 4.5° - 100° C (40°-220° F).



WARNING

Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 "Occupational Safety and Health Hazards."



CAUTION

Never exceed life of facing material. Facing life depends on the volume of material and the total energy over the life of the unit. Expected life (in hrs) can be found by:

$$\text{Time} = \frac{\text{Volume}}{(\text{Power} \cdot \text{Wear Rate})}$$

TABLE 1

Size	Max RPM
BW	3,600

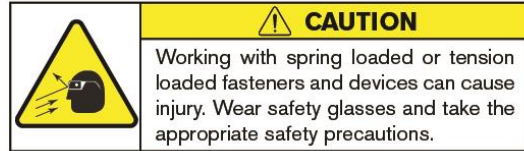
TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	SOLUTION
Failure to engage	Air not getting to the clutch due to a control valve malfunction or low air pressure.	Check control valve and air pressure setting.
	Defective O-ring Seals causing air leaks.	Replace O-ring Seals.
	Lack of lubrication on the Hub spline or in the air chamber.	Lubricate the Hub spline with a thin film of Never Seez® or check air line lubricator settings.
	Rigid pipe or tubing for air line connections.	Use flexible pipe or tubing for all air line connections.
Failure to disengage	Friction lock due to a lack of lubrication on the Hub spline or in the air chamber.	Lubricate the Hub spline with a thin film of Never Seez® or check air line lubricator settings.
	Broken Return Spring	Install a new Return Spring.
	Unexhausted air due to a control valve malfunction.	Check or replace control valve.
Excessive drag on the air line	Defective Bearings	Replace Bearings.
	Air line is not properly supported.	Rest the air line against a support that is parallel to the center line of the clutch.

PARTS REPLACEMENT

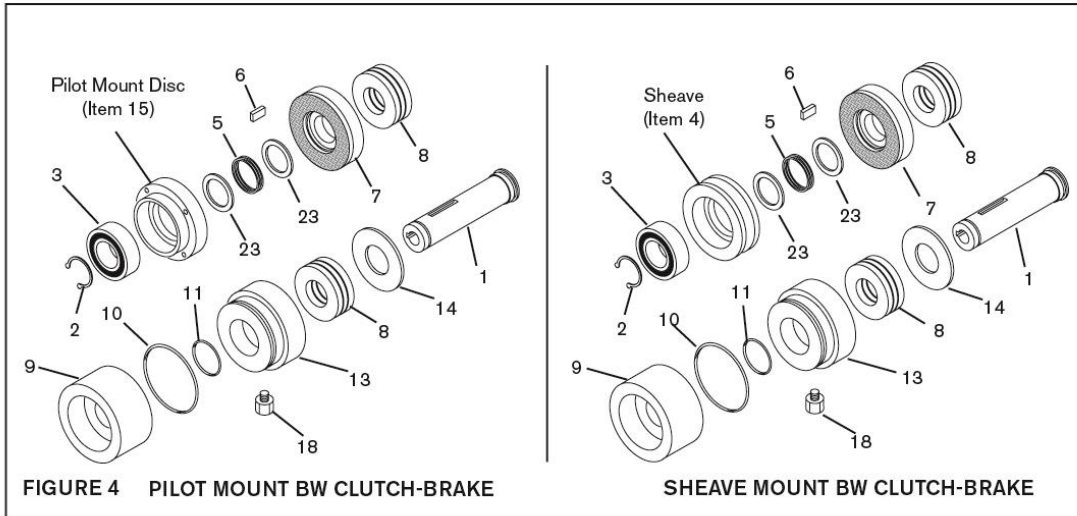
REFER TO FIGURE 4.

1. Remove the Retaining Ring (Item 2).
2. Depending on which version of the BW Clutch is being used, remove the Pilot Mount Disc (Item 15) or the Sheave (Item 4).
3. Press the old Bearing (Item 3) out of the Sheave or Pilot Mount Disc.
4. Clean the bearing bore of the Sheave (Item 4) or Pilot Mount Disc (Item 15) with fresh solvent making sure all old Loctite® residue is removed.
5. Apply an adequate amount of Loctite® RC609 to evenly coat the outer race of new Bearing (Item 3).
6. Carefully align the outer race of the new Bearing (Item 3) with the bore of the Sheave or Pilot Mount Disc and press the new Bearing (Item 3) into place.
7. Remove the first old Spring Retaining Washer (Item 23), old Return Spring (Item 5), and the second old Spring Retaining Washer (Item 23) from the Hub (Item 1).
8. Slide the old Friction Disc Assembly (Item 7) off of the Hub (Item 1).
9. Remove the old Disc Key (Item 6).
10. Slide the Hub (Item 1) out of the Air Chamber (Item 9) and Piston (Item 13).
11. Separate the Piston (Item 13) from the Air Chamber (Item 9).
12. Remove the old O-ring Seal (Item 11) from the Air Chamber (Item 9).
13. Press the old Thrust Bearing (Item 8) out of the Air Chamber (Item 9).
14. Carefully align the outer race of the new Thrust Bearing (Item 8) with the bore of the Air Chamber (Item 9) and press the new Thrust Bearing (Item 8) into place.
15. Remove the old O-ring Seal (Item 10) from the Piston (Item 13).
16. Press the old Thrust Bearing (Item 8) out of the Piston (Item 13).
17. Carefully align the outer race of the new Thrust Bearing (Item 8) with the bore of the Piston (Item 13) and press the new Thrust Bearing (Item 8) into place.
18. Clean the O-ring contact surfaces of the Air Chamber and Piston with fresh safety solvent.
19. Coat the O-ring contact surfaces of the Air Chamber and Piston with fresh O-ring lubricant and wipe off any excess lubricant.
20. Coat the new O-ring Seals (Items 10 and 11) with fresh O-ring Lubricant.
21. Install the new O-ring Seals (Items 10 and 11).
22. Slide the Piston (Item 13) into Air Chamber (Item 9).
23. Slide the Air Chamber and Piston onto Hub (Item 1).
24. Install the new Disc Key (Item 6) into the Hub.
25. Slide new Friction Disc Assembly (Item 7) onto the Hub (Item 1) and Disc Key (Item 6).
26. Install the new Return Spring (Item 5) and Spring Retaining Washers (Item 23).
27. Press the Pilot Mount Disc (Item 15) and Bearing (Item 3) or the Sheave (Item 4) and Bearing (Item 3) onto the Hub (Item 1).
28. Reinstall the Retaining Ring (Item 2).



NOTE: The closed end of the Return Spring (Item 5) must face toward the Retaining Ring (Item 2).

PARTS LIST



ITEM	DESCRIPTION	QTY
1	Hub	1
2	Retaining Ring (Ext.)	1
3	Bearing	1
4	Sheave	1
5 ¹	Return Spring	1
6 ¹	Disc Key	1
7 ¹	Friction Disc Assembly	1
8 ¹	Thrust Bearing	2
9	Air Chamber	1
10 ¹	O-Ring Seal (Large)	1
11 ¹	O-Ring Seal (Small)	1
13	Piston	1
14	Washer	1
15	Pilot Mount Disc	1
18	Air Inlet Fitting	1
19	Air Hose Assembly (Not Shown)	1
20	Set Screw (Not Shown)	2
21	Key (Not Shown)	1
23 ¹	Spring Retaining Washer	2

¹ Denotes Repair Kit Item (Repair Kit No. 846800)

WARRANTY

Warranties

Nexen warrants that the Products will (a) be free from any defects in material or workmanship for a period of 12 months from the date of shipment, and (b) will meet and perform in accordance with the specifications in any engineering drawing specifically for the Product that is in Nexen's current product catalogue, or that is accessible at the Nexen website, or that is attached to this Quotation and that specifically refers to this Quotation by its number, subject in all cases to any limitations and exclusions set out in the drawing. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if: (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

Exclusive Remedy

The exclusive remedy for the Buyer for any breach of any warranties provided in connection with this agreement will be, at the election of Nexen: (a) repair or replacement with new, serviceably used, or reconditioned parts or products; or (b) issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

Agent's Authority

Buyer agrees that no agent, employee or representative of Nexen has authority to bind Nexen to any affirmation, representation, or warranty concerning the Products other than those warranties expressly set forth herein.

Limitation on Nexen's Liability

TO THE EXTENT PERMITTED BY LAW NEXEN SHALL HAVE NO LIABILITY TO BUYER OR ANY OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE, EVEN IF NEXEN SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For all of the purposes hereof, the term "consequential damages" shall include lost profits, penalties, delay damages, liquidated damages or other damages and liabilities which Buyer shall be obligated to pay or which Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Nexen be liable for any amount of damages in excess of amounts paid by Buyer for Products or services as to which a breach of contract has been determined to exist. The parties expressly agree that the price for the Products and the services was determined in consideration of the limitation on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose.

Inspection

Buyer shall inspect all shipments of Products upon arrival and shall notify Nexen in writing, of any shortages or other failures to conform to these terms and conditions which are reasonably discoverable upon arrival without opening any carton or box in which the Products are contained. Such notice shall be sent within 14 days following arrival. All notifications shall be accompanied by packing slips, inspection reports and other documents necessary to support Buyer's claims. In addition to the foregoing obligations, in the event that Buyer receives Products that Buyer did not order, Buyer shall return the erroneously shipped Products to Nexen within thirty (30) days of the date of the invoice for such Products; Nexen will pay reasonable freight charges for the timely return of the erroneously shipped Products, and issue a credit to Buyer for the returned Products at the price Buyer paid for them, including any shipping expenses that Nexen charged Buyer. All shortages, overages and nonconformities not reported to Nexen as required by this section will be deemed waived.

Limitation on Actions

No action, regardless of form, arising out of any transaction to which these terms and conditions are applicable may be brought by the Buyer more than one year after the cause of action has accrued.

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Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, MN 55127

800.843.7445
Fax: 651.286.1099
www.nexengroup.com

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