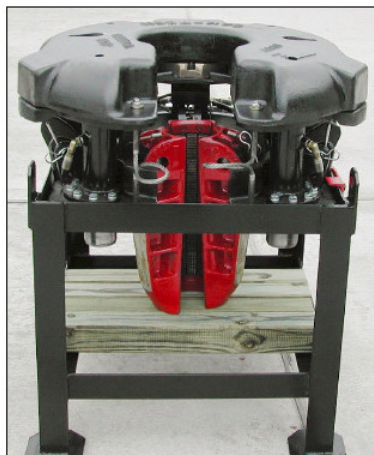
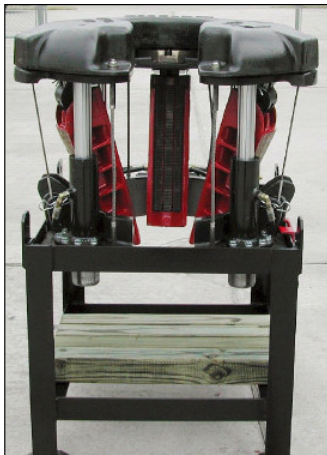




**Cam-Tech
Products, Inc.**



AS-16 Air Power Slip Operation and Maintenance Manual

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AS-16 Air Slip Size Options

Air Slip AS-16	Slip Body Size	Drill Pipe Size	Insert Set	Insert Spacer (12 Req'd)	Slip Segments Only
C-AS16-4535	4-1/2	3-1/2	2163-54	N/A	C-90700-PS
C-AS16-4540	4-1/2	4	2164-54	N/A	C-90710-PS
C-AS16-4545	4-1/2	4-1/2	2165-54	N/A	C-90720-PS
C-AS16-5545	5-1/2	4-1/2	2168-54	N/A	C-90730-PS
C-AS16-5550	5-1/2	5	2169-54	N/A	C-90740-PS
C-AS16-5555	5-1/2	5-1/2	2170-54	N/A	C-90750-PS
C-AS16-7578	7	5-7/8	2656-60	201349-5	Special Order
C-AS16-7658	7	6-5/8	2172-60	201349-5	Special Order

Insert Retainer	Slip Body Size	Part No.
Retainer Ring	4-1/2	C-3739
Retainer Ring	5-1/2	C-3740
Retainer Ring	7	C-3742
Bolt Kit	All sizes	C-3737

Content	Page
General Description	2
Installation	3
Operation	5
Preventive Maintenance	6
Maintenance	9
Assembly Parts List	22
Spare Parts Kit	24
Figures	25

GENERAL DESCRIPTION

The AS-16 is a pneumatic power slip designed to offset the weight of hand slips in the released or up position. Pneumatic cylinders lift the slips to a released or up position and gravity is used to set the slips. The AS-16 is designed to fit 27½, 37½, and 49½ inch rotary tables equipped with pin drive master bushings. It is capable of handling 3½ through 5½ inch OD drill pipe. The AS-16, by special order, is also capable of handling 5-7/8 inch and 6-5/8 inch OD drill pipe using modified SDXL hand slips.

Caution: Do not use standard hand slips in the AS-16.

The AS-16 has an opening in the front for easy installation and removal from around the drill pipe. The three independently hung slip segment assemblies move down and inward gripping the pipe uniformly in the same manner as hand slips. By using three slip assemblies and not four, the AS-16 eliminates the need for guide rings and allows slip segments to set evenly around the drill pipe. The patented two-stage linkage and cable design allows for maximum displacement of the slip segments within the minimum vertical movement of the AS-16's upper housing.

AS-16 Safety Features:

- Relative to traditional manual slips, the AS-16 prevents back injuries due to the use of air powered cylinders to raise slip segments.
- Slip Segment Safety Cable prevents the segment from dropping into the hole.
- Maintenance Safety Brackets, when used as instructed, prevent injury while work is being performed on the AS-16 in the released or up position.
- An auto foot pedal valve only allows the AS-16 to cycle when the pedal is depressed. Additionally, the foot pedal valve is assembled inside a protective housing that prevents inadvertent depression of the foot pedal.

WARNING: Before operating or servicing Cam-Tech products, be sure to wear your company's required safety equipment and follow your company's safety rules and the practices outlined in this manual to the letter.

Failure to do so can result in serious injury or death.

INSTALLATION

Note: When the AS-16 is delivered, remove all packaging. The AS-16 will include a lifting sling and components for the air supply. The air supply components (See Figure A) will have to be installed prior to using the AS-16.

Installation of Air Supply – See Figure A

- 1) Attach the lubricator, regulator and filter to rig air supply (90-120 PSI).
- 2) Run your customer supplied air hose from pressure regulator to foot control valve.
- 3) Place the foot control valve close to operator to ensure easy operation.
- 4) Run the 15-foot Cam-Tech air hose to drill area to ensure that it will connect to the quick disconnect located at the rear of the AS-16 base plate.
- 5) Check the system for leaks and if needed, and repair as required.

WARNING: Do not attempt to lift the AS-16 and storage stand before placing the retention latches in the secure or latched position. Failure to do so may cause personal injury or damage to the AS-16.

Lifting of the AS-16 and Storage Stand (C-90270)

A 4-chain lifting sling is provided to hoist and lower the AS-16 and storage stand onto and off the rig floor. Before lifting the AS-16 and storage stand up to the floor, be sure the AS-16 is in the set or down position, and check that the red retention latches located on the side of the stand are in the closed or latched position and locked in place with the j-hooks. (This should already be the condition of the AS-16 and storage stand when received.) Securing these latches will prevent the AS-16 from coming out of the stand and falling during lifting operations. The AS-16 and storage stand are now ready to be lifted to the rig floor.

Installation of AS-16 for Use

Note: Before installing the AS-16 and while it is still sitting on the storage stand, the AS-16 slip segments must be raised to the released or up position.

WARNING: Removing the AS-16 from the storage stand prior to placing it in the released or up position may cause personal injury or damage to the AS-16.

Attach air supply (90-120 PSI) to the quick disconnect located at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position. Step on the foot pedal valve and then open the ball valve to raise the slip segments.

- 1) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 2) Disconnect the air supply hose. The slip segments should remain in the released or up position.

Note: Before installing the AS-16, make sure the proper slip segments and gripping inserts are installed matching the drill pipe to be run.

- 3) Check to be sure that the AS-16 slip segments are in the released or up position.
- 4) Remove the j-hooks and release the red safety latches located on the storage stand, allowing the AS-16 to be removed from the stand.
- 5) Attach an insert bowl lifting sling to the AS-16 using the holes provided in the top cover. Hoist the AS-16 off of the stand and move into position.
- 6) Using the opening in front of the AS-16, position the AS-16 around the drill pipe.
- 7) While maintaining its position around the pipe, lower the AS-16 onto the master bushing aligning the four pins located on the AS-16 into the master bushing.

Note: The drive pins must be fully engaged inside the master bushing with the bottom of the AS-16 base plate seated flush with the top of the master bushing.

- 8) Reconnect the air supply hose and open the ball valve. The AS-16 is now ready to be used.

OPERATION

To SET the Slips:

The Operator engages the slips by stepping on the foot pedal valve. This causes the air cylinders to vent, lowering the slip segments downward and inward until they engage the drill string. The cylinders will continue to lower the top cover and slip segments until the drill string is securely captured between the slip segments.

Caution: Downward movement of the drill string should always be slowed when setting slips to prevent possible damage to the AS-16. Also, do not allow slips to clamp onto tool joints or set the slips with the elevators to prevent damage to the AS-16.

To RELEASE the Slips:

The Operator releases the slip segments by stepping on the foot pedal valve. The air cylinders will activate raising the top cover and slip segments moving the slip segments upward and outward until they clear the drill string as it moves upward.

PREVENTIVE MAINTENANCE

Note: While performing any preventive maintenance, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 slip segments must be raised to the released or up position.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

Recommended lubricants

- 10W hydraulic oil for lubricator
- SAE 90 gear oil
- Multipurpose water-resistant grease

Lubrication of Slip Segments

Prior to each time the AS-16 is used for tripping in and tripping out, use a brush to liberally coat the backs of the slip segments with the recommended grease. If grease is not available for the slip segments, gear oil is adequate.

Preventive Maintenance Checklist

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

Prior to each time the AS-16 is placed into operation, ensure that the AS-16 is in its storage stand in the released or up position, and that the AS-16 retention latches located on the stand are closed and locked. Then perform each of the preventive maintenance tasks listed below.

- 1) **Lubricator** (C-90290) – Check lubricator fluid level. If required, fill reservoir with 10W hydraulic oil.
- 2) **Filter** (C-90280) – Inspect filter for accumulated liquids and dirt. If required, drain liquid and/or replace filter element.
- 3) **AS-16 Power Slip**
 - a. Slip Retaining Pins (C-90461) – Lubricate liberally at lower linkage.
 - b. H - Linkage Hanger Pins (C-90710) – Lubricate liberally at upper linkage.
 - c. Base Plate Retraction Cable Pins (C-90460) – Lubricate liberally at base plate.
 - d. Retraction Cable Linkage Pins (C-90810) and Sleeves (C-90811) – Lubricate liberally at upper and lower linkages.
- 4) **Retraction Cables** (C-90070)
 - e. Check cable adjustment. Refer to Slip Retraction Cable Adjustment Procedure, page 9.
 - f. Inspect for wear and damage.
 - g. If wear or damage is visible, replace the affected cable(s). Refer to Slip Retraction Cable Replacement Procedure, page 10.
- 5) **Tension Cables** (C-90220) – Inspect for wear and damage.
 - h. If wear or damage is visible, replace the affected cable(s). Refer to Tension Cable Replacement Procedure, page 11.
- 6) **Upper and Lower Linkages** (C-90150 / C-90160) – Inspect linkages for bushing wear and pin wear.
 - i. If wear is visible, replace worn components as instructed.

- j. Refer to the Upper Linkage (H Linkage) Replacement Procedure, page 15.
 - k. Refer to the Lower Linkage Replacement Procedure , page 17.
- 7) Air Cylinders** (C-90040) – Inspect for leaks and damage.
- l. If damage is evident, replace damaged cylinder. Refer to Air Cylinder Replacement Procedure, page 18.
- 8) Air hoses** (C-90230, C-90240, C-90310) – Inspect for damage.
- m. If damage is evident, replace damaged hoses as needed.
- 9) Slip Segments** – Inspect in accordance with slip inspection guidelines found in standard Rotary Equipment Care & Maintenance Handbook.
- n. If slip segments are found to be unacceptable, replace slip segments as required. Contact Cam-Tech for the correct parts for your slip. Refer to Slip Segments Replacement Procedure, page 20.

MAINTENANCE

Slip Retraction Cable Adjustment Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located on the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve (C-90380) located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare the safety brackets (C-90610) for installation by removing safety pins from holes in bracket.
- 5) Place safety brackets on two opposite tension cables (C-90220).
- 6) Install safety pins, securing the tension cable inside of bracket.
- 7) Pull the slip retraction cable (C-90070) to check that there is enough cable slack to move the slip segment upward a minimum of 1/4" in order to maintain enough clearance for a tool joint. If not, proceed with the following steps.
 - a. Remove safety brackets from tension cables.
 - b. Open the ball valve and then step on the foot pedal valve to lower the slip segments to the down position.
 - c. To shorten or lengthen the cable as required, adjust the lower nut (C-90071) on the end of the slip retraction cable on the bottom side of the base plate retraction cable pin (C-90460). During adjustment of the lower nut, thread the upper nut (C-90072) to maintain its position directly against top side of the retraction cable pin. It may be necessary to remove the upper nut if additional lower nut adjustment is required.

- d. Repeat steps 2 thru 7 above, as many times as required to correctly adjust the slip retraction cable.

Slip Retraction Cable Replacement Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located on the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) If the AS-16 is in the up position, step on the foot pedal valve and then open the ball valve to lower the slip segments to the down position.
- 3) With the AS-16 in the down position, remove the lower slip retraction cable nut (C-90071) from the end of the slip retraction cable (C-90070) to be replaced.
- 4) Step on the foot pedal to raise the slip segments to the up position, and then close the ball valve. This will keep the slip segments in the released or up position.
- 5) Prepare safety brackets (C-90610) for installation by removing the safety pins from holes in bracket.
- 6) Place safety brackets on two opposite tension cables.
- 7) Install the safety pins, securing the tension cable inside of bracket.
- 8) Remove all four cover plate bolts (C-90050) and lock washers (C-90060).
- 9) Carefully lift the cover plate straight up until it has cleared the threaded ends of the four tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 10) Remove slip segment from lower linkage of retraction cable to be replaced by performing Slip Segments Replacement Procedure, using steps 7 thru 10.
- 11) Remove cotter pin (C-90813) and washer (C-90812) from the retraction cable linkage pin (C-90810).

- 12) Slide out the linkage pin to remove the cable pin sleeve (C-90811) and the loop end of the retraction cable.
- 13) Inspect the cable pin sleeve and linkage pin for wear and replace if needed.
- 14) Apply grease liberally to cable linkage pin and cable pin sleeve.
- 15) Slip the sleeve into the loop end of the new retraction cable and slide pin into linkages and sleeve. Install washer onto end of the linkage pin and secure with cotter pin.
- 16) Disassemble the pulley assembly by removing the lock nut (C-90142) and flat washer(s) (C-90141) from shoulder bolt on which the pulley is mounted. Remove two bolts (C-90120) and lock washers (C-90122) from one pulley cover (C-90110). Remove the pulley cover, and then remove the old retraction cable from pulley (C-90130).
- 17) Inspect the covers and pulley bushing for wear and replace covers and/or pulley if needed.
- 18) Install the new retraction cable onto the pulley and feed the threaded end of cable down into hole in top plate. Slip the removed pulley cover back onto the shoulder bolt (C-90140) and install the washer(s) and lock nut. Re-install the pulley cover to top plate with two lock washers and bolts.
- 19) Install the removed slip segment onto lower linkage by performing the Slip Segments Replacement Procedure, following steps 11 thru 17.
- 20) Carefully lower the cover plate straight down onto the top plate and the threaded ends of the four tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 21) Install the four bolts and lock washers that secure the cover plate to the top plate, and tighten securely.
- 22) Remove the safety brackets from the tension cables.
- 23) Open the ball valve and then step on the foot pedal valve to lower the slip segments to the down position.
- 24) Feed the threaded end of new retraction cable through base plate retraction cable pin (C-90460), and then install the lock nut onto the threaded end of cable.
- 25) Complete the installation of the retraction cable by performing the Slip Retraction Cable Adjustment Procedure.

Tension Cable Replacement Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located off the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare the safety brackets (C-90610) for installation by removing safety pins from holes in bracket.
- 5) Place the safety brackets on two opposite tension cables, not including the one to be replaced.
- 6) Install the safety pins, securing the tension cable inside of bracket.

Important: Do not attempt to replace more than one (1) tension cable at the same time. Doing so may require that all four tension cables be re-adjusted in order to re-level the top plate. If this occurs, refer to Tension Cable Adjustment Procedure. If more than one tension cable must be replaced, completely follow all the steps below thru 15 before installing the next cable.

- 7) Remove the lock nut (C-90222) and flat washer (C-90221) located above the cover plate (C-90030) from the damaged tension cable (C-90220).
- 8) Pull the tension cable downward out of the top plate (C-90010) and cover plate.
- 9) Unthread the tension cable from the base plate (C-90020).
- 10) Install a new jam nut (C-90223) onto the upper end of the new tension cable, which has approx. 3-1/2" of thread.

- 11) Apply Loctite® thread locker to the new tension cable at the base end prior to installing it into the base plate. The base end of the cable has approximately $\frac{3}{4}$ " of thread.
- 12) Install the tension cable into the base plate. Use the wrench flats on the lug to tighten the cable into the base plate securely.
- 13) Bend the tension cable and install it into the top plate and cover plate.
- 14) Thread the jam nut up to the bottom side of the top plate.
- 15) Install new lock nut with flat washer onto the top end of the cable and tighten securely.
- 16) To replace another tension cable, repeat steps 5 thru 15.
- 17) Remove safety brackets from tension cables to enable operation of the power slip.

Tension Cable Adjustment Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

Note: This procedure should only be necessary to perform when two or more locknuts (C-90222) are removed from the tension cables thereby allowing one or more cylinders to fully extend.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located on the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare safety brackets (C-90610) for installation by removing safety pins from holes in bracket.

- 5) Place safety brackets on two opposite tension cables.
- 6) Install safety pins, securing the tension cable inside of the bracket.
- 7) Remove all four lock nuts (C-90222) located above the cover plate (C-90030) from tension cables (C-90220).
- 8) Lower the tension cable jam nuts below the top plate until stopped at end of thread, allowing for maximum adjustment between bottom of top plate and the top of the jam nuts.
- 9) Open the ball valve and cycle the AS-16 to allow all four cylinders to fully extend.
- 10) With the cylinders fully extended, depress foot valve to allow air to bleed. (Cylinders should not retract.)
- 11) Start locknuts onto the thread of the same two tension cables which have the safety brackets installed.
- 12) Begin to tighten down the locknuts evenly until the AS-16 drops or sets down on top of the safety brackets. This will indicate that the top plate is level.
- 13) If the AS-16 does not set after the locknuts are fully tightened, then move the safety brackets to the other two opposite tension cables and repeat steps 11 and 12.
- 14) Cycle the AS-16 to the up position and tighten jam nuts against top plate until securely seated.
- 15) Remove safety brackets from tension cables to enable operation of power slip.

Upper Linkage (H Linkage) Replacement Procedure

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

- 1) Attach air supply to the quick disconnect located off the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare safety brackets (C-90610) for installation by removing safety pins from holes in bracket.
- 5) Place safety brackets on two opposite tension cables.
- 6) Install safety pins, securing the tension cable inside of bracket.
- 7) Remove slip segment from lower linkage to be replaced by performing the Slip Segments Replacement Procedure, using steps 7 thru 10.
- 8) Remove all four cover plate bolts (C-90050) and lock washers (C-90060).
- 9) Carefully lift the cover plate straight up until it has cleared the threaded ends of the four tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 10) Remove all eight bolts, 6 long (C-90016) and 2 short (C-90015), with lock washers (C-90060) that secure the horseshoe plate to top plate (C-90010).
- 11) Remove the horseshoe plate (C-90011) and two round spacers (C-90012) under the horseshoe plate from where the short bolts were removed.
- 12) Remove the socket head cap screw (C-90313) and lock washer (C-90314) from cover (C-90190) to the upper linkage (C-90150) to be replaced.

- 13) Remove the upper linkage cover.
- 14) Remove cotter pin (C-90813) and washer (C-90812) from the retraction cable linkage pin (C-90810).
- 15) Slide out the linkage pin to remove the cable pin sleeve (C-90811), the loop end of the retraction cable (C-90070) and the lower linkage (C-90160).
- 16) Inspect the cable pin sleeve and linkage pin for wear and replace if needed.
- 17) Apply grease liberally to the linkage pin and cable pin sleeve.
- 18) Position the lower linkage inside the new upper linkage for assembly.
- 19) Slip sleeve into the loop end of the retraction cable and slide the pin into the linkages and sleeve. Install the washer onto the end of the linkage pin and secure with cotter pin. Allow the new upper linkage to pivot down and hang on the lower linkage.
- 20) Remove the old upper linkage with hanger pin by raising them up above the top plate.
- 21) Remove the upper linkage hanger pin (C-90710) from the old upper linkage and inspect the hanger pin for wear and replace if needed.
- 22) Apply grease liberally to the hanger pin.
- 23) Pivot up the new upper linkage with attached lower linkage and raise the linkages thru opening high enough to install the hanger pin into the upper linkage, and then the lower hanger pin into the existing groove in the top plate.
- 24) Place upper the linkage cover (C-90190) on top of the upper linkage and install the socket head cap screw and lock washer thru cover into the top plate.
- 25) Position the horseshoe plate on top of the upper linkage covers; matching the holes in the plate with two holes on top of each upper linkage cover.
- 26) Position two round spacers under the two holes in the horseshoe plate under which there is no upper linkage cover.
- 27) Install six 3" long bolts thru the horseshoe plate and upper linkage cover into the top plate and (2) 2-1/2" long bolts thru the horseshoe plate and spacer into the top plate.
- 28) Securely tighten all eight horseshoe bolts and one socket head cap screw in the upper linkage cover where the upper linkage was replaced.
- 29) Install the removed slip segment onto the lower linkage by performing the Slip Segments Replacement Procedure, steps 11 thru 17.

- 30) Carefully lower the cover plate straight down onto the top plate and the threaded ends of the four tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 31) Install the four bolts and lock washers that secure the cover plate to the top plate, and tighten securely.
- 32) Complete installation by performing the Slip Retraction Cable Adjustment Procedure, beginning with step 7.

Lower Linkage Replacement Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located on the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare safety brackets (C-90610) for installation by removing safety pins from holes in bracket.
- 5) Place safety brackets on two opposite tension cables.
- 6) Install safety pins, securing tension cable inside of bracket.
- 7) Remove the slip segment from lower linkage to be replaced by performing Slip Segments Replacement Procedure, steps 7 thru 10.
- 8) Remove cotter pin (C-90813) and washer (C-90812) from the retraction cable linkage pin (C-90810).
- 9) Slide out the linkage pin to remove the cable pin sleeve (C-90811), the loop end of the retraction cable (C-90070) and the lower linkage (C-90160).

- 10) Inspect the cable pin sleeve and linkage pin for wear and replace if needed.
- 11) Apply grease liberally to the linkage pin and the cable pin sleeve.
- 12) Position the new lower linkage inside the upper linkage for installation.
- 13) Slip the sleeve into the loop end of the retraction cable and slide pin into the linkages and sleeve. Install the washer onto end of the linkage pin and secure with a cotter pin.
- 14) Install the removed slip segment onto the new lower linkage by performing Slip Segments Replacement Procedure, steps 11 thru 17.
- 15) Remove the safety brackets from the tension cables to enable operation of power slip.

Air Cylinder Replacement Procedure

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

- 1) Attach the air supply to the quick disconnect located on the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare safety brackets (C-90610) for installation by removing the safety pins from holes in bracket.
- 5) Place the safety brackets on two opposite tension cables.
- 6) Install safety pins, securing the tension cable inside of bracket.
- 7) Remove all four cover plate bolts (C-90050) and lock washers (C-90060).

- 8) Carefully lift the cover plate straight up until it has cleared the threaded ends of the four tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 9) Remove the lock nut (C-90080) and flat washer (C-90090) from the cylinder to be replaced.
- 10) Disconnect the applicable hose assembly (C-90230 or C-90240) by unthreading the swivel nut on the end of the hose assembly from the elbow (C-90260) on the bottom of the cylinder. This will allow the cylinder to retract.
- 11) With the cylinder retracted, the male half of a spherical washer (C-90100) will be resting on top of the cylinder. Remove the washer and save it for re-use.
- 12) Remove the 5 mounting bolts (C-90050) and lock washers (C-90060) from the base of the cylinder.
- 13) Remove the cylinder.
- 14) Position the new cylinder on top of the base plate and install with 5 mounting bolts and lock washers.
- 15) Place the saved half of the spherical washer on top of the cylinder with the spherical side up.
- 16) Connect the hose assembly to the elbow on the bottom of the cylinder.
- 17) Open the ball valve and cycle the AS-16 in order to allow the new cylinder to extend into the hole inside the 'cup' that is part of the top plate. All four air cylinders should now be supporting the top plate.
- 18) Close the ball valve. This will keep the AS-16 in the released or up position.
- 19) Install the flat washer and lock nut onto the top end of the new cylinder.
- 20) Carefully lower the cover plate straight down onto the top plate and the threaded ends of the four (4) tension cables. **Caution:** Failure to do so may cause damage to the tension cables.
- 21) Install the four bolts and lock washers that secure the cover plate to the top plate, and tighten securely.
- 22) Complete the installation by performing Slip Retraction Cable Adjustment Procedure, beginning with step 7.

Slip Segments Replacement Procedure

Note: Before performing this procedure, the AS-16 must be sitting on the AS-16 storage stand and the AS-16 retention latches located on the stand must be closed and locked.

WARNING: Prior to performing any task with the AS-16 in the released or up position, install aluminum safety brackets (P/N C-90610) on two opposite tension cables as instructed to prevent the AS-16 from lowering or falling to the set position during maintenance (See Figure 1). Failure to do so may cause personal injury or damage to the AS-16.

- 1) Attach the air supply to the quick disconnect located off the manifold at the rear of the AS-16 base plate. Check to be sure the ball valve located next to the quick disconnect is in the closed position.
- 2) Step on the foot pedal valve and then open the ball valve to raise the slip segments.
- 3) After raising the slip segments to the released or up position, close the ball valve. This will keep the slip segments in the released or up position.
- 4) Prepare safety brackets (C-90610) for installation by removing safety pins from holes in bracket.
- 5) Place safety brackets on two opposite tension cables.
- 6) Install safety pins, securing the tension cable inside of bracket.
- 7) Remove lock nut (C-90071) from the end of the slip segment safety cable (C-90161). Remove and save the cable with lock nut for re-use with the new segment.
- 8) Remove the cotter pin (C-90181) from the slip retaining pin (C-90461).
- 9) While supporting the slip segment, remove the retaining pin from the lower linkage (C-90160).
- 10) Remove the segment through one of the side open areas located on the AS-16.
- 11) Apply grease liberally to slip retaining pin.
- 12) Position the new slip segment onto lower linkage and install the slip retaining pin.
- 13) Install the cotter pin.

- 14) Place the safety cable loop end along the right side of the lower linkage (looking toward the back of the slip), close to thru hole in lower linkage and hold in place.
- 15) Take the threaded end of the safety cable and bring it down and thru the large hole (left to right) located in the upper right flange of the slip segment.
- 16) Bring the threaded end of the cable up and thru the safety cable loop end and thru the hole in the lower linkage (right to left).
- 17) Install the lock nut on the threaded end of the cable to secure it in place.
- 18) Repeat the process for the remaining slip segments
- 19) Remove safety brackets from the tension cables to enable operation of power slip.

The following pages include parts lists and drawings to help you install and service your Cam-Tech PS-16 Air Power Slip. While the drawings are accurate, they are not necessarily to scale, and for that reason may not be dimensionally accurate. Please contact Cam-Tech Products, Inc. with any questions you may have on the installation, operation or service of the tool.

AS-16 Assembly Parts List
Refer to Figures for Location of Parts

Item	Part No.	Part Description	Quantity	Figure
01	C-90010	Top Plate, Power Slip	1	4
02	C-90011	Horseshoe Plate	1	4
03	C-90012	Spacer, Horseshoe Plate	2	4
04	C-90015	Hex Head Bolt	2	4
05	C-90016	Hex Head Bolt	6	4
06	C-90020	Base Plate, Power Slip	1	6
07	C-90030	Cover Plate, Power Slip	1	3
08	C-90040	Cylinder	4	6
09	C-90050	Hex Head Bolt	24	3, 6
10	C-90060	Lock Washer	32	3, 4, 6
11	C-90070	Cable, Slip Retraction	3	1
12	C-90071	Lock Nut	6	1, 2
13	C-90072	Hex Nut	3	1
14	C-90080	Lock Nut	4	2
15	C-90090	Flat Washer	4	2
16	C-90100	Washer, Spherical	4	2
17	C-90110	Pulley Cover	6	4
18	C-90120	Hex Head Bolt	12	4
19	C-90122	Lock Washer	12	4
20	C-90130	Pulley, Retraction Cable	3	5
21	C-90140	Socket Head Cap Shoulder Bolt	3	4
22	C-90141	Flat Washer	9	4
23	C-90142	Lock Nut	3	4
24	C-90150	H Linkage, Slip	3	2
25	C-90160	Lower Linkage, Slip	3	2
26	C-90161	Cable, Safety	3	2
27	C-90181	Hairpin Cotter Pin	6	2
28	C-90190	Cover, Hanger Pin, H Linkage	3	5
29	C-90220	Cable, Tension	4	1
30	C-90221	Flat Washer	4	1

AS-16 Assembly Parts List
Refer to Figures for Location of Parts

Item	Part No.	Part Description	Quantity	Figure
31	C-90222	Lock Nut	4	1
32	C-90223	Jam Nut	4	1
33	C-90230	Long Air Hose	2	6
34	C-90240	Short Air Hose	2	6
35	C-90250	Manifold	1	6
36	C-90251	Socket Head Cap Screw	2	6
37	C-90260	Elbow, Male Thread	8	6
38	C-90270	Stand Assembly	1	1
39	C-90280	Filter	1	A
40	C-90290	Lubricator	1	A
41	C-90300	Regulator w/ Gauge	1	A
42	C-90310	Air Hose, 15' (Foot Control)	1	A, 7
43	C-90313	Socket Head Cap Screw	3	4
44	C-90314	Lock Washer, Hi Collar	3	4
45	C-90360	Plug, Hex Head	1	6
46	C-90370	Male Connector	1	6
47	C-90371	Female Connector	1	6
48	C-90372	Hex Nipple	1	6
49	C-90380	Ball Valve	1	6
50	C-90390	QD Coupling, Male	1	6
51	C-90391	QD Coupling, Female	1	A, 7
52	C-90400	Hex Head Bolt	4	6
53	C-90410	Lock Washer	6	6, 7
54	C-90420	Manifold Plate	1	6
55	C-90440	4-hook Lifting Sling	1	n/a
56	C-90445	Foot Valve Assembly	1	7
57	C-90450	Foot Valve, Air	1	A, 7
58	C-90451	Housing, Foot Valve	1	7
59	C-90453	Elbow, Male	1	7
60	C-90454	Muffler	1	7

AS-16 Assembly Parts List
Refer to Figures for Location of Parts

Item	Part No.	Part Description	Quantity	Figure
61	C-90455	Plug, Socket	1	7
62	C-90456	Hex Head Bolt	2	7
63	C-90457	Hex Nut	2	7
64	C-90460	Pin, Retraction Cable, Base Plate	3	2
65	C-90461	Pin, Slip Retaining	3	2
66	C-90480	Seal Kit	Spare Pt	2
67	C-90600	Caution Sign/Storage	1	3
68	C-90601	Caution Sign/Up Position	1	3
69	C-90602	Caution Sign/Cable	1	3
70	C-90610	Safety Bracket	2	1
71	C-90710	Pin, Hanger, H Linkage	3	5
72	C-90810	Pin, Retraction Cable, Linkage	3	5
73	C-90811	Sleeve, Linkage Cable Pin	3	5
74	C-90812	Flat Washer	3	5
75	C-90813	Cotter Pin	3	5
76	C-90921	Male Connector	2	7

AS-16 Gorilla Grip Air Slip
Spare Parts Kit
P/N C-90500

Consists of the following:

Part No.	Part Description	Quantity
C-90070	Cable, Slip Retraction	3
C-90130	Pulley, Retraction Cable	3
C-90140	Socket Head Cap Shoulder Bolt	3
C-90150	H Linkage, Slip	1
C-90160	Lower Linkage, Slip	1
C-90161	Cable, Safety	3
C-90181	Hairpin Cotter Pin	6
C-90220	Cable, Tension	4
C-90223	Jam Nut	4
C-90230	Long Air Hose	2
C-90240	Short Air Hose	2
C-90260	Elbow, Male Thread	8
C-90460	Pin, Retraction Cable, Base Plate	3
C-90461	Pin, Slip Retaining	3
C-90480	Seal Kit, Cylinder	4
C-90710	Pin, Hanger, H Linkage	3
C-90810	Pin, Retraction Cable, Linkage	3

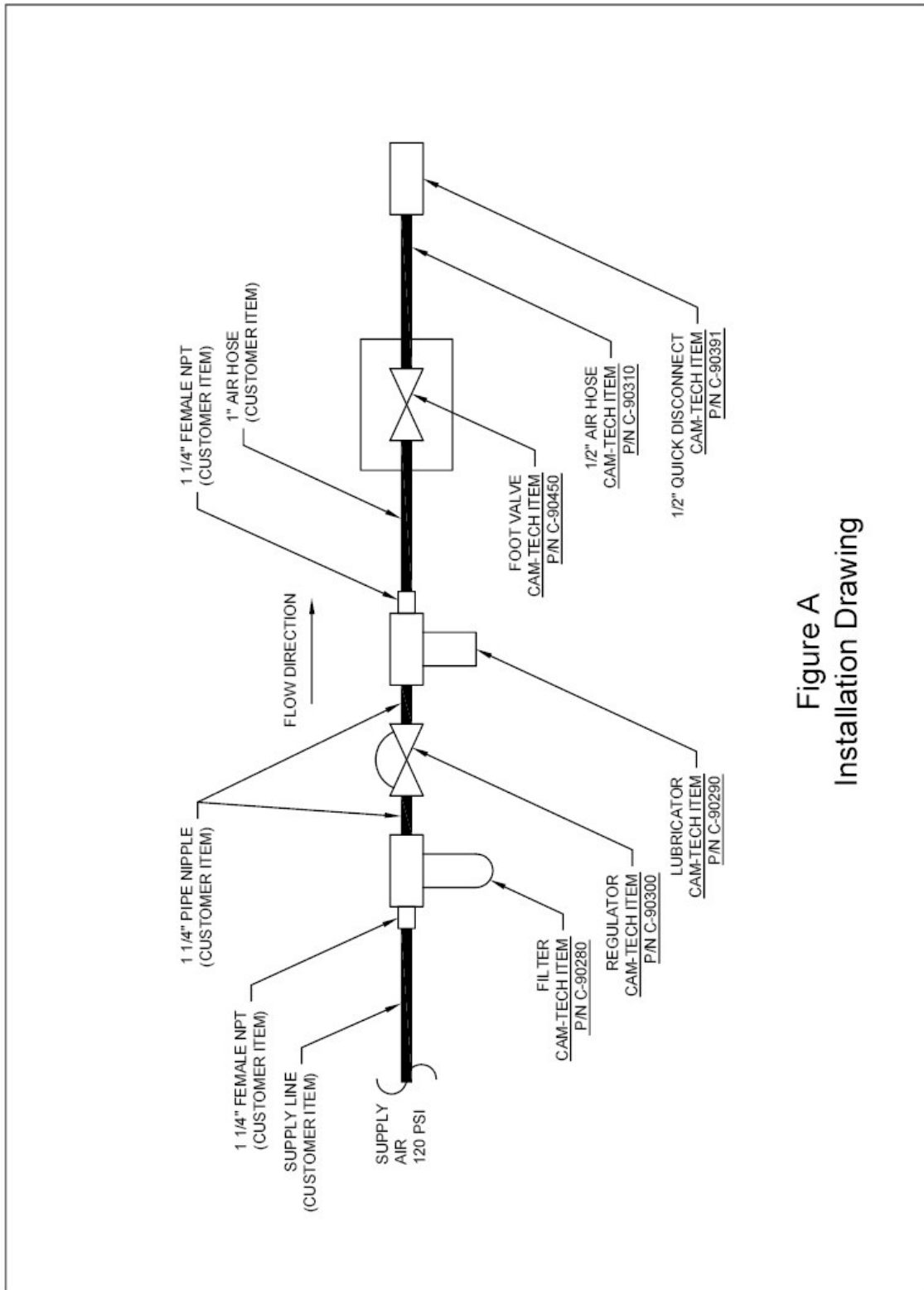


Figure A
Installation Drawing

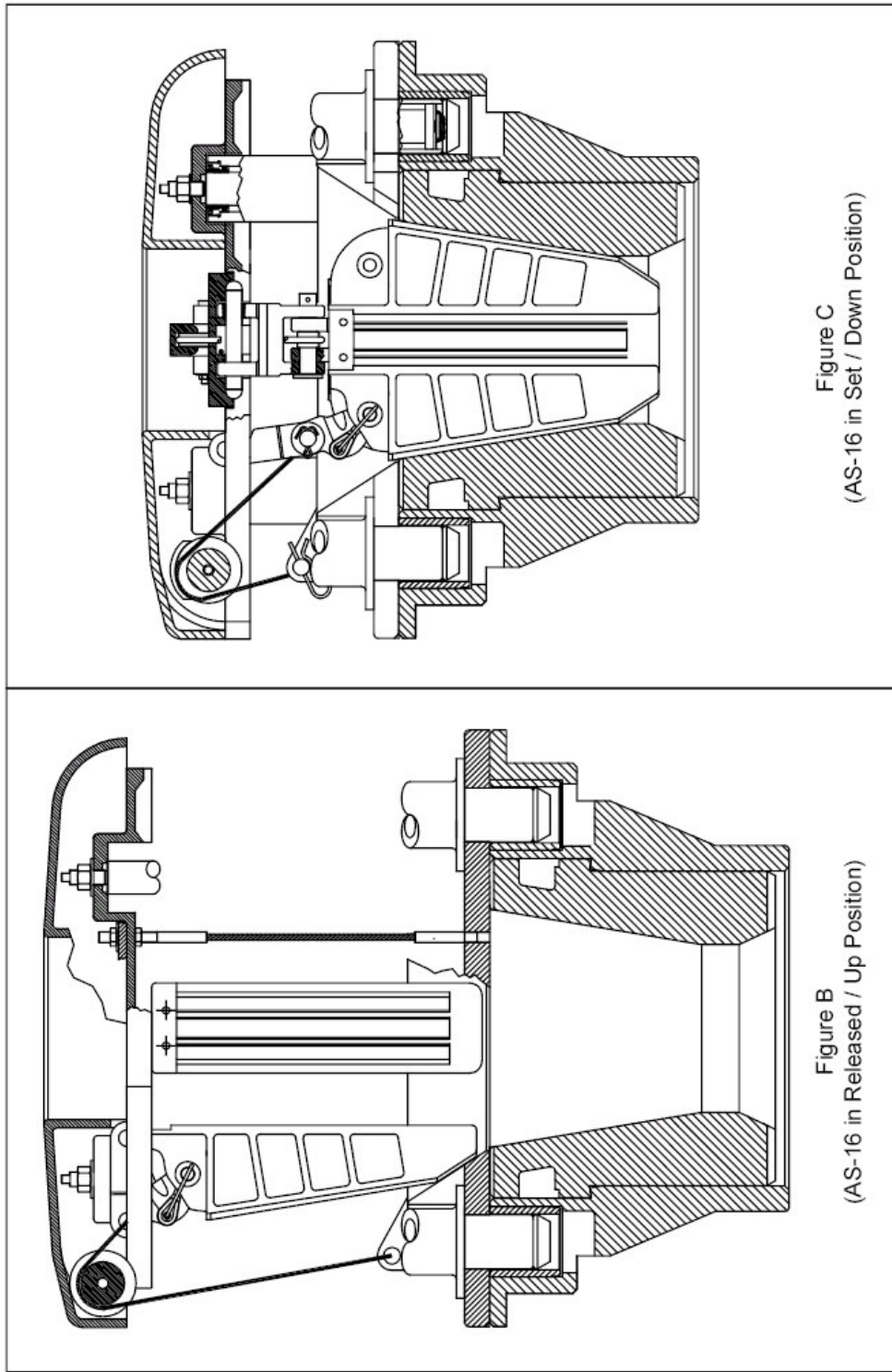
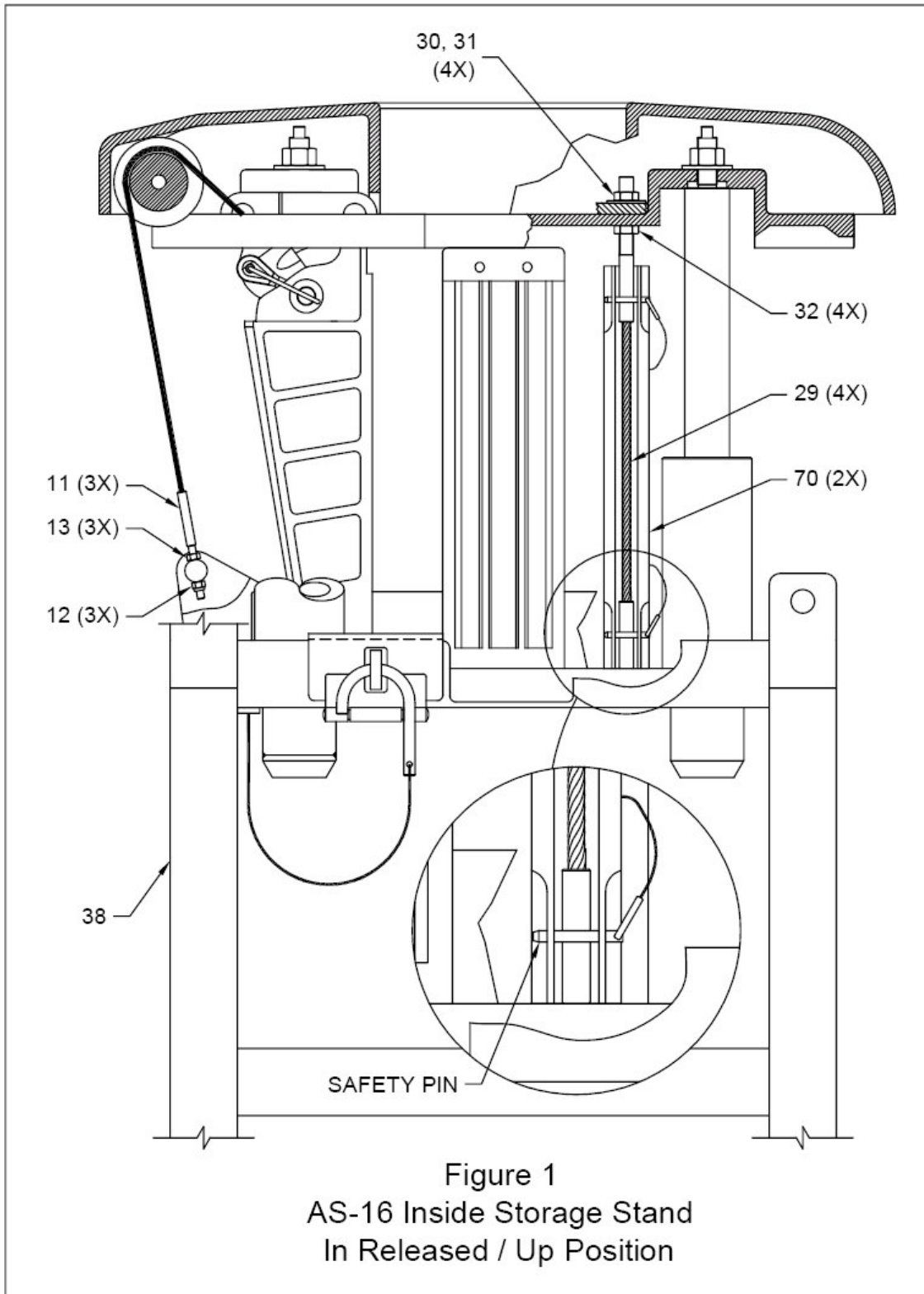
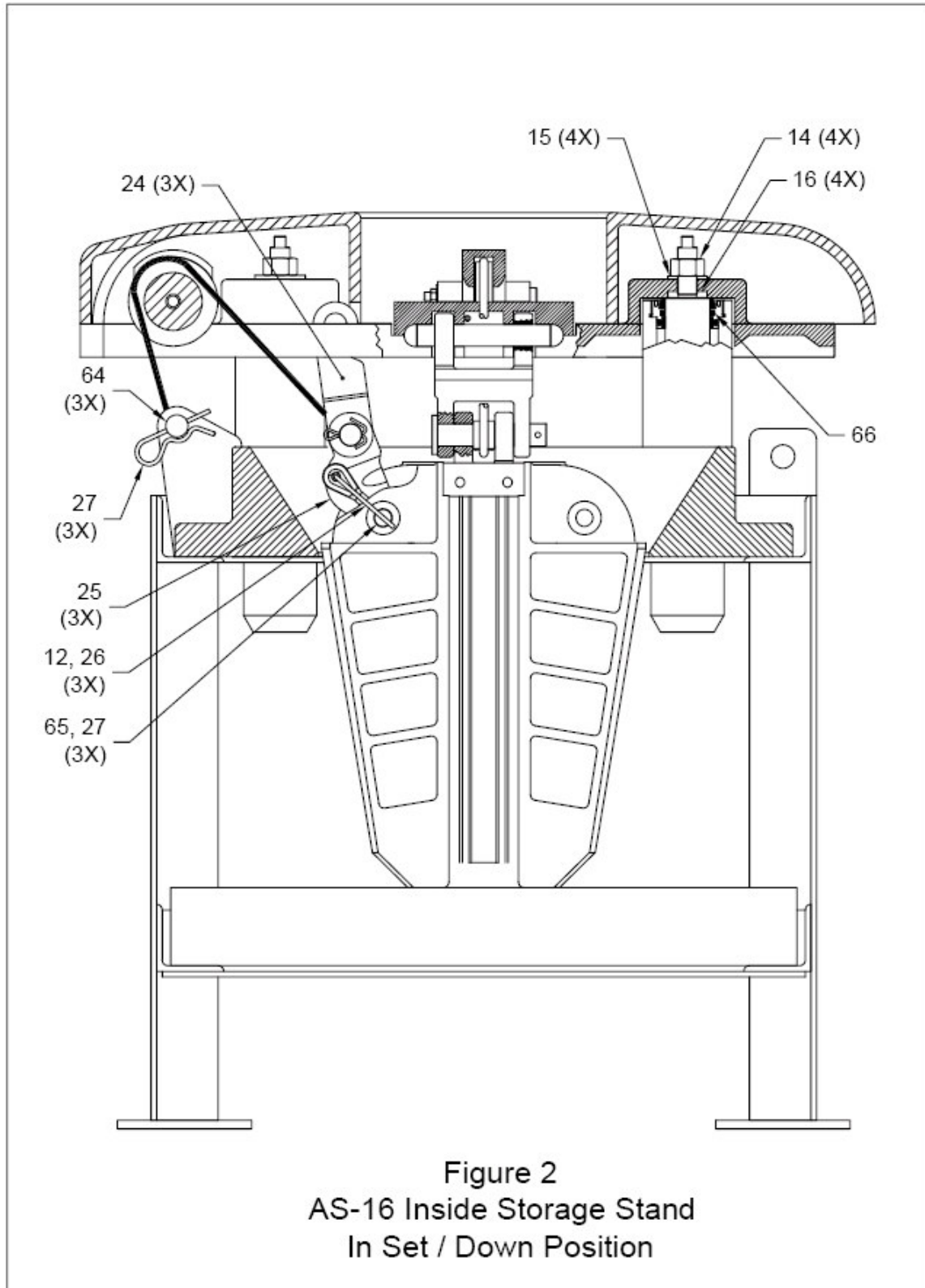


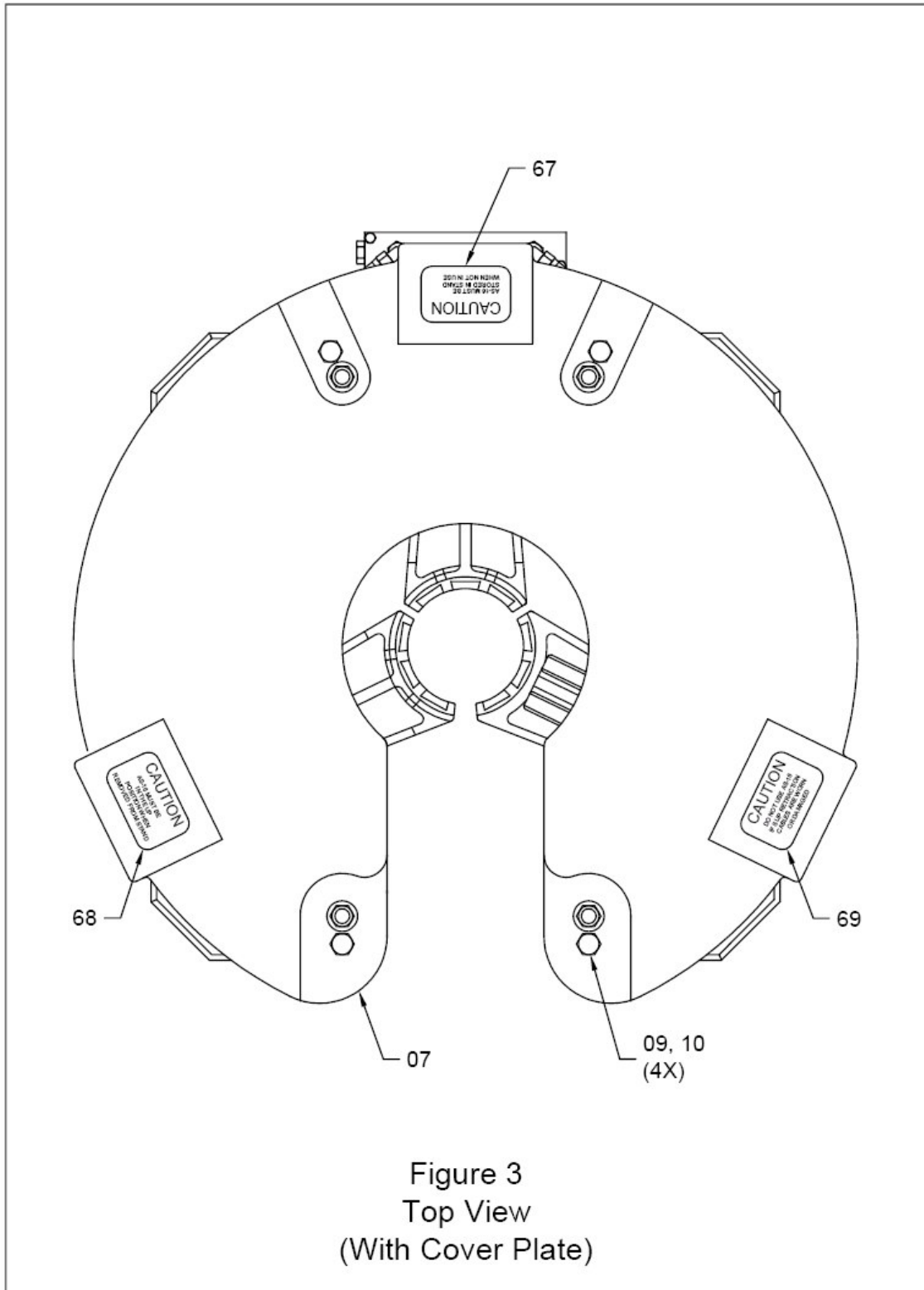
Figure C
(AS-16 in Set / Down Position)

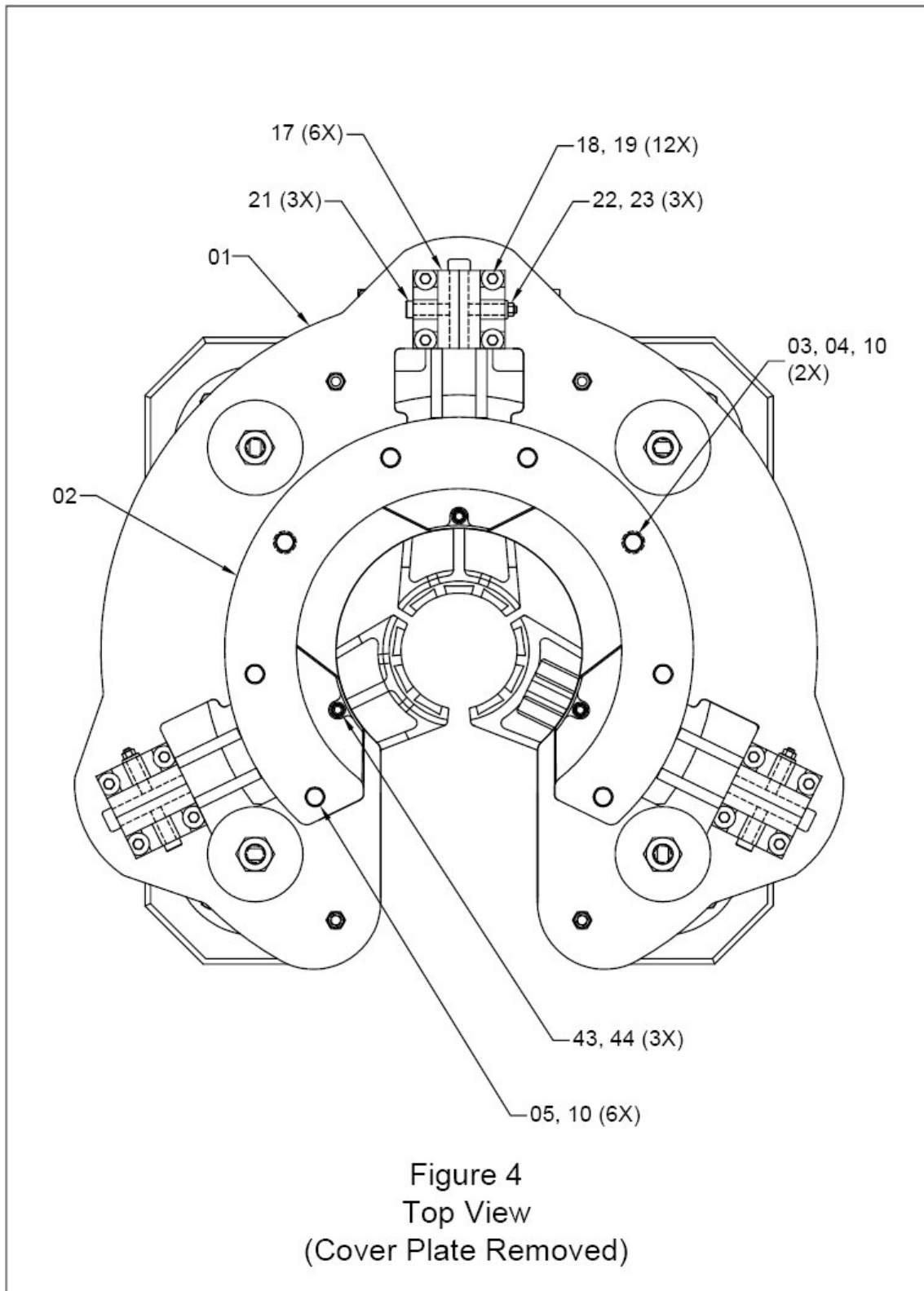
Figure B
(AS-16 in Released / Up Position)

AS-16 INSTALLED ONTO PIN DRIVE MASTER BUSHING









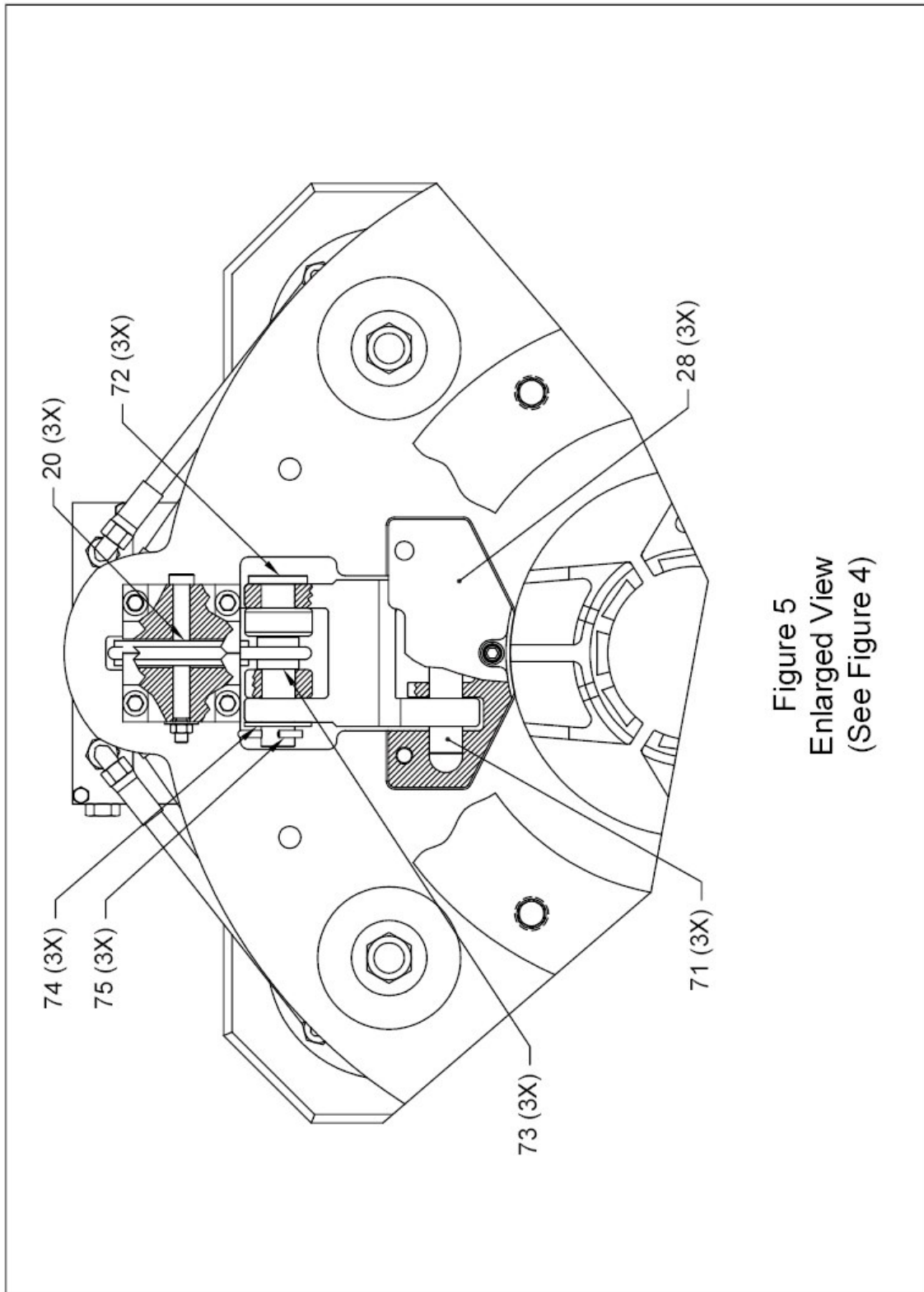
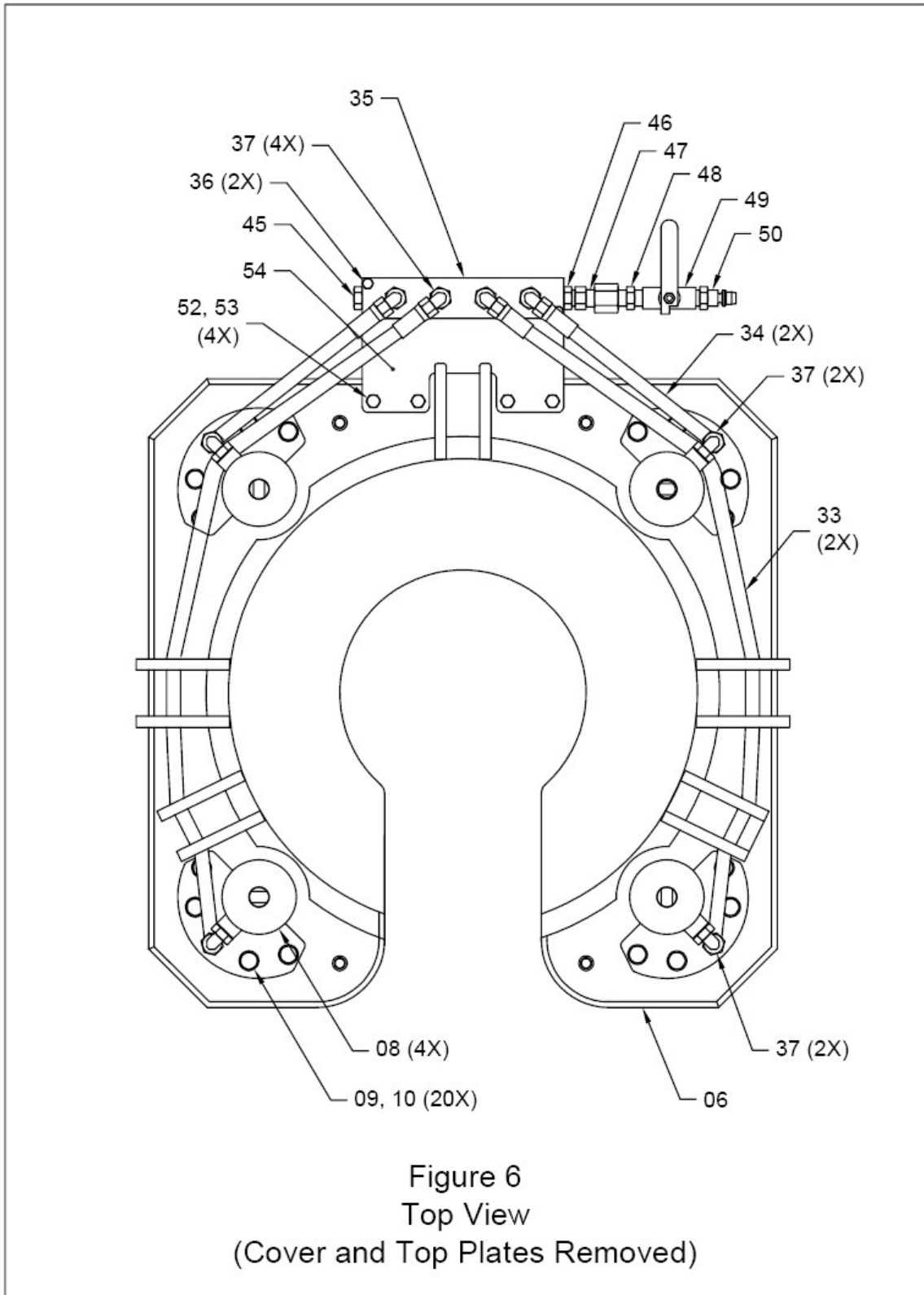


Figure 5
Enlarged View
(See Figure 4)



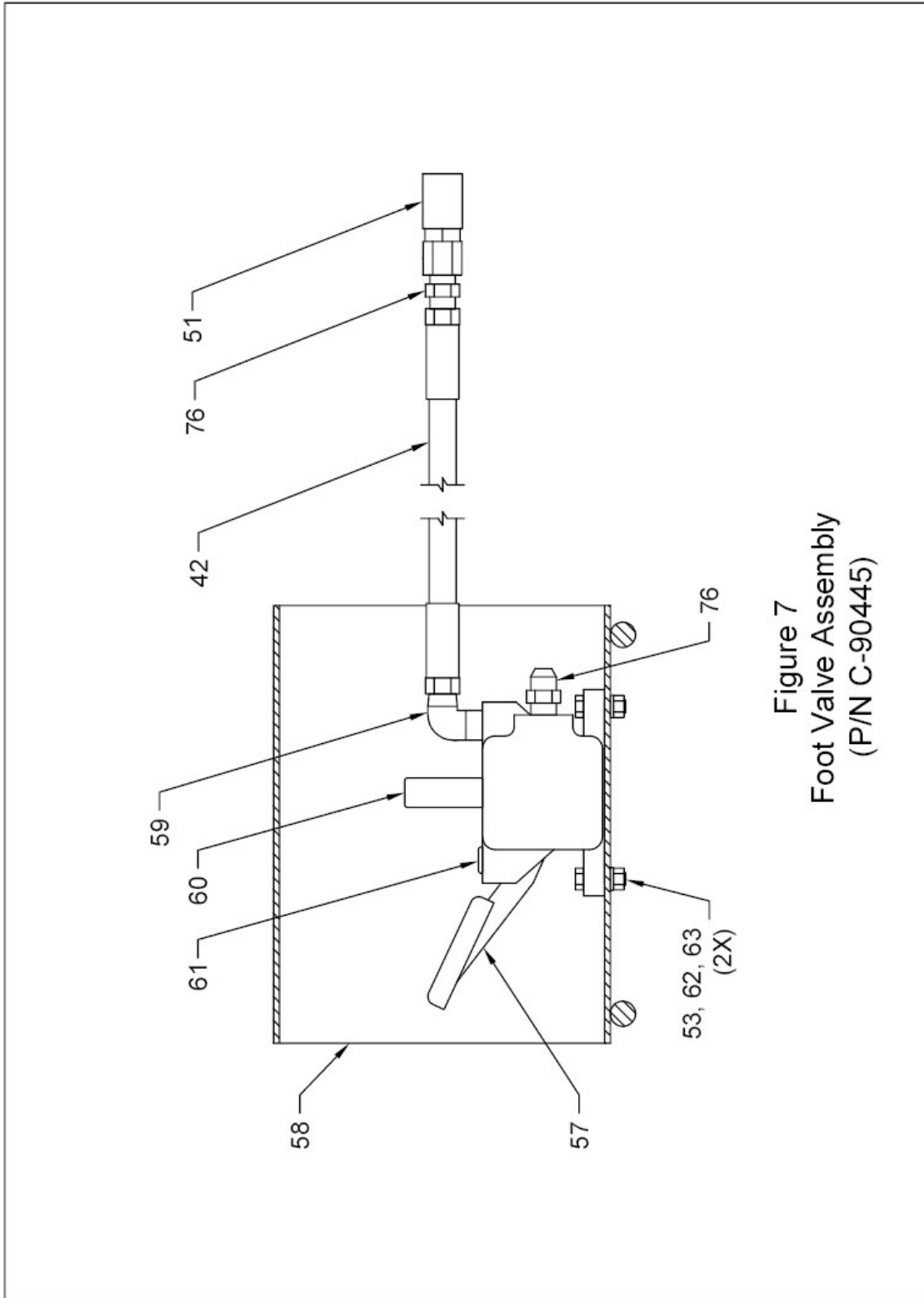


Figure 7
Foot Valve Assembly
(P/N C-90445)