Quad Crank Upper Top Drive Valve and Quad Crank Actuator Assembly

Assembly & Maintenance Procedures

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Return to Table of Contents

SAFETY CONSIDERATIONS

- Safety glasses should be worn along with other protective clothing as required.

- Proper tools and restraining devices (vises, clamps, etc.) should be used to secure the components in a safe manner.

- Operations should be performed in a safe and suitable work area as designated by your supervisor.

- Personnel performing these operations should be familiar with Global top drive valves and actuator assemblies and their uses.

- If unsure of any part of the operations, check with the manufacturer before proceeding.

- ***At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated. Care is to be taken to avoid pinch points between the actuator sleeve, crank assemblies, link assemblies, and other top drive components on which work is being done.***

These instructions are intended for assembly and maintenance of the Global Manufacturing, Inc. Quad Crank Upper Top Drive Valve and the Quad Crank Actuator Assembly only.

Additional Safety Considerations

In addition to the safety procedures described above for performing maintenance on Global Quad Crank Top Drive Valves and Actuator Assemblies, it is necessary to follow all applicable safety procedures related to installing equipment and performing maintenance for each specific type of top drive on which the Quad Crank Upper Top Drive Valve Assembly is installed. Consult the proper rig equipment and top drive manuals for these procedures. Prior to performing any installation or maintenance, rig supervisory personnel are to review the procedures provided in this manual to ensure that the procedures are compatible and suitable for each specific model of top drive on which the Quad Crank Upper Top Drive Valve and Quad Crank Actuator Assembly will be installed. If unsure of any part of the assembly or maintenance procedures in this manual, check with representatives of Global Manufacturing, Inc. before proceeding.

A. Installation for UPPER Ball Actuation

1. Move both the upper and lower balls of the Quad Crank Upper Top Drive Valve to the full open position.

2. Install the Quad Crank Upper Top Drive Valve.

3. With the groove at the bottom, slide actuator sleeve up over the splined end of the valve. Turn the sleeve so that the horizontal slot in the sleeve is opposite the “Close” indicator mark at the upper stem (see **Figure 1**).

4. Move the upper ball to the half open position and move the sleeve so that the crank assembly vertical slots in the sleeve are centered on the upper ball stems (see **Figure 2***)*.

5. Install upper crank assembly (with cam follower) on one side of the valve. Ensure proper orientation of hex of cam follower crank. Also, ensure that the tab on the crank mount is aligned with the cam follower crank (see **Figure 3**). Torque the 0.375-16 UNC grade 8 cap screws 45 to 50 ft-lb.

6. Install upper crank assembly (with cam follower) on the other side of the valve.

7. Make sure that the lower ball is in the full open position. Install the stem lock plates on both of the lower ball stem holes. Torque the 0.375-16 UNC grade 8 cap screws 45 to 50 ft-lb.

8. Safety wire the bolts in the following locations: upper crank assemblies and stem lock plates on the lower ball.

Safety Warning: The safety wire must be properly installed to prevent the crank assemblies and the stem lock plates from vibrating loose and falling to the rig floor. Also, the crank assemblies and stem lock plates must be kept in place to ensure that the valve can be actuated properly.

9. Verify proper operation of the valve.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

Note: For reference, when the active ball is in the fully opened position, the small end of crank will point down at a 45 degree angle as shown in Figures A & C. When the active ball is in the fully closed position, the small end of the crank will point up at a 45 degree angle as shown in Figures B & D.

B. Conversion from Upper Ball Actuation to Lower Ball Actuation

1. Ensure that actuator sleeve is in the fully raised position (upper ball is in the closed position).

2. Remove the stem lock plates from the lower ball stem holes. Manually close the lower ball (see **Figure 4**).

3. Install lower crank assembly (with shoulder bolt hole) in the lower ball stem hole of the Quad Crank Upper Top Drive Valve. Torque the 0.375-16 UNC grade 8 cap screws 45 to 50 ft-lb. Ensure crank with shoulder bolt is in the correct position, which is approximately 2 1/4 inches from the crank shoulder bolt hole to the actuator sleeve shoulder bolt hole (see **Figure 5**).

4. Install clevis onto actuator sleeve with shoulder bolt, nut, and cotter pin. Note proper orientation of clevis (see markings on clevis). (See **Figure 6**.) Be sure that the end of the clevis marked "SLEEVE" is connected to the actuator sleeve.

Note: Each side of the valve requires unique clevis geometry. Make sure that each clevis is installed with the relief ("horse shoe – U shaped") side of the clevis facing towards the stem.

5. Connect clevis to crank with shoulder bolt, nut, and cotter pin (see **Figure 7**). Be sure that the end of the clevis marked "CRANK" is connected to the crank.

6. Repeat steps 3, 4, and 5 for the other side of the valve.

7. Move the actuator sleeve to the half raised position (upper ball is half open). Remove the upper crank assemblies from both sides of the valve.

8. Manually open the upper ball. Install the stem lock plates in both of the upper ball stem holes (see **Figure 8).** Torque the 0.375-16 UNC grade 8 cap screws 45 to 50 ft-lb.

9. Safety wire the bolts in the following locations: lower crank assemblies and stem lock plates on the upper ball.

10. Make sure that the safety cotter pins have been properly installed and secured in the shoulder bolts. The safety cotter pins prevent the nuts on the backside of the clevises from backing off.

Safety Warning: The safety cotter pins and safety wire must be properly installed to prevent the crank assemblies and the stem lock plates from vibrating loose and falling to the rig floor. Also, the crank assemblies and stem lock plates must be kept in place to ensure that the valve can be actuated properly.

11. Verify proper operation of the valve. After completing the operation, check on the valve, perform a second safety check, and verify that all of the required bolts have been wired and that the safety cotter pins are properly installed.

At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

Note: For reference, when the active ball is in the fully opened position, the small end of crank will point down at a 45 degree angle as shown in Figures A & C. When the active ball is in the fully closed position, the small end of the crank will point up at a 45 degree angle as shown in Figures B & D.

C. Preventive Maintenance of Quad Crank Upper Top Drive Valve Used with Quad Crank Actuator Assembly

Inspect all parts for damage, wear or corrosion. If parts are damaged, determine the cause of the damage, correct the problem, and replace the damaged parts before putting the unit back in service. Replace all worn or corroded parts as soon as possible.

Preventive maintenance should be performed on both balls in the Quad Crank Upper Top Drive Valve that are used with the Global Quad Crank Actuator Assembly. The ball that is being used (actuated) is referred to as the "***active ball***." The ball that is not being used and is locked in the open position with the stem lock plates is referred to as the "***reserve ball***." For example, if the upper ball is being used (actuated), then the upper ball is designated as the "***active ball***," and the lower ball that is locked in the open position with the stem lock plates would be designated as the "***reserve ball***." See **Figures A & B**. When the lower ball is put into service and is being used, the lower ball would be designated as the "***active ball***," and the upper ball that is locked with the stem lock plates would be designated as the "***reserve ball***." See **Figures C & D**.

"*Active Ball*" Greasing Procedure

Lubricate the "***active ball***" once a week:

1. Fully open the valve. See **Figures A & C**.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

2. Pump a small volume of fresh water through the valve to remove drilling mud residue from the bore of the valve. Safely reduce the pressure in the valve until there is no pressure remaining in the valve.

3. Remove the 1/4" NPT plug from the grease port in the body for the "***active ball***."

4. Install a grease fitting into the 1/4" NPT grease port, and torque the grease fitting to approximately 15 to 20 ft-lbs.

5. With the ball in the open position, apply Oil Center Research, Inc.'s Liquid-O-Ring 600/1 Valve Life grease to the valve through the grease fitting from a manual grease gun. For a standard bore (3 1/16" ID) valve, use 45 strokes from a manual grease gun. For a large bore (3 3/4" ID) valve, use 120 strokes from a manual grease gun. *Note: The grease pressure should not exceed 150 psi.*

6. Remove the grease fitting from the grease port.

7. Reinstall the 1/4" NPT plug into the grease port and torque to approximately 15 to 20 ft-lbs.

8. Grease crank assemblies with two strokes each from a manual grease gun (see **Figures A & C**).

"*Reserve Ball*" Greasing Procedures

Weekly Maintenance Procedure – "*Reserve Ball*"

Lubricate the "***reserve ball***" once a week:

1. The "***reserve ball***" is to be greased with the "***reserve ball***" fully opened (see **Figures A & C)** and locked in place with the stem lock plates.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

2. Pump a small volume of fresh water through the valve to remove drilling mud residue from the bore of the valve. Safely reduce the pressure in the valve until there is no pressure remaining in the valve.

3. Remove the 1/4" NPT plug from the grease port in the body for the "***reserve ball***."

4. Install a grease fitting into the 1/4" NPT grease port, and torque the grease fitting to approximately 15 to 20 ft-lbs.

5. With the ball in the open position, apply Oil Center Research, Inc.'s Liquid-O-Ring 600/1 Valve Life grease to the valve through the grease fitting from a manual grease gun. For a standard bore (3 1/16" ID) valve, use 45 strokes from a manual grease gun. For a large bore (3 3/4" ID) valve, use 120 strokes from a manual grease gun. *Note: The grease pressure should not exceed 150 psi.*

6. Remove the grease fitting from the grease port.

7. Reinstall the 1/4" NPT plug into the grease port and torque to approximately 15 to 20 ft-lbs.

Monthly Maintenance Procedure – "*Reserve Ball*"

Once a month after performing the weekly greasing procedure, the "***reserve ball***" is to be cycled from the opened position to the closed position and then opened back up and re-secured in the fully opened and locked position.

1. Pump a small volume of fresh water through the valve to remove drilling mud residue from the bore of the valve. Safely reduce the pressure in the valve until there is no pressure remaining in the valve.

2. Position the Quad Crank Actuator Sleeve so that the stem lock plates on the "***reserve ball***" are accessible.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

   2a. If the lower ball is the "***reserve ball***," then move the sleeve to the up (ball closed) position. See **Figure B**.

   2b. If the upper ball is the "***reserve ball***", then move the sleeve to the half up (ball half open) position. See **Figure E**.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

3. Remove the safety wires and stem lock plates on both sides of the valve.

4. Once the stem lock plates have been removed, the valve stems can be accessed with the hex wrench.

5. Cycle the "**reserve ball**" from the fully opened position to the fully closed position once.

6. Open the "***reserve ball***" back to the fully opened position.

7. Install the stem lock plates on both of the "***reserve ball***" stem holes. Torque the 0.375-16 UNC grade 8 cap screws 45 to 50 ft-lb.

8. Wire the bolts for the stem lock plates on the "***reserve ball***" (2 places each).

Safety Warning: The safety cotter pins and safety wire must be properly installed to prevent the crank assemblies and the stem lock plates from vibrating loose and falling to the rig floor. Also, the crank assemblies and stem lock plates must be kept in place to ensure that the valve can be actuated properly.

D. Procedure for Removing the Quad Crank Upper Top Drive Valve from Service

1. Move both balls to the fully open position. See **Figures A & C**.

   At all times, personnel should take care to stand clear of the top drive while the actuator assembly is being operated.

2. Safely reduce the pressure in the valve until there is no pressure remaining in the valve.

3. Disassemble the actuator assembly in reverse order of the assembly procedure.

4. Remove the valve from the string.

Note: A pressure relief port has been provided in the Quad Crank Upper Top Drive Valve for the valve manufacturer's use only. Rig personnel are to contact Global Manufacturing in the event that the pressure port needs to be accessed on the rig.

Revision 5 Manual Note: This manual has been updated based on the current configuration of the Quad Crank Upper Top Drive Valve and Quad Crank Actuator Assembly. Future updates to the manual will be made based on feedback from rigs that are using the Global Quad Crank Valve and Actuator Assembly and based on future refinements that may be made to the Quad Valve and Actuator System.

Patent Pending

Figure 1

Quad Crank Top Drive Valve and Actuator Assembly

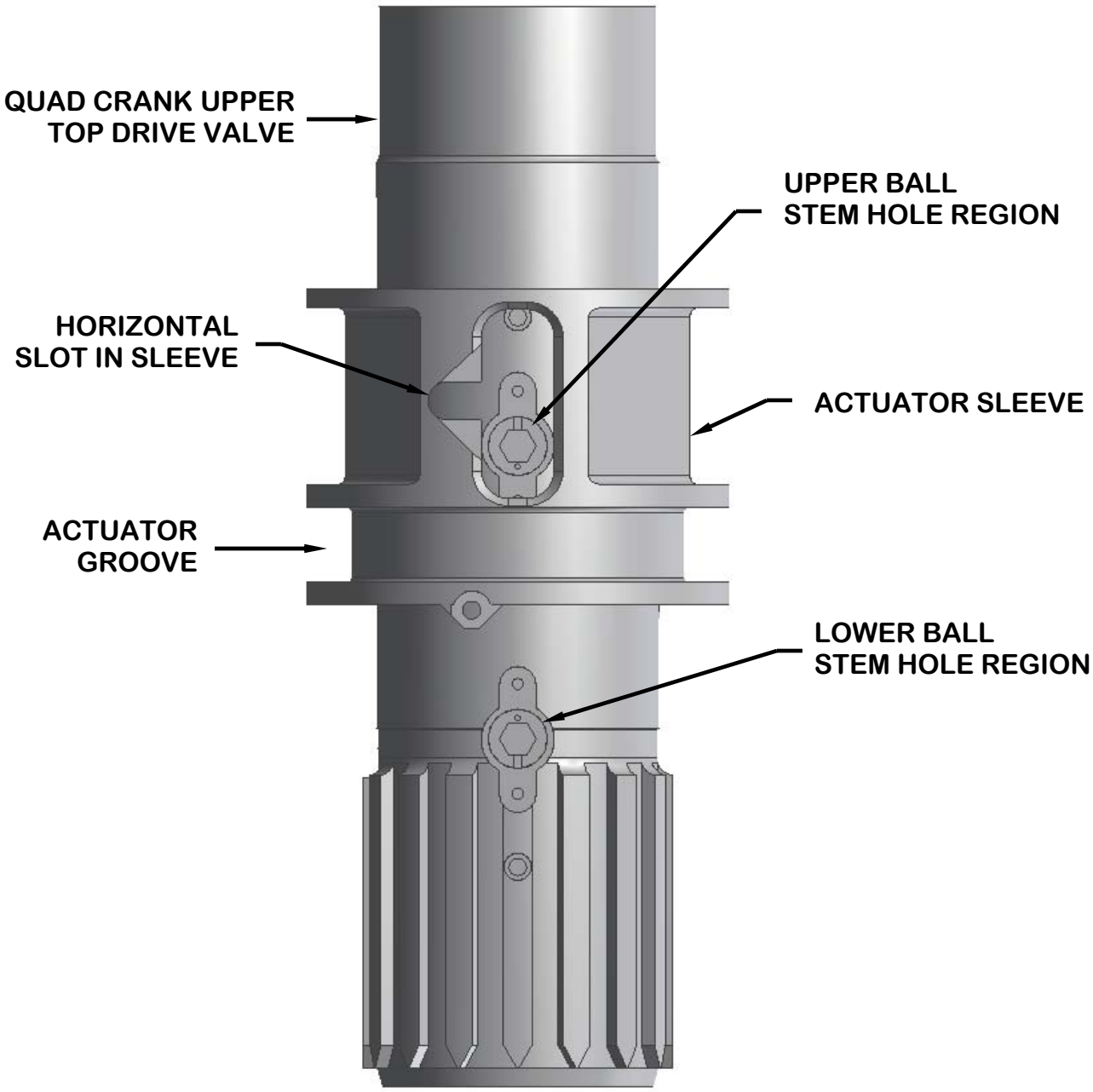


Figure 2

Actuator Sleeve on Upper Ball

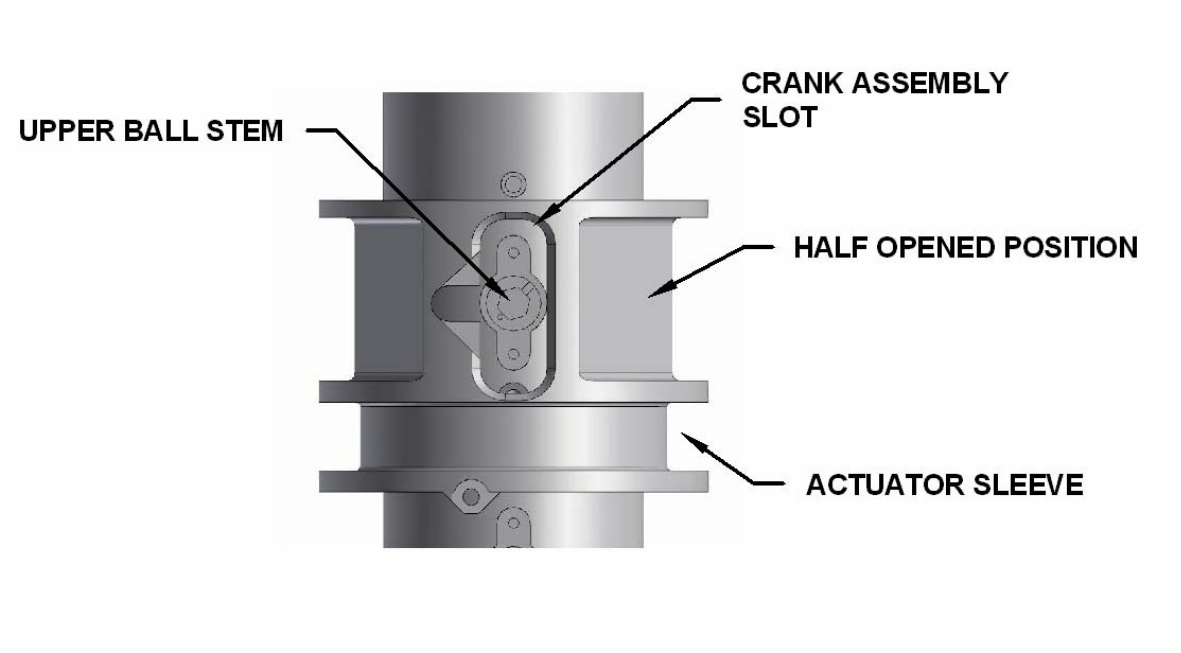


Figure 3

Upper Crank Assembly (w/ Cam Follower) and Lower Crank Assembly w/ Shoulder Bolt Hole

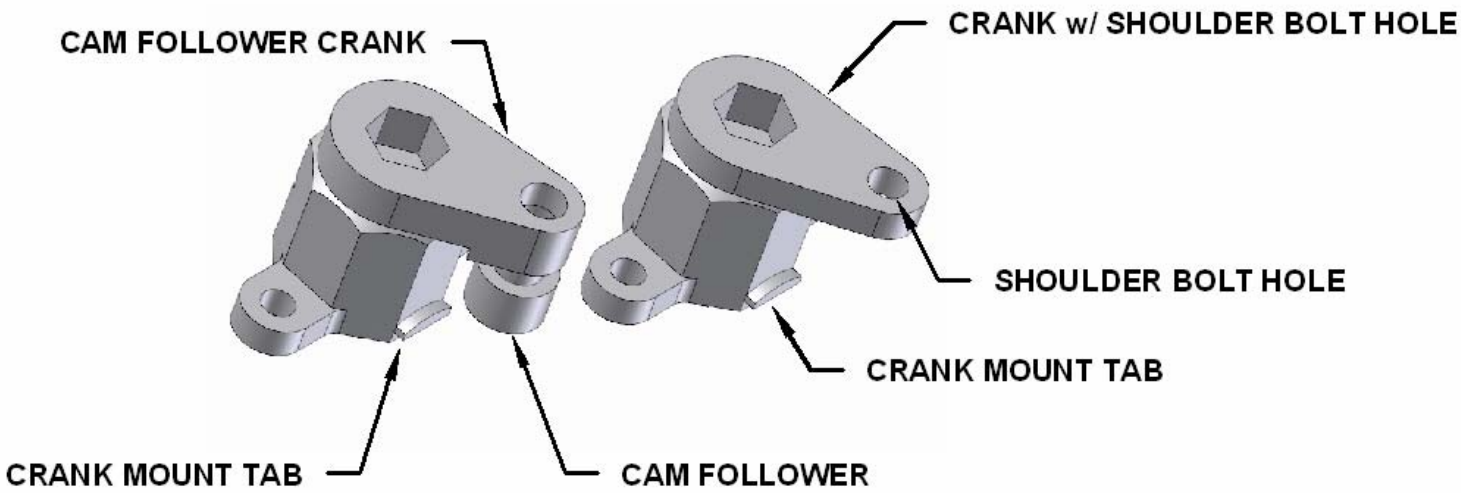
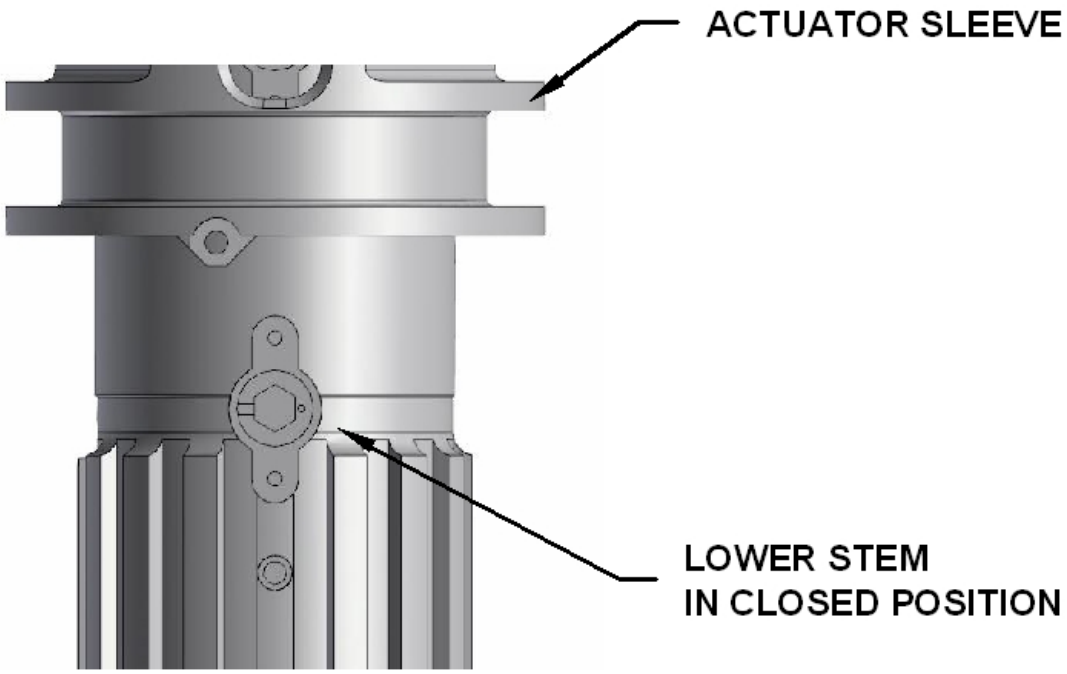


Figure 4

Lower Crank Assembly on Lower Ball



Figures 5

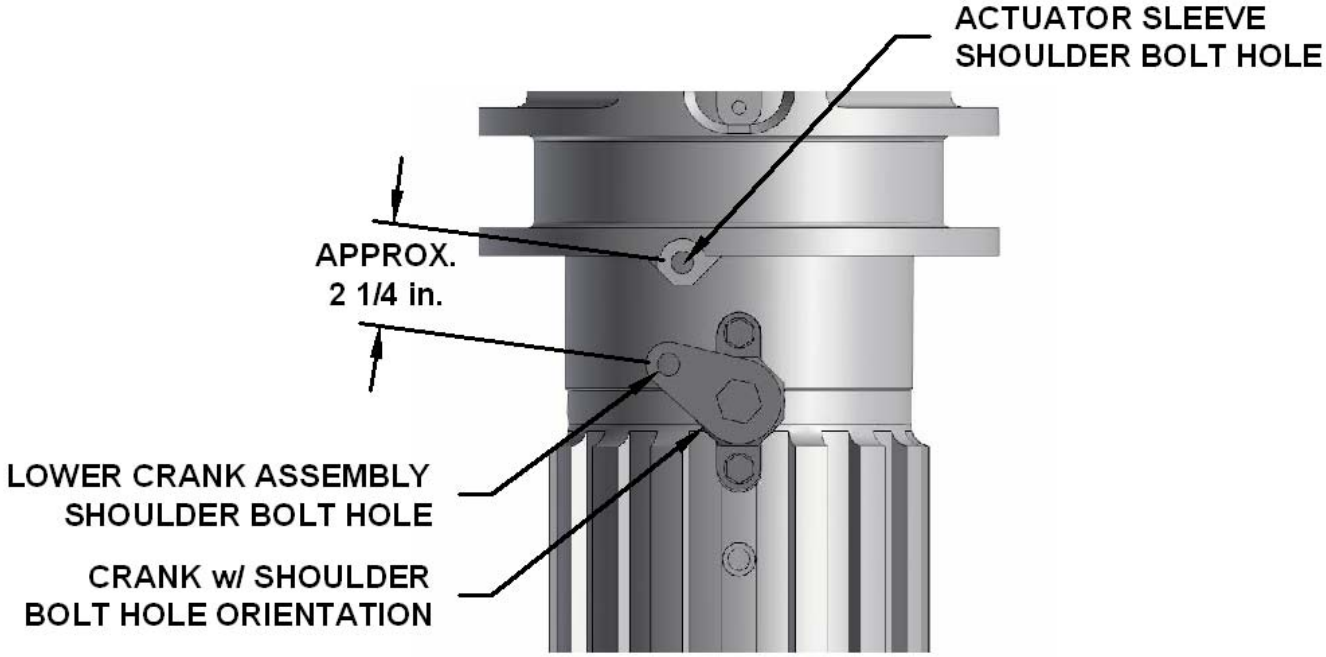


Figure 6

Lower Crank Assembly on Lower Ball

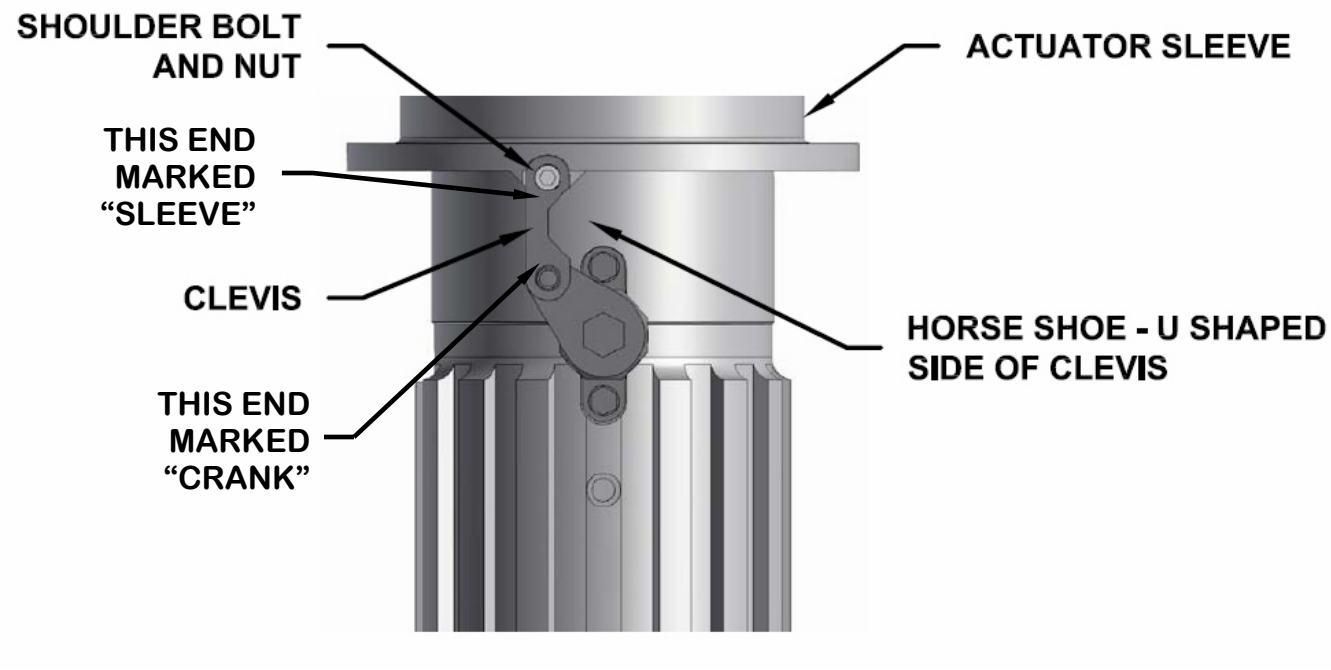


Figure 7

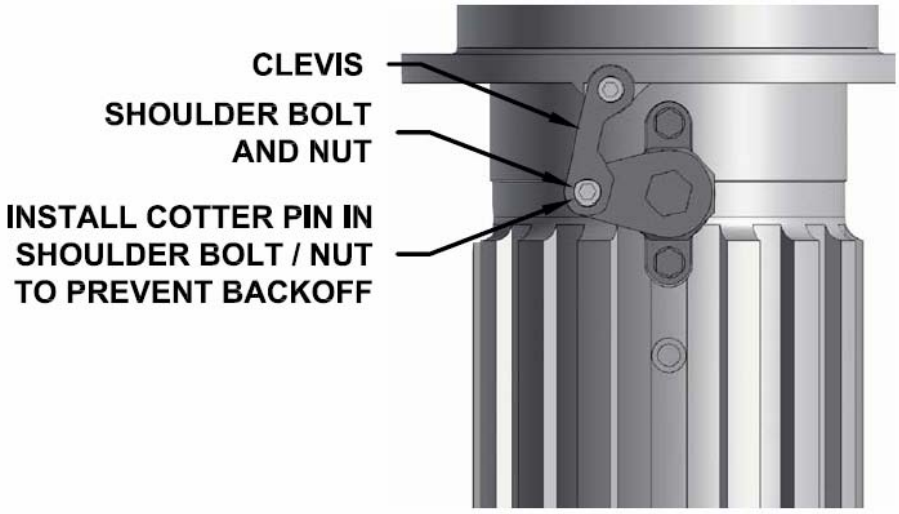
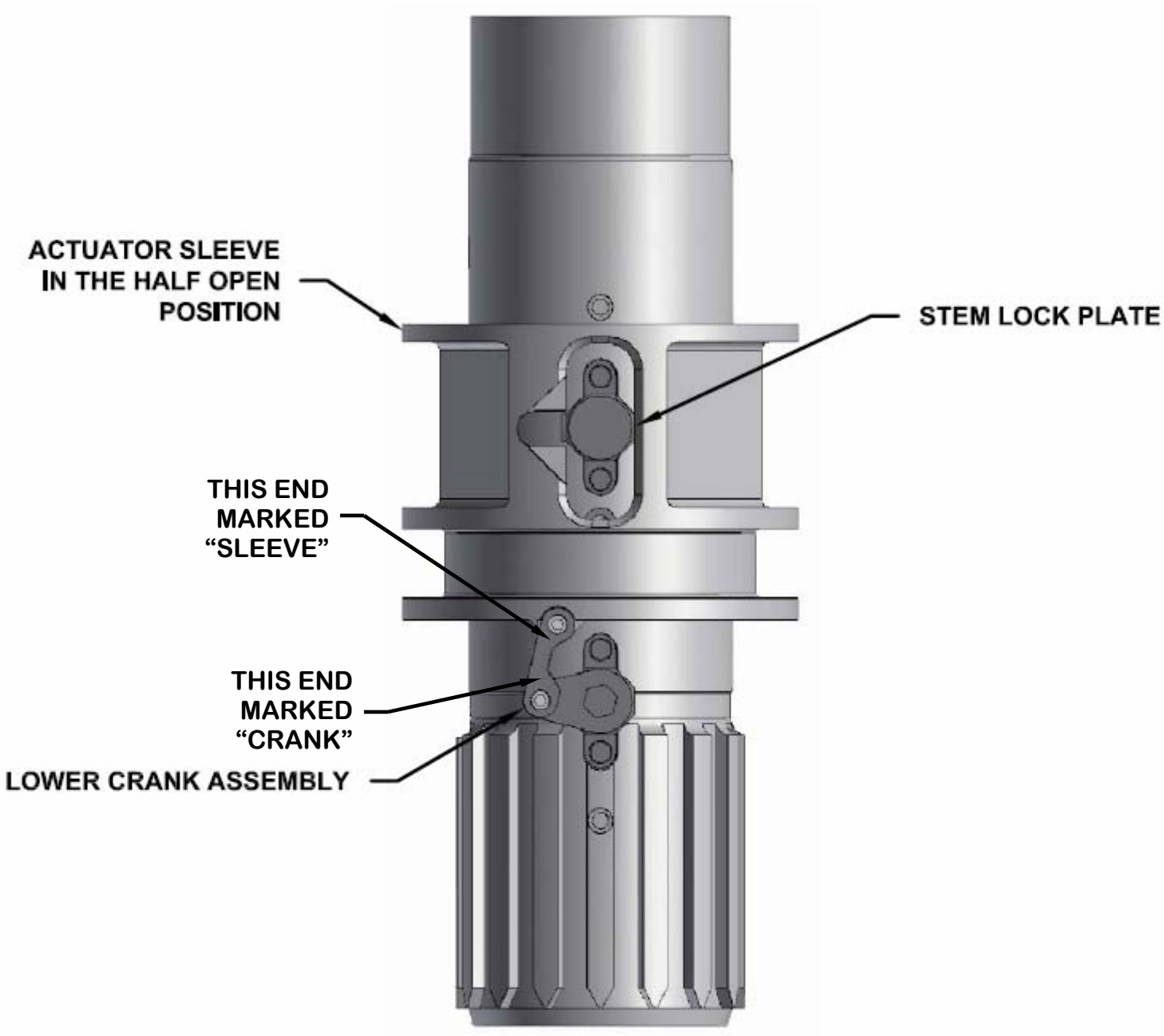


Figure 8

Lower Crank Assembly on Lower Ball



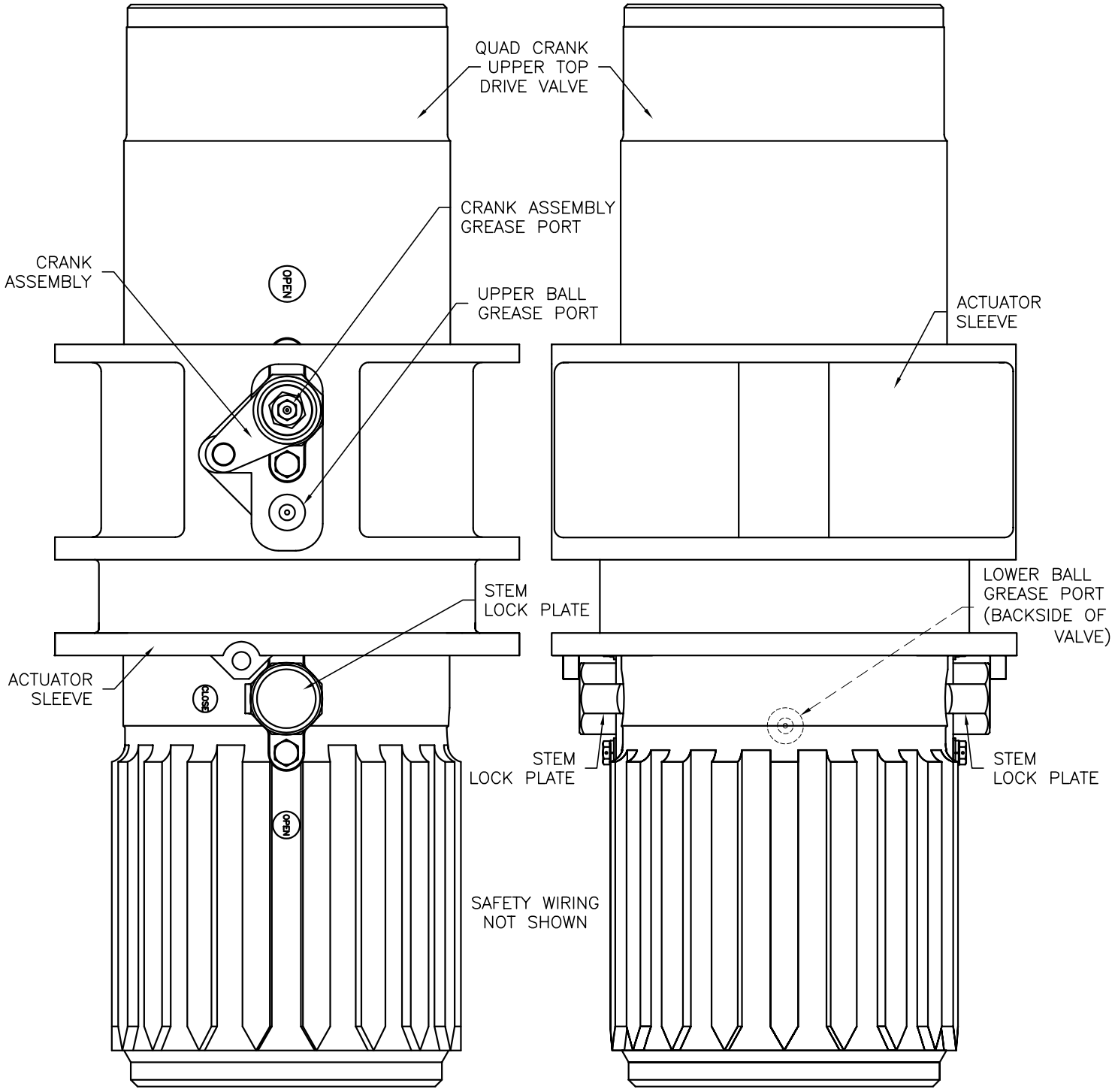


FIGURE A:
ACTIVE UPPER BALL, RESERVE LOWER BALL,
SLEEVE IN THE DOWN (BALL OPEN) POSITION

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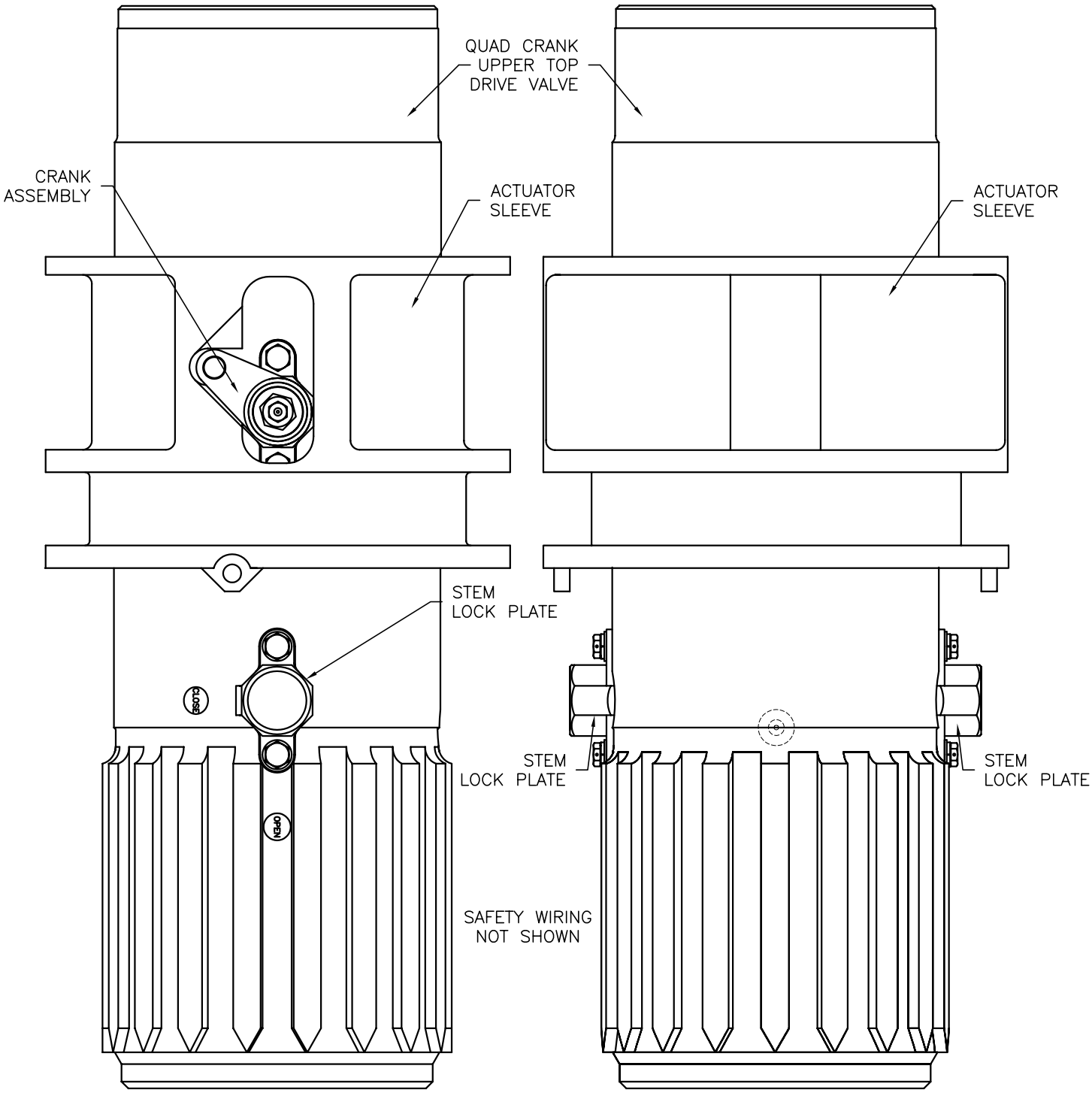

FIGURE B:
ACTIVE UPPER BALL, RESERVE LOWER BALL,
SLEEVE IN THE UP (BALL CLOSED) POSITION

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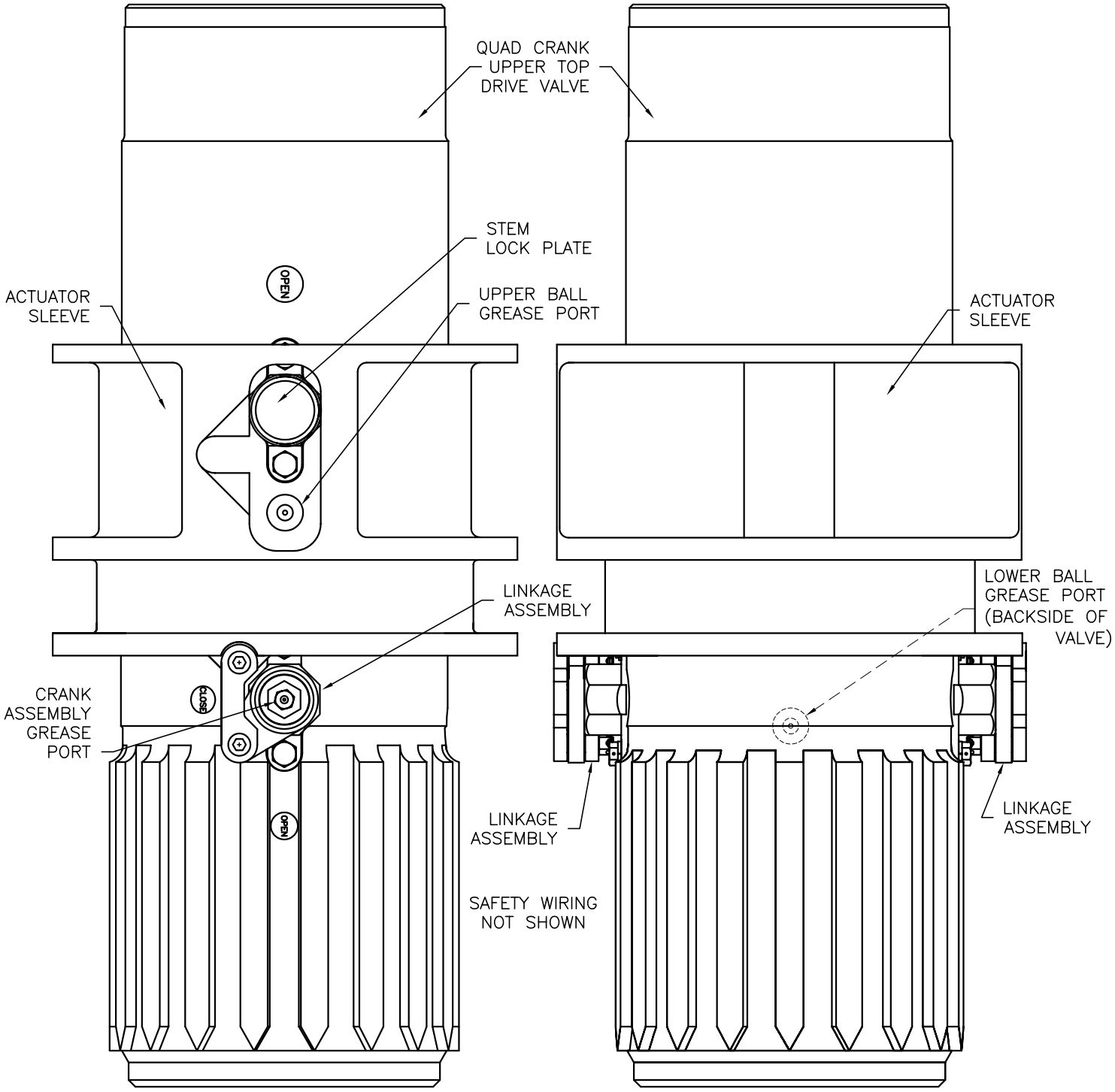

FIGURE C:
ACTIVE LOWER BALL, RESERVE UPPER BALL,
SLEEVE IN THE DOWN (BALL OPEN) POSITION

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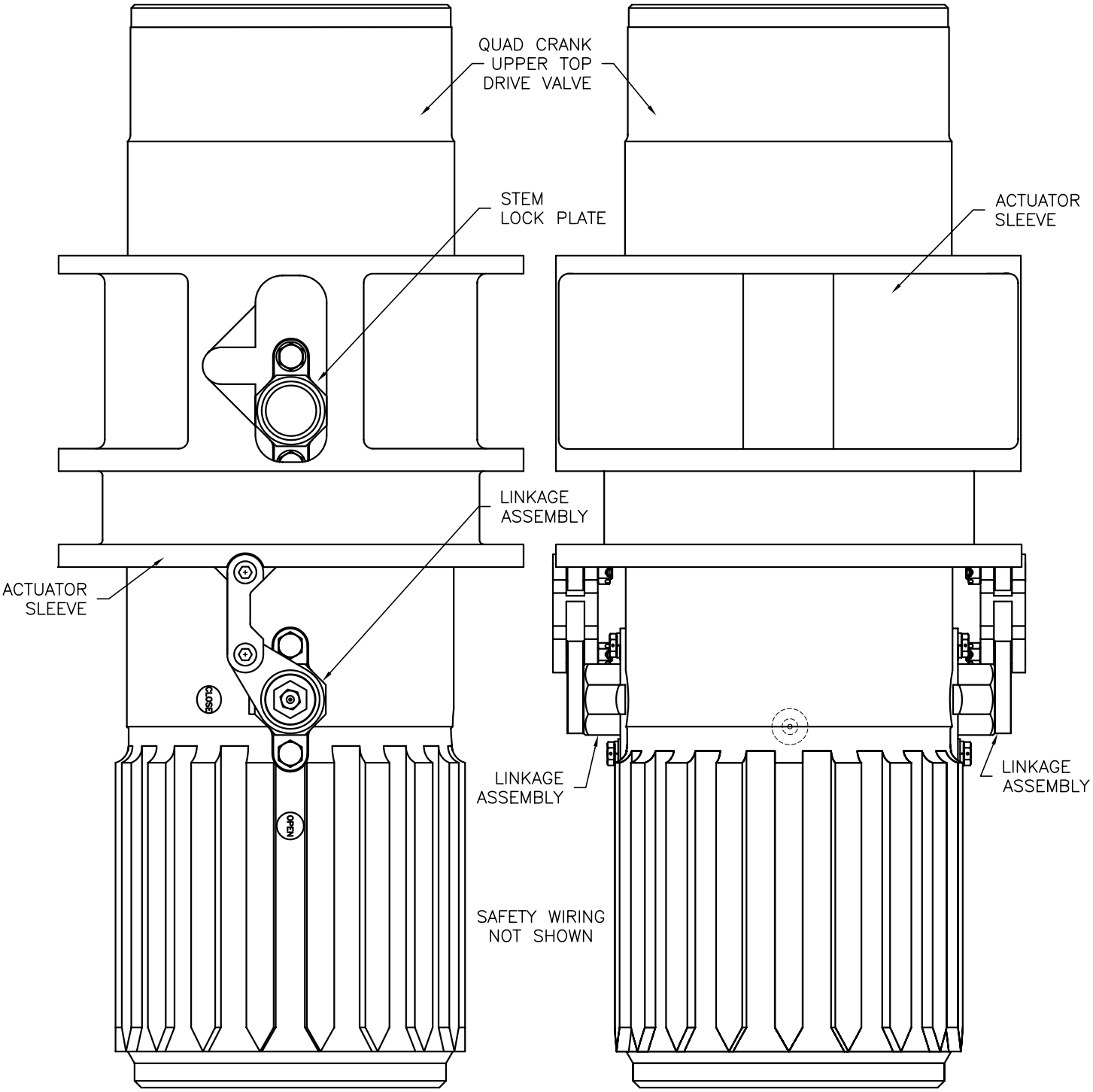

FIGURE D:
ACTIVE LOWER BALL, RESERVE UPPER BALL,
SLEEVE IN THE UP (BALL CLOSED) POSITION

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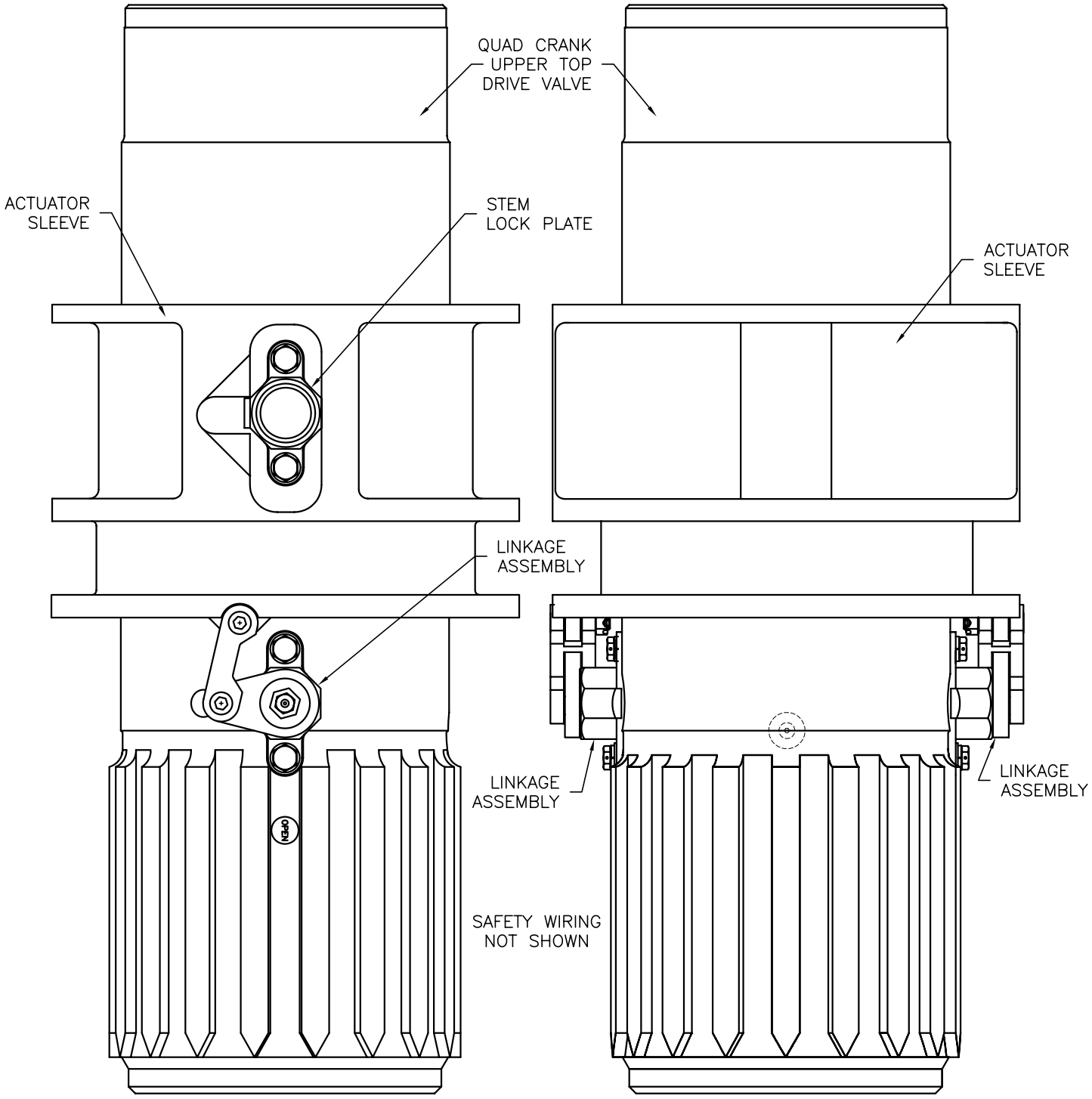

FIGURE E:
ACTIVE LOWER BALL, RESERVE UPPER BALL,
SLEEVE IN THE HALF UP (BALL HALF OPEN) POSITION

Return to Table of Contents

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