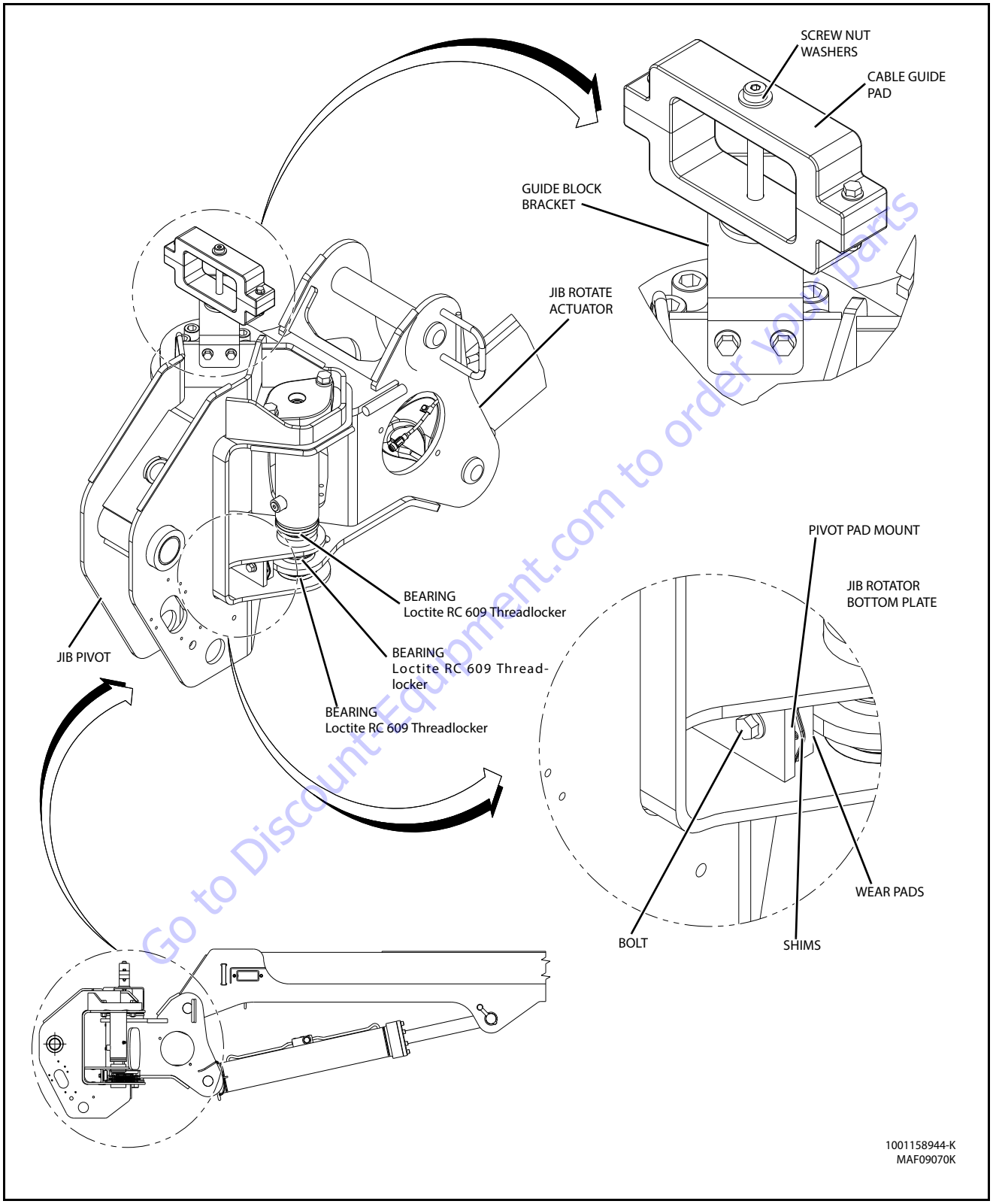
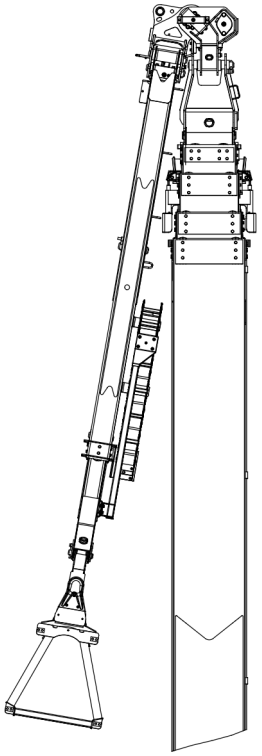


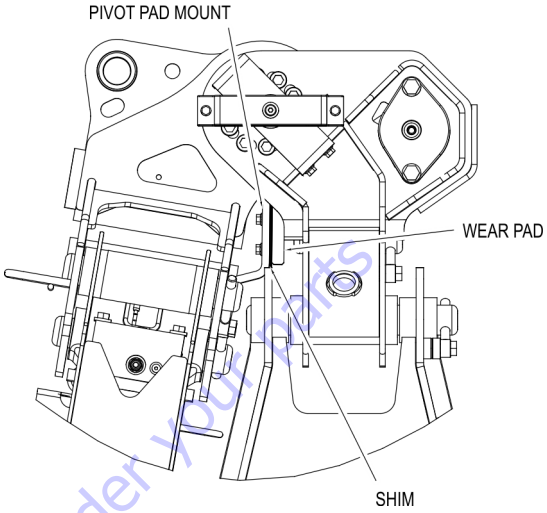
Figure 4-38. Jib Assembly - Sheet 4 of 4

Stowed Jib Shimming Procedure

1. Rotate the jib to the appropriate position as shown below.



2. Insert a shim between the wear pad and pivot pad mount.



3. Add shims as required to fill the gap between the wear pad and the edge of the side plate of the jib rotator.
4. Shim until the distance between the jib and the side of the base boom reaches the dimension shown in Figure 4-39., Jib Stow Shimming Measurements.

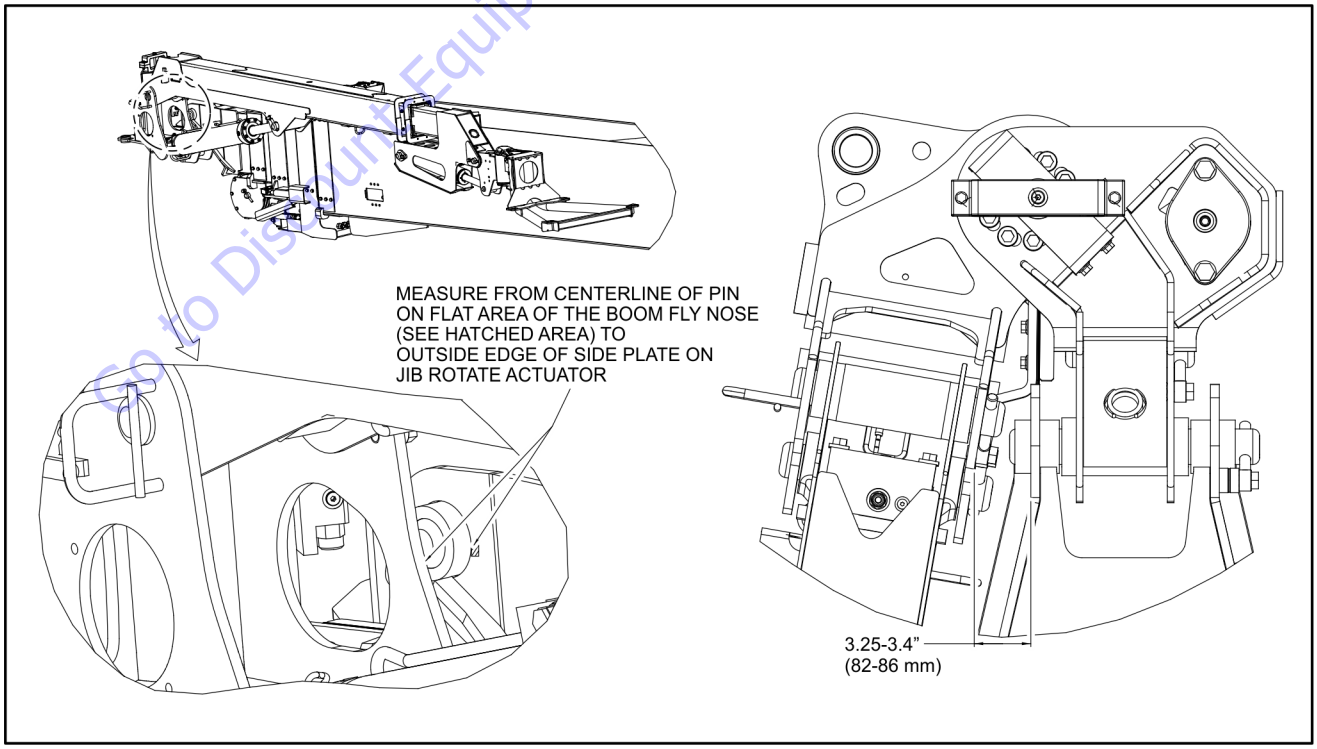


Figure 4-39. Jib Stow Shimming Measurements

4.13 WIRE ROPE

⚠ CAUTION

WIRE ROPE CAN HAVE SHARP EDGES AND CAUSE SERIOUS INJURY. NEVER HANDLE WIRE ROPE WITH BARE HANDS.

Each day before using machine:

1. Raise main boom approximately horizontal.
2. Extend and retract the boom sections.
3. Check for delayed movement of fly section which indicates loose wire ropes.

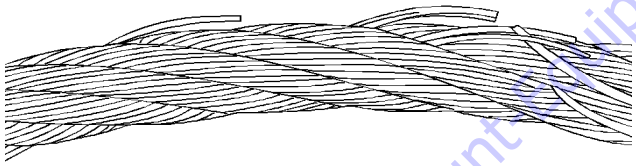
⚠ WARNING

IF DELAYED MOVEMENT IS DETECTED IN WIRE ROPE OPERATION, LOWER PLATFORM TO STOWED POSITION, SHUT DOWN MACHINE, AND HAVE WIRE ROPES INSPECTED/SERVICED BY A QUALIFIED JLG MECHANIC. LOOSE OR MISADJUSTED WIRE ROPES COULD RESULT IN SERIOUS INJURY OR DEATH.

Inspection

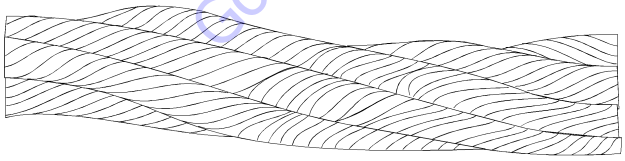
NOTE: *The pictures in this paragraph are just samples to show the replacement criteria of the rope.*

1. Inspect ropes for broken wires, particularly valley wire breaks and breaks at end terminations.



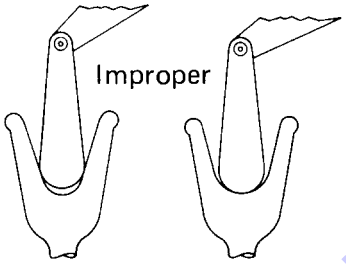
Flexing a wire rope can often expose broken wires hidden in valleys between strands.

2. Inspect ropes for corrosion.
3. Inspect ropes for kinks or abuse.



A kink is caused by pulling down a loop in a slack line during improper handling, installation, or operation.

4. Inspect sheaves for condition of bearings/pins. (See Dimension Of Sheaves for proper dimension.)
5. Inspect sheaves for condition of flanges. (See Dimension Of Sheaves for proper dimension.)
6. Inspect sheaves with a groove wearout gauge for excessive wear.



Observe the groove so that it may be clearly seen whether the contour of the gauge matches the contour of the bottom of the groove.

7. Ropes passing inspection should be lubricated with wire rope lubricant before reassembly.

Three Month Inspection

1. Remove boom covers and visually (with flashlight) inspect the ropes for rust, broken wires, frays, abuse, or any signs of abnormalities.
2. Check rope tension by deflecting the ropes by hand...properly tensioned ropes should have little or no movement.

NOTE: *Delayed movement of the fly boom indicates loose wire ropes.*

Additional Inspection Required If:

1. Machine is exposed to hostile environment or conditions.
2. Erratic boom operation or unusual noise exists.
3. Machine is idle for an extended period.
4. Boom is overloaded or sustained a shock load.
5. Boom exposed to electrical arc. Wires may be fused internally.

12 Year or 7000 Hour Replacement

1. Mandatory wire rope and sheave replacement.

Additional Replacement Criteria

1. Sheaves and wire rope must be replaced as sets.
2. Rusted or corroded wire ropes.
3. Kinked, "bird caged", or crushed ropes.
4. Ropes at end of adjustment range.
5. Sheaves failing wearout gage inspection.

6. Ropes with 6 total broken wires in one rope lay, 3 in one strand in one rope lay, 1 valley break, or 1 break at any end termination.

4.14 WIRE ROPE TENSIONING ADJUSTMENT

If new wire ropes are installed, there is a general starting point for the initial exposed thread length for each wire rope adjuster stud. Refer to Figure 4-40., Fully Retracted Boom Section Positions for these dimensions. The proper position of the boom sections (See Figure 4-40.) must be achieved with wire rope equalized on both sides of the sheaves and ropes properly seated in sheave grooves prior to tensioning. This will allow for proper tensioning of the wire ropes.

There are two major steps to this procedure:

- Positioning the boom sections so proper tensioning can be achieved
- Tensioning the wire rope

Boom Preparation for Section Repositioning

NOTE: *Because each rope actuated section controls the movement of the next smaller section, any repositioning of the larger will affect the position of the next smaller. Correctly position Section #3 before setting the position of Section #4, followed by section #5.*

Use the Boom Telescope function to position the boom sections. Using the wire rope adjustment nuts to position the boom sections will cause damage to the wire rope adjusters.

1. Before making any adjustments, confirm the boom assembly is in the fully retracted position (See Figure 4-40., Fully Retracted Boom Section Positions).
2. Take preliminary measurements of the position of each boom section with the boom in the fully retracted position and compare them to Figure 4-40., Fully Retracted Boom Section Positions.
3. If the measurements fall within tolerance shown on Figure 4-40., proceed to the Wire Rope Tensioning Procedure.

NOTE: *Proper boom position does not confirm that rope tension is correct, at this point.*

4. If the measurements do not fall within the tolerances in Figure 4-40., adjust the position using the re-position procedures in this sub-section

BOOM SECTION #2 REPOSITIONING:

NOTE: *Boom Section #2 is positioned by the telescope cylinder. No adjustments to this section are necessary. The wire ropes within this assembly only control the movement of the remaining smaller sections.*

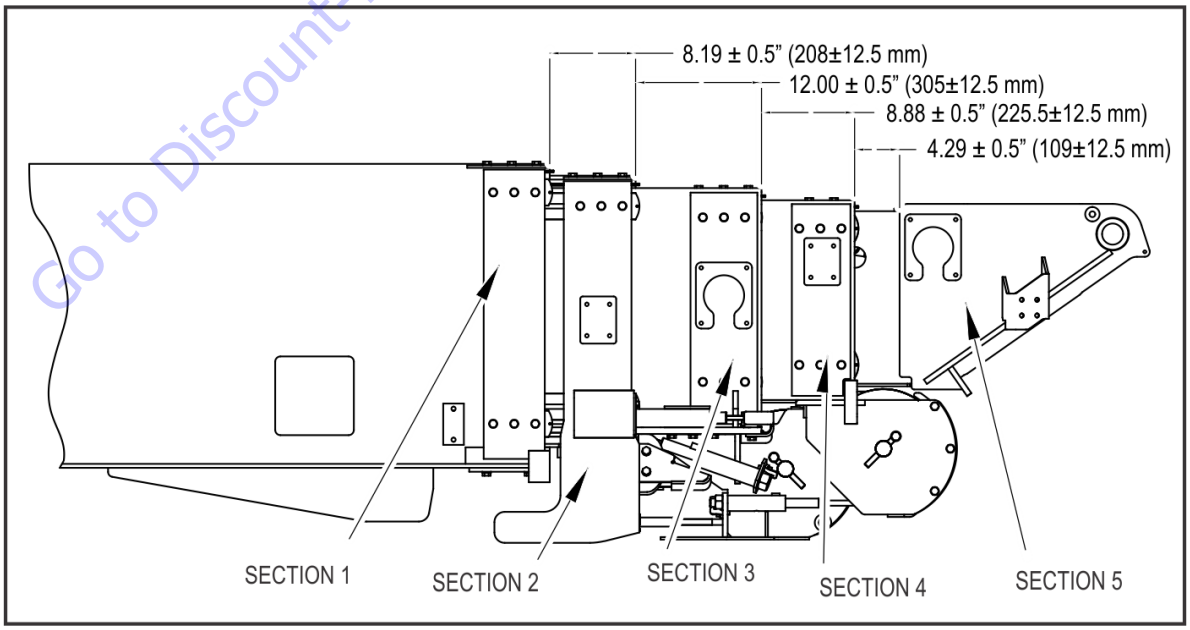


Figure 4-40. Fully Retracted Boom Section Positions

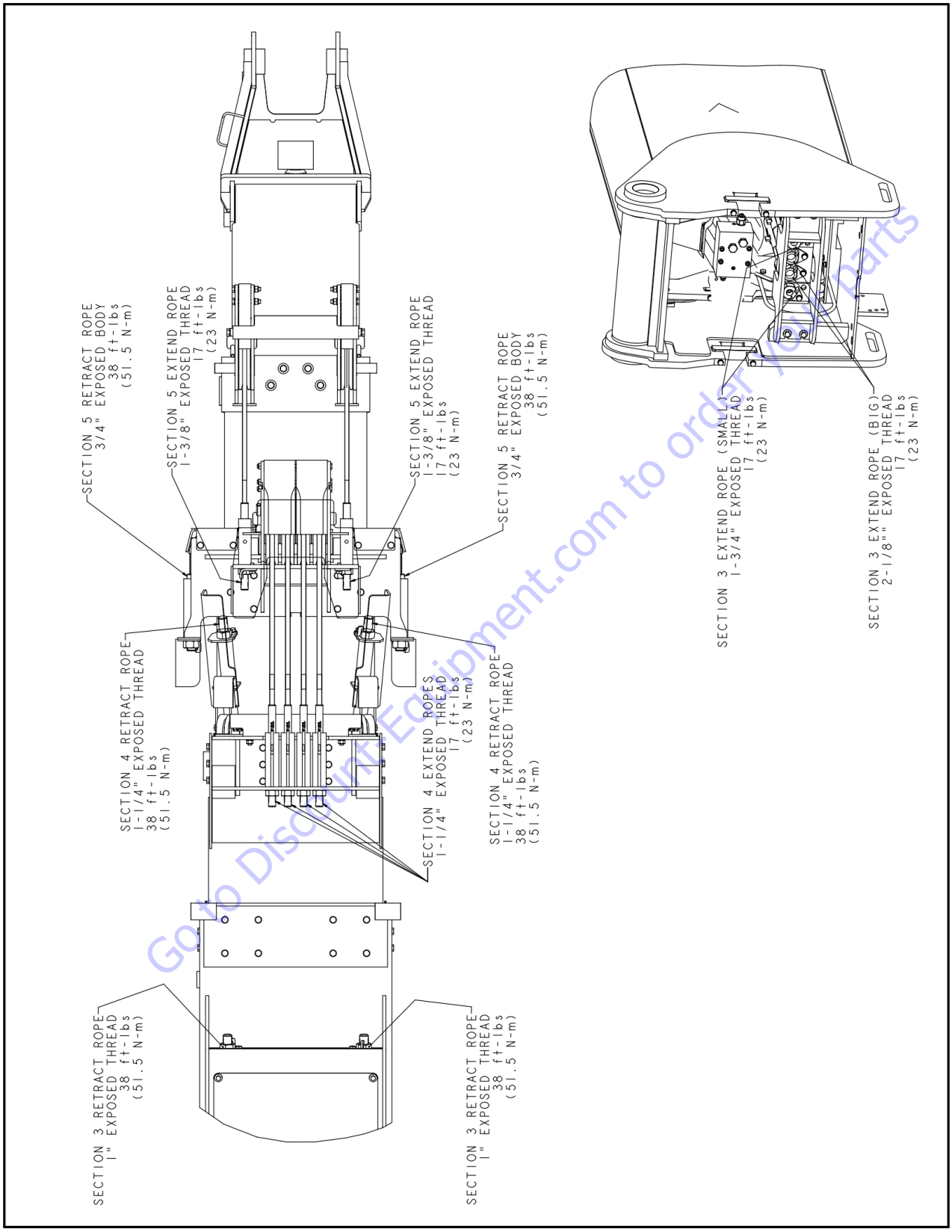
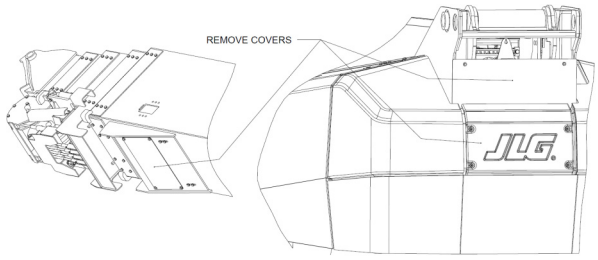


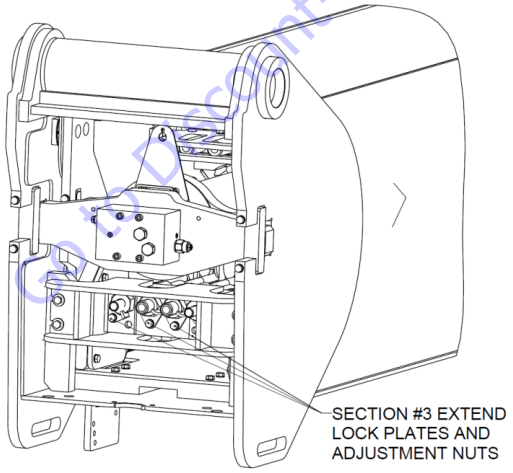
Figure 4-41. Initial Exposed Thread Length for Wire Rope Adjustment

BOOM SECTION #3 REPOSITIONING:

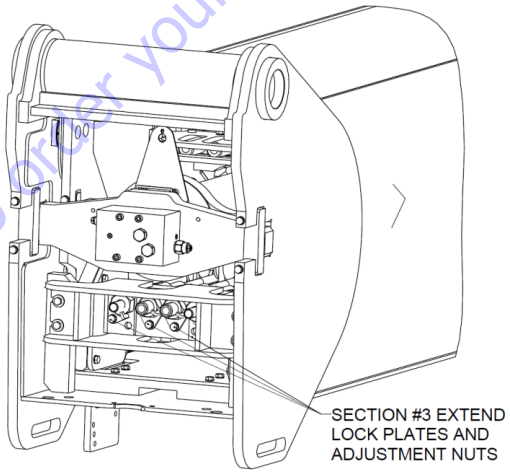
1. If Boom Section #3 falls within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, proceed to Boom Section #4 Repositioning procedure in this section.
2. If Boom Section #3 does not fall within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, perform the following procedure:
3. If the Section needs to be RETRACTED (measured dimension is greater than dimension shown in Figure 4-40.):
   a. Remove any covers necessary to access the wire rope adjustment nuts.



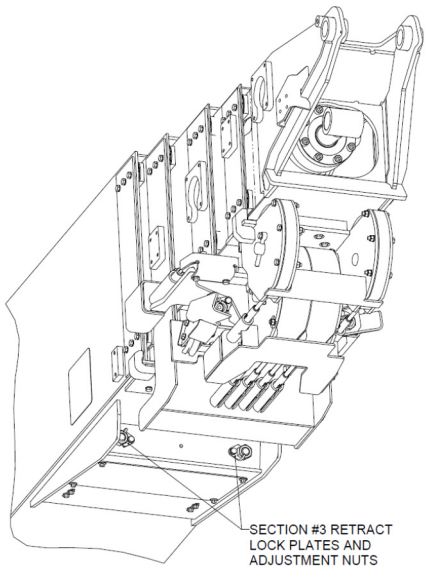
   b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.
   c. Loosen the Section #3 Extend Adjustment Nuts, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)



   d. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.
   e. Tighten the Section #3 Retract Adjustment Nuts, moving them a distance equal to what the section needs to move to be within tolerance (for example, if the section must move 0.5 inches to fall within the dimension shown, tighten the nut so it moves 0.5 inches further from the exposed end of the adjustment stud).
   f. Fully retract the boom.
   g. To remove slack resulting from the adjustment in step e., tighten the Section #4 Extend adjustment.
   h. To remove slack resulting from the adjustment in step d., tighten the Section #4 Retract Adjustment Nuts shown below until they contact the rope mount plate.

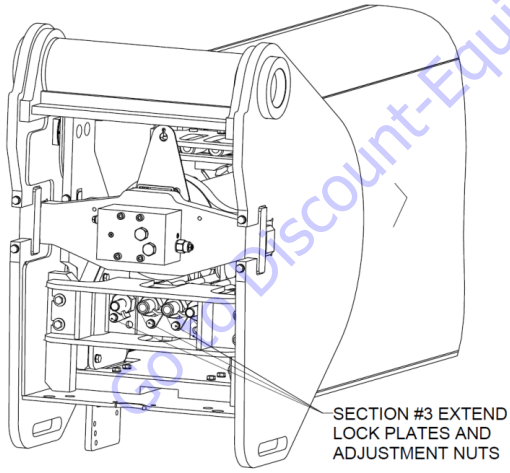


   i. Extend the boom assembly so the platform moves 4 to 5 feet, then fully retract.
   j. Repeat step i three times to equalize rope position.
   k. Go to step 5.
4. If the Section needs to be EXTENDED (measured dimension is less than dimension shown in Figure 4-40.):
   a. Remove any covers necessary to access the wire rope adjustment nuts.
   b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.
   c. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.
   d. Loosen the Section #3 Retract Adjustment Nuts, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)



e. Retract the boom assembly such that the platform moves 2 to 3 feet (0.6m-0.9m) from the previous extended position in Step c.

f. Tighten the Section #3 Extend Adjustment Nuts shown below, moving them a distance equal to what the section needs to move to be within tolerance. (For example, if the section must move 0.5 inches to fall within the dimension shown, tighten the nut such that it moves 0.5 inches further from the exposed end of the adjustment stud.)



g. To remove slack resulting from the adjustment in Step d., tighten the Section #4 Extend Adjustment Nuts until they contact the rope mount plate.

h. Extend the boom assembly so the platform moves 4 to 5 feet, then fully retract.

i. Repeat Step h. three times to equalize rope position.

j. Go to Step 5.

5. Fully retract the boom sections.

6. Verify that the exposed boom section dimensions meet the dimension and tolerance of Figure 4-40..

a. If Section #3 still does not fall within the dimension and tolerance of Figure 4-40., repeat the steps outlined in 3. Boom Section #3 Repositioning.

b. If Section #3 does fall within the dimension and tolerance of Figure 4-40., proceed to 4. Boom Section #4 Repositioning.

BOOM SECTION #4 REPOSITIONING:

1. If Boom Section #4 falls within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, proceed to Boom Section #5 Repositioning procedure in this section.

2. If Boom Section #4 does not fall within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, perform the following procedure:

3. If the Section needs to be RETRACTED (measured dimension is greater than dimension shown in Figure 4-40.):

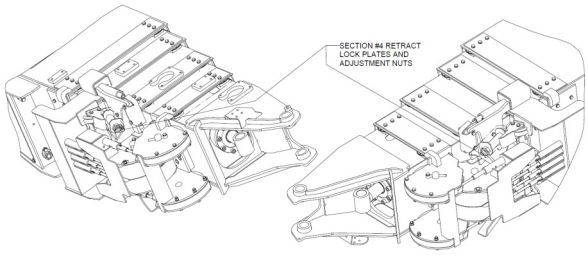
a. Remove any covers necessary to access the wire rope adjustment nuts.

b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.

c. Loosen the Section #4 Extend Adjustment Nuts, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)

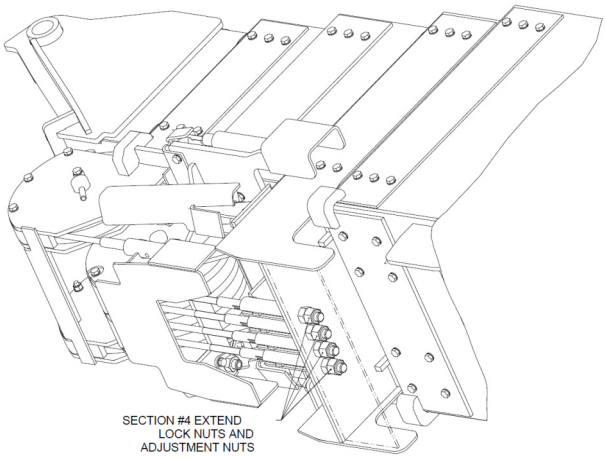
d. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.

e. Tighten the Section #4 Retract Adjustment Nuts shown below, moving them a distance equal to what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, tighten the nut such that it moves ½" farther from the exposed end of the adjustment stud.)



f. Fully retract the boom.

g. To remove slack resulting from the adjustment in c, tighten the Section #4 Extend Adjustment Nuts shown below until they contact the rope mount plate.



h. Extend the boom assembly so the platform moves 4 to 5 feet, then fully retract.

i. Repeat step h three times to equalize rope position.

j. Go to step 5.

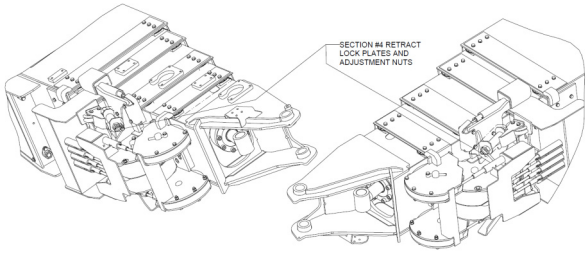
4. If the Section needs to be EXTENDED (measured dimension is less than dimension shown in Figure 4-40.):

a. Remove any covers necessary to access the wire rope adjustment nuts.

b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.

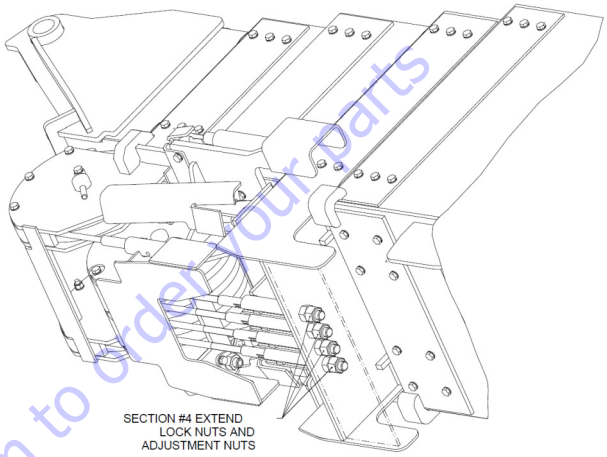
c. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.

d. Loosen the Section #4 Retract Adjustment Nuts shown below, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)

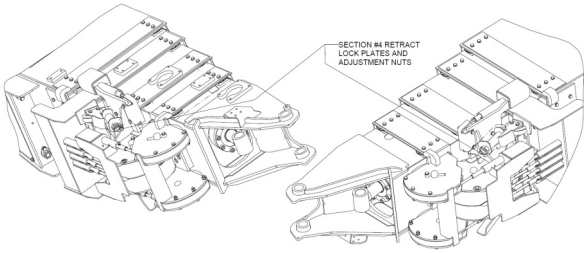


e. Retract the boom assembly such that the platform moves 2 to 3 feet (0.6m-0.9m) from the previous extended position in step c.

f. Tighten the Section #4 Extend Adjustment Nuts shown below, moving them a distance equal to what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, tighten the nut such that it moves ½" farther from the exposed end of the adjustment stud.)



g. To remove slack resulting from the adjustment in step d, tighten the Section #4 Retract Adjustment Nuts shown below until they contact the rope mount plate.



h. Extend the boom assembly such that the platform moves 4 to 5 feet, then fully retract.

i. Repeat step h three times to equalize rope position.

j. Go to step 5.

5. Fully retract the boom sections.

6. Verify that the exposed boom section dimensions meet the dimension and tolerance of Figure 4-40.

a. If Section #4 still does not fall within the dimension and tolerance of Figure 4-40., repeat the steps outlined in 4. Boom Section #4 Repositioning.

b. If Section #4 does fall within the dimension and tolerance of Figure 4-40., proceed to 5. Boom Section #5 Repositioning.

BOOM SECTION #5 REPOSITIONING:

1. If Boom Section #5 falls within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, proceed to Wire Rope Tensioning procedure in Section 6 of this document.

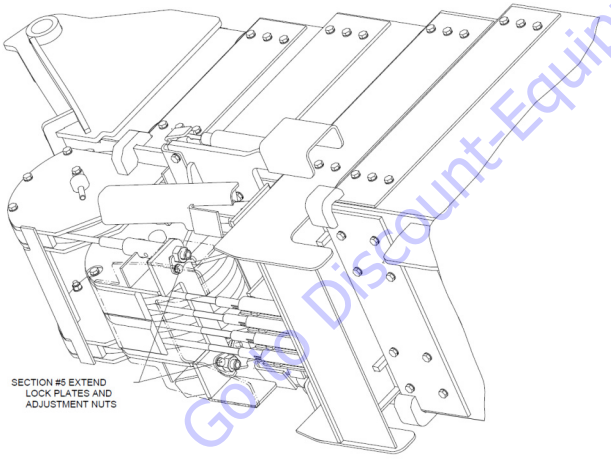
2. If Boom Section #5 does not fall within the dimension and tolerance shown in Figure 4-40. with the boom fully retracted, perform the following procedure:

3. If the Section needs to be RETRACTED (measured dimension is greater than dimension shown in Figure 4-40.):

   a. Remove any covers necessary to access the wire rope adjustment nuts.

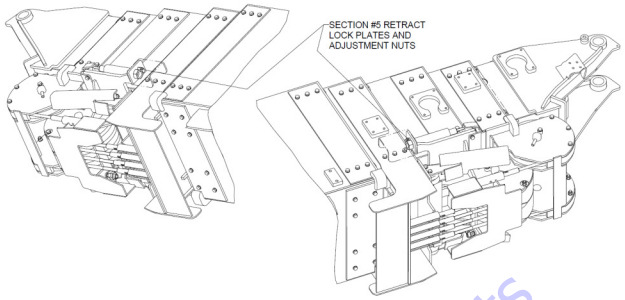
   b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.

   c. Loosen the Section #5 Extend Adjustment Nuts, shown below, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)



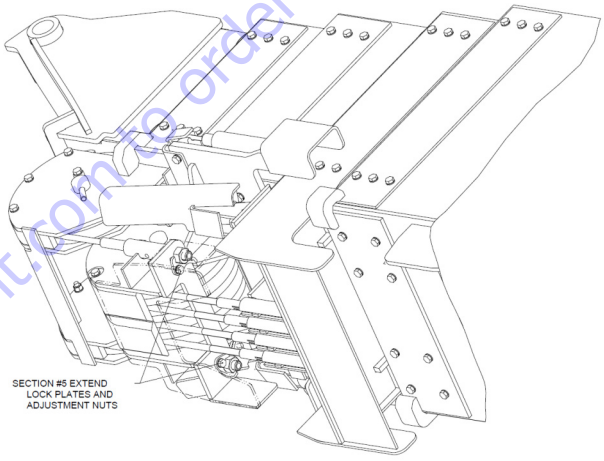
   d. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.

   e. Tighten the Section #5 Retract Adjustment Nuts shown below, moving them a distance equal to what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, tighten the nut such that it moves ½" farther from the exposed end of the adjustment stud.)



   f. Fully retract the boom.

   g. To remove slack resulting from the adjustment in step c, tighten the Section #5 Retract Adjustment Nuts shown below until they contact the rope mount plate.



   h. Extend the boom assembly such that the platform moves 4 to 5 feet, then fully retract.

   i. Repeat h three times to equalize rope position

   j. Go to Step 5.

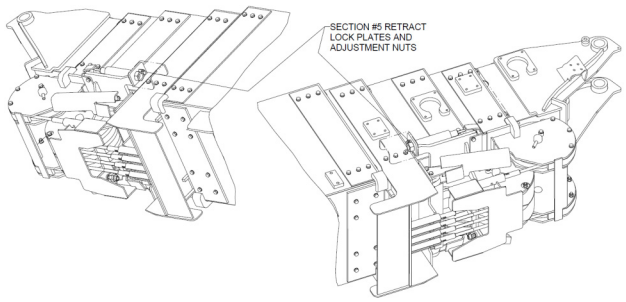
4. If the Section needs to be EXTENDED (measured dimension is less than dimension shown in Figure 4-40.):

   a. Remove any covers necessary to access the wire rope adjustment nuts.

   b. Remove lock plates and nylon collar locknuts from wire rope adjustment studs.

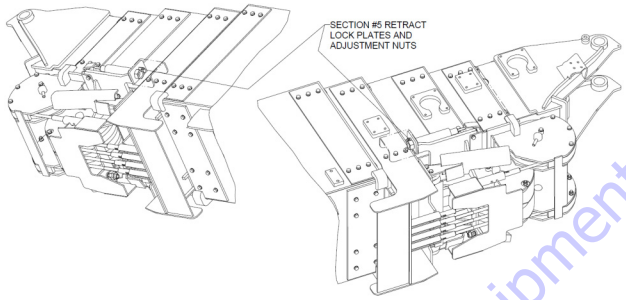
   c. Extend the boom assembly so the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position.

   d. Loosen the Section #5 Retract Adjustment Nuts, shown below, moving them a distance equal to twice what the section needs to move to be within tolerance. (E.g. If the section must move ½" to fall within the dimension shown, loosen the nut such that it moves 1" closer to the exposed end of the adjustment stud.)



e. Retract the boom assembly such that the platform moves 2 to 3 feet (0.6m-0.9m) from the previous extended position in Boom Section #3 Positioning, Step 4c.

f. To remove slack resulting from the adjustment in Step 3d, tighten the Section #4 Extend Adjustment Nuts shown below until they contact the rope mount plate.



g. Go to Step 5.

5. Fully retract the boom sections.

6. Verify that the exposed boom section dimensions meet the dimension and tolerance of Figure 4-40..

a. If Section #5 still does not fall within the dimension and tolerance of Figure 4-40., repeat the steps outlined in Boom Section #5 Repositioning.

b. If Section #5 does fall within the dimension and tolerance of Figure 4-40., proceed to Wire Rope Tensioning Procedure.

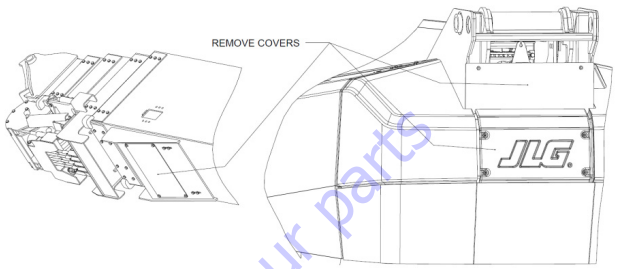
Wire Rope Tensioning Procedure

NOTE: *NOTE: Repeat Wire Rope Tensioning Procedure only as necessary to achieve proper tension.*

Verification of the rope tension should be determined by proper deployment function of the boom assembly and by the dimensions and tolerances shown in Figure 4-40..

If the boom sections have been properly positioned but there is not enough adjustment travel remaining on a wire rope to achieve proper torque, the service life of the rope has been consumed. Do not continue with the remainder of this procedure. Replace all wire ropes and sheaves.

1. Remove any covers necessary to access the wire rope adjustment nuts.



2. Remove lock plates and nylon collar nuts from wire rope adjustment studs.

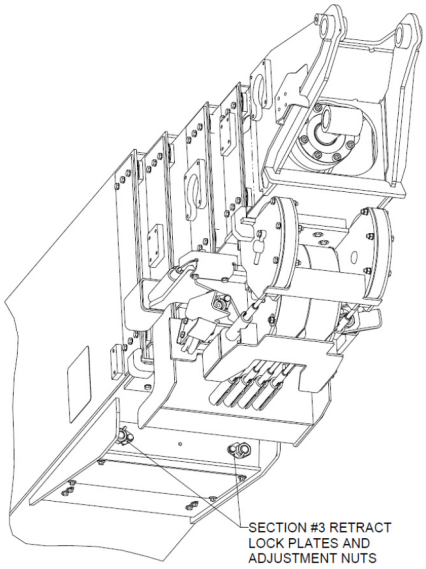
3. Position the boom so that it is horizontal within +/- 5º, and not supported by the boom rest.

4. Extend the boom assembly such that the platform moves 4 to 5 feet (1.2m-1.5m) from the fully retracted position. The purpose of this step is to position the boom sections such that the ropes to be tensioned are not under load. If the extending boom reaches end of stroke and then automatically retracts a small amount, the ropes may still be under load. In such case, the following additional steps are necessary:

a. Note where the boom reached end of stroke.

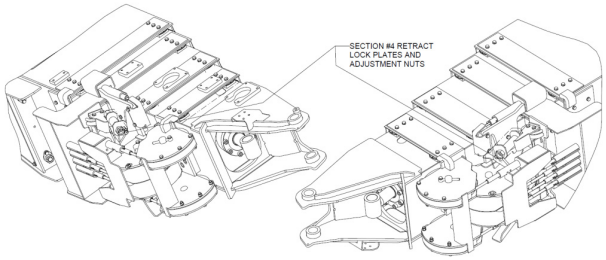
b. Retract 3 to 4 feet (1m-1.3m).

c. Extend the boom, stopping just before end of stroke is reached.

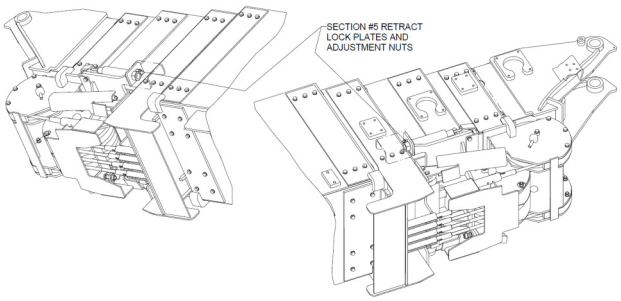


5. Using tool, JLG p/n 1001162217, torque Section #3 Retract Adjustment Nuts to 38 ft-lb (51.5 Nm), alternat-

ing between the two ropes until both maintain the required torque.



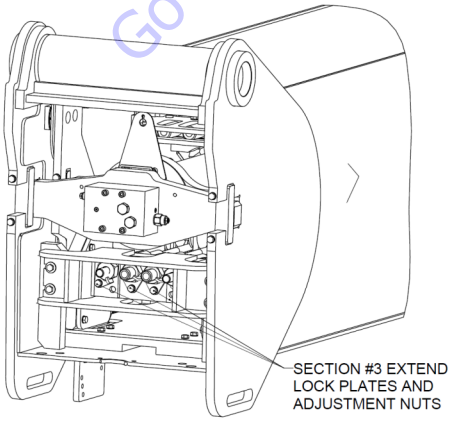
6. Using tool, JLG p/n 1001162217, torque Section #4 Retract Adjustment Nuts to 38 ft-lb (51.5 Newton meters), alternating between the two ropes until both maintain the required torque.



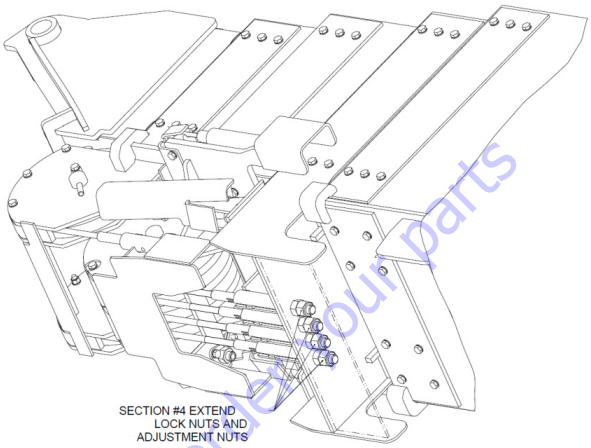
7. Using tool, JLG p/n 1001162217, torque Section #5 Retract Adjustment Nuts to 38 ft-lb (51.5 Newton meters), alternating between the two ropes until both maintain the required torque.

8. Retract the boom 2-3 feet (.6m – 1.0m) Do NOT fully retract the boom or bottom out any section.

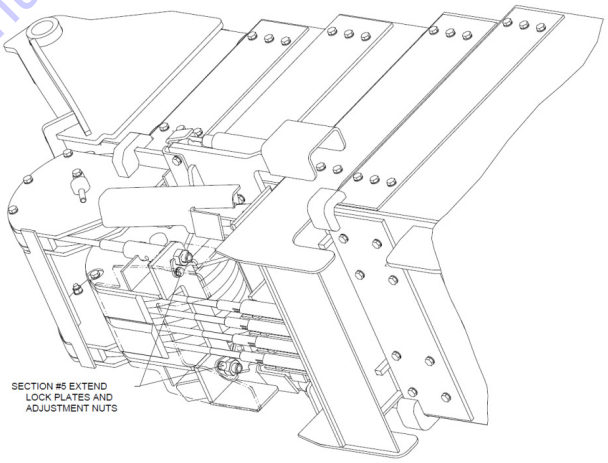
9. Using tool, JLG p/n 1001162218, torque Section #3 Extend Adjustment Nuts to 17 ft-lb (23 Newton meters), alternating between the two ropes until both maintain the required torque.



10. Using tool, JLG p/n 1001162216, torque Section #4 Extend Adjustment Nuts to 17 ft-lb (23 Newton meters), alternating between the two ropes until both maintain the required torque.



11. Using tool, JLG p/n 1001162216, torque Section #5 Extend Adjustment Nuts to 17 ft-lb (23 Newton meters), alternating between the two ropes until both maintain the required torque.



12. Equalize the rope tension across the sheaves by exercising the boom telescope position:

    a. Fully retract the boom

    b. Extend the boom 4 to 5 feet (1.2m-1.5m) from the fully retracted position or to the stroke limit identified in 6.4.

    c. Repeat 12a and 12b for a minimum of three cycles, stopping with the boom extended 4 to 5 feet (1.2m-1.5m) from the fully retracted position or to the stroke limit identified in Step 4.

13. Verify wire rope torque values for retract ropes.

14. Retract the boom 2-3 feet (.6m – 1.0m) Do NOT fully retract the boom or bottom out any section.
15. Verify wire rope torque values for extend ropes.
16. If the torque values are NOT correct, repeat the Wire Rope Tensioning Procedure.
17. If the torque values are correct, proceed to Confirm Proper Boom Deployment Function.

Confirm Proper Boom Deployment Function

Exercise the boom telescope function. When wire ropes are properly torqued, all traveling sections will move simultaneously when extending and retracting.

Re-Assembly

1. Install nylon collar locknuts on Section #4 extend wire rope fittings.
   a. Do not re-use the nylon collar lock nuts. Replace with new nylon collar lock nuts.
   b. Torque locknuts to 10 ft-lb (13.5 Nm).
2. Reinstall lock plates to remaining adjuster nuts.
3. Install all covers.

Boom Calibration

Any adjustment of wire rope tension should be immediately followed by Boom Calibration. For Boom calibration Refer Section 6, JLG Control System.

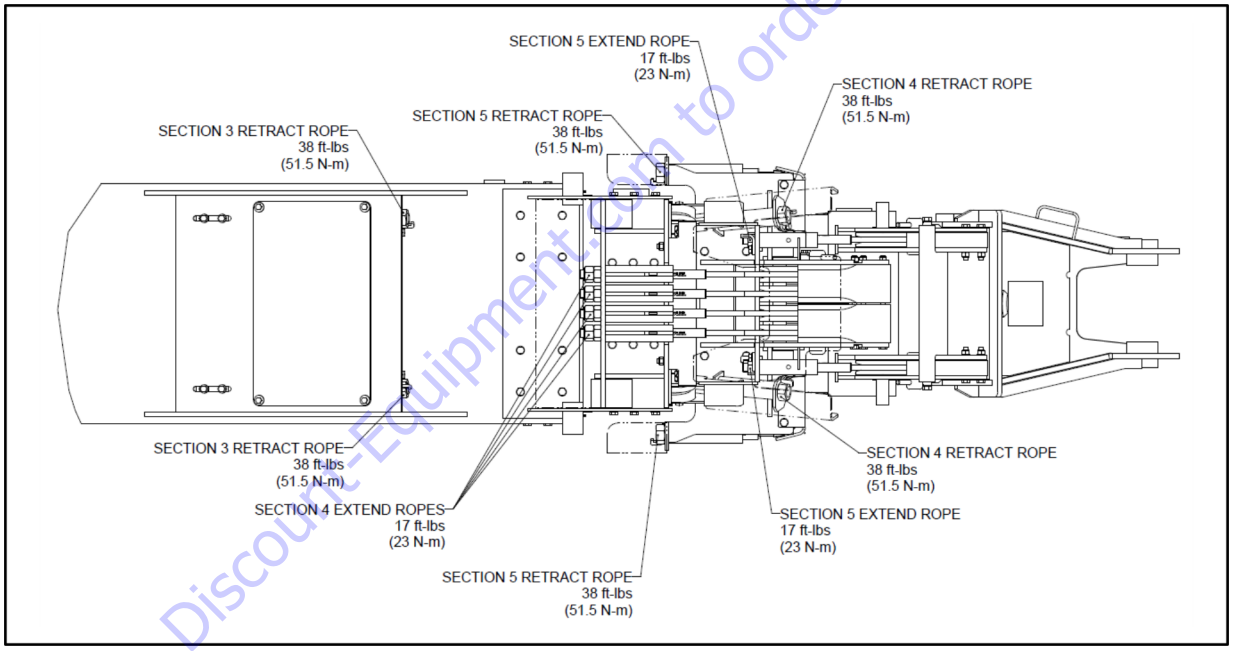


Figure 4-42. Boom Wire Rope Torques

4.15 BROKEN BOOM CABLE PROXIMITY SWITCH

This system uses a proximity switch to detect excessive movement of the cable block. If movement is detected the Cable Break indicator will illuminate in the platform control panel. No restrictions are made to the functionality of the control system. It is the responsibility of the operator to take immediate action.

To avoid damaging the proximity switch, install and adjust after assembling the switch block, compression spring, and torquing the wire ropes.

Adjusting the Proximity Switch

1. Thread the switch in until it contacts the adjuster block.
2. Thread the switch out 1/8 to 1/2 turn to achieve proper sensing range.

NOTE: *The LED light on the sensor illuminates when power is applied and the sensor is within the proper range.*

3. Tighten the jam nut.

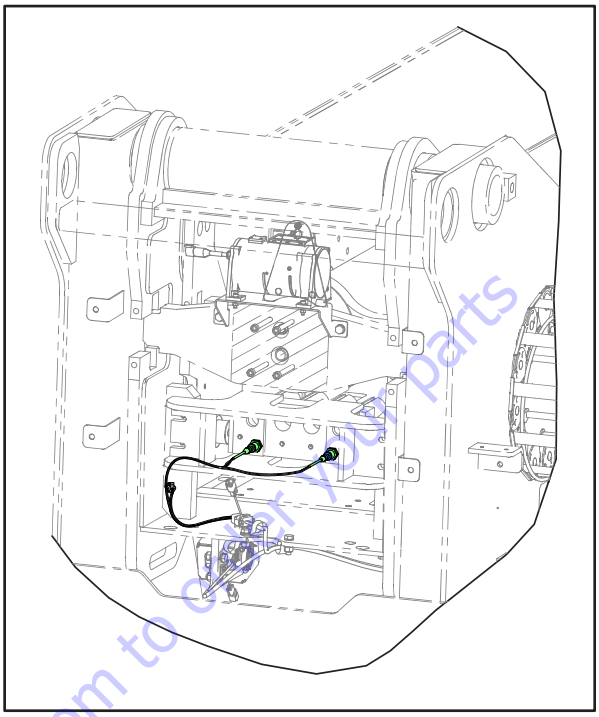
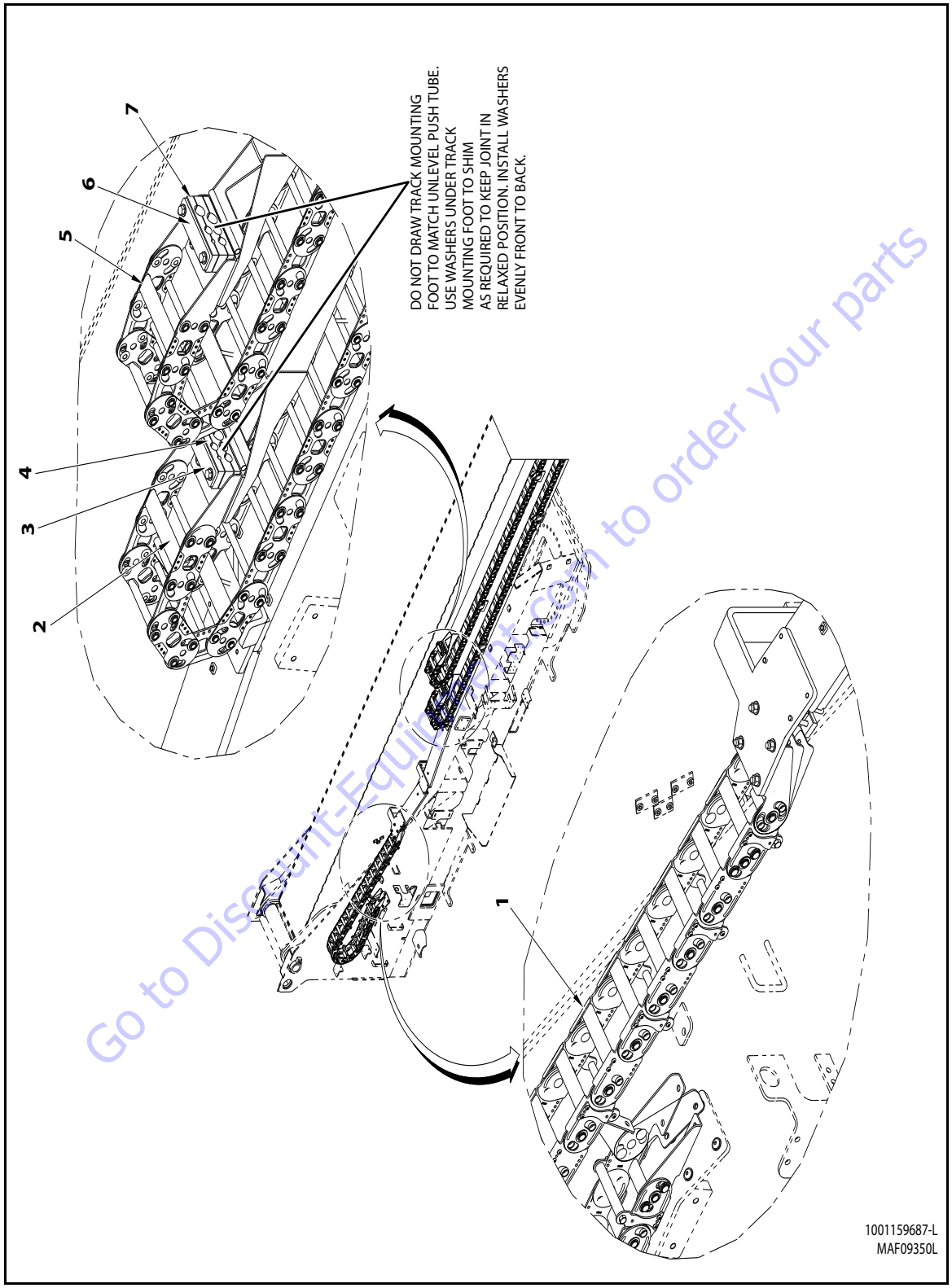
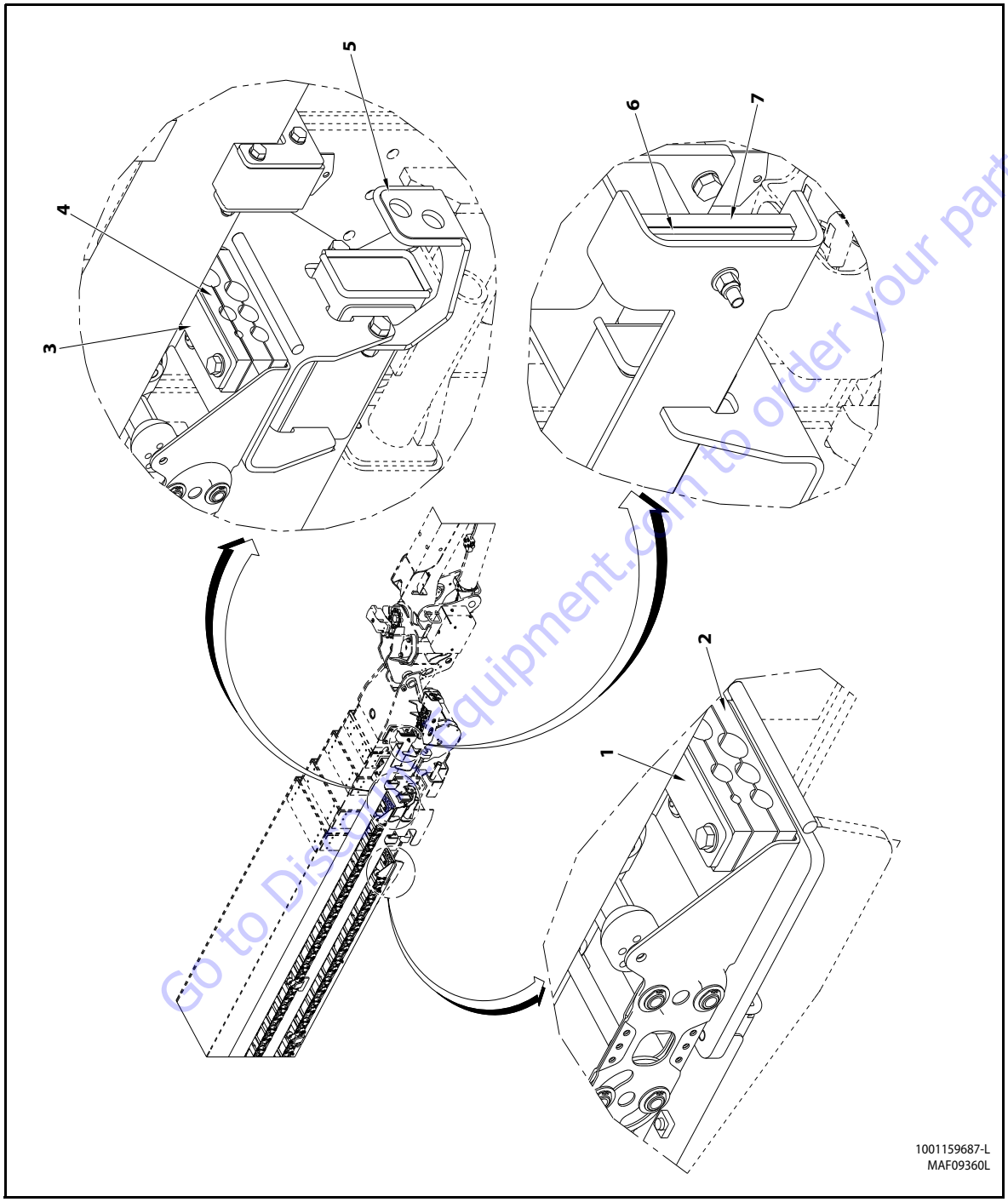


Figure 4-43. Broken Cable Proximity Switch Location



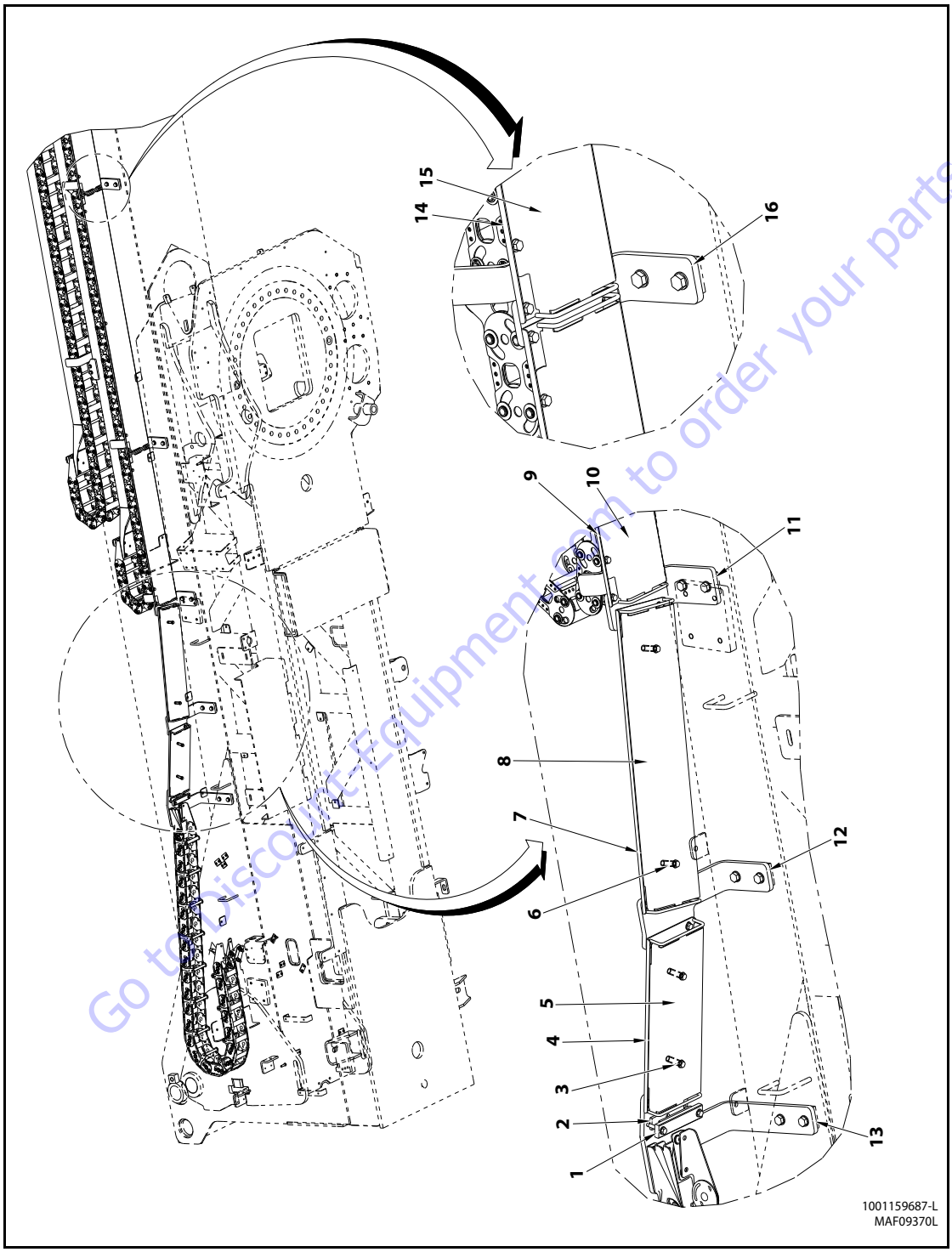
1. Powertrack
2. Powertrack
3. Clamp Plate
4. Rubber Pad
5. Powertrack
6. Clamp Plate
7. Rubber Pad

Figure 4-44. Powertrack Installation - Sheet 1 of 4



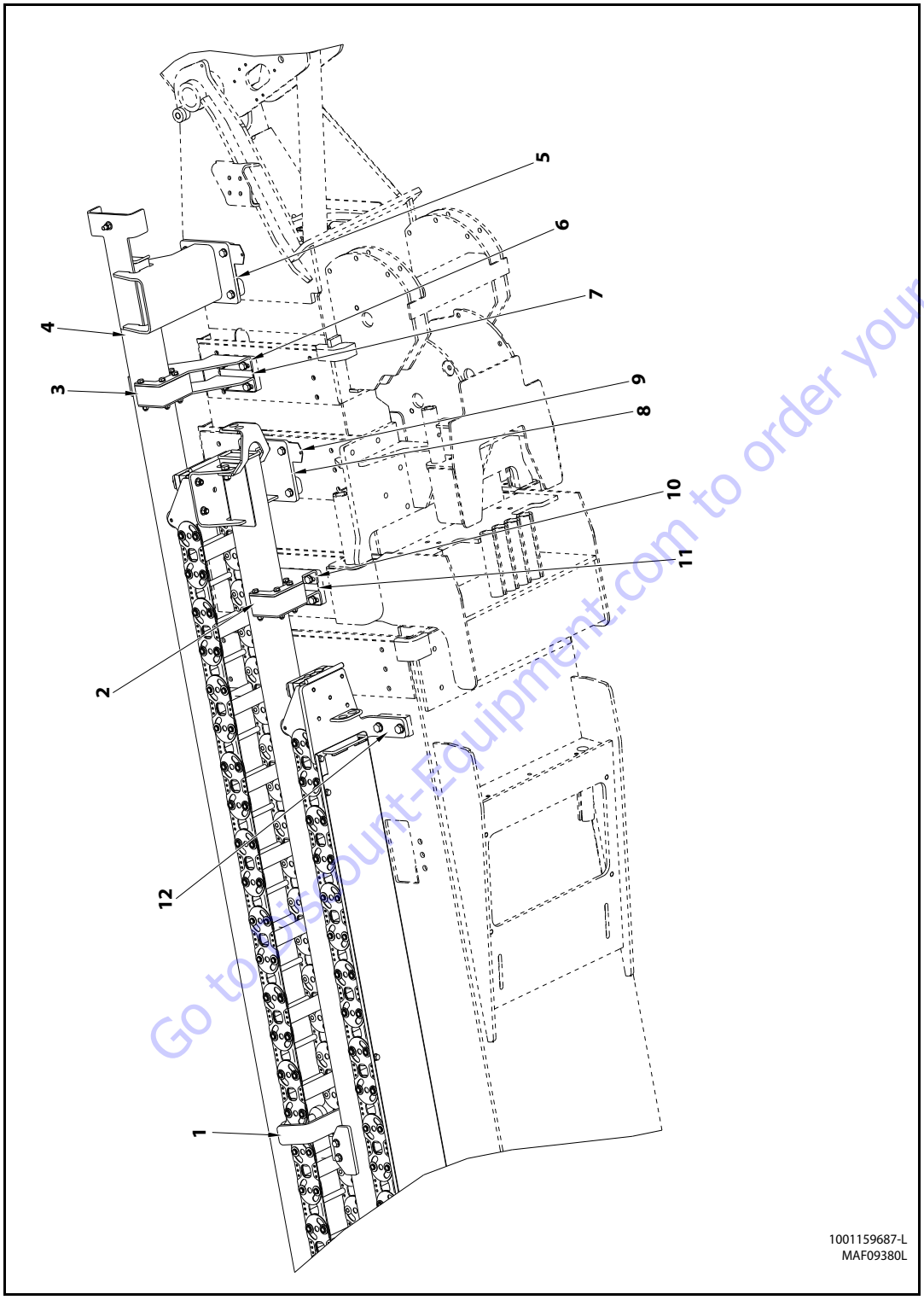
1. Clamp Plate
2. Rubber Pad
3. Clamp Plate
4. Rubber Pad
5. Bracket
6. Clamp Plate
7. Rubber Pad

Figure 4-45. Powertrack Installation - Sheet 2 of 4



1. Clamp Bar
2. Rubber Pad
3. Spacer Tube
4. Power Track Support
5. Track Support Cover
6. Spacer Tube
7. Power Track Support
8. Track Support Cover
9. Power Track Support
10. Track Support Cover
11. Support Bracket
12. Support Bracket
13. Support Bracket
14. Hose Cover
15. Track Support Cover
16. Support Bracket

Figure 4-46. Powertrack Installation - Sheet 3 of 4



1. Support Bracket
2. Push Tube Pad
3. Push Tube Pad
4. Upper Push Tube Assembly
5. Adjusting Shims
6. Mounting Plate
7. Adjusting Shims
8. Lower Push Tube Assembly
9. Adjusting Shims
10. Mounting Plate
11. Adjusting Shims
12. Support Bracket

Figure 4-47. Powertrack Installation - Sheet 4 of 4

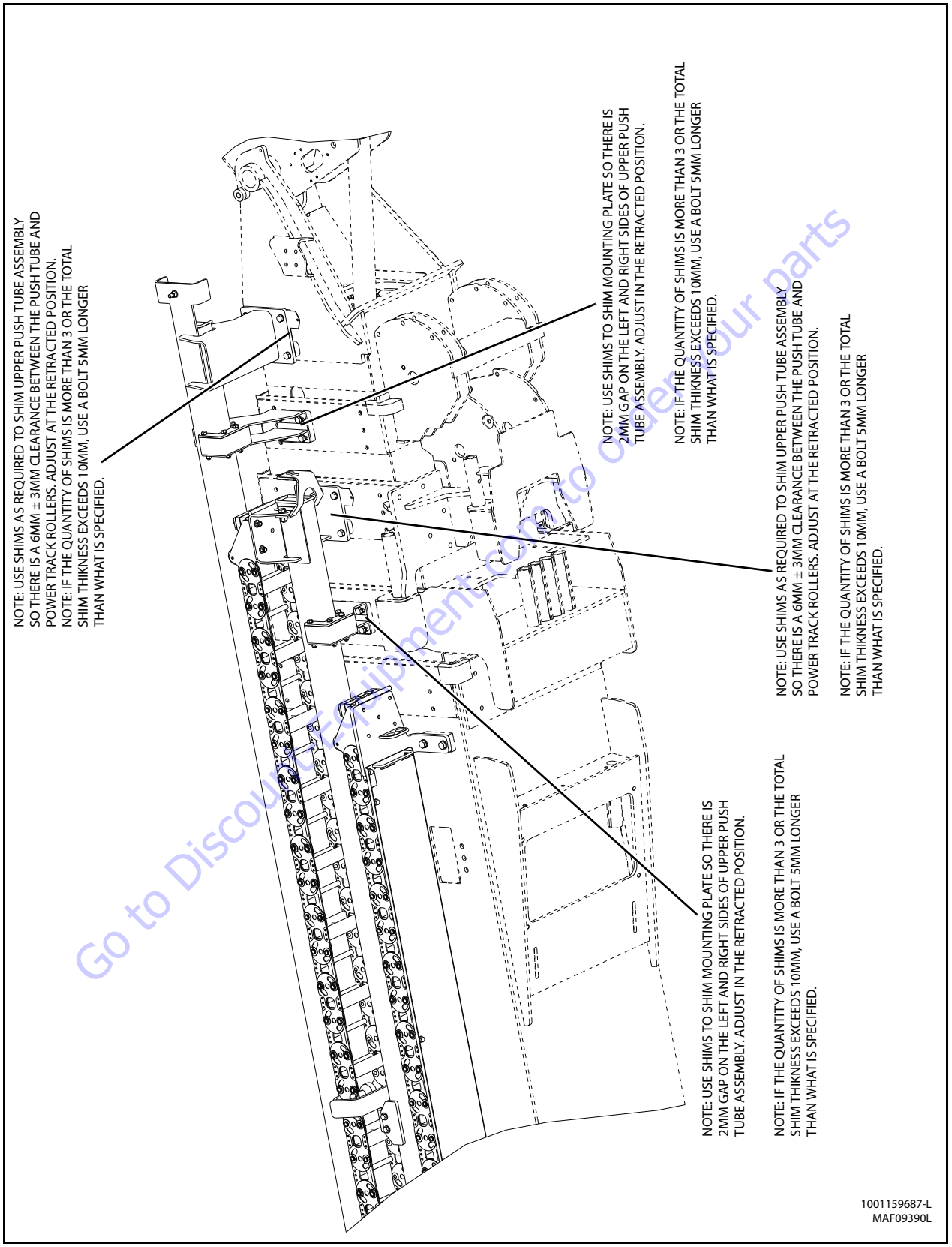


Figure 4-48. Powertrack Shimming Instructions

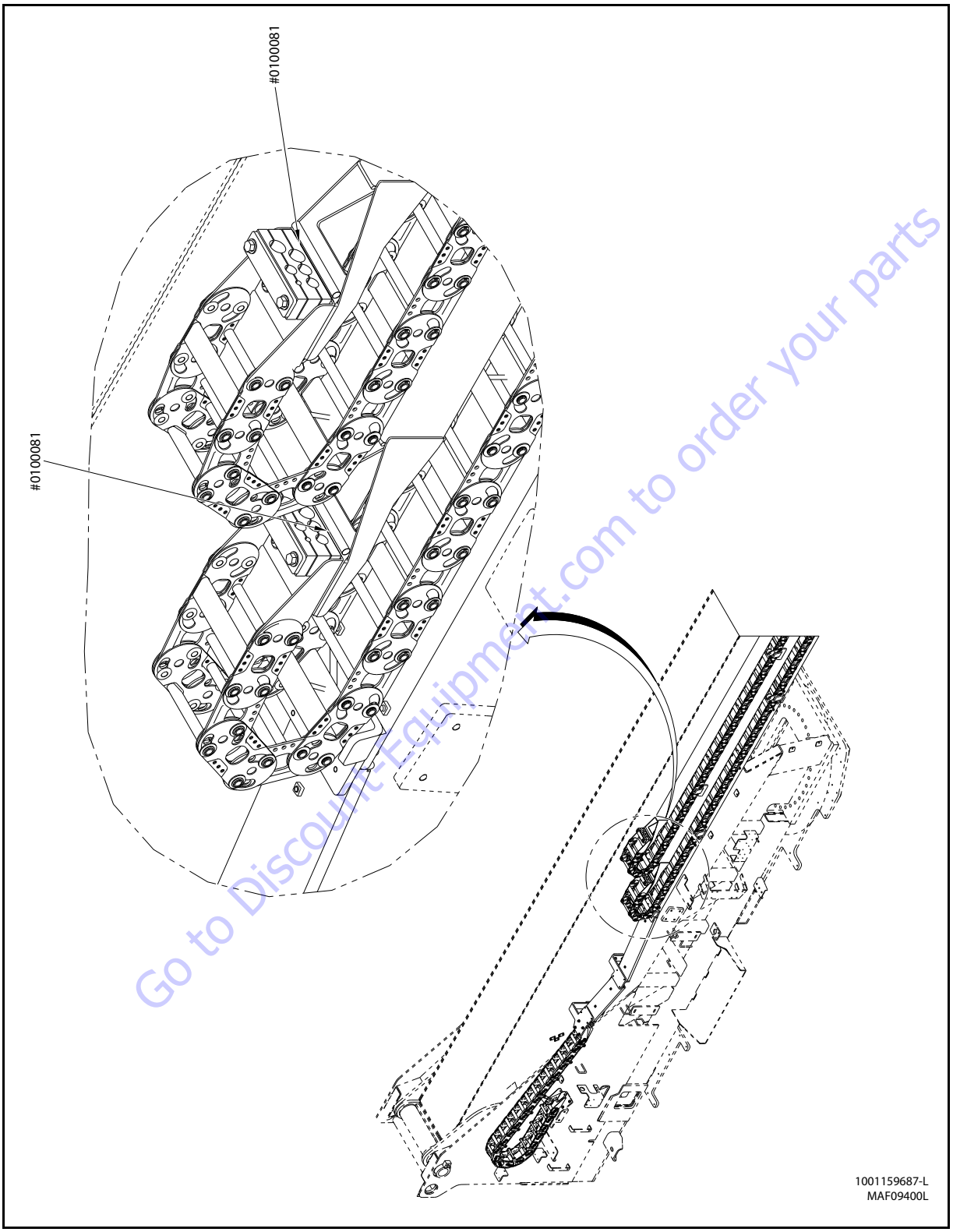


Figure 4-49. Powertrack Locations for Threadlocker Application and Torque - Sheet 1 of 4

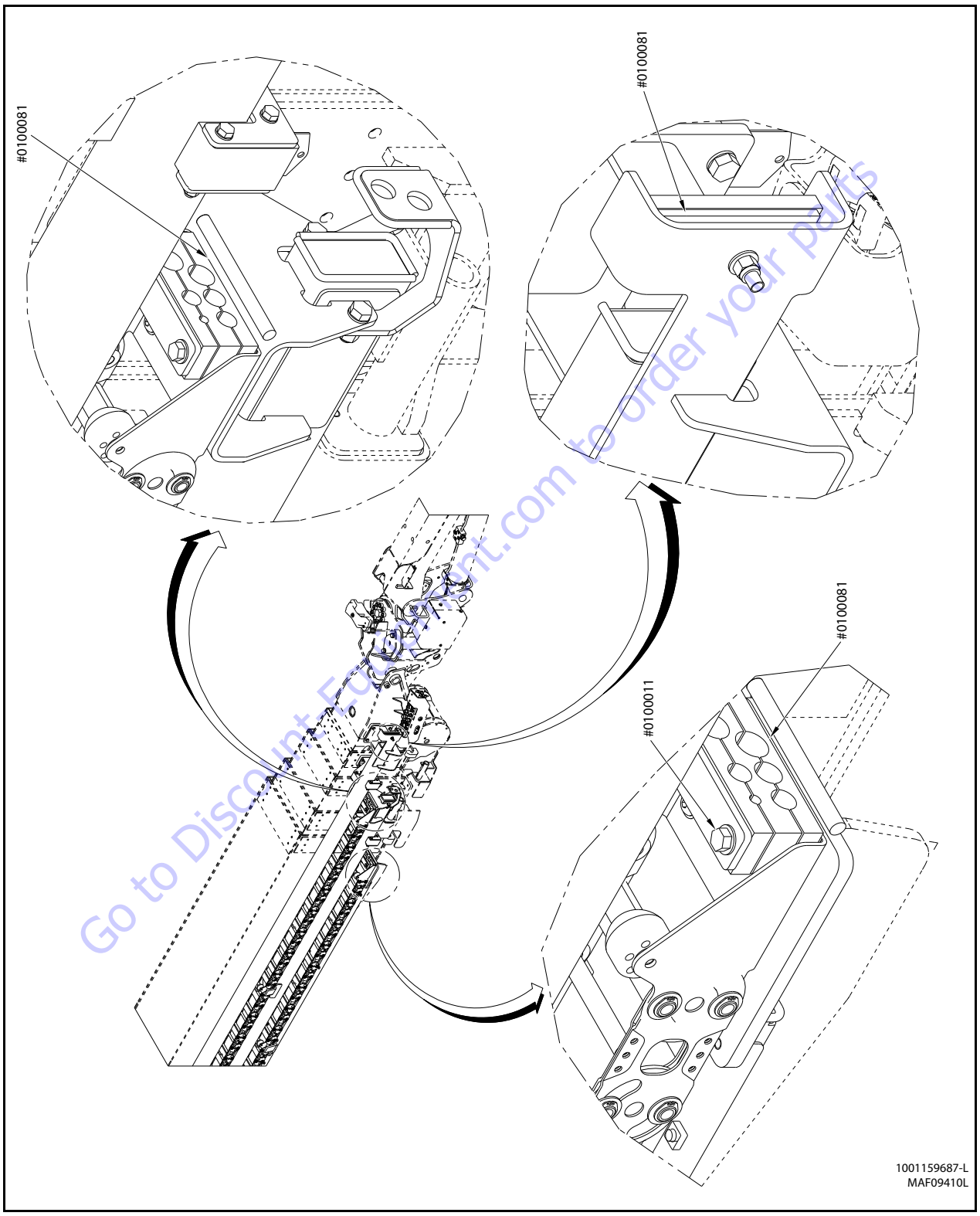


Figure 4-50. Powertrack Locations for Threadlocker Application and Torque - Sheet 2 of 4

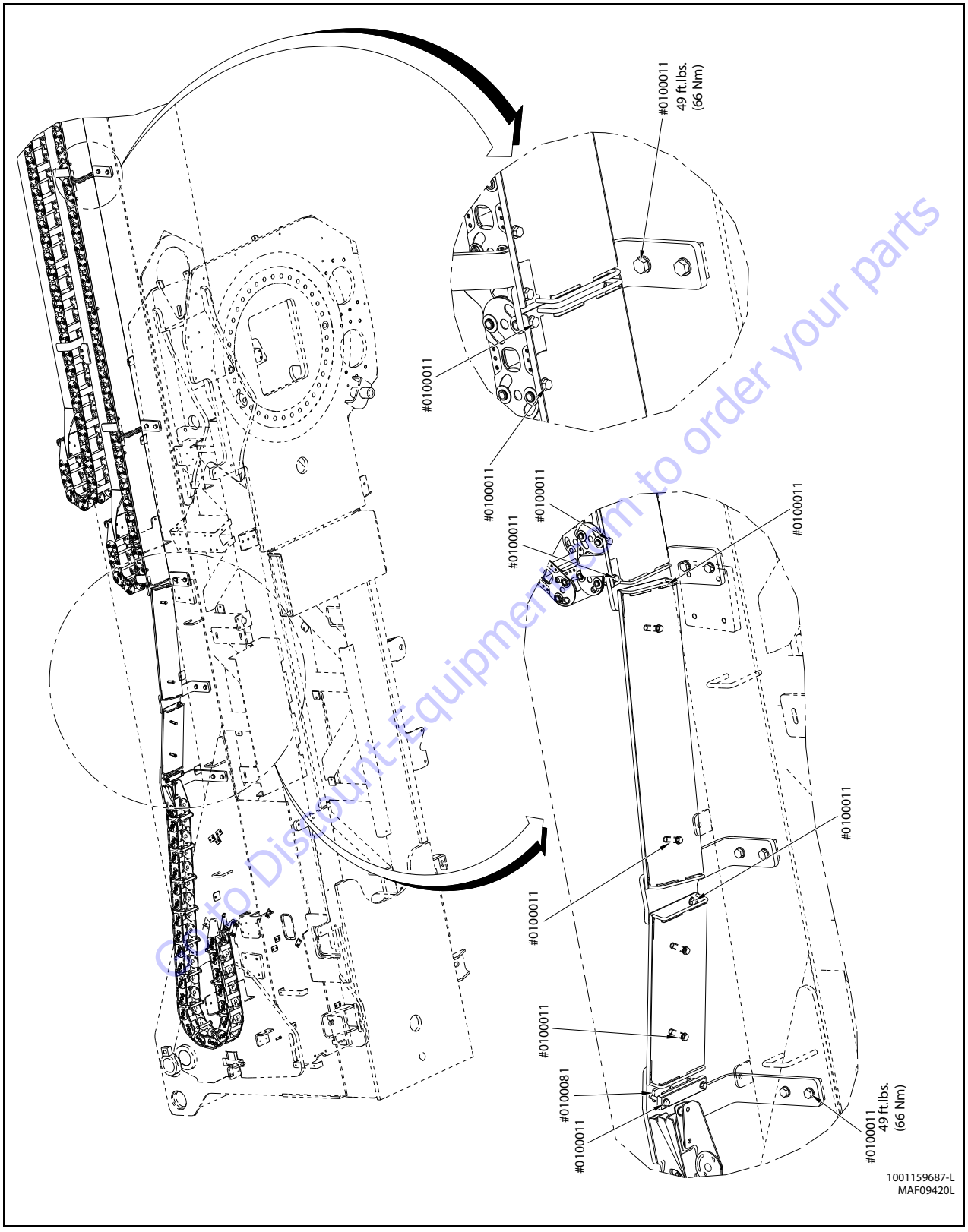


Figure 4-51. Powertrack Locations for Threadlocker Application and Torque - Sheet 3 of 4

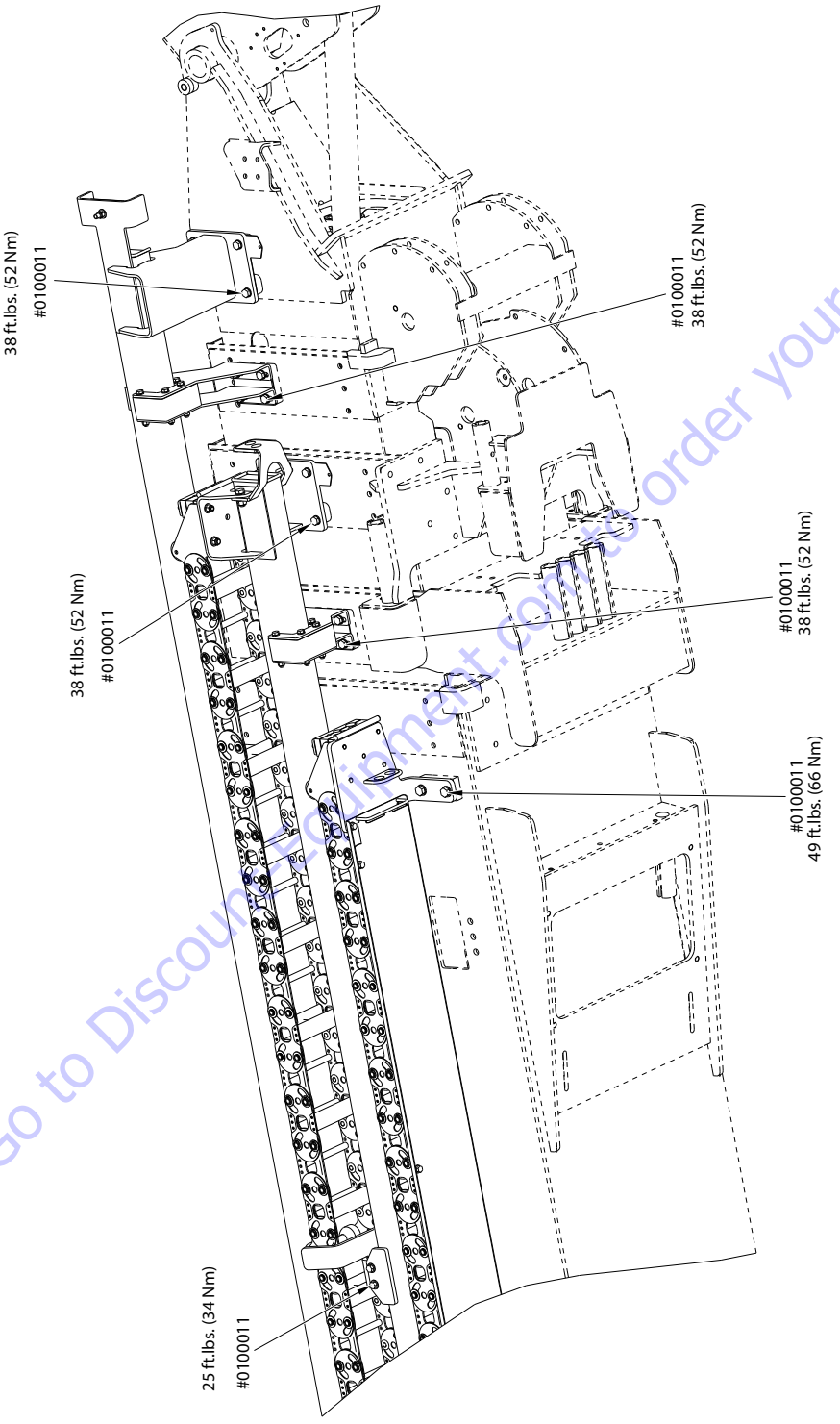


Figure 4-52. Powertrack Locations for Threadlocker Application and Torque - Sheet 4 of 4

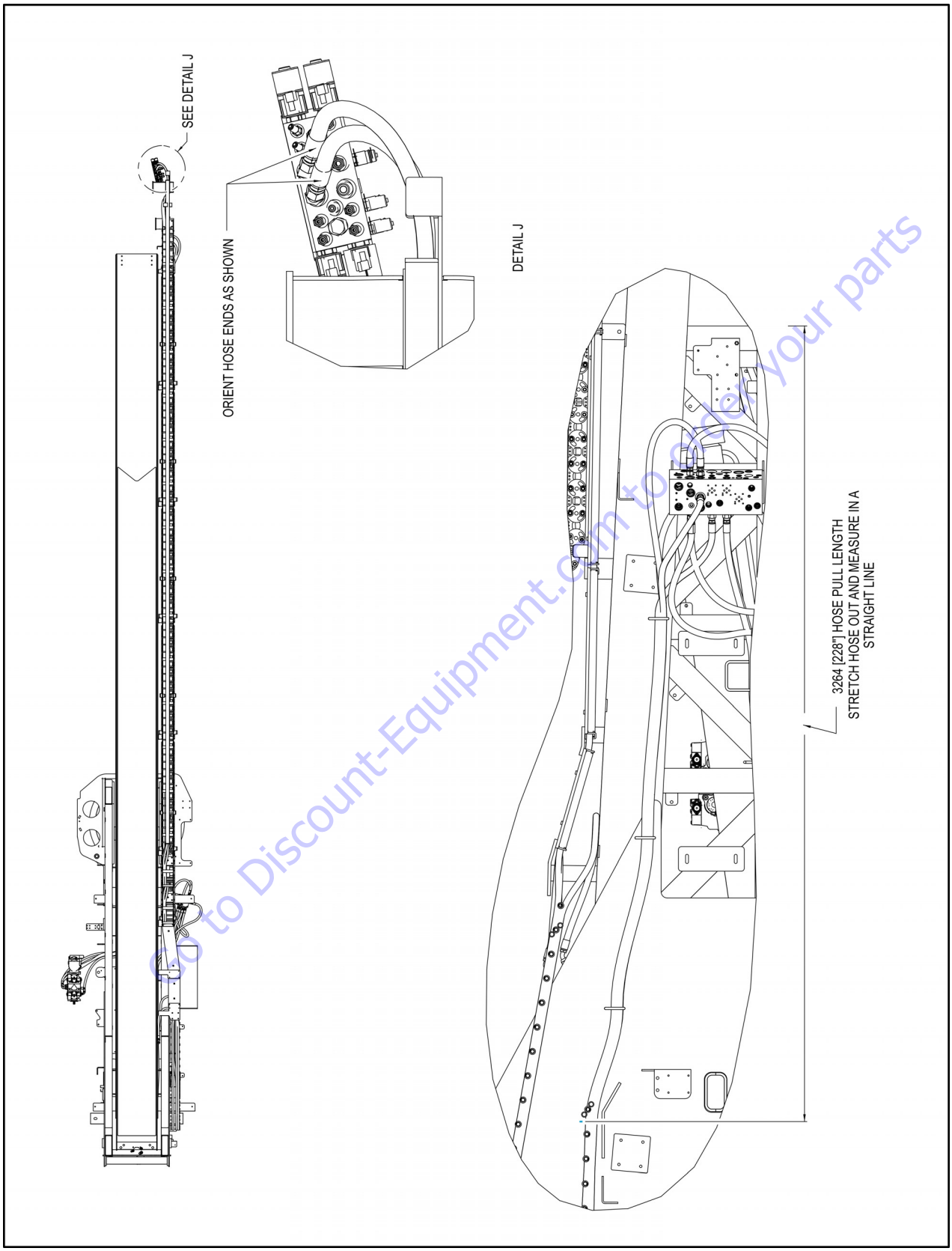


Figure 4-53. Powertrack Hose Installation - Sheet 1 of 4

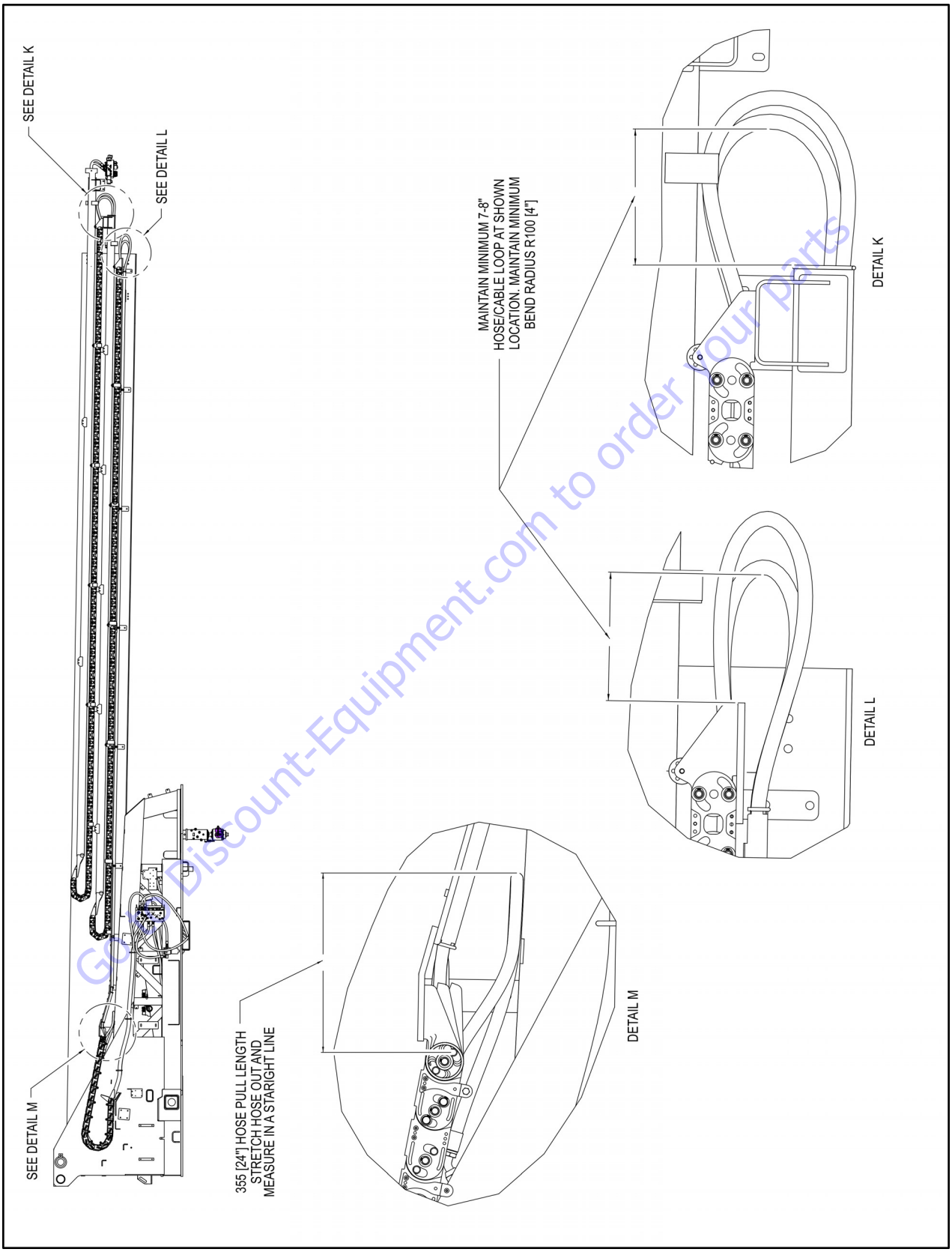


Figure 4-54. Powertrack Hose Installation - Sheet 2 of 4

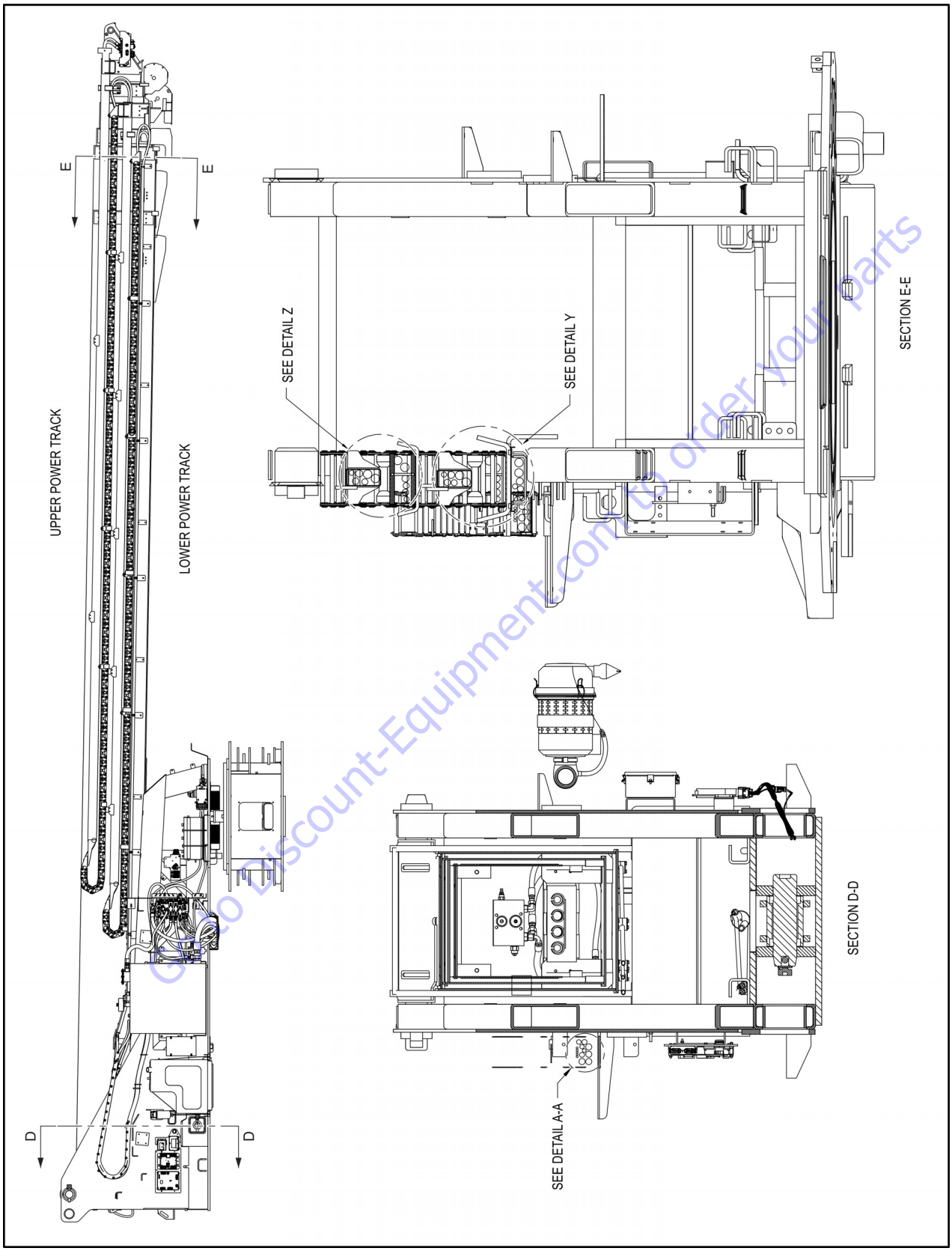


Figure 4-55. Powertrack Hose Installation - Sheet 3 of 4

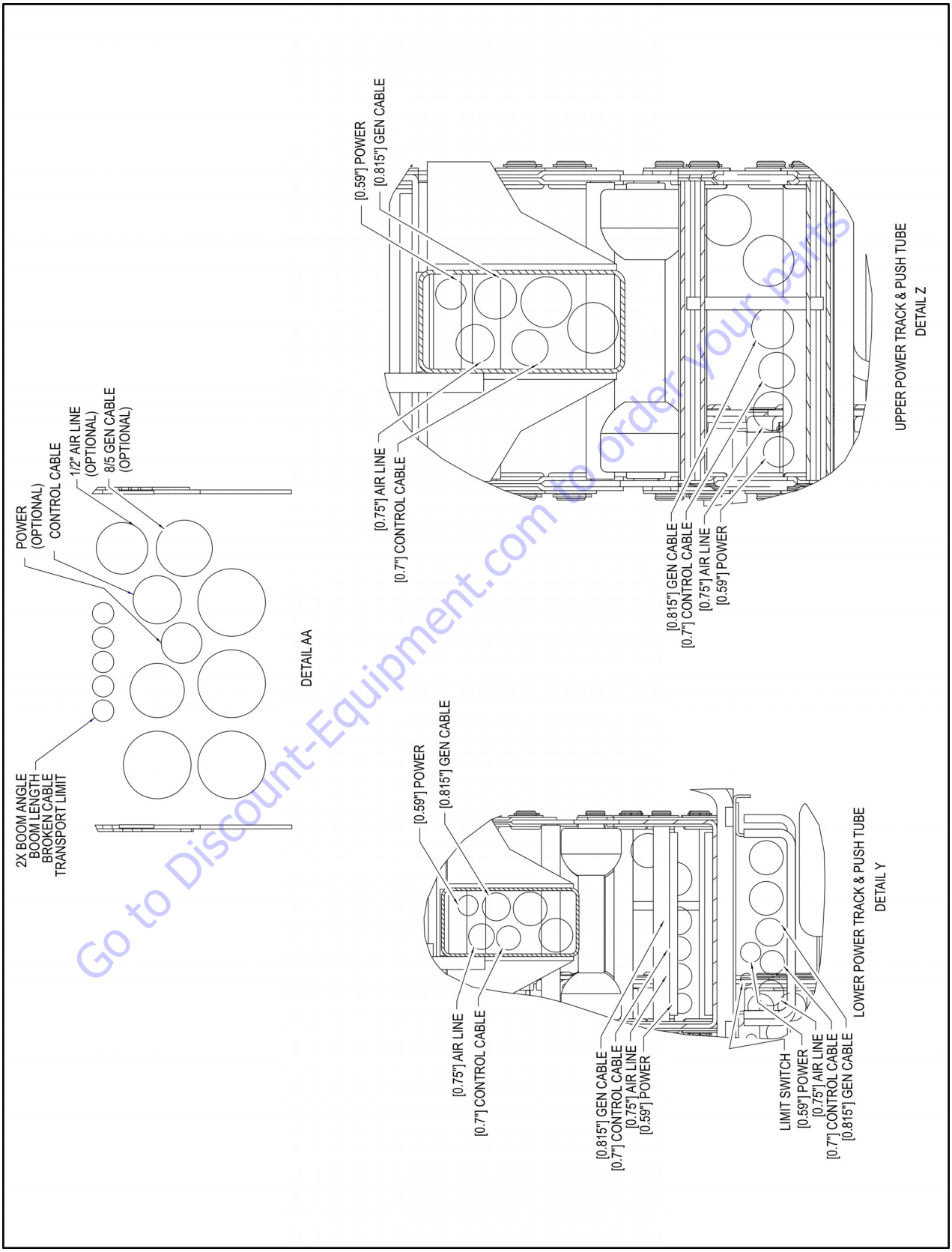
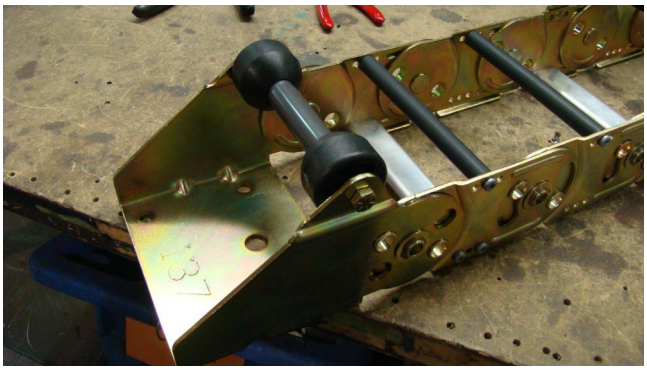


Figure 4-56. Powertrack Hose Installation - Sheet 4 of 4

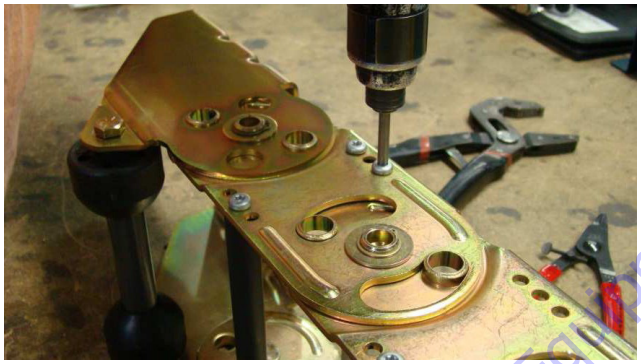
4.16 POWERTRACK MAINTENANCE

One Piece Bracket Maintenance

1. Place the powertrack on a workbench.



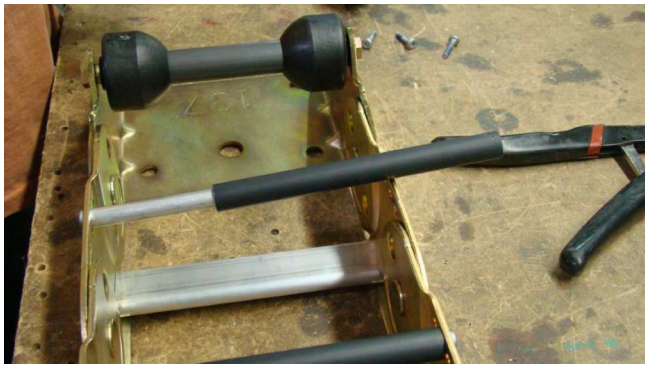
2. Remove the screws from the bars on one side of the powertrack on the first link.

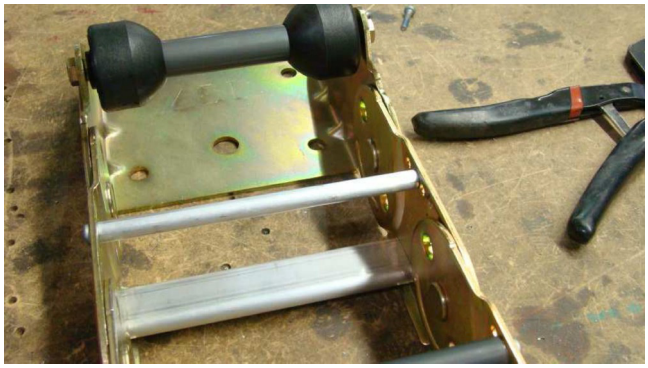


3. Remove the screws from the flat bar on the other side of the powertrack.

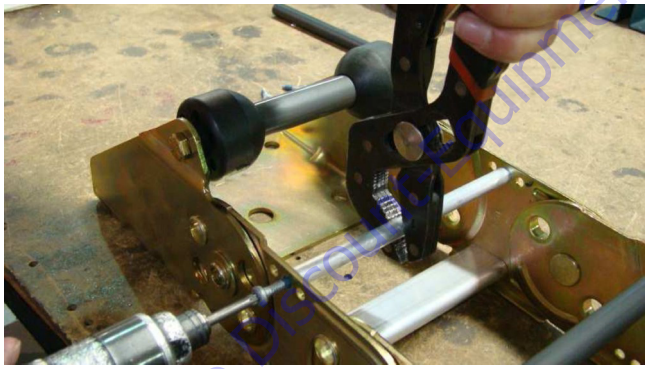
4. Pull up on the loose side of the round bar to allow the poly roller to slide off.

5. Slide the poly roller off of the round bar.

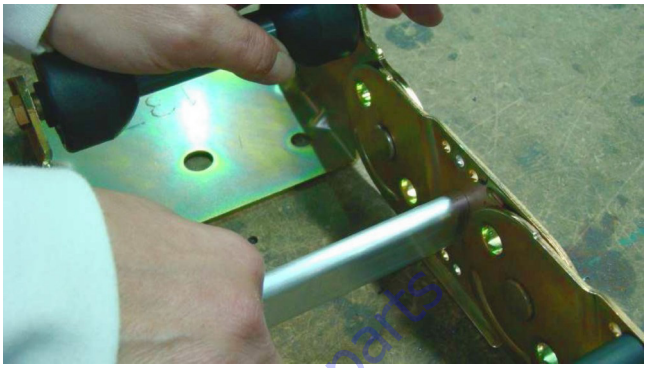


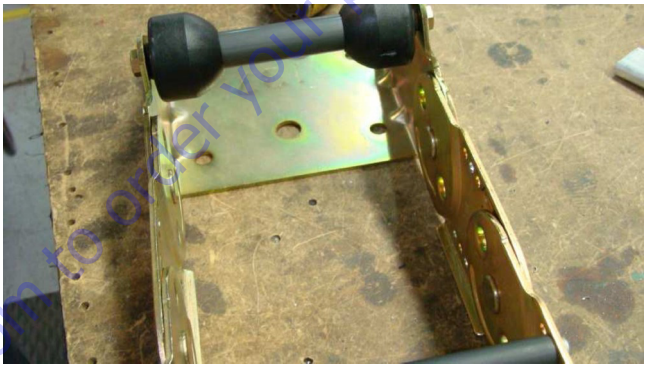


6. Hold the round bar to remove the other screw.

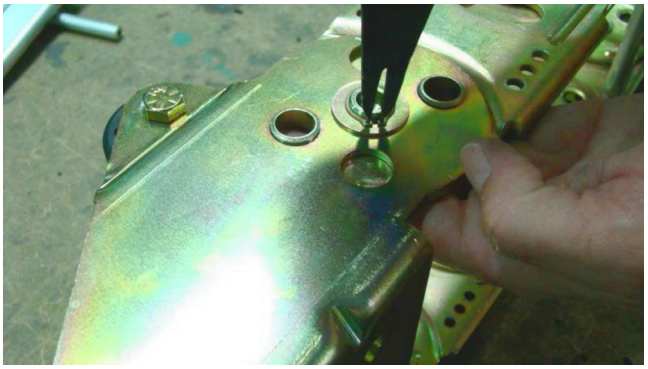


7. Slide the flat bar out.



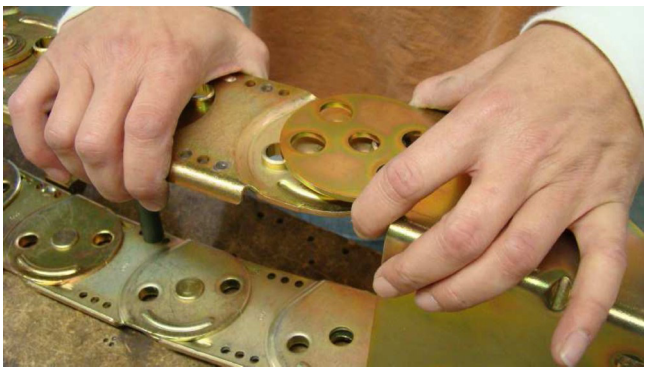


8. Remove the snap ring from one side of the bracket.



9. Remove the snap ring from the other side of the bracket.

10. Push down with slight pressure on the link and slide the bracket side up and over the extrusion on the link.

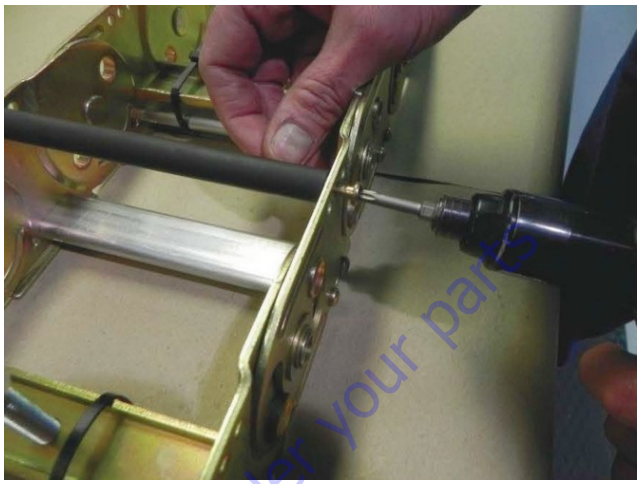


11. Repeat the previous step on the other side.

12. Slide the bracket off of the powertrack.

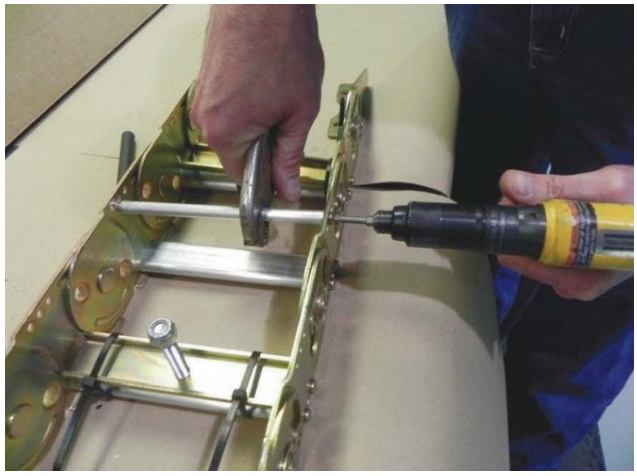
Two Piece Bracket Maintenance

1. Loosen the screw.

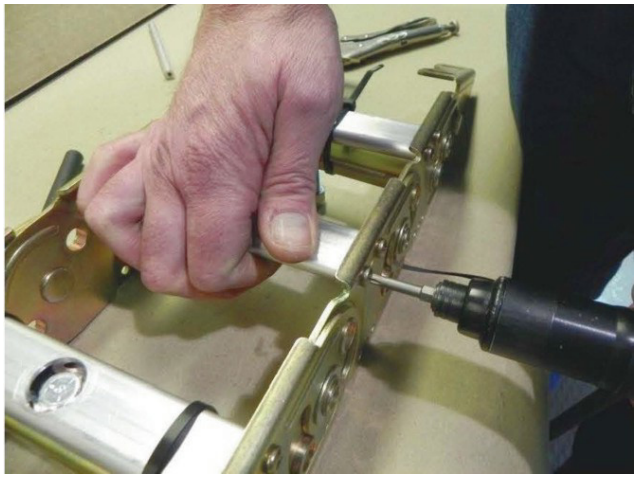


2. Slide the roller off the bar.

3. Hold the bar tightly and remove the other screw.



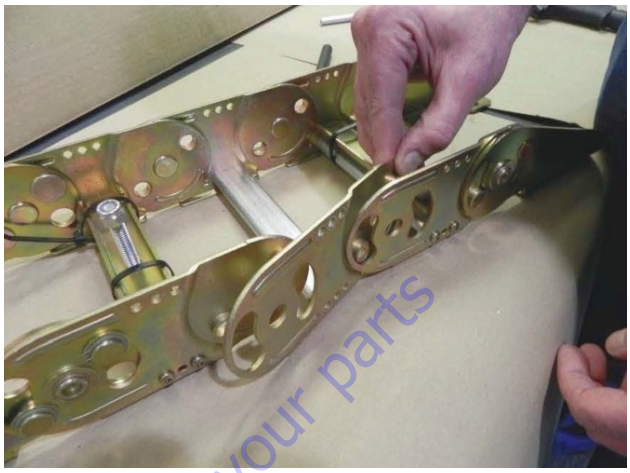
4. Hold the flat bar and remove the screws.



5. Remove the snap rings and pins.

6. Remove the screws from the bar. Remove the snap ring and pin.

7. Slide the link out.

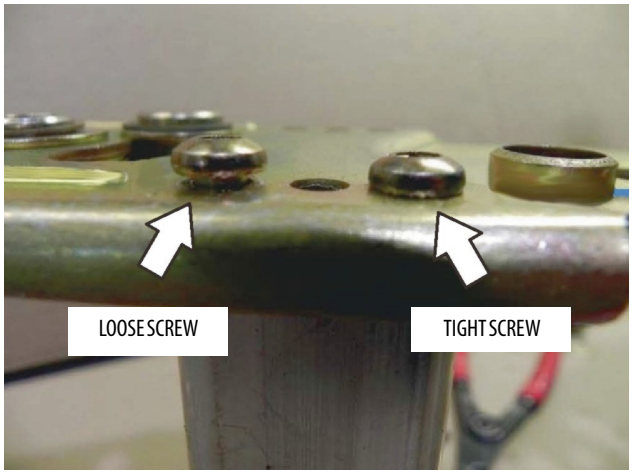


Snap Rings and Screws

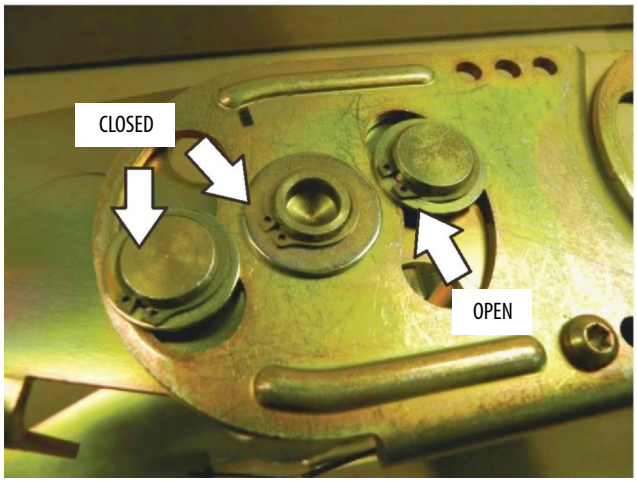
NOTICE

WHEN PERFORMING MAINTENANCE ON THE POWERTRACK, MAKE SURE TO DISCARD AND REPLACE ALL OLD SCREWS.

Make sure screws are tight and installed properly.

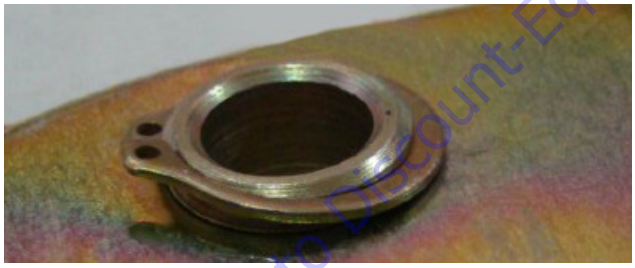


Make sure that all snap rings are closed and seated.



An open snap ring is shown below.

A snap ring that is not seated is shown below.



A seated and closed snap ring is shown below.

10-24 x 0.812 button torx socket head with blue locking patch:

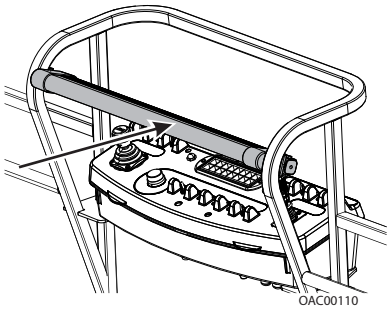
- Tighten to 45-50 in.lbs. (5-5.6 Nm).
- Use T-25 torx bit.
- Do not reuse this screw. After removing replace with a new one.

4.17 SKYGUARD®

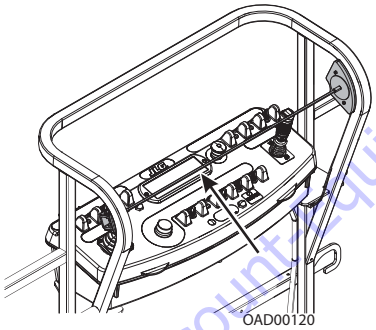
Operation

SkyGuard provides enhanced control panel protection. When the SkyGuard sensor is activated, functions in use at the time of actuation will reverse or cutout. The SkyGuard Function Table provides more details on these functions.

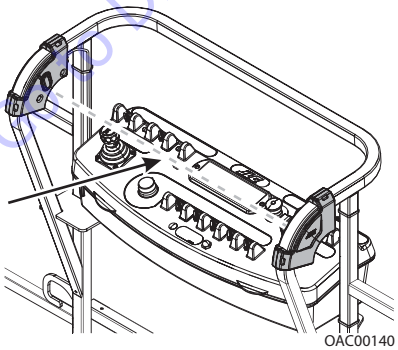
Consult the following illustrations to determine which type of SkyGuard the machine is equipped with. Regardless of the type, SkyGuard function according to the SkyGuard Function Table does not change.



SkyGuard



SkyGuard SkyLine™



SkyGuard SkyEye™

⚠ WARNING

THE MACHINE OPERATOR IS REQUIRED TO PERFORM A DAILY FUNCTION TEST TO ENSURE PROPER OPERATION OF THE SKYGUARD SYSTEM.

Function Test

SKYGUARD ONLY

Perform this function test if **SkyGuard only** is selected in machine setup (refer to Table 6-2).

From the Platform Control Console in an area free from obstructions:

1. Operate the telescope out function, then activate SkyGuard sensor.
2. Once sensor has been activated, ensure telescope out function stops then telescope in function operates for a short duration. Additionally, verify Soft Touch/SkyGuard indicator light flashes and horn sounds. If machine is equipped with SkyGuard beacon, ensure it flashes when sensor activates.
3. With SkyGuard sensor still engaged, press and hold yellow Soft Touch/SkyGuard override button. Operate a function to verify operation can be resumed.
4. Disengage SkyGuard sensor, release controls, and recycle footswitch. Ensure normal operation available.

In Ground Mode:

1. Operation is allowed regardless of SkyGuard activation.

BOTH SKYGUARD AND SOFT TOUCH

Perform this procedure **if both SkyGuard and Soft Touch** are selected in machine setup (refer to Table 6-2).

From the Platform Control Console in an area free from obstructions:

NOTE: *Machine will treat Soft Touch/SkyGuard override switch as if it is a Soft Touch and SkyGuard switch.*

1. Operate the telescope out function, then activate SkyGuard sensor.
2. Once sensor has been activated, ensure telescope out function stops. Additionally, verify Soft Touch/SkyGuard indicator light flashes and horn sounds. If machine is equipped with SkyGuard beacon, ensure it flashes when sensor activates.
3. With SkyGuard sensor still engaged, press and hold yellow Soft Touch/SkyGuard override button. Operate a function to verify operation can be resumed.
4. Disengage SkyGuard sensor, release controls, and recycle footswitch. Ensure sure normal operation is available.

In Ground Mode:

1. Operation is allowed regardless of SkyGuard activation.

SOFT TOUCH ONLY

If **Soft Touch only** is selected in machine setup (refer to Table 6-2), machine will treat the Soft Touch/SkyGuard override switch as if it is a Soft Touch switch.

SKYGUARD NOT SELECTED IN MACHINE SETUP

If the SkyGuard system is installed on the machine, but no option is selected in the machine setup (refer to Table 6-2), SkyGuard sensor status will be ignored. No function cutout or reversal will be implemented.

Diagnostics & Troubleshooting

If SkyGuard does not function when the sensor is engaged, first verify the configuration under the
MACHINE SETUP: SKYGUARD OPTION menu using the handheld Analyzer. Ensure the selected configuration matches the actual system installed on the machine. If not, select the correct configuration, then verify operation.

Additionally, use the handheld analyzer to navigate to the DIAGNOSTICS: FEATURES → SKYGUARD INPUTS menu to determine additional SkyGuard fault information.

Engage the SkyGuard sensor and observe the Analyzer to determine if the switch/relay closes.

If the status of the switch/relay remains OPEN while the SkyGuard sensor is actively engaged, it is possible the sensor has failed and should be replaced immediately.

If the status of the switch/relay remains CLOSED while the SkyGuard sensor is actively engaged, a power or ground wire may not be making good contact or may be loose or broken. Additionally, there is a low probability that both relays may have failed.

If the switch/relay status is in disagreement, then one may have failed or is not installed correctly. In this case, the machine will be inoperable.

FAULT CODES

Refer to Table 6-12 for more fault code information

- **0039 -** SkyGuard switch activation fault
- **2563 -** switch disagreement fault

Table 4-1. SkyGuard Function Table

Drive Forward	Drive Reverse	Steer	Swing	Boom Lift Up	Boom Lift Down	Boom Tel e O ut	Boom Tele In	Jib Lift	Jib Swing	Jib Tele	Basket Level	Basket Rotate
R*/C**	R	C	R	R	R	R	C	C	C	C	C	C
R = Indicates Reversal is Activated												
C = Indicates Cutout is Activated												
* DOS (Drive Orientation System) Enabled												
** DOS Not Enabled, machine is driving straight without steering, and any other hydraulic function is active												
NOTE: If SkyGuard is enabled with the Soft Touch system, functions will cut out instead of reversing.												

4.18 BOLT-ON EXTERNAL FALL ARREST

The bolt-on external fall arrest system is designed to provide a lanyard attach point while allowing the operator to access areas outside the platform. Exit/Enter the platform through the gate area only. The system is designed for use by one person.

Personnel must use fall protection at all times. A full body harness is required with lanyard not to exceed 6 ft. (1.8 M) in length, that limits the maximum arrest force to 900 lbs. (408 kg).

The bolt-on external fall arrest System capacity is 310 lb (140 kg) - one (1) person maximum.

Do not move the platform during use of the bolt-on external fall arrest system.

⚠ WARNING

DO NOT OPERATE ANY MACHINE FUNCTIONS WHILE OUTSIDE OF PLATFORM. BE CAREFUL WHEN ENTERING/EXITING THE PLATFORM AT ELEVATION.

⚠ WARNING

IF THE BOLT-ON EXTERNAL FALL ARREST SYSTEM IS USED TO ARREST A FALL OR IS OTHERWISE DAMAGED, THE ENTIRE SYSTEM MUST BE REPLACED AND THE PLATFORM FULLY INSPECTED BEFORE RETURNING TO SERVICE. REFER TO THE SERVICE MANUAL FOR REMOVAL AND INSTALLATION PROCEDURES.

THE BOLT-ON EXTERNAL FALL ARREST SYSTEM REQUIRES AN ANNUAL INSPECTION AND CERTIFICATION. THE ANNUAL INSPECTION AND CERTIFICATION MUST BE PERFORMED BY A QUALIFIED PERSON OTHER THAN THE USER.

Inspection Before Use

The bolt-on external fall arrest system must be inspected before each use of the aerial work platform. Replace components if there are any signs of wear or damage.

Before each use, perform a visual inspection of the following components:

- Cable: Inspect cable for proper tension, broken strands, kinks, or any signs of corrosion.

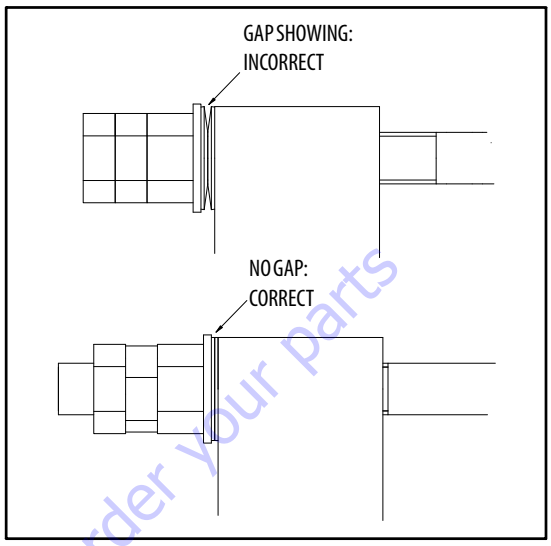
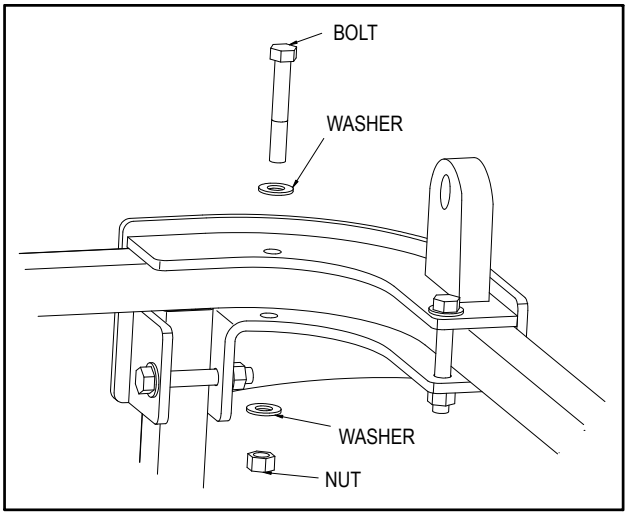


Figure 4-57. Bolt-On External Fall Arrest Cable Tension

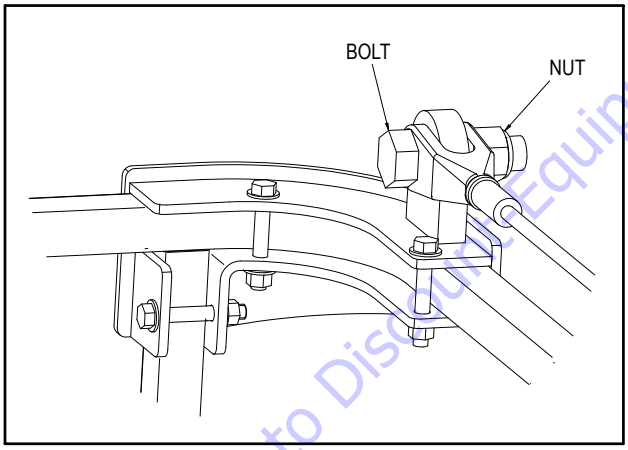
- Fittings & Brackets: Ensure all fittings are tight and there are no signs of fractures. Inspect brackets for any damage.
- Attachment Ring: No cracks or signs of wear are acceptable. Any signs of corrosion requires replacement.
- Attaching Hardware: Inspect all attaching hardware to ensure there are no missing components and hardware is properly tightened.
- Platform Rails: No visible damage is acceptable.

Installation

1. Install the retaining hardware (bolts, nuts, and washers) and secure the brackets to the platform rail. Tighten the nuts but do not torque them yet.

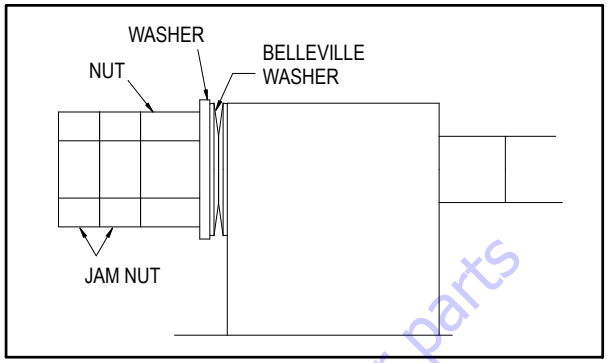


2. Attach the fall arrest cable to the right hand bracket Using the attaching bolt and nut. Orient the bolt as shown below. Do not tighten the nut so cable can still rotate.

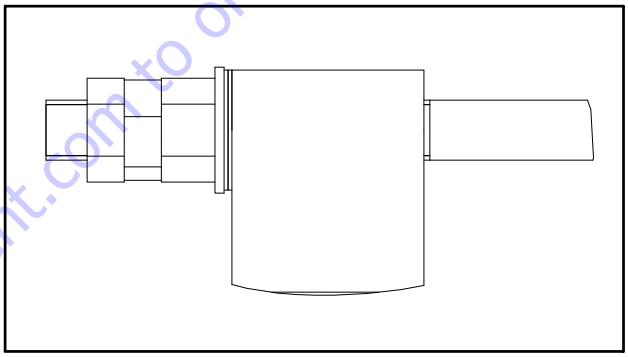


3. Install the Attachment Ring onto the cable.

4. Without twisting the fall arrest cable, pull it thru the left hand bracket and mark the top of the swaged cable end. Install the fall arrest cable through the left hand bracket and secure it using the belleville washers, washer, retaining nut, and jam nuts. Orient the hardware as shown below and with the belleville washers so the gap is present at the outside diameter of the washers. install the nuts onto the cable finger tight so the mark on the cable does not move.

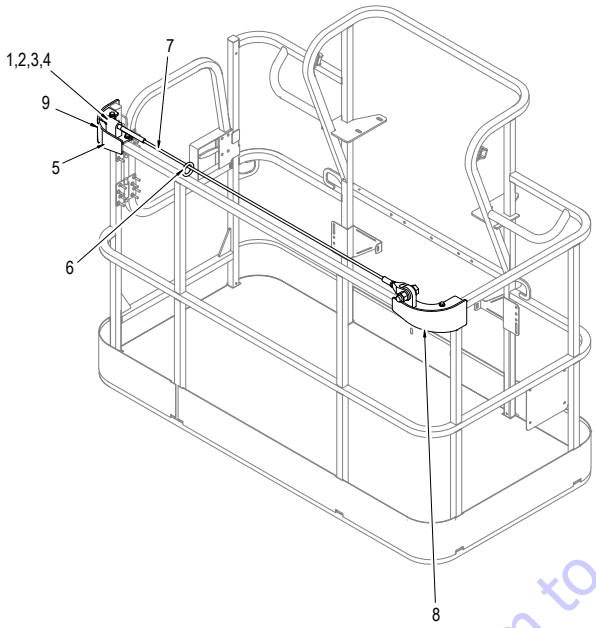


5. Use the two jam nuts to prevent the cable from rotating while the nut is tightened. Tighten the nut until the belleville washers are fully compressed and no gap is present at the outside diameter of the washers. Ensure the cable has not rotated during tightening.



6. Tighten the first jam nut against the retaining nut to keep the nut from loosening. Tighten the remaining jam nut against the first jam nut.

7. Torque the nuts and bolts securing the brackets to 15 ft.lbs. (20 Nm).



1. Belleville Washer
2. Washer
3. Hex Nut
4. Jam Nut
5. LH Bracket
6. Attachment Ring
7. Cable
8. RH Bracket
9. Decal

Figure 4-58. Bolt-On External Fall Arrest System

PARTS FINDER

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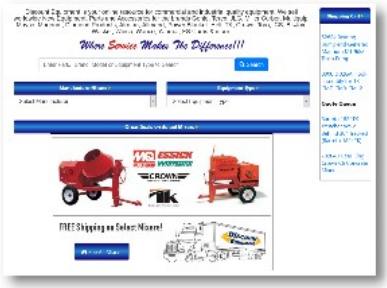

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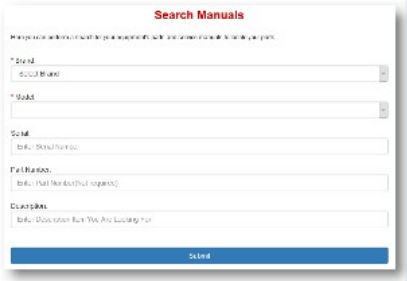

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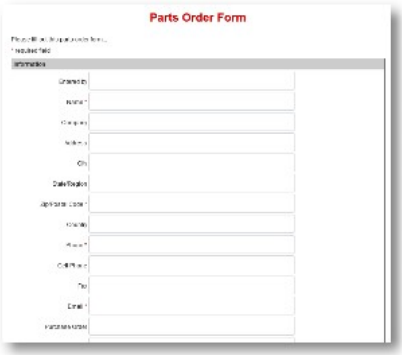

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SECTION 5. BASIC HYDRAULIC INFORMATION & HYDRAULIC SCHEMATICS

5.1 LUBRICATING O-RINGS IN THE HYDRAULIC SYSTEM

When assembling connectors in the hydraulic that use o-ring fittings, it is necessary to lubricate all fittings with hydraulic oil prior to assembly. To lubricate the fittings, use one of the following procedures.

NOTE: *All O-ring fittings must be pre-lubricated with hydraulic oil prior to assembly.*

Cup and Brush

The following is needed to correctly oil the o-ring in this manner:

- A small container for hydraulic oil
- Small paint brush

1. Hold the fitting in one hand while using the brush with the other hand to dip into the container. Remove excess hydraulic oil from the brush so an even film of oil is applied on the o-ring.

2. Holding the fitting over the hydraulic oil container, brush an even film of oil around the entire o-ring in the fitting, making sure the entire o-ring is completely saturated.

3. Turn the o-ring on the other side of the fitting and repeat the previous step, ensuring the entire o-ring is coated with hydraulic oil.

Dip Method

NOTE: *This method works best with Face Seal o-rings, but will work for all o-ring fitting types.*

The following is needed to correctly oil the o-ring in this manner:

- A small leak proof container
- Sponge cut to fit inside the container
- A small amount of hydraulic oil to saturate the sponge.

1. Place the sponge inside the container and add hydraulic oil to the sponge until it is fully saturated.
2. Dip the fitting into the sponge using firm pressure. Upon lifting the fitting, a small droplet will form and drip from the bottom of the fitting. This should signify an even coating of oil on the fitting.

3. O-ring Boss type fittings will require more pressure in able to immerse more of the fitting into the saturated sponge. This will also cause more oil to be dispersed from the sponge.

Spray Method

This method requires a pump or trigger spray bottle.

1. Fill the spray bottle with hydraulic oil.
2. Hold the fitting over a suitable catch can.
3. Spray the entire o-ring surface with a medium coat of oil.

Brush-on Method

This method requires a sealed bottle brush.

1. Fill the bottle with hydraulic oil.
2. Using slight pressure to the body of the spray bottle, invert the bottle so the brush end is in the downward position.
3. Brush hydraulic oil on the entire o-ring, applying an even coat of oil.

5.2 HYDRAULIC CONNECTION ASSEMBLY AND TORQUE SPECIFICATION

Tapered Thread Types

NPTF = national tapered fuel (Dry Seal) per SAE J476/J512

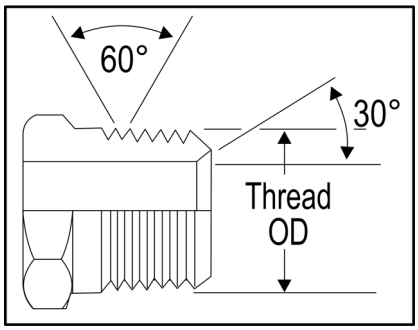


Figure 5-1. NPTF Thread

BSPT = British standard pipe tapered per ISO7-1

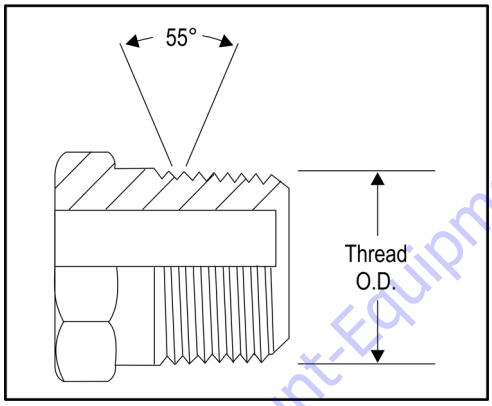


Figure 5-2. BSPT Thread

Straight Thread Types, Tube and Hose Connections

JIC = 37° flare per SAE J514

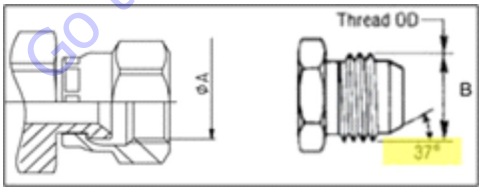


Figure 5-3. JIC Thread

SAE = 45° flare per SAE J512

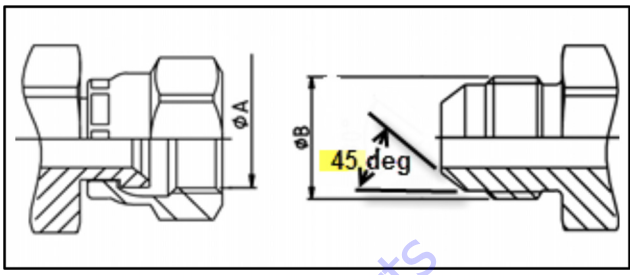


Figure 5-4. SAE Thread

ORFS = o-ring face seal per SAE J1453

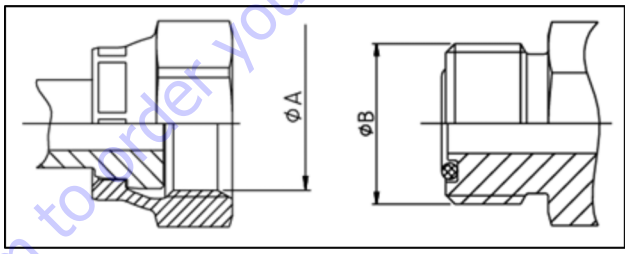


Figure 5-5. ORFS Thread

MBTL = metric flareless bite type fitting, pressure rating L (medium) per ISO 8434, DIN 2353

MBTS = metric flareless bite type fitting, pressure rating S (high) per ISO 8434, DIN 2353

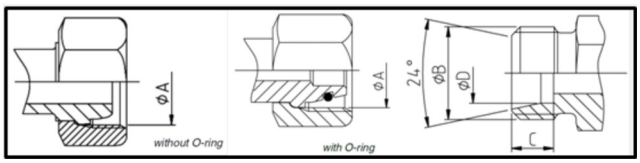


Figure 5-6. MTBL-MBTS Thread

BH = bulkhead connection – JIC, ORFS, MBTL, or MBTS types

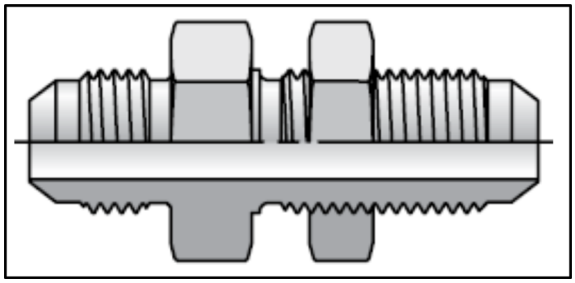


Figure 5-7. Bulkhead Thread

Straight Thread Types, Port Connections

ORB = o-ring boss per SAE J1926, ISO 11926

MPP = metric pipe parallel o-ring boss per SAE J2244, ISO 6149, DIN 3852

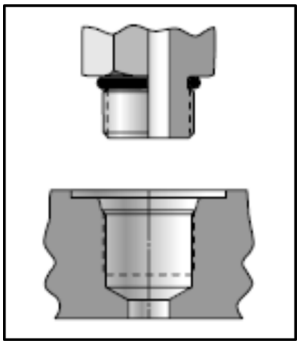


Figure 5-8. ORB-MPP Thread

MFF = metric flat face port per ISO 9974-1

BSPP = British standard parallel pipe per ISO 1179-1, DIN 3852-2

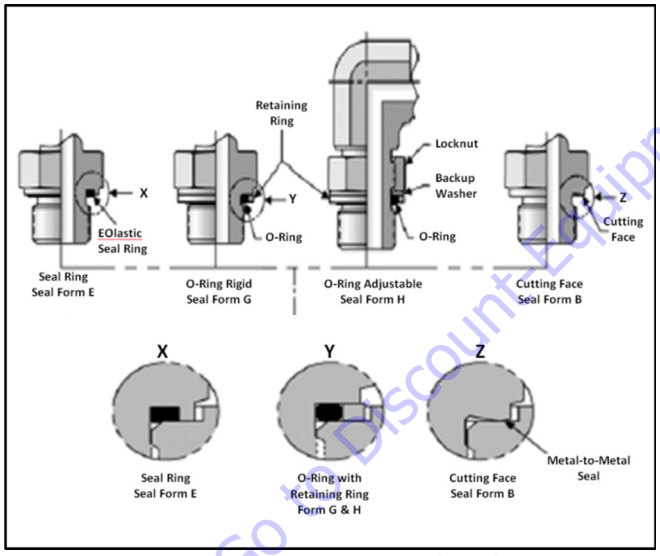


Figure 5-9. MFF-BSPP Thread

Flange Connection Types

FL61 = code 61 flange per SAE J518, ISO 6162

FL62 = code 62 flange per SAE J518, ISO 6162

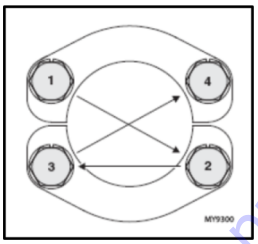


Figure 5-10. ORB-MPP Thread

Tightening Methods

Torque = Application of a twisting force to the applicable connection by use of a precise measurement instrument (i.e. torque wrench).

Finger Tight = The point where the connector will no longer thread onto the mating part when tightened by hand or fingers. Finger Tight is relative to user strength and will have some variance. The average torque applied by this method is 3 ft-lbs [4 N-m] Also referred to as 'Hand Tight.'

TFFT = Turns From Finger Tight; Application of a preload to a connection by first tightening the connection by hand (fingers) and applying an additional rotation counted by a defined number of turns by use of a tool.

FFWR = Flats from Wrench Resistance; Application of a preload to a connection by tightening to the point of initial wrench resistance and turning the nut a described number of 'flats'. A 'flat' is one side of the hexagonal tube nut and equates to 1/6 of a turn. Also referred to as the 'Flats Method.'

Assembly And Torque Specifications

Prior to selecting the appropriate torque from the tables within this section, it is necessary to properly identify the connector being installed. Refer to the Figures and Tables in this section.

GENERAL TUBE TYPE FITTING ASSEMBLY INSTRUCTIONS

1. Take precautions to ensure that fittings and mating components are not damaged during storage, handling or assembly. Nicks and scratches in sealing surfaces can create a path for leaks which could lead to component contamination and/or failure.
2. When making a connection to tubing, compression or flare, inspect the tube in the area of the fitting attachment to ensure that the tube has not been damaged.
3. The assembly process is one of the leading causes for contamination in air and hydraulic systems. Contamination can prevent proper tightening of fittings and adapters from occurring.
   - **a.** Avoid using dirty or oily rags when handling fittings.
   - **b.** If fittings are disassembled, they should be cleaned and inspected for damage. Replace fittings as necessary before re-installing.
   - **c.** Sealing compounds should be applied where specified; however, care should be taken not to introduce sealant into the system.
   - **d.** Avoid applying sealant to the area of the threads where the sealant will be forced into the system. This is generally the first two threads of a fitting.
   - **e.** Sealant should only be applied to the male threads.
   - **f.** Straight thread fittings do not require sealants. O-rings or washers are provided for sealing.
   - **g.** When replacing or installing an O-ring, care is to be taken while transferring the O-ring over the threads as it may become nicked or torn. When replacing an O-ring on a fitting, the use of a thread protector is recommended.
   - **h.** When installing fittings with O-rings, lubrication shall be used to prevent scuffing or tearing of the O-ring. See O-ring Installation (Replacement) in this section.
4. Take care to identify the material of parts to apply the correct torque values.
   - **a.** Verify the material designation in the table headings.
   - **b.** If specifications are given only for steel fittings and components, the values for alternate materials shall be as follows: Aluminum and Brass- reduce steel values by 35%; Stainless Steel- Use the upper limit for steel.
5. To achieve the specified torque, the torque wrench is to be held perpendicular to the axis of rotation.

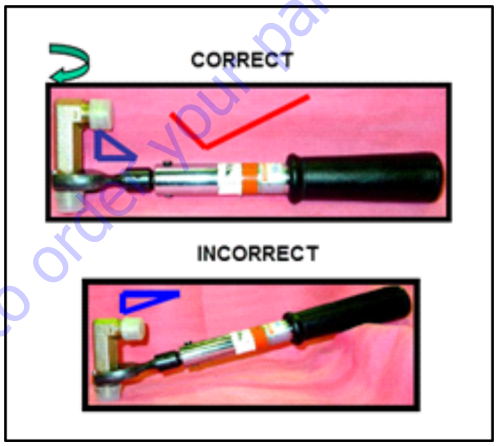


Figure 5-11. Torque Wrench Angle

6. Refer to the appropriate section in this manual for more specific instructions and procedures for each type of fitting connection

Assembly Instructions for American Standard Pipe Thread Tapered (NPTF) Connections.

1. Inspect components to ensure male and female port threads are free of rust, splits, dirt, foreign matter, or burrs.
2. Apply a suitable thread sealant, such as JLG Threadlocker, to the male pipe threads if not already applied. Ensure the first 1 to 2 threads are uncovered to prevent system contamination.
3. Assemble connection hand tight.
4. Mark fittings, male and female.

⚠ CAUTION

OVER TIGHTENING MAY CAUSE DEFORMATION OF THE PIPE FITTING AND DAMAGE TO THE JOINING FITTING, FLANGE OR COMPONENT MAY OCCUR.

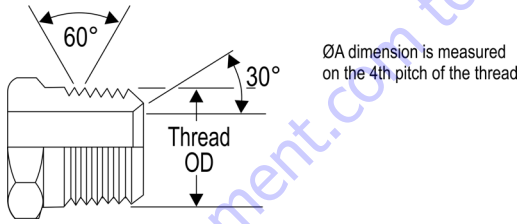
NEVER BACK OFF (LOOSEN) PIPE THREADED CONNECTORS TO ACHIEVE ALIGNMENT. MEET THE MINIMUM REQUIRED TURNS AND USE THE LAST TURN FOR ALIGNMENT.

5. Rotate male fitting the number of turns per Table 5-1, NPTF Pipe Thread. See FFWR and TFFT Methods for TFFT procedure requirements.

NOTE: *TFFT values provided in Table 5-1, NPTF Pipe Thread are applicable for the following material configurations:*

- STEEL fittings with STEEL mating components
- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

Table 5-1. NPTF Pipe Thread



TYPE/FITTING IDENTIFICATION					Turns From Finger Tight (TFFT)**
Material	Dash Size	Thread Size (UNF)	ØA* (in)	ØA* (mm)	
STEEL, ALUMINUM, OR BRASS FITTINGS WITH STEEL, ALUMINUM, OR BRASS MATING COMPONENTS	2	1/8-27	0.40	10.24	2 to 3
	4	1/4-18	0.54	13.61	2 to 3
	6	3/8-18	0.67	17.05	2 to 3
	8	1/2-14	0.84	21.22	2 to 3
	12	3/4-14	1.05	26.56	2 to 3
	16	1-11 1/2	1.31	33.22	1.5 to 2.5
	20	1 1/4-11 1/2	1.65	41.98	1.5 to 2.5
	24	1 1/2-11 1/2	1.89	48.05	1.5 to 2.5
	32	2-11 1/2	2.37	60.09	1.5 to 2.5

* ØA thread dimension for reference only.

** See FFWR and TFFT Methods subsection for TFFT procedure requirements.

Assembly Instructions for British Standard Pipe Thread Tapered (BSPT) Connections

1. Inspect components to ensure male and female port threads are free of rust, splits, dirt, foreign matter, or burrs.
2. Apply a suitable thread sealant, such as JLG Threadlocker, to the male pipe threads if not already applied. Ensure the first 1 to 2 threads are uncovered to prevent system contamination.
3. Assemble connection hand tight.
4. Mark fittings, male and female.

⚠ CAUTION

OVER TIGHTENING MAY CAUSE DEFORMATION OF THE PIPE FITTING AND DAMAGE TO THE JOINING FITTING, FLANGE OR COMPONENT MAY OCCUR.

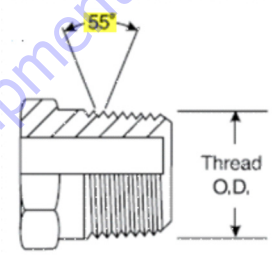
NEVER BACK OFF (LOOSEN) PIPE THREADED CONNECTORS TO ACHIEVE ALIGNMENT. MEET THE MINIMUM REQUIRED TURNS AND USE THE LAST TURN FOR ALIGNMENT.

5. Rotate male fitting the number of turns per Table 5-2, BSPT Pipe Thread. See FFWR and TFFT Methods for TFFT procedure requirements.

NOTE: *TFFT values provided in Table 5-2, BSPT Pipe Thread are applicable for the following material configurations:*

- STEEL fittings with STEEL mating components
- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

Table 5-2. BSPT Pipe Thread



TYPE/FITTING IDENTIFICATION					Turns From Finger Tight (TFFT)**
MATERIAL	Dash Size	Thread Size (BSPT)	ØA* (in)	ØA* (mm)	
STEEL, ALUMINUM, OR BRASS FITTINGS WITH STEEL, ALUMINUM, OR BRASS MATING COMPONENTS	2	1/8-28	0.38	9.73	2 to 3
	4	1/4-19	0.52	13.16	2 to 3
	6	3/8-19	0.66	16.66	2 to 3
	8	1/2-14	0.83	20.96	2 to 3
	12	3/4-14	1.04	26.44	2 to 3
	16	1-11	1.31	33.25	1.5 to 2.5
	20	1 1/4-11	1.65	41.91	1.5 to 2.5
	24	1 1/2-11	1.88	47.80	1.5 to 2.5
	32	2-11	2.35	59.61	1.5 to 2.5

* ØA thread dimension for reference only.

** See Appendix B for TFFT procedure requirements.

Assembly Instructions for 37° (JIC) Flare Fittings

1. Inspect the flare for obvious visual squareness and concentricity issues with the tube OD. Ensure surface is smooth, free of rust, weld and brazing splatter, splits, dirt, foreign matter, or burrs. If necessary replace fitting or adapter.

⚠ CAUTION

DO NOT FORCE A MISALIGNED OR SHORT HOSE/TUBE INTO ALIGNMENT. IT PUTS UNDESIRABLE STRAIN ONTO THE JOINT EVENTUALLY LEADING TO LEAKAGE.

2. Align tube to fitting and start threads by hand.

⚠ CAUTION

THE TORQUE METHOD SHOULD NOT BE USED ON LUBRICATED OR OILY FITTINGS. NO LUBRICATION OR SEALANT IS REQUIRED. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

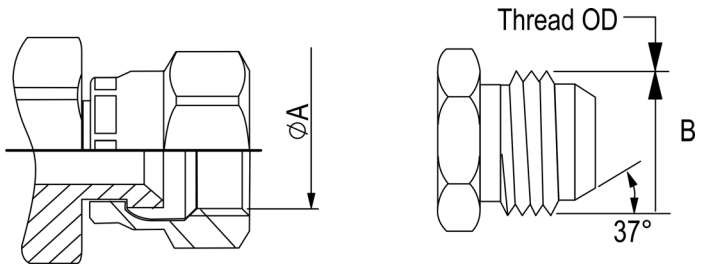
3. Torque assembly to value listed in Table Table 5-3, 37° Flare (JIC)Thread - Steel or Table 5-4, 37° Flare (JIC)Thread - Aluminum/Brass while using the Double Wrench Method per Double Wrench Method. Refer to FFWR and TFFT Methods for procedure requirements if using the FFWR method.

NOTE: *Torque values provided in Table Table 5-3, 37° Flare (JIC)Thread - Steel and Table 5-4, 37° Flare (JIC)Thread - Aluminum/Brass are segregated based on the material configuration of the connection.*

ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

Table 5-3. 37° Flare (JIC)Thread - Steel

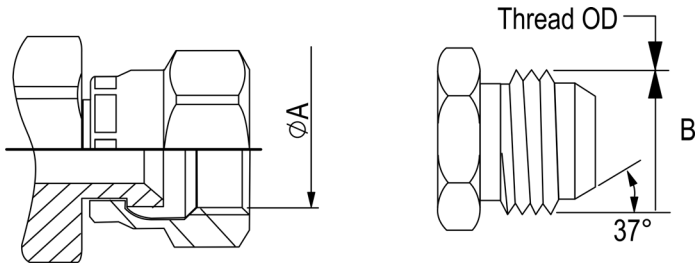


Type/Fitting Identification							Torque						Flats from Wrench Resistance (F.F.W.R)**
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]			
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max	
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.28	7.00	0.31	7.75	6	7	7	8	9	10	--
	3	3/8-24	0.34	8.60	0.37	9.50	8	9	10	11	12	14	--
	4	7/16-20	0.39	10.00	0.44	11.10	13	14	14	18	19	19	1-1/2 to 1-3/4
	5	1/2-20	0.46	11.60	0.50	12.70	14	15	15	19	20	21	1 to 1-1/2
	6	9/16-18	0.51	13.00	0.56	14.30	22	23	24	30	31	33	1 to 1-1/2
	8	3/4-16	0.69	17.60	0.75	19.10	42	44	46	57	60	63	1-1/2 to 1-3/4
	10	7/8-14	0.81	20.50	0.87	22.20	60	63	66	81	85	89	1 to 1-1/2
	12	1 1/16-12	0.97	24.60	1.06	27.00	84	88	92	114	120	125	1 to 1-1/2
	14	1 3/16-12	1.11	28.30	1.19	30.10	100	105	110	136	142	149	1 to 1-1/2
	16	1 5/16-12	1.23	31.30	1.31	33.30	118	124	130	160	168	176	3/4 to 1
	20	1 5/8-12	1.54	39.20	1.63	41.30	168	176	185	228	239	251	3/4 to 1
	24	1 7/8-12	1.80	45.60	1.87	47.60	195	205	215	264	278	291	3/4 to 1
	32	2 1/2-12	2.42	61.50	2.50	63.50	265	278	292	359	377	395	3/4 to 1

* ØA and ØB thread dimensions for reference only.

** See Appendix B for FFWR procedure requirements.

Table 5-4. 37° Flare (JIC)Thread - Aluminum/Brass



TYPE/FITTING IDENTIFICATION							Torque						Flats from Wrench Resistance (F.F.W.R)**
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]			
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max	
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.28	7.00	0.31	7.75	4	4	5	5	6	7	--
	3	3/8-24	0.34	8.60	0.37	9.50	5	6	7	7	8	9	--
	4	7/16-20	0.39	10.00	0.44	11.10	8	9	9	11	12	13	1-1/2 to 1-3/4
	5	1/2-20	0.46	11.60	0.50	12.70	9	10	10	12	13	14	1 to 1-1/2
	6	9/16-18	0.51	13.00	0.56	14.30	14	15	16	19	20	21	1 to 1-1/2
	8	3/4-16	0.69	17.60	0.75	19.10	27	29	30	37	39	41	1-1/2 to 1-3/4
	10	7/8-14	0.81	20.50	0.87	22.20	39	41	43	53	56	58	1 to 1-1/2
	12	11/16-12	0.97	24.60	1.06	27.00	55	57	60	74	78	81	1 to 1-1/2
	14	13/16-12	1.11	28.30	1.19	30.10	65	68	72	88	93	97	1 to 1-1/2
	16	15/16-12	1.23	31.30	1.31	33.30	77	81	84	104	109	114	3/4 to 1
	20	15/8-12	1.54	39.20	1.63	41.30	109	115	120	148	155	163	3/4 to 1
	24	17/8-12	1.80	45.60	1.87	47.60	127	133	139	172	180	189	3/4 to 1
	32	21/2-12	2.42	61.50	2.50	63.50	172	181	189	234	245	257	3/4 to 1

* ØA and ØB thread dimensions for reference only.

** See FFWR and TFFT Methodsfor FFWR procedure requirements.

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Assembly Instructions for 45° SAE Flare Fittings

1. Inspect the flare for obvious visual squareness and concentricity issues with the tube OD. Ensure surface is smooth, free of rust, weld and brazing splatter, splits, dirt, foreign matter, or burrs. If necessary replace fitting or adapter.

⚠ CAUTION

DO NOT FORCE A MISALIGNED OR SHORT HOSE/TUBE INTO ALIGNMENT. IT PUTS UNDESIRABLE STRAIN ONTO THE JOINT EVENTUALLY LEADING TO LEAKAGE.

2. Align tube to fitting.
3. Tighten fitting by hand until hand tight.

⚠ CAUTION

THE TORQUE METHOD SHOULD NOT BE USED ON LUBRICATED OR OILY FITTINGS. NO LUBRICATION OR SEALANT IS REQUIRED. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

Torque fitting to value listed in Table 5-5, 45° Flare (SAE) - Steel and Table 5-6, 45° Flare (SAE) - Aluminum/Brass while using the Double Wrench Method outlined in this section. Refer to FFWR and TFFT Methods for procedure requirements if using the TFFT method.

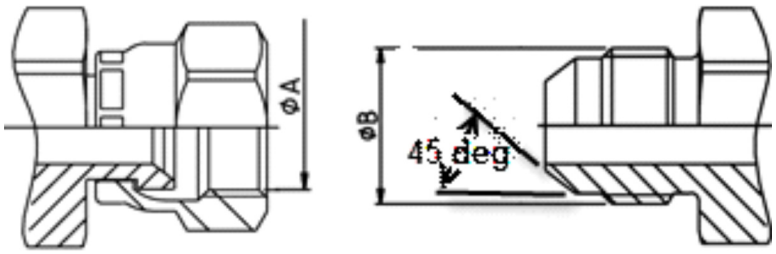
NOTE: *Torque values provided in Table 5-5, 45° Flare (SAE) - Steel and Table 5-6, 45° Flare (SAE) - Aluminum/Brass are segregated based on the material configuration of the connection.*

ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS

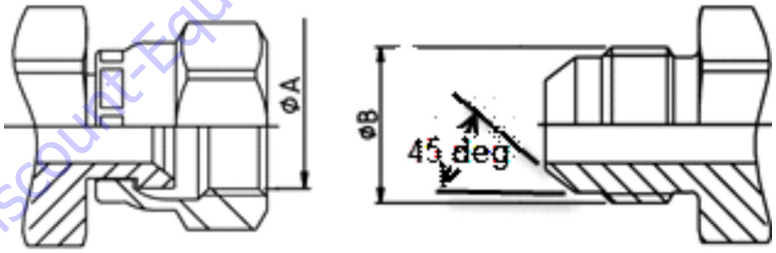
mating components.

Table 5-5. 45° Flare (SAE) - Steel



TYPE/FITTING IDENTIFICATION							Torque					
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]		
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	4	7/16-20	0.39	9.90	0.44	11.10	13	14	14	18	19	19
	6	5/8-18	0.56	14.30	0.63	15.90	22	23	24	30	31	33
	8	3/4-16	0.69	17.50	0.75	19.10	42	44	46	57	60	62
	10	7/8-14	0.81	20.60	0.87	22.20	60	63	66	81	85	89
	12	11/16-14	0.98	25.00	1.06	27.00	84	88	92	114	119	125
* ØA and ØB thread dimensions for reference only.												
** See FFWR and TFFT Methodsfor FFWR procedure requirements.												

Table 5-6. 45° Flare (SAE) - Aluminum/Brass



TYPE/FITTING IDENTIFICATION							Torque					
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]		
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	4	7/16-20	0.39	9.90	0.44	11.10	8	9	9	11	12	12
	6	5/8-18	0.56	14.30	0.63	15.90	14	15	15	19	20	20
	8	3/4-16	0.69	17.50	0.75	19.10	27	29	30	37	39	41
	10	7/8-14	0.81	20.60	0.87	22.20	39	41	43	53	56	58
	12	11/16-14	0.98	25.00	1.06	27.00	55	58	61	75	79	83
* ØA and ØB thread dimensions for reference only.												
** See FFWR and TFFT Methods for TFFT procedure requirements.												

Assembly Instructions for O-Ring Face Seal (ORFS) Fittings

1. Ensure proper O-ring is installed. If O-ring is missing install per O-ring Installation (Replacement).
2. Ensure surface is smooth, free of rust, weld and brazing splatter, splits, dirt, foreign matter, or burrs. If necessary replace fitting or adapter.

⚠ CAUTION

CARE TO BE TAKEN WHEN LUBRICATING O-RING. AVOID ADDING OIL TO THE THREADED CONNECTION OF THE FITTING. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

3. Pre-lubricate the O-ring with Hydraulic Oil.
4. Place the tube assembly against the fitting body so that the flat face comes in contact with the O-ring. Hand thread the nut onto the fitting body.
5. Torque nut to value listed in Table 5-7, O-ring Face Seal (ORFS) - Steel or Table 5-8, O-ring Face Seal (ORFS) - Aluminum/Brass while using the Double Wrench Method. Refer to FFWR and TFFT Methods for procedure requirements if using the FFWR method.

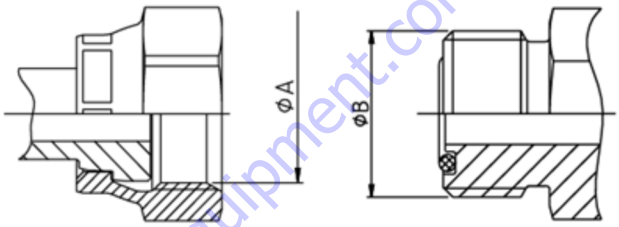
NOTE: *Torque values provided in Table 5-7, O-ring Face Seal (ORFS) - Steel and Table 5-8, O-ring Face Seal (ORFS) - Aluminum/Brass are segregated based on the material configuration of the connection.*

ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or

BRASS mating components

Table 5-7. O-ring Face Seal (ORFS) - Steel

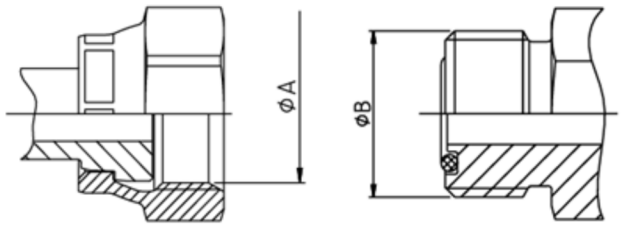


TYPE/FITTING IDENTIFICATION							Torque						Flats from Wrench Resistance (F.F.W.R)**	
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]			Tube Nuts	Swivel & Hose Ends
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max		
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	4	9/16-18	0.51	13.00	0.56	14.20	18	19	20	25	26	27	1/4 to 1/2	1/2 to 3/4
	6	11/16-16	0.63	15.90	0.69	17.50	30	32	33	40	43	45	1/4 to 1/2	1/2 to 3/4
	8	13/16-16	0.75	19.10	0.81	20.60	40	42	44	55	57	60	1/4 to 1/2	1/2 to 3/4
	10	1-14	0.94	23.80	1.00	25.40	60	63	66	81	85	89	1/4 to 1/2	1/2 to 3/4
	12	13/16-12	1.11	28.20	1.19	30.10	85	90	94	115	122	127	1/4 to 1/2	1/2 to 3/4
	16	17/16-12	1.34	34.15	1.44	36.50	110	116	121	149	157	164	1/4 to 1/2	1/2 to 3/4
	20	1 11/16-12	1.59	40.50	1.69	42.90	150	158	165	203	214	224	1/4 to 1/2	1/2 to 3/4
	24	2-12	1.92	48.80	2.00	50.80	230	242	253	312	328	343	1/4 to 1/2	1/2 to 3/4
	32	2 1/2-12	2.43	61.67	2.50	63.50	375	394	413	508	534	560	1/4 to 1/2	1/2 to 3/4

* ØA and ØB thread dimensions for reference only.

** See FFWR and TFFT Methods for FFWR procedure requirements.

Table 5-8. O-ring Face Seal (ORFS) - Aluminum/Brass



TYPE/FITTING IDENTIFICATION							Torque						Flats from Wrench Resistance (F.F.W.R)**	
MATERIAL	Dash Size	Thread Size	ØA*		ØB*		[Ft-Lb]			[N-m]			Tube Nuts	Swivel & Hose Ends
		(UNF)	(in)	(mm)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max		
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	4	9/16-18	0.51	13.00	0.56	14.20	12	13	13	16	18	18	1/4 to 1/2	1/2 to 3/4
	6	11/16-16	0.63	15.90	0.69	17.50	20	21	22	27	28	30	1/4 to 1/2	1/2 to 3/4
	8	13/16-16	0.75	19.10	0.81	20.60	26	28	29	35	38	39	1/4 to 1/2	1/2 to 3/4
	10	1-14	0.94	23.80	1.00	25.40	39	41	43	53	56	58	1/4 to 1/2	1/2 to 3/4
	12	13/16-12	1.11	28.20	1.19	30.10	55	58	61	75	79	83	1/4 to 1/2	1/2 to 3/4
	16	17/16-12	1.34	34.15	1.44	36.50	72	76	79	98	103	107	1/4 to 1/2	1/2 to 3/4
	20	111/16-12	1.59	40.50	1.69	42.90	98	103	108	133	140	146	1/4 to 1/2	1/2 to 3/4
	24	2-12	1.92	48.80	2.00	50.80	12	13	13	16	18	18	1/4 to 1/2	1/2 to 3/4
	32	21/2-12	2.43	61.67	2.50	63.50	20	21	22	27	28	30	1/4 to 1/2	1/2 to 3/4

* ØA and ØB thread dimensions for reference only.

** See FFWR and TFFT Methods for FFWR procedure requirements.

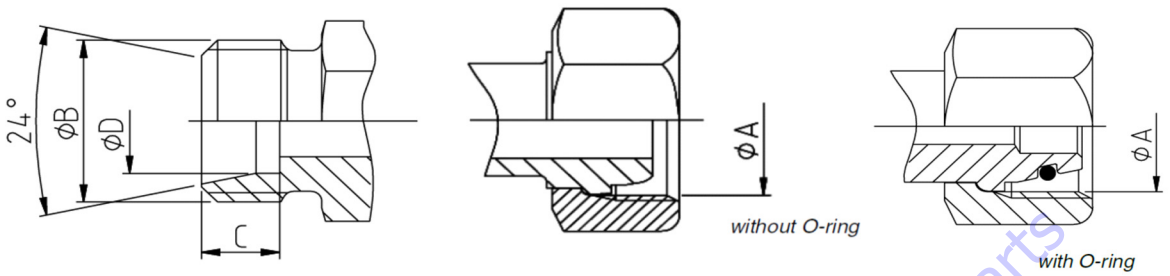
Assembly Instructions for DIN 24° Flare Bite Type Fittings (MBTL and MBTS)

⚠ CAUTION

A NON-SQUARE TUBE END CAN CAUSE IMPROPERLY SEATED FITTINGS AND LEAKAGE.

1. Inspect the components to ensure free of contamination, external damage, rust, splits, dirt, foreign matter, or burrs. Ensure tube end is visibly square. If necessary replace fitting or tube.
2. Lubricate thread and cone of fitting body or hardened pre-assembly tool, as well as the progressive ring and nut threads.
3. Slip nut and progressive ring over tube, assuring that they are in the proper orientation.
4. Push the tube end into the coupling body.
5. Slide collet into position and tighten until finger tight. Mark nut and tube in the finger-tight position. Tighten nut to the number of flats listed in Table Table 5-9, DIN 24°Cone (MBTL & MBTS) while using the Double Wrench Method. The tube must not turn with the nut.

Table 5-9. DIN 24°Cone (MBTL & MBTS)



TYPE/FITTING IDENTIFICATION								DIN 24° CONE FLARELESS BITE FITTING (With or Without O-Ring)						
MATERIAL	TYPE	Tube O.D.	Thread M Size	ØA*	ØB*	C*	ØD*	Torque [Ft-Lb] Min	Nom	Max	Torque [N-m] Min	Nom	Max	Flats from Wrench Resistance (F.F.W.R)**
		(mm)	(Metric)	(mm)	(mm)	(mm)	(mm)							
STEEL FITTINGS WITH STEEL MATING COMPONENTS	DIN 24° CONE FLARELESS BITE (MBTL) FITTING	6	M12x1.5	10.50	12.00	7.00	6.20	FFWR is the recommended method of fitting assembly. Torque values are application specific due to variability in the fitting supplier, coating, lubrication, and other physical characteristics of the connection. Refer to the specific procedure in the						1.5 to 1.75
		8	M14x1.5	12.50	14.00	7.00	8.20							1.5 to 1.75
		10	M16x1.5	14.50	16.00	7.00	10.20							1.5 to 1.75
		12	M18x1.5	16.50	18.00	7.00	12.20							1.5 to 1.75
		15	M22x1.5	20.50	22.00	7.00	15.20							1.5 to 1.75
		18	M26x1.5	24.50	26.00	7.50	18.20							1.5 to 1.75
		22	M30x2	27.90	30.00	7.50	22.20							1.5 to 1.75
		28	M36x2	33.90	36.00	7.50	28.20							1.5 to 1.75
		35	M45x2	42.90	45.00	10.50	35.30							1.5 to 1.75
		42	M52x2	49.90	52.00	11.00	42.30							1.5 to 1.75
	TYPE	Tube O.D.	Thread M Size	ØA*	ØB*	C*	ØD*	Torque [Ft-Lb] Min	Nom	Max	Torque [N-m] Min	Nom	Max	Flats from Wrench Resistance (F.F.W.R)**
		(mm)	(Metric)	(mm)	(mm)	(mm)	(mm)							
	DIN 24° CONE FLARELESS BITE (MBTS) FITTING	6	M14x1.5	12.50	14.00	7.00	6.20	FFWR is the recommended method of fitting assembly. Torque values are application specific due to variability in the fitting supplier, coating, lubrication, and other physical characteristics of the connection. Refer to the specific procedure in the						1.5 to 1.75
		8	M16x1.5	14.50	16.00	7.00	8.20							1.5 to 1.75
		10	M18x1.5	16.50	18.00	7.50	10.20							1.5 to 1.75
		12	M20x1.5	18.50	20.00	7.50	12.20							1.5 to 1.75
		14	M22x1.5	20.50	22.00	8.00	14.20							1.5 to 1.75
		16	M24x1.5	22.50	24.00	8.50	16.20							1.5 to 1.75
		20	M30x2	27.90	30.00	10.50	20.20							1.5 to 1.75
		25	M36x2	33.90	36.00	12.00	25.20							1.5 to 1.75
		30	M42x2	39.90	42.00	13.50	30.20							1.5 to 1.75
		38	M52x2	49.90	52.00	16.00	38.30							1.5 to 1.75

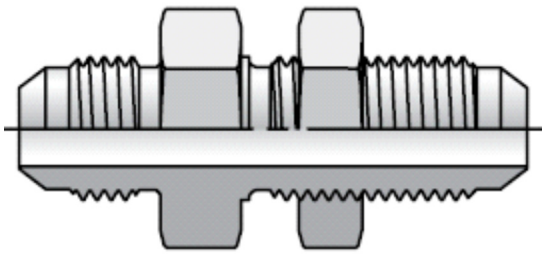
* ØA, ØB, C, & ØD thread dimensions for reference only.

** See Appendix B for FFWR procedure requirements.

Assembly Instructions for Bulkhead (BH) Fittings

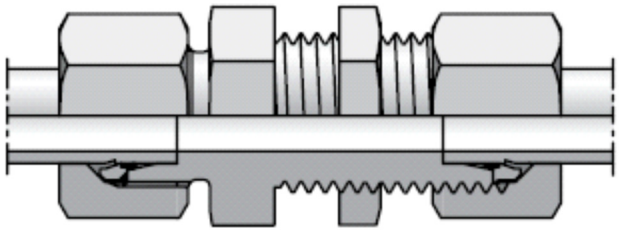
1. Ensure threads and surface are free of rust, weld and brazing splatter, splits, burrs or other foreign material. If necessary replace fitting or adapter.
2. Remove the locknut from the bulkhead assembly.
3. Insert the bulkhead side of the fitting into the panel or bulkhead bracket opening.
4. Hand thread the locknut onto the bulkhead end of the fitting body.
5. Torque nut onto fitting per Table 5-10 and Table 5-11 while using the Double Wrench Method.

Table 5-10. Bulkhead Fittings (BH) - INCH



TYPE/FITTING IDENTIFICATION				FASTENING JAM NUT for Bulkhead Connectors					
MATERIAL	TYPE	Dash Size	Thread Size	Torque					
				[Ft-Lb]			[N-m]		
			(UNF)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS	O-RING FACE SEAL (ORFS) BULKHEAD FITTING	4	9/16-18	15	16	17	20	22	23
		6	11/16-16	25	27	28	34	37	38
		8	13/16-16	55	58	61	75	79	83
		10	1-14	85	90	94	115	122	127
		12	13/16-12	135	142	149	183	193	202
		14	15/16-12	170	179	187	230	243	254
		16	17/16-12	200	210	220	271	285	298
		20	111/16-12	245	258	270	332	350	366
		24	2-12	270	284	297	366	385	403
	TYPE	Dash Size	Thread Size	Torque					
				[Ft-Lb]			[N-m]		
			(UNF)	Min	Nom	Max	Min	Nom	Max
	37° FLARE (JIC) BULKHEAD FITTING	3	3/8-24	8	9	9	11	12	12
		4	7/16-20	13	14	14	18	19	19
		5	1/2-20	20	21	22	27	28	30
		6	9/16-18	25	27	28	34	37	38
		8	3/4-16	50	53	55	68	72	75
		10	7/8-14	85	90	94	115	122	127
		12	11/16-12	135	142	149	183	193	202
		14	13/16-12	170	179	187	230	243	254
		16	15/16-12	200	210	220	271	285	298
		20	15/8-12	245	258	270	332	350	366
		24	17/8-12	270	284	297	366	385	403
		32	21/2-12	310	326	341	420	442	462

Table 5-11. Bulkhead Fittings (BH) - METRIC



TYPE/FITTING IDENTIFICATION				FASTENING JAM NUT for Bulkhead Connectors					
MATERIAL	TYPE	Connecting Tube O.D.	Thread M Size	Torque					
				[Ft-Lb]			[N-m]		
		(mm)	(metric)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS	DIN 24° CONE FLARELESS BITE (MBTL) BULKHEAD FITTING	6	M12x1.5	14	15	16	19	20	22
		8	M14x1.5	17	18	19	23	24	26
		10	M16x1.5	22	23	24	30	31	33
		12	M18x1.5	35	37	39	47	50	53
		15	M22x1.5	44	47	50	60	64	68
		18	M26x1.5	70	75	80	95	102	108
		22	M30x2	115	120	125	156	163	169
		28	M36x2	150	157	164	203	213	222
		35	M45x2	155	162	169	210	220	229
		42	M52x2	220	230	240	298	312	325
	DIN 24° CONE FLARELESS BITE (MBTS) BULKHEAD FITTING	Connecting Tube O.D.	Thread M Size	Torque					
				[Ft-Lb]			[N-m]		
		(mm)	(metric)	Min	Nom	Max	Min	Nom	Max
		6	M14x1.5	17	15	16	23	20	22
		8	M16x1.5	22	18	19	30	24	26
		10	M18x1.5	35	23	24	47	31	33
		12	M20x1.5	40	35	37	54	47	50
		14	M22x1.5	44	47	50	60	64	68
		16	M24x1.5	70	75	80	95	102	108
		20	M30x2	115	120	125	156	163	169
		25	M36x2	150	157	164	203	213	222
		30	M42x2	155	162	169	210	220	229
		38	M52x2	220	230	240	298	312	325

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Assembly Instructions for O-Ring Boss (ORB) Fittings

1. Inspect components to ensure that male and female port threads are free of rust, splits, dirt, foreign matter, or burrs.
2. Ensure proper O-ring is installed. If O-ring is missing install per O-ring Installation (Replacement).

⚠ CAUTION

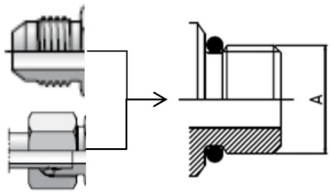
CARE TO BE TAKEN WHEN LUBRICATING O-RING. AVOID ADDING OIL TO THE THREADED CONNECTION OF THE FITTING. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

3. Pre-lubricate the O-ring with Hydraulic Oil.
4. For Non-Adjustable and Plugs, thread the fitting by hand until contact.
5. For Adjustable fittings, refer to Adjustable Stud End Assembly for proper assembly.
6. Torque the fitting or nut to value listed in Table 5-12 thru Table 5-17 while using the Double Wrench Method.
   a. The table headings identify the straight thread O-ring port and the type on the other side of the fitting. The torque will be applied to the straight thread O-ring port.
   b. Torque values provided in Table 5-12 thru Table 5-17 are segregated based on the material configuration of the connection. 'ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

7. Inspect to ensure the O-ring is not pinched and the washer is seated flat on the counter bore of the port.

Table 5-12. O-ring Boss (ORB) - Table 1 of 6



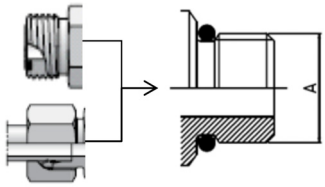
TYPE/FITTING IDENTIFICATION					HEX TYPE PLUGS & STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(85)	(90)	(94)	10	10	11
	3	3/8-24	0.37	9.52	(155)	(163)	(171)	18	18	19
	4	7/16-20	0.44	11.11	22	23	24	29	31	33
	5	1/2-20	0.50	12.70	23	25	26	32	34	35
	6	9/16-18	0.56	14.28	29	31	32	40	42	43
	8	3/4-16	0.75	19.10	52	55	57	70	75	77
	10	7/8-14	0.87	22.22	85	90	94	115	122	127
	12	1 1/16-12	1.06	27.00	135	142	149	185	193	202
	14	1 3/16-12	1.19	30.10	175	184	193	235	249	262
	16	1 5/16-12	1.31	33.30	200	210	220	270	285	298
	20	1 5/8-12	1.63	41.30	250	263	275	340	357	373
	24	1 7/8-12	1.87	47.60	305	321	336	415	435	456
	32	2 1/2-12	2.50	63.50	375	394	413	510	534	560

TYPE/FITTING IDENTIFICATION					HEX TYPE PLUGS & STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(55)	(58)	(61)	6	7	7
	3	3/8-24	0.37	9.52	(101)	(106)	(111)	11	12	13
	4	7/16-20	0.44	11.11	14	15	16	19	20	22
	5	1/2-20	0.50	12.70	15	16	17	20	22	23
	6	9/16-18	0.56	14.28	19	20	21	26	27	28
	8	3/4-16	0.75	19.10	34	36	37	46	49	50
	10	7/8-14	0.87	22.22	55	58	61	75	79	83
	12	1 1/16-12	1.06	27.00	88	93	97	119	126	132
	14	1 3/16-12	1.19	30.10	114	120	126	155	163	171
	16	1 5/16-12	1.31	33.30	130	137	143	176	186	194
	20	1 5/8-12	1.63	41.30	163	171	179	221	232	243
	24	1 7/8-12	1.87	47.60	198	208	218	268	282	296
	32	2 1/2-12	2.50	63.50	244	256	268	331	347	363

* ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

Table 5-13. O-ring Boss (ORB) - Table 2 of 6



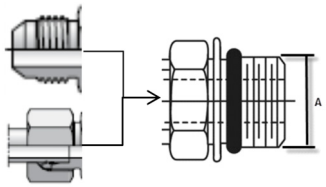
TYPE/FITTING IDENTIFICATION					STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	--	--	--	--	--	--
	3	3/8-24	0.37	9.52	--	--	--	--	--	--
	4	7/16-20	0.44	11.11	26	27	28	35	37	38
	5	1/2-20	0.50	12.70	30	32	33	40	43	45
	6	9/16-18	0.56	14.28	35	37	39	46	50	53
	8	3/4-16	0.75	19.10	60	63	66	80	85	89
	10	7/8-14	0.87	22.22	100	105	110	135	142	149
	12	1 1/16-12	1.06	27.00	135	142	149	185	193	202
	14	1 3/16-12	1.19	30.10	175	184	193	235	249	262
	16	1 5/16-12	1.31	33.30	200	210	220	270	285	298
	20	1 5/8-12	1.63	41.30	250	263	275	340	357	373
	24	1 7/8-12	1.87	47.60	305	321	336	415	435	456
	32	2 1/2-12	2.50	63.50	375	394	413	510	534	560

TYPE/FITTING IDENTIFICATION					STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	--	--	--	--	--	--
	3	3/8-24	0.37	9.52	--	--	--	--	--	--
	4	7/16-20	0.44	11.11	17	18	18	23	24	24
	5	1/2-20	0.50	12.70	20	21	21	27	28	28
	6	9/16-18	0.56	14.28	23	24	24	31	33	33
	8	3/4-16	0.75	19.10	39	41	43	53	56	58
	10	7/8-14	0.87	22.22	65	69	72	88	94	98
	12	1 1/16-12	1.06	27.00	88	93	97	119	126	132
	14	1 3/16-12	1.19	30.10	114	120	126	155	163	171
	16	1 5/16-12	1.31	33.30	130	137	143	176	186	194
	20	1 5/8-12	1.63	41.30	163	171	179	221	232	243
	24	1 7/8-12	1.87	47.60	198	208	218	268	282	296
	32	2 1/2-12	2.50	63.50	244	256	268	331	347	363

* ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

Table 5-14. O-ring Boss (ORB) - Table 3 of 6



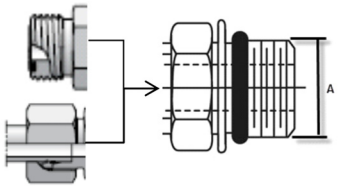
TYPE/FITTING IDENTIFICATION					ADJUSTABLE STUD END with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(60)	(63)	(66)	7	7	7
	3	3/8-24	0.37	9.52	(100)	(105)	(110)	11	12	12
	4	7/16-20	0.44	11.11	15	16	17	20	22	23
	5	1/2-20	0.50	12.70	21	22	23	28	30	31
	6	9/16-18	0.56	14.28	29	31	32	40	42	43
	8	3/4-16	0.75	19.10	52	55	57	70	75	77
	10	7/8-14	0.87	22.22	85	90	94	115	122	127
	12	1 1/16-12	1.06	27.00	135	142	149	185	193	202
	14	1 3/16-12	1.19	30.10	175	184	193	235	249	262
	16	1 5/16-12	1.31	33.30	200	210	220	270	285	298
	20	1 5/8-12	1.63	41.30	250	263	275	340	357	373
	24	1 7/8-12	1.87	47.60	305	321	336	415	435	456
	32	2 1/2-12	2.50	63.50	375	394	413	510	534	560

TYPE/FITTING IDENTIFICATION					ADJUSTABLE STUD END with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(39)	(41)	(43)	4	5	5
	3	3/8-24	0.37	9.52	(65)	(69)	(72)	7	8	8
	4	7/16-20	0.44	11.11	10	11	11	14	15	15
	5	1/2-20	0.50	12.70	14	15	15	19	20	20
	6	9/16-18	0.56	14.28	19	20	21	26	27	28
	8	3/4-16	0.75	19.10	34	36	37	46	49	50
	10	7/8-14	0.87	22.22	55	58	61	75	79	83
	12	1 1/16-12	1.06	27.00	88	93	97	119	126	132
	14	1 3/16-12	1.19	30.10	114	120	126	155	163	171
	16	1 5/16-12	1.31	33.30	130	137	143	176	186	194
	20	1 5/8-12	1.63	41.30	163	171	179	221	232	243
	24	1 7/8-12	1.87	47.60	198	208	218	268	282	296
	32	2 1/2-12	2.50	63.50	244	256	268	331	347	363

*ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

Table 5-15. O-ring Boss (ORB) - Table 4 of 6



TYPE/FITTING IDENTIFICATION					ADJUSTABLE STUD END with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	--	--	--	--	--	--
	3	3/8-24	0.37	9.52	--	--	--	--	--	--
	4	7/16-20	0.44	11.11	15	16	17	20	22	23
	5	1/2-20	0.50	12.70	30	32	33	40	43	45
	6	9/16-18	0.56	14.28	35	37	39	46	50	53
	8	3/4-16	0.75	19.10	60	63	66	80	85	89
	10	7/8-14	0.87	22.22	100	105	110	135	142	149
	12	1 1/16-12	1.06	27.00	135	142	149	185	193	202
	14	1 3/16-12	1.19	30.10	175	184	193	235	249	262
	16	1 5/16-12	1.31	33.30	200	210	220	270	285	298
	20	1 5/8-12	1.63	41.30	250	263	275	340	357	373
	24	1 7/8-12	1.87	47.60	305	321	336	415	435	456
	32	2 1/2-12	2.50	63.50	375	394	413	510	534	560

TYPE/FITTING IDENTIFICATION					ADJUSTABLE STUD END with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	--	--	--	--	--	--
	3	3/8-24	0.37	9.52	--	--	--	--	--	--
	4	7/16-20	0.44	11.11	10	11	11	14	15	15
	5	1/2-20	0.50	12.70	20	21	21	27	28	28
	6	9/16-18	0.56	14.28	23	24	24	31	33	33
	8	3/4-16	0.75	19.10	39	41	43	53	56	58
	10	7/8-14	0.87	22.22	65	69	72	88	94	98
	12	1 1/16-12	1.06	27.00	88	93	97	119	126	132
	14	1 3/16-12	1.19	30.10	114	120	126	155	163	171
	16	1 5/16-12	1.31	33.30	130	137	143	176	186	194
	20	1 5/8-12	1.63	41.30	163	171	179	221	232	243
	24	1 7/8-12	1.87	47.60	198	208	218	268	282	296
	32	2 1/2-12	2.50	63.50	244	256	268	331	347	363

* ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

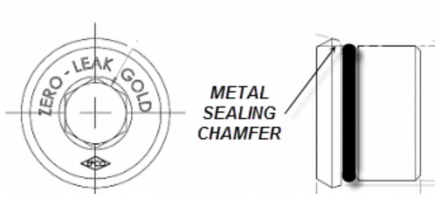
Table 5-16. O-ring Boss (ORB) - Table 5 of 6

TYPE/FITTING IDENTIFICATION					HOLLOW HEX PLUGS					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(30)	(32)	(33)	3	4	4
	3	3/8-24	0.37	9.52	(55)	(58)	(61)	6	7	7
	4	7/16-20	0.44	11.11	10	11	11	14	15	15
	5	1/2-20	0.50	12.70	14	15	16	19	20	22
	6	9/16-18	0.56	14.28	34	36	38	46	49	52
	8	3/4-16	0.75	19.10	60	63	66	80	85	89
	10	7/8-14	0.87	22.22	100	105	110	135	142	149
	12	11/16-12	1.06	27.00	135	142	149	185	193	202
	14	13/16-12	1.19	30.10	175	184	193	235	249	262
	16	15/16-12	1.31	33.30	200	210	220	270	285	298
	20	15/8-12	1.63	41.30	250	263	275	340	357	373
	24	17/8-12	1.87	47.60	305	321	336	415	435	456
	32	21/2-12	2.50	63.50	375	394	413	510	534	560
TYPE/FITTING IDENTIFICATION					HOLLOW HEX PLUGS					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	(20)	(21)	(21)	2	2	2
	3	3/8-24	0.37	9.52	(36)	(38)	(40)	4	4	5
	4	7/16-20	0.44	11.11	6	7	7	8	9	9
	5	1/2-20	0.50	12.70	9	10	10	12	14	14
	6	9/16-18	0.56	14.28	22	24	25	30	33	34
	8	3/4-16	0.75	19.10	39	41	43	53	56	58
	10	7/8-14	0.87	22.22	65	69	72	88	94	98
	12	11/16-12	1.06	27.00	88	93	97	119	126	132
	14	13/16-12	1.19	30.10	114	120	126	155	163	171
	16	15/16-12	1.31	33.30	130	137	143	176	186	194
	20	15/8-12	1.63	41.30	163	171	179	221	232	243
	24	17/8-12	1.87	47.60	198	208	218	268	282	296
	32	21/2-12	2.50	63.50	244	256	268	331	347	363

* ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

Table 5-17. O-ring Boss (ORB) - Table 6 of 6



TYPE/FITTING IDENTIFICATION					ZERO LEAK GOLD® HOLLOW HEX PLUGS					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	2	3	4	3	4	5
	3	3/8-24	0.37	9.52	3	4	5	4	5	7
	4	7/16-20	0.44	11.11	7	8	9	9	11	12
	5	1/2-20	0.50	12.70	9	10	11	12	14	15
	6	9/16-18	0.56	14.28	11	12	13	15	16	18
	8	3/4-16	0.75	19.10	28	30	32	38	41	43
	10	7/8-14	0.87	22.22	46	48	50	62	65	68
	12	1 1/16-12	1.06	27.00	51	54	57	69	73	77
	14	1 3/16-12	1.19	30.10	Fitting size greater than -12 not typically specified on JLG applications. Consult specific service procedure if encountered.					
	16	1 5/16-12	1.31	33.30						
	20	1 5/8-12	1.63	41.30						
	24	1 7/8-12	1.87	47.60						
	32	2 1/2-12	2.50	63.50						

TYPE/FITTING IDENTIFICATION					ZERO LEAK GOLD® HOLLOW HEX PLUGS					
MATERIAL	Dash Size	Thread Size	ØA*		Torque					
		(UNF)	(in)	(mm)	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	2	5/16-24	0.31	7.93	2	3	4	3	4	5
	3	3/8-24	0.37	9.52	3	4	5	4	5	7
	4	7/16-20	0.44	11.11	7	8	9	9	11	12
	5	1/2-20	0.50	12.70	9	10	11	12	14	15
	6	9/16-18	0.56	14.28	11	12	13	15	16	18
	8	3/4-16	0.75	19.10	28	30	32	38	41	43
	10	7/8-14	0.87	22.22	46	48	50	62	65	68
	12	1 1/16-12	1.06	27.00	51	54	57	69	73	77
	14	1 3/16-12	1.19	30.10	Fitting size greater than -12 not typically specified on JLG applications. Consult specific service procedure if encountered.					
	16	1 5/16-12	1.31	33.30						
	20	1 5/8-12	1.63	41.30						
	24	1 7/8-12	1.87	47.60						
	32	2 1/2-12	2.50	63.50						

* ØA Thread OD dimension for reference only.

**Removal Torque for Zero Leak Gold® Hollow Hex Plugs is significantly higher than install torque, typically 1.5-3.5X install torque.

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Assembly Instructions for Adjustable Port End Metric (MFF) Fittings

1. Inspect components to ensure that male and female threads and surfaces are free of rust, splits, dirt, foreign matter, or burrs.
2. If O-ring is not pre-installed, install proper size, taking care not to damage it. See O-ring Installation (Replacement) for instructions.

⚠ CAUTION

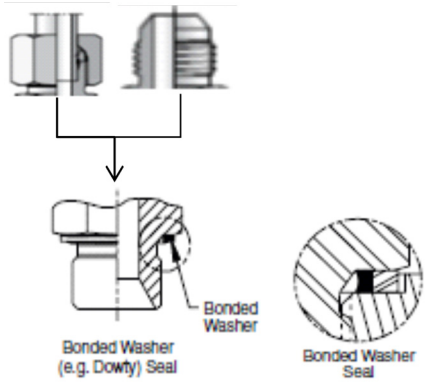
CARE TO BE TAKEN WHEN LUBRICATING O-RING. AVOID ADDING OIL TO THE THREADED CONNECTION OF THE FITTING. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

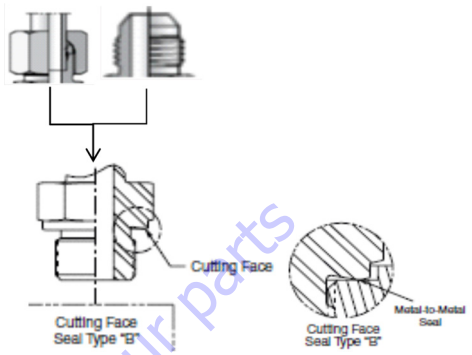
3. Pre-lubricate the O-ring with Hydraulic Oil.
4. For Non-Adjustable Fittings and Plugs, thread the fitting by hand until contact.
5. For Adjustable fittings, refer to Adjustable Stud End Assembly for proper assembly.
6. Torque the fitting or nut to value listed in Table 5-18, Table 5-19, Table 5-20, Table 5-21, Table 5-22, or Table 5-23 while using the Double Wrench Method.
   a. The table headings identify the Metric port and the type on the other side of the fitting. The torque will be applied to the Metric port.
   b. Torque values provided in Table 5-18, Table 5-19, Table 5-20, Table 5-21, Table 5-22, and Table 5-23 are segregated based on the material configuration of the connection. 'ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

7. Inspect to ensure the O-ring is not pinched and the washer is seated flat on the counter bore of the port.

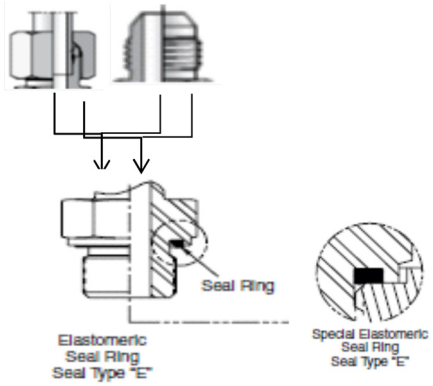
Table 5-18. Metric Flat Face Port (MFF) - L Series - Table 1 of 3

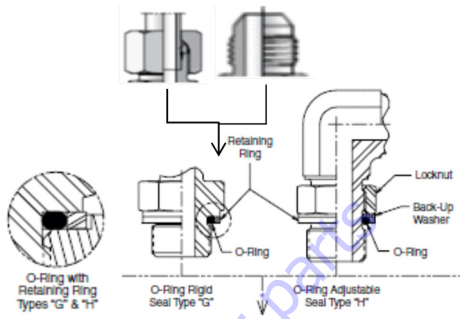




TYPE/FITTING IDENTIFICATION			FORM A (SEALING WASHER) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end						FORM B (CUTTING FACE) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	7	8	8	9	11	11	13	14	14	18	19	19
	M12x1.5	8	15	16	17	20	22	23	22	23	24	30	31	33
	M14x1.5	10	26	28	29	35	38	39	33	35	36	45	47	49
	M16x1.5	12	33	35	36	45	47	49	48	51	53	65	69	72
	M18x1.5	15	41	43	45	55	58	61	59	62	65	80	84	88
	M22x1.5	18	48	51	53	65	69	72	103	108	113	140	146	153
	M27x2	22	66	70	73	90	95	99	140	147	154	190	199	209
	M33x2	28	111	117	122	150	159	165	251	264	276	340	358	374
	M42x2	35	177	186	195	240	252	264	369	388	406	500	526	550
	M48x2	42	214	225	235	290	305	319	465	489	512	630	663	694
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	4	5	5	5	7	7	8	9	9	11	12	12
	M12x1.5	8	10	11	11	14	15	15	14	15	16	19	20	22
	M14x1.5	10	17	18	19	23	24	26	21	22	23	28	30	31
	M16x1.5	12	21	22	23	28	30	31	31	33	34	42	45	46
	M18x1.5	15	27	28	29	37	38	39	38	40	42	52	54	57
	M22x1.5	18	31	33	34	42	45	46	67	70	73	91	95	99
	M27x2	22	43	45	47	58	61	64	91	96	100	123	130	136
	M33x2	28	72	76	79	98	103	107	163	171	179	221	232	243
	M42x2	35	115	121	127	156	164	172	240	252	264	325	342	358
	M48x2	42	139	146	153	188	198	207	302	318	332	409	431	450

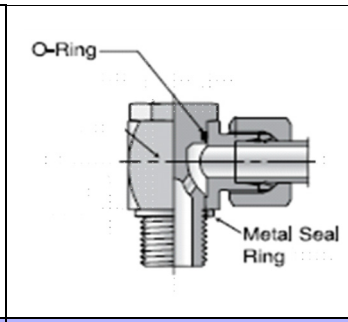
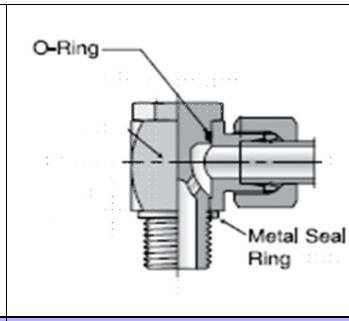
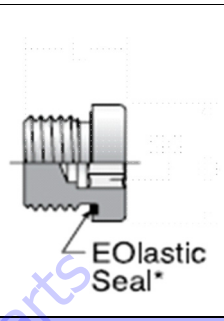
Table 5-19. Metric Flat Face Port (MFF) - L Series - Table 2 of 3





TYPE/FITTING IDENTIFICATION			FORM A (SEALING WASHER) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end						FORM B (CUTTING FACE) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	13	14	14	18	19	19	13	14	15	18	19	20
	M12x1.5	8	18	19	20	25	26	27	18	19	20	25	26	28
	M14x1.5	10	33	35	36	45	47	49	30	31	32	40	42	44
	M16x1.5	12	41	43	45	55	58	61	41	43	45	55	58	61
	M18x1.5	15	52	55	57	70	75	77	52	54	57	70	74	77
	M22x1.5	18	92	97	101	125	132	137	66	70	73	90	95	99
	M27x2	22	133	140	146	180	190	198	133	139	146	180	189	198
	M33x2	28	229	241	252	310	327	342	229	240	252	310	326	341
	M42x2	35	332	349	365	450	473	495	332	348	365	450	473	495
	M48x2	42	398	418	438	540	567	594	398	418	438	540	567	594
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	8	9	9	11	12	12	8	9	9	11	12	12
	M12x1.5	8	12	13	13	16	18	18	12	13	13	16	18	18
	M14x1.5	10	21	22	23	28	30	31	19	20	21	26	27	29
	M16x1.5	12	27	28	29	37	38	39	26	28	29	36	38	39
	M18x1.5	15	34	36	37	46	49	50	34	35	37	46	48	50
	M22x1.5	18	60	63	66	81	85	89	43	45	47	59	61	64
	M27x2	22	86	91	95	117	123	129	86	91	95	117	123	129
	M33x2	28	149	157	164	202	213	222	149	157	164	202	213	222
	M42x2	35	216	227	237	293	308	321	216	227	237	293	308	321
	M48x2	42	259	272	285	351	369	386	259	272	285	351	369	386

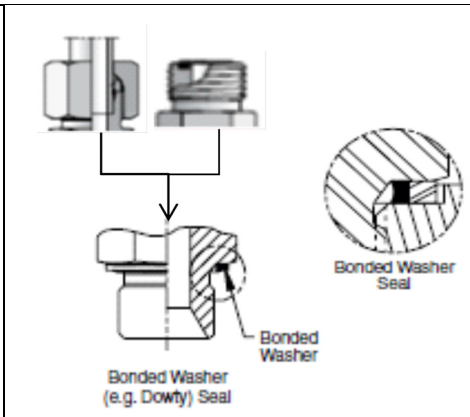
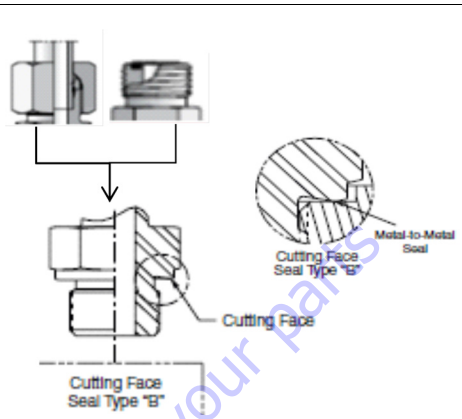
Table 5-20. Metric Flat Face Port (MFF) - L Series - Table 3 of 3

			
TYPE/FITTING IDENTIFICATION	**BANJO FITTINGS with L series DIN (MBTL) opposite end**	**HIGH PRESSURE BANJO FITTINGS with L series DIN (MBTL) opposite end**	**FORM E (EOLASTIC SEALING RING) HOLLOW HEX PLUGS**

MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	13	14	14	18	19	19	13	14	14	18	19	19	9	10	10	12	14	14
	M12x1.5	8	26	28	29	35	38	39	33	35	36	45	47	49	18	19	20	25	26	27
	M14x1.5	10	37	39	41	50	53	56	41	43	45	55	58	61	26	28	29	35	38	39
	M16x1.5	12	44	46	48	60	62	65	59	62	65	80	84	88	41	43	45	55	58	61
	M18x1.5	15	59	62	65	80	84	88	74	78	81	100	106	110	48	51	53	65	69	72
	M22x1.5	18	89	94	98	120	127	133	103	108	113	140	146	153	66	70	73	90	95	99
	M27x2	22	96	101	106	130	137	144	236	248	260	320	336	353	100	105	110	135	142	149
	M33x2	28	--	--	--	--	--	--	266	280	293	360	380	397	166	175	183	225	237	248
	M42x2	35	--	--	--	--	--	--	398	418	438	540	567	594	266	280	293	360	380	397
	M48x2	42	--	--	--	--	--	--	516	542	568	700	735	770	266	280	293	360	380	397

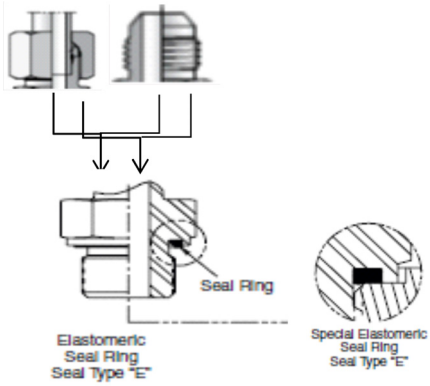
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	8	9	9	11	12	12	8	9	9	11	12	12	6	7	7	8	9	9
	M12x1.5	8	17	18	19	23	24	26	21	22	23	28	30	31	12	13	13	16	18	18
	M14x1.5	10	24	26	27	33	35	37	27	28	29	37	38	39	17	18	19	23	24	26
	M16x1.5	12	29	30	31	39	41	42	38	40	42	52	54	57	27	28	29	37	38	39
	M18x1.5	15	38	40	42	52	54	57	48	51	53	65	69	72	31	33	34	42	45	46
	M22x1.5	18	58	61	64	79	83	87	67	70	73	91	95	99	43	45	47	58	61	64
	M27x2	22	62	66	69	84	89	94	153	161	169	207	218	229	65	69	72	88	94	98
	M33x2	28	--	--	--	--	--	--	173	182	190	235	247	258	108	114	119	146	155	161
	M42x2	35	--	--	--	--	--	--	259	272	285	351	369	386	173	182	190	235	247	258
	M48x2	42	--	--	--	--	--	--	335	352	369	454	477	500	173	182	190	235	247	258

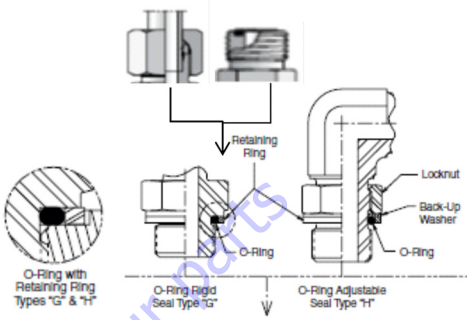
Table 5-21. Metric Flat Face Port (MFF) - S Series - Table 1 of 3

TYPE/FITTING IDENTIFICATION			FORM A (SEALING WASHER) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end						FORM B (CUTTING FACE) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M12x1.5	6	15	16	17	20	22	23	26	28	29	35	38	39
	M14x1.5	8	26	28	29	35	38	39	41	43	45	55	58	61
	M16x1.5	10	33	35	36	45	47	49	52	55	57	70	75	77
	M18x1.5	12	41	43	45	55	58	61	81	85	89	110	115	121
	M20x1.5	14	41	43	45	55	58	61	111	117	122	150	159	165
	M22x1.5	16	48	51	53	65	69	72	125	132	138	170	179	187
	M27x2	20	66	70	73	89	95	99	199	209	219	270	283	297
	M33x2	25	111	117	122	150	159	165	302	317	332	410	430	450
	M42x2	30	177	186	195	240	252	264	398	418	438	540	567	594
	M48x2	38	214	225	235	290	305	319	516	542	568	700	735	770
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M12x1.5	6	10	11	11	14	15	15	17	18	19	23	24	26
	M14x1.5	8	17	18	19	23	24	26	27	28	29	37	38	39
	M16x1.5	10	21	22	23	28	30	31	34	36	37	46	49	50
	M18x1.5	12	27	28	29	37	38	39	53	56	58	72	76	79
	M20x1.5	14	27	28	29	37	38	39	72	76	79	98	103	107
	M22x1.5	16	31	33	34	42	45	46	81	86	90	110	117	122
	M27x2	20	43	45	47	58	61	64	129	136	142	175	184	193
	M33x2	25	72	76	79	98	103	107	196	206	216	266	279	293
	M42x2	30	115	121	127	156	164	172	259	272	285	351	369	386
	M48x2	38	139	146	153	188	198	207	335	352	369	454	477	500

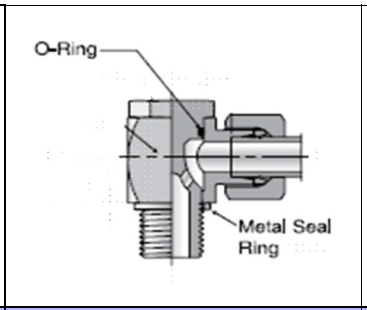
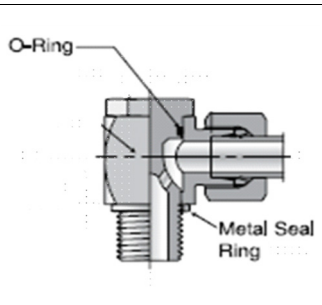
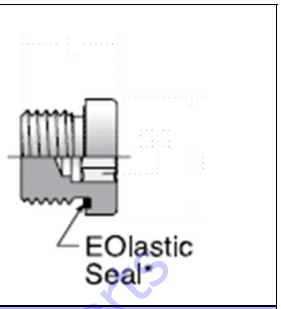
Table 5-22. Metric Flat Face Port (MFF) - S Series - Table 2 of 3





TYPE/FITTING IDENTIFICATION			FORM E (EOLASTIC SEALING RING) STUD ENDS AND HEX TYPE PLUGS with (ORFS) or S series DIN (MBTS) opposite end						FORM G/H (O-RING W/ RETAINING RING) STUD ENDS & ADJUSTABLE STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	26	28	29	35	38	39	26	28	29	35	38	39
	M12x1.5	8	33	35	36	45	47	49	41	43	45	55	58	61
	M14x1.5	10	52	55	57	70	75	77	52	55	57	70	75	77
	M16x1.5	12	66	70	73	90	95	99	66	70	73	90	95	99
	M18x1.5	15	92	97	101	125	132	137	92	97	101	125	132	137
	M22x1.5	18	100	105	110	135	142	149	100	105	110	135	142	149
	M27x2	22	133	140	146	180	190	198	133	140	146	180	190	198
	M33x2	28	229	241	252	310	327	342	229	241	252	310	327	342
	M42x2	35	332	349	365	450	473	495	332	349	365	450	473	495
	M48x2	42	398	418	438	540	567	594	398	418	438	540	567	594
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	17	18	19	23	24	26	17	18	19	23	24	26
	M12x1.5	8	21	23	23	29	31	32	27	28	29	37	38	39
	M14x1.5	10	34	36	37	46	49	50	34	36	37	46	49	50
	M16x1.5	12	43	45	47	58	61	64	43	45	47	58	61	64
	M18x1.5	15	60	63	66	81	85	89	60	63	66	81	85	89
	M22x1.5	18	65	69	72	88	94	98	65	69	72	88	94	98
	M27x2	22	86	91	95	117	123	129	86	91	95	117	123	129
	M33x2	28	149	157	164	202	213	222	149	157	164	202	213	222
	M42x2	35	216	227	237	293	308	321	216	227	237	293	308	321
	M48x2	42	259	272	285	351	369	386	259	272	285	351	369	386

Table 5-23. Metric Flat Face Port (MFF) - L Series - Table 3 of 3

																		
TYPE/FITTING IDENTIFICATION			**BANJO FITTINGS with S series DIN (MBTS) opposite end**						**HIGH PRESSURE BANJO FITTINGS with S series DIN (MBTS) opposite end**						**FORM E (EOLASTIC SEALING RING) HOLLOW HEX PLUGS**					
MATERIAL	**Thread M Size**	**Connecting Tube O.D.**	**Torque**						**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	26	28	29	35	38	39	33	35	36	45	47	49	--	--	--	--	--	--
	M12x1.5	8	37	39	41	50	53	56	41	43	45	55	58	61	--	--	--	--	--	--
	M14x1.5	10	44	46	48	60	62	65	59	62	65	80	84	88	--	--	--	--	--	--
	M16x1.5	12	59	62	65	80	84	88	74	78	81	100	106	110	--	--	--	--	--	--
	M18x1.5	15	81	85	89	110	115	121	92	97	101	125	132	137	59	62	65	80	84	88
	M22x1.5	18	89	94	98	120	127	133	100	105	110	135	142	149	--	--	--	--	--	--
	M27x2	22	100	105	110	135	142	149	236	248	260	320	336	353	--	--	--	--	--	--
	M33x2	28	--	--	--	--	--	--	266	280	293	360	380	397	--	--	--	--	--	--
	M42x2	35	--	--	--	--	--	--	398	418	438	540	567	594	--	--	--	--	--	--
	M48x2	42	--	--	--	--	--	--	516	542	568	700	735	770	--	--	--	--	--	--
MATERIAL	**Thread M Size**	**Connecting Tube O.D.**	**Torque**						**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M10x1	6	17	18	19	23	24	26	21	22	23	28	30	31	--	--	--	--	--	--
	M12x1.5	8	24	26	27	33	35	37	27	28	29	37	38	39	--	--	--	--	--	--
	M14x1.5	10	29	30	31	39	41	42	38	40	42	52	54	57	--	--	--	--	--	--
	M16x1.5	12	38	40	42	52	54	57	48	51	53	65	69	72	--	--	--	--	--	--
	M18x1.5	15	53	56	58	72	76	79	60	63	66	81	85	89	38	40	42	52	54	57
	M22x1.5	18	58	61	64	79	83	87	65	69	72	88	94	98	--	--	--	--	--	--
	M27x2	22	65	69	72	88	94	98	153	161	169	207	218	229	--	--	--	--	--	--
	M33x2	28	--	--	--	--	--	--	173	182	190	235	247	258	--	--	--	--	--	--
	M42x2	35	--	--	--	--	--	--	259	272	285	351	369	386	--	--	--	--	--	--
	M48x2	42	--	--	--	--	--	--	335	352	369	454	477	500	--	--	--	--	--	--

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Assembly Instructions for Metric ISO 6149 (MPP) Port Assembly Stud Ends

1. Inspect components to ensure that male and female threads and surfaces are free of rust, splits, dirt, foreign matter, or burrs.
2. If O-ring is not preinstalled, install proper size, taking care not to damage it. See O-ring Installation (Replacement) for instructions.

⚠ CAUTION

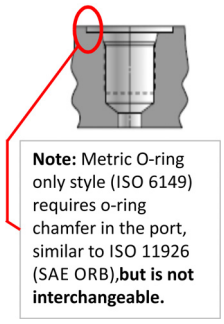
CARE TO BE TAKEN WHEN LUBRICATING O-RING. AVOID ADDING OIL TO THE THREADED CONNECTION OF THE FITTING. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

3. Pre-lubricate the O-ring with Hydraulic Oil.
4. For Non-Adjustable Fittings and Plugs, thread the fitting by hand until contact.
5. For Adjustable fittings, refer to Adjustable Stud End Assembly for proper assembly.
6. Torque the fitting or nut to value listed in Table 5-24 while using the Double Wrench Method.
   a. The table headings identify the Metric port and the type on the other side of the fitting. The torque will be applied to the Metric port.
   b. Torque values provided in Table 5-24 are segregated based on the material configuration of the connection. 'ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

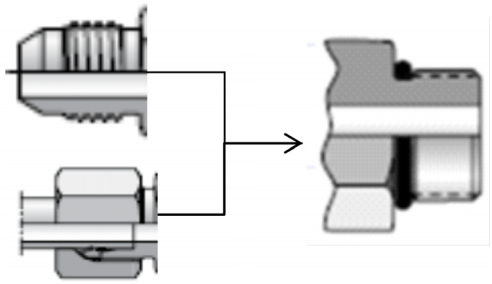
- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

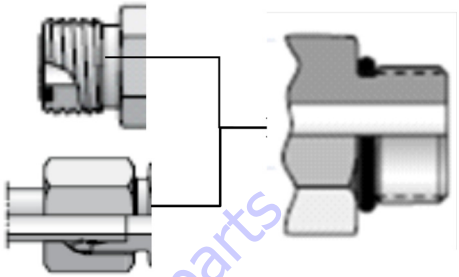
7. Inspect to ensure the O-ring is not pinched and the washer is seated flat on the counter bore of the port.

Table 5-24. Metric Pipe Parallel O-Ring Boss (MPP)



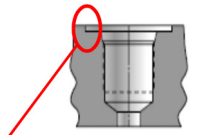
Note: Metric O-ring only style (ISO 6149) requires o-ring chamfer in the port, similar to ISO 11926 (SAE ORB),**but is not interchangeable.**



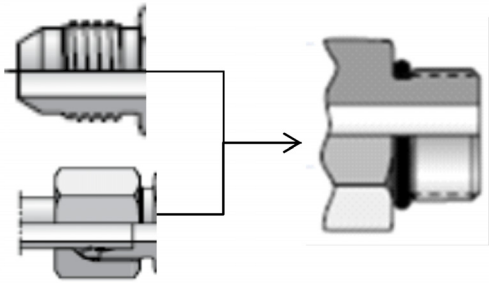


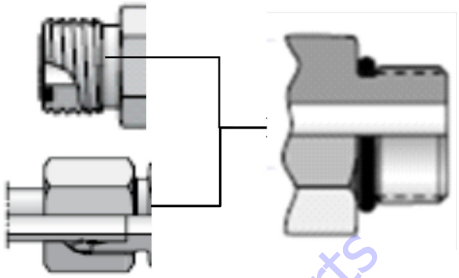
TYPE/FITTING IDENTIFICATION			STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end						STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	M8x1	4	6	7	7	8	9	9	8	9	9	10	12	12
	M10x1	6	11	12	12	15	16	16	15	16	17	20	22	23
	M12x1.5	8	18	19	20	25	26	27	26	28	29	35	38	39
	M14x1.5	10	26	28	29	35	38	39	33	35	36	45	47	49
	M16x1.5	12	30	32	33	40	43	45	41	43	45	55	58	61
	M18x1.5	15	33	35	36	45	47	49	52	55	57	70	75	77
	M20x1.5	--	--	--	--	--	--	--	59	62	65	80	84	88
	M22x1.5	18	44	46	48	60	62	65	74	78	81	100	106	110
	M27x2	22	74	78	81	100	106	110	125	132	138	170	179	187
	M30x2	--	95	100	105	130	136	142	175	184	193	237	249	262
	M33x2	25	120	126	132	160	171	179	230	242	253	310	328	343
	M38x2	--	135	142	149	183	193	202	235	247	259	319	335	351
	M42x2	30	155	163	171	210	221	232	245	258	270	330	350	366
	M48x2	38	190	200	209	260	271	283	310	326	341	420	442	462
	M60x2	50	230	242	253	315	328	343	370	389	407	500	527	552

Table 5-24. Metric Pipe Parallel O-Ring Boss (MPP)



Note: Metric O-ring only style (ISO 6149) requires o-ring chamfer in the port, similar to ISO 11926 (SAE ORB),**but is not interchangeable.**





TYPE/FITTING IDENTIFICATION			STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end						STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	Thread M Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	M8x1	4	4	5	5	5	7	7	5	6	6	7	8	8
	M10x1	6	7	8	8	9	11	11	10	11	11	14	15	15
	M12x1.5	8	12	13	13	16	18	18	17	18	19	23	24	26
	M14x1.5	10	17	18	19	23	24	26	21	22	23	28	30	31
	M16x1.5	12	20	21	21	27	28	28	27	28	29	37	38	39
	M18x1.5	15	21	22	23	28	30	31	34	36	37	46	49	50
	M20x1.5	--	--	--	--	--	--	--	30	40	42	41	54	57
	M22x1.5	18	29	30	31	39	41	42	48	51	53	65	69	72
	M27x2	22	48	51	53	65	69	72	81	86	90	110	117	122
	M30x2	--	62	65	68	84	88	92	114	120	125	155	163	169
	M33x2	25	78	82	86	106	111	117	150	157	164	203	213	222
	M38x2	--	88	93	97	119	126	132	153	161	168	207	218	228
	M42x2	30	101	106	111	137	144	150	159	168	176	216	228	239
	M48x2	38	124	130	136	168	176	184	202	212	222	274	287	301
	M60x2	50	150	157	164	203	213	222	241	253	265	327	343	359

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Assembly instructions for Adjustable Port End (BSPP) Fittings

1. Inspect components to ensure that male and female threads and surfaces are free of rust, splits, dirt, foreign matter, or burrs.
2. If O-ring is not preinstalled, install proper size, taking care not to damage it. See O-ring Installation (Replacement) for instructions.

⚠ CAUTION

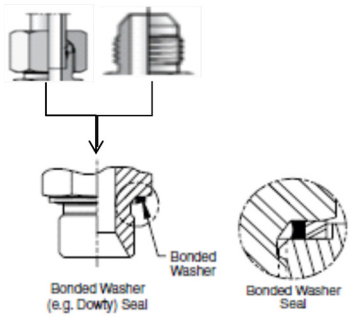
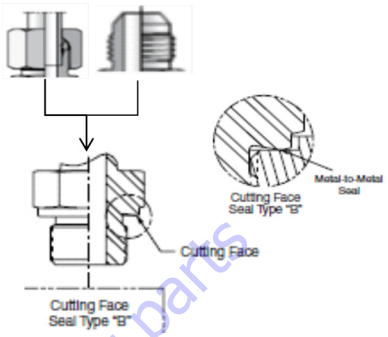
CARE TO BE TAKEN WHEN LUBRICATING O-RING. AVOID ADDING OIL TO THE THREADED CONNECTION OF THE FITTING. THE LUBRICATION WOULD CAUSE INCREASED CLAMPING FORCE AND CAUSE FITTING DAMAGE.

3. Pre-lubricate the O-ring with Hydraulic Oil.
4. For Non-Adjustable Fittings and Plugs, thread the fitting by hand until contact.
5. For Adjustable fittings, refer to Adjustable Stud End Assembly for proper assembly.
6. Torque the fitting or nut to value listed in Table 5-25, Table 5-26, Table 5-27, Table 5-28, Table 5-29, or Table 5-30 while using the Double Wrench Method.
   a. The table headings identify the BSPP port and the type on the other side of the fitting. The torque will be applied to the BSPP port.
   b. Torque values provided in Table 5-25, Table 5-26, Table 5-27, Table 5-28, Table 5-29, and Table 5-30 are segregated based on the material configuration of the connection. 'ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS' indicate either the following material configurations:

- STEEL fittings with ALUMINUM or BRASS mating components
- ALUMINUM or BRASS fittings with STEEL mating components
- ALUMINUM or BRASS fittings with ALUMINUM or BRASS mating components.

7. Inspect to ensure the O-ring is not pinched and the washer is seated flat on the counter bore of the port.

Table 5-25. British Standard Parallel Pipe Port (BSPP) - L Series - Table 1 of 3

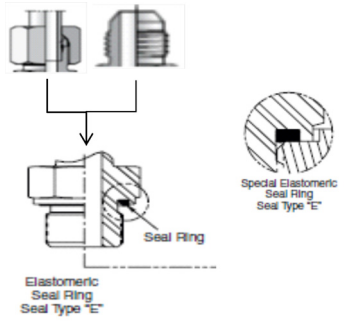
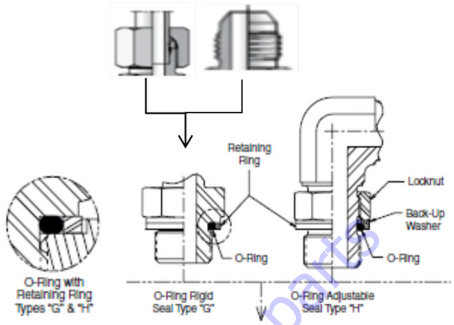
														
TYPE/FITTING IDENTIFICATION			**FORM A**(SEALING WASHER) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end**						**FORM B** (CUTTING FACE) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end**					
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	7	8	8	9	11	11	13	14	14	18	19	19
	G1/4A	8	26	28	29	35	38	39	26	28	29	35	38	39
	G1/4A	10	26	28	29	35	38	39	26	28	29	35	38	39
	G3/8A	12	33	35	36	45	47	49	52	55	57	70	75	77
	G1/2A	15	48	51	53	65	69	72	103	108	113	140	146	153
	G1/2A	18	48	51	53	65	69	72	74	78	81	100	106	110
	G3/4A	22	66	70	73	90	95	99	133	140	146	180	190	198
	G1A	28	111	117	122	150	159	165	243	255	267	330	346	362
	G1-1/4A	35	177	186	195	240	252	264	398	418	438	540	567	594
	G1-1/2A	42	214	225	235	290	305	319	465	489	512	630	663	694
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	4	5	5	5	7	7	8	9	9	11	12	12
	G1/4A	8	17	18	19	23	24	26	17	18	19	23	24	26
	G1/4A	10	17	18	19	23	24	26	17	18	19	23	24	26
	G3/8A	12	21	22	23	28	30	31	34	36	37	46	49	50
	G1/2A	15	31	33	34	42	45	46	67	70	73	91	95	99
	G1/2A	18	31	33	34	42	45	46	48	51	53	65	69	72
	G3/4A	22	42	45	47	57	61	64	86	91	95	117	123	129
	G1A	28	72	76	79	98	103	107	158	166	174	214	225	236
	G1-1/4A	35	115	121	127	156	164	172	259	272	285	351	369	386
	G1-1/2A	42	139	146	153	188	198	207	302	318	333	409	431	451

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

Table 5-26. British Standard Parallel Pipe Port (BSPP) - L Series - Table 2 of 3

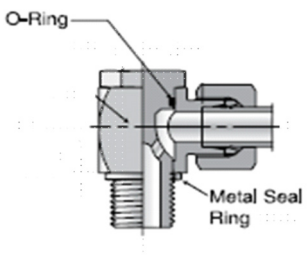
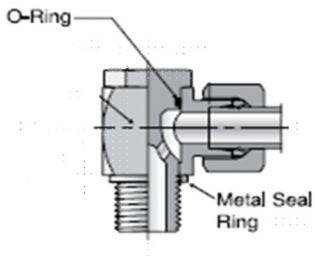
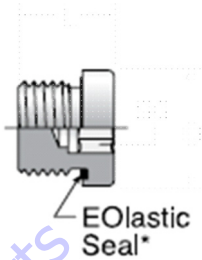
														
TYPE/FITTING IDENTIFICATION			**FORM E* (EOLASTIC SEALING RING) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end**						**FORM G/H*** (O-RING W/ RETAINING RING) STUD ENDS & ADJUSTABLE STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end**					
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	13	14	14	18	19	19	13	14	14	18	19	19
	G1/4A	8	26	28	29	35	38	39	26	28	29	35	38	39
	G1/4A	10	26	28	29	35	38	39	26	28	29	35	38	39
	G3/8A	12	52	55	57	70	75	77	52	55	57	70	75	77
	G1/2A	15	66	70	73	90	95	99	66	70	73	90	95	99
	G1/2A	18	66	70	73	90	95	99	66	70	73	90	95	99
	G3/4A	22	133	140	146	180	190	198	133	140	146	180	190	198
	G1A	28	229	241	252	310	327	342	229	241	252	310	327	342
	G1-1/4A	35	332	349	365	450	473	495	332	349	365	450	473	495
	G1-1/2A	42	398	418	438	540	567	594	398	418	438	540	567	594
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	8	9	9	11	12	12	8	9	9	11	12	12
	G1/4A	8	17	18	19	23	24	26	17	18	19	23	24	26
	G1/4A	10	17	18	19	23	24	26	17	18	19	23	24	26
	G3/8A	12	34	36	37	46	49	50	34	36	37	46	49	50
	G1/2A	15	43	45	47	58	61	64	43	45	47	58	61	64
	G1/2A	18	43	45	47	58	61	64	43	45	47	58	61	64
	G3/4A	22	86	91	95	117	123	129	86	91	95	117	123	129
	G1A	28	149	157	164	202	213	222	149	157	164	202	213	222
	G1-1/4A	35	216	227	237	293	308	321	216	227	237	293	308	321
	G1-1/2A	42	259	272	285	351	369	386	259	272	285	351	369	386

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

Table 5-27. British Standard Parallel Pipe Port (BSPP) - L Series - Table 3 of 3

			
TYPE/FITTING IDENTIFICATION	**BANJO FITTINGS with L series DIN (MBTL) opposite end**	**HIGH PRESSURE BANJO FITTINGS with L series DIN (MBTL) opposite end**	**FORM E (EOLASTIC SEALING RING) HOLLOW HEX PLUGS**

MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	13	14	14	18	19	19	13	14	14	18	19	19	10	11	11	13	15	15
	G1/4A	8	30	32	33	40	43	45	33	35	36	45	47	49	22	23	24	30	31	33
	G1/4A	10	30	32	33	40	43	45	33	35	36	45	47	49	22	23	24	30	31	33
	G3/8A	12	48	51	53	65	69	72	52	55	57	70	75	77	44	46	48	60	62	65
	G1/2A	15	66	70	73	90	95	99	89	94	98	120	127	133	59	62	65	80	84	88
	G1/2A	18	66	70	73	90	95	99	89	94	98	120	127	133	59	62	65	80	84	88
	G3/4A	22	92	97	101	125	132	137	170	179	187	230	243	254	103	108	113	140	146	153
	G1A	28	--	--	--	--	--	--	236	248	260	320	336	353	148	156	163	200	212	221
	G1-1/4A	35	--	--	--	--	--	--	398	418	438	540	567	594	295	313.5	332	400	425	450
	G1-1/2A	42	--	--	--	--	--	--	516	542	568	700	735	770	332	349	365	450	473	495

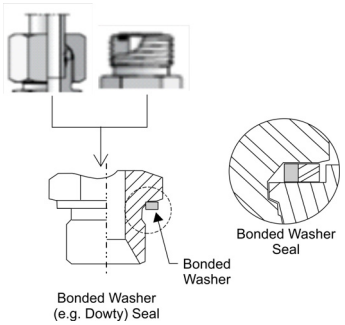
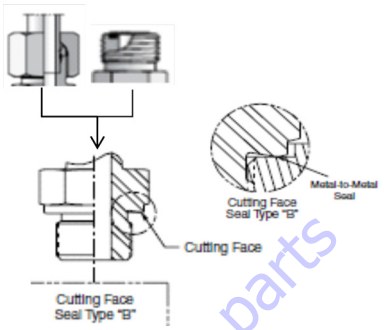
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/8A	6	8	9	9	11	12	12	8	9	9	11	12	12	6	7	7	8	9	9
	G1/4A	8	20	21	21	27	28	28	21	22	23	28	30	31	14	15	16	19	20	22
	G1/4A	10	20	21	21	27	28	28	21	22	23	28	30	31	14	15	16	19	20	22
	G3/8A	12	31	33	34	42	45	46	34	36	37	46	49	50	29	30	31	39	41	42
	G1/2A	15	43	45	47	58	61	64	58	61	64	79	83	87	38	40	42	52	54	57
	G1/2A	18	43	45	47	58	61	64	58	61	64	79	83	87	38	40	42	52	54	57
	G3/4A	22	60	63	66	81	85	89	111	117	122	150	159	165	67	70	73	91	95	99
	G1A	28	--	--	--	--	--	--	153	161	169	207	218	229	96	101	106	130	137	144
	G1-1/4A	35	--	--	--	--	--	--	259	272	285	351	369	386	216	227	237	293	308	321
	G1-1/2A	42	--	--	--	--	--	--	335	352	369	454	477	500	216	227	237	293	308	321

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

Table 5-28. British Standard Parallel Pipe Port (BSPP) - S Series - Table 1 of 3

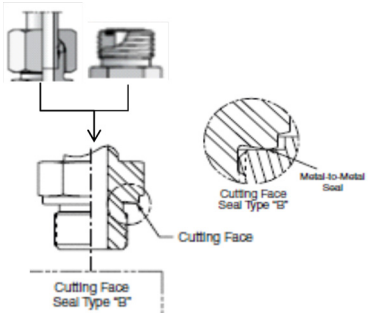
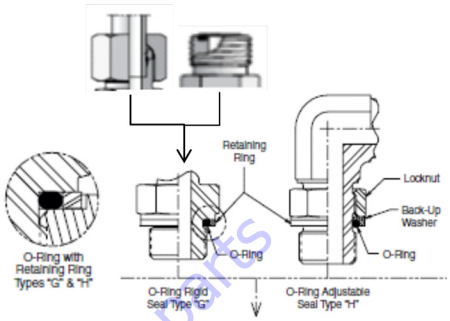
TYPE/FITTING IDENTIFICATION			FORM A** (SEALING WASHER) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end						FORM B** (CUTTING FACE) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	26	28	29	35	38	39	41	43	45	55	58	61
	G1/4A	8	26	28	29	35	38	39	41	43	45	55	58	61
	G3/8A	10	33	35	36	45	47	49	66	70	73	90	95	99
	G3/8A	12	33	35	36	45	47	49	66	70	73	90	95	99
	G1/2A	14	48	51	53	65	69	72	111	117	122	150	159	165
	G1/2A	16	48	51	53	65	69	72	96	101	106	130	137	144
	G3/4A	20	66	70	73	90	95	99	199	209	219	270	283	297
	G1A	25	111	117	122	150	159	165	251	264	276	340	358	374
	G1-1/4A	30	177	186	195	240	252	264	398	418	438	540	567	594
	G1-1/2A	38	214	225	235	290	305	319	516	542	568	700	735	770
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque [Ft-Lb]			Torque [N-m]			Torque [Ft-Lb]			Torque [N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	17	18	19	23	24	26	27	28	29	37	38	39
	G1/4A	8	17	18	19	23	24	26	27	28	29	37	38	39
	G3/8A	10	21	22	23	28	30	31	43	45	47	58	61	64
	G3/8A	12	21	22	23	28	30	31	43	45	47	58	61	64
	G1/2A	14	31	33	34	42	45	46	72	76	79	98	103	107
	G1/2A	16	31	33	34	42	45	46	62	66	69	84	89	94
	G3/4A	20	43	45	47	58	61	64	129	136	142	175	184	193
	G1A	25	72	76	79	98	103	107	163	171	179	221	232	243
	G1-1/4A	30	115	121	127	156	164	172	259	272	285	351	369	386
	G1-1/2A	38	139	146	153	188	198	207	335	352	369	454	477	500

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

Table 5-29. British Standard Parallel Pipe Port (BSPP) - S Series - Table 2 of 3

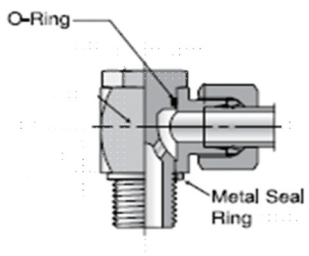
												
TYPE/FITTING IDENTIFICATION			**FORM E* (EOLASTIC SEALING RING) STUD ENDS AND HEX TYPE PLUGS with (ORFS) or S series DIN (MBTS) opposite end**						**FORM G/H*** (O-RING W/ RETAINING RING) STUD ENDS & ADJUSTABLE STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end**					
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	41	43	45	55	58	61	26	28	29	35	38	39
	G1/4A	8	41	43	45	55	58	61	26	28	29	35	38	39
	G3/8A	10	59	62	65	80	84	88	52	55	57	70	75	77
	G3/8A	12	59	62	65	80	84	88	52	55	57	70	75	77
	G1/2A	14	85	90	94	115	122	127	66	70	73	90	95	99
	G1/2A	16	85	90	94	115	122	127	66	70	73	90	95	99
	G3/4A	20	133	140	146	180	190	198	133	140	146	180	190	198
	G1A	25	229	241	252	310	327	342	229	241	252	310	327	342
	G1-1/4A	30	332	349	365	450	473	495	332	349	365	450	473	495
	G1-1/2A	38	398	418	438	540	567	594	398	418	438	540	567	594
MATERIAL	**BSPP Thread G Size**	**Connecting Tube O.D.**	**Torque**						**Torque**					
			[Ft-Lb]			**[N-m]**			**[Ft-Lb]**			**[N-m]**		
	(metric)	**(mm)**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**	**Min**	**Nom**	**Max**
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	27	28	29	37	38	39	17	18	19	23	24	26
	G1/4A	8	27	28	29	37	38	39	17	18	19	23	24	26
	G3/8A	10	38	40	42	52	54	57	34	36	37	46	49	50
	G3/8A	12	38	40	42	52	54	57	34	36	37	46	49	50
	G1/2A	14	55	58	61	75	79	83	43	45	47	58	61	64
	G1/2A	16	55	58	61	75	79	83	43	45	47	58	61	64
	G3/4A	20	86	91	95	117	123	129	86	91	95	117	123	129
	G1A	25	149	157	164	202	213	222	149	157	164	202	213	222
	G1-1/4A	30	216	227	237	293	308	321	216	227	237	293	308	321
	G1-1/2A	38	259	272	285	351	369	386	259	272	285	351	369	386

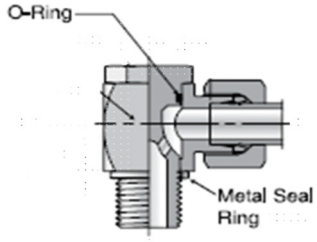
* Typical for JLG Straight Male Stud Fittings

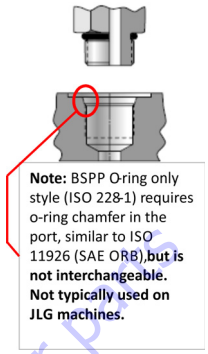
** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

Table 5-30. British Standard Parallel Pipe Port (BSPP) - S Series - Table 3 of 3







TYPE/FITTING IDENTIFICATION			BANJO FITTINGS with S series DIN (MBTS) opposite end						HIGH PRESSURE BANJO FITTINGS with S series DIN (MBTS) opposite end						JIS/BSPP O-RING ONLY					
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	30	32	33	40	43	45	33	35	36	45	47	49	Fitting type not typically specified on JLG applications. Refer to the specific procedure in this Service Manual.					
	G1/4A	8	30	32	33	40	43	45	33	35	36	45	47	49						
	G3/8A	10	48	51	53	65	69	72	52	55	57	70	75	77						
	G3/8A	12	48	51	53	65	69	72	52	55	57	70	75	77						
	G1/2A	14	66	70	73	90	95	99	89	94	98	120	127	133						
	G1/2A	16	66	70	73	90	95	99	89	94	98	120	127	133						
	G3/4A	20	92	97	101	125	132	137	170	179	187	230	243	254						
	G1A	25	--	--	--	--	--	--	236	248	260	320	336	353						
	G1-1/4A	30	--	--	--	--	--	--	398	418	438	540	567	594						
	G1-1/2A	38	--	--	--	--	--	--	516	542	568	700	735	770						
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G1/4A	6	20	21	21	27	28	28	22	22	23	30	30	31	Fitting type not typically specified on JLG applications. Refer to the specific procedure in this Service Manual.					
	G1/4A	8	20	21	21	27	28	28	22	22	23	30	30	31						
	G3/8A	10	31	33	34	42	45	46	34	36	37	46	49	50						
	G3/8A	12	31	33	34	42	45	46	34	36	37	46	49	50						
	G1/2A	14	43	45	47	58	61	64	58	61	64	79	83	87						
	G1/2A	16	43	45	47	58	61	64	58	61	64	79	83	87						
	G3/4A	20	60	63	66	81	85	89	111	117	122	150	159	165						
	G1A	25	--	--	--	--	--	--	153	161	169	207	218	229						
	G1-1/4A	30	--	--	--	--	--	--	259	272	285	351	369	386						
	G1-1/2A	38	--	--	--	--	--	--	335	352	368	454	477	499						

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

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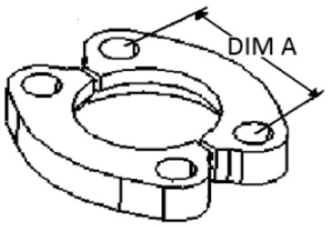
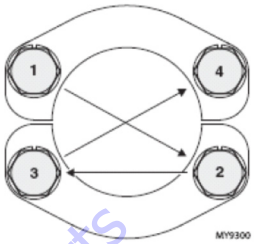
Assembly Instructions for Flange Connections: (FL61 and FL62)

1. Make sure sealing surfaces are free of rust, splits, scratches, dirt, foreign matter, or burrs.
2. See Figure for O-ring installation instructions.
3. Pre-lubricate the O-ring with Hydraulic Oil.
4. Position flange and clamp halves.
5. Place lock washers on bolt and bolt through clamp halves.
6. Tighten all bolts by hand.
7. Torque bolts in diagonal sequence in two or more increments to the torque listed on Table Table 5-31and Table 5-32.

Table 5-31. Flange Code (FL61 & FL62) -Inch Fasteners

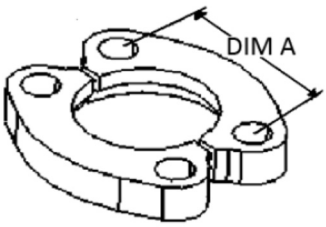


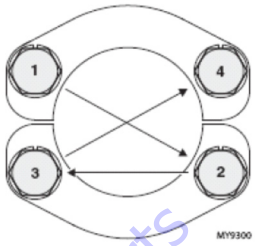


TYPE/FITTING IDENTIFICATION						STEEL 4-BOLT FLANGE SAE J518 (INCH FASTENERS)													
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size	Fastener Torque for Flanges Equipped with GRADE 5 Screws						Fastener Torque for Flanges Equipped with GRADE 8 Screws						
							[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
		(in)	(mm)	(in)	(mm)	(UNF)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 61 SPLIT FLANGE (FL61)	8	0.50	13	1.50	38.10	5/16-18	18	19	19	24	25	26	24	25	26	32	34	35
	12	0.75	19	1.88	47.75	3/8-16	32	33	35	43	45	47	44	46	49	60	63	66
	16	1.00	25	2.06	52.32	3/8-16	32	33	35	43	45	47	44	46	49	60	63	66
	20	1.25	32	2.31	58.67	7/16-14	52	54	57	70	74	77	68	71	75	92	97	101
	24	1.50	38	2.75	69.85	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	32	2.00	51	3.06	77.72	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	40	2.50	64	3.50	88.90	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	48	3.00	76	4.19	106.43	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	56	3.50	89	4.75	120.65	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	64	4.00	102	5.13	130.30	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	80	5.00	127	6.00	152.40	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size	Fastener Torque for Flanges Equipped with GRADE 5 Screws						Fastener Torque for Flanges Equipped with GRADE 8 Screws						
							[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
		(in)	(mm)	(in)	(mm)	(UNF)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 62 SPLIT FLANGE (FL62)	8	0.50	13	1.59	40.39	5/16-18	--	--	--	--	--	--	24	25	26	32	34	35
	12	0.75	19	2.00	50.80	3/8-16	--	--	--	--	--	--	44	46	49	60	63	66
	16	1.00	25	2.25	57.15	7/16-14	--	--	--	--	--	--	68	71	75	92	97	101
	20	1.25	32	2.62	66.55	1/2-13	--	--	--	--	--	--	111	116	122	150	158	165
	20	1.25	32	2.62	66.55	--	--	--	--	--	--	--	--	--	--	--	--	--
	24	1.50	38	3.12	79.25	5/8-11	--	--	--	--	--	--	218	228	239	295	310	325
	32	2.00	51	3.81	96.77	3/4-10	--	--	--	--	--	--	332	348	365	450	473	495

* A dimension for reference only.

Table 5-32. Flange Code (FL61 & FL62) - Metric Fasteners





TYPE/FITTING IDENTIFICATION						STEEL 4-BOLT FLANGE SAE J518 (INCH FASTENERS)													
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size	Fastener Torque for Flanges Equipped with CLASS 8.8 Screws						Fastener Torque for Flanges Equipped with CLASS 10.9 Screws					
							[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
		(in)	(mm)	(in)	(mm)	(Metric)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 61 SPLIT FLANGE (FL61)	8	0.50	13	1.50	38.10	(Metric)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
	12	0.75	19	1.88	47.75	M8x1.25	18	19	19	24	25	26	18	19	19	24	25	26
	16	1.00	25	2.06	52.32	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	20	1.25	32	2.31	58.67	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	24	1.50	38	2.75	69.85	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	32	2.00	51	3.06	77.72	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	40	2.50	64	3.50	88.90	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	48	3.00	76	4.19	106.43	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	56	3.50	89	4.75	120.65	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
	64	4.00	102	5.13	130.30	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
	80	5.00	127	6.00	152.40	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size	Fastener Torque for Flanges Equipped with CLASS 8.8 Screws						Fastener Torque for Flanges Equipped with CLASS 10.9 Screws					
							[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
		(in)	(mm)	(in)	(mm)	(Metric)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 62 SPLIT FLANGE (FL62)	8	0.50	13	1.59	40.39	M8x1.25	--	--	--	--	--	--	24	25	26	32	34	35
	12	0.75	19	2.00	50.80	M10x1.5	--	--	--	--	--	--	52	54	57	70	74	77
	16	1.00	25	2.25	57.15	M12x1.75	--	--	--	--	--	--	96	101	105	130	137	143
	20	1.25	32	2.62	66.55	M12x1.75	--	--	--	--	--	--	96	101	105	130	137	143
	20	1.25	32	2.62	66.55	M14x2	--	--	--	--	--	--	133	139	146	180	189	198
	24	1.50	38	3.12	79.25	M16x2	--	--	--	--	--	--	218	228	239	295	310	325
	32	2.00	51	3.81	96.77	M20x2.5	--	--	--	--	--	--	406	426	446	550	578	605

* A dimension for reference only.

Double Wrench Method

To prevent undesired hose or connector rotation, two wrenches must be used; one torque wrench and one back- up wrench. If two wrenches are not used, inadvertent component rotation may occur which absorbs torque and causes improper joint load and leads to leaks. For hose connections, the 'layline' printed on the hose is a good indicator of proper hose installation. A twisted lay-line usually indicates the hose is twisted. See Figure 5-12. for double wrench method requirements.

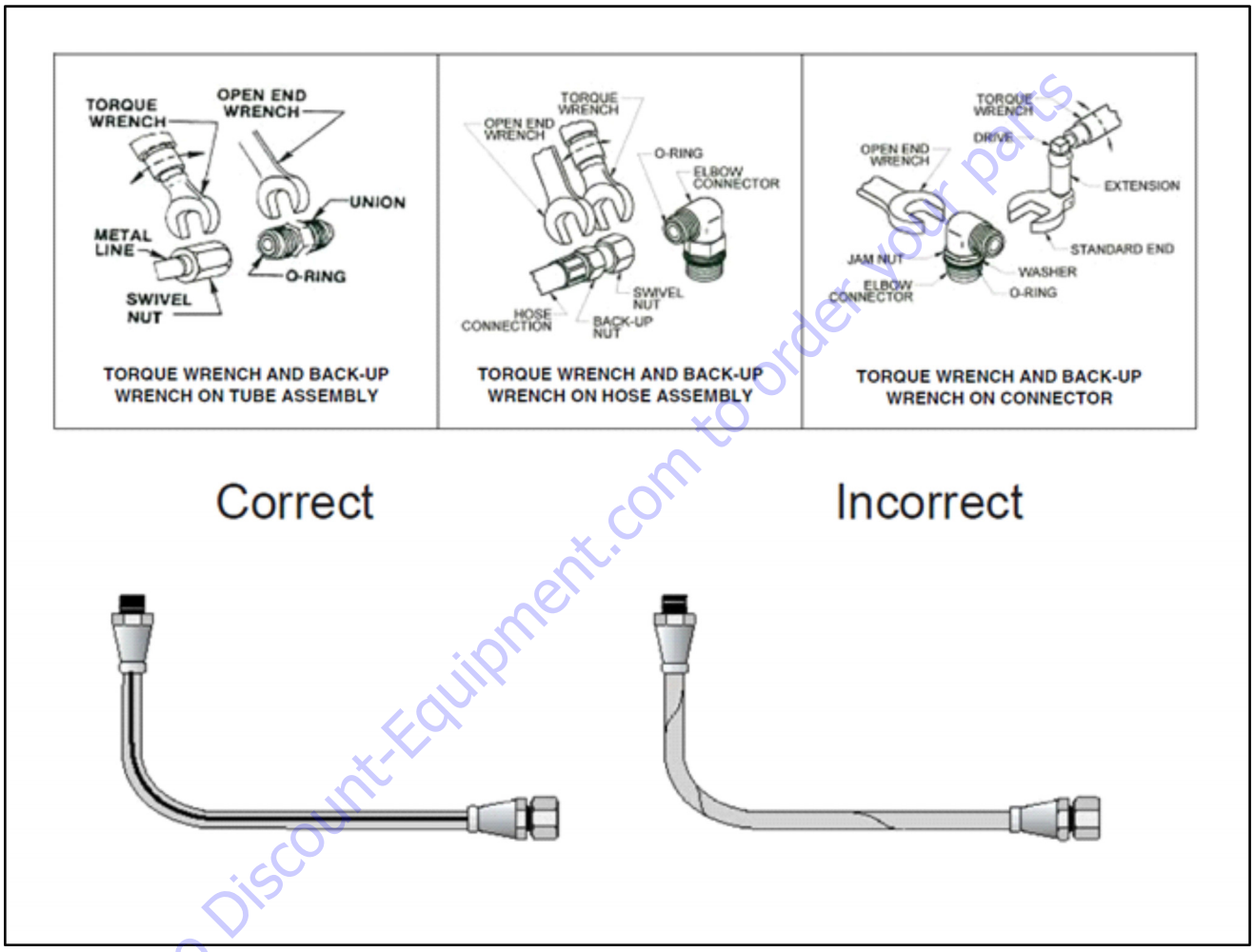


Figure 5-12. Double Wrench Method

FFWR and TFFT Methods

FFWR (FLATS FROM WRENCH RESISTANCE METHOD)

1. Tighten the swivel nut to the mating fitting until no lateral movement of the swivel nut can be detected; finger tight condition.
2. Mark a dot on one of the swivel hex nut flats and another dot in line on the connecting tube adapter. See Figure B.1.
3. Use the double wrench method per Appendix A, turn the swivel nut to tighten as shown in Figure B.1. The nut is to be rotated clockwise the number of hex flats as defined by the applicable Table in Section 5.0.
4. After the connection has been properly tightened, mark a straight line across the connecting parts, not covering the dots, to indicate the connection has been properly tightened. See Figure 5-13.

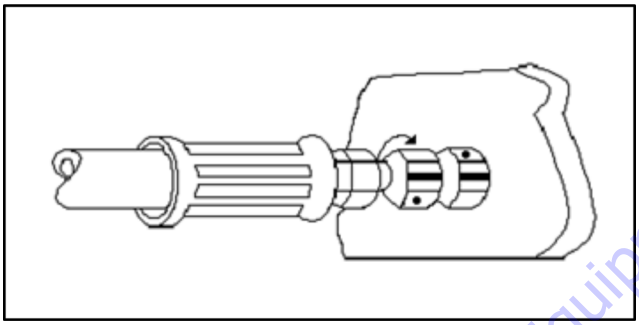


Figure 5-13. FFWR Method

TFFT (TURNS FROM FINGER TIGHT METHOD)

1. Tighten the swivel nut to the mating fitting until no lateral movement of the swivel nut can be detected; finger tight condition.
2. Mark a dot on one of the swivel hex nut flats and another dot in line on the connecting tube adapter.
3. Use the double wrench method per Appendix A, turn the swivel nut to tighten. The nut is to be rotated clockwise the number of turns as defined by the applicable Table in Section 5.0.
4. After the connection has been properly tightened, mark a straight line across the connecting parts, not covering the dots, to indicate the connection has been properly tightened.

Adjustable Stud End Assembly

For Adjustable Stud End Connections; the following assembly steps are to be performed:

1. Lubricate the o-ring with a light coat of hydraulic oil.
2. Position #1 – The o-ring should be located in the groove adjacent to the face of the back-up washer. The washer and o-ring should be positioned at the extreme top end of the groove as shown.
3. Position #2 – Position the locknut to just touch the back-up washer as shown. The locknut in this position will eliminate potential back up washer damage during the next step.
4. Position #3 – Install the connector into the straight thread box port until the metal back-up washer contacts the face of the port as shown.
5. Position #4 – Adjust the connector to the proper position by turning out (counterclockwise) up to a maximum of one turn as shown to provide proper alignment with the mating connector, tube assembly, or hose assembly.
6. Position #5 – Using two wrenches, use the backup wrench to hold the connector in the desired position and then use the torque wrench to tighten the locknut to the appropriate torque.
7. Visually inspect, where possible, the joint to ensure the o-ring is not pinched or bulging out from under the washer and that the backup washer is properly seated flat against the face of the port.

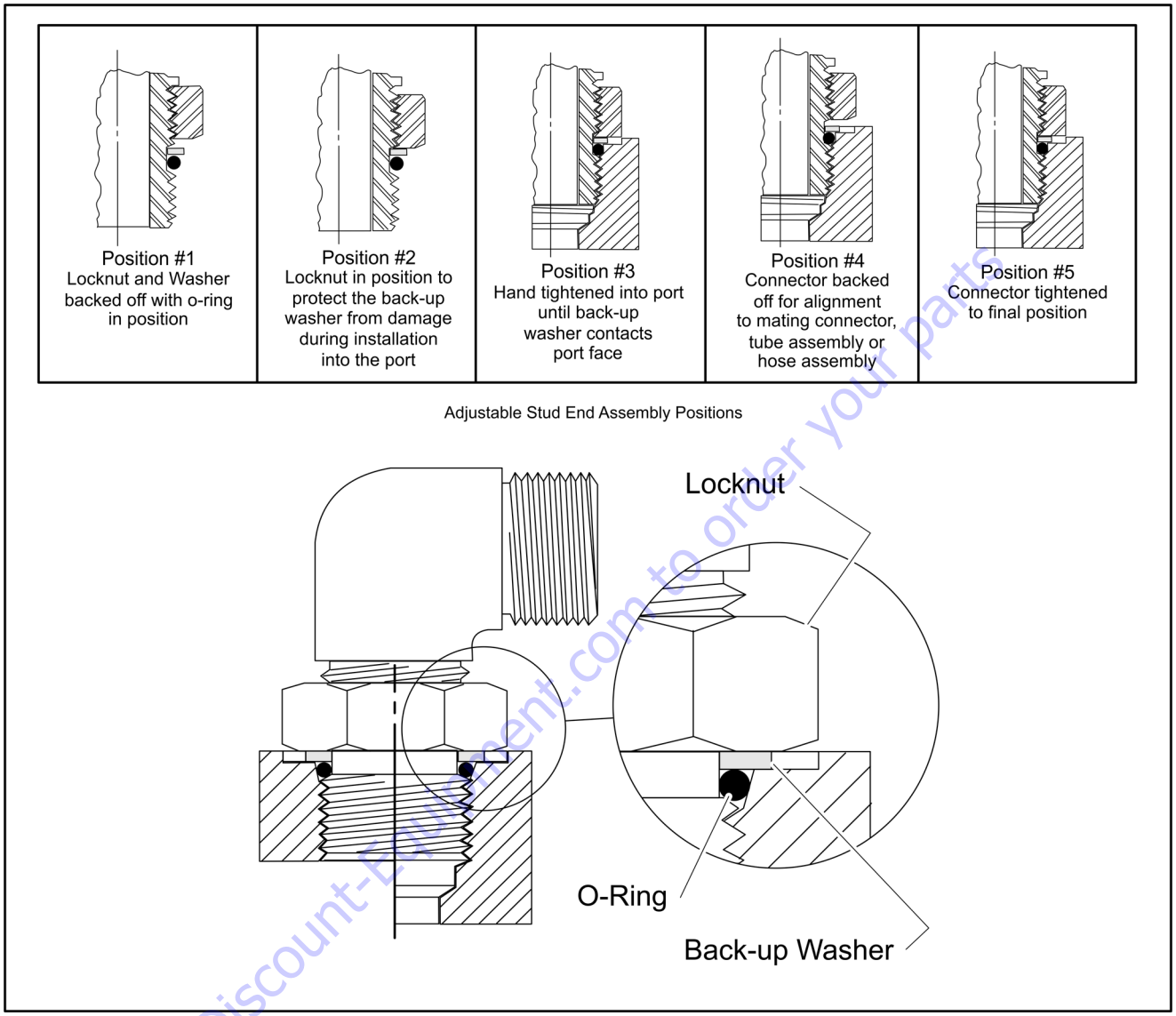


Figure 5-14. Adjustable Stud End Assembly

O-ring Installation (Replacement)

Care must be taken when installing O-rings over threads during replacement or installation. O-rings could become nicked or torn. A damaged O-ring could lead to leakage problems.

1. Inspect O-ring for tears or nicks. If any are found replace O-ring.
2. Ensure proper O-ring to be installed. Many O-rings look the same but are of different material, different hardness, or are slightly different diameters or widths.
3. Use a thread protector when replacing O-rings on fittings.
4. In ORB; ensure O-ring is properly seated in groove. On straight threads, ensure O-ring is seated all the way past the threads prior to installation.
5. Inspect O-ring for any visible nicks or tears. Replace if found.

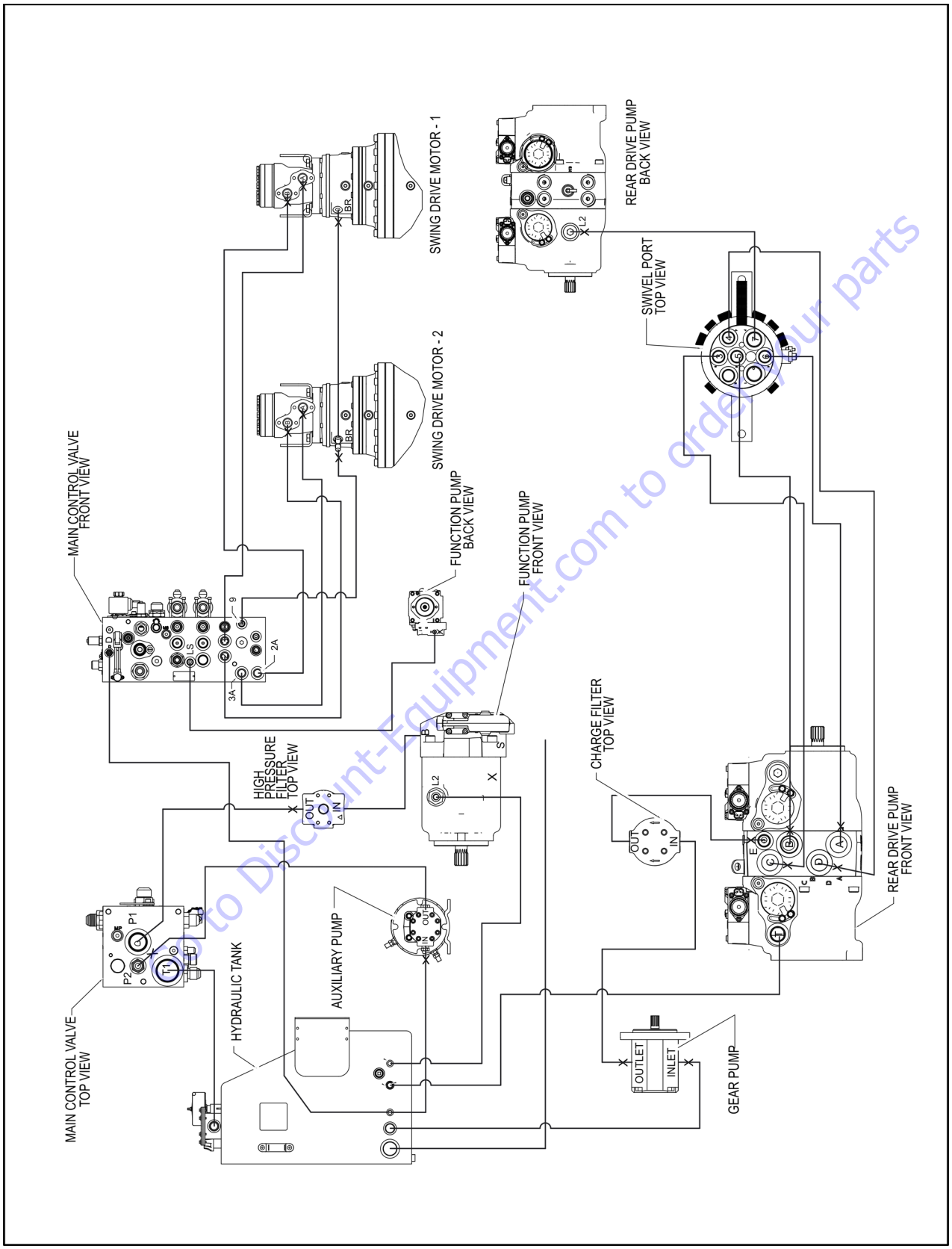


Figure 5-15. Turntable Hydraulic System

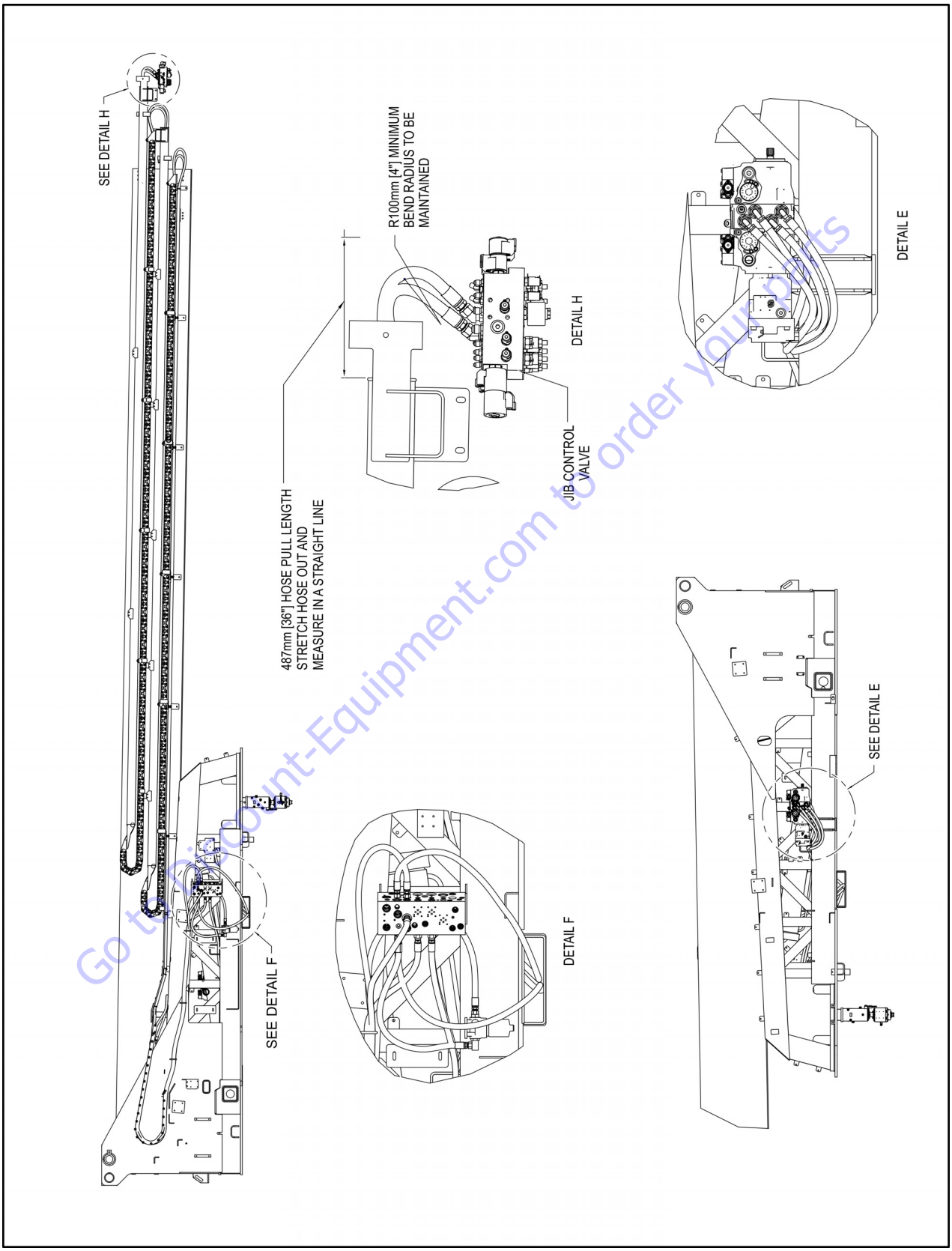


Figure 5-16. Hydraulic Hose Installation - Sheet 1 of 8

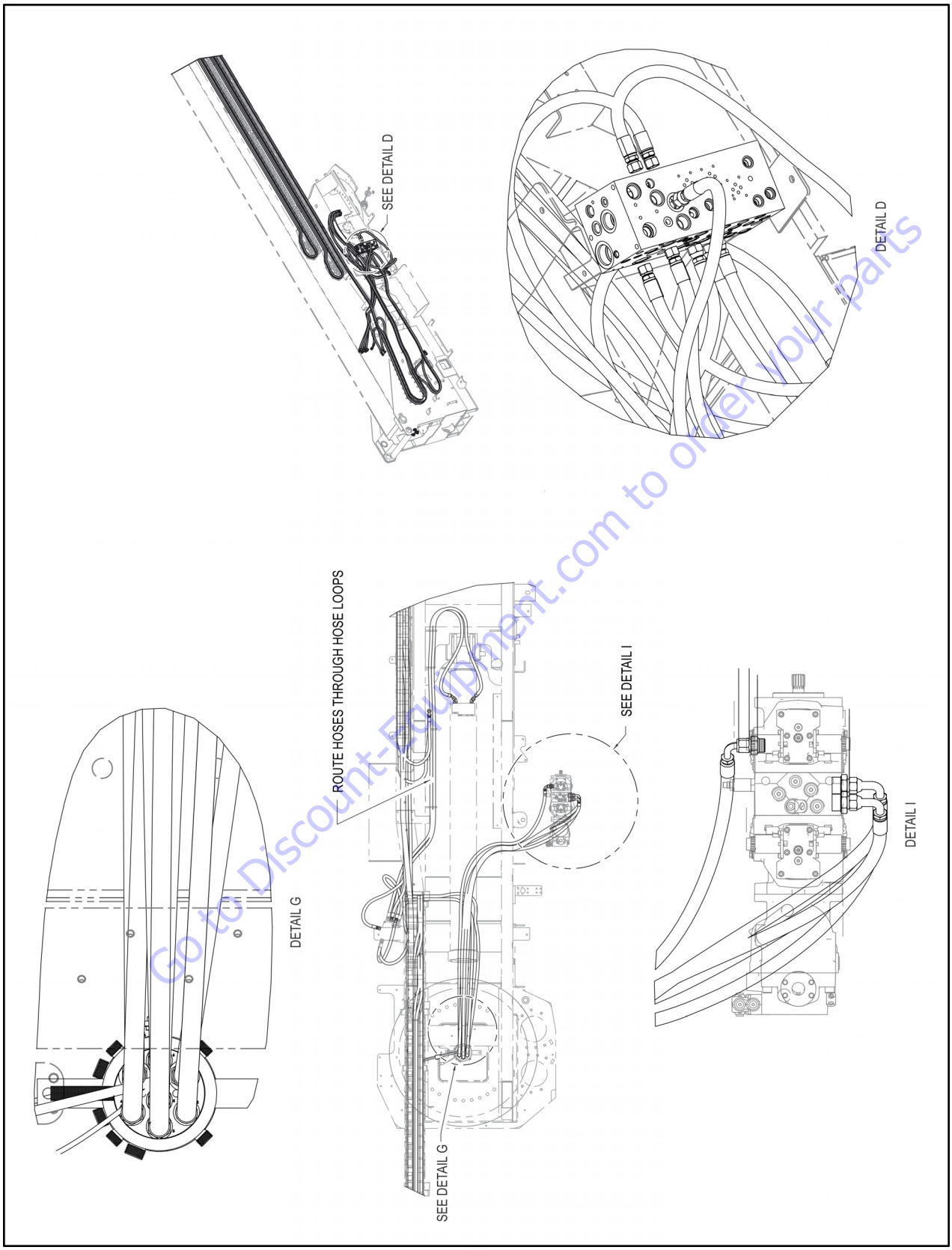


Figure 5-17. Hydraulic Hose Installation - Sheet 2 of 8

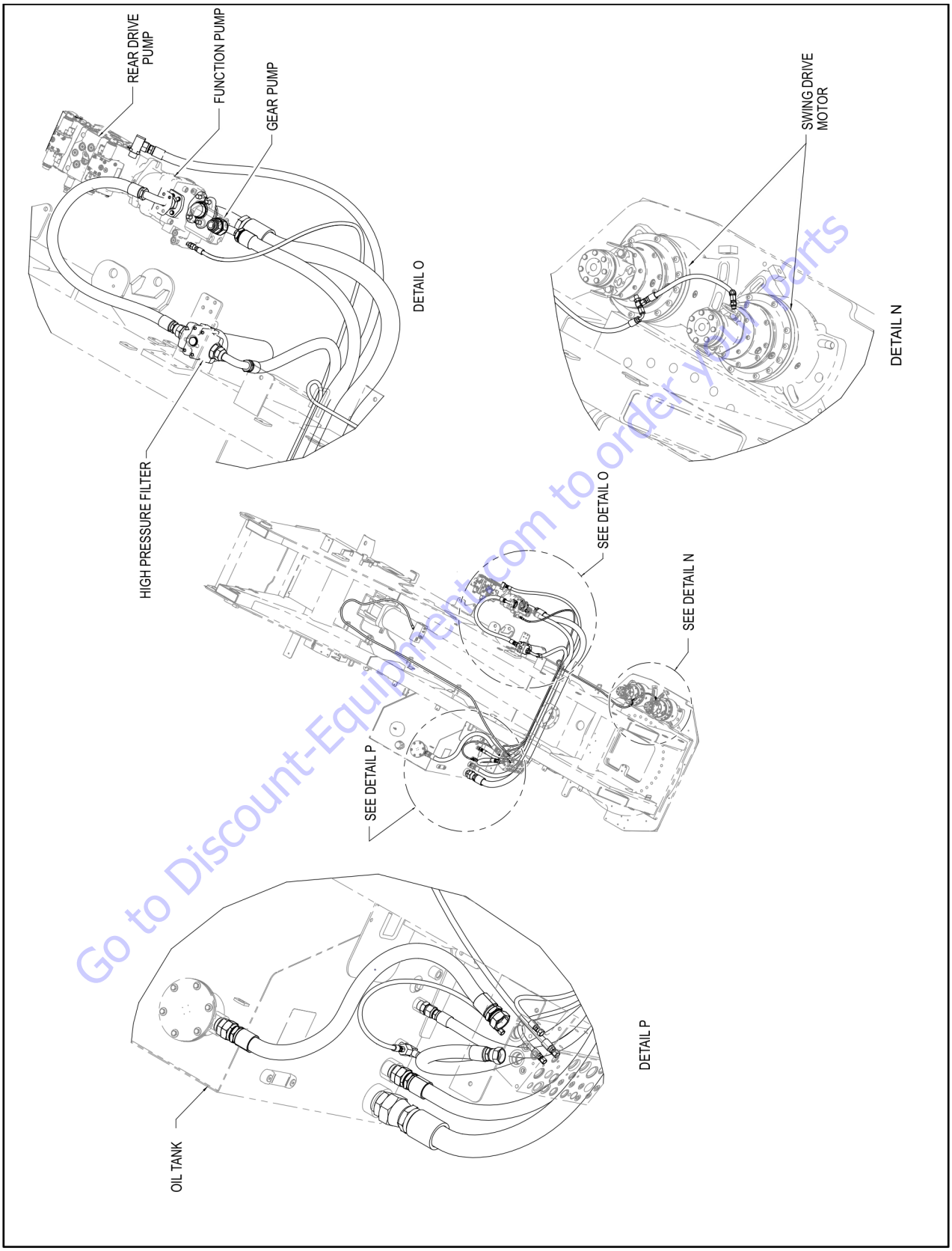


Figure 5-18. Hydraulic Hose Installation - Sheet 3 of 8

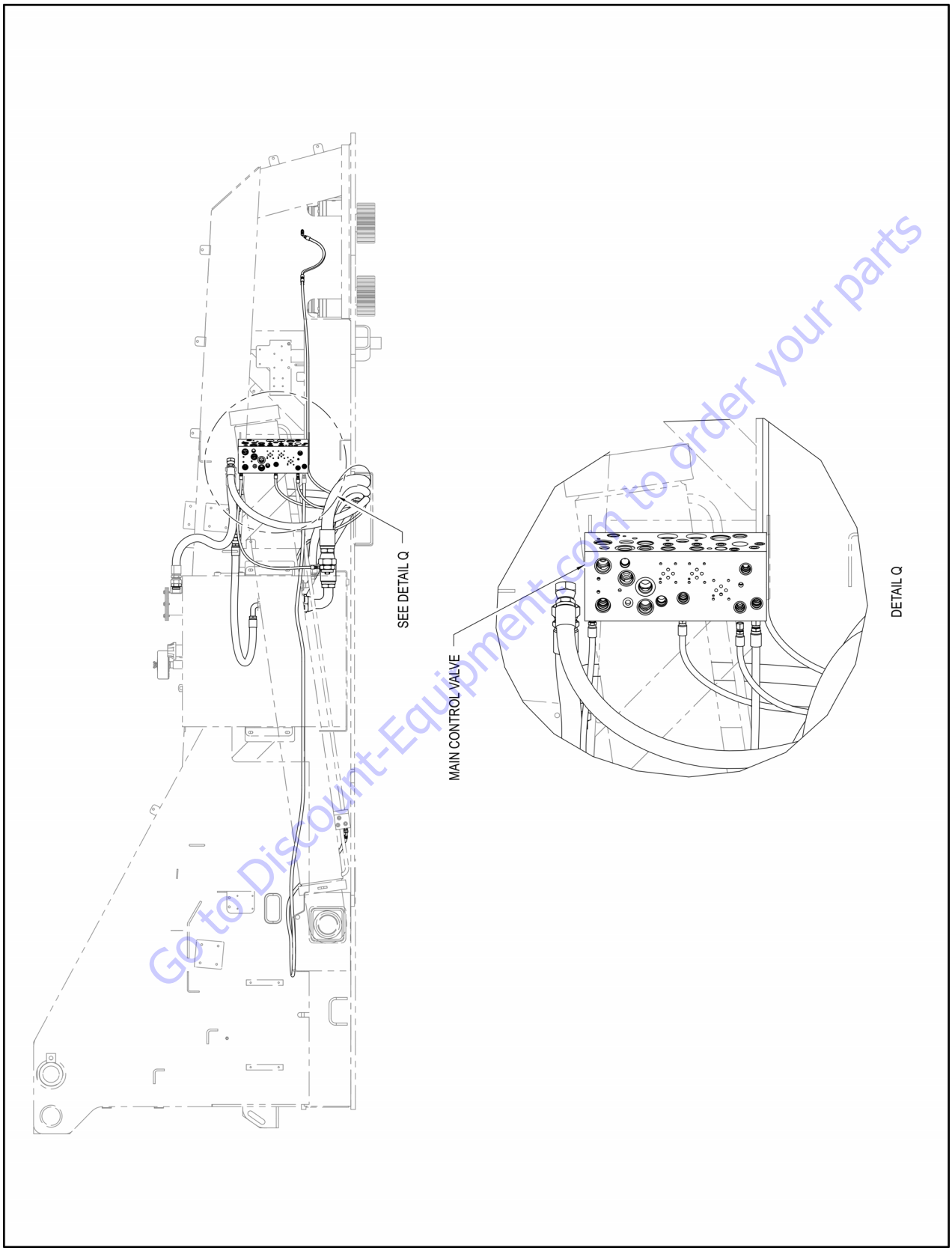


Figure 5-19. Hydraulic Hose Installation - Sheet 4 of 8

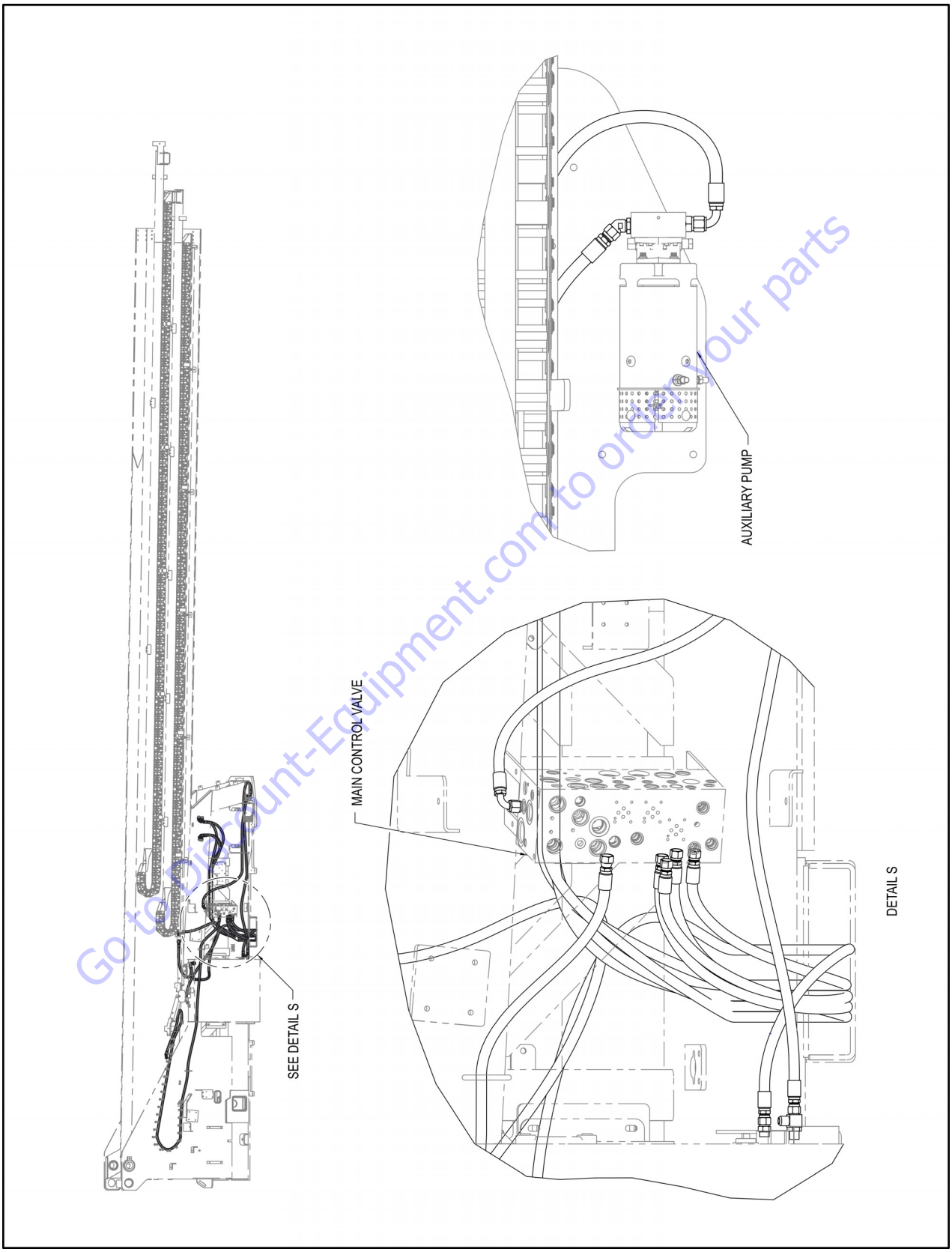


Figure 5-20. Hydraulic Hose Installation - Sheet 5 of 8

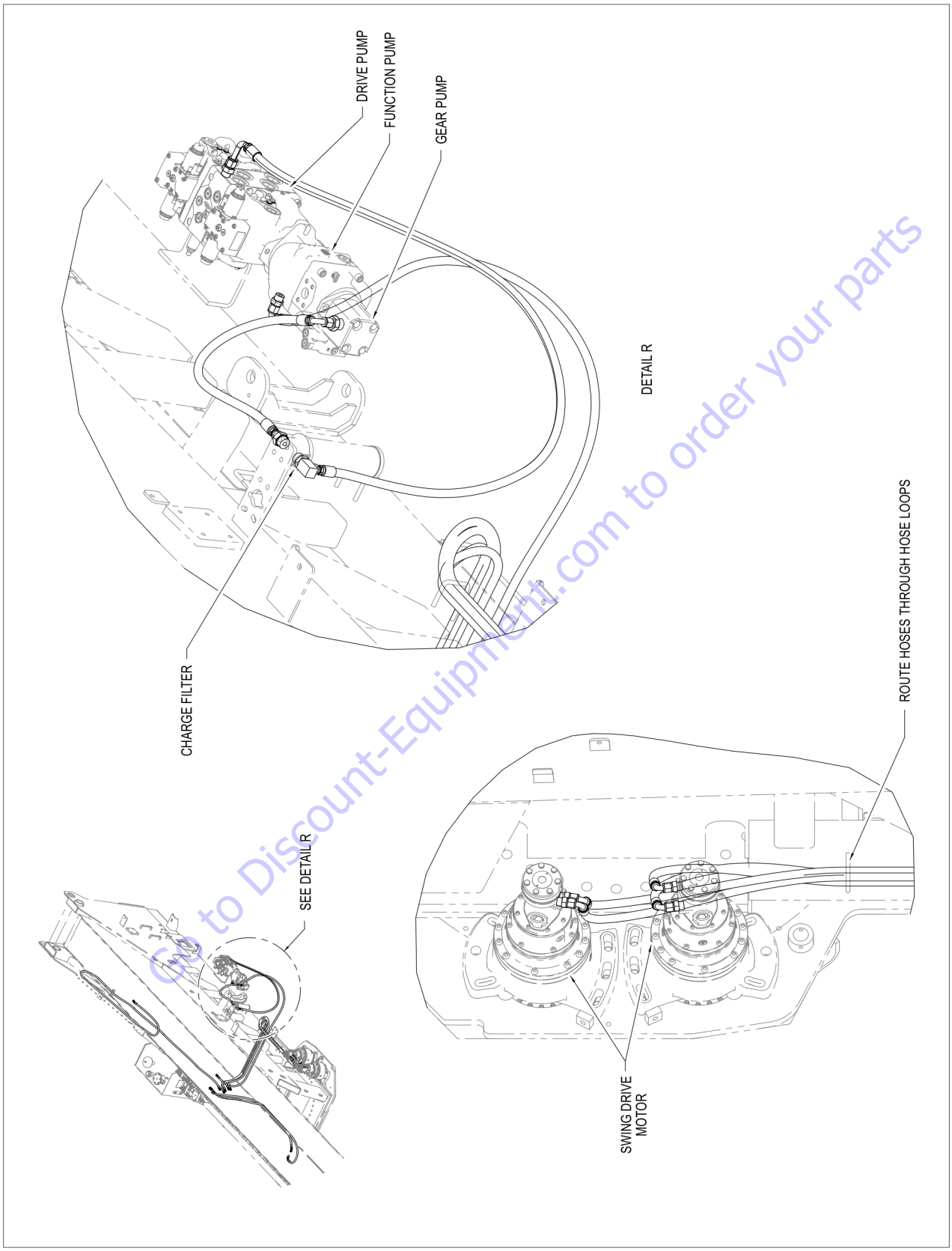


Figure 5-21. Hydraulic Hose Installation - Sheet 6 of 8

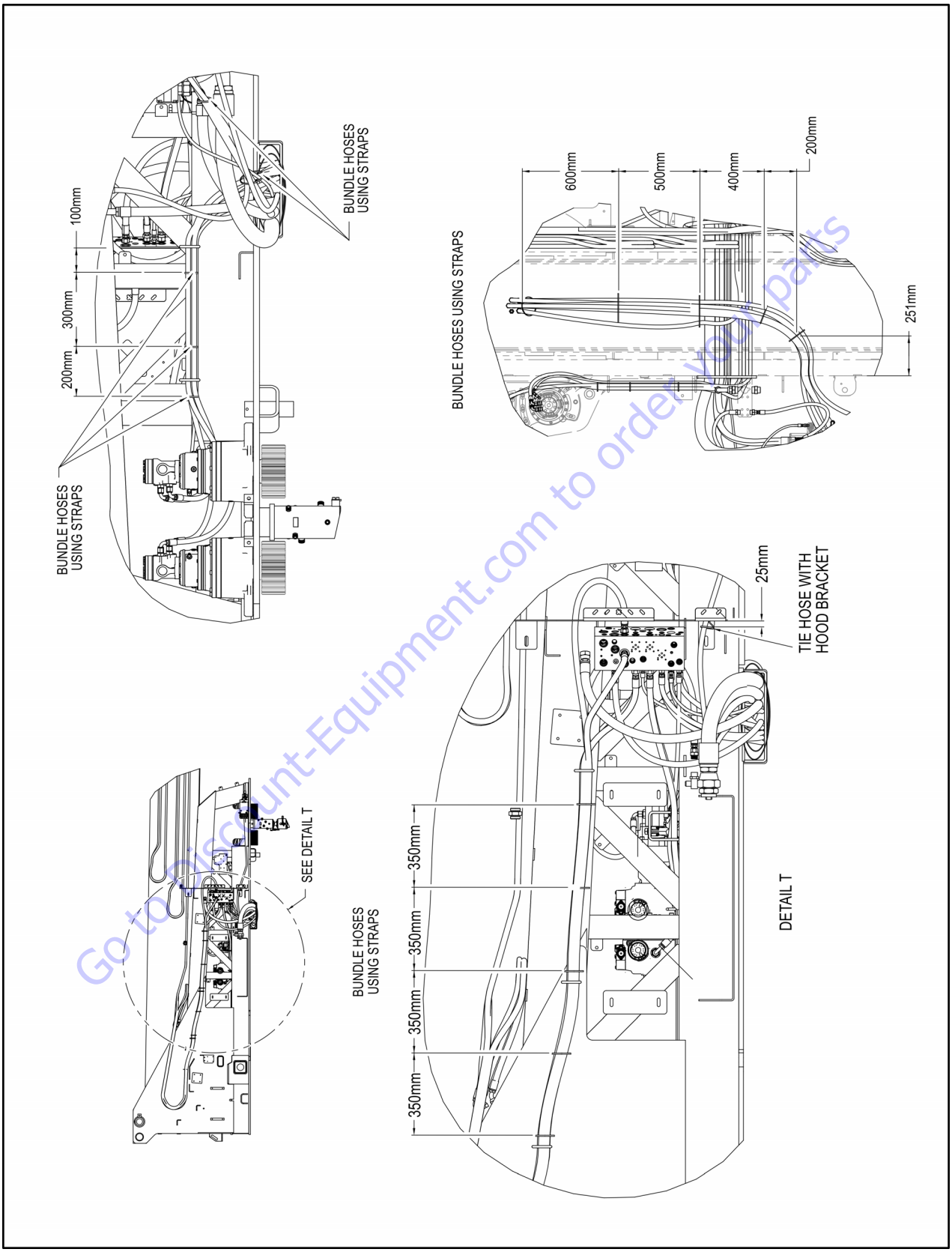


Figure 5-22. Hydraulic Hose Installation - Sheet 7 of 8

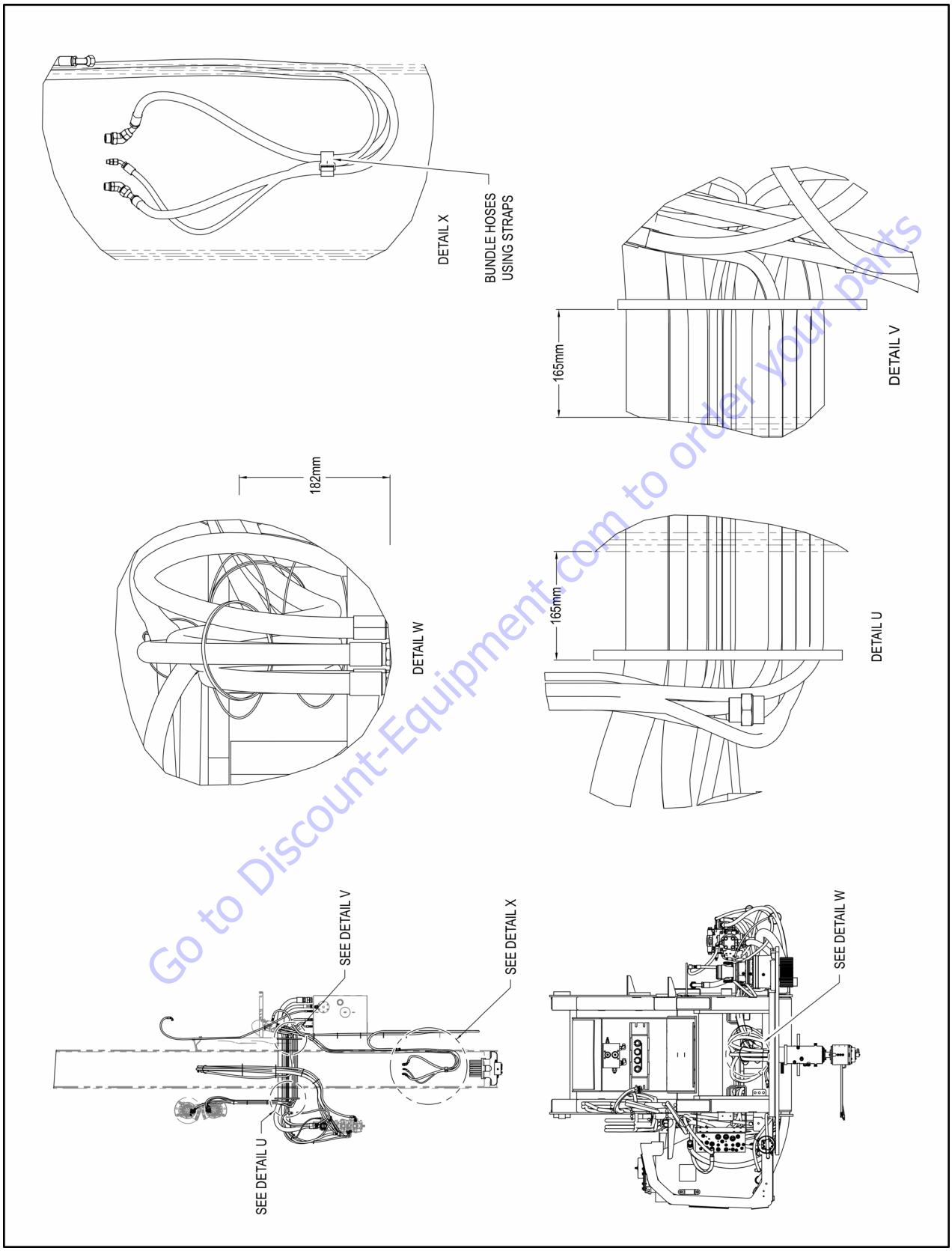


Figure 5-23. Hydraulic Hose Installation - Sheet 8 of 8

5.3 HYDRAULIC CYLINDERS

Axle Extend Cylinder (Prior to SN 0300239676)

Refer to Figure 5-27.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.
3. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

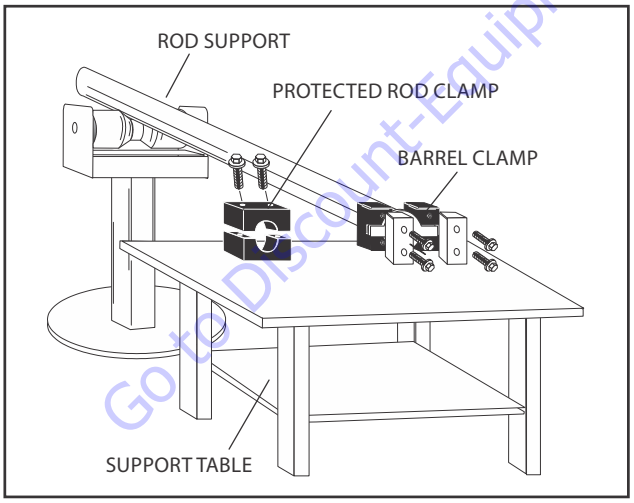


Figure 5-24. Cylinder Barrel Support

5. Mark cylinder head and barrel with center punch marks for later realignment. Remove the capscrews (4).

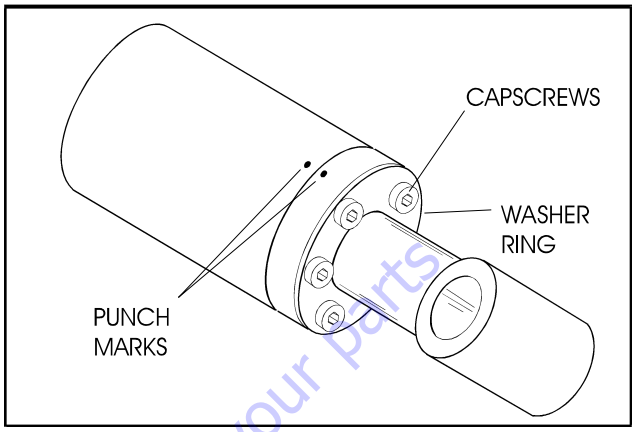


Figure 5-25. Capscrew Removal

6. Attach a suitable pulling device to the cylinder rod end.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD, AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, carefully withdraw the complete rod assembly from the cylinder barrel (2).

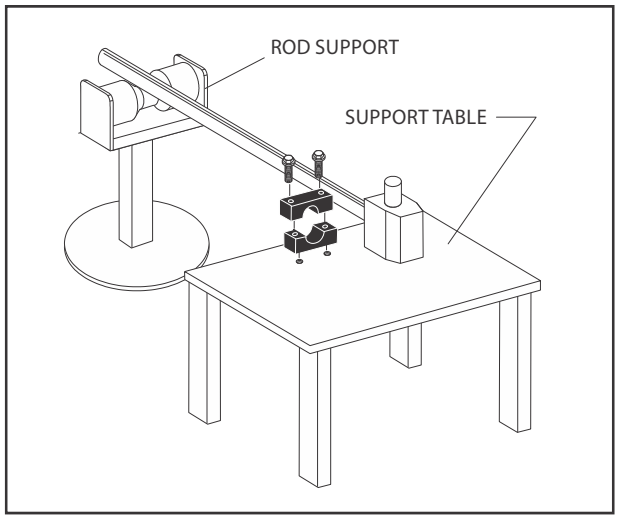
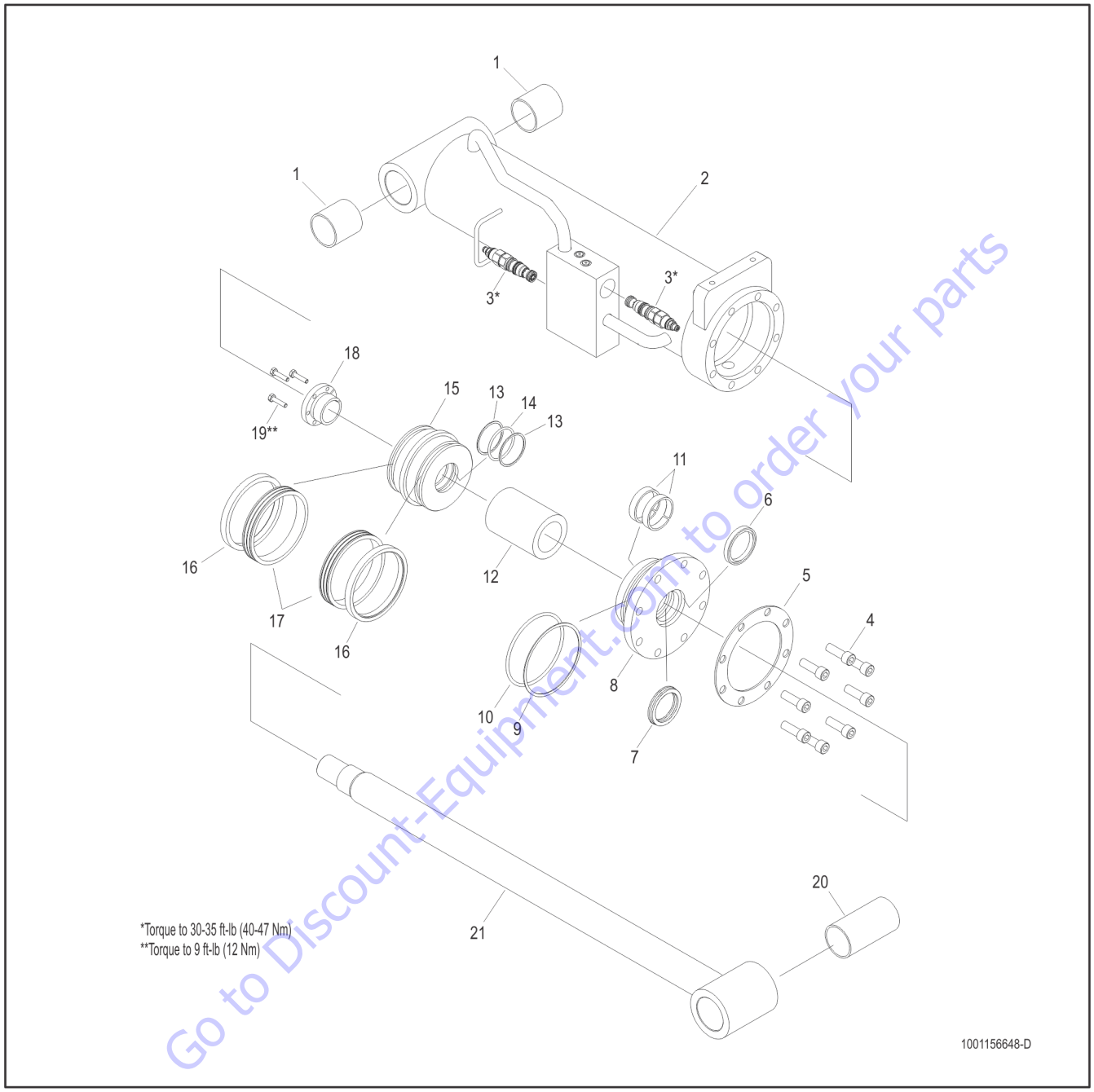


Figure 5-26. Cylinder Rod Support

8. Using suitable protection, clamp the cylinder rod (21) in a vise or holding fixture as close to the piston (15) as possible.



1. Bushing
2. Barrel
3. Counterbalance Valve
4. Capscrew
5. Washer Ring
6. Wiper Seal
7. Seal
8. Cylinder Head
9. Backup Ring
10. O-Ring
11. Wear Ring
12. Spacer
13. Backup Ring
14. O-Ring
15. Piston
16. Lock Ring
17. Seal
18. Tapered Bushing
19. Bolt
20. Bushing
21. Rod

Figure 5-27. Axle Extend Cylinder Assembly (Prior to SN 0300239676)

9. Loosen and remove bolts from tapered bushing (18) and piston (15).

10. Insert bolts in threaded holes in outer piece of tapered bushing (18). Progressively tighten bolts until bushing is loose. Remove tapered bushing (18) from piston (15).

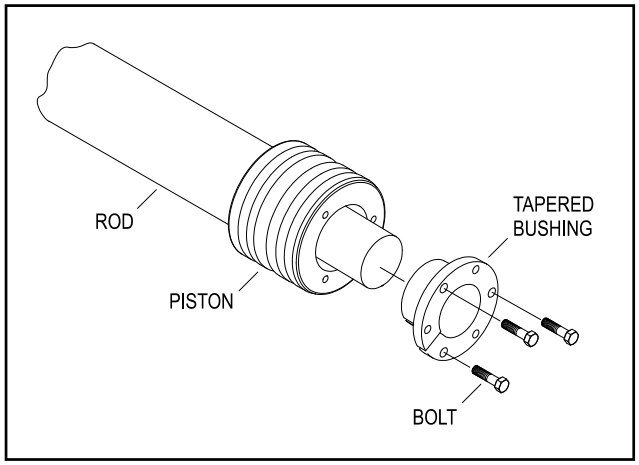


Figure 5-28. Tapered Bushing Removal

11. By hand, screw the piston (15) counterclockwise and remove it from cylinder rod (21).

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

12. Remove and discard backup ring, o-ring, and backup ring from inside grooves of piston (15). Remove and discard two lock rings and seals from outer grooves of piston (15).

13. Remove piston spacer from rod.

14. Remove rod (21) from holding fixture. Remove cylinder head (8) and washer ring (5).

15. Remove and discard two wear rings (11), wiper seal (6) and rod seal (7) from inside of cylinder head (8). Remove and discard O-ring and backup ring (9) from outer groves of cylinder head (8).

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.

2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.

3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.

4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.

5. Inspect threaded portion of barrel for damage. Dress threads as necessary.

6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.

7. Inspect threaded portion of piston for damage. Dress threads as necessary.

8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.

9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.

10. Inspect threaded portion of head for damage. Dress threads as necessary.

11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.

13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.

    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.

    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.

    c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

d. Press bushing in barrel or rod bushing with correct size arbor.

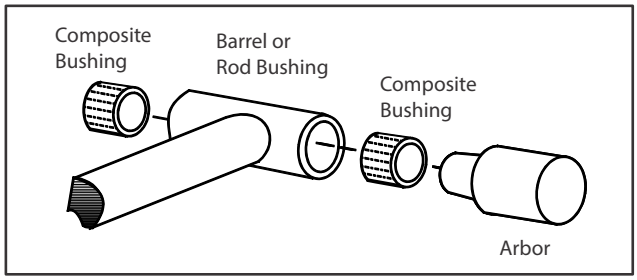


Figure 5-29. Bushing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.

15. Inspect port block fittings and holding valves. Replace as necessary.

16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

1. Install backup ring (9) and o-ring (10) in outside diameter grooves of cylinder head (8).

2. Install rod seal (7), wiper ring (6), and wear rings (11) in cylinder head (8) as shown.

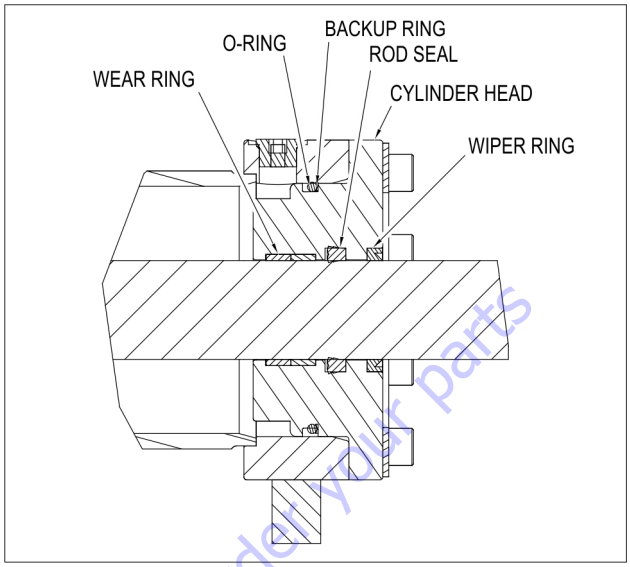


Figure 5-30. Cylinder Head Seal Installation

3. Slide washer ring on rod. Install cylinder head assembly (8) on rod. Do not damage or dislodge wiper (6) and rod seals (7). Push cylinder head (8) to rod end (21).

4. Install spacer (12) on rod (21).

5. Install backup ring (13), O-ring (14), and backup ring (13) in inside grooves of piston (15).

6. Install hydrolock seals (17) and guidelock rings (16) in outer grooves of piston (15).

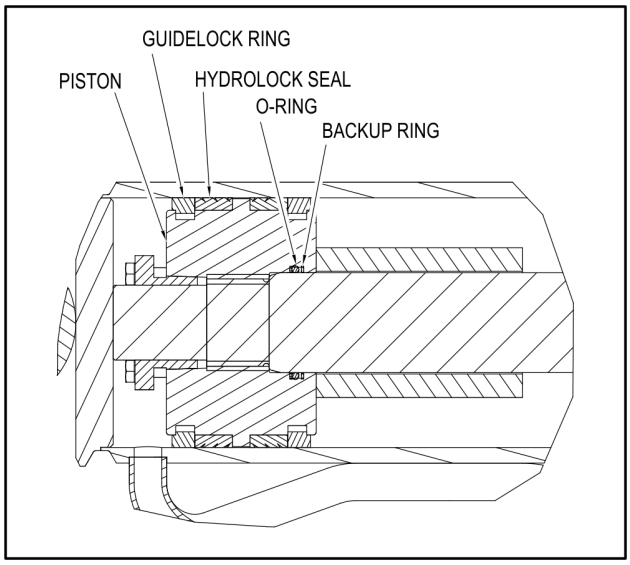


Figure 5-31. Piston Seal Kit Installation

7. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.

8. Thread piston (15) on cylinder rod (21) hand tight. Ensure O-ring (14) and back-up rings (13) are not damaged or dislodged.

NOTE: *When installing the tapered bushing, piston and mating end of rod must be free of oil.*

9. Assemble the tapered bushing (18) loosely into the piston (15) and insert capscrews (19) through the drilled holes in the bushing and into the tapped holes in the piston (15).

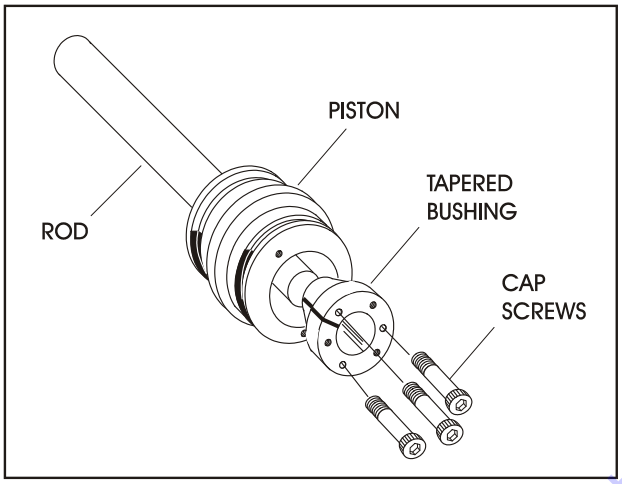


Figure 5-32. Tapered Bushing Installation

10. Tighten the capscrews (19) evenly and progressively in rotation to 9 ft.lbs (12 Nm).

11. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

    b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

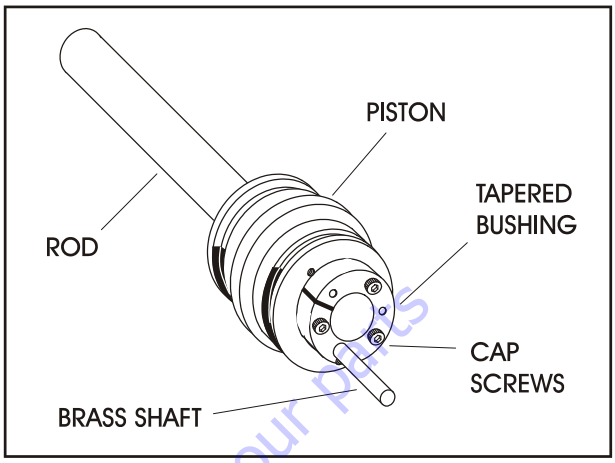


Figure 5-33. Seating the Tapered Bearing

12. Retorque the capscrews (4) evenly and progressively in rotation to 9 ft.lbs (12 Nm).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

13. Clamp barrel (2) securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston O-ring and seal ring.

14. Continue pushing rod (21) in barrel (2) until cylinder head (8) can be inserted into barrel cylinder.

NOTE: *Apply locking primer and JLG Threadlocker (P/N 0100011) to capscrews.*

15. Secure cylinder head (8) and washer ring (5) with eight capscrews (4).

16. Install two counterbalance valves with new O-rings in valve block. Torque to 30-35 ft-lb (40-47 Nm).

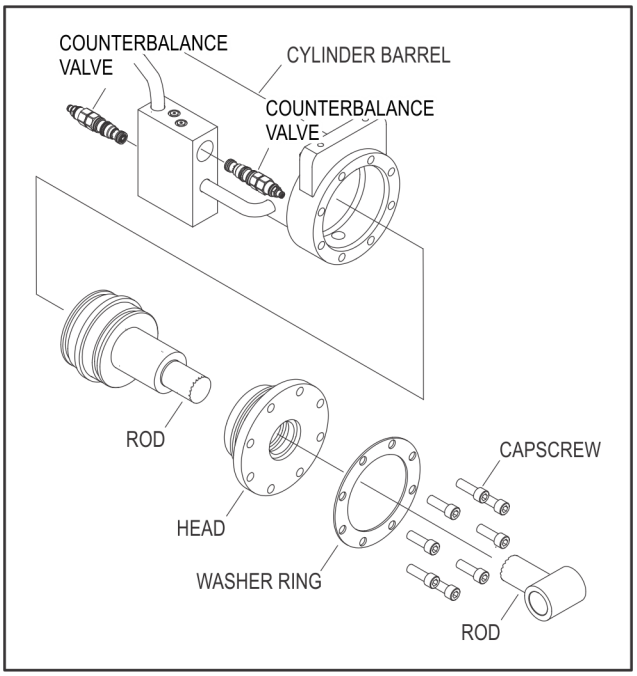


Figure 5-34. Rod Assembly Installation

Axle Extend Cylinder (SN 0300239676 to Present)

Refer to Figure 5-38.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.
3. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

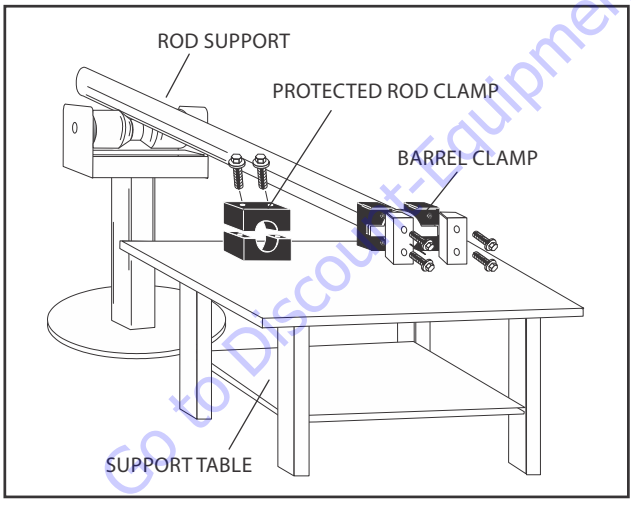


Figure 5-35. Cylinder Barrel Support

5. Mark cylinder head and barrel with center punch marks for later realignment. Remove the capscrews (4).

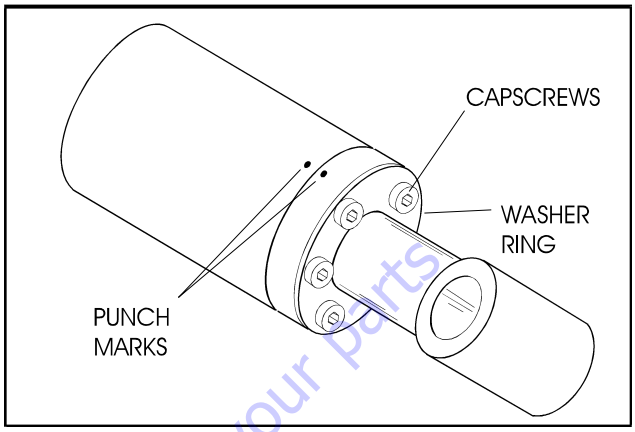


Figure 5-36. Capscrew Removal

6. Attach a suitable pulling device to the cylinder rod end.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD, AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, carefully withdraw the complete rod assembly from the cylinder barrel (2).

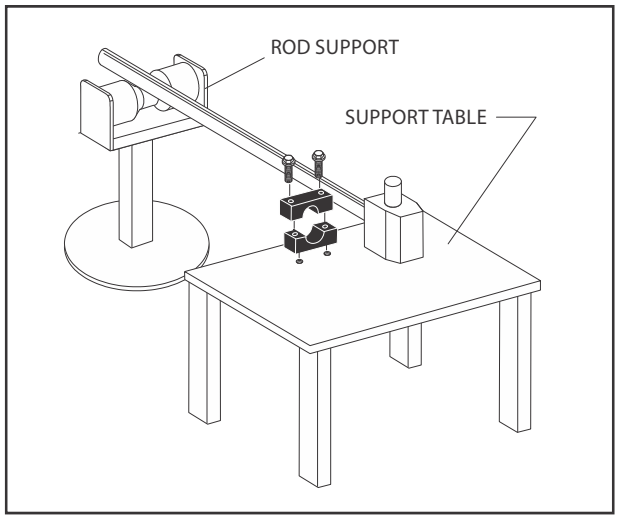
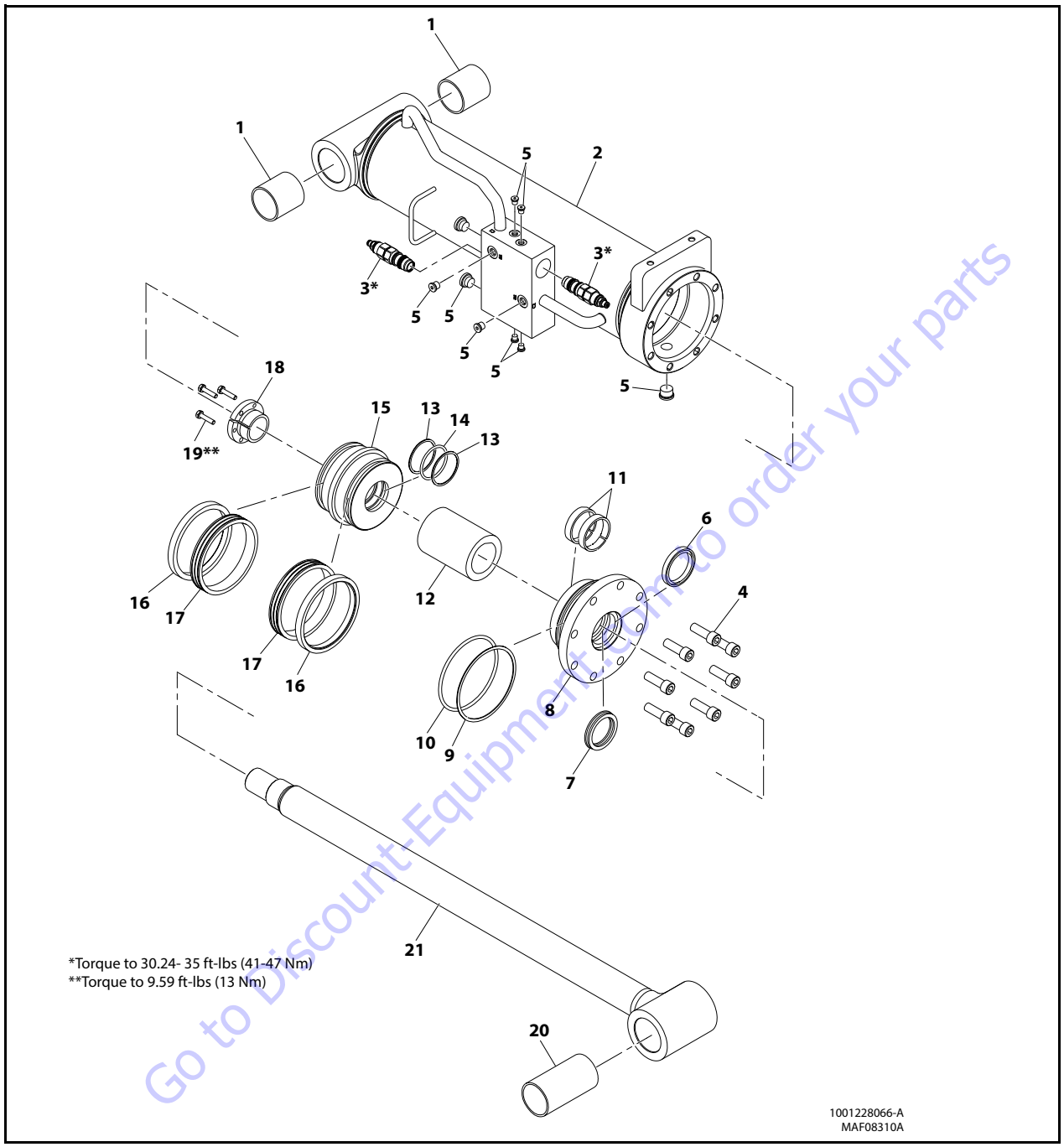


Figure 5-37. Cylinder Rod Support

8. Using suitable protection, clamp the cylinder rod (21) in a vise or holding fixture as close to the piston (15) as possible.



1. Bushing
2. Barrel
3. Counterbalance Valve
4. Capscrew
5. O-Ring
6. Wiper Seal
7. Seal
8. Cylinder Head
9. Backup Ring
10. O-Ring
11. Wear Ring
12. Spacer
13. Backup Ring
14. O-Ring
15. Piston
16. Lock Ring
17. Seal
18. Tapered Bushing
19. Bolt
20. Bushing
21. Rod

Figure 5-38. Axle Extend Cylinder Assembly (SN 0300239676 to Present)

9. Loosen and remove bolts from tapered bushing (18) and piston (15).

10. Insert bolts in threaded holes in outer piece of tapered bushing (18). Progressively tighten bolts until bushing is loose. Remove tapered bushing (18) from piston (15).

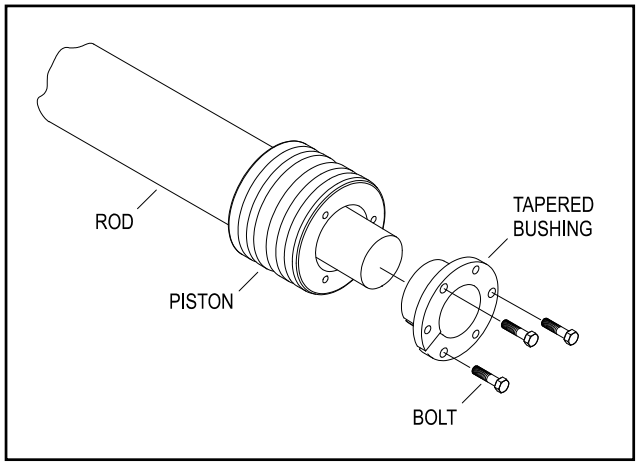


Figure 5-39. Tapered Bushing Removal

11. By hand, screw the piston (15) counterclockwise and remove it from cylinder rod (21).

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

12. Remove and discard backup ring, o-ring, and backup ring from inside grooves of piston (15). Remove and discard two lock rings and seals from outer grooves of piston (15).

13. Remove piston spacer from rod.

14. Remove rod (21) from holding fixture.

15. Remove and discard two wear rings (11), wiper seal (6) and rod seal (7) from inside of cylinder head (8). Remove and discard O-ring and backup ring (9) from outer groves of cylinder head (8).

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.

2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.

3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.

4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.

5. Inspect threaded portion of barrel for damage. Dress threads as necessary.

6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.

7. Inspect threaded portion of piston for damage. Dress threads as necessary.

8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.

9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.

10. Inspect threaded portion of head for damage. Dress threads as necessary.

11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.

13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.

    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.

    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.

    c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

d. Press bushing in barrel or rod bushing with correct size arbor.

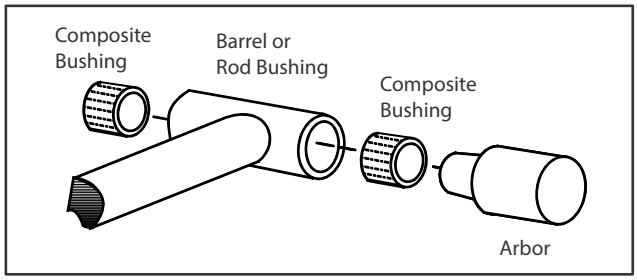


Figure 5-40. Bushing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.

15. Inspect port block fittings and holding valves. Replace as necessary.

16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

1. Install backup ring (9) and o-ring (10) in outside diameter grooves of cylinder head (8).

2. Install rod seal (7), wiper ring (6), and wear rings (11) in cylinder head (8) as shown.

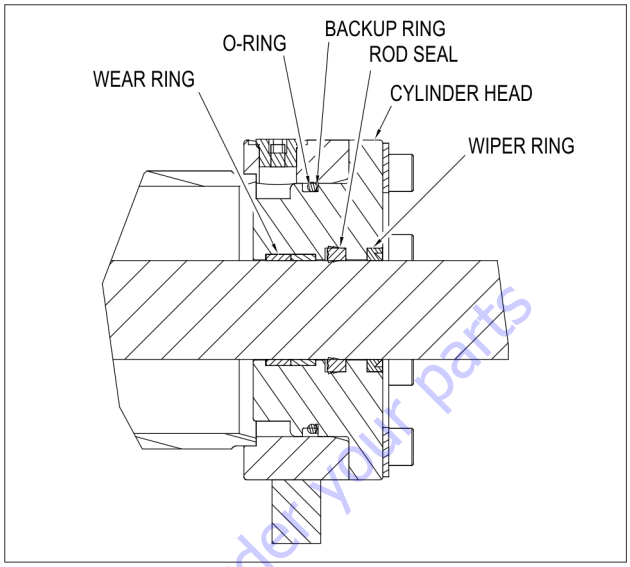


Figure 5-41. Cylinder Head Seal Installation

3. Install cylinder head assembly (8) on rod. Do not damage or dislodge wiper (6) and rod seals (7). Push cylinder head (8) to rod end (21).

4. Install spacer (12) on rod (21).

5. Install backup ring (13), O-ring (14), and backup ring (13) in inside grooves of piston (15).

6. Install hydrolock seals (17) and guidelock rings (16) in outer grooves of piston (15).

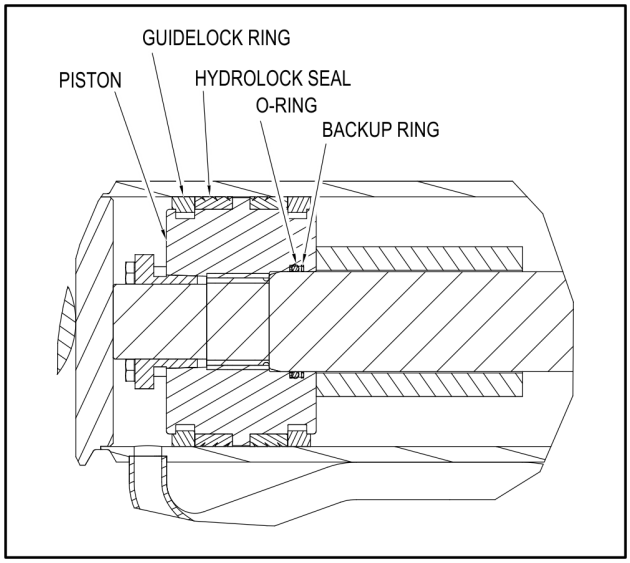


Figure 5-42. Piston Seal Kit Installation

7. Using suitable protection, clamp cylinder rod (21) in a vise or similar holding fixture as close to piston (15) as possible.

8. Thread piston (15) on cylinder rod (21) hand tight. Ensure O-ring (14) and back-up rings (13) are not damaged or dislodged.

NOTE: *When installing the tapered bushing, piston and mating end of rod must be free of oil.*

9. Assemble the tapered bushing (18) loosely into the piston (15) and insert capscrews (19) through the drilled holes in the bushing and into the tapped holes in the piston (15).

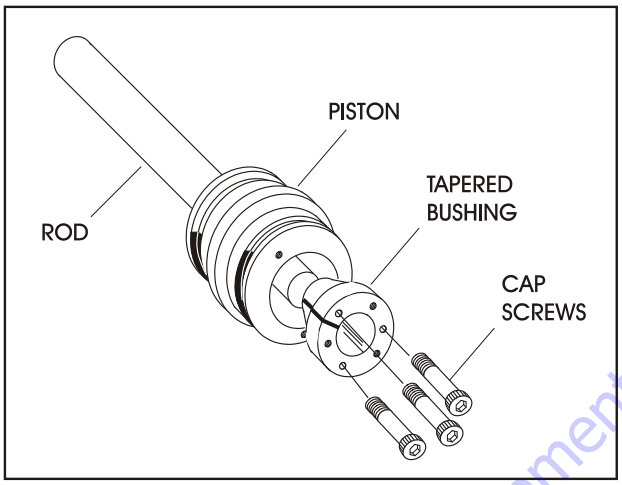


Figure 5-43. Tapered Bushing Installation

10. Tighten the capscrews (19) evenly and progressively in rotation to 9.59 ft.lbs (13 Nm).

11. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

    b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

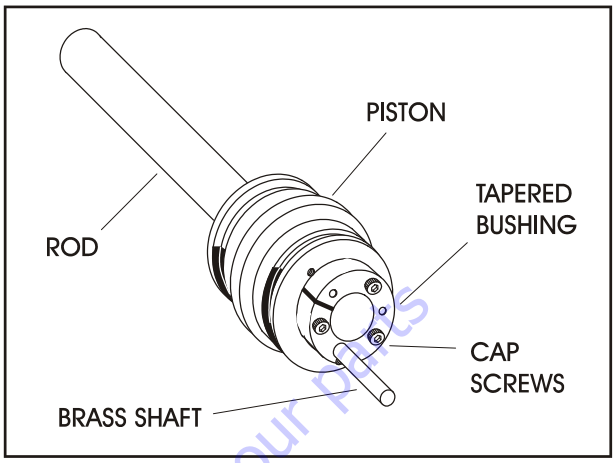


Figure 5-44. Seating the Tapered Bearing

12. Retorque the capscrews (4) evenly and progressively in rotation to 9 ft.lbs (12 Nm).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

13. Clamp barrel (2) securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston O-ring and seal ring.

14. Continue pushing rod (21) in barrel (2) until cylinder head (8) can be inserted into barrel cylinder.

NOTE: *Apply locking primer and JLG Threadlocker (P/N 0100011) to capscrews.*

15. Secure cylinder head (8) with capscrews (4).

16. Install two counterbalance valves (3) with new O-rings in valve block. Torque to 30.24-35 ft-lbs (41-47 Nm).

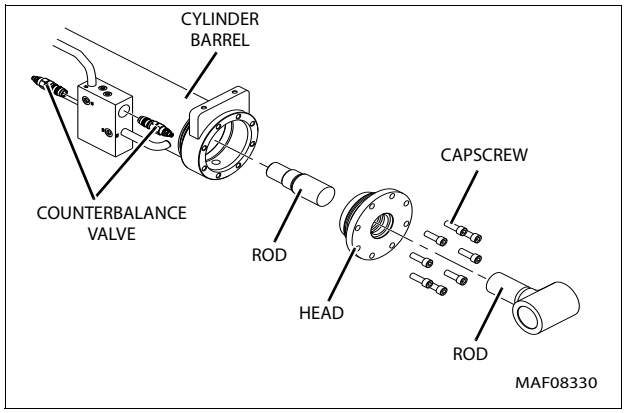


Figure 5-45. Rod Assembly Installation

Jib Level (Slave) Cylinder (Prior to SN 0300239676)

Refer to Figure 5-49.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.
3. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

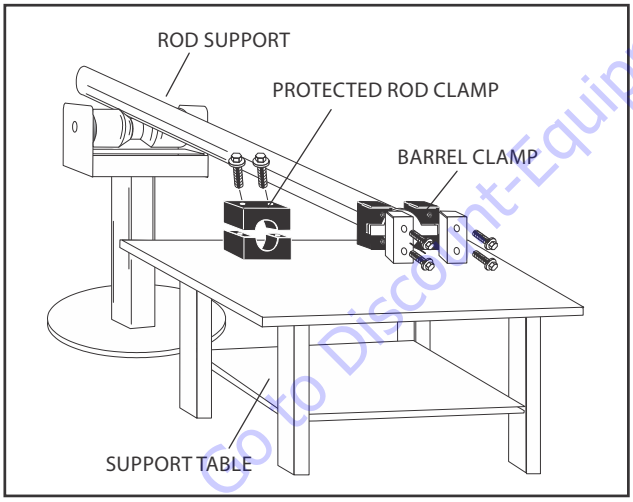


Figure 5-46. Cylinder Barrel Support

5. Mark cylinder head and barrel with center punch marks (3) for later realignment. Remove eight cylinder head capscrews

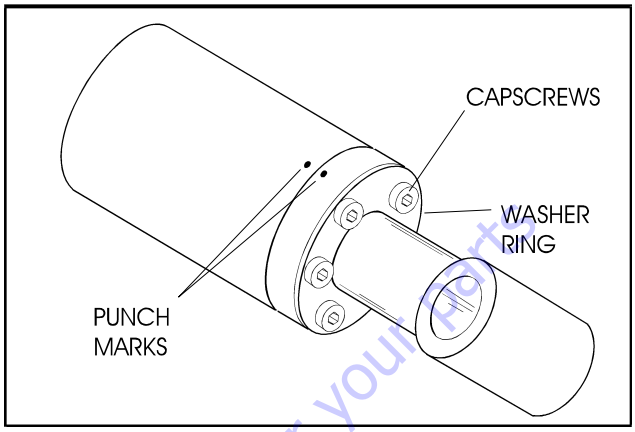


Figure 5-47. Capscrew Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

6. Clamp barrel securely. Unscrew cylinder head and pull rod assembly from barrel.
7. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

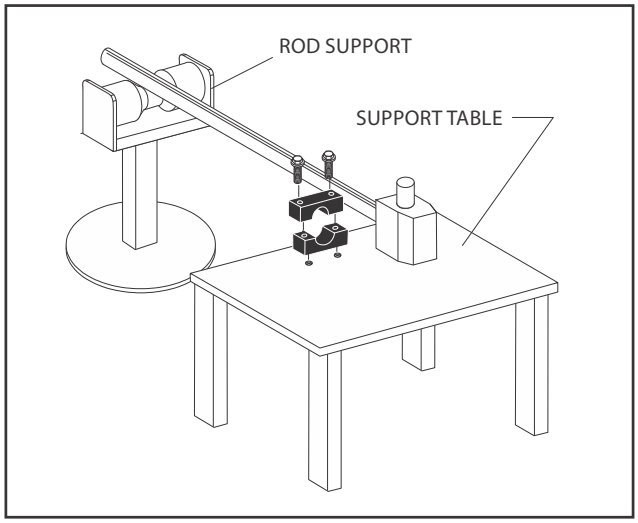
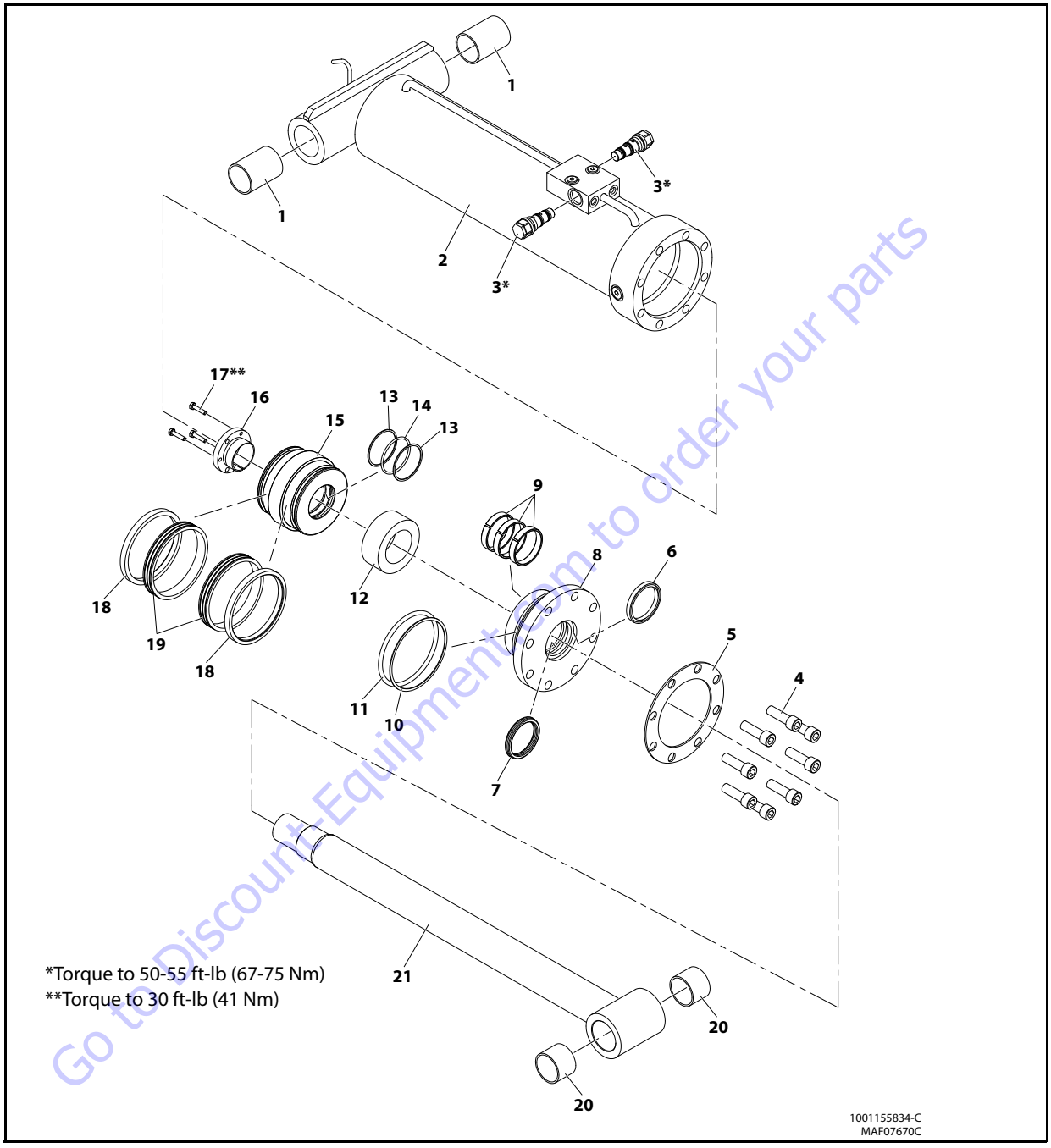


Figure 5-48. Cylinder Rod Support



1. Bushing
2. Barrel
3. Counterbalance Valve
4. Capscrew
5. Washer Ring
6. Wiper Seal
7. Rod Seal
8. Cylinder Head
9. Wear Ring
10. Backup Ring
11. O-Ring
12. Spacer
13. Back-Up Ring
14. O-Ring
15. Piston
16. Tapered Bushing
17. Bolt
18. Lock Ring
19. Seal
20. Bushing
21. Rod

Figure 5-49. Jib Level (Slave) Cylinder Assembly (Prior to SN 0300239676)

8. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
9. Loosen and remove bolts from tapered bushing and piston.
10. Insert bolts in threaded holes in outer piece of tapered bushing. Progressively tighten bolts until bushing is loose. Remove tapered bushing from piston.
11. Screw piston counter-clockwise by hand and remove from cylinder rod.

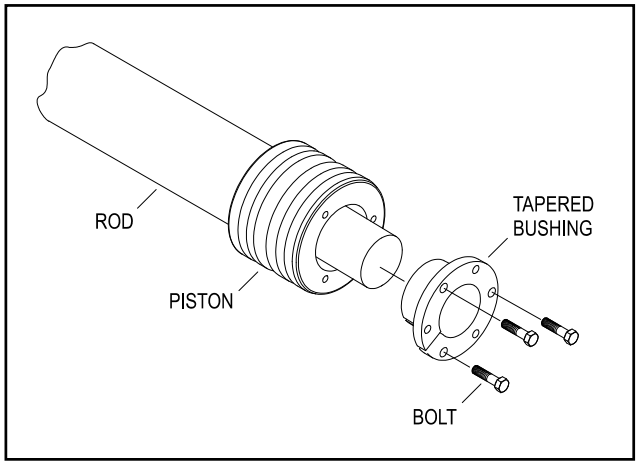


Figure 5-50. Tapered Bushing Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

12. Remove and discard backup ring (13), O-ring (14), and backup ring (13) from inside grooves of piston (15).
13. Remove and discard two lock rings (18) and seals (19) from outside grooves of piston.

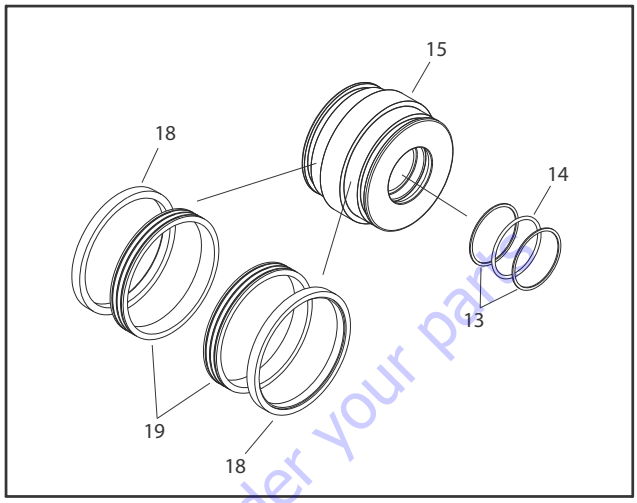


Figure 5-51. Piston Disassembly

14. Remove piston spacer (12) from rod (7).
15. Remove rod from holding fixture. Remove cylinder head (8) and washer ring (5)
16. Remove and discard three wear rings (9), wiper seal (6), and rod seal (7) from inside of cylinder head (8). Remove and discard O-ring (11) and backup ring (10) from outer groves of cylinder head.

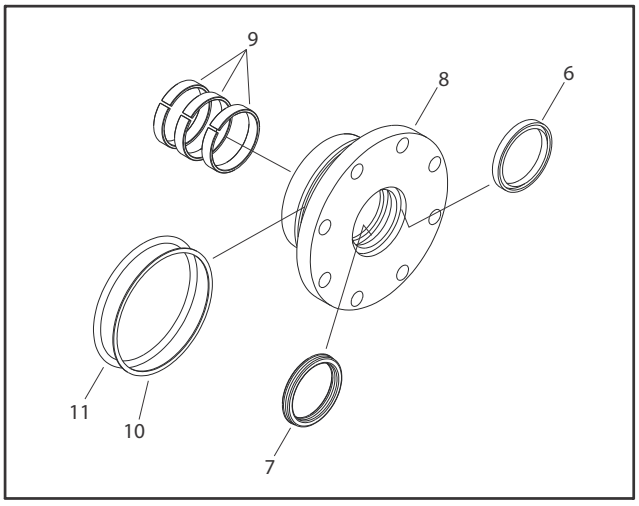


Figure 5-52. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing in barrel or rod bushing with correct size arbor.

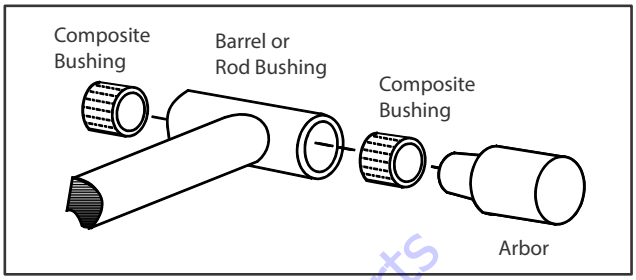


Figure 5-53. Bushing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect port block fittings and holding valves. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

1. Install backup ring (10) and O-ring (11) in outside diameter grooves of cylinder head (8).
2. Install rod seal (7), wiper seal (6), and three wear rings (9) in cylinder head as shown.

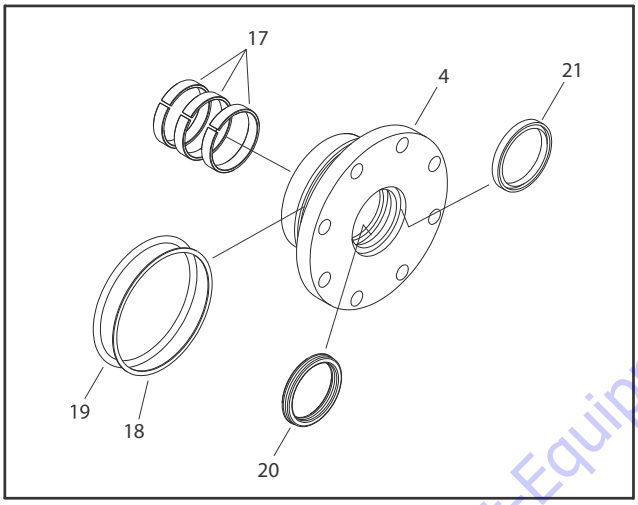


Figure 5-54. Cylinder Head Assembly

3. Slide washer ring (5) on rod (21). Install cylinder head assembly (8) on rod. Do not damage or dislodge wiper and rod seals. Push cylinder head to rod end.
4. Install spacer (12) on rod (21).
5. Install backup ring (13), O-ring (14), and backup ring (13) in inside grooves of piston (15).
6. Install two seals (13) and lock rings (14) in outer grooves of piston.

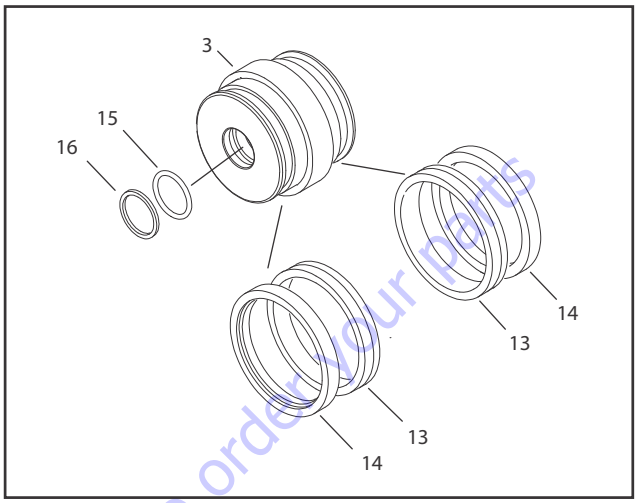


Figure 5-55. Piston Seal Kit Installation

7. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
8. Thread piston on cylinder rod hand tight. Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

9. Thread piston on rod until it aligns with spacer end and install tapered bushing.

NOTE: *Apply JLG Threadlocker (P/N 0100011) to tapered bushing bolts.*

10. Assemble the tapered bushing loosely into the piston and insert capscrews through the drilled holes in the bushing and into the tapped holes in the piston.

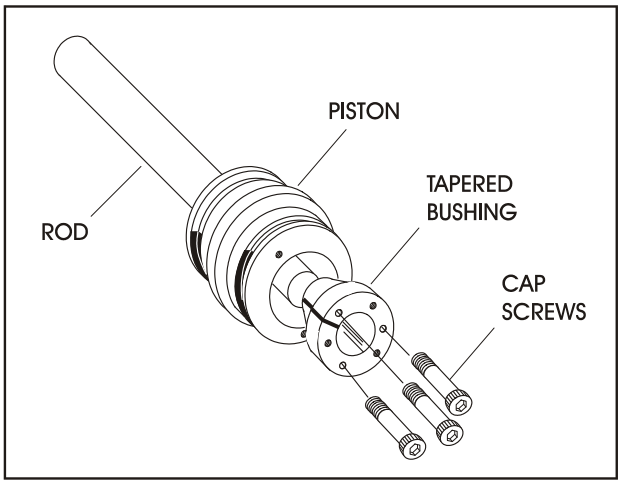


Figure 5-56. Tapered Bushing Installation

11. Tighten the capscrews evenly and progressively in rotation to 30 ft-lb (41 Nm).

12. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

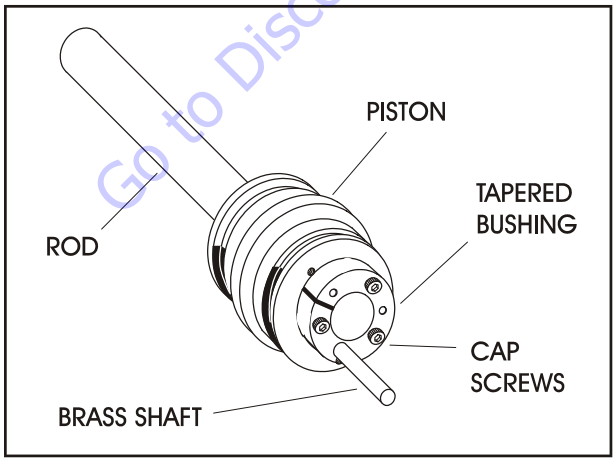


Figure 5-57. Seating the Tapered Bearing

13. Re-torque capscrews evenly and progressively in rotation to 30 ft-lb (41 Nm).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

14. Clamp barrel securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston O-ring and seal ring.

15. Continue pushing rod (21) in barrel (2) until cylinder head (8) can be inserted into barrel cylinder.

NOTE: *Apply locking primer and medium strength (Blue) Locking Compound (JLG P/N 0100011 or equivalent to capscrews.*

16. Secure cylinder head (8) and washer ring (5) with eight capscrews (4).

17. Install two counterbalance valves (3) with new O-rings in valve block. Torque to 50-55 ft-lb (67-75 Nm).

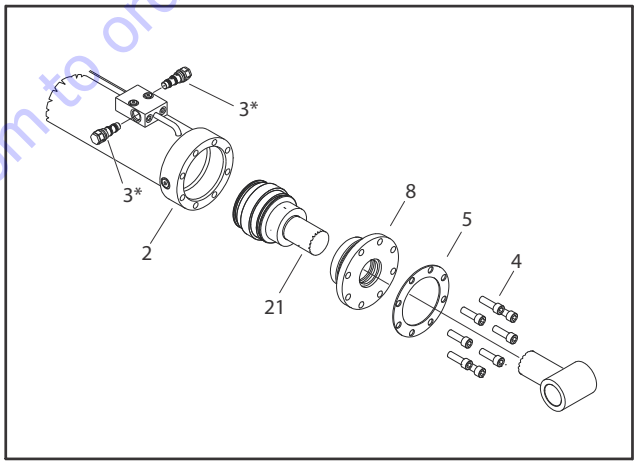


Figure 5-58. Rod Assembly Installation

Jib Level (Slave) Cylinder (SN 0300239676 to Present)

Refer to Figure 5-49.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.
3. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

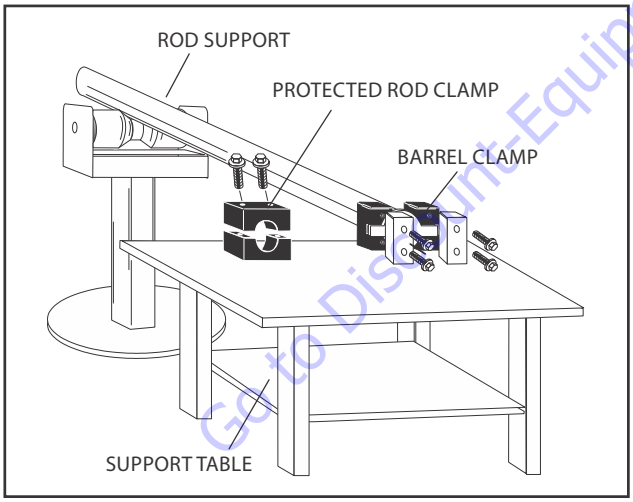


Figure 5-59. Cylinder Barrel Support

5. Unscrew cylinder head with hook spanner wrench.

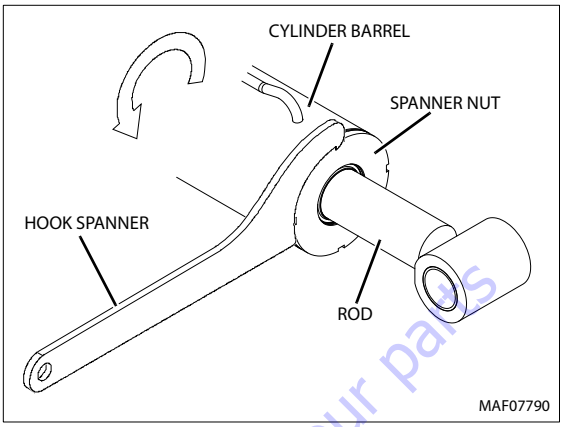


Figure 5-60. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port-block end or cylinder rod end, as applicable.

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

7. Clamp barrel securely. Unscrew cylinder head and pull rod assembly from barrel.
8. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

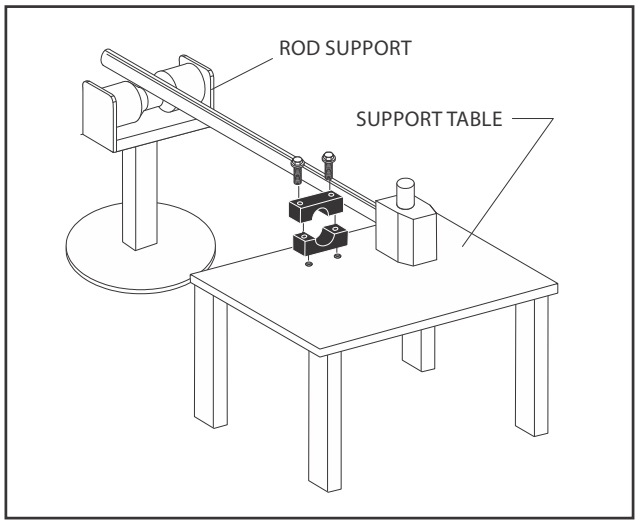
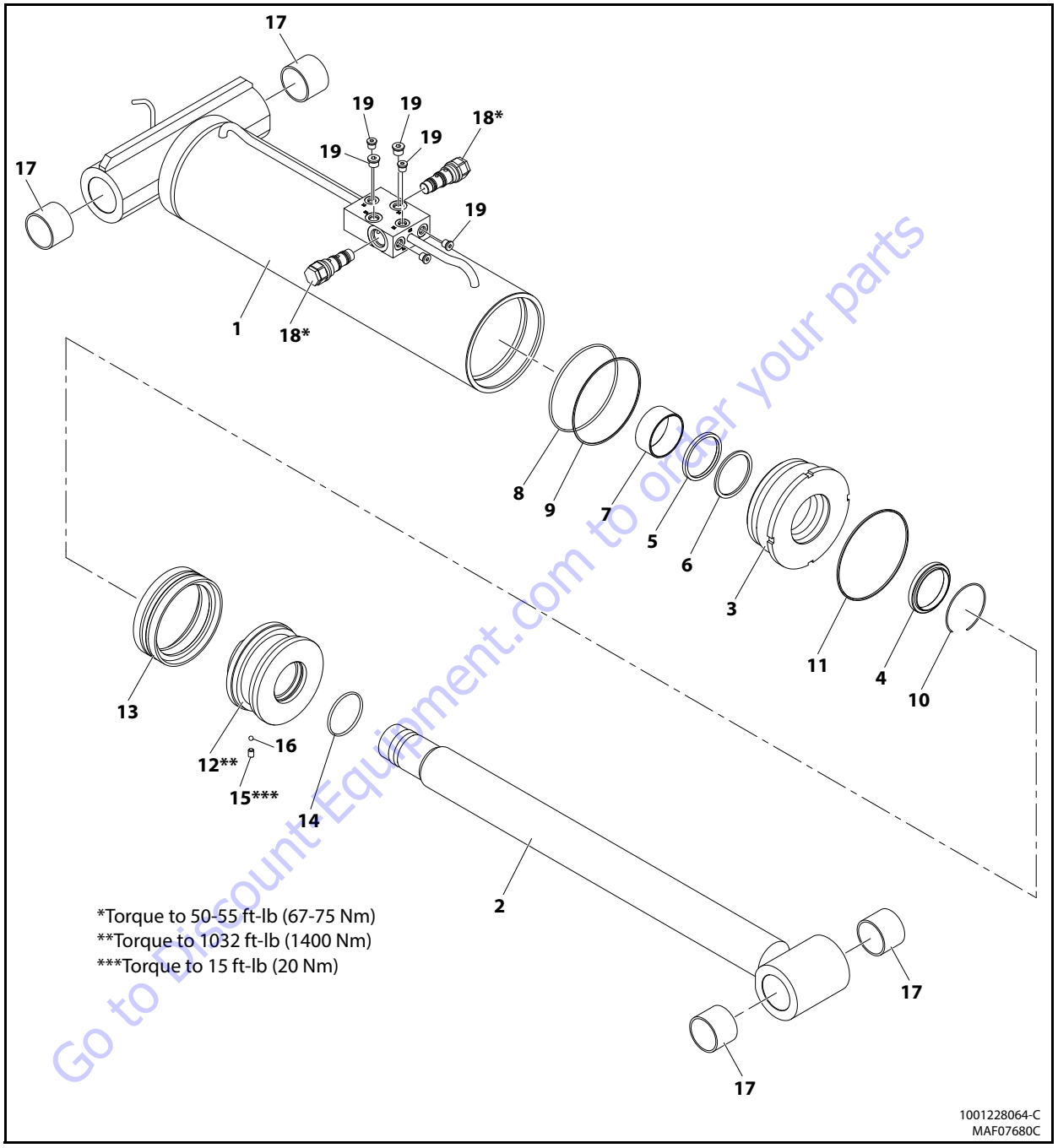


Figure 5-61. Cylinder Rod Support



1. Barrel
2. Rod
3. Head
4. Wiper Seal
5. Rod Seal
6. Backup Ring
7. Wear Ring
8. O-Ring
9. Backup Ring
10. Retainer
11. O-Ring
12. Piston
13. Seal, Piston
14. O-Ring
15. Setscrew
16. Steel Ball
17. Bushing
18. Counterbalance Valve
19. Plug

Figure 5-62. Jib Level (Slave) Cylinder Assembly (SN 0300239676 to Present)

9. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
10. Loosen and remove the setscrew (15) and ball (16) which attaches the piston to the rod.
11. Screw the piston (12) counterclockwise and remove the piston from cylinder rod (2).

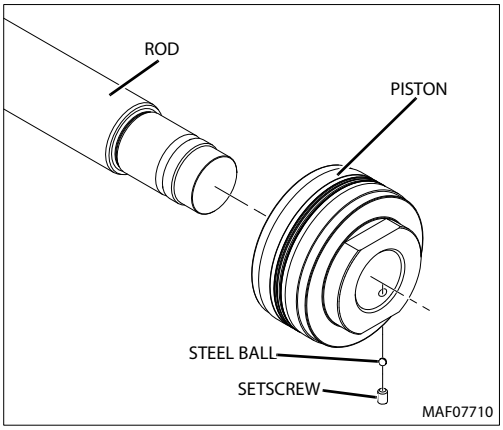


Figure 5-63. Piston Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

12. Remove and discard the piston seal (13) from outside grooves of piston (12).
13. Remove and discard the o-ring (14) from inside grooves of piston (12).

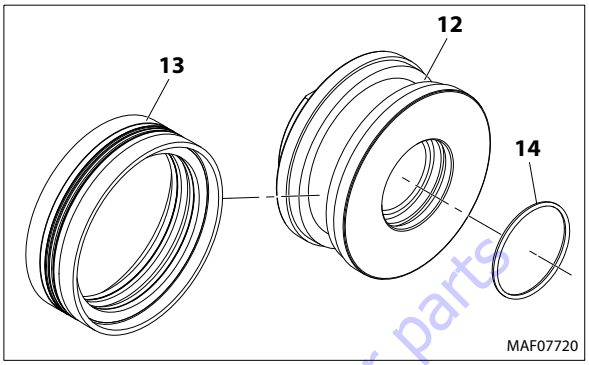


Figure 5-64. Piston Seal Disassembly

14. Remove rod from holding fixture and remove cylinder head (3).
15. Remove and discard wear ring (7), wiper seals (4), retainer ring (10), backup ring (6) and rod seal (5) from inside of cylinder head (3).
16. Remove and discard O-ring (8), backup ring (9) and O-ring (11) from outside groves of cylinder head (3).

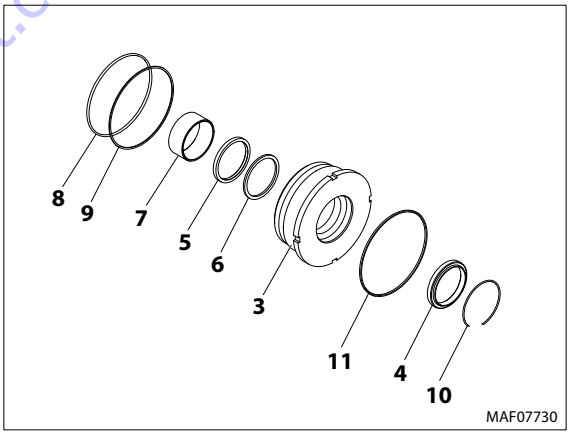


Figure 5-65. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing in barrel or rod bushing with correct size arbor.

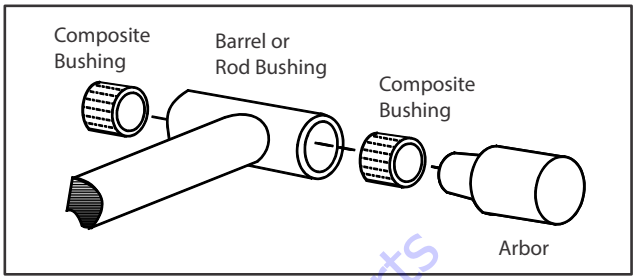


Figure 5-66. Bushing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect port block fittings and holding valves. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

NOTE: *Apply a light film of hydraulic oil to all components before assembly.*

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new bearing into the applicable inside diameter of the cylinder head groove.

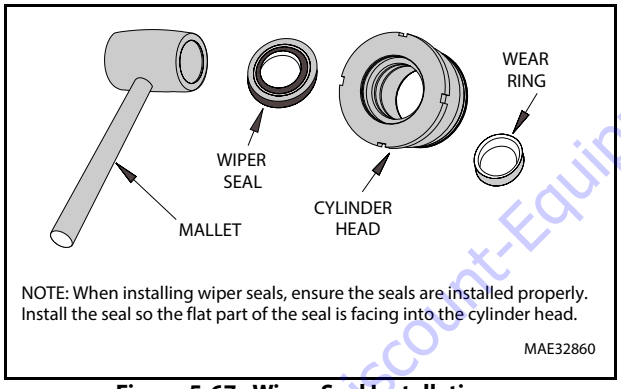


Figure 5-67. Wiper Seal Installation

3. Install wear ring (7), wiper seals (4), retainer ring (10), backup ring (6) and rod seal (5) in inside groves of cylinder head (3).

4. Install o-ring (8), backup ring (9) and o-ring (11) in outside groves of cylinder head (3).

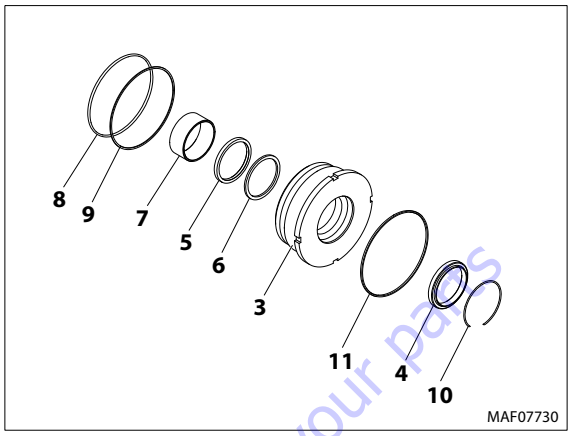


Figure 5-68. Cylinder Head Assembly

5. Carefully install the cylinder head (3) on the rod (2), ensuring that the wiper seal (4), wear ring (7), backup rings (6), rod seal (5) and backup rings (9) are not damaged or dislodged. Push the head (3) along the rod (2) to the rod end, as applicable.

6. Using suitable protection, clamp the cylinder rod (2) in a vise or similar holding fixture as close to piston as possible.

7. Place new o-ring (14) in the inside diameter of the piston (12).

8. Carefully thread the piston (12) on the cylinder rod (2), ensuring that the o-ring (14) and seal (13) are not damaged or dislodged.
Torque piston (12) to 1032 ft-lb (1400 Nm).

9. Install the setscrew (15) and ball (16) on the piston and attach the piston on the rod.
Torque setscrew (15) to 15 ft-lb (20 Nm).

10. Remove the cylinder rod (2) from the holding fixture.

11. Place new piston seal (13) in the outer diameter of piston (12) groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

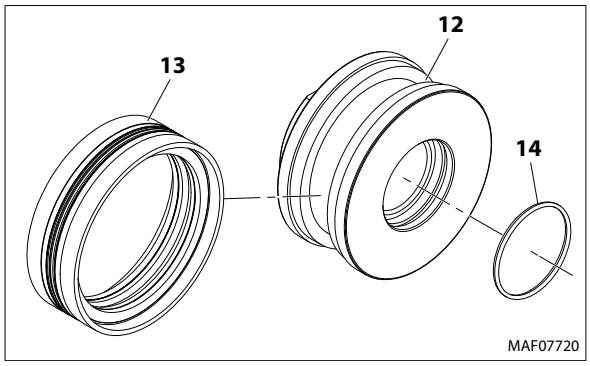


Figure 5-69. Piston Seal Installation

12. Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

13. With barrel clamped secured and adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading o-ring and piston seal is not damaged or dislodged.

14. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.

15. Screw the cylinder head into the barrel using a hook spanner wrench.

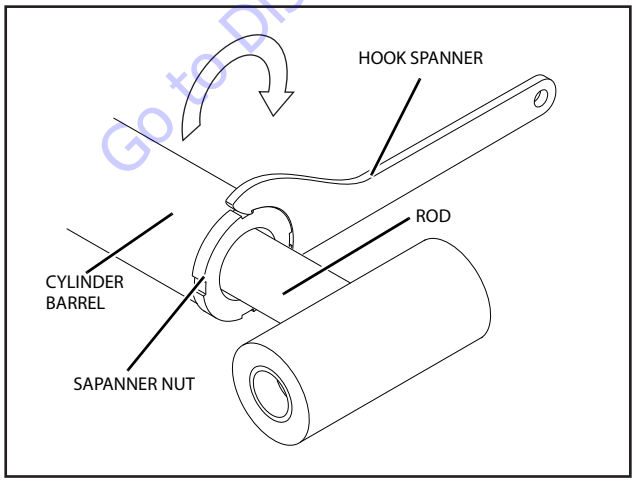


Figure 5-70. Cylinder Head Tightening

16. Caulk at the machined area of the cylinder barrel end so that it locks the cylinder head in place and it does not unscrew from the barrel.

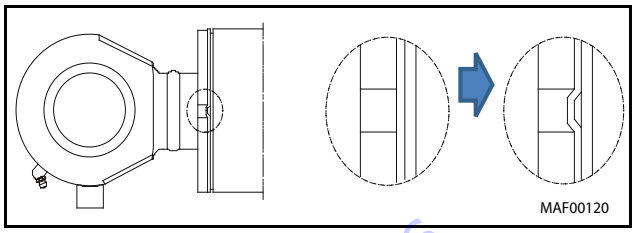


Figure 5-71. Caulking

17. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any plugs.

18. Install the plugs (19) in the cylinder ports.

19. Install two counterbalance valves (3) with new O-rings in valve block. Torque to 50-55 ft-lb (67-75 Nm).

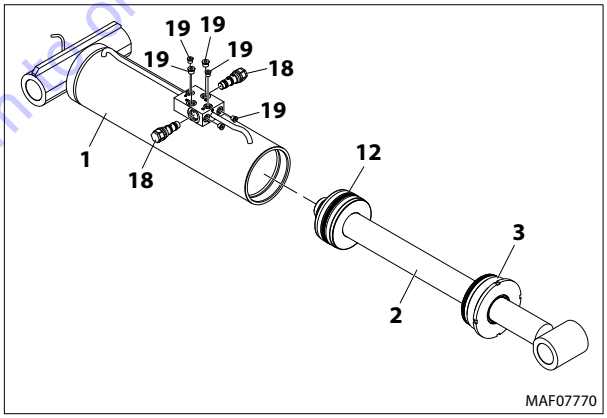


Figure 5-72. Rod Assembly Installation

Platform Level Cylinder (Prior to SN 0300239170)

Refer to Figure 5-76.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.
2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.
3. Place cylinder barrel in a suitable holding fixture.

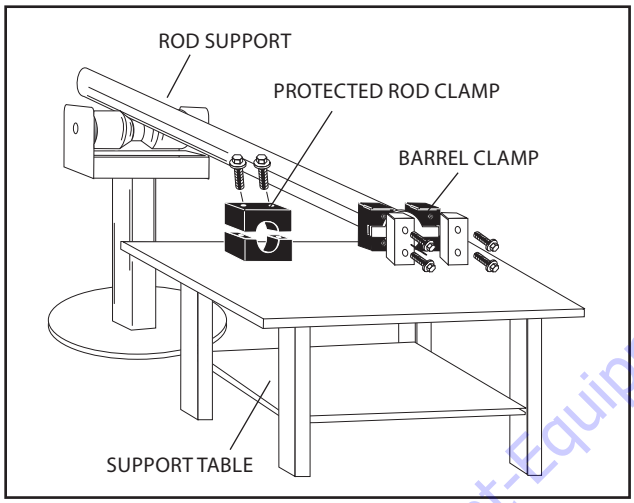


Figure 5-73. Cylinder Barrel Support

4. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
5. If necessary, remove eight capscrews (8) and retainer cap (7). Remove O-Ring plug (12) and setscrew (11). Remove cylinder length sensor assembly (6) from barrel (3).

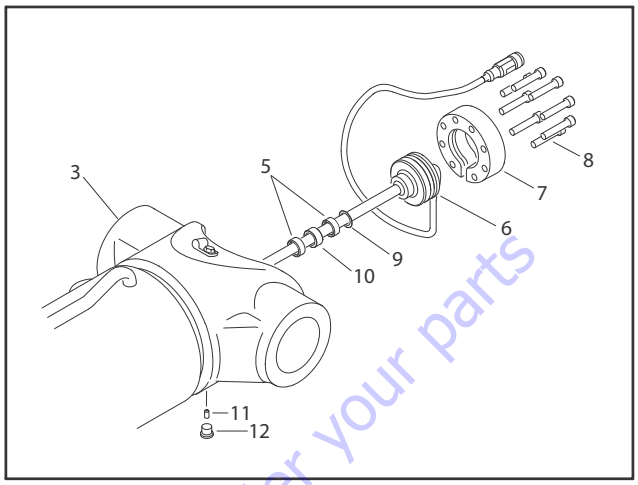


Figure 5-74. Cylinder Length Sensor Removal

6. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.
7. Mark cylinder head and barrel with a center punch for realignment.
8. Remove setscrew (1) from barrel (3). Unscrew cylinder head with pin-face spanner wrench.

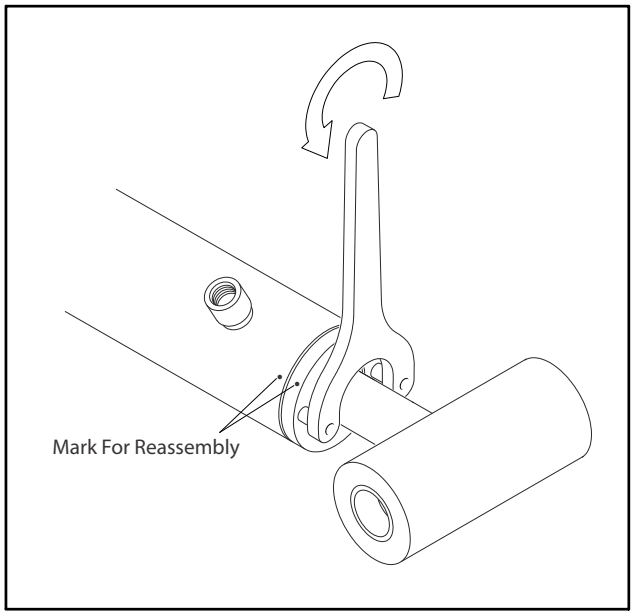
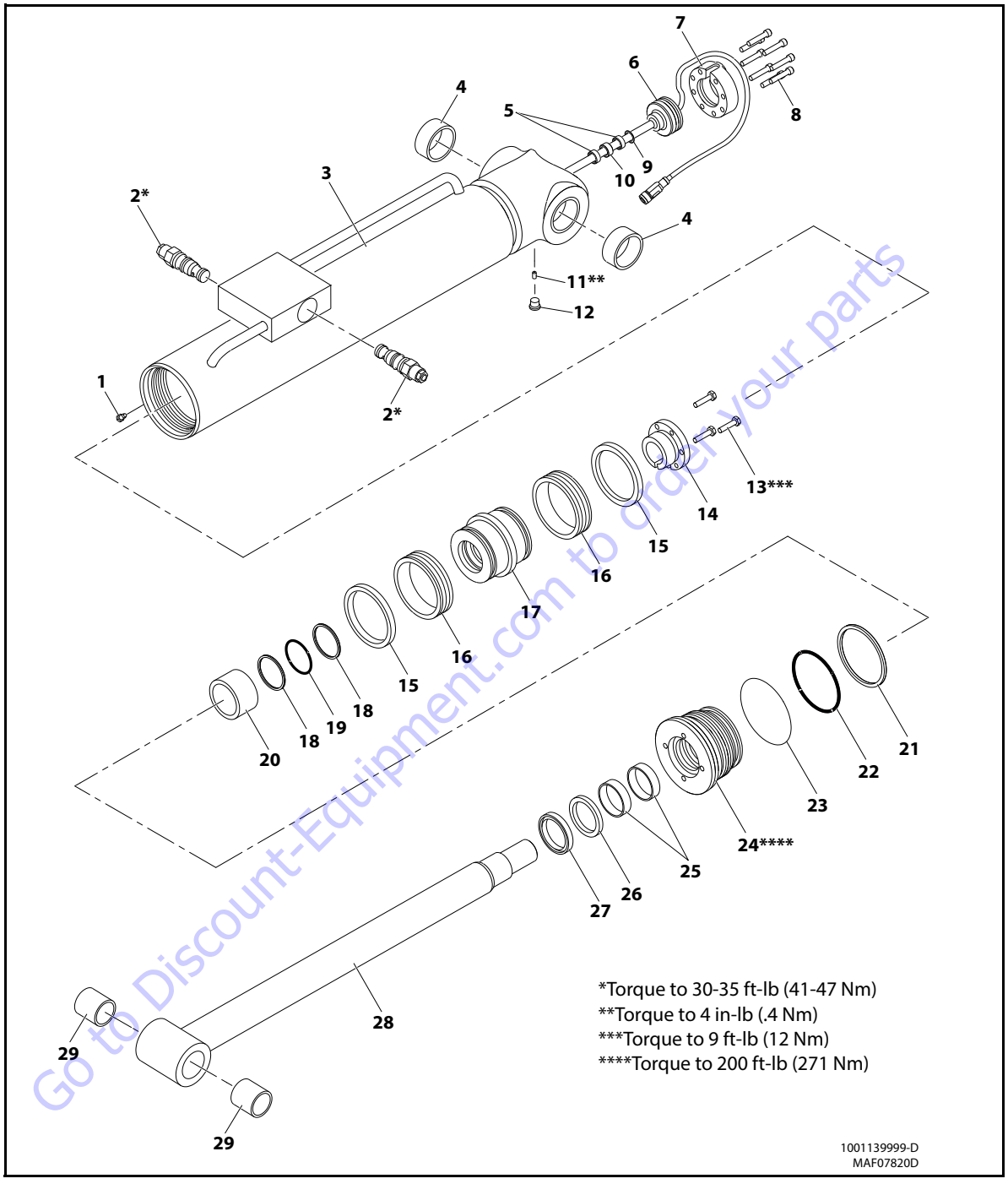


Figure 5-75. Cylinder Head Removal



1.	Screw	6.	Length Sensor	11.	Setscrew	16.	Seal	21.	Backup Ring	26.	Seal
2.	Counterbalance Valve	7.	Retainer Cap	12.	Plug	17.	Piston	22.	O-Ring	27.	Rod Wiper
3.	Barrel	8.	Capscrew	13.	Capscrew	18.	Backup Ring	23.	O-Ring	28.	Rod
4.	Bushing	9.	Retaining Ring	14.	Tapered Bushing	19.	O-Ring	24.	Head	29.	Bushing
5.	Spacer Sleeve	10.	Sensor Magnet	15.	Lock Ring	20.	Spacer	25.	Wear Ring		

Figure 5-76. Platform Level Cylinder Assembly (Prior to SN 0300239170)

NOTICE

OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

9. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.

10. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

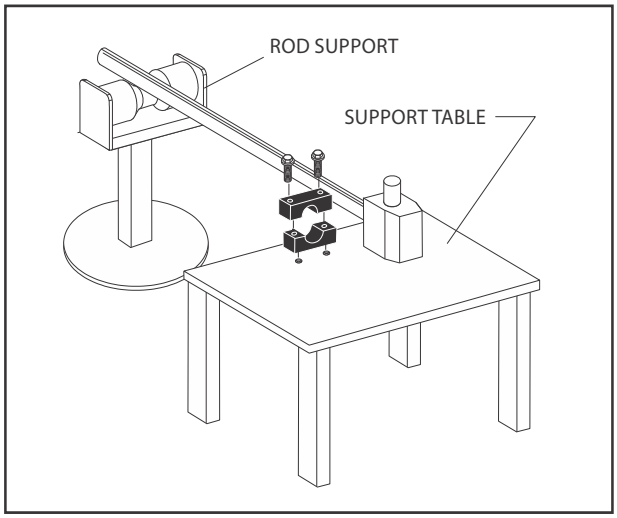


Figure 5-77. Cylinder Rod Support

11. Loosen and remove bolts from tapered bushing and piston.

12. Insert bolts in threaded holes in outer piece of tapered bushing. Progressively tighten bolts until bushing is loose. Remove tapered bushing from piston.

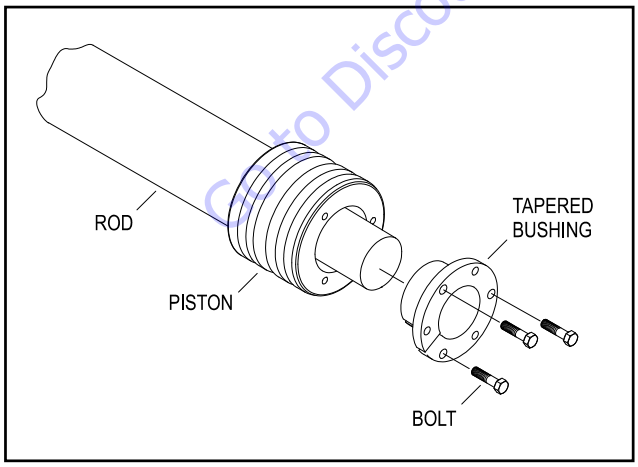


Figure 5-78. Tapered Bushing Removal

13. Screw piston counter-clockwise by hand and remove from cylinder rod.

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

14. Remove and discard two lock rings (15), seals (16), backup ring (18), O-ring (19), and backup ring (18) from piston (17).

15. Remove piston spacer (20) from rod.

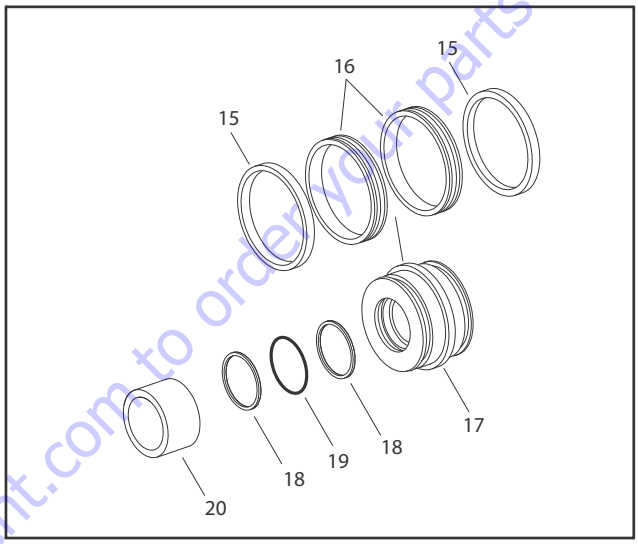


Figure 5-79. Piston Disassembly

16. Remove rod from holding fixture. Remove cylinder head (24).

17. Remove and discard backup ring (21), O-ring (22), O-ring (23), rod wiper (27), seal (26), and two wear rings (25), from cylinder head (24).

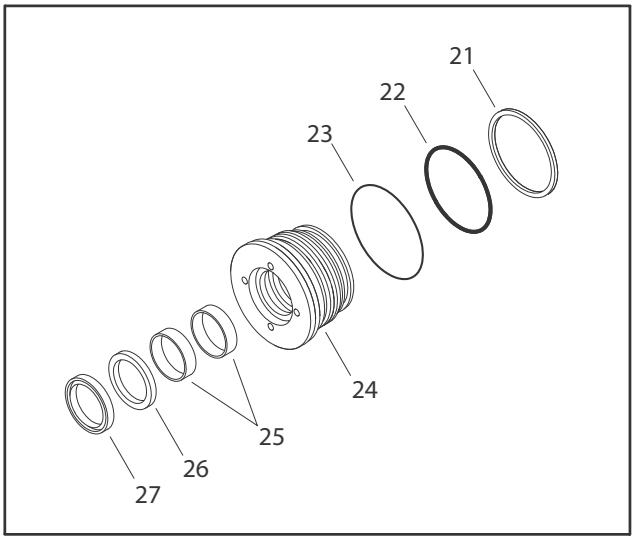


Figure 5-80. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect cylinder length sensor components for damage. Replace as needed.
14. Inspect rod and barrel bearings for signs of excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of steel bushing with WD40 before installing bushings.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing into barrel or rod bushing with correct size arbor.

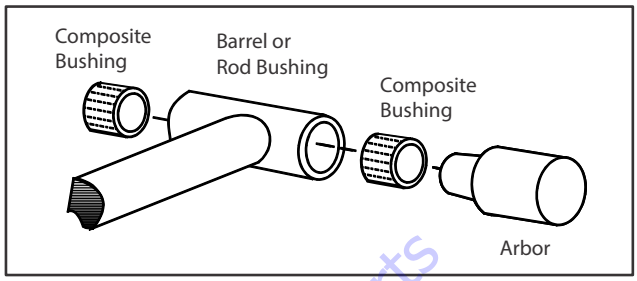


Figure 5-81. Composite Bushing Installation

15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install O-ring (23), O-ring (22), and backup ring (21) in outside diameter grooves of cylinder head (24).
2. Install two wear rings (25) seal (26), and rod wiper (27), in cylinder head as shown.

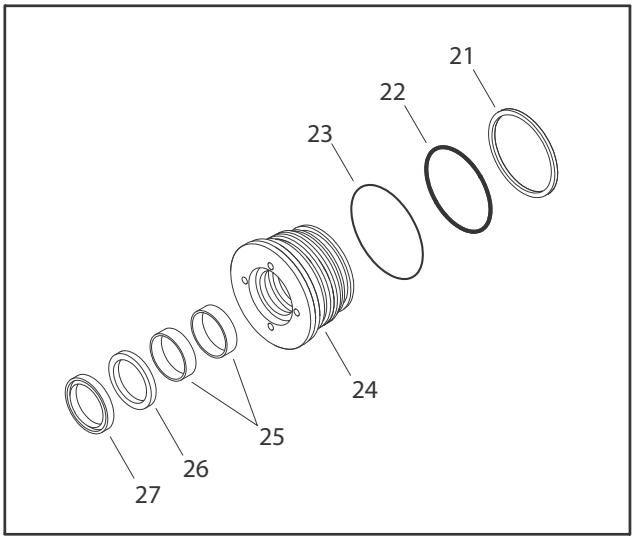


Figure 5-82. Cylinder Head Seal Kit Installation

3. Install cylinder head assembly on rod. Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.
4. Install piston spacer (20) on rod.
5. Install backup ring (18), O-ring (19) and backup ring (18) in inner diameter grooves of piston (17). Install two seals (16) and lock rings (15) in outer grooves of piston.

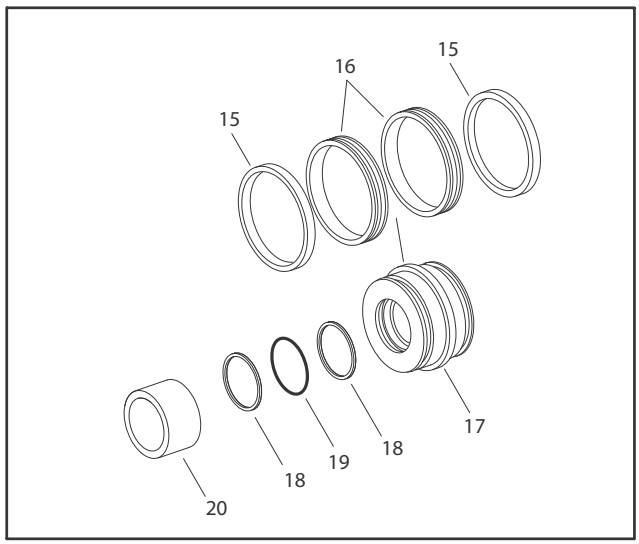


Figure 5-83. Piston Seal Kit Installation

6. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
7. Thread piston on cylinder rod hand tight. Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

8. Thread piston on rod until it aligns with spacer end and install tapered bushing.
9. Apply JLG Threadlocker (P/N 0100011) or equivalent to tapered bushing capscrews and assemble the tapered bushing loosely into the piston. Insert capscrews through the drilled holes in the bushing and into the tapped holes in the piston.

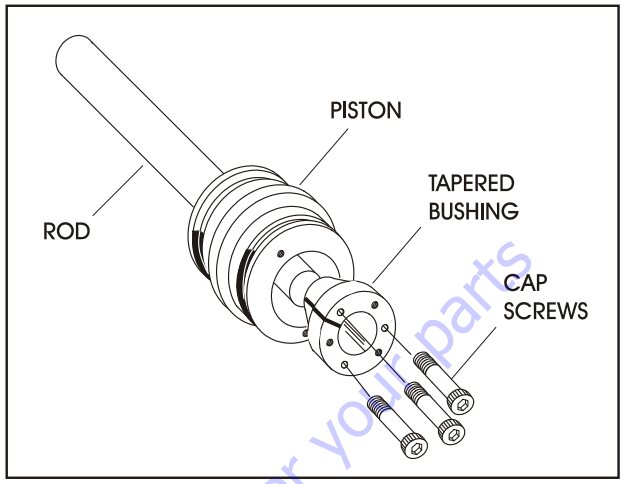


Figure 5-84. Tapered Bushing Installation

10. Tighten the capscrews evenly and progressively in rotation to 9 ft.lbs. (12 Nm).
11. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;
    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.
    b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

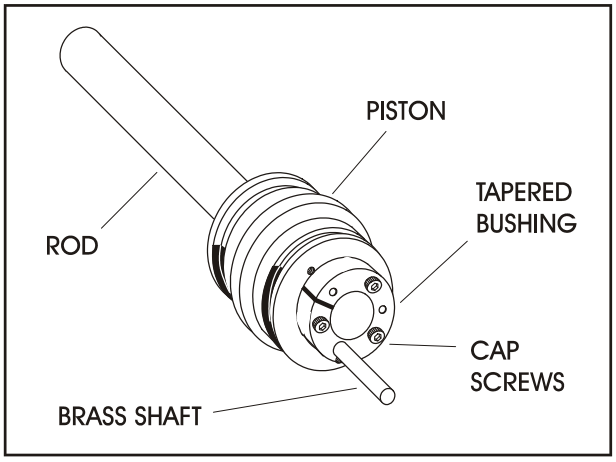


Figure 5-85. Seating the Tapered Bearing

12. Retorque the capscrews evenly and progressively in rotation to 9 ft.lbs. (12 Nm).
13. Install two counterbalance valves (2) with new O-rings in valve block. Torque to 30-35 ft-lb (41-47 Nm).

14. If removed, install the cylinder length sensor. See Section 5.4, Cylinder Length Sensor.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

15. Clamp barrel securely and support rod.

NOTE: *Apply locking primer and JLG Threadlocker* **01** *(P/N 0100011) to cylinder head threads.*

16. Insert piston end into barrel cylinder. Do not damage or dislodge piston loading O-ring and seal ring.

17. Continue pushing rod into barrel until cylinder head gland can be inserted into barrel cylinder.

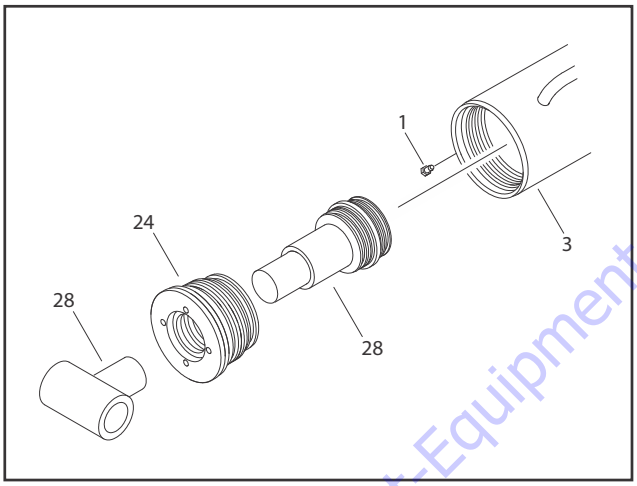


Figure 5-86. Rod and Cylinder Head Installation

18. Tighten cylinder head with pin spanner wrench. Torque to 200 ft-lb (271 Nm).

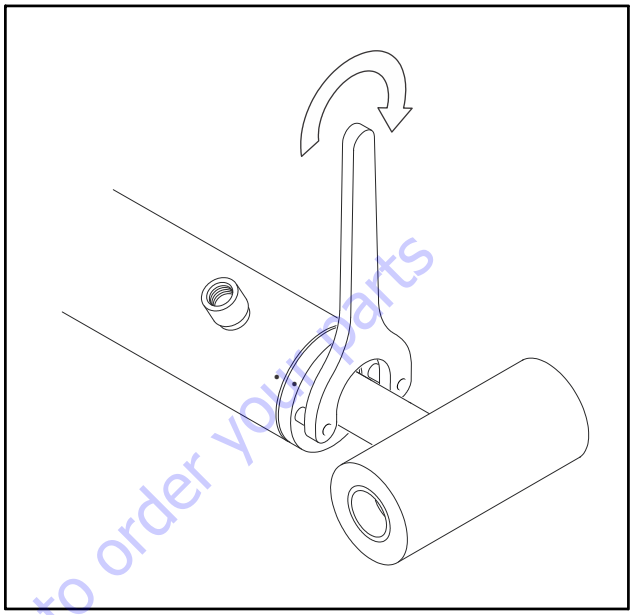


Figure 5-87. Cylinder Head Tightening

19. Secure cylinder head (24) with setscrew (1).

Platform Level Cylinder (SN 0300239170 to Present)

Refer to Figure 5-91.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.
2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.
3. Place cylinder barrel in a suitable holding fixture.

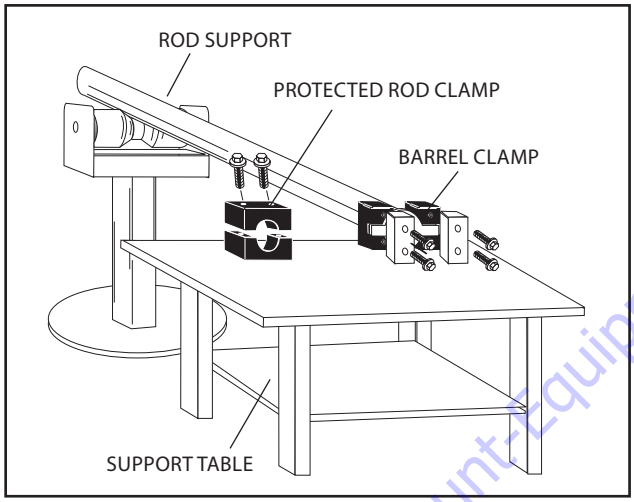


Figure 5-88. Cylinder Barrel Support

4. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
5. If necessary, remove eight capscrews (8) and retainer cap (7). Remove O-Ring plug (12). Remove cylinder length sensor assembly (6) from barrel (3).

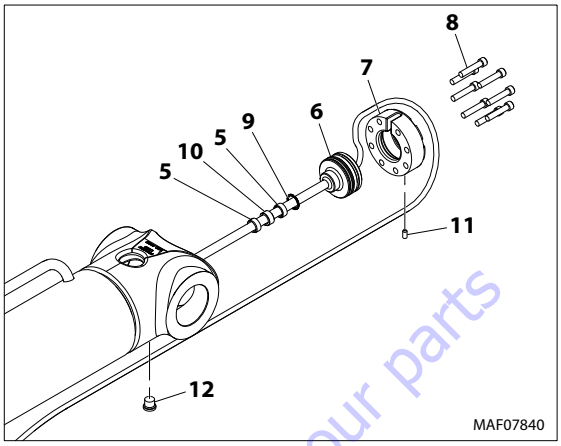


Figure 5-89. Cylinder Length Sensor Removal

6. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.
7. Mark cylinder head and barrel with center punch marks for later realignment. Unscrew cylinder head with hook spanner wrench.

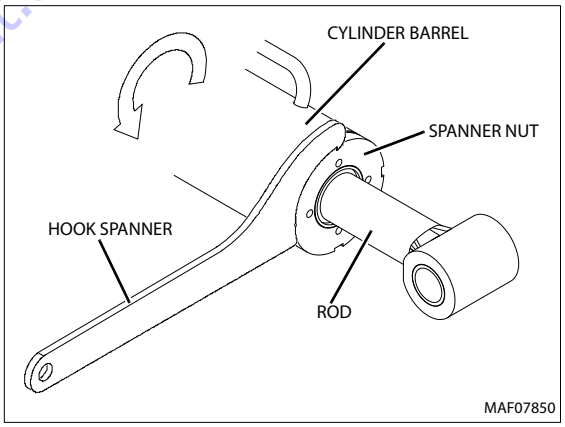
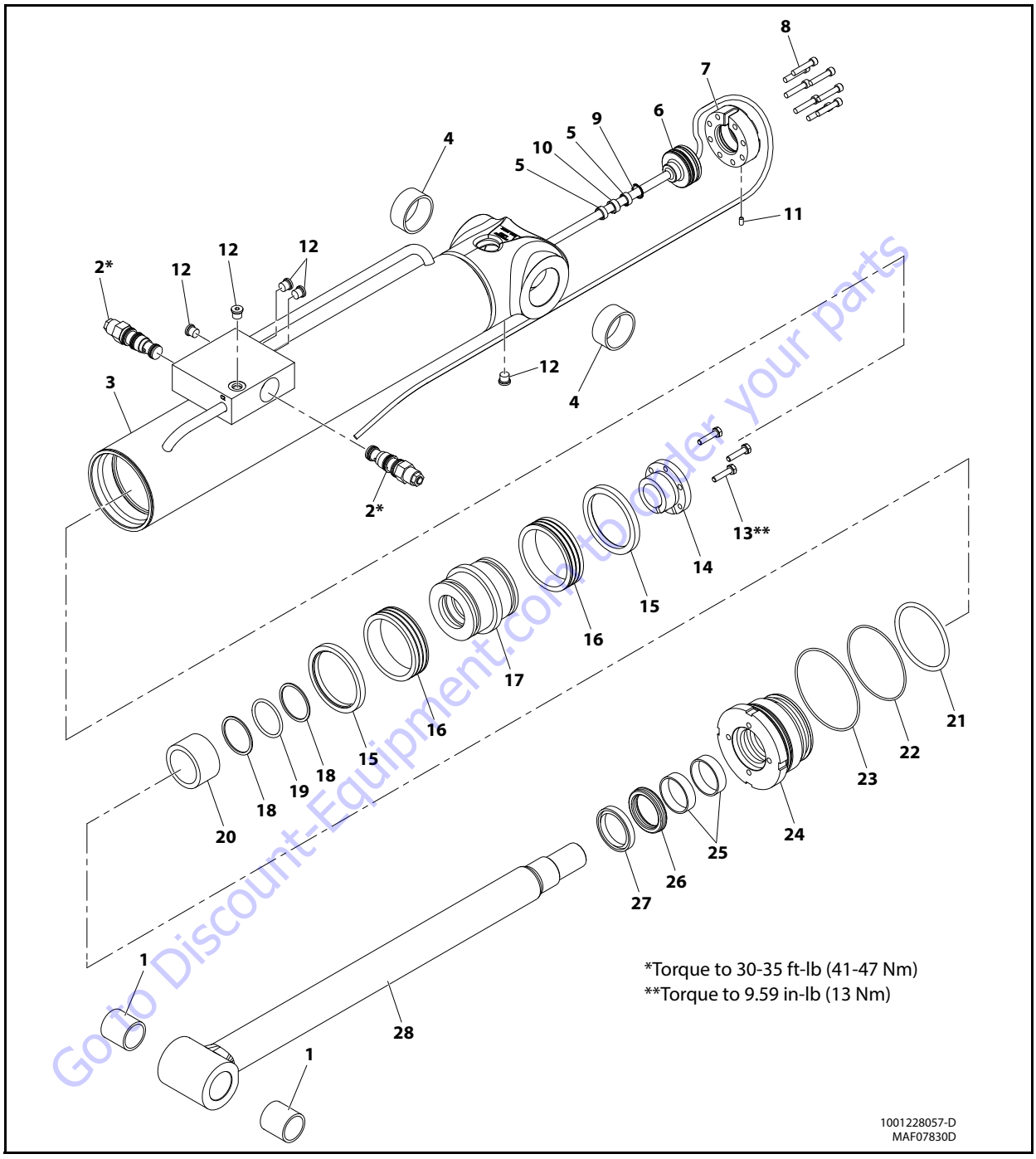


Figure 5-90. Cylinder Head Installation



1. Bushing
2. Counterbalance Valve
3. Barrel
4. Bushing
5. Spacer Sleeve
6. Length Sensor
7. Retainer Cap
8. Capscrew
9. Retaining Ring
10. Sensor Magnet
11. Setscrew
12. Plug
13. Capscrew
14. Tapered Bushing
15. Guidelock Ring
16. Lock Ring
17. Piston
18. Backup Ring
19. O-Ring
20. Spacer
21. Backup Ring
22. O-Ring
23. O-Ring
24. Head
25. Wear Ring
26. Seal
27. Rod Wiper
28. Rod

Figure 5-91. Platform Level Cylinder Assembly (SN 0300239170 to Present)

NOTICE

OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

8. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.

9. Protect cylinder rod (28) from damage and clamp in a vise or holding fixture as close to piston (17) as possible.

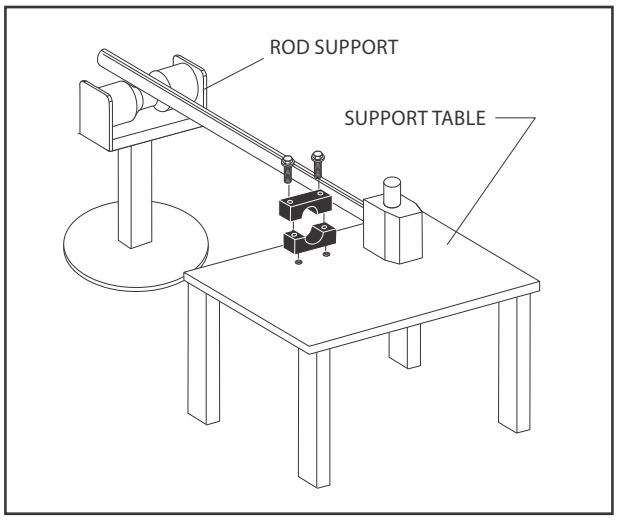


Figure 5-92. Cylinder Rod Support

10. Loosen and remove Capscrews (13) from tapered bushing (14) and piston (17).

11. Insert capscrews (13) in threaded holes in outer piece of tapered bushing (14). Progressively tighten capscrews (13) until tapered bushing (14) is loose. Remove tapered bushing (14) from piston (17).

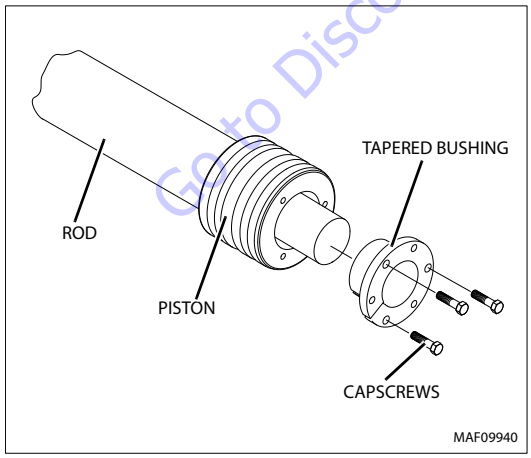


Figure 5-93. Tapered Bushing Removal

12. Screw piston (17) counter-clockwise by hand and remove from cylinder rod (28).

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

13. Remove and discard two guidelock ring (15), lock rings (16), backup rings (18), O-ring (19) from piston (17).

14. Remove piston spacer (20) from cylinder rod (28).

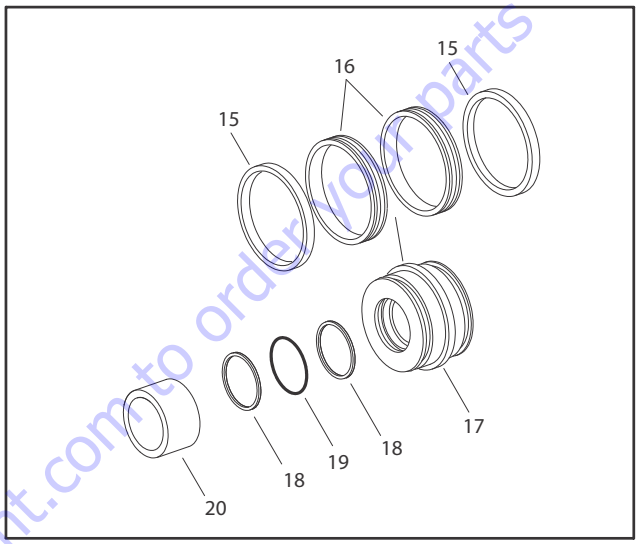


Figure 5-94. Piston Disassembly

15. Remove cylinder rod (28) from holding fixture. Remove cylinder head (24).

16. Remove and discard backup ring (21), O-ring (22), O-ring (23), rod wiper (27), seal (26), and two wear rings (25), from cylinder head (24).

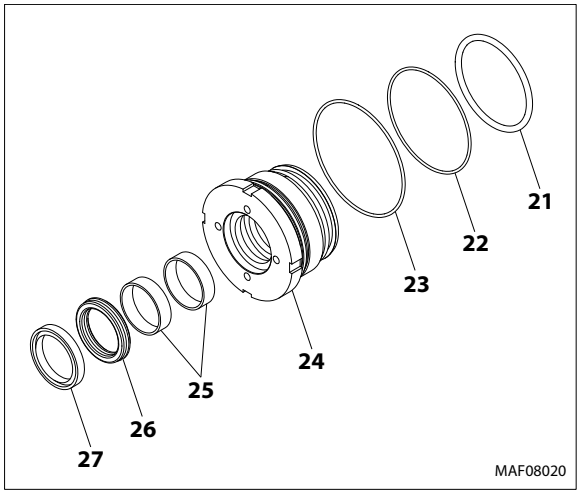


Figure 5-95. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect cylinder length sensor components for damage. Replace as needed.
14. Inspect rod and barrel bearings for signs of excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of steel bushing with WD40 before installing bushings.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing into barrel or rod bushing with correct size arbor.

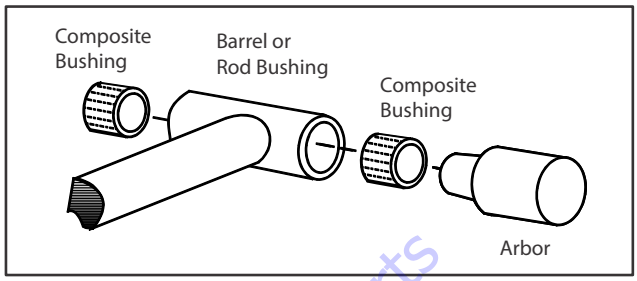


Figure 5-96. Composite Bushing Installation

15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install O-ring (23), O-ring (22), and backup ring (21) in outside diameter grooves of cylinder head (24).
2. Install two wear rings (25), seal (26), and rod wiper (27), into cylinder head (24).

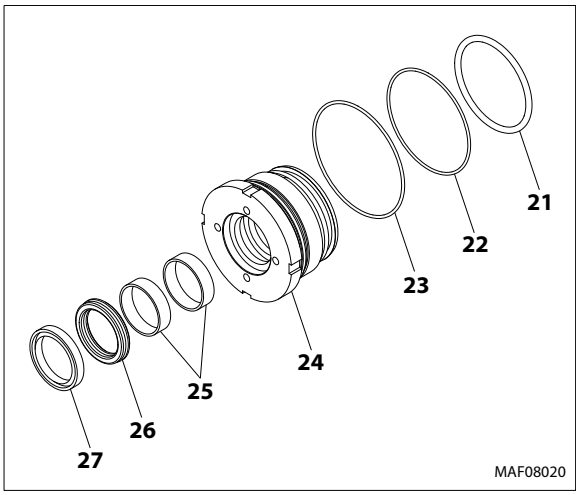


Figure 5-97. Cylinder Head Seal Kit Installation

3. Install cylinder head assembly on rod. Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.
4. Install piston spacer (20) on cylinder rod (28).
5. Install backup rings (18), O-ring (19) in inner diameter grooves of piston (17). Install two guidelock rings (15), lock rings (16) in outer grooves of piston (17).

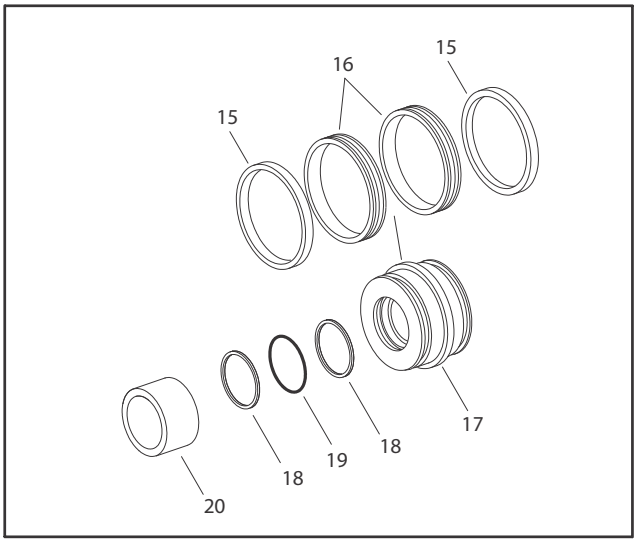


Figure 5-98. Piston Seal Kit Installation

6. Using suitable protection, clamp cylinder rod (28) in a vise or similar holding fixture as close to piston (17) as possible.
7. Thread piston (17) on cylinder rod (28) hand tight. Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

8. Thread piston (17) on cylinder rod (28) until it aligns with spacer (20) end and install tapered bushing (14).
9. Apply JLG Threadlocker (P/N 0100011) or equivalent to tapered bushing capscrews (13) and assemble the tapered bushing (14) loosely into the piston (17. Insert capscrews (13) through the drilled holes in the tapered bushing (14) and into the tapped holes in the piston (17). Insert capscrews (13) through the drilled holes in the tapered bushing (14) and into the tapped holes in the piston (17).

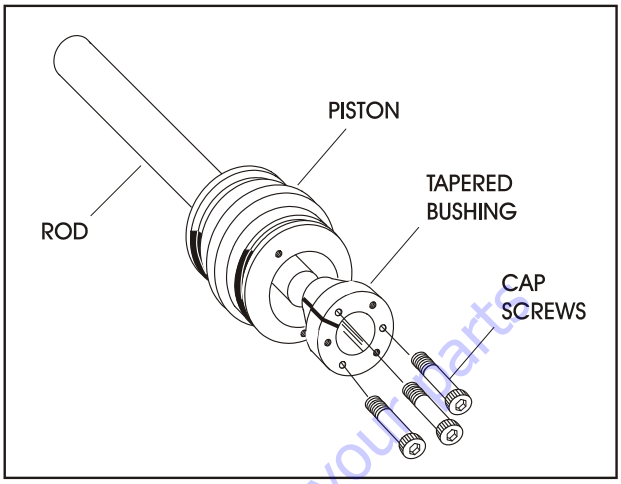


Figure 5-99. Tapered Bushing Installation

10. Tighten the capscrews (13) evenly and progressively in rotation to 9.59 ft. lbs. (13 Nm).
11. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;
    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.
    b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

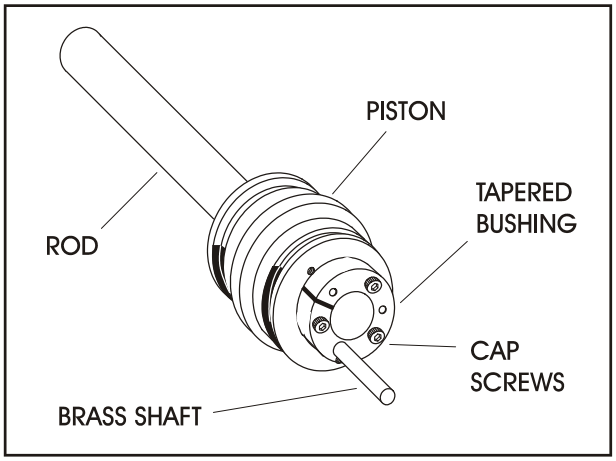


Figure 5-100. Seating the Tapered Bearing

12. Retorque the capscrews evenly and progressively in rotation to 9.59 ft. lbs. (13 Nm).
13. Install two counterbalance valves (2) with new O-rings in valve block. Torque to 30-35 ft-lb (41-47 Nm).
14. If removed, install the cylinder length sensor. See Section 5.4, Cylinder Length Sensor.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

15. Clamp barrel (3) securely and support cylinder rod (28).

NOTE: *Apply locking primer and JLG Threadlocker* **01** *(P/N 0100011) to cylinder head threads.*

16. Insert piston (17) end into cylinder barrel (3). Do not damage or dislodge piston loading O-ring and seal ring.

17. Continue pushing cylinder rod (28) into cylinder barrel (3) until cylinder head (24) gland can be inserted into cylinder barrel (3).

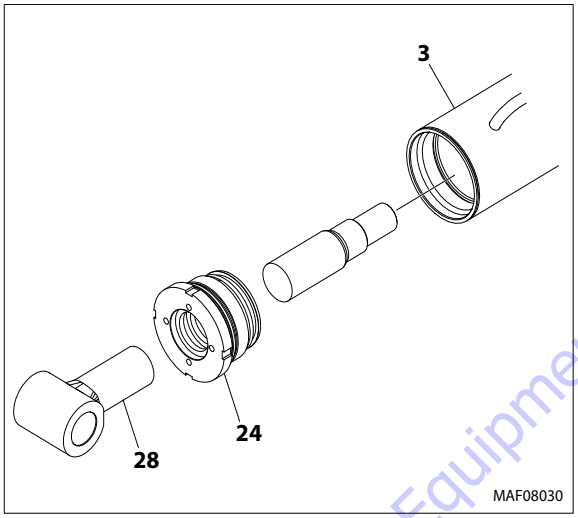


Figure 5-101. Rod and Cylinder Head Installation

18. Tighten cylinder head with hook spanner wrench. Torque cylinder head to 180-220 ft. lbs. (244-298 Nm).

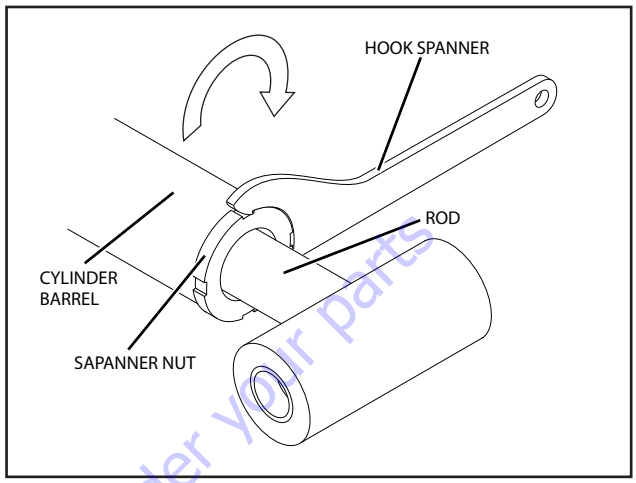


Figure 5-102. Cylinder Head Tightening

19. Install the plugs (12) in the cylinder ports.

Boom Lift Cylinder (Prior to SN 0300239676)

Refer to Figure 5-106.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.
3. If applicable, remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

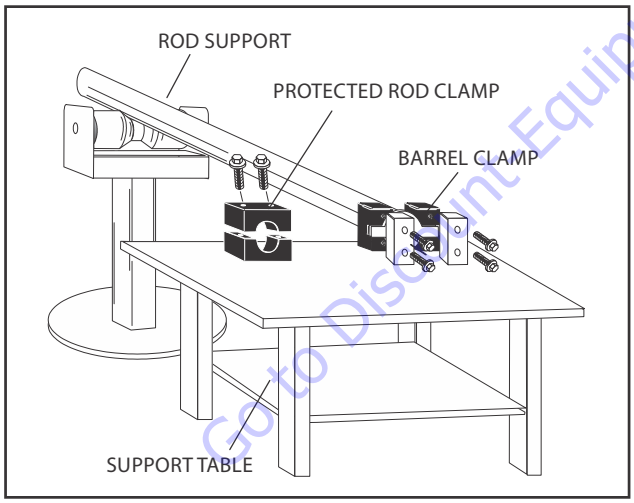


Figure 5-103. Cylinder Barrel Support

5. Mark cylinder head and barrel with center punch marks for later realignment. Remove cylinder head cap screws.

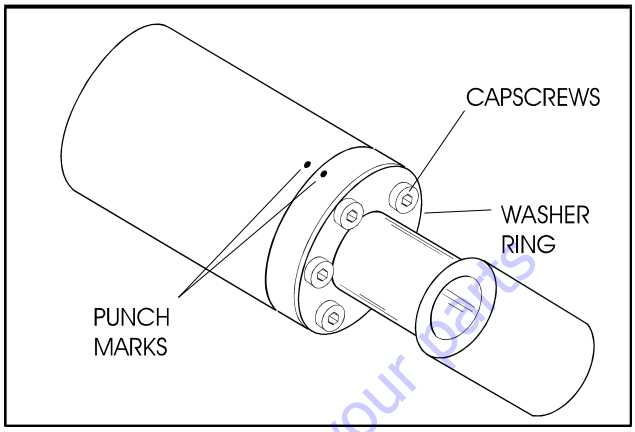


Figure 5-104. Capscrew Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

6. Clamp barrel securely. Unscrew cylinder head and pull rod assembly from barrel.
7. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

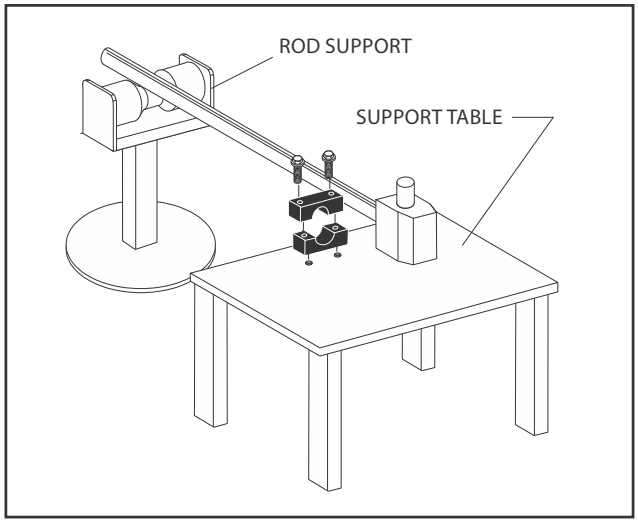
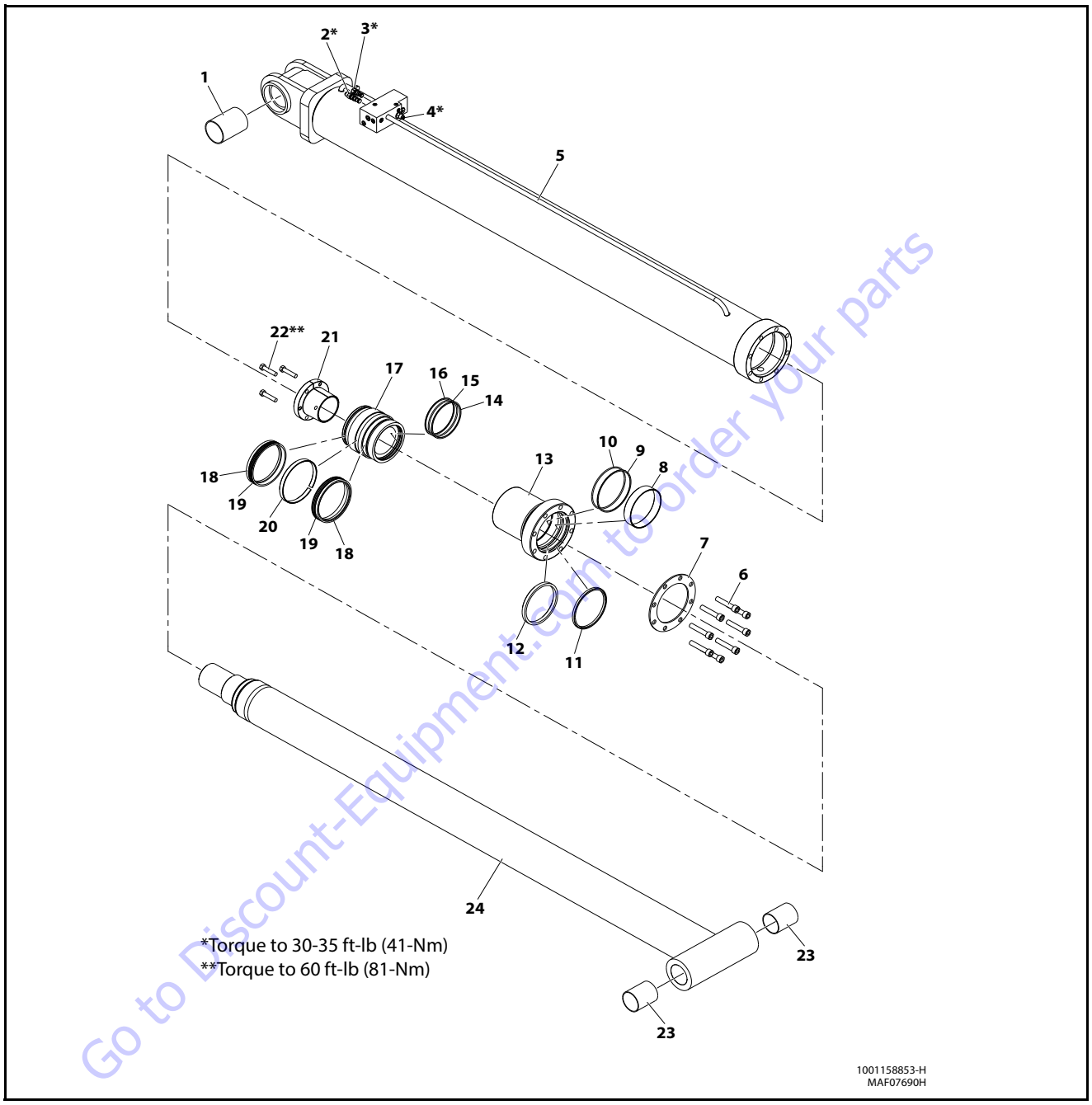


Figure 5-105. Cylinder Rod Support



1. Bearing
2. Counterbalance Valve
3. Counterbalance Valve
4. Counterbalance Valve
5. Barrel
6. Capscrew
7. Washer Ring
8. Wear Ring
9. Backup Ring
10. O-Ring
11. Wiper Seal
12. Rod Seal
13. Head
14. Backup Ring
15. O-Ring
16. Backup Ring
17. Piston
18. Lock Ring
19. Seal
20. Wear Ring
21. Bushing
22. Bolt
23. Bushing
24. Rod

Figure 5-106. Boom Lift Cylinder Assembly (Prior to SN 0300239676)

8. Remove three bolts attaching tapered bushing to piston.

9. Insert bolts in threaded holes in outer piece of Tapered Bushing. Alternately tighten bolts until bushing is loose on piston. Remove tapered bushing from piston.

10. Screw the piston counterclockwise by hand and remove piston from cylinder rod.

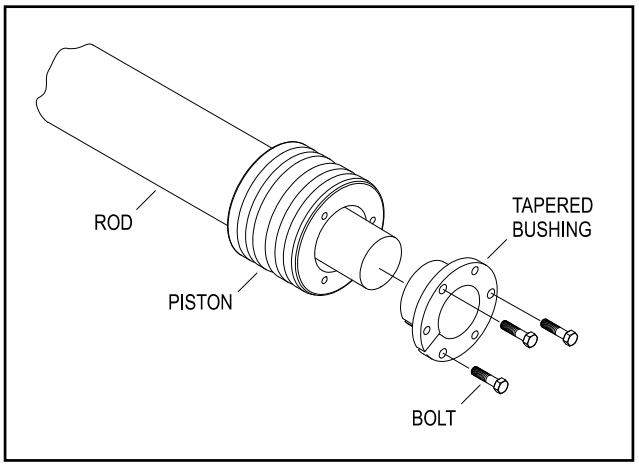


Figure 5-107. Tapered Bushing Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

11. Remove and discard backup ring (14), O-ring (15), and backup ring (16) from inside of piston (17). Remove and discard two lock rings (18), seals (19), and wear ring (20) from outside of piston.

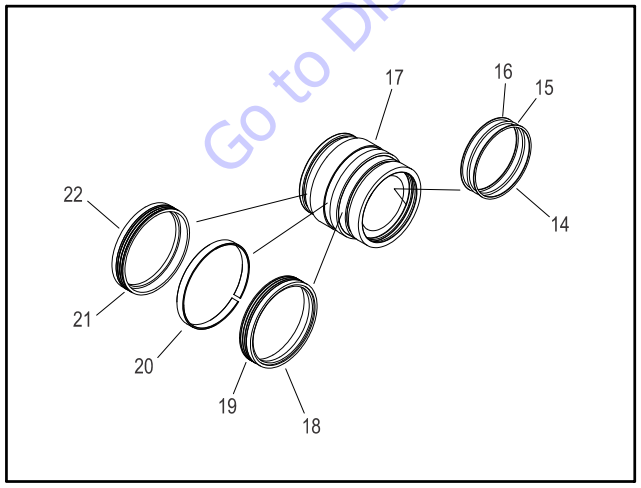


Figure 5-108. Piston Disassembly

12. Remove rod from holding fixture. Remove cylinder head (13) and washer ring (7) from rod.

13. Remove and discard wiper seal (11), rod seal (12), wear ring (8), back-up ring (9), and O-ring (10).

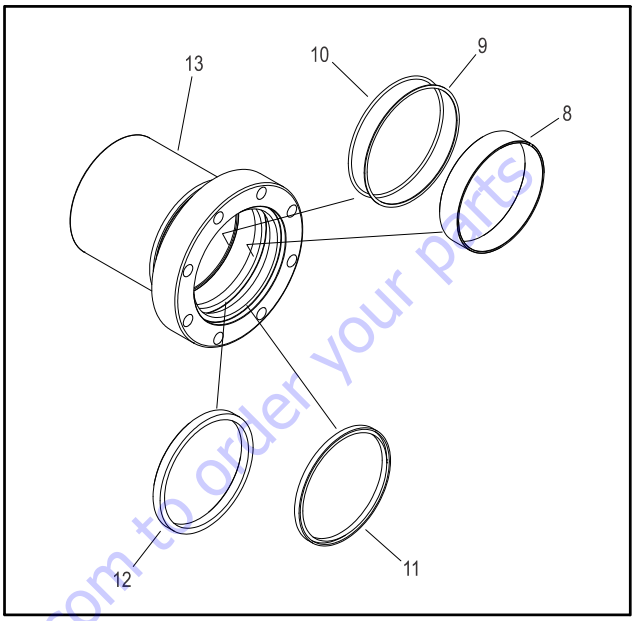


Figure 5-109. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.

2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.

3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.

4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.

5. Inspect threaded portion of barrel for damage. Dress threads as necessary.

6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.

7. Inspect threaded portion of piston for damage. Dress threads as necessary.

8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.

9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.

10. Inspect threaded portion of head for damage. Dress threads as necessary.

11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.

13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.

a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.

b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.

c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

d. Press bushing into barrel or rod bushing with correct size arbor.

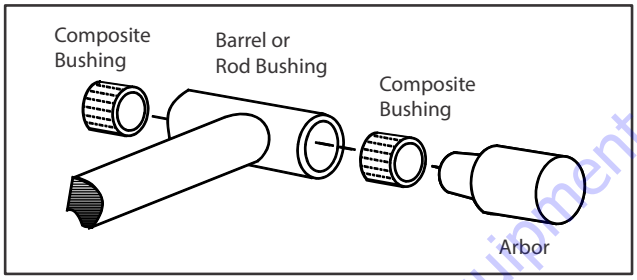


Figure 5-110. Bushing Installation

14. Inspect port block fittings and holding valves. Replace as necessary.

15. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install O-ring (10), backup ring (9), wear ring (8), rod seal (12), and wiper seal (11) in cylinder head (13).

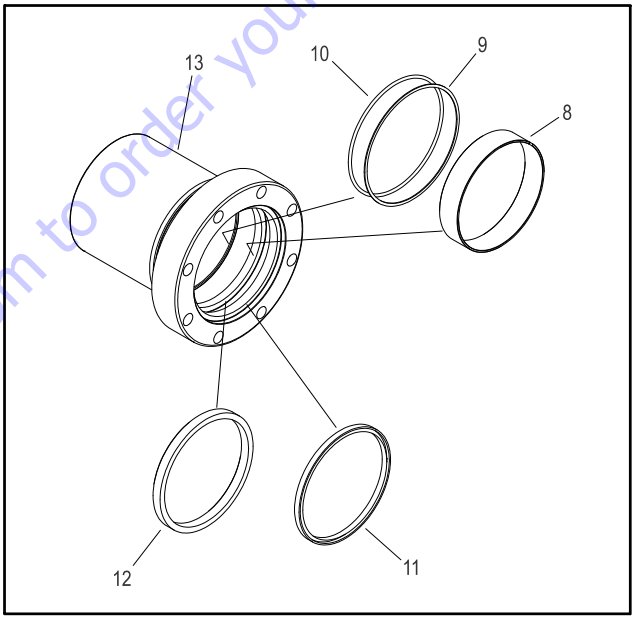


Figure 5-111. Cylinder Head Assembly

2. Slide washer ring (7) and cylinder head Assembly (13) on rod (26).

3. Install backup ring (16), O-ring (15), and backup ring (14) to inside groves of piston (17).

4. Install wear ring (20), two seals ring (19), and lock rings (18) to outside grooves of piston (17).

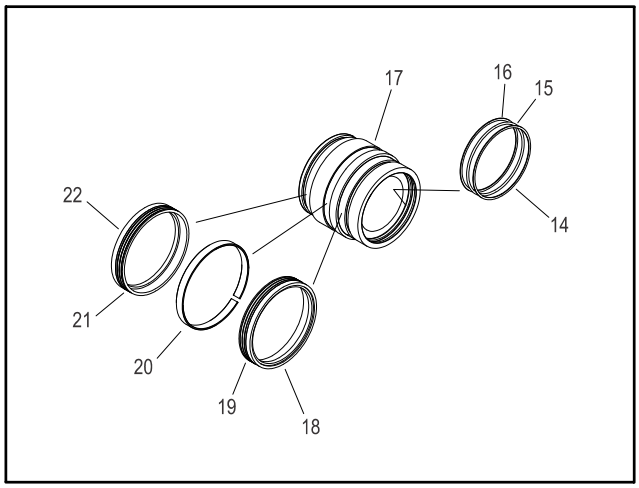


Figure 5-112. Piston Assembly

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

5. Install piston assembly (17) and tapered bushing (23) on rod (26).

NOTE: *When installing the tapered bushing, piston and mating end of rod must be free of oil.*

6. Apply JLG Threadlocker (P/N 0100011) to tapered bushing capscrews. Assemble the tapered bushing loosely into the piston and insert capscrews through the drilled holes in the bushing and into the tapped holes in the piston.

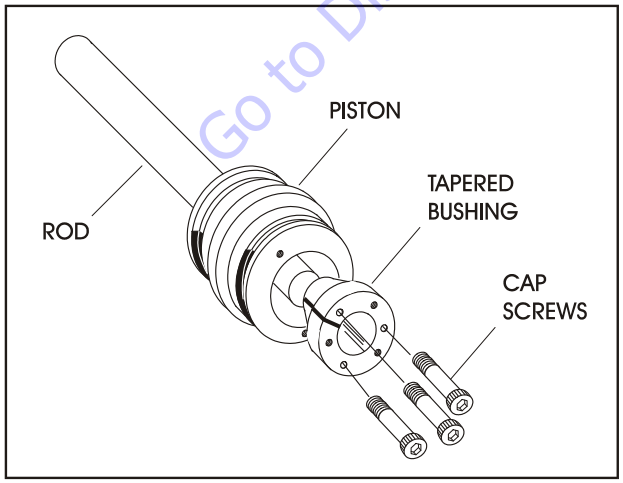


Figure 5-113. Tapered Bushing Installation

7. Tighten the capscrews evenly and progressively in rotation to 60 ft-lb (81 Nm).

8. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

   a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

   b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

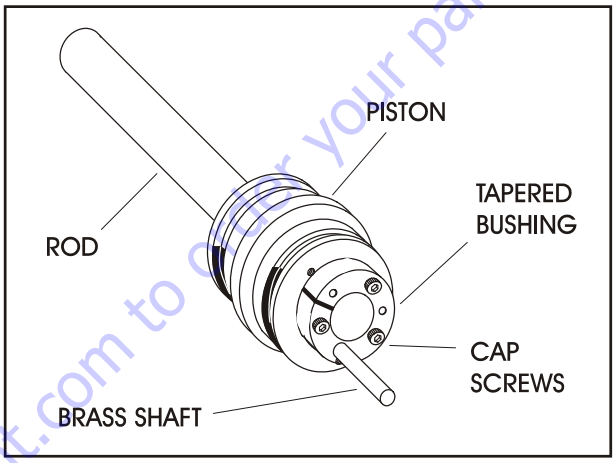


Figure 5-114. Seating the Tapered Bearing

9. Re-torque the capscrews evenly and progressively in rotation to 60 ft-lb (81 Nm).

10. Remove cylinder rod from holding fixture.

11. Position cylinder barrel in a suitable holding fixture.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

12. Clamp barrel (5) securely and support rod (24). Insert piston (17) end in barrel. Do not damage or dislodge piston O-rings or seal rings.

13. Continue pushing rod in barrel until cylinder head (13) can be inserted in barrel.

14. Install cylinder head until tight and marks made during disassembly are aligned.

15. Apply primer and medium-strength locking compound JLG P/N 0100011or equivalent to eight capscrews (6). Secure cylinder head assembly (13) and washer ring (7) to barrel (5)with capscrews.

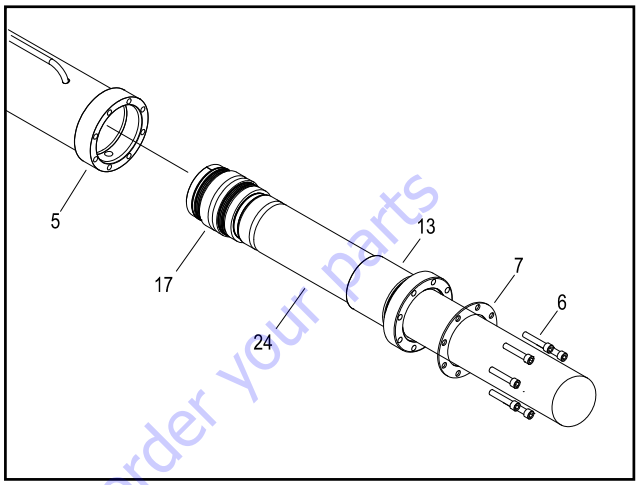


Figure 5-115. Rod Assembly Installation

Boom Lift Cylinder (SN 0300239676 to Present)

Refer to Figure 5-119.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.
3. If applicable, remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
4. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

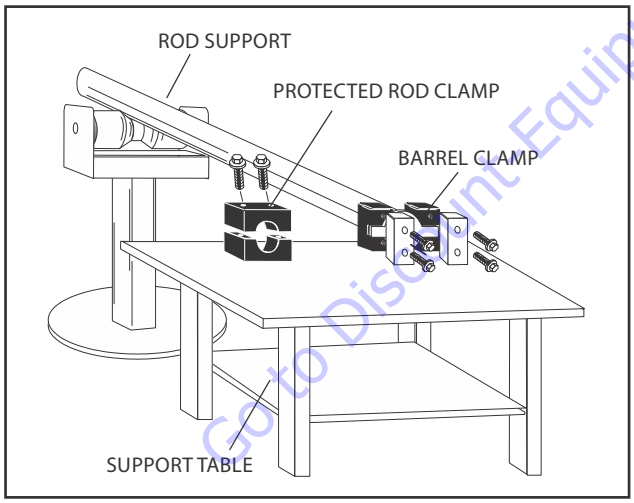


Figure 5-116. Cylinder Barrel Support

5. Mark cylinder head and barrel with center punch marks for later realignment. Remove cylinder head cap screws.

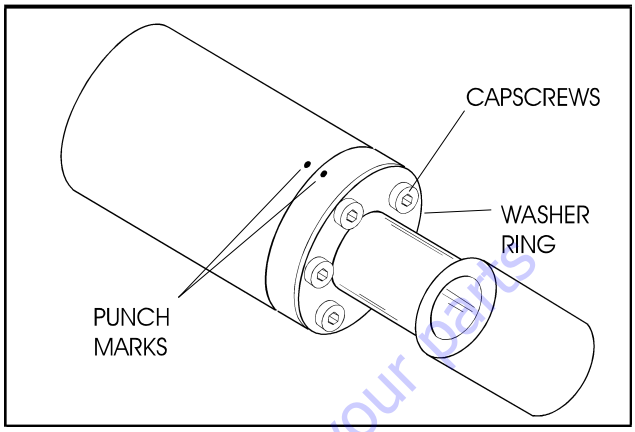


Figure 5-117. Capscrew Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

6. Clamp barrel securely. Unscrew cylinder head and pull rod assembly from barrel.
7. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

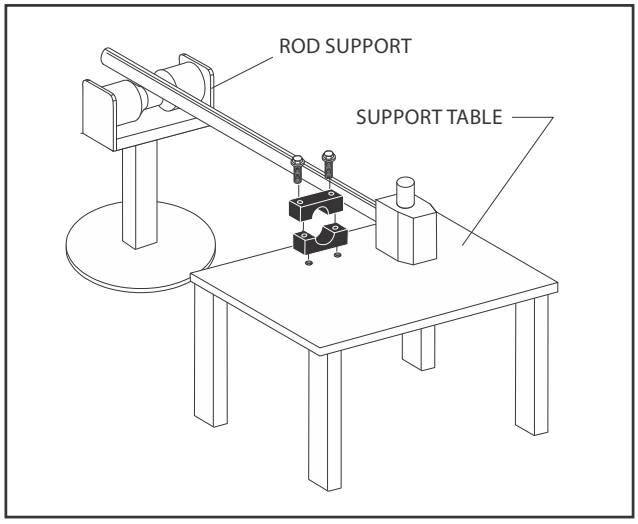
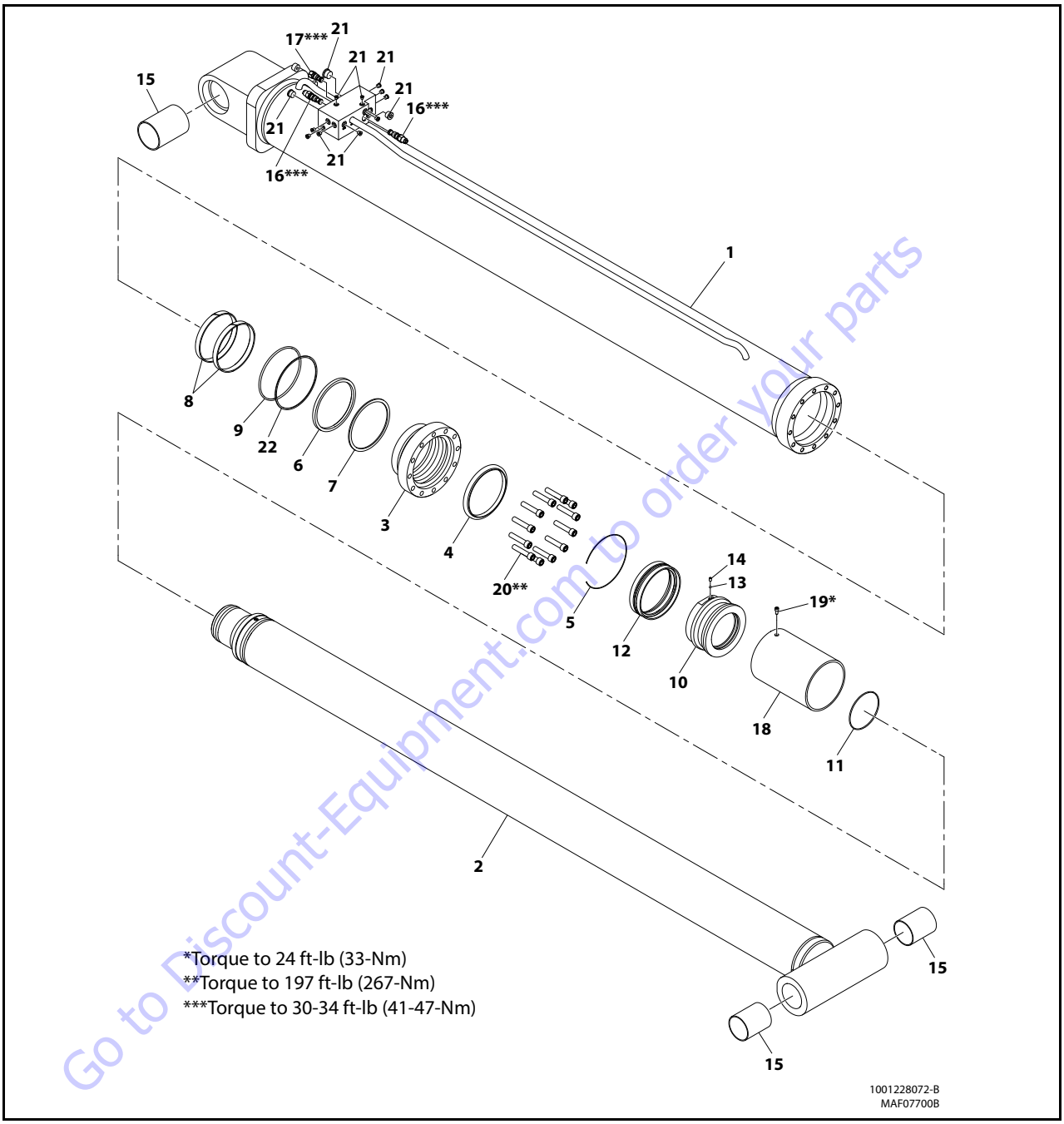


Figure 5-118. Cylinder Rod Support



1. Barrel
2. Rod
3. Head
4. Wiper Seal
5. Retainer Ring
6. Rod Seal
7. Backup Ring
8. Wear Ring
9. O-Ring
10. Piston
11. Rod, O-Ring
12. Piston Seal
13. Stell Ball
14. Setscrew
15. Bushing
16. Counterbalance Valve
17. Shuttle Valve
18. Spacer
19. Capscrew
20. Capscrew
21. Plug
22. Back-up Ring

Figure 5-119. Boom Lift Cylinder Assembly (SN 0300239676 to Present)

8. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
9. Remove setscrews attaching piston to cylinder rod.
10. Screw the piston counterclockwise by hand and remove piston from cylinder rod.

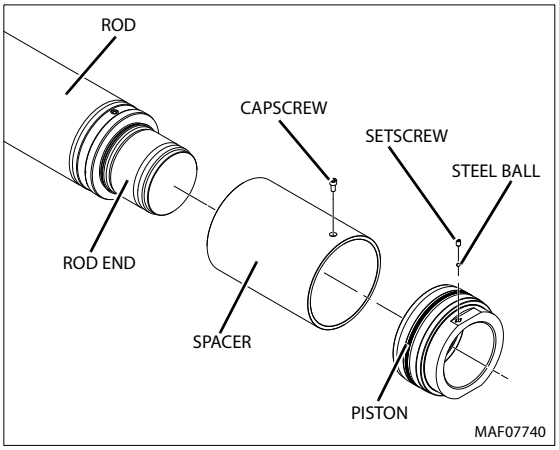


Figure 5-120. Piston Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

11. Remove and discard piston seal (12) from outside grooves of piston (10).
12. Remove spacer (18) from rod (2). Remove and discard O-ring (11).

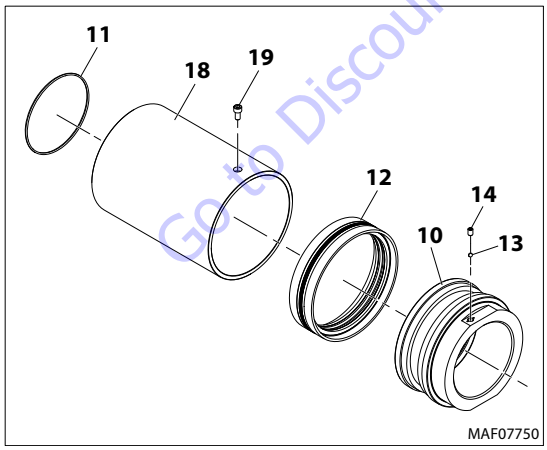


Figure 5-121. Piston Disassembly

13. Remove rod (2) from holding fixture. Remove cylinder head (3) from rod (2).
14. Remove and discard wear rings (8), wiper seal (4), retaining ring (5), rod seal (6), backup ring (7) from inside of cylinder head (3).

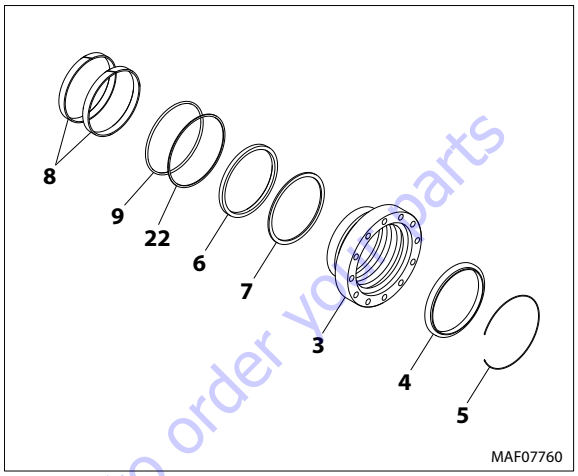


Figure 5-122. Cylinder Head Disassembly

15. Remove and discard O-ring (9) and backup ring (22) from outside grooves of cylinder head (3).

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.

11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.

13. Inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.

    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.

    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.

    c. Lubricate inside of the steel bushing with WD40 prior to bearing installation.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing into barrel or rod bushing with correct size arbor.

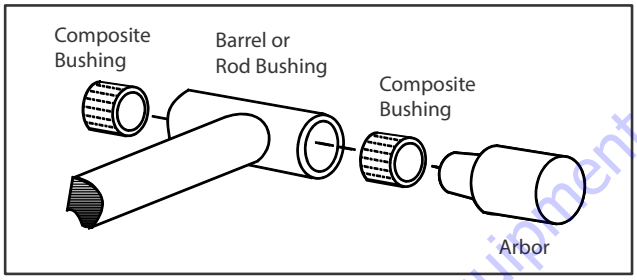


Figure 5-123. Bushing Installation

14. Inspect port block fittings and holding valves. Replace as necessary.

15. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install wear rings (8), wiper seal (4), retaining ring (5), rod seal (6), backup ring (7) in inside grooves of cylinder head (3).

2. Install O-ring (9) and backup ring (22) in outside grooves of cylinder head (3).

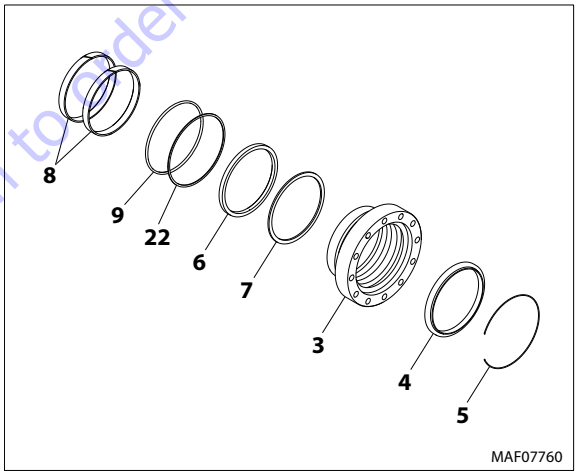


Figure 5-124. Cylinder Head Assembly

3. Carefully install cylinder head assembly (3) on rod (2). Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.

4. Install O-ring (11) into the spacer (18) and Carefully slide spacer (18) onto rod (2) with O-ring (11) end facing cylinder head. Ensure that O-ring not damage and dislodge.

5. Install piston seal (12) in outside grooves of piston (10).
6. Using suitable protection, clamp cylinder rod (2) in a vise or similar holding fixture as close to piston as possible.

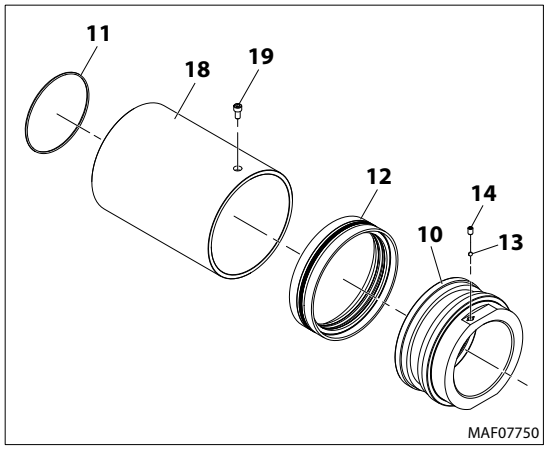


Figure 5-125. Piston Assembly

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

7. Carefully thread piston (10) on cylinder rod (2) hand tight. Do not damaged or dislodge O-ring and backup rings.
8. Install the setscrew (14) and stell ball (13) on the piston (10) and attach the piston (10) on the rod (2).
9. Position cylinder barrel (1) in a suitable holding fixture.

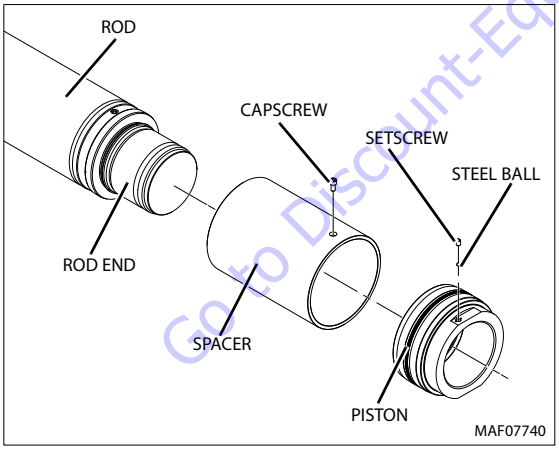


Figure 5-126. Piston Removal

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

10. Clamp barrel (1) securely and support rod (2). Insert piston (10) end in barrel. Do not damage or dislodge piston O-rings or seal rings.
11. Continue pushing rod in barrel until cylinder head (3) can be inserted in barrel.
12. Install cylinder head (3) until tight and marks made during disassembly are aligned.
13. Secure cylinder head assembly (3) to barrel (1) with capscrews (20). Torque to 197 ft-lb (267-Nm).

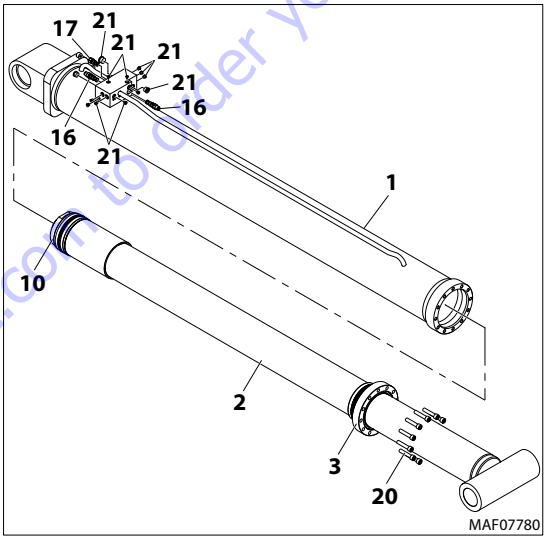


Figure 5-127. Rod Assembly Installation

14. Install the plugs (21) in the cylinder ports.
15. Install two counterbalance valves (16) in valve block. Torque to 30-34 ft-lb (41-47-Nm).
16. Install shuttle valves (17) valve block. Torque to 30-34 ft-lb (41-47-Nm).

Jib Lift Cylinder (Prior to SN 0300239676)

Refer to Figure 5-131.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.
3. Place cylinder barrel in a suitable holding fixture.

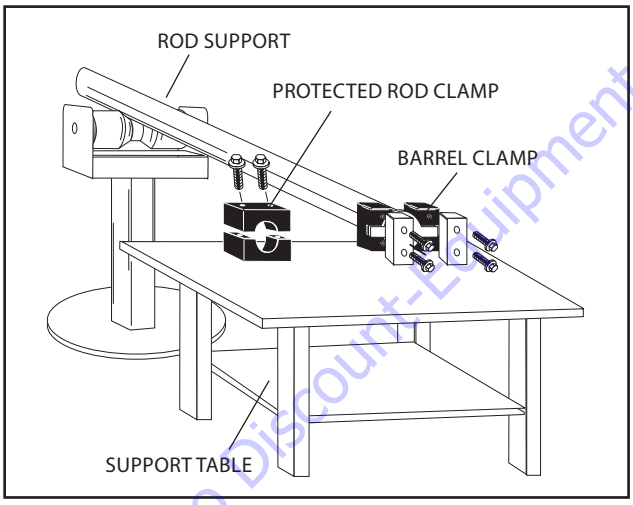


Figure 5-128. Cylinder Barrel Support

4. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.
5. If necessary, remove eight capscrews (11) and retainer cap (10). Remove O-Ring plug (5) and setscrew (4). Remove cylinder length sensor assembly (9) from barrel (1).

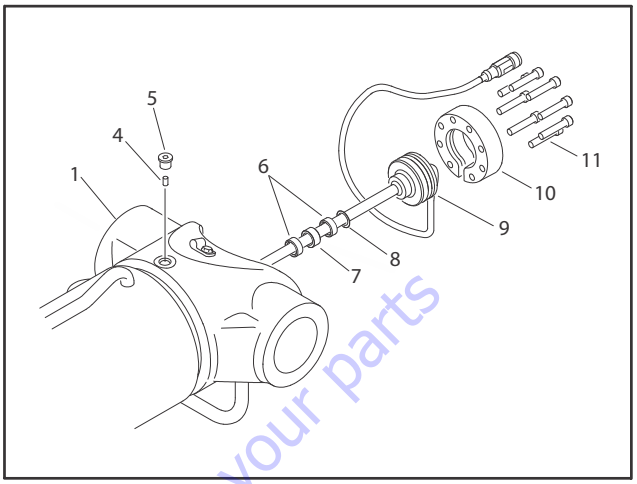


Figure 5-129. Cylinder Length Sensor Removal

6. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.
7. Mark cylinder head and barrel with center punch marks for later realignment. Remove eight cylinder head cap screws.

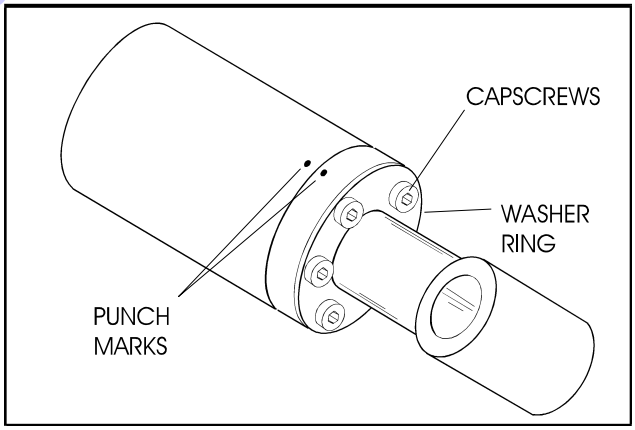
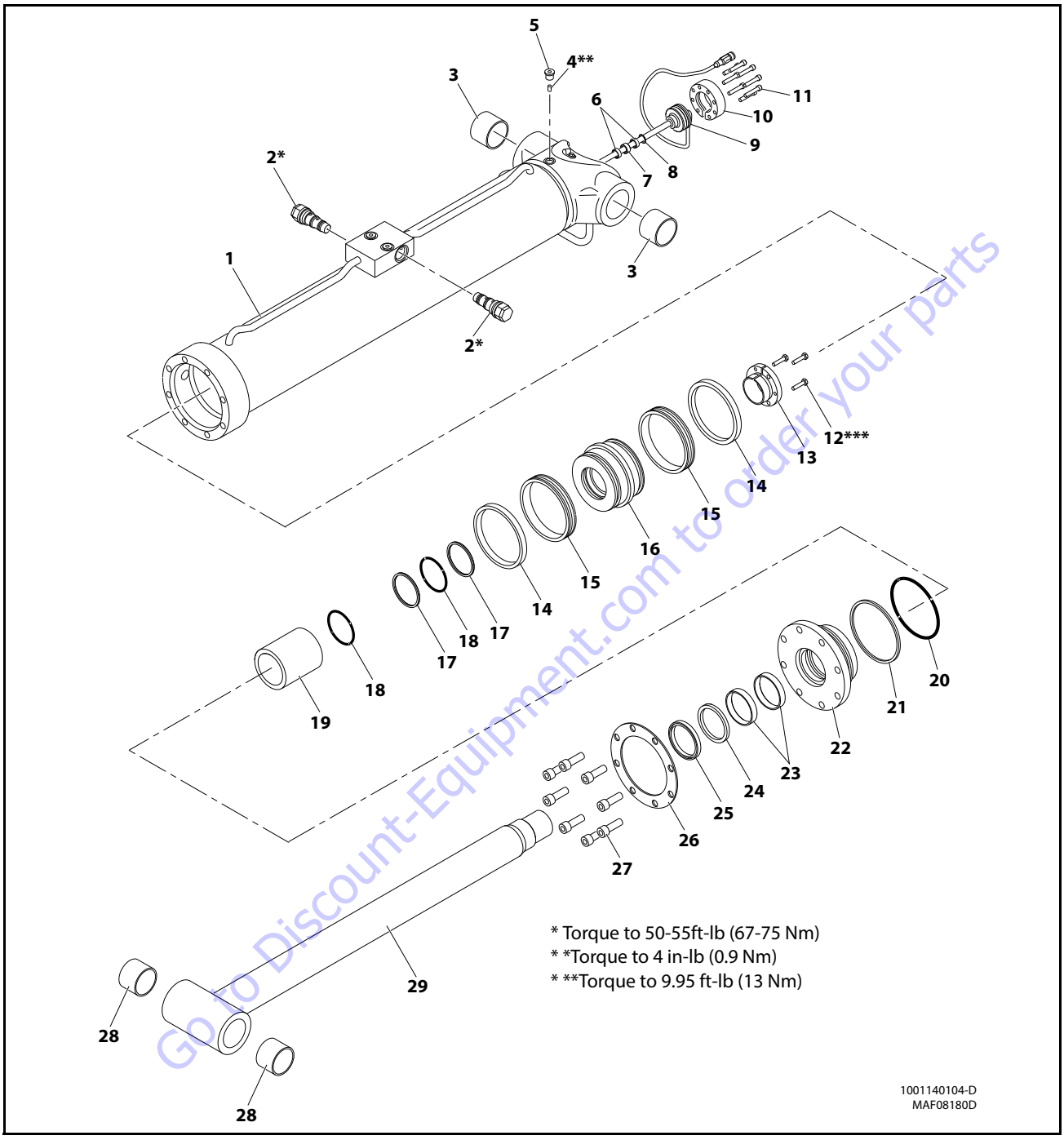


Figure 5-130. Capscrew Removal



1. Barrel
2. Counterbalance Valve
3. Bushing
4. Setscrew
5. O-Ring Plug
6. Spacer
7. Sensor Magnet
8. Internal Retaining Ring
9. Cylinder Length Sensor
10. Retainer Cap
11. Capscrew
12. Capscrew
13. Tapered Bushing
14. Lock Ring
15. Seal
16. Piston
17. Backup Ring
18. O-Ring
19. Spacer
20. O-Ring
21. Backup Ring
22. Cylinder Head
23. Wear Ring
24. Seal
25. Rod Wiper
26. Washer Ring
27. Capscrew
28. Bushing
29. Rod

Figure 5-131. Jib Lift Cylinder Assembly (Prior to SN 0300239676)

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

8. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.
9. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

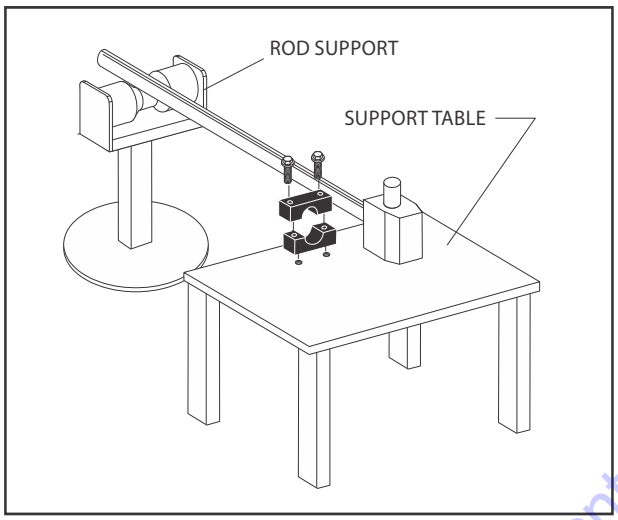


Figure 5-132. Cylinder Rod Support

10. Loosen and remove bolts from tapered bushing and piston.
11. Insert Capscrews (12) in threaded holes in outer piece of tapered bushing (13). Progressively tighten bolts until bushing isloose. Remove tapered bushing (13) from piston (16).
12. Screw piston counter-clockwise by hand and remove from cylinder rod.

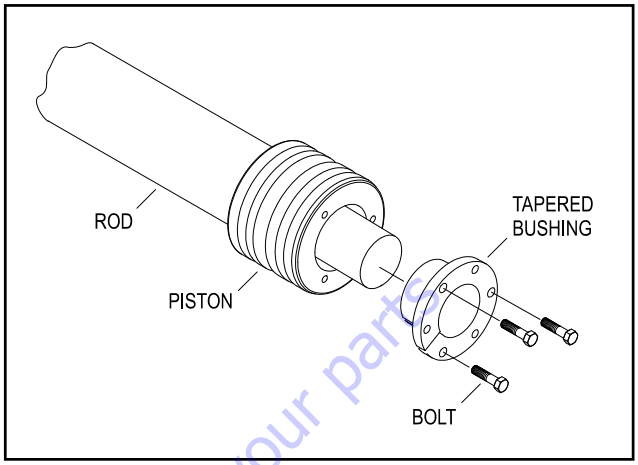


Figure 5-133. Tapered Bushing Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

13. Remove and discard two lock rings (14), seals (15), backup ring (17), O-ring (18), and backup ring (17) from piston (16).
14. Remove piston spacer (19) from rod (29). Remove and discard O-ring (18) from inside of spacer.

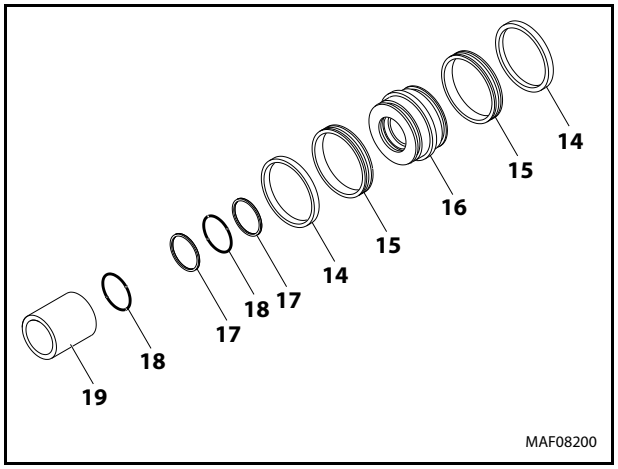


Figure 5-134. Piston Disassembly

15. Remove rod from holding fixture.
16. Remove cylinder head (22) and washer ring (26).
17. Remove and discard O-ring (20), backup ring (21), rod wiper (25), seal (24), and two wear rings (23), from cylinder head (22).

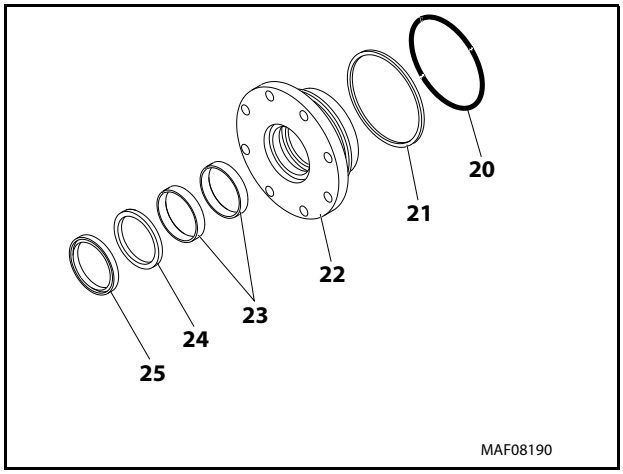


Figure 5-135. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect cylinder length sensor components for damage. Replace as needed.
14. Inspect rod and barrel bearings for signs of excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of steel bushing with WD40 before installing bushings.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing (3) into barrel (1) or rod bushing with correct size arbor.

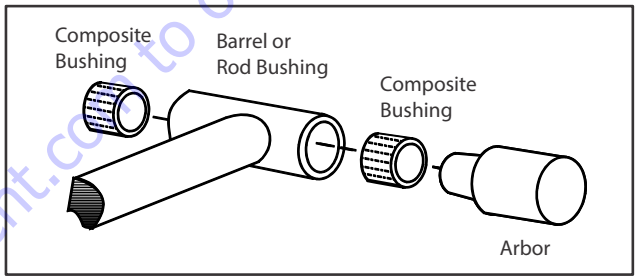


Figure 5-136. Composite Bushing Installation

15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install backup ring (21) and O-ring (20) in outside diameter grooves of cylinder head (22).
2. Install two wear rings (23), seal (24) and rod wiper (25) in cylinder head (22) as shown.

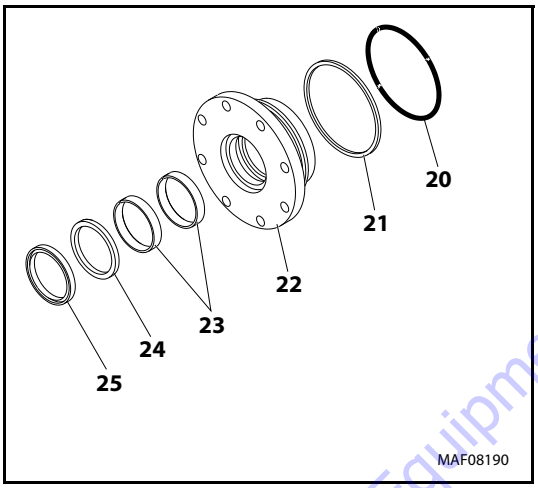


Figure 5-137. Cylinder Head Seal Kit Installation

3. Install washer ring (26) on rod (29). Install cylinder head assembly on rod. Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.
4. Install O-ring (18) in spacer (19). Slide piston spacer on rod (29).
5. Install backup ring (17), O-ring (18) and backup ring (17) in inner diameter grooves of piston (16). Install two seals (15) and lock rings (14) in outer grooves of piston (16).

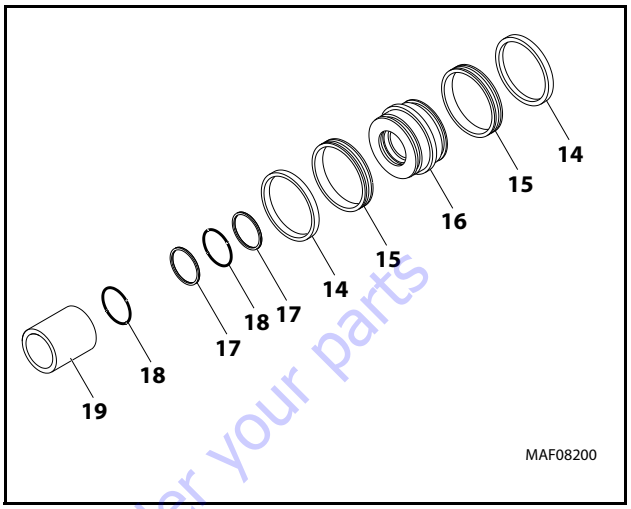


Figure 5-138. Piston Seal Kit Installation

6. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
7. Thread piston on cylinder rod hand tight. Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

8. Thread piston (16) on rod (29) until it aligns with spacer end and install tapered bushing (13).

NOTE: *When installing the tapered bushing, piston and mating end of rod must be free of oil.*

9. Apply JLG Threadlocker (P/N 0100011) to tapered bushing bolts. Assemble the tapered bushing (13) loosely into the piston (16) and insert capscrews (12) through the drilled holes in the bushing and into the tapped holes in the piston (16).

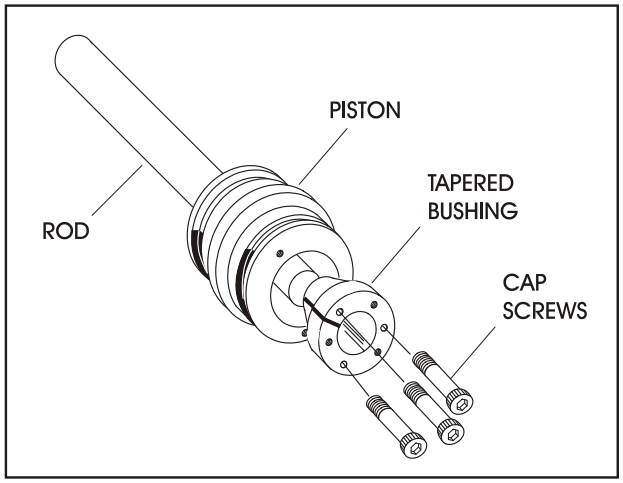


Figure 5-139. Tapered Bushing Installation

10. Tighten the capscrews (12) evenly and progressively in rotation to 9 ft.lb (12 Nm).

11. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

    b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

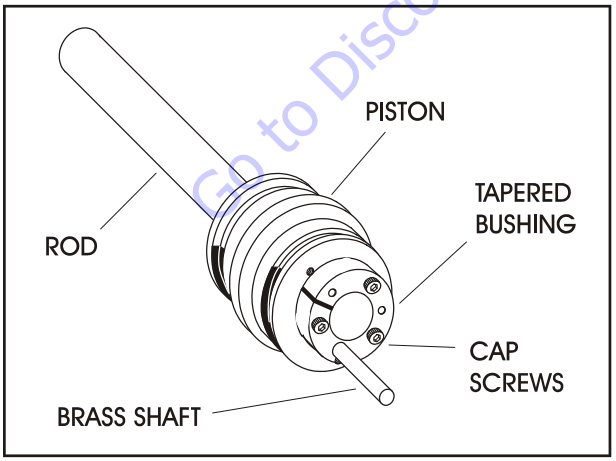


Figure 5-140. Seating the Tapered Bearing

12. Retorque the capscrews (12) evenly and progressively in rotation to 9 ft.lb (12 Nm).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

13. Clamp barrel securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston loading O-ring and seal ring.

14. Continue pushing rod into barrel until cylinder head gland can be inserted into barrel cylinder.

NOTE: *Apply JLG Threadlocker (P/N 0100011) or equivalent to capscrews.*

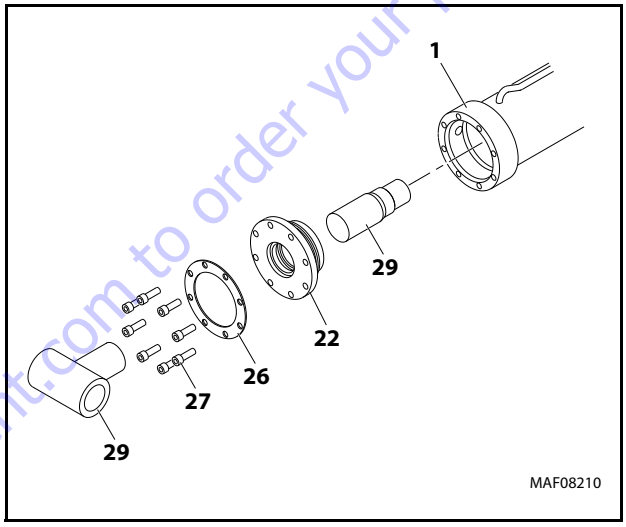


Figure 5-141. Rod Assembly Installation

15. Secure cylinder head (22) and washer ring (26) with eight capscrews (27).

16. Install two counterbalance valve (3) with new O-rings valve block. Torque to 50-55 ft-lb (67-75 Nm).

17. If removed, install the cylinder length sensor. See Section 5.4, Cylinder Length Sensor.

Jib Lift Cylinder (SN 0300239676 to Present)

Refer to Figure 5-145.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod, if applicable.

3. Place cylinder barrel in a suitable holding fixture.

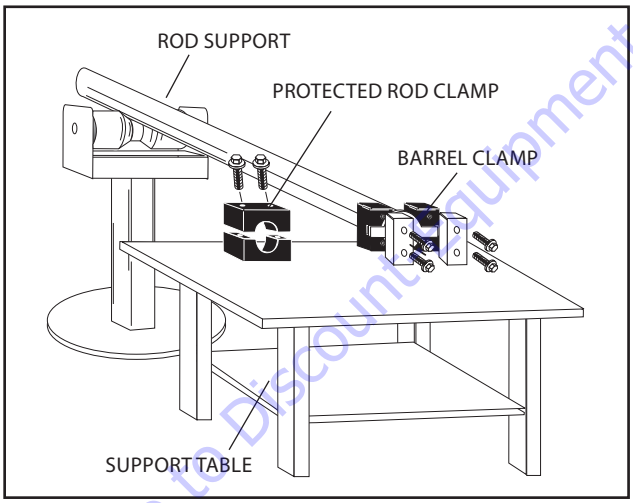


Figure 5-142. Cylinder Barrel Support

4. Remove cartridge-type counterbalance valve and fittings from cylinder port block. Discard O-rings.

5. If necessary, remove eight capscrews (11) and retainer cap (10). Remove O-Ring plug (5) and setscrew (4). Remove cylinder length sensor assembly (9) from barrel (1).

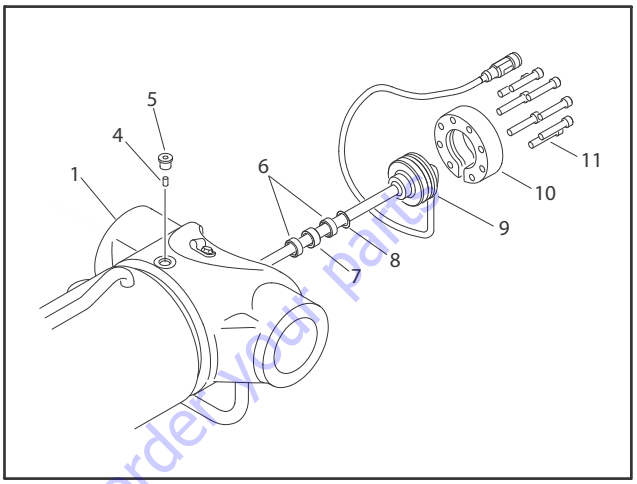


Figure 5-143. Cylinder Length Sensor Removal

6. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

7. Mark cylinder head and barrel with center punch marks for later realignment. Remove eight cylinder head cap screws.

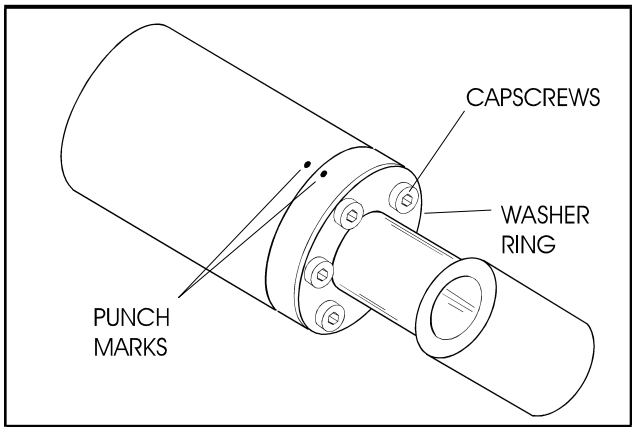
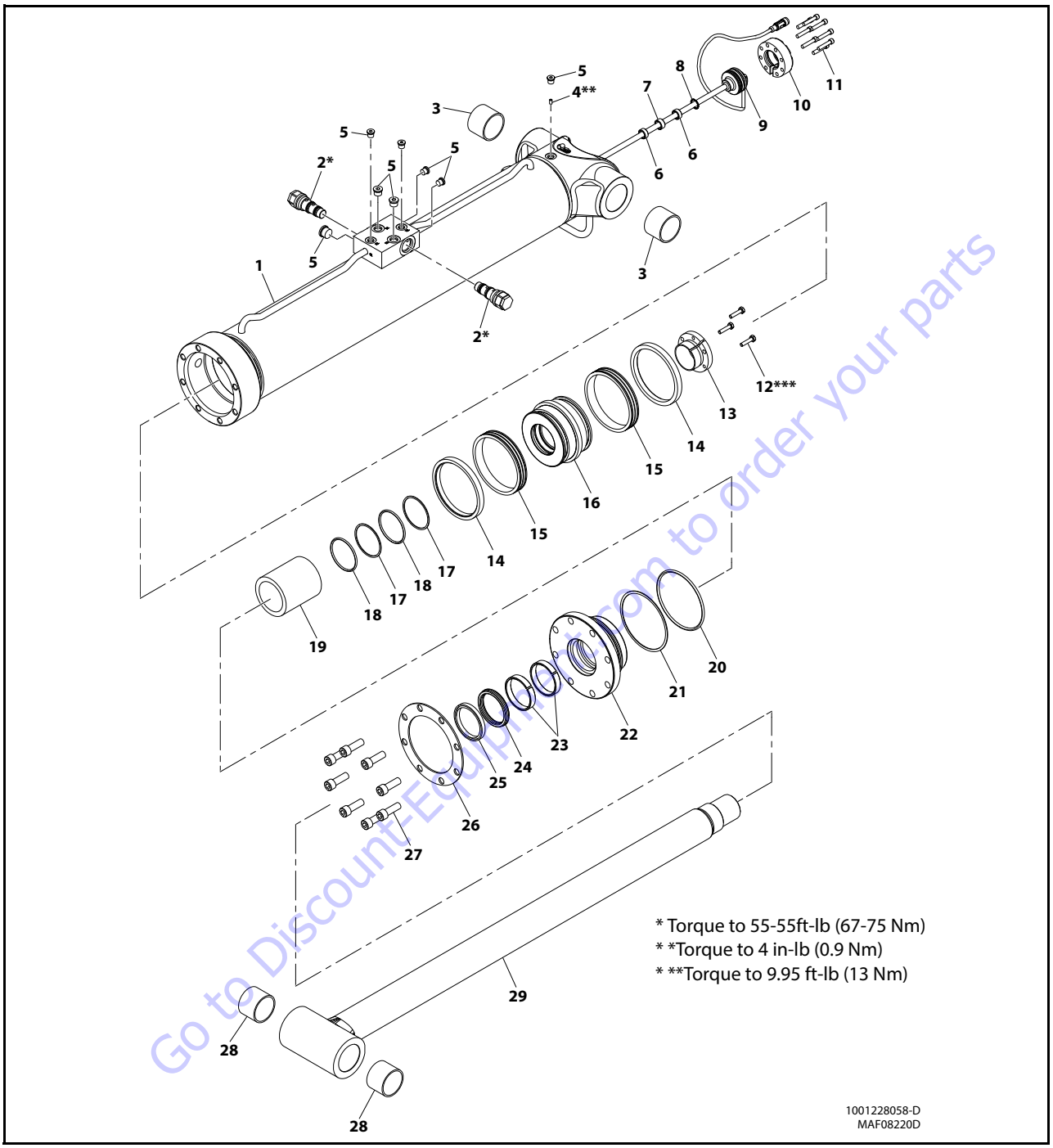


Figure 5-144. Capscrew Removal



1. Barrel
2. Counterbalance Valve
3. Bushing
4. Setscrew
5. O-Ring Plug
6. Spacer
7. Sensor Magnet
8. Internal Retaining Ring
9. Cylinder Length Sensor
10. Retainer Cap
11. Capscrew
12. Capscrew
13. Tapered Bushing
14. Lock Ring
15. Seal
16. Piston
17. Backup Ring
18. O-Ring
19. Spacer
20. O-Ring
21. Backup Ring
22. Cylinder Head
23. Wear Ring
24. Seal
25. Rod Wiper
26. Washer Ring
27. Capscrew
28. Bushing
29. Rod

Figure 5-145. Jib Lift Cylinder Assembly (SN 0300239676 to Present)

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

8. Clamp barrel (1) securely. Pull rod assembly and cylinder head from barrel.

9. Protect cylinder rod (29) from damage and clamp in a vise or holding fixture as close to piston (16) as possible.

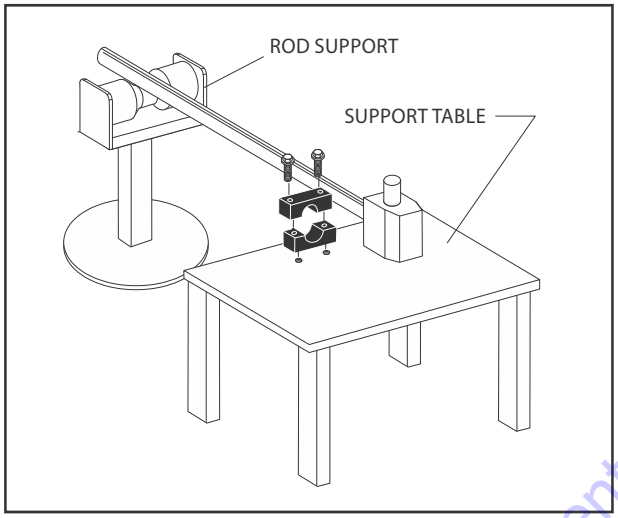


Figure 5-146. Cylinder Rod Support

10. Loosen and remove Capscrews (12) from tapered bushing (13) and piston (16).

11. Insert Capscrews (12) in threaded holes in outer piece of tapered bushing (13). Progressively tighten bolts until bushing is loose. Remove tapered bushing (13) from piston (16).

12. Screw piston(16) counter-clockwise by hand and remove from cylinder rod (29).

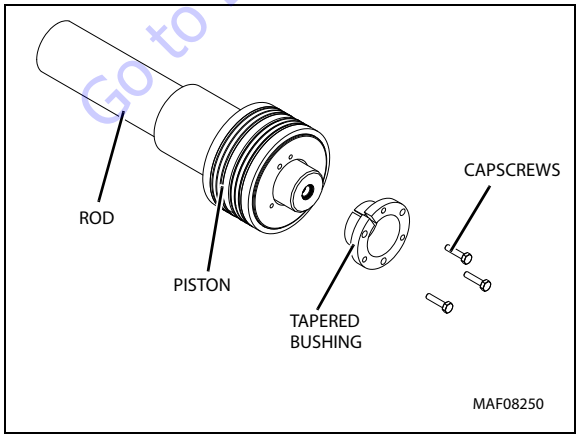


Figure 5-147. Tapered Bushing Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

1. Remove and discard two lock rings (14), seals (15), backup ring (17), O-ring (18), and backup ring (17) from piston (16).

2. Remove piston spacer (19) from rod (29). Remove and discard O-ring (18) from inside of spacer.

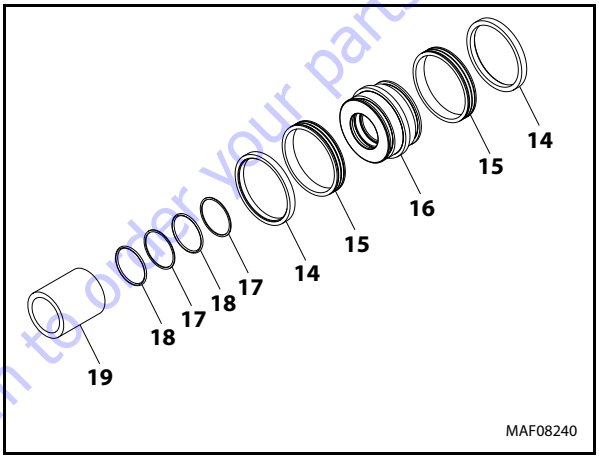


Figure 5-147. Piston Disassembly

3. Remove rod from holding fixture. Remove cylinder head (22) and washer ring (26).

4. Remove and discard O-ring (20), backup ring (21), rod wiper (25), seal (24) and two wear rings (23) from cylinder head (22).

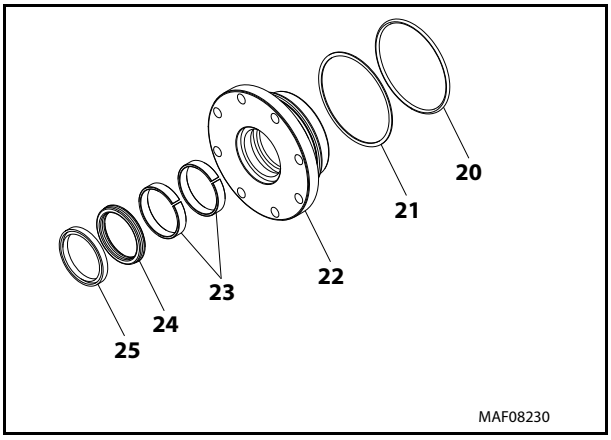


Figure 5-148. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect cylinder length sensor components for damage. Replace as needed.
14. Inspect rod and barrel bearings for signs of excessive wear or damage. Replace as necessary.
    a. Thoroughly clean hole, (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
    b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
    c. Lubricate inside of steel bushing with WD40 before installing bushings.

NOTE: *Lubrication is not required with nickel plated pins and bearings. Install pin in composite bushing dry.*

    d. Press bushing into barrel or rod bushing with correct size arbor.

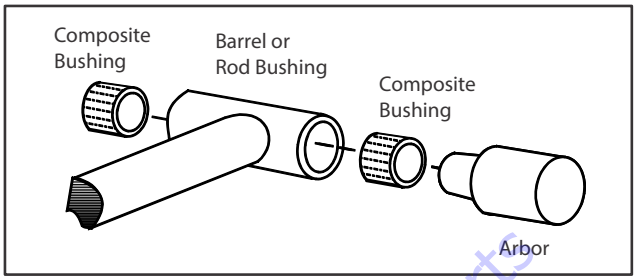


Figure 5-149. Composite Bushing Installation

15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*
Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install backup ring (21) and O-ring (20) in outside diameter grooves of cylinder head (22).
2. Install two wear rings (23) seal (24) and rod wiper (25) in cylinder head as shown.

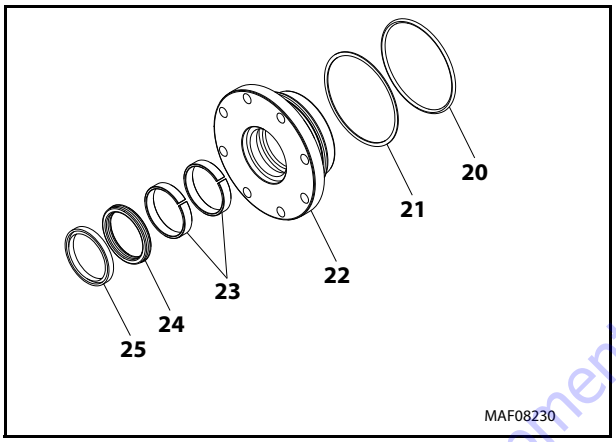


Figure 5-150. Cylinder Head Seal Kit Installation

3. Install washer ring (26) on rod (29). Install cylinder head assembly on rod. Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.
4. Install O-ring (18) in spacer (19). Slide piston spacer on rod (29).
5. Install backup ring (17), O-ring (18) and backup ring (17) in inner diameter grooves of piston (16). Install two seals (15) and lock rings (14) in outer grooves of piston.

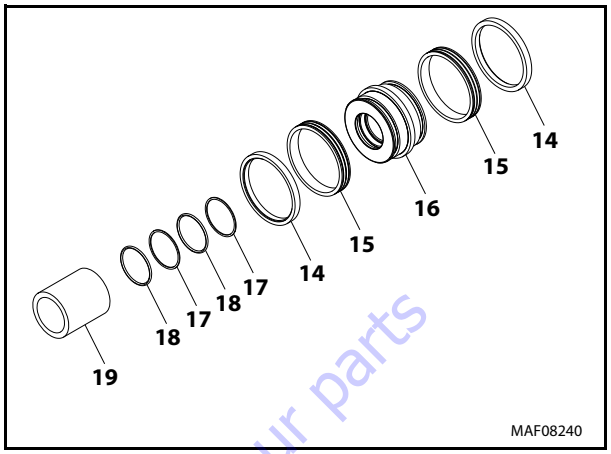


Figure 5-151. Piston Seal Kit Installation

6. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston (16) as possible.
7. Thread piston (16) on cylinder rod (29) hand tight. Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

8. Thread piston on rod until it aligns with spacer end and install tapered bushing.

NOTE: *When installing the tapered bushing, piston and mating end of rod must be free of oil.*

9. Apply JLG Threadlocker (P/N 0100011) to tapered capscrews (12). Assemble the tapered bushing (13) loosely into the piston (16) and insert capscrews through the drilled holes in the bushing and into the tapped holes in the piston (16).

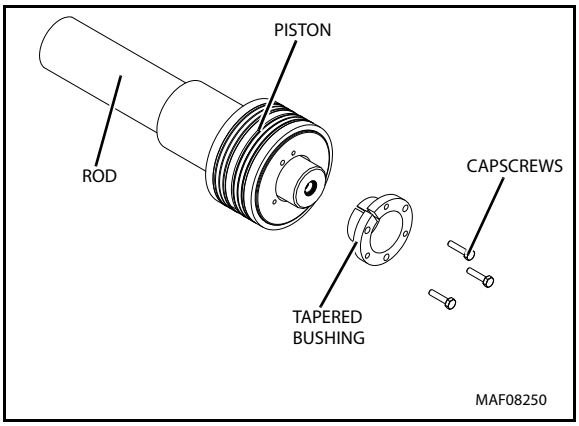


Figure 5-152. Tapered Bushing Installation

1. Tighten the capscrews (12) evenly and progressively in rotation to 9.59 ft.lbs (13 Nm).

2. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;
   a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.
   b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

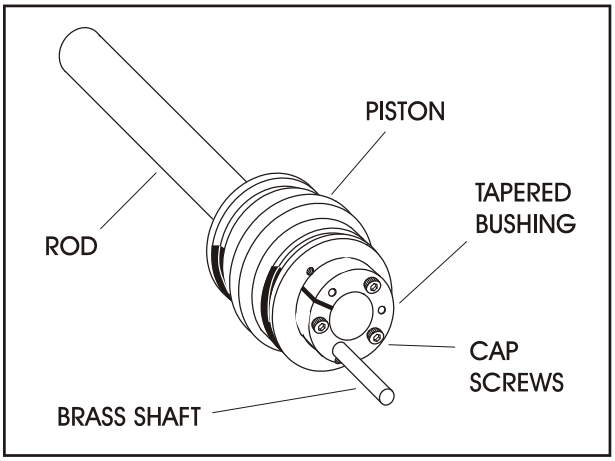


Figure 5-152. Seating the Tapered Bearing

3. Retorque the capscrews (12) evenly and progressively in rotation to 9.59 ft.lbs (13 Nm).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

4. Clamp barrel securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston loading O-ring and seal ring.
5. Continue pushing cylinder rod (29) into barrel (1) until cylinder head (23) gland can be inserted into cylinder barrel (1).

NOTE: *Apply JLG Threadlocker (P/N 0100011) or equivalent to capscrews*

6. Secure cylinder head (22) and washer ring (26) with eight capscrews (27).

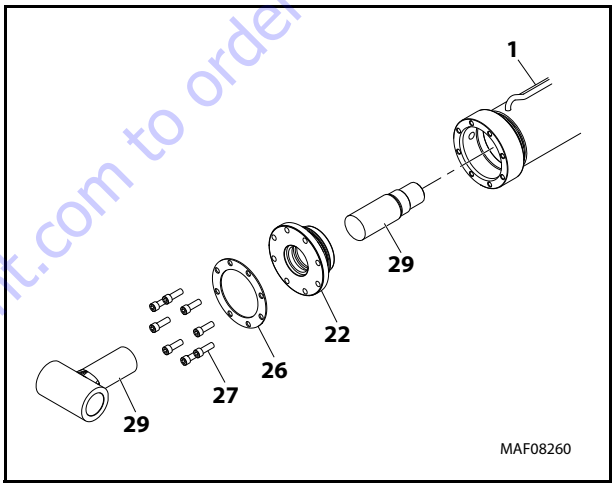


Figure 5-153. Rod Assembly Installation

7. Install two counterbalance valves (2) with new O-rings in valve block. Torque to 50-55 ft-lb (67-75 Nm).
8. If removed, install the cylinder length sensor. See Section 5.4, Cylinder Length Sensor.

Jib Lock Cylinder

Refer to Figure 5-155. and Figure 5-156.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source.
3. Place cylinder barrel in a suitable holding fixture. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.
4. Mark cylinder head and barrel with a center punch for realignment. Unscrew cylinder head with pin-face spanner wrench.

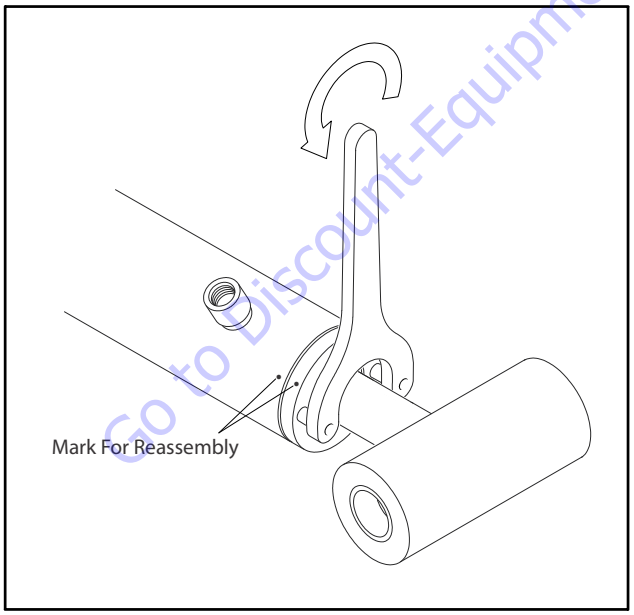


Figure 5-154. Cylinder Head Removal

NOTICE

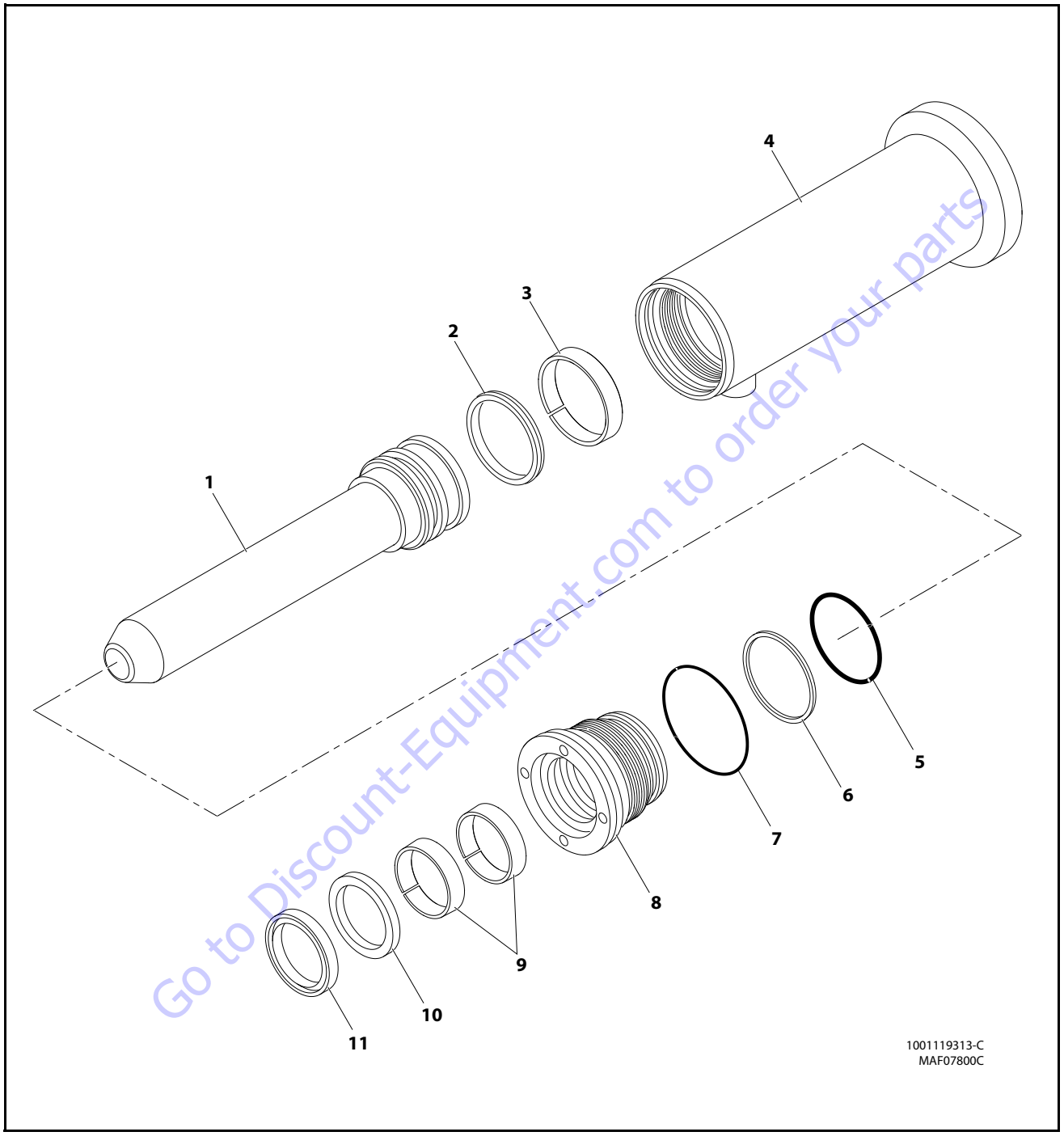
PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

5. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.
6. Protect cylinder rod from damage and clamp in a vise or holding fixture.

NOTICE

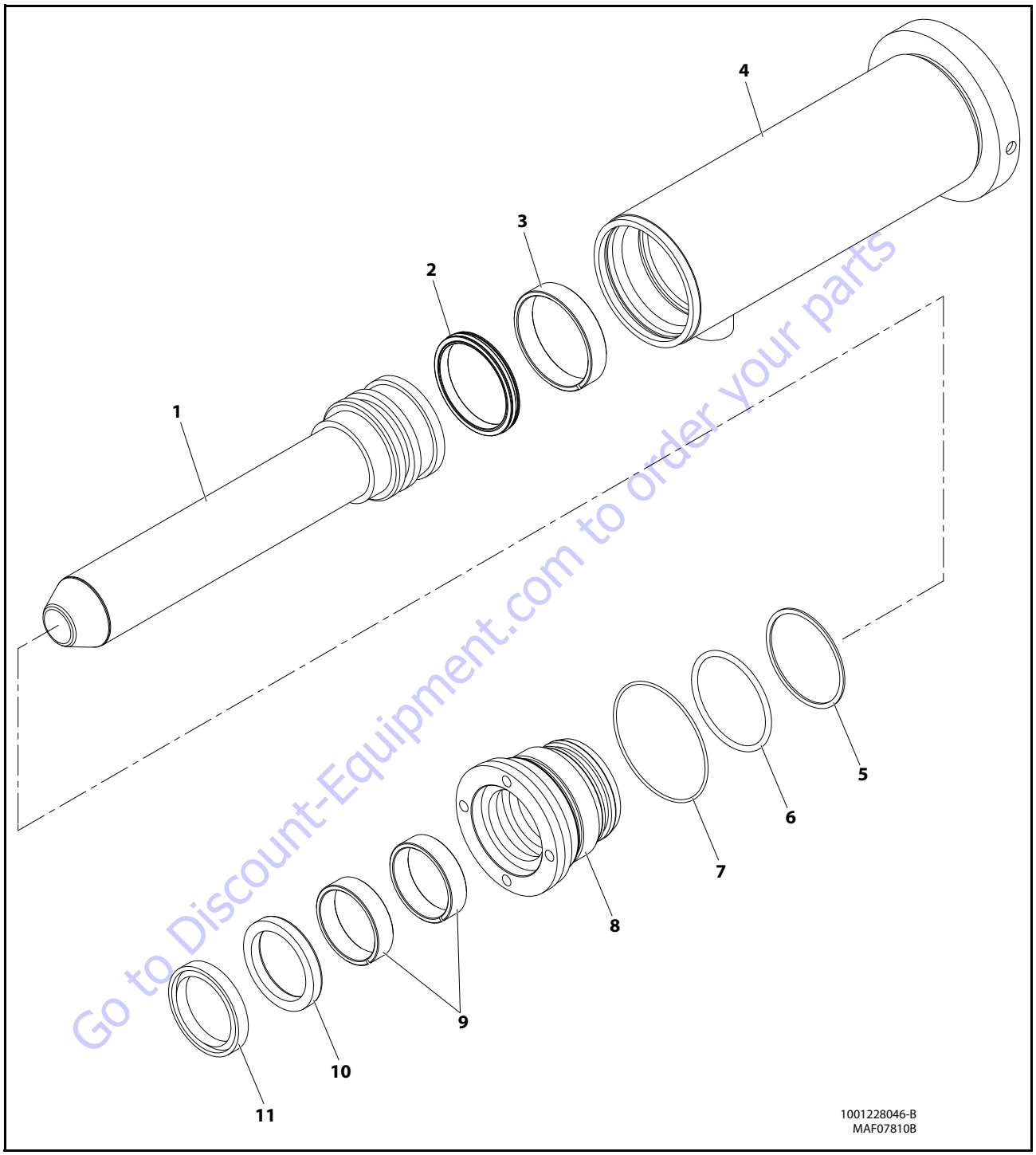
REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

7. Remove and discard seal (2) and wear ring (3) from rod (1).
8. Remove and discard rod wiper (11), seal (10), and two wear rings (9) from inside of cylinder head (8).
9. Remove and discard O-ring (5), backup ring (6), and O-ring (7) from outer groves of cylinder head.



1. Rod
2. Seal
3. Wear Ring
4. Barrel
5. O-Ring
6. Backup Ring
7. O-Ring
8. Head
9. Wear Ring
10. Seal
11. Rod Wiper

Figure 5-155. Jib Lock Cylinder Assembly (Prior to SN 0300239170)



1. Rod
2. Seal
3. Wear Ring
4. Barrel
5. O-Ring
6. Backup Ring
7. O-Ring
8. Head
9. Wear Ring
10. Seal
11. Rod Wiper

Figure 5-156. Jib Lock Cylinder Assembly (SN 0300239170 to Present)

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect inner surface of barrel for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect threaded portion of barrel for damage. Dress threads as necessary.
5. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
6. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
7. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
8. Inspect threaded portion of head for damage. Dress threads as necessary.
9. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
10. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
11. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

1. Position cylinder barrel in a suitable holding fixture.
2. Use seal tool to install new rod seal into applicable cylinder head gland groove.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

3. Install O-ring (7), back-up ring (6), and O-ring (5) in applicable outside diameter groove of cylinder head (8).
3. Install two wear rings (9), seal (10), and rod wiper (11) to inside grooves of cylinder head.
4. Install seal (2) and wear ring (3) to piston end of rod (1).

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

NOTE: *Apply anti-seize compound to cylinder head threads.*

5. Insert piston end into barrel cylinder. Do not damage or dislodge piston loading O-ring and seal ring. Push rod in barrel as far as possible without excess force.
6. Slide cylinder head assembly (8) over rod and screw into barrel. Tighten cylinder head with pin spanner wrench.

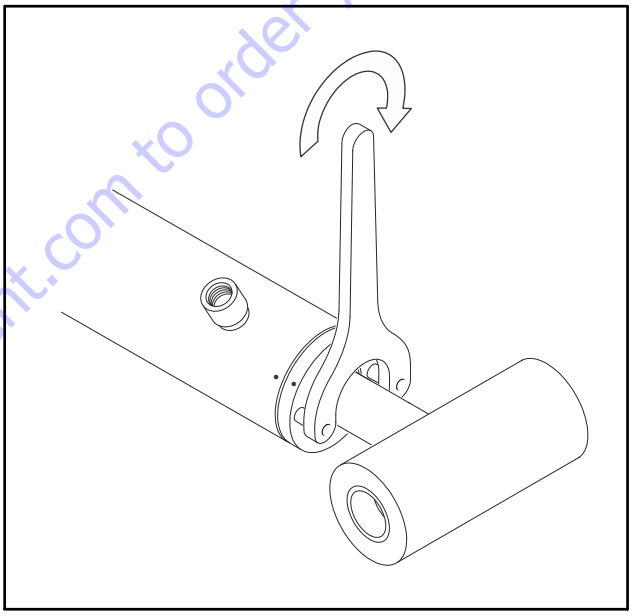


Figure 5-157. Cylinder Head Installation

Steer Cylinder (Prior to SN 0300239676)

Refer to Figure 5-160.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source.
3. Place cylinder barrel in a suitable holding fixture.
4. Remove self-tapping screw (9) from cylinder head (5) and barrel (2).
5. Unscrew cylinder head with pin-face spanner wrench.

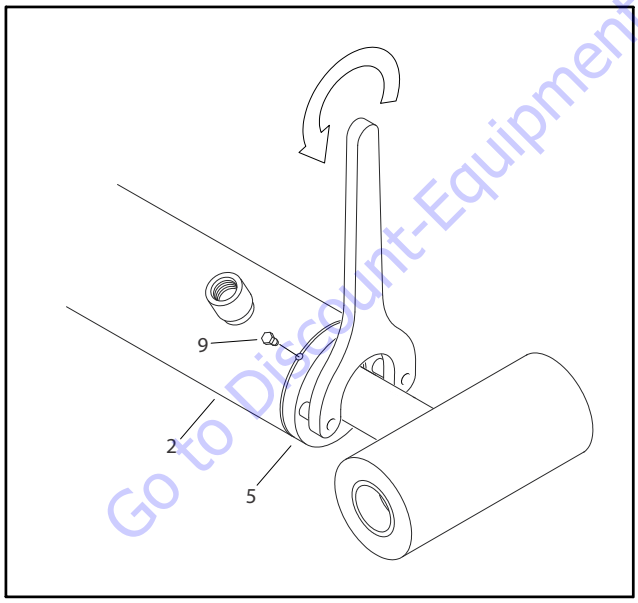


Figure 5-158. Cylinder Head Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

6. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.
7. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

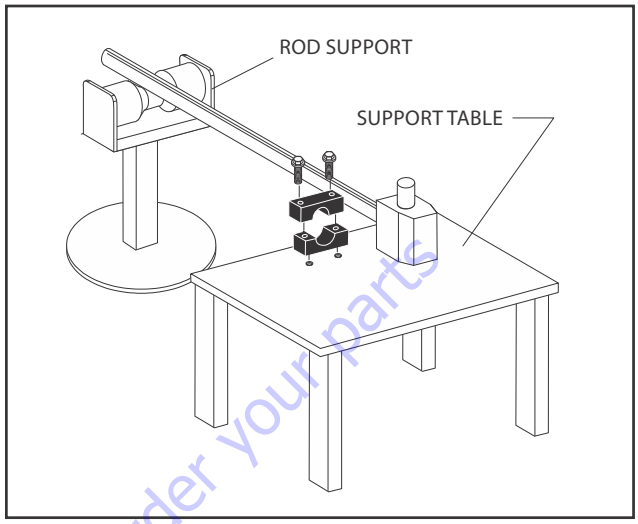
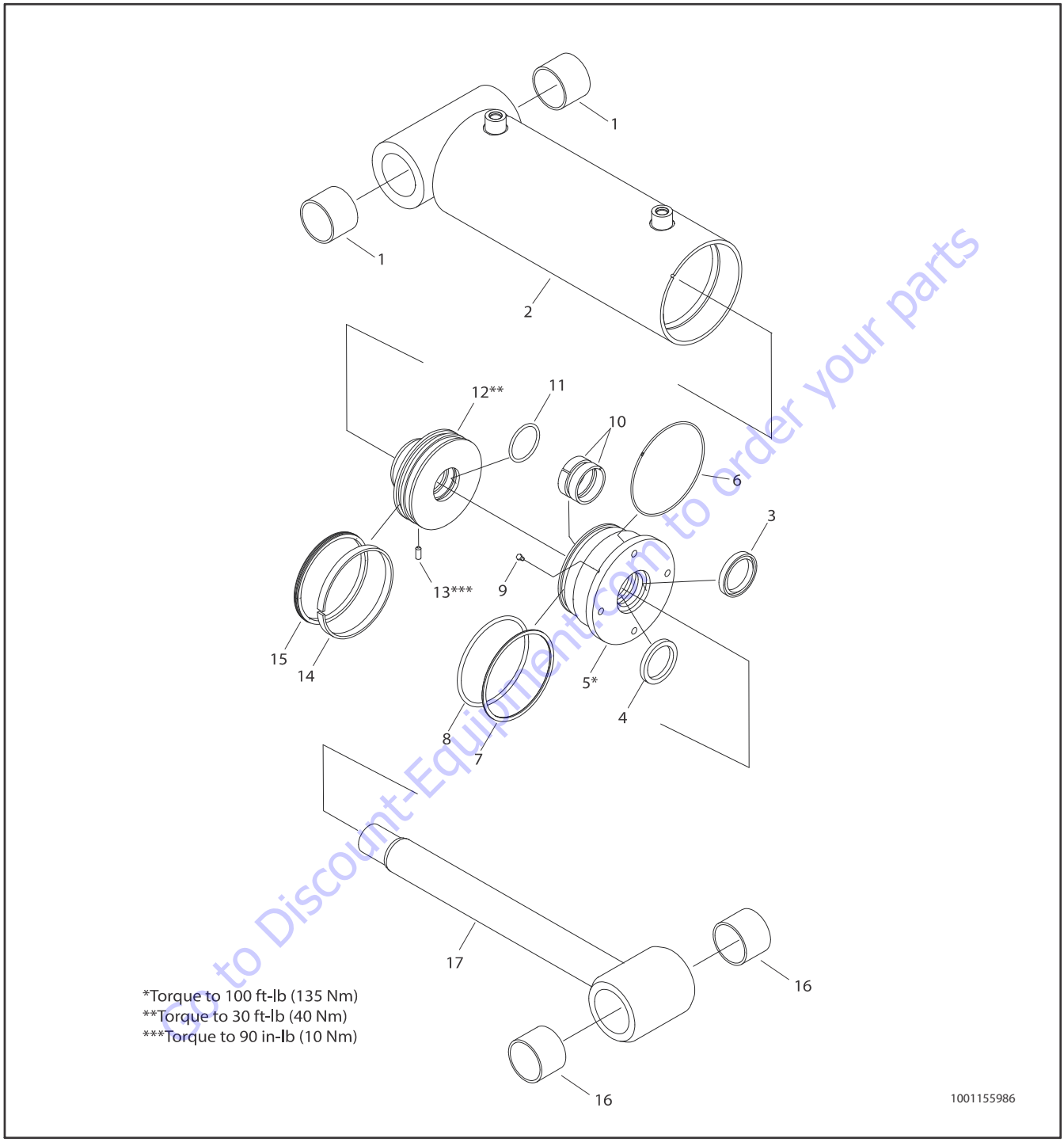


Figure 5-159. Cylinder Rod Support

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

8. Remove setscrew (13) from piston (12). remove piston (12) from rod (17).
9. Remove and discard O-ring (11), seal (15), and wear ring (14) from piston (12). Remove rod (17) from clamp or vise.



1. Bushing
2. Barrel
3. Wiper Seal
4. Seal
5. Head
6. O-Ring
7. Backup Ring
8. O-Ring
9. Screw
10. Wear Ring
11. O-Ring
12. Piston
13. Setscrew
14. Wear Ring
15. Seal
16. Bushing
17. Rod

Figure 5-160. Steer Cylinder Assembly (Prior to SN 0300239676)

10. Remove cylinder head assembly (5) from rod (17). Remove and discard two wear rings (10), seal (4), wiper seal (3), O-ring (8), backup ring (7), and O-ring (6) from cylinder head.

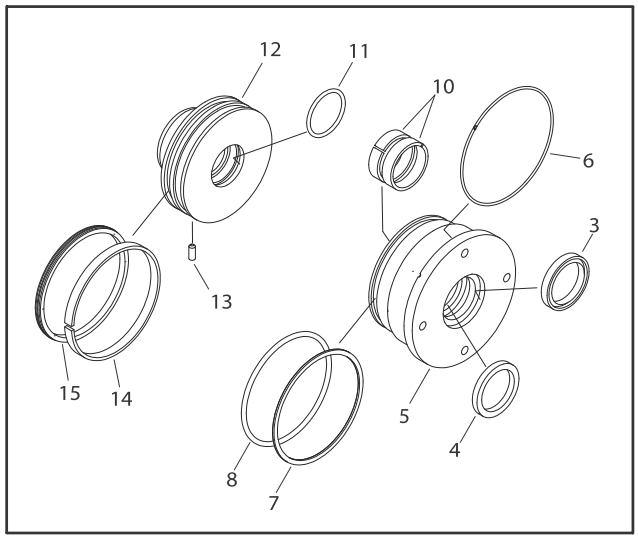


Figure 5-161. Piston and Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
13. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION. ENSURE 'POLY-PAK' PISTON SEALS ARE PROPERLY INSTALLED. REFER TO WIPER SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION.

1. Install seal (4) and wiper seal (3) to inside grooves of cylinder head (5).
2. Install two wear rings (10) in cylinder head.
3. Install O-Ring (6), backup ring (7), and O-ring (8) to outside grooves of cylinder head.
4. Slide cylinder head assembly on rod.
5. Install O-ring (11) to inside groove of piston (12).
6. Install wear ring (14) and seal (15) in outside grooves of piston.
7. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
8. Apply medium-high strength (red) thread-locking compound JLG P/N 0100071 or equivalent to rod threads.
9. Thread piston assembly on rod. Do not dislodge or damage O-ring. Torque piston to 30 ft-lb (40 Nm).

10. Install setscrew (13) in piston. Torque to 90 in-lb (10 Nm).

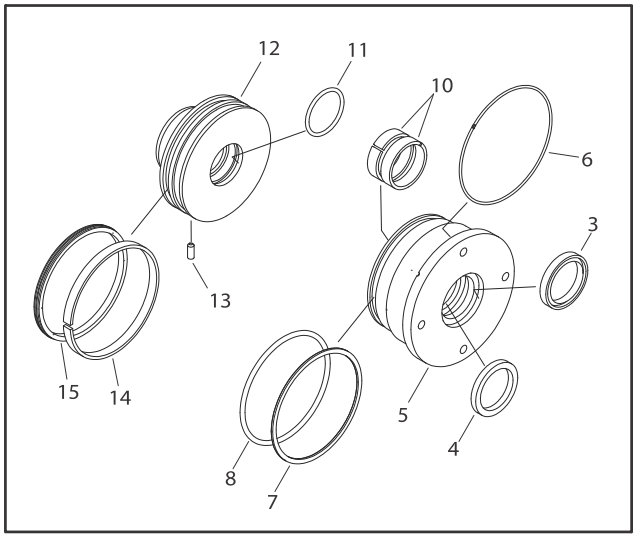


Figure 5-162. Cylinder Head and Piston Assembly

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

11. Clamp barrel securely in suitable fixture and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston O-rings or seal rings.

12. Apply ant-seize compound to cylinder head threads.

13. Continue pushing rod into barrel until cylinder head can be inserted into barrel cylinder.

14. Screw in cylinder head (5) to barrel (2). Torque to 100 ft-lb (135 Nm).

15. Adjust cylinder head until screw hole aligns with barrel. Install screw (9).

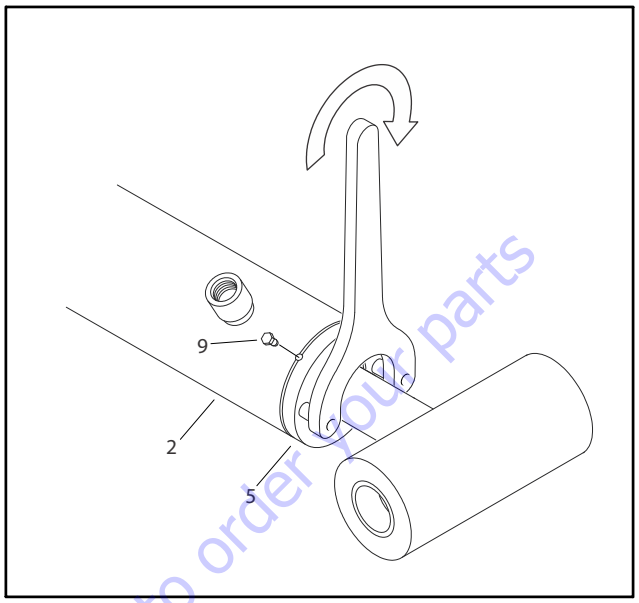


Figure 5-163. Cylinder Head Installation

Steer Cylinder (SN 0300239676 to Present)

Refer to Figure 5-166.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source.
3. Place cylinder barrel in a suitable holding fixture.
4. Mark cylinder head and barrel with center punch marks for later realignment.
5. Unscrew cylinder head with hook spanner wrench.

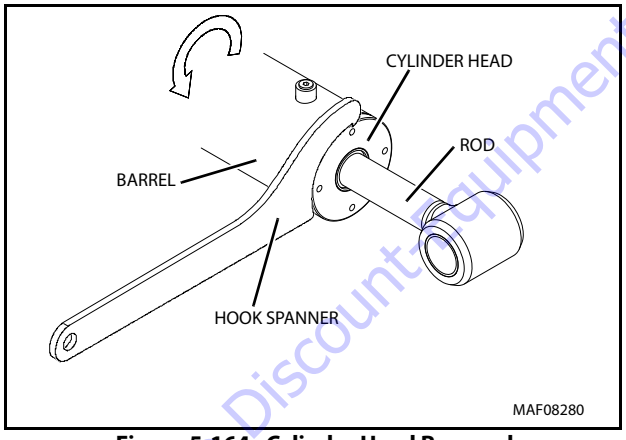


Figure 5-164. Cylinder Head Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

6. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.
7. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

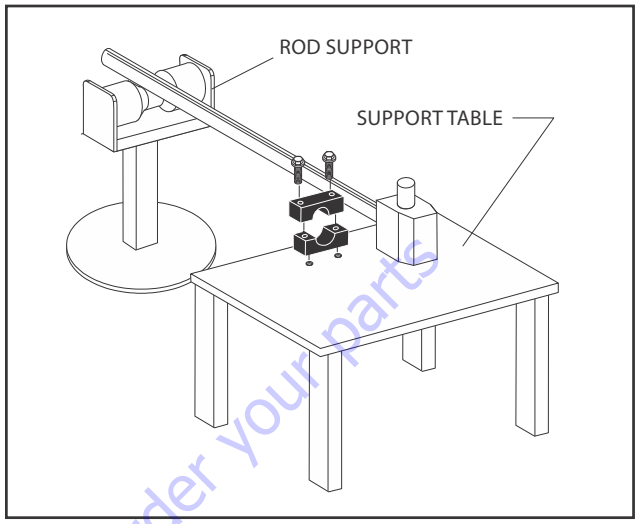
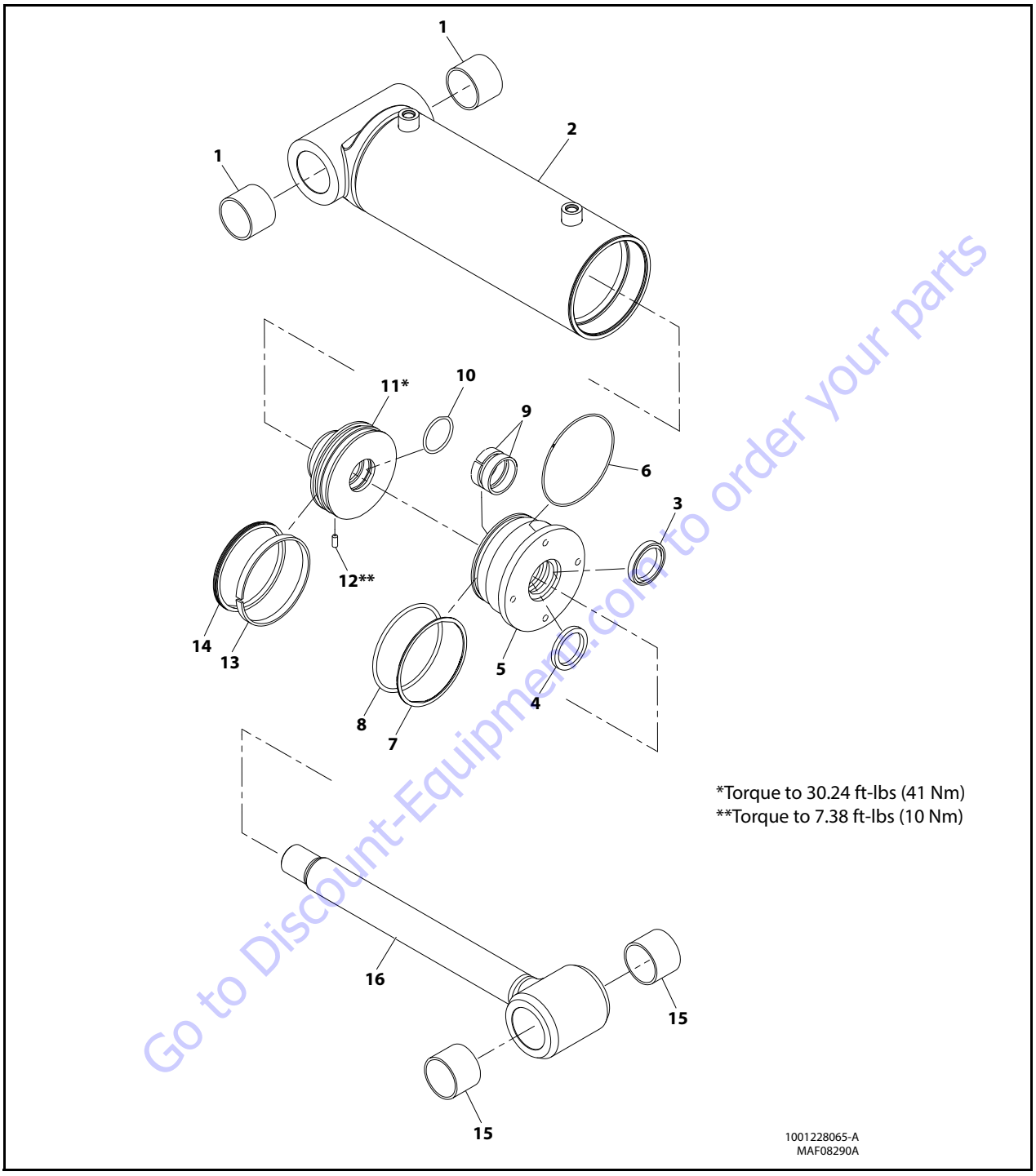


Figure 5-165. Cylinder Rod Support

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

8. Remove setscrew (13) from piston (12). remove piston (12) from Cylinder rod (16).
9. Remove and discard O-ring (11), seal (15), and wear ring (14) from piston (12). Remove cylinder rod (16) from clamp or vise.



1. Bushing
2. Barrel
3. Wiper Seal
4. Seal
5. Head
6. O-Ring
7. Backup Ring
8. O-Ring
9. Wear Ring
10. O-Ring
11. Piston
12. Setscrew
13. Wear Ring
14. Seal
15. Bushing
16. Rod

Figure 5-166. Steer Cylinder Assembly (SN 0300239676 to Present)

10. Remove cylinder head assembly (5) from rod (16).

10. Remove and discard two wear rings (9), seal (4), wiper seal (3), O-ring (8), backup ring (7), and O-ring (6) from cylinder head (5).

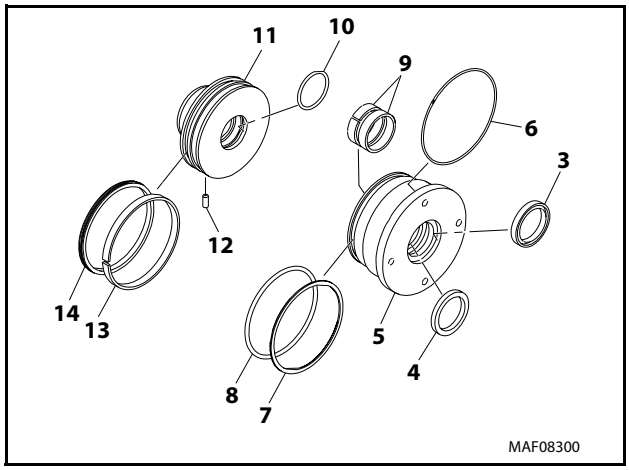


Figure 5-167. Piston and Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.

2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.

3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.

4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.

5. Inspect threaded portion of barrel for damage. Dress threads as necessary.

6. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.

7. Inspect threaded portion of piston for damage. Dress threads as necessary.

8. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.

9. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.

10. Inspect threaded portion of head for damage. Dress threads as necessary.

11. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

12. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.

13. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION. ENSURE 'POLY-PAK' PISTON SEALS ARE PROPERLY INSTALLED. REFER TO WIPER SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION.

1. Install two wear rings (9) in cylinder head (5).
2. Install two wear rings (10) in cylinder head.
3. Install O-Ring (6), backup ring (7), and O-ring (8) to outside grooves of cylinder head (5).
4. Slide cylinder head assembly (5) on cylinder rod (16).
5. Install O-ring (10) to inside groove of piston (11).
6. Install wear ring (13) and seal (14) in outside grooves of piston (11).
7. Using suitable protection, clamp cylinder rod (16) in a vise or similar holding fixture as close to piston (5) as possible.
8. Apply medium-high strength (red) thread-locking compound JLG P/N 0100071 or equivalent to rod threads.
9. Thread piston (5) assembly on cylinder rod (16). Do not dislodge or damage O-ring. Torque piston to 30.24 ft-lbs (41 Nm).
10. Install setscrew (12) in piston. Torque to 7.38 ft-lbs (10 Nm).

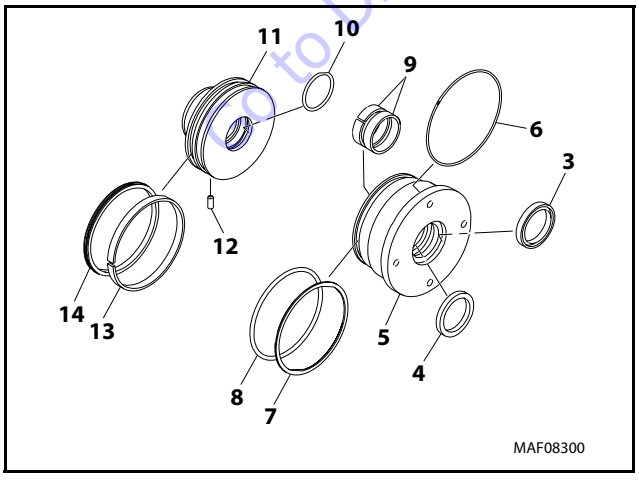


Figure 5-168. Cylinder Head and Piston Assembly

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

11. Clamp barrel (2) securely in suitable fixture and support rod. Insert piston (5) end into barrel cylinder. Do not damage or dislodge piston O-rings or seal rings.
12. Apply ant-seize compound to cylinder head threads.
13. Continue pushing rod into barrel until cylinder head can be inserted into barrel cylinder.
14. Screw in cylinder head (5) to barrel (2).
15. Adjust cylinder head until Mark up of Center Punch hole aligns with barrel.

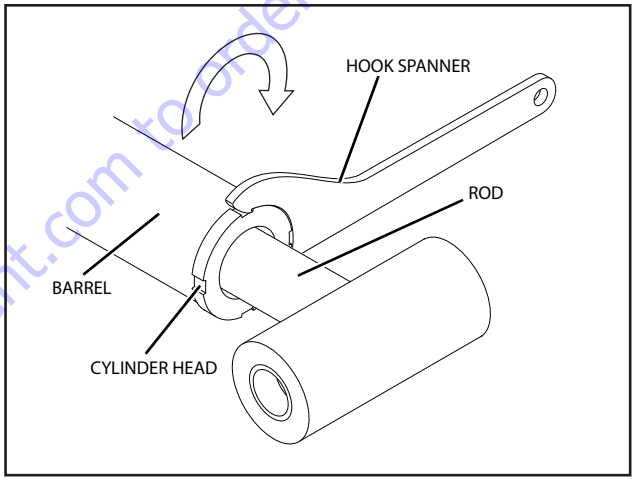


Figure 5-169. Cylinder Head Installation

Jib Telescope Cylinder

Refer to Figure 5-172.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source.
3. Place cylinder barrel in a suitable holding fixture. Clean outside of cylinder to prevent contamination.
4. Remove two bolts (3), four washers (4), two nuts (9) and wear pad (5) from bracket (7). Repeat for remaining wear pad.
5. Remove eight socket head screws (6) and two pad supports (7) from cylinder head (12). Reinstall one socket head screw finger-tight.
6. Remove three cartridge valves from valve block.
7. Tap around outside of cylinder head retainer with a suitable hammer to break thread-locking compound.

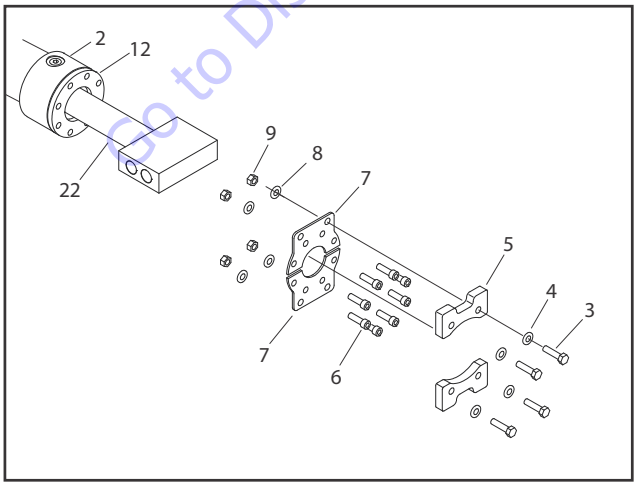


Figure 5-170. Cylinder Head and Wear Pads

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

8. Clamp barrel securely. Pull rod assembly out until piston bottoms to cylinder head.
9. Remove capscrew and pull rod assembly and cylinder head from barrel.
10. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

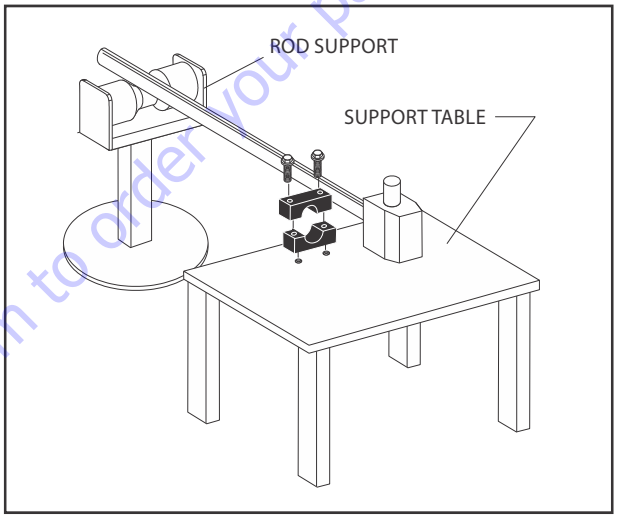
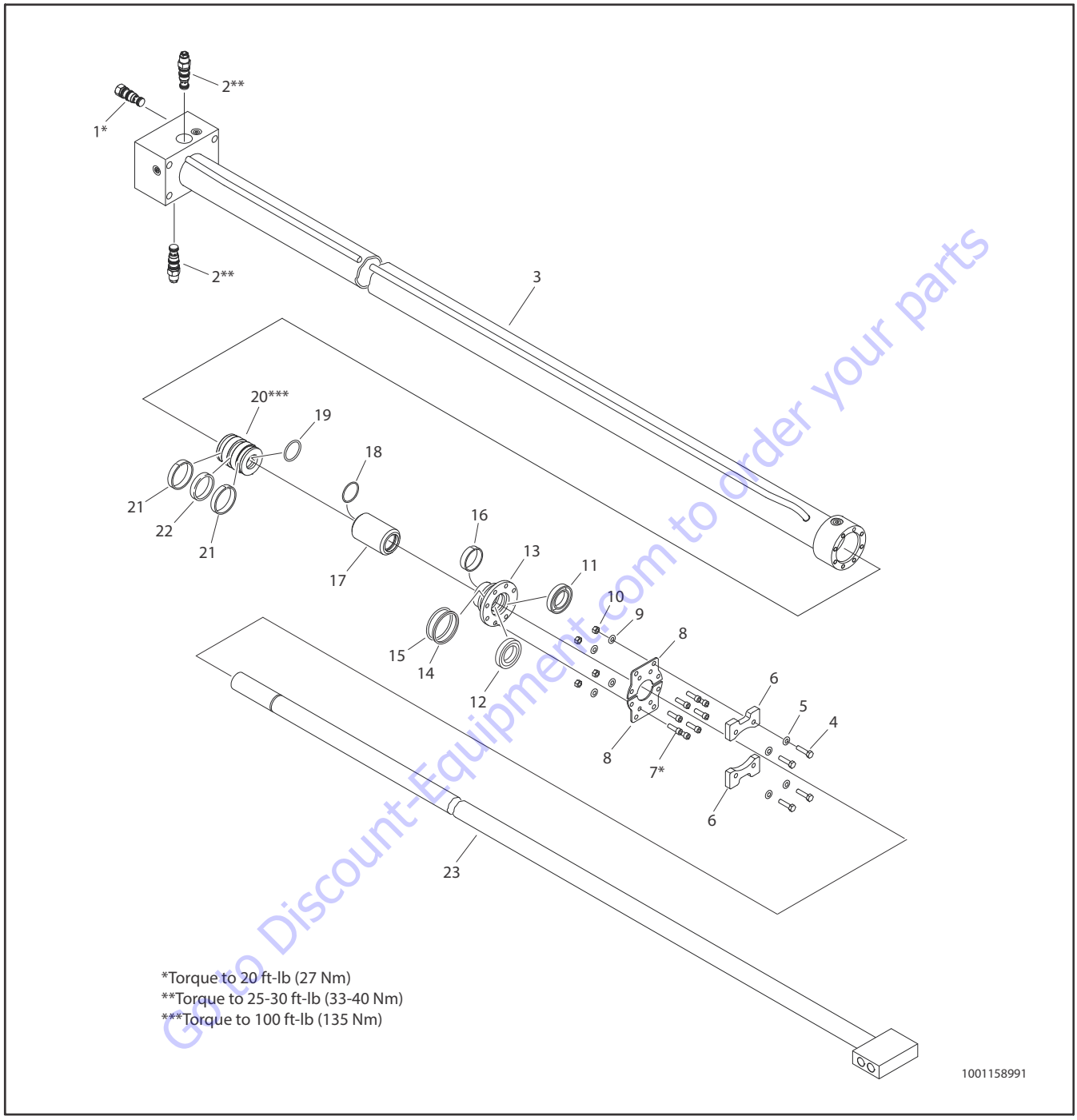


Figure 5-171. Cylinder Rod Support

11. Remove piston assembly (19) from rod (22) with spanner wrench.
12. Remove spacer assembly (16) from rod (22).
13. Remove cylinder head assembly (12) from rod (22).



1.	Shuttle Valve	5.	Washer	9.	Washer	13.	Cylinder Head	17.	Spacer	21.	Wear Ring
2.	Counterbalance Valve	6.	Wear Pad	10.	Nut	14.	Backup Ring	18.	O-Ring	22.	Seal
3.	Barrel	7.	Capscrew	11.	Wiper	15.	O- Ring	19.	O-Ring	23.	Rod
4.	Bolt	8.	Support Pad	12.	Seal	16.	Wear Ring	20.	Piston		

Figure 5-172. Jib Telescope Cylinder Assembly

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

14. Remove and discard O-ring (19), two wear rings (21), and seal (22) from piston (20).
15. Remove and discard O-ring (18) from spacer (17).

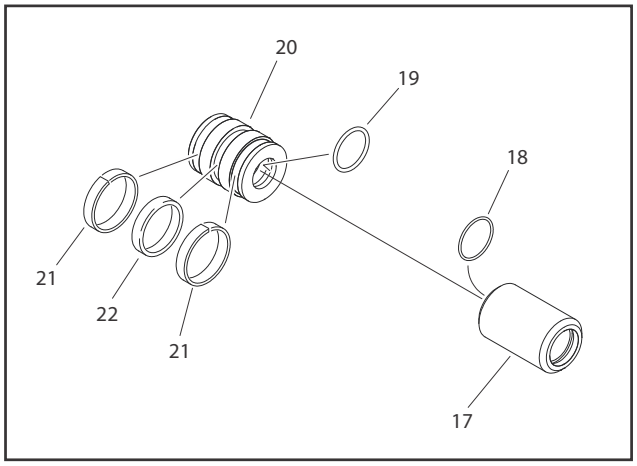


Figure 5-173. Piston and Spacer Disassembly

16. Remove rod from holding fixture and remove cylinder head.
17. Remove and discard wiper (11), seal (12), wear ring (16), O-ring (15), and backup ring (14) from cylinder head (13).

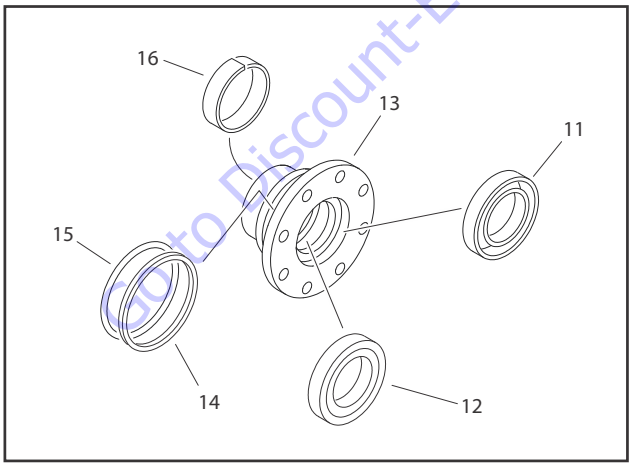


Figure 5-174. Cylinder Head Disassembly

CLEANING AND INSPECTION

NOTICE

CLEAN PARTS THOROUGHLY WITH WATER AND A RUST PREVENTATIVE ONLY. DO NOT USE ANY FORM OF DETERGENT OR SOAP.

1. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
2. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
3. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
5. Inspect threaded portion of piston for damage. Dress threads as necessary.
6. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
7. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
8. Inspect threaded portion of head for damage. Dress threads as necessary.
9. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
10. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
11. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
12. Inspect port block fittings and cartridge valves. Replace as necessary.
13. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION.

1. Install new wear ring (16) in cylinder head (13).
2. Install seal (12) and wiper (11) in cylinder head.
3. Install backup ring (14) and O-ring (15) in outside diameter grooves of cylinder head.

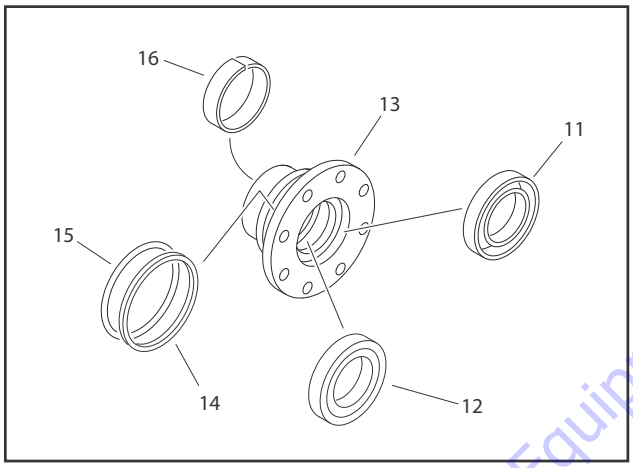


Figure 5-175. Cylinder Head Assembly

4. Install cylinder head assembly on rod. Do not damage or dislodge wiper and rod seals. Push head along rod to rod end.
5. Install O-ring (18) in spacer (17). Slide spacer on rod.
6. Install O-ring (19) to inside groove of piston (20).
7. Install seal (22) and two wear rings in outer grooves of piston.

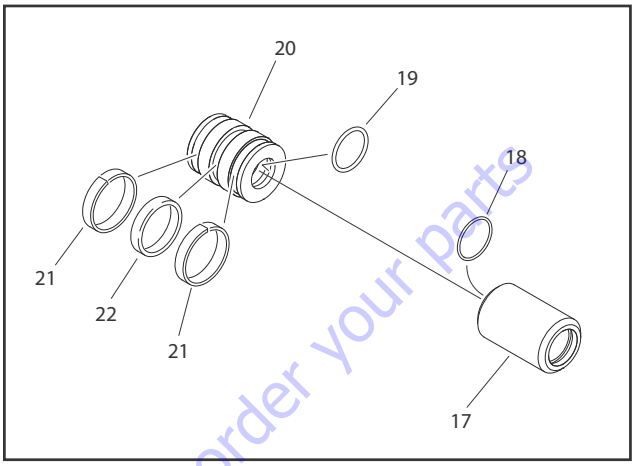


Figure 5-176. Piston and Spacer Assembly

8. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
9. Apply medium-strength locking compound JLG P/N 0100011or equivalent to rod threads.
10. Install piston on cylinder rod. Do not damage or dislodge O-ring. Torque to 100 ft-lb (135 Nm).
11. Remove cylinder rod from holding fixture.
12. Position cylinder barrel in a suitable holding fixture.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

13. Clamp barrel securely and support rod. Insert piston end into barrel cylinder. Do not damage or dislodge piston O-rings and seals.
14. Continue pushing rod into barrel until cylinder head gland can be inserted into barrel cylinder.

NOTE: *Apply locking primer and JLG Threadlocker (P/N 0100011) or equivalent to capscrew threads.*

15. Install two pad supports (7) to cylinder head (12) and barrel (2) with eight capscrews (6). Torque capscrews to 20 ft-lb (27 Nm) following sequence shown in Figure 5-178.

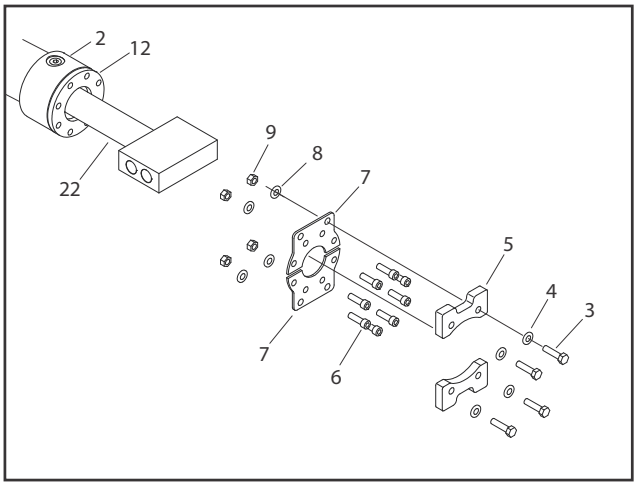


Figure 5-177. Rod Assembly Installation

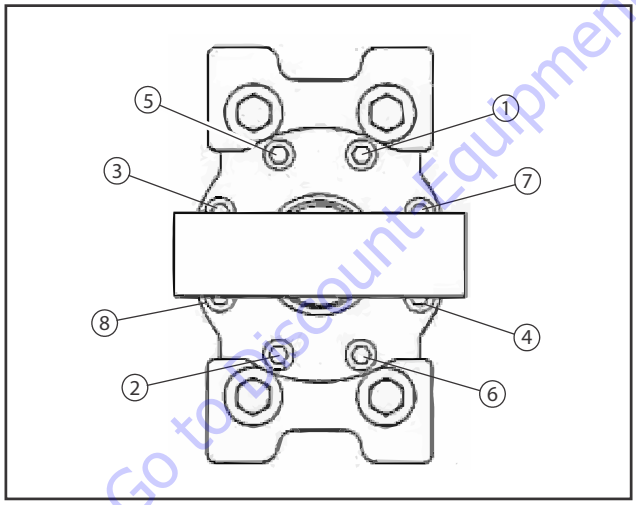


Figure 5-178. Cylinder Head Torque Sequence

16. Install each wear pad (5) with two bolts (3), four washers (4) and two bolts (9).

17. Install shuttle valve (1) with new O-ring in valve block. Torque to 20 ft-lb (27 Nm).

18. Install two counterbalance valves (2) with new O-rings in valve block. Torque to 25-30 ft-lb (33-40 Nm).

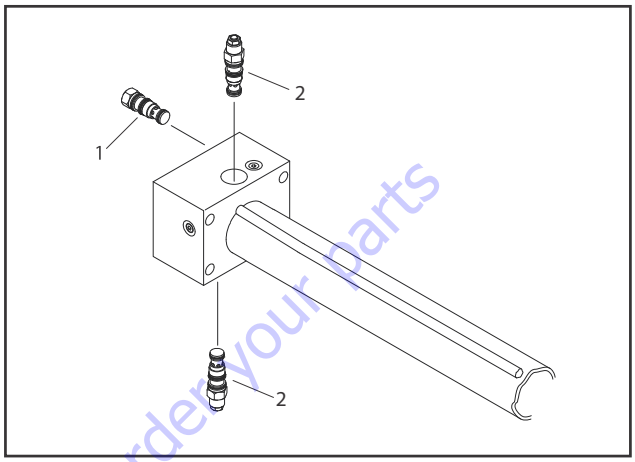


Figure 5-179. Valve Installation

Boom Telescope Cylinder (SN 0300190128 through 0300244677)

Refer to Figure 5-183.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.

3. Place cylinder barrel in a suitable holding fixture.

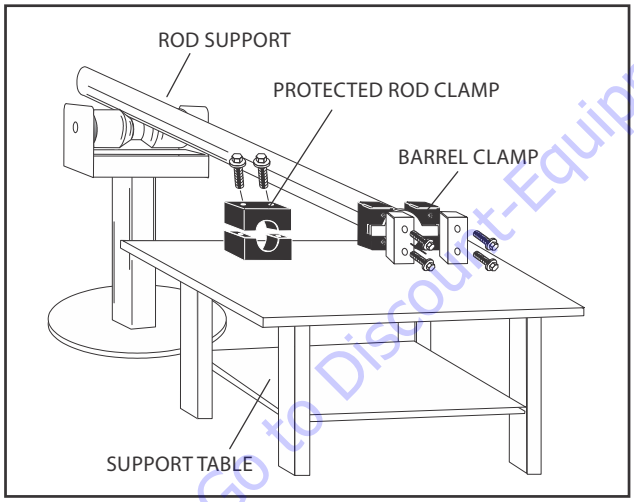


Figure 5-180. Cylinder Barrel Support

4. Remove check valves (3), counterbalance valves (4), and fittings from valve block (2). Discard O-rings. Remove four capscrews (1) and valve block from rod (7). Discard O-rings (5, 6).

5. Mark cylinder head (23) and barrel (28) with center punch marks for later realignment. Remove two capscrews (27) and bracket (26).

6. Remove six remaining capscrews (25) and washers (24).

7. Tap around outside of Cylinder Head with a suitable hammer to break thread-locking compound. Unscrew Cylinder Head (23).

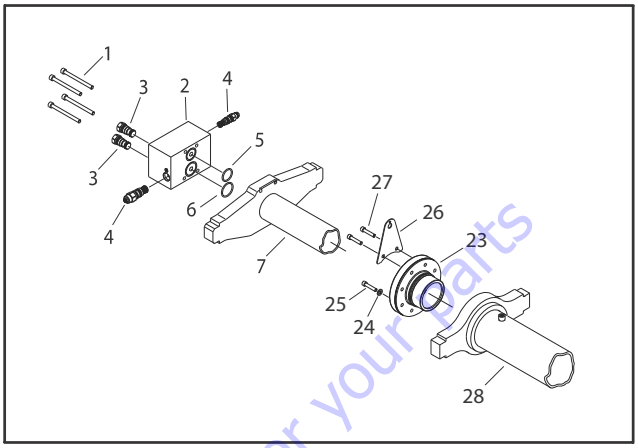


Figure 5-181. Port Block And Rod Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

8. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.

9. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

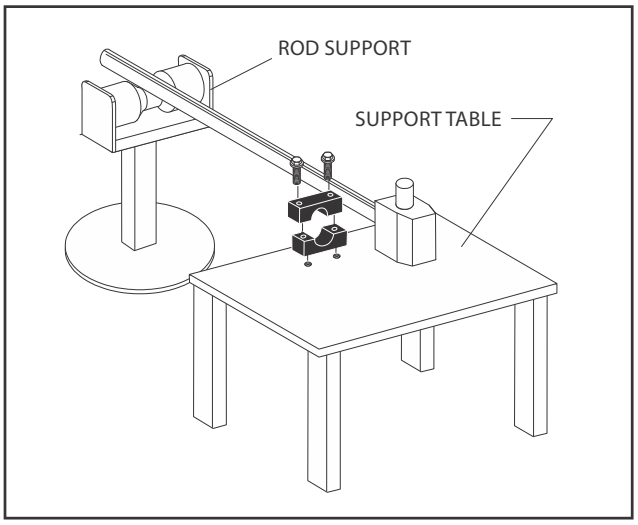
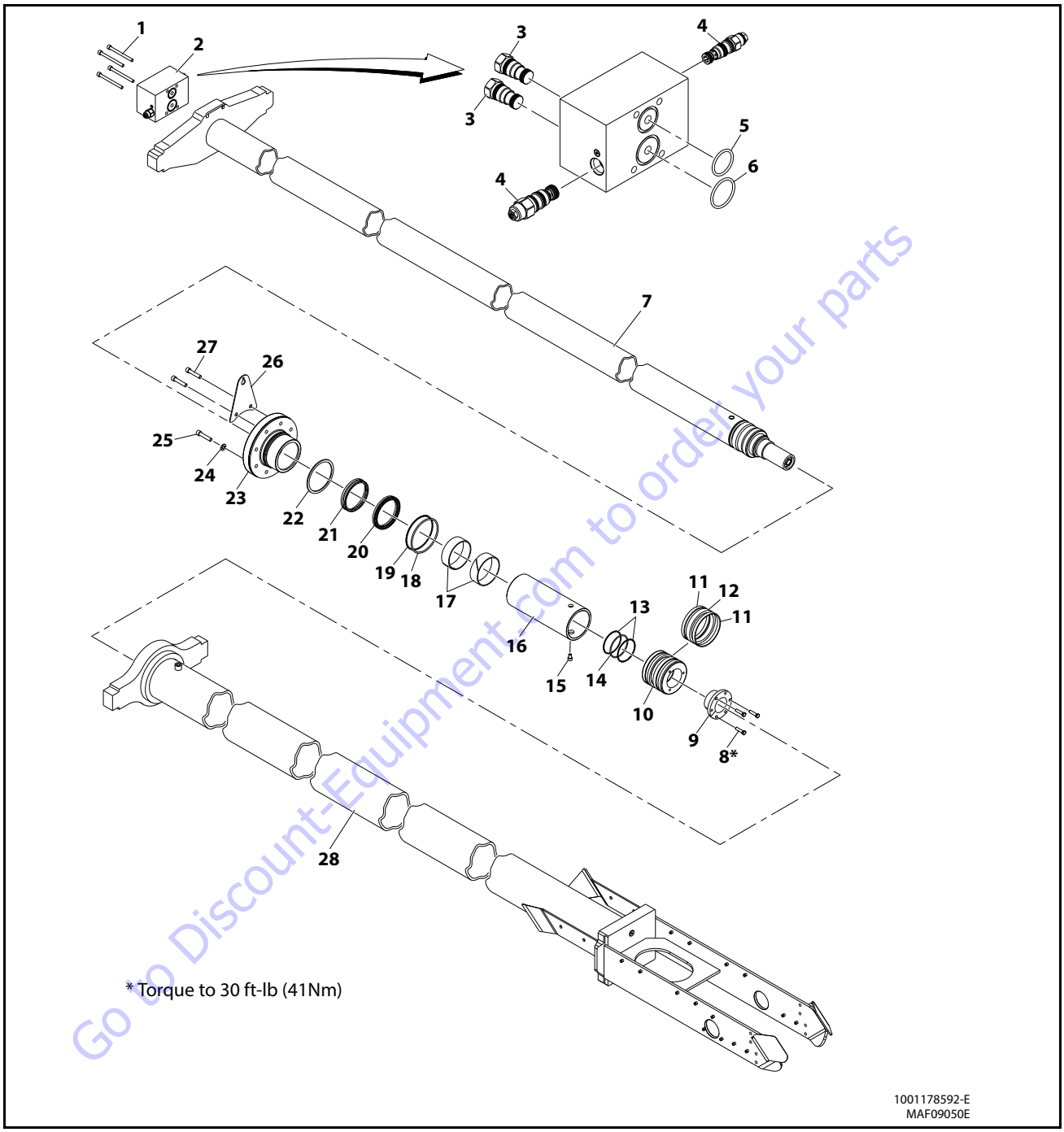


Figure 5-182. Cylinder Rod Support



1. Capscrew
2. Valve Block
3. Check Cartridge
4. Counterbalance Valve
5. O-Ring
6. O-Ring
7. Rod
8. Bolt
9. Tapered Bushing
10. Piston
11. Wear Ring
12. Seal
13. Backup Ring
14. Washer Ring
15. Capscrew
16. Spacer
17. Wear Ring
18. O-Ring
19. Back-Up Ring
20. Rod Seal
21. Wiper Seal
22. Retaining Ring
23. Cylinder Head
24. Washer
25. Capscrew
26. Bracket
27. Capscrew
28. Barrel

Figure 5-183. Boom Telescope Cylinder Assembly (SN 0300190128 through 0300244677)

10. Remove three bolts attaching tapered bushing to piston.

11. Insert bolts in threaded holes in outer piece of tapered bushing. Alternately tighten bolts until bushing is loose on piston. Remove tapered bushing from piston.

12. Remove piston from cylinder rod.

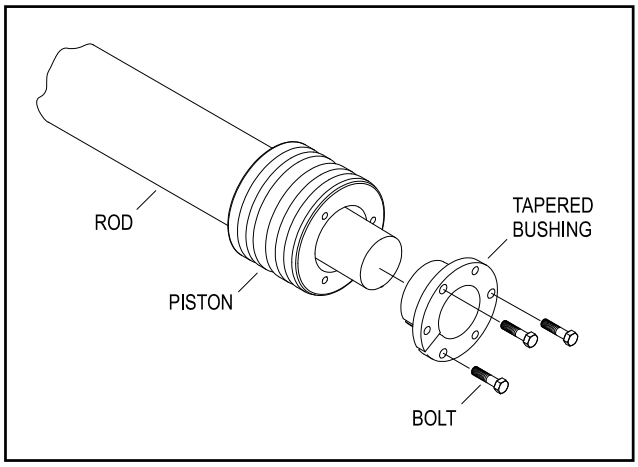


Figure 5-184. Tapered Bushing Removal

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

13. Remove and discard two backup rings (13), washer ring (14), two wear rings (11), and seal (12) from piston (10).

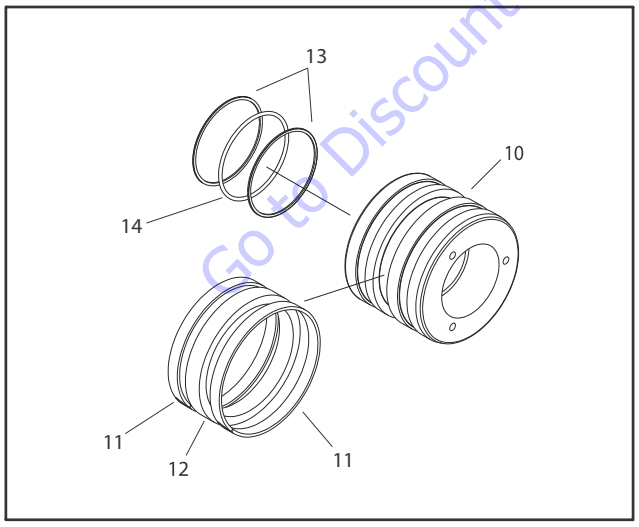


Figure 5-185. Piston Disassembly

14. Remove capscrew (15) and spacer (16) from rod (7).

15. Remove rod from holding fixture.

NOTE: *Record orientation of rings for reassembly.*

16. Remove cylinder head (23) from rod (7). Remove and discard O-Ring (18), backup ring (19), retaining ring (22), wiper seal (21), rod seal (20), and two wear rings (17).

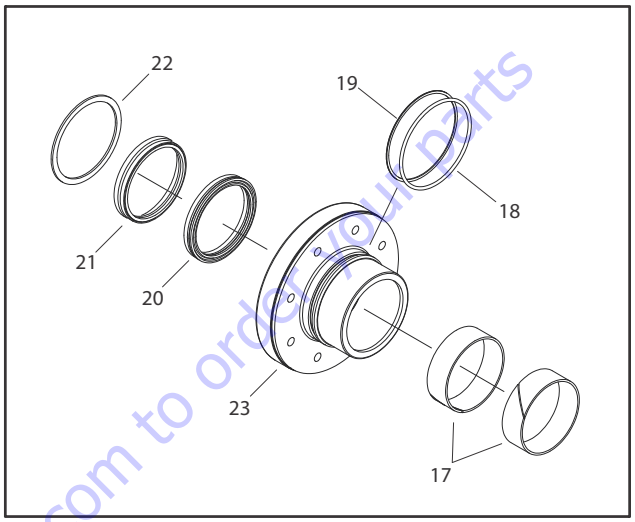


Figure 5-186. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect threaded portion of barrel for damage. Dress threads as necessary.
5. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
6. Inspect threaded portion of piston for damage. Dress threads as necessary.
7. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
8. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
9. Inspect threaded portion of cylinder head for damage. Dress threads as necessary.
10. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
11. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
12. Inspect spacer for burrs and sharp edges. Dress inside diameter surface with Scotch Brite or equivalent.
13. Inspect port block fittings and cartridge valves. Replace as necessary.
14. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION. WIPER SEAL ROUNDED SURFACE MUST FACE TOWARD PISTON AS NOTED DURING DISASSEMBLY.

1. Install rod seal (20), wiper seal (21), and locking ring (22) in cylinder head (23).
2. Install two wear rings (17) in cylinder head.
3. Install backup ring (19) and O-ring (18) on cylinder head.

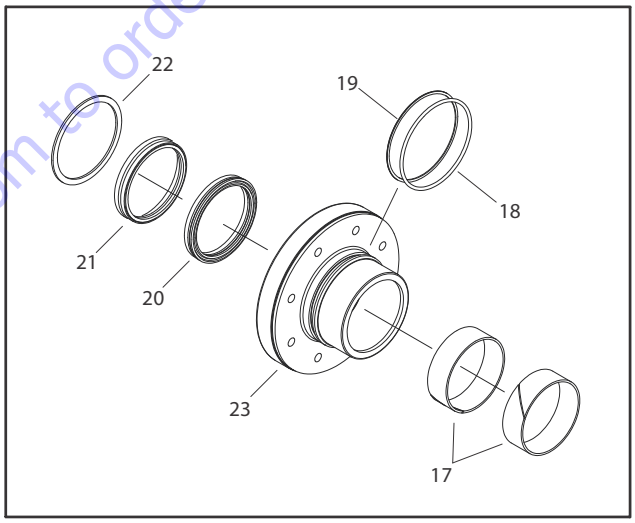


Figure 5-187. Cylinder Head Seal Kit Installation

4. Install cylinder head assembly (23) on rod (7). Do not damage or dislodge wiper and rod seals. Push cylinder head along rod to rod end.

5. Install Spacer (16) on Rod (7) with screw hole facing toward piston end. Align hole in spacer and rod. Apply locking primer and medium strength (Blue) locking compound JLG P/N 0100011 or equivalent to socket head capscrew (10). Install capscrew.

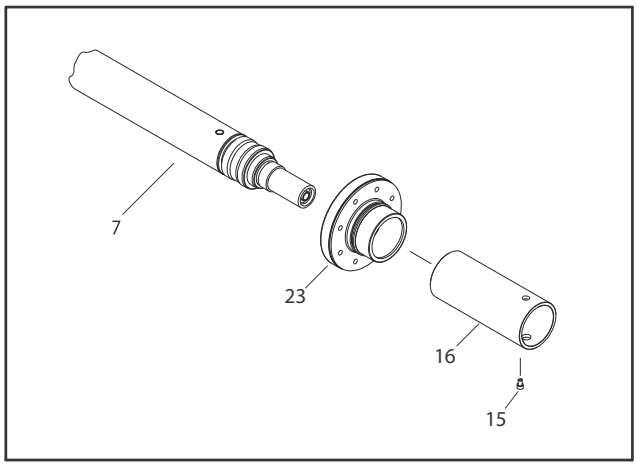


Figure 5-188. Cylinder Head and Spacer Installation

6. Install backup ring (13), washer ring (14), and backup ring (13) in piston (11).

7. Install seal (12), and two wear rings (11) on piston.

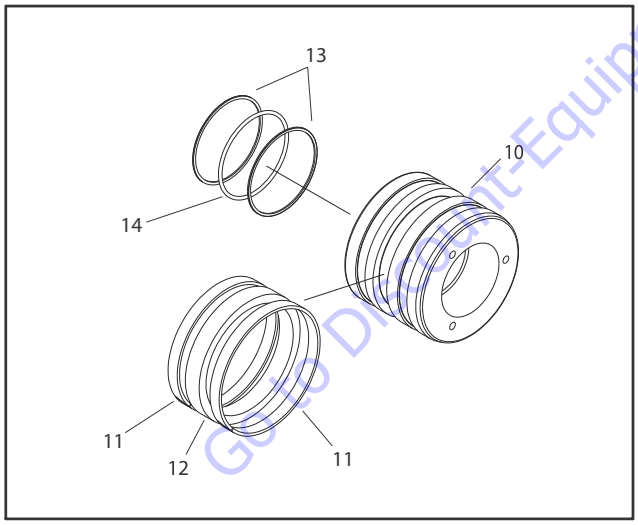


Figure 5-189. Piston Seal Kit Installation

8. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.

9. Carefully thread piston on cylinder rod hand tight, Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

10. Thread piston on rod until it aligns with spacer end and install tapered bushing.

11. Apply JLG Threadlocker (P/N 0100011) to tapered bushing bolts. Assemble the tapered bushing loosely into the piston and insert capscrews through the drilled holes in the bushing and into the tapped holes in the piston.

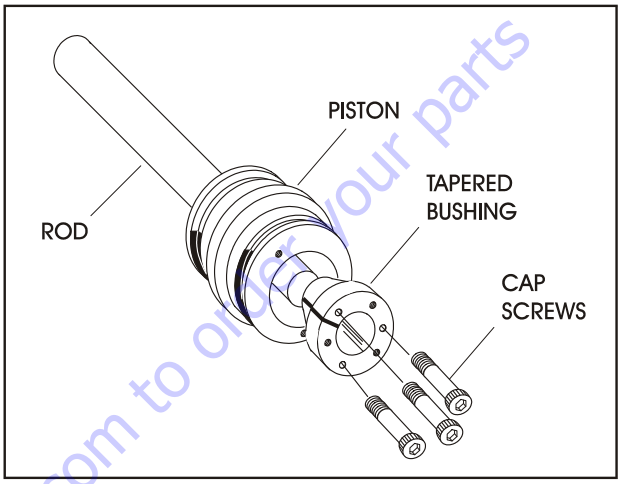


Figure 5-190. Tapered Bushing Installation

12. Tighten the capscrews evenly and progressively in rotation to 30 ft-lb (41 Nm).

13. After the screws have been torqued, tap the tapered bushing with a hammer (16 to 24 oz.) and brass shaft (approximately 3/4" in diameter) as follows;

    a. Place the shaft against the cylinder rod and in contact with the bushing in the spaces between the capscrews.

b. Tap each space once; this means the tapered bushing is tapped 3 times as there are 3 spaces between the capscrews.

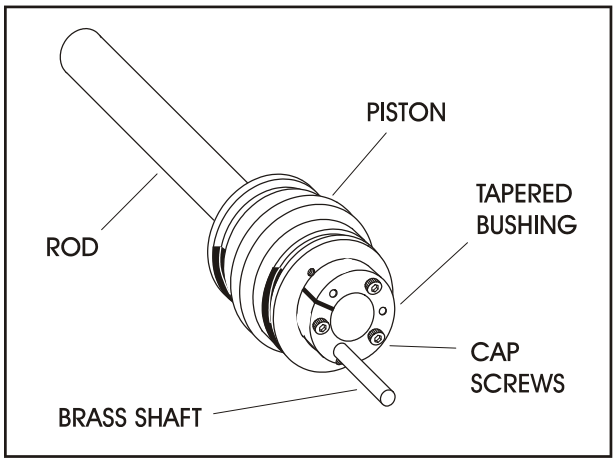


Figure 5-191. Seating the Tapered Bearing

14. Retorque the capscrews evenly and progressively in rotation to 30 ft-lb (41 Nm).

15. Remove cylinder rod from holding fixture.

16. Position cylinder barrel in a suitable holding fixture.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

17. Clamp barrel clamped securely and support rod. Insert piston end into barrel. Do not damage or dislodge piston O-ring and seal ring.

18. Push rod in barrel until cylinder head can be inserted.

19. Install cylinder head (23) in barrel (28) and align marks made during disassembly.

NOTE: *Apply locking primer and JLG Threadlocker (P/N 0100011 to capscrews.*

20. Install bracket (26) with two capscrews (27).

21. Install six washers (24) and capscrews (25). Tighten all capscrews.

22. Install small O-ring (5) and large O-ring (6) in valve block (2). Install valve block to rod (7) with four capscrews (1).

23. Install two check cartridges (3) and two counterbalance valves (4) with new O-rings in valve block (2).

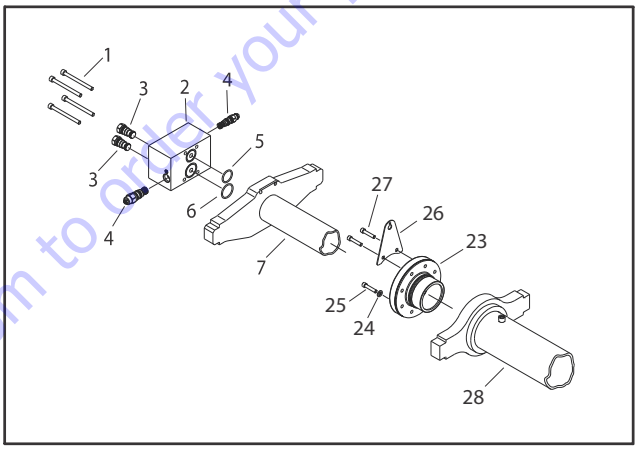


Figure 5-192. Rod Assembly And Valve Installation

Boom Telescope Cylinder (SN 0300244678 to Present)

Refer to Figure 5-196.

DISASSEMBLY

NOTICE

CONTAMINATION MAY DAMAGE EQUIPMENT. DISASSEMBLE CYLINDER ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to cylinder port block fitting.

⚠ WARNING

DO NOT FULLY EXTEND CYLINDER TO END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder. Shut down and disconnect power source. Adequately support cylinder rod.
3. Remove the plugs from the cylinder ports.
4. Place cylinder barrel in a suitable holding fixture.

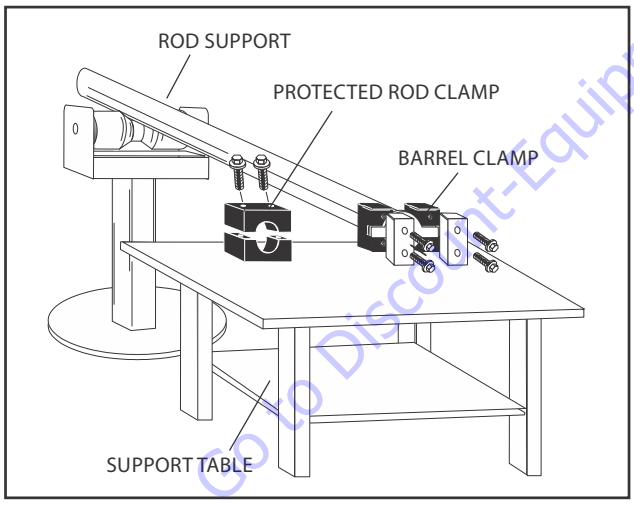


Figure 5-193. Cylinder Barrel Support

5. Remove check valves (3), counterbalance valves (4), and fittings from valve block (2). Discard O-rings. Remove four capscrews (1) and valve block from rod (7). Discard O-rings (5, 6).
6. Mark cylinder head (21) and barrel (25) with center punch marks for later realignment. Remove two capscrews (23) and bracket (24).
7. Remove remaining capscrews (23) and washers (22).
8. Tap around outside of Cylinder Head with a suitable hammer to break thread-locking compound. Unscrew Cylinder Head (23).

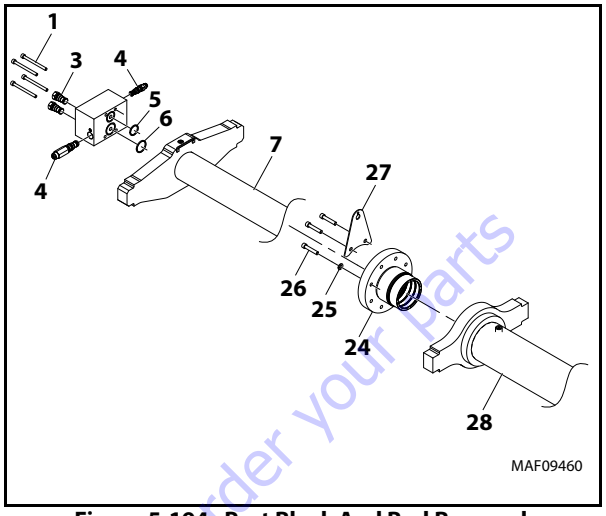


Figure 5-194. Port Block And Rod Removal

NOTICE

PULLING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN REMOVING CYLINDER ROD, HEAD, AND PISTON.

9. Clamp barrel securely. Pull rod assembly and cylinder head from barrel.
10. Protect cylinder rod from damage and clamp in a vise or holding fixture as close to piston as possible.

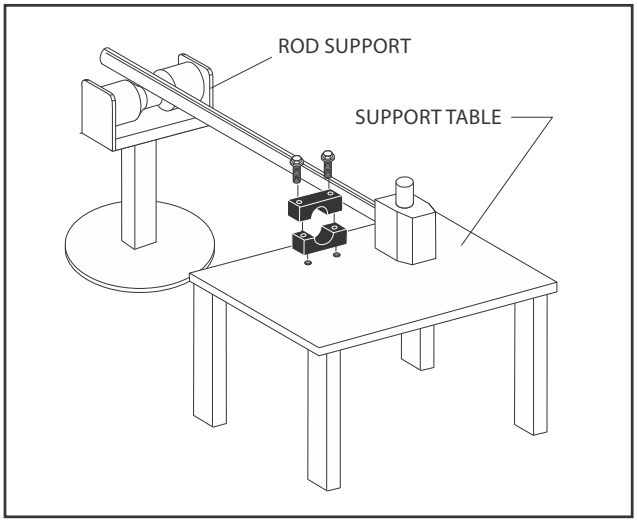
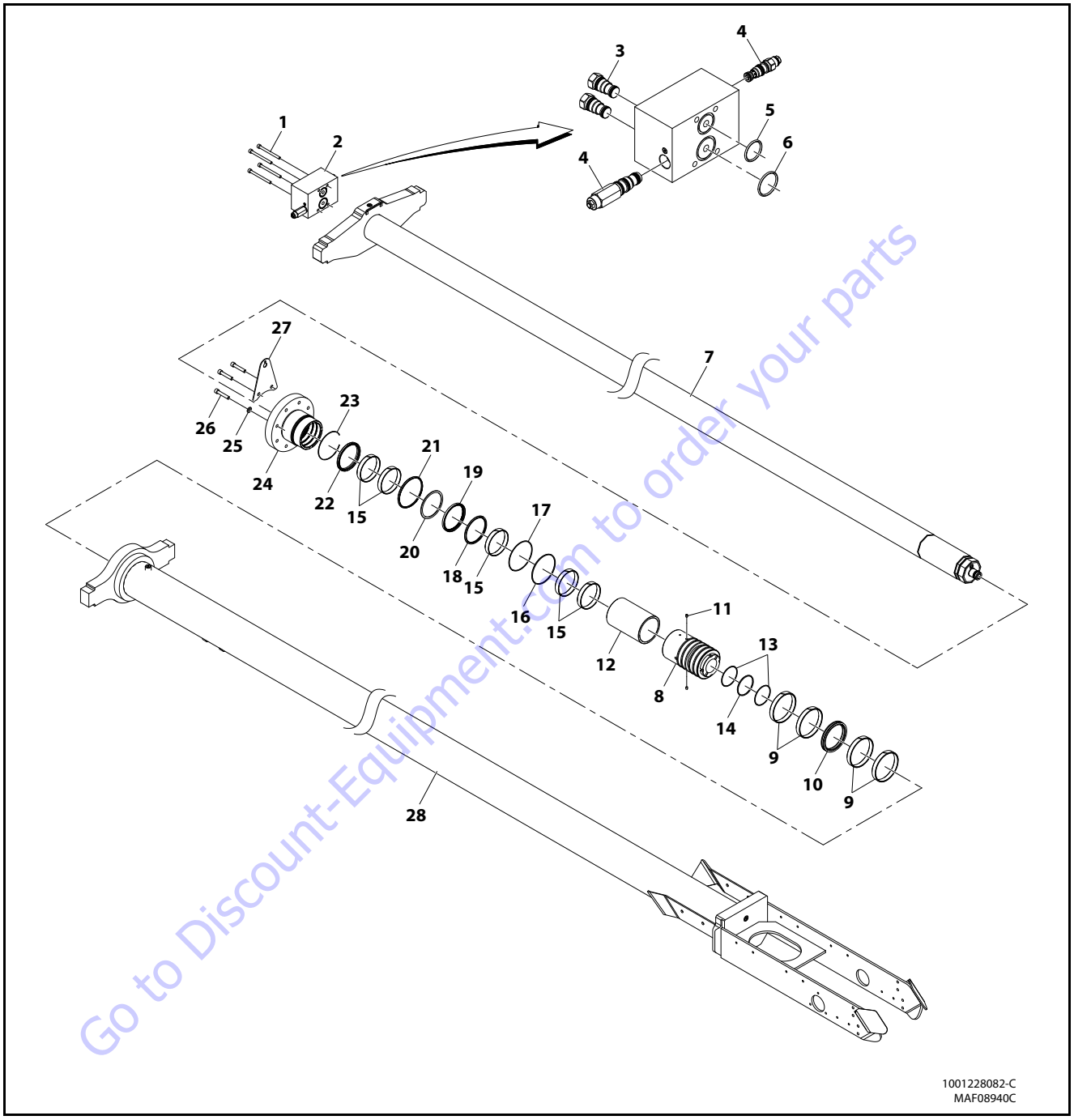


Figure 5-195. Cylinder Rod Support



1. Capscrew
2. Valve Block
3. Check Cartridge
4. Counterbalance Valve
5. O-Ring
6. O-Ring
7. Rod
8. Piston
9. Wear Ring
10. Piston Seal
11. Setscrew
12. Spacer
13. Wear Ring
14. O-Ring
15. O-Ring
16. Rod Seal
17. Back-Up Ring
18. Head Back-Up Ring
19. Wiper Seal
20. Retaining Ring
21. Cylinder Head
22. Washer
23. Capscrew
24. Bracket
25. Barrel

Figure 5-196. Boom Telescope Cylinder Assembly (SN 0300244678 to Present)

11. Loosen and remove the setscrew which attaches the piston to the rod.

12. Screw the piston counterclockwise and remove the piston from cylinder rod.

13. Remove and discard the piston seal and O-ring.

14. Remove spacer from the rod.

15. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, wearing, retaining ring, and wiper seal.

NOTICE

REMOVE SEALS USING A BRASS OR PLASTIC PICK ONLY. DO NOT USE A KNIFE, SHARP OBJECT, OR SCREW DRIVER. MAKE NOTE OF SEAL ORIENTATION BEFORE REMOVING FOR PROPER INSTALLATION.

16. Remove and discard piston seal (10) and piston wear ring (9) from piston (8).

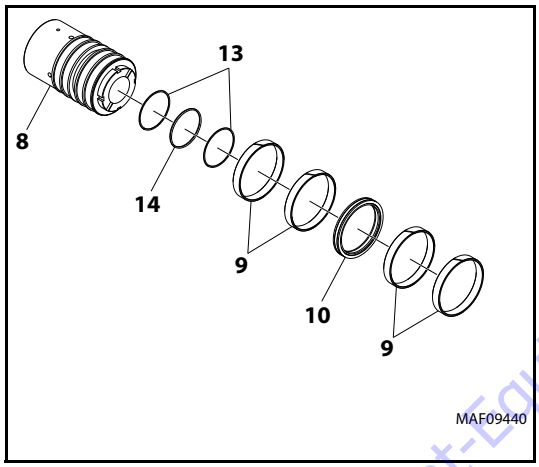


Figure 5-197. Piston Disassembly

17. Remove spacer (12) from rod (7).

18. Remove rod from holding fixture.

NOTE: *Record orientation of rings for reassembly.*

19. Remove cylinder head (21) from rod (7). Remove and discard O-Ring (14 and 15), backup ring (17), head backup ring (18), wiper seal (19), rod seal (16), retaining ring (20), and wear rings (13).

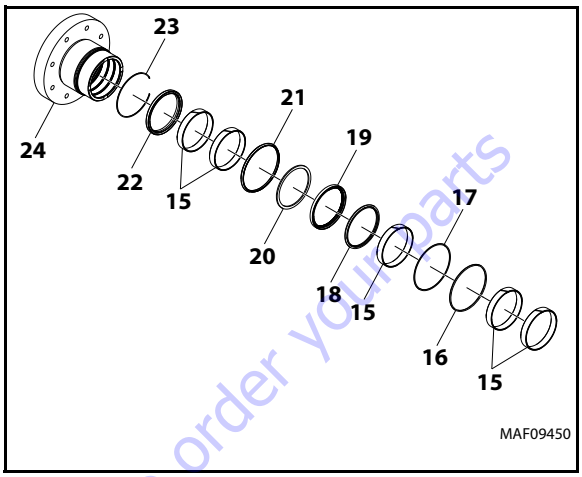


Figure 5-198. Cylinder Head Disassembly

CLEANING AND INSPECTION

1. Clean parts thoroughly with approved cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect threaded portion of barrel for damage. Dress threads as necessary.
5. Inspect piston surface for damage, scoring, or distortion. Dress piston surface or replace piston as necessary.
6. Inspect threaded portion of piston for damage. Dress threads as necessary.
7. Inspect seal and O-ring grooves in piston for burrs and sharp edges. Dress surfaces as necessary.
8. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace as necessary.
9. Inspect threaded portion of cylinder head for damage. Dress threads as necessary.
10. Inspect seal and O-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
11. Inspect cylinder head outside diameter for scoring, damage, ovality, and tapering. Replace as necessary.
12. Inspect spacer for burrs and sharp edges. Dress inside diameter surface with Scotch Brite or equivalent.
13. Inspect port block fittings and cartridge valves. Replace as necessary.
14. Inspect oil ports for blockage or presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Use proper cylinder seal kit for cylinder assembly. See your JLG Parts Manual.*

Apply a light film of hydraulic oil to all components before assembly.

NOTICE

IMPROPER SEAL INSTALLATION CAN CAUSE CYLINDER LEAKS AND IMPROPER CYLINDER OPERATION. WIPER SEAL ROUNDED SURFACE MUST FACE TOWARD PISTON AS NOTED DURING DISASSEMBLY.

1. Install O-Ring (14), backup ring (17), wiper seal (19), rod seal (16), retaining ring (20) in cylinder head (23).
2. Install wear rings (13) in cylinder head (21).
3. Install head backup ring (18) and O-ring (15) on cylinder head (21).

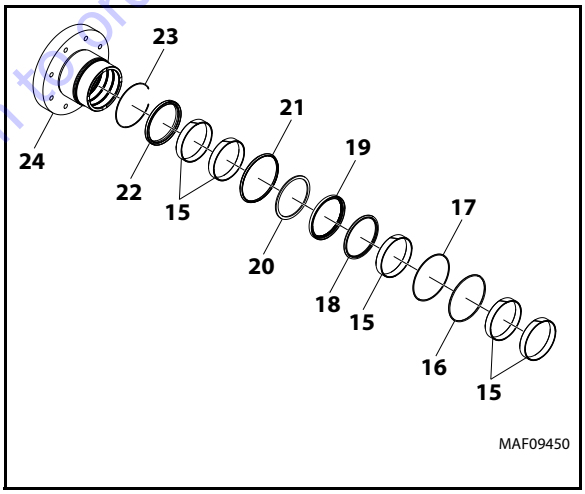


Figure 5-199. Cylinder Head Seal Kit Installation

4. Install cylinder head assembly (21) on rod (7). Do not damage or dislodge wiper and rod seals. Push cylinder head along rod to rod end.

5. Install Spacer (12) on Rod (7) with screw hole facing toward piston end. Align hole in spacer and rod.
6. Install piston seal (10) in piston (8).
7. Install piston wear rings (9) on piston (8).

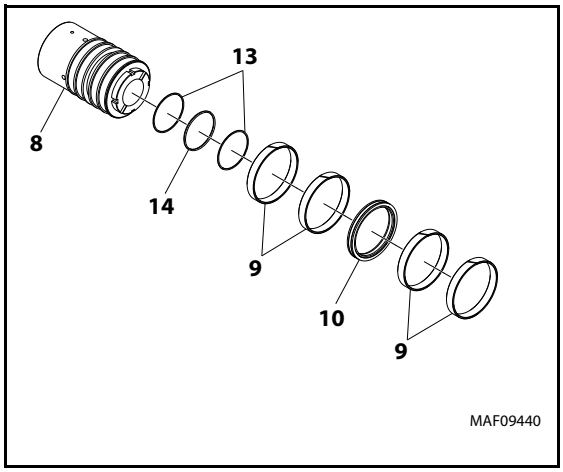


Figure 5-200. Piston Seal Kit Installation

8. Using suitable protection, clamp cylinder rod in a vise or similar holding fixture as close to piston as possible.
9. Carefully thread piston on cylinder rod hand tight, Ensure O-ring and back-up rings are not damaged or dislodged.

NOTE: *Piston and mating end of rod must be free of oil when installing tapered bushing.*

10. Thread piston on rod until it aligns with spacer end.
11. Remove cylinder rod from holding fixture.
12. Position cylinder barrel in a suitable holding fixture.

NOTICE

INSERTING ROD OFF-CENTER CAN DAMAGE PISTON AND CYLINDER BARREL SURFACES. USE EXTREME CARE WHEN INSTALLING CYLINDER ROD, HEAD, AND PISTON.

13. Clamp barrel clamped securely and support rod. Insert piston end into barrel. Do not damage or dislodge piston O-ring and seal ring.
14. Push rod in barrel until cylinder head can be inserted.
15. Install cylinder head (21) in barrel (25) and align marks made during disassembly
16. Install bracket (24) with capscrews (23).
17. Install washers (22) and capscrews (23). Tighten all capscrews.
18. Install small O-ring (5) and large O-ring (6) in valve block (2). Install valve block (2) to rod (7) with capscrews (1).
19. Install two check cartridges (3) and two counterbalance valves (4) with new O-rings in valve block (2).

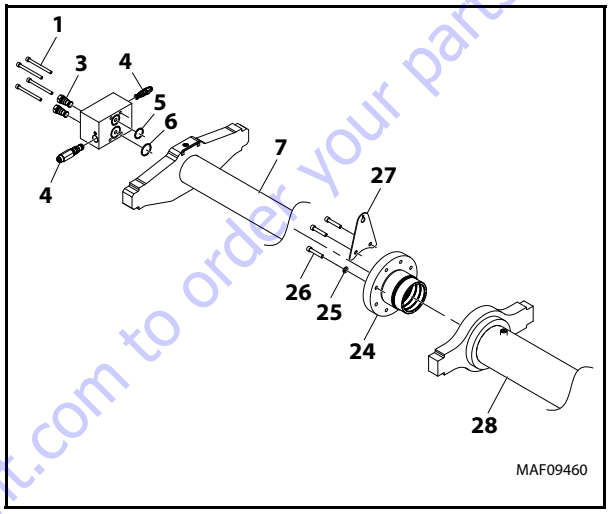


Figure 5-201. Rod Assembly And Valve Installation

5.4 CYLINDER LENGTH SENSOR

Both the jib lift cylinder and the platform level cylinder utilize a cylinder length sensor which communicates with the JLG control system. These sensors can be removed from without the cylinder being disassembled.

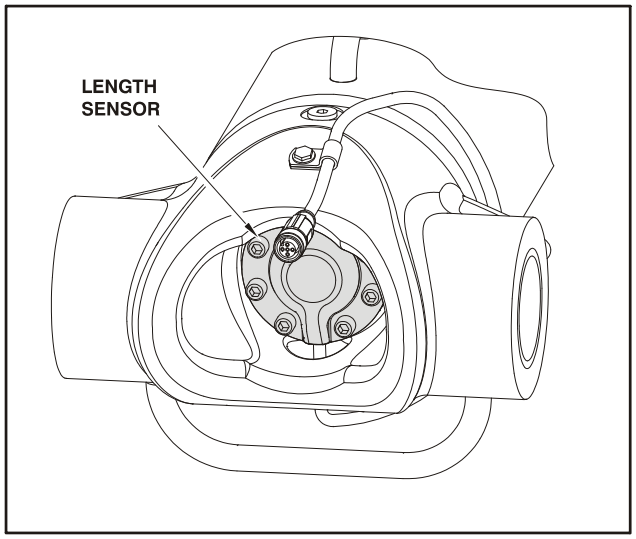


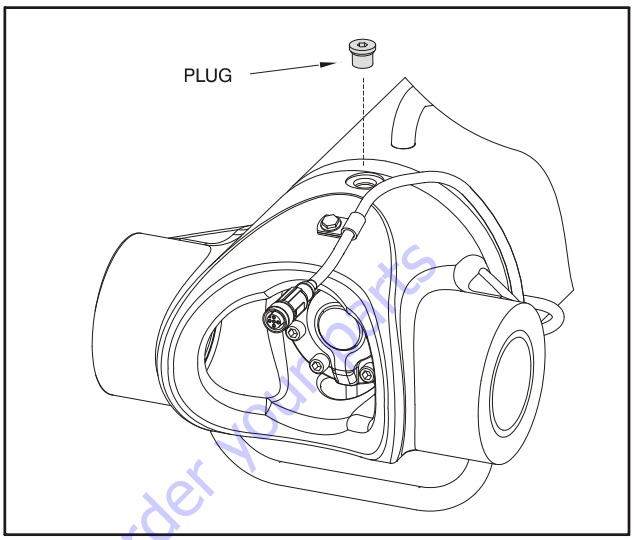
Figure 5-202. Cylinder Length Sensor

Removal

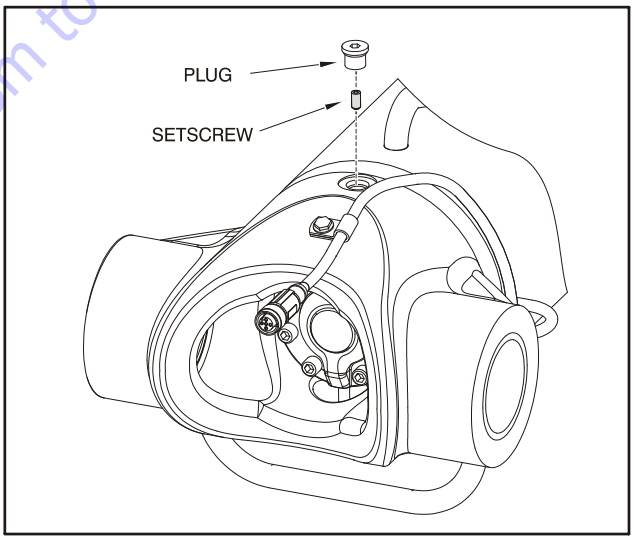
1. Lower the platform to the ground or on suitable blocking.

NOTE: The jib lift cylinder weighs approximately 186 lbs.(84 kg) and the platform level cylinder weighs approximately 76 lbs. (34 kg)

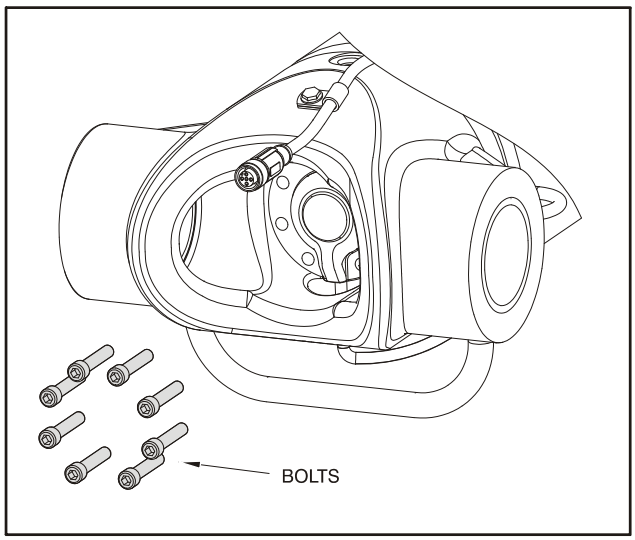
2. Support the weight of the jib cylinder and remove the bolt and keeper pin that secure the cylinder barrel retaining pin. Remove the pin.
3. Lower the cylinder to a horizontal position to gain access to the rear of the cylinder.
4. Place a catch pan under the cylinder to capture any oil that may drain out of the cylinder. If the cylinder is removed from the machine, drain the oil out of the cylinder.
5. Remove the plug that is over the setscrew that secures the sensor in place.

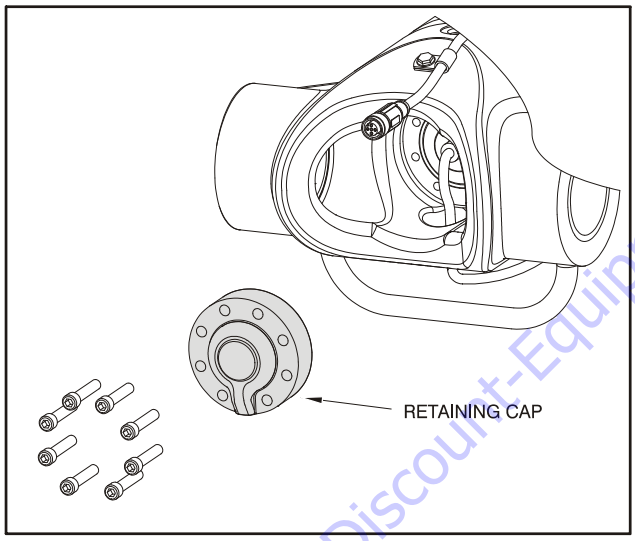


6. Using an allen wrench, remove the setscrew.

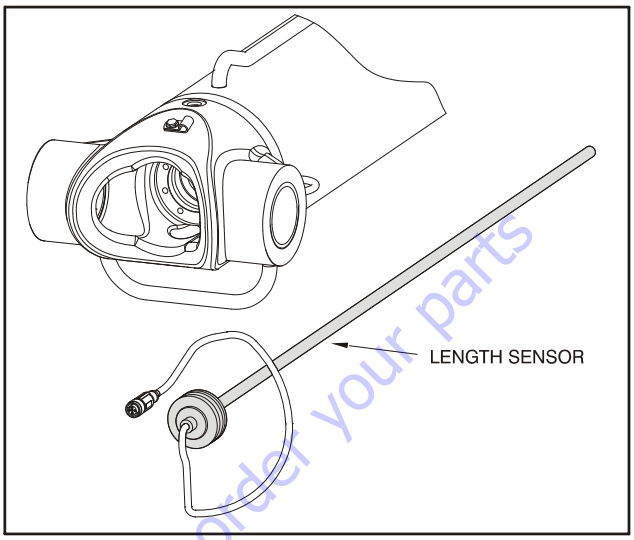


7. Using an allen wrench, remove the bolts securing the retaining cap and remove the cap.



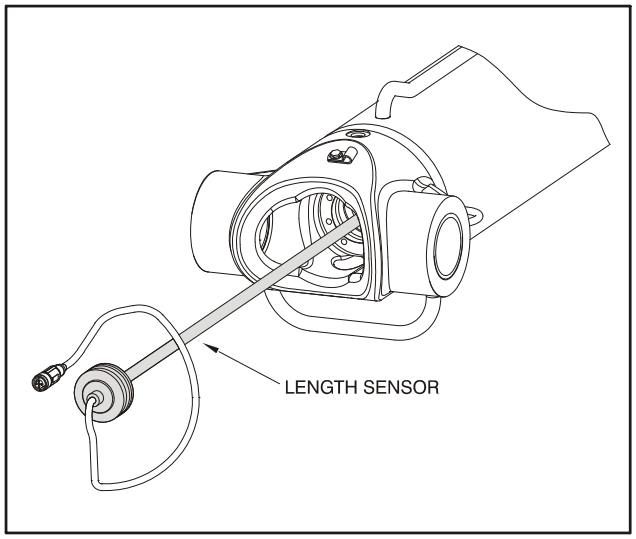


8. Pull sensor out of the cylinder. DO NOT use the wiring harness to pull the sensor out as this will cause damage to the wiring.

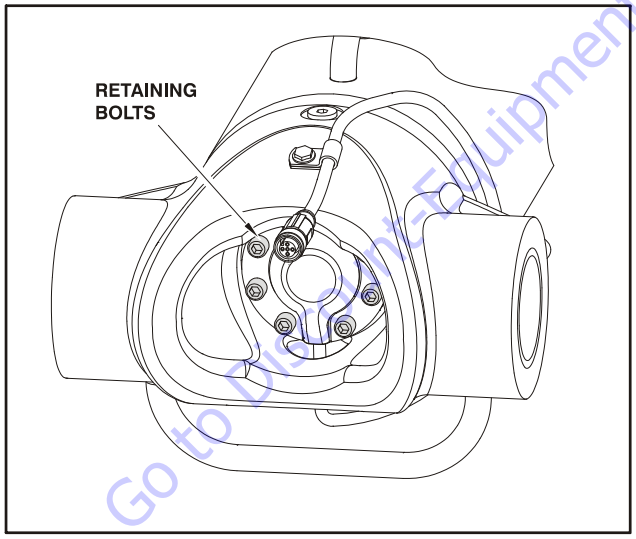


Installation

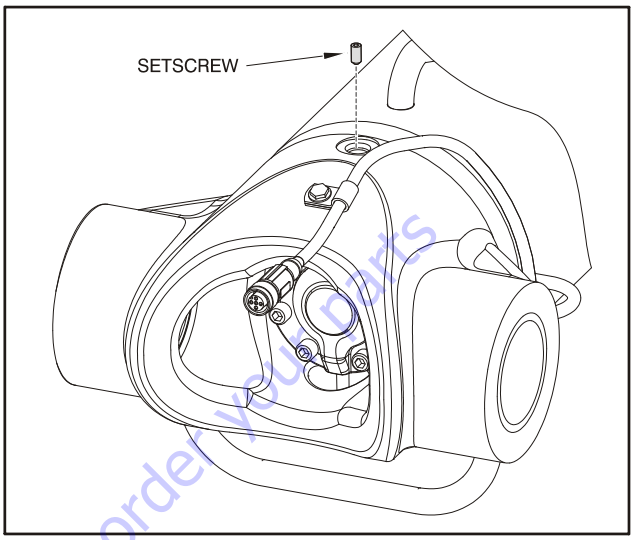
1. Carefully insert the sensor into the cylinder. It may be necessary to gently tap the end of the sensor to seat the o-ring into the sensor bore. DO NOT tap on the wiring harness.



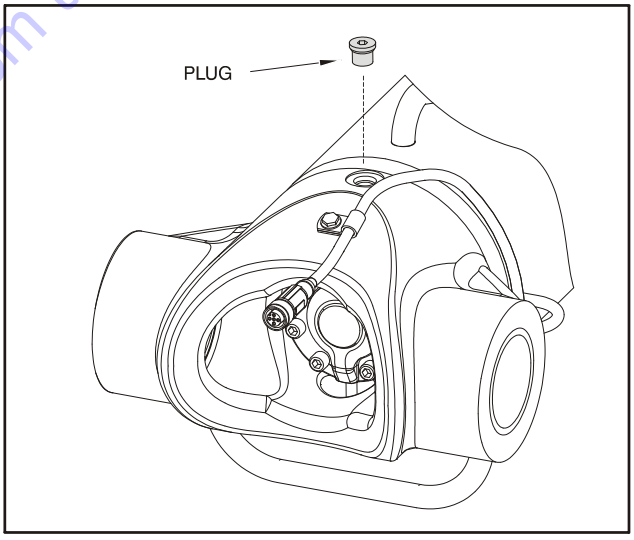
2. Install the cap and secure in place with the retaining bolts.



3. Apply lubricant JLG P/N 3020039 to the setscrew and install the setscrew. Torque the setscrew to 4 in. lbs. (0.45 Nm).



4. Install the plug over the setscrew.



5. Raise the cylinder back in place and install the retaining pin.
6. Install the keeper pin and retaining bolt.
7. Check the cylinder for proper operation.

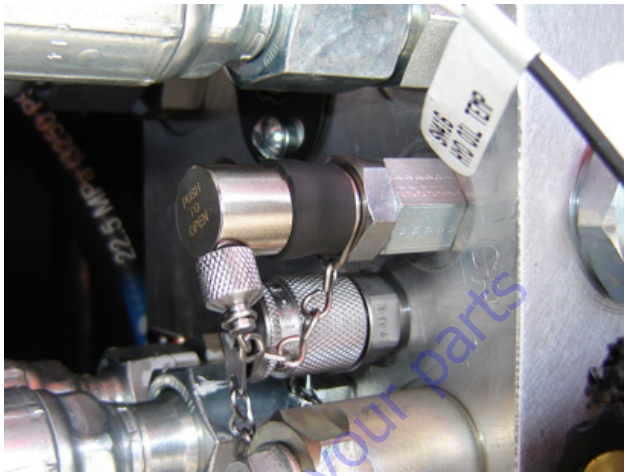
5.5 OIL SAMPLING

See Figure 5-203., Oil Sampling Valve Location.

This machine is equipped with an oil sampling valve to allow for verification of hydraulic oil condition.

Procedure

1. Function the machine for approximately 15 minutes operating all functions.
2. Switch the select switch to the ground controls and start the engine.
3. Locate the oil sampling valve on the front of the main control valve.
4. Unscrew the knurled end which is attached to the chain.



5. Place a drip pan under the spout and push in for approximately 10 seconds. This should flush out the valve.
6. Open and place the sample bottle under the spout.
7. Push in on the end of the valve and fill up the bottle.
8. Cap the bottle immediately.
9. Thread the knurled cap back onto the valve.
10. The sample is complete.

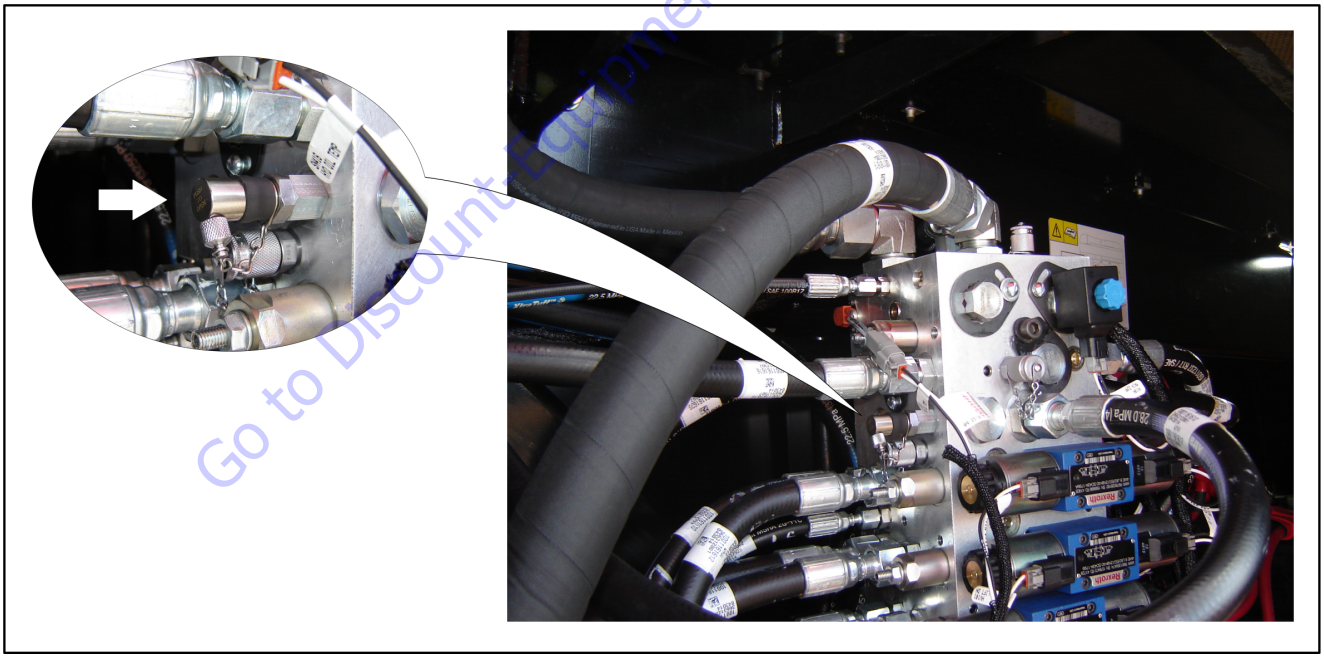


Figure 5-203. Oil Sampling Valve Location

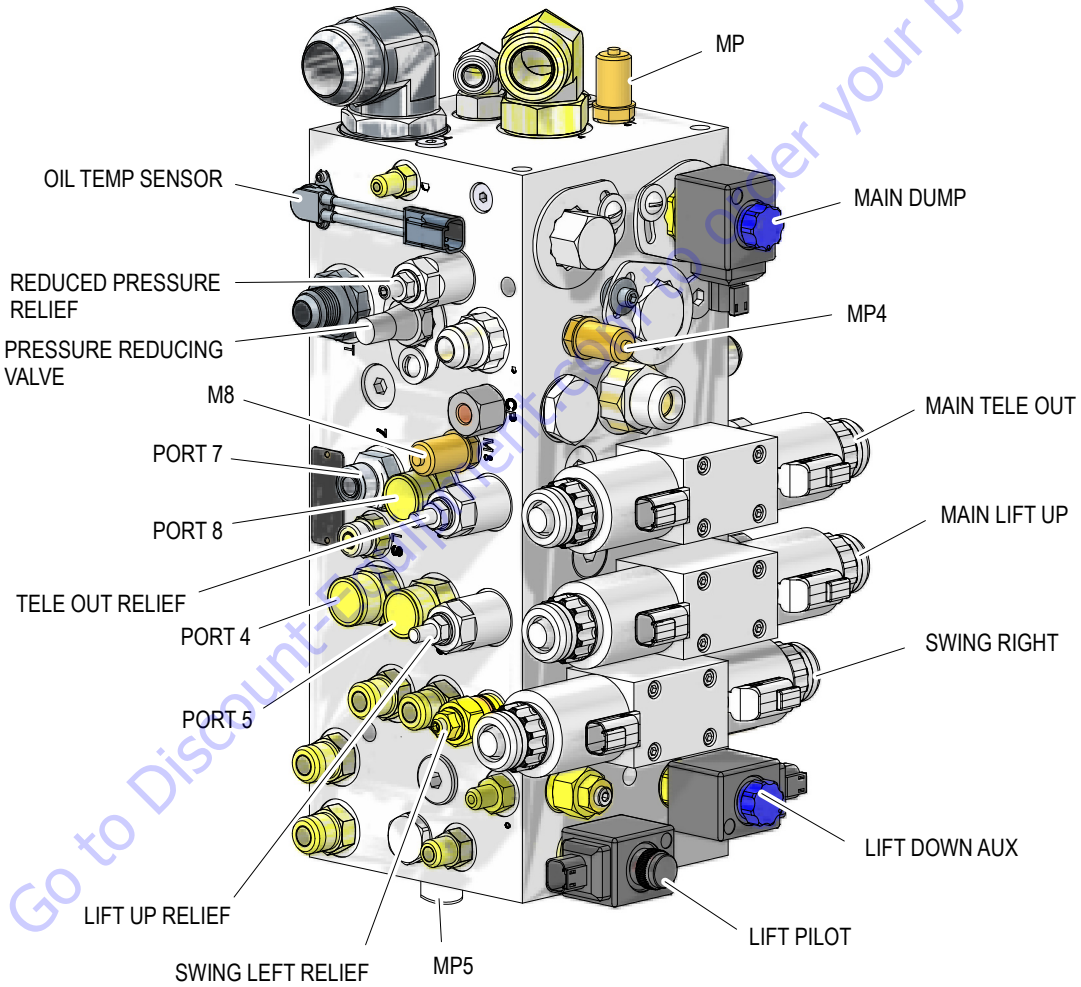


Figure 5-204. Main Valve Identification (Prior to SN 0300247849) - Sheet 1 of 2

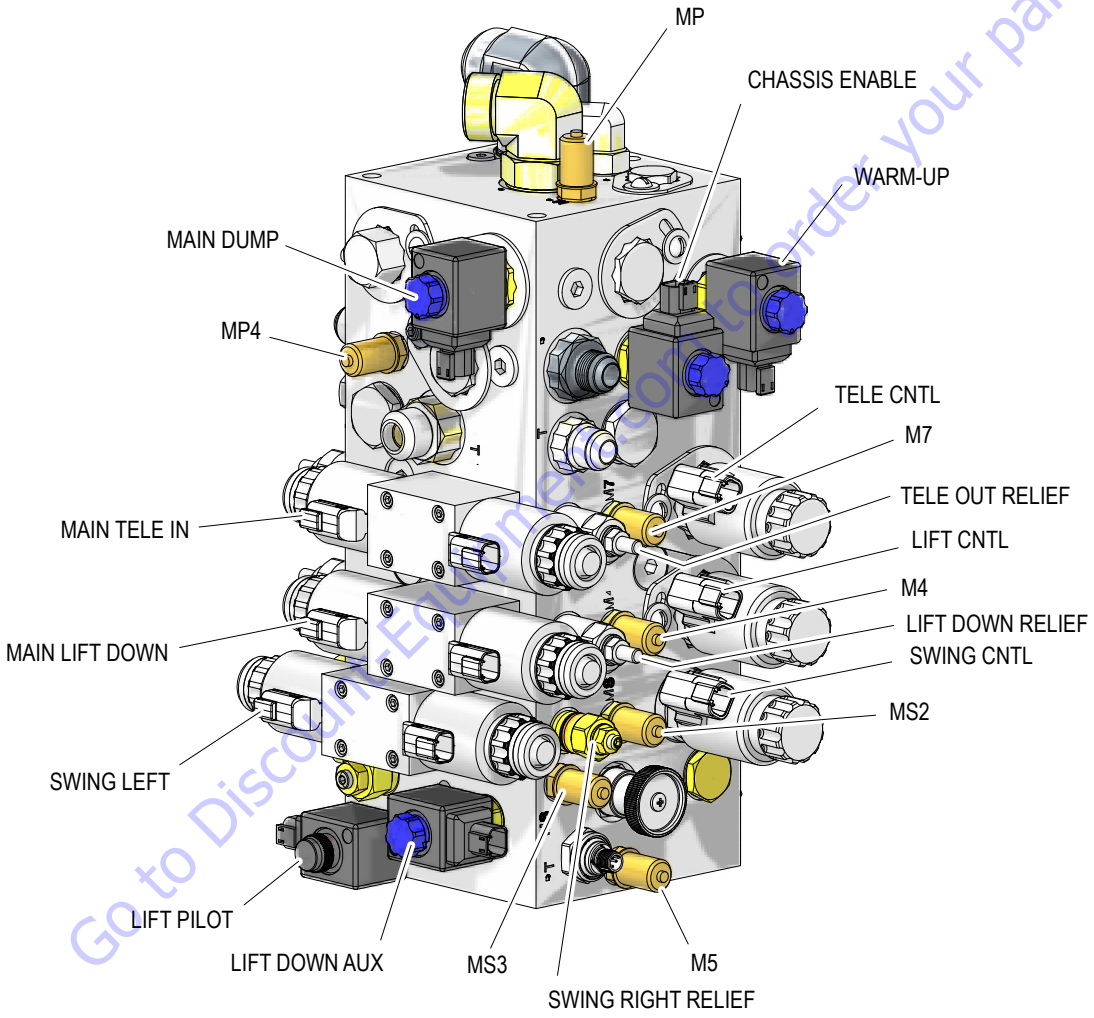
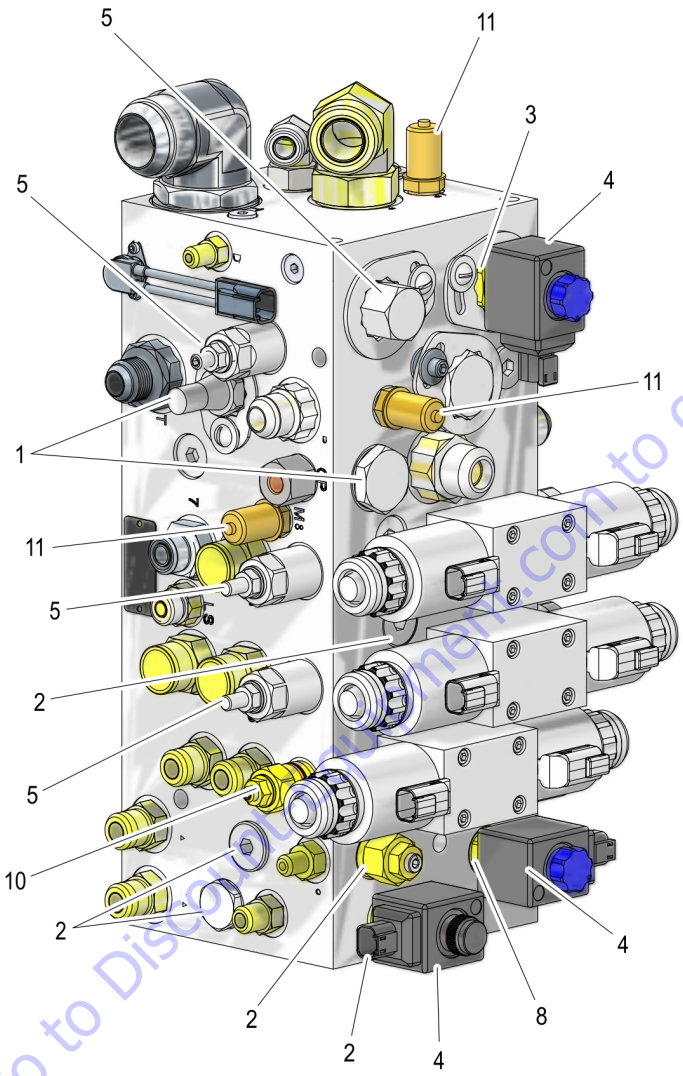


Figure 5-205. Main Valve Identification (Prior to SN 0300247849) - Sheet 2 of 2



Item	Ft.Lbs.	Nm
1	60-70	81-95
2	25-30	34-40.5
3	40-49	54-66
4	2.2-3	3-4
5	30-35	40.5-47
6	122-133	165-180
7	3.7-5.2	5-7
8	28.8-37.6	39-51
9	46	62
10	30-37	40.5-50
11	13	17.5

Figure 5-206. Main Valve Torque Values (Prior to SN 0300247849) - Sheet 1 of 2

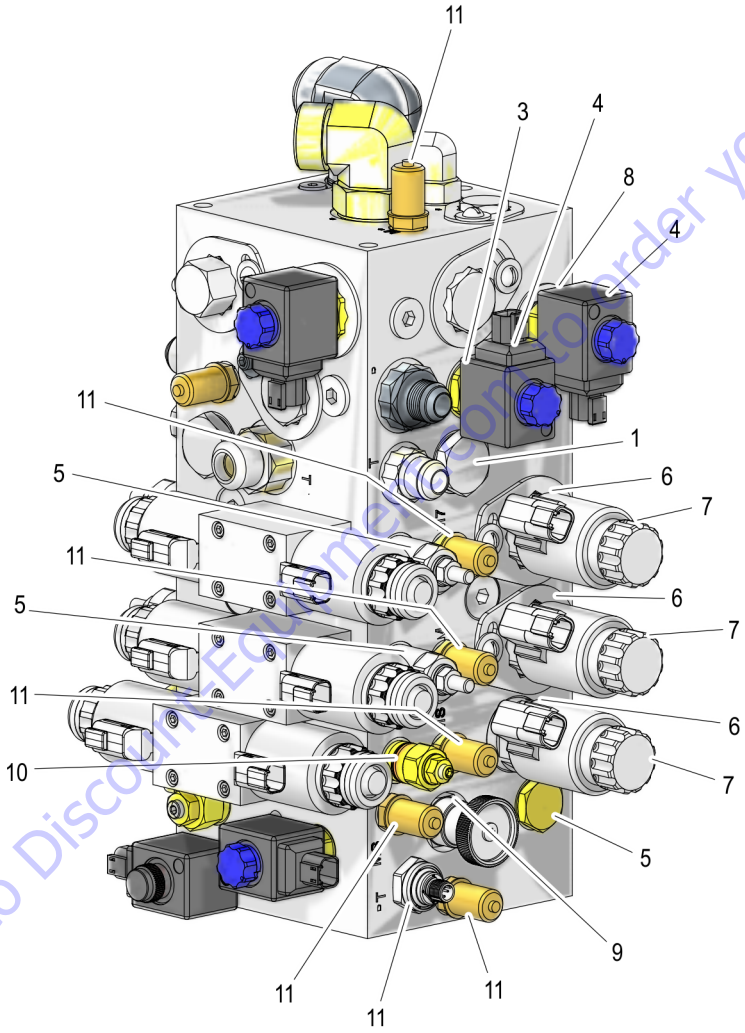


Figure 5-207. Main Valve Torque Values (Prior to SN 0300247849) - Sheet 2 of 2

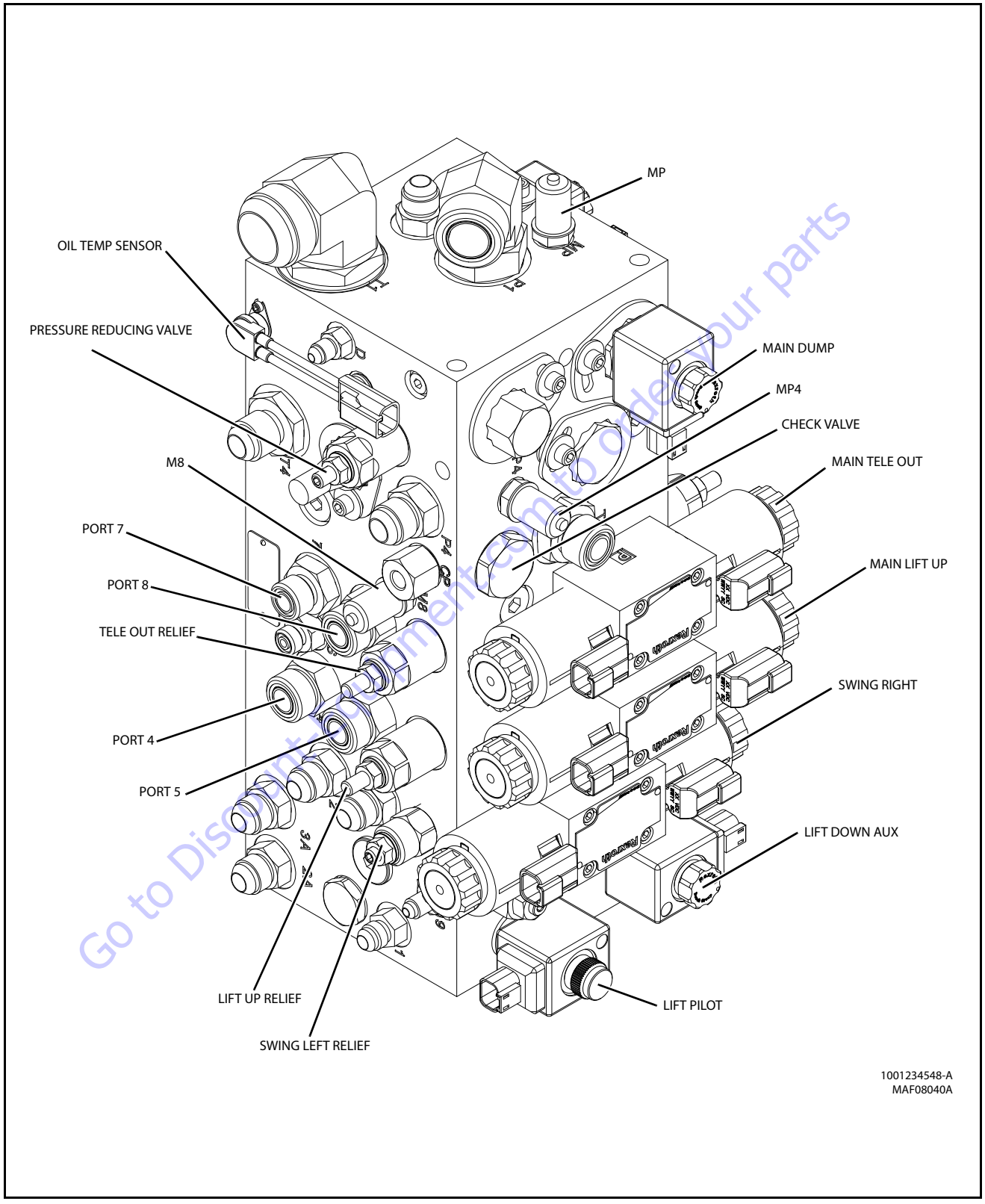


Figure 5-208. Main Valve Torque Values (SN 0300247850 to Present) - Sheet 1 of 2

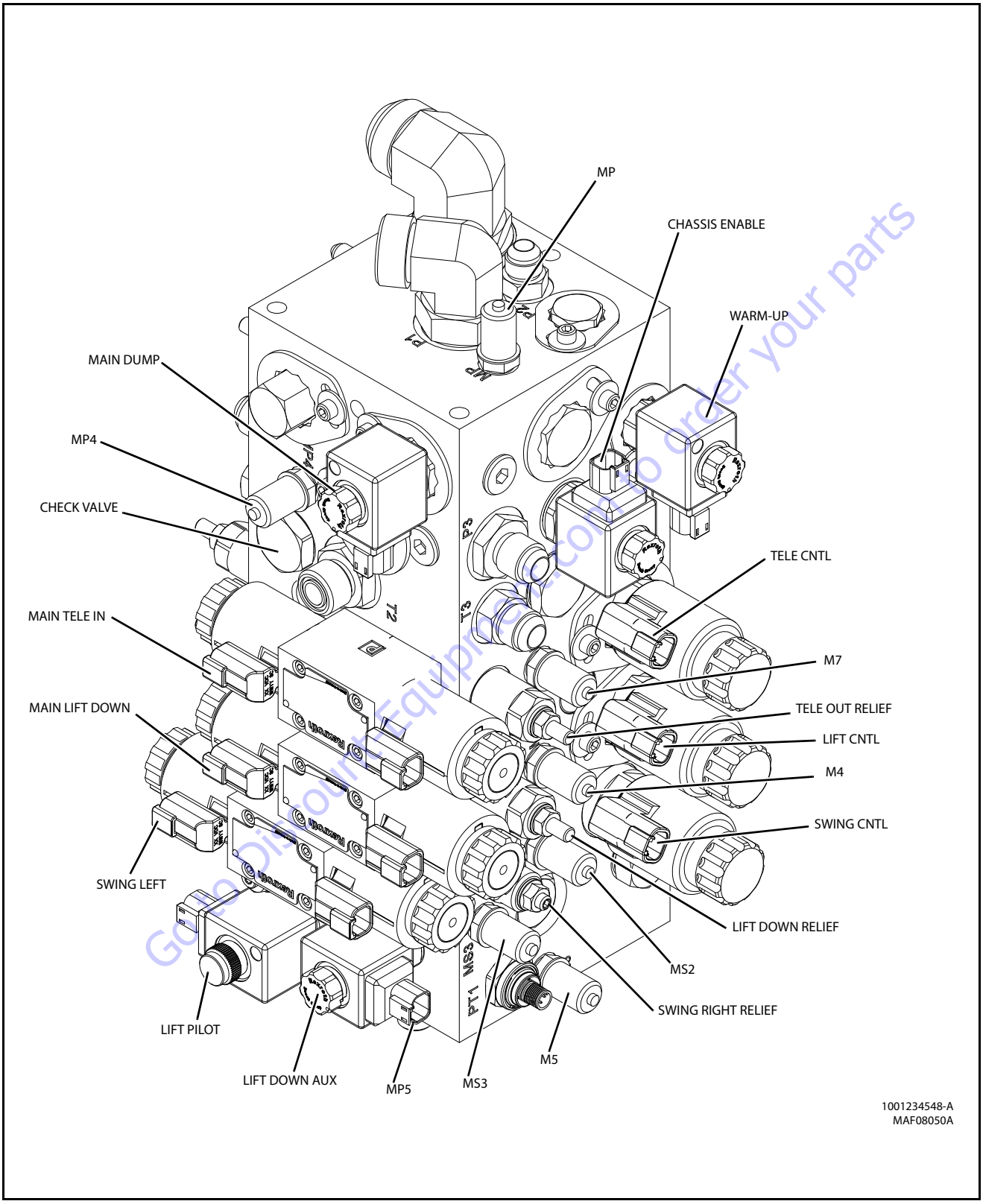
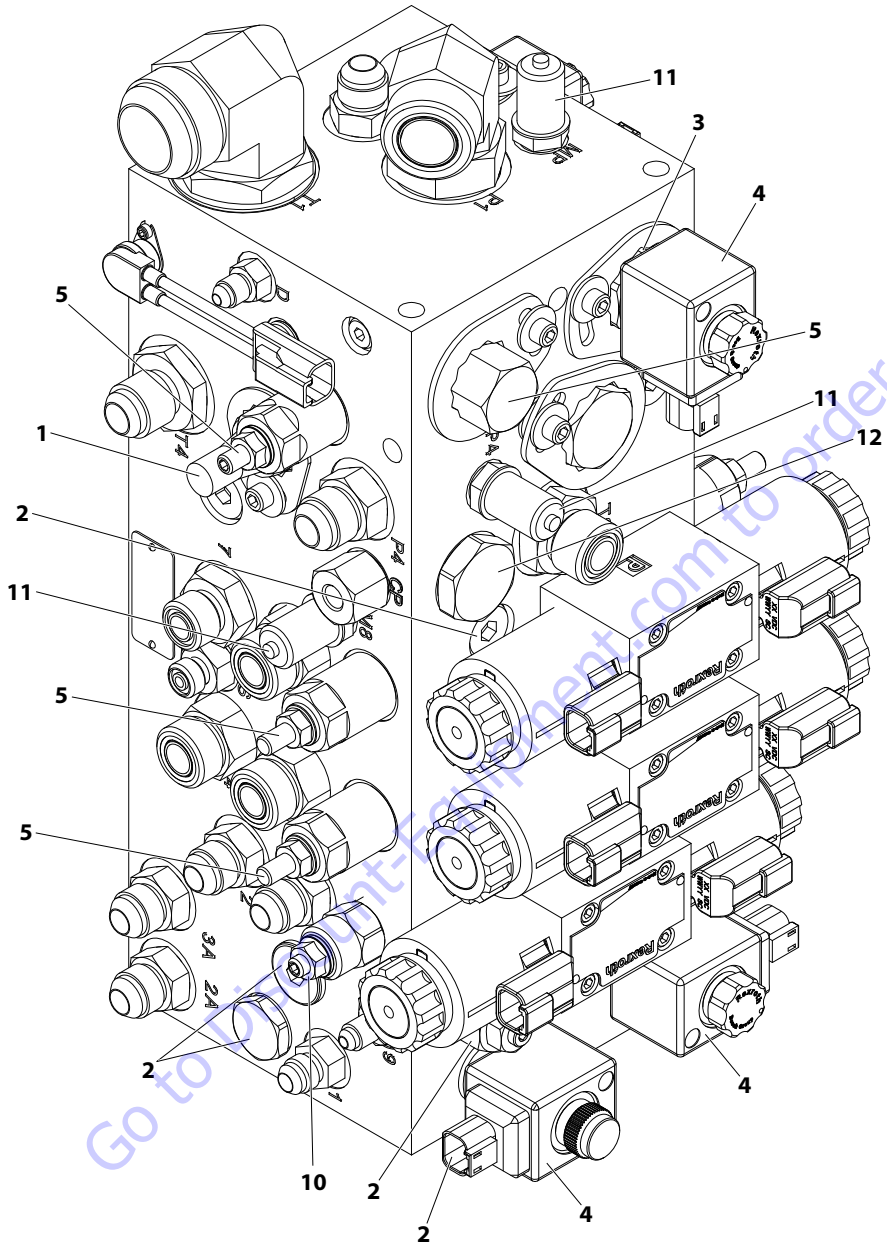


Figure 5-209. Main Valve Torque Values (SN 0300247850 to Present) - Sheet 2 of 2



Item	Ft.Lbs.	Nm
1	60-70	81-95
2	25-30	34-40.5
3	40-49	54-66
4	2.2-3	3-4
5	30-35	40.5-47
6	122-133	165-180
7	3.7-5.2	5-7
8	28.8-37.6	39-51
9	46	62
10	30-37	40.5-50
11	13	17.5
12	33-37	40.5-50

1001234548-A
MAF08060A

Figure 5-210. Main Valve Torque Values (SN 0300247850 to Present) - Sheet 1 of 2

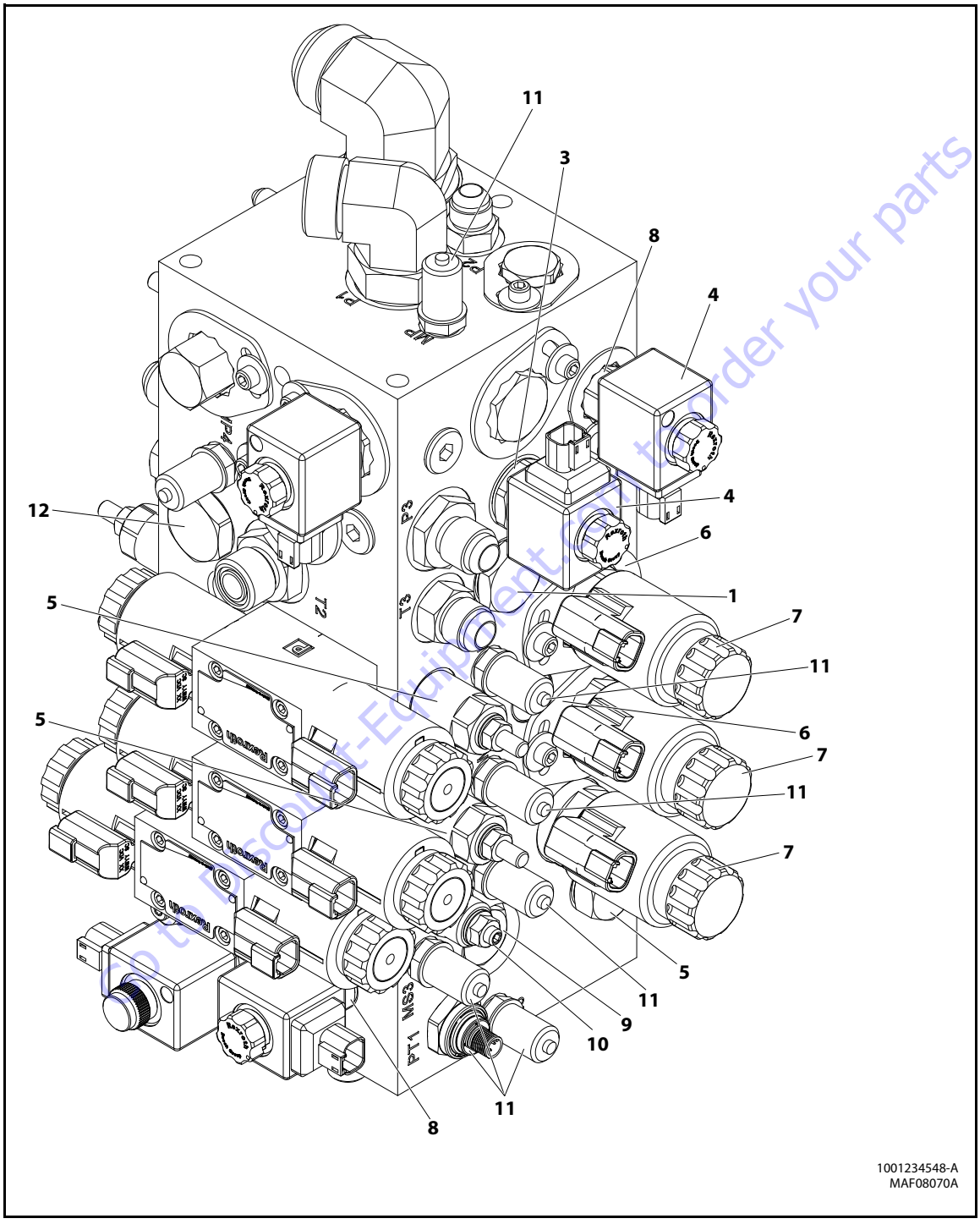


Figure 5-211. Main Valve Torque Values (SN 0300247850 to Present) - Sheet 2 of 2

5.6 PRESSURE SETTING PROCEDURE

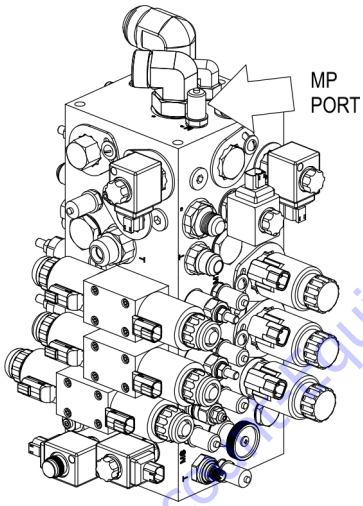
Cold temperatures have a significant impact on pressure readings. JLG Industries Inc. recommends operating the machine until the hydraulic system has warmed to normal operating temperatures prior to checking pressures. JLG Industries Inc. also recommends the use of a calibrated gauge. Pressure readings are acceptable if they are within ± 5% of specified pressures.

To ensure all pressures are set correctly, the following procedures must be followed in order.

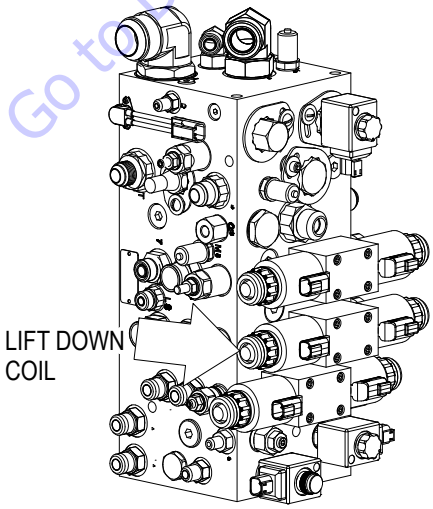
1. Setup of the Function Pump

PRESSURE COMPENSATOR (PC) SETTING

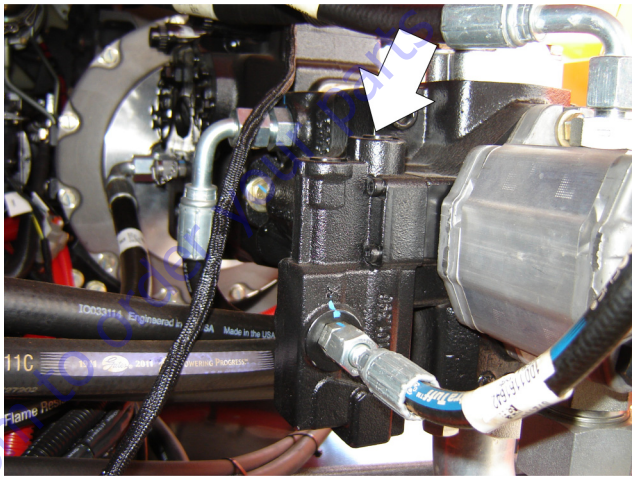
1. Install a high pressure gauge 5000 psi (345 bar) at the "MP" port of the main valve block.



2. Remove the Deutsch connector from the lift down coil.



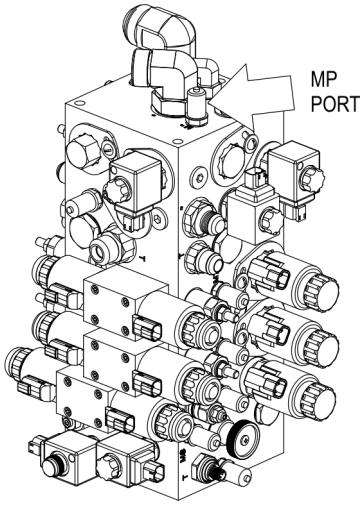
3. Using the Analyzer, go to service mode - set pressures - passcode:14605, select Boom Lift. Activate boom lift down.
4. Activate lift down. The gauge should read 4000 psi. (275 bar).
5. To make an adjustment to this pressure, go back to the engine compartment to the function pump which is the rear pump. The high pressure relief adjustment is the adjustment closest to the pump case.



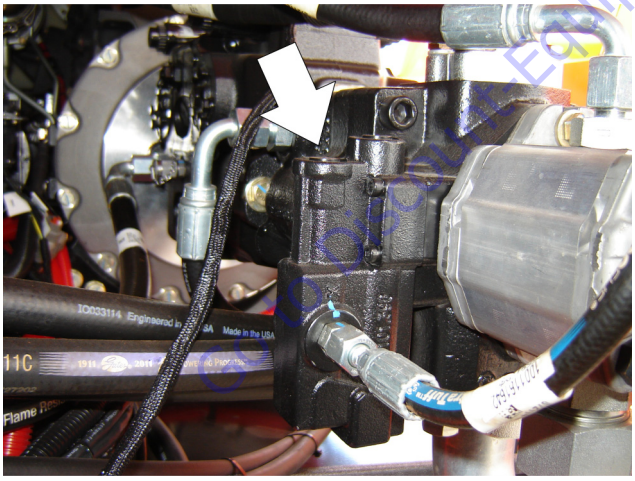
6. Loosen the locking set screw at the side of the adjustment. Adjust the PC to obtain 4000 psi (275 bar), clockwise increases pressure.
7. If a pressure increase is necessary and the adjustment described above does not result in a change, then Perform "Lift Down Procedure" before repeating "Pressure Compensator (PC) Setting".
8. After adjusting the pressure, tighten the locking set screw, and reconnect the Lift Down coil.

STAND BY PRESSURE OR LOAD (LS) SENSE PRESSURE

1. Install a low pressure gauge at port "MP" of the main valve block. The gauge must be capable of reading 500 psi (34.5 bar).



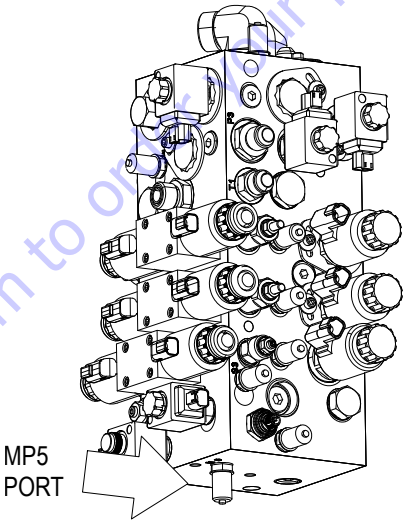
2. Start the engine, the gauge should read 500psi (34.5 bar).
3. To make an adjustment to this pressure, go to the engine compartment, locate the function pump which is the rear pump.
4. The stand by adjustment is the outside adjustment. Using the same procedure as in the (PC) setting above adjust (LS) to 500psi (34.5 bar).

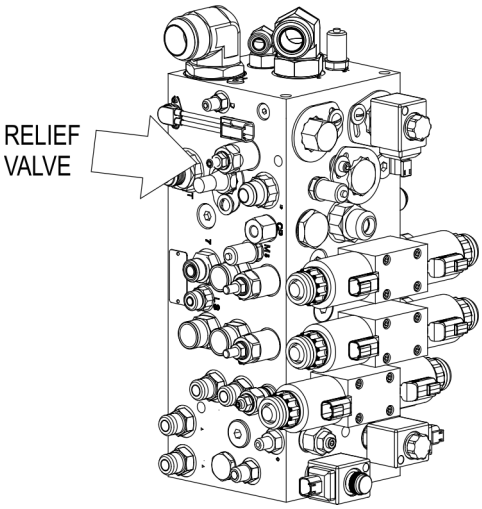


2. Adjustments Made at the Main Valve Bank

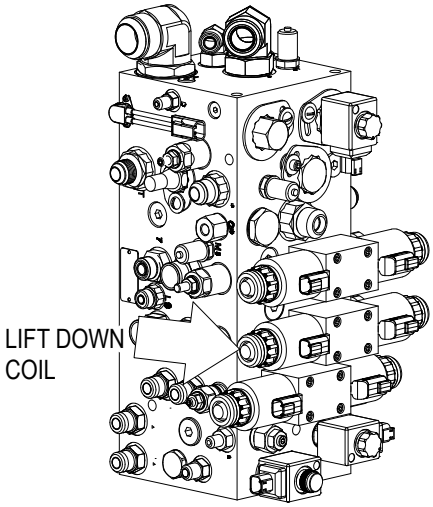
REDUCED PRESSURE SECTION

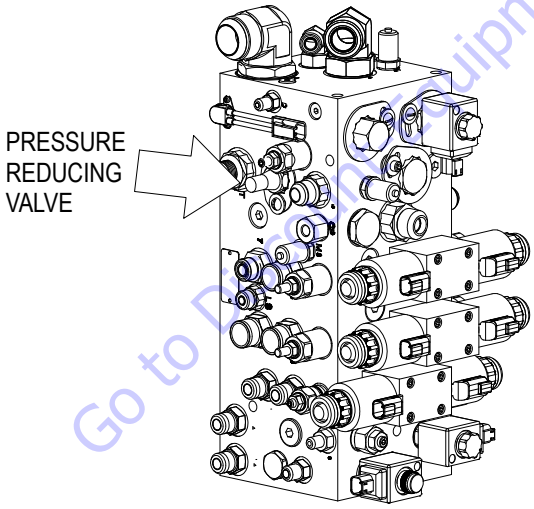
1. Relief Valve: Install pressure 5000 psi (345 bar) gauge at port MP5. Using the Analyzer, go to service mode - Hyd warm up - passcode: 12671. An alternative method is to unplug the temperature and switch on the tank manifold with the engine temperature less than normal operating temperature. Adjust the relief valve located at 5 o' clock adjacent port P4 to obtain gauge reading of 3600 psi (248 bar) After adjusting the pressure, tighten the locking set screw and Exit hydraulic warm up mode.

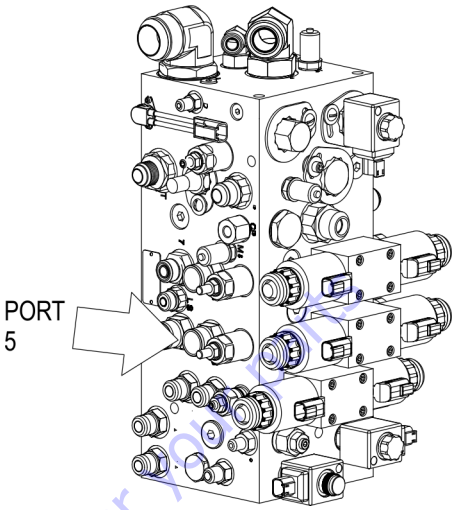




2. Pressures Reducing Valve: Install pressure 5000 psi (345 bar) gauge at port MP5. Using the Analyzer, go to service mode - set pressures - passcode: 14605. select Boom Lift. Activate boom lift down and the gauge should read 3200 psi (221 bar). Adjust the pressure reducing value, located at 3 o' clock behind port P5 until gauge reads 3200 psi (221 bar). If a pressure increase is necessary and the adjustment described above does not result in a change, then Perform “Pressure Compensator (PC) Setting" and “Relief Valve" before repeating “Pressure Reducing Valve" procedure.

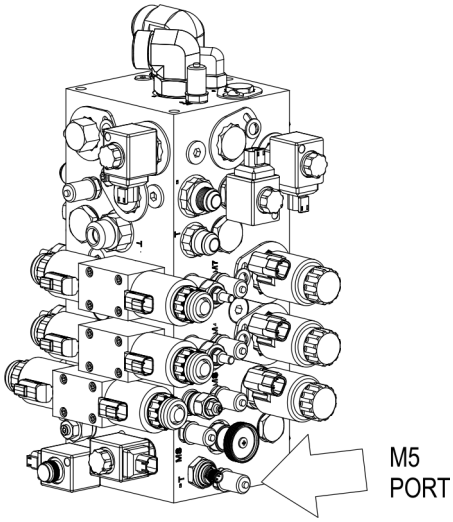




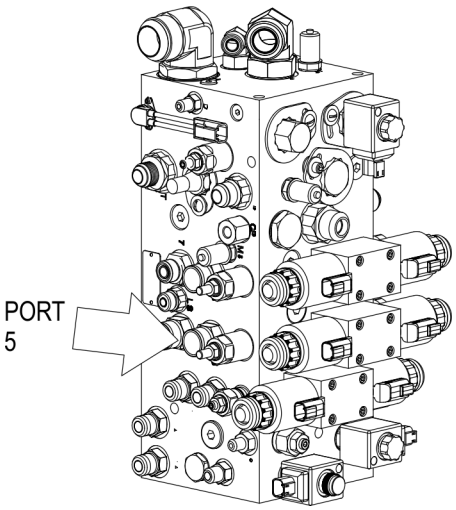


LIFT UP

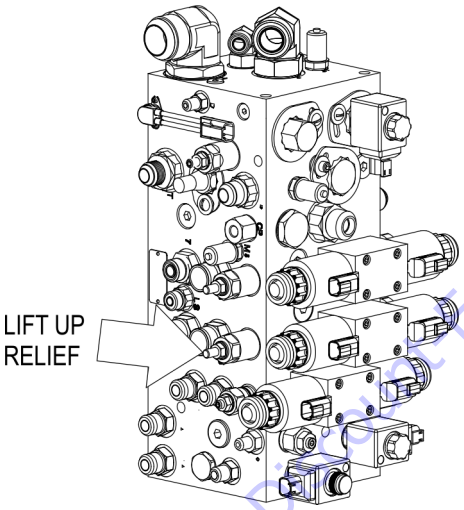
1. Install a high pressure gauge at the “M5” port of the main valve block.



2. Plug and cap the hose on port 5. Activate lift up. The gauge should read 3700 psi. (255 bar).

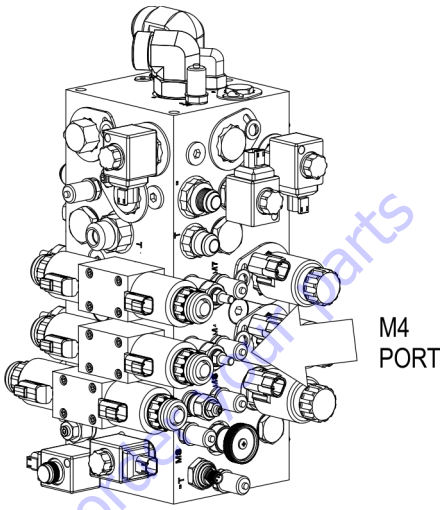


3. The adjustment cartridge is located to the right of port 5. Turn clockwise to increase pressure, counter clockwise to decrease.

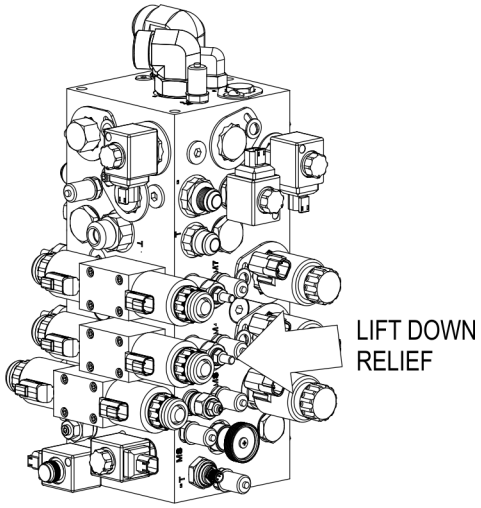


LIFT DOWN

1. Install a high pressure 5000 psi (345 bar) gauge at the “M4” port of the main valve block.

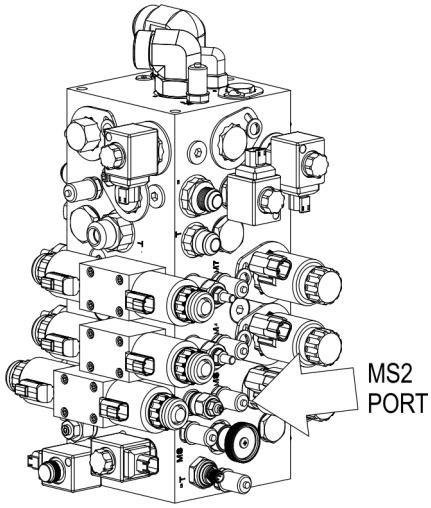


2. Install pressure gauge (5000 psi) at port “M4". Using the Analyzer, go to service mode – set pressures - passcode: 14605, select Boom Lift. Activate boom lift down. The gauge should read 2850 psi (196 bar). The adjustment cartridge is located to the left of the “M4" gauge port. Turn clockwise to increase, counterclockwise to decrease.



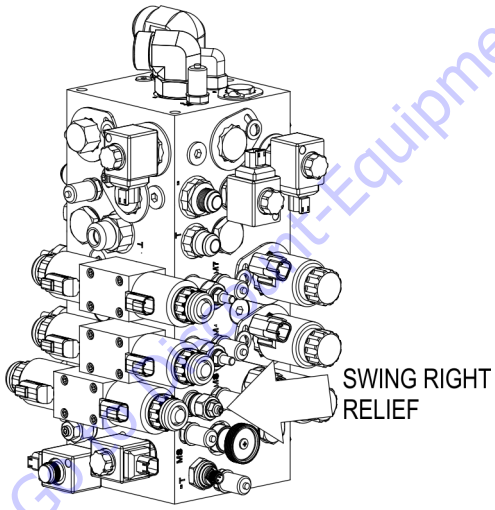
SWING

1. Install a high pressure gauge at port "MS2".

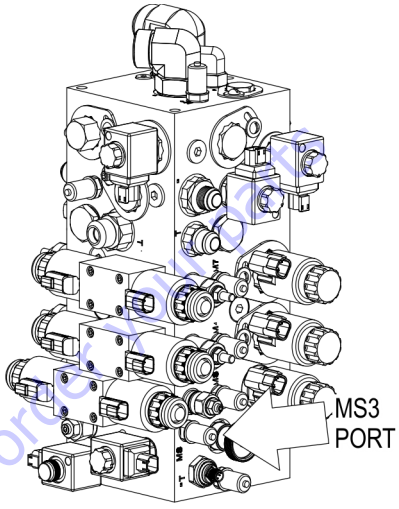


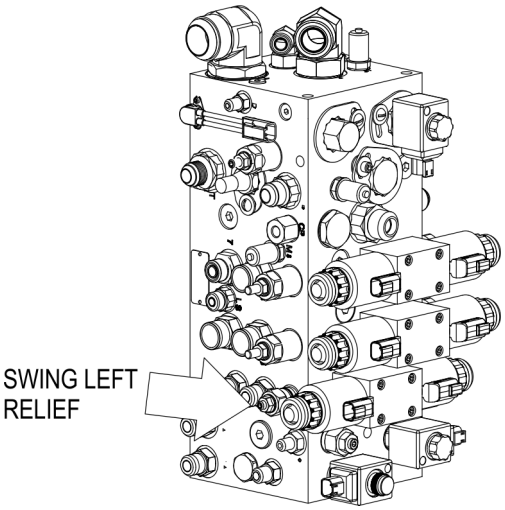
2. Install the Turntable lock pin.

3. Activate swing right, the gauge should read 2000 psi. The adjustment cartridge is located at beside the "MS2" gauge port. Turn clockwise to increase, counterclockwise to decrease.



4. Install gauge at MS3, Activate swing left, the gauge should read 2000 psi. (138 bar), The adjustment is located at 9 o'clock beside port 3, Turn clockwise to increase pressure, counter clockwise to decrease pressure.

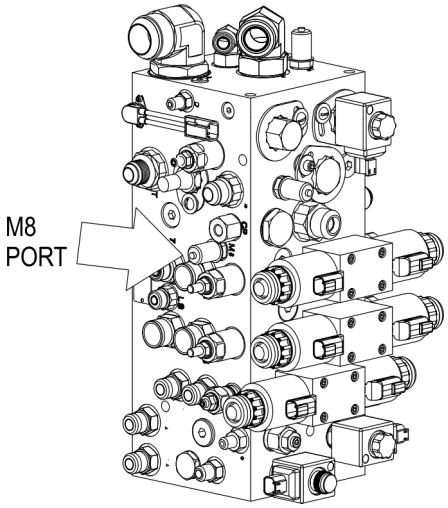




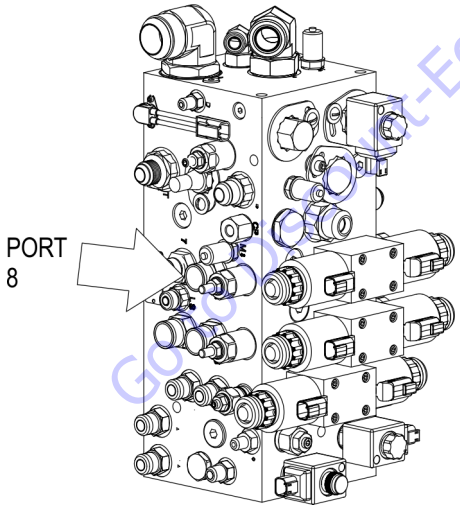
TELESCOPE OUT

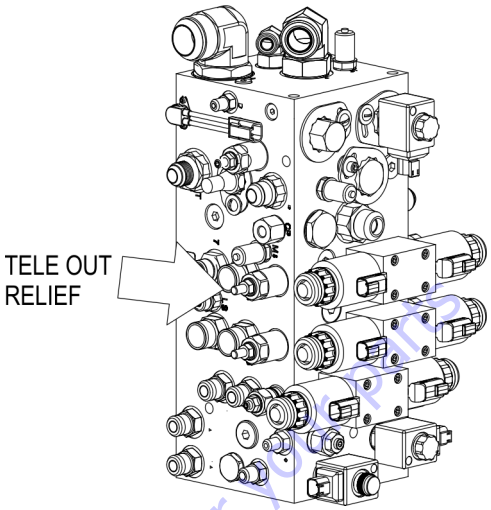
NOTE: *NEVER increase telescope out pressure to achieve desired telescope length.*

1. Install a high pressure gauge at the "M8" port of the main valve bank.



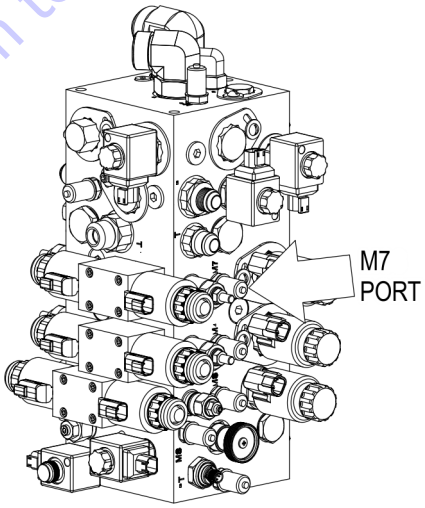
2. Plug the telescope out hose either at the valve bank (port #8) or at the inlet of the telescope cylinder (V1). Activate telescope out. The gauge should read 3000 psi (207 Bar). The adjustment cartridge is located at 2 o'clock adjacent to M8 gauge port. Turn clockwise to increase, counter clockwise to decrease.



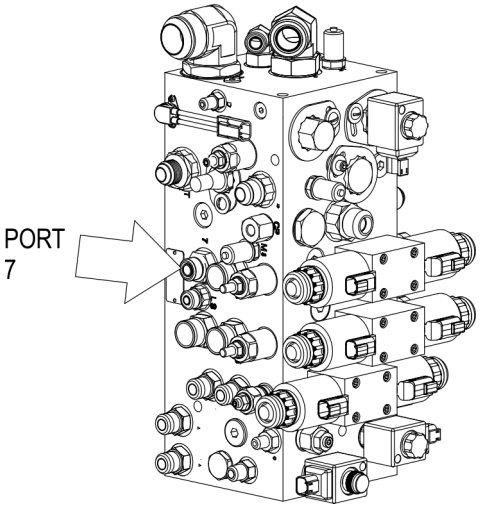


TELESCOPE IN

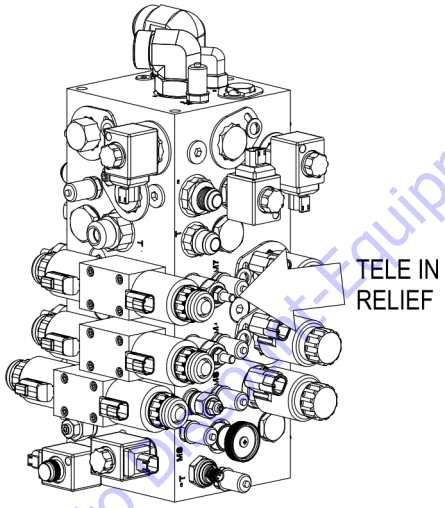
1. Install a high pressure gauge at the "M7" port of the main valve block.



2. Plug the telescope in hose either at the valve bank (port #7) or at the inlet of the telescope cylinder (V2).



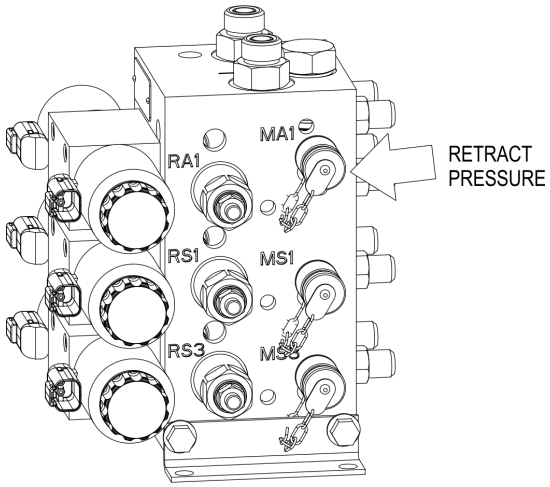
3. Activate telescope in. The gauge should read 3300 psi. (227 bar). The adjustment cartridge is located at 3 o'clock adjacent to "M7" gauge port. Turn clockwise to increase, counterclockwise to decrease.

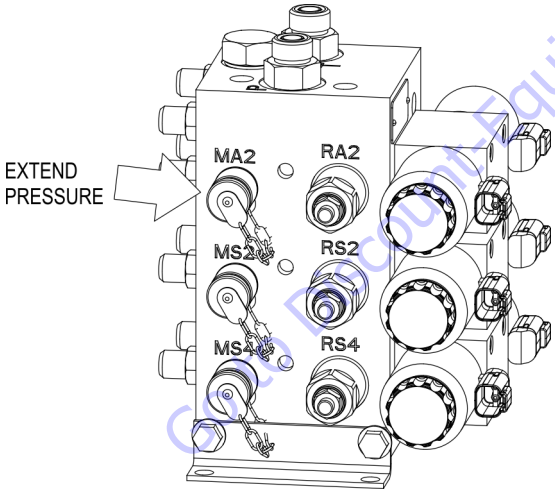


3. Adjustments Made at the Frame Valve Bank

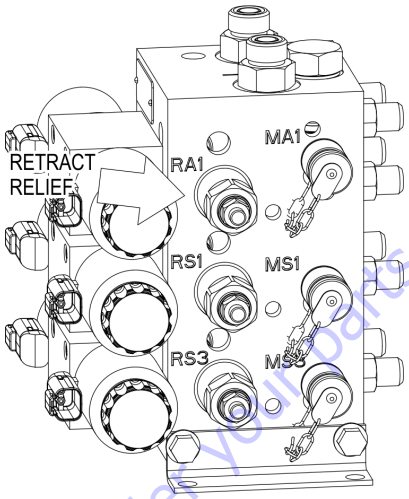
AXLE EXTEND AND RETRACT, FRONT AND REAR

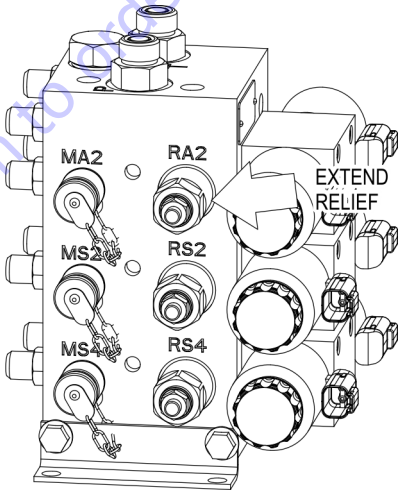
1. To extend the axles drive the machine back and forth until extended. A machine that cannot be driven must be jacked up.
2. On both the front and rear frame valve banks install a high pressure gauge on ports “MA1” for retract and “MA2” for extend. The gauge should read 2500 psi. for both directions.





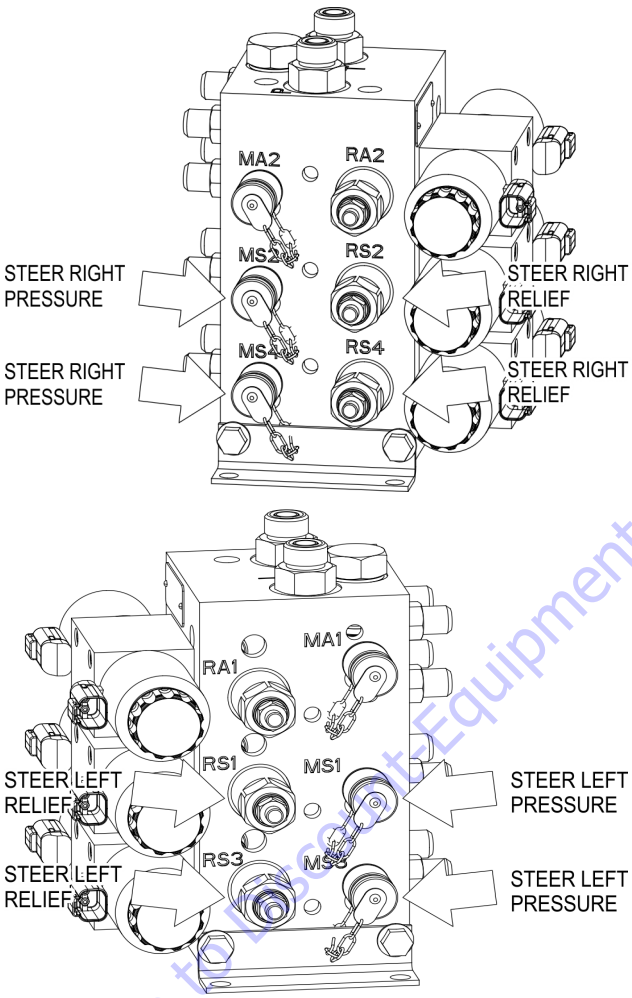
3. Turn clockwise to increase, counterclockwise to decrease.





STEERING, FRONT AND REAR

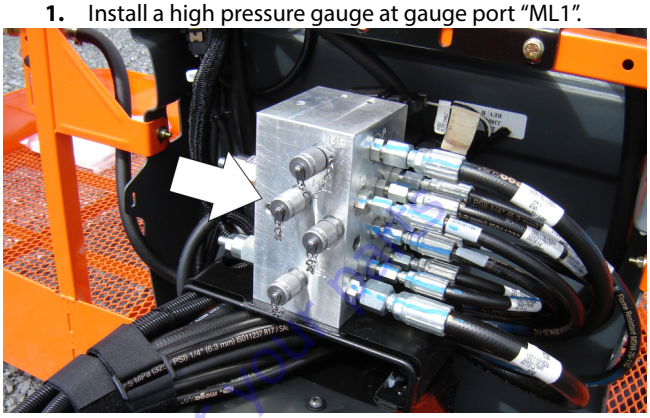
1. The axles must be extended to set the steer pressures.
2. Install a high pressure gauge at “MS2” and “MS4” gauge ports for steer right (extend), adjust to 2000 psi, and “MS1 and “MS3” for steer left (retract), adjust to 2600 psi, on both the front and rear valves. Each relief valve is located next to its own gauge port. Turn clockwise to increase, counterclockwise to decrease.



4. Adjustments Made at the Platform Valve Bank

PLATFORM LEVEL UP

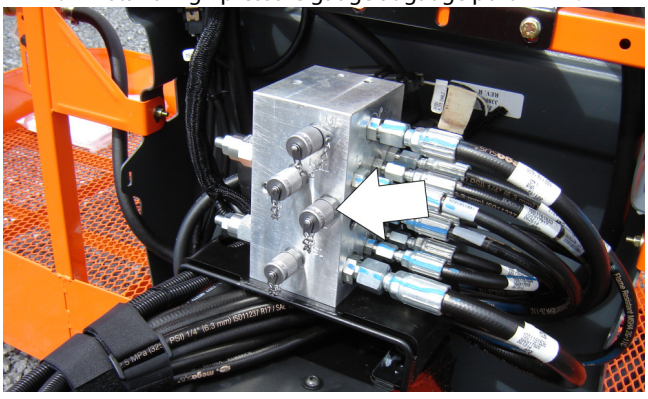
1. Install a high pressure gauge at gauge port “ML1”.



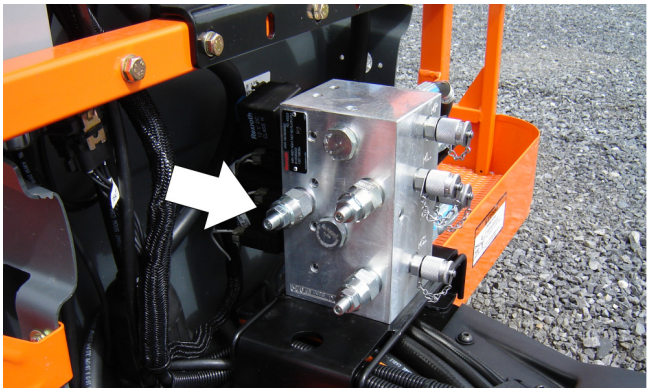
2. Activate level up to the end of stroke, the gauge should read 2500 psi.(172bar).
3. All the relief valves are located on the same face. The level up relief valve is on the top. Turn clockwise to increase, counterclockwise to decrease.

PLATFORM LEVEL DOWN

1. Install a high pressure gauge at gauge port “ML2”.

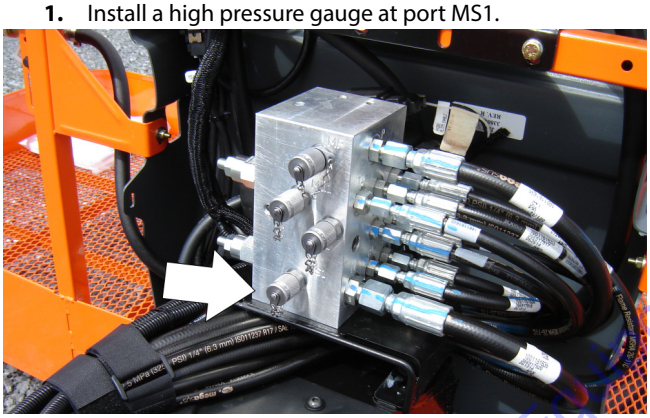


2. Activate level down to the end of stroke, the gauge should read 2000 psi. (138bar). The level down relief valve is the second from the top. Turn clockwise to increase, counterclockwise to decrease.

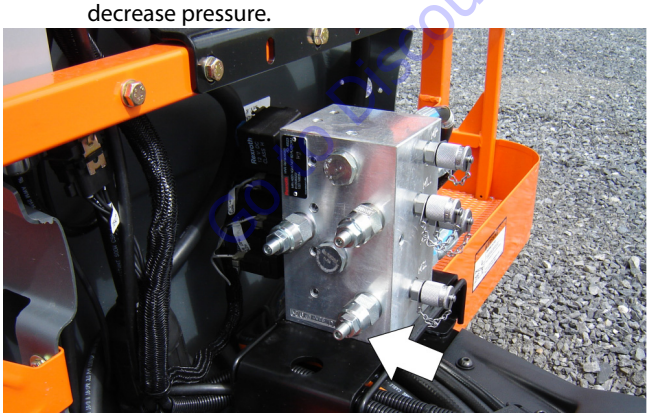


JIB PIN EXTEND (2500 PSI [172BAR]) PRESET

1. Install a high pressure gauge at port MS1.



2. Using the analyzer and “set pressures” menu, select jib lock pin extend. This is the bottom relief valve on the platform valve. Turn CW to increase and CCW to decrease pressure.

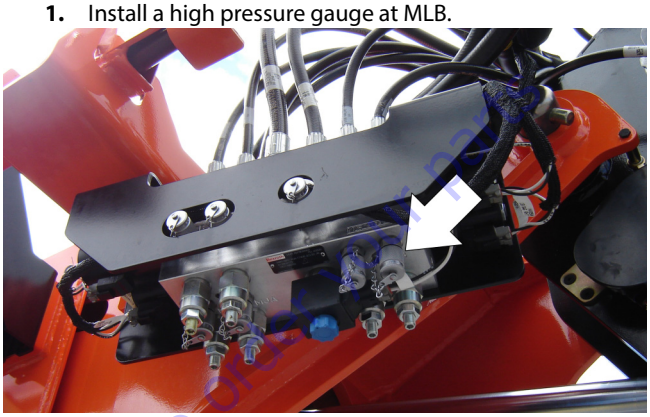


5. Adjustments Made at Jib Valve

JIB LEVEL UP

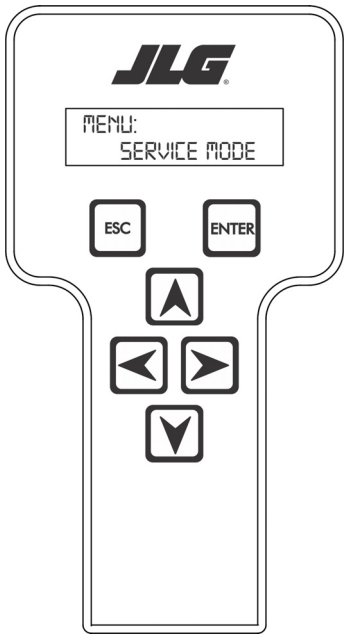
NOTE: *To check or adjust the jib level up pressure setting the JLG Analyzer must be used to override the automatic jib level function.*

1. Install a high pressure gauge at MLB.

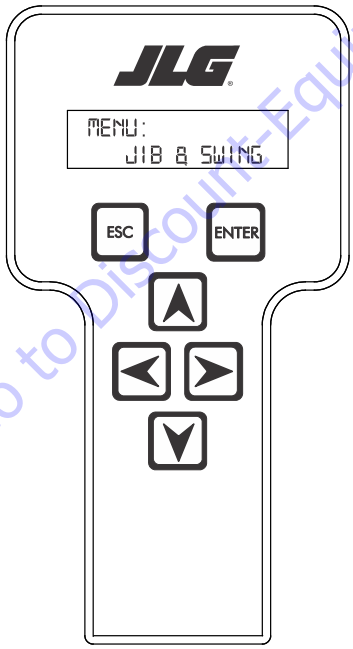


2. Connect the analyzer to the ground control connector.
3. Position the main boom on the boom rest and the jib to horizontal.
4. Using the analyzer, press the RIGHT  or LEFT  arrow key until ACCESS LEVEL 2 is reached. Press ENTER  .
5. Using the arrow keys, enter access code 33271 and press ENTER  .

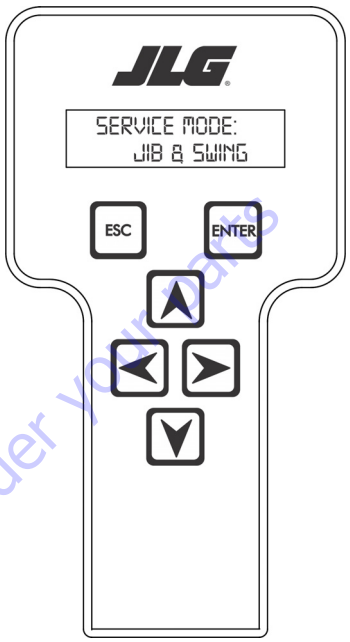
6. Using the arrow keys scroll until MENU: SERVICE MODE is reached. Press ENTER (ENTER).



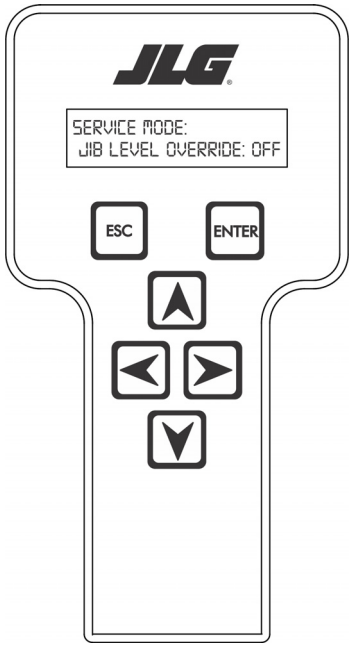
7. The analyzer should read JIB & SWING. Press ENTER (ENTER).



8. Enter code 58237 and Press ENTER (ENTER). The screen should read SERVICE MODE: JIB & SWING AND JIB LEVEL.



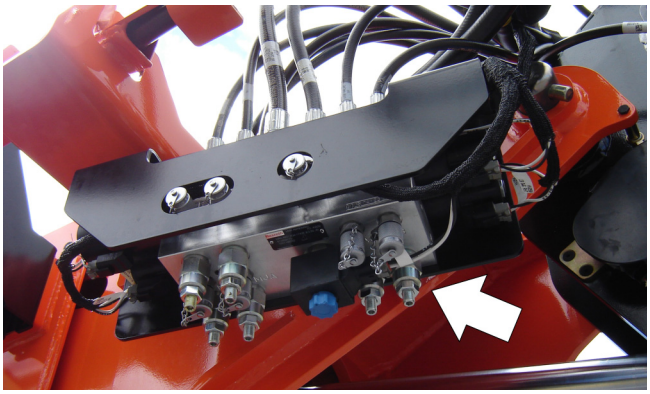
9. Press ENTER (ENTER) again. The screen will read JIB LEVEL OVERRIDE: OFF. Use the UP or DOWN arrow keys to toggle the override from Off to On.



10. Once turned on, operate the Jib Lift Up function. This will activate the jib level up function.

11. When the function bottoms out, pressure should read 2600 psi.(180bar).

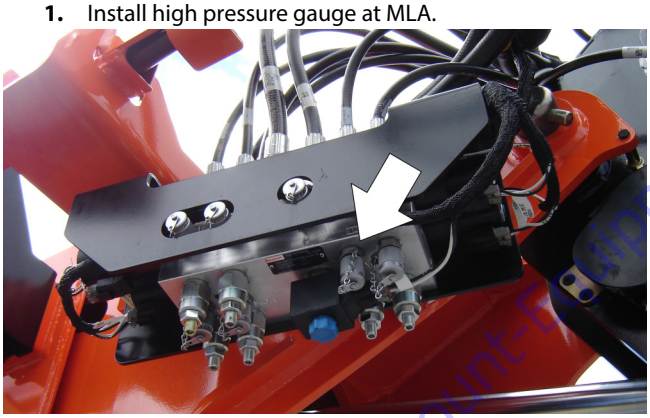
12. If necessary to adjust pressure, CW increases and CCW decreases setting. Jib level up adjustment is adjacent to MLB.



13. Make sure to reset Jib override to off after pressure is set, and cycle machine power.

JIB LEVEL DOWN

1. Install high pressure gauge at MLA.



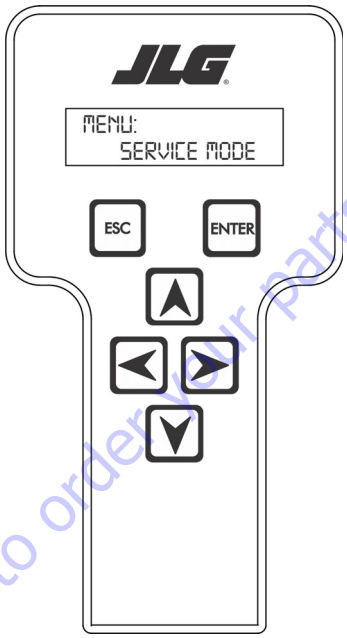
2. Connect the analyzer to the ground control connector.

3. Position the main boom on the boom rest and the jib fully elevated.

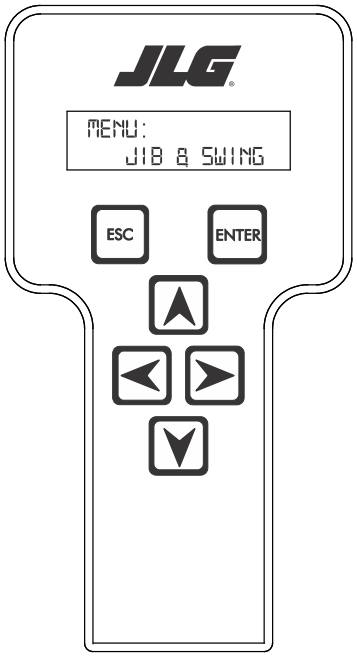
4. Using the analyzer, press the RIGHT  or LEFT  arrow key until ACCESS LEVEL 2 is reached. Press ENTER  .

5. Using the arrow keys, enter access code 33271 and press ENTER  .

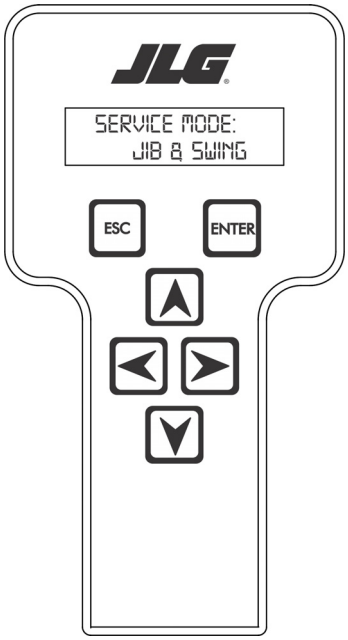
6. Using the arrow keys scroll until MENU: SERVICE MODE is reached. Press ENTER  .



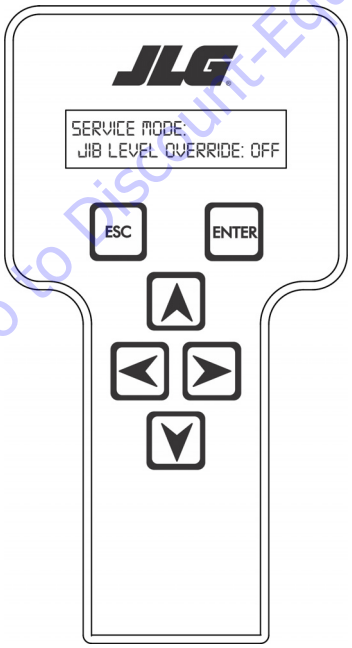
7. The analyzer should read JIB & SWING. Press ENTER  .



8. Enter code 58237 and Press ENTER (ENTER). The screen should read SERVICE MODE: JIB & SWING AND JIB LEVEL.



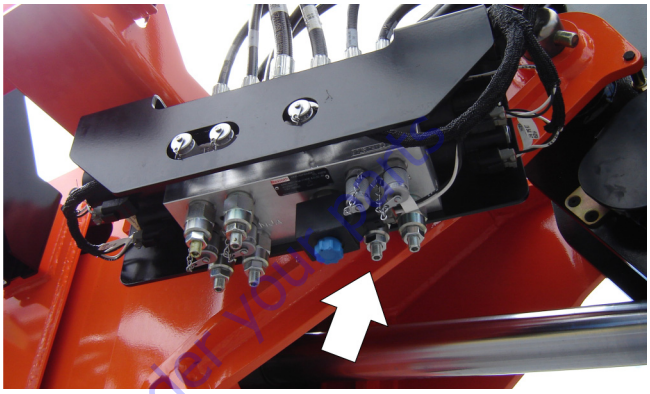
9. Press ENTER (ENTER) again. The screen will read JIB LEVEL OVERRIDE: OFF. Use the UP or DOWN arrow keys to toggle the override from Off to On.



NOTE: *Using this override may set the Jib Leveling System Fault, depending upon how far out of level the jib is moved.*

10. Once turned on, operate the Jib Lift Down function. This will activate the Jib Level Down function.

11. When the cylinder is completely retracted, the pressure should be 1500 psi. (104bar). CW increases and CCW decreases setting. Jib level down adjustment is adjacent to MLA.



12. Make sure to reset Jib override to off after pressure is set, and cycle machine power.

NOTE: *Steps 13 thru 17 are only necessary if the Jib Leveling System Fault has been set.*

13. To adjust the jib back to level, go into override mode for jib leveling. Turn the override mode to "On" and press the ESCAPE (ESC) key until out of the Service Modes menu.

14. Go to the Diagnostics/Boom Sensors menu. Use the Right arrow key until reaching the "Jib Level CNTL: Angle 0.0" screen.