Out of Usable Range Message

8/1 UMS SENSOR OUT OF USABLE RANGE

When both the Chassis tilt sensor and the UMS sensor read greater than 10° in the same direction the UMS will be disengaged until the condition no longer exists and a fault shall be raised.

Solution:

- Verify the message clears when operating the machine on grade less than 10°.
- Inspect sensor mounting.
- Verify sensor calibration on level pad.

UMS Sensor Not Calibrated Message

8/1 UMS SENSOR NOT CALIBRATED

If the control system detects a sensor out of range condition or a not calibrated fault with the UMS angle sensor, the control system shall report a fault and disable Tower Lift Down and activate the ground boom malfunction indicator lamp, upright tilted lamp and platform alarm continually.

If the control system detects that the UMS angle sensor has not been calibrated, the ground boom malfunction lamp will flash at a 3 Hz rate until the system is calibrated or disabled.

Solution:

- Calibrate sensor.

UMS Sensor Faulted Message

8/1 UMS SENSOR FAULTED

If the system detects that the UMS sensor frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% range the control system shall report a fault.

Solution:

- Inspect wire harness going to the sensor and UMS module.
- Inspect sensor mounting.
- Replace sensor.

Incompatible Software Detected Message

9/9 INCOMPATIBLE SOFTWARE DETECTED

If the control system detects that the ground module software is incompatible with the UMS module, the UMS module shall report a fault and disable the footswitch signal to the ground module.

Solution:

- Update ground module software.

Calibration Faults

CAL FAILED-CHASSIS NOT LEVEL

The control system shall display a fault in the event the raw sensor output is greater than ±5° for the chassis sensor.

CAL FAILED-UMS SENSOR RAW OUTPUT OUT OF RANGE

The control system shall display a fault in the event the raw sensor output is greater then ±5° for the UMS sensor.

CAL FAILED-CALIBRATION DISRUPTED

If calibration is disrupted, the control system shall display this fault.

CAL FAILED- UMS SENSOR MOVEMENT NOT DETECTED

The UMS angle has not detected the required amount of movement during calibration.

4.20 USE AND CARE OF FALL ARREST SYSTEM

The external fall arrest system is designed to provide a lanyard attach point while allowing the operator to access areas of an aircraft for inspection and maintenance purposes. 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 and shock absorbing lanyard, not to exceed 6 feet (1.8 m) in length, is required when using the external fall arrest system.

⚠ WARNING

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

NOTICE

THE EXTERNAL FALL ARREST SYSTEM REQUIRES AN ANNUAL INSPECTION AND CERTIFICATION. THE ANNUAL INSPECTION AND CERTIFICATION MUST BE PERFORMED BY A COMPETENT PERSON.

If inspection services are required, contact:

Flexible Lifeline Systems
14325 West Hardy Rd.
Houston, TX 77060
Phone: 281-448-8821

NOTICE

IF THE FALL ARREST SYSTEM IS USED TO ARREST A FALL OR IS OTHERWISE DAMAGED, THE ENTIRE SYSTEM MUST BE REPLACED AND THE PLATFORM FULLY INSPECTED. REFER TO THE SERVICE MANUAL.

Prior to Use Inspection

Fall arrest systems must be inspected prior to each use. Replace if there are any signs of wear or damage to any of the components.

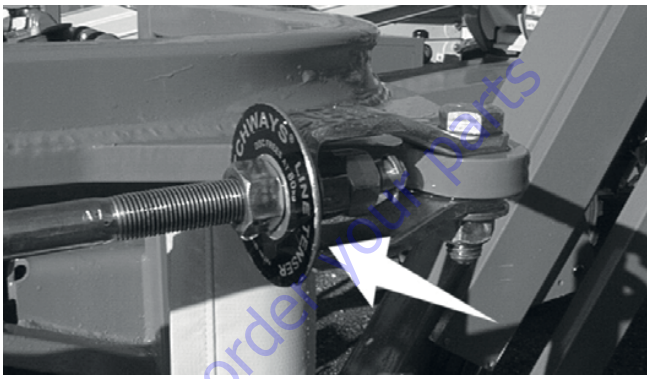
Prior to use inspection should include a visual inspection of the following items:

Cable: Proper tension, broken strands, corrosion.
Fittings: Loose fittings and fractures, damage to hanger.

Transfastener: Damage, free and proper sliding
Attaching Hardware: Loose, missing, properly tightened.

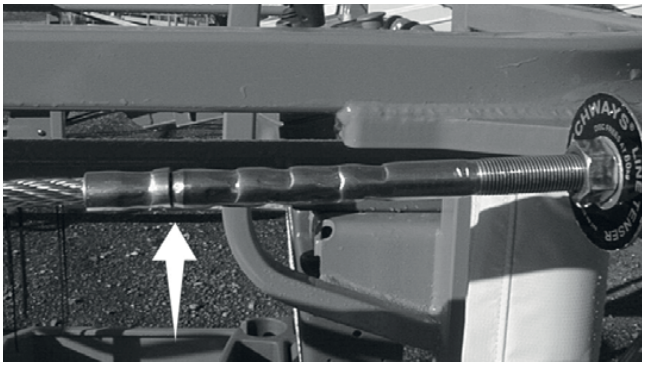
Inspecting Cable Tension and Slip Indicator

Cable tension is adjusted using the Line Tenser. The Line Tenser is the disc at the end of the cable (shown below). When proper tension is achieved, the disc will spin by hand. When less than proper tension is present the disc will not turn by hand. The cable will stretch normally over time. To tension the cable, rotate the turnbuckle until proper tension is achieved.

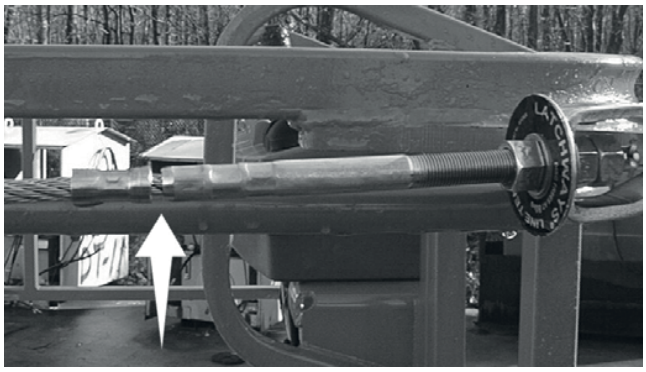


The slip indicator is the short tube crimped beside the end connection of the cable. If the cable slips from the end connection a gap will be present between the slip indicator and the end connection. No gap is acceptable. A cable that is slipped should be taken out of service and the system replaced.

Shown below is the slip indicator as it should appear.



Shown below is the slip indicator with a gap, signifying that the fall arrest system should be replaced immediately.



Annual Inspection and Certification

NOTICE

THE EXTERNAL FALL ARREST SYSTEM REQUIRES AN ANNUAL INSPECTION AND CERTIFICATION. THE ANNUAL INSPECTION AND CERTIFICATION MUST BE PERFORMED BY A COMPETENT PERSON.

If inspection services are required, contact:

Flexible Lifeline Systems
14325 West Hardy Rd.
Houston, TX 77060
Phone: 281-448-8821

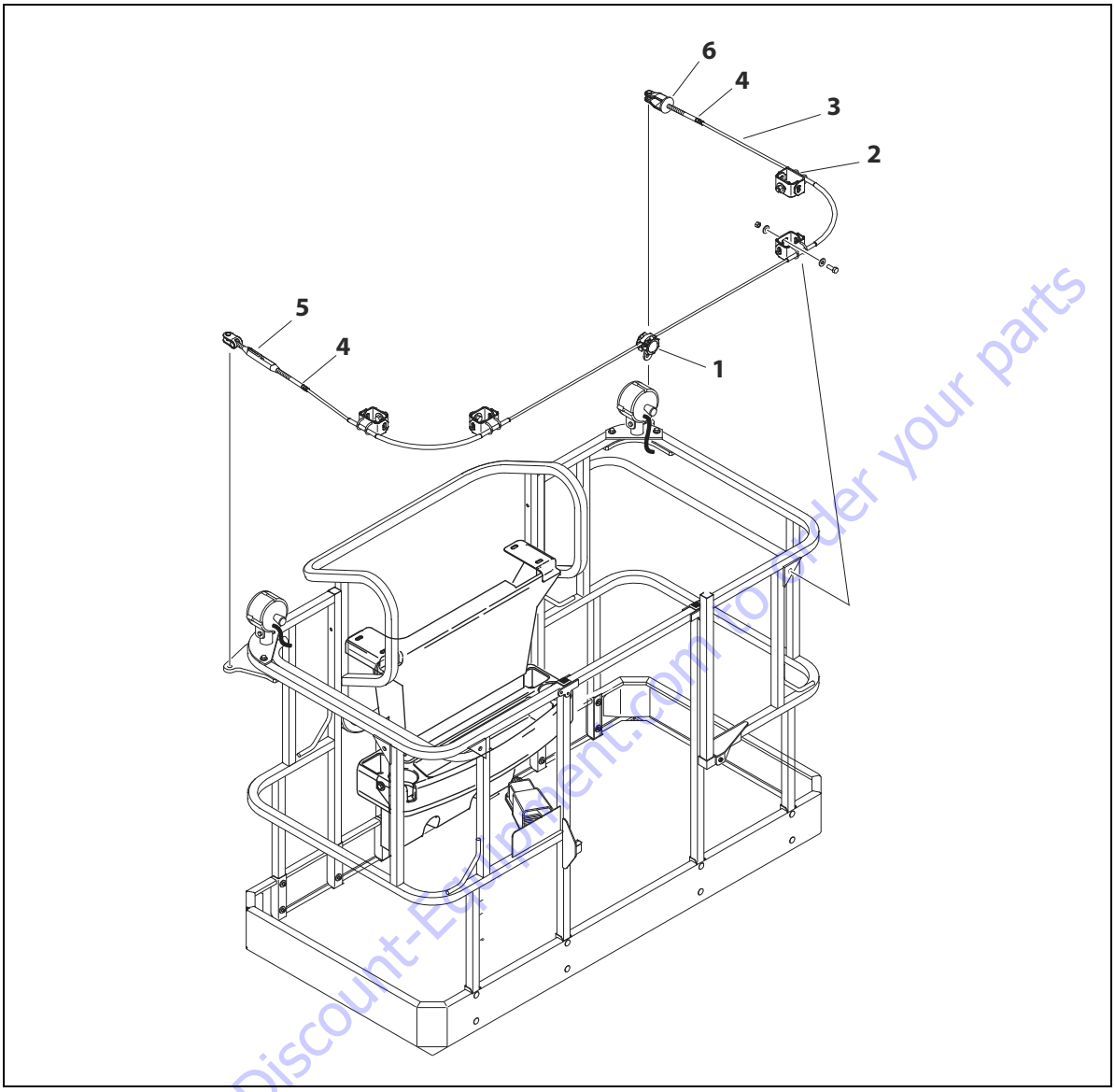
The following items should be checked per your maintenance schedule.

Cable:
- Corrosion
- Broken Strands
- Swage Pull Out
- Dust or Debris

Fittings:
- Loose Fittings
- Hardware (Nuts and Bolts)
- Hanger
- Corner Bracket
- Line Tenser/Transfastener

Installation

Installation requires bolting the ends of the cable to the platform with the supplied drilled bolt, castle nut, and split pin. The drilled bolts only need to be tightened enough to fully engage all of the threads of the castle nut and then further just enough to install the split pin. The intermediate supports are also bolted to the platform. The intermediate supports are adjusted to an angle slightly below horizontal to improve the movement of the transfastener. Ensure all bolts and locknuts are tightened properly. The cable is then tensioned until the tension indicator spins and the locking pins are then installed in the turnbuckle to hold it in place.



1. Transfastener
2. Bracket
3. Cable
4. Swage/Slip Indicator
5. Turnbuckle
6. Line Tenser

Figure 4-30. External Fall Arrest System Components

4.21 PLATFORM LOAD SENSING SYSTEM

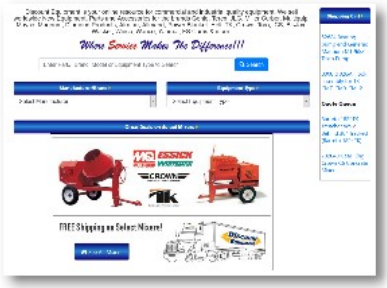
The Platform Load Sensing System (LSS) consists of 1 load cell and 2 linkages mounted to the platform rotator and replaces the platform support on machines that get this optional installation. The load cell includes a sealed circuit and is connected directly to a CAN based platform control panel within the platform box. This system measures the weight in the platform.

When the capacity is exceeded, or when there is a fault in the system, the platform overload indicator will flash, the platform alarm will sound at the standard JLG duty cycle of
5 sec on / 2 sec off and all platform controls (except emergency descent) will be disabled.

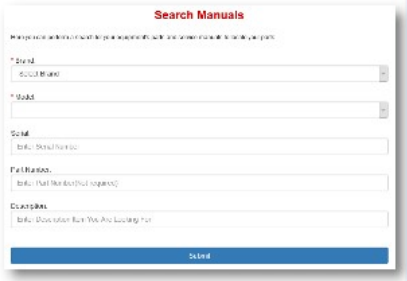
PARTS FINDER

Search Website by Part Number

Discount Equipment



Search Manual Library For Parts Manual & Lookup Part Numbers – Purchase or Request Quote



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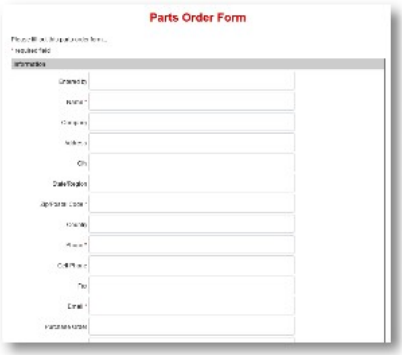

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SECTION 5. BASIC HYDRAULIC INFORMATION AND SCHEMATICS

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 VALVES - THEORY OF OPERATION

Solenoid Control Valve - Rexroth

Control valves used are four-way three-position solenoid valves of the sliding spool design. When a circuit is activated and the control valve solenoid energizes, the spool is shifted and the corresponding work port opens to permit oil flow to the component in the selected circuit with the opposite work port opening to reservoir. Once the circuit is deactivated (control returned to neutral) the valve spool returns to neutral (center) and oil flow is then directed through the valve body and returns to reservoir. A typical control valve consist of the valve body, sliding spool, and two solenoid assemblies. The spool is machine fitted in the bore of the valve body. Lands on the spool divide the bore into various chambers, which when the spool is shifted, align with corresponding ports in the valve body open to common flow. At the same time other ports would be blocked to flow. The spool is spring loaded to center position, therefore when the control is released, the spool automatically returns to neutral, prohibiting any flow through the circuit.

Relief Valves

Relief valves are installed at various points within the hydraulic system to protect associated systems and components against excessive pressure. Excessive pressure can be developed when a cylinder reaches its limit of travel and the flow of pressurized fluid continues from the system control. The relief valve provides an alternate path for the continuing flow from the pump, thus preventing rupture of the cylinder, hydraulic line or fitting. Complete failure of the system pump is also avoided by relieving circuit pressure. The relief valve is installed in the circuit between the pump outlet (pressure line) and the cylinder of the circuit, generally as an integral part of the system valve bank. Relief pressures are set slightly higher than the load requirement, with the valve diverting excess pump delivery back to the reservoir when operating pressure of the component is reached.

5.3 HOLDING VALVE CHECKS

1. Start the machine and warm the hydraulic system to operating temperature.

NOTICE

PERFORM ALL HOLDING VALVE CHECKS FROM THE GROUND CONTROL STATION WITH AN EMPTY PLATFORM.

2. Check the Upright level cylinder rod side holding valve as follows:
   a. Fully retract and fully lower the main boom and tower boom assemblies.
   b. Power the main boom lift down function into the turntable boom rest by holding the function switch down between 10 and 20 seconds.
   c. Verify the upright remains perpendicular to the turntable and that the Upright Monitoring System alarms have not been activated.
3. Check the Upright level cylinder barrel side holding valve function as follows:
   a. Fully retract and fully lower the main boom and tower boom assemblies. Raise the tower boom between 2 ft. and 5 ft. (0.6 m and 1.5 m).
   b. Pull and hold the re-leveling knob between 20 and 30 seconds.
   c. Verify the upright remains perpendicular to the turntable and that the Upright Monitoring System alarms have not been activated.
4. Check the Tower lift cylinder barrel side holding valve function as follows:
   a. Fully raise and fully retract the tower boom. Fully raise and fully extend the main boom.
   b. Using auxiliary power, fully lower the tower boom.
   c. Verify the upright remains perpendicular to the turntable and that the Upright Monitoring System alarms have not been activated.

5. Check the Tower lift up holding valve function as follows:

   a. Fully retract and fully lower the main boom and tower boom assemblies.

   b. Install a 5000 psi (345 bar) pressure gauge to the pressure tap connection installed on port #7 or port MX7 of the main control valve block. This pressure test connection was installed in earlier steps.

   c. Hold the tower boom lift up function between 2 and 5 seconds, and then release the function.

   d. Verify that the gauge reads, and maintains, pressure above 1000 psi (68.95 bar) for one minute.

NOTE: *If pressure does not remain above the stated pressure for one minute, replace the tower lift check valve (#7017474).*

   e. Activate tower lift down to release any trapped pressure and remove pressure gauge from the test port.

6. Load the platform with the rated capacity and cycle all functions a minimum of five times to confirm safe and proper operational characteristics.

7. The machine may be returned to service once proper operation is confirmed.

5.4 CYLINDERS - THEORY OF OPERATION

Systems Incorporating Double Acting Cylinders

Cylinders are of the double acting type. Systems incorporating double acting cylinders are as follows: - Tower Lift, Slave Level/ Main Level, Main Lift, Main Telescope, Master Level/Upright Level, Articulating Jib Boom Lift, Steer and Axle lockout. A double acting cylinder is one that requires oil flow to operate the cylinder rod in both directions. Directing oil (by actuating the corresponding control valve to the piston side of the cylinder) forces the piston to travel toward the rod end of the barrel, extending the cylinder rod (piston attached to rod). When the oil flow is stopped, movement of rod will stop. By directing oil to the rod side of the cylinder, the piston will be forced in the opposite direction and the cylinder rod will retract.

Systems Incorporating Holding Valves

Holding valves are used in the - Tower lift, Tower Telescope, Upright Level, Lockout, Articulating Jib Boom Lift, Main Lift/ Slave Level and Main Telescope circuits to prevent retraction of the cylinder rod should a hydraulic line rupture or a leak develop between the cylinder and its related control valve.

5.5 CYLINDER CHECKING PROCEDURE

NOTE: *Cylinder check must be performed anytime a system component is replaced or when improper system operation is suspected.*

Cylinders Without Counterbalance Valves - Master Cylinder and Steer Cylinders

1. Using all applicable safety precautions, activate engine and fully extend cylinder to be checked. Shut down engine.
2. Carefully disconnect hydraulic hoses from retract port of cylinder. There will be some initial weeping of hydraulic fluid which can be caught in a suitable container. After the initial discharge, there should be no further drainage from the retract port.
3. Activate engine and extend cylinder.
4. If cylinder retract port leakage is less than 6-8 drops per minute, carefully reconnect hose to port and retract cylinder. If leakage continues at a rate of 6-8 drops per minute or more, cylinder repair must be made.
5. With cylinder fully retracted, shut down engine and carefully disconnect hydraulic hose from cylinder extend port.
6. Activate engine and retract cylinder. Check extend port for leakage.
7. If extend port leakage is less than 6-8 drops per minute, carefully reconnect hose to extend port, than activate cylinder through one complete cycle and check for leaks. If leakage continues at a rate of 6-8 drops per minute or more, cylinder repairs must be made.

Cylinders With Single Counterbalance Valve

Main Lift Cylinder.

NOTICE

OPERATE ALL FUNCTIONS FROM GROUND CONTROL STATION ONLY.

1. Using all applicable safety precautions, activate hydraulic system.

⚠ WARNING

WHEN WORKING ON THE MAIN LIFT CYLINDER, RAISE THE BOOM TO HORIZONTAL AND SUPPORT THE MAIN BOOM, UPRIGHT, AND TOWER BOOM. DO NOT WORK ON THE CYLINDER WITHOUT A SUITABLE SUPPORT IN PLACE.

2. Shut down hydraulic system and allow machine to sit for 10-15 minutes. If machine is equipped with bang-bang or proportional control valves, turn IGNITION SWITCH to ON, move control switch or lever for applicable cylinder in each direction, then turn IGNITION SWITCH to OFF. If machine is equipped with hydraulic control valves, move control lever for applicable cylinder in each direction. This is done to relieve pressure in the hydraulic lines. Carefully remove hydraulic hoses from appropriate cylinder port block.
3. There will be initial weeping of hydraulic fluid, which can be caught in a suitable container. After the initial discharge, there should be no further leakage from the ports. If leakage continues at a rate of 6-8 drops per minute or more, the counterbalance valve is defective and must be replaced.
4. To check piston seals, carefully remove the counterbalance valve from the retract port. After initial discharge, there should be no further leakage from the ports. If leakage occurs at a rate of 6-8 drops per minute or more, the piston seals are defective and must be replaced.
5. If no repairs are necessary or when repairs have been made, replace counterbalance valve and carefully connect hydraulic hoses to cylinder port block.
6. If used, remove lifting device from upright or remove prop from below main boom, activate hydraulic system and run cylinder through one complete cycle to check for leaks.

Cylinders With Dual Counterbalance Valves

Articulating Jib Boom Lift, Slave Level, Tower Lift, Upright level and Main Telescope.

NOTICE

OPERATE ALL FUNCTIONS FROM GROUND CONTROL STATION ONLY.

1. Using all applicable safety precautions, activate hydraulic system.

⚠ WARNING

IF WORKING ON THE TOWER BOOM LIFT CYLINDER, RAISE TOWER BOOM HALFWAY, FULLY ELEVATE MAIN BOOM WITH TELESCOPE CYLINDER FULLY RETRACTED AND ATTACH AN OVERHEAD CRANE TO THE UPRIGHT FOR SUPPORT, LEAVING APPROXIMATELY 1 INCH (2.54 CM) OF SLACK IN CHAIN OR SLING FOR TEST PURPOSES. IF WORKING ON THE UPRIGHT LEVEL, RAISE THE TOWER BOOM HALFWAY, THEN RAISE MAIN BOOM TO HORIZONTAL, AND SUPPORT WITH A CRANE OR SUITABLE LIFTING DEVICE, APPROXIMATELY 1 INCH (2.54 CM) BELOW MAIN BOOM. IF WORKING ON THE PLATFORM LEVEL CYLINDER, STROKE PLATFORM LEVEL CYLINDER FORWARD UNTIL PLATFORM SITS AT A 45 DEGREES ANGLE.

2. Shut down hydraulic system and allow machine to sit for 10-15 minutes. If machine is equipped with bang-bang or proportional control valves, turn IGNITION SWITCH to ON, move control switch or lever for applicable cylinder in each direction, then turn IGNITION SWITCH to OFF. If machine is equipped with hydraulic control valves, move control lever for applicable cylinder in each direction. This is done to relieve pressure in the hydraulic lines. Carefully remove hydraulic hoses from appropriate cylinder port block.
3. There will be initial weeping of hydraulic fluid, which can be caught in a suitable container. After the initial discharge, there should be no further leakage from the ports. If leakage continues at a rate of 6-8 drops per minute or more, the counterbalance valve is defective and must be replaced.
4. To check piston seals, carefully remove the counterbalance valve from the retract port. After initial discharge, there should be no further leakage from the ports. If leakage occurs at a rate of 6-8 drops per minute or more, the piston seals are defective and must be replaced.
5. If no repairs are necessary or when repairs have been made, replace counterbalance valve and carefully connect hydraulic hoses to cylinder port block.
6. If used, remove lifting device from upright or remove prop from below main boom, activate hydraulic system and run cylinder through one complete cycle to check for leaks.

5.6 CYLINDER REPAIR

Upright Level Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance holding valves and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

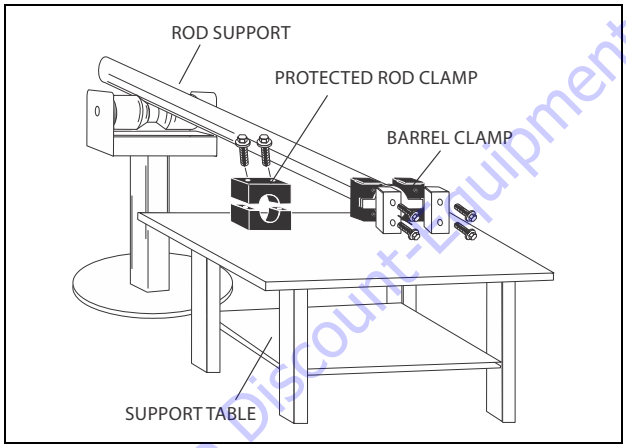


Figure 5-1. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

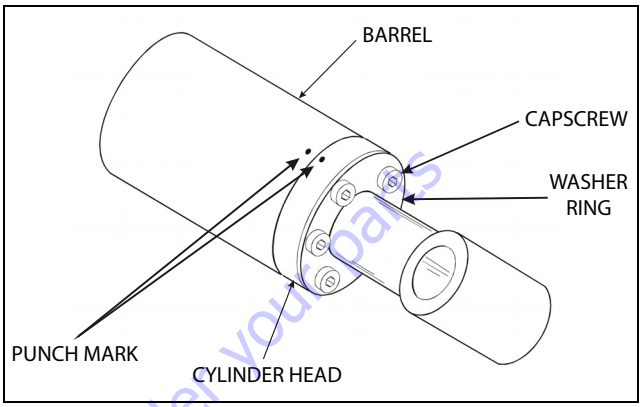


Figure 5-2. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

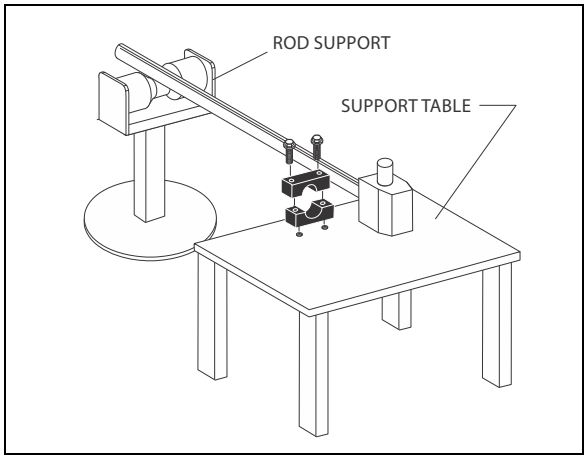
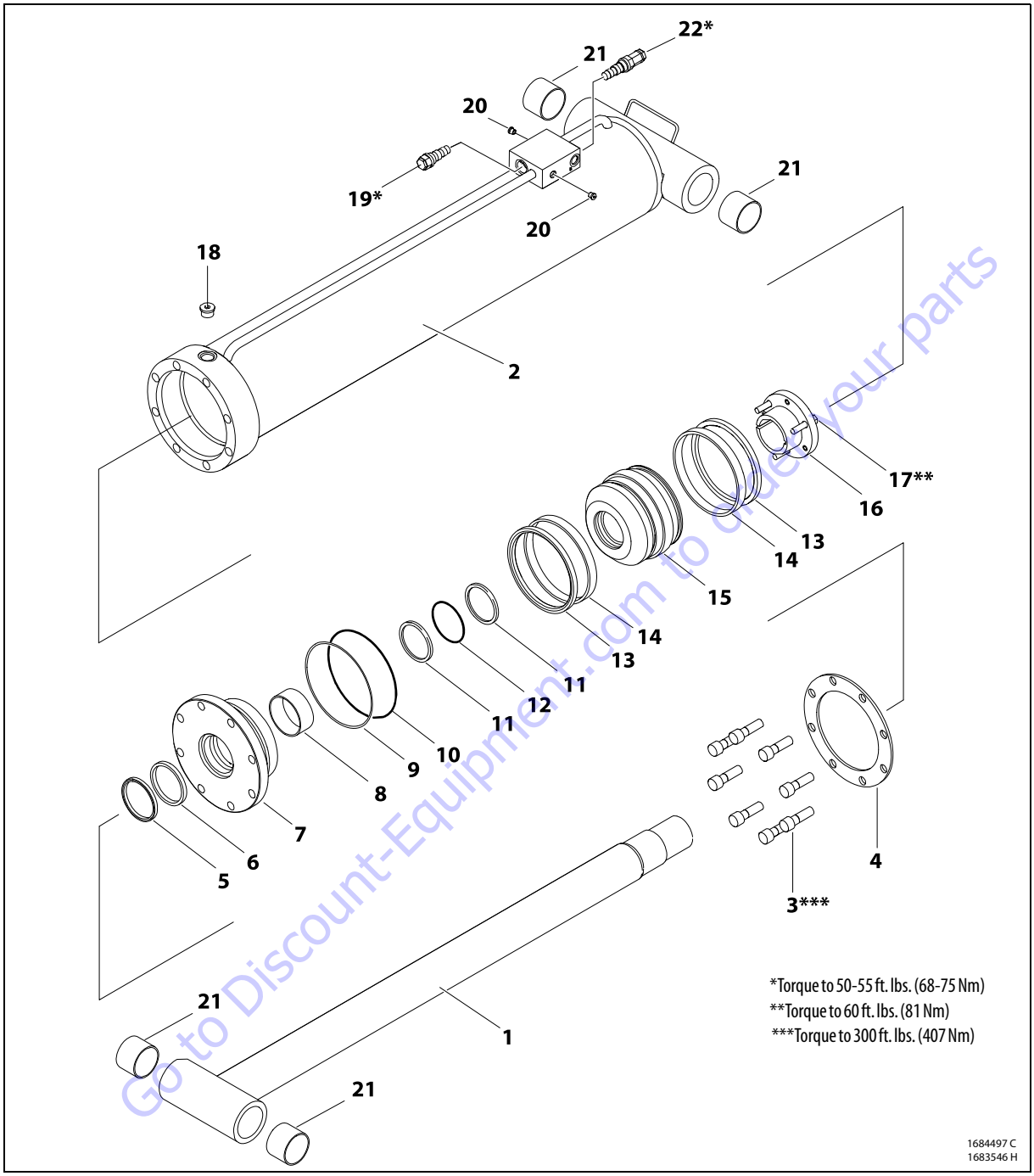


Figure 5-3. Cylinder Rod Support



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

Figure 5-4. Upright Level Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

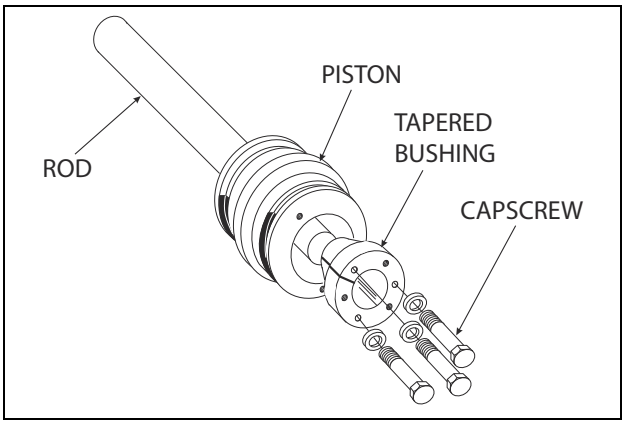


Figure 5-5. Tapered Bushing Removal

12. Screw the piston counterclockwise with hand and remove the piston from cylinder rod.
13. Remove and discard the piston o-ring, backup ring, hydrolock seals, and guidelock rings.
14. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-ring, backup ring, rod seal, wear ring, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

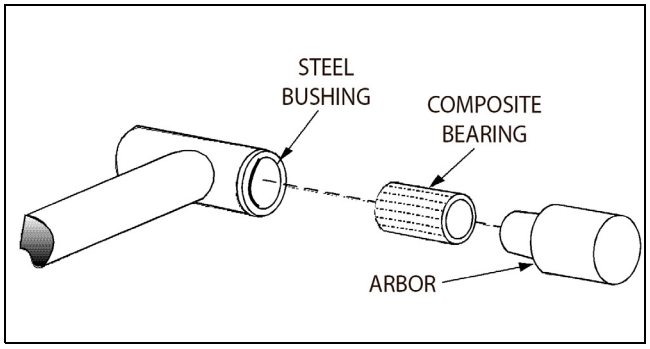


Figure 5-6. Composite Bearing Installation

14. If applicable, inspect port block fittings and holding valve. Replace as necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

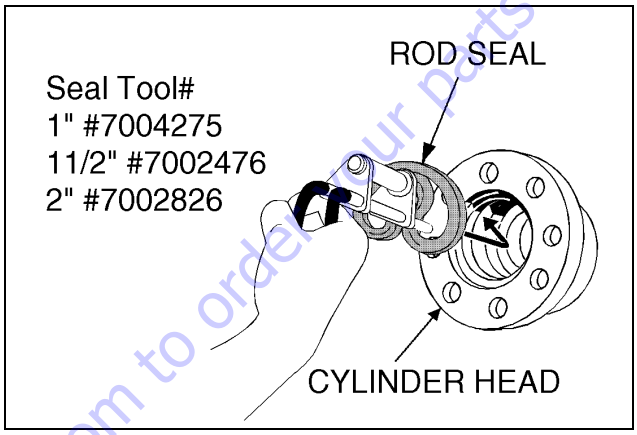


Figure 5-7. Rod Seal Installation

NOTICE

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

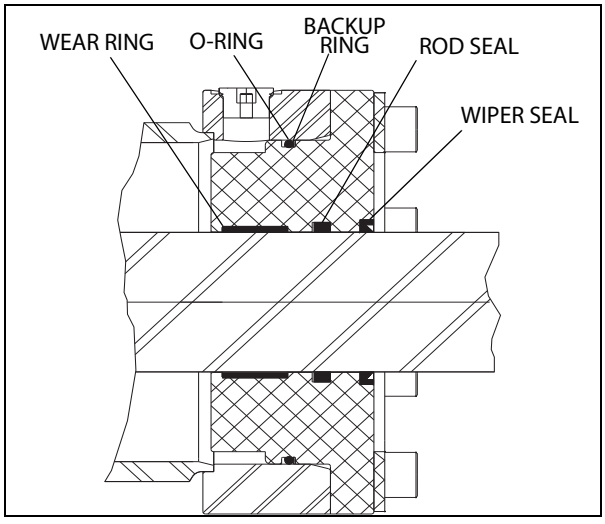


Figure 5-8. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

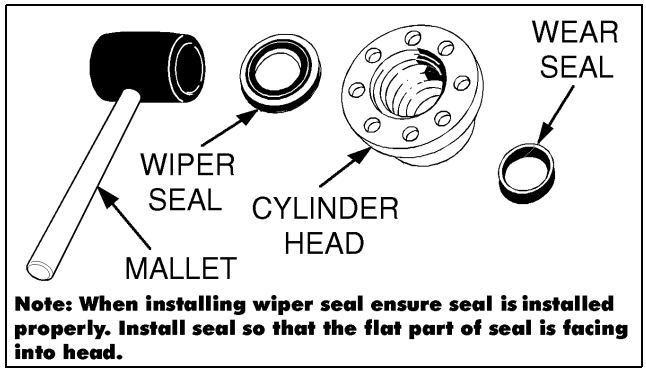


Figure 5-9. Wiper Seal Installation

3. Place a new o-ring and backup seal in the applicable outside diameter groove of the cylinder head.

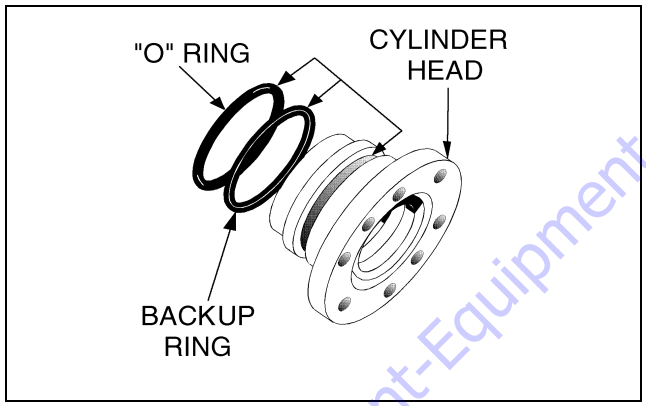


Figure 5-10. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Place a new washer ring and backup rings in the inner piston diameter groove.

7. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the washer ring and backup rings are not damaged or dislodged.

8. Thread piston onto rod until it abuts the spacer end and install the tapered bushing.

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

9. 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.

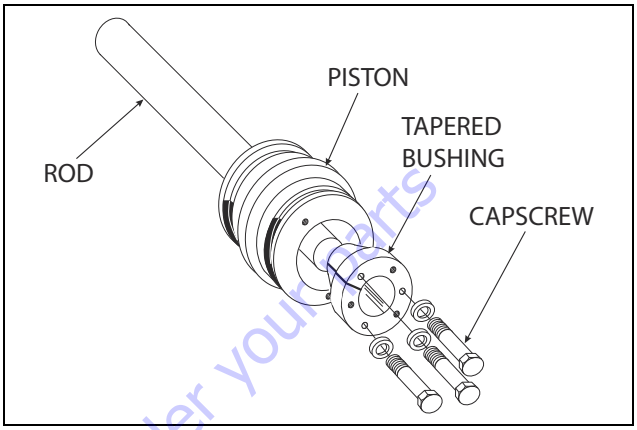


Figure 5-11. Tapered Bushing Installation

10. Tighten the capscrews evenly and progressively in rotation to 60 ft. lbs. (81 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. 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.

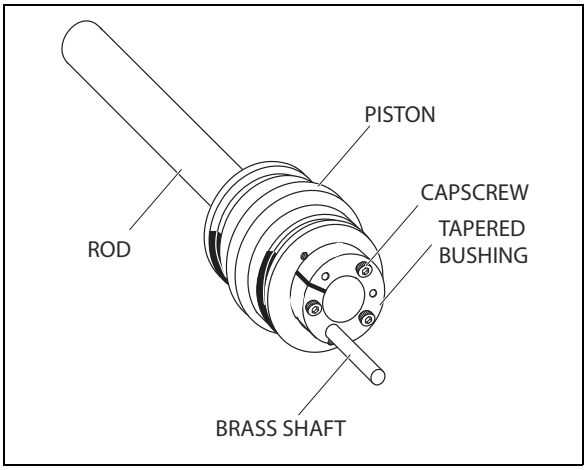


Figure 5-12. Seating the Tapered Bearing

12. Rotate the capscrews evenly and progressively in rotation to 60 ft. lbs. (81 Nm).

13. Remove the cylinder rod from the holding fixture.

NOTICE

WHEN INSTALLING HYDROLOCK PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO HYDROLOCK PISTON SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

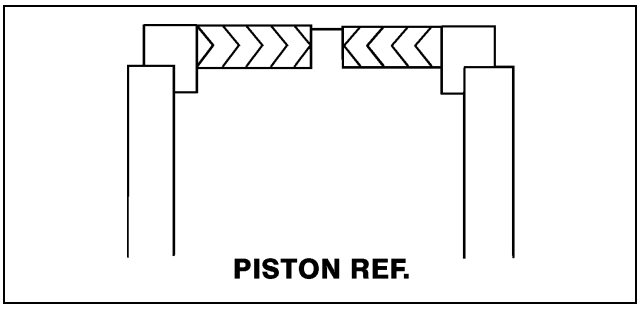


Figure 5-13. Hydrolock Piston Seal Installation

14. Place new hydrolock seal and guidelock rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal.)

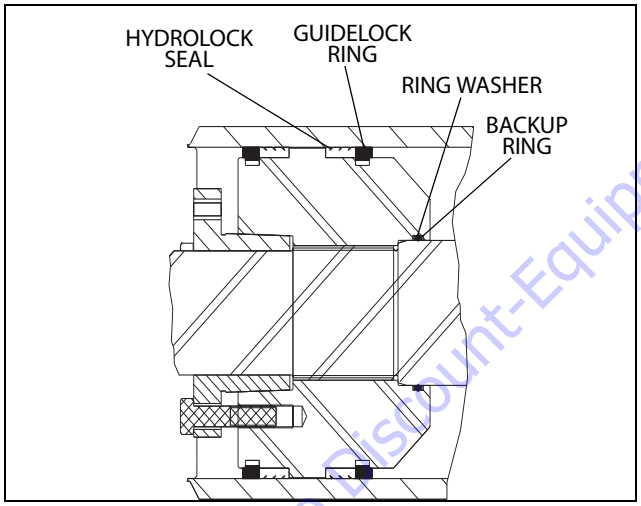


Figure 5-14. Piston Seal Kit Installation

15. 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.

16. With barrel clamped securely and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading guidelock rings and hydrolock seals are not damaged or dislodged.

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

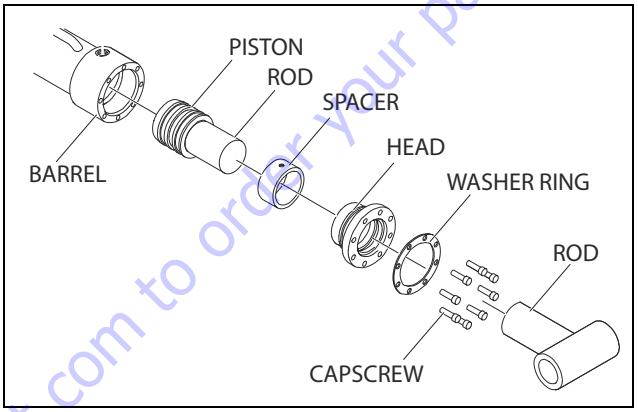


Figure 5-15. Rod Assembly Installation

18. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 300 ft. lbs. (406 Nm).

19. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

20. Install the counterbalance valve and fittings in the rod port block, using new o-rings as applicable. Torque to counterbalance valve as shown in Figure 5-4., Upright Level Cylinder.

Jib Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance holding valves and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

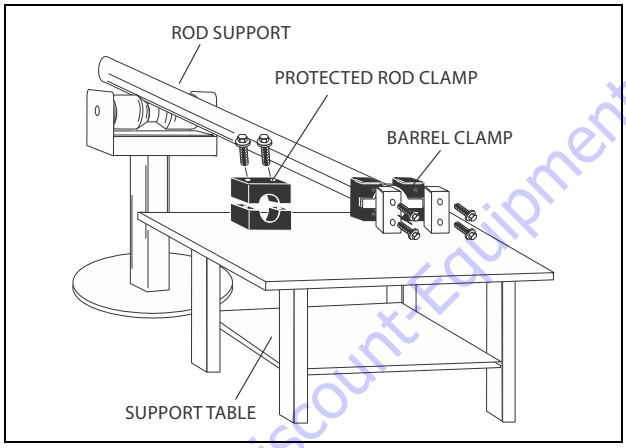


Figure 5-16. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

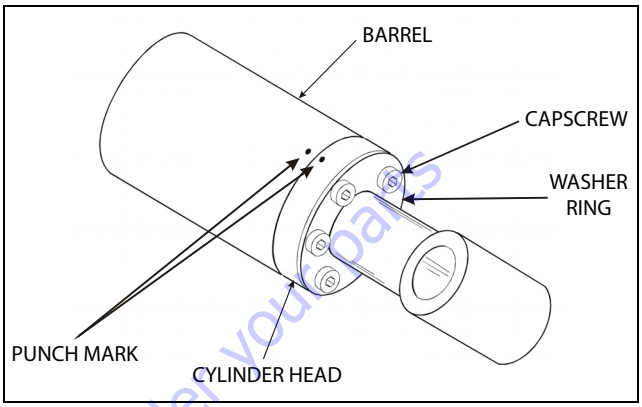


Figure 5-17. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

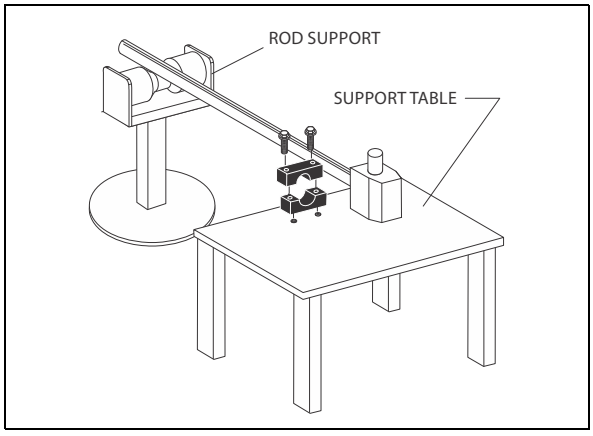
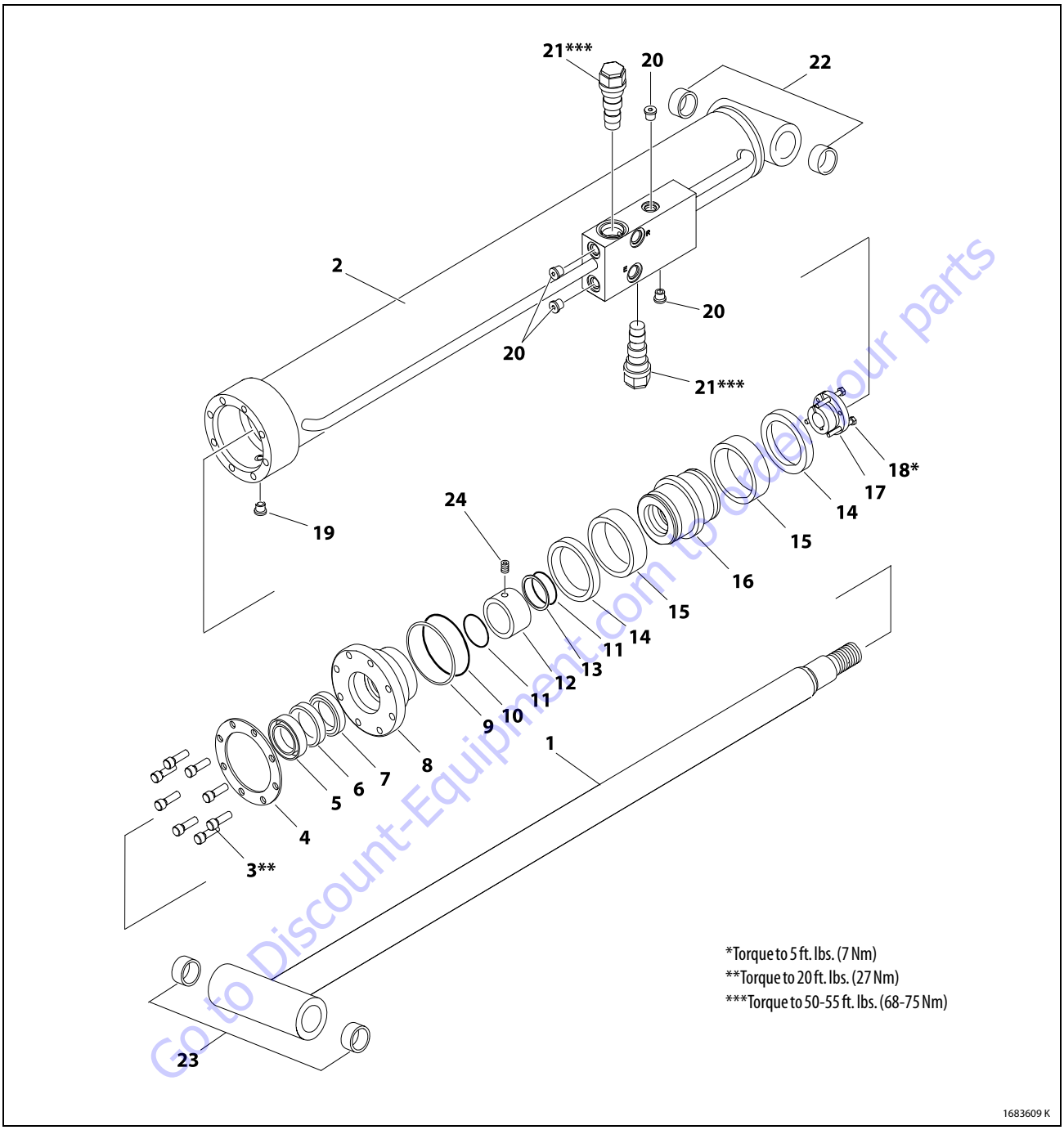
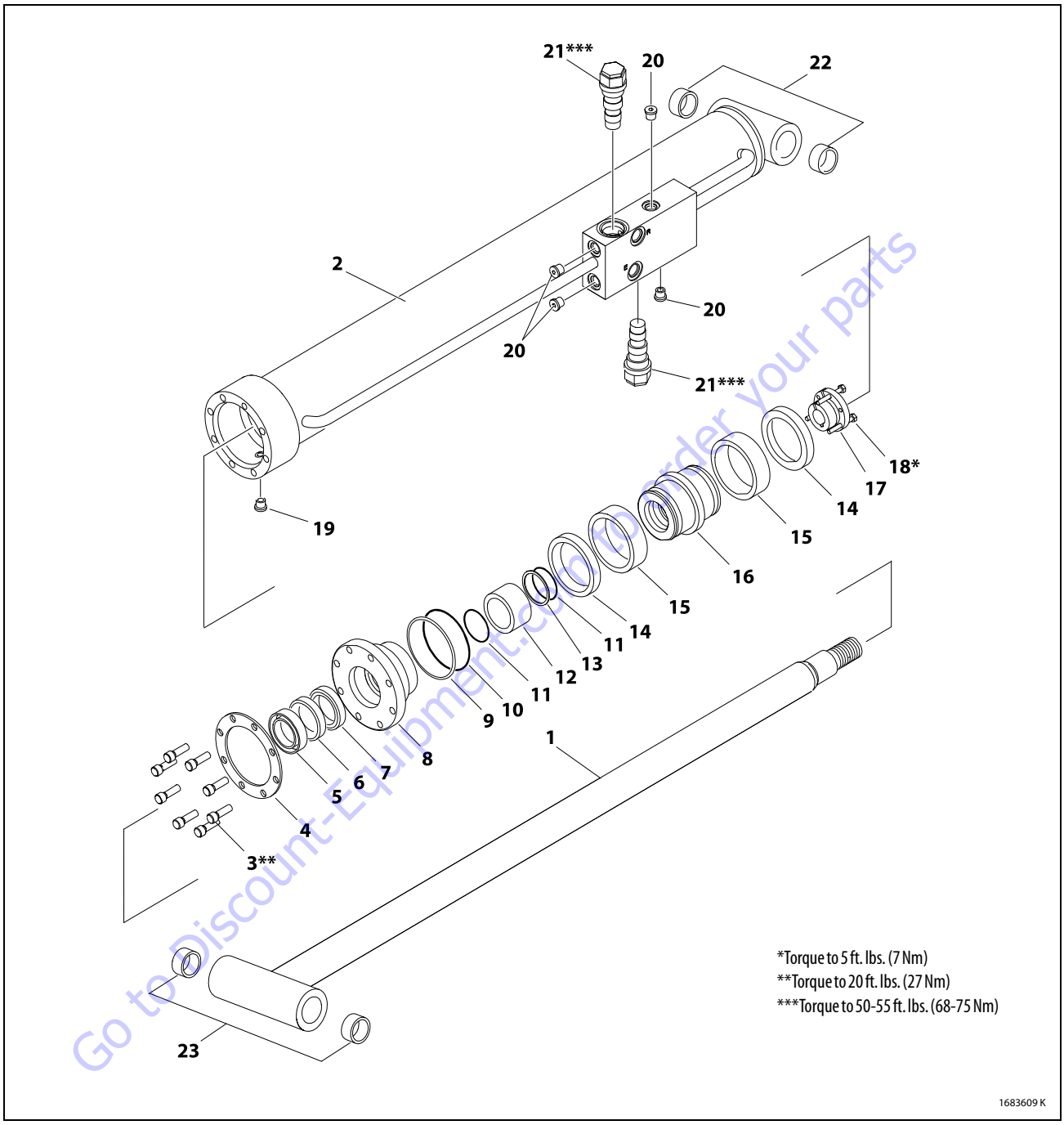


Figure 5-18. Cylinder Rod Support



1. Rod
2. Barrel
3. Capscrew
4. Ring Washer
5. Wiper Seal
6. Hydrolock Seal
7. Wear Ring
8. Head
9. Backup Ring
10. O-ring
11. O-ring
12. Spacer Tube
13. Backup Ring
14. Guidelock Ring
15. Piston Seal
16. Piston
17. Tapered Bushing
18. Capscrew
19. Plug
20. Plug
21. Counterbalance Valve
22. Bushing
23. Bushing
24. Setscrew

Figure 5-19. Jib Lift Cylinder (SN 0300069000 through 0300079612)



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

Figure 5-20. Jib Lift Cylinder (SN 0300079613 through 0300185827)

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

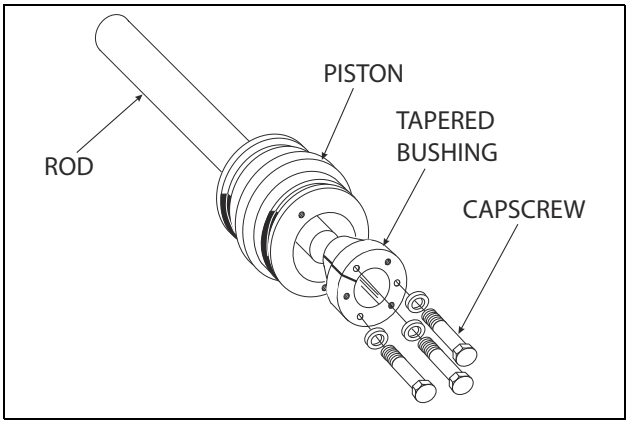


Figure 5-21. Tapered Bushing Removal

12. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
13. Remove and discard the piston o-ring, backup ring, hydrolock seals, and guidelock rings.

NOTE: *Step 14 is applicable only for cylinders with SN 0300069000 through 0300079612.*

14. Remove setscrew and piston spacer from the rod.

NOTE: *Step 15 is applicable only for cylinders with SN 0300079613 through 0300185827.*

15. Remove piston spacer from the rod.
16. Remove and discard o-ring from piston spacer inside groove.
17. Remove the rod from the holding fixture. Remove capscrews and washer ring. Remove the cylinder head gland. Discard the o-rings, backup ring, rod seal, wiper seal, and wear ring.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

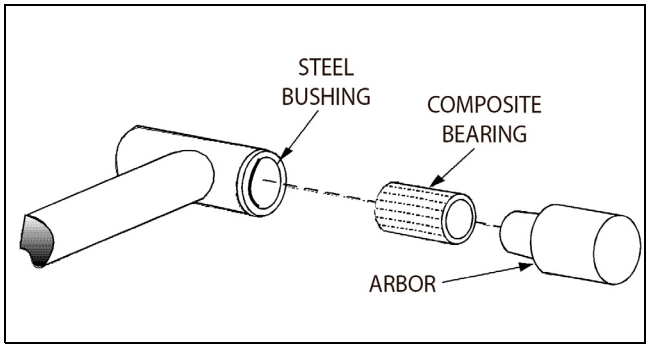


Figure 5-22. Composite Bearing Installation

14. Inspect travel limiting collar or spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. If applicable, inspect port block fittings and holding valve. Replace as necessary.
16. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
17. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

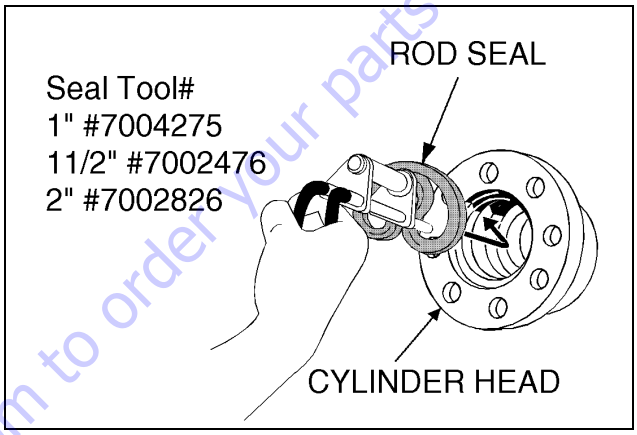


Figure 5-23. Rod Seal Installation

NOTICE

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

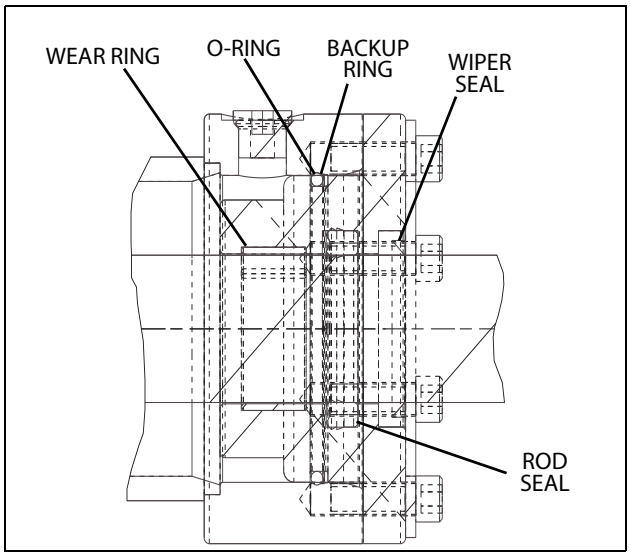


Figure 5-24. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

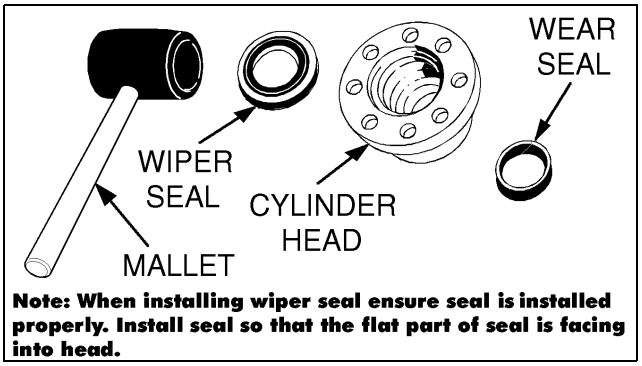


Figure 5-25. Wiper Seal Installation

3. Place a new o-ring and backup seal in the applicable outside diameter groove of the cylinder head.

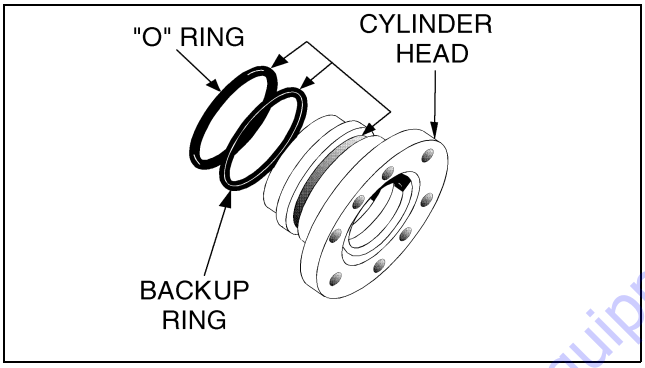


Figure 5-26. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Place new o-ring in the inner piston spacer diameter groove.

NOTE: *Step 7 is applicable only for cylinders with SN 0300069000 through 0300079612.*

7. Carefully slide the piston spacer onto the rod and install setscrew. Ensure that o-ring is not damaged or dislodged.

NOTE: *Step 8 is applicable only for cylinders with SN 0300079613 through 0300185827.*

8. Carefully slide the piston spacer onto rod. Ensure that o-ring is not damaged or dislodged.

9. Place a new o-ring and backup rings in the inner piston diameter groove.

10. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

11. Thread piston onto rod until it abuts the spacer end and install the tapered bushing.

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

12. 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.

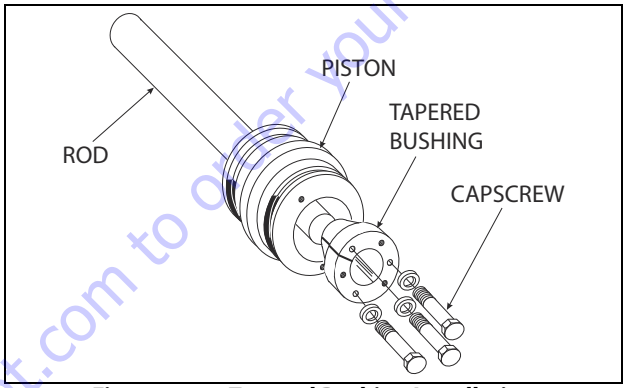


Figure 5-27. Tapered Bushing Installation

13. Tighten the capscrews evenly and progressively in rotation to 5 ft. lbs. (7 Nm).

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

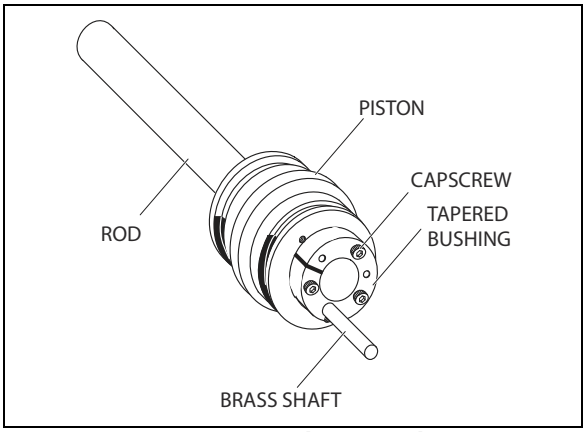


Figure 5-28. Seating the Tapered Bearing

15. Rotate the capscrews evenly and progressively in rotation to 5 ft. lbs. (7 Nm).

16. Remove the cylinder rod from the holding fixture.

NOTICE

WHEN INSTALLING HYDROLOCK PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO HYDROLOCK PISTON SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

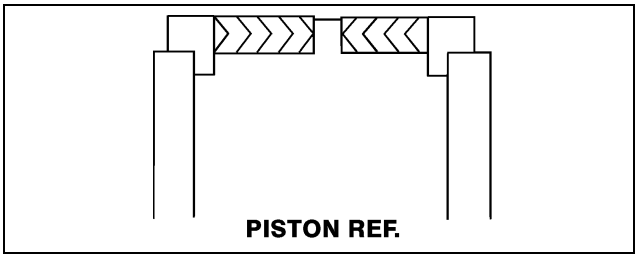


Figure 5-29. Hydrolock Piston Seal Installation

17. Place a new o-ring and backup rings in the inner piston diameter groove.

18. Place new hydrolock seals and guidelock rings in the applicable outside diameter grooves of the cylinder piston.

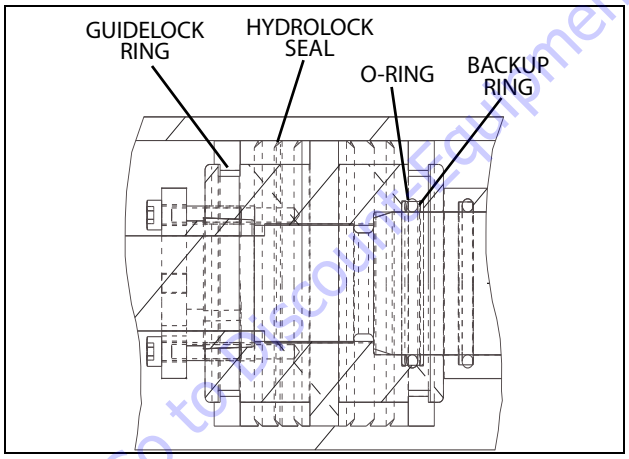


Figure 5-30. Piston Seal Kit Installation

19. 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.

20. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading guidelock rings and hydrolock seals are not damaged or dislodged.

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

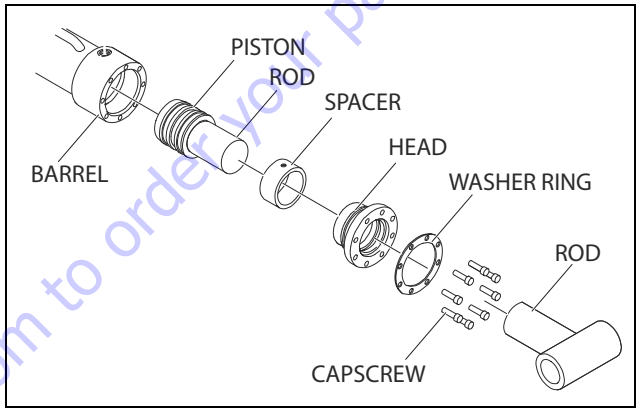


Figure 5-31. Rod Assembly Installation

22. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 20 ft. lbs. (27 Nm).

23. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

24. Install the counterbalance valve and fittings in the rod port block, using new o-rings as applicable. Torque to counterbalance valve as shown in Figure 5-20., Jib Lift Cylinder (SN 0300079613 through 0300185827) and Figure 5-20., Jib Lift Cylinder (SN 0300079613 through 0300185827).

Main Boom Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance holding valves and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

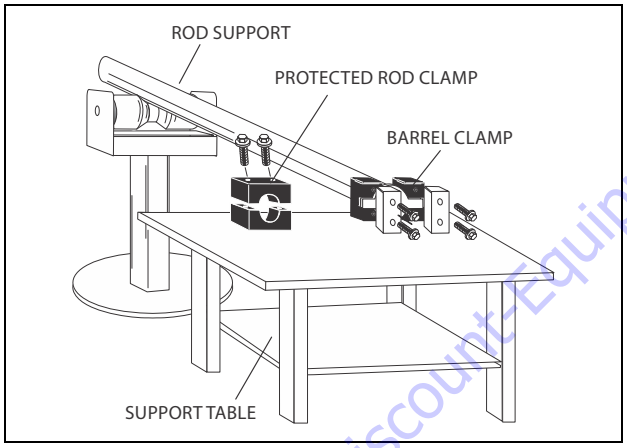


Figure 5-32. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

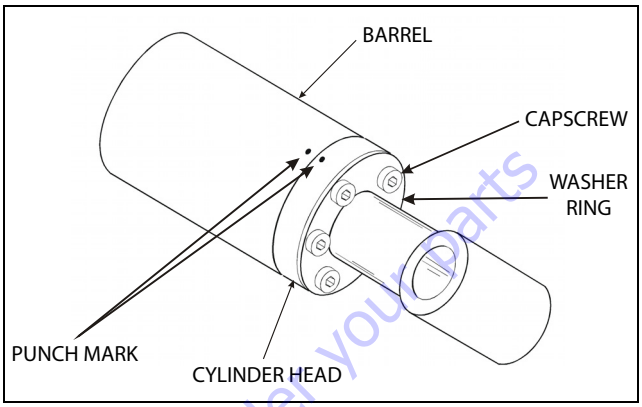


Figure 5-33. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

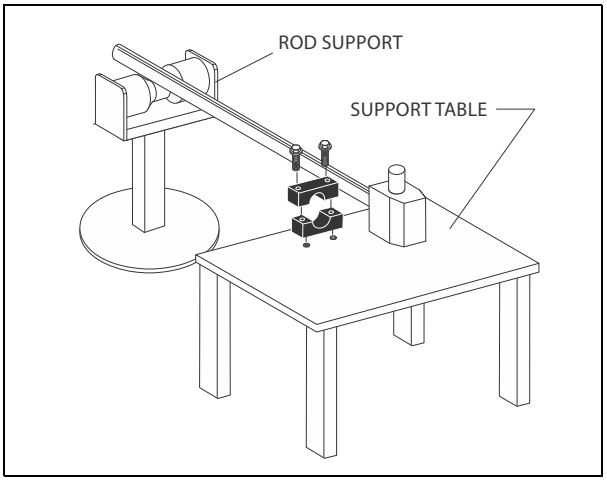
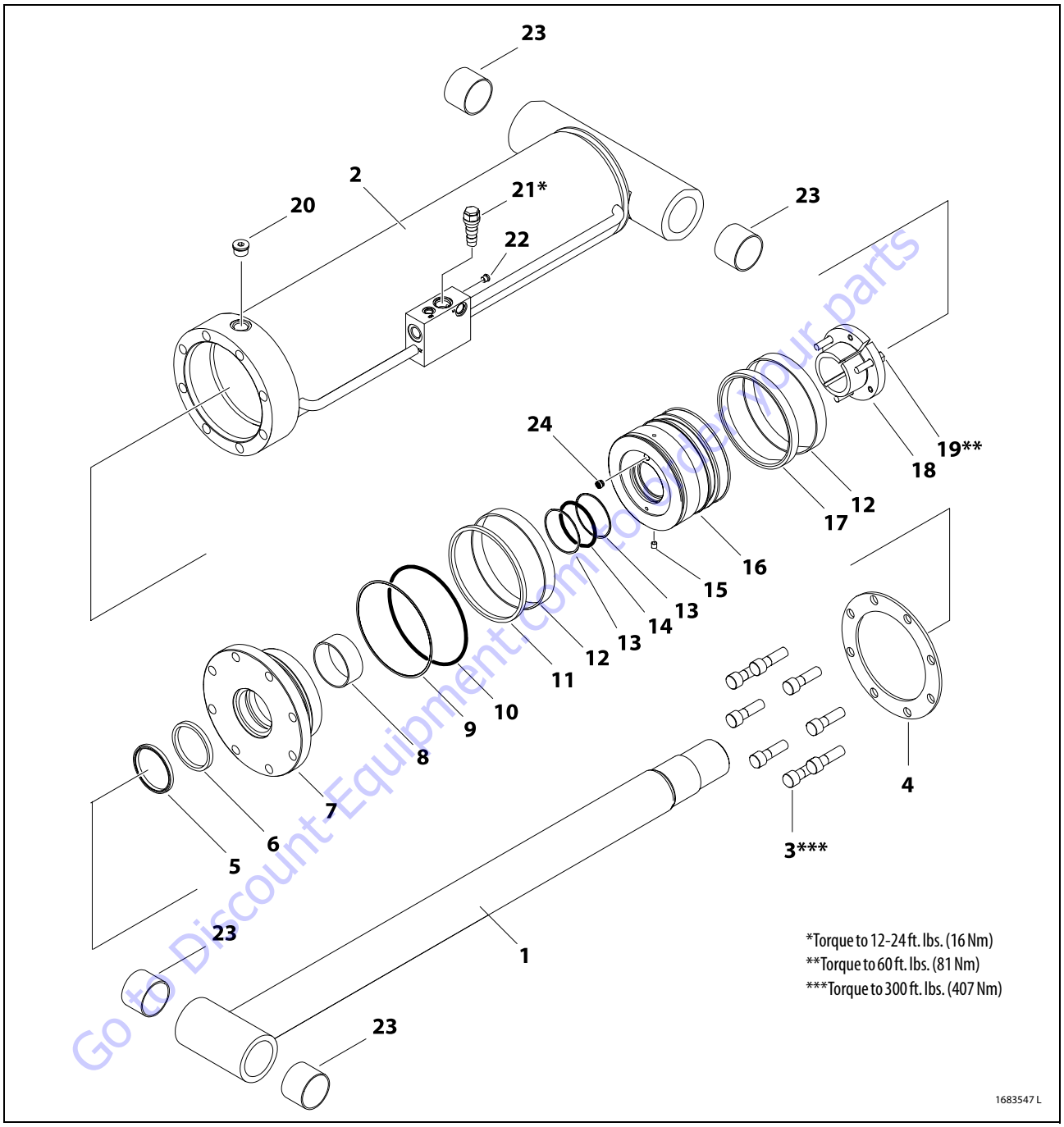


Figure 5-34. Cylinder Rod Support



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

Figure 5-35. Main Boom Lift Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

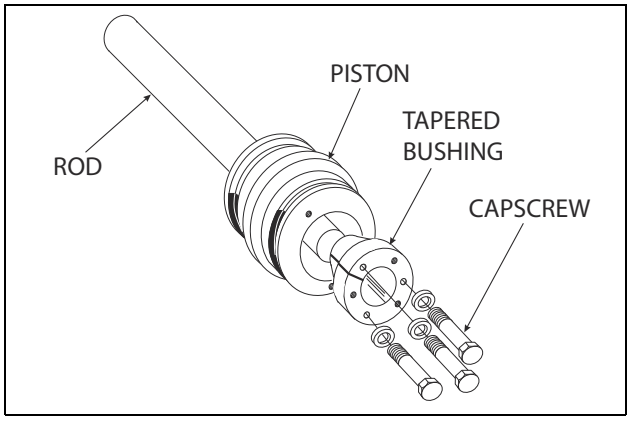


Figure 5-36. Tapered Bushing Removal

12. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
13. Remove and discard piston seal, T-seal, o-ring and backup rings. Remove check valve and plug fittings.
14. Remove piston spacer from the rod.
15. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, backup rings, wear ring, rod seal, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

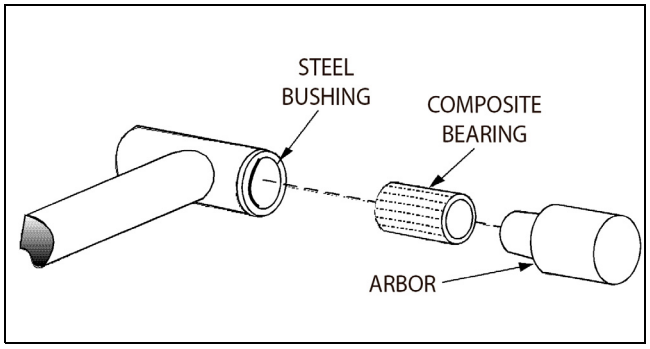


Figure 5-37. Composite Bearing Installation

14. If applicable, inspect port block fittings and holding valve. Replace as necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

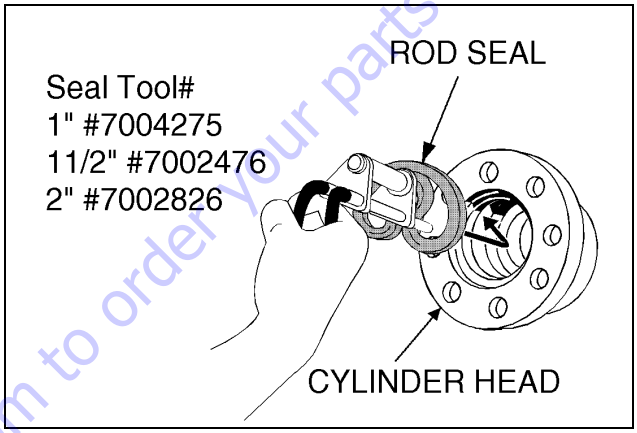


Figure 5-38. Rod Seal Installation

NOTICE

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

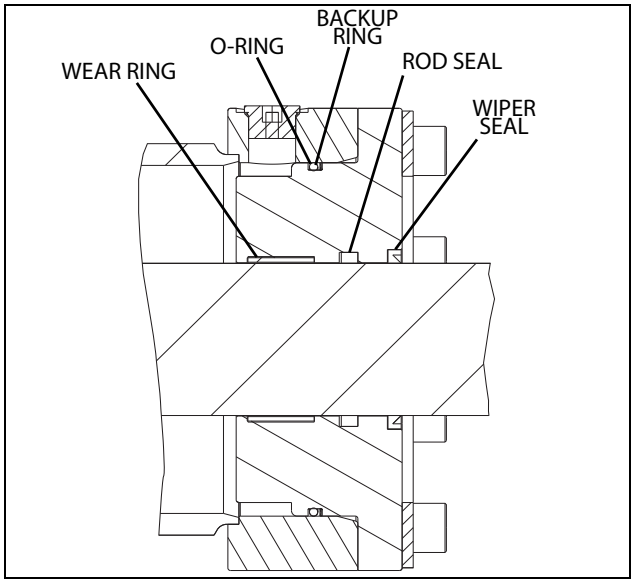


Figure 5-39. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

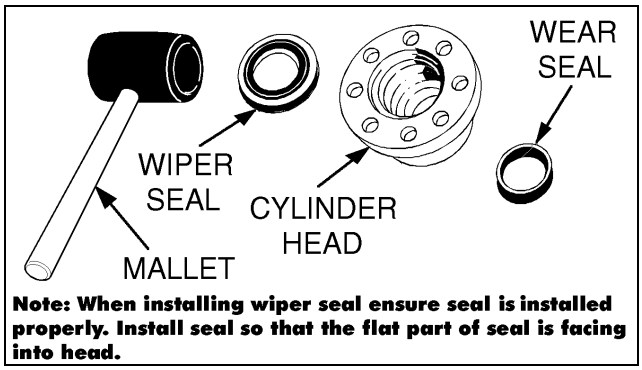


Figure 5-40. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

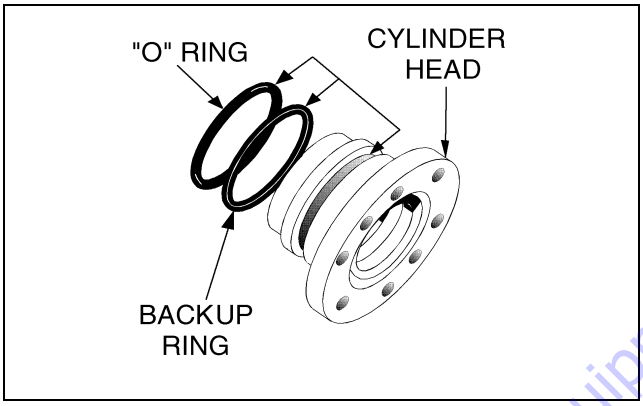


Figure 5-41. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Place a new o-ring and backup ring in the inner piston diameter groove.

7. Install check valve into piston and torque to 12-24 in. lbs (1.4-2.7 Nm).

8. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

9. Thread piston onto rod until it abuts the rod end and install the tapered bushing.

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

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.

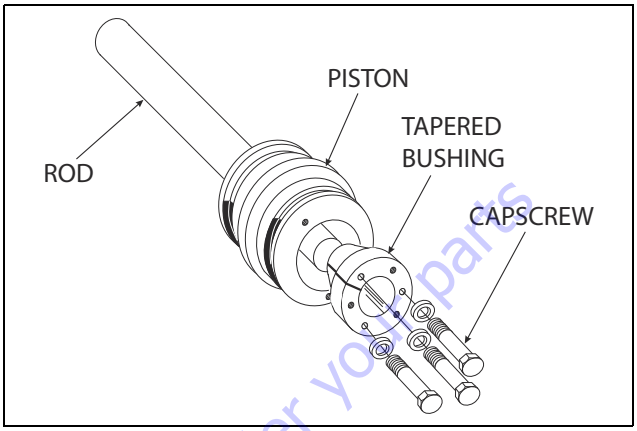


Figure 5-42. Tapered Bushing Installation

11. Tighten the capscrews evenly and progressively in rotation to 60 ft. lbs. (81 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. 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.

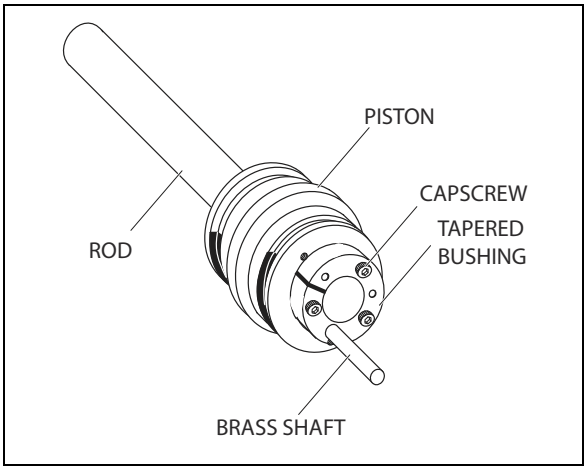


Figure 5-43. Seating the Tapered Bearing

13. Rotate the capscrews evenly and progressively in rotation to 60 ft. lbs. (81 Nm).
14. Insert plug into piston.
15. Remove the cylinder rod from the holding fixture.
16. Place T-seal, piston seal and wear rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

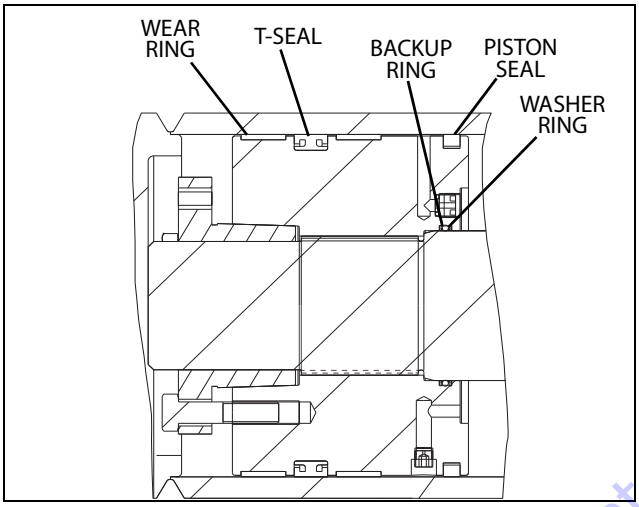


Figure 5-44. Piston Seal Kit Installation

17. 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.

18. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading T-seal, piston seal and wear ring are not damaged or dislodged.
19. Continue pushing the rod into the barrel until the cylinder head gland can be inserted into the barrel cylinder.

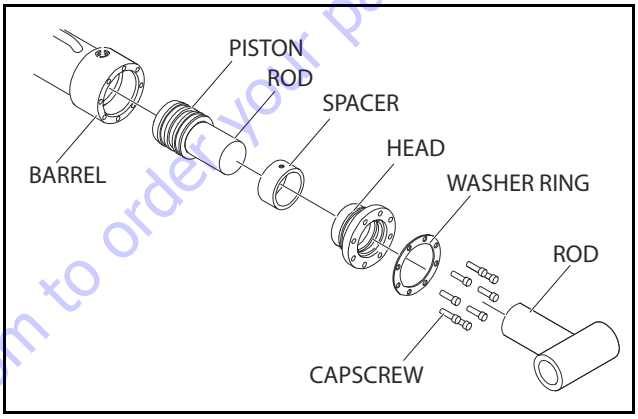


Figure 5-45. Rod Assembly Installation

20. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 300 ft. lbs. (406 Nm).
21. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
22. Install the counterbalance valve and fittings in the rod port block, using new o-rings as applicable. Torque to counterbalance valve as shown in Figure 5-35., Main Boom Lift Cylinder.

Tower Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance valves and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

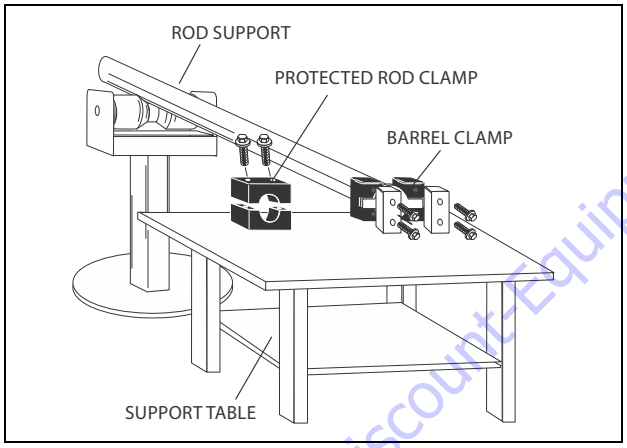


Figure 5-46. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

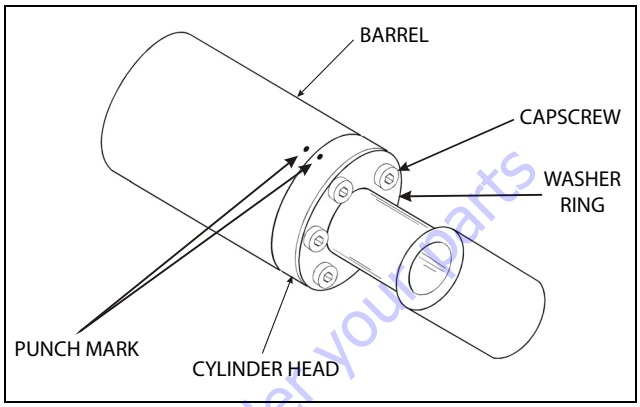


Figure 5-47. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

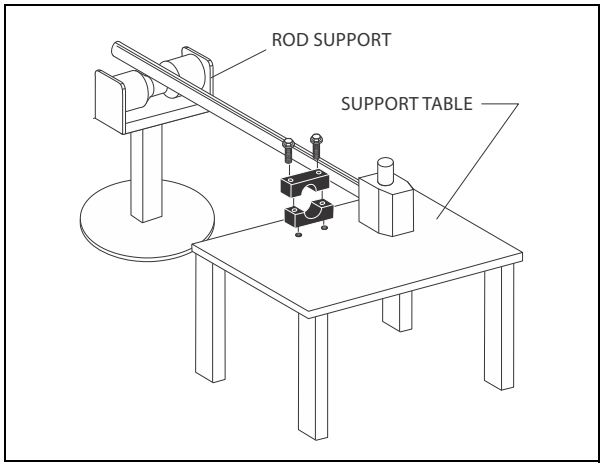
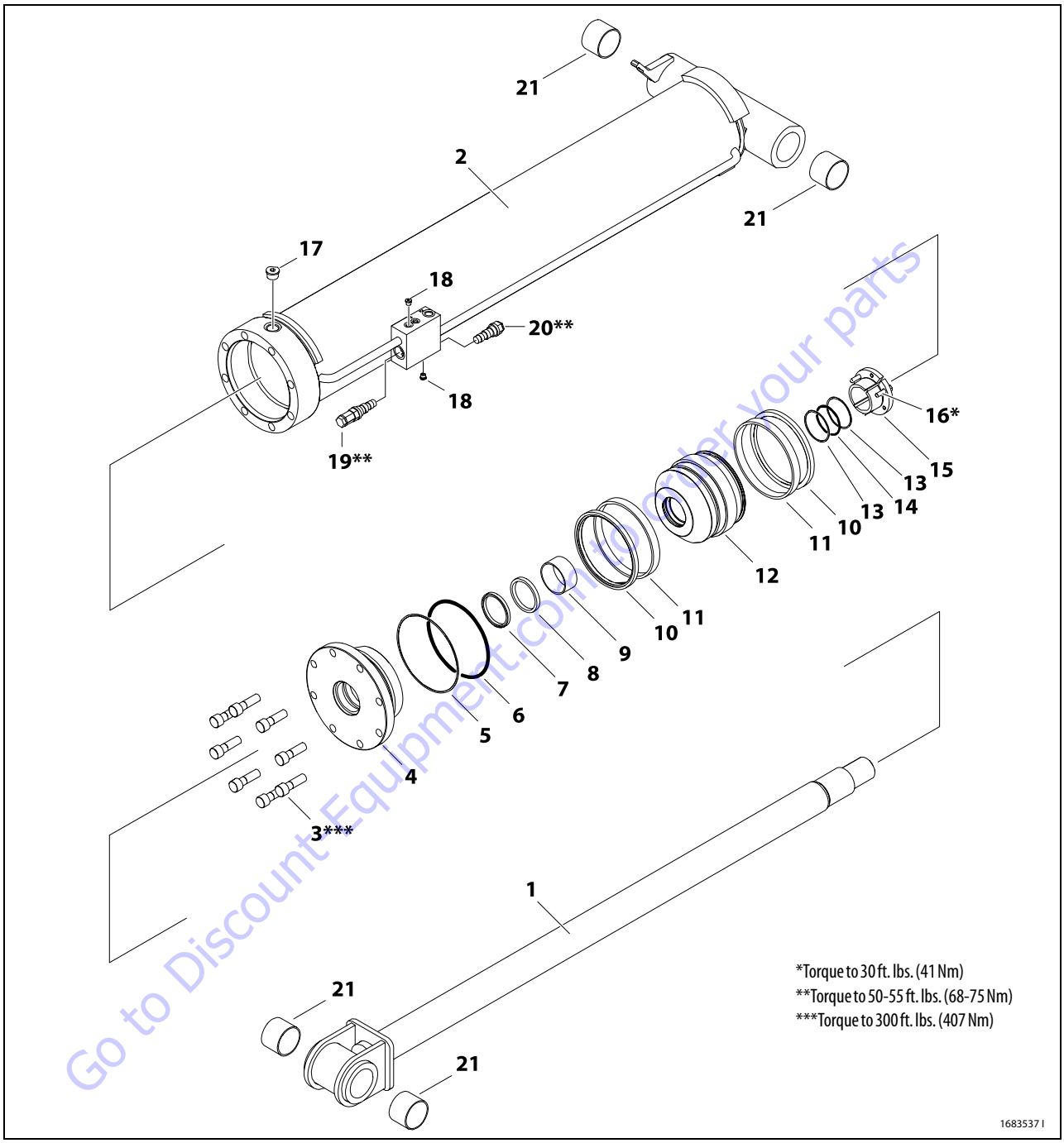


Figure 5-48. Cylinder Rod Support



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

Figure 5-49. Tower Lift Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

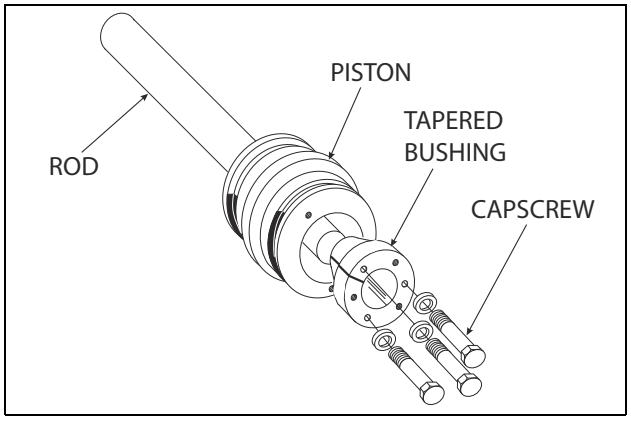


Figure 5-50. Tapered Bushing Removal

12. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
13. Remove and discard the piston o-rings, hydrolock seals, guidelock rings and backup rings.
14. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, backup rings, rod seal, wear ring, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

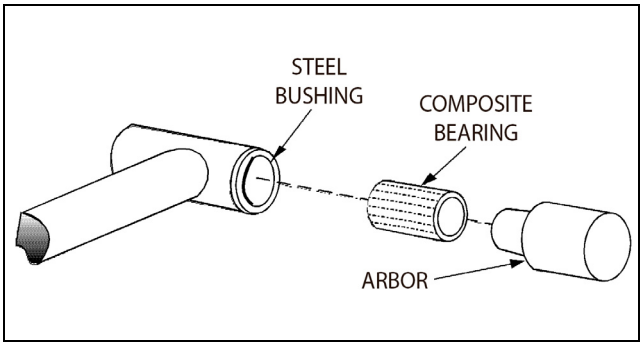


Figure 5-51. Composite Bearing Installation

14. If applicable, inspect port block fittings and holding valve. Replace as necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

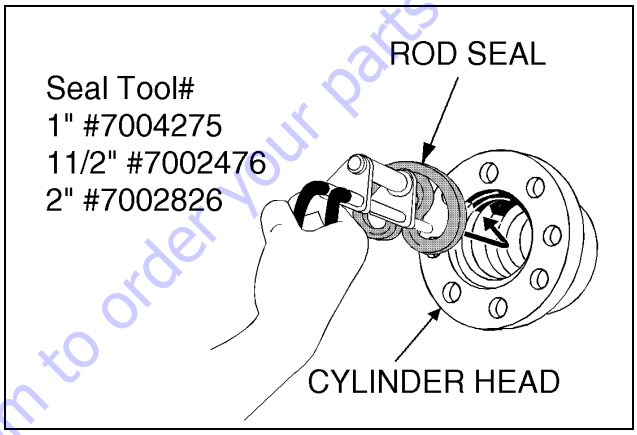


Figure 5-52. Rod Seal Installation

NOTICE

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

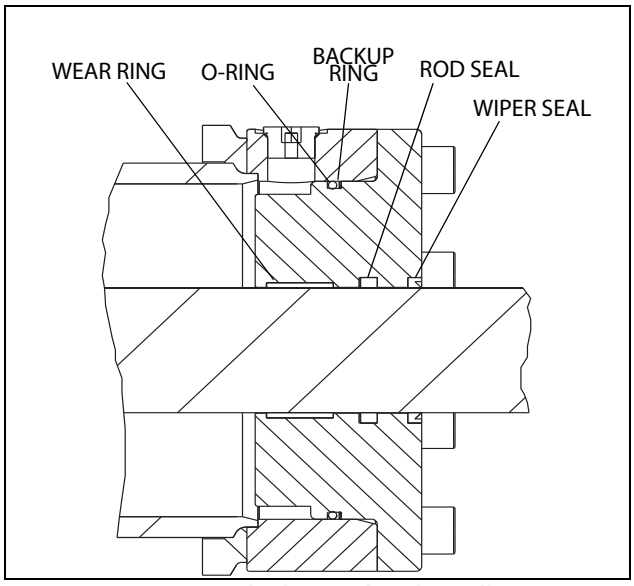


Figure 5-53. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

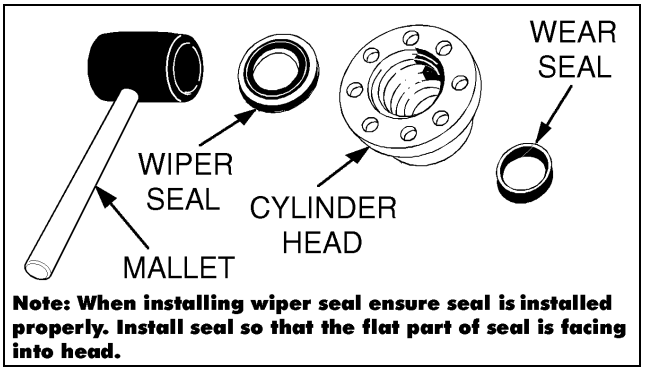


Figure 5-54. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

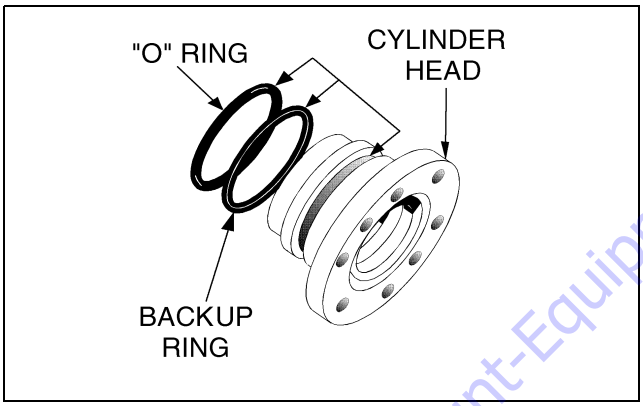


Figure 5-55. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland on the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

5. Using suitable support, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.

6. Place a new o-ring and backup ring in the inner piston diameter groove.

7. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

8. Thread piston onto rod until it abuts the rod and install the tapered bushing.

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

9. 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.

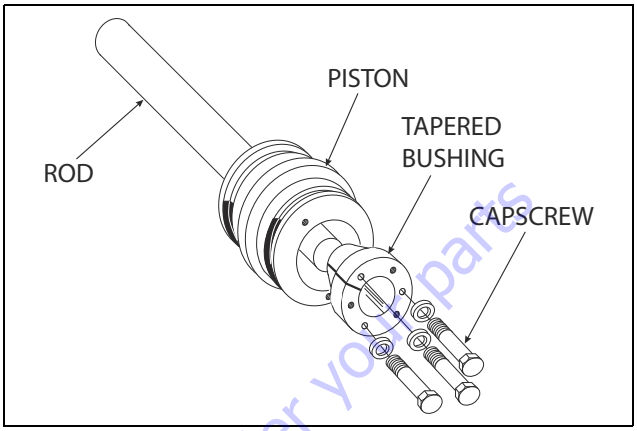


Figure 5-56. Tapered Bushing Installation

10. Tighten the capscrews evenly and progressively in rotation to 30 ft. lbs. (41 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. 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.

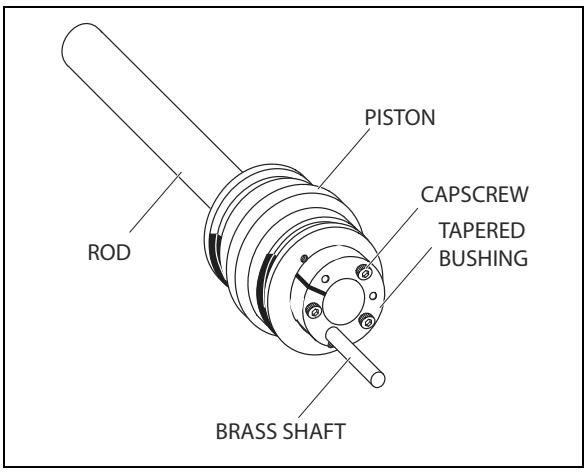


Figure 5-57. Seating the Tapered Bearing

12. Rotate the capscrews evenly and progressively in rotation to 30 ft. lbs. (41 Nm).

13. Remove the cylinder rod from the holding fixture.

NOTICE

WHEN INSTALLING HYDROLOCK PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO HYDROLOCK PISTON SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

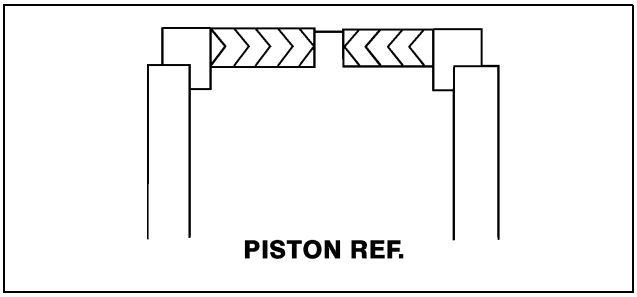


Figure 5-58. Hydrolock Piston Seal Installation

14. Place new hydrolock seals and guidelock rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

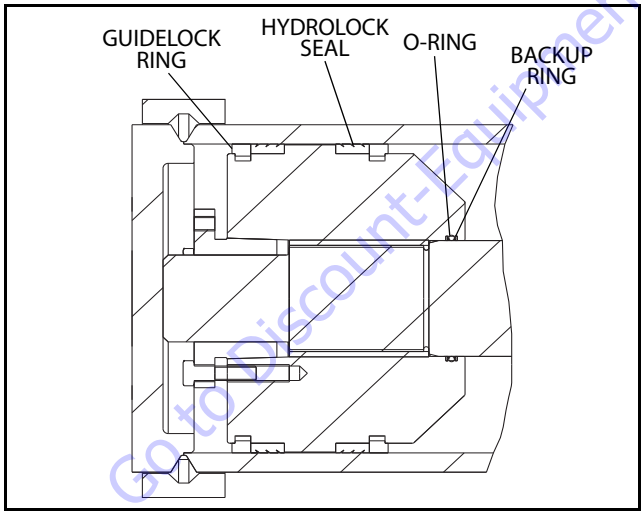


Figure 5-59. Piston Seal Kit Installation

15. 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.

16. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading hydrolock seals and guidelock rings are not damaged or dislodged.

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

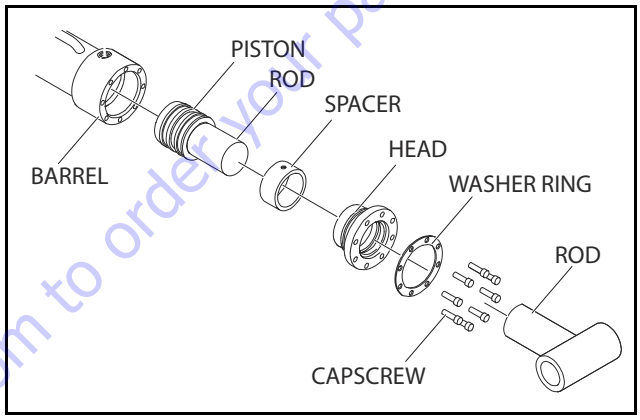


Figure 5-60. Rod Assembly Installation

18. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 300 ft. lbs. (406 Nm).

19. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

20. Install the counterbalance valve and fittings in the rod port block, using new o-rings as applicable. Torque to counterbalance valve as shown in Figure 5-49., Tower Lift Cylinder.

Master Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

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

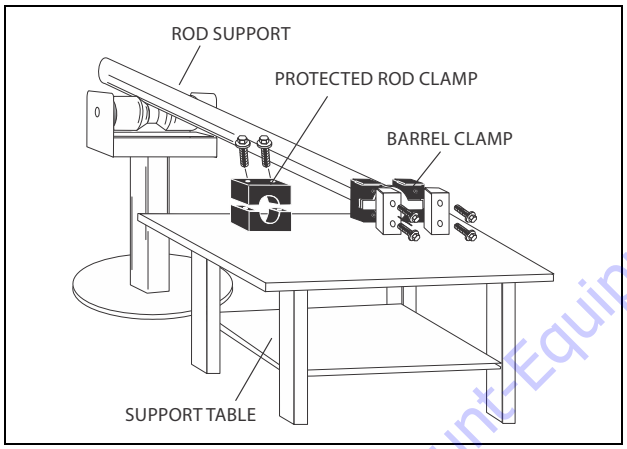


Figure 5-61. Cylinder Barrel Support

4. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

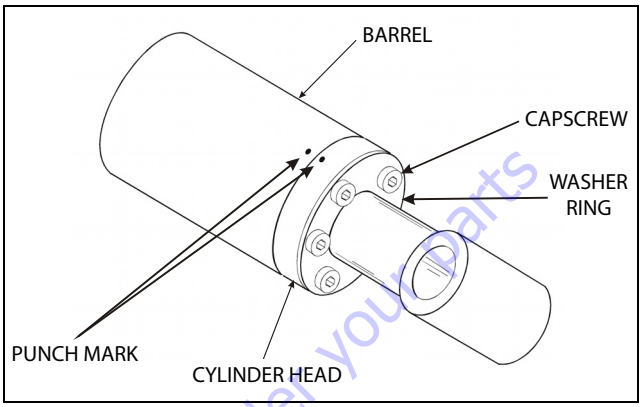


Figure 5-62. Capscrew Removal

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

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.

6. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

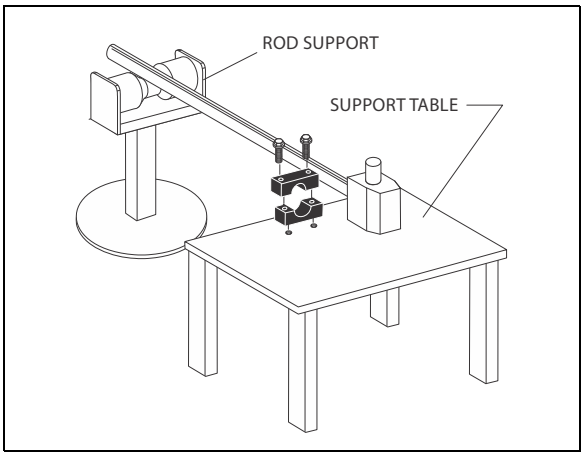
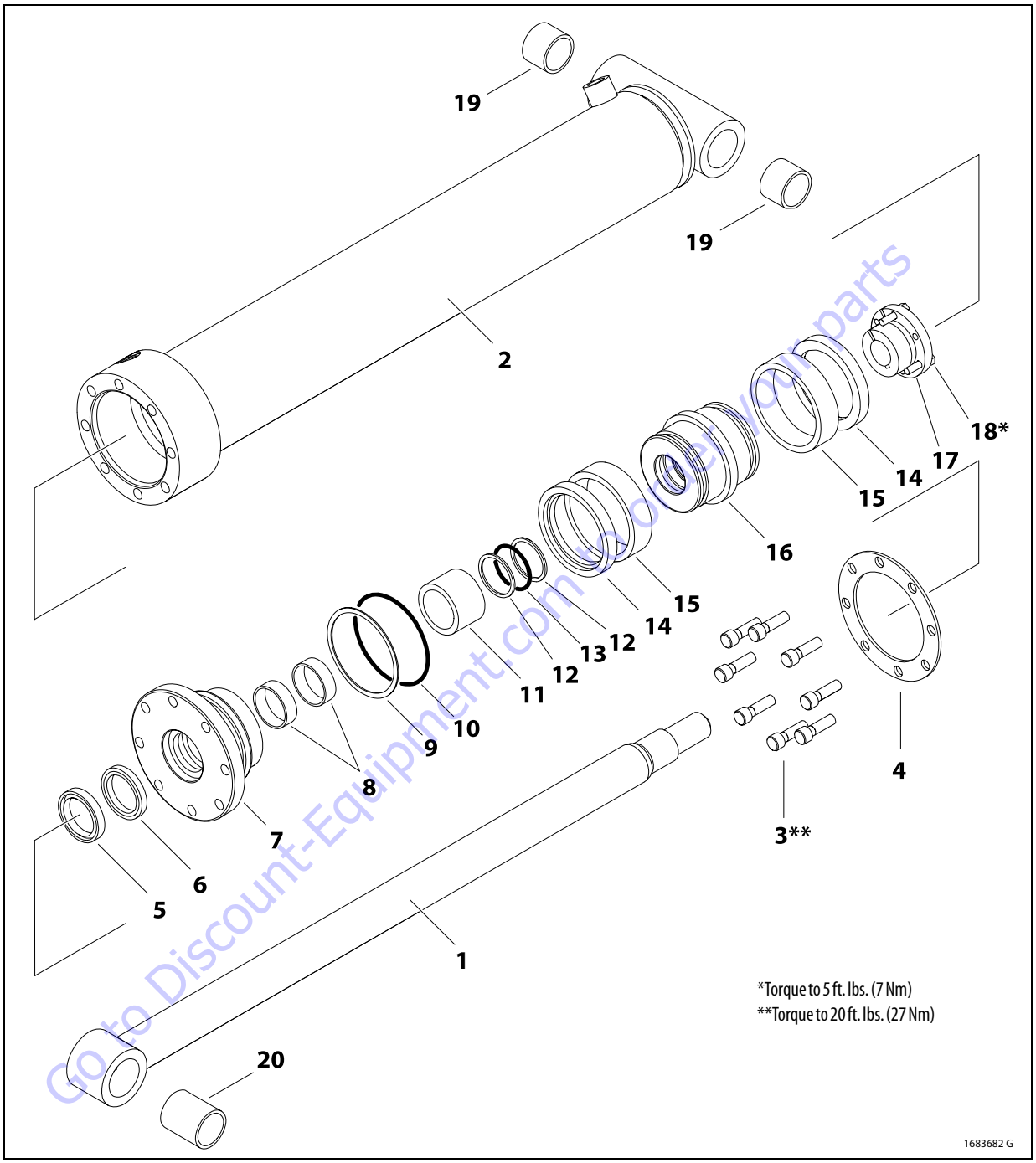


Figure 5-63. Cylinder Rod Support



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

Figure 5-64. Master Cylinder

7. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
8. Remove capscrews from drilled holes.
9. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
10. Remove the bushing from the piston.

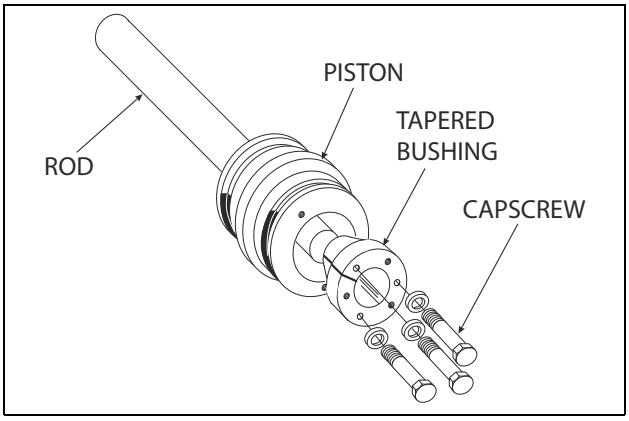


Figure 5-65. Tapered Bushing Removal

11. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
12. Remove and discard the piston hydrolock seals, guide-lock rings, o-ring, and backup rings.
13. Remove piston spacer from rod.
14. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, backup rings, wear ring, rod seal, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 inner side of steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

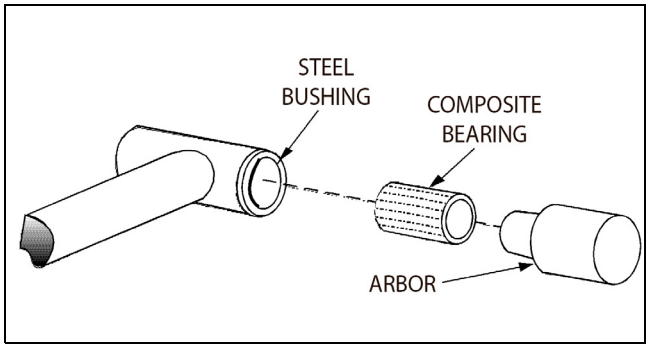


Figure 5-66. Composite Bearing Installation

14. Inspect travel limiting collar or spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. If applicable, inspect port block fittings and holding valve. Replace as necessary.
16. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
17. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

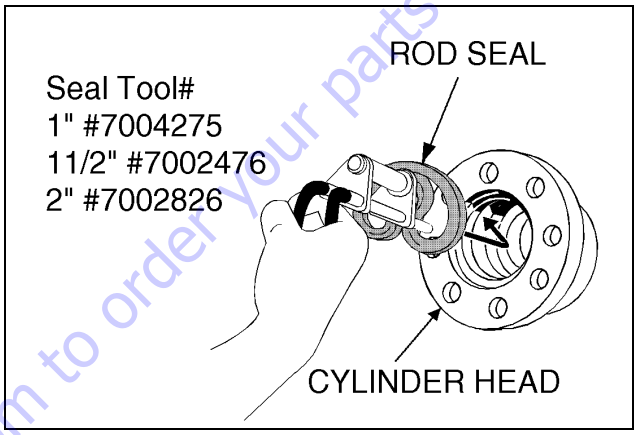


Figure 5-67. Rod Seal Installation

NOTICE

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

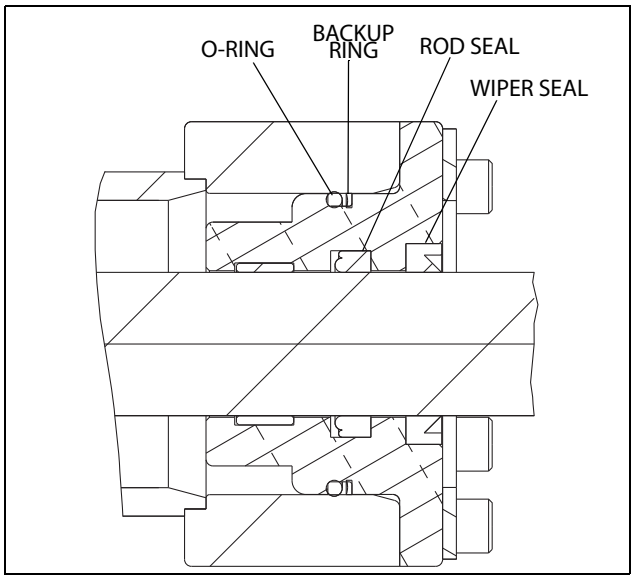


Figure 5-68. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear rings into the applicable cylinder head gland groove.

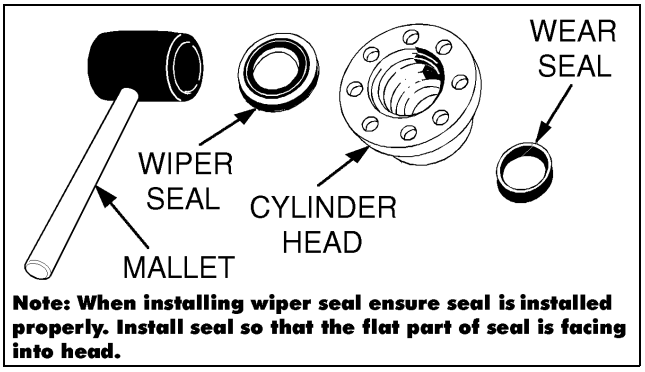


Figure 5-69. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

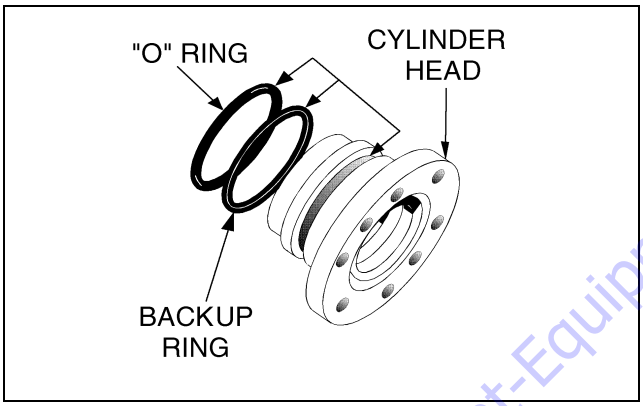


Figure 5-70. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland onto the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.
5. Carefully slide the piston spacer on the rod.
6. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
7. Place a new o-ring and backup rings in the inner piston diameter groove.
8. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.
9. Thread piston onto rod until it abuts the spacer end and install the tapered bushing.

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

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.

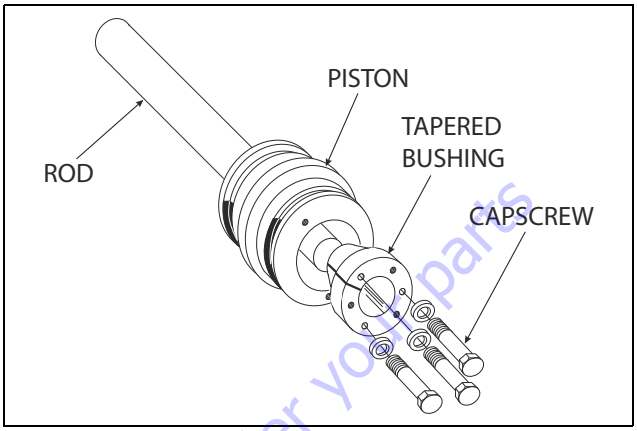


Figure 5-71. Tapered Bushing Installation

11. Tighten the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 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. 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.

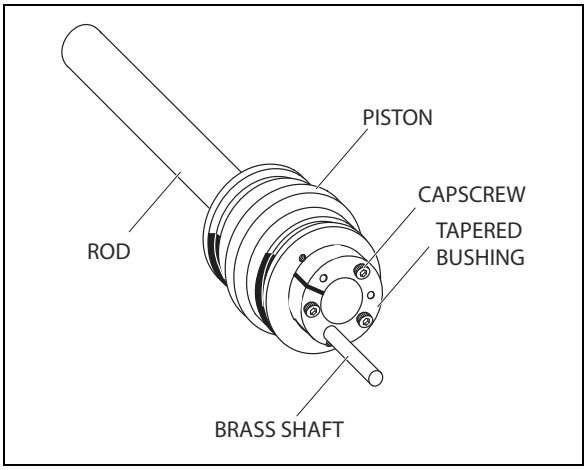


Figure 5-72. Seating the Tapered Bearing

13. Rotate the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 Nm).

14. Remove the cylinder rod from the holding fixture.

NOTICE

WHEN INSTALLING HYDROLOCK PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO HYDROLOCK PISTON SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

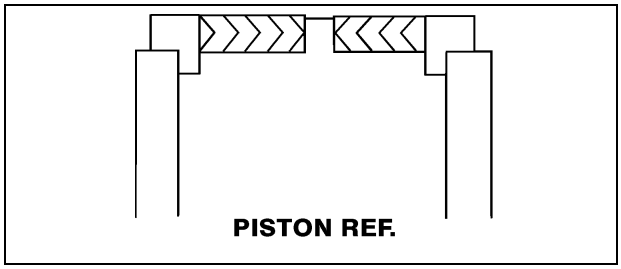


Figure 5-73. Hydrolock Piston Seal Installation

15. Place new hydrolock seals and guidelock rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

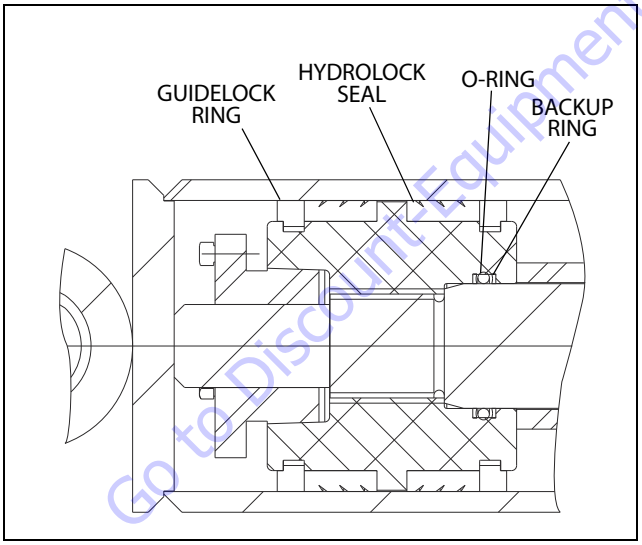


Figure 5-74. Piston Seal Kit Installation

16. 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.

17. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading hydrolock seals and guidelock rings are not damaged or dislodged.

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

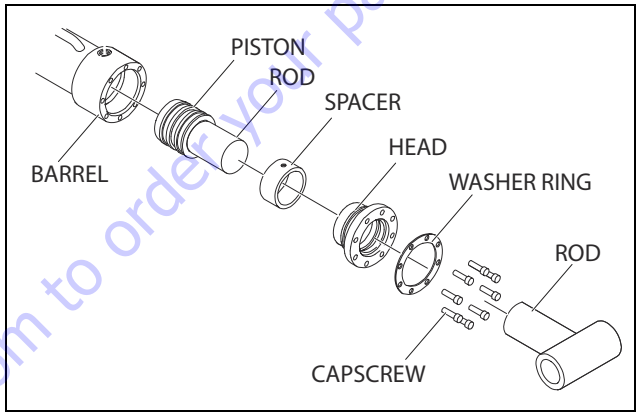


Figure 5-75. Rod Assembly Installation

19. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 35 ft. lbs. (47.5 Nm).

20. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

Slave Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance valves and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

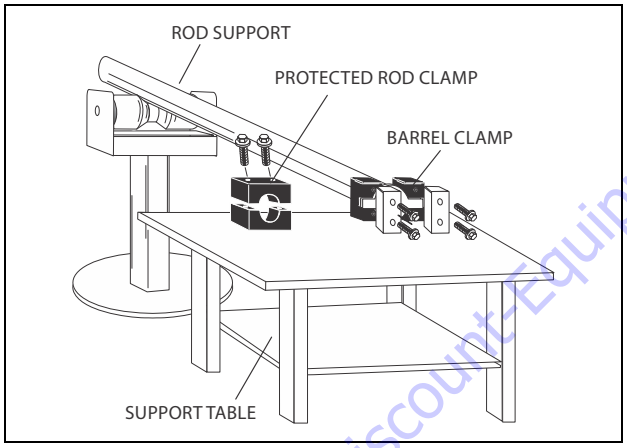


Figure 5-76. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

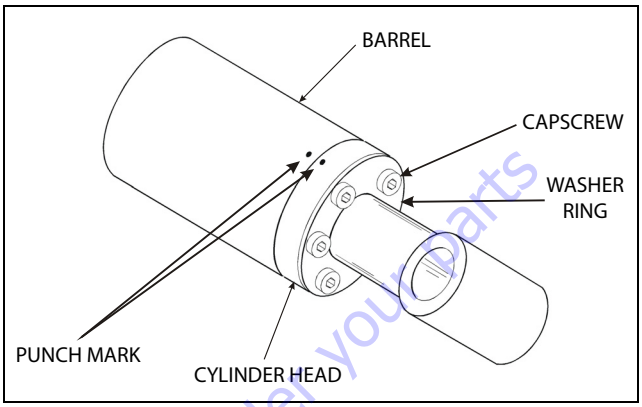


Figure 5-77. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

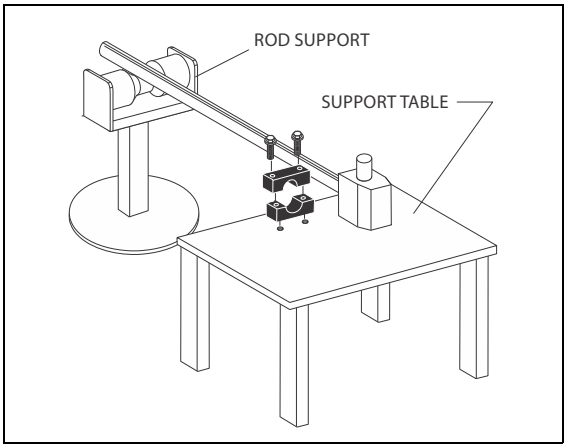
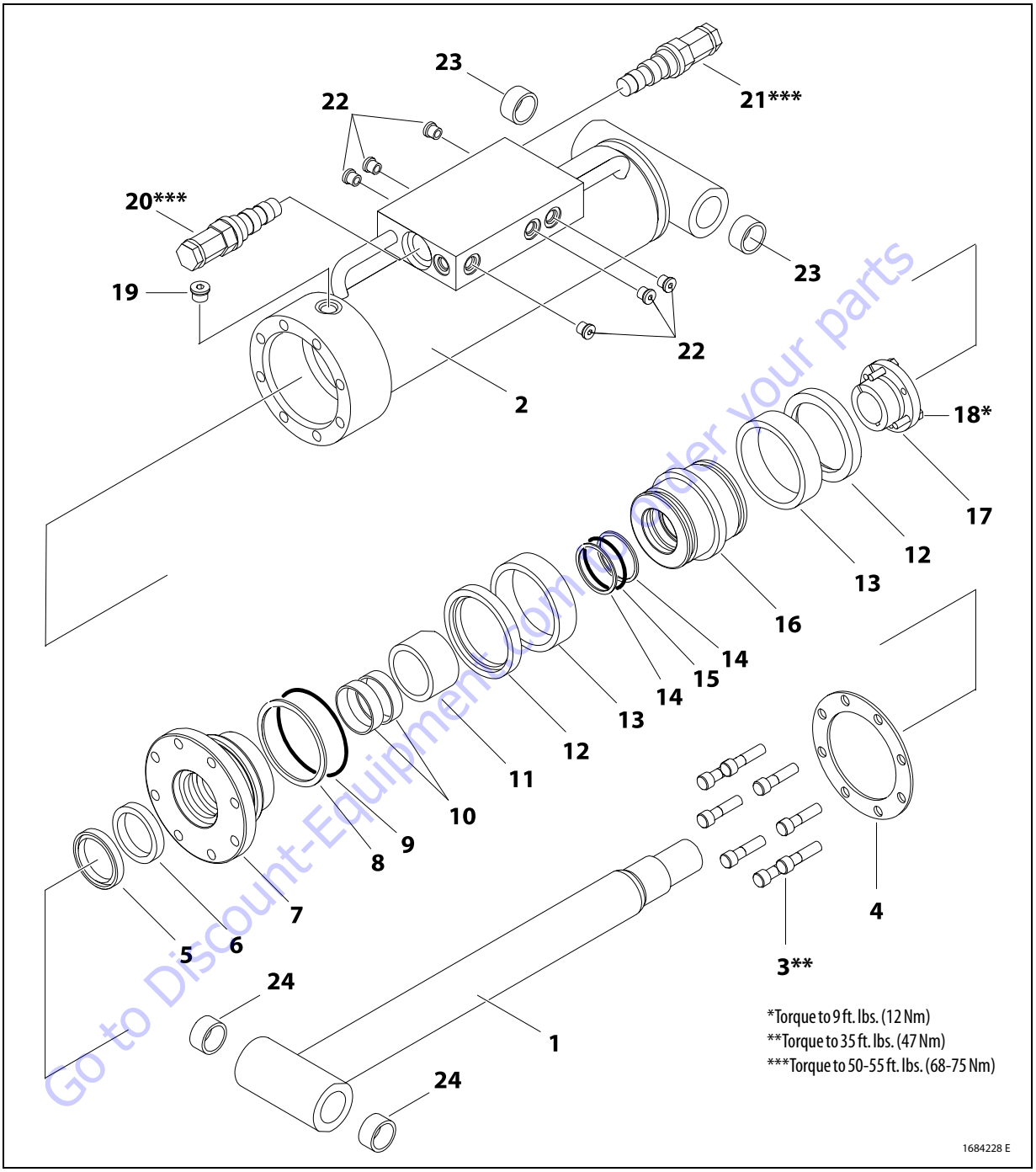


Figure 5-78. Cylinder Rod Support



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

Figure 5-79. Slave Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

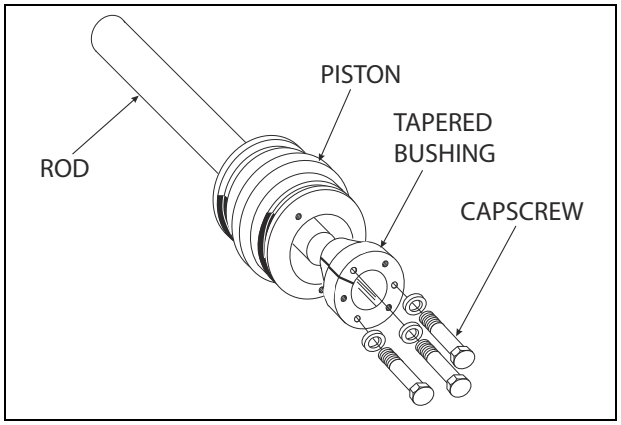


Figure 5-80. Tapered Bushing Removal

12. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
13. Remove and discard the piston hydrolock seals, guide-lock rings, o-ring, and backup rings.
14. Remove piston spacer from rod.
15. Remove the rod from the holding fixture. Remove the cylinder head gland. Remove and discard the o-rings, backup rings, wear ring, rod seal, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 inner side of steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

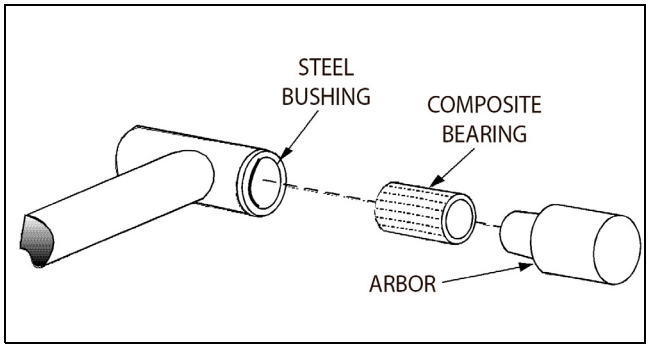


Figure 5-81. Composite Bearing Installation

14. Inspect travel limiting collar or spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
17. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

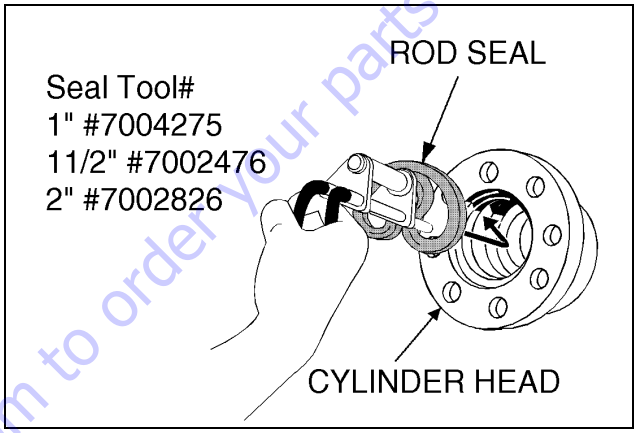


Figure 5-82. Rod Seal Installation

NOTICE

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

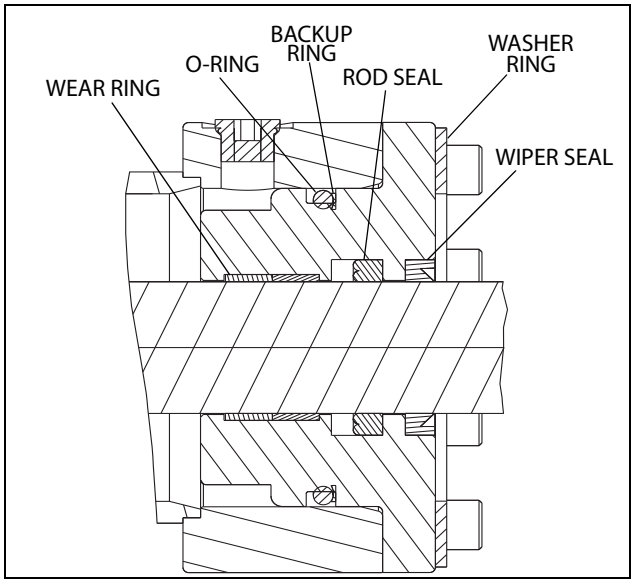


Figure 5-83. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear rings into the applicable cylinder head gland groove.

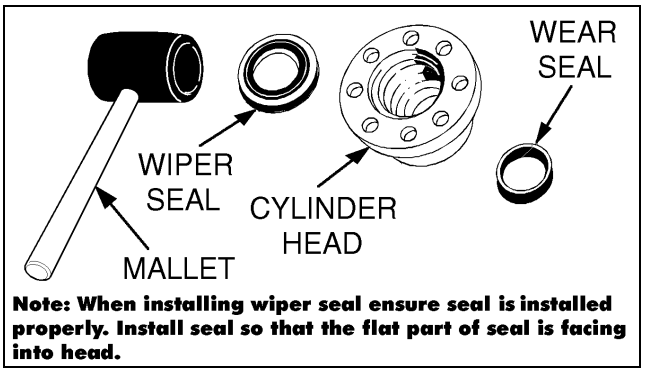


Figure 5-84. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

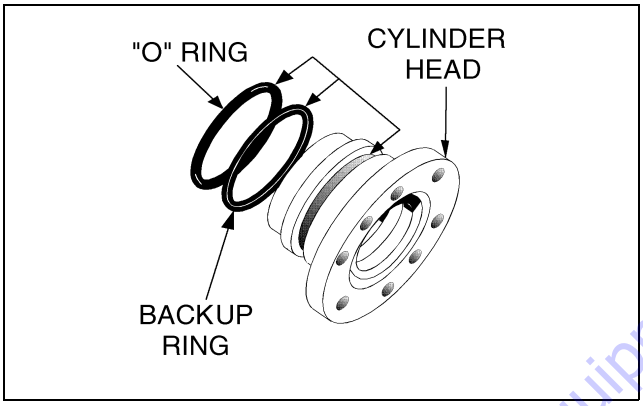


Figure 5-85. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland onto the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

5. Carefully slide the piston spacer on the rod.

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

7. Place a new o-ring and backup rings in the inner piston diameter groove.

8. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

9. Thread piston onto rod until it abuts the spacer end and install the tapered bushing.

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

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.

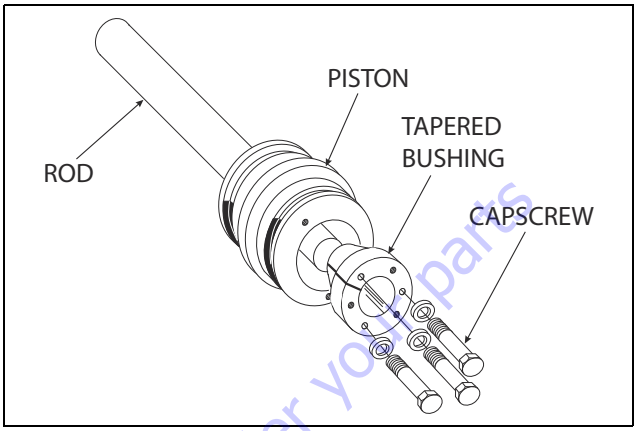


Figure 5-86. Tapered Bushing Installation

11. Tighten the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 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. 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.

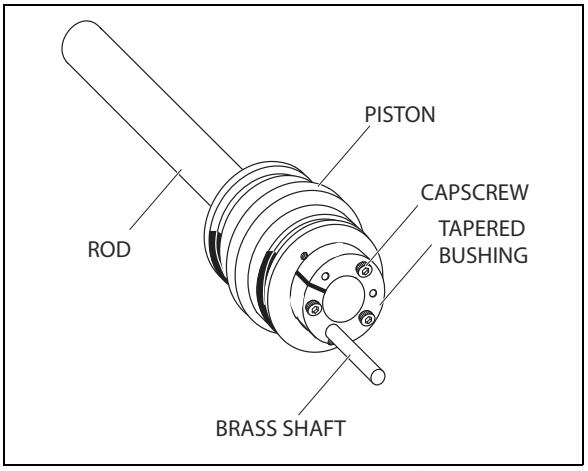


Figure 5-87. Seating the Tapered Bearing

13. Rotate the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 Nm).

14. Remove the cylinder rod from the holding fixture.

NOTICE

WHEN INSTALLING HYDROLOCK PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO HYDROLOCK PISTON SEAL INSTALLATION FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

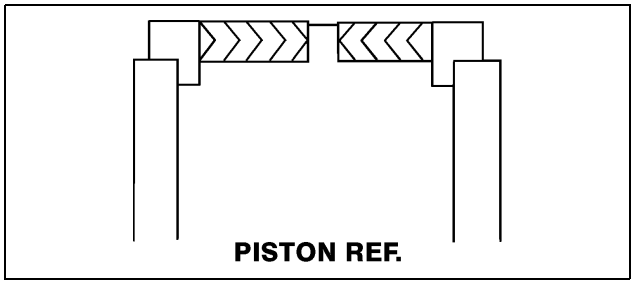


Figure 5-88. Hydrolock Piston Seal Installation

15. Place new hydrolock seals and guidelock rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

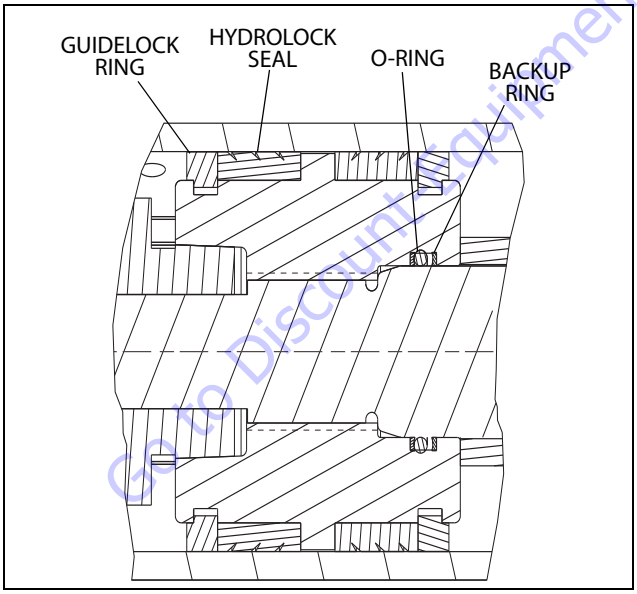


Figure 5-89. Piston Seal Kit Installation

16. 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.

17. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading hydrolock seals and guidelock rings are not damaged or dislodged.

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

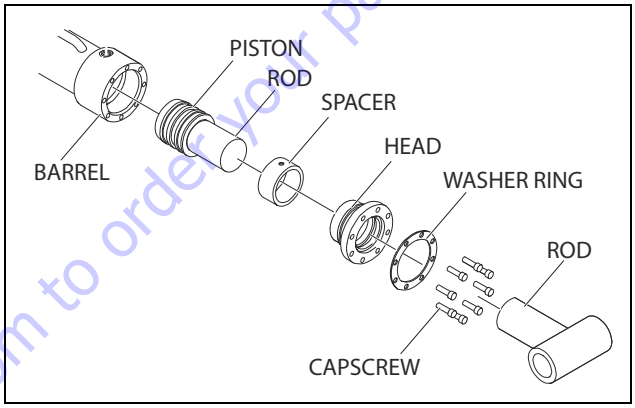


Figure 5-90. Rod Assembly Installation

19. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 35 ft. lbs. (47.5 Nm).

20. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

21. Install the counterbalance valves and fittings in the rod port block, using new o-rings as applicable. Torque to counterbalance valves as shown in Figure 5-79., Slave Cylinder.

Steer Cylinder (Prior to SN 0300142664)

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

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

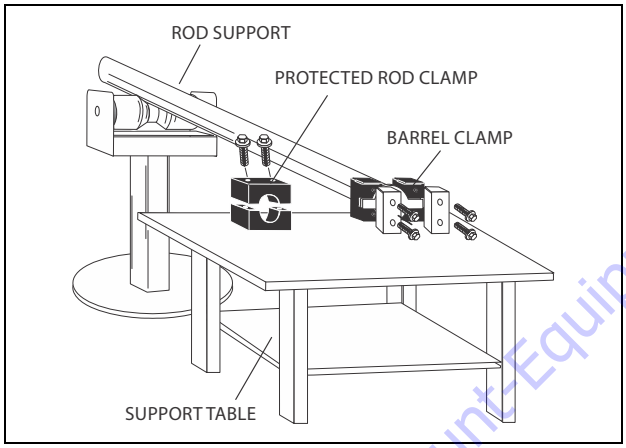


Figure 5-91. Cylinder Barrel Support

4. Using a hook spanner, loosen the spanner nut retainer, and remove spanner nut from cylinder barrel.

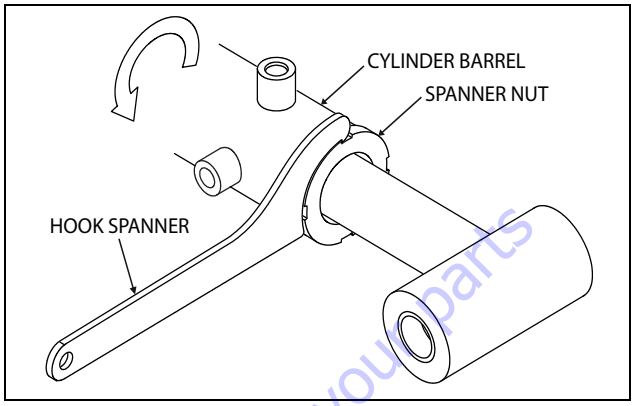


Figure 5-92. Spanner Nut Removal

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

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.

6. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

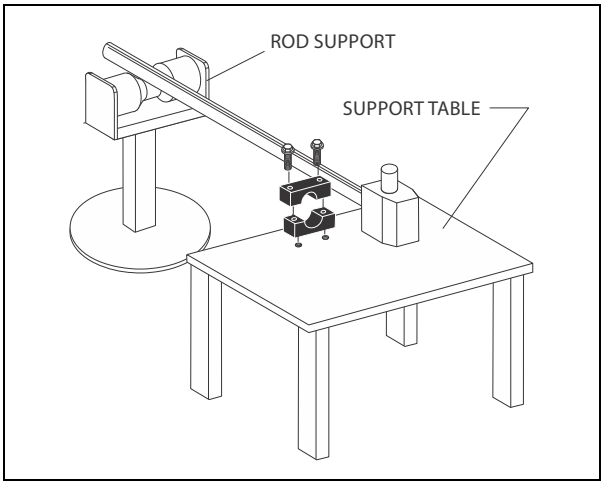
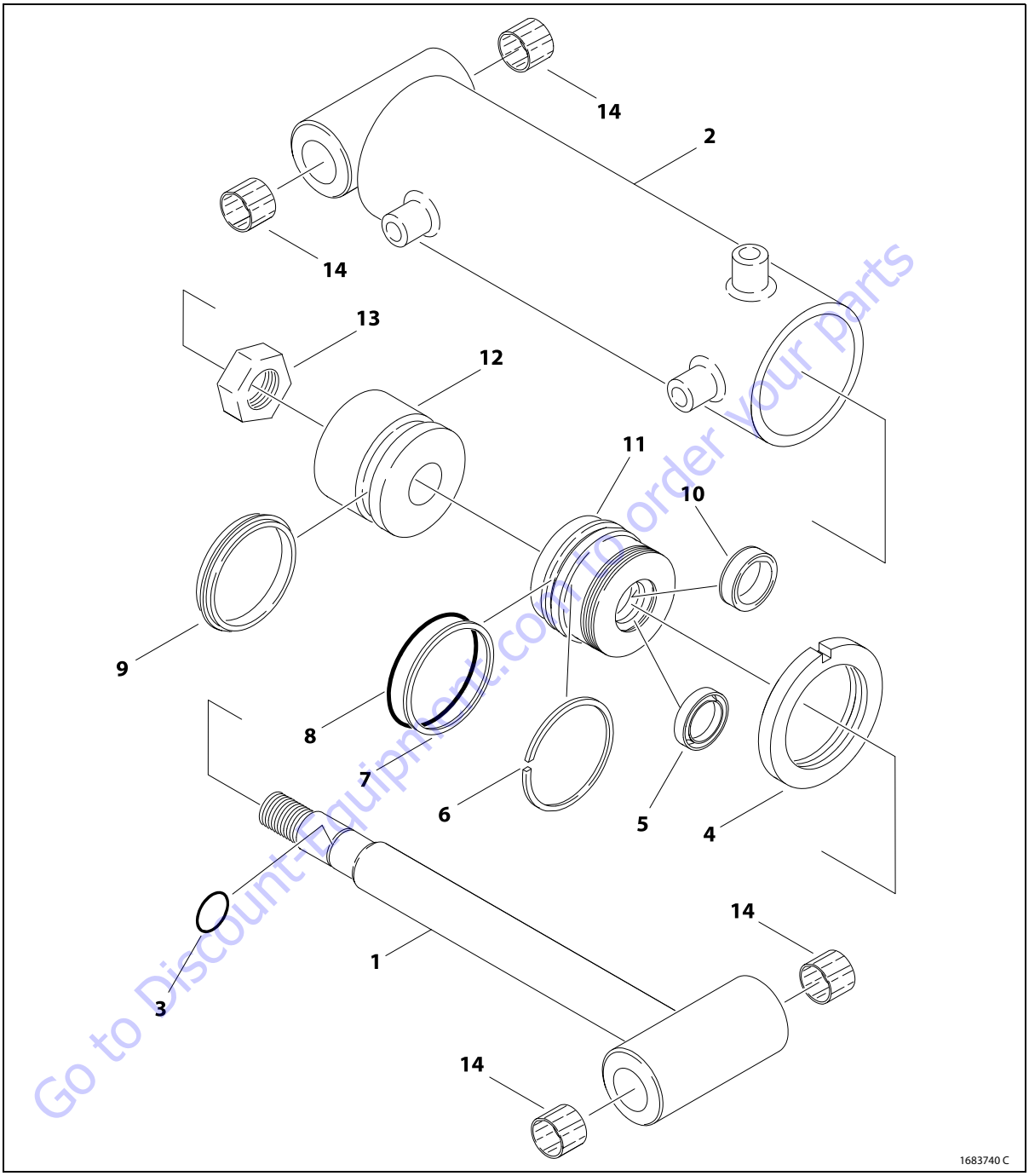


Figure 5-93. Cylinder Rod Support



1. Rod
2. Barrel
3. O-Ring
4. Spanner Nut
5. Wiper Seal
6. Retainer Ring
7. Backup Ring
8. O-Ring
9. Seal
10. Seal
11. Head
12. Piston
13. Locknut
14. Bushing

Figure 5-94. Steer Cylinder (Prior to SN 0300142664)

7. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
8. Remove Locknut from the piston rod.
9. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
10. Remove and discard the piston o-rings and seal rings.
11. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, backup rings, rod seals, retainer ring, and wiper seals.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 piston surface for damage and scoring and for 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 applicable surfaces as necessary.
8. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace 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 or other damage and ovality and tapering. Replace as necessary.
11. If applicable, 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 inner side of steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

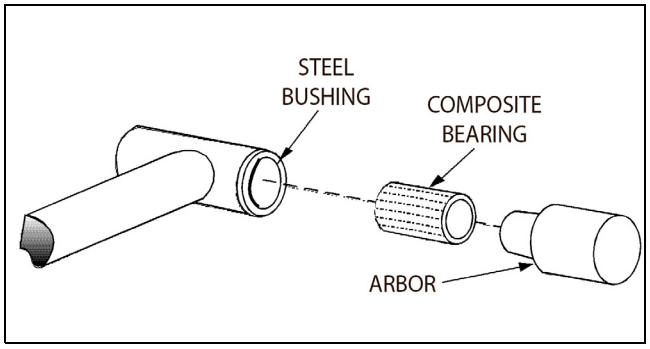


Figure 5-95. Composite Bearing Installation

12. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
13. If applicable, inspect port block fittings and holding valve. Replace as necessary.
14. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
15. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

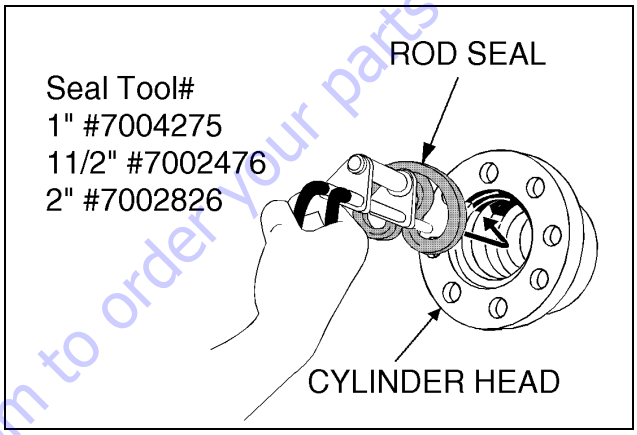


Figure 5-96. Rod Seal Installation

NOTICE

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

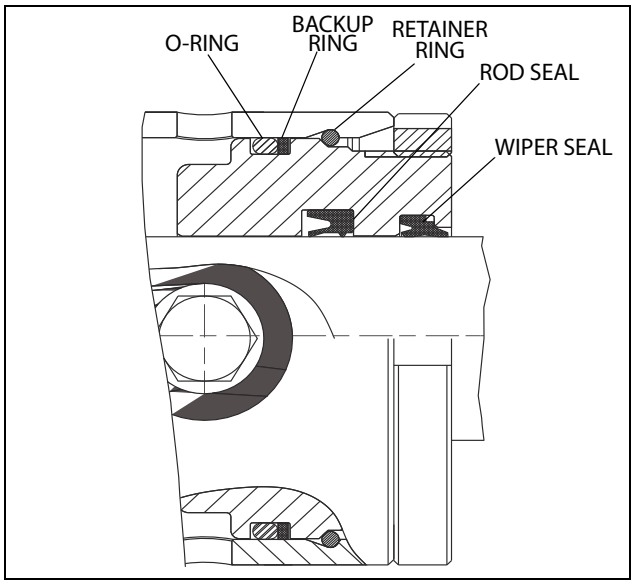


Figure 5-97. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

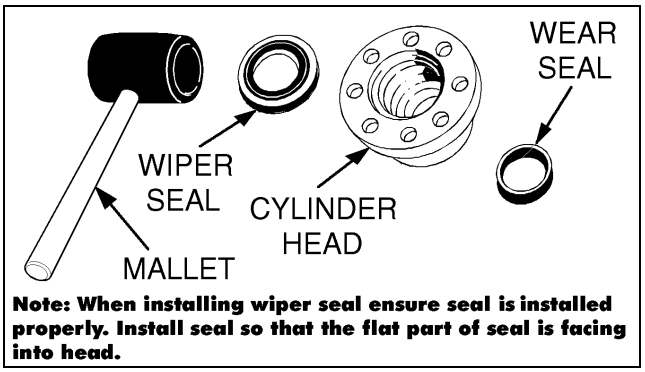


Figure 5-98. Wiper Seal Installation

3. Place a new o-ring, backup ring and retaining ring in the applicable outside diameter groove of the cylinder head.

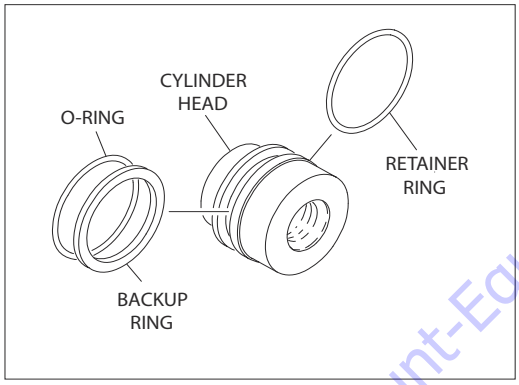


Figure 5-99. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland onto the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

7. Install locknut onto the piston rod.

8. Remove the cylinder rod from the holding fixture.

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

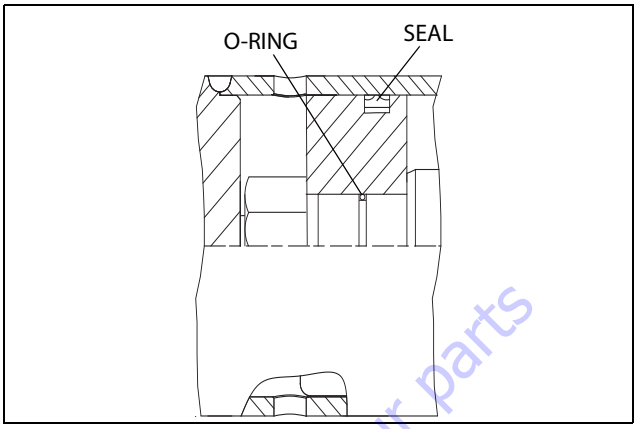


Figure 5-100. Piston Seal Kit Installation

10. 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.

11. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading hydrolock seals and guidelock rings are not damaged or dislodged.

12. Secure piston to the rod using nut.

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

14. Secure the cylinder head gland using the spanner nut and tighten.

15. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves, if applicable.

Steer Cylinder (SN 0300142664 through 0300185827)

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

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

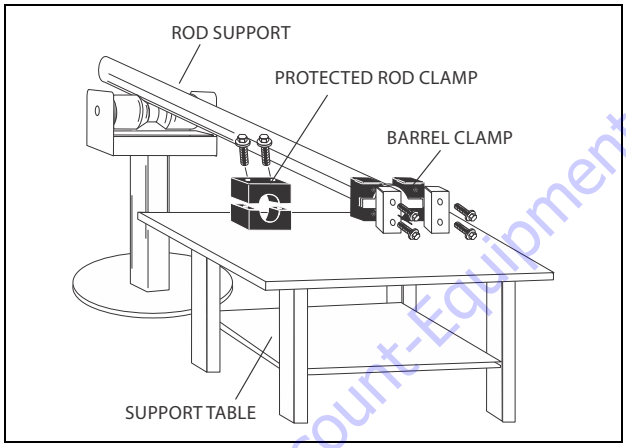


Figure 5-101. Cylinder Barrel Support

4. Using a hook spanner, loosen the spanner nut retainer, and remove spanner nut from cylinder barrel.

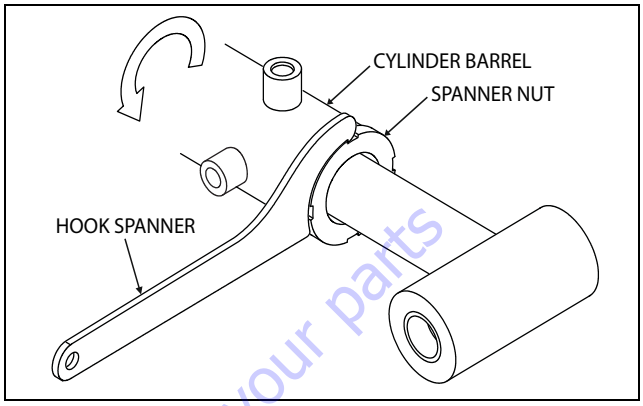


Figure 5-102. Spanner Nut Removal

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

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.

6. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

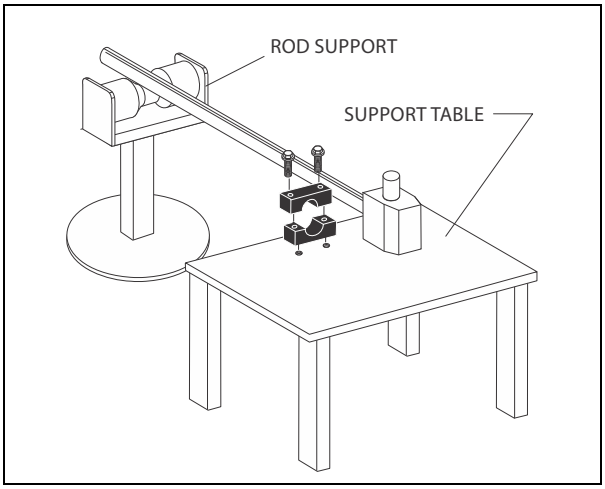
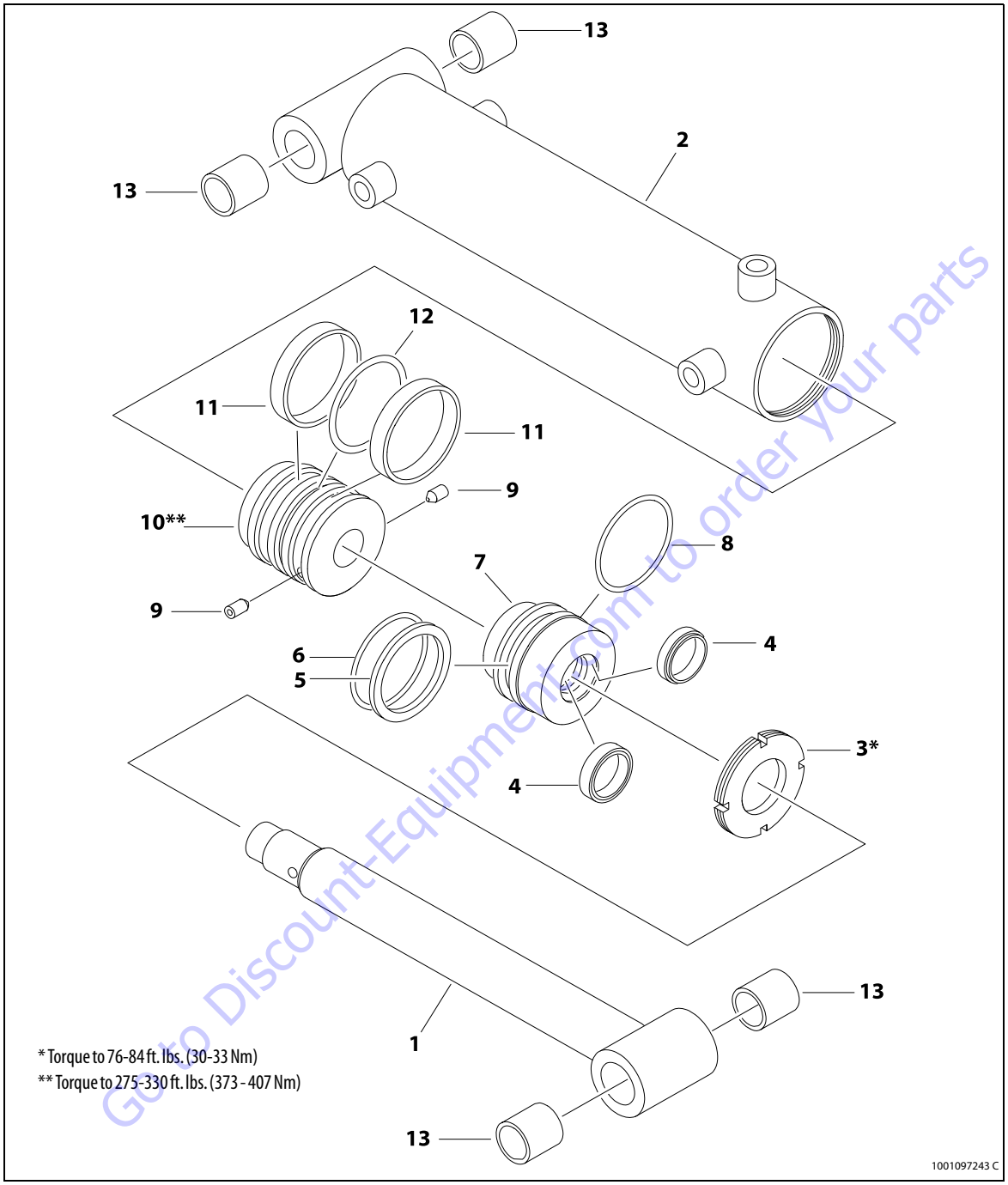


Figure 5-103. Cylinder Rod Support



1. Rod
2. Barrel
3. Spanner Nut
4. Seal
5. Backup Ring
6. O-Ring
7. Head
8. Retainer Ring
9. Setscrew
10. Piston
11. Seal
12. Seal
13. Bushing

Figure 5-104. Steer Cylinder (SN 0300142664 through 0300185827)

7. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
8. Loosen and remove setscrew which attaches the piston to the rod.
9. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
10. Remove and discard the piston o-rings and seal rings.
11. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, backup rings, rod seals, retainer ring, and wiper seals.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 piston surface for damage and scoring and for 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 applicable surfaces as necessary.
8. Inspect cylinder head inside diameter for scoring or other damage, and for ovality and tapering. Replace 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 or other damage and ovality and tapering. Replace as necessary.
11. If applicable, 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 inner side of steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

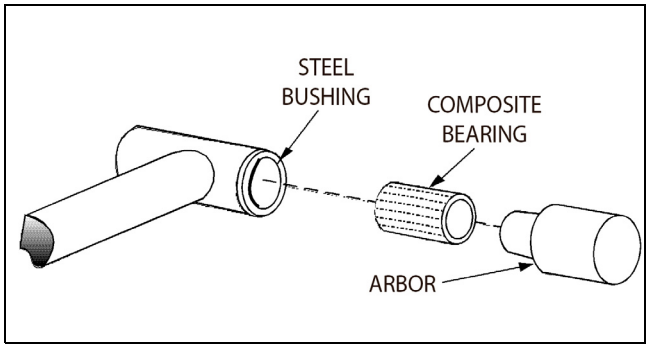


Figure 5-105. Composite Bearing Installation

12. If applicable, inspect port block fittings and holding valve. Replace as necessary.
13. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
14. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

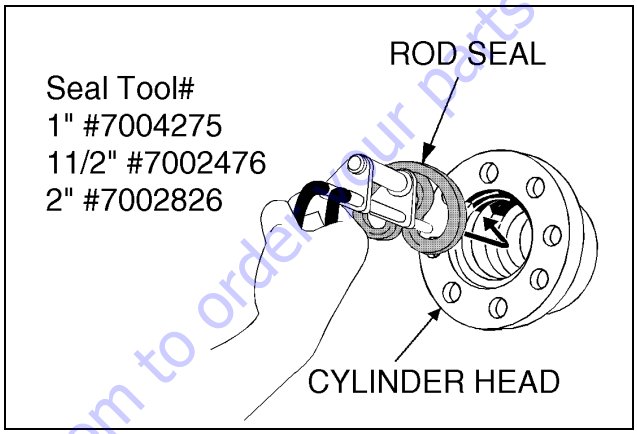


Figure 5-106. Rod Seal Installation

NOTICE

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

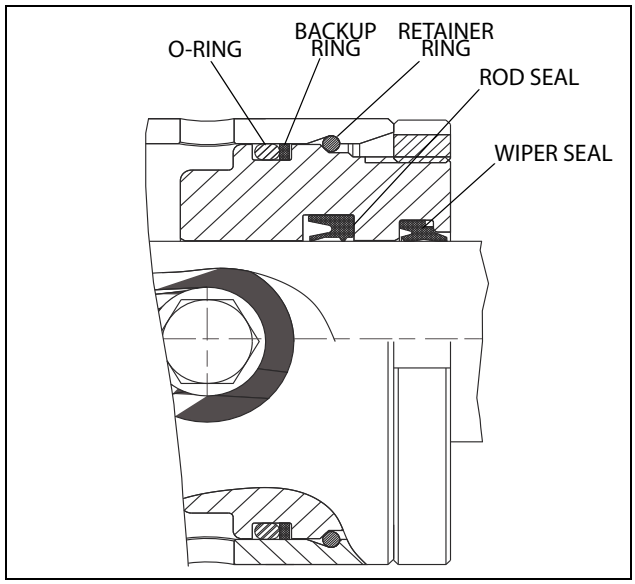


Figure 5-107. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install a new wear ring into the applicable cylinder head gland groove.

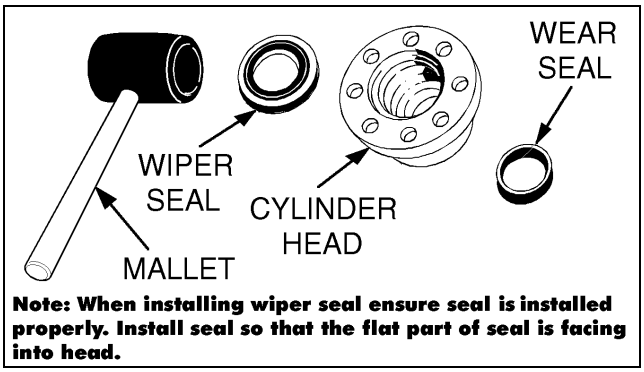


Figure 5-108. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

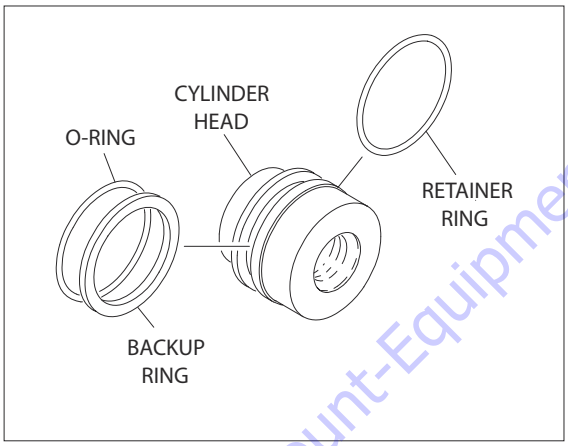


Figure 5-109. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland onto the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Carefully thread the piston on the cylinder rod and hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

7. Remove the cylinder rod from the holding fixture.

8. Place a new o-ring in the inner piston diameter groove.

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

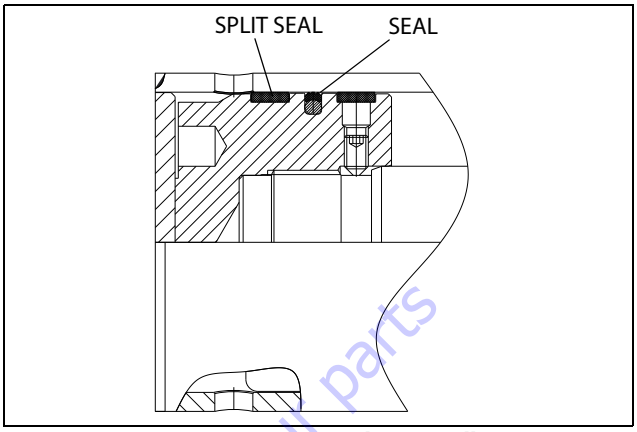


Figure 5-110. Piston Seal Kit Installation

10. 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.

11. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading hydrolock seals and guidelock rings are not damaged or dislodged.

12. Secure Piston to the rod using nut.

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

14. Secure the cylinder head gland using the spanner nut. Torque to 275-300 ft.lbs (373- 407 Nm).

15. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves, if applicable.

Main Telescope Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

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

⚠ WARNING

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

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove capscrew securing valve assembly to cylinder barrel end. Remove valve assembly from cylinder barrel end.
4. Place the cylinder barrel into a suitable holding fixture.

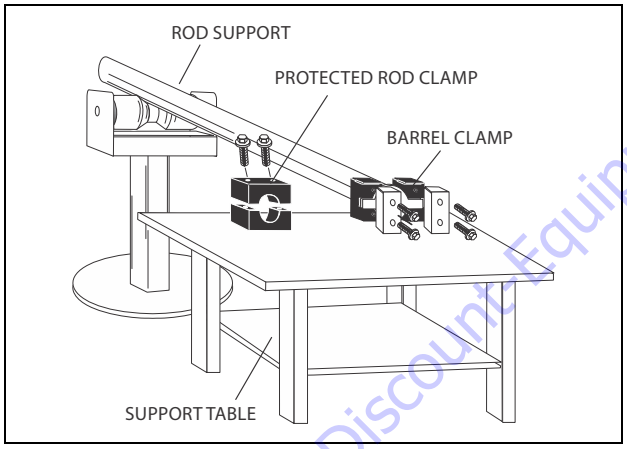


Figure 5-111. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the cylinder head retainer capscrews and remove capscrews from cylinder barrel.

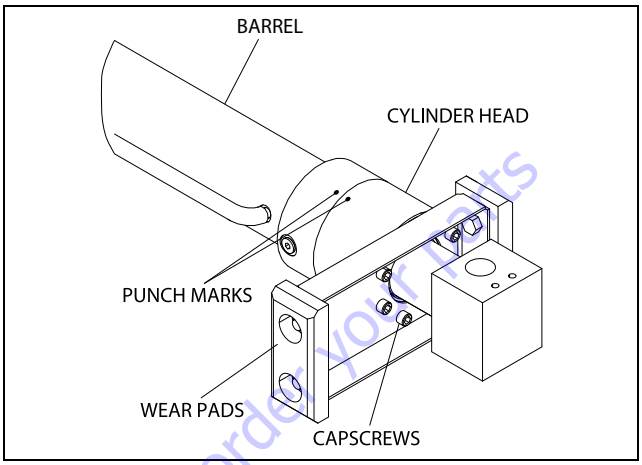


Figure 5-112. Capscrew Removal

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

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, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

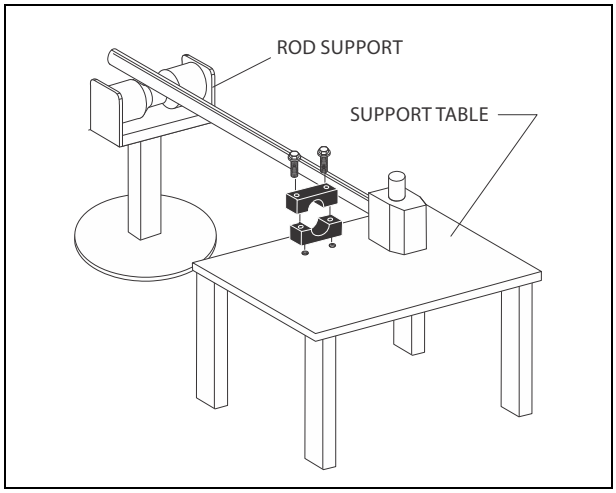
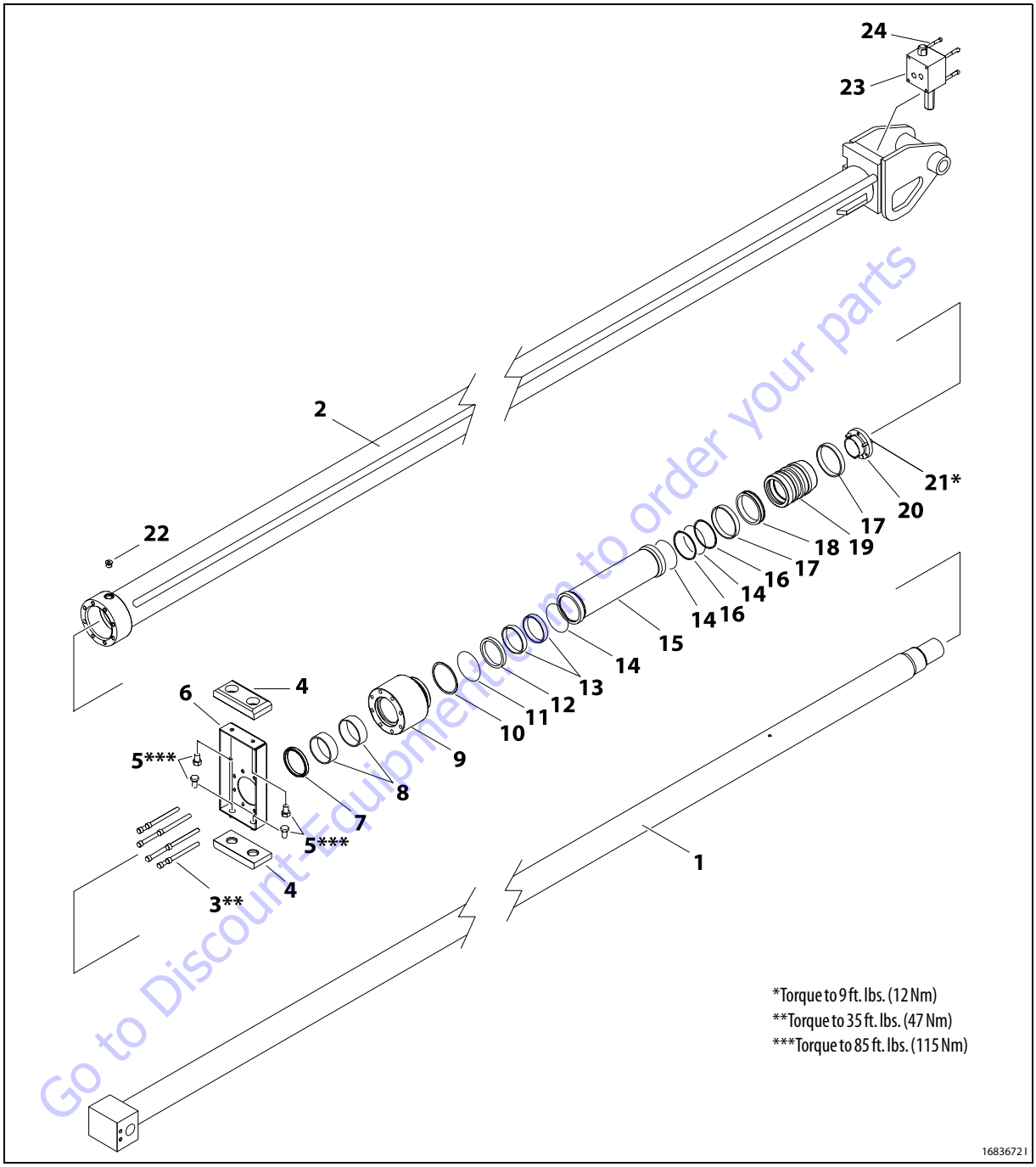


Figure 5-113. Cylinder Rod Support



1. Rod
2. Barrel
3. Capscrew
4. Wear Pad
5. Bolt
6. Plate
7. Wiper Seal
8. Wear Ring
9. Head
10. Backup Ring
11. O-Ring
12. Rod Seal
13. Wear Ring
14. O-Ring
15. Tube Spacer
16. Backup Ring
17. Wear Ring
18. T-Seal
19. Piston
20. Tapered Bushing
21. Capscrew
22. Plug
23. Valve Assembly
24. Capscrew

Figure 5-114. Main Telescope Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove capscrews from drilled holes.
10. Insert the capscrews in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrews until the bushing is loosen on the piston.
11. Remove the bushing from the piston.

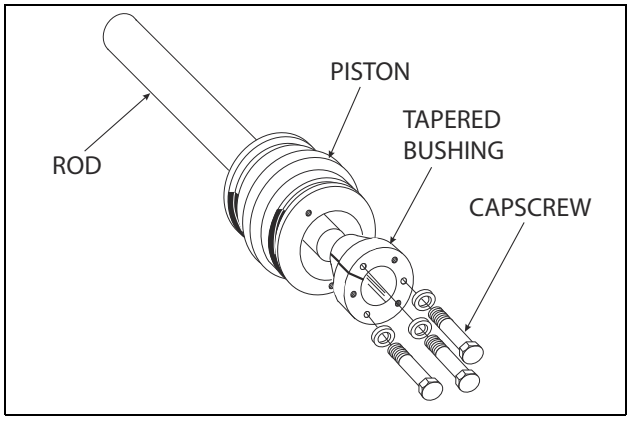


Figure 5-115. Tapered Bushing Removal

12. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
13. Remove and discard the piston T-seal, wear rings, o-ring, and backup rings.
14. Remove piston spacer from rod. Remove and discard the o-rings.
15. Remove the rod from the holding fixture. Remove the cylinder head gland. Remove and discard the o-rings, backup rings, wear ring, rod seal, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the 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 and scoring and for 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 applicable 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 or other damage and ovality and tapering. Replace as necessary.
13. If applicable, 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 inner side of steel bushing with prior to bearing installation.
    d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: *Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.*

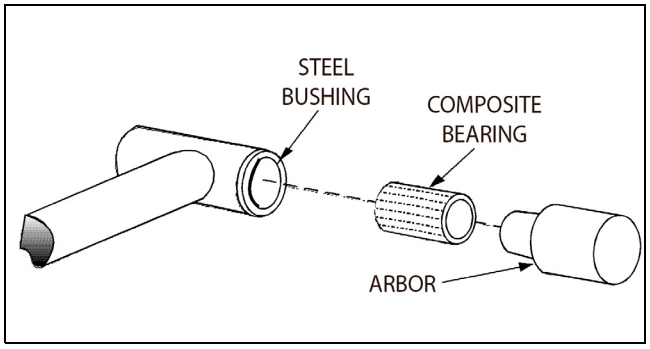


Figure 5-116. Composite Bearing Installation

14. Inspect travel limiting collar or spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect port block fittings and holding valve. Replace as necessary.
16. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
17. If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.*

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

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

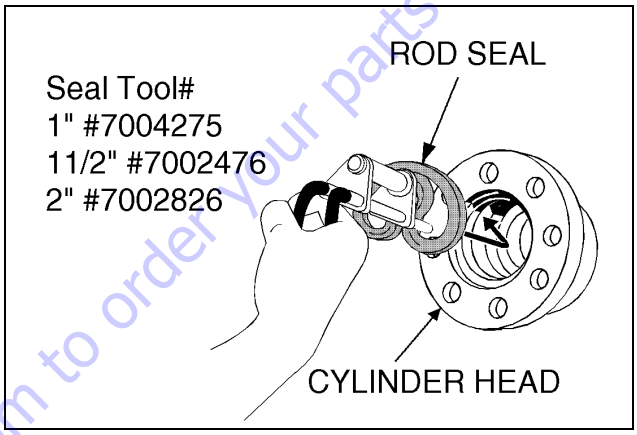


Figure 5-117. Rod Seal Installation

NOTICE

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

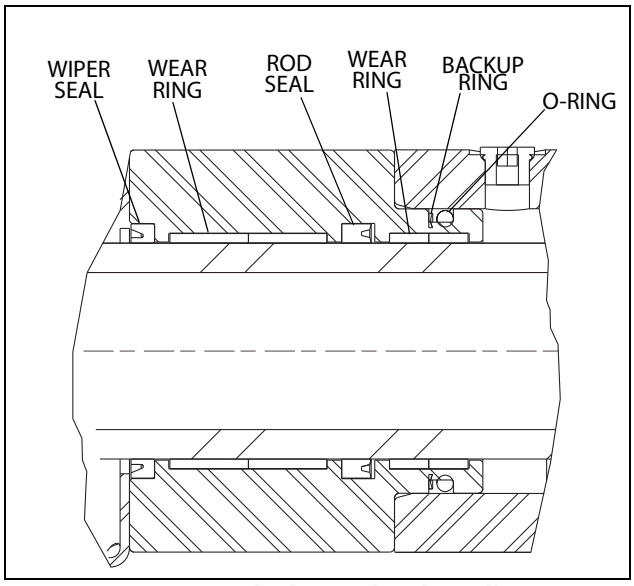


Figure 5-118. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head gland groove. Install new wear rings into the applicable cylinder head gland groove.

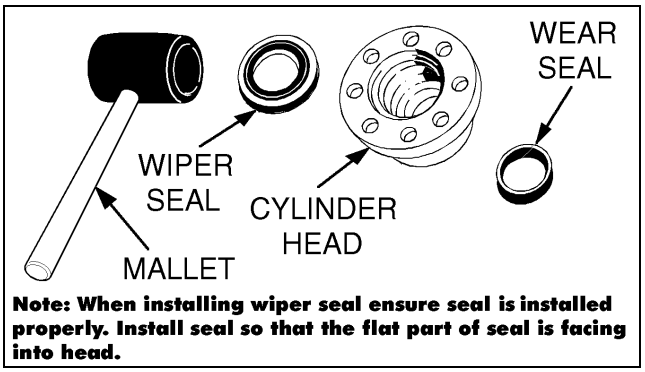


Figure 5-119. Wiper Seal Installation

3. Place a new o-ring and backup ring in the applicable outside diameter groove of the cylinder head.

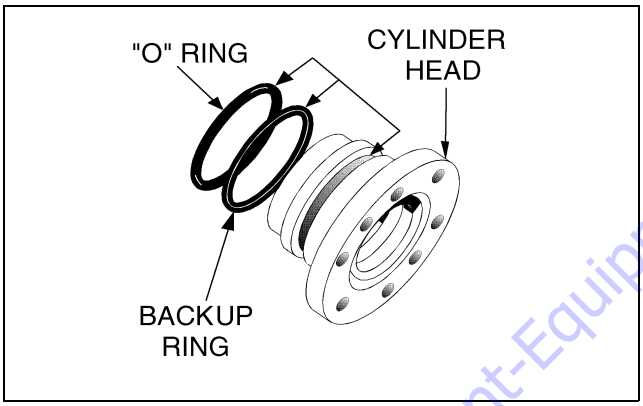


Figure 5-120. Installation of Head Seal Kit

4. Install washer ring onto rod, carefully install the head gland onto the rod, ensuring that the wiper and rod seal are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

5. Place new o-rings in the inner piston spacer diameter groove.

6. Carefully slide the spacer onto the rod, ensuring that the o-rings are not damaged and dislodged.

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

8. Place a new o-ring and backup rings in the inner piston diameter groove.

9. Carefully thread the piston on the cylinder rod hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.

10. Thread piston onto rod until it abuts the spacer end and install the tapered bushing.

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

11. 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.

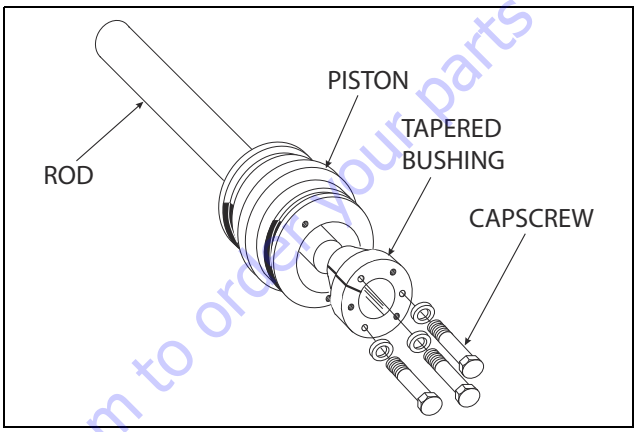


Figure 5-121. Tapered Bushing Installation

12. Tighten the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 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. 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.

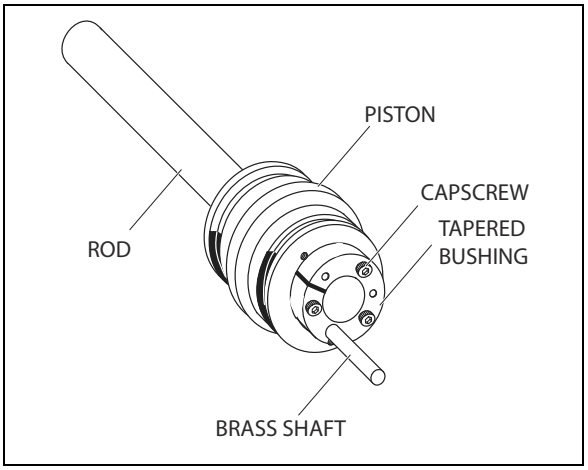


Figure 5-122. Seating the Tapered Bearing

14. Rotate the capscrews evenly and progressively in rotation to 9 ft. lbs. (12.2 Nm).
15. Remove the cylinder rod from the holding fixture.
16. Place T-seal and wear rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

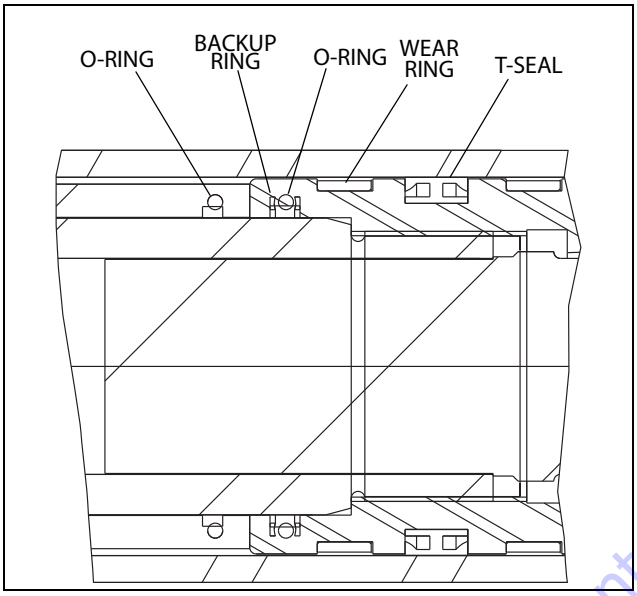


Figure 5-123. Piston Seal Kit Installation

17. 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.

18. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading T-seal and wear rings are not damaged or dislodged.
19. Continue pushing the rod into the barrel until the cylinder head gland can be inserted into the barrel cylinder.

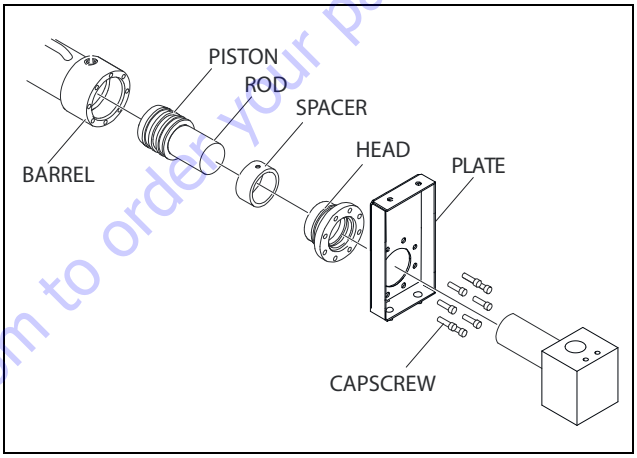


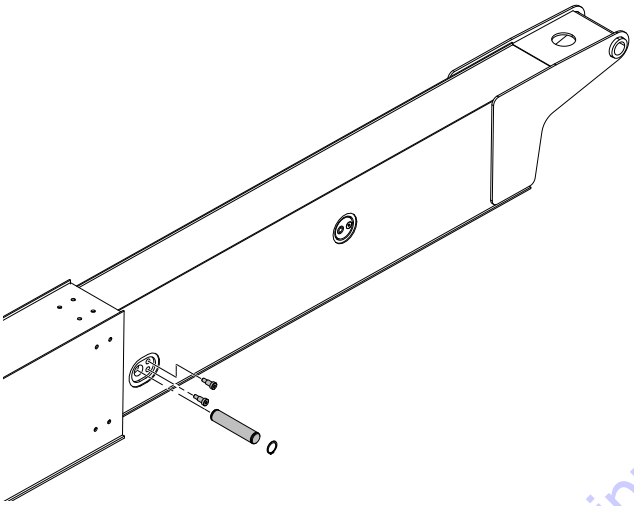
Figure 5-124. Rod Assembly Installation

20. Apply JLG Threadlocker (P/N 0100011) to the socket head bolts and secure the cylinder head gland using the washer ring and bolts. Torque bolts to 35 ft. lbs. (47.5 Nm).
21. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
22. Install the valve assembly. Torque capscrew to 114 in. lbs. (13 Nm).

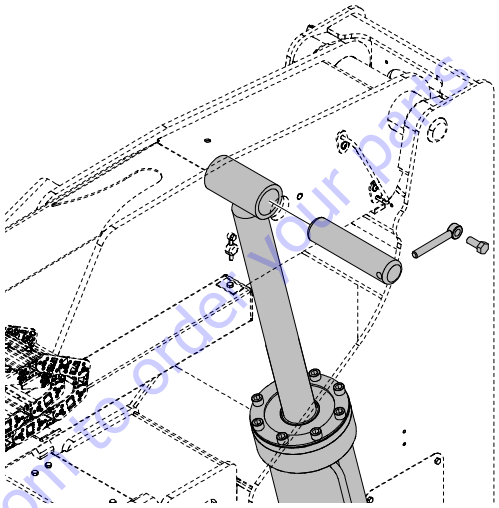
5.7 CYLINDER REMOVAL AND INSTALLATION

Main Boom Telescope Cylinder Removal

1. Place machine on a flat and level surface, with main boom in the horizontal position.
2. Extend the boom to gain access to main fly boom telescope cylinder rod end pin.
3. Remove the hardware securing the telescope cylinder rod attach pin to the boom. Using a suitable brass drift, drive out the cylinder rod attach pin.



4. Using a suitable sling and lifting device, secure the platform end of the boom.
5. Place blocking under the main lift cylinder to prevent it from falling when the attaching hardware is removed.
6. Remove the hardware securing the main lift cylinder rod attach pin to the boom. Using a suitable brass drift, drive out the cylinder rod attach pin.



NOTE: *The Main Boom weighs approximately 2226 lbs. (1010 kg).*

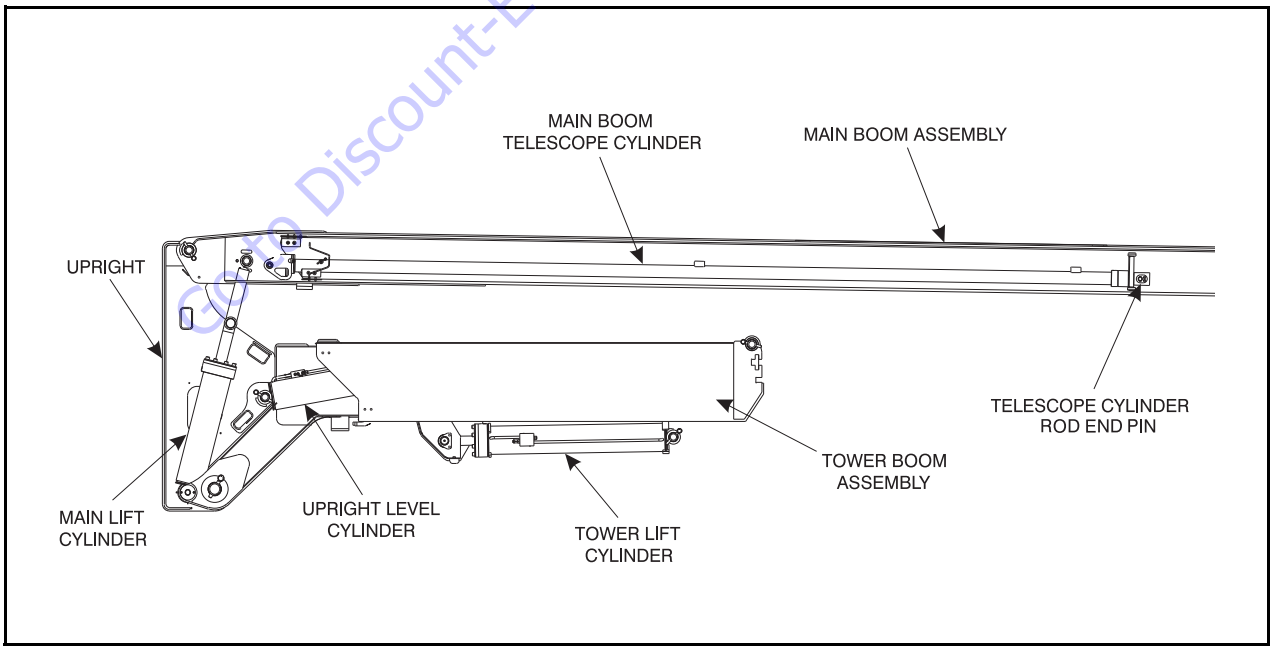
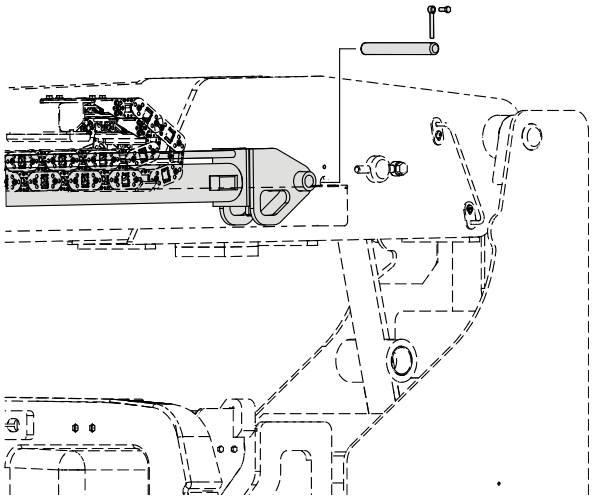


Figure 5-125. Components Main Boom and Tower Boom

7. Using auxiliary power from ground controls, retract the lift cylinder rod completely.
8. Disconnect, cap, and tag the main boom lift cylinder hydraulic lines and ports.
9. Remove mounting hardware securing the telescope cylinder barrel to the main base boom.



10. Using an external pump, extend the cylinder as far as the hydraulic lines will allow to enable a lifting device to be attached to the telescope cylinder.

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM

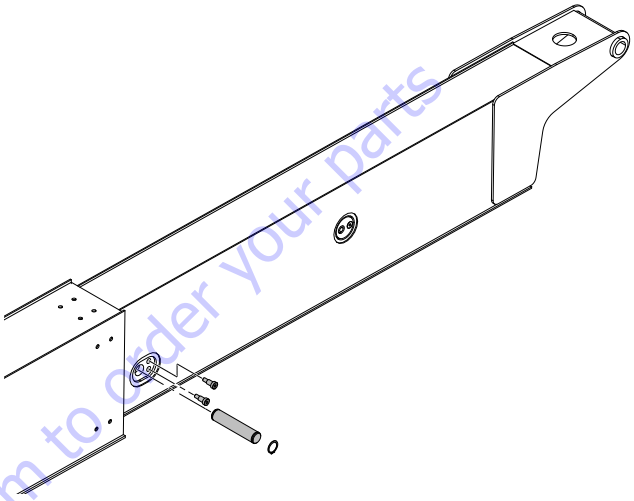
11. Tag and disconnect hydraulic lines from telescope cylinder. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.

NOTE: *The Telescope Cylinder weighs approximately 459 lbs. (208.2 kg).*

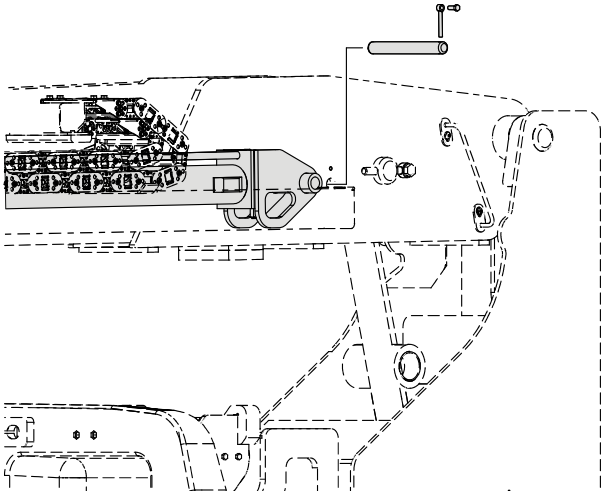
12. Secure the telescope cylinder with a suitable sling and lifting device.
13. Carefully remove the telescope cylinder from the main boom assembly and place in a suitable work area.

Main Boom Telescope Cylinder Installation

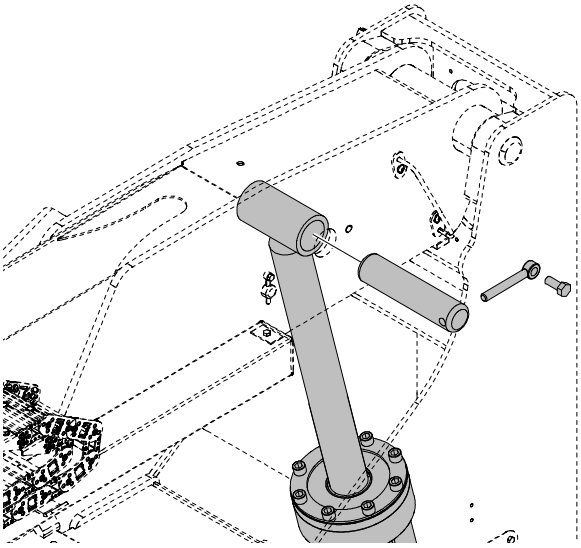
1. Using suitable lifting equipment, carefully insert the cylinder into the boom assembly.
2. Remove the lifting device from the telescope cylinder.
3. Carefully install main telescope cylinder rod pin through the fly boom and secure it with the retaining rings.



4. Remove applicable hydraulic line and port caps and properly connect the hydraulic lines to the telescope cylinder. Ensure all hoses are correctly routed.
5. Carefully install the telescope cylinder barrel end support into mounting block in base boom and secure with blocks and torque the bolts to 35 ft. lbs. (48 Nm). Use JLG Threadlocker P/N 0100011 on bolts. Shim as necessary.



6. Remove the lifting device from the main telescope cylinder and retract the main telescope cylinder.
7. Extend the main lift cylinder using the auxiliary control from the ground controls to align with rod end hole in main base boom.
8. Carefully insert the main lift cylinder rod end pin through the base boom and install the mounting hardware.

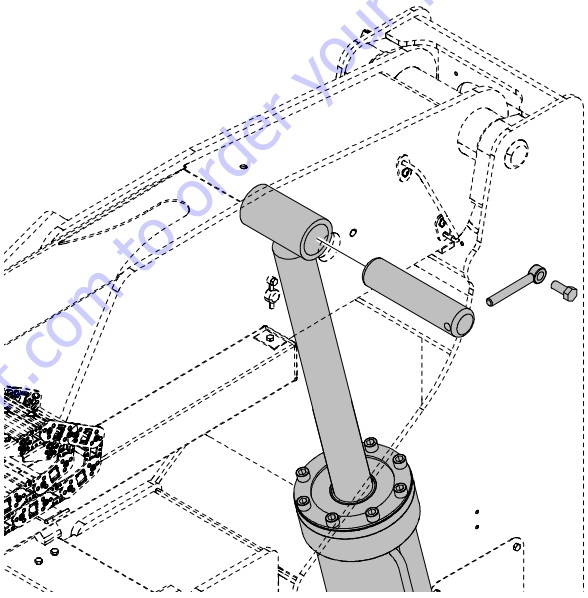


9. Using all applicable safety precautions, operate the boom functions. Check for proper operation and hydraulic leaks. Secure as necessary.
10. Check fluid level of hydraulic tank and adjust as necessary.

Main Lift Cylinder Removal

NOTE: *The Main Boom weighs approximately 2226 lbs. (1010 kg).*

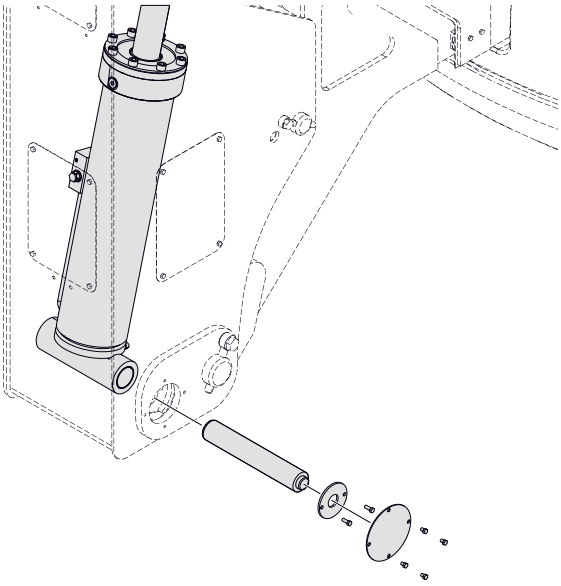
1. Place the machine on a flat and level surface. Attach a suitable lifting device and sling, sufficient to lift the main boom assembly, to the approximate center of the main boom assembly.
2. Place blocking under the cylinder to prevent it from falling when the attaching hardware is removed.
3. Remove the hardware securing the main lift cylinder rod attach pin to the boom. Using a suitable brass drift, drive out the cylinder rod attach pin.



4. Using auxiliary power from ground controls, retract the lift cylinder rod completely.
5. Disconnect, cap, and tag the main boom lift cylinder hydraulic lines and ports.
6. Attach a suitable lifting device and sling to the main lift cylinder.

NOTE: *The Main Lift Cylinder weighs approximately 445 lbs. (202 kg).*

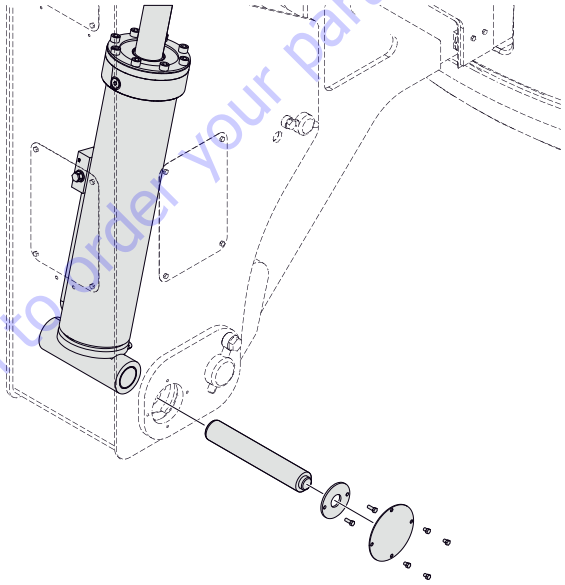
7. Remove hardware securing cover plate on the bottom of the upright. Remove cover plate.
8. Use a suitable brass drift and hammer to remove main lift cylinder barrel end pin from Upright.



9. Using a suitable brass drift drive out the barrel end attach pin from the tower upright. Raise the main boom assembly with the lifting device and sling to allow enough space to remove the main lift cylinder from the upright top.
10. Carefully lift the cylinder clear of the boom assembly and lower to the ground or suitably supported work area.
11. Lower the boom assembly to the stowed position.

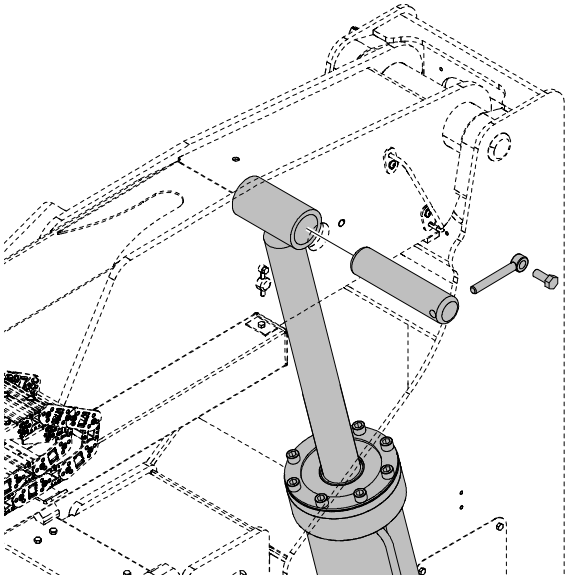
Main Lift Cylinder Installation

1. Lift the main boom to allow enough space to lower the main lift cylinder to align with pin mounting holes of the tower fly boom and barrel end of main lift cylinder.
2. Using a suitable brass drift, drive barrel end attach pin through the mounting holes in the lift cylinder and the tower fly boom. Secure in place with the pin and torque the bolts to 35 ft. lbs. (48 Nm). Use Threadlocker P/N 0100011 on bolts.



3. Remove cylinder port plugs and hydraulic line caps and attach lines to cylinder ports as tagged during removal.
4. Using auxiliary power extend the cylinder rod until the attach pin hole aligns with those in the main boom.

5. Using a suitable drift drive cylinder rod attach pin through the aligned holes, taking care to align the grooved pin holes. Secure the pin in place and torque the bolt to 285 ft. lbs. (388 Nm). Use JLG Threadlocker P/N 0100011 on bolts.



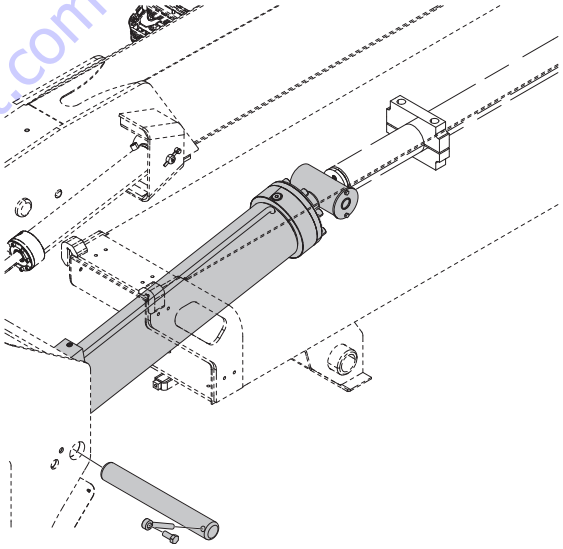
6. Remove lifting device and sling. Activate hydraulic system.
7. Using all applicable safety precautions, operate the boom functions. Check for proper operation and hydraulic leaks. Secure as necessary.
8. Check fluid level of hydraulic tank and adjust as necessary.

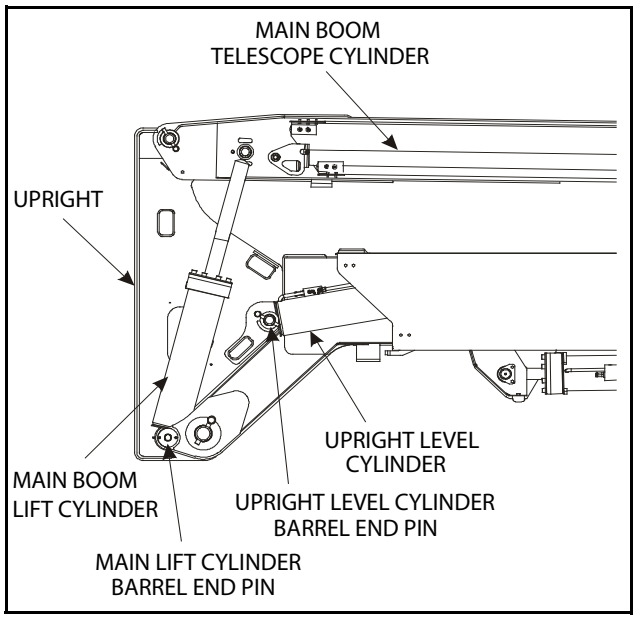
Upright Level Cylinder Removal

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO SYSTEM.

1. Remove the Main Boom. Refer to Main Boom removal.
2. Tag and disconnect hydraulic lines to the main lift cylinder. Use suitable container to collect any residual hydraulic fluid. Cap hydraulic lines and ports.
3. Remove mounting hardware from the main boom lift cylinder barrel end. Use a suitable brass drift and hammer to remove main lift cylinder barrel end pin from Upright and remove main lift cylinder.
4. Disconnect the Upright Level Cylinder as follows:
   a. Use a suitable lifting device to support the Upright.
   b. Remove mounting hardware securing the Upright Level Cylinder to the upright. Use a suitable brass drift and hammer to remove upright level cylinder barrel end pin from upright and disconnect the upright level cylinder from the Upright.





NOTE: *The Upright weighs approximately 1175 lbs. (535 kg).*

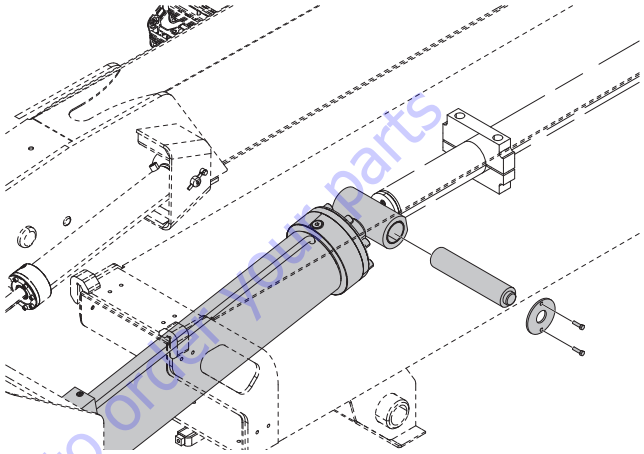
5. Before extending the tower boom, support the tower boom from the bottom.

6. Extend the Tower Boom to get access to the Upright level cylinder rod end pin by using an external auxiliary pump.

7. Tag, disconnect and cap the hydraulic lines of the Upright level Cylinder barrel.

8. Attach a suitable lifting device to support the Upright Level Cylinder.

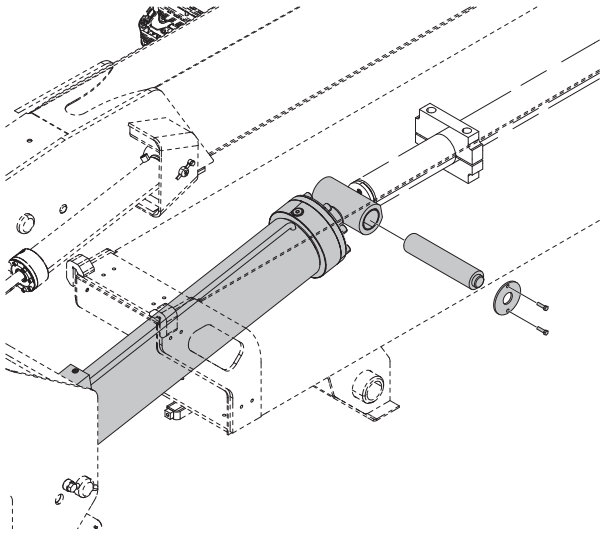
9. Remove mounting hardware from the upright level cylinder rod end and remove the pin.



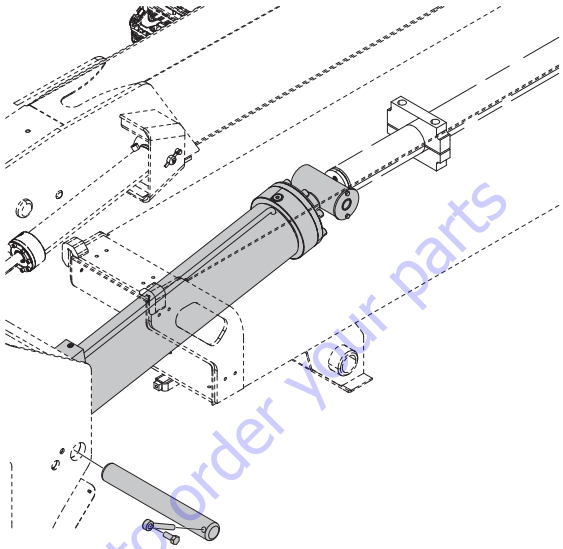
10. Remove the Upright Level Cylinder from the Tower Fly Boom. Place the upright level cylinder in a suitable work area.

Upright Level Cylinder Installation

1. Put the leveling cylinder in position in the tower boom, align holes in the tower boom and leveling cylinder rod end.
2. Secure the leveling cylinder rod end pin to tower boom and torque the bolts to 35 ft. lbs. (48 Nm). Use JLG Threadlocker P/N 0100011 on bolts.



3. Remove Cylinder Port plugs and hydraulic line caps. Properly attach lines to Cylinder ports as tagged during removal.
4. Use all applicable safety precautions, operate the lifting device to move upright assembly into proper position.
5. Align holes in upright and barrel end of level cylinder. Use a suitable rubber mallet to install level barrel end pin. Secure pin and torque the bolt 285 ft. lbs. (388 Nm). Use JLG Threadlocker P/N 0100011 on bolts.



6. Install Main Lift Cylinder.
7. Install Main Boom. Refer to Main Boom installation.
8. Remove hydraulic line caps and attach all the hydraulic and electrical lines as tagged during removal.
9. Use all applicable safety precautions, operate the boom functions. Check for proper operation and hydraulic leaks.
10. Check fluid level of hydraulic tank and add fluid, if required.

Tower Boom Lift Cylinder Removal

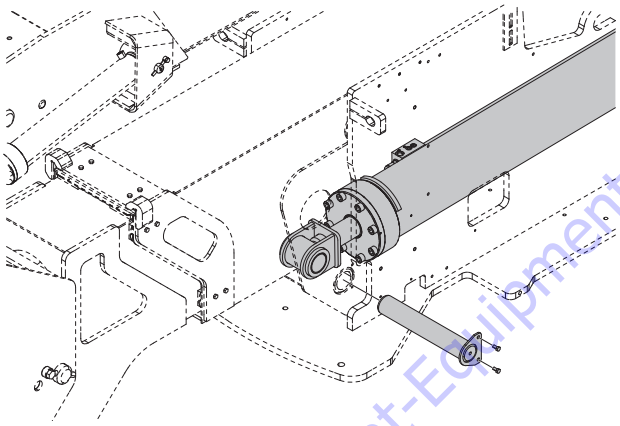
1. Place machine on a flat and level surface. Place the main boom in a horizontal position with the telescope cylinder fully retracted. Place the tower boom in a fully elevated and fully retracted position.

NOTE: *The Main Boom weighs approximately 2226 lbs. (1010 kg), Upright weighs approximately 1175 lbs. (535 kg) & Tower Boom weighs approximately 3450 lbs. (1565 kg).*

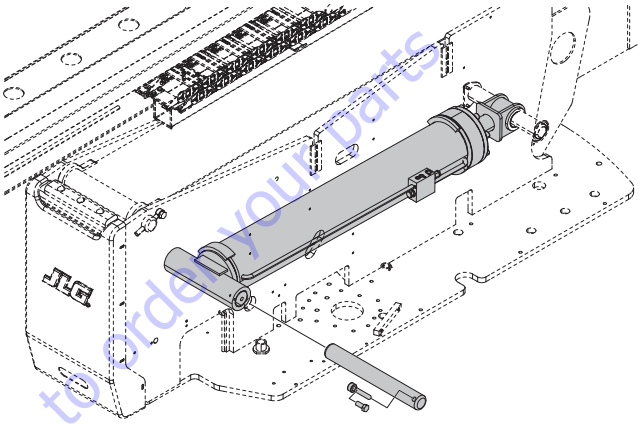
2. Support the main boom, upright and tower boom with adequate overhead crane.

NOTE: *The Tower lift cylinder weighs approximately 544 lbs. (247 kg).*

3. Adequately support the tower lift cylinder.
4. Remove mounting hardware securing the lift cylinder rod pin to the tower boom. Using a suitable brass drift, drive out the tower lift cylinder rod attach pin.



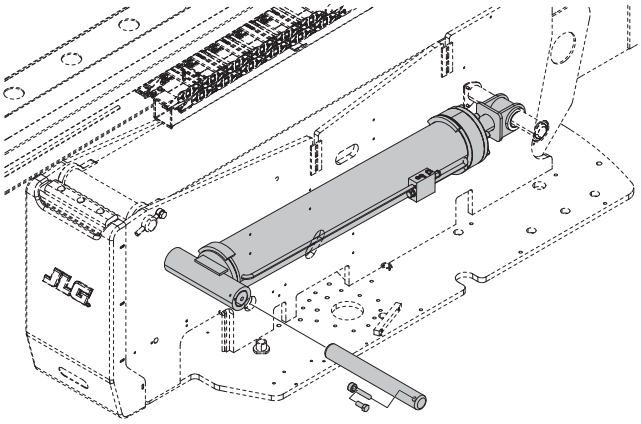
5. Using all applicable safety precautions, operate auxiliary power, activate tower lift down and fully retract lift cylinder.
6. Tag, disconnect, and cap the tower lift cylinder hydraulic lines and ports.
7. Remove mounting hardware securing the tower lift cylinder barrel pin to the turntable. Using a suitable brass drift, drive out the tower lift cylinder barrel pin.



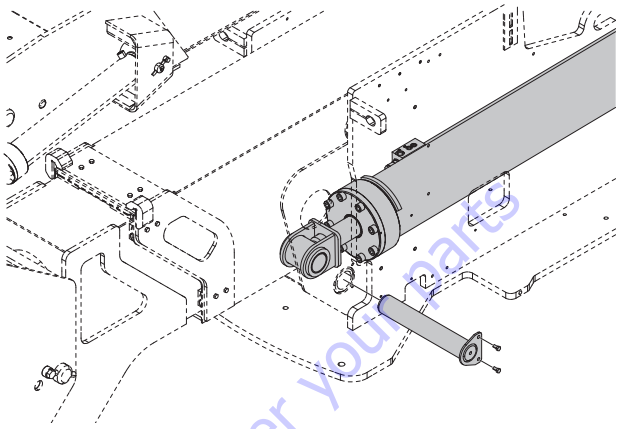
8. Carefully remove the tower lift cylinder from turntable. Place in a suitable work area.

Tower Boom Lift Cylinder Installation

1. Support the main boom and tower boom, place the tower lift cylinder on the turntable and align the holes. Install the cylinder barrel pin and torque the bolt to 285 ft. lbs. (388 Nm). Use JLG Threadlocker P/N 0100011 on bolts.



2. Remove caps from cylinder hydraulic lines properly and install lines to cylinder as previously tagged.
3. Using auxiliary power, activate tower lift function and extend cylinder rod until the cylinder rod bushing aligns with bushings on boom.
4. Using an appropriate brass drift, drive the tower lift cylinder rod end attach pin through the aligned bushings. Secure pin and torque the bolt 35 ft. lbs. (48 Nm). Use JLG Threadlocker P/N 0100011 on bolts.



5. Remove main boom support and lifting device supporting the upright.
6. Using all applicable safety precautions, operate the boom functions. Check for proper operation and hydraulic leaks. Secure as necessary.
7. Check fluid level of hydraulic tank and add fluid, if required.

Slave Cylinder Removal

1. Place the machine on a flat surface and lower the main boom and tower boom to the lowest position.
2. Using auxiliary power, retract the slave cylinder rod completely.
3. Raise the jib to gain access to the Slave Cylinder piston end Pin.

NOTE: *The Slave Cylinder weighs approximately 77.15 lbs. (35 kg).*

4. Using a suitable lifting device, properly secure the platform to prevent the platform from tilting backward or forward during removal of the slave cylinder.
5. Tag and disconnect the slave cylinder hydraulic hoses. Cap hoses to prevent the hydraulic system from being contaminated.
6. Properly secure the slave cylinder by using a suitable sling or support.

NOTE: *The Slave cylinder weighs approximately 77.15 lbs. (35 kg).*

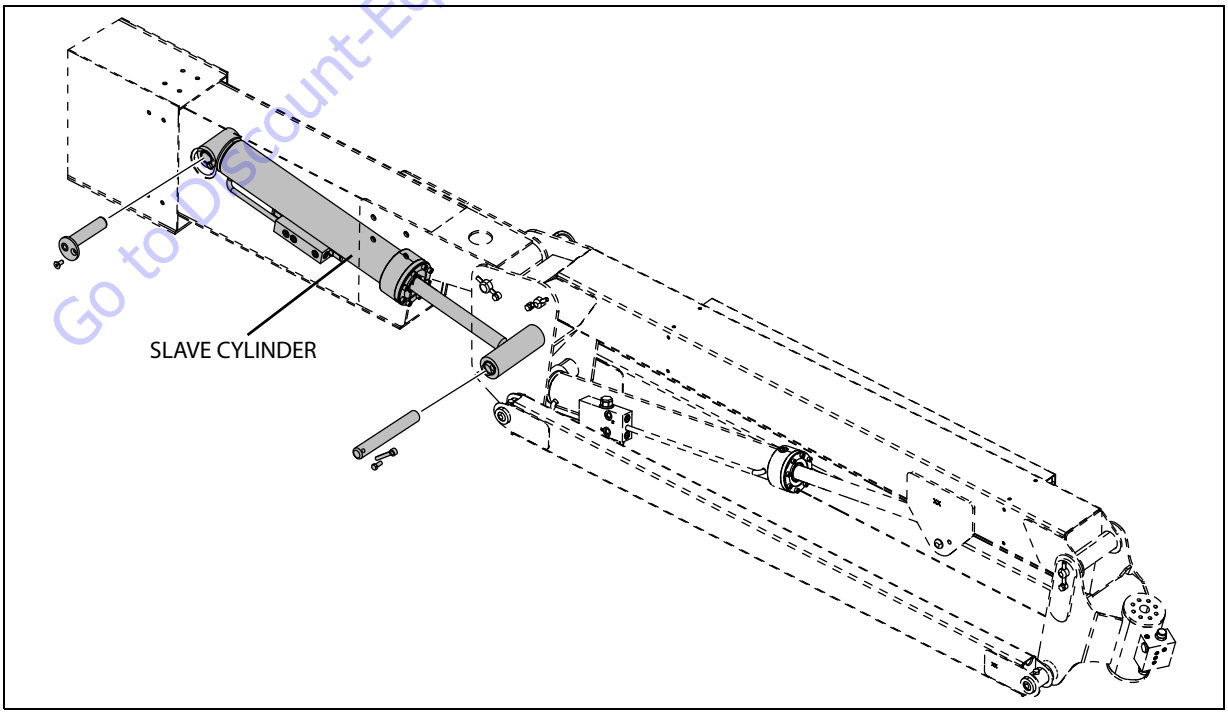
7. Remove the slave cylinder pin retaining hardware. Using a suitable brass drift, remove the slave cylinder pins from the rod and barrel ends.
8. Carefully remove the slave cylinder.
9. Clean and inspect the cylinder pins and retaining hardware for reuse. Replace if necessary.

Slave Cylinder Installation

1. Remove caps from the hydraulic hoses and attach hoses to the proper cylinder ports.

NOTE: *The Slave cylinder weighs approximately 77.15 lbs. (35 kg).*

2. Use suitable slings or support to position the Slave cylinder in place. Align barrel end mounting holes with the holes in main fly boom.
3. Use suitable mallet to install the barrel end attach pin and torque the bolts to 35 ft. lbs. (48 Nm).
4. Extend the slave cylinder rod until the rod attach pin hole aligns with holes in the platform pivot. Use suitable mallet and keeper to install the rod end pin.
5. Remove lifting device from the slave cylinder and support from the platform.
6. Use all applicable safety precautions, start the machine from the ground control. Fully raise and lower the main boom through several cycles to bleed the platform level hydraulic circuit.
7. Check for proper operation and hydraulic leaks.
8. Check the fluid level of hydraulic tank. Fill the tank, if required.



5.8 HYDRAULIC PUMP W/HAYES PUMP DRIVE COUPLING LUBRICATION

Any time pump or pump drive coupling is removed coat, pump and drive coupling splines with Lithium Soap Base Grease (TEXACO CODE 1912 OR EQUIVALENT) coupling is greased prior to assembly.

5.9 PRESSURE SETTING PROCEDURES

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.

Set Up the Function Pump

BOSCH/REXROTH PUMP

1. **Stand by pressure or load sense pressure**

   Install a low pressure gauge at port “MP” of the main valve block. A gauge capable of reading 400 psi (27.5 bar). Remove the wires from the main lift, valve coils on the main valve block. Start the engine and activate main lift up or down. Hold the function for 10-15 seconds. This bleeds the air out of the sense line. The gauge should be reading 400, +40-0 psi. (27.5, +2.7 -0 bar). To make an adjustment to this pressure, go to the engine compartment, locate the variable pump. There are (2) adjustments at the top of the pump. The stand by adjustment is at the top. Using a 17 mm wrench, remove the cover nut. Be careful not to lose the o-ring washer inside the cover nut. Loosen the jam nut at the set screw with the 17 mm wrench. Using a 3 mm allen wrench adjust clockwise to increase, or counterclockwise to decrease. After adjusting the pressure, tighten the jam nut and replace the cover nut. Reconnect the wires on the main lift coils.

2. **High pressure relief**

   Install a high pressure gauge at the "MP" port of the main valve block. Activate upper (main) telescope in. The gauge should read 2600 psi (179 bar). To make an adjustment to this pressure, go back to the engine compartment to the variable pump. The high pressure relief adjustment is on the lower one of the (2). Repeat the same procedure as setting the stand by pressure. This is the maximum relief pressure for all functions governed by this pump.

SAUER/DANFOSS PUMP

1. **Stand by pressure or load sense pressure**

   Install a low pressure gauge at port “MP” of the main valve block. A gauge capable of reading 400 psi (27.5 bar). Remove the wires from the main lift, valve coils on the main valve block. Start the engine and activate main lift up or down. Hold the function for 10-15 seconds. This bleeds the air out of the sense line. The gauge should be reading 400, +40-0 psi. (27.5, +2.7 -0 bar). To make an adjustment to this pressure, go to the engine compartment, locate the function pump. There are (2) adjustments at the top of the pump. They are located on the pump compensator which has (4) bolts mounting it to the pump. The stand by adjustment is at the top. To adjust this, a 4 mm and 6 mm Allen wrench will be needed. The adjustment screw is facing the front of the pump, or towards the engine. First, using 4 m wrench, loosen the setscrew on the side of compensator (facing you) which is in line with the adjustment screw. This is the jam nut screw which holds the main adjustment from turning. Loosen it 1 turn. Then using the 6 mm wrench adjust the main adjustment clockwise to increase or counterclockwise to decrease. The pressure should read between 400-440 psi.

2. High pressure relief

Install a high pressure gauge at the "MP" port of the main valve block. Activate main telescope in. The gauge should read 2600 psi (179 bar). To make an adjustment to this pressure, go back to the engine compartment to the function pump. The high pressure relief adjustment is the lower one of the (2) on the compensator. To adjust this, a 4 mm and 6 mm Allen wrench will be needed. The adjustment screw is facing the front of the pump, or towards the engine. First, using 4 mm wrench, loosen the setscrew on the side of compensator (facing you) which is in line with the adjustment screw. This is the jam nut screw which holds the main adjustment from turning. Loosen it 1 turn. Then using the 6 mm wrench adjust the main adjustment clockwise to increase or counterclockwise to decrease. This is the maximum relief pressure for all functions governed by this pump.

Adjustments Made At The Main Valve Block

1. Main lift down

Install a high pressure gauge at the "MP" port of the main valve block. Activate main lift down. The gauge should read 1400 psi (96.5 bar). The adjustment cartridge is located to the right of port #11. Turn clockwise to increase, counterclockwise to decrease.

2. Swing (left and right are done with one adjustment)

Install a high pressure gauge at the "MP" port of the main valve block. Lock the turn-table lock pin. Activate swing, the gauge should read 1400 psi (96.5 bar). The adjustment cartridge is located on the right side of the block, the second relief valve cartridge down from the top. Turn clockwise to increase, counterclockwise to decrease.

NOTE: *The front of the block has the bolt on valves on that face.*

3. 2 Wheel Steer

Use the same gauge at the same port. Activate steer left or right. The gauge should read 1800 psi. (2-wheel steer) both directions. One relief cartridge is located on the right side of the block, at the top. The other one is located on the left side next to port #15. Turn clockwise to increase, counterclockwise to decrease.

4. 4 Wheel Steer

Use the same gauge at the same port. Activate front wheel steer left or right. One relief cartridge is located on the right side of the block, at the top. The other one is located on the left side next to port #15. Turn clockwise to increase, counterclockwise to decrease. Adjust both reliefs to 2600 psi. Remove the coils from the front wheel directional valve. Activate 4 wheel steer. Adjust the rear wheel steer reliefs to 2600 psi. Those reliefs are located on the 4 wheel steer block bolted on the front of the main control valve.

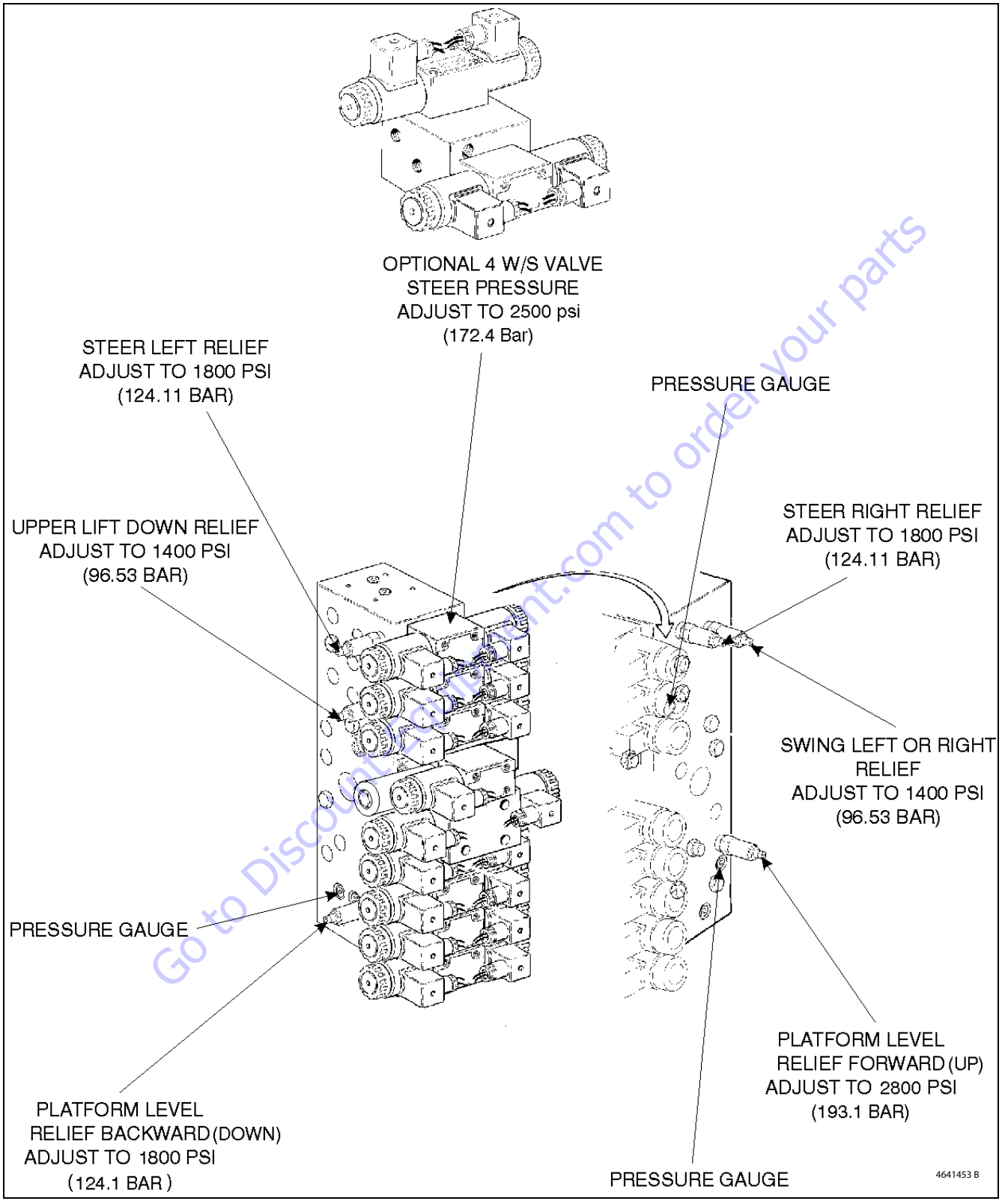
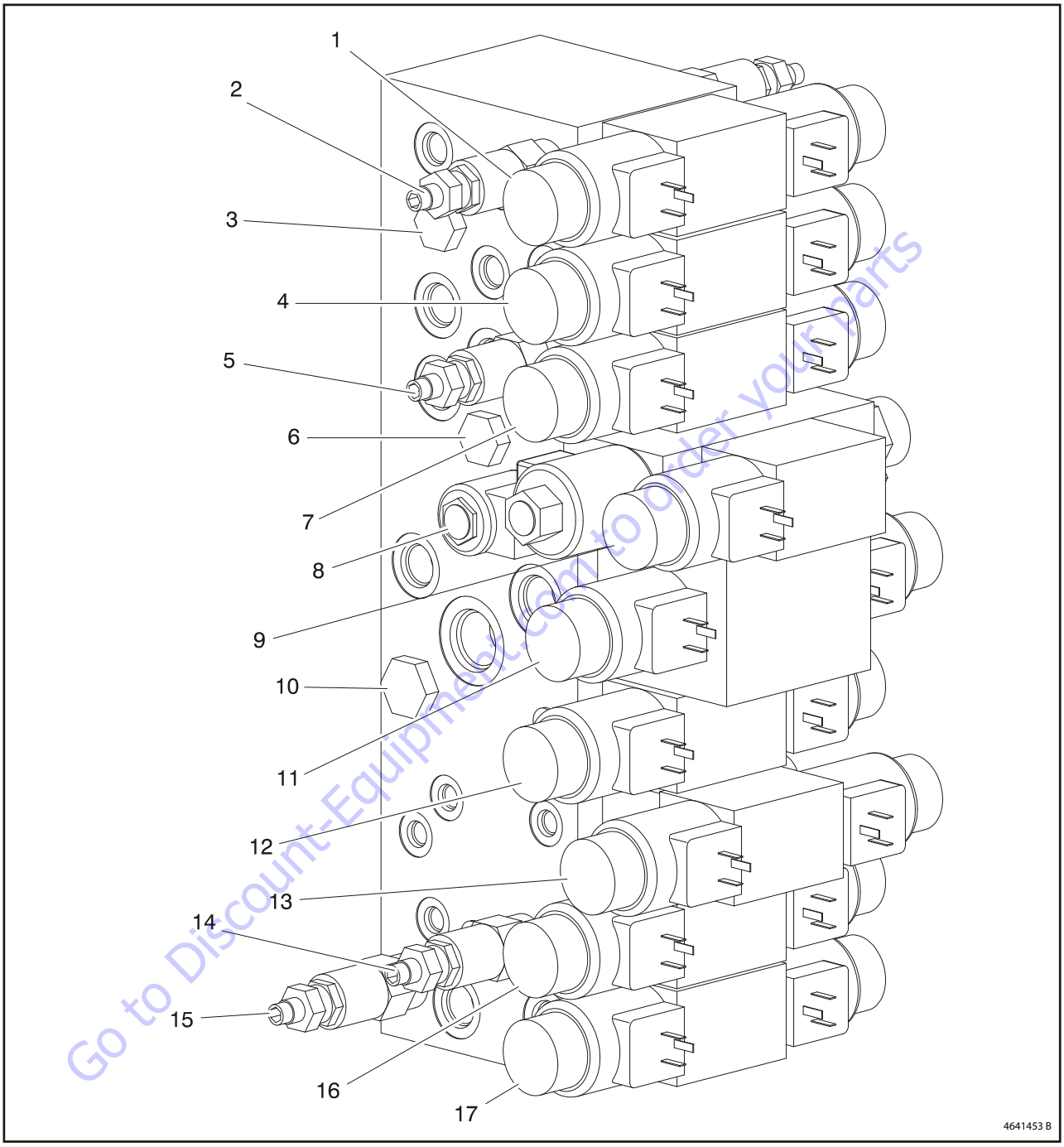
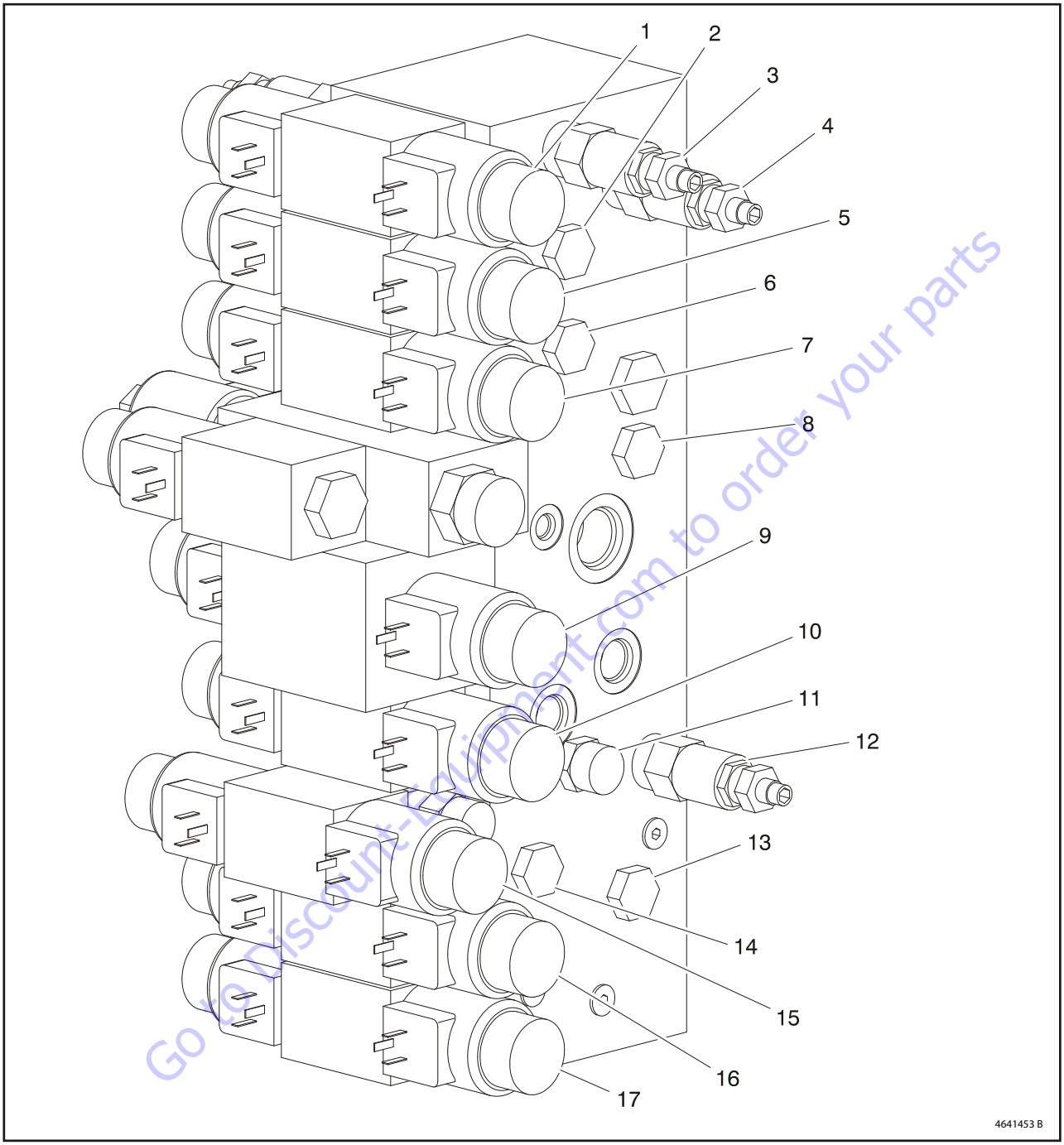


Figure 5-126. Main Control Valve Pressure Adjustments



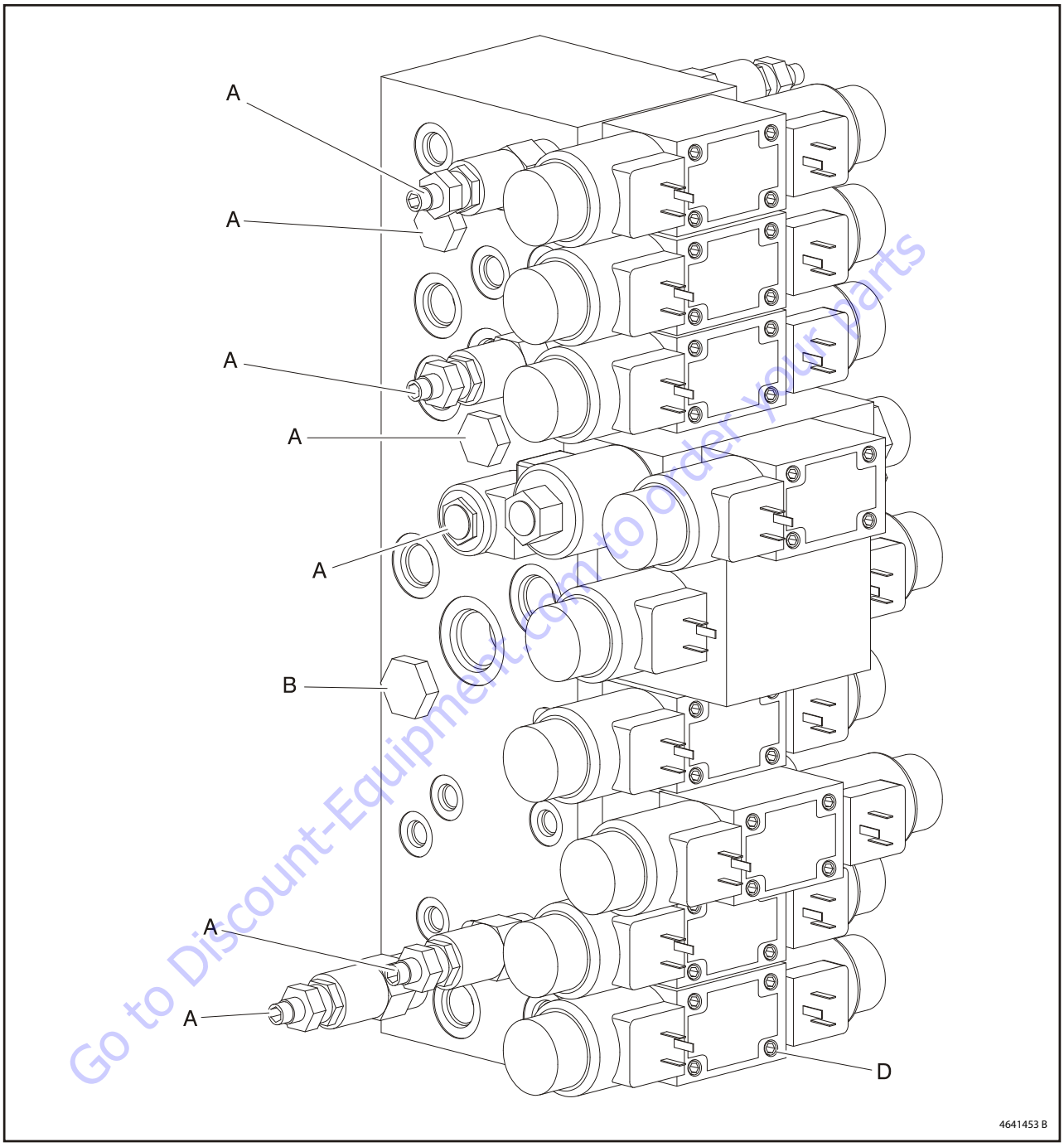
1. Front Steer Right Solenoid
2. Front Steer Relief
3. Load Sensing Cartridge
4. Swing Right Solenoid
5. Main Lift Relief
6. Load Sensing Cartridge
7. Main Lift Up Solenoid
8. Load Sensing Dump Valve
9. Flow Control Valve
10. Tower Lift Check
11. Main Tele In Solenoid
12. Tower Lift Down Solenoid
13. Platform Rotate Right
14. Platform Level Down Relief
15. Tower Tele Relief
16. Platform Level Up Solenoid
17. Tower Tele Out Solenoid

Figure 5-127. Main Valve Components - Sheet 1 of 2



1. Front Steer Left Solenoid
2. Load Sensing Cartridge
3. Front Steer Relief
4. Swing Relief
5. Swing Left Solenoid
6. Load Sensing Cartridge
7. Main Lift Down Solenoid
8. Load Sensing Cartridge
9. Main Tele Out Solenoid
10. Tower Lift Up
11. Platform Rotate Flow Regulator
12. Platform Level Up Relief
13. Orifice
14. Platform Level Check
15. Platform Rotate Left Solenoid
16. Platform Level Down Solenoid
17. Tower Tele In Solenoid

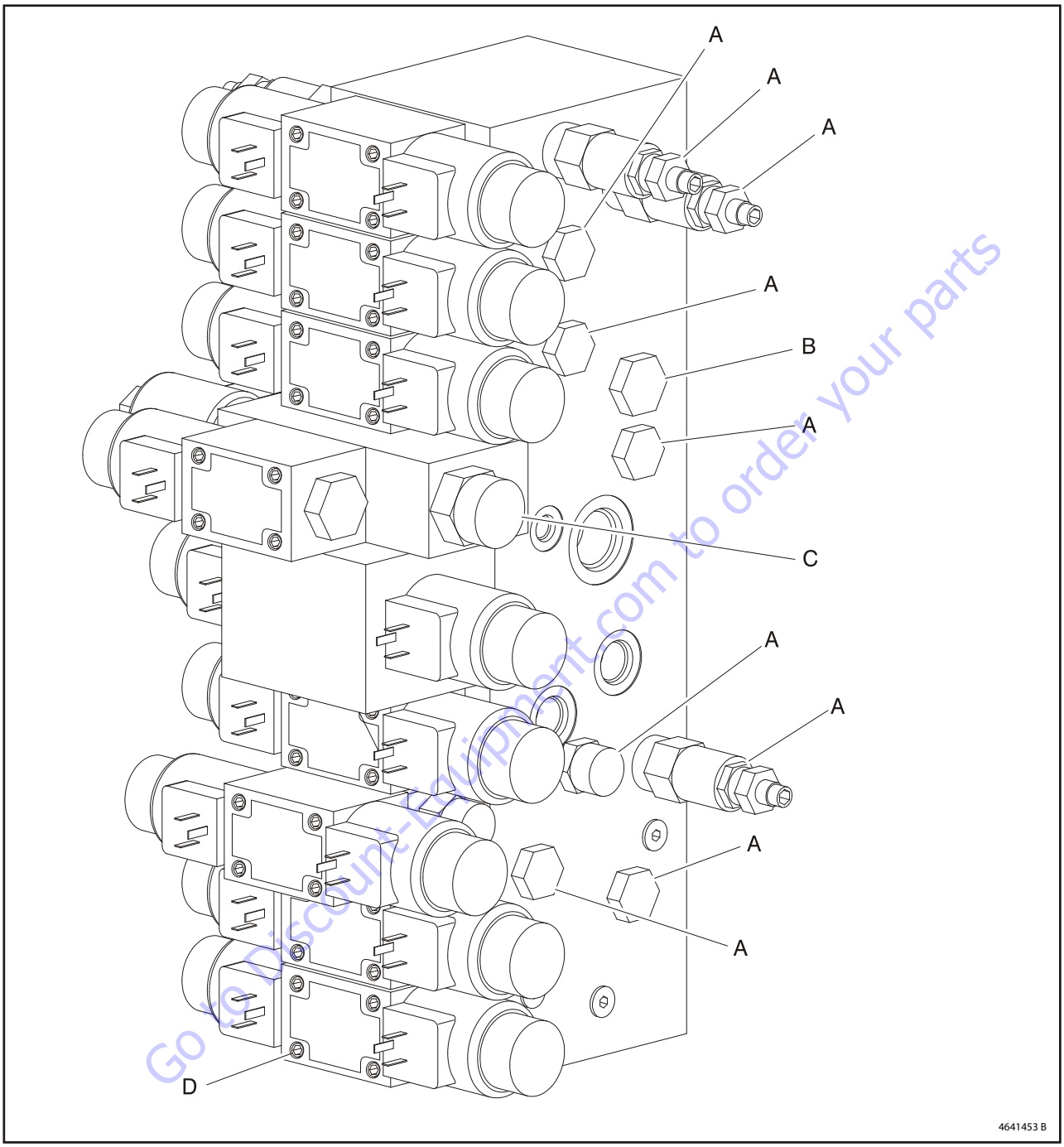
Figure 5-128. Main Valve Components - Sheet 2 of 2



	Ft. Lbs.	Nm
A	19-21	25.8-28.5
B	24-26	32.6-35.4
C	33-37	44.9-50.3
D	60 in. lbs.	6.7

NOTE: *When removing control valves from the manifold, it is important to observe the tag on the face of the valve, as the new valve must be installed with the tag facing the same way as the tag on the valve that was removed. The bolt pattern on the control valves is not symmetrical, so if the bolts seem difficult to turn when installing, it would indicate the valve is upside down and forcing the bolts will result in cross-threading. Check the tag, and if necessary, rotate the valve 180 degrees.*

Figure 5-129. Valve Component Torque - Sheet 1 of 2



	Ft. Lbs.	Nm
A	19-21	25.8-28.5
B	24-26	32.6-35.4
C	33-37	44.9-50.3
D	60 in. lbs.	6.7

NOTE: *When removing control valves from the manifold, it is important to observe the tag on the face of the valve, as the new valve must be installed with the tag facing the same way as the tag on the valve that was removed. The bolt pattern on the control valves is not symmetrical, so if the bolts seem difficult to turn when installing, it would indicate the valve is upside down and forcing the bolts will result in cross-threading. Check the tag, and if necessary, rotate the valve 180 degrees.*

Figure 5-130. Valve Component Torque - Sheet 2 of 2

5. **Platform Level Up**

   Install a high pressure gauge at port "M3", located on the right side of the block at the bottom. There is pressure trapped at this test port. To release this pressure, activate level down to the end of stroke (the pressure in the up side goes to 0). This will allow you to snap a gauge on this port. Activate level up to the end of stroke, you should read 2600 psi (179 bar). This is what the pump high pressure valve is set at. We want level up to read 2800 psi (193 bar). The level up relief valve is located in front of the "M3" gauge port. When activating level up, and reading 2600 psi (179 bar), turn the adjustment counterclockwise until the pressure drops below 2600 psi (179 bar), turn clockwise (slowly) until the gauge stops moving. It should stop at 2600 psi (179 bar), turn clockwise 1/2 turn and lock. This will give you 2800 psi (193 bar) on level up. This pressure is required to keep the platform level when the boom is being lowered.

6. **Platform Level Down**

   Install a high pressure gauge at the "M4" port located on the left of the valve near the bottom. To get a gauge on this point, activate level up to the end of stroke (the pressure in the down side will go to 0, allowing you to snap a gauge on). Activate level down to the end of stroke, reading 1800 psi (124 bar). The level down relief valve is located on the right side of the block above the "M4" port. Turn clockwise to increase, and counterclockwise to decrease.

7. **Articulating Jib Up**

   Install a high pressure gauge on the gauge port of the jib block located on the top of the main valve block. The gauge port has a 12 in. hose plumbed into it for easy access. Activate jib up, you should read 2500 psi (172 bar). The up relief valve is located on the right side of the jib block toward the front. Turn clockwise to increase, and counterclockwise to decrease.

8. **Articulating Jib Down**

   Install a high pressure gauge on the gauge port of the jib block located on top of the main valve block. The gauge port has a 12 in. hose plumbed into it for easy access. Activate jib down, you should read 1200 psi (83 bar). The down relief valve is located on the right side of the jib block toward the back. Turn clockwise to increase, and counterclockwise to decrease.

4 Wheel Steer (If Equipped)

1. At the platform console using the steer select switch activate "4 wheel steer".
2. Install a pressure gauge in port **"G"** on main control valve.
3. With the aid of an assistant, activate steer left and right, adjust front steer relief valve to **2500 psi** (172 bar). This pressure only affects the front axle.
4. At the platform console using the steer select switch activate "crab" or "coordinated" steer.
5. At the main control valve block disconnect the wire din connectors on the front steer valve. When steer is activated only the rear steer will work.
6. Install a pressure gauge in port **"G"** on main control valve.
7. With the aid of an assistant, activate steer left and right, adjust rear steer relief valve to **2500 psi** (172 bar) Reading at the valve bank. **2500 psi** (172 bar) will give you **2000 psi** (138 bar) at the cylinders.
8. Re-connect the front steer din connectors at the valve bank.

5.10 HYDRAULIC OIL CHANGE-OUT PROCEDURE

This procedure is written to change out JLG std. hydraulic oil (Mobile 424) to cold weather fluid for machines operating in temperatures exceeding -20°F. (-29°C.). JLG recommends (Mobile DTE 10). This procedure also applies to change-out of cold weather oil to std. Mobil 424 hydraulic oil.

NOTE: *This is not a procedure for changing from a petroleum based fluid to a water based fluid. Stricter guidelines are required when fluids are not compatable.*

1. All booms stowed, (jib also), drain the hydraulic oil tank, (approx. 40 gallons (150 L)).
2. Disconnect the main drive lines (A & B) from the right rear drive motor, and right front motor if 4 wheel drive. Drain into a container.
3. Disconnect the case drain lines from each of these motors and drain. This will drain most of the drive system. After they have been drained, reconnect them.
4. Refill the hydraulic oil tank with the appropriate fluid as recommended.
5. Remove the o-ring plug, (#10 size) on top of the Rexroth load sense pump. The plug is removed until the oil flows out of the pump. This insures that the pump cases are full of oil before starting. Install the plug after there is a steady flow of oil.
6. Jog the Auxiliary power pump 2-3 times (not energizing a function, only the Aux. Pump switch). Then activate the Aux. switch for approx. 20 seconds. This will flush the Aux. system.
7. Start the engine and let idle for a couple of minutes. Shut off engine.
8. If the machine has a jib: Remove the hose connected to port #17 on the main valve block and drain into a container that will hold at least 2 gallons (8 L) of oil. Plug port #17. Start the engine and activate jib up to the end of stroke. Stop, reconnect the hose to port#17, and cycle the jib function.
9. Remove the hose at port #8 on the main valve block. Place this hose inside a container that will hold approx 10 gallons (38 L). Activate tower lift up to the end of stroke. Reconnect the hose on port #8 and lower the tower boom.

NOTE: *Depending on the ceiling height, the upper boom might have to be lowered while lifting the tower.*

10. Locate the manual pull valve on the side of the oil tank (red knob). Disconnect the 1/4" hose (port #1) where it connects to the side of the hyd. return filter (plug the port) and place into a container that will hold approx. 10 gallons (38 L). Start the engine. Pull the red knob and hold it open, while tower is lifting up. Raise the tower 7-8 ft. (2-2.5 m) and stop. Release the red knob, and lower the tower boom. At the end of stroke, hold the switch in the down position. You will hear a hissing sound coming from the upright. this is oil being replenished in the tower circuit. Hold the switch until the sound stops. (approx. 15-20 secs.) Repeat this procedure 2 more times. Reconnect port #1 hose to the hyd. return filter.
11. Disconnect the 1/4" hose at the port marked "MT" (plug the port). Drain the hose into a container that will hold approx. 2 gallons (8 L). Activate platform rotate and hold for approx. 60 seconds each direction. Reconnect the hose to port "MT"
12. Raise the tower boom to the end of stroke. Disconnect the hose from port #1 (plug the port) and drain into a container that will hold approx. 3 gallons (11.5 L). Activate tower telescope out. At end of stroke, reconnect the hose and retract the tower telescope cylinder.
13. Disconnect the hose at port #9 (plug the port), and drain into a container that will hold approx. 4 gallons. Activate main telescope out. At end of stroke, reconnect the hose and retract the telescope function.
14. From the ground control, tilt the platform back to the end of stroke. Turn off the engine. Locate the master cylinder and disconnect the rod end hose (plug the port). NOTE: THERE WILL BE PRESSURE IN THIS CIRCUIT. Drain this hose into a container that will hold approx. 2 gallons, and activate platform level down, to end of stroke. Reconnect hose. Cycle platform level, 2 more times. Raise the tower boom to full height. Disconnect the hose at port #12 and drain into a container that will hold approx. 10 gallons. Activate main lift down to the end of stroke. Reconnect the hose to port #12. Disconnect the hose on port #11 (plug the port) and drain into a container that will hold approx. 10 gallons (38 L). Activate lift up to end of stroke. Reconnect the hose to port #11.

NOTE: *After all functions have been cycled 2-3 times, check the hydraulic oil tank level.*

5.11 HYDRAULIC COMPONENT START-UP PROCEDURES AND RECOMMENDATIONS

From a hydrostatic component standpoint, the goal at system start up is to put into functional operation, the hydrostatic system in such a way as to preserve the designed life span of the system. The following start-up procedure should be adhered to whenever a new pump or motor is initially installed into a machine, or a system is restarted after either a pump or motor has been removed and/or replaced.

⚠ WARNING

THE FOLLOWING PROCEDURE MAY REQUIRE THE MACHINE TO BE DISABLED (WHEELS RAISED OFF THE GROUND, WORK FUNCTIONS DISCONNECTED, ETC.) WHILE PERFORMING THE PROCEDURE IN ORDER TO PREVENT INJURY. TAKE NECESSARY SAFETY PRECAUTIONS BEFORE MOVING THE VEHICLE/MACHINE.

Prior to installing the pump and/or motor, inspect the unit(s) for damage that may have been incurred during shipping and handling. Make certain that all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

Fill the reservoir with recommended hydraulic fluid. This fluid should be passed through a 10 micron (nominal, no bypass) filter prior to entering the reservoir. The use of contaminated fluid will cause damage to the components, which may result in unexpected vehicle/machine movement.

NOTE: *If a pump or motor is being replaced due to internal damage, the remaining units (pump or motors) need to be inspected for damage and contamination, and the entire hydraulic system will need to be flushed and the fluid replaced. Failure to do so may cause considerable damage to the entire system.*

The inlet line leading from the reservoir to the pump must be filled prior to start-up. Check the inlet line for property tightened fittings and make sure it is free of restrictions and air leaks.

NOTE: *In most cases, the reservoir is above the pump inlet so that the pressure head created by the higher oil level helps to keep the inlet pressures within an acceptable range and prevent high vacuum levels. However, due to hose routing or low reservoir locations, there may be air trapped within this line. It is important to assure that the air is bled from this line. This can be accomplished by loosening the hose at the fitting closest the pump. When oil begins to flow, the line is full, the air has been purged, and the fitting can be retightened to its specified torque. If the tank needs to be pressurized in order to start the flow of oil, a vacuum reading should be taken at the inlet of the pump during operation in order to verify that the pump is not being asked to draw an inlet vacuum higher than it is capable of. Be certain to fill the pump and/or motor housing with clean hydraulic fluid prior to start up. Fill the housing by pouring filtered oil into the upper case drain port.*

NOTE: *It is highly recommended to use the highest possible case drain port, this ensures that the housing contains as much oil as possible and offers the greatest amount of lubrication to the internal components.*

NOTE: *In initial start-up conditions, it may be convenient to fill the housing, just prior to installing the case drain line. Component, (especially motor), location may be such that access to the case drain port after installation is not realistic.*

NOTE: *Make certain that the oil being used to fill the component housing is as clean as possible, and store the fill container in such a way as to prevent it from becoming contaminated.*

Install a 60 bar (or 1000 psi) pressure gauge in the charge pressure gauge port in order to monitor the charge pressure during start-up.

It is recommended that the external control input signal, (electrical connections for EDC), be disconnected at the pump control until after initial start-up. This will ensure that the pump remains in its neutral position.

⚠ WARNING

DO NOT START THE ENGINE UNLESS PUMP IS IN THE NEUTRAL POSITION (0 DEGREES SWASHPLATE ANGLE). TAKE PRECAUTIONS TO PREVENT MACHINE MOVEMENT IN CASE PUMP IS ACTUATED DURING INITIAL START-UP.

"Jog" or slowly rotate the engine until charge pressure starts to rise. Start the engine and run at the lowest possible RPM until charge pressure has been established. Excess air should be bled from the system lines as close to the motors as possible.

NOTE: *With the engine on low idle, "crack", (loosen-don't remove), the system lines at the motor(s). Continue to run the engine at low idle and tighten the system lines as soon as oil is observed to leak from them. When oil is observed to "leak" at the motor the line is full, the air has been purged, and the system hoses should be retightened to their specified torque.*

Once charge pressure has been established, increase speed to normal operating RPM. Charge pressure should be as indicated in the pump model code. If charge pressure is inadequate, shut down and determine the cause for improper pressure.

⚠ WARNING

INADEQUATE CHARGE PRESSURE WILL AFFECT THE OPERATOR'S ABILITY TO CONTROL THE MACHINE.

Shut down the engine and connect the external control input signal. Also reconnect the machine function(s), if disconnected earlier. Start the engine, checking to be certain the pump remains in neutral. With the engine at normal operating RPM, slowly check for forward and reverse machine operation.

Charge pressure may slightly decrease during forward or reverse operation. Continue to cycle slowly between forward and reverse for at least five minutes.

Shut down engine, remove gauges, and plug ports. Check reservoir level and add filtered fluid if needed.

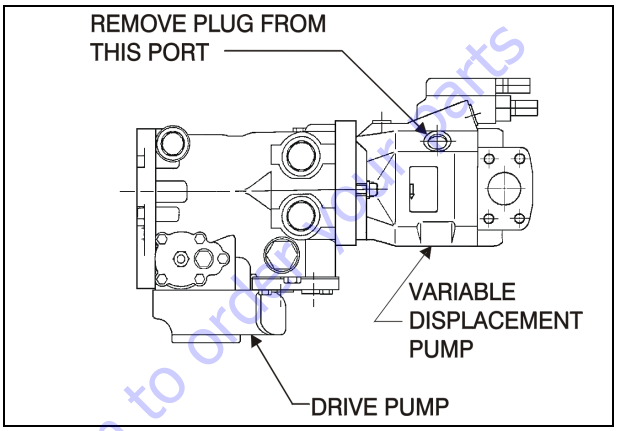
The machine is now ready for operation.

5.12 REXROTH VARIABLE DISPLACEMENT PUMP (PRIOR TO SN 0300121643)

The variable displacement axial piston pump is a swashplate design for hydrostatic drives in open circuits. The flow is proportional to the speed and the displacement. By adjusting the swashplate, it is possible to vary the flow steplessly. See Figure 2-43 for pressure settings and schematic.

1. Variable, swashplate design SAE nominal pressure 3600 psi (248 bar), peak pressure 4600 psi (317 bar).
2. Pump, open circuit.
3. Displacement Vgmax 2.75 in^3 (45 cm^3).
4. Pressure and flow control (DFR1).
5. Series 52.
6. Clockwise rotation.
7. NBR seals (Nitrile rubber to DIN ISO 1629).
8. SAE 1.00 in. (2.54 cm) splined shaft.(not suitable for through drive).
9. SAE 2 bolt mounting Flange - SAE 101-2 (B).

NOTE: *The Drive Pump and Displacement Pump must be filled with oil before starting the engine. As the tank is being filled, remove the specified plug from the Variable Displacement Pump. As oil enters the tank it flows to the pumps, fills them and flows out the port where the plug was removed. Removing the plug gives the air a place to escape. In approx. 5 min.,oil should flow out the port. Replace the plug, the procedure is completed.*



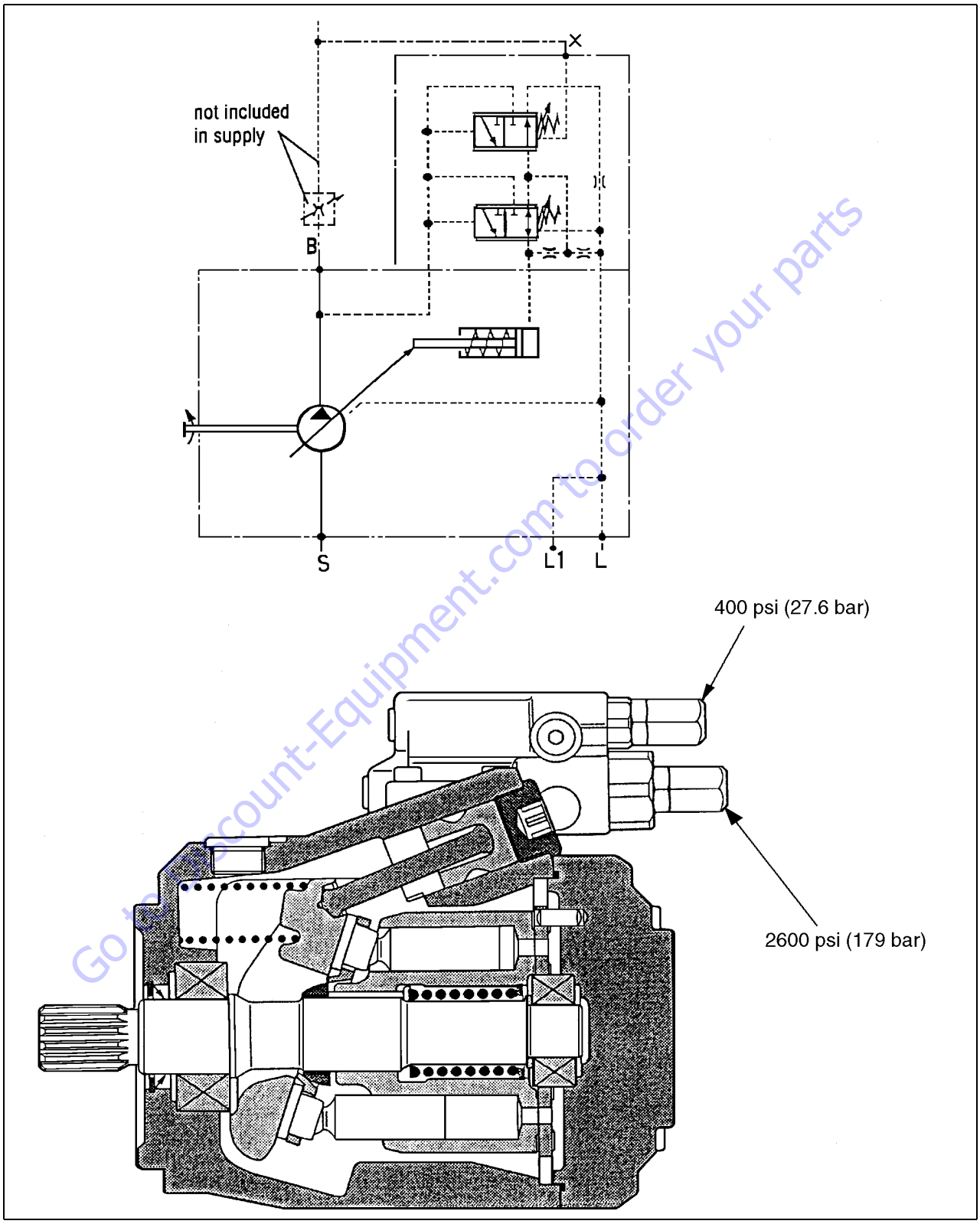


Figure 5-131. Variable Displacement Pump (Rexroth)

5.13 SAUER PISTON PUMP

Table 5-1. Symbols Used

Symbol	Meaning	Symbol	Meaning
	Non-reusable part, use a new part		Inspect for wear or damage
	Option - either part may exist		Note correct orientation
	Internal hex head		Torque specification
ORB	O-ring boss port		Pull out with tool - press fit
	Lubricate with hydraulic fluid		Cover splines with installation sleeve
	Apply grease /petroleum jelly		Pressure measurement / gauge location or specification
The symbols above can be found in the pump illustrations. The legend above is provided to define each symbol and explain its purpose.			

Table 5-2. Gauge and Port Information

Port	Purpose	Range of Pump	Fitting
M2	System pressure	0-5000 psi (0-300 bar)	7/16 - 20 o-ring fitting
M4	Servo pressure	0-5000 psi (0-300 bar)	7/16 - 20 o-ring fitting
L1,L2	Case pressure	0-100 psi (0-10 bar)	7/8 - 14 o-ring fitting
X1	Load Sense signal	0-5000 psi (0-300 bar)	7/16 - 20 o-ring fitting (tee into Load Sense signal line)

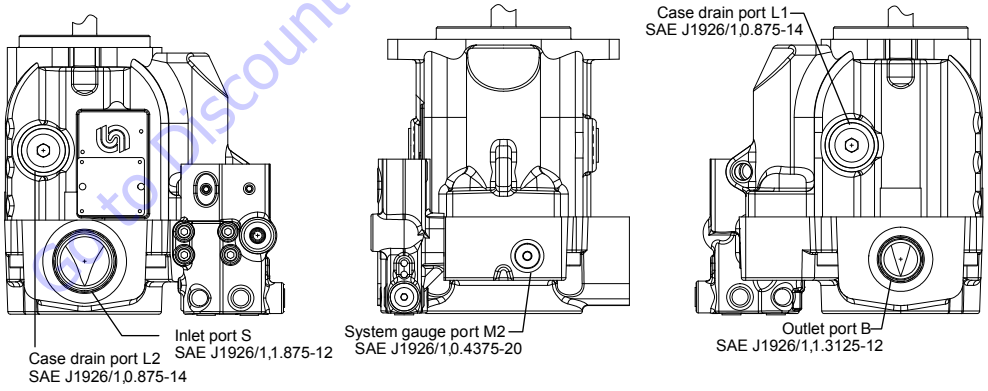


Figure 5-132. Gauge Port Locations

Initial Start-up Procedures

Follow this procedure when starting-up a new pump or when the pump has been removed.

1. Install the pump on the engine. Ensure the pump shaft is properly aligned.

⚠ CAUTION

INCORRECT SHAFT ALIGNMENT MAY RESULT IN DAMAGE TO DRIVE SHAFT, BEARINGS, OR SEAL WHICH CAN CAUSE EXTERNAL OIL LEAKAGE.

2. Fill the main pump housing with clean hydraulic fluid. Pour filtered oil directly into the upper most case drain port.
3. Fill the inlet line leading from the pump to the reservoir. Check the inlet line for properly tightened fittings and be certain it is free of restrictions and air leaks.
4. To ensure the pump stays filled with oil, install the case drain line in the upper most case drain port.
5. Install a gauge at port M2 to monitor system pressure during start up.
6. While watching the pressure gauge installed at M2, jog the engine or run at the lowest possible speed until system pressure builds to normal levels (minimum 160psi (11 bar)). Once system pressure is established, increase to full operating speed. If system pressure is not maintained, shutdown the engine, determine cause, and take corrective action. Refer to Troubleshooting.
7. Operate the hydraulic system for at least fifteen minutes under light load conditions.
8. Check and adjust control settings as necessary after installation. Refer to Adjustments.
9. Shut down the engine and remove the pressure gauge. Replace plug at port M2.
10. Check the fluid level in the reservoir; add clean filtered fluid if necessary. The pump is now ready for operation.

Troubleshooting

Table 5-2. Excessive Noise and/or Vibration

Item	Description	Action
Check fluid level in reservoir.	Insufficient hydraulic fluid will cause cavitation.	Fill the reservoir to proper level.
Check for air in system.	Air in system will cause noisy, erratic control.	Purge air and tighten fittings. Check inlet for leaks.
Check pump inlet pressure / vacuum.	Improper inlet conditions will cause erratic behavior and low output flow.	Correct pump inlet pressure / vacuum conditions. Refer to Hydraulic parameters.
Inspect shaft couplings.	A loose or incorrect shaft coupling will cause excessive noise and/or vibration.	Repair or replace coupling and ensure that correct coupling is being used.
Check shaft alignment.	Misaligned shafts will create excessive noise and/or vibration.	Correct shaft misalignment.
Hydraulic fluid viscosity above acceptable limits.	Hydraulic fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operation or use fluid with the appropriate viscosity grade for expected operating temperatures.

Table 5-3. Actuator Response Is Sluggish

Item	Description	Action
Check external system relief valve setting.	Low external relief valve setting will slow down system.	Adjust external relief valve setting per manufacturer's recommendations. External relief setting must be above Pressure Compensator setting for proper operation.
Check Pressure Compensator and LS control setting.	Low Pressure Compensator setting will prevent the pump from achieving full stroke. Low Load Sense setting will limit output flow.	Adjust Pressure Compensator and Load Sense setting. Refer to Adjustments.
Check Load Sense control signal pressures.	Incorrect Load Sense signal will not allow pump to operate correctly.	Inspect system, ensure that proper Load Sense signal is transmitted to the pump.
Internal system leaks.	Worn internal parts will not allow the pump to operate properly.	Refer to Authorized Service Center for repairs as required.
Hydraulic fluid viscosity above acceptable limits.	Hydraulic fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operation or use fluid with the appropriate viscosity grade for expected operating temperatures.
Check external system valving.	Malfunctioning valving may not allow system to respond properly.	Repair or replace system valving as required.
Check pump case pressure.	High case pressure will cause the system to be sluggish.	Correct case drain line restrictions.
Check pump inlet pressure / vacuum.	High inlet vacuum will cause low output flow.	Correct inlet pressure conditions.

Table 5-4. System Operating Hot

Item	Description	Action
Check fluid level in reservoir.	Insufficient volume of hydraulic fluid will not meet cooling demands of system.	Fill reservoir to proper level. Verify proper size of reservoir.
Inspect heat exchanger. Check air flow and input air temperature for the heat exchanger.	Insufficient air flow, high input air temperature, or undersized heat exchanger will not meet cooling demands of the system.	Clean, repair, or replace heat exchanger as required. Verify proper size of heat exchanger.
Check external system relief valve setting.	Fluid passing through relief valve adds heat to system.	Adjust external system relief valve setting per manufacturer's recommendations. External relief valve setting must be above Pressure Compensator setting for proper operation.
Check pump inlet pressure / vacuum.	High inlet vacuum adds heat to system.	Correct inlet pressure / vacuum conditions.

Table 5-5. Low Pump Output Flow

Item	Description	Action
Check fluid level in reservoir.	Insufficient hydraulic fluid will limit output flow and cause internal damage to pump.	Fill the reservoir to proper level.
Hydraulic fluid viscosity above acceptable limits.	Fluid viscosity above acceptable limits or low fluid temperature will not allow the pump to fill or control to operate properly.	Allow system to warm up before operation or use fluid with the appropriate viscosity grade for expected operating temperatures.
Check external system relief valve setting.	External relief valve set below Pressure Compensator setting will cause low output flow.	Adjust external relief valve per manufacturer's recommendation. External relief valve setting must be above Pressure Compensator setting for proper operation.
Check Pressure Compensator and Load Sense control setting.	Low Pressure Compensator setting will prevent the pump from achieving full stroke. Low Load Sense setting will limit output flow.	Adjust Pressure Compensator and Load Sense setting. Refer to Adjustments.
Check pump inlet pressure / vacuum.	High inlet vacuum will cause low output flow.	Correct inlet pressure conditions.
Check input speed.	Low input speeds decrease flow.	Adjust input speed.
Check pump rotation.	Incorrect rotational configuration will cause low flow.	Use pump with appropriate rotational configuration.

Table 5-6. Pressure or Flow Instability

Item	Description	Action
Check for air in system.	Air in system will cause erratic operation.	Activate Pressure Compensator, allowing system to bleed air. Check inlet line for leaks and eliminate source of air ingression.
Check control spools.	Sticking control spools will cause erratic operation.	Inspect spools for free movement in bore. Clean or replace as needed.
Check Load Sense setting.	Low Load Sense setting may cause instability.	Adjust Load Sense setting to proper level. See Adjustments.
Check Load Sense signal line.	Blocked Load Sense signal line will interfere with proper Load Sense operation.	Remove blockage.
Check external relief valve and Pressure Compensator setting.	Insufficient pressure differential between Pressure Compensator Pressure Compensator setting and external relief valve.	Adjust external relief valve or Pressure Compensator control settings to appropriate level. Relief valve setting must be above Pressure Compensator setting for proper operation.
Check external relief valve.	Chattering external relief valve may cause unstable feedback to pump control.	Adjust or replace relief valve.

Table 5-7. System Pressure Not Reaching Pressure Compensator Setting

Item	Description	Action
Check Pressure Compensator control setting.	System pressure will not rise above Pressure Compensator setting.	Adjust Pressure Compensator to appropriate setting. Refer to Adjustments.
Check external relief valve.	External relief valve setting below Pressure Compensator setting will prevent pressure compensation.	Adjust external relief valve per manufacturer's recommendations. External relief valve must be set above Pressure Compensator setting for proper operation.
Inspect Pressure Compensator control spring.	Broken, damaged, or missing spring will cause erratic operation.	Replace spring as required.
Inspect Pressure Compensator spool for wear.	Wear of the Pressure Compensator spool will cause internal leakage in the control.	Replace the spool as required.
Inspect Pressure Compensator spool for proper orientation.	Improper orientation will result in poor operation.	Correct orientation of spool.
Check Pressure Compensator control for contamination.	Contamination may interfere with movement of the Pressure Compensator Spool.	Clean Pressure Compensator control components, take appropriate action to eliminate contamination.

⚠ CAUTION

HIGH INLET VACUUM CAUSES CAVITATION WHICH CAN DAMAGE INTERNAL PUMP COMPONENTS.

Table 5-8. High Inlet Vacuum

Item	Description	Action
Check fluid temperature.	Low temperature increases viscosity. High fluid viscosity causes high inlet vacuum.	Allow system to warm up before operation.
Inspect inlet screen.	Blocked or restricted inlet screen will cause high inlet vacuum.	Clean screen / remove blockage.
Check inlet piping.	Too many fittings, bends, or long piping will cause high inlet vacuum.	Eliminate fittings to make path more direct.
Hydraulic fluid viscosity above acceptable limits.	High fluid viscosity causes high inlet vacuum.	Select fluid with appropriate viscosity for expected operating temperature.

Shaft Seal Replacement

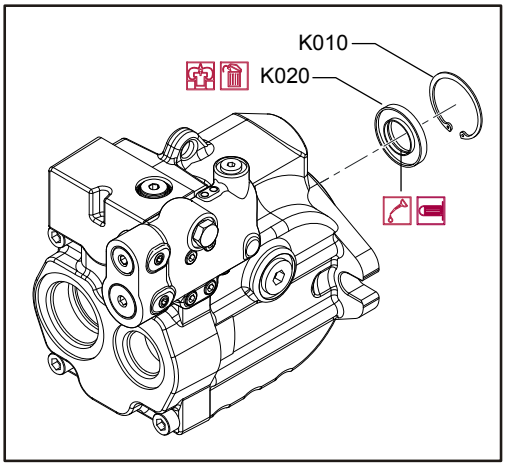


Figure 5-133. Shaft Seal and Retaining Ring

A lip type shaft seal is used in the pump and can be replaced without major disassembly of the unit. Replacement of the shaft seal requires removal of the pump from the machine.

REMOVAL

1. Using the appropriate snap-ring pliers, remove the retaining ring (K010) from the housing.
2. Remove the shaft seal (K020) from the bore in the pump housing and discard. Avoid damaging the pump housing or shaft. Puncture the face of the seal with a packing hook, or use a slide-hammer type puller to remove the seal.

INSTALLATION

1. Inspect the pump housing and new seal for damage. Inspect the sealing area on the shaft for rust, wear, or contamination. Polish the sealing area on the shaft if necessary.
2. Lubricate the lip of the new shaft seal with clean hydraulic fluid. Place a protective sleeve over the shaft end to prevent damage to the seal during installation.

⚠ CAUTION

PREMATURE BEARING FAILURE CAN RESULT IF THE SHAFT SEAL CONTACTS THE SHAFT BEARING. PRESS THE SEAL INTO THE HOUSING ONLY FAR ENOUGH TO CLEAR THE RETAINING RING GROOVE.

3. Keeping the seal perpendicular to the shaft, press the new seal into the housing just far enough to clear the retaining ring groove. Install seal with the cupped side toward the shaft bearing. Do not damage the seal during installation.
4. Using the appropriate snap ring pliers, install the seal retaining ring.
5. Remove the installation sleeve.

Control Assembly

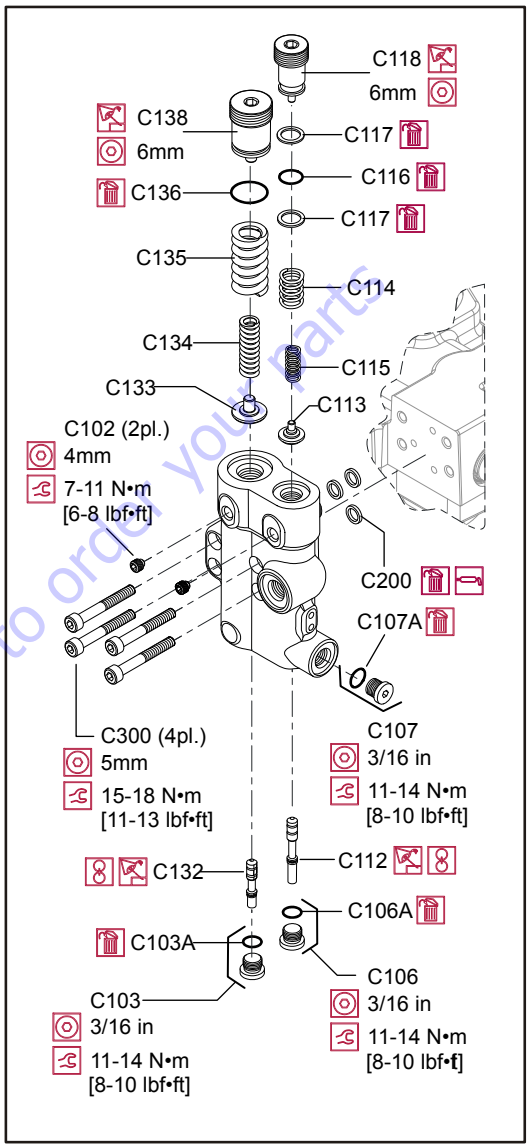


Figure 5-134. Control Assembly

DISASSEMBLY

1. Remove the four screws (C300) holding the control housing onto the end cap.
2. Remove the control and discard the three interface O-rings (C200).
3. Remove the Pressure Compensator set screw (C102), Pressure Compensator adjustment screw (C138),O-ring (C136), springs (C135, C134), and seat (C133). Discard the o-ring.
4. Remove the plug (C103), o-ring (C103A),and Pressure Compensator spool (C132) from the control housing; discard the o-ring. Note orientation of the spool for reassembly.
5. Remove the plug (C107) and o-ring (C107A); discard the o-ring.

NOTE: *For Pressure Compensator only controls, skip steps 6 and 7.*

6. Remove the Load Sense set screw (C102), Load Sense adjustment screw (C118), o-ring (C116), backup rings (C117), springs (C114, C115), and seat (C113); discard the o-ring.
7. Remove the plug (C106), O-ring (C106A), and Load Sense spool (C112) from the control housing; discard the o-ring. Note orientation of the spool for reassembly.

INSPECTION

1. Inspect the adjustment screws for wear at the tips and where they contact the springs; replace as necessary
2. Inspect the springs and spring guides for wear or damage; replace as necessary.
3. Carefully inspect the spools. Ensure the sealing lands are free of nicks and scratches. Check the ends that contact the spring guides for wear. Replace spools as necessary.
4. Inspect the control housing for damage. Check the spool bores for excessive wear.
5. Clean all parts and lubricate spools, springs, guides and new o-rings with clean hydraulic fluid.

REASSEMBLY

1. Install the Pressure Compensator spool, spherical end first, into the Pressure Compensator bore. The Pressure Compensator spool is the shorter of the two. Using a new o-ring, install the plug (C103). Torque to 8-10 ft. lbs. (11-14 Nm).
2. Place the two Pressure Compensator springs onto the spring guide and install into the Pressure Compensator bore. Place a new o-ring onto the Pressure Compensator adjustment screw and thread it into the Pressure Compensator bore until flush, then make another full turn. Install and torque the set screw to 6-8 ft. lbs. (7-11 Nm).

NOTE: *For Pressure Compensator only controls, skip steps 15 and 16.*

3. Install the Load Sense spool, spherical end first, into the Load Sense bore. The Load Sense spool is the longer of the two. Using a new o-ring, install the plug (C106). Torque to 8-10 ft. lbs. (11-14 Nm).
4. Place the two Load Sense springs onto the spring guide and install into the Load Sense bore. Place a new o-ring and backup rings onto the Load Sense adjustment screw and thread it into the Load Sense bore until flush, then make another full turn. Install and torque the set screw to 6-8 ft. lbs. (7-11 Nm).
5. Using a new o-ring, install the plug (C107). Torque to 8-10 ft. lbs. (11-14 Nm).
6. Using petroleum jelly to retain them, install the three interface o-rings (C200) in the recesses on the control housing.
7. Install the control assembly onto the endcap using the four screws (C300). Torque to 11-13 ft. lbs. (15-18 Nm). Torque screws in a criss-cross pattern and re-torque the first screw to ensure proper torque retention.
8. Check and adjust the control setting. See Adjustments.

Plug and Fitting Sizes and Torques

If any plugs or fittings are removed from the unit during service, install and torque as indicated here. This drawing is a composite. Your configuration may differ but the appropriate wrench size and torque can be found here.

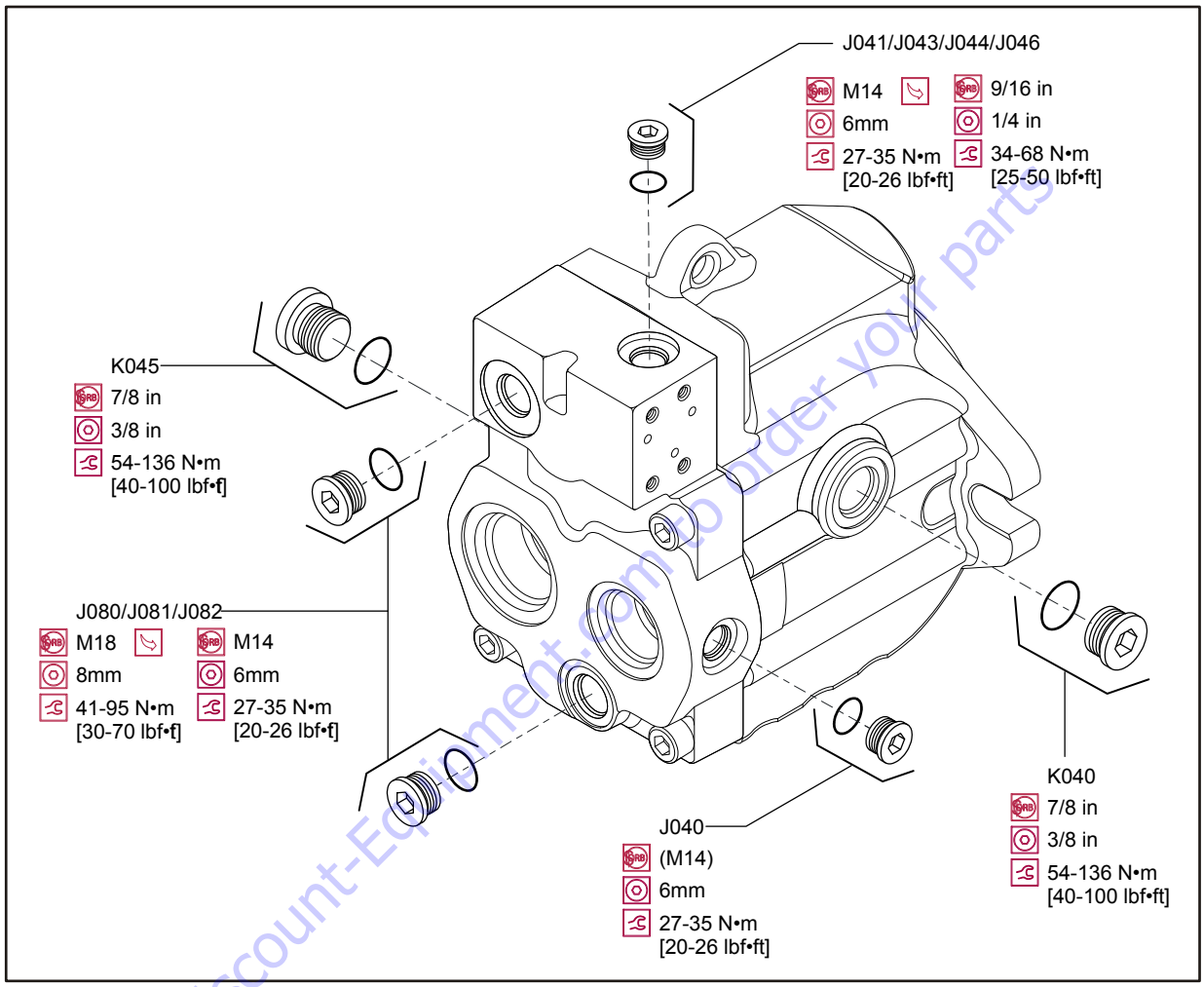


Figure 5-135. Plug Locations, Sizes, and Torques

5.14 EATON PISTON PUMP

Servo Controlled Piston Pump

DISASSEMBLY

The following instructions apply to a single servo controlled piston pump with or without a gerotor charge pump. A tandem pump assembly should be separated into individual pumps before disassembly.

1. Position the pump into a protected jaw vise, clamping onto the outer portion of the flange, with the capscrews up. Mark the relationship of the working ports (for assembly identification) to the servo control assembly with a scribe. Remove the four capscrews retaining endcover.
2. Lift the charge pump adapter assembly straight up off endcover, shaft and gerotor. Gerotor may stay in adapter or on endcover.
3. Remove o-ring from charge pump adapter.
4. Remove outer gerotor ring from either the charge pump adapter or the inner gerotor ring.

NOTE: *Refer to "Charge Pump Adapter Assembly" for disassembly and inspection of charge pump adapter assembly.*

5. Remove the inner gerotor ring and key from drive shaft or inner gerotor ring and coupler assembly from shaft.
6. Lift endcover straight up off shaft and housing. Remove valve plate from endcover or from rotating kit assembly, still in housing.
7. From endcover, remove bypass valve or plug, and relief valve assemblies.

NOTE: *Mark the relief valve in relationship to the cavity it was removed, for reassembly purposes.*

Endcover Inspection

- Check the bearing (press fit) in endcover. If needles remain in cage, move freely, and setting is at the dimension shown in Figure 5-136., removal not required.
- Check roll pin in endcover. If tight and set to the dimension shown in Figure 5-136., removal not required.

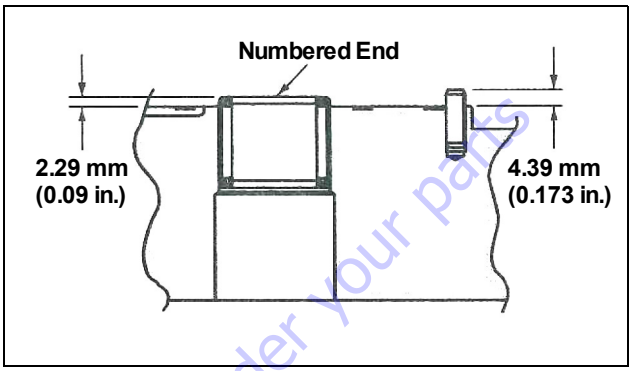


Figure 5-136. Endcover Inspection

1. Remove housing gasket from housing or endcover.
2. With pump still in vise, remove the six capscrews retaining the manual servo control assembly. Remove the control assembly and control housing gasket from the housing. Remove orifice plates, noting location for reassembly. Remove nut and lock washer from control arm, remove arm. Note position of control arm for reassembly.

NOTE: *Refer to "Manual Servo Control Basic Assembly" for disassembly and Inspection of control assembly.*

3. To remove rotating kit assembly from housing, first remove pump from vise holding the rotating kit assembly in position. Lower pump so that the shaft end (flange end) is up. Set the rear of housing onto table with housing flat and rotating kit assembly at rest on table. (Hole in table, for protruding shaft, is required.) Lift and remove the housing and shaft from rotating kit assembly, and swashplate.
4. Remove swash plate from rotating kit assembly and servo piston follower from swashplate.

NOTE: *Refer to "Rotating Kit Assembly" for disassembly and Inspection of rotating kit.*

Swashplate Inspection

- The finish on the piston shoe surfaces of the swash plate should show no signs of scoring.
- Inspect swashplate bushing surface for wear and surface for coating transfer from bushing.

1. To remove servo piston assembly from housing, start with the four each capscrews and washers retaining each cover plate.
2. In removing the cover plate from the servo piston bolt, remove jam nut, washer, and seal washer. Hold the servo piston bolt with hex key and unscrew cover plate off of bolt.
3. Remove servo piston assembly and seal sub-assemblies (two sets) from housing.

NOTE: *Disassembly of servo piston assembly is not required.*

4. Remove retaining ring from the front of housing. Press the shaft, shaft seal or spacer, and washer from housing. Remove retaining ring, thrust washer, thrust bearing, second thrust washer, and second retaining ring from shaft.

Housing Inspection

- Check the bearing (press fit) in housing. If needles remain in cage, move freely, and setting at the dimension shown in Figure 5-137., removal not required.

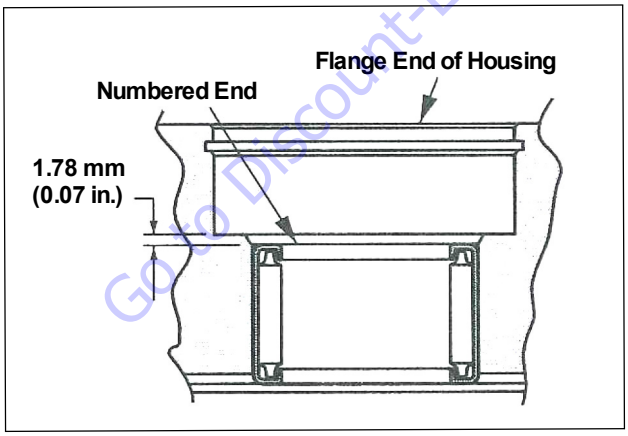


Figure 5-137. Housing Inspection

1. To remove cradle sub-assembly, remove the two capscrews retaining cradle inside housing. Removing cradle subassembly from housing.
2. Remove button head capscrews (2 Qty.) to remove bushing from cradle.

Bushing Inspection

- Inspect bushing for contamination embedment within coating of bushing surface coming in contact with swashplate.

1. Remove all plugs from housing.
2. Discard the shaft seal, gaskets, and o-rings from all assemblies. Replace with new seals upon reassembly.

ASSEMBLY

1. All parts should be cleaned and critical moving parts lubricated before reassembly.
2. If necessary, press new bearing in housing to dimension shown in Figure 5-137., with the numbered end of bearing outward.
3. Install the two new seal sub-assemblies into the servo piston cavity of housing.
4. Screw the cover plate onto the servo piston assembly. Install new cover plate gasket in place on housing. Install servo piston assembly and cover plate into servo piston bore in right side of housing (as shown in Figure 5-138.) Retain cover plate with four each washers and capscrews. Torque capscrews 40 to 48 in. lbs (4.5 to 5.4 Nm). To obtain neutral, centering the servo piston assembly is required. Measure in from the left side and set servo piston 0.5 in. (12.7 mm) from surface of housing servo bore as shown in Figure 5-138.

NOTE: *Re-adjustment may be required for neutral at unit start-up.*

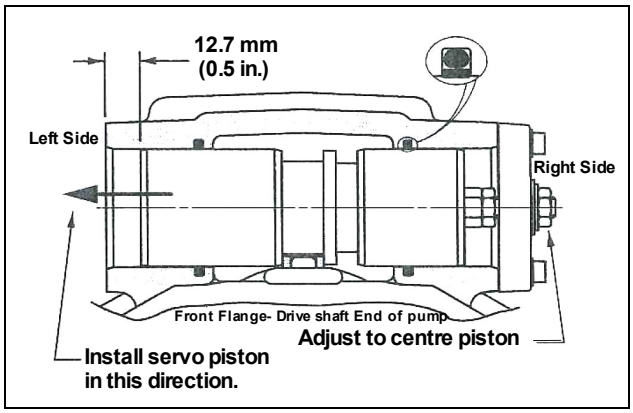


Figure 5-138. Servo Piston Installation

5. Install new seal washer, washer, and jam nut to servo piston bolt. Holding servo piston bolt with hex key wrench Torque jam nut (150 to 160 in. lbs) 17 to 18 Nm. Check the centering of servo piston assembly. Install new cover plate gasket and cover plate to left side of servo piston and retain with four each washers and #10-24 capscrews. Torque capscrews 40 to 48 in. lbs. (4.5 to 5.4 Nm).

6. To assemble cradle sub-assembly, install bushing onto cradle retaining with button head capscrews. Torque button head capscrew 14 to 16 in. lbs. (1.6 to 1.8 Nm).

7. Place cradle sub-assembly into housing making sure cradle is completely seated into housing. Retain cradle sub-assembly with two capscrews. Torque capscrews 20 to 24 ft. lbs (27 to 33 Nm).

8. To install shaft, place exterior retaining ring, thrust race, thrust bearing, second thrust race, and second retaining ring onto shaft. Position washer and shaft seal or spacer onto shaft.

9. Install shaft assembly into front of housing for units with spacer, retain with interior retaining ring and go on to step 10. For units with shaft seal. seat seal into position with seal driver and retain with interior retaining ring.

10. Install servo piston follower onto swashplate dowel pin. Install swashplate carefully onto bushing (coat bushing surface with hydraulic oil), aligning servo piston follower with slot in servo piston assembly.

NOTE: *Refer to "Rotating Kit Assembly" for reassembly of rotating kit assembly.*

11. To install rotating kit assembly, leave housing and shaft in the horizontal position. Holding swashplate into position with screw driver through controller linkage passageway at the top of housing. place rotating kit assembly over shaft and into housing until pistons are in against swashplate. Make sure all parts are in housing completely and properly positioned. Return the pump to the vise with open end of housing up, clamping housing on the outer portion of the flange.

12. Install gasket on to housing.

13. If necessary, press new bearing and roll pin in endcover to dimension shown in figure 1-3. Bearing installed with the numbered end outward. Roll pin installed with split oriented away from bearing.

14. Install new o-ring on relief valves. Install relief valve in its original cavity in endcover that it was removed. Torque 100 to 110 ft. lbs (136 to 149 Nm).

15. Install new o-ring on bypass valve or plug. Install bypass valve or plug into endcover.

NOTE: *Make sure paddle of bypass valve is perpendicular to relief valve axis prior to installing or damage could result.*

16. Apply a small amount of petroleum jelly to the steel side of valve plate to hold in place for installation. Aligning the index pin, place the valve plate in position onto the endcover, with steel side against endcover.

17. Install endcover assembly onto housing assembly. Make sure ports are positioned correctly, valve plate and gasket stay in place.

18. Install key and inner ring gerotor onto shaft or coupler assembly. Lubricate inner ring gerotor.

NOTE: *Refer to "Charge Pump Adapter Assembly" for assembly of charge relief valve in adapter plate.*

19. Install o-ring and outer ring gerotor onto adapter plate. Lubricate both a-ring and outer ring to hold in position during assembly of adapter plate. Install adapter plate onto endcover. Make sure o-ring and gerotor ring stay in place.

20. Retain endcover and adapter plate (when used) with four capscrews, Torque 27 to 31 ft. lbs (37 to 42 Nm).

NOTE: *Refer to "Manual Servo Control Basic Assembly" for reassembly of manual servo control assembly.*

21. Install control housing gasket onto housing. Install orifices into control assembly and retain in position with petroleum jelly. Position the feedback link at 90 degrees from control housing. Install manual servo control assembly onto housing making sure feedback link entered small groove in servo piston assembly.

22. Retain control assembly with six capscrews, torque 40 to 48 in. lbs (4.5 to 5.4 Nm).

23. Install control arm onto control assembly input arm. Retain with lock washer and nut, torque 4 to 6 ft. lbs (5 to 8 Nm).

24. Install new o-rings on all plugs. Install plugs into housing. Torque 3/4 in. plug 21 to 24 ft. lbs (28 to 32 Nm). Torque 1-1/4 in. plug 40 to 45 ft. lbs (54 to 61 Nm).

25. Refer to "Start-up Procedure".

Charge Pump Adapter Assembly

DISASSEMBLY

1. Remove plug, shims, spring, and poppet from adapter assembly as shown in Figure 5-140.

Inspection

- Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that seat is smooth and free of burrs or other defects.
- Inspect the charge pump relief valve spring.
- Inspect the bearing or bushing inside the charge pump adapter. The bearing needles must remain in the bearing cage and bearing at dimension shown in Figure 5-139. The bushing must have no excessive scoring.
- Inspect the gerotor pocket inside the charge pump adapter assembly. It should not be scored excessively.

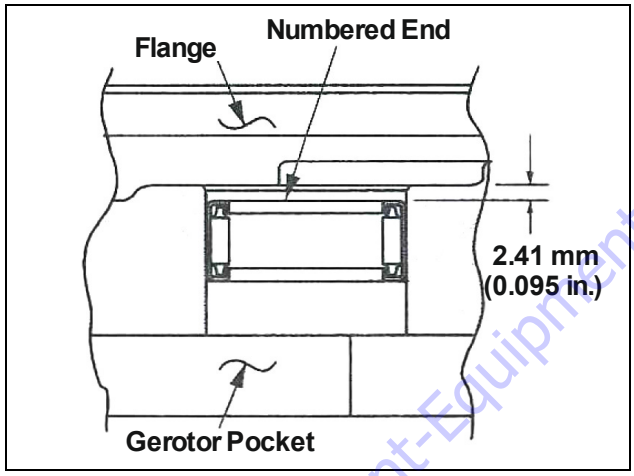
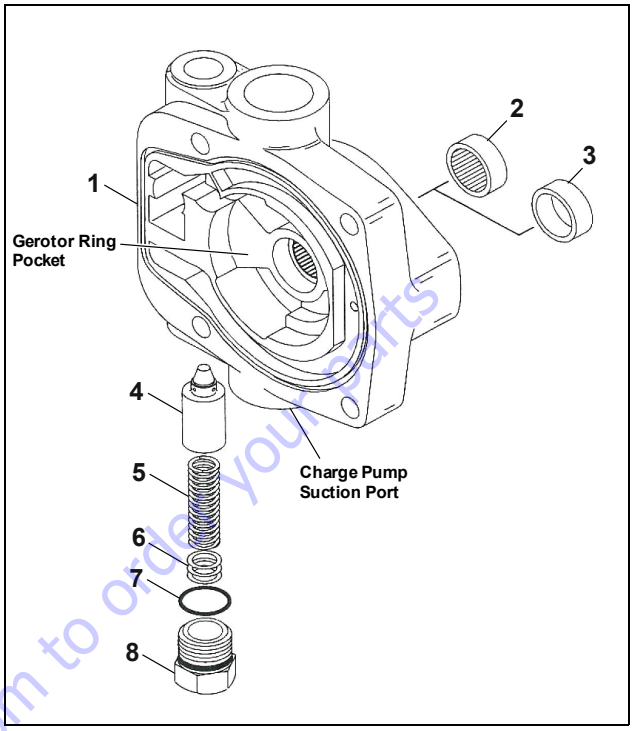


Figure 5-139. Bearing Or Bushing Inspection

ASSEMBLY

1. If necessary, press new bearing or bushing in adapter assembly. The bearing to dimension shown in Figure 5-139. with the numbered end of bearing outward and closest to mounting flange. The bushing is to be pressed flush to 0.254 mm (0.010 in.) recessed.
2. Install poppet. spring, shims, new o-ring on plug, and plug into adapter assembly. Torque plug 30 to 27 ft. lbs. (40.7 to 36.6 Nm).



1. Charge Pump Adapter
2. Bearing
3. Bushing
4. Poppet
5. Spring
6. Shims
7. O-ring
8. Plug

Figure 5-140. Charge Pump Adapter Assembly

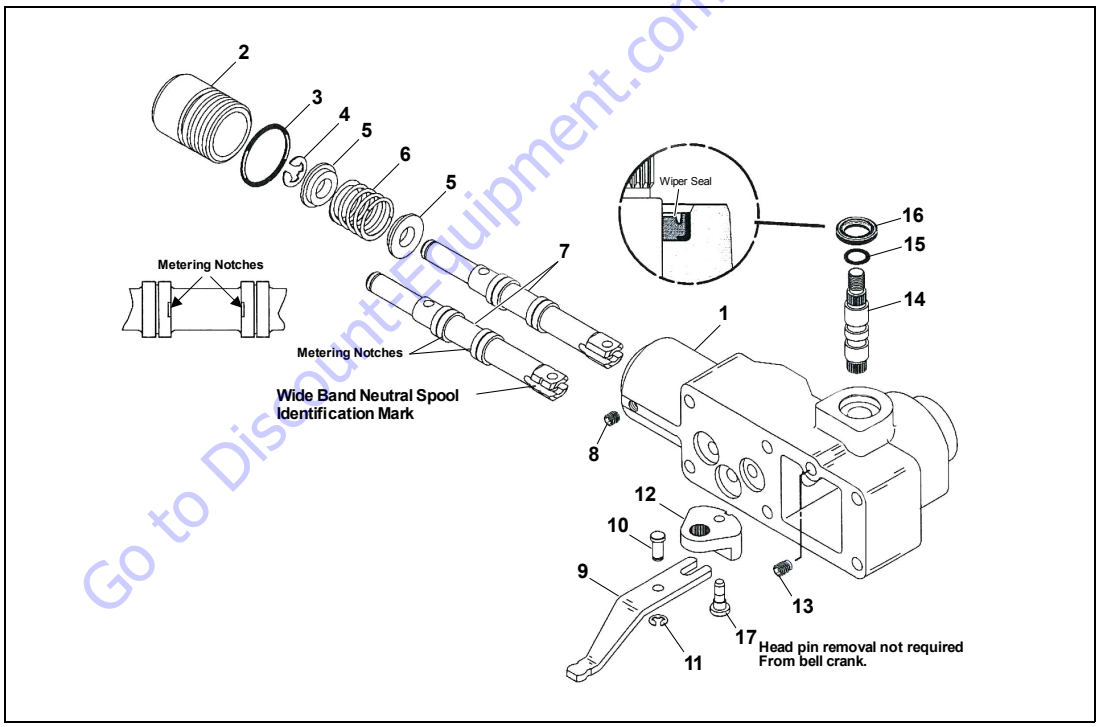
Manual Servo Control Basic Assembly

DISASSEMBLY

1. Remove wiper seal with screw driver. Remove set screw retaining input shaft and remove input shaft from control housing.
2. Remove set screw from plug retaining valve spool and remove plug.
3. Remove o-ring from pin retaining feedback link and valve spool. Remove pin, feedback link, valve spool, and bell crank from control housing.
4. Compress spring and remove o-ring, spring retainer, spring, and second spring retainer from valve spool.
5. Remove o-rings from plug and input shaft. Clean all parts and lubricate in prep for reassembly.

ASSEMBLY

1. Install spring retainer, spring, and second spring retainer onto spool. Compress spring with retainer and retain with o-ring onto valve spool.
2. Install valve spool into control housing making sure that metering notches on valve spool can be seen in the metering ports. Notches shown in Figure 5-141.
3. Position bell crank in housing. Slide feedback link into position between clevis on valve spool, aligning holes, and install dowel pin retaining with o-ring.
4. Install new o-ring onto input shaft. Hold bell crank in position with feedback link slot and align splined hole of bell crank with input shaft cavity. Install input shaft into control housing and bell crank.
5. JLG Threadlocker P/N 0100011 or equivalent to set screw and install retaining input shaft. Adjust set screw until it bottoms out on input shaft and back out one-quarter turn.
6. Install wiper seal on input shaft as shown in Figure 5-141. Install new o-ring onto plug. retaining valve spool, and install plug. Adjust plug until there is no play in the valve spool with input shaft held stationary. Lock in place with set screw. Torque set screw 17 to 25 in. lbs. (2 to 3 Nm).



1. Control Housing
2. Plug
3. O-ring
4. Retaining Ring
5. Spring Retainer
6. Spool Centering Spring
7. Valve Spool
8. Set Screw
9. Feedback Link
10. Dowel Pin
11. Retaining Ring
12. Bell Crank
13. Set Screw
14. Input Shaft
15. O-ring
16. Wiper Seal
17. Head Pin

Figure 5-141. Manual Servo Control Basic Assembly

Manual Servo Control Assembly Options

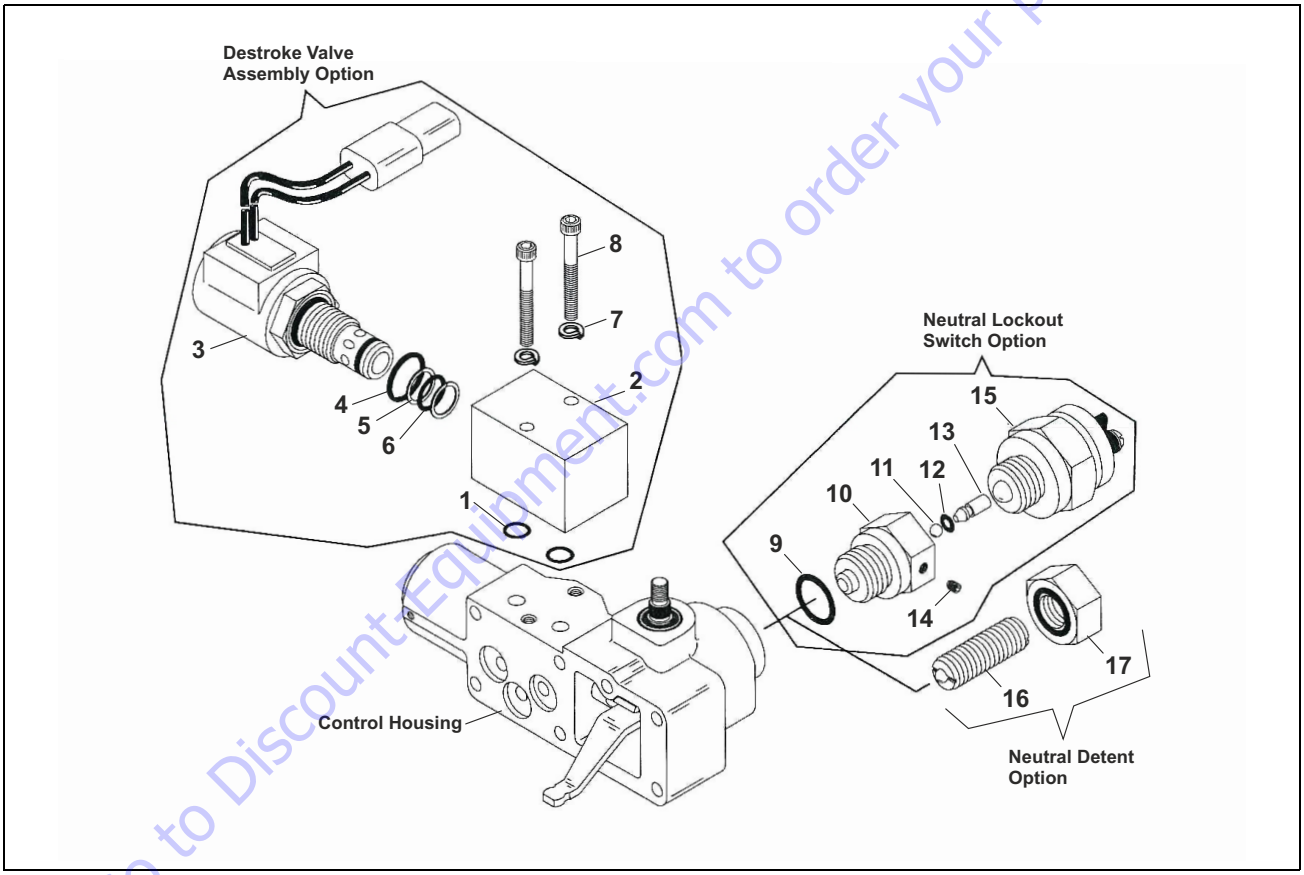
DISASSEMBLY - DESTROKE VALVE ASSEMBLY OPTION

1. Remove the two capscrews and lock washers from manifold. Removing destroke valve assembly and two a-rings.
2. Remove destroke valve from manifold in order to remove o-rings and backup washers.

NOTE: *In order to remove destroke valve the solenoid may need to be removed from core first (not shown).*

ASSEMBLY - DESTROKE VALVE ASSEMBLY OPTION

1. Install new o-rings and backup washers onto destroke valve.
2. Install destroke valve into manifold by hand until top o-ring is met by manifold. Then wrench tighten to 25 ft.lbs. (34 Nm) max. Loosen Nut retaining coil to reposition if necessary and re-torque 4 to 5 ft. lbs. (5.4 to 7 Nm).
3. Lubricate the two o-rings and install onto manifold. Install destroke valve assembly onto control assembly. Retain with lock washers and capscrews. Torque 2.2 to 2.6 ft. lbs. (3 to 3.5 Nm).



1. O-ring
2. Manifold
3. Destroke Valve
4. O-ring
5. Backup Washer
6. O-ring
7. Lock Washer
8. Capscrew
9. O-ring
10. Neutral Lockout Adapter
11. Ball
12. O-ring
13. Pin
14. Set Screw
15. Neutral Lockout Switch
16. Ball Plunger
17. Nut Seal

Figure 5-142. Manual Servo Control Basic Assembly Option

DISASSEMBLY - NEUTRAL LOCKOUT SWITCH ASSEMBLY OPTION

1. Loosen set screw in adapter and remove neutral lockout switch from adapter.
2. Remove neutral lockout adapter from control assembly.
3. Remove pin, ball, and o-rings from adapter.

ASSEMBLY - NEUTRAL LOCKOUT SWITCH ASSEMBLY OPTION

1. Install new o-ring onto adapter and new o-ring onto pin.
2. Install ball and pin into adapter. Lubricate with petroleum jelly to hold in place during installation.
3. Install adapter into control assembly. Torque 44 to 53 ft. lbs. (60 to 70 Nm).
4. Apply Loctite #222 or equivalent to threads of switch and install neutral lockout switch into adapter. The adjustment procedures for the switch are as follows.
   a. Install switch, while moving control arm back and forth, until "detent" action is detected. Back out the switch until the "detent" action is very slight.
   b. Obtain a test light or use a multimeter. Attach the leads from the test light to the switch or the wiring connector.
   c. Move the control arm out of the detent position. The test light will go on. Screw in the switch until the light goes off. Mark this as position "A". See Figure 5-143. Move the control arm to the detent position and the test light should come back on.
   d. Leaving the control arm in the detent position, the light will remain on. Screw in the switch until the light goes off. Mark this position "B".
   e. Unscrew the switch one third of the distance between "B" and "A". Install and tighten the hex socket head set screw in one of the main quadrants of the hex of the switch adapter. See Figure 5-143. Torque set screw 2.3 to 2.8 in. lbs (3.2 to 3.8 Nm).
5. Test the switch by moving the control arm to the detent position, the light should be on. Move the control arm out of detent, the light should go off.
6. Remove test light and put servo control assembly into operation.

DISASSEMBLY - NEUTRAL DETENT OPTION

1. Loosen seal nut and remove ball plunger from control housing.

ASSEMBLY- NEUTRAL DETENT OPTION

1. Install ball plunger into control housing until contact with bell crank detent is detected. After contact screw in 1/2 turn and retain with seal nut. Torque nut 10 to 22 ft. lbs. (14 to 30 Nm).

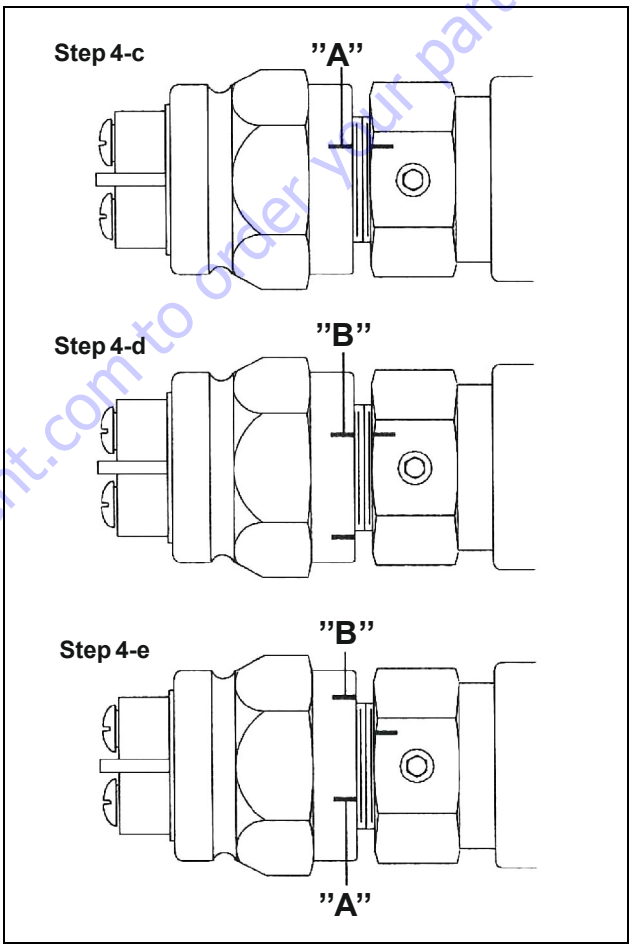


Figure 5-143. Neutral Lockout Switch Assembly

Rotating Kit Assembly

DISASSEMBLY

Disassembly of rotating assembly is required for inspection only.

1. Remove the nine piston assemblies, shoe retainer, and shoe retainer pivot from cylinder barrel.

Inspection

- Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the swashplate. **Do not lap piston shoes.**
- Examine the shoe retainer for wear in the pivot area.
- Examine the pivot to insure smoothness and no signs of wear.
- Inspect the cylinder barrel surface that makes contact with valve plate. This surface should be smooth and free of deep scratches. Do not lap piston block.
- The pistons should move freely in the cylinder barrel bore. If they are sticky in the bore, examine the bore for scoring or contamination.

2. To inspect pins and spring caution should be taken in removing spring. The spring is highly compressed and the retaining ring should not be removed without compressing the spring safely.

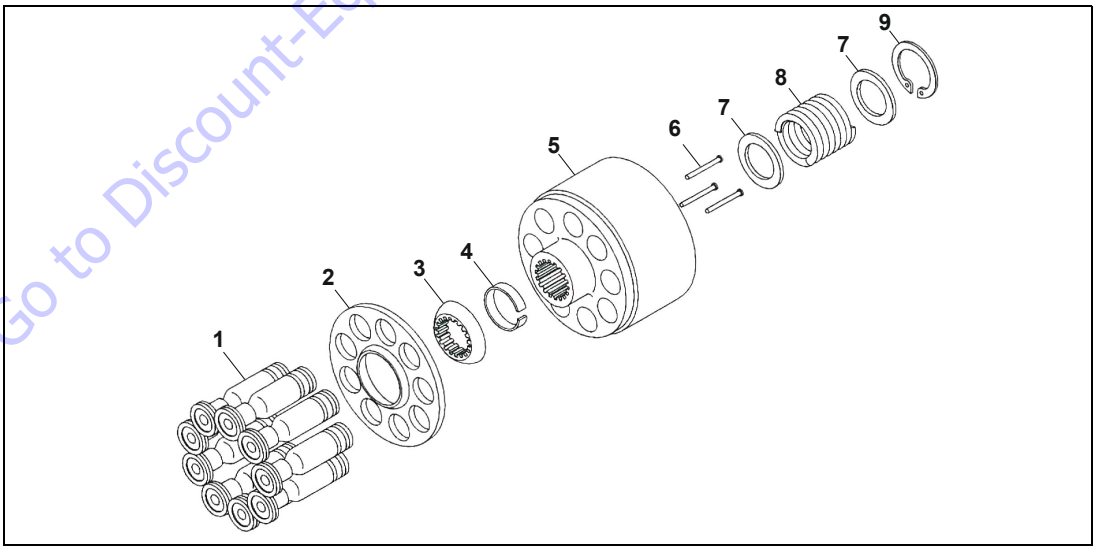
The following parts are required to disassemble the cylinder barrel:

2 ea.	3/8 in. I.D. x 1-1/8 in. O.D. flat washers
1 ea.	3/8 in. x 3-1/4 in. N.C. capscrew, and
1 ea.	3/8 in. N.C. nut

To remove spring, place one of the flat washers over the 3/8 in. x 3-1/4 in. capscrew. Put capscrew through the center of the cylinder barrel and apply the second washer. Let washer rest on the three pins and retain with nut. Turning nut and compressing spring inside the barrel. Use a pair of retaining ring pliers and remove the internal retaining ring. Remove nut, bolt, and the two washers from barrel. Remove the washer, spring, second washer, three pins, and pin keeper at the same time.

ASSEMBLY

1. To reassemble the rotating kit assembly complete the following: Compress the pin keeper and install in the spline of the cylinder barrel. Install the three pins with head end to the inside of the barrel and position in the special grooves of the cylinder barrel spline.
2. Install the washer, spring, and second washer into the cylinder barrel. Use the two 3/8 in. I. D. washers, nut, and 3/8 in. x 3-1/4 in. capscrew to compress the spring and retain with retaining ring. Remove the nut, capscrew, and the two washers.
3. Install the pivot onto the three pins, shoe retainer on the pivot, and piston assemblies through the shoe retainer and into cylinder barrel resting on shoe retainer.



1. Piston assemblies
2. Shoe Retainer
3. Shoe Retainer Pivot
4. Retainer
5. Cylinder Barrel
6. Pins
7. Washer
8. Spring
9. Retaining Ring

Figure 5-144. Rotating Kit Assembly

Fault- logic Trouble Shooting

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

RECOMMENDED GAUGE LOCATIONS

Gauges Recommended

Inlet vacuum gauge: 30 psi to 14.8 psi (2 bar to 1 bar)

System pressure gauge: 10,000 psi (700 bar)

Charge pressure gauge: 0 to 600 psi (0 to 50 bar)

Case pressure gauge: 0 to 300 psi (0 to 25 bar)

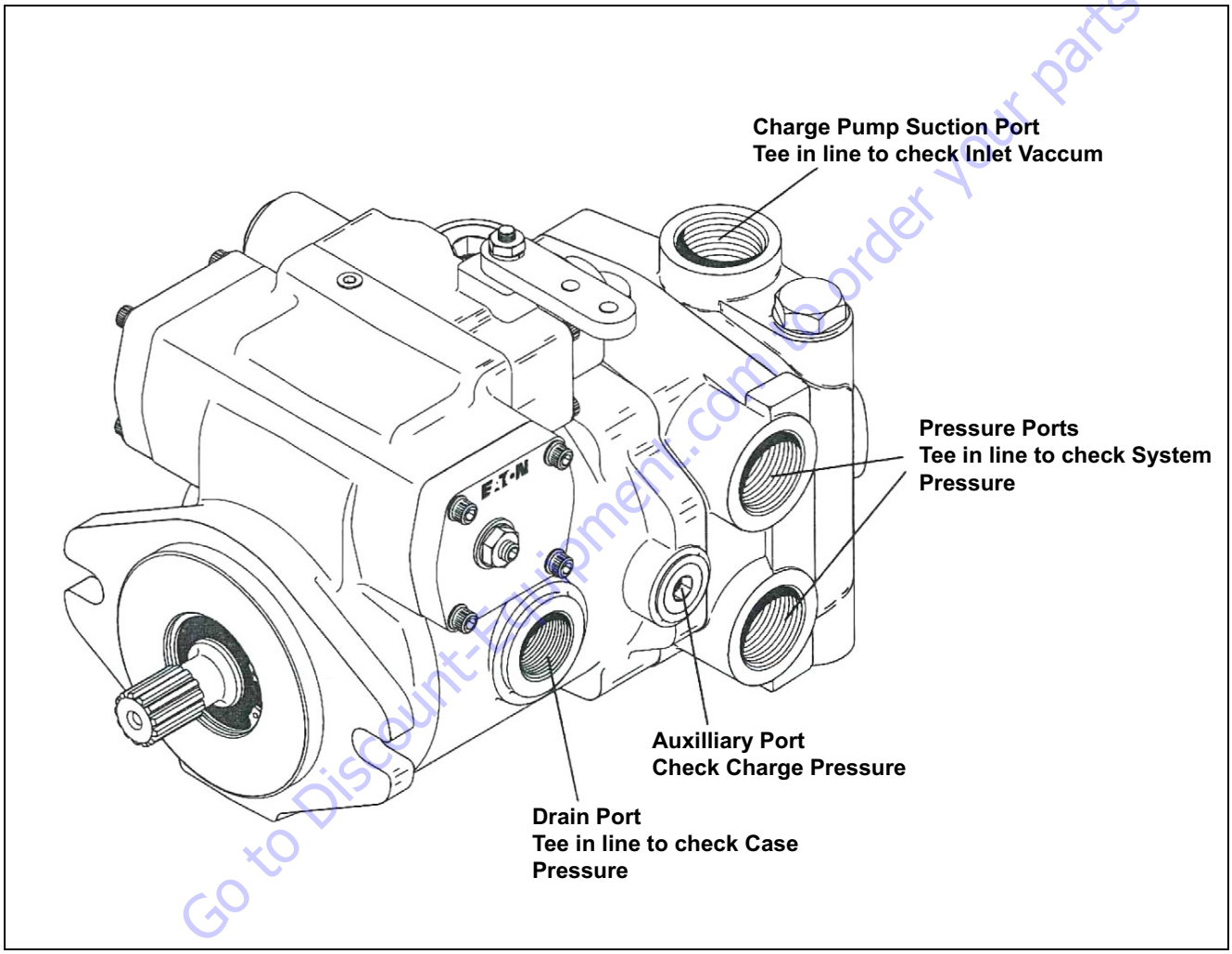


Figure 5-145. Gauge Locations

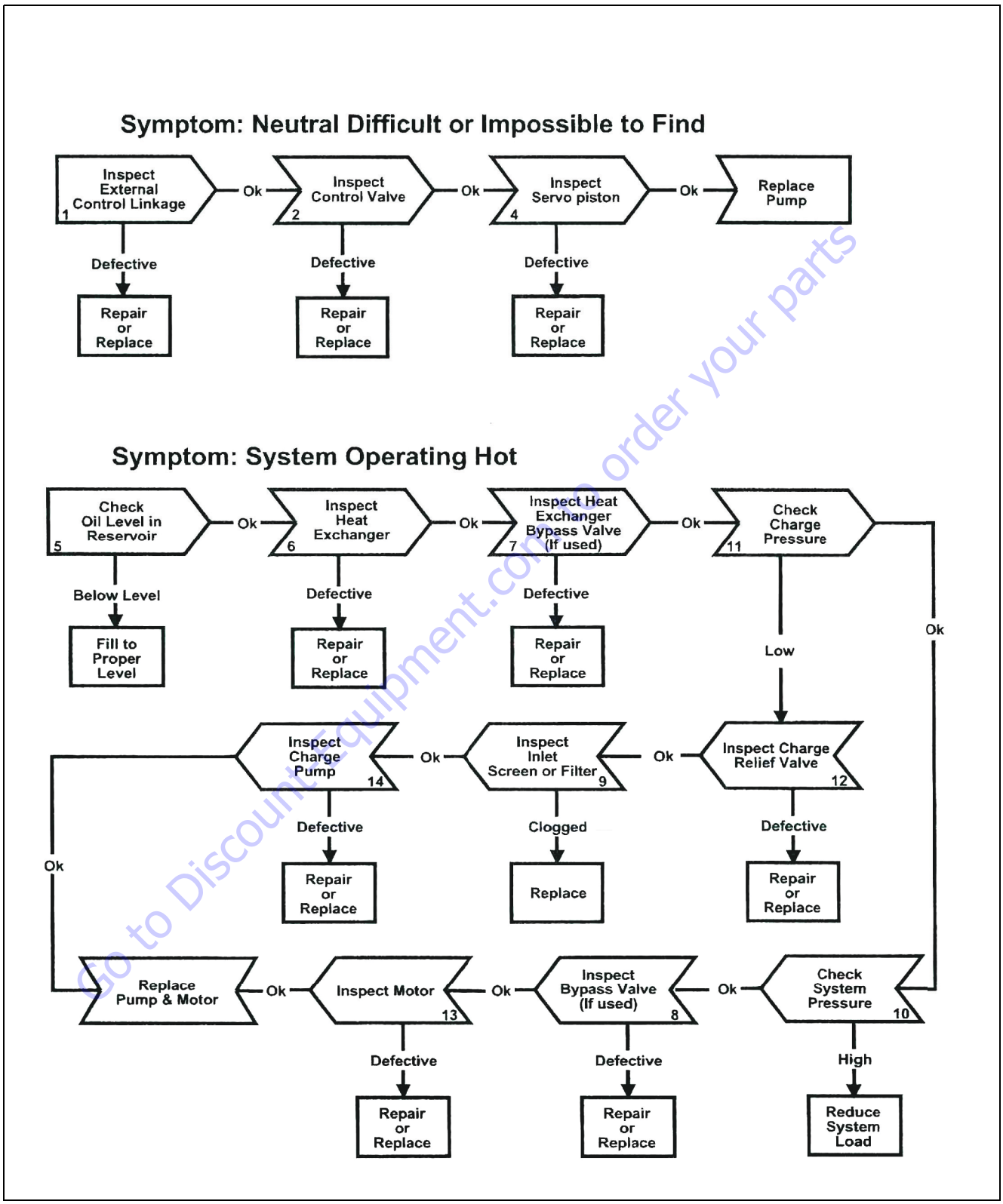


Figure 5-146. Fault - Logic Troubleshooting

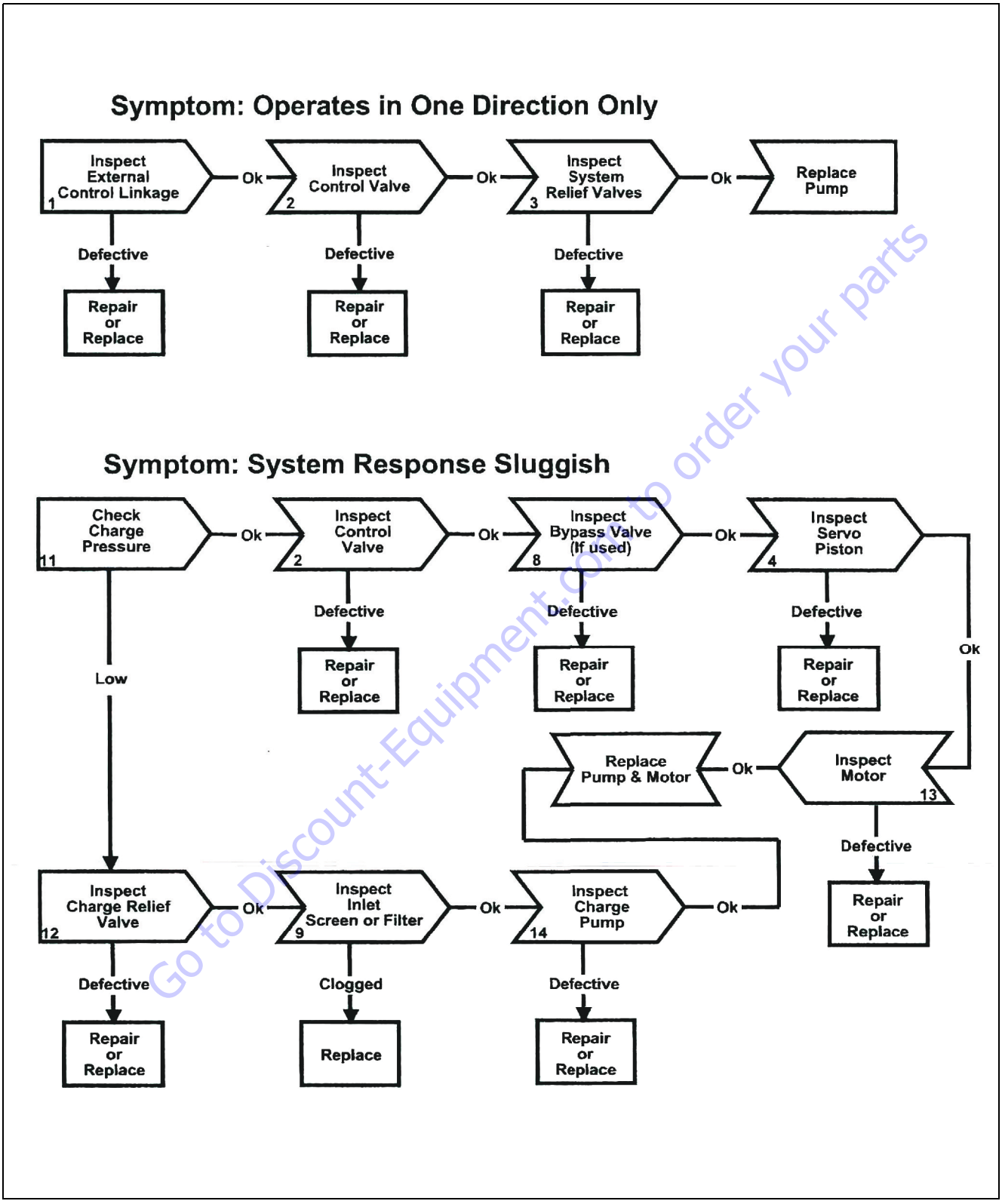


Figure 5-147. Fault - Logic Troubleshooting

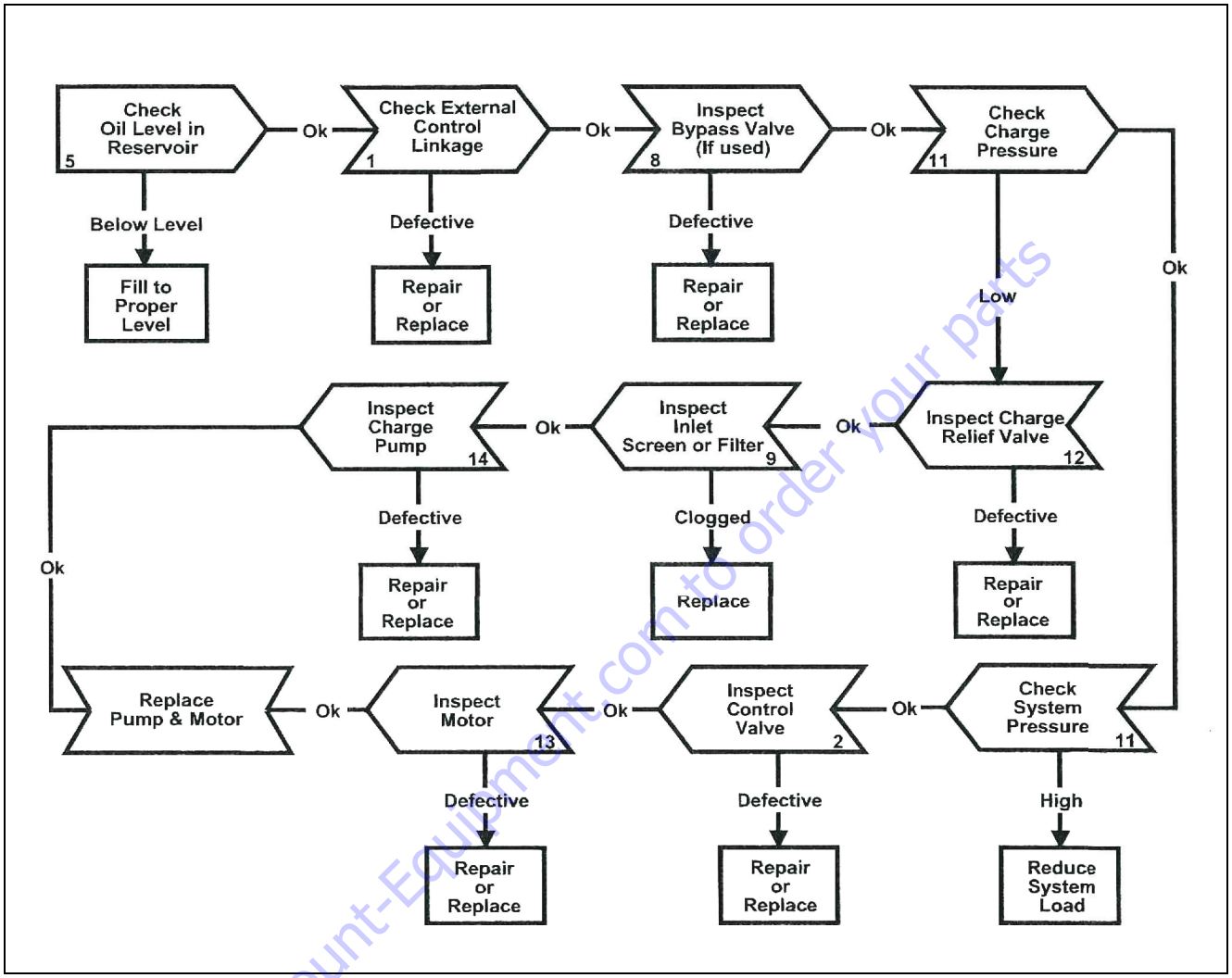


Figure 5-148. Fault - Logic Troubleshooting

DIAGRAM ACTION STEP COMMENTS

1. **Inspect External Control Linkage for:**
   - **a.** Misadjusted or disconnected
   - **b.** Binding, bent or broken
2. **Inspect Control Valve for:**
   - **a.** Plugged control orifice(s)
   - **b.** Damaged mounting gasket
   - **c.** Misadjusted, damaged or broken neutral return spring
   - **d.** Broken control connector pin
   - **e.** Faulty destroke valve (if used)
   - **f.** Galled or stuck control spool
   - **g.** Neutral detent or lockout switch misadjusted (if used)
3. **Inspect System Relief Valves for:**
   - **a.** Improper pressure relief setting
   - **b.** Damaged or broken spring
   - **c.** Valve held off seat
   - **d.** Damaged valve seat
4. **Inspect Servo Piston for:**
   - **a.** Misadjusted, damaged or broken neutral return spring assembly
   - **b.** Galled or stuck servo piston
   - **c.** Damaged or missing o-ring and/or backup ring
5. **Check Oil Level in Reservoir:**
   - **a.** Consult owner/operators manual for the proper type fluid and level
6. **Inspect Heat Exchanger for:**
   - **a.** Obstructed air flow (air cooled)
   - **b.** Obstructed water flow (water cooled)
   - **c.** Improper plumbing (inlet to outlet)
   - **d.** Obstructed fluid flow
7. **Inspect Heat Exchanger Bypass Valve for:**
   - **a.** Improper pressure adjustment
   - **b.** Stuck or broken valve
8. **Inspect Bypass Valve for: (if used)**
   - **a.** Held in a partial or full open position
9. **Inspect Inlet Screen or Filter for:**
   - **a.** Plugged or clogged screen or filter element
   - **b.** Obstructed inlet or outlet
   - **c.** Open inlet to charge pump
10. **Check System Pressure:**
    - **a.** See Figure 5-145. for location of pressure gauge installation
    - **b.** Consult owner/operators manual for maximum system relief valve settings
11. **Check Charge Pressure:**
    - **a.** See Figure 5-145. for location of charge pressure gauge installation
    - **b.** Consult owner/operators manual for maximum charge relief valve settings
12. **Inspect Charge Relief Valve for:**
    - **a.** Improper charge relief pressure setting
    - **b.** Damaged or broken spring
    - **c.** Poppet valve held off seat
13. **Inspect Motor for:**
    - **a.** Consult owner/operator manual for motor operation and trouble shooting
14. **Inspect Charge Pump for:**
    - **a.** Broken or missing drive key
    - **b.** Damaged or missing o-ring
    - **c.** Excessive gerotor clearance
    - **d.** Galled or broken gerotor set

System/Charge Relief Valve Pressure Settings

Inlet Vacuum	2.94 psi (0.203 bar) max.
Case Pressure	25 psi (1.7 bar) maximum
Charge Pressure	250 to 300 psi (17.24 to 20.68 bar)
System Pressure	5000 psi (345 bar) maximum
	3000 psi (207 bar) continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting is stamped on each valve with a three digit number. To identify, multiply the noted number by 10 to get the valves pressure setting.

Example: 10 x 500 = 5000 psi (345 bar)

Start-up Procedure

When initially starting a new or a rebuilt transmission system. it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1. After the transmission components have been properly installed, fill the servo pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.
2. Install and adjust all control linkage.
3. Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.
4. Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.
5. Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.
6. After the system starts to show signs of fill, slowly move pump swashplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.
7. Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.
8. Check all line connections for leaks and tighten if necessary.
9. The machine is now ready to be put into operation.
10. Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second at approximately 50 hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

5.15 HYDRAULIC SCHEMATICS

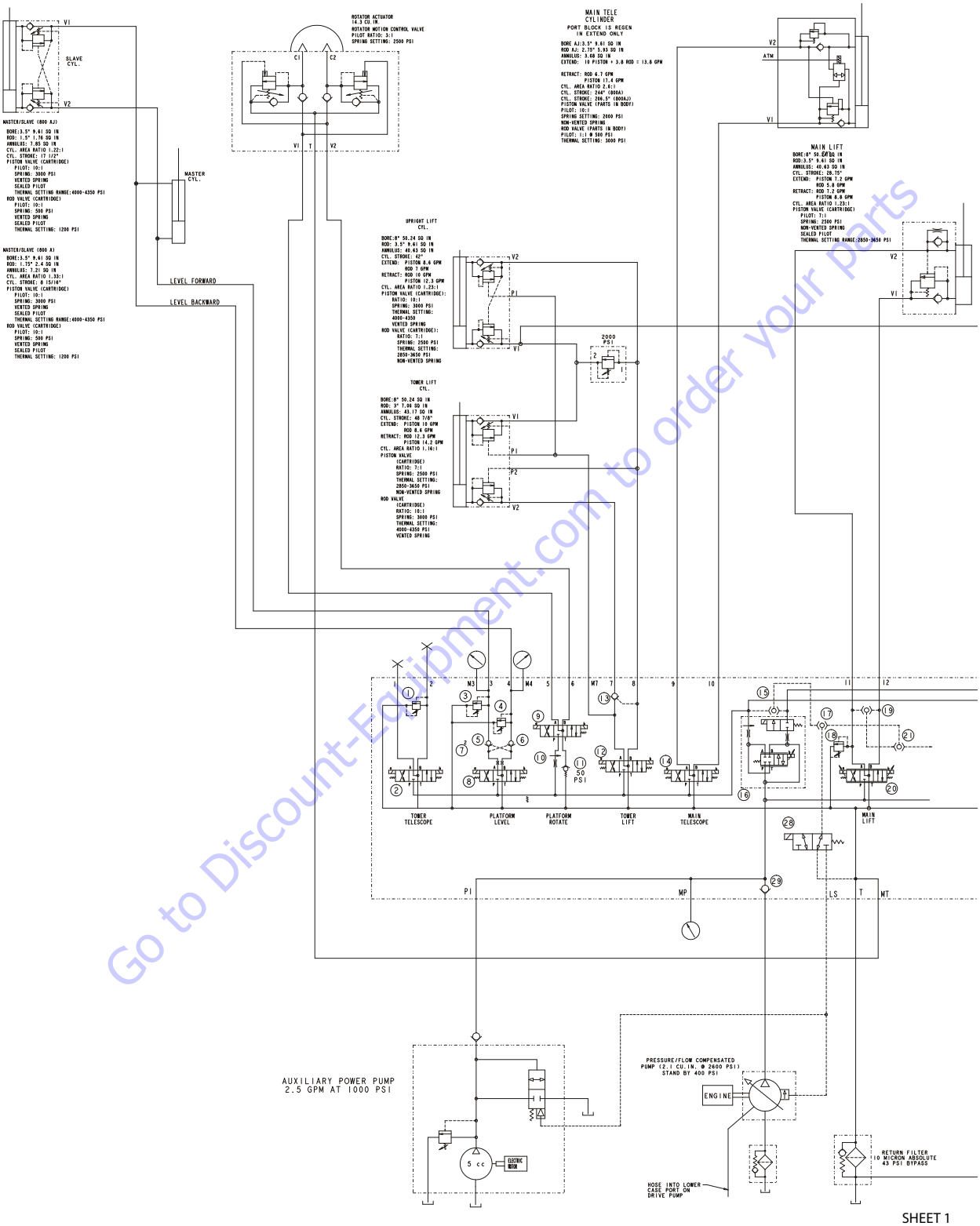


Figure 5-149. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 1 of 6

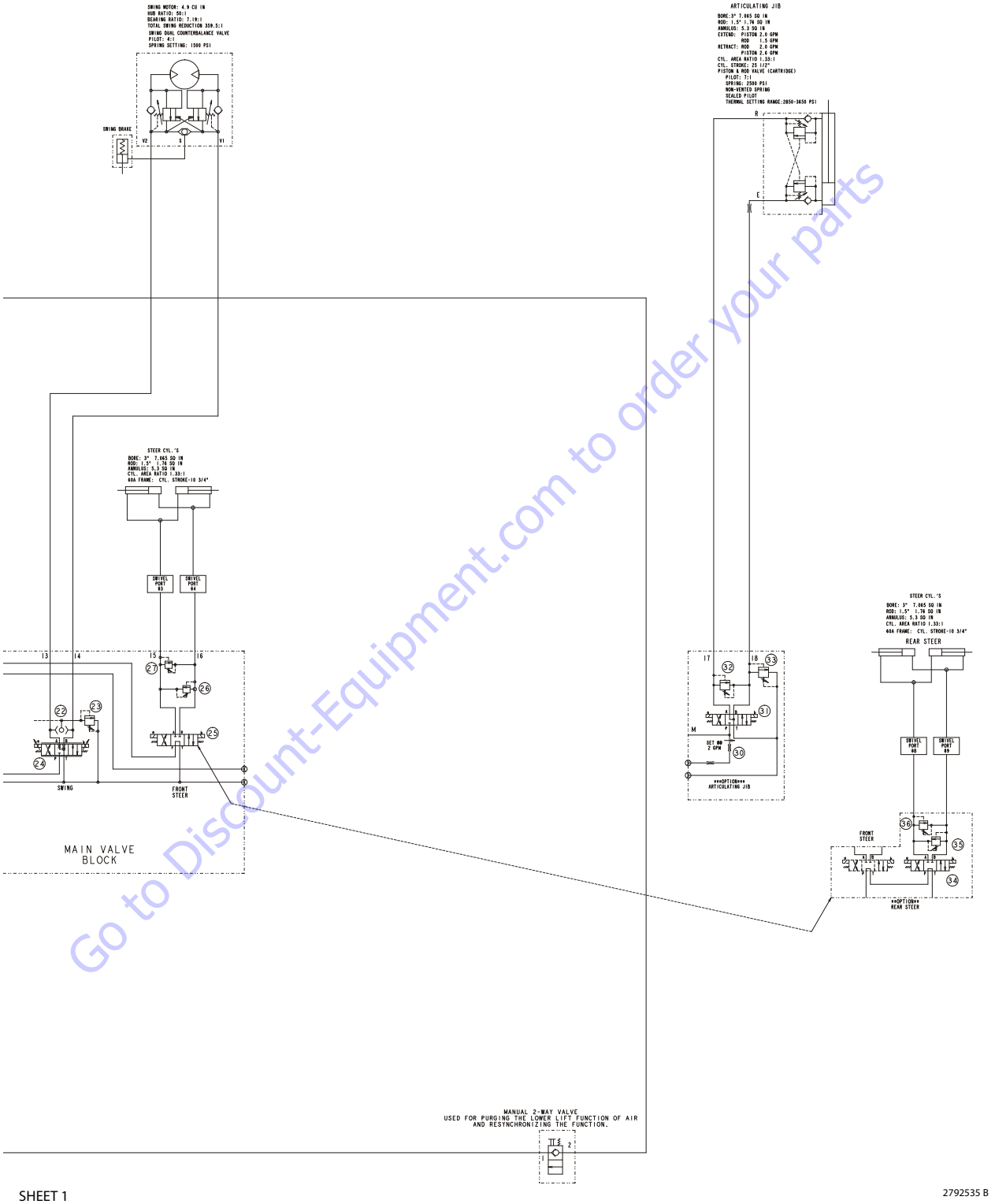


Figure 5-150. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 2 of 6

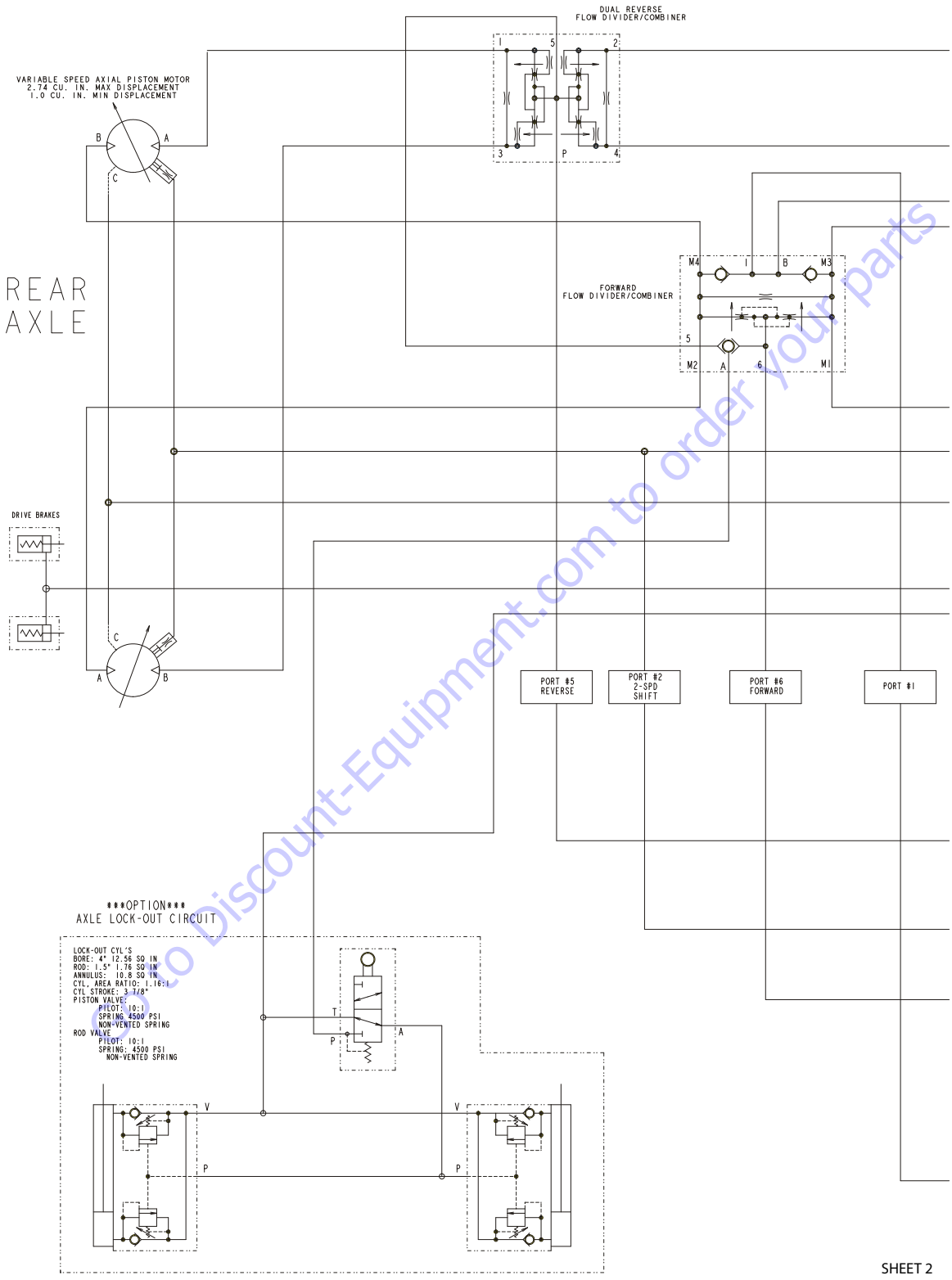
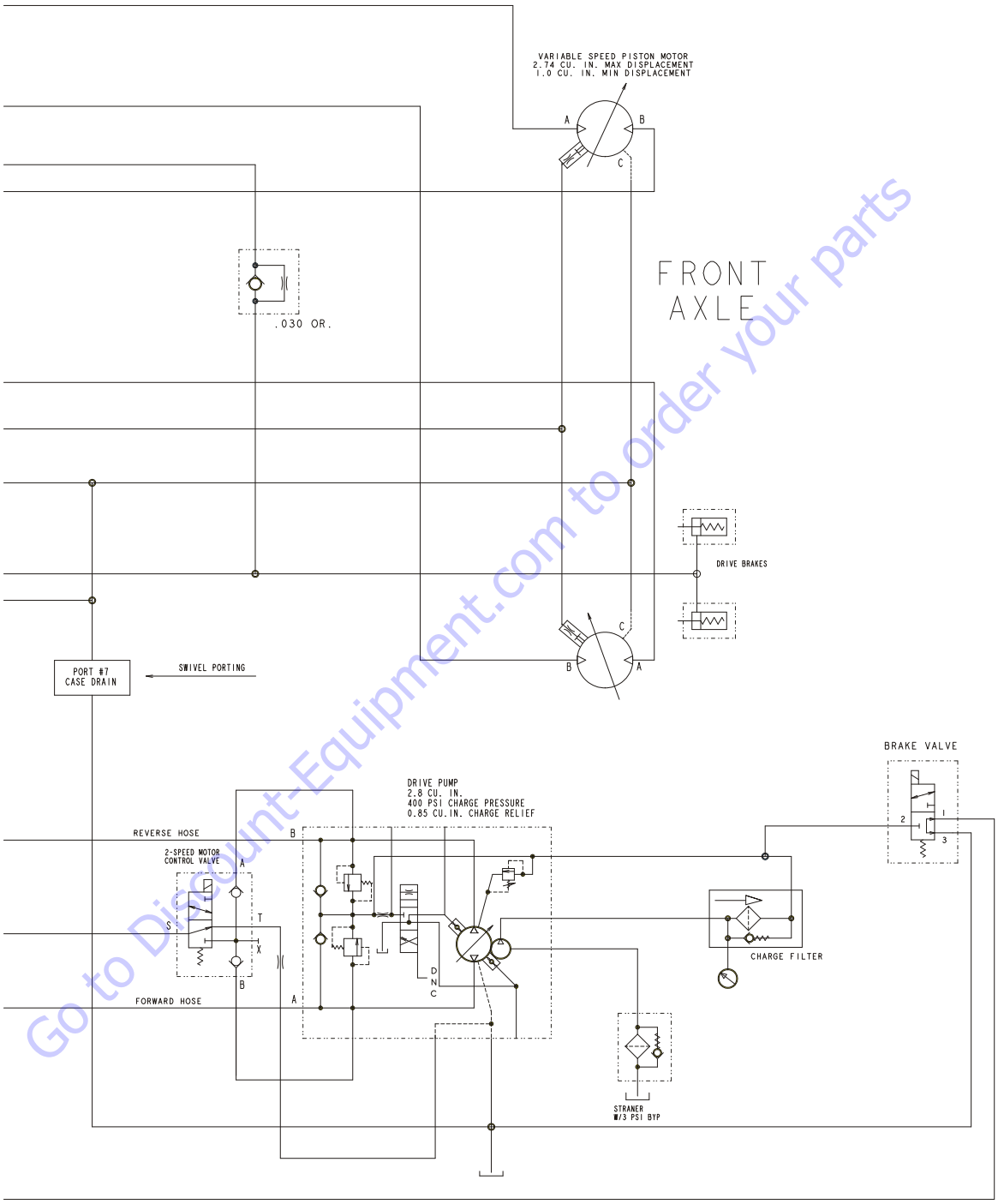


Figure 5-151. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 3 of 6



SHEET 2

2792535 B

Figure 5-152. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 4 of 6

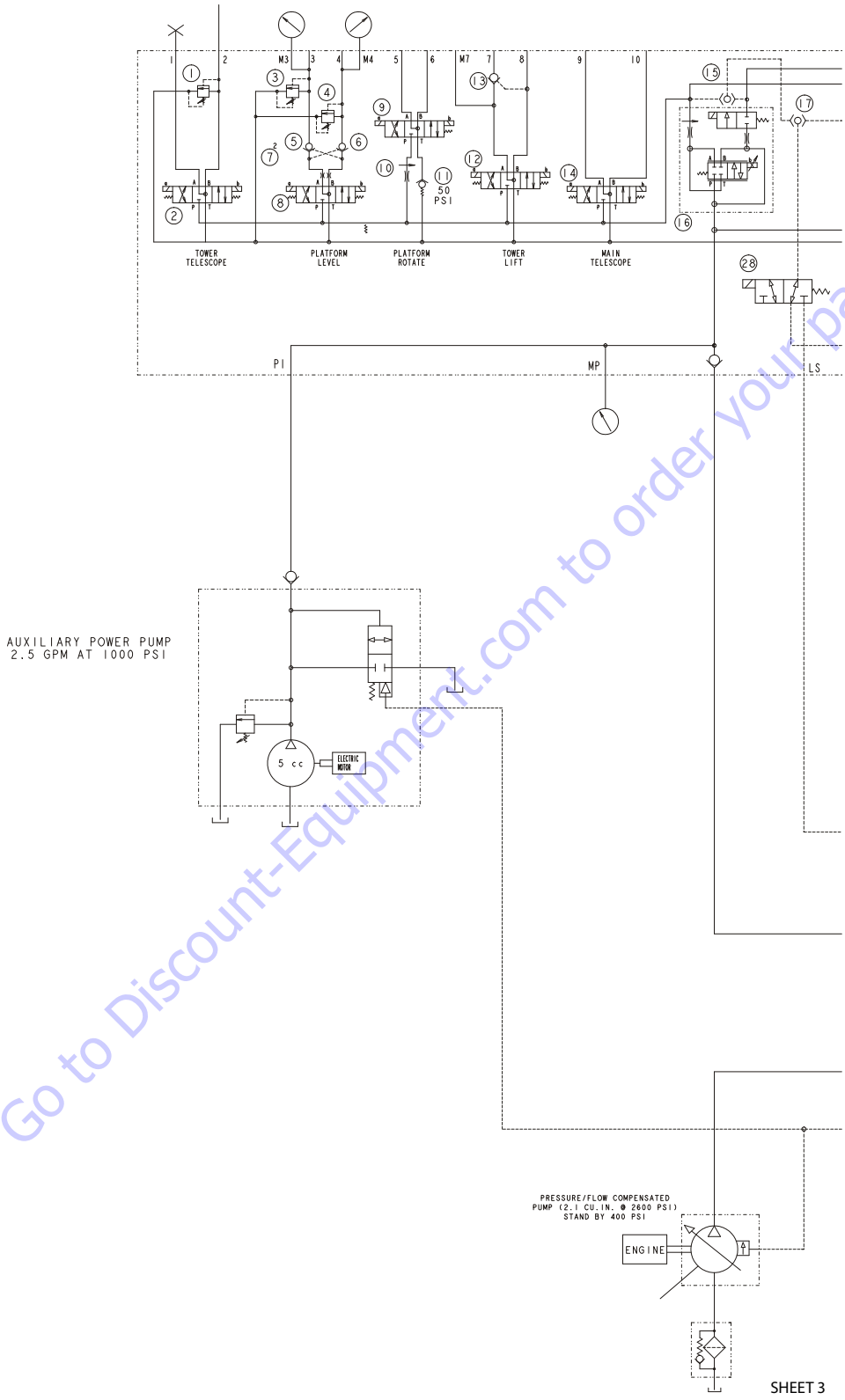


Figure 5-153. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 5 of 6

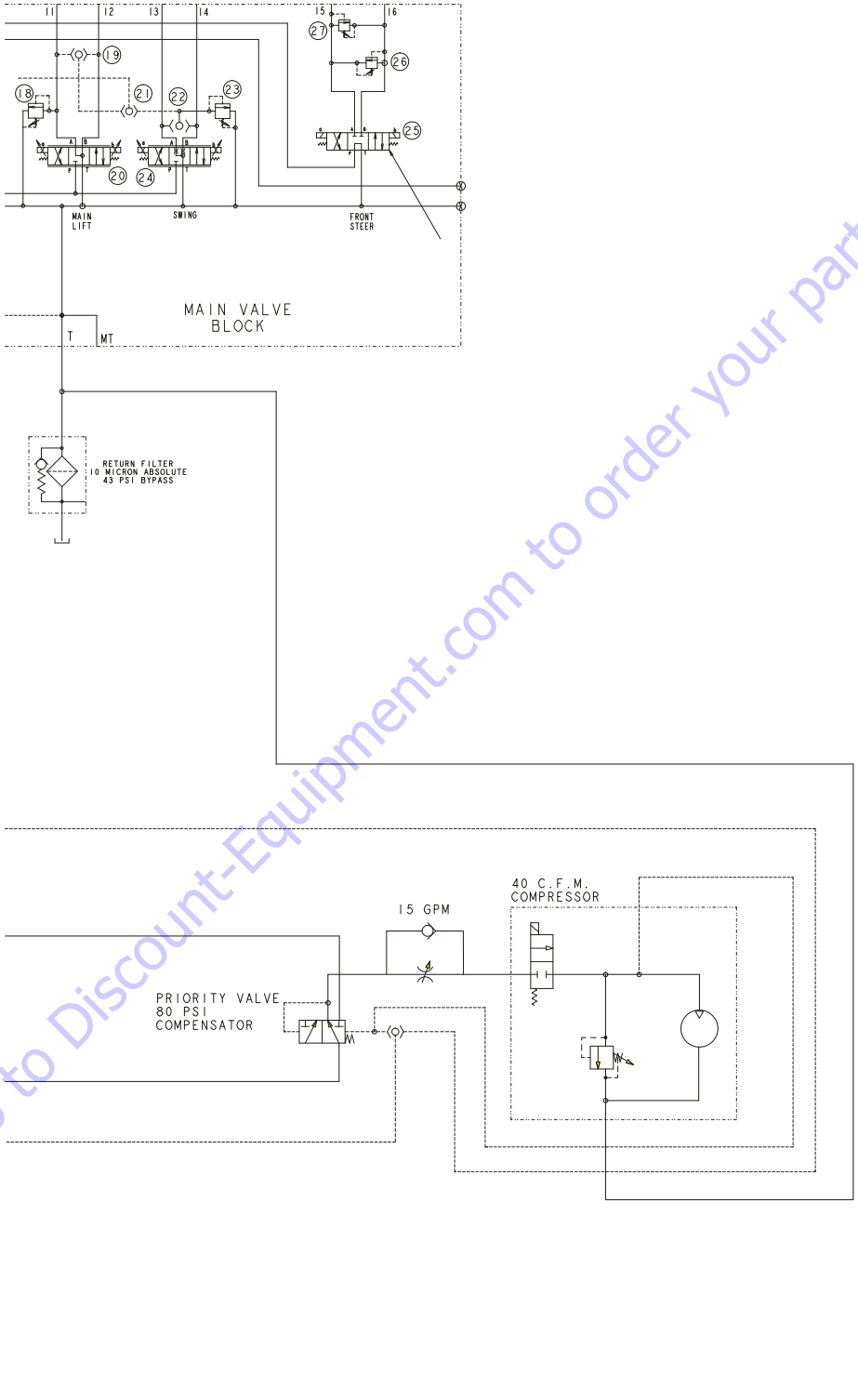


Figure 5-154. Hydraulic Schematic (Prior to SN 0300137975) - Sheet 6 of 6

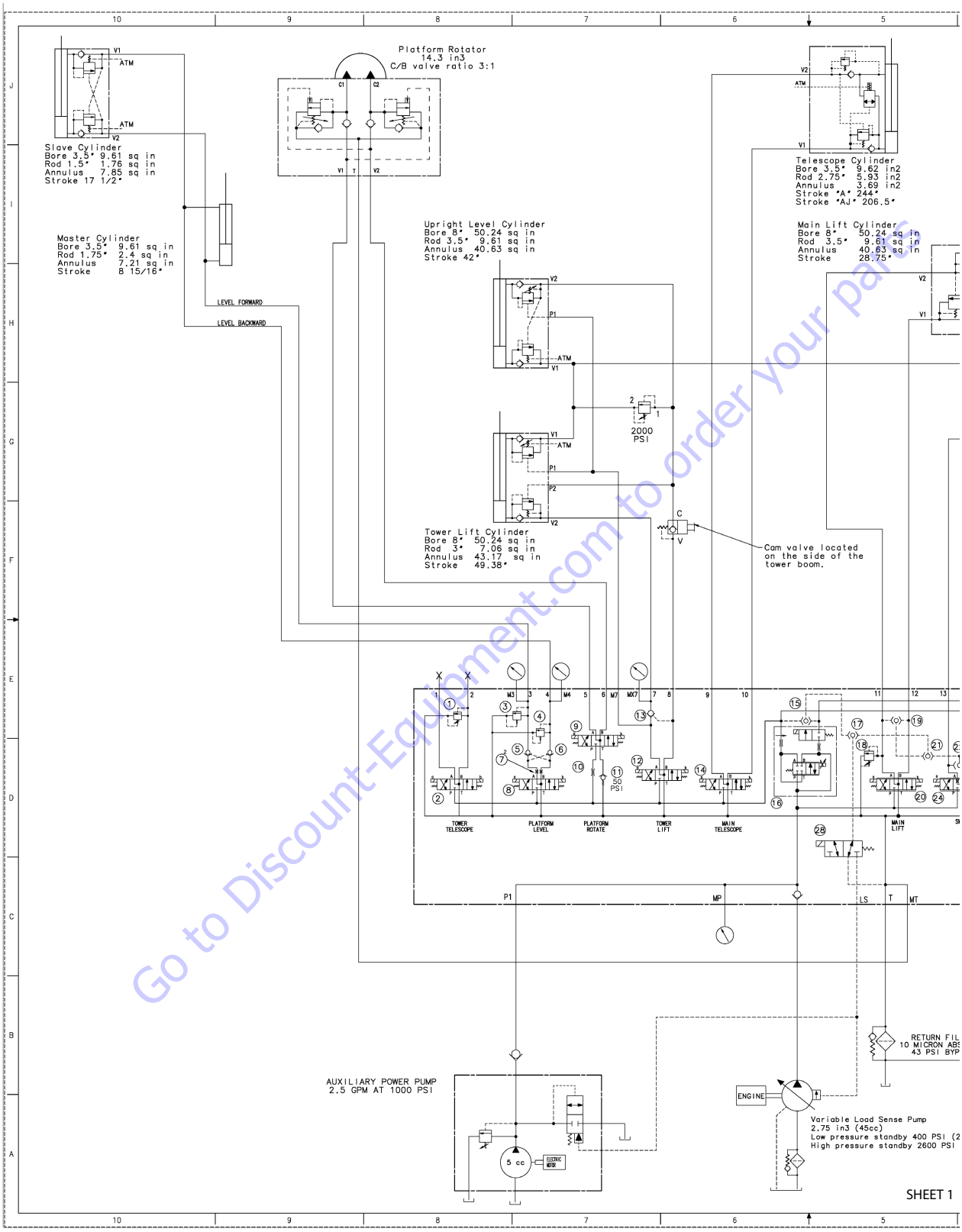


Figure 5-155. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 1 of 6

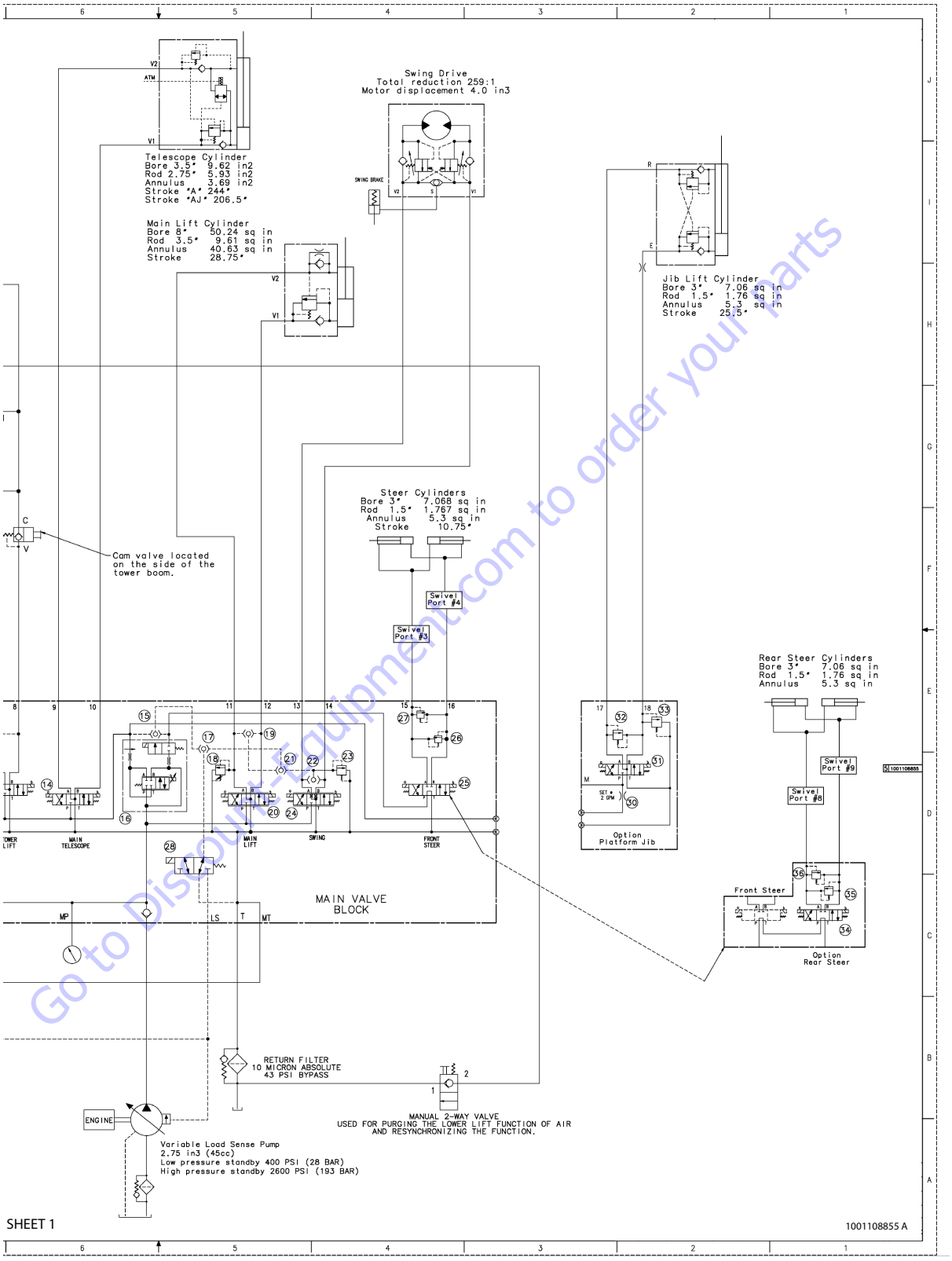


Figure 5-156. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 2 of 6

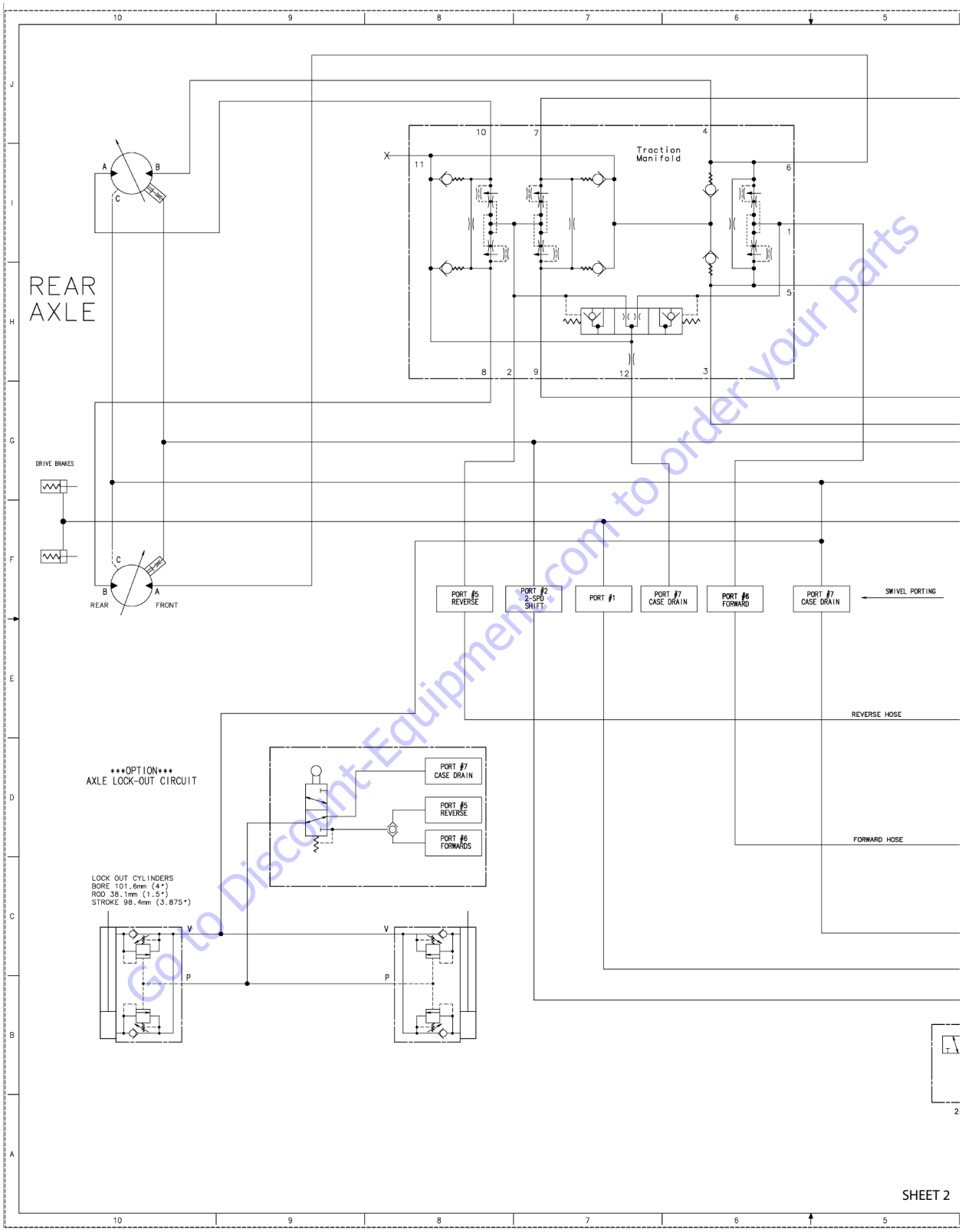


Figure 5-157. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 3 of 6

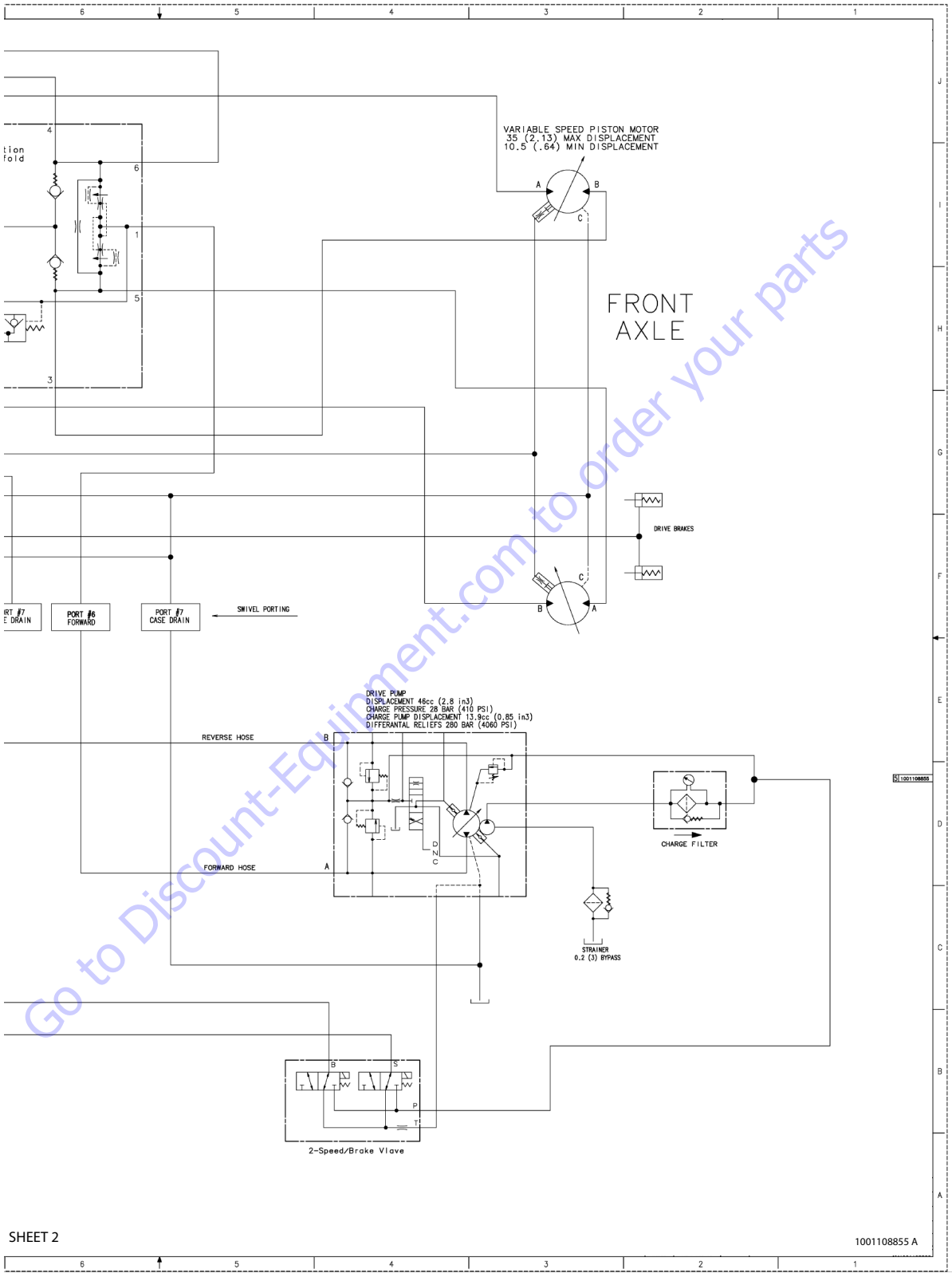


Figure 5-158. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 4 of 6

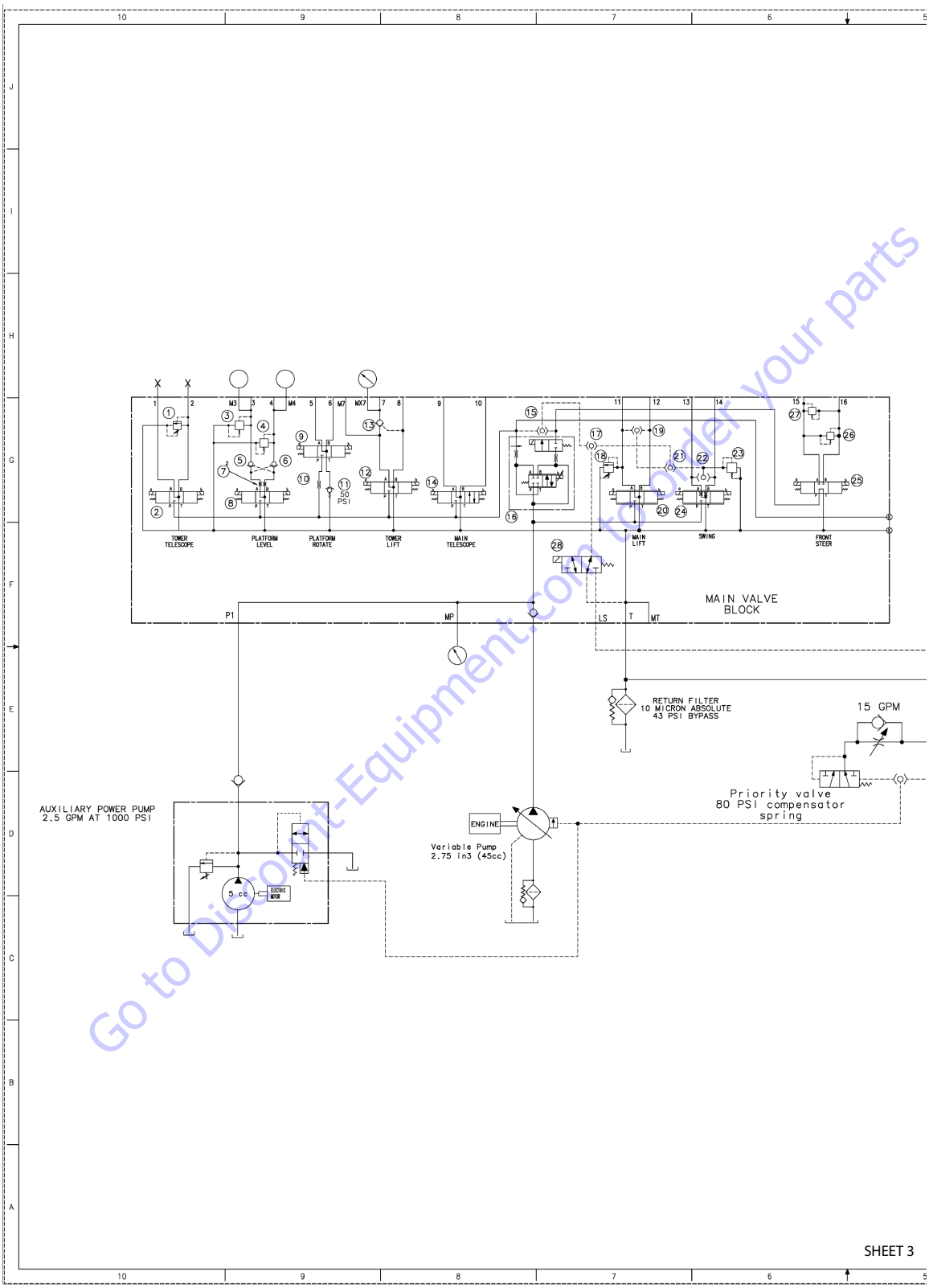


Figure 5-159. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 5 of 6

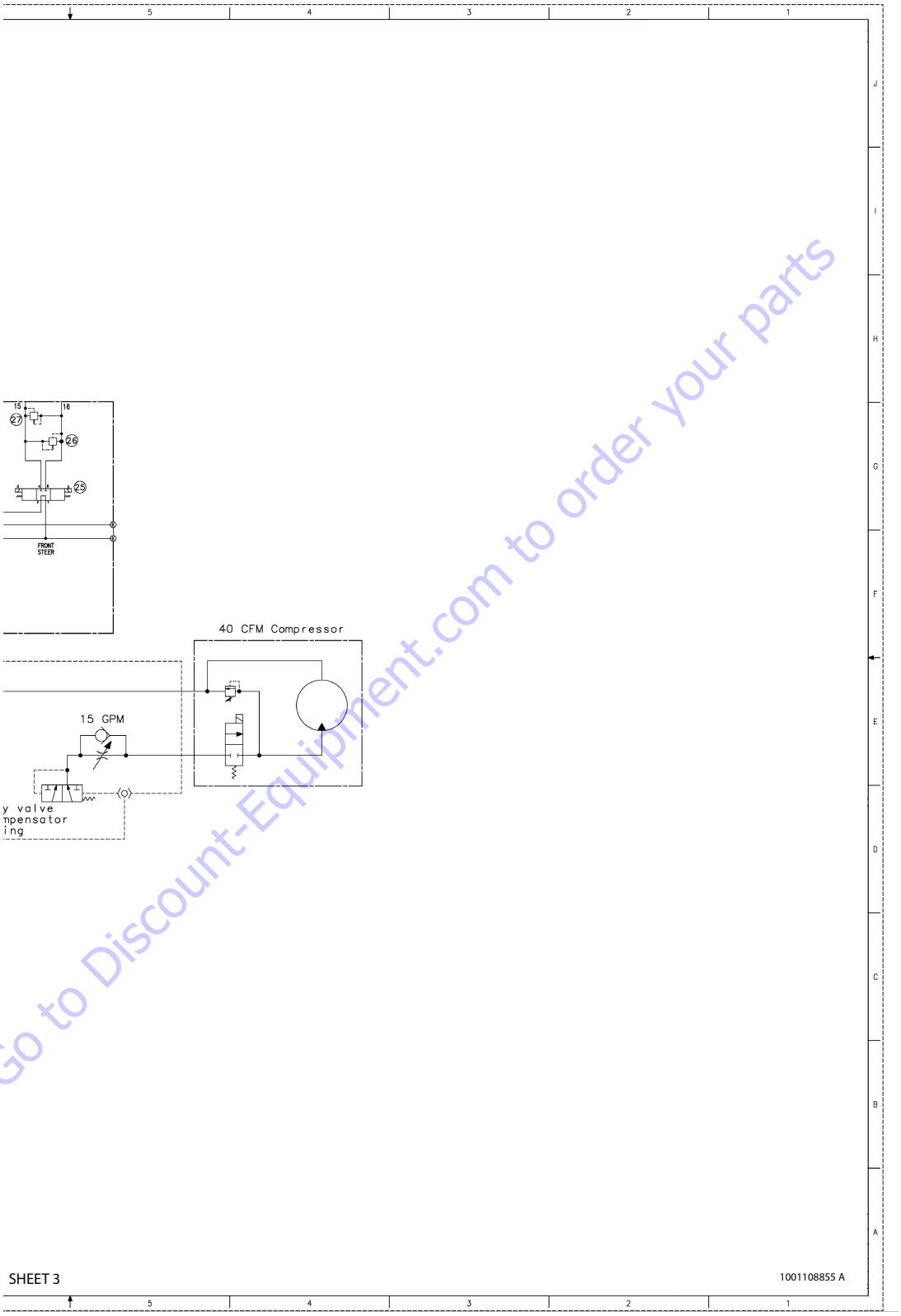
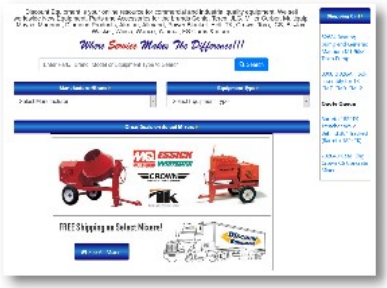


Figure 5-160. Hydraulic Schematic (SN 0300137975 through 0300185827) - Sheet 6 of 6

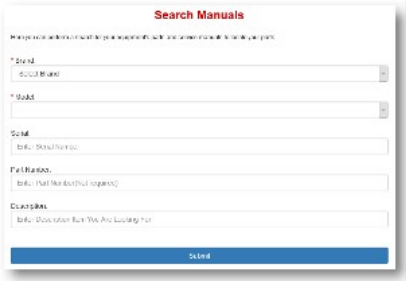
PARTS FINDER

Search Website by Part Number

Discount Equipment



Search Manual Library For Parts Manual & Lookup Part Numbers – Purchase or Request Quote



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SECTION 6. JLG CONTROL SYSTEM

6.1 JLG CONTROL SYSTEM ANALYZER KIT INSTRUCTIONS

Introduction

NOTICE

WHEN INSTALLING ANY NEW MODULE CONTROLLER ON THE MACHINE, IT WILL BE NECESSARY TO PROGRAM THE CONTROLLER FOR THE PROPER MACHINE CONFIGURATION, INCLUDING OPTIONS AND PROPERLY CALIBRATE THE TILT SENSOR.

NOTICE

IT IS A GOOD PRACTICE TO AVOID PRESSURE-WASHING ELECTRICAL/ELECTRONIC COMPONENTS. SHOULD PRESSURE-WASHING BE UTILIZED TO WASH AREAS CONTAINING ELECTRICAL/ELECTRONIC COMPONENTS, JLG INDUSTRIES, INC. RECOMMENDS A MAXIMUM PRESSURE OF 750 PSI (52 BAR) AT A MINIMUM DISTANCE OF 12 INCHES (30.5 CM) AWAY FROM THESE COMPONENTS. IF ELECTRICAL/ELECTRONIC COMPONENTS ARE SPRAYED, SPRAYING MUST NOT BE DIRECT AND BE FOR BRIEF TIME PERIODS TO AVOID HEAVY SATURATION.

The JLG designed Control System is a 12 volt based control unit installed on the boom lift.

The JLG Control System has reduced the need for exposed terminal strips, diodes and trimpots and provides simplicity in viewing and adjusting the various personality settings for smooth control of: acceleration, deceleration, creep, min speed, and max.-speed for all boom, drive, and steering functions.

The upper lift, swing, and drive are controlled by individual joysticks, with steering being controlled by a rocker switch built into the top the drive joystick. To activate Drive, Lift, and Swing simply pull up on the slide lock location on the joystick and move the handle into the direction desired.

The control system will control the voltage output to the valves and pump, as programmed for smooth operation and maximum cycle time. Ground control speeds for all boom functions can also be programmed into the control system.

The JLG Control System controller has a built in LED to indicate any faults. The system stores recent faults which may be accessed for troubleshooting. Optional equipment includes a soft touch system, head and tail lights, and ground alarm. These options may be added later but must be programmed into the control system when installed.

The Control System may be accessed utilizing a custom designed, hand held analyzer (Analyzer Kit, JLG part no. 2901443) which will display two lines of information at a time, by scrolling through the program.

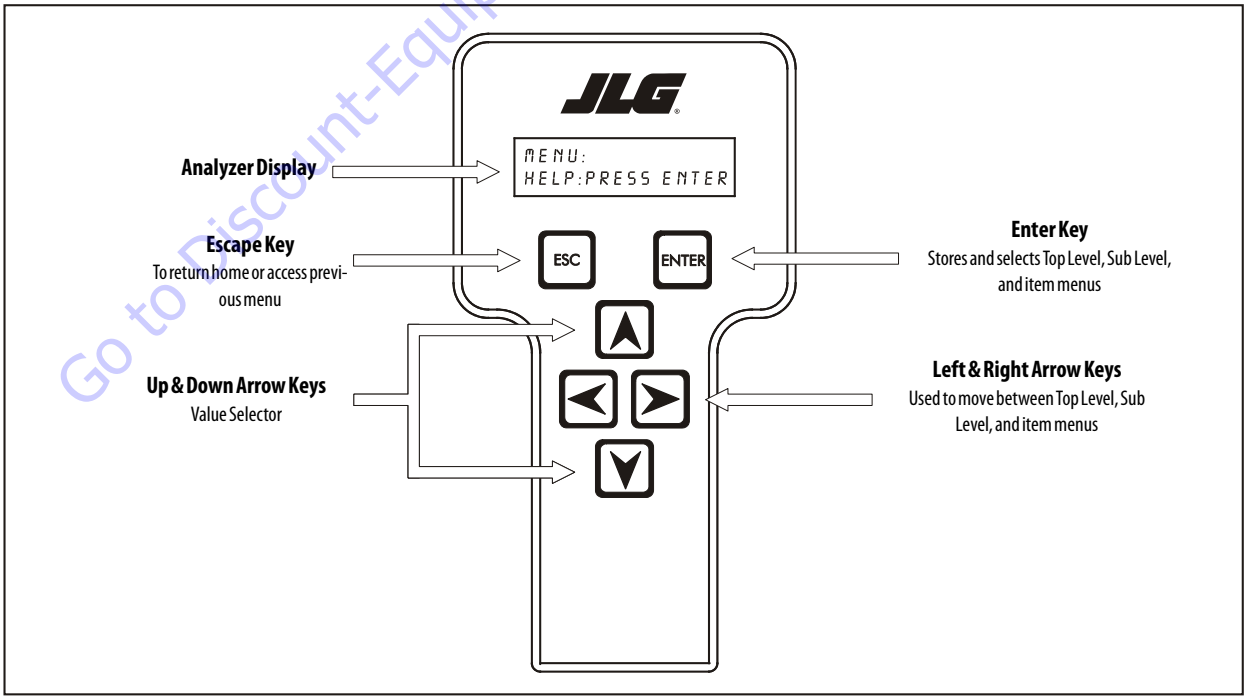


Figure 6-1. Hand Held Analyzer

To Connect the JLG Control System Analyzer

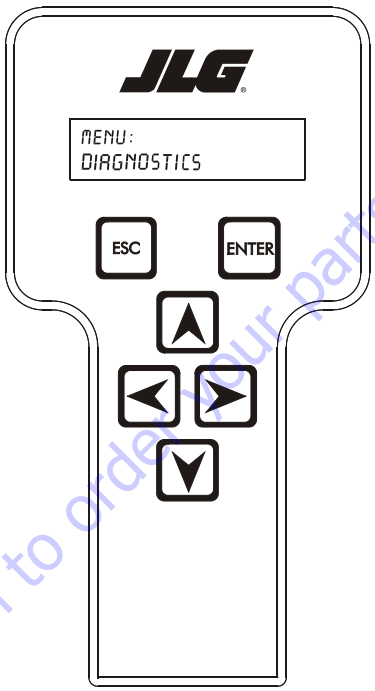
1. Connect one end of the cable, supplied with the analyzer, to the correct four pin connector on the motor control unit; there will be only one connector which correctly fits the cable.
2. Connect the other end of the cable to the analyzer.

NOTE: *The ends of the cable are identical and can be reversed; the cable end can only be inserted one way into the matching connector.*

3. Power up the vehicle by turning the key to the platform or ground position and pulling the emergency stop buttons on; this will power the SMART System and the analyzer.

Using the Analyzer

The analyzer will display the current top level menu item, for example::



MENU:
DIAGNOSTICS

Press LEFT & RIGHT to move between menu items; press ENTER to select the displayed menu item.

When a top level menu item is selected, a new set of menu items may be offered; press **LEFT** & **RIGHT** arrows then **ENTER** again to select the required item.

To cancel a selected menu item, press **ESCAPE**; then a different menu item can be chosen.

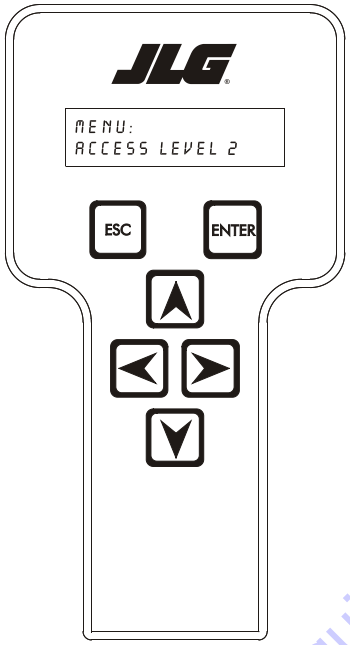
The available menu items will vary depending on the vehicle; check the vehicle manual for more information.

Changing the Access Level of the Hand Held Analyzer

When the analyzer is first connected, its access level ensures that most configurations cannot be changed; this ensures that a setting cannot be accidentally altered.

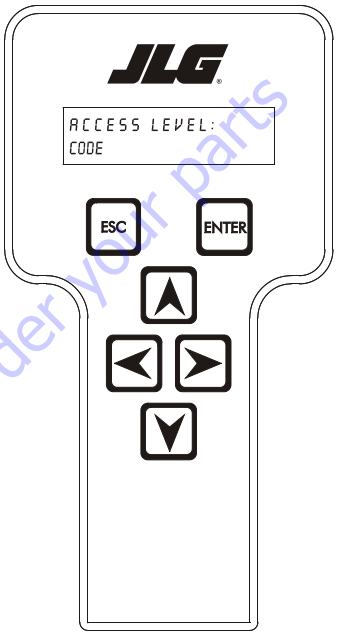
To change the access level, a PASSWORD must be entered; the password must be known.

To enter a password, first find the appropriate top level menu item:



MENU:
ACCESS LEVEL 2

Press **ENTER** ENTER to select the ACCESS LEVEL item; then press **UP** ENTER & **DOWN** arrows and **LEFT** & **RIGHT** arrows to enter the correct five digit password:



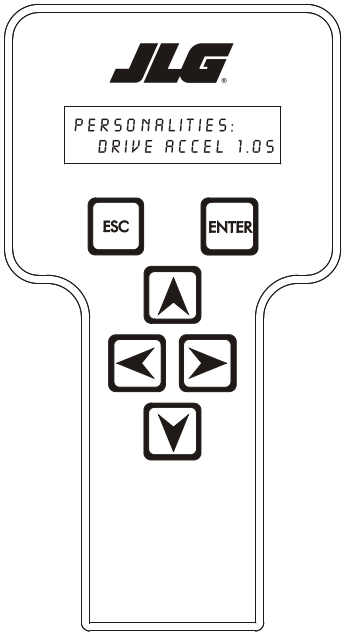
ACCESS LEVEL:
CODE 33271

When the correct password is displayed, press **ENTER** ENTER to confirm it; the access level will change to match the password (if not, press **ENTER** ENTER to check and correct the password).

The correct passwords will vary depending on the vehicle; check the vehicle manual for more information.

Adjusting Configuration Using the Hand Held Analyzer

When a personality item is selected, press **UP** & **DOWN** arrows to adjust its value, for example:



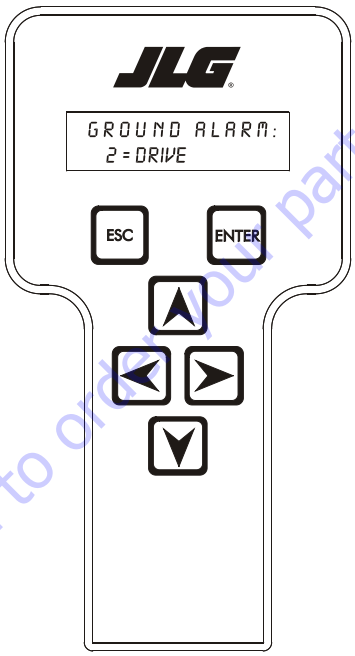
PERSONALITIES:
DRIVE ACCEL 1.0s

There will be a maximum and minimum for the value to ensure safe, operation; the value will not increase if **UP** is pressed when at the maximum, or if DOWN is pressed when at the minimum.

If the value does not change when **UP** or **DOWN** is pressed, check the access level.

Machine Setup

When a machine digit item is selected, press **UP** & **DOWN** to adjust its value, for example:



GROUND ALARM:
2 = DRIVE

The effect of the machine digit value is displayed along with its value; there will only be certain settings allowed to ensure safe operation.

If the value does not change when **UP** or **DOWN** is pressed, check the access level.

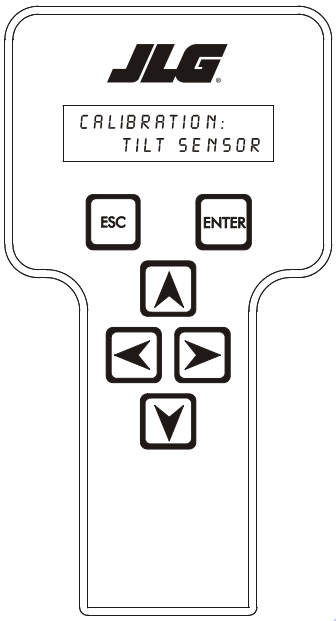
The available personality and machine digit items will vary depending on the vehicle; check the vehicle manual for more information.

Level Vehicle Description

A NEW TILT MODULE WILL ACT AS IF IT IS TILTED ALL OF THE TIME UNTIL THE FOLLOWING PROCEDURE IS PERFORMED.

⚠ WARNING

DO NOT CALIBRATE THE LEVEL SENSOR EXCEPT ON A LEVEL SURFACE.



Place machine in stowed position with the boom between the rear wheels.

To level machine chose:

CALIBRATION:
TILT SENSOR

Press ENTER (ENTER).

When prompted, swing machine 180°

Press ENTER (ENTER).

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
ACCEL	ACCELERATE
ACT	ACTIVE
A/D	ANALOG DIGITAL CONVERTER COUNT
AMB	AMBIENT
ANG	ANGLE
AUX	AUXILIARY
BCS	BOOM CONTROL SYSTEM
BM or BLAM	BOOM LENGTH ANGLE MODULE
BR	BROKEN
BSK	BASKET
CAL	CALIBRATION
CL	CLOSED
CM	CHASSIS MODULE
CNTL or CNTRL	CONTROL
COOR	COORDINATED
CRK PT	CRACK POINT
CRP	CREEP
CUT	CUTOUT
CYL	CYLINDER
DECEL	DECELERATE
D or DN	DOWN
DEG	DEGREE
DOS	DRIVE ORIENTATION SYSTEM
DRV	DRIVE
E	ERROR
E&T	ELEVATED & TILTED
ELEV	ELEVATION
ENG	ENGINE
EXT	EXTEND
F or FNT	FRONT
FL	FLOW
FOR or FWD	FORWARD
FSW	FOOT SWITCH
GRN	GREEN
GM	GROUND MODULE
h	HOURS
HW	HARDWARE
L or LT	LEFT
LB	POUND

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
LEN	LENGTH
LIM	LIMIT
LVL	LEVEL
m	MINUTES
MIN	MINIMUM
MAX	MAXIMUM
MN	MAIN
NO	NORMALLY OPEN or NO
NC	NORMALLY CLOSED
OP	OPEN
O/R	OVERRIDE or OUTRIGGER
OSC	OSCILLATING
OVRD	OVERRIDE
P or PRS	PRESSURE
PCV	PROPORTIONAL CONTROL VALVE
PLAT	PLATFORM
PM	PLATFORM MODULE
POT	POTENTIOMETER
PT	POINT
R	REAR or RIGHT
REV	REVERSE or REVISION
RET	RETRACT
ROT	ROTATE
RT	RIGHT
SEL	SELECTOR
SN	SERIAL NUMBER
SPD	SPEED
STOW or STOWD	STOWED
SW	SWITCH or SOFTWARE
TELE	TELESCOPE
TEMP	TEMPERATURE
TORQ	TORQUE
TRN	TRANSPORT
T/T or TURNTBL	TURNTABLE
TWR	TOWER
U	UPPER or UP
VER	VERSION
VLV	VALVE
WIT	WITNESS
YEL	YELLOW

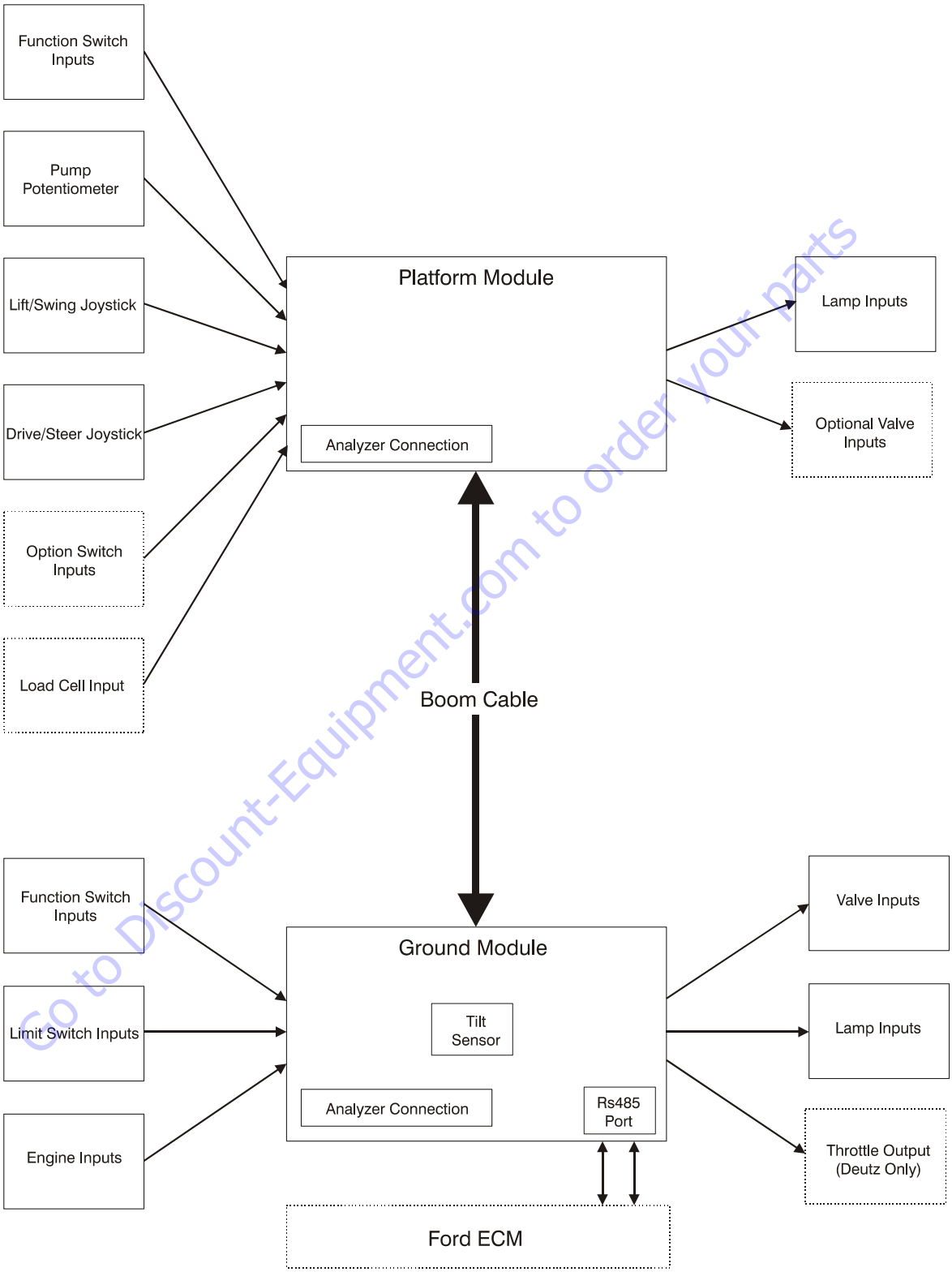
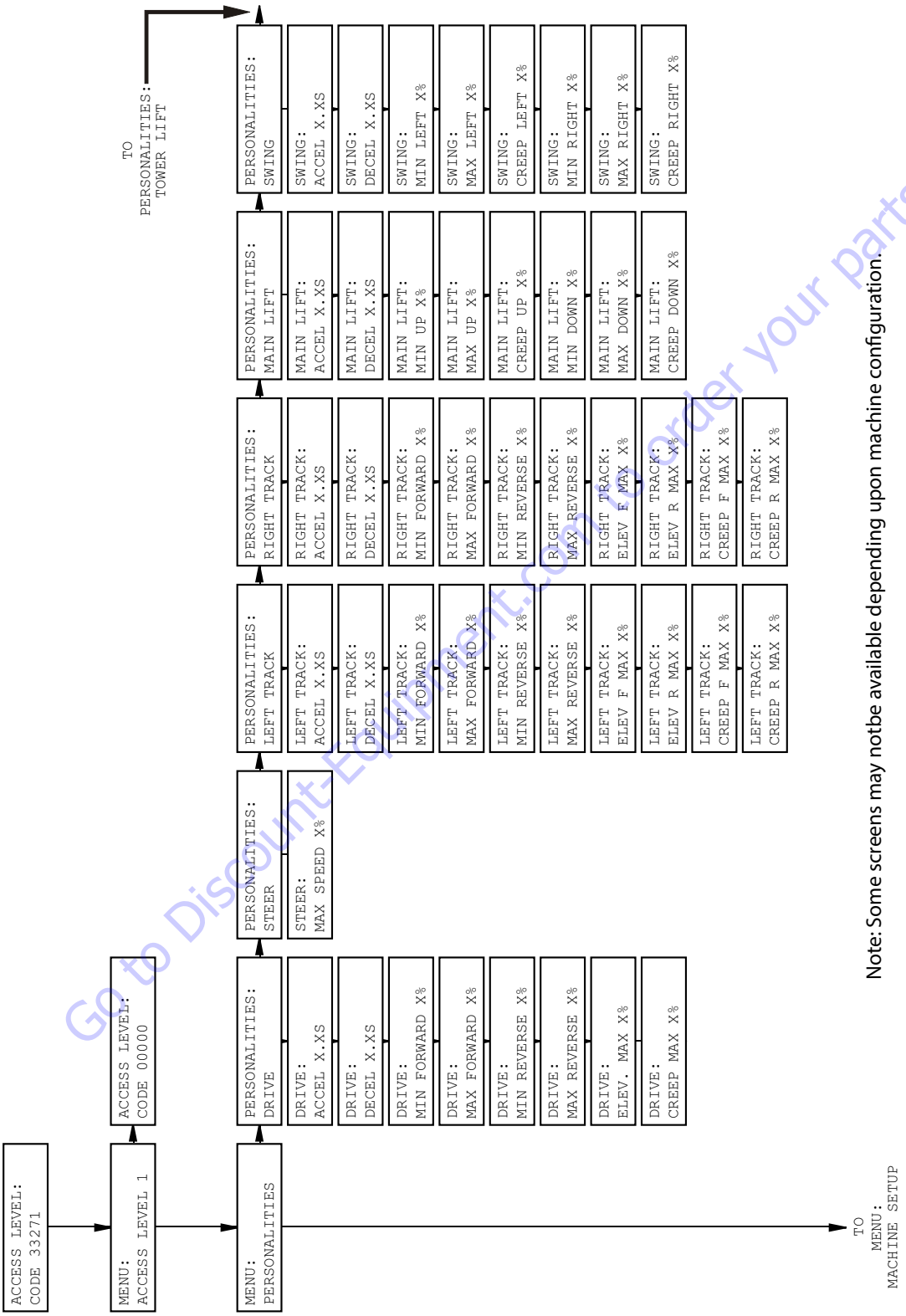


Figure 6-2. ADE Block Diagram



Note: Some screens may notbe available depending upon machine configuration.

Figure 6-3. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 1 of 4

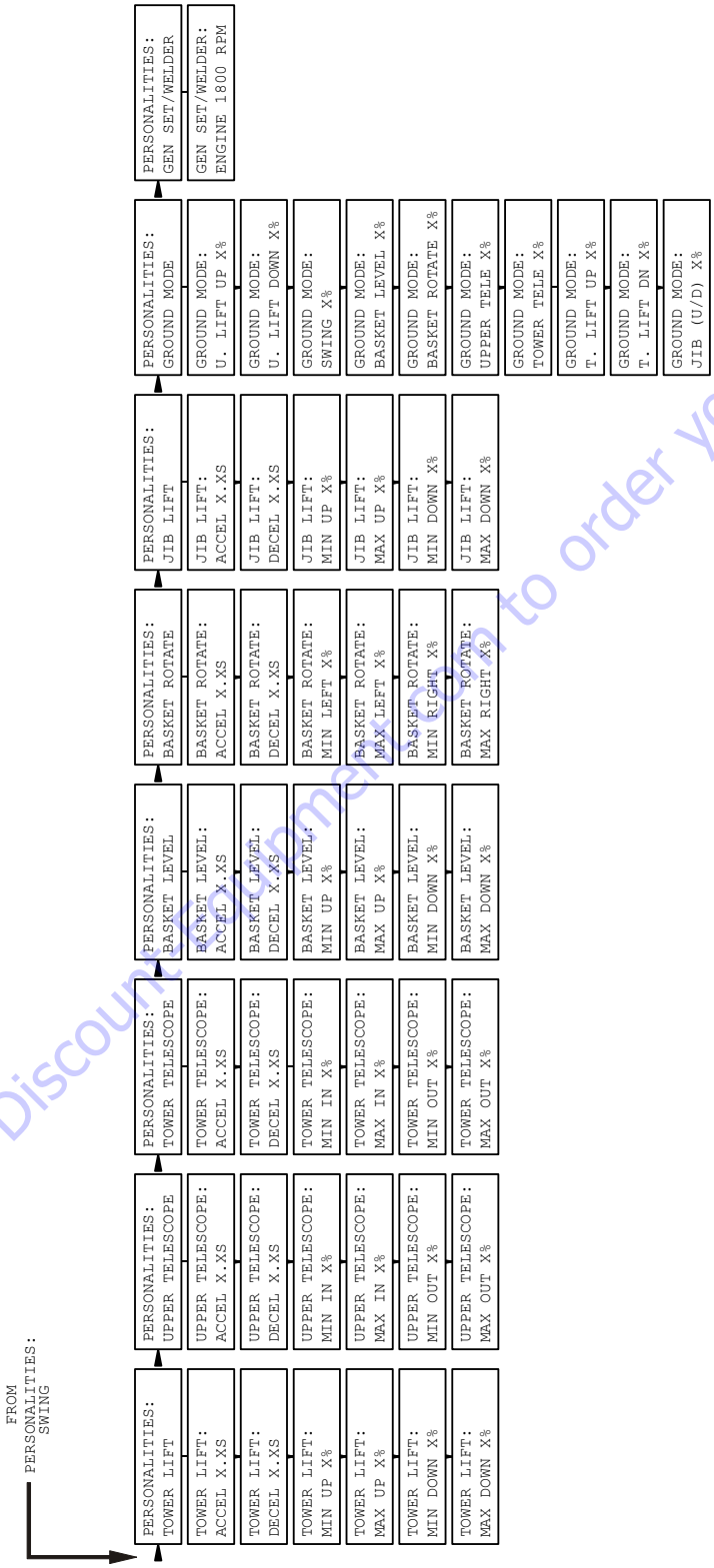


Figure 6-4. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 2 of 4

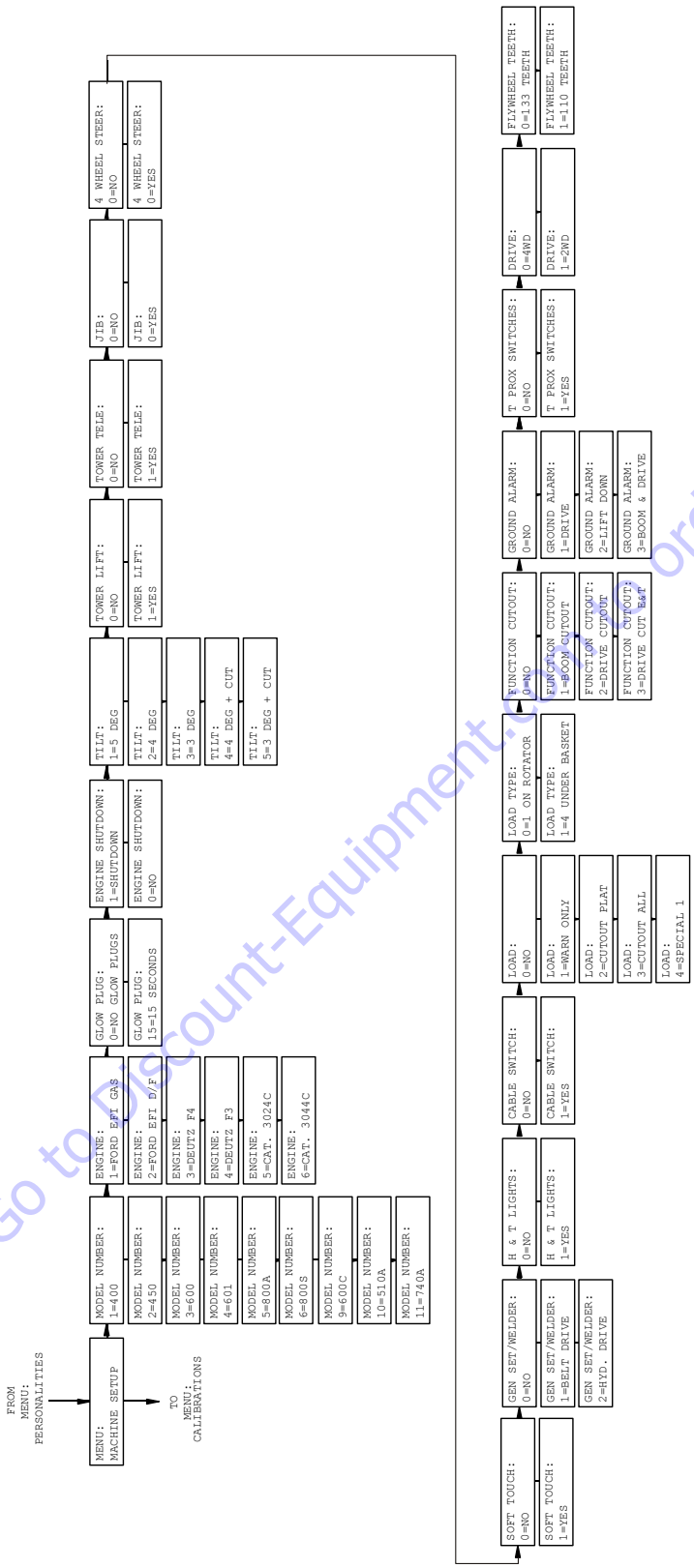
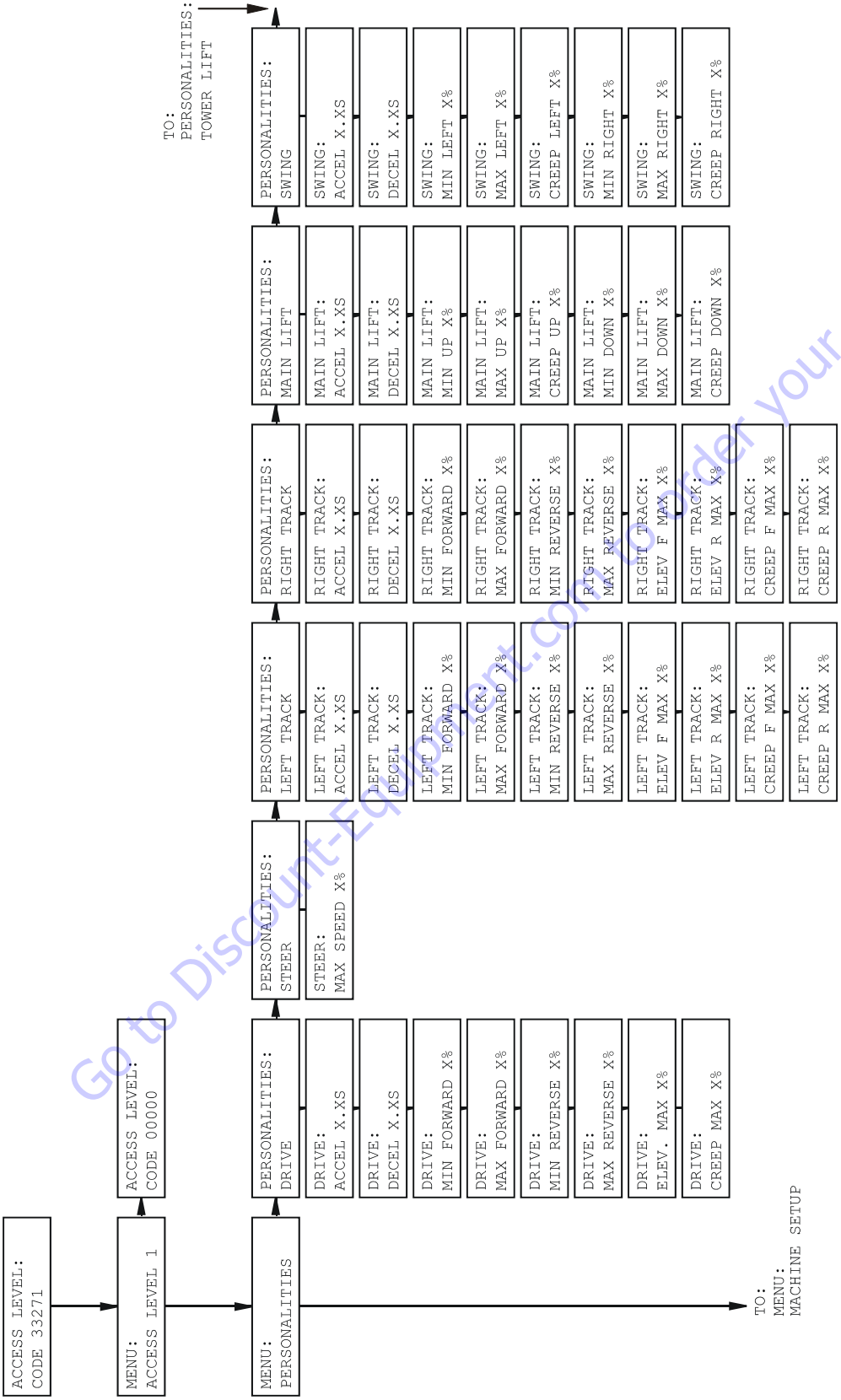


Figure 6-5. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 3 of 4

Figure 6-6. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 4 of 4



NOTE: *Some screens may not be available depending upon machine configuration.*

Figure 6-7. Analyzer Flow Chart, Version 5.X Software - Sheet 1 of 4

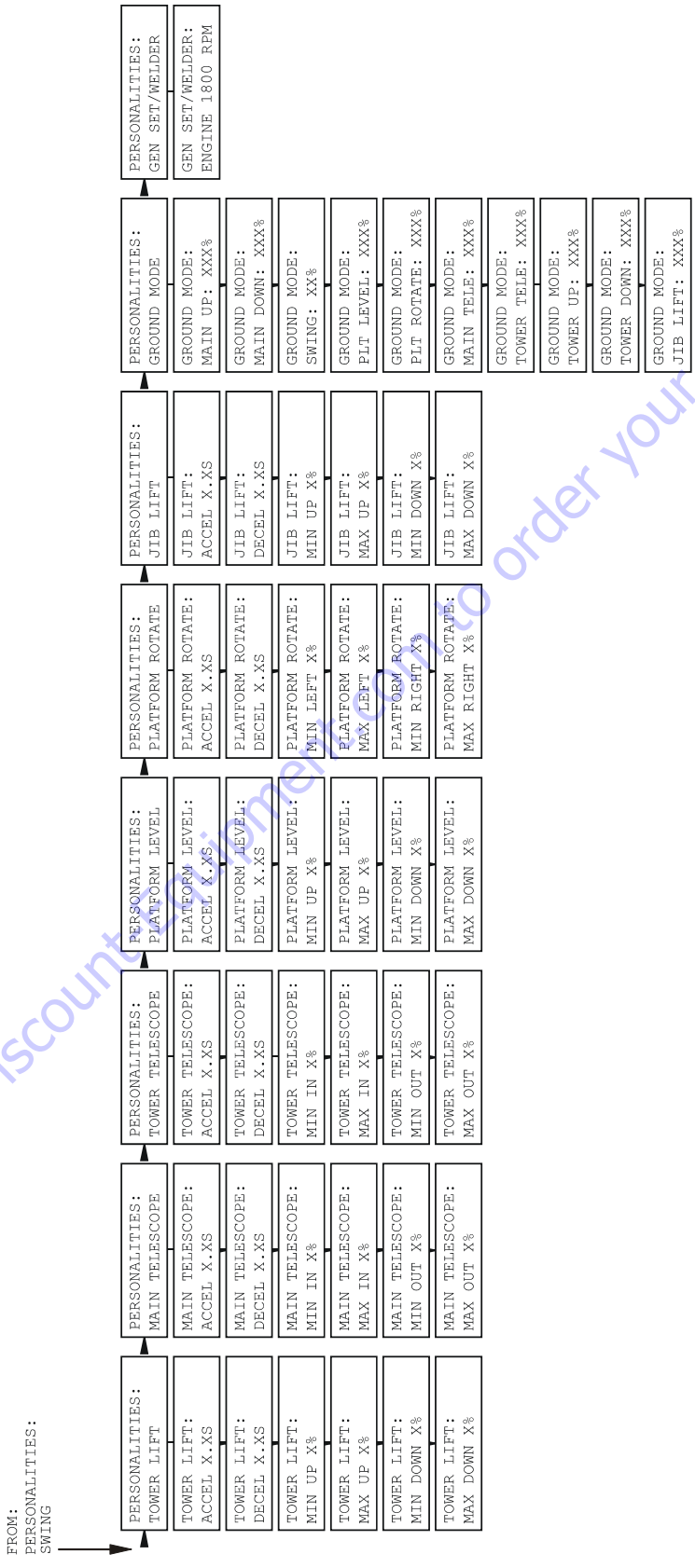


Figure 6-8. Analyzer Flow Chart, Version 5.X Software - Sheet 2 of 4

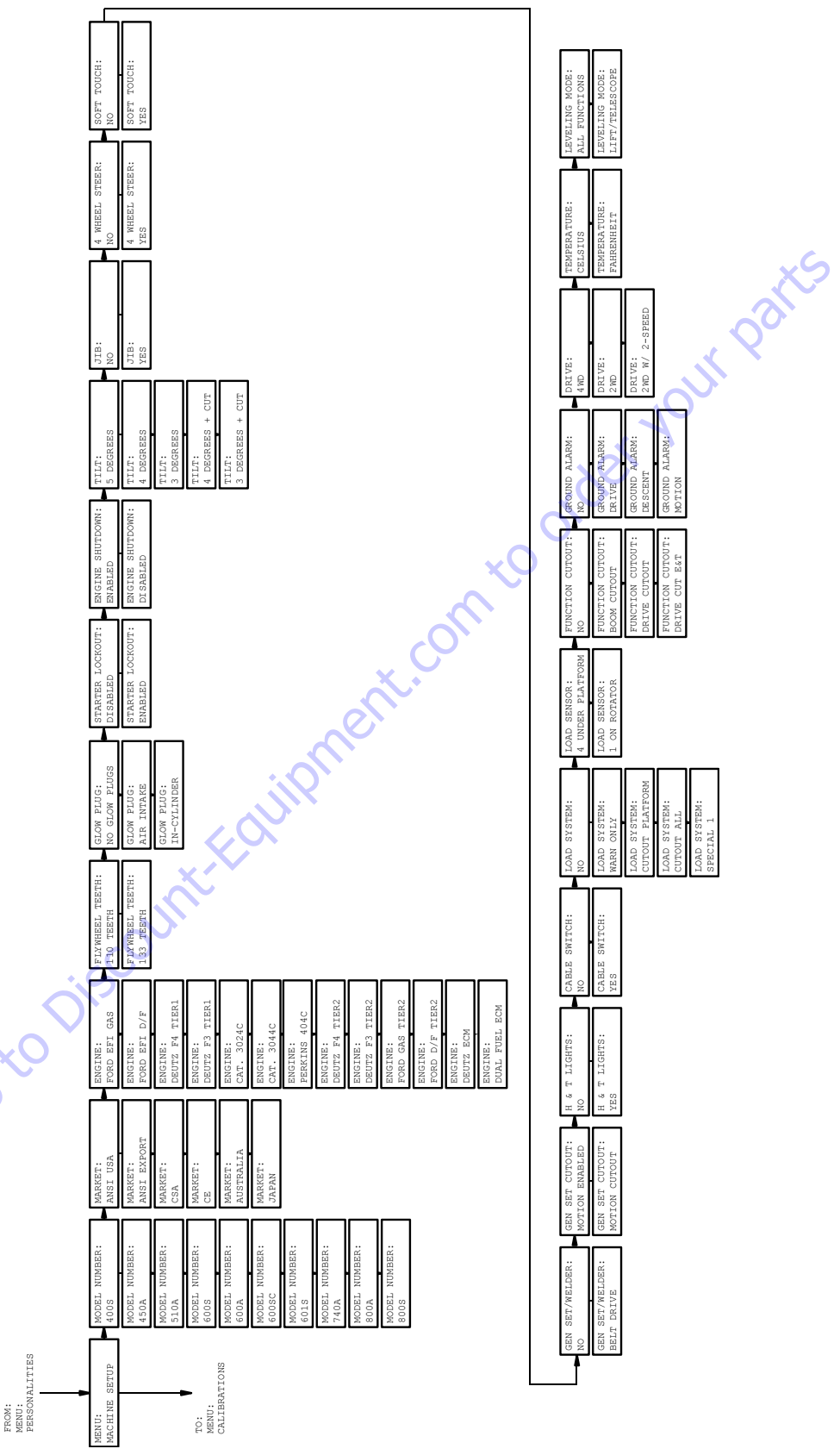


Figure 6-9. Analyzer Flow Chart, Version 5.X Software - Sheet 3 of 4

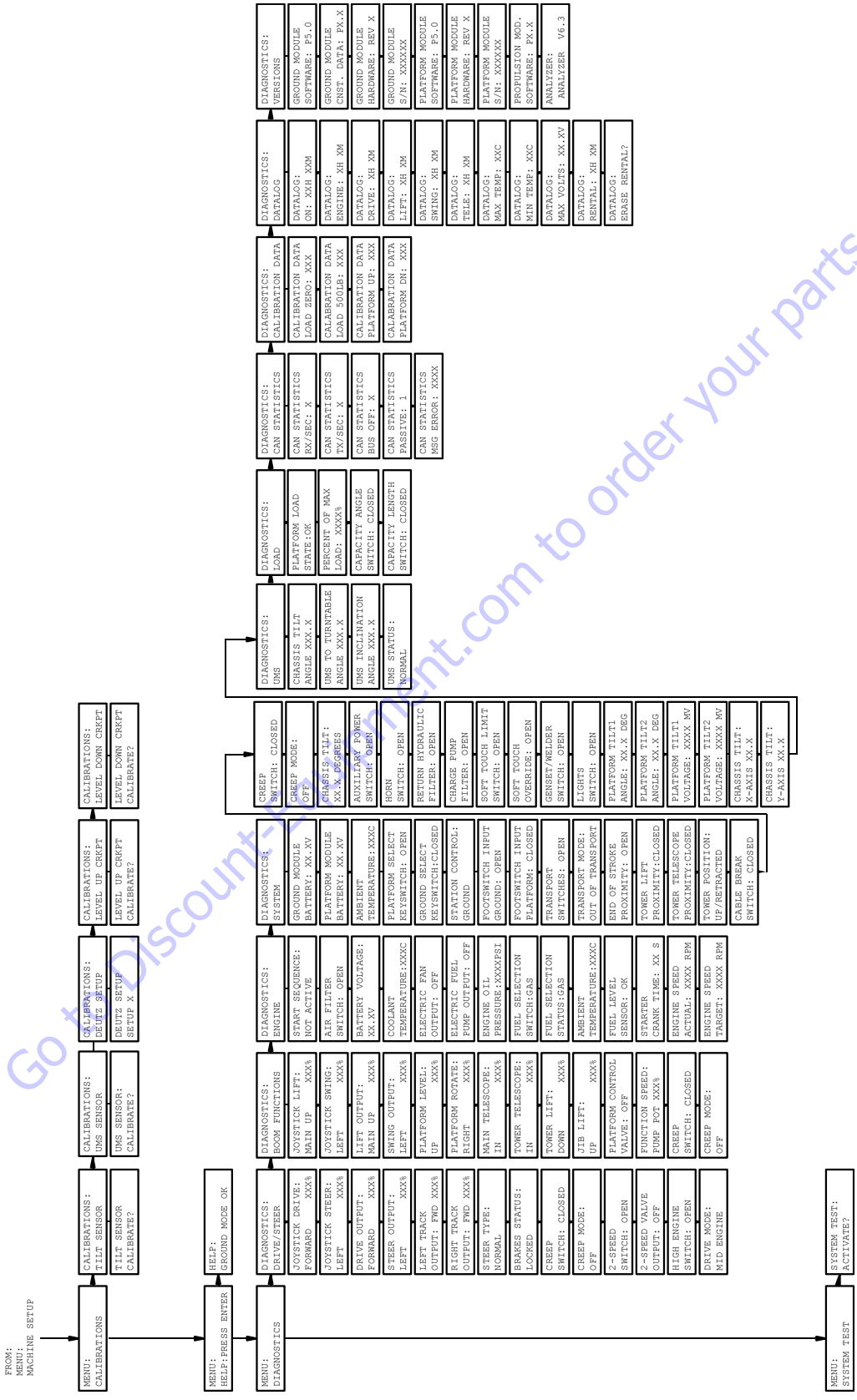
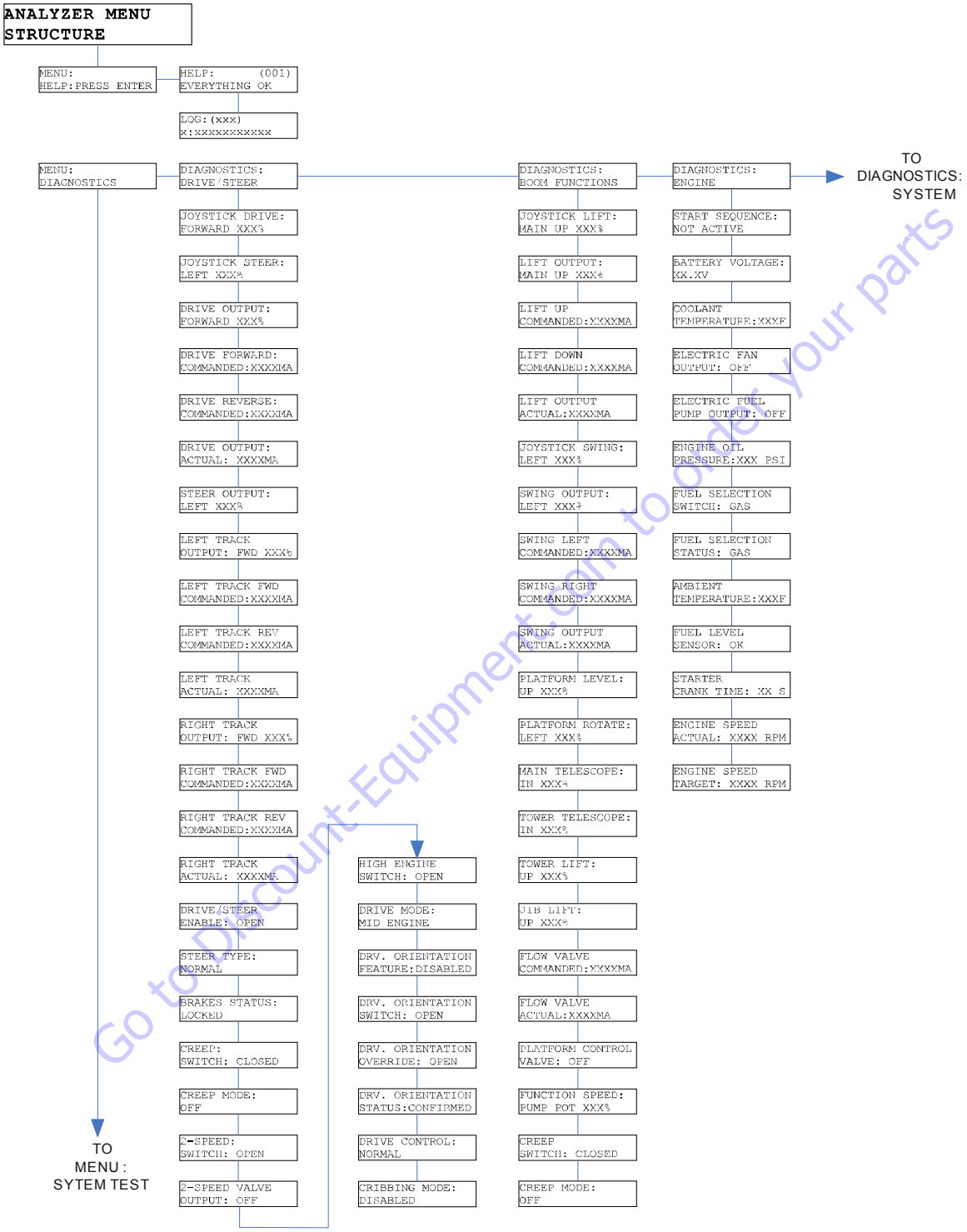
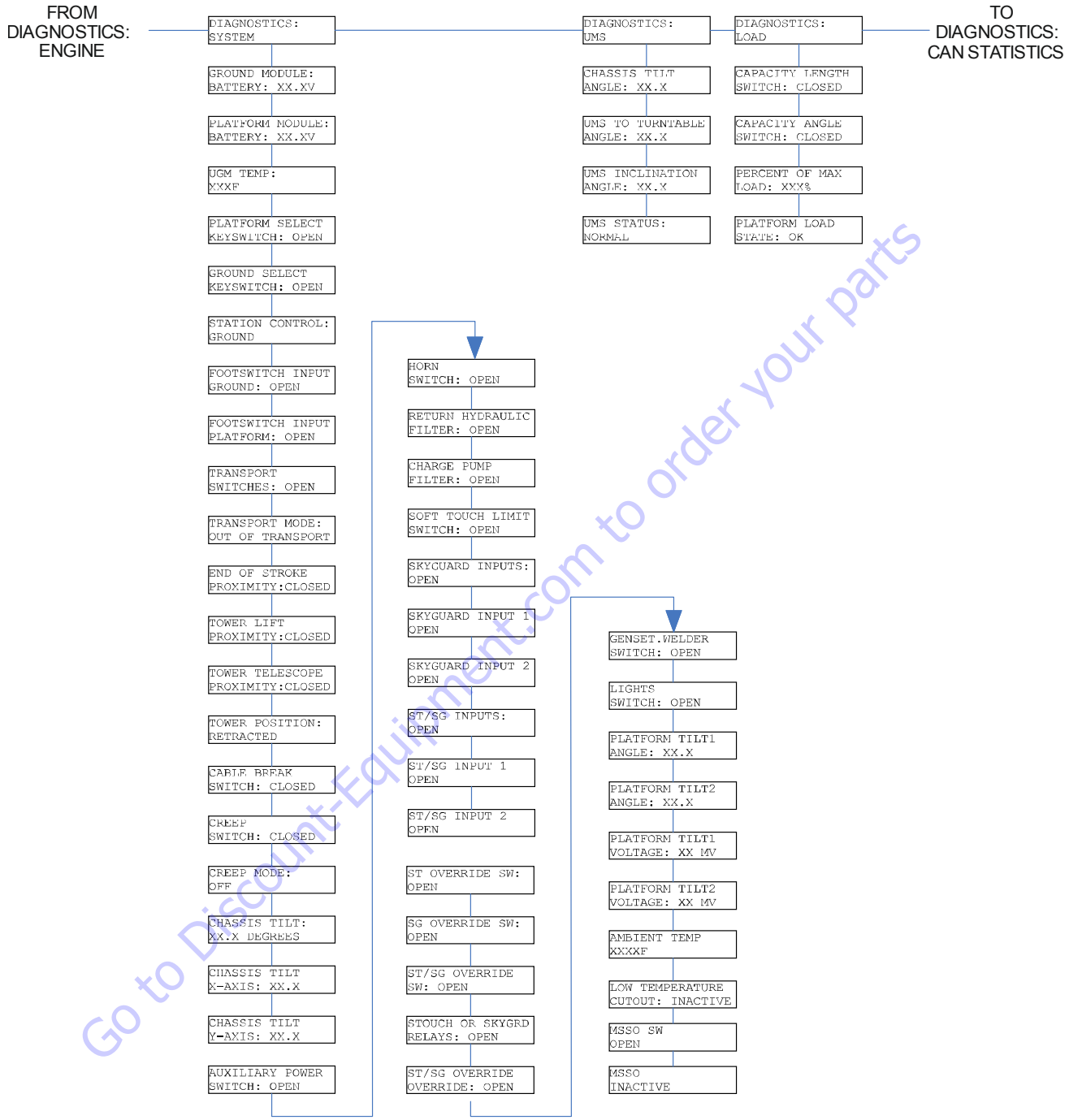


Figure 6-10. Analyzer Flow Chart, Version 5.X Software - Sheet 4 of 4



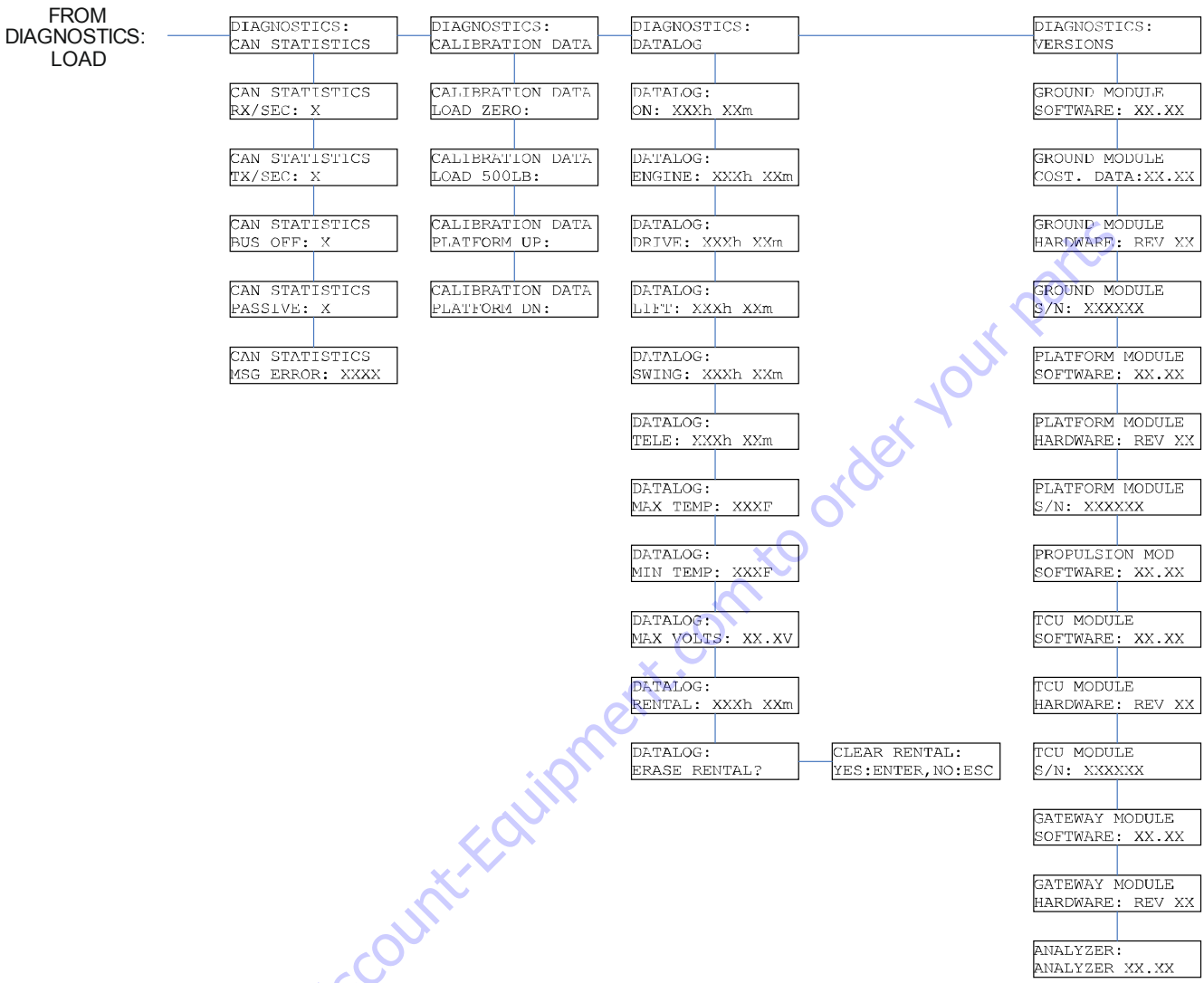
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-11. Analyzer Flow Chart Version 6.X Software - Sheet 1 of 8



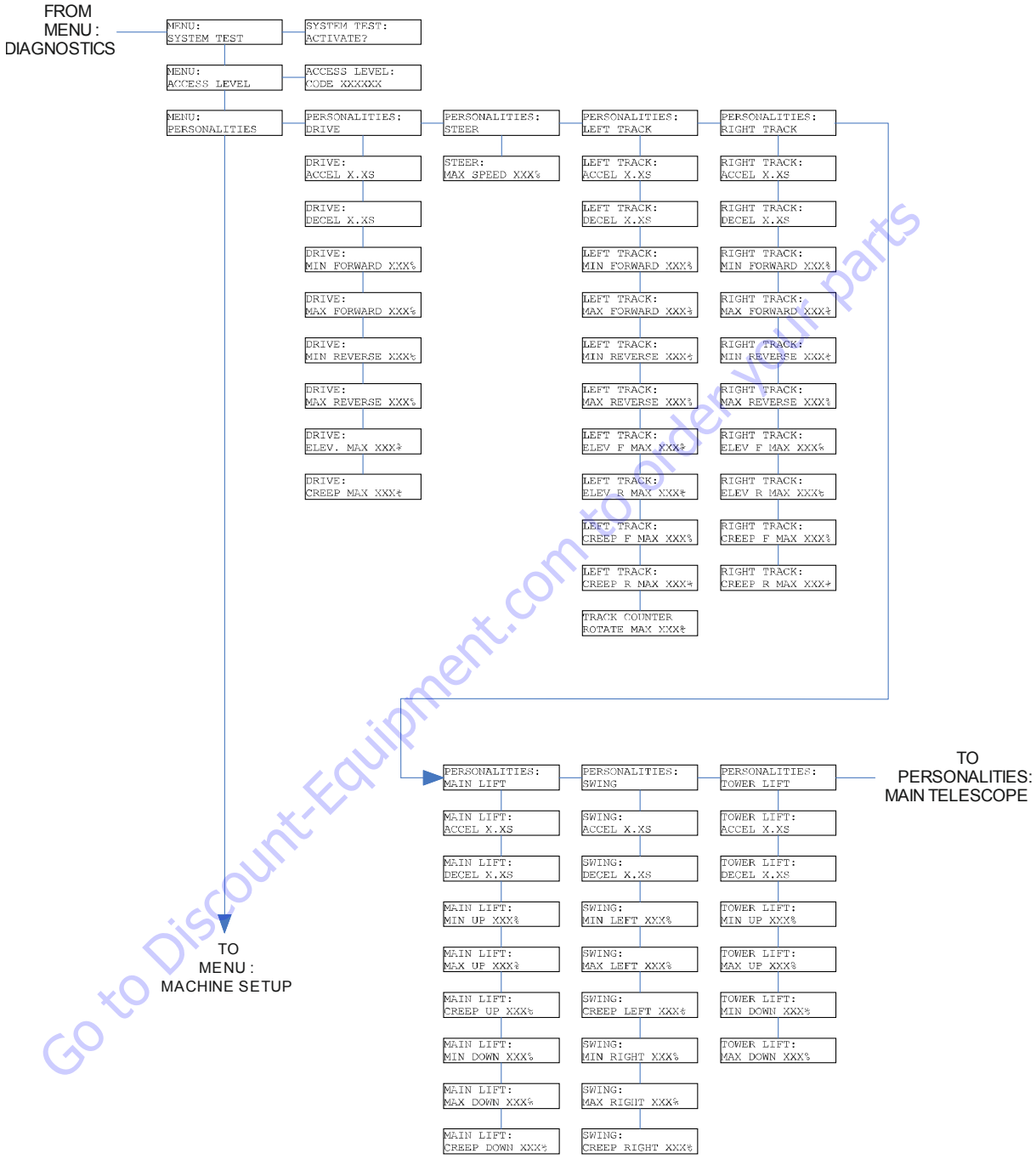
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-12. Analyzer Flow Chart Version 6.X Software - Sheet 2 of 8



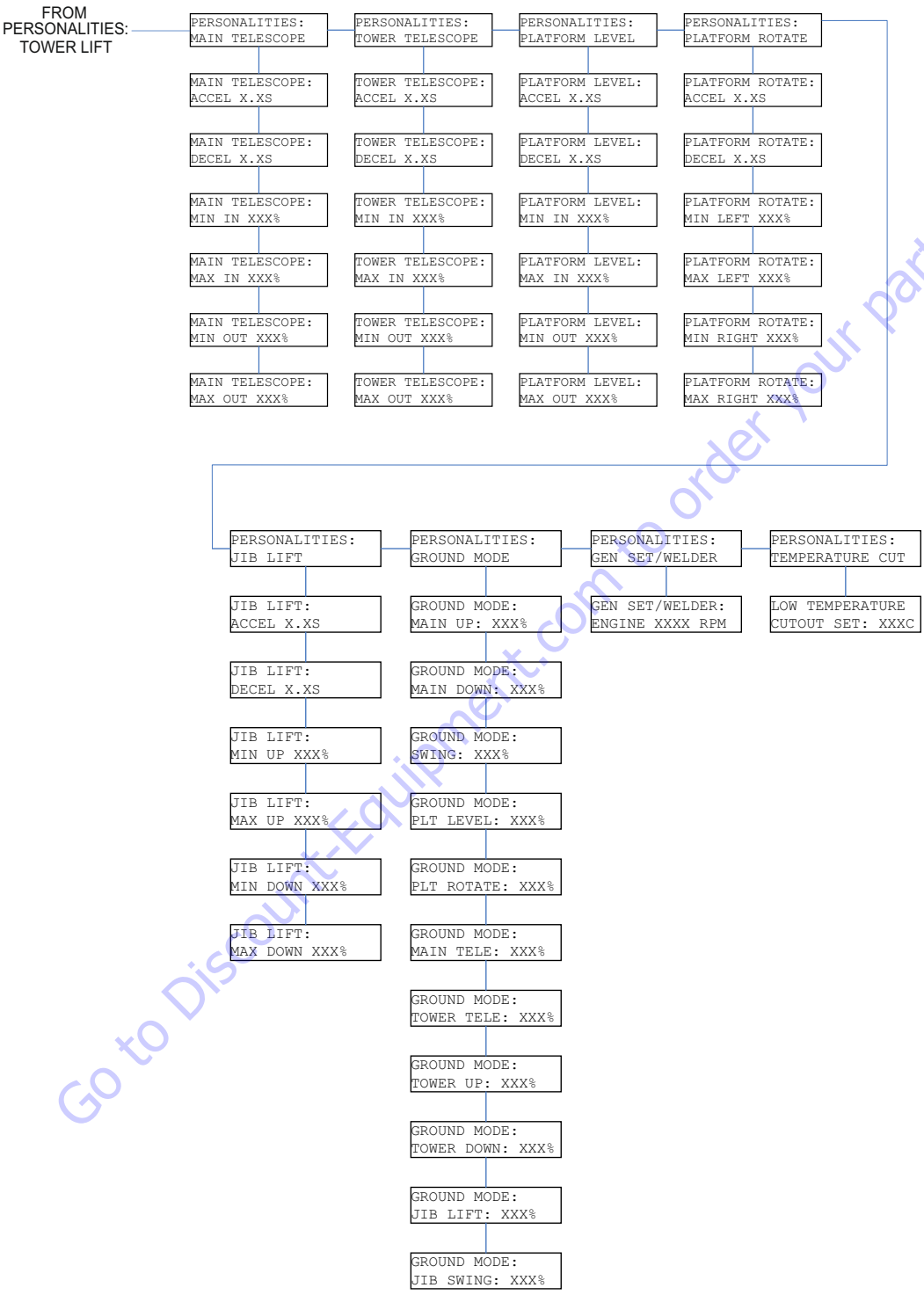
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-13. Analyzer Flow Chart Version 6.X Software - Sheet 3 of 8



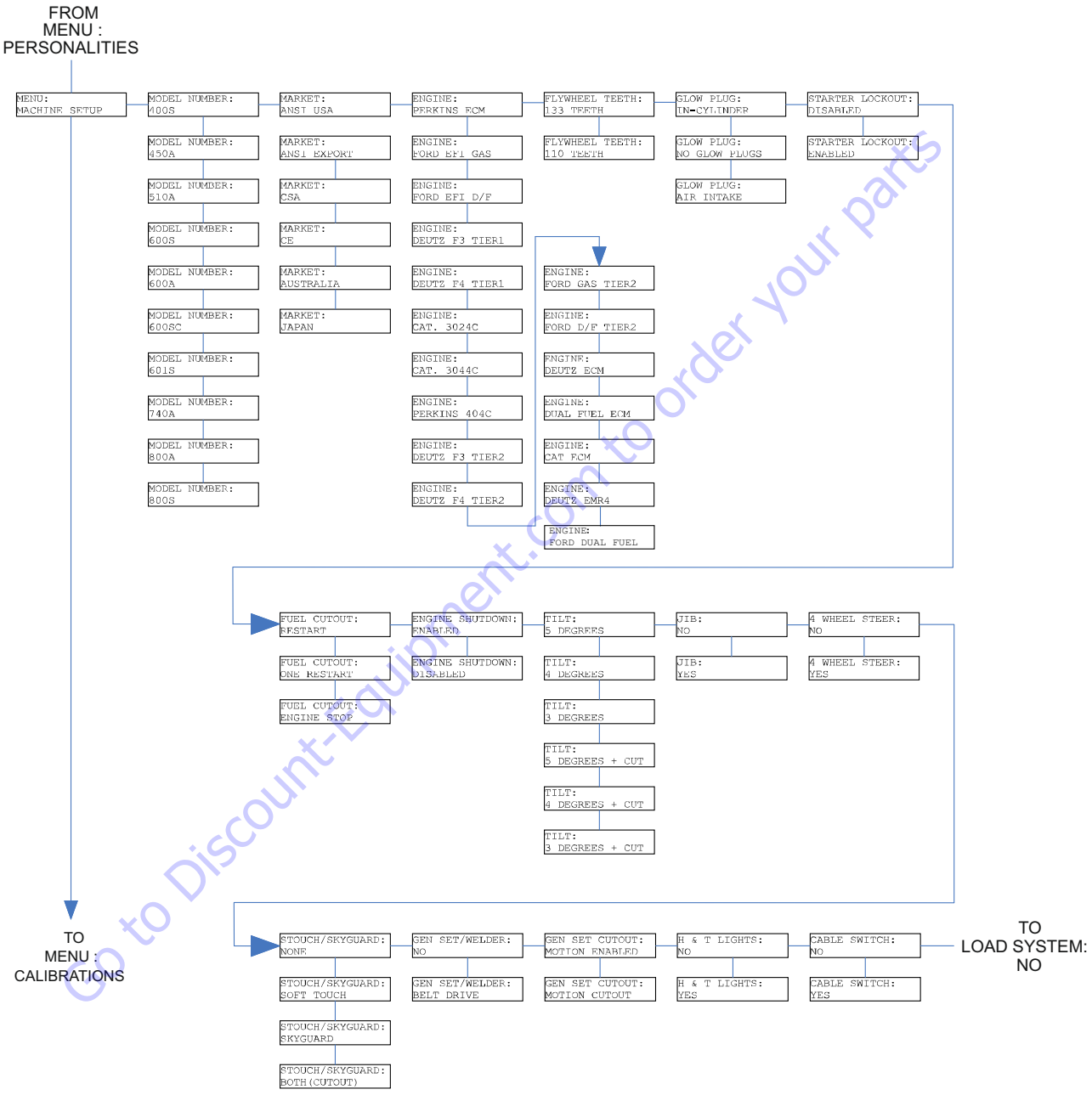
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-14. Analyzer Flow Chart Version 6.X Software - Sheet 4 of 8



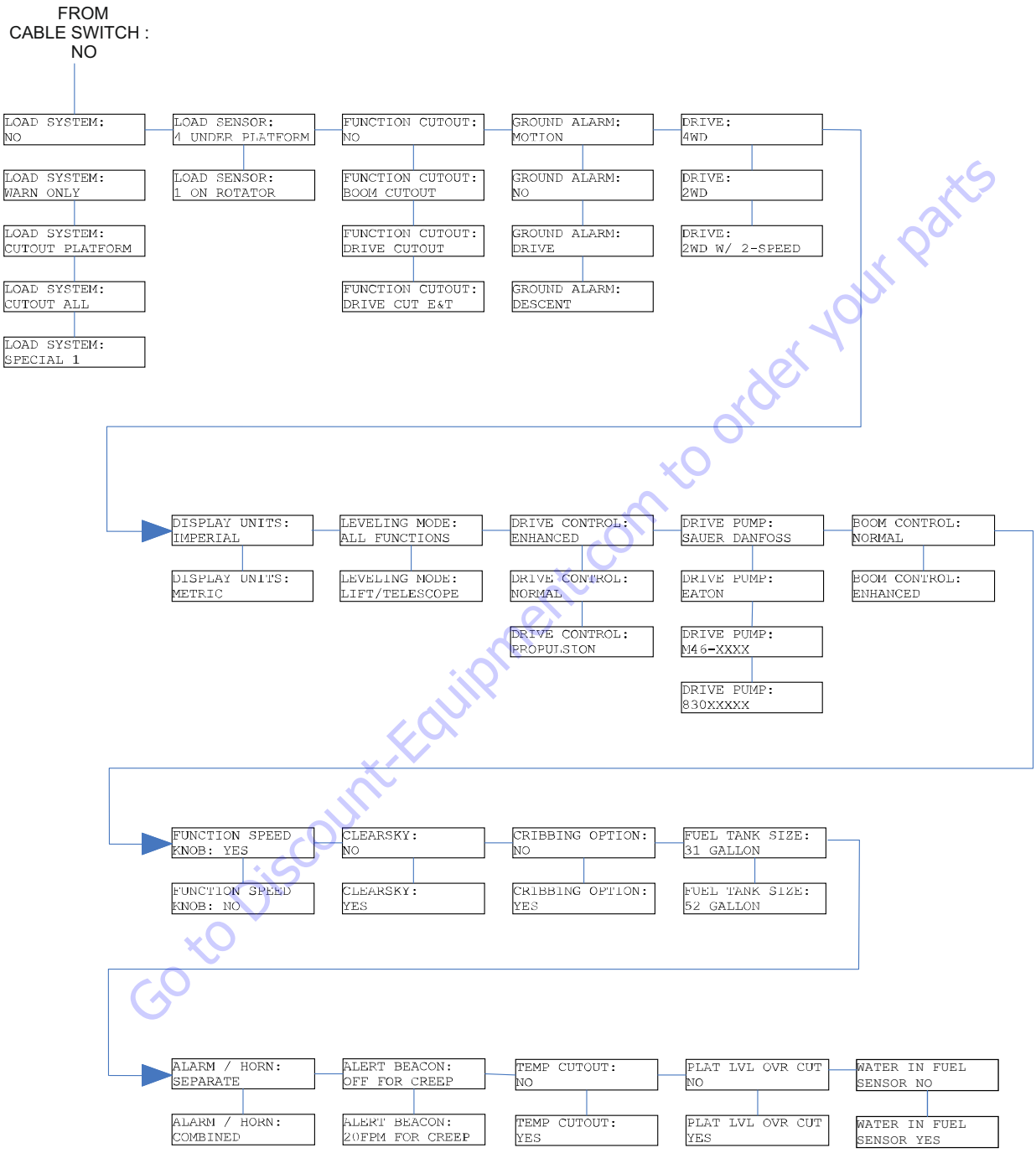
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-15. Analyzer Flow Chart Version 6.X Software - Sheet 5 of 8



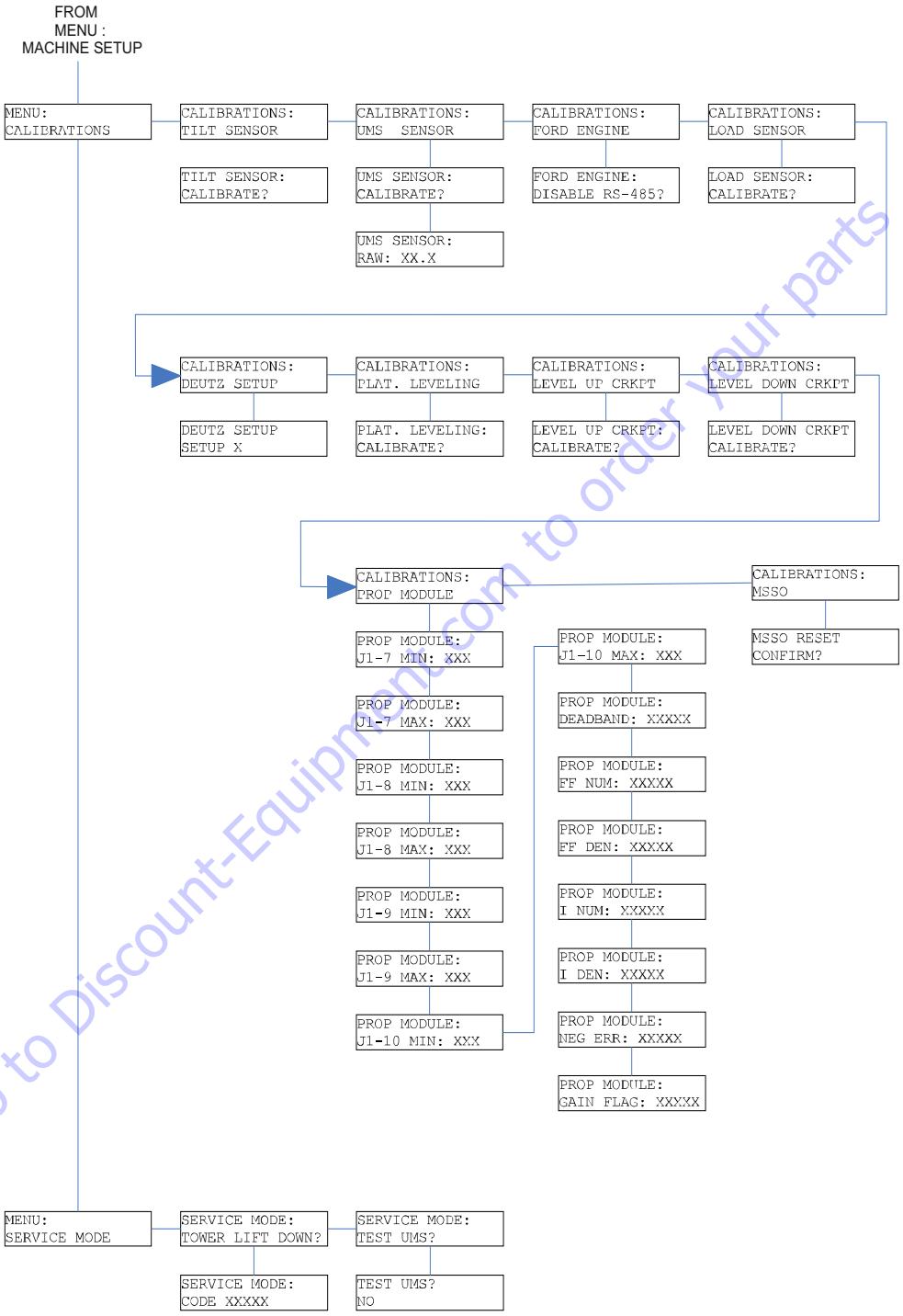
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-16. Analyzer Flow Chart Version 6.X Software - Sheet 6 of 8



NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-17. Analyzer Flow Chart Version 6.X Software - Sheet 7 of 8



NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.*

Figure 6-18. Analyzer Flow Chart Version 6.X Software - Sheet 8 of 8

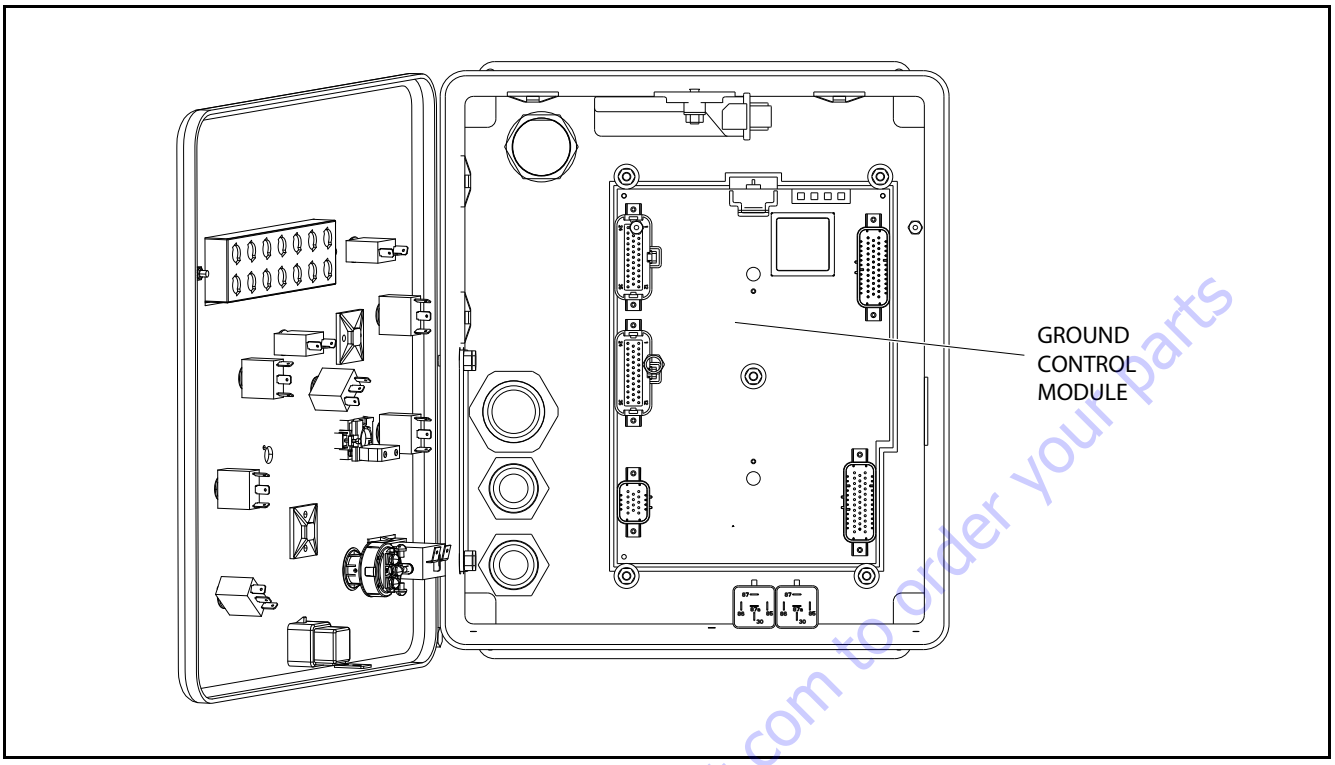


Figure 6-19. Ground Control Module Location (Prior to SN 0300139070)

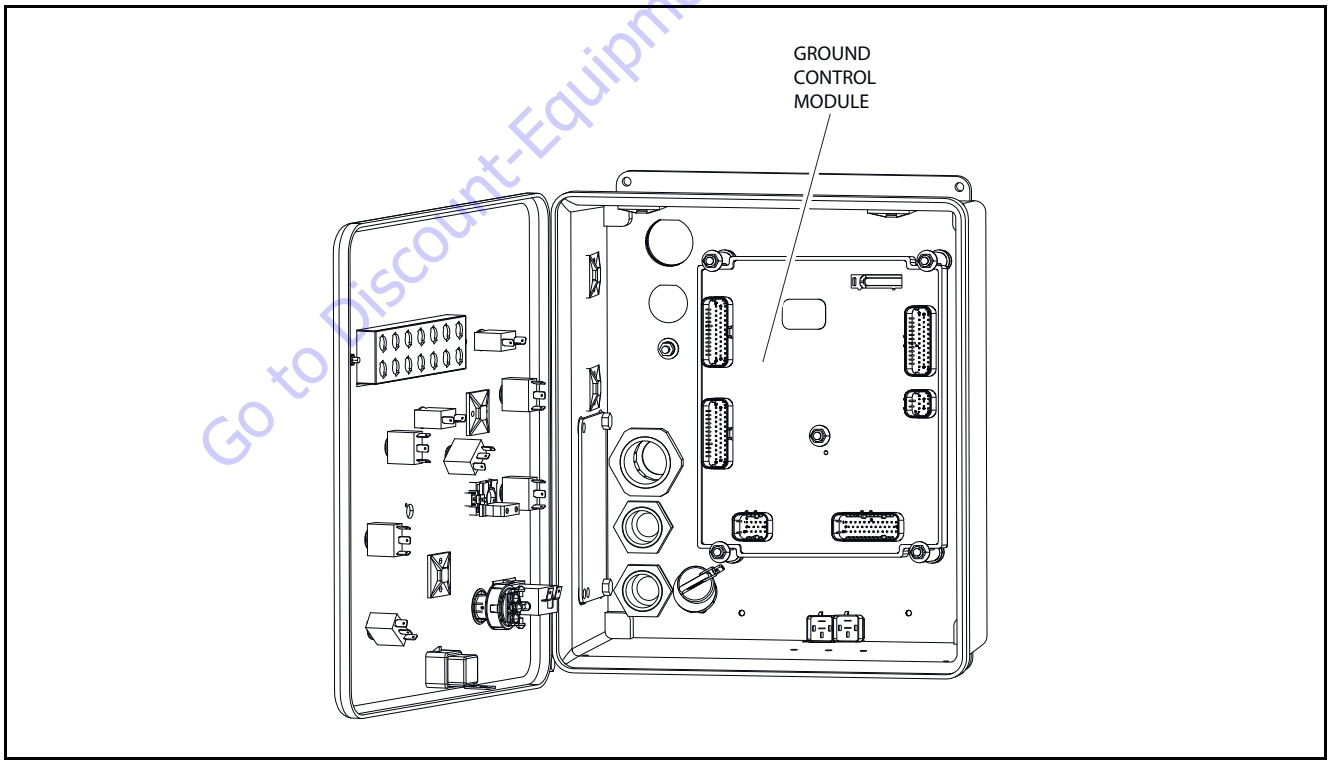


Figure 6-20. Ground Control Module Location (SN 0300139070 through 0300185827)

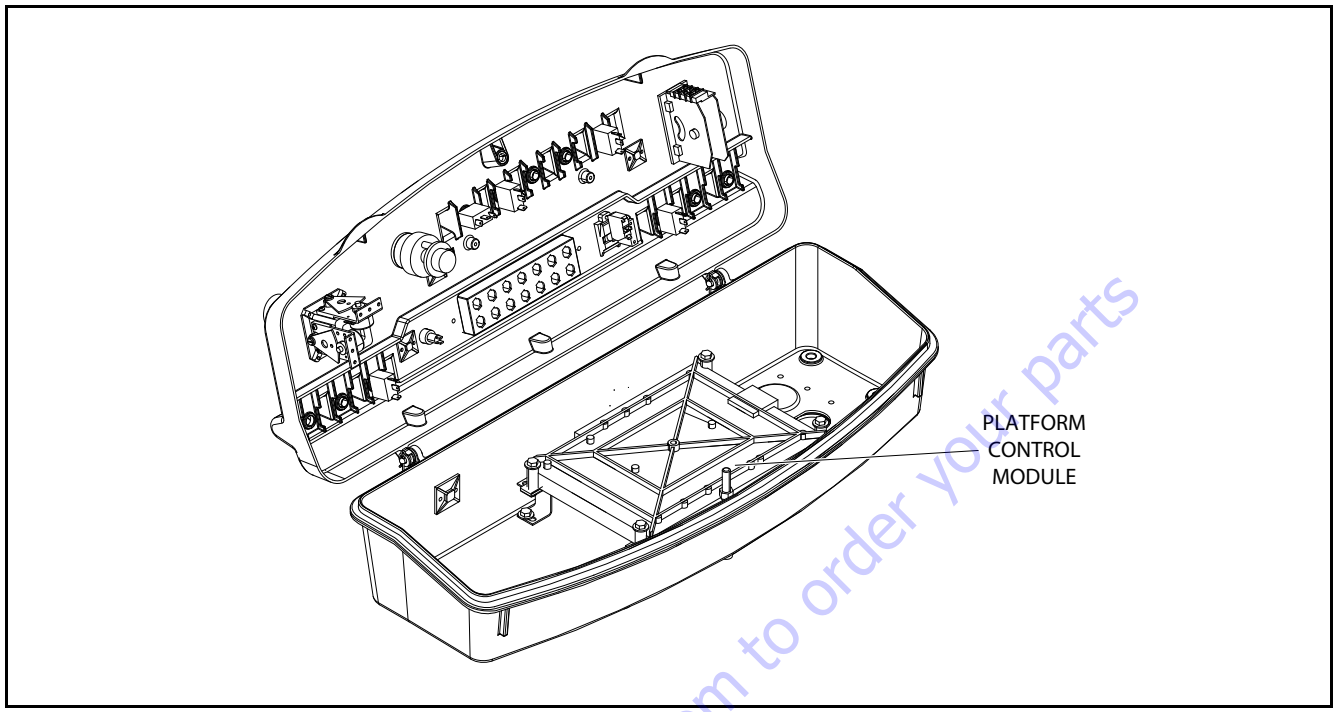


Figure 6-21. Platform Control Module Location (Prior to SN 0300138447)

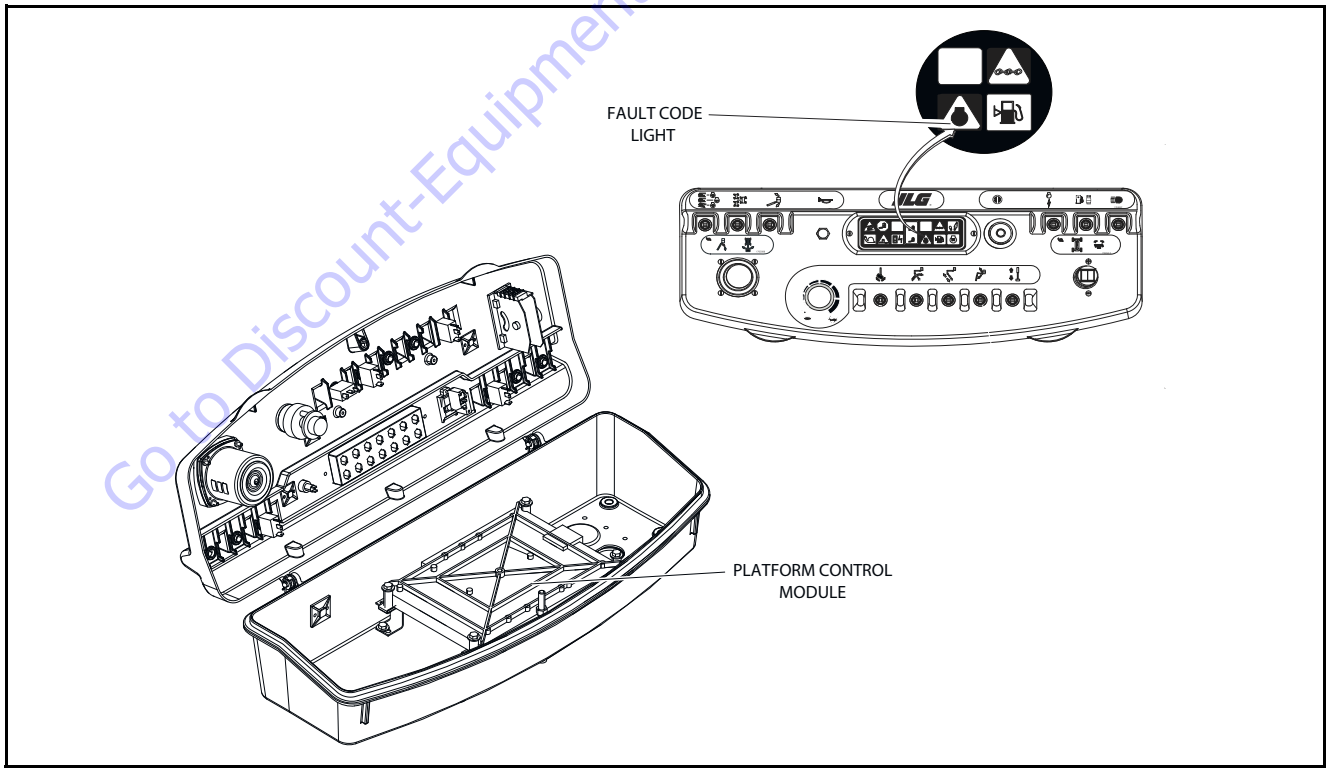
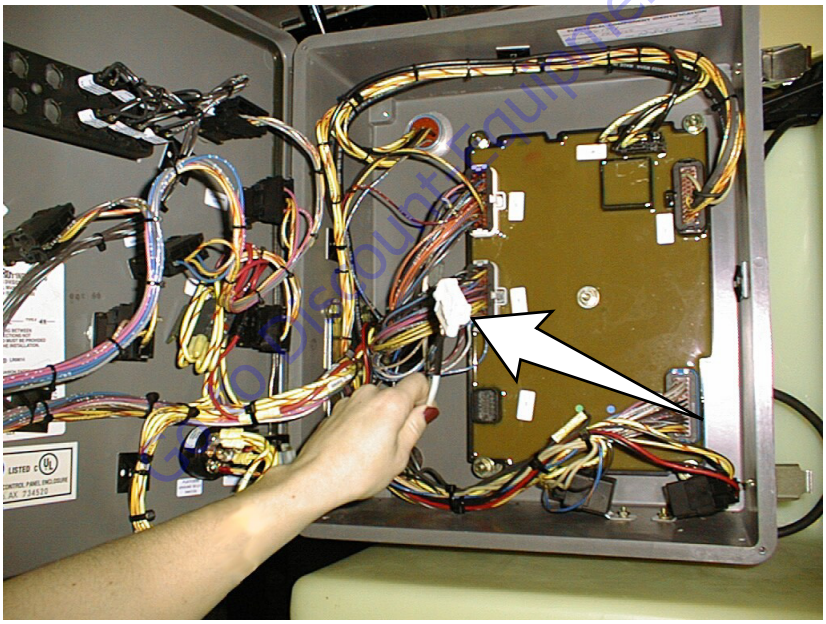


Figure 6-22. Platform Control Module Location (SN 0300138447 through 0300185827)

PLATFORM CONNECTION



GROUND CONTROL CONNECTION

Figure 6-23. Analyzer Connecting Points

Table 6-2. Machine Configuration Programming Information Prior to Software Version P5.3

Configuration Digit	Number	Description	Default Number
MODEL NUMBER: 1	**1** 2 3 4 5 6 7 8 9 10	**400S** 450A 510A 600S 600A 600SC 601S 740A 800A 800S	**1**
MARKET: 2	**0** 1 2 3 4 5	**ANSI USA** ANSI EXPORT CSA CE AUSTRALIA JAPAN	**0**
ENGINE: 3* *Engine selections vary depending on model selection.	1 2 3 4 5 6 7 8 9 10 **11**	FORD EFI GAS: Ford LRG425 EFI Gas (Tier 1) FORD EFI D/F: Ford LRG425 EFI dual fuel (Tier 1) DEUTZ F4 TIER1: Deutz F4M1011F Diesel (Tier 1) DEUTZ F3 TIER1: Deutz F3M1011F Diesel (Tier 1) CAT. 3024C: CAT 3024C Diesel (Tier 2) CAT. 3044C: CAT 3044C Diesel (Tier 2) DEUTZ F4 TIER2: Deutz F4M2011 Diesel (Tier 2) DEUTZ F3 TIER2: Deutz F3M2011 Diesel (Tier 2) FORD GAS TIER2: Ford LRG425 EFI Gas (Tier 2) FORD D/F TIER2: Ford LRG425 EFI Dual Fuel (Tier 2) **DEUTZ ECM: Engine Control Module - ECM**	**11**
FLYWHEEL TEETH: 4* *This menu item is only visible if Deutz engine selections 3 or 4 are selected.	0 **1**	133 TEETH: 133 flywheel teeth. **110 TEETH: 110 flywheel teeth.**	**1**

Table 6-2. Machine Configuration Programming Information Prior to Software Version P5.3

Configuration Digit	Number	Description	Default Number
GLOW PLUG: 5	0 **1** 2	NO GLOW PLUGS: No glow plugs installed. **W/O STARTER LOCK: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.** W/ STARTER LOCK: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	**1**
ENGINE SHUTDOWN: 6	0 **1**	DISABLED: No engine shutdown. **ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or the oil pressure is less than 8 psi.**	**1**
TILT: 7* *Certain market selections will limit tilt options.	**1** 2 3 4 5	**5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep.** 4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep. 3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep. 4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. *Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.*	**1**
JIB: 8* *Only visible under certain model selections	**0** 1	**NO: No jib installed.** YES: Jib installed which has up and down movements only.	**0**
4 WHEEL STEER: 9* *Only visible under certain model selections.	**0** 1	**NO: No four-wheel steer installed.** YES: Four-wheel steer installed.	**0**
SOFT TOUCH: 10* *Only visible under certain model selections.	**0** 1	**NO: No soft touch system installed.** YES: Soft touch system installed.	**0**
GEN SET/WELDER: 11	**0** 1	**NO: No generator installed.** BELT DRIVE: Belt driven setup.	**0**

Table 6-2. Machine Configuration Programming Information Prior to Software Version P5.3

Configuration Digit	Number	Description	Default Number
GEN SET CUTOUT: 12* *Only visible if Gen Set / Welder Menu selection is not 0.	**0** 1	**MOTION ENABLED: Motion enabled when generator is ON.** MOTION CUTOUT: Motion cutout in platform mode only.	**0**
H & T LIGHTS: 13	**0** 1	**NO: No head and tail lights installed.** YES: Head and tail lights installed.	**0**
CABLE SWITCH: 14* *Only visible under certain model selections. *Certain market and model selections will alter the default setting.	**0** 1	**NO: No broken cable switch installed.** YES: Broken cable switch installed.	**0**
LOAD SYSTEM: 15* *Only visible under certain model selections. *Certain market selections will limit load system options or alter default setting.	**0** 1 2 3 4	**NO: No load sensor installed.** WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF). SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	**0**
LOAD SENSOR: 16* *Only visible if Load Sensor Menu selection is not 0. *Market selections will limit certain load sensor options.	0 **1**	1 ON ROTATOR: Use the on-board load sensor for all models except those which use the Leveling Platform Module. **4 UNDER PLATFORM: Use the EIM for load sensing.**	**1**
FUNCTION CUTOUT: 17* *Only visible under certain market selections. *Certain market selections will limit function cutout options or alter default setting.	**0** 1 2 3	**NO: No drive cutout.** BOOM CUTOUT: Boom function cutout while driving above elevation. DRIVE CUTOUT: Drive cutout above elevation. DRIVE CUT E&T: Drive cutout above elevation and tilted.	**0**
GROUND ALARM: 18* *Certain market selections will alter default setting.	**0** 1 2 3	**NO: No ground alarm installed.** DRIVE: Travel alarm sounds when the drive function is active (Option). DESCENT: Descent alarm sounds when lift down is active (Option). MOTION: Motion alarm sounds when any function is active (Option).	**0**
DRIVE: 19* *Only visible under certain model selections.	**0** 1 2	**4WD: Four wheel drive.** 2WD: Two wheel drive. 2WD W/ 2-SPEED: Two wheel drive with 2-speed valve.	**0**

Table 6-2. Machine Configuration Programming Information Prior to Software Version P5.3

Configuration Digit	Number	Description	Default Number
TEMPERATURE: 20	0	CELSIUS: Celsius unit selection.	**1**
	1	**FAHRENHEIT: Fahrenheit unit selection.**	
LEVELING MODE: 21* * Only visible on 800S models.	**0**	**ALL FUNCTIONS: Platform level with all functions.**	**0**
	1	LEVEL LIFT/TELESCOPE: Platform level on lift and telescope only.	

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Table 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

Configuration Label/Digit	Number	Description	Default Number
MODEL NUMBER: 1	**1** 2 3 4 5 6 7 8 9 10	**400S** 450A 510A 600S 600A 600SC 601S 740A 800A 800S	**1**
MARKET: 2	**0** 1 2 3 4 5	**ANSI USA** ANSI EXPORT CSA CE AUSTRALIA JAPAN	**0**

Table 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

Configuration Label/Digit	Number	Description	Default Number
ENGINE: 3* *Engine selections vary depending on model selection.	1	FORD EFI GAS: Ford LRG425 EFI Gas (Tier 1)	**7**
	2	FORD EFI D/F: Ford LRG425 EFI dual fuel (Tier 1)	
	3	DEUTZ F4 TIER1: Deutz F4M1011F Diesel (Tier 1)	
	4	DEUTZ F3 TIER1: Deutz F3M1011F Diesel (Tier 1)	
	5	CAT. 3024C: CAT 3024C Diesel (Tier 2)	
	6	CAT. 3044C: CAT 3044C Diesel (Tier 2)	
	7	**PERKINS 404C (Tier 2)**	
	8	DEUTZ F4 TIER2: Deutz F4M2011 Diesel (Tier 2)	
	9	DEUTZ F3 TIER2: Deutz F3M2011 Diesel (Tier 2)	
	10	FORD GAS TIER2: Ford LRG425 EFI Gas (Tier 2)	
	11	FORD D/F TIER2: Ford LRG425 EFI Dual Fuel (Tier 2)	
	12	DEUTZ ECM: Engine Control Module - ECM	
	13	DUAL FUEL ECM: GM/PSI 3.0L Dual Fuel (Tier 2)	
FLYWHEEL TEETH: 4* *This menu item is only visible if Deutz engine selections 3 or 4 are selected.	0	133 TEETH: 133 flywheel teeth.	**1**
	1	**110 TEETH: 110 flywheel teeth.**	
GLOW PLUG: 5	0	NO GLOW PLUGS: No glow plugs installed.	**2**
	1	AIR INTAKE: Glow plugs installed in the air intake on the manifold.	
	2	**IN-CYLINDER: Glow plugs installed in each cylinder.**	
STARTER LOCKOUT: 6	**0**	**DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.**	**0**
	1	ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	

Table 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

Configuration Label/Digit	Number	Description	Default Number
ENGINE SHUTDOWN: 7	0 **1**	DISABLED: No engine shutdown. **ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or the oil pressure is less than 8 PSI.**	**1**
TILT: 8* *Certain market selections will limit tilt options and alter default setting. *Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.*	**1** 2 3 4 5	**5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep.** 4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep. 3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep. 4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up.	**1**
JIB: 9* *Only visible under certain model selections.	**0** 1	**NO: No jib installed.** YES: Jib installed which has up and down movements only.	**0**
4 WHEEL STEER: 10* *Only visible under certain model selections.	**0** 1	**NO: No four-wheel steer installed.** YES: Four-wheel steer installed.	**0**
SOFT TOUCH: 11* *Only visible under certain model selections.	**0** 1	**NO: No soft touch system installed.** YES: Soft touch system installed.	**0**
GEN SET/WELDER: 12	**0** 1	**NO: No generator installed.** BELT DRIVE: Belt driven setup.	**0**
GEN SET CUTOUT: 13* *Only visible if Gen Set / Welder Menu selection is not 0.	**0** 1	**MOTION ENABLED: Motion enabled when generator is ON.** MOTION CUTOUT: Motion cutout in platform mode only.	**0**

Table 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

Configuration Label/Digit	Number	Description	Default Number
H&T LIGHTS: 14	**0** 1	**NO: No head and tail lights installed.** YES: Head and tail lights installed.	**0**
CABLE SWITCH: 15* *Only visible under certain model selections. *Certain market and model selections will alter the default setting.	**0** 1	**NO: No broken cable switch installed.** YES: Broken cable switch installed.	**0**
LOAD SYSTEM: 16* *Only visible under certain market selections. *Certain market selections will limit load system options or alter default setting.	**0** 1 2 3 4	**NO: No load sensor installed.** WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF). SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	**0**
LOAD SENSOR: 17* *Only visible if Load Sensor Menu selection is not 0 and under certain market selections. *Certain market selections will limit load sensor options.	0 **1**	1 ON ROTATOR: Use the on-board load sensor for all models except those which use the Leveling Platform Module. **4 UNDER PLATFORM: Use the EIM for load sensing.**	**1**
FUNCTION CUTOUT: 18* *Only visible under certain market selections. *Certain market selections will limit function cutout options or alter default setting.	**0** 1 2 3	**NO: No drive cutout.** BOOM CUTOUT: Boom function cutout while driving above elevation. DRIVE CUTOUT: Drive & steer cutout above elevation. DRIVE CUT E&T: Drive & steer cutout above elevation and tilted.	**0**

Table 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

Configuration Label/Digit	Number	Description	Default Number
GROUND ALARM: 19* *Certain market selections will alter default setting.	0 1 2 **3**	NO: No ground alarm installed. DRIVE: Travel alarm sounds when the drive function is active (Option). DESCENT: Descent alarm sounds when lift down is active (Option). **MOTION: Motion alarm sounds when any function is active (Option).**	**3**
DRIVE: 20* *Only visible under certain model selections.	**0** 1 2	**4WD: Four wheel drive.** 2WD: Two wheel drive. 2WD W/ 2-SPEED: Two wheel drive with 2-speed valve.	**0**
TEMPERATURE: 21* *Certain market selections will alter default setting.	0 **1**	CELSIUS: Celsius unit selection. **FAHRENHEIT: Fahrenheit unit selection.**	**1**
LEVELING MODE: 22* *Only visible on 800S models.	**0** 1	**ALL FUNCTIONS: Platform level with all functions.** LEVEL LIFT/TELESCOPE: Platform level on lift and telescope only.	**0**

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Table 6-4. Machine Configuration Programming Information Software Version P6.1 to Present

Configuration Label/Digit	Number	Description	Default Number
MODEL NUMBER: 1	1	400S	1
	2	450A	
	3	510A	
	4	600S	
	5	600A	
	6	600SC	
	7	601S	
	8	740A	
	9	800A	
	10	800S	
MARKET: 2	0	ANSI USA	0
	1	ANSI EXPORT	
	2	CSA	
	3	CE	
	4	AUSTRALIA	
	5	JAPAN	

Table 6-4. Machine Configuration Programming Information Software Version P6.1 to Present

Configuration Label/Digit	Number	Description	Default Number
ENGINE: 3* *Engine selections vary depending on model selection.	1	FORD EFI GAS: Ford LRG425 EFI Gas (Tier 1)	14
	2	FORD EFI D/F: Ford LRG425 EFI dual fuel (Tier 1)	
	3	DEUTZ F4 TIER1: Deutz F4M1011F Diesel (Tier 1)	
	4	DEUTZ F3 TIER1: Deutz F3M1011F Diesel (Tier 1)	
	5	CAT. 3024C: CAT 3024C Diesel (Tier 2)	
	6	CAT. 3044C: CAT 3044C Diesel (Tier 2)	
	7	PERKINS 404C (Tier 2)	
	8	DEUTZ F4 TIER2: Deutz F4M2011 Diesel (Tier 2)	
	9	DEUTZ F3 TIER2: Deutz F3M2011 Diesel (Tier 2)	
	10	FORD GAS TIER2: Ford LRG425 EFI Gas (Tier 2)	
	11	FORD D/F TIER2: Ford LRG425 EFI Dual Fuel (Tier 2)	
	12	DEUTZ ECM: Engine Control Module - ECM (Tier 2 and Tier 3)	
	13	DUAL FUEL ECM: GM/PSI 3.0L Dual Fuel (Tier 2)	
	14	PERKINS ECM	
	15	CAT ECM	
FLYWHEEL TEETH: 4* *This menu item is only visible if Deutz engine selections 3 or 4 are selected.	0	133 TEETH: 133 flywheel teeth.	1
	1	110 TEETH: 110 flywheel teeth.	
GLOW PLUG: 5	0	NO GLOW PLUGS: No glow plugs installed.	2
	1	AIR INTAKE: Glow plugs installed in the air intake on the manifold.	
	2	IN-CYLINDER: Glow plugs installed in each cylinder.	
STARTER LOCKOUT: 6	0	DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.	0
	1	ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	

Table 6-4. Machine Configuration Programming Information Software Version P6.1 to Present

Configuration Label/Digit	Number	Description	Default Number
ENGINE SHUTDOWN: 7	0 1	DISABLED: No engine shutdown. ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or the oil pressure is less than 8 PSI.	1
TILT: 8* *Certain market selections will limit tilt options and alter default setting. *Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.*	1 2 3 4 5	5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep. 4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep. 3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep. 4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up.	1
JIB: 9* *Only visible under certain model selections.	0 1	NO: No jib installed. YES: Jib installed which has up and down movements only.	0
4 WHEEL STEER: 10* *Only visible under certain model selections.	0 1	NO: No four-wheel steer installed. YES: Four-wheel steer installed.	0
SOFT TOUCH: 11* *Only visible under certain model selections.	0 1	NO: No soft touch system installed. YES: Soft touch system installed.	0
GEN SET/WELDER: 12	0 1	NO: No generator installed. BELT DRIVE: Belt driven setup.	0
GEN SET CUTOUT: 13* *Only visible if Gen Set / Welder Menu selection is not 0.	0 1	MOTION ENABLED: Motion enabled when generator is ON. MOTION CUTOUT: Motion cutout in platform mode only.	0

Table 6-4. Machine Configuration Programming Information Software Version P6.1 to Present

Configuration Label/Digit	Number	Description	Default Number
H & T LIGHTS: 14	0 1	NO: No head and tail lights installed. YES: Head and tail lights installed.	0
CABLE SWITCH: 15* *Only visible under certain model selections. *Certain market and model selections will alter the default setting.	0 1	NO: No broken cable switch installed. YES: Broken cable switch installed.	0
LOAD SYSTEM: 16* *Only visible under certain market selections. *Certain market selections will limit load system options or alter default setting.	0 1 2 3 4	NO: No load sensor installed. WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF). SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	0
LOAD SENSOR: 17* *Only visible if Load Sensor Menu selection is not 0 and under certain market selections. *Certain market selections will limit load sensor options.	0 1	1 ON ROTATOR: Use the on-board load sensor for all models except those which use the Leveling Platform Module. 4 UNDER PLATFORM: Use the EIM for load sensing.	1
FUNCTION CUTOUT: 18* *Only visible under certain market selections. *Certain market selections will limit function cutout options or alter default setting.	0 1 2 3	NO: No drive cutout. BOOM CUTOUT: Boom function cutout while driving above elevation. DRIVE CUTOUT: Drive & steer cutout above elevation. DRIVE CUT E&T: Drive & steer cutout above elevation and tilted.	0

Table 6-4. Machine Configuration Programming Information Software Version P6.1 to Present

Configuration Label/Digit	Number	Description	Default Number
GROUND ALARM: 19* *Certain market selections will alter default setting.	0 1 2 3	NO: No ground alarm installed. DRIVE: Travel alarm sounds when the drive function is active (Option). DESCENT: Descent alarm sounds when lift down is active (Option). MOTION: Motion alarm sounds when any function is active (Option).	3
DRIVE: 20* *Only visible under certain model selections.	0 1 2	4WD: Four wheel drive. 2WD: Two wheel drive. 2WD W/ 2-SPEED: Two wheel drive with 2-speed valve.	0
TEMPERATURE: 21* *Certain market selections will alter default setting.	0 1	CELSIUS: Celsius unit selection. FAHRENHEIT: Fahrenheit unit selection.	1
LEVELING MODE: 22* *Only visible on 800S models.	0 1	ALL FUNCTIONS: Platform level with all functions. LEVEL LIFT/TELESCOPE: Platform level on lift and telescope only.	0
DRIVE CONTROL: 23	0 1 2	NORMAL: Drive coils are energized from the Ground Module. PROPULSION: Drive coils are energized from the Propulsion Module. ENHANCED: Drive coils are energized from the Ground Module and the ground side of the drive coils are brought back to current feedback returns.	2
CLEARSKY: 24	0 1	NO: Clearsky (telematics) option is disabled. YES: Clearsky (telematics) option is enabled.	0
CRIBBING OPTION: 25	0 1	NO: Cribbing Option is disabled. YES: Cribbing Option is enabled.	0

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Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
NOTE: *For version **6.X software**, some screens may not be available depending upon machine configuration and software versions.* ***NOTE:*** *The machine configuration must be completed before any personality settings can be changed. Changing the personality settings first and then changing the model number of the machine configuration will cause the personality settings to return to default values.*			
MODEL NUMBER: 1	**1** 2 3 4 5 6 7 8 9 10	**400S** 450A 510A 600S 600A 600SC 601S 740A 800A 800S	**1**
MARKET: 2	**0** 1 2 3 4 5 6	**ANSI USA** ANSI EXPORT CSA CE AUSTRALIA JAPAN GB	**0**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
ENGINE: 3* *Engine selections vary depending on model selection.	1	FORD EFI GAS: Ford LRG425 EFI Gas (Tier 1)	**14**
	2	FORD EFI D/F: Ford LRG425 EFI dual fuel (Tier 1)	
	3	DEUTZ F4 TIER1: Deutz F4M1011F Diesel (Tier 1)	
	4	DEUTZ F3 TIER1: Deutz F3M1011F Diesel (Tier 1)	
	5	CAT. 3024C: CAT 3024C Diesel (Tier 2)	
	6	CAT. 3044C: CAT 3044C Diesel (Tier 2)	
	7	PERKINS 404C (Tier 2)	
	8	DEUTZ F4 TIER2: Deutz F4M2011 Diesel (Tier 2)	
	9	DEUTZ F3 TIER2: Deutz F3M2011 Diesel (Tier 2)	
	10	FORD GAS TIER2: Ford LRG425 EFI Gas (Tier 2)	
	11	FORD D/F TIER2: Ford LRG425 EFI Dual Fuel (Tier 2)	
	12	DEUTZ ECM: Engine Control Module - ECM (Tier 2 and Tier 3)	
	13	DUAL FUEL ECM: GM/PSI 3.0L Dual Fuel (Tier 2)	
	14	**PERKINS ECM**	
	15	CAT ECM	
	16	DEUTZ EMR4: Deutz Engine Control Module (Tier 4 Final)	
	17	FORD DUAL FUEL	
FLYWHEEL TEETH: 4* *This menu item is only visible if Deutz engine selections 3 or 4 are selected.	0	133 TEETH: 133 flywheel teeth.	**1**
	1	**110 TEETH: 110 flywheel teeth.**	

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
GLOW PLUG: 5	0 1 **2**	NO GLOW PLUGS: No glow plugs installed. AIR INTAKE: Glow plugs installed in the air intake on the manifold. **IN-CYLINDER: Glow plugs installed in each cylinder.**	**2**
STARTER LOCKOUT: 6	**0** 1	**DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.** ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	**0**
FUEL CUTOUT 7 * This menu item is only visible if non dual fuel engines are selected.	**0** 1 2	**RESTART: Engine allowed to be restarted multiple times when very low fuel level is reached.** ONE RESTART: Engine allowed to be restarted once for 2 minutes when very low fuel level is reached. ENGINE STOP: Engine not able to restart when very low fuel level is reached.	**0**
ENGINE SHUTDOWN: 8	0 **1**	DISABLED: No engine shutdown. **ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or the oil pressure is less than 8 PSI (0.55 bar).**	**1**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
TILT: 9* *Certain market selections will limit tilt options and alter default setting. *Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.*	**1** 2 3 4 5 6 7 8 9	**5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep.** 4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep. 3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep. 4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 5 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up. 5 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise. 4 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise. 3 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	**1**
JIB: 10* *Only visible under certain model selections.	**0** 1	**NO: No jib installed.** YES: Jib installed which has up and down movements only.	**0**
4 WHEEL STEER: 11* *Only visible under certain model selections.	**0** 1	**NO: No four-wheel steer installed.** YES: Four-wheel steer installed.	**0**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
STOUCH / SKYGUARD: 12	**0** 1 2 3	**NONE: No soft touch or skyguard system installed.** SOFT TOUCH - Soft touch only installed. SKYGUARD - Skyguard only installed. BOTH (CUTOUT) - Soft touch and Skyguard installed.	**0**
GEN SET/WELDER: 13	**0** 1	**NO: No generator installed.** BELT DRIVE: Belt driven setup.	**0**
GEN SET CUTOUT: 14* *Only visible if Gen Set / Welder Menu selection is not 0.	**0** 1	**MOTION ENABLED: Motion enabled when generator is ON.** MOTION CUTOUT: Motion cutout in platform mode only.	**0**
H & T LIGHTS: 15	**0** 1	**NO: No head and tail lights installed.** YES: Head and tail lights installed.	**0**
CABLE SWITCH: 16* *Only visible under certain model selections. *Certain market and model selections will alter the default setting.	**0** 1	**NO: No broken cable switch installed.** YES: Broken cable switch installed.	**0**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
LOAD SYSTEM: 17* *Only visible under certain market selections. *Certain market selections will limit load system options or alter default setting. *LOAD SYSTEM will not be visible in CE and defaulted to CUTOUT ALL for machines equipped with MSSO.	**0** 1 2 3 4	**NO: No load sensor installed.** WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF). SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	**0**
LOAD SENSOR: 18* *Only visible if Load Sensor Menu selection is not 0 and under certain market selections. *Certain market selections will limit load sensor options.	0 **1** 2	1 ON ROTATOR: Use the on-board load sensor for all models except those which use the Leveling Platform Module. **4 UNDER PLATFORM: Use the EIM for load sensing.** SINGLE CELL: Single Cell, CANbus based sensor.	**1**
FUNCTION CUTOUT: 19* *Only visible under certain market selections. *Certain market selections will limit function cutout options or alter default setting.	**0** 1 2 3	**NO: No drive cutout.** BOOM CUTOUT: Boom function cutout while driving above elevation. DRIVE CUTOUT: Drive & steer cutout above elevation. DRIVE CUT E&T: Drive & steer cutout above elevation and tilted.	**0**
GROUND ALARM: 20* *Certain market selections will alter default setting.	0 1 2 **3**	NO: No ground alarm installed. DRIVE: Travel alarm sounds when the drive function is active (Option). DESCENT: Descent alarm sounds when lift down is active (Option). **MOTION: Motion alarm sounds when any function is active (Option).**	**3**
DRIVE: 21* *Only visible under certain model selections.	**0** 1 2	**4WD: Four wheel drive.** 2WD: Two wheel drive. 2WD W/ 2-SPEED: Two wheel drive with 2-speed valve.	**0**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
DISPLAY UNITS: 22* *Certain market selections will alter default setting.	**0** 1	**IMPERIAL: DEG F, PSI, LBS.** METRIC: DEG C, KPA, KGS	**0**
LEVELING MODE: 23* *Only visible on 800S models.	**0** 1	**ALL FUNCTIONS: Platform level with all functions.** LEVEL LIFT/TELESCOPE: Platform level on lift and telescope only.	**0**
DRIVE CONTROL: 24	0 1 **2**	NORMAL: Drive coils are energized from the Ground Module. PROPULSION: Drive coils are energized from the Propulsion Module. **ENHANCED: Drive coils are energized from the Ground Module and the ground side of the drive coils are brought back to current feedback returns.**	**2**
DRIVE PUMP 25* *Only visible on 600A, 600S, and 800S models.	**0** 1 2 3	**SAUER DANFOSS: Machine equipped with Sauer Danfoss drive pump** EATON: Machine equipped with Eaton drive pump. M46 - XXXX: Machine equipped with M46 - XXXX drive pump. 830XXXXX: Machine equipped with 830XXXXX: drive pump.	**0**
BOOM CONTROL: 26	**0** 1	**NORMAL: Boom function coils are energized from the Ground Module.** ENHANCED: Boom function are energized from the Ground Module and the ground side of the drive coils and brought back to current feedback returns.	**0**
FUNCTION SPEED KNOB: 27	**0** 1	**YES: Machine is equipped with Function Speed Knob.** NO: Machine is equipped with Operation Speed Switch.	**0**
CLEARSKY: 28	**0** 1	**NO: Clearsky (telematics) option is disabled.** YES: Clearsky (telematics) option is enabled.	**0**
CRIBBING OPTION: 29	**0** 1	**NO: Cribbing Option is disabled.** YES: Cribbing Option is enabled.	**0**

Table 6-5. Machine Configuration Programming Information

Configuration Digit	Number	Description	Default Number
FUEL TANK SIZE: 30	**0** 1	**31 Gallon Tank** 52 Gallon Tank	**0**
ALARM / HORN: 31	**0** 1	**SEPERATE: Separate alarm and horn.** COMBINED: Combination alarm / horn.	**0**
ALERT / BEACON: 32	**0** 1	**OFF FOR CREEP: Alert beacon will not flash while in Creep.** 20 FPS FOR CREEP: Alert beacon will flash at 20 FPS while in Creep.	**0**
TEMP CUTOUT: 33	**0** 1	**NO: Temp Cutout is Disabled** YES: Temp Cutout is Enabled	**0**
PLAT LVL OVR CUT: 34	**0** 1	**NO: Platform Level Override will always be functional.** YES: Platform Level Override will only be functional when In Transport.	**0**
WATER IN FUEL SENSOR: 35* *This menu item is only visible if Deutz EMR 4 engine is selected. *Only visible under certain market selections.	**0** 1	**NO: Water in Fuel Sensor Disabled.** YES: Water in Fuel Sensor Enabled.	**0**

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Table 6-6. Machine Configuration Programming Settings

740 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	8	8	8	8	8	8
Market	0	1	2	3	4	5
Engine	12	12	12	12	12	12
Flywheel Teeth	0	0	0	0	0	0
	1	1	1	1	1	1
Glow Plugs	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Starter Lockout	0	0	0	0	0	0
	1	1	1	1	1	1
Fuel Cutout	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Engine Shutdown	0	0	0	0	0	0
	1	1	1	1	1	1
Tilt	1	1	1	X	X	1
	2	2	2	X	X	2
	3	3	3	X	3	3
	4	4	4	X	X	4
	5	5	5	5	5	5
	6	6	6	X	X	6
	7	7	7	X	X	7
	8	8	8	X	X	8
	9	9	9	9	9	9
Jib	1	1	1	1	1	1
4 Wheel Steer	1	1	1	1	1	1
Soft Touch/Sky-guard	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
Gen Set / Welder	0	0	0	0	0	0
	1	1	1	1	1	1
Gen Set Cutout	0	0	0	0	0	0
	1	1	1	1	1	1
Head & Taillights	0	0	0	0	0	0
	1	1	1	1	1	1
Cable Break Switch	0	0	0	0	0	0
	1	1	1	1	1	1
Load System	0	0	0	0	0	0
	X	1	X	X	X	1
	X	2	X	2	2	2
	X	3	X	3	X	3
	X	4	X	X	X	4

Table 6-6. Machine Configuration Programming Settings

740 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Load Sensor	0	0	0	0	0	0
	1	1	1	1	1	1
	X	2	X	2	2	2
Function Cutout	0	0	0	0	0	0
	X	1	1	1	1	1
	2	2	2	X	2	2
	X	3	3	X	3	3
Ground Alarm	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
Drive Type	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Display Units	0	0	0	0	0	0
	1	1	1	1	1	1
Leveling Mode	0	0	0	0	0	0
	1	1	1	1	1	1
Drive Control	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Drive Pump	0	0	0	0	0	0
	1	1	1	1	1	1
	X	X	X	X	X	X
	X	X	X	X	X	X
Boom Control	0	0	0	0	0	0
	1	1	1	1	1	1
Function Speed Knob	0	0	0	0	0	0
	1	1	1	1	1	1
Clearsky	0	0	0	0	0	0
	1	1	1	1	1	1
Cribbing Option	0	0	0	0	0	0
	1	1	1	1	1	1
Fuel Tank Size	0	0	0	0	0	0
	1	1	1	1	1	1
Alarm / Horn	0	0	0	0	0	0
	1	1	1	1	1	1
Alert Beacon	0	0	0	0	0	0
	1	1	1	1	1	1

Table 6-6. Machine Configuration Programming Settings

740 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Temp Cutout	X	**0**	X	**0**	X	X
	X	1	X	1	X	X
Plat Lvl Ovr Cut	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Water in Fuel Sensor	X	**0**	X	X	X	X
	X	1	X	X	X	X
Dual Capacity	0	**0**	0	**0**	0	**0**
	1	1	**1**	1	**1**	1

BOLD BLUE text indicates the default setting. Plain text indicates another available selection. ***RED ITALIC*** text indicates the default when option is factory installed. SHADED CELLS indicate hidden menu or selection.

6.2 CANBUS COMMUNICATIONS

CANbus: CAN (Control Area Network) is a two wire differential serial link between the Platform Module and Ground Module providing bi-directional communications.

Two-wire: One wire (red) is driven high (5v) and the other low (black) (0v) to send a signal; both wires "float" (2.5v) when no signal is being sent.

Differential: Any electrical line noise can affect the high or the low wires but never both, so communications is not corrupted.

Serial Link: Messages are being sent bit by bit along the wires; the high bus speed allow all modules to be constantly updated around 20 times per second. Typical traffic is 300 - 500 messages per second.

A complete CANbus circuit is approximately 60 ohms, which can be verified at the "T" fitting inside the ground station. Each individual circuit from the modules is approximately 120 ohms.

6.3 MACHINE ORIENTATION WHEN DOING SPEED TESTS

Tower Lift: Upper Boom horizontal, telescoped in. Tower lift up, record time. Tower lift down, record time.

Lift: Tower lift fully elevated, tower telescope fully extended, main telescope fully retracted.

Swing: Boom at full elevation, telescope retracted. Swing the turntable off center and stop. Swing the opposite direction and start the test when the turntable is centered up. This eliminates ramp up and down on the controller affecting times.

Telescope: Boom at full elevation, telescope retracted. Telescope out, record time. Telescope in, record time.

Drive: Test should be done on a smooth, level surface. Drive select switch should be set at high speed. Start approximately 25 feet from starting point so that the unit is at maximum speed when starting the test. Results should be recorded for a 200 foot course. Drive forward, record time. Drive reverse, record time.

Drive (Above Horizontal): Test should be done on a smooth, level surface. Drive select switch should be set at low engine, low drive. The platform speed control knob should be selected to the creep speed. This simulates machine speed when the boom is above horizontal. Results should be recorded for a 50 foot course. Drive forward, record time. Drive in reverse, record time.

Platform Rotate: Platform level and completely rotated one direction. Rotate the opposite direction, record time. Rotate the other direction, record time.

Articulating Jib: Platform level and centered with the boom. Start with jib down. Jib up, record time. Jib down, record time.

Test Notes

1. Stop watch should be started with the function, not with the controller or switch.
2. Drive test results reflect (15 X 19.5 OR 18 X 19.5). Tires on 740AJ is, air or foam filled.
3. All speed tests are run from the platform. These speeds do not reflect ground control operation.
4. The platform speed control knob must be at full speed (turned clockwise completely).
5. Function speeds may vary due to cold thick hydraulic oil. Tests should be run with the oil temperature above 100° F (38° C).
6. Some flow control functions may not work with the speed knob clicked into the creep position.

Table 6-7. Function Speeds (In Seconds)

Function	740AJ Speed Tolerances (Seconds)
Main Lift Up	45-50
Main Lift Down	45-50
Swing Right & Left ***NOTE:*** *Max 10% Difference Between Left & Right*	79-101
Platform Rotate Left & Right ***NOTE:*** *Max 15% Difference Between Left & Right*	19-30
Jib Up	20-30
Jib Down	30-40
Tower Lift Up	57-70
Tower Lift Down	44-53
Drive (2-WD) Forward & Reverse	33-45
Drive (4-WD) Forward & Reverse	33-45
Drive (2 & 4-WD) Horizontal Above elevation forward & reverse (CE)	122 MIN
Drive (2WD) Horizontal above elevation Forward & reverse (ANSI)	61-70
Drive (4WD) Horizontal above elevation Forward & reverse (ANSI)	122 MIN

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