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.

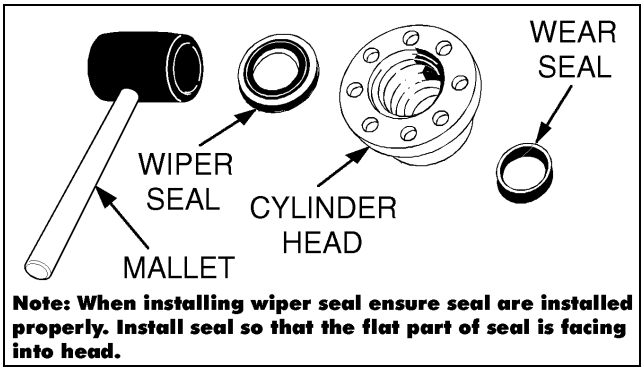


Figure 5-111. Wiper Seal Installation

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

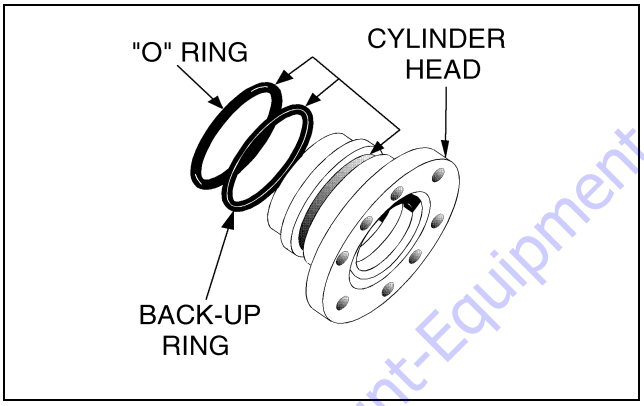


Figure 5-112. Installation Of Head Seal Kit

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

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

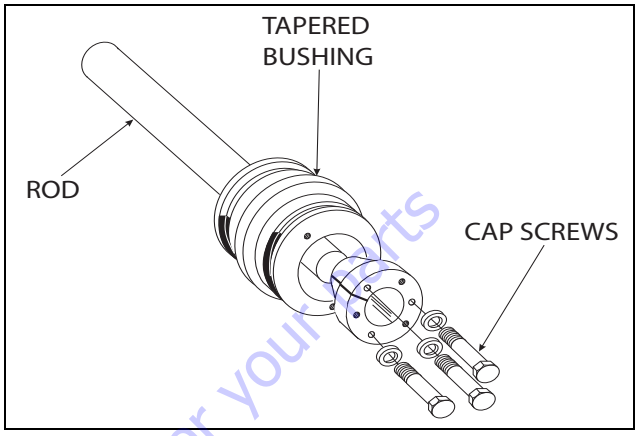


Figure 5-113. Tapered Bushing Installation

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

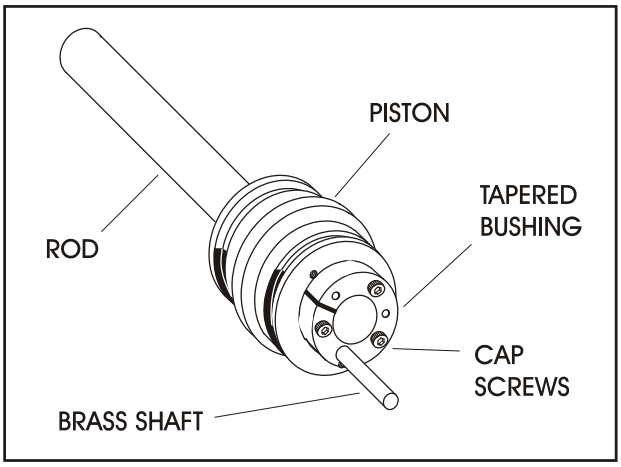


Figure 5-114. Seating the Tapered Bearing

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

12. Remove the cylinder rod from the holding fixture.

NOTICE

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

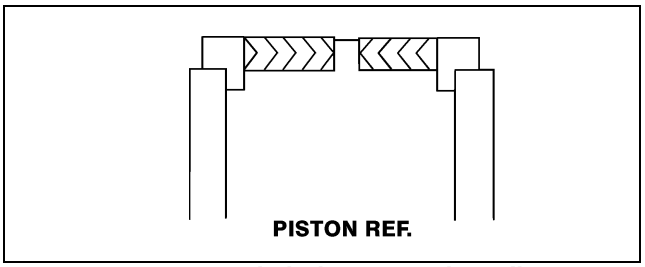


Figure 5-115. Hydrolock Piston Seal Installation

13. Place a new o-ring and back-up rings in the inner piston diameter groove.

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).

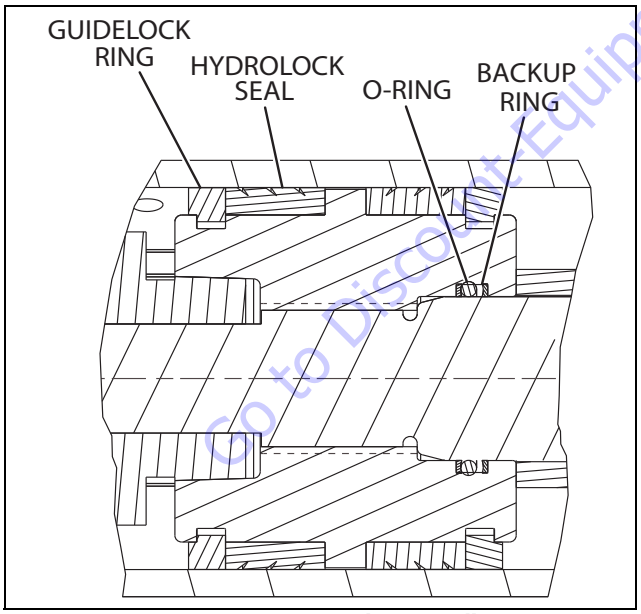


Figure 5-116. Piston Seal Kit Installation

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 o-ring and seal ring 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.

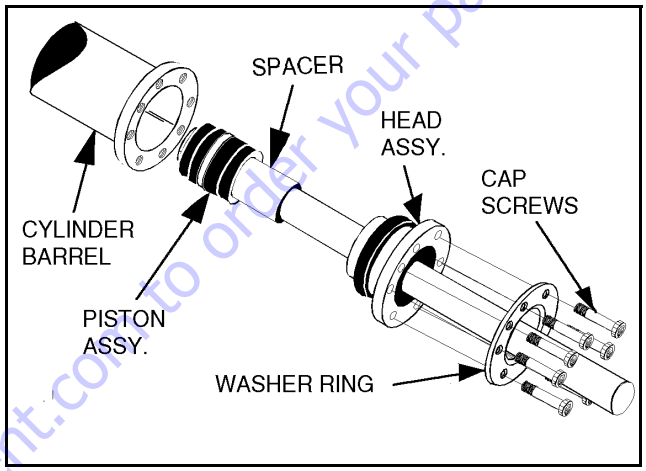


Figure 5-117. Rod Assembly Installation

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 35 ft.lbs. (47 Nm).

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

20. If applicable, install the cartridge-type holding valve and fittings in the rod port block, using new o-rings as applicable.

Steer 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. If applicable, remove the cartridge-type holding valve and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

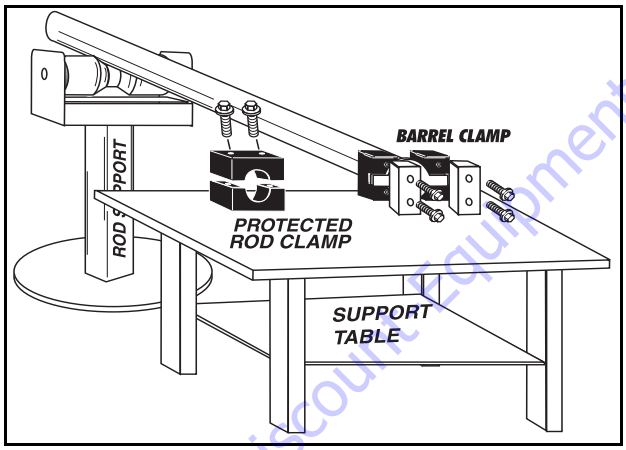


Figure 5-118. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the eight (8) cylinder head retainer capscrews, and remove capscrews from cylinder barrel.

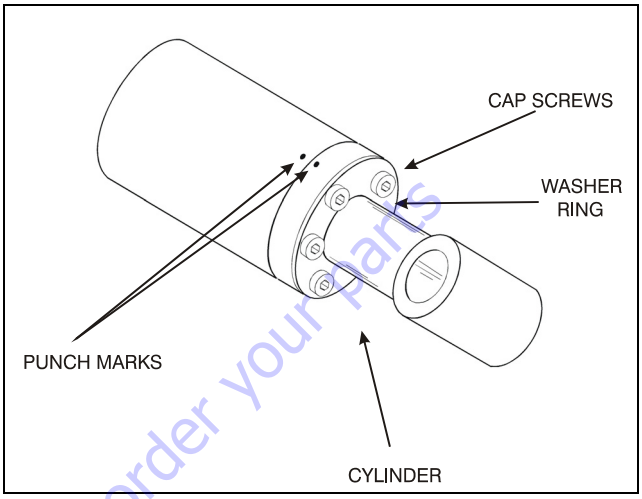
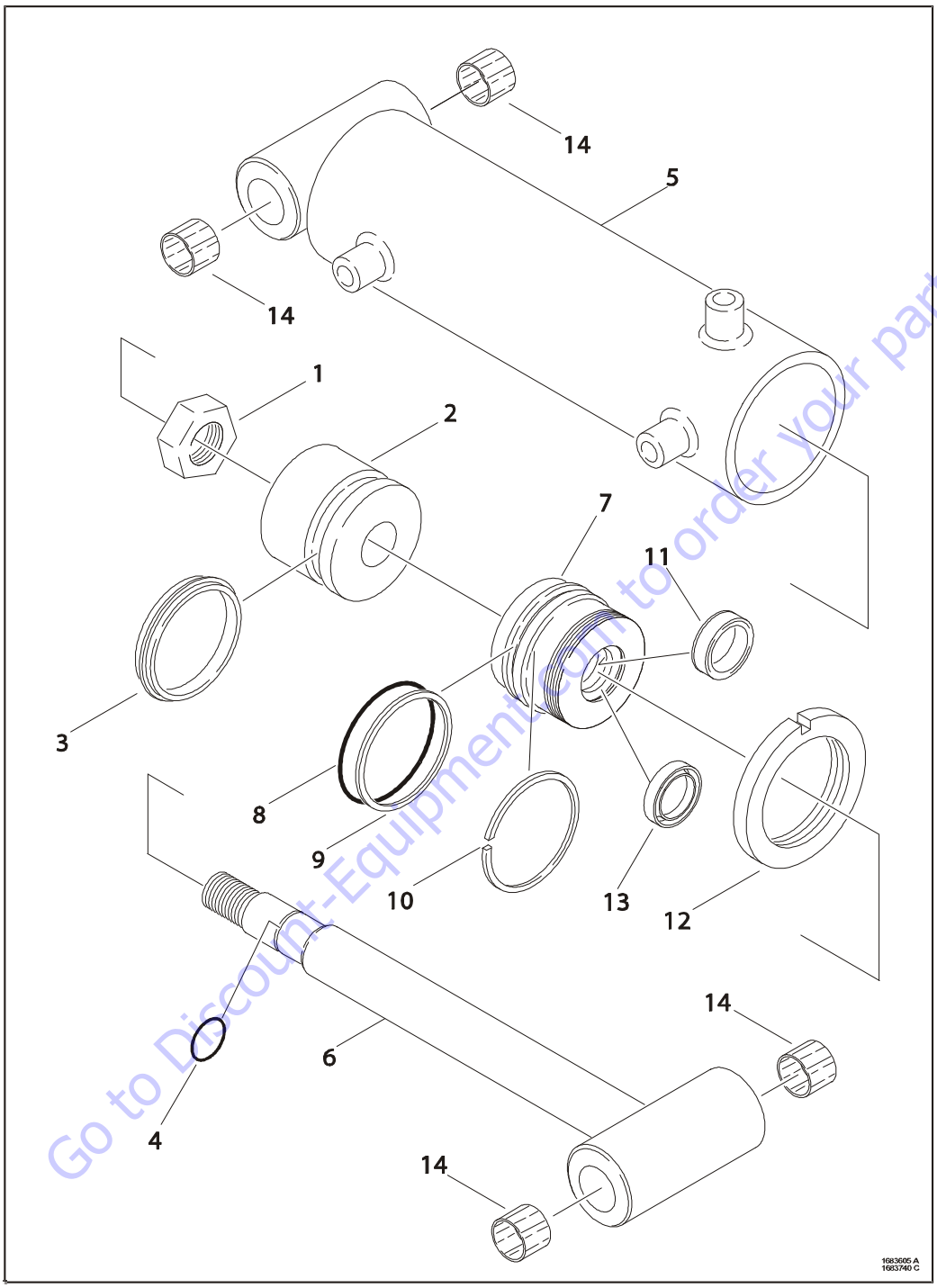


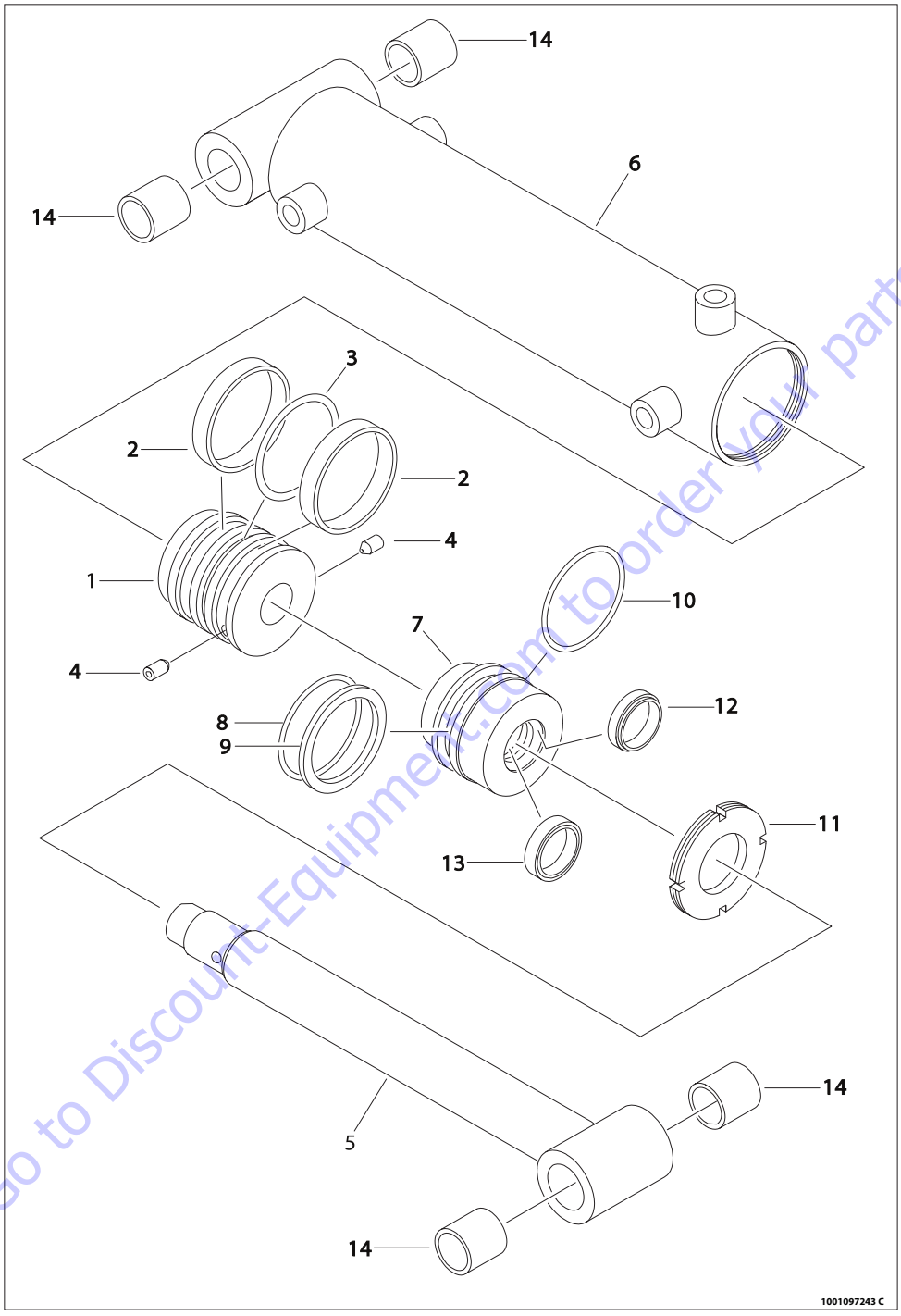
Figure 5-119. Capscrew Removal

6. Using a spanner wrench, loosen the spanner nut retainer, and remove spanner nut from cylinder barrel.
7. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.



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

Figure 5-120. Steer Cylinder (Prior to S/N 0300142664)



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

Figure 5-121. Steer Cylinder (S/N 0300142664 to S/N 0300183033)

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.

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

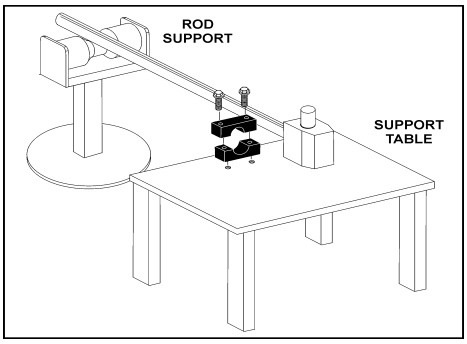


Figure 5-122. Cylinder Rod Support

9. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
10. Loosen and remove nut which attaches the piston to the rod.
11. Screw the piston counter clockwise (CCW), by hand, and remove the piston from cylinder rod.
12. Remove and discard the piston o-rings, seal rings, and backup rings.
13. Remove piston spacer, if applicable, from the rod.
14. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, back-up rings, rod seals, 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 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 WD40 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.*

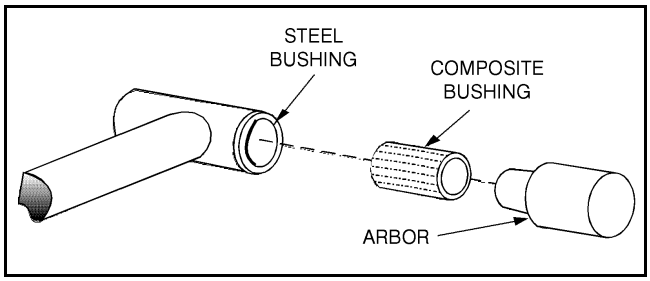


Figure 5-123. Composite Bearing Installation

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.

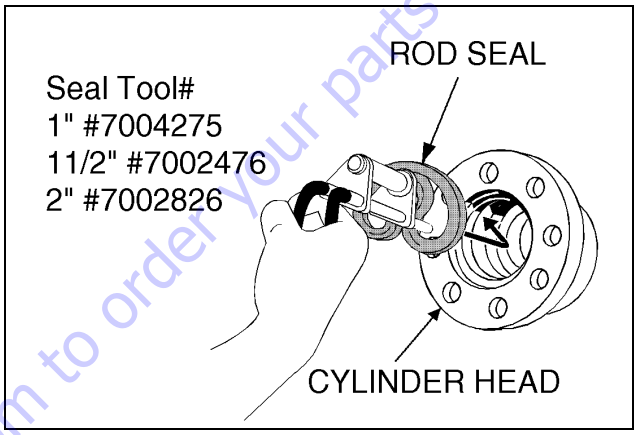


Figure 5-124. Rod Seal Installation

NOTICE

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

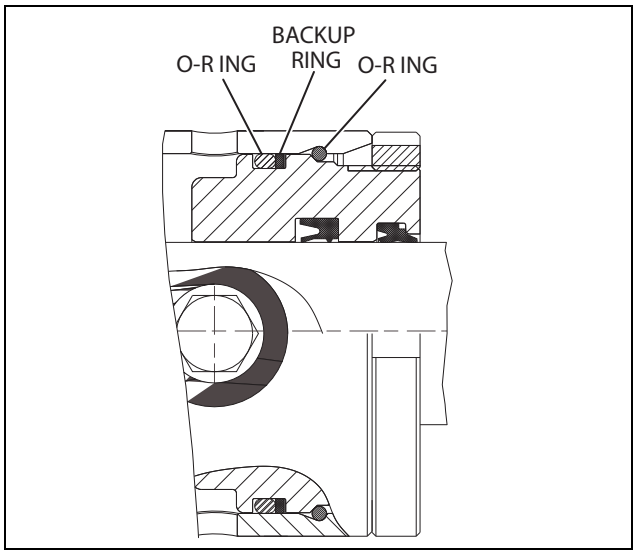


Figure 5-125. Cylinder Head Seal Installation

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.

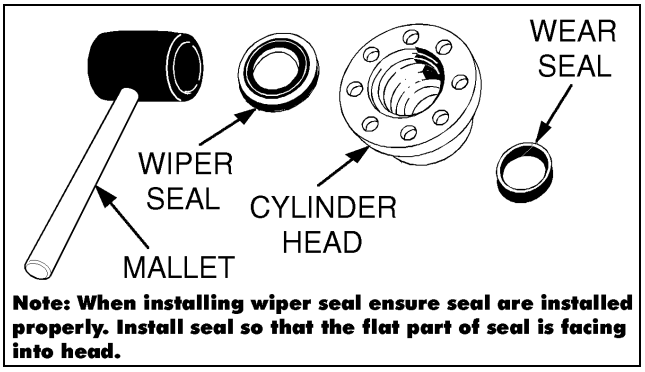


Figure 5-126. Wiper Seal Installation

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

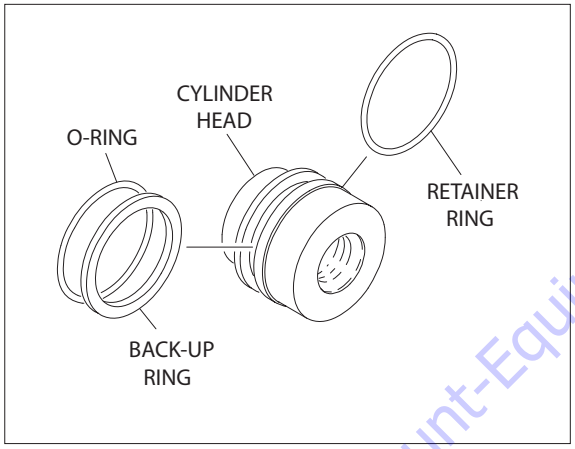


Figure 5-127. Installation Of Head Seal Kit

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. Carefully thread the piston on the cylinder rod hand tight, ensuring that the o-ring and back-up 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. (See Figure 5-128.)
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). (See Figure 5-128. and Figure 5-129.)

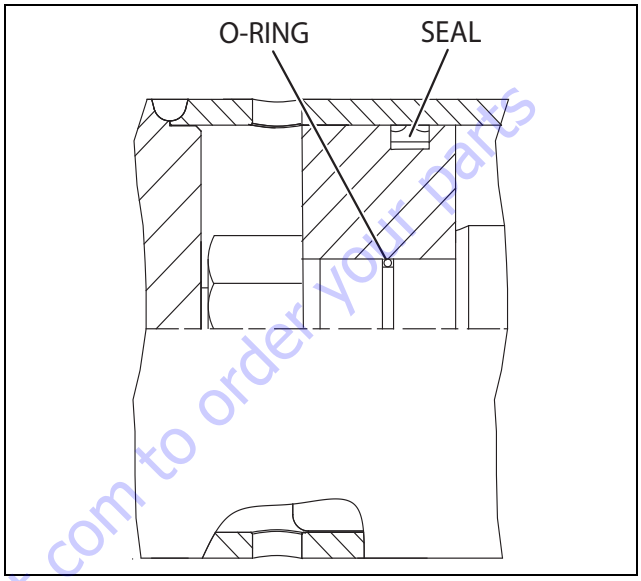


Figure 5-128. Piston Seal Kit Installation (Prior to S/N 0300142664)

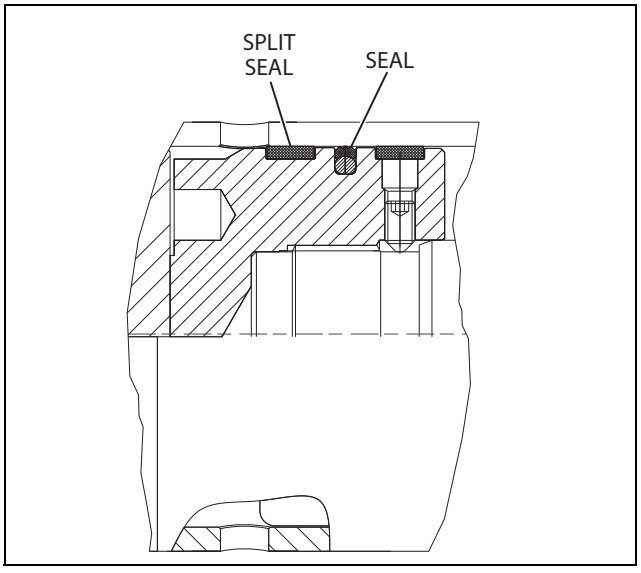


Figure 5-129. Piston Seal Kit Installation (S/N 0300142664 to S/N 0300183033)

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 o-ring and seal ring are not damaged or dislodged.
12. Continue pushing the rod into the barrel until the cylinder head gland can be inserted into the barrel cylinder.

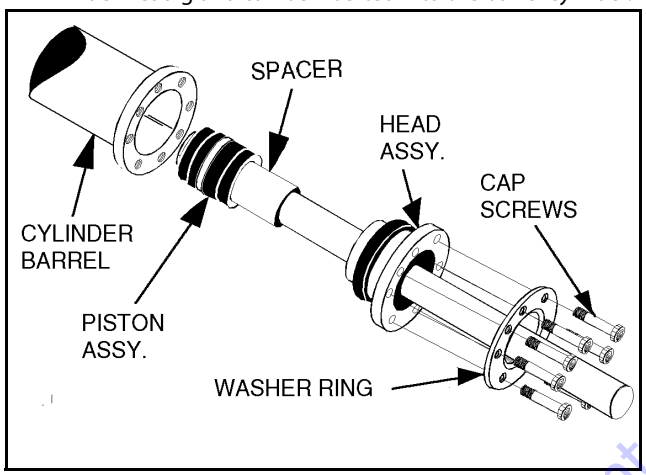


Figure 5-130. Rod Assembly Installation

13. 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 275-300 ft.lbs. (372.8-406.7 Nm).
14. 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.
15. If applicable, install the cartridge-type holding valve and fittings in the rod port block, using new o-rings as applicable.

NOTE: **Steer cylinder spanner nut is tightened as per Spec. "CYR" Cylinder spanner nut tightening procedure. Pressurize cylinder on retract to 80/100 psi to push rod guide firmly against the round retaining ring. (Apply 1 drop of JLG Threadlocker P/N 0100011, 2 places, at 180° apart. Hand tighten nut, then tighten 1/4 turn with spanner wrench).*

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. If applicable, remove the cartridge-type holding valve and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

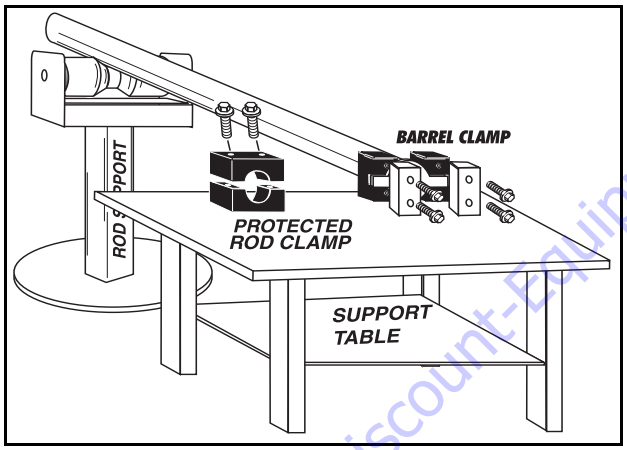


Figure 5-131. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the eight (8) cylinder head retainer capscrews, and remove capscrews from cylinder barrel.

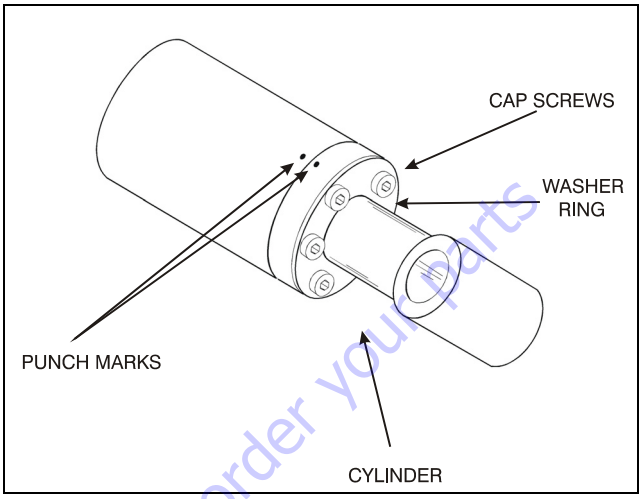
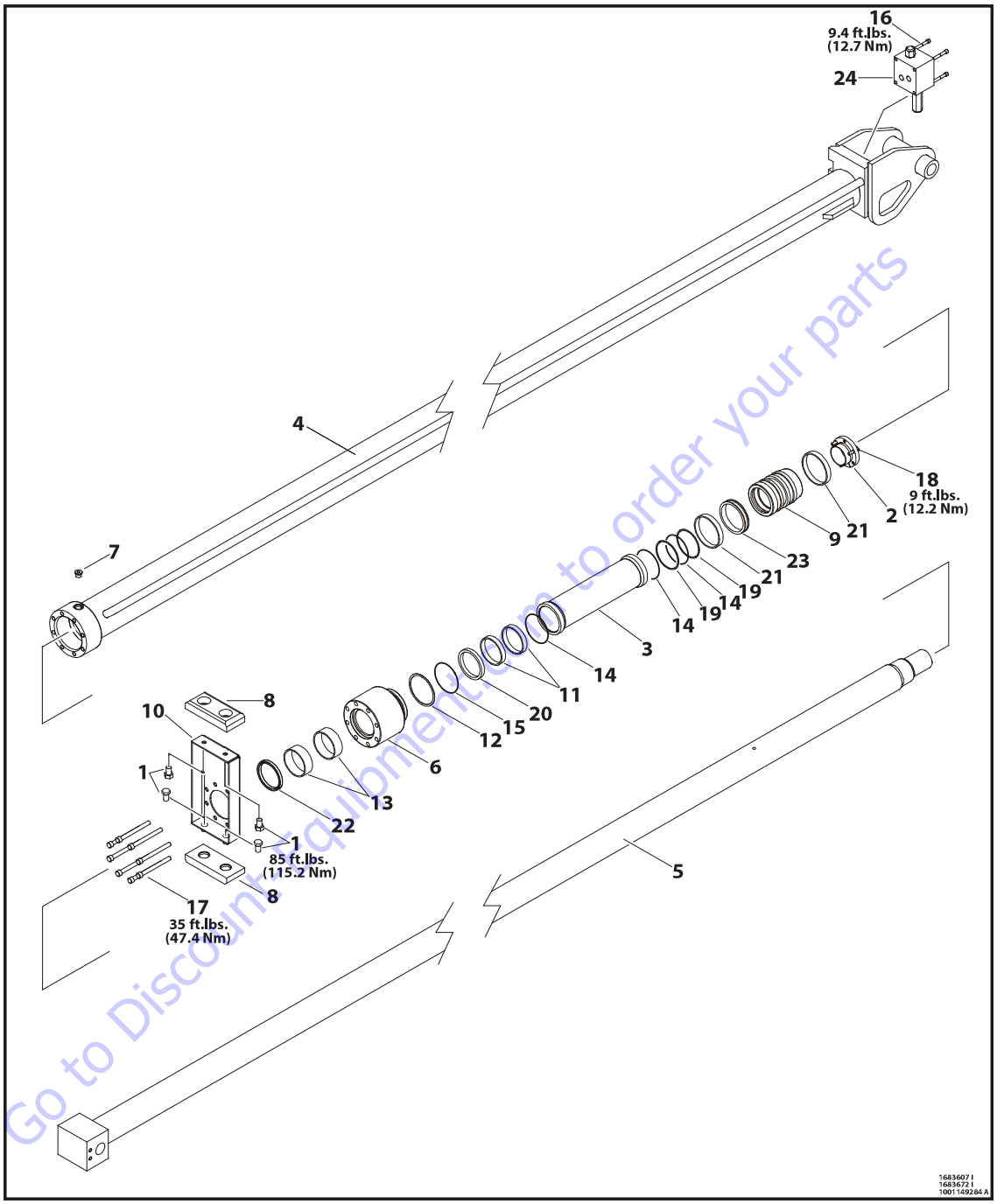


Figure 5-132. Capscrew Removal

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



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

Figure 5-133. Main Telescope Cylinder

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.

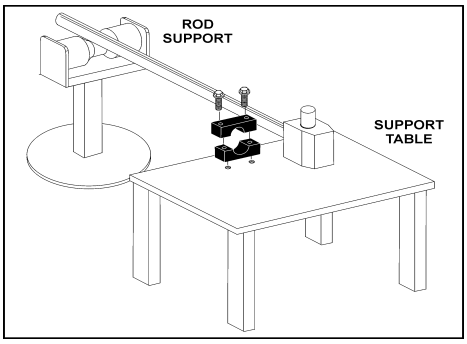


Figure 5-134. Cylinder Rod Support

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Loosen and remove nut which attaches the piston to the rod, and remove the piston.
10. Insert the capscrew(s) in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrew(s) until the bushing is loose on the piston.
11. Remove the bushing from the piston.

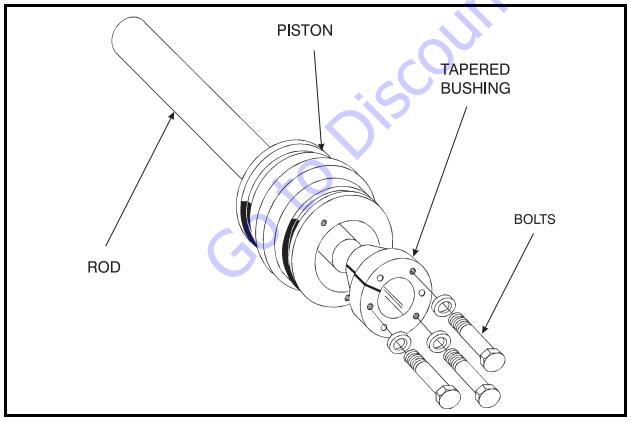


Figure 5-135. Tapered Bushing Removal

12. Screw the piston counter clockwise (CCW), by hand, and remove the piston from cylinder rod.
13. Remove and discard the piston o-rings, seal rings, and backup rings.
14. Remove piston spacer, if applicable, from the rod.
15. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, back-up rings, rod seals, 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 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 WD40 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.*

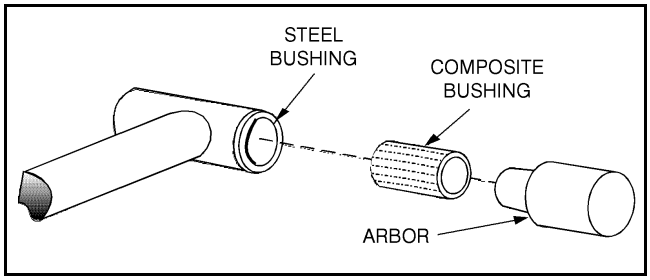


Figure 5-136. Composite Bearing Installation

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.

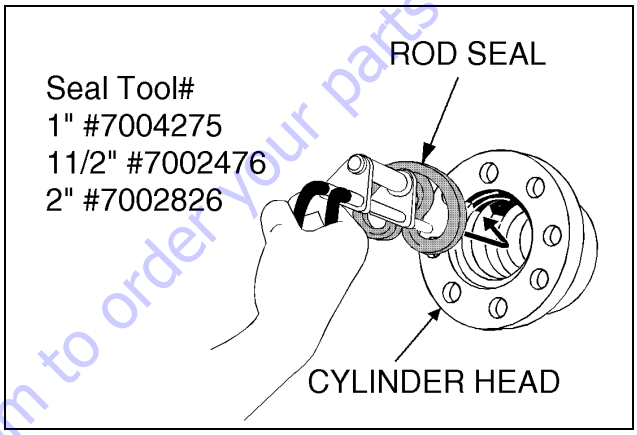


Figure 5-137. Rod Seal Installation

NOTICE

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

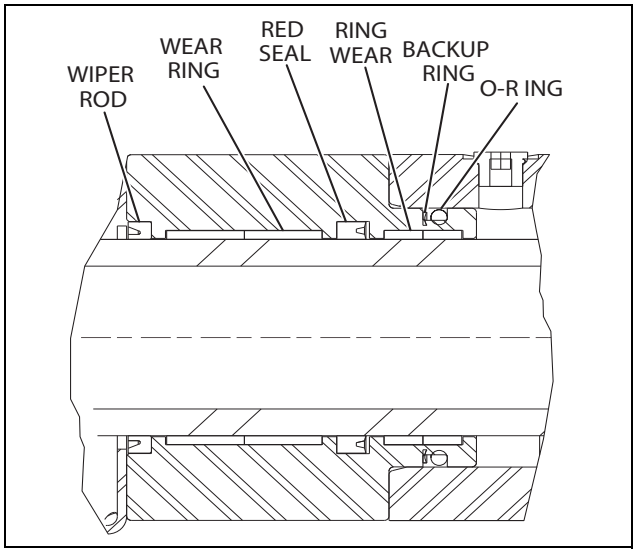


Figure 5-138. Cylinder Head Seal Installation

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.

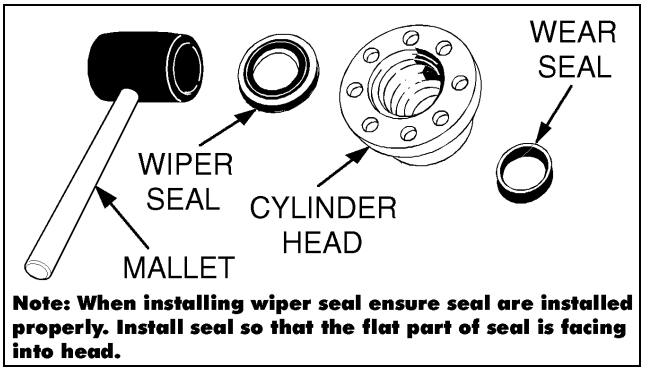


Figure 5-139. Wiper Seal Installation

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

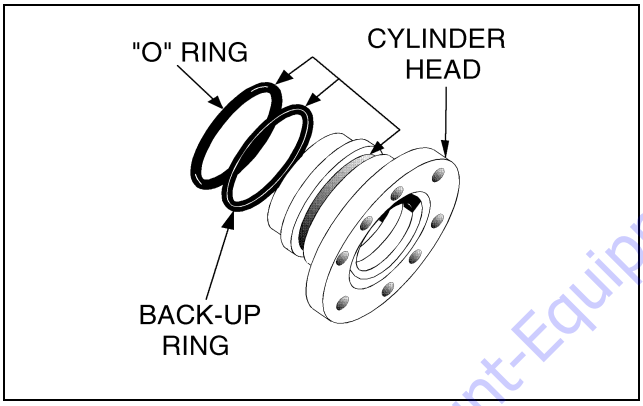


Figure 5-140. Installation Of Head Seal Kit

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. Carefully slide the spacer on the rod.

NOTE: *Upper telescope cylinder piston has an o-ring installed inside the spacer.*

6. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
7. Carefully thread the piston on the cylinder rod hand tight, ensuring that the o-ring and back-up 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.

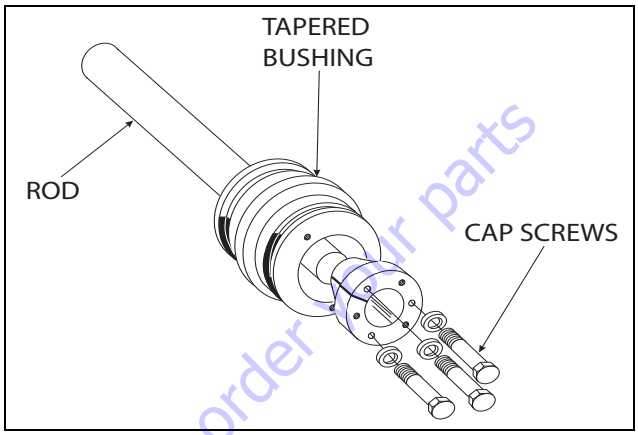


Figure 5-141. Tapered Bushing Installation

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

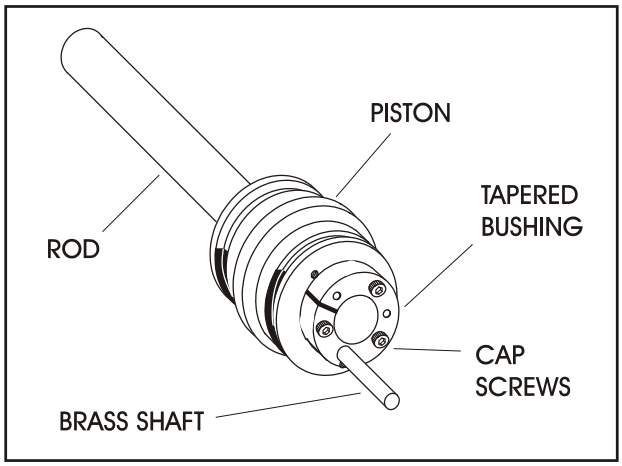


Figure 5-142. Seating the Tapered Bearing

12. Rotate the capscrews evenly and progressively in rotation to 9 ft.lbs. (12 Nm).
13. Remove the cylinder rod from the holding fixture.
14. Place a new o-ring and back-up rings in the inner piston diameter groove.
15. 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).

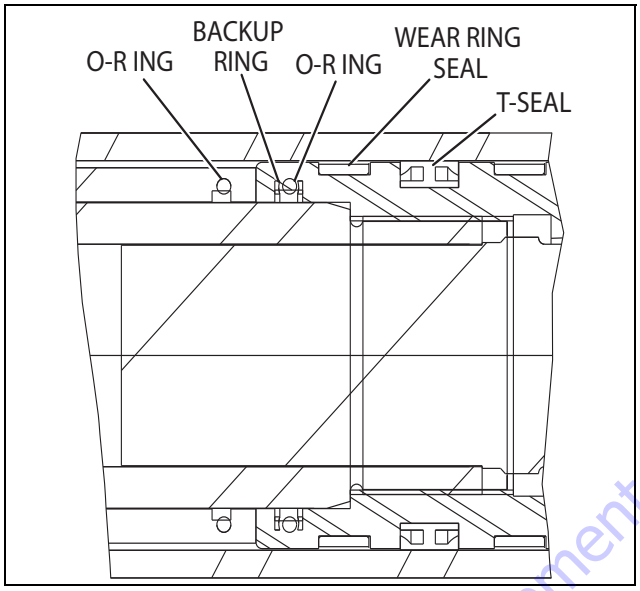


Figure 5-143. Piston Seal Kit Installation

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 o-ring and seal ring 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.

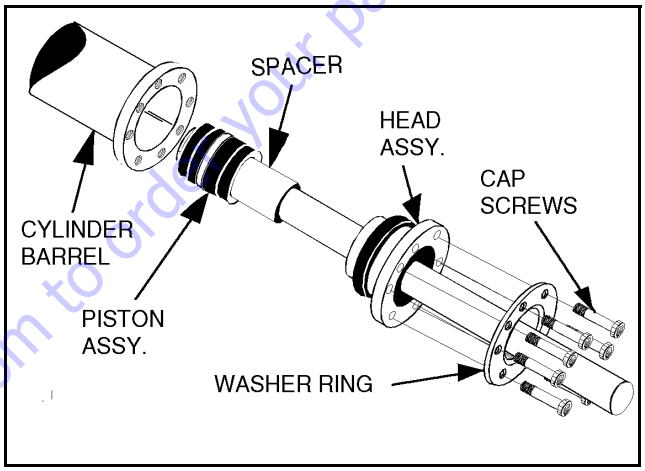


Figure 5-144. Rod Assembly Installation

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 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. If applicable, install the cartridge-type holding valve and fittings in the rod port block, using new o-rings as applicable.

Tower 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. If applicable, remove the cartridge-type holding valve and fittings from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

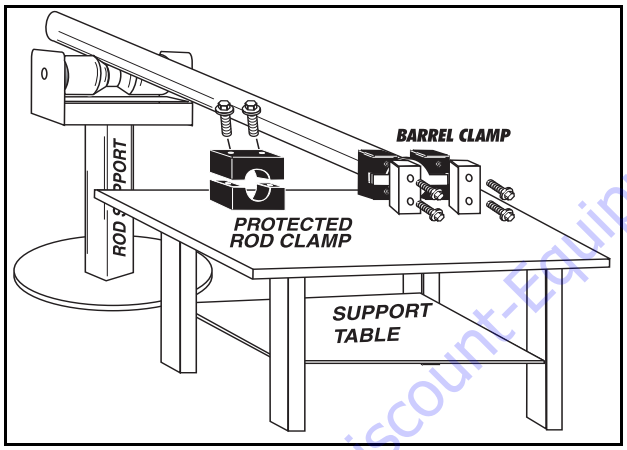


Figure 5-145. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen the eight (8) cylinder head retainer capscrews, and remove capscrews from cylinder barrel.

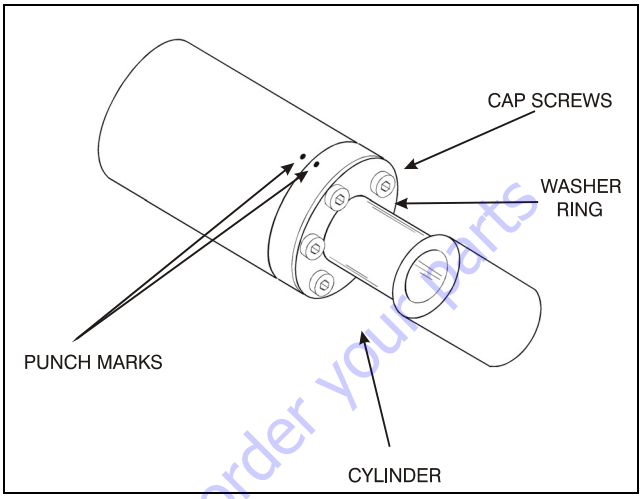
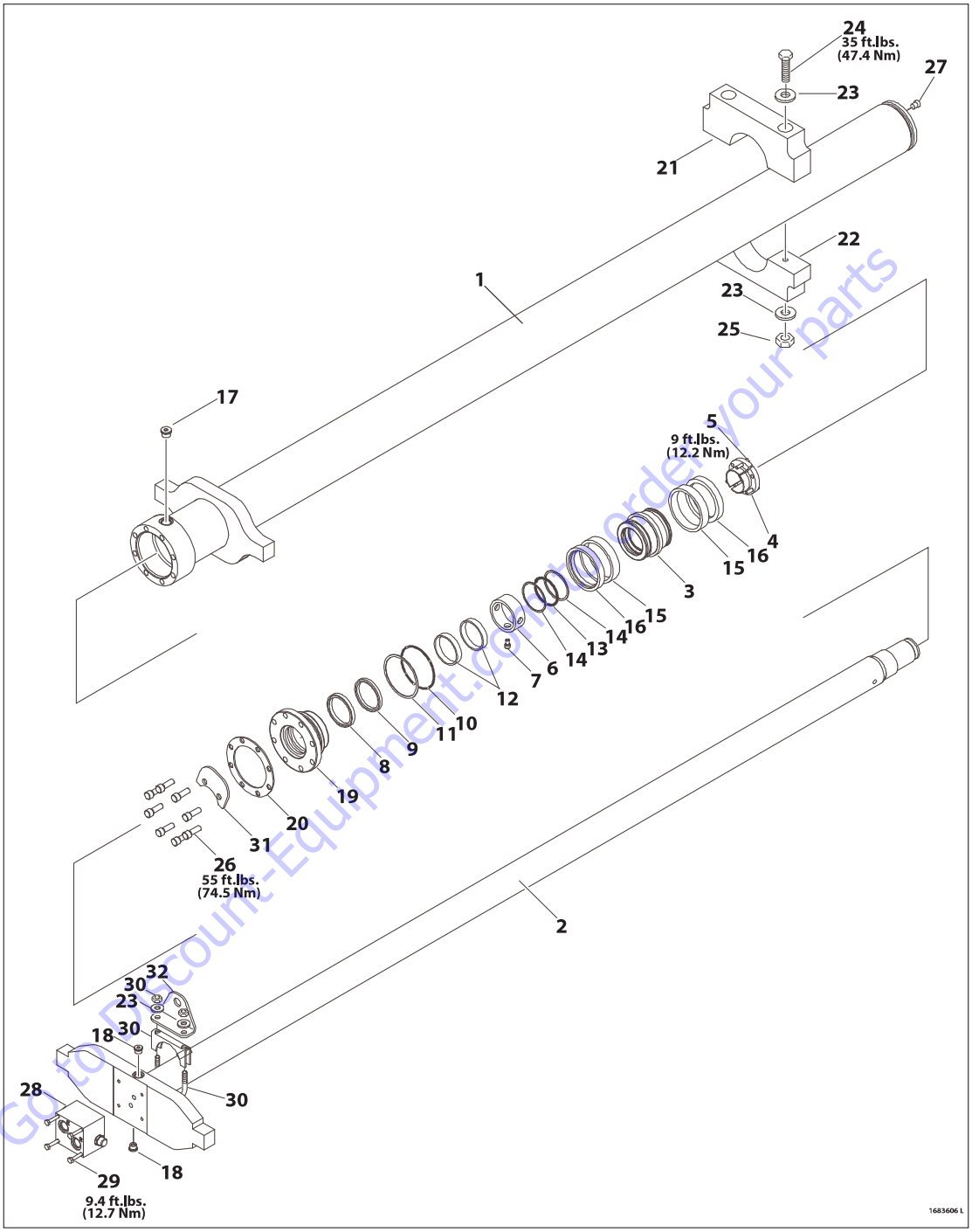


Figure 5-146. Capscrew Removal

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



1. Barrel
2. Rod
3. Piston
4. Tapered Bushing
5. Bolt
6. Tube Spacer
7. Bolt
8. Wiper
9. Seal
10. O-ring
11. Backup Ring
12. Wear Ring
13. O-ring
14. Backup Ring
15. Seal
16. Lock Ring
17. O-ring Plug
18. O-ring Plug
19. Head
20. Washer Ring
21. Support Pad
22. Support Pad
23. Flatwasher
24. Bolt
25. Locknut
26. Capscrew
27. O-ring Plug
28. Valve Assembly
29. Capscrew
30. Clamp
31. Target Plate
32. Target Plate

Figure 5-147. Tower Telescope Cylinder

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.

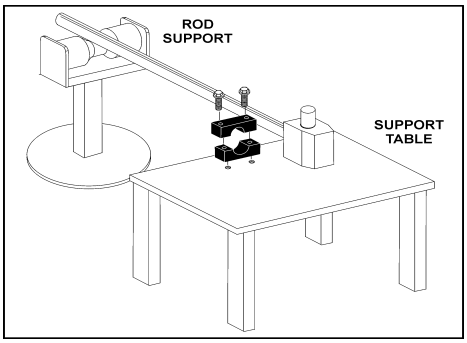


Figure 5-148. Cylinder Rod Support

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

9. Loosen and remove nut which attaches the piston to the rod, and remove the piston.

10. Insert the capscrew(s) in the threaded holes in the outer piece of the tapered bushing. Progressively tighten the capscrew(s) until the bushing is loose on the piston.

11. Remove the bushing from the piston.

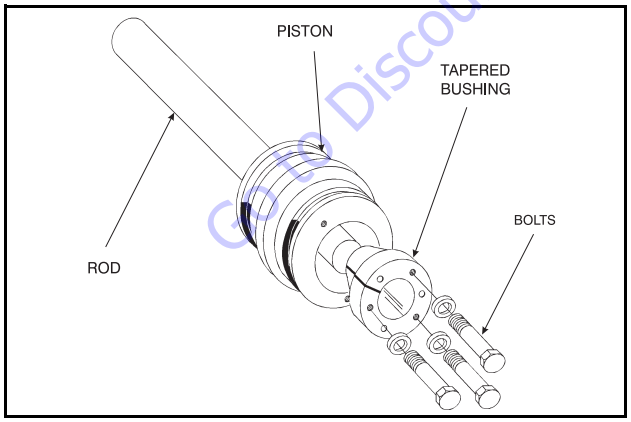


Figure 5-149. Tapered Bushing Removal

12. Screw the piston counter clockwise (CCW), by hand, and remove the piston from cylinder rod.

13. Remove and discard the piston o-rings, seal rings, and backup rings.

14. Remove piston spacer, if applicable, from the rod.

15. Remove the rod from the holding fixture. Remove the cylinder head gland. Discard the o-rings, back-up rings, rod seals, 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 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 WD40 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.*

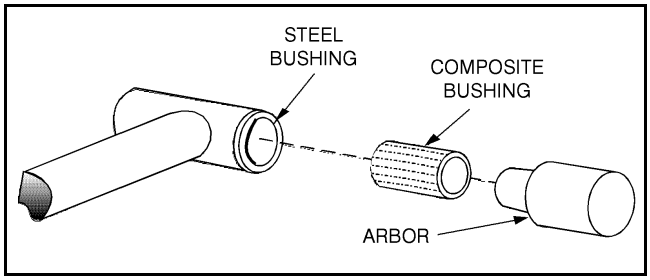


Figure 5-150. Composite Bearing Installation

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.

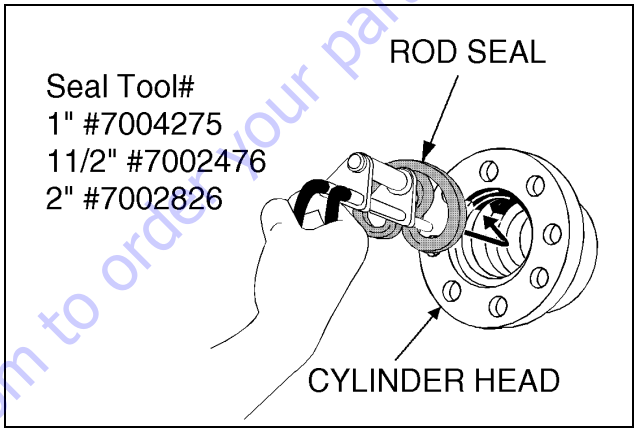


Figure 5-151. Rod Seal Installation

NOTICE

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

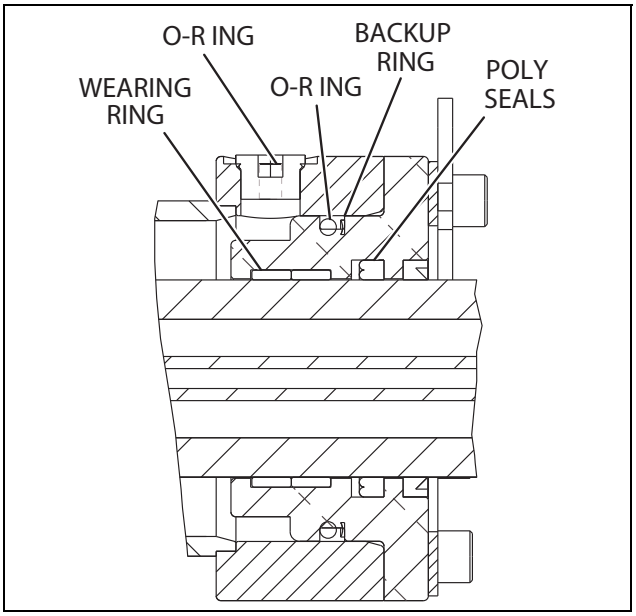


Figure 5-152. Cylinder Head Seal Installation

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.

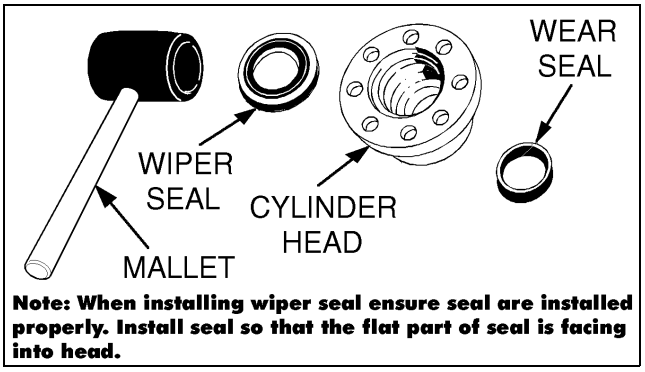


Figure 5-153. Wiper Seal Installation

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

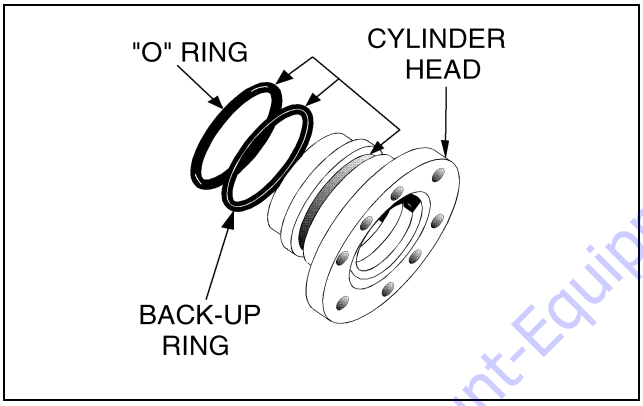


Figure 5-154. Installation Of Head Seal Kit

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. Carefully slide the piston spacer on the rod.

NOTE: *Upper telescope cylinder piston has an o-ring installed inside the spacer.*

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

7. Carefully thread the piston on the cylinder rod hand tight, ensuring that the o-ring and back-up 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. Install the bolts in tapered bushing.

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.

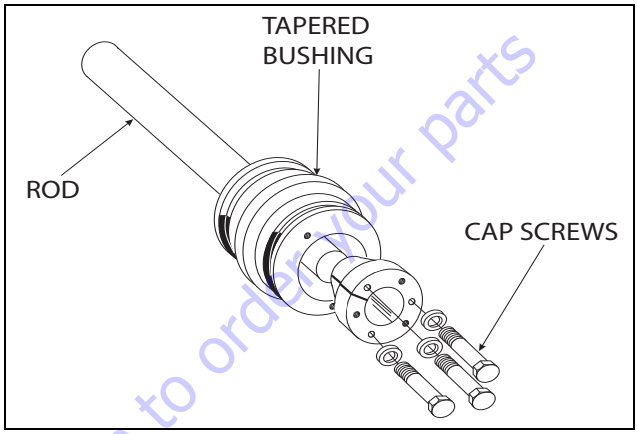


Figure 5-155. Tapered Bushing Installation

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

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

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

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

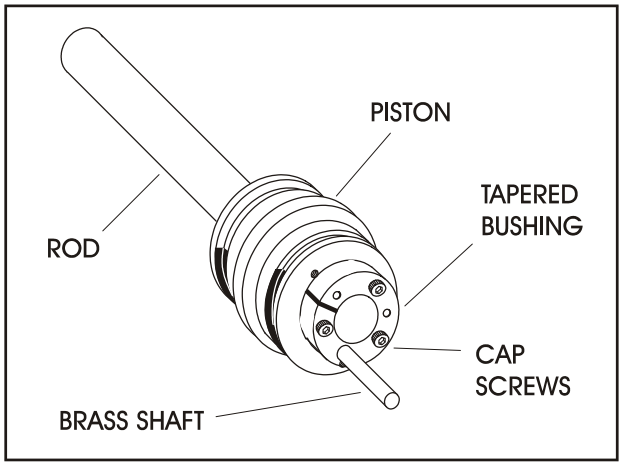


Figure 5-156. Seating the Tapered Bearing

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

14. Remove the cylinder rod from the holding fixture.

NOTICE

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

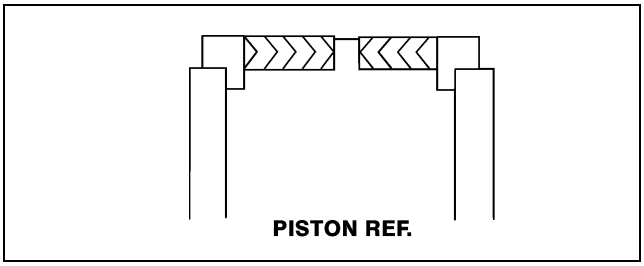


Figure 5-157. Hydrolock Piston Seal Installation

15. Place a new o-ring and back-up rings in the inner piston diameter groove.

16. 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).

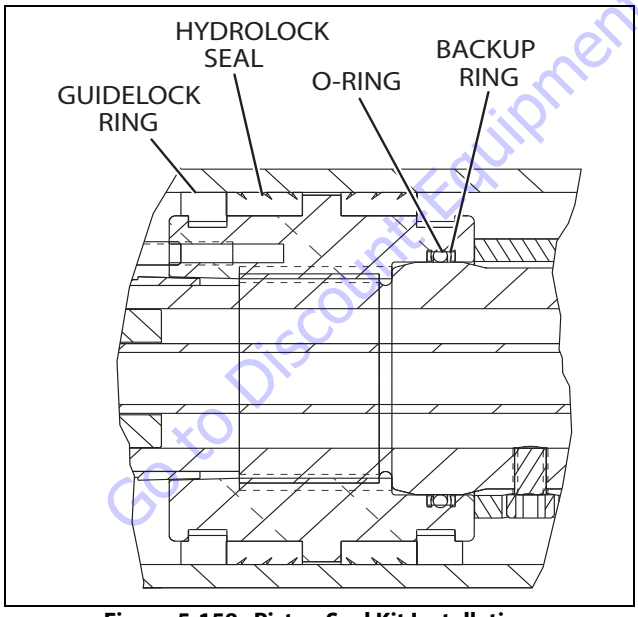


Figure 5-158. Piston Seal Kit Installation

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 o-ring and seal 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.

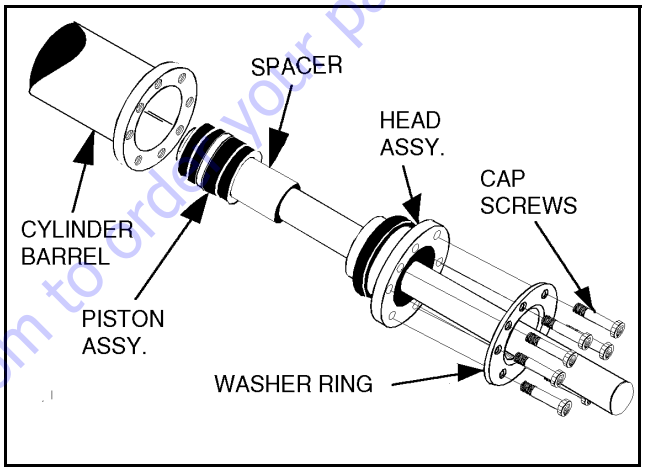


Figure 5-159. Rod Assembly Installation

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 55 ft.lbs. (74 Nm).

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

22. If applicable, install the cartridge-type holding valve and fittings in the rod port block, using new o-rings as applicable.

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.

NOTE: *The Main Boom weighs approximately 2528 lbs. (1147 kg).*

3. Using a suitable sling and lifting device, secure the platform end of the boom.
4. Place blocking under the cylinder to prevent it from falling when the attaching hardware is removed.
5. 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.
6. Using auxiliary power from ground controls, retract the lift cylinder rod completely.
7. Disconnect, cap, and tag the main boom lift cylinder hydraulic lines and ports.
8. Remove mounting hardware securing the telescope cylinder barrel to the main base boom.
9. 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

10. 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 522 lbs. (237 kg).*

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

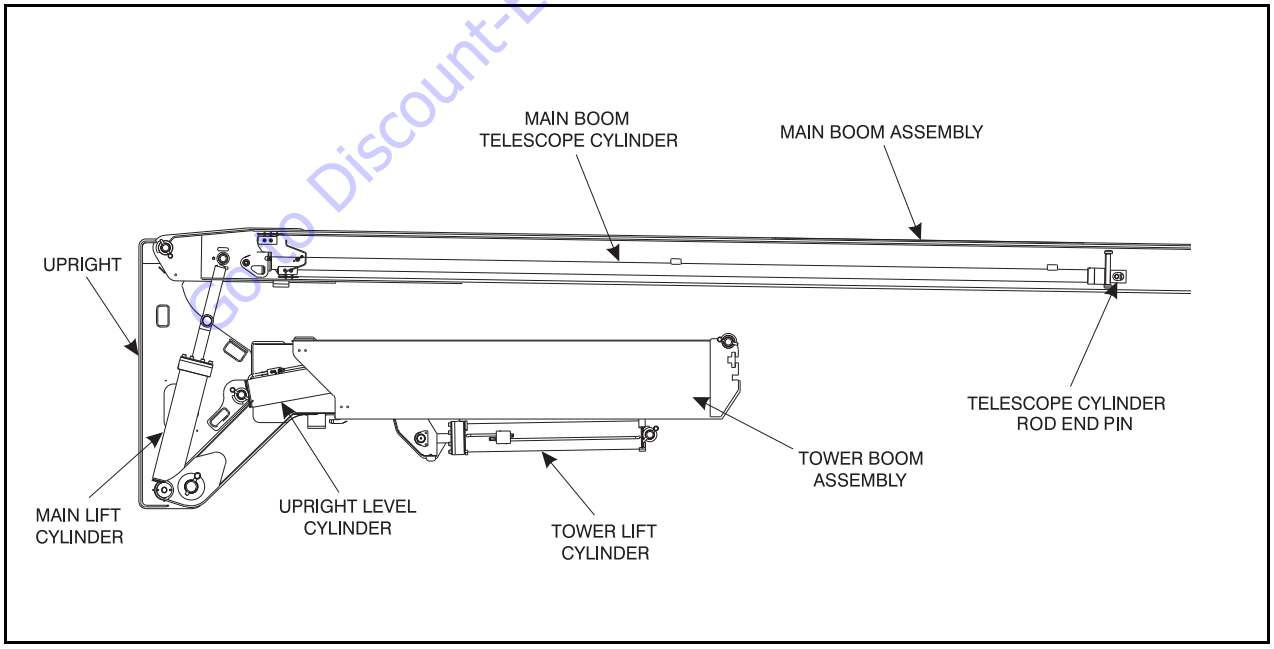


Figure 5-160. Components Upper Boom and Tower Boom

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 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 lifting device.
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 2528 lbs. (1147 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 barrel end attach pin retaining hardware.
8. 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.
9. Carefully lift the cylinder clear of the boom assembly and lower to the ground or suitably supported work area.
10. Lower the boom assembly to the stowed position.

Main Lift Cylinder Installation

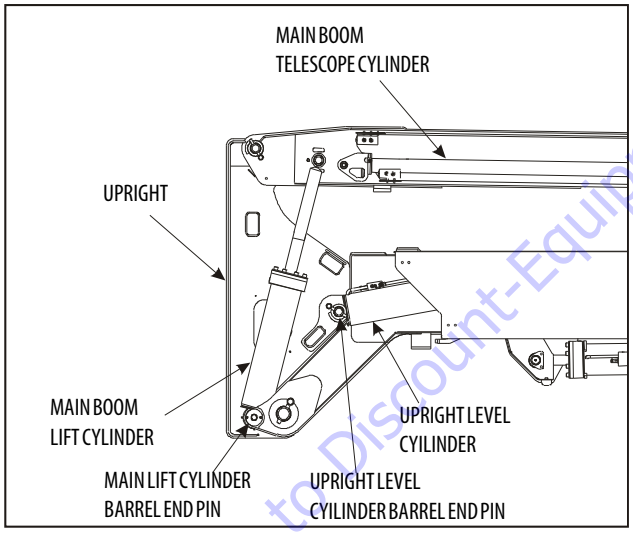
1. Lift the main boom to allow enough space to lower the upper lift cylinder to align with pin mounting holes of the tower fly boom and barrel end of main lift cylinder.
2. Using a suitable brass drift, drive barrel end attach pin through the mounting holes in the lift cylinder and the tower fly boom. 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. 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.
5. Remove lifting device and sling. Activate hydraulic system.
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 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 upper 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.



5. Use overhead sling to raise and support upright on the machine.

NOTE: *The Upright weighs approximately 1136 lbs. (515 kg).*

6. Before extending the tower boom, support the tower boom from the bottom.
7. Extend the Tower Boom to get access to the Upright level cylinder rod end pin by using an external auxiliary pump.
8. Tag, disconnect and cap the hydraulic lines of the Upright level Cylinder barrel.
9. Attach a suitable lifting device to support the Upright Level Cylinder.
10. Remove mounting hardware from the upright level cylinder rod end and remove the pin.
11. 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 2528 lbs. (114 kg), Upright weighs approximately 1136 lbs. (515 kg) & Tower Boom weighs approximately 2944 lbs. (1335 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 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.

Tower Telescope Cylinder Removal

1. Place machine on flat and level surface.
2. Remove the tower telescope cylinder rod end trunion hardware.
3. Using an external pump, extend the tower telescope cylinder as far enough to attach the lifting device.
4. Tag, disconnect and cap hydraulic hoses to Tower Telescope Cylinder. Plug cylinder ports. Remove the hoses.

NOTE: *The Tower Telescope Cylinder weighs approximately 233 lbs. (105kg).*

5. Properly secure the Tower Telescope Cylinder by using a suitable sling or support.
6. Remove the tower telescope cylinder barrel end trunion hardware.
7. Carefully remove the Tower Telescope Cylinder from the Boom. Place cylinder on a suitable work area.

Tower Telescope Cylinder Installation

1. Slide the telescope cylinder into the boom, aligning the cylinder port block end with slotted holes in Base Boom.
2. Secure the telescope cylinder barrel end to the fly boom by using retaining plate and torque the bolts 35 ft. lbs. (48Nm). Use JLG Threadlocker P/N 0100011 on bolts.
3. Secure telescope cylinder rod end and torque the bolts to 35 ft. lbs. (48 Nm). Use JLG Threadlocker P/N 0100011 on bolts.
4. Remove caps and plugs from hydraulic lines and ports. Properly connect hydraulic lines to cylinder. Reinstall cover plate.
5. Using all applicable safety precautions, operate the boom functions. Check for correct operation and hydraulic leaks. Secure as necessary.
6. 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 upper boom and tower boom to the lowest position.
2. Using auxiliary power, retract the slave cylinder rod completely.

NOTE: *Step 3 is applicable for 800AJ models only.*

3. Raise the JIB to gain access to the Slave Cylinder piston end Pin.

NOTE: *The Slave Cylinder weighs approximately 68 lbs (31 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 68 lbs (31 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 68 lbs (31 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 upper 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.

FIRST: Set Up the Function Pump

(the pump that is mounted on the back of the drive pump).

MACHINES PRIOR TO S/N 0300121643

1. **Stand by pressure <u>or</u> load sense pressure**.

   Install a low pressure gauge at port **"MP"** of the main valve block. A gauge capable of reading **400 psi (27.58 bar)**. Remove the wires from the upper lift (upper lift), valve coils on the main valve block. Start the engine and activate upper 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 between **400-440 psi (28-30 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 upper 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 (179.26 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 **<u>maximum</u>** relief pressure for all functions governed by this pump.

MACHINES S/N 0300121643 TO PRESENT

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

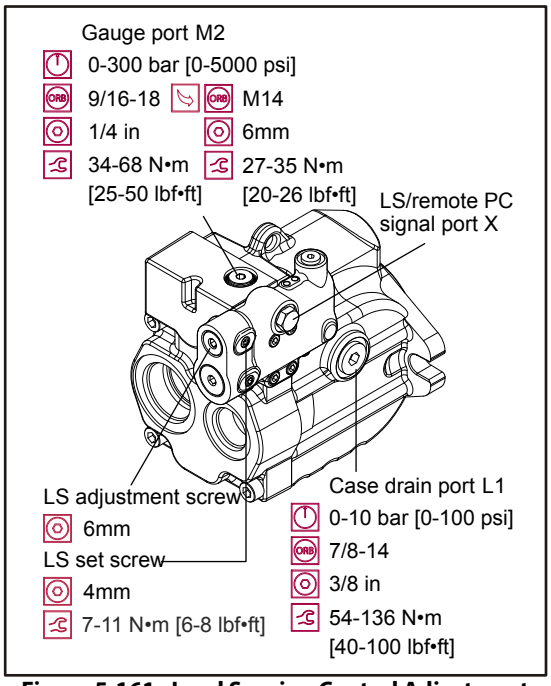


Figure 5-161. Load Sensing Control Adjustment

a. Install a low pressure gauge at port **"MP"** of the main valve block. A gauge capable of reading **400 psi (27.58 bar)**.

b. Remove the wires from the upper lift (main lift), valve coils on the main valve block. Start the engine and activate upper 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 between **400-440 psi (28-30 bar)**. To make an adjustment to this pressure, go to the engine compartment, locate the function pump.

c. 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.

d. 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 toward the engine. First, using the 4 mm wrench, loosen the setscrew on the side of the compensator (facing you) which is in line with the adjustment screw. This is a 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 counter-clockwise to decrease. The pressure should read between **400-440 psi (27.58-30.34 bar)**.

2. **Set High pressure relief**

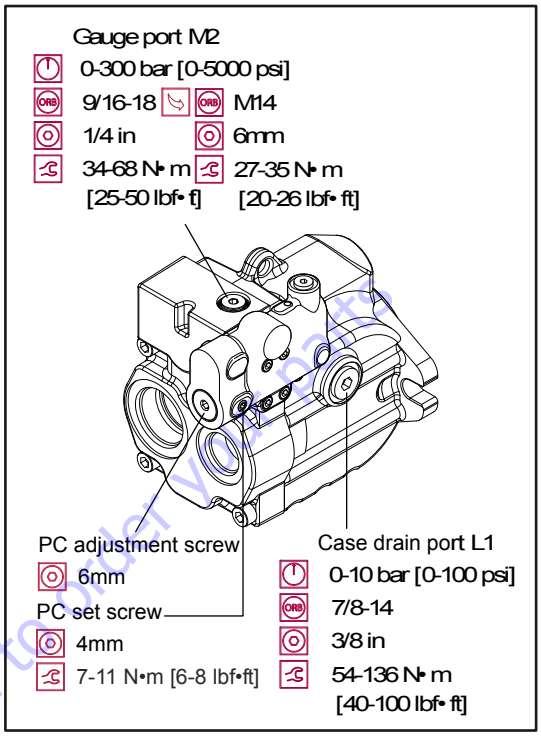


Figure 5-162. Pressure Compensation Control Adjustment

a. Install a high pressure gauge at the **"MP"** port of the main valve block.

b. Activate upper (main) telescope in. The gauge should read **2600 psi (179 bar)**.

c. 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 toward the engine.

d. First, using the 4 mm wrench, loosen the setscrew on the side of the compensator (facing you) which is in line with the adjustment screw. This is a jam nut screw which holds the main adjustment from turning. Loosen it 1 turn.

e. Then using the 6 mm wrench adjust the main adjustment clockwise to increase or counter-clockwise to decrease. This is the **maximum** relief pressure for all functions governed by this pump.

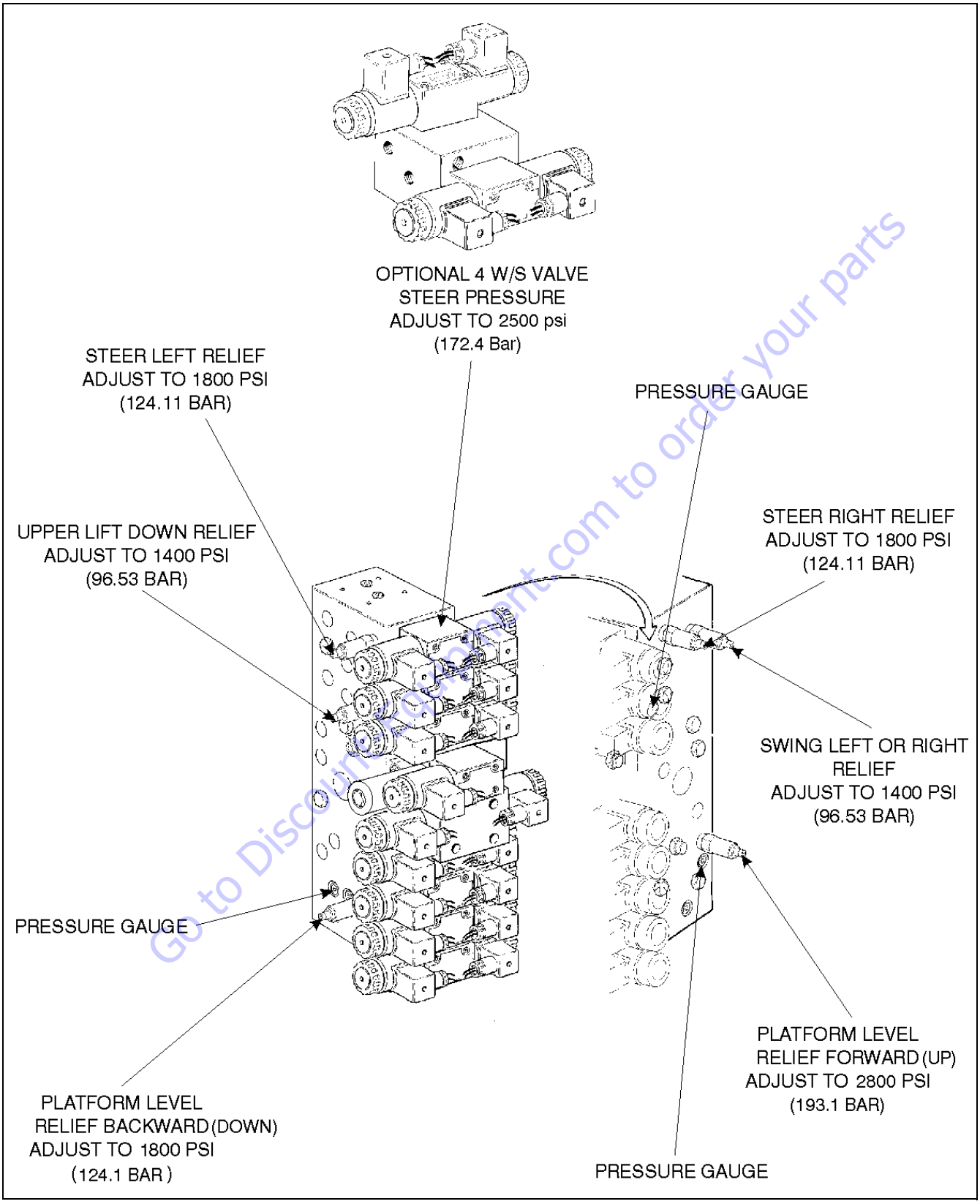
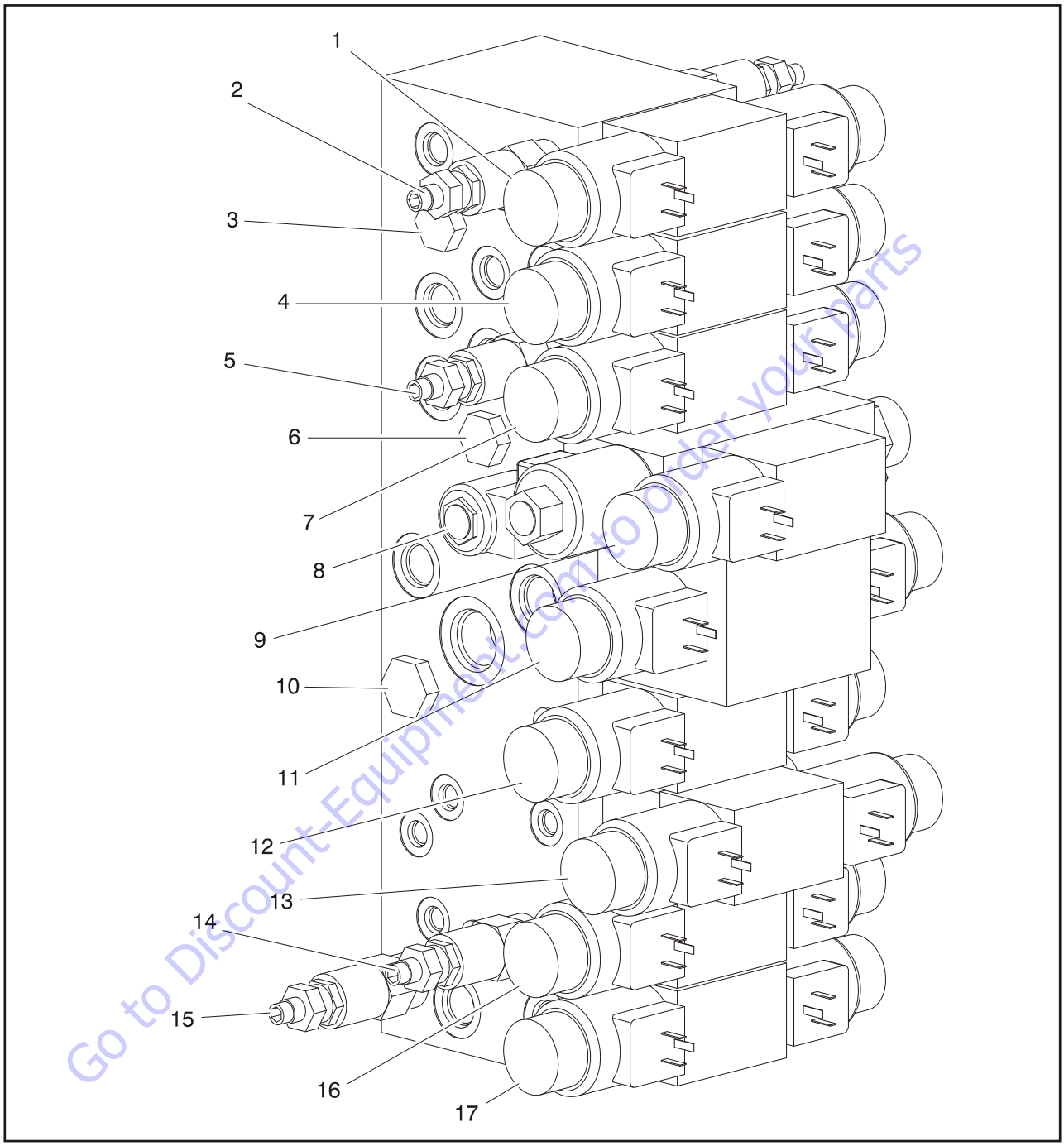
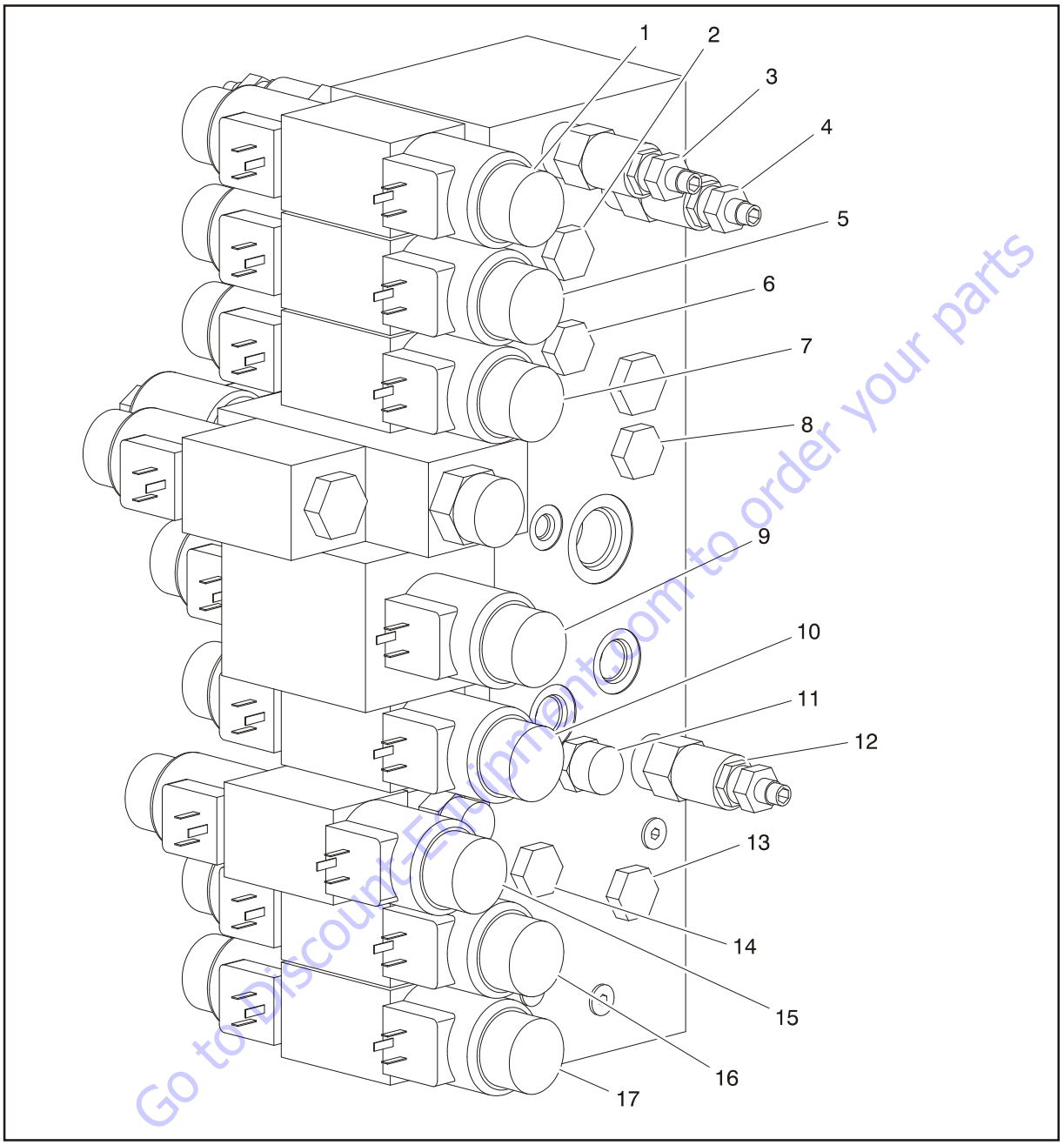


Figure 5-163. Main Control Valve Pressure Adjustments



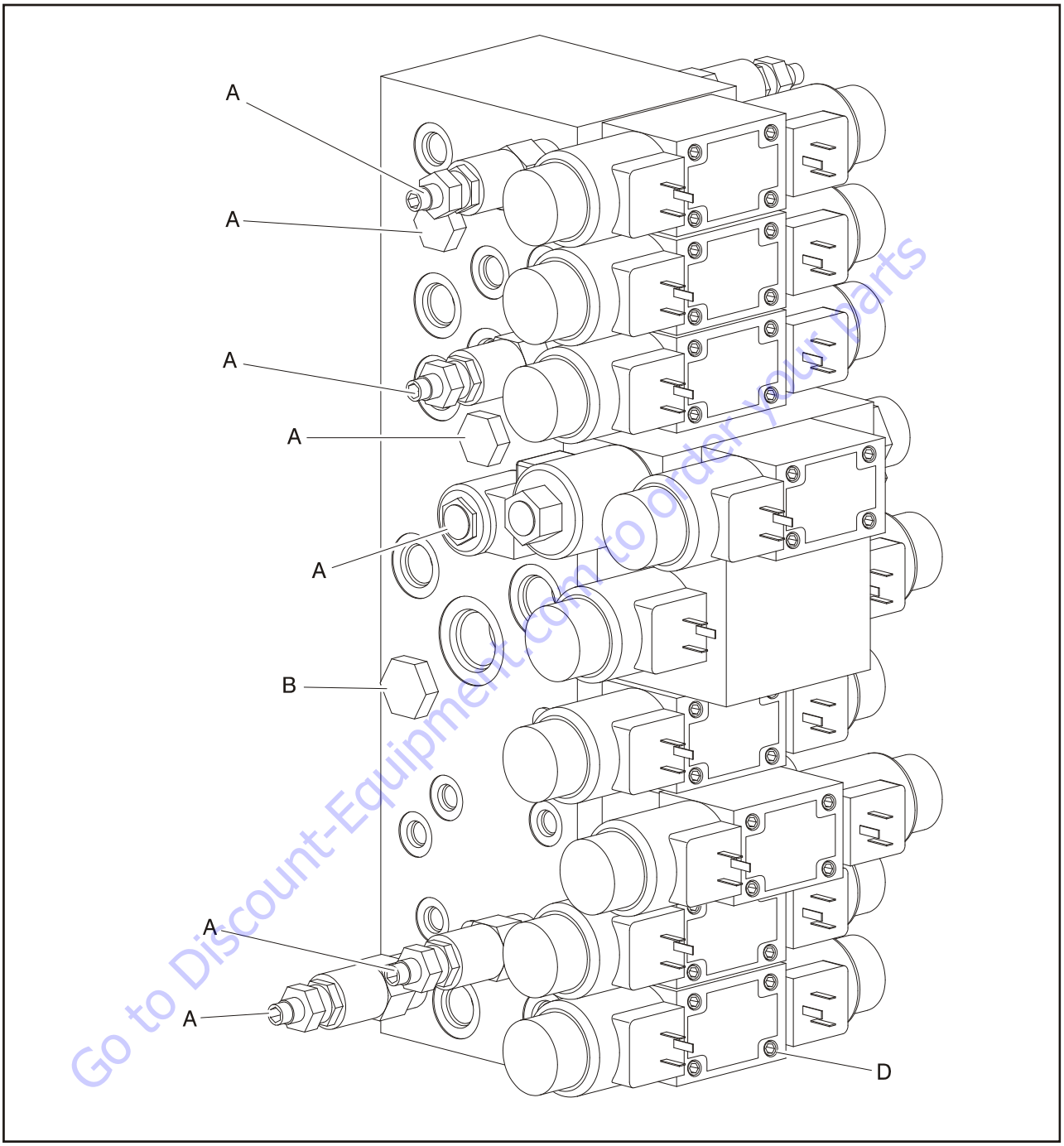
1. Front Steer Right Solenoid
2. Front Steer Relief
3. Load Sensing Cartridge
4. Swing Right Solenoid
5. Main Lift Relief
6. Load Sensing Cartridge
7. Main Lift Up Solenoid
8. Load Sensing Dump Valve
9. Flow Control Valve
10. Tower Lift Check
11. Main Tele In Solenoid
12. Tower Lift Down Solenoid
13.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

Figure 5-164. 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

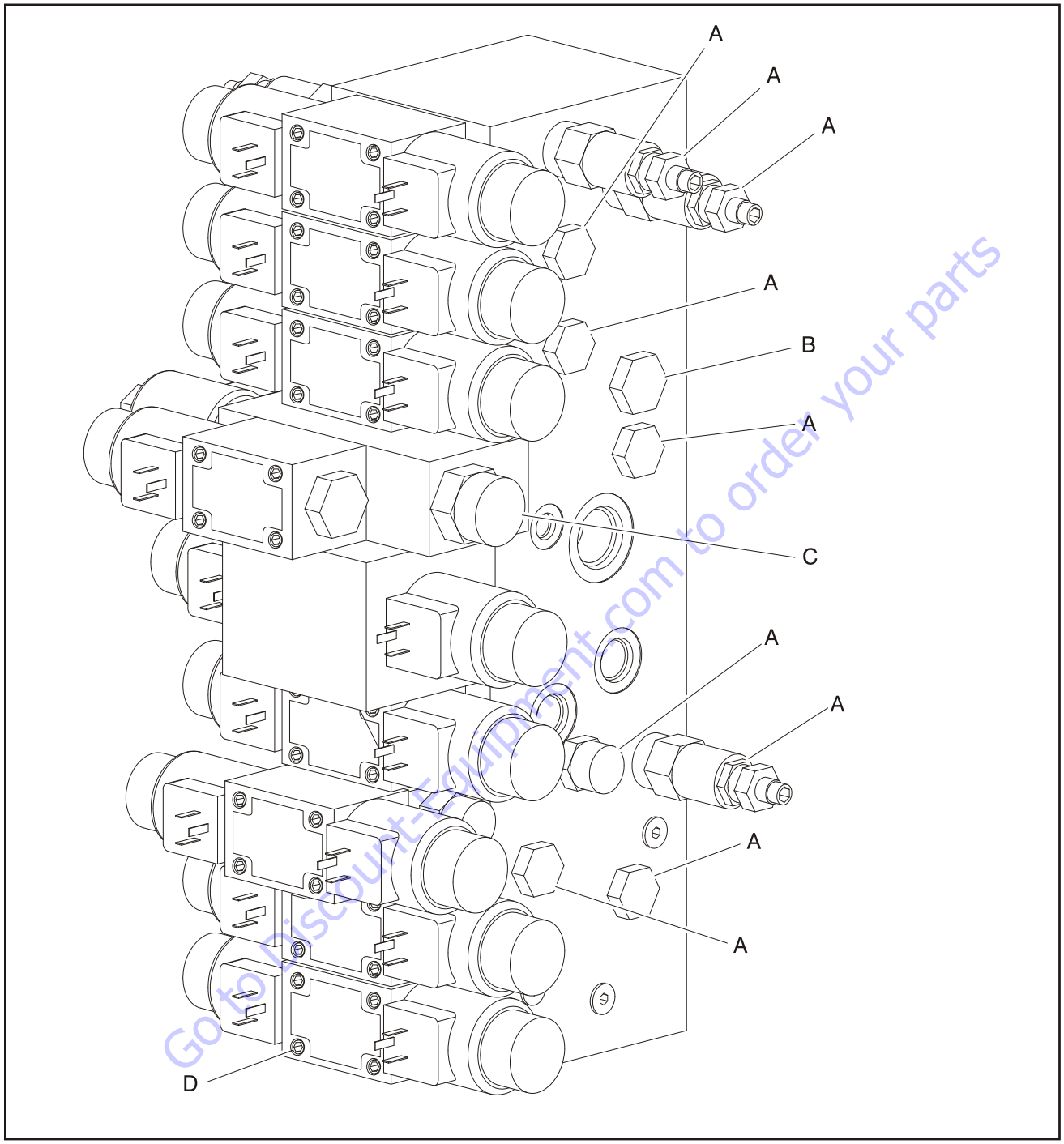
Figure 5-165. Main Valve Components - Sheet 2 of 2



	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 5-166. 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 5-167. Valve Component Torque - Sheet 2 of 2

SECOND: Adjustments Made at the Main Valve Block

MAIN RELIEF, STEER, SWING AND LIFT DOWN

1. **Upper (main) lift down**

   Install a high pressure gauge at the "MP" port of the main valve block. Activate upper lift down. The gauge should read **1400 psi (97 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)

   Using the same gauge at the same port, lock the turntable lock pin. Activate swing, the gauge should read **1400 psi (97 bar)**. The adjustment cartridge is located on the right side of the block, the second relief valve cartridge down from the top. (Note: the front of the block has the bolt on valves on that face.) Turn clockwise to increase, and counterclockwise to decrease.

3. **Steer**

   Using the same gauge at the same port. Activate steer left or right. The gauge should read **1800 psi (124 bar)**. (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. **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.

5. **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.

6. **Tower Telescope Out**

   Install a high pressure gauge at gauge port **"M2"** located on the right side of the valve block, at the bottom. Activate tower telescope out, the gauge should read **2200 psi (152 bar)**. This can be done with the tower lift down or up. If the tower lift is up, you must run tower telescope out to the end of stroke. The tower telescope out relief valve is located on the left side, at the bottom, next to port #2. Turn clockwise to increase, 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" 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" hose plumbed into it for easy access. Activate jib down, you should read **1200 psi (82 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.

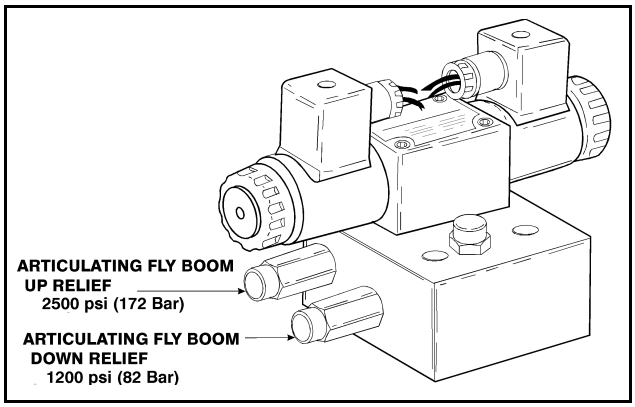


Figure 5-168. Articulating Jib Boom Pressure adjust.

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 the control valve.
3. With the aid of an assistant, activate steer left and right, adjust front steer relief valve to **2500 psi (172.4 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 the 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 below -20°F (-29°C). JLG recommends (Mobil DTE 13). 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 compatible.*

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 upper 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.

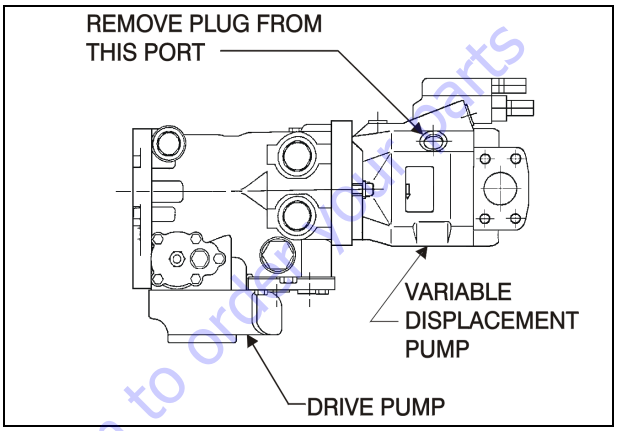
The machine is now ready for operation.

5.12 REXROTH VARIABLE DISPLACEMENT PUMP (PRIOR TO S/N 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 5-169. 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.*



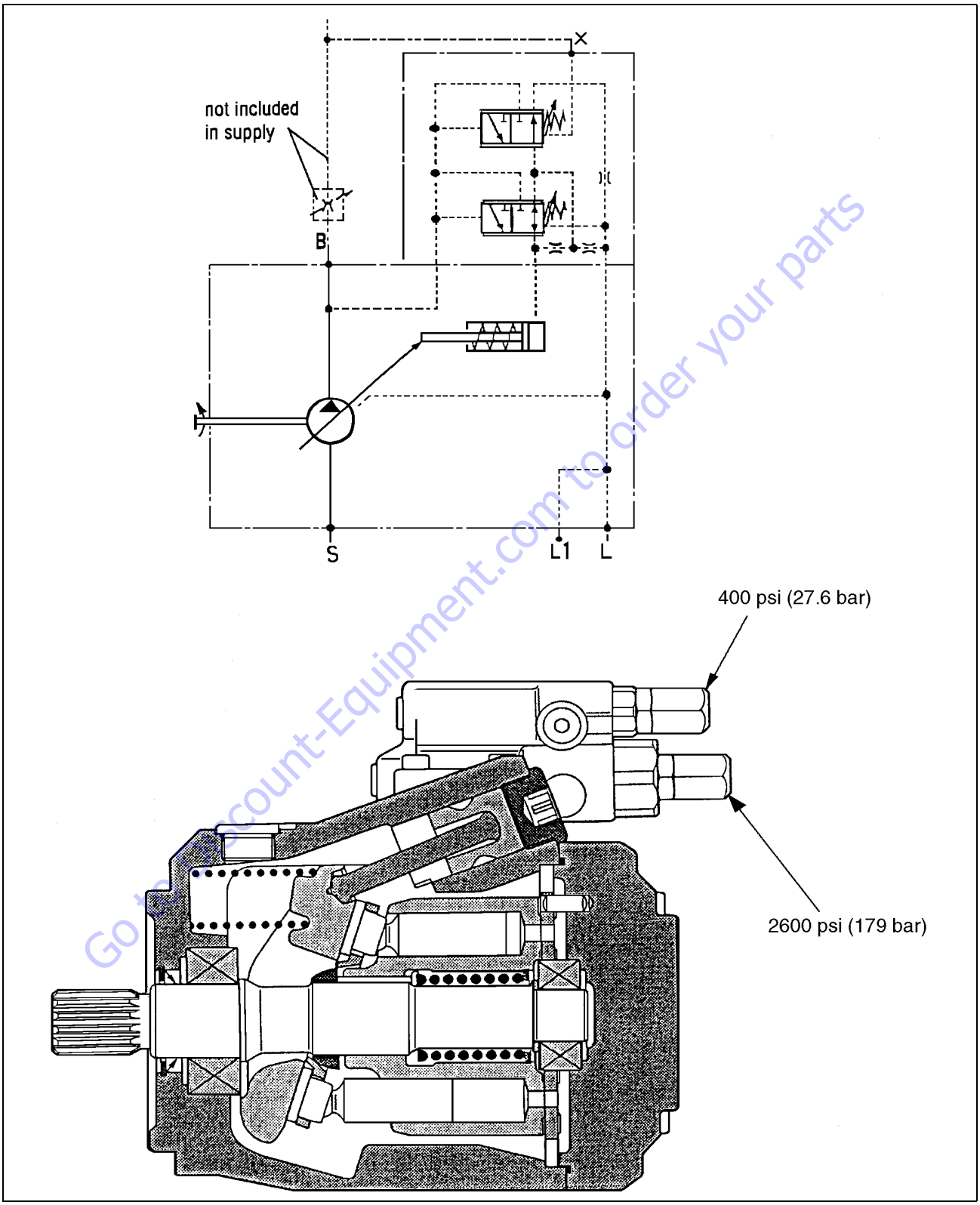


Figure 5-169. Variable Displacement Pump (Rexroth)

5.13 SAUER PISTON PUMP (S/N 0300121643 TO S/N 0300183033)

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)

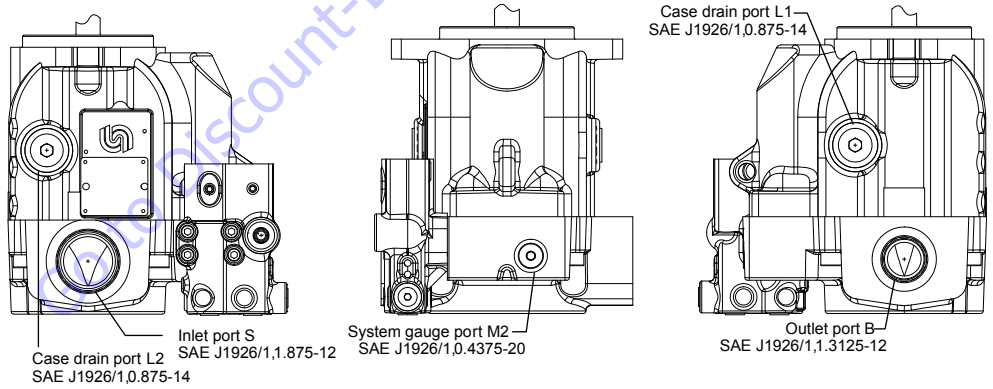


Figure 5-170. Gauge Port Locations

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 160 psi [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 5-3. 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 5-4. 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 5-5. 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 5-6. 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 5-7. 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 5-8. 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.
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 5-9. 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

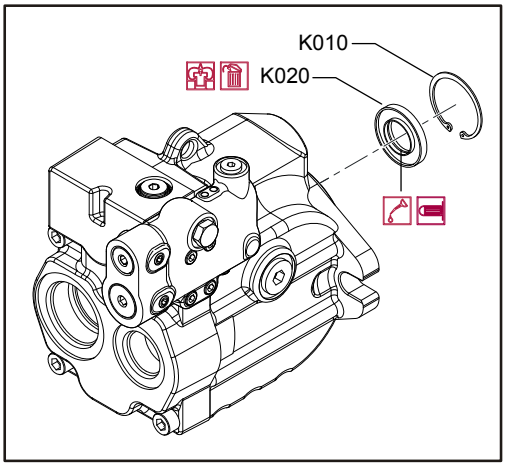


Figure 5-171. Shaft Seal and Retaining Ring

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

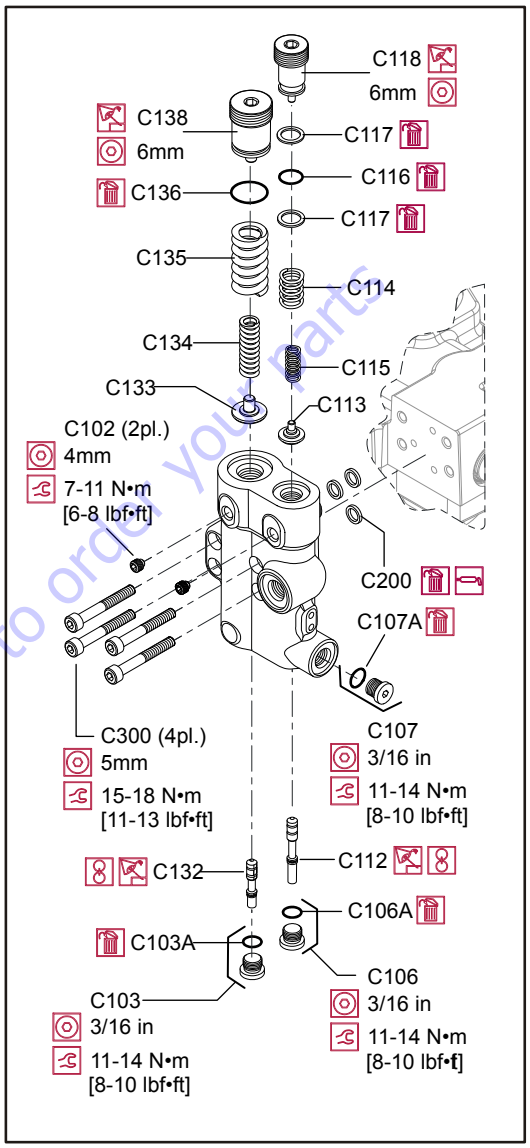


Figure 5-172. Control Assembly

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), back-up 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.lb. [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.lb. [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.lb. [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.lb. [7-11 Nm].
5. Using a new o-ring, install the plug (C107). Torque to 8-10 ft.lb. [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.lb. [15-18 Nm]. Torque screws in a criss-cross pattern and re-torque the first screw to ensure proper torque retention.

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.

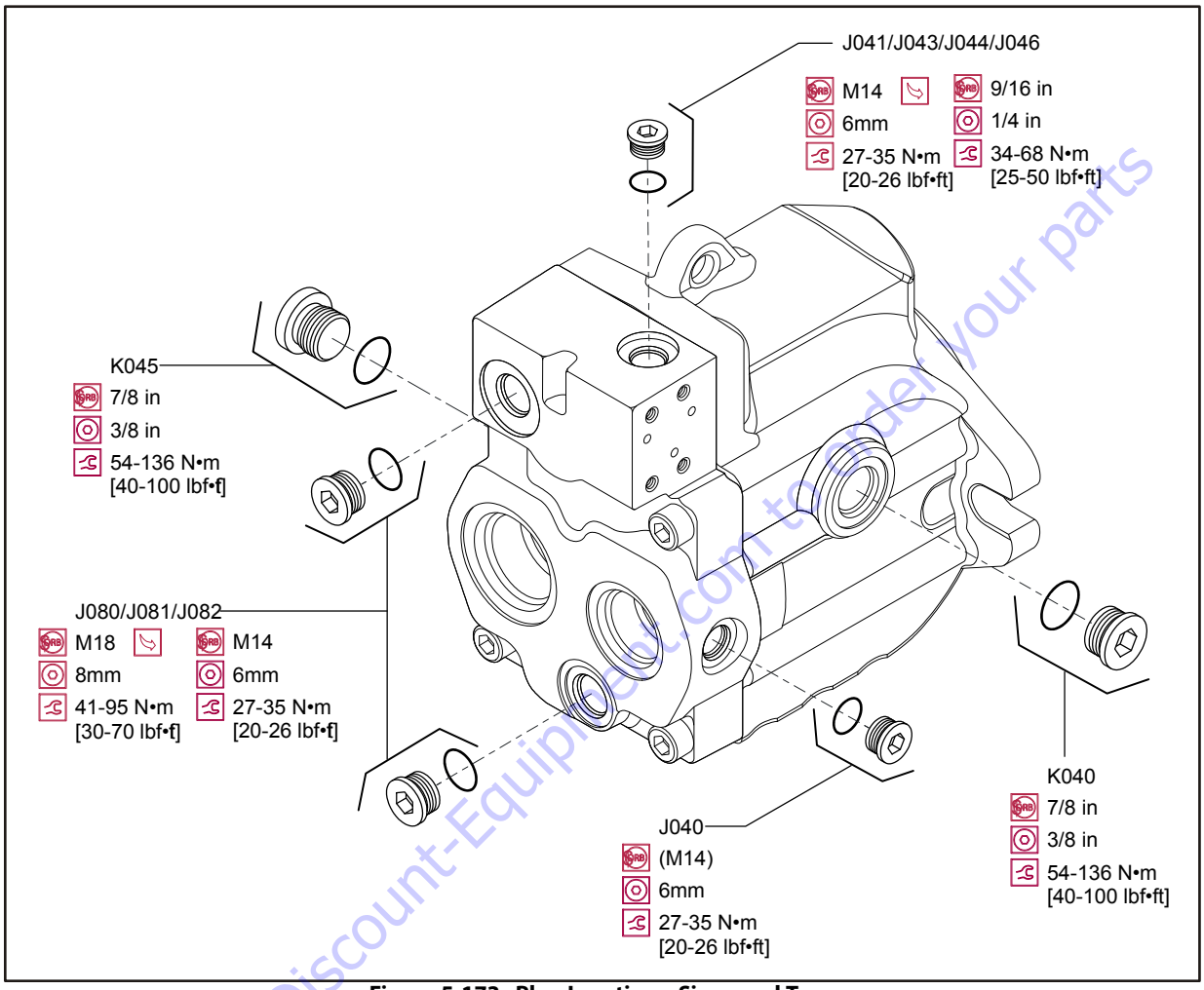


Figure 5-173. Plug Locations, Sizes, and Torques

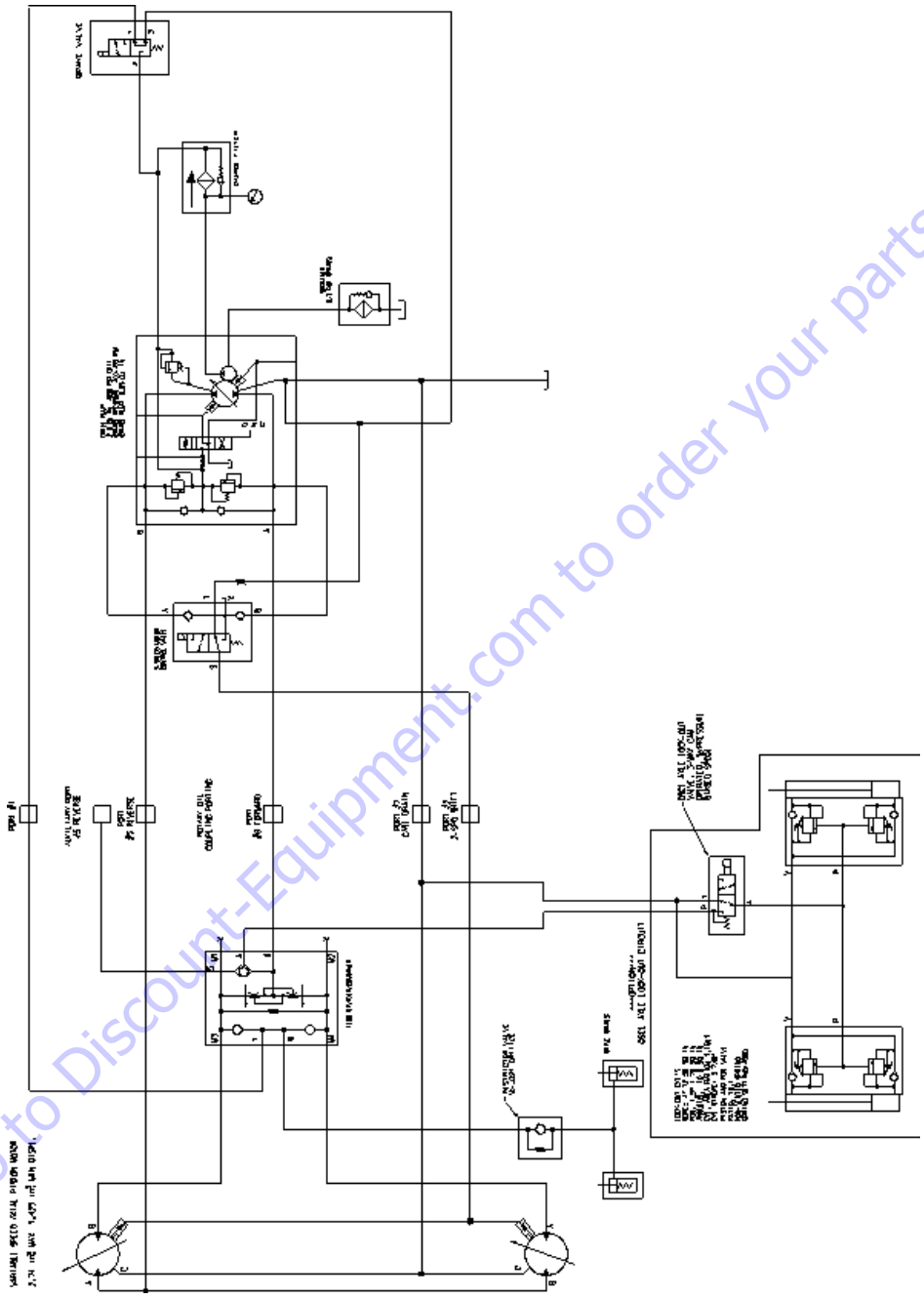


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Figure 5-174. Hydraulic Schematic 2 Wheel Drive (Prior to S/N 0300083332)

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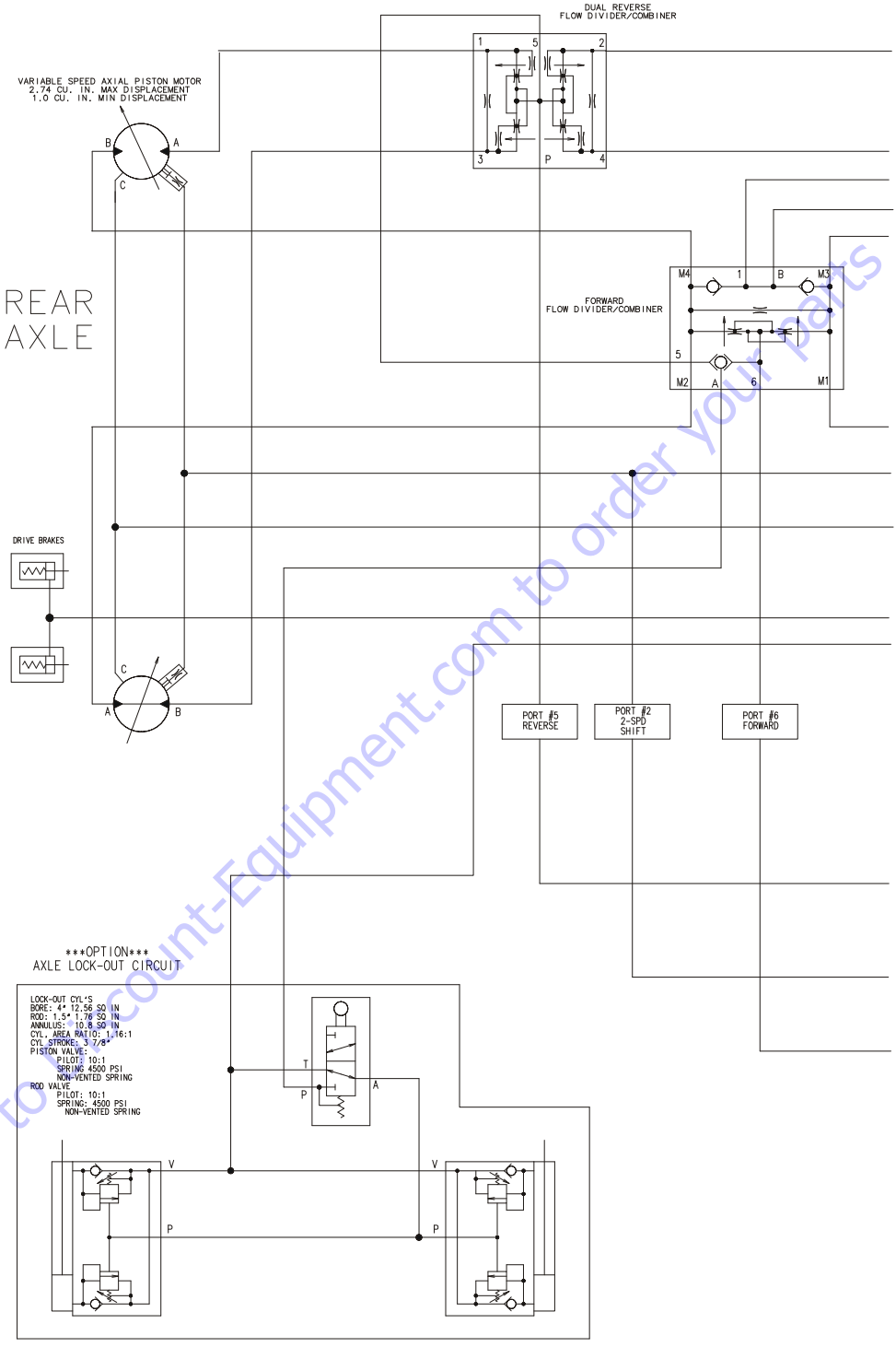

Figure 5-175. Hydraulic Schematic 4 Wheel Drive - (Prior to S/N 0300083332) - Sheet 1 of 2

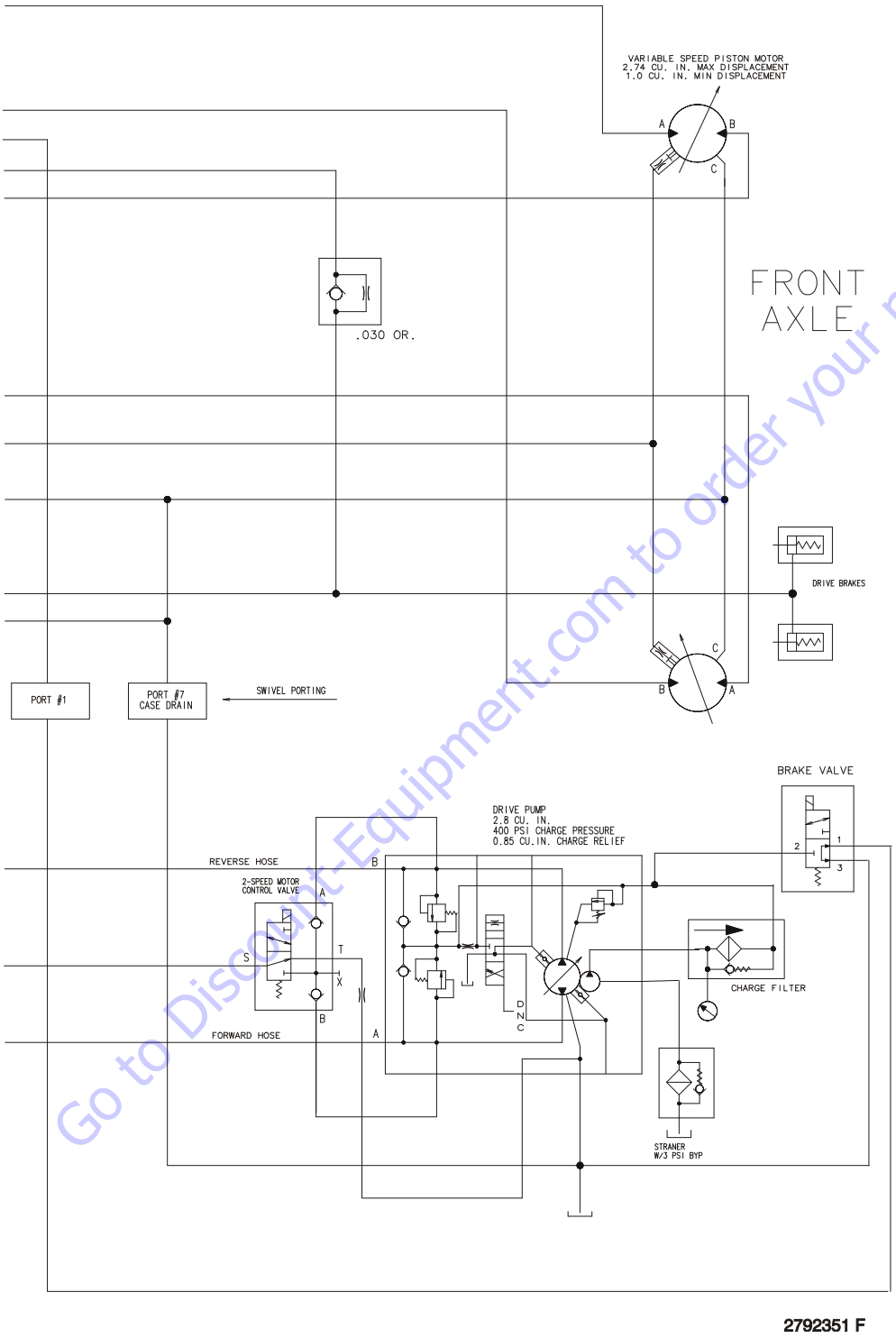

Figure 5-176. Hydraulic Schematic 4 Wheel Drive (Prior to S/N 0300083332) - Sheet 2 of 2

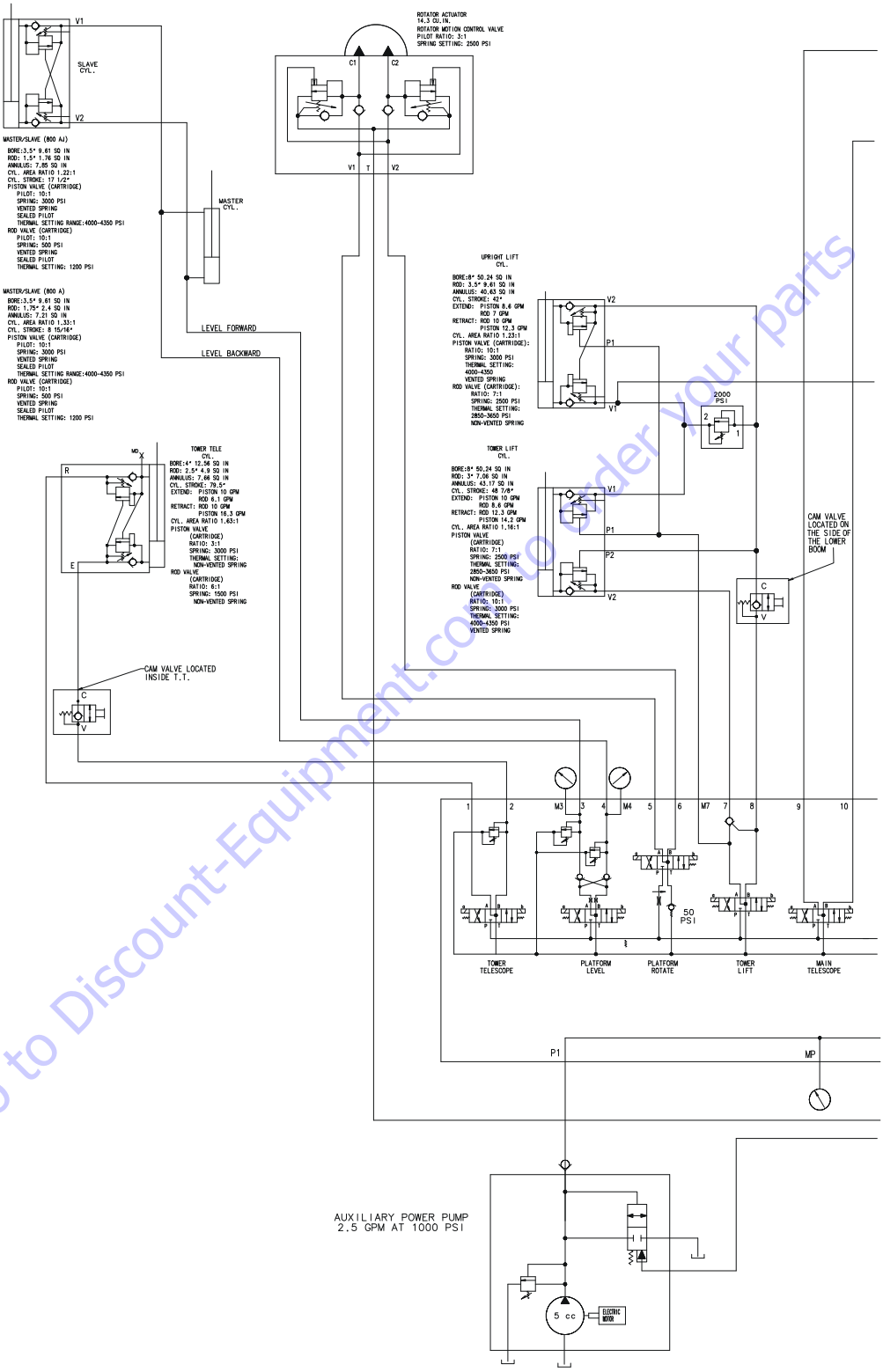

Figure 5-177. Hydraulic Schematic (Prior to S/N 0300083332) - Sheet 1 of 2

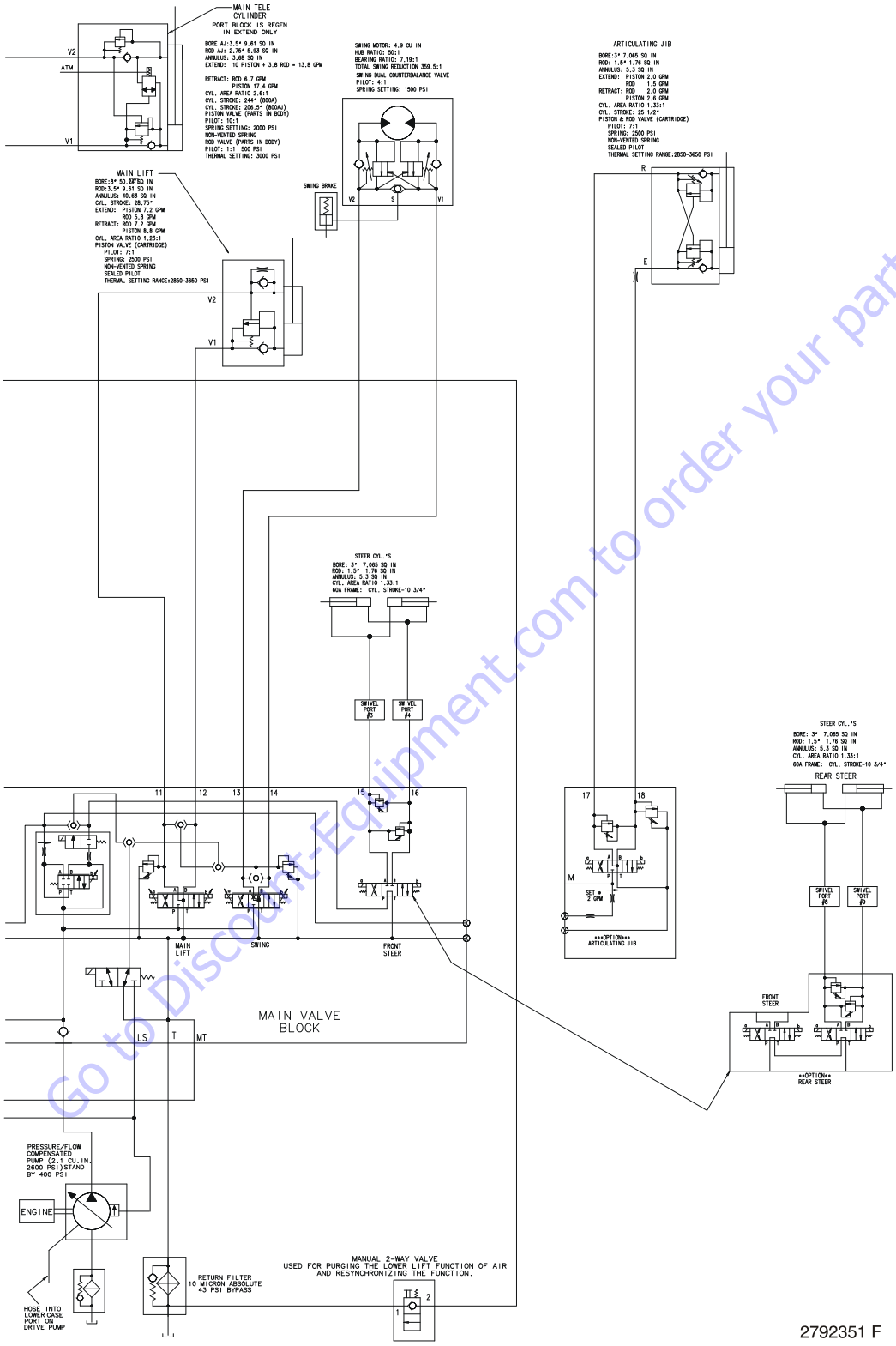

Figure 5-178. Hydraulic Schematic (Prior to S/N 0300083332) - Sheet 2 of 2

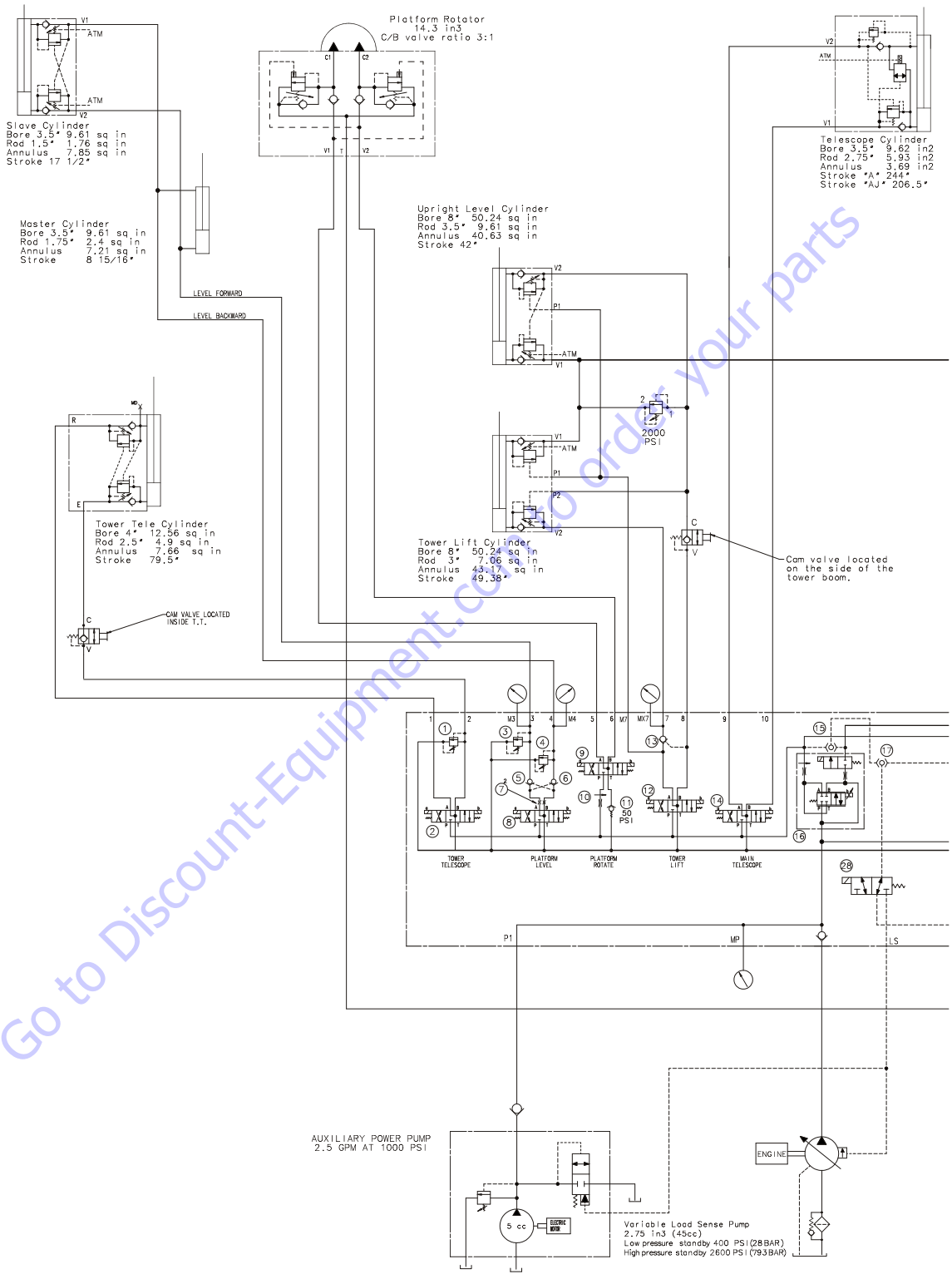

Figure 5-179. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 1 of 6

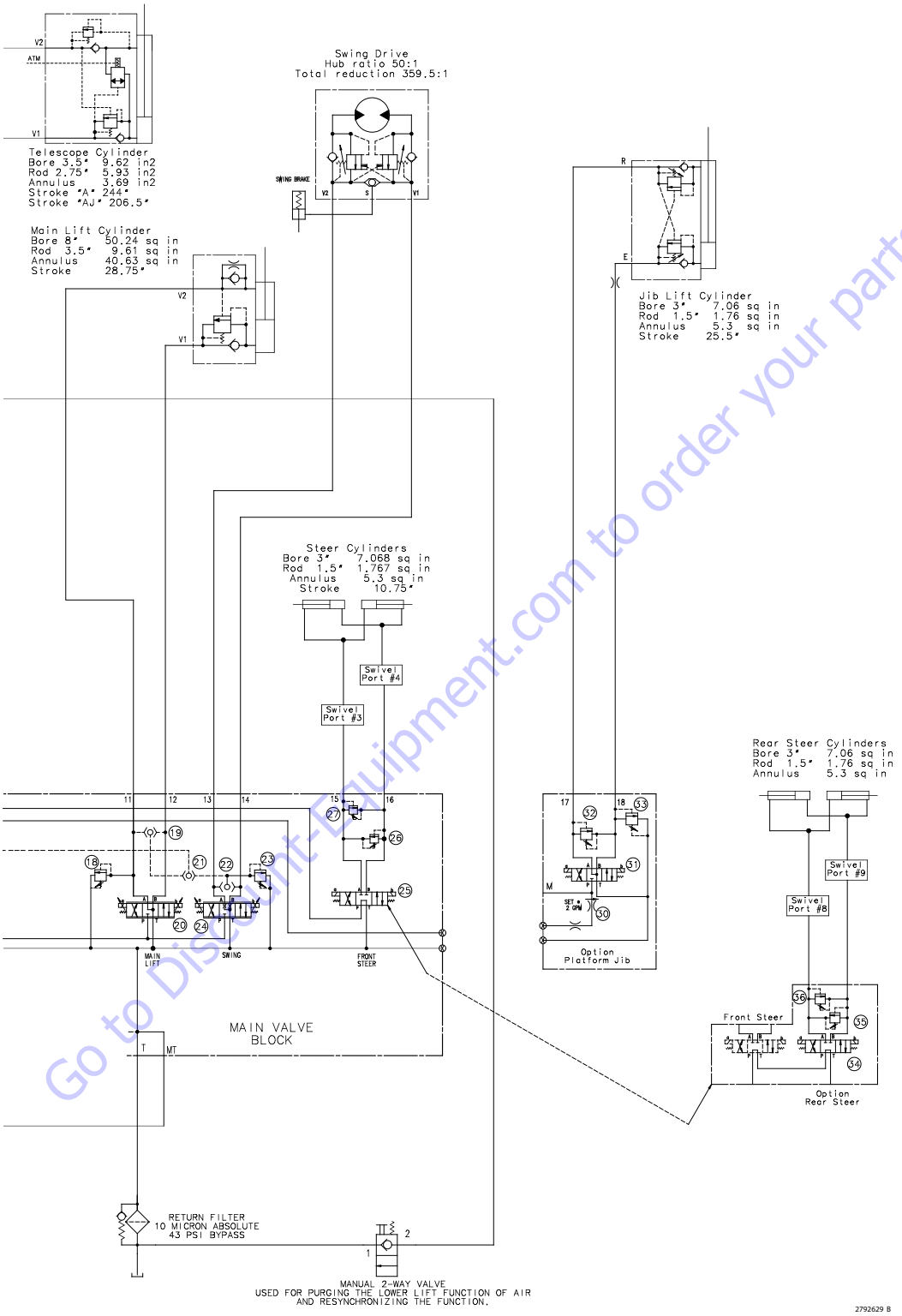

Figure 5-180. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 2 of 6

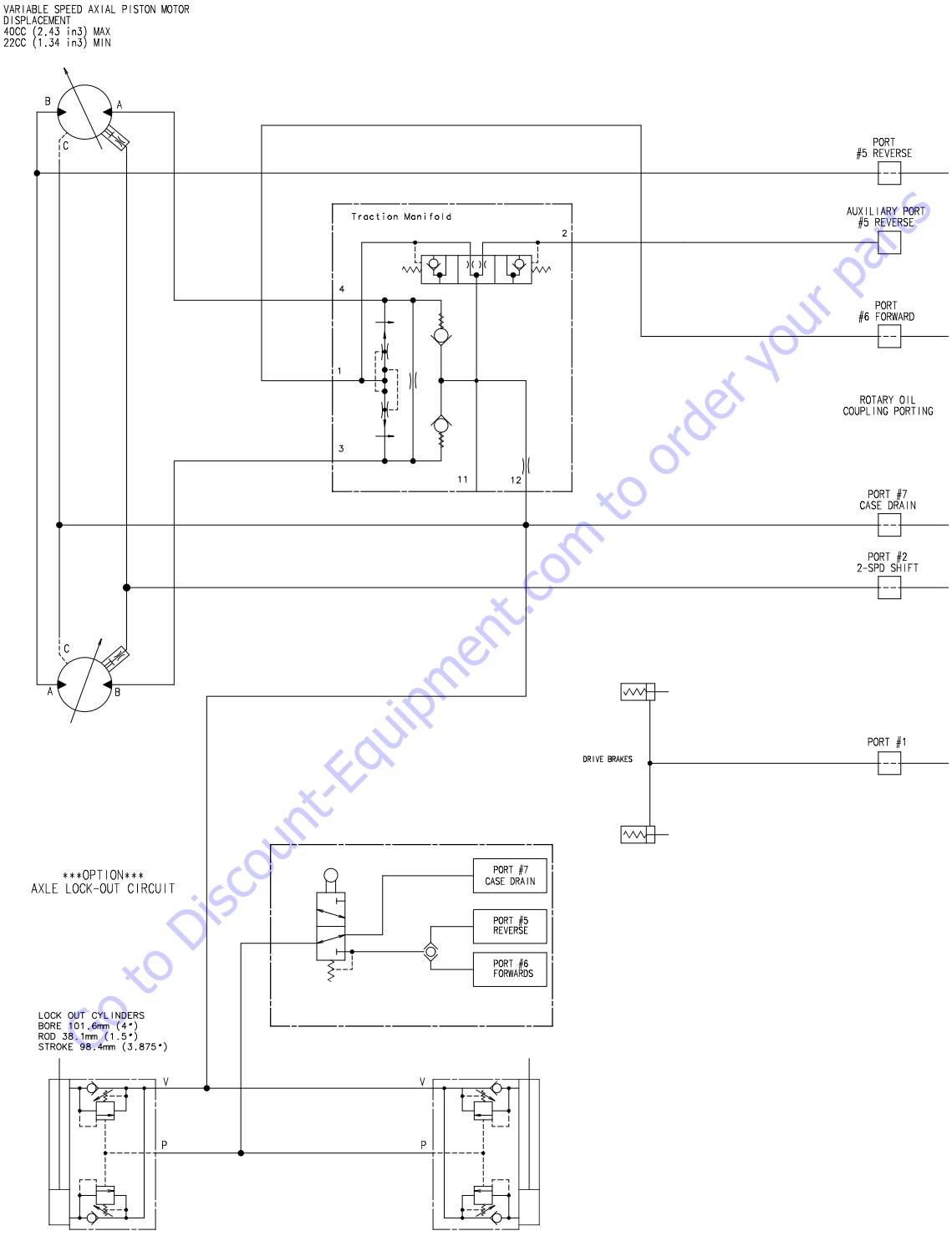

Figure 5-181. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 3 of 6

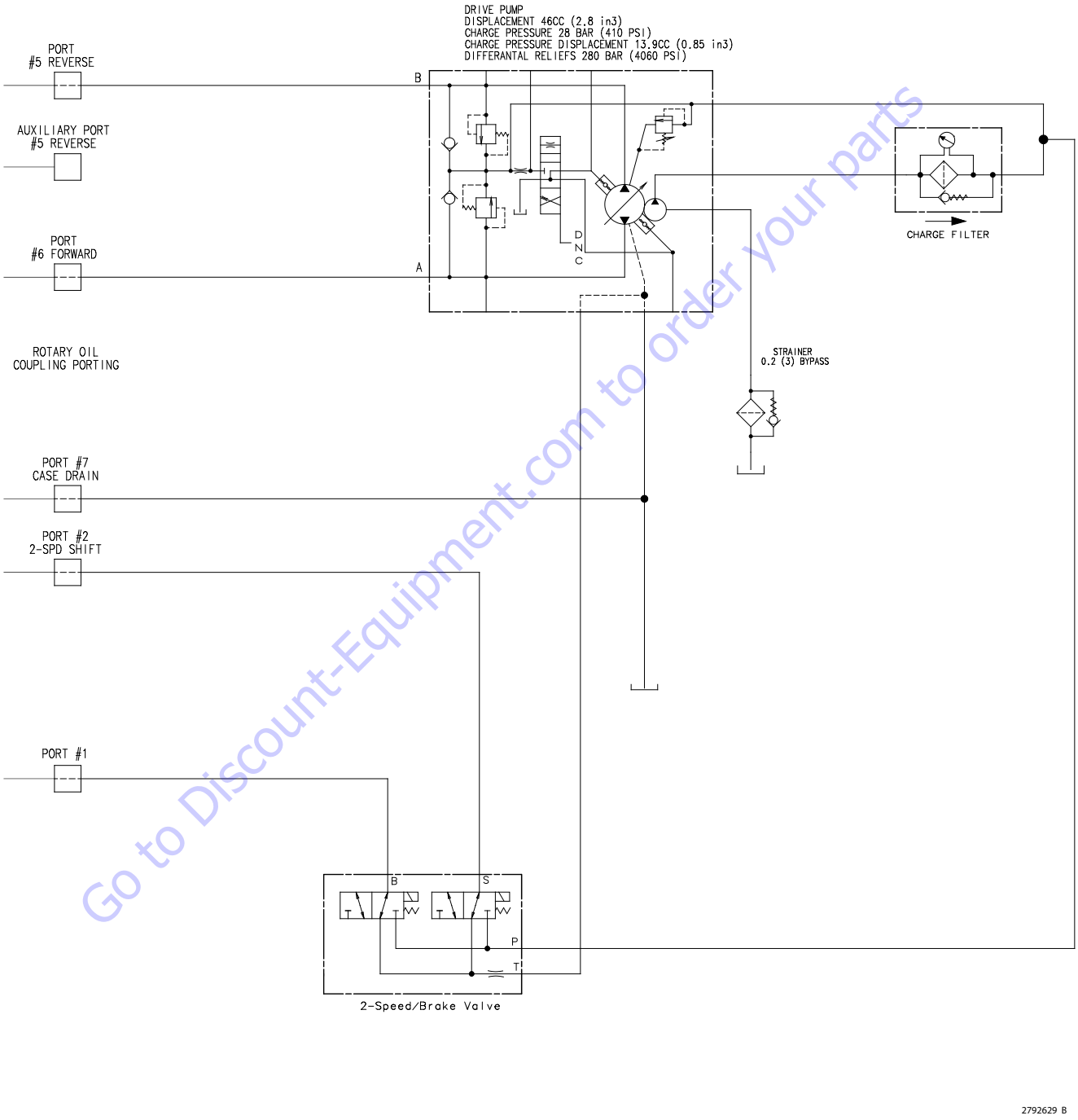

Figure 5-182. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 4 of 6

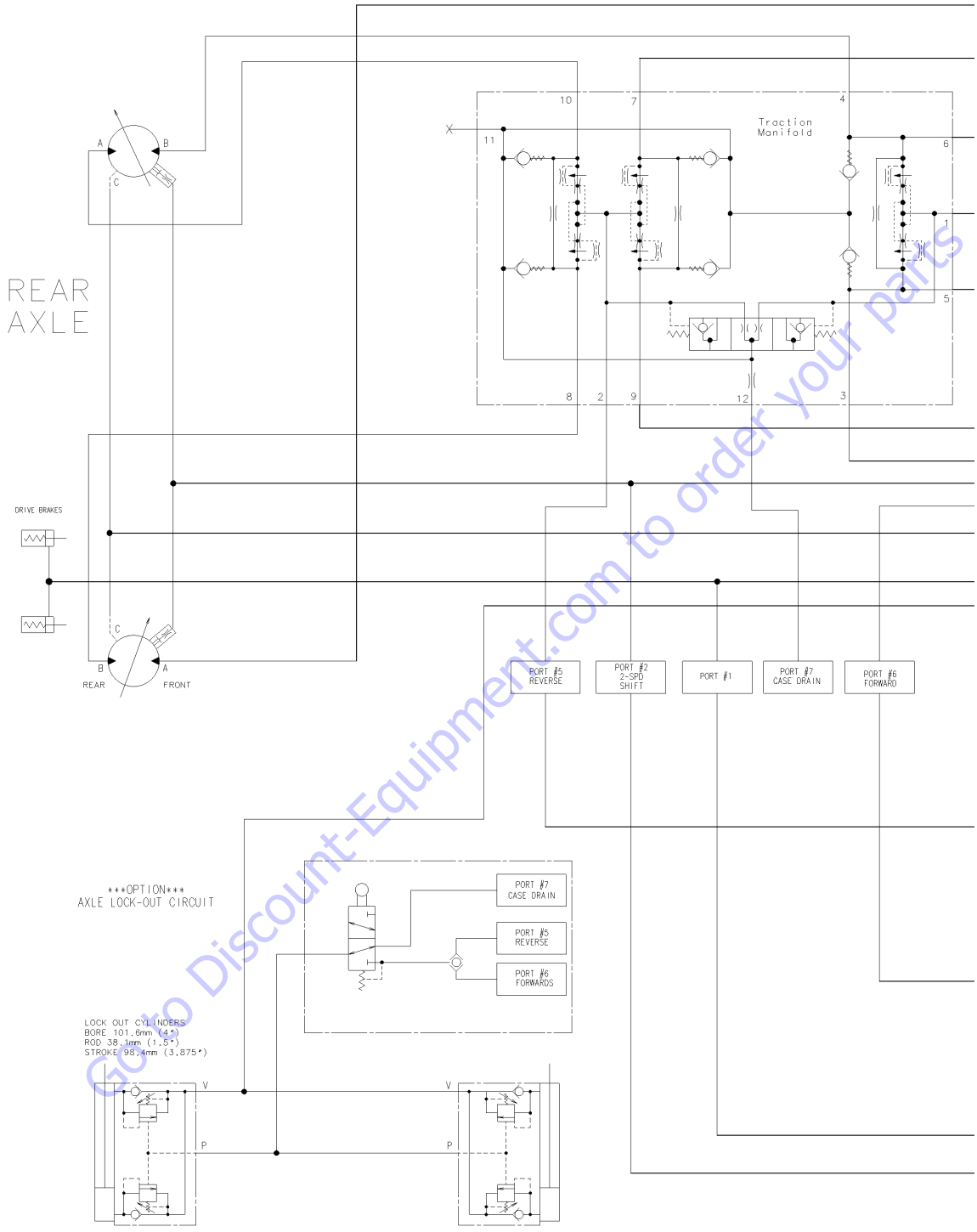

Figure 5-183. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 5 of 6

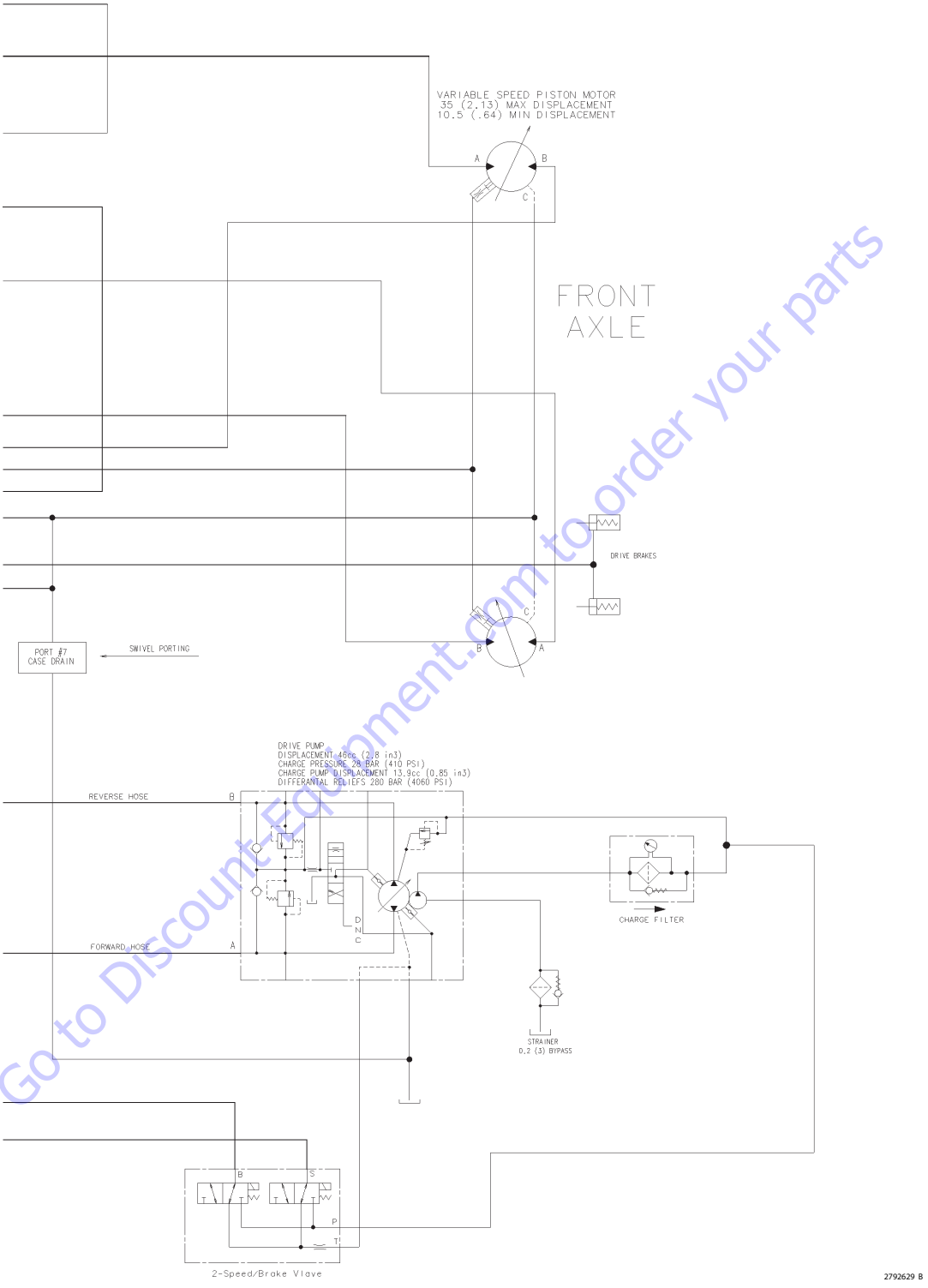

Figure 5-184. Hydraulic Schematic (S/N 0300083332 to S/N 0300183033) - Sheet 6 of 6

PARTS FINDER

Search Website by Part Number

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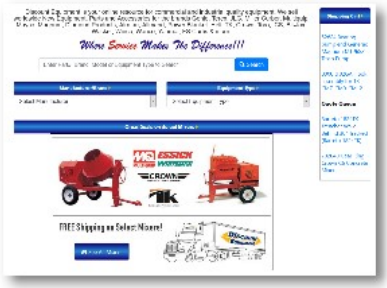

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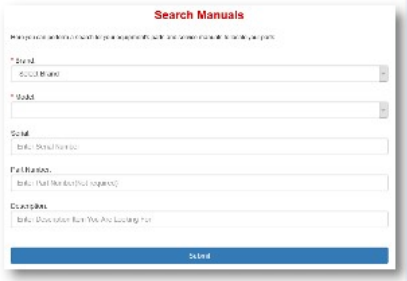

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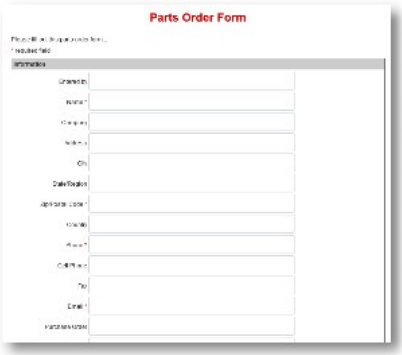

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Click on this link: http://www.discount-equipment.com/category/5443-parts/ and choose one of the options to help get the right parts and equipment you are looking for. Please have the machine model and serial number available in order to help us get you the correct parts. If you don't find the part on the website or on once of the online manuals, please fill out the request form and one of our experienced staff members will get back to you with a quote for the right part that your machine needs.

We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, , Stow, Wacker, Sakai, Mi-T- M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, Barreto, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, ,AMida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, Small Line, Wanco, Yanmar

SECTION 6. JLG CONTROL SYSTEM (S/N 0300065534 TO S/N 0300183033)

6.1 INTRODUCTION

NOTE: *All 800A and 800AJ machines from S/N 0300065534 incorporate ADE (JLG Control System). The following machine serial numbers prior to S/N 65534 also utilize ADE: 62045, 62797, 63013, 63665, 63975, 64000, 64007, 64009, 64015, 64017, 64390, 64392, and 64411.*

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.

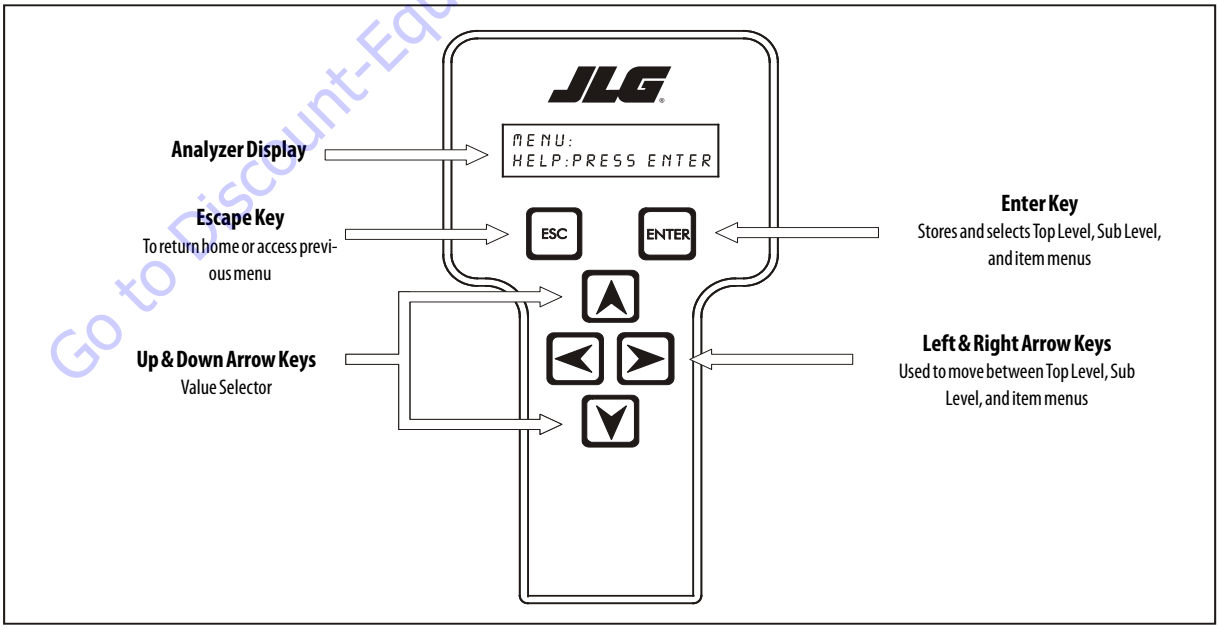


Figure 6-1. Hand Held Analyzer

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	BOOM LENGTH ANGLE MODULE
BLAM	BOOM LENGTH ANGLE MODULE
BR	BROKEN
BSK	BASKET
CAL	CALIBRATION
CL	CLOSED
CM	CHASSIS MODULE
CNTL	CONTROL
CNTRL	CONTROL
C/O	CUT OUT
CONT(S)	CONTRACTOR(S)
COOR	COORDINATED
CRK PT	CRACK POINT
CRP	CREEP
CUT	CUTOUT
CYL	CYLINDER
DECEL	DECELERATE
D	DOWN
DN	DOWN
DWN	DOWN
DEG.	DEGREE
DOS	DRIVE ORIENTATION SYSTEM
DRV	DRIVE
E	ERROR
E&T	ELEVATED & TILTED
ELEV	ELEVATION
ENG	ENGINE
EXT	EXTEND
F	FRONT
FL	FLOW
FNT	FRONT
FOR	FORWARD
FWD	FORWARD
FSW	FOOT SWITCH
FUNC	FUNCTION
G	GROUND
GND	GROUND

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
GRN	GREEN
GM	GROUND MODULE
H	HOURS
HW	HARDWARE
HWFS	HARDWARE FAILSAFE
I	IN or CURRENT
JOY	JOYSTICK
L	LEFT
LB	POUND
LEN	LENGTH
LIM	LIMIT
LT	LEFT
LVL	LEVEL
M	MINUTES
MIN	MINIMUM
MAX	MAXIMUM
M	MAIN
MN	MAIN
NO	NORMALLY OPEN or NO
NC	NORMALLY CLOSED
O	OUT
O/C	OPEN CIRCUIT
OP	OPEN
O/R	OVERRIDE or OUTRIGGER
O//R	OVERRIDE
OSC	OSCILLATING
OVRD	OVERRIDE
P	PLATFORM
P	PRESSURE
PCV	PROPORTIONAL CONTROL VALVE
PLAT	PLATFORM
PLT	PLATFORM
PM	PLATFORM MODULE
POT	POTENTIOMETER
PRES	PRESSURE
PRS	PRESSURE
PT	POINT
R	REAR or RIGHT
REV	REVERSE or REVISION
RET	RETRACT
ROT.	ROTATE
RT	RIGHT
S/C	SHORT CIRCUIT
SEL	SELECTOR

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
SN	SERIAL NUMBER
SPD	SPEED
STOW	STOWED
STOWD	STOWED
SW	SWITCH or SOFTWARE
TELE	TELESCOPE
TEMP	TEMPERATURE
TORQ.	TORQUE
TRN	TRANSPORT
T/T	TURNTABLE
T	TOWER
TURNTBL	TURNTABLE
TWR	TOWER
U	UPPER or UP
V	VOLT
VER	VERSION
VLV	VALVE
WIT	WITNESS
YEL	YELLOW

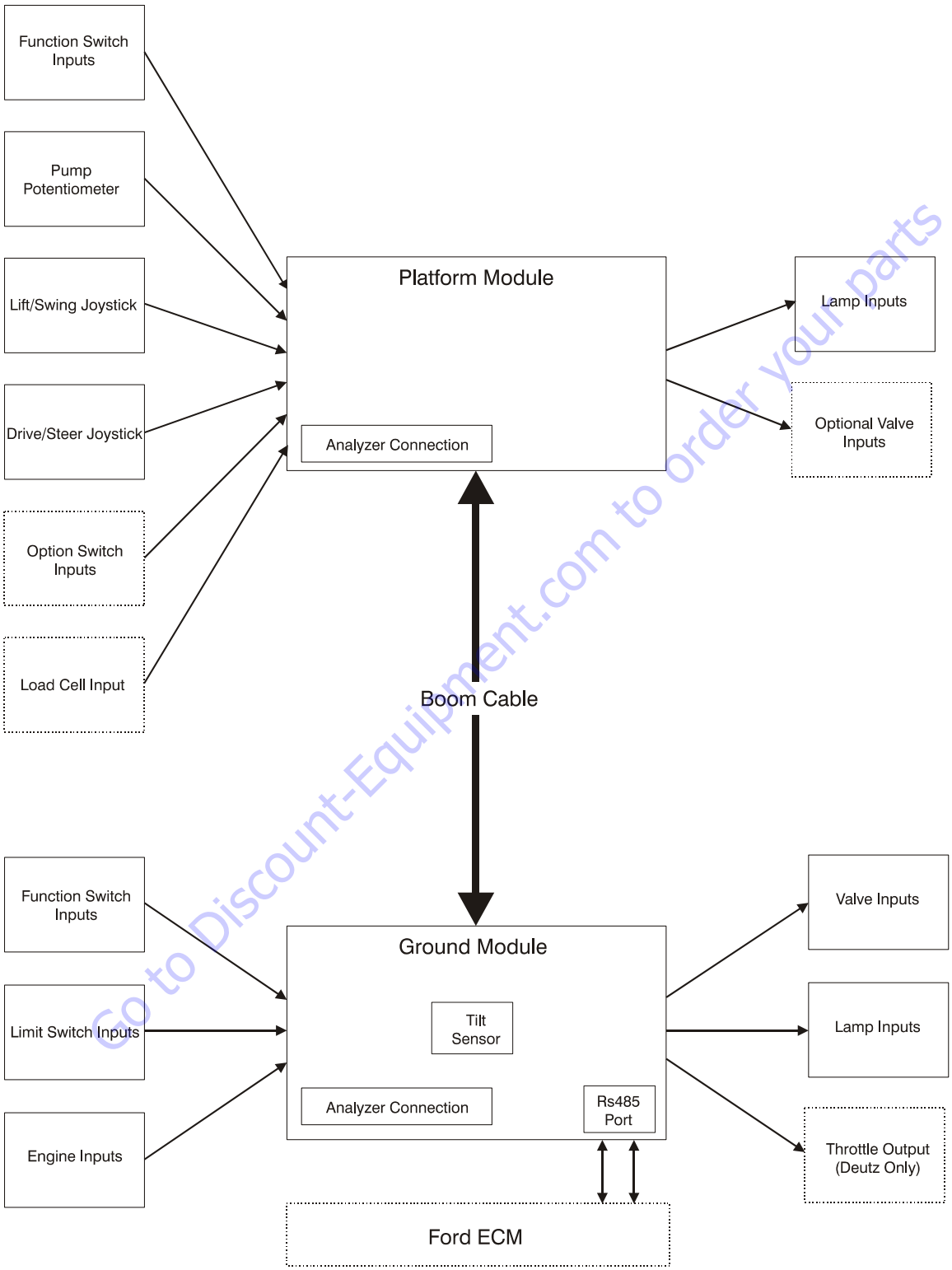
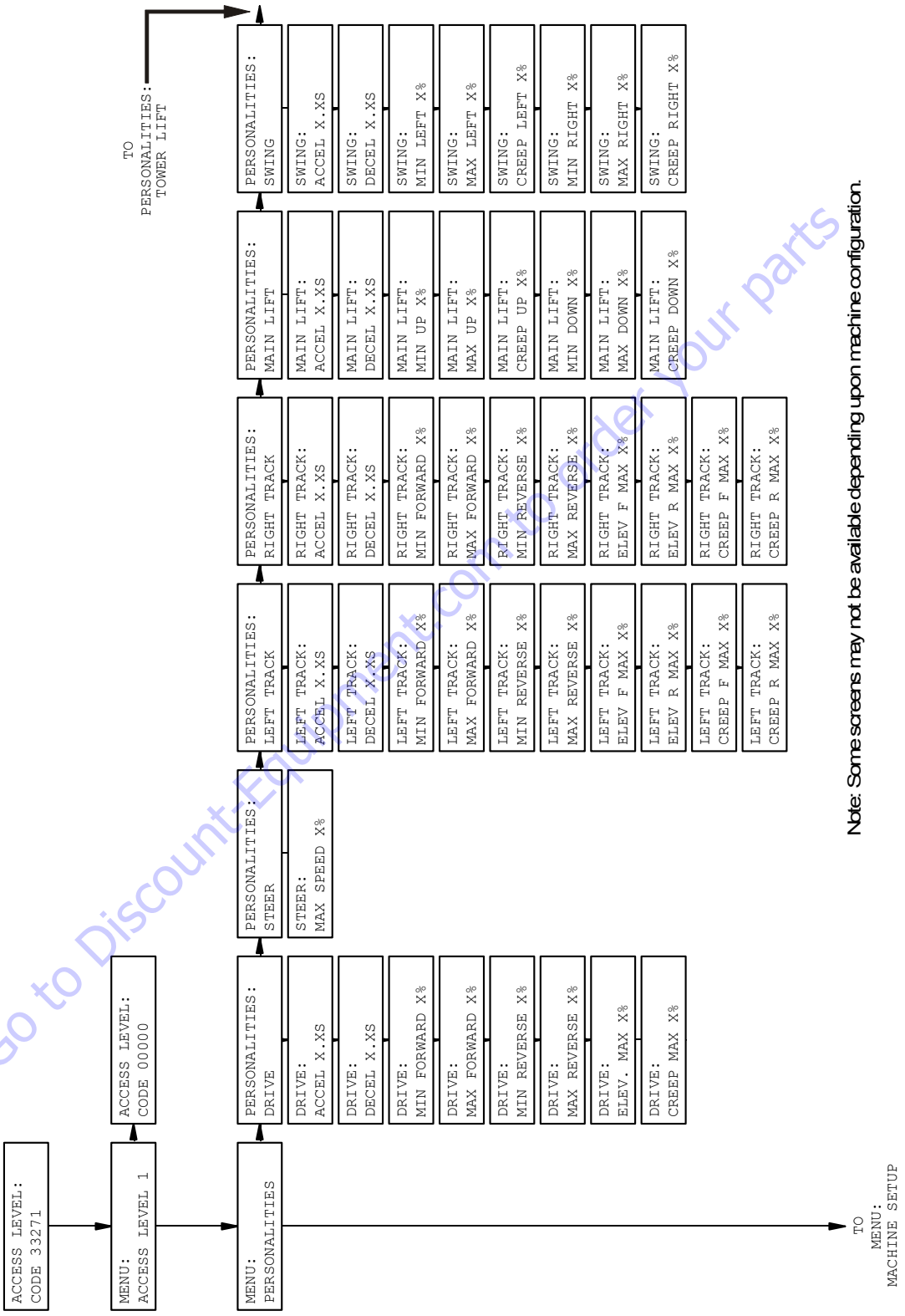


Figure 6-2. ADE Block Diagram



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

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

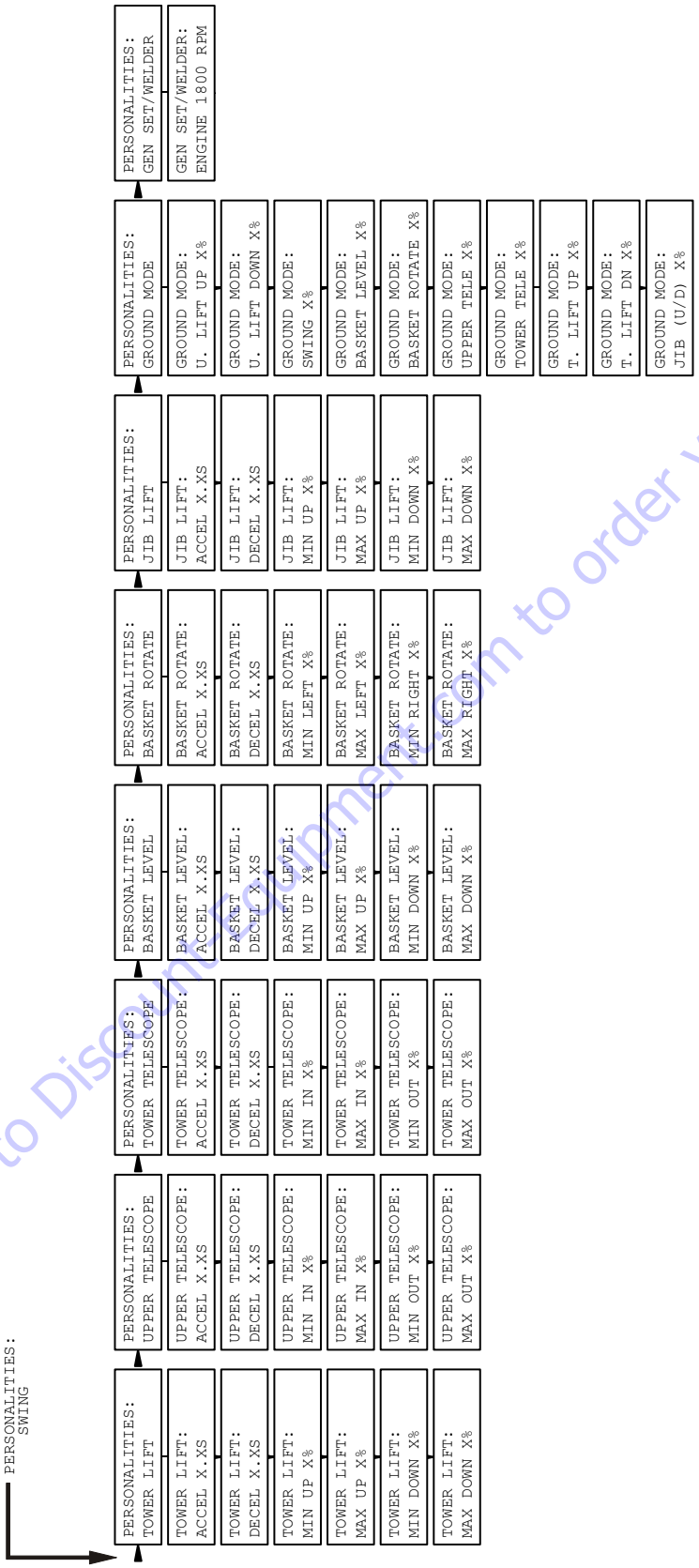


Figure 6-4. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 2 of 4

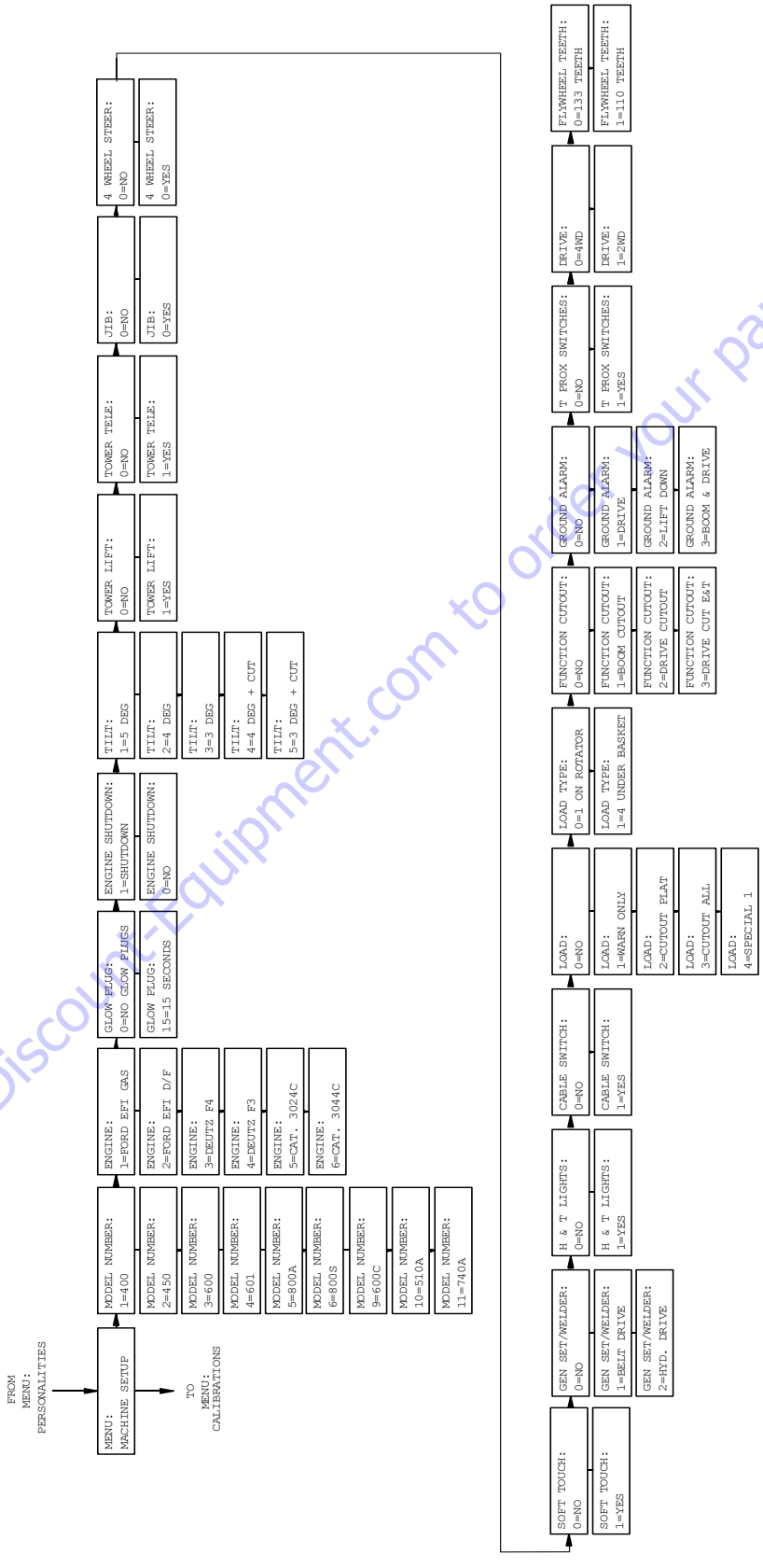
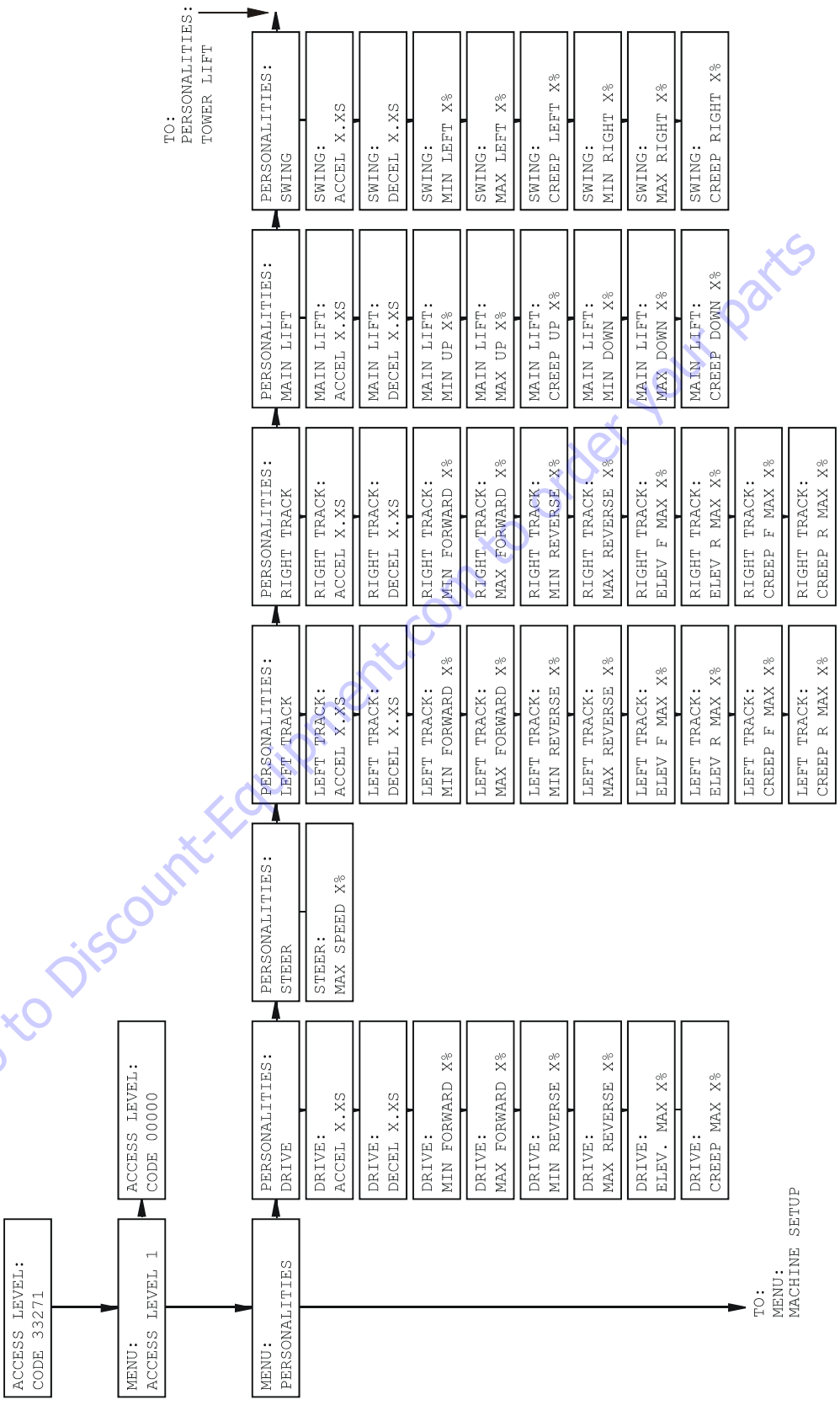


Figure 6-5. Analyzer Flow Chart, Prior to Version 5.X Software - Sheet 3 of 4

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

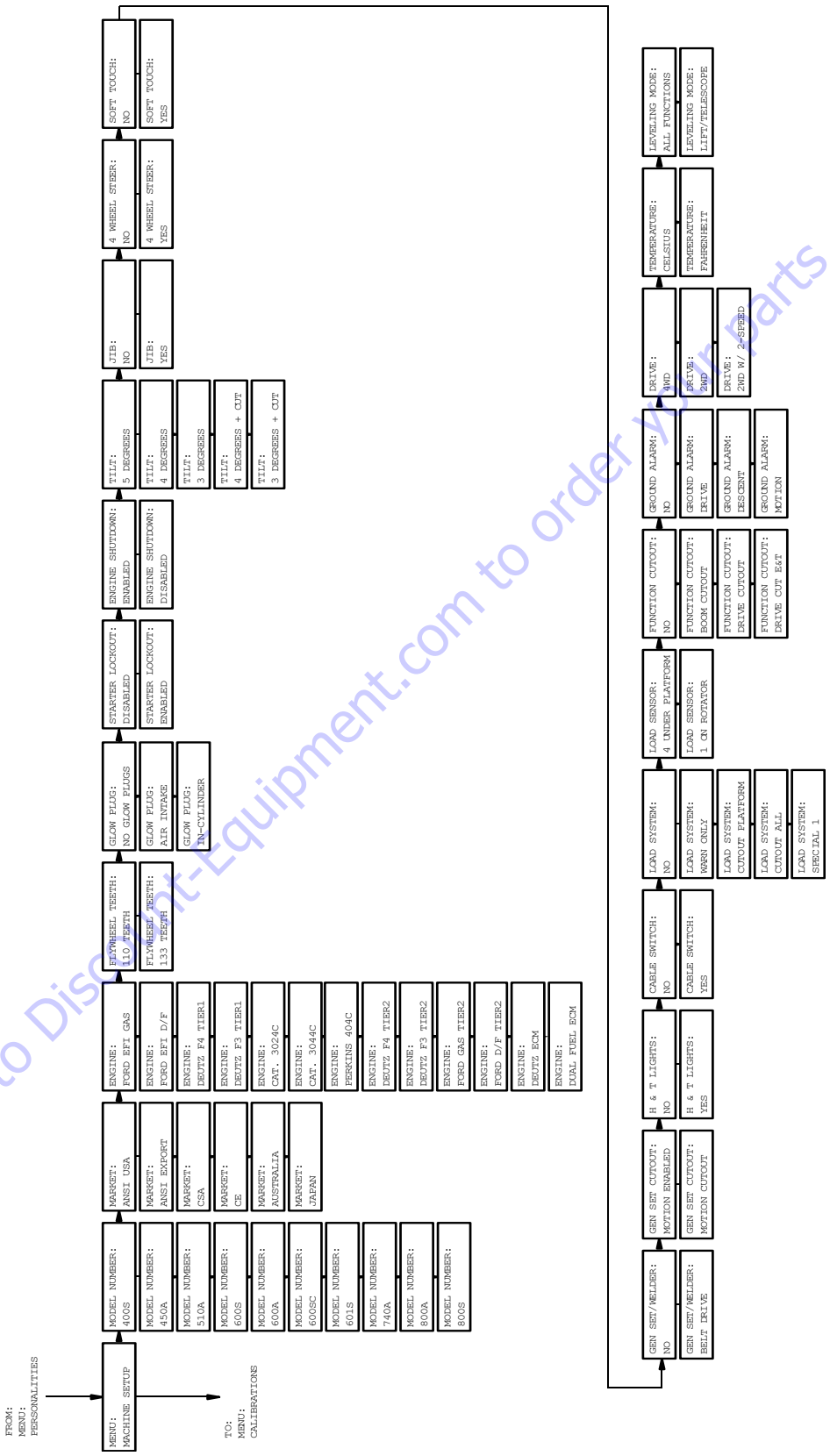


Figure 6-9. Analyzer Flow Chart, Version 5.X Software - Sheet 3 of 4

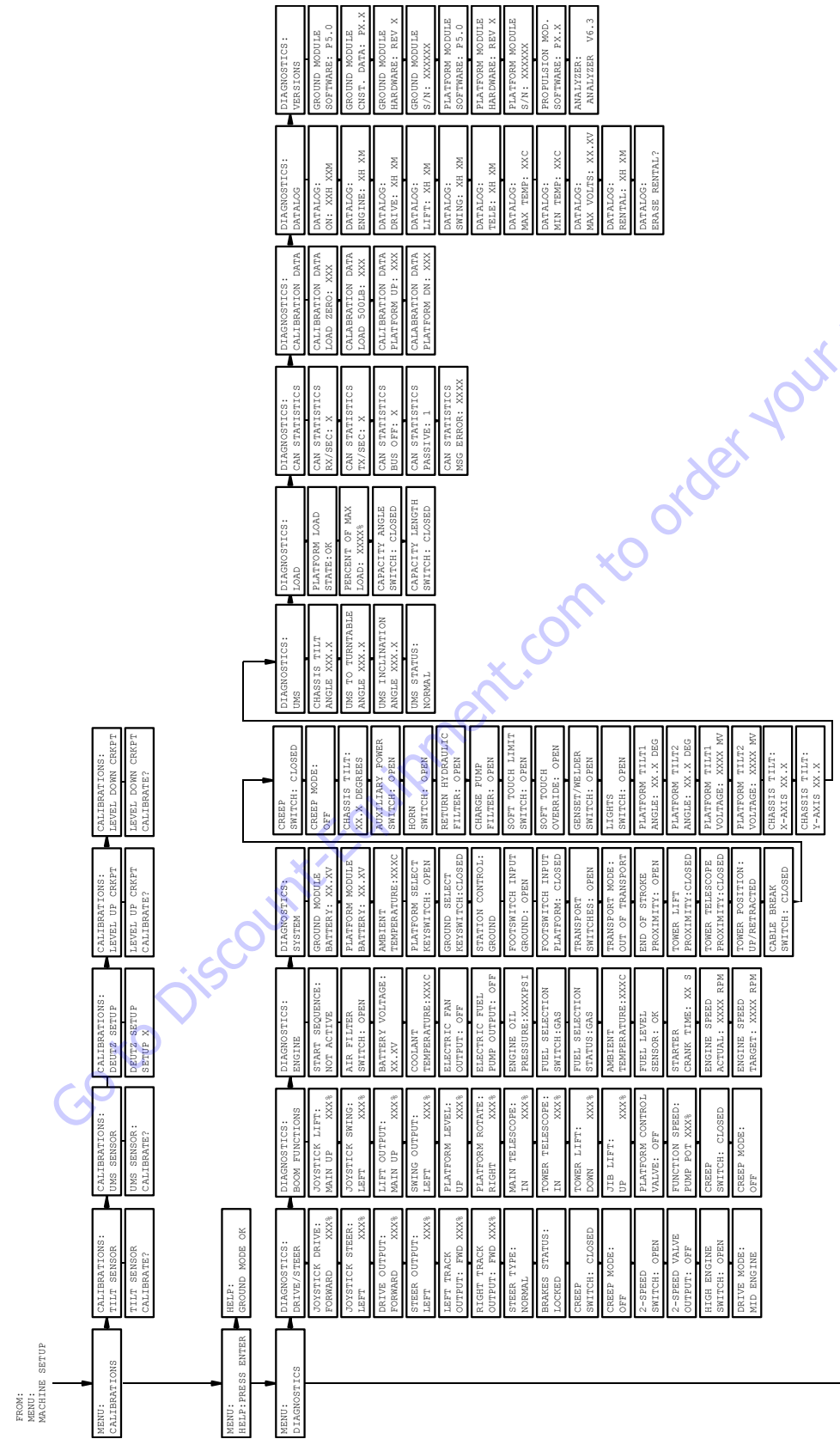
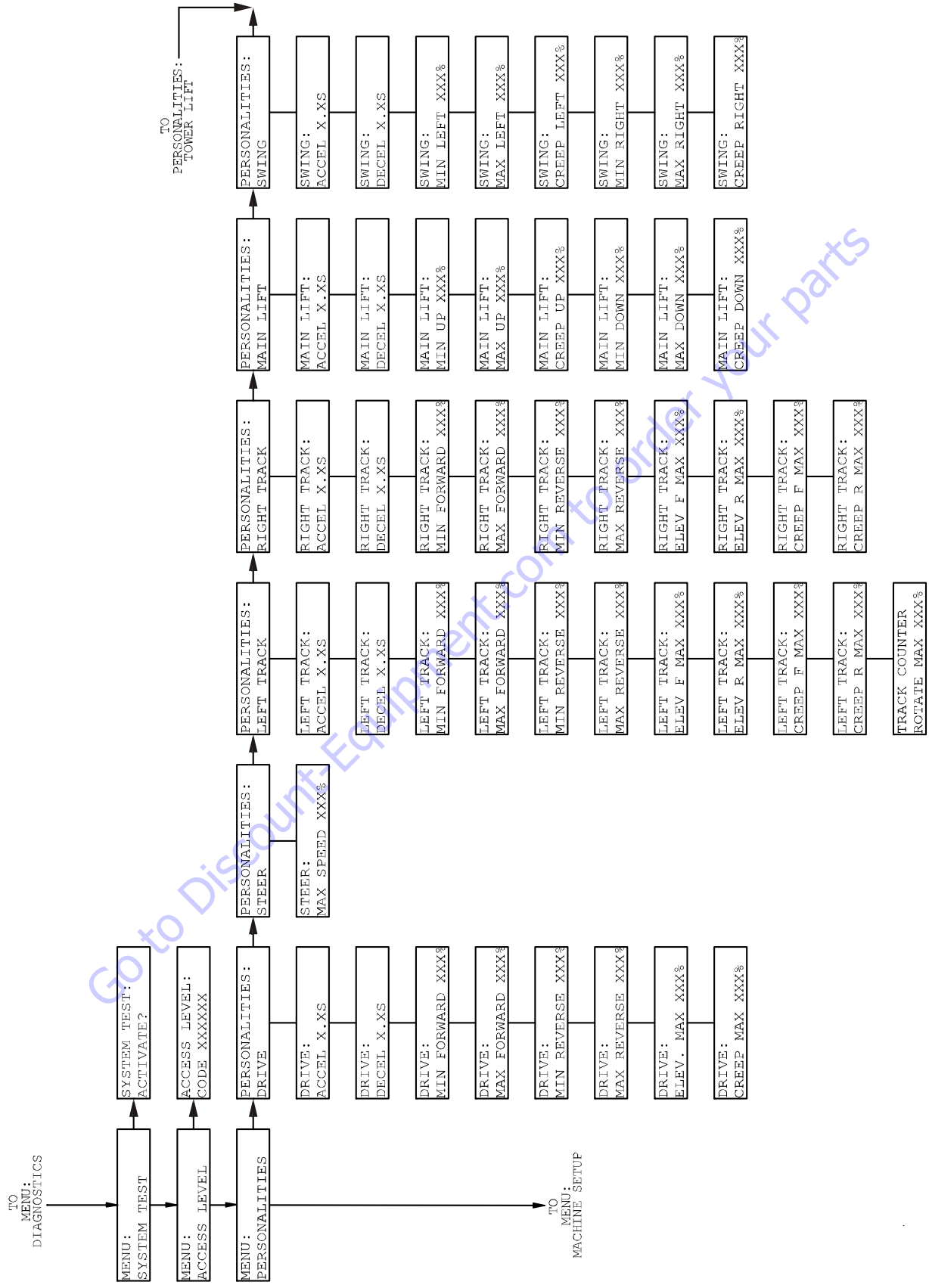


Figure 6-10. Analyzer Flow Chart, Version 5.X Software - Sheet 4 of 4



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

Figure 6-11. Analyzer Flow Chart, Version 6.X Software - Sheet 1 of 5

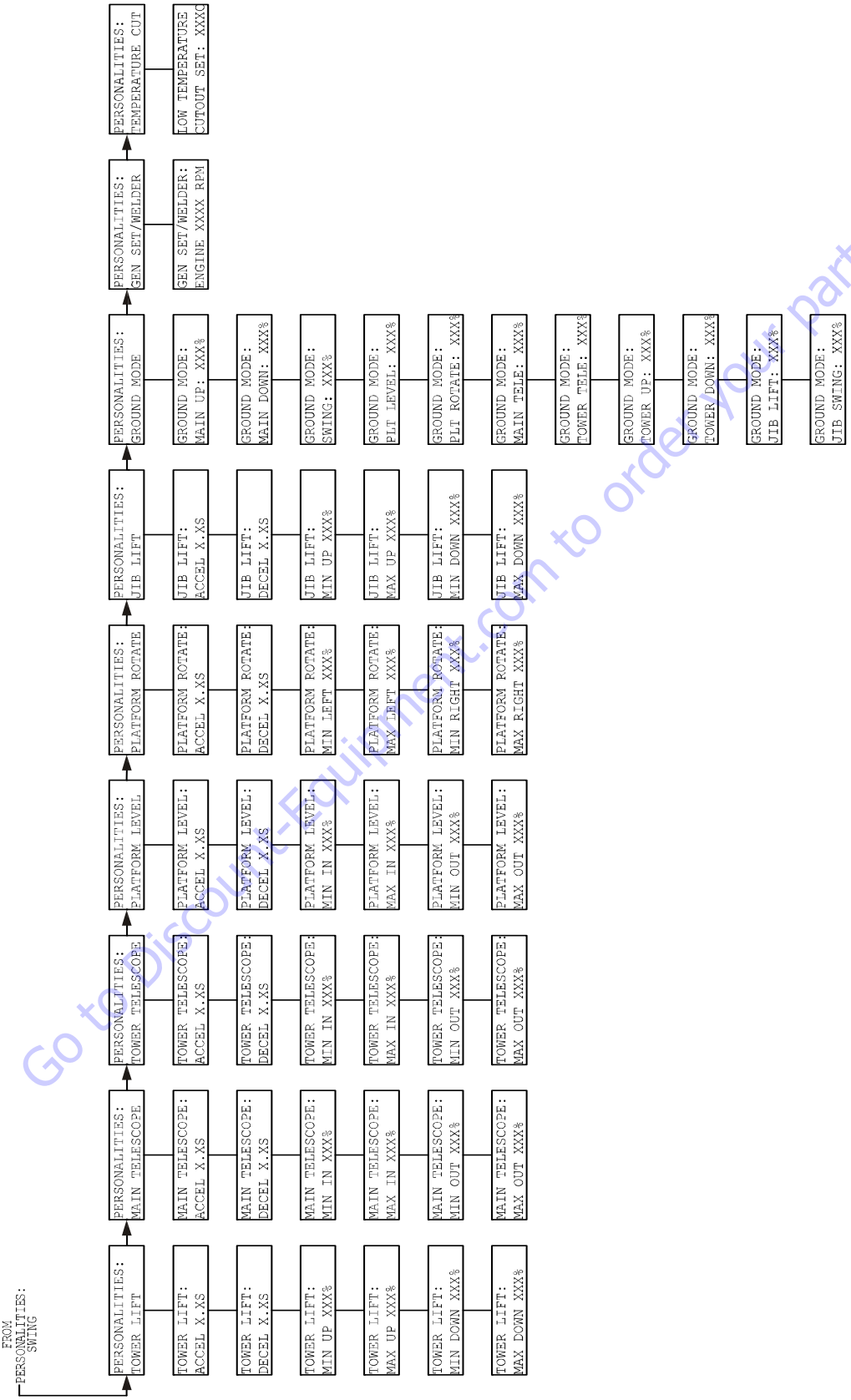


Figure 6-12. Analyzer Flow Chart, Version 6.X Software - Sheet 2 of 5

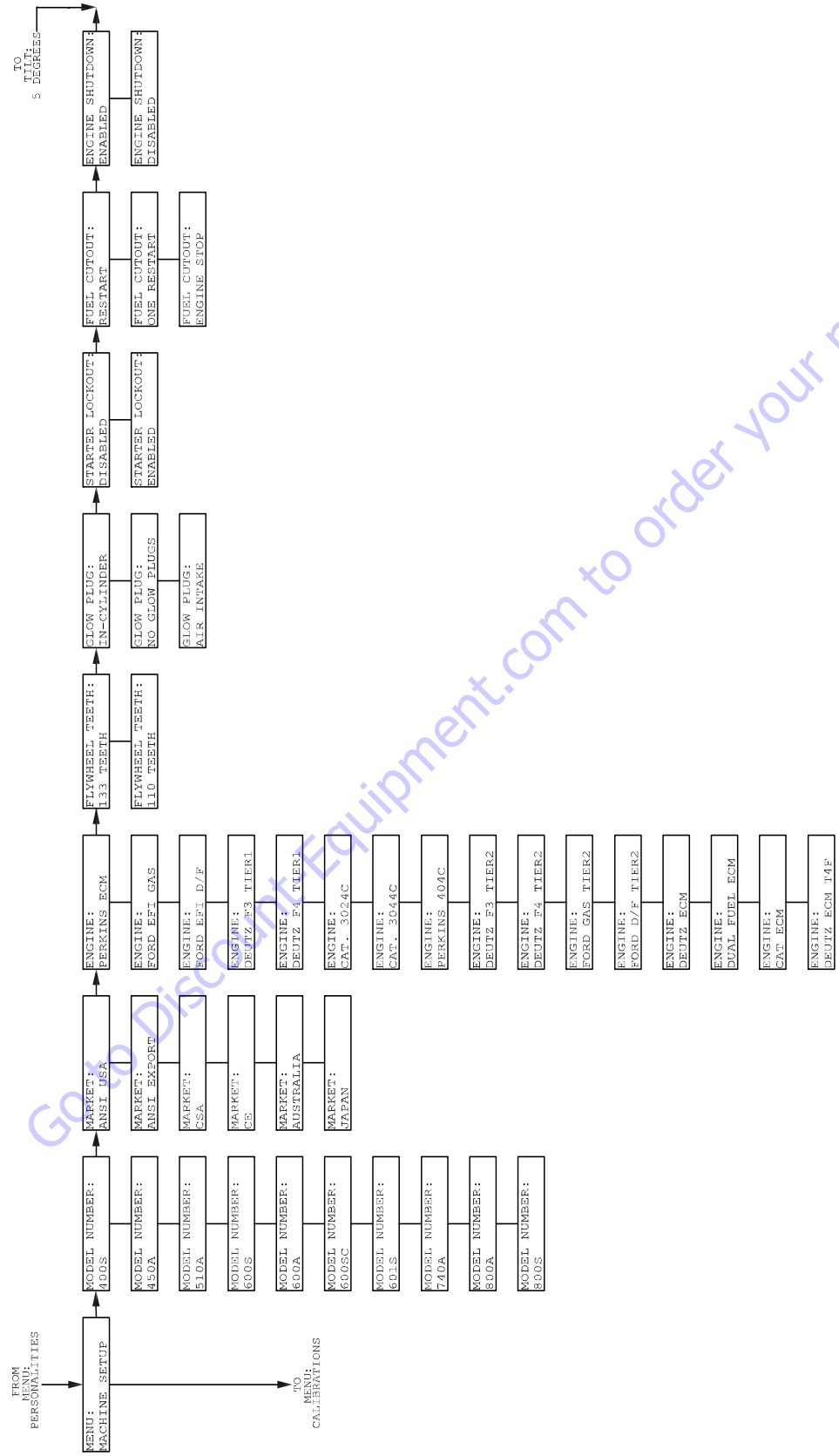


Figure 6-13. Analyzer Flow Chart, Version 6.X Software - Sheet 3 of 5

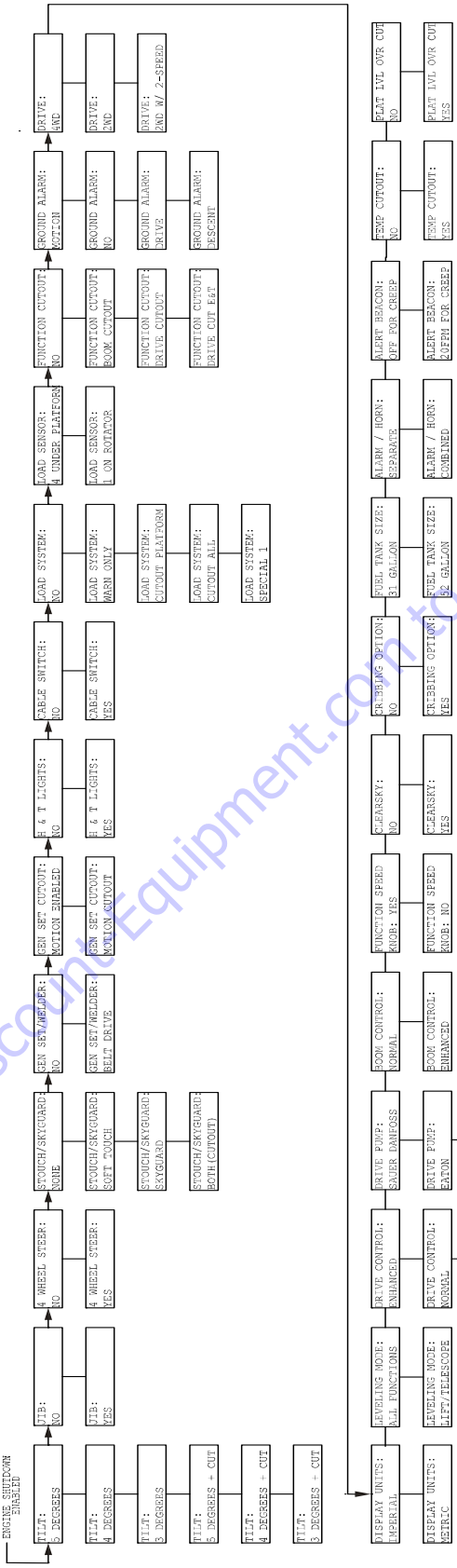


Figure 6-14. Analyzer Flow Chart, Version 6.X Software - Sheet 4 of 5

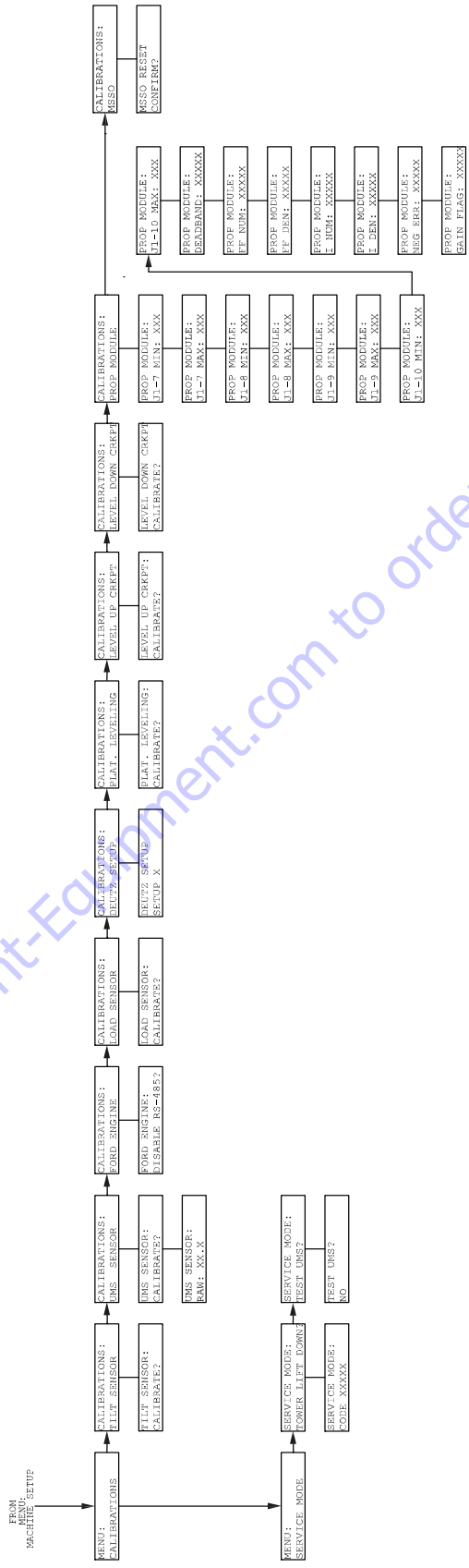


Figure 6-15. Analyzer Flow Chart, Version 6.X Software - Sheet 5 of 5

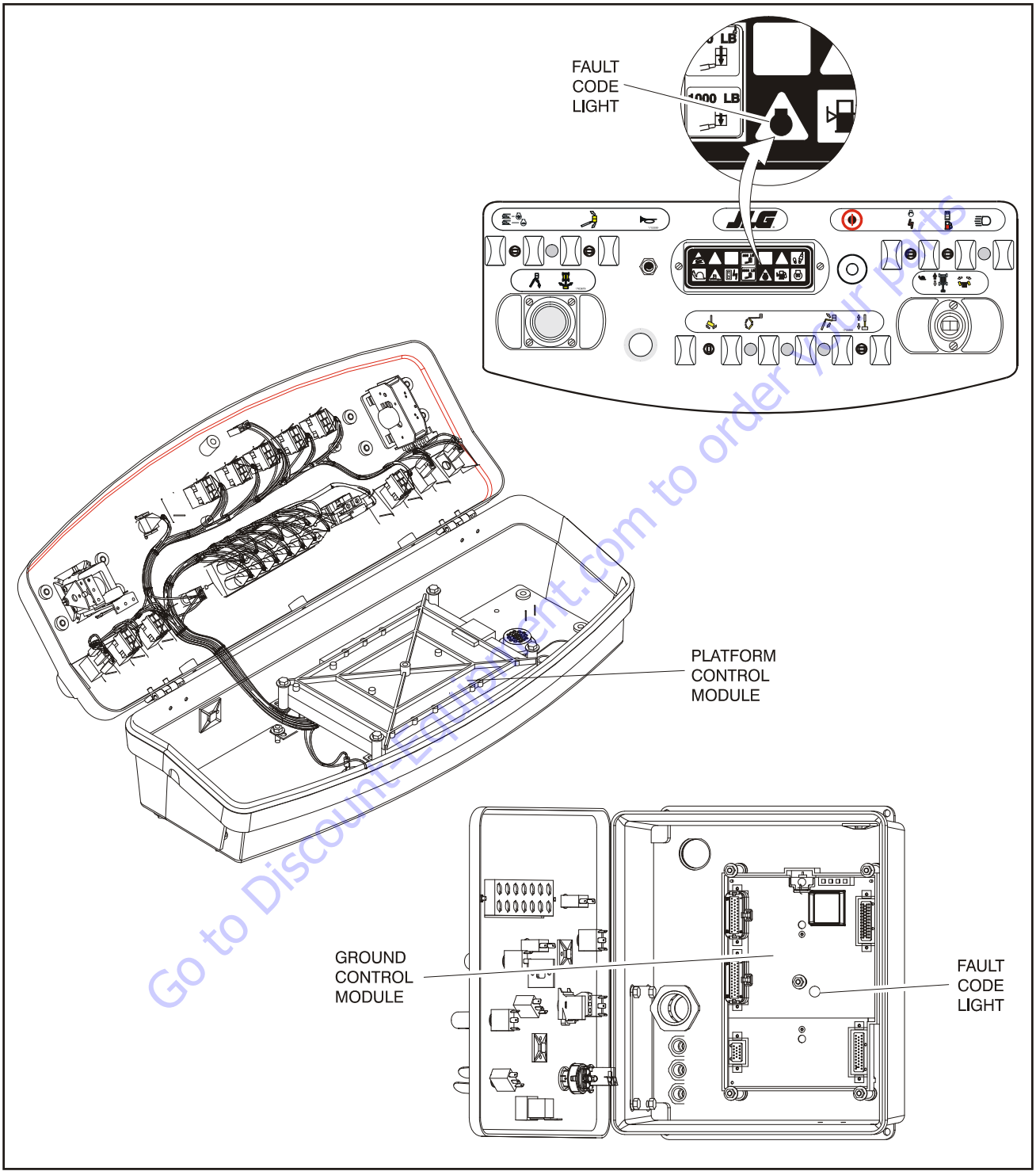
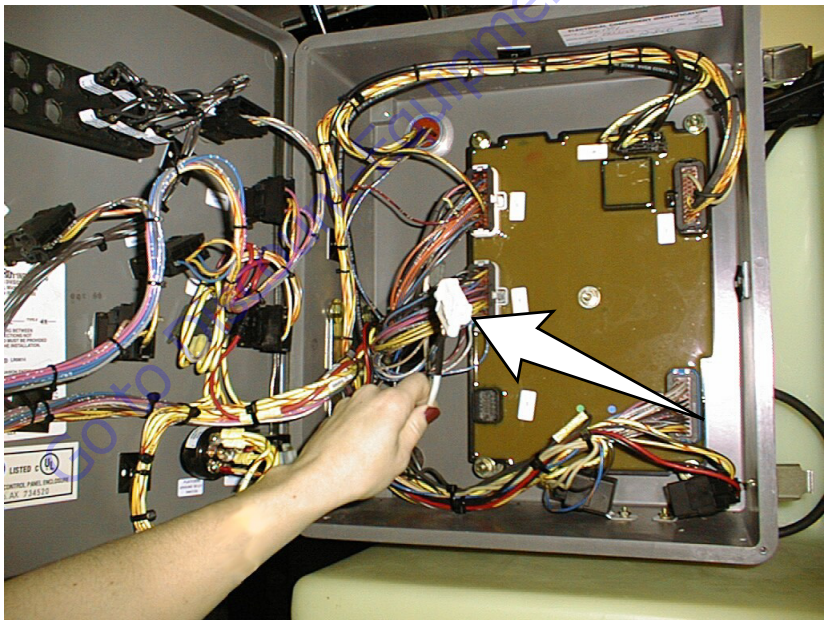


Figure 6-16. Control Module Location

PLATFORM CONNECTION



GROUND CONTROL CONNECTION

Figure 6-17. Analyzer Connecting Points

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 TO CONNECT THE JLG CONTROL SYSTEM ANALYZER

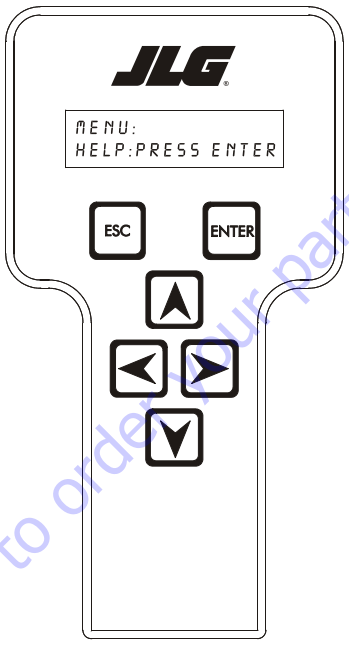
1. Connect the four pin end of the cable supplied with the analyzer, to the controller module located in the platform box or at the controller module in the ground control box and connect the remaining end of the cable to the analyzer.

NOTE: *The cable has a four pin connector at each end of the cable; the cable cannot be connected backwards.*

2. Power up the Control System by turning the lower key to the platform or ground position and pulling both emergency stop buttons on.

6.4 USING THE ANALYZER

With the machine power on and the analyzer connected properly, the analyzer will display the following:



HELP:
PRESS ENTER

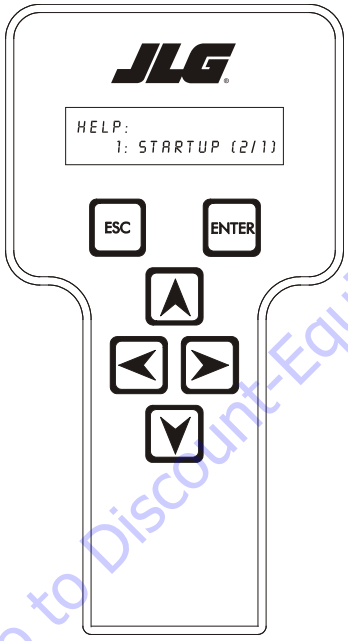
At this point, using the **RIGHT** and **LEFT** arrow keys, you can move between the top level menu items. To select a displayed menu item, press **ENTER**. To cancel a selected menu item, press **ESC**.; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

HELP
DIAGNOSTICS
SYSTEM TEST
ACCESS LEVEL
PERSONALITIES
MACHINE SETUP
CALIBRATIONS (view only)
LEVEL VEHICAL (level 1 only)

If you press **ENTER**, at the **HELP: PRESS ENTER** display, and a fault is present, the analyzer display will scroll the fault across the screen. If there was no fault detected, the display will read: **HELP: EVERYTHING OK.** If powered up at the ground station, the display will read: **GROUND OK.**

If **ENTER** is pressed again, the display moves to the following display:



LOGGED HELP
1: STARTUP (2/1)

At this point, the analyzer will display the last fault the system has seen, if any are present. You may scroll through the fault logs to view what the last 25 faults were. Use the right and left arrow keys to scroll through the fault logs. To return to the beginning, press **ESC**. two times. **STARTUP (2/1)** indicates a power up.

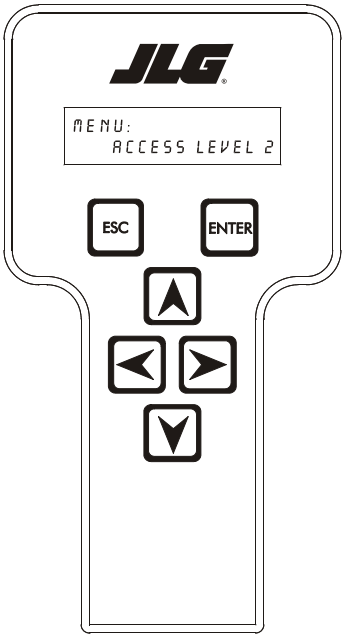
When a top level menu is selected, a new set of menu items may be offered: for example:

DRIVE
BOOM
SYSTEM
DATALOG
VERSIONS

Pressing **ENTER** with any of the above displayed menus, will display additional sub-menus within the selected menu. In some cases, such as **DRIVE**, the next level is the parameter or information to be changed. Refer to the flow chart for what menus are available within the top level menus. You may only view the personality settings for selected menus while in access level 2. Remember, you may always cancel a selected menu item by pressing the **ESC**. key.

6.5 CHANGING THE ACCESS LEVEL OF THE HAND HELD ANALYZER

When the analyzer is first connected, you will be in access level 2 which enables you to only view most settings which cannot be changed until you enter a password to advance to a lower level. This ensures that a setting cannot be accidentally altered. To change the access level, the correct password must be entered. To enter the password, scroll to the **ACCESS LEVEL** menu. For example:



MENU:
ACCESS LEVEL 2

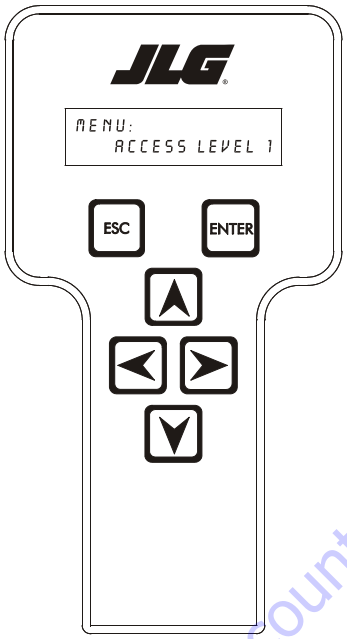
Press **ENTER** to select the **ACCESS LEVEL** menu.

Using the **UP** or **DOWN** arrow keys, enter the first digit of the password, 3.

Then using the **RIGHT** arrow key, position the cursor to the right one space to enter the second digit of the password.

Use the **UP** or **DOWN** arrow key to enter the second digit of the password which is 33271.

Once the correct password is displayed, press **ENTER**. The access level should display the following, if the password was entered correctly:

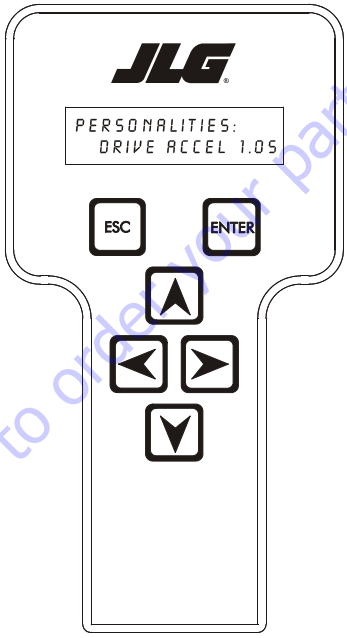


MENU:
ACCESS LEVEL 1

Repeat the above steps if the correct access level is not displayed or you can not adjust the personality settings.

6.6 ADJUSTING PARAMETERS USING THE HAND HELD ANALYZER

Once you have gained access to level 1, and a personality item is selected, press the **UP** or **DOWN** arrow keys to adjust its value, for example:

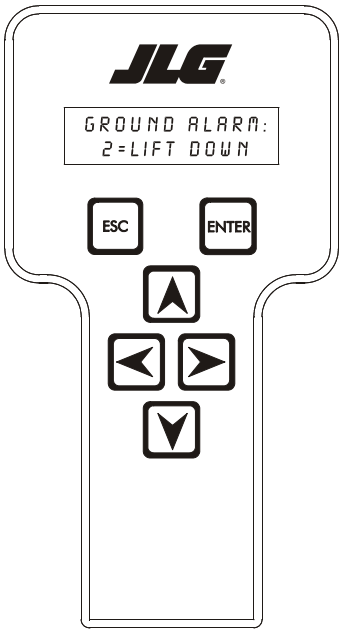


PERSONALITIES:
DRIVE ACCEL 1.0s

There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP** arrow is pressed when at the maximum value nor will the value decrease if the **DOWN** arrow is pressed and the value is at the minimum value for any particular personality. If the value does not change when pressing the up and won arrows, check the access level to ensure you are at access level 1.

6.7 MACHINE SETUP

When a machine digit item is selected, press the **UP** or **DOWN** arrow keys to adjust its value, for example:



GROUND ALARM:
2 = LIFT DOWN

The effect of the machine digit value is displayed along with its value. The above display would be selected if the machine was equipped with a ground alarm and you wanted it to sound when lifting down. There are certain settings allowed to install optional features or select the machine model.

When selection the machine model to match the size of the machine, the personality settings will all default to the factory recommended setting.

NOTE: *Refer to Table 6-9, Personality Ranges/Defaults, and in this Service Manual for the recommended factory settings.*

NOTE: *Password 33271 will give you access to level 1, which will permit you to change all machine personality settings.*

There is a setting that JLG strongly recommends that you do not change. This setting is so noted below:

ELEVATION CUTBACK

⚠ WARNING

CHANGING THIS SETTING MAY ADVERSELY AFFECT THE PERFORMANCE OF YOUR MACHINE.

NOTICE

ITS 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 (30.5CM) 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.

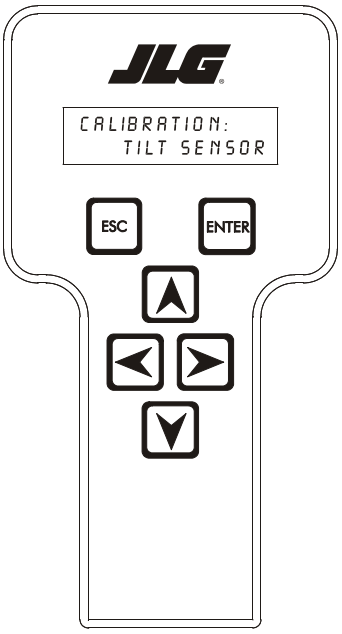
6.8 LEVEL VEHICLE DESCRIPTION

NOTICE

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 6-2. 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	NO GLOW PLUGS: No glow plugs installed.	2
	1	W/O STARTER LOCK: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.	
	2	W/ STARTER LOCK: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	
ENGINE SHUTDOWN: 6	0	DISABLED: No engine shutdown.	1
	1	ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or the oil pressure is less than 8 psi.	
TILT: 7* * Certain market selections will limit tilt options.	1	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.	1
	2	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	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	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.	
	5	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.	
JIB: 8* * Only visible under certain model selections	0	NO: No jib installed.	0
	1	YES: Jib installed which has up and down movements only.	
4 WHEEL STEER: 9* * Only visible under certain model selections.	0	NO: No four-wheel steer installed.	0
	1	YES: Four-wheel steer installed.	
SOFT TOUCH: 10* * Only visible under certain model selections.	**0**	**None: No Soft touch or SkyGuard system installed.**	0
	1	SOFT TOUCH: Soft touch only installed.	
	2	SKYGUARD: SkyGuard only installed.	
	3	BOTH(CUTOUT): Soft touch and SkyGuard only installed.	
GEN SET/WELDER: 13	0	NO: No generator installed.	0
	1	BELT DRIVE: Belt driven setup.	

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 1	CELSIUS: Celsius unit selection. FAHRENHEIT: Fahrenheit unit selection.	1
LEVELING MODE: 21* *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 6-3. Machine Configuration Programming Information Software Version P5.3 to P6.1

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 6-3. 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 (S/N 0300065534 to S/N 0300183033)

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 (S/N 0300065534 to S/N 0300183033)

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	
	16	DEUTZ ECM T4F: Deutz Engine Control Module (Tier 4 Final)	
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 (S/N 0300065534 to S/N 0300183033)

Configuration Label/Digit	Number	Description	Default Number
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.	1
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	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.	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 6-4. Machine Configuration Programming Information Software Version P6.1 (S/N 0300065534 to S/N 0300183033)

Configuration Label/Digit	Number	Description	Default Number
ST TOUCH / 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
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

Table 6-4. Machine Configuration Programming Information Software Version P6.1 (S/N 0300065534 to S/N 0300183033)

Configuration Label/Digit	Number	Description	Default Number
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	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: 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
DISPLAY UNITS: 22* * Certain market selections will alter default setting.	0 1	IMPERIAL: DEG F , PSI, LBS. METRIC: DEG C, KPA, KGS	1
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

Table 6-4. Machine Configuration Programming Information Software Version P6.1 (S/N 0300065534 to S/N 0300183033)

Configuration Label/Digit	Number	Description	Default Number
DRIVE PUMP 25 *Only visible on 600A, 600S, and 800S models.	0 1 2 3	SAUER DANFOSS: MAchine equiped with Sauer Danfoss drive pump EATON: Machine equiped with Eaton drive pump M46 - XXXX:Machine equiped with M46 - XXXX drive pump 830XXXXX: Machine equiped with 830XXXXX: drive pump	0
BOOM CONTROL: 26	0 1	NORMAL: Boom function coils are energised from the Ground Module. ENHANCED: Boom function are energised 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 equiped with Function Speed Knob. NO: Machine is equiped 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
FUEL TANK SIZE: 30	0 1	31 Gallon Tank 52 Gallon Tank	0
ALARM / HORN: 31	0 1	SEPERATE: Seperate alarm and horn. COMBINED: Combination alarm / horn.	0
ALERT / BEACON: 32	0 1	OFF FOR CREEP : Alert beacon will not flash while in Creep. 20FPS FOR CREEP: Alert beacon will flash at 20FPS while in Creep.	0

Table 6-4. Machine Configuration Programming Information Software Version P6.1 (S/N 0300065534 to S/N 0300183033)

Configuration Label/Digit	Number	Description	Default Number
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

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Table 6-5. 800A Machine Configuration Programming Settings

800 A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**9**	**9**	**9**	**9**	**9**	**9**
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	**2**	2
	3	3	3	X	3	3
	4	4	4	4	4	4
	5	5	5	**5**	5	5
	6	6	6	X	X	6
Jib	**0**	**0**	**0**	**0**	**0**	**0**
4 Wheel Steer	**0**	**0**	**0**	**0**	**0**	**0**
Soft Touch/Skyguard	**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 Breaks 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
Load Sensor	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**

Table 6-5. 800A Machine Configuration Programming Settings

800 A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
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
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

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

Table 6-6. 800 AJ Machine Configuration Programming Settings

800 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**9**	**9**	**9**	**9**	**9**	**9**
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	**2**	2
	3	3	3	X	3	3
	4	4	4	4	4	4
	5	5	5	**5**	5	5
	6	6	6	X	X	6
Jib	**1**	**1**	**1**	**1**	**1**	**1**
4 Wheel Steer	**0**	**0**	**0**	**0**	**0**	**0**
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 Breaks 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
Load Sensor	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**

Table 6-6. 800 AJ Machine Configuration Programming Settings

800 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
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
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

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

Table 6-7. Machine Configuration Parameters

Configuration Digit	Parameter (Displayed on Analyzer 1st Line)	Parameter Value (Displayed on Analyzer 2nd Line)	Description	Range	Definition	Data Increment	Default Value
1	Model Number:	1=400 2=450 3=600 4=601 5=800	Displays/adjusts machine model	1 2 3 4 5	400 450 600 601 800	1	1
2	Engine:	1=FORD EFI GAS 2=FORD EFI D/F 3=DEUTZ F4 4=DEUTZ F3	Displays/adjusts engine manufacturer/ type	1 2 3	Ford LRG425EFI Gas Ford LRG425EFI Gas with dual fuel Deutz F4M1011F Diesel Deutz F3M1011F Diesel	1	1
3	Glow Plug:	0=NO 1="NUMBER OF MINUTES"	Display/adjusts glow plug presence and on-time	0 1-10	No glow plugs installed Setting this number tells the controller how many minutes after the EMS is pulled to output to the glow plugs before permitting the engine to be started.	1	0
4	ENG SHUTDOWN:	0=NO 1=SHUTDOWN	Displays/adjusts presence of the engine shutdown feature.	0 1	No engine shutdown Shutdown engine when coolant temperature is greater than 130° C (266° F) or the oil pressure is less than 0.5 bar (8 psi).	1	0
5	JOYSTICK TYPE:	1=RESISTIVE 2=INDUCTIVE	Displays/adjusts joystick type	1 2	Resistive Inductive	1	0

Table 6-7. Machine Configuration Parameters

6	Tilt:	1=5Deg 2=4Deg 3=3Deg	Displays/adjusts tilt sensor function	1 2 3	5 degree – reduces the maximum speed of all boom functions to creep when tilted and above elevation. Reduces drive speed to creep when tilted ANSI (US); ANSI (EXPORT); CSA; JAPAN-All Models 4 degree - reduces the maximum speed of all boom functions to creep when tilted and above elevation. Reduces drive speed to creep when tilted. CE; AUSTRALIA - Model 400S Only 3 degree – reduces the maximum speed of all boom functions to creep when titled and above elevation. Reduces drive speed to creep when tilted. CE; AUSTRALIA - Models 450, 600, 601, and 800.	1	1
7	Tower Lift:	0=NO 1=YES	Displays/adjusts tower lift presence	0 1	No Tower Lift installed Yes	1	0
8	Tower Tele:	0=NO 1=YES	Displays/adjusts tower telescope presence	0 1	No Tower Telescope installed Yes	1	0
9	Jib:	0=NO 1=YES 2=SIDESWING	Displays/adjusts jib presence	0 1 2	No Jib installed Jib installed which has up and down movements only Jib installed which has up and down movements and side to side movements	1	0
10	4ws	0=NO 1=YES	Displays/adjusts 4 wheel steer presence	0 1	No 4 wheel steer installed Yes	1	0
11	soft touch	0=NO 1=YES	Displays presence of soft touch system	0 1	No Soft Touch System installed Yes	1	0
12	generator	0=NO 1=YES	Displays presence of generator	0 1	No Generator installed Yes	1	0

Table 6-7. Machine Configuration Parameters

13	Head & Tail LIGHTS	0=NO 1=YES	Displays presence of head and tail lights	0 1	No Head and Tail Lights installed Yes	1	0
14	BROKEN Cable switch	0=NO 1=YES	Displays presence of broken cable switch	0 1	No Broken Cable Switch installed Yes	1	0
15	load SENSOR	0=NO 1=WARN ONLY 2=WARN & CUTOUT	Displays presence/ function of load sensor	0 1 2	No Load Sensor installed Functions in Creep, Overload Lamp Lit, Platform Alarm Beeps Continuously All functions cutout, flash overload light (500mS on, 500mS off), Platform Alarm beeps (5 sec on, 55 sec off, 5 sec on)	1	0
16	angle SENSOR	0=NO 1=DIGITAL 2=ANALOG	Displays presence/ function of angle sensor	0 1 2	No Angle Sensor installed Limit switches are installed An analog sensor is installed	1	0
17	length SENSOR	0=NO 1=DIGITAL 2=ANALOG	Displays presence/ function of length sensor	0 1 2	No Length Sensor Installed Limit switch installed An analog sensor is installed	1	0
18	FUNCTION CUTOUT	0=NO 1=BOOM CUTOUT 2=DRIVE CUTOUT 3=DRIVE CUT E & T	Displays presence/ function of drive cutout.	0 1 2 3	No Drive Cutout Boom Function Cutout While Driving Above Elevation. (CE) Drive Cutout Above Elevation Drive Cutout Above Elevation And Tilted	1	0
19	ground alarm	0=NO 1=DRIVE 2=LIFT DOWN 3=BOOM & DRIVE	Displays/adjusts ground alarm presence/function	0 1 2 3	No Ground Alarm installed Travel alarm – sounds when the drive function is active. (Option) Descent alarm – sounds when either lift down is active. (Option) Motion alarm – sounds when any function is active. (Option)	1	0

Table 6-7. Machine Configuration Parameters

20	PLATFORM ALARM	0=NO 1=FAULT CODE	Displays/adjusts platform alarm presence/ functions	0 1	Sounds Continuously When Above Elevation And Tilted Only. Sounds Continuously When Above Elevation And Tilted, And In Conjunction With Fault Code Flashes. (Option)	1	0
21	Tower Prox Switches	0=NO 1=YES	Displays presence/ function of Tower Proximity switches for the models specified.	0 1	No Tower Prox Switches Installed Tower Prox Switches Installed	1	0

6.9 MACHINE PERSONALITY SETTINGS

Function Speeds

Machine Orientation When Doing Speed Tests

Tower Lift: Upper Boom Horizontal, Telescoped In. Tower Lift Up, Record Time. Tower Lift Down, Record Time.

Tower Telescope: Tower Lift Fully Elevated, Upper Boom Horizontal, Telescoped In. Tower Tele Out, Record Time. Tower Tele In, 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 (Forward/Reverse): Test should be done on a smooth level surface. Drive Select Switch should be set to High Engine. Start approximately 25 ft. (7.62 m) from the starting point so that the unit is at maximum speed when starting the test. Results should be recorded for a 200 ft. (60.96 m) 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 to Low Engine, Low Drive. The Platform Speed Knob control should be positioned to Creep Speed. This simulates machine speed when the boom is above horizontal. Results should be recorded for a 50 ft. (15.2 m) course. Drive Forward, Record Time. Drive 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 the 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 15x19.5 or 18x19.5 tires, pneumatic or foam filled.
3. All speed tests are run from the platform. These speeds do not reflect the ground control operation.
4. The platform speed knob control must be at full speed (turned clockwise completely).
5. Function speeds may vary due to cold, thick hydraulic oil. Test 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 6-8. Function Speeds

Function	Speed (In Seconds)
Main Lift Up	45 - 50
Main Lift Down	45 - 50
Swing Right & Left	79 - 101
NOTE: *No more than 10% difference between swing left and swing right.*	
Main Telescope In 800A 800AJ	 30-40 24-34
Main Telescope Out 800A 800AJ	 35-45 30-40
Platform Rotate Right & Left	19 - 30
NOTE: *No more that 15% difference between rotator left and rotator right.*	
Jib Up	20-30
Jib Down	30-40
Tower Lift Up	57 - 70
Tower Lift Down	44 - 53
Tower Telescope Out	24 - 32
Tower Telescope In	15-25
Drive (2WD) Forward & Reverse	33-45
Drive (4WD) Forward & Reverse	33-45
Drive Horizontal Above Elevation 2WD Forward & Reverse	 61-70
Drive Horizontal Above Elevation 4WD Forward & Reverse	 122 Min

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Table 6-9. Personality Ranges/Defaults

	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
DRIVE	ACCELeration	0.0 to 5.0s	2.0	2.0
	DECELeration	0.0 to 3.0s	2.0	2.0
	FORward MINimum speed	1 to 35%	4	15
	FORward MAXimum speed	1 to 100%	30	55
	REVerse MINimum speed	1 to 35%	4	15
	REVerse MAXimum speed	1 to 100%	34	55
	ELEVATED MAXimum speed	1 to 50%	15	28
	CREEP MAXimum speed	1 to 90%	15	32
STEER	MAXimum speed	1 to 100%	100	100
UPPERLIFT	ACCELeration	0.0 to 5.0s	2.9	2.9
	DECELeration	0.0 to 3.0s	1.0	1.0
	MINimum UP speed	1 to 60%	26	26
	MAXimum UP speed	1 to 100%	88	88
	CREEP Maximum UP speed	1 to 65%	62	62
	MINimum DOWN speed	1 to 60%	25	25
	MAXimum DOWN speed	1 to 100%	95	95
	CREEP maximum DOWN speed	1 to 75%	69	69
TOWERLIFT	ACCELeration	0.0 to 5.0s	2.8	2.8
	DECELeration	0.0 to 3.0s	0.8	0.8
	MINimum UP speed	1 to 60%	53	53
	MAXimum UP speed	1 to 100%	90	90
	MINimum DOWN speed	1 to 60%	53	53
	MAXimum DOWN speed	1 to 100%	90	90
	Medium Speed	0.01 to 1.00	0.30	0.30

Table 6-9. Personality Ranges/Defaults

	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
SWING	ACCELeration	0.0 to 5.0s	2.8	2.8
	DECELeration	0.0 to 3.0s	2.5	2.5
	MINimum LEFT speed	1 to 50%	25	25
	MAXimum LEFT speed	1 to 100%	70	70
	CREEP maximum LEFT speed	1 to 65%	62	62
	MINimum RIGHT speed	1 to 50%	25	25
	MAXimum RIGHT speed	1 to 100%	73	73
	CREEP maximum RIGHT speed	1 to 65%	62	62
TELEscope-UPPER	ACCELeration	0.0 to 5.0s	3.5	3.5
	DECELeration	0.0 to 3.0s	0.8	0.8
	MINimum IN speed	1 to 65%	40	40
	MAXimum IN speed	1 to 100%	75	75
	MINimum OUT speed	1 to 65%	40	40
	MAXimum OUT speed	1 to 100%	70	70
	Medium Speed	0.01 to 1.00	0.50	0.50
TELEscope-TOWER	ACCELeration	0.0 to 5.0s	1.0	1.0
	DECELeration	0.0 to 3.0s	0.5	0.5
	MINimum IN speed	1 to 65%	45	45
	MAXimum IN speed	1 to 100%	90	90
	MINimum OUT speed	1 to 65%	55	55
	MAXimum OUT speed	1 to 100%	90	90
	Medium Speed	0.01 to 1.00	0.40	0.40
PLATFORM LEVEL	ACCELeration	0.0 to 5.0s	2.5	2.5
	DECELeration	0.0 to 3.0s	1.0	1.0
	MINimum UP speed	1 to 65%	45	45
	MAXimum UP speed	1 to 100%	55	55
	MINimum DOWN speed	1 to 65%	45	45
	MAXimum DOWN speed	1 to 100%	55	55
	Medium Speed	0.01 to 1.00	0.60	0.60

Table 6-9. Personality Ranges/Defaults

	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
PLATFORM ROTATE	ACCELeration	0.0 to 5.0s	1.8	1.8
	DECELeration	0.0 to 3.0s	0.5	0.5
	MINimum LEFT speed	1 to 100%	25	25
	MAXimum LEFT speed	1 to 100%	60	60
	MINimum RIGHT speed	1 to 100%	25	25
	MAXimum RIGHT speed	1 to 100%	60	60
	Medium Speed	0.01 to 1.00	0.35	0.35
JIB LIFT	Lift ACCELeration	0.0 to 5.0s	2.5	2.5
	Lift DECELeration	0.0 to 3.0s	1.0	1.0
	MINimum UP speed	1 to 65%	27	27
	MAXimum UP speed	1 to 100%	50	50
	MINimum DOWN speed	1 to 65%	26	26
	Max Down	1 to 100%	45	45
	Medium Speed	0.01 to 1.00	0.35	0.35
GROUND MODE	Tower LIFT UP speed	1 to 100%	89	89
	Tower LIFT DOWN speed	1 to 100%	89	89
	Main LIFT UP speed	1 to 100%	87	87
	Main LIFT DOWN speed	1 to 100%	94	94
	SWING speed	1 to 100%	65	65
	Main TELEscope speed	1 to 100%	69	69
	Tower TELEscope speed	1 to 100%	89	89
	PLATFORM ROTATE speed	1 to 100%	59	59
	PLATFORM LEVEL speed	1 to 100%	54	54
	JIB LIFT speed	1 to 100%	44	44

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Table 6-10. Help Fault Codes, Displayed Faults, and Descriptions - (Prior to S/N 0300066931)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
None	**No flash code is indicated for the following help messages. They are intended to hint at a possible problem if the vehicle is not behaving as expected.**		1
	EVERYTHING OK	The "normal" help message in platform mode	
	GROUND MODE OK	The "normal" help message in ground mode	
	DRIVING AT CREEP - TILTED	Drive speed is limited to creep because the vehicle is tilted.	
	FSW OPEN	A drive or boom function has been selected but footswitch is open.	
	RUNNING AT CREEP - CREEP SWITCH OPEN	All function speeds are limited to creep because the creep switch is open.	
	RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	All function speeds are limited to creep because the vehicle is tilted and above elevation.	
	RUNNING AT CUTBACK - ABOVE ELEVATION	Drive speed is limited to "ELEVATED MAX" because the vehicle is above elevation.	
	TESTS ACTIVE – RECYCLE EMS TO END	The system tests have been activated; normal vehicle operation is not allowed.	
1/1	**Flash code 1/1 indicates a "sleep" mode. NOT REQUIRED**		
2/1	**Flash code 2/1 indicates problems with footswitch.**		2
	FSW FAULTY	The two foot switch signals do not agree. EMS recycle required.	
	KEYSWITCH FAULTY	Both platform and ground modes are selected simultaneously	
2/2	**Flash code 2/2 indicates problems with drive & steer selection.**		3
	DRIVE JOYSTICK FAULTY	The drive joystick center tap is out of valid range, or the wiper is wire-off.	
	DRIVE LOCKED – JOYSTICK MOVED BEFORE EMS/FSW	Drive was selected before and during footswitch closure.	
	FSW INTERLOCK TRIPPED	Footswitch was closed for seven seconds with no function selected.	
	STEER LOCKED – SELECTED BEFORE EMS/FSW	Steer was selected before and during footswitch closure.	
	STEER SWITCHES FAULTY	Both steer switches are active together.	
	WAITING FOR FSW TO BE OPEN	Footswitch was closed when platform mode was selected.	
	JOYSTICK FAULTS – CHECK PLATFORM BOX WIRING	More than one of the drive, lift, and swing joystick center tap or wiper voltages is out of range. This is probably due to a short-circuit across a joystick pot.	
	FUNCTION LOCKED OUT - TOWER LIFT DOWN PERMANENTLY CLOSED	The control system detected the TOWER LIFT DOWN input high during startup.	

Table 6-10. Help Fault Codes, Displayed Faults, and Descriptions - (Prior to S/N 0300066931)

2/3	**Flash code 2/3 indicates problems with boom function selection.**		3
	LIFT/SWING JOYSTICK FAULTY	The lift or swing joystick center tap is out of valid range, or the wiper is wire-off.	
	LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE EMS/FSW	Platform upper lift or swing was selected before and during footswitch closure.	
	PUMP POT FAULTY	The pump pot is open-circuit; all platform boom functions except upper lift & swing will run at creep.	
	PUMP SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	A boom function (lower lift, telescope, basket level, basket rotate, jib) has both directions selected together.	
	PUMP SWITCHES LOCKED - SELECTED BEFORE EMS/FSW	A platform boom function (lower lift, telescope, basket level, basket rotate, jib) was selected before key switch or footswitch closure.	
	PUMP SWITCHED LOCKED - SELECTED BEFORE EMS	A ground boom function (lower lift, telescope, basket level, basket rotate, jib) was selected before key switch.	
	SWING/LIFT JOYSTICK FAULTY	The swing joystick center tap is out of valid range, or the wiper is wire-off.	
2/4	**Flash code 2/4 indicates that steering digital inputs are faulty.** **NOT REQUIRED**		
2/5	**Flash code 2/5 indicates that a function is prevented due to a cutout.**		4
	BOOM PREVENTED - DRIVE SELECTED	A boom function is selected while a drive function is selected and drive cutout is configured to prevent simultaneous drive & boom operation.	
	DRIVE PREVENTED - ABOVE ELEVATION	Drive is selected while above elevation and drive cutout is configured to prevent drive.	
	DRIVE PREVENTED - BOOM MOVEMENT SELECTED	Drive is selected while a boom function is selected and drive cutout is configured to prevent simultaneous drive & boom operation.	
	DRIVE PREVENTED - TILTED & ABOVE ELEVATION	Drive is selected while tilted and above elevation and tilt is configured to cutout drive.	
	BOOM PREVENTED – FUNCTION CUTOUT ACTIVE	A boom function is selected while function cutout is active and configured to cutout boom functions.	
	BOOM & DRIVE PREVENTED-FUNCTION CUTOUT ACTIVE	Drive or a boom function is selected while function cutout is active and configured to cutout all functions.	
	UMS SENSOR BACKWARD LIMIT REACHED	The upright angle relative to the turntable is higher than +2.5°.	
	UMS SENSOR FORWARD LIMIT REACHED	The upright angle relative to the turntable is less than –4.0°.	
	UMS SENSOR OUT OF USABLE RANGE	Both the Turntable tilt sensor and the UMS sensor read greater then ±10° in the same direction.	
2/7	**Flash code 2/7 indicates that the accelerator input is faulty.** **NOT REQUIRED**		
2/8	**Flash code 2/8 indicates that the hydraulic filter is being bypassed.**		5
	RETURN FILTER BYPASSED	Hydraulic return filter clogged	
	CHARGE PUMP FILTER BYPASSED	Charge pump filter clogged	
3/1	Flash code 3/1 indicates that a contactor did not close when energized. NOT REQUIRED		

Table 6-10. Help Fault Codes, Displayed Faults, and Descriptions - (Prior to S/N 0300066931)

3/2	**Flash code 3/2 indicates that a contactor did not open when energized. NOT REQUIRED**		
3/3	**Flash code 3/3 indicates that a driver is short-circuit.**		6
	ADD DRIVER FAULTS		
3/5	**Flash code 3/5 indicates a brake pressure problem. NOT REQUIRED**		7
4/2	**Flash code 4/2 indicates that the engine is over temperature. NOT REQUIRED**		8
4/3	**Flash code 4/3 indicates problems with the engine**		9
	ENGINE TEMP GREATER THAN 130°C (266° F)		
	AIR FILTER BYPASSED	Air filter clogged	
	NO ALTERNATOR OUTPUT	The measured battery voltage is less than 12.5 VDC	
	OIL PRESSURE LESS THAN 0.5 BAR (8PSI)		
4/4	**Flash code 4/4 indicates problems with the battery supply.**		7
	BATTERY LOW	Battery voltage is below 11V. This is a warning - the controller does not shut down.	
	BATTERY TOO HIGH - SYSTEM SHUT DOWN	Battery voltage is above 18V. EMS recycle required.	
	BATTERY TOO LOW - SYSTEM SHUT DOWN	Battery voltage is below 6V. EMS recycle required.	
	SYSTEM VOLTS LOW	Battery voltage is below 9V.	
	SYSTEM VOLTS HIGH	Battery voltage is above 16V.	
5/5	**Flash code 5/5 indicates problems with vehicle engine RPM or the encoder.**		8
	SPEED SENSOR READING INVALID SPEED	Speed sensor is indicating an impossible number of pulses. This is probably due to a faulty speed sensor.	
	SPEED INPUT LOST	This indicates that the control system has determined that the diesel engine speed input to the system has been lost. This is probably due to wiring problems at the ground module or a faulty speed sensor.	
	ENGINE SPEED DOES NOT MATCH COMMAND	This indicates that the control system has determine that the diesel engine governor has stuck. This is probably due to electrical or mechanical problems with the governor.	
6/6	**Flash code 6/6 indicates problems with the CAN bus.**		10
	CAN BUS FAILURE:	The ground module or platform module is not receiving. This is probably due to wiring problems between the platform and ground modules.	
7/7	**Flash code 7/7 indicates problems with a motor. NOT REQUIRED**		

Table 6-10. Help Fault Codes, Displayed Faults, and Descriptions - (Prior to S/N 0300066931)

8/1	**Flash codes 8/1 indicate sensor issues.**		11
	UMS SENSOR NOT CALIBRATED	The control system detects a sensor out of range condition or a not calibrated fault with the UMS angle sensor	
	UMS SENSOR FAULTED	The system detects that the UMS sensor frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% range	
	TOWER LIFT DOWN OUTPUT SHORT TO GROUND OR OPEN CIRCUIT	Short to Ground or open circuit has been detected on the Tower Lift Down output.	
	TOWER LIFT DOWN OUTPUT SHORT TO BATTERY	Short to battery has been detected on the Tower Lift Down output	
	PLATFORM INDICATOR OUTPUT SHORT TO GROUND OR OPEN CIRCUIT	Short to Ground or open circuit has been detected on the Platform Indicator output	
	PLATFORM INDICATOR OUTPUT SHORT TO BATTERY	Short to battery has been detected on the Platform Indicator output	
	GROUND INDICATOR OUTPUT SHORT TO GROUND OR OPEN CIRCUIT	Short to Ground or open circuit has been detected on the Ground Indicator output	
	GROUND INDICATOR OUTPUT SHORT TO BATTERY	Short to battery has been detected on the Ground Indicator Output	11
	TURNTABLE SENSOR NOT CALIBRATED	The control system detects that the Chassis Tilt sensor is not calibrated or there is an internal fault with the sensor	
	TURNTABLE FAULTED	The system detects that the Chassis tilt sensor frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% range the control	
9/9	**Flash code 9/9 indicates problems with the controller or memory issues.**		11
	PLATFORM MODULE FAILURE: hwfs CODE 1	Platform module V(Low) FET has failed	
	GROUND MODULE FAILURE: hwfs CODE 1	Ground module V(Low) FET has failed	
	EEPROM FAILURE – CHECK ALL SETTINGS	A critical failure occurred with the EEPROM	12

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
None	**No flash code is indicated for the following help messages. They are intended to hint at a possible problem if the vehicle is not behaving as expected.**		**1**
	EVERYTHING OK	The "normal" help message in platform mode	
	GROUND MODE OK	The "normal" help message in ground mode	
	FSW OPEN	A drive or boom function has been selected but footswitch is open.	
	RUNNING AT CREEP – CREEP SWITCH OPEN	All function speeds are limited to creep because the creep switch is open.	
	RUNNING AT CREEP – TILTED AND ABOVE ELEVATION	All boom function speeds are limited to creep because the vehicle is tilted and above elevation.	
	RUNNING AT CUTBACK – ABOVE ELEVATION	Drive speed is limited to "ELEVATED MAX" because the vehicle is above elevation.	
	TILT SENSOR OUT OF RANGE	The tilt sensor has indicated a tilt angle greater than 19 degrees for more than 4 seconds. Not reported during 2 second power-up.	
	LOAD SENSOR READING UNDER WEIGHT	The load sensor is reading 20% or more under the calibrated zero point. This fault may occur if the basket is resting on the ground. Not reported during 2 second power-up.	
1/1	**Flash code 1/1 indicates a "sleep" mode. NOT REQUIRED**		
2/1	**Flash code 2/1 indicates problems with footswitch.**		**2**
	FSW FAULTY	The two footswitch inputs have read the same state for more than one second.	
	KEYSWITCH FAULTY	Both platform and ground modes are selected simultaneously	

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
2/2	**Flash code 2/2 indicates problems with drive & steer selection. Except where noted, these faults are not reported during 2 second power-up sequence.**		3
	DRIVE LOCKED – JOYSTICK MOVED BEFORE FOOTSWITCH	Drive was selected before and during footswitch closure. Can be reported during power-up sequence.	
	FSW INTERLOCK TRIPPED	Footswitch was closed for seven seconds with no function selected. Can be reported during power-up sequence.	
	STEER LOCKED – SELECTED BEFORE FOOTSWITCH	Steer was selected before and during footswitch closure.	
	STEER SWITCHES FAULTY	Both steer switches are active together.	
	DRIVE / STEER WITH NO QPROX	This fault only occurs with inductive joysticks. It occurs if the joystick is moved out of the neutral position with no Qprox sensors active.	
	D/S JOY. QPROX BAD	These faults only occur with inductive joysticks. They indicate that the Q-Prox sensor is reading above 3.18 volts.	
	D/S JOY. OUT OF RANGE LOW	Resistive joysticks: These faults do not occur. Inductive joysticks: The trigger points for these faults are dependent on the centertap voltage reading. These faults will be triggered when the voltage is less than the centertap voltage minus half the center tap voltage minus 0.3 volts. If the centertap is at the high end of the range, these faults will be triggered below 1.05 volts. If the centertap is at the low end of the range, these faults will be triggered below 0.79 volts.	
	D/S JOY. OUT OF RANGE HIGH	Resistive joysticks: These faults do not occur if the Vref voltage is below 8.1 volts. If Vref is above 7.7 volts, Vref is operating out of tolerance or a short to battery has occurred. Inductive joysticks: The trigger points for these faults are dependent on the centertap voltage reading. These faults will be triggered when the voltage is more than the centertap voltage plus half the centertap voltage plus 0.3 volts. If the centertap is at the high end of the range, these faults will be triggered above 4.35 volts. If the centertap is at the low end of the range, these faults will be triggered above 3.8 volts.	
	D/S JOY. CENTER TAP BAD	Resistive joysticks: These faults occur when the center tap voltage is not between 3.08 volts and 3.83 volts. Due to resistor tolerances there is a +/-.1 volt range around these values where the fault may be indicated. Inductive joysticks: These faults occur when the center tap voltage is not between 2.18 volts and 2.70 volts. Due to resistor tolerances there is a +/-.1 volt range around these values where the fault may be indicated.	
	WAITING FOR FSW TO BE OPEN	Footswitch was closed when platform mode was selected. Can be reported during power-up sequence.	

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
2/3	**Flash code 2/3 indicates problems with boom function selection.**		**3**
	LIFT/SWING LOCKED – JOYSTICK MOVED BEFORE FOOTSWITCH	Platform upper lift or swing was selected before and during footswitch closure.	
	PUMP SWITCHES FAULTY – CHECK DIAGNOSTICS/BOOM	A boom function (lower lift, telescope, basket level, basket rotate, jib) has both directions selected together.	
	PUMP SWITCHES LOCKED – SELECTED BEFORE FOOTSWITCH	A platform boom function (lower lift, telescope, basket level, basket rotate, jib) was selected before key switch or footswitch closure.	
	PUMP SWITCHES LOCKED – SELECTED BEFORE AUX POWER	A ground boom function (lower lift, telescope, basket level, basket rotate, jib) was selected before aux power.	
	LIFT / SWING WITH NO QPROX	This fault only occurs with inductive joysticks. It occurs if the joystick is moved out of the neutral position with no Qprox sensors active.	
	l/s joy. qprox bad	These faults only occur with inductive joysticks. They indicate that the Q-Prox sensor is reading above 3.18 volts.	
	l/s joy. out of range low	Resistive joysticks: These faults do not occur. Inductive joysticks: The trigger points for these faults are dependent on the centertap voltage reading. These faults will be triggered when the voltage is less than the centertap voltage minus half the center tap voltage minus 0.3 volts. If the centertap is at the high end of the range, these faults will be triggered below 1.05 volts. If the centertap is at the low end of the range, these faults will be triggered below 0.79 volts.	
	l/s joy. out of range high	Resistive joysticks: These faults do not occur if the Vref voltage is below 8.1 volts. If Vref is above 7.7 volts, Vref is operating out of tolerance or a short to battery has occurred. Inductive joysticks: The trigger points for these faults are dependent on the centertap voltage reading. These faults will be triggered when the voltage is more than the centertap voltage plus half the centertap voltage plus 0.3 volts. If the centertap is at the high end of the range, these faults will be triggered above 4.35 volts. If the centertap is at the low end of the range, these faults will be triggered above 3.8 volts.	
	l/s joy. center tap bad	Resistive joysticks: These faults occur when the center tap voltage is not between 3.08 volts and 3.83 volts. Due to resistor tolerances there is a +/-.1 volt range around these values where the fault may be indicated. Inductive joysticks: These faults occur when the center tap voltage is not between 2.18 volts and 2.70 volts. Due to resistor tolerances there is a +/-.1 volt range around these values where the fault may be indicated.	
	PUMP SWITCHES LOCKED – SELECTED BEFORE START SWTICH	This fault occurs when a hydraulic function switch is closed before the start switch is closed.	
	FOOTSWITCH SELECTED BEFORE START	The user attempted to start the machine with the footswitch engaged.	
2/4	**Flash code 2/4 indicates that steering digital inputs are faulty. NOT REQUIRED**		
2/5	**Flash code 2/5 indicates that a function is prevented due to a cutout.**		**4**
	BOOM PREVENTED – DRIVE SELECTED	A boom function is selected while a drive function is selected and drive cutout is configured to prevent simultaneous drive & boom operation.	
	DRIVE PREVENTED – ABOVE ELEVATION	Drive is selected while above elevation and drive cutout is configured to prevent drive.	
	DRIVE PREVENTED – BOOM SELECTED	Drive is selected while a boom function is selected and drive cutout is configured to prevent simultaneous drive & boom operation.	
	DRIVE PREVENTED – TILTED & ABOVE ELEVATION	Drive is selected while tilted and above elevation and tilt is configured to cutout drive.	
	MODEL CHANGED – HYDRAULICS SUSPENDED – CYCLE EMS	User changed the model number using the analyzer. User must cycle power before the hydraulics system will be active again.	11
	UMS SENSOR BACKWARD LIMIT REACHED	The UMS to turntable angle is a value greater than 2.5°	5
	UMS SENSOR FORWARD LIMIT REACHED	The UMS to turntable angle is a value less than –4.0°	
	AUTO DETECTION INPUT LOW	UMS detects a valid ground module software version but digital input 2 is not tied high	

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
2/7	**Flash code 2/7 indicates that the accelerator input is faulty. NOT REQUIRED**		
2/8	**Flash code 2/8 indicates a problem with a hydraulic filter. Not reported during 2 second power-up.**		5
	RETURN FILTER BYPASSED	Hydraulic return filter clogged	
	charge pump filter bypassed	Charge pump filter clogged	
3/1	**Flash code 3/1 indicates that a contactor did not close when energized. NOT REQUIRED**		
3/2	**Flash code 3/2 indicates that a contactor did not open when energized. NOT REQUIRED**		
3/3	**Flash code 3/3 indicates a driver problem. All driver faults are detected in a similar manner. Open circuit faults are detected when the analog feedback reads too high and the output is commanded off. Short to ground is detected when the analog feedback reads low and the output is commanded on. Short to battery is detected when the analog feedback reads Vbat and the output is commanded off. Not reported during 2 second power-up.**		6
	ALTERNATOR/ECM POWER SHORT TO GROUND		
	HOUR METER SHORT TO GROUND		
	HOUR METER SHORT TO BATTERY		
	HORN SHORT TO GROUND		
	HORN OPEN CIRCUIT		
	HORN SHORT TO BATTERY		
	AUX POWER SHORT TO GROUND		
	AUX POWER OPEN CIRCUIT		
	AUX POWER SHORT TO BATTERY		
	GLOW PLUG SHORT TO GROUND		
	GLOW PLUG OPEN CIRCUIT		
	GLOW PLUG SHORT TO BATTERY		
	LP LOCK SHORT TO GROUND		
	LP LOCK OPEN CIRCUIT		
	LP LOCK SHORT TO BATTERY		
	LP START ASSIST SHORT TO GROUND		
	LP START ASSIST OPEN CIRCUIT		
	LP START ASSIST SHORT TO BATTERY		
	MAIN DUMP SHORT TO GROUND		
	MAIN DUMP OPEN CIRCUIT		
	MAIN DUMP SHORT TO BATTERY		
	PARKING BRAKE SHORT TO GROUND		
	PARKING BRAKE OPEN CIRCUIT		
	PARKING BRAKE SHORT TO BATTERY		
	START SOLENOID SHORT TO GROUND		

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
	START SOLENOID OPEN CIRCUIT		
	START SOLENOID SHORT TO BATTERY		
	STEER DUMP SHORT TO GROUND		
	STEER DUMP OPEN CIRCUIT		
	STEER DUMP SHORT TO BATTERY		
	TWO SPEED SHORT TO GROUND		
	TWO SPEED OPEN CIRCUIT		
	TWO SPEED SHORT TO BATTERY		
	GROUND ALARM SHORT TO GROUND		
	GROUND ALARM OPEN CIRCUIT		
	GROUND ALARM SHORT TO BATTERY		
	GENERATOR SHORT TO GROUND		
	GENERATOR OPEN CIRCUIT		
	GENERATOR SHORT TO BATTERY		
	WELDER SHORT TO GROUND		
	WELDER OPEN CIRCUIT		
	WELDER SHORT TO BATTERY		
	HEAD TAIL LIGHT SHORT TO GROUND		
	HEAD TAIL LIGHT OPEN CIRCUIT		
	HEAD TAIL LIGHT SHORT TO BATTERY		
	BASKET UP OVERRIDE SHORT TO GROUND	Only occurs on machines with electronic leveling systems.	
	BASKET UP OVERRIDE OPEN CIRCUIT	Only occurs on machines with electronic leveling systems.	
	BASKET UP OVERRIDE SHORT TO BATTERY	Only occurs on machines with electronic leveling systems.	
	BASKET UP SHORT TO GROUND		
	BASKET UP OPEN CIRCUIT		
	BASKET UP SHORT TO BATTERY		
	BASKET DOWN SHORT TO GROUND		

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
	BASKET DOWN OPEN CIRCUIT		
	BASKET DOWN SHORT TO BATTERY		
	BASKET DOWN OVERRIDE SHORT TO GROUND	Only occurs on machines with electronic leveling systems.	
	BASKET DOWN OVERRIDE OPEN CIRCUIT	Only occurs on machines with electronic leveling systems.	
	BASKET DOWN OVERRIDE SHORT TO BATTERY	Only occurs on machines with electronic leveling systems.	
	BASKET LEFT OPEN CIRCUIT		
	BASKET LEFT SHORT TO BATTERY		
	BASKET LEFT SHORT TO GROUND		
	BASKET RIGHT SHORT TO GROUND		
	BASKET RIGHT OPEN CIRCUIT		
	BASKET RIGHT SHORT TO BATTERY		
	JIB UP SHORT TO GROUND		
	JIB UP OPEN CIRCUIT		
	JIB UP SHORT TO BATTERY		
	JIB DOWN SHORT TO GROUND		
	JIB DOWN OPEN CIRCUIT		
	JIB DOWN SHORT TO BATTERY		
	JIB LEFT SHORT TO GROUND		
	JIB LEFT OPEN CIRCUIT		
	JIB LEFT SHORT TO BATTERY		
	JIB RIGHT SHORT TO GROUND		
	JIB RIGHT OPEN CIRCUIT		
	JIB RIGHT SHORT TO BATTERY		
	TOWER UP SHORT TO GROUND		
	TOWER UP OPEN CIRCUIT		
	TOWER UP SHORT TO BATTERY		
	TOWER DOWN SHORT TO GROUND		

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
	TOWER DOWN OPEN CIRCUIT		
	TOWER DOWN SHORT TO BATTERY		
	TOWER IN SHORT TO GROUND		
	TOWER IN OPEN CIRCUIT		
	TOWER IN SHORT TO BATTERY		
	TOWER OUT SHORT TO GROUND		
	TOWER OUT OPEN CIRCUIT		
	TOWER OUT SHORT TO BATTERY		
	UPPER IN SHORT TO GROUND		
	UPPER IN OPEN CIRCUIT		
	UPPER IN SHORT TO BATTERY		
	UPPER OUT SHORT TO GROUND		
	UPPER OUT OPEN CIRCUIT		
	UPPER OUT SHORT TO BATTERY		
	LIFT UP DUMP SHORT TO GROUND		
	LIFT UP DUMP OPEN CIRCUIT		
	LIFT UP DUMP SHORT TO BATTERY		
	LIFT DOWN HOLDING SHORT TO GROUND		
	LIFT DOWN HOLDING OPEN CIRCUIT		
	LIFT DOWN SHORT TO BATTERY		
	HOUR METER OPEN CIRCUIT	This fault cannot be detected during normal operation. It may be reported during self test.	
	FORD ECM POWER OPEN CIRCUIT	This fault cannot be detected during normal operation. It may be reported during self test.	
	FORD ECM POWER SHORT TO BATTERY	This fault cannot be detected during normal operation. It may be reported during self test.	
3/4	**Flash code 3/4 indicates a driver problem on a platform valve block valve driver. All driver faults are detected in a similar manner. Open circuit faults are detected when the analog feedback reads too high and the output is commanded off. Short to ground is detected when the analog feedback reads low and the output is commanded on. Short to battery is detected when the analog feedback reads Vbat and the output is commanded off. Not reported during 2 second power-up.**		**6**
	BASKET UP SHORT TO BATTERY		
	BASKET UP SHORT TO GROUND		
	BASKET UP OPEN CIRCUIT		
	BASKET UP SHORT TO BATTERY OR OPEN CIRCUIT	Only occurs on machines with electronic basket leveling.	
	BASKET DOWN SHORT TO BATTERY		
	BASKET DOWN SHORT TO GROUND		
	BASKET DOWN OPEN CIRCUIT		

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
	BASKET DOWN SHORT TO BATTERY OR OPEN CIRCUIT	Only occurs on machines with electronic basket leveling.	
	BASKET LEFT SHORT TO BATTERY		
	BASKER LEFT SHORT TO GROUND		
	BASKET LEFT OPEN CIRCUIT		
	BASKET RIGHT SHORT TO BATTERY		
	BASKET RIGHT SHORT TO GROUND		
	BASKET RIGHT OPEN CIRCUIT		
	JIB UP SHORT TO BATTERY		
	JIB UP SHORT TO GROUND		
	JIB UP OPEN CIRCUIT		
	JIB DOWN SHORT TO BATTERY		
	JIB DOWN SHORT TO GROUND		
	JIB DOWN OPEN CIRCUIT		
	JIB LEFT SHORT TO BATTERY		
	JIB LEFT SHORT TO GROUND		
	JIB LEFT OPEN CIRCUIT		
	JIB RIGHT SHORT TO BATTERY		
	JIB RIGHT SHORT TO GROUND		
	JIB RIGHT OPEN CIRCUIT		
	PLATFORM CONTROL VALVE SHORT TO BATTERY	Only occurs on machines with electronic basket leveling	
	PLATFORM CONTROL VALVE SHORT TO GROUND	Only occurs on machines with electronic basket leveling	
	PLATFORM CONTROL VALVE OPEN CIRCUIT	Only occurs on machines with electronic basket leveling	
3/5	**Flash code 3/5 indicates a brake pressure problem. NOT REQUIRED**		
4/2	**Flash code 4/2 indicates that the engine is over temperature. NOT REQUIRED**		
4/3	**Flash code 4/3 indicates problems with the engine. Except where noted, these faults are not reported during 2 second power-up sequence.**		**9**
	HIGH ENGINE TEMP	Occurs when the engine temperature is above 117 degrees Celsius for the Ford engines, and above 130 degrees Celsius for the Deutz engines.	
	AIR FILTER BYPASSED	Air filter clogged	
	NO ALTERNATOR OUTPUT	The engine has been running for 15 seconds or more and the battery voltage is still below 12.5 volts.	
	LOW OIL PRESSURE	If a Deutz engine is installed, the oil pressure is below 8 PSI and the engine has been running for at least 10 seconds. If a Ford engine is installed, the Ford ECM has reported a low oil pressure fault.	
	OIL PRESSURE SHORT TO BATTERY	If a Deutz engine is installed, this indicates that the oil pressure sensor is reading above 6.6 volts.	
	OIL PRESSURE SHORT TO GROUND	If a Deutz engine is installed, this indicates that the oil pressure sensor is reading below 0.1 volts for more than 5 seconds. This fault is not detected during crank.	

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
	COOLANT TEMPERATURE SHORT TO GROUND	If a Deutz engine is installed, this indicates that the coolant temperature is reading below 0.1 volts.	
	FORD FAULT CODE ##	All Ford fault codes except 63 are simply passed through from the FORD ECM. They only occur if a Ford engine is selected in the machine configuration digits. Can be reported during power-up sequence.	
	FORD FAULT CODE UNKNOWN	An unrecognized Ford ECM fault code has been received. Can be reported during power-up sequence.	
	485 COMMUNICATIONS LOST	This fault only occurs with a Ford engine. It occurs when no responses are received from the ECM for 2.5 seconds. Can be reported during power-up sequence.	
	FUEL SENSOR SHORT TO BATTERY	Indicates that the fuel sensor is reading above 4.3 volts.	
	FUEL SENSOR SHORT TO GROUND	Indicates that the fuel sensor is reading below 0.2 volts.	
4/4	**Flash code 4/4 indicates problems with the battery supply. Not reported during 2 second power-up.**		**7**
	BATTERY LOW	Battery voltage is below 11V for more than 5 seconds. This fault is not detected during crank. This is a warning – the controller does not shut down.	
	BATTERY TOO HIGH – SYSTEM SHUT DOWN	Battery voltage is above 16V. EMS recycle required.	
	BATTERY TOO LOW – SYSTEM SHUT DOWN	Battery voltage is below 9V.	
5/5	**Flash code 5/5 indicates problems with vehicle engine RPM or the encoder. Not reported during 2 second power-up.**		**8**
	SPEED SENSOR READING INVALID SPEED	This fault is detected with diesel engines only. The RPM pickup is indicating a speed that greater than 4000 RPM or approximately 8875 Hz.	
	SPEED INPUT LOST	This fault is detected with diesel engines only. It occurs if there is no RPM detected and the oil pressure input is reading above 8 PSI for more than three seconds. This is probably due to wiring problems at the ground module or a faulty speed sensor.	
6/6	**Flash code 6/6 indicates problems with the CAN bus.**		**10**
	CAN BUS FAILURE:	The ground module or platform module is not receiving CAN messages. This is probably due to wiring problems between the platform and ground modules.	
	UMS SENSOR COMMUNICATIONS LOST	The Ground module is not receiving CANbus information from the UMS module.	10
7/7	**Flash code 7/7 indicates problems with a motor.** **NOT REQUIRED**		
8/1	**Flash code 8/1 indicates UMS sensor issues.**		**11**
	UMS SENSOR OUT OF USABLE RANGE	Both the Chassis tilt sensor and the UMS sensor read greater then 10°	
	UMS SENSOR NOT CALIBRATED	The Ground module detects that the UMS angle sensor has not been calibrated	
	UMS SENSOR FAULTED	The Ground module detects the UMS sensor is reading a frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% range	

Table 6-11. Help Fault Codes, Displayed Faults, and Descriptions - (S/N 0300066931 to S/N 0300183033)

Fault Flash Code	Communicated (Displayed on Analyzer) Fault	Description	Priority
9/9	**Flash code 9/9 indicates problems with the controller.**		**11**
	PLATFORM MODULE SOFTWARE UPDATE REQUIRED	Platform module code is too old to support the EIM or BPE load sensor and the machine is configured to use one of these two sensors. The PM code must be updated to a newer version.	
	HIGH RESOLUTION A2D FAILURE – INTERRUPT LOST	The ADS1213 chip in the platform module has stopped asserting its interrupt (DRDY) line for some reason. An EMS cycle is required.	
	HIGH RESOLUTION A2D FAILURE-REINIT LIMIT	The ADS1213 has needed to be reset 3 or more times.	
	PLATFORM MODULE FAILURE: hwfs CODE 1	Platform module Flow) FET has failed	
	GROUND MODULE FAILURE: hwfs CODE 1	Ground module V(Low) FET has failed	
	GROUND SENSOR REF VOLTAGE OUT OF RANGE	These faults occur when the seven volt reference voltage used for the joysticks, sensors, etc goes out of range. Not reported during 2 second power-up.	
	PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	These faults occur when the seven volt reference voltage used for the joysticks, sensors, etc goes out of range. Not reported during 2 second power-up.	
	EEPROM FAILURE – CHECK ALL SETTINGS	A critical failure occurred with the EEPROM. Personalities, machine configuration digits, etc may be reset to default values and should be checked.	
	CHASSIS TILT SENSOR NOT GAIN CALIBRATED	Indicates that the chassis tilt sensor calibration information has been lost. Machine will indicate that it is tilted at all times. This calibration data is programmed into the unit at the factory.	
	CHASSIS TILT SENSOR GAIN OUT OF RANGE	Indicates that the chassis tilt sensor calibration has become corrupted.	
	INCOMPATIBLE SOFTWARE DETECTED	The UMS module detects that the Ground module software is incompatible with the UMS module	**12**

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
HELP COMMENT	000	00	0		
EVERYTHING OK	001	00	1	Y	N
GROUND MODE OK	002	00	2	Y	N
RUNNING AT CUTBACK - OUT OF TRANSPORT POSITION	0010	00	10	Y	N
FSW OPEN	0011	00	11	Y	N
RUNNING AT CREEP - CREEP SWITCH OPEN	0012	00	12	Y	N
RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	0013	00	13	Y	N
CHASSIS TILT SENSOR OUT OF RANGE	0014	00	14	Y	N
LOAD SENSOR READING UNDER WEIGHT	0015	00	15	Y	N
APU ACTIVE	0035	00	35	Y	N
RUNNING AT CREEP-CREEP SWITCH CLOSED	0040	00	40	Y	N
POWER-UP	210	21	0	Y	N
POWER CYCLE	211	21	1	Y	N
KEYSWITCH FAULTY	212	21	2	N	N
FSW FAULTY	213	21	3	N	N
PLATFORM INPUTS	220	22	0		N
STEER SWITCHES FAULTY	227	22	7	N	N
FSW INTERLOCK TRIPPED	2211	22	11	Y	N
DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2212	22	12	Y	N
STEER LOCKED - SELECTED BEFORE FOOTSWITCH	2213	22	13	Y	N
DRIVE/STEER LOCKED - JOYSTICK MOVED BEFORE ENABLE	2214	22	14	Y	N
D/S JOY. OUT OF RANGE LOW	2215	22	15	N	N
D/S JOY. OUT OF RANGE HIGH	2216	22	16	N	N
D/S JOY. CENTER TAP BAD	2217	22	17	N	N
L/S JOY. OUT OF RANGE LOW	2218	22	18	N	N
L/S JOY. OUT OF RANGE HIGH	2219	22	19	N	N
L/S JOY. CENTER TAP BAD	2220	22	20	N	N
LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2221	22	21	Y	N
WAITING FOR FSW TO BE OPEN	2222	22	22	Y	N
FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	2223	22	23	Y	N
FOOTSWITCH SELECTED BEFORE START	2224	22	24	Y	N
FUNCTION PROBLEM-HIGH SPEED AND CREEP ACTIVE TOGETHER	2269	22	69	N	N
GROUND INPUTS	230	23	0		
FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	234	23	4	Y	N
FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	235	23	5	Y	N
FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	236	23	6	Y	N
START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	237	23	7	Y	N
FUNCTION PREVENTED	250	25	0		
MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS	259	25	9	Y	N
GENERATOR MOTION CUTOUT ACTIVE	2513	25	13	Y	N
BOOM PREVENTED - DRIVE SELECTED	2514	25	14	Y	N
DRIVE PREVENTED - ABOVE ELEVATION	2516	25	16	Y	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
DRIVE PREVENTED - TILTED & ABOVE ELEVATION	2517	25	17	Y	N
DRIVE PREVENTED - BOOM SELECTED	2518	25	18	Y	N
DRIVE PREVENTED - TILTED & EXTENDED OR HIGH ANGLE	2519	25	19	Y	N
FUNCTIONS LOCKED OUT - CONSTANT DATA VERSION IMPROPER	2520	25	20	N	N
UMS SENSOR FORWARD LIMIT REACHED	2530	25	30	N	N
UMS SENSOR OUT OF USABLE RANGE	2531	25	31	N	N
UMS SENSOR BACKWARD LIMIT REACHED	2532	25	32	N	N
GROUND OUTPUT DRIVER	330	33	0		
BRAKE - SHORT TO BATTERY	331	33	1	N	N
BRAKE - OPEN CIRCUIT	332	33	2	N	N
GROUND ALARM - SHORT TO BATTERY	3311	33	11	N	N
RIGHT FORWARD DRIVE PUMP - SHORT TO GROUND	3316	33	16	N	N
RIGHT FORWARD DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3319	33	19	N	N
RIGHT REVERSE DRIVE PUMP - SHORT TO GROUND	3320	33	20	N	N
RIGHT REVERSE DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3323	33	23	N	N
LEFT FORWARD DRIVE PUMP - SHORT TO GROUND	3324	33	24	N	N
LEFT FORWARD DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3327	33	27	N	N
LEFT REVERSE DRIVE PUMP - SHORT TO GROUND	3328	33	28	N	N
LEFT REVERSE DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3331	33	31	N	N
FORWARD DRIVE PUMP - SHORT TO GROUND	3332	33	32	N	N
FORWARD DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3333	33	33	N	N
REVERSE DRIVE PUMP - SHORT TO GROUND	3334	33	34	N	N
REVERSE DRIVE PUMP - SHORT TO BATTERY OR OPEN CIRCUIT	3335	33	35	N	N
ALTERNATOR POWER - SHORT TO GROUND	3336	33	36	N	N
AUX POWER - SHORT TO GROUND	3340	33	40	N	N
AUX POWER - OPEN CIRCUIT	3341	33	41	N	N
AUX POWER - SHORT TO BATTERY	3342	33	42	N	N
ELECTRIC FAN - SHORT TO GROUND	3346	33	46	N	N
ELECTRIC FAN - OPEN CIRCUIT	3347	33	47	N	N
ELECTRIC FAN - SHORT TO BATTERY	3348	33	48	N	N
ELECTRIC PUMP - SHORT TO GROUND	3349	33	49	N	N
ELECTRIC PUMP - OPEN CIRCUIT	3350	33	50	N	N
ELECTRIC PUMP - SHORT TO BATTERY	3351	33	51	N	N
LP LOCK - SHORT TO GROUND	3352	33	52	N	N
LP LOCK - OPEN CIRCUIT	3353	33	53	N	N
LP LOCK - SHORT TO BATTERY	3354	33	54	N	N
LP START ASSIST - SHORT TO GROUND	3355	33	55	N	N
LP START ASSIST - OPEN CIRCUIT	3356	33	56	N	N
LP START ASSIST - SHORT TO BATTERY	3357	33	57	N	N
MAIN DUMP VALVE - SHORT TO GROUND	3358	33	58	N	N
MAIN DUMP VALVE - OPEN CIRCUIT	3359	33	59	N	N
MAIN DUMP VALVE - SHORT TO BATTERY	3360	33	60	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
BRAKE - SHORT TO GROUND	3361	33	61	N	N
START SOLENOID - SHORT TO GROUND	3362	33	62	N	N
START SOLENOID - OPEN CIRCUIT	3363	33	63	N	N
START SOLENOID - SHORT TO BATTERY	3364	33	64	N	N
STEER DUMP VALVE - SHORT TO GROUND	3365	33	65	N	N
STEER DUMP VALVE - OPEN CIRCUIT	3366	33	66	N	N
STEER DUMP VALVE - SHORT TO BATTERY	3367	33	67	N	N
TWO SPEED VALVE - SHORT TO GROUND	3368	33	68	N	N
TWO SPEED VALVE - OPEN CIRCUIT	3369	33	69	N	N
TWO SPEED VALVE - SHORT TO BATTERY	3370	33	70	N	N
GROUND ALARM - SHORT TO GROUND	3371	33	71	N	N
GROUND ALARM - OPEN CIRCUIT	3372	33	72	N	N
GEN SET/WELDER - SHORT TO GROUND	3373	33	73	N	N
GEN SET/WELDER - OPEN CIRCUIT	3374	33	74	N	N
GEN SET/WELDER - SHORT TO BATTERY	3375	33	75	N	N
HEAD TAIL LIGHT - SHORT TO GROUND	3376	33	76	N	N
HEAD TAIL LIGHT - OPEN CIRCUIT	3377	33	77	N	N
HEAD TAIL LIGHT - SHORT TO BATTERY	3378	33	78	N	N
HOUR METER - SHORT TO GROUND	3379	33	79	N	N
PLATFORM LEVEL UP VALVE - SHORT TO GROUND	3382	33	82	N	N
PLATFORM LEVEL UP VALVE - OPEN CIRCUIT	3383	33	83	N	N
PLATFORM LEVEL UP VALVE - SHORT TO BATTERY	3384	33	84	N	N
PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO GROUND	3385	33	85	N	N
PLATFORM LEVEL UP OVERRIDE VALVE - OPEN CIRCUIT	3386	33	86	N	N
PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO BATTERY	3387	33	87	N	N
PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	3388	33	88	N	N
PLATFORM LEVEL DOWN VALVE - OPEN CIRCUIT	3389	33	89	N	N
PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY	3390	33	90	N	N
PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO GROUND	3391	33	91	N	N
PLATFORM LEVEL DOWN OVERRIDE VALVE - OPEN CIRCUIT	3392	33	92	N	N
PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO BATTERY	3393	33	93	N	N
PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	3394	33	94	N	N
PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	3395	33	95	N	N
PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	3396	33	96	N	N
PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	3397	33	97	N	N
PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	3398	33	98	N	N
PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	3399	33	99	N	N
JIB LIFT UP VALVE - SHORT TO GROUND	33100	33	100	N	N
JIB LIFT UP VALVE - OPEN CIRCUIT	33101	33	101	N	N
JIB LIFT UP VALVE - SHORT TO BATTERY	33102	33	102	N	N
JIB LIFT DOWN VALVE - SHORT TO GROUND	33103	33	103	N	N
JIB LIFT DOWN VALVE - OPEN CIRCUIT	33104	33	104	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
JIB LIFT DOWN VALVE - SHORT TO BATTERY	33105	33	105	N	N
TOWER LIFT UP VALVE - SHORT TO GROUND	33106	33	106	N	N
TOWER LIFT UP VALVE - OPEN CIRCUIT	33107	33	107	N	N
TOWER LIFT UP VALVE - SHORT TO BATTERY	33108	33	108	N	N
TOWER LIFT DOWN VALVE - SHORT TO GROUND	33109	33	109	N	N
TOWER LIFT DOWN VALVE - OPEN CIRCUIT	33110	33	110	N	N
TOWER LIFT DOWN VALVE - SHORT TO BATTERY	33111	33	111	N	N
TOWER TELESCOPE IN VALVE - SHORT TO GROUND	33112	33	112	N	N
TOWER TELESCOPE IN VALVE - OPEN CIRCUIT	33113	33	113	N	N
TOWER TELESCOPE IN VALVE - SHORT TO BATTERY	33114	33	114	N	N
TOWER TELESCOPE OUT VALVE - SHORT TO GROUND	33115	33	115	N	N
TOWER TELESCOPE OUT VALVE - OPEN CIRCUIT	33116	33	116	N	N
TOWER TELESCOPE OUT VALVE - SHORT TO BATTERY	33117	33	117	N	N
SWING RIGHT VALVE - SHORT TO GROUND	33118	33	118	N	N
SWING RIGHT VALVE - OPEN CIRCUIT	33119	33	119	N	N
TELESCOPE IN VALVE - SHORT TO BATTERY	33120	33	120	N	N
SWING RIGHT VALVE - SHORT TO BATTERY	33121	33	121	N	N
SWING LEFT VALVE - SHORT TO GROUND	33122	33	122	N	N
TELESCOPE OUT VALVE - SHORT TO BATTERY	33123	33	123	N	N
LIFT UP DUMP VALVE - SHORT TO GROUND	33124	33	124	N	N
LIFT UP DUMP VALVE - OPEN CIRCUIT	33125	33	125	N	N
LIFT UP DUMP VALVE - SHORT TO BATTERY	33126	33	126	N	N
LIFT DOWN HOLDING VALVE - SHORT TO GROUND	33127	33	127	N	N
LIFT DOWN HOLDING VALVE - OPEN CIRCUIT	33128	33	128	N	N
LIFT DOWN HOLDING VALVE - SHORT TO BATTERY	33129	33	129	N	N
THROTTLE ACTUATOR - SHORT TO GROUND	33130	33	130	N	N
THROTTLE ACTUATOR - OPEN CIRCUIT	33131	33	131	N	N
THROTTLE ACTUATOR - SHORT TO BATTERY	33132	33	132	N	N
PLATFORM CONTROL VALVE - SHORT TO GROUND	33133	33	133	N	N
PLATFORM CONTROL VALVE - OPEN CIRCUIT	33134	33	134	N	N
PLATFORM CONTROL VALVE - SHORT TO BATTERY	33135	33	135	N	N
LIFT DOWN VALVE - OPEN CIRCUIT	33170	33	170	N	N
LIFT DOWN VALVE - SHORT TO BATTERY	33171	33	171	N	N
LIFT DOWN VALVE - SHORT TO GROUND	33172	33	172	N	N
JIB ROTATE LEFT VALVE - OPEN CIRCUIT	33175	33	175	N	N
JIB ROTATE LEFT VALVE - SHORT TO BATTERY	33176	33	176	N	N
JIB ROTATE LEFT VALVE - SHORT TO GROUND	33177	33	177	N	N
JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	33178	33	178	N	N
JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	33179	33	179	N	N
JIB ROTATE RIGHT VALVE - SHORT TO GROUND	33180	33	180	N	N
TELESCOPE OUT VALVE - OPEN CIRCUIT	33186	33	186	N	N
TELESCOPE OUT VALVE - SHORT TO GROUND	33188	33	188	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
TELESCOPE IN VALVE - OPEN CIRCUIT	33189	33	189	N	N
TELESCOPE IN VALVE - SHORT TO GROUND	33190	33	190	N	N
HORN - OPEN CIRCUIT	33207	33	207	N	N
HORN - SHORT TO BATTERY	33208	33	208	N	N
HORN - SHORT TO GROUND	33209	33	209	N	N
GLOWPLUG - OPEN CIRCUIT	33279	33	279	N	N
GLOWPLUG - SHORT TO BATTERY	33280	33	280	N	N
GLOWPLUG - SHORT TO GROUND	33281	33	281	N	N
SWING LEFT VALVE - OPEN CIRCUIT	33295	33	295	N	N
SWING LEFT VALVE - SHORT TO BATTERY	33306	33	306	N	N
FLOW CONTROL VALVE - OPEN CIRCUIT	33314	33	314	N	N
FLOW CONTROL VALVE - SHORT TO BATTERY	33315	33	315	N	N
FLOW CONTROL VALVE - SHORT TO GROUND	33316	33	316	N	N
DRIVE FORWARD VALVE - OPEN CIRCUIT	33317	33	317	N	N
DRIVE FORWARD VALVE - SHORT TO BATTERY	33318	33	318	N	N
DRIVE FORWARD VALVE - SHORT TO GROUND	33319	33	319	N	N
DRIVE REVERSE VALVE - OPEN CIRCUIT	33320	33	320	N	N
DRIVE REVERSE VALVE - SHORT TO BATTERY	33321	33	321	N	N
DRIVE REVERSE VALVE - SHORT TO GROUND	33322	33	322	N	N
LIFT UP VALVE - OPEN CIRCUIT	33323	33	323	N	N
LIFT UP VALVE - SHORT TO BATTERY	33324	33	324	N	N
LIFT UP VALVE - SHORT TO GROUND	33325	33	325	N	N
DRIVE - CURRENT FEEDBACK READING TOO LOW	33331	33	331	N	N
LEFT TRACK - CURRENT FEEDBACK READING TOO LOW	33332	33	332	N	N
RIGHT TRACK - CURRENT FEEDBACK READING TOO LOW	33333	33	333	N	N
LEFT TRACK - CURRENT FEEDBACK READING LOST	33408	33	408	N	N
RIGHT TRACK - CURRENT FEEDBACK READING LOST	33409	33	409	N	N
DRIVE - CURRENT FEEDBACK READING LOST	33410	33	410	N	N
PLATFORM OUTPUT DRIVER	340	34	0		
PLATFORM LEVEL UP VALVE - OPEN CIRCUIT	341	34	1	N	N
PLATFORM LEVEL UP VALVE - SHORT TO BATTERY	342	34	2	N	N
PLATFORM LEVEL UP VALVE - SHORT TO GROUND	343	34	3	N	N
PLATFORM LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	344	34	4	N	N
PLATFORM LEVEL DOWN VALVE - OPEN CIRCUIT	345	34	5	N	N
PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY	346	34	6	N	N
PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	347	34	7	N	N
PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	348	34	8	N	N
PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	349	34	9	N	N
PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	3410	34	10	N	N
PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	3411	34	11	N	N
PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	3412	34	12	N	N
PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	3413	34	13	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	3414	34	14	N	N
JIB LIFT UP VALVE - OPEN CIRCUIT	3415	34	15	N	N
JIB LIFT UP VALVE - SHORT TO BATTERY	3416	34	16	N	N
JIB LIFT UP VALVE - SHORT TO GROUND	3417	34	17	N	N
JIB LIFT DOWN VALVE - OPEN CIRCUIT	3418	34	18	N	N
JIB LIFT DOWN VALVE - SHORT TO BATTERY	3419	34	19	N	N
JIB LIFT DOWN VALVE - SHORT TO GROUND	3420	34	20	N	N
JIB ROTATE LEFT VALVE - OPEN CIRCUIT	3421	34	21	N	N
JIB ROTATE LEFT VALVE - SHORT TO BATTERY	3422	34	22	N	N
JIB ROTATE LEFT VALVE - SHORT TO GROUND	3423	34	23	N	N
JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	3424	34	24	N	N
JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	3425	34	25	N	N
JIB ROTATE RIGHT VALVE - SHORT TO GROUND	3426	34	26	N	N
ENGINE	430	43	0		
FUEL SENSOR - SHORT TO BATTERY	431	43	1	N	Y
FUEL SENSOR - SHORT TO GROUND	432	43	2	N	Y
OIL PRESSURE - SHORT TO BATTERY	433	43	3	N	Y
OIL PRESSURE - SHORT TO GROUND	434	43	4	N	Y
COOLANT TEMPERATURE - SHORT TO GROUND	435	43	5	N	Y
FORD FAULT CODE ##	436	43	6	N	Y
ENGINE TROUBLE CODE	437	43	7	N	N
HIGH ENGINE TEMP	438	43	8	N	Y
AIR FILTER BYPASSED	439	43	9	N	Y
NO ALTERNATOR OUTPUT	4310	43	10	N	Y
LOW OIL PRESSURE	4311	43	11	N	Y
485 COMMUNICATIONS LOST	4312	43	12	N	Y
THROTTLE ACTUATOR FAILURE	4313	43	13	N	Y
WRONG ENGINE SELECTED - ECM DETECTED	4314	43	14	N	Y
LOSS OF ENGINE SPEED SENSOR	4322	43	22	N	Y
SPEED SENSOR READING INVALID SPEED	4323	43	23	N	Y
BATTERY / GENSET	440	44	0		
BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN	441	44	1	N	Y
BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN	442	44	2	N	Y
BATTERY VOLTAGE LOW	445	44	5	N	Y
COMMUNICATION	660	66	0		
CANBUS FAILURE - PLATFORM MODULE	662	66	2	N	N
CANBUS FAILURE - ACCESSORY MODULE	664	66	4	N	N
CANBUS FAILURE - PROPULSION MODULE	665	66	5	N	N
CANBUS FAILURE - ENGINE CONTROLLER	666	66	6	N	N
CANBUS FAILURE - UMS SENSOR	6620	66	20	N	N
ACCESSORY	670	67	0		
ACCESSORY FAULT	671	67	1	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
TILT SENSOR	810	81	0		
CHASSIS TILT SENSOR NOT CALIBRATED	813	81	3	N	N
CHASSIS TILT SENSOR DISAGREEMENT	815	81	5	N	N
UMS SENSOR NOT CALIBRATED	816	81	6	N	N
UMS SENSOR FAULT	817	81	7	N	N
PLATFORM LOAD SENSE	820	82	0		
LSS HAS NOT BEEN CALIBRATED	825	82	5	N	N
RUNNING AT CREEP - PLATFORM OVERLOADED	826	82	6	N	N
DRIVE & BOOM PREVENTED - PLATFORM OVERLOADED	827	82	7	N	N
LIFT UP & TELE OUT PREVENTED - PLATFORM OVERLOADED	828	82	8	N	N
PLATFORM / JIB	830	83	0		
PLATFORM LEVELING OVERRIDE ON	831	83	1	N	N
PLATFORM LEVELING OVERRIDE OFF	832	83	2	N	N
PLATFORM LEVEL UP CRACKPOINT - NOT CALIBRATED	833	83	3	N	N
PLATFORM LEVEL DOWN CRACKPOINT - NOT CALIBRATED	834	83	4	N	N
PLATFORM LEVEL SENSOR #1 - NOT ZERO CALIBRATED	835	83	5	N	N
PLATFORM LEVEL SENSOR #1 - ZERO OUT OF RANGE	836	83	6	N	N
PLATFORM LEVEL SENSOR #1 - SHORT TO BATTERY	837	83	7	N	N
PLATFORM LEVEL SENSOR #1 - SHORT TO GROUND OR OPEN CIRCUIT	838	83	8	N	N
PLATFORM LEVEL SENSOR #2 - NOT ZERO CALIBRATED	839	83	9	N	N
PLATFORM LEVEL SENSOR #2 - ZERO OUT OF RANGE	8310	83	10	N	N
PLATFORM LEVEL SENSOR #2 - SHORT TO BATTERY	8311	83	11	N	N
PLATFORM LEVEL SENSOR #2 - SHORT TO GROUND OR OPEN CIRCUIT	8312	83	12	N	N
PLATFORM LEVEL SENSOR #1 - REFERENCE VOLTAGE OUT OF RANGE	8313	83	13	N	N
PLATFORM LEVEL SENSOR #2 - REFERENCE VOLTAGE OUT OF RANGE	8314	83	14	N	N
PLATFORM LEVELING SENSOR - DISAGREEMENT	8315	83	15	N	N
PLATFORM LEVEL SENSOR #1 - COMMUNICATIONS LOST	8316	83	16	N	N
PLATFORM LEVEL SENSOR #2 - COMMUNICATIONS LOST	8317	83	17	N	N
PLATFORM LEVELING SYSTEM TIMEOUT	8318	83	18	N	N
STEERING / AXLE	860	86	0		
FRONT LEFT STEER VALVE - OPEN CIRCUIT	8639	86	39	N	N
FRONT LEFT STEER VALVE - SHORT TO BATTERY	8640	86	40	N	N
FRONT LEFT STEER VALVE - SHORT TO GROUND	8641	86	41	N	N
FRONT RIGHT STEER VALVE - OPEN CIRCUIT	8642	86	42	N	N
FRONT RIGHT STEER VALVE - SHORT TO BATTERY	8643	86	43	N	N
FRONT RIGHT STEER VALVE - SHORT TO GROUND	8644	86	44	N	N
REAR LEFT STEER VALVE - OPEN CIRCUIT	8645	86	45	N	N
REAR LEFT STEER VALVE - SHORT TO BATTERY	8646	86	46	N	N
REAR LEFT STEER VALVE - SHORT TO GROUND	8647	86	47	N	N
REAR RIGHT STEER VALVE - OPEN CIRCUIT	8648	86	48	N	N
REAR RIGHT STEER VALVE - SHORT TO BATTERY	8649	86	49	N	N
REAR RIGHT STEER VALVE - SHORT TO GROUND	8650	86	50	N	N

Table 6-12. Analyzer Fault Code Listing

Analyzer Text	DTC	Flash Code	Sequence	Operational Fault	Clear Sky Default Information
RIGHT TRACK FORWARD VALVE - OPEN CIRCUIT	8652	86	52	N	N
RIGHT TRACK FORWARD VALVE - SHORT TO BATTERY	8653	86	53	N	N
RIGHT TRACK FORWARD VALVE - SHORT TO GROUND	8654	86	54	N	N
RIGHT TRACK REVERSE VALVE - OPEN CIRCUIT	8655	86	55	N	N
RIGHT TRACK REVERSE VALVE - SHORT TO BATTERY	8656	86	56	N	N
RIGHT TRACK REVERSE VALVE - SHORT TO GROUND	8657	86	57	N	N
LEFT TRACK FORWARD VALVE - OPEN CIRCUIT	8658	86	58	N	N
LEFT TRACK FORWARD VALVE - SHORT TO BATTERY	8659	86	59	N	N
LEFT TRACK FORWARD VALVE - SHORT TO GROUND	8660	86	60	N	N
LEFT TRACK REVERSE VALVE - OPEN CIRCUIT	8661	86	61	N	N
LEFT TRACK REVERSE VALVE - SHORT TO BATTERY	8662	86	62	N	N
LEFT TRACK REVERSE VALVE - SHORT TO GROUND	8663	86	63	N	N
SERVICE REQUIRED	870	87	0		
RETURN FILTER BYPASSED	871	87	1	N	N
CHARGE PUMP FILTER BYPASSED	872	87	2	N	N
HARDWARE	990	99	0		
EEPROM FAILURE - CHECK ALL SETTINGS	998	99	8	N	N
FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER	9910	99	10	N	N
FUNCTIONS LOCKED OUT - PROPULSION MODULE SOFTWARE VERSION IMPROPER	9913	99	13	N	N
PLATFORM MODULE SOFTWARE UPDATE REQUIRED	9914	99	14	N	N
CHASSIS TILT SENSOR NOT GAIN CALIBRATED	9915	99	15	N	N
CHASSIS TILT SENSOR GAIN OUT OF RANGE	9916	99	16	N	N
HIGH RESOLUTION A2D FAILURE - INTERRUPT LOST	9917	99	17	N	N
HIGH RESOLUTION A2D FAILURE - REINIT LIMIT	9918	99	18	N	N
GROUND SENSOR REF VOLTAGE OUT OF RANGE	9919	99	19	N	N
PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	9920	99	20	N	N
GROUND MODULE FAILURE - HIGH SIDE DRIVER CUTOUT FAULTY	9921	99	21	N	N
PLATFORM MODULE FAILURE - HWFS CODE 1	9922	99	22	N	N
GROUND MODULE FAILURE - HWFS CODE 1	9923	99	23	N	N
FUNCTIONS LOCKED OUT - MACHINE NOT CONFIGURED	9924	99	24	N	N
CURRENT FEEDBACK GAINS OUT OF RANGE	9944	99	44	N	N
CURRENT FEEDBACK CALIBRATION CHECKSUM INCORRECT	9945	99	45	N	N

Analyzer Diagnostics Menu Structure

In the following structure descriptions, an intended item is selected by pressing ENTER; pressing ESC steps back to the next outer level. The LEFT/RIGHT arrow keys move between items in the same level. The UP or DOWN arrow keys alter a value if allowed

Table 6-13. ADJUSTMENTS - Personality Descriptions

DRIVE	
ACCEL	Displays/adjusts drive acceleration
DECEL	Displays/adjusts drive deceleration
MIN FORWARD	Displays/adjusts minimum forward drive speed
MAX FORWARD	Displays/adjusts maximum forward drive speed
MIN REVERSE	Displays/adjusts minimum reverse drive speed
MAX REVERSE	Displays/adjusts maximum reverse drive speed
ELEVATED MAX	Displays/adjusts maximum drive speed NOTE: used when elevation cutout switches are limiting maximum speed
CREEP MAX	Displays/adjusts maximum drive speed NOTE: used when creep switch on pump pot is active
STEER MAX	Displays/adjusts the maximum steer speed
LIFT	
ACCEL	Displays/adjusts upper lift acceleration
DECEL	Displays/adjusts upper lift deceleration
MIN UP	Displays/adjusts minimum upper lift up speed
MAX UP	Displays/adjusts maximum upper lift up speed
CREEP UP	Displays/adjusts maximum upper lift up speed NOTE: used when creep switch on pump pot is active
MIN DOWN	Displays/adjusts minimum upper lift down speed
MAX DOWN	Displays/adjusts maximum upper lift down speed
CREEP DOWN	Displays/adjusts maximum upper lift down speed NOTE: used when creep switch on pump pot is active
SWING	
ACCEL	Displays/adjusts swing acceleration
DECEL	Displays/adjusts swing deceleration
MIN LEFT	Displays/adjusts minimum swing left speed
MAX LEFT	Displays/adjusts maximum swing left speed

Table 6-13. ADJUSTMENTS - Personality Descriptions

CREEP LEFT	Displays/adjusts maximum swing left speed NOTE: used when creep switch on pump pot is active
MIN RIGHT	Displays/adjusts minimum swing right speed
MAX RIGHT	Displays/adjusts maximum swing right speed
CREEP RIGHT	Displays/adjusts maximum swing right speed NOTE: used when creep switch on pump pot is active
UPPER TELESCOPE	
ACCEL	Displays/adjusts telescope acceleration
DECEL	Displays/adjusts telescope deceleration
MIN IN	Displays/adjusts minimum telescope in speed
MAX IN	Displays/adjusts maximum telescope in speed
MIN OUT	Displays/adjusts minimum telescope out speed
MAX OUT	Displays/adjusts maximum telescope out speed
BASKET LEVEL	
ACCEL	Displays/adjusts basket level acceleration
DECEL	Displays/adjusts basket level deceleration
MIN UP	Displays/adjusts minimum basket level up speed
MAX UP	Displays/adjusts maximum basket level up speed
MIN DOWN	Displays/adjusts minimum basket level down speed
MAX DOWN	Displays/adjusts maximum basket level down speed
BASKET ROTATE	
ACCEL	Displays/adjusts basket rotate acceleration
DECEL	Displays/adjusts basket rotate deceleration
MIN LEFT	Displays/adjusts minimum basket rotate left speed
MAX LEFT	Displays/adjusts maximum basket rotate left speed
MIN RIGHT	Displays/adjusts minimum basket rotate right speed
MAX RIGHT	Displays/adjusts maximum basket rotate right speed
JIB LIFT	Not displayed if JIB = NO
ACCEL	Displays/adjusts jib acceleration
DECEL	Displays/adjusts jib deceleration
MIN UP	Displays/adjusts minimum jib up speed
MAX UP	Displays/adjusts maximum jib up speed
MIN DOWN	Displays/adjusts minimum jib down speed

Table 6-13. ADJUSTMENTS - Personality Descriptions

MAX DOWN	Displays/adjusts maximum jib down speed
MIN LEFT	Displays/adjusts minimum jib left speed
MAX LEFT	Displays/adjusts maximum jib left speed
MIN RIGHT	Displays/adjusts minimum jib right speed
MAX RIGHT	Displays/adjusts maximum jib right speed
STEER	
MAX SPEED	Displays/adjusts maximum steer speed, which applies when vehicle speed is at minimum
GROUND MODE	
LIFT UP	Displays/adjusts fixed lift up speed
LIFT DOWN	Displays/adjusts fixed lift down speed
SWING	Displays/adjusts fixed swing speed
TELE	Displays/adjusts fixed telescope speed
BASKETLEVEL	Displays/adjusts fixed basket level speed
BASKETROTATE	Displays/adjusts fixed basket rotate speed
JIB (U/D)	Displays/adjusts jib lift speed Not displayed if JIB = NO
JIB (L/R)	Displays/adjusts jib swing speed Not displayed if JIB = NO

Table 6-14. Diagnostic Menu Descriptions

DRIVE	
DRIVE FOR	Displays drive joystick direction & demand
STEER	Displays steer switch direction & demand NOTE: steer demand is inversely proportional to vehicle speed
BRAKES	Displays brake control system status
CREEP	Displays pump pot creep switch status
TWO SPEED	Displays two speed switch status
2 SPEED MODE	Displays status of two speed valve
HIGH ENGINE	Displays high engine switch status
BOOM	
U LIFT UP	Displays lift joystick direction & demand
SWING LEFT	Displays swing joystick direction & demand
LEVEL UP	Displays basket level switch direction & demand NOTE: demand is controlled by the pump pot
ROT. LEFT	Displays basket rotate switch direction & demand NOTE: demand is controlled by the pump pot
U TELE IN	Displays telescope switch direction & demand NOTE: demand is controlled by the pump pot
JIB UP	Displays jib lift switch direction & demand NOTE: demand is controlled by the pump pot Not displayed if JIB = NO
JIB LEFT	Displays jib swing switch direction & demand NOTE: demand is controlled by the pump pot Not displayed if JIB = NO
PUMP POT	Displays pump pot demand
ENGINE	
START	Displays start switch status
AIR FILTER	Displays air filter status
BATTERY	Displays measured battery voltage
COOLANT	Displays coolant temperature
OIL PRS	Displays oil pressure status
FUEL SELECT	Displays selected fuel (Dual Fuel only)
FUEL LEVEL	Displays fuel level status
RPM	Displays Engine RPM
GM BATTERY	Displays battery voltage at ground module

Table 6-14. Diagnostic Menu Descriptions

PM BATTERY	Displays battery voltage at platform module
TEMP	Displays ground module temperature
ELEV. CUTOUT	Displays elevation cutout switch status
FUNC. CUTOUT	Displays function cutout switch status
CREEP	Displays creep switch status
TILT	Displays measured vehicle tilt
AUX POWER	Displays status of auxiliary power switch
HORN	Displays status of horn switch
R FILTER	Displays status of return filter switch
C FILTER	Displays status of charge pump filter
LOAD LENGTH	Displays length switch status
ANGLE	Displays angle switch status
LOAD	Displays load sensor value NOTE: Not displayed if load = 0.
DATALOG	
ON	Displays total controller on (EMS) time
ENGINE	Displays engine run time
DRIVE	Displays total controller drive operation time
LIFT	Displays total controller lift operation time
SWING	Displays total controller swing operation time
TELE	Displays total controller tele operation time
MAX.TEMP	Displays maximum measured heatsink temp.
MIN.TEMP	Displays minimum measured heatsink temp.
MAX.VOLTS	Displays maximum measured battery voltage
RENTAL	Displays total controller operation time NOTE: can be reset
ERASE RENTAL	Not available at password level 2
YES:ENTER, NO:ESC	ENTER resets rental datalog time to zero
VERSIONS	
GROUND	Displays ground module software version
PLATFORM	Displays platform module software version
ANALYSER	Displays Analyzer software version

PARTS FINDER

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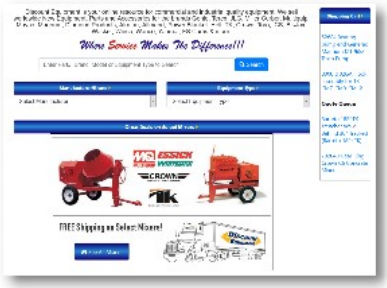

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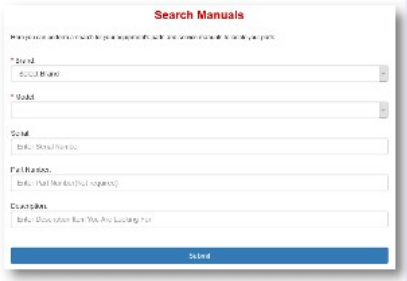

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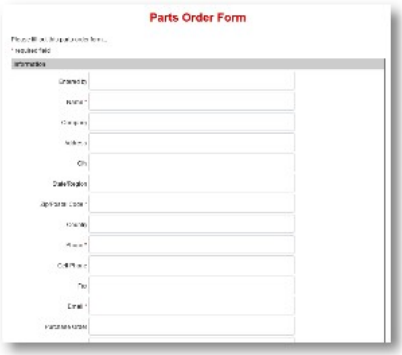

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SECTION 7. ELECTRICAL INFORMATION & SCHEMATICS

7.1 GENERAL

This section contains basic electrical information and schematics to be used for locating and correcting most of the operating problems which may develop. If a problem should develop which is not presented in this section or which is not corrected by listed corrective actions, technically qualified guidance should be obtained before proceeding with any maintenance.

NOTE: *Some of the procedures/connectors shown in this section may not be applicable to all models.*

7.2 MULTIMETER BASICS

A wide variety of multimeters or Volt Ohm Meters (VOM) can be used for troubleshooting your equipment. This section shows diagrams of a common, digital VOM configured for several different circuit measurements. Instructions for your VOM may vary. Please consult the meter operator's manual for more information.

Grounding

"Grounding the meter" means to take the black lead (which is connected to the COM (common) or negative port) and touch it to a good path to the negative side of the Voltage source.

Backprobing

To "backprobe" means to take the measurement by accessing a connector's contact on the same side as the wires, the back of the connector. Readings can be done while maintaining circuit continuity this way. If the connector is the sealed type, great care must be taken to avoid damaging the seal around the wire. It is best to use probes or probe tips specifically designed for this technique, especially on sealed connectors. Whenever possible insert probes into the side of the connector such that the test also checks both terminals of the connection. It is possible to inspect a connection within a closed connector by backprobing both sides of a connector terminal and measuring resistance. Do this after giving each wire a gentle pull to ensure the wires are still attached to the contact and contacts are seated in the connector.

Min/Max

Use of the "Min/Max" recording feature of some meters can help when taking measurements of intermittent conditions while alone. For example, you can read the Voltage applied to a solenoid when it is only operational while a switch, far from the solenoid and meter, is held down.

Polarity

Getting a negative Voltage or current reading when expecting a positive reading frequently means the leads are reversed. Check what reading is expected, the location of the signal and that the leads are connected to the device under test correctly. Also check that the lead on the "COM" port goes to the Ground or negative side of the signal and the lead on the other port goes to the positive side of the signal.

Scale

M = Mega = 1,000,000 * (Displayed Number)

k = kilo = 1,000 * (Displayed Number)

m = milli = (Displayed Number) / 1,000

µ = micro = (Displayed Number) / 1,000,000

Example: 1.2 kW = 1200 W
Example: 50 mA = 0.05 A

Voltage Measurement

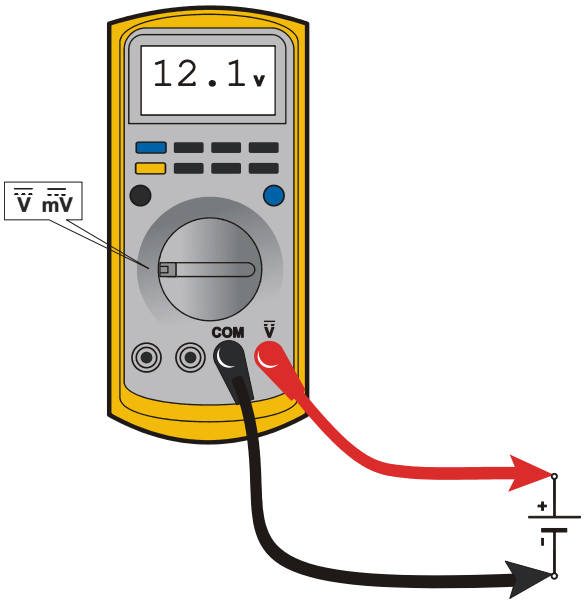


Figure 7-1. Voltage Measurement (DC)

- If meter is not auto ranging, set it to the correct range. (See multimeter's operation manual).
- Use firm contact with meter leads.

Resistance Measurement

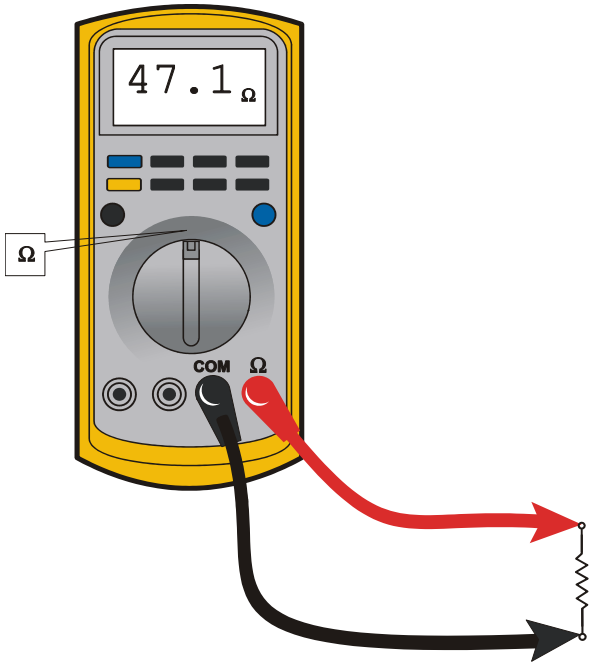


Figure 7-2. Resistance Measurement

- First test meter and leads by touching leads together. Resistance should read a short circuit. (very low resistance).
- Circuit power must be turned OFF before testing resistance.
- Disconnect component from circuit before testing.
- If meter is not auto ranging, set it to the correct range. (See multimeter's operation manual).
- Use firm contact with meter leads.

Continuity Measurement

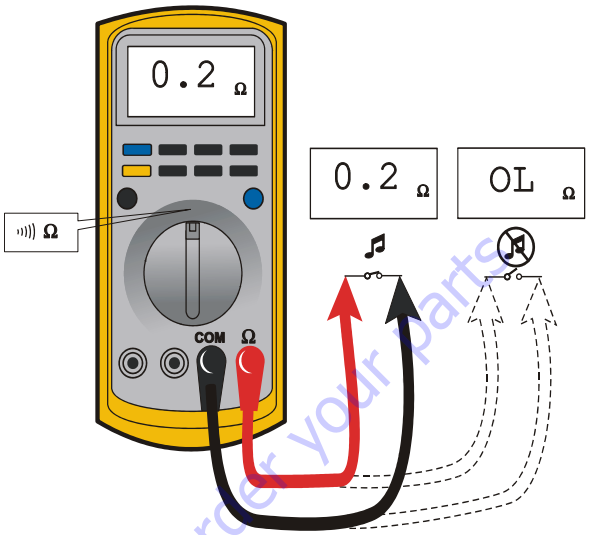


Figure 7-3. Continuity Measurement

- Some meters require a separate button press to enable audible continuity testing.
- Circuit power must be turned OFF before testing continuity.
- Disconnect component from circuit before testing.
- Use firm contact with meter leads.
- First test meter and leads by touching leads together. Meter should produce an audible alarm, indicating continuity.

Current Measurement

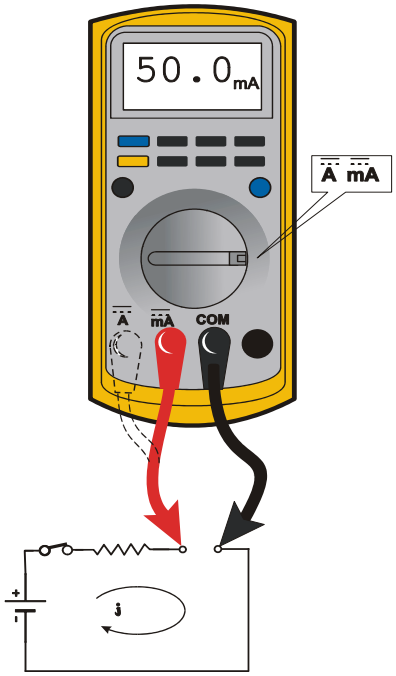


Figure 7-4. Current Measurement (DC)

- Set up the meter for the expected current range.
- Be sure to connect the meter leads to the correct jacks for the current range you have selected.
- If meter is not auto ranging, set it to the correct range. (See multi meter's operation manual).
- Use firm contact with meter leads.

7.3 APPLYING SILICONE DIELECTRIC COMPOUND TO ELECTRICAL CONNECTIONS

NOTE: *This section is not applicable for battery terminals.*

NOTICE

JLG P/N 0100048 DIELECTRIC GREASE (NOVAGARD G661) IS THE ONLY MATERIAL APPROVED FOR USE AS A DIELECTRIC GREASE.

NOTE: *Do NOT apply dielectric grease to the following connections:*

- Main Boom Rotary sensor connections (on Celesco Sensor),
- LSS Modules connections,
- Deutz EMR 2 ECM connection.

Silicone Dielectric Compound must be used on all electrical connections except for those mentioned above for the following reasons:

- To prevent oxidation at the mechanical joint between male and female pins.
- To prevent electrical malfunction caused by low level conductivity between pins when wet.

Use the following procedure to apply Silicone Dielectric Compound to the electrical connectors. This procedure applies to all plug connections not enclosed in a box. Silicone grease should not be applied to connectors with external seals.

1. To prevent oxidation, silicone grease must be packed completely around male and female pins on the inside of the connector prior to assembly. This is most easily achieved by using a syringe.

NOTE: *Over a period of time, oxidation increases electrical resistance at the connection, eventually causing circuit failure.*

2. To prevent shorting, silicone grease must be packed around each wire where they enter the outside of the connector housing. Also, silicone grease must be applied at the joint where the male and female connectors come together. Any other joints (around strain reliefs, etc.) where water could enter the connector should also be sealed.

NOTE: *This condition is especially common when machines are pressure washed since the washing solution is much more conductive than water.*

3. Anderson connectors for the battery boxes and battery chargers should have silicone grease applied to the contacts only.

NOTE: *Curing-type sealants might also be used to prevent shorting and would be less messy, but would make future pin removal more difficult.*

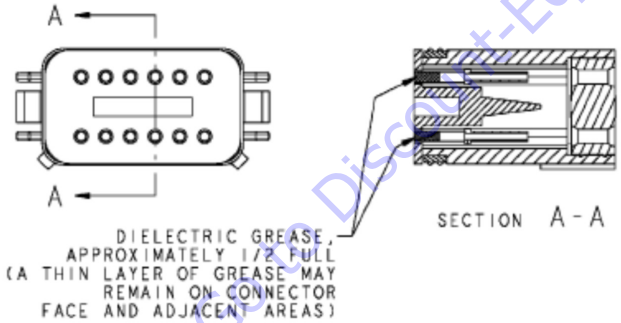
When applied to electrical connections, dielectric grease helps to prevent corrosion of electrical contacts and improper conductivity between contacts from moisture intrusion. Open and sealed connectors benefit from the application of dielectric grease.

Dielectric grease shall be applied to all electrical connectors at the time of connection (except those noted under Exclusions).

Installation of Dielectric Grease

Before following these instructions, refer to excluded connector types (See Exclusions below).

1. Use dielectric grease in a tube for larger connection points or apply with a syringe for small connectors.
2. Apply dielectric grease to the female contact (fill it approximately ½ full; see example below)
3. Leave a thin layer of dielectric grease on the face of the connector
4. Assemble the connector system immediately to prevent moisture ingress or dust contamination
5. Pierce one of the unused wire seals prior to assembly if the connector system tends to trap air (i.e. AMP Seal) and then install a seal plug.



Deutsch HD, DT, DTM, DRC Series

The Deutsch connector system is commonly used for harsh environment interconnect. Follow the installation instructions.

AWP Seal

The AMP Seal connector system is used on the Control ADE Platform and Ground Modules.

Apply dielectric grease to the female contact. If trapped air prevents the connector from latching, pierce one of the unused wire seals. After assembly, install a seal plug (JLG #4460905) in that location to prevent moisture ingress.

Note that seal plugs may be installed by the wire harness manufacturer if an unused wire seal becomes compromised (wire inserted in the wrong cavity during assembly and then corrected).

Figure 7-5. Application to Female Contacts

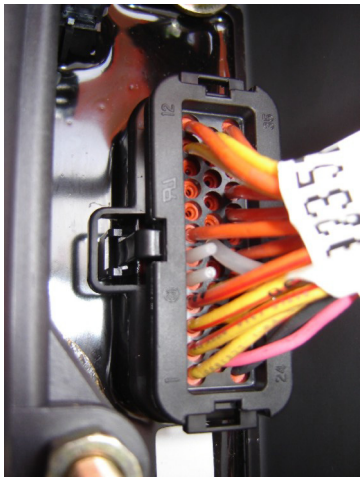
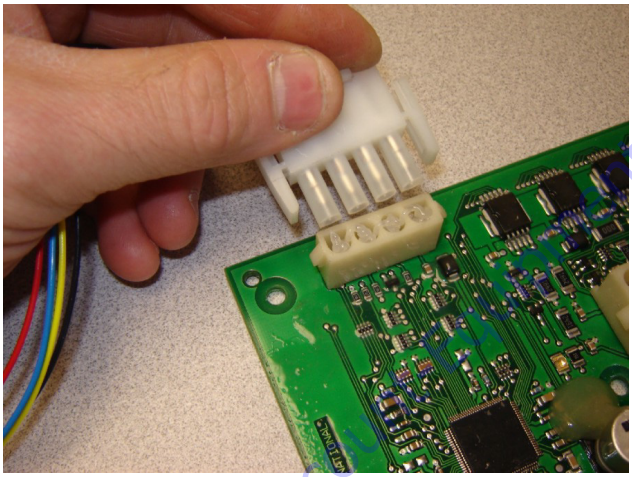


Figure 7-6. Use of Seal Plugs

AMP Mate-N-Lok

Follow the installation instructions.



DIN Connectors

This connector is typically used on hydraulic valves. Follow the installation instructions.

Exclusions

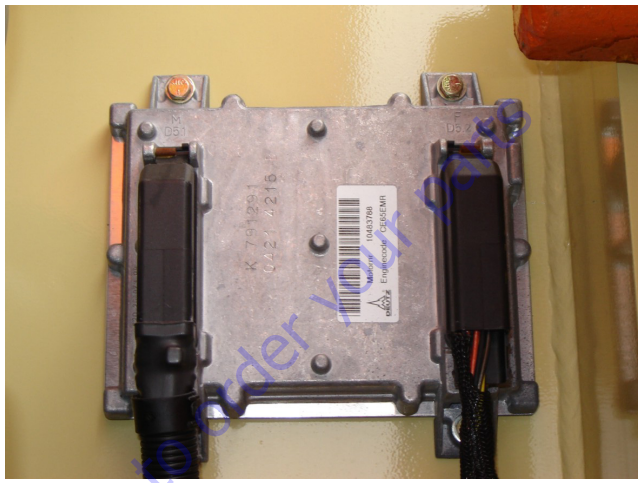
A limited number of connectors do not benefit from dielectric grease, or may be permanently damaged by application. Dielectric grease may not be required in properly sealed enclosures.

BRAD HARRISON / PHOENIX CONTACT M12

The connector uses gold contact material to resist corrosion and an o-ring seal for moisture integrity. If dielectric grease is mistakenly applied to this connector system, the low-force contacts cannot displace the grease to achieve electrical contact. Once contaminated, there is no practical way to remove the dielectric grease (replacement of female contacts required). The JLG Load Sensing System and 1250AJP Rotary Angle Sensors are examples of components with the M12 connector system.

AMP JUNIOR TIMER

This type of connector uses back-seals for moisture integrity. However, the low-force contacts cannot displace dielectric grease and create electrical contact. It is possible to use solvents (i.e. contact cleaner or mineral spirits) for the removal of improperly applied dielectric grease. The EMR2 engine control module from Deutz employs this connector system (for example).



7.4 AMP CONNECTOR

Assembly

Check to be sure the wedge lock is in the open, or as-shipped, position. (See Figure 7-7.). Proceed as follows

:

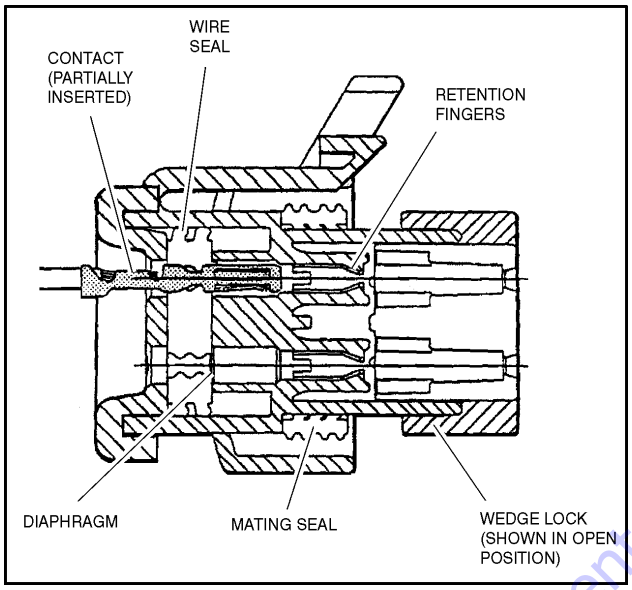


Figure 7-7. Connector Assembly Figure 1

1. To insert a contact, push it straight into the appropriate circuit cavity as far as it will go. (See Figure 7-9.).
2. Pull back on the contact wire with a force of 1 or 2 lbs. to be sure the retention fingers are holding the contact. (See Figure 7-9.).

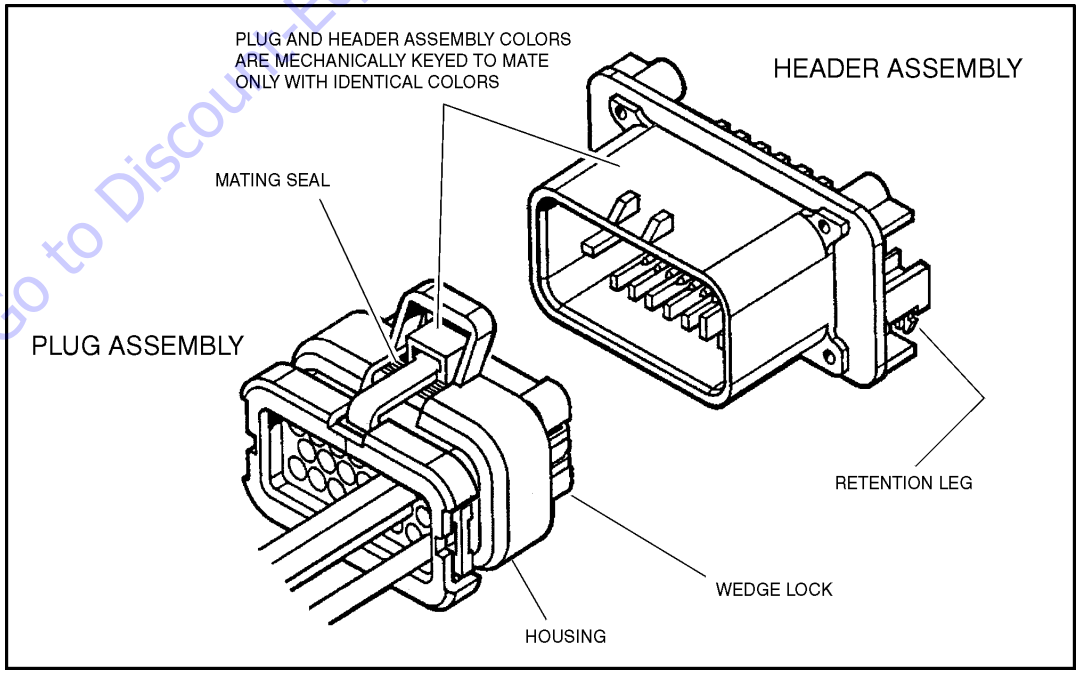


Figure 7-8. AMP Connector

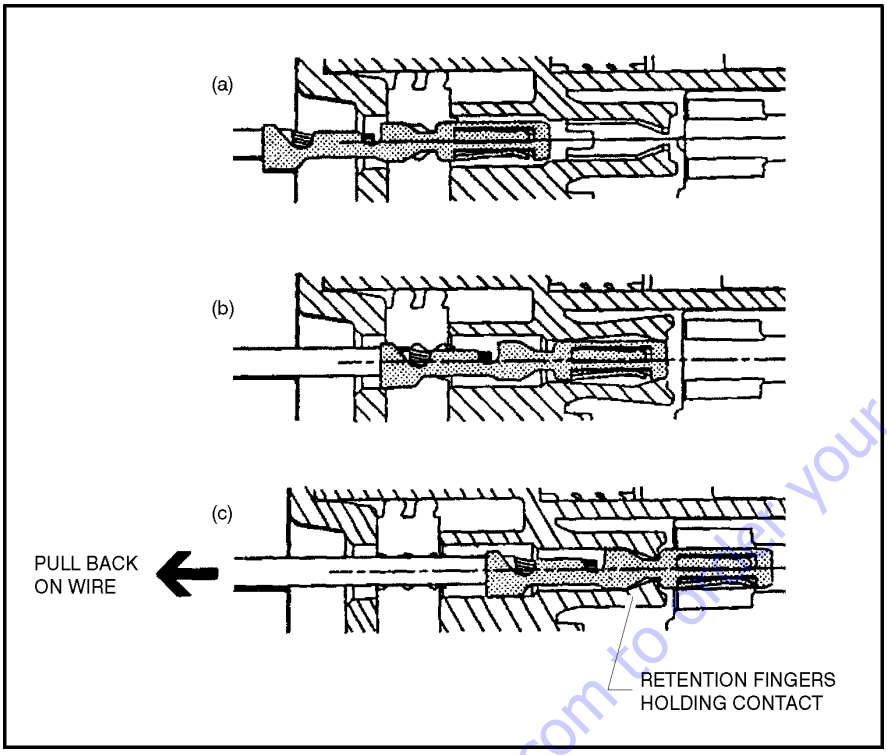


Figure 7-9. Connector Assembly Figure 2

3. After all required contacts have been inserted, the wedge lock must be closed to its locked position. Release the locking latches by squeezing them inward. (See Figure 7-10.).

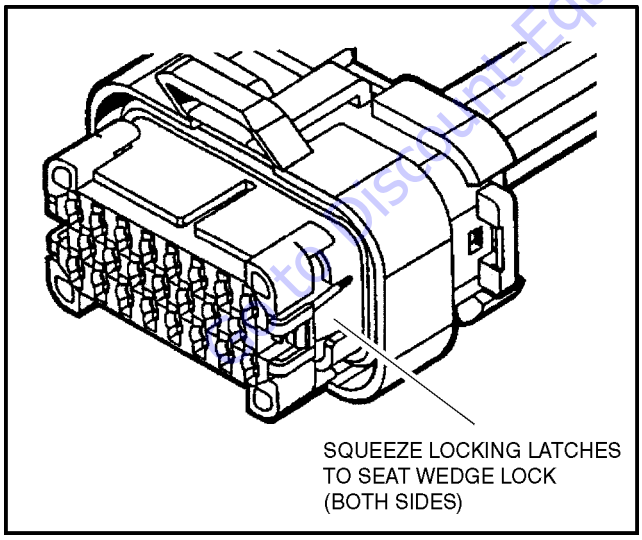


Figure 7-10. Connector Assembly Figure 3

4. Slide the wedge lock into the housing until it is flush with the housing. (See Figure 7-11.).

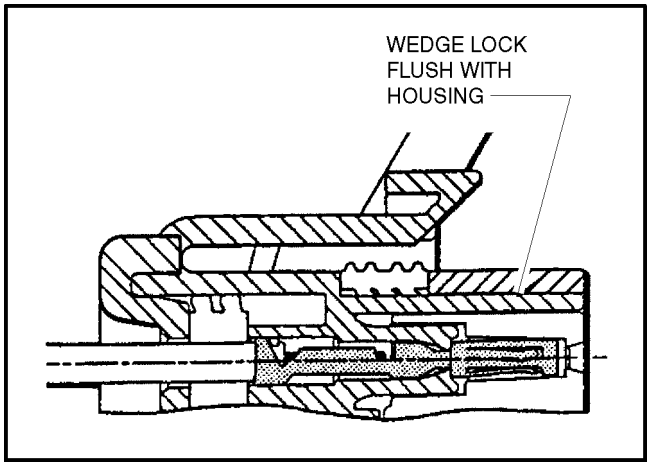


Figure 7-11. Connector Assembly Figure 4

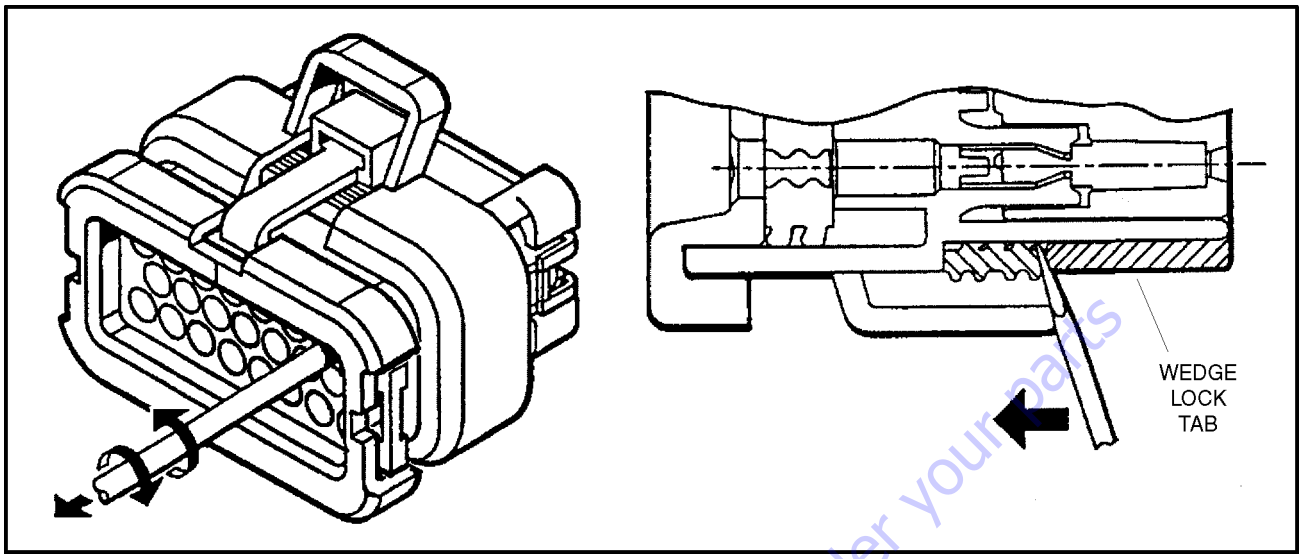


Figure 7-12. Connector Disassembly

Disassembly

1. Insert a 4.8 mm (3/16") wide screwdriver blade between the mating seal and one of the red wedge lock tabs.
2. Pry open the wedge lock to the open position.
3. While rotating the wire back and forth over a half turn (1/4 turn in each direction), gently pull the wire until the contact is removed.

NOTE: *The wedge lock should never be removed from the housing for insertion or removal of the contacts.*

Wedge Lock

The wedge lock has slotted openings in the forward, or mating end. These slots accommodate circuit testing in the field, by using a flat probe such as a pocket knife. DO NOT use a sharp point such as an ice pick.

Service - Voltage Reading

NOTICE

DO NOT PIERCE WIRE INSULATION TO TAKE VOLTAGE READINGS.

It has been common practice in electrical troubleshooting to probe wires by piercing the insulation with a sharp point. This practice should be discouraged when dealing with the AMP-SEAL plug assembly, or any other sealed connector system. The resulting pinholes in the insulation will allow moisture to invade the system by traveling along the wire strands. This nullifies the effectiveness of the connector seals and could result in system failure.

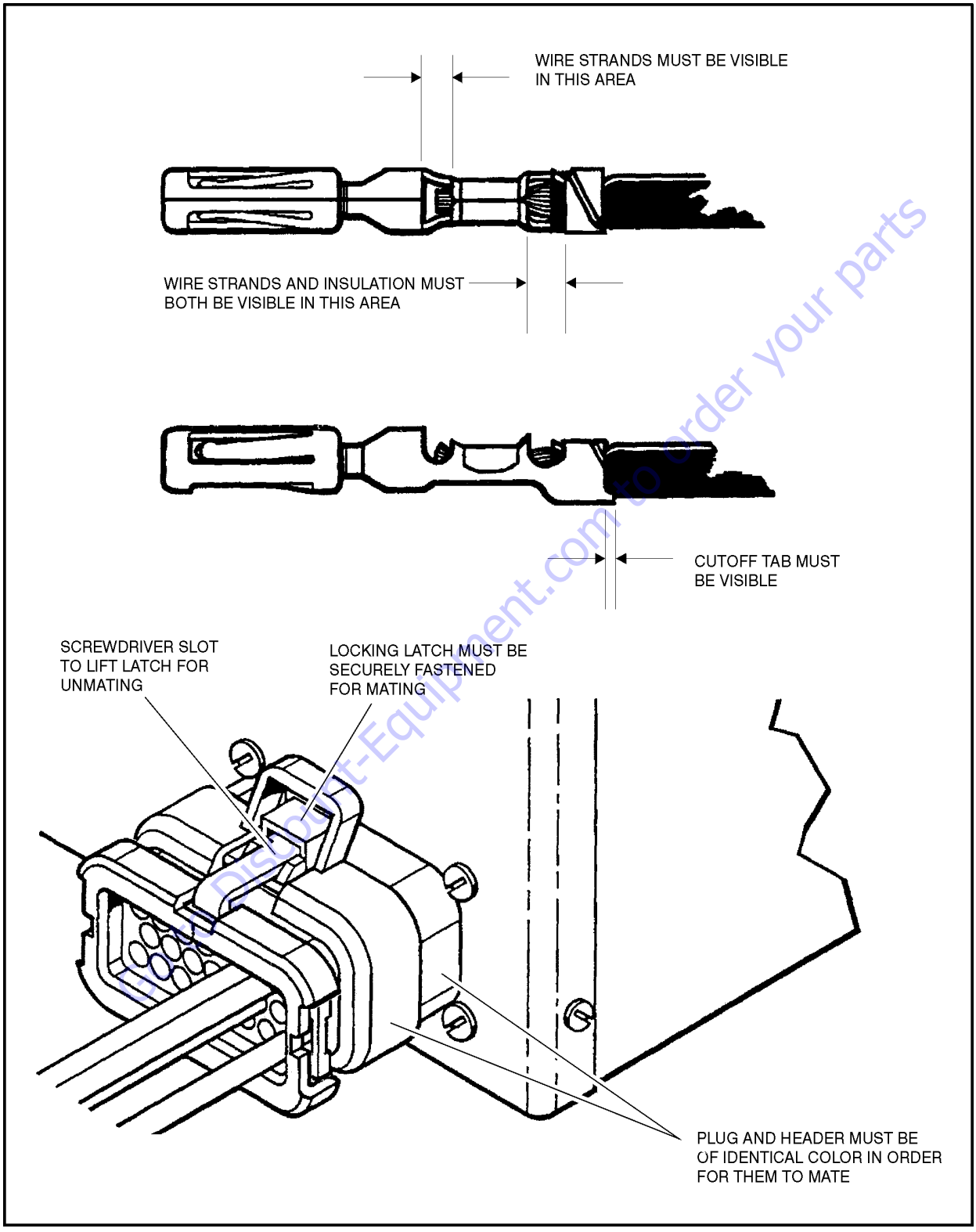


Figure 7-13. Connector Installation

7.5 DEUTSCH CONNECTORS

DT/DTP Series Assembly

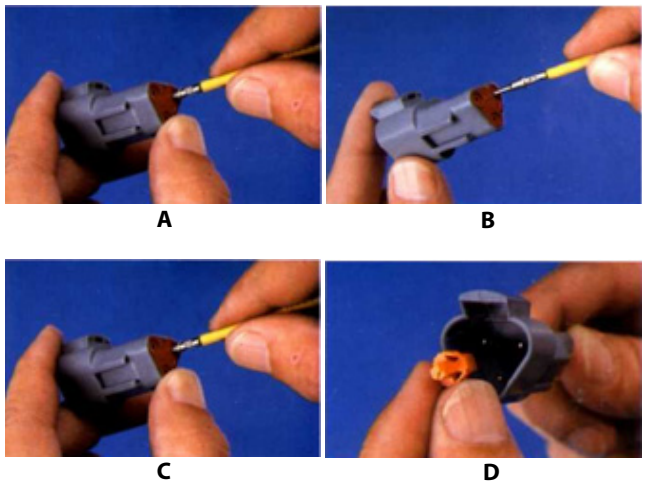


Figure 7-14. DT/DTP Contact Installation

1. Grasp crimped contact about 25mm behind the contact barrel.
2. Hold connector with rear grommet facing you.
3. Push contact straight into connector grommet until a click is felt. A slight tug will confirm that it is properly locked in place.
4. Once all contacts are in place, insert wedgelock with arrow pointing toward exterior locking mechanism. The wedgelock will snap into place. Rectangular wedges are not oriented. Thy may go in either way.

NOTE: *The receptacle is shown - use the same procedure for plug.*

DT/DTP Series Disassembly

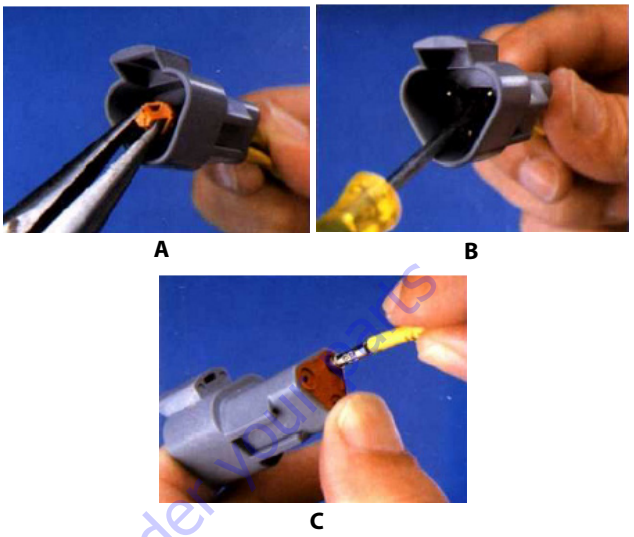


Figure 7-15. DT/DTP Contact Removal

1. Remove wedgelock using needle nose pliers or a hook shaped wire to pull wedge straight out.
2. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.
3. Hold the rear seal in place, as removing the contact may displace the seal.

HD30/HDP20 Series Assembly

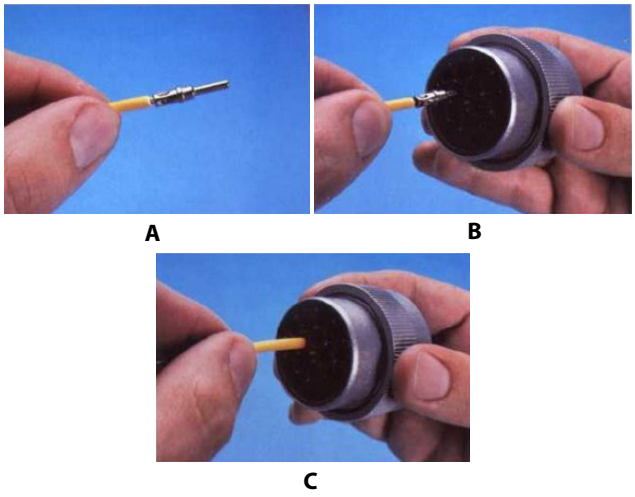


Figure 7-16. HD/HDP Contact Installation

1. Grasp contact about 25mm behind the contact crimp barrel.
2. Hold connector with rear grommet facing you.
3. Push contact straight into connector grommet until a positive stop is felt. A slight tug will confirm that it is properly locked in place.

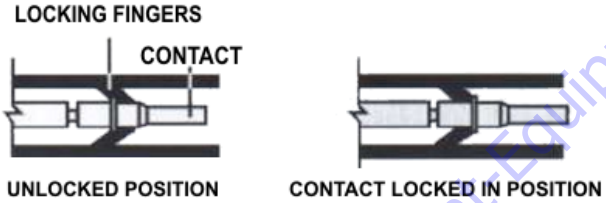


Figure 7-17. HD/HDP Locking Contacts Into Position

NOTE: *For unused wire cavities, insert sealing plugs for full environmental sealing.*

HD30/HDP20 Series Disassembly

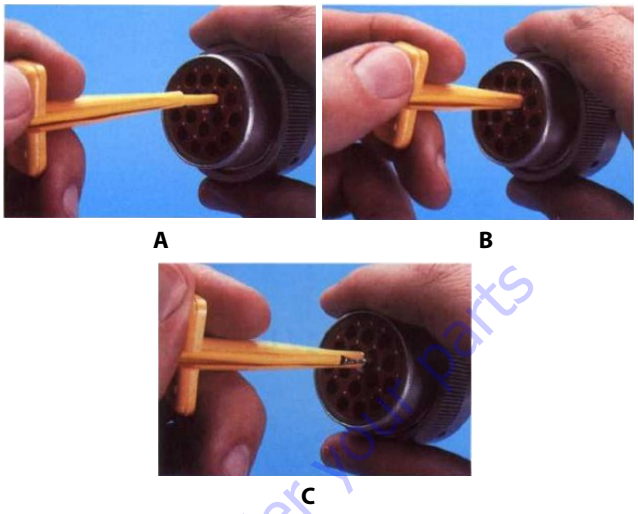


Figure 7-18. HD/HDP Contact Removal

1. With rear insert toward you, snap appropriate size extractor tool over the wire of contact to be removed.
2. Slide tool along into the insert cavity until it engages contact and resistance is felt.
3. Pull contact-wire assembly out of connector.

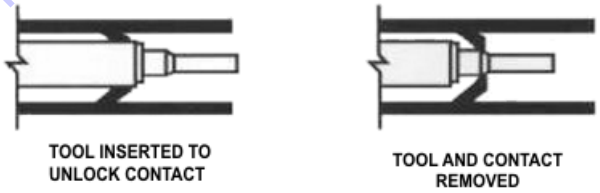


Figure 7-19. HD/HDP Unlocking Contacts

NOTE: *Do Not twist or insert tool at an angle.*

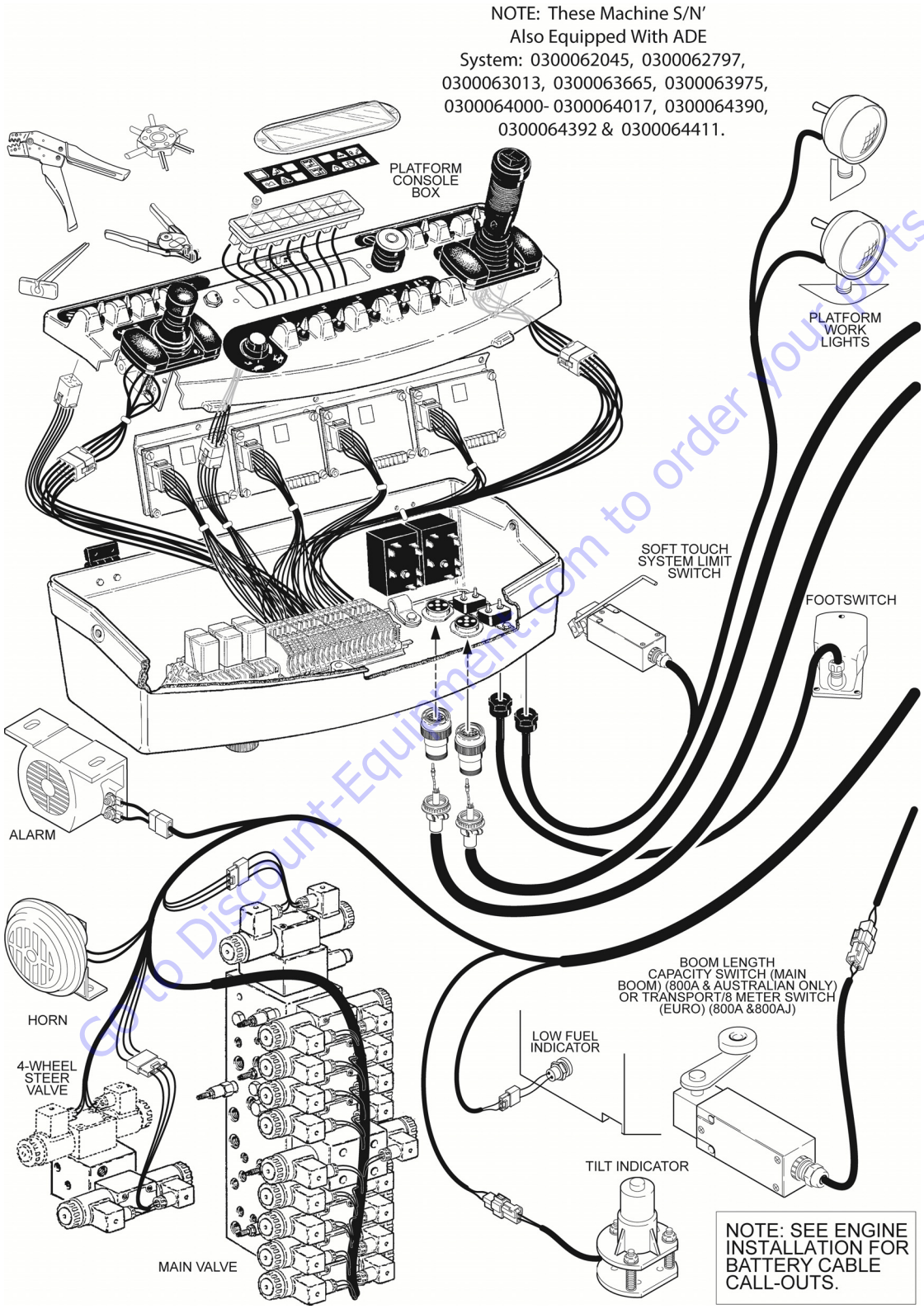


Figure 7-20. Electrical Components Installation (Prior to S/N 0300064432) - Sheet 1 of 2

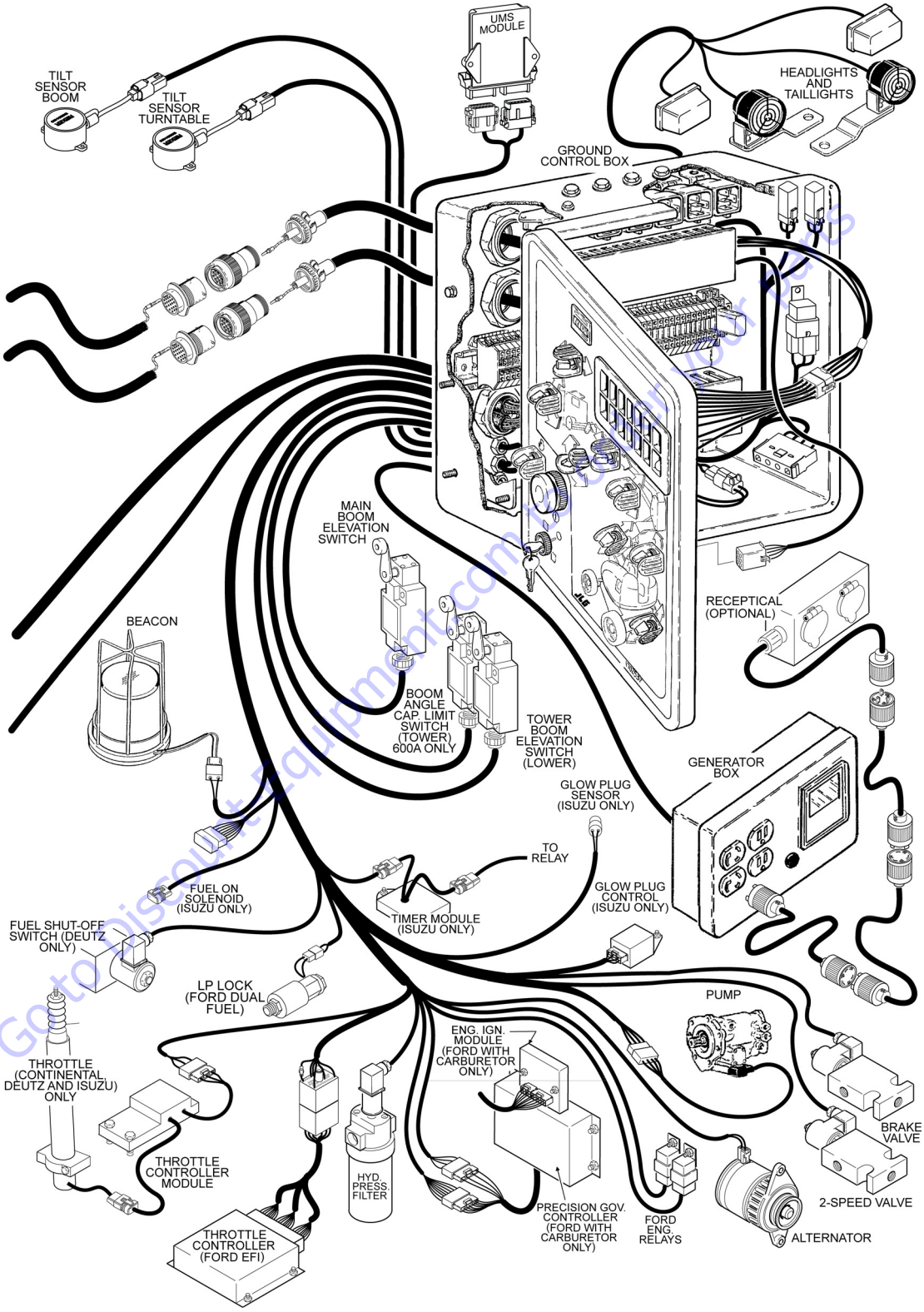


Figure 7-21. Electrical Components Installation (Prior to S/N 0300064432) - Sheet 2 of 2

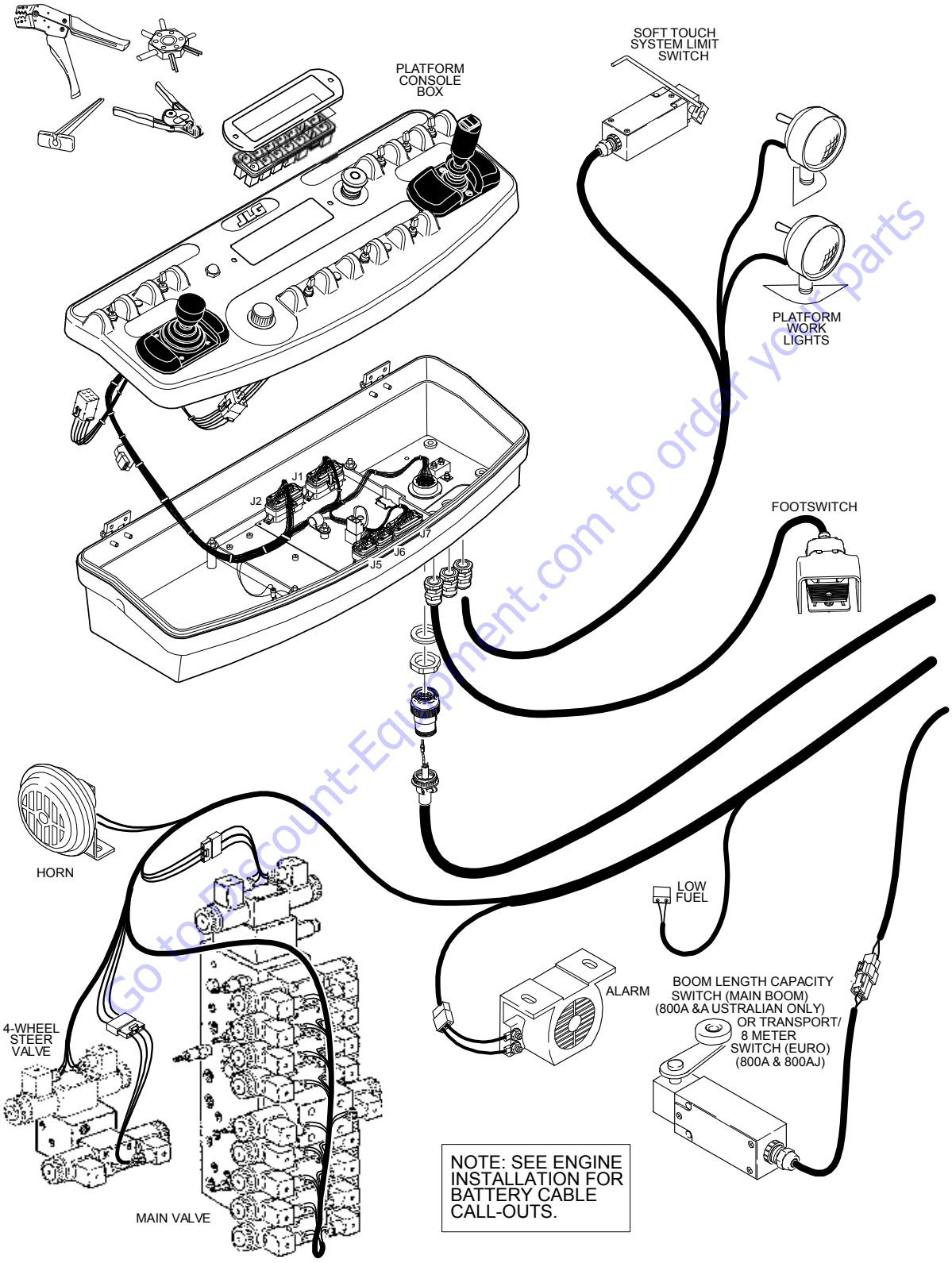


Figure 7-22. Electrical Components Installation (S/N 0300064432 to S/N 0300069000) - Sheet 1 of 2

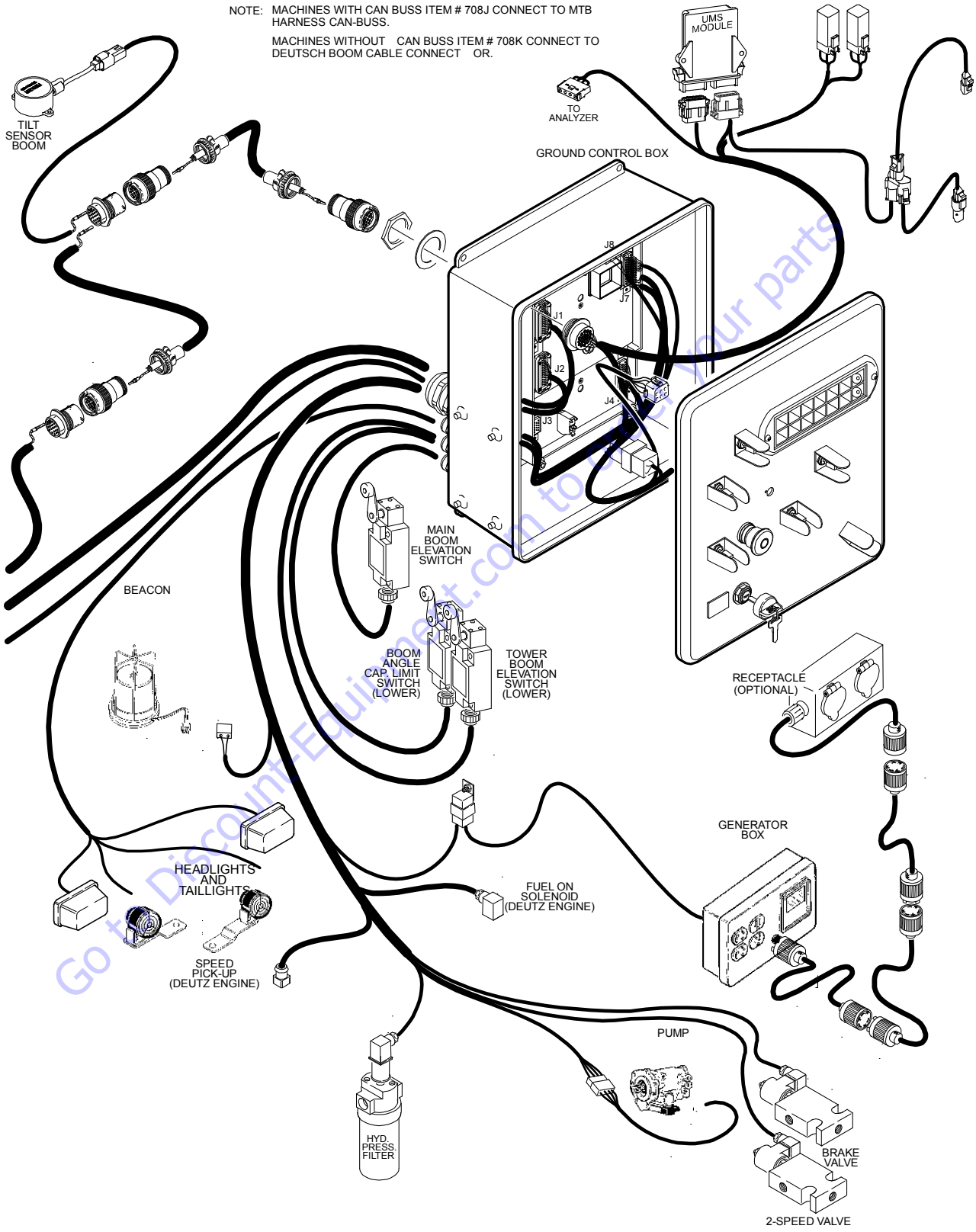


Figure 7-23. Electrical Components Installation (S/N 00300064432 to S/N 0300069000) - Sheet 2 of 2

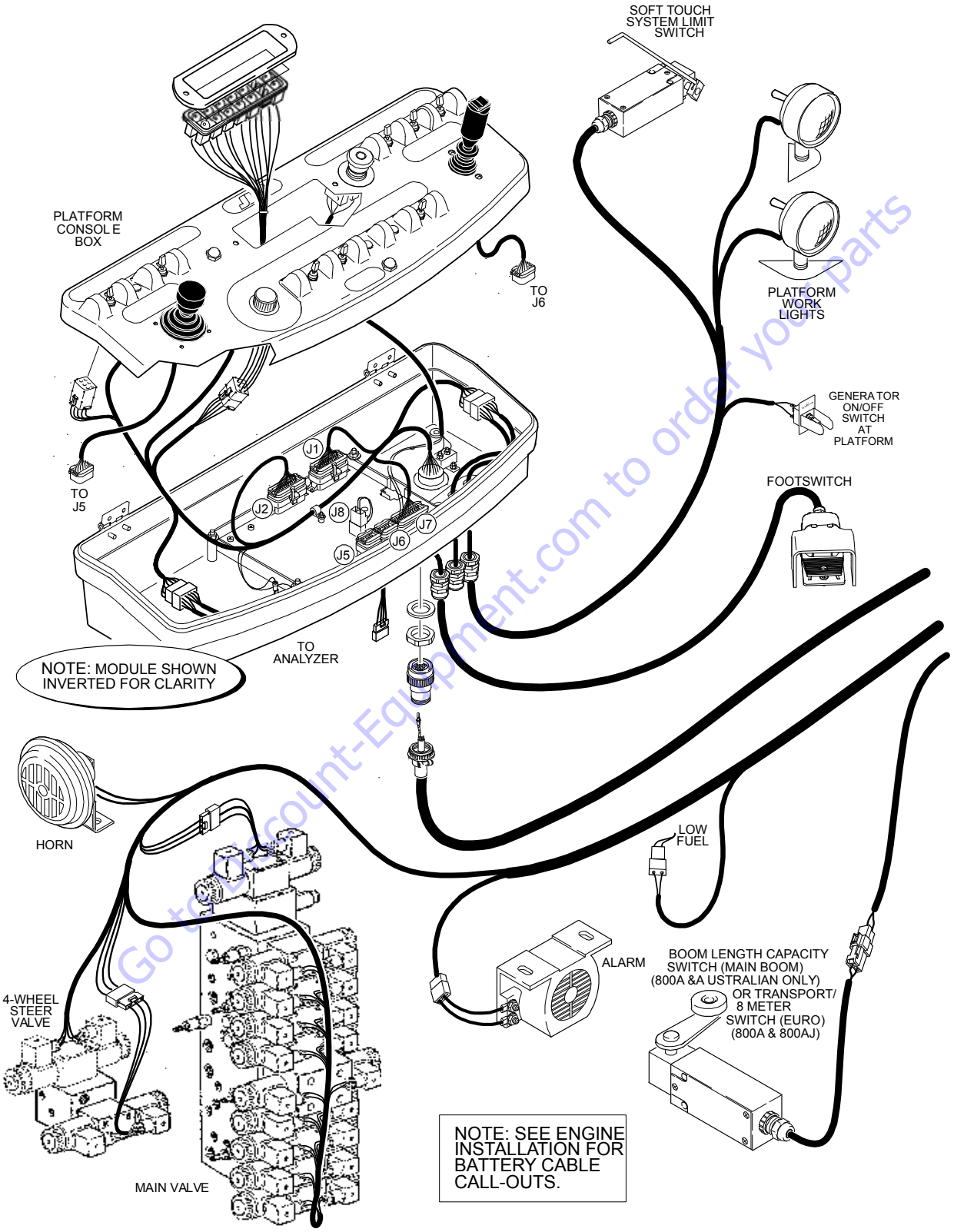


Figure 7-24. Electrical Components Installation w/ADE (S/N 0300064432 to S/N 0300069000) - Sheet 1 of 2

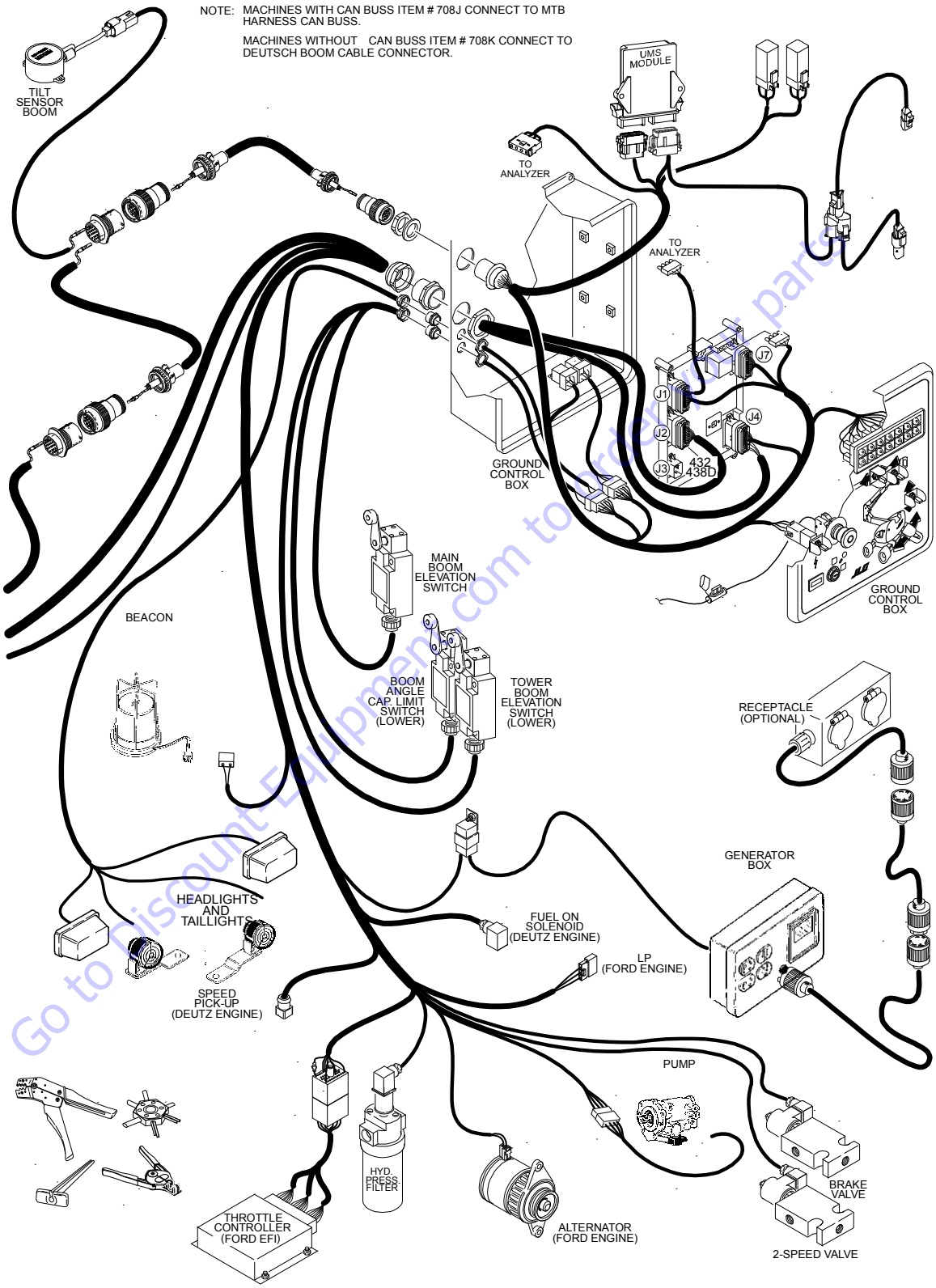


Figure 7-25. Electrical Components Installation w/ADE (S/N 0300064432 to S/N 0300069000) - Sheet 2 of 2

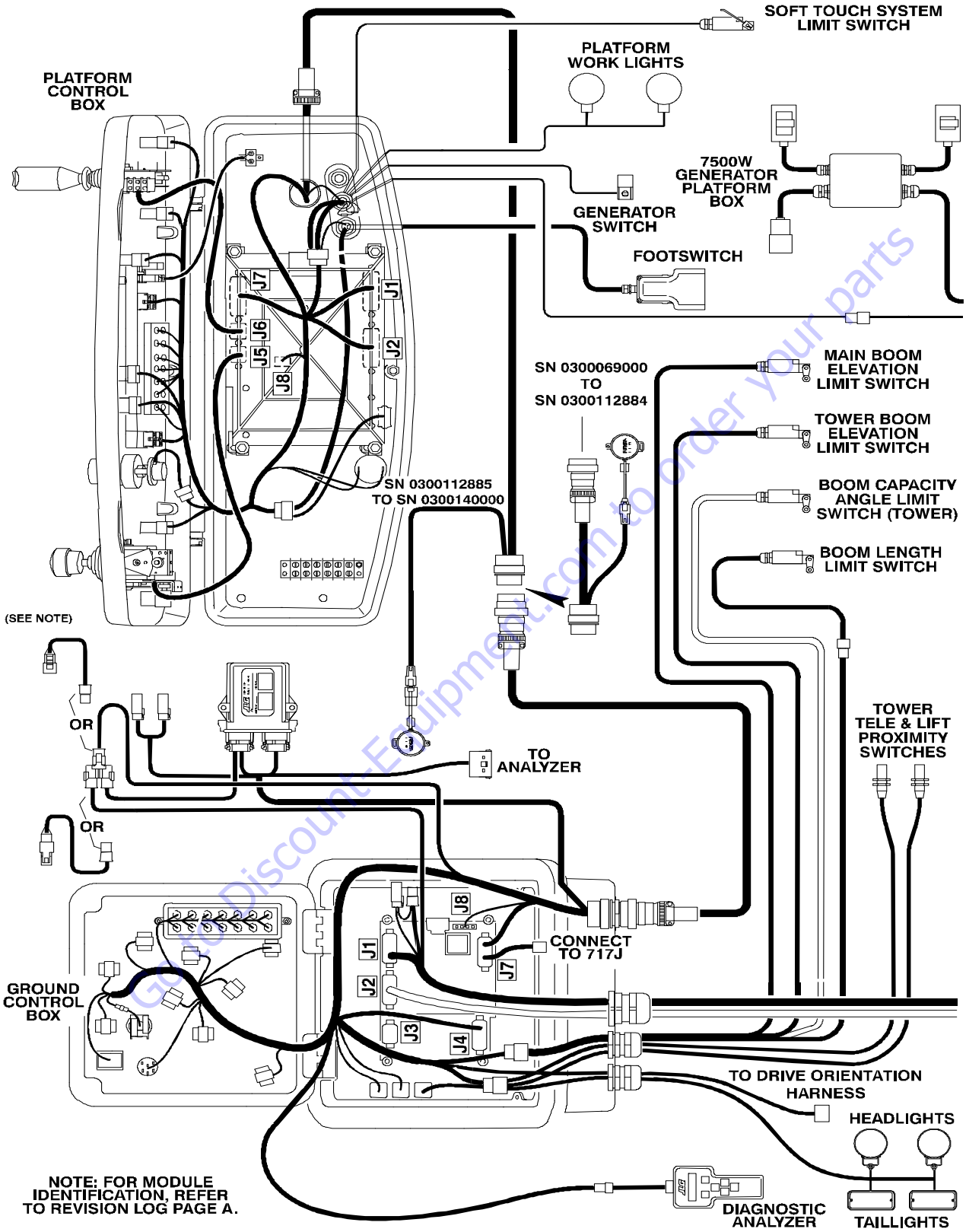


Figure 7-26. Electrical Components Installation w/ADE (S/N 0300069000 to S/N 0300140000) - Sheet 1 of 2

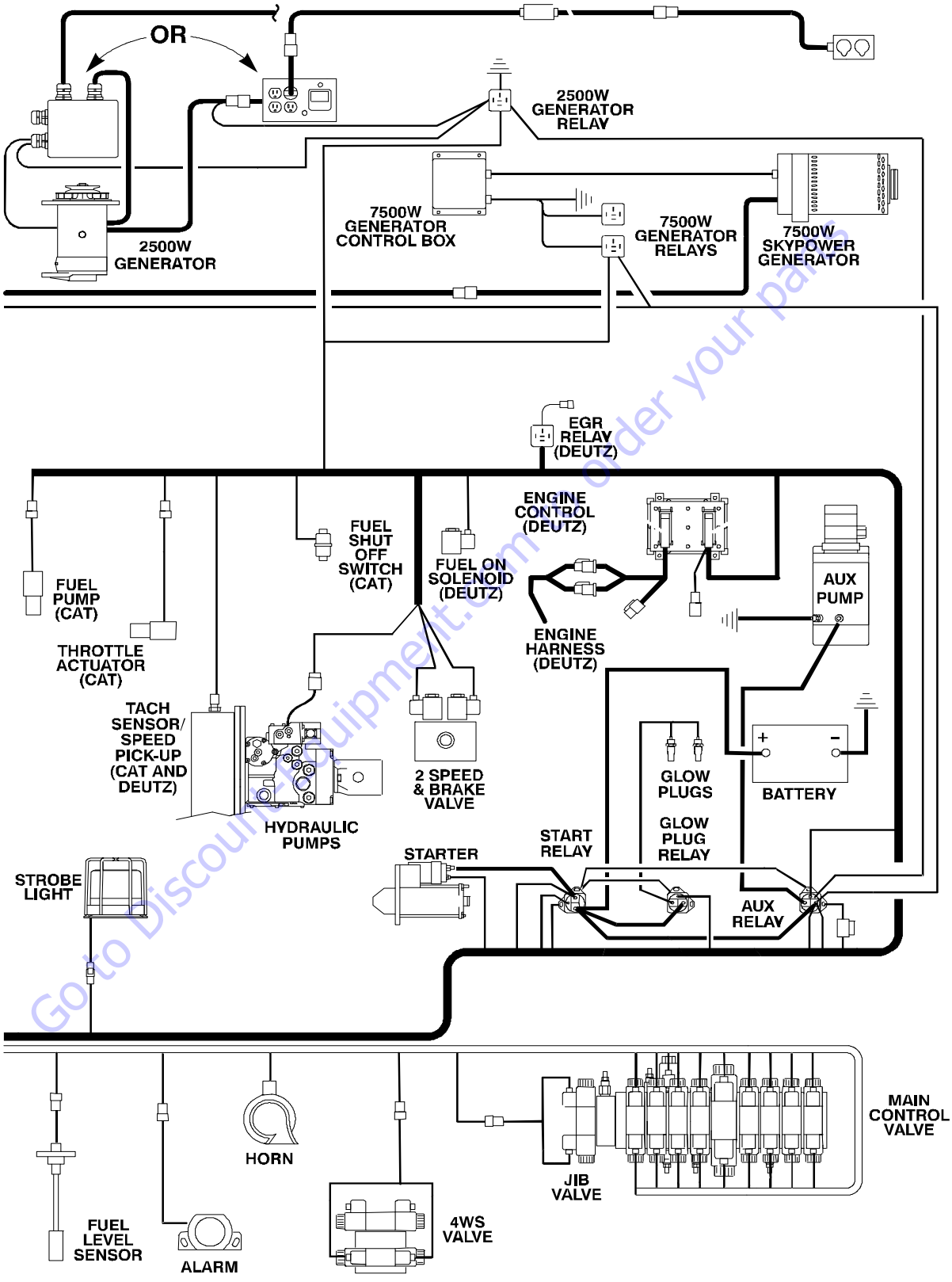


Figure 7-27. Electrical Components Installation w/ADE (S/N 0300069000 to S/N 0300140000) - Sheet 2 of 2

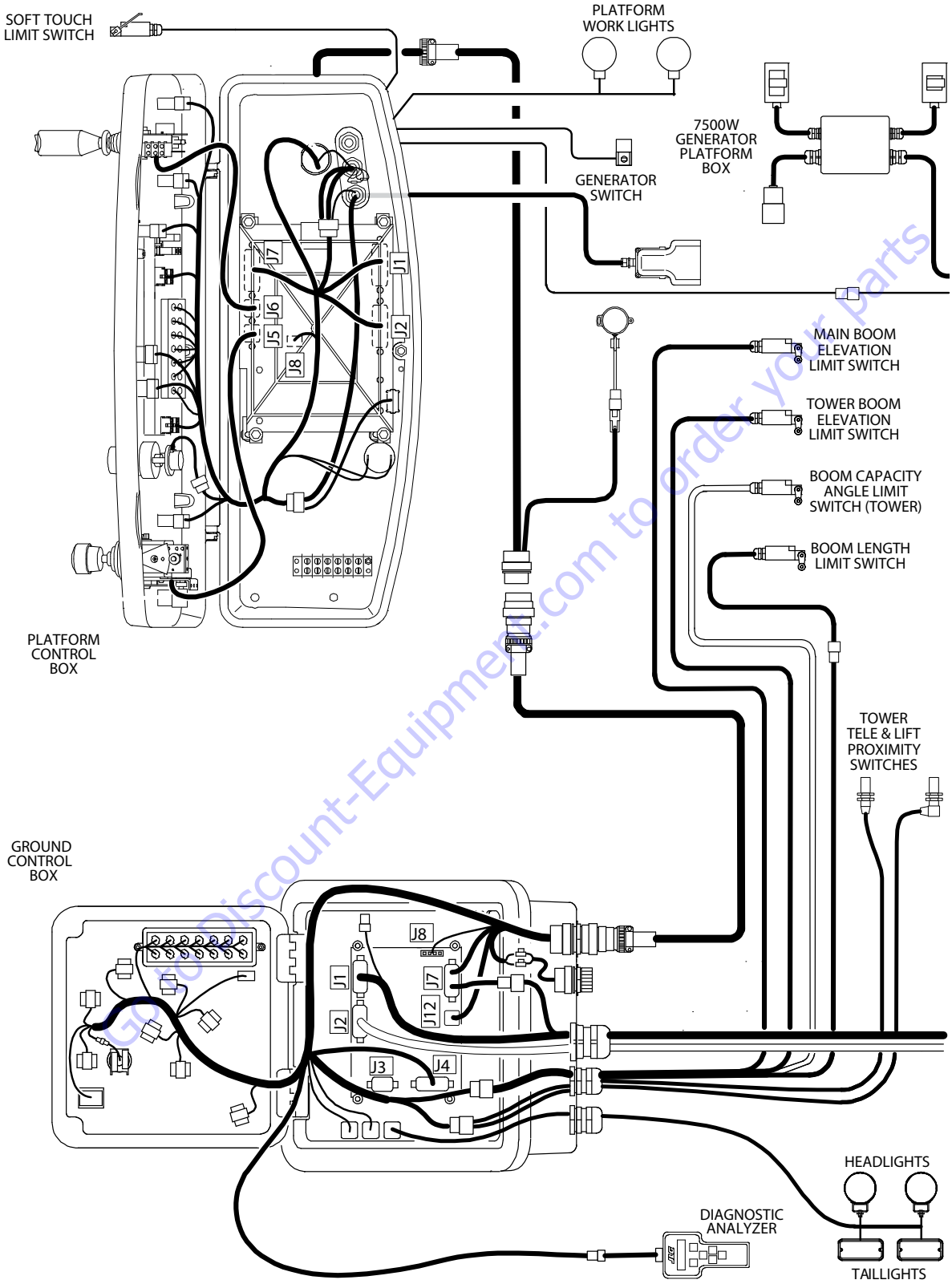


Figure 7-28. Electrical Components Installation w/ADE (S/N 0300140000 to S/N 0300183033) - Sheet 1 of 2

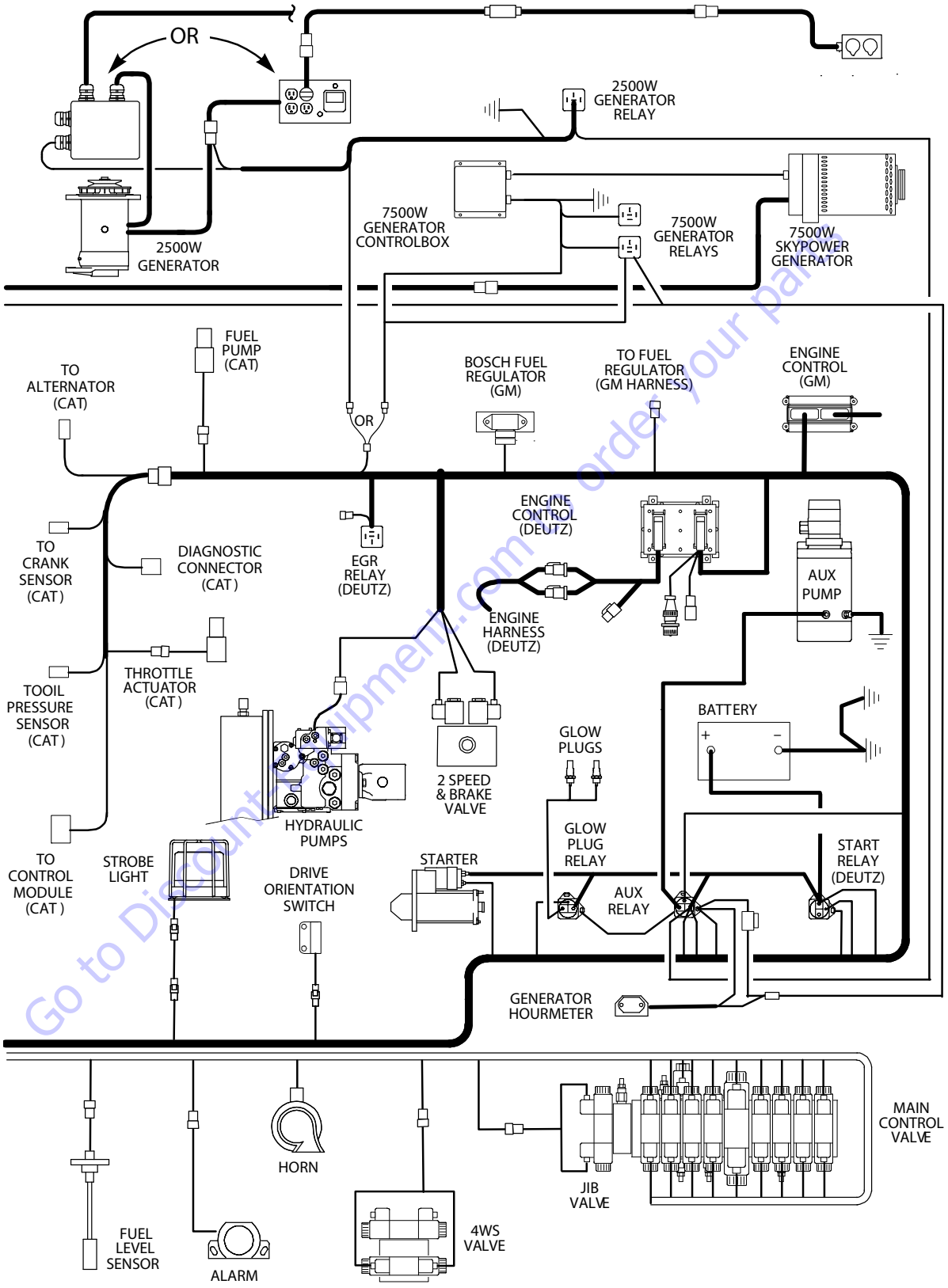


Figure 7-29. Electrical Components Installation w/ADE (S/N 0300140000 to S/N 0300183033) - Sheet 2 of 2

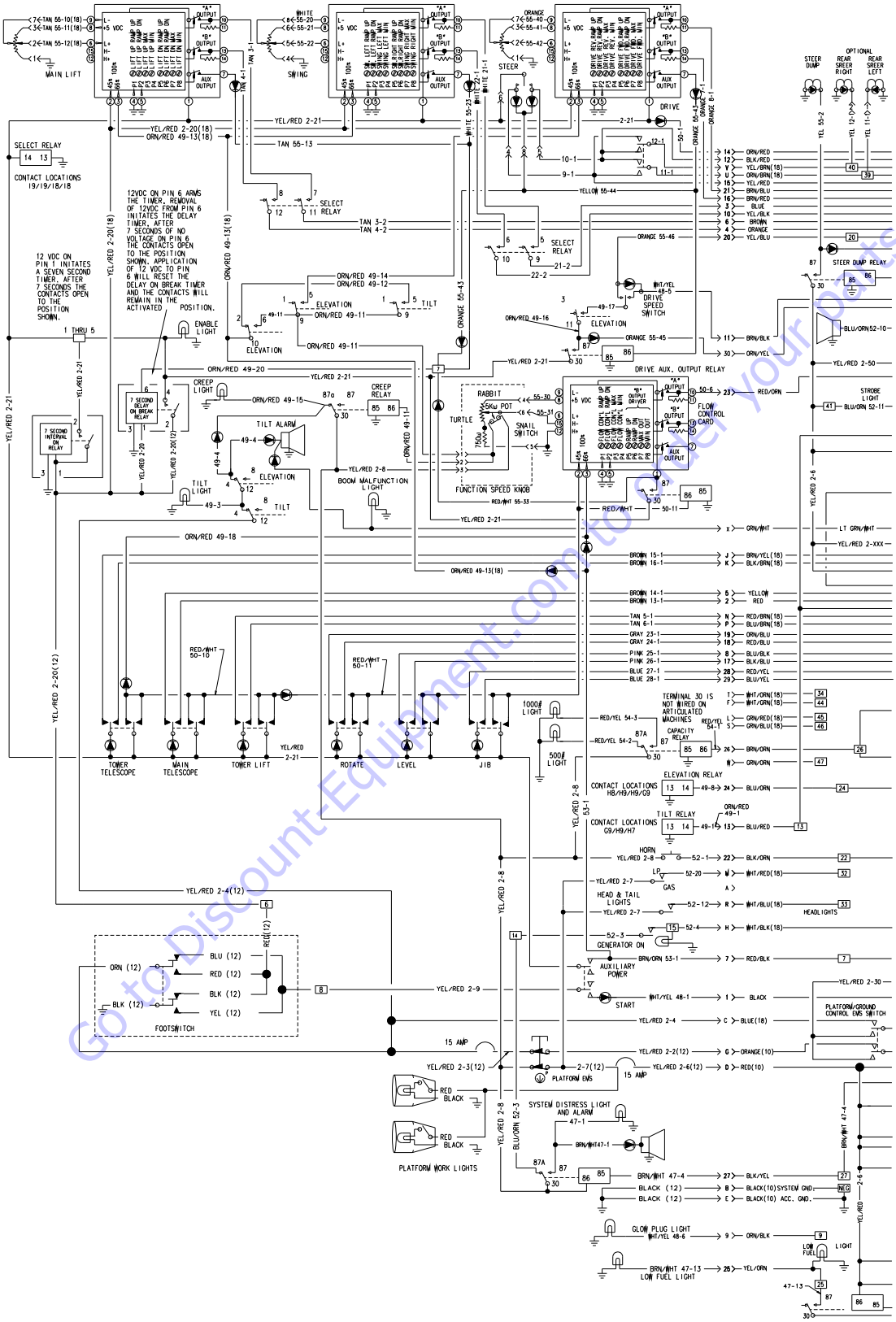


Figure 7-30. Electrical Schematic - Deutz Engine (Prior to S/N 0300065634) - Sheet 1 of 2

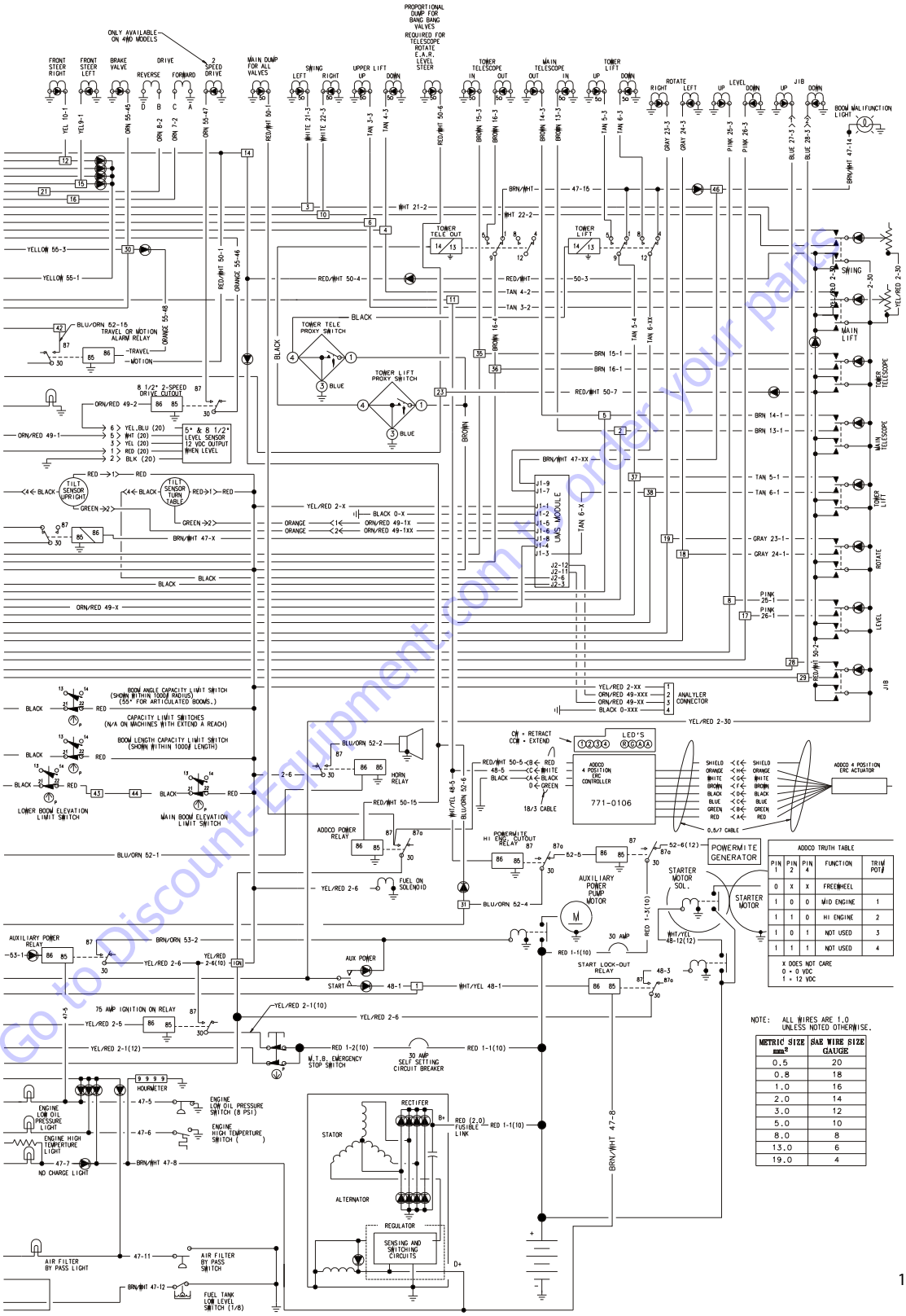


Figure 7-31. Electrical Schematic - Deutz Engine (Prior to S/N 0300065634) - Sheet 2 of 2

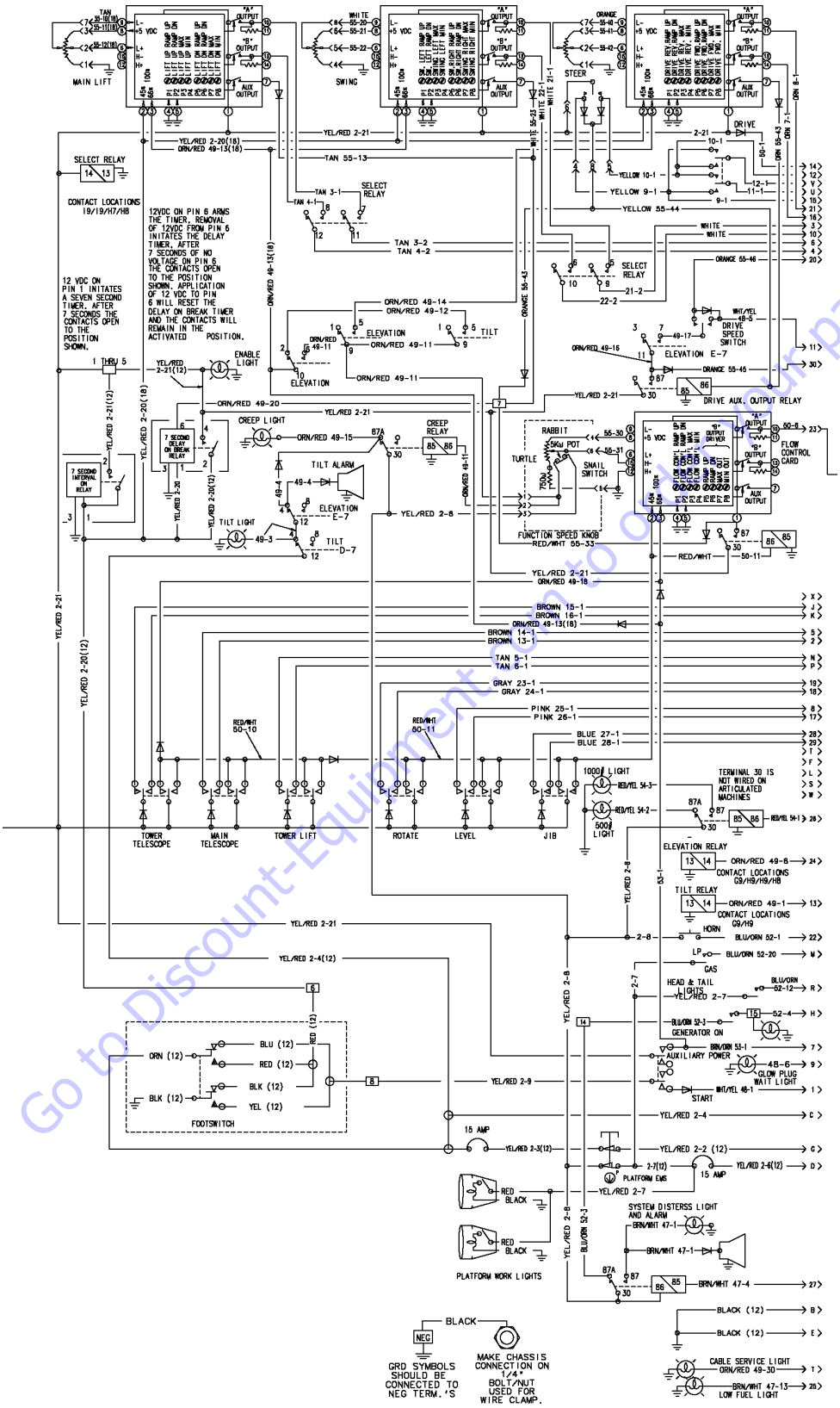


Figure 7-32. Electrical Schematic - Ford Engine (Prior to S/N 0300048538) - Sheet 1 of 2

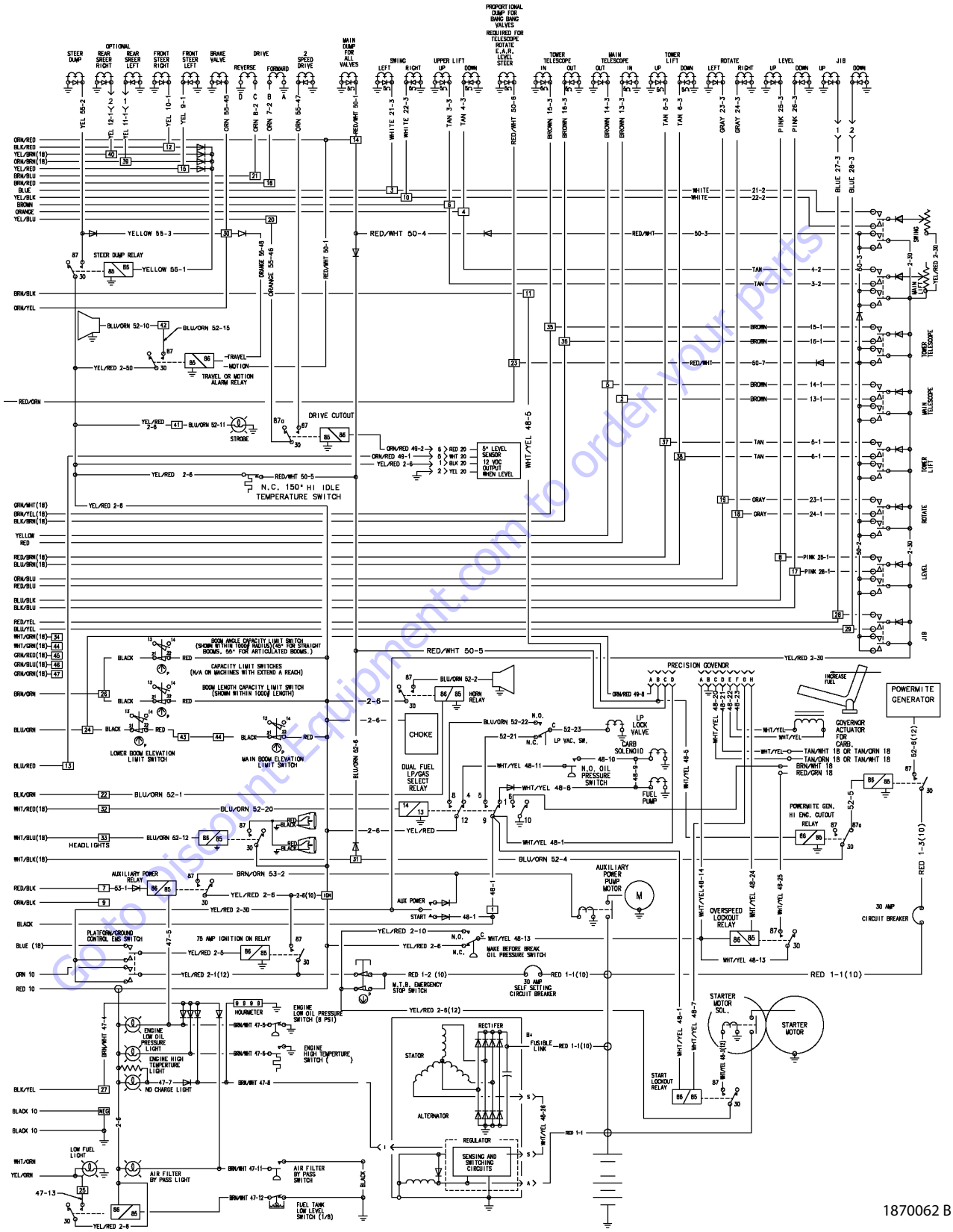


Figure 7-33. Electrical Schematic - Ford Engine (Prior to S/N 0300048538) - Sheet 2 of 2

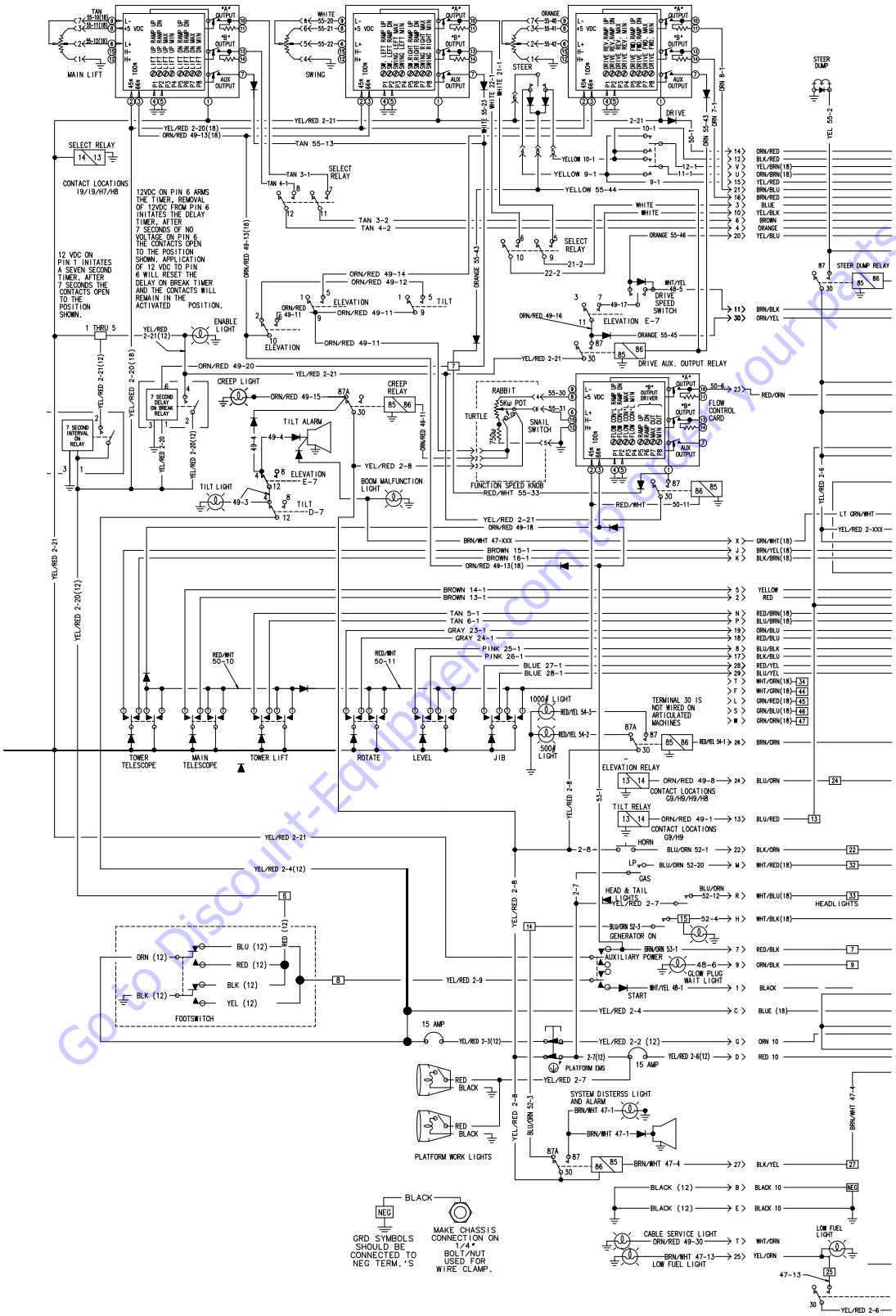


Figure 7-34. Electrical Schematic - Ford EFI Engine (S/N 0300048538 to S/N 0300065634) - Sheet 1 of 2

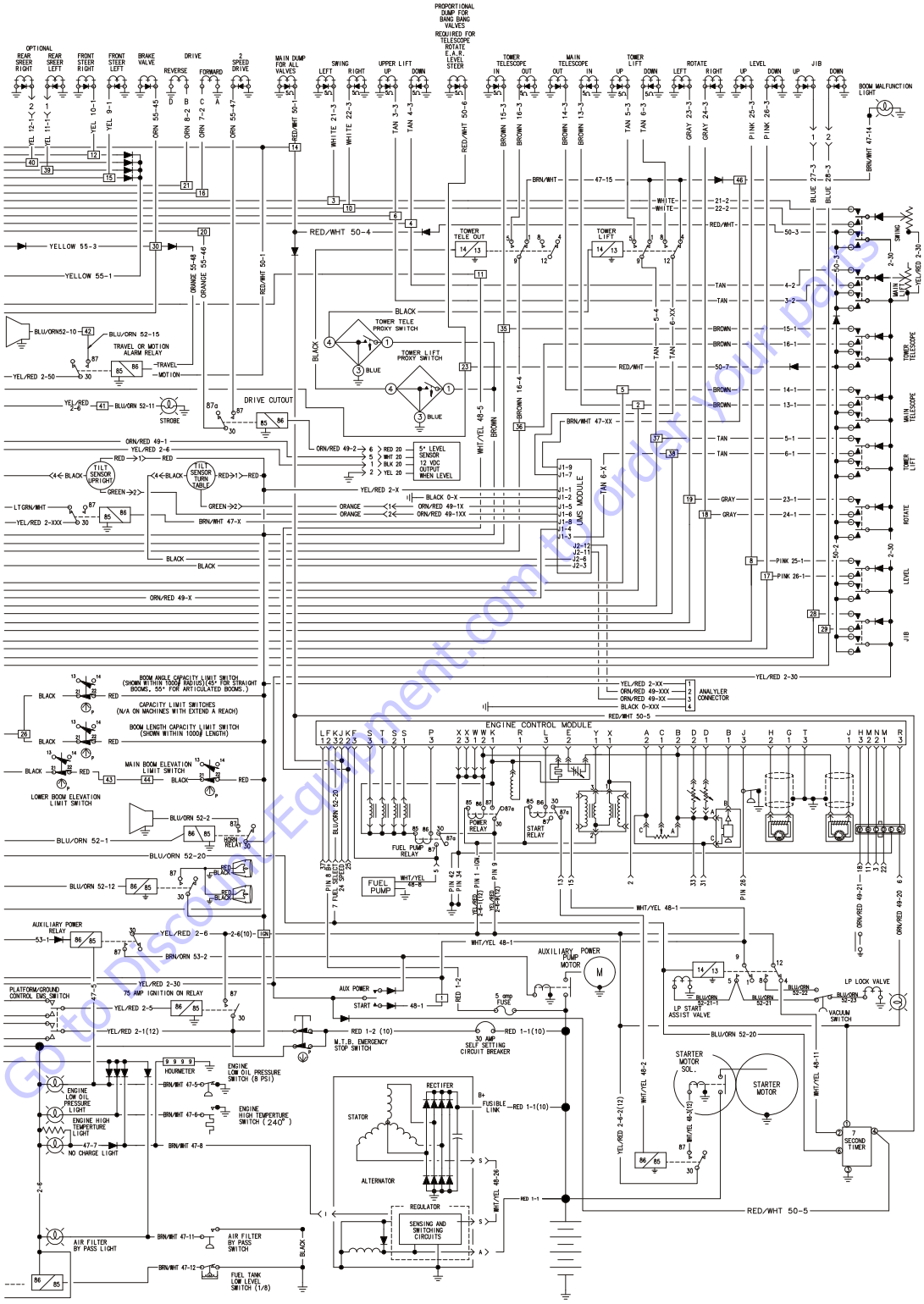


Figure 7-35. Electrical Schematic - Ford EFI Engine (S/N 0300048538 to S/N 0300065634) - Sheet 2 of 2

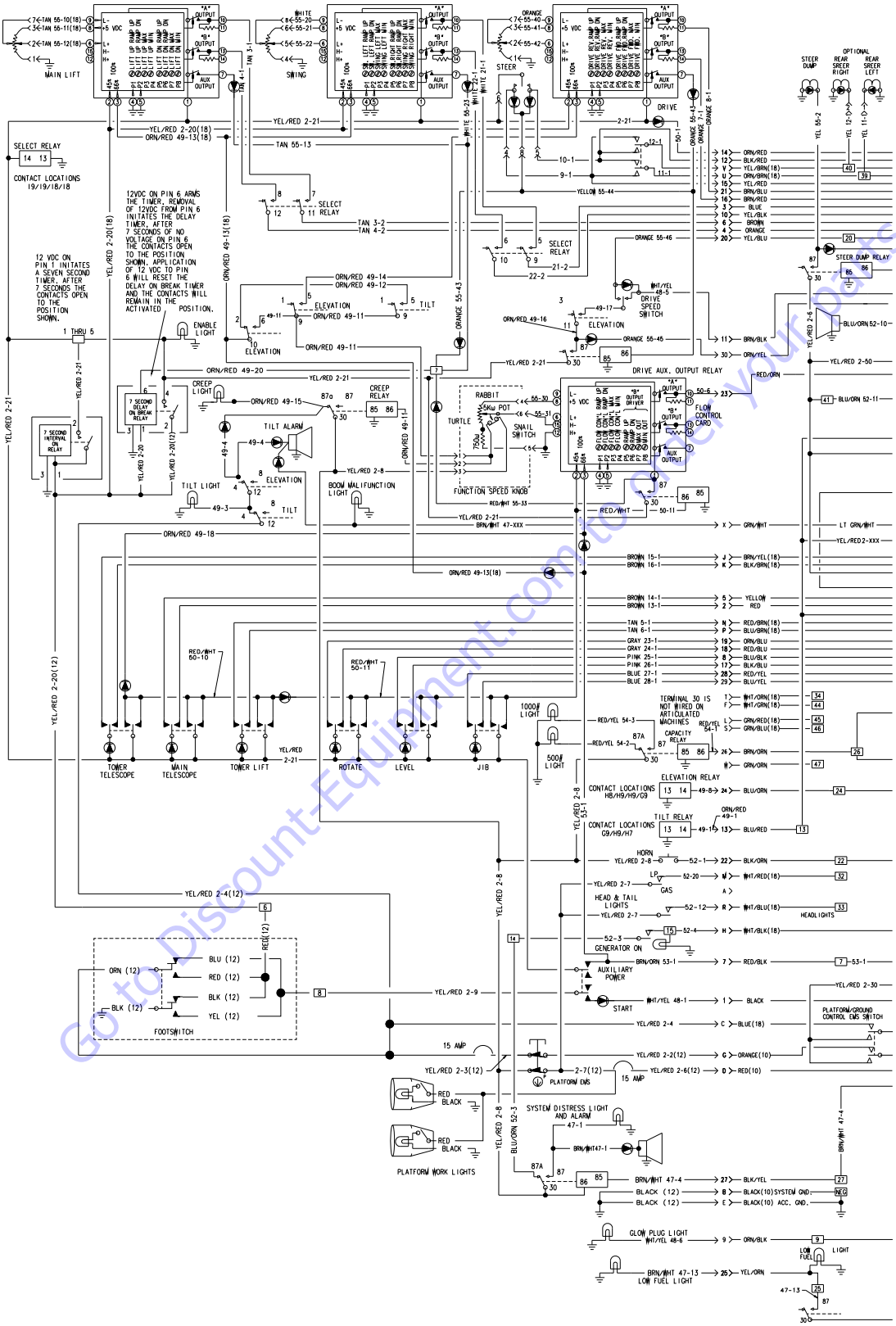


Figure 7-36. Electrical Schematic Isuzu Engine (Sheet 1 of 2)

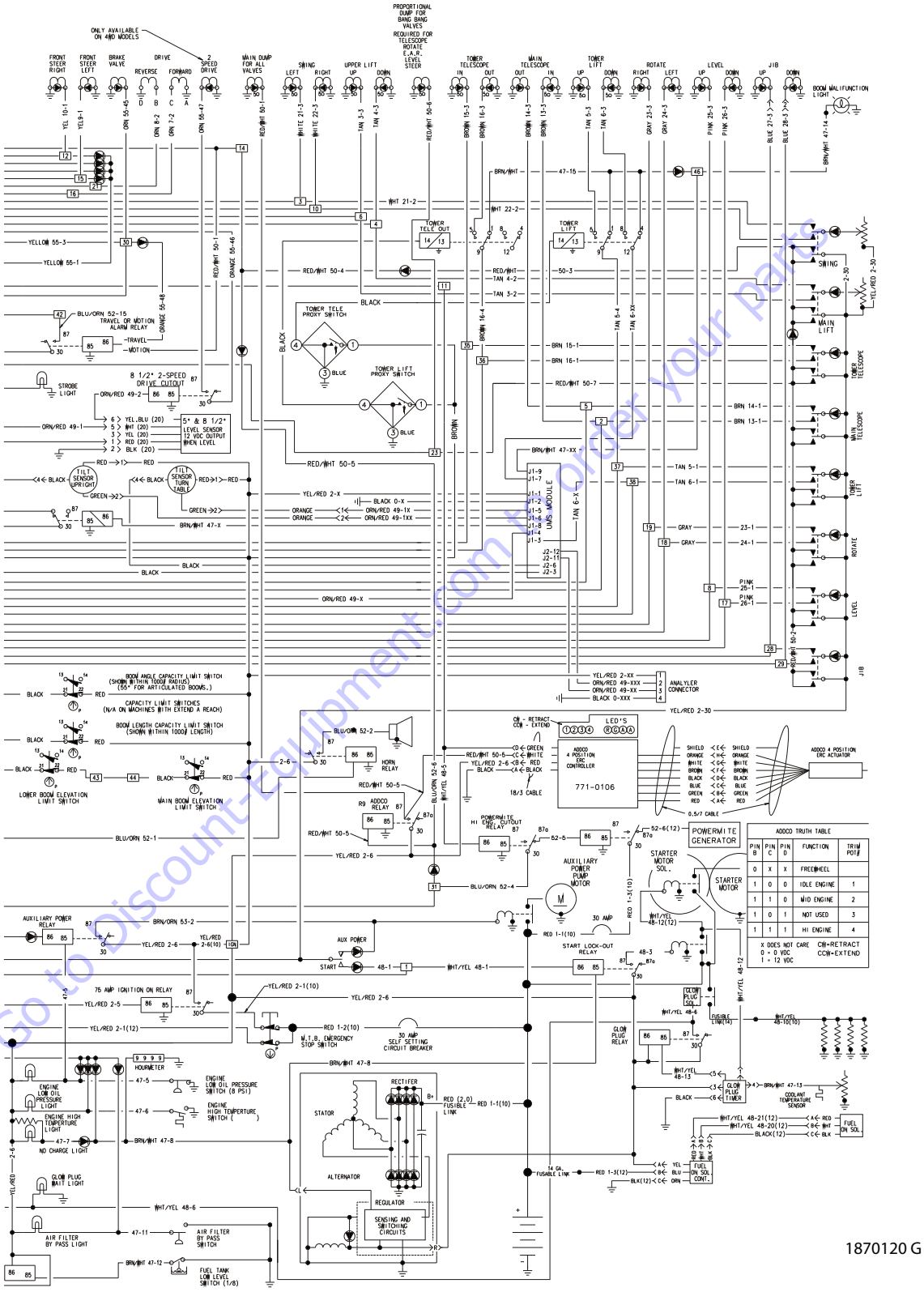


Figure 7-37. Electrical Schematic Isuzu Engine (Sheet 2 of 2)

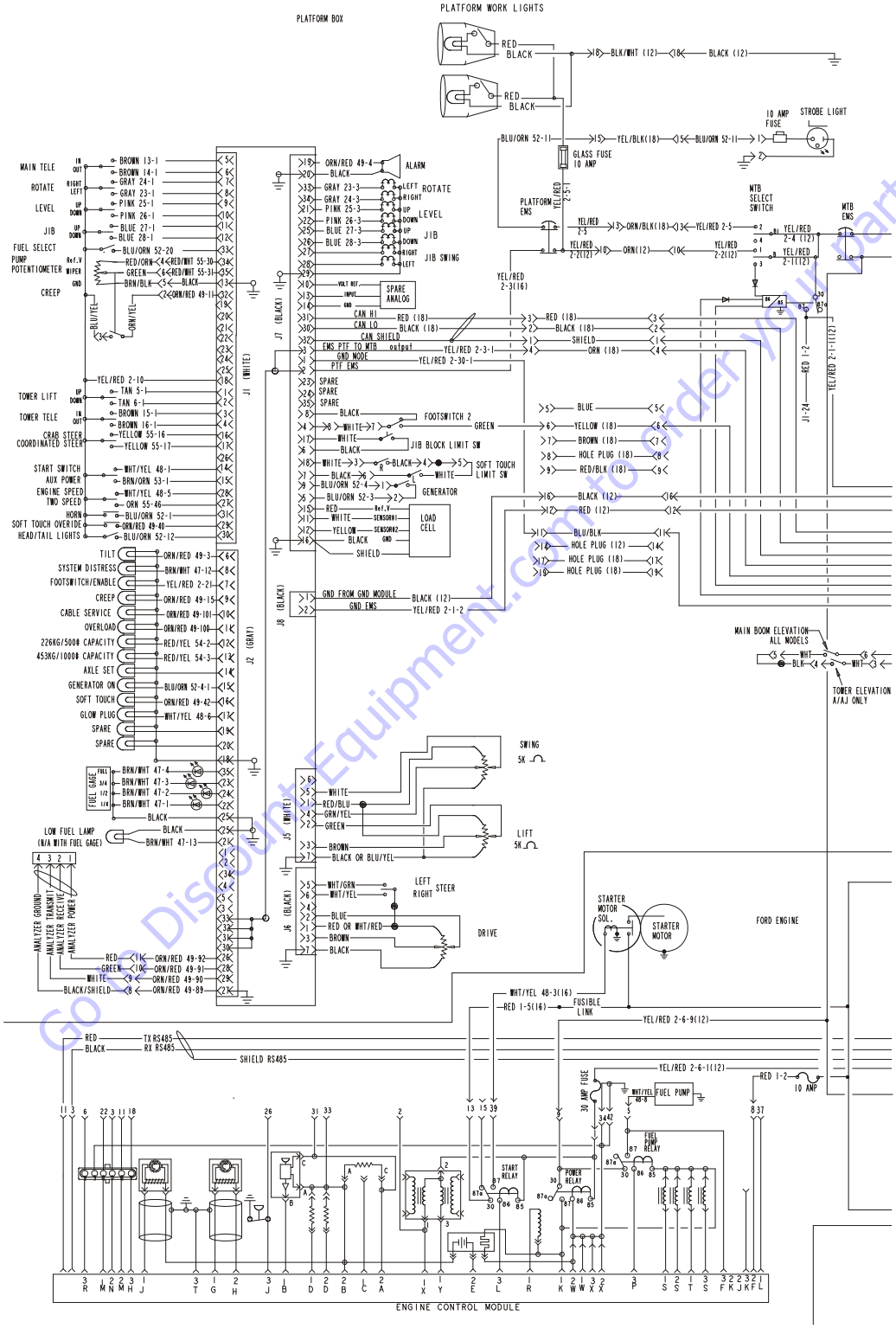
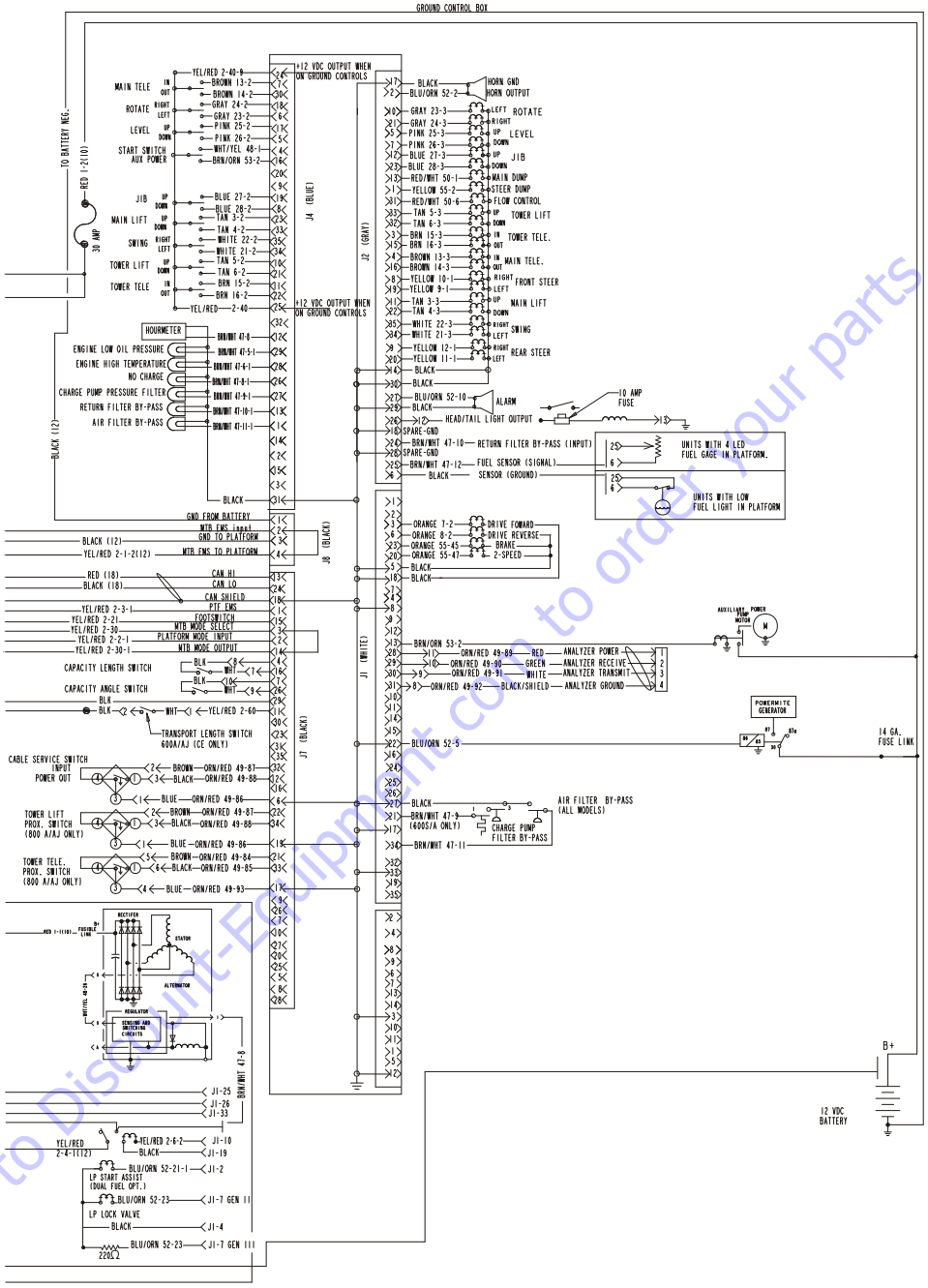


Figure 7-38. Electrical Schematic - UL - Sheet 1 of 2



NOTE: SEE SCHEMATIC 1001110310 FOR PLATFORM AND MAIN TERMINAL BOX WIRING. THIS SCHEMATIC CAN BE USED FOR ENGINE WIRING.

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Figure 7-39. Electrical Schematic - UL - Sheet 2 of 2

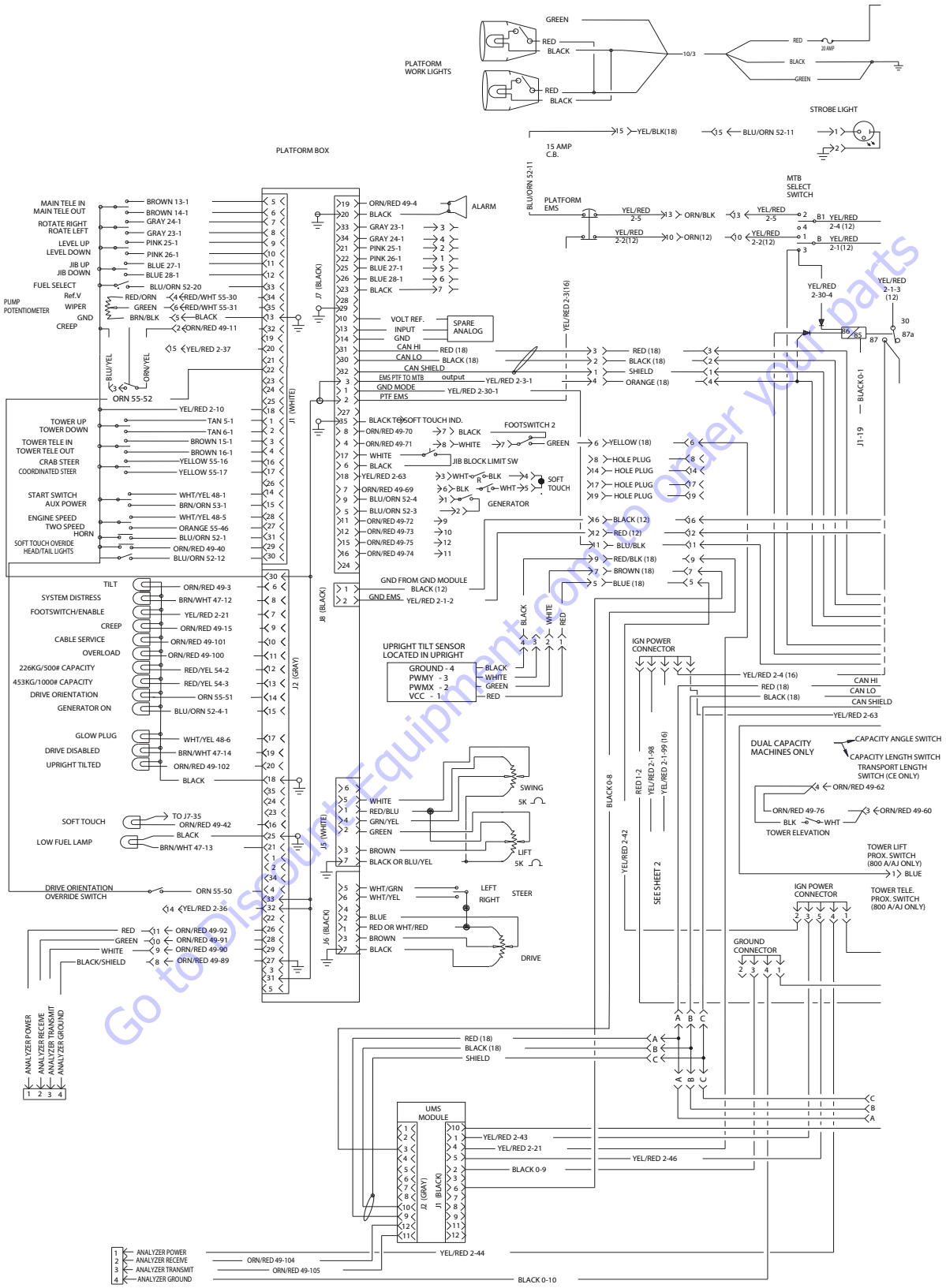

Figure 7-40. Electrical Schematic - Caterpillar, Deutz, & GM - with UGM - Sheet 1 of 6

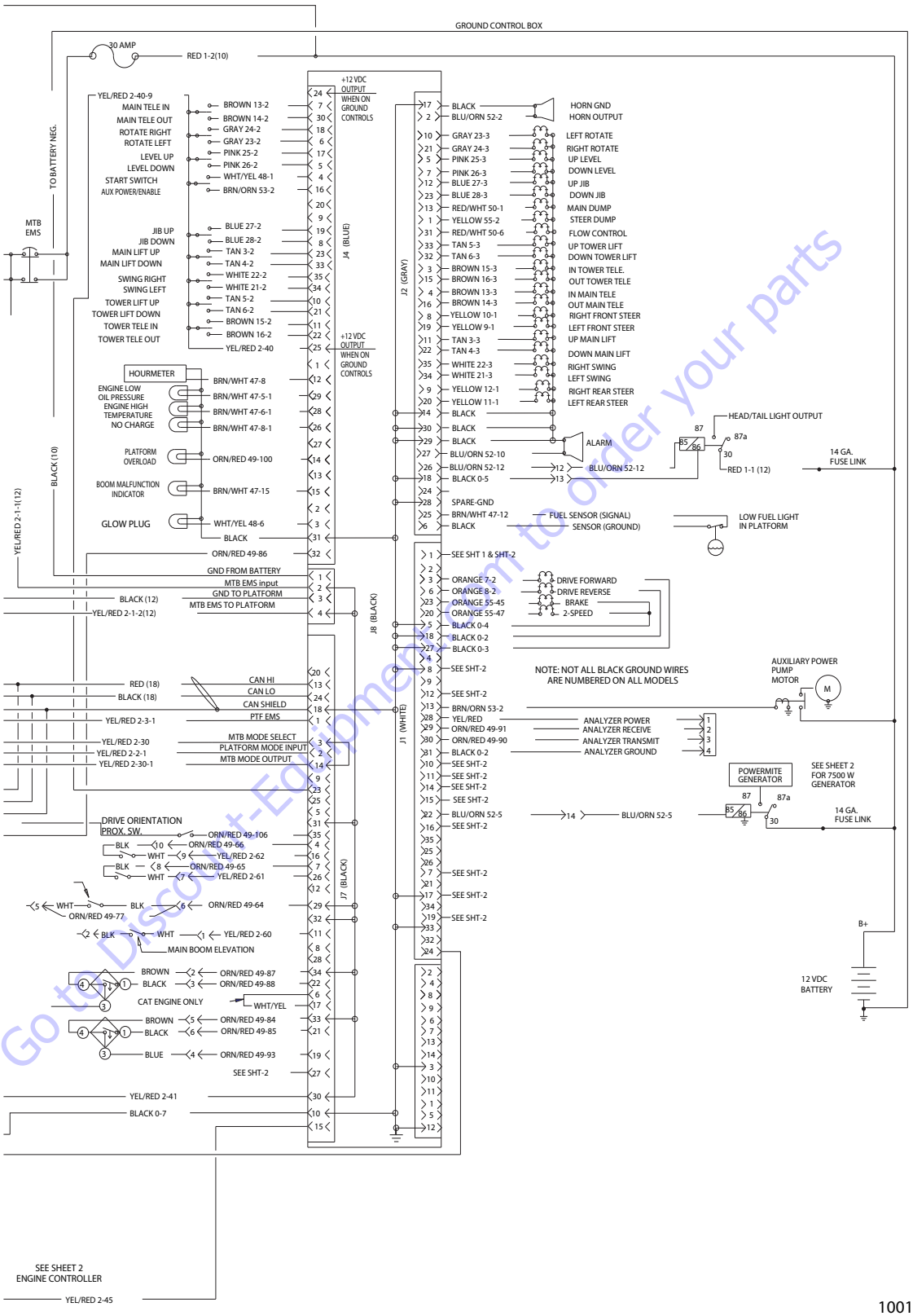

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Figure 7-41. Electrical Schematic - Caterpillar, Deutz, & GM - with UGM - Sheet 2 of 6

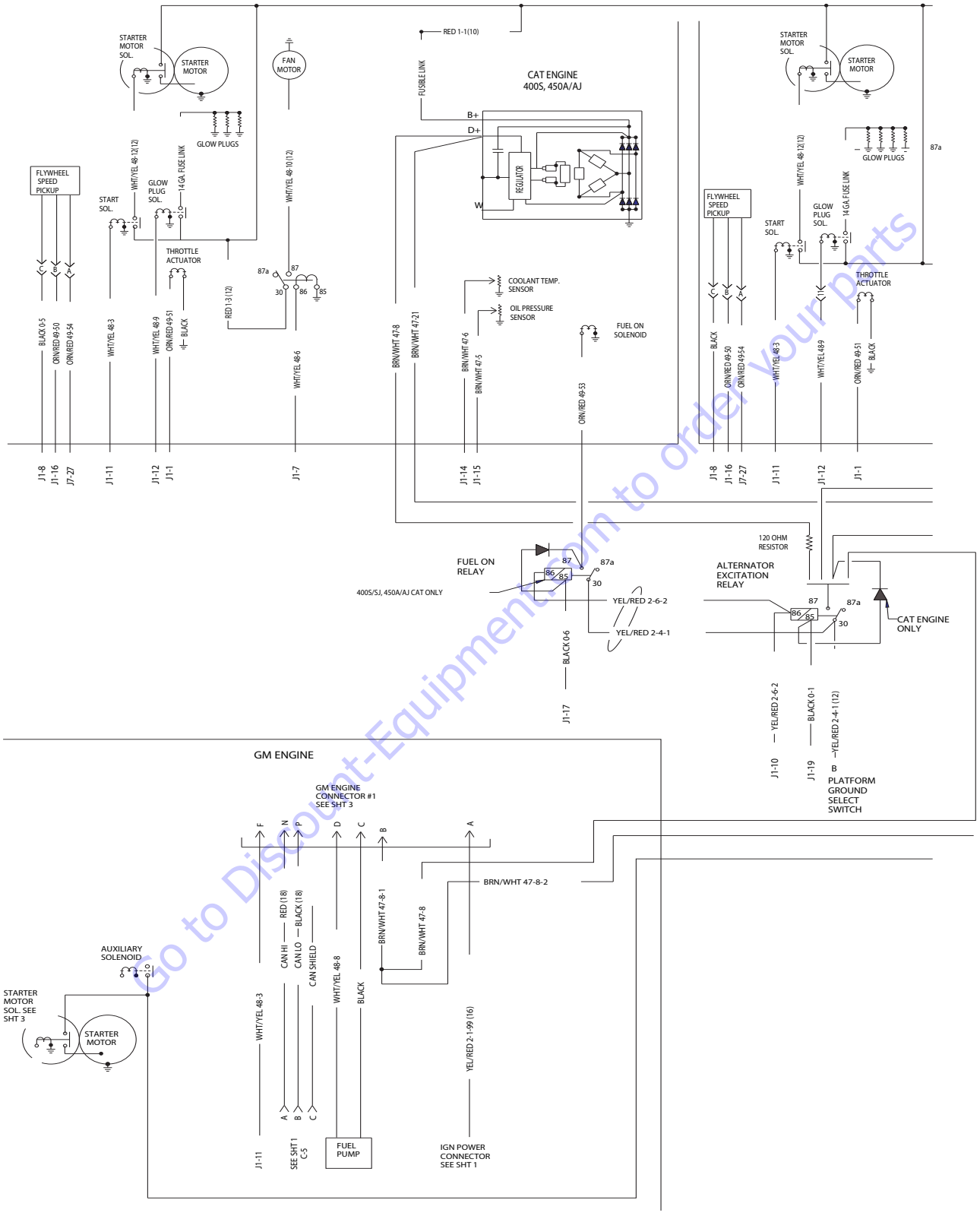

Figure 7-42. Electrical Schematic - Caterpillar, Deutz, & GM - with UGM - Sheet 3 of 6

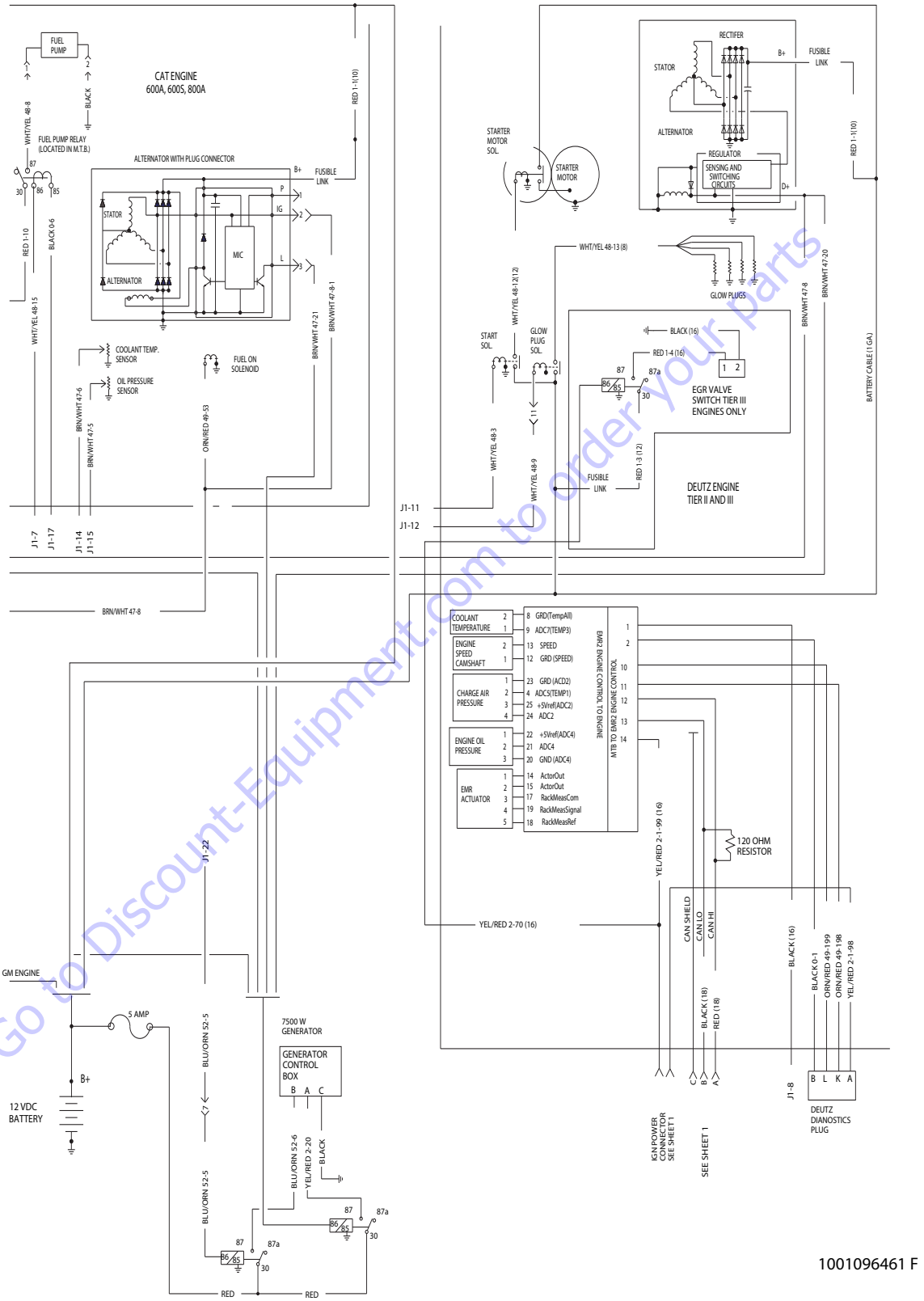

Figure 7-43. Electrical Schematic - Caterpillar, Deutz, & GM - with UGM - Sheet 4 of 6

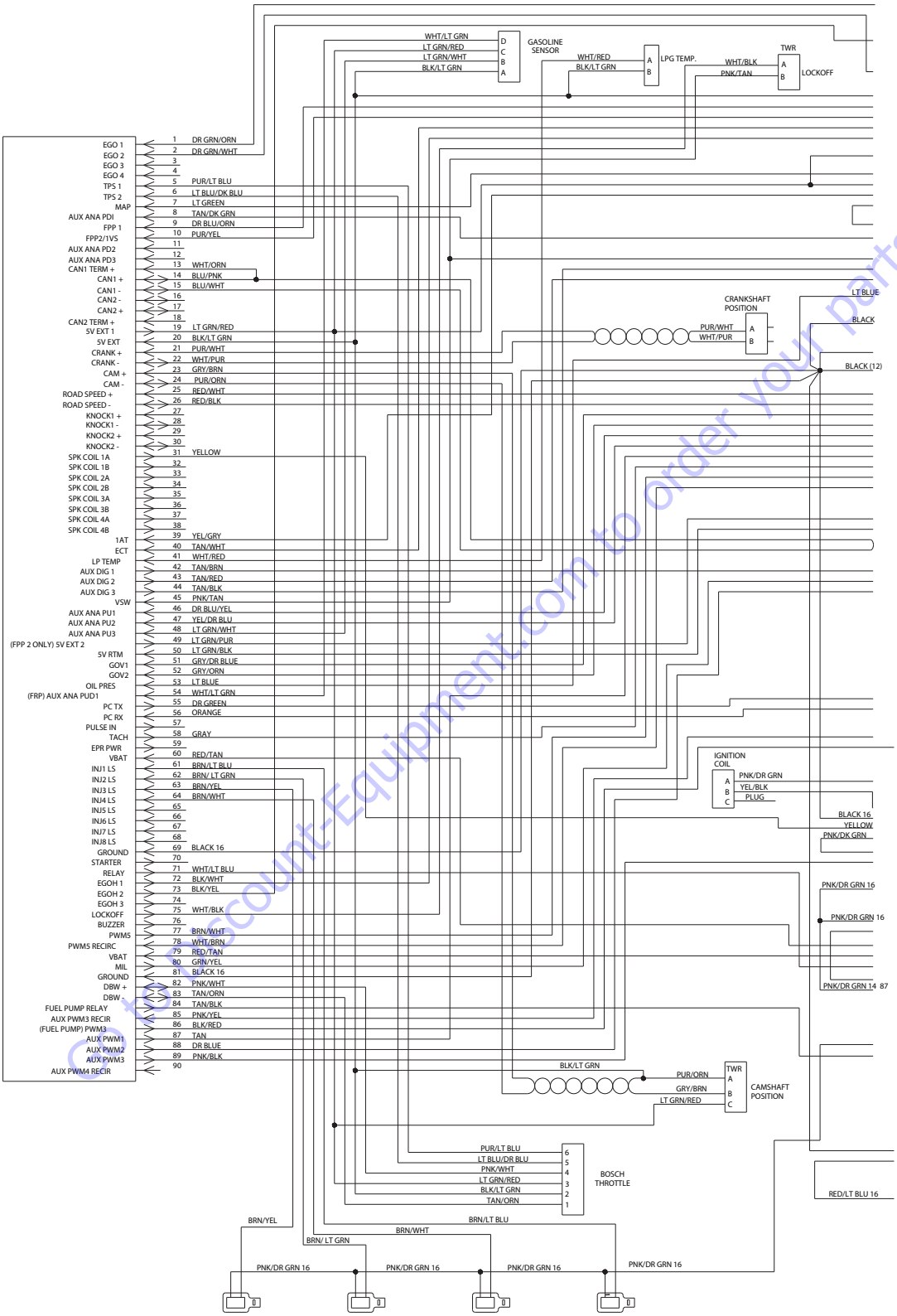

Figure 7-44. Electrical Schematic - Caterpillar, Deutz, & GM - with UGM - Sheet 5 of 6