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

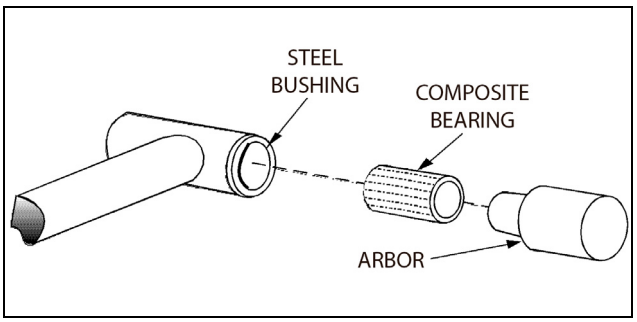


Figure 5-48. Composite Bearing Installation

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

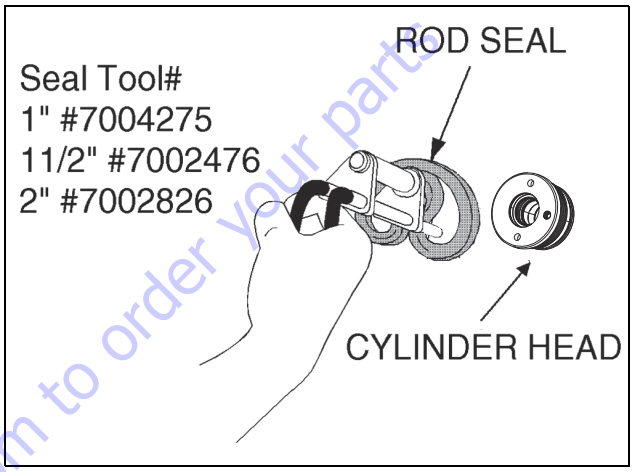


Figure 5-49. Rod Seal Installation

NOTICE

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

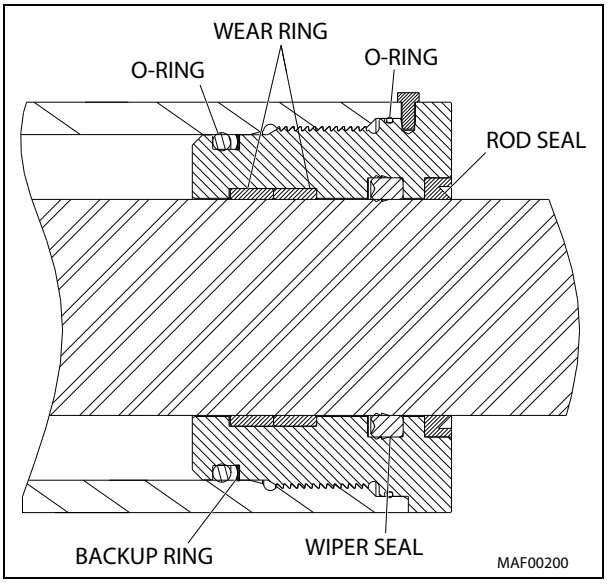


Figure 5-50. Cylinder Head Seal Installation

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

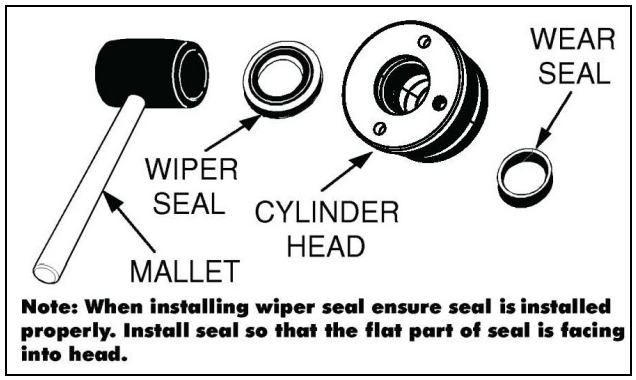


Figure 5-51. Wiper Seal Installation

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

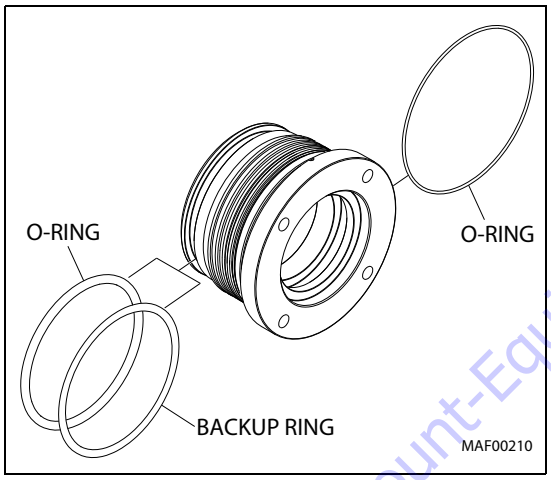


Figure 5-52. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the backup rings, wear rings, rod seals and wiper seals are not damaged or dislodged. Push the head along the rod to the rod end.

5. Place a new o-ring in the inside diameter groove of spacer.

6. Install the spacer tube onto the cylinder rod.

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

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

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

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

10. Insert the tapered bushing into piston.

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

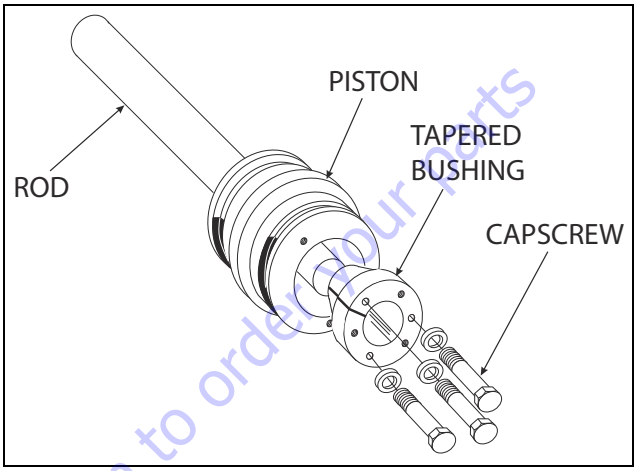


Figure 5-53. Tapered Bushing Installation

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

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

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

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

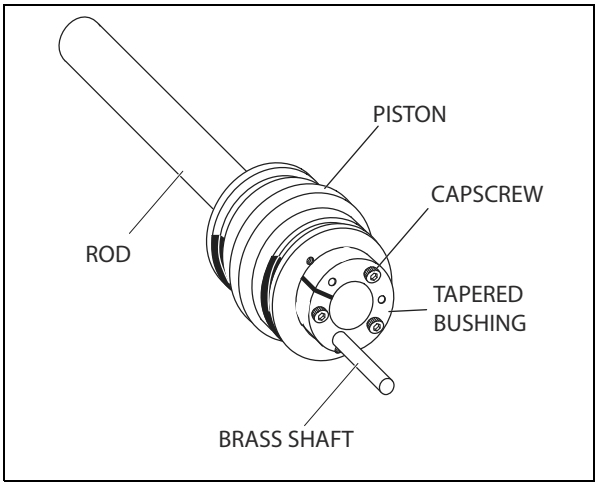


Figure 5-54. Seating the Tapered Bearing

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

15. 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.

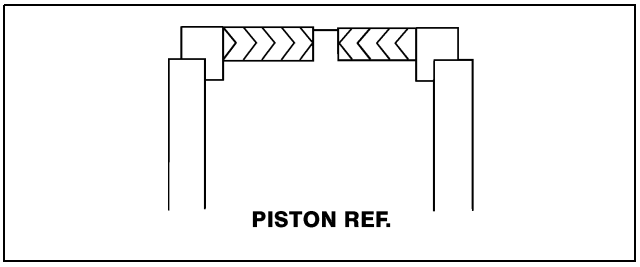


Figure 5-55. Hydrolock Piston Seal Installation

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).

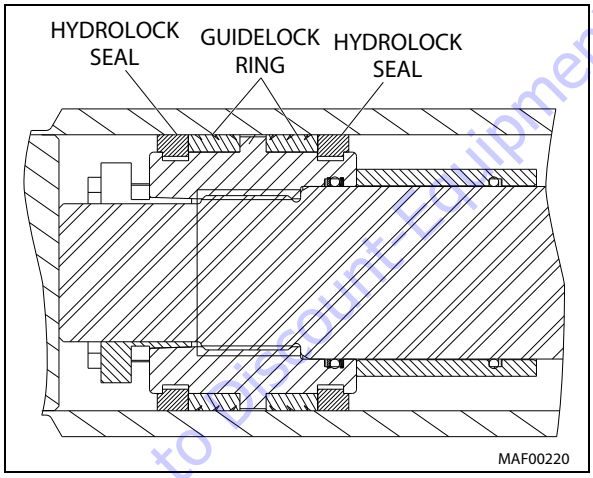


Figure 5-56. Piston Seal Kit Installation

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 hydrolock seals and guidelock rings are not damaged or dislodged.

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

20. Apply anti-seize to the threads of the cylinder head.

21. Screw the cylinder head into the barrel using a pin-face spanner wrench. Torque as shown in Figure 5-44., Figure 5-45. and Figure 5-46. as per respective cylinder.

22. Align the cylinder head with the barrel and install the setscrew in the hole.

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

24. Apply Loctite #222 to the orifice plug.

25. Install the orifice plug, plug, check valve and pressure compensator valve in the rod port block. Torque as shown in Figure 5-44., Figure 5-45. and Figure 5-46. as per respective cylinder.

26. Install the new o-rings and plugs into the cylinder port block. Torque as shown in Figure 5-44., Figure 5-45. and Figure 5-46. as per respective cylinder.

Main Lift Cylinder (SN 0300243704 to Present, SN E300005608 to Present)

DISASSEMBLY

NOTICE

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

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

⚠ WARNING

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

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

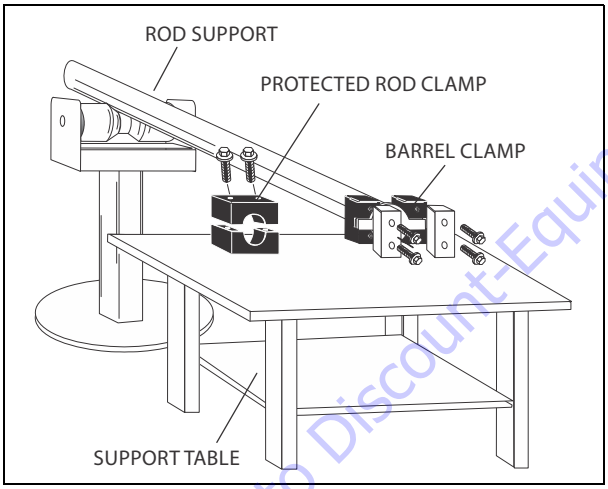


Figure 5-57. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a hook wrench, unscrew the cylinder head from the barrel.

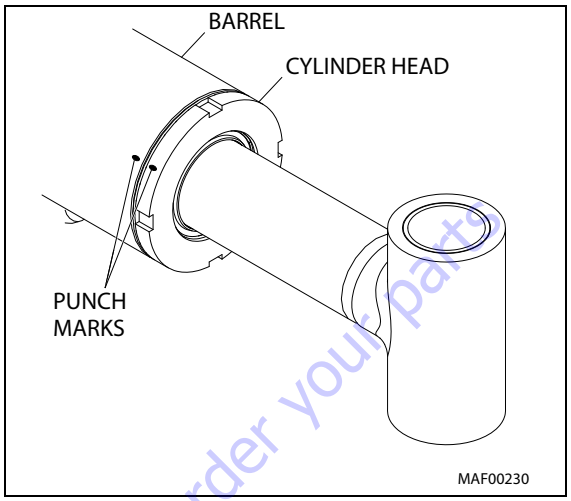


Figure 5-58. Cylinder Head Removal

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

NOTICE

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

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

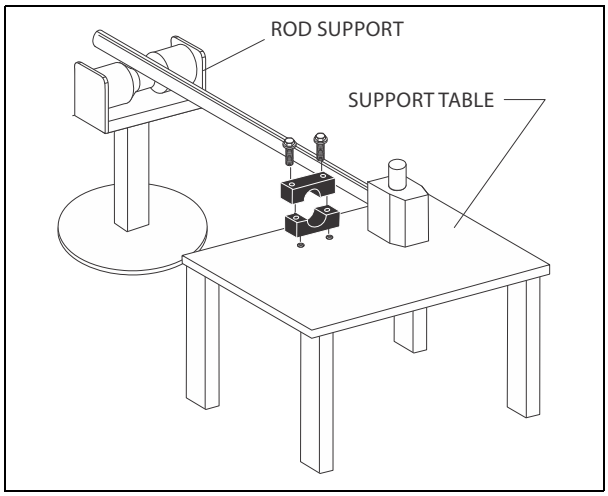
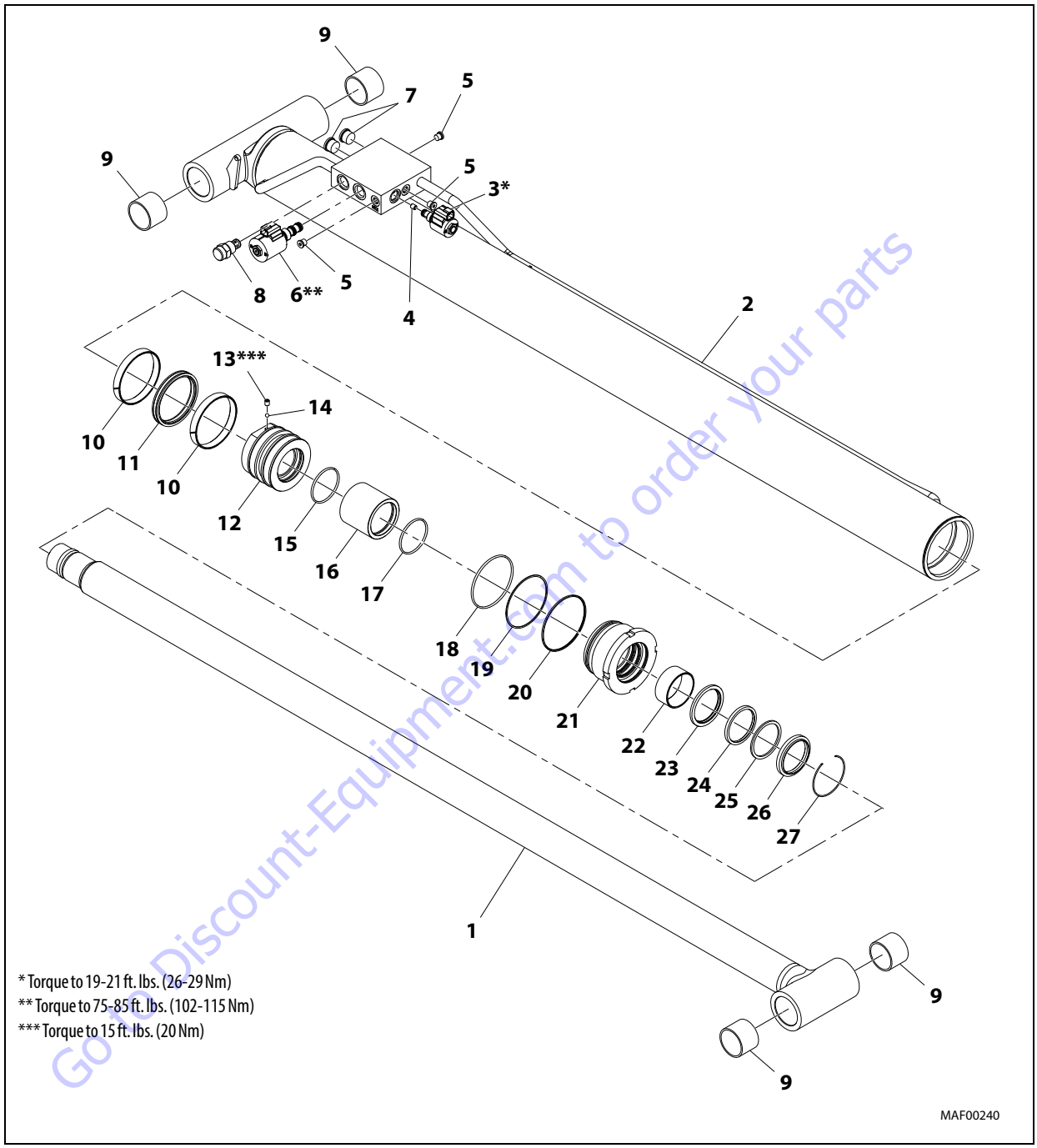


Figure 5-59. Cylinder Rod Support



1. Rod
2. Barrel
3. Cartridge Valve
4. Orifice Plug
5. Plug
6. Cartridge Valve
7. Plug
8. Check Valve
9. Bushing
10. Wear Ring
11. Piston Seal
12. Piston
13. Setscrew
14. Ball
15. O-ring
16. Spacer
17. O-ring
18. O-ring
19. Backup Ring
20. O-ring
21. Cylinder Head
22. Bearing
23. Buffer Ring
24. Rod Seal
25. Backup Ring
26. Wiper Seal
27. Retaining Ring

Figure 5-60. Main Lift Cylinder (SN 0300243704 to Present, SN E300005608 to Present)

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 the setscrew which attaches the piston to the rod.
10. Screw the piston counterclockwise by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston o-ring, wear rings, and piston seal.
12. Remove piston spacer from the rod. Remove and discard the o-ring from the spacer.
13. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, bearing, buffer seal and wiper seal.

CLEANING AND INSPECTION

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

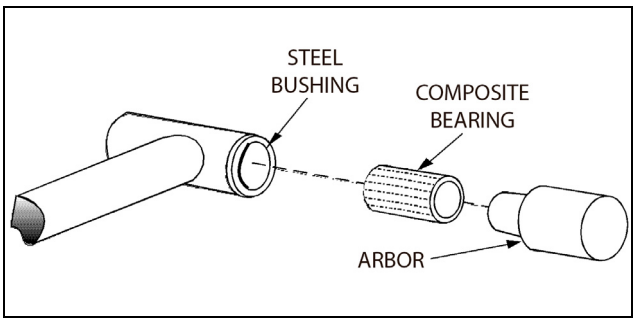


Figure 5-61. Composite Bearing Installation

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

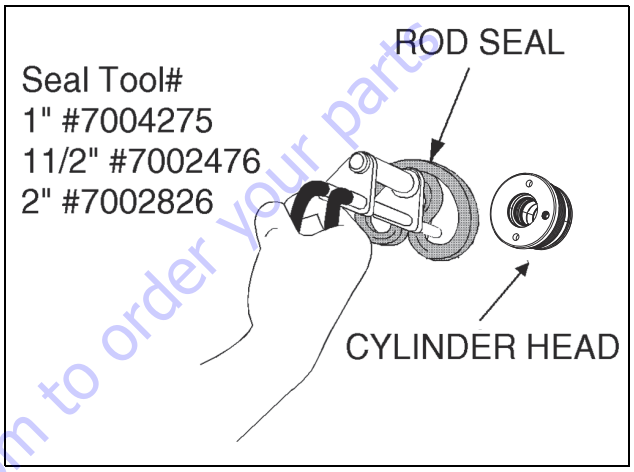


Figure 5-62. Rod Seal Installation

NOTICE

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

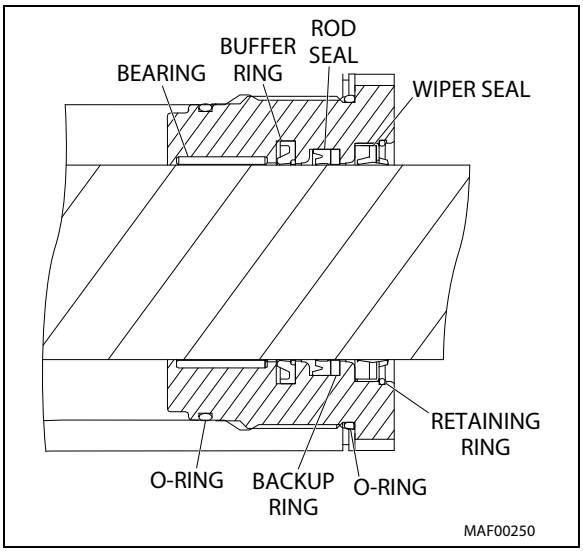


Figure 5-63. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install new bearing, buffer ring, backup ring and retaining ring into the applicable inside diameter of the cylinder head groove.

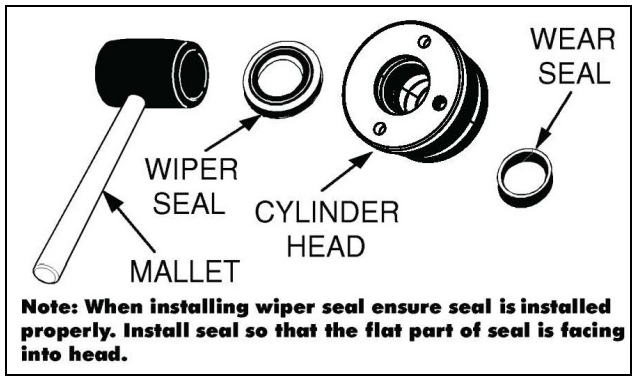


Figure 5-64. Wiper Seal Installation

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

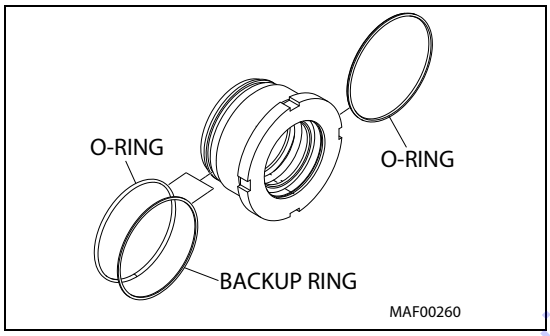


Figure 5-65. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper seal, backup ring, retaining ring and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Place a new o-ring in the inside diameter groove of spacer. Install the spacer tube onto the cylinder rod.

7. Carefully thread the piston on the cylinder rod, hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged. Secure using setscrew and ball. Torque setscrew to 15 ft. lbs. (20 Nm).

8. Remove the cylinder rod from the holding fixture.

9. Place new wear rings and piston seal 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).

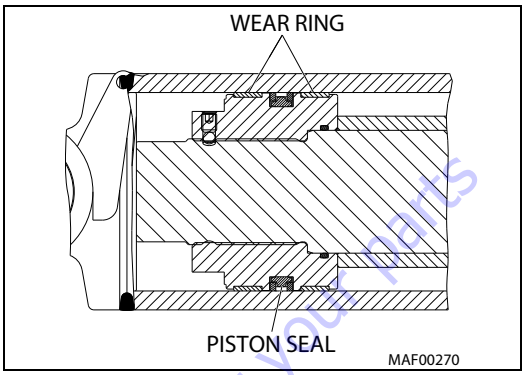


Figure 5-66. Piston Seal Kit Installation

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

NOTICE

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

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

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

13. Screw the cylinder head into the barrel using a hook wrench and torque the cylinder head.

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

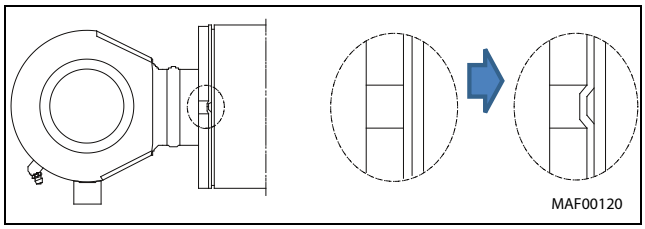


Figure 5-67. Caulking

15. Install the new o-rings, plugs, check valve, cartridge valves, pressure compensator valve and orifice plug in the cylinder port block. Torque as per values shown in Figure 5-60.

Master Cylinder

DISASSEMBLY

NOTICE

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

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

⚠ WARNING

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

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

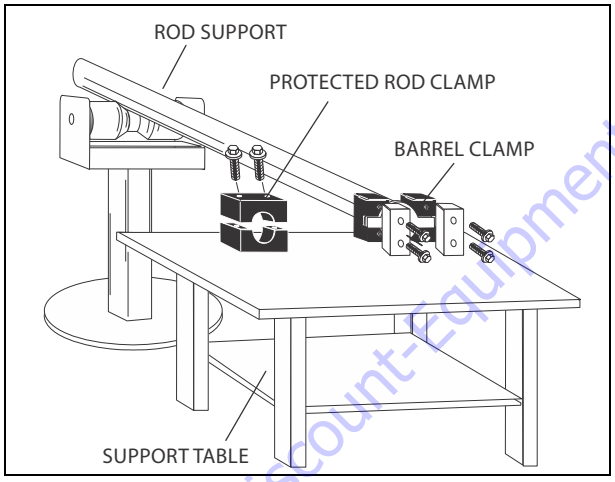


Figure 5-68. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a hook spanner wrench, unscrew the cylinder head from the barrel.

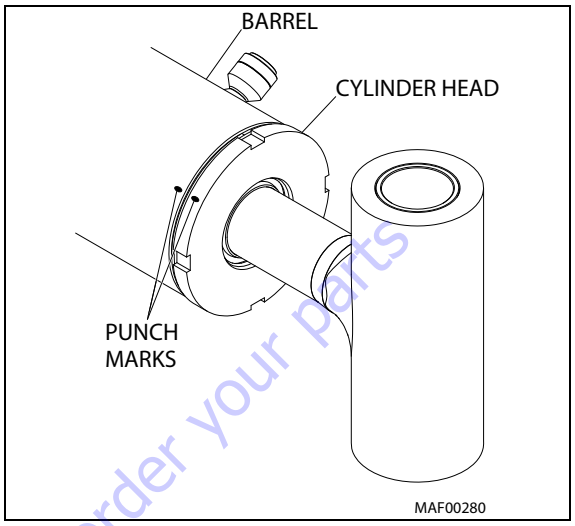


Figure 5-69. Cylinder Head Removal

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

NOTICE

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

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

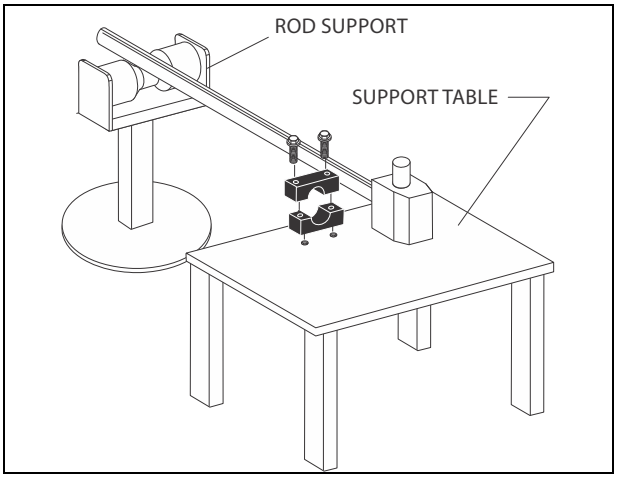
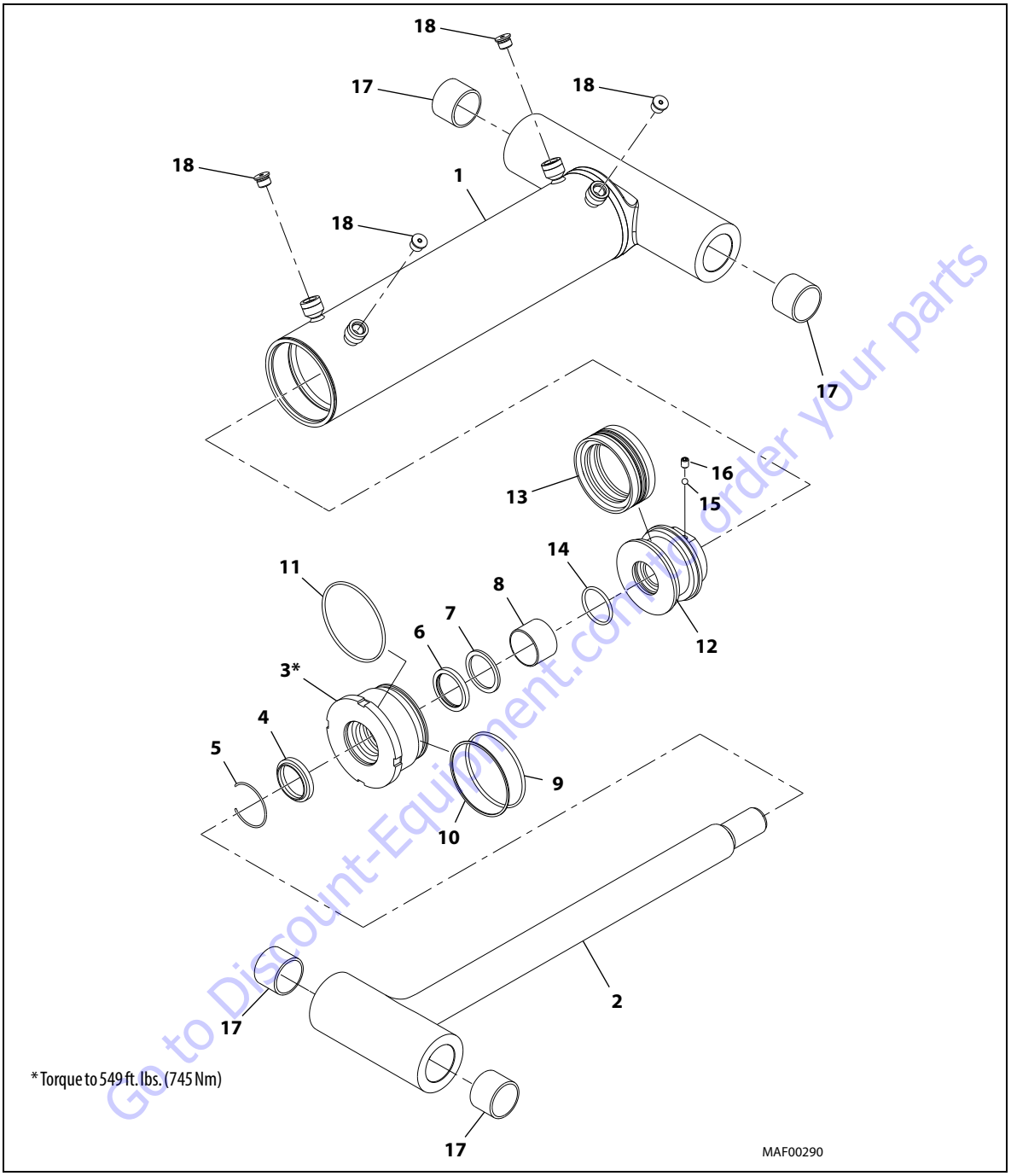


Figure 5-70. Cylinder Barrel Support



1. Barrel
2. Rod
3. Cylinder Head
4. Wiper Seal
5. Retaining Ring
6. Rod Seal
7. Backup Ring
8. Bearing
9. O-ring
10. Backup Ring
11. O-ring
12. Piston
13. Piston Seal
14. O-ring
15. Ball
16. Setscrew
17. Bushing
18. Bushing

Figure 5-71. Master Cylinder

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 the setscrew and ball which attaches the piston to the rod.
10. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston seal and o-ring.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, bearing, retaining ring, and wiper seal.

CLEANING AND INSPECTION

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

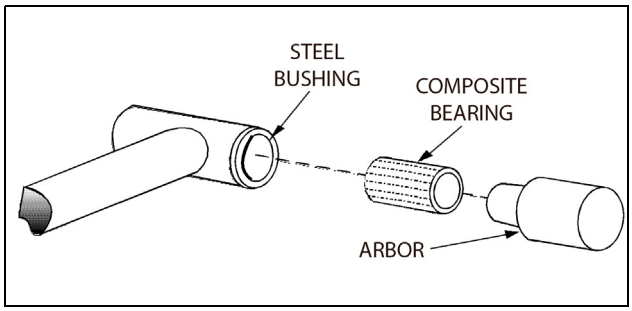


Figure 5-72. Composite Bearing Installation

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

15. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective 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 groove.

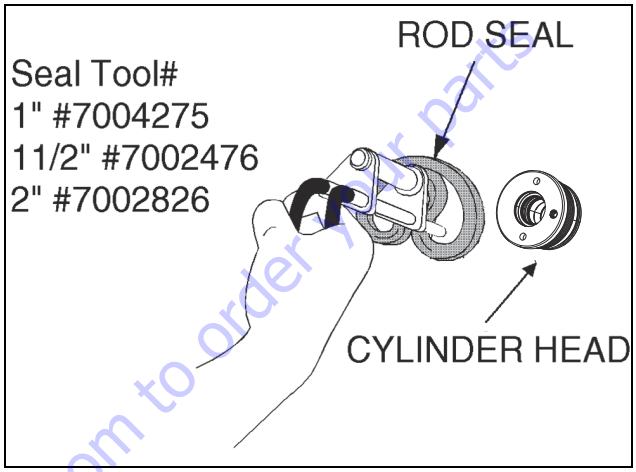


Figure 5-73. Rod Seal Installation

NOTICE

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

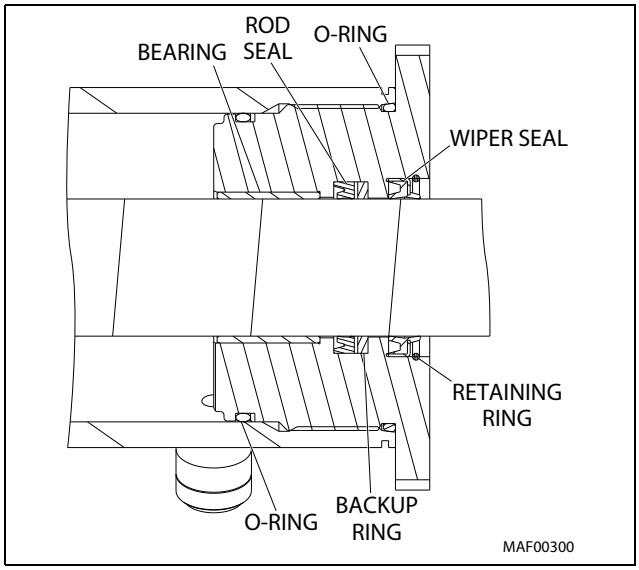


Figure 5-74. Cylinder Head Seal Installation

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

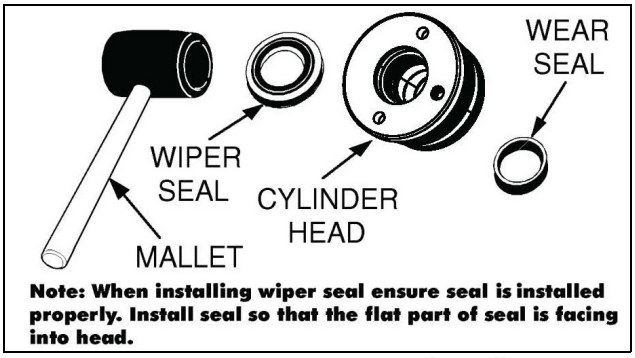


Figure 5-75. Wiper Seal Installation

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

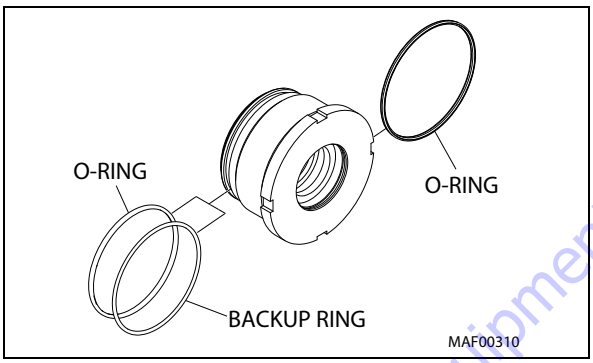


Figure 5-76. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper seal, bearing, retaining ring, backup ring and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.

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

6. Place new o-ring in the applicable inside diameter of the piston.

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

8. Install the setscrew and ball on the piston and attach the piston on the rod.

9. Remove the cylinder rod from the holding fixture.

10. Place new piston seal 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).

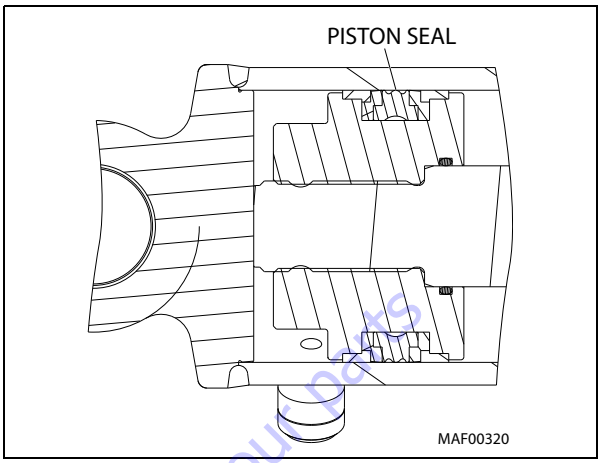


Figure 5-77. Installation of Piston Seal Kit

11. 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.

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

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

14. Screw the cylinder head into the barrel using a hook spanner wrench and torque cylinder head to 549 ft. lbs. (745 Nm).

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

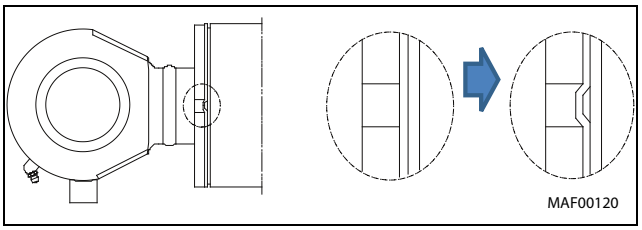


Figure 5-78. Caulking

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

17. Install the plugs in the cylinder ports.

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. Remove the plugs from the cylinder ports. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

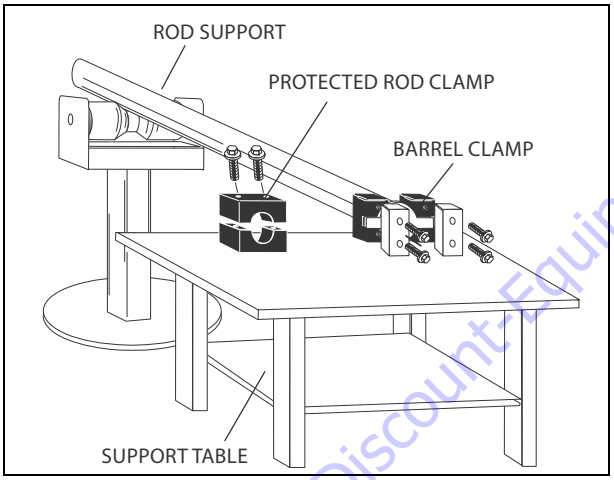


Figure 5-79. Cylinder Barrel Support

5. Using a hook spanner, loosen the cylinder head on both ends of the rod. Remove the cylinder heads from the barrel and the rod.

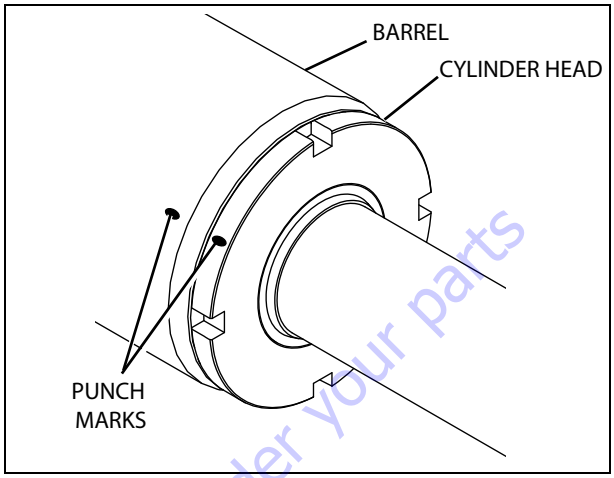


Figure 5-80. Cylinder Head Removal

6. Remove and discard the wiper seal, rod seal, backup ring, bearing, and o-ring from both the cylinder head.
7. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

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

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

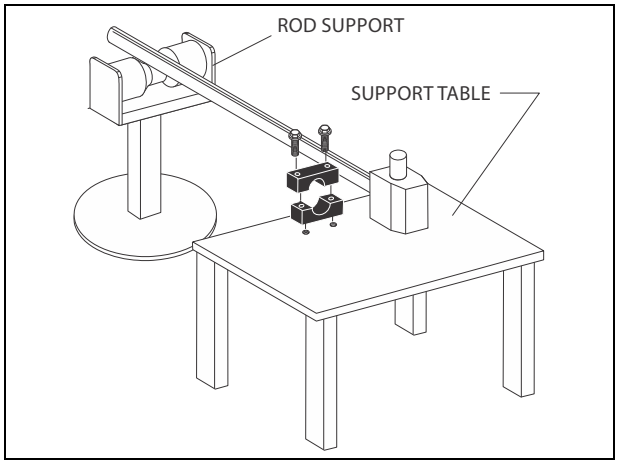
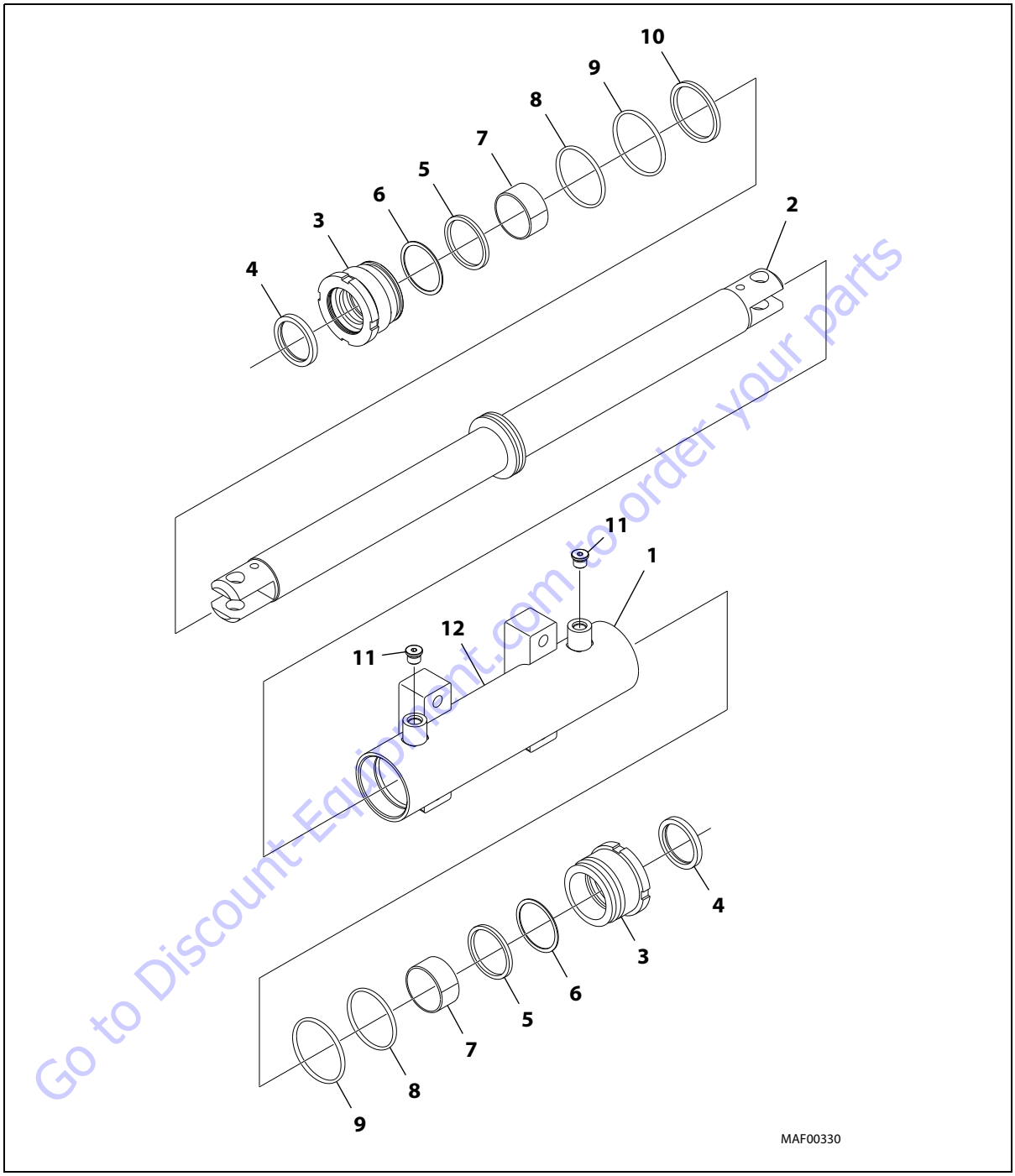


Figure 5-81. Cylinder Barrel Support

9. Remove and discard the piston seal form the rod.



1. Barrel
2. Rod
3. Cylinder Head
4. Wiper Seal
5. Rod Seal
6. Backup Ring
7. Bearing
8. O-ring
9. O-ring
10. Piston Seal
11. Plug

Figure 5-82. Steer Cylinder

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 inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect threaded portion of barrel for damage. Dress threads as necessary.
5. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
6. Inspect threaded portion of head for damage. Dress threads as necessary.
7. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
8. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
9. Inspect port block fittings and valves. Replace if necessary.
10. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: *Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective 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 groove.

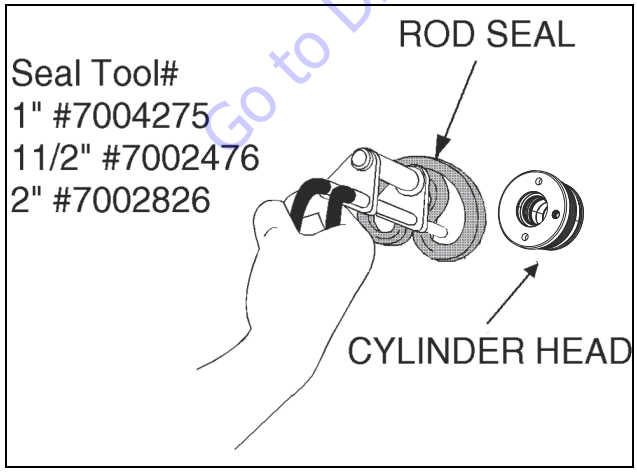


Figure 5-83. Rod Seal Installation

NOTICE

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

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

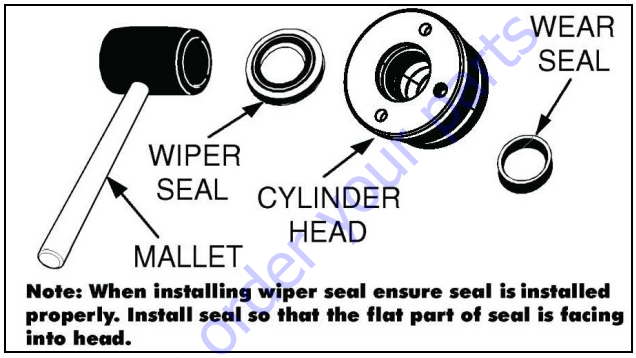


Figure 5-84. Wiper Seal Installation

3. Place new o-rings in the applicable outside diameter groove of the cylinder heads.
4. Place new piston seal in the applicable groove of the rod.
5. With barrel clamped secured and adequately supporting the rod, insert the rod into the barrel cylinder.
6. Carefully install the cylinder head on both the side of the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the heads along the rod to the barrel, as applicable.
7. Install new plugs into the cylinder port block.

Telescope Cylinder

DISASSEMBLY

NOTICE

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

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

⚠ WARNING

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

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

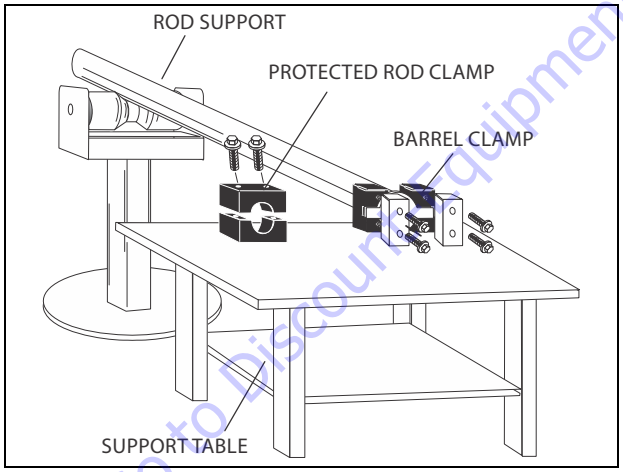


Figure 5-85. Cylinder Barrel Support

6. Mark cylinder head and barrel with a center punch for easy realignment. Using an allen wrench, loosen and remove the capscrews securing the wearpad plate and cylinder head to the barrel. Remove the hardware securing the wear pads to the plate. Remove the wear pads.

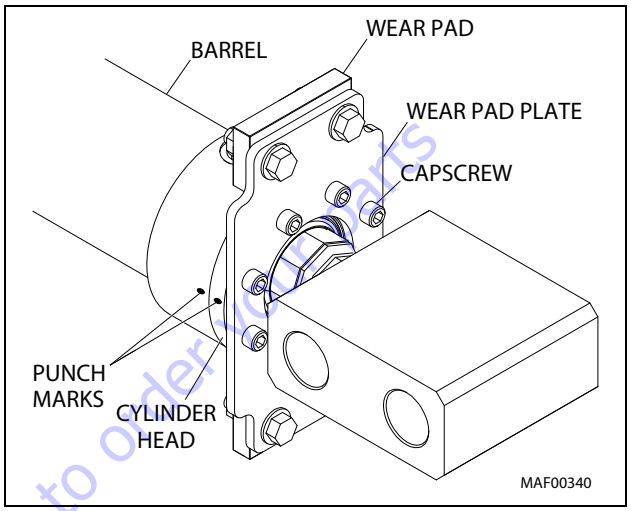


Figure 5-86. Cylinder Head Removal

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

NOTICE

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

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

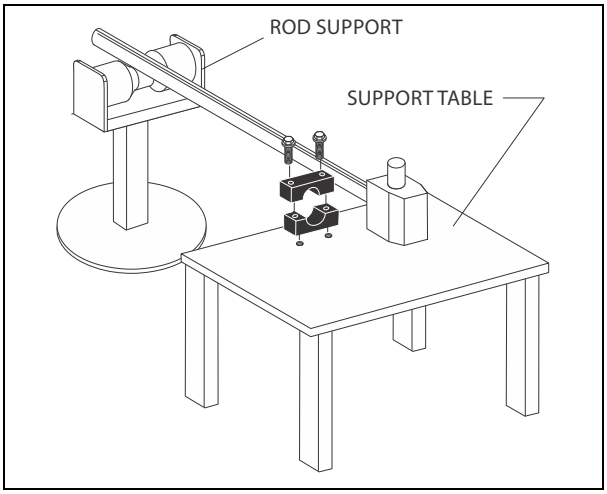
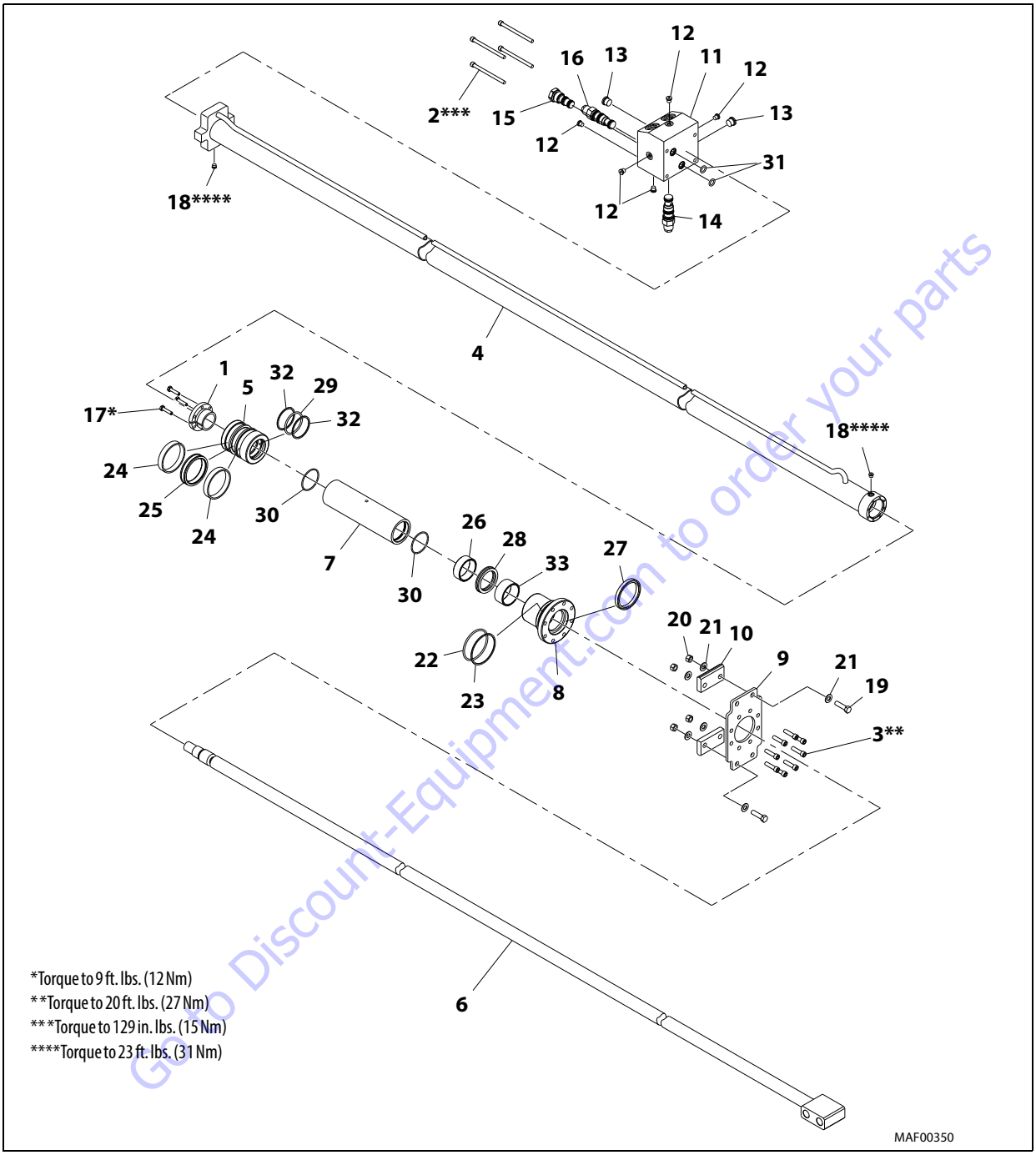


Figure 5-87. Cylinder Rod Support



1.	Tapered Bushing	7.	Spacer	13.	Plug	19.	Capscrew	24.	Wear Ring	29.	O-ring
2.	Capscrew	8.	Cylinder Head	14.	Counterbalance Valve	20.	Nut	25.	Piston Seal	30.	O-ring
3.	Capscrew	9.	Plate	15.	Shuttle Valve	21.	Washer	26.	Wear Ring	31.	O-ring
4.	Barrel	10.	Wear Pad	16.	Counterbalance Valve	22.	O-ring	27.	Wiper Seal	32.	Backup Ring
5.	Piston	11.	Valve Block	17.	Capscrew	23.	Backup Ring	28.	Rod Seal	33.	Wear Ring
6.	Rod	12.	Plug	18.	Plug						

Figure 5-88. Telescope Cylinder

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

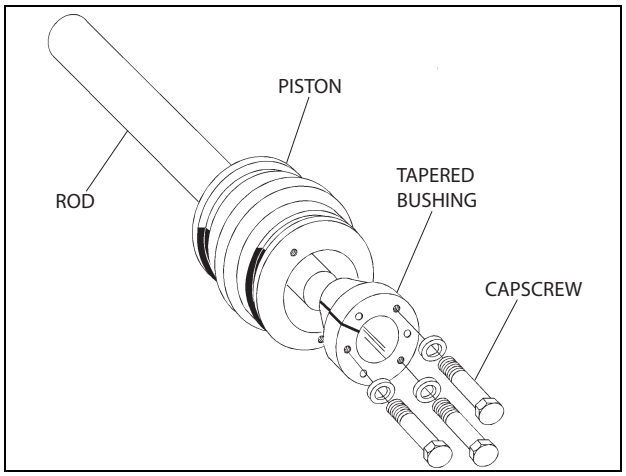


Figure 5-89. Tapered Bushing Removal

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

CLEANING AND INSPECTION

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

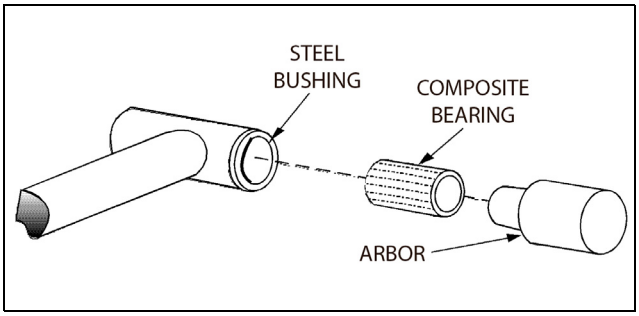


Figure 5-90. Composite Bearing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect o-ring groove in spacer for burrs and sharp edges. Dress applicable surfaces as necessary.
16. Inspect port block fittings and holding valve. Replace if necessary.
17. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair if necessary.
18. Inspect piston rings for cracks or other damage. Replace if 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 groove.

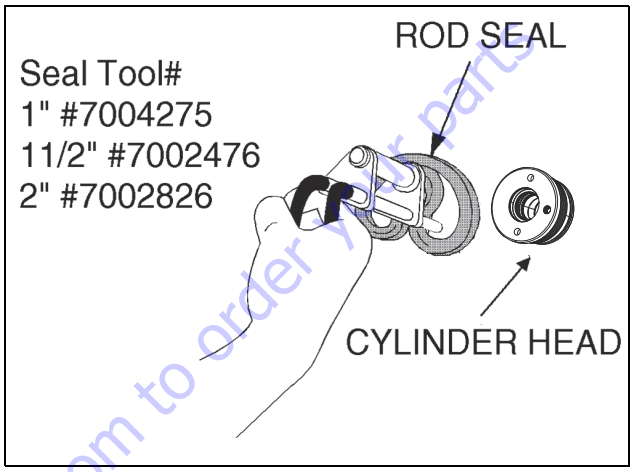


Figure 5-91. Rod Seal Installation

NOTICE

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

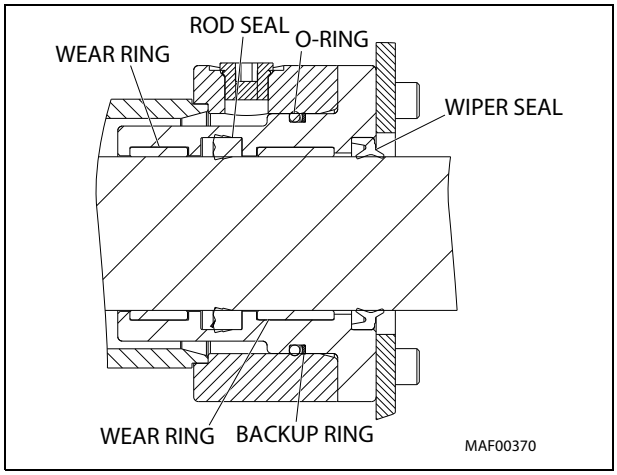


Figure 5-92. Cylinder Head Seal Installation

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

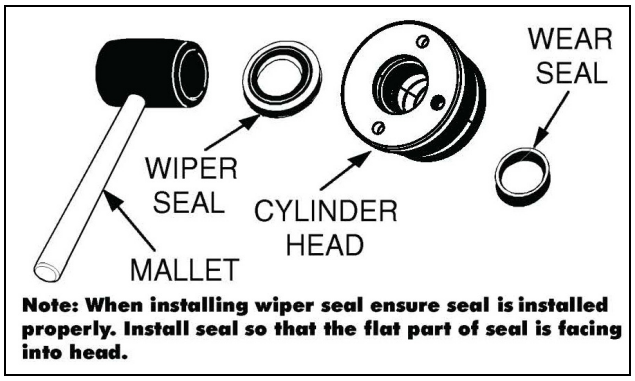


Figure 5-93. Wiper Seal Installation

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

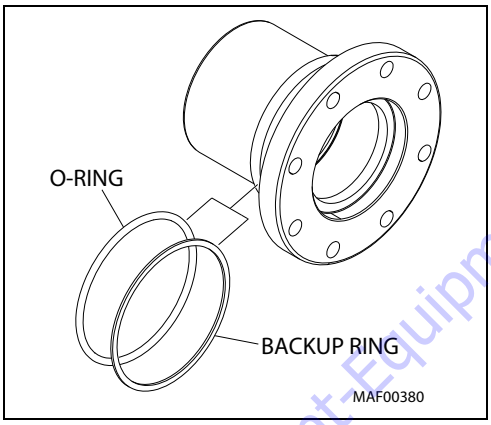


Figure 5-94. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wear ring, rod seal and wiper seal are not damaged or dislodged. Push the head along the rod to the rod end.

5. Place new o-rings in the applicable inside diameter groove of spacer.

6. Install the spacer tube onto the cylinder rod ensuring that the o-rings are not damaged or dislodged.

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

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

9. Carefully thread the piston on the cylinder rod till it abuts the spacer, ensuring that the o-ring and backup ring is not damaged or dislodged.

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

10. Insert the tapered bushing into piston.

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

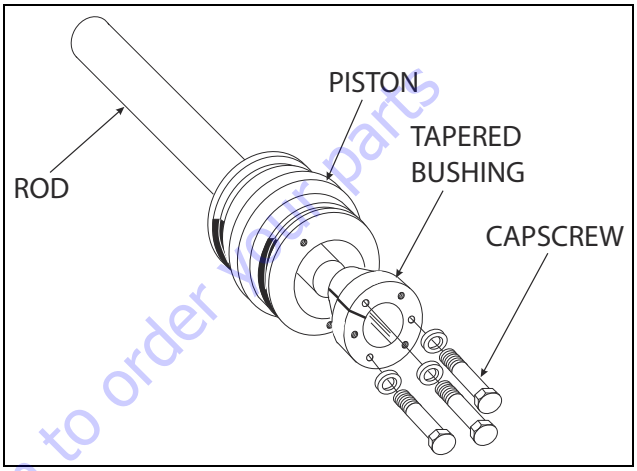


Figure 5-95. Tapered Bushing Installation

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

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

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

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

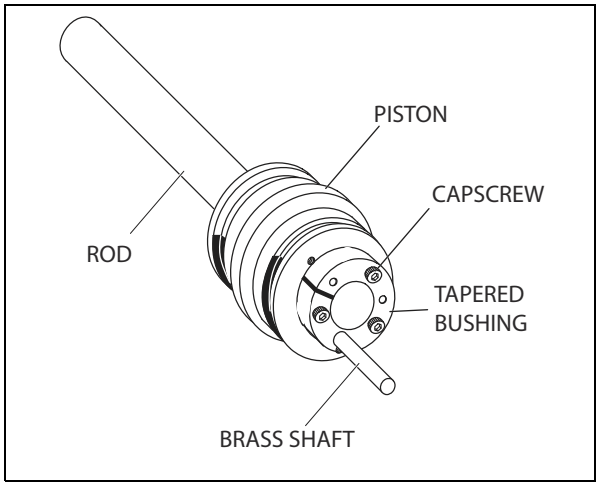


Figure 5-96. Seating the Tapered Bearing

14. Rotate the capscrews evenly and progressively in rotation to 9 ft. lbs. (12 Nm).
15. Remove the cylinder rod from the holding fixture.
16. Position the cylinder barrel in a suitable holding fixture.
17. Place new piston seal and wear rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

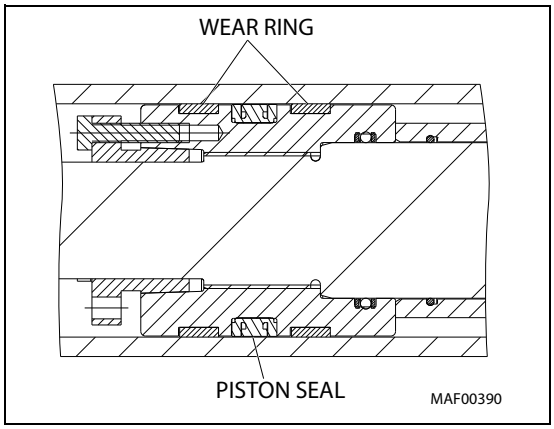


Figure 5-97. Piston Seal Kit Installation

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 can be inserted into the barrel cylinder.
20. Install wear pads onto the wearpad plate using bolts, washers and nuts.
21. Apply JLG Threadlocker P/N 0100011 to the capscrews. Secure the cylinder head to the barrel using the plate and capscrews. Torque capscrews to 20 ft. lbs. (27 Nm).
22. 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.
23. Install the new o-rings and plugs in the cylinder port block. Torque to 23 ft. lbs. (31 Nm).
24. Install the counterbalance and shuttle valves onto the valve block.
25. Apply JLG Threadlocker P/N 0100011 to the capscrews. Install the valve assembly at the barrel end of the cylinder and secure using capscrews. Torque to 129 in. lbs. (15 Nm).

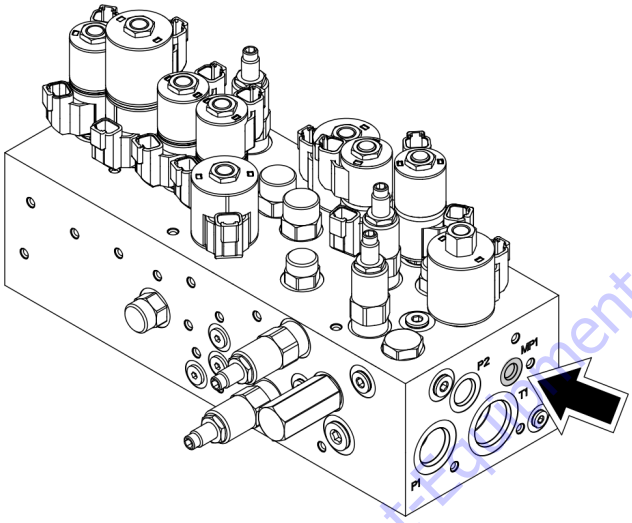
5.4 PRESSURE SETTING PROCEDURE

Cold temperatures have a significant impact on pressure readings. JLG Industries Inc. recommends operating the machine until the hydraulic system has warmed to normal operating temperatures prior to checking pressures. JLG Industries Inc. also recommends the use of a calibrated gauge. Pressure readings are acceptable if they are within ± 5% of specified pressures.

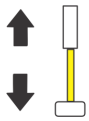
To ensure all pressures are set correctly, the following procedures must be followed.

Main System Relief

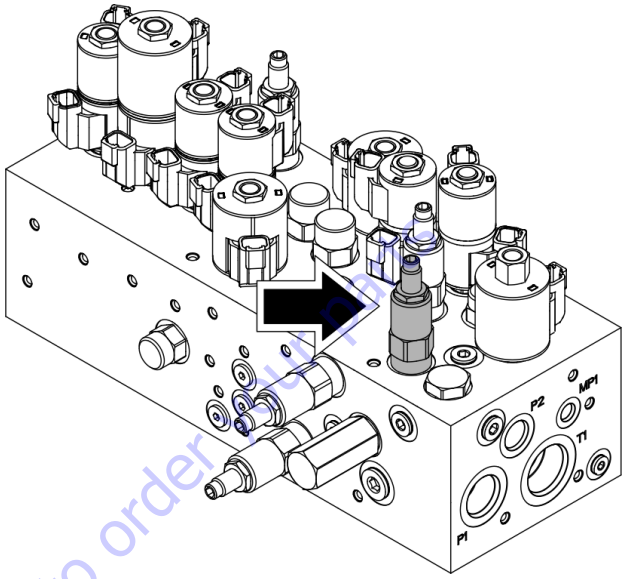
1. Install a pressure gauge at MP1 port of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).



2. Activate telescope in function continuously at end of stroke. Observed pressure should be 3000 ± 75 psi (207 ± 6 Bar).

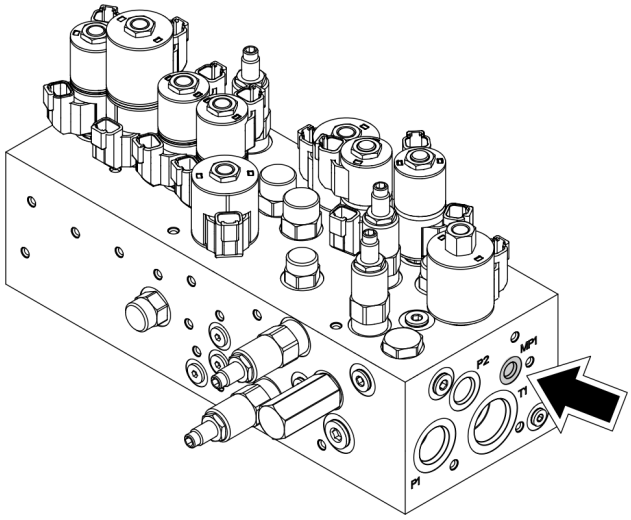


3. If necessary, loosen jam nut and adjust the Main System Relief valve clockwise to increase and counter-clockwise to decrease.

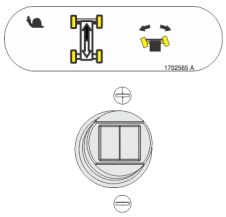


Steer Left Relief

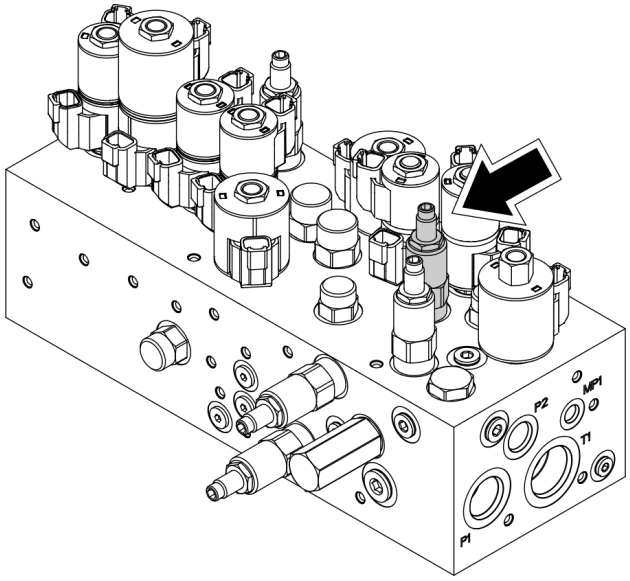
1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).



2. Activate Steer Left function continuously at end of stroke. Observed pressure should be 2750 ± 75 psi (190 ± 6 Bar).



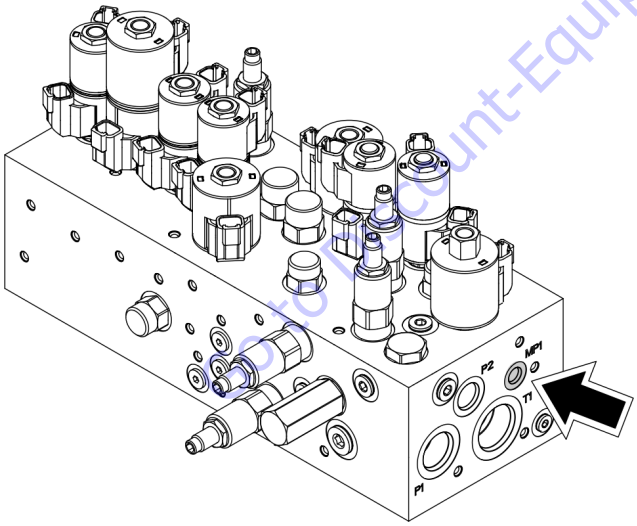
3. If necessary, loosen jam nut and adjust the Steer Left Relief valve clockwise to increase and counterclockwise to decrease.



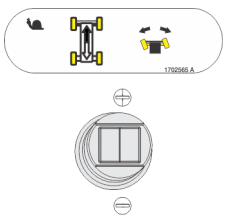
NOTE: *Steer left pressure at port 24 is 2500 psi (173 Bar); a gauge may be placed there for troubleshooting.*

Steer Right Relief

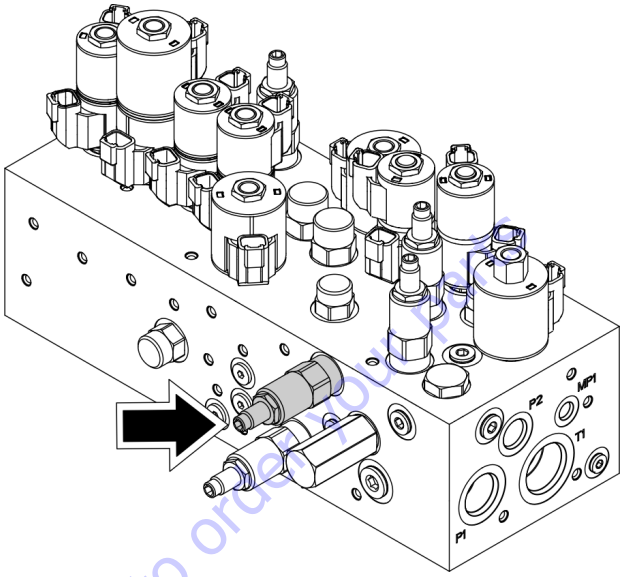
1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).



2. Activate Steer Right function continuously at end of stroke. Observed pressure should be 2750 ± 75 psi (190 ± 6 Bar).



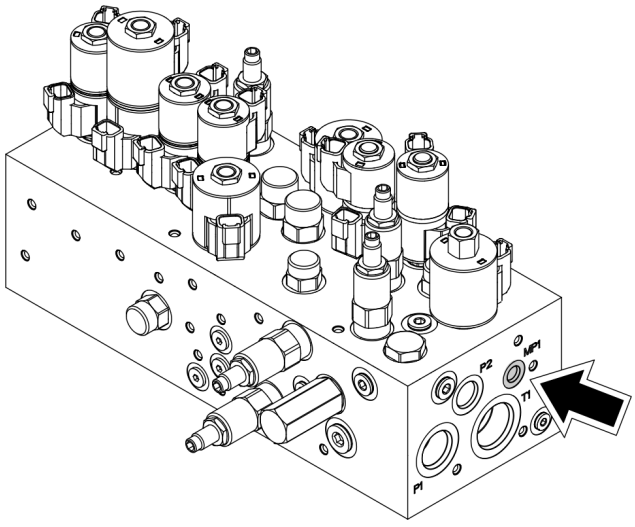
3. If necessary, loosen jam nut and adjust the Steer Right Relief valve clockwise to increase and counterclockwise to decrease.



NOTE: *Steer Right pressure at port 23 is 2500 psi (173 Bar); a gauge may be placed there for troubleshooting.*

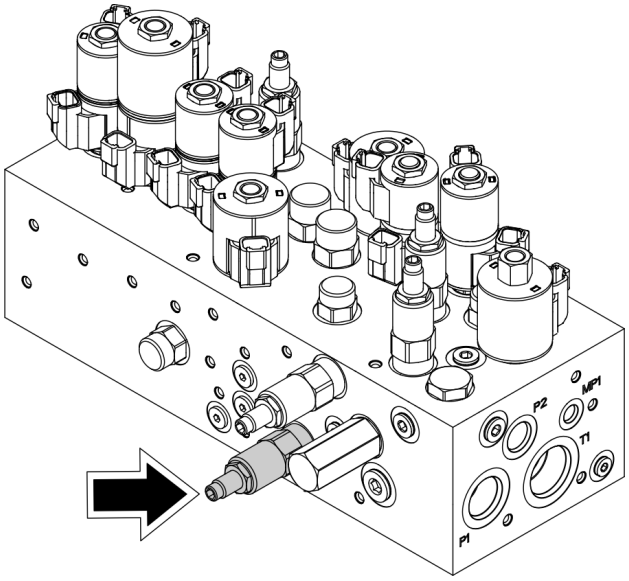
Swing Relief

1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 3000 psi (207 Bar).



2. Activate Boom Swing Right or Left function continuously against the stop or lock. Observed pressure should be 1700 ± 50 psi (117 ± 4 Bar).

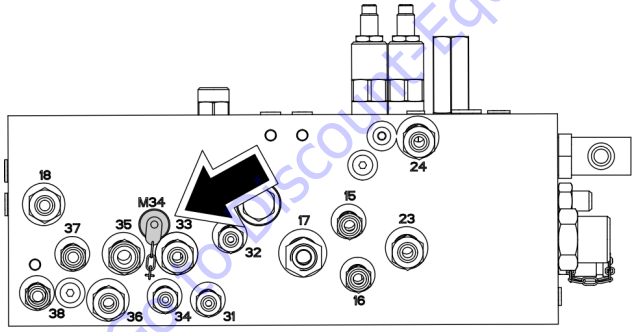
3. If necessary, loosen jam nut and adjust the Boom Swing Relief valve clockwise to increase and counterclockwise to decrease.



NOTE: *Boom Swing Right pressure at port 15 and Boom Swing Left pressure at port 16 is 1600 psi (110 Bar); a gauge may be placed there for troubleshooting.*

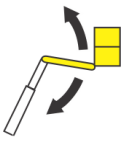
Jib Lift Down Relief (460SJ only)

1. Install a pressure gauge at port M34 of the Main Control Valve capable of reading pressures up to 3000 psi (207 Bar).

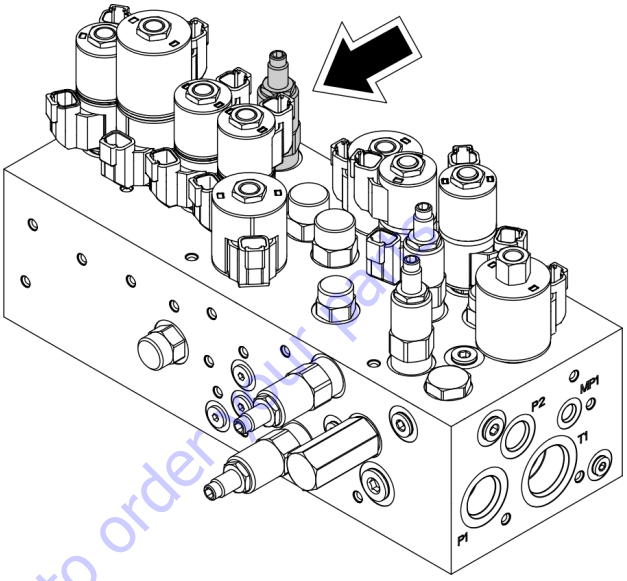


BOTTOM OF MAIN CONTROL VALVE

2. Activate Jib Lift Down function continuously at end of stroke. Observed pressure should be 1200 ± 50 psi (83 ± 4 Bar).



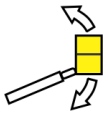
3. If necessary, loosen jam nut and adjust the Jib Lift Down Relief valve clockwise to increase and counterclockwise to decrease.



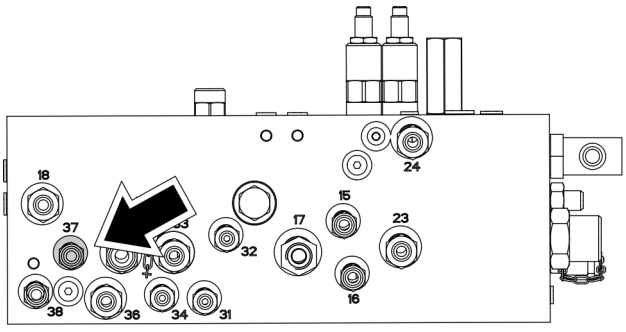
Platform Level Up Relief

The Platform Level Up relief is set at the vendor and does not normally need checked or adjusted. If necessary, the following procedure may be utilized for trouble shooting purposes:

1. Lift the main boom up enough to allow the platform to be fully leveled up.
2. Activate Level Up to end of stroke.



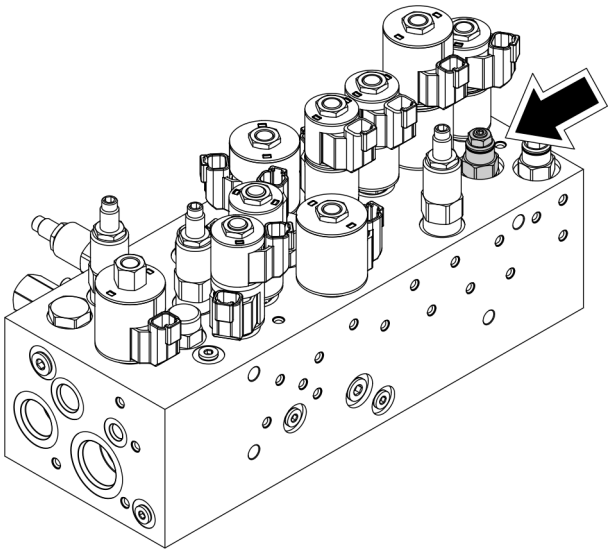
3. Remove the hose from the Level Up port on the main control valve (Port 37) - "T" a pressure gauge capable of reading pressures up to 4000 psi (275 Bar) onto this port and reconnect the hose.



BOTTOM OF MAIN CONTROL VALVE

4. Activate Main Boom Lift Down function using Auxiliary Mode continuously until fully lowered. Observed pressure should be 3200 ± 80 psi (220 ± 6 Bar).

5. If necessary, loosen jam nut and adjust the Platform Level Up Relief valve clockwise to decrease and counter-clockwise to increase.



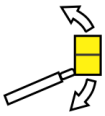
6. Remove "T" and the gauge and reinstall the hose.

Platform Level Down Relief

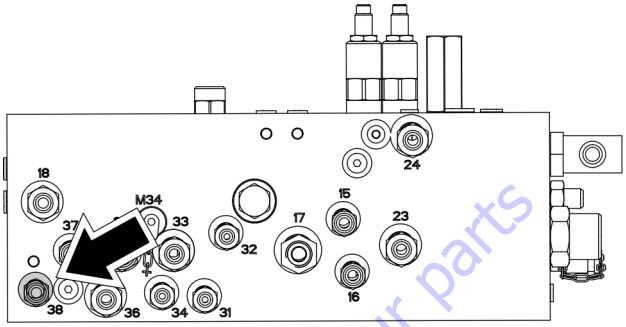
The Platform Level Down relief is set at the vendor and does not normally need checked or adjusted. If necessary, the following procedure may be utilized for trouble shooting purposes:

1. Lift the main boom up enough to allow the platform to be fully leveled down.

2. Activate Level Down to end of stroke.

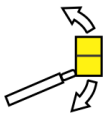


3. Remove the hose from the Level Down port on the main control valve (Port 38) - "T" a pressure gauge capable of reading pressures up to 3000 psi (207 Bar) onto this port and reconnect the hose.

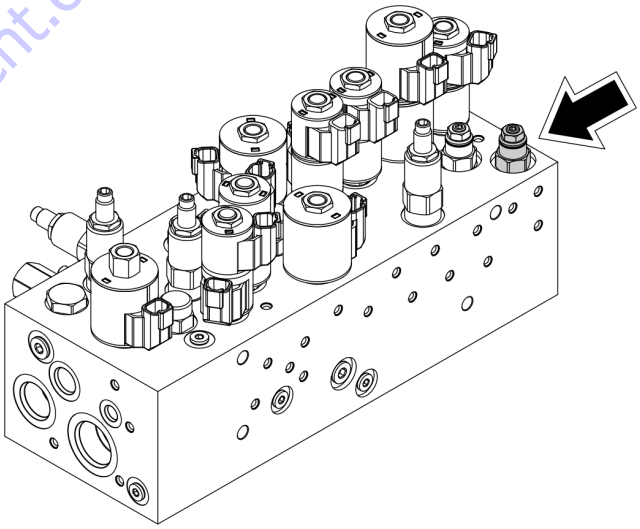


BOTTOM OF MAIN CONTROL VALVE

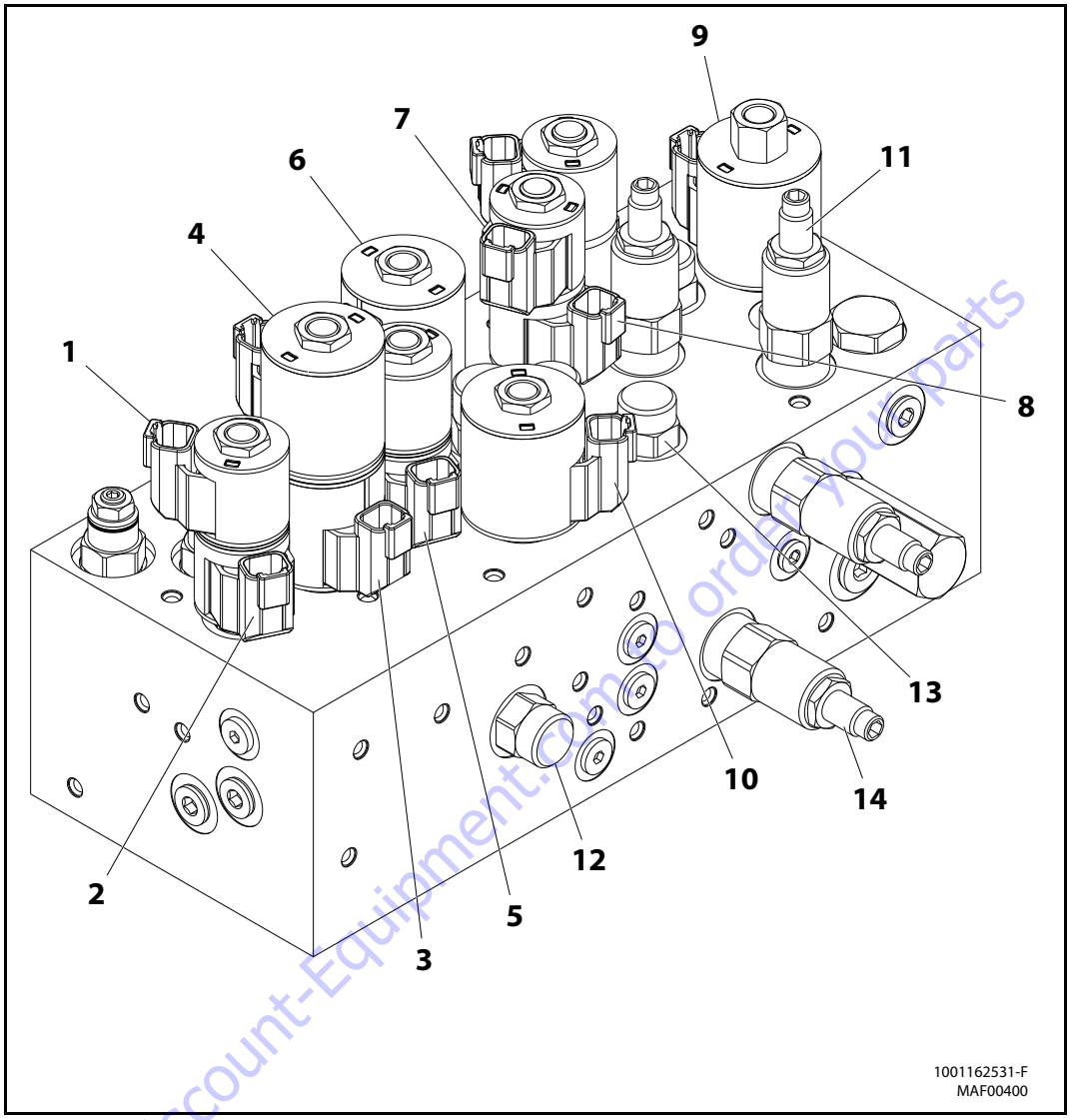
4. Activate Platform Level Down function continuously at end of stroke. Observed pressure should be 2000 ± 50 psi (138 ± 4 Bar).



5. If necessary, loosen jam nut and adjust the Platform Level Down Relief valve clockwise to decrease and counter-clockwise to increase.

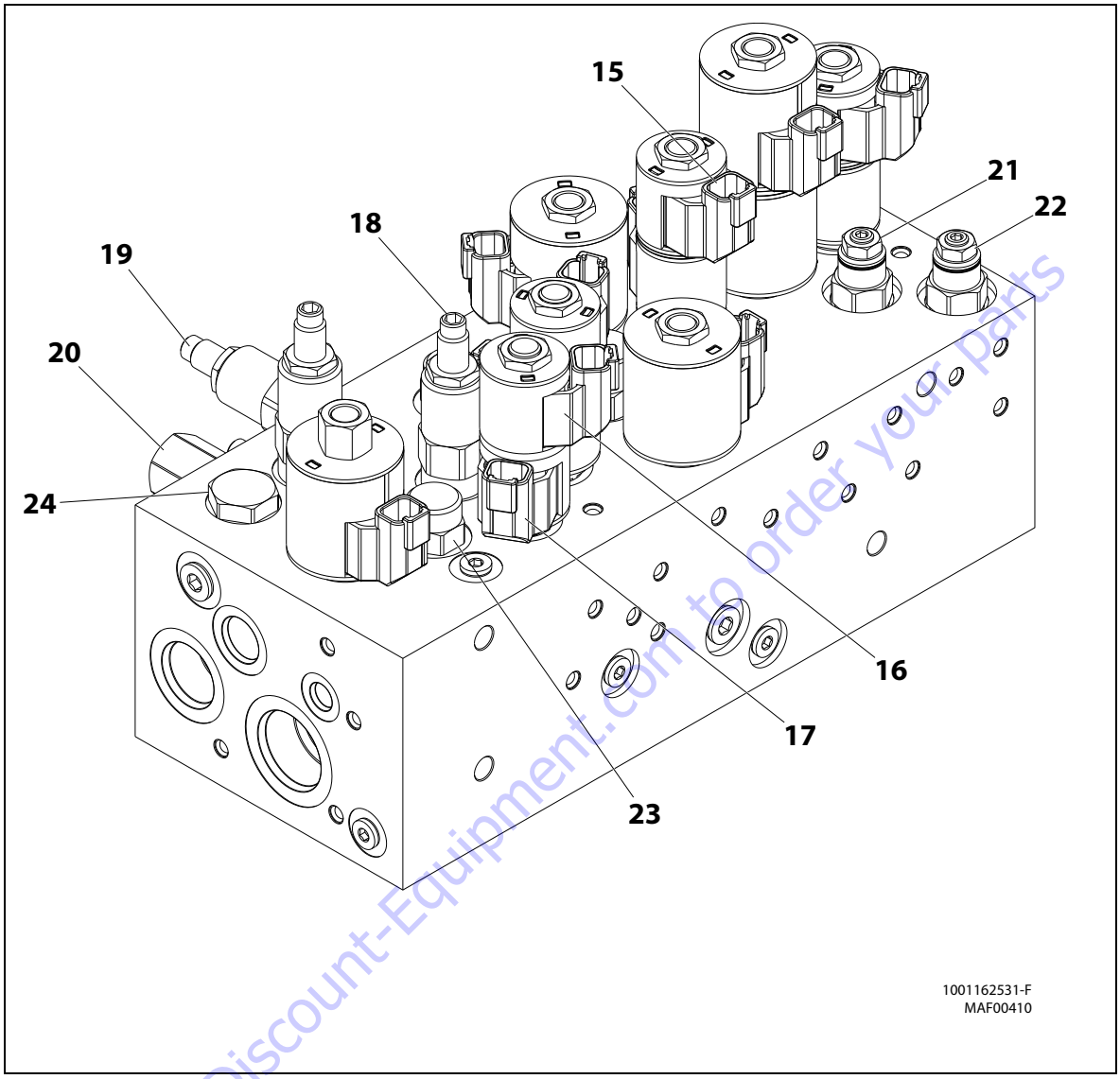


6. Remove "T" and the gauge and reinstall the hose.



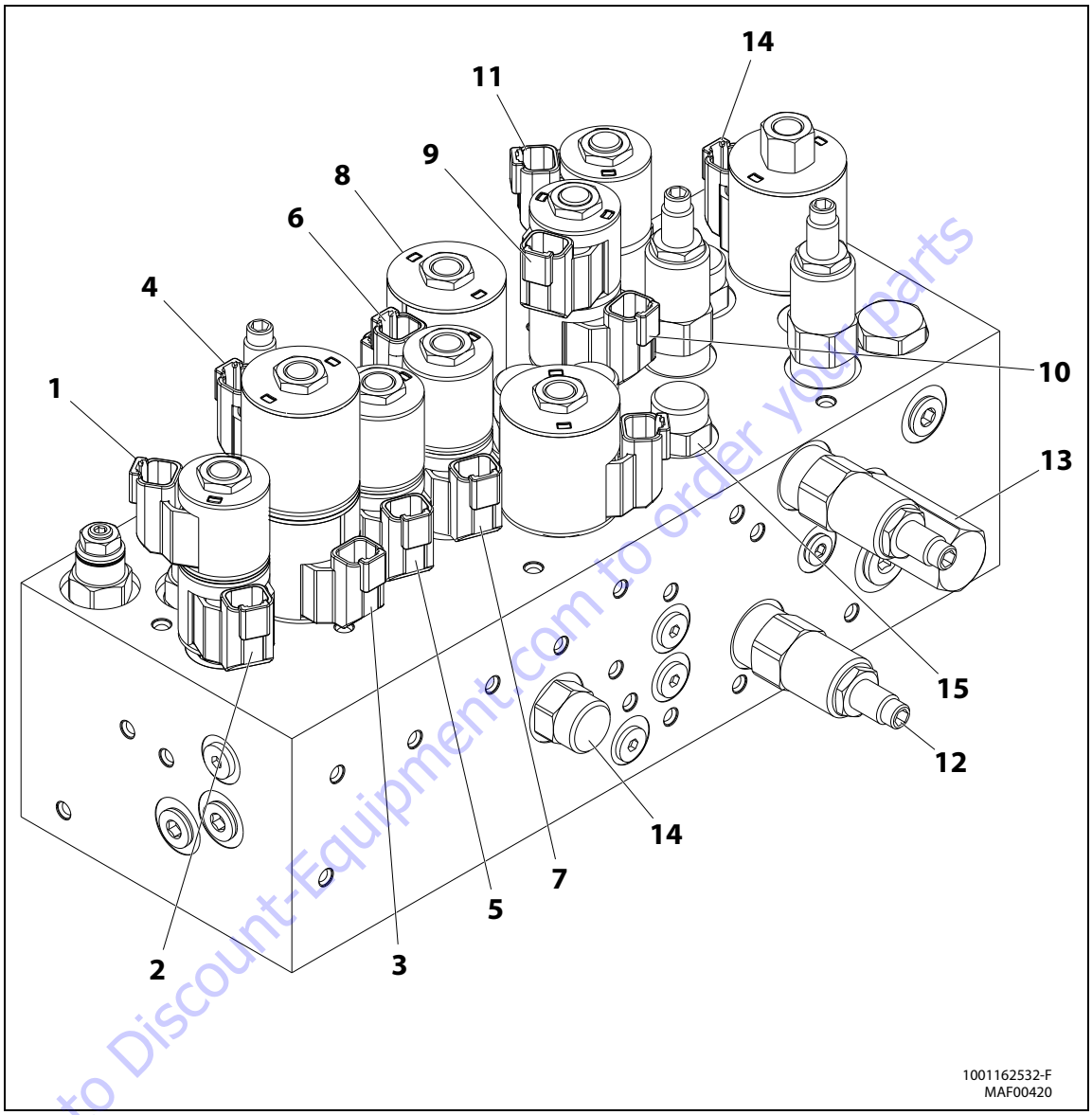
1. Level Up
2. Level Down
3. Tele In
4. Tele Out
5. Not Used
6. Not Used
7. Rotate Left
8. Rotate Right
9. Main Lift Up
10. Swing Right
11. Swing Left
12. Not Used
13. Not Used
14. Main Dump

Figure 5-98. Main Control Valve Identification (400S) - Sheet 1 of 2



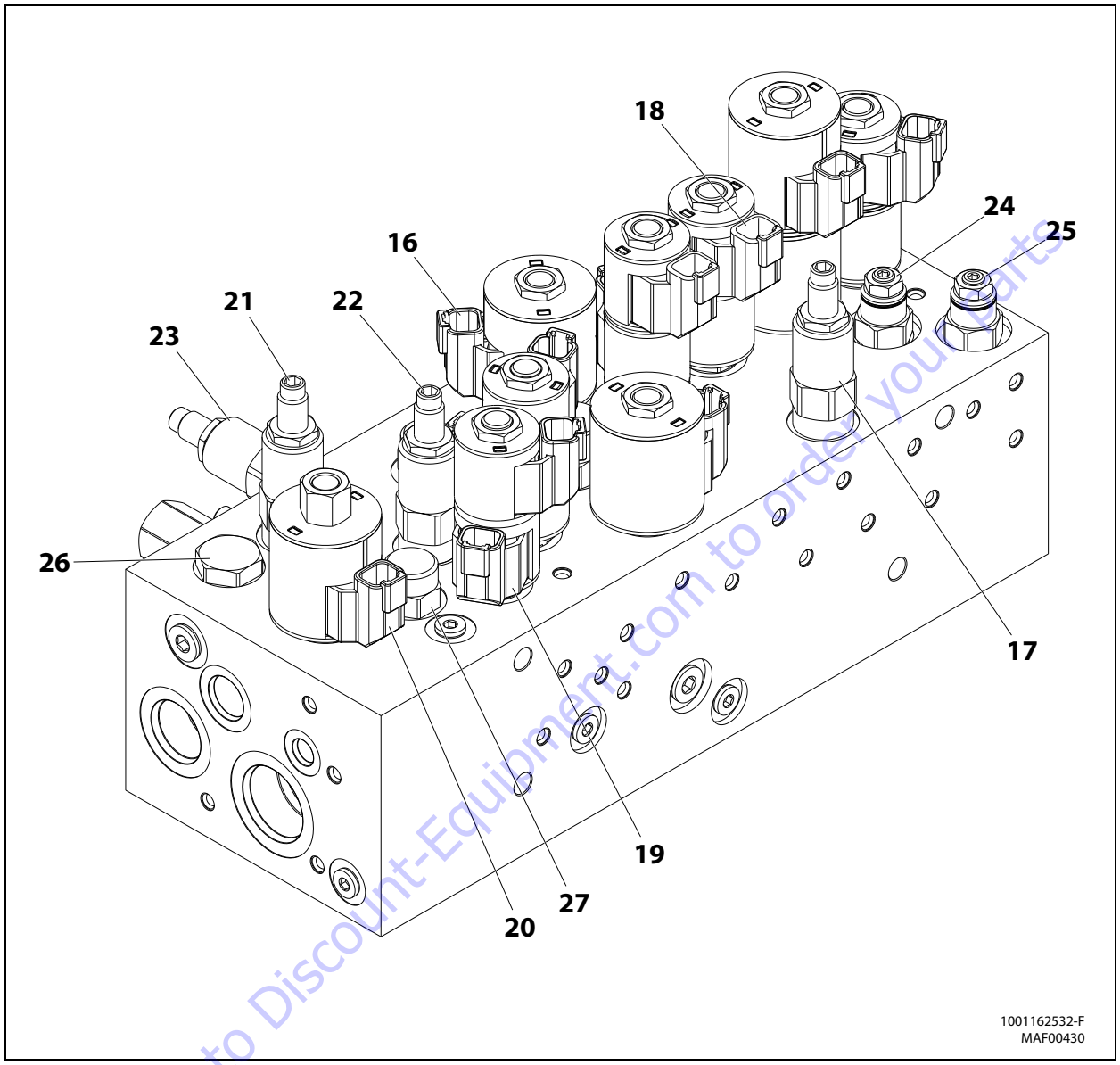
15. Rotate Left
16. Steer Left
17. Steer Right
18. Steer Left Relief
19. Steer Right Relief
20. Flow Regulator
21. Level Up Relief
22. Level Down Relief
23. Flow Regulator
24. Check Valve

Figure 5-99. Main Control Valve Identification (400S) - Sheet 2 of 2



1. Level Up
2. Level Down
3. Tele In
4. Tele Out
5. Jib Down
6. Rotate Left
7. Rotate Right
8. Main Lift Up
9. Swing Right
10. Swing Left
11. Steer Left
12. Swing Relief
13. Flow Regulator
14. Flow Regulator
15. Pressure Compensator

Figure 5-100. Main Control Valve Identification (460SJ) - Sheet 1 of 2



16. Flow Control
17. Jib Lift Relief
18. Jib Up
19. Steer Right
20. Main Dump
21. Steer Relief
22. Steer Left Relief
23. Steer Right Relief
24. Level Up Relief
25. Level Down Relief
26. Check Valve
27. Flow Regulator

Figure 5-101. Main Control Valve Identification (460SJ) - Sheet 2 of 2

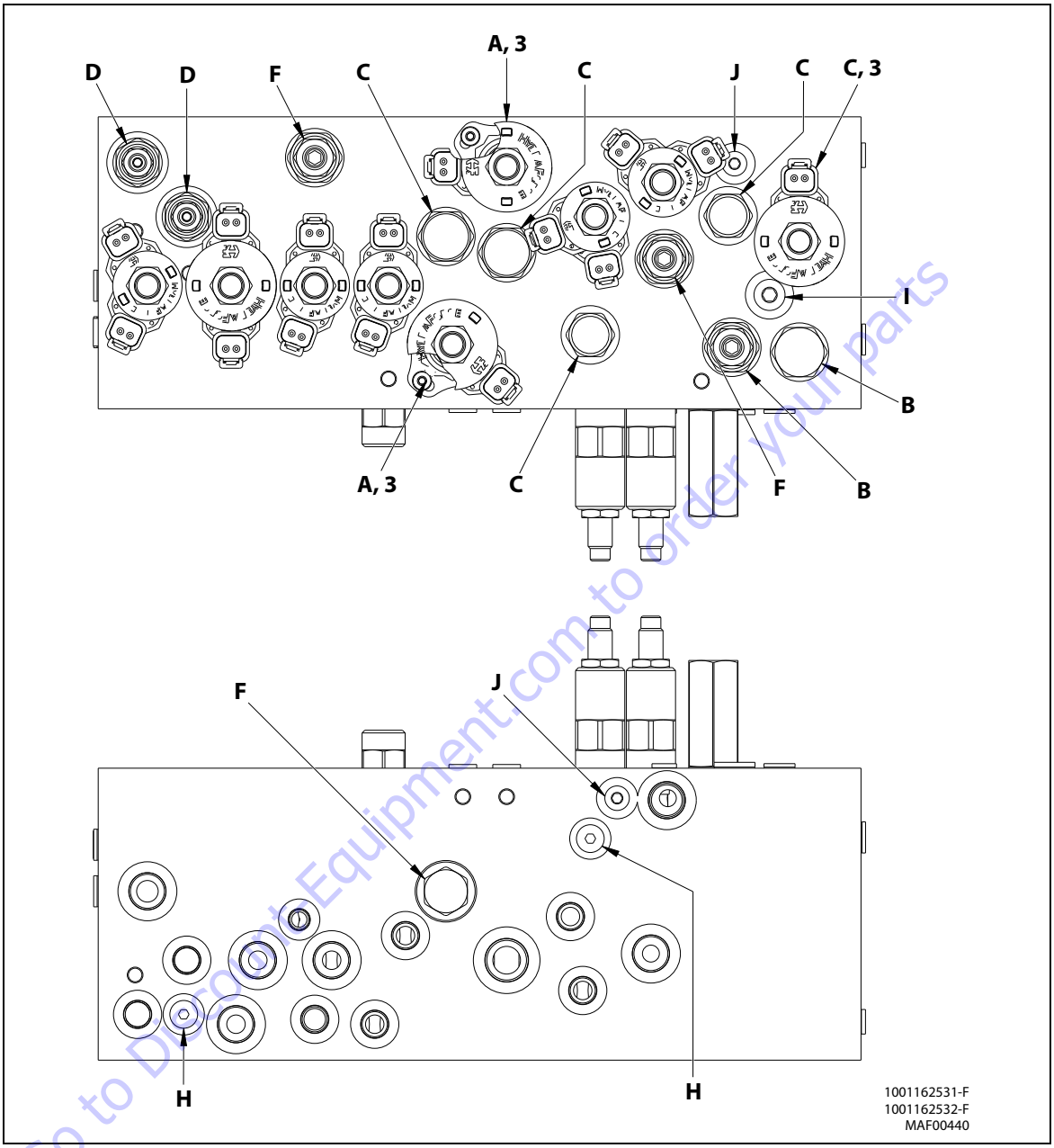


Figure 5-102. Main Control Valve Torque Values - Sheet 1 of 2

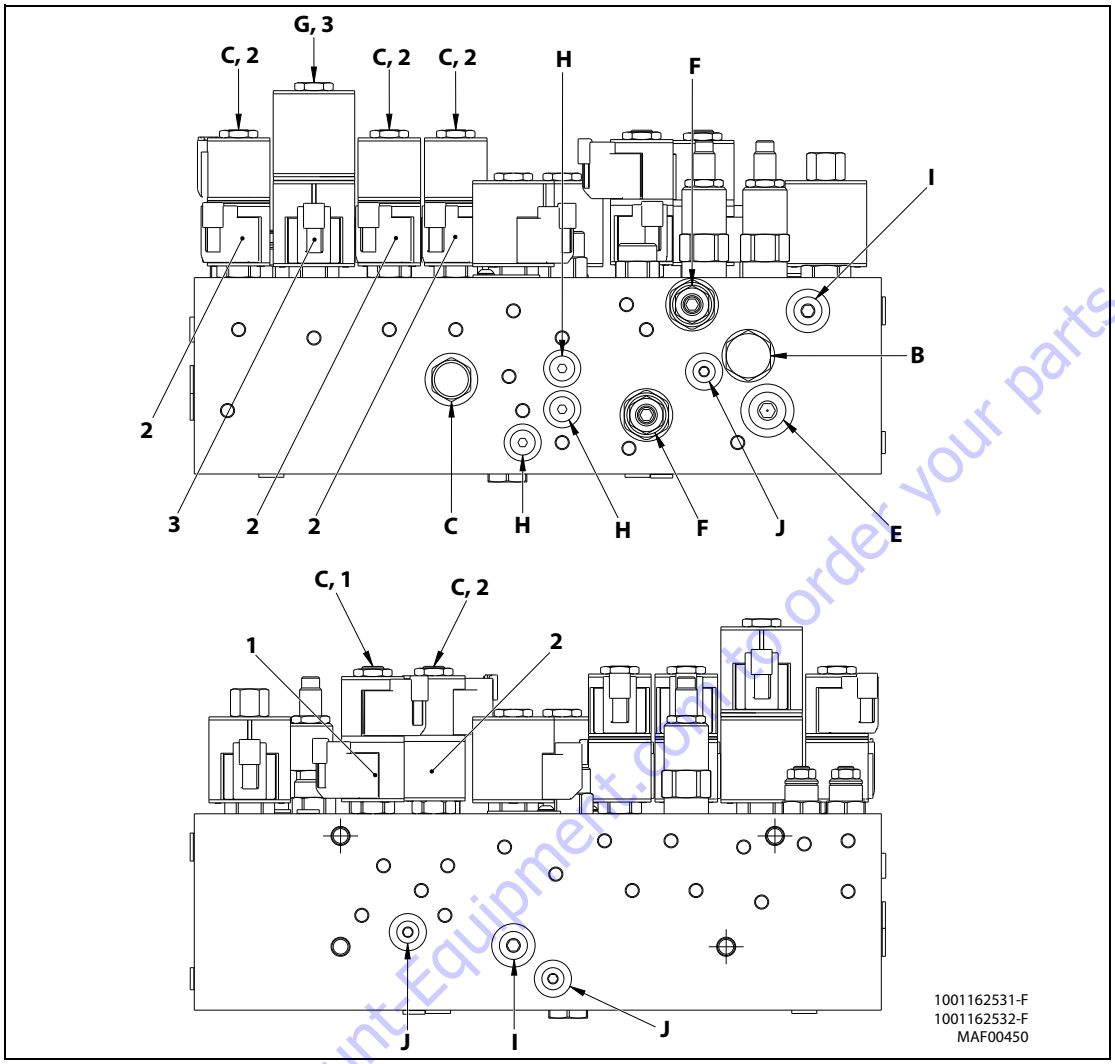


Table 5-33. Cartridge Torque Values

	Ft. lbs.	Nm
A	48	65
B	43	58
C	38	51
D	35	47
E	30	41
F	28	38
G	25	34
H	13	18
I	12	16
J	8	11

Table 5-34. Coil Torque Values

	Ft. lbs.	Nm
1	4.5	6
2	4.5	6
3	6	8

Table 5-35. Coil Resistance Values

	Temperature	Resistance
1	20°C	6.2
2	20°C	8.8
3	20°C	7.1

Figure 5-103. Main Control Valve Torque Values - Sheet 2 of 2

5.5 DRIVE PUMP PRE-FILL PROCEDURE

The case of the hydraulic drive pump, MUST be pre-filled before starting the engine. Failure to do so can cause premature failure of the pump.

1. Fill the hydraulic reservoir.
2. Determine if the hydraulic oil tank sight level gauge is higher than other hydraulic components.
   a. Determine if the hydraulic oil tank sight level gauge is higher than the hydraulic drive pump assembly.
   b. Determine if the hydraulic oil tank sight level gauge is higher than all hydraulic hose loops or routings between the hydraulic tank and the drive pump assembly.
   c. If sight level gauge is the highest hydraulic oil level point, proceed to step 3.
   d. If sight level gauge is NOT the highest hydraulic oil level point, low pressure air may need to be applied to the hydraulic oil tank (fill cap via air regulator) in conjunction with step 4 to get hydraulic oil to move over the air locks created by these high spots.
3. If the machine is be equipped with a hydraulic oil cooler option:
   a. Determine if there is a hydraulic 'tee' fitting installed at the hydraulic drive pump that has a 'cap' fitting attached to it. (this will generally be at or near the top of the hydraulic drive pump body). This 'cap' fitting is to be used to manually fill the hydraulic drive pump case.
   b. Remove 'cap' fitting.
   c. Fill hydraulic drive pump case with hydraulic oil.
   d. Reattach and torque 'cap' fitting.
   e. Prefilling of the hydraulic drive pump w/oil cooler option is complete (Step #4 can be omitted at this point).s
4. If machine is NOT equipped with a hydraulic oil cooler option,
   a. Locate a case access port on the hydraulic drive pump. Preferably one located at or near the top or upper sides of the pump.
   b. Using the proper wrench, remove the o-ring plug to allow air to escape from the hydraulic drive pump case.
   c. Hydraulic oil will flow by gravity from the hydraulic tank to the drive pump.
   d. When hydraulic oil starts to flow out this port, the pump is full.
   e. Re-install the o-ring plug and torque.
5. Pre-filling of the hydraulic drive pump is complete.

5.6 HYDRAULIC SCHEMATICS

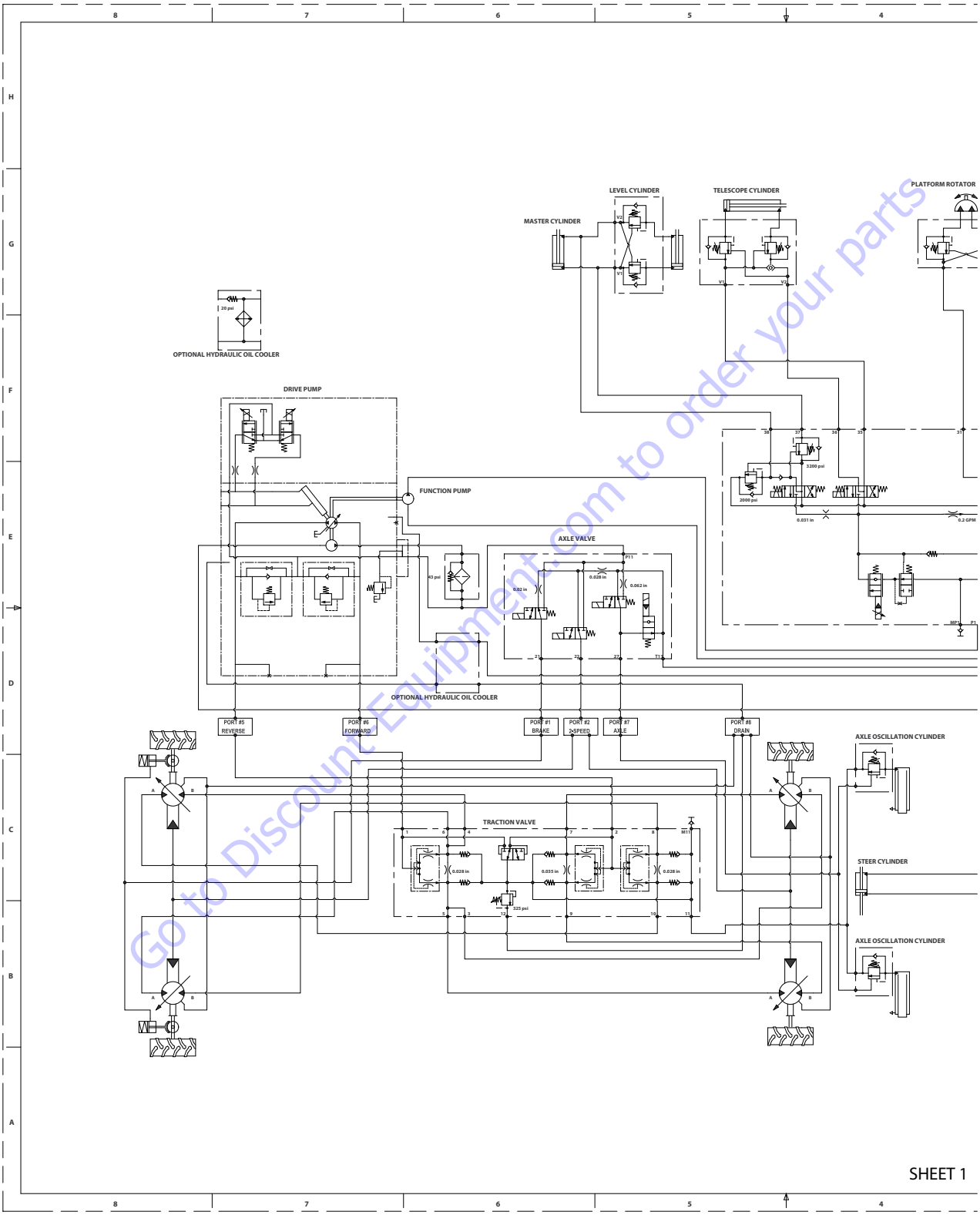


Figure 5-104. Hydraulic Schematic - Sheet 1 of 8

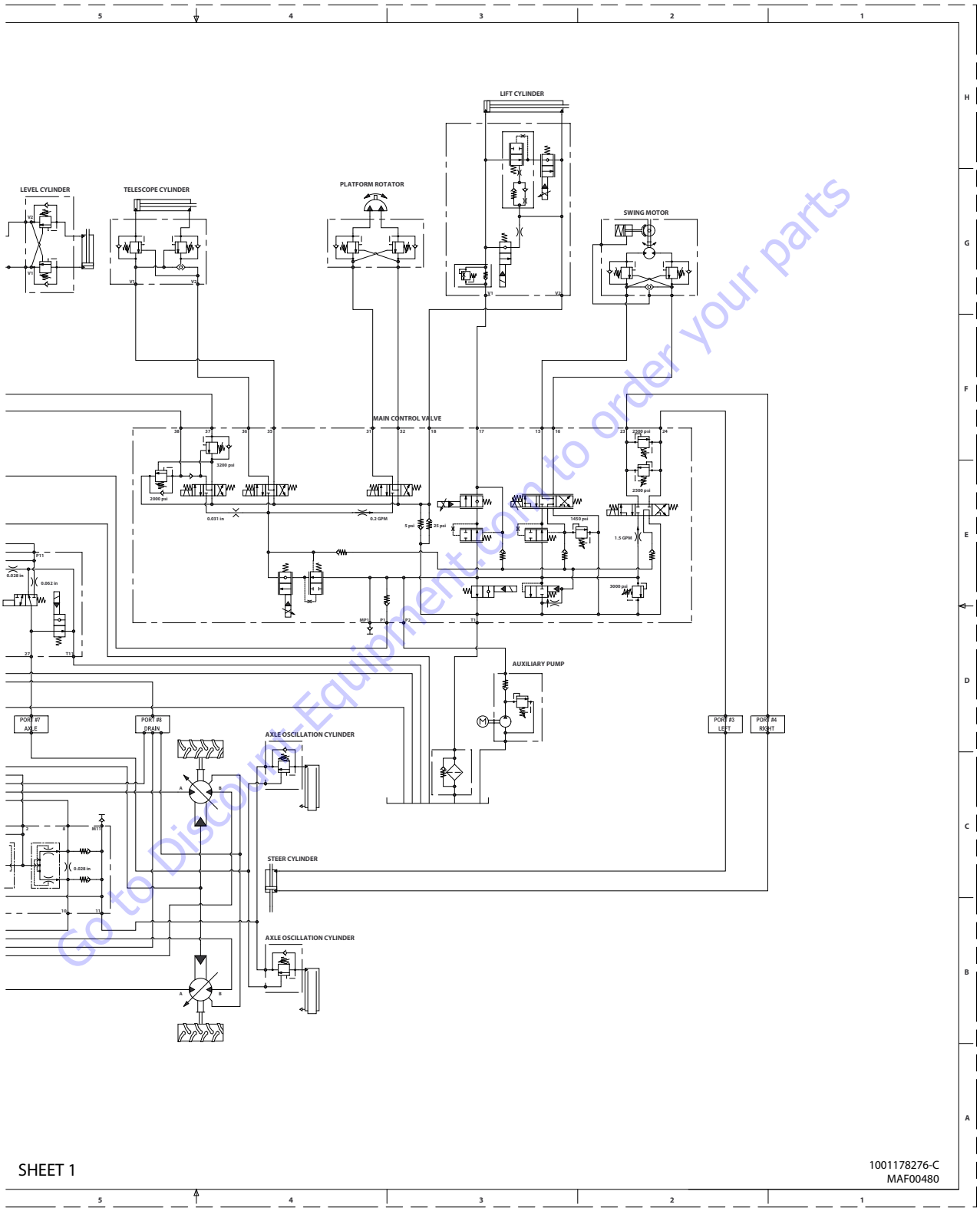


Figure 5-105. Hydraulic Schematic - Sheet 2 of 8

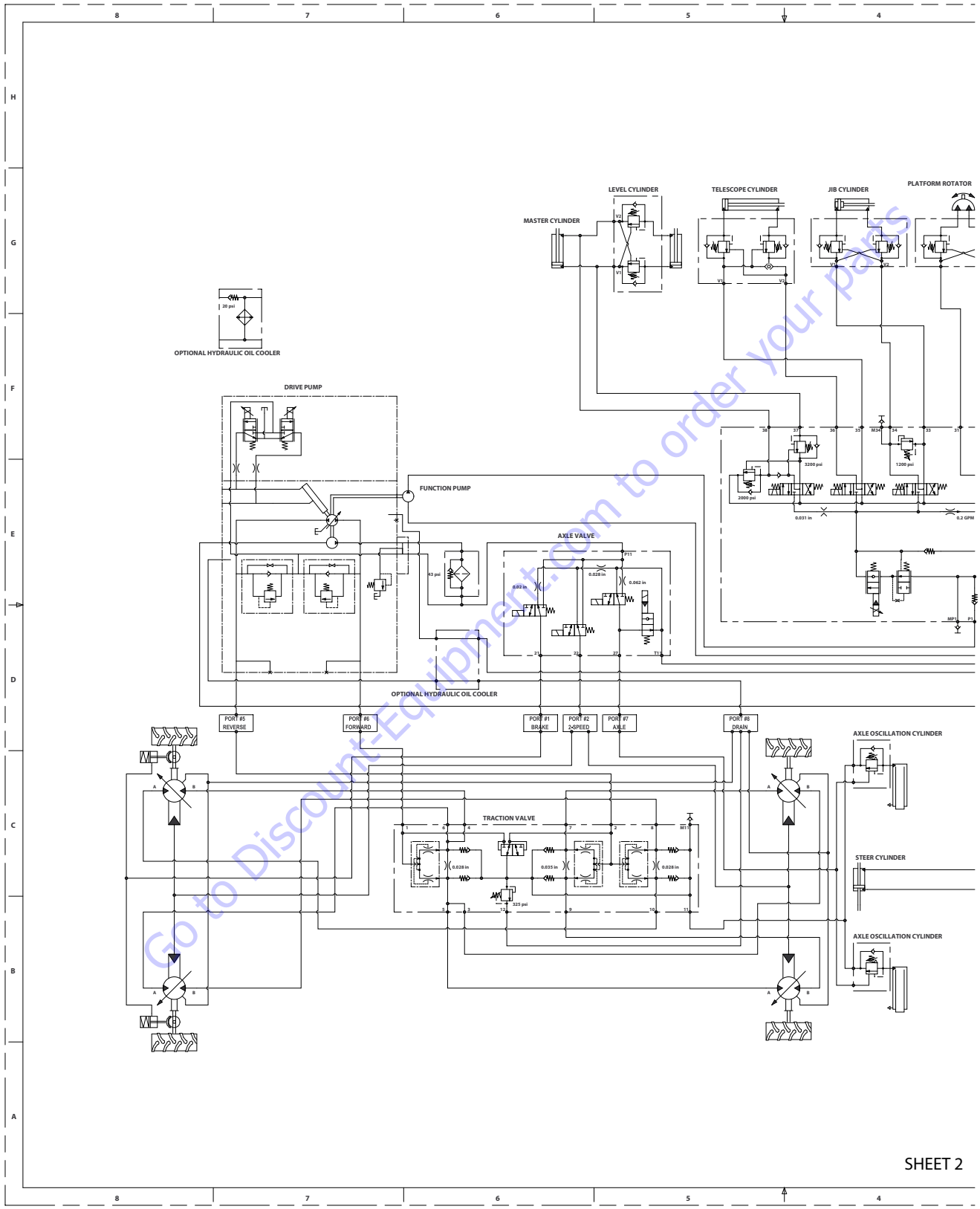


Figure 5-106. Hydraulic Schematic - Sheet 3 of 8

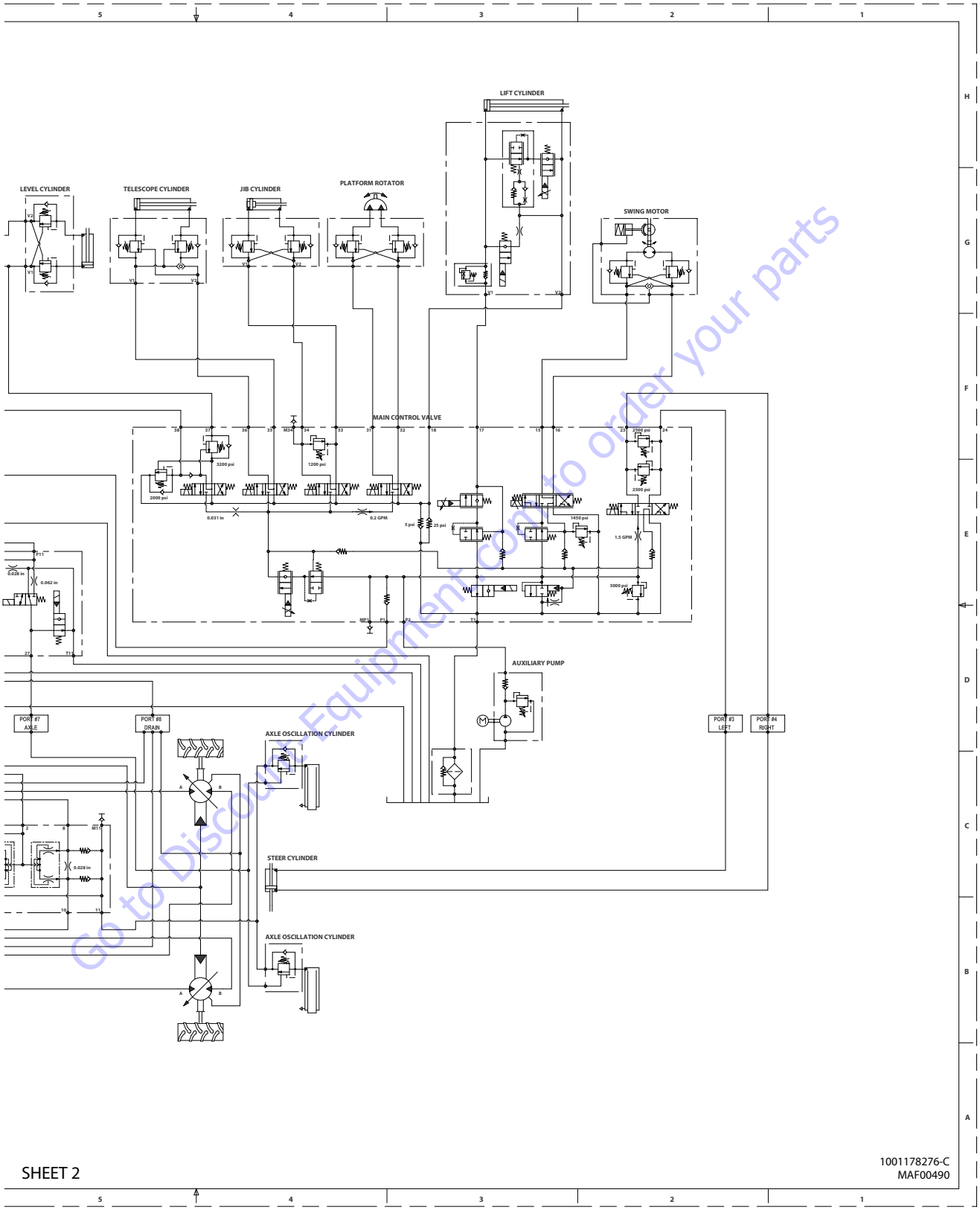


Figure 5-107. Hydraulic Schematic - Sheet 4 of 8

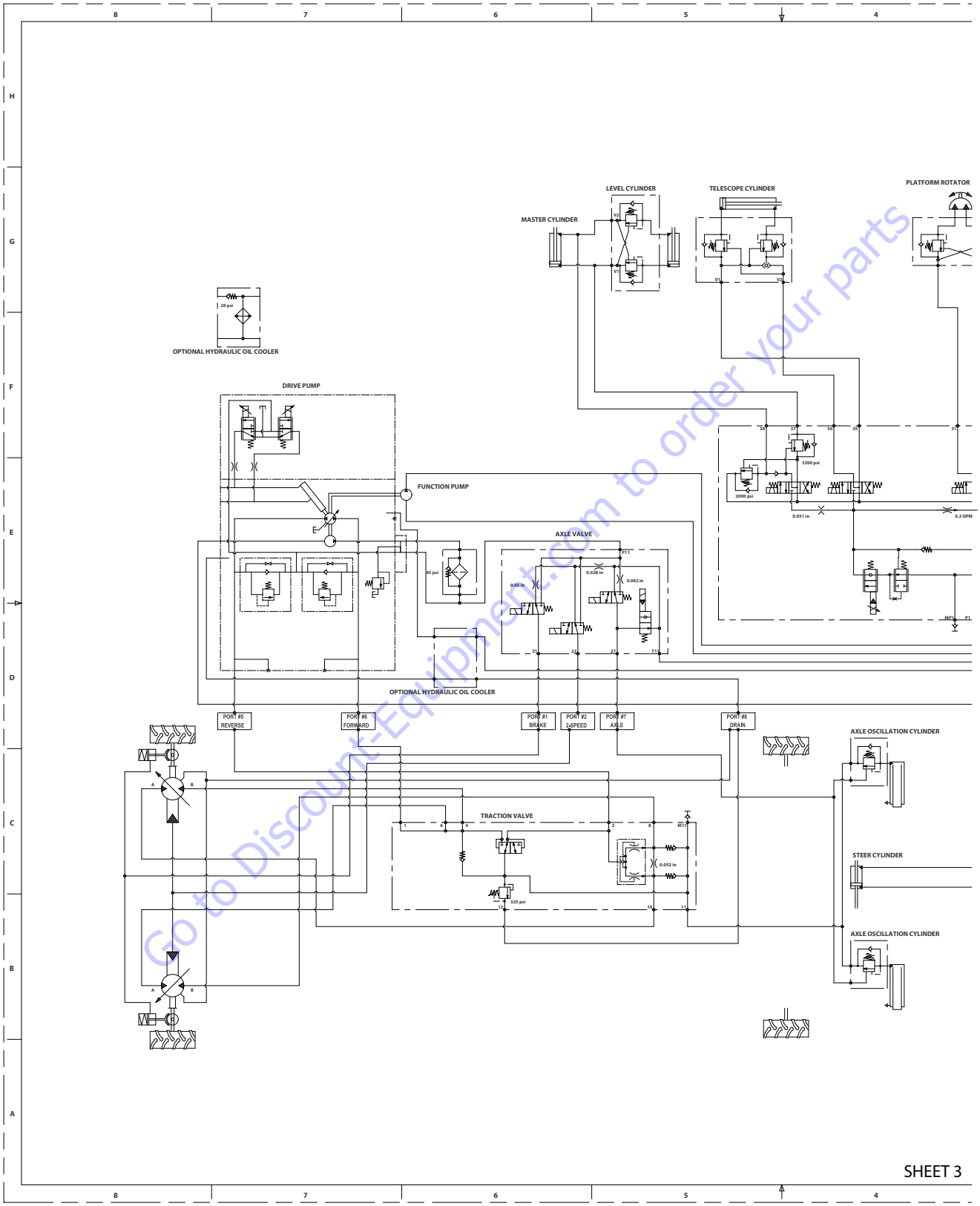


Figure 5-108. Hydraulic Schematic - Sheet 5 of 8

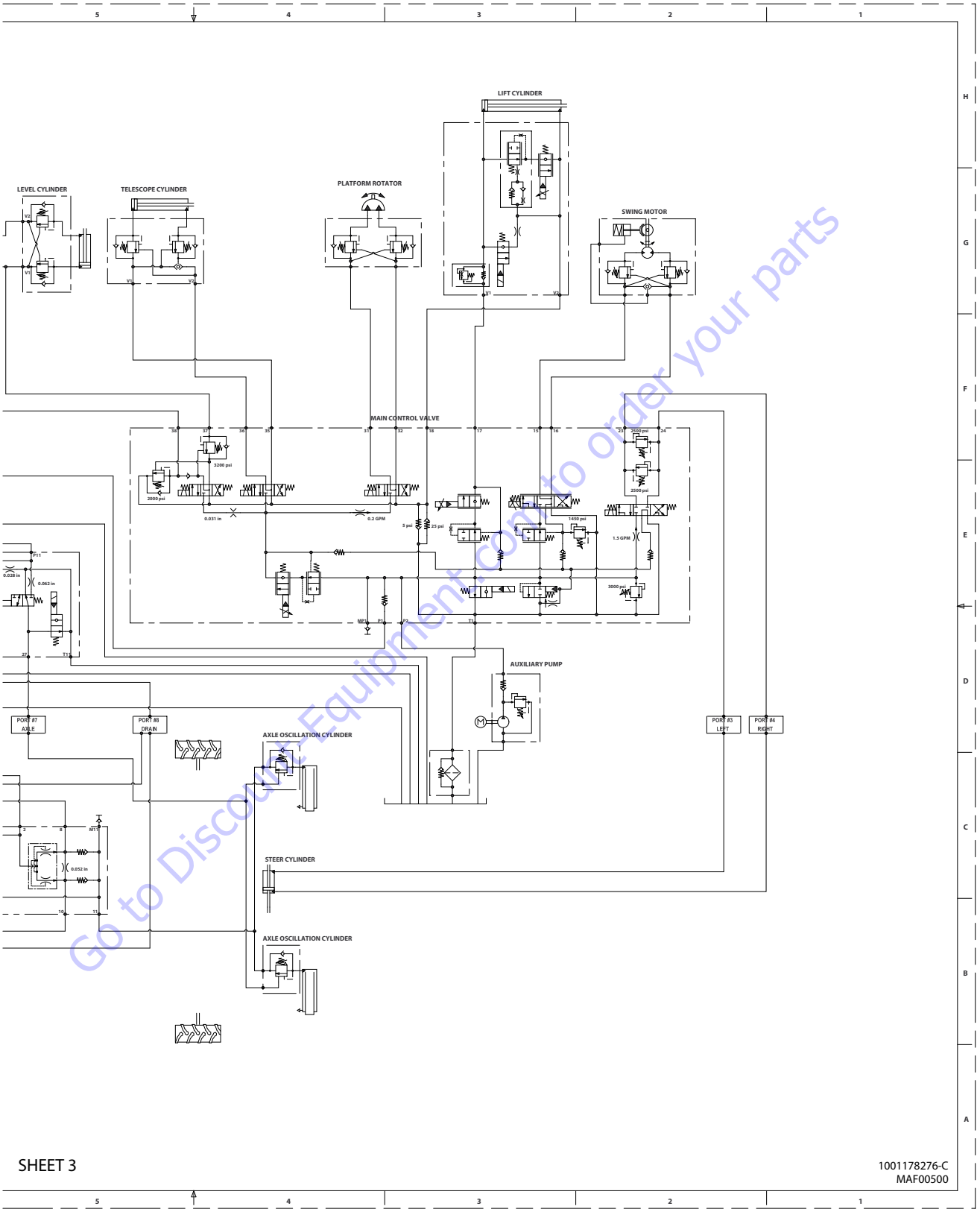


Figure 5-109. Hydraulic Schematic - Sheet 6 of 8

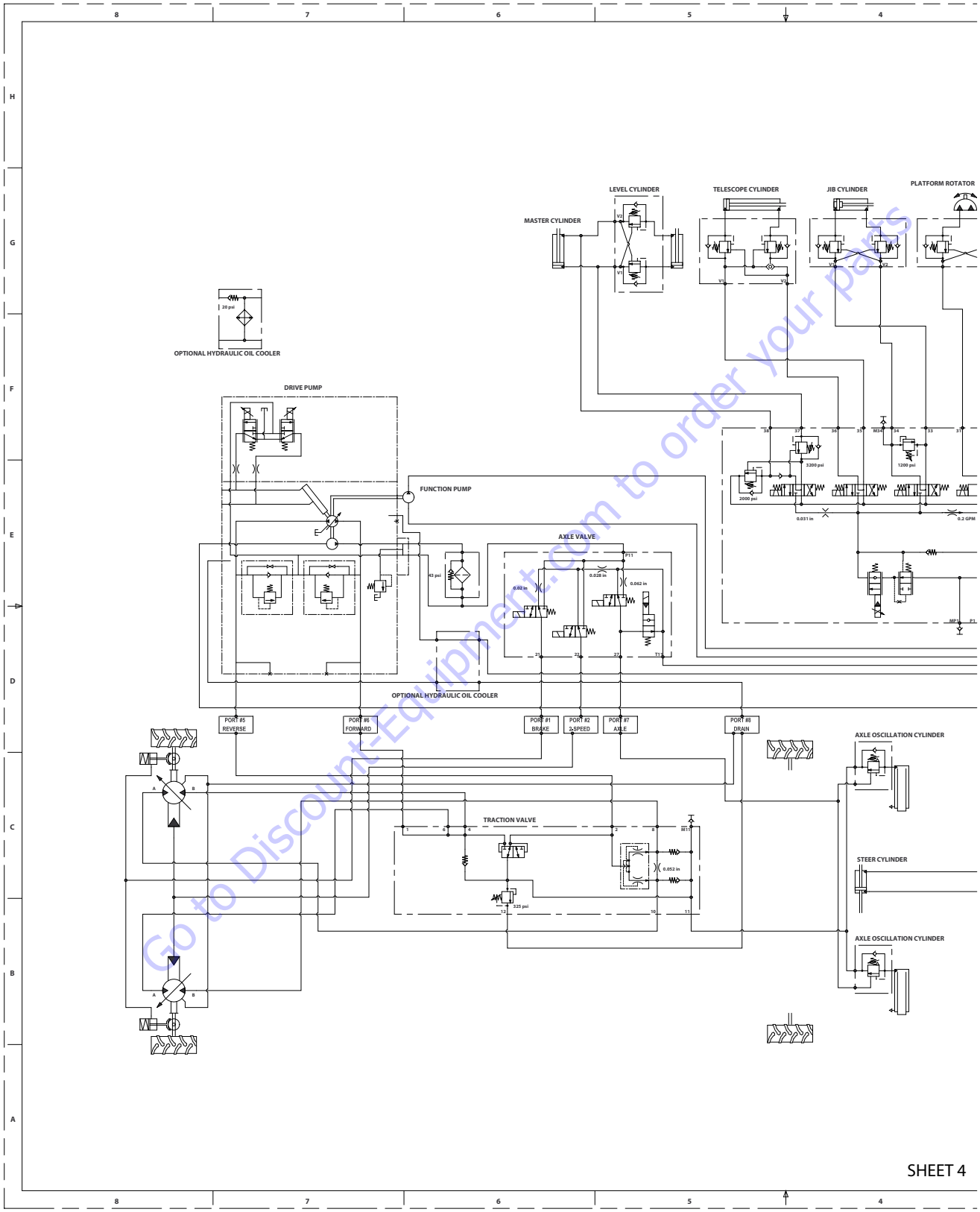


Figure 5-110. Hydraulic Schematic - Sheet 7 of 8

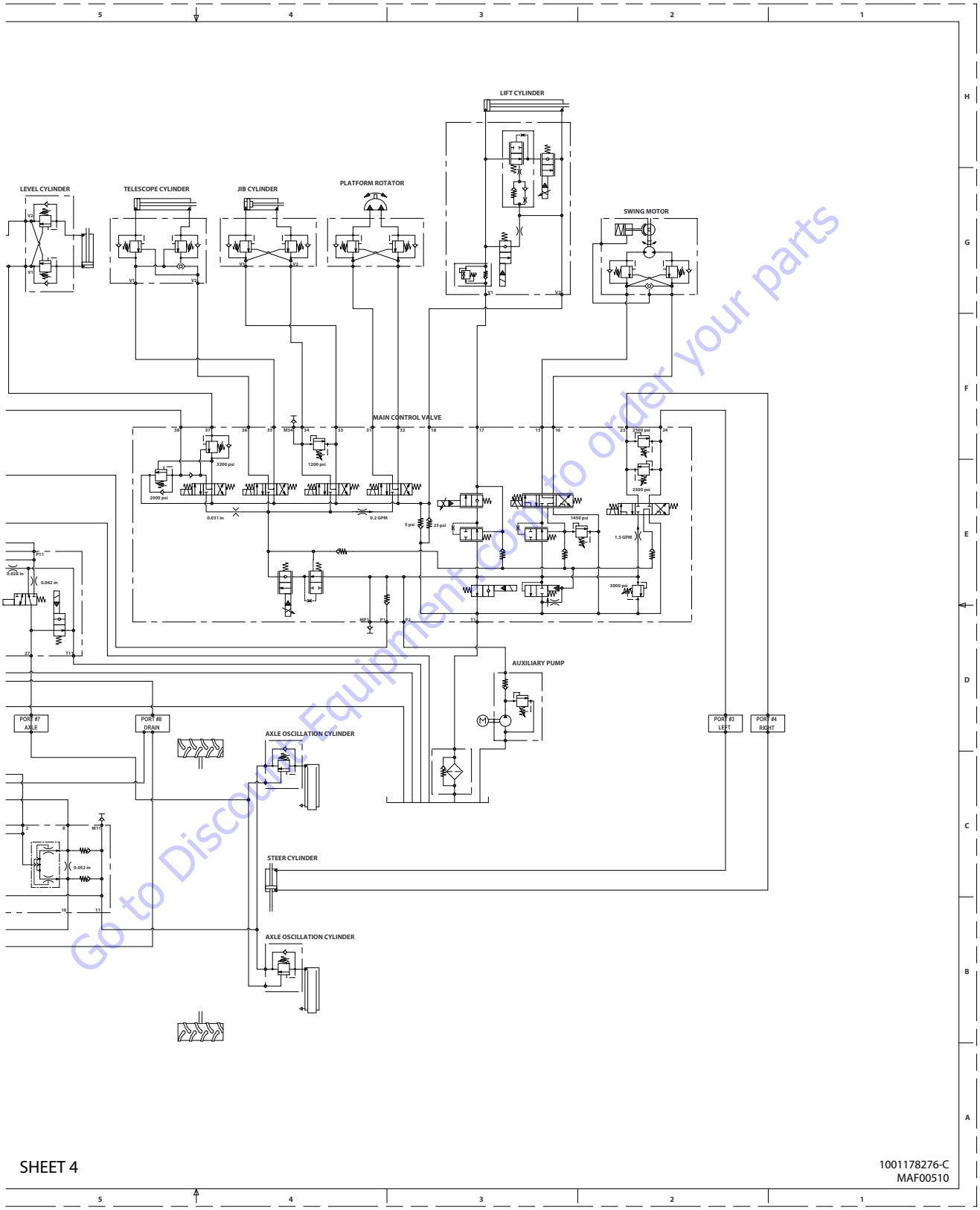
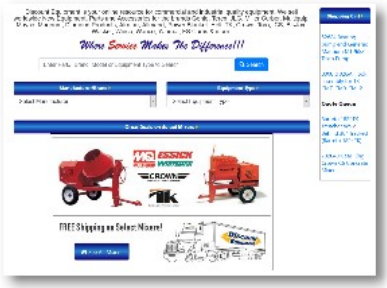


Figure 5-111. Hydraulic Schematic - Sheet 8 of 8

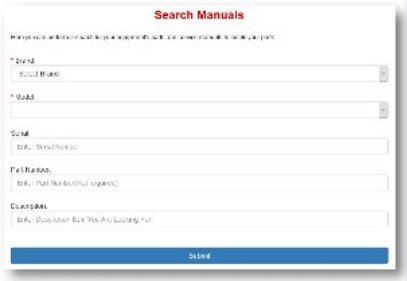
PARTS FINDER

Search Website by Part Number

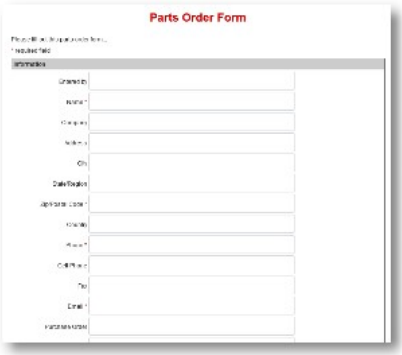
Discount Equipment



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



Can't Find Part or Manual? Request Help by Manufacturer, Model & Description



Discount-Equipment.com is your online resource for quality parts & equipment.

Florida: 561-964-4949 Outside Florida TOLL FREE: 877-690-3101

Need parts?

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

6.1 JLG CONTROL SYSTEM ANALYZER KIT INSTRUCTIONS

Introduction

NOTICE

WHEN INSTALLING A NEW POWER MODULE CONTROLLER ON THE MACHINE, IT WILL BE NECESSARY TO PROGRAM THE CONTROLLER FOR THE PROPER MACHINE CONFIGURATION, INCLUDING OPTIONS.

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

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

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

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

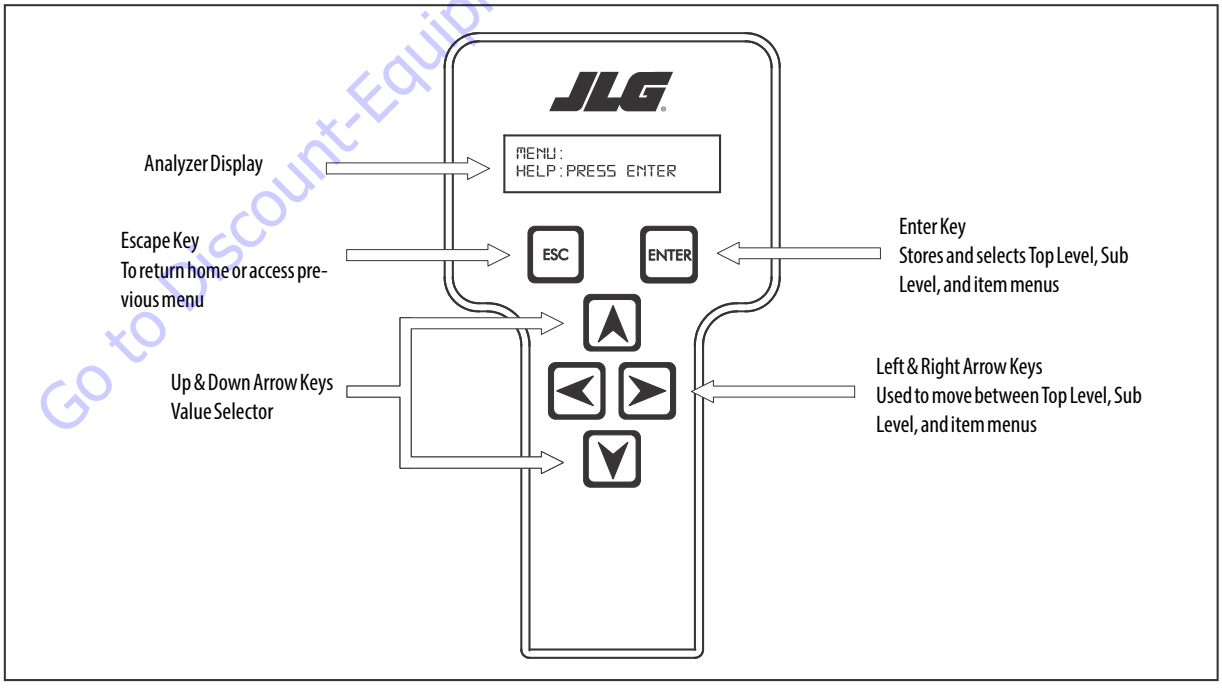


Figure 6-1. Hand Held Analyzer

To Connect the JLG Control System Analyzer

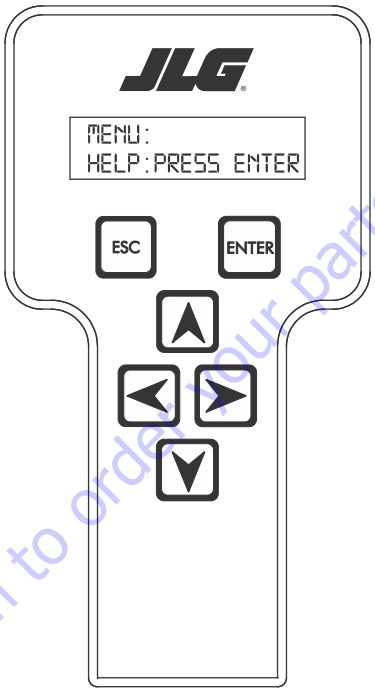
1. Connect the four pin end of the cable supplied with the analyzer, to the motor controller module located in the platform box or at the power module and connect the remaining end of the cable to the analyzer.

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.

Using the Analyzer

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



HELP:
PRESS ENTER

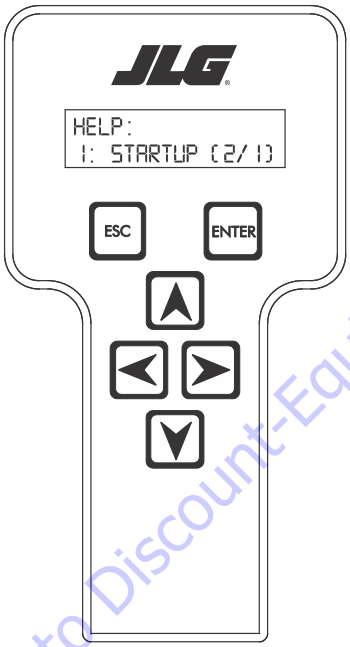
At this point, using the RIGHT  and LEFT  arrow keys, you can move between the top level menu items. To select a displayed menu item, press ENTER  . To cancel a selected menu item, press Escape  ; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

HELP
DIAGNOSTICS
ACTIVATE TEST
ACCESS LEVEL
PERSONALITIES
MACHINE SETUP
LEVEL VEHICLE (level 1 only)
CALIBRATIONS (view only)

If you press **ENTER** [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** [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 **ESCAPE** [ESC] two times. **STARTUP (2/1)** indicates a power up.

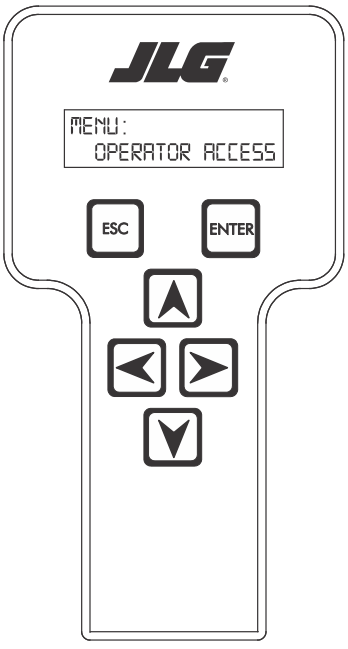
When a top level menu is selected, a new set of menu items may be offered: for example:

DRIVE
BOOM
SYSTEM
DATALOG
VERSIONS

Pressing **ENTER** [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 **ESCAPE** [ESC] key.

Changing the Access Level of the Hand Held Analyzer

When the analyzer is first connected, you will be in Operator Access 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:



ACCESS LEVEL:
CODE 00000

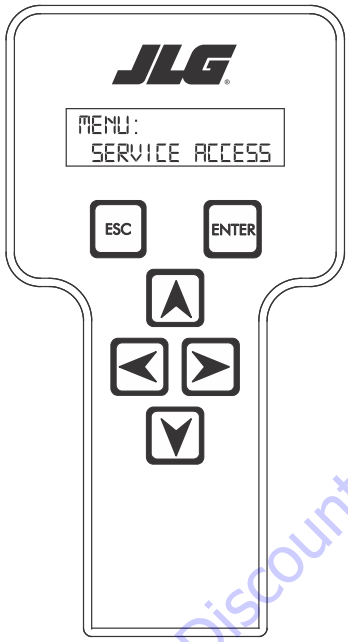
Press **ENTER** to select the **ACCESS LEVEL** menu.

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:

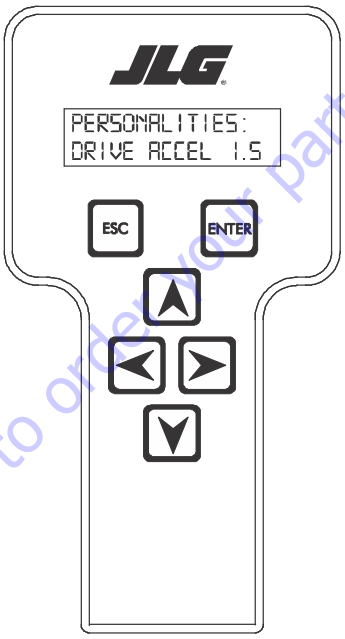


MENU:
SERVICE ACCESS

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

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:

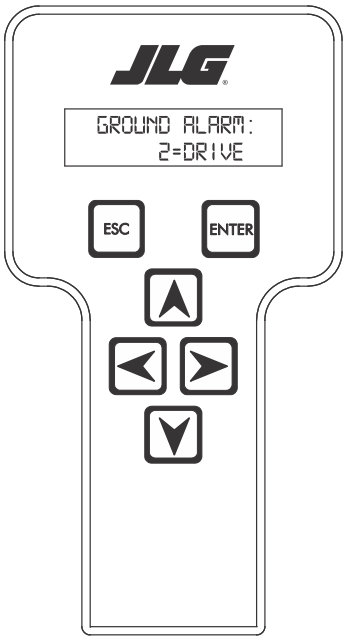


DRIVE:
ACCEL 1.5s

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 down arrows, check the access level to ensure you are at access level 1.

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 = DRIVE

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 driving. 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 Personality Ranges/Defaults 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.

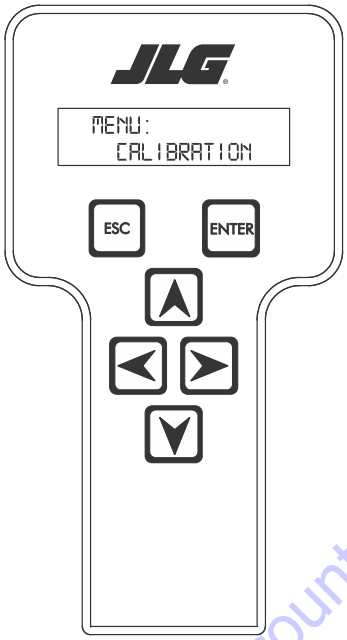
Tilt Sensor Calibration

Refer to Figure 6-2., Tilt Sensor Location.

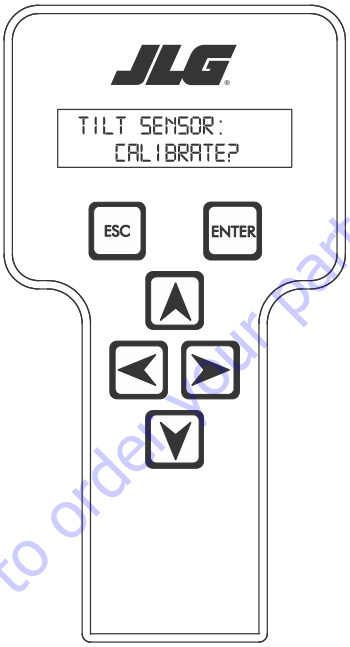
⚠ WARNING

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

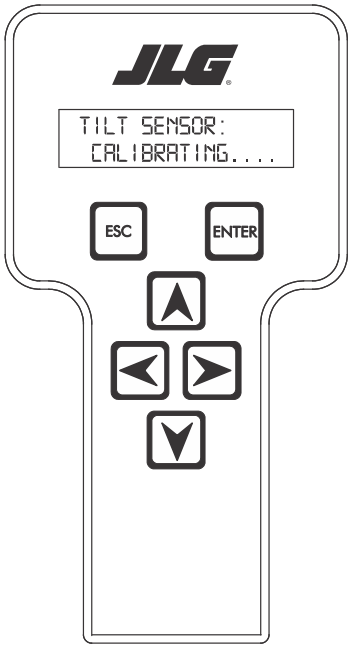
1. Place the machine on a firm, level surface.
2. Using the analyzer, go to Service Access level. Refer to Changing the Access Level of the Hand Held Analyzer in this section.
3. Using the arrow keys, navigate to Calibrations Menu as shown below and press **ENTER** (ENTER).



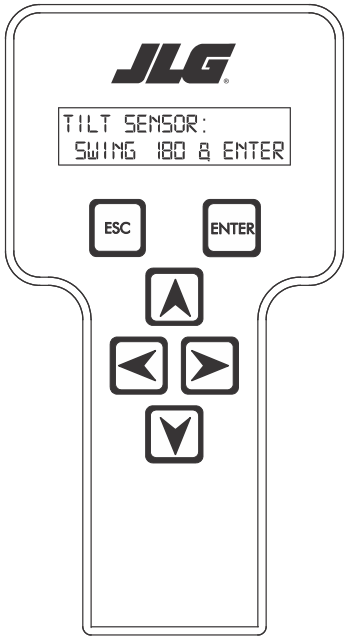
4. Using the arrow keys, navigate to the Tilt Sensor calibration as shown below and press **ENTER** (ENTER).



the screen will then read:

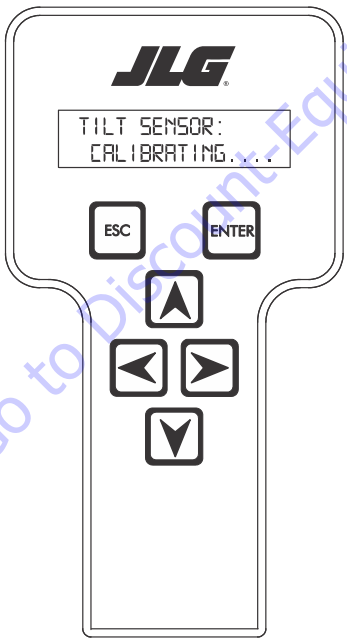


5. When the sensor is calibrated in that position, the screen will read:

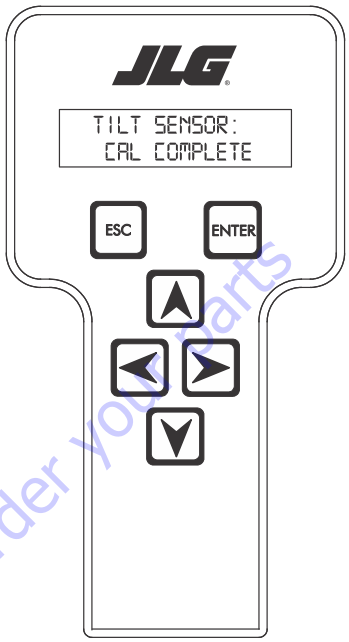


6. Swing the machine 180 degrees, making sure the boom is centered and in the transport position, and **ENTER** 

. The screen will read:



7. When the calibration is complete the screen will read as shown below. Return the machine to the travel position.



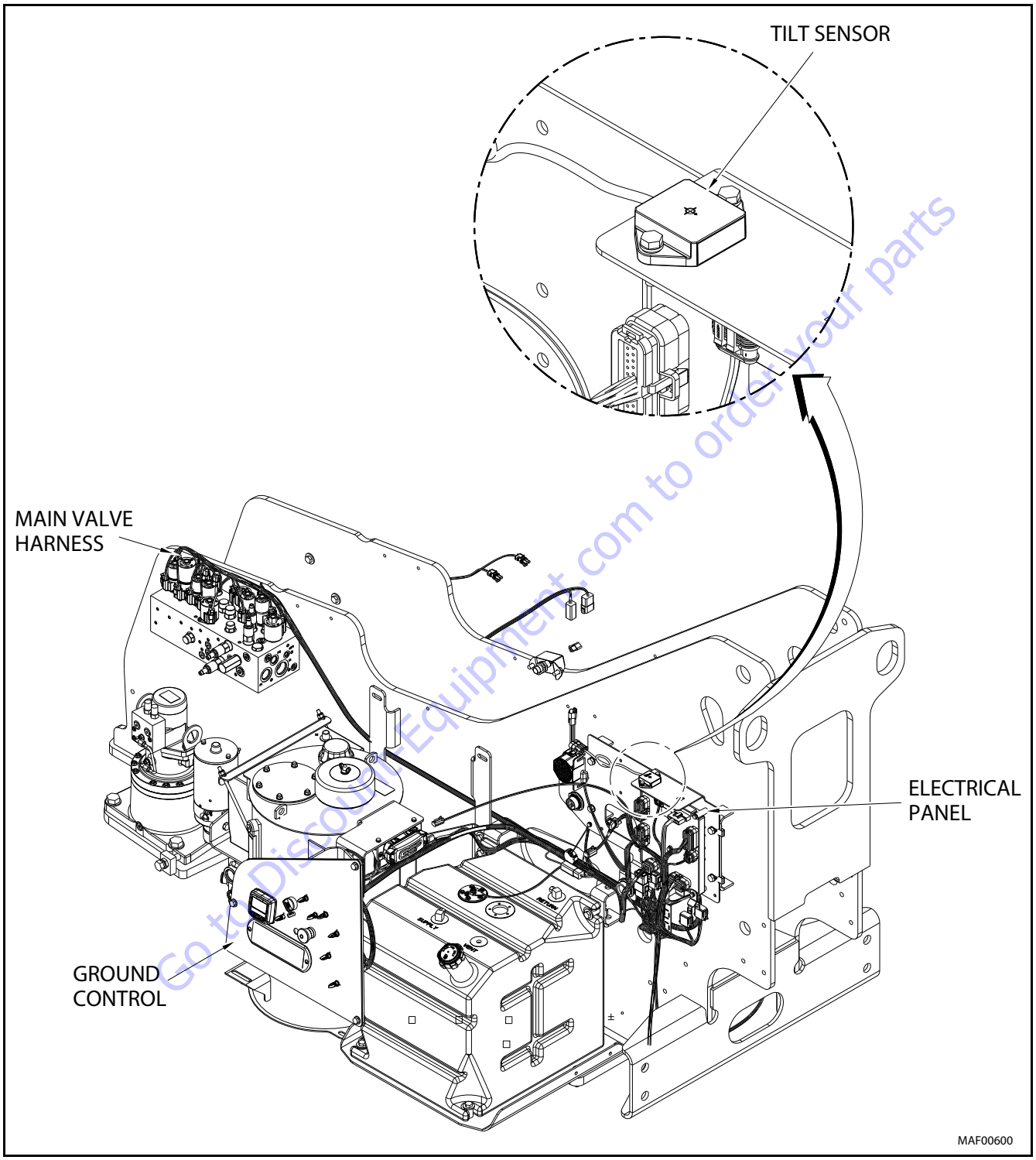


Figure 6-2. Tilt Sensor Location

Ground Control Console Display Gauge

(See Figure 6-6., Ground Control Console Display Gauge)

The Display Gauge shows engine hours, fuel level (if applicable), and Diagnostic Trouble Codes (DTCs) from both the JLG Control System and the engine control system. During machine start up, with no active DTCs in the control system, the splash screen will show for 3 seconds and then switch to main screen. If there is an active DTC while powering up the machine, the splash screen will show for 3 seconds, and then launch the Diagnostics Screen. The indicator lamp will light when there is an active DTC in the Fault Log.

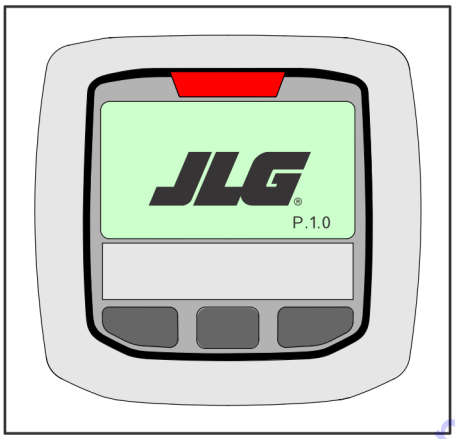


Figure 6-3. Splash Screen

The Diagnostic Screen will show active and inactive faults from the JLG Control System on the screen. An asterisk (*) will be displayed to show active faults.

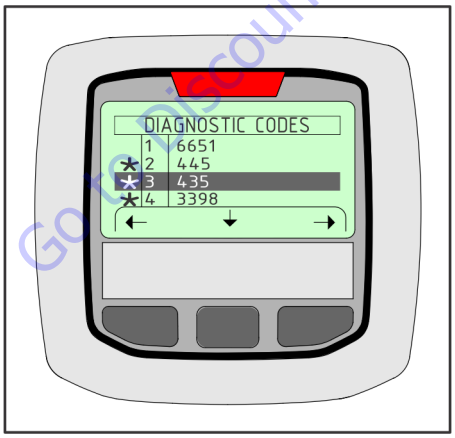


Figure 6-4. Diagnostic Screen

The Engine Diagnostics Screen will show SPN (Suspect Parameter Number), FMI (Failure Mode Identifier), and Occurrence count information. Engine SPN text is not scrollable. If there is more than one engine trouble code, the operator must exit from the Engine DTC Screen to see other SPN and FMI information.

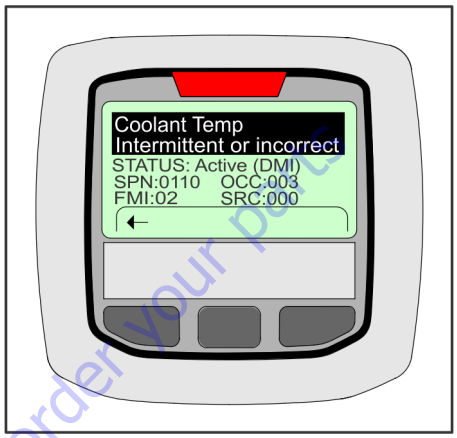


Figure 6-5. Engine Diagnostic Screen

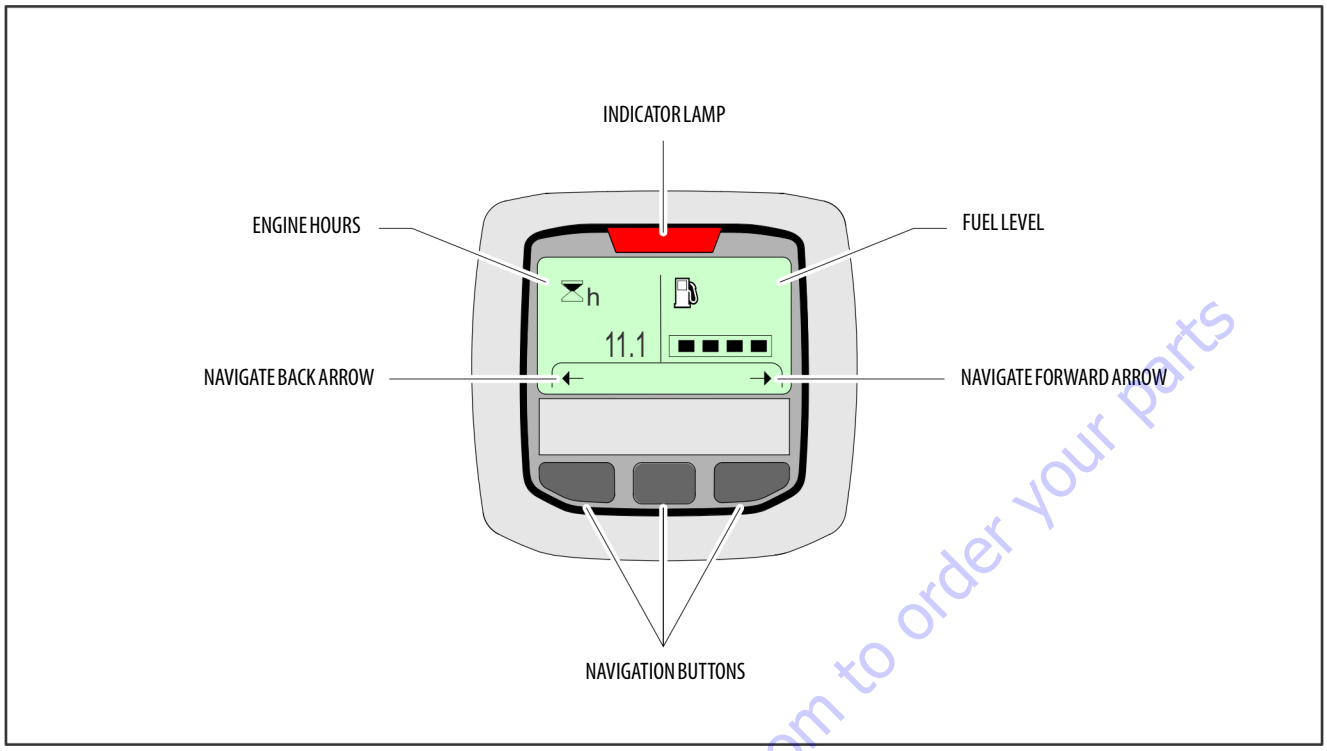


Figure 6-6. Ground Control Console Display Gauge

Table 6-1. Analyzer Abbreviations

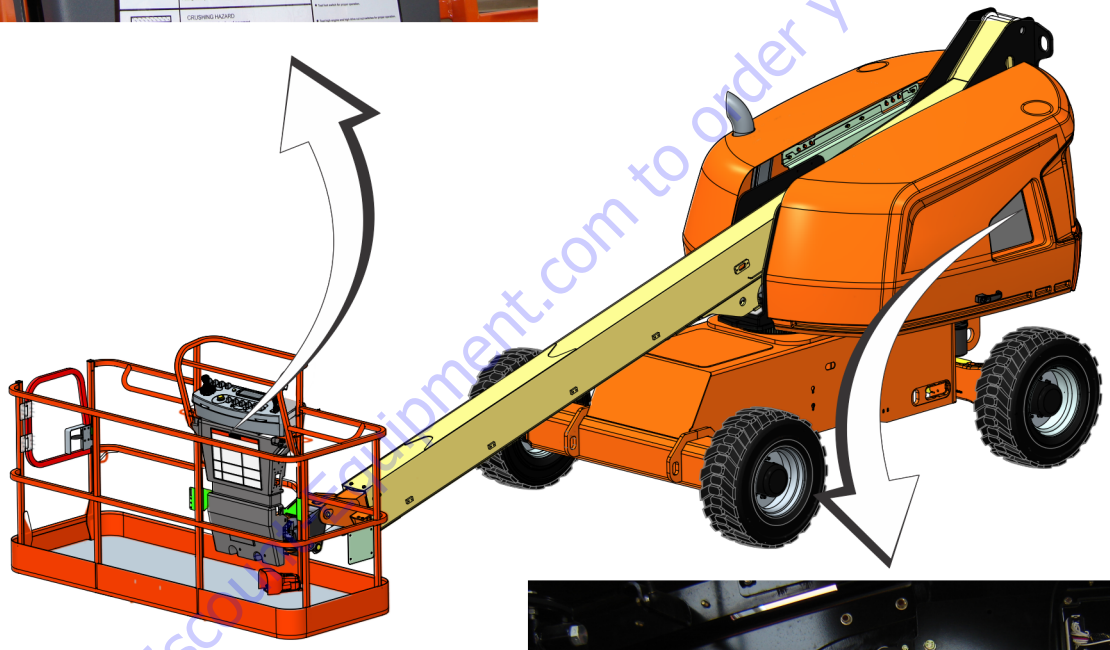
ABBREVIATION	MEANING
ACCEL	ACCELERATE
ACT	ACTIVE
A/D	ANALOG DIGITAL CONVERTER COUNT
AMB.	AMBIENT
ANG	ANGLE
AUX	AUXILIARY
BCS	BOOM CONTROL SYSTEM
BM	BOOM LENGTH ANGLE MODULE
BLAM	BOOM LENGTH ANGLE MODULE
BR	BROKEN
BSK	BASKET
CAL	CALIBRATION
CL	CLOSED
CM	CHASSIS MODULE
CNTL	CONTROL
CNTRL	CONTROL
C/O	CUT 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

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
GND	GROUND
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

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
S/C	SHORT CIRCUIT
SEL	SELECTOR
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



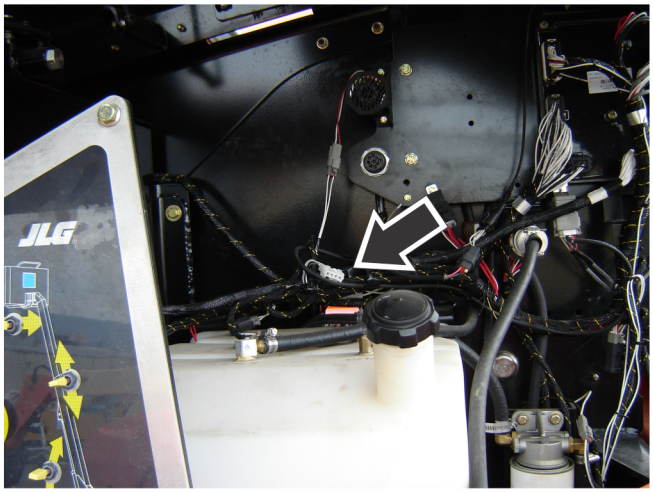
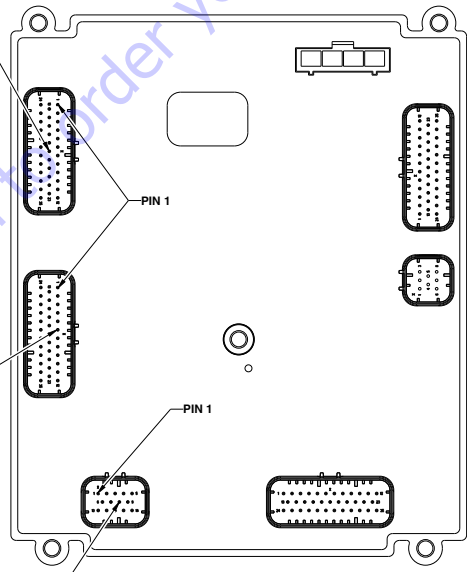


Figure 6-7. Analyzer Connecting Points

Connector	Pin	Function	Type	
J1 (Natural)	1	UNUSED (PROPORTIONAL FUEL RACK ACTUATOR)	DIGITAL	OUTPUT
	2	OSCILLATING AXLE VALVE #2	DIGITAL	OUTPUT
	3	DRIVE FORWARD / LEFT TRACK DRIVE FORWARD VALVE	DIGITAL	OUTPUT
	4	UNUSED (GROUND)	GROUND	INPUT
	5	UNUSED (GROUND)	GROUND	INPUT
	6	DRIVE REVERSE / LEFT TRACK DRIVE REVERSE VALVE	DIGITAL	OUTPUT
	7	OSCILLATING AXLE VALVE #1	DIGITAL	OUTPUT
	8	UNUSED (GROUND)	GROUND	INPUT
	9	MSSO SWITCH GROUND	GROUND	INPUT
	10	ECU POWER	DIGITAL	OUTPUT
	11	START RELAY	DIGITAL	OUTPUT
	12	ENGAGE GLOW PLUGS RELAY	DIGITAL	OUTPUT
	13	APU ENABLE RELAY	DIGITAL	OUTPUT
	14	UNUSED (ENGINE COOLANT TEMPERATURE SENSOR)	ANALOG	INPUT
	15	UNUSED (ENGINE OIL PRESSURE SENSOR)	ANALOG	INPUT
	16	UNUSED (ENGINE SPEED SENSOR)	FREQUENCY	INPUT
	17	UNUSED (ENGINE SPEED SENSOR GROUND)	GROUND	INPUT
	18	UNUSED (ENGINE GROUND)	GROUND	INPUT
	19	UNUSED (GROUND)	GROUND	INPUT
	20	2 SPEED VALVE	DIGITAL	OUTPUT
	21	UNUSED (TOWER ELEVATION SWITCH #2)	DIGITAL	INPUT
	22	GENERATOR ENABLE RELAY	DIGITAL	OUTPUT
	23	BRAKE VALVE	DIGITAL	OUTPUT
	24	UNUSED	N/C	N/C
	25	UNUSED (RESERVED FOR RS-485 HIGH)	SERIAL	I/O
	26	UNUSED (RESERVED FOR RS-485 LOW)	SERIAL	I/O
	27	BRAKE / 2 SPEED VALVE GROUND	GROUND	INPUT
	28	ANALYZER POWER	VOLTAGE	OUTPUT
	29	ANALYZER RS-232 RX	SERIAL	INPUT
	30	ANALYZER RS-232 TX	SERIAL	OUTPUT
	31	ANALYZER GROUND	GROUND	INPUT
	32	ALTERNATOR EXCITATION	DIGITAL	OUTPUT
	33	UNUSED (GROUND)	GROUND	INPUT
	34	TELESCOPE RETRACTED SWITCH #2	DIGITAL	INPUT
	35	CAPACITY LENGTH SWITCH #2	DIGITAL	INPUT

Connector	Pin	Function	Type	
J2 (Gray)	1	UNUSED (STEER DUMP VALVE)	DIGITAL	OUTPUT
	2	GROUND ALARM	DIGITAL	OUTPUT
	3	UNUSED (TOWER TELESCOPE IN VALVE)	DIGITAL	OUTPUT
	4	MAIN TELESCOPE IN VALVE	DIGITAL	OUTPUT
	5	PLATFORM LEVEL UP VALVE	DIGITAL	OUTPUT
	6	FUEL SENSOR GROUND	GROUND	INPUT
	7	PLATFORM LEVEL DOWN VALVE	DIGITAL	OUTPUT
	8	FRONT STEER RIGHT / RIGHT TRACK DRIVE REVERSE VALVE	DIGITAL	OUTPUT
	9	AUX MAIN LIFT DOWN / TOWER LIFT DOWN VALVE	DIGITAL	OUTPUT
	10	PLATFORM ROTATE LEFT VALVE	DIGITAL	OUTPUT
	11	MAIN LIFT UP VALVE	DIGITAL	OUTPUT
	12	JIB LIFT UP VALVE	DIGITAL	OUTPUT
	13	MAIN DUMP VALVE	DIGITAL	OUTPUT
	14	MAIN TELESCOPE / PLATFORM LEVEL VALVES GROUND	GROUND	INPUT
	15	UNUSED (TOWER TELESCOPE OUT VALVE)	DIGITAL	OUTPUT
	16	MAIN TELESCOPE OUT VALVE	DIGITAL	OUTPUT
	17	PLATFORM ROTATE / JIB LIFT VALVE GROUND	GROUND	INPUT
	18	UNUSED (STEER DUMP VALVE GROUND)	GROUND	INPUT
	19	FRONT LEFT STEER / RIGHT TRACK DRIVE FORWARD VALVE	DIGITAL	OUTPUT
	20	TOWER LIFT UP VALVE	DIGITAL	OUTPUT
	21	AUX MAIN LIFT DOWN / PLATFORM ROTATE RIGHT VALVE	DIGITAL	OUTPUT
	22	MAIN LIFT DOWN VALVE	DIGITAL	OUTPUT
	23	AUX TOWER LIFT DOWN / JIB LIFT DOWN VALVE	DIGITAL	OUTPUT
	24	UNUSED (CONFIGURATION #2)	DIGITAL	INPUT
	25	FUEL SENSOR SIGNAL	ANALOG	INPUT
	26	HEAD / TAIL LIGHT ENABLE RELAY	DIGITAL	OUTPUT
	27	GROUND ALARM / HORN OUTPUT	DIGITAL	OUTPUT
	28	STEER VALVES GROUND	GROUND	INPUT
	29	GROUND ALARM GROUND	GROUND	INPUT
	30	MAIN DUMP VALVE GROUND	GROUND	INPUT
	31	FLOW CONTROL VALVE	DIGITAL	OUTPUT
	32	UNUSED (REAR STEER RIGHT VALVE)	DIGITAL	OUTPUT
	33	UNUSED (REAR STEER LEFT VALVE)	DIGITAL	OUTPUT
	34	SWING LEFT VALVE	DIGITAL	OUTPUT
	35	SWING RIGHT VALVE	DIGITAL	OUTPUT

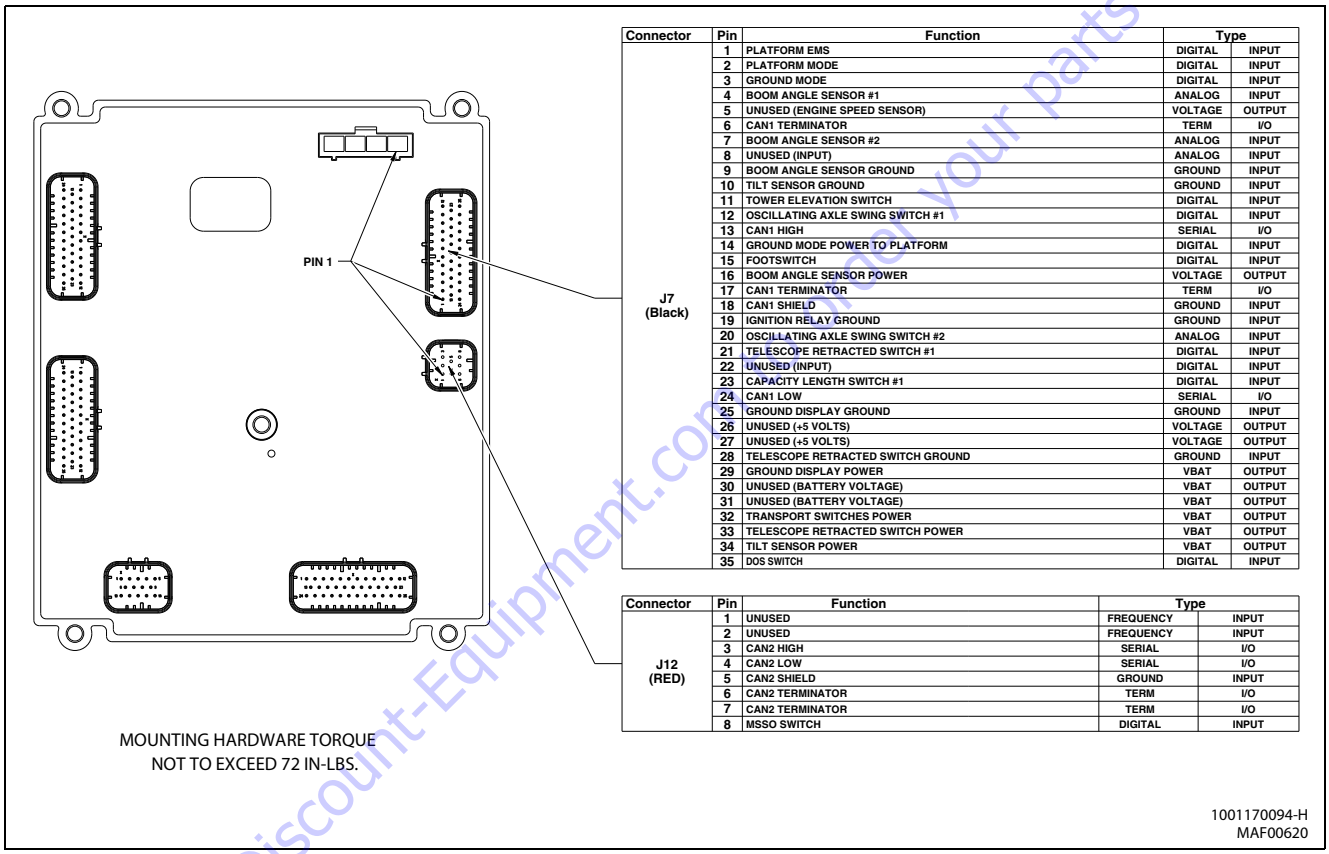
Connector	Pin	Function	Type	
J3 (Black)	1	DRIVE / LEFT TRACK DRIVE VALVES CURRENT FEEDBACK	GROUND	INPUT
	2	AUX DOWN / RIGHT TRACK DRIVE VALVES CURRENT FEEDBACK	GROUND	INPUT
	3	UNUSED (CABLE BRAKE SWITCH GROUND)	GROUND	INPUT
	4	SWING VALVES CURRENT FEEDBACK	GROUND	INPUT
	5	TOWER LIFT / AUX DOWN VALVES CURRENT FEEDBACK	GROUND	INPUT
	6	FLOW CONTROL VALVE CURRENT FEEDBACK	GROUND	INPUT
	7	GROUND ALARM POWER	VBAT	OUTPUT
	8	UNUSED (CABLE BRAKE SWITCH)	DIGITAL	INPUT
	9	CRIBBING ENABLE SWITCH	DIGITAL	INPUT
	10	UNUSED (INPUT)	DIGITAL	INPUT
	11	UNUSED (CONFIGURATION #1)	DIGITAL	INPUT
	12	UNUSED (+5 VOLTS)	VOLTAGE	OUTPUT
	13	UNUSED (INPUT)	ANALOG	INPUT
	14	MAIN LIFT VALVES CURRENT FEEDBACK	GROUND	INPUT



MOUNTING HARDWARE TORQUE
NOT TO EXCEED 72 IN-LBS.

1001170094-H
MAF00610

Figure 6-8. Ground Control Module - Sheet 1 of 3

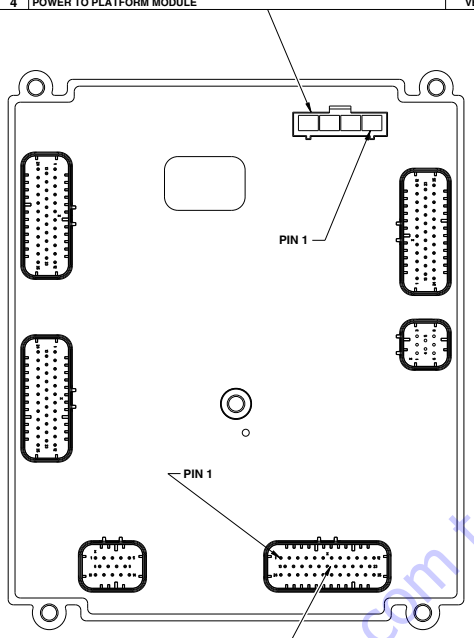


Connector	Pin	Function	Type	
J7 (Black)	1	PLATFORM EMS	DIGITAL	INPUT
	2	PLATFORM MODE	DIGITAL	INPUT
	3	GROUND MODE	DIGITAL	INPUT
	4	BOOM ANGLE SENSOR #1	ANALOG	INPUT
	5	UNUSED (ENGINE SPEED SENSOR)	VOLTAGE	OUTPUT
	6	CAN1 TERMINATOR	TERM	I/O
	7	BOOM ANGLE SENSOR #2	ANALOG	INPUT
	8	UNUSED (INPUT)	ANALOG	INPUT
	9	BOOM ANGLE SENSOR GROUND	GROUND	INPUT
	10	TILT SENSOR GROUND	GROUND	INPUT
	11	TOWER ELEVATION SWITCH	DIGITAL	INPUT
	12	OSCILLATING AXLE SWING SWITCH #1	DIGITAL	INPUT
	13	CAN1 HIGH	SERIAL	I/O
	14	GROUND MODE POWER TO PLATFORM	DIGITAL	INPUT
	15	FOOTSWITCH	DIGITAL	INPUT
	16	BOOM ANGLE SENSOR POWER	VOLTAGE	OUTPUT
	17	CAN1 TERMINATOR	TERM	I/O
	18	CAN1 SHIELD	GROUND	INPUT
	19	IGNITION RELAY GROUND	GROUND	INPUT
	20	OSCILLATING AXLE SWING SWITCH #2	ANALOG	INPUT
	21	TELESCOPE RETRACTED SWITCH #1	DIGITAL	INPUT
	22	UNUSED (INPUT)	DIGITAL	INPUT
	23	CAPACITY LENGTH SWITCH #1	DIGITAL	INPUT
	24	CAN1 LOW	SERIAL	I/O
	25	GROUND DISPLAY GROUND	GROUND	INPUT
	26	UNUSED (+5 VOLTS)	VOLTAGE	OUTPUT
	27	UNUSED (+5 VOLTS)	VOLTAGE	OUTPUT
	28	TELESCOPE RETRACTED SWITCH GROUND	GROUND	INPUT
	29	GROUND DISPLAY POWER	VBAT	OUTPUT
	30	UNUSED (BATTERY VOLTAGE)	VBAT	OUTPUT
	31	UNUSED (BATTERY VOLTAGE)	VBAT	OUTPUT
	32	TRANSPORT SWITCHES POWER	VBAT	OUTPUT
	33	TELESCOPE RETRACTED SWITCH POWER	VBAT	OUTPUT
	34	TILT SENSOR POWER	VBAT	OUTPUT
	35	DOS SWITCH	DIGITAL	INPUT

Connector	Pin	Function	Type	
J12 (RED)	1	UNUSED	FREQUENCY	INPUT
	2	UNUSED	FREQUENCY	INPUT
	3	CAN2 HIGH	SERIAL	I/O
	4	CAN2 LOW	SERIAL	I/O
	5	CAN2 SHIELD	GROUND	INPUT
	6	CAN2 TERMINATOR	TERM	I/O
	7	CAN2 TERMINATOR	TERM	I/O
	8	MSSO SWITCH	DIGITAL	INPUT

Figure 6-9. Ground Control Module - Sheet 2 of 3

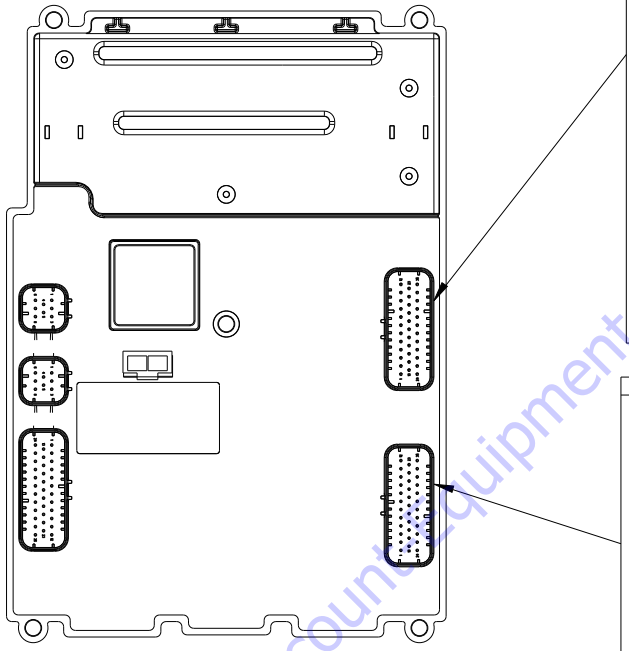
Connector	Pin	Function	Type	
J8 (Black)	1	MODULE GROUND	GROUND	OUTPUT
	2	MODULE POWER	VBAT	INPUT
	3	GROUND TO PLATFORM MODULE	GROUND	INPUT
	4	POWER TO PLATFORM MODULE	VBAT	OUTPUT



Connector	Pin	Function	Type	
J4 (Blue)	1	CRIBBING ENGAGED INDICATOR	DIGITAL	OUTPUT
	2	SYSTEM DISTRESS INDICATOR	DIGITAL	OUTPUT
	3	GLOWPLUG INDICATOR	DIGITAL	OUTPUT
	4	ENGINE START SWITCH	DIGITAL	INPUT
	5	PLATFORM LEVEL DOWN SWITCH	DIGITAL	INPUT
	6	PLATFORM ROTATE LEFT SWITCH	DIGITAL	INPUT
	7	MAIN TELESCOPE IN SWITCH	DIGITAL	INPUT
	8	JIB LIFT DOWN SWITCH	DIGITAL	INPUT
	9	UNUSED (JIB LEFT SWITCH)	DIGITAL	INPUT
	10	TOWER LIFT UP SWITCH	DIGITAL	INPUT
	11	UNUSED (TOWER TELESCOPE IN SWITCH)	DIGITAL	INPUT
	12	UNUSED (OUTPUT)	DIGITAL	OUTPUT
	13	LOW FUEL INDICATOR	DIGITAL	OUTPUT
	14	PLATFORM OVERLOADED INDICATOR	DIGITAL	OUTPUT
	15	UNUSED (BOOM MALFUNCTION INDICATOR)	DIGITAL	OUTPUT
	16	AUXILIARY POWER / FUNCTION ENABLE SWITCH	DIGITAL	INPUT
	17	PLATFORM LEVEL UP SWITCH	DIGITAL	INPUT
	18	PLATFORM ROTATE RIGHT SWITCH	DIGITAL	INPUT
	19	JIB LIFT UP SWITCH	DIGITAL	INPUT
	20	UNUSED (JIB RIGHT SWITCH)	DIGITAL	INPUT
	21	TOWER LIFT DOWN SWITCH	DIGITAL	INPUT
	22	UNUSED (TOWER TELESCOPE OUT SWITCH)	DIGITAL	INPUT
	23	MAIN LIFT UP SWITCH	DIGITAL	INPUT
	24	UNUSED (BATTERY VOLTAGE)	VBAT	OUTPUT
	25	SWITCHES POWER	VBAT	OUTPUT
	26	BATTERY LOW / NOT CHARGING INDICATOR	DIGITAL	OUTPUT
	27	UNUSED (OUTPUT)	DIGITAL	OUTPUT
	28	ENGINE HIGH COOLANT TEMPERATURE INDICATOR	DIGITAL	OUTPUT
	29	ENGINE LOW OIL PRESSURE INDICATOR	DIGITAL	OUTPUT
	30	MAIN TELESCOPE OUT SWITCH	DIGITAL	INPUT
	31	INDICATORS GROUND	GROUND	INPUT
	32	INDICATORS GROUND	GROUND	INPUT
	33	MAIN LIFT DOWN SWITCH	DIGITAL	INPUT
	34	SWING LEFT SWITCH	DIGITAL	INPUT
	35	SWING RIGHT SWITCH	DIGITAL	INPUT

1001170094-H
MAF00630

Figure 6-10. Ground Control Module - Sheet 3 of 3



CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J2 GRAY	1	UNUSED (JIB RIGHT SWITCH)	DIGITAL INPUT
	2	UNUSED (JIB LEFT SWITCH)	DIGITAL INPUT
	3	UNUSED (POWER)	HS DIGITAL INPUT
	4	DOS OVERRIDE SWITCH	HS DIGITAL INPUT
	5	UNUSED	LAMP OUTPUT
	6	CHASSIS TILTED INDICATOR	LAMP OUTPUT
	7	FUNCTION ENABLE INDICATOR	LAMP OUTPUT
	8	VEHICLE SYSTEM DISTRESS INDICATOR	LAMP OUTPUT
	9	CREEP SPEED INDICATOR	LAMP OUTPUT
	10	UNUSED (BROKEN CABLE INDICATOR)	LAMP OUTPUT
	11	PLATFORM OVERLOADED INDICATOR	LAMP OUTPUT
	12	500 / 600 LB CAPACITY INDICATOR	LAMP OUTPUT
	13	1000 LB CAPACITY INDICATOR	LAMP OUTPUT
	14	DOS INDICATOR	LAMP OUTPUT
	15	GENERATOR ON INDICATOR	LAMP OUTPUT
	16	SOFT TOUCH / SKYGUARD INDICATOR	LAMP OUTPUT
	17	GLOW PLUG ENGAGED INDICATOR	LAMP OUTPUT
	18	INDICATOR GROUND	GROUND
	19	UNUSED (LOW BATTERY INDICATOR)	LAMP OUTPUT
	20	UNUSED	LAMP OUTPUT
	21	LOW FUEL INDICATOR	LAMP OUTPUT
	22	1/4 FUEL LEVEL INDICATOR	LAMP OUTPUT
	23	3/4 FUEL LEVEL INDICATOR	LAMP OUTPUT
	24	1/2 FUEL LEVEL INDICATOR	LAMP OUTPUT
	25	INDICATOR GROUND	GROUND
	26	ANALYZER POWER	ANALYZER POWER
	27	ANALYZER GROUND	ANALYZER GROUND
	28	ANALYZER RX	ANALYZER RX
	29	ANALYZER TX	ANALYZER TX
	30	UNUSED (POWER)	BATTERY VOLTAGE
	31	SOFT TOUCH POWER	BATTERY VOLTAGE
	32	LSS POWER	BATTERY VOLTAGE
	33	OPTION POWER	BATTERY VOLTAGE
	34	UNUSED (POWER)	BATTERY VOLTAGE
	35	FULL FUEL LEVEL INDICATOR	LAMP OUTPUT

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J1 NATURAL	1	TOWER LIFT UP SWITCH	DIGITAL INPUT
	2	TOWER LIFT DOWN SWITCH	DIGITAL INPUT
	3	UNUSED (TOWER TELESCOPE IN SWITCH)	DIGITAL INPUT
	4	UNUSED (TOWER TELESCOPE OUT SWITCH)	DIGITAL INPUT
	5	MAIN TELESCOPE IN SWITCH	DIGITAL INPUT
	6	MAIN TELESCOPE OUT SWITCH	DIGITAL INPUT
	7	PLATFORM ROTATE RIGHT SWITCH	DIGITAL INPUT
	8	PLATFORM ROTATE LEFT SWITCH	DIGITAL INPUT
	9	PLATFORM LEVEL UP SWITCH	DIGITAL INPUT
	10	PLATFORM LEVEL DOWN SWITCH	DIGITAL INPUT
	11	JIB LIFT UP SWITCH	DIGITAL INPUT
	12	JIB LIFT DOWN SWITCH	DIGITAL INPUT
	13	SPEED PUMP POTENTIOMETER GROUND	GROUND
	14	ENGINE START SWITCH	DIGITAL INPUT
	15	AUXILIARY POWER SWITCH	DIGITAL INPUT
	16	UNUSED (CRAB STEER SELECT SWITCH)	DIGITAL INPUT
	17	UNUSED (COORDINATED STEER SELECT SWITCH)	DIGITAL INPUT
	18	SWITCH POWER	BATTERY VOLTAGE
	19	UNUSED	DIGITAL INPUT
	20	SOFT TOUCH SWITCH	DIGITAL INPUT
	21	UNUSED (CAPACITY SELECT SWITCH)	DIGITAL INPUT
	22	UNUSED	DIGITAL INPUT
	23	SKYGUARD INPUT #2 SWITCH	DIGITAL INPUT
	24	UNUSED	DIGITAL INPUT
	25	UNUSED	DIGITAL INPUT
	26	UNUSED	DIGITAL INPUT
	27	MAX SPEED SWITCH	DIGITAL INPUT
	28	MAX TORQUE SWITCH	DIGITAL INPUT
	29	SOFT TOUCH / SKYGUARD OVERRIDE BUTTON	DIGITAL INPUT
	30	HEAD / TAIL LIGHT SWITCH	DIGITAL INPUT
	31	HORN BUTTON	DIGITAL INPUT
	32	CREEP SWITCH	DIGITAL INPUT
	33	FUEL SELECT SWITCH	DIGITAL INPUT
	34	SPEED PUMP POTENTIOMETER POWER	+7 REFERENCE VOLTAGE
	35	SPEED PUMP POTENTIOMETER SIGNAL	DIGITAL INPUT

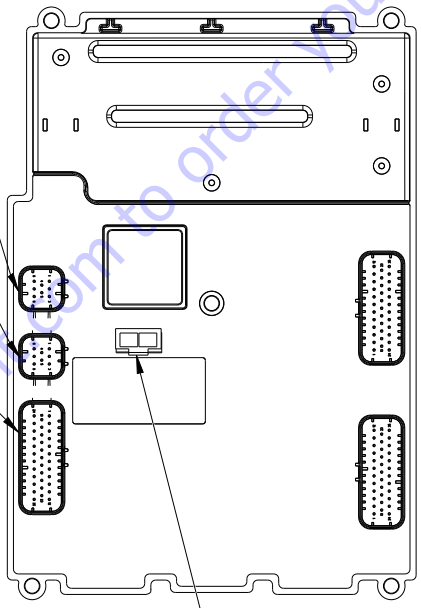
1001157196-F
MAF01160

Figure 6-11. Platform Module - Sheet 1 of 2

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J5 NATURAL	1	LIFT / SWING JOYSTICK POWER	SUPPLY VOLTAGE
	2	LIFT CENTER TAP	INPUT
	3	LIFT SIGNAL	INPUT
	4	SWING SIGNAL	INPUT
	5	SWING CENTER TAP	INPUT
	6	UNUSED	INPUT
	7	LIFT / SWING JOYSTICK GROUND	GROUND
	8	UNUSED (GROUND)	GROUND

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J6 BLACK	1	DRIVE / STEER JOYSTICK POWER	SUPPLY VOLTAGE
	2	DRIVE CENTER TAP	INPUT
	3	DRIVE SIGNAL	INPUT
	4	STEER SIGNAL	INPUT
	5	STEER LEFT	INPUT
	6	STEER RIGHT	INPUT
	7	DRIVE / STEER JOYSTICK GROUND	GROUND
	8	UNUSED (GROUND)	GROUND

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J7 BLACK	1	GROUND MODE	GROUND MODE
	2	PLATFORM EMS	PLATFORM EMS
	3	PLATFORM EMS TO GROUND MODULE	PLATFORM MODE
	4	FOOTSWITCH POWER	BATTERY VOLTAGE
	5	GENERATOR SWITCH POWER	BATTERY VOLTAGE
	6	UNUSED (JIB BLOCK LIMIT SWITCH POWER)	BATTERY VOLTAGE
	7	SKYGUARD POWER	BATTERY VOLTAGE
	8	FOOTSWITCH DISENGAGE	DIGITAL INPUT
	9	GENERATOR SWITCH	DIGITAL INPUT
	10	UNUSED (+7 VOLTS)	+7 REFERENCE VOLTAGE
	11	UNUSED	ANALOG INPUT
	12	UNUSED	ANALOG INPUT
	13	UNUSED	ANALOG INPUT
	14	UNUSED (GROUND)	GROUND
	15	UNUSED (+7 VOLTS)	+7 REFERENCE VOLTAGE
	16	LSS GROUND	GROUND
	17	UNUSED (JIB BLOCK LIMIT SWITCH)	HS DIGITAL INPUT
	18	SKYGUARD INPUT #1 SWITCH	HS DIGITAL INPUT
	19	PLATFORM ALARM	LAMP OUTPUT
	20	PLATFORM ALARM GROUND	GROUND
	21	UNALLOCATED	UNALLOCATED
	22	UNALLOCATED	UNALLOCATED
	23	UNUSED (VALVES GROUND)	GROUND
	24	SKYGUARD GROUND	GROUND
	25	UNALLOCATED	UNALLOCATED
	26	UNALLOCATED	UNALLOCATED
	27	UNALLOCATED	UNALLOCATED
	28	UNALLOCATED	UNALLOCATED
	29	OPTION GROUND	GROUND
	30	CAN LOW	CAN LOW
	31	CAN HIGH	CAN HIGH
	32	CAN SHIELD	CAN SHIELD
	33	UNALLOCATED	UNALLOCATED
	34	UNALLOCATED	UNALLOCATED
	35	UNUSED (GROUND)	GROUND



CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J8	1	MODULE GROUND	GROUND
	2	MODULE POWER	BATTERY VOLTAGE

1001157196-F
MAF01170

Figure 6-12. Platform Module - Sheet 2 of 2

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
MODEL NUMBER: 1	0	????: Visible only on a Non-Configured UGM.	
	1	**400S**	**1**
	2	400SC	
	3	450AJ	
MARKET: 2	**1**	**USA**	**1**
	2	ANSI EXPORT	
	3	CSA	
	4	CE	
	5	AUSTRALIA	
	6	JAPAN	
	7	GB	
* Certain model selections will limit market options.			
ENGINE: 3	1	KUBOTA D1105	
	2	GM DUAL FUEL: GM/PSI 0.97 Dual Fuel (Tier 3)z	
	3	KUBOTA DUAL FUEL	
	4	**DEUTZ EMR2: (Tier 4i)**	**4**
	5	DEUTZ EMR4: (Tier 4f)	
* Only visible under certain model selections. * Certain model selections will limit engine options. * Certain market selections will limit engine options.			
FLYWHEEL TEETH: 4*	**1**	**98 TEETH: 98 flywheel teeth.**	**1**
* This menu item is not visible.			
GLOW PLUG: 5*	1	NO GLOW PLUGS: No glow plugs installed.	
	2	**IN-CYLINDER: Glow plugs installed in each cylinder.**	**2**
* This menu item is not visible.			

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
STARTER LOCKOUT: 6*		**DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.**	**1**
	2	ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	
* Only visible for Engine Selection = Kubota D1105, Deutz EMR2 or Deutz EMR4.			
ENGINE SHUTDOWN: 7	1	DISABLED: No engine shutdown.	
	2	ENABLED: Shutdown engine for high coolant temperature fault or low oil pressure fault.	**2**
FUEL CUTOUT: 8*	1	ONE RESTART: One restart with limited run time when near Empty.	
	2	ENGINE STOP: No starting permitted when near Empty.	
	3	NONE	
	4	**RESTART: Restarts allowed with limited run time when near Empty.**	**4**
*Only visible for Engine Selection = Kubota D1105, Deutz EMR2 or Deutz EMR4. * Only visible if Fuel Level Menu selection is not NONE.			

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
TILT: 9*	1	5 DEGREES: Reduces the maximum speed of all boom functions tocreep when tilted more than 5 degrees and above elevation; alsoreduces drive speed to creep.	
	2	4.5 DEGREES: Reduces the maximum speed of all boom functions to creepwhen tilted more than 4.5 degrees and above elevation; also reduces drivespeed to creep.	
	3	4 DEGREES: Reduces the maximum speed of all boom functions to creepwhen tilted more than 4 degrees and above elevation; also reduces drivespeed to creep.	
	4	3 DEGREES: Reduces the maximum speed of all boom functions to creepwhen tilted more than 3 degrees and above elevation; also reduces drivespeed to creep.	
	5	5 DEG + 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, drive, telescope out and lift up.	
	6	4.5 DEG + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4.5 degrees and above elevation; also disallows tower lift up, drive, telescope out and lift up.	
	7	4 DEG + 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, drive, telescope out and lift up.	
	8	3 DEG + 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, drive, telescope out and lift up.	
	9	**5 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.**	**9**
	10	4.5 DEG + DRV CT: Reduces the maximum speed of all boom functions to creep when tilted more than 4.5 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
	11	4 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
	12	3 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise..	
* Certain market selections will limit tilt options and alter default setting. * Drive Reversal feature of X DEG + DRV CUT does not apply to crawlers. *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: 10	1	NO: No jib installed.	
	2	**YES: Jib installed, which has up and down movements only.**	**2**
* Certain model selections will limit visibility.			
SOFT TOUCH: 11	**1**	**NO: No Soft Touch system installed.**	**1**
	2	YES: Soft Touch system installed.	

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
SKYGUARD: 12	1	NO: No SkyGuard system installed.	
	2	**YES: SkyGuard system installed.**	**2**
GEN SET/WELDER: 13	**1**	**NO: No generator installed.**	**1**
	2	BELT DRIVE: Belt driven setup.	
GEN SET CUTOUT: 14*	**1**	**MOTION ENABLED: Motion enabled when generator is ON.**	**1**
	2	MOTION CUTOUT: Motion cutout in platform mode only.	
* Only visible if Gen Set / Welder Menu selection is not NO.			
H & T LIGHTS: 15*	**1**	**NO: No head and tail lights installed.**	**1**
	2	YES: Head and tail lights installed.	
* Only visible under certain model selections.			
LOAD SYSTEM: 16*	**1**	**NO: No load sensor installed.**	**1**
	2	WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	3	CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	4	CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF).	
	5	SPECIAL 1: Functions in creep, overload lamp lit, disables telescope out & lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	
* Only visible under certain market selections. * Certain market selections will limit load system options or alter default setting.			
FUNCTION CUTOUT: 17*	**1**	**NO: No drive cutout.**	**1**
	2	BOOM CUTOUT: Boom function cutout while driving above elevation.	
	3	DRIVE CUTOUT: Drive & steer cutout above elevation.	
	4	DRIVE CUT E&T: Drive & steer cutout above elevation and tilted.	
* Only visible under certain market selections. * Certain market selections will limit function cutout options or alter default setting.			

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
GROUND ALARM: 18*	1	NO: No ground alarm installed.	
	2	DRIVE: Travel alarm sounds when the drive function is active.	
	3	DESCENT: Descent alarm sounds when lift down is active.	
	4	**MOTION: Motion alarm sounds when any function is active.**	**4**
DRIVE TYPE: 19*	**1**	**4WD: 4 wheel drive.**	**1**
	2	2WD: 2 wheel drive.	
* Only visible under certain model selections.			
DISPLAY UNITS: 20*	1	METRIC: Celsius, Kilograms, KiloPascal.	
	2	**IMPERIAL: Fahrenheit, Pounds, Pounds/in^2.**	**2**
* Certain market selections will alter default setting.			
CLEARSKY: 21	**1**	**NO: ClearSky (telematics) options is disabled.**	**1**
	2	YES: ClearSky (telematics) option is enabled.	
* Only visible under certain model selections.			
CRIBBING OPTION: 22	**1**	**NO: Cribbing Option is disabled.**	**1**
	2	YES: Cribbing Option is enabled.	
* Only visible under certain model selections. * Only visible under certain market selections.			
ALERT BEACON: 23	**1**	**OFF FOR CREEP**	**1**
	2	IN CREEP 20FPM	
TEMP CUTOUT: 24	**1**	**NO: No Low Temp Cutout system installed.**	**1**
	2	YES: Low Temp Cutout system installed.	
* Only visible under certain market selections.			
PLAT LVL OVR CUT: 25	**1**	**NO: Platform Level functions above elevation.**	**1**
	2	YES: Platform Level does not function above elevation.	
ALARM / HORN: 26	1	SEPARATE: Ambient alarm installed.	
	2	**COMBINED: Single Horn / Alarm installed.**	**2**

Table 6-2. Machine Configuration Programming Information (Software Version P2.10)

Configuration Label/Digit	Number	Description	Default Number
TELE CUTBACK: 27	**1**	**NO: Telescope Cutback Option is disabled.**	**1**
	2	YES: Telescope Cutback Option is enabled.	
* Only visible under certain model selections.			
FUEL LEVEL: 28	1	NONE: Fuel Level Switch / Sensor is not installed.	
	2	SWITCH: Fuel Level Switch is installed.	
	3	**SENSOR: Fuel Level Sensor is installed.**	**3**
* Only visible under certain model selections.			
WATER IN FUEL SESNOR: 26	**1**	**NO: Water in Fuel Sensor is not installed.**	**1**
	2	YES: Water in Fuel Sensor is installed.	
* Only visible under certain market selections. * Only visible for Engine Selection = Deutz EMR4.			

1001193425-F

Table 6-3. Machine Configuration Programming Settings - 400S (Software Version P2.10)

400S	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**1**	**1**	**1**	**1**	**1**	**1**
Market	**1**	**2**	**3**	**4**	**5**	**6**
Engine	X	X	X	X	X	X
	2	2	2	X	X	2
	3	3	3	X	X	3
	4	**4**	**4**	**4**	**4**	**4**
	5	5	5	5	5	5
Flywheel Teeth	X	X	X	X	X	X
Glow Plug	**2**	**2**	**2**	**2**	**2**	**2**
Starter Lockout	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Engine Shutdown	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
Fuel Cutout	1	1	1	1	1	1
	2	2	2	2	2	2
	X	X	X	X	X	X
	4	**4**	**4**	**4**	**4**	**4**
Tilt	1	1	1	1	1	1
	X	X	X	X	X	X
	3	3	3	3	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	6	6	6	6	6	6
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	**9**	**9**	**9**	**9**	**9**
	X	X	X	X	X	X
	11	11	11	11	11	11
	12	12	12	12	12	12
Jib	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Soft Touch	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
SkyGuard	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
Gen Set / Welder	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Gen Set Cutout	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2

Table 6-3. Machine Configuration Programming Settings - 400S (Software Version P2.10)

400S	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Head & Taillights	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Load System	**1**	**1**	**1**	1	1	1
	X	***2***	X	X	X	***2***
	X	3	X	X	**3**	**3**
	X	4	X	**4**	X	4
	X	X	X	X	X	X
Function Cutout	**1**	**1**	**1**	X	**1**	**1**
	X	2	2	**2**	2	2
	3	3	3	X	3	3
	X	X	X	X	X	X
Ground Alarm	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
	4	**4**	**4**	**4**	**4**	**4**
Drive Type	**1**	**1**	**1**	**1**	**1**	**1**
	X	X	X	X	X	X
Display Units	1	1	**1**	**1**	**1**	**1**
	2	**2**	2	2	2	2
Clearsky	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Cribbing Option	**1**	X	X	X	X	X
	2	X	X	X	X	X
Alert Beacon	**1**	**1**	**1**	**1**	1	**1**
	2	2	2	2	**2**	2
Temp Cutout	**1**	**1**	**1**	**1**	**1**	**1**
	X	2	X	2	X	X
Plat Lvl Ovr Cut	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Alarm/Horn	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
TELE CUTBACK	X	X	X	X	X	X
	X	X	X	X	X	X
FUEL LEVEL	X	X	X	X	X	X
	X	X	X	X	X	X
	3	**3**	**3**	**3**	**3**	**3**
WATER IN FUEL SENSOR	X	1	X	X	X	X
	X	**2**	X	X	X	X

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

Table 6-4. Machine Configuration Programming Settings - 460SJ (Software Version P2.10)

460SJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**1**	**1**	**1**	**1**	**1**	**1**
Market	**1**	**2**	**3**	**4**	**5**	**6**
Engine	X	X	X	X	X	X
	2	2	2	X	X	2
	3	3	3	X	X	3
	4	**4**	**4**	**4**	**4**	**4**
	5	5	5	5	5	5
Flywheel Teeth	X	X	X	X	X	X
Glow Plug	**2**	**2**	**2**	**2**	**2**	**2**
Starter Lockout	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Engine Shutdown	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
Fuel Cutout	1	1	1	1	1	1
	2	2	2	2	2	2
	X	X	X	X	X	X
	4	**4**	**4**	**4**	**4**	**4**
Tilt	1	1	1	1	1	1
	X	X	X	X	X	X
	3	3	3	3	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	X	X	X	X	X	X
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	**9**	**9**	**9**	**9**	**9**
	X	X	X	X	X	X
	11	11	11	11	11	11
	12	12	12	12	12	12
Jib	**1**	**1**	**1**	**1**	**1**	**1**
	2	***2***	***2***	***2***	***2***	***2***
Soft Touch	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
SkyGuard	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
Gen Set / Welder	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Gen Set Cutout	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2

Table 6-4. Machine Configuration Programming Settings - 460SJ (Software Version P2.10)

460SJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Head & Taillights	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Load System	**1**	**1**	**1**	1	1	1
	X	***2***	X	X	X	***2***
	X	3	X	X	**3**	**3**
	X	4	X	**4**	X	4
	X	X	X	X	X	X
Function Cutout	**1**	**1**	**1**	X	**1**	**1**
	X	2	2	**2**	2	2
	3	3	3	X	3	3
	X	X	X	X	X	X
Ground Alarm	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
	4	**4**	**4**	**4**	**4**	**4**
Drive Type	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Display Units	1	1	**1**	**1**	**1**	**1**
	2	**2**	2	2	2	2
Clearsky	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Cribbing Option	**1**	X	X	X	X	X
	2	X	X	X	X	X
Alert Beacon	**1**	**1**	**1**	**1**	1	**1**
	2	2	2	2	**2**	2
Temp Cutout	**1**	**1**	**1**	**1**	**1**	**1**
	X	2	X	2	X	X
Plat Lvl Ovr Cut	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Alarm/Horn	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
TELE CUTBACK	X	X	X	X	X	X
	X	X	X	X	X	X
FUEL LEVEL	X	X	X	X	X	X
	X	X	X	X	X	X
	3	**3**	**3**	**3**	**3**	**3**
WATER IN FUEL SENSOR	X	1	X	X	X	X
	X	**2**	X	X	X	X

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

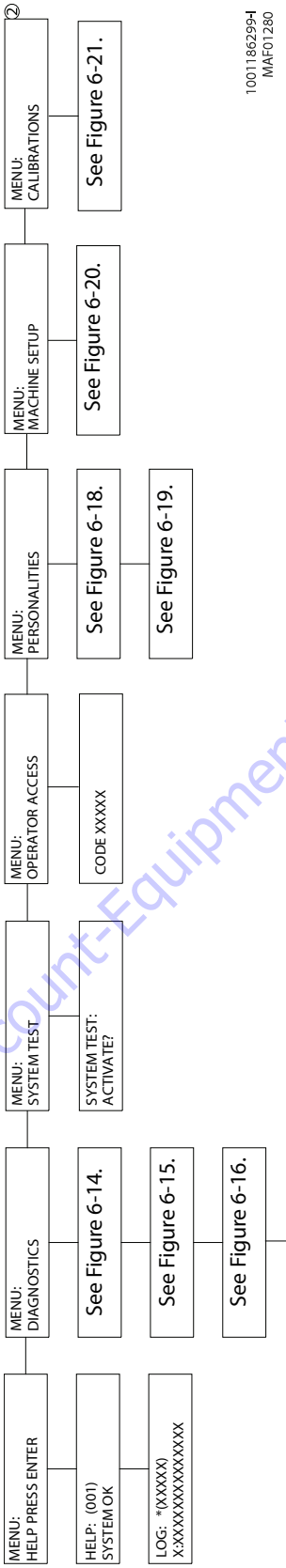
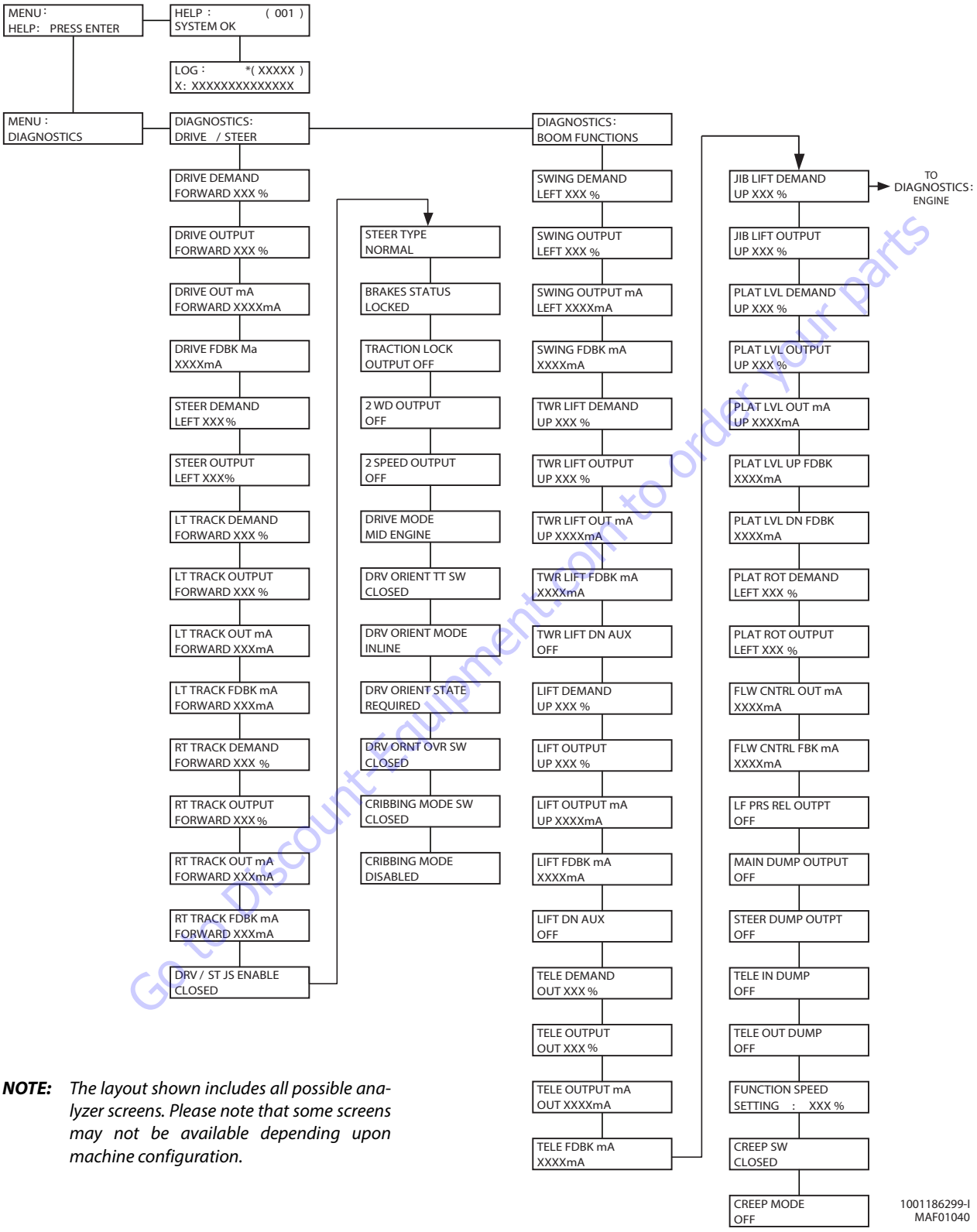


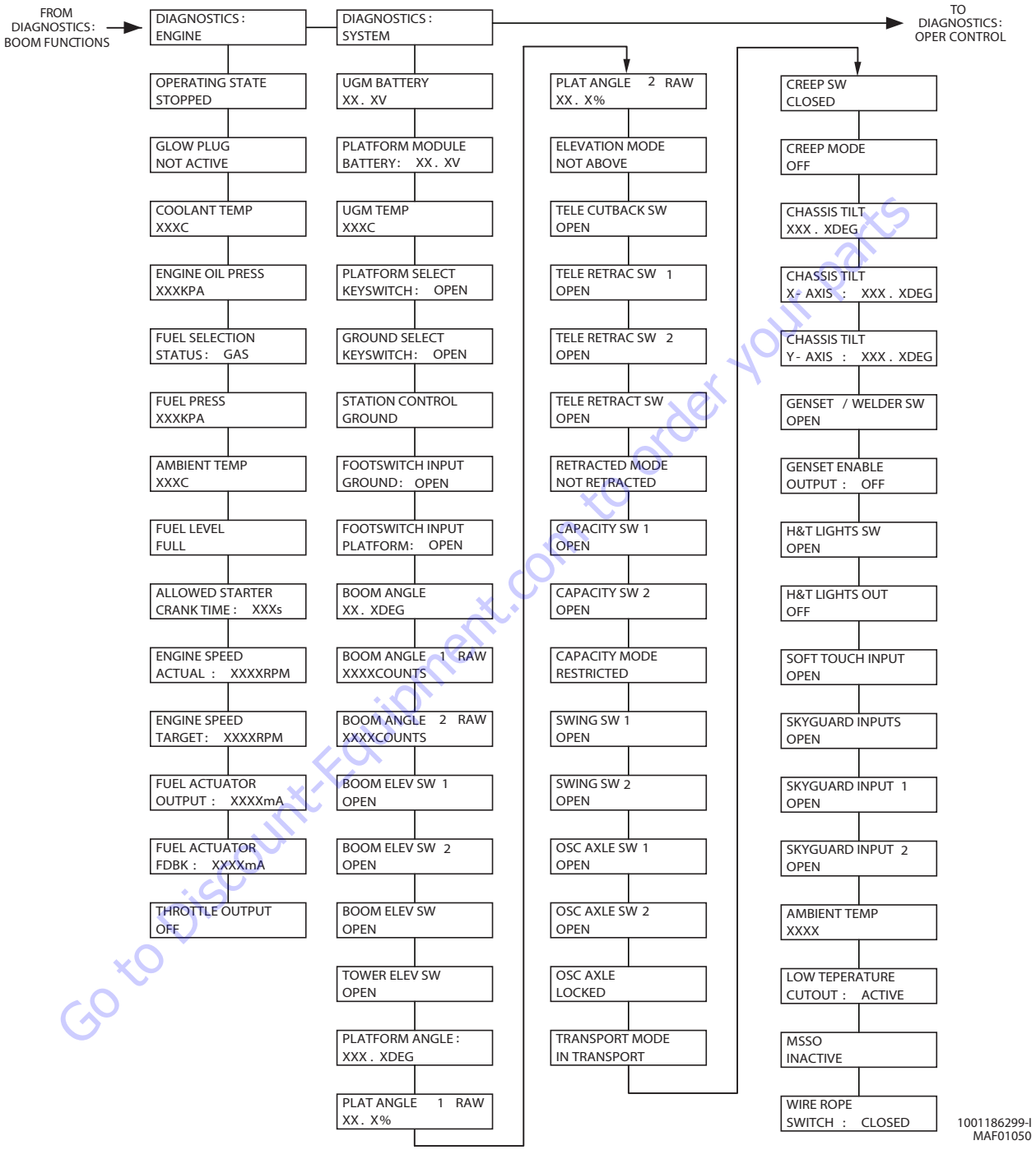
Figure 6-13. Analyzer Flow Chart (Software Version P2.10)

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



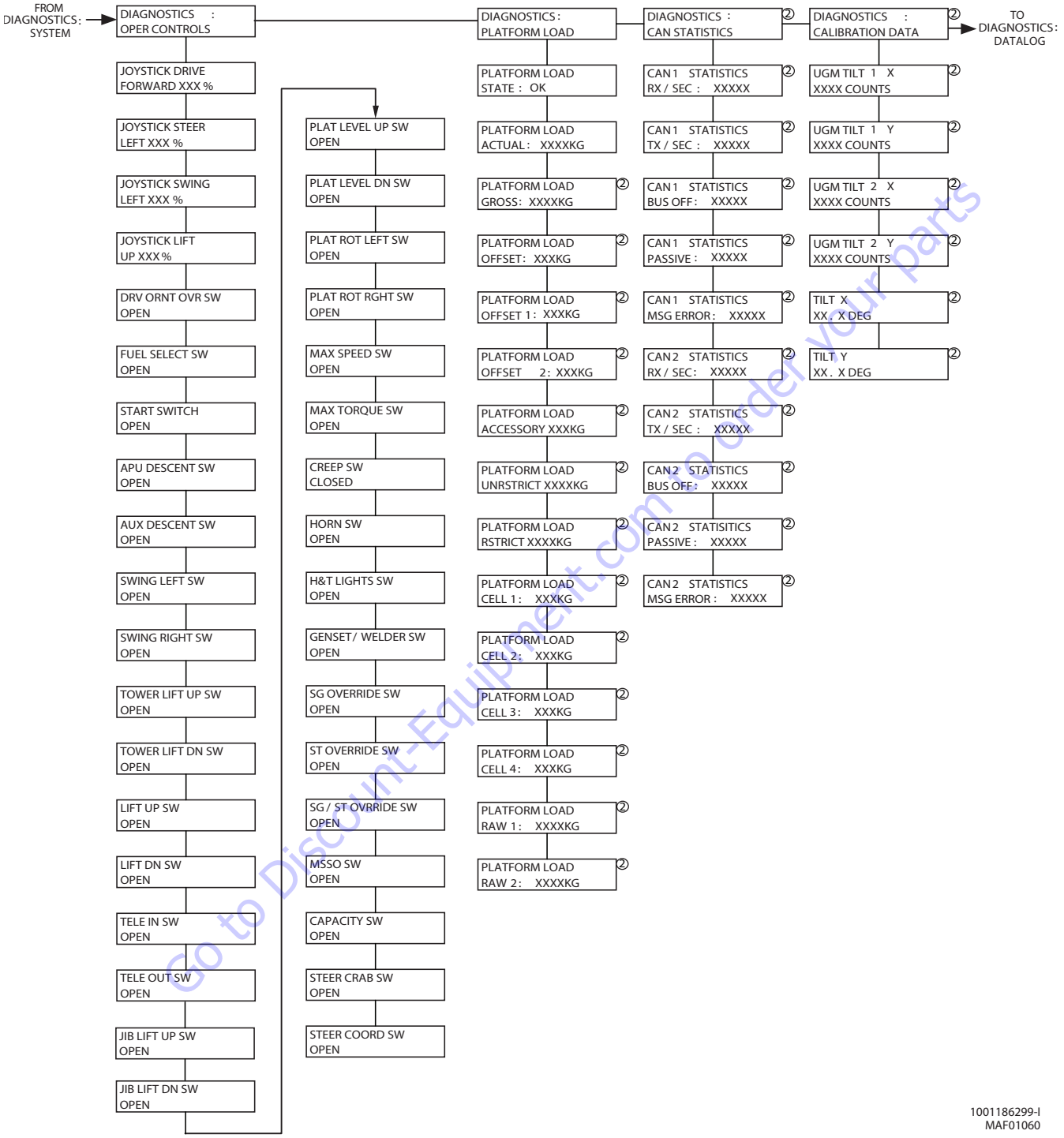
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-14. Analyzer Flow Chart - Diagnostics (Software Version P2.10) - Sheet 1 of 4



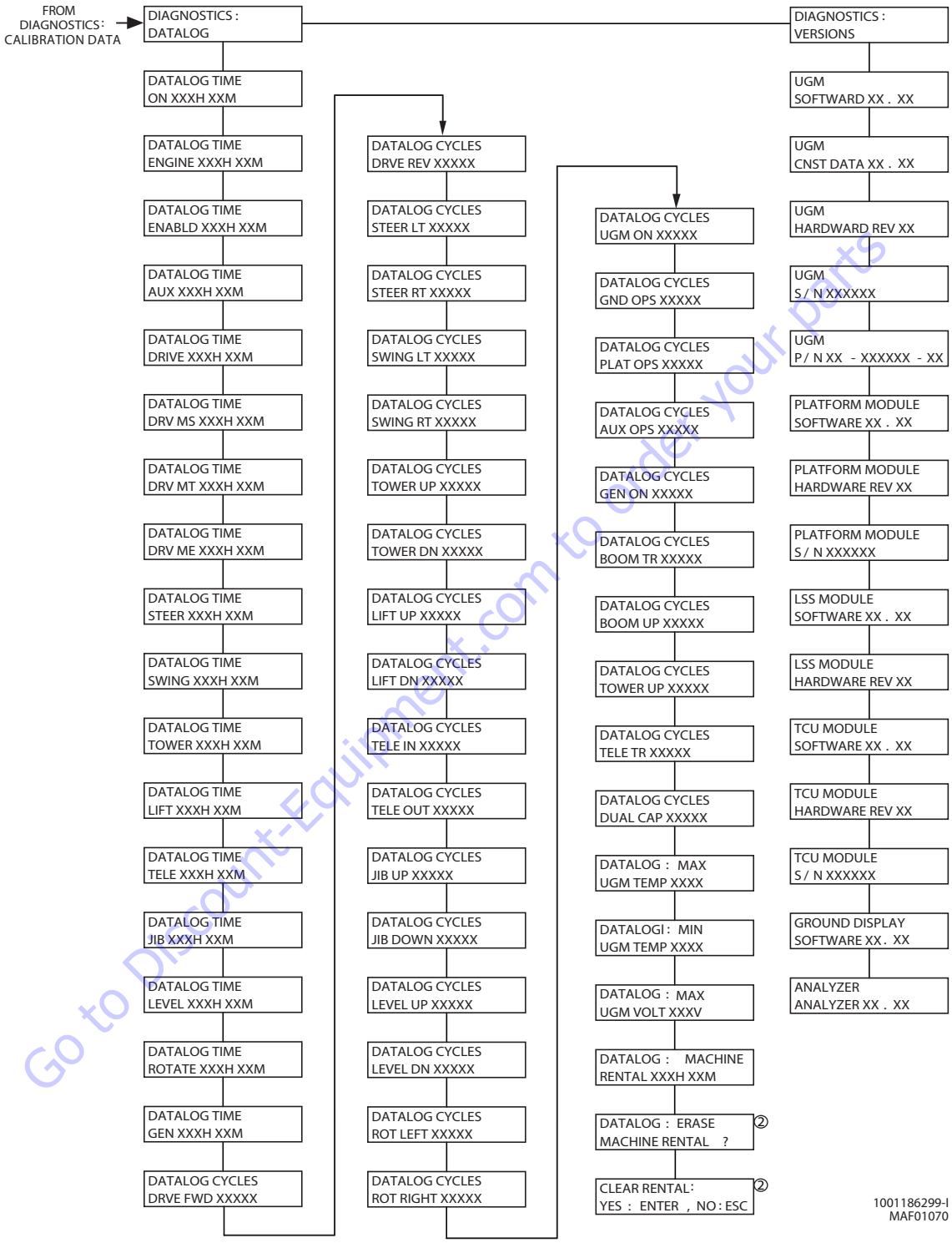
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-15. Analyzer Flow Chart - Diagnostics (Software Version P2.10) - Sheet 2 of 4



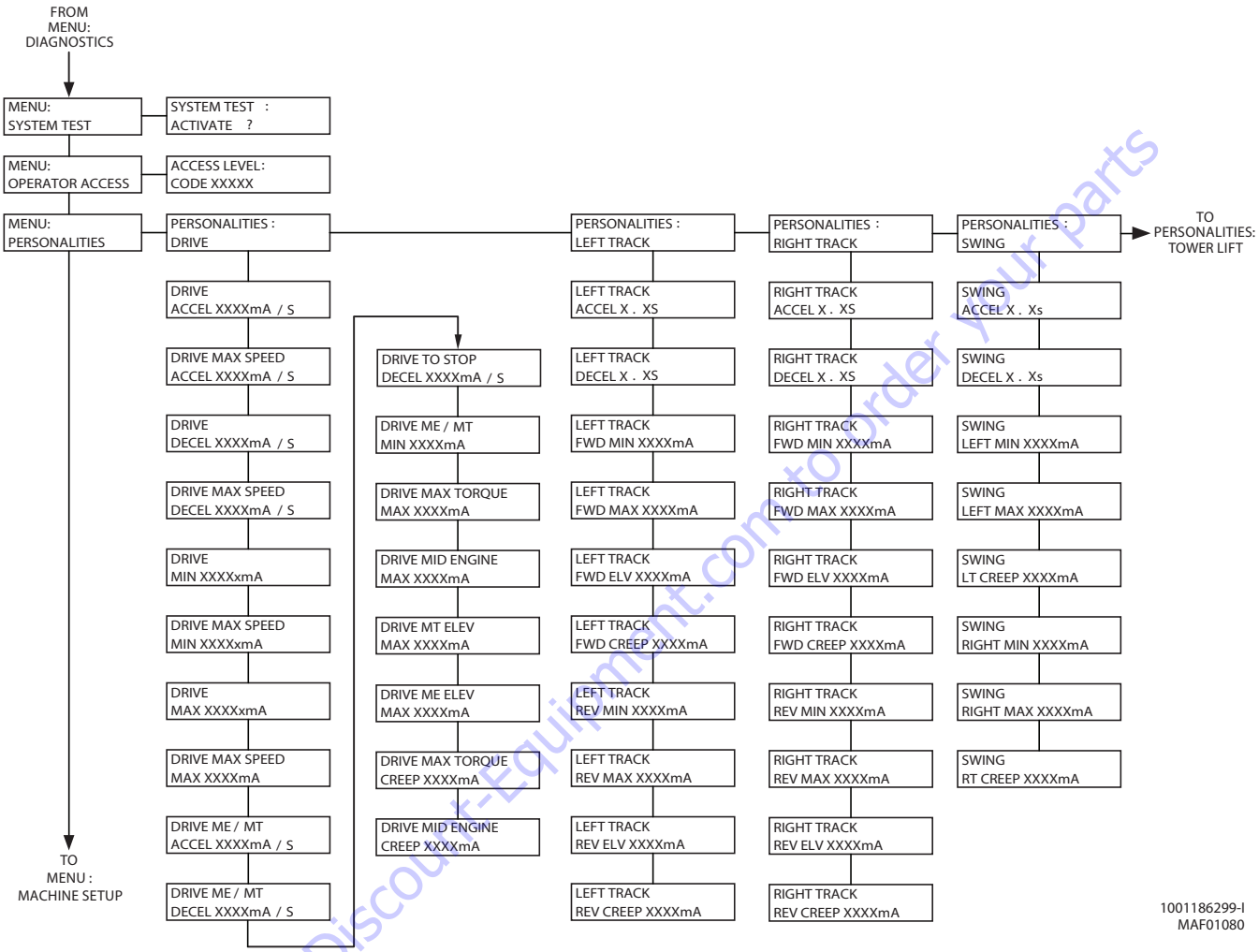
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-16. Analyzer Flow Chart - Diagnostics (Software Version P2.10) - Sheet 3 of 4



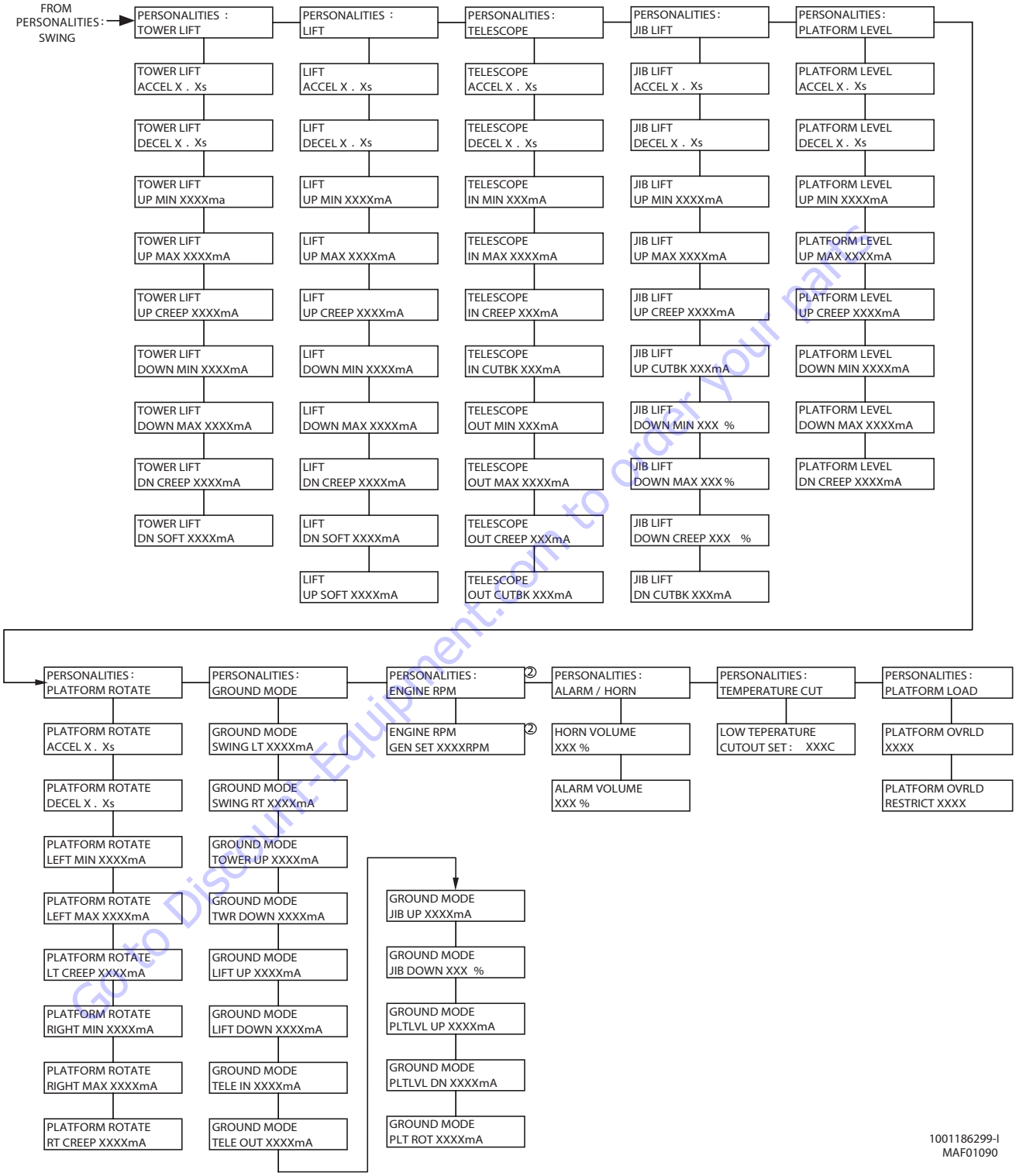
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-17. Analyzer Flow Chart - Diagnostics (Software Version P2.10) - Sheet 4 of 4



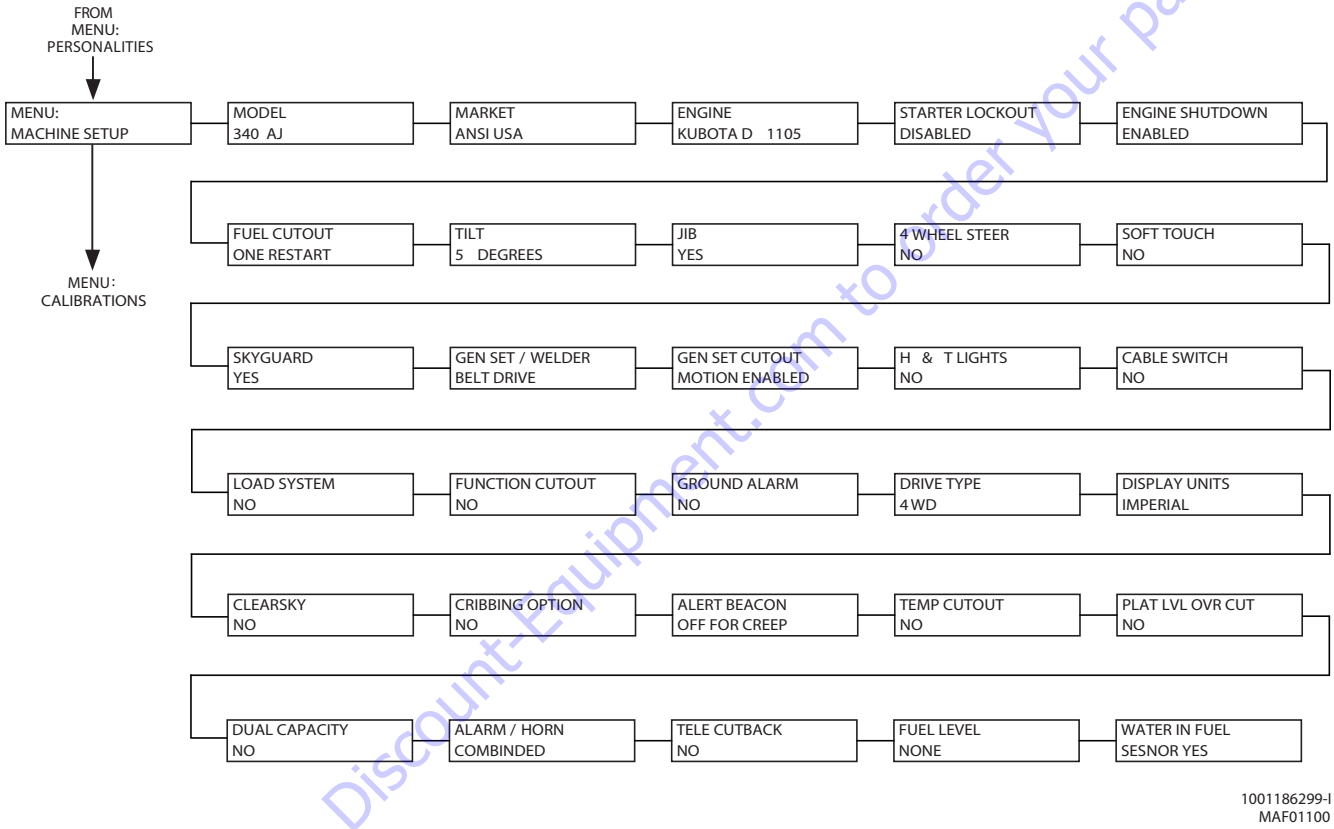
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-18. Analyzer Flow Chart - Personalities (Software Version P2.10) - Sheet 1 of 2



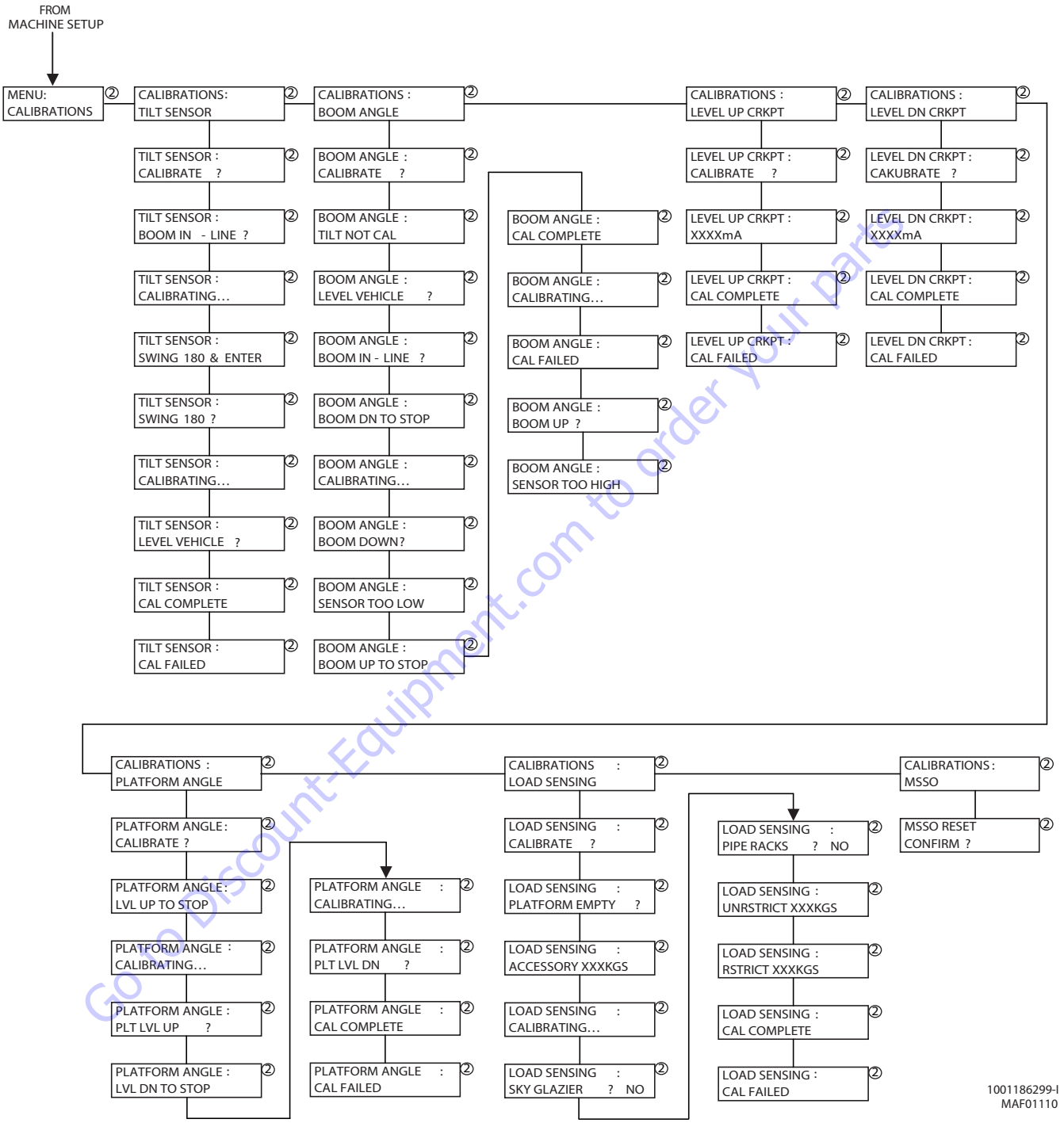
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-19. Analyzer Flow Chart - Personalities (Software Version P2.10) - Sheet 2 of 2



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

Figure 6-20. Analyzer Flow Chart - Machine setup (Software Version P2.10)



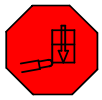
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-21. Analyzer Flow Chart - Calibrations (Software Version P2.10)

6.2 LSS SYSTEM

The JLG-designed Load Sensing System (LSS) measures platform load via a sensor mounted in the platform support structure. If the actual platform load exceeds the selected Rated Load, the following will occur:

1. The Overload Visual Warning Indicator will flash at the selected control position (platform or ground).



2. The Platform and Ground Alarms will sound 5 seconds On, and 2 seconds Off.
3. All normal movement will be prevented from the platform control position (optional - ground control functions may be prevented).
4. Further movement is permitted by:
   a. Removing the excess platform load until actual platform load is less than Rated Load.
   b. Operation of the overriding emergency system (Auxiliary Power Unit).
   c. By an authorized person at the ground control position (optional - ground control functions may be prevented).

NOTICE

THE LOAD SENSING SYSTEM MUST BE CALIBRATED WHEN ONE OR MORE OF THE FOLLOWING CONDITIONS OCCUR:

a. LSS Sensor removal or replacement
b. Addition or removal of certain platform mounted accessories. (Refer to Calibration)
c. Platform is removed, replaced, repaired or shows evidence of impact.

NOTICE

THE LOAD SENSING SYSTEM REQUIRES PERIODIC FUNCTION VERIFICATION NOT TO EXCEED 6 MONTHS FROM PREVIOUS VERIFICATION. REFER TO TESTING & EVALUATION.

All calibration procedures are menu driven through the use of a JLG Analyzer.

Diagnostic Menu

The Diagnostic Menu is another troubleshooting tool for the Load Sensing System. Sensor and status information is presented in real-time for the technician. Several sub-menus exist to organize the data.

To access the Diagnostic Menu, use the LEFT and RIGHT Arrow keys to select DIAGNOSTICS from the Top Level Menu. Press the ENTER key to view the menu.

Press the LEFT and RIGHT Arrow keys to view the displays and select the various sub-menus. To access a sub-menu, press the ENTER key. Once in a sub-menu, press the LEFT and RIGHT Arrow keys to view the various displays (just like a Top Level menu). To exit a sub-menu, press the ESC key.

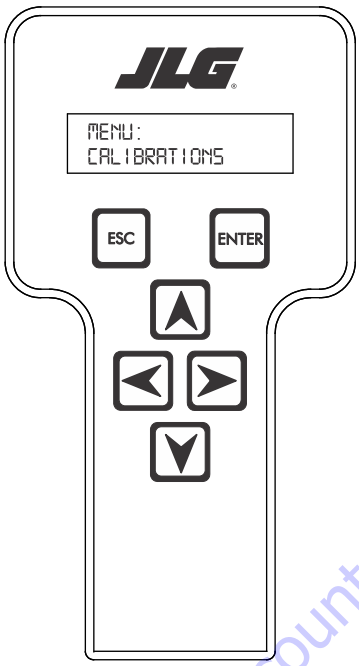
Table 6-5, Diagnostic Menu Descriptions details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

Table 6-5. Diagnostic Menu Descriptions

Diagnostics Menu (Displayed on Analyzer 1st Line)	Parameter (Displayed on Analyzer 2nd Line)	Parameter Value (Displayed on Analyzer 2nd Line)	Description
PLATFORM LOAD	STATE:	OK / OVERLOAD	LSS Status.
PLATFORM LOAD	ACTUAL:	XXX.X KG	Calibrated weight of the platform. ??? if Platform Load is Unhealthy**.
PLATFORM LOAD (service*)	GROSS:	XXX.X KG	Gross weight of the platform. ??? if both Cells are Unhealthy**.
PLATFORM LOAD (service*)	OFFSET 1:	XXX.X KG	Stored offset weight of Cell 1. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	OFFSET 2:	XXX.X KG	Stored offset weight of Cell 1. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	ACCESSORY	XXX.X KG	Stored accessory weight. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	UNRESTRICT	XXX.X KG	UGM will set Unrestricted Rated Load as defined by Machine Configuration.
PLATFORM LOAD (service*)	RESTRICT	XXX.X KG	UGM will set Restricted Rated Load as defined by Machine Configuration.
PLATFORM LOAD (service*)	RAW 1:	XXX.X KG	Gross value from Cell 1. ??? if Unhealthy**.
PLATFORM LOAD (service*)	RAW 2:	XXX.X KG	Gross value from Cell 2. ??? if Unhealthy**.
* Indicates only visible in service view mode ** Typically indicates a DTC is active			

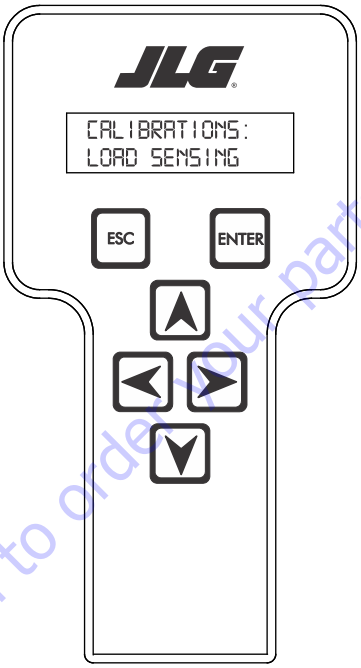
Calibration Procedure

1. Remove everything from the platform, except permanently fixed JLG Accessories, to allow the Load Sensing System to record its' weight during calibration. This includes all tools, debris, and customer-installed devices.
2. Plug the JLG Analyzer into the Machine at the Ground Station and enter Service Access Password 33271.
3. The platform should be approximately level for calibration. Level the platform from ground control (if necessary) to within +/- 5°.
4. To access the Calibration Menu, use the LEFT and RIGHT Arrow keys to select CALIBRATION from the Top Level Menu. The screen will read:

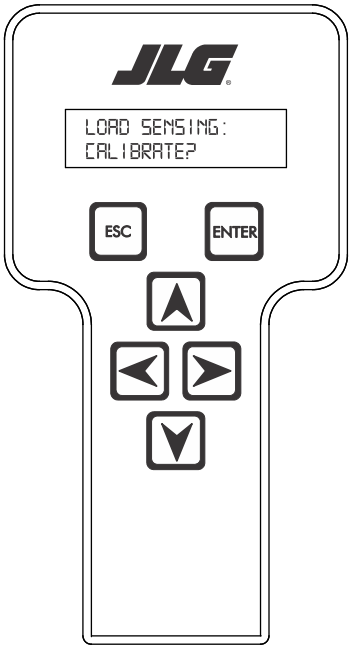


NOTE: *The Calibration Menu is not available in OPERATOR ACCESS.*

5. Press the ENTER key (ENTER) to view the menu. Upon entry to the Calibration Menu, the JLG Control System will link to the Analyzer and the screen will read:



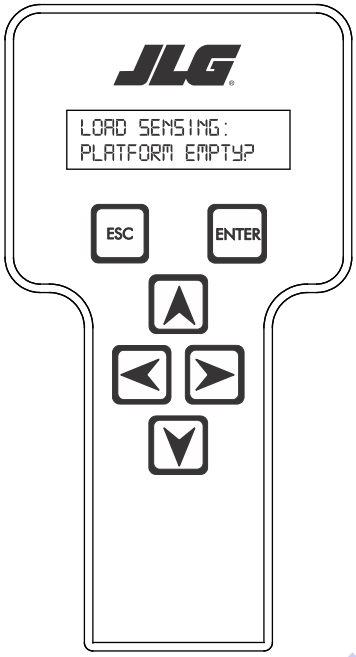
6. Press Enter (ENTER). The Screen will read:



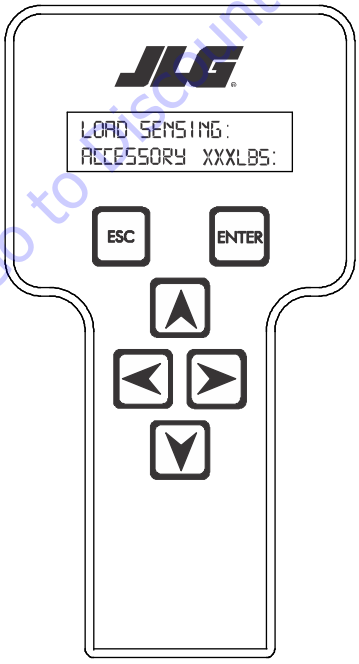
NOTE: *Calibration will auto fail if LSS DTC's are active (443, 444, 4479, 4480, 663, 821, 822, 823, 824, 8218, 8222 -> 8238, 991, 992, 993, 994 or 99285).*

Pressing the ESC key [ESC] after starting calibration and before calibration is complete will display the CAL FAILED message. This will not disturb the prior calibration information.

7. Press ENTER [ENTER]. The analyzer screen will read:



8. If the platform is empty, press ENTER [ENTER]. The screen will read:



NOTE: *Accessory weight will reset to 0 lbs. each time the machine is re-calibrated and will need to be re-entered.*

NOTE: *The Accessory weight will be temporarily stored in the Control System until calibration has been completed successfully.*

Refer to Table 6-6, Accessory Weights. Use the up and down analyzer keys to enter the accessory weight(s) (in lbs). When all the accessory weights are entered, press ENTER [ENTER]. The screen will read:

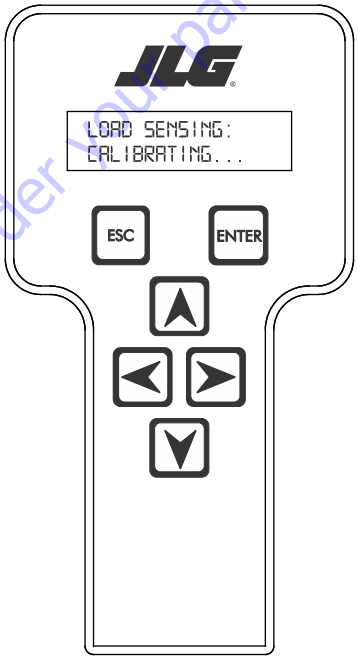


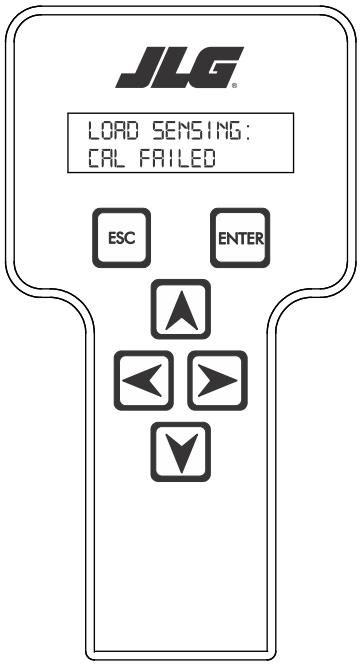
Table 6-6. Accessory Weights

Accessory	Weight
SkyWelder (stick welder)	70 lb (32 kg)
SkyWelder Prep	Prep only = 15 lb (7 kg) Full install = 70 lb (32 kg)
SkyCutter (plasma cutter)	70 lb (32 kg)
SkCutter / SkyWelder Combo	140 lb (64 kg)
Fire Extinguisher	45 lb (20 kg)
Overhead SoftTouch	80 lb (36 kg)
Work Surface	20 lb (9 kg)

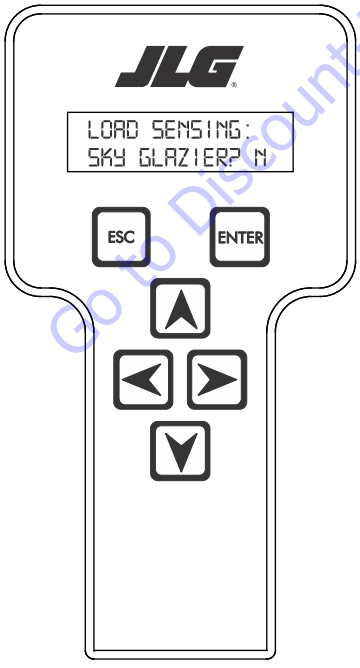
NOTE: *Not all Accessories are available on every JLG model. Some Accessory combinations are prohibited due to excessive weight and/or load restriction. If any installed JLG Accessories are labeled with weight decals but are not listed in the table above, include their weight when entering the ACC WEIGHT value.*

9. The control system will calculate the load cell readings and ensure it is greater than 130 lbs. (59 kg), but less than 575 lbs.(261 kg).

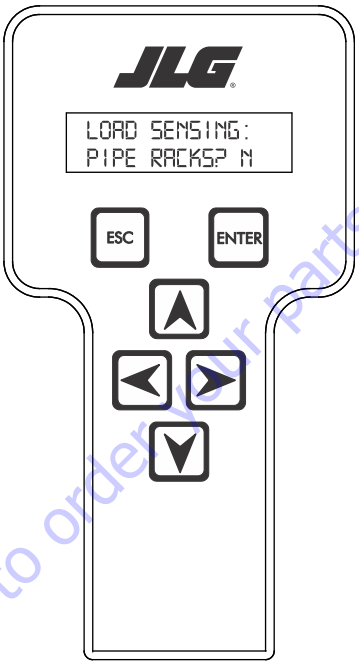
If the platform weight is not within the allowed range, the calibration attempt will be unsuccessful and the Analyzer will show the following:



10. Press ENTER (ENTER). The control system will ask for installed accessories. The screen will show the following:



11. Use the analyzer keys to select N for no or Y for yes. Press ENTER (ENTER). The screen will read:



12. Use the analyzer keys to select N for no or Y for yes. Press ENTER (ENTER). The control system will default to an estimate of unrestricted capacity, which can be adjusted if necessary. Refer to Table 6-7, SkyGlazier Capacity Reductions and Table 6-8, Pipe Rack Capacity Reductions.

The screen will read:

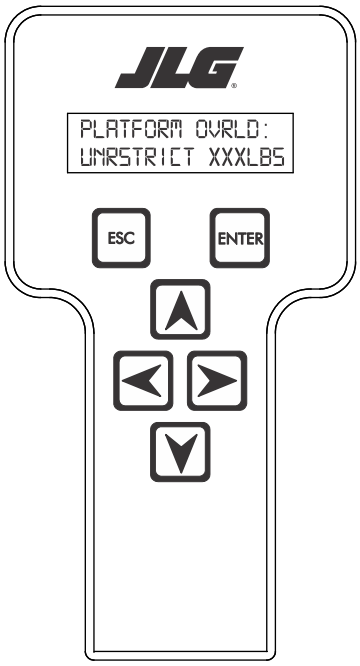


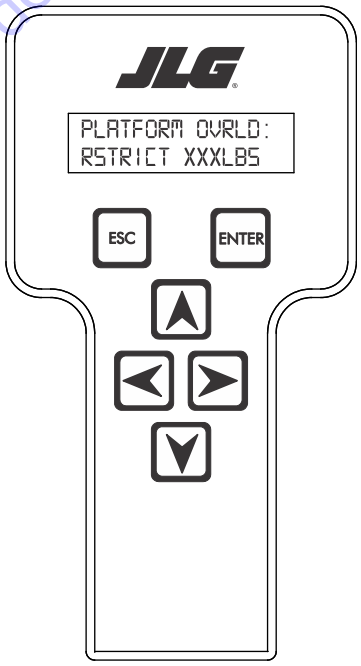
Table 6-7. SkyGlazier Capacity Reductions

Capacity	PLATFORM OVRLD	PLATFORM OVRLD RESTRICT
500 lb (227 kg)	400 lb (181 kg)	n/a
550 lb (250 kg)	400 lb (181 kg)	n/a
600 lb (272 kg)	400 lb (181 kg)	n/a
750 lb (340 kg)	n/a	590 lb (268 kg)
1000 lb (454 kg)	n/a	750 lb (340 kg)
Note: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.		

Table 6-8. Pipe Rack Capacity Reductions

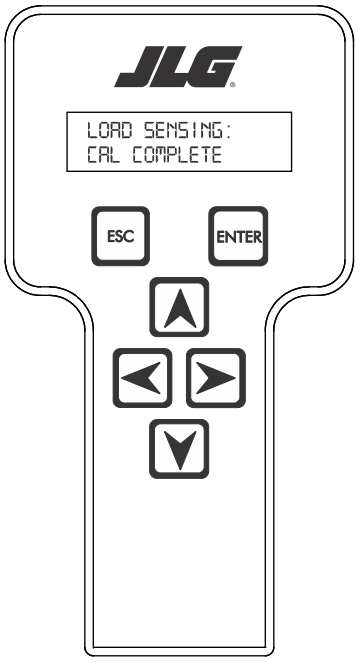
Capacity	PLATFORM OVRLD	PLATFORM OVRLD RESTRICT
500 lb (227 kg)	400 lb (181 kg)	n/a
550 lb (250 kg)	450 lb (204 kg)	n/a
600 lb (272 kg)	500 lb (227 kg)	n/a
750 lb (340 kg)	n/a	650 lb (295 kg)
1000 lb (454 kg)	n/a	900 lb (408 kg)
Note: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.		

13. Press ENTER (ENTER). The following screen will be displayed for restricted capacity, which can be adjusted if necessary. Refer to Table 6-7, SkyGlazier Capacity Reductions and Table 6-8, Pipe Rack Capacity Reductions.



14. Press ENTER 

. If calibration is successful, the screen will read:



Testing & Evaluation

Refer to Troubleshooting if the Load Sensing System fails to meet these guidelines.

1. Connect the JLG Analyzer.
2. Level the Platform. The platform should be approximately level for analysis, or the guidelines below will not be applicable. Level the platform from Ground Control (if necessary) to within ±5 degrees.
3. Observe the Empty Platform Weight. Proceed to the DIAGNOSTICS, PLTLOAD sub-menu and observe the measured platform load. All tools, debris, and customer-installed devices shall be removed during evaluation. Ideally, the PLTLOAD should be zero but can vary ±15lbs (± 7kg). Further, the reading should be stable and should not vary by more than ±2lbs (±1kg) (unless there is heavy influence from wind or vibration).
4. Use the Technician's Weight to Evaluate. The technician should enter the platform and record the PLTLOAD reading while standing in the center of the platform.
5. Confirm Control System Warnings and Interlocks. Using the keyswitch, select Platform Mode and power-up. Start the vehicle's engine and ensure that all controls are functional and the Load Sensing System's Overload Visual and Audible Warnings are not active. Simulate an Overload by unplugging the Shear Beam Load Cell. The Overload Visual Warning should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, and 2 seconds Off. With the engine running, all control should be prevented. Cycle the Platform EMS to stop the engine and then power-up again. The Overload Visual and Audible Warning should continue. Confirm that controls are responsive when using the Auxiliary Power Unit for emergency movement. Reconnect the Load Cell. The Overload Visual and Audible Warnings should cease and normal control function should return. Switch the vehicle's keyswitch to Ground Mode and repeat the above procedure. The Overload Visual Warning at the Ground Controls should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, 2 seconds Off. However, the controls should remain functional when using the engine and the Auxiliary Power Unit (if the Control System's MACHINE SETUP, LOAD is set to "2=CUTOUT PLT". If set to "3=CUTOUT ALL", then Ground Controls will be prevented when using the engine as in the platform).
6. Confirm Control System Capacity Indication (optional for vehicles with Dual Capacity Ratings). For vehicles equipped with a Capacity Select switch on the Platform Console Box, it is necessary to examine an additional interface between the Load Sensing System and the Control System. Using the keyswitch, select Platform Mode and power-up. If necessary, put the boom in the transport position (completely stowed) and center the Jib Plus (if equipped). Place the Capacity Select switch in the unrestricted position and ensure that the proper indicator illuminates on the Platform Console Box. Plug the JLG Analyzer into the Analyzer connection and proceed to the DIAGNOSTICS, SYSTEM submenu. Ensure that the CAPACITY displays indicate OFF. Place the Capacity Select switch in the unrestricted position (if so equipped) and ensure that the proper indicator illuminates on the Platform Console Box (but does not flash). For vehicles with unrestricted capacity, ensure that the unrestricted CAPACITY display indicates ON but the restricted CAPACITY indicates OFF. For vehicles with restricted capacity, ensure that the unrestricted CAPACITY display indicates OFF but the restricted CAPACITY indicates ON.
7. Confirm Load Sensing System Performance with Calibrated Weights. Operate the vehicle from Ground Control and place the boom in the transport position (fully stowed) for safety. Plug the JLG Analyzer into the control system connection and proceed to the DIAGNOSTICS, PLTLOAD display. Place 500lbs (230kg) in the platform and ensure that PLTLOAD is with ±5% of the actual weight. For Dual Capacity vehicles, do the same for the alternate capacity (unrestricted or restricted).

Troubleshooting

The following tables are furnished to provide possible resolutions for common difficulties. Difficulties are classified as General, Calibration, Measurement Performance, and Host System Functionality.

Table 6-9. LSS Troubleshooting Chart

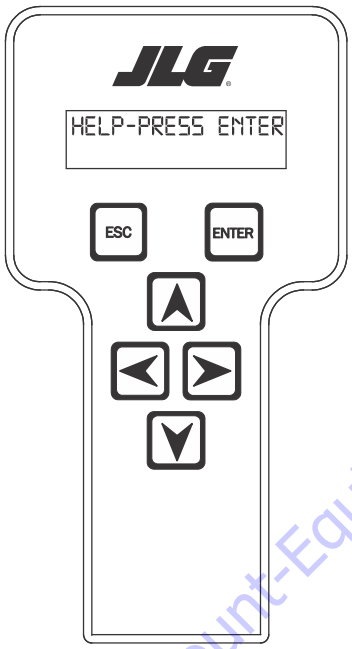
Difficulty	Possible Resolution
Empty Platform Weight (DIAGNOSTICS, PLATFORM LOAD) is not within ±15lbs (±7kg) of zero. or Platform Load readings (DIAGNOTICS, PLTLOAD) are unstable by more than ±2lbs (±1kg) (without the influence of vibration or wind). or There are large variations in Platform Load (DIAGNOSTICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lbs for an evaluation using the technician's weight, and ±5% of Rated Load when using calibrated weights.	The LSS System is unable to properly measure the platform weight. 1. The Load Cell is not properly plugged into the LSS Harness. It is possible poor electrical contact is made. 2. Wiring leading to the Load Cell is damaged. Carefully inspect sensor wiring where it passes through cable clamps for signs of damage. Inspect wiring where damage to the channel is apparent. 3. The Load Cell was not assembled properly during installation. Examine the sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL, LOAD displays and determine if the readings are reasonable. It is often helpful to apply slight downward pressure above the sensor and observe that its output increases (increasing force measurement; decreasing means the sensor is mounted upside-down). 4. The Load Cell is contaminated by debris or moisture. Examine the sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL, LOAD displays and determine if the readings are reasonable and stable (not changing by more than ±2lbs (±1kg) (without the influence of vibration or wind). Lack of measurement stability is a key indication of contamination. Unplug the connector and inspect for dirt or moisture. Look carefully into the female connector on the sensor's cordset for evidence of contamination. Debris should be brushed away with a soft bristle brush (do not introduce any cleaners as they will leave conductive residue). Moisture should be allowed to evaporate or accelerated with a heat-gun (use low heat and be carefully to not melt connector materials). Moisture intrusion into the molded portion of the connector (capillary action into the wire bundle) or the Shear Beam Load Cell itself will require replacement of the sensor. 5. The Load Cell has been mechanically damaged. If the Load Cell is physically deformed or has damage to the cover it should be replaced immediately. It is also possible to have invisible mechanical damage resulting from an extreme overload (>6000lbs [>2722kg]).
The Visual and Audible Overload Warnings fail to sound when platform is loaded beyond Rated Load, or when simulated by unplugging the Load Cell. Controls remain functional at Platform and Ground Control positions.	The Control System is failing to regard the overload signal from the LSS System, or the signal is shorted. 1. The Load Sensing System must be enabled within the Control System. Plug the JLG Analyzer into the Control System, enter the Access Level 1 password (33271), and examine the MACHINE SETUP, LOAD sub-menu. The selection "2=CUTOUT PLT" should be displayed (platform controls prevented during overload, ground controls remain operational). In country- or customer-specific circumstance, the selection "3=CUTOUT ALL" is used (platform and ground controls prevented during overload).
The Ground Audible Warning fails to sound, but the Platform Audible Warning sounds properly.	The Ground Alarm is missing or improperly installed. Verify that the device is mounted. Verify wiring from the Main Terminal Box and Ground Module.
Controls remain functional at the Ground Control position during an overload, or when simulated by unplugging the Load Cell. The Controls at the Platform Control position are prevented when using the engine, but not when using the Auxiliary Power Unit.	The JLG Control System is configured to prevent platform controls only in the event of overload. Alternately, the Host Control System can be configured to prevent ground and platform controls for country- or customer-specific circumstances. Using the JLG Analyzer, enter the Access Level 1 password (33271). Proceed to the MACHINE SETUP, LOAD sub-menu. Set this parameter to "2=CUTOUT PLT" to prevent platform controls in the event of overload. Set this parameter to "3=CUTOUT ALL" to prevent platform and ground controls in the event of overload.

6.3 RESETTING THE MSSO SYSTEM

1. Use the following procedure to reset the MSSO system.
2. Position the Platform/Ground select switch to the desired position.
3. Plug the analyzer into the connector coming from the ground control module or from the platform console.

NOTE: *If performing the procedure from the platform console, the Emergency Stop switch on the ground console must also be pulled out.*

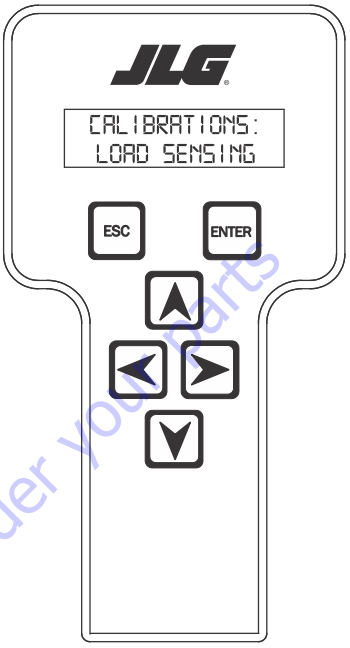
4. Pull out the Emergency Stop switch.
5. The analyzer screen should read:



6. Use the arrow button to reach OPERATOR ACCESS. Press Enter 

.
7. Enter the Access Code, 33271.
8. Use the right Arrow key to reach MENU: CALIBRATIONS. Press Enter 

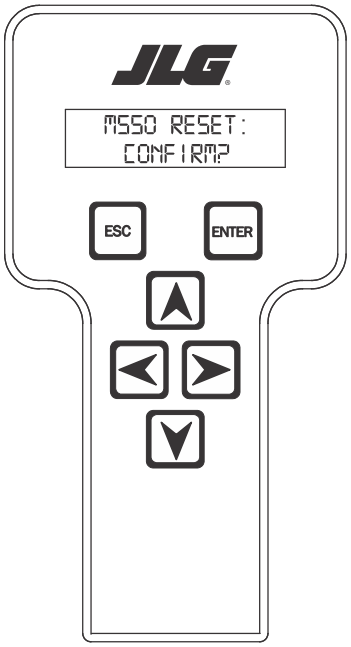
.
9. Use the arrow keys to reach the LOAD SENSING menu. The screen should read:



10. Press ENTER 

.
11. Use the left arrow key  or right arrow key  arrow to reach MSSO RESET.

12. Press Enter (ENTER). The screen will read:

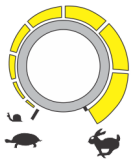


13. Press Enter (ENTER). The JLG Control System will reset an active 873 DTC and the MSSO System will be reset. Press Escape (ESC) to return to the CALIBRATIONS menu.

6.4 MACHINE MODEL ADJUSTMENT

Adjustment Notes

1. Personality settings can be adjusted anywhere within the adjustment range in order to achieve optimum machine performance.
2. Stop watch should be started with the function movement, not with actuation of the joystick or switch.
3. Drive speeds should be set to the values below regardless of the tire size.
4. All speed tests are run from the platform, these speeds do not reflect the ground control operation.
5. The Function Speed Control knob must be at full speed (turned clockwise completely) unless noted.



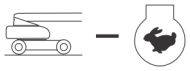
6. Some flow control functions may not work with the Function Speed Control knob clicked into the creep position.

7. Functional speeds may vary due to cold thick hydraulic oil. Test should be run with the oil temperature above 38° C (100° F)

Machine Orientation When Performing Test

DRIVE (BELOW ELEVATION)

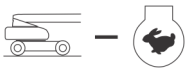
1. Test should be done on a smooth, level surface. The Drive Select Switch should be in the "Max Speed" position.



2. Start approximately 7.6m (25 ft) from starting point so the unit is at a maximum speed when starting the test.
3. Results should be recorded for a 61m (200ft) course.
4. Drive forward, "High Speed", record time
5. Drive Reverse, "High Speed", record time

DRIVE (ABOVE ELEVATION)

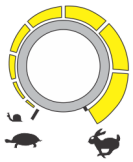
1. Test should be done on a smooth, level surface. The Drive Select Switch should be in the "Max Speed" position.



2. The boom should be > 10° above horizontal to ensure the drive is operating in Max Torque mode.
3. Results should be recorded for a 15.2m (50ft) course.
4. Drive forward, record time
5. Drive Reverse, record time
6. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

7. Creep light on Panel must be energized.

8. Verify that machine will Drive Forward and Reverse.
9. Return Knob to fully clockwise.

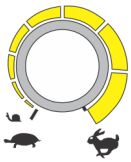


SWING

1. Boom at full elevation, Telescope retracted. Swing Right until over rear axle or end stop (if equipped).
2. Swing Left 360° or end stop (if equipped), record time.
3. Swing Right 360° or end stop (if equipped), record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

6. Verify that machine will swing left and right.
7. Return Function Speed Knob to fully clockwise.

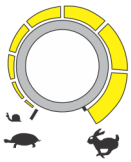


TOWER LIFT

1. Tower Lift in stowed position, Telescope Retracted.
2. Tower Lift Up, record time.
3. Tower Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

6. Verify that machine will Tower Up and Down. Return Knob to fully clockwise.



MAIN LIFT

1. Main Lift in stowed position, Telescope Retracted.
2. Main Lift Up, record time.
3. Main Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

6. Verify that machine will Lift Up and Down.
7. Return Knob to fully clockwise.

TELESCOPE

1. Main Lift at full elevation, Telescope Retracted.
2. Telescope Out, record time.
3. Telescope In, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

6. Verify that machine will Telescope In and Out.
7. Return Knob to fully clockwise.

JIB LIFT

1. Platform level and centered with the boom. Jib Lift Down until stop.
2. Jib Lift Up, record time.
3. Jib Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

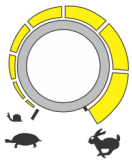
6. Verify that machine will Jib Lift Up and Down.
7. Return Knob to fully clockwise.

PLATFORM ROTATE

1. Platform level, Rotate Platform Right until stop
2. Platform Left, record time.
3. Platform Right, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.

5. Creep light on Panel must be energized.

6. Verify that machine will Platform Rotate Left and Right.
7. Return Knob to fully clockwise.



NOTE: *When the platform speed control knob is turned fully counterclockwise. The platform rotate may not work, this is acceptable.*

Table 6-10. Machine Model Adjustment Speeds

FUNCTION		ADJUSTMENT RANGES	400S / 460SJ MODEL DEFAULTS		MODEL TIME RANGES (IN SECONDS)	
					400S	460SJ
DRIVE						
	Accel	25 – 2000mA/s	300mA/s			
	Decel	25 – 2000mA/s	800 mA/s			
	Min	250 – 1000mA	725 mA			
	Max	250 – 1400mA	1175 mA		30 – 34	30 – 34
Drive to Stop	Decel	25 – 2000mA/s	400 mA/s			
MT: Elevated	Max	250 – 1200mA	890 mA	795 mA	68 – 85	68 – 85
ME: Elevated	Max	250 – 1200mA	990 mA	835mA	68 – 85	68 – 85
Max Torque	Creep	250 – 1200mA	890 mA	795 mA		
Mid Engine	Creep	250 – 1200mA	990 mA	835mA		
ME = Max Engine, MT = Max Torque						
SWING						
	Accel	0 – 5s	2.2 s			
	Decel	0 – 5s	1.2s			
LEFT	Min	250 – 1400mA	420 mA			
	Max	250 – 1400mA	860 mA		70 – 90	70 – 90
	Creep	250 – 1400mA	650 mA			
RIGHT	Min	250 – 1400mA	400 mA			
	Max	250 – 1400mA	800 mA		70 – 90	70 – 90
	Creep	250 – 1400mA	650 mA			
LIFT						
	Accel	0 – 5s	1.5 s			
	Decel	0 – 5s	0.8 s			
UP	Min	250 – 1400mA	400 mA			
	Max	250 – 1400mA	900 mA		33 – 40	34 – 41
	Creep	250 – 1400mA	600 mA			
DOWN	Min	250 – 1400mA	380 mA			
	Max	250 – 1400mA	750 mA		33 – 40	34 – 41
	Creep	250 – 1400mA	500 mA			
	Soft Down	250 – 1400mA	450 mA			
	Soft Down	250 – 1400mA	450 mA			
TELECOPE						
	Accel	0 – 5s	1 s			
	Decel	0 – 5s	0.8 s			
IN	Min	250 – 1400mA	415 mA			
	Max	250 – 1400mA	890 mA		33 – 40	33 – 40
	Creep	250 – 1400mA	580 mA			
OUT	Min	250 – 1400mA	415 mA			
	Max	250 – 1400mA	780 mA		33 – 40	33 – 40
	Creep	250 – 1400mA	525 mA			

Table 6-10. Machine Model Adjustment Speeds

FUNCTION		ADJUSTMENT RANGES	400S / 460SJ MODEL DEFAULTS	MODEL TIME RANGES (IN SECONDS)	
				400S	460SJ
JIB LIFT					
	Accel	0 – 5s	1.2 s		
	Decel	0 – 5s	0.5 s		
UP	Min	250 – 1400mA	350 mA		
	Max	250 – 1400mA	690 mA	18 – 22	18 – 22
	Creep	250 – 1400mA	500 mA		
DOWN	Min	250 – 1400mA	350 mA		
	Max	250 – 1400mA	630 mA	18 – 22	18 – 22
	Creep	250 – 1400mA	450 mA		
PLATFORM LEVEL					
	Accel	0 – 5s	0 s		
	Decel	0 – 5s	0 s		
UP	Min	250 – 1400mA	400 mA		
	Max	250 – 1400mA	600 mA		
	Creep	250 – 1400mA	600 mA		
DOWN	Min	250 – 1400mA	400 mA		
	Max	250 – 1400mA	600 mA		
	Creep	250 – 1400mA	600 mA		
PLATFORM ROTATE					
	Accel	0 – 5s	0 s		
	Decel	0 – 5s	0 s		
LEFT	Min	250 – 1400mA	500 mA		
	Max	250 – 1400mA	600 mA	20 – 25	20 – 25
	Creep	250 – 1400mA	600 mA		
RIGHT	Min	250 – 1400mA	500 mA		
	Max	250 – 1400mA	600 mA	20 – 25	20 – 25
	Creep	250 – 1400mA	600 mA		
GROUND MODE					
SWING	Left	250 – 1400mA	855 mA		
	Right	250 – 1400mA	795 mA		
LIFT	Up	250 – 1400mA	895 mA		
	Down	250 – 1400mA	745 mA		
TELESCOPE	In	250 – 1400mA	885 mA		
	Out	250 – 1400mA	775 mA		
JIB	Up	250 – 1400mA	685 mA		
	Down	250 – 1400mA	625 mA		
PLATFORM	Up / Down	250 – 1400mA	595 mA		
PLATFORM	Left / Right	250 – 1400mA	595 mA		

1001193361-F

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
Note: "Controls Initialized" means all controls have been released / returned to neutral, and the machine enable (footswitch) has been released.						
EVERYTHING OK	001[1]	Machine is in Platform Mode; The UGM determines no problems exist	No response required for this DTC		X	X
GROUND MODE OK	002[1]	Machine is in Ground Mode; The UGM determines no problems exist	No response required for this DTC		X	X
RUNNING AT CUTBACK – OUT OF TRANSPORT POSITION	0010[1]	Machine is in the Out of Transport position	Response described in Drive Modes section	Machine is not in the Out of Transport position	X	X
FSW OPEN	0011[1]	Machine is in Platform Mode; Any of the following Platform inputs become active after power up, but before Machine Enabled: Drive joystick is not in the neutral position Steer; Lift and/or Swing joystick is not in the neutral position; Tower Lift (340AJ, 450AJ); Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized	X	X
RUNNING AT CREEP - CREEP SWITCH OPEN	0012[1]	Machine is in Platform Mode; Platform Creep switch input = HIGH; DTC 0013 is not active	The UGM shall limit the machine to Creep speed	Platform Creep switch input = Low	X	X
RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	0013[1]	Machine is in Platform Mode; The Boom is Above Elevation; Machine chassis is considered Tilted	The UGM shall limit the machine to Creep speed; If MACHINE SETUP > TILT = (angle) + CUT, response described in Tilted Output Cutouts section	Not all of the trigger conditions are met	X	X
LOAD SENSOR READING UNDER WEIGHT	0015	LSS has been calibrated and the UGM has determined that the load sensing system reading is less than -50lbs for 2 seconds. If the load sensing system determines that the reading is greater than -50lbs for 5 seconds this fault will no longer be annunciated. No control system interlocks present when DTC is active.		Ensure platform is not resting on the ground or is not leveled at an extreme negative angle. Re-calibrate the load sensing system if the above items are not a factor.		
FUEL LEVEL LOW – ENGINE SHUTDOWN	0031	Engine Shutdown has occurred due to Fuel Level = EMPTY condition.	Response described in Fuel Shutdown section	Power Cycled	X	X
APU ACTIVE	0035	Auxiliary Power/Emergency Descent Mode is active	Response described in Auxiliary Power/Emergency Descent Mode section	Auxiliary Power/Emergency Descent Mode is not active	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
FUNCTION PREVENTED - FUNCTION SELECTED BEFORE GROUND ENABLE	0036	Machine is in Ground Mode; Any of the following Ground inputs become active after power up, but before Machine Enabled: Lift; Swing; Tower Lift (340AJ, 450AJ); Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized	X	X
SKYGUARD ACTIVE – FUNCTIONS CUTOUT	0039	MACHINE SETUP > SKYGUARD = YES; Machine is in Platform Mode; SkyGuard Enabled	Response described in SkyGuard section	Not all of the trigger conditions are met	X	X
KEYSWITCH FAULTY	212	UGM Ground Mode input J7-3 input = High; UGM Platform Mode input J7-2 input = High	The UGM shall assume a station selection of Ground	(J7-3 input = LOW) or (J7-2 input = LOW)	X	X
FSW FAULTY	213	The ground footswitch input and platform footswitch input have been both HIGH or both LOW for greater than or equal to 1 second	The UGM shall not Enable the Machine	Power Cycled	X	X
FUNCTION PROBLEM - HORN PERMANENTLY SELECTED	221	Machine is in Platform Mode; The Horn switch input = High at Startup	The UGM shall prohibit Horn; Ground and Platform Alarm are still permitted	The Horn switch input = Low	X	X
FUNCTION PROBLEM - STEER LEFT PERMANENTLY SELECTED	224	Machine is in Platform Mode; The Steer Left switch input = High at Startup	The UGM shall prohibit Steer Left and Right; The UGM shall limit Drive to Creep	The Steer Left switch input = Low; Steer Left and Right and full Drive speed permitted after controls are initialized	X	X
FUNCTION PROBLEM - STEER RIGHT PERMANENTLY SELECTED	225	Machine is in Platform Mode; The Steer Right switch input = High at Startup	The UGM shall prohibit Steer Left and Right; The UGM shall limit Drive to Creep	The Steer Right switch input = Low; Steer Left and Right and full Drive speed permitted after controls are initialized	X	X
STEER SWITCHES FAULTY	227	The Steer Left switch input = High; The Steer Right switch input = High; (detectable in Platform or Ground mode)	The UGM shall prohibit Steer; The UGM shall limit Drive to Creep	The Steer Left switch input = Low; The Steer Right switch input = Low; Steer and full Drive speed permitted after controls are initialized	X	X
FSW INTERLOCK TRIPPED	2211	Machine is in Platform Mode; The Footswitch is active for more than seven seconds with no Drive, Steer, or Boom commands	The UGM shall disable Machine Enable	The footswitch is released	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2212	Machine is in Platform Mode; The UGM detects one of the following conditions: Drive joystick is not in the neutral position at Startup; Drive joystick is not in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223 is active	If triggered by the Drive joystick not being in the neutral position at Startup, the UGM shall prohibit Drive and Steer. If triggered by the Drive joystick not being in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223 is active, the UGM shall not Enable the Machine	If triggered by the Drive joystick not being in the neutral position at Startup, then (Drive joystick is returned to its neutral position) and (Drive and Steer permitted after controls initialized) If triggered by the Drive joystick not being in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223, then controls initialized	X	X
STEER LOCKED - SELECTED BEFORE FOOTSWITCH	2213	Machine is in Platform Mode; A Steer input is active when Footswitch becomes active or while DTC 2212, 2221 or 2223 is active	The UGM shall not Enable the Machine	Controls initialized	X	X
D/S JOY. OUT OF RANGE HIGH	2216	The PM detects that the Drive or Steer joystick signal voltage > 8.1V and reports the fault to the UGM.	The UGM shall prohibit Drive; Brake release and Steer still permitted	The PM no longer reports the fault	X	X
D/S JOY. CENTER TAP BAD	2217	The PM detects that the Drive or Steer center tap voltage is not between 3.31 volts and 3.75 volts and reports the fault to the UGM	The UGM shall prohibit Drive; Brake release and Steer still permitted	The PM detects that the drive/steer center tap voltage is between 3.31 and 3.75 volts and no longer reports the fault to the UGM	X	X
L/S JOY. OUT OF RANGE HIGH	2219	The PM detects that the Lift or Swing joystick signal voltage > 8.1V and reports the fault to the UGM.	If the Machine is in Platform Mode, the UGM shall prohibit Lift and Swing	The PM detects that the Lift and Swing joystick signal voltage is < 8.1V and no longer reports the fault to the UGM	X	X
L/S JOY. CENTER TAP BAD	2220	The PM detects that the Lift or Swing center tap voltage is not between 3.31 volts and 3.75 volts and reports the fault to the UGM	If the Machine is in Platform Mode, the UGM shall prohibit Lift and Swing	The PM detects that the lift/swing center tap voltage is between 3.31 and 3.75 volts and no longer reports the fault to the UGM	X	X
LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2221	Machine is in Platform Mode; The UGM detects one of the following conditions: Lift and/or Swing joystick is not in the neutral position at Startup; Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active	If triggered by the Lift and/or Swing joystick not being in the neutral position at Startup, the UGM shall prohibit Lift and Swing. If triggered by Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active, the UGM shall not Enable the Machine	If triggered by the Lift and/or Swing joystick not being in the neutral position at Startup, then (Lift and/or Swing joystick is returned to its neutral position) and (Lift and Swing permitted after controls initialized) If triggered by the Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active, then controls initialized	X	X
WAITING FOR FSW TO BE OPEN	2222	Machine is in Platform Mode; Footswitch is active at Start Up	The UGM shall not Enable the Machine	Controls initialized	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	2223	Machine is in Platform Mode; Any of the following Platform inputs are active when Footswitch becomes active or while DTC 2212, 2213 or 2221 is active: Tower Lift; Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized	X	X
FOOTSWITCH SELECTED BEFORE START	2224	Machine is in Platform Mode; The engine is stopped; Startup time has expired; The Footswitch is active before the Platform Engine Start switch input = High	The UGM shall prohibit Engine Start	The Platform Engine Start switch input = Low;	X	X
FUNCTION PROBLEM - PLATFORM ROTATE LEFT PERMANENTLY SELECTED	2247	Machine is in Platform Mode; The Platform Rotate Left switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Left switch input = Low; Platform Rotate Left and Right permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM ROTATE RIGHT PERMANENTLY SELECTED	2248	Machine is in Platform Mode; The Platform Rotate Right switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Right switch input = Low; Platform Rotate Left and Right permitted after controls are initialized	X	X
FUNCTION PROBLEM - JIB LIFT UP PERMANENTLY SELECTED	2249	Machine is in Platform Mode; MACHINE SETUP > JIB = YES; The Jib Lift Up switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Up switch input = Low; Jib Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - JIB LIFT DOWN PERMANENTLY SELECTED	2250	Machine is in Platform Mode; MACHINE SETUP > JIB = YES; The Jib Lift Down switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Down switch input = Low; Jib Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - TELESCOPE IN PERMANENTLY SELECTED	2251	Machine is in Platform Mode; The Telescope In switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope In switch input = Low; Telescope permitted after controls are initialized	X	X
FUNCTION PROBLEM - TELESCOPE OUT PERMANENTLY SELECTED	2252	Machine is in Platform Mode; The Telescope Out switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope Out switch input = Low; Telescope permitted after controls are initialized	X	X
FUNCTION PROBLEM - TOWER LIFT UP PERMANENTLY SELECTED	2257	Machine is in Platform Mode; The Tower Lift Up switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift In switch input = Low; Tower Lift Up and Down permitted after controls are initialized		X
FUNCTION PROBLEM - TOWER LIFT DOWN PERMANENTLY SELECTED	2258	Machine is in Platform Mode; The Tower Lift Down switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Down switch input = Low; Tower Lift Up and Down permitted after controls are initialized		X
FUNCTION PROBLEM - PLATFORM LEVEL UP PERMANENTLY SELECTED	2262	Machine is in Platform Mode; The Platform Level Up switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Up switch input = Low; Platform Level Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM LEVEL DOWN PERMANENTLY SELECTED	2263	Machine is in Platform Mode; The Platform Level Down switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Down switch input = Low; Platform Level Up and Down permitted after controls are initialized	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
FUNCTION PROBLEM - DOS OVERRIDE PERMANENTLY SELECTED	2264	Machine is in Platform Mode; The DOS Override switch input = High at Startup	No response required for this DTC	The DOS Override switch input = Low	X	X
FUNCTION PROBLEM - SOFT TOUCH / SKYGUARD OVERRIDE PERMANENTLY SELECTED	2286	[(MACHINE SETUP > SKYGUARD = YES) or (MACHINE SETUP > SOFT TOUCH = YES)]; Machine is in Platform Mode; The Soft Touch / SkyGuard Override switch input = High at Startup	No response required for this DTC	The Soft Touch / SkyGuard Override switch input = Low	X	X
FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	234	The UGM detects one of the following conditions (continuous monitoring): The machine is in Ground Mode and both direction inputs of the following boom controls are engaged at the same time: Engine Start/Aux, Telescope, Platform Level, Platform Rotate, Jib Lift, Tower Lift, Lift, or Swing. The machine is in Platform Mode and both direction inputs of the following boom controls are engaged at the same time: Engine Start/Aux, Telescope, Platform Level, Platform Rotate, Jib Lift (MACHINE SETUP > JIB = YES), Tower Lift (340AJ, 450AJ); or for Drive Mode – Max Speed/Max Torque	Disable whichever boom functions whose boom control inputs are triggering the fault. If Engine Start/Aux at fault, disable Engine Start but permit Auxiliary Power/Emergency Descent.	None of the boom controls that trigger this fault have both of their direction inputs engaged at the same time	X	X
FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	235	The UGM detects one of the following conditions: The machine is in Ground Mode and the engine is stopped and the ground APU/Function Enable switch becomes engaged while a Ground control input is already engaged. The machine is in Platform Mode and the engine is stopped and the platform APU/Auxiliary Descent switch becomes engaged while a Platform control input is already engaged.	The UGM not enable Auxiliary Power/ Emergency Descent mode	The applicable APU/Auxiliary Descent switch is disengaged or all applicable control inputs become disengaged or the engine state becomes ENGINE RUNNING	X	X
FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	236	The UGM detects one of the following conditions: The machine is in Ground Mode and the engine is stopped and any configured boom control is already engaged and the ground start switch changes from not engaged to engaged The machine is in Platform Mode and the engine is stopped and any drive/steer or configured boom control is already engaged and the footswitch is not engaged and the platform start switch changes from not engaged to engaged	The UGM shall prohibit Engine Start	The selected station's start switch is no longer engaged	X	X
START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	237	The start switch for the selected station is engaged during the UGM startup sequence	The UGM shall prohibit Engine Start	The selected station's start switch is no longer engaged	X	X
FUNCTION PROBLEM - GROUND ENABLE PERMANENTLY SELECTED	2310	Machine is in Ground Mode; The Ground Enable switch input = High at Startup	The UGM shall prohibit Engine Start; The UGM shall not Enable the Machine	Controls initialized	X	X
BOOM ANGLE SENSOR – NOT CALIBRATED	2343	The Boom Angle Sensor has not been calibrated	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Boom angle sensor calibrated	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
BOOM ANGLE SENSOR - OUT OF RANGE HIGH	2344	The UGM detects that Boom Angle Sensor #1 or Boom Angle Sensor #2 signal voltage > 4.5V.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled	X	X
BOOM ANGLE SENSOR - OUT OF RANGE LOW	2345	The UGM detects that Boom Angle Sensor #1 or Boom Angle Sensor #2 signal voltage < 0.5V.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled	X	X
BOOM ANGLE SENSOR – NOT RESPONDING	2346	The UGM detects the following conditions: The UGM detects < 1 deg change of Boom Angle Main Lift Up or Main Lift Down output value ≥ Creep output value Main Lift Up or Main Lift Down has been active longer than 5 seconds.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled	X	X
FUNCTION PROBLEM - JIB LIFT UP PERMANENTLY SELECTED	2370	Machine is in Ground Mode; MACHINE SETUP > JIB = YES; The Jib Lift Up switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Up switch input = Low; Jib Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - JIB LIFT DOWN PERMANENTLY SELECTED	2371	Machine is in Ground Mode; MACHINE SETUP > JIB = YES; The Jib Lift Down switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Down switch input = Low; Jib Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - SWING LEFT PERMANENTLY SELECTED	2372	Machine is in Ground Mode; The Swing Left switch input = High at Startup	The UGM shall prohibit Swing Left and Right	The Swing Left switch input = Low; Swing Left and Right permitted after controls are initialized	X	X
FUNCTION PROBLEM - SWING RIGHT PERMANENTLY SELECTED	2373	Machine is in Ground Mode; The Swing Right switch input = High at Startup	The UGM shall prohibit Swing Left and Right	The Swing Left switch input = Low; Swing Left and Right permitted after controls are initialized	X	X
BOOM ANGLE SENSOR DIS-AGREEMENT	2396	The UGM detects that Boom Angle Sensor #1 and Boom Angle Sensor #2 readings disagree ≥ 2.5 deg for longer than 5 seconds; Do not report if DTC 2343 is active	The UGM shall assume the Boom is Above Elevation and will report a faulted boom angle of 90 degrees	Power Cycled	X	X
FUNCTION PROBLEM – TOWER LIFT UP PERMANENTLY SELECTED	23105	Machine is in Ground Mode; The Tower Lift Up switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Up switch input = Low; Tower Lift Up and Down permitted after controls are initialized		X
FUNCTION PROBLEM – TOWER LIFT DOWN PERMANENTLY SELECTED	23106	Machine is in Ground Mode; The Tower Lift Down switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Down switch input = Low; Tower Lift Up and Down permitted after controls are initialized		X
FUNCTION PROBLEM - LIFT UP PERMANENTLY SELECTED	23107	Machine is in Ground Mode; The Lift Up switch input = High at Startup	The UGM shall prohibit Lift Up and Down	The Lift Up switch input = Low; Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - LIFT DOWN PERMANENTLY SELECTED	23108	Machine is in Ground Mode; The Lift Down switch input = High at Startup	The UGM shall prohibit Lift Up and Down	The Lift Down switch input = Low; Lift Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - TELE-SCOPE IN PERMANENTLY SELECTED	23109	Machine is in Ground Mode; The Telescope In switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope In switch input = Low; Telescope In and Out permitted after controls are initialized	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
FUNCTION PROBLEM - TELESCOPE OUT PERMANENTLY SELECTED	23110	Machine is in Ground Mode; The Telescope Out switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope Out switch input = Low; Telescope In and Out permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM LEVEL UP PERMANENTLY SELECTED	23111	Machine is in Ground Mode; The Platform Level Up switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Up switch input = Low; Platform Level Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM LEVEL DOWN PERMANENTLY SELECTED	23112	Machine is in Ground Mode; The Platform Level Down switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Down switch input = Low; Platform Level Up and Down permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM ROTATE LEFT PERMANENTLY SELECTED	23113	Machine is in Ground Mode; The Platform Rotate Left switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Left switch input = Low; Platform Rotate Left and Right permitted after controls are initialized	X	X
FUNCTION PROBLEM - PLATFORM ROTATE RIGHT PERMANENTLY SELECTED	23114	Machine is in Ground Mode; The Platform Rotate Right switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Right switch input = Low; Platform Rotate Left and Right permitted after controls are initialized	X	X
TELESCOPE RETRACT SWITCHES - DISAGREEMENT	23154	The UGM detects the following conditions: Telescope Retracted Switch #1 and Telescope Retracted Switch #2 readings disagree for longer than 5 seconds; Telescope In or Telescope Out output value ≥ Creep output value	The UGM shall assume the Boom is Not Retracted	Power Cycled	X	
SWING SWITCHES - DISAGREEMENT	23155	The UGM detects the following conditions: Swing Switch #1 and Swing Switch #2 readings disagree for longer than 5 seconds; Swing Left or Swing Right value ≥ Creep output value	The UGM shall assume the Boom is Swung	Power Cycled		X
FUNCTION PROBLEM – MSSO PERMANENTLY SELECTED	23163	The MSSO switch input = Low at Startup	No response required for this DTC	Power Cycled	X	X
BOOM ANGLE SENSOR - SINGLE POINT CALIBRATION PERFORMED	23170	Single point Boom Angle calibration is successfully completed	No response required for this DTC	Fault shall be retentive through Power Cycled; Can be reset if CALIBRATIONS > BOOM ANGLE is successfully completed	X	X
CAPACITY LENGTH SWITCHES - DISAGREEMENT	23173	Dual Capacity is configured; The UGM detects the following conditions: Capacity Length Switch #1 and Capacity Length Switch #2 readings disagree for longer than 5 seconds; Telescope In or Telescope Out output value ≥ Creep output value	The UGM shall assume Dual Capacity = 600#	Power Cycled	X	

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
AMBIENT TEMPERATURE SENSOR – OUT OF RANGE LOW	241	MACHINE SETUP > TEMP CUTOUT = YES; Ambient Temperature sensor reading ≤ -50C	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ. 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed If the Machine is in Ground Mode; No response required for this DTC	Ambient Temperature sensor reading > -50C; Full Speed permitted after controls are initialized	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
AMBIENT TEMPERATURE SENSOR – OUT OF RANGE HIGH	242	MACHINE SETUP > TEMP CUTOUT = YES; Ambient Temperature sensor reading ≥ 85C	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ. 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed If the Machine is in Ground Mode; No response required for this DTC	Ambient Temperature sensor reading < 85C; Full Speed permitted after controls are initialized	X	X
MODEL CHANGED – HYDRAULICS SUSPENDED – CYCLE EMS	259	The MACHINE SETUP > MODEL NUMBER is changed using the analyzer	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start)	Power Cycled	X	X
GENERATOR MOTION CUTOUT ACTIVE	2513	MACHINE SETUP > GEN SET = BELT DRIVE; MACHINE SETUP > GEN SET CUTOUT = MOTION CUTOUT; The platform Generator Switch is engaged Footswitch State = Depressed The machine is in Platform mode	The UGM shall not Enable the Machine	Not all of the trigger conditions are met	X	X
BOOM PREVENTED – DRIVE SELECTED	2514	MACHINE SETUP > FUNCTION CUTOUT = BOOM CUTOUT; Drive or Steer is already engaged; The boom is Above Elevation The operator is attempting to activate one of the boom functions DTC 2514 supercedes DTC 2518 if drive/steer and boom functions are both active when machine transitions from Below Elevation to Above Elevation.	The UGM shall prohibit all boom functions	Not all of the trigger conditions are met	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
DRIVE PREVENTED – ABOVE ELEVATION	2516	MACHINE SETUP > FUNCTION CUTOUT = DRIVE CUTOUT The boom is Above Elevation The operator is attempting to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met	X	X
DRIVE PREVENTED – TILTED & ABOVE ELEVATION	2517	MACHINE SETUP > FUNCTION CUTOUT = DRIVE CUT E&T The boom is Above Elevation The chassis is considered Tilted The operator is attempting to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met	X	X
DRIVE PREVENTED – BOOM SELECTED	2518	MACHINE SETUP > FUNCTION CUTOUT = BOOM CUT-OUT The boom is Above Elevation Any boom function is already active The operator attempts to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met	X	X
DRIVE & BOOM PREVENTED - SOFT TOUCH ACTIVE	2549	MACHINE SETUP > SOFT TOUCH = YES; Machine is in Platform Mode; Soft Touch State = Enabled	Response detailed in Soft Touch section	Not all of the trigger conditions are met	X	X
SKYGUARD SWITCH – DISAGREEMENT	2563	MACHINE SETUP > SKYGUARD = YES; Machine is in Platform Mode; [(SkyGuard input #1 Platform Module J7-18) ≠ (SkyGuard input #2 Platform Module J1-23)] > 160ms	Response detailed in SkyGuard section	[{SkyGuard inputs (Platform Module J7-18 = High) and (Platform Module J1-23 = High)} and (Footswitch State = Not Depressed)]	X	X
TEMPERATURE CUTOUT ACTIVE – AMBIENT TEMPERATURE TOO LOW	2568	Low Temperature Cutout = Active	If the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ. 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed	Low Temperature Cutout = Inactive; Full Speed permitted after controls are initialized	X	X
PLATFORM LEVEL PREVENTED – ABOVE ELEVATION	2576	Platform Level Override Cutout = Enabled; The Platform Level Up or Down switch input = High; Footswitch is active	The UGM shall suspend Platform Level Up and Down commands; The UGM shall prohibit Platform Level Up and Down	Controls initialized	X	X
RUNNING AT CREEP - PLATFORM LEVELED UNDER	2587	The control system has determined that the platform is leveled under and is being considered to be in a loading/unloading position. Boom, Tower, and Level Override functions will operate at creep speed.				

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
BRAKE – SHORT TO BATTERY	331	The UGM detects a short to battery at this output	The UGM shall prohibit Drive and Brake outputs.	Power Cycled	X	X
BRAKE – OPEN CIRCUIT	332	The UGM detects an open circuit at this output	No response required for this DTC	Power Cycled	X	X
LIFT UP VALVE – OPEN CIRCUIT	334	The UGM detects an open circuit at this output	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Lift Up and Down permitted after controls are initialized	X	X
LIFT DOWN VALVE – OPEN CIRCUIT	336	The UGM detects an open circuit at this output	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall prohibit Lift Up; The UGM shall limit Lift Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Lift Up and Lift Down permitted after controls are initialized	X	X
GROUND ALARM – SHORT TO BATTERY	3311	The UGM detects a short to battery at this output	No response required for this DTC	Power Cycled	X	X
MAIN DUMP VALVE – SHORT TO GROUND	3358	The UGM detects a short to ground at this output	The UGM shall prohibit Main Dump	Power Cycled	X	X
MAIN DUMP VALVE – OPEN CIRCUIT	3359	The UGM detects an open circuit at this output	The UGM shall suspend Swing (340AJ, 400S, 450AJ), Tower Lift Up (340AJ, 450AJ), Lift Up, Telescope (400S, 450AJ, 18RS, 24RS), Jib Lift (400S, 450AJ); Platform Rotate (400S, 450AJ) and Platform Level (400S, 450AJ); The UGM shall limit Tower Lift Up (340AJ, 450AJ), Telescope (400S, 450AJ, 18RS, 24RS), Lift Up, Platform Rotate (400S, 450AJ), Platform Level (400S, 450AJ), and Jib Lift (400S, 450AJ) to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Swing (340AJ, 400S, 450AJ), Tower Lift Up (340AJ, 450AJ), Lift Up, Telescope (400S, 450AJ, 18RS, 24RS) Jib Lift (400S, 450AJ), Platform Rotate (400S, 450AJ) and Platform Level (400S, 450AJ)permitted after controls are initialized	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
MAIN DUMP VALVE – SHORT TO BATTERY	3360	The UGM detects a short to battery at this output	The UGM shall prohibit Main Dump, Steer (400S, 450AJ), Swing (340AJ, 400S, 450AJ), Tower Lift Up (340AJ, 450AJ), Lift Up, Telescope (400S, 450AJ, 18RS, 24RS), Jib Lift (400S, 450AJ), Platform Level (400S, 450AJ) and Platform Rotate (400S, 450AJ)	Power Cycled	X	X
BRAKE – SHORT TO GROUND	3361	The UGM detects a short to ground at this output	Disable UGM Drive/Steer and Brake outputs	Power Cycled	X	X
START SOLENOID – SHORT TO GROUND	3362	UGM detects a short to ground at this output	Engine Start attempt shall not be permitted.	Power Cycled	X	X
START SOLENOID – OPEN CIRCUIT	3363	UGM detects an open circuit at this output; if MACHINE SETUP > ENGINE = DUAL FUEL ECU, only evaluate until first Start is attempted for each power cycle due to possibility of ECU opening ground solenoid return path to disable Start and causing erroneous diagnostics.	No response required for this DTC	Power Cycled	X	X
START SOLENOID – SHORT TO BATTERY	3364	UGM detects a short to battery at this output	Disable UGM Engine Start by deenergizing Fuel Actuator (Kubota) or sending Engine Shutdown command (CAN-based ECUs)	Power Cycled	X	X
STEER DUMP VALVE – SHORT TO GROUND	3365	The UGM detects a short to ground at this output	The UGM shall prohibit Steer Dump	Power Cycled		
TWO SPEED VALVE - SHORT TO GROUND	3368	The UGM detects a short to ground at this output	Disable UGM 2 Speed output. If in Max Speed drive mode, switch to Max Torque; disable Max Speed drive mode	Power Cycled	X	X
TWO SPEED VALVE - OPEN CIRCUIT	3369	The UGM detects an open circuit at this output	If in Max Speed drive mode, switch to Max Torque; disable Max Speed drive mode	Power Cycled	X	X
TWO SPEED VALVE - SHORT TO BATTERY	3370	The UGM detects a short to battery at this output	If in Max Speed drive mode, switch to Max Torque; disable Max Speed drive mode. Ramp and limit drive speed to Creep value for associated drive mode: The UGM shall disable Drive when the Boom is Above Elevation.	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
GEN SET/WELDER – SHORT TO GROUND	3373	MACHINE SETUP > GEN SET = BELT DRIVE and the UGM detects a short to ground at this output	Disable UGM Generator output. Do not Enable generator functionality or set Engine to Generator RPM.	Power Cycled	X	X
GEN SET/WELDER – OPEN CIRCUIT	3374	MACHINE SETUP > GEN SET = BELT DRIVE and the UGM detect an open circuit at this output	No response required for this DTC	Power Cycled	X	X
GEN SET/WELDER – SHORT TO BATTERY	3375	MACHINE SETUP > GEN SET = BELT DRIVE and the UGM detects a short to battery at this output	Disable UGM Generator output, but UGM shall consider Generator always excited (enabled) and restrict engine to Generator RPM. If MACHINE SETUP > GENSET CUTOUT = MOTION CUTOUT, disregard cutout and permit motion.	Power Cycled	X	X
HEAD TAIL LIGHT – SHORT TO GROUND	3376	MACHINE SETUP > H & T LIGHTS = YES and the UGM detects a short to ground at this output	Disable UGM H&T Light relay output	Power Cycled	X	X
HEAD TAIL LIGHT – OPEN CIRCUIT	3377	MACHINE SETUP > H & T LIGHTS = YES and the UGM detects an open circuit at this output	No response required for this DTC	Power Cycled	X	X
HEAD TAIL LIGHT – SHORT TO BATTERY	3378	MACHINE SETUP > H & T LIGHTS = YES and the UGM detects a short to battery at this output	Disable UGM H&T Light relay output	Power Cycled	X	X
PLATFORM LEVEL UP VALVE – SHORT TO GROUND	3382	The UGM detects a short to ground at this output	The UGM shall prohibit Platform Level Up; (340AJ, 400S, 450AJ) The UGM shall limit Platform Level Down to Creep speed	Power Cycled	X	X
PLATFORM LEVEL UP VALVE – OPEN CIRCUIT	3383	The UGM detects an open circuit at this output	The UGM shall suspend Platform Level Up and Down; (340AJ, 400S, 450AJ) The UGM shall limit Platform Level Up and Down to Creep speed after controls initialized; (18RS, 24RS) Platform Level Up and Down permitted after controls are initialized	The UGM no longer detects open circuit; (340AJ, 400S, 450AJ) Full speed Platform Level Up and Down permitted after controls are initialized	X	X
PLATFORM LEVEL UP VALVE – SHORT TO BATTERY	3384	The UGM detects a short to battery at this output	The UGM shall prohibit Platform Level Up, Level Down, and Flow Control	Power Cycled	X	X
PLATFORM LEVEL DOWN VALVE – SHORT TO GROUND	3388	The UGM detects a short to ground at this output	The UGM shall prohibit Platform Level Up and Down	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
PLATFORM LEVEL DOWN VALVE – OPEN CIRCUIT	3389	The UGM detects an open circuit at this output	The UGM shall suspend Platform Level Up and Down; The UGM shall prohibit Platform Level Up; (340AJ, 400S, 450AJ) The UGM shall limit Platform Level Down to Creep speed after controls initialized; (18RS, 24RS) Platform Level Down permitted after controls are initialized	The UGM no longer detects open circuit; (340AJ, 400S, 450AJ) Full speed Platform Level Up and Platform Level Down permitted after controls are initialized	X	X
PLATFORM LEVEL DOWN VALVE – SHORT TO BATTERY	3390	The UGM detects a short to battery at this output	The UGM shall prohibit Platform Level Up, Level Down, and Flow Control	Power Cycled	X	X
PLATFORM ROTATE LEFT VALVE – SHORT TO GROUND	3394	The UGM detects a short to ground at this output	The UGM shall prohibit Platform Rotate Left and Right	Power Cycled	X	
PLATFORM ROTATE LEFT VALVE – OPEN CIRCUIT	3395	The UGM detects an open circuit at this output	The UGM shall suspend Platform Rotate Left and Right; (340AJ, 400S, 450AJ) The UGM shall limit Platform Rotate Left and Right to Creep speed after controls initialized; (18RS, 24RS) Platform Rotate Left and Right permitted after controls are initialized	The UGM no longer detects open circuit; (340AJ, 400S, 450AJ) Full speed Platform Rotate Left and Right permitted after controls are initialized	X	
PLATFORM ROTATE LEFT VALVE – SHORT TO BATTERY	3396	The UGM detects a short to battery at this output	The UGM shall prohibit Platform Rotate Left, Right and Flow Control Valve outputs	Power Cycled	X	
PLATFORM ROTATE RIGHT VALVE – SHORT TO GROUND	3397	The UGM detects a short to ground at this output	The UGM shall prohibit Platform Rotate Left and Right	Power Cycled	X	

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
PLATFORM ROTATE RIGHT VALVE – OPEN CIRCUIT	3398	The UGM detects an open circuit at this output	The UGM shall suspend Platform Rotate Left and Right; (340AJ, 400S, 450AJ) The UGM shall limit Platform Rotate Left and Right to Creep speed after controls initialized; (18RS, 24RS) Platform Rotate Left and Right permitted after controls are initialized	The UGM no longer detects open circuit; (340AJ, 400S, 450AJ) Full speed Platform Rotate Left and Right permitted after controls are initialized	X	
PLATFORM ROTATE RIGHT VALVE – SHORT TO BATTERY	3399	The UGM detects a short to battery at this output	The UGM shall prohibit Platform Rotate Left, Right and Flow Control Valve outputs	Power Cycled	X	
JIB LIFT UP VALVE - SHORT TO GROUND	33100	MACHINE SETUP > JIB = YES; The UGM detects a short to ground at this output	The UGM shall prohibit Jib Lift Up; The UGM shall limit Jib Lift Down to Creep speed	Power Cycled	X	
JIB LIFT UP VALVE - OPEN CIRCUIT	33101	MACHINE SETUP > JIB = YES; The UGM detects an open circuit at this output	The UGM shall suspend Jib Lift Up and Down; The UGM shall limit Jib Lift Up and Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Jib Lift Up and Down permitted after controls are initialized	X	
JIB LIFT UP VALVE - SHORT TO BATTERY	33102	MACHINE SETUP > JIB = YES; The UGM detects a short to battery at this output	The UGM shall prohibit Jib Lift Up, Down and Flow Control	Power Cycled	X	
JIB LIFT DOWN VALVE - SHORT TO GROUND	33103	MACHINE SETUP > JIB = YES; The UGM detects a short to ground at this output	The UGM shall prohibit Jib Lift Up and Down	Power Cycled	X	
JIB LIFT DOWN VALVE - OPEN CIRCUIT	33104	MACHINE SETUP > JIB = YES; The UGM detects an open circuit at this output	The UGM shall suspend Jib Lift Up and Down; The UGM shall prohibit Jib Lift Up; The UGM shall limit Jib Lift Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Jib Lift Up permitted after controls are initialized Full speed Jib Lift Down permitted after controls are initialized	X	
JIB LIFT DOWN VALVE - SHORT TO BATTERY	33105	MACHINE SETUP > JIB = YES; The UGM detects a short to battery at this output	The UGM shall prohibit Jib Lift Up, Down and Flow Control	Power Cycled	X	
TOWER LIFT UP VALVE – SHORT TO GROUND	33106	The UGM detects a short to ground at this output	The UGM shall prohibit Tower Lift Up; The UGM shall limit Tower Lift Down Creep speed	Power Cycled		X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
TOWER LIFT UP VALVE – OPEN CIRCUIT	33107	The UGM detects an open circuit at this output	The UGM shall suspend Tower Lift Up and Down command and revert to Open Loop Current control for Tower Lift; The UGM shall limit Tower Lift Up and Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Tower Lift Up and Down permitted after controls are initialized		X
TOWER LIFT DOWN VALVE – SHORT TO GROUND	33109	The UGM detects a short to ground at this output	The UGM shall prohibit Tower Lift Up and Down	Power Cycled		X
TOWER LIFT DOWN VALVE – OPEN CIRCUIT	33110	The UGM detects an open circuit at this output	The UGM shall suspend Tower Lift Up and Down command and revert to Open Loop Current control for Tower Lift; The UGM shall prohibit Tower Lift Up; The UGM shall limit Tower Lift Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Tower Lift Up permitted after controls are initialized; Full speed Tower Lift Down permitted after controls are initialized		X
SWING RIGHT VALVE – SHORT TO GROUND	33118	The UGM detects a short to ground at this output	The UGM shall prohibit Swing Left and Right	Power Cycled	X	X
SWING RIGHT VALVE – OPEN CIRCUIT	33119	The UGM detects an open circuit at this output	The UGM shall suspend Swing Left and Right command and revert to Open Loop Current control for Swing; The UGM shall limit Swing Left and Right to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Swing Left and Right permitted after controls are initialized	X	X
TELESCOPE IN VALVE – SHORT TO BATTERY	33120	The UGM detects a short to battery at this output	The UGM shall prohibit Telescope In, Out and Flow Control	Power Cycled	X	X
SWING LEFT VALVE – SHORT TO GROUND	33122	The UGM detects a short to ground at this output	The UGM shall prohibit Swing Left and Right	Power Cycled	X	X
TELESCOPE OUT VALVE – SHORT TO BATTERY	33123	The UGM detects a short to battery at this output	The UGM shall prohibit Telescope In, Out and Flow Control	Power Cycled	X	X
LIFT VALVES – SHORT TO BATTERY	33182	The UGM detects a short to battery at either the Lift Up or Lift Down valve	The UGM shall prohibit Lift Up and Down; The UGM shall open the Lift Current Feedback low side FET	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
TELESCOPE OUT VALVE – OPEN CIRCUIT	33186	The UGM detects an open circuit at this output	(340AJ, 400S, 450AJ) The UGM shall suspend Telescope In and Out (18RS, 24RS) The UGM shall suspend Telescope In and Out command and revert to Open Loop Current control for Telescope The UGM shall limit Telescope In and Out to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Telescope In and Out permitted after controls are initialized	X	X
TELESCOPE OUT VALVE – SHORT TO GROUND	33188	The UGM detects a short to ground at this output	The UGM shall prohibit Telescope Out; Tele In speed limited to Creep	Power Cycled	X	X
TELESCOPE IN VALVE – OPEN CIRCUIT	33189	The UGM detects an open circuit at this output	(340AJ, 400S, 450AJ) The UGM shall suspend Telescope In and Out (18RS, 24RS) The UGM shall suspend Telescope In and Out command and revert to Open Loop Current control for Telescope The UGM shall prohibit Telescope Out; The UGM shall limit Telescope In to Creep speed after controls initialized	The UGM no longer detects open circuit; Telescope Out permitted after controls are initialized; Full speed Telescope In permitted after controls are initialized	X	X
TELESCOPE IN VALVE – SHORT TO GROUND	33190	The UGM detects a short to ground at this output	The UGM shall prohibit Telescope In and Out	Power Cycled	X	X
APU PUMP RELAY - OPEN CIRCUIT	33276	The UGM detects an open circuit at this output	No response required for this DTC	Power Cycled	X	X
APU PUMP RELAY - SHORT TO BATTERY	33277	The UGM detects a short to battery at this output	Disable UGM APU Pump relay output	Power Cycled	X	X
APU PUMP RELAY - SHORT TO GROUND	33278	The UGM detects a short to ground at this output	Disable UGM APU Pump relay output	Power Cycled	X	X
GLOWPLUG – OPEN CIRCUIT	33279	MACHINE SETUP > ENGINE ≠ DUAL FUEL ECM MACHINE SETUP > ENGINE ≠ DEUTZ EMR4 MACHINE SETUP > GLOW PLUG ≠ NO The UGM detects an open circuit at this output	No response required for this DTC	Power Cycled	X	X
GLOWPLUG – SHORT TO BATTERY	33280	MACHINE SETUP > ENGINE ≠ DUAL FUEL ECM MACHINE SETUP > ENGINE ≠ DEUTZ EMR4 MACHINE SETUP > GLOW PLUG ≠ NO The UGM detects a short to battery at this output	Disable UGM Glow Plug relay output	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
GLOWPLUG – SHORT TO GROUND	33281	MACHINE SETUP > ENGINE ≠ DUAL FUEL ECM MACHINE SETUP > ENGINE ≠ DEUTZ EMR4 MACHINE SETUP > GLOW PLUG ≠ NO The UGM detects a short to ground at this output	Disable UGM Glow Plug relay output	Power Cycled	X	X
LIFT – CURRENT FEEDBACK READING TOO LOW	33287	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized	Power Cycled	X	X
SWING LEFT VALVE – OPEN CIRCUIT	33295	The UGM detects an open circuit at this output	The UGM shall suspend Swing Left and Right command and revert to Open Loop Current control for Swing; The UGM shall limit Swing Left and Right to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Swing Left and Right permitted after controls are initialized	X	X
FLOW CONTROL VALVE – OPEN CIRCUIT	33314	The UGM detects an open circuit at this output	The UGM shall suspend Flow Control and revert to Open Current loop control for Flow Control; The UGM shall limit Telescope, Jib Lift Up, Jib Lift Down (400S, 450AJ), Platform Rotate and Platform Level to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Telescope, Jib Lift Up, Jib Lift Down (400S, 450AJ), Platform Rotate and Platform Level permitted after controls are initialized	X	X
FLOW CONTROL VALVE – SHORT TO BATTERY	33315	The UGM detects a short to battery at this output	The UGM shall prohibit Flow Control, Telescope, Jib Lift Up (permitted if operating in Auxiliary Power/Emergency Descent mode), Jib Lift Down (permitted if operating in Auxiliary Power/Emergency Descent mode) (400S, 450AJ), Platform Rotate and Platform Level	Power Cycled	X	X
FLOW CONTROL VALVE – SHORT TO GROUND	33316	The UGM detects a short to ground at this output	The UGM shall prohibit Flow Control, Telescope, Jib Lift Up, Jib Lift Down (400S, 450AJ), Platform Rotate and Platform Level	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
DRIVE FORWARD VALVE – OPEN CIRCUIT	33317	The UGM detects an open circuit at this output	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Drive Forward and Reverse permitted after controls are initialized	X	X
DRIVE VALVES – SHORT TO BATTERY	33318	The UGM detects a short to battery at either the Drive Forward or Drive Reverse valve.	The UGM shall prohibit Drive Forward and Reverse; The UGM shall open the Drive Current Feedback low side FET	Power Cycled	X	X
DRIVE FORWARD VALVE – SHORT TO GROUND	33319	The UGM detects a short to ground at this output	The UGM shall prohibit Drive Forward and Reverse	Power Cycled	X	X
DRIVE REVERSE VALVE – OPEN CIRCUIT	33320	The UGM detects an open circuit at this output	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Drive Forward and Reverse permitted after controls are initialized	X	X
DRIVE REVERSE VALVE – SHORT TO GROUND	33322	The UGM detects a short to ground at this output	The UGM shall prohibit Drive Forward and Reverse	Power Cycled	X	X
DRIVE – CURRENT FEEDBACK READING TOO LOW	33331	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized	Power Cycled	X	X
LIFT UP VALVE – SHORT TO GROUND	33406	The UGM detects a short to ground at this output	The UGM shall prohibit Lift Up; The UGM shall limit Lift Down Creep speed	Power Cycled	X	X
LIFT DOWN VALVE – SHORT TO GROUND	33407	The UGM detects a short to ground at this output	The UGM shall prohibit Lift Up and Down	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
DRIVE – LOSS OF CURRENT FEEDBACK	33410	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized	Power Cycled	X	X
SWING VALVES – SHORT TO BATTERY	33412	The UGM detects a short to battery at either the Swing Right or Swing Left valve	The UGM shall prohibit Swing Left and Right; The UGM shall open the Swing Current Feedback low side FET	Power Cycled	X	X
TOWER LIFT – CURRENT FEEDBACK READING TOO LOW	33413	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Tower Lift Up and Down command and revert to Open Loop Current control for Tower Lift; The UGM shall limit Tower Lift Up and Down to Creep speed after controls initialized	Power Cycled		X
SWING – CURRENT FEEDBACK READING TOO LOW	33414	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Swing Left and Right command and revert to Open Loop Current control for Swing; The UGM shall limit Swing Left and Right to Creep speed after controls initialized	Power Cycled	X	X
FLOW CONTROL VALVE – CURRENT FEEDBACK READING TOO LOW	33415	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Flow Control and revert to Open Current loop control for Flow Control; The UGM shall limit Telescope, Jib Lift Up; Jib Lift Down (400S, 450AJ), Platform Rotate and Platform Level to Creep speed after controls initialized	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
TOWER LIFT – CURRENT FEEDBACK READING LOST	33416	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Tower Lift Up and Down command and revert to Open Loop Current control for Tower Lift; The UGM shall limit Tower Lift Up and Down to Creep speed after controls initialized	Power Cycled		X
LIFT – CURRENT FEEDBACK READING LOST	33417	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized	Power Cycled	X	X
SWING – CURRENT FEEDBACK READING LOST	33418	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Swing Left and Right command and revert to Open Loop Current control for Swing; The UGM shall limit Swing Left and Right to Creep speed after controls initialized	Power Cycled	X	X
FLOW CONTROL VALVE – CURRENT FEEDBACK READING LOST	33419	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Flow Control and revert to Open Current loop control for Flow Control; The UGM shall limit Telescope In and Out, Jib Lift Up and Down (400S, 450AJ), Platform Rotate Right and Left and Platform Level Up and Down to Creep speed after controls initialized	Power Cycled	X	X
TOWER LIFT VALVES – SHORT TO BATTERY	33425	The UGM detects a short to battery at either the Tower Lift Up or Tower Lift Down valve.	The UGM shall prohibit Tower Lift Up and Down; The UGM shall open the Tower Lift Current Feedback low side FET	Power Cycled		X
AUXILIARY LIFT DOWN VALVE - SHORT TO GROUND	33537	The UGM detects a short to ground at this output	The UGM shall prohibit Aux Lift Down	Power Cycled	X	X
AUXILIARY LIFT DOWN VALVE - OPEN CIRCUIT	33538	The UGM detects an open circuit at this output	The UGM shall suspend Aux Lift Down; Aux Lift Down permitted after controls are initialized	The UGM no longer detects open circuit	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
AUXILIARY LIFT DOWN VALVE - SHORT TO BATTERY	33539	The UGM detects a short to battery at this output	The UGM shall prohibit Aux Lift Down; The UGM shall open the Auxiliary low side FET	Power Cycled	X	
AUXILIARY TOWER LIFT DOWN VALVE - SHORT TO GROUND	33540	The UGM detects a short to ground at this output	The UGM shall prohibit Aux Tower Lift Down	Power Cycled		X
AUXILIARY TOWER LIFT DOWN VALVE - OPEN CIRCUIT	33541	The UGM detects an open circuit at this output	The UGM shall suspend Aux Tower Lift Down; Aux Tower Lift Down permitted after controls are initialized	The UGM no longer detects open circuit		X
OSCILLATING AXLE #1 VALVE - SHORT TO GROUND	33543	The UGM detects a short to ground at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X
OSCILLATING AXLE #1 VALVE - OPEN CIRCUIT	33544	The UGM detects an open circuit at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X
OSCILLATING AXLE #1 VALVE - SHORT TO BATTERY	33545	The UGM detects a short to battery at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X
OSCILLATING AXLE #2 VALVE - SHORT TO GROUND	33546	The UGM detects a short to ground at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X
OSCILLATING AXLE #2 VALVE - OPEN CIRCUIT	33547	The UGM detects an open circuit at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X
OSCILLATING AXLE #2 VALVE - SHORT TO BATTERY	33548	The UGM detects a short to battery at this output	UGM shall disable Oscillating Axle #1 valve and Oscillating Axle #2 valve outputs; The UGM shall Lock the Oscillating Axle	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
AUXILIARY VALVES - SHORT TO BATTERY	33567	The UGM detects a short to battery at either the Aux Lift Down or Aux Tower Lift Down valve	The UGM shall prohibit Aux Lift Down and Aux Tower Lift Down; The UGM shall open the Auxiliary low side FET	Power Cycled		X
AUXILIARY - CURRENT FEEDBACK READING LOST	33568	Measured feedback current < 225mA while output is active for a period of 100ms.	The UGM shall suspend Aux Lift Down and Aux Tower Down (450AJ); Aux Lift Down and Aux Tower Down (450AJ) permitted after controls are initialized	Power Cycled	X	X
ECM PULL DOWN RESISTOR - OPEN CIRCUIT	33575	MACHINE SETUP > ENGINE = DEUTZ EMR4; Pull down resister not detected	The UGM shall send the Engine Shutdown command	Power Cycled	X	X
PLATFORM ROTATE LEFT VALVE – OPEN CIRCUIT	349	The PM detects an open circuit at this output and reports it to the UGM	The UGM shall suspend commands to PM for Platform Rotate Right and Left; The UGM shall limit Platform Rotate Right and Left to Creep speed after controls are initialized	The PM no longer detects open circuit; Full speed Platform Rotate Right and Left permitted after controls are initialized		X
PLATFORM ROTATE LEFT VALVE – SHORT TO BATTERY	3410	The PM detects a short to battery at this output and reports it to the UGM	The UGM shall disable commands to PM for Platform Rotate Right and Left; The UGM shall prohibit Flow Control	Power Cycled		X
PLATFORM ROTATE LEFT VALVE – SHORT TO GROUND	3411	The PM detects a short to ground at this output and reports it to the UGM	The UGM shall disable commands to PM for Platform Rotate Right and Left	Power Cycled		X
PLATFORM ROTATE RIGHT VALVE – OPEN CIRCUIT	3412	The PM detects an open circuit at this output and reports it to the UGM	The UGM shall suspend commands to PM for Platform Rotate Right and Left; The UGM shall limit Platform Rotate Right and Left to Creep speed after controls are initialized	The PM no longer detects open circuit; Full speed Platform Rotate Right and Left permitted after controls are initialized		X
PLATFORM ROTATE RIGHT VALVE – SHORT TO BATTERY	3413	The PM detects a short to battery at this output and reports it to the UGM	The UGM shall disable commands to PM for Platform Rotate Right and Left; The UGM shall prohibit Flow Control	Power Cycled		X
PLATFORM ROTATE RIGHT VALVE – SHORT TO GROUND	3414	The PM detects a short to ground at this output and reports it to the UGM	The UGM shall disable commands to PM for Platform Rotate Right and Left	Power Cycled		X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
JIB LIFT UP VALVE – OPEN CIRCUIT	3415	MACHINE SETUP > JIB = YES The PM detects an open circuit at this output and reports it to the UGM	The UGM shall suspend commands to PM for Jib Lift Up and Down; The UGM shall limit Jib Lift Up and Down to Creep speed	The PM no longer detects open circuit; Full speed Jib Lift Up and Down permitted after controls are initialized		X
JIB LIFT UP VALVE – SHORT TO BATTERY	3416	MACHINE SETUP > JIB = YES The PM detects a short to battery at this output and reports it to the UGM	The UGM shall disable commands to PM for Jib Lift Up and Down; The UGM shall prohibit Flow Control	Power Cycled		X
JIB LIFT UP VALVE – SHORT TO GROUND	3417	MACHINE SETUP > JIB = YES The PM detects a short to ground at this output and reports it to the UGM	The UGM shall disable commands to PM for Jib Lift Up; The UGM limits Jib Lift Down to Creep speed	Power Cycled		X
JIB LIFT DOWN VALVE – OPEN CIRCUIT	3418	MACHINE SETUP > JIB = YES The PM detects an open circuit at this output and reports it to the UGM	The UGM shall suspend commands to PM for Jib Lift Up and Down; The UGM shall prohibit Jib Lift Up; The UGM shall limit Jib Lift Down to Creep speed	The PM no longer detects open circuit; Jib Lift Up permitted after controls are initialized Full speed Jib Lift Down permitted after controls are initialized		X
JIB LIFT DOWN VALVE – SHORT TO BATTERY	3419	MACHINE SETUP > JIB = YES The PM detects a short to battery at this output and reports it to the UGM	The UGM shall disable commands to PM for Jib Lift Up and Down; (450AJ) The UGM shall prohibit Flow Control	Power Cycled		X
JIB LIFT DOWN VALVE – SHORT TO GROUND	3420	MACHINE SETUP > JIB = YES The PM detects a short to ground at this output and reports it to the UGM; detection occurs for PWM output approximately ≤ 15% or for STG condition.	The UGM shall disable commands to PM for Jib Lift Up and Down	Power Cycled		X
FUEL SENSOR - SHORT TO BATTERY OR OPEN CIRCUIT	431	UGM fuel sensor analog input J2-25 detects a voltage higher than 2.50 volts (A/D > 512)	Energize fuel sensor per System Indicators	Power Cycled	X	
FUEL SENSOR - SHORT TO GROUND	432	UGM fuel sensor analog input J2-25 detects a voltage less than or equal to 0.3 volts (A/D < 61)	Energize fuel sensor per System Indicators	Power Cycled	X	
ENGINE TROUBLE CODE	437	An engine with a CAN engine controller is configured in MACHINE SETUP The engine controller reports a J1939 fault	Report and log in Help If [(MACHINE SETUP > DEUTZ EMR2) or (MACHINE SETUP > DEUTZ EMR4) and SPN:FMI = 535:7], prohibit engine cranking	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
HIGH ENGINE TEMP	438	An engine with a CAN engine controller is not configured in MACHINE SETUP: The Engine State = ENGINE RUNNING > 10 seconds The coolant temperature is greater than or equal to the configured engines max allowed temperature. The maximum allowed temperature > 110°C. An engine with a CAN engine controller is configured in MACHINE SETUP: ECM transmits a J1939 DM1 message for an engine coolant high temperature critical fault (SPN:FMI 110:0) on CAN2 or uses the J1939 Transport Protocol every one second to send this information if multiple engine faults exist.	MACHINE SETUP > ENGINE SHUTDOWN = ENABLED then shutdown the engine Activate High Engine Temperature indicator J4-28	Power Cycled	X	X
NO ALTERNATOR OUTPUT	4310	The Engine State = ENGINE RUNNING > 10 seconds and UGM system voltage < 11.5 volts for 10 seconds	Activate the No Charge indicator J4-26 per System Indicators	UGM system voltage > 11.7 volts	X	X
LOW OIL PRESSURE	4311	An engine with a CAN engine controller is not configured in MACHINE SETUP The Engine State = ENGINE RUNNING > 10 seconds The engine oil pressure is LOW (debounce 3s). An engine with a CAN engine controller is configured in MACHINE SETUP ECM transmits a J1939 DM1 message for an engine oil low pressure critical fault (SPN:FMI 100:1) on CAN2 or uses the J1939 Transport Protocol every one second to send this information if multiple engine faults exist.	MACHINE SETUP > ENGINE SHUTDOWN = ENABLED then shutdown the engine Activate the Low Oil Pressure indicator J4-29	Power Cycled	X	X
ENGINE COOLANT – LOW LEVEL	4334	MACHINE SETUP > ENGINE = DEUTZ EMR4; ECM transmits a J1939 DM1 message for an engine coolant low level fault (SPN:FMI 111:1) on CAN2 or uses the J1939 Transport Protocol every one second to send this information if multiple engine faults exist.	MACHINE SETUP > ENGINE SHUTDOWN = ENABLED then shutdown the engine; Activate High Engine Temperature indicator J4-28	Power Cycled	X	X
WATER IN FUEL	4375	The engine has shut down because an unacceptable amount of water has been detected in the fuel or there is an issue with the water in fuel sensor. If operating in platform mode, platform alarm will sound continuously and low fuel indicator will flash. If operating in ground mode, the ground alarm will sound		Water in fuel filter for water or in fuel or water in fuel sensor.		

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
FUNCTIONS PREVENTED - ENGINE OIL WARM UP ACTIVE	4376	Engine Oil Warm Up is active because the engine was started when the engine coolant was less than 32 deg F. Engine Oil Warm Up will remain active until the engine coolant is greater than 32 deg F or the engine has been running for 60s and the engine coolant is less than 32 deg F. Machine functions will be prevented until Engine Oil Warm Up is complete.				
BATTERY VOLTAGE TOO LOW – SYSTEM SHUTDOWN	441	The UGM detects that its supply voltage is less than 9 volts Engine State ≠ ENGINE CRANKING Auxiliary Power/Emergency Descent Mode is not active	Disable all UGM valve outputs except those used during APU/Emergency Descent [Tower Lift Down, Lift Down, Swing (400S, 450AJ, 24RS), Jib Lift Up/Down (MACHINE SETUP > JIB= YES)]. If MACHINE SETUP > H&T LIGHTS = YES or > ENGINE ≠ DUAL FUEL ECM turn off lights	Voltage is greater than 9.25 volts	X	X
BATTERY VOLTAGE TOO HIGH – SYSTEM SHUTDOWN	442	The UGM detects that its supply voltage > 16.0 volts	Disable all UGM and Platform outputs until voltage < 15.75 volts and do not permit Machine Enable	Power Cycled	X	X
LSS BATTERY VOLTAGE TOO HIGH	443	MACHINE SETUP > LOAD SYSTEM ≠ NO The UGM detects that the LSS reports supply voltage > 16.0V	The load sensor has determined that its supply voltage is too high (> 16V). The machine will assume the platform is overloaded.	Check for issue with sensor supply voltage.	X	X
LSS BATTERY VOLTAGE TOO LOW	444	MACHINE SETUP > LOAD SYSTEM ≠ NO The UGM detects that the LSS reports supply voltage < 9.0V	The load sensor has determined that its supply voltage is too low (> 8V). The machine will assume the platform is overloaded.	Check for issue with sensor supply voltage.	X	X
BATTERY VOLTAGE LOW	445	The UGM detects that its supply voltage < 11 volts for 5 seconds. Engine State ≠ ENGINE CRANKING Auxiliary Power/Emergency Descent Mode is not active Glow Plugs are not energized	No response required for this DTC	Voltage is greater than 11.25 volts	X	X
LSS BATTERY VOLTAGE - INITIALIZATION ERROR	4479	The shear beam is reporting a Sensor Supply Voltage Initialization Error The machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.			

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS BATTERY VOLTAGE - NOT CALIBRATED	4480	The shear beam is reporting a Sensor Supply Voltage calibration error. The machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.			
CANBUS FAILURE – PLATFORM MODULE	662	UGM does not receive any CAN messages from the PM in 250ms	The UGM shall suspend motion; If MACHINE SETUP > GENERATOR, the UGM shall disable to turn off generator relay output and assume generator off state. If MACHINE SETUP > ENGINE = DUAL FUEL and > H&T LIGHTS = YES, state of switch prior to loss of CAN Bus 1 shall be retained until CAN Bus 1 is restored or power cycled. Reactivation of Footswitch is required after CAN Bus 1 is restored to obtain Machine Enable. (340AJ, 450AJ) If the Machine is in Ground Mode, the UGM shall disable commands to PM for Jib Lift Up and Down, Platform Rotate Right and Left;	CAN messages are received from the PM	X	X
CANBUS FAILURE – LOAD SENSING SYSTEM MODULE	663	MACHINE SETUP > LOAD SYSTEM ≠ NO UGM does not receive any CAN messages from the LSS module in 1000ms	The control system has lost communication with the load sensing system load pin. The machine will assume the platform is overloaded.	Check wiring to load sensor.	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
CANBUS FAILURE – ENGINE CONTROLLER	666	An engine with a CAN engine controller is configured in MACHINE SETUP No CAN messages are received from the engine controller for more than 250ms	UGM shall set Target engine RPM = Mid-Engine if Engine State ≠ ENGINE STOPPED, and assume Engine Controller reporting mid-Engine; otherwise, Engine State = ENGINE STOPPED. If engine state = ENGINE STOPPED at time of CAN loss, UGM shall permit one start attempt. If engine state ≠ ENGINE STOPPED at time of CAN loss, UGM shall decel all functions. If MACHINE SETUP > GENERATOR ≠ NO, Generator Relay output to be turned off until re-enabled by operator after CAN is re-established.	CAN messages are received from the engine controller; UGM shall require re-activation of Footswitch (Platform Mode) or Ground Enable (Ground Mode) to enable functions and resume operation.	X	X
CANBUS FAILURE – EXCESSIVE CANBUS ERRORS	6613	More than 22 error frames per second for 4 seconds or more than 500 Buss Off conditions since last power cycle.	No response required for this DTC	Power Cycled	X	X
CANBUS FAILURE – TCU MODULE	6622	MACHINE SETUP > CLEARSKY = YES No CAN2 messages are received from the TCU module for more than 30 seconds	No response required for this DTC	Not all of the trigger conditions are met	X	X
CANBUS FAILURE – CHASSIS TILT SENSOR	6635	UGM does not receive any CAN messages from the Chassis Tile Sensor in 250ms	The UGM shall consider the machine Tilted; UGM reports a combined chassis tilt angle of 90 degrees; UGM shall report individual axis readings as??	CAN messages are received from the Chassis tilt Sensor and controls are initialized	X	X
CANBUS FAILURE - GROUND DISPLAY	6651	UGM does not receive any CAN messages from the Ground Display in 250ms	No response required for this DTC	CAN messages are received from the Ground Display	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
CANBUS FAILURE – TEMPERATURE SENSOR	6657	MACHINE SETUP > TEMP CUTOUT = YES; UGM does not receive any CAN messages from the Ambient Temperature sensor in 250ms	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ. 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed If the Machine is in Ground Mode; No response required for this DTC	CAN messages are received from the Ambient Temperature sensor	X	X
REMOTE CONTRACT MANAGEMENT OVERRIDE – ALL FUNCTIONS IN CREEP	681	MACHINE SETUP > CLEARSKY = YES Value set by ClearSky TCU	Response detailed in Remote Contract Management section.	Cleared by ClearSky TCU	X	X
CHASSIS TILT SENSOR NOT CALIBRATED	813	The UGM detects one of the follow conditions: The tilt sensor has not been calibrated; For 400S, 450AJ, the Tilt Sensor source Address is 0xC0; For 400S, 450AJ, the Tilt Sensor Serial number does not match	The UGM shall consider the machine Tilted UGM reports a combined chassis tilt angle of 90 degrees; UGM shall report individual axis readings	Tilt sensor calibrated	X	X
CHASSIS TILT SENSOR OUT OF RANGE	814	Fault CHASSIS TILT SENSOR NOT CALIBRATED (813) is not present and Tilt sensor measurement > 19º for 4 seconds. Not to be reported during Tilt Sensor calibration.	No additional action required beyond Tilted requirements specified elsewhere; UGM reports a combined chassis tilt angle of 90 degrees; UGM shall report individual axis readings	Not all of the trigger conditions are met.	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
TILT SENSOR STAGNANT	818	The UGM detects the following conditions: The X axis or Y axis filtered readings change by < ±0.1° in 5 second; Drive Forward or Drive Reverse output value is ≥ Creep output value; Do not report if DTC 823 is active	The UGM shall consider the machine Tilted; UGM reports a combined chassis tilt angle of 90 degrees; The UGM reports individual axis readings	Power Cycled	X	X
LSS CELL #1 ERROR	821	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; The UGM detects that LSS is reporting error with Cell #1	UGM to set Platform Load State = Overloaded	Not all of the trigger conditions are met	X	X
LSS CELL #2 ERROR	822	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; The UGM detects that LSS is reporting error with Cell #2	UGM to set Platform Load State = Overloaded	Not all of the trigger conditions are met	X	X
LSS CELL #3 ERROR	823	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; The UGM detects that LSS is reporting error with Cell #3	UGM to set Platform Load State = Overloaded	Not all of the trigger conditions are met	X	X
LSS CELL #4 ERROR	824	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; The UGM detects that LSS is reporting error with Cell #4.	UGM to set Platform Load State = Overloaded	Not all of the trigger conditions are met	X	X
LSS HAS NOT BEEN CALIBRATED	825	The load sensing system is configured but has not been calibrated. The machine will assume the platform is overloaded.	UGM to set Platform Load State = Overloaded	Calibrate the load sensing system.	X	X
RUNNING AT CREEP – PLATFORM OVERLOADED	826	Machine Setup > LOAD SYSTEM = WARN ONLY The platform is Overloaded Ground mode is active with Auxiliary Power/Emergency Descent mode not active or Platform mode is active	Refer to Table 7-1 for machine response.	Not all of the trigger conditions are met	X	X
DRIVE & BOOM PREVENTED – PLATFORM OVERLOADED	827	The Platform is Overloaded and Machine Setup > LOAD SYSTEM = CUTOUT PLATFORM, Platform Mode is active, and conditions of Table 7-1 apply. -or- The Platform is Overloaded and Machine Setup > LOAD SYSTEM = CUTOUT ALL and conditions of Table 7-1 apply.	Refer to Table 7-1 for machine response.	Not all of the trigger conditions are met	X	X
LIFT UP & TELE OUT PREVENTED – PLATFORM OVERLOADED	828	MACHINE SETUP > LOAD SYSTEM = SPECIAL 1 Platform Mode is active The platform is Overloaded	Refer to Table 7-1 for machine response.	Not all of the trigger conditions are met	X	X
LSS READING UNDER WEIGHT	8211	LSS has been calibrated and the UGM has determined that the load sensing system reading is underweight while a period of time while operating drive or boom lift up at speeds greater than creep OR the UGM has determined that the load sensing system reading is less than -1.5 x Gross Platform Weight. The machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Ensure platform is not resting on the ground or is not leveled at an extreme negative angle. Re-calibrate the load sensing system if the above items are not a factor.	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS SENSOR DISAGREEMENT	8218	The control system has determined that the difference between the calculated load for sensor 1 and sensor 2 differ by more than 50lbs OR the internal strain gauge sensor 1 gross platform weight reading and the internal strain gauge sensor 2 gross platform weight reading differ by more than 200lbs. If the platform is not considered to be overloaded boom functions will be restricted to creep. This fault, once annunciated is latched within a given key cycle.		Attempt to re-calibrate the load sensing system. Possible sensor hardware issue.	X	X
LSS SENSOR - OUT OF RANGE HIGH	8219	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 1-Cell LSS; Strain Gauge 1 or 2 reports Out of Range High error	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS SENSOR - OUT OF RANGE LOW	8220	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 1-Cell LSS; Strain Gauge 1 or 2 reports Out of Range Low error	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS SENSOR - OUT OF CALIBRATION	8221	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 1-Cell LSS; Strain Gauge 1 or 2 reports Not Calibrated error	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS STRAIN GAUGE 1 - STAGNANT	8222	The control system has determined that the strain gauge 1 reading in the load sensor is stagnant (not changing). If the platform is not considered to be overloaded boom functions will be restricted to creep.. If DTC 8223 is active in combination with DTC 8222 the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - STAGNANT	8223	The control system has determined that the strain gauge 2 reading in the load sensor is stagnant (not changing). If the platform is not considered to be overloaded boom functions will be restricted to creep. If DTC 8222 is active in combination with DTC 8223 the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS STRAIN GAUGE 1 - OUT OF RANGE LOW	8224	The shear beam is reporting an out of range low issue with the strain gauge 1 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8225 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - OUT OF RANGE LOW	8225	The shear beam is reporting an out of range low issue with the strain gauge 2 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8224 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 1 - OUT OF RANGE HIGH	8226	The shear beam is reporting an out of range high issue with the strain gauge 1 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8227 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - OUT OF RANGE HIGH	8227	The shear beam is reporting an out of range high issue with the strain gauge 2 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8226 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS STRAIN GAUGE 1 - INITIALIZATION ERROR	8228	The shear beam is reporting an initialization issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8229 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - INITIALIZATION ERROR	8229	The shear beam is reporting an initialization issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8228 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 1 - NOT CALIBRATED	8230	The shear beam is reporting a calibration issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8231 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - NOT CALIBRATED	8231	The shear beam is reporting a calibration issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8230 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS STRAIN GAUGE 1 - SENSOR DEFECT	8232	The shear beam is reporting a sensor defect issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8233 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - SENSOR DEFECT	8233	The shear beam is reporting a sensor defect issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8232 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 1 - NOT INSTALLED	8234	The shear beam is reporting a not installed issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8235 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - NOT INSTALLED	8235	The shear beam is reporting a not installed issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8234 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
LSS NOT DETECTING CHANGE	8236	The control system has determined that the load sensor reading has not deviated by more than 1lb for 5s while operating drive or boom functions at greater than creep speed. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 1 - A/D DEFECT	8237	The shear beam is reporting an internal issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8238 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
LSS STRAIN GAUGE 2 - A/D DEFECT	8238	The shear beam is reporting an internal issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8237 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		
FRONT LEFT STEER VALVE – OPEN CIRCUIT	8639	The UGM detects an open circuit at this output	Steer Left and Right speed limited to Creep (340AJ, 400S, 450AJ); No response required for this DTC (18RS, 24RS)	Power Cycled	X	X
FRONT LEFT STEER VALVE – SHORT TO BATTERY	8640	The UGM detects a short to battery at this output	Disable UGM Drive Forward/Reverse and Steer Left/Right outputs	Power Cycled	X	X
FRONT LEFT STEER VALVE – SHORT TO GROUND	8641	The UGM detects a short to ground at this output	Disable UGM Steer Left and Right outputs	Power Cycled	X	X
FRONT RIGHT STEER VALVE – OPEN CIRCUIT	8642	The UGM detects an open circuit at this output	Steer Left and Right speed limited to Creep(340AJ, 400S, 450AJ); No response required for this DTC (18RS, 24RS)	Power Cycled	X	X
FRONT RIGHT STEER VALVE – SHORT TO BATTERY	8643	The UGM detects a short to battery at this output	Disable UGM Drive Forward/Reverse and Steer Left/Right outputs	Power Cycled	X	X
FRONT RIGHT STEER VALVE – SHORT TO GROUND	8644	The UGM detects a short to ground at this output	Disable UGM Steer Left and Right outputs	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
MACHINE SAFETY SYSTEM OVERRIDE OCCURRED	873	MSSO = Active	Response described in MSSO Influence on Machine Operation section	Fault shall be retentive through Power Cycled; Can be reset only with an Analyzer via the CALIBRATIONS > MSSO > MSSO RESET menu	X	X
LSS WATCHDOG RESET	991	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; UGM detects LSS report of an anomaly exists that has caused a WatchDog Timer reset.	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS EEPROM ERROR	992	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; UGM detects LSS report of an anomaly that exists in the LSS EEPROM	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS INTERNAL ERROR – PIN EXCITATION	993	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; UGM detects LSS report of improper excitation voltage	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS INTERNAL ERROR – DRDY MISSING FROM A/D	994	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; UGM detects LSS report of an anomaly that exists in the LSS A/D converter operations.	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
EEPROM FAILURE - CHECK ALL SETTINGS	998	The UGM has detected an anomaly in EEPROM	Disable all machine and engine functions (i.e., command engine shut-down and do not permit start); reset the section of EEPROM where the failure occurred to defaults.	Power Cycled	X	X
FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER	9910	The UGM software version type is 'P' or 'B' The UGM has received valid version information from the PM The PM software version type is 'P' or 'B' The UGM software major version number does not match the major version number of the platform software	Activate the platform alarm continuously Creep mode is active If Platform Mode is active, disable all Drive, Steer, and Boom functions and do not permit Machine Enable	Not all of the trigger conditions are met	X	X
FUNCTION LOCKED OUT - LSS MODULE SOFTWARE VERSION IMPROPER	9911	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; The UGM determines that the LSS software version is not compatible with existing code.	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
CHASSIS TILT SENSOR NOT GAIN CALIBRATED	9915	The tilt sensor gain calibration values recorded to flash memory during Phoenix International's manufacturing test are not present	The UGM reports a faulted chassis tilt angle of 90 degrees	Valid values are present	X	X
PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	9920	The PM detects that its reference voltage is out of range and reports the fault to the UGM	If in Platform mode, Lift/Swing and Drive shall be place in Creep. All other functions shall operate normally.	Power Cycled	X	X

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
GROUND MODULE FAILURE:HIGH SIDE DRIVER CUTOUT FAULTY	9921	The engine is not running The engine is not cranking The UGM footswitch input J7-15 is LOW The machine is in Platform Mode The Main Dump output J2-13 is detected as HIGH via the analog feedback 300ms after it is attempted to be activated during the one time startup test of the UGM hardware shutoff circuitry	Disable all Drive/Steer and Boom functions except Tower Lift Down (340AJ, 450AJ), Lift Down, and Jib Lift Down (340AJ).	Power Cycled	X	X
PLATFORM MODULE FAILURE: HWFS CODE 1	9922	The PM detects that its V(low) FET has failed and reports this fault to the UGM	No response required for this DTC	Power Cycled	X	X
FUNCTIONS LOCKED OUT - MACHINE NOT CONFIGURED	9924	The machine is powered up and no model has been selected yet in the MACHINE SETUP menu	Display??? or NO MODEL at Analyzer MACHINE SETUP menu MACHINE SETUP->MODEL NUMBER Do not report any other faults Disable all machine and engine functions (i.e., command engine shutdown and do not permit start)	Power Cycled	X	X
GROUND MODULE CONSTANT DATA UPDATE REQUIRED	9927	The UGM detects one of the following conditions when software type is 'P' or 'B': The Version Verification Word #1 or the Version Verification Word #2 values located in the constant data sector of flash memory (found on constant data spreadsheet tab pstConstantDataVersion) do not match the values located in the code area of flash memory The Version Major value located in the constant data sector of flash memory (found on constant data spreadsheet tab pstConstantDataVersion) does not match the value located in the code area of flash memory	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start)	A different application code or constant data version is programmed so that the values match Power Cycled	X	X
CURRENT FEEDBACK GAINS OUT OF RANGE	9944	One or more of the current feedback gains that are calculated and written to flash memory during the PIC manufacturing test process are detected as being out of range	A gain of 1 is used for the factory gain(s) that was out of range; all functions shall be placed in Creep mode.	Power Cycled	X	X
CURRENT FEEDBACK CALIBRATION CHECKSUM INCORRECT	9945	The current feedback gains checksum that is calculated and written to flash memory during the PIC manufacturing test process is detected as being incorrect	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start).	Power Cycled	X	X

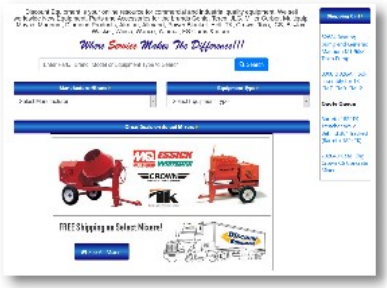
Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault	400S	450AJ
MACHINE CONFIGURATION OUT OF RANGE – CHECK ALL SETTINGS	9949	UGM has detected an anomaly in EEPROM with regard to the Machine Setup configuration.	UGM to prompt operator to correct issue via Analyzer and disable all machine and engine functions (i.e., command engine shutdown and do not permit start).until EEPROM data in corrupted area is changed.	Power Cycled and EEPROM data in associated area is changed	X	X
LSS CORRUPT EEPROM	9977	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 4-Cell LSS; and one of the following conditions: UGM determines LSS-stored values for Unloaded weight in Indirect 0x100≠ 0x108 or UGM determines LSS-stored values for Accessory weight in Indirect 0x102≠ 0x10A UGM determines LSS-stored checksum1 (0x10F) ≠ checksum 2 (0x107)	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
FUNCTIONS LOCKED OUT - GROUND MODULE SOFTWARE VERSION IMPROPER	9979	Ground software has been installed on a UGM with a ST10F274 processor (Hardware Rev < 6), which does not have guaranteed flash storage in the sector where Constant Data is written.	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start)	Power Cycled	X	X
GROUND MODULE VLOW FET FAILURE	9986	VLow FET determined to be failed because all Digital Inputs are high; UGM unable to read high-sensing inputs.	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start).	Power Cycled	X	X
LSS INTERNAL ERROR	99171	MACHINE SETUP > LOAD SYSTEM ≠ NO; Load System is the 1-Cell LSS; Strain Gauge 1 or 2 reports Initialization, Defect or Not Installed error	UGM to set Platform Load State = Overloaded	Power Cycled	X	X
LSS - FACTORY CALIBRATION ERROR	99285	The load sensor is reporting a factor calibration issue (internal error) The machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.		Possible sensor hardware issue.		

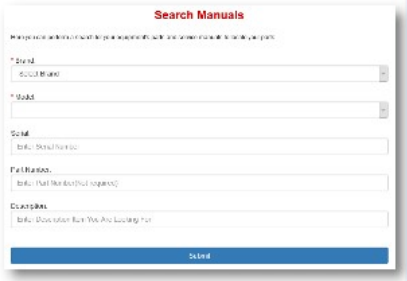
PARTS FINDER

Search Website by Part Number

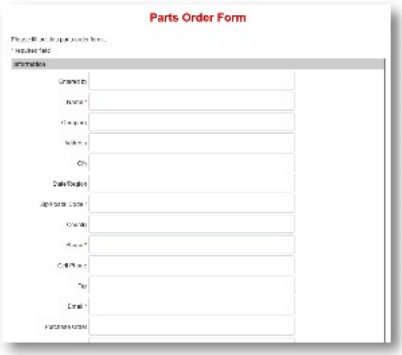
Discount Equipment



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



Can't Find Part or Manual? Request Help by Manufacturer, Model & Description



Discount-Equipment.com is your online resource for quality parts & equipment.

Florida: 561-964-4949 Outside Florida TOLL FREE: 877-690-3101

Need parts?

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 7. BASIC 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

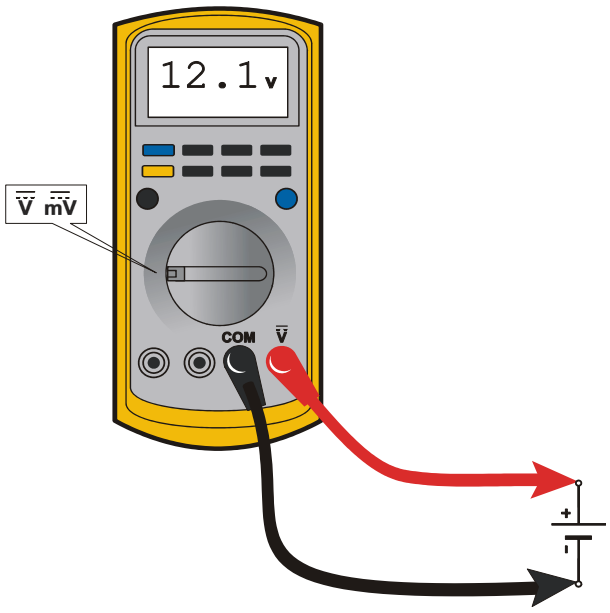


Figure 7-1. Voltage Measurement (DC)

- 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

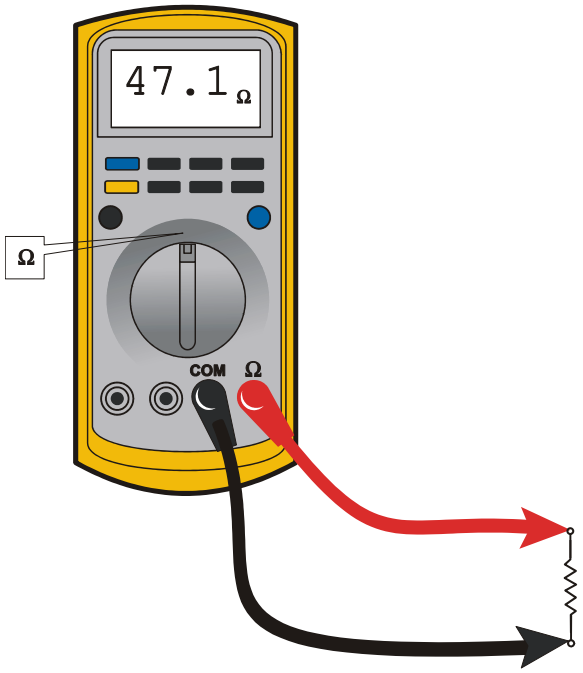


Figure 7-2. Resistance Measurement

- 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

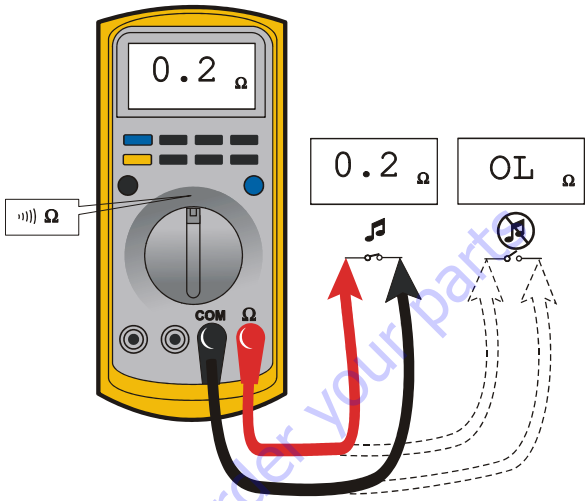


Figure 7-3. Continuity Measurement

- 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

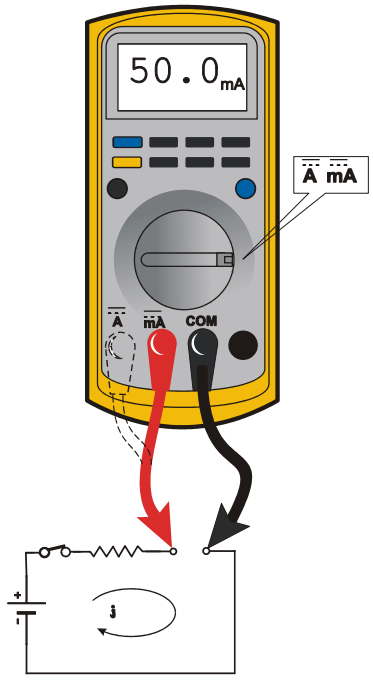


Figure 7-4. Current Measurement (DC)

- 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.*

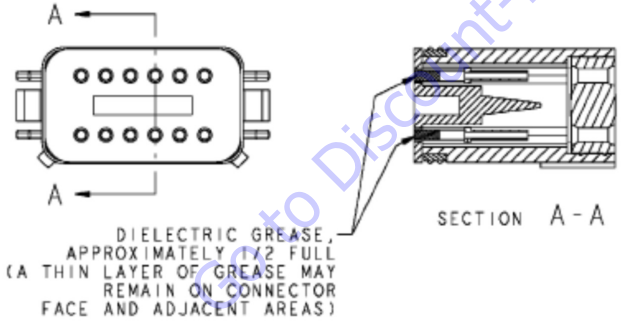
When applied to electrical connections, dielectric grease helps to prevent corrosion of electrical contacts and improper conductivity between contacts from moisture intrusion. Open and sealed connectors benefit from the application of dielectric grease.

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 plug/male connector housing which typically contains sockets contact/female terminals (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.

AMP Seal

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

Apply dielectric grease to the male contact. If trapped air prevents the connector from latching, pierce one of the unused wire seals. After assembly, install a seal plug (JLG #4460905) 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 Male Contacts

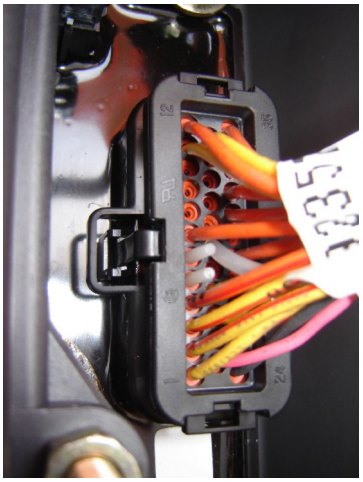
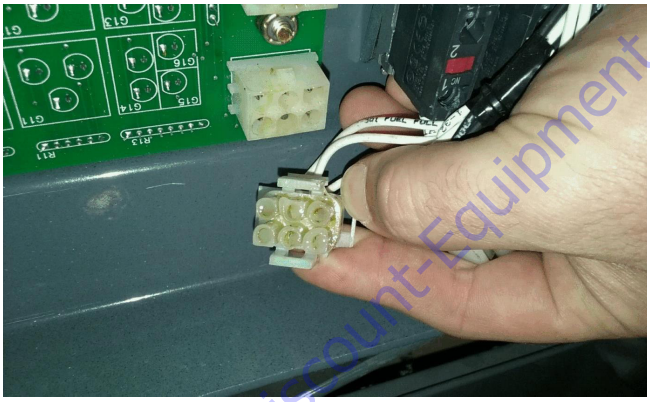


Figure 7-6. Use of Seal Plugs

AMP Mate-N-Lok

This connector system is widely used inside enclosures for general purpose interconnect. Follow the installation instructions.



MAF0157C

DIN Connectors

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

MAF01580

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 Rotary Angle Sensors are examples of components with the M12 connector system.

Figure 7-7. Brad-Harrison M12

Figure 7-8. Phoenix Contact M12

Engine Control unit connectors

These connectors use 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 EMR4 engine control module from Deutz employs this connector system (for example).

Sealed Enclosures

Application of dielectric grease is not required in properly sealed enclosures. To meet criteria, the enclosure must be rated to at least IP66 (dust tight; protected from powerful jets of water). The enclosure must be fitted with a high quality, continuous gasket and all wiring must pass through cable entrances.

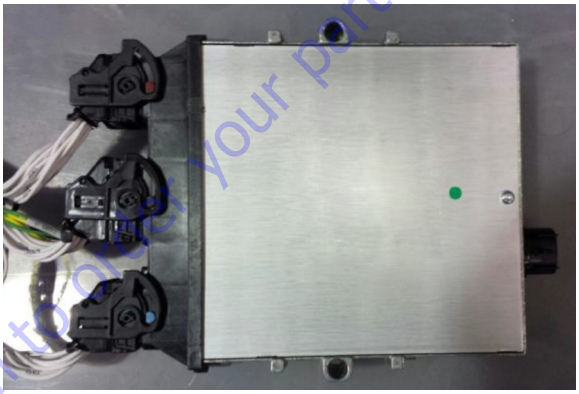
MAF01600

MIL-C-5015 spec connectors

Crown Connector Inc's recommendation is to not use dielectric grease for this series connector. For similar model series connectors, the manufacturer should be contacted for confirmation before applying dielectric grease. A typical application for this connector is on David Clark Intercom connections in Aerial Work Platforms.

MOLEX CMC series connectors

The CMC connector family is a sealed, high-density connection system using matte-seal technology for CP 0.635 and 1.50 mm terminals. To guarantee IP6K7 and IP6K9 sealing, a seal plug option is used. 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 flexbox control modules from JDES employ 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 7-9.). Proceed as follows:

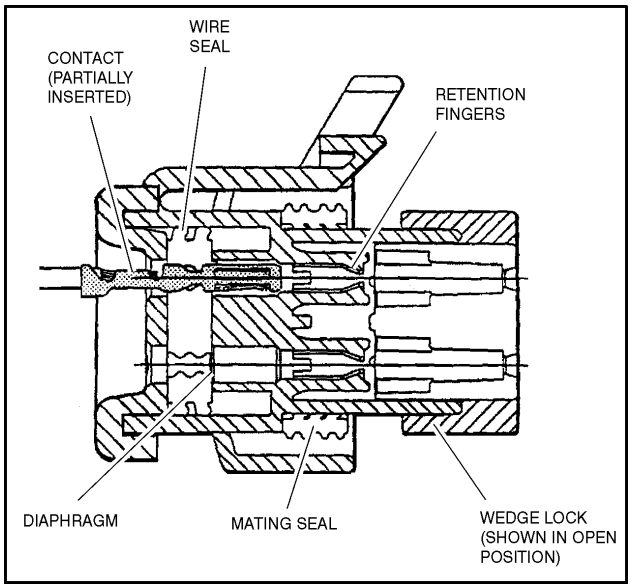


Figure 7-9. Connector Assembly Figure 1

1. To insert a contact, push it straight into the appropriate circuit cavity as far as it will go (See Figure 7-11.).
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 7-11.).

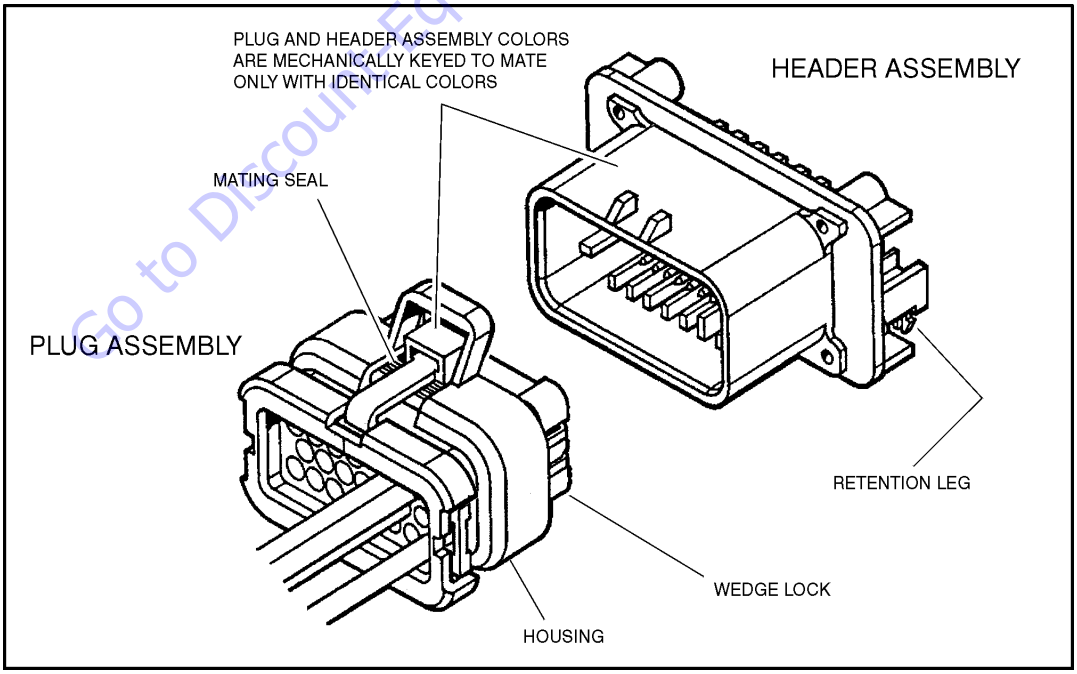


Figure 7-10. AMP Connector

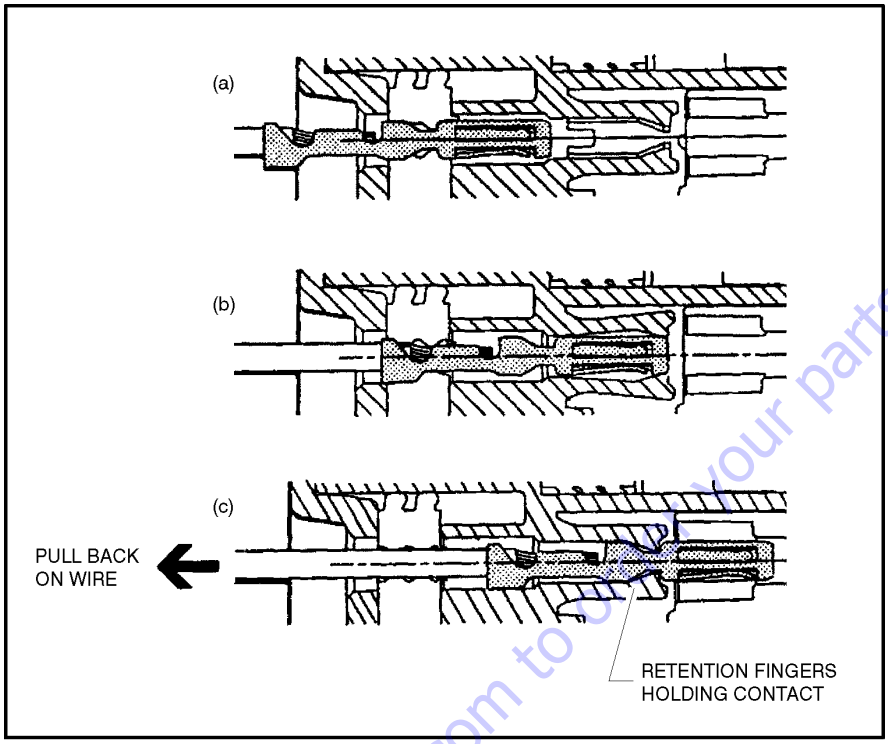


Figure 7-11. Connector Assembly Figure 2

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 7-12.).

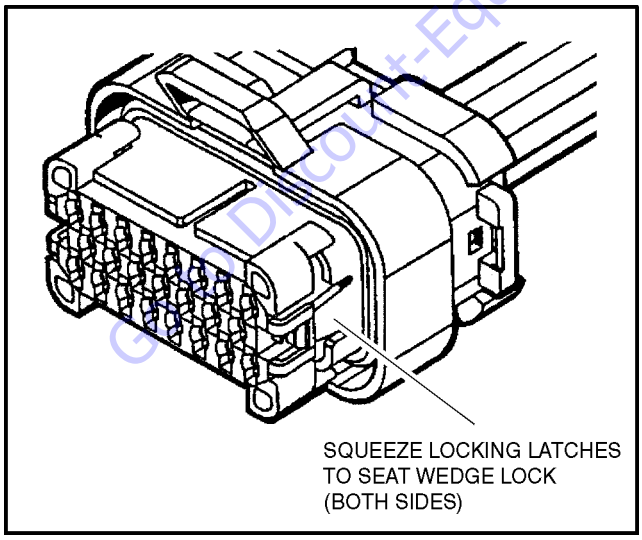


Figure 7-12. Connector Assembly Figure 3

4. Slide the wedge lock into the housing until it is flush with the housing (See Figure 7-13.).

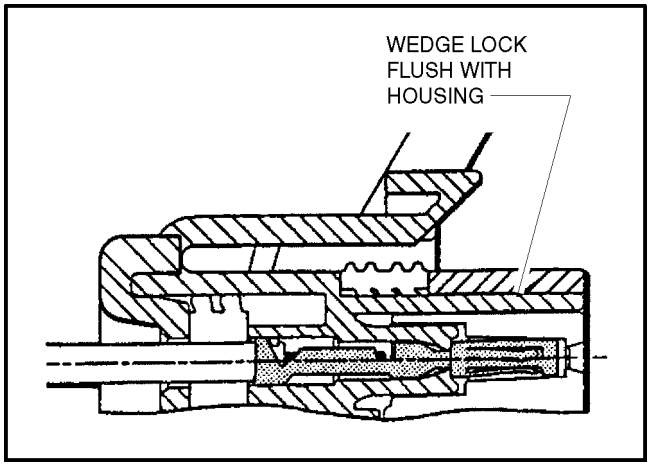


Figure 7-13. Connector Assembly Figure 4

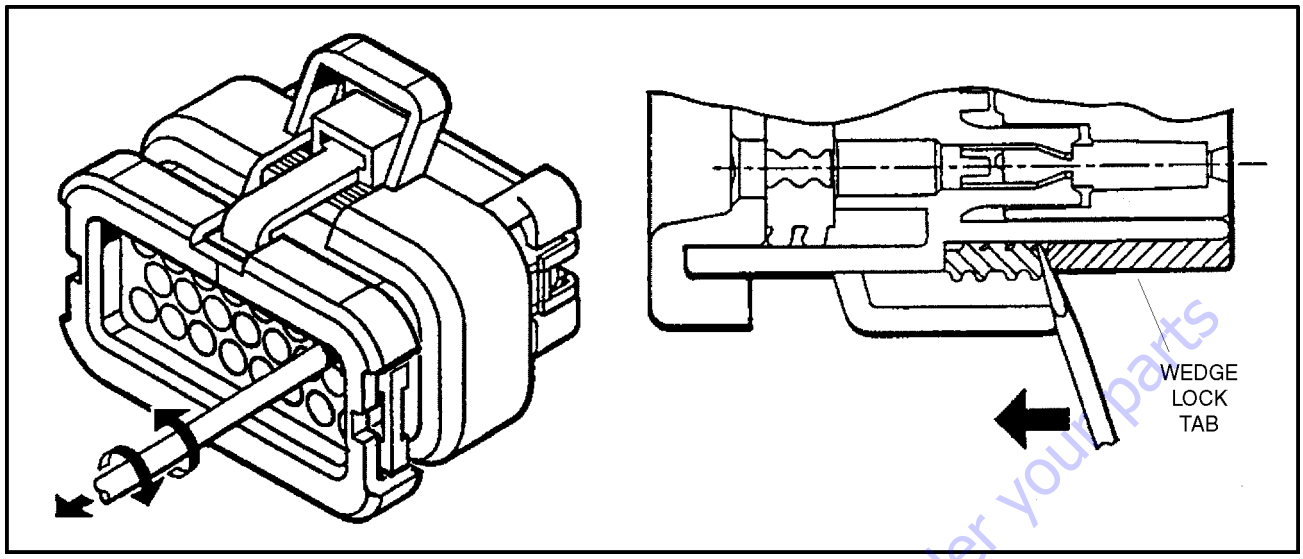


Figure 7-14. Connector Disassembly

Disassembly

1. Insert a 4.8 mm (3/16 in.) 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 AMPSEAL 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.

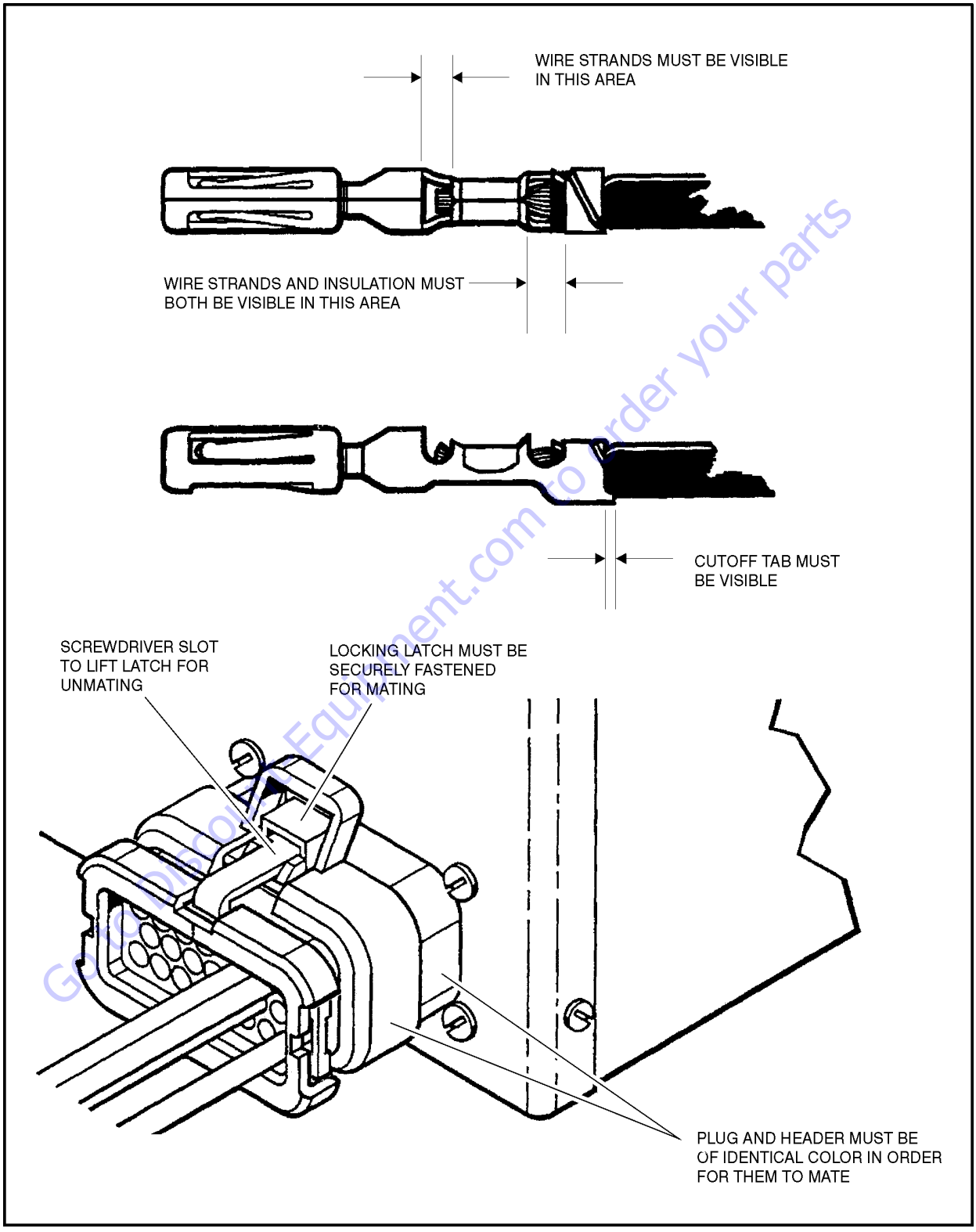


Figure 7-15. Connector Installation

7.5 DEUTSCH CONNECTORS

DT/DTP Series Assembly

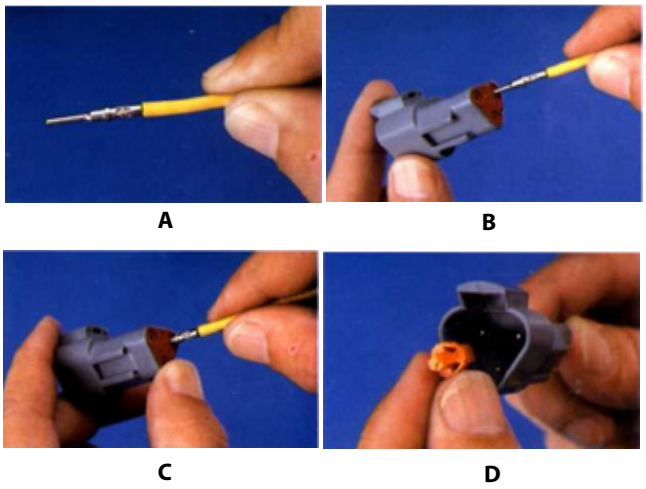


Figure 7-16. DT/DTP Contact Installation

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. They may go in either way.

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

DT/DTP Series Disassembly

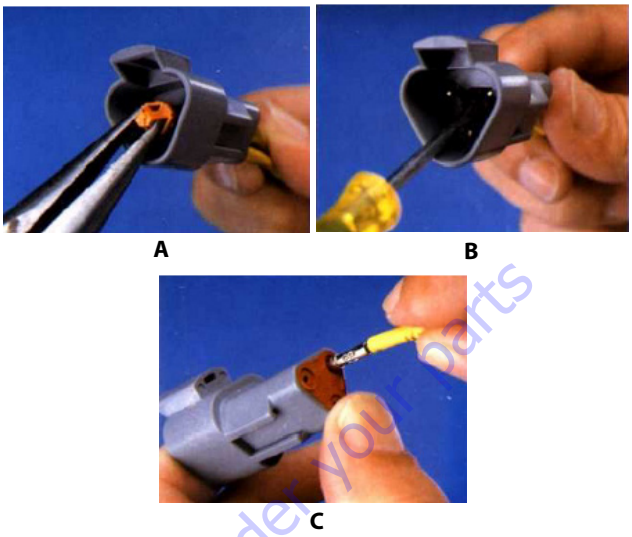


Figure 7-17. DT/DTP Contact Removal

5. Remove wedgelock using needle nose pliers or a hook shaped wire to pull wedge straight out.
6. 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.
7. Hold the rear seal in place, as removing the contact may displace the seal.

HD30/HDP20 Series Assembly

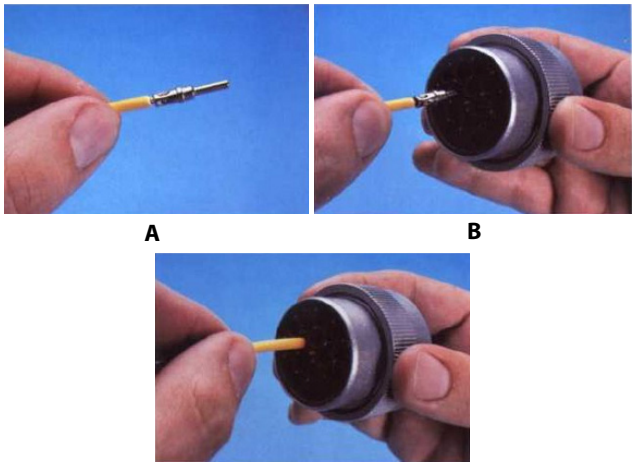


Figure 7-18. HD/HDP Contact Installation

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.

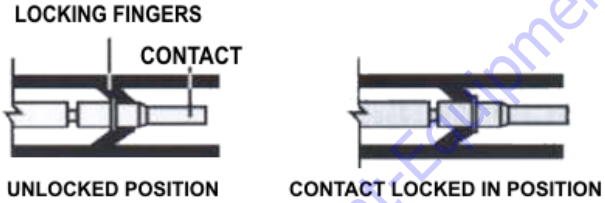


Figure 7-19. HD/HDP Locking Contacts Into Position

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

HD30/HDP20 Series Disassembly

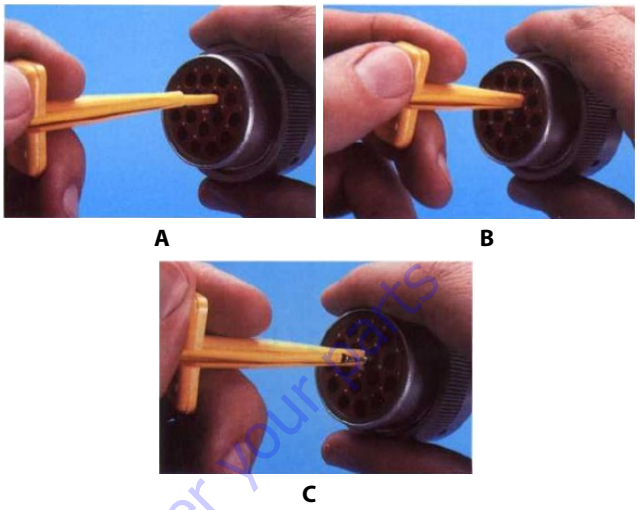


Figure 7-20. HD/HDP Contact Removal

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

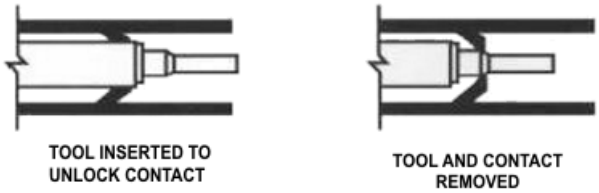


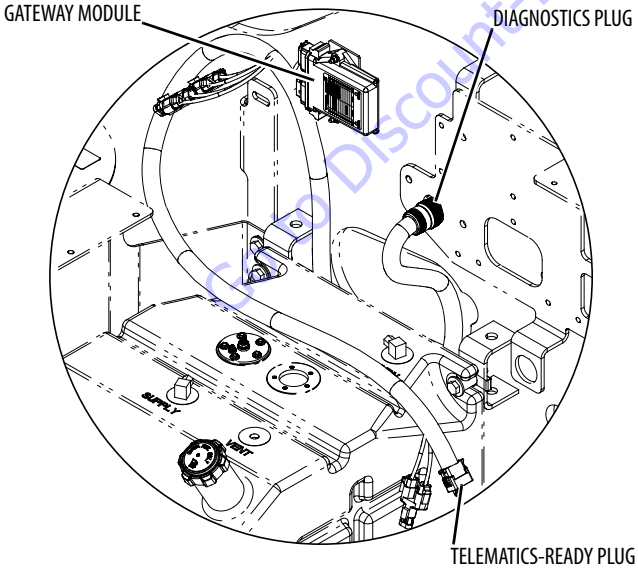
Figure 7-21. HD/HDP Unlocking Contacts

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

7.6 TELEMATICS GATEWAY

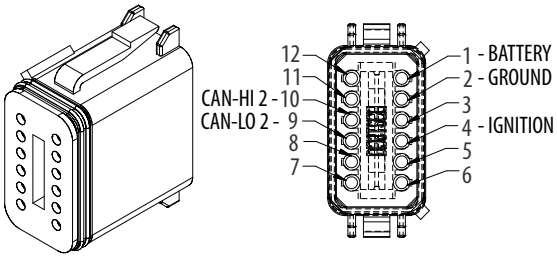
Personnel using machines equipped with an optional telematics gateway will be able to view the following data through their telematics device:

JLG LABEL	DESCRIPTION	UNIT
Engine Speed	Actual engine speed.	RPM
DEF Tank Level (If Equipped)	Indicates the level of DEF (diesel exhaust fluid) within the DEF tank if the machine is equipped with DEF tank. • 0% = Empty • 100% = Full	Percentage (%)
JLG Machine Faults: Active / Not-Active	• 00 - No Machine Faults • 01 - Active Machine Fault • 10 - Error • 11 - Not available	Bit
Total Idle Fuel Used	Total amount of fuel used during vehicle operation during idle conditions.	Liters
Total Idle Hours	Total time of engine operation during idle conditions.	Seconds
Total Engine Hours	Total time of engine operation.	Seconds
Total Fuel Used	Total amount of fuel used during vehicle operation.	Liters
Fuel Rate	Amount of fuel consumed by engine per unit of time.	Liters/Hour
Fuel Level	Ratio of fuel volume to the total volume of the fuel storage container. When a low fuel limit switch is present, the fuel level will indicate "full" until the switch opens, which will then indicate 10% fuel remaining. When Fuel Level 2 (SPN 38) is not used, Fuel Level 1 represents the total fuel in all fuel storage containers. When Fuel Level 2 is used, Fuel Level 1 represents the fuel level in the primary or left side fuel storage container.	Percentage (%)
DM1 Engine Faults	Shows actual engine fault codes.	N/A



Telematics-Ready (TCU) Plug

The telematics-ready (TCU) plug is a standard 12-pin Deutsch connector. Pin-out locations are shown below:



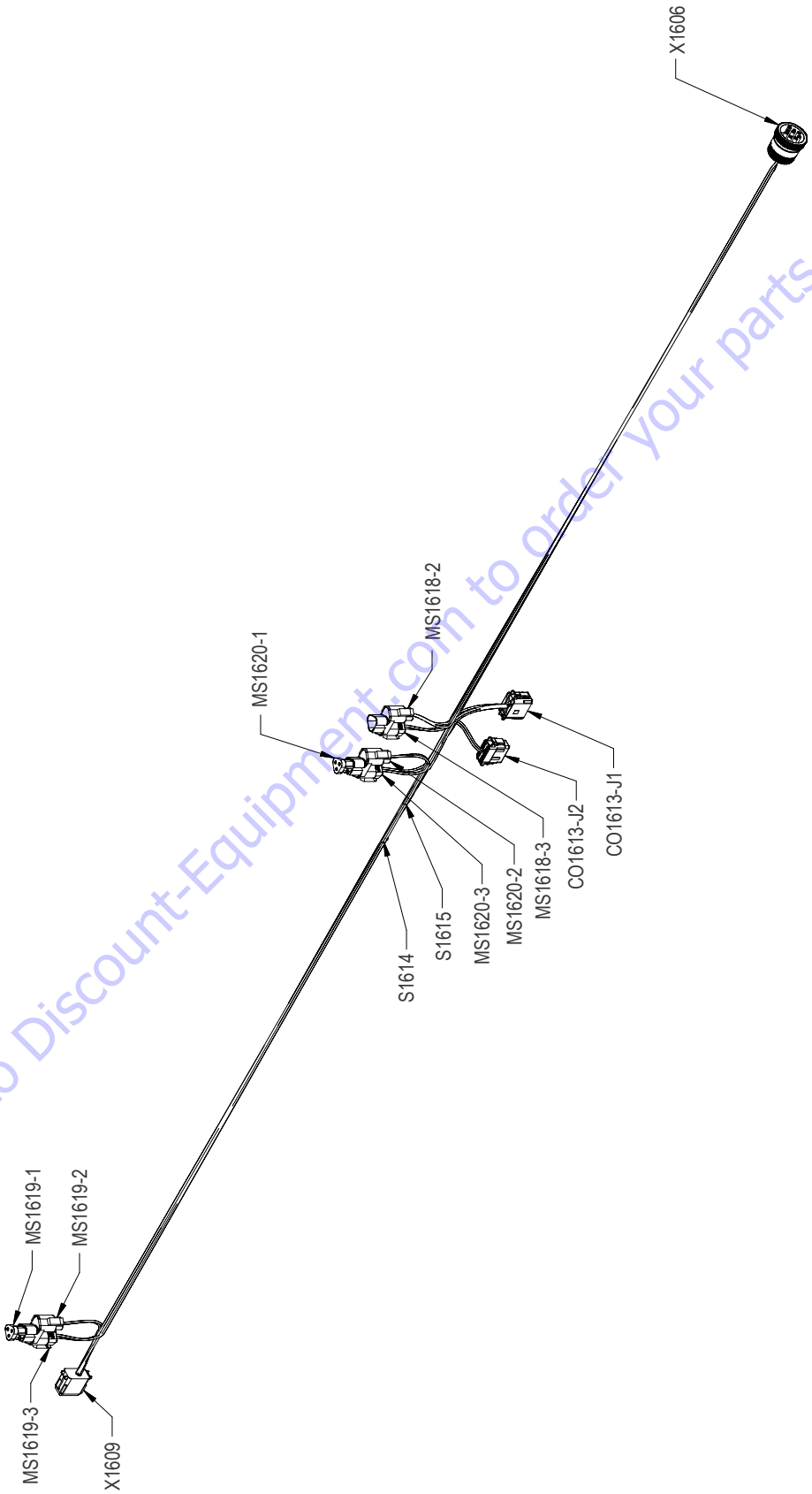


Figure 7-22. Telematics Gateway Harness - Sheet 1 of 3

X1609 (TCU)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	RED	1-0 BAT	16 AWG	GXL	X1606 (B)
2	BLK	0-0 GND	16 AWG	GXL	S1615 (1)
4	ORN	2-0 IGN	16 AWG	GXL	S1614 (1)
9	GRN	CANL2	18 AWG	GXL	MS1619-2 (B)
10	YEL	CANH2	18 AWG	GXL	MS1619-2 (A)

MS1619-2 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	X1609 (10)
B	GRN	CANL2	18 AWG	GXL	X1609 (9)

MS1619-3 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	MS1620-2 (A)
B	GRN	CANL2	18 AWG	GXL	MS1620-2 (B)

CO1613-J1 (GATEWAY 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
9	GRN	CAN1	18 AWG	GXL	MS1618-2 (B)
10	YEL	CANH1	18 AWG	GXL	MS1618-2 (A)
11	BLK	0-2 GND	16 AWG	GXL	S1615 (2)
12	ORN	2-2 IGN	16 AWG	GXL	S1614 (2)

CO1613-J2 (GATEWAY 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
9	GRN	CANL2	18 AWG	GXL	MS1620-3 (B)
10	YEL	CANH2	18 AWG	GXL	MS1620-3 (A)

MS1620-2 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	MS1619-3 (A)
B	GRN	CANL2	18 AWG	GXL	MS1619-3 (B)

MS1620-3 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	CO1613-J2 (10)
B	GRN	CANL2	18 AWG	GXL	CO1613-J2 (9)

S1614					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	ORN	2-0 IGN	16 AWG	GXL	X1609 (4)
2	ORN	2-1 IGN	16 AWG	GXL	X1606 (H)
2	ORN	2-2 IGN	16 AWG	GXL	CO1613-J1 (12)

S1615					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	0-0 GND	16 AWG	GXL	X1609 (2)
2	BLK	0-1 GND	16 AWG	GXL	X1606 (A)
2	BLK	0-2 GND	16 AWG	GXL	CO1613-J1 (11)

MS1618-2 (CAN-T 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH1	18 AWG	GXL	CO1613-J1 (10)
B	GRN	CANL1	18 AWG	GXL	CO1613-J1 (9)

MS1618-3 (CAN-T 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH1	18 AWG	GXL	X1606 (C)
B	GRN	CANL1	18 AWG	GXL	X1606 (D)

X1606 (DIAG)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	BLK	0-1 GND	16 AWG	GXL	S1615 (2)
B	RED	1-0 BAT	16 AWG	GXL	X1609 (1)
C	YEL	CANH1	18 AWG	GXL	MS1618-3 (A)
D	GRN	CANL1	18 AWG	GXL	MS1618-3 (B)
H	ORN	2-1 IGN	16 AWG	GXL	S1614 (2)

Figure 7-23. Telematics Gateway Harness - Sheet 2 of 3

					FROM		TO	
WIRE NO.	COLOR	WIRE GAUGE	LENGTH (mm)	JACKET	REFERENCE	PIN	REFERENCE	PIN
CAN L2	GRN	18 AWG	1151	GXL	MS1619-3	B	MS1620-2	B
CAN L2	GRN	18 AWG	151	GXL	X1609	9	MS1619-2	B
CAN L1	GRN	18 AWG	157	GXL	MS1618-2	B	CO1613-J1	9
CAN L2	GRN	18 AWG	225	GXL	MS1620-3	B	CO1613-J2	9
CAN L1	GRN	18 AWG	1076	GXL	MS1618-3	B	X1606	D
CAN H2	YEL	18 AWG	155	GXL	X1609	10	MS1619-2	A
CAN H2	YEL	18 AWG	233	GXL	MS1620-3	A	CO1613-J2	10
CAN H1	YEL	18 AWG	157	GXL	MS1618-2	A	CO1613-J1	10
CAN H2	YEL	18 AWG	1150	GXL	MS1619-3	A	MS1620-2	A
CAN H1	YEL	18 AWG	1079	GXL	MS1618-3	A	X1606	C
0-0 GND	BLK	16 AWG	1006	GXL	X1609	2	S1615	1
0-1 GND	BLK	16 AWG	1145	GXL	X1606	A	S1615	2
0-2 GND	BLK	16 AWG	223	GXL	CO1613-J1	11	S1615	2
1-0 BAT	RED	16 AWG	2150	GXL	X1609	1	X1606	B
2-0 IGN	ORN	16 AWG	939	GXL	X1609	4	S1614	1
2-1 IGN	ORN	16 AWG	1212	GXL	S1614	2	X1606	H
2-2 IGN	ORN	16 AWG	287	GXL	CO1613-J1	12	S1614	2

Figure 7-24. Telematics Gateway Harness - Sheet 3 of 3

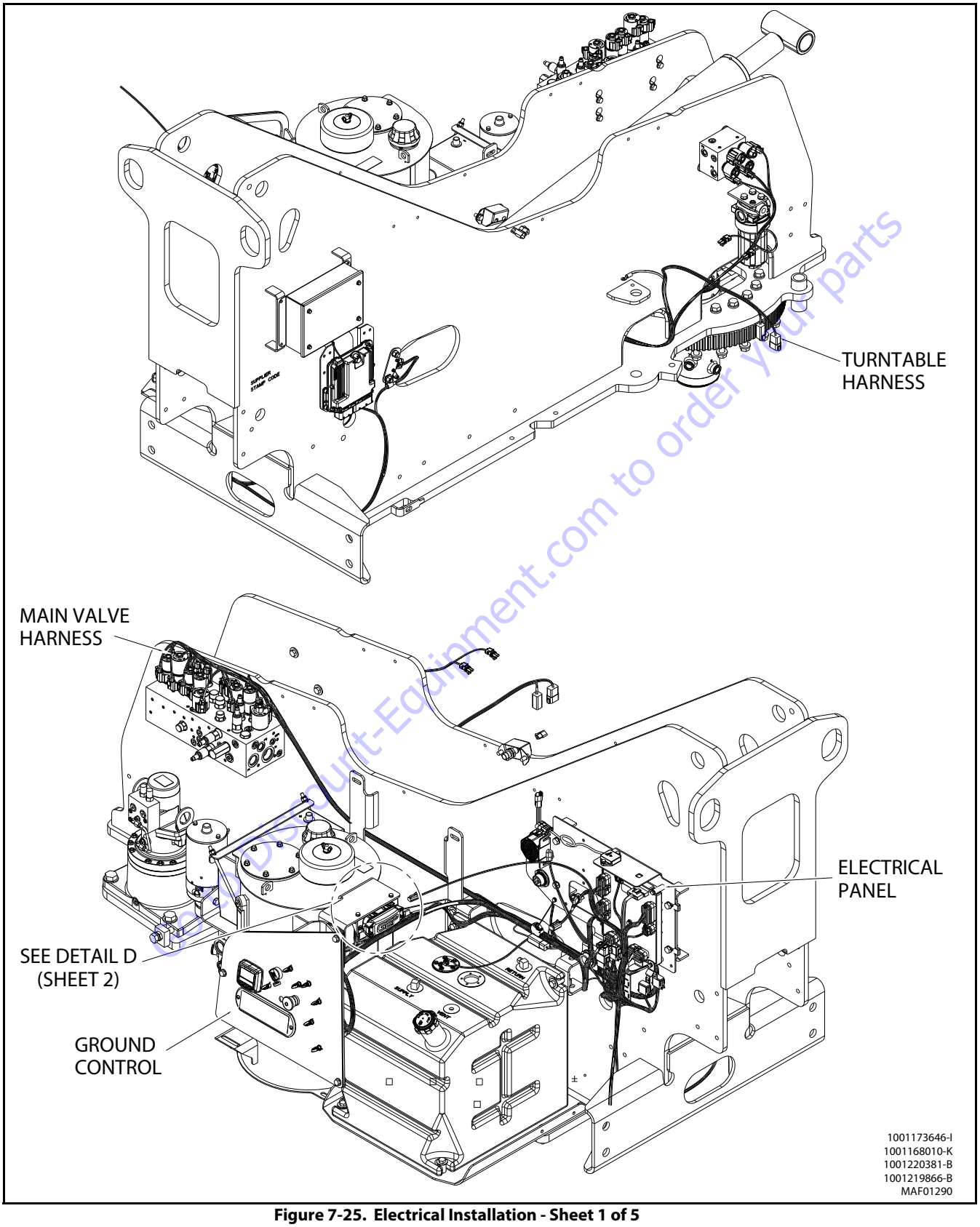


Figure 7-25. Electrical Installation - Sheet 1 of 5

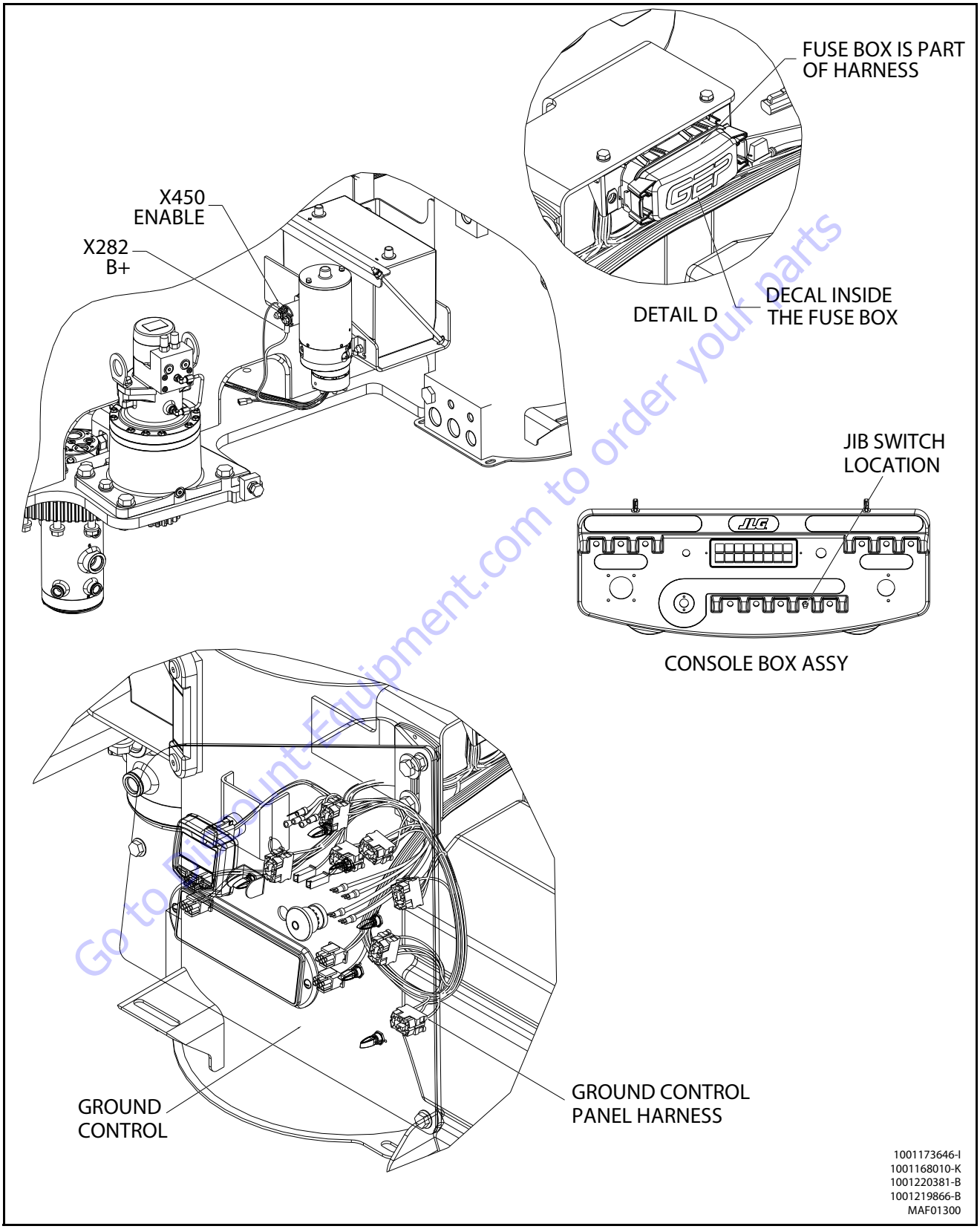


Figure 7-26. Electrical Installation - Sheet 2 of 5

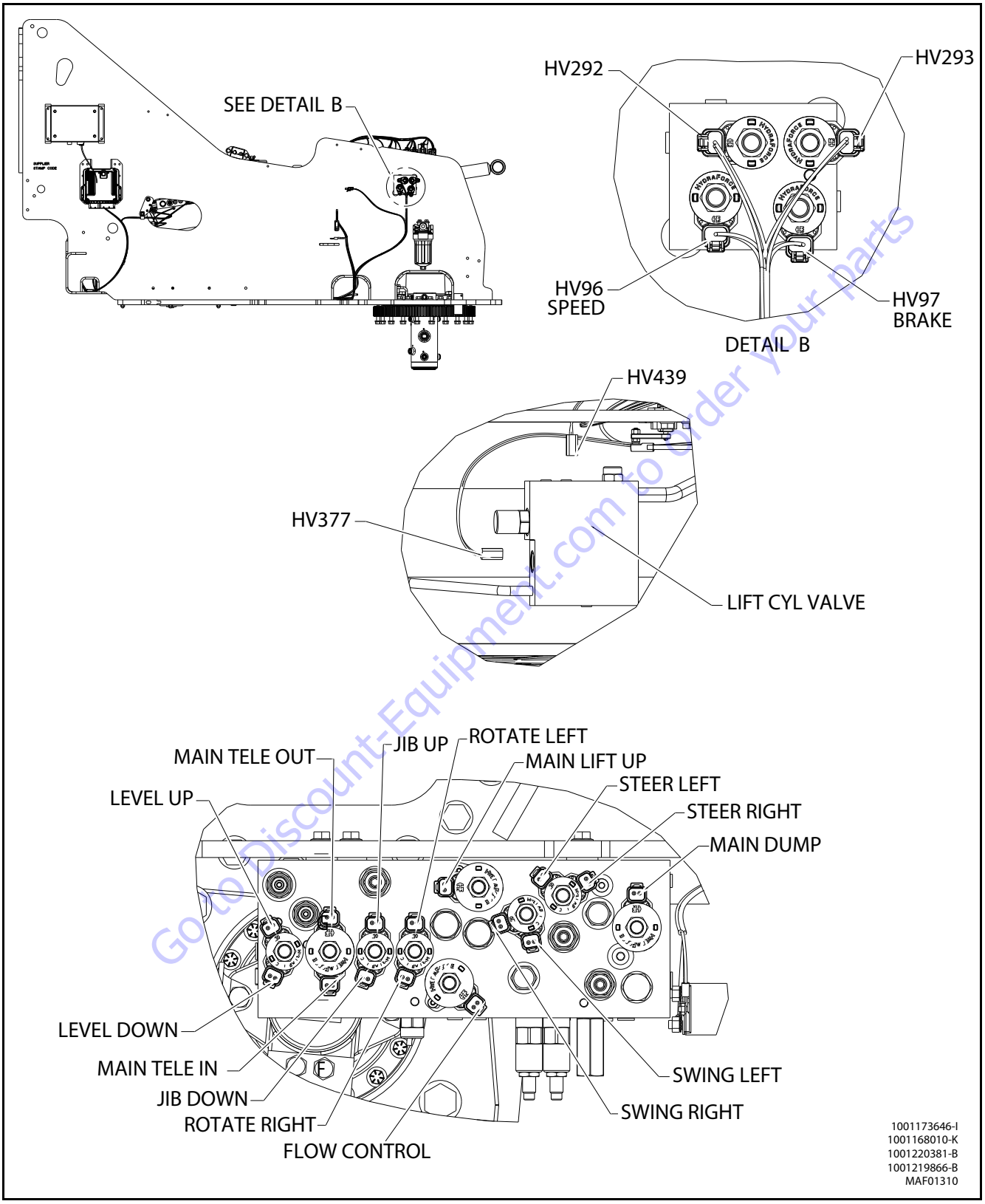


Figure 7-27. Electrical Installation - Sheet 3 of 5

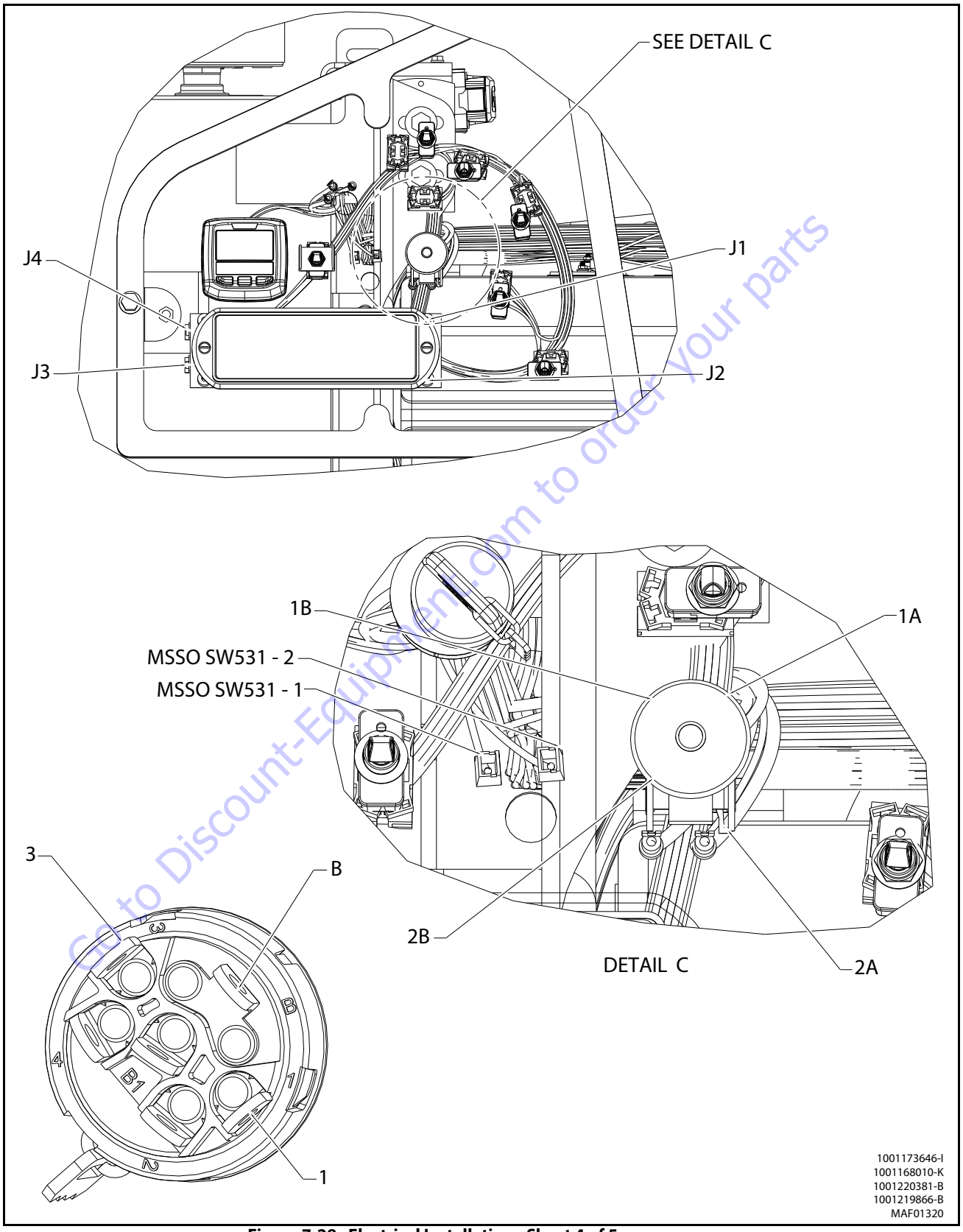


Figure 7-28. Electrical Installation - Sheet 4 of 5

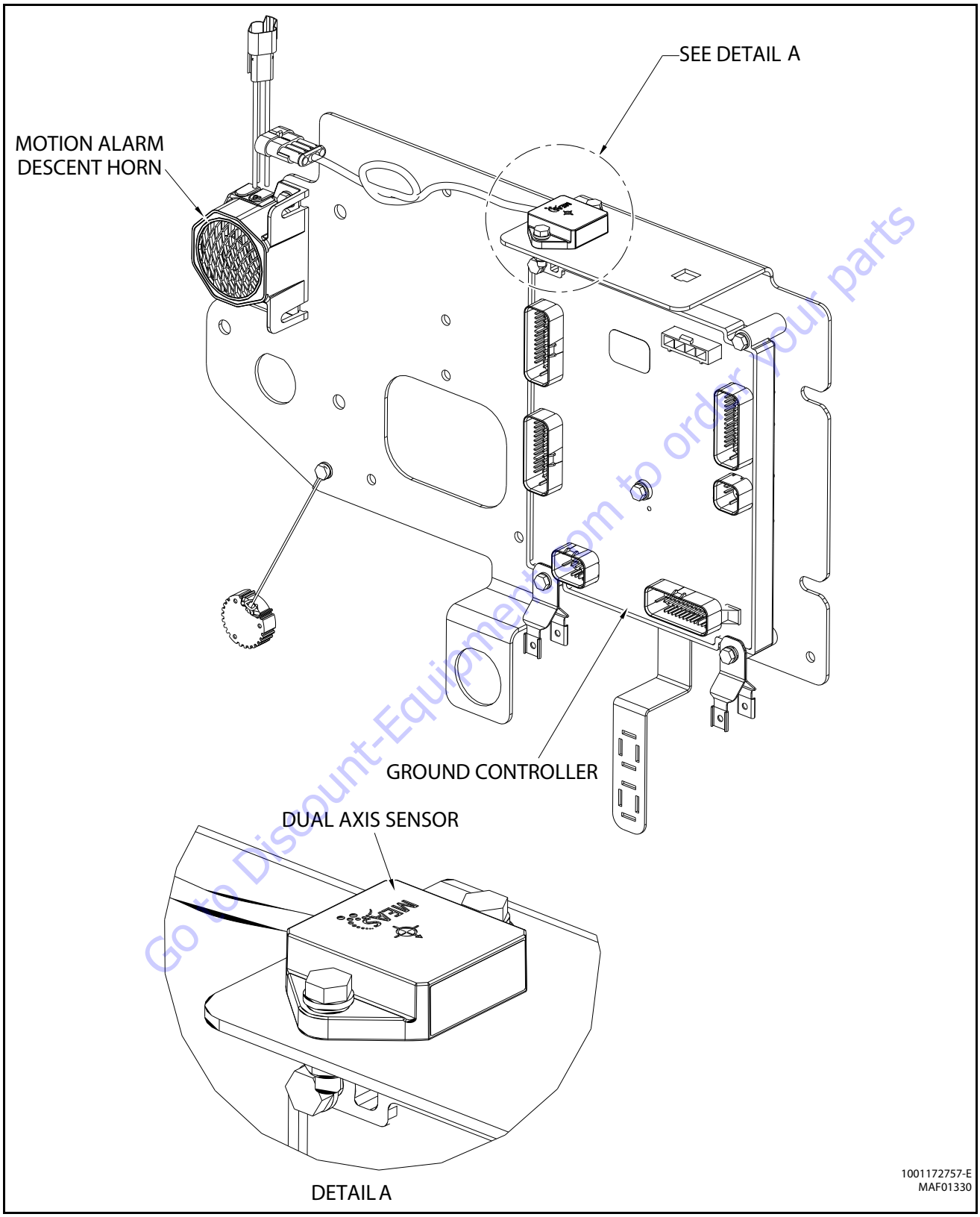


Figure 7-29. Electrical Installation - Sheet 5 of 5

7.7 WIRING HARNESS CONNECTOR LABELS AND WIRING HARNESSES

Connector Labels

Connectors between harnesses are identified by the prefix "X" and a sequentially assigned number. An optional suffix (letters & numbers) may be added when multiple terminations occur at one device or when there are optional connections.

Examples:

X25 connects to X25 in another harness.

X65A, X65B connect to different portions of one device

X163 connects to X163A in ANSI and X163B in CE machines

Component Labels

Every component on the vehicle has a unique identification. A standard prefix letter is assigned according to the table below, followed by a unique sequential number. An optional suffix (letters & numbers) may be added when multiple terminations occur at one device.

Terminals that are not loaded into connectors are considered independent components and labeled in the same fashion.

Table 7-1. Wiring Harness Connector Labels

Component	Category	Label
Audible	Alarms	AH
	Horns	
Battery	Batteries	BT
	Battery Terminals	
Control Module	Ground	CO
	LSS	
	Platform	
Engine	Alternator	EC
	Cold Start	
	Controller	
	Coolant Temp	
	Fuel Pump	
	Fuel Solenoid	
	Glow Plugs	
	Oil Pressure	
	Starter	
Fuse & CB Fuse FC	Fuse	FC
	Fusible Link	FC
	Circuit Breaker	CB
Gauge & Display	Board	GD
	Cluster	
	Hour meter	
	LMI	
	Speedometer	
Inline	Resistor	R
	Diode	D
Joystick & Steering	Electronic	JS
	Hydraulic	
Lights	Dome	LB
	Headlights	
	Simple	
	Taillights	
Membrane Panel		MP
Miscellaneous	Radio	MS
	Speakers	
	Splice Blocks	
	T-Connectors	

Table 7-1. Wiring Harness Connector Labels

Component	Category	Label
Other Switches	Disconnect	SW
	EMS	
	Foot	
	HVAC	WH
	Key	SW
	Park brake	
	Pump pot	
	Push	
	Shifter	
	Turn signal	
Relay	5 Pin	RL
	4 Pin	
	Contactor	
	Power module	
Rocker Switch		SW
Sensor	Angle	SN
	Fuel	
	Length	
	Limit	
	Load	
	Pressure	
	Proximity	
	Speed	
	Temperature	
Terminals	Pins	T
	Sockets	
	Male Blades	
	Female Blades	
	Rings	
	Forks	
Toggle Switch	DPDT	SW
	DPST	
	SPDT	
	SPST	
	Special	
Valves	Simple	HV
	Suppression	
Examples: *T67 is a ring terminal connected during installation.* *C01-J3 is the J3 connector for a UGM control module.* *EC9 is a glow plug supplied with the engine*		

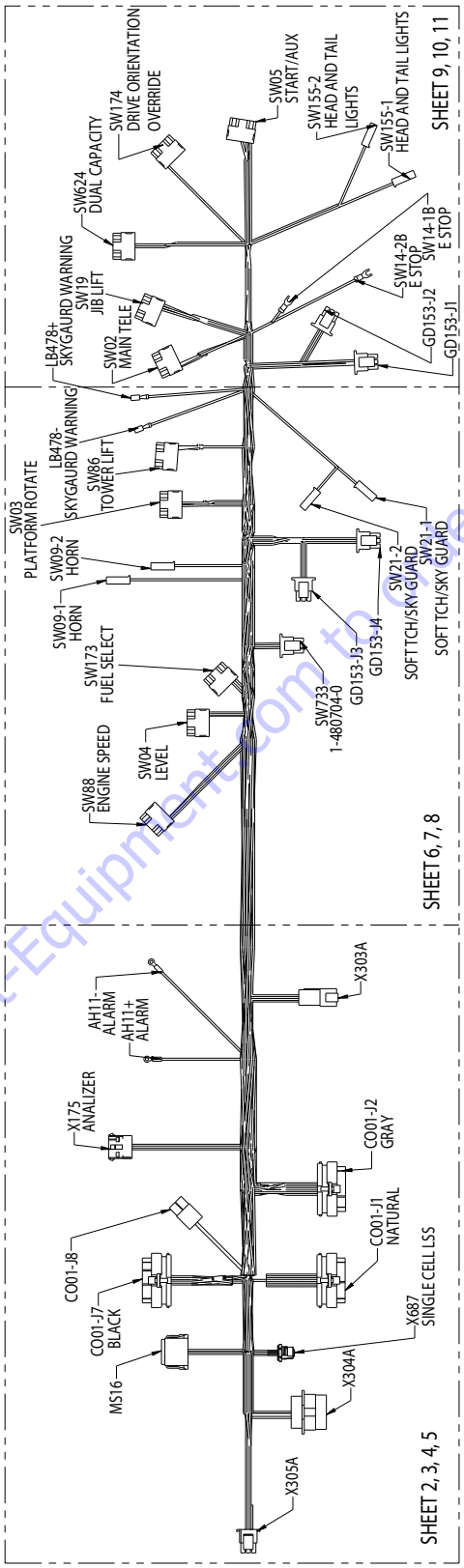


Figure 7-30. Platform Control Box Harness - Sheet 1 of 12

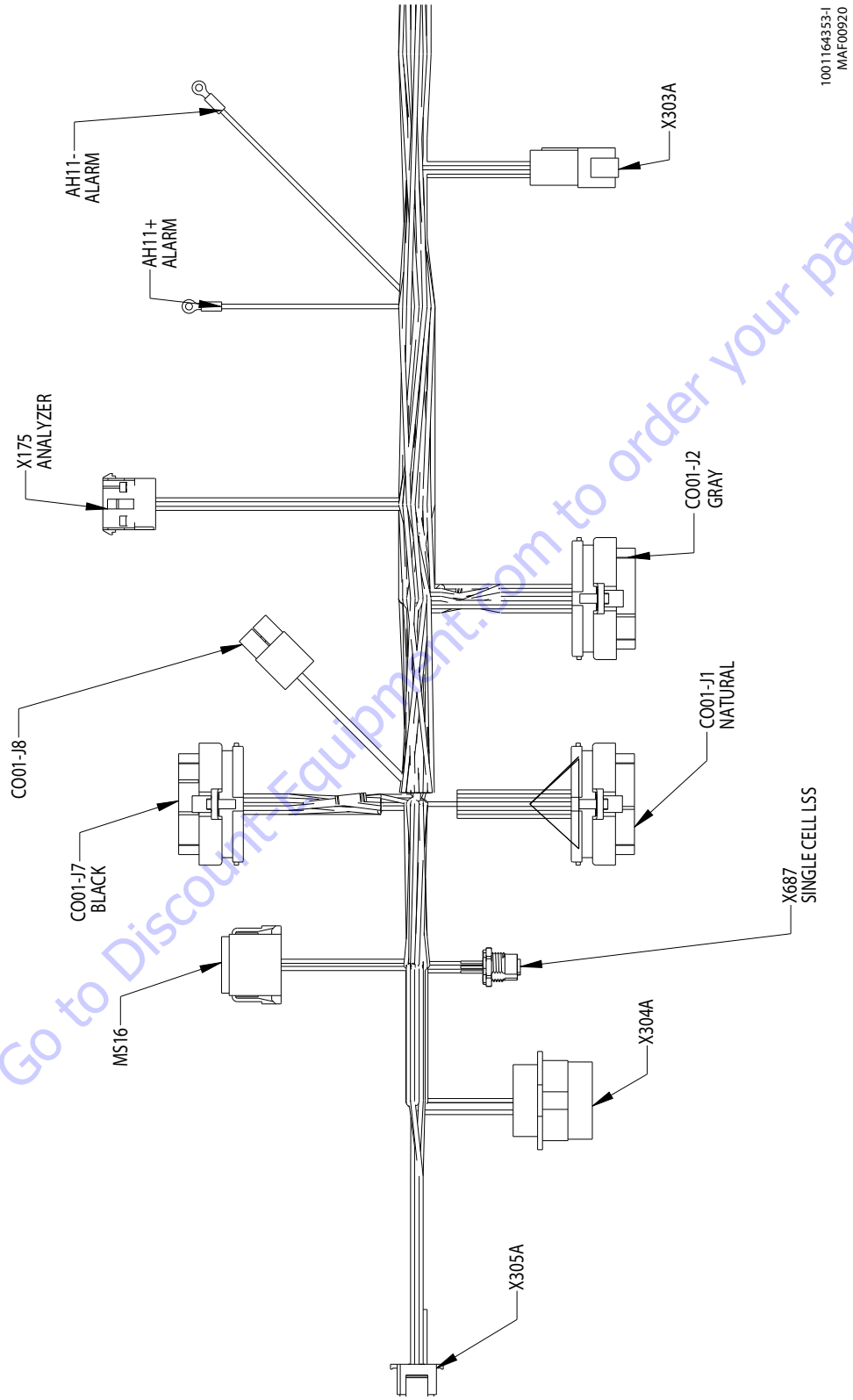


Figure 7-31. Platform Control Box Harness - Sheet 2 of 12

X305A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-35 GENERATOR SWITCH	18AWG	GXL	C001-J7 (9)
2	WHT	1-38 GEN ON SWITCH	18AWG	GXL	C001-J7 (5)
3					
4	WHT	1-39 FOOT SW DISENGAGED	18AWG	GXL	C001-J7 (8)
5	WHT	1-40 FOOT SW	18AWG	GXL	C001-J7 (4)
6					
7	WHT	1-90 SG POWER	18AWG	GXL	C001-J7 (7)
8	BLK	1-86 SG GND	18AWG	GXL	C001-J7 (24)
9	WHT	1-85 ST POWER	18AWG	GXL	C001-J2 (31)
10	WHT	1-87 SG INPUT 1	18AWG	GXL	C001-J7 (18)
11	WHT	1-88 SG INPUT 2	18AWG	GXL	C001-J1 (23)
12	WHT	1-91 ST SWITCH	18AWG	GXL	C001-J1 (20)
13					
14	WHT	1-551	18AWG	GXL	X305A (15)
15	WHT	1-551	18AWG	GXL	X305A (14)

X303A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-41 PLATF ROTATE LEFT	18AWG	GXL	C001-J7 (33)
2	WHT	1-42 PLATF ROTATE RIGHT	18AWG	GXL	C001-J7 (34)
3	WHT	1-36 JIB UP	18AWG	GXL	C001-J7 (25)
4	WHT	1-43 JIB DOWN	18AWG	GXL	C001-J7 (26)
5	BLK	000-10-11 VALVES GND	18AWG	GXL	C001-J7 (23)
6	BLK	000-10-34 OPTION GND	18AWG	GXL	C001-J7 (29)
7	WHT	1-89 OPTION POWER	18AWG	GXL	C001-J2 (33)
8	YEL	CAN	20AWG	J1939 CABL	MS16 (3)
9	GRN	CAN	20AWG	J1939 CABL	MS16 (6)
10					
11	BLK	000-10-30-2 LSS GND	18AWG	GXL	S688 (2)
12	WHT	1-33-2 LSS PWR	18AWG	GXL	S689 (2)

X304A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	GRN	CAN	20AWG	J1939 CABL	MS16 (5)
3	YEL	CAN	20AWG	J1939 CABL	MS16 (2)
4	WHT	1-44 EMS	18AWG	GXL	C001-J7 (3)
5					
6					
7					
8					
9	WHT	1-62 EMS B+	18AWG	GXL	SW14-1B (1B)
10					
11	WHT	1-37 GROUND MODE	18AWG	GXL	C001-J7 (1)
12	WHT	1-1	18AWG	GXL	C001-J8 (2)
13					
14					
15					
16	BLK	000-10-14 GND	12AWG	GXL	C001-J8 (1)
17					
18					
19					

X175 ANALIZER					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-66 POWER	18 AWG	GXL	C001-J2 (26)
2	WHT	1-81 RECEIVE	18 AWG	GXL	C001-J2 (28)
3	WHT	1-82 TRANSMIT	18 AWG	GXL	C001-J2 (29)
4	BLK	000-10-12 GND	18 AWG	GXL	C001-J2 (27)

Figure 7-32. Platform Control Box Harness - Sheet 3 of 12

C001-J2 GRAY					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2					
3					
4	WHT	1-67 PLTF ORIENT OVERRIDE	18AWG	GXL	SW174 (1)
5					
6	WHT	1-20 TILT	18AWG	GXL	GD153-J4 (5)
7	WHT	1-32 FT SWITCH ENABLE	18AWG	GXL	GD153-J2 (2)
8	WHT	1-25 SYSTEM DISTRESS	18AWG	GXL	GD153-J3 (6)
9	WHT	1-24 CREEP	18AWG	GXL	GD153-J2 (1)
10					
11	WHT	1-22 PLATFORM OVERLOAD	18AWG	GXL	GD153-J4 (3)
12	WHT	1-21 500#/600# MODE	18AWG	GXL	GD153-J4 (4)
13	WHT	1-27 1000# MODE	18AWG	GXL	GD153-J3 (4)
14	WHT	1-28 DRIVE ORIENT SW	18AWG	GXL	GD153-J3 (3)
15	WHT	1-23 GENERATOR ON	18AWG	GXL	GD153-J4 (2)
16	WHT	1-31 SOFT TCH/SKY GUARD	18AWG	GXL	LB478+ (1)
17	WHT	1-29 GLOW PLUG	18AWG	GXL	GD153-J4 (6)
18	BLK	000-10-27 GND	18AWG	GXL	GD153-J2 (6)
19					
20	WHT	1-92 DRIVE DISABLE	18AWG	GXL	GD153-J3 (1)
21	WHT	1-30 LOW FUEL	18AWG	GXL	GD153-J2 (3)
22	WHT	1_498 1/4 FUEL	18AWG	GXL	GD153-J1 (1)
23	WHT	1_499 3/4 FUEL	18AWG	GXL	GD153-J1 (3)
24	WHT	1_500 1/2 FUEL	18AWG	GXL	GD153-J1 (2)
25	BLK	1_497 FUEL GND	18AWG	GXL	GD153-J1 (4)
26	WHT	1-66 POWER	18AWG	GXL	X175 (1)
27	BLK	000-10-12 GND	18AWG	GXL	X175 (4)
28	WHT	1-81 RECEIVE	18AWG	GXL	X175 (2)
29	WHT	1-82 TRANSMIT	18AWG	GXL	X175 (3)
30					
31	WHT	1-85 ST POWER	18AWG	GXL	X305A (9)
32	WHT	1-33 LSS PWR	18AWG	GXL	S689 (1)
33	WHT	1-89 OPTION POWER	18AWG	GXL	X303A (7)
34					
35	WHT	1_501 FUEL FULL	18AWG	GXL	GD153-J1 (6)

C001-J7 BLACK					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-37 GROUND MODE	18AWG	GXL	X304A (11)
2	WHT	1-45 PLATF EMS	18AWG	GXL	SW14-2B (2B)
3	WHT	1-44 EMS	18AWG	GXL	X304A (4)
4	WHT	1-40 FOOT SW	18AWG	GXL	X305A (5)
5	WHT	1-38 GEN ON SWITCH	18AWG	GXL	X305A (2)
6					
7	WHT	1-90 SG POWER	18AWG	GXL	X305A (7)
8	WHT	1-39 FOOT SW DISENGAGED	18AWG	GXL	X305A (4)
9	WHT	1-35 GENERATOR SWITCH	18AWG	GXL	X305A (1)
10					
11					
12					
13					
14					
15					
16	BLK	000-10-30 LSS GND	18AWG	GXL	S688 (1)
17					
18	WHT	1-87 SG INPUT1	18AWG	GXL	X305A (10)
19	WHT	1-34 PLAT ALRM	18AWG	GXL	AH11+ (1)
20	WHT	000-10-16 PLAT ALARM GND	18AWG	GXL	AH11- (1)
21					
22					
23	BLK	000-10-11 VALVES GND	18AWG	GXL	X303A (5)
24	BLK	1-86 SG GND	18AWG	GXL	X305A (8)
25	WHT	1-36 JIB UP	18AWG	GXL	X303A (3)
26	WHT	1-43 JIB DOWN	18AWG	GXL	X303A (4)
27					
28					
29	BLK	000-10-34 OPTION GND	18AWG	GXL	X303A (6)
30	GRN	CAN	20AWGJ	J1939 CABL	MS16 (4)
31	YEL	CAN	20AWGJ	J1939 CABL	MS16 (1)
32					
33	WHT	1-41 PLATF ROTATE LEFT	18AWG	GXL	X303A (1)
34	WHT	1-42 PLATF ROTATE RIGHT	18AWG	GXL	X303A (2)
35					

Figure 7-33. Platform Control Box Harness - Sheet 4 of 12

C001-J8					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	000-10-14 GND	12AWG	GXL	X304A (16)
2	WHT	1-1	18AWG	GXL	X304A (12)

AH11- ALARM					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	000-10-16 PLAT ALARM GND	18 AWG	GXL	C001-J7 (20)

X687					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	WHT	LSS PWR	20AWG	CABLE	S689 (2)
3	BLU	LSS GND	20AWG	CABLE	S688 (2)
4	BLK	CAN H1	20AWG	CABLE	MS16 (10)
5	GRY	CAN LO	20AWG	CABLE	MS16 (7)

MS16					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	YEL	CAN	20AWG	J1939 CABLE	C001-J7(31)
2	YEL	CAN	20AWG	J1939 CABLE	X304A (3)
3	YEL	CAN	20AWG	J1939 CABLE	X303 A (8)
4	GRN	CAN	20AWG	J1939 CABLE	C001-J7(30)
5	GRN	CAN	20AWG	J1939 CABLE	X304 A (2)
6	GRN	CAN	20AWG	J1939 CABLE	X303 A (9)
7	GRY	CAN LO	20AWG	CABLE	X687 (5)
8					
9					
10	BLK	CAN HI	20 AWG	CABLE	X687 (4)
11					
12					

AH11+ ALARM					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-34 PLAT ALRM	18AWG	GXL	C001-J7 (19)

Figure 7-34. Platform Control Box Harness - Sheet 5 of 12

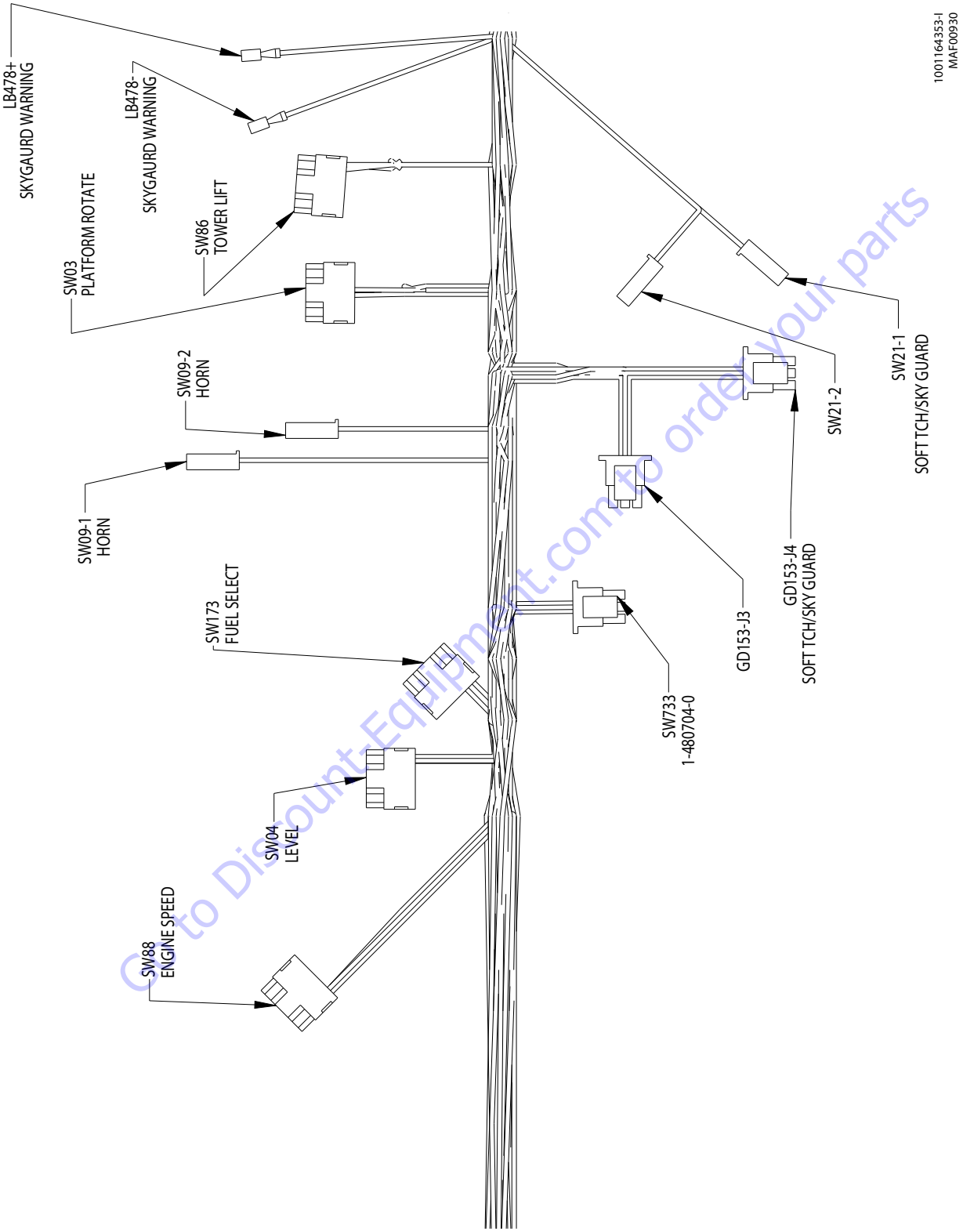


Figure 7-35. Platform Control Box Harness - Sheet 6 of 12

SW88 ENGINE SPEED					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-11 MIN SPEED	18AWG	GXL	C001-J1(28)
2	WHT	1-70 SWITCHES PWR	18AWG	GXL	C001-J1(18)
2	WHT	1-80 SWITCHES PWR	18AWG	GXL	SW04(2)
3	WHT	1-12 MAX SPEED	18AWG	GXL	C001-J1(27)
4					
5					
6					

SW04 LEVEL					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	LEVEL DOWN	18AWG	GXL	C001-J1(10)
2	WHT	1-73 SWITCHES PWR	18AWG	GXL	SW173(2)
2	WHT	1-80 SWITCHES PWR	18AWG	GXL	SW88(2)
3	WHT	1-8 LEVEL UP	18AWG	GXL	C001-J1(9)
4					
5					
6					

GD153-J3					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-92 DRIVE DISABLE	18AWG	GXL	C001-J2(20)
2					
3	WHT	1-28 DRIVE ORIENT SW	18AWG	GXL	C001-J2(14)
4	WHT	1-27 1000# MODE	18AWG	GXL	C001-J2(13)
5					
6	WHT	1-25 SYSTEM DISTRESS	18AWG	GXL	C001-J2(8)

SW733 PUMP POT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	WHT	1-101 RSII PORT 2	18AWG	GXL	C001-J1(32)
3	WHT	1-102 SWITCHES PWR	18AWG	GXL	SW09-2(1)
3	WHT	1-80 SWITCHES PWR	18AWG	GXL	SW174(2)
4	WHT	1-105 POT CCW	18AWG	GXL	C001-J1(34)
5	WHT	1-103 POT CW	18AWG	GXL	C001-J1(13)
6	WHT	1-104 POT W	18AWG	GXL	C001-J1(35)

SW09-2 HORN					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-102 SWITCHES PWR	18AWG	GXL	SW733(3)
1	WHT	1-87 SWITCHES PWR	18AWG	GXL	SW21-2(1)

SW09-1 HORN					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-2 HORN	18AWG	GXL	C001-J1(31)

SW173 FUEL SELECT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	WHT	1-73 SWITCHES PWR	18AWG	GXL	SW04(2)
2	WHT	1-74 SWITCHES PWR	18AWG	GXL	SW03(2)
3	WHT	1-68 FUEL SELECT	18AWG	GXL	C001-J1(33)
4					
5					
6					

Figure 7-36. Platform Control Box Harness - Sheet 7 of 12

GD153-J4					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	WHT	1-23 GENERATOR ON	18 AWG	GXL	C001-J2 (15)
3	WHT	1-22 PLATFORM OVERLOAD	18 AWG	GXL	C001-J2 (11)
4	WHT	1-21 500#/600# MODE	18 AWG	GXL	C001-J2 (12)
5	WHT	1-20 TILT	18 AWG	GXL	C001-J2 (6)
6	WHT	1-29 GLOW PLUG	18 AWG	GXL	C001-J2 (17)

SW03 PLATFORM ROTATE					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-7 PLTF ROTATE LEFT	18 AWG	GXL	C001-J1 (8)
2	WHT	1-72 SWITCHES PWR	18 AWG	GXL	SW86 (2)
2	WHT	1-74 SWITCHES PWR	18 AWG	GXL	SW173 (2)
3	WHT	1-6 PLTF ROTATE RIGHT	18 AWG	GXL	C001-J1 (7)
4					
5					
6					

SW21-2 SOFT TCH/SKY GUARD					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-87 SWITCHES PWR	18 AWG	GXL	SW09-2 (1)

SW86 TOWER LIFT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-17TOWER DOWN	18 AWG	GXL	C001-J1 (2)
2	WHT	1-72 SWITCHES PWR	18 AWG	GXL	SW03 (2)
2	WHT	1-78 SWITCHES PWR	18 AWG	GXL	SW19 (2)
3	WHT	1-16 TOWER UP	18 AWG	GXL	C001-J1 (1)
4					
5					
6					

SW21-1 SOFT TCH/SKY GUARD					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-4 SOFT TOUCH	18 AWG	GXL	C001-J1 (29)

LB478- SKYGAURD WARNING					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	000-10-501 GND	18 AWG	GXL	GD153-J2 (6)

LB478+ SKYGAURD WARNING					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-31 SOFT TCH/SKY GUARD	18 AWG	GXL	C001-J2 (16)

Figure 7-37. Platform Control Box Harness - Sheet 8 of 12

This page left blank intentionally.

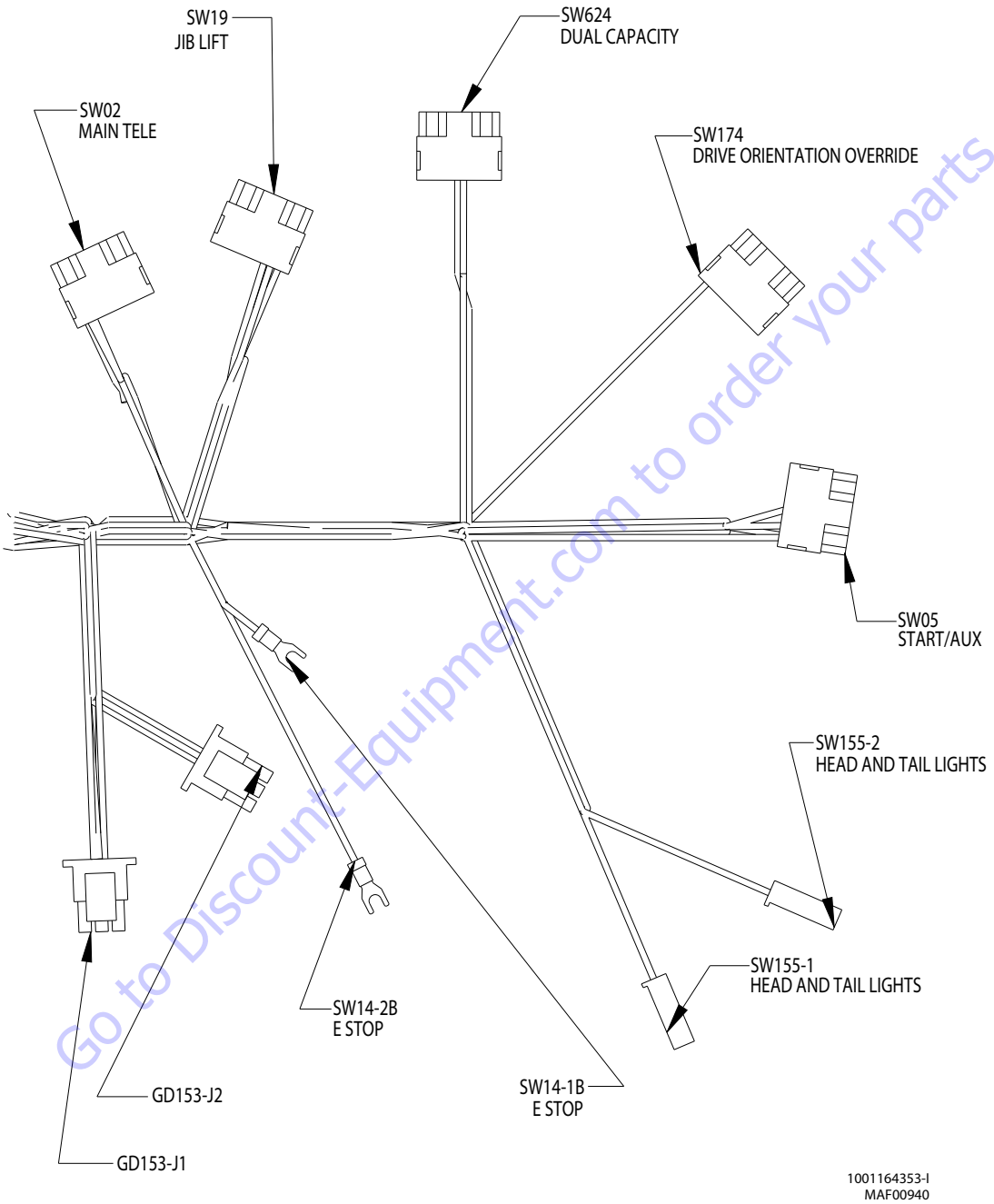


Figure 7-38. Platform Control Box Harness - Sheet 9 of 12

GD153-J2					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-24 CREEP	18 AWG	GXL	C001-J2 (9)
2	WHT	1-32 FT SWITCH ENABLE	18 AWG	GXL	C001-J2 (7)
3	WHT	1-30 LOW FUEL	18 AWG	GXL	C001-J2 (21)
4					
5					
6	BLK	000-10-27 GND	18 AWG	GXL	C001-J2 (18)
6	BLK	000-10-501 GND	18 AWG	GXL	LB478- (1)

GD153-J1					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1_498 1/4 FUEL	18 AWG	GXL	C001-J2 (22)
2	WHT	1_500 1/2 FUEL	18 AWG	GXL	C001-J2 (24)
3	WHT	1_499 3/4 FUEL	18 AWG	GXL	C001-J2 (23)
4	BLK	1_497 FUEL GND	18 AWG	GXL	C001-J2 (25)
5					
6	WHT	1_501 FUEL FULL	18 AWG	GXL	C001-J2 (35)

SW14-1B E STOP					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1B	WHT	1-62 EMS B+	18 AWG	GXL	X304A (9)

SW02 MAIN TELE					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-5 TELE OUT	18 AWG	GXL	C001-J1 (6)
2	WHT	1-71 SWITCHES PWR	18 AWG	GXL	SW155-2 (1)
2	WHT	1-76 SWITCHES PWR	18 AWG	GXL	SW19 (2)
3	WHT	1-3 TELE IN	18 AWG	GXL	C001-J1 (5)
4					
5					
6					

SW19 JIB LIFT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-14 JIB DOWN	18 AWG	GXL	C001-J1 (12)
2	WHT	1-76 SWITCHES PWR	18 AWG	GXL	SW02 (2)
2	WHT	1-78 SWITCHES PWR	18 AWG	GXL	SW86 (2)
3	WHT	1-13 JIB UP	18 AWG	GXL	C001-J1 (11)
4					
5					
6					

Figure 7-39. Platform Control Box Harness - Sheet 10 of 12

SW624 DUAL CAPACITY					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1					
2	WHT	1-75 SWITCHES PWR	18AWG	GXL	SW174 (2)
2	WHT	1-79 SWITCHES PWR	18AWG	GXL	SW05 (2)
3	WHT	1-50 DUAL CAPACITY	18AWG	GXL	C001-J1 (21)
4					
5					
6					

SW05 START/AUX					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-10 AUX POWER	18AWG	GXL	C001-J1 (15)
2	WHT	1-77 SWITCHES PWR	18AWG	GXL	SW155-2 (1)
2	WHT	1-79 SWITCHES PWR	18AWG	GXL	SW624 (2)
3	WHT	1-9 START SWITCH	18AWG	GXL	C001-J1 (14)
4					
5					
6					

SW155-1 HEAD AND TAIL LIGHTS					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-15 HEAD LIGHTS	18AWG	GXL	C001-J1 (30)

SW155-2 HEAD AND TAIL LIGHTS					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-71 SWITCHES PWR	18AWG	GXL	SW02 (2)
1	WHT	1-77 SWITCHES PWR	18AWG	GXL	SW05 (2)

SW174 DRIVE ORIENTATION OVERRIDE					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	1-67 PLTF ORIENT OVERRIDE	18AWG	GXL	C001-J2 (4)
2	WHT	1-75 SWITCHES PWR	18AWG	GXL	SW624 (2)
2	WHT	1-80 SWITCHES PWR	18AWG	GXL	SW733 (3)
3					
4					
5					
6					

SW14-2B E STOP					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
2B	WHT	1-45 PLATF EMS	18AWG	GXL	C001-J7 (2)

Figure 7-40. Platform Control Box Harness - Sheet 11 of 12

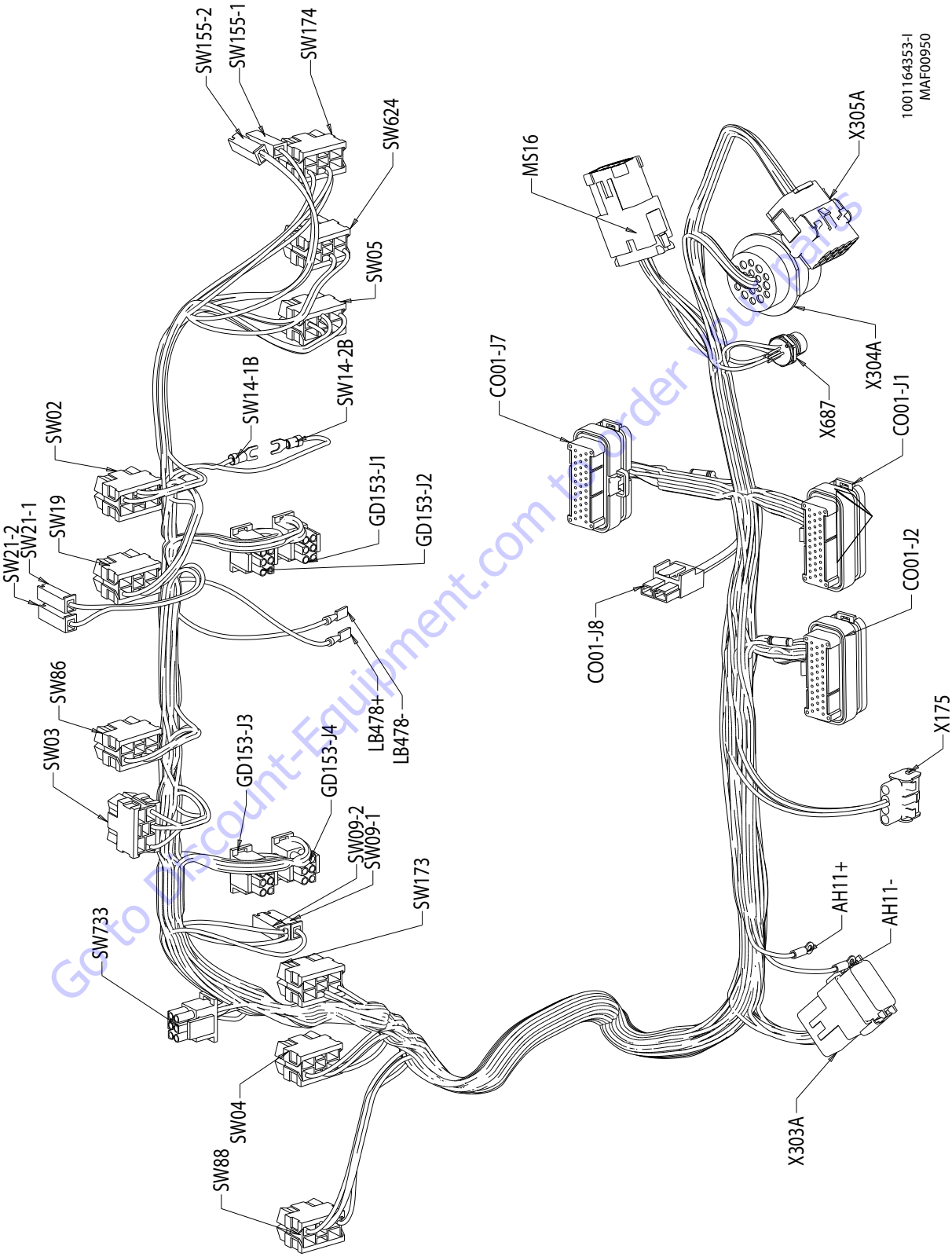
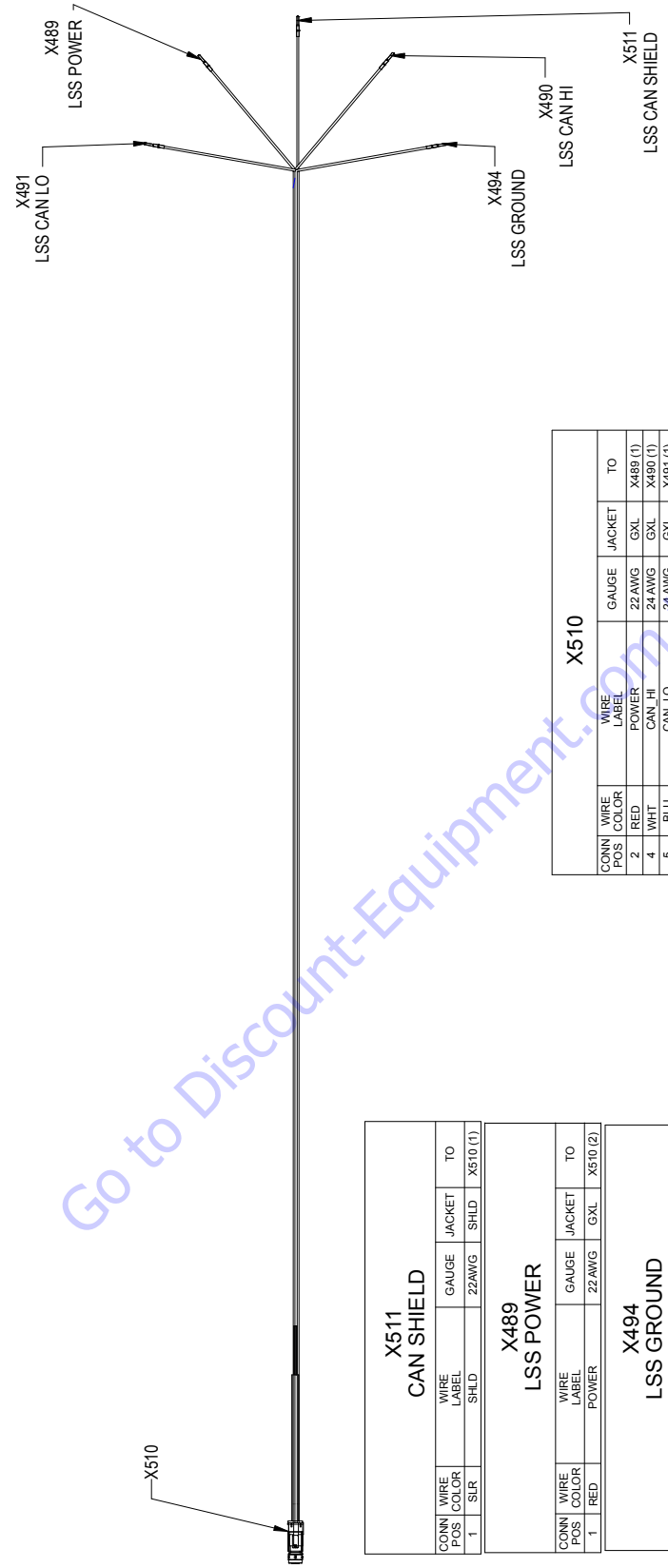


Figure 7-41. Platform Control Box Harness - Sheet 12 of 12



X510

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
2	RED	POWER	22 AWG	GXL	X489 (1)
4	WHT	CAN_HI	24 AWG	GXL	X490 (1)
5	BLU	CAN_LO	24 AWG	GXL	X491 (1)
3	BLK	V-	22 AWG	GXL	X494 (1)
1	SLR	SHLD	22 AWG	SHLD	X511 (1)

X511
CAN SHIELD

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	SLR	SHLD	22AWG	SHLD	X510 (1)

X489
LSS POWER

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	RED	POWER	22 AWG	GXL	X510 (2)

X494
LSS GROUND

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	V-	22 AWG	GXL	X510 (3)

X491
LSS CAN LO

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLU	CAN_LO	24 AWG	GXL	X510 (5)

X490
LSS CAN HI

CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	CAN_HI	24 AWG	GXL	X510 (4)

Figure 7-42. LSS Harness

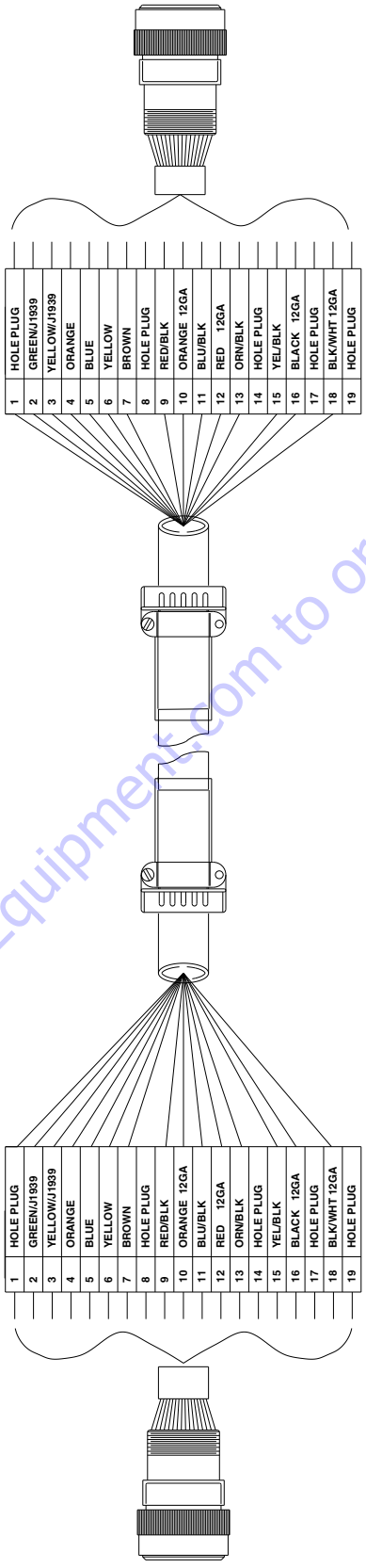


Figure 7-43. Main Boom Harness

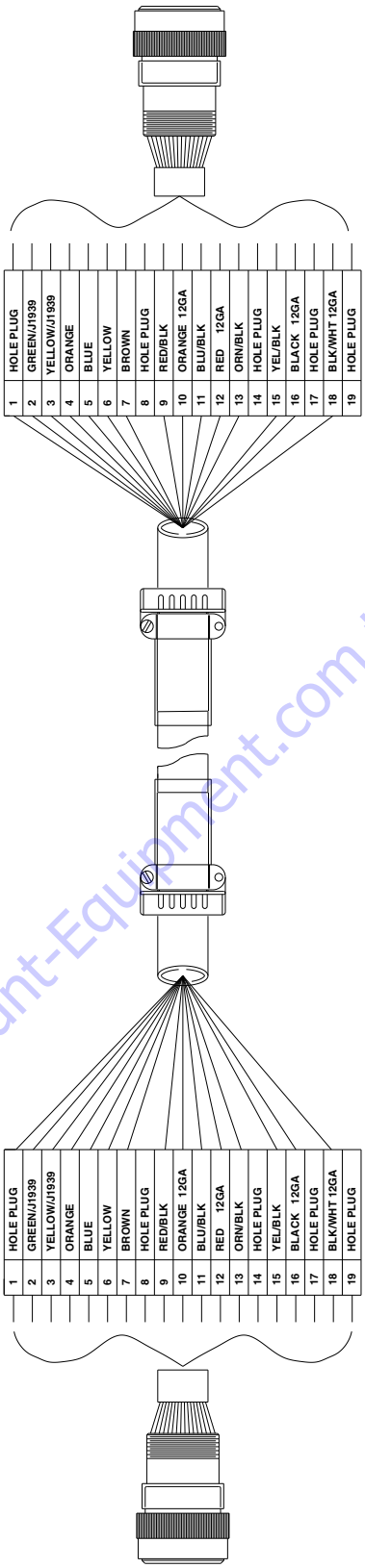
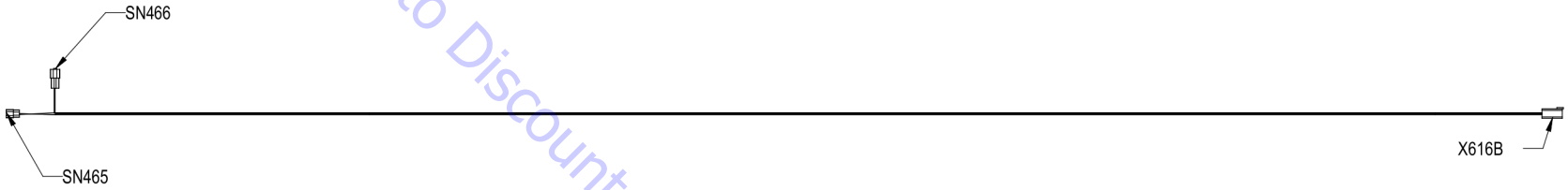


Figure 7-44. Main Boom with Jib Harness



X616B					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	ORN/BLK	CABLE CABLE	18 AWG	TFFN	SN465 (1)
2	BLK/RED	CABLE CABLE	18 AWG	TFFN	SN465 (3)
3	BLU/RED	CABLE CABLE	18 AWG	TFFN	SN465 (2)
4	YEL/BLK	CABLE CABLE	18 AWG	TFFN	SN466 (1)
5	BRN/BLK	CABLE CABLE	18 AWG	TFFN	SN466 (3)
6	BLU/BLK	CABLE CABLE	18 AWG	TFFN	SN466 (2)

SN466					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	YEL/BLK	CABLE CABLE	18 AWG	TFFN	X616B (4)
2	BLU/BLK	CABLE CABLE	18 AWG	TFFN	X616B (6)
3	BRN/BLK	CABLE CABLE	18 AWG	TFFN	X616B (5)

SN465					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	ORN/BLK	CABLE CABLE	18 AWG	TFFN	X616B (1)
2	BLU/RED	CABLE CABLE	18 AWG	TFFN	X616B (3)
3	BLK/RED	CABLE CABLE	18 AWG	TFFN	X616B (2)

1001173808 C

Figure 7-45. Tele In Proximity Switches Harness

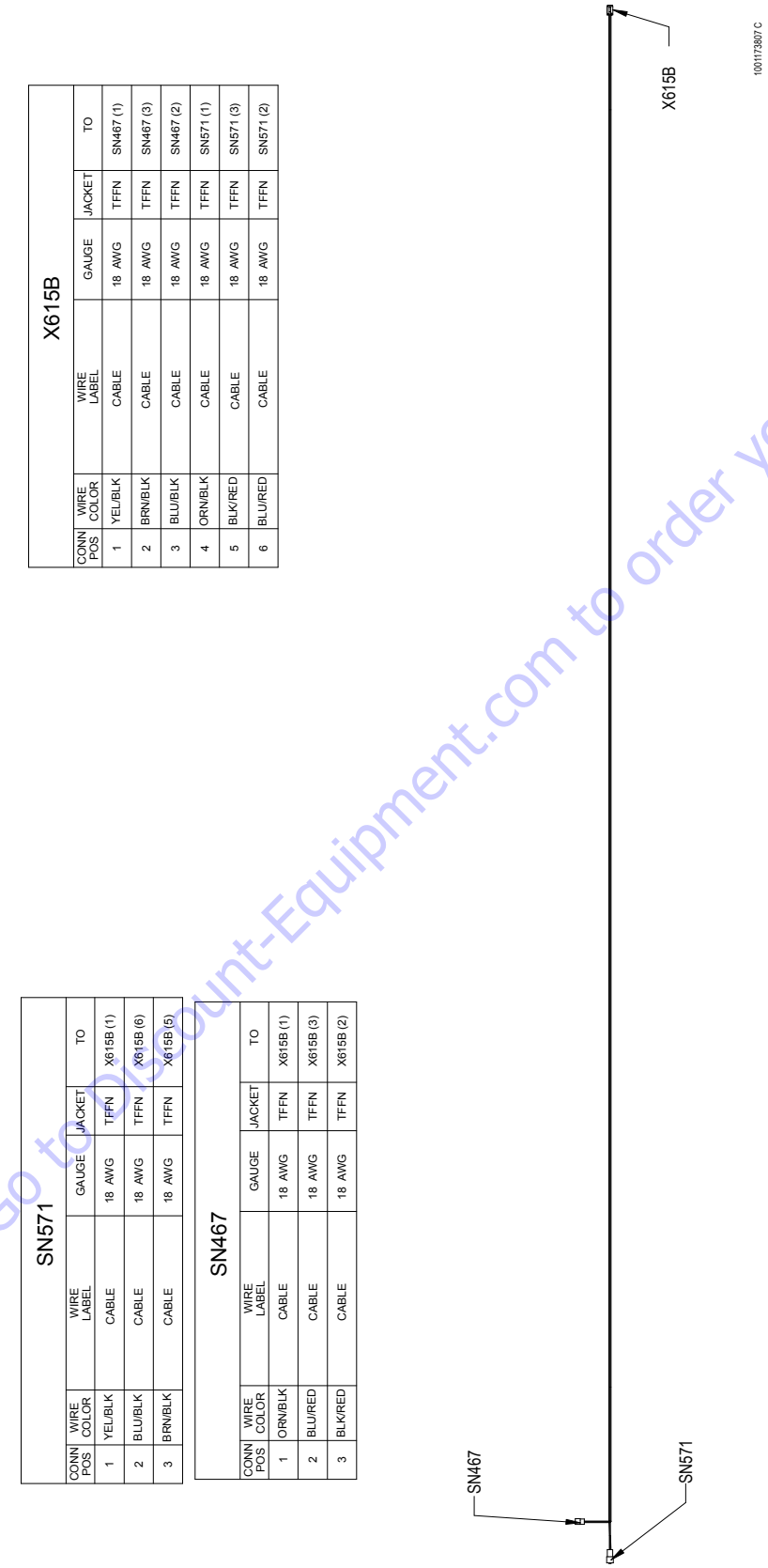


Figure 7-46. Capacity Proximity Switches Harness

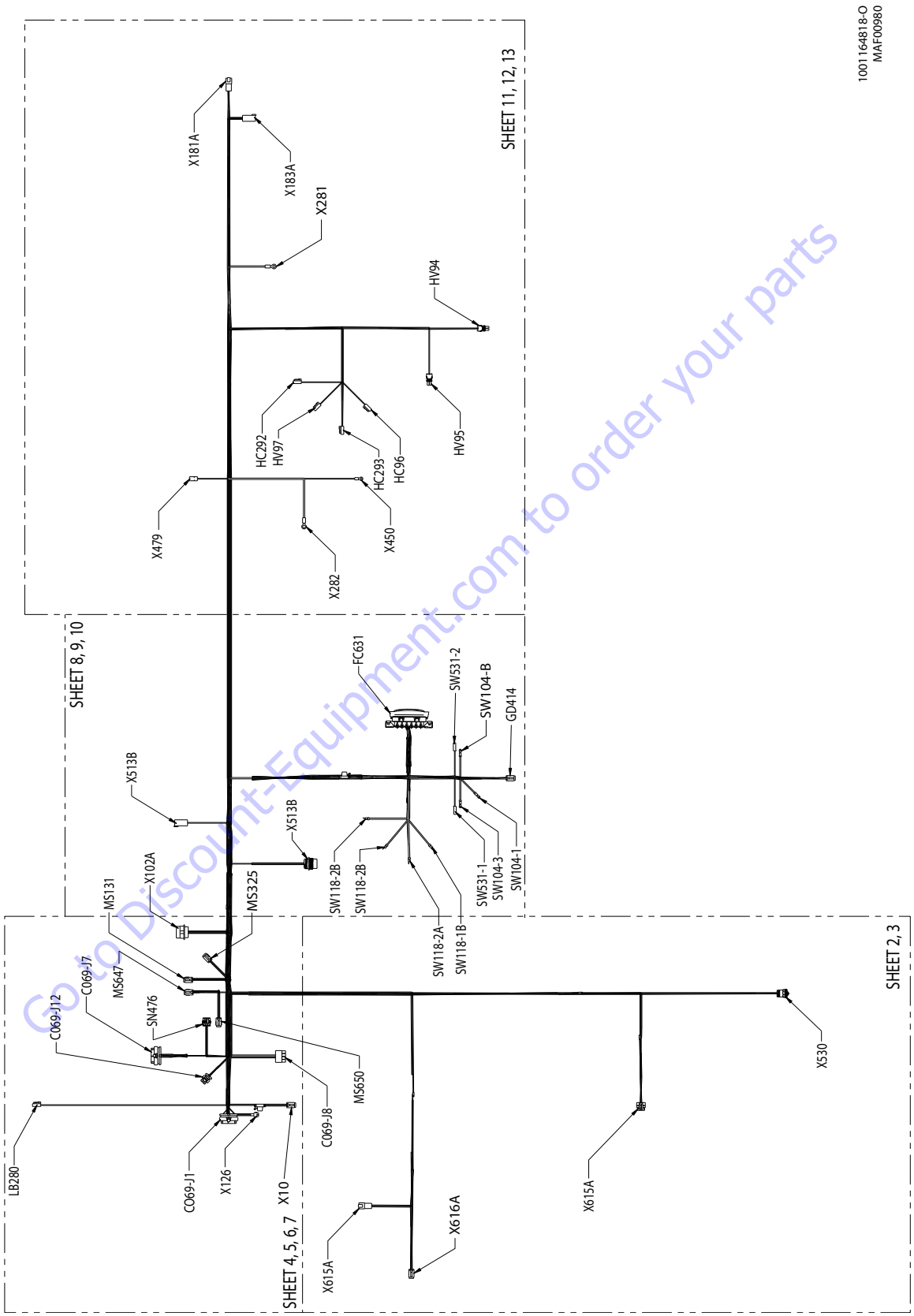


Figure 7-47. Turntable Harness - Sheet 1 of 14

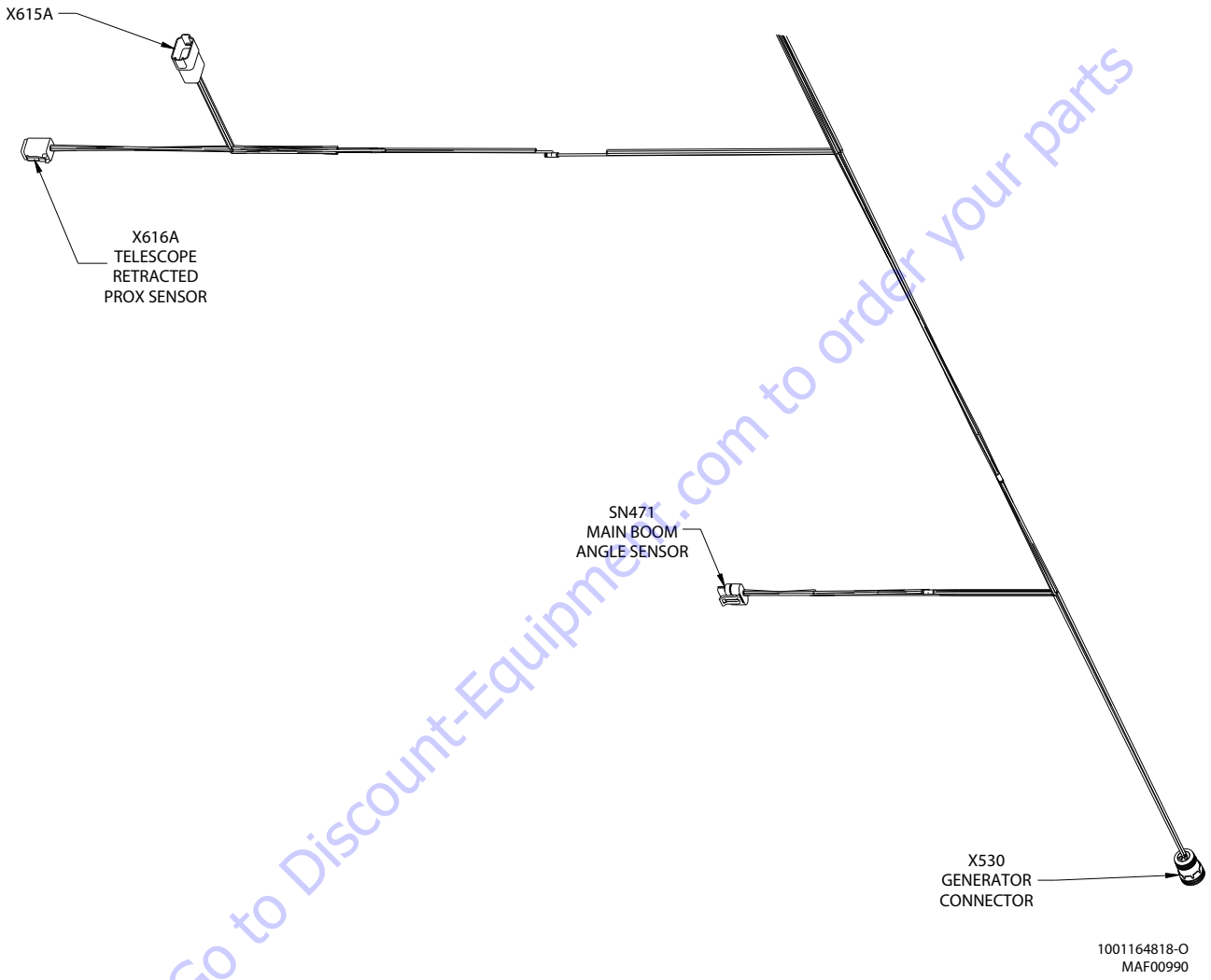


Figure 7-48. Turntable Harness - Sheet 2 of 14

X615A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	4-168 PWR 12V	18 AWG	GXL	S468 (2)
2	BLK	000-40-167 GND	18 AWG	GXL	S469 (2)
3	WHT	4-115 CAPACITY 1	18 AWG	GXL	C069-J7 (23)
4	WHT	4-114 PWR 12V	18 AWG	GXL	S468 (1)
5	BLK	000-40-98 GND	18 AWG	GXL	S469 (1)
6	WHT	4-167 CAP PROX 2	18 AWG	GXL	C069-J1 (35)
7					
8					

X616A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	4-111 PWR 12V	18 AWG	GXL	S469 (2)
2	WHT	000-40-77 GND	18 AWG	GXL	C069-J7 (21)
3	WHT	4-110 PROX 1	18 AWG	GXL	S468 (2)
4	BLK	4-113 PWR 12V	18 AWG	GXL	S469 (2)
5	WHT	000-40-80 GND	18 AWG	GXL	C069-J1 (34)
6	BLK	4-117 PROX 2	18 AWG	GXL	S469 (2)

SN471					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	BLK	000-40-78 GND	18 AWG	GXL	S294 (2)
B	WHT	4-106 PWR 5V	18 AWG	GXL	C069-J7 (4)
C	WHT	4-86 BM ANGLE SEN 1	18 AWG	GXL	C069-J7 (7)
D	WHT	4-87 BM ANGLE SEN 2	18 AWG	GXL	S295 (2)
E	BLK	000-40-79 GND	18 AWG	GXL	S294 (2)
F	WHT	4-112 PWR 5V	18 AWG	GXL	S294 (2)

X530					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	YEL	4-82 GEN IGN	18 AWG	GXL	FC631 (41)
2	WHT	4-74 GEN ON	18 AWG	GXL	C069-J1 (22)
3	BLK	000-40-161 GEN GND	18 AWG	GXL	MS647 (5)

Figure 7-49. Turntable Harness - Sheet 3 of 14

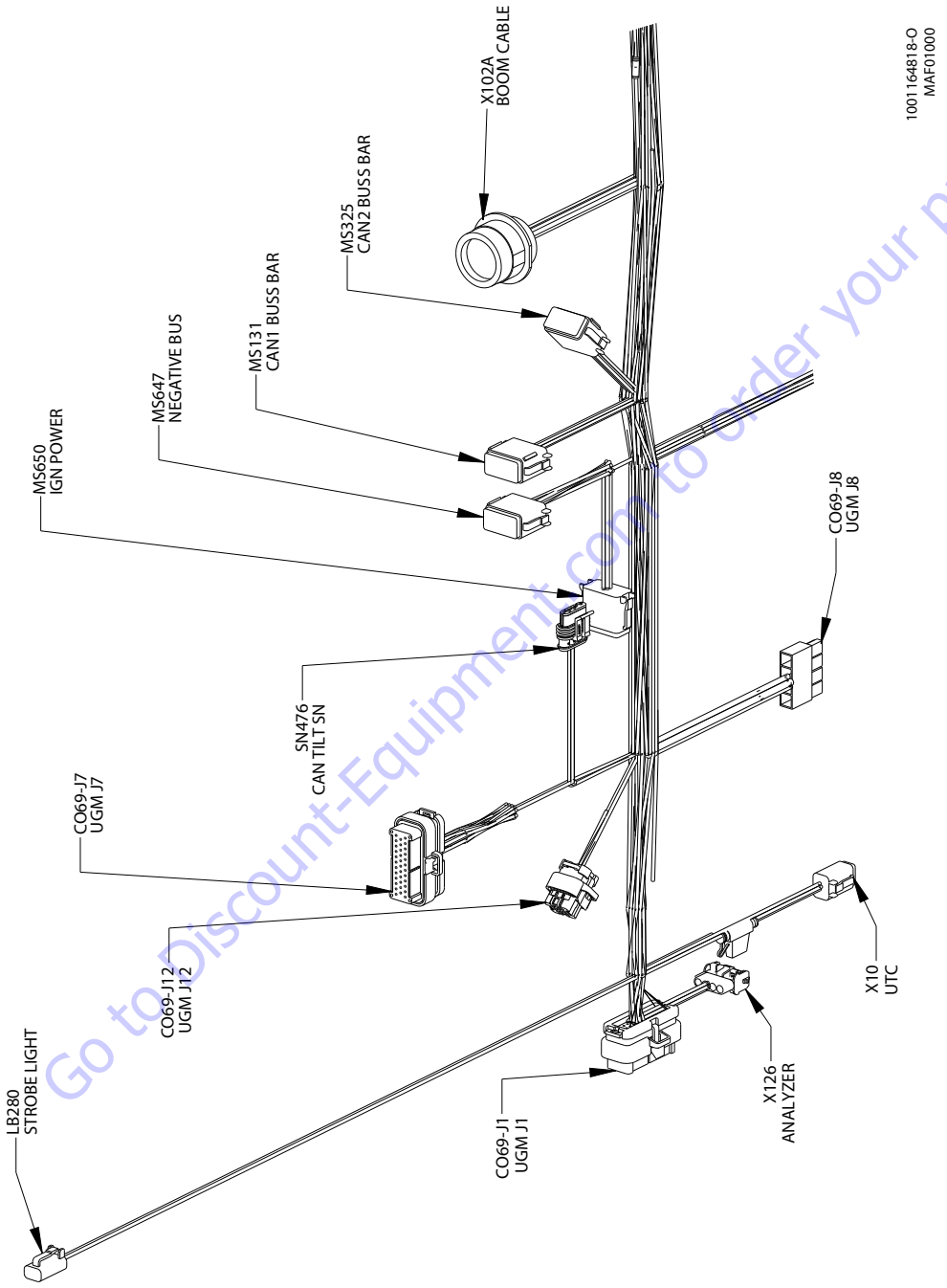


Figure 7-50. Turntable Harness - Sheet 4 of 14

X10					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	RED	4-65 PWR	18AWG	GXL	S18 (1)
2	BLK	00-40-558 GND	18AWG	GXL	MS647 (8)
3	RED	4-97 IGN	18AWG	GXL	S15 (1)
4	WHT	4-51-1 PLTFM ENABLE	18AWG	GXL	IP103 (2)

X126					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-5 POWER	18AWG	GXL	C069-J1 (28)
2	WHT	4-6 RECEIVE	18AWG	GXL	C069-J1 (29)
3	WHT	4-7 TRANSMIT	18AWG	GXL	C069-J1 (30)
4	BLK	000-40-4 GND	18AWG	GXL	C069-J1 (31)

C069-J12					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2					
3	YEL	CAN2 HI	20 AWG	J1939 CABLE	MS325 (5)
4	GRN	CAN2 LO	20 AWG	J1939 CABLE	MS325 (3)
5					
6	WHT	4-96 CAN2 TERM	18 AWG	GXL	C069-J12 (7)
7	WHT	4-96 CAN2 TERM	18 AWG	GXL	C069-J12 (6)
8	WHT	4-163 MSSO	18 AWG	GXL	SW531-1 (1)

LB280					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	YEL	4-54 STRB LIGHT	18 AWG	GXL	MS650 (3)
2	BLK	000-40-14 STRB GND	18 AWG	GXL	MS647 (3)

C069-J7					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2	WHT	4-132 PLAT MODE	18 AWG	GXL	S121 (1)
3	RED+	4-169-1 MODE SOL	18 AWG	GXL	FC631 (46)
4	WHT	4-86 BM ANGLE SEN 1	18 AWG	GXL	SN471 (C)
5					
6	WHT	4-133 CAN1 TERM	18 AWG	GXL	C069-J7 (17)
7	WHT	4-87 BM ANGLE SEN 2	18 AWG	GXL	SN471 (D)
8					
9	BLK	000-40-76 GND	18 AWG	GXL	S295 (1)
10	WHT	4-123 GND	18 AWG	GXL	SN476 (2)
11					
12					
13	YEL	CAN 1 HI	18 AWG	J1939 CABLE	MS131 (12)
14	WHT	4-53 GROUND MODE	18 AWG	GXL	X102A (11)
15	WHT	4-52 FOOT SW	18 AWG	GXL	X102A (6)
16	WHT	4-118 PWR 5V	18 AWG	GXL	S294 (1)
17	WHT	4-133 CAN1 TERM	18 AWG	GXL	C069-J7 (6)
18					
19	BLK	000-40-13 GND	18 AWG	GXL	FC631 (1)
20					
21	WHT	4-110 PROX 1	18 AWG	GXL	X616A (3)
22					
23	WHT	4-115 CAPACITY 1	18 AWG	GXL	X615A (3)
24	GRN	CAN 1 LO	18 AWG	J1939 CABLE	MS131 (4)
25	BLK	000-40-51 GND	18 AWG	GXL	GD414 (1)
26					
27					
28	BLK	000-40-75 GND	18 AWG	GXL	S469 (1)
29	RED	4-97 PWR	18 AWG	GXL	S15 (1)
30					
31					
32	WHT	4-116 POWER 12V	18 AWG	GXL	X479 (1)
33	WHT	4-119 PWR 12V	18 AWG	GXL	S468 (1)
34	WHT	4-108 VCC	18 AWG	GXL	SN476 (1)
35	WHT	4-92 DOS SW	18 AWG	GXL	X479 (2)

Figure 7-51. Turntable Harness - Sheet 5 of 14

C069-J1					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2	WHT	4-120 OSC AXL V 2	18 AWG	GXL	HV293 (1)
3	WHT	4-3 DRIVE FORWARD	16 AWG	GXL	HV95 (1)
4					
5	BLK	000-40-3 GND	18 AWG	GXL	S98 (2)
6	WHT	4-4 DRIVE REVERSE	16 AWG	GXL	HV94 (1)
7	WHT	4-121 OSC AXL V 1	18 AWG	GXL	HV292 (1)
8					
9	BLK	000-40-162 GND	18 AWG	GXL	SW531-2 (1)
10	WHT	4-94 EMR4 IGNITION	18 AWG	GXL	X181A (1)
11	WHT	4-67 START	16 AWG	GXL	X183A (2)
12	WHT	4-80 GLOW PLUG	16 AWG	GXL	X181A (4)
13	WHT	4-78 AUX PUMP	16 AWG	GXL	X450 (1)
14					
15					
16					
17					
18					
19					
20	WHT	4-2 TWO SPEED	18 AWG	GXL	HV96 (1)
21					
22	WHT	4-74 GEN ON	18 AWG	GXL	X530 (2)
23	WHT	4-1 BRAKE	18 AWG	GXL	HV97 (1)
24					
25					
26					
27					
28	WHT	4-5 POWER	18 AWG	GXL	X126 (1)
29	WHT	4-6 RECEIVE	18 AWG	GXL	X126 (2)
30	WHT	4-7 TRANSMIT	18 AWG	GXL	X126 (3)
31	BLK	000-40-4 GND	18 AWG	GXL	X126 (4)
32	RED	4-76 ALT EXCITE	16 AWG	GXL	X183A (5)
33					
34	WHT	4-117 PROX 2	18 AWG	GXL	X616A (6)
35	WHT	4-167 CAP PROX 2	18 AWG	GXL	X615A (6)

SN476					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-108 VCC	18 AWG	GXL	C069-J7 (34)
2	WHT	4-123 GND	18 AWG	GXL	C069-J7 (10)
3	YEL	CAN 1 HI	20 AWG	J1939 CABLE	MS131 (11)
4	GRN	CAN 1 LO	20 AWG	J1939 CABLE	MS131 (10)

MS650					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	YEL	4-36 MODL PWR	14 AWG	GXL	C069-J8 (4)
2	YEL	4-72 IGN	18 AWG	GXL	FC631 (36)
3	YEL	4-54 STRB LIGHT	18 AWG	GXL	LB280 (1)
4	YEL	4-84 IGN	18 AWG	GXL	X183A (1)
5	YEL	4-81 GEN IGN	18 AWG	GXL	Fc631 (45)
6					
7					
8					
9					
10					
11					
12					

MS647					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-64 BATT GND	16 AWG	GXL	C069-J8 (1)
2	BLK	000-40-47 OSC VLVs GND	18 AWG	GXL	S300 (1)
3	BLK	000-40-14 STRB GND	18 AWG	GXL	LB280 (2)
4	BLK	000-40-11 NEGATIVE	18 AWG	GXL	X429 (A)
5	BLK	000-40-161 GEN GND	18 AWG	GXL	X530 (3)
6	BLK	000-40-81	16 AWG	GXL	X281 (1)
7	BLK	000-40-557 GND	18 AWG	GXL	X181A (2)
8	BLK	00-40-558 GND	18 AWG	GXL	X10 (2)
9					
10					
11					
12					

Figure 7-52. Turntable Harness - Sheet 6 of 14

MS131					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	YEL	CAN 1 HI	18 AWG	J1939 CABLE	X102A (3)
2					
3	GRN	CAN 1 LO	18 AWG	J1939 CABLE	X102A (2)
4	GRN	CAN 1 LO	18 AWG	J1939 CABLE	C069-J7 (24)
5					
6					
7					
8					
9					
10	GRN	CAN 1 LO	20 AWG	J1939 CABLE	SN476 (4)
11	YEL	CAN 1 HI	20 AWG	J1939 CABLE	SN476 (3)
12	YEL	CAN 1 HI	18 AWG	J1939 CABLE	C069-J7 (13)

MS325					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2					
3	GRN	CAN2 LO	20 AWG	J1939 CABLE	C069-J12 (4)
4	GRN	CAN2 LO	20 AWG	J1939 CABLE	X183A (4)
5	YEL	CAN2 HI	20 AWG	J1939 CABLE	C069-J12 (3)
6	YEL	CAN2 HI	20 AWG	J1939 CABLE	X183A (3)
7	YEL	CAN2 HI	20 AWG	J1939 CABLE	X429 (C)
8	YEL	CAN2 HI	20 AWG	J1939 CABLE	GD414 (3)
9	GRN	CAN2 LO	20 AWG	J1939 CABLE	X429 (D)
10	GRN	CAN2 LO	20 AWG	J1939 CABLE	GD414 (4)
11					
12					

C069-J8					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-64 BATT GND	16 AWG	GXL	1
1	BLK	000-40-8 MODL GND	10 AWG	GXL	1
2	RED	4-35 IGN	12 AWG	GXL	2
3	BLK	000-40-12 PLATF GND	12 AWG	GXL	3
4	YEL	4-36 MODL PWR	14 AWG	GXL	4

X102A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2	GRN	CAN 1 LO	18 AWG	J1939 CABLE	MS131 (3)
3	YEL	CAN 1 HI	18 AWG	J1939 CABLE	MS131 (1)
4	WHT	4-43 PLTF EMS	18 AWG	GXL	S121 (2)
5					
6	WHT	4-52 FOOT SW	18 AWG	GXL	C069-J7 (15)
7					
8					
9	RED	4-552	16 AWG	GXL	FC631 (34)
10					
11	WHT	4-53 GROUND MODE	18 AWG	GXL	C069-J7 (14)
12	RED	4-71	12 AWG	GXL	FC631 (37)
13					
14					
15					
16	BLK	000-40-12 PLATF GND	12 AWG	GXL	C069-J8 (3)
17					
18					
19					

Figure 7-53. Turntable Harness - Sheet 7 of 14

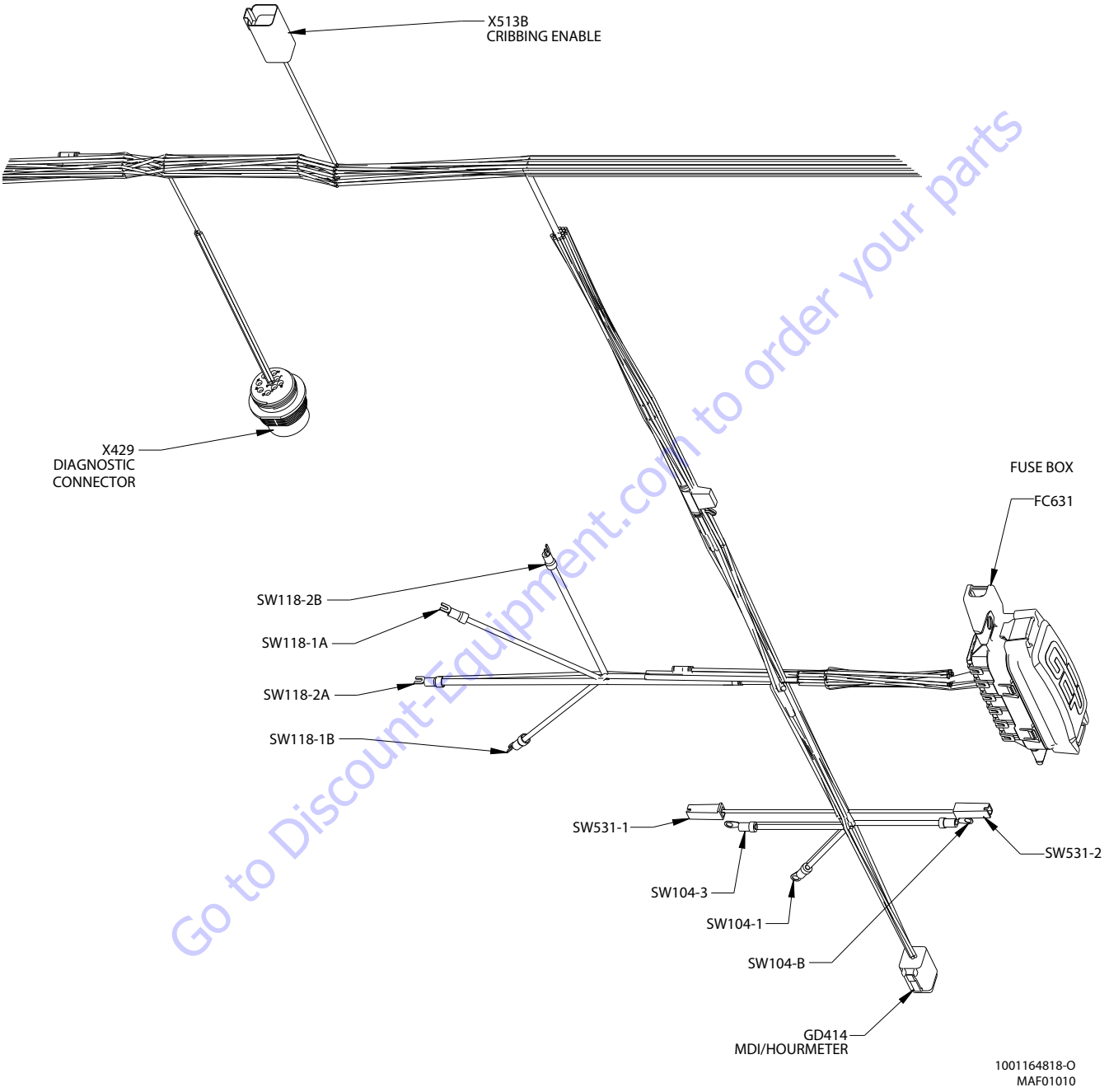


Figure 7-54. Turntable Harness - Sheet 8 of 14

X513B					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-43 CF	16 AWG	GXL	S171 (2)
2					
3					
4					
5					
6					

X429					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
A	BLK	000-40-11 NEGATIVE	18 AWG	GXL	MS647 (4)
B	RED	4-65 PWR	18 AWG	GXL	S18 (2)
C	YEL	CAN2 HI	20 AWG	J1939 CABLE	MS325 (7)
D	GRN	CAN2 LO	20 AWG	J1939 CABLE	MS325 (9)
E					
F					
G					
H	WHT	4-66 IGN	18 AWG	GXL	FC631 (40)
J					

SW118-2B					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
2B	RED	4-47 SW-118-2B	10 AWG	GXL	S123 (1)

SW118-1A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1A	RED	4-37 SW118-1A	12 AWG	GXL	FC631 (9)

SW118-2A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
2A	RED	4-175 SW118-2A	10 AWG	GXL	S123 (1)
2A	RED	4-50	18 AWG	GXL	FC631 (35)

SW118-1B					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1B	RED	4-46	12 AWG	GXL	SW104-B (1)

SW531-1					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-163 MSSO	18 AWG	GXL	63119-1

SW531-2					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-162 GND	18 AWG	GXL	4460259

SW104-3					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	RED	4-51	12 AWG	GXL	FC631 (38)
1	WHT	4-51 PLTFM ENABLE	18 AWG	GXL	IP103 (1)

SW104-1					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	RED	4-169 MODE SEL	12 AWG	GXL	FC631 (42)
1	RED	Apr-40	12 AWG	GXL	FC631 (29)

GD414					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-51 GND	18 AWG	GXL	C069-J7 (25)
2	RED	4-97 PWR	18 AWG	GXL	S15 (2)
3	YEL	CAN2 HI	20 AWG	J1939 CABLE	MS325 (8)
4	GRN	CAN2 LO	20 AWG	J1939 CABLE	MS325 (10)
5					
6					
NC					

Figure 7-55. Turntable Harness - Sheet 9 of 14

FC631					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-13 GND	18 AWG	GXL	C069-J7 (19)
2	RED	4-166	12 AWG	GXL	S621 (2)
3					
4					
5					
6					
7					
8					
9	RED	4-37 SW118-1A	12 AWG	GXL	SW118-1A (1A)
10	WHT	4-170	18 AWG	GXL	S509 (2)
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25	RED	4-39	18 AWG	GXL	S509 (1)
26	WHT	4-38	18 AWG	GXL	S509 (1)
27					
28	RED	4-350	12 AWG	GXL	S621 (1)
29	RED	4-40	12 AWG	GXL	SW104-1 (1)
30	WHT	4-41	18 AWG	GXL	S121 (2)
31					
32	RED	4-35 IGN	12 AWG	GXL	C069-J8 (2)
33	RED	4-550	12 AWG	GXL	S621 (1)

FC631					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
34	RED	4-552	16 AWG	GXL	X102A (9)
35	RED	4-50	18 AWG	GXL	SW118-2A (2A)
36	YEL	4-72 IGN	18 AWG	GXL	MS650 (2)
37	RED	4-71	12 AWG	GXL	X102A (12)
38	RED	4-51	12 AWG	GXL	SW104-3 (1)
39	RED	4-65 PWR	18 AWG	GXL	S18 (2)
40	WHT	4-66 IGN	18 AWG	GXL	X429 (H)
41	YEL	4-82 GEN IGN	18 AWG	GXL	X530 (1)
42	RED	4-169 MODE SEL	12 AWG	GXL	SW104-1 (1)
43					
44					
45	YEL	4-81 GEN IGN	18 AWG	GXL	MS650 (5)
46	RED	4-169-1 MODE SOL	18 AWG	GXL	C069-J7 (3)
47	RED	4-563 LIGHT OPT	18 AWG	GXL	S621 (2)
48					

SW104-B					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	RED	4-46	12 AWG	GXL	SW118-1B (1B)

Figure 7-56. Turntable Harness - Sheet 10 of 14

This page left blank intentionally.

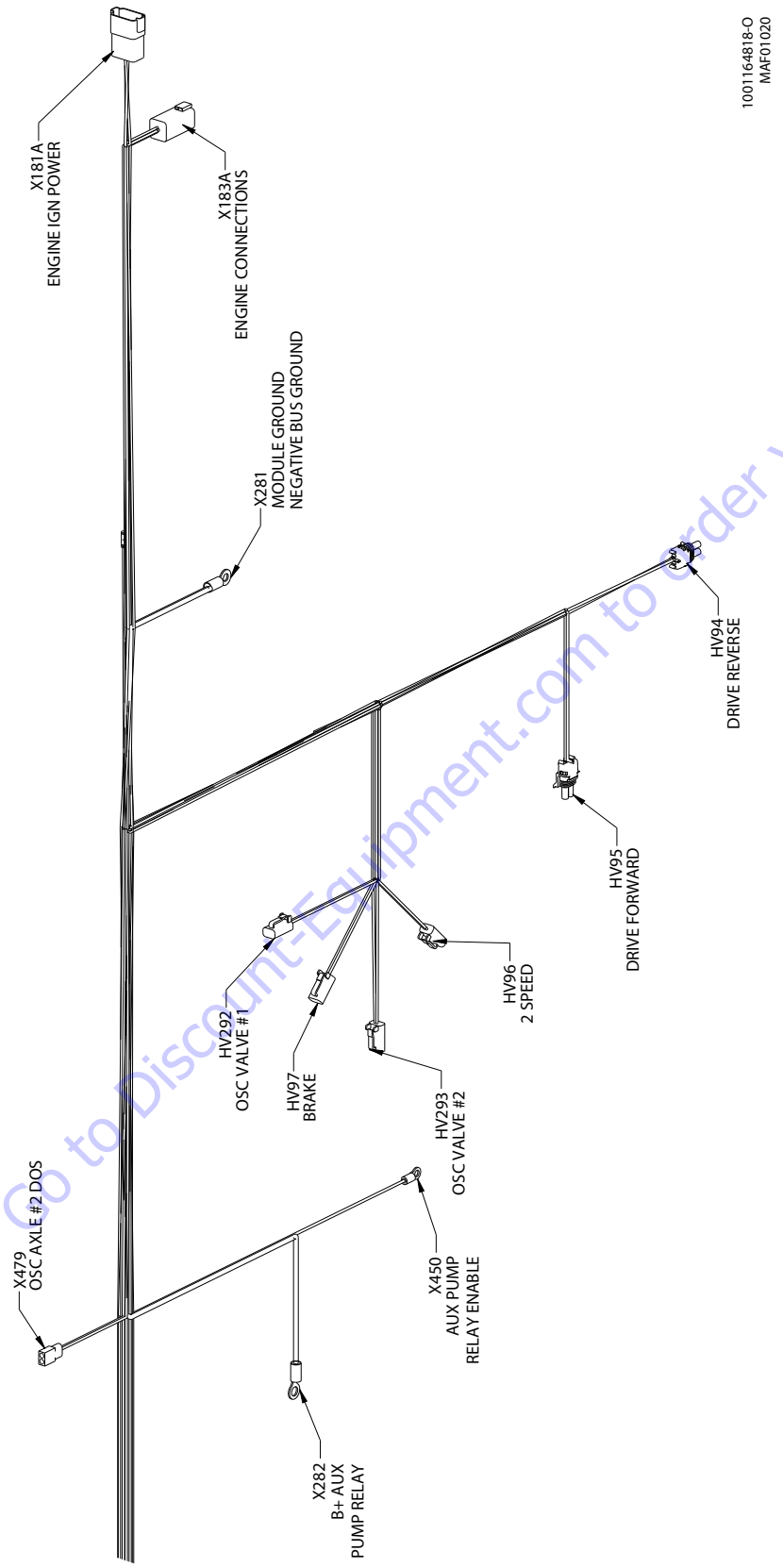


Figure 7-57. Turntable Harness - Sheet 11 of 14

X479					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-116 POWER 12V	18 AWG	GXL	C069-J7 (32)
2	WHT	4-92 DOS SW	18 AWG	GXL	C069-J7 (35)

X181A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-94 EMR4 IGNITION	18 AWG	GXL	C069-J1 (10)
2	BLK	000-40-557 GND	18 AWG	GXL	MS647 (7)
3					
4	WHT	4-80 GLOW PLUG	16 AWG	GXL	C069-J1 (12)
5					
6					
7					
8					

X183A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	YEL	4-84 IGN	18 AWG	GXL	MS650 (4)
2	WHT	4-67 START	16 AWG	GXL	C069-J1 (11)
3	YEL	CAN2 HI	20 AWG	J1939 CABLE	MS325 (6)
4	GRN	CAN2 LO	20 AWG	J1939 CABLE	MS325 (4)
5	RED	4-76 ALT EXCITE	16 AWG	GXL	C069-J1 (32)
6					

X281					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-8 MODL GND	10 AWG	GXL	C069-J8 (1)
1	BLK	000-40-81	16 AWG	GXL	MS647 (6)

HV94					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-4 DRIVE REVERSE	16 AWG	GXL	C069-J1 (6)
2	BLK	000-40-41 CF	16 AWG	GXL	S171 (1)

HV95					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-3 DRIVE FORWARD	16 AWG	GXL	C069-J1 (3)
2	BLK	000-40-40 CF	16 AWG	GXL	S171 (1)

HV96					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-2 TWO SPEED	18 AWG	GXL	C069-J1 (20)
2	BLK	000-40-2 GND	18 AWG	GXL	S98 (1)

Figure 7-58. Turntable Harness - Sheet 12 of 14

HV293					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-120 OSC AXL V 2	18 AWG	GXL	C069-J1 (2)
2	BLK	000-40-72	18 AWG	GXL	S300 (2)

HV97					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-1 BRAKE	18 AWG	GXL	C069-J1 (23)
2	BLK	000-40-1 GND	18 AWG	GXL	S98 (1)

HV292					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-121 OSC AXL V 1	18 AWG	GXL	C069-J1 (7)
2	BLK	000-40-73	18 AWG	GXL	S300 (2)

X450					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-78 AUX PUMP	16 AWG	GXL	C069-J1 (13)

X282					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	RED	4-49 B+ AUX PMP 10AWG	10 AWG	GXL	IP136 (2)

Figure 7-59. Turntable Harness - Sheet 13 of 14

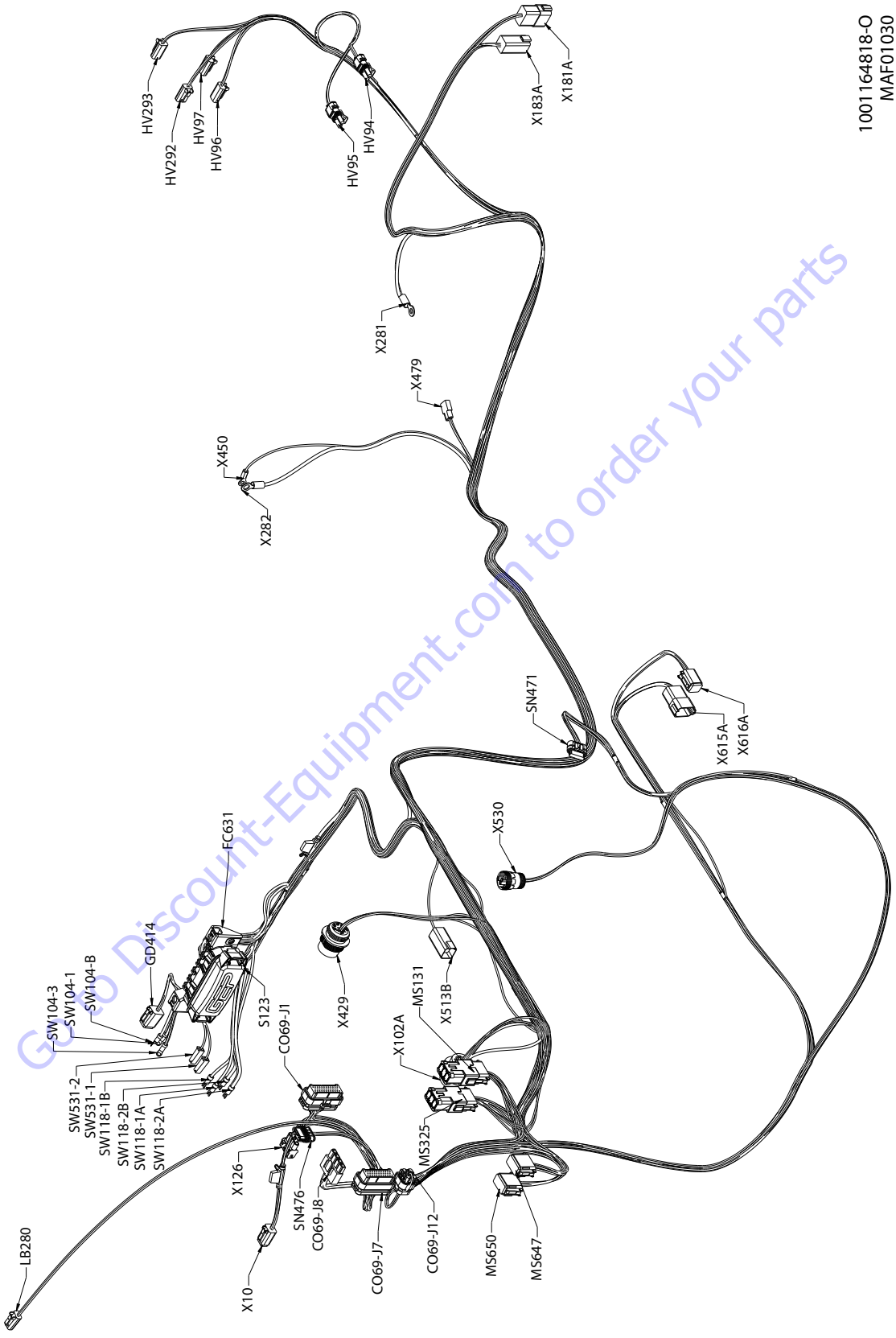


Figure 7-60. Turntable Harness - Sheet 14 of 14

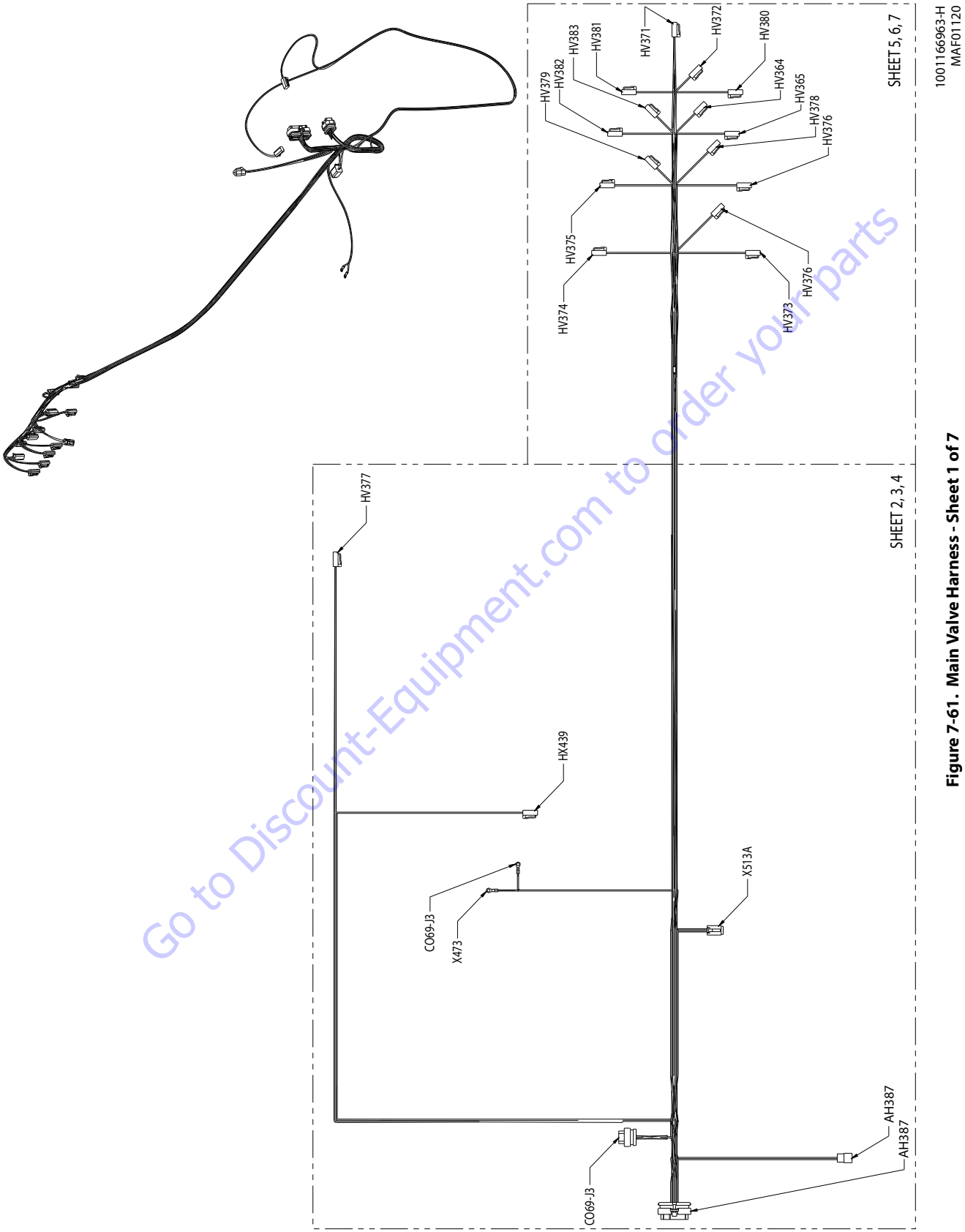


Figure 7-61. Main Valve Harness - Sheet 1 of 7

This page left blank intentionally.

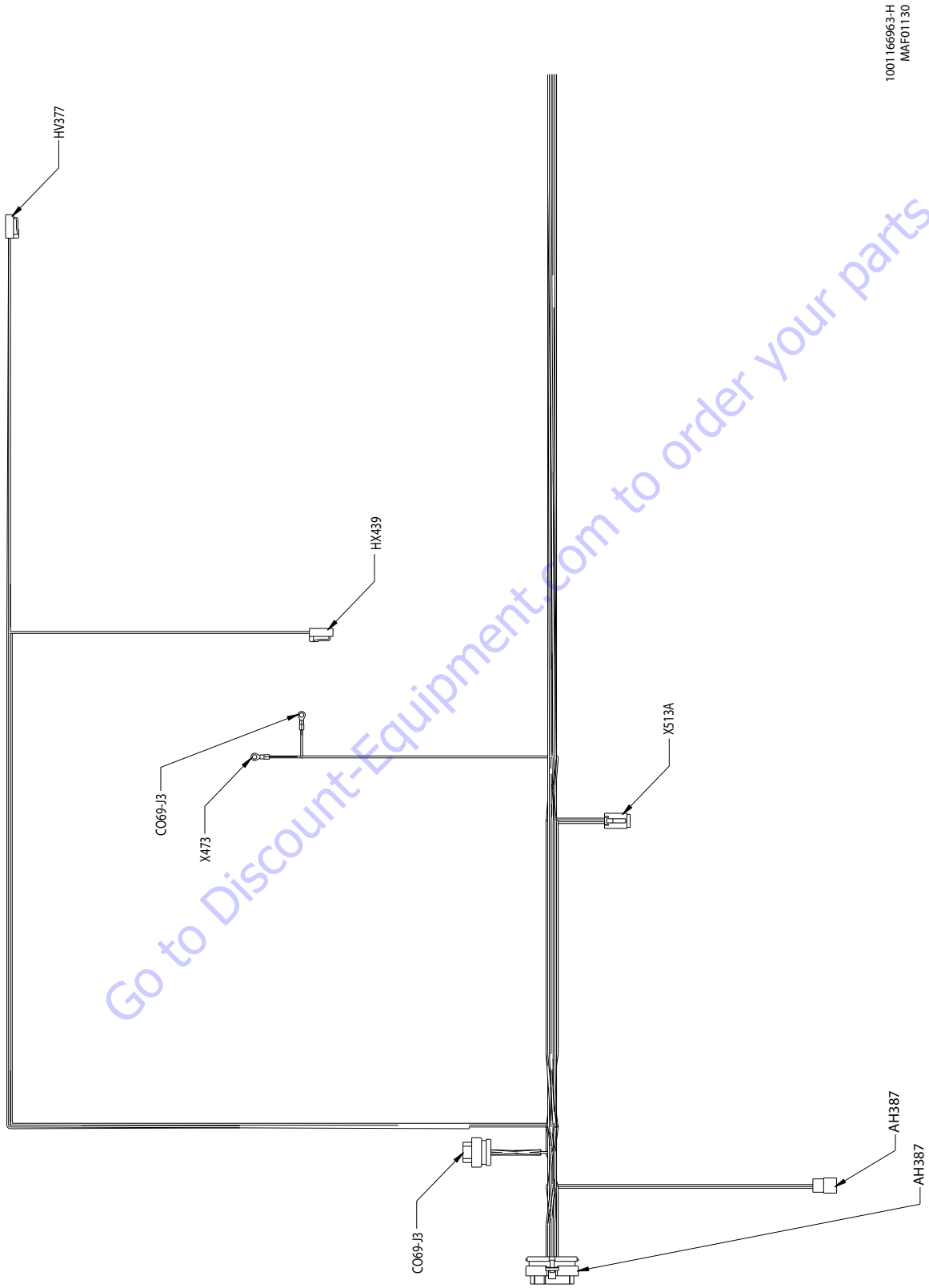


Figure 7-62. Main Valve Harness - Sheet 2 of 7

C069-J2					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1					
2					
3					
4	WHT	4-19 MAIN TELE IN	18 AWG	GXL	HV371 (1)
5	WHT	4-8 LEVEL UP	18 AWG	GXL	HV381 (1)
6	BLK	000-40-45	18 AWG	GXL	X474 (1)
7	WHT	4-11 LEVEL DOWN	18 AWG	GXL	HV380 (1)
8	WHT	4-21 STEER RIGHT	18 AWG	GXL	HV373 (1)
9	WHT	4-103 MAIN LIFT DOWN AUX	18 AWG	GXL	HV439 (1)
10	WHT	4-9 ROTATE LEFT	18 AWG	GXL	HV383 (1)
11	WHT	4-24 MAIN LIFT UP	18 AWG	GXL	HV376 (1)
12	WHT	4-12 JIB UP	18 AWG	GXL	HV364 (1)
13	WHT	4-14 MAIN DUMP	18 AWG	GXL	HV366 (1)
14	BLK	000-40-7 GND	18 AWG	GXL	S386 (2)
15					
16	WHT	4-20 MAIN TELE OUT	18 AWG	GXL	HV372 (1)
17	BLK	000-40-5 GND	18 AWG	GXL	S384 (2)
18					
19	WHT	4-22 STEER LEFT	18 AWG	GXL	HV374 (1)
20					
21	WHT	4-10 ROTATE RIGHT	18 AWG	GXL	HV382 (1)
22	WHT	4-104 MAIN LIFT DOWN	18 AWG	GXL	HV377 (1)
23	WHT	4-13 JIB DOWN	18 AWG	GXL	HV365 (1)
24					
25	WHT	4-75 FUEL SENSOR	18 AWG	GXL	X473 (1)
26	WHT	4-102 HEAD & TAIL LIGHTS	18 AWG	GXL	X513A (2)
27	WHT	4-29 ALRM	18 AWG	GXL	AH387 (B)
28	BLK	000-40-53 GND	18 AWG	GXL	S415 (2)
29	BLK	000-40-10 ALRM GND	18 AWG	GXL	AH387 (C)
30	BLK	000-40-25 GND	18 AWG	GXL	HV366 (2)
31	WHT	4-23 FLOW CONTROL	18 AWG	GXL	HV375 (1)
32					
33					
34	WHT	4-27 SWING LEFT	18 AWG	GXL	HV379 (1)

C069-J3					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-44 CF	18 AWG	GXL	X513A (1)
2	BLK	000-40-49 AUX TWR LIFT DOWN	18 AWG	GXL	HV439 (2)
3					
4	BLK	000-40-38 CF	18 AWG	GXL	S389 (2)
5					
6	BLK	000-40-33 CF	18 AWG	GXL	HV375 (2)
7	WHT	4-30 ALRM	18 AWG	GXL	AH387 (A)
8					
9	WHT	4-105 CRIBBING	18 AWG	GXL	X513A (3)
10	WHT	5-101 JUMP ENABLE	18 AWG	GXL	X513A (4)
11					
12					
13					
14	BLK	000-40-35 CF	18 AWG	GXL	S388 (2)

HV439					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-103 MAIN LIFT DOWN AUX	18 AWG	GXL	C069-J2 (9)
2	BLK	000-40-49 AUX TWR LIFT DOWN	18 AWG	GXL	C069-J3 (2)

HV377					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-104 MAIN LIFT DOWN	18 AWG	GXL	C069-J2 (22)
2	BLK	000-40-63 CF	18 AWG	GXL	S388 (2)

X473					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-75 FUEL SENSOR	18 AWG	GXL	C069-J2 (25)

Figure 7-63. Main Valve Harness - Sheet 3 of 7

AH387					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
A	WHT	4-30 ALRM	18 AWG	GXL	C069-J3 (7)
B	WHT	4-29 ALRM	18 AWG	GXL	C069-J2 (27)
C	BLK	000-40-10 ALRM GND	18 AWG	GXL	C069-J2 (29)

X474					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-30 ALRM	18 AWG	GXL	C069-J3 (7)

X513A					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	BLK	000-40-44 CF	18 AWG	GXL	C069-J3 (1)
2	WHT	4-102 HEAD & TAIL LIGHTS	18 AWG	GXL	C069-J2 (26)
3	WHT	4-105 CRIBBING	18 AWG	GXL	C069-J3 (9)
4	WHT	5-101 JUMP ENABLE	18 AWG	GXL	C069-J3 (10)
5					
6					

Figure 7-64. Main Valve Harness - Sheet 4 of 7

This page left blank intentionally.

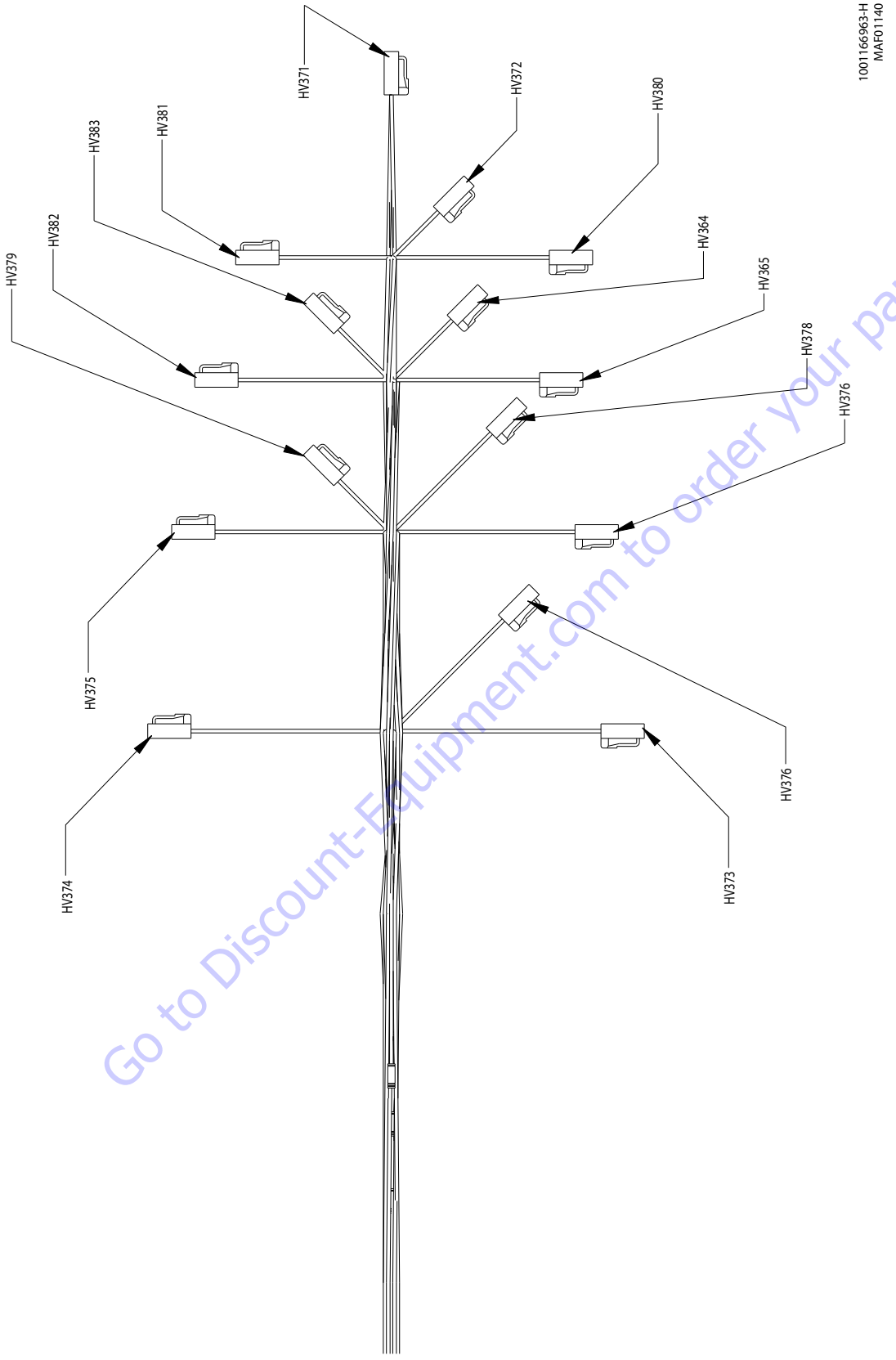


Figure 7-65. Main Valve Harness - Sheet 5 of 7

HV374 STEER LEFT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-22 STEER LEFT	18 AWG	GXL	C069-J2 (19)
2	BLK	000-40-32 GND	18 AWG	GXL	S415 (1)

HV372 MAIN TELE OUT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-20 MAIN TELE OUT	18 AWG	GXL	C069-J2 (16)
2	BLK	000-40-21	18 AWG	GXL	S386 (1)

HV375 FLOW CONTROL					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-23 FLOW CONTROL	18 AWG	GXL	C069-J2 (31)
2	BLK	000-40-33 CF	18 AWG	GXL	C069-J3 (6)

HV380 PLTF LVL DOWN					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-27 SWING LEFT	18 AWG	GXL	C069-J2 (34)
2	BLK	000-40-39 CF	18 AWG	GXL	S389 (1)

HV379 SWING LEFT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-27 SWING LEFT	18 AWG	GXL	C069-J2 (34)
2	BLK	000-40-39 CF	18 AWG	GXL	S389 (1)

HV364 SWING LEFT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-12 JIB UP	18 AWG	GXL	C069-J2 (12)
2	BLK	000-40-23	18 AWG	GXL	S384 (1)

HV382 PLTF ROT R					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-10 ROTATE RIGHT	18 AWG	GXL	C069-J2 (21)
2	BLK	000-40-20	18 AWG	GXL	S384 (1)

HV365 JIB DOWN					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-13 JIB DOWN	18 AWG	GXL	C069-J2 (23)
2	BLK	000-40-24	18 AWG	GXL	S384 (2)

HV376 MAIN LIFT UP					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-24 MAIN LIFT UP	18 AWG	GXL	C069-J2 (11)
2	BLK	000-40-34 CF	18 AWG	GXL	S388 (1)

Figure 7-66. Main Valve Harness - Sheet 6 of 7

HV378 SWING RIGHT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-26 SWING RIGHT	18 AWG	GXL	C069-J2 (35)
2	BLK	000-40-37 CF	18 AWG	GXL	S389 (1)

HV381 PLTF LVL UP					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-8 LEVEL UP	18 AWG	GXL	C069-J2 (5)
2	BLK	000-40-22	18 AWG	GXL	S386 (1)

HV383 PLTF ROT L					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-9 ROTATE LEFT	18 AWG	GXL	C069-J2 (10)
2	BLK	000-40-19	18 AWG	GXL	S384 (1)

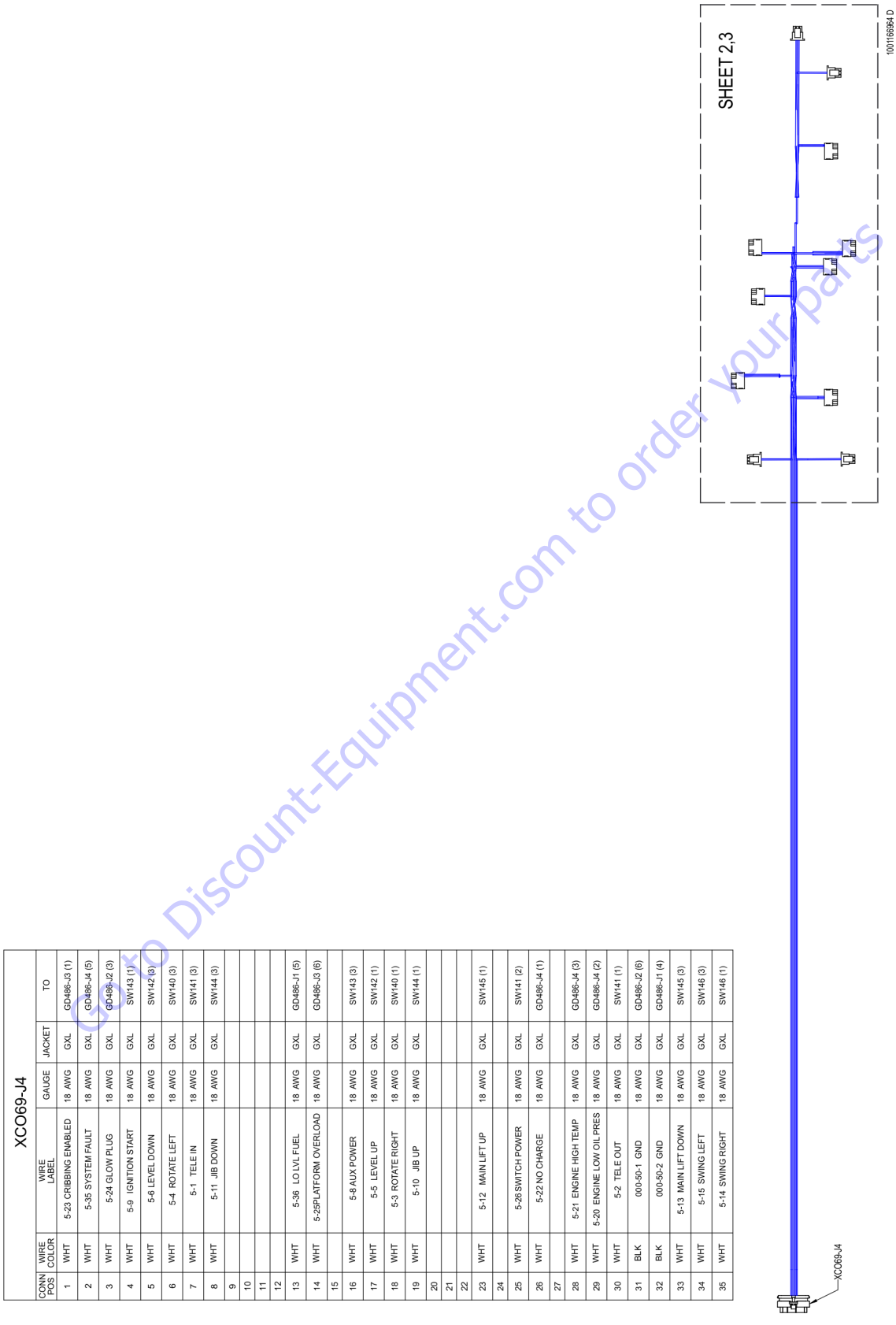
HV373 STEER RIGHT					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-21 STEER RIGHT	18 AWG	GXL	C069-J2 (8)
2	BLK	000-40-32 GND	18 AWG	GXL	S415 (1)

HV366 MAIN DUMP					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-14 MAIN DUMP	18 AWG	GXL	C069-J2 (13)
2	BLK	000-40-25 GND	18 AWG	GXL	C069-J2 (30)

HV371 MAIN TELE IN					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	To
1	WHT	4-19 MAIN TELE IN	18 AWG	GXL	C069-J2 (4)
2	BLK	000-40-31	18 AWG	GXL	S386 (1)

Figure 7-67. Main Valve Harness - Sheet 7 of 7

This page left blank intentionally.



XCO69-J4					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	WHT	5-23 CRIBBING ENABLED	18 AWG	GXL	GD486-J3 (1)
2	WHT	5-35 SYSTEM FAULT	18 AWG	GXL	GD486-J4 (5)
3	WHT	5-24 GLOW PLUG	18 AWG	GXL	GD486-J2 (3)
4	WHT	5-9 IGNITION START	18 AWG	GXL	SW143 (1)
5	WHT	5-6 LEVEL DOWN	18 AWG	GXL	SW142 (3)
6	WHT	5-4 ROTATE LEFT	18 AWG	GXL	SW140 (3)
7	WHT	5-1 TELE IN	18 AWG	GXL	SW141 (3)
8	WHT	5-11 JIB DOWN	18 AWG	GXL	SW144 (3)
9					
10					
11					
12					
13	WHT	5-36 LO LVL FUEL	18 AWG	GXL	GD486-J1 (6)
14	WHT	5-25PLATFORM OVERLOAD	18 AWG	GXL	GD486-J3 (6)
15					
16	WHT	5-8 AUX POWER	18 AWG	GXL	SW143 (3)
17	WHT	5-5 LEVEL UP	18 AWG	GXL	SW142 (1)
18	WHT	5-3 ROTATE RIGHT	18 AWG	GXL	SW140 (1)
19	WHT	5-10 JIB UP	18 AWG	GXL	SW144 (1)
20					
21					
22					
23	WHT	5-12 MAIN LIFT UP	18 AWG	GXL	SW145 (1)
24					
25	WHT	5-26 SWITCH POWER	18 AWG	GXL	SW141 (2)
26	WHT	5-22 NO CHARGE	18 AWG	GXL	GD486-J4 (1)
27					
28	WHT	5-21 ENGINE HIGH TEMP	18 AWG	GXL	GD486-J4 (3)
29	WHT	5-20 ENGINE LOW OIL PRES	18 AWG	GXL	GD486-J4 (2)
30	WHT	5-2 TELE OUT	18 AWG	GXL	SW141 (1)
31	BLK	000-50-1 GND	18 AWG	GXL	GD486-J2 (6)
32	BLK	000-50-2 GND	18 AWG	GXL	GD486-J1 (4)
33	WHT	5-13 MAIN LIFT DOWN	18 AWG	GXL	SW145 (3)
34	WHT	5-15 SWING LEFT	18 AWG	GXL	SW146 (3)
35	WHT	5-14 SWING RIGHT	18 AWG	GXL	SW146 (1)

Figure 7-68. Ground Control Panel Harness - Sheet 1 of 5