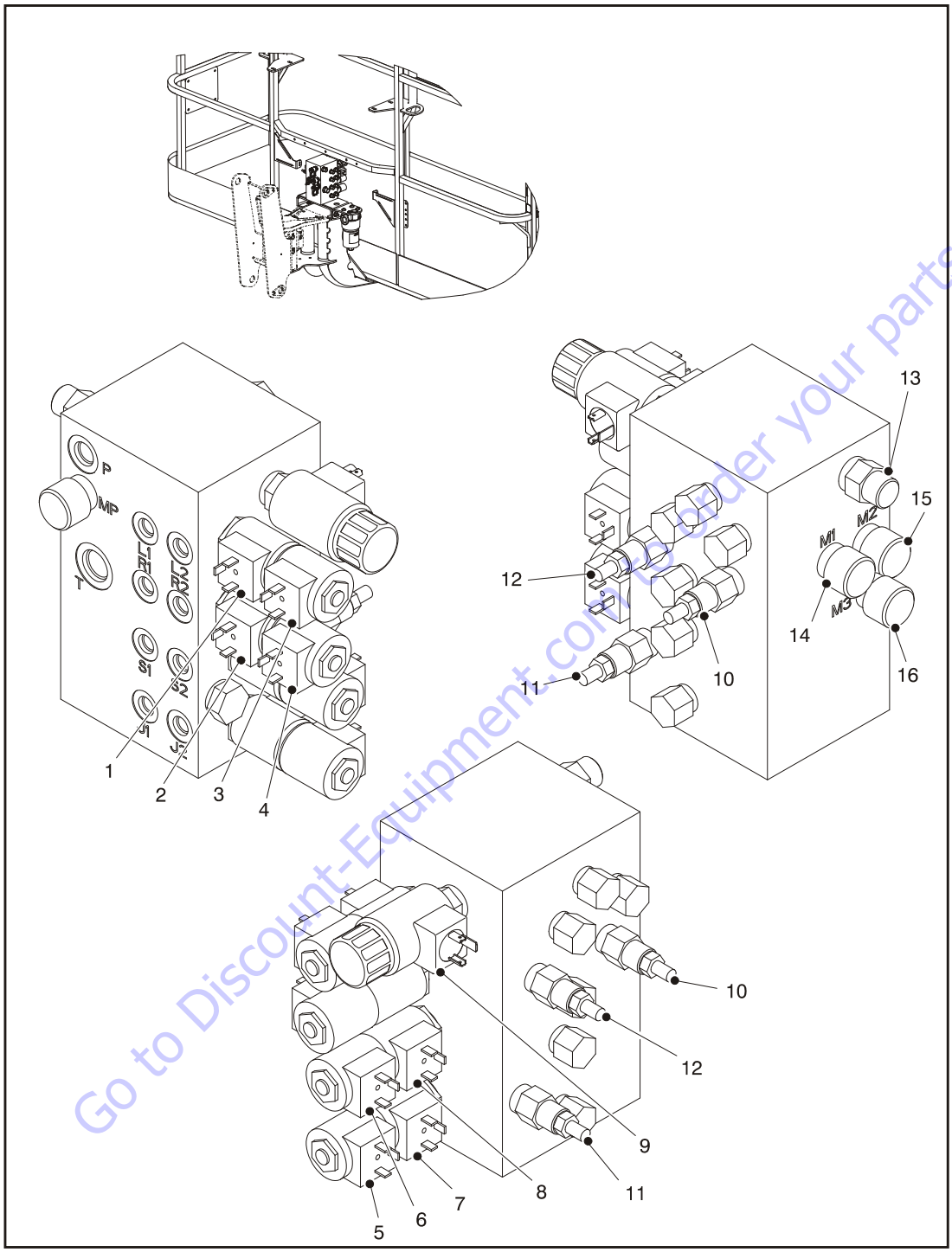
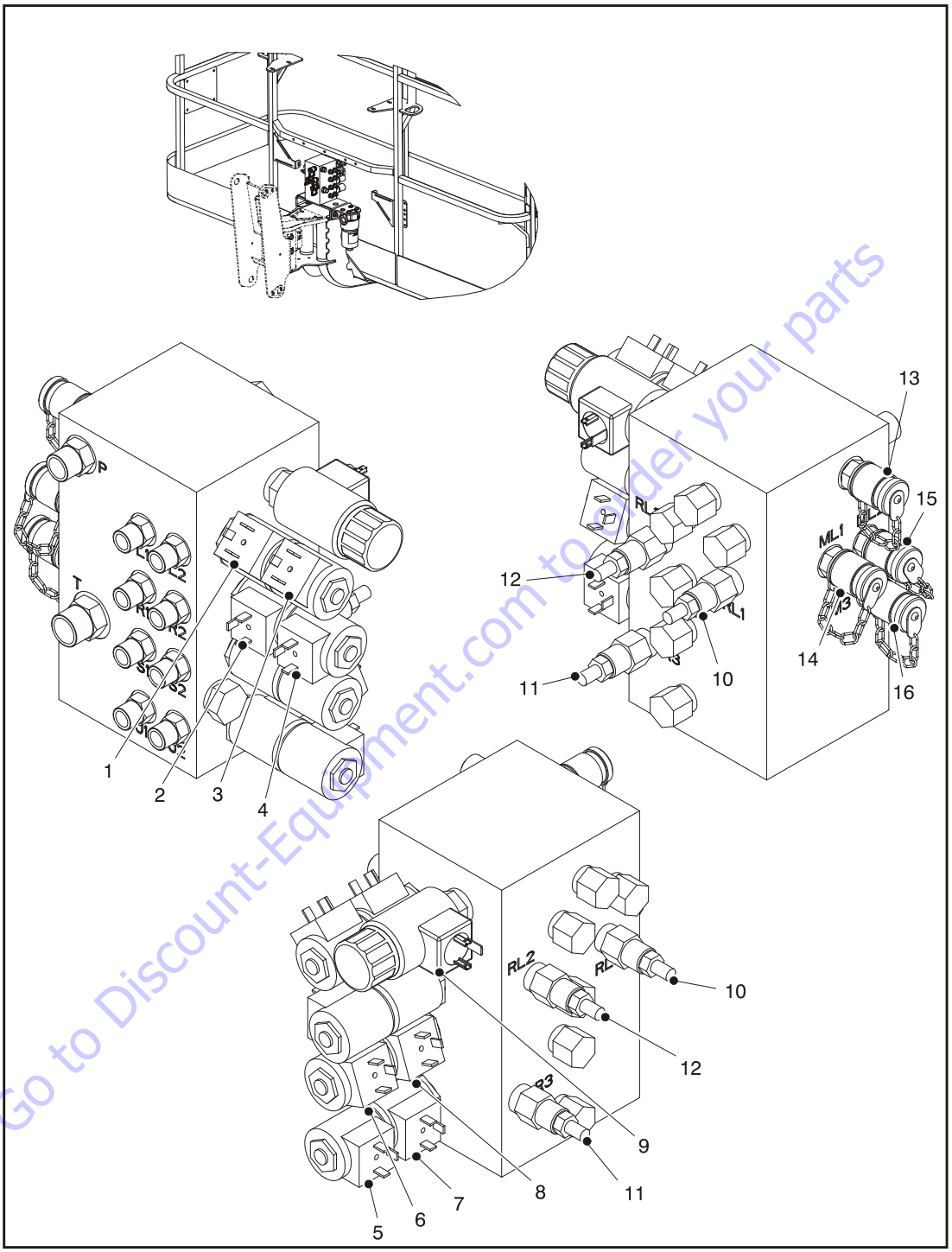


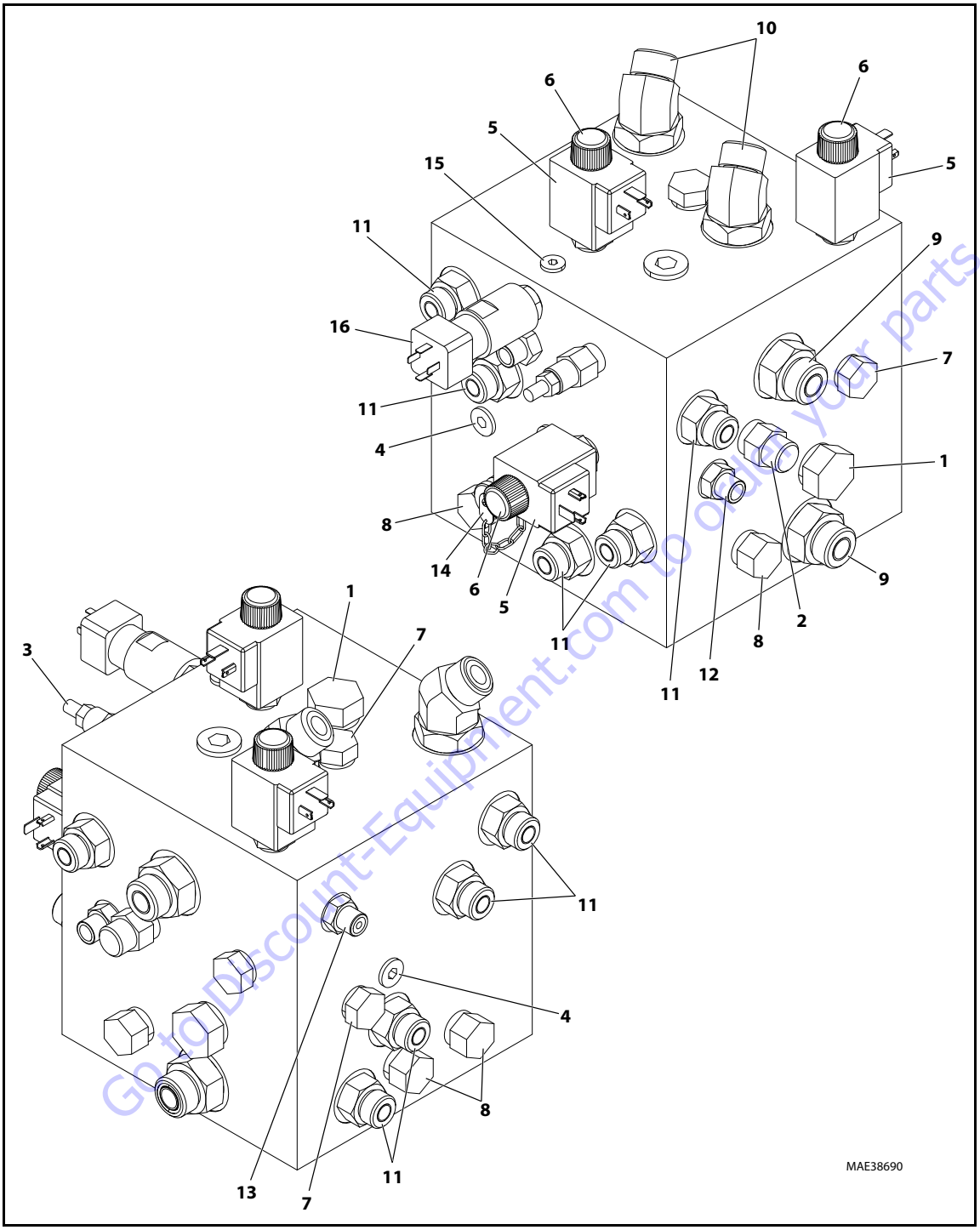
1. Level Up
2. Rotate Right
3. Level Down
4. Rotate Left
5. Jib Down
6. Jib Swing Left
7. Jib Up
8. Jib Swing Right
9. Platform Dump
10. Level Up Relief
11. Jib Up/Down Relief
12. Level Down Relief
13. Main Pressure Check Port
14. Level Up Test Port
15. Level Down Test Port
16. Jib Up/Down Test Port

Figure 5-61. Platform Valve Identification - JLG P/N 4641266



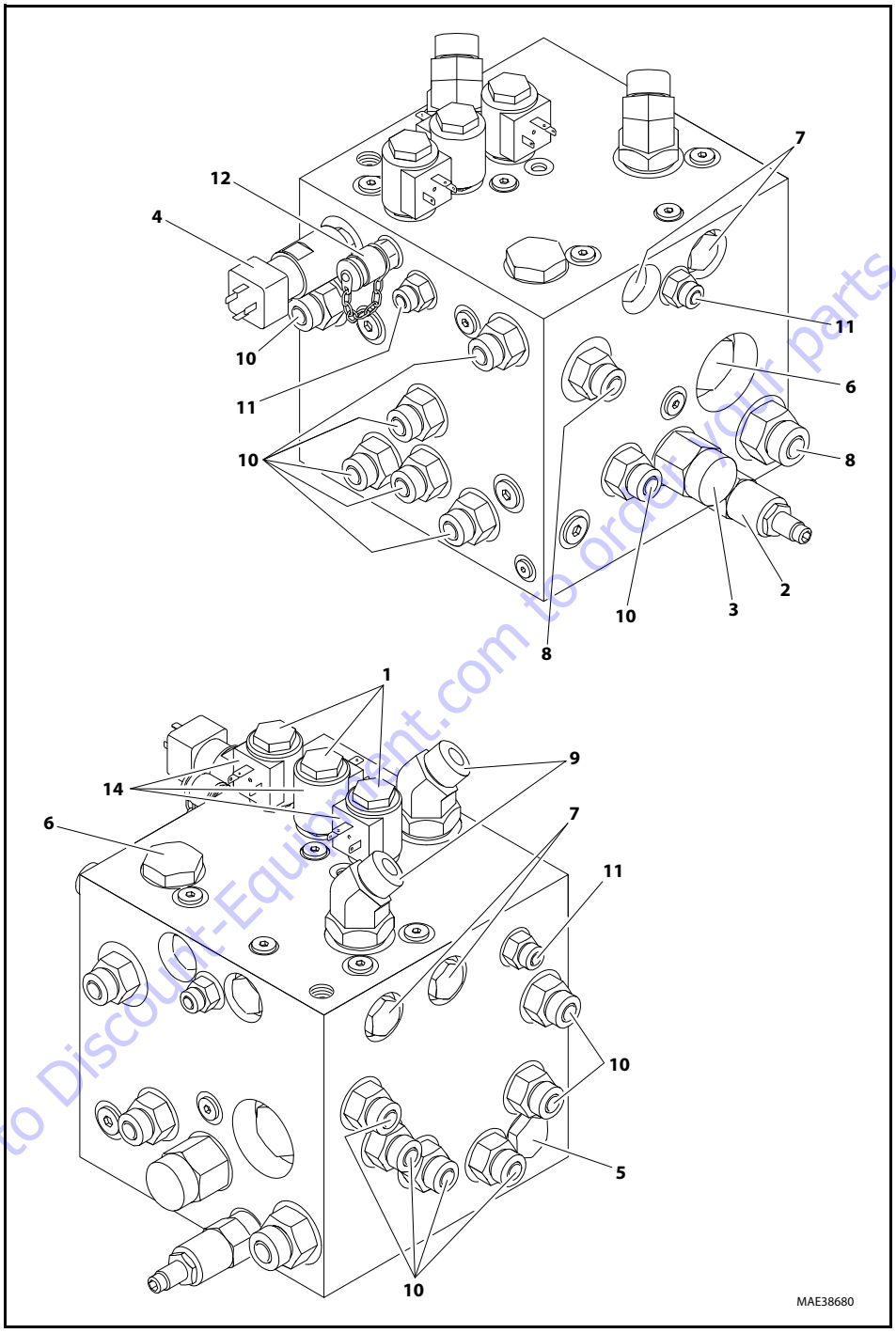
1. Level Up
2. Rotate Right
3. Level Down
4. Rotate Left
5. Jib Down
6. Jib Swing Left
7. Jib Up
8. Jib Swing Right
9. Platform Dump
10. Level Up Relief
11. Jib Up/Down Relief
12. Level Down Relief
13. Main Pressure Check Port
14. Level Up Test Port
15. Level Down Test Port
16. Jib Up/Down Test Port

Figure 5-62. Platform Valve Identification - JLG P/N 4641460



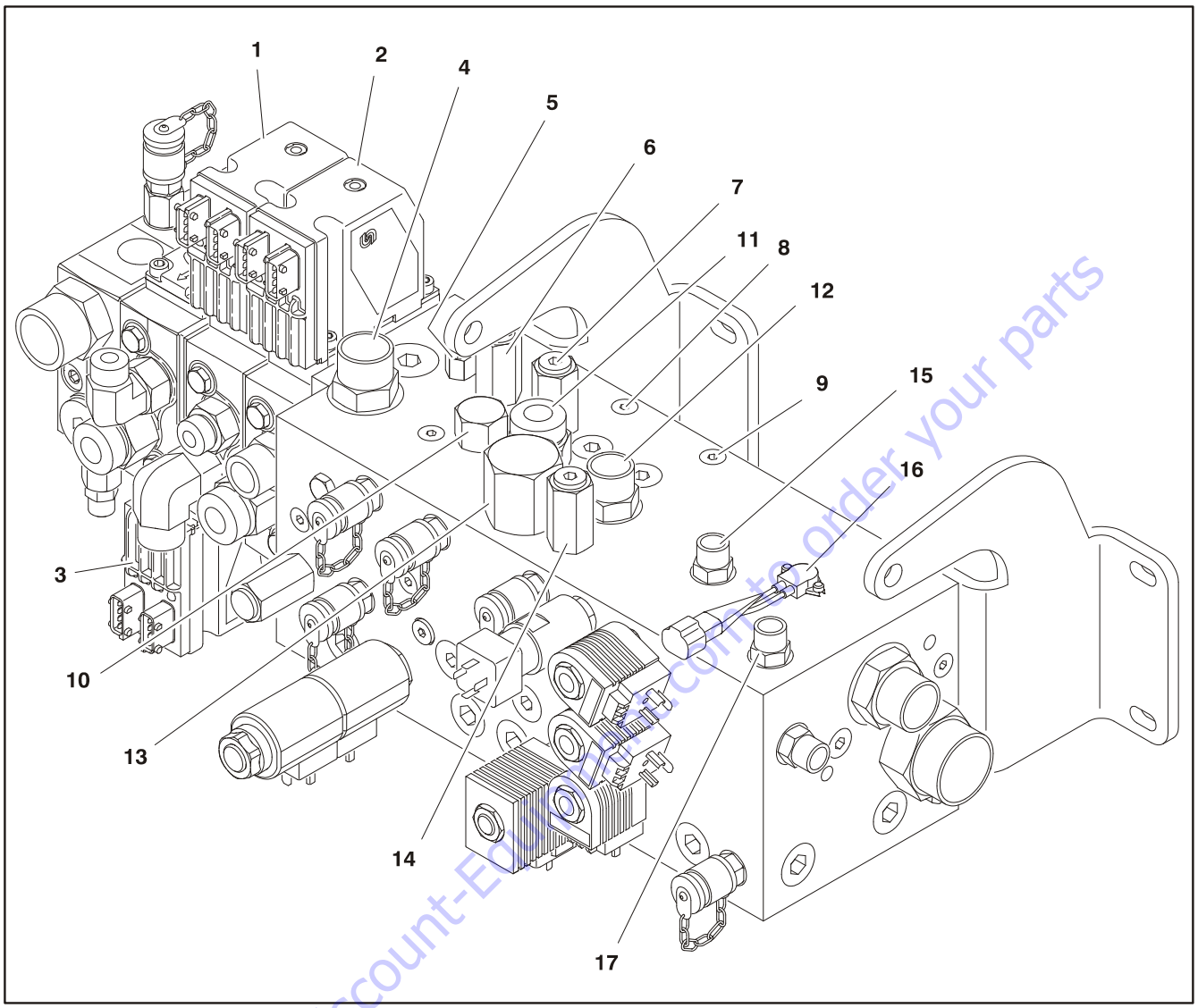
1. Flow Divider Valve
2. Shuttle Valve
3. Relief Valve
4. Orifice
5. Brake and lockout Valve
6. Coil
7. Shuttle Valve
8. Check Valve
9. Fitting
10. Fitting
11. Fitting
12. Fitting
13. Orifices Fitting
14. Pressure Check
15. Plug
16. Pressure Switch

Figure 5-63. Traction Valve Identification (Prior to SN 0300103907)



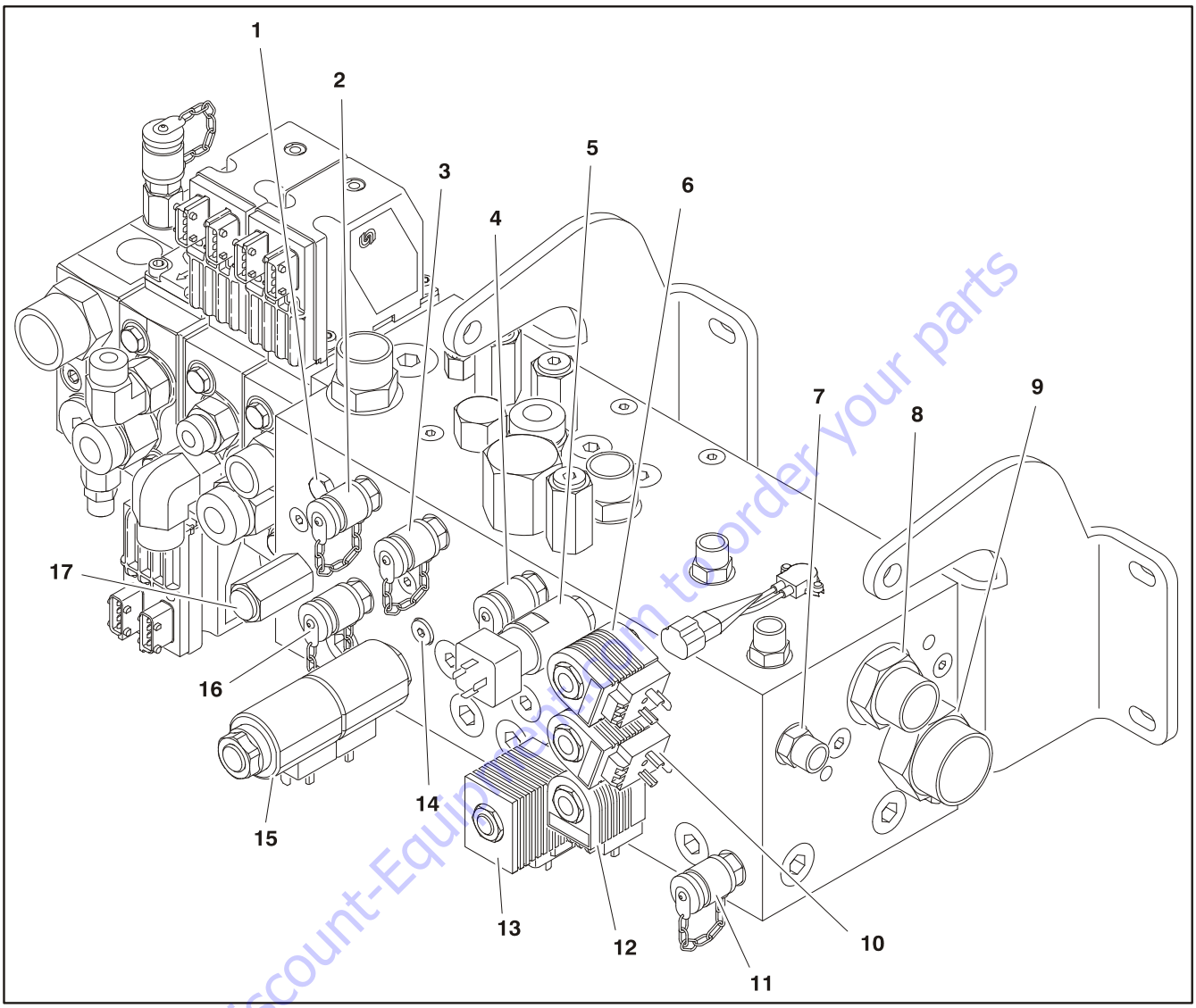
1. Brake and Axle Lockout Valve
2. Relief Valve
3. Pilot Valve
4. Pressure Switch
5. Shuttle Valve
6. Flow Divider Valve
7. Check Valve
8. Fitting
9. Fitting
10. Fitting
11. Fitting
12. Pressure Check
13. Plug
14. Coil

Figure 5-64. Traction Valve Identification (SN 0300103907 through 0300201017)



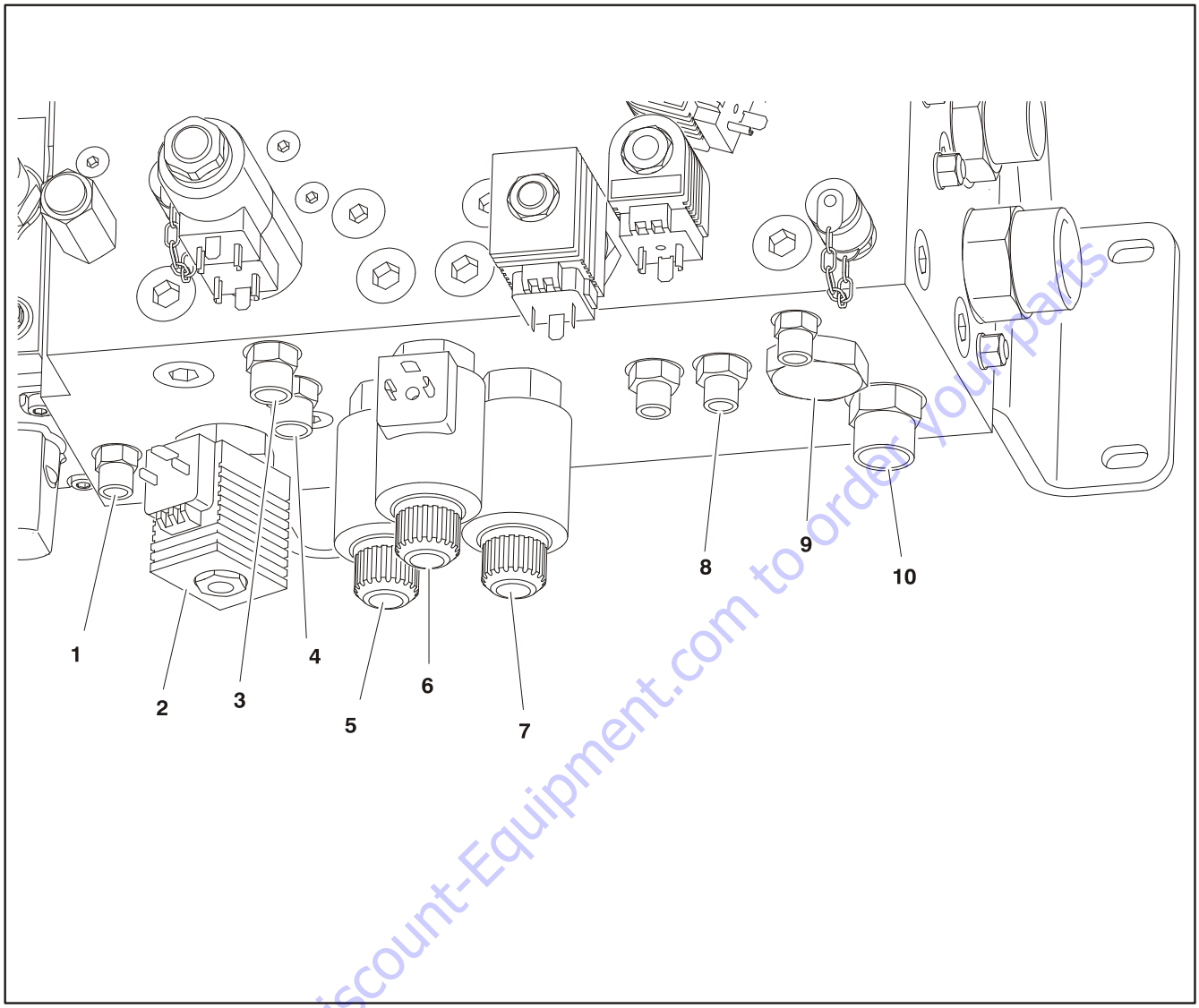
1. Tower Lift
2. Tower Tele
3. Main Lift
4. Main Tele Exhaust Port
5. Main Tele Exhaust Check
6. Swing Right Relief
7. Main Tele Extend Relief
8. Main Tele Extend Check
9. Main Tele Retract Check
10. Swing Differential Sensing
11. Main Tele Extend Port
12. Main Tele Retract Port
13. Main Tele Differential Sensing
14. Main Tele Retract Relief
15. Aux Port to Main Lift
16. Temperature Switch
17. Port to Platform Valve

Figure 5-65. Main Valve Identification - Top



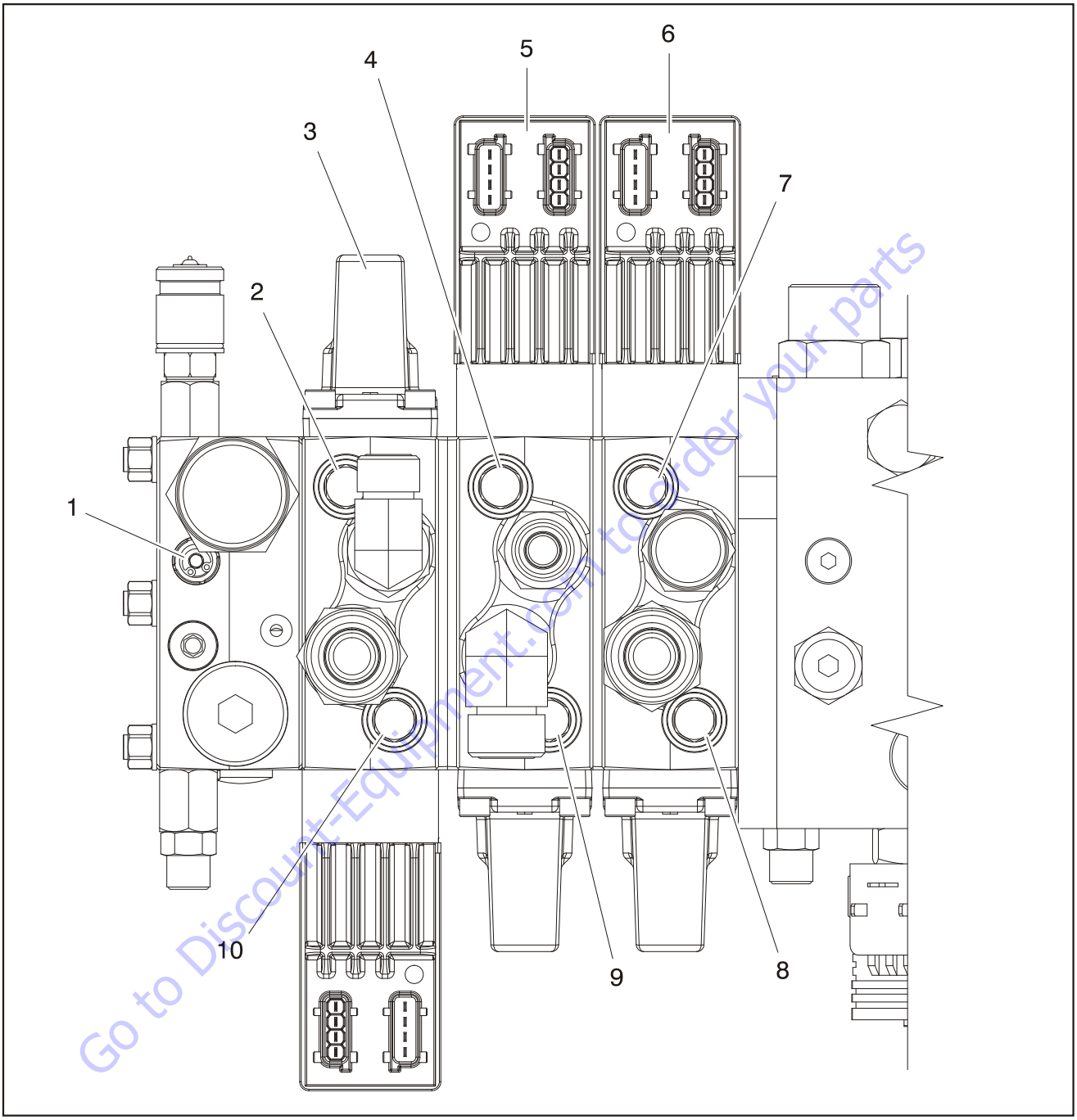
1. Main Tele Exhaust Check
2. Swing Right Test Port
3. Main Tele Extend Test Port
4. Main Tele Retract Test Port
5. Pressure Switch
6. Main Lift Solenoid
7. Pressure from Aux Pump
8. Return (Swivel)
9. Pressure from Function Pump
10. Tower Tele Solenoid
11. Main Pressure Port
12. Tower Lift Solenoid
13. Main Dump Solenoid
14. Swing Check Valve
15. Proportional Swing Valve
16. Swing Left Test Port
17. Swing Left Relief

Figure 5-66. Main Valve Identification - Front & Side



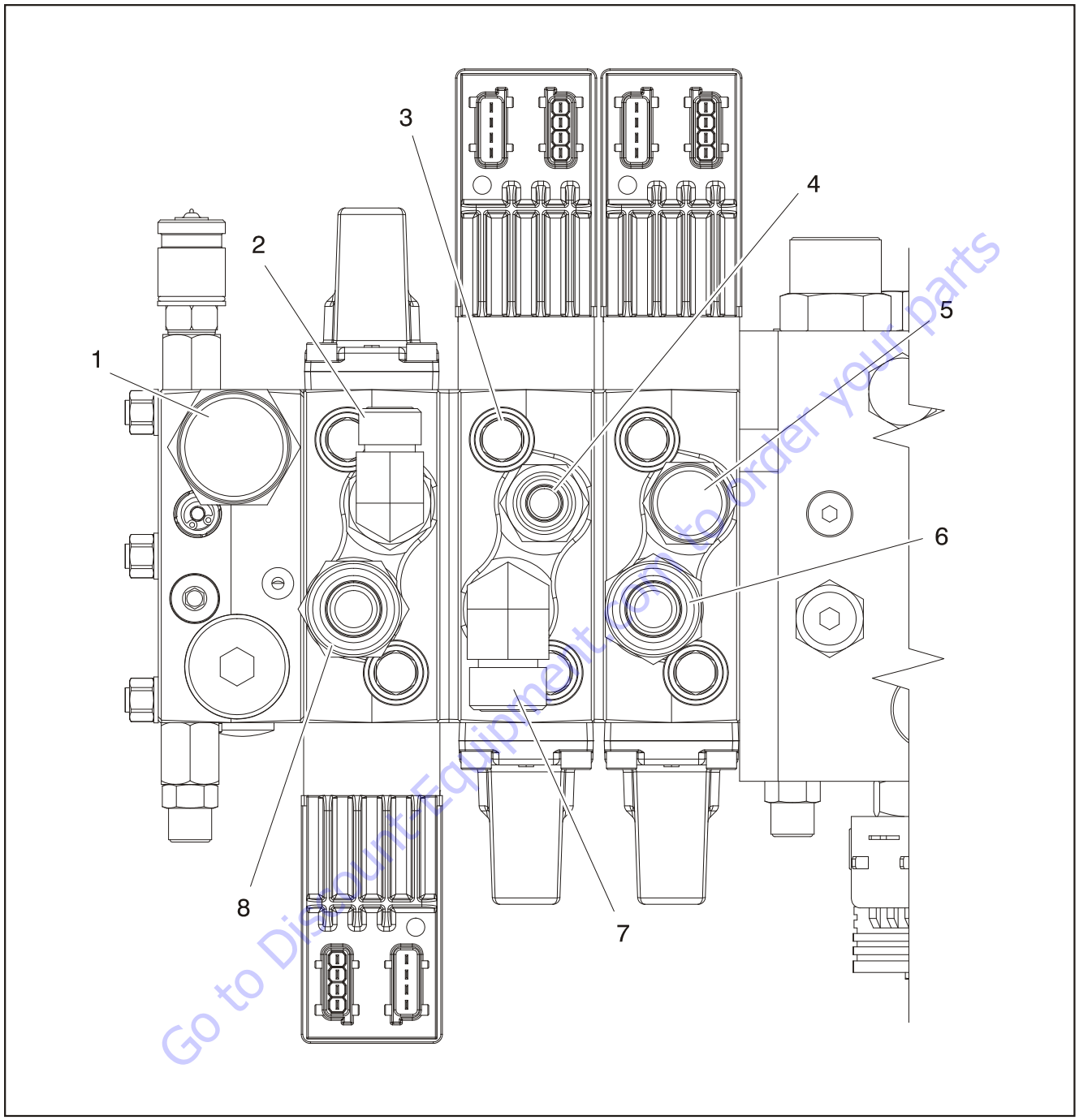
1. Load Sense Port
2. PVG Enable Solenoid Valve
3. Swing Left Port
4. Swing Right Port
5. Main Tele Extend Solenoid
6. Main Tele Proportional Valve
7. Main Tele Retract Solenoid
8. Aux Port to Tower Lift
9. Main Pressure Check
10. Swing Check

Figure 5-67. Main Valve Identification - Bottom



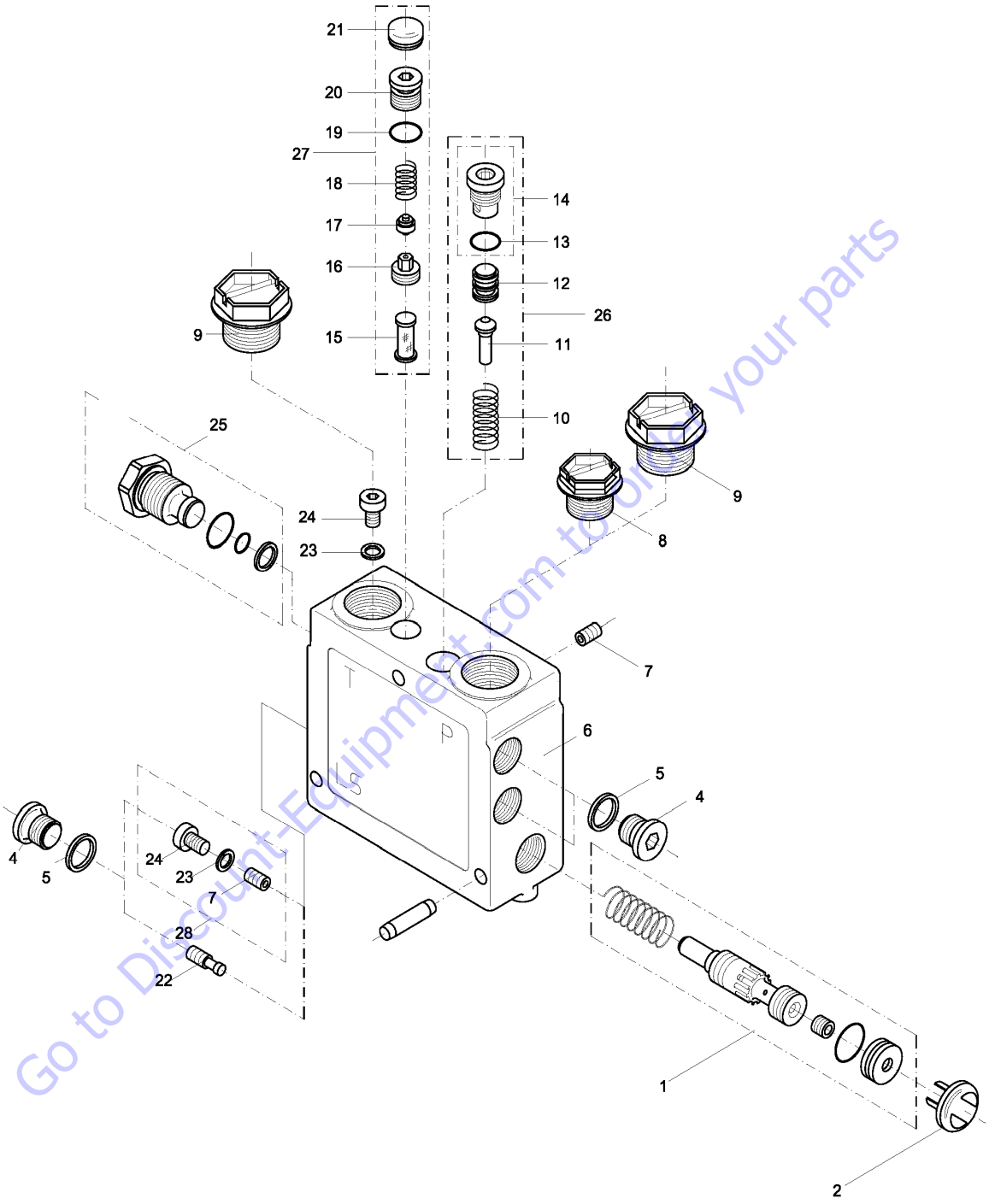
1. Pressure Adjustment
2. Main Lift Extend Shock Valve
3. Main Lift Section
4. Tower Lift Retract Shock Valve
5. Tower Lift Section
6. Tower Telescope Section
7. Tower Telescope Retract Shock Valve
8. Tower Telescope Extend Shock Valve
9. Tower Lift Extend Shock Valve
10. Main Lift Retract Shock Valve

Figure 5-68. PVG Section



1. Pressure Port
2. LS Port
3. Main Lift B Port
4. Tower Lift B Port
5. Tower Telescope B Port
6. Tower Telescope A Port
7. Tower Lift A Port
8. Main Lift A Port

Figure 5-69. PVG Section Ports



1. Inlet Compensator
2. Plug
4. Plug
5. Washer
6. Housing
7. Orifice
8. Plug
9. Plug
10. Spring
11. Cone
12. Spool
13. O-ring
14. Plug
15. Filter
16. Seat
17. Thrust Pad
18. Spring
19. O-ring
20. Adjusting Screw
21. Plug
22. Plug
23. Seal
24. Screw
25. Plug
26. Pilot Supply
27. Relief Valve
28. Conversion Kit

Figure 5-70. PVP Pump Side Module

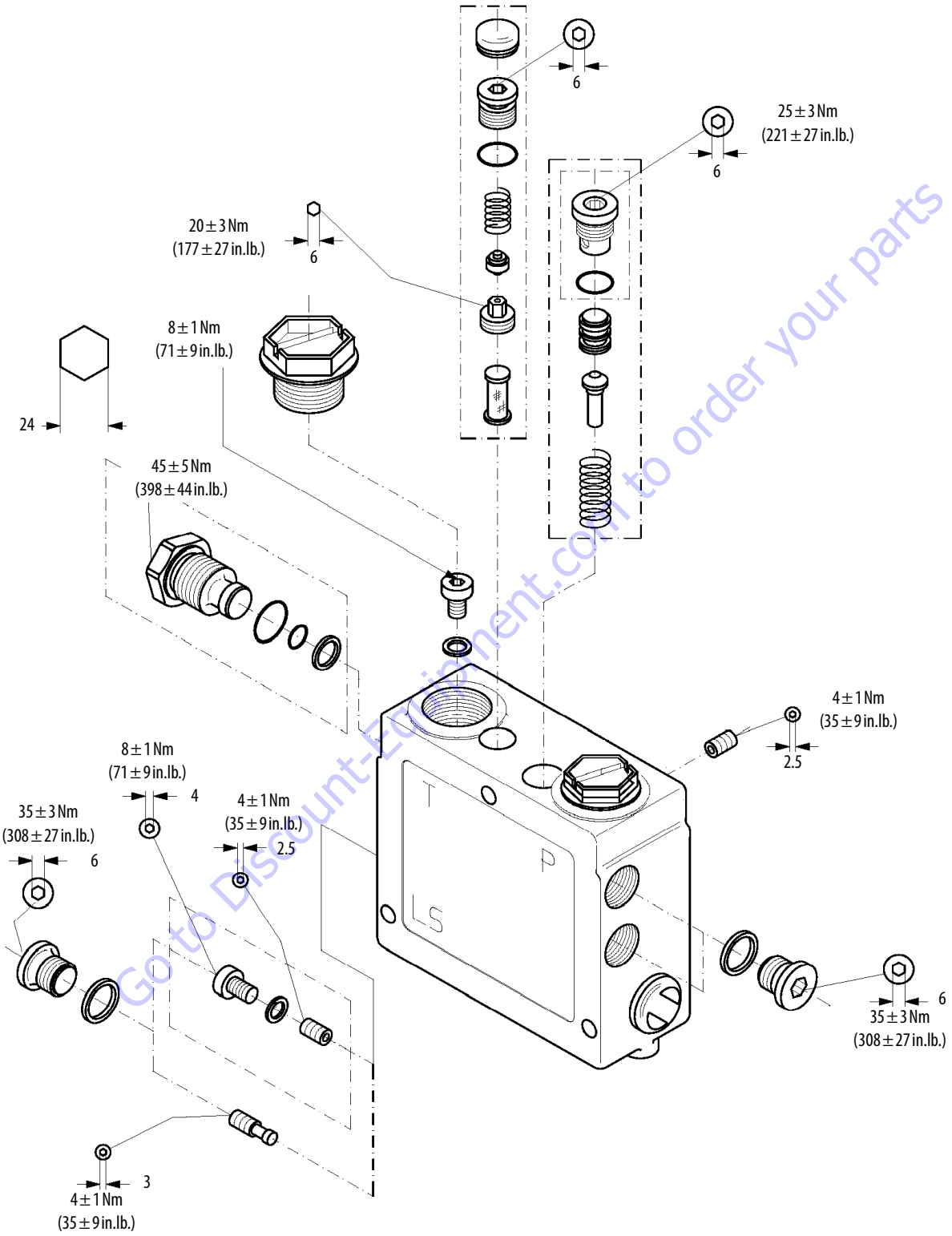
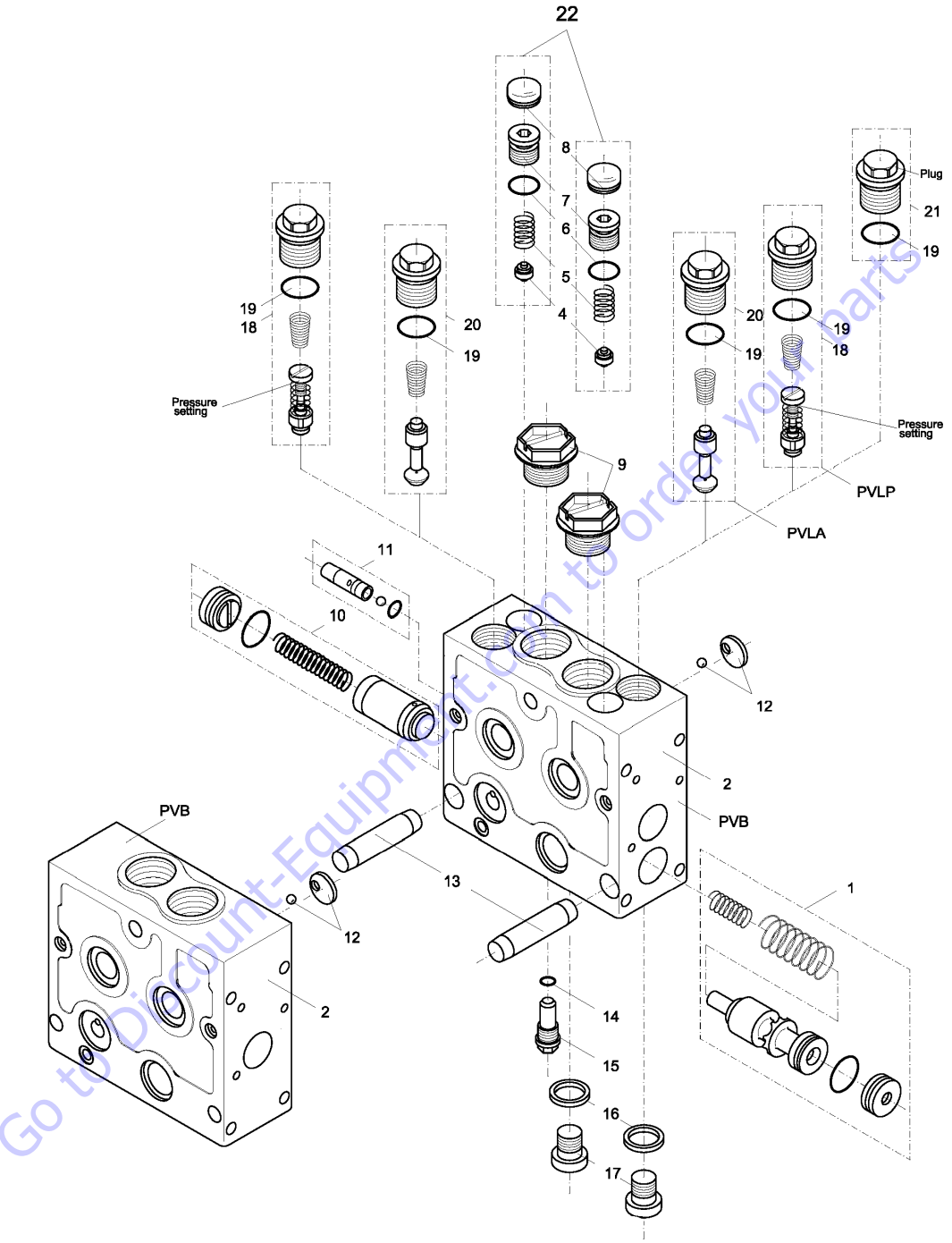


Figure 5-71. PVP Pump Side Module Torque Values & Tool Size



1. Compensator Valve
2. Housing
4. Thrust Pad
5. Spring
6. O-ring
7. Adjusting Screw
8. Plug
9. Plug
10. Check Valve
11. Shuttle
12. Shuttle
13. Pipe
14. O-ring
15. Screw
16. Washer
17. Plug
18. PVLP
19. O-Ring
20. PVLA valve
21. PVLA Plug
22. Relief Valve

Figure 5-72. PVB Basic Module

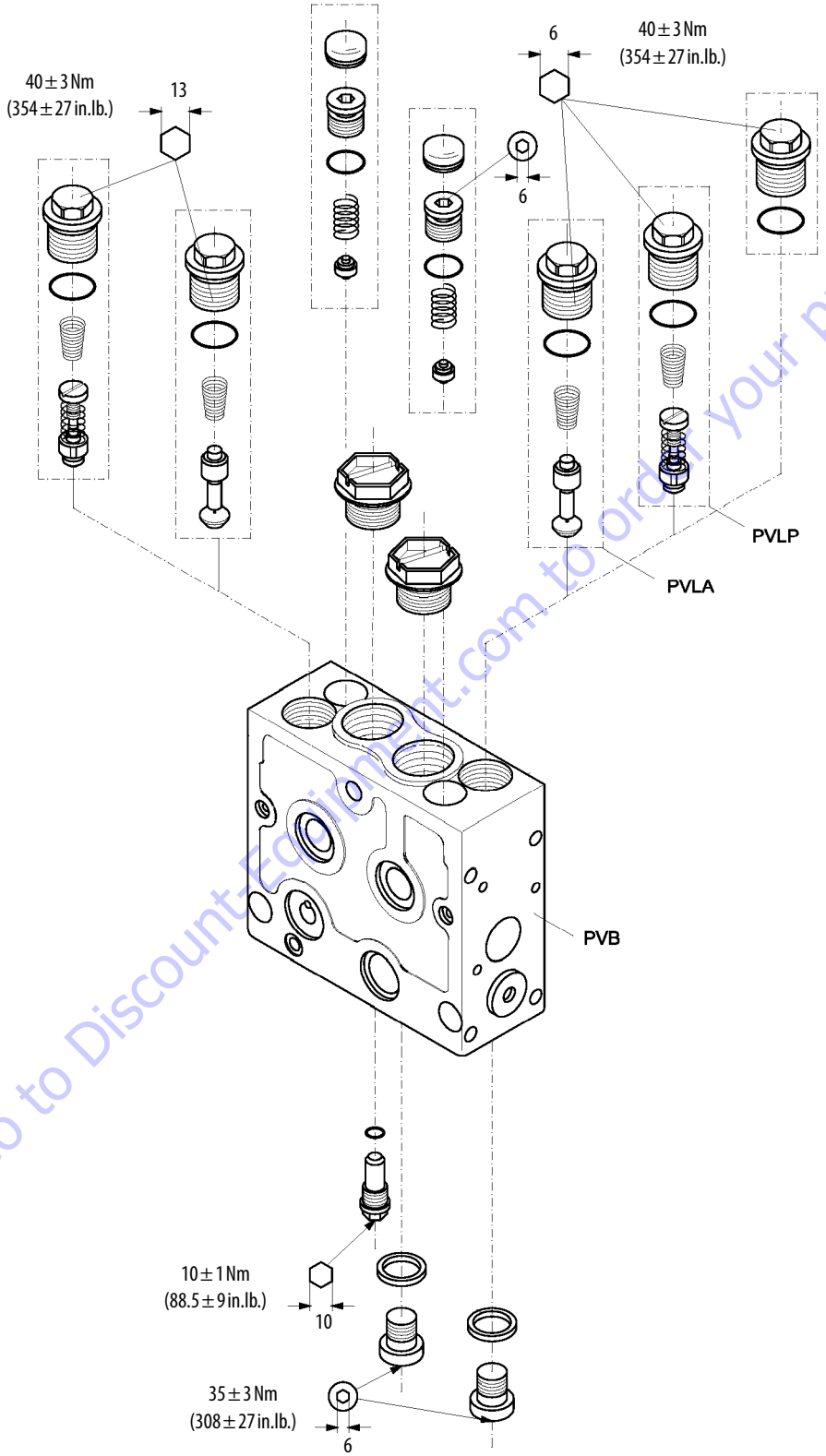
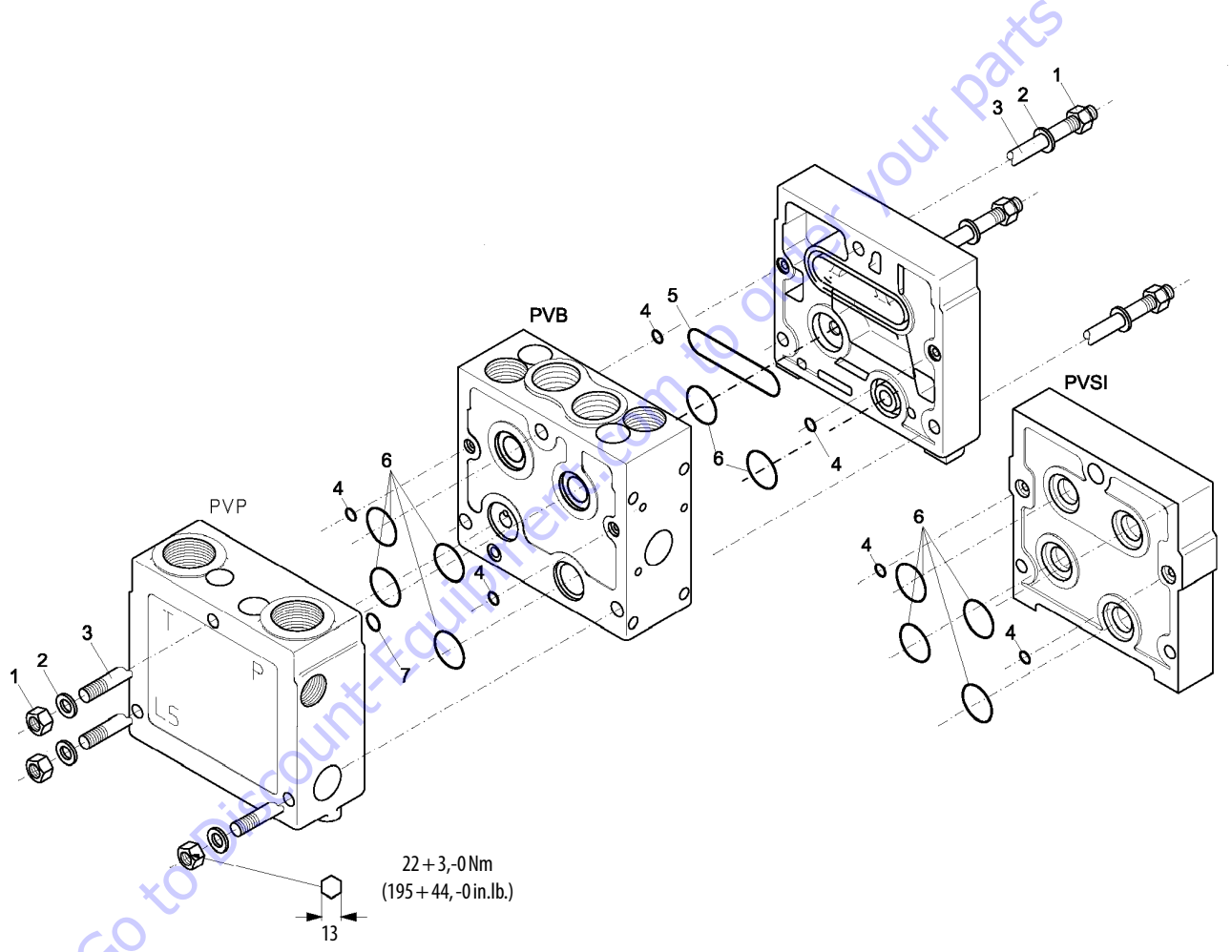
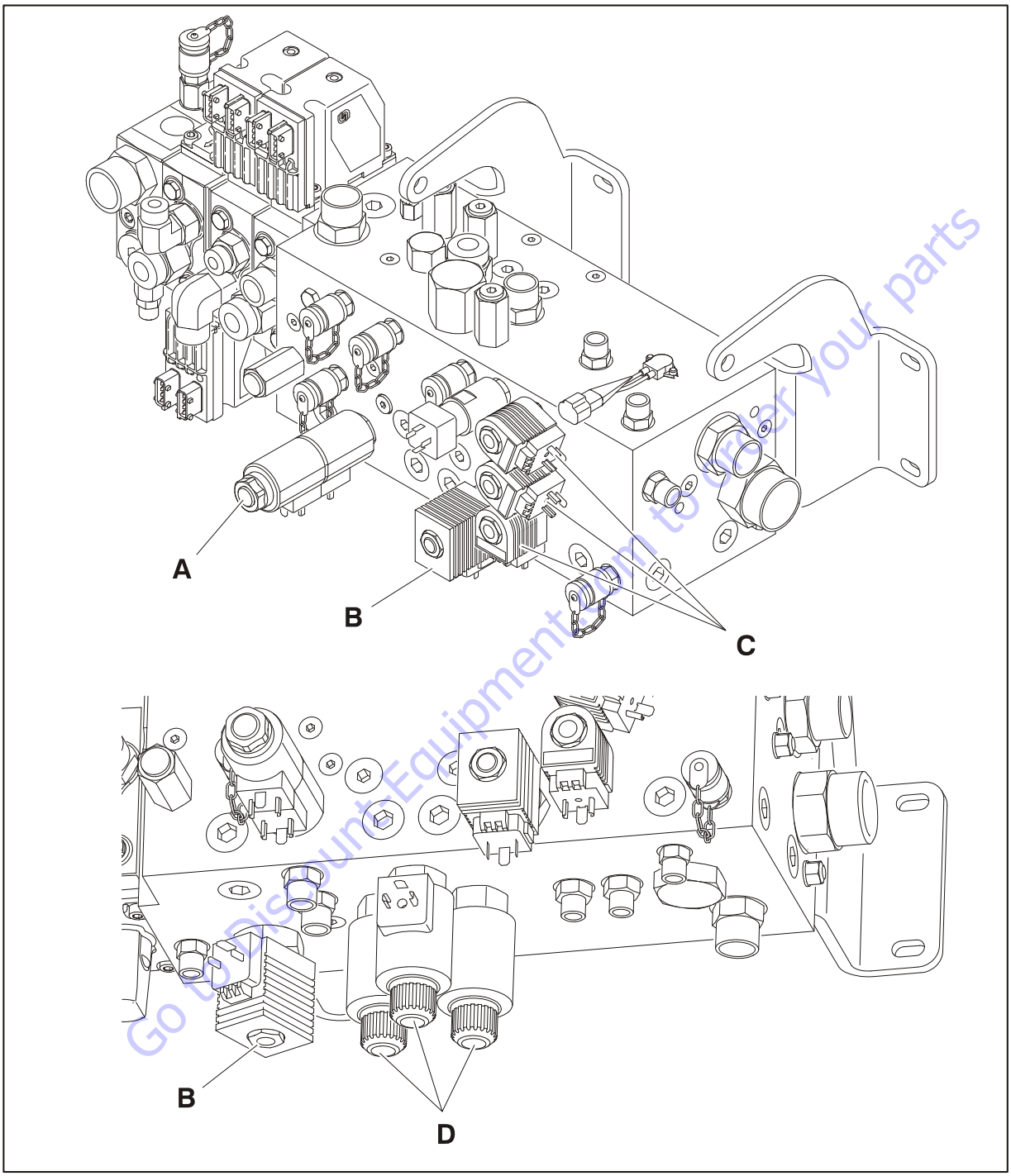


Figure 5-73. PVB Basic Module Torque Values & Tool Size



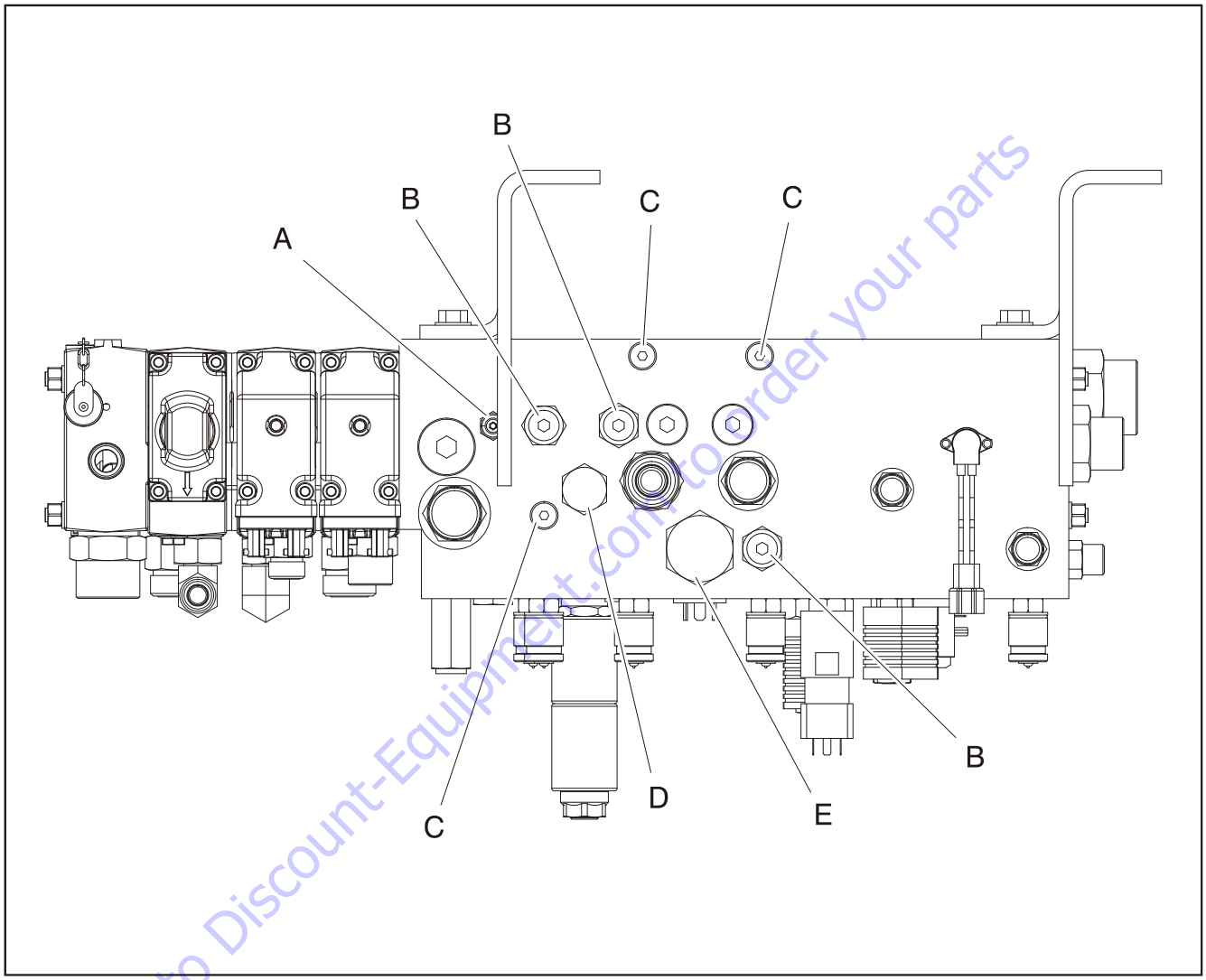
1. Nut
2. Washer
3. Stay Bolt
4. O-ring
5. O-ring
6. O-ring
7. O-ring

Figure 5-74. Assembly Kit & Torque for PVP Section



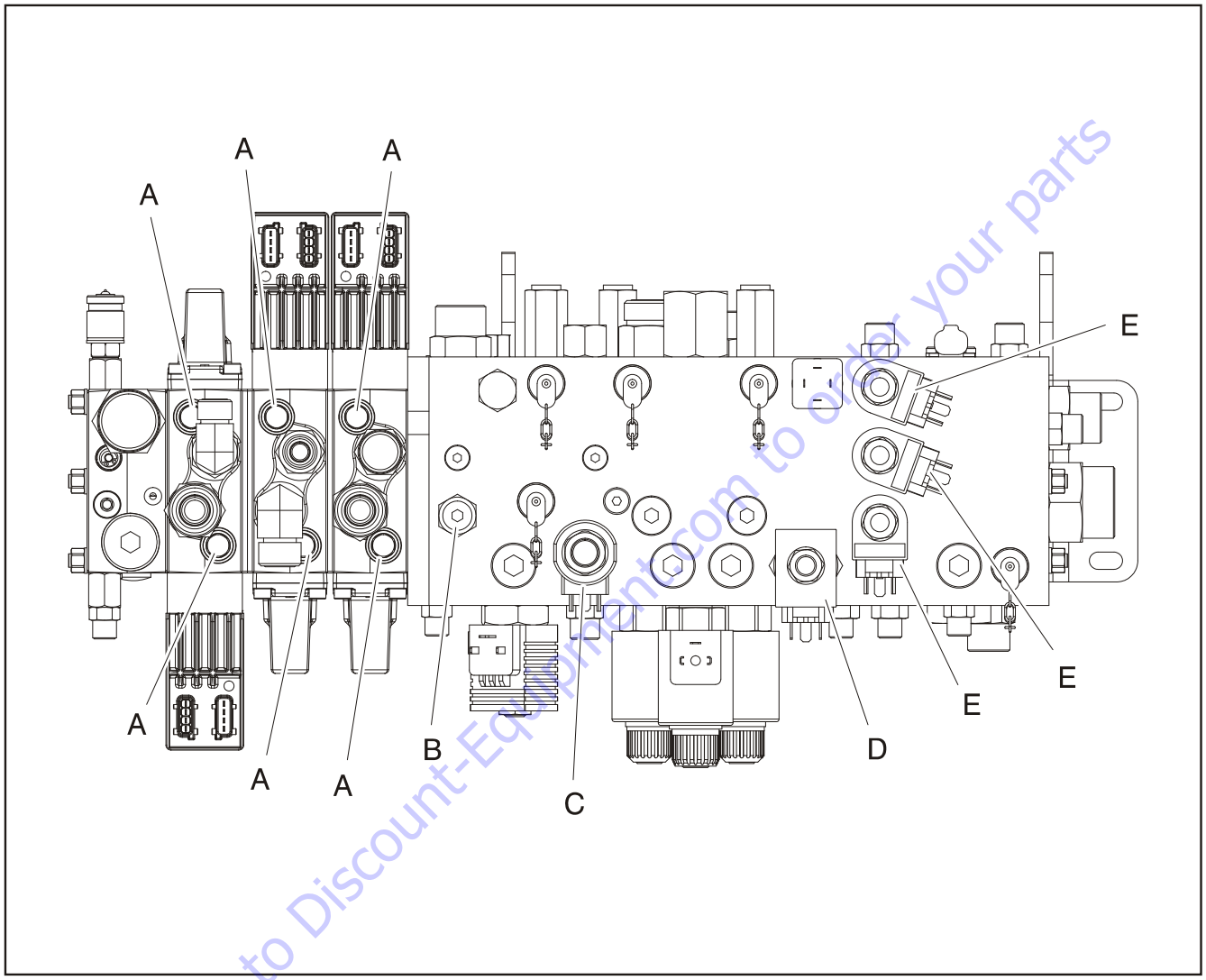
A. 5.2 Ohm ± 5%
B. 7.2 Ohm
C. 8.7 Ohm ± 5%
D. 4.7 Ohm ± 5%

Figure 5-75. Main Valve Ohm Values



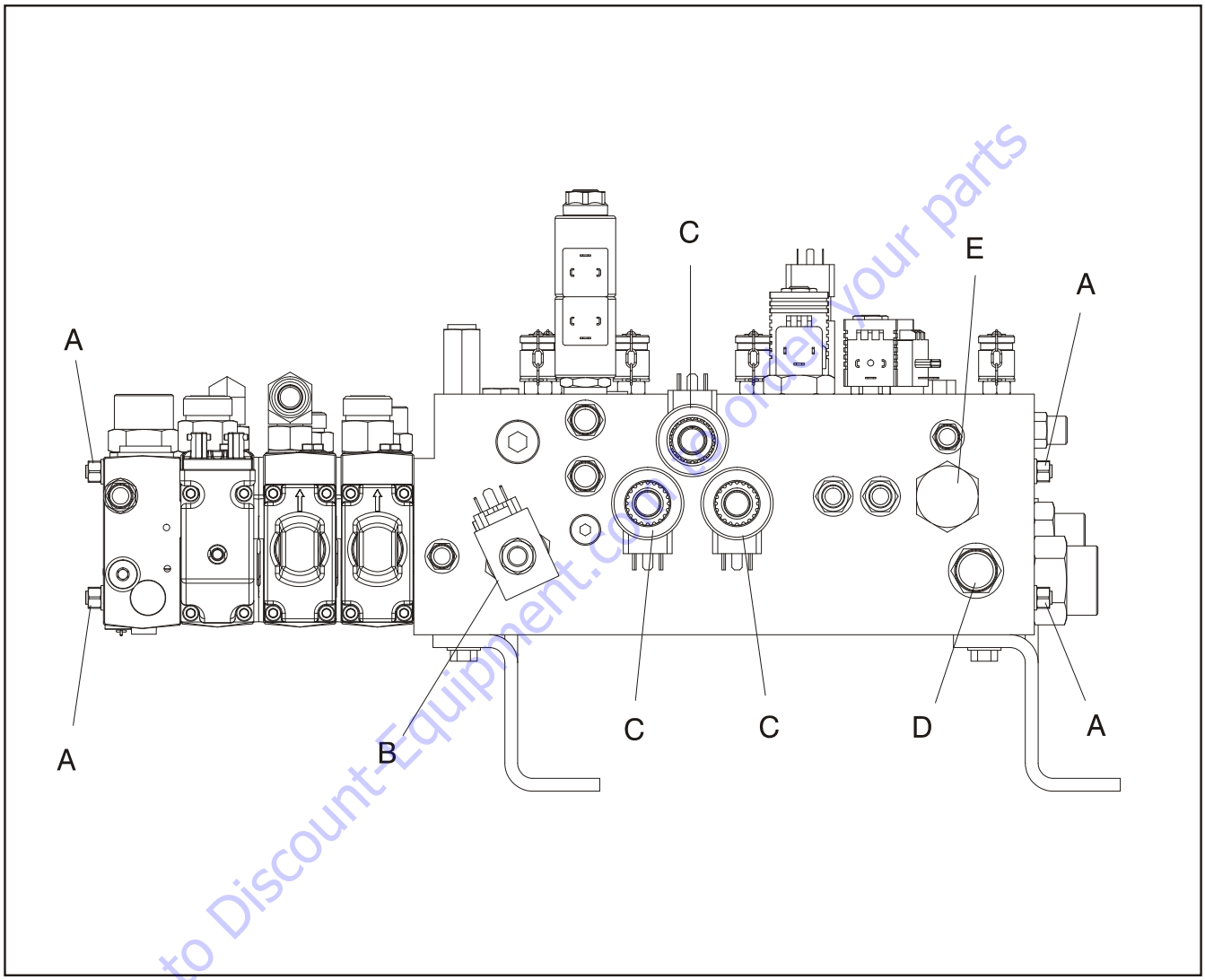
	Ft-Lbs.	Nm
A	14	19
B	20-25	27-34
C	8-10	10-15
D	30-35	41-47
E	90-100	122-136
Coil Nuts	4-6	5-8

Figure 5-76. Main Valve Cartridge Torque Values - Top



	Ft-Lbs.	Nm
A	354 in.lbs.	40
B	20-25	27-34
C	35-40	47-54
D	50	68
E	90-100	122-136
Coil Nuts	4-6	5-8

Figure 5-77. Main Valve Cartridge Torque Values - Front



	Ft-Lbs.	Nm
A	195 in.lbs.	22
B	50	68
C	50-55	68-75
D	8-10	10-15
E	90-100	122-136
Coil Nuts	4-6	5-8

Figure 5-78. Main Valve Cartridge Torque Values - Bottom

5.7 ENABLE VALVES

Removal

1. Make sure the machine is on a firm level surface.
2. Extend the axles until the axle locked light is illuminated.
3. Position the machine with the booms on suitable boom rests.
4. Shut off the engine; remove the key and tag out the machine.
5. Locate and identify the three enable valves on the left side of the machine. Mark the function that the valve controls on the valve, i.e. tower lift, tower tele, main lift.
6. Position a drain pan to catch any hydraulic spills and tag and disconnect the hydraulic hoses going to the three enable valves. Cap or plug all hoses to prevent contamination of the hydraulic system and loss of hydraulic oil.
7. Tag and disconnect the electrical harness from each enable valve solenoid.
8. Remove the existing hardware securing the enable valves to the turntable and remove the three enable valves.

Installation

1. Install the enable valves onto the turntable using the mounting hardware.
2. Connect all hoses and electrical lines as tagged during removal.
3. If coils were removed, reinstall and torque to 5 foot pounds (6.8 Nm) maximum.
4. Check the hydraulic oil level in the tank and replenish as necessary.
5. Remove the tag out from the machine.
6. Proceed to next test procedure.

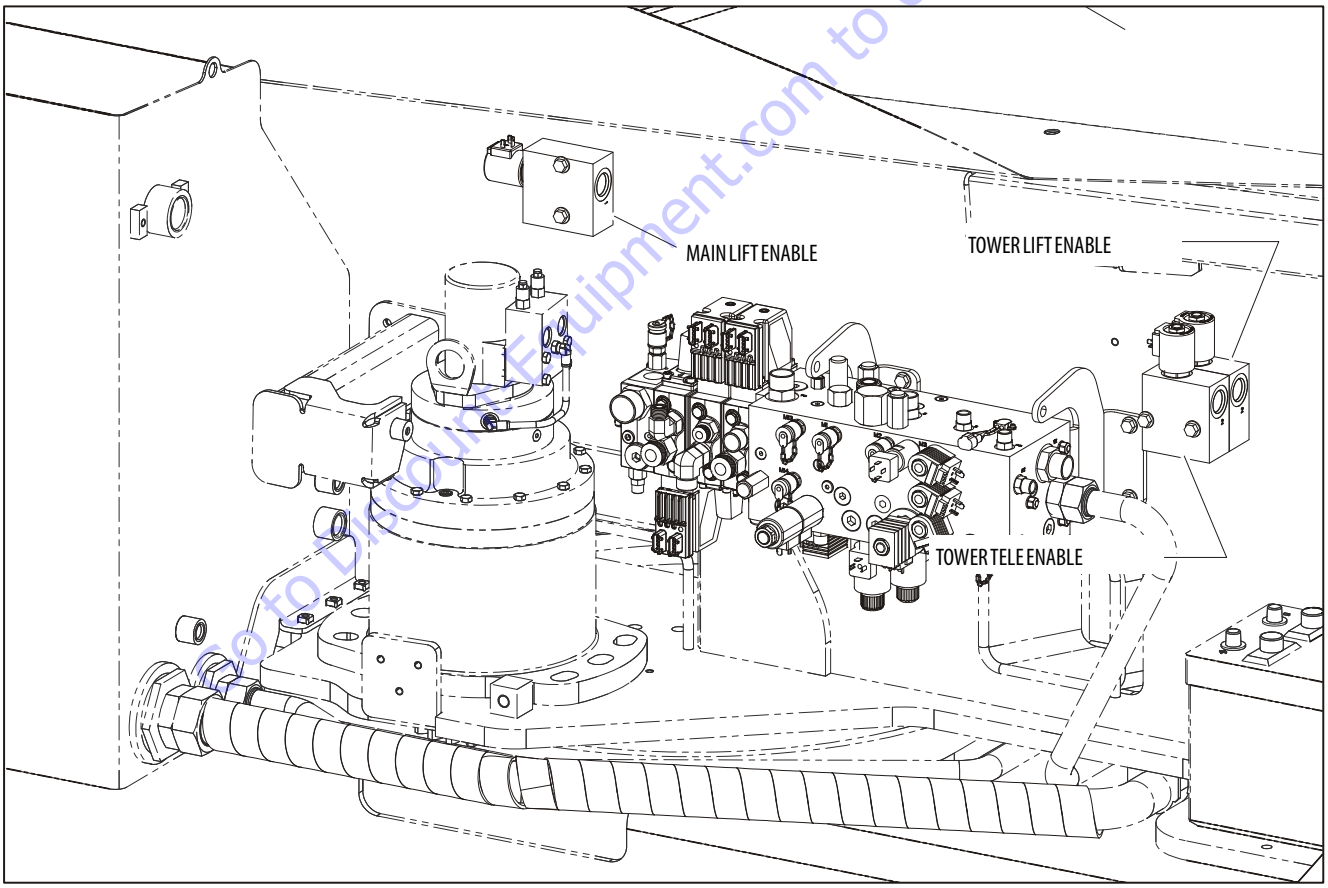


Figure 5-79. Enable Valves

Air Purge Procedure for Non-Calibrated Machines

1. Loosen the hoses on Port #2 (side) of Tower Lift and Tower Telescope enable valves. This is not necessary on Main Lift Enable Valve because the orientation of the valve allows the air to escape.
2. Operate the Main Telescope in until oil appears at Port #2 of both valves.
3. Tighten both hoses.
4. Raise the Main Boom to approximately 10° above horizontal.
5. Operate the Tower Lift for 25 of the following cycles:
   a. Raise the Tower Boom approximately 18"
   b. Pause for approximately 2 seconds.
   c. Lower the Tower Boom to the boom rest.
   d. Pause for approximately 2 seconds.
6. Operate the Tower Telescope for 25 of the following cycles:
   a. Extend the Tower Booms approximately 2'
   b. Pause for approximately 2 seconds
   c. Fully retract the Tower Booms.
   d. Pause for approximately 2 seconds.

Air Purge Procedure for Calibrated Machines

1. Loosen the hoses on Port #2 (side) of Tower Lift and Tower Telescope enable valves. It is not necessary on Main Lift Enable Valve because the orientation of the valve allows the air to escape.
2. Operate the Main Telescope in until oil appears at Port #2 of both valves.
3. Tighten both hoses.
4. Operate Tower Lift up until Tower Booms begins to Telescope.
5. If an ENABLE VALVE STUCK OPEN fault occurs;
   a. Cycle power.
   b. Use Auxiliary Power to raise the Tower Boom until the Tower Telescope starts to move.
6. Under engine power, operate the Tower Lift for 25 of the following cycles:
   a. Raise the Tower Boom approximately 18".
   b. Pause for approximately 2 seconds.
   c. Lower the Tower Boom 18".

NOTE: *Do not pause at this reversal. Quickly switch from Tower down to Tower up.*

7. Raise the Tower Boom 18", then lower it and stop before the boom is on the boom rest.
8. Command Tower Boom up until boom moves.
9. Check for faults.
10. If there are faults, continue cycling as in Step #6 until there are no faults after completing Steps #7 and #8.
11. If there are no faults, position the machine in the stowed position.

5.8 PRESSURE SETTING PROCEDURE

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

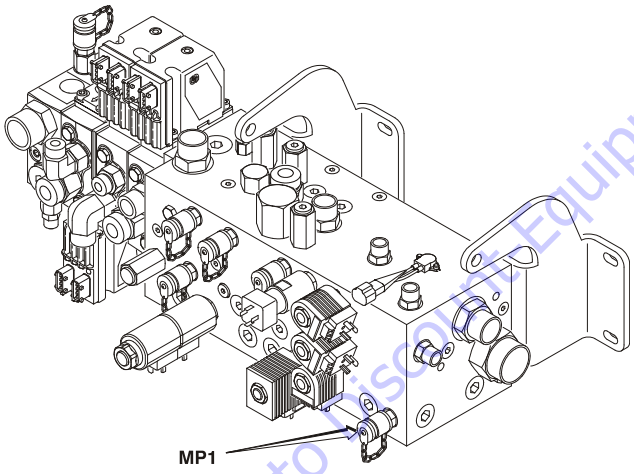
To ensure all pressures are set correctly, the following procedures must be followed in order.

1. All applicable steps in Section 5.11, Drive & Function Pump Start Up must be followed.
2. Set up of the function pump.
3. Adjustments made at the main valve bank.
4. Adjustments made at the platform valve.

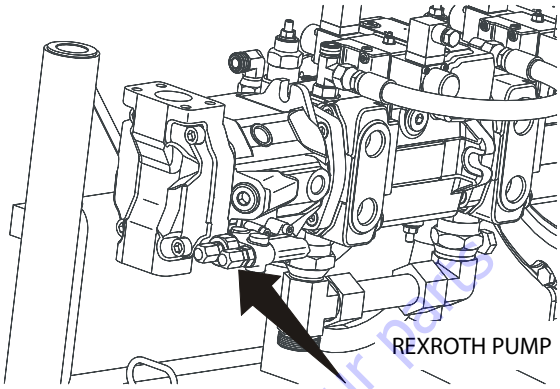
Set Up of the Function Pump

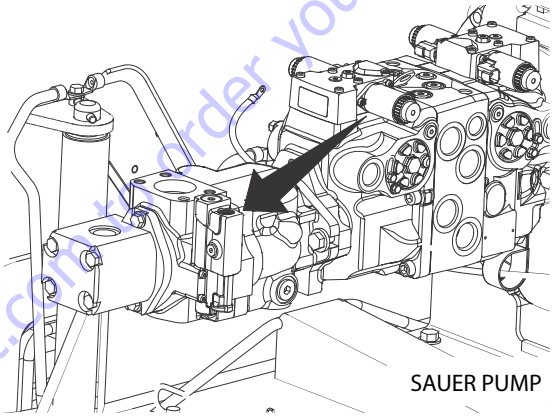
STAND BY PRESSURE OR LOW PRESSURE RELIEF - 450 PSI (31 BAR)

1. Install a low pressure gauge at port MP1 of the main valve block capable of reading 450 psi (31 bar).



2. Start the engine from the ground control. The gauge should read 425-475 psi (29.3-32.75 bar).
3. To make an adjustment to this pressure, go to the engine compartment, locate the function pump. The stand by adjustment is the outside adjustment, closest to the turntable.



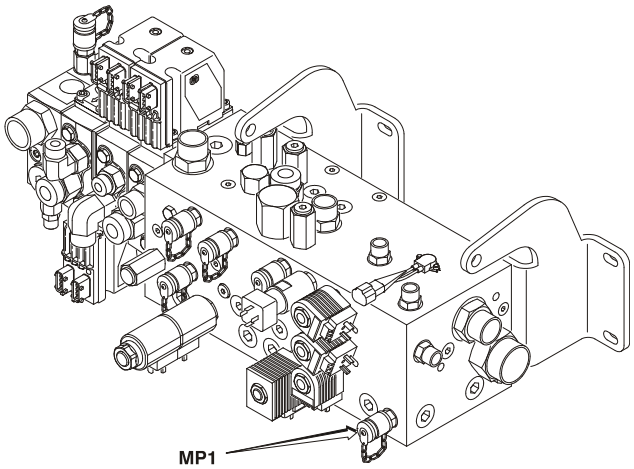


4. To make an adjustment to this pressure on a Rexroth pump, go to the engine compartment and locate the function pump which is the back pump. The high pressure relief adjustment is the adjustment closest to the pump. Using a 17 mm wrench, remove the cover nut. Be careful not to lose the o-ring washer inside the cover nut. Loosen the jam nut at the setscrew with the 17 mm wrench. Using a 3 mm allen wrench, adjust clockwise to increase, or counterclockwise to decrease pressure.

   To make an adjustment to this pressure on a Sauer pump, loosen the 4 mm setscrew towards the engine. Using a 6 mm allen wrench, turn clockwise to increase pressure and counterclockwise to decrease pressure.
5. After adjusting the pressure, tighten the jam nut and the cover nut if applicable.
6. Start the engine and verify the gauge reads 425-475 psi (29.3-32.75 bar).

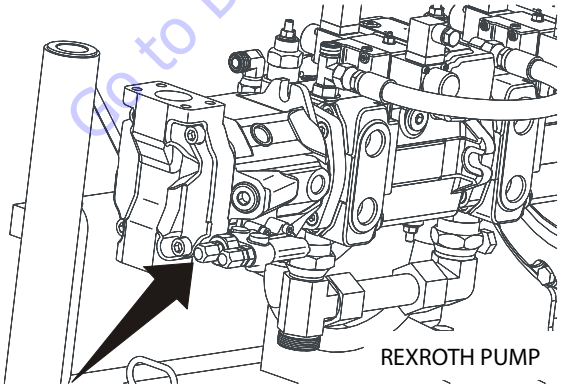
HIGH PRESSURE RELIEF - 3200 PSI (220.6 BAR)

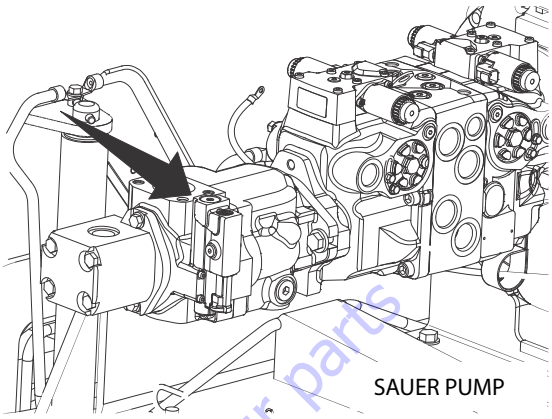
1. Install a high pressure gauge at the MP1 port of the main valve block.



2. Using a screwdriver, remove the Din connector from the telescope proportional flow coil.
3. Activate telescope in. The gauge should read 3200 psi (220.6 bar).
4. To make an adjustment to this pressure on a Rexroth pump, go to the engine compartment and locate the function pump which is the back pump. The high pressure relief adjustment is the adjustment closest to the pump. Using a 17 mm wrench, remove the cover nut. Be careful not to lose the o-ring washer inside the cover nut. Loosen the jam nut at the setscrew with the 17 mm wrench. Using a 3 mm allen wrench, adjust clockwise to increase, or counterclockwise to decrease pressure.

   To make an adjustment to this pressure on a Sauer pump, loosen the 4 mm setscrew towards the engine. Using a 6 mm allen wrench, turn clockwise to increase pressure and counterclockwise to decrease pressure.



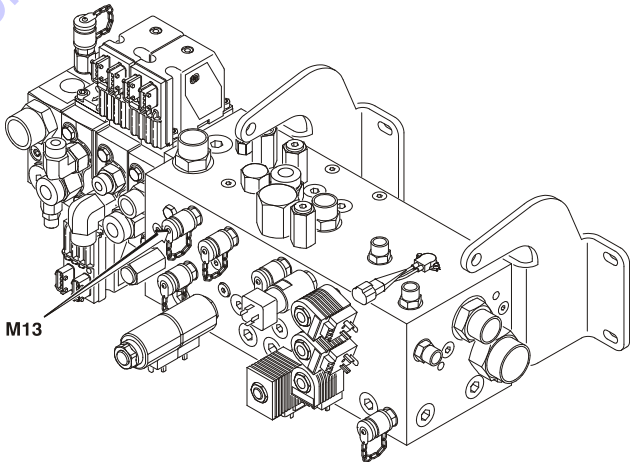


5. After adjusting the pressure, tighten the jam nut and the cover nut if applicable. This is the **maximum** relief pressure for all the functions governed by this pump.

Adjustments made at the Main Valve Bank

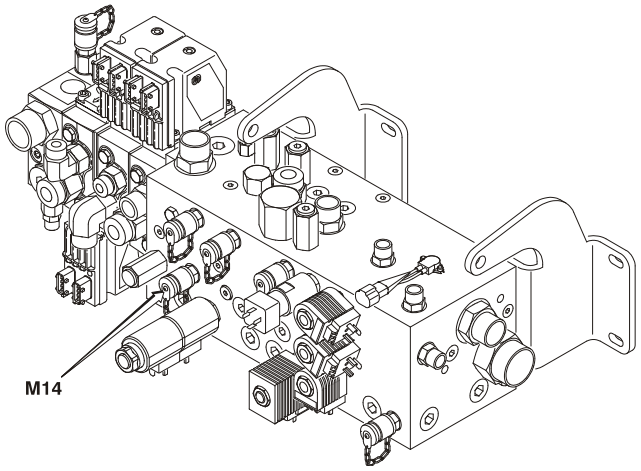
SWING 1500 PSI (103.4 BAR)

1. Install turntable lock pin.
2. Install high pressure gauge at port "M13".



3. Activate swing right.
4. Swing right relief valve is located on top surface of valve directly behind "M13". The adjustment is below the outer plug. Turn CW to increase pressure.

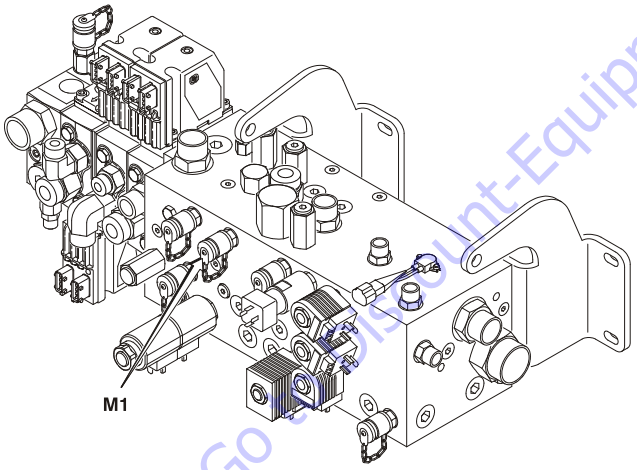
5. Install high pressure gauge at "M14".



6. Activate swing left.
7. Swing left relief is located to the left of "M14". The adjustment is below the outer cap. Turn CW to increase pressure.
8. Remove turntable lock pin.

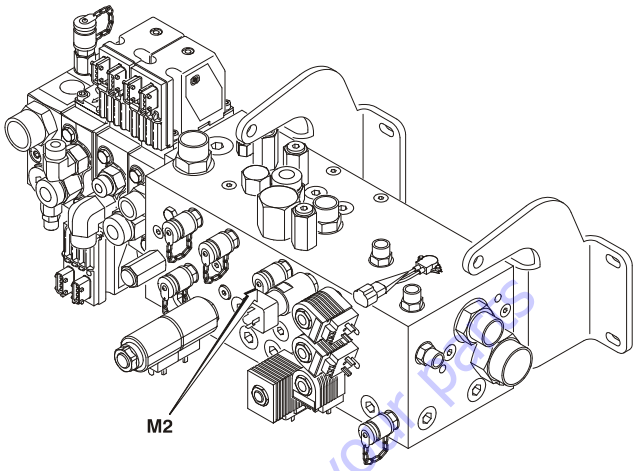
MAIN TELESCOPE 2200 PSI (151.6 BAR)

1. Cap ports 1 and 2.
2. Install high pressure gauge at "M1".



3. Activate main telescope extend.
4. Main telescope extend relief is located on the top surface of the valve directly behind "M1". The adjustment is below the outer cap. Turn CW to increase pressure.

5. Install high pressure relief at "M2".



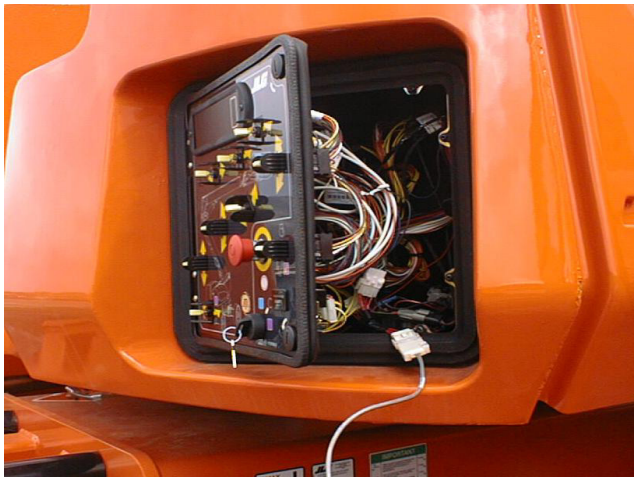
6. Activate main telescope retract.
7. Main telescope retract is on top surface of valve directly behind "M2". The adjustment is below the outer plug. Turn CW to increase pressure.
8. Reconnect hoses.

PVG VALVE (MAIN LIFT, TOWER LIFT, AND TOWER TELE)

Because of an internal shuttle network in the PVG valve, all port pressures can be measured at the "LS" quick connect on the top surface of the valve to the extreme left.

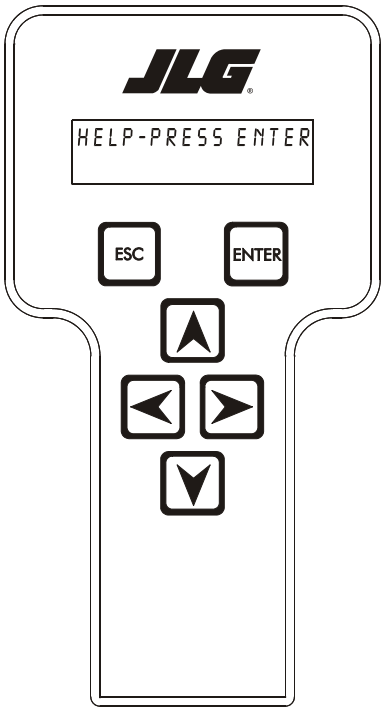
NOTE: *Pressures are not adjustable and can only be monitored. Should the setting be outside of the pressure tolerance the respective shock valve must be replaced.*

1. To check port pressure on PVG, install analyzer and go to access level 1 as follows.
   a. Plug the analyzer into the connector inside the Ground control box.



   b. Pull out the Emergency Stop switch and start the engine.

c. The analyzer screen should read:



d. Use the arrow button to reach ACCESS LEVEL 2. Press the ENTER key.

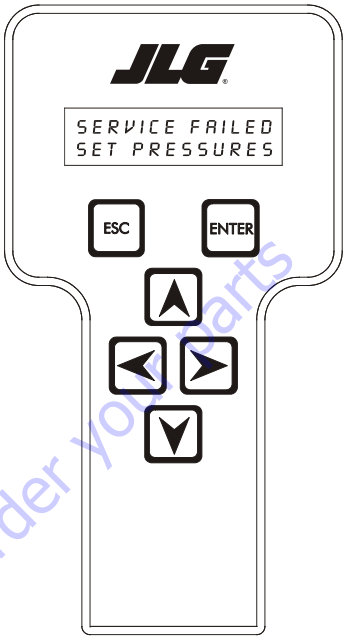
e. Enter the Access Code, 33271 to get into Access Level 1 mode.

NOTE: *The service mode will only be displayed on the analyzer when in access level 1 or 0 in the ground mode and be hidden while in access level 2.*

NOTICE

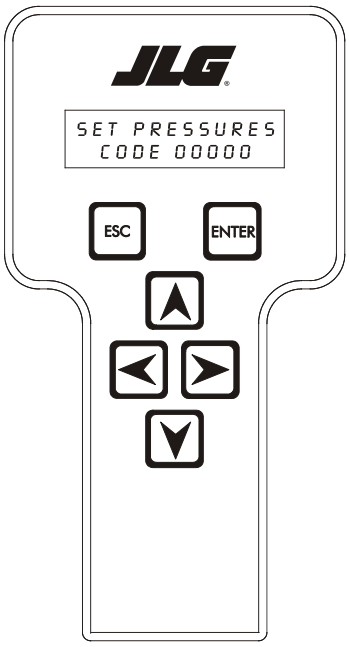
THE SERVICE MODE MENU WILL BE SELECTABLE AT THE TOP LEVEL OF THE ANALYZER MENU STRUCTURE. "SERVICE MODE" WILL BE DISPLAYED ON THE TOP LINE OF THE ANALYZER WITH THE CURRENT SUB-MENU SELECTION ON THE BOTTOM LINE. THE SUB-MENUS WILL SCROLL WITH THE LEFT AND RIGHT ARROW KEYS.

2. In this level, enter the "service mode" menu then scroll left or right to "set pressure" submenu as shown below.

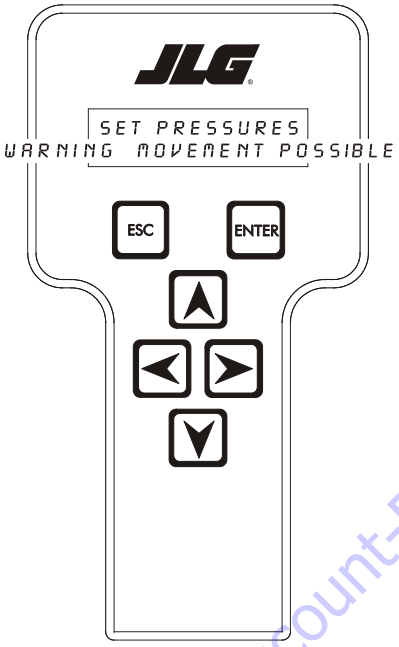


3. Set Pressures - allows function of selected submenu with enable valve closed (to set pressure settings of functions that should not/cannot not be independently operated)

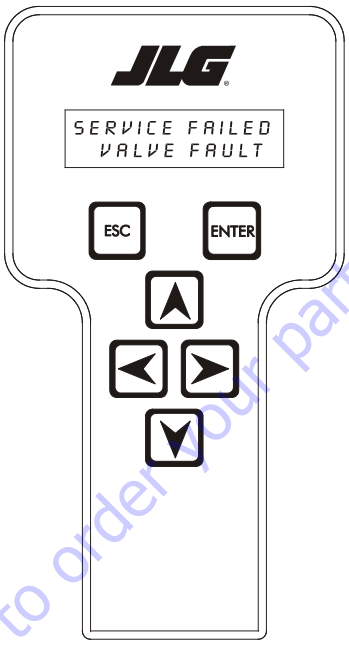
4. When the operator presses the ENTER key, the controller will display "SET PRESSURES" on the top line and "CODE 00000" on the bottom line of the analyzer.



5. When the operator enters access code 146005, "SET PRESSURES" will be displayed on the top line and current sub-menu on the bottom line. The sub-menus will scroll with the left and right arrow keys.
6. Pressure setting sub-menus will include the following:
   - "MAIN LIFT?"
   - "TWR LIFT?"
   - "TWR TELE?"
7. When the operator presses the ENTER key, "SET PRESSURES" will be displayed on the top line of the analyzer and the bottom line will display the following: "WARNING" flashed on a 0.5 hertz rate for 3 cycles followed by the scrolling of "MOVEMENT POSSIBLE". This flashing and scrolling will repeat until the ENTER key is pressed.



8. When the operator pressed the ENTER key, the controller will display "SET PRESSURE" on the top line, "MAIN LIFT" or "TWR LIFT" or "TWR TELE" on the bottom line and will allow operation of the selected submenu function with the enable valve closed. If movement of any of the three functions is detected, the controller will display "SERVICE FAILED" on the top line and "VALVE FAULT" on the bottom line as shown below.



9. Pressing the ESCAPE or the ENTER key once will revert back to the pressure setting sub-menus ("MAIN LIFT", "TWR LIFT", "TWR TELE").
10. Select the PVG function then use the toggle switches at ground control to energize function. Pressure should be:
    - Main Lift UP - 2755 to 3088 psi (190 to 213 Bar)
    - Main Lift DN - 2755 to 3088 psi (190 to 213 Bar)
    - Tower lift UP - 2755 to 3088 psi (190 to 213 Bar)
    - Tower Lift DN - 2755 to 3088 psi (190 to 213 Bar)
    - Tower Tele OUT - 2537 to 2871 psi (175 to 198 Bar)
    - Tower Tele IN - 2537 to 2871 psi (175 to 198 Bar)

Adjustments Made at the Frame Valve Bank

AXLE EXTEND AND RETRACT, FRONT AND REAR - 2500 PSI (172.3 BAR)

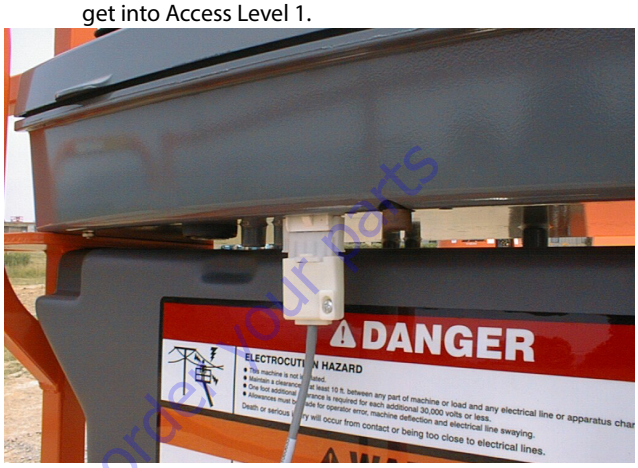
1. To extend axles, drive machine back and forth until extended. A machine that cannot be driven must be jacked up.
2. On both the front and rear frame valve banks, install a high pressure gauge on ports MA1 for extend and MA2 for retract. The gauge should read 2500 psi (172.3 Bar) in both directions.
3. The axle extend/retract cylinders are connected hydraulically in parallel. In order to get the correct pressure of the circuit being adjusted, unscrew the solenoid coil from the circuit not being adjusted and pull it away from the valve.
4. Turn clockwise to increase, counterclockwise to decrease.

STEERING, FRONT AND REAR

NOTE: *The following procedure requires 2 people to perform. One is needed for verifying / adjusting pressure readings and wheel spindle alignment the other for operating the steer functions and using the Analyzer from the platform.*

The Analyzer is required to perform the pressure check procedure through access of the calibration menu. The calibration menu will allow for extending and retracting the steer cylinders individually, verifying pressures, and proper steer sensor calibration. Verification of the steer sensor calibration will require one of two types of measuring methods; using a square and ruler or using string as explained in Section 6 - JLG Control System. The purpose of these measuring tools is to assure that the wheel spindle is aligned “straight” with the extended axle weldment.

1. Position machine with front and rear axles fully extended.
2. Install the Analyzer in the platform control box and scroll menu’s to Access Level 2 and insert password (33271) to get into Access Level 1.



3. Scroll to the calibration mode. Once in the calibration mode, press “ENTER” and scroll to steer. Once in the steer calibration mode, the Analyzer is going to ask to calibrate the steer sensors, this is going to allow extending and retracting each steer cylinder individually during this process. The JLG control system will ask to calibrate the left front sensor, the left rear sensor, the right front sensor and finally the right rear sensor in that order. During this calibration mode each individual steer cylinder will be extended and retracted to verify correct pressures with the marked MS (Measure Steer) ports on the steer / axle valve that pertains to that steer cylinder. Refer to the Hydraulic Schematic in Section 7 - Schematics.

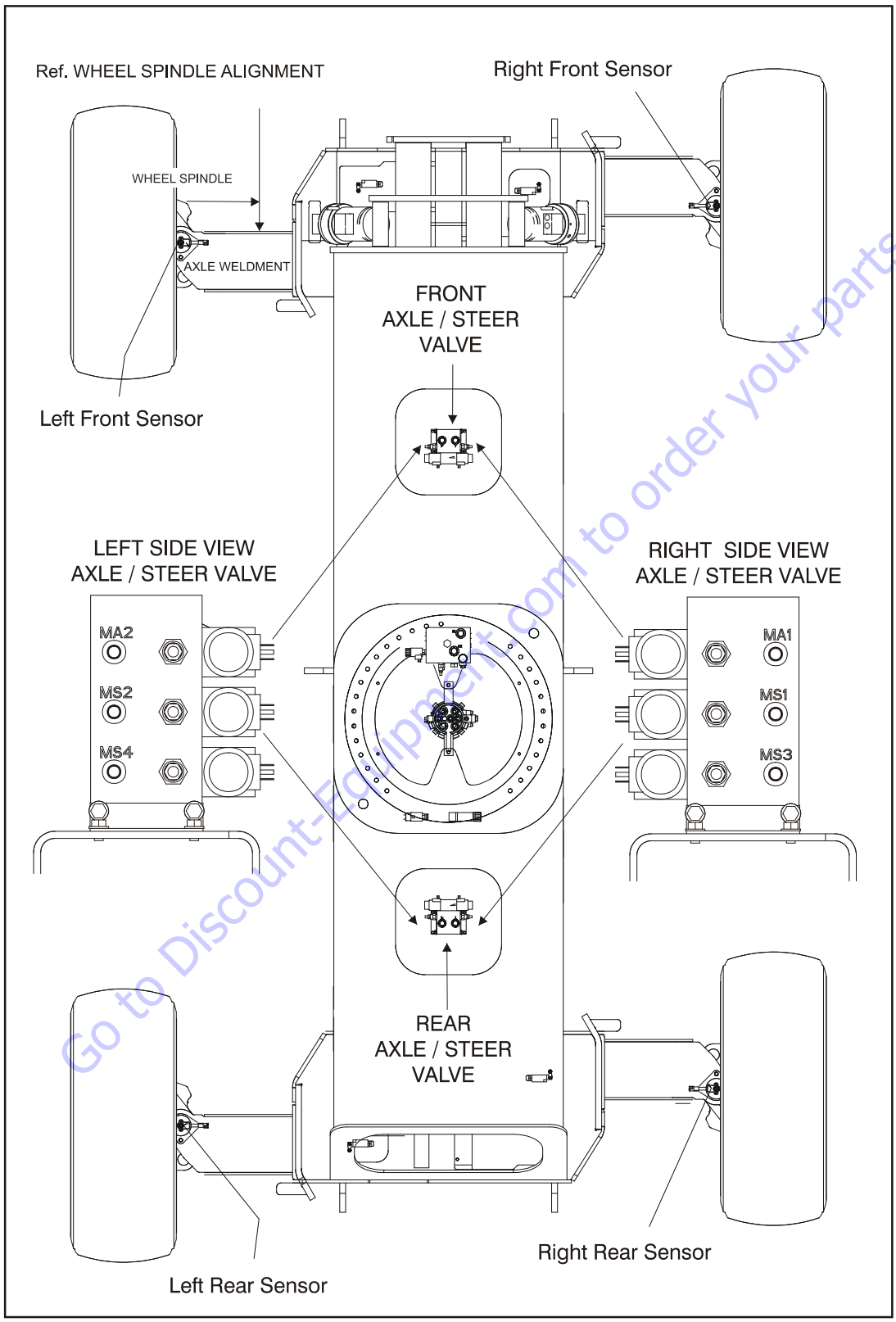
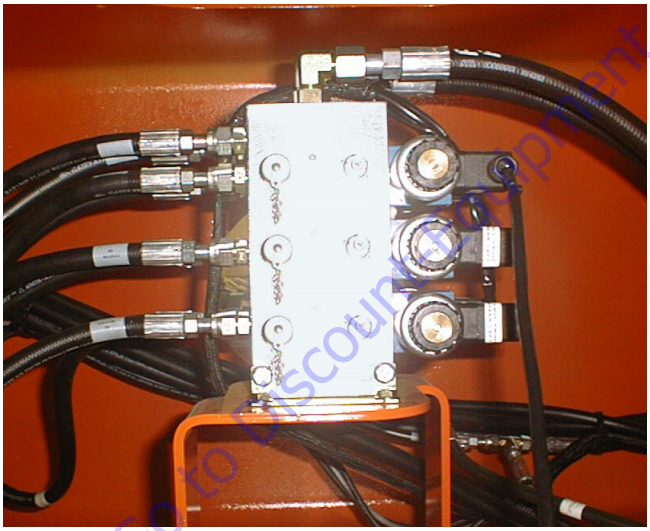


Figure 5-80. Steer Pressure Adjustments

4. Remove the circular covers at the side or square cover at the top to gain access to the axle/steer valves.

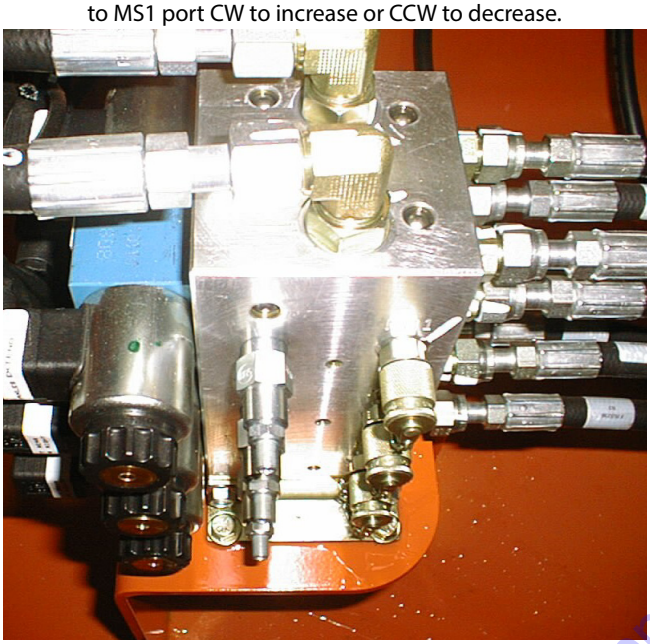
5. Install a pressure gauge at the front axle/steer valve at MS2 port. This should be located on the left side of the valve closest to the left front wheel spindle. Position the steer switch to activate the left front steer cylinder until the rod is in the fully extended position and hold the switch for a few seconds after the rod has been fully extended. The MS2 port should read 2000 psi (138 Bar). If the pressure is not 2000 psi (138 Bar) adjust relief valve mounted next to the MS2 port, CW to increase or CCW to decrease.



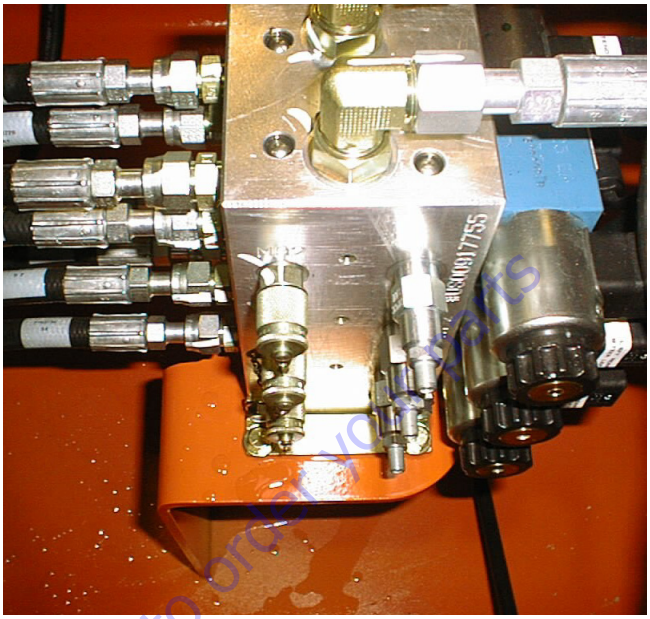
6. Remove the pressure gauge from MS2 port and install on the MS1 port, which is on the right side of the front axle/steer valve, closest to the right front wheel spindle. Position the steer switch to activate the left front steer cylinder until the rod is in the fully retracted position and hold the switch for a few seconds after the rod has stopped. The MS1 port should read 2600 psi (179 Bar). If the pressure is not correct, adjust relief valve next to MS1 port, CW to increase or CCW to decrease.

7. This step involves aligning the left front wheel spindle with the axle weldment. Position the left front wheel spindle “straight” using a square and rule or string for proper alignment (Refer to Section 6 - JLG Control System). Once the left front wheel spindle has been properly measured, press “ENTER” on the Analyzer. This is calibrating data to the JLG Control System that the left front steer sensor is centered.

8. Checking the left rear steer cylinder is identical to the procedure for left front steer cylinder, except now we are checking pressures at the rear axle/steer valve location. Install pressure gauge at MS1 port. This should be located on the left side of the valve closest to the left rear wheel spindle. MS1 port should read 2600 psi (179 Bar) when the left rear steer cylinder is activated with the rod in the fully retracted position. If the pressure is not 2600 psi (179 Bar) adjust relief valve mounted next to MS1 port CW to increase or CCW to decrease.



9. Remove the gauge from MS1 port and install on MS2 port, which is on the right side of the rear axle/steer valve, closest to the right rear wheel spindle. Position the steer switch to activate the left rear steer cylinder until the rod is in the fully extended position and hold the steer switch for a few seconds after the rod has been fully extended. The MS2 port should read 2000 psi (179 Bar). If the pressure is not correct, adjust the relief valve mounted next to MS2 port CW to increase or CCW to decrease.



10. The next step is identical to the left front step mentioned above. Make sure the left rear wheel spindle is straight and press "ENTER" to accept the new calibration settings, now press "ESC" (escape) and scroll to the right front steer calibration step.

11. Checking the right front steer cylinder is identical to the procedure laid out for the left front steer cylinder, except the pressures are now checked at MS3 port of the front axle/steer valve. This should be at the right side of the valve closest to the right front wheel spindle. Install the gauge at MS3 port. Position the steer switch to activate the right front steer cylinder until the rod is in the fully retracted position and hold the steer switch for a few seconds after the rod has been fully retracted. If the pressure is not 2600 psi (179 Bar), adjust the relief valve mounted next to the MS3 port CW to increase or CCW to decrease.

12. Remove the gauge from MS3 port and install on MS4 port, which is on the left side of the front axle/steer valve, closest to the left front wheel spindle. Position the steer switch to activate the right front steer cylinder until the rod is in the fully extended position and hold the steer switch for a few seconds after the rod has stopped extending. The MS4 port should read 2000 psi (138 Bar). If the pressure is not correct, adjust relief valve mounted next to the MS4 port CW to increase or CCW to decrease.
13. The next step is identical to the left front step mentioned above. Make sure the right front wheel spindle is straight and press "ENTER" to accept the new calibration settings. Scroll over to right rear steer calibration step.
14. Checking the right rear steer cylinder is identical to the procedure laid out for the left rear steer cylinder. Install gauge at MS4 port of the rear axle/steer valve. This should be at the right side of the valve closest to the right rear wheel spindle. Position the steer switch to activate the right rear steer cylinder until the rod is in the fully extended position and hold the steer switch for a few seconds after the rod has stopped extending. The MS4 port should read 2000 psi (138 Bar. If the pressure is not correct, adjust relief valve next to the MS4 port CCW to increase or CCW to decrease.
15. Remove gauge from MS4 port and install on MS3 port, which is on the left side of the rear axle/steer valve, closest to the left rear wheel spindle. Position the steer switch to activate the right rear steer cylinder until the rod is in the fully retracted position and hold the steer switch for a few seconds after the rod stops retracting. If the pressure is not 2600 psi (179 Bar), adjust the relief valve mounted next to the MS3 port CW to increase or CCW to decrease.
16. The next step is identical to the left front step mentioned above, make sure the right rear wheel spindle is straight and press "ENTER" to accept the new calibration settings, now escape out of the calibration menu and remove the Analyzer and pressure gauge.

Adjustments Made at the Platform Valve Bank

PLATFORM LEVEL UP - 3000 PSI (206.8 BAR)

1. Install a high pressure gauge at the gauge port M1.
2. Activate level up to the end of stroke, it should read 3000 psi (206.8 Bar).
3. All the relief valves are located on the same face. The level up relief valve is located closest to the M1 gauge port. Turn clockwise to increase, counterclockwise to decrease.

PLATFORM LEVEL DOWN - 2500 PSI (172.3 BAR)

1. Install a high pressure gauge at gauge port M2.
2. Activate level down to the end of stroke, it should read 2500 psi (172.3 Bar).
3. The level down relief valve is located to the left of the level up relief valve. Turn clockwise to increase, counterclockwise to decrease.

ARTICULATING JIB UP AND DOWN - 2750 PSI (189.6 BAR)

1. Install a high pressure gauge on gauge port M3. The jib relief valve is located below the level down relief valve. Activate jib up or down, it should read 2750 psi (189.6 Bar). Turn clockwise to increase, counterclockwise to decrease.

5.9 DRIVE PUMPS

Troubleshooting Procedure

To aid in troubleshooting, refer also to the pressure measuring port connections for test gauge installation information as shown on the hydraulic circuit diagram. Procedure assumes proper gauges are installed. (Minimum gauges required: (2) 0-6000 psi, (1) 0-3000 psi & (1) 0-1000 psi [{2} 0-415 bar, {1} 0-210 bar & {1} 0-70 bar]). This procedure was written to aid the troubleshooter in following a logical approach to a hydraulic system fault.

1. Transmission does not propel the machine, diesel engine running properly

a. Is there oil in the reservoir?
No - Fill reservoir
Yes - If yes, proceed to step 1.b

b. Is the pump input shaft connected to the engine flex plate or rear of forward pump?
No - Connect pump input shaft
Yes - If yes, proceed to step 1.c

c. Are the hydraulic hoses and tubing connected in accordance with the hydraulic circuit diagram?

No - Correct the hoses/tubing
Yes - If yes, proceed to step 1.d

d. Is the pump direction of rotation correct? (clockwise as looking at the shaft)

No - Fit pump having the correct direction of rotation
Yes - If yes, proceed to step 1.e

e. Are there "O"-rings missing from fittings (as example - suction leak), pinched hoses, broken tubing, etc?

No - Proceed to step 1.f
Yes - Repair damage or fault

f. Are the electrical connectors/wiring intact and secure to the pump control solenoids?
No - Repair damage or fault
Yes - If yes, proceed to step 1.g

g. Does the engine "labor" when attempting drive, are the brakes released?
No - Proceed to step 1.h
Yes - Check brake release circuit, measure pressure at port "MP" on Traction Control manifold

h. Are all four wheel drive planetary reduction gearboxes engaged?
No - Engage wheel drive(s)
Yes - If yes, proceed to step 2.a

2. Transmission does not propel the machine, diesel engine running properly - Charge Pump/Relief Valve

a. Is there any charge pressure at port G or indicated by measuring pressure at Ma and Mb?
No - Proceed to step 2.d
Yes - Proceed to step 2.b

b. Is the charge pressure at least 500 psi while running at high engine speed?
No - Proceed to step 2.c
Yes - Proceed to step 3.a

c. Can the charge pressure be raised by removing dirt/debris from charge relief poppet or by adding or removing shims from the charge pressure relief valve mounted in the second pump of the triple?
No - Proceed to step 2.d
Yes - Adjust pressure to 500 psi +50 psi, -0 psi (34.4 bar +3.4 bar, -0 bar)

NOTE: *The propulsion circuit uses a hot oil flushing valve to obtain brake release pressure. The hot oil flushing valve cartridge (#120) is mounted in the Traction Control Manifold. The flushing valve receives its oil from the "left side" wheel drive pump; the middle pump of the triple. With the engine running and propelling the machine forward or reverse, the "hot oil flushing valve" and the brake release pressure must be adjusted to 475 psi, +25 psi, -0 psi (32.7 bar, +1.7 bar, -0 bar), as set by adjusting pressure relief cartridge (#130). The brake release pressure must be 25 psi less than the charge pump pressure. Measure pressure at port "MP" using a 0-1000 psi (0 - 70 bar) pressure gauge.*

d. Is the transmission pumps suction hose pinched shut?
No - Proceed to step 2e
Yes - Repair damaged hose

e. Is the charge pump suction pressure/vacuum within recommended limits? (0.8 bar absolute or 6.3 inches of mercury)
No - Proceed to step 2.f
Yes - Proceed to step 2.g

f. Is the suction strainer inside the reservoir blocked, clogged, restricted?
No - Proceed to step 2.g
Yes - Repair/replace with a clean suction strainer

g. Is the reservoir air breather blocked or restricted?
No - Proceed to step 2.h
Yes - Clean or replace air breather

h. Remove charge pressure relief valve from the middle pump and inspect. Is it damaged?
No - Refit cartridge and proceed to step 2.i
Yes - Clean & inspect cartridge, poppet, springs, seals to determine cause of damage. Repair or fit a new cartridge and return to step 2.a

i. Remove and inspect charge pump assemblies. Are they damaged?
No - Proceed to step 2.j
Yes - Repair and/or replace damaged components and return to step 2.a

j. Is the charge pump installed for the clockwise rotation?
No - Refit charge pump. Return to step 2.a
Yes - With proper charge pressure and transmission still does not operate, proceed to step 3.a

3. Transmission does not propel the machine, diesel engine running properly - Pump Control: (Insure Generator Drive option is not turned "on")

a. Are the electrical connectors & wiring connected properly to the pump control solenoids?
No - Connect a ammeter in series with solenoid wiring. Is a current of 400 mA to 1060 mA being applied. (Current signal varies with joystick position)
Yes - Proceed to step 3.b

b. Are all four of the two-speed motors, mounted in the wheel drive planetary reduction gearboxes, shifted to maximum displacement (high torque - low speed)?
No - Select maximum displacement
Yes - Proceed to step 3.c

c. Actuate the pump control in both directions. Do the pumps stroke? Do they go to full stroke?
No - Refer to the pump service manual and then proceed to step 3.d
Yes - Operate the transmission

d. Remove stroking orifices in X_1 and X_2. Install pressure gauges in X_1 and X_2 (0-500 psi [0 - 35 bar]). Stroke the pump in both directions. Do the pressures at X_1 and X_2 alternate between 30 & 250 psi (2 & 17 bar)?
No - Remove the EP control module & replace it with a new unit. Repeat step 3.c
Yes - Proceed to step 3.e.

e. Is the pressure at port "R", case pressure, less than 15 psi (1 bar) gauge pressure?
No - Correct problem restricting case drain oil flow (oil cooler blockage, pinched hoses, etc)
Yes - Proceed to step 3.f

f. Stroke pump in both directions, while measuring pressure at Ma & Mb ports of the pump. Does any pressure greater than charge pressure alternate between ports Ma & Mb?
No - Verify that loading the pump will cause system pressure to increase above charge pressure. Proceed to step 3.a
Yes - Proceed to step 3.g

g. Is it possible to adjust high pressure relief valves using 0-6000 psi (0 - 415 bar) gauges to monitor pressure at Ma & Mb? (Refer to relief valve adjustment)
No - Replace high pressure relief valve and return to step 3.c
Yes - Adjust high pressure relief valves to 5000 psi +50 psi, -0 psi (344.7 bar +3.4 bar, -0 bar)

h. Actuate control in both directions. Does transmission operate?
No - Check that minimum displacement stops on the wheel drive motors are adjusted properly, check that the motors stroke between maximum to minimum.
Yes - Operate the transmission

4. Transmission Drive is Sluggish or Erratic

a. Does the "EP" proportional pump control current vary with joystick movement?
No - Rectify the problem - broken wires, electrical connector, open solenoid coil, etc.
Yes - Proceed to step 4.b

b. Are all four (4) brakes fully released?
No - Check brake release pressure and insure each wheel receives correct release pressure.
Yes - Proceed to step 4.c

c. Are the pumps stroking time orifices installed tight and clean?
No - Remove the Plugs in ports X_1 and X_2. Remove orifices with a 3mm allen wrench. Check that orifices are clean & re-install.
Yes - Proceed to step 4.d

d. Is an motor displacement stroking time orifice plugged or is the two-speed shift hose pinched?
Yes - Inspect and clean stroking orifice, check two-speed hose routing

e. Is a flow divider/combiner cartridge stuck in the Traction Control Manifold? Flow divider/combiner cartridge # 111 controls the right side wheels, # 112 controls the left side wheels. Also check to insure bypass orifices #151 (right side) and # 152 (left side are not plugged.

5. Transmission Drives in one direction only

a. Are electrical connections to pump control proportional solenoids correct, intact and without defects?
Yes - Proceed to step 5.b
No - Rectify the problem

b. Check hot oil flushing valve cartridge #120 located in the Traction Control Manifold.
Remove and inspect flushing valve cartridge for stuck spool or damaged cartridge "O"-ring seals & backup rings.

c. Inspect "Make-Up" check valve cartridges, #190.1-190.4, installed in the Traction Control Manifold. Is a cartridge "stuck" open with debris or is an "O"-ring failed?
No - Proceed to step 5.d
Yes - Clean/repair or replace Make-Up check cartridge.

d. Swap high pressure relief valves in the transmission. Does the transmission drive in the other direction?
No - Proceed to step 5.e
Yes - Repair/clean/adjust or replace high pressure relief valve on the non-driving side

e. Replace "EP" control module. Does pump operate properly?
No - Replace or repair pump
Yes - Operate the transmission

6. Transmission Drives in Wrong Direction

a. Check to see if electrical connectors or wiring have been swapped on the pump.

b. Check to determine want end of the machine the boom is swung over.

7. Transmission Does Not Find or Hold Neutral

a. Does pump remain in neutral with electrical connectors removed?
No - proceed to step 7.b
Yes - Check electrical system for signal problem

b. With electrical connectors removed and machines wheels jacked off the ground and engine running, momentarily apply 12 volt DC signal (battery voltage) to a pump control solenoid. Does the pump return to neutral after the 12 volt signal is removed?
No - Apply 12 volts to opposite solenoid & recheck.
No - Replace pump control module, repeat step 7.a
Yes - Possibly dirt was dislodged from control module, re-check thoroughly to determine problem has definitely been resolved.

c. Check mechanical centering of the pumps

8. Transmission Drives at a High Noise Level

a. Are the wheel drive planetary reduction gearboxes filled to the correct level and do they have the proper lubricant?
No - Fill gearbox with correct grade of oil to the prescribed level.
Yes - Proceed to step 8.b

b. Is the engine flex plate and drive coupling correctly installed and aligned with the transmission pump?
No - Install flex plate and bell housing per manufacturer's instructions
Yes - proceed to step 8.c

c. Is a rigid item or object contacting the resilient mounted engine/pump assembly?
No - Proceed to step 8.d
Yes - Insure no item is contacting the unit, transmitting air borne noise.

d. Is the suction pressure/vacuum at the charge pumps inlets within recommended limits?
No - Return to step 1.h
Yes - Proceed to step 8.e

e. Is there air in the hydraulic fluid? This may be indicated by foaming or milky colored oil.
No - Proceed to step 8.f
Yes - De-aerate the oil and inspect system for cause of air induction. Check for loose or missing O-rings on face seal connections.

f. Is a wheel drive hydraulic motor operating at excessive speed?
Yes - Check minimum displacement stop screw adjustments on the motors. Should be 0.433" or 11mm above the stop screw lock nut. Is one or more motors "stuck" at minimum displacement, check for plugged/blocked two-speed stroking orifice(s).

9. Transmission Operates at a Higher than Normal Temperature

a. Is the reservoir temperature above 195°F (90.5° C)?
No - 195°F (90.5° C) is the upper limit. If temperature is over 195°F (90.5° C), the oil cooler may need to be cleaned.
Yes - Proceed to step 9.c

b. Are the hydraulic motor(s) stalling (wheels not turning) intermittently?
No - Proceed to step 9.c
Yes - Hydraulic fluid is being heated through system pressure relief valves. Shut down system and rectify the cause of motor stall.

c. Does oil temperature remain above 195°F (90.5° C), after cleaning the oil cooler?
No - Operate transmission. Check oil cooler more often.
Yes - Proceed to step 8.a

10. Transmission Operates at a Higher than Normal Temperature

a. Check for differential temperature across the oil cooler. Is there a temperature difference?
No - Check to determine if the bypass check valve (10 psi [0.7 bar] crack pressure) is stuck open. Check to determine if the oil cooler is restricted internally, causing oil flow to pass across the bypass check valve.
Yes - Proceed to step 8.b

NOTE: *Oil cooler flow is received from the transmission pumps cases, max. continuous pump case pressure is 15 psi gauge pressure. Higher pressure will prematurely damage pump shaft seals*

b. Disconnect pump case drain from oil cooler & check flow rate from charge pumps. Is the flow rate 3.8 GPM (14.4 LPM) with diesel idle speed of 1200 rpm?
No - Refer to charge pump removal & inspection procedure

11. Transmission Pump(s) Do Not Develop Maximum Horsepower (Flow & Pressure)

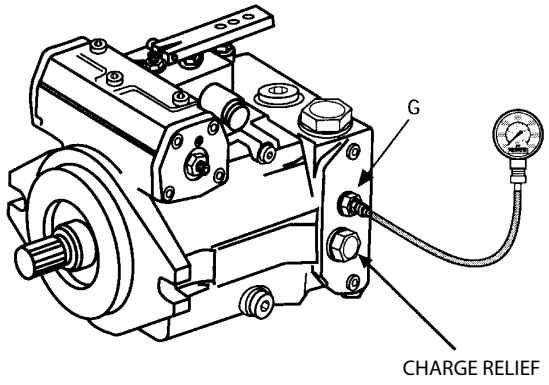
a. Does the charge pump pressure meet specification?
No - Return to step 2.a
Yes - Proceed to step 11.b

b. Does the pump case pressure exceed 15 psi gauge pressure?
No - Proceed to step 11.c
Yes - Check case drain hoses, oil cooler, etc. for pinched or restricted oil flow

c. Are the pump(s) high pressure cross port relief valves adjusted to the required pressure (5000 psi) so they do not bypass prematurely?
No - Inspect/clean/adjust and or replace valve cartridge
Yes - Replace the pump, after blocking the "A" & "B" ports, running the pump and measuring pressure developed at "A" & "B". This must be done to insure that flow & pressure loss in not elsewhere in the system. (motors, swivel coupling, etc)

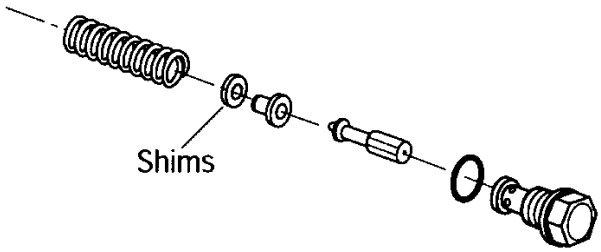
d. Is the diesel engine capable of developing horsepower at design rpm?
Follow recommended troubleshooting procedures to insure the engine is developing full power at specified rpms.

Charge Pressure Relief Valve Adjustment



With a low pressure (0 – 1000 psi [0 - 70 bar]) pressure gauge tee'd into the "G" port or two (2) low pressure gauges installed into "Ma" and "Mb", run pump at engine idle speed. Do not place the pump on stroke – low pressure gauges installed in "Ma" & "Mb" will be damaged! Prior to adjusting pressure, insure charge pressure relief valve is clean of any dirt or debris. The charge pressure relief valve does not wear appreciably over time. If charge pressure was normal and then has decayed, check for other causes of low charge pressure. If pressure is low, remove relief valve and add shim(s). If pressure is high, remove relief valve and take out shim(s).

NOTE: *Shim thickness 1 mm = 56 psi (3.86 bar). Shims are available in 0.3, 0.5, and 1.0 mm thickness.*



Mechanical Centering of Pump

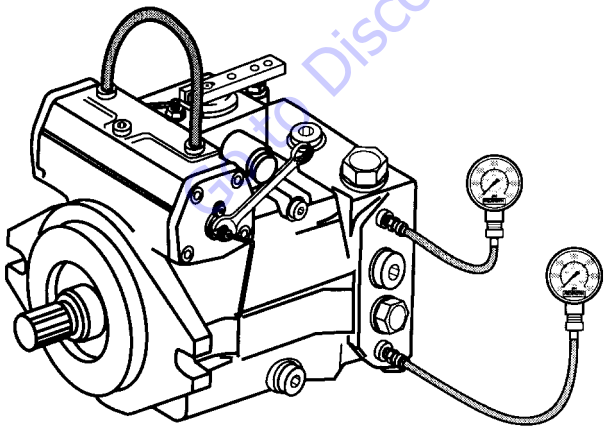
PREPARATION FOR ADJUSTMENT

The control piston has strong centering springs to ensure that once the pump is adjusted for the neutral position it will always return to neutral. If an adjustment is necessary follow the steps listed below.

To ensure there is equal pressure on both sides of the control module during the centering operation, it is necessary to connect the X_1 and X_2 ports together by means of hose or tubing. (No less than a 1/4 inch ID) The port sizes are:

Pump Size	Allen Wrench	Wrench
28	5 mm	17 mm

With pressure gages installed at M_A, and M_B, and with A and B ports blocked (or motor stalled), and with the pump running, loosen the jam nut. Turn the mechanical centering adjusting screw until 1000 psi is read on M_A, or M_B then turn screw opposite direction until 1000 psi is read on other pressure port. Turn the screw back, splitting the distance between the previous two positions. This should be the neutral position. Pressure on M_A, and M_B should be equal.

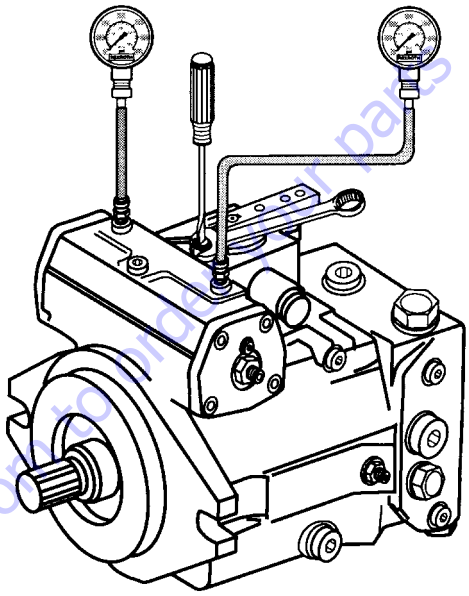


Tighten jam nut, stop the pump drive, remove the hose connecting ports X_1 and X_2.

Hydraulic Centering of Control Modules

PREPARATION FOR ADJUSTMENT

When control modules are exchanged or replaced, it is generally necessary to center the new module. This is done by running the pump with gauges installed at ports X_1, X_2, M_A, and M_B Release the jam nut and turn the adjustment screw on top of the control module valve body.



The adjustment screw is an eccentric, therefore, turning more than 90' in either direction will have no further centering effect, and could cause damage to the eccentric pin.

Pump Size	Tool Required	Wrench
28	Screwdriver	10 mm

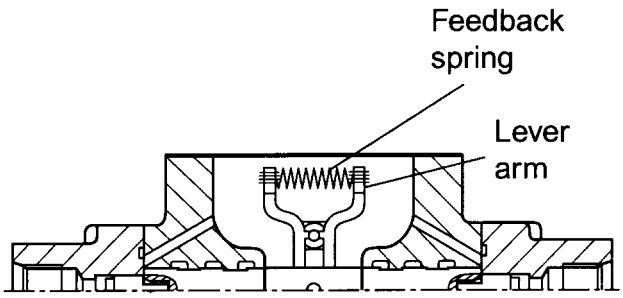
CENTERING THE EP CONTROL MODULE

With no electrical signal to solenoids A and B, (remove both plug-in connectors), the EP control module is correctly adjusted when any or all of the following conditions exist:

1. Approximately, when equal control pressures are obtained at control pressure ports X_1 and X_2.
2. The hydraulic motor does not turn when the brake is released.
3. Charge pressure is registered equally at ports M_A and M_B, when the flow output of the pump is deadheaded against a locked motor or a valve.

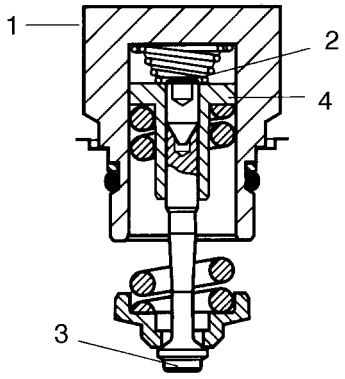
If difficulties are encountered in obtaining neutral position of the HD or EP control modules, check that the ends of the con-

trol spring are correctly located in the grooves near the end of the feedback lever arms.



High Pressure Relief Valve Adjustments

1. Remove relief valve cover from pump (ref. item 1).



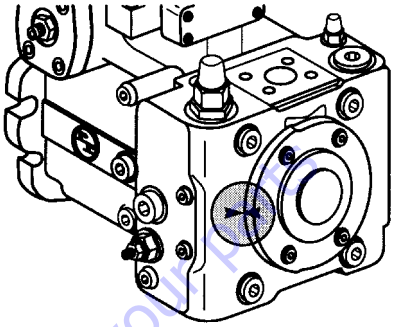
2. Loosen jam screw (ref. item 2).
3. Holding spring loading nut (ref. item 4) rotate valve spindle (ref. item 3). For high range relief valve, one turn equals approximately 630 psi (44 bar). For low range relief valve, one turn equals approximately 377 psi (26 bar).
4. After adjustment is completed torque jam screw (ref. item 4) to 5 ft.lb. (7 Nm).
5. Install relief valve assembly into pump, reinstall cover (ref. item 1) to proper torque.

Table 5-35. Torque Specs for Relief Valves into Port Block

Pump Size	Wrench Size	Torque
28	32 mm	66 ft.lb. (90 Nm)

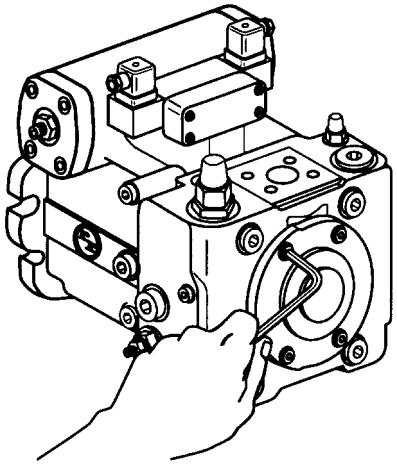
Removal and inspection of charge pump

Before removing capscrews, mark the position of the charge pump housing and separator plate in relation to the port block.



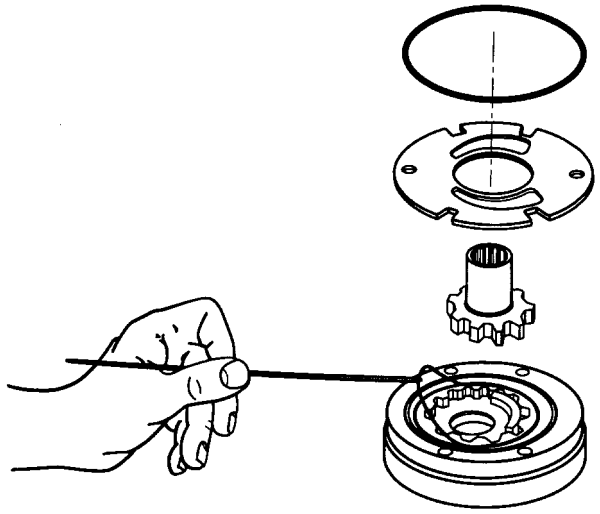
Loosen screws with metric allen wrench.

Pump Size	Allen Wrench
28	8 mm



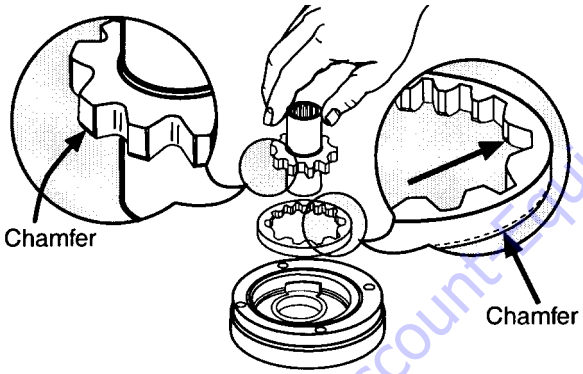
Remove charge pump housing and inspect for wear or damage to gear set and 0-ring seals. Grease 0-rings prior to reas-

sembly. Make sure 0-rings are completely seated in their grooves.



Withdraw pinion shaft and inspect gear teeth and bearing surfaces for abnormal wear.

When reassembling, make sure chamfer (on outer edge of driven gear and drive gear) is installed into housing per illustration.



Torque value for bolts when replacing charge pump.

Pump Size	Torque
28	18 ft.lb. (24 Nm)

NOTE: *If serious wear or damage has occurred to one component, the complete charge pump assembly must be replaced because they are matched components.*

Routine Maintenance

The Variable Displacement Hydrostatic Transmission Pumps are relatively maintenance free. Maintenance work is confined to the system, by way of maintaining hydraulic fluid condition, the "life blood" of the machine. Oil monitoring, changes and filter renewal promote system cleanliness. This will prevent premature breakdown and repairs. Under normal application conditions, the following maintenance intervals are suggested:

1. Renewal of Filter Elements
   a. After commissioning or re-build.
   b. At every 500 operating hours or when filter indicator shows a dirty element.
   c. With the suction strainer, the strainer should be renewed as soon as charge pump inlet pressure is less than -3.2 psi, 6.3"Hg or 0.8 bar absolute.
   d. Only JLG recommended filter elements are to be used. Paper elements cannot be cleaned; use throwaway cartridges.
2. Hydraulic Fluid Change
   a. After 2000 operating hours (1st oil change)
   b. Thereafter, every 2000 operating hours or annually, irrespective of operating hours achieved.
   c. Oil change should be performed with the system in warm running condition. Before re-filling, the reservoir interior should be inspected and cleaned to remove any sludge.
   d. Rags or threaded material must not be used.
   e. This machine has been designed & manufactured to operate on an Exxon-Mobil Oil Co. hydraulic fluid, Mobilfluid #424, Product #52233-4. Consult JLG Industries prior to introducing any other type of fluid to prevent interaction or possible contamination.
   f. The recommended interval between oil changes is based on various factors and should be carried out according to the degree of aging, contamination and water content.

g. Under application conditions with a heavy occurrence of dust or severe temperature fluctuations, the intervals between fluid maintenance should be shortened accordingly.

NOTICE

PRACTICAL EXPERIENCE SHOWS THAT MOST FLUID MAINTENANCE ERRORS OCCUR DURING AN OIL CHANGE DUE TO:

- **Use of an unsuitable hydraulic fluid**
- **Use of oil contaminated due to poor storage practices**
- **Failure to clean the reservoir**
- **Inadequate cleanliness when filling the reservoir (dirty drums, containers, water, etc)**

3. Leakage Inspection

a. After commissioning

b. The complete transmission drive system (pumps, motors, hosing, filters, valves, etc) should be checked for leakage at regular intervals.

c. Leaking joints & connections must only be tightened when pressureless.

4. Cleanliness Inspection

a. The oil tank breather should be regularly cleaned of dirt and dust to prevent clogging. With each cylinder movement, gallons of oil pumped, an equal amount of air exchange occurs across the reservoir breather. A dirty or clogged breather will affect **all** machine functions!

b. The air/oil cooler surfaces and engine radiator should be cleaned at the same time.

c. If hose connections are disassembled, it is imperative that the utmost care be taken that no foreign bodies infiltrate the oil circuit. Catastrophic component failure may occur.

5. Oil Level Inspection

a. Inspect oil level in the reservoir daily.

b. If "topping off" is required, use only the same Mobilfluid #424, Product #52233-4.

c. Do Not Mix Fluids.

6. Hydraulic Fluid - The "Life Blood" of the Machine

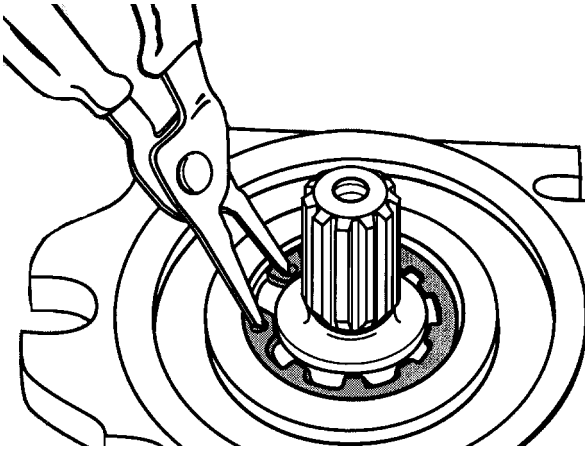
a. The type of hydraulic fluid supplied in the machine from the factory was selected after extensive testing and development. The fluid was selected to perform under "most" applications and conditions. Should this machine be in service for extended time periods at the extremes (hot or cold), JLG should be consulted for assistance in selection of the most suitable fluid type and grade for your application.

b. When operating at temperatures below 0°F, allow a warm-up period, if at all possible, to a temperature of 40°F.

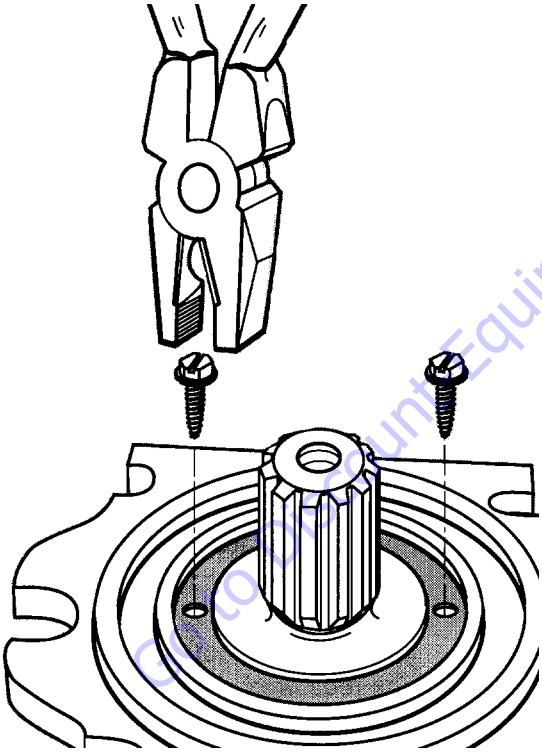
c. When beginning motion of a "cold" machine, operate all functions at reduced speeds until the "cold" oil has circulated out of the drive loop.

Removal and Installation of Shaft Seal

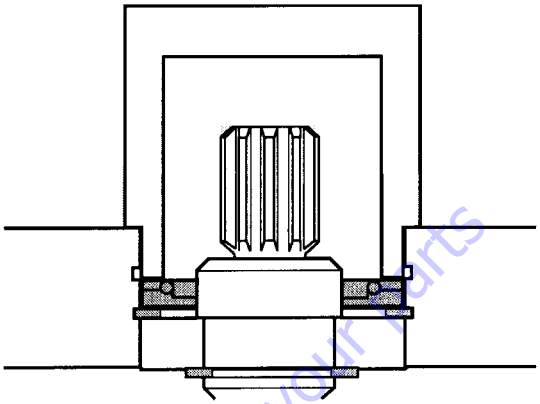
Remove the retaining ring with snap ring pliers.

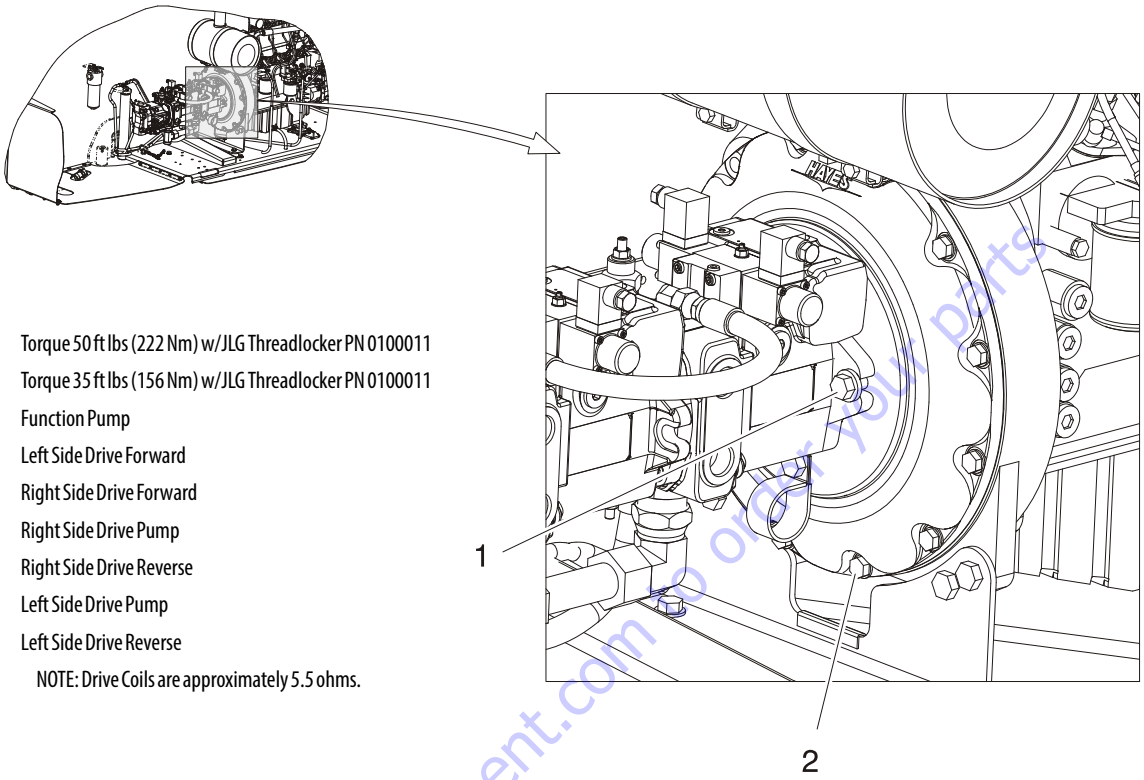


Screw in sheet metal screw into the holes fitted with rubber. Pull out shaft seal with pliers.



Press in shaft seal with bushing to the stop. Then replace snap ring.





1. Torque 50 ft lbs (222 Nm) w/JLG Threadlocker PN 0100011
2. Torque 35 ft lbs (156 Nm) w/JLG Threadlocker PN 0100011
3. Function Pump
4. Left Side Drive Forward
5. Right Side Drive Forward
6. Right Side Drive Pump
7. Right Side Drive Reverse
8. Left Side Drive Pump
9. Left Side Drive Reverse

NOTE: Drive Coils are approximately 5.5 ohms.

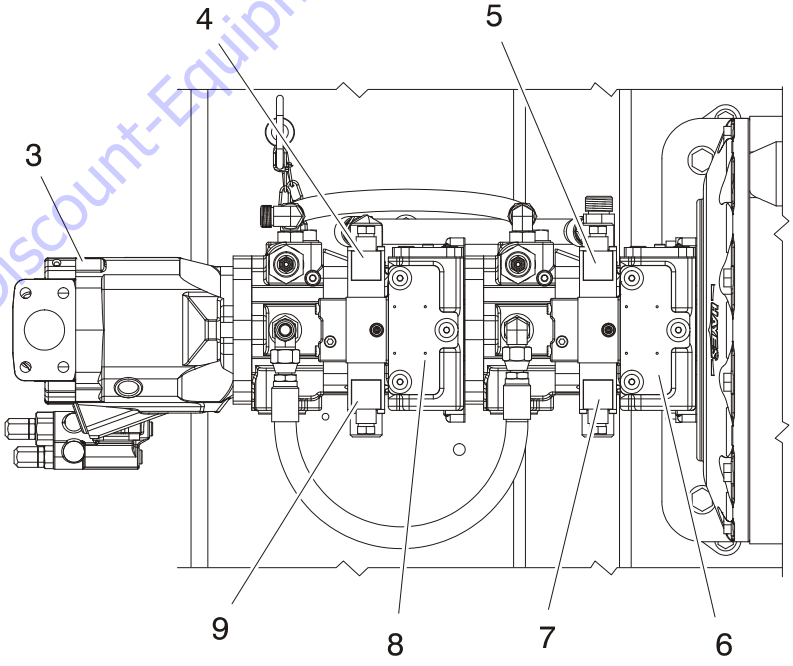


Figure 5-81. Drive & Function Pumps

5.10 FUNCTION PUMP

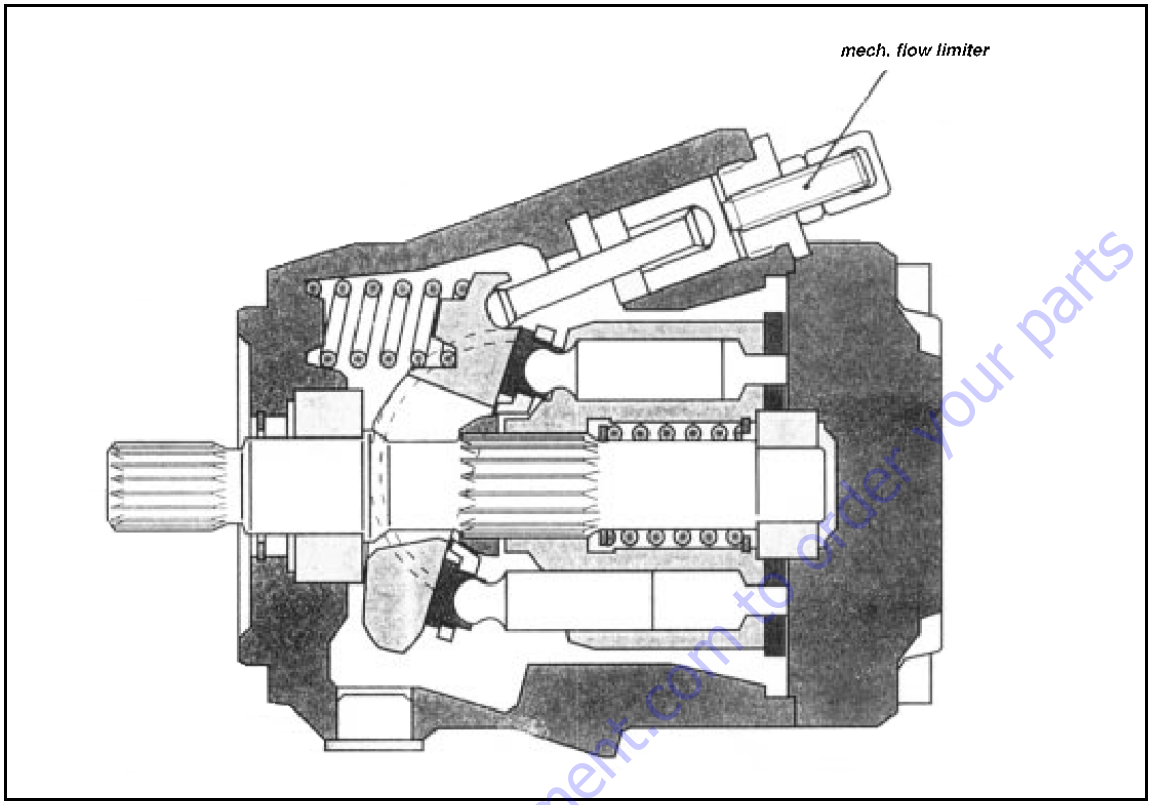
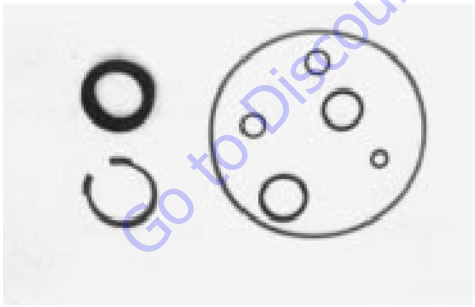


Figure 5-82. Function Pump - Sectional View

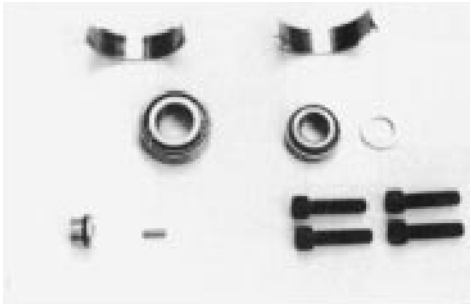
Spare Parts

1. Sealing kit, existing spare parts: shaft sealing ring, o-rings, and a circlip.

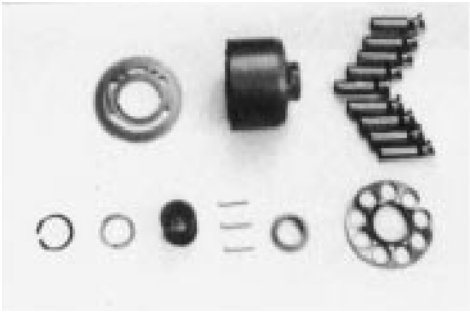


2. Drive Shaft

3. Bearing set, miscellaneous parts.

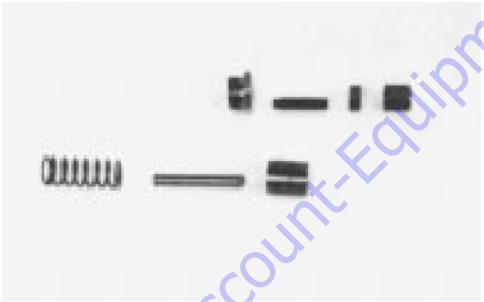


4. Rotary Group complete: 9 pistons, cylinder subassembly, valve plate, retaining plate, and retaining ball.



5. Swash Plate.

6. Parts of the control valve: control piston, piston rod, plug, spring stopper max flow, hex nut, and hex head nut.



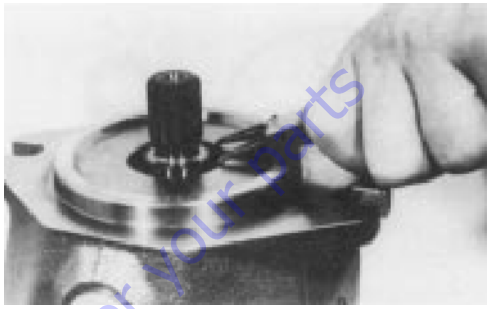
7. DFR pilot valve.

Sealing the Drive Shaft

NOTICE

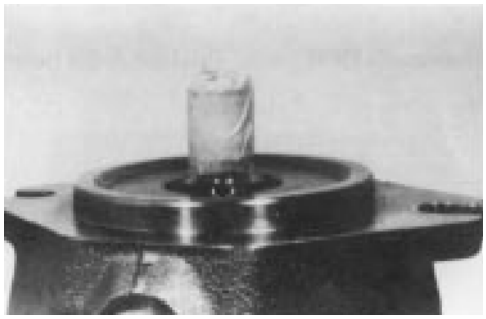
BE VERY CAREFUL SO THE DRIVE SHAFT IS NOT DAMAGED DURING THE REMOVAL OF THE SHAFT SEALING RING.

1. Remove the snap ring.



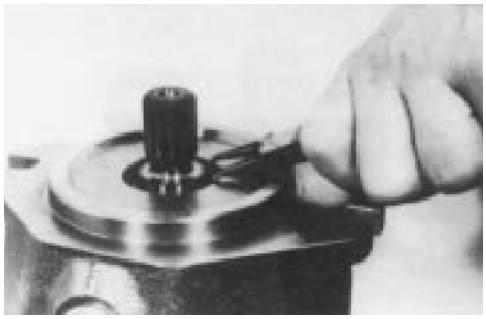
2. Change the shaft seal and check its' sliding surface (drive shaft) and housing. Grease the sealing ring.

3. Be careful while you seal the drive shaft. Use an adhesive tape to prevent the shaft splines from damaging the seal.



4. Assemble the sealing ring, fitting tool holds the correct position of the sealing ring in the pump housing.

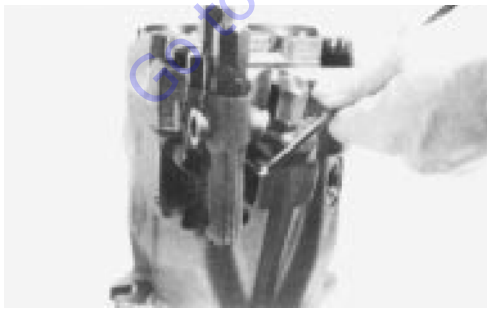
5. Assemble the snap ring.



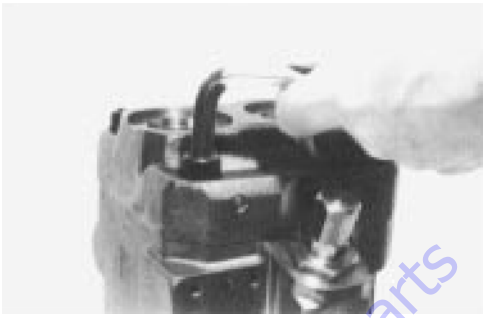
6. Assemble the snap ring in the correct position.

Disassembly and Assembly of the Complete Unit

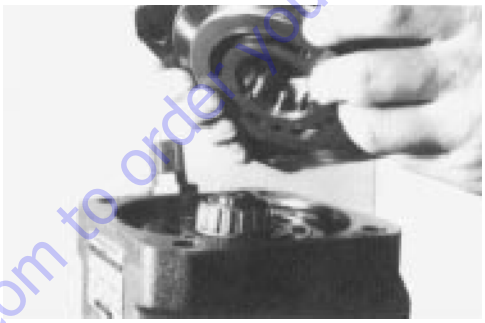
1. Disassemble the pilot valve.



2. Mark the position of the port plate and remove the socket screw of the port plate.



3. Remove the port plate together with the valve plate (hold the valve plate so the plate can't fall down).

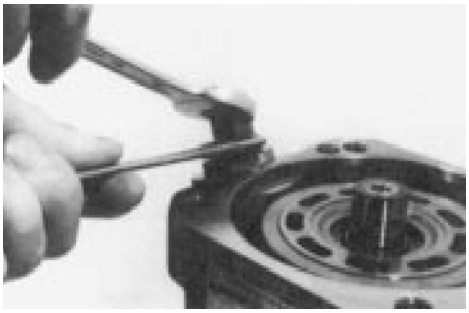


4. Remove the o-ring.

5. Disassemble the taper roller bearing (nearby port plate).

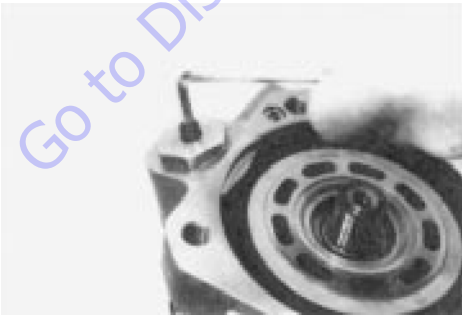
6. Remove the adjustment shim.

7. Unscrew the cap nut and remove it.



8. Loosen the fixing nut of the stopper max flow and disassemble it.

9. Turn in the stopper max flow to get swivel angle zero.



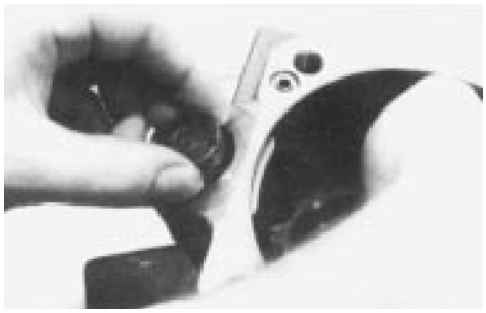
10. Disassemble the rotary group in horizontal position.

11. Disassemble the stopper max flow.

12. Remove the threaded pin.

13. Disassemble the plug.

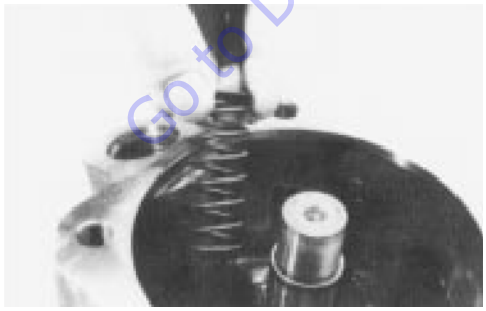
14. Disassemble the control piston while moving the swash plate.



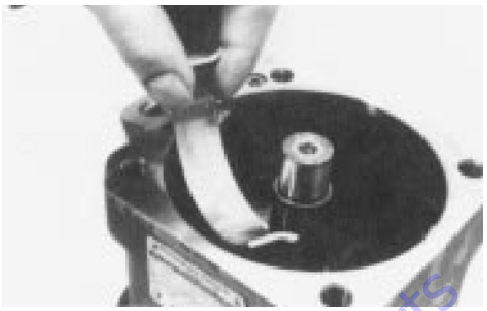
15. The swash plate must be lifted a little bit to disassemble the piston rod.

16. Remove the swash plate.

17. Remove the spring.



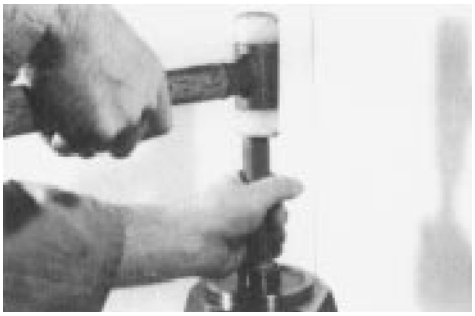
18. Remove both bearing shells.



19. Remove the drive shaft.

20. Disassemble the snap ring.

21. Disassemble the sealing ring.



22. The external front bearing ring is pulled out of the pump housing.

23. Remove the o-ring. Lifting of the valve plate isn't shown.

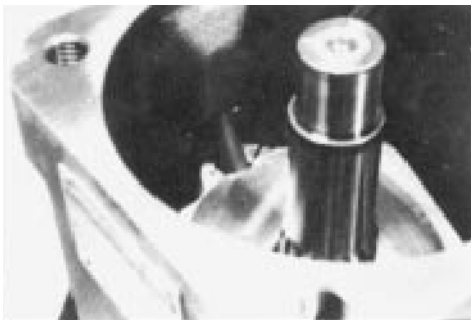
24. A bearing puller is used to disassemble the external bearing ring of the taper roller bearing inside the port plate. Take care of the surface of the port plate.

25. The spring has additional pretension while you disassemble the three pressure pins inside the cylinder.

Assembly

1. Measurement of the taper roller bearing pretention.

2. Ensure there is a correct connection of the piston rod and the swash plate.



3. Pumps clockwise driven must have a position of the valve plate 4 degrees out of center in the same direction decentered like drive direction.

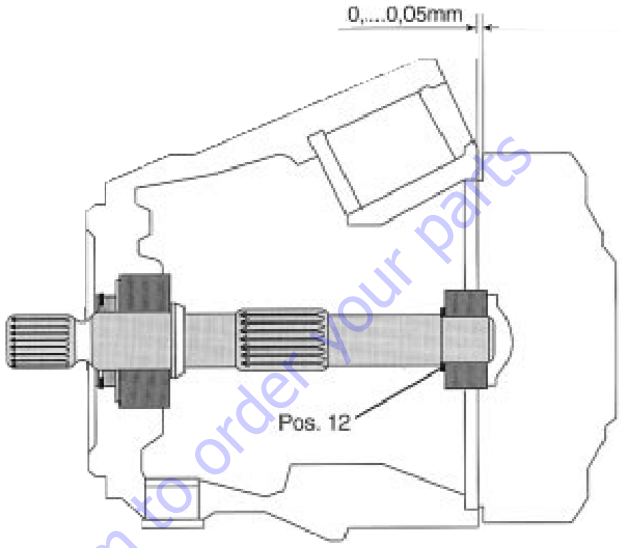
4. Pumps counterclockwise driven must have a position of the valve plate 4 degrees decentered in the ccw position.

5. Note the correct position of the drilling that connects high pressure to the control valve. Check control valve drilling position at the pump housing and fit together.

Adjustments

TAPER ROLLER BEARING INITIAL TENSION

Cast Iron pump housing must have initial tension of the bearings: 0 to 0.05 mm.



MECHANICAL FLOW LIMITER

Differential volume if you are rotating the threaded pin - each rotation is approximately 3.1 cm3.

Tightening Torques

For break-off plugs, use Loctite #601.
For all other parts, use Loctite #242.

Table 5-36. Tightening Torques

	M4	M5	M6	M8	M10	M12	M14	M16	M18	M20	M24	M30
8.8	2.3	5.0	8.5	21	41	72	115	176	240	350	600	1220
10.9	3.2	7.2	12	29	58	100	165	250	350	490	840	1670
12.9	4.1	8.5	14.5	35	70	121	195	300	410	590	990	2000

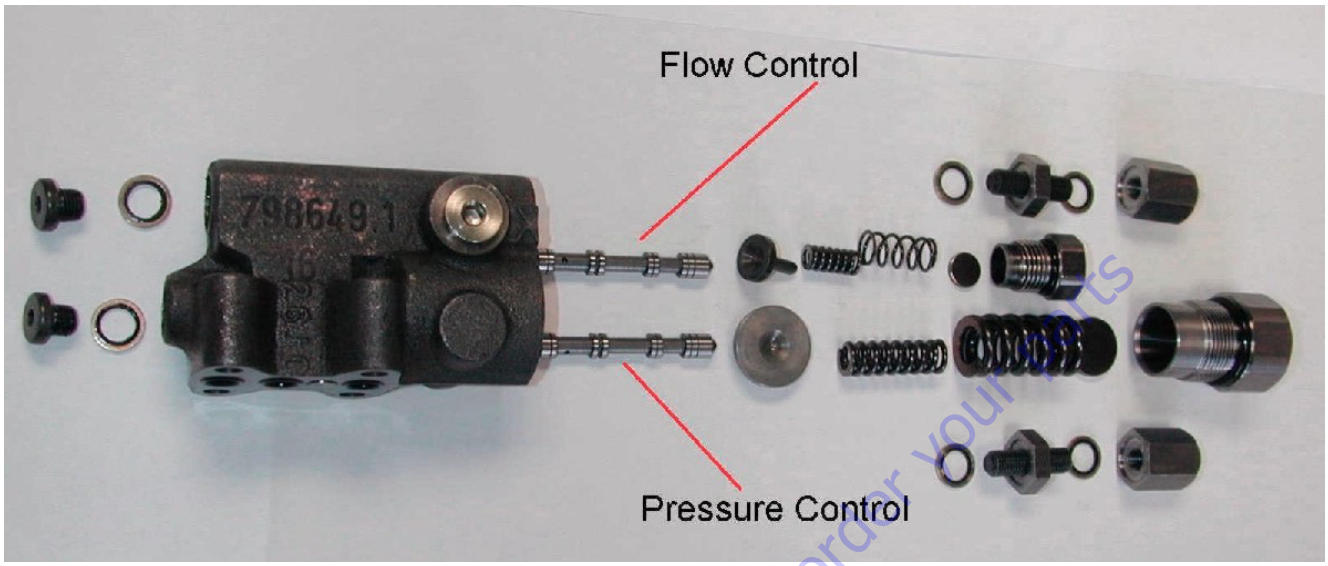


Figure 5-83. Function Pump, Pressure and Flow Control - Sheet 1

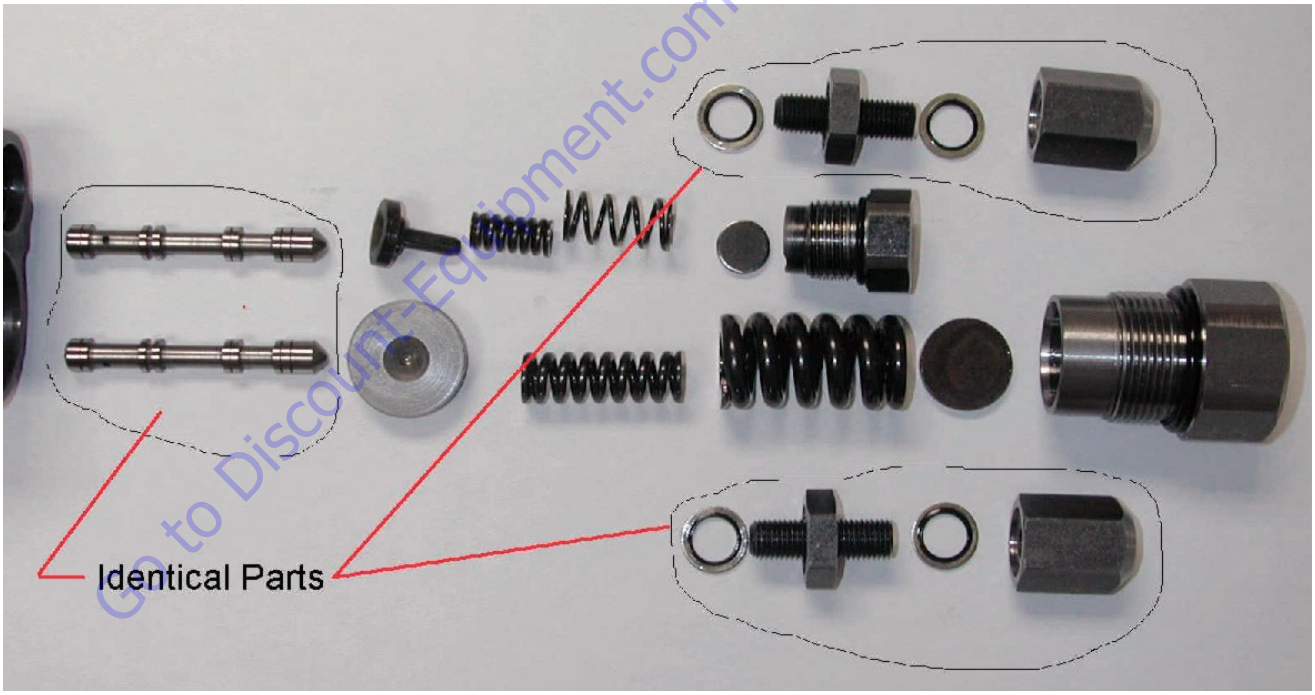


Figure 5-84. Function Pump, Pressure and Flow Control - Sheet 2

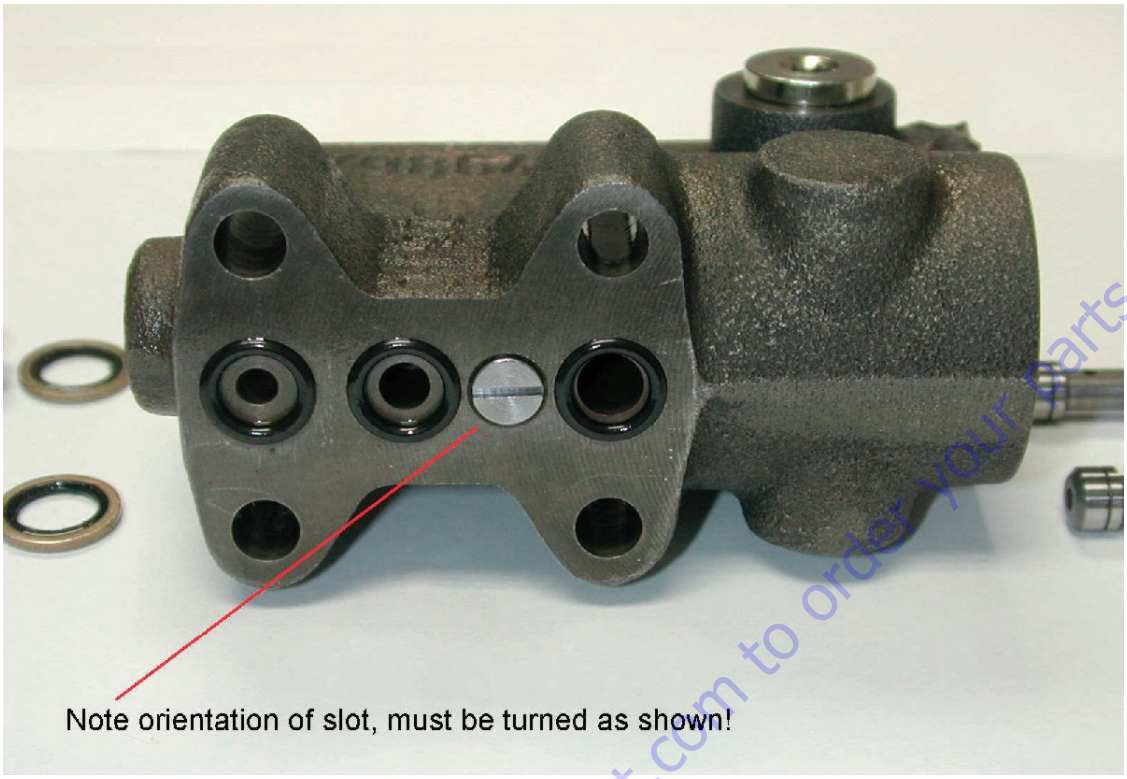


Figure 5-85. Function Pump, Pressure and Flow Control - Sheet 3

Pump Control Disassembly For Cleaning

NOTE: If the Function Pump does not perform correctly after following pre-start procedures, it is possible that a contaminate particle has lodged in the pump control preventing proper operation. The pump control's internal parts are not provided as spare parts due to the close tolerances required between the mating parts. However, the control can be disassembled, cleaned and placed back in service should the only problem prove to be contamination. Disassembly, inspection, cleaning and reassembly MUST BE done in a clean well-illuminated area.

Pump Control removal:

1. Disconnect plug the hose attached to the pump control Port "X".
2. Remove the four (4) socket head capscrews that attach the control to the pump. Insure that the three (3) "0"-rings are also removed with the control.
3. Hydraulic fluid may drip from the pump. Wiping the surface clean and installing some adhesive tape should prevent oil from seeping from the pump control.
4. Work on a clean, lint free area.

NOTE: *The pump control can be equipped with either O-rings or a sealing plate. These components are NOT interchangeable.*

5. Remove three (3) 0-rings (Parker # 2-011, Viton 90 shore) or the sealing plate.
6. Remove both the adjustment hex caps and bonded seal rings. (17 mm wrench)
7. Remove both the adjustment lock nuts and bonded seal rings. (17 mm wrench)
8. Remove both the adjusting screws. (3-mm Allen wrench)
9. Remove spring cover hex cap for the "outer" flow regulation adjustment this requires a 19-mm wrench.
10. Remove the spring disc.
11. Remove the adjusting springs (two springs, one "nested" inside the other) and spring follower.
12. The flow regulation spool should slide from the control housing, (a magnet should aid in removal). If it does not, remove the hollow hex head plug at the rear of the flow regulation spool and carefully push the spool from the housing - do not scratch/mar the spool's bore.
13. Remove the spring cover hex cap for the "inner" pressure compensation adjustment – this requires a 30-mm wrench.
14. Remove the spring disc.

15. Remove adjusting springs (two springs, one "nested" inside the other).

16. Remove spring follower. Pressure compensation spool should slide from control housing, (a magnet should aid in removal). If it does not, remove the hollow hex head plug at rear of flow regulation spool. Carefully push spool from housing. Do not scratch/mar spool bore.

NOTE: *Spools are identical.*

17. Wash housing and all parts in a clean JLG approved solvent such as non-chlorinated brake cleaner, Stoddard solvent, etc.

18. Blow off all parts with clean, dry compressed air.

19. Blow out housing with clean compressed air. Inspect housing for contamination or plugged orifices. Clean orifices carefully with a soft steel wire to ensure they are open. Inspect parts for burrs, scoring, debris, etc.

NOTICE

ON CONTROL HOUSING MOUNTING SURFACE, BETWEEN OIL PORTS, IS WHAT APPEARS TO BE A SLOTTED HEAD SCREW. IT IS NOT A SCREW. THIS IS A BLEED ORIFICE, WHICH MUST BE ORIENTATED TO ALLOW PROPER CONTROL OPERATION. THE SLOT IN THE HEAD SHOULD BE ORIENTED TO FALL IN-LINE WITH THE OIL PORTS, NOT PERPENDICULAR TO THE OIL PORTS. IF SLOT IS ORIENTED PERPENDICULAR TO THE THREE PORTS, PUMP PRESSURE WILL NOT RETURN FROM LOAD PRESSURE TO STAND-BY PRESSURE AT THE END OF OPERATING A FUNCTION! PUMP PRESSURE WILL REMAIN AT THE LAST HIGHEST PRESSURE GENERATED.)

20. After all parts are clean and dry, lightly oil a control spool and install in its bore. The spool must slide smoothly and easily within the housing. If it does not, check for contamination. If contamination cannot be found check for "scoring" or "burring" of the control housing. If spool does not slide smoothly & freely, the control must be replaced with a new unit.

21. Lightly oil and check operation of the second spool. The spools are installed correctly when there "pointed" end faces the spring followers

22. Re-assemble in reverse order.

23. Bench set the pressure adjustments as described in "C. 4" of the Operating Instructions.

NOTE: *The pump control can be equipped with either O-rings or a sealing plate. These components are NOT interchangeable.*

24. Re-install Function Pump. Ensure 0-rings or sealing plate are installed properly. Tighten four (4) M6 socket head capscrews to 105 in-lb.

5.11 DRIVE & FUNCTION PUMP START UP

Start-Up Procedure

The machine utilizes a Triple Combination Pump coupled to the Deutz diesel engine. Pumps are connected in-line to each other as follows:

1. The front hydrostatic transmission pump, or drive pump, is coupled directly to the diesel engine and provides oil flow to operate the machine's right side wheels.

2. The middle hydrostatic transmission pump, or drive pump, is coupled to the back of the front pump and provides oil flow to operate the machine's left side wheels.

3. The third or rear pump is the function pump. It is coupled to the back of the middle pump and provides oil flow to operate the boom, axle, steer and platform functions.

Transmission pumps share some common connections. Each pumps' charge oil suction ports are connected by steel tubing. Discharge oil flows are connected and flow to a common charge pump inline oil filter. Cleaned & filtered oil flows back to the transmission pumps "G" ports. Case drain ports are connected (T1 & T2), oil flow from the middle pumps T1 port also provides flows to the oil cooler.

The charge pumps oil pressure is regulated by a single boost oil pressure relief valve installed in the middle pump. The front pump has an orifice cartridge (0.047" diameter) installed in place of a charge oil pressure relief cartridge. This insures that only one valve controls charge pressure & provides an amount of charge oil flow to the front pump's case to insure flushing & removal of hot oil.

Each pump has its own separate electrical proportional directional control valve to control oil flow and direction. The signals or command values to each pump are similar except when steering. During steering and propel of the machine the pump supplying oil to the "inside turning radius" has a command less than the pump supplying oil flow to the "outside turning radius" pump.

"Posi-Traction" control, front to rear on a given side of the machine, is accomplished by a flow divider/combiner cartridge installed in the Traction Control Manifold. There is a flow divider/combiner for each side. Each flow divider/combiner also has a "bleed orifice" to limit the amount of flow splitting or combining.

The middle transmission pump also supplies oil to a hot oil flushing valve cartridge, #120, in the Traction Control Manifold. This cartridge provides a means to obtain brake release oil pressure. The brake release pressure is controlled by a pressure relief valve cartridge # 130 and a solenoid operated brake release directional control cartridge, #170, also located in the Traction Control Manifold.

NOTICE

BRAKE RELEASE OIL PRESSURE MUST BE SET 25 PSI (1.7 BAR) BELOW THE BOOST OIL PRESSURE RELIEF VALVE. IF BRAKE RELEASE PRESSURE IS SET TOO LOW, BRAKE DRAG AND PUMP CONTROL WILL BE AFFECTED. IF SET TOO HIGH, DAMAGE TO THE WHEEL DRIVE PARKING BRAKES COULD RESULT. PRIOR TO START, CONNECT APPROPRIATE PRESSURE GAUGES TO THE UNIT.

FOR START-UP OF NEW OR OVERHAULED INSTALLATIONS:

1. Insure all electrical checks have been performed & the machine is set up correctly with the JLG Analyzer.
2. Insure the machine has all four wheels jacked & blocked off the ground per JLG procedures.
3. Ensure the triple pump assembly is installed and connected correctly per the hydraulic circuit diagram.
4. Disconnect the electrical connector from the diesel's throttle actuator, to prevent engine start.
5. Crank the engine until charge pressure reaches 50 psi or more.
6. Re-connect throttle actuator electrical connector and start engine. Allow engine to run at idle speed only for at least 5 minutes. This will allow the hydrostatic system to filled.
7. Listen for any abnormal noises.
8. Check for oil leaks.
9. Check charge pressure (500 psi +50psi, - 0 psi [34.4 bar +3.4 bar, - 0 bar]). Pressure can be measured at pump ports Ma & Mb or by “teeing” into the inlet for the charge oil filter. Charge pressure is checked with the joystick in neutral. A 0-1000 psi (0-70 bar) pressure gauge must be used. (If pressure gauges were installed in Ma & Mb to check charge pressure, disconnect the gauges installed in Ma & Mb, as they will be damaged if loop pressure rises above 1000 psi [34.4 bar].)
10. Operate drive system in “turtle mode”, forward and reverse.
11. De-aerate system by bleeding fluid from Ma & Mb ports.
12. Switch drive mode speed control from “turtle” to “rabbit”. Gradually increase drive speed forward & reverse, still with no load - wheels off the ground.
13. With joystick in neutral, check for creep in neutral. If evident, most likely dirt is present in the proportional pump control, an incorrect electrical signal is present on the pump's electrical control(s), or the control was not centered properly when overhauled. See service manual for centering instructions.
14. Check controls are connected so transmissions operate in correct direction related to control input.
15. Continue to monitor all pressure gauges & correct any irregularities.
16. Remove brake coil (leaving electrical connection intact) from brake release solenoid cartridge located on the Traction Manifold.

NOTE: *This disables machine's ability to release brakes.*

17. Stroke transmission pumps slightly (less than 20%) and check the setting of the high pressure cross port relief valves. Setting should be 5000 psi +50 psi, - 0 psi (344.7 bar +3.4 bar, -0 bar). Install 0-6000 psi (0 - 415 bar) gauges on Pump ports Ma & Mb.
18. Check oil level & temperature.
19. Remove and inspect charge pressure oil filter. Replace with new element.
20. Operate transmission under no load conditions for about 15 minutes to stabilize temperature and remove any residual air from the fluid.
21. Set machine back on the ground. Operate transmissions under full and normal conditions.
22. Erratic operation may indicate there is still air trapped in the system. By working the pump controls forward and reverse the remaining air can be eliminated. The system is free of air when all functions can be operated smoothly and when the oil in the reservoir is no longer aerated. (Usually less than one hour of operation)

NOTE: *If transmissions do not perform correctly after following pre-start & start-up procedures, refer to relevant sections of the trouble-shooting procedures.*

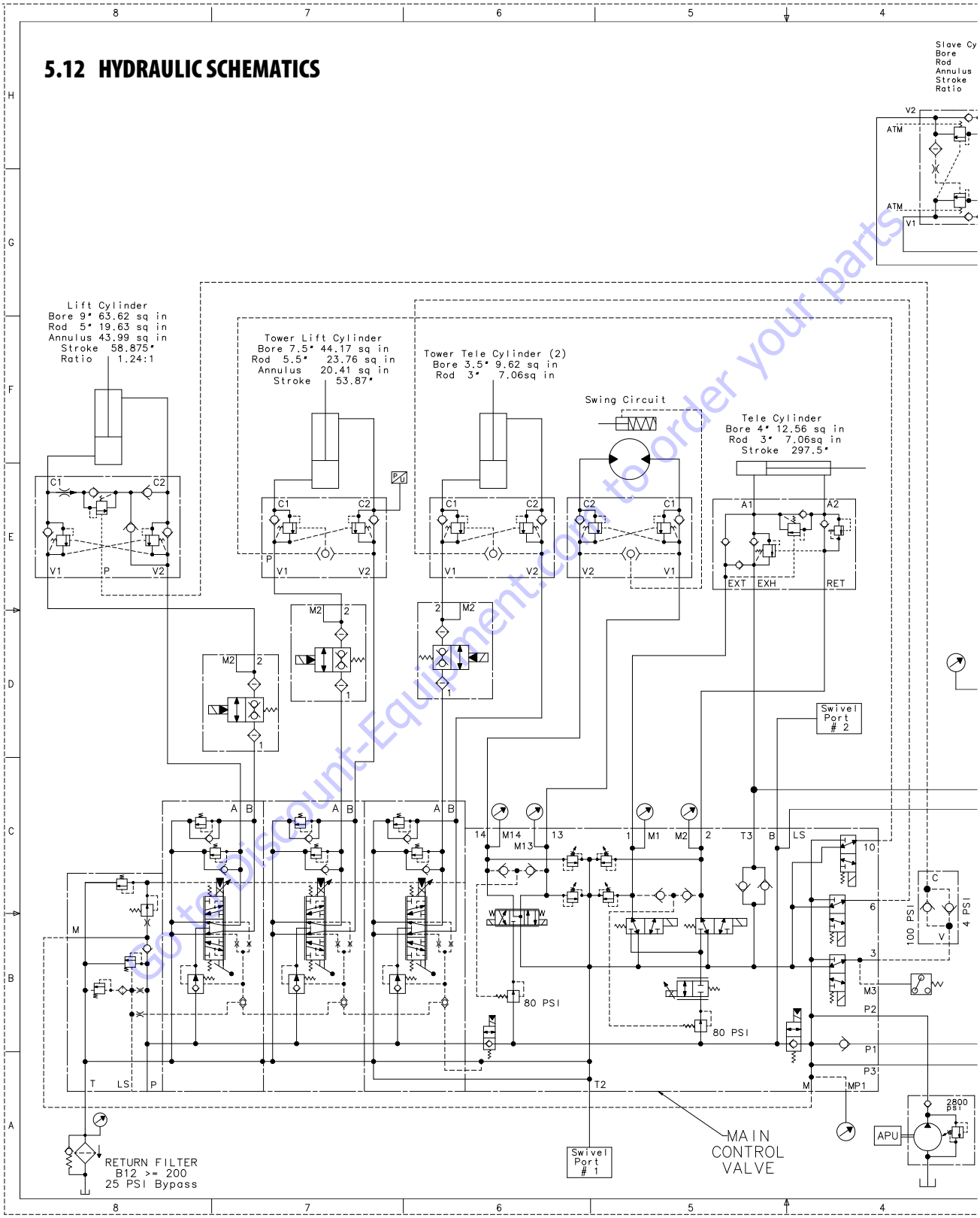


Figure 5-86. Hydraulic Schematic - Sheet 1 of 8

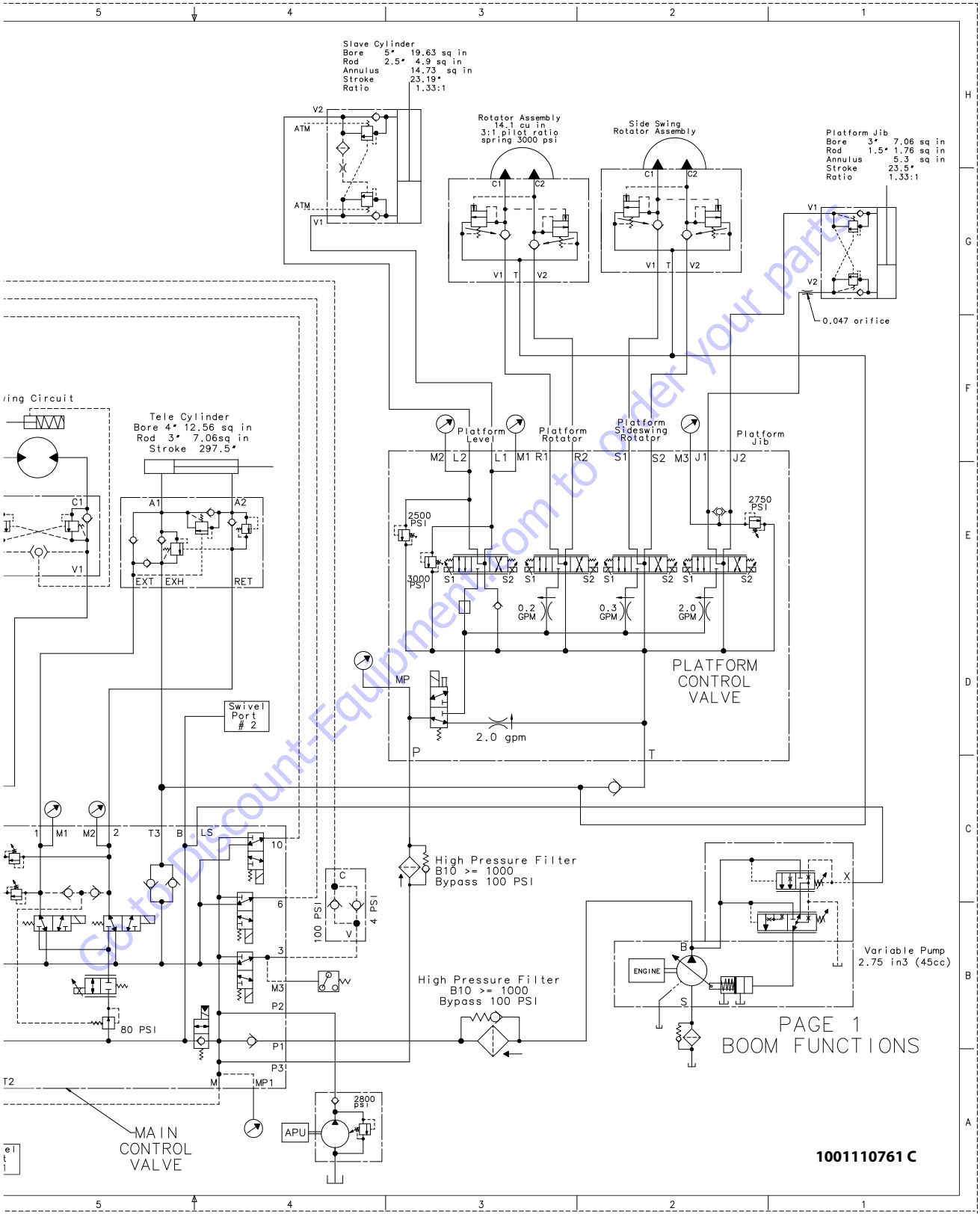


Figure 5-87. Hydraulic Schematic - Sheet 2 of 8

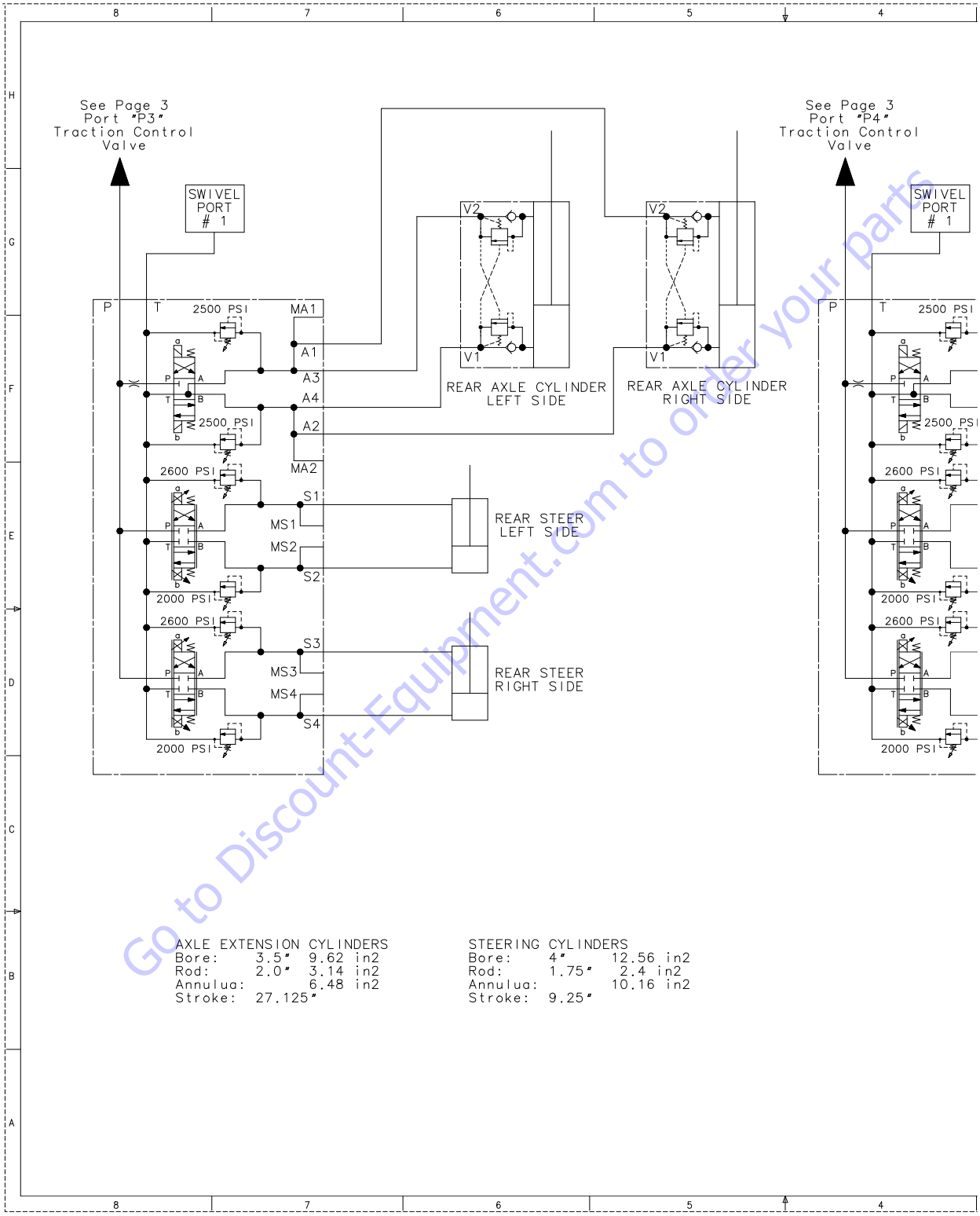


Figure 5-88. Hydraulic Schematic - Sheet 3 of 8

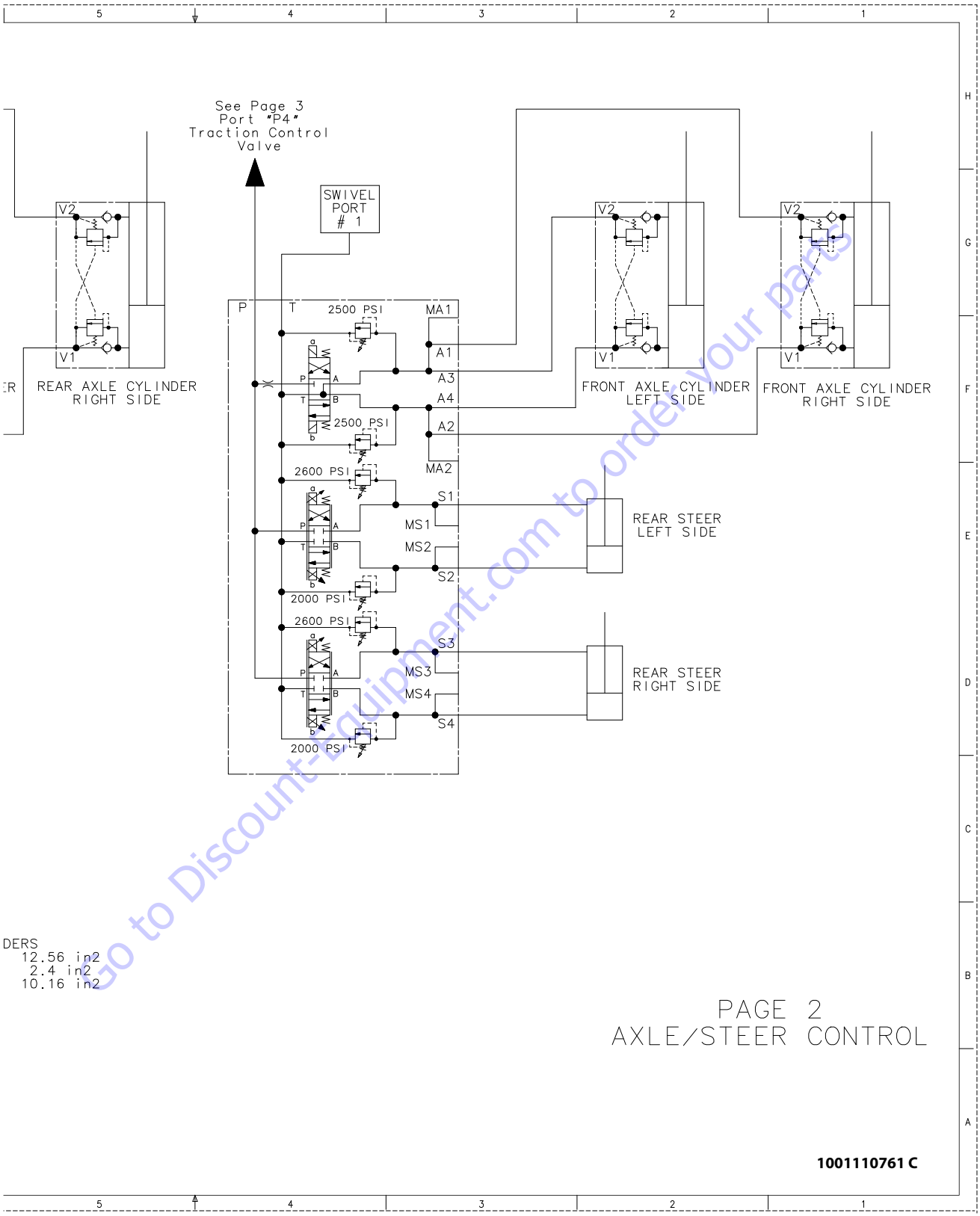


Figure 5-89. Hydraulic Schematic Sheet 4 of 8

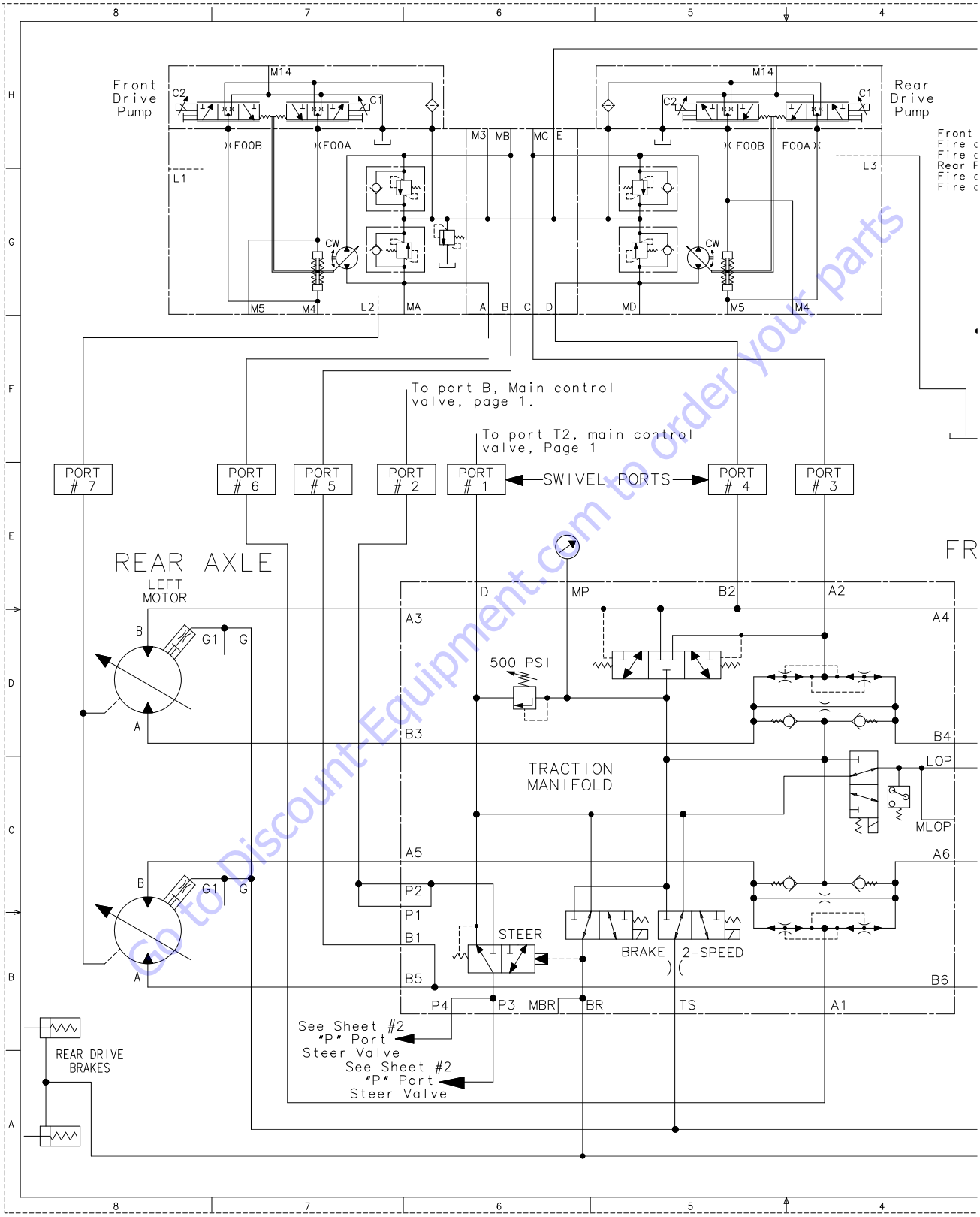


Figure 5-90. Hydraulic Schematic - Sheet 5 of 8

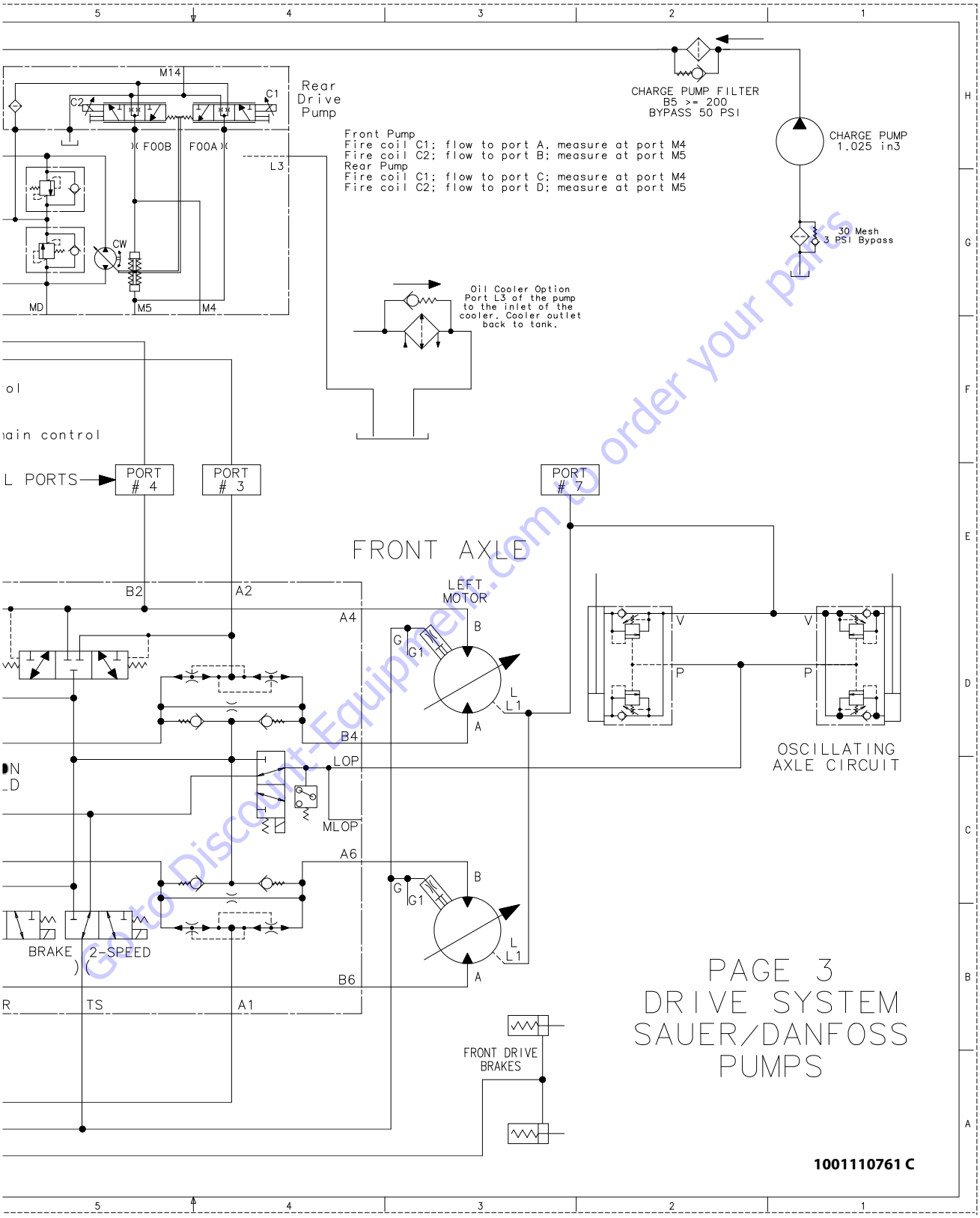


Figure 5-91. Hydraulic Schematic - Sheet 6 of 8

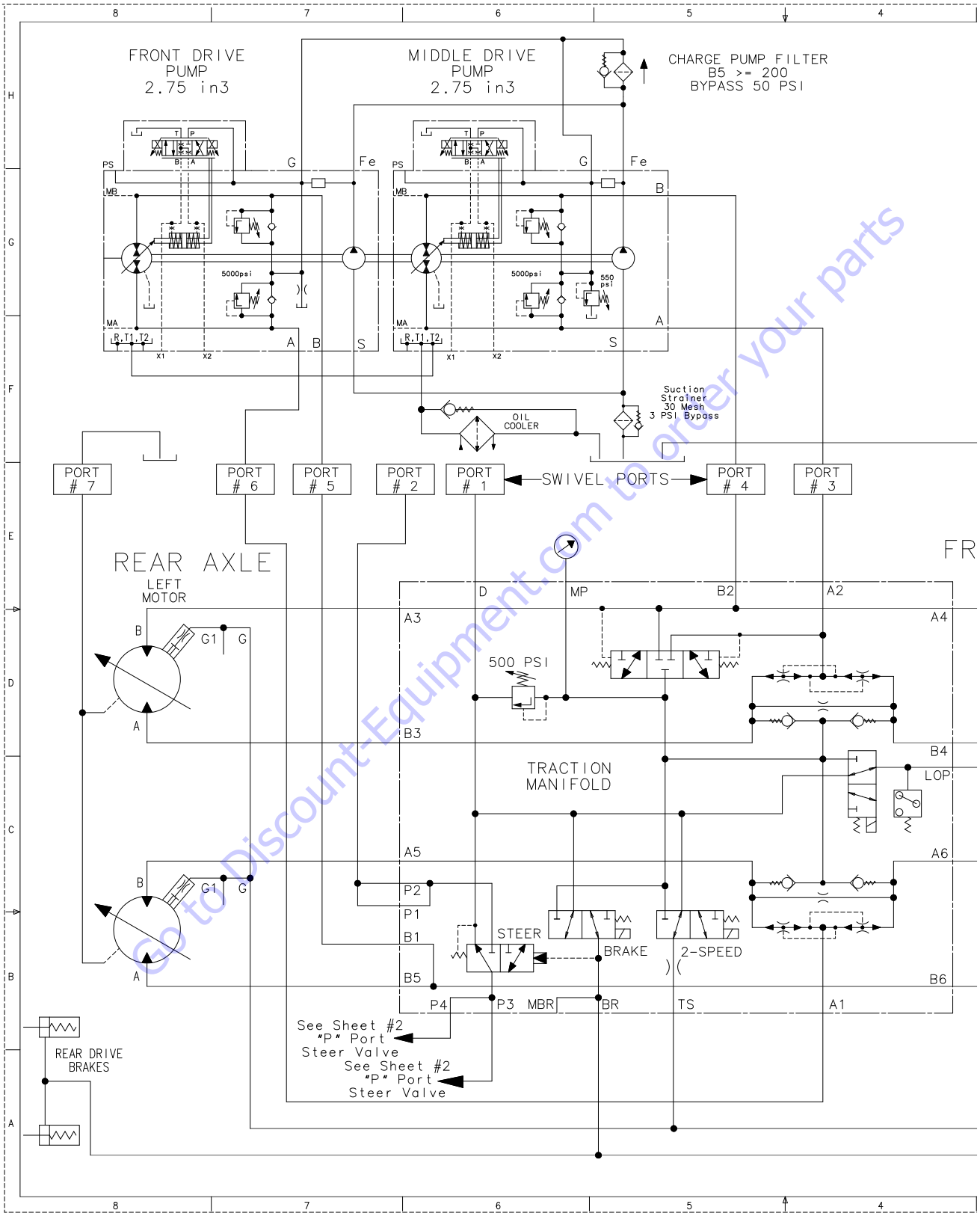


Figure 5-92. Hydraulic Schematic - Sheet 7 of 8

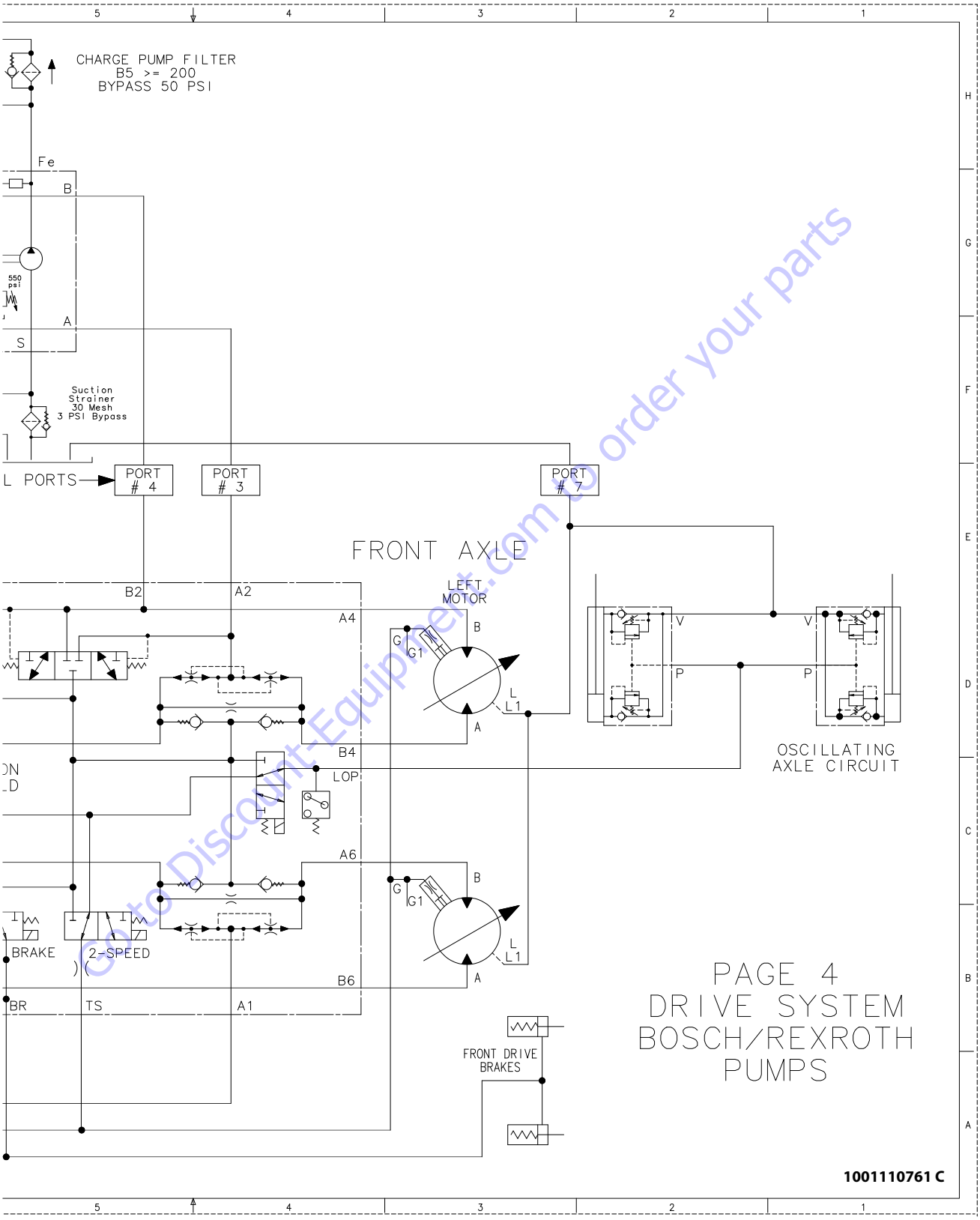
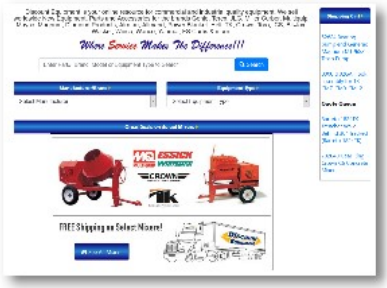


Figure 5-93. Hydraulic Schematic - Sheet 8 of 8

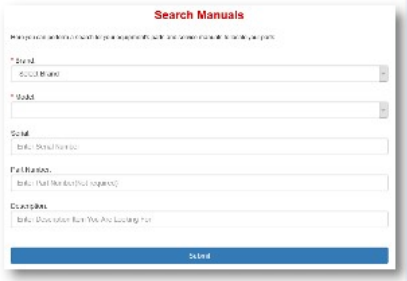
PARTS FINDER

Search Website by Part Number

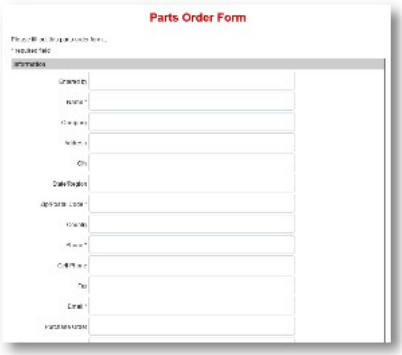
Discount Equipment



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



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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 INTRODUCTION

NOTICE

WHEN INSTALLING ANY NEW MODULE CONTROLLER ON THE MACHINE, IT IS NECESSARY TO PROGRAM THE CONTROLLER FORPROPER MACHINE CONFIGURATION, INCLUDING OPTIONS, AND PROPERLY CALIBRATE THE TILT SENSOR.

NOTICE

IT IS A GOOD PRACTICE TO AVOID PRESSURE-WASHING ELECTRICAL/ELECTRONIC COMPONENTS. IF PRESSURE-WASHING IS USED 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 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 reduces the need for exposed terminal strips, diodes, and trimpots. It 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 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 with a custom designed, direct connect hand held analyzer or wireless adapter using an app on your Android or iPhone/iPad device. The analyzer or wireless output displays two lines of information at a time, by scrolling through the program.

Each module has a label with JLG part number and a serial number containing a date code.

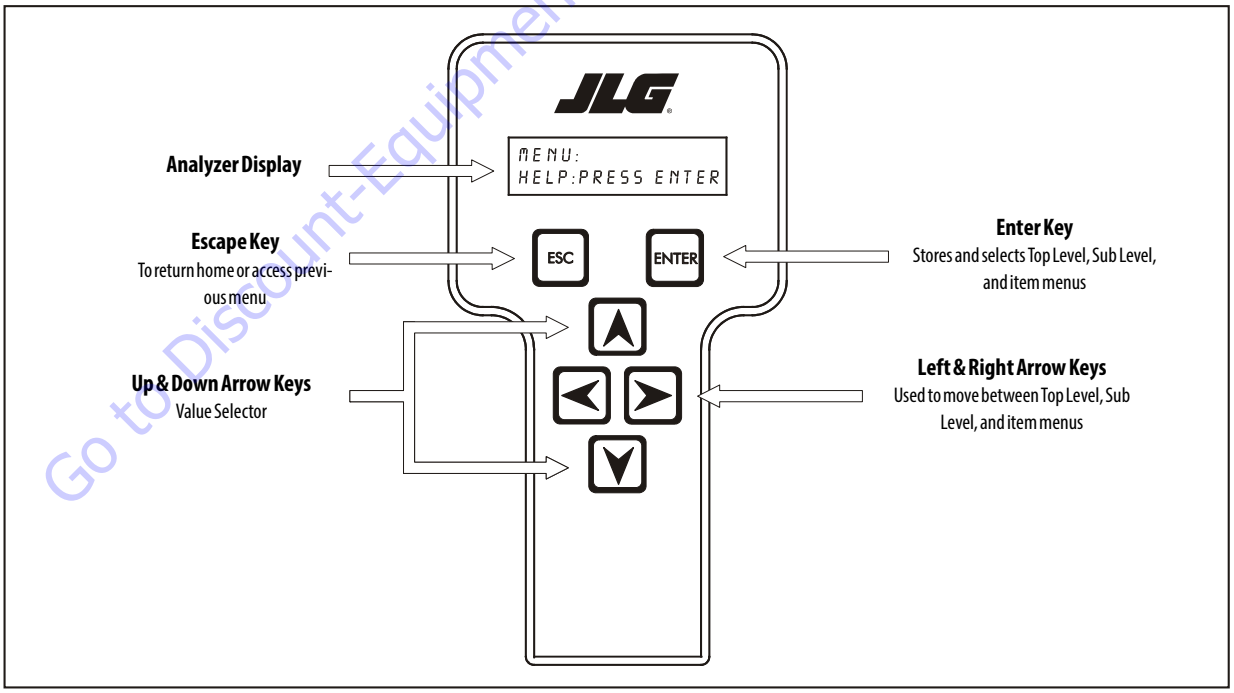


Figure 6-1. Hand Held Analyzer (Analyzer Controls and Display Similar)

Connect the JLG Control System Analyzer

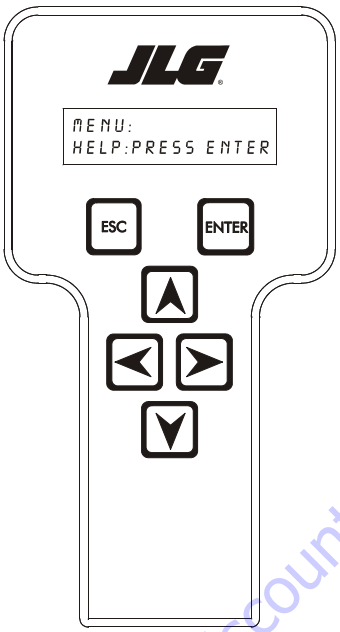
1. Connect the cable supplied with the analyzer, to the controller module located in the platform box or at the controller module in the ground control box and connect the remaining end of the cable to the analyzer.

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

2. Power up the Control System by turning the 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

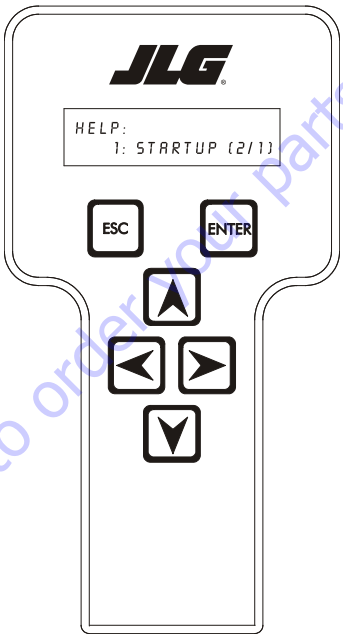
At this point, using the **RIGHT** and **LEFT** arrow keys, you can move between the top level menu items. To select a displayed menu item, press **ENTER**. To cancel a selected menu item, press ESC.; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

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

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

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



LOGGED HELP
1: POWER CYCLE (2/1)

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

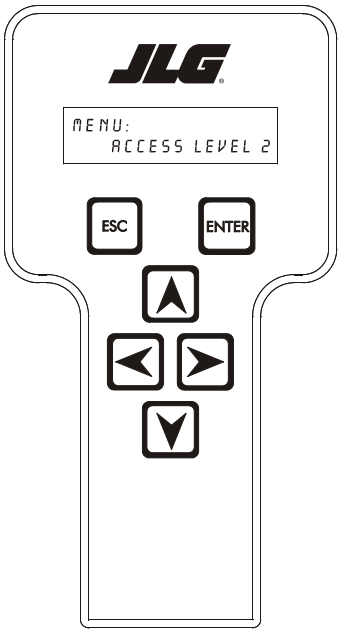
When a top level menu is selected, a new set of menu items may be offered: for example:

DRIVE
BOOM
SYSTEM
DATALOG
VERSIONS

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

Changing Access Level of Hand Held Analyzer

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



MENU:
ACCESS LEVEL 2

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

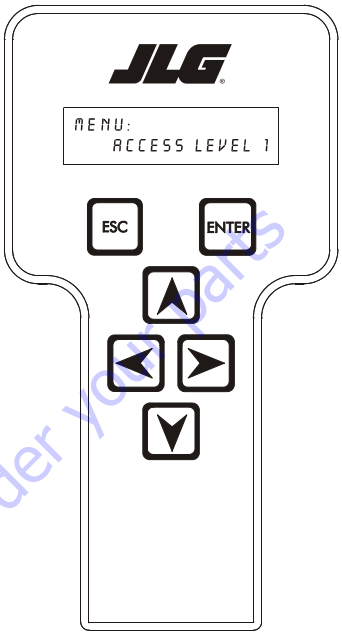
Using the **UP** or **DOWN** arrow keys, enter the first digit of the password, 3.

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

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

Continue using the arrow keys until all the remaining digits of the password is shown.

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

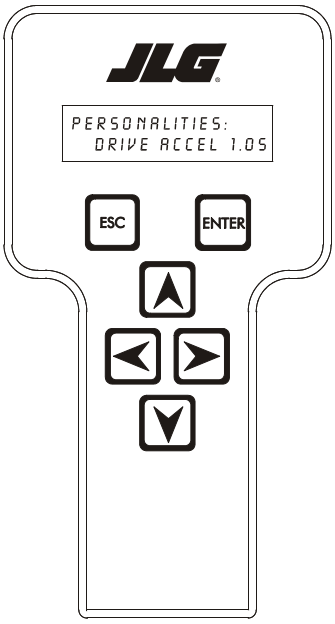


MENU:
ACCESS LEVEL 1

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

Adjusting Parameters Using Hand Held Analyzer

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

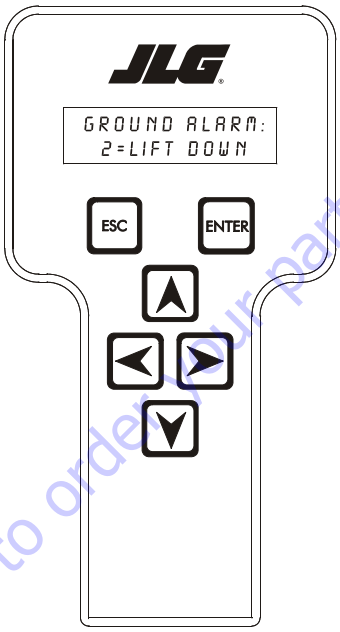


PERSONALITIES:
DRIVE ACCEL 1.0s

There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP** arrow is pressed when at the maximum value nor will the value decrease if the **DOWN** arrow is pressed and the value is at the minimum value for any particular personality. If the value does not change when pressing the up and 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 = LIFT DOWN

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

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

NOTE: *Refer to Table 6.2, Machine Personality Settings and Function Speeds in this Service Manual for the recommended factory settings.*

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

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

ELEVATION CUTBACK

⚠ WARNING

CHANGING THIS SETTING MAY ADVERSELY AFFECT PERFORMANCE OF YOUR MACHINE.

Table 6-1. Analyzer Abbreviations

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

Table 6-1. Analyzer Abbreviations

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

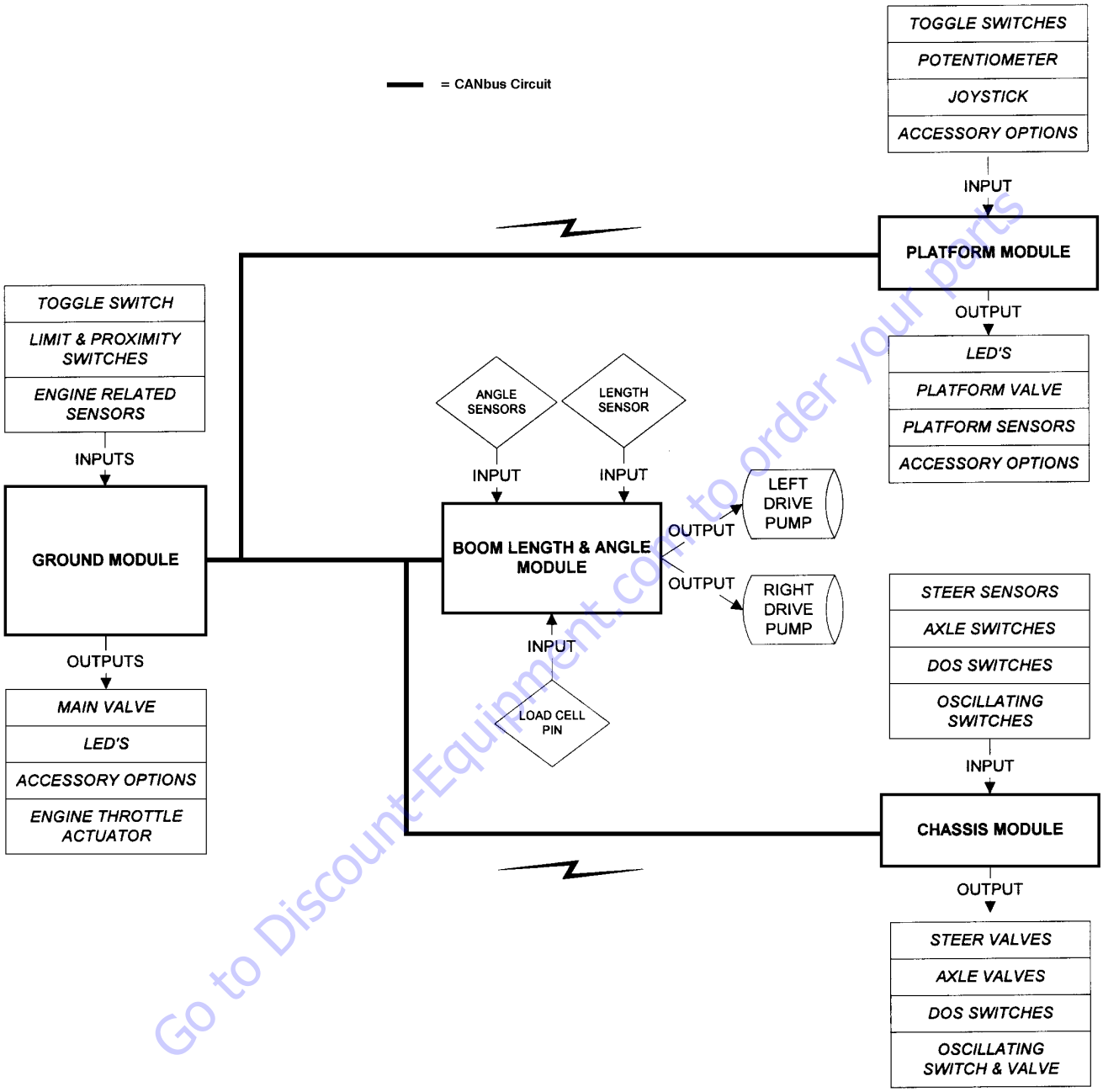


Figure 6-2. Control System Block Diagram

Table 6-2. Machine Configuration Programming Information - Version P7.24

Configuration Digit	Number	Description	Default Number
NOTE: *The machine configuration must be completed before any personality settings can be changed. Changing the personality settings first and then changing the model number of the machine configuration will cause the personality settings to return to default*			
MODEL NUMBER: 1	**1**	**1200S**	**1**
	2	1250A	
	3	1350S	
	4	1100S	
ENVELOPE HEIGHT: 2	1	1350S: 135' MAX	**5**
	2	1350S: 125' MAX	
	3	1350S: 120' MAX	
	4	1350S: 110' MAX	
	5	**1200S: 120' MAX**	
	6	1200S: 110' MAX	
	7	1250A: 125' MAX	
	8	1250A: 100' MAX	
	9	1250A: 80' MAX	
	10	1100S: 110' MAX	
Note: The default settings (bold) will vary depending on the model selection with selection # 5 being the initial default setting.			
MARKET: 3	**0**	**ANSI USA**	**0**
	1	ANSI EXPORT	
	2	CSA	
	3	CE	
	4	AUSTRALIA	
	5	JAPAN	
ENGINE: 4	1	DEUTZ F4 TIER1: Deutz BF4M1011 Diesel (Tier 1)	**3**
	2	DEUTZ F4 TIER2: Deutz BF4M2011 Diesel (Tier 2)	
	3	**DEUTZ ECM: Engine Control Module**	
	4	CAT ECM: Engine Control Module	
	5	DEUTZ ECM T4F: Engine Control Module (Tier 4 Final)	

Table 6-2. Machine Configuration Programming Information - Version P7.24

Configuration Digit	Number	Description	Default Number
GLOW PLUG: 5	0	NO GLOW PLUGS: No glow plugs installed.	**2**
	1	AIR INTAKE: Glow plugs installed in the air intake on the manifold.	
	2	**IN-CYLINDER: Glow plugs installed in each cylinder.**	
STARTER LOCKOUT: 6	**0**	**DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.**	**0**
	1	ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	
ENGINE SHUTDOWN: 7	0	DISABLED: No engine shutdown.	**1**
	1	**ENABLED: Shutdown engine when coolant temperature is greater than 110 deg. C or oil pressure is less than 8 PSI.**	
FUEL CUTOUT: 8	**0**	**RESTART: Engine allowed to be restarted multiple times when very low fuel is reached.**	**0**
	1	ONE RESTART: Engine allowed to be restarted once for 2 minutes when very low fuel is reached.	
	2	ENGINE STOP: Engine not able to restart when very low fuel is reached.	
* This menu item is only visible if non dual fuel engines are selected.			
CHASSIS TILT: 9	**1**	**5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep.**	**1**
	2	4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep.	
	3	3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep.	
	4	5 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out, and main lift up.	
	5	4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up.	
	6	3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, tower telescope out, drive, main telescope out and main lift up.	
Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.			

Table 6-2. Machine Configuration Programming Information - Version P7.24

Configuration Digit	Number	Description	Default Number
JIB: 10	0 1 **2**	NO: No jib installed. YES: Jib installed. **SIDESWING:Jib with sideswing installed.**	**2**
4WS: 11	0 **1**	NO: 2WS mode enabled. **YES: 4WD drive mode enabled.**	**1**
DRIVE: 12	0 **1**	2WD drive mode enabled. **4WD mode enabled.**	**1**
STOUCH/SKYGUARD: 13	**0** 1 2 3	**NONE: No Soft Touch or SkyGuard system installed.** SOFT TOUCH: Soft Touch only installed. SKYGUARD: Skyguard only installed. BOTH (CUTOUT): Soft Touch and SkyGuard installed.	**0**
GEN SET/WELDER: 14	0 **1** 2	NO: No generator installed. **BELT DRIVE: Belt driven setup.** HYDRAULIC DRIVE: Hydraulic driven setup.	**1**
GEN SET CUTOUT: 15*	**0** 1	**MOTION ENABLED: Motion enabled when generator is ON.** MOTION CUTOUT: Motion cutout in platform mode only.	**0**
* Only visible if Gen Set / Welder Menu selection is not 0.			
H & T LIGHTS: 16	**0** 1	**NO: No head and tail lights installed.** YES: Head and tail lights installed.	**0**

Table 6-2. Machine Configuration Programming Information - Version P7.24

Configuration Digit	Number	Description	Default Number
LOAD SYSTEM: 17*	**0**	**NO: No load sensor installed.**	**0**
	1	WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	2	CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	3	CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF).	
	4	SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main 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.			
LOAD TYPE: 18	0	NON CAN LSS: Non CAN based LSS is installed.	**1**
	1	**CAN LSS: CAN based LSS is installed.**	
FUNCTION CUTOUT: 19*	**0**	**NO: No drive cutout.**	**0**
	1	BOOM CUTOUT: Boom function cutout while driving above elevation.	
	2	DRIVE CUTOUT: Drive cutout above elevation.	
	3	DRIVE CUT E&T: Drive cutout above elevation and tilted.	
* Only visible under certain market selections. * Certain market selections will limit function cutout options or alter default setting.			
GROUND ALARM: 20*	**0**	**NO: No ground alarm installed.**	**0**
	1	DRIVE: Travel alarm sounds when the drive function is active (Option).	
	2	DESCENT: Descent alarm sounds when lift down is active (Option).	
	3	MOTION: Motion alarm sounds when any function is active (Option).	
* Certain market selections will alter default setting.			
OSCILLATING AXLE: 21	0	NO: No oscillating axle system installed.	**1**
	1	**YES: Oscillating axle system installed.**	
DISPLAY UNITS: 22*	**0**	**IMPERIAL: DEG F, PSI, LBS.**	**0**
	1	METRIC: DEG C, KPA, KGS.	
* Certain market selections will alter default setting.			

Table 6-2. Machine Configuration Programming Information - Version P7.24

Configuration Digit	Number	Description	Default Number
LEVELING MODE: 23	0 **1**	LIFT: Platform leveling during lift only. **ALL: Platform leveling during all functions.**	**1**
CLEARSKY: 24	**0** 1	**NO: ClearSky Telematics system not installed.** YES: ClearSky Telematics system installed.	**0**
FUEL TANK: 25	**0** 1 2	**31 Gallon Fuel Tank.** 52 Gallon Fuel Tank. 62 Gallon Fuel Tank	**0**
ALERT BEACON: 26	**0** 1	**OFF for CREEP.** 20 FPS for CREEP.	**0**
TEMP CUTOUT: 27	**0** 1	**NO: Temp Cutout is Disabled.** YES: Temp Cutout is Enabled.	**0**
PLAT LVL OVR CUT: 28	**0** 1	**NO: Platform Level Override will always be functional.** YES: Platform Level Override will only be functional when in Transport.	**0**
HV CONTROL: 29	**0** 1	**NO: Machine is not configured with HV Control.** YES: Machine is configured for HV Control.	**0**
CRIBBING OPTION: 30	**0** 1	**NO: Cribbing Option is disabled.** YES: Cribbing Option is enabled.	**0**
* Only visible under certain market selections.			
WATER IN FUEL SENSOR: 31	**0** 1	**NO: The Water In Fuel Sensor option is not installed.** YES: The Water in Fuel Sensor option is installed.	**0**

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1250AJP	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**2**	**2**	**2**	**2**	**2**	**2**
Envelope Height	**7**	**7**	**7**	**7**	**7**	**7**
Market	**0**	**1**	**2**	**3**	**4**	**5**
Engine	**3**	**3**	**3**	**3**	3	**3**
Glow Plug	0	0	0	0	0	0
	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
Starter Lockout	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Engine Shutdown	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
Fuel Cutout	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
	2	2	2	2	2	2
Tilt	**1**	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
	3	3	3	3	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	6	6	6	6	6	6
Jib	0	0	0	0	0	0
	1	1	1	1	1	1
	2	**2**	**2**	**2**	**2**	**2**
4 Wheel Steer	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
Drive Type	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
Soft Touch\Skyguard	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
Gen Set / Welder	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
	2	2	2	2	2	2
Gen Set Cutout	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Head & Tail lights	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Load System	**0**	**0**	**0**	0	**0**	0
	X	***1***	X	X	X	**1**
	X	2	X	**2**	***2***	2
	X	3	X	3	X	3
	X	4	X	X	X	4
Load Type	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**

1250AJP	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Function Cutout	**0**	**0**	**0**	0	**0**	**0**
	X	1	1	**1**	1	1
	X	2	2	X	2	2
	X	3	3	X	3	3
Ground Alarm	**0**	**0**	0	0	**0**	0
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	**3**	**3**	3	**3**
Oscillating Axle	0	0	0	0	0	0
	1	**1**	1	1	1	1
Display Units	**0**	**0**	0	0	0	0
	1	1	**1**	**1**	**1**	**1**
Leveling Mode	0	0	0	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
Clearsky	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Fuel Tank	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
	2	2	2	2	2	2
Alert Beacon	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Temp Cutout	X	**0**	X	**0**	X	X
	X	1	X	1	X	X
Plat Lvl Ovr Cut	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
HV Control	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Cribbing Option	**0**	X	X	X	X	X
	1	X	X	X	X	X
Water In Fuel Sensor	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1

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

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6.2 MACHINE PERSONALITY SETTINGS AND FUNCTION SPEEDS

NOTE: *Personality settings can be adjusted within the allowed range in order to achieve optimum machine performance.*

Table 6-3. Machine Personality Settings and Speeds

Submenu (Displayed on Analyzer 1st Line)	Parameter (Displayed on Analyzer 2nd Line)	Description	Range	DEFAULT VALUES	TIME RANGE (SEC) (SEE Section FOR MACHINE ORIENTATION WHENSETTING SPEEDS)
DRIVE:					
	ACCEL X.Xs	Displays/adjusts drive acceleration	0.1 to 5.0 sec	2.0	
	DECEL X.Xs	Displays/adjusts drive deceleration	0.1 to 3.0 sec	1.3	
	MIN forward XX%	Displays/adjusts minimum forward drive speed	0 to 35%	1	
	MAX forward XXX%	Displays/adjusts maximum forward drive speed	0 to 100%	100	40-48 (see orientation)
	MIN reverse XX%	Displays/adjusts minimum reverse drive speed	0 to 35%	1	
	MAX reverse XXX%	Displays/adjusts maximum reverse drive speed	0 to 100%	100	
	ELEV. MAX XX%	Displays/adjusts maximum drive speed NOTE: used when elevation cutout switches are limiting maximum speed	0 to 50%	25	93-104 (see orientation)
	CREEP MAX XX%	Displays/adjusts maximum drive speed NOTE: used when creep switch on pump pot is active	0 to 50%	35	79-87 (see orientation)
STEER:					
	max SPEED XXX%	Displays/adjusts maximum steer speed.	0 to 100%	100	
MAIN LIFT:					
	ACCEL X.Xs	Displays/adjusts main lift acceleration	0.1 to 5.0 sec	1.0	
	DECEL X.Xs	Displays/adjusts main lift deceleration	0.1 to 3.0 sec	1.0	
	MIN Up XX%	Displays/adjusts minimum main lift up speed	0 to 60%	1	
	MAX UP XX%	Displays/adjusts maximum main lift up speed	0 to 60%	60	57-69 (see orientation)
	CREEP UP XX%	Displays/adjusts maximum main lift up speed NOTE: used when creep switch on pump pot is active	0 to 65%	35	
	MIN DOWN XX%	Displays/adjusts minimum main lift down speed	0 to 60%	1	
	MAX DOWN XXX%	Displays/adjusts maximum main lift down speed	0 to 60%	60	59-70 (see orientation)
	CREEP DOWN XX%	Displays/adjusts maximum main lift down speed NOTE: used when creep switch on pump pot is active	0 to 75%	35	

Table 6-3. Machine Personality Settings and Speeds

SWING:					
	ACCEL X.Xs	Displays/adjusts swing acceleration	0.1 to 5.0 sec	2.0	
	DECEL X.Xs	Displays/adjusts swing deceleration	0.1 to 3.0 sec	1.5	
	MIN LEFT XX%	Displays/adjusts minimum swing left speed	0 to 50%	20	
	MAX LEFT XXX%	Displays/adjusts maximum swing left speed	0 to 65%	73	102-146 (see orientation)
	CREEP LEFT XX%	Displays/adjusts maximum swing left speed NOTE: used when creep switch on pump pot is active	0 to 65%	45	
	MIN RIGHT XX%	Displays/adjusts minimum swing right speed	0 to 50%	20	
	MAX RIGHT XXX%	Displays/adjusts maximum swing right speed	0 to 65%	65	102-146 (see orientation)
	CREEP RIGHT XX%	Displays/adjusts maximum swing right speed NOTE: used when creep switch on pump pot is active	0 to 65%	45	
TOWER LIFT:					
	ACCEL X.Xs	Displays/adjusts tower lift acceleration	1.0 to 1.0 sec	1.0	
	DECEL SLOW-FAST	Displays/adjusts tower lift deceleration	Slow, Medium, Fast	0.5	
	MIN Up XX%	Displays/adjusts minimum tower lift up speed	1 to 1%	1	
	MAX UP XX%	Displays/adjusts maximum tower lift up speed	60 to 60%	60	105-119 (see orientation)
	MIN DOWN XX%	Displays/adjusts minimum tower lift down speed	1 to 1%	1	
	MAX DOWN XXX%	Displays/adjusts maximum tower lift down speed	60 to 60%	60	108-122 (see orientation)
MAIN TELESCOPE:					
	ACCEL X.Xs	Displays/adjusts main telescope acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts main telescope deceleration	0.1 to 3.0 sec	0.5	
	MIN IN XX%	Displays/adjusts minimum main telescope in speed. Same as Creep speed	0 to 65%	40	
	MAX IN XXX%	Displays/adjusts maximum main telescope in speed	0 to 100%	85	35-54 (see orientation)
	MIN OUT XX%	Displays/adjusts minimum main telescope out speed. Same as Creep speed	0 to 65%	40	
	MAX OUT XXX%	Displays/adjusts maximum main telescope out speed	0 to 100%	85	29-49 (see orientation)
TOWER TELESCOPE:					
	ACCEL X.Xs	Displays/adjusts tower telescope acceleration	1.0 to 1.0 sec	1.0	
	DECEL X.Xs	Displays/adjusts tower telescope deceleration	0.5 to 0.5 sec	0.5	
	MIN IN XX%	Displays/adjusts minimum tower telescope in speed. Same as Creep speed	1 to 1%	1	
	MAX IN XXX%	Displays/adjusts maximum tower telescope in speed	60 to 60%	60	
	MIN OUT XX%	Displays/adjusts minimum tower telescope out speed. Same as Creep speed	1 to 1%	1	
	MAX OUT XXX%	Displays/adjusts maximum tower telescope out speed	60 to 60%	60	

Table 6-3. Machine Personality Settings and Speeds

BASKET LEVEL:					
	ACCEL X.Xs	Displays/adjusts basket level acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts basket level deceleration	0.1 to 3.0 sec	0.5	
	MIN UP XX%	Displays/adjusts minimum basket level up speed. Same as Creep speed	0 to 65%	40	
	MAX UP XXX%	Displays/adjusts maximum basket level up speed	0 to 100%	70	
	MIN DOWN XX%	Displays/adjusts minimum basket level down speed. Same as Creep speed	0 to 65%	40	
	MAX DOWN XXX%	Displays/adjusts maximum basket level down speed	0 to 100%	70	
BASKET ROTATE:					
	ACCEL X.Xs	Displays/adjusts basket rotate acceleration	0.1 to 5.0 sec	1.0	
	DECEL X.Xs	Displays/adjusts basket rotate deceleration	0.1 to 3.0 sec	0.5	
	MIN LEFT XX%	Displays/adjusts minimum basket rotate left speed. Same as Creep speed	0 to 100%	60	
	MAX LEFT XXX%	Displays/adjusts maximum basket rotate left speed	0 to 100%	60	24-30 (180°)
	MIN RIGHT XX%	Displays/adjusts minimum basket rotate right speed. Same as Creep speed	0 to 100%	60	
	MAX RIGHT XXX%	Displays/adjusts maximum basket rotate right speed	0 to 100%	60	24-30 (180°)
JIB LIFT:					
	ACCEL X.Xs	Displays/adjusts jib lift acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts jib lift deceleration	0.1 to 3.0 sec	1.0	
	MIN UP XX%	Displays/adjusts minimum jib up speed. Same as Creep speed	0 to 65%	40	
	MAX UP XXX%	Displays/adjusts maximum jib up speed	0 to 100%	65	30-36
	MIN DOWN XX%	Displays/adjusts minimum jib down speed. Same as Creep speed	0 to 65%	40	
	MAX DOWN XXX%	Displays/adjusts maximum jib down speed	0 to 100%	60	30-36
JIB SWING:					
	ACCEL X.Xs	Displays/adjusts jib swing acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts jib swing deceleration	0.1 to 3.0 sec	0.5	
	MIN LEFT XX%	Displays/adjusts minimum jib left speed. Same as Creep speed	0 to 65%	40	
	MAX LEFT XXX%	Displays/adjusts maximum jib left speed	0 to 100%	70	42-47 (125°)
	MIN RIGHT XX%	Displays/adjusts minimum jib right speed. Same as Creep speed	0 to 65%	40	
	MAX RIGHT XXX%	Displays/adjusts maximum jib right speed	0 to 100%	70	42-47 (125°)

Table 6-3. Machine Personality Settings and Speeds

GROUND MODE:					
	m. LIFT UP XXX%	Displays/adjusts fixed main lift up speed	0 to 100%	60	
	m. lift DN XXX%	Displays/adjusts main lift down speed	0 to 100%	60	
	SWING XXX%	Displays/adjusts fixed swing speed	0 to 65%	45	
	BASKET LVL XXX%	Displays/adjusts fixed basket level speed	0 to 100%	75	
	BASKET ROT XXX%	Displays/adjusts fixed basket rotate speed	0 to 100%	75	
	MAIN TELE XXX%	Displays/adjusts fixed main telescope speed	0 to 100%	65	
	TOWER TELE XXX%	Displays/adjusts fixed tower telescope speed Not displayed if TOWER TELE=NO	40 to 40%	40	
	T. LIFT UP XXX%	Displays/adjusts fixed tower lift up speed Not displayed if TOWER LIFT=NO	40 to 40%	40	
	T. LIFT DN XXX%	Displays/adjusts fixed tower lift down speed Not displayed if TOWER LIFT=NO	40 to 40%	40	
	JIB (U/D) XXX%	Displays/adjusts jib lift speed Not displayed if JIB = 0	0 to 100%	60	
	JIB (L/R) XXX%	Displays/adjusts jib swing speed Displayed if JIB = 2	0 to 100%	70	
GEN SET/WELDER:					
	Engine XXXX RPM	Control generator/welder RPM. Not displayed if GEN SET/WELDER = 0	1200-2800	1800	

NOTE: *Personality settings can be adjusted anywhere within the adjustment range in order to achieve optimum machine performance.*
Stop watch should start when the function is activated.Not with the controller or switch.
Unless noted, function speeds should be measured from platform.
Platform speed knob must be at full speed (fully clockwise).
All test should be done with the oil temp above 100° F (38° C).

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6.3 MACHINE ORIENTATION WHEN SETTING SPEEDS

MAIN BOOM LIFT UP: From platform control, lowest elevation up to maximum elevation, main boom retracted, tower boom on boom rest.

MAIN BOOM LIFT DOWN: From platform control, maximum elevation down to minimum elevation, main boom retracted, tower boom on boom rest.

TOWER BOOM LIFT UP: From platform control, lowest elevation up to maximum elevation, main boom retracted and horizontal.

TOWER BOOM LIFT DOWN: From platform control, maximum elevation down to minimum elevation, main boom retracted and horizontal.

SWING RIGHT (Max): 360 Degrees, from platform control, main boom retracted, tower boom on boom rest.

SWING LEFT (Max): 360 Degrees, from platform control, main boom retracted, tower boom on boom rest.

MAIN BOOM TELESCOPE OUT: from platform control, main boom horizontal, tower boom on boom rest, 500 lb. capacity selected, jib swing centered.

MAIN BOOM TELESCOPE IN: from platform control, boom horizontal, tower boom on boom rest, 500 lb. capacity selected, jib swing centered.

DRIVE FORWARD (Max): high speed - low torque setting, drive 200 ft. front wheels to front wheels. Timed after machine has obtained maximum speed.

DRIVE REVERSE (Max): high speed - low torque setting, drive 200 ft. front wheels to front wheels. Timed after machine has obtained maximum speed.

DRIVE FORWARD (Creep Max): high torque - low speed setting, platform speed knob at full creep

DRIVE REVERSE (Creep Max): high torque - low speed setting, platform speed knob at full creep

DRIVE FORWARD (Elevated Max - Boom Beyond Transport): high speed - low torque setting, platform speed knob out of creep, Lift boom above transport, drive forward 50 ft.

DRIVE REVERSE (Elevated Max - Boom Beyond Transport): high speed - low torque setting, platform speed knob out of creep, Lift boom above transport, drive backward 50 ft.

Test Notes

1. Personality settings can be adjusted anywhere within the adjustment range in order to achieve optimum machine performance
2. Stop watch should start when the function is activated.Not with the controller or switch.
3. Unless noted, function speeds should be measured from platform.
4. Platform speed knob must be at full speed (fully clockwise). All test should be done with the oil temp above 100° F (38° C).

6.4 CANBUS COMMUNICATIONS

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

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

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

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

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

The GROUND MODULE is the master system controller. Most functions are dispatched and coordinated from this module, all other system modules (PLATFORM, BLAM L CHASSIS) handle sub-tasks. All characterized information (values) are stored into the ground module (i.e., Personalities or Calibrations).

Interlocks: Any device that sends an electrical input. (For an example a limit switch, proximity switch, etc;)

Platform Level: The GROUND MODULE stores the default values and handles interlocks. The PLATFORM MODULE reads the sensors mounted on the platform assembly and controls the Level Up / Down valves to maintain setpoint sent from the GROUND MODULE.

Steer: The GROUND MODULE stores crack points, sends desired drive direction, sends steering mode and sends axle extend / retract commands. The PLATFORM MODULE reports the steering switch position to the GROUND MODULE. The CHASSIS MODULE modulates each steer left / right valve to maintain commanded wheel position.

Drive: The GROUND MODULE stores crack points, sends commands for each drive pump to the BLAM. (Command is computed from drive joystick input, interlocks, wheel angle, etc). BLAM maintains proper current for the drive pumps by modulating PWM outputs.

Lift, Tele, & Swing: The GROUND MODULE stores default values, handles interlocks and calibration information. Lift, Telescope and Swing commands are dependent upon interlocks through out the machine. Boom angle, length and swing are controlled by the GROUND MODULE. The BLAM monitors and communicates (CANbus) to the GROUND MODULE boom angle and boom length via two angle sensors, a length sensor and a load moment pin.

6.5 CALIBRATION INSTRUCTIONS

This machine incorporates a variety of sensors and a high degree of function interaction. For safety and proper machine functionality, the calibration procedures must be repeated for any control module replacement, system calibration related fault, or removal or replacement of any sensors, valves, coils, motors, or pumps. The chart below lists the calibrations required and potential reasons for re-calibration.

All calibration procedures are menu driven through the use of the standard JLG analyzer. With the exception of steering calibration, no external tools are required to complete the calibration procedures. The user is prompted to exercise the machine in a specific order to use the machines physical properties to consistently establish sensor response and the interaction of valves, pumps, and motors. Steering calibration also uses the analyzer and is performed on one side of the machine at a time requiring the use of a string or other means to determine when the tires are in line with each other. With the exception of the load control calibration, all calibrations are accessed by connecting the analyzer into the control system inside the main terminal box or on the bottom of the platform control box. Calibration of the platform load sensing system is accessed by connecting the analyzer directly into the EIM module.

Table 6-4. Reasons for Re-Calibration

Calibration Procedure	Reasons for Re-calibration
Steering Calibration	Ground module replacement Chassis module replacement Steer sensor removal or replacement Persistent wheel misalignment
Drive Calibration	Ground module replacement BLAM module replacement Drive pump/coil replacement Drive pulls to one side Drive lugs engine Poor slow speed control
Boom Valve Calibration	Main lift valve/control module replacement Tower lift valve/control module replacement Tower telescope valve/control module replacement
Platform Level Crack Point Calibration	Platform module replacement Ground module replacement Platform level valve/coil replacement Erratic platform leveling
Chassis Tilt Calibration	Ground module removal or replacement Main terminal box removal or replacement Tilt indication inaccuracy
Boom Sensors Calibration	Ground module removal or replacement BLAM module removal or replacement Tower boom angle sensor removal or replacement Tower boom length sensor removal or replacement Tower lift cylinder angle sensor removal or replacement Load pin removal or replacement Main boom angle sensor removal or replacement Any boom sensor calibration faults Boom control system inaccuracies
Platform Load Sensing System Calibration	EIM module replacement Load cell removal or replacement Load control inaccuracy

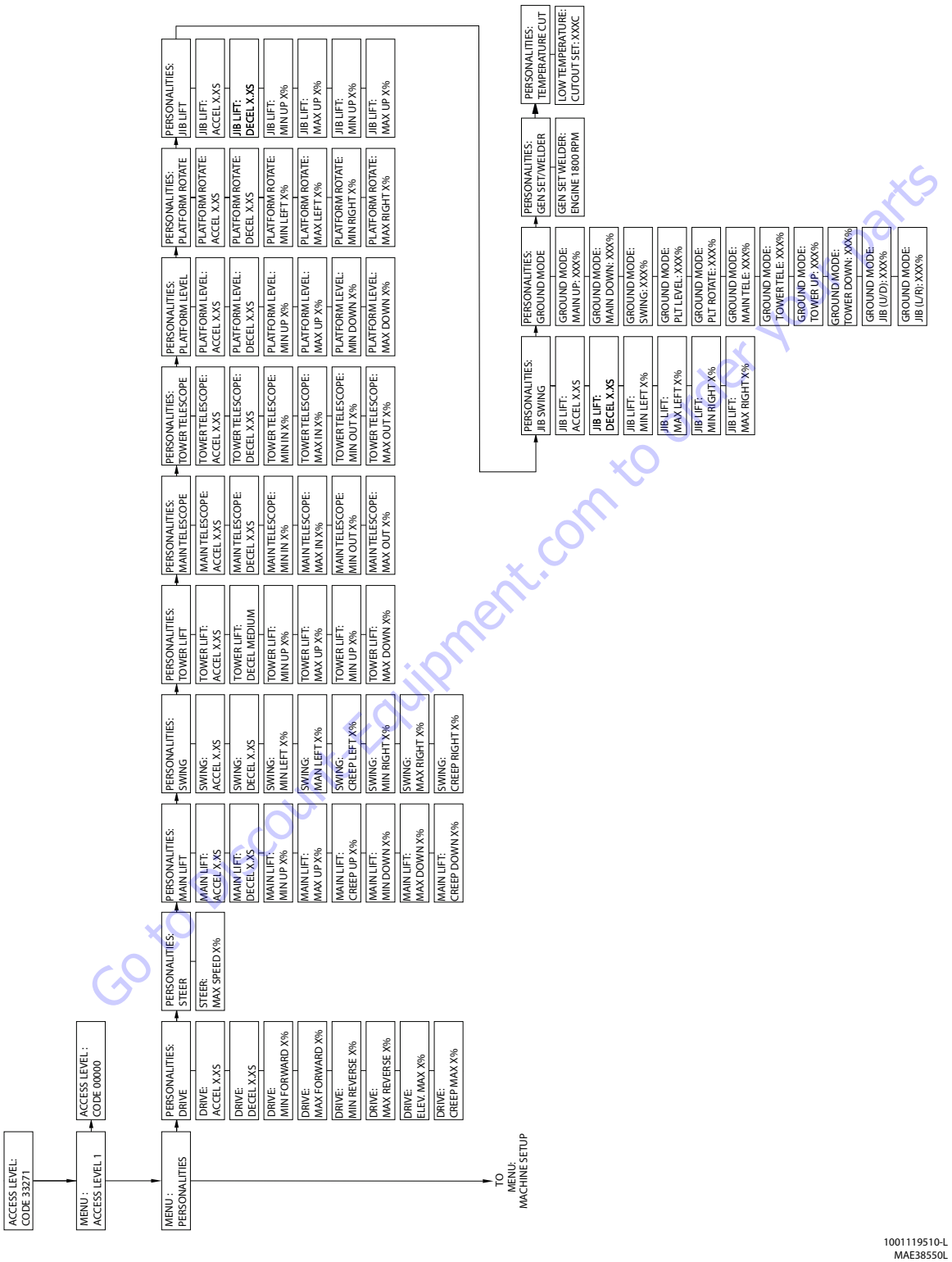


Figure 6-3. Analyzer Software P7.24 - Sheet 1 of 6

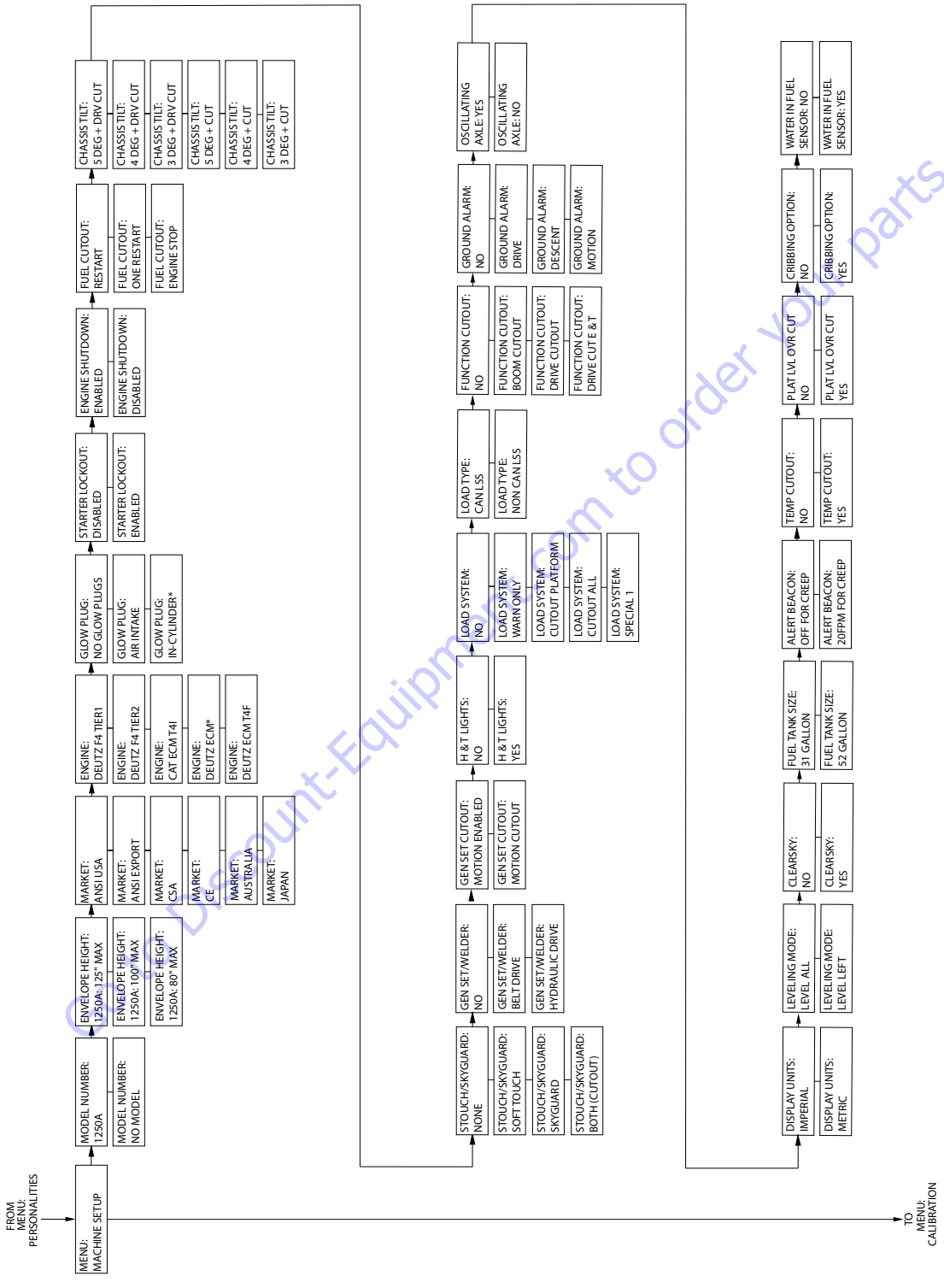
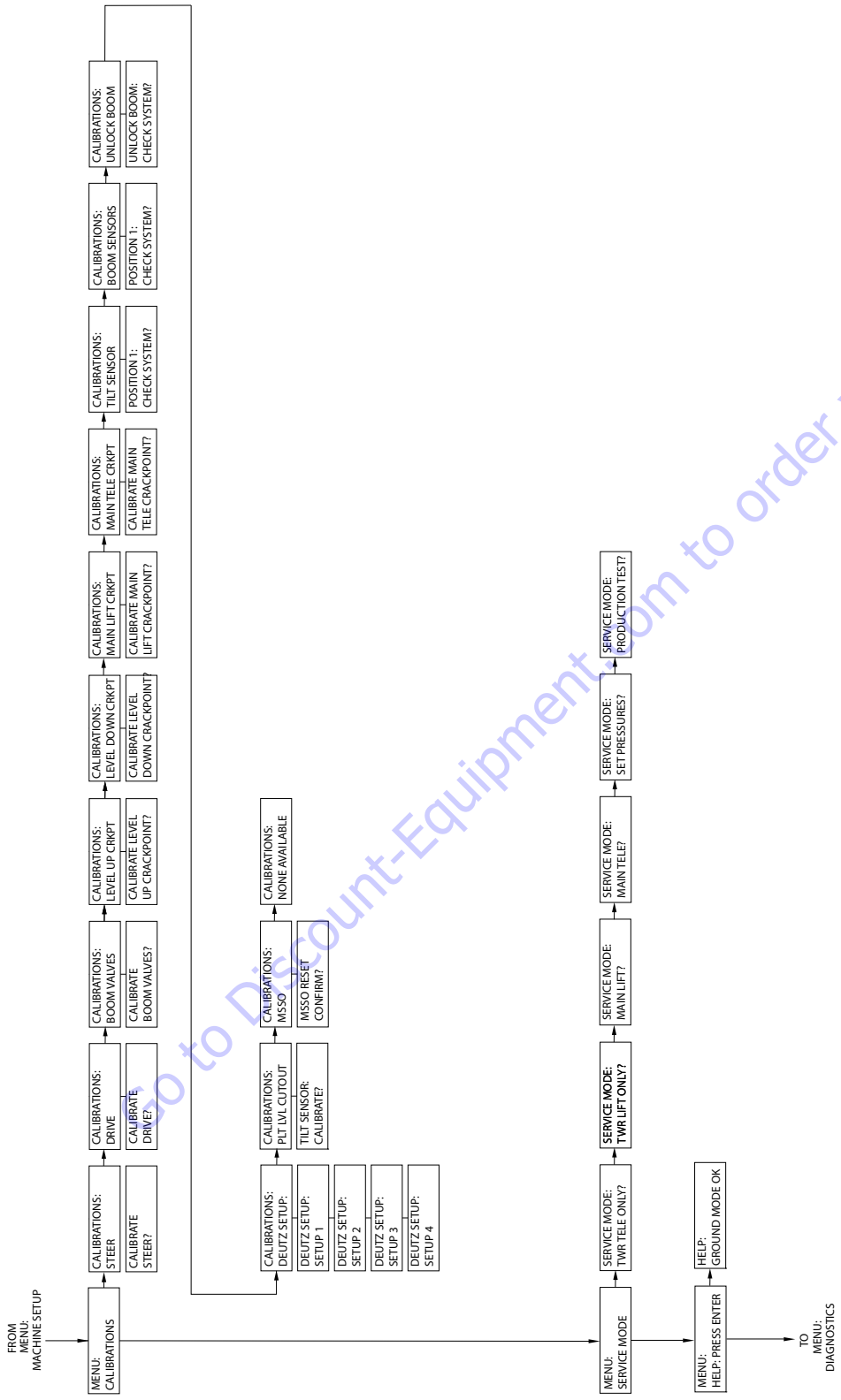


Figure 6-4. Analyzer Software P7.24 - Sheet 2 of 6



1001119510-L
MAE38570L

Figure 6-5. Analyzer Software P7.24 - Sheet 3 of 6

1001119510-L
MAE38580L

Figure 6-6. Analyzer Software P7.24 - Sheet 4 of 6

Figure 6-7. Analyzer Software P7.24 - Sheet 5 of 6

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MAE38670L

Figure 6-8. Analyzer Software P7.24 - Sheet 6 of 6

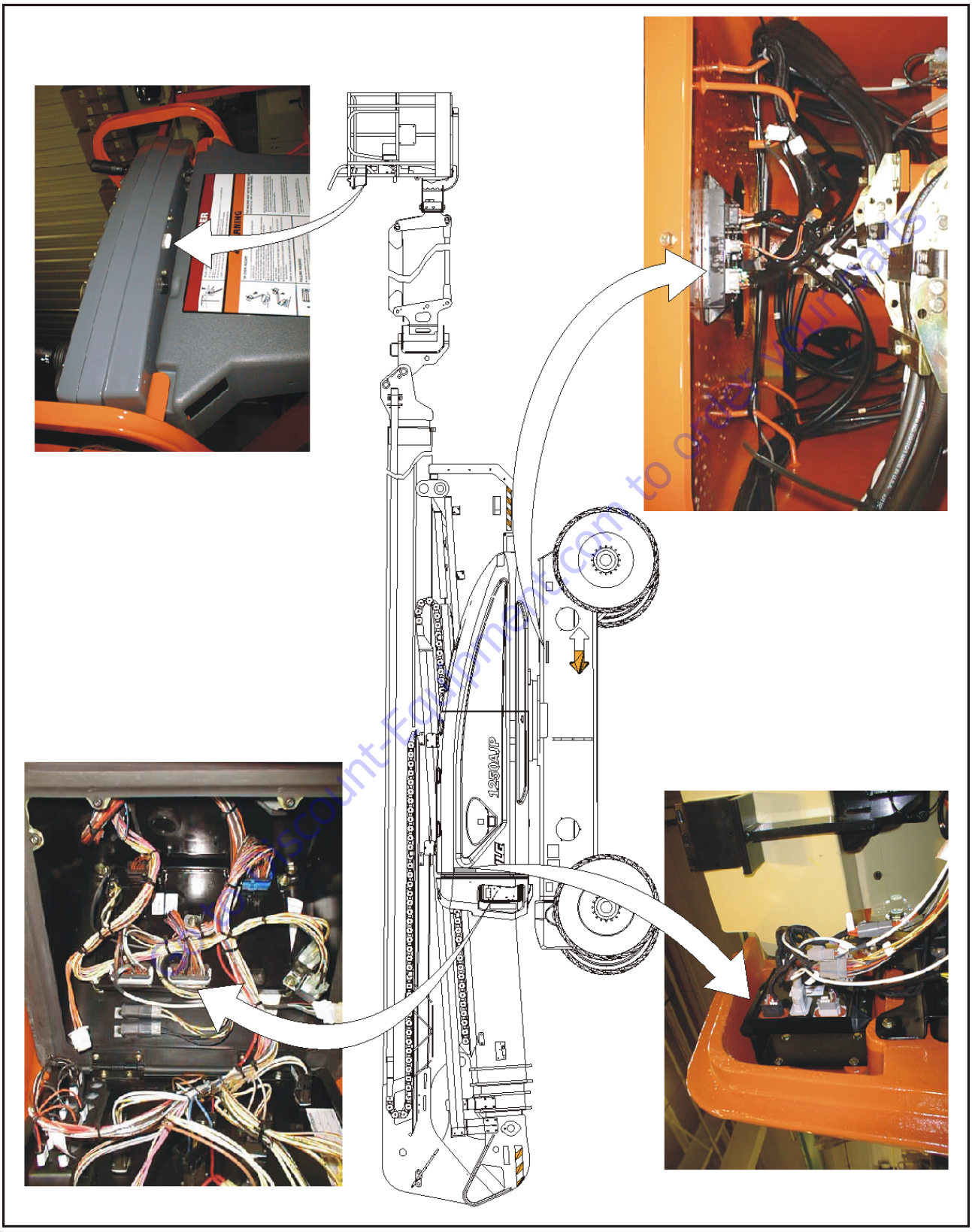

Figure 6-9. Control Module Location

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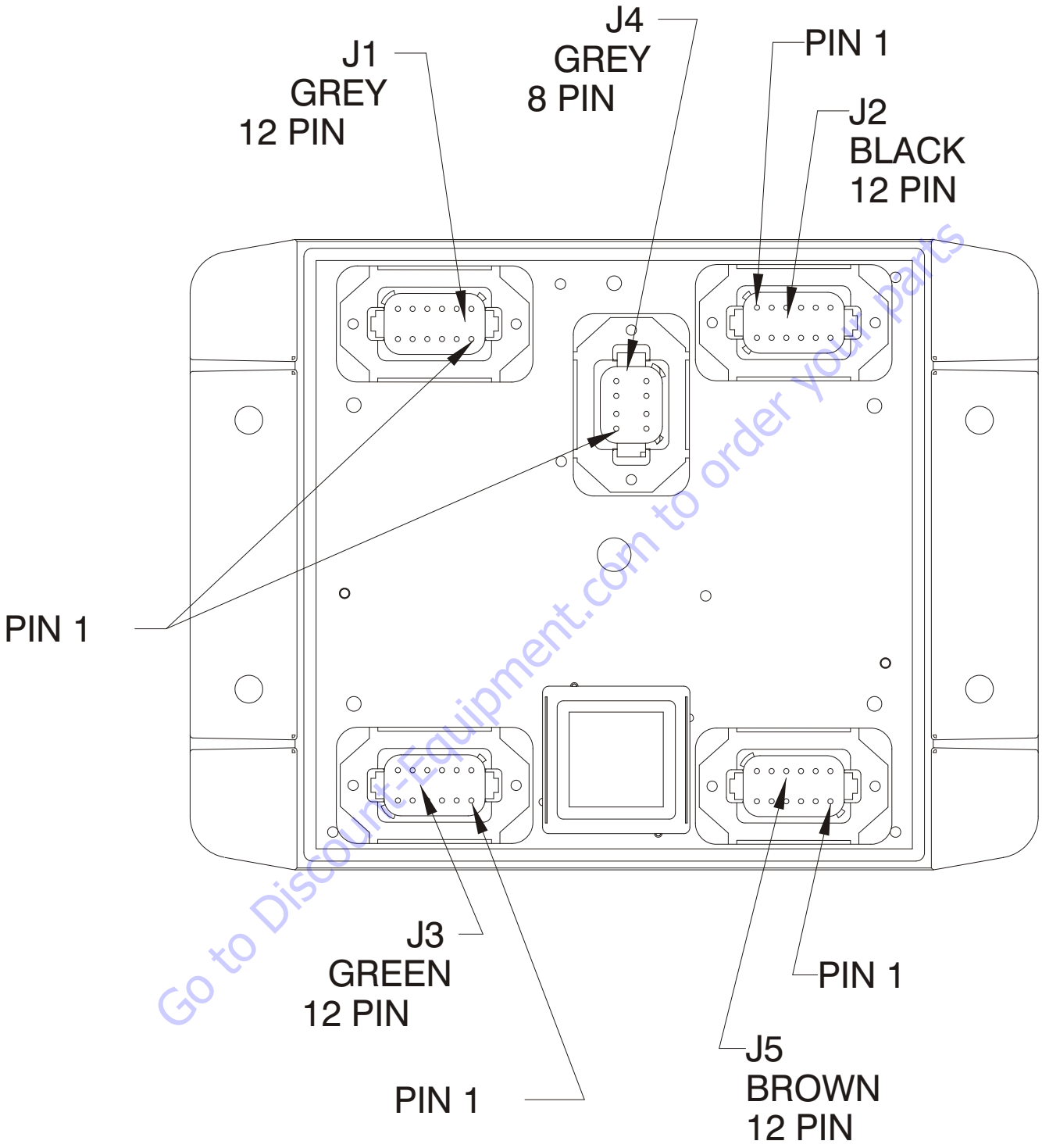


Figure 6-10. Chassis and Boom, Length, Angle Modules (BLAM)

Chassis Pin Module Function

CONNECTOR	PIN	FUNCTION	TYPE	
J1 (GREY)	1	POWER FEED THROUGH TO J2-1	POWER	I/O
	2	POWER FEED THROUGH TO J2-2	POWER	I/O
	3	SIGNAL FEED THROUGH TO J2-4	DIGITAL	INPUT
	4	MASTER GROUND CONNECT	POWER	INPUT
	5	MASTER IGNIITION CONNECT	POWER	INPUT
	6	CANBUS HIGH	SERIAL	I/O
	7	CANBUS LOW	SERIAL	I/O
	8	CANBUS SHIELD	SERIAL	I/O
	9	CANBUS TERMINATOR	SERIAL	I/O
	10	CANBUS TERMINATOR	SERIAL	I/O
	11	IGNIITION	POWER	OUTPUT
	12	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J2 (BLACK)	1	POWER FEED THROUGH TO J1-1	POWER	I/O
	2	POWER FEED THROUGH TO J1-2	POWER	I/O
	3	GROUND	POWER	OUTPUT
	4	FRONT AXLES LIMIT SWITCH	DIGITAL	INPUT
	5	REAR AXLES LIMIT SWITCH	DIGITAL	INPUT
	6	DRIVE ORIENTATION SWITCH	DIGITAL	INPUT
	7	OSCILLATING AXLE PRESSURE SWITCH	DIGITAL	INPUT
	8	SPARE INPUT	DIGITAL	INPUT
	9	SPARE INPUT	DIGITAL	INPUT
	10	SPARE ANALOG INPUT	ANALOG	INPUT
	11	FRONT/REAR AXLE EXTEND	DIGITAL	OUTPUT
	12	FRONT/REAR AXLE RETRACT	DIGITAL	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J3 (GREEN)	1	+5V ANALOG REFERENCE	POWER	OUTPUT
	2	FRONT RIGHT STEER ANGLE	ANALOG	INPUT
	3	GROUND	POWER	OUTPUT
	4	+5V ANALOG REFERENCE	POWER	OUTPUT
	5	FRONT LEFT STEER ANGLE	ANALOG	INPUT
	6	GROUND	POWER	OUTPUT
	7	+5V ANALOG REFERENCE	POWER	OUTPUT
	8	REAR RIGHT STEER ANGLE	ANALOG	INPUT
	9	GROUND	POWER	OUTPUT
	10	+5V ANALOG REFERENCE	POWER	OUTPUT
	11	REAR LEFT STEER ANGLE	ANALOG	INPUT
	12	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J4 (GREY)	1	IGNITION	POWER	OUTPUT
	2	GROUND	POWER	OUTPUT
	3	CANBUS HIGH	SERIAL	I/O
	4	CANBUS LOW	SERIAL	I/O
	5	CANBUS SHIELD	ANALOG	INPUT
	6	BOOTSTRAP MODE	DIGITAL	INPUT
	7	IGNITION	POWER	OUTPUT
	8	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J5 (BROWN)	1	RIGHT FRONT STEER RIGHT	DIGITAL	OUTPUT
	2	RIGHT FRONT STEER LEFT	DIGITAL	OUTPUT
	3	LEFT FRONT STEER RIGHT	DIGITAL	OUTPUT
	4	LEFT FRONT STEER LEFT	DIGITAL	OUTPUT
	5	RIGHT REAR STEER RIGHT	DIGITAL	OUTPUT
	6	RIGHT REAR STEER LEFT	DIGITAL	OUTPUT
	7	LEFT REAR STEER RIGHT	DIGITAL	OUTPUT
	8	LEFT REAR STEER LEFT	DIGITAL	OUTPUT
	9	IGNITION	POWER	OUTPUT
	10	RS232 RECEIVE	SERIAL	INPUT
	11	RS232 TRANSMIT	SERIAL	OUTPUT
	12	GROUND	POWER	OUTPUT

BLAM Pin Module Function

CONNECTOR	PIN	FUNCTION	TYPE	
J1 (GREY)	1	POWER FEED THROUGH TO J2-1	POWER	I/O
	2	POWER FEED THROUGH TO J2-2	POWER	I/O
	3	SIGNAL FEED THROUGH TO J2-4	DIGITAL	INPUT
	4	MASTER GROUND CONNECT	POWER	INPUT
	5	MASTER IGNIITION CONNECT	POWER	INPUT
	6	CANBUS HIGH	SERIAL	I/O
	7	CANBUS LOW	SERIAL	I/O
	8	CANBUS SHIELD	SERIAL	I/O
	9	CANBUS TERMINATOR	SERIAL	I/O
	10	CANBUS TERMINATOR	SERIAL	I/O
	11	IGNIITION	POWER	OUTPUT
	12	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J2 (BLACK)	1	POWER FEED THROUGH TO J1-1	POWER	I/O
	2	POWER FEED THROUGH TO J1-2	POWER	I/O
	3	GROUND	POWER	OUTPUT
	4	LOAD PIN PUSH TO TEST	DIGITAL	INPUT
	5	PLATFORM ROTATE RIGHT	DIGITAL	INPUT
	6	PLATFORM ROTATE LEFT	DIGITAL	INPUT
	7	SPARE INPUT	DIGITAL	INPUT
	8	TOWER BOOM ANG 1 (GRAVITY)	DIGITAL	INPUT
	9	TOWER BOOM ANG 2 (GRAVITY)	DIGITAL	INPUT
	10	SPARE ANALOG	ANALOG	INPUT
	11	RIGHT DRIVE PUMP FORWARD	DIGITAL	OUTPUT
	12	RIGHT DRIVE PUMP REVERESE	DIGITAL	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J3 (GREEN)	1	+5V ANALOG REFERENCE	POWER	OUTPUT
	2	REFERENCE VOLTAGE FROM J3-1	ANALOG	INPUT
	3	GROUND	POWER	OUTPUT
	4	+5V ANALOG REFERENCE	POWER	OUTPUT
	5	TOWER BOOM CYLINDER ANGLE	ANALOG	INPUT
	6	GROUND	POWER	OUTPUT
	7	+5V ANALOG REFERENCE	POWER	OUTPUT
	8	TOWER BOOM LENGTH SENSOR #1	ANALOG	INPUT
	9	GROUND	POWER	OUTPUT
	10	+5V ANALOG REFERENCE	POWER	OUTPUT
	11	TOWER BOOM LENGTH SENSOR #2	ANALOG	INPUT
	12	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J4 (GREY)	1	IGNITION	POWER	OUTPUT
	2	GROUND	POWER	OUTPUT
	3	CANBUS HIGH	SERIAL	I/O
	4	CANBUS LOW	SERIAL	I/O
	5	CANBUS SHIELD	POWER	INPUT
	6	BOOTSTRAP MODE	DIGITAL	INPUT
	7	IGNITION	POWER	OUTPUT
	8	GROUND	POWER	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J5 (BROWN)	1	LEFT DRIVE PUMP FORWARD	DIGITAL	OUTPUT
	2	LEFT DRIVE PUMP FORWARD	DIGITAL	OUTPUT
	3	OSCILLATING AXLES	DIGITAL	OUTPUT
	4	TOWER BOOM TRANSPORT ANGLE	DIGITAL	OUTPUT
	5	SPARE OUPUT -D006	DIGITAL	OUTPUT
	6	SPARE OUPUT -D007	DIGITAL	OUTPUT
	7	SPARE OUPUT -D008	DIGITAL	OUTPUT
	8	SPARE OUPUT -D009	DIGITAL	OUTPUT
	9	IGNITION	POWER	OUTPUT
	10	RS232 RECEIVE	SERIAL	INPUT
	11	RS232 TRANSMIT	SERIAL	OUTPUT
	12	GROUND	POWER	OUTPUT

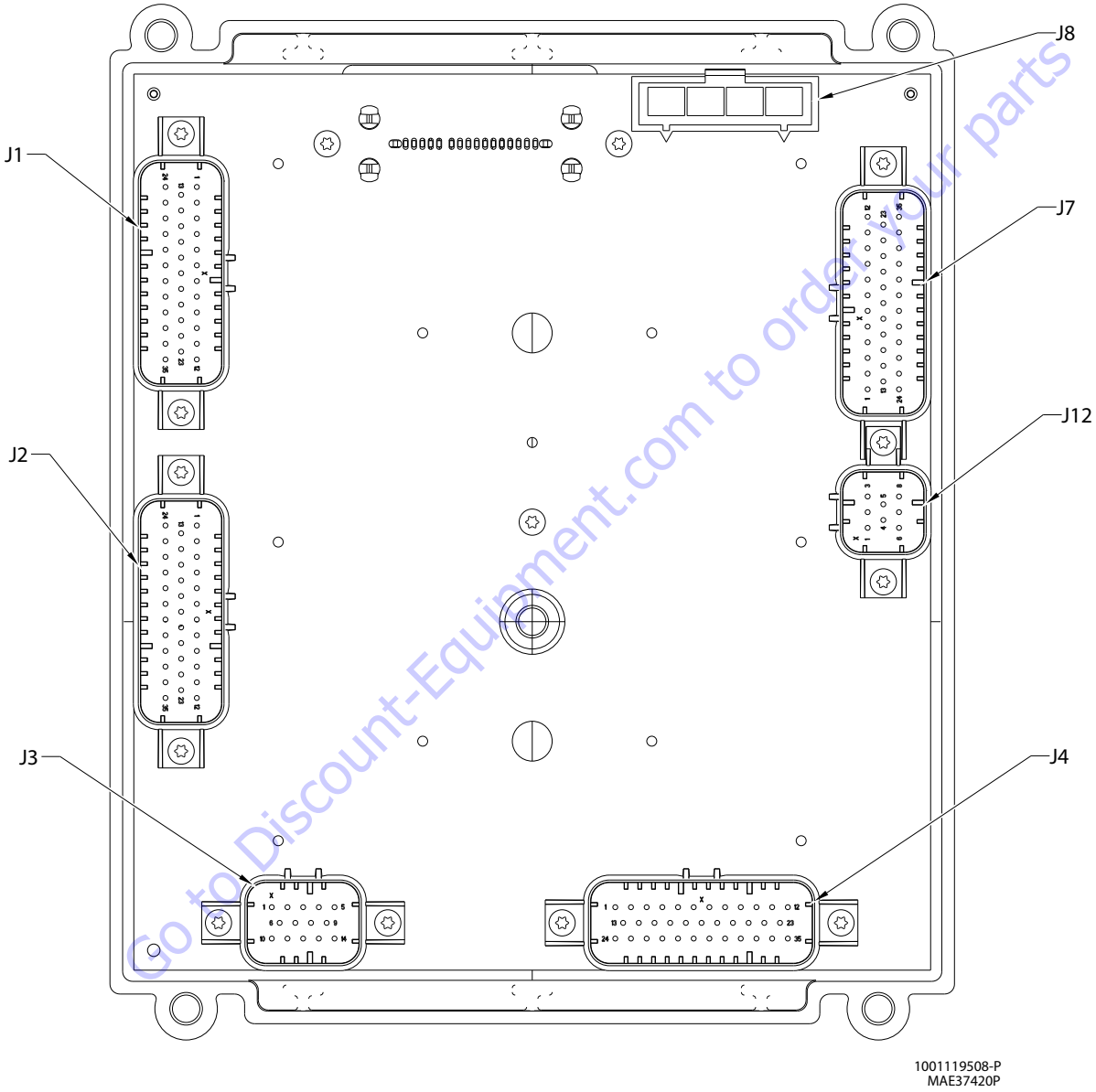


Figure 6-11. Ground Control Module (With UGM)

Connector	Pin	Function	Type	
J1 (Natural)	1	THROTTLE ACTUATOR (DIESEL ONLY)	DIGITAL	OUTPUT
	2	SPARE (LP NOT USED)	DIGITAL	OUTPUT
	3	TOWER BOOM LIFT POWER	DIGITAL	OUTPUT
	4	PRESSURE TRANSDUCER GROUND	GROUND	INPUT
	5	GROUND	GROUND	INPUT
	6	TOWER TELESCOPE ENABLE	DIGITAL	OUTPUT
	7	SPARE (LP NOT USED)	DIGITAL	OUTPUT
	8	GROUND	GROUND	INPUT
	9	GROUND	GROUND	INPUT
	10	IGNITION ON RELAY	DIGITAL	OUTPUT
	11	START SOLENOID (DIESEL ONLY)	DIGITAL	OUTPUT
	12	GLOW PLUG (DIESEL ONLY OPTION)	DIGITAL	OUTPUT
	13	AUXILIARY POWER	DIGITAL	OUTPUT
	14	COOLANT TEMP (DIESEL ONLY)	ANALOG	INPUT
	15	OIL PRESSURE (DIESEL ONLY)	ANALOG	INPUT
	16	FLYWHEEL SPEED PICKUP (DIESEL ONLY)	FREQUENCY	INPUT
	17	GROUND	GROUND	INPUT
	18	SPARE GROUND	GROUND	INPUT
	19	SPARE GROUND	GROUND	INPUT
	20	TWO SPEED	DIGITAL	OUTPUT
	21	MAIN LIFT PILOT PRESSURE SWITCH	DIGITAL	INPUT
	22	GENERATOR/WELDER (OPTION)	DIGITAL	OUTPUT
	23	PARKING BRAKE	DIGITAL	OUTPUT
	24	CONSTANT BATTERY	N/C	N/C
	25	RS-485 HI	SERIAL	I/O
	26	RS-485 LO	SERIAL	I/O
	27	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	GROUND SHIELD	GROUND	INPUT
	34	SPARE	DIGITAL	INPUT
	35	HYDRAULIC OIL TEMPERATURE SWITCH	DIGITAL	INPUT

Connector	Pin	Function	Type	
J2 (Gray)	1	MAIN LIFT PILOT	DIGITAL	OUTPUT
	2	HORN	DIGITAL	OUTPUT
	3	PLATFORM CONTROL VALVE	DIGITAL	OUTPUT
	4	UPPER TELESCOPE IN	DIGITAL	OUTPUT
	5	BASKET LEVEL UP OVERRIDE	DIGITAL	OUTPUT
	6	GROUND	GROUND	INPUT
	7	BASKET LEVEL DOWN OVERRIDE	DIGITAL	OUTPUT
	8	TOWER TELESCOPE POWER	DIGITAL	OUTPUT
	9	TELESCOPE FLOW CONTROL	DIGITAL	OUTPUT
	10	LIFT PILOT	DIGITAL	OUTPUT
	11	UPPER LIFT UP	DIGITAL	OUTPUT
	12	LIFT DOWN AUXILIARY	DIGITAL	OUTPUT
	13	MAIN DUMP	DIGITAL	OUTPUT
	14	GROUND	GROUND	INPUT
	15	NOT CONNECTED RS232 BACKUP COMM. ENABLE	DIGITAL	OUTPUT
	16	UPPER TELESCOPE OUT	DIGITAL	OUTPUT
	17	GROUND	GROUND	INPUT
	18	SPARE PIN	GROUND	INPUT
	19	LIFT FLOW CONTROL	DIGITAL	OUTPUT
	20	SPARE OUTPUT	DIGITAL	OUTPUT
	21	MAIN BOOM ANGLE SENSOR #2 POWER	DIGITAL	OUTPUT
	22	UPPER LIFT DOWN	DIGITAL	OUTPUT
	23	MAIN BOOM LIFT ENABLE	DIGITAL	OUTPUT
	24	TOWER CYLINDER TYPE	DIGITAL	INPUT
	25	FUEL SENSOR	ANALOG	INPUT
	26	HEAD/TAIL LIGHT	DIGITAL	OUTPUT
	27	ALARM	DIGITAL	OUTPUT
	28	SPARE PIN	GROUND	INPUT
	29	GROUND	GROUND	INPUT
	30	GROUND	GROUND	INPUT
	31	PVG ENABLE	DIGITAL	OUTPUT
	32	TOWER BOOM TELESCOPE PILOT	DIGITAL	OUTPUT
	33	TOWER BOOM LIFT ENABLE	DIGITAL	OUTPUT
	34	SWING LEFT	DIGITAL	OUTPUT
	35	SWING RIGHT	DIGITAL	OUTPUT

Connector	Pin	Function	Type	
J3 (Black)	1	SPARE VAVLE RETURN 1	GROUND	INPUT
	2	SPARE VAVLE RETURN 2	GROUND	INPUT
	3	GROUND	GROUND	INPUT
	4	SPARE VAVLE RETURN 4	GROUND	INPUT
	5	SPARE VAVLE RETURN 5	GROUND	INPUT
	6	SPARE VAVLE RETURN 6	GROUND	INPUT
	7	VBAT	VBAT	OUTPUT
	8	SPARE HS DIGITAL IN (FREQ. CAPABLE)	DIGITAL	INPUT
	9	ALTERNATOR EXCITATION INPUT	DIGITAL	INPUT
	10	SPARE HS SWITCH INPUT (MODEL INPUT FOR 1100S)	DIGITAL	INPUT
	11	SPARE LS DIGITAL INPUT	DIGITAL	INPUT
	12	ANALOG REF. VOLTAGE	VOLTAGE	OUTPUT
	13	SPARE ANALOG INPUT 8	ANALOG	INPUT
	14	SPARE VALVE RETURN 3	GROUND	INPUT

Connector	Pin	Function	Type	
J8 (Black)	1	GROUND FROM BATTERY	GROUND	INPUT
	2	GROUND EMS	GROUND	INPUT
	3	GROUND TO PLATFORM	GROUND	OUTPUT
	4	GROUND EMS OUT TO PLATFORM	GROUND	OUTPUT

Connector	Pin	Function	Type	
J12 (Black)	1	FREQUENCY INPUT 2	FREQUENCY	INPUT
	2	FREQUENCY INPUT 2 RETURN	FREQUENCY	INPUT
	3	CAN 2 H	SERIAL	I/O
	4	CAN 2 L	SERIAL	I/O
	5	CAN 2 SHIELD	GROUND	INPUT
	6	CAN 2 TERMINATOR	TERM	I/O
	7	CAN 2 TERMINATOR	TERM	I/O
	8	SPARE LS DIGITAL INPUT	DIGITAL	INPUT

Connector	Pin	Function	Type	
J4 (Blue)	1	AXLES SET LAMP	DIGITAL	OUTPUT
	2	500# CAPACITY LAMP	DIGITAL	OUTPUT
	3	BOOM CONTROL SYSTEM LAMP	DIGITAL	OUTPUT
	4	START SWITCH	DIGITAL	INPUT
	5	BASKET LEVEL DOWN	DIGITAL	INPUT
	6	BASKET LEVEL DOWN	DIGITAL	INPUT
	7	UPPER TELESCOPE IN	DIGITAL	INPUT
	8	JIB DOWN	DIGITAL	INPUT
	9	JIB LEFT	DIGITAL	INPUT
	10	TOWER UP	DIGITAL	INPUT
	11	MAIN TOWER TRANSPORT ANGLE OPEN	DIGITAL	INPUT
	12	HOUR METER	DIGITAL	OUTPUT
	13	BCS CALIBRATED LAMP	DIGITAL	OUTPUT
	14	OVERLOAD LAMP	DIGITAL	OUTPUT
	15	SPARE	DIGITAL	OUTPUT
	16	AUXILIARY POWER	DIGITAL	INPUT
	17	BASKET LEVEL UP	DIGITAL	INPUT
	18	BASKET ROTATE RIGHT	DIGITAL	INPUT
	19	JIB UP	DIGITAL	INPUT
	20	JIB RIGHT	DIGITAL	INPUT
	21	TOWER DOWN	DIGITAL	INPUT
	22	MAIN BOOM TRANSPORT ANGLE CLOSED	DIGITAL	INPUT
	23	UPPER LIFT UP	DIGITAL	INPUT
	24	VBAT	VBAT	OUTPUT
	25	VBAT	VBAT	OUTPUT
	26	NO CHARGE LAMP	DIGITAL	OUTPUT
	27	1000# CAPACITY LAMP	DIGITAL	OUTPUT
	28	ENGINE HIGH TEMPERATURE LENGTH	DIGITAL	OUTPUT
	29	ENGINE LOW OIL PRESSURE LAMP	DIGITAL	OUTPUT
	30	UPPER TELESCOPE OUT	DIGITAL	INPUT
	31	GROUND	GROUND	INPUT
	32	SPARE PIN	GROUND	INPUT
	33	UPPER LIFT DOWN	DIGITAL	INPUT
	34	SWING LEFT	DIGITAL	INPUT
	35	SWING RIGHT	DIGITAL	INPUT

Connector	Pin	Function	Type	
J7 (Black)	1	PLATFORM EMS	DIGITAL	INPUT
	2	PLATFORM MODE	DIGITAL	INPUT
	3	GROUND MODE	DIGITAL	INPUT
	4	TOWER CYLINDER PRESSURE	ANALOG	INPUT
	5	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	6	CAN TERMINATION	TERM	I/O
	7	SPARE	ANALOG	INPUT
	8	SPARE ANALOG INPUT 2	ANALOG	INPUT
	9	GROUND	GROUND	INPUT
	10	GROUND	GROUND	INPUT
	11	BOOM RETRACTED CLOSED	DIGITAL	INPUT
	12	BROKEN CABLE SWITCH		INPUT
	13	CAN HI	SERIAL	I/O
	14	GROUND MODE OUT TO PLATFORM	DIGITAL	INPUT
	15	FOOTSWITCH ENGAGE	DIGITAL	INPUT
	16	PRESSURE TRANSDUCER EXCITATION	VOLTAGE	OUTPUT
	17	CAN TERMINATION	TERM	I/O
	18	CAN SHEILD	GROUND	INPUT
	19	SPARE PIN	GROUND	INPUT
	20	SPARE ANALOG INPUT 1	ANALOG	INPUT
	21	PUSH TO TEST	DIGITAL	INPUT
	22	TOWER BOOM TRANSPORT ANGLE	DIGITAL	INPUT
	23	GROUND CONTROL ENABLE	DIGITAL	INPUT
	24	CAN LO	SERIAL	I/O
	25	GROUND	GROUND	INPUT
	26	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	27	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	28	GROUND (RESERVED FOR CRIBBING OPTION)	GROUND	INPUT
	29	VBAT	VBAT	OUTPUT
	30	VBAT	VBAT	OUTPUT
	31	VBAT	VBAT	OUTPUT
	32	VBAT	VBAT	OUTPUT
	33	VBAT (RESERVED FOR CRIBBING OPTION)	VBAT	OUTPUT
	34	CLEARSKY POWER (VBAT)	VBAT	OUTPUT
	35	BOOM RETRACT OPEN	DIGITAL	INPUT

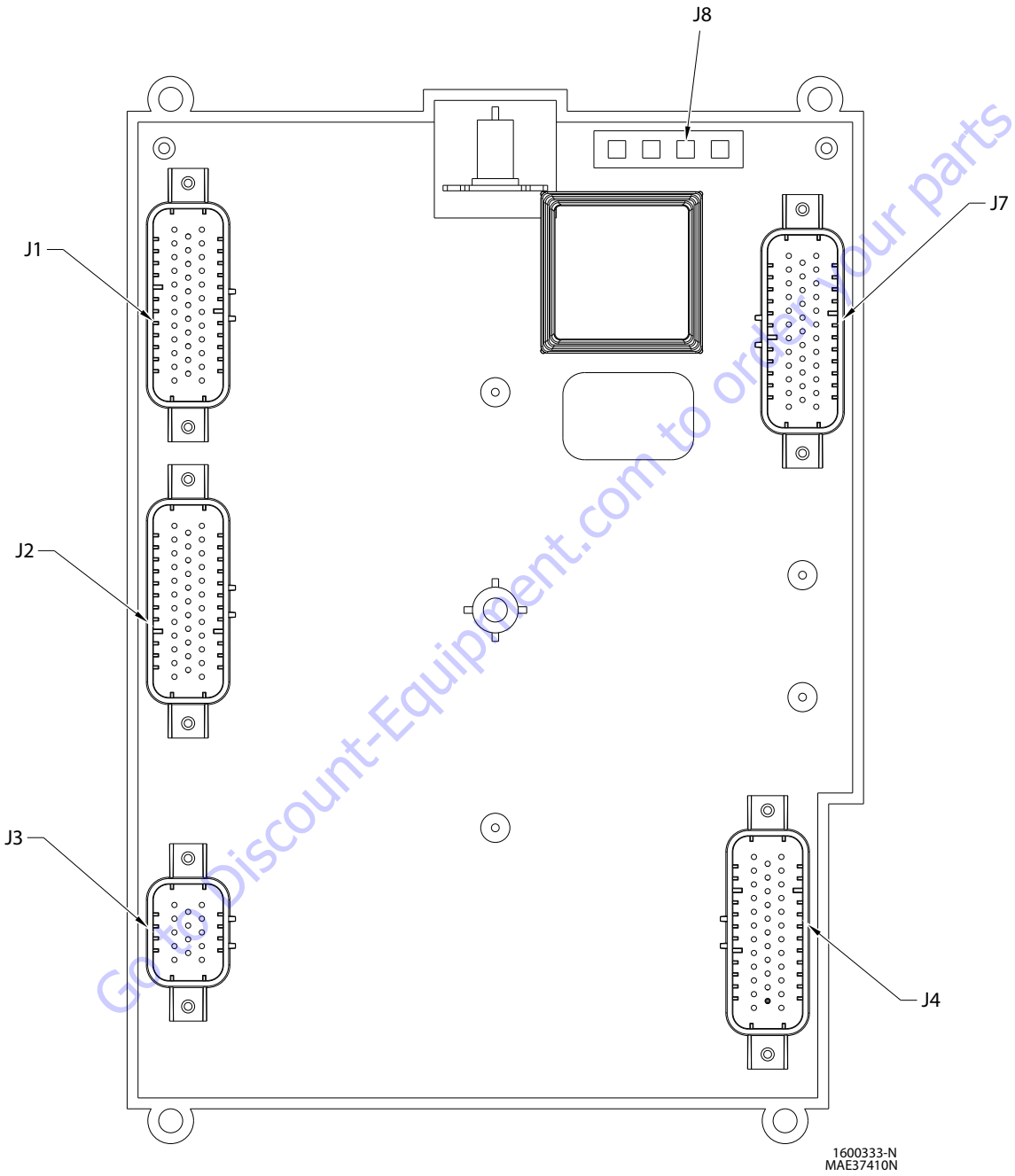


Figure 6-12. Ground Control Module (Without UGM)

CONNECTOR	PIN	FUNCTION	TYPE	
J7 (BLACK)	1	PLATFORM EMS	DIGITAL	INPUT
	2	PLATFORM MODE	DIGITAL	INPUT
	3	GROUND MODE	DIGITAL	INPUT
	4	SPARE (SJP) / TOWER CYLINDER PRESSURE (AJP)	ANALOG	INPUT
	5	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	6	CAN TERMINATION	TERM	I/O
	7	SPARE	ANALOG	INPUT
	8	SPARE	ANALOG	INPUT
	9	SPARE	GROUND	INPUT
	10	SPARE	GROUND	INPUT
	11	BOOM TRANSPORT LENGTH SWITCH CLOSED (SJP) / TOWER TRANSPORT LENGT CLOSED (AJP)	DIGITAL	INPUT
	12	BROKEN CABLE SWITCH (SJP) / BOOM TRANSPORT LENGTH #1 CLOSED (AJP)		INPUT
	13	CAN 1 HI	SERIAL	I/O
	14	GROUND MODE OUT TO PLATFORM	DIGITAL	INPUT
	15	FOOTSWITCH ENGAGE	DIGITAL	INPUT
	16	SPARE (SJP) / PRESSURE TRANSDUCER EXCITATION (AJP)	VOLTAGE	OUTPUT
	17	CAN TERMINATION	TERM	I/O
	18	CAN 1 SHIELD	GROUND	INPUT
	19	BROKEN CABLE SWITCH GROUND (SJP) / SPARE (AJP)	GROUND	INPUT
	20	SPARE	ANALOG	INPUT
	21	BCS TEST SWITCH (SJP) / BOOM TRANSPORT LENGTH #2 OPEN (AJP)	DIGITAL	INPUT
	22	SPARE (SJP) / TOWER TRANSPORT ANGLE BLAM J5-4 (AJP)	DIGITAL	INPUT
	23	GROUND CONTROL ENABLE	DIGITAL	INPUT
	24	CAN 1 LO	SERIAL	I/O
	25	SPARE	GROUND	INPUT
	26	SPARE REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	27	SPARE REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	28	SPARE	GROUND	INPUT
	29	VBAT	VBAT	OUTPUT
	30	VBAT	VBAT	OUTPUT
	31	VBAT	VBAT	OUTPUT
	32	VBAT	VBAT	OUTPUT
	33	VBAT	VBAT	OUTPUT
	34	CLEARSKY POWER	VBAT	OUTPUT
	35	BOOM TRANSPORT LENGTH SWITCH OPEN (SJP) / TOWER TRANSPORT LENGTH SWITCH OPEN (AJP)	DIGITAL	INPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J8 (BLACK)	1	GROUND FROM BATTERY	GROUND	INPUT
	2	GROUND EMS	GROUND	INPUT
	3	GROUND TO PLATFORM	GROUND	OUTPUT
	4	GROUND EMS OUT TO PLATFORM	GROUND	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J3 (BLACK)	1	SPARE VALVE RETURN	GROUND	INPUT
	2	SPARE VALVE RETURN	GROUND	INPUT
	3	SPARE	GROUND	INPUT
	4	SPARE VALVE RETURN	GROUND	INPUT
	5	SPARE VALVE RETURN	GROUND	INPUT
	6	SPARE VALVE RETURN	GROUND	INPUT
	7	VBAT	VBAT	OUTPUT
	8	SPARE HS DIGITAL IN (FREQ CAPABLE)	DIGITAL	INPUT
	9	SPARE	DIGITAL	INPUT
	10	SPARE HS SWITCH INPUT	DIGITAL	INPUT
	11	SPARE LS DIGITAL INPUT	DIGITAL	INPUT
	12	SPARE ANALOG REF. VOLTAGE	VOLTAGE	OUTPUT
	13	SPARE ANALOG	ANALOG	INPUT
	14	SPARE VALVE RETURN	GROUND	INPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J4 (BLUE)	1	AXLES SET LAMP	DIGITAL	OUTPUT
	2	500# CAPACITY LAMP	DIGITAL	OUTPUT
	3	BOOM CONTROL SYSTEM LAMP	DIGITAL	OUTPUT
	4	START SWITCH	DIGITAL	INPUT
	5	BASKET LEVEL DOWN SWITCH	DIGITAL	INPUT
	6	BASKET ROTATE LEFT SWITCH (SJP) / DUAL CAPCITY SWITCH #2 SIGNAL (AJP)	DIGITAL	INPUT
	7	BOOM TELESCOPE IN SWITCH	DIGITAL	INPUT
	8	JIB LIFT DOWN SWITCH	DIGITAL	INPUT
	9	JIB SWING LEFT SWITCH	DIGITAL	INPUT
	10	SPARE (SJP) / TOWER LIFT UP SWITCH (AJP)	DIGITAL	INPUT
	11	SPARE (SJP) / BOOM TRANSPORT ANGLE OPEN (AJP)	DIGITAL	INPUT
	12	HOUR METER	DIGITAL	OUTPUT
	13	BCS CALIBRATED LAMP	DIGITAL	OUTPUT
	14	OVERLOAD LAMP	DIGITAL	OUTPUT
	15	SPARE (SJP) / GLOW PLUG LAMP (AJP)	DIGITAL	OUTPUT
	16	AUXILIARY POWER SWITCH	DIGITAL	INPUT
	17	BASKET LEVEL UP SWITCH	DIGITAL	INPUT
	18	BASKET ROTATE RIGHT SWITCH (SJP) / DUAL CAPACITY SWITCH #1 SIGNAL (AJP)	DIGITAL	INPUT
	19	JIB LIFT UP SWITCH	DIGITAL	INPUT
	20	JIB SWING RIGHT SWITCH	DIGITAL	INPUT
	21	TOWER LIFT DOWN SWITCH	DIGITAL	INPUT
	22	SPARE (SJP) / BOOM TRANSPORT ANGLE CLOSED (AJP)	DIGITAL	INPUT
	23	BOOM LIFT UP SWITCH	DIGITAL	INPUT
	24	SPARE	VBAT	OUTPUT
	25	SWITCHES POWER	VBAT	OUTPUT
	26	NO CHARGE LAMP	DIGITAL	OUTPUT
	27	1000# CAPACITY LAMP	DIGITAL	OUTPUT
	28	ENGINE HIGH TEMPERATURE LAMP	DIGITAL	OUTPUT
	29	ENGINE LOW OIL PRESSURE LAMP	DIGITAL	OUTPUT
	30	BOOM TELESCOPE OUT SWITCH	DIGITAL	INPUT
	31	INDICATORS GROUND	GROUND	INPUT
	32	SPARE	GROUND	INPUT
	33	BOOM LIFT DOWN SWITCH	DIGITAL	INPUT
	34	SWING LEFT SWITCH	DIGITAL	INPUT
	35	SWING RIGHT SWITCH	DIGITAL	INPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J2 (GRAY)	1	BOOM LIFT PILOT VALVE	DIGITAL	OUTPUT
	2	HORN	DIGITAL	OUTPUT
	3	PLATFORM DUMP VALVE	DIGITAL	OUTPUT
	4	BOOM TELE IN VALVE	DIGITAL	OUTPUT
	5	BASKET LEVEL UP OVERRIDE	DIGITAL	OUTPUT
	6	FUEL SENSOR GROUND	GROUND	INPUT
	7	BASKET LEVEL DOWN OVERRIDE	DIGITAL	OUTPUT
	8	TOWER TELESCOPE PVG POWER	DIGITAL	OUTPUT
	9	BOOM TELESCOPE FLOW CONTROL VALVE	DIGITAL	OUTPUT
	10	BOOM LIFT DOWN AUX SELECT (SJP) / BOOM ANGLE SENSOR #1 POWER (AJP)	DIGITAL	OUTPUT
	11	BOOM LIFT UP (SJP) / BOOM LIFT PVG POWER (AJP)	DIGITAL	OUTPUT
	12	BOOM LIFT DOWN AUX (SJP) / TOWER LIFT PILOT VALVE (AJP)	DIGITAL	OUTPUT
	13	MAIN DUMP	DIGITAL	OUTPUT
	14	SPARE	GROUND	INPUT
	15	NC RS232 BACKUP COMM. ENABLE	DIGITAL	OUTPUT
	16	BOOM TELESCOPE OUT VALVE	DIGITAL	OUTPUT
	17	SPARE	GROUND	INPUT
	18	SPARE	GROUND	INPUT
	19	BOOM LIFT FLOW CONTROL VALVE	DIGITAL	OUTPUT
	20	SPARE	DIGITAL	OUTPUT
	21	BOOM ANGLE SENSOR #2 POWER (AJP)	DIGITAL	OUTPUT
	22	MAIN LIFT DOWN (SJP) / SPARE (AJP)	DIGITAL	OUTPUT
	23	SPARE (SJP) / BOOM LIFT ENABLE VALVE (AJP)	DIGITAL	OUTPUT
	24	SPARE (SJP) / TOWER CYLINDER TYPE (AJP)	DIGITAL	INPUT
	25	FUEL SENSOR	ANALOG	INPUT
	26	HEAD/TAILLIGHT	DIGITAL	OUTPUT
	27	ALARM	DIGITAL	OUTPUT
	28	SPARE	GROUND	INPUT
	29	GROUND	GROUND	INPUT
	30	SPARE	GROUND	INPUT
	31	SPARE (SJP) / PVG ENABLE (AJP)	DIGITAL	OUTPUT
	32	SPARE (SJP) / TOWER TELESCOPE PILOT (AJP)	DIGITAL	OUTPUT
	33	SPARE (SJP) / TOWER LIFT ENABLE (AJP)	DIGITAL	OUTPUT
	34	SWING LEFT	DIGITAL	OUTPUT
	35	SWING RIGHT	DIGITAL	OUTPUT

CONNECTOR	PIN	FUNCTION	TYPE	
J1 (NATURAL)	1	THROTTLE ACTUATOR (DIESEL ONLY)	DIGITAL	OUTPUT
	2	SPARE (LP NOT USED)	DIGITAL	OUTPUT
	3	TOWER LIFT POWER	DIGITAL	OUTPUT
	4	TOWER CYLINDER PRESSURE TRANSDUCER GROUND	GROUND	INPUT
	5	SPARE	GROUND	INPUT
	6	TOWER TELESCOPE ENABLE	DIGITAL	OUTPUT
	7	SPARE (LP NOT USED)	DIGITAL	OUTPUT
	8	SPARE	GROUND	INPUT
	9	SPARE	GROUND	INPUT
	10	IGNITION ON RELAY	DIGITAL	OUTPUT
	11	START SOLENOID (DIESEL ONLY)	DIGITAL	OUTPUT
	12	GLOW PLUG (DIESEL ONLY OPTION)	DIGITAL	OUTPUT
	13	AUXILIARY POWER	DIGITAL	OUTPUT
	14	COOLANT TEMP (DIESEL ONLY)	ANALOG	INPUT
	15	OIL PRESSURE (DIESEL ONLY)	ANALOG	INPUT
	16	FLYWHEEL SPEED PICKUP (DIESEL ONLY)	FREQUENCY	INPUT
	17	SPARE	GROUND	INPUT
	18	GROUND	GROUND	INPUT
	19	IGNITION RELAY COIL GROUND	GROUND	INPUT
	20	TWO SPEED	DIGITAL	OUTPUT
	21	BOOM LIFT PILOT PRESSURE SWITCH	DIGITAL	INPUT
	22	GENERATOR/WELDER(OPTION)	DIGITAL	OUTPUT
	23	PARKING BRAKE	DIGITAL	OUTPUT
	24	CONSTANT BATTERY	N/C	N/C
	25	RS-485 HI	SERIAL	I/O
	26	RS-485 LO	SERIAL	I/O
	27	SPARE	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	SPARE GROUND SHIELD	GROUND	INPUT
	34	SPARE	DIGITAL	INPUT
	35	HYDRAULIC OIL TEMP SWITCH	DIGITAL	INPUT

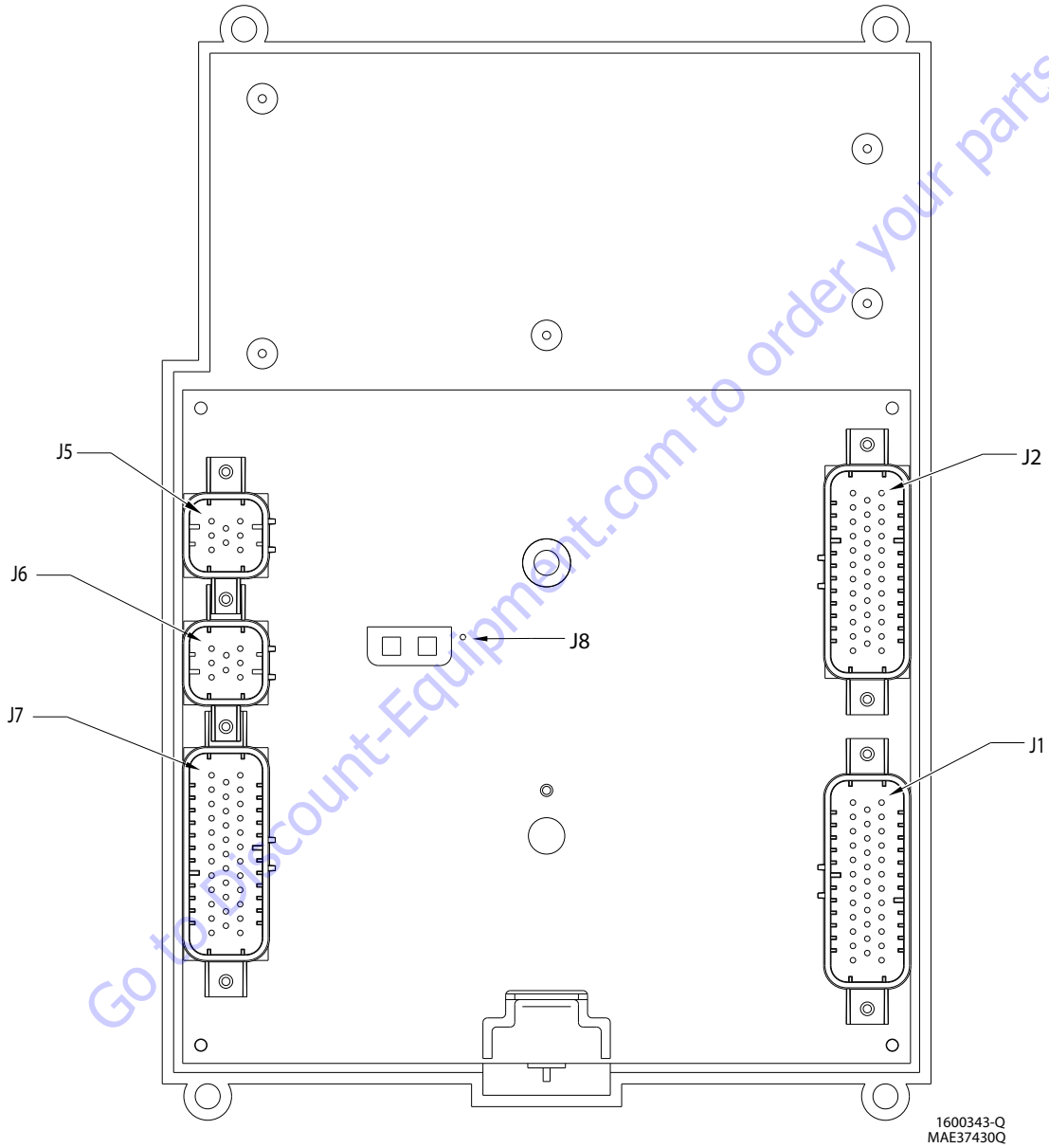


Figure 6-13. Platform Control Module

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J1 NATURAL	1	TOWER LIFT UP	HS DIGITAL INPUT
	2	TOWER LIFT DOWN	HS DIGITAL INPUT
	3	TOWER TELESCOPE IN	HS DIGITAL INPUT
	4	TOWER TELESCOPE OUT	HS DIGITAL INPUT
	5	MAIN TELESCOPE IN	HS DIGITAL INPUT
	6	MAIN TELESCOPE OUT	HS DIGITAL INPUT
	7	PLATFORM ROTATE RIGHT	HS DIGITAL INPUT
	8	PLATFORM ROTATE LEFT	HS DIGITAL INPUT
	9	PLATFORM LEVEL UP	HS DIGITAL INPUT
	10	PLATFORM LEVEL DOWN	HS DIGITAL INPUT
	11	JIB UP	HS DIGITAL INPUT
	12	JIB DOWN	HS DIGITAL INPUT
	13	SPEED PUMP POTENTIOMETER GROUND	GROUND
	14	ENGINE START	HS DIGITAL INPUT
	15	AUXILIARY POWER	HS DIGITAL INPUT
	16	CRAB STEER SELECT	HS DIGITAL INPUT
	17	COORDINATED STEER SELECT	HS DIGITAL INPUT
	18	SWITCH POWER	BATTERY VOLTAGE
	19	JIB 1000LB ENABLE	HS DIGITAL INPUT
	20	EIM PLATFORM OVERLOAD	HS DIGITAL INPUT
	21	500/1000 LB. CAPACITY SELECT	HS DIGITAL INPUT
	22	DRIVE ORIENTATION SYSTEM FEATURE ENABLE	HS DIGITAL INPUT
	23	SPARE PIN	HS DIGITAL INPUT
	24	SPARE PIN	HS DIGITAL INPUT
	25	LEVEL SENSOR 1 SIGNAL	HS DIGITAL INPUT
	26	LEVEL SENSOR 2 SIGNAL	HS DIGITAL INPUT
	27	TWO SPEED VALVE (HIGH ENGINE)	HS DIGITAL INPUT
	28	TORQUE MODE	HS DIGITAL INPUT
	29	SOFT TOUCH OVERRIDE	HS DIGITAL INPUT
	30	HEAD/TAIL LIGHT	HS DIGITAL INPUT
	31	HORN	HS DIGITAL INPUT
	32	CREEP MODE	HS DIGITAL INPUT
	33	DUAL-FUEL SELECT	HS DIGITAL INPUT
	34	SPEED PUMP POTENTIOMETER REFERENCE VOLTAGE	+7 REFERENCE VOLTAGE
	35	SPEED PUMP POTENTIOMETER	ANALOG INPUT

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J5 NATURAL	1	LIFT / SWING JOYSTICK SUPPLY VOLTAGE	SUPPLY VOLTAGE
	2	LIFT CENTER TAP	ANALOG INPUT
	3	LIFT SIGNAL	ANALOG INPUT
	4	SWING SIGNAL	ANALOG INPUT
	5	SWING CENTER TAP	ANALOG INPUT
	6	NOT CONNECTED	ANALOG INPUT
	7	LIFT / SWING JOYSTICK RETURN	GROUND
	8	SPARE PIN	BLANK

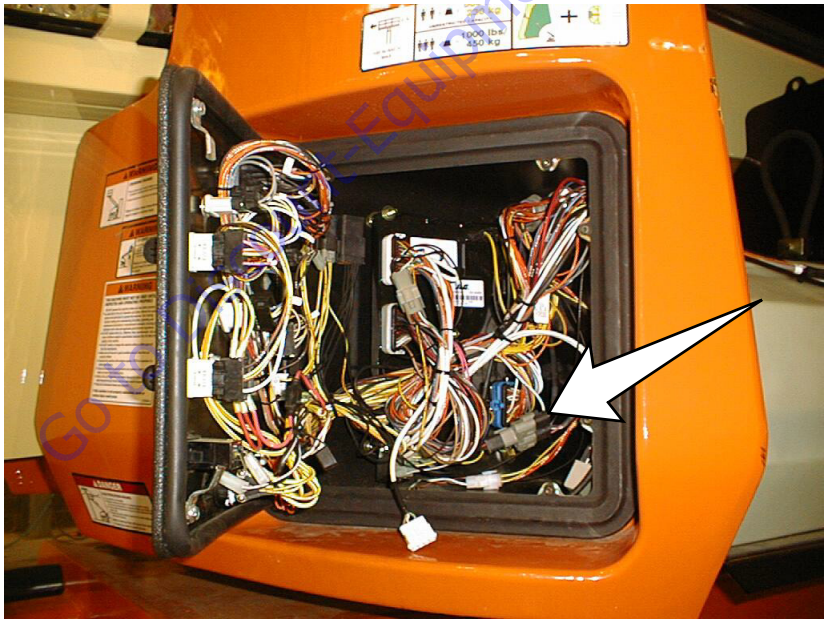
CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J6 BLACK	1	DRIVE / STEER JOYSTICK SUPPLY VOLTAGE	SUPPLY VOLTAGE
	2	DRIVE CENTER TAP	ANALOG INPUT
	3	DRIVE SIGNAL	ANALOG INPUT
	4	STEER SIGNAL	ANALOG INPUT
	5	STEER LEFT	ANALOG INPUT
	6	STEER RIGHT	ANALOG INPUT
	7	DRIVE / STEER JOYSTICK RETURN	GROUND
	8	SPARE PIN	BLANK

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

CONNECTOR	PIN	ASSIGNMENT	FUNCTION
J2 BLUE	1	SPARE PIN	HS DIGITAL INPUT
	2	SPARE PIN	HS DIGITAL INPUT
	3	BATTERY VOLTAGE	BATTERY VOLTAGE
	4	DRIVE ORIENTATION SYSTEM OVERRIDE SWITCH	HS DIGITAL INPUT
	5	PLATFORM STOWED	HS DIGITAL INPUT
	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	BROKEN CABLE INDICATOR	LAMP OUTPUT
	11	PLATFORM OVERLOADED INDICATOR	LAMP OUTPUT
	12	500 LB CAPACITY INDICATOR	LAMP OUTPUT
	13	1000 LB CAPACITY INDICATOR	LAMP OUTPUT
	14	DRIVE ORIENTATION SYSTEM INDICATOR	LAMP OUTPUT
	15	GENERATOR ON INDICATOR	LAMP OUTPUT
	16	SOFT TOUCH TRIGGERED INDICATOR	LAMP OUTPUT
	17	GLOW PLUG ENGAGED INDICATOR	LAMP OUTPUT
	18	LAMP RETURN	GROUND
	19	SPARE PIN	LAMP OUTPUT
	20	UPRIGHT TILTED INDICATOR	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	FUEL LEVEL INDICATORS RETURN	GROUND
	26	ANALYZER POWER	ANALYZER POWER
	27	ANALYZER GROUND	ANALYZER GROUND
	28	ANALYZER RX	ANALYZER RX
	29	ANALYZER TX	ANALYZER TX
	30	SPARE PIN	LAMP OUTPUT
	31	SPARE PIN	DIGITAL OUTPUT
	32	BATTERY VOLTAGE	BATTERY VOLTAGE
	33	BATTERY VOLTAGE	BATTERY VOLTAGE
	34	SWITCH POWER	BATTERY VOLTAGE
	35	FULL FUEL LEVEL INDICATOR	LAMP OUTPUT

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 (FUNCTION ENABLE SWITCH) POWER	BATTERY VOLTAGE
	5	PLATFORM ROTATE LEFT	ME DIGITAL OUTPUT
	6	PLATFORM ROTATE RIGHT	ME DIGITAL OUTPUT
	7	SOFT TOUCH LIMIT SWITCH POWER	BATTERY VOLTAGE
	8	FOOTSWITCH SIGNAL	DIGITAL INPUT
	9	GENERATOR ON SIGNAL	DIGITAL INPUT
	10	+7 REFERENCE VOLTAGE	+7 REFERENCE VOLTAGE
	11	SPARE PIN	+5V REFERENCE VOLTAGE
	12	SPARE PIN	+5V REFERENCE VOLTAGE
	13	SPARE PIN	ANALOG INPUT
	14	GROUND RETURN	GROUND
	15	PLATFORM LEVEL UP	HS DIGITAL OUTPUT
	16	PLATFORM LEVEL DOWN	HS DIGITAL OUTPUT
	17	JIB BLOCK LIMIT SWITCH	HS DIGITAL INPUT
	18	SOFT TOUCH LIMIT SWITCH	HS DIGITAL INPUT
	19	PLATFORM ALARM	LAMP OUTPUT
	20	ALARM RETURN	GROUND
	21	SPARE PIN	GROUND
	22	SPARE PIN	GROUND
	23	SPARE PIN	ANALOG INPUT
	24	SPARE PIN	DIGITAL OUTPUT
	25	JIB UP	ME DIGITAL OUTPUT
	26	JIB DOWN	ME DIGITAL OUTPUT
	27	JIB RIGHT	ME DIGITAL OUTPUT
	28	JIB LEFT	ME DIGITAL OUTPUT
	29	GROUND RETURN	GROUND
	30	CAN LOW	CAN LOW
	31	CAN HIGH	CAN HIGH
	32	CAN SHIELD	CAN SHIELD
	33	SPARE PIN	GROUND
	34	SPARE PIN	GROUND
	35	SPARE PIN	ANALOG INPUT

PLATFORM CONNECTION



GROUND CONTROL CONNECTION

Figure 6-14. Analyzer Connecting Points

6.6 SYSTEM TEST

The Control System Incorporates a built-in system test to check the system components and functions. To use this function, use the following procedures.

Test from the Platform

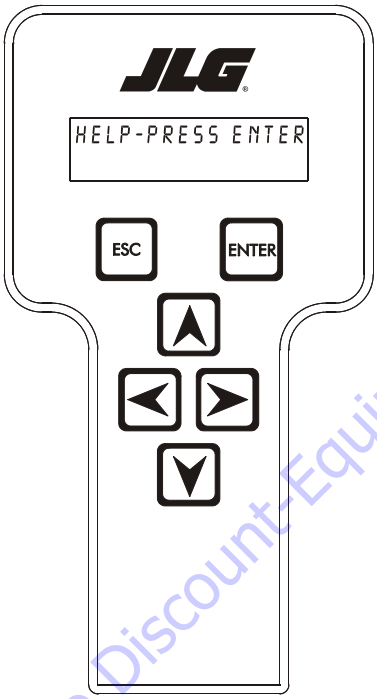
1. Position the Platform/Ground select switch to the Platform position.

2. Plug the analyzer into the connector at the base of the platform control box.

3. Before proceeding, ensure that the switches on the platform console are in the following positions:
   a. Drive speed switch is in the Middle position. (Turtle Icon)
   b. 4WS switch is in the Middle position. (2WS mode)
   c. Capacity select switch in the 1000 lb. (450 kg) mode.
   d. Function speed potentiometer out of creep mode switch.
   e. Generator (if equipped) switched to the off position.
   f. Head and Tail lights (if equipped) switched to the off position.

4. Pull out the Emergency Stop switch and Start the engine.

5. The analyzer screen should read:



6. Use the arrow button to reach SYSTEM TEST. Hit Enter. The analyzer will prompt you asking if you want to activate the system test; hit Enter again to activate.

7. Follow the flow path in Figure 6-15., System Test Flow Chart - Platform Tests and go through the component tests. Hit the ESC key during any part of the test to return to the main menu without completing all tests or wait until all tests are complete. During the TEST ALL INPUTS sequence, the analyzer allows control switches to be operated and shows if they are closed (CL) or open (OP).

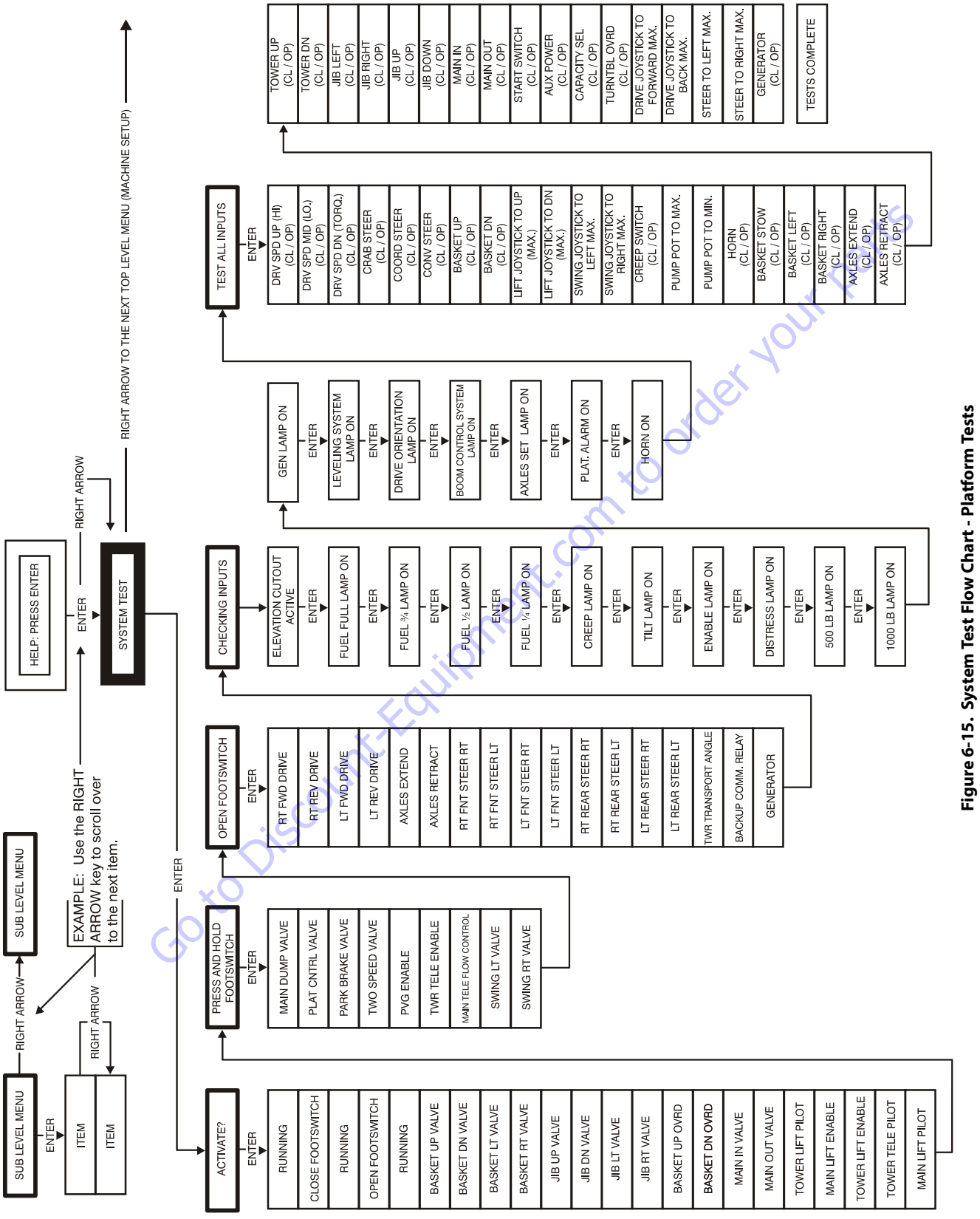


Figure 6-15. System Test Flow Chart - Platform Tests

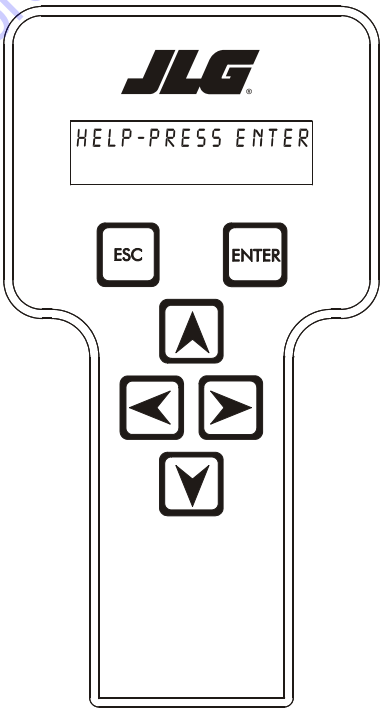
Test from the Ground Station

1. Position the Platform/Ground select switch to the Ground position.

2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch. and Start the engine.

4. The analyzer screen should read:



5. Use the arrow button to reach SYSTEM TEST. Hit Enter. The analyzer will prompt you asking if you want to activate the system test; hit Enter again to activate.

6. Follow the flow path in Figure 6-16., System Test Flow Chart - Ground Station Tests and go through the component tests. Hit the ESC key during any part of the test to return to the main menu without completing all tests or wait until all tests are complete. During the TEST ALL INPUTS sequence, the analyzer allows control switches to be operated and shows if they are closed (CL) or open (OP).

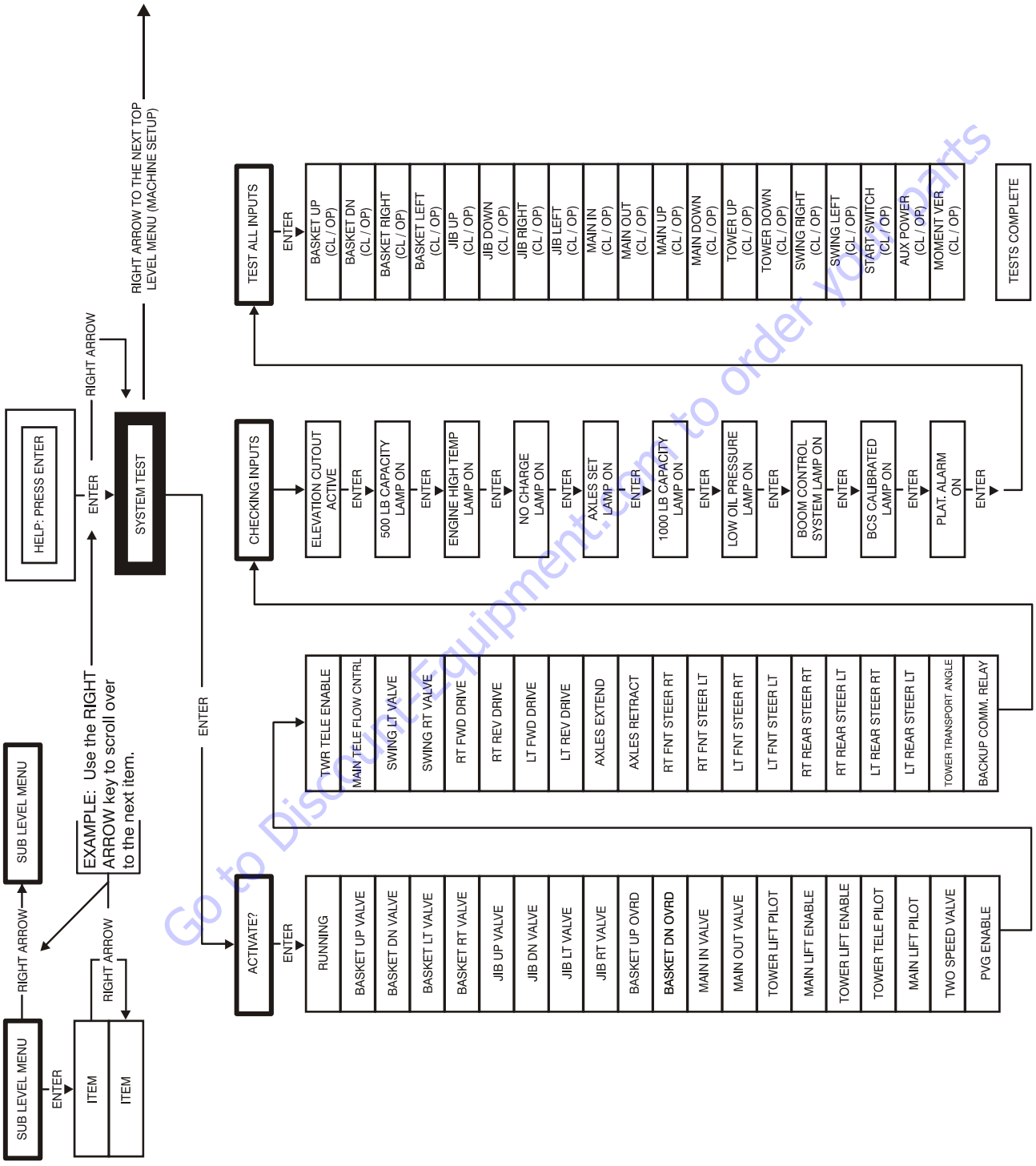


Figure 6-16. System Test Flow Chart - Ground Station Tests

Table 6-5. System Test Messages

Message Displayed on Analyzer	Message Displayed on Analyzer	Description
RUNNING		Initial display when system test is run; certain "critical" checks are made. Problems that can be reported include below messages.
	ONLY 1 ANALYZER!	Do not connect two Analyzers while running the system test.
	BATTERY TOO LOW	The system test cannot run with battery voltage below minimum (9 V).
	BATTERY TOO HIGH	The system test cannot run with battery voltage above maximum. (16 V).
	CHECK CAN WIRING	The system test cannot run in platform mode unless data is being received from the platform and ground modules. The system test cannot run in ground mode unless data is being received from the platform module.
	CHECK SPEED	There is an open- or short- circuit in the speed encoder wiring. Check speed encoder.
	BAD GROUND MODULE	An internal problem was detected in the ground module.
	HIGH TILT ANGLE	The vehicle is very tilted (19.3°), or the tilt sensor has been damaged. Check tilt sensor.
	HOT ENGINE	The engine temperature exceeds 100°C. This is only a warning.
	BAD I/O PORTS	The controller detected a problem with its internal circuits at switch on. If other problems are also detected, the controller may need replacing.
	SUSPECT EEPROM	The controller detected a problem with its EEPROM stored personality settings at switch on. Check and, if necessary correct, all personality settings.
	OPEN FSW	In platform mode, the footswitch must be open at the start of the test.
	CLOSE FSW	In platform mode, the footswitch must be closed when this message is displayed; the footswitch MUST BE KEPT CLOSED during the valve & contactor tests.
	BAD FSW	The two footswitch signals are not changing together, probably because one is open-circuit. One footswitch signal ("FSW1") is routed to the power module, the other ("FSW2") is routed to the platform module. Check footswitch and wiring.
TESTING VALVES		Indicates that the valve test is beginning. Each valve is alternately energized and de-energized; checks are made for open- and short- circuit valve coils. NOTE: In platform mode, the footswitch must be closed. NOTE: Tower lift valves are not tested if TOWER LIFT=NO. Tower telescope valves are not tested if TOWER TELE=NO. Jib valves are not tested if JIB = NO. Extendable axle valves are not tested if EXT AXLES=NO. Four wheel steer valves are not tested if 4WS=NO. NOTE: Left/right jib valves are not tested unless JIB = SIDESWING. Problems that can be reported include below messages.
	CANT TEST VALVES	There is a wiring problem, which prevents the valve test from functioning correctly. Check valve wiring. Check ground alarm & hour meter wiring.
	XXXXXXX S/C	The named valve is drawing too much current so is presumed to be short-circuited. Check valve wiring.
	XXXXXXX O/C	The named valve is drawing too little current so is presumed to be open-circuit. Check valve wiring.

Table 6-5. System Test Messages

Message Displayed on Analyzer	Message Displayed on Analyzer	Description
CHECKING INPUTS		Indicates that the inputs test is beginning. Every input is checked to ensure that it is in its "normal" position; function switches should be open, cutout switches should be closed, joysticks should be in neutral. In platform mode any non-neutral platform switch or joystick is reported; any active cutouts are reported. In ground mode any non-neutral ground switches is reported; any active cutouts are reported. NOTE: Switches, which are not in use (due to the settings of machine digits), are not checked. NOTE: The pump pot is checked only for a wire-off condition; it can be at any demand from creep to maximum. Problems that can be reported include below messages.
	CHECK XXXXXXX	The named switch is not in its "normal" position. Check switch & wiring.
	CHECK XXXXXXX JOY	The named joystick appears to be faulty. Check joystick.
TESTING LAMPS		Indicates that the lamps test is beginning. Each lamp is energized in turn; a prompt asks for confirmation that the lamp is lit. ENTER must be pressed or clicked to continue the test. NOTE: Lamps, which are not in use (due to the settings of machine digits), are not checked. NOTE: Platform Lamps are only tested in platform mode. NOTE: The GM overload lamp and 500# capacity lamp are not tested. NOTE: Head and tail lamps are tested in both platform and ground mode if enabled by a machine digit.
TESTING ALARMS		Indicates that the alarms test is beginning. Each alarm is energized in turn; a prompt asks for confirmation that the alarm is sounding. ENTER must be pressed or clicked to continue the test. NOTE: The platform alarm and the horn are only tested in platform mode. NOTE: The ground alarm is not tested if GROUND ALARM = NO.

Table 6-5. System Test Messages

Message Displayed on Analyzer	Message Displayed on Analyzer	Description
TEST ALL INPUTS?		Prompts whether to check every operator input. If ESC is pressed or clicked, the system test ends. If ENTER is pressed or clicked, each operator input is prompted for in turn. In platform mode every platform switch and joystick is tested. In ground mode every ground switch is tested. NOTE: Tower lift switches are not tested if TOWER LIFT=NO. Tower telescope switches are not tested if TOWER TELE=NO. Jib switches are not tested if JIB = NO. Extendable axle switches are not tested if EXT AXLES=NO. Four wheel steer switches are not tested if 4WS=NO. NOTE: Left/right jib switches are not tested unless JIB = SIDESWING. Prompts displayed during the operator input test below messages.
	CLOSE XXXXXXX	The named switch should be closed.
	OPEN XXXXXXX	The named switch should be opened.
	XXXXXXX XXXXXXX TO MAX	The named joystick should be pushed to its full extent in the named direction.
	XXXXXXX XXXXXXX TO MIN	The named joystick should be returned to neutral from the named direction.
	PUMP POT TO MAX	The pump pot should be turned to maximum.
	PUMP POT TO MIN	The pump pot should be turned to minimum.
	MULTIPLE CLOSURE	More than one operator input is closed; if only one has been operated, there could be a short between two inputs.
TESTS COMPLETE		Indicates that the system test is complete. Any problems reported should have been noted and should now be rectified. Press ESC/CANCEL to return to the RUN SYSTEM TEST Analyzer menu.

6.7 CALIBRATING STEER

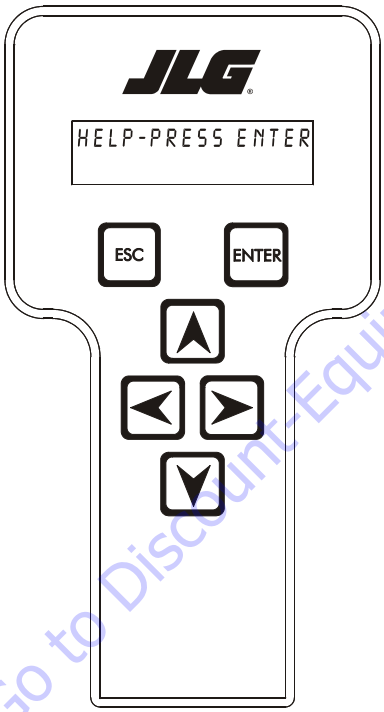
When calibrating steering, each individual wheel must be calibrated in order to make the tire and wheel parallel with the frame. Two methods to help ensure proper calibration are the use of a carpenter's square to square the spindle to the axle or aligning the two wheels on one side using a stretched string.

1. Position the Platform/Ground select switch to the Platform position.

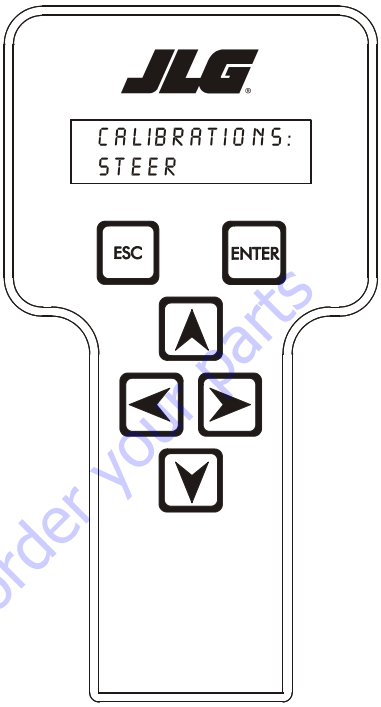
2. Plug the analyzer into the connector at the base of the platform control box.

3. Pull out the Emergency Stop switch and Start the engine.

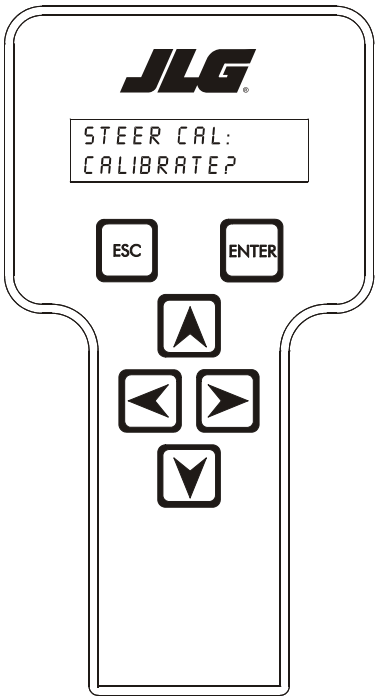
4. The analyzer screen should read:



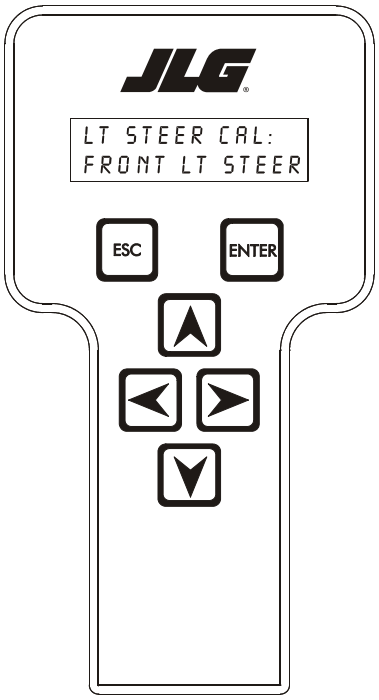
5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Use the right Arrow key to reach CALIBRATIONS. Hit Enter.
8. Use the arrow keys to reach Steer. The screen will read:



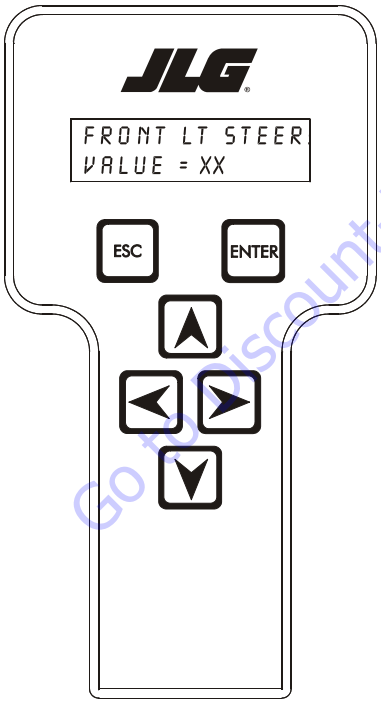
9. Hit Enter. The screen will read:



10. Hit Enter. The screen will read:

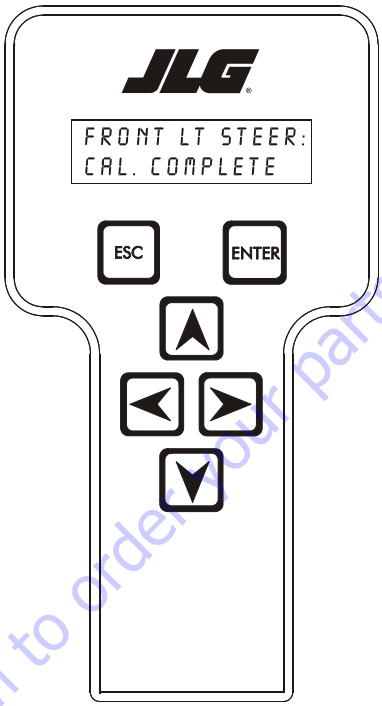


11. Hit Enter again. The screen will read:



12. Activate the steer control until the tire and wheel are straight in relationship with the chassis, then leave off the control. The display will read FRT LEFT = and show the numeric calibration value for that wheel.

13. Hit Enter. The screen will read:



14. Repeat steps 10 thru 12 for left rear steer.

15. Left Rear Steer Calibration will be followed by Right Forward Steer Calibration which will be followed by Right Rear Steer Calibration.

16. After completing all the Steer Calibrations, hit ESC twice to go back to CALIBRATIONS.

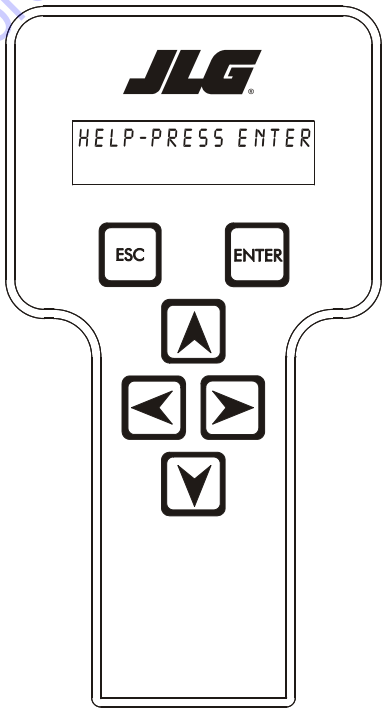
6.8 CALIBRATING DRIVE

1. Position the Platform/Ground select switch to the Platform position.

2. Plug the analyzer into the connector at the base of the platform control box.

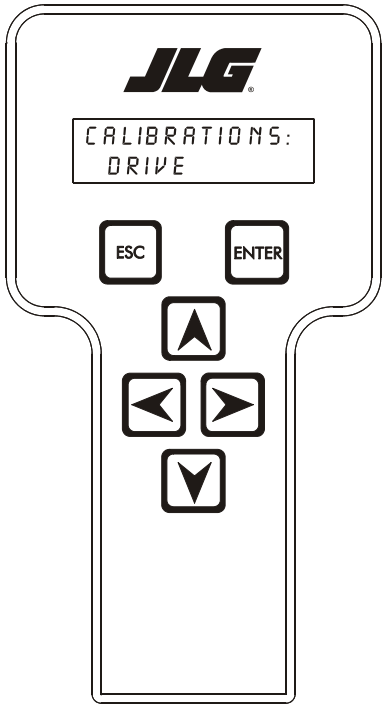
3. Pull out the Emergency Stop switch and Start the engine.

4. The analyzer screen should read:

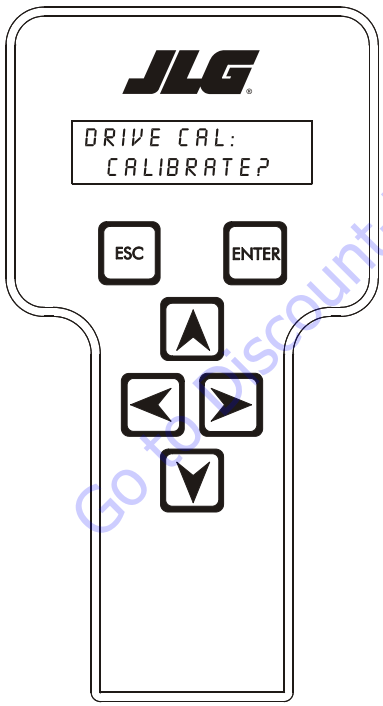


5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Use the right Arrow key to reach CALIBRATIONS. Hit Enter.

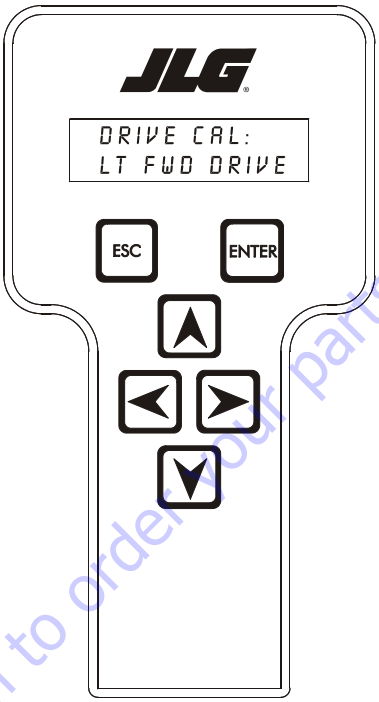
8. Use the arrow keys to reach DRIVE.



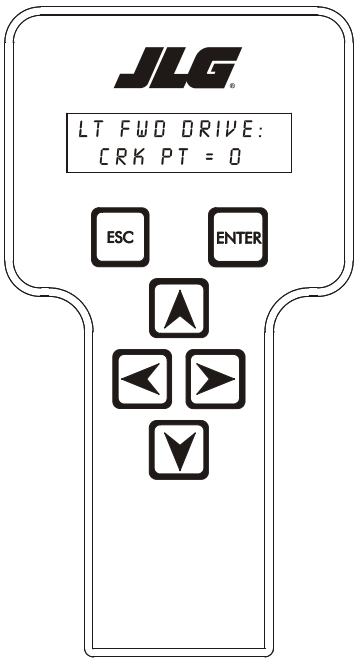
9. Hit Enter. The screen will read:



10. Hit Enter again. The screen will read:

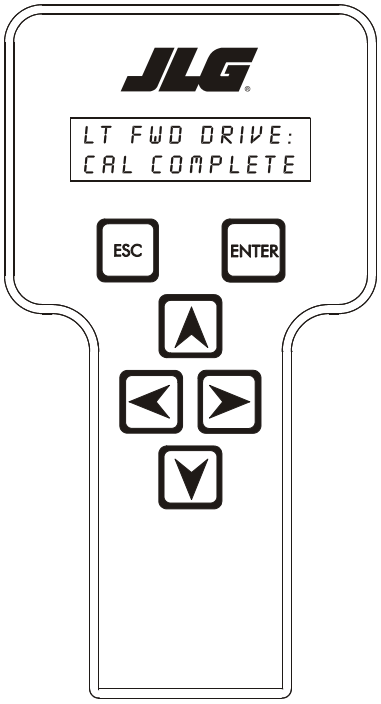


11. Hit Enter again. The screen will read:

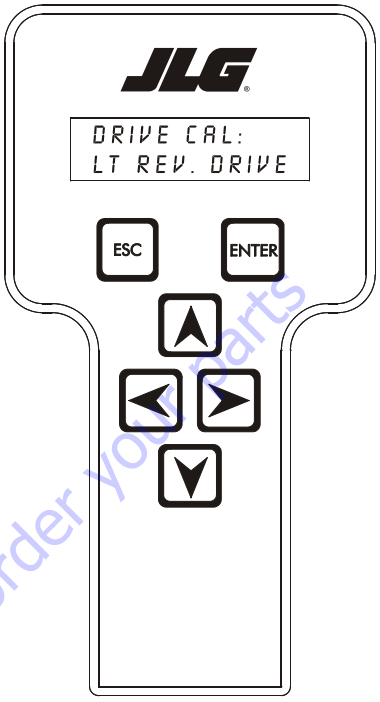


12. Activate the Drive Joystick forward full stroke until the machine just begins to move, then leave off the joystick immediately. The display will read CRK PT = and show the numeric crack point value.

13. Hit Enter. The number displayed will be the value that the crack point is set to. The screen will show:



14. Hit Enter. The screen will read:



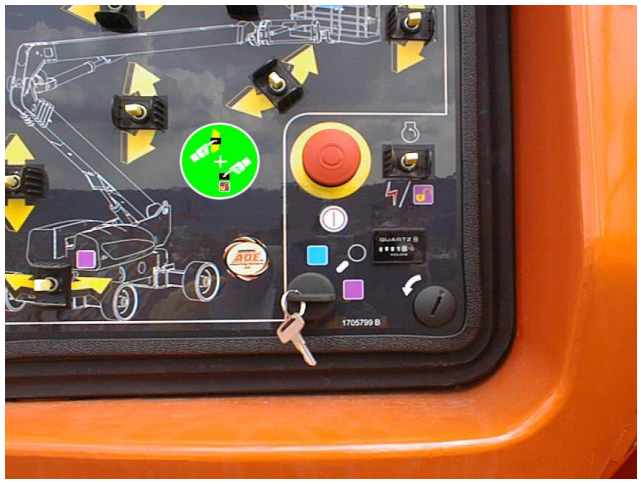
15. Repeat steps 10 thru 12 for left reverse drive.

16. Left Reverse Drive Calibration will be followed by Right Forward Drive Calibration which will be followed by Right Reverse Calibration.

17. After completing all the Drive Calibrations, hit ESC twice to go back to CALIBRATIONS.

6.9 CALIBRATING BOOM VALVES

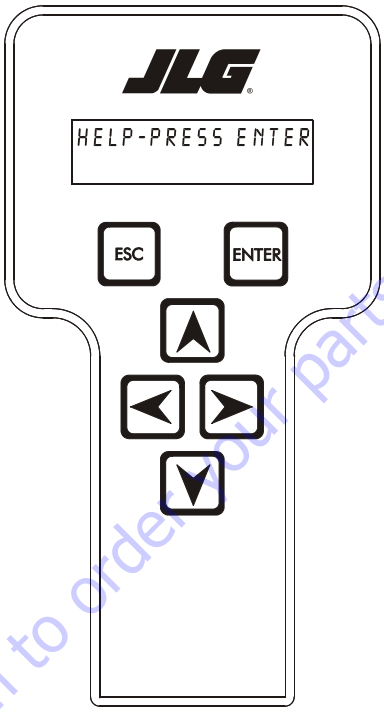
1. Position the Platform/Ground select switch to the Ground position.



2. Plug the analyzer into the connector inside the Ground control box.

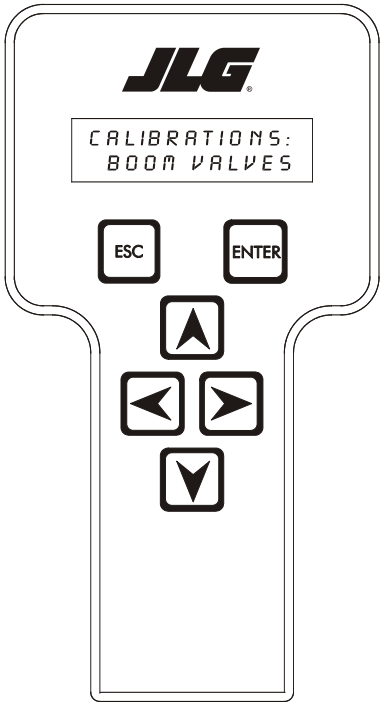
3. Pull out the Emergency Stop switch.

4. The analyzer screen should read:

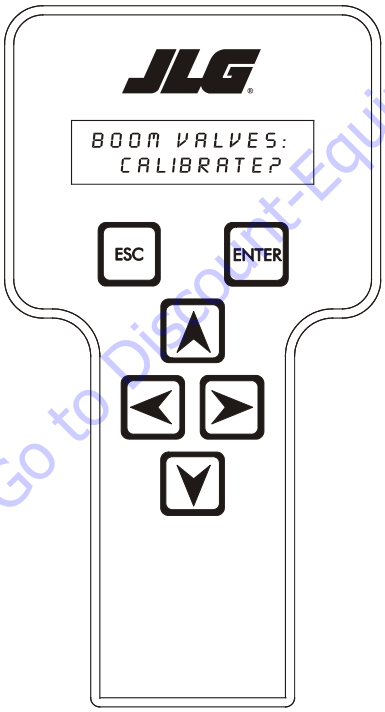


5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Use the arrow keys to reach CALIBRATIONS. Hit Enter.

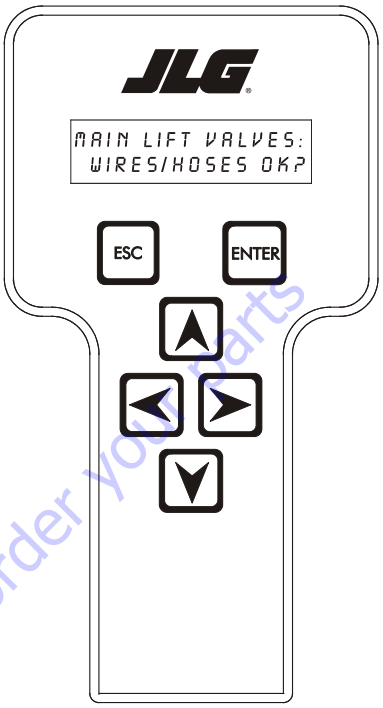
8. Use the arrow keys to reach Boom Valves. The screen will read:



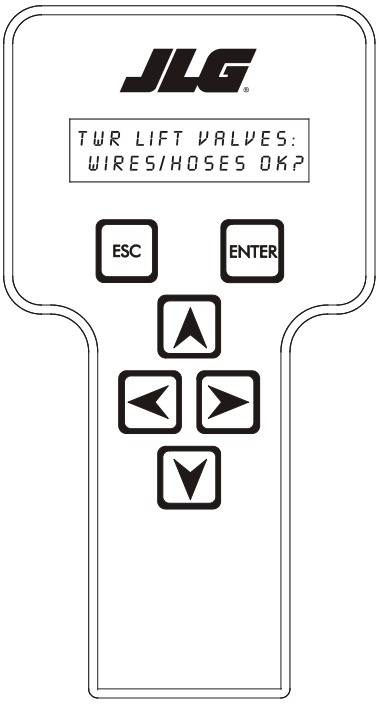
9. Hit Enter. The screen will read:



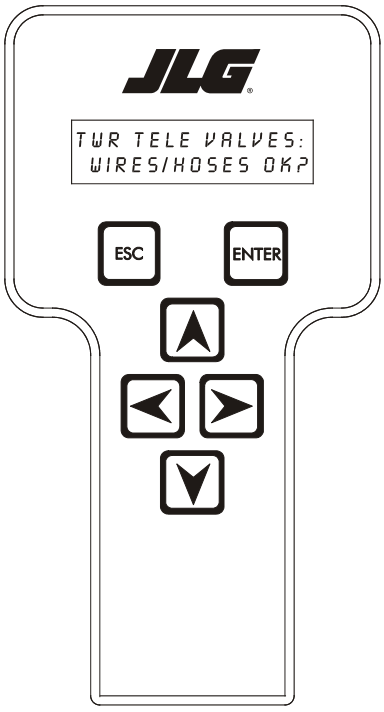
10. Hit Enter. The screen will read:



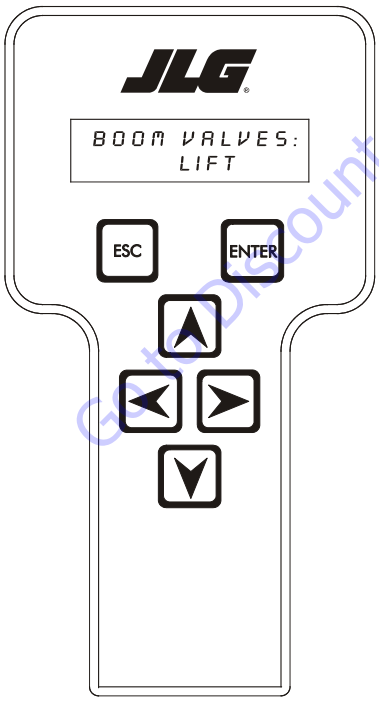
11. If the main lift wiring and hosing is properly installed and not damaged, hit enter. The screen will read:



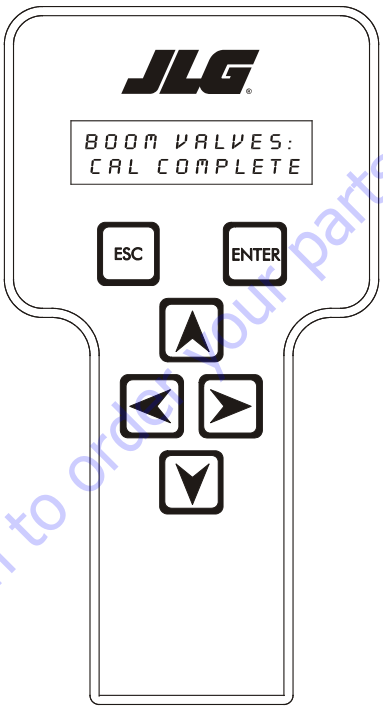
12. If the tower lift wiring and hosing is properly installed and not damaged, hit enter. The screen will read:



13. If the tower telescope wiring and hosing is properly installed and not damaged, hit enter. The screen will read:



14. The control system will next calibrate the LIFT, TWR LIFT, and TWR TELE valves. This can be confirmed by watching the LED's on the respective valves as they are being calibrated. When the valves are calibrated, the screen will read:



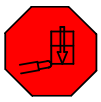
NOTE: *It may take several minutes per valve section for the calibration procedure.*

15. After completing Boom Valve Calibration, hit ESC twice to go back to CALIBRATIONS.

6.10 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:

- **d.** LSS Sensor removal or replacement
- **e.** Addition or removal of certain platform mounted accessories. (Refer to Calibration)
- **f.** 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.

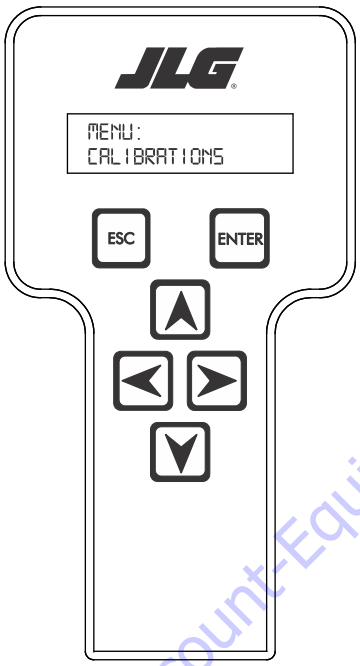
Table 6-6, Diagnostic Menu Descriptions details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

Table 6-6. 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			

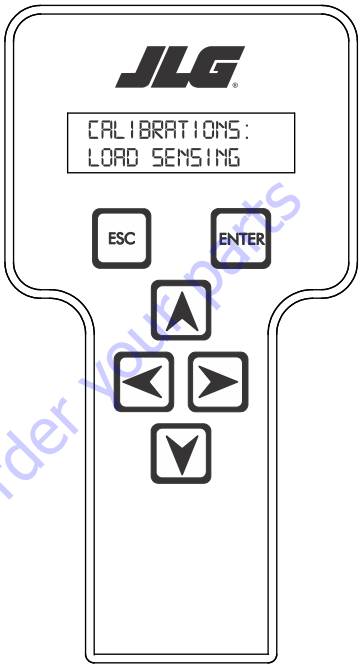
Calibration Procedure

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:

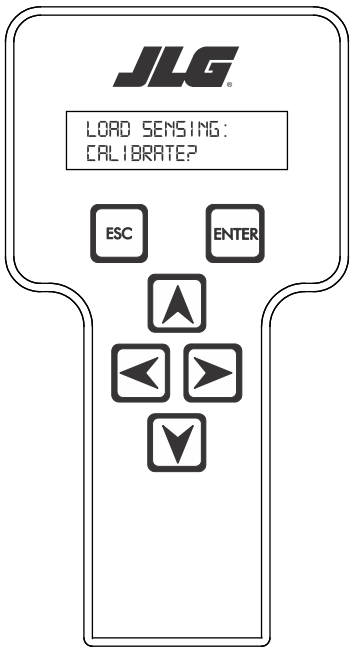


NOTE: *The Calibration Menu is not available in OPERATOR ACCESS.*

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:



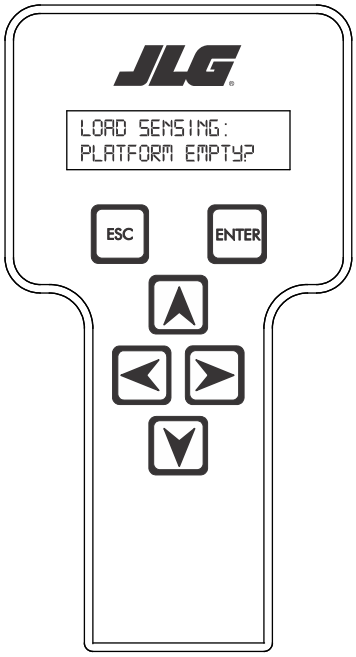
6. Press Enter (ENTER). The Screen will read:



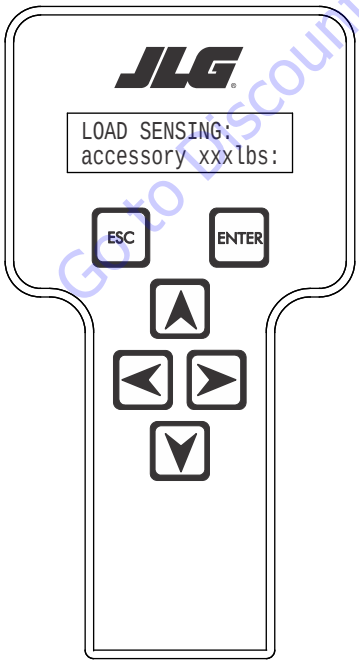
NOTE: *Calibration will auto fail if LSS DTC's are active (443, 444, 4479, 4480, 663, 821, 822, 823, 824, 8218, 8222 -> 8238, 991, 992, 993, 994 or 99285).*

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 6-7, 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:

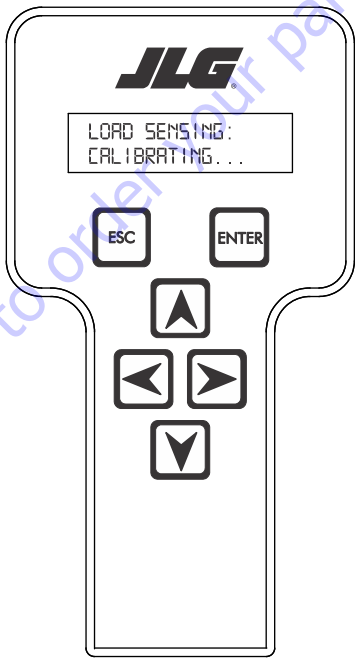


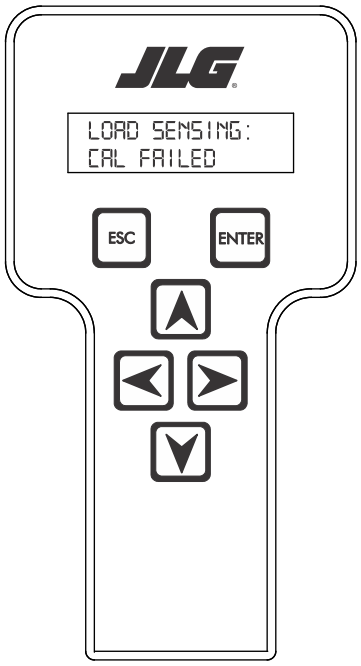
Table 6-7. Accessory Weights

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)

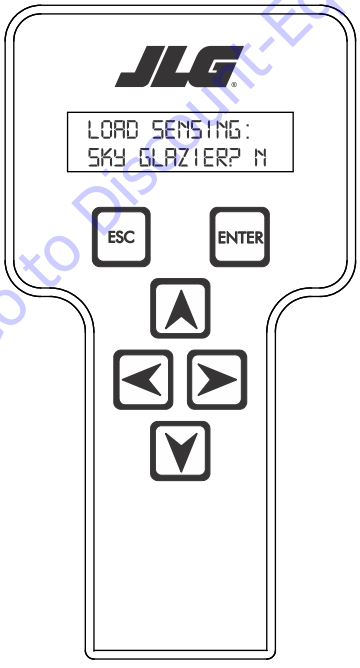
NOTE: *Not all Accessories are available on every JLG model. Some Accessory combinations are prohibited due to excessive weight and/or load restriction. If any installed JLG Accessories are labeled with weight decals but are not listed in the table above, include their weight when entering the ACC WEIGHT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

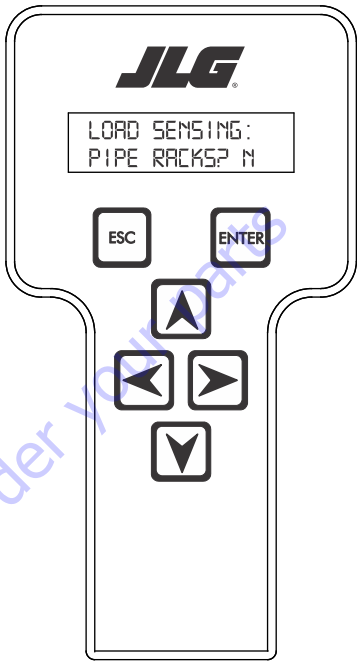
If the platform weight is not within the allowed range, the calibration attempt will be unsuccessful and the Analyzer will show the following:



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 6-8, SkyGlazier Capacity Reductions and Table 6-9, Pipe Rack Capacity Reductions.

The screen will read:

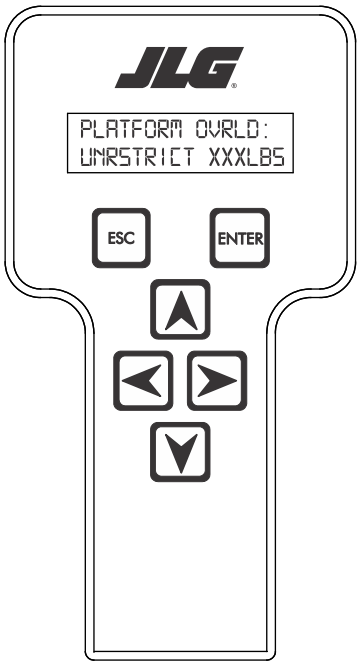


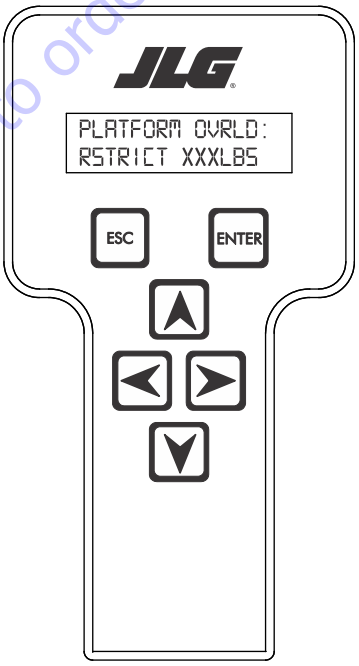
Table 6-8. SkyGlazier Capacity Reductions

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.		

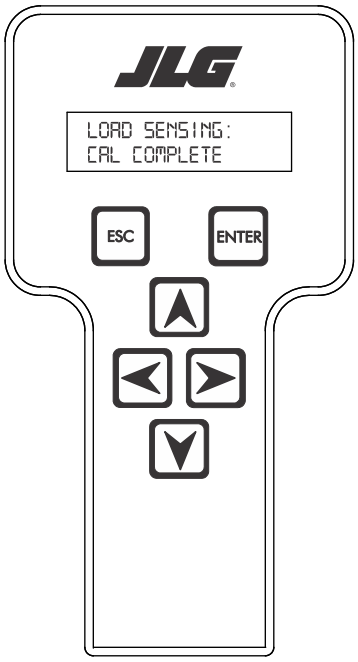
Table 6-9. Pipe Rack Capacity Reductions

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 6-8, SkyGlazier Capacity Reductions and Table 6-9, Pipe Rack Capacity Reductions.



14. Press ENTER (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 6-10. LSS Troubleshooting Chart

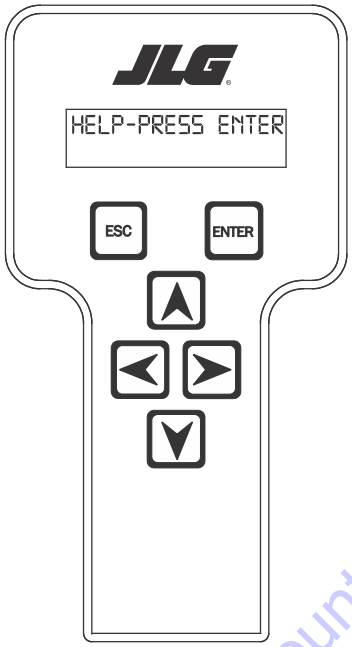
Difficulty	Possible Resolution
Empty Platform Weight (DIAGNOSTICS, PLATFORM LOAD) is not within ±15lbs (±7kg) of zero. or Platform Load readings (DIAGNOTICS, PLTLOAD) are unstable by more than ±2lbs (±1kg) (without the influence of vibration or wind). or There are large variations in Platform Load (DIAGNOSTICS, 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.

6.11 RESETTING THE MSSO SYSTEM

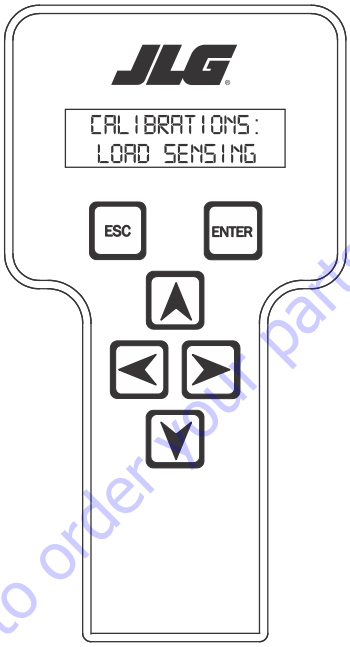
1. Use the following procedure to reset the MSSO system.
2. Position the Platform/Ground select switch to the desired position.
3. Plug the analyzer into the connector coming from the ground control module or from the platform console.

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:

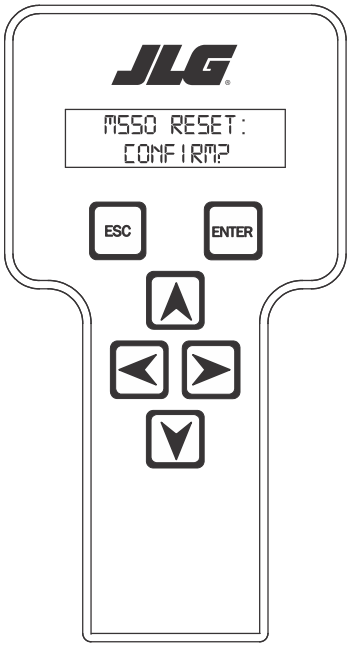


6. Use the arrow button to reach OPERATOR ACCESS. Press Enter ENTER.
7. Enter the Access Code, 33271.
8. Use the right Arrow key to reach MENU: CALIBRATIONS. Press Enter ENTER.
9. Use the arrow keys to reach the LOAD SENSING menu. The screen should read:



10. Press ENTER ENTER.
11. Use the Down 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.

6.12 ELECTRONIC PLATFORM LEVELING

Platform Leveling Fault Warning

The JLG Control System takes a snapshot of the two sensor values and records the difference once on each power up. The Control system allows a ±5 degree difference from those values. For example, if Sensor 1 is at 5 degrees and Sensor 2 is at 11 degrees, the difference is 6 degrees and the DTC is triggered when the sensors are 1 degree (or less) apart or 11 degrees (or more) apart.

If a fault occurs in the platform leveling system the following will occur:

1. Automatic platform leveling will stop (except when there is a fault in only one sensor automatic leveling will remain active as the control system will use the other sensor to control leveling)
2. The level fault lamp will flash
3. The audible alarm will sound
4. All functions will default to creep speed if the platform is out of the transport position.

To reset the fault the emergency stop switch should be recycled.

NOTICE

IF THE FAULT PERSISTS BRING THE PLATFORM TO THE GROUND POSITION, SWITCH THE MACHINE OFF AND CONTACT A QUALIFIED SERVICE REPRESENTATIVE TO INVESTIGATE THE FAULT.

Fault Response

ERROR RESPONSE

If basket level varies from the current **setpoint** by ± 5.5° for more than 1.5 seconds when the platform is not in the transport position, the following events will occur:

1. The platform dump valve will be disabled (level, rotate and jib functions disabled).
2. The level system fault lamp will flash (to indicate that the leveling function has been lost).
3. The platform alarm will sound.
4. A system fault will be logged.
5. All function speeds (lift, swing, telescope and drive) will be placed in creep mode (except when the platform is in the transport position see below).

When the unit is in the transport position and driving and the current setpoint varies by ± 5.5° for more than 8 seconds the events 1,2,3 & 4 above will occur. (note function speeds will operate normally). Cycling the EMS will clear the fault and allow the operator to operate the machine as a new level **setpoint** is taken.

VALVE DRIVER ERRORS

There are three possible level valve driver errors, short to battery, short to ground, and open circuit.

1. In the case of a **short to ground or an open circuit**, the platform valve cannot be turned on and the following will occur:
   a. All interactions with platform leveling shall cease
   b. The Electronic Leveling System Fault Lamp shall flash (to indicate that the leveling function has been lost).
   c. The platform alarm will sound.
   d. A system fault will be logged.
   e. All function speeds (lift, swing, telescope and drive) will be placed in creep mode (except when the platform is in the transport position).
2. In the case of a **short to battery** on one of the platform leveling valves, the valve cannot be turned off and the following will occur:
   a. The platform dump valve will be turned off to prevent unintended tilting of the platform.
   b. All interactions with platform leveling shall cease.
   c. The Electronic Leveling System Fault Lamp shall flash (to indicate that the leveling function has been lost).
   d. The platform alarm will sound.
   e. A system fault will be logged.
   f. All function speeds (lift, swing, telescope and drive) will be placed in creep mode (except when the platform is in the transport position)
3. In the case of a **short to battery on the platform dump valve**, the valve cannot be turned off. The controllability of the platform leveling function will be impaired and the following will occur:
   a. All interactions with platform leveling shall cease.
   b. The Electronic Leveling System Fault Lamp shall flash (to indicate that the leveling function has been lost).
   c. The platform alarm will sound.
   d. A system fault will be logged.
   e. All function speeds (lift, swing, telescope and drive) will be placed in creep mode (except when the platform is in the transport position).

Lift, swing, drive and telescope will continue to operate

In each of the cases above it shall be necessary to re-cycle the EMS to clear the fault. Operable functions shall be in the creep mode except while below elevation.

TILT SENSOR ERRORS

If the secondary tilt sensor is faulty, the control system will continue to utilize information from the primary sensor.

If the primary sensor is faulty, the control system will switch to the backup sensor for control.

In both cases above the following will occur:

1. The Electronic Leveling System Fault Lamp will flash (to indicate that there is a leveling fault).
2. The platform alarm will sound.
3. A system fault will be logged.
4. All function speeds (lift, swing, telescope, jib and drive) will be placed in creep mode (except when the platform is in the transport position).
5. Automatic leveling remains active.

Lift, swing, drive and telescope will continue to operate.

In each of the cases above it will be necessary to re-cycle the EMS to clear the fault. Operable functions shall be in the creep mode except while below elevation.

When both sensors appear to be working but have measurements that disagree by ±5.5° The following will occur:

1. All interactions with platform leveling shall cease.
2. The Electronic Leveling System Fault Lamp shall flash (to indicate that the leveling function has been lost).
3. The platform alarm will sound.
4. A system fault will be logged.
5. All function speeds (lift, swing, telescope and drive) will be placed in creep mode (except when the platform is in the transport position)

At this point, the operator must use the level up and down toggle switch to manually level during descent. It shall be necessary to re-cycle the EMS to clear the fault.

CAN Errors

The Ground Module has two direct outputs dedicated to overriding the Platform Module's control of the leveling valves. The Ground Module "Platform Level Up/Down" outputs are used to control the platform level up and down valves.

When in ground mode, if the Ground Module reads a platform leveling switch command, the switch command is communicated over CAN to the Platform Module where it is handled normally.

If Ground Module determines that CAN communication is inoperable, it turns on the platform control valve and the appropriate platform leveling override outputs while the switch is engaged.

If the Platform Module is still running when CAN is down nothing will operate when in platform mode. When the operator switches to ground mode, the platform will not control any of its valve outputs and a CAN error message is signaled.

Additional Platform and Jib Valves

The high side drivers for the platform left and right and the jib up and down valves are be located in the Platform Module and are proportional. Flow through the valves is individually controllable. The individually controlled duty cycle will be the same as would otherwise have been commanded to the flow control valve.

Only one platform or jib function is allowed at one time to limit the amount of current draw, minimizing the voltage drop on the supply to the Platform Module.

The function is enabled first shall remain active until it is released. Any other function commanded while another function is active is ignored.

6.13 CALIBRATING PLATFORM LEVEL

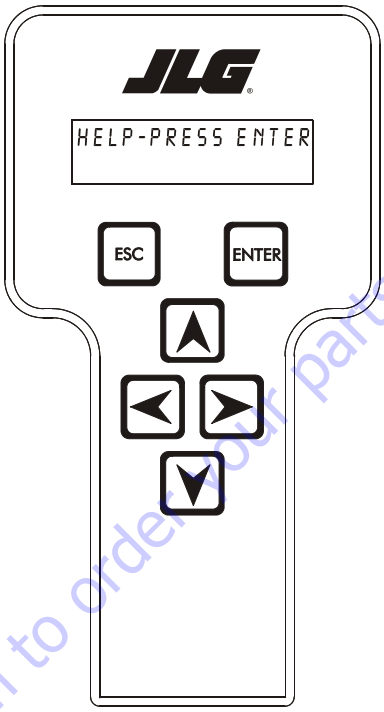
STEP 1: SETTING THE PLATFORM VALVE MINIMUMS

1. Position the Platform/Ground select switch to the Ground position.

2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch and start the engine.

4. The analyzer screen should read:



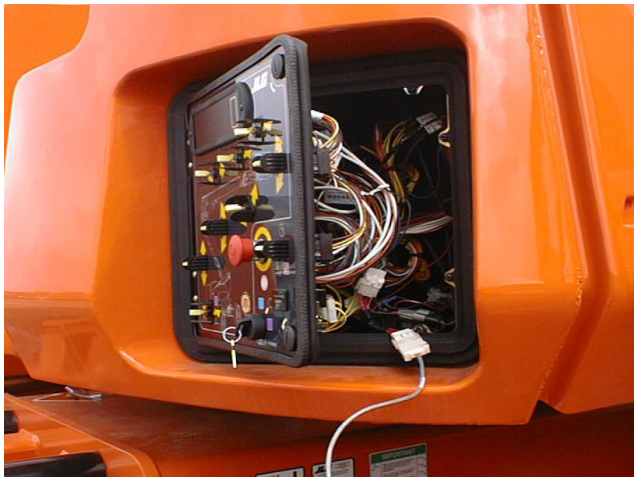
5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Use the arrow button to reach PERSONALITIES adjust the following personalities. Refer to the Personality Ranges/Defaults table for proper setting values.

   Basket Level Up Min
   Basket Level Up Max
   Basket Level Down Max
   Jib Up Min
   Jib Down Min

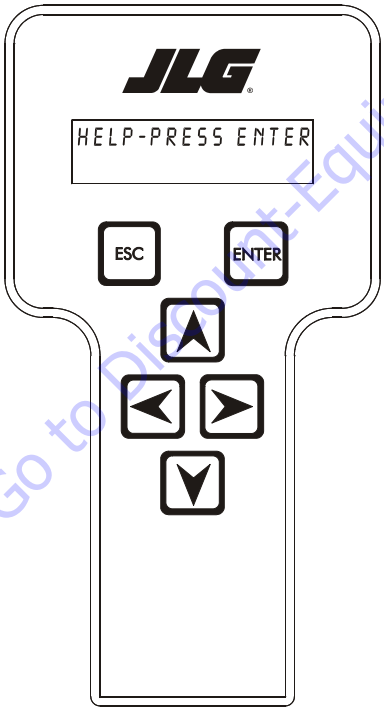
8. Recycle EMS.

STEP 2: BLEEDING THE PLATFORM VALVES

1. Position the Platform/Ground select switch to the Ground position.
2. Plug the analyzer into the connector inside the Ground control box.



3. Pull out the Emergency Stop switch and start the engine.
4. The analyzer screen should read:



5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Go to the PERSONALITIES menu.
8. Using the left arrow button, go to the GROUND MODE menu.
9. Hit ENTER.
10. Using the UP/DOWN arrows, adjust the following personalities to 100%.

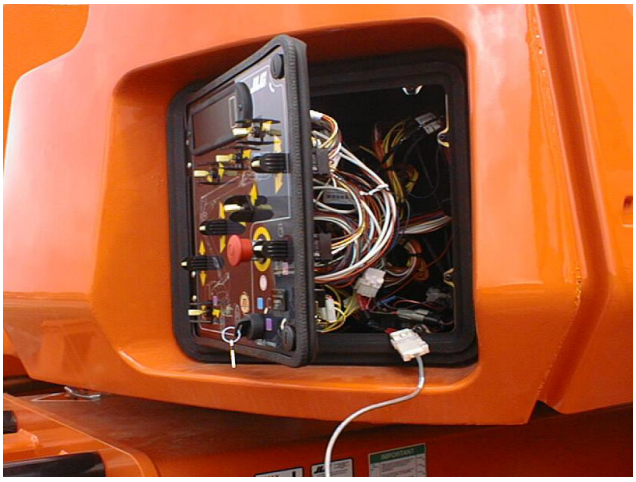
    Basket Rotate
    Basket Level
    Jib U/D (if configured)

    Start up the machine and exercise each above platform function (from the ground) eight (8) to ten (10) times for 5 seconds in each direction.
11. Return the personality settings back to the values as shown in the Personality Ranges/Defaults table in Section 6 - JLG Control System.
12. Recycle EMS.

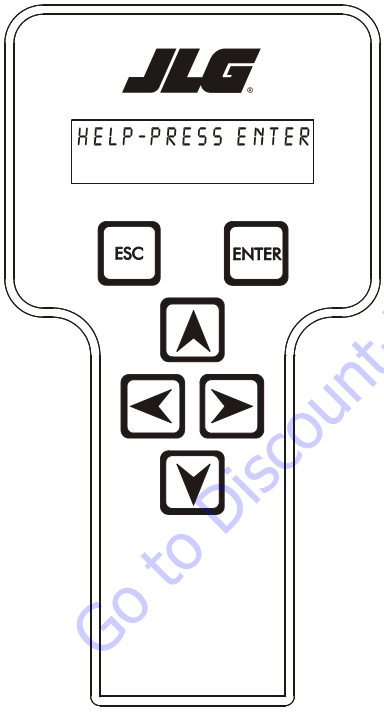
STEP 3: CALIBRATING THE PLATFORM LEVEL UP AND DOWN VALVE CRACKPOINTS

1. Position the Platform/Ground select switch to the Ground position.

2. Plug the analyzer into the connector inside the Ground control box.



3. Pull out the Emergency Stop switch and start the engine.
4. The analyzer screen should read:



5. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
6. Enter the Access Code, 33271.
7. Go to the CALIBRATIONS menu and hit ENTER.
8. Go to the BASKET U CRKPT Screen. Hit ENTER.
9. CALIBRATE? prompt should appear. Hit ENTER again.
10. You will hear engine go to 1800 rpm.
11. Using UP ARROW, increase the value until you see the basket up movement.
12. Hit ENTER again. CAL. COMPLETE message should appear
13. Engine should again return to idle.
14. Hit ESC should return to BASKET U CRKPT screen.
15. Hit RIGHT ARROW to get to the "BASKET D CRKPT" screen. Hit ENTER.
16. CALIBRATE? prompt should appear. Hit ENTER again.
17. You will hear engine go to 1800 rpm.

Using UP ARROW, increase the value until you see the basket down movement.

Hit ENTER again. CAL. COMPLETE message should appear

Engine should again return to idle.

Hit ESC to exit.

Cycle power to the machine.

6.14 CALIBRATING TILT SENSOR

NOTICE

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

⚠ WARNING

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

1. Use the following procedure to calibrate the tilt sensor.

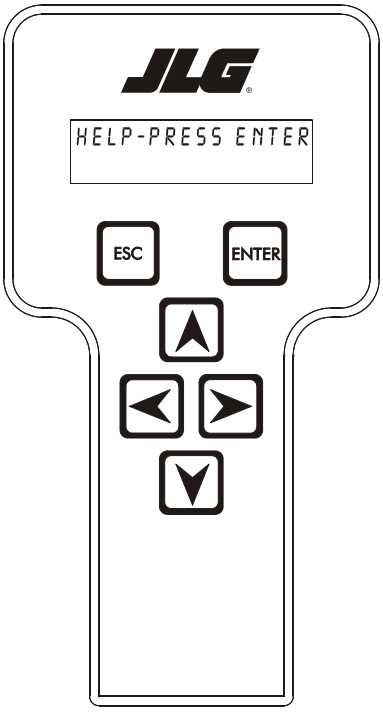
   Before the tilt sensor can be calibrated, the following conditions must be met:

   a. Steering previously calibrated.
   b. Axles extended.
   c. Wheels straight.
   d. Turntable centered.
   e. Boom fully retracted.
   f. Boom angle is less than 45°.
   g. Machine on firm, level ground.

2. Position the Platform/Ground select switch to the Ground position.

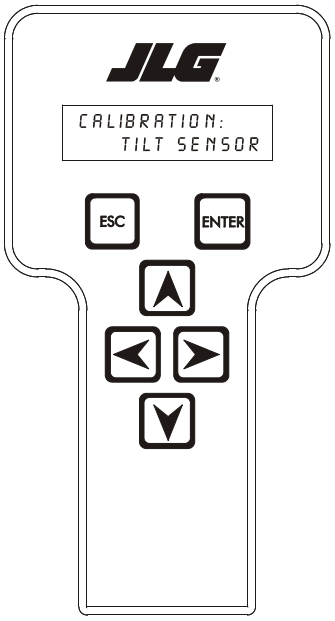
3. Plug the analyzer into the connector inside the Ground control box.

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

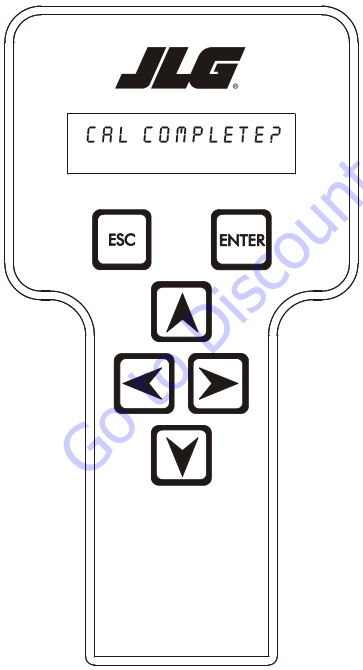


6. Use the arrow button to reach ACCESS LEVEL 2. Hit Enter.
7. Enter the Access Code, 33271.
8. Use the right Arrow key to reach CALIBRATIONS. Hit Enter.

9. Use the arrow keys to reach the TILT SENSOR. The screen should read:



10. Press ENTER.
11. When prompted, swing turntable 180° to opposite end of chassis.
12. Press ENTER. The screen should read:



13. Upon completing swing calibration, swing turntable 180° back to the stowed position.
14. Hit ESC twice to go back to CALIBRATIONS.

6.15 BOOM SENSOR CALIBRATION

To begin calibration of the boom sensors, the following conditions must be met:

- Successful completion of the steering sensor and tilt sensor calibrations
- The axles are completely extended
- The wheels are straight
- The platform is unloaded and booms are clean
- The jib is fully raised
- The jib swing is centered
- The platform is level
- The platform is not rotated
- The turntable is centered between the rear tires
- The tower boom is fully retracted
- The tower boom is fully lowered
- The main boom is fully retracted
- The main boom is fully lowered
- The machine indicates that it is on a level surface (within ±1.5°)
- Ground Mode is selected

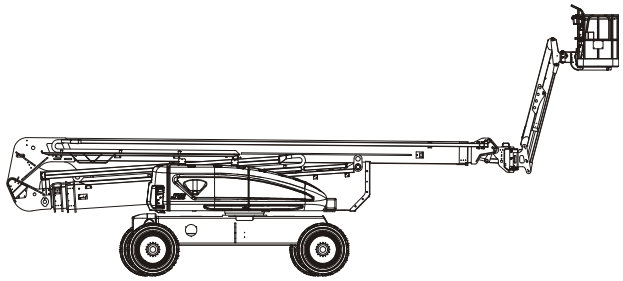
General Notes:

- During all Control System lag times the analyzer should display "CALIBRATING…"
- After each "ENTER" [ENTER] input and before the Control System records sensor values, the Control System will wait 10 seconds for the boom activity to settle down before readings are taken.
- During calibration, if the ESC key [ESC] is pressed after the calibration procedure is started, the calibration will be aborted and "CAL FAILED" will be displayed on the bottom line of the analyzer and the previous calibration values will be used for the boom sensors. The analyzer will continue to display "CAL FAILED" and follow the electrical retrieval system sequence for positions of backward stability concern until all transport positions are met or the power is cycled. Refer to Section 4.9, Electrical Retrieval System.

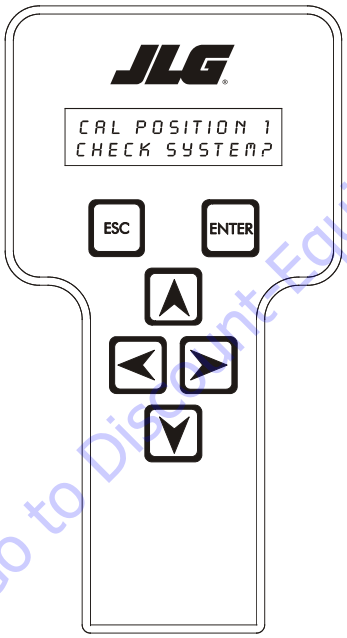
- During calibration if the main boom becomes extended the Control System will abort the calibration sequence and the analyzer will display “CAL FAILED” and “MAIN EXTENDED”. Continue to display “CAL FAILED” and follow the electrical retrieval system sequence for positions of backward stability concern until all transport positions are met or the power is cycled. Refer to Section 4.9, Electrical Retrieval System.

Step 1 - Position 1

1. After the machine is in Position 1, using the analyzer, put the machine into Access Level 1 and enter the “BOOM SENSORS” calibration.



The analyzer will read:



After pressing the ENTER key ENTER, the Control System will verify the load pin, main boom angle, tower boom angle, tower lift cylinder rotary angle, and tower boom length sensors are reporting valid data, the axles are completely extended, the wheels are straight within 10°, the tower length sensors are reading less than 8.41 inches plus 6.39 inches (21.36 cm plus 16.23 cm) of tolerance for the upper length and 12.47 inches plus 6.39 inches (31.67 cm plus 16.23 cm) of tolerance for the lower length, tower boom transport length, main boom transport length, and main boom dual capacity length, limit switches are all in the retracted positions, the main boom transport angle switch is in the transport position, the tower lift cylinder rotary angle sensor reads less than 21.5°, +15° of tolerance, the drive orientation switch is indicating the turntable is between the rear tires, the jib aligned switch is on, the chassis tilt sensor reads less than 1.5° out of level, the steering and tilt sensor calibrations have been successfully completed, and the machine is in Ground Mode.

If these conditions are not met, the analyzer will prompt the operator with any of the following analyzer messages necessary to satisfy the initial conditions.

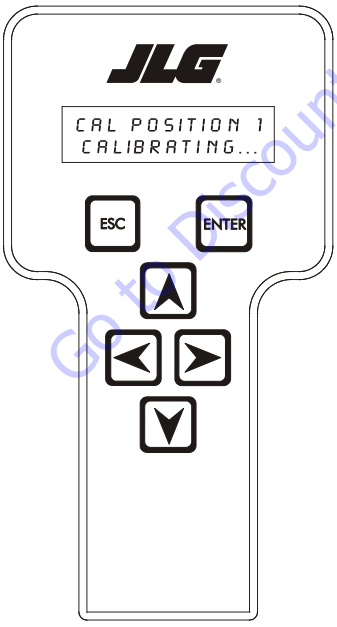
- “BLAM CAN LOST”
- “AXLE VALVE FAULT”
- “OSC AXL SW FAULT”
- “PARK BRAKE FAULT”
- “LOAD PIN FAULT”
- “MAIN ANGL1 FAULT”
- “MAIN ANGL2 FAULT”
- “TWR ANGL1 FAULT”
- “TWR ANGL2 FAULT”
- “CYL ANGL FAULT”
- “TWR LEN1 FAULT”,
- “TWR LEN2 FAULT”
- “EXTEND AXLES”
- “CENTER WHEELS”
- “TOWER IN”
- “MAIN DOWN”
- “TOWER DOWN”
- “RETRACT MAIN”
- “ALIGN TURNTABLE”
- “CENTER JIB SWING”
- “LEVEL MACHINE”

- "CAL STEERING"
- "CAL TILT SENSOR"
- "SELECT GRND MODE"

The analyzer will then prompt with "UNLOAD PLATFORM?", "LEVEL PLATFORM?", "CENTER PLATFORM?", "JIB UP TO MAX?", "MAIN DWN TO MIN?", "TWR DWN TO MIN?"(control system energizes tower lift down and tower tele in with tower lift down commands), "TWR IN TO MIN?"(control system energizes tower lift down and tower tele in with tower lift down commands) to ensure the machine is set up in the proper position for Calibration Step 1.

2. Once the initial conditions are verified, the analyzer will display "SKY WELDER YES". If a sky welder is not installed, press an ARROW key to switch to "SKY WELDER NO. A similar set of menus will prompt selection of Sky Cutter, Sky Glazier, Sky Bright, Pipe Racks and Camera Mount. If Sky Bright is selected, the analyzer will display "CAL FAILED" and "REMOVE SKYBRIGHT". If more then one accessories is selected except for the combination of Sky Welder/Sky Cutter the analyzer will display "CAL FAILED" and "# OF ACCESSORIES". If a valid accessory option has been selected after the camera mount selection and the operator presses the ENTER key (ENTER), the analyzer will display "CALIBRATE?" on the bottom line.

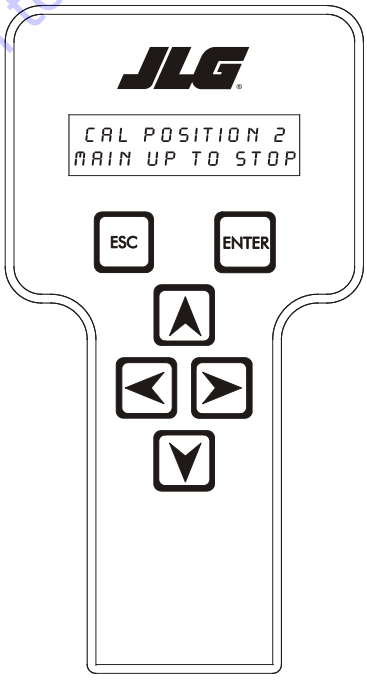
3. After pressing the ENTER key (ENTER), the analyzer will read:



If there is a fault in the configuration process "CAL FAILED" and "MAIN ANGL1 FAULT" or "MAIN ANGL2 FAULT" will be displayed. The Control System will then record right main boom min angle, left main boom min angle, retracted tower length 1 (upper), retracted tower length 2 (lower) and low cylinder angle. The main boom min angle will be set at –4.2° (ref tower). The low cylinder angle will be set to 1.0°. The tower retracted length will be set at 305.4" (775.7 cm). The right main boom angle sensor reading must be within 5° and 25° and the left main boom angle sensor reading must be within 155° and 175° or "CAL FAILED" and "MAIN ANGL1 FAULT" or "MAIN ANGL2 FAULT" will be displayed. The length 1 sensor and the length 2 sensor must be within range or "CAL FAILED" and "TWR LEN1 FAULT" or "TWR LEN2 FAULT" will be displayed. The cylinder angle reading must be within range or "CAL FAILED" and "CYL ANGL FAULT" will be displayed.

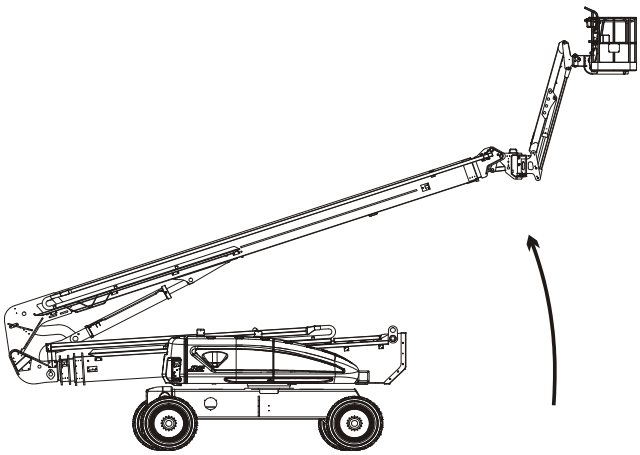
Step 2 - Position 2

1. After completing the previous step, the analyzer will read:



The Control System will disable all functions except auto platform level and main lift up. The Control System will energize main lift up, tower lift down and tower tele in with the main lift up command until the main boom transport angle limit switch is tripped. The analyzer will display "CAL FAILED" and "TWR NOT IN" if movement of either tower length sensors is detected or "TWR NOT DWN" if movement of the cylinder angle sensor is detected. The Control System will monitor and record the main boom angle reading at which the main boom transport angle limit switch is tripped (see position 6 for

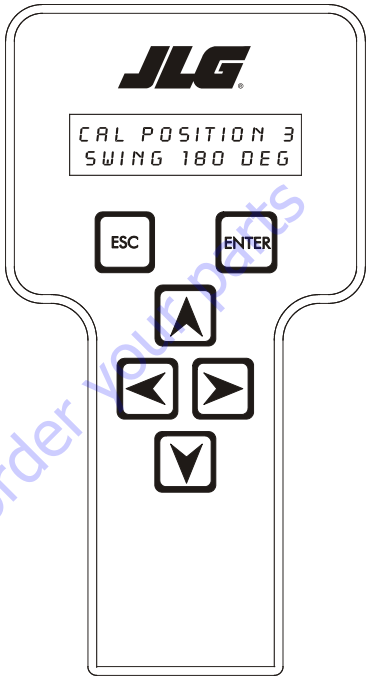
use of this value). The analyzer will display “CAL FAILED” and “MAIN ANGL FAULT” if the uncalibrated main boom angle sensors read more than 30° (ref tower) before the main boom transport angle limit switch is tripped.



2. After the operator presses the ENTER key [ENTER], the Control System will verify the main boom transport angle limit switch has changed state, otherwise, the analyzer will display “CAL FAILED” on the top line and “MAIN UP TO STOP” on the bottom line each time the ENTER key [ENTER] is pressed and the switch has not changed state. The analyzer will display “CALIBRATING…”on the bottom line and the Control System will record left tower angle 2, right tower angle 2 and chassis tilt sensor values

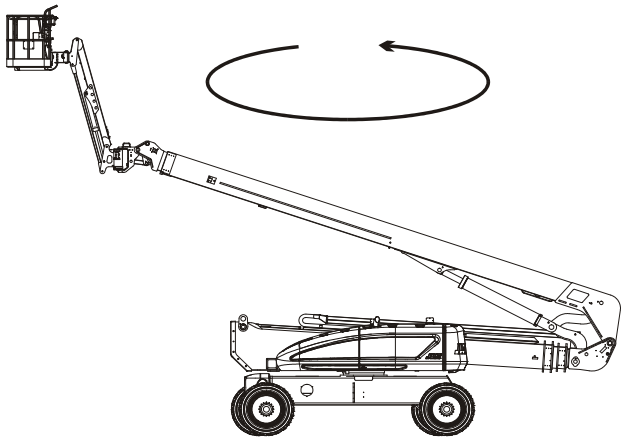
Step 3 - Position 3

1. After completing the previous step, the analyzer will read:



The Control System will disable all functions except auto platform level and swing.

Swing turntable 180° - The turntable MUST be centered over opposite end of chassis

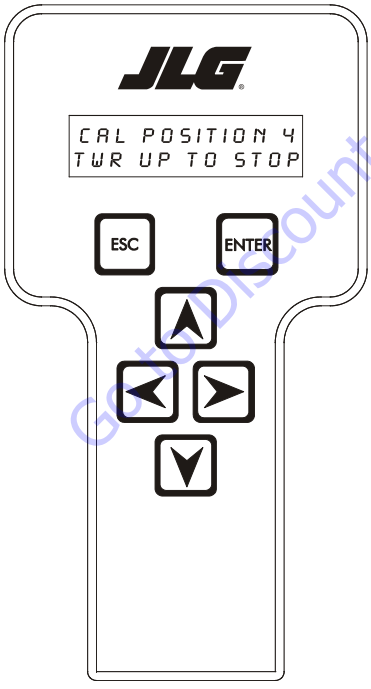


2. After the pressing the ENTER key 

, the analyzer will display “CALIBRATING…”on the bottom line and Control System will record left tower angle 3, right tower angle 3, and chassis tilt sensor values. The Control System must see a change in the drive orientation switch or “CAL FAILED” and “DRIVE ORNT SW” will be displayed. If the change in right sensor readings is more than 1.0° from the change in left sensor readings, “CAL FAILED” and “TWR ANGL FAILED” will be displayed. The control system establishes the ground slope in relation to the boom using the 4 tower boom angle sensor readings before and after rotation. Ground Slope Left angle sensor = (left 2-left 3)/2; Ground Slope Right angle sensor = (right 2-right 3)/2. The Control system establishes the low tower angle calibration point per sensor by taking the difference between the angle 3 and the ground slope in the direction of the boom. Low Tower Angle Calibration value = -3.8 +/- Ground Slope. The chassis tilt calibration is calculated as in the chassis tilt calibration procedure. The chassis tilt calibration will be established here and in the separate chassis tilt procedure. If the chassis tilt reads more than 1.75° the Control System will keep the chassis tilt calibration data and the analyzer will display “CAL FAILED” and “TILT CAL FAULT”.

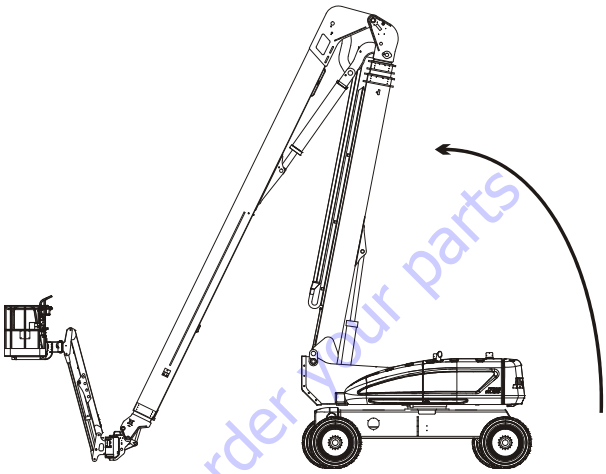
Step 4 - Position 4

1. After completing the previous step, the analyzer will read:



The Control System will disable all functions except auto platform level and tower lift up.

Operate the Lift tower function.

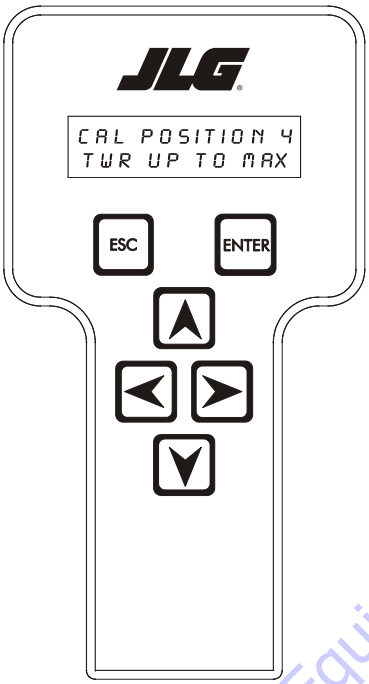


2. Once the Tower Boom lifts such that the Tower Boom Angle reads greater then 25 degrees, Tower Lift Up will be suspended and the analyzer will display “CHECKING BOOM…”

3. Once “CHECKING BOOM…” is started the control system will wait 2 seconds and then capture the position of the Main Boom to Tower, Tower Cylinder Angle and Tower Length. The control system will then command the Main Lift, Tower Lift and Tower Telescope PVG valves to 40%, engage the Main Control and PVG enable valves and command the Engine to 1800 RPM for 20 seconds. The control system will monitor for the Main Lift angle increasing by more then 0.2 deg, Tower Lift angle increasing by more than 0.2 deg and the Tower Telescope length increasing by more than 0.5" (1.3 cm). If one of these conditions occur the test will abort and display on the top line “CHECK FAILED:” and “MN LIFT ENABLE”, “TWR LIFT ENABLE” or “TWR TELE ENABLE” on the bottom line depending on which section moved. After the 20 seconds has elapsed the control system will command the engine back to idle, shut off the commands to the PVG valves, disengage the Main Control and PVG enable valves and Turn On the Main Lift, Tower Lift and Tower Telescope Enable valves and monitor the Main Lift angle for decreasing movement of more than 0.2 deg, Tower Lift angle for decreasing movement of more than 0.2 deg and Tower Telescope length decreasing movement of more than 0.5" (1.27 cm) for 60 seconds. If one of these conditions occur the test will abort and display on the top line “CHECK FAILED:” and “MAIN LIFT HOLD”, “TOWER LIFT HOLD” or “TOWER TELE HOLD” on the bottom line depending on which section moved. After the 60 seconds has elapsed the control system will leave the enable valves on and turn on the Main Control Valve and turn on the Tower Lift PVG valve at a 20% down command and monitor the Main Lift angle for

decreasing movement of more than 0.2 deg, Tower Lift angle for decreasing movement of more than 0.2 deg and Tower Telescope length decreasing movement of more than 0.5" (1.27 cm) for 60 seconds. If one of these conditions occur the test will abort and display on the top line "CHECK FAILED:" and "MAIN LIFT APU", "TOWER LIFT APU" or "TOWER TELE APU" on the bottom line depending on which section moved.

4. If the "CHECKING BOOM…" test passes then Tower Lift Up will be enabled and the analyzer will read:

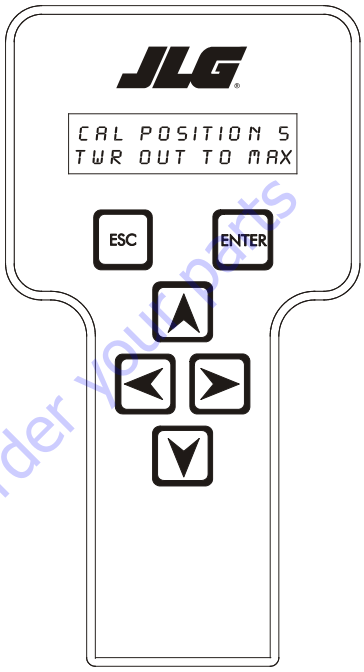


The Control System will disable all functions except auto platform level and tower lift up.

5. After the pressing the ENTER key ENTER, the analyzer will display "CALIBRATING…"on the bottom line and Control System will record left tower angle 4, right tower angle 4, and high cylinder angle. The Control system establishes the high tower angle calibration point per sensor by taking the difference between the angle 4 and the ground slope in the direction of the boom. High Tower Angle Calibration value = 80.0 (77.0 on old cylinder stroke towers) +/- Ground Slope. The high cylinder angle will be set to 81.7°. The cylinder angle reading must be within the proper range or "CAL FAILED" and "CYL ANGL FAULT" will be displayed.

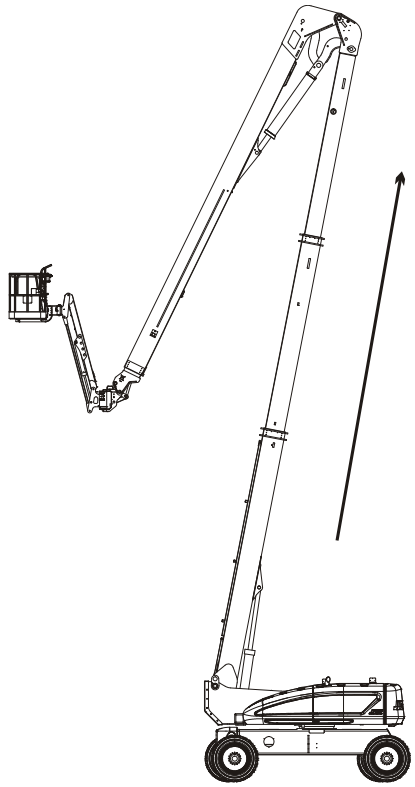
Step 5 - Position 5

1. After completing the previous step, the analyzer will read:



The Control System will disable all functions except auto platform level and tower tele out. The Control System will energize tower lift up with the tower tele out command. The analyzer will display "CAL FAILED" and "TWR NOT UP" if movement of the cylinder angle sensor is detected. The Control System will monitor and record the tower length sensor reading at which the tower transport length switch changes state. The analyzer will display "CAL FAILED" and "TWR LEN FAULT" if the switch does not change state by 4"+/-3".

Telescope tower out to max length



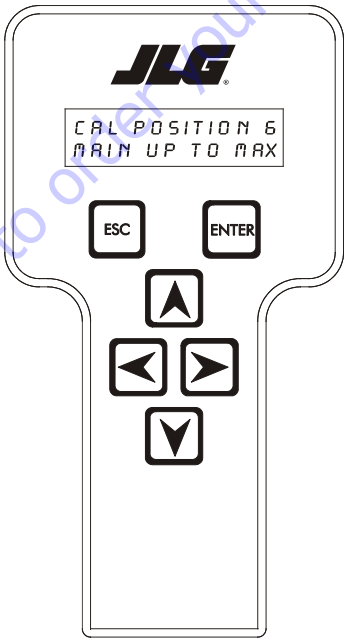
2. After pressing the ENTER key 

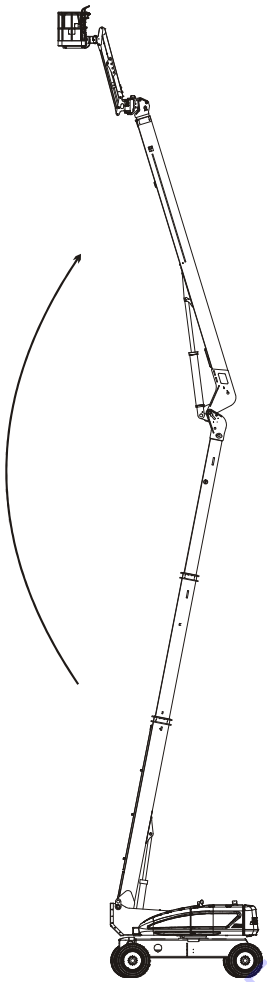
, the analyzer will display “CHECKING BOOM…” and capture the position of the Tower Length. The control system will then, Keep the PVG command at zero leave the Main Control and PVG enable valves off and Turn On the Tower Telescope Enable valve and monitor the Tower Telescope length for decreasing movement of more than 0.5" (1.27 cm) for 60 seconds. If this occurs the test will abort and display on the top line “CHECK FAILED:” and “TOWER TELE HOLD” on the bottom line. After the 60 seconds has elapsed the control system will leave the Enable valve on and turn on the Main Control Valve and monitor the Tower Telescope length for decreasing movement of more than 0.5" (1.27 cm) for 60 seconds. If this occurs the test will abort and display on the top line “CHECK FAILED:” and “TOWER TELE APU” on the bottom line.

3. If the “CHECK BOOM…” test passes the analyzer will display “CALIBRATING…”on the bottom line and record tower extended length 1 (upper) and tower extended length 2 (lower). The tower extended length will be set at 669.4”. The length 1 sensor and the length 2 sensor must be in the proper range or “CAL FAILED” and “TWR LEN1 FAULT” or “TWR LEN2 FAULT” will be displayed. The precise tower transport length switch trip point will be verified to be 4.0”+3.5”/-1.5”, otherwise the analyzer will display “CAL FAILED” and “TWR L SW FAULT”.

Step 6 - Position 6

1. After completing the previous step, the analyzer will read:





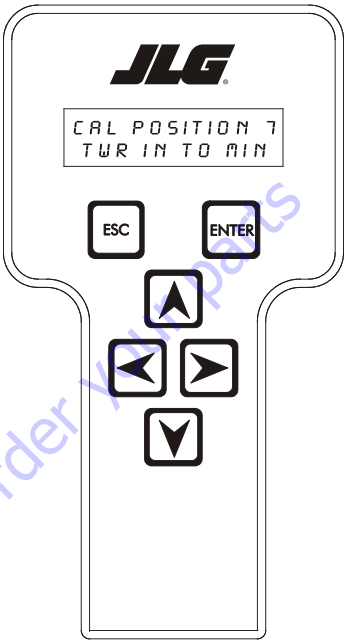
The Control System will disable all functions except auto platform level and main lift up. The Control System will energize tower tele out with the main lift up command. The analyzer will display "CAL FAILED" and "TWR NOT OUT" if movement of either tower length sensors is detected.

2. After pressing the ENTER key 

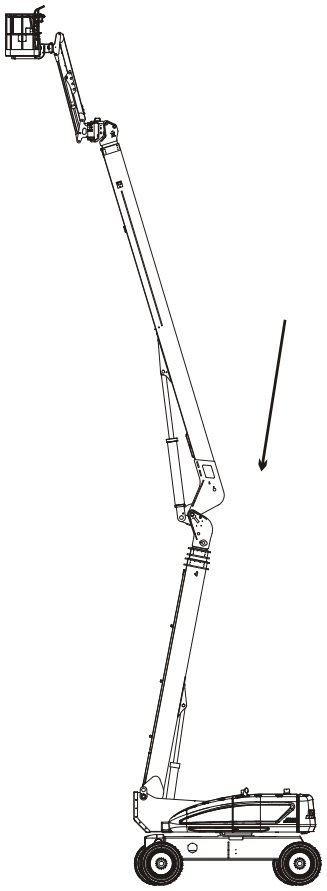
, the analyzer will display "CALIBRATING…"on the bottom line and record right main boom max angle, left main boom max angle. The main boom max angle will be set at 145.0° (ref tower). The right main boom angle sensor reading must be within 155° and 175° and the left main boom angle sensor reading must be within 5° and 25° or "CAL FAILED" and "MAIN ANGL1 FAULT" or "MAIN ANGL2 FAULT" will be displayed. The Control System will calculate and verify the precise main boom angle reading at main boom transport angle switch trip (from position 2) to be 15.8°+6.0°/-3.0°, otherwise the analyzer will display "CAL FAILED" and "MAIN A SW FAULT"

Step 7 - Position 7

1. After completing the previous step, the analyzer will read:



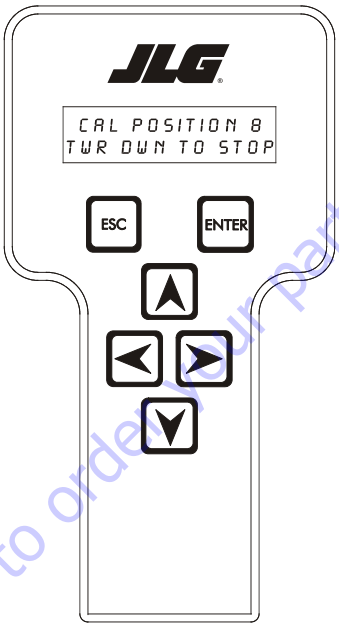
The Control System will disable all functions except auto platform level and tower tele in. The Control System will energize main lift up with the tower tele in command. The analyzer will display "CAL FAILED" and "MAIN NOT UP" if movement of either main angle sensors is detected. The Control System will monitor and record the tower tele in crack point at which the control system detects movement of the tower length sensors (if required).



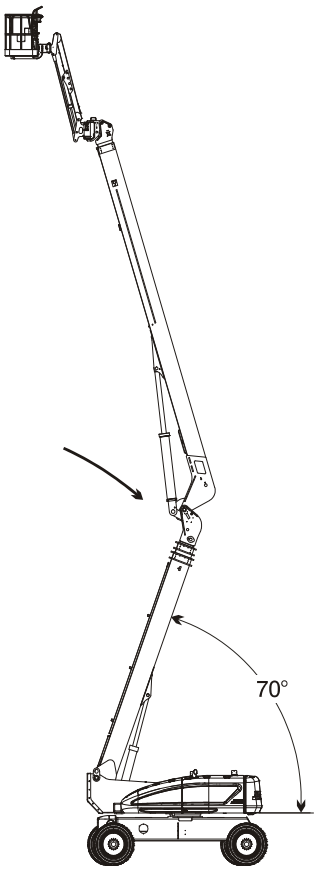
2. After pressing the ENTER key [ENTER], the Control System will verify the measured length of the tower boom matches the expected length of 305.4" +/- 0.5", otherwise, the analyzer will display "CAL FAILED" on the top line and "TWR IN TO MIN" on the bottom line each time the ENTER key [ENTER] is pressed and the measured length does not match the expected length.

Step 8 - Position 8

1. After completing the previous step, the analyzer will read:



The Control System will disable all functions except auto platform level and tower lift up and down. The Control System will monitor and record the tower lift down crack point at which the control system detects movement of the cylinder angle sensor (if required). When tower lift is commanded, the tower cylinder angle will be controlled to target angle of 74.6° +/-0.5° (relative to the turntable). When the target angle is reached the Control System will disable tower lift up and down. If the tower angle (ref. To gravity) gets below 66° disable tower lift down and display "CAL FAILED" and "TOWER TOO LOW" on the analyzer.

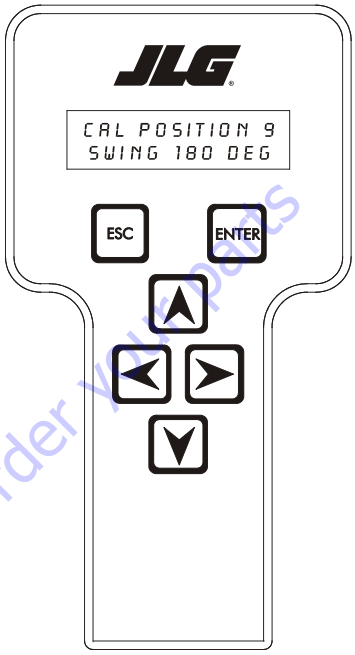


2. After pressing the ENTER key 

, the Control System will verify the measured angle of the tower cylinder matches the target angle of 74.6° +/-0.5° (relative to the turntable), otherwise, the analyzer will display "CAL FAILED" on the top line and "TWR UP TO STOP" or "TOWER DWN TO STOP" on the bottom line each time the ENTER key is pressed and the measured angle does not match the expected angle. If the target is reached, the analyzer will display "CAL POSITION 8" on the top line and "CALIBRATING…"on the bottom line and calculate the load pin cal resultant force 8, load pin cal force vector angle (ref t/t base plate), and the calculated cylinder angle at load pin cal point. The Control System will calculate the required rotation correction angle of the load pin cal force vector angle to match the cylinder angle at the load pin cal point. The control system will modify the load pin x and y values into x' and y' values for use in determining moments by rotating the forces by the rotation correction angle and redistributing the forces onto the new axis. The control system shall calculate the corrected load pin cal moment 8. The Control System will also verify the calculated rotational correction angle is +/- 10 degrees. If it falls outside of this tolerance, the Control System will fail calibration and the analyzer will display "PIN ANGLE FAULT".

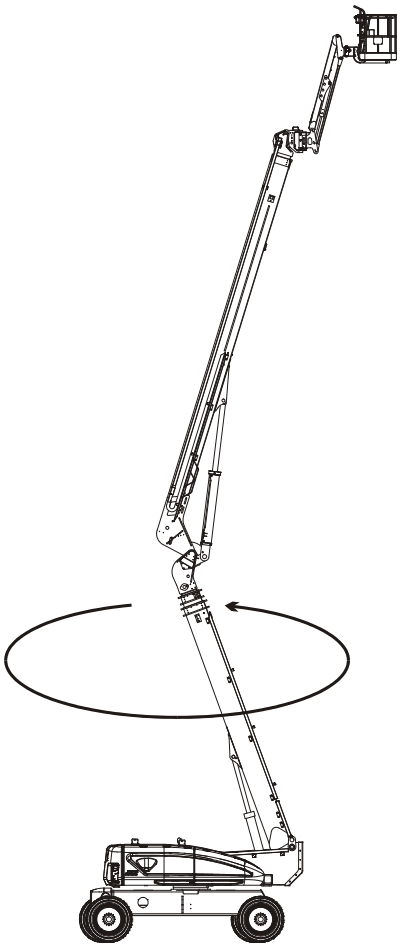
Step 9 - Position 9

1. After completing the previous step, the analyzer will read:



The Control System will disallow all functions except auto platform level and swing.

Swing turntable 180° - The turntable must be centered over the original end of chassis

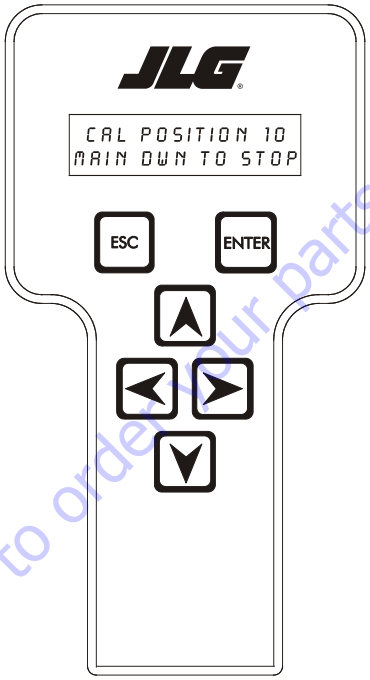


2. After pressing the ENTER key 

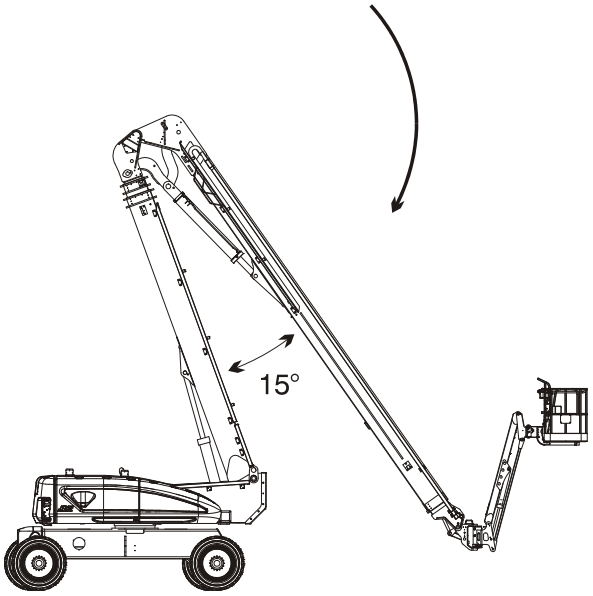
, the analyzer will display "CALIBRATING…"on the bottom line and Control System will calculate load pin cal resultant force 9. The Control System must see a change in the drive orientation switch or "CAL FAILED" and "DRIVE ORNT SW" will be displayed. The Control System will calculate and record the load pin cal resultant force by averaging the load pin cal angle resultant forces 8 and 9. If the load pin cal resultant force is not within 31,140lb +/-13000lb, the analyzer will display "CAL FAILED" and "LOAD PIN FAULT", otherwise the control system shall calculate the corrected load pin cal moment 9 and calculate and record the corrected load pin cal moment by averaging the corrected load pin cal moments 8 and 9. If the load pin cal moment is not within 1,011,000 +/-566000, the analyzer will display "CAL FAILED" and "LOAD PIN FAULT".

Step 10 - Position 10

1. After completing the previous step, the analyzer will read:



Lift main down to stop



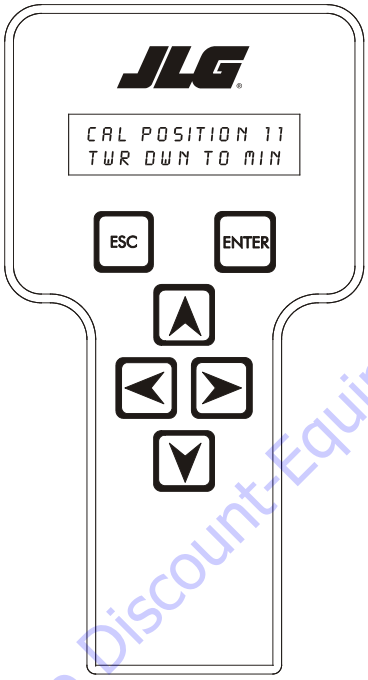
The Control System will disable all functions except auto platform level and main lift down. When main lift down is commanded, the main boom angle will be controlled to the target angle of 15.0° +/- 3.0° (relative to tower). When the angle is reached, the Control System will disable main lift down. The Control System will monitor and record the main lift down crack point at which the

control system detects movement of the main boom angle sensors (if required).

2. After pressing the ENTER key (ENTER), the Control System will verify the angle of the main boom matches the target angle of 15.0° +/- 3.0° (relative to tower), otherwise, the analyzer will display “CAL FAILED” on the top line and “MAIN UP TO STOP” or “MAIN DWN TO STOP” on the bottom line each time the ENTER key (ENTER) is pressed and the measured angle does not match the expected angle.

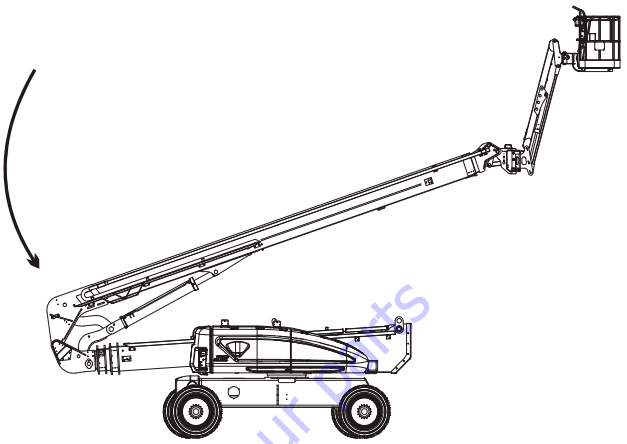
Step 11 - Position 11

1. If the target is reached in the previous step, the analyzer will read:

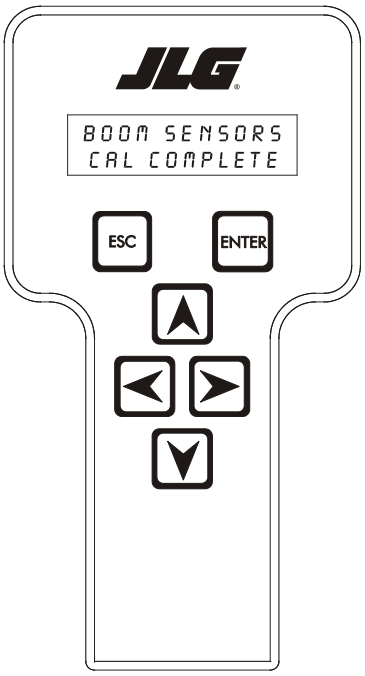


The Control System will disallow all functions except auto platform level and tower lift down.

Lift tower down to min angle



2. After pressing the ENTER key (ENTER), the Control System will verify the cylinder angle reading is less than 5.9°, otherwise, the analyzer will display “CAL FAILED” on the top line and “TWR NOT DWN” on the bottom line each time the ENTER key (ENTER) is pressed and the measured angle not less than the expected angle. If the angle is less than the expected angle, the analyzer will read:



After Boom Sensor Calibration is complete, the BCS will light. DTCs 6614 and 6615 will also be set. This is a normal condition and the codes will be reset when power is cycled.

3. Cycle the emergency stop switch.

6.16 BOOM CONTROL SYSTEM (BCS) VIOLATION

The Boom Control System (BCS) will generate a fault ("BCS VIOLATION – BOOM LOCKED") when one of the following faults become active;

- "TOWER LENGTH MOVEMENT WITHOUT COMMAND"
- "MAIN ANGLE MOVEMENT WITHOUT COMMAND"
- "TOWER CYLINDER ANGLE MOVEMENT WITHOUT COMMAND"
- "TOWER ENVELOPE MASSIVELY ENCROACHED"
- "TOWER ENVELOPE MULTIPLE ENCROACHMENTS".

This fault will be stored in BCS memory and prevent Main Telescope Out and Main Lift Up functions when that section is out of Transport position and Lock the Boom into Transport position once a section reaches transport position. The fault will also cause the Ground and Platform alarms to sound and illuminate the BCS Lamp.

To clear the "BCS VIOLATION – BOOM LOCKED" fault a "UNLOCK BOOM" calibration procedure shall be used.

"UNLOCK BOOM" Calibration Procedure

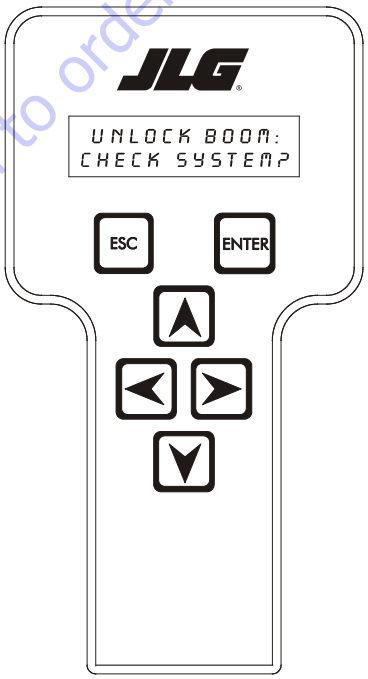
To perform the Unlock Boom Calibration Procedure, these initial conditions **must** be met:

- successful completion of Boom Sensors and Tilt Sensor calibrations
- The Boom must be operating in the BCS Normal Mode
- The "AXLE LOCKOUT VALVE – SHORT TO BATTERY OR OPEN CIRCUIT FAULT" fault must not be active
- The "OSCILLATING AXLE PRESSURE SWITCH DISAGREEMENT" fault must not be active
- The "BRAKE – SHORT TO BATTERY" fault must not be active
- the main boom must be fully retracted
- the main boom must be fully lowered
- the tower boom must be fully retracted
- the tower boom must be fully lowered
- the axles must be completely extended
- the machine indicates that it is not tilted
- the turntable is centered between the rear tires
- Ground Mode is selected

NOTE: *During the calibration procedure, if the ESC key* ESC *is pressed after the procedure is started, the calibration will be terminated and exit back to the "UNLOCK BOOM" prompt.*

NOTE: *In the BCS state, Main envelope and Tower envelope will continuously be monitored after the initial conditions are satisfied. If at any time during the test the BCS state is not Normal or the Main envelope or Tower envelope indicated encroachment the Calibration will terminate and the analyzer will display "BCS VIOLATION".*

1. Using the analyzer, put the vehicle into Access Level 1 and enter the "UNLOCK BOOM" calibration. The analyzer will display the following:



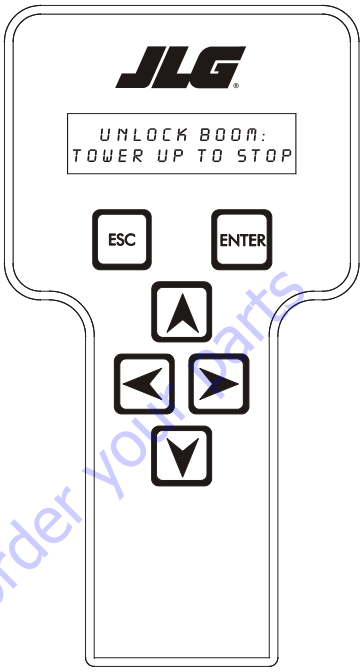
2. After the operator presses the ENTER key (ENTER), the Control System will verify that the BCS is in the Normal state:

   - The "AXLE LOCKOUT VALVE – SHORT TO BATTERY OPEN CIRCUIT FAULT", "OSCILLATING AXLE PRESSURE SWITCH DISAGREEMENT" and "BRAKE – SHORT TO BATTERY" faults are not active
   - the axles are completely extended
   - the tower is retracted the boom transport length
   - main boom dual capacity length and limit switches are all in the retracted positions
   - the main boom transport angle switch is in the transport position
   - the tower lift is below elevation
   - the drive orientation switch is indicating the turntable is between the rear tires
   - the chassis is not tilted
   - the Boom Sensors and tilt sensor calibrations have been successfully completed
   - the machine is in Ground Mode.

   If the initial conditions are not met, the Control System will prompt the operator with analyzer messages to satisfy the initial conditions.

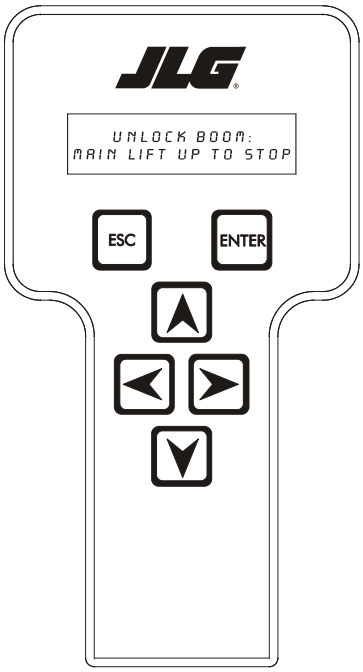
   - "CHECK FAULTS"
   - "AXLE VALVE FAULT"
   - "OSC AXL SW FAULT"
   - "PARK BRAKE FAULT"
   - "EXTEND AXLES"
   - "TOWER IN"
   - "MAIN DOWN"
   - "TOWER DOWN"
   - "RETRACT MAIN"
   - "ALIGN TURNTABLE"
   - "LEVEL MACHINE"
   - "CAL. BOOM"
   - "SELECT GRND MODE"

3. The Control System will then prompt with the following:

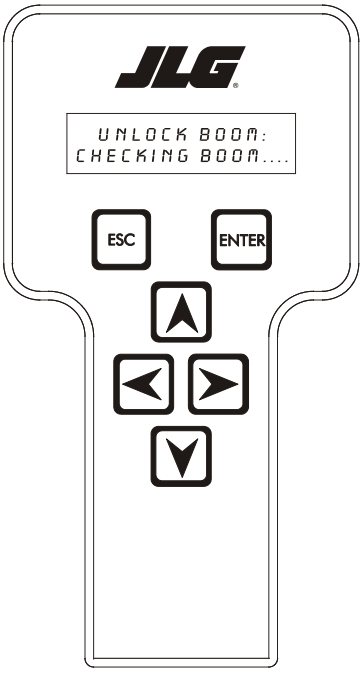


   The control system will then suppress the "BCS VIOLATION – BOOM LOCKED" fault to allow the boom to be taken out of transport position and disable all hydraulic functions except Tower Lift Up and Down.

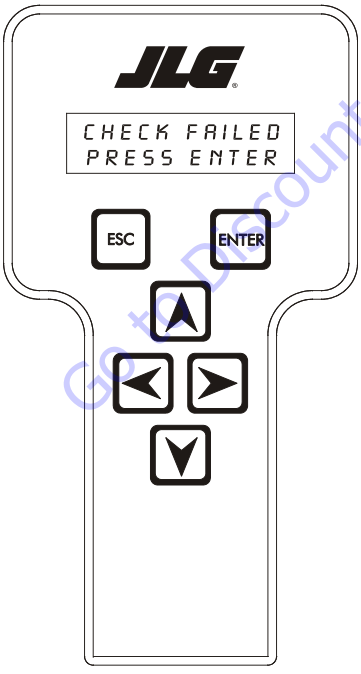
4. Once the Tower boom lifts such that the Tower Cylinder Angle sensor reads greater then 20 degrees, Tower Lift up will be suspended and Main Lift up and down will be enabled. The screen will read:



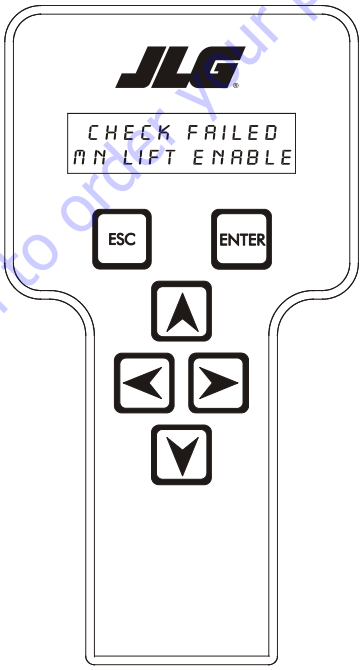
5. Once the Main boom lifts such that the Main Boom to Gravity Angle reads greater then 50 degrees, Main Lift Up control will be suspended and once the Main Lift up control is released, the analyzer will read:



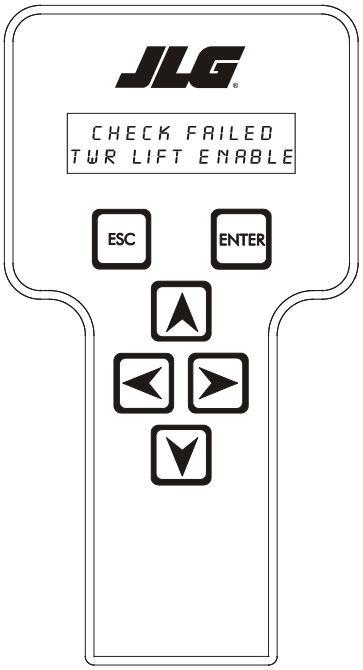
During the "CHECKING BOOM…" test if Tower Lift or Main Lift is selected, the test will abort and the screen will read:



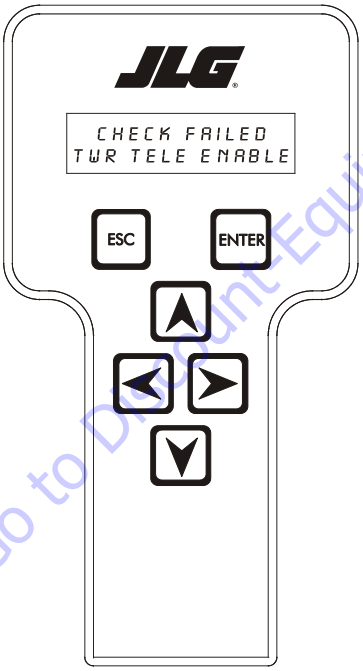
6. Once "CHECKING BOOM…" is started, the control system will wait 2 seconds and then capture the position of the Main Boom to Tower, Tower Cylinder Angle and Tower Length. The control system then will command the Main Lift, Tower Lift and Tower Telescope PVG valves to 40%, engage the Main Control and PVG enable valves and command the Engine to 1800 RPM for 20 seconds. The control system will monitor for the Main Lift and Tower Lift angles increasing by more then 0.2 deg and the Tower Telescope length increasing by more then 0.5". If one of these conditions occur the test will abort and display on the top line "CHECK FAILED:" and "MN LIFT ENABLE", "TWR LIFT ENABLE" or "TWR TELE ENABLE" on the bottom line depending on which section moved.



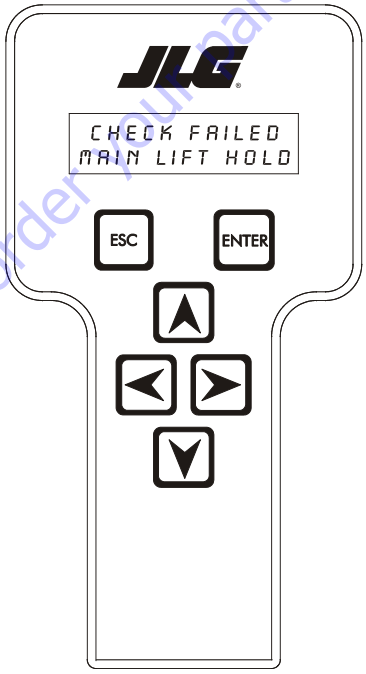
or



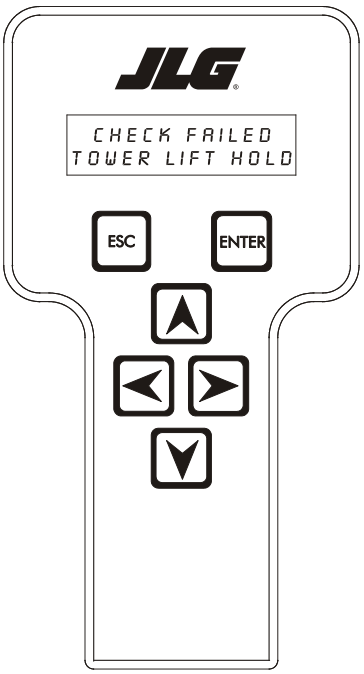
or



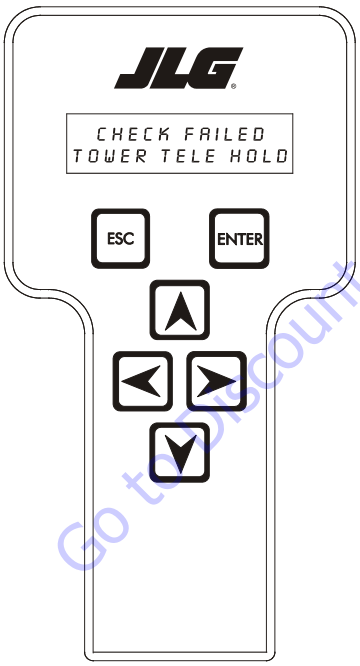
7. After the 20 seconds has elapsed the control system will command the engine back to idle, shut off the commands to the PVG valves, disengage the Main Control and PVG enable valves and turn on the Main Lift, Tower Lift and Tower Telescope Enable valves and monitor the Main Lift and Tower Lift angles for decreasing movement of more then 0.2 deg and Tower Telescope length decreasing movement of more then 0.5" for 60 seconds. If one of these conditions occur the test will abort and display on the top line "CHECK FAILED:" and "MAIN LIFT HOLD", "TOWER LIFT HOLD" or "TOWER TELE HOLD" on the bottom line depending on which section moved.



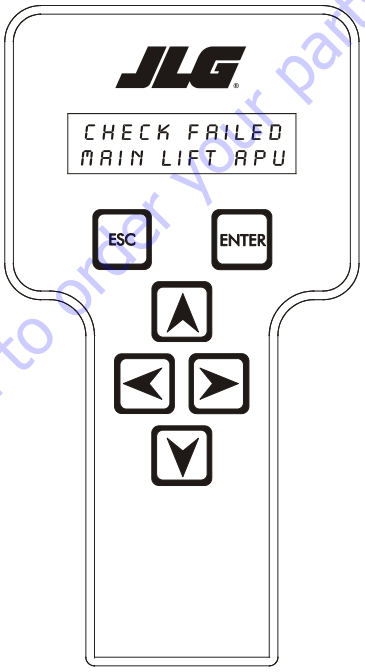
or



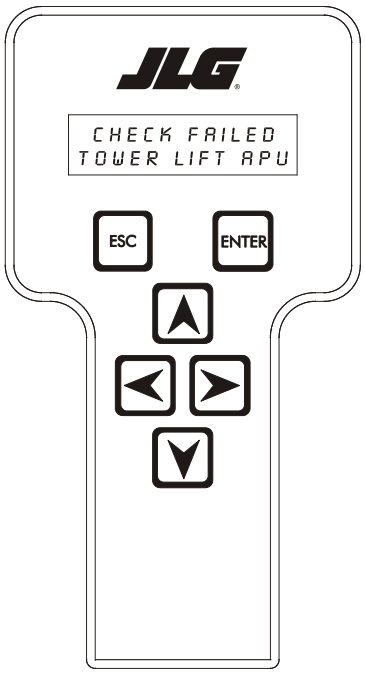
or



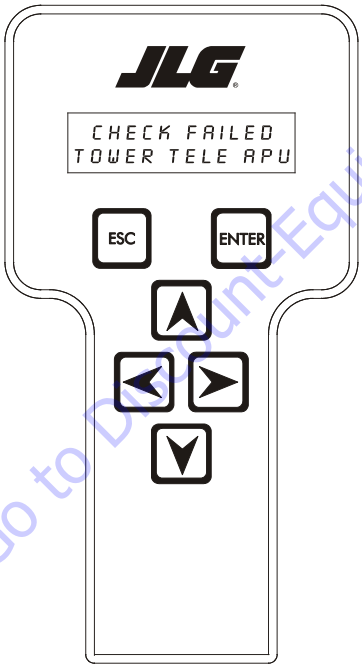
8. After the 60 seconds has elapsed the control system will Leave the Enable valves on and turn on the Main Control Valve and turn on the Tower Lift PVG valve at a 20% down command and monitor the Main Lift and Tower Lift angles for decreasing movement of more then 0.2 deg and Tower Telescope length decreasing movement of more then 0.5" for 60 seconds. If one of these conditions occur the test will abort and display on the top line "CHECK FAILED:" and "MAIN LIFT APU", "TOWER LIFT APU" or "TOWER TELE APU" on the bottom line depending on which section moved.



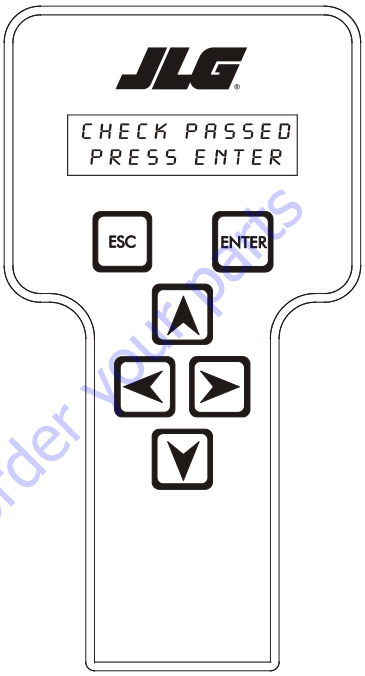
or



or

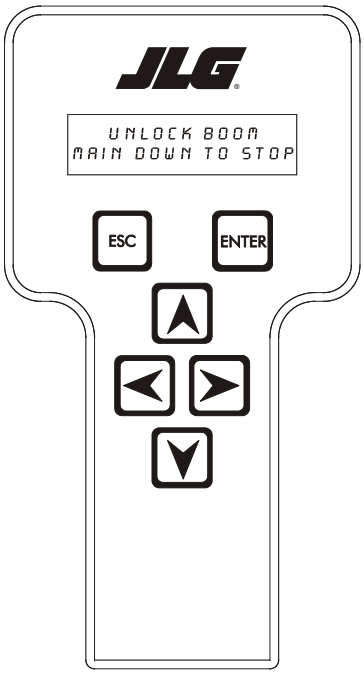


9. Once the "CHECKING BOOM…" testing is complete and the test passes the control system will clear the Tower Event log and clear the "BCS VIOLATION – BOOM LOCKED" fault flag. The screen will read:

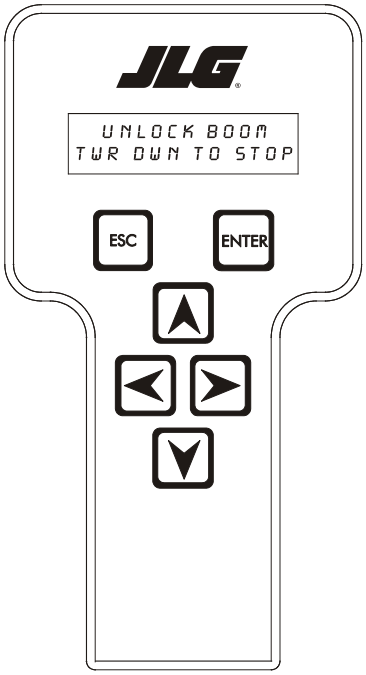


10. Once "ENTER" 

is pressed on either one of the "CHECK FAILED" or "CHECK PASSED" states the control system will Prompt for "MAIN DWN TO STOP" and enable all hydraulic functions.



11. Once the Main boom transport angle switch indicates it is below elevation the Analyzer will display “TWR DWN TO STOP”.



12. Once the Tower Boom is below elevation the Analyzer will display “TEST COMPLETE”.

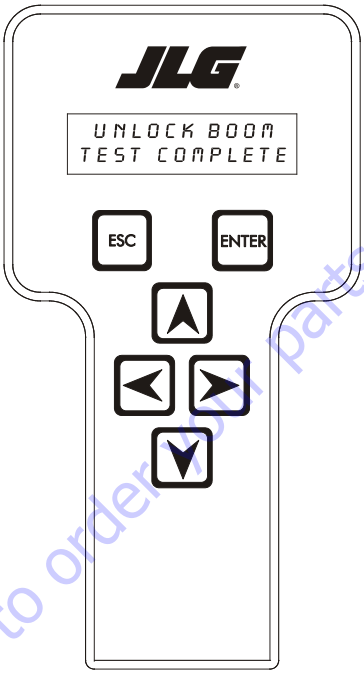


Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
001	00	1	EVERYTHING OK	The normal help message in Platform Mode.	
002	00	2	GROUND MODE OK	The normal help message in Ground Mode.	
0010	00	10	RUNNING AT CUTBACK - OUT OF TRANSPORT POSITION	Drive speed is limited to "ELEVATED MAX" while the vehicle is out of transport position.	
000	**00**	**0**	**<<< HELP COMMENT >>>**		
0011	00	11	FSW OPEN	A drive / boom function was selected with the Footswitch open.	
0012	00	12	RUNNING AT CREEP - CREEP SWITCH OPEN	All functions at creep while the Creep Switch is open.	
0013	00	13	RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	All functions at creep while the Platform is elevated and the Chassis is tilted.	
0014	00	14	CHASSIS TILT SENSOR OUT OF RANGE	The Chassis is tilted > 19 degrees for more then 4 seconds.	- Not reported during power-up.
0015	0	15	LOAD SENSOR READING UNDER WEIGHT	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.
0016	00	16	ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	There is an envelope violation.	- Envelope control system equipped vehicle only.
0017	00	17	OVER MOMENT - HYDRAULICS SUSPENDED	There is an over moment violation.	- Envelope control system equipped vehicle only.
0018	00	18	UNDER MOMENT - HYDRAULICS SUSPENDED	There is an under moment violation.	- Envelope control system equipped vehicle only.
0019	00	19	MAIN ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	There is a main envelope violation.	- Main envelope system equipped vehicle only.
0020	00	20	TOWER ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	There is a tower envelope violation.	- Tower envelope system equipped vehicle only.
0021	00		ADS1213 REINITIALIZED		
0030	00		RUNNING AT CREEP - PLATFORM STOWED		
0031	00		FUEL LEVEL LOW - ENGINE SHUTDOWN		
0035	00		APU ACTIVE		

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
210	**21**	**0**	**<<< POWER-UP >>>**		
211	21	1	POWER CYCLE	The normal help message is issued at each power cycle.	
212	21	2	KEYSWITCH FAULTY	Both Platform and Ground modes are selected simultaneously.	
213	21	3	FSW FAULTY	Both Footswitches are closed for more then one second.	
220	**22**	**0**	**<<< PLATFORM CONTROLS >>>**		
227	22	7	STEER SWITCHES FAULTY	Both Steer Left and Steer Right inputs are closed simultaneously.	
2211	22	11	FSW INTERLOCK TRIPPED	The Footswitch was closed for more then seven seconds.	- Can be reported during power-up.
2212	22	12	DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A drive function was selected with Footswitch open.	- Can be reported during power-up.
2213	22	13	STEER LOCKED - SELECTED BEFORE FOOTSWITCH	A steer function was selected with Footswitch open.	
2215	22	15	D/S JOY. OUT OF RANGE LOW	The D/S Joystick reference voltage is low.	- Resistive joysticks, these faults do not occur.
2216	22	16	D/S JOY. OUT OF RANGE HIGH	The D/S Joystick reference voltage is > 8.1V.	- Resistive joysticks. - If the reference voltage is > 7.7V then the reference voltage is out of tolerance of a short to battery has occurred.
2217	22	17	D/S JOY. CENTER TAP BAD	The D/S Joystick center tap voltage is < 3.08V or > 3.83V.	- Resistive joysticks. - There is a +/- .1V range. around these values due to resistor tolerances
2218	22	18	L/S JOY. OUT OF RANGE LOW	The L/S Joystick reference voltage is low.	- Resistive joysticks, these faults do not occur.
2219	22	19	L/S JOY. OUT OF RANGE HIGH	The L/S Joystick reference voltage is > 8.1V.	- Resistive joysticks. - If the reference voltage is > 7.7V then the reference voltage is out of tolerance of a short to battery has occurred.
2220	22	20	L/S JOY. CENTER TAP BAD	The L/S Joystick center tap voltage is < 3.08V or > 3.83V.	- Resistive joysticks. - There is a +/- .1V range. around these values due to resistor tolerances
2221	22	21	LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A lift / swing function was selected with Footswitch open.	
2222	22	22	WAITING FOR FSW TO BE OPEN	The Footswitch was closed during Platform selection.	- Can be reported during power-up.
2223	22	23	FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	A boom function was selected with Footswitch open.	
2224	22	24	FOOTSWITCH SELECTED BEFORE START	The Footswitch was closed during engine start.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
230	**23**	**0**	**<<< GROUND CONTROLS >>>**		
234	23	4	FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	A boom function has both directions selected together.	
235	23	5	FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	A boom function was selected before aux power.	
236	23	6	FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	A boom function was selected before engine start.	
237	23	7	START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	The Start Switch was closed during power-up.	
23100	23		TOWER LIFT PRESSURE SENSOR - OUT OF RANGE HIGH	Pressure transducer output more than 4.6 VDC.	Out of range high
23101	23		TOWER LIFT PRESSURE SENSOR - OUT OF RANGE LOW	Pressure transducer output less than 0.4 VDC.	Out of range low
23102	23		TOWER LIFT PRESSURE SENSOR - NOT DETECTING CHANGE	Pressure does not change by at least 20 psi when tower lift is commanded	Not detecting change
23103	23		TOWER LIFT CYLINDER - OVER PRESSURE	At the conclusion of a tower lift command that was held for at least three seconds with the boom not on the rest and the pressure is greater than 2200 psi for three seconds	Tower lift cylinder over pressure
250	**25**	**0**	**<<< FUNCTION PREVENTED >>>**		
259	25	9	MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS	The model selection has been changed.	
2513	25	13	GENERATOR MOTION CUTOUT ACTIVE	Driving is not possible while the vehicle generator is running AND is configured to prevent drive.	
2514	25	14	BOOM PREVENTED - DRIVE SELECTED	Boom functions are not possible while the vehicle is being driven AND is configured to not allow simultaneous drive & boom operation.	
2515	25	15	DRIVE PREVENTED - BOOM SELECTED	Driving is not possible while the vehicle above elevation AND is configured to prevent drive while above elevation.	
2516	25	16	DRIVE PREVENTED - ABOVE ELEVATION	Driving is not possible while Boom functions are selected AND is configured to not allow simultaneous drive & boom operation.	
2517	25	17	DRIVE PREVENTED - TILTED & ABOVE ELEVATION	Driving is not possible while the vehicle is tilted and above elevation AND is configured to prevent drive while tilted and above elevation.	
2521	25	21	JIB SWING PREVENTED - IN 1000# MODE	JIB Swing is not possible while the vehicle is in 1000 LB Mode.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
2522	25	22	CAN DONGLE ATTACHED - HYDRAULICS NOT RESTRICTED	CAN Dongle attached. Very limited restrictions for all hydraulics systems.	
2523	25	23	BACKUP BLAM COMMUNICATIONS ACTIVE	RS232 serial backup communications link to the BLAM is active.	
2524	25	24	DISCONNECT ANALYZER AND CYCLE EMS TO PERFORM BOOM RETRIEVAL	RS232 serial backup communications link to the BLAM is needed but an analyzer is connected.	
2546	25		MACHINE SETUP FAULT - JIB SWING		
2547	25		MACHINE SETUP FAULT - MODEL		
2587	2	5	RUNNING AT CREEP - PLATFORM LEVELED UNDER	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.	
330	**33**	**0**	**<<< GROUND OUTPUT DRIVER >>>**		
331	33	1	BRAKE - SHORT TO BATTERY	There is a Short to Battery to the Brake Valve.	
332	33	2	BRAKE - OPEN CIRCUIT	There is an Open Circuit to the Brake Valve.	
3311	33	11	GROUND ALARM - SHORT TO BATTERY	There is a Short to Battery to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3316	33	16	RIGHT FORWARD DRIVE PUMP - SHORT TO GROUND	There is a Short to Ground to the Right Forward Drive Valve.	- Chassis Module equipped vehicles only.
3317	33	17	RIGHT FORWARD DRIVE PUMP - OPEN CIRCUIT	There is an Open Circuit to the Right Forward Drive Valve.	- Chassis Module equipped vehicles only.
3318	33	18	RIGHT FORWARD DRIVE PUMP - SHORT TO BATTERY	There is a Short to Battery to the Right Forward Drive Valve.	- Chassis Module equipped vehicles only.
3320	33	20	RIGHT REVERSE DRIVE PUMP - SHORT TO GROUND	There is a Short to Ground to the Right Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3321	33	21	RIGHT REVERSE DRIVE PUMP - OPEN CIRCUIT	There is an Open Circuit to the Right Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3322	33	22	RIGHT REVERSE DRIVE PUMP - SHORT TO BATTERY	There is a Short to Battery to the Right Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3324	33	24	LEFT FORWARD DRIVE PUMP - SHORT TO GROUND	There is a Short to Ground to the Left Forward Drive Valve.	- Chassis Module equipped vehicles only.
3325	33	25	LEFT FORWARD DRIVE PUMP - OPEN CIRCUIT	There is an Open Circuit to the Left Forward Drive Valve.	- Chassis Module equipped vehicles only.
3326	33	26	LEFT FORWARD DRIVE PUMP - SHORT TO BATTERY	There is a Short to Battery to the Left Forward Drive Valve.	- Chassis Module equipped vehicles only.
3328	33	28	LEFT REVERSE DRIVE PUMP - SHORT TO GROUND	There is a Short to Ground to the Left Reverse Drive Valve.	- Chassis Module equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3329	33	29	LEFT REVERSE DRIVE PUMP - OPEN CIRCUIT	There is an Open Circuit to the Left Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3330	33	30	LEFT REVERSE DRIVE PUMP - SHORT TO BATTERY	There is a Short to Battery to the Left Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3336	33	36	ALTERNATOR/ECM POWER - SHORT TO GROUND	There is a Short to Ground to the Alternator/ECM.	
3338	33	38	ALTERNATOR POWER - OPEN CIRCUIT	There is an Open Circuit to the Alternator.	
3339	33	39	ALTERNATOR POWER - SHORT TO BATTERY	There is a Short to Battery to the Alternator	
3340	33	40	AUX POWER - SHORT TO GROUND	There is a Short to Ground to the Auxiliary Power Pump Relay.	
3341	33	41	AUX POWER - OPEN CIRCUIT	There is an Open Circuit to the Auxiliary Power Pump Relay.	
3342	33	42	AUX POWER - SHORT TO BATTERY	There is a Short to Battery to the Auxiliary Power Pump Relay.	
3343	33	43	COLD START ADVANCE SOLENOID - SHORT TO GROUND	There is a Short to Ground to the Cold Start Advance Solenoid.	- CAT engines only.
3344	33	44	COLD START ADVANCE SOLENOID - OPEN CIRCUIT	There is an Open Circuit to the Cold Start Advance Solenoid.	- CAT engines only.
3345	33	45	COLD START ADVANCE SOLENOID - SHORT TO BATTERY	There is a Short to Battery to the Cold Start Advance Solenoid.	- CAT engines only.
3349	33	49	ELECTRIC PUMP - SHORT TO GROUND	There is a Short to Ground to the Pump Relay.	- CAT engines only.
3350	33	50	ELECTRIC PUMP - OPEN CIRCUIT	There is an Open Circuit to the Pump Relay.	- CAT engines only.
3351	33	51	ELECTRIC PUMP - SHORT TO BATTERY	There is a Short to Battery to the Pump Relay.	- CAT engines only.
3358	33	58	MAIN DUMP VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Dump Valve.	
3359	33	59	MAIN DUMP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Dump Valve.	
3360	33	60	MAIN DUMP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Dump Valve.	
3361	33	61	BRAKE - SHORT TO GROUND	There is a Short to Ground to the Brake Valve.	
3362	33	62	START SOLENOID - SHORT TO GROUND	There is a Short to Ground to the Start Relay.	- Diesel engines only.
3363	33	63	START SOLENOID - OPEN CIRCUIT	There is an Open Circuit to the Start Relay.	- Diesel engines only.
3364	33	64	START SOLENOID - SHORT TO BATTERY	There is a Short to Battery to the Start Relay.	- Diesel engines only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3368	33	68	TWO SPEED VALVE - SHORT TO GROUND	There is a Short to Ground to the Two Speed Valve.	
3369	33	69	TWO SPEED VALVE - OPEN CIRCUIT	There is an Open Circuit to the Two Speed Valve.	
3370	33	70	TWO SPEED VALVE - SHORT TO BATTERY	There is a Short to Battery to the Two Speed Valve.	
3371	33	71	GROUND ALARM - SHORT TO GROUND	There is a Short to Ground to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3372	33	72	GROUND ALARM - OPEN CIRCUIT	There is an Open Circuit to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3373	33	73	GEN SET/WELDER - SHORT TO GROUND	There is a Short to Ground to the Generator Relay.	- Generator / Welder equipped vehicles only.
3374	33	74	GEN SET/WELDER - OPEN CIRCUIT	There is an Open Circuit to the Generator Relay.	- Generator / Welder equipped vehicles only.
3375	33	75	GEN SET/WELDER - SHORT TO BATTERY	There is a Short to Battery to the Generator Relay.	- Generator / Welder equipped vehicles only.
3376	33	76	HEAD TAIL LIGHT - SHORT TO GROUND	There is a Short to Ground to the Head Light Relay.	- Head Light equipped vehicles only.
3377	33	77	HEAD TAIL LIGHT - OPEN CIRCUIT	There is an Open Circuit to the Head Light Relay.	- Head Light equipped vehicles only.
3378	33	78	HEAD TAIL LIGHT - SHORT TO BATTERY	There is a Short to Battery to the Head Light Relay.	- Head Light equipped vehicles only.
3379	33	79	HOUR METER - SHORT TO GROUND	There is a Short to Ground to the Hour Meter.	
3380	33	80	HOUR METER - OPEN CIRCUIT	There is an Open Circuit to the Hour Meter.	- Can be reported during power-up.
3381	33	81	HOUR METER - SHORT TO BATTERY	There is a Short to Battery to the Hour Meter.	
3385	33	85	PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Up Override Valve.	- Electronic leveling system equipped vehicles only.
3386	33	86	PLATFORM LEVEL UP OVERRIDE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Up Override Valve.	- Electronic leveling system equipped vehicles only.
3387	33	87	PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Up Override Valve.	- Electronic leveling system equipped vehicles only.
3391	33	91	PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Down Override Valve.	- Electronic leveling system equipped vehicles only.
3392	33	92	PLATFORM LEVEL DOWN OVERRIDE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Down Override Valve.	- Electronic leveling system equipped vehicles only.
3393	33	93	PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Down Override Valve.	- Electronic leveling system equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3394	33	94	PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Left Valve.	
3395	33	95	PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Left Valve.	
3396	33	96	PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Left Valve.	
3397	33	97	PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Right Valve.	
3398	33	98	PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Right Valve.	
3399	33	99	PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Right Valve.	
33100	33	100	JIB LIFT UP VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Lift Up Valve.	
33101	33	101	JIB LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Up Valve.	
33102	33	102	JIB LIFT UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Up Valve.	
33103	33	103	JIB LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Lift Down Valve.	
33104	33	104	JIB LIFT DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Down Valve.	
33105	33	105	JIB LIFT DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Down Valve.	
33118	33	118	SWING RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Swing Right Valve.	
33119	33	119	SWING RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Swing Right Valve.	
33120	33	120	MAIN TELESCOPE IN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope In Valve.	
33121	33	121	SWING RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Swing Right Valve.	
33122	33	122	SWING LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Swing Left Valve.	
33123	33	123	MAIN TELESCOPE OUT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope Out Valve.	
33130	33	130	THROTTLE ACTUATOR - SHORT TO GROUND	There is a Short to Ground to the Throttle Actuator.	
33131	33	131	THROTTLE ACTUATOR - OPEN CIRCUIT	There is an Open Circuit to the Throttle Actuator.	
33132	33	132	THROTTLE ACTUATOR - SHORT TO BATTERY	There is a Short to Battery to the Throttle Actuator.	
33133	33	133	PLATFORM CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.
33134	33	134	PLATFORM CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33135	33	135	PLATFORM CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.
33136	33	136	MAIN LIFT APU VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift APU Valve.	- 1250AJP only.
33137	33	137	MAIN LIFT APU VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift APU Valve.	- 1250AJP only.
33138	33	138	MAIN LIFT APU VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift APU Valve.	- 1250AJP only.
33139	33	139	MAIN LIFT PILOT - PRESSURE FAILURE	The Main Lift Pilot has a Pressure Failure.	- 1250AJP only.
33140	33	140	MAIN LIFT PILOT - NO PRESSURE	The Main Lift Pilot has No Pressure.	- 1250AJP only.
33141	33	141	MAIN LIFT PILOT - PRESSURE SWITCH FAILURE	The Main Lift Pilot has a Pressure Switch Failure.	- 1250AJP only.
33142	33	142	TOWER LIFT APU VALVE - STUCK OPEN	The Tower Lift APU Valve is Stuck Open	- 1250AJP only.
33143	33	143	TOWER LIFT ENABLE VALVE - STUCK OPEN	The Tower Lift Enable Valve is Stuck Open	- 1250AJP only.
33144	33	144	TOWER LIFT ENABLE VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Lift Enable Valve.	- 1250AJP only.
33145	33	145	TOWER LIFT ENABLE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Lift Enable Valve.	- 1250AJP only.
33146	33	146	TOWER LIFT ENABLE VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Lift Enable Valve.	- 1250AJP only.
33147	33	147	TOWER TELESCOPE APU VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Telescope APU Valve.	- 1250AJP only.
33148	33	148	TOWER TELESCOPE APU VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Telescope APU Valve.	- 1250AJP only.
33149	33	149	TOWER TELESCOPE APU VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Telescope APU Valve.	- 1250AJP only.
33150	33	150	LIFT PILOT VALVE - SHORT TO GROUND	There is a Short to Ground to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.
33151	33	151	LIFT PILOT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.
33152	33	152	LIFT PILOT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.
33153	33	153	LIFT DOWN AUX VALVE - SHORT TO GROUND	There is a Short to Ground to the Lift Down Auxiliary Valve.	- Gravity Lift Down equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33154	33	154	LIFT DOWN AUX VALVE - OPEN CIRCUIT	There is an Open Circuit to the Lift Down Auxiliary Valve.	- Gravity Lift Down equipped vehicles only.
33155	33	155	LIFT DOWN AUX VALVE - SHORT TO BATTERY	There is a Short to Battery to the Lift Down Auxiliary Valve.	- Gravity Lift Down equipped vehicles only.
33156	33	156	TOWER LIFT APU VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Lift APU Valve.	- 1250AJP only.
33157	33	157	TOWER LIFT APU VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Lift APU Valve.	- 1250AJP only.
33158	33	158	TOWER LIFT APU VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Lift APU Valve.	- 1250AJP only.
33159	33	159	MAIN LIFT ENABLE VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift Enable Valve.	- 1250AJP only.
33160	33	160	MAIN LIFT ENABLE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift Enable Valve.	- 1250AJP only.
33161	33	161	MAIN LIFT ENABLE VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift Enable Valve.	- 1250AJP only.
33162	33	162	TOWER TELESCOPE APU VALVE - STUCK OPEN	The Tower Telescope APU Valve is Stuck Open	- 1250AJP only.
33163	33	163	TOWER TELESCOPE ENABLE VALVE - STUCK OPEN	The Tower Telescope Enable Valve is Stuck Open	- 1250AJP only.
33164	33	164	TOWER TELESCOPE ENABLE VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Telescope APU Valve.	- 1250AJP only.
33165	33	165	TOWER TELESCOPE ENABLE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Telescope APU Valve.	- 1250AJP only.
33166	33	166	TOWER TELESCOPE ENABLE VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Telescope APU Valve.	- 1250AJP only.
33167	33	167	PVG ENABLE VALVE - SHORT TO GROUND	There is a Short to Ground to the PVG Valve.	- 1250AJP only.
33168	33	168	PVG ENABLE VALVE - OPEN CIRCUIT	There is an Open Circuit to the PVG Valve.	- 1250AJP only.
33169	33	169	PVG ENABLE VALVE - SHORT TO BATTERY	There is a Short to Battery to the PVG Valve.	- 1250AJP only.
33173	33	173	RESTRICTED TO TRANSPORT - AXLE LOCKOUT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Axle Lockout Valve.	
33174	33	174	RESTRICTED TO TRANSPORT - BRAKE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Brake.	
33175	33	175	JIB ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Left Valve.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33176	33	176	JIB ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Left Valve.	
33177	33	177	JIB ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Left Valve.	
33178	33	178	JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Right Valve.	
33179	33	179	JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Right Valve.	
33180	33	180	JIB ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Right Valve.	
33181	33	181	MAIN LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift Up Valve.	
33183	33	183	MAIN LIFT UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift Up Valve.	
33184	33	184	MAIN LIFT DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift Down Valve.	
33185	33	185	MAIN LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift Down Valve.	
33186	33	186	MAIN TELESCOPE OUT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Telescope Out Valve.	
33188	33	188	MAIN TELESCOPE OUT VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope Out Valve.	
33189	33	189	MAIN TELESCOPE IN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Telescope In Valve.	
33190	33	190	MAIN TELESCOPE IN VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope In Valve.	
33207	33	207	HORN - OPEN CIRCUIT	There is an Open Circuit to the Horn.	
33208	33	208	HORN - SHORT TO BATTERY	There is a Short to Battery to the Horn.	
33209	33	209	HORN - SHORT TO GROUND	There is a Short to Ground to the Horn.	
33279	33	279	GLOWPLUG - OPEN CIRCUIT	There is an Open Circuit to the Glow Plugs.	- Glowplugs equipped vehicles only.
33280	33	280	GLOWPLUG - SHORT TO BATTERY	There is a Short to Battery to the Glow Plugs.	- Glowplugs equipped vehicles only.
33281	33	281	GLOWPLUG - SHORT TO GROUND	There is a Short to Ground to the Glow Plugs.	- Glowplugs equipped vehicles only.
33285	33		ALTERNATOR EXCITATION LINE - SHORT TO BATTERY		
33295	33	295	SWING LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Swing Left Valve.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33306	33	306	SWING LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Swing Left Valve.	
33307	33	307	MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope Flow Control Valve.	
33308	33	308	MAIN TELESCOPE FLOW CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Telescope Flow Control Valve.	
33309	33	309	MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope Flow Control Valve.	
33310	33	310	MAIN LIFT DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift Down Valve.	
33311	33	311	MAIN LIFT FLOW CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift Flow Control Valve.	
33312	33	312	MAIN LIFT FLOW CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift Flow Control Valve.	
33313	33	313	MAIN LIFT FLOW CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift Flow Control Valve.	
33329	33	329	MAIN LIFT UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift Up Valve.	
340	**34**	**0**	**<<< PLATFORM OUTPUT DRIVER >>>**		
343	34	3	PLATFORM LEVEL UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Up Valve.	
344	34	4	PLATFORM LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Platform Level Up Valve.	- Electronic leveling system equipped vehicles only.
347	34	7	PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Down Valve.	
348	34	8	PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Platform Level Down Valve.	- Electronic leveling system equipped vehicles only.
430	**43**	**0**	**<<< ENGINE >>>**		
431	43	1	FUEL SENSOR SHORT TO BATTERY	The Fuel Sensor reading is > 4.3V.	
432	43	2	FUEL SENSOR SHORT TO GROUND	The Fuel Sensor reading is < 0.2V.	
433	43	3	OIL PRESSURE SHORT TO BATTERY	The Oil Pressure Sensor reading is > 6.6V.	- Deutz engine only.
434	43	4	OIL PRESSURE SHORT TO GROUND	The Oil Pressure Sensor reading is < 0.1V for more then 5 seconds.	- Deutz engine only. - Not reported during engine start.
435	43	5	COOLANT TEMPERATURE SHORT TO GROUND	The Coolant Temperature Sensor reading is < 0.1V.	- Deutz engine only.
437	43	7	ENGINE TROUBLE CODE	Displays engine SPN FMI code.	
438	43	8	HIGH ENGINE TEMP	(Ford engine only) The engine temperature is > 117 C. (Deutz engine only) The engine temperature is > 130 C.	- Ford / Deutz engine only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
439	43	9	AIR FILTER BYPASSED	The Air Filter is clogged.	
4310	43	10	NO ALTERNATOR OUTPUT	Battery voltage is < 11.5 volts for more then 15 seconds after engine start.	
4311	43	11	LOW OIL PRESSURE	(Ford engine only) The ECM has reported a low oil pressure fault. (Deutz engine only) Oil pressure is < 8 PSI for more then 10 seconds after engine start.	- Ford / Deutz engine only.
4313	43	13	THROTTLE ACTUATOR FAILURE	The engine RPM is > XXX for more then XX seconds.	
4314	43	14	WRONG ENGINE SELECTED - ECM DETECTED	A ECM was detected with a non-ECM type engine selected.	
4322	43	22	LOSS OF ENGINE SPEED SENSOR	The engine RPM sensor indicates 0 RPM AND the Oil Pressure Sensor indicates > 8 PSI for three seconds.	- Diesel engine only.
4323	43	23	SPEED SENSOR READING INVALID SPEED	The engine RPM sensor indicates > 4000 RPM.	- Diesel engine only.
4331	43		SOOT LOAD WARNING - LOW		
4332	43		SOOT LOAD WARNING - HIGH		
4333	43		SOOT LOAD WARNING - SEVERE		
4375	4	3	WATER IN FUEL	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.
4376	4	3	FUNCTIONS PREVENTED - ENGINE OIL WARM UP ACTIVE	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.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
440	**44**	**0**	**<<< BATTERY SUPPLY >>>**		
441	44	1	BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN	Battery voltage is < 9V.	
442	44	2	BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN	Battery voltage is > 16V.	
443	4	4	LSS BATTERY VOLTAGE TOO HIGH	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.
4430	4	4	BATTERY VOLTAGE TOO LOW	The control system has detected that the system battery voltage is less than 11 volts for 5s and the engine is not cranking and auxiliary mode is not active.	Check the control system battery as the control system has indicated that its voltage is low.
444	4	4	LSS BATTERY VOLTAGE TOO LOW	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.
445	44	5	BATTERY VOLTAGE LOW	Battery voltage is < 11V for more then 5 seconds.	
4479	4	4	LSS BATTERY VOLTAGE - INITIALIZATION ERROR	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.
4480	4	4	LSS BATTERY VOLTAGE - NOT CALIBRATED	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.
450	**45**	**0**	**<<< CAN CONTROLLED VALVES >>>**		
451	45	1	MAIN LIFT PVG VALVE - INTERNAL FAULT	The Main Lift PVG Valve has an internal fault.	- 1250AJP only.
452	45	2	TOWER LIFT PVG VALVE - INTERNAL FAULT	The Tower Lift PVG Valve has an internal fault.	- 1250AJP only.
453	45	3	TOWER TELESCOPE PVG VALVE - INTERNAL FAULT	The Tower Telescope PVG Valve has an internal fault.	- 1250AJP only.
454	45	4	MAIN LIFT PVG VALVE - HIGH VOLTAGE	The Main Lift PVG Valve supply voltage is high.	- 1250AJP only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
455	45	5	TOWER LIFT PVG VALVE - HIGH VOLTAGE	The Tower Lift PVG Valve supply voltage is high.	- 1250AJP only.
456	45	6	TOWER TELESCOPE PVG VALVE - HIGH VOLTAGE	The Tower Telescope PVG Valve supply voltage is high.	- 1250AJP only.
457	45	7	MAIN LIFT PVG VALVE - LOW VOLTAGE	The Main Lift PVG Valve supply voltage is low.	- 1250AJP only.
458	45	8	TOWER LIFT PVG VALVE - LOW VOLTAGE	The Tower Lift PVG Valve supply voltage is low.	- 1250AJP only.
459	45	9	TOWER TELESCOPE PVG VALVE - LOW VOLTAGE	The Tower Telescope PVG Valve supply voltage is low.	- 1250AJP only.
4510	45	10	MAIN LIFT PVG VALVE - STUCK NEUTRAL	The Main Lift PVG Valve is stuck in its neutral position.	- 1250AJP only.
4511	45	11	TOWER LIFT PVG VALVE - STUCK NEUTRAL	The Tower Lift PVG Valve is stuck in its neutral position.	- 1250AJP only.
4512	45	12	TOWER TELESCOPE PVG VALVE - STUCK NEUTRAL	The Tower Telescope PVG Valve is stuck in its neutral position.	- 1250AJP only.
4513	45	13	MAIN LIFT PVG VALVE - STUCK EXTENDED	The Main Lift PVG Valve is stuck in its extended position.	- 1250AJP only.
4514	45	14	TOWER LIFT PVG VALVE - STUCK EXTENDED	The Tower Lift PVG Valve is stuck in its extended position.	- 1250AJP only.
4515	45	15	TOWER TELESCOPE PVG VALVE - STUCK EXTENDED	The Tower Telescope PVG Valve is stuck in its extended position.	- 1250AJP only.
4516	45	16	MAIN LIFT PVG VALVE - STUCK RETRACTED	The Main Lift PVG Valve is stuck in its retracted position.	- 1250AJP only.
4517	45	17	TOWER LIFT PVG VALVE - STUCK RETRACTED	The Tower Lift PVG Valve is stuck in its retracted position.	- 1250AJP only.
4518	45	18	TOWER TELESCOPE PVG VALVE - STUCK RETRACTED	The Tower Telescope PVG Valve is stuck in its retracted position.	- 1250AJP only.
4519	45	19	MAIN LIFT PVG VALVE - OBSTRUCTED	The Main Lift PVG Valve is obstructed	- 1250AJP only.
4520	45	20	TOWER LIFT PVG VALVE - OBSTRUCTED	The Tower Lift PVG Valve is obstructed	- 1250AJP only.
4521	45	21	TOWER TELESCOPE PVG VALVE - OBSTRUCTED	The Tower Telescope PVG Valve is obstructed	- 1250AJP only.
4522	45	22	MAIN LIFT PVG VALVE - COMMAND IMPROPER	The Main Lift PVG Valve command is improper.	- 1250AJP only.
4523	45	23	TOWER LIFT PVG VALVE - COMMAND IMPROPER	The Tower Lift PVG Valve command is improper.	- 1250AJP only.
4524	45	24	TOWER TELESCOPE PVG VALVE - COMMAND IMPROPER	The Tower Telescope PVG Valve command is improper.	- 1250AJP only.
4525	45	25	MAIN LIFT PVG VALVE - TIMEOUT	The Main Lift PVG Valve has timed out.	- 1250AJP only.
4526	45	26	TOWER LIFT PVG VALVE - TIMEOUT	The Tower Lift PVG Valve has timed out.	- 1250AJP only.
4527	45	27	TOWER TELESCOPE PVG VALVE - TIMEOUT	The Tower Telescope PVG Valve has timed out.	- 1250AJP only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
4528	45	28	MAIN LIFT PVG VALVE - SETUP FAULT	The Main Lift PVG Valve has a setup fault.	- 1250AJP only.
4529	45	29	TOWER LIFT PVG VALVE - SETUP FAULT	The Tower Lift PVG Valve has a setup fault.	- 1250AJP only.
4530	45	30	TOWER TELESCOPE PVG VALVE - SETUP FAULT	The Tower Telescope PVG Valve has a setup fault.	- 1250AJP only.
4531	45	31	MAIN LIFT PVG VALVE - SENT UNRECOGNIZED FAULT	The Main Lift PVG Valve has an unrecognized fault.	- 1250AJP only.
4532	45	32	TOWER LIFT PVG VALVE - SENT UNRECOGNIZED FAULT	The Tower Lift PVG Valve has an unrecognized fault.	- 1250AJP only.
4533	45	33	TOWER TELESCOPE PVG VALVE - SENT UNRECOGNIZED FAULT	The Tower Telescope PVG Valve has an unrecognized fault.	- 1250AJP only.
4534	45	34	MAIN LIFT PVG VALVE - PARAMETERS INCORRECT	The Main Lift PVG Valve parameters are incorrect.	- 1250AJP only.
4535	45	35	TOWER LIFT PVG VALVE - PARAMETERS INCORRECT	The Tower Lift PVG Valve parameters are incorrect.	- 1250AJP only.
4536	45	36	TOWER TELESCOPE PVG VALVE - PARAMETERS INCORRECT	The Tower Telescope PVG Valve parameters are incorrect.	- 1250AJP only.
4537	45	37	MAIN LIFT PVG VALVE - LOCATION IMPROPER	The Main Lift PVG Valve is in the wrong location.	- 1250AJP only.
4538	45	38	TOWER LIFT PVG VALVE - LOCATION IMPROPER	The Tower Lift PVG Valve is in the wrong location.	- 1250AJP only.
4539	45	39	TOWER TELESCOPE PVG VALVE - LOCATION IMPROPER	The Tower Telescope PVG Valve is in the wrong location.	- 1250AJP only.
4540	45	40	MAIN LIFT PVG VALVE - WIRING INCORRECT	The Main Lift PVG Valve has incorrect wiring.	- 1250AJP only.
4541	45	41	TOWER LIFT PVG VALVE - WIRING INCORRECT	The Tower Lift PVG Valve has incorrect wiring.	- 1250AJP only.
4542	45	42	TOWER TELESCOPE PVG VALVE - WIRING INCORRECT	The Tower Telescope PVG Valve has incorrect wiring.	- 1250AJP only.
4543	45	43	MAIN LIFT PVG VALVE - SPOOL CANNOT REACH NEUTRAL	X	- 1250AJP only.
4544	45	44	TOWER LIFT PVG VALVE - SPOOL CANNOT REACH NEUTRAL	X	- 1250AJP only.
4545	45	45	TOWER TELESCOPE PVG VALVE - SPOOL CANNOT REACH NEUTRAL	X	- 1250AJP only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
660	**66**	**0**	**<<< COMMUNICATION >>>**		
662	66	2	CANBUS FAILURE - PLATFORM MODULE	Platform Module CAN communication lost.	
663	66		CANBUS FAILURE - LOAD SENSING SYSTEM MODULE		
666	66	6	CANBUS FAILURE - ENGINE CONTROLLER	Engine Control Module CAN communication lost.	- ECM equipped engine only.
667	66	7	CANBUS FAILURE - MAIN LIFT PVG	Main Lift PVG CAN communication lost.	- 1250AJP only.
668	66	8	CANBUS FAILURE - TOWER LIFT PVG	Tower Lift PVG CAN communication lost.	- 1250AJP only.
669	66	9	CANBUS FAILURE - TOWER TELESCOPE PVG	Tower Telescope PVG CAN communication lost.	- 1250AJP only.
6610	66	10	CANBUS FAILURE - BLAM	BLAM CAN communication lost.	- BLAM equipped vehicles only.
6611	66	11	CANBUS FAILURE - CHASSIS MODULE	Engine Control Module CAN communication lost.	- ECM equipped engine only.
6612	66	12	CANBUS FAILURE - CYLINDER LOAD PIN	Cylinder Load Pin CAN communication lost.	- Cylinder Load Pin equipped engine only.
6613	66	13	CANBUS FAILURE - EXCESSIVE CANBUS ERRORS	There has been > 500 Bus Off errors or > 500 Bus Passive Errors.	
6614	66	14	CANBUS FAILURE - MAIN ANGLE SENSOR #1	Angle Sensor #1 CAN communication lost.	- 1250AJP only.
6615	66	15	CANBUS FAILURE - MAIN ANGLE SENSOR #2	Angle Sensor #2 CAN communication lost.	- 1250AJP only.
6622	66	22	CANBUS FAILURE - TCU MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6623	66	23	CANBUS FAILURE - GATEWAY MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6629	66	29	CANBUS FAILURE - TELEMATICS CANBUS LOADING TOO HIGH	X	-Telematics only
663	6	6	CANBUS FAILURE - LOAD SENSING SYSTEM MODULE	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.
680	**68**	**0**	**<<< TELEMATICS >>>**		
681	68	1	REMOTE CONTRACT MANAGEMENT OVERRIDE - ALL FUNCTIONS IN CREEP	X	-Telematics only
810	**81**	**0**	**<<< TILT SENSOR >>>**		
813	81	3	CHASSIS TILT SENSOR NOT CALIBRATED	The Chassis Tilt Sensor has not been calibrated.	
815	81	5	CHASSIS TILT SENSOR DISAGREEMENT	X	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
820	**82**	**0**	**<<< PLATFORM LOAD SENSE >>>**		
821	82		LSS CELL #1 ERROR		
8211	8	2	LSS READING UNDER WEIGHT	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.
8218	8	2	LSS SENSOR DISAGREEMENT	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.
822	82		LSS CELL #2 ERROR		
8222	8	2	LSS STRAIN GAUGE 1 - STAGNANT	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.