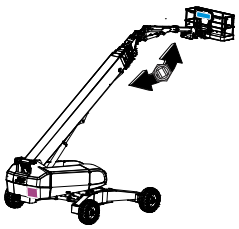
15. Adjust the jib level using the Jib Lift function switch until the jib level control angle reads zero (0).

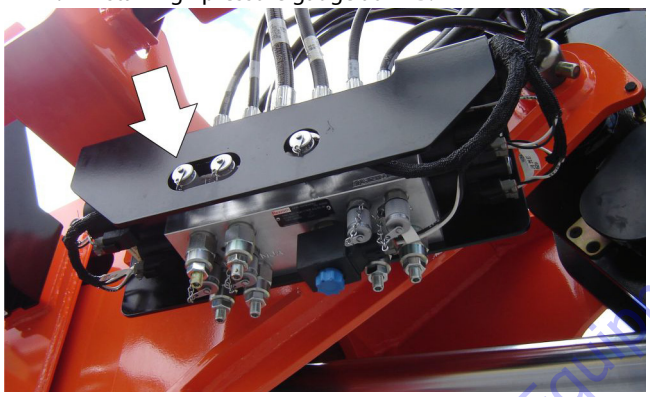


16. After the control angle is set, use the UP or DOWN arrow keys to toggle the override from On to Off.

17. Make sure to reset Jib override to off after pressure is set, and cycle machine power. Operate the main boom to verify jib level is working properly.

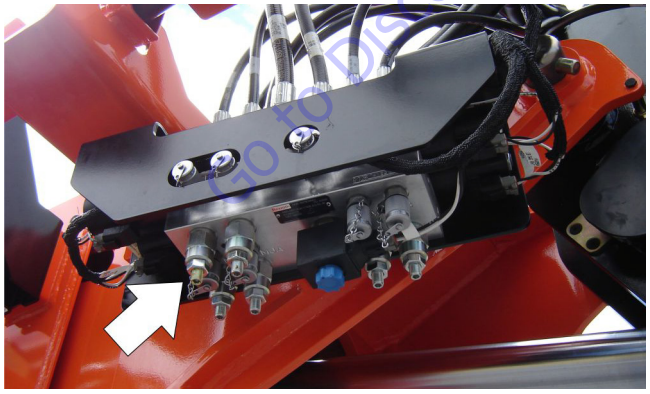
JIB TELESCOPE OUT

1. Install high pressure gauge at MTB.



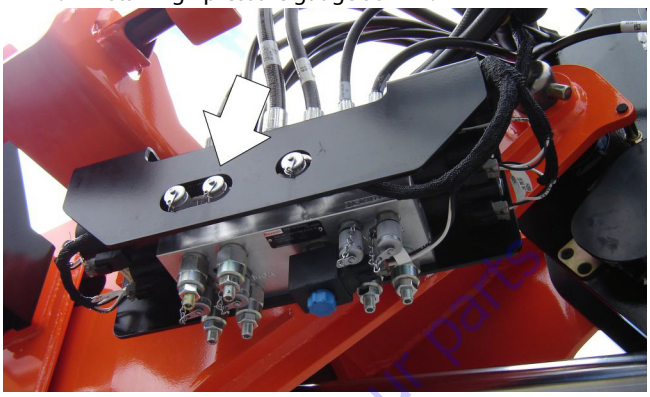
2. Extend jib telescope fully.

3. Set pressure at 2850 psi. (197bar). CW increases and CCW decreases setting. Adjustment is the one closest to MTB.



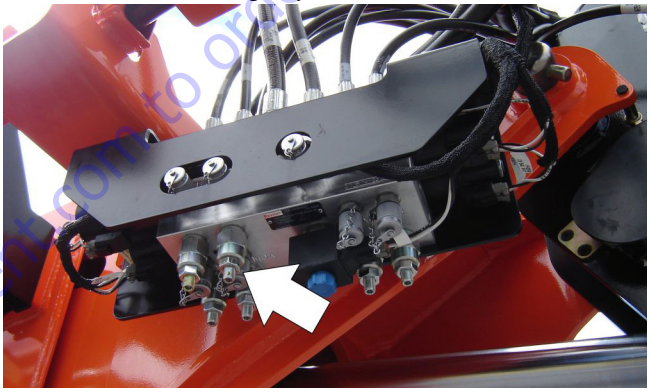
JIB TELESCOPE IN

1. Install high pressure gauge at MTA.



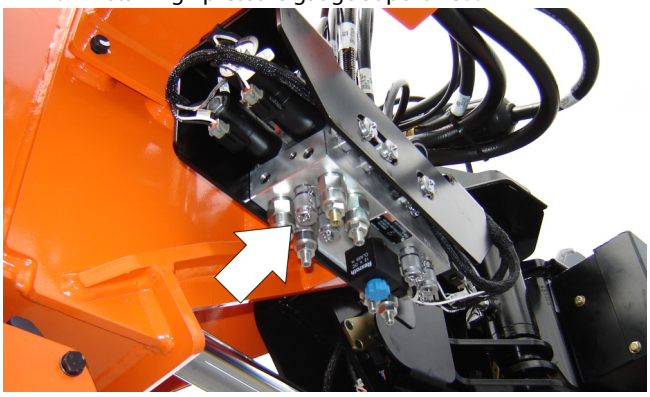
2. Retract jib telescope fully.

3. Set pressure at 2850 psi.(197bar). CW increases and CCW decreases setting. Adjustment is the one closest to MTA.

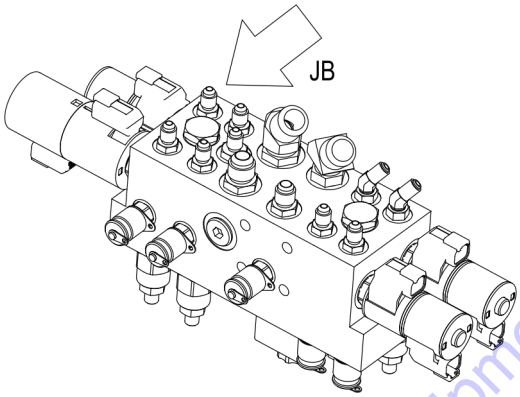


JIB LIFT UP

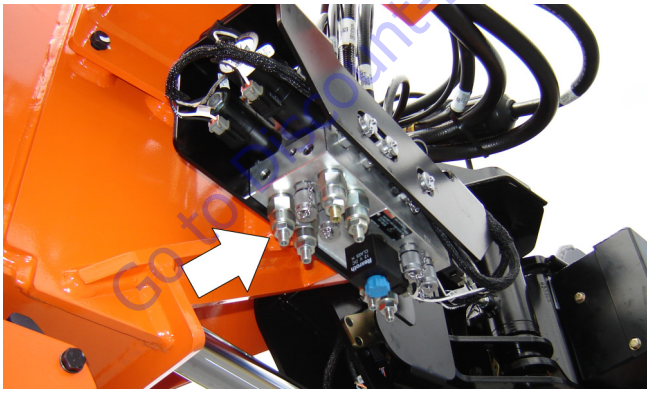
1. Install high pressure gauge at port MJB.



2. Fully extend jib lift cylinder or cap port JB.

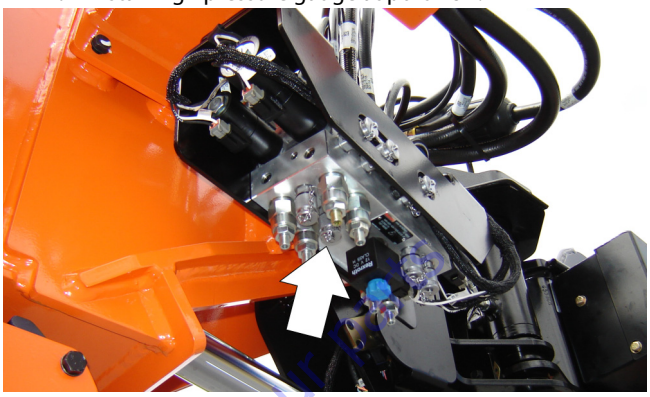


3. Set pressure to 2800 psi.(193bar). Clockwise increases and Counterclockwise decreases setting. Adjustment is on the boom side of MJB.

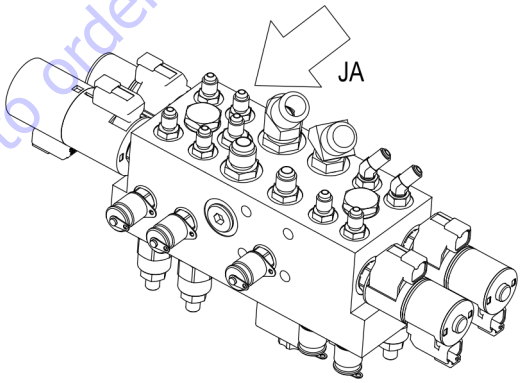


JIB LIFT DOWN

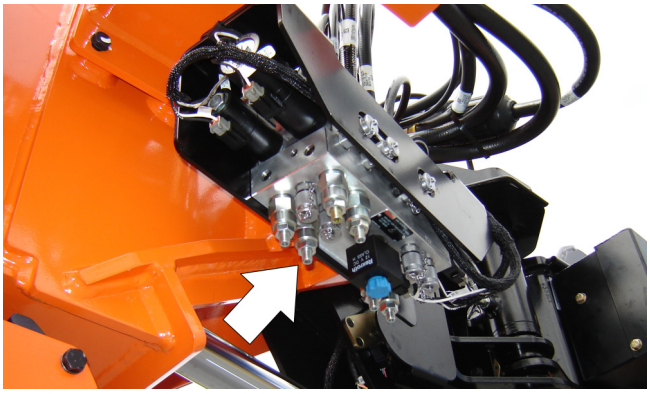
1. Install high pressure gauge at port MJA.



2. Fully retract jib lift cylinder or cap port JA. Set pressure to 1200 psi (83bar).



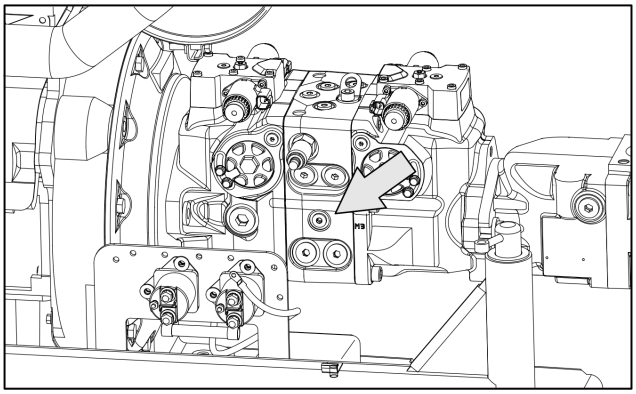
3. CW increases and CCW decreases setting. Adjustment is on the boom side of MJA.



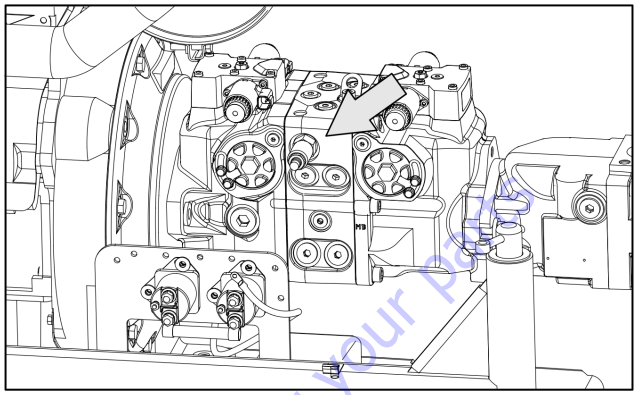
6. Adjustments Made in Traction Circuit

CHARGE PRESSURE RELIEF

1. Install gauge 1000psi (69bar)) at port M3 on traction pump.



2. With the drive hubs disconnected, start the engine.
3. Adjust the charge relief valve to obtain reading of 400psi (28bar). The charge relief is located on the turntable side of the pump above M3. Clockwise increases pressure, Counterclockwise decreases pressure.



LOOP FLUSHING RELIEF

1. Install pressure gauge at port MP on traction valve.
2. With hubs still disconnected energize Drive, adjust loop flushing valve to obtain gauge reading of 350psi (24bar). Clockwise increases pressure, counter clockwise decreases.

5.7 DRIVE PUMPS

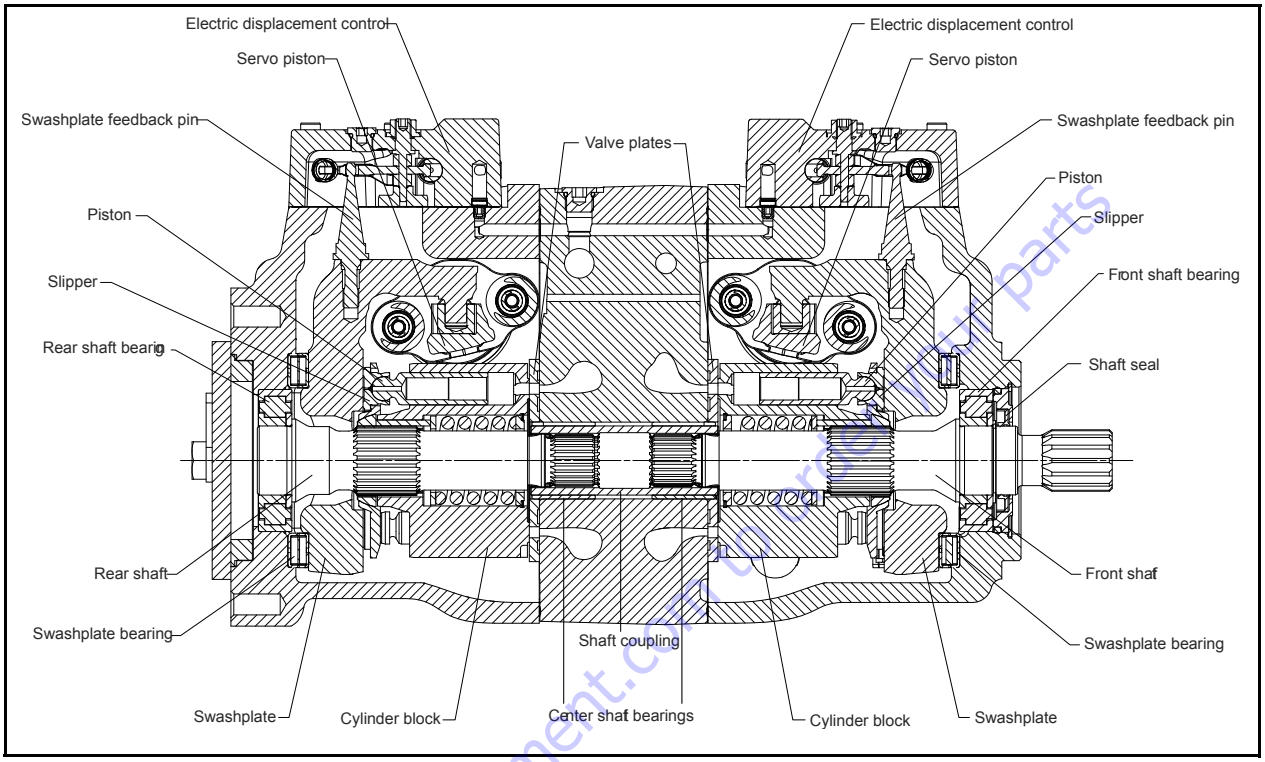


Figure 5-212. Piston Pump Cross Sectional View

Port Locations and Gauge Installation

Table 5-33. Port information

Port identifier	Port size	Wrench size	Reading	Gauge size, bar [psi]
L1, L2, L3	1 1/16-12 UNF 2B	9/16 internal hex	Case drain	10 bar [100 psi]
MA, MB, MC, MD	9/16-18 UNF	1/4 internal hex	System pressure	600 bar [10,000 psi]
M3	9/16-18 UNF 2B	1/4 internal hex	Charge pressure	50 bar [1000 psi]
M4, M5	7/16-20 UNF 2B	3/16 internal hex	Servo pressure	50 bar [1000 psi]
X7	9/16-18 UNF 2B	1/4 internal hex	Brake pressure	50 bar [1000 psi]

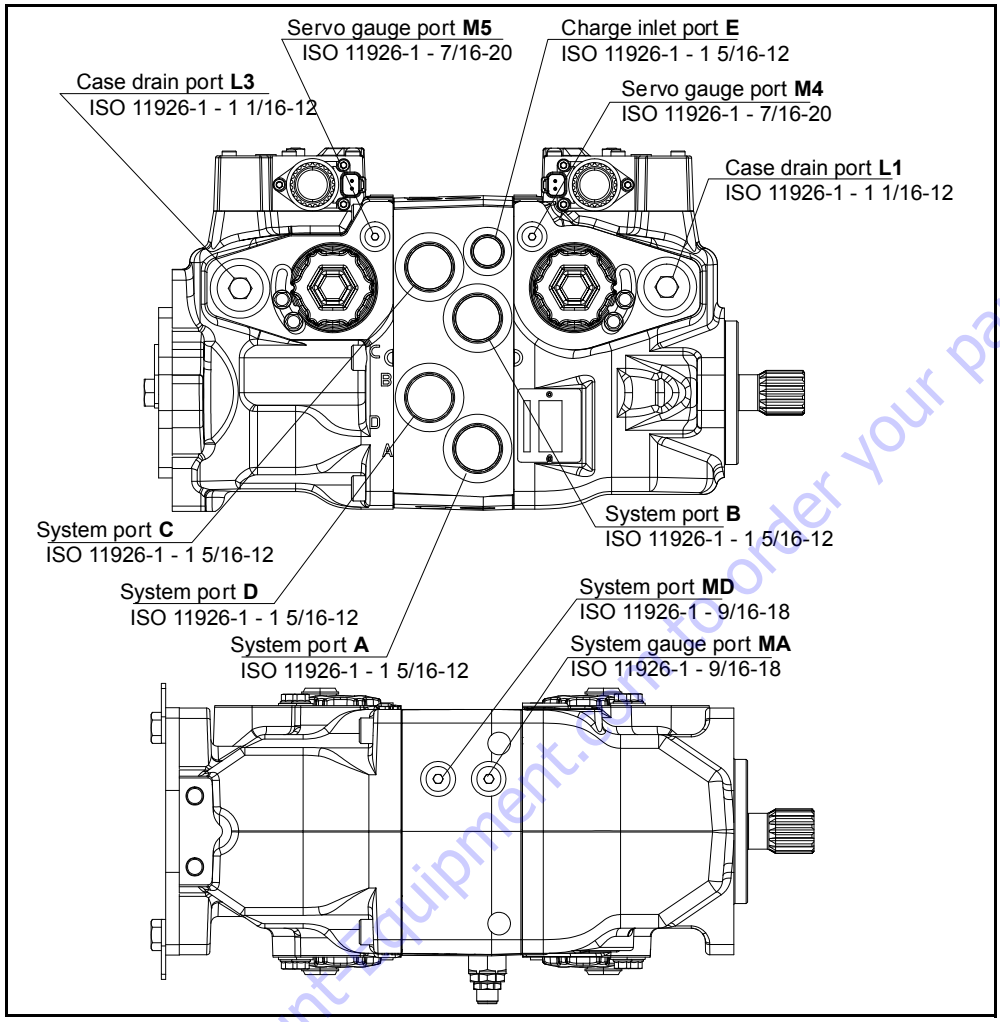


Figure 5-213. Port locations - Sheet 1 of 2

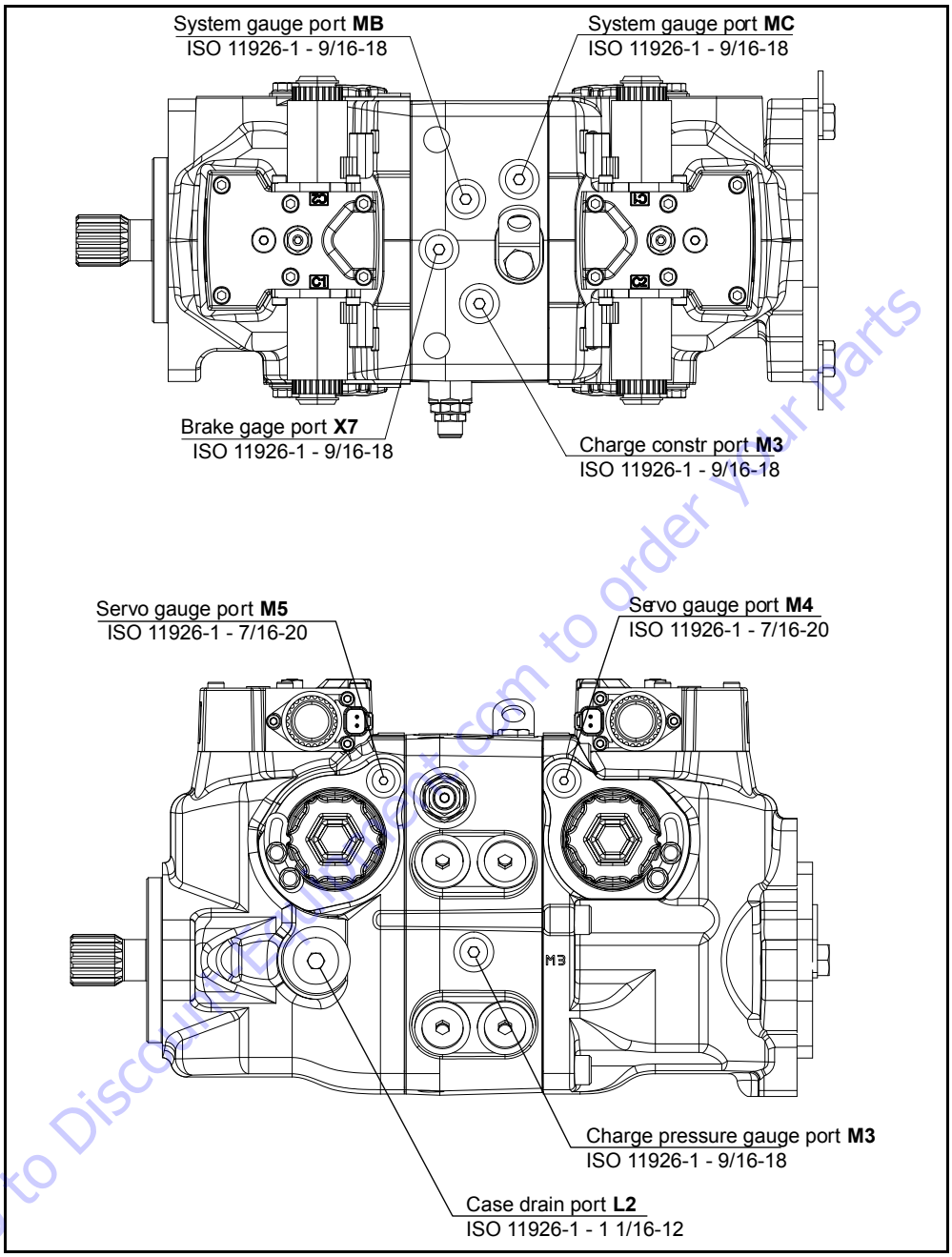


Figure 5-214. Port locations - Sheet 2 of 2

Initial Startup Procedures

Follow this procedure when starting-up a new pump or when restarting a pump that has been removed. Ensure the pump is thoroughly tested on a test stand before installing.

Prior to installing the pump, inspect for damage that may have occurred during shipping.

1. Ensure that the machine hydraulic oil and system components (reservoir, hoses, valves, fittings, and heat exchanger) are clean and free of any foreign material.
2. Install new system filter element(s) if necessary. Check that inlet line fittings are properly tightened and free of air leaks.
3. Install the pump. Install a 50 bar [1000 psi] gauge in the charge pressure gauge port M3.
4. Fill the housing by adding filtered hydraulic fluid to the upper case drain port. If the controls are installed on top, open the construction plugs in the top of the controls to assist in air bleed.
5. Fill the reservoir with hydraulic fluid of the recommended type and viscosity. Use a 10-micron filler filter. Ensure construction plug is closed after filling is complete.
6. Disconnect the pump from all control input signals.

⚠ CAUTION

AFTER START-UP THE FLUID LEVEL IN THE RESERVOIR MAY DROP DUE TO SYSTEM COMPONENTS FILLING DAMAGE TO HYDRAULIC COMPONENTS MAY OCCUR IF THE FLUID SUPPLY RUNS OUT. ENSURE RESERVOIR REMAINS FULL OF FLUID DURING START-UP.

⚠ CAUTION

AIR ENTRAPMENT IN OIL UNDER HIGH PRESSURE MAY DAMAGE HYDRAULIC COMPONENTS. CHECK CAREFULLY FOR INLET LINE LEAKS.

⚠ CAUTION

DO NOT RUN AT MAXIMUM PRESSURE UNTIL SYSTEM IS FREE OF AIR AND FLUID HAS BEEN THOROUGHLY FILTERED.

7. Use a common method to disable the engine to prevent it from starting. Crank the starter for several seconds. Do not to exceed the engine manufacturer's recommendation. Wait 30 seconds and then crank the engine a second time as stated above. This operation helps remove air from the system lines. Refill the reservoir to recommended full oil level.
8. When the gauge begins to register charge pressure, enable and start engine. Let the engine run for a minimum of 30 seconds at low idle to allow the air to work itself out of the system. Check for leaks at all line connections and listen for cavitation. Check for proper fluid level in reservoir.
9. When adequate charge pressure is established (as shown in model code), increase engine speed to normal operating rpm to further purge residual air from the system.
10. Shut the off engine. Connect the pump control signal. Start the engine, checking to be certain the pump remains in neutral. Run the engine at normal operating speed and carefully check for forward and reverse control operation.
11. Continue to cycle between forward and reverse for at least five minutes to bleed all air and flush system contaminants out of the system loop.

NOTE: *Normal charge pressure fluctuation may occur during forward and reverse operation.*

12. Check that the reservoir is full. Remove charge pressure gauge and cap port. The pump is now ready for operation.

Troubleshooting

⚠ CAUTION

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

⚠ WARNING

ESCAPING HYDRAULIC FLUID UNDER PRESSURE CAN HAVE SUFFICIENT FORCE TO PENETRATE YOUR SKIN CAUSING SERIOUS INJURY AND/OR INFECTION AND MAY BE HOT ENOUGH TO CAUSE BURNS. RELIEVE PRESSURE IN THE SYSTEM BEFORE REMOVING HOSES, FITTINGS, GAUGES, OR COMPONENTS. SEEK IMMEDIATE MEDICAL ATTENTION IF YOU ARE CUT OR BURNED BY HYDRAULIC FluID.

⚠ CAUTION

CONTAMINATION CAN DAMAGE INTERNAL COMPONENTS. TAKE PRECAUTIONS TO ENSURE SYSTEM CLEANLINESS WHEN REMOVING AND REINSTALLING SYSTEM COMPONENTS AND LINES

Table 5-34. Electrical troubleshooting

Item	Description	Action
Control operates pump in one direction only	Control coil failure.	Measure resistance at coil pins. Resistance should be 14.2W (24V) or 3.66W (12V) at 20°C [70°F]. Replace coil.
No pump function	No power to controller.	Restore power to controller.
Erratic pump function	Electrical connection to pump is bad.	Disconnect connection, check wires, reconnect wires.
Erratic or no machine function	External controller malfunction or hydraulic system problem.	Verify external controller problem using spare controller. Replace controller. Check hydraulic system fluid level/pressures/filters/etc. Fix hydraulic system problems.

Table 5-35. Neutral difficult or impossible to find

Item	Description	Action
Input to pump control	Input to control module is operating improperly.	Disconnect input and check to see if pump comes back to neutral. If Yes, input fault, replace/repair external controller. If No, go to next step.
Pump control neutral	Neutral set improperly.	Shunt servo gauge ports M4 and M5 together with external hose and see if pump comes back to neutral. If Yes: control neutral improperly set. If no: balance swashplate (see Mechanical neutral adjustment). If you still cannot set neutral, replace control.

Table 5-36. System operating hot

Item	Description	Action
Oil level in reservoir	Insufficient hydraulic fluid will not meet cooling demands of system.	Fill reservoir to proper level.
Heat exchanger	Heat exchanger not sufficiently cooling the system.	Check air flow and input air temperature for heat exchanger. Clean, repair or replace heat exchanger.
Charge pressure	Low charge pressure will overwork system.	Measure charge pressure. Inspect and adjust or replace charge relief valve. Inspect charge pump. Repair or replace charge pump.
Charge pump inlet vacuum	High inlet vacuum will overwork system. A dirty filter will increase the inlet vacuum. Inadequate line size will restrict flow.	Check charge inlet vacuum. If high, inspect inlet filter and replace as necessary. Check for adequate line size, length or other restrictions.
System relief pressure settings	If the system relief valves are worn, contaminated, or valve settings are too low, the relief valves will be overworked.	Verify settings of high pressure relief valves and replace valves as necessary.
System pressure	Frequent or long term operation over system relief setting will create heat in system.	Measure system pressure. If pressure is too high, reduce loads.

Table 5-37. System will not operate

Item	Description	Action
Oil level in reservoir	Insufficient hydraulic fluid to supply system loop.	Fill reservoir to proper level.
Control orifices	Control orifices are blocked.	Clean control orifices.
Control screens	Control screens are blocked.	Clean or replace control screens.
Charge pressure with pump in neutral	Low charge pressure insufficient to recharge system loop.	Measure charge pressure with the pump in neutral. If pressure is low, go to next step.
Pump charge relief valve	A pump charge relief valve that is leaky, contaminated, or set too low will depressurize the system.	Adjust or replace pump charge relief valve as necessary.
Charge pump inlet filter	A clogged filter will under supply system loop.	Inspect filter and replace if necessary.
Charge pump	A malfunctioning charge pump will provide insufficient charge flow.	Repair or replace the charge pump.
System pressure	Low system pressure does not provide enough power to move load.	Measure system pressure. Continue to next step.
Charge check / HPRVs	Defective charge check / HPRVs cause system pressure to be low.	Repair or replace charge check / HPRVs.
Input to control	Input to control module is operating improperly.	Repair or replace control.
Optional control cutoff valve	Control cutoff valve coil not energized.	Ensure charge pressure to control via port X7. If none, confirm control cutoff valve coil is energized. If still no pressure, repair or replace control cutoff valve.

Table 5-38. System noise or vibration

Item	Description	Action
Reservoir oil level	Low oil level leads to cavitation.	Fill reservoir.
Aeration of the oil/pump inlet vacuum	Air in system decreases efficiency of units and controls. Air in system is indicated by excessive noise in pump, foaming in oil, and hot oil.	Find location where air is entering into the system and repair. Check that inlet line is not restricted and is proper size.
Cold oil	If oil is cold, it may be too viscous for proper function and pump cavitates.	Allow the oil to warm up to its normal operating temperature with engine at idle speed.
Pump inlet vacuum	High inlet vacuum causes noise/cavitation.	Check that inlet line is not restricted and is proper size. Check filter and bypass switch.
Shaft couplings	A loose input shaft to prime mover coupling will cause excessive noise.	Replace loose shaft coupling.
Shaft alignment	Misaligned input and prime mover shafts create noise.	Correct misalignment.
Charge/system relief valves	Unusual noise may indicate sticking valves. Possible contamination.	Clean/replace valves and test pump. May be a normal condition.

Table 5-39. Sluggish system response

Item	Description	Action
Oil level in reservoir	Low oil level will cause sluggish response.	Fill reservoir.
Charge check / HPRVs	Incorrect pressure settings will affect system reaction time.	Replace charge check / HPRVs.
Low prime mover speed	Low engine speed will reduce system performance.	Adjust engine speed.
Charge and control pressures	Incorrect pressures will affect system performance.	Measure and adjust charge and control pressures.
Air in system	Air in system will produce sluggish system response.	Fill tank to proper level. Cycle system slowly for several minutes to remove air from system.
Contaminated control orifices	Control orifices are plugged.	Clean control orifices.
Contaminated control screens	Control screens are plugged.	Clean or replace control screens.
Pump inlet vacuum	Inlet vacuum is too high resulting in reduced system pressure.	Measure charge inlet vacuum. Inspect line for proper sizing. Replace filter. Confirm proper bypass operation.

Adjustments

⚠ CAUTION

CONTAMINATION CAN DAMAGE INTERNAL COMPONENTS AND VOID YOUR WARRANTY. TAKE PRECAUTIONS TO ENSURE SYSTEM CLEANLINESS WHEN REMOVING AND REINSTALLING SYSTEM LINES

1. Thoroughly clean the outside of the pump.
2. If removing the pump, tag each hydraulic line. When you disconnect hydraulic lines, cap them and plug each open port to prevent contamination.
3. Ensure the surrounding area is clean and free of contaminants like dirt and grime.
4. Inspect the system for contamination.
5. Check the hydraulic fluid for signs of contamination: oil discoloration, foam in the oil, sludge, or metal particles.
6. If there are signs of contamination in the hydraulic fluid, replace all filters and drain the hydraulic system. Flush the lines and refill the reservoir with the correct filtered hydraulic fluid.
7. Before reinstalling the pump, test for leaks.

CHARGE PRESSURE RELIEF VALVE.

1. Install a 50 bar [1000 psi] pressure gauge in charge pressure gauge port M3. Install a 10 bar [100 psi] gauge at case pressure port L1, L2, or L3. Operate the system with the pump in neutral (zero displacement) when measuring charge pressure.
2. The table below shows the acceptable pump charge pressure range for some nominal charge relief valve settings (refer to model code located on serial number plate). These pressures assume 1800 min-1 (rpm) pump speed and a reservoir temperature of 50°C [120°F], and are referenced to case pressure.

NOTE: *Listed pressures assume a pump speed of 1800 min-1 (rpm) and charge flow of 26.5 l/min [7 US gal/min]. At higher pump speeds or higher charge flows the charge pressure will rise over the rated setting.*

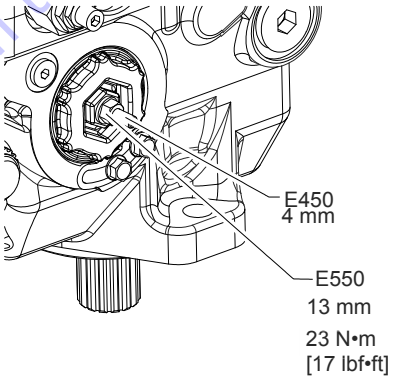
3. Loosen the locknut and rotate the adjusting screw clockwise to increase the setting; counterclockwise to decrease it. Subtract the case pressure reading to compute the actual charge pressure.

NOTE: *Pressure change per turn is dependent on charge flow entering pump.*

4. While holding the adjusting screw, torque locknut to 12 Nm [9 lbft].
5. When you achieve the desired charge pressure setting, remove the gauges and plug the ports.

DISPLACEMENT LIMITER ADJUSTMENT

1. Mark servo cylinder location in case it rotates during displacement limiter adjustment.
2. Loosen the locknut (E550).



3. Rotate the adjusting screw (E450) based on the following table. Rotating the adjusting screw clockwise decreases the maximum displacement of the pump while rotating the adjusting screw counterclockwise increases the maximum displacement.

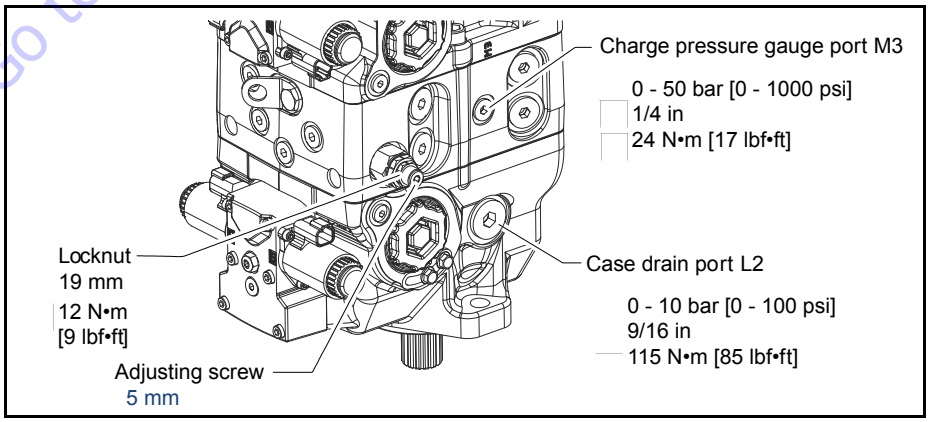


Figure 5-215. Charge Pressure Adjustment

4. After establishing the desired maximum displacement setting, hold adjusting screw in place and tighten the locknut. Torque to 23 Nm [17 lbft]. C

⚠ CAUTION

BE SURE SERVO CYLINDER DOES NOT ROTATE WHEN DISPLACEMENT LIMITER LOCKNUT (E550) IS TORQUED.

5. One turn of the adjusting screw will change the maximum displacement approximately as follows.

Table 5-40. Displacement Limiter Adjustment Data

Displacement	Locknut wrench size and torque	Adjusting screw size	Approximate displacement change per revolution of adjusting screw
45	13 mm 23 Nm [17 lbft]	4 mm internal hex	5.1 cc / turn

CONTROL NEUTRAL ADJUSTMENT

All functions of the Electric Displacement Control (EDC) are preset at the factory. Adjust the pump to neutral with the pump running on a test stand or on the vehicle/machine with the prime mover operating. If adjustment fails to give satisfactory results, you may need to replace the control or coils.

1. Install a 50 bar [1000 psi] gauge in each of the two servo gauge ports (M4 and M5). Disconnect the external control input (electrical connections) from the control. Start the prime mover and operate at normal speed.

2. Use a 4mm internal hex wrench to hold the neutral adjusting screw stationary while loosening the locknut with a 13mm wrench.

3. Observe pressure gauges. If necessary, turn adjusting screw to reduce any pressure differential.

NOTE: *Adjustment of the EDC is very sensitive. Be sure to hold the hex wrench steady while loosening the locknut. Total adjustment is less than 120 degrees.*

4. Rotate the neutral adjusting screw clockwise until the pressure increases on the gauge. Note the angular position of the wrench. Then rotate the neutral adjusting screw counterclockwise until the pressure increases by an equal amount on the other gauge. Again note the angular position of the wrench.

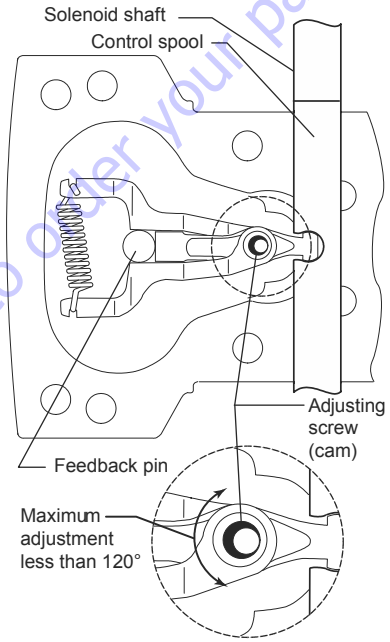


Illustration shows how eccentric cam on adjusting screw rotates to adjust neutral.

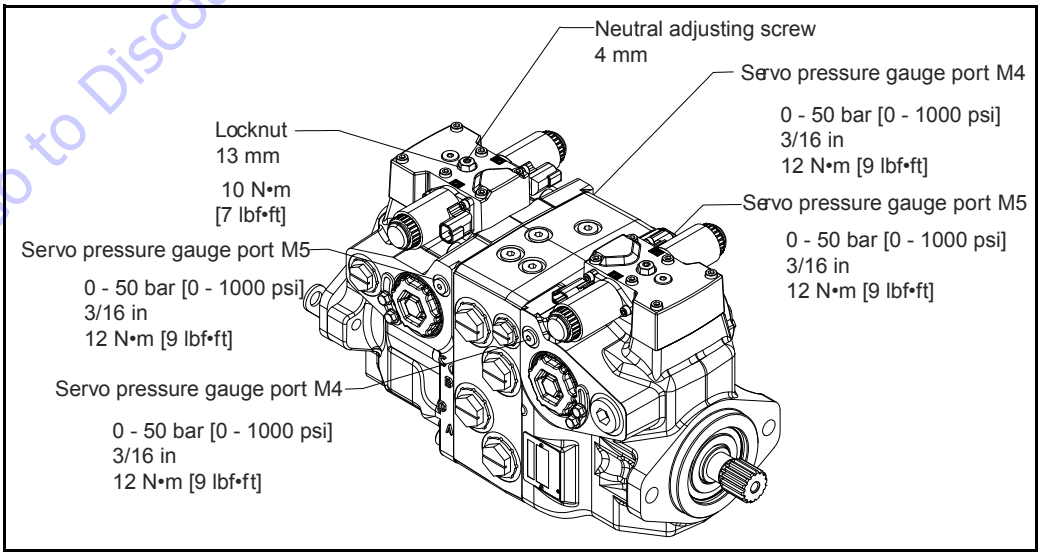


Figure 5-216. Control Neutral Adjustment

5. Rotate the neutral adjusting screw clockwise half the distance between the wrench positions noted above. The gauges should read the same pressure, indicating that the control is in its neutral position.

6. Hold the neutral adjusting screw stationary and tighten the lock nut. Torque to 10.Nm [7 lbft]. Do not over torque the nut.

7. When the neutral position is set, stop the prime mover, remove the gauges, and install the gauge port plugs. Reconnect the external control input.

NOTE: *A small pressure differential of 1.5 bar [22 psi] or less is acceptable. Zero differential is usually not possible.*

MECHANICAL NEUTRAL ADJUSTMENT

Mechanical neutral is set with the pump running at 1800 min (rpm). To set neutral, you must stroke the pump in each direction.

This procedure details setting neutral for the entire pump, one side at a time. The procedure is the same for each side of each pump so you will need to repeat it four times to set mechanical neutral for both the front and rear sections. Alternate M4/M5 and MA/MB to zero out forward and reverse directions of the front unit, then move the gauges to M4/M5 of the rear unit and MC/MD (system gauge ports for the rear unit). Refer to the drawing that follows to identify all ports. The front and rear sections are basically mirror images of each other. The control solenoids C1 and C2 are marked on each control.

While performing this adjustment, you monitor the following pressures.:

- Servo pressure at M4 and M5
- System pressure at MA and MB or MC and MD
- Pressure differential between M4 and M5 (optional)
- Pressure differential between A and B or C and D (optional)

PUMP SETUP

1. Attach a 50 bar [1000 psi] gauge to each servo pressure port M4 and M5.

2. Attach a 600 bar [10 000 psi] gauge to each system pressure port (MA and MB for front pump, MC and MD for rear pump).

3. Remove servo cylinder locking screws (E350) and plates (E300) from both sides of the pump.

4. Disconnect the control solenoids from the vehicle wiring harness.

5. If using a PWM signal to set mechanical neutral, connect the control solenoids C1 and C2 to the signal source. Ensure the source supplies no current to the solenoids until required in the following procedure.

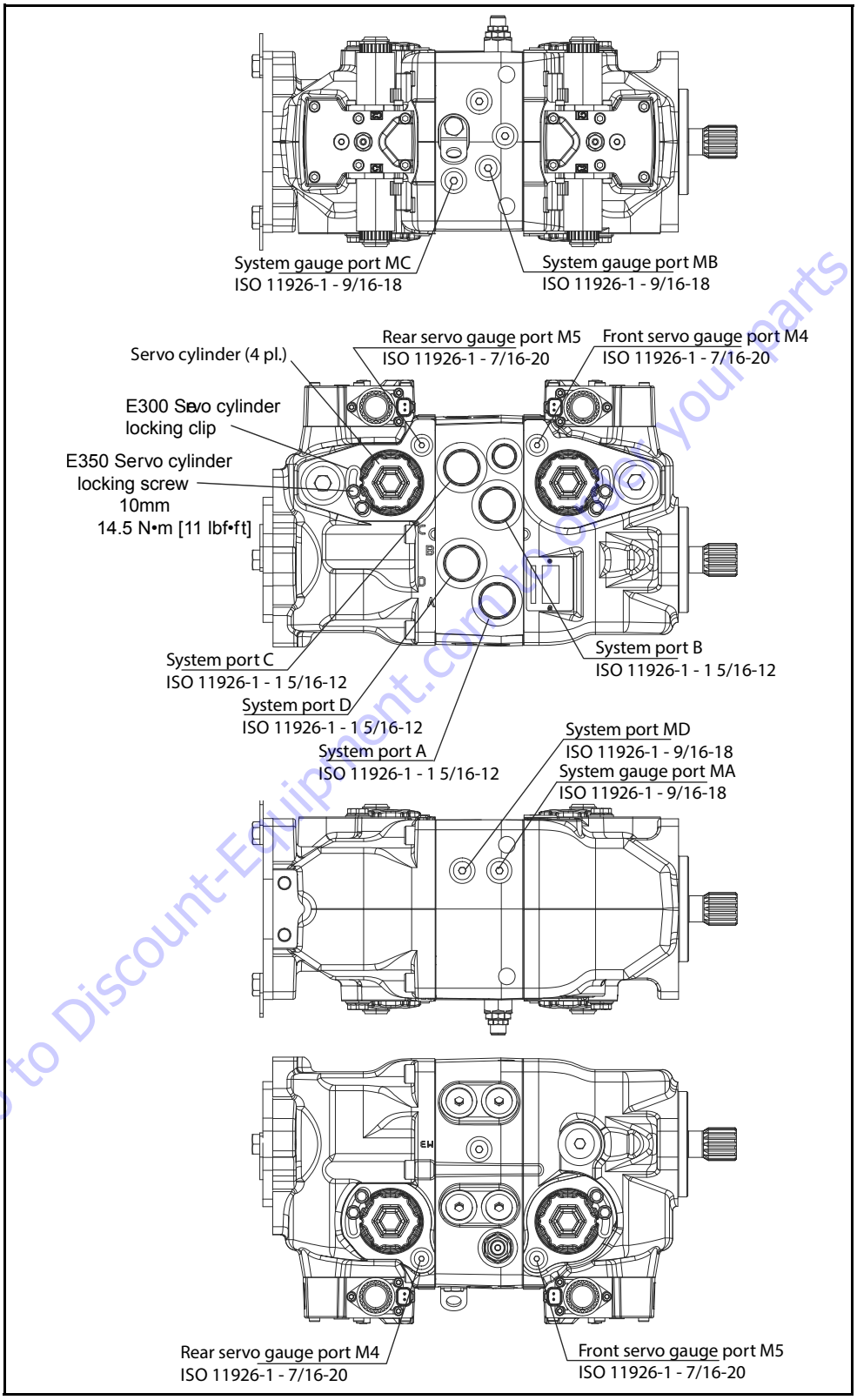


Figure 5-217. Servo and System Pressure Gauge Port Locations

SERVO ADJUSTMENT

6. Run prime mover at 1800 min (rpm).

7. If using a PWM signal, ensure the signal is off. Check the servo pressure gauges. Ensure the differential between M4 and M5 is less than 1.5 bar [22 psi].

8. Using a 3/4 in deep socket, unthread both servo cylinders 2-3 turns. This step ensures the servo cylinders have no contact with the servo piston.

9. Stroke the pump by turning the control eccentric screw (or supplying current to solenoid C1) until the servo pressure at port M4 is 1 to 2 bar [14 -29 psi] greater than at port M5 and the system pressure gauges indicate displacement. Pressure should be greater at port MA for clockwise rotation, or MB for counterclockwise rotation. This also indicates the servo piston is in contact with the servo cylinder on side M5.

10. Slowly thread the servo cylinder on the M5 side in until the system pressure differential starts to decrease. Maintain servo pressure differential between 1-2 bar [14-29 psi] during this step. Continue turning the servo cylinder in until the system pressure differential (between ports MA/MB or MC/MD) is less than 1.5 bar [22 psi]. This procedure sets the servo and swashplate to mechanical neutral on the M5 side.

11. To complete setting neutral, repeat steps 1-5 but stroke the pump in the opposite direction by turning the eccentric screw in the opposite direction, or by supplying current to solenoid C2. Reverse gauge locations (M4 for M5, MB for MA etc.) from those stated above since the pump is now stroking the other direction.

12. Set neutral for the rear pump by repeating steps 1-6 on the rear pump. Remember that the rear pump is a mirror image of the front pump and therefore the locations of the servo gauge ports (M4/M5) and the control solenoids (C1/C2) are opposite.

13. Remove all gauges and replace gauge port plugs.

Removing The Pump

Before working on the pump, thoroughly clean the outside. If the pump has an auxiliary pump attached, remove both pumps as a single unit. Tag and cap all hydraulic lines as you disconnect them, and plug all open ports to ensure that dirt and contamination do not get into the system.

⚠ CAUTION

CONTAMINATION CAN DAMAGE INTERNAL COMPONENTS. TAKE PRECAUTIONS TO ENSURE SYSTEM CLEANLINESS WHEN REMOVING AND INSTALLING SYSTEM LINES.

1. Thoroughly clean all dirt and grime from the outside of the pump.
2. Tag, disconnect, and cap each hydraulic line connected to the pump. As hydraulic lines are disconnected, plug each open port, to ensure that dirt and contamination do not get into the pump.
3. Remove the pump and its auxiliary pump (if applicable) as a single unit.

NOTE: *Be careful, do not damage solenoids and electrical connections when using straps or chains to support the pump.*

Inspection

1. Ensure the work surface and surrounding area are clean and free of contaminants such as dirt and grime.
2. Inspect the system for contamination.
3. Look at the hydraulic fluid for signs of system contamination, oil discoloration, foam in the oil, sludge, or metal particles.

Replacement

1. Before replacing the pump, replace all filters and drain the hydraulic system. Flush the system lines and fill the reservoir with the correct, filtered hydraulic fluid.
2. Fill the pump with clean, filtered hydraulic fluid.
3. Attach the pump to the prime mover. Torque mounting screws according to the manufacturers recommendation.
4. Replace all hydraulic lines. Ensure the charge inlet line is filled with fluid.

Electric Control Module

REMOVAL

Refer to exploded diagram, next page.

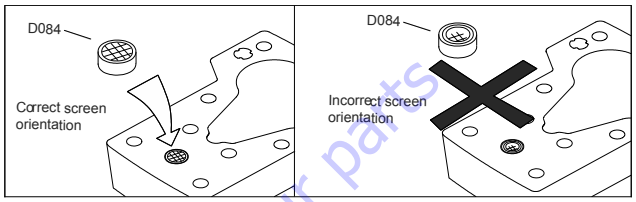
1. Using a 5 mm internal hex wrench, remove the six cap screws (D250).
2. Remove the control module and gasket (D150). Discard the gasket.
3. If necessary, remove orifices (F100) using a 3 mm internal hex wrench. Tag and number them for reinstallation.
4. Inspection
5. Inspect the machined surfaces on the control and top of the pump. If you find any nicks or scratches, replace the component.

NOTE: *Remove plug on top of control to ensure the swashplate feedback pin is properly positioned in the center of the control module when installing control.*

REASSEMBLY

NOTE: *Ensure you install dowel pins (D300) in housing before installing control.*

1. Install a new gasket (D150).
2. If you removed screen (D084), install a new one. Install with the mesh facing outward.



3. If previously removed, install orifices (F100) using a 3 mm internal hex wrench. Torque to 2.5 Nm [1.8 lbft].
4. Install the control module and six cap screws (D250).
5. Using a 5 mm internal hex wrench, torque the cap screws (D250) to 13.5 Nm [10.lbft].

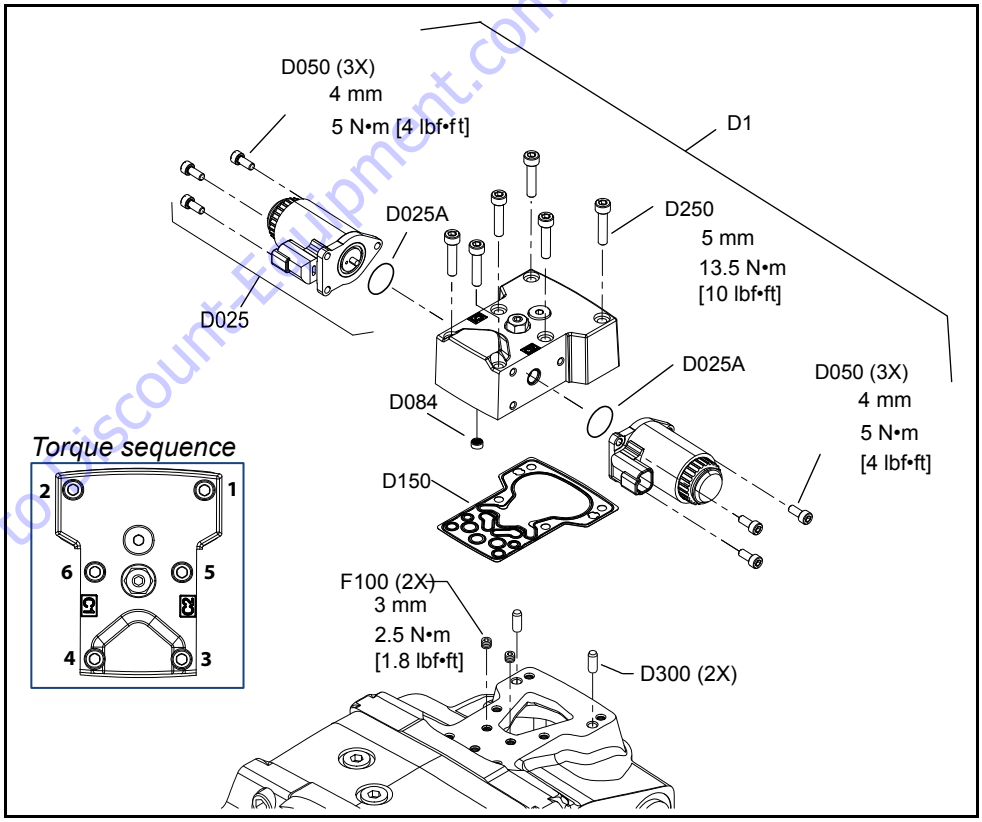


Figure 5-218. Control Module And Solenoid Removal/installation

CONTROL SOLENOIDS REMOVAL

1. Disconnect electrical connection and remove the three cap screws (D050) using a 4.mm internal hex wrench.
2. Remove the solenoid (D025) and O-ring (D025A). Discard the O-ring.
3. If necessary, remove the coil using a 12 point 26 mm socket.

CONTROL SOLENOIDS INSPECTION

1. Inspect the machined surface on the control. If you find any nicks or scratches, replace the component.

CONTROL SOLENOIDS REASSEMBLY

1. Lubricate new O-ring (D025A) using petroleum jelly and install.
2. Install solenoid with three cap screws (D050) using a 4 mm internal hex wrench. Torque screws to 5 Nm [4 lbft].
3. Install coil using a 12 point 26 mm socket. Torque coil nut to 5 Nm [3.7 lbft].
4. Reconnect electrical connections and test the pump for proper operation.

Shaft, Seal, and Bearing

The front pump input shaft assembly is serviceable without disassembling the pump, the rear shaft is not. Orient the pump on the work surface so the shaft is pointing to the side.

REMOVAL

1. Unwind the spiral ring (J300) from the housing to release the shaft/seal/bearing subassembly.
2. Pry on the lip of the seal carrier (J275) to remove it from the pump. Remove the seal carrier. Remove and discard O-ring (J260). Press the seal (J250) out of the carrier and discard.
3. Pull the shaft (J100) with bearing (J150) out of the pump. If necessary, tap lightly on the shaft to dislodge it from the cylinder block. C

⚠ CAUTION

DO NOT DAMAGE THE HOUSING BORE, SHAFT OR BEARING WHEN REMOVING THE SHAFT AND BEARING.

4. Remove the retaining ring (J200) using retaining ring pliers. Press the bearing off the shaft.

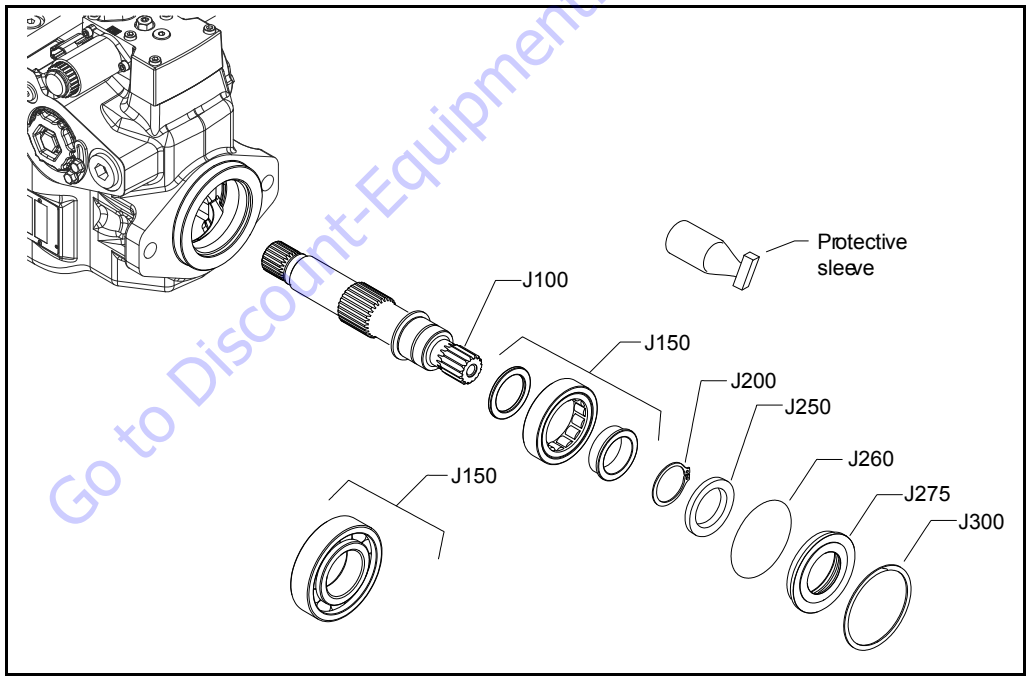


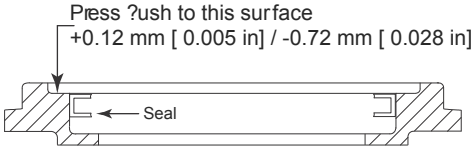
Figure 5-219. Shaft Assembly

INSPECTION

1. Inspect the shaft journals for wear, scratching, and pits. Check the splines for fretting; replace if damaged. Rotate the bearing, if it does not rotate smoothly, replace it.

REASSEMBLY

1. Press the bearing (J150) onto the shaft (J100) and replace the retaining ring (J200). Ensure the retaining ring diameter is less than 38.84 mm [1.53.in] when installed on the shaft.
2. Install the shaft/bearing assembly into the pump.
3. Lubricate and install a new O-ring (J260) onto seal carrier (J275). Press a new seal (J250) into the seal carrier. Press the seal until it is flush within +0.12mm [0.005 in] or -0.72 mm [0.0028 in] of the inside lip of the carrier: see illustration.



4. Cover the shaft with a protective sleeve while installing the seal carrier. Hand press the seal carrier into the housing. Ensure the seal carrier clears the spiral ring groove in the housing. Remove the protective sleeve.
5. Wind the spiral ring into the housing. Ensure the inside diameter of the spiral ring is greater than 68 mm [2.677 in] after installation.

Charge Pump

Position pump with front shaft pointing downward. Attach securely to a proper work stand. If an auxiliary pump is attached, remove auxiliary pump before servicing charge pump.

REMOVAL

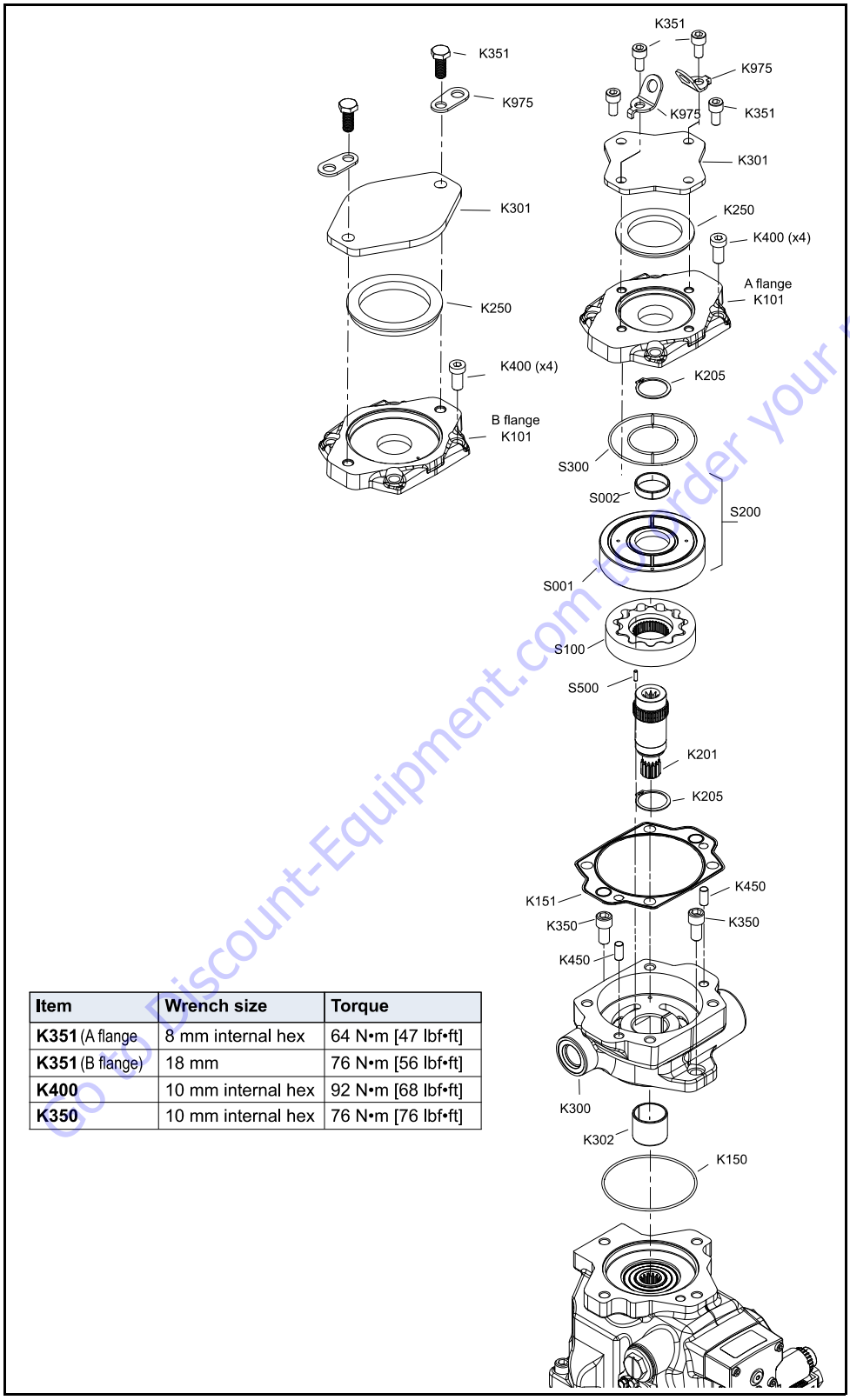
1. Remove screws (K351), and hangers (K975).
2. Remove running cover (K301). Remove and discard seal ring (K250).
3. Using a 10 mm internal hex, remove screws (K400). Remove cover (K101).
4. Remove charge pump assembly with shaft.

NOTE: *Note position of alignment pin (S500) in housing. Alignment pin position will change for clockwise or counter-clockwise rotation.*

5. Remove and discard seal (S300).
6. Using a snap ring pliers, remove two clips (K205).
7. Remove geroter cover (S200). Remove geroter assembly (S100).
8. Remove and discard gasket (K151). Remove alignment pins (K450).
9. If it is necessary to remove housing (K300), use a 10 mm internal hex to remove screws (K350).
10. Remove housing (K300).
11. Remove and discard seal (K150).

INSPECTION

1. Inspect all machined surfaces. If you find any nicks or scratches, replace the component.
2. Inspect geroter and cover for wear or damage. If wear or damage is found, replace geroter kit.
3. Inspect shaft for wear or damage. If found, replace shaft.
4. Inspect journal bearings in aux pad and housing. If worn or damaged, replace journal bearings or aux pad or housing assembly.

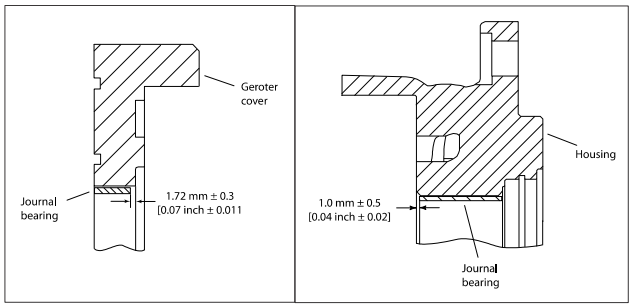


Item	Wrench size	Torque
K351 (A flange	8 mm internal hex	64 N•m [47 lbf•ft]
K351 (B flange)	18 mm	76 N•m [56 lbf•ft]
K400	10 mm internal hex	92 N•m [68 lbf•ft]
K350	10 mm internal hex	76 N•m [76 lbf•ft]

Figure 5-220. Charge Pump

REPLACING CHARGE PUMP JOURNAL BEARINGS

Use a suitable press to remove and replace the journal bearings. Refer to the drawings below for installation dimensions.



ASSEMBLY

1. Lubricate and install new seal (K150).
2. Install housing (K300). Install screws (K350). Using a 10 mm internal hex, torque screws per listing in table.
3. Install alignment pins (K450). Install new gasket (K151).
4. Lubricate and reassemble charge pump assembly [shaft (K201), pin (S500), geroter (S100), cover (S200), two clips (K205)].
5. Install charge pump assembly into housing in original position.
6. Lubricate and install seal (S300).
7. Install aux pad (K101).
8. Using a 10 mm internal hex, install screws (K400). Torque screws per listing in table.
9. Lubricate and install seal (K250). Install running cover (K301).
10. Install screws (K351) and brackets (K975). Torque screws per listing in the table.

Charge Check / HPRV

The high pressure relief and charge check valve assembly may be removed for cleaning and replacement of the O-rings. These valves are factory set and are not field adjustable. Refer to the pump model code for the factory setting when ordering replacements.

REMOVAL

1. Using an 8 mm internal hex wrench, remove the valve seat plugs (K007).
2. Carefully lift the valve (H002) and spring (H003) assemblies from the center section using a magnet.

INSPECTION

1. Inspect the valves and mating seats in the valve seat plugs (K007) for damage or foreign material.

REASSEMBLY

1. Lubricate and install new O-rings (K008, K010) and backup ring (K009) on valve seat plug (K007).
2. Verify that the conical springs (H003) are properly retained on the check relief valves (H002). Install the valve assemblies into the center section. Ensure each valve assembly moves freely in its bore.
3. Install the valve seat plugs into the center section and torque to 80 Nm [59.lbft].
4. Operate machine through full range of controls to ensure proper operation. Check for leaks.

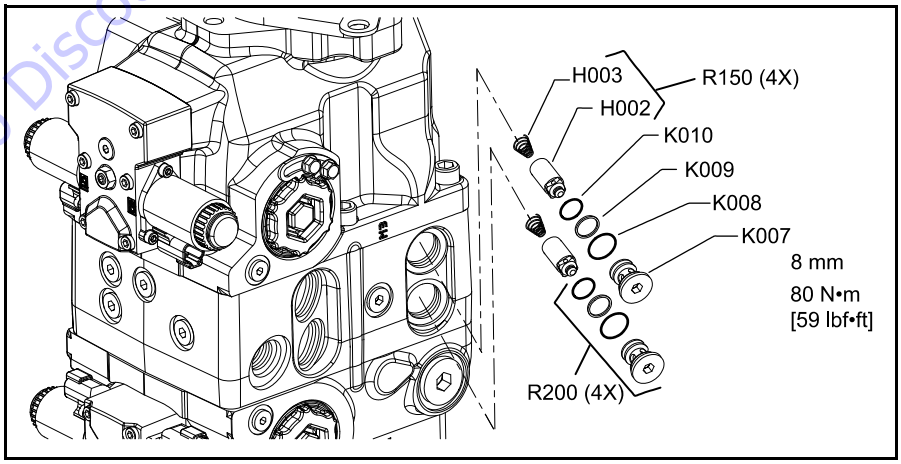


Figure 5-221. Charge Check / HPRV

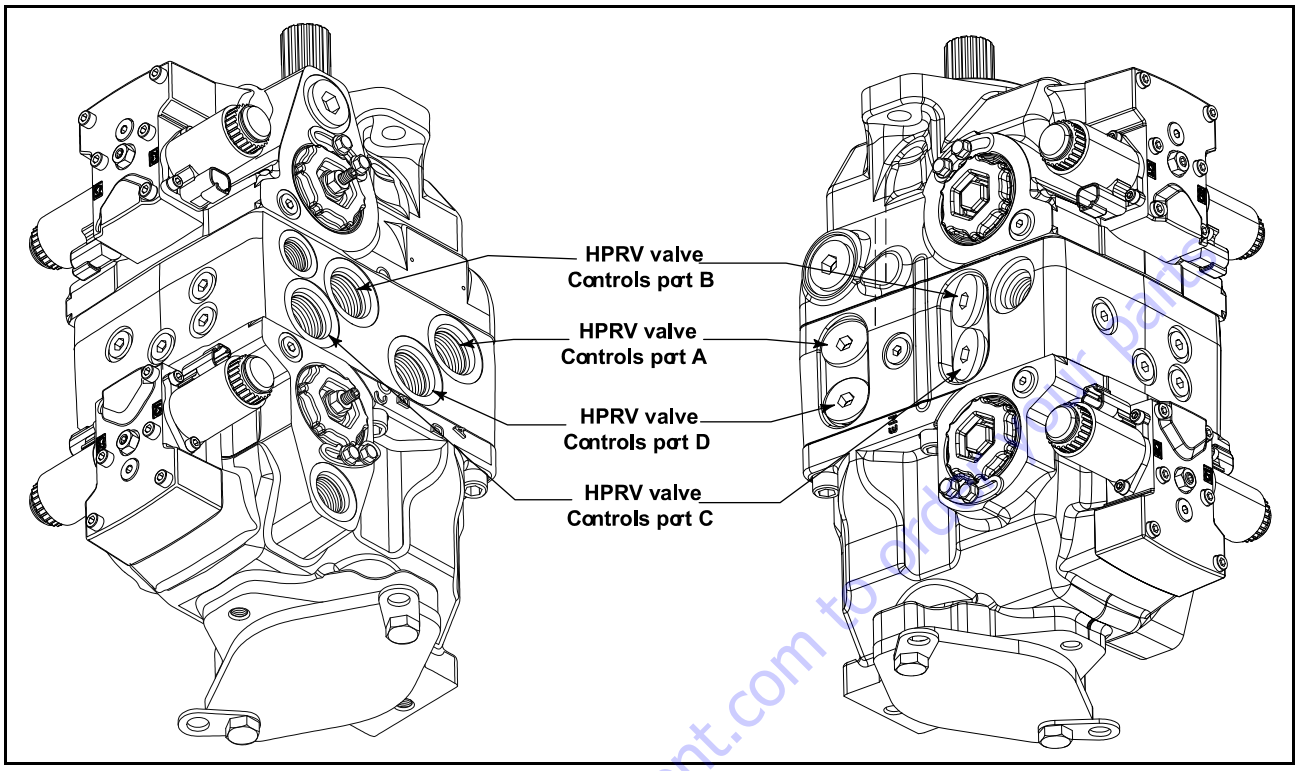


Figure 5-222. Charge Check / HPRV

Charge Pressure Relief Valve

Replace the charge pressure relief valve (V10-1) or (V10-2) as a complete unit. Do not attempt to repair the internal components of the valve.

REMOVAL

1. Using a 27 mm (V10-1) or a 1 in (V10-2) wrench, remove the charge pressure relief valve. Discard the O-rings (V10A).

INSPECTION

1. Inspect the sealing surfaces of the pump and charge pressure relief valve for nicks or scratches, replace components as necessary.

REASSEMBLY

1. Lubricate and install new O-rings (V10A).
2. Install the charge pressure relief valve (V10). Torque to 52 Nm [38 lbft].
3. Operate vehicle/machine through full range of controls to ensure proper operation.

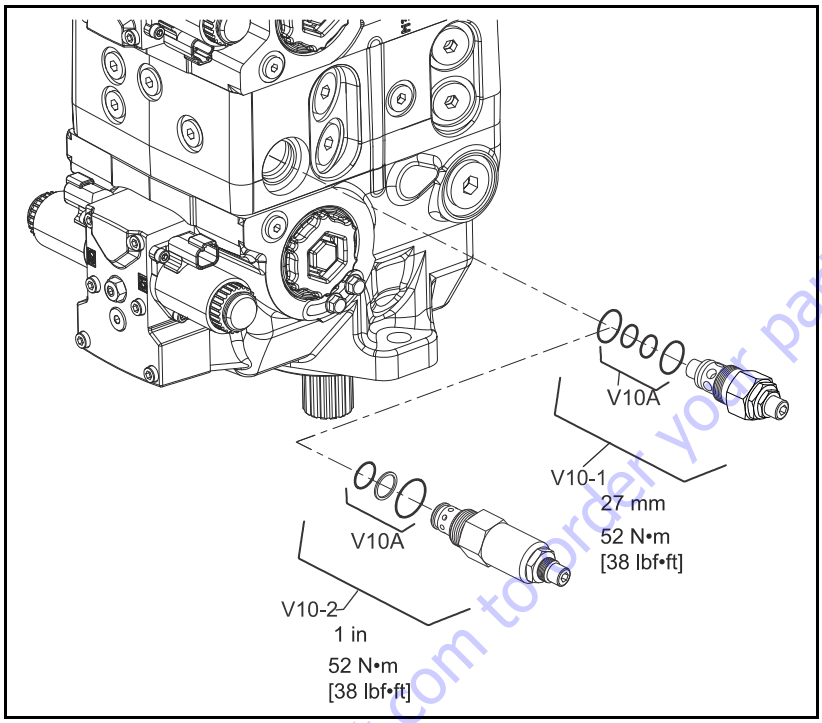


Figure 5-223. Charge Pressure Relief Valve

Control Cutoff Valve

Replace the control cutoff valve as a complete unit. Do not attempt to repair the internal components of the valve.

REMOVAL

1. Disconnect the coil from the vehicle/machine wire harness.
2. Using a 24 mm hex wrench, remove the control cutoff valve coil nut (G30). Remove the coil (G20).
3. Use a 1 1/16 in hex wrench to remove the control cutoff valve (G10). Remove and discard the O-rings and backup rings (G10A).

INSPECTION

1. Inspect the sealing surfaces of the pump and control cutoff valve for nicks or scratches. Replace components as necessary.

REASSEMBLY

1. Lubricate and install new O-rings (G10A) onto the valve.
2. Install the control cutoff valve (G10). Torque to 46 Nm [34 lbft]. Slide the coil (G20) onto the valve.
3. Install the coil nut (G30). Torque to 9 Nm [7.lbft]. Do not overtorque.
4. Operate vehicle/machine through full range of controls to ensure proper operation

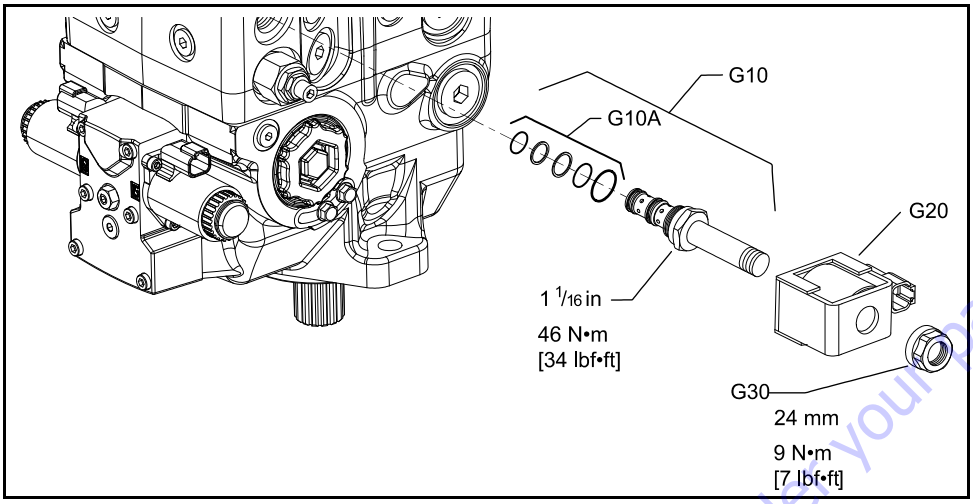


Figure 5-224. Control Cutoff Valve

Table 5-41. Fastener Size and Torque Chart

Item	Fastener	Wrench size	Torque
D015	Neutral adjust screw	4 mm internal hex	NA
D050	Control coil mounting screw	4 mm internal hex	8 Nm [5.9 lbft]
D060	Neutral adjust locking nut	13 mm hex	10 Nm [7 lbft]
D200	Swash plate feedback pin (not shown)	13 mm hex	25 Nm [18.4 lbft]
D250	Electric control mounting screw	5 mm internal hex	13 Nm [9.5 lbft]
E350	Servo cylinder locking screw	10 mm hex	14.5 Nm [11 lbft]
G10	Control cutoff valve	1 1/16 in hex	45 Nm [33 lbft]
G10B	Control cutoff valve coil nut	24 mm hex	9 Nm [7 lbft]
K007	Charge check / HPRV	8 mm internal hex	80 Nm [60 lbft]
K350	A pad cover mounting screw	17 mm hex	70 Nm [52 lbft]
	B pad cover mounting screw	8 mm hex	111 Nm [82 lbft]
V10-1	Charge relief valve	27 mm hex	52 Nm [38 lbft]
V10-2	Charge relief valve	1 in hex	52 Nm [38 lbft]

Table 5-42. Plug Size and Torque Chart

Item	O-ring plug	Wrench size	Torque
B015	7/16 - 20	3/16 internal hex	20 Nm [15 lbft]
B020	1-1/16 - 12	9/16 internal hex	48 Nm [35 lbft]
D065	7/16 - 20	3/16 internal hex	12 Nm [9 lbft]
G250	9/16 - 18	1/4 internal hex (hardened plug)	45 Nm [33 lbft]

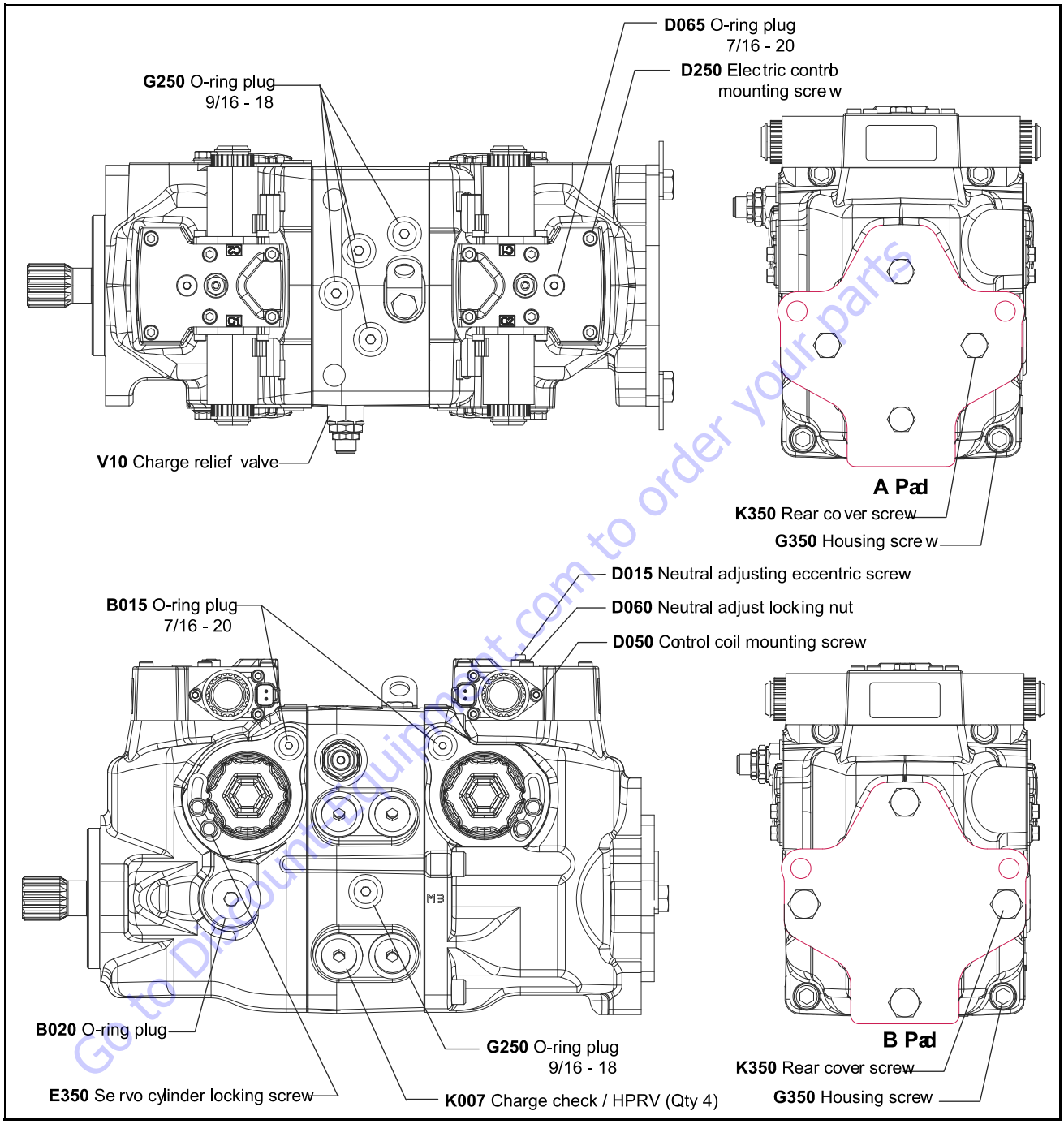
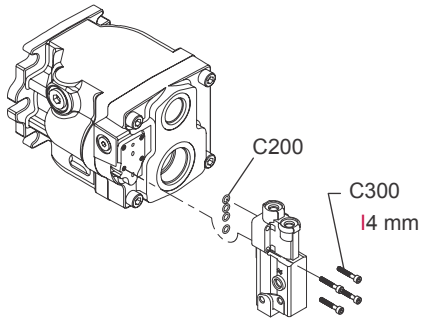


Figure 5-225. Fastener and Plug Locations

5.8 FUNCTION PUMP

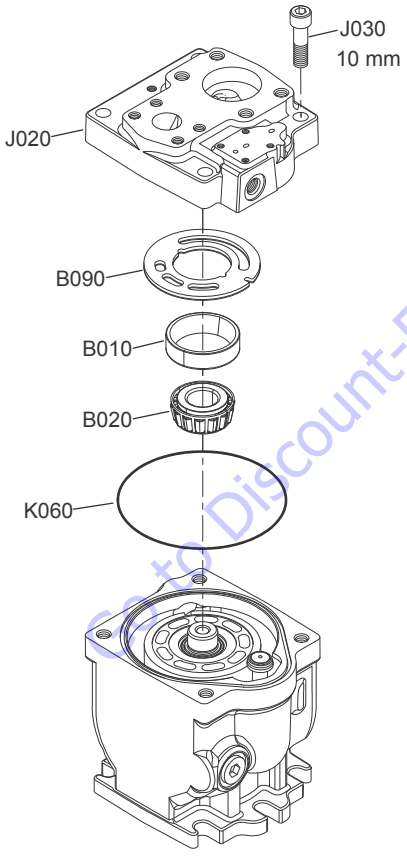
Disassembly

1. Remove the control from the endcap by removing the 4 control bolts (C300), using a 4 mm internal hex wrench.



2. Remove and discard the 4 O-rings (C200).

3. Remove the 4 endcap screws (J030) using a 10 mm internal hex wrench.



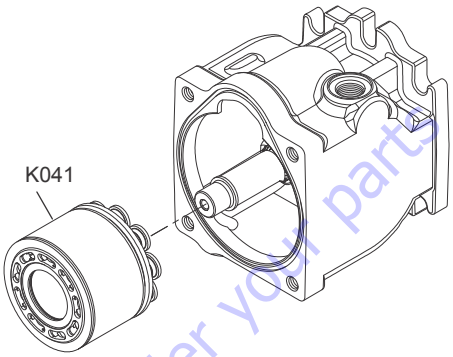
4. Carefully remove the endcap (J020). Prevent the valve (B090) plate from falling off.

5. Place the endcap and valve plate in a clean area, protecting them from contamination.

6. Remove the bearing cup (B010), bearing cone (B020) and housing O-ring (K060). Discard the O-ring.

7. Tilt the housing on its side to allow fluid to drain.

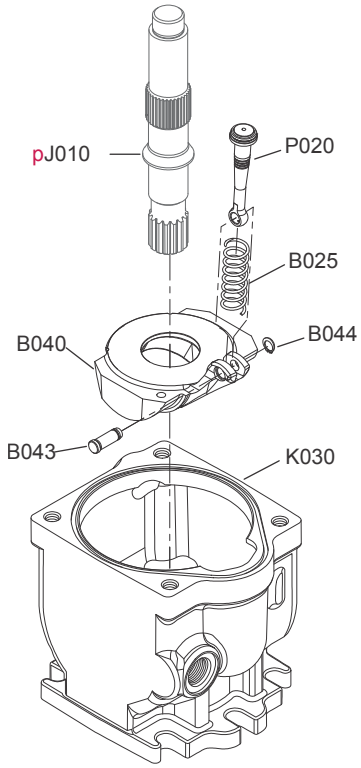
8. Remove the cylinder block kit while holding onto the front shaft.



9. Set cylinder block on a clean dry surface.

10. Rotate pump back to a position so that the shaft is pointing down.

11. Pull the shaft (J010) from the shaft seal.

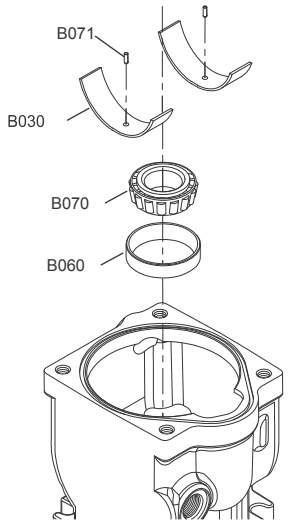


12. Compress the bias spring (B025) and rotate the servo piston assembly (P020) towards the swashplate (B040).

13. Lift the swashplate/servo piston assembly up at an angle and remove it from the housing.

14. Remove the servo piston (P020) and bias spring (B025) from the swashplate by removing the clevis pin (B043) and snap ring (B044). Discard the snap ring.

15. Pull to remove the front tapered roller bearing cup (B060) and cone (B070).



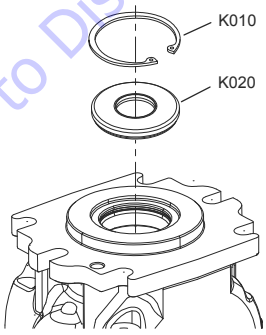
16. Examine the cradle bearings (B030) to determine if they need replacement.

NOTE: *Removing the pins (B071) will likely damage the cradle bearings, so make sure you have replacement bearings before you remove them.*

17. If cradle bearings need replacing, remove the 2 pins (B071) holding the cradle bearings, and then remove the cradle bearings. Note the location and orientation of the bearings for re-installation.

18. Orient the housing with the flange facing up.

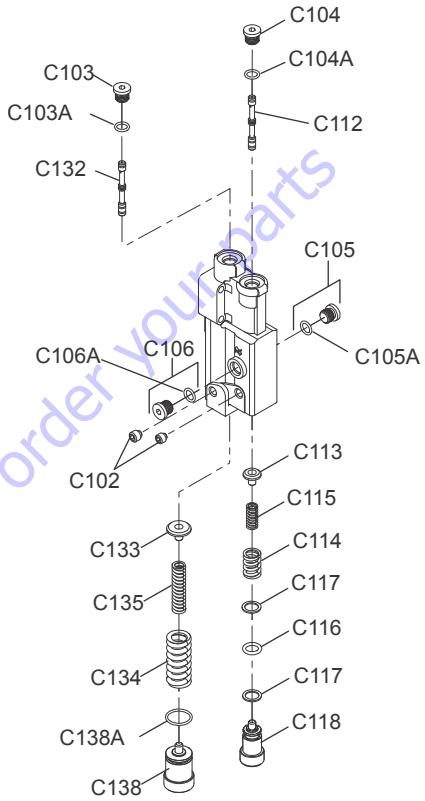
19. Using snap-ring pliers, remove the snap ring (K010).



20. Carefully pry out the shaft seal (K020).

If you are unable to pull the shaft seal out, try to push the seal out by going through the inside of the housing.

21. Remove the 4 plugs (C103, C104, C105, C106) and their O-rings (C103A, C104A, C105A, C106A). Discard the O-rings. Remove the 2 set screws (C102). Remove the spools (C112, C132). Note which bore each spool came out of. Also note the orientation of each spool for reinsertion. There may be differences in reinserting into the same bore.

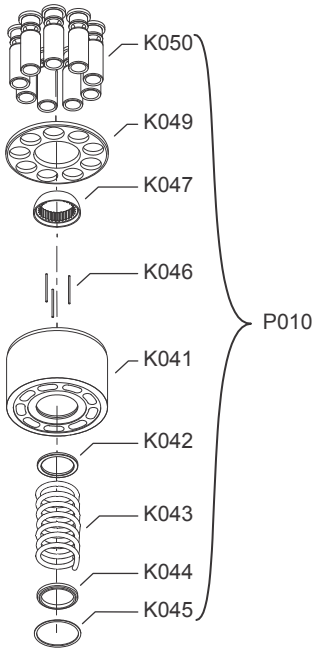


22. Remove the adjusting screw (C138) and the O-ring (C138A). Discard the O-ring. Remove the springs (C134, C135) and spring guide (C133).

23. Remove the adjusting screw (C118), O-ring (C116) and 2 backup rings (C117). Discard the O-ring and backup rings. Remove the springs (C114, C115) and spring guide (C113).

24. Pull to remove the slipper retainer (K049) with the pistons (K050) from the cylinder kit.

NOTE: *The pistons are not selectively fitted, however units with high hourly usage may develop wear patterns. Number the pistons and bores for reassembly if they are to be reused.*



25. Remove the ball guide (K047).

26. Remove the 3 pins (K046).

NOTE: *Most repairs do not require block spring removal. Perform this procedure only if you suspect problems with the block spring.*

27. Turn the block over. Using a press, apply pressure on the block spring washer (K044) to compress the block spring (K043). Compress the spring enough to safely remove the spiral retaining ring (K045). While maintaining pressure, unwind the spiral retaining ring. Carefully release the pressure and remove the outer block spring washer, block spring, and inner block spring washer (K042) from the cylinder block.

⚠ WARNING

RISK OF PERSONAL INJURY: COMPRESSING THE BLOCK SPRING REQUIRES ABOUT 350 TO 400 N [80 TO 90.LBF]. USE A PRESS SUFFICIENT TO MAINTAIN THIS FORCE WITH REASONABLE EFFORT. ENSURE THE SPRING IS SECURE BEFORE ATTEMPTING TO REMOVE. THE SPIRAL RETAINING RING. RELEASE THE PRESSURE SLOWLY AFTER THE RETAINING.RING IS REMOVED.

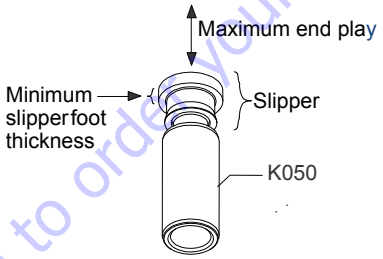
Inspection

After disassembly, wash all parts (including the end-cap and housing) thoroughly with clean solvent and allow to air dry. Blow out oil passages in the housing and endcap with compressed air. Conduct inspection in a clean area and keep all parts free from contamination. Clean and dry parts again after any rework or resurfacing.

PISTONS AND SLIPPERS

Inspect the pistons for damage and discoloration. Discolored pistons may indicate excessive heat; do not reuse.

Inspect the running surface of the slippers. Replace any piston assemblies with scored or excessively rounded slipper edges. Measure the slipper foot thickness. Replace any piston assemblies with excessively worn slippers. Check the slipper axial end-play. Replace any piston assemblies with excessive end-play.

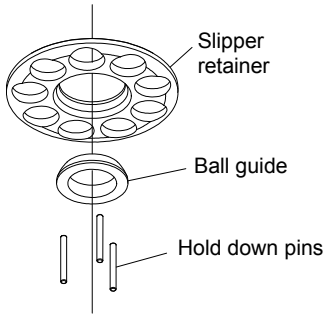


Minimum slipper foot thickness and maximum axial end-play are given in the table below.

J Frame	
Slipper foot thickness	3.23 mm [0.127 in]
Piston/slipper end play	0.05 mm [0.002 in]

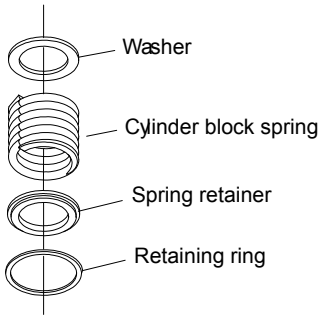
BALL GUIDE, SLIPPER RETAINER, AND HOLD-DOWN PINS

The ball guide should be free of nicks and scratches, and should not be excessively scored. Examine for discoloration that may indicate excessive heat or lack of lubrication. The slipper retainer should be flat, and slippers should fit in the retainer with minimal side play. Place the hold-down pins on a flat surface and roll them to make sure they are straight. Discard and replace any damaged parts.



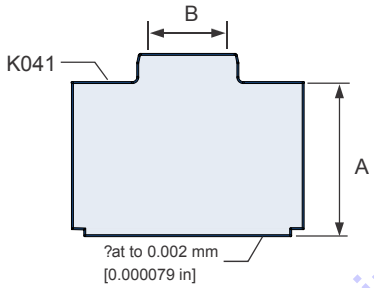
BLOCK SPRING, AND WASHERS

If cylinder kit was fully dissembled, visual inspection of the cylinder block, spring, and washers should indicate minimal wear. Replace if cracks or other damage is present.



CYLINDER BLOCK

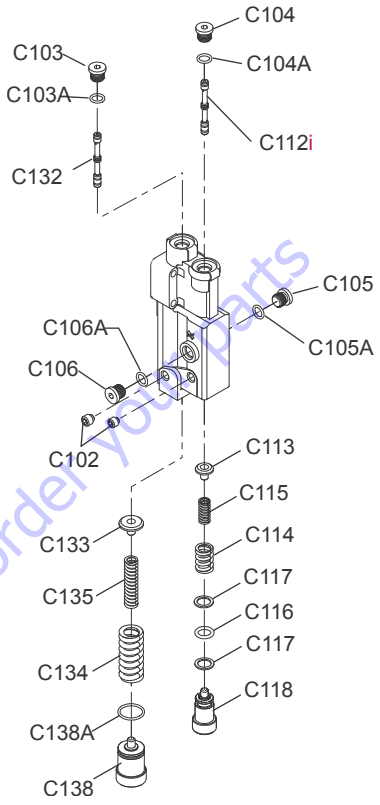
Examine the running face of the cylinder block. The surface should be smooth and free of nicks and burrs. Ensure that no scratches or grooves exist; these may drastically reduce output flow.



J Frame	45-60 cc	65-75 cc
Minimum cylinder block height (A)	62.25 mm [2.45 in]	
Maximum block bore diameter (B)	19.8 mm [0.785 in]	21.57 mm [0.85 in]

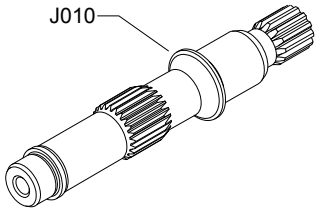
CONTROL

Carefully examine the plug(s) for signs of wear. Also check the small tip of the plug(s) for heavy wear and replace if necessary. Inspect each spool's springs to make sure they are intact. Check the inside and outside surfaces of the springs for wear and replace if necessary. Check the spool's outside diameter for scratches and / or burrs. Clean and coat all spools, bores, and seals with a light coating of hydraulic oil.



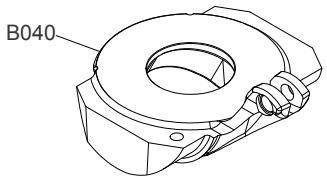
INPUT SHAFT

Check to see that the shaft (J010) and its splines are straight and free of damage or heavy wear. Inspect the shaft surface where it meets the shaft seal. Replace the shaft if a groove exists at the sealing land surface that may let dirt into or hydraulic fluid out of the unit. Clean the sealing area with a nonabrasive material if necessary. Lubricate the shaft with a light coat of hydraulic fluid.



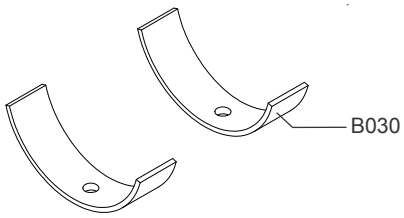
SWASHPLATE

Carefully inspect each surface of the swashplate for wear. All swashplate surfaces should be smooth. Inspect the swashplate's slipper running surface for damage and brass transfer. Excessive brass transfer from slippers may indicate that the slippers should be replaced. Finally, check the swashplate bearing journal for scratches. Replace swashplate if necessary.



JOURNAL BEARINGS

Inspect the journal bearings for damage or excessive wear. Replace journal bearings if scratched, warped, or excessively worn. The polymer wear layer must be smooth and intact.

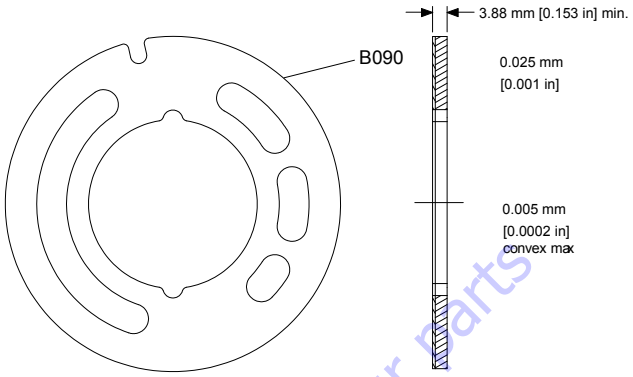


VALVE PLATE

Inspect the valve plate for scratches and grooves. Check the plate for evidence of any cavitation along the running face of the valve plate. If pitting from cavitation exists, replace the valve plate. Check for excess wear on the brass running face. If any discoloration or burn marks are observed, replace the valve plate.

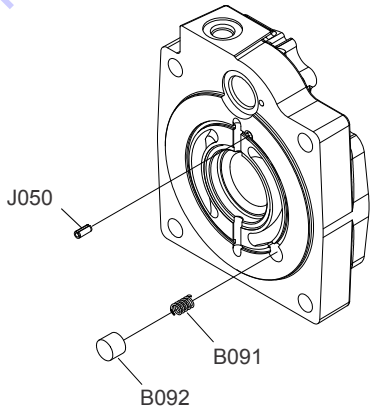
Run a fingernail or pencil tip across the diameter of the sealing land surface (see illustration). No deep or outstanding grooves should be felt, as these may decrease pump flow. Lap or replace if grooves or nicks are present. Inspect the mating surfaces of the endcap and valve plate for any possible contamination; even a few thousandths of an inch may affect pump operation.

Measure the thickness of the valve plate. Ensure that valve plate parallelism is equal to or less than 0.025 mm [0.001 in]. Appearance should be flat and smooth on both the running face and the bottom surface. The valve plate should be flat to 0.005 mm [0.0002.in] convex. A magnetic particle inspection is recommended to detect cracks. The valve plate must be replaced if any cracks exist.



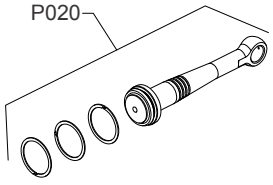
ENDCAP

Inspect the endcap. Remove the check valve (B092) to expose the spring (B091). Check and record orientation of the timing pin (J050) The split in the timing pin should be facing into or out of the slot in the valve plate. Inspect the check valve for wear on its sealing face and replace if necessary. Make sure the spring is undamaged. Replace any components if excess wear is present.



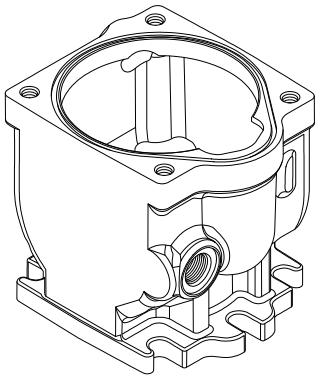
SERVO PISTON

Check the servo piston assembly (P020) for any obvious wear or damage. Check the corresponding endcap bore for galling or excessive wear. Discard the piston if damaged. Replace the servo piston-rings.



HOUSING

Inspect the housing to ensure that it is clean and free of foreign material. Inspect the swashplate bearing surfaces, and endcap mating surfaces.

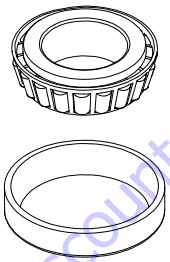


SHAFT BEARING KITS

The tapered roller bearing kit consists of a cup and cone. Make sure the cup and cone are free of excessive wear or contamination. Rotate the bearings to check for smoothness. If a contaminated bearing is suspected, clean with a solvent and lubricate with hydraulic fluid.

NOTE: *Replace the bearing if the problem is not remedied by cleaning.*

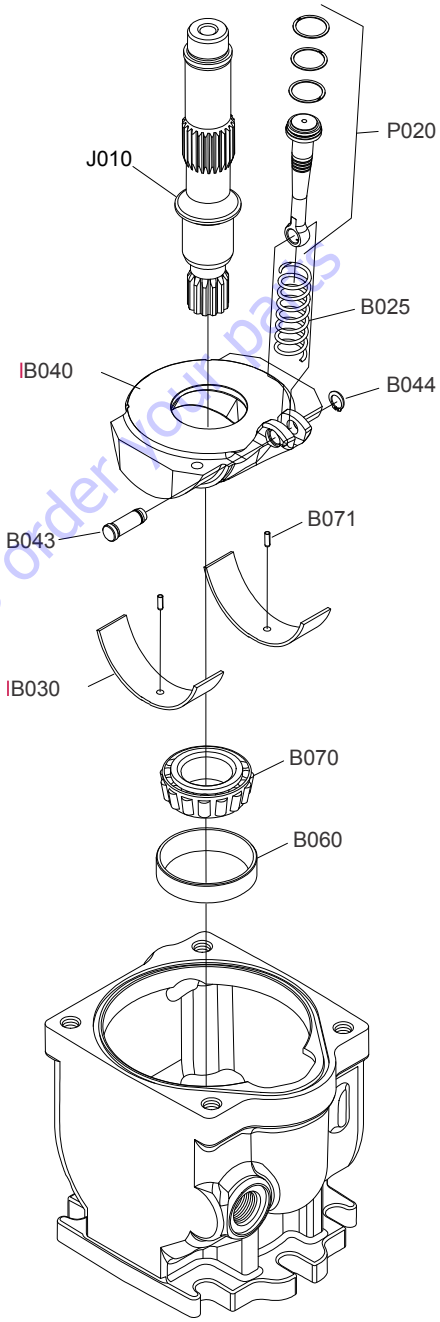
Inspect for uneven wear. If abnormal wear is found, replace the bearing kit.



Assembly

1. Coat the journal bearings (B030) with hydraulic fluid and install them into the pump housing. Punch in retaining pins (B071) a minimum of 0.5 mm [0.002 in] below the bearing surface.

NOTE: *If journal bearings are reused, reinstall them in their original orientation and position.*



2. Reinstall shaft bearing cup (B060) and cone (B070). Before replacing the bias spring (B025), coat the curved surface of the swashplate with hydraulic fluid.

3. Reinstall the swashplate/servo piston/bias spring assembly in its original orientation in the housing. Rotate the servo piston perpendicular to the swashplate, and at the same time compress the bias spring to fit into housing pocket. Lubricate all sides of the servo piston and its respective bore liberally with hydraulic oil. Also, lubricate the flat face of the swashplate to prevent premature wear during start-up.

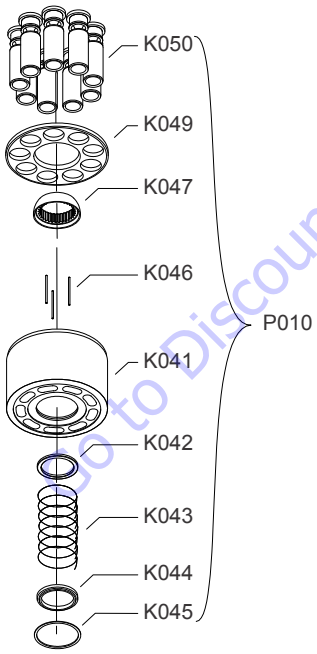
4. Insert the input shaft (J010) through the bearing into the housing. You may need to push on the servo piston to rotate the swashplate in order to put the shaft in properly.

5. Coat all parts with hydraulic fluid prior to reassembly.

⚠ WARNING

COMPRESSING THE BLOCK SPRING REQUIRES ABOUT 350 TO 400 N [80 TO 90 LBF]. USE A PRESS SUFFICIENT TO MAINTAIN THIS FORCE WITH REASONABLE EFFORT. ENSURE THE SPRING IS SECURE BEFORE ATTEMPTING TO INSTALL.THE SPIRAL RETAINING RING. RELEASE THE PRESSURE SLOWLY AFTER THE RETAINING RING IS INSTALLED.

6. Install the inner block spring washer (K042), block spring (K043), and outer washer (K044) into the cylinder block. Using a press, compress the block spring enough to expose the retaining ring groove. Wind the spiral retaining ring (K045) into the groove in the cylinder block.

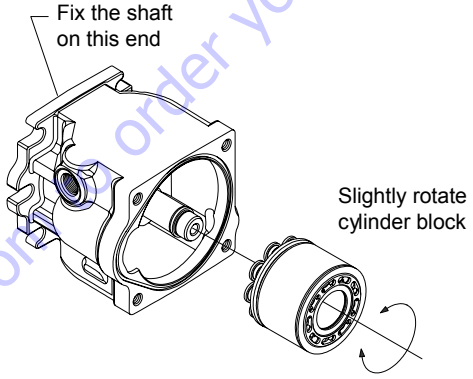


7. Turn the block over and install the hold-down pins (K046), and ball guide (K047) to the cylinder block.

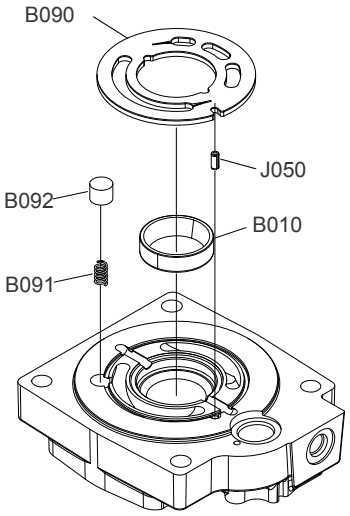
8. Install the pistons (K050) to the slipper retainer (K049). Install the piston/retainer assembly into the cylinder block. Ensure the concave surface of the retainer seats on the ball guide. If you're reusing the pistons, install them to the original block bores. Lubricate the pistons, slippers, retainer, and ball guide before assembly. Set the cylinder kit aside on a clean surface until needed.

NOTE: *Be sure to install the slipper retainer so it mates correctly with the ball guide (concave side of the slipper retainer against the convex side of the ball guide).*

9. Set the pump on its side. Secure the end of the shaft with one hand and keep it horizontal. Insert the cylinder kit onto the shaft. While holding the shaft still, slightly rotate the cylinder block kit to help start the shaft splines over the ball guide and align it with the block splines. When the cylinder block kit slides completely over the shaft splines, reposition the unit with the flange facing downward.

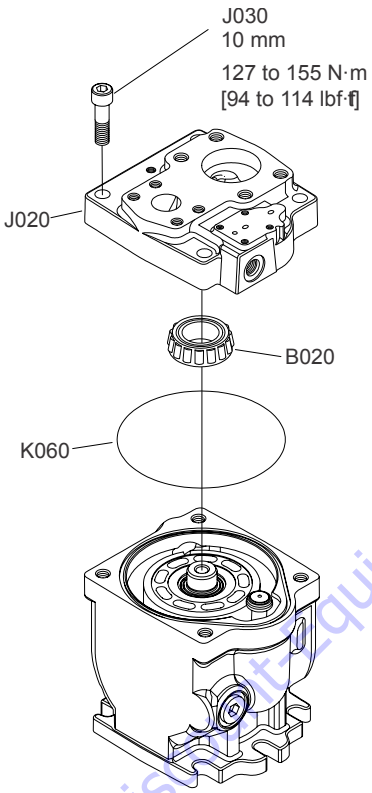


10. Clean the valve plate (B090) and endcap. Install the timing pin (J050) in the endcap and verify that it is properly oriented with the split facing into or out of the slot in the valve plate. The timing pin should be installed to 3.61 ? 0.25.mm [0.14.?.0.01 in] above the valve plate surface. Apply a liberal amount of assembly grease to the backside of the valve plate surface to hold it in position. Install the valve plate over the timing pin, check valve (B092), and bearing cup (B010).

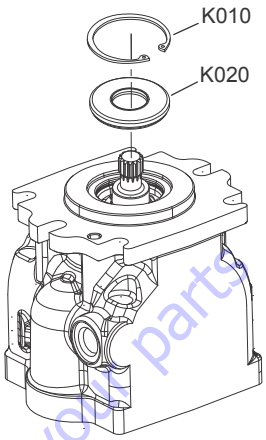


NOTE: *To insure proper pump operation, it is extremely important to ensure that there is no contamination between the endcap and valve plate.*

11. Install the bearing cone (B020) onto the shaft. Using assembly grease to hold the seal (K060), install the endcap to the housing. Ensure that seals remain properly seated and are not pinched during assembly. With a 10 mm internal hex wrench, install and torque endcap screws at 127 to 155 Nm [94.to.114.lbft], using the criss cross pattern. Retorque the first screw to ensure proper torque retention.

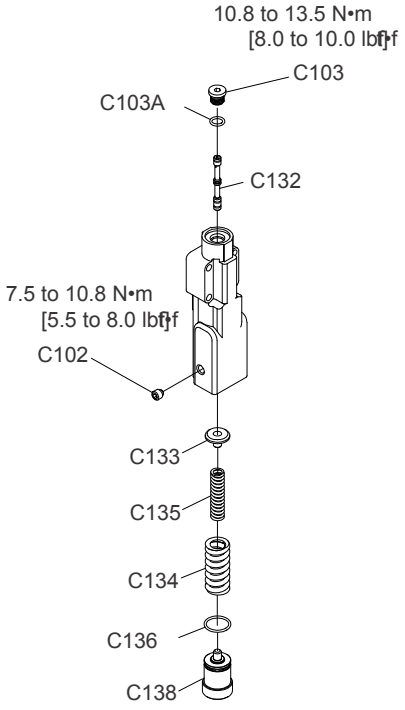


12. Lubricate the lip of the new shaft seal (K020) with clean hydraulic fluid. Place a protective sleeve over the shaft end to prevent damage to the seal during installation. Keeping the seal perpendicular to the shaft, press the new seal into the housing just far enough to clear the retaining ring groove. Install seal with the cupped side toward the shaft bearing. Do not damage the seal during installation. Using the appropriate snap ring pliers, install the seal retaining ring (K010). Remove the installation sleeve.

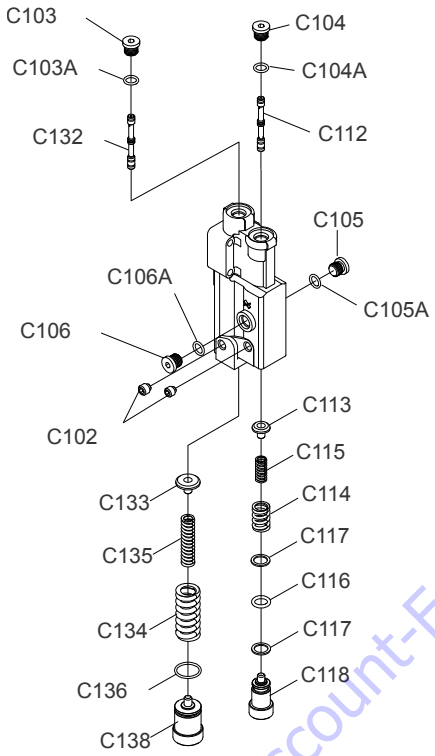


13. Clean all control parts and cover with a light coating of hydraulic fluid prior to reassembly.

14. Install the spherical end of the PC spool (C132) into the PC bore (refer to illustration). Install the PC plug (C103) using a new O-ring (C103A). Torque at 10.8 to 13.5 Nm [8.to.10.lbft]. Place the two PC springs (C134, C135) onto the PC spring guide (C133) and install into the PC bore. Place a new O-ring onto the PC plug and install it so that it sits one turn below the surface of the control housing. Install and tighten set screw (C102) at 7.5 to 10.8 Nm [5.5 to 8.0 lbft] to retain the adjusting plug.

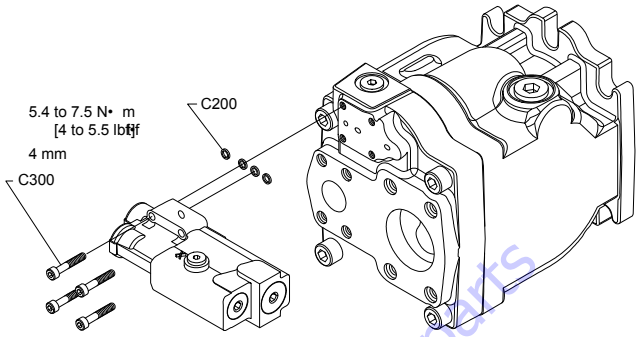


15. Hold the control in a horizontal position. Install the spherical end of the LS spool (C112) into the LS bore (see illustration). Using a new O-ring, install the LS plug (C104), torque at 10.8 to 13.5 Nm [8 to 10 lbft]. Place the 2 LS springs (C114, C115) onto the LS spring guide (C113) and install into the LS bore. Place a new O-ring (C116) and back-up rings (C117) onto the LS adjustment screw (C118). Install the LS plug assembly so that it sits one turn below the surface of the control housing. Install and tighten set screw (C102) at 7.5 to 10.8 Nm [5.5.to 8.0 lbft]. Also, install the plugs (C105, C106) with new O-rings. Torque the plugs at 10.8 to 13.5 Nm [8 to 10 lbft].



NOTE: *PC and LS spools need to be adjusted to proper setting according to tag nomenclature.*

16. Using petroleum jelly to retain them, install 4 new seal rings (C200) in the recesses on the control housing. Install the control assembly onto the endcap using the 4 screws (C300). Torque at 5.4 to 7.5 Nm [4.0 to 5.5 lbft] using a criss cross pattern and retorque the first screw to ensure proper torque retention.



5.9 GEAR PUMP

Disassembly

Prior to proceeding it may be necessary to prepare some subassemblies separately.

The details for preparing each subassembly are given in the following section.

Also, some general recommendations are given below.

CLEANLINESS

Cleanliness is a primary factor for reliable pump performance. Wash the outside of the pump thoroughly before disassembly and all pieces prior to assembly. Cleaning parts with clean shop solvent and air drying is usually adequate.

LUBRICATION OF MOVING PARTS

During assembly, it is imperative to provide lubrication with clean hydraulic oil to all the running parts of the pump.

It is also necessary to coat the seals with grease. The absence of lubrication during assembly can cause the unit to seize after a few minutes of running.

CARE OF SURFACE TREATMENT

Be careful when handling all the internal surfaces, especially bearings, gears, and body faces. Do not touch or score them with metal tools or cutting edges.

MARKING THE PARTS

Mark the parts before completely disassembling a pump. The marks allow components to be reassembled in the same relative position. This action should be applied to the body, bearings, and gears. Scribing, bluing, or using a felt tip pen to mark the outside of the body on the inlet side is suggested to indicate the relative position of the front flange and the rear cover to the body. Mark the bearing blocks also on the inlet side and the gears position relative to each other. DO NOT scribe internal surfaces.

PROCEDURE

1. Clamp the unit.

   Clamp the unit in a vice from the flange side.

   Make sure the vice jaws are clean and have smooth surfaces to prevent damage to the pump.

NOTE: *Clamping the pump on the body is not recommended because serious damage to the surfaces, on which the ports are located, may occur.*

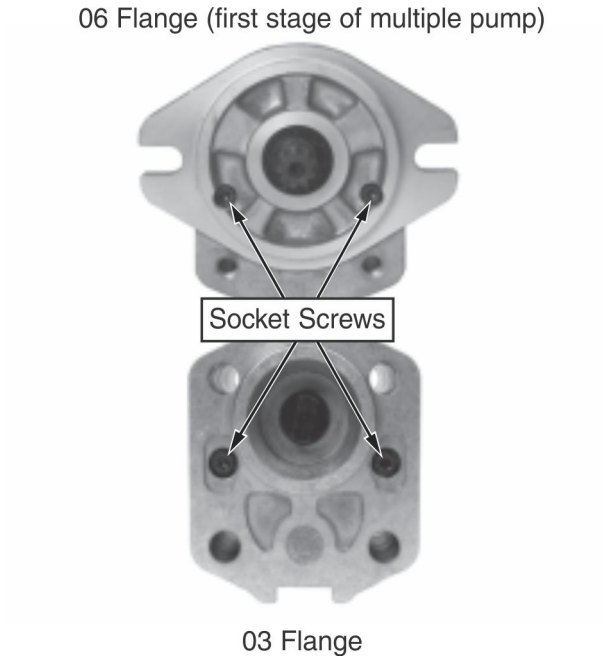
2. Remove capscrews. (Except Units with 03 Flange).

   Use a 17 mm socket wrench and loosen the four capscrews on the cover. Next completely unscrew the capscrews and remove them.

   Inspect the threads of the capscrews for damage.

3. Remove socket head capscrews. (03 Flange or Multiple Pump Stages Only).

Using a 4 mm internal hex wrench, loosen and remove the two small socket screws placed in the center of the cover. Repeat the same operation for the corresponding screws on the rear flange.



4. Remove front flange.

Place the pump on the table and slowly remove the front flange.

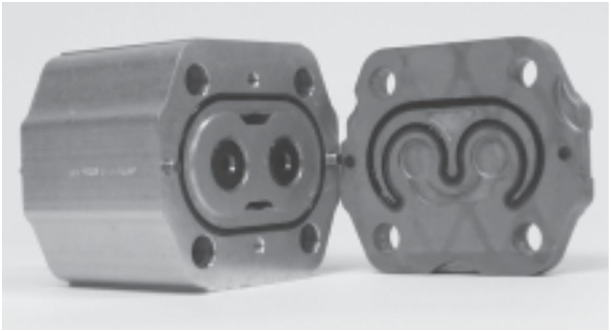
Be careful not to damage the shaft seal when removing the flange. Avoid contact of the shaft seal lips with key-way edges (in tapered and parallel shafts) or splined shaft teeth.

Inspect the front flange and seal area.

Clean with shop solvent, dry, and set aside.

5. Remove rear cover.

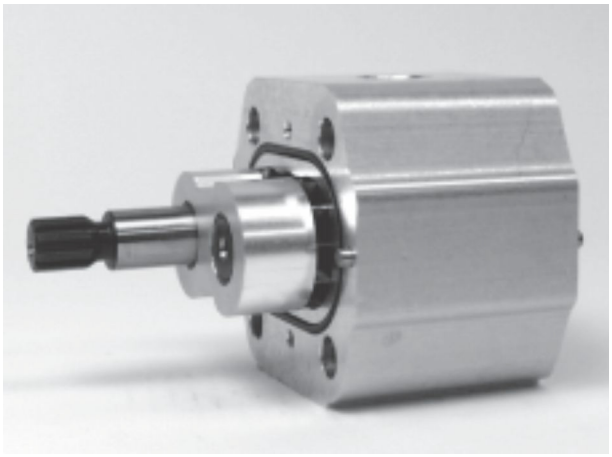
Remover rear cover. Clean with shop solvent, dry, and set aside. Visually inspect rear cover and seal area.



6. Remove bearing blocks and gears.

Place the pump on its side and carefully remove the bearing block and gear set. To accomplish this, hold the pump body and push with your fingers on the rear bearing block.

Mark the relative positions of the gear mesh (drive gear tooth to idler gear tooth) and the bearing blocks to the body so they can be reas?sembled in the same position.

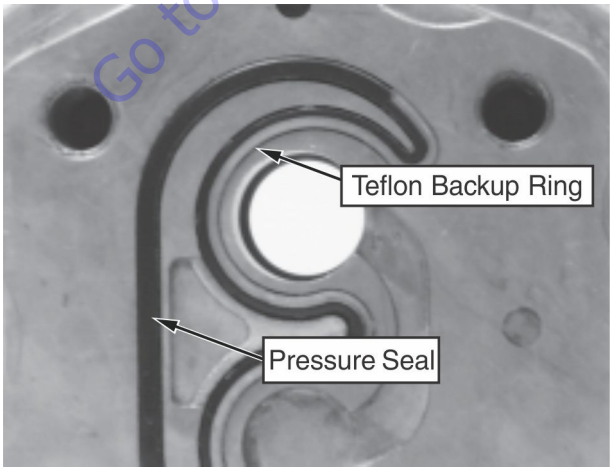


7. Remove pressure seals.

Check the seal quality. Replacement is recommended whenever there are burrs, evidence of extrusion, or marks caused by overheating. If the seals need to be replaced, carefully remove them from the flange cover, beginning with the backup ring and then the pressure seal.

Do not use tools with sharp edges to remove the seals, as damage to the cover can result.

After removal, dispose of damaged seals.

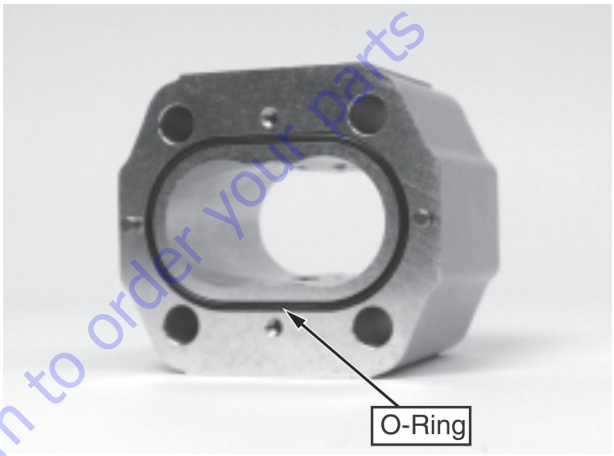


8. Remove Outer O-Ring Seal

Check the quality of this seal. If necessary, replace it. Follow the same removal recommenda?tions given in step 7.

After removal, discard the damaged seal.

Do not use tools with sharp edges to remove the seals, as damage to the cover can result.



9. Remove the snap ring.

Place the flange on the work surface. Using internal snap ring pliers, remove the snap ring.

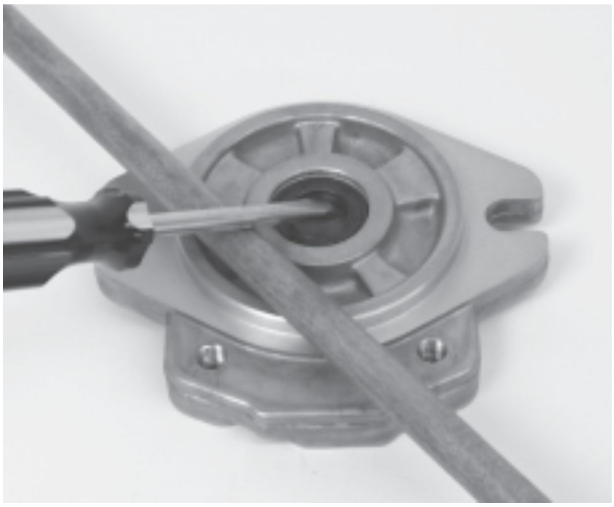
10. Remove the shaft seal.

Check the shaft seal quality and remove if necessary.

To remove, pry the bottom of the shaft seal and force it out while rotating the flange to lift it out evenly.

Do not use the flange pilot to gain leverage, damage may result. Use a plastic rod or wooden dowel as a fulcrum.

After removal, dispose of damaged seal.



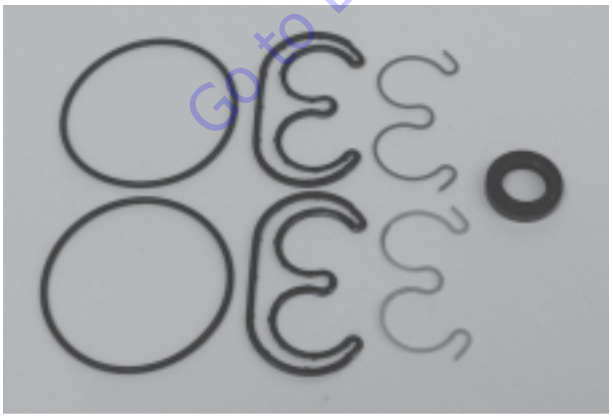
Assembly

1. Prepare the seals.

Have the entire seal kit available.

Lightly coat all seals with seal grease. The grease is needed to adhere the seals to their grooves.

Do not install dry seals.



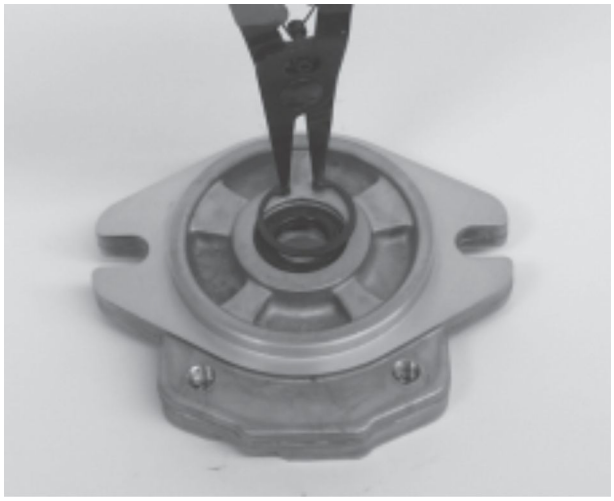
2. Install shaft seal into front flange.

Prepare the flange and shaft seal by lightly lubricating with grease.

Seat the seal in the flange by hand. Then, using the shaft seal installation tool, press the seal until the tool stops on the flange. This will insure the seal is inserted to the proper depth.

3. Install snap ring.

Install the snap ring using internal snap ring pliers. Ensure the snap ring fits securely in its groove. This is necessary to retain the shaft seal.

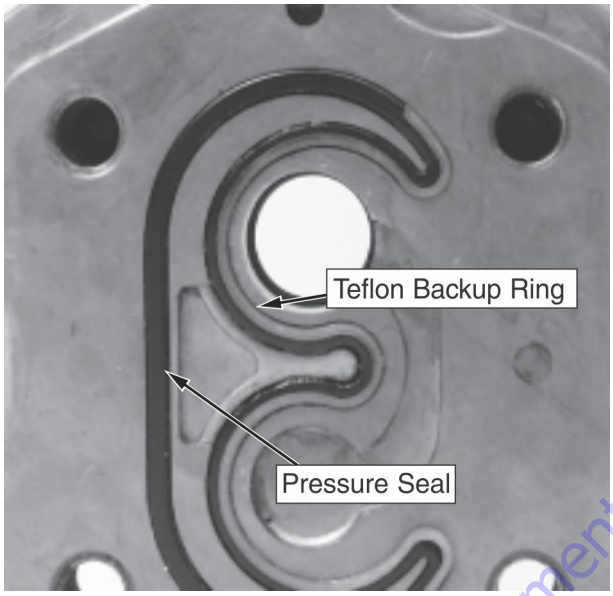


4. Install pressure seals.

   Prepare the pressure seals by lightly lubricating them with grease.

   Install pressure seals into the grooves on the front flange and rear cover. Then install the teflon backup ring.

   Ensure that the seals are located in the grooves, as shown.



5. Prepare the body.

   Clean the body.

   Inspect the internal and mating surfaces. Ensure the surfaces are free of burrs and scratches. Check both the bearing block mating surface and the cut-in path. The cut-in path should be no deeper than 0.1 mm (0.004 in).

6. Install outer seal.

   Prepare the outer seal by lightly lubricating with grease.

   Install outer seals in the grooves on both sides of the body.

7. Prepare the gears.

⚠ CAUTION

THE GEAR SURFACES ARE SUPER-FINISHED. RESIDUE ON HANDS AND FINGERS MAY BE CORROSIVE TO THIS SURFACE. DO NOT TOUCH.

Carefully clean the two gears. If the gears are new, wash them with shop solvent to remove any anticorrosive grease on the surfaces.

Inspect the journals and the flat faces on the top and bottom of the gears. Ensure these surfaces are free from burrs or scratches. If scratches or burrs are found, clean them with a flat stone and/or very fine emery paper. Rewash the gears after this operation.

8. Prepare the bearing blocks.

Clean the two bearing blocks.

Inspect the flat surfaces of the bearing blocks for burrs or scratches on the edges. If necessary, remove burrs with very fine emery paper. Then rewash the bearings.

Inspect the DU bushings for wear. There should be no bronze showing.

Using clean hydraulic oil, lubricate the internal and external surfaces of the bearing blocks.

9. Assemble the bearing blocks and gears.

Lubricate the journals and the gear faces.

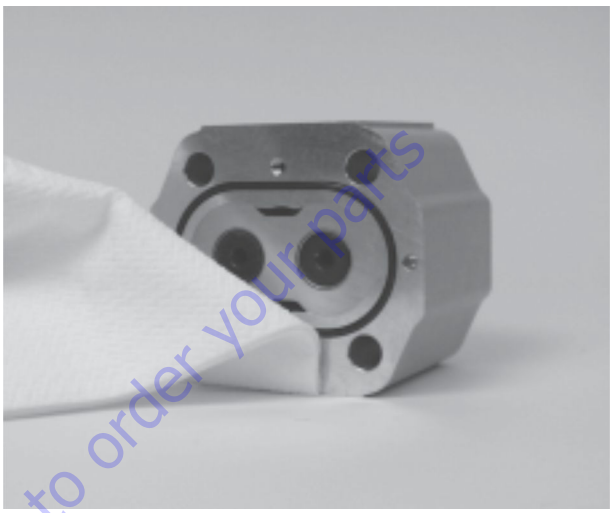
Assemble the bearing blocks and gears. Ensure that the recessed bearing faces are installed adjacent to the gear faces. Align all assembly marks made during disassembly. Ensure the front and rear bearing blocks occupy the same location with respect to the housing as before disassembly. Ensure that the relative position of the gear mesh is maintained as before disassembly. Misalignment of the gear teeth may increase operating noise.

10. Install the gear block assembly.

Install the bearing block and gear assembly into the body cavity. Align the assembly marks to ensure that the gear block assembly is installed with the same orientation as before disassembly.

11. Clean the mating surfaces.

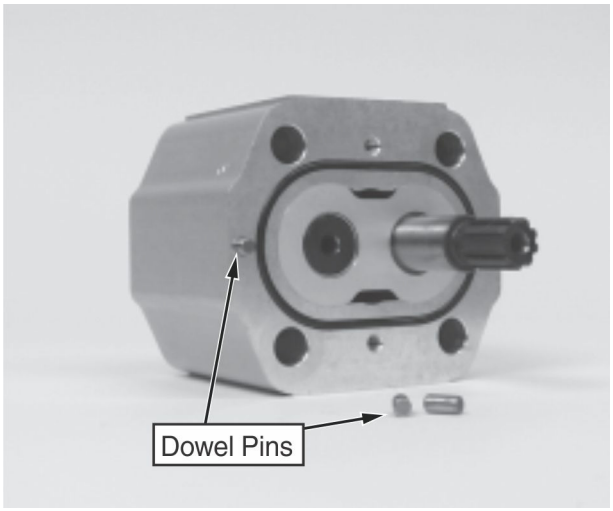
Remove any excess lubrication and grease from the mating surfaces of the pump body. Ensure that these surfaces are dry and free of contamination before moving on to the next step.

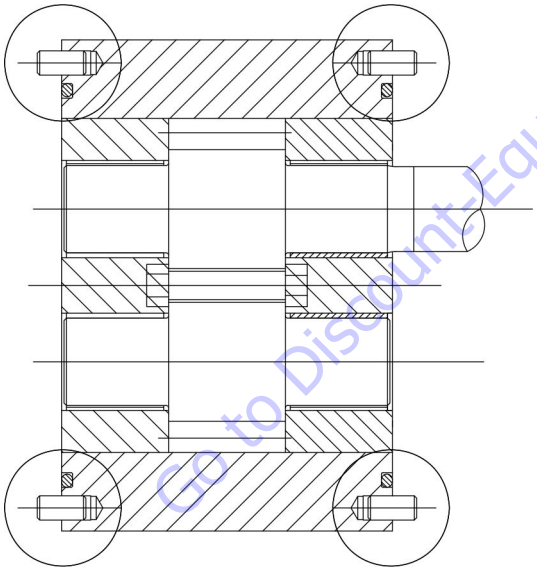


12. Install the dowel pins.

Install four 5 mm dowel pins into the proper cavities on both sides of the body (refer to the illustration). Swab the pins with assembly grease or petroleum jelly to retain them during assembly.

Do not install dowel pins to the rear cover or flange, as one of them may drop inside the pump during assembly.

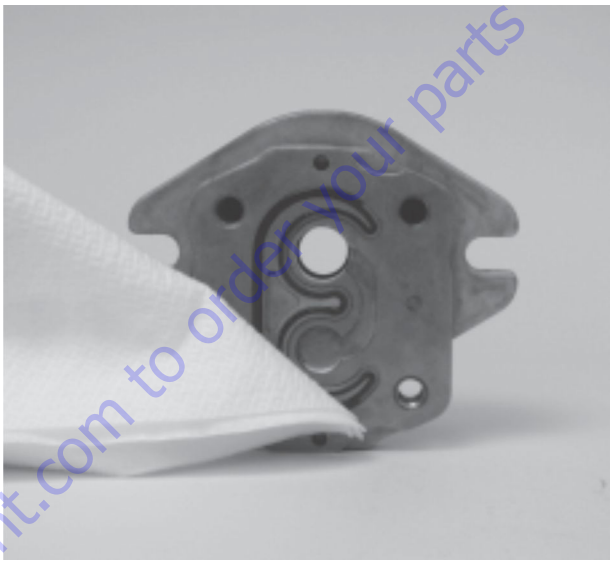




13. Clean the mating surfaces.

Remove any excess lubrication and grease from the mating surfaces of the front flange and rear cover. Ensure that these surfaces are dry and free of contamination before moving on to the next step.

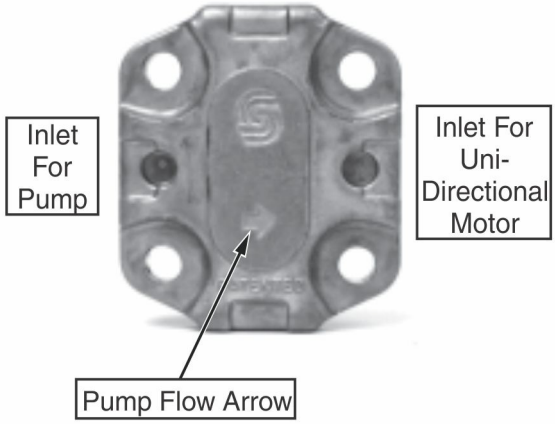
Ensure the pressure seals are seated properly after this operation.



14. Install Rear Cover.

Mount the cover on the body. Ensure the arrow on the back is oriented properly. The arrow should be In the same direction as the flow.

Ensure that all the pressure seals stay in place during this operation.



15. Prepare pump for front flange assembly.

Place the pump with the rear cover downwards.

Ensure that the assembly marks on the bearing block / body are properly aligned.

16. Install the front flange.

Install a protective sleeve over the shaft. The sleeve is used to protect the shaft seal from damage by the shaft splines / keyway during front flange assembly.

Install the flange onto the body, then remove the protective sleeve.

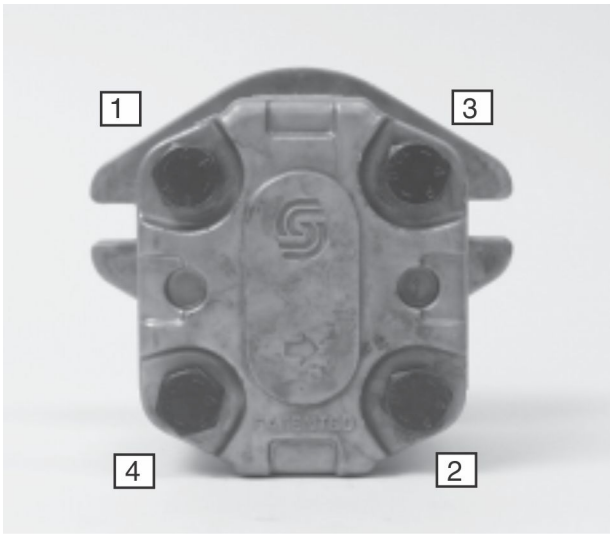
Ensure that the seals remain seated in their grooves during this operation.

17. Torque sequence.

When assembling units with 01 flange and short coupled tandems, wash the capscrews and apply JLG Threadlocker PN 0100011 or equivalent thread lock compound to the threads before assembly.

Install capscrews. While observing the torque sequence shown, pre tighten the capscrews. Then, using a torque wrench, tighten them to the proper torque.

Torque 44-54 Nm (32-40 ft.lbs.).



18. Install socket head capscrews. (03 flange and first stage of multiple).

Using a 4 mm internal hex wrench, install the socket head capscrews to the front flange and rear cover.

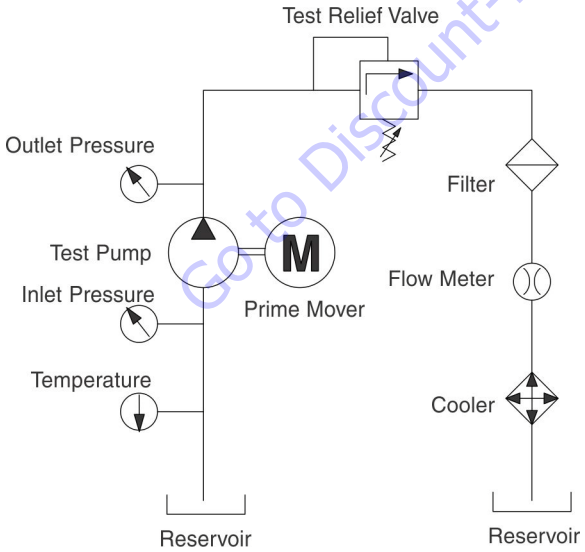
Torque 2.5-3.4 Nm (22-30 ft.lbs.).

If used, install new o-ring to flange pilot.

19. Testing

After pump has been disassembled and reassembled, it is suggested that the pump be run in and tested on an appropriate test stand. This is done to verify the volumetric efficiency and the integrity of the unit.

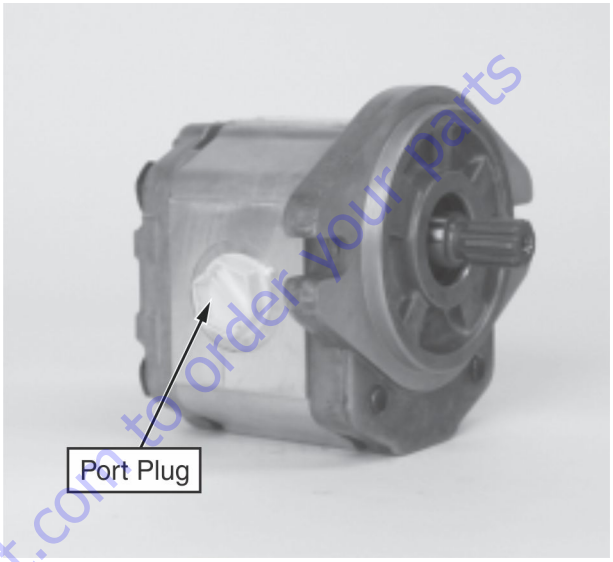
Test specifications and procedure are given in Testing the Pump.



20. Prepare the unit for shipment or storage.

Clean the exterior of the pump and install the following:

- **a.** Port Plugs
- **b.** Key (CI and CO shafts)
- **c.** Shaft protective cap (CI and CO shafts)
- **d.** Nut and washer (CO shaft)



Trouble Shooting

Table 5-43. Troubleshooting

Low or No Flow From Gear Pump		
Item	Description	Action
1. Check oil level in reservoir.	Description Insufficient oil to supply gear pump.	Fill reservoir to proper level.
2. Check input spline condition.	Input shaft broken or stripped.	Repair or replace gear pump.
3. Check pressure at pump inlet. Recommended inlet pressure: 0.8 to 3.0 bar absolute. 0.6 Minimum at cold start.	Clogged suction filter or inlet screen.	Replace filter or clean suction screen.
4. Check condition of gear faces and bearing blocks.	Scored bearing block and gear faces will reduce pump efficiency.	Repair or replace gear pump.
5. Check bushings.	Overpressure of gear pump will cause idler gear bushing to fail.	Repair or replace gear pump.
Excessive Noise		
Item	Description	Action
1. Check oil level in reservoir.	Excessive air will cause cavitation sound.	Fill reservoir to proper level.
2. Check inlet line for leaks.	Excessive air will cause cavitation sound.	Repair inlet line.
3. Check pressure at pump inlet. Recommended inlet pressure: 0.8 to 3.0 bar absolute. 0.6 Minimum at cold start.	Lower than normal inlet pressure causes excessive pump noise.	Return inlet pressure to recommended levels.
External Leakage		
Item	Description	Action
1. Check for pinched o-rings or backup ring seal.	Pinched seal will allow leakage.	Replace pinched seal.
2. Check pressure seals.	Damage to pressure seals is typically caused by reduced stack-up in the pump assembly. This may be due to under-torqued assembly fasteners, or more commonly is attributed to excessive wear on the bearing blocks. Reduced stack-up will affect seal efficiency possibly to the point of seal extrusion.	Inspect condition of bearing blocks. If they are found to be worn, repair or replace the pump. If bearing blocks are not worn, replace pressure seals and re-torque pump assembly fasteners.

5.10 DRIVE & FUNCTION PUMP START UP PROCEDURES

Start-Up Procedure

The Boom Lift utilizes a Triple Combination Pump coupled to the Deutz diesel engine. The 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.

The transmission pumps share some common connections. Each pumps charge oil suction ports are connected by steel tubing, the charge pumps 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. The pumps 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. This is important to note as the brake release oil pressure must be set 25 psi (1.7 bar) below the boost oil pressure relief valve. If the 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 THE 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. Insure 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 a 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 the drive system in the “turtle mode”, forward and reverse.
11. De-aerate the system by bleeding fluid from the Ma & Mb ports.
12. Switch the drive mode speed control from “turtle” to “rabbit”. Gradually increase drive speed forward & reverse, still with no load - wheels off the ground.
13. With the 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 that the controls are connected so that the transmissions operate in the correct direction related to control input.
15. Continue to monitor all pressure gauges & correct any irregularities.
16. Remove the brake coil (leaving the electrical connection intact) from the brake release solenoid cartridge located on the Traction Manifold. This disables the machine's ability to release the brakes! Stroke the 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.
17. Check oil level & temperature.
18. Remove and inspect charge pressure oil filter, replace with new element.
19. Operate the transmission under no load conditions for about 15 minutes to stabilize the temperature and remove any residual air from the fluid.
20. Set the machine back on the ground. Operate the transmissions under full and normal conditions.
21. 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 the transmissions do not perform correctly after following the pre-start & start-up procedures, refer to the relevant sections of the trouble-shooting procedures.*

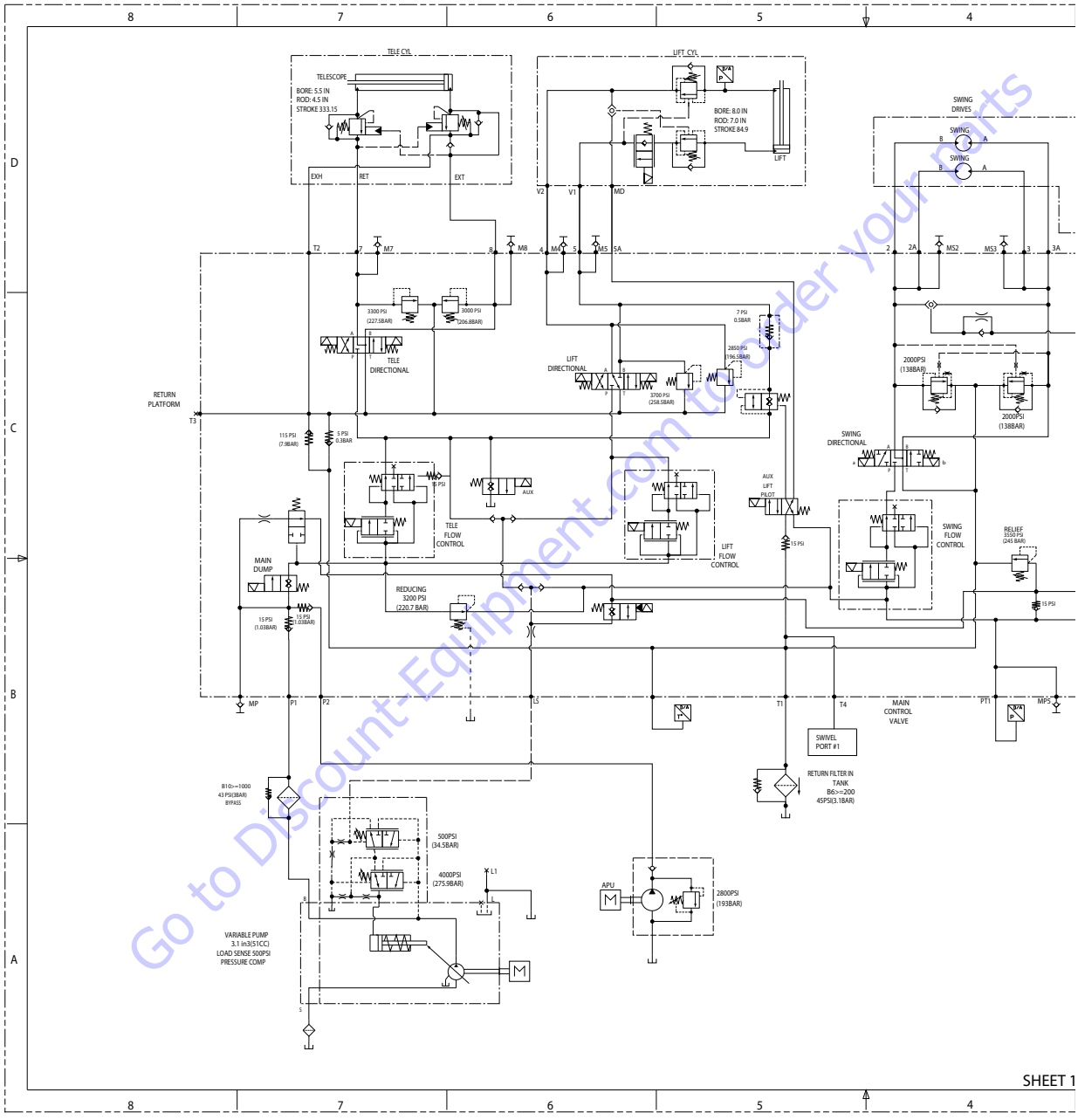


Figure 5-226. Hydraulic Schematic - Sheet 1 of 8

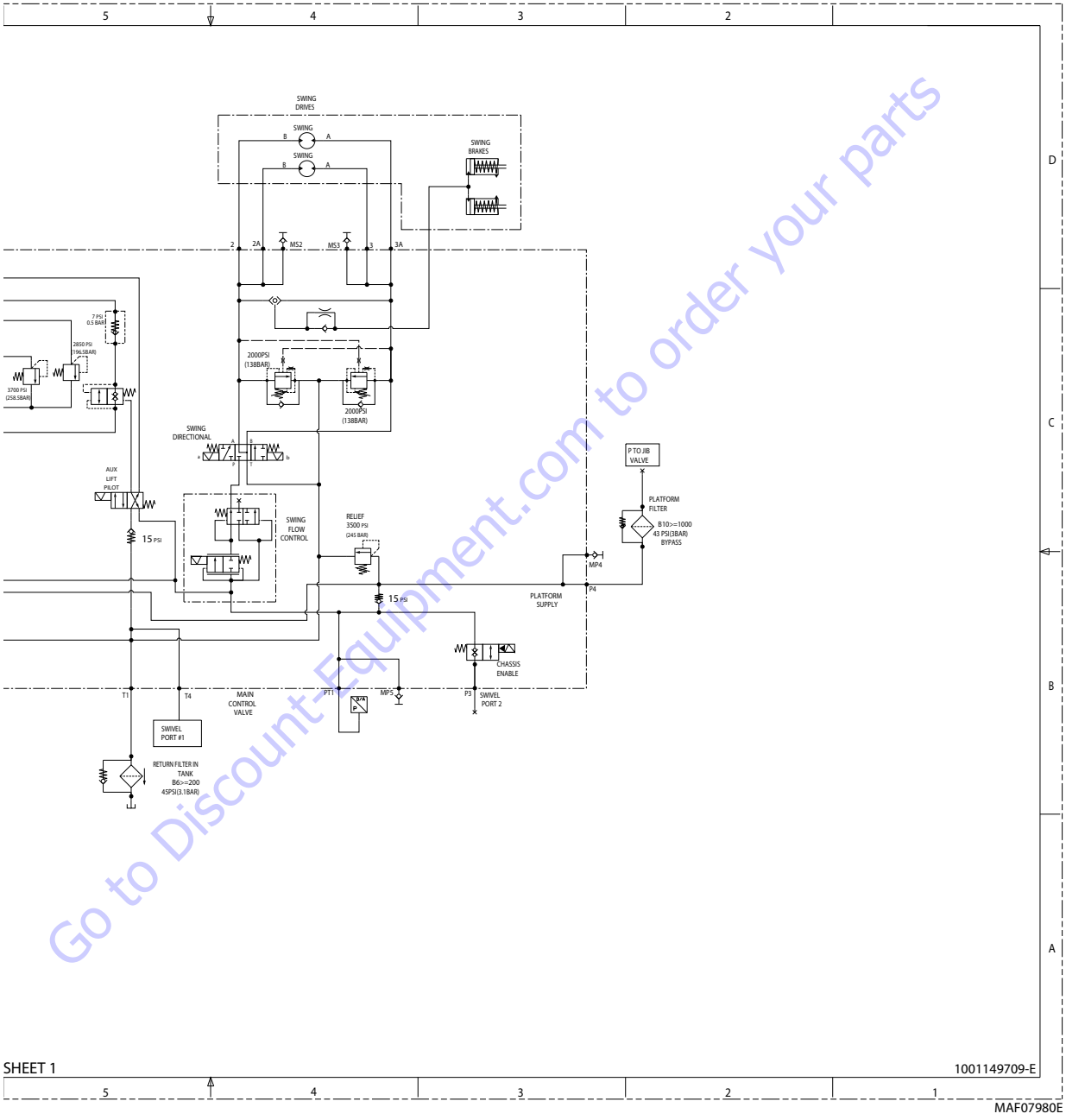


Figure 5-227. Hydraulic Schematic - Sheet 2 of 8

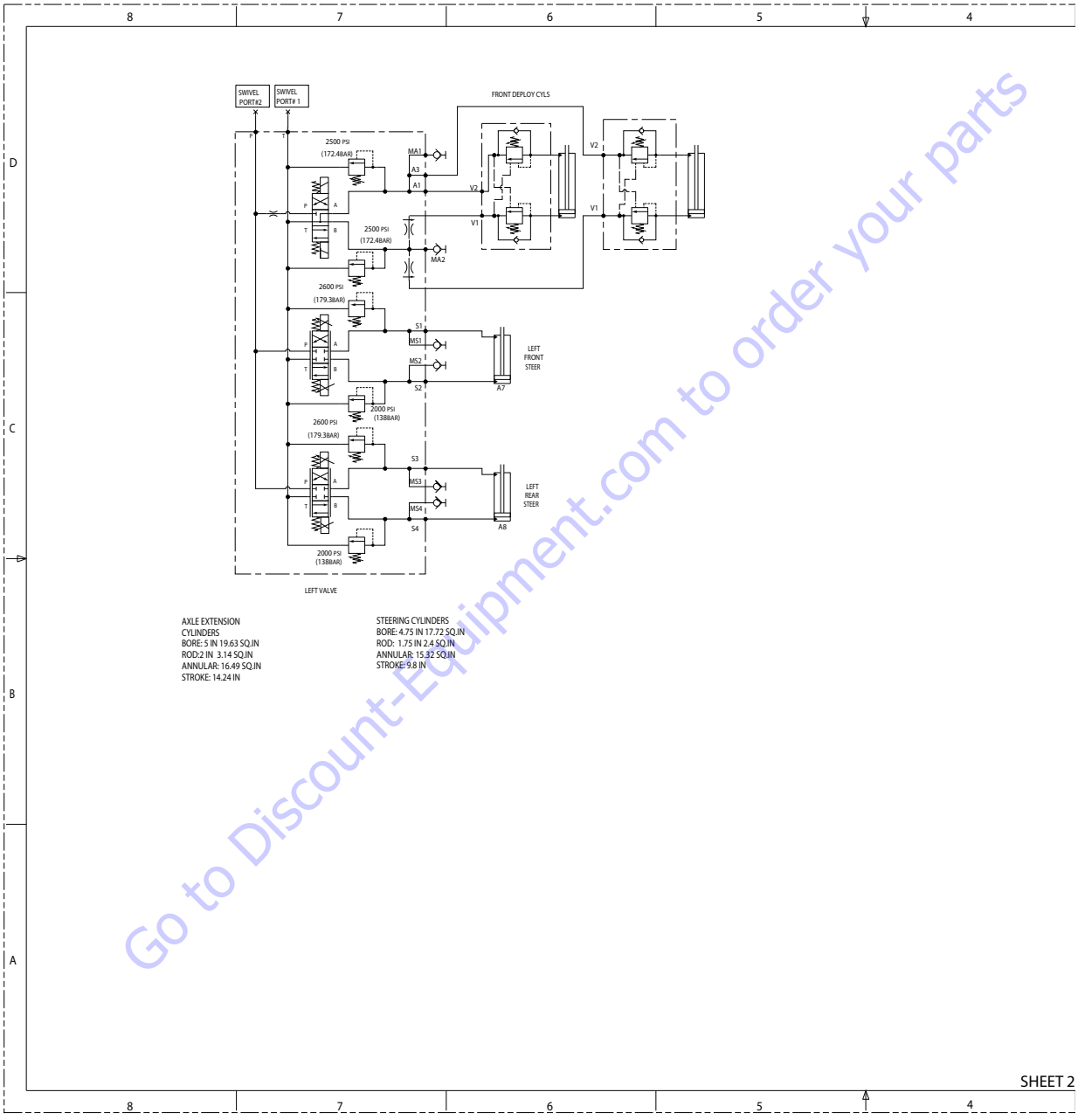


Figure 5-228. Hydraulic Schematic - Sheet 3 of 8

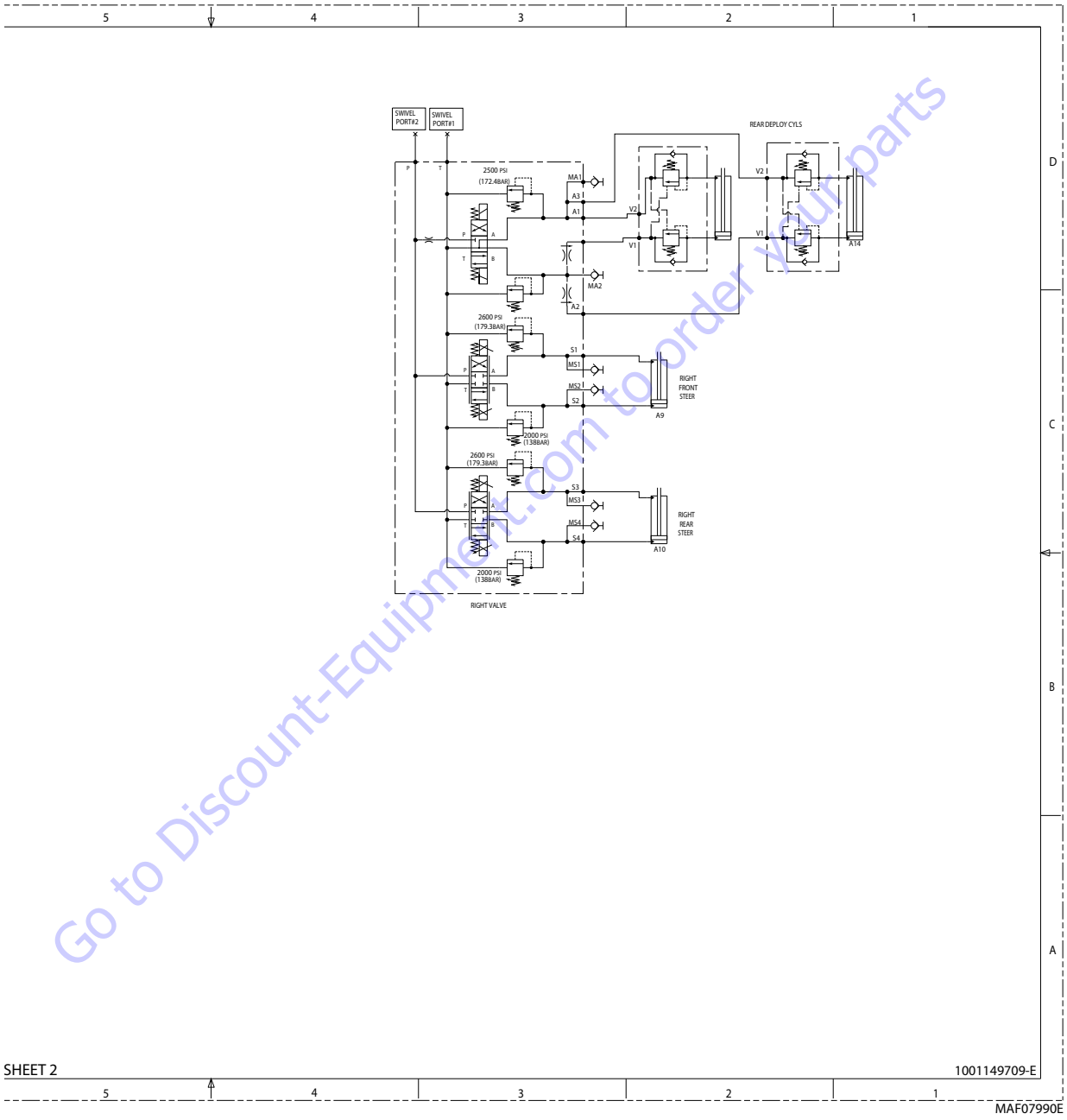


Figure 5-229. Hydraulic Schematic - Sheet 4 of 8

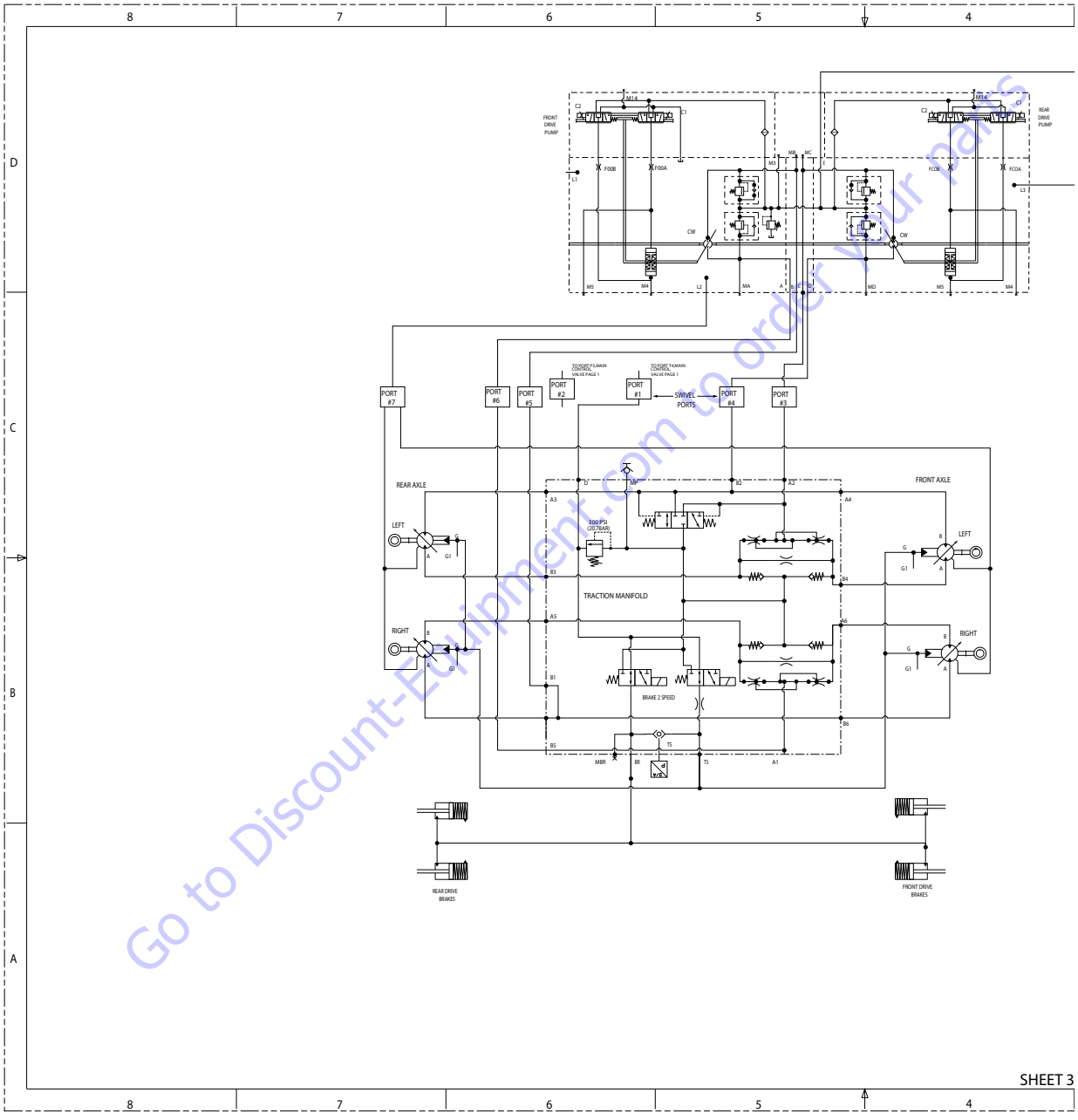


Figure 5-230. Hydraulic Schematic - Sheet 5 of 8

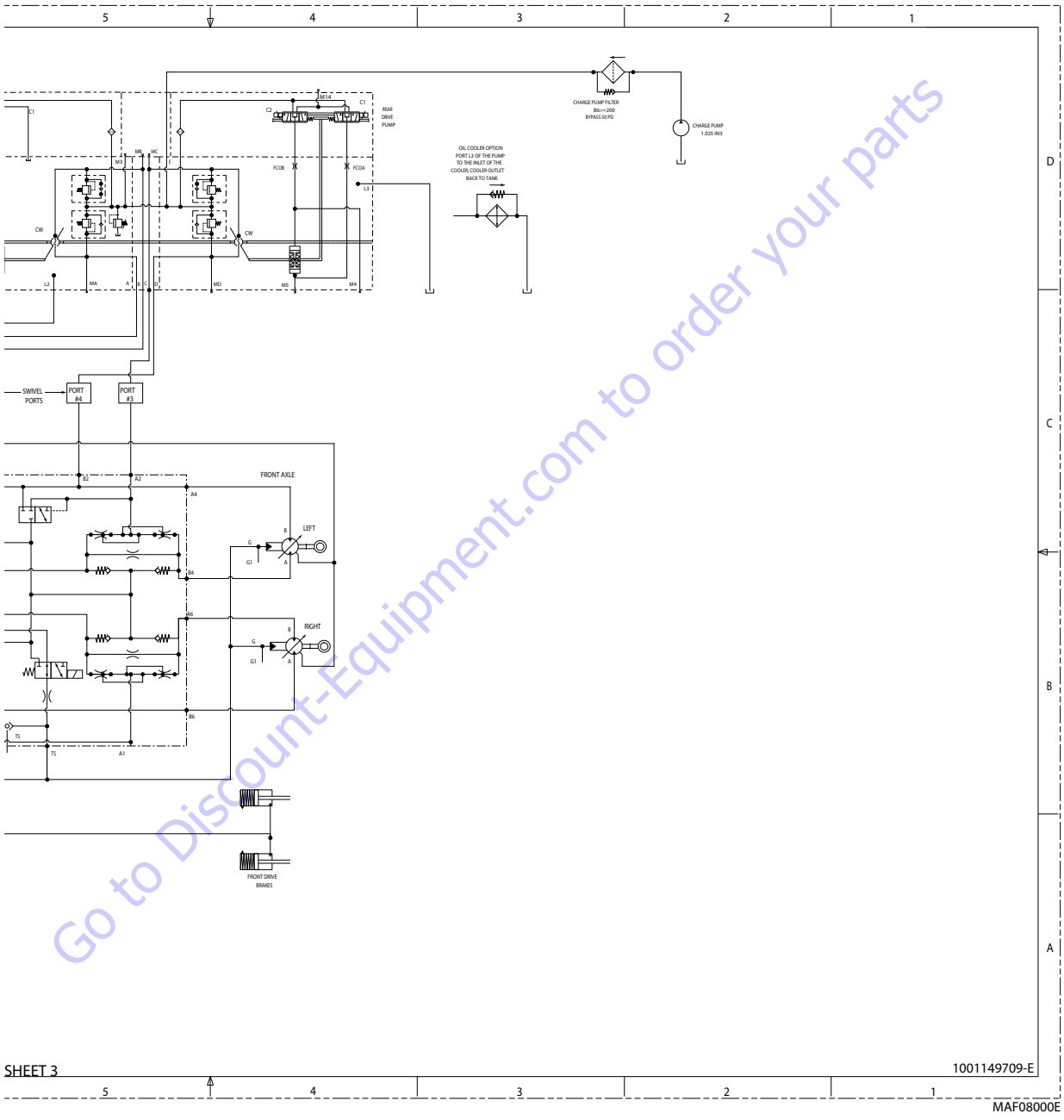


Figure 5-231. Hydraulic Schematic - Sheet 6 of 8

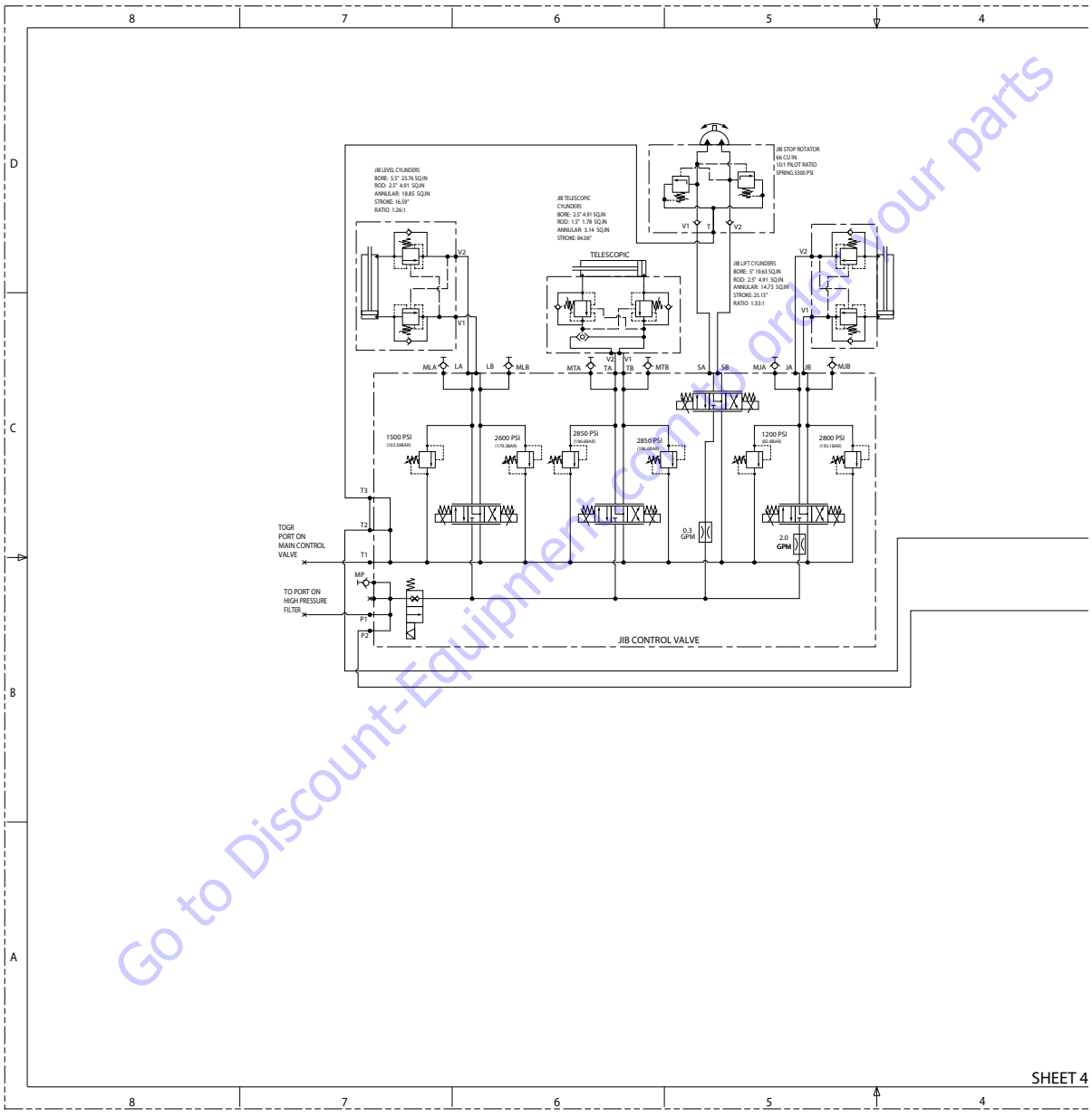


Figure 5-232. Hydraulic Schematic - Sheet 7 of 8

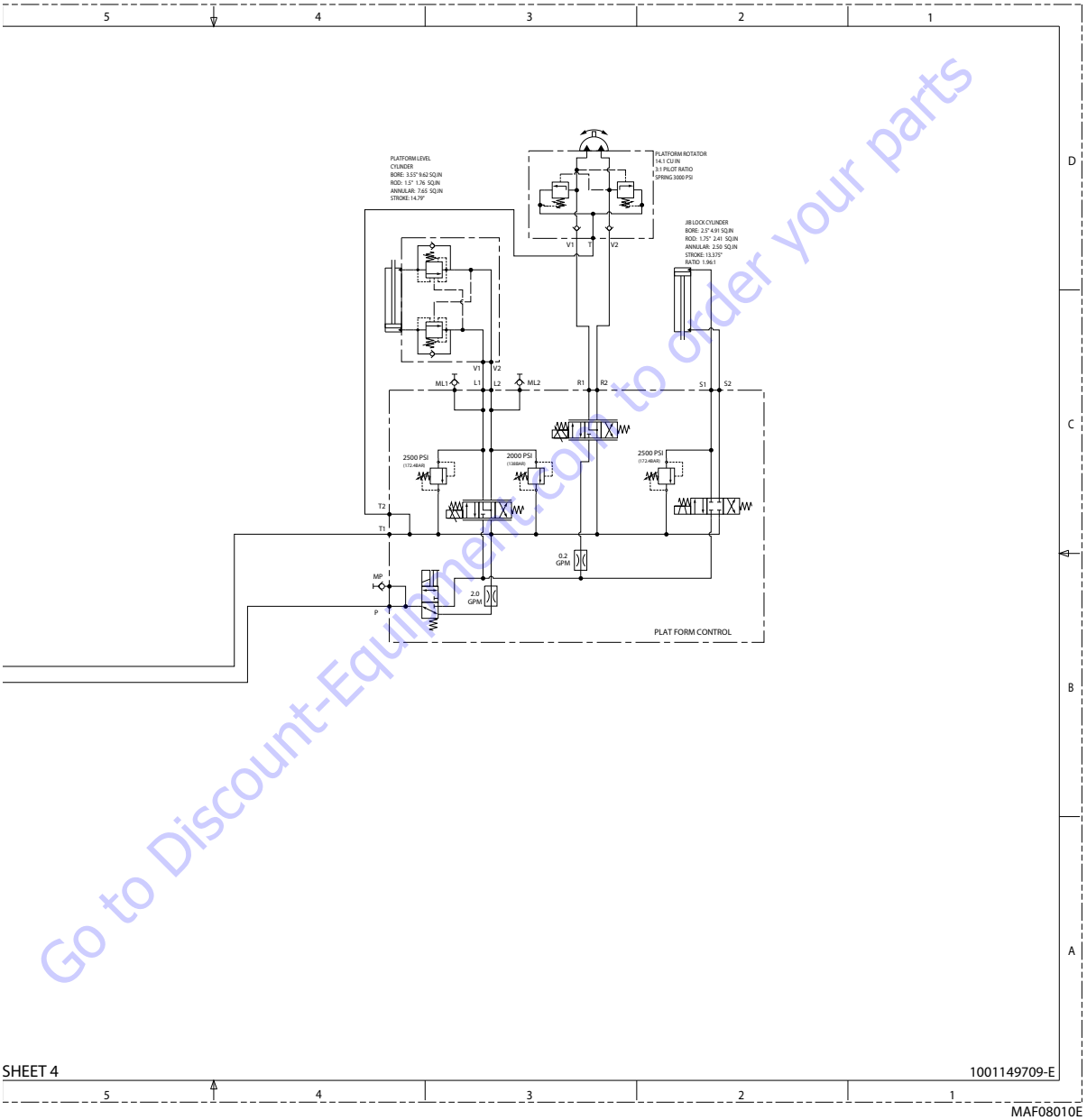
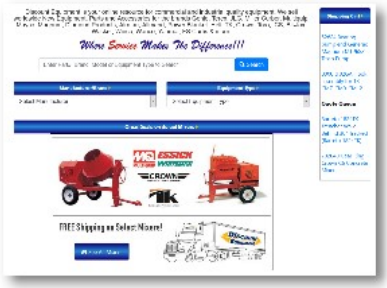


Figure 5-233. Hydraulic Schematic - Sheet 8 of 8

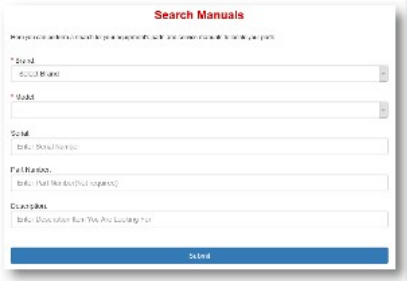
PARTS FINDER

Search Website by Part Number

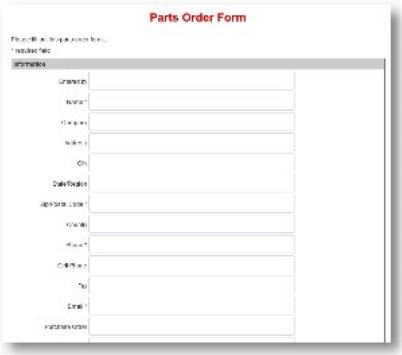
Discount Equipment



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 JLG CONTROL SYSTEM ANALYZER KIT INSTRUCTIONS

Introduction

NOTICE

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

NOTICE

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

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

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

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

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

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

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

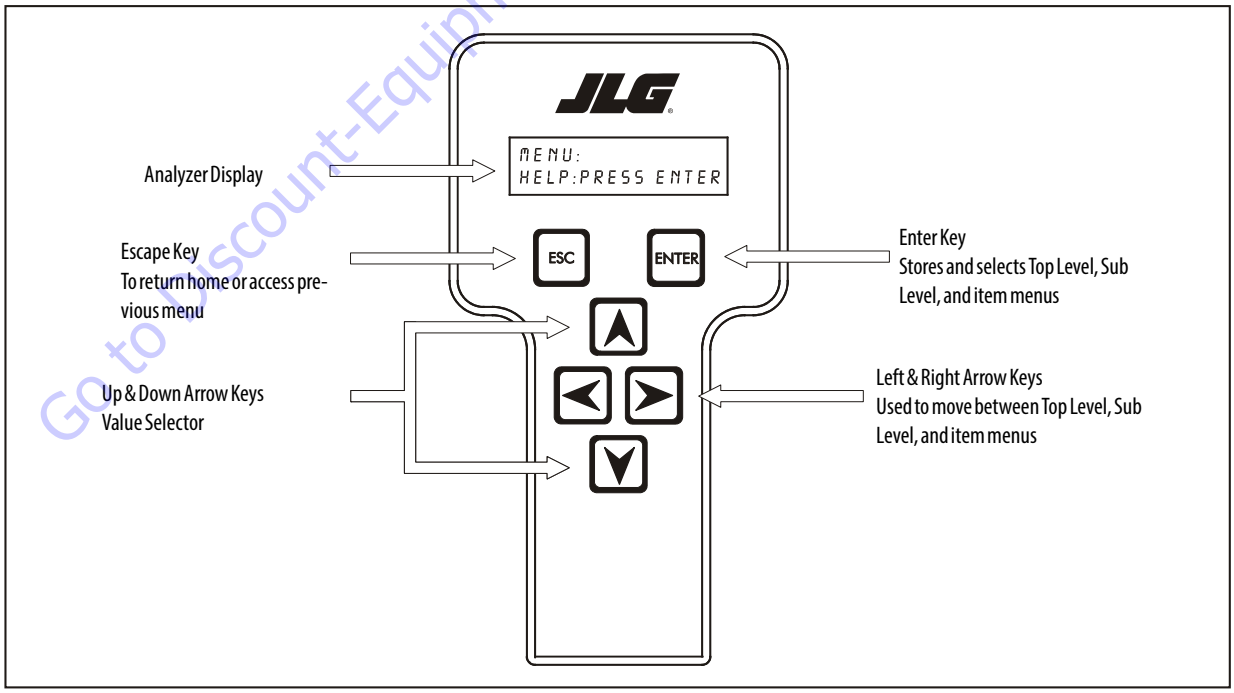


Figure 6-1. Hand Held Analyzer

To Connect the JLG Control System Analyzer

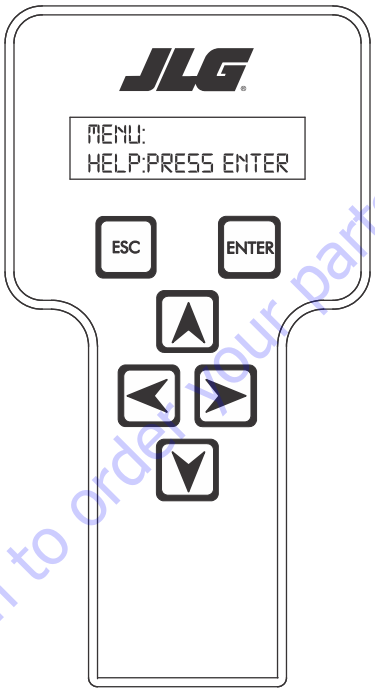
1. Connect the four pin end of the cable supplied with the analyzer, to the motor controller module located in the platform box or at the power module and connect the remaining end of the cable to the analyzer.

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

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

Using the Analyzer

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



HELP:
PRESS ENTER

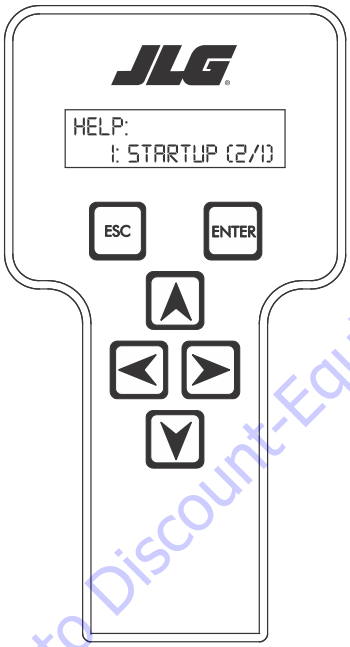
At this point, using the RIGHT  and LEFT  arrow keys, you can move between the top level menu items. To select a displayed menu item, press ENTER  . To cancel a selected menu item, press Escape  ; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

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

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

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



LOGGED HELP
1: STARTUP (2/1)

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

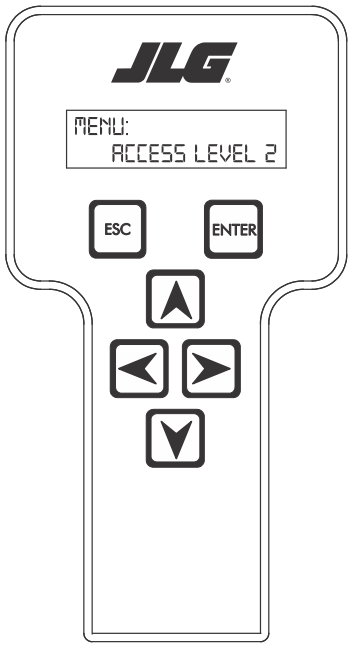
When a top level menu is selected, a new set of menu items may be offered: for example:

DRIVE
BOOM
SYSTEM
DATALOG
VERSIONS

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

Changing the Access Level of the Hand Held Analyzer

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



ACCESS LEVEL:
CODE 00000

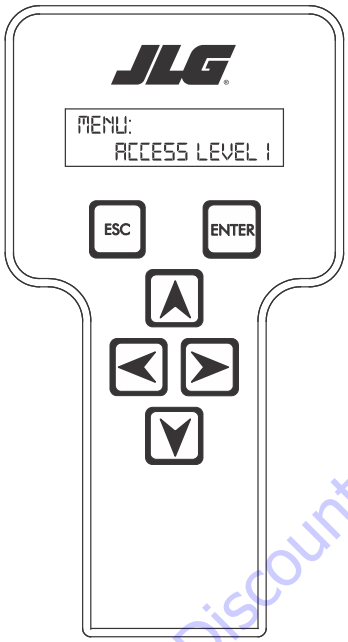
Press **ENTER** to select the **ACCESS LEVEL** menu.

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

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

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

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

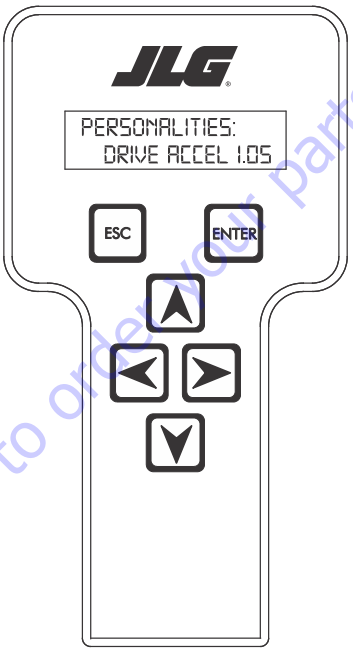


MENU:
ACCESS LEVEL 1

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

Adjusting Parameters Using the Hand Held Analyzer

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

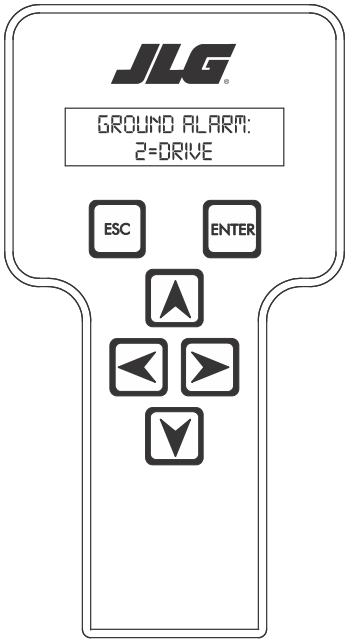


DRIVE:
ACCEL 1.5s

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

Machine Setup

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



GROUND ALARM:
2 = DRIVE

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

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

NOTE: *Refer to Personality Ranges/Defaults for the recommended factory settings.*

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

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

ELEVATION CUTBACK

⚠ WARNING

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

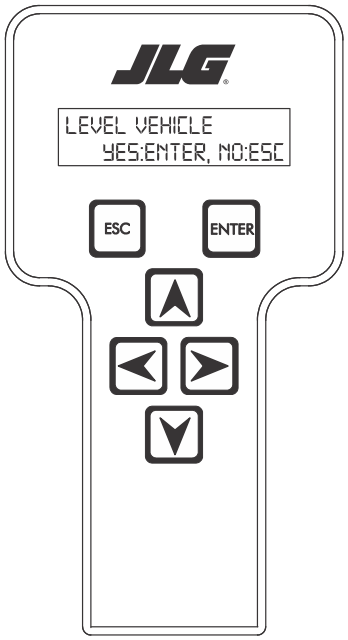
NOTICE

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

Level Vehicle Description

⚠ WARNING

DO NOT LEVEL VEHICLE EXCEPT ON A LEVEL SURFACE.



LEVEL VEHICLE
YES:ENTER, NO:ESC

Not available at password level 2 ENTER confirms that vehicle is currently level, and zeroes the tilt sensor measurements

Ground Control Console Display Gauge - Machines using Diesel Exhaust Fluid (DEF)

(See Figure 6-5., Ground Control Console Display Gauge)

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

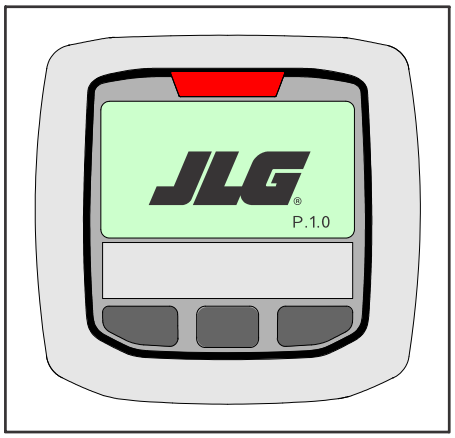


Figure 6-2. Splash Screen

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

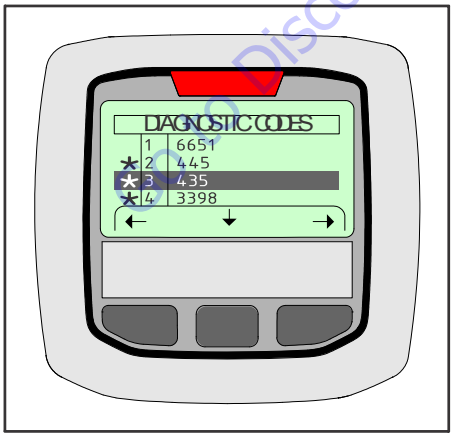


Figure 6-3. Diagnostic Screen

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

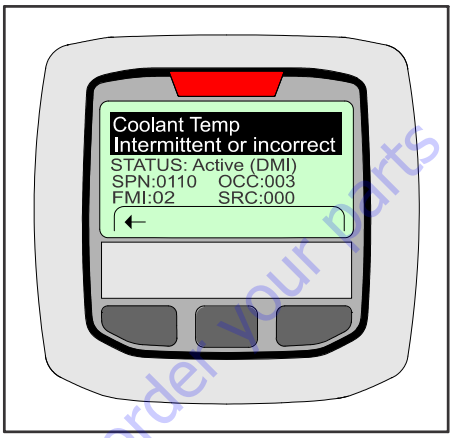


Figure 6-4. Engine Diagnostic Screen

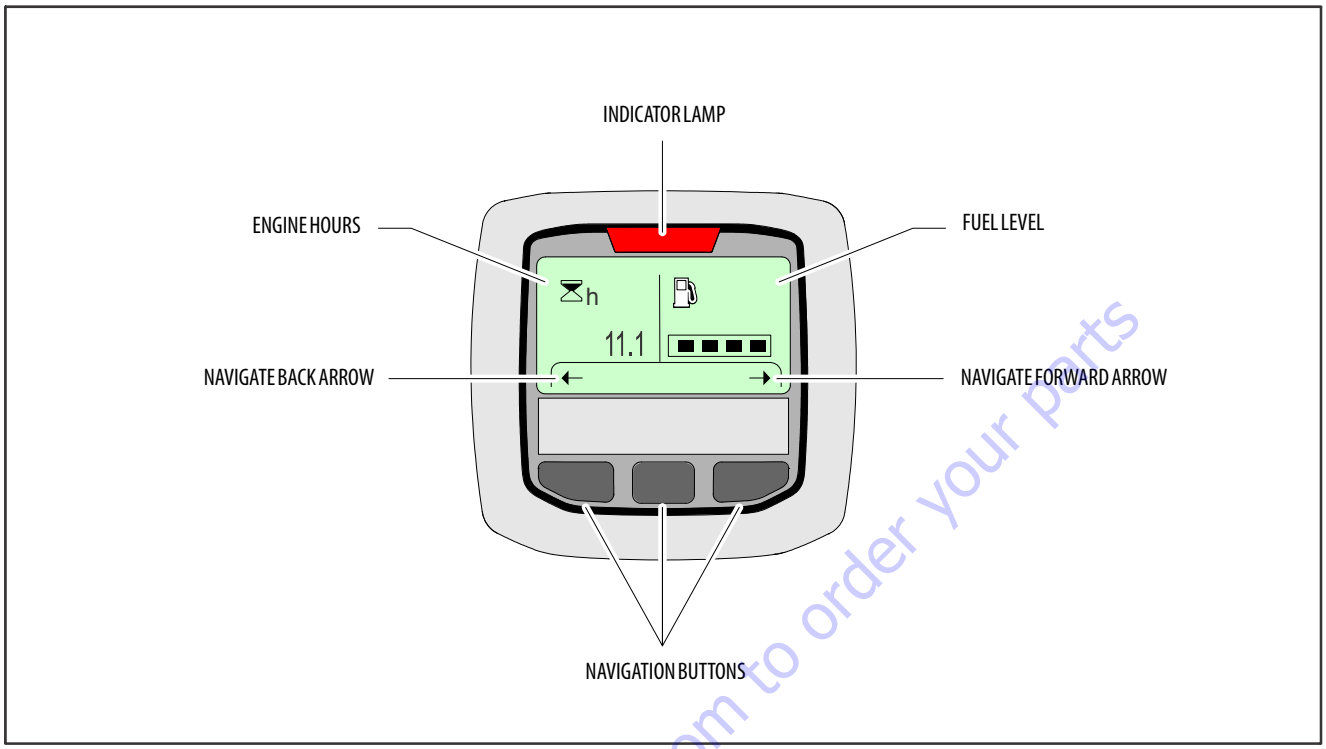


Figure 6-5. Ground Control Console Display Gauge

Table 6-1. Analyzer Abbreviations

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

Table 6-1. Analyzer Abbreviations

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

Table 6-1. Analyzer Abbreviations

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

Table 6-2. Machine Configuration Programming Information (Software Version P7.29)

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 values.* *The items marked in BOLD bold text on this sheet represent a new board that has never been configured.*			
MODEL NUMBER: 1	**0** 1 2	**No Model** 1500SJ 1850SJ	**0**
ENVELOPE HEIGHT: 2	**0** 1	**1500SJ: 150' MAX** 1850SJ: 185' MAX	**0**
Note: The default settings (bold) will vary depending on the model selection with selection #0 being the initial default setting.			
MARKET: 3	**0** 1 2 3 4 5	**ANSI USA** ANSI EXPORT CSA CE AUSTRALIA JAPAN	**0**
ENGINE: 4	1 2 3 4 5 **6**	DEUTZ F4 TIER1: Deutz BF4M1011 Diesel (Tier 1) DEUTZ F4 TIER2: Deutz BF4M2011 Diesel (Tier 2) DEUTZ ECM: Engine Control Module CAT Engine DEUTZ ECM T4i: Engine Control Module (Tier 4 Interim) **DEUTZ ECM T4F: Engine Control Module (Tier 4 Final)**	**6**

Table 6-2. Machine Configuration Programming Information (Software Version P7.29)

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

Table 6-2. Machine Configuration Programming Information (Software Version P7.29)

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: 4WS mode enabled.**	**1**
DRIVE: 12	0 **1**	2WD drive mode enabled. **4WD drive 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	**2**
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 (Software Version P7.29)

Configuration Digit	Number	Description	Default Number
LOAD SYSTEM: 17*	**0** 1 2 3 4	**NO: No load sensor installed.** WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF). CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF). SPECIAL 1: Functions in creep, overload lamp lit, disables main telescope out & main lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	**0**
* Only visible under certain market selections.			
* Certain market selections will limit load system options or alter default setting.			
LOAD TYPE 18	0 **1**	NON CAN LSS: Non CAN based LSS installed **CAN LSS: CAN based LSS installed**	**1**
FUNCTION CUTOUT: 19*	**0** 1 2 3	**NO: No drive cutout.** BOOM CUTOUT: Boom function cutout while driving above elevation. DRIVE CUTOUT: Drive cutout above elevation. DRIVE CUT E&T: Drive cutout above elevation and tilted.	**0**
* Only visible under certain market selections.			
* Certain market selections will limit function cutout options or alter default setting.			
GROUND ALARM: 20*	**0** 1 2 3	**NO: No ground alarm installed.** DRIVE: Travel alarm sounds when the drive function is active (Option). DESCENT: Descent alarm sounds when lift down is active (Option). MOTION: Motion alarm sounds when any function is active (Option).	**0**
* Certain market selections will alter default setting.			
FLYWHEEL TEETH 21*	**0** 1 2	**110 TEETH: Engine speed is calculated using 110 flywheel teeth** 133 TEETH: Engine speed is calculated using 110 flywheel teeth 112 TEETH: Engine speed is calculated using 110 flywheel teeth	**0**
* Only visible when Deutz F4 Tier 1 or Tier 2 engines selected			

Table 6-2. Machine Configuration Programming Information (Software Version P7.29)

Configuration Digit	Number	Description	Default Number
OSCILLATING AXLE: 22	0	NO: No oscillating axle system installed.	**1**
	1	**YES: Oscillating axle system installed.**	
Note: The default settings (bold) will vary depending on the model selection with selection #0 being the initial default setting.			
DISPLAY UNITS: 23*	0	METRIC: units selection. (Deg. C, KPA, Kg.)	**1**
	1	**IMPERIAL: units selection. (Deg. F, PSI, Lbs.)**	
* Certain market selections will alter default setting.			
LEVELING MODE: 24	0	LIFT: Platform leveling during lift only.	**1**
	1	**ALL: Platform leveling during all functions.**	
CLEARSKY: 25	**0**	**NO: ClearSky Telematics system not installed.**	**0**
	1	YES: ClearSky Telematics system installed.	
FUEL TANK: 26	**0**	**52 Gallon Fuel tank.**	**0**
	1	31 Gallon Fuel tank.	
	1	45 Gallon Fuel tank.	
ALERT BEACON: 27	**0**	**OFF FOR CREEP.**	**0**
	1	20FPS FOR CREEP.	
LANGUAGE: 28	**0**	**ENGLISH**	**0**
	1	SPANISH	
	2	EURO PORTUGUESE	
	3	BRAZILIAN PORTUGUESE	
	4	FRENCH	
	5	GERMAN	
	6	DUTCH	
	7	ITALIAN	
	8	SIMPLIFIED CHINESE	
	9	JAPANESE	
	10	KOREAN	

Table 6-2. Machine Configuration Programming Information (Software Version P7.29)

Configuration Digit	Number	Description	Default Number
TEMP CUTOUT: 29*	**0** 1	**NO: No temperature cutout** YES: Temperature cutout enabled	**0**
* Certain market selections will alter default setting.			
PLAT LVL OVR CUT: 30	**0** 1	**NO: No platform cutout** YES: Platform cutout enabled	**0**
CRIBBING: 31	**0** 1	**NO: No temperature cutout** YES: Cribbing is installed	**0**
* Only visible under certain market selections.			
WATER IN FUELSENSOR: 32	**0** 1	**NO: Water in fuel sensor option not installed** YES: Water in fuel sensor option installed	**0**
*Only visible under certain market selections.			
ALARM/HORN: 33	**0** 1	**COMBINED: The white noise alarm option is not installed** SEPARATE: The white noise alarm option is installed	**0**

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Table 6-3. Machine Configuration Programming Settings (Software Version P7.29)

1850SJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	**2**	**2**	**2**	**2**	**2**	**2**
Envelope Height	**1**	**1**	**1**	**1**	**1**	**1**
Market	**0**	**1**	**2**	**3**	**4**	**5**
Engine	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**
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
Chassis 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
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

Table 6-3. Machine Configuration Programming Settings (Software Version P7.29)

1850SJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
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 & Taillights	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
Load System	**0**	**0**	**0**	0	0	0
	X	***1***	X	2	2	**1**
	X	2	X	**2**	**2**	2
	X	3	X	3	3	3
	X	4	X	X	4	4
Load Type	X	0	X	0	0	0
	1	**1**	**1**	**1**	**1**	**1**
Function Cutout	X	0	0	**1**	0	0
	X	1	1	X	1	1
	X	2	2	X	2	2
	3	**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**
Flywheel Teeth	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1
	2	2	2	2	2	2
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

Table 6-3. Machine Configuration Programming Settings (Software Version P7.29)

1850SJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Language	**0**	**0**	**0**	**0**	**0**	**0**
	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
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	9	9	9	9	9
	10	10	10	10	10	10
Platform Cutout	**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
Cribbing	0	0	0	X	X	0
	0	**0**	**0**	X	X	**1**
Water In Fuel Sensor	X	**0**	X	X	X	X
	X	1	X	X	X	X
Alarm/Horn	**0**	**0**	**0**	**0**	**0**	**0**
	1	1	1	1	1	1

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

6.2 MACHINE PERSONALITY SETTINGS AND FUNCTION SPEEDS

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

Table 6-4. Machine Personality Settings and Function Speeds (Software Version P7.29)

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PARAMETER (DISPLAYED ON ANALYZER 2ND LINE)	DESCRIPTION	RANGE	DEFAULT VALUES	TIME RANGE (SEC)
DRIVE:	ACCEL X.Xs	Displays/adjusts drive acceleration	0.1 to 5.0 sec	2	
	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	54-58 (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	110-112 (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	
	DECEL X.Xs	Displays/adjusts main lift deceleration	0.1 to 3.0 sec	1	
	MIN UP XX%	Displays/adjusts minimum main lift up speed	0 to 60%	20	
	MAX UP XX%	Displays/adjusts maximum main lift up speed	0 to 100%	80	130-160 (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%	50	
	MIN DOWN XX%	Displays/adjusts minimum main lift down speed	0 to 60%	10	
	MAX DOWN XXX%	Displays/adjusts maximum main lift down speed	0 to 100%	60	145-175 (see orientation)
	CREEP DOWN XX%	Displays/adjusts maximum main lift down speed	0 to 75%	45	

Table 6-4. Machine Personality Settings and Function Speeds (Software Version P7.29)

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PARAMETER (DISPLAYED ON ANALYZER 2ND LINE)	DESCRIPTION	RANGE	DEFAULT VALUES	TIME RANGE (SEC)
SWING:	ACCEL X.Xs	Displays/adjusts swing acceleration	0.1 to 5.0 sec	3	
	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%	15	
	MAX LEFT XXX%	Displays/adjusts maximum swing left speed	0 to 100%	75	110-130 (see orientation)
	CREEP LEFT XX%	Displays/adjusts maximum swing left speed NOTE: used when creep switch on pump pot is active	0 to 65%	40	
	MIN RIGHT XX%	Displays/adjusts minimum swing right speed	0 to 50%	22	
	MAX RIGHT XXX%	Displays/adjusts maximum swing right speed	0 to 100%	81	110-130 (see orientation)
	CREEP RIGHT XX%	Displays/adjusts maximum swing right speed	0 to 65%	47	
MAN 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	1	
	MIN IN XX%	Displays/adjusts minimum main telescope in speed. Same as Creep speed	0 to 65%	15	
	MAX IN XXX%	Displays/adjusts maximum main telescope in speed	0 to 100%	65	45-65 (see orientation)
	MIN OUT XX%	Displays/adjusts minimum main telescope out speed. Same as Creep speed	0 to 65%	15	
	MAX OUT XXX%	Displays/adjusts maximum main telescope out speed	0 to 100%	60	45-65 (see orientation)
PLATFORM 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%	55	
	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%	50	
	MAX DOWN XXX%	Displays/adjusts maximum basket level down speed	0 to 100%	70	

Table 6-4. Machine Personality Settings and Function Speeds (Software Version P7.29)

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PARAMETER (DISPLAYED ON ANALYZER 2ND LINE)	DESCRIPTION	RANGE	DEFAULT VALUES	TIME RANGE (SEC)
PLATFORM ROTATE:	ACCEL X.Xs	Displays/adjusts basket rotate acceleration	0.1 to 5.0 sec	1	
	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	15-20 (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	15-20 (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	
	MIN UP XX%	Displays/adjusts minimum jib up speed. Same as Creep speed	0 to 65%	46	
	MAX UP XXX%	Displays/adjusts maximum jib up speed	0 to 100%	65	70-120
	MIN DOWN XX%	Displays/adjusts minimum jib down speed. Same as Creep speed	0 to 65%	46	
	MAX DOWN XXX%	Displays/adjusts maximum jib down speed	0 to 100%	76	65-100
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%	48	
	MAX LEFT XXX%	Displays/adjusts maximum jib left speed	0 to 100%	70	60-68 (180°)
	MIN RIGHT XX%	Displays/adjusts minimum jib right speed. Same as Creep speed	0 to 65%	55	
	MAX RIGHT XXX%	Displays/adjusts maximum jib right speed	0 to 100%	70	60-68 (180°)
JIB TELESCOPE:	ACCEL X.Xs	Displays/adjusts jib tele acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts jib tele deceleration	0.1 to 3.0 sec	1	
	MIN IN XX%	Displays/adjusts minimum jib tele in speed. Same as Creep speed	0 to 65%	45	
	MAX IN XXX%	Displays/adjusts maximum jib tele in speed	0 to 100%	70	20-25 (see orientation)
	MIN OUT XX%	Displays/adjusts minimum jib right speed. Same as Creep speed	0 to 65%	40	
	MAX OUT XXX%	Displays/adjusts maximum jib right speed	0 to 100%	70	20-25 (see orientation)

Table 6-4. Machine Personality Settings and Function Speeds (Software Version P7.29)

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PARAMETER (DISPLAYED ON ANALYZER 2ND LINE)	DESCRIPTION	RANGE	DEFAULT VALUES	TIME RANGE (SEC)
JIB LEVEL:	ACCEL X.Xs	Displays/adjusts jib level acceleration	0.1 to 5.0 sec	1.5	
	DECEL X.Xs	Displays/adjusts jib level deceleration	0.1 to 3.0 sec	0.5	
	MIN UP XX%	Displays/adjusts minimum jib level up speed. Same as Creep speed	0 to 65%	60	
	MAX UP XXX%	Displays/adjusts maximum jib level up speed	0 to 100%	100	
	MIN DOWN XX%	Displays/adjusts minimum jib level down speed. Same as Creep speed	0 to 65%	60	
	MAX DOWN XXX%	Displays/adjusts maximum jib level down speed	0 to 100%	100	
GROUND MODE:	M. LIFT UP XXX%	Displays/adjusts fixed main lift up speed	0 to 50%	50	
	M. lift DN XXX%	Displays/adjusts main lift down speed	0 to 100%	60	
	SWING XXX%	Displays/adjusts fixed swing speed	0 to 100%	60	
	PLATFORM LVL XXX%	Displays/adjusts fixed basket level speed	0 to 100%	75	
	PLATFORM ROT XXX%	Displays/adjusts fixed basket rotate speed	0 to 100%	75	
	MAIN TELE XXX%	Displays/adjusts fixed main telescope speed	0 to 100%	60	
	JIB (U/D) XXX%	Displays/adjusts jib lift speed	0 to 100%	80	
		Not displayed if JIB = 0			
	JIB (L/R) XXX%	Displays/adjusts jib swing speed	0 to 100%	80	
		Displayed if JIB = 2			
	JIB TELE XXX%	Displays/adjusts jib tele speed	0 to 100%	80	
	JIB LEVEL XXX%	Displays/adjusts jib level speed	0 to 100%	100	
GEN SET/WELDER:	Engine XXXX RPM	Control generator/welder RPM. Not displayed if GEN SET/WELDER = 0	1200-2800	1800	1800 for 60Hz, 1900 for 50Hz

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6.3 MACHINE ORIENTATION WHEN SETTING FUNCTION SPEEDS

LIFT UP, from platform control, lowest elevation up to maximum elevation, boom retracted, jib retracted.

LIFT DOWN, from platform control, maximum elevation down to minimum elevation, boom retracted, jib retracted.

JIB LIFT UP, from platform control, lowest jib elevation up to maximum jib elevation, boom retracted, jib retracted.

JIB LIFT DOWN, from platform control, maximum jib elevation down to minimum jib elevation, boom retracted, jib retracted.

SWING RIGHT(Max),360 Degrees, from platform control, boom approximately 45° elevation, boom retracted, jib retracted.

SWING LEFT(Max),360 Degrees, from platform control, boom approximately 45° elevation, boom retracted, jib retracted.

TELESCOPE OUT, from platform control, boom @ 0 degrees, 500 lb. capacity selected.

TELESCOPE IN, from platform control, boom @ 0 degrees, 500 lb. capacity selected.

JIB TELESCOPE IN, from platform control, boom horizontal, jib horizontal, 500 lb. capacity selected.

JIB TELESCOPE OUT, from platform control, boom horizontal, jib horizontal, 500 lb. capacity selected.

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 forward 50 ft.

DRIVE REVERSE (Creep Max), high torque - low speed setting, platform speed knob at full creep, drive reverse 50 ft.

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).
5. All test should be done with the oil temp above 100° F (38° C).

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6.4 CANBUS COMMUNICATIONS

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

Two-wire: One wire (yellow) is driven high (5v) and the other low (green) (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 below the BLAM. Each individual circuit from the modules is approximately 120 ohms.
This machine has 3 CAN Networks. The UGM and BLAM are on the side sheet.

- CAN1 - Unplug MDI and check for 60 Ohms
- CAN2 - Verify 60 Ohm at Diagnostic connector.
- CAN3 - Verify 60 Ohm at Deutz Diagnostic Connector

The GROUND MODULE (UGM) is the master system controller. Most functions are dispatched and coordinated from this module, all other system modules (PLATFORM, JIB, BLAM, 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 CHASSIS MODULE. (Command is computed from drive joystick input, interlocks, wheel angle, etc). CHASSIS MODULE 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.

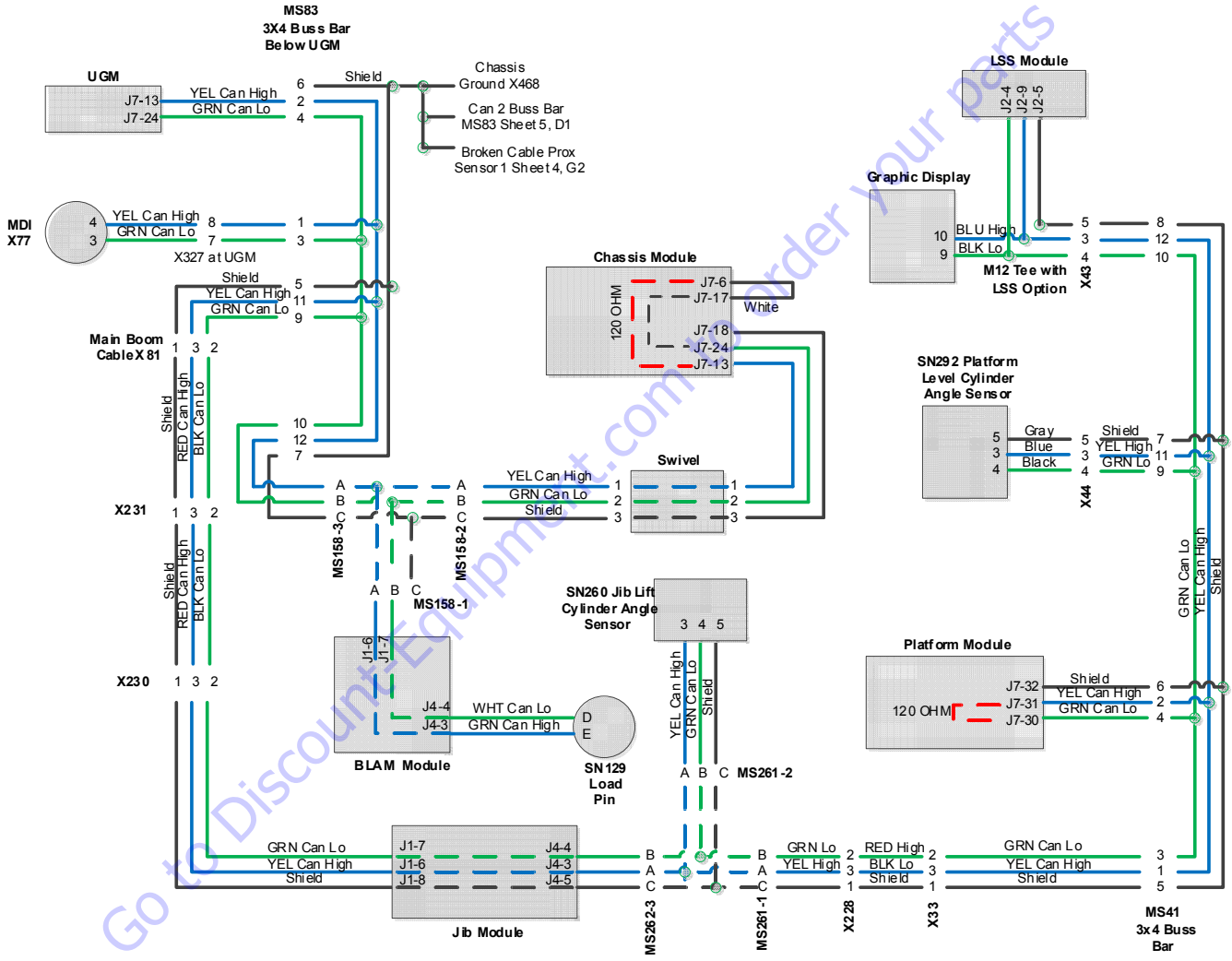


Figure 6-6. Control System CAN Circuit 1

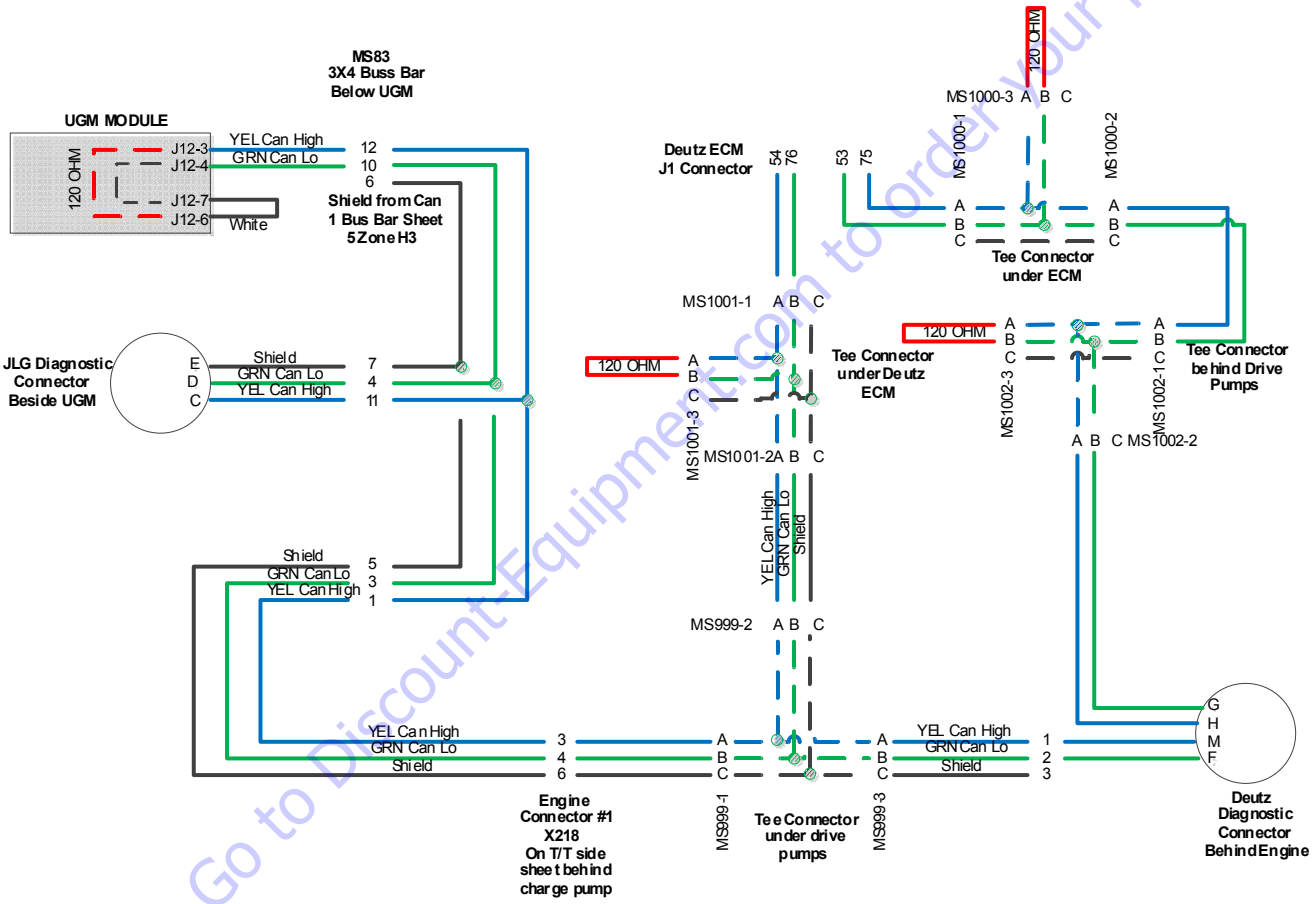


Figure 6-7. Control System CAN Circuit 2 & 3

6.5 CALIBRATION INSTRUCTIONS

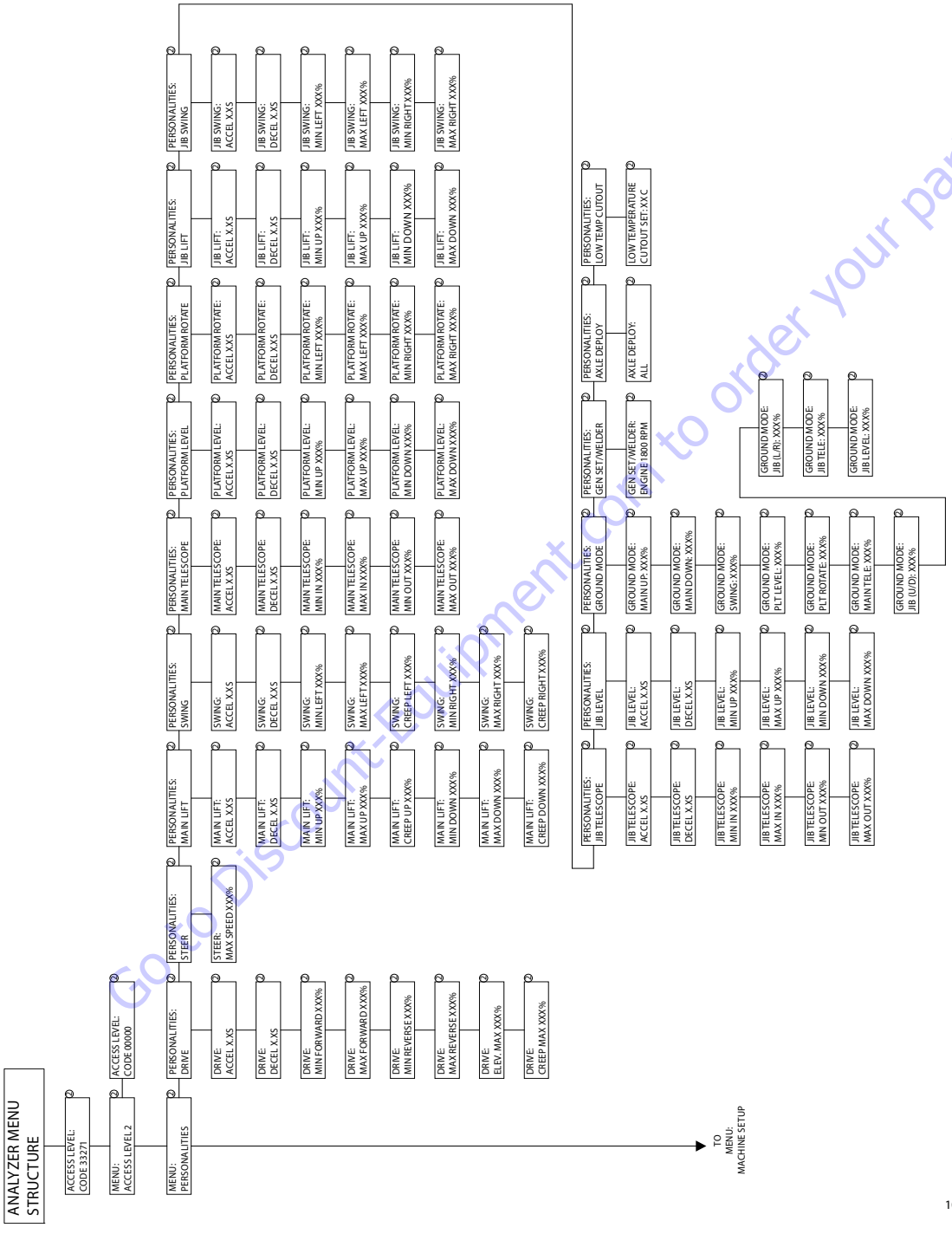
This machine incorporates a variety of sensors and a high degree of function interaction. For safety and proper machine functionality, the calibration procedures must be repeated for any control module replacement, system calibration related fault, or removal or replacement of any sensors, valves, coils, 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 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.

Table 6-5. Calibration Instructions

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
Platform Leveling Calibration	Ground module replacement Platform module replacement Platform level sensor removal or replacement Platform level sensor calibration fault
Platform Level Crack Point Calibration	Platform module replacement Ground module replacement Platform level valve/coil replacement Erratic platform leveling
Jib Level Crack Point Calibration	Ground Module replacement Jib Control Module replacement Jib Level Sensor replacement Jib Level valve/coil replacement Erratic Jib leveling

Table 6-5. Calibration Instructions

Lift Crack Point Calibration	Ground module replacement Lift proportional valve/coil replacement Erratic controlled arc operation Erratic controlled boom angle operation
Telescope Crack Point Calibration	Ground module replacement Telescope proportional valve replacement Erratic controlled arc operation Erratic controlled boom angle operation
Jib Level Crack Point Calibration	Jib Control Module replacement Jib level proportional valve replacement
Chassis Tilt Calibration	Ground module removal or replacement Main terminal box removal or replacement Tilt indication inaccuracy External tilt sensor removal or replacement
Boom Sensors Calibration	Ground module removal or replacement BLAM module removal or replacement Main Boom angle sensor removal or replacement Main Boom length sensor removal or replacement Moment pin removal or replacement Main Boom angle sensor calibration fault Main Boom length sensor calibration fault Moment pin fault Failed BCS functional check Boom control system inaccuracies
Jib Sensor Calibration	Ground module removal or replacement Replacement of any Jib sensor Replacement of the Jib Control Module
Platform Load Control Calibration	LSS module replacement Load cell removal or replacement Load control inaccuracy
Axle Extend/Retract Sensors Calibration	Ground module replacement Chassis module replacement Axle extend/retract sensor removal or replacement Axle extend out of range fault



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MAF09890P

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

Figure 6-8. Analyzer Flow Chart - Sheet 1 of 5 (Software Version P7.29)

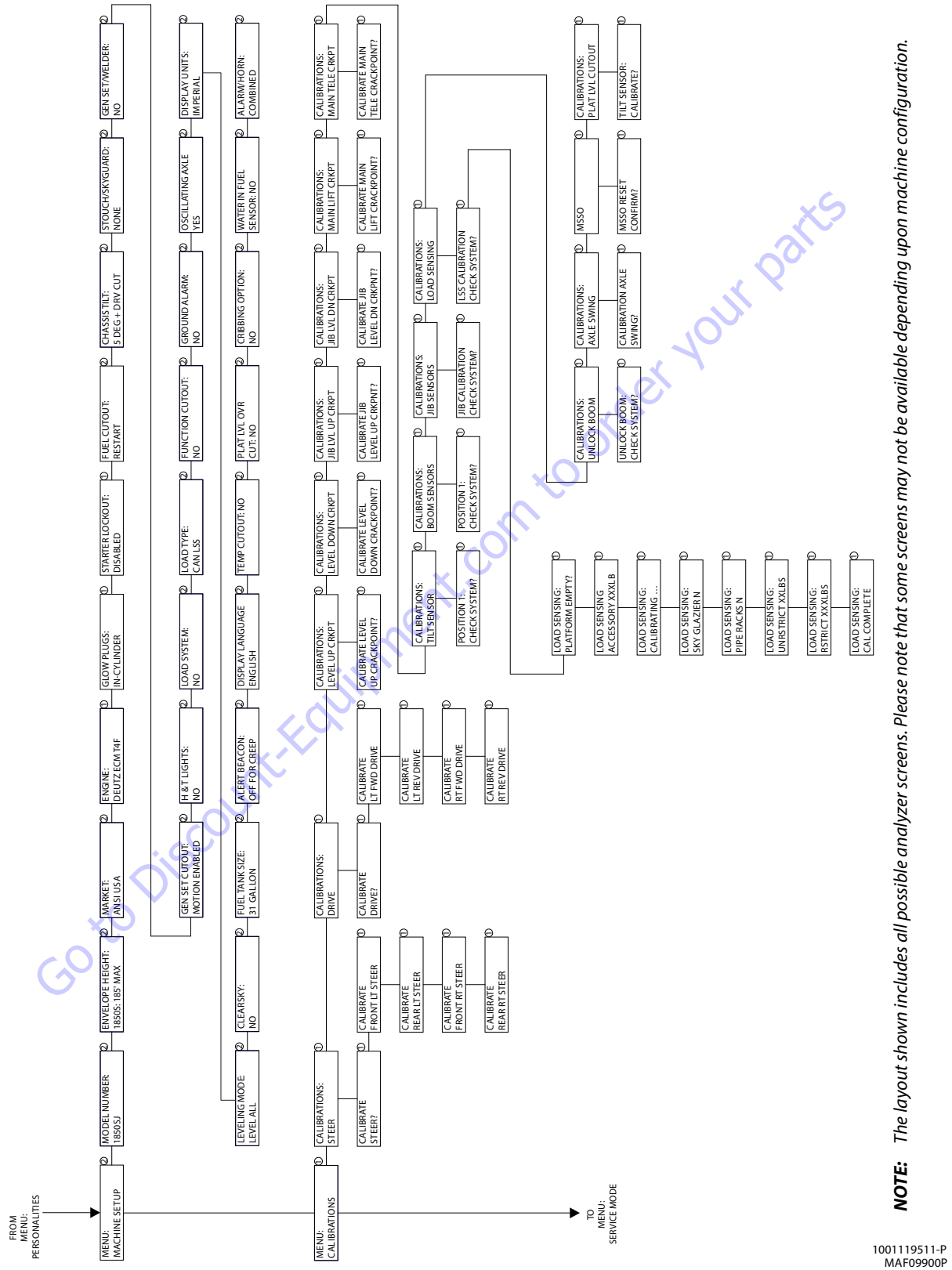

Figure 6-9. Analyzer Flow Chart - Sheet 2 of 5 (Software Version P7.29)

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

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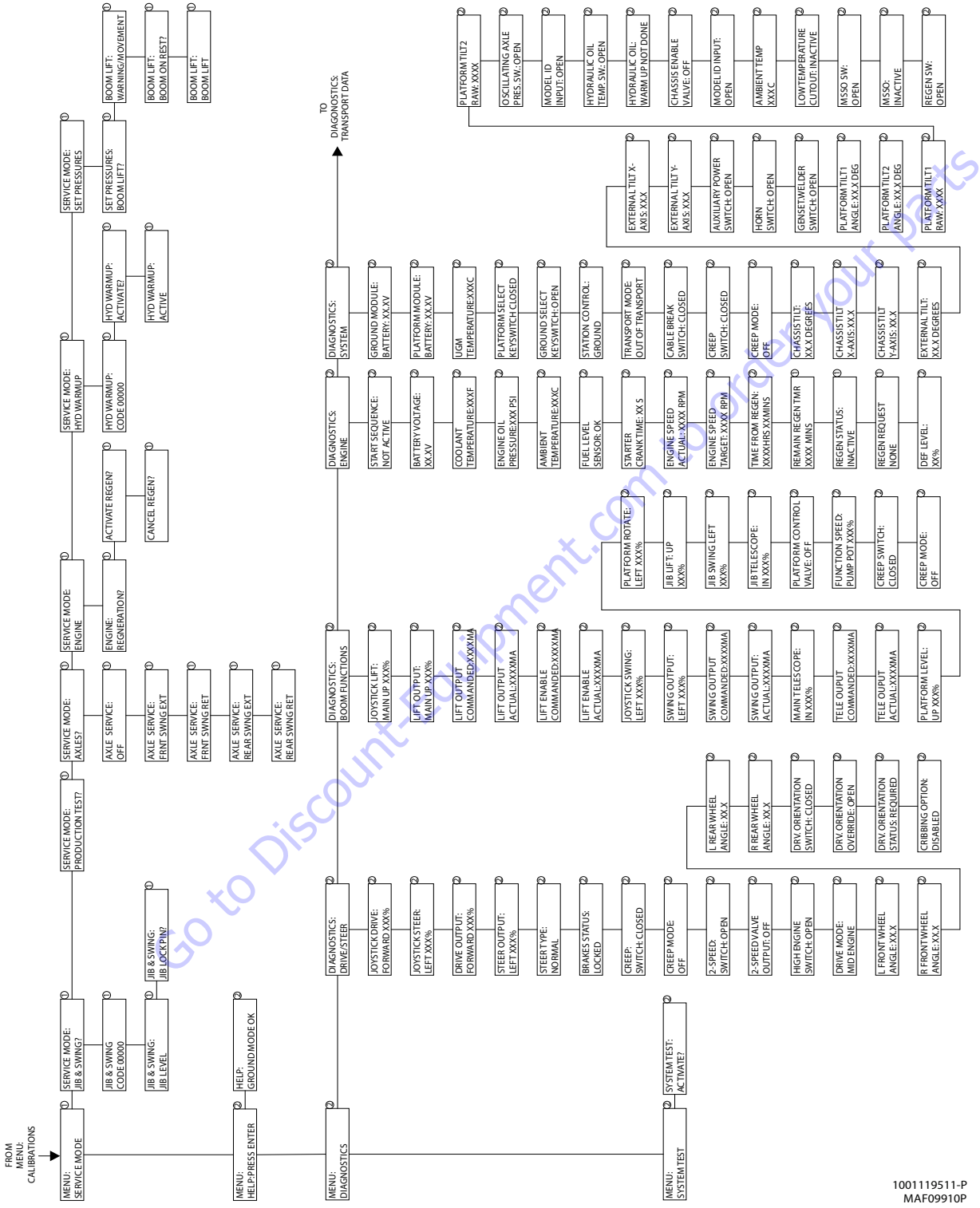
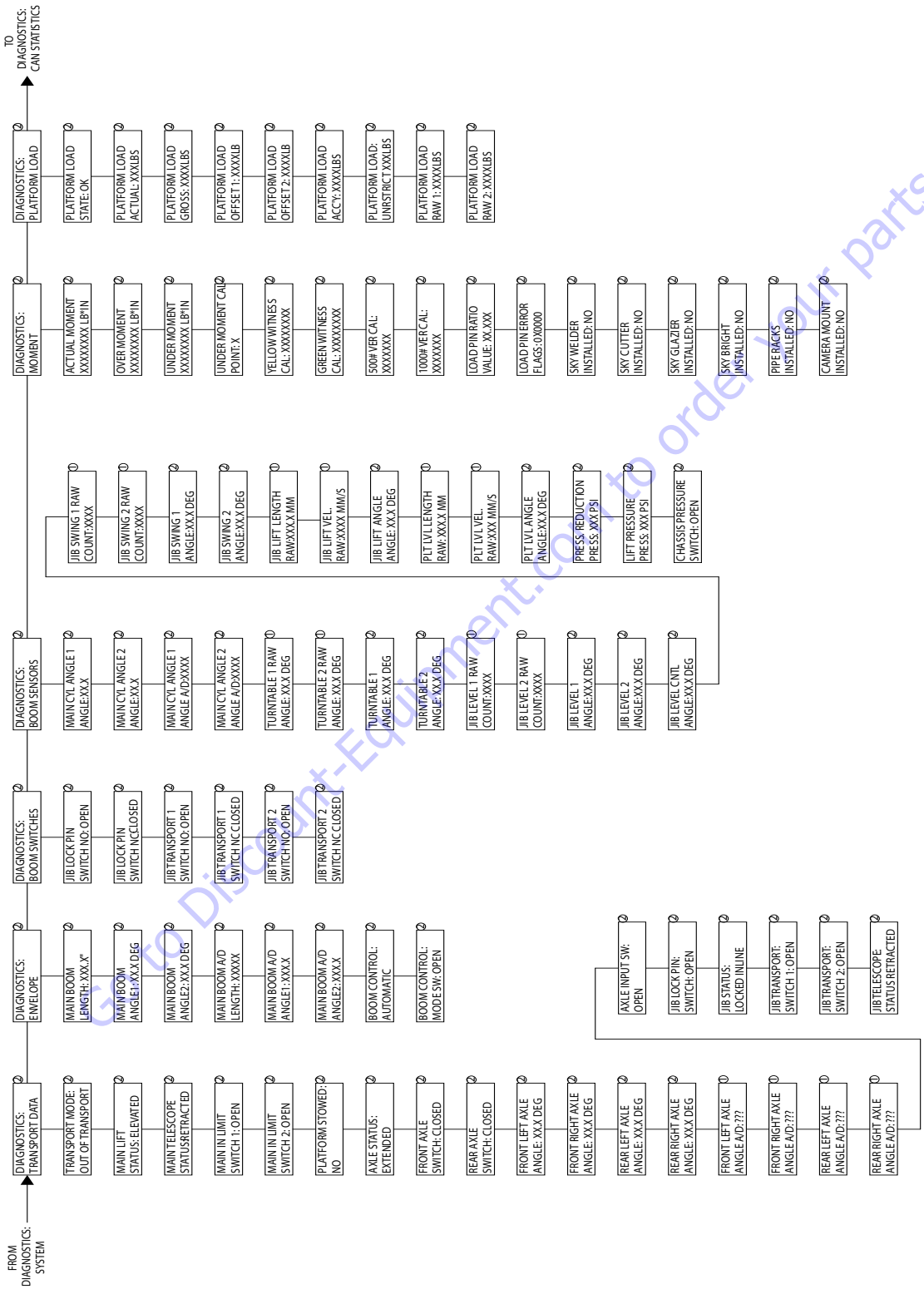


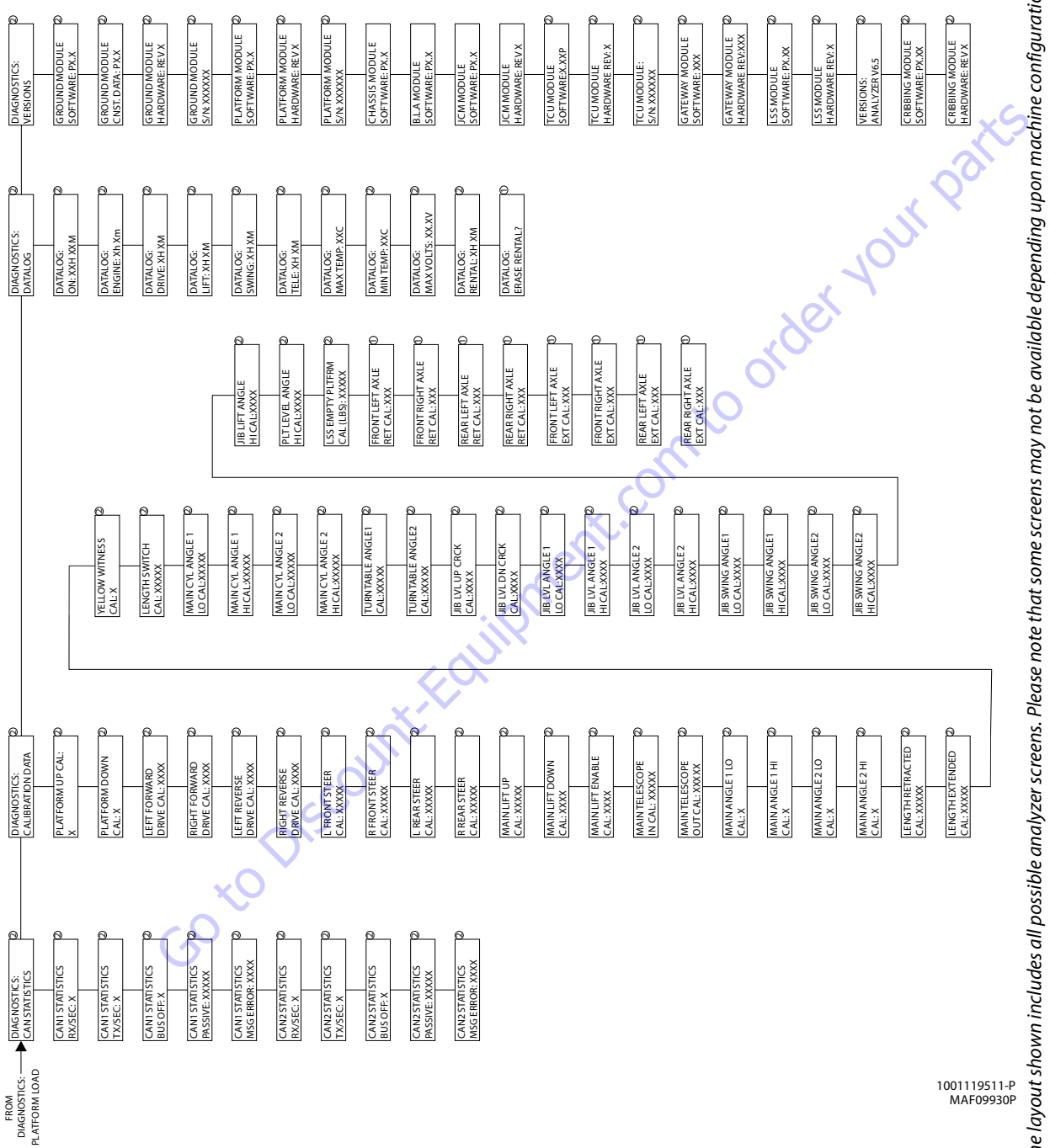
NOTE: *The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.*

Figure 6-10. Analyzer Flow Chart - Sheet 3 of 5 (Software VersionP 7.29)



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

Figure 6-11. Analyzer Flow Chart - Sheet 4 of 5 (Software Version P7.29)



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

Figure 6-12. Analyzer Flow Chart - Sheet 5 of 5 (Software Version P7.29)

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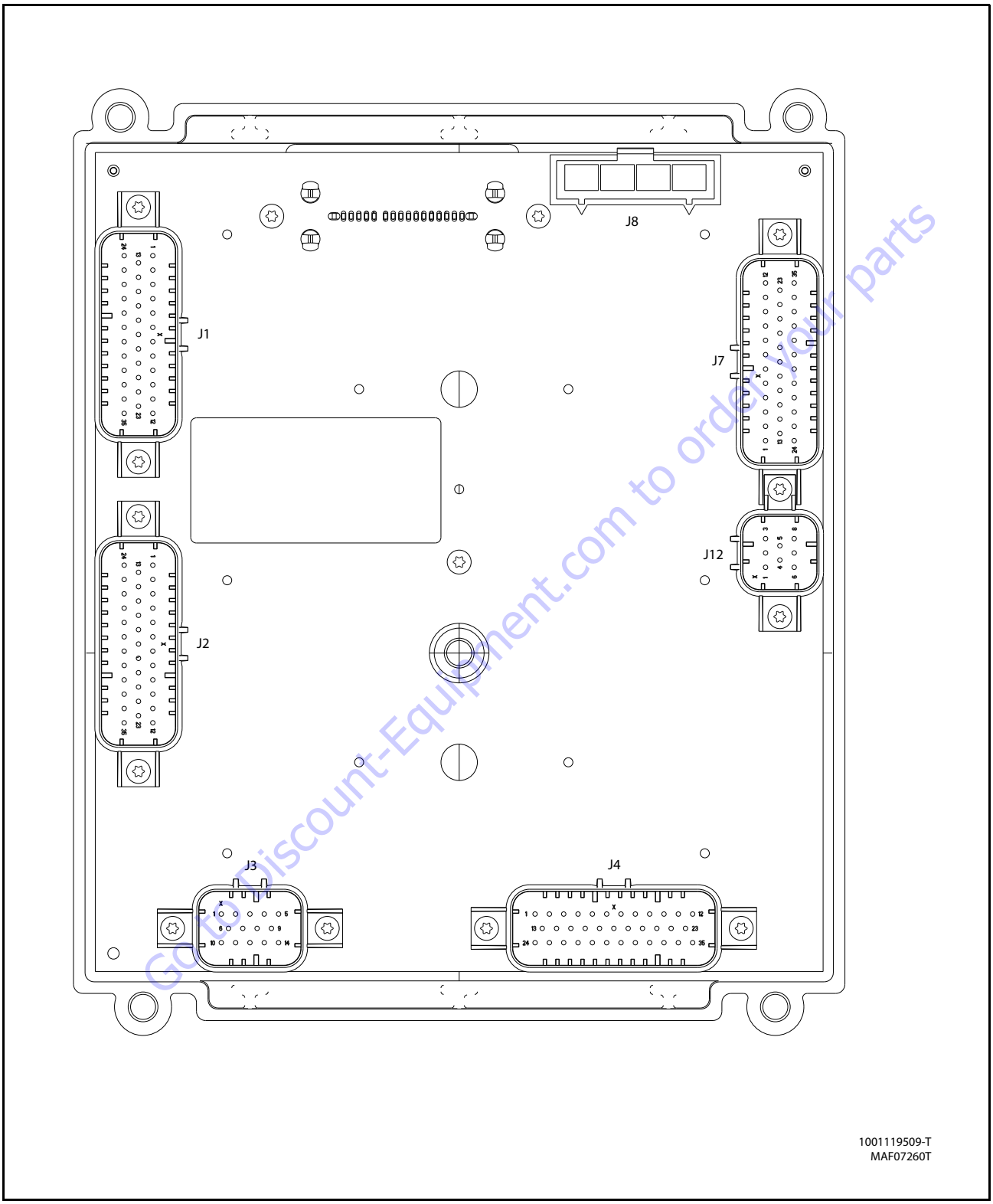

Figure 6-13. Ground Control Module

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	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	
J8 (Black)	1	GROUND FROM BATTERY	GROUND	OUTPUT
	2	GROUND EMS	VBAT	INPUT
	3	GROUND TO PLATFORM	GROUND	INPUT
	4	GROUND EMS OUT TO PLATFORM	VBAT	OUTPUT

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 CONNECTEDRS232 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	
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	
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	
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	DIGITAL	IPUT
	13	CAN HI	SERIAL	I/O
	14	GROUND MODE OUT TO PLATFORM	DIGITAL	INPUT
	15	FOOTSWITCH ENGAGE	DIGITAL	INPUT
	16	REFERENCE VOLTAGE	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

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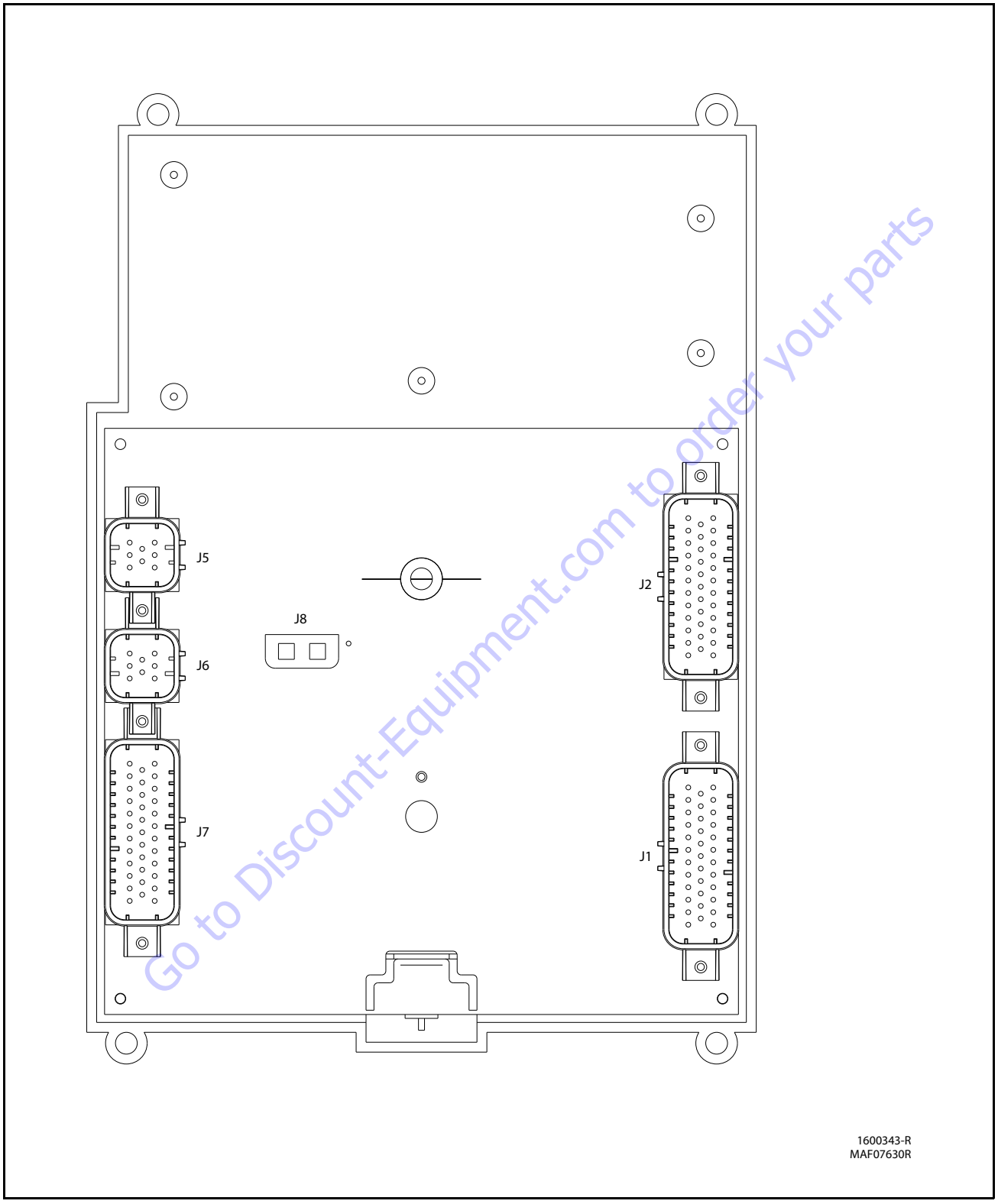

Figure 6-14. Platform Control Module

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
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
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	GRPOUND
	8	SPARE PIN	BLANK

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

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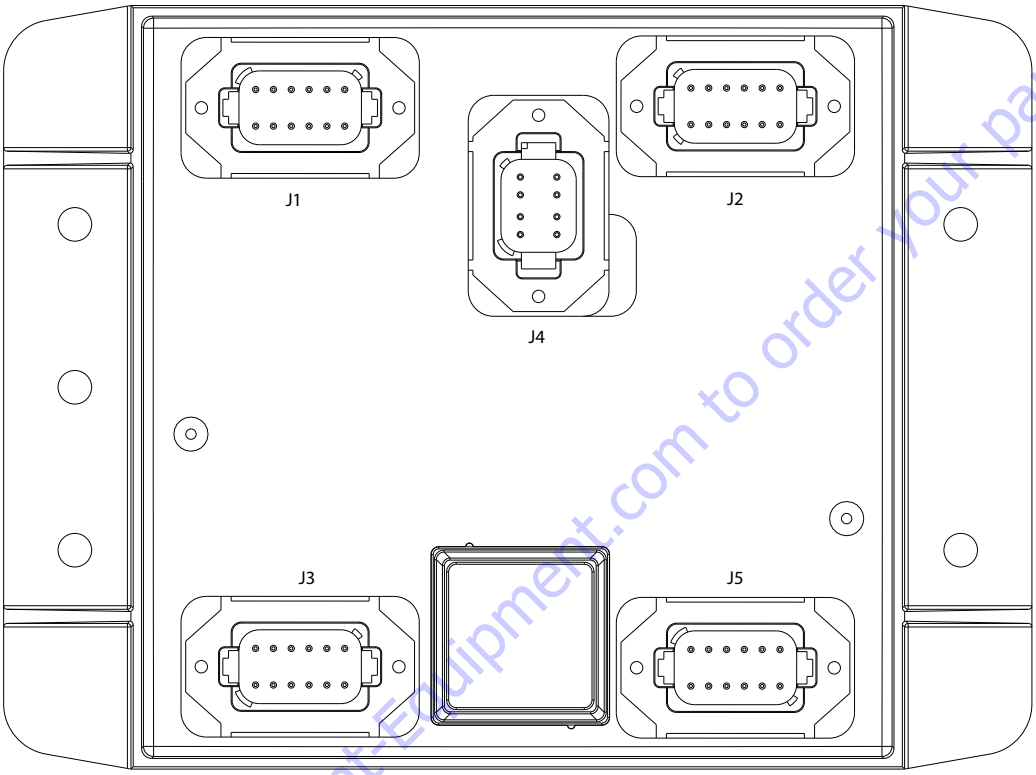

Figure 6-15. Chassis Control Module

Connector	Pin	Function	Type	
J1 (Gray)	1	POWER FEED THRU TO J2-1	POWER	I/O
	2	POWER FEED THRU TO J2-2	POWER	I/O
	3	SIGNAL FEED THRU TO J2-4	DIGITAL	I/O
	4	MASTER GROUND CONNECT	POWER	INPUT
	5	MASTER IGNITION 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	IGNITION	POWER	OUTPUT
	12	GROUND	POWER	OUTPUT

Connector	Pin	Function	Type	
J2 (Black)	1	POWER FEED THRU TO J1-1	POWER	I/O
	2	POWER FEED THRU 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 PRES SW	DIGITAL	INPUT
	8	TURNTABLE ANGLE SENSOR #1	DIGITAL	INPUT
	9	TURNTABLE ANGLE SENSOR #2	DIGITAL	INPUT
	10	SPARE ANALOG	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 (Gray)	1	IGNITION	POWER	OUTPUT
	2	GROUND	POWER	OUTPUT
	3	CANBUS HIGH	POWER	I/O
	4	CANBUS LOW	SERIAL	I/O
	5	CANBUS SHIELD	SERIAL	INPUT
	6	BOOTSTRAP MODE	POWER	INPUT
	7	IGNITION	DIGITAL	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

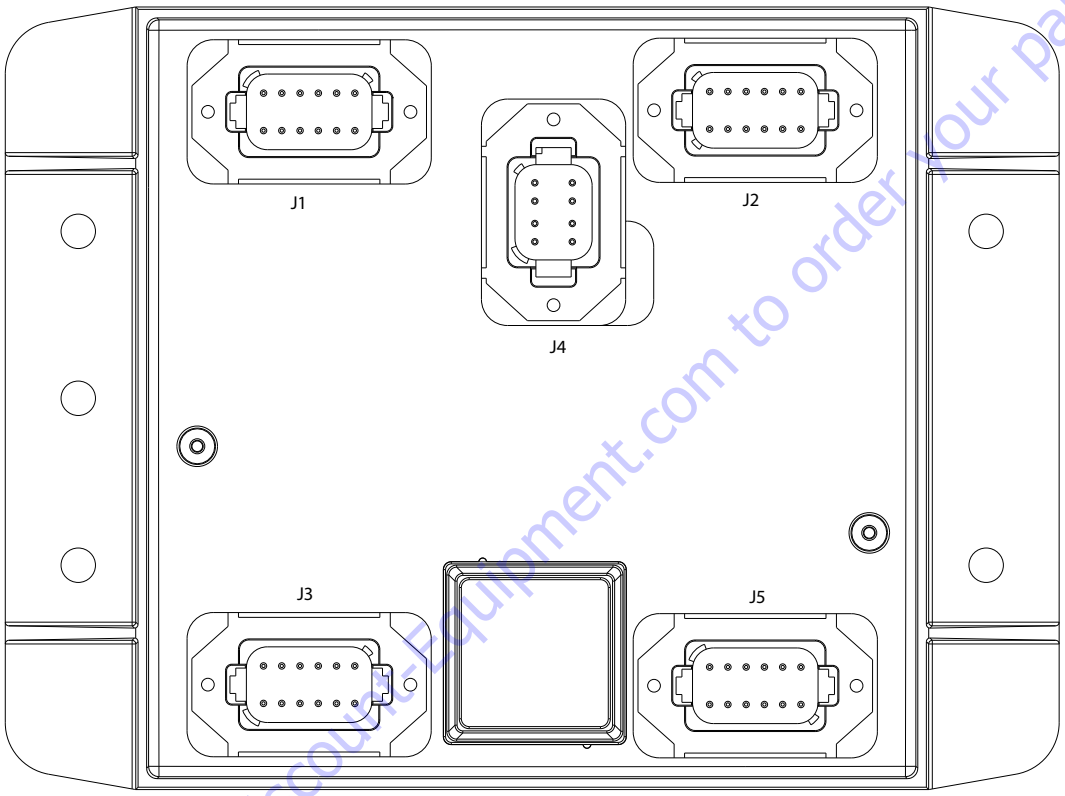

Figure 6-16. BLAM Control Module (Prior to SN 0300248234)

Connector	Pin	Function	Type	
J1 (Gray)	1	POWER FEED THRU TO J2-1	POWER	I/O
	2	POWER FEED THRU TO J2-2	POWER	I/O
	3	SIGNAL FEED THRU TO J2-4	DIGITAL	INPUT
	4	MASTER GROUND CONNECT	POWER	INPUT
	5	MASTER IGNITION 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	IGNITION	POWER	OUTPUT
	12	GROUND	POWER	OUTPUT

Connector	Pin	Function	Type	
J2 (Black)	1	POWER FEED THRU TO J1-1	POWER	I/O
	2	POWER FEED THRU TO J1-2	POWER	I/O
	3	GROUND	POWER	OUTPUT
	4	SPARE INPUT	DIGITAL	INPUT
	5	SPARE INPUT	DIGITAL	INPUT
	6	SPARE INPUT	DIGITAL	INPUT
	7	SPARE INPUT	DIGITAL	INPUT
	8	MAIN BOOM ANG 1 (GRAVITY)	DIGITAL	INPUT
	9	MAIN BOOM ANG 2 (GRAVITY)	DIGITAL	INPUT
	10	SPARE ANALOG	ANALOG	INPUT
	11	RIGHT DRIVE PUMP FORWARD	DIGITAL	OUTPUT
	12	RIGHT DRIVE PUMP REVERSE	DIGITAL	OUTPUT

Connector	Pin	Function	Type	
J3 (Green)	1	+5V ANALOG REFERENCE	POWER	OUTPUT
	2	REF VOLTAGE FROM J3-1	ANALOG	INPUT
	3	GROUND	POWER	OUTPUT
	4	+5V ANALOG REFERENCE	POWER	OUTPUT
	5	MAIN CYL ANGLE #1(ABSOLUTE)	ANALOG	INPUT
	6	GROUND	POWER	OUTPUT
	7	+5V ANALOG REFERENCE	POWER	OUTPUT
	8	BOOM LENGTH SENSOR	ANALOG	INPUT
	9	GROUND	POWER	OUTPUT
	10	+5V ANALOG REFERENCE	POWER	OUTPUT
	11	MAIN CYL ANGLE #2(ABSOLUTE)	ANALOG	INPUT
	12	GROUND	POWER	OUTPUT

Connector	Pin	Function	Type	
J4 (Gray)	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	SPARE OUTPUT - D005	DIGITAL	OUTPUT
	5	SPARE OUTPUT - D006	DIGITAL	OUTPUT
	6	SPARE OUTPUT - D007	DIGITAL	OUTPUT
	7	SPARE OUTPUT - D008	DIGITAL	OUTPUT
	8	SPARE OUTPUT - D009	DIGITAL	OUTPUT
	9	IGNITION	POWER	OUTPUT
	10	RS232 RECEIVE	SERIAL	INPUT
	11	RS232 TRANSMIT	SERIAL	OUTPUT
	12	GROUND	POWER	OUTPUT

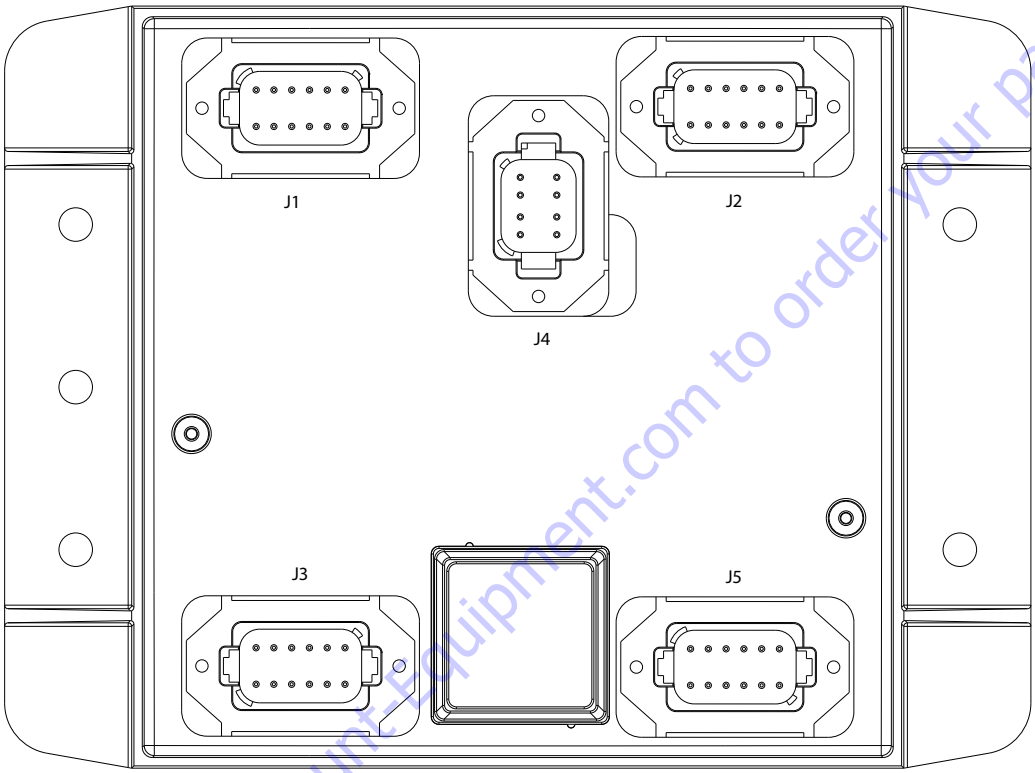

Figure 6-17. BLAM Control Module (SN 0300248235 to Present)

Connector	Pin	Function	Type	
J1 (Gray)	1	POWER FEED THRU TO J2-1	POWER	I/O
	2	POWER FEED THRU TO J2-2	POWER	I/O
	3	SIGNAL FEED THRU TO J2-4	DIGITAL	INPUT
	4	MASTER GROUND CONNECT	POWER	INPUT
	5	MASTER IGNITION 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	IGNITION	POWER	OUTPUT
	12	GROUND	POWER	OUTPUT

Connector	Pin	Function	Type	
J2 (Black)	1	POWER FEED THRU TO J1-1	POWER	I/O
	2	POWER FEED THRU TO J1-2	POWER	I/O
	3	GROUND	POWER	OUTPUT
	4	SPARE INPUT	DIGITAL	INPUT
	5	SPARE INPUT	DIGITAL	INPUT
	6	SPARE INPUT	DIGITAL	INPUT
	7	SPARE INPUT	DIGITAL	INPUT
	8	MAIN BOOM ANG 1 (GRAVITY)	DIGITAL	INPUT
	9	MAIN BOOM ANG 2 (GRAVITY)	DIGITAL	INPUT
	10	SPARE ANALOG	ANALOG	INPUT
	11	RIGHT DRIVE PUMP FORWARD	DIGITAL	OUTPUT
	12	RIGHT DRIVE PUMP REVERSE	DIGITAL	OUTPUT

Connector	Pin	Function	Type	
J3 (Green)	1	+5V ANALOG REFERENCE	POWER	OUTPUT
	2	REF VOLTAGE FROM J3-1	ANALOG	INPUT
	3	GROUND	POWER	OUTPUT
	4	+5V ANALOG REFERENCE	POWER	OUTPUT
	5	MAIN CYL ANGLE #1(ABSOLUTE)	ANALOG	INPUT
	6	GROUND	POWER	OUTPUT
	7	+5V ANALOG REFERENCE	POWER	OUTPUT
	8	BOOM LENGTH SENSOR	ANALOG	INPUT
	9	GROUND	POWER	OUTPUT
	10	+5V ANALOG REFERENCE	POWER	OUTPUT
	11	MAIN CYL ANGLE #2(ABSOLUTE)	ANALOG	INPUT
	12	GROUND	POWER	OUTPUT

Connector	Pin	Function	Type	
J4 (Gray)	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	SPARE OUTPUT - D005	DIGITAL	OUTPUT
	5	SPARE OUTPUT - D006	DIGITAL	OUTPUT
	6	SPARE OUTPUT - D007	DIGITAL	OUTPUT
	7	SPARE OUTPUT - D008	DIGITAL	OUTPUT
	8	SPARE OUTPUT - D009	DIGITAL	OUTPUT
	9	IGNITION	DIGITAL	OUTPUT
	10	RS232 RECEIVE	SERIAL	INPUT
	11	RS232 TRANSMIT	SERIAL	OUTPUT
	12	GROUND	POWER	OUTPUT

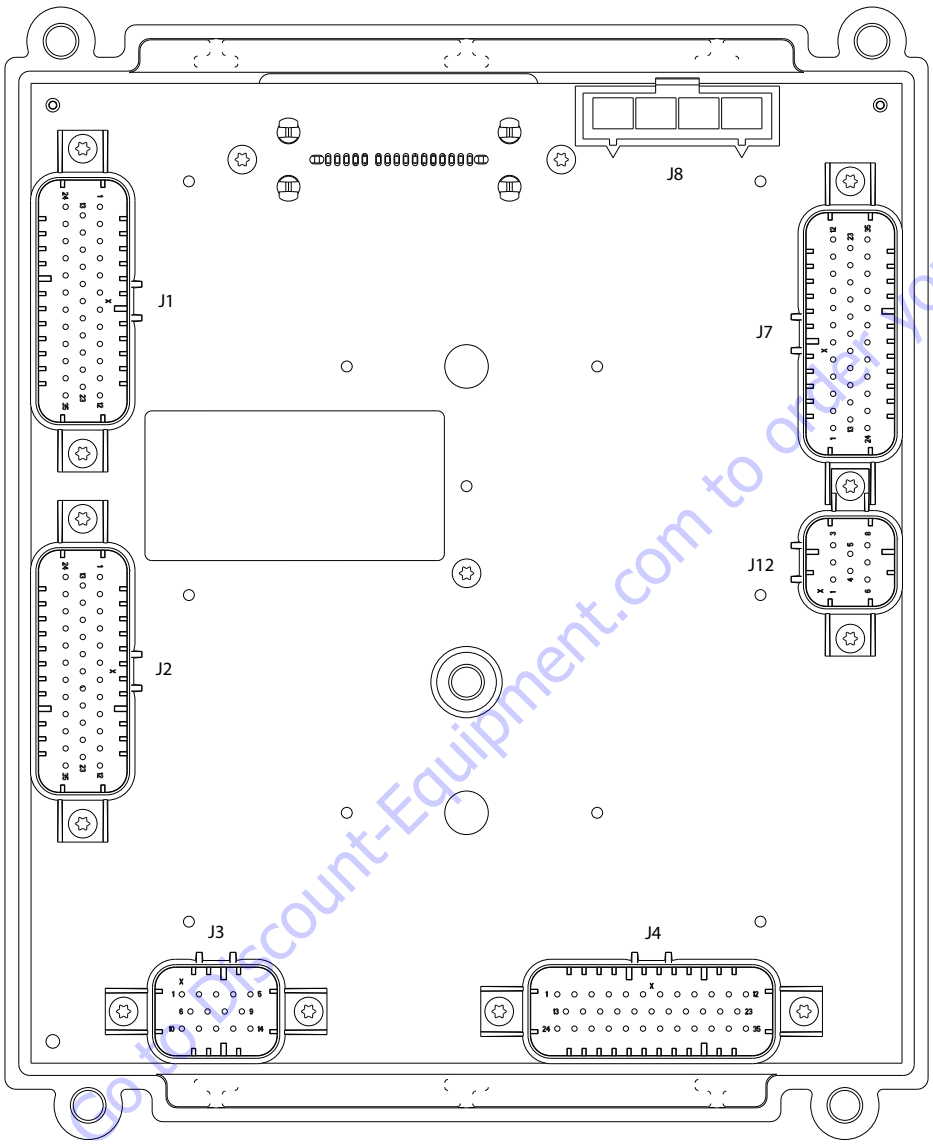

Figure 6-18. Ultra Boom Control Module

Connector	Pin	Function	Type	
J1 (Natural)	1	SPARE	DIGITAL	OUTPUT
	2	SPARE	DIGITAL	OUTPUT
	3	SPARE	DIGITAL	OUTPUT
	4	SPARE	GROUND	INPUT
	5	SPARE	GROUND	INPUT
	6	SPARE	DIGITAL	OUTPUT
	7	SPARE	DIGITAL	OUTPUT
	8	GROUND	GROUND	INPUT
	9	GROUND	GROUND	INPUT
	10	SPARE	DIGITAL	OUTPUT
	11	SPARE	DIGITAL	OUTPUT
	12	SPARE	DIGITAL	OUTPUT
	13	SPARE	DIGITAL	OUTPUT
	14	LEFT FRONT AXLE SWING	ANALOG	INPUT
	15	RIGHT REAR AXLE SWING	ANALOG	INPUT
	16	TURNTABLE ANGLE #1	FREQUENCY	INPUT
	17	SPARE	GROUND	INPUT
	18	SPARE	GROUND	INPUT
	19	SPARE	GROUND	INPUT
	20	SPARE	DIGITAL	OUTPUT
	21	SPARE	DIGITAL	INPUT
	22	SPARE	DIGITAL	OUTPUT
	23	SPARE	DIGITAL	OUTPUT
	24	SPARE	N/C	N/C
	25	SPARE	SERIAL	I/O
	26	SPARE	SERIAL	I/O
	27	SPARE	GROUND	INPUT
	28	ANALYZER POWER	VOLTAGE	OUTPUT
	29	ANALYZER RS-232 Rx	SERIAL	INPUT
	30	ANALYZER RS-232 Rx	SERIAL	OUTPUT
	31	ANALYZER GROUND	GROUND	INPUT
	32	SPARE	DIGITAL	OUTPUT
	33	SPARE	GROUND	INPUT
	34	SPARE	DIGITAL	INPUT
	35	SPARE	DIGITAL	INPUT

Connector	Pin	Function	Type	
J2 (Gray)	1	TWO SPEED	DIGITAL	OUTPUT
	2	SPARE	DIGITAL	OUTPUT
	3	SPARE	DIGITAL	OUTPUT
	4	FRONT AXLE SWING EXTEND	DIGITAL	OUTPUT
	5	REAR AXLE SWING EXTEND	DIGITAL	OUTPUT
	6	GROUND	GROUND	INPUT
	7	REAR AXLE SWING RETRACT	DIGITAL	OUTPUT
	8	RIGHT REAR STEER RIGHT	DIGITAL	OUTPUT
	9	LEFT REAR STEER RIGHT	DIGITAL	OUTPUT
	10	SPARE	DIGITAL	OUTPUT
	11	RIGHT FRONT STEER RIGHT	DIGITAL	OUTPUT
	12	SPARE	DIGITAL	OUTPUT
	13	BRAKE	DIGITAL	OUTPUT
	14	GROUND	GROUND	INPUT
	15	SPARE	DIGITAL	OUTPUT
	16	FRONT AXLE SWING RETRACT	DIGITAL	OUTPUT
	17	GROUND	GROUND	INPUT
	18	GROUND	GROUND	INPUT
	19	RIGHT REAR STEER LEFT	DIGITAL	OUTPUT
	20	LEFT REAR STEER LEFT	DIGITAL	OUTPUT
	21	SPARE	DIGITAL	OUTPUT
	22	RIGHT FRONT STEER LEFT	DIGITAL	OUTPUT
	23	SPARE	DIGITAL	OUTPUT
	24	SPARE	DIGITAL	INPUT
	25	FRONT RIGHT AXLE SWING	ANALOG	INPUT
	26	SPARE	DIGITAL	OUTPUT
	27	SPARE	DIGITAL	OUTPUT
	28	GROUND	GROUND	INPUT
	29	SPARE	GROUND	INPUT
	30	GROUND	GROUND	INPUT
	31	SPARE	DIGITAL	OUTPUT
	32	SPARE	DIGITAL	OUTPUT
	33	SPARE	DIGITAL	OUTPUT
	34	LEFT FRONT STEER LEFT	DIGITAL	OUTPUT
	35	LEFT FRONT STEER RIGHT	DIGITAL	OUTPUT

Connector	Pin	Function	Type	
J8 (Black)	1	GROUND FROM BATTERY	GROUND	INPUT
	2	POWER FROM BATTERY	POWER	INPUT
	3	SENSOR SHIELD	GROUND	OUTPUT
	4	SPARE	POWER	OUTPUT

Connector	Pin	Function	Type	
J12 (Black)	1	TURNTABLE ANGLE #2	FREQUENCY	INPUT
	2	GROUND	FREQUENCY	INPUT
	3	SPARE	SERIAL	I/O
	4	SPARE	SERIAL	I/O
	5	SPARE	GROUND	INPUT
	6	SPARE	TERM	I/O
	7	SPARE	TERM	I/O
	8	SPARE	DIGITAL	INPUT

Connector	Pin	Function	Type	
J3 (Black)	1	FRONT AXLE SWING RETURN	GROUND	INPUT
	2	REAR AXLE SWING RETURN	GROUND	INPUT
	3	GROUND	GROUND	INPUT
	4	SPARE	GROUND	INPUT
	5	SPARE	GROUND	INPUT
	6	SPARE	GROUND	INPUT
	7	SPARE	VBAT	OUTPUT
	8	SPARE	DIGITAL	INPUT
	9	SPARE	DIGITAL	INPUT
	10	SPARE	DIGITAL	INPUT
	11	SPARE	DIGITAL	INPUT
	12	ANALOG REF. VOLTAGE	VOLTAGE	OUTPUT
	13	LEFT REAR AXLE SWING	ANALOG	INPUT
	14	SPARE	GROUND	INPUT

Connector	Pin	Function	Type	
J4 (Blue)	1	SPARE	DIGITAL	OUTPUT
	2	SPARE	DIGITAL	OUTPUT
	3	SPARE	DIGITAL	OUTPUT
	4	SPARE	DIGITAL	INPUT
	5	SPARE	DIGITAL	INPUT
	6	SPARE	DIGITAL	INPUT
	7	SPARE	DIGITAL	INPUT
	8	SPARE	DIGITAL	INPUT
	9	SPARE	DIGITAL	INPUT
	10	SPARE	DIGITAL	INPUT
	11	SPARE	DIGITAL	INPUT
	12	SPARE	DIGITAL	INPUT
	13	SPARE	DIGITAL	OUTPUT
	14	SPARE	DIGITAL	OUTPUT
	15	SPARE	DIGITAL	OUTPUT
	16	SPARE	DIGITAL	OUTPUT
	17	SPARE	DIGITAL	INPUT
	18	SPARE	DIGITAL	INPUT
	19	SPARE	DIGITAL	INPUT
	20	SPARE	DIGITAL	INPUT
	21	SPARE	DIGITAL	INPUT
	22	SPARE	DIGITAL	INPUT
	23	SPARE	DIGITAL	INPUT
	24	SPARE	VBAT	OUTPUT
	25	SPARE	VBAT	OUTPUT
	26	SPARE	DIGITAL	OUTPUT
	27	SPARE	DIGITAL	OUTPUT
	28	SPARE	DIGITAL	OUTPUT
	29	SPARE	DIGITAL	OUTPUT
	30	SPARE	DIGITAL	INPUT
	31	SPARE	GROUND	INPUT
	32	SPARE	GROUND	INPUT
	33	SPARE	DIGITAL	INPUT
	34	SPARE	DIGITAL	INPUT
	35	SPARE	DIGITAL	INPUT

Connector	Pin	Function	Type	
J7 (Black)	1	SPARE	DIGITAL	INPUT
	2	SPARE	DIGITAL	INPUT
	3	SPARE	DIGITAL	INPUT
	4	RIGHT FRONT STEER	ANALOG	INPUT
	5	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	6	CAN TERMINATION	TERM	I/O
	7	LEFT FRONT STEER	ANALOG	INPUT
	8	LEFT REAR STEER	ANALOG	INPUT
	9	GROUND	GROUND	INPUT
	10	GROUND	GROUND	INPUT
	11	DRIVE ORIENTATION SWITCH	DIGITAL	INPUT
	12	SPARE		INPUT
	13	CAN HI	SERIAL	I/O
	14	SPARE	DIGITAL	INPUT
	15	BRAKE RELEASE FROM UGM	DIGITAL	INPUT
	16	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	17	CAN TERMINATION	TERM	I/O
	18	CAN SHEILD	GROUND	INPUT
	19	SPARE	GROUND	INPUT
	20	RIGHT REAR STEER	ANALOG	INPUT
	21	SPARE	DIGITAL	INPUT
	22	SPARE	DIGITAL	INPUT
	23	SPARE	DIGITAL	INPUT
	24	CAN LO	SERIAL	I/O
	25	GROUND	GROUND	INPUT
	26	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	27	REFERENCE VOLTAGE	VOLTAGE	OUTPUT
	28	GROUND	GROUND	INPUT
	29	VBAT	VBAT	OUTPUT
	30	SPARE	VBAT	OUTPUT
	31	SPARE	VBAT	OUTPUT
	32	SPARE	VBAT	OUTPUT
	33	SPARE	VBAT	OUTPUT
	34	SPARE	VBAT	OUTPUT
	35	SPARE	DIGITAL	INPUT

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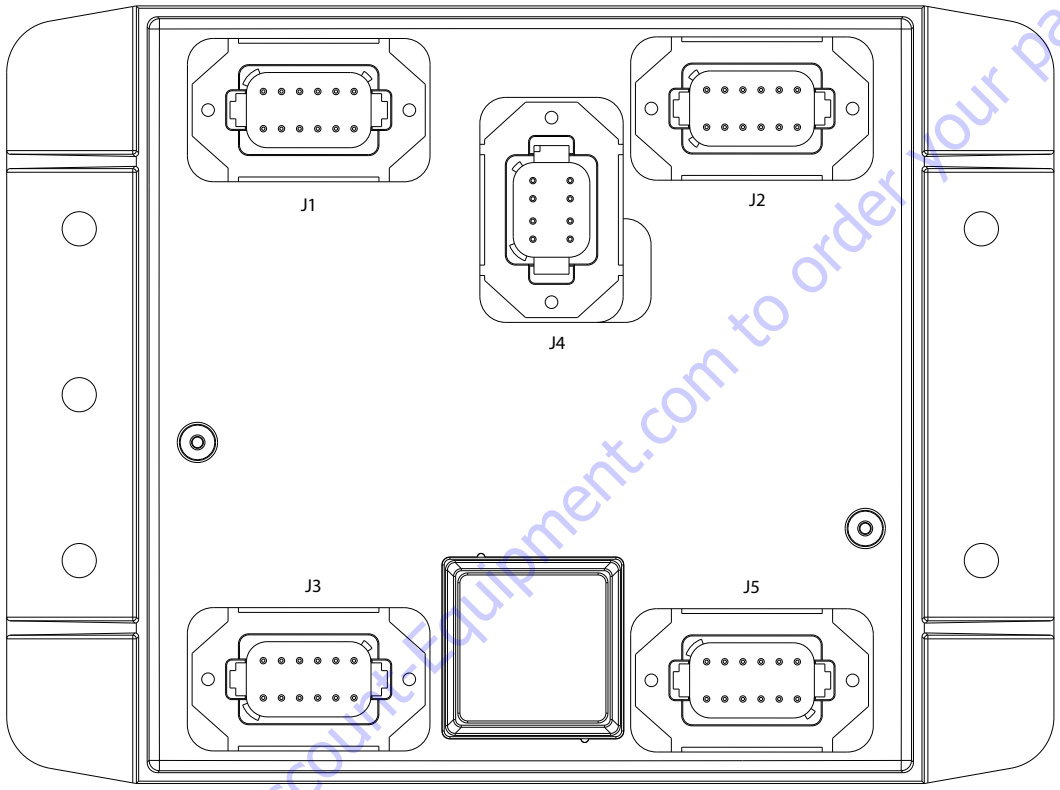


Figure 6-19. Jib Control Module

Connector	Pin	Function	Type	
J1 (Gray)	1	Power Feed Thru to J2-1	Power	I/O
	2	Power Feed Thru to J2-2	Power	I/O
	3	Signal Feed Thru to J2-4	Digital	Input
	4	Master Ground Connect	Power	Input
	5	Master Ignition 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	Ignition	Power	Output
	12	Ground	Power	Output

Connector	Pin	Function	Type	
J2 (Black)	1	Power Feed Thru to J1-1	Power	I/O
	2	Power Feed Thru to J1-2	Power	I/O
	3	Ground	Power	Output
	4	Lock Pin NO Contact	Digital	Input
	5	Lock Pin NC Contact	Digital	Input
	6	Jib Transport #1 NO Contact	Digital	Input
	7	Jib Transport #1 NC Contact	Digital	Input
	8	Spare Input	Digital	Input
	9	Spare Input	Digital	Input
	10	Spare Analog Input	Analog	Input
	11	Jib Level Up	Digital	Output
	12	Jib Level Down	Digital	Output

Connector	Pin	Function	Type	
J3 (Green)	1	+5V Analog Reference	Power	Output
	2	Jib Level Angle #1	Analog	Input
	3	Ground	Power	Output
	4	+5V Analog Reference	Power	Output
	5	Jib level Angle #2	Analog	Input
	6	Ground	Power	Output
	7	+5V Analog Reference	Power	Output
	8	Jib Swing Angle #1	Analog	Input
	9	Ground	Power	Output
	10	+5V Analog Reference	Power	Output
	11	Jib Swing Angle #2	Analog	Input
	12	Ground	Power	Output

Connector	Pin	Function	Type	
J4 (Gray)	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	Jib Lift Up	Digital	Output
	2	Jib Lift Down	Digital	Output
	3	Jib Swing Right	Digital	Output
	4	Jib Swing Left	Digital	Output
	5	Jib Telescope In	Digital	Output
	6	Jib Telescope Out	Digital	Output
	7	Spare Output	Digital	Output
	8	Spare Output	Digital	Output
	9	Ignition	Power	Output
	10	RS232 Receive	Serial	Input
	11	RS232 Transmit	Serial	Output
	12	Ground	Power	Output

Figure 6-20. Analyzer Connecting Points

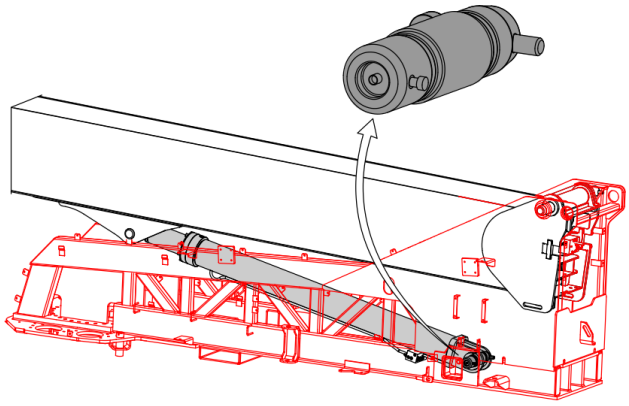
6.6 CONTROL SYSTEM BOOM SENSORS

The Boom Control System (BCS) requires the use of multiple sensors to measure the position of the boom. The sensors used to determine main boom and jib boom position are shown in the following figures.

NOTICE

THE CONTROL SYSTEM MUST BE RECALIBRATED AFTER REPLACING OF ANY SENSOR.

Sensor #1 - Load Pin (1)



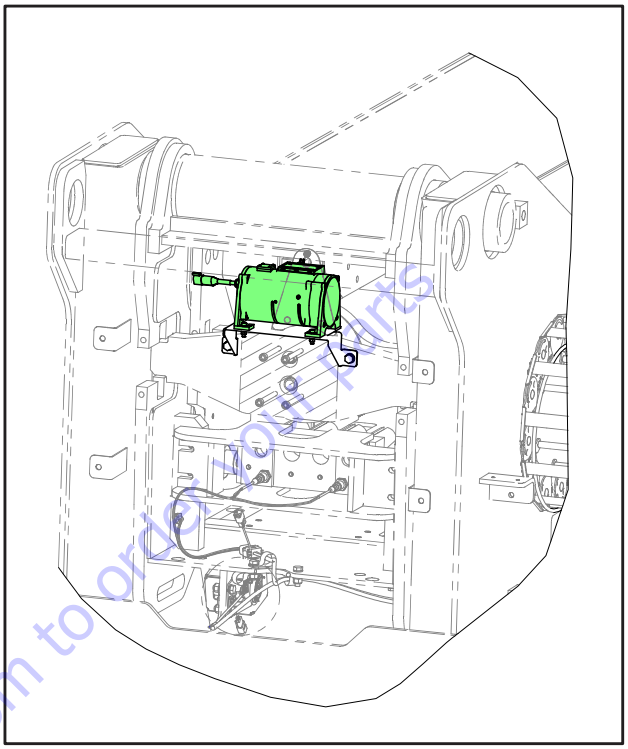
The Main Lift Cylinder is attached to the Turntable with a load cell pin. This pin is fixed to the Turntable so as to allow measurement of the force exerted by the cylinder regardless of the cylinder orientation.

Sensor #2 - Main Boom Angle Sensors (2)

See (See Figure 6-21.)

These sensors measure Main Boom angle with respect to gravity. They are located in the rear of the Section #1boom and mounted such that they generate opposing signals with respect to boom movement.

Sensor #3 - Main Boom Length Sensor (1)



This sensor is used to measure total stroke of the Main Boom. It is located in the rear of the Base Boom and consists of a wire rope attached to a rotating drum.

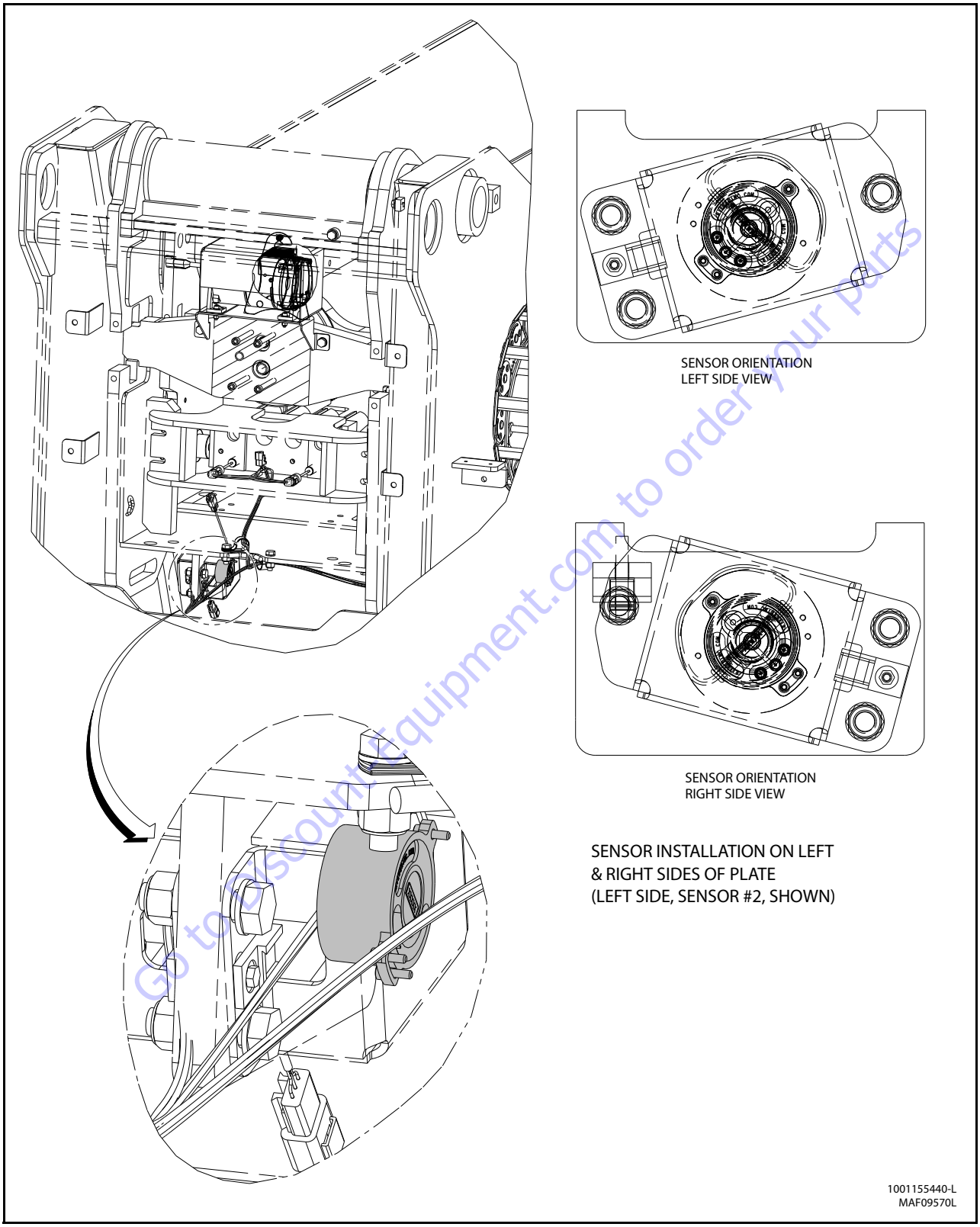


Figure 6-21. Main Boom Angle Sensors

ANGLE SENSOR #1 (RIGHT)			
PIN #	**DESC**	**SENSOR**	**HARNESS**
PIN #1	POWER	RED	RED
PIN #2	OUTPUT	WHITE	BLUE
PIN #3	GROUND	BLACK	BLACK

ANGLE SENSOR #2 (LEFT)			
PIN #	**DESC**	**SENSOR**	**HARNESS**
PIN #1	POWER	RED	ORANGE
PIN #2	OUTPUT	WHITE	YELLOW
PIN #3	GROUND	BLACK	BLACK

Sensor #4 - Main Boom Cylinder Angle Sensor (1)

See (See Figure 6-22.)

This sensor's function is to measure Main Boom angle relative to the Turntable. A rotary type sensor is mounted to the Turntable and attached to the Main Lift cylinder of the base boom. It is a dual output sensor in a single mechanical body with electrically opposing signals.

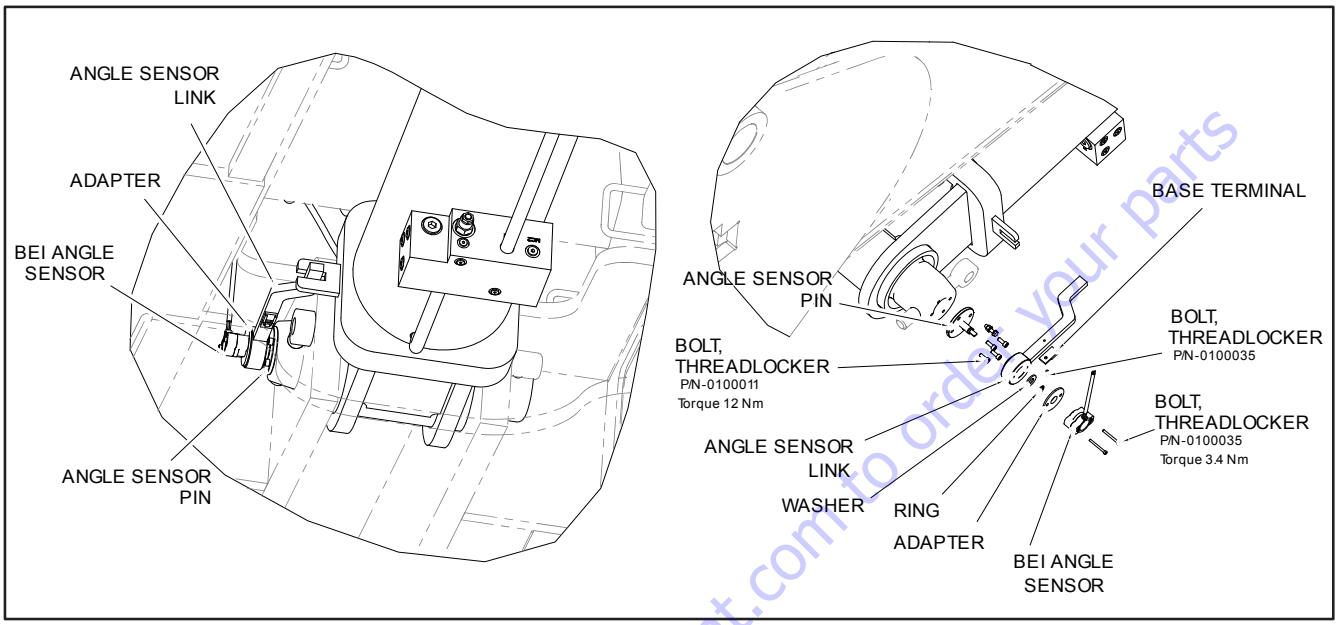


Figure 6-22. Main Boom Cylinder Angle (Protractor) Sensor

Sensor #5 - Main Boom Transport Length Switch (1)

See (See Figure 6-23.)

This switch is used to indicate Main Boom retracted position for transport. This is a mechanical limit switch.

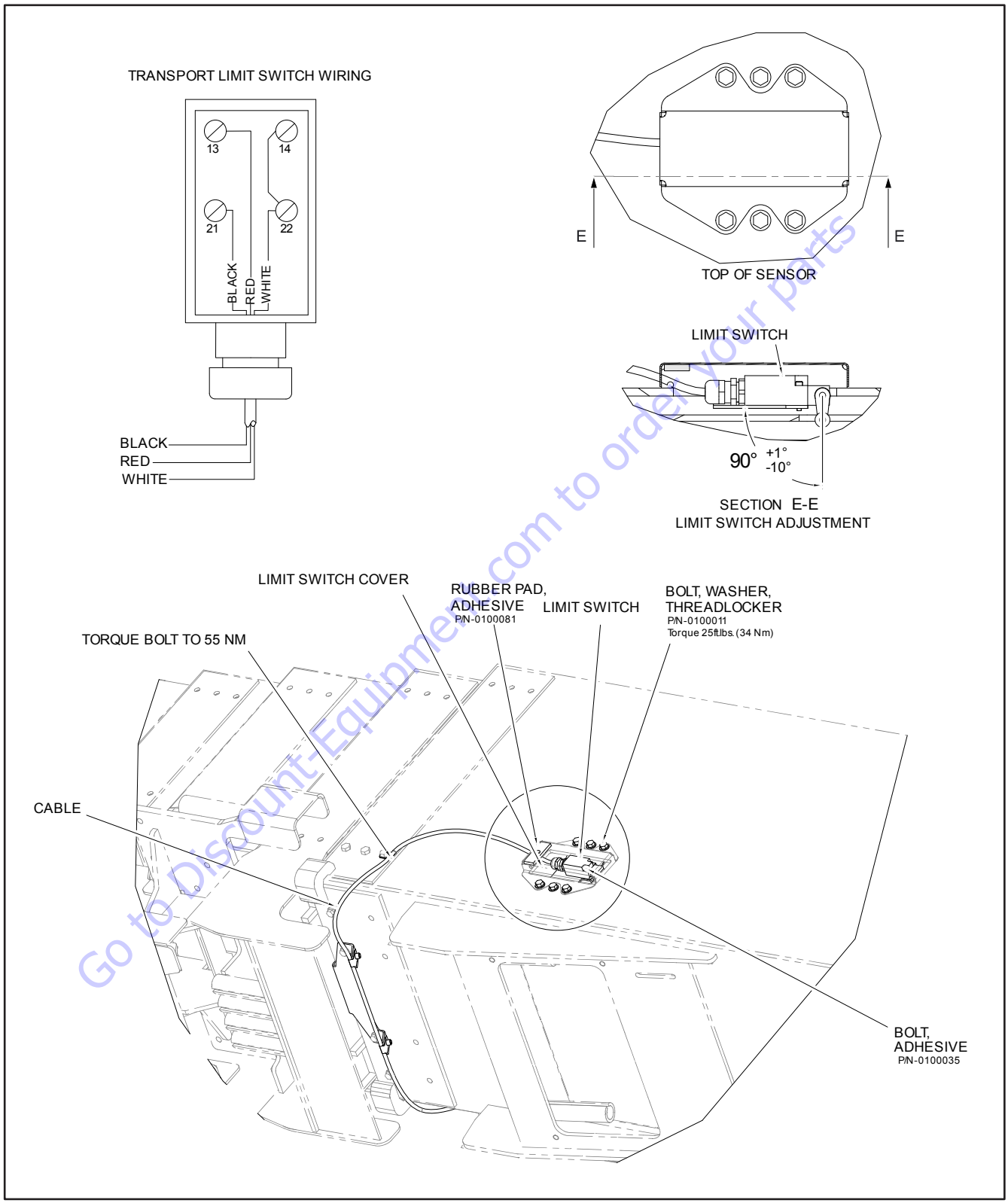


Figure 6-23. Main Boom Transport Length Switch

Sensor #6 - Jib Level Angle Sensor (1)

See (See Figure 6-25.)

This sensor is used to measure Jib Level angle relative to the Main Boom. A rotary type sensor is mounted between the Main Boom Fly nose and the Jib Pivot weldment. It is a dual output sensor in a single mechanical body with electrically opposing signals.

SENSOR INSTALLATION

1. Attach the sensor to the mounting plate.
2. Attach the link to the sensor arm.
3. Install the sensor subassembly onto the boom.
4. Connect the sensor wiring.

Sensor #7 - Jib Lock Pin Proximity Sensor (1)

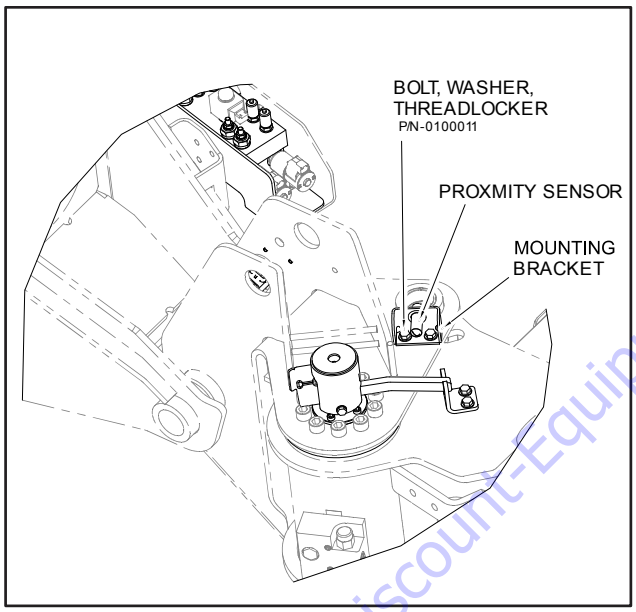
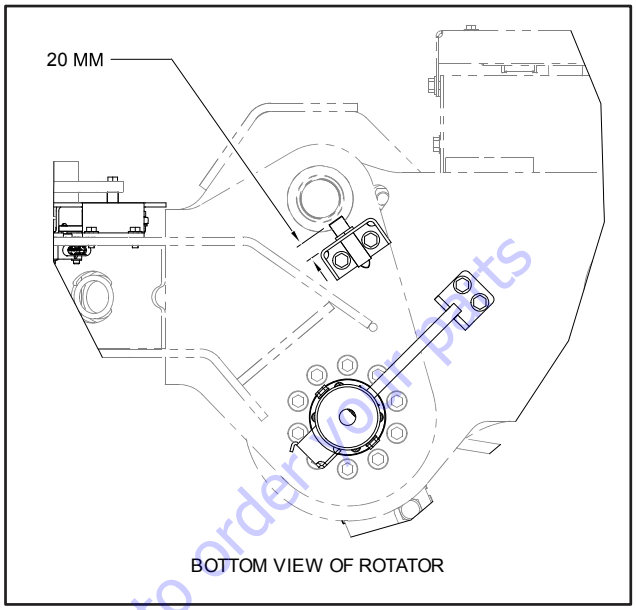


Figure 6-24. Jib Lock Pin Proximity Sensor

This sensor is used to indicate the Jib Lock Pin is fully engaged. This is a proximity switch mounted to the Jib Pivot weldment.

LOCK PIN SENSOR ADJUSTMENT

Adjust the proximity sensor to 20 mm from the front face of the proximity sensor to the front mounting face of the mounting bracket. The LED on the sensor will light when power is applied and the sensor is within range.



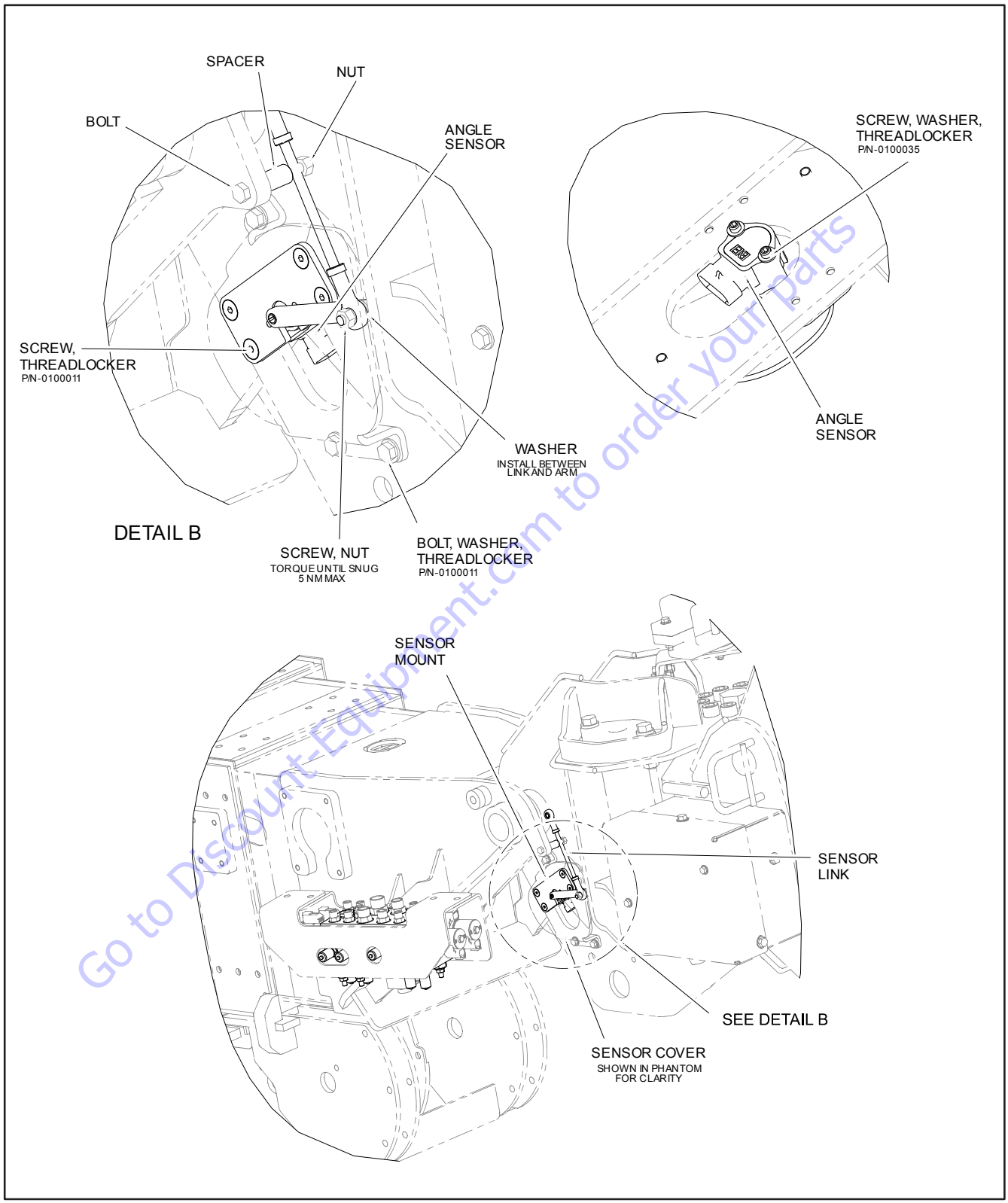


Figure 6-25. Jib Level Angle Sensor

Sensor #8 - Jib Stow Angle Sensor (1)

See (See Figure 6-26.)

This sensor is used to measure Jib swing angle. This is a rotary sensor mounted to the underside of the Jib Pivot weldment. It is a dual output sensor in a single mechanical body with electrically opposing signals.

Sensor #9 - Jib Lift Angle Sensor (1)

This sensor's function is to measure the Jib angle relative to the Main Boom Pivot weldment. A linear position sensor is located inside the Jib lift cylinder to measure cylinder stroke.

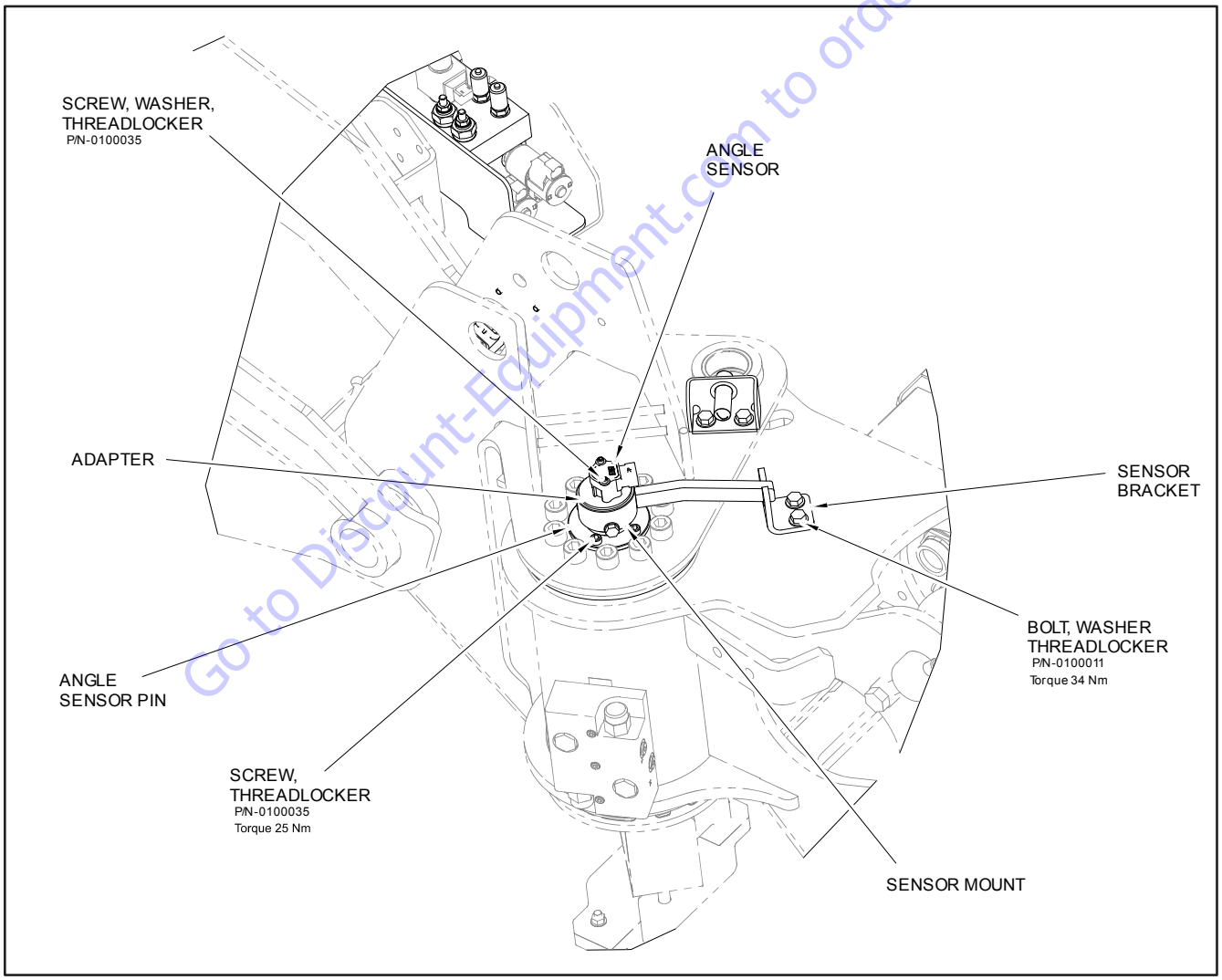


Figure 6-26. Jib Stow Angle Sensor

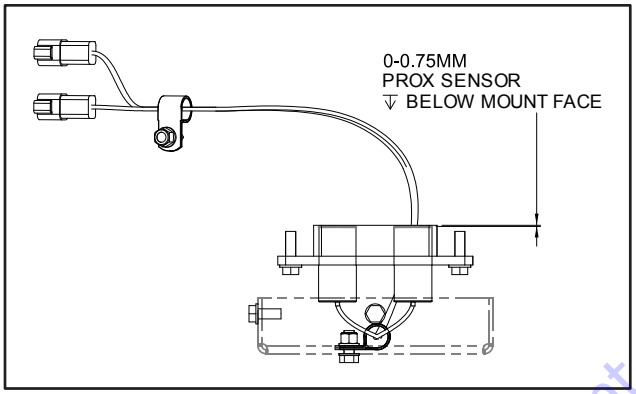
Sensor #10 - Dual Capacity / Jib Transport Length Switches (2)

See (See Figure 6-27.)

These switches are located on the Jib Base Boom and are used to measure transport position and 1000# length limit. These are proximity switches mounted such that they generate opposing signals.

ADJUSTMENT

Adjust the Proximity Sensors so the front sensing face is flush to 0.75 mm below the surface of the mounting face.



Sensor #11 - Platform Level Angle Sensor (1)

This sensor is used to measure Platform angle relative to the Jib. A linear position sensor is located inside the Platform Level cylinder to measure cylinder stroke.

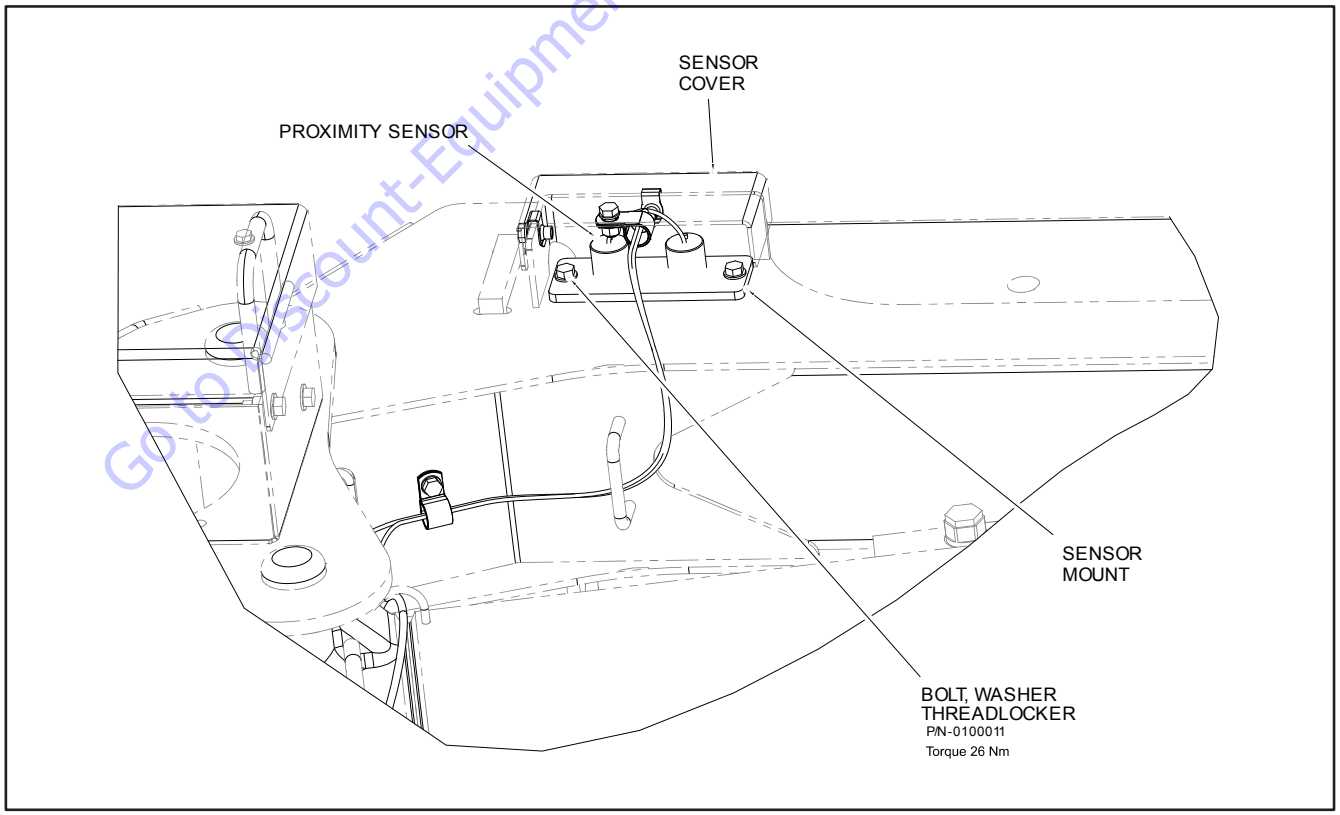


Figure 6-27. Jib Transport Length Sensors

Sensor #12 - Platform Level Angle Gravity Sensors (2)

See (See Figure 6-28.)

These sensors are located on the Platform Support and are used to measure platform angle with respect to gravity. They are mounted such that they generate opposing signals.

Sensor #13 - Turntable Swing Angle (1)

This sensor is used to determine turntable swing angle. It is used for turntable swing control when the boom is in transport position (Axles Retracted). It is a dual output sensor in a single mechanical body with electrically opposing signals mounted integral to the electrical collector ring.

Sensor #14 - Steer Angle Sensor (4)

These sensors are used to measure wheel steer angles. These rotary sensors are mounted on top of each king pin.

Sensor #15 - Axle extend/retract Sensor (4)

These sensors are used to measure axle rotation between the retracted and extended positions. Each sensor is mounted between the frame and an axle.

Sensor #16 - Brake-Two Speed Pressure Sensor (1)

This pressure switch monitors that there is no pressure present when the associated valves are not activated.

Sensor #17 - Chassis Tilt Sensor (Externally mounted) (1)

This sensor is the primary tilt sensor and measures the tilted angle of the turntable relative to gravity. It is mounted on a bracket on the left side of the turntable adjacent to the UGM and BLAM module. It is a dual axis output sensor in a single body.

Sensor #18 - Tilt Sensor (1)

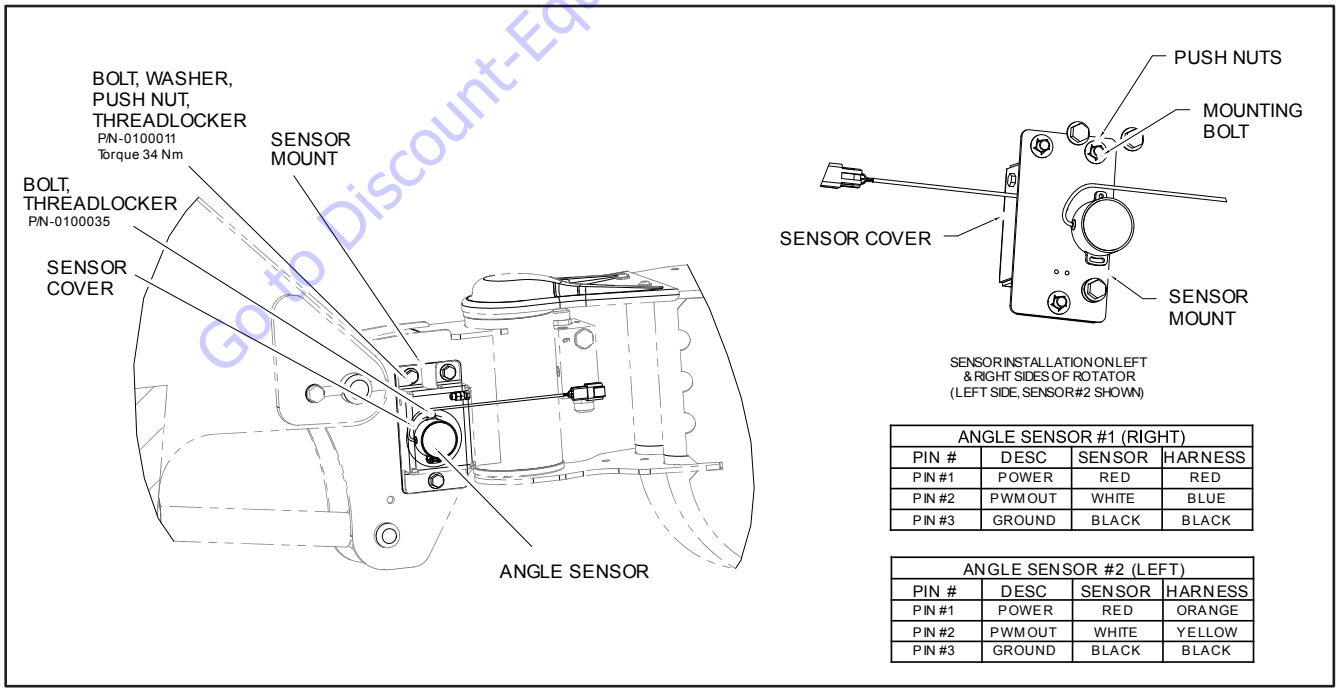
This sensor is integral to the UGM. This sensor is the secondary tilt sensor and measures the tilted angle of the chassis relative to gravity. It is used to check plausibility of the primary chassis tilt sensor reading (See Sensor #17).

Sensor #19 - Warm up Switch (1)

This switch is located on Main Control valve. It monitors the temperature of the main control valve.

Sensor #20 - Main Valve Pressure Transducer (1)

This pressure transducer is located on the main control valve. It is used to monitor pressure of the lower pressure functions of the machine (all control valve functions except Lift and Telescope), to assure that they are within the regulated range.



ANGLE SENSOR #1 (RIGHT)			
PIN #	DESC	SENSOR	HARNESS
PIN #1	POWER	RED	RED
PIN #2	PWMOUT	WHITE	BLUE
PIN #3	GROUND	BLACK	BLACK

ANGLE SENSOR #2 (LEFT)			
PIN #	DESC	SENSOR	HARNESS
PIN #1	POWER	RED	ORANGE
PIN #2	PWMOUT	WHITE	YELLOW
PIN #3	GROUND	BLACK	BLACK

Figure 6-28. Platform Level Sensor

Sensor #21 - Main Lift Cylinder Pressure Transducer (1)

This pressure transducer is located on the port block of the main boom lift cylinder. This is used for the diagnostics of the lift cylinder.

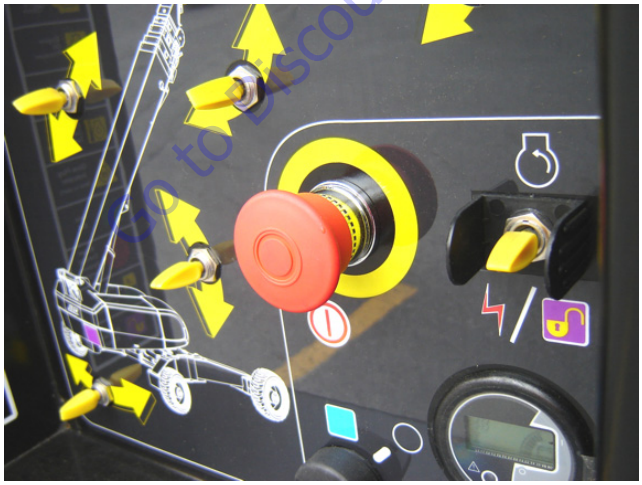
6.7 SYSTEM TEST

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. Pull out the Emergency Stop switch at the Ground Control Station.

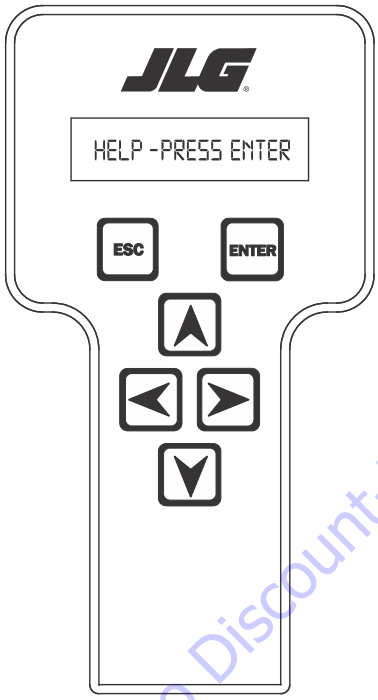


3. Plug the analyzer into the connector at the base of the platform control box.

4. 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.

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

6. The analyzer screen should read:



7. 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.

8. Follow the flow path in Figure 6-29., System Test Flow Chart - Platform Tests - Sheet 1 of 2 and Figure 6-30., System Test Flow Chart - Platform Tests - Sheet 2 of 2 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).

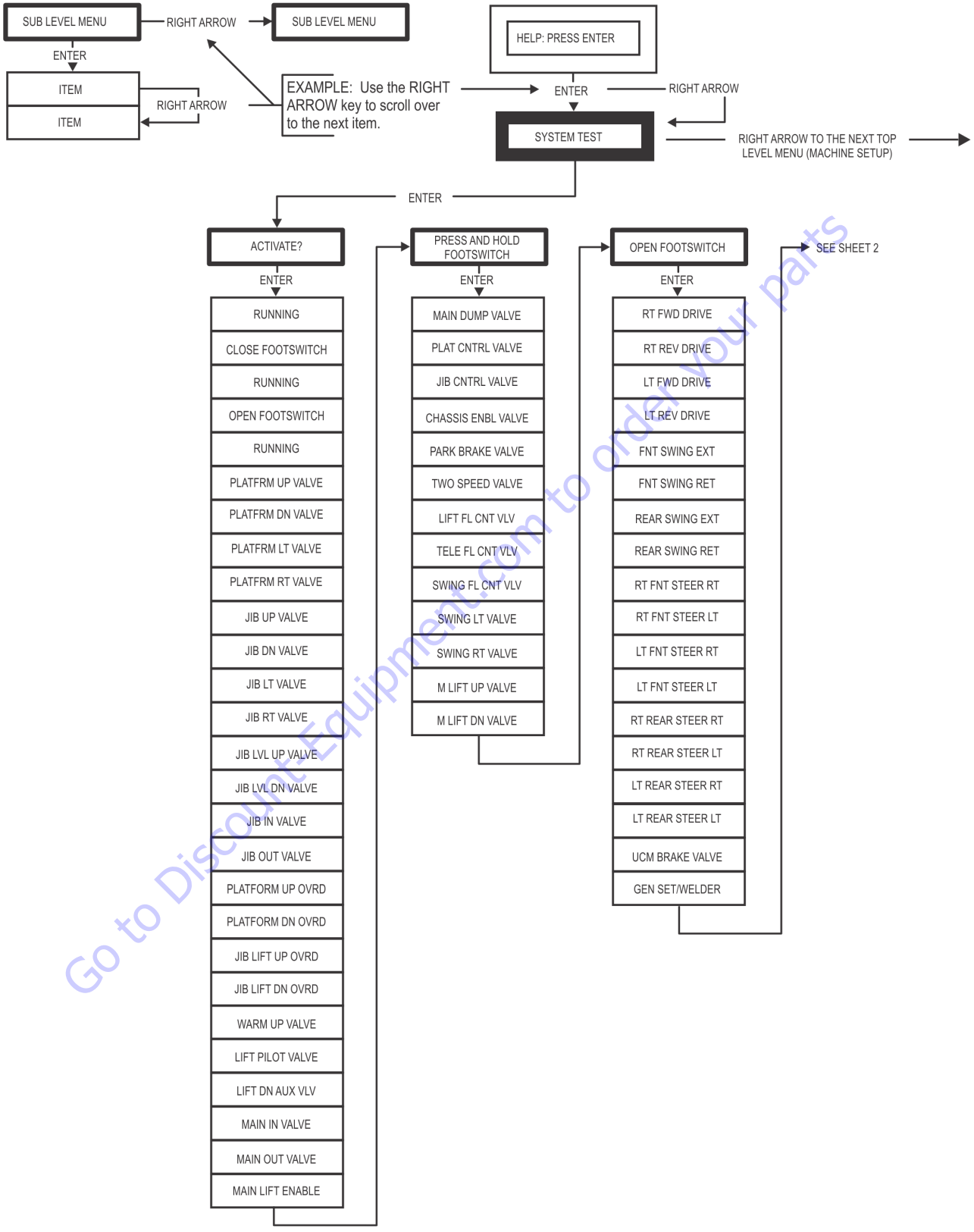


Figure 6-29. System Test Flow Chart - Platform Tests - Sheet 1 of 2

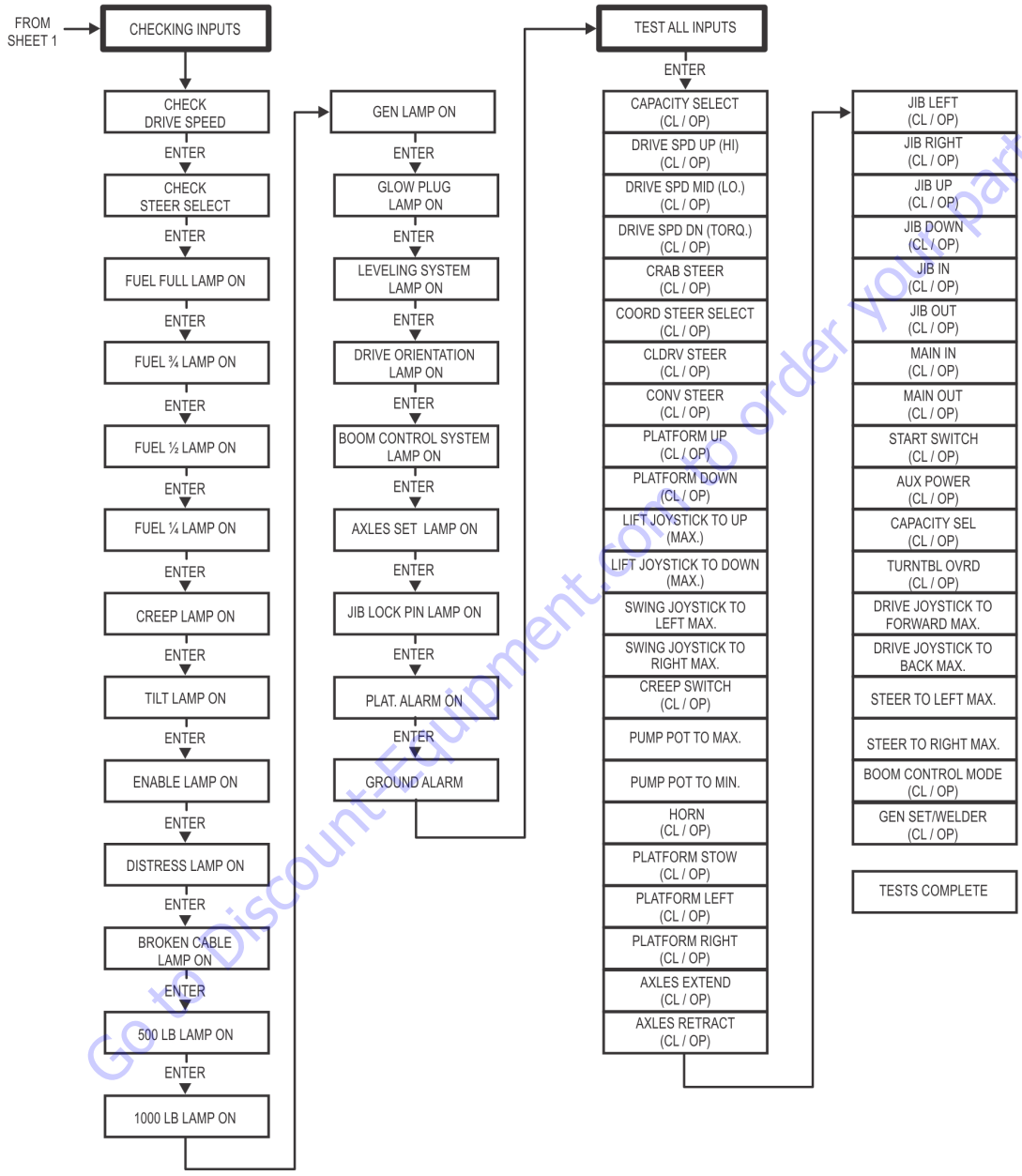


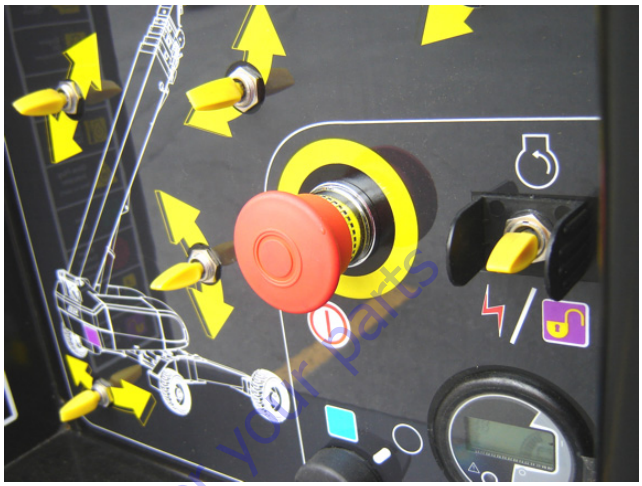
Figure 6-30. System Test Flow Chart - Platform Tests - Sheet 2 of 2

Test from the Ground Station

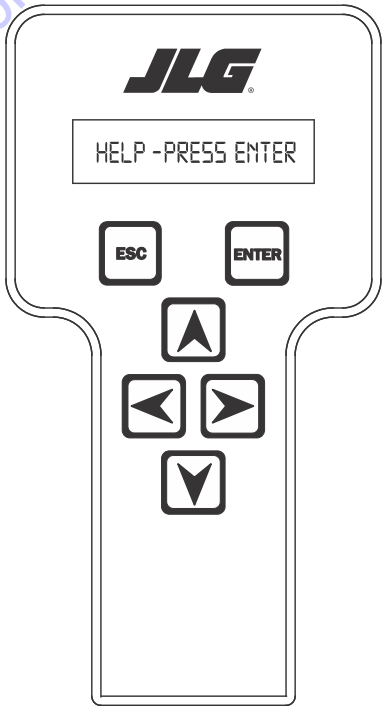
1. Position the Platform/Ground select switch to the Ground position.

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 6-31., 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).

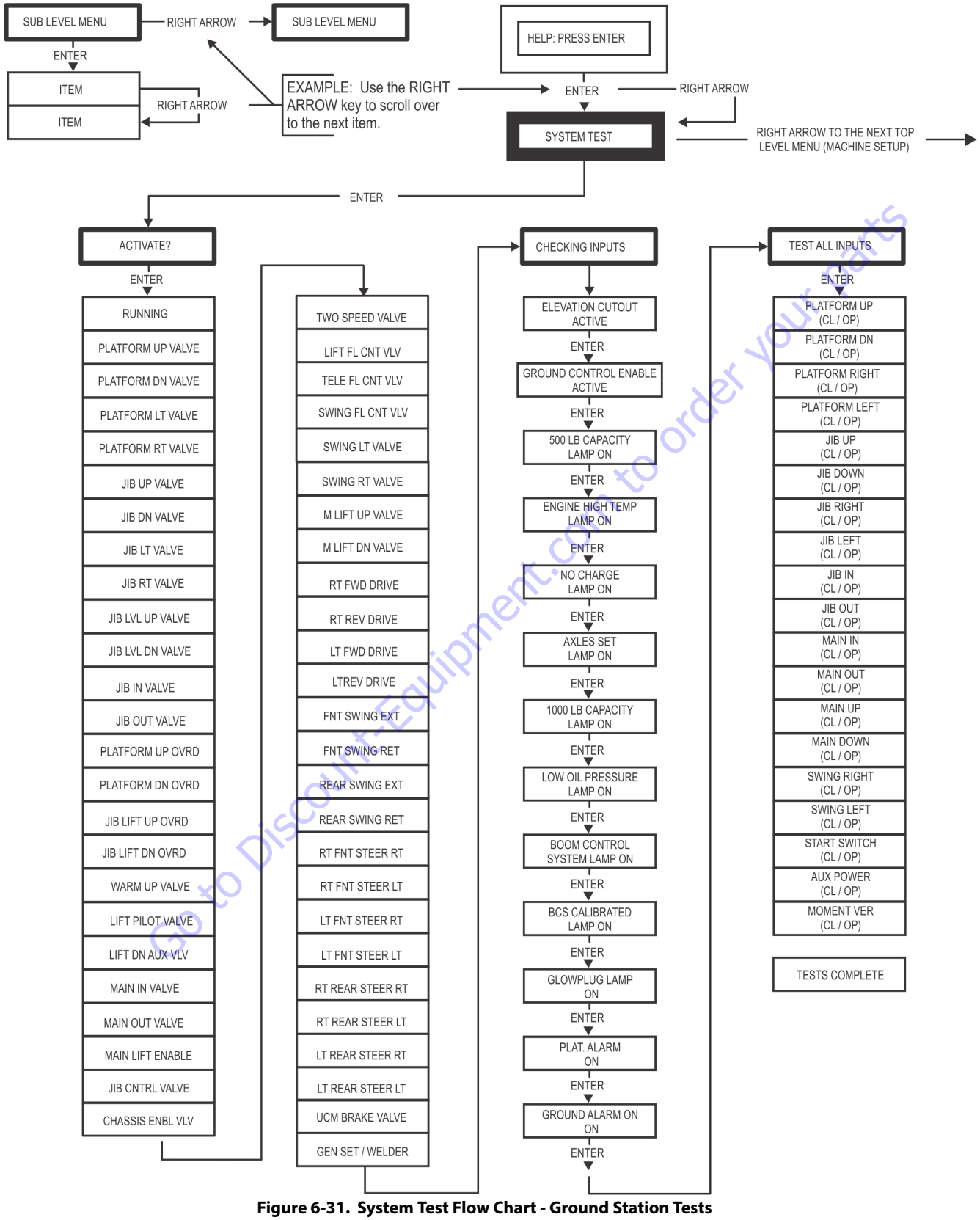


Figure 6-31. System Test Flow Chart - Ground Station Tests

Table 6-6. 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 6-6. 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 6-6. 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.

6.8 CALIBRATION PROCEDURES

Axle Calibration

The axle angle sensors need to be calibrated to ensure that the axle angle can be accurately calculated. The machine must be in transport position to perform an axle calibration. If the steer sensors have not been calibrated, they will be calibrated as part of the axle calibration procedure.

Axle Calibration is available under AXLE SWING under the CALIBRATIONS menu using the analyzer.

When performing a calibration, the first prompt will be to RETRACT AXLES.

The analyzer will prompt to move to the next sequence once the axle retract conditions are met and retract values are stored in the Control System.

If the steer sensors have not been calibrated when an axle calibration is attempted, the system shall require the steer sensors be calibrated. If this is the case, the analyzer prompt shall automatically redirect to the steer sensor calibration section after the axle retract position is calibrated (Refer to steer sensor calibration). If the steer sensors have been calibrated, this step shall be skipped.

The analyzer will prompt to EXTEND AXLES.

The analyzer shall prompt to move after the extend conditions are met and extend values are stored in the Control System. The axle calibration is complete at this point.

Boom Sensor Calibration

Initial conditions prior to initiating boom sensor calibration:

- Steering sensor, tilt sensor, and telescope crack point calibrations are complete
- Axle calibration is complete
- Chassis tilt calibration is complete
- Ensure the axles are completely extended and axle set lamp is ON
- Ensure the wheels are straight
- Ensure the platform is unloaded and boom is clean
- Ensure the jib is horizontal
- Ensure the jib swing is centered if Jib swing is configured
- Ensure the platform is level
- Ensure the platform is not rotated
- Ensure the turntable is centered between the rear tires
- Ensure the boom is fully retracted
- Ensure the machine indicates that it is on a level surface +/- 1.5°
- Ensure Ground Mode is selected

General notes:

During all controller lag times the controller should display "CALIBRATING…"

After each operator "ENTER" input preceding the recording of sensor values, the controller will wait 10 seconds for the boom dynamics to settle down before readings are taken.

During the calibration if the ESC key 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.

1. With the analyzer, put the vehicle into Access Level 1 and enter the "BOOM SENSORS" calibration. The Controller will display "CAL. POSITION 1" on the top line and "CHECK SYSTEM?" on the bottom line.
2. After the operator presses the ENTER key, the controller will verify:

- the angle sensors and length sensors are reporting valid data,
- the axles are completely extended,
- the wheels are straight within 10°,
- the Boom Length Limit switch is in the retracted position,
- the drive orientation switch is indicating the turntable is between the rear tires,
- the Jib aligned switch is on if equipped,
- the chassis tilt sensor reads less than 1.5° out of level,
- the machine is in Ground Mode and the steering, tilt sensor calibrations have been successfully completed,
- Jib Transport sensors are healthy,
- the Jib Level, Jib Swing, Main Cylinder Angle, Jib Lift, Platform Level Cylinder Position and turntable sensors are healthy,
- the Jib is fully retracted and the Jib Pin is Locked,
- if Model 1850 the axle calibration has been performed.

3. If the initial conditions are not met, the controller will prompt the operator with analyzer messages "BLAM CAN LOST", "AXLE VALVE FAULT", OSC AXL SW FAULT", "PARK BRAKE FAULT", "ANGL SNSR1 FAULT", "ANGL SNSR2 FAULT", "MOMENT PIN FAULT", "LEN SNSR FAULT", "CAL STEERING", "CAL TILT SENSOR", "CAL UPPER TELE", "EXTEND AXLES", "LEVEL MACHINE", "CENTER WHEELS", "TELE IN", "ALIGN TURNTABLE", "CENTER JIB SWING", "SELECT GRND MODE", "JIB TRANSPORT SENSOR FAULT", "JIB LEVEL SENOSR FAULT", JIB SWING SENSOR FAULT", "MAIN CYL ANGLE SENSOR FAULT", "JIB LIFT SENSOR FAULT", "PLATFORM LEVEL SENSOR FAULT", "TURN TABLE SENSOR FAULT", "JIB TELE IN", "LOCK JIB PIN" and "REMOVE DONGLE" to satisfy the initial conditions. The controller will then prompt with "UNLOAD PLATFORM?", "JIB HORIZONTAL?", "LEVEL PLATFORM?", "CENTER PLATFORM?" and "TELE IN TO STOP?".

4. Once the initial conditions are verified, the controller will display "SKY WELDER NO". If a sky welder is installed, the operator presses an ARROW key to switch to "SKY WELDER YES. A similar set of menus will prompt the operator to select sky cutter, sky glazier, sky bright, pipe racks and camera mount.

5. If the operator selects sky bright the controller will display "CAL FAILED" and "REMOVE SKYBRIGHT". If more than one accessory is selected except for the combination of sky welder/sky cutter the controller 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, the controller will display "CALIBRATE?". After the operator presses the ENTER key, the controller will check that the Main Cylinder Angle 1 sensor counts are between 100 and 14000 counts and that Main Cylinder Angle 2 sensor counts are between 15000 and 32767 counts. If they are not in the given ranges, the controller shall display "CAL FAILED" and "CYLN SNSR1 FAULT" or "CYLN SNSR2 FAULT". If the sensors are in range, the controller will disable Envelope and Moment control, Telescope out, Jib Lift/Swing, Jib Telescope and Basket Level/Rotate functions and display "CAL POSITION 2" on the first line.

6. The controller shall display "LIFT UP TO STOP". After the operator presses the ENTER key, the controller shall display "CAL POSITION 3" and "SWING 180 DEG". After the operator presses the ENTER key, the controller must see a change in the drive orientation switch or "CAL FAILED" and "DRIVE ORNT SW" shall be displayed. The boom angle sensors must also be within 10° of 40.6° (80.6° - 40.0° = 40.6° equals rough angle sensor mounting offset) or "CAL FAILED" and "ANGL SNSR# FAULT" will be displayed. The controller shall also check that the Main Cylinder Angle 1 sensor counts are between 15000 and 32767 and that sensor 2 is between 100 and 14000 counts or "CAL FAILED" and "CYLN SNSR1 FAULT" or "CYLN SNSR2 FAULT" will be displayed.

7. The controller at this point shall disable lift down. The controller will record the following: moment value based on load-pin output, both boom angle sensor raw outputs, both main cylinder angle counts and the retracted length of the boom. The retracted length will be set at 539.7". The raw length sensor A/D counts must between 100 and 1311 counts or "CAL FAILED" and "LEN SNSR FAULT" shall be displayed.

8. The controller will display "CAL POSITION 4" on the first line and "SWING 180 DEG". After the operator presses the ENTER key, the controller must see a change in the drive orientation switch or "CAL FAILED" and "DRIVE ORNT SW" will be displayed. The controller will record moment value based on load-pin output and both boom angle sensor raw outputs. If the change in right boom angle sensor readings is more than 1.0° from the change in left boom angle sensor readings, "CAL FAILED" and "ANGL SNSR FAILED" will be displayed. If this moment falls outside the expected calibration moment range of 1.288E+06 to 1.932E+06, "CAL FAILED" and "MOMENT PIN FAULT" will be displayed.

9. If no failures have occurred, The controller will enable telescope out, disable swing, and display "CAL POSITION 5" on the first line and "TELE OUT TO STOP".

10. After the operator presses the ENTER key, the controller will establish this length as 1911.7". The raw length sensor A/D counts must between 29220 and 31220 counts or "CAL FAILED" and "LEN SNSR FAULT" will be displayed.

11. The controller will disable telescope out, enable telescope in and display "CAL POSITION 6" on the first line and "TELE IN TO STOP". The controller will monitor the length sensor reading at which the length limit switch is tripped. The switch should change state at 553 +3.5"/-5.5". If the switch changes state in the wrong length range for the selected model, "CAL FAILED" and "CHECK MODEL" will be displayed. If the switch does not change state at all, the calibration should be aborted and "CAL FAILED" and "LENGTH SW FAILED" will be displayed. The length sensor reading at the precise switch trip point will be recorded for operational length calibration checks each time the boom passes through that point.

12. If no failures have occurred, the controller will enable lift functions, disable telescope out functions and display "CAL POSITION 7" on the first line and "LIFT DN TO STOP".

13. When operator presses ENTER controller will record angle 7. The controller must see a moment reading less than 50,000 lb-in, or "CAL FAILED" and "LIFT DN TO STOP" will be displayed each time the ENTER key is pressed and the moment reading is too high.

14. The Control system establishes the low angle calibration point by taking into account ground slope in the direction of the boom. Low Angle Calibration value = -1.3° +/- Ground Slope. If either of the angle sensors are not within 10.0° of –39.3° (-1.3° - 38.0° = –39.3° equals rough angle sensor mounting offset) then "CAL FAILED" and "ANGL SNSR# FAULT" will be displayed.

15. The controller shall enable telescope out and display "CAL POSITION 8" on the first line and "LIFT UNTIL STOP". The controller will disable Lift functions when the boom angle reaches 0°. When the operator presses the ENTER key, the controller will verify the measured angle is 0° +/ -1°. If not, The controller will display "CAL FAILED" and "LIFT UP(DOWN) STOP" each time the ENTER key is pressed and the angle does not match 0° +/-1°.

16. The controller shall display "CAL POSITION 9" on the first line and "TELE TO YELLOW". The swing function will be enabled and the telescope functions will be disabled when the measured length reaches 810.0" until the function is cycled. While the boom is in this state the telescope functions will be allowed to extend or retract the boom 1.0" at a time. This can be repeated until the length reading deviates from the expected witness mark by more than +/-14", when "CAL FAILED" and "LENGTH FAILED" will be displayed. When the operator presses the ENTER key, the controller will calculate and record the 500# verification moment value. If this moment falls outside the expected calibration moment value of 10.720E+06 lb-in, "CAL FAILED" and "MOMENT PIN FAULT" will be displayed. The raw length sensor A/D counts must between 5220 and 7220 counts or "CAL FAILED" and "LEN SNSR FAULT" will be displayed.

17. The controller shall display "CAL POSITION 9" on the first line and "JIB OUT TO STOP" on the second. When the operator reaches the stopping point with the Jib and presses enter, the controller will record the moment for the 500# forward calibration. If this moment falls outside the expected calibration moment range of 8.11E+06 to 10.81E+06 lb-in "CAL FAILED" and "MOMENT PIN FAULT" shall be displayed.

18. The controller shall then display "CAL POSITION 10" on the first line and "JIB IN TO STOP" on the second. When the operator reaches the retracted position for the Jib, the menu will automatically advance.

19. The controller will enable telescope in and display "CAL POSITION 10" on the first line and "TELE IN TO GREEN". When Telescope In is commanded, boom length will be controlled to 762.0" +/-0.5".

20. When the operator presses the ENTER key, the controller will verify the measured length matches the expected green witness mark location, otherwise the controller will display "CAL FAILED" and "TELE TO GREEN" each time the ENTER key is pressed and the measured length does not match the expected length. The controller will calculate and record the 1000# forward calibration moment and validate the moment is within the expected range of 7.658E+06 to 10.21E+06 lb-in. If the Moment is not in this range the controller shall display "CAL FAILED" and "MOMENT PIN FAULT". The controller will also revalidate the length switch trip point using the retracted and yellow witness mark to calculate length. If the length switch trip point is not 553 +3.5"/-5.5", the controller shall display "CAL FAILED" and "LEN SNSR FAULT". Otherwise, the controller shall display "BOOM SENSORS" on the first line and "CAL COMPLETE" on the second line.

6.9 JIB SENSOR CALIBRATIONS

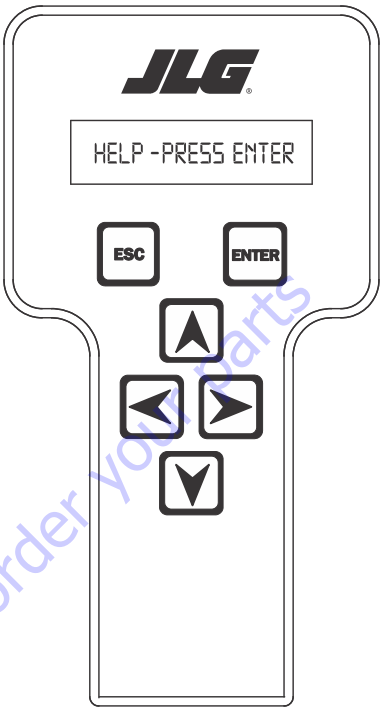
To calibrate the jib sensors, the analyzer must be in access level 1. All jib sensors can be calibrated at one time or each calibration can be performed on an individual basis.

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

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

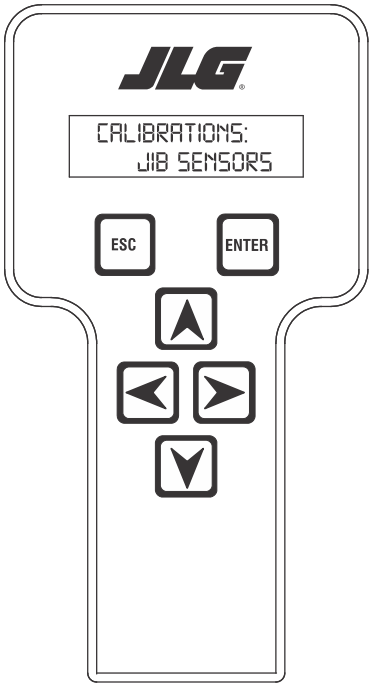
3. Pull out the Emergency Stop switch and start the engine.

4. The analyzer screen should read:

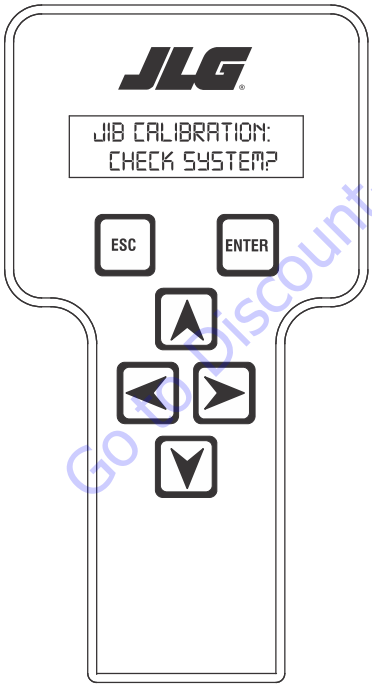


5. Use the arrow button to reach OPERATOR ACCESS. Hit Enter.
6. Enter the Access Code, 33271.
7. Use the right Arrow key to reach CALIBRATIONS. Hit Enter.

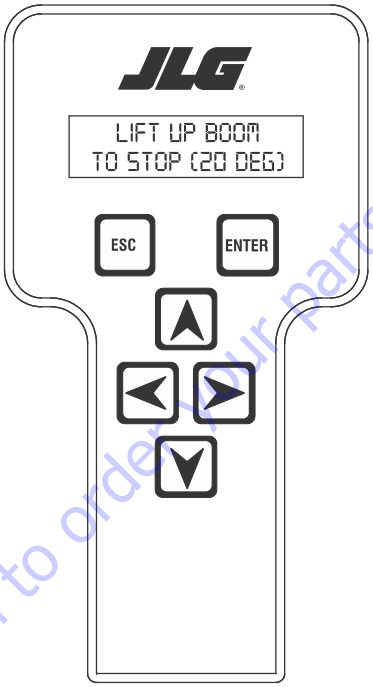
8. Use the arrow keys to reach the JIB SENSORS. The screen should read:



9. Press ENTER. The screen should read:

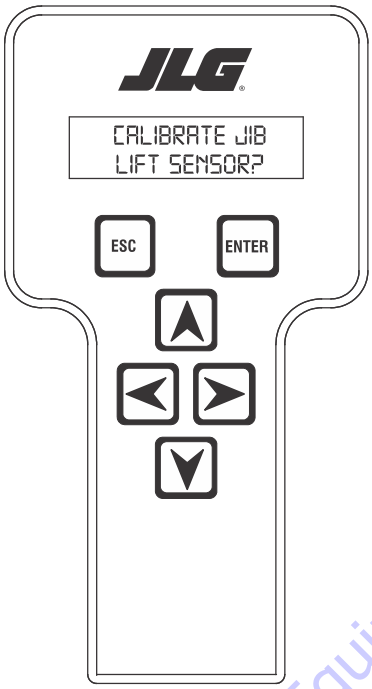


10. Press ENTER. The screen should read as shown below. When it does, activate boom lift until the control system stops it at 20 degrees boom angle.

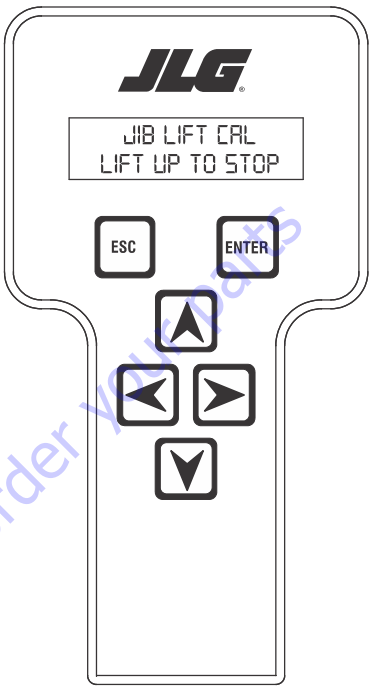


11. Press ENTER. The screen should read as shown below. When it does, the operator can either press enter to begin the jib lift sensor calibration, or use the right or left arrow key to locate the desired jib sensor calibration. The available sensor calibrations are:

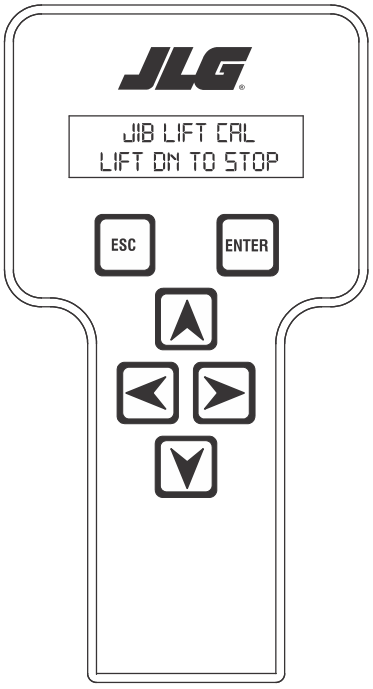
JIB LIFT
JIB LEVEL
JIB SWING
PLATFORM LEVEL



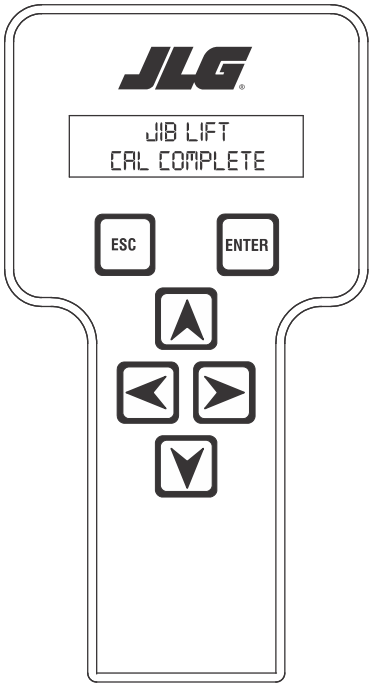
12. If the operator presses enter at the jib lift sensor calibration prompt, the screen shown below will be displayed. At this point, lift the jib up to the mechanical stop.



13. When the jib is at the mechanical stop, press ENTER. The screen shown below will be displayed. At that point, jib lift down until the control system stops the jib.



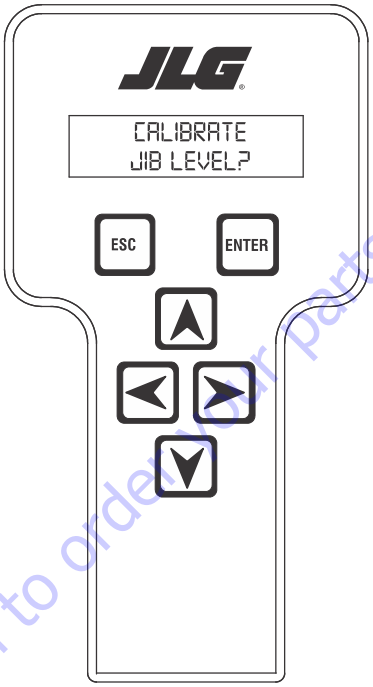
14. Once the jib is stopped the screen shown below will be displayed.



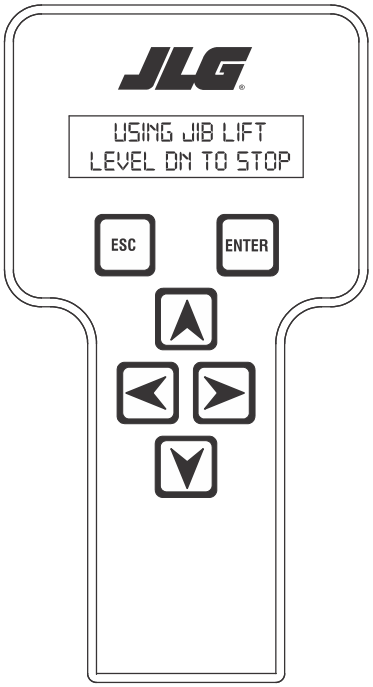
15. Hitting the escape key (ESC) will take the system back to the initial jib lift calibration display.

NOTE: *At this point the left or right arrow key may be used to skip to any of the other jib sensor calibrations.*

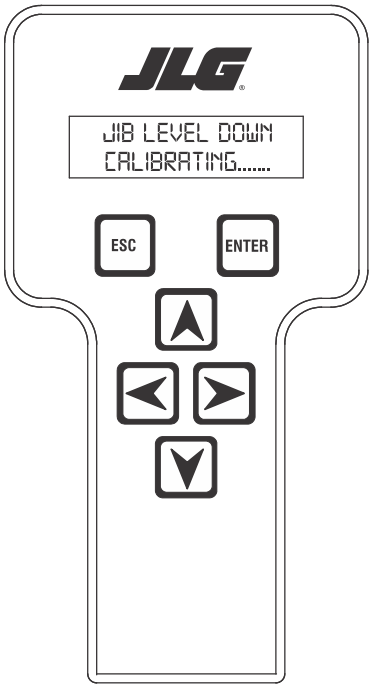
16. Hitting the ENTER key at this point will take the operator to the next jib sensor calibration. The screen will show:



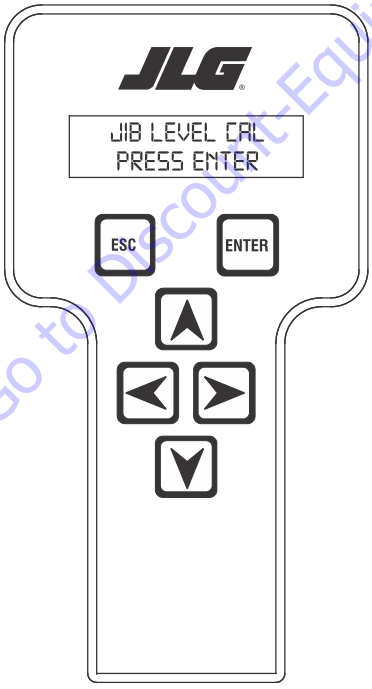
17. Press Enter. The screen will show:



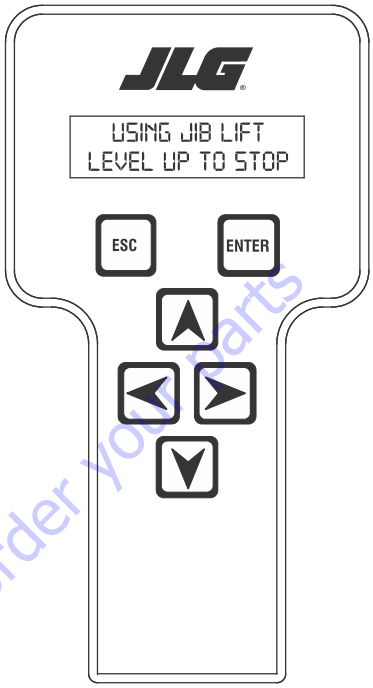
18. Operate jib lift down until the jib stops. When the jib is at the mechanical stop the operator must hit ENTER again. The screen will show:



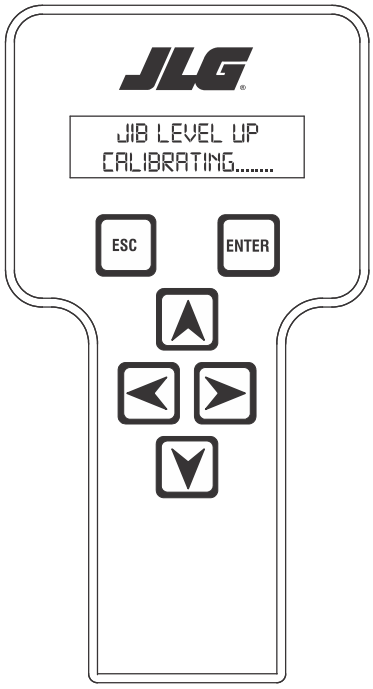
19. When the system completes this step, the next screen will show:



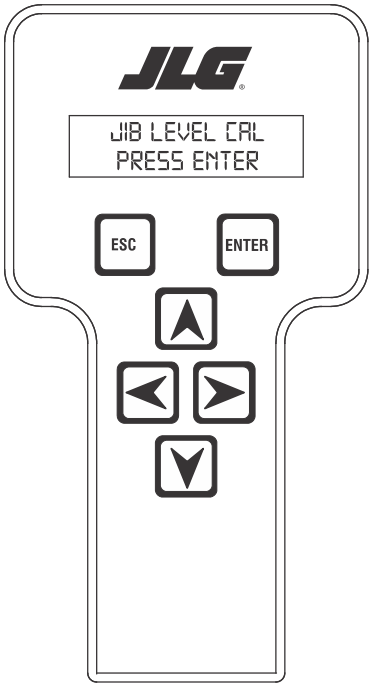
20. Press ENTER. The screen should read:



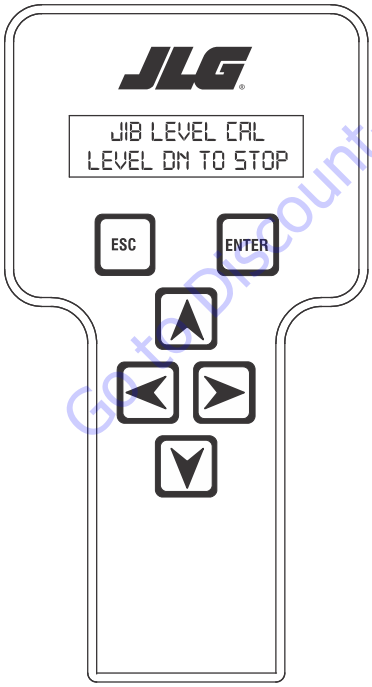
21. Operate jib lift up until the jib stops. When the jib is at the mechanical stop, Hit ENTER again. The screen will show:



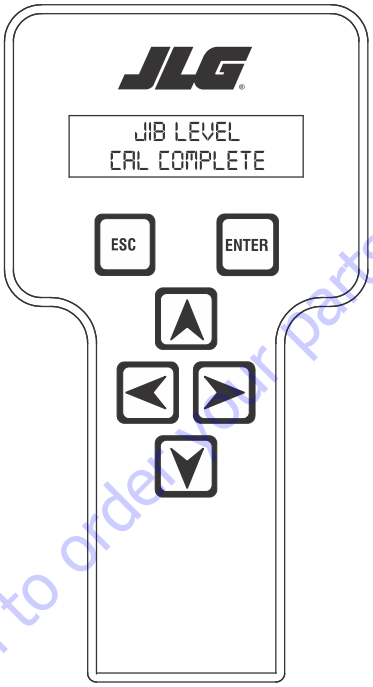
22. When the system completes this step, the next screen will show:



23. Press ENTER. The screen should read as shown below. The control system will jib level down and stop the jib leveling command.



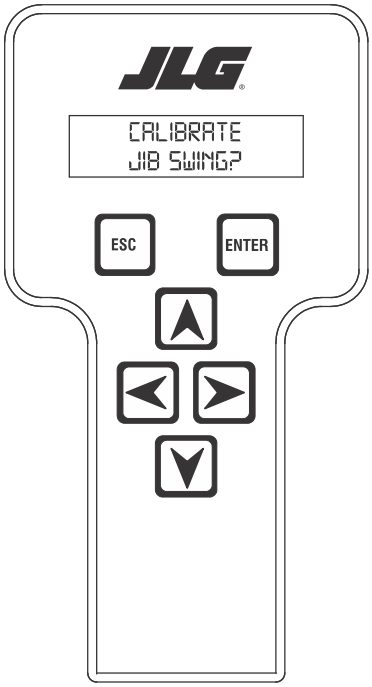
24. When the system completes the previous step, the screen will read:



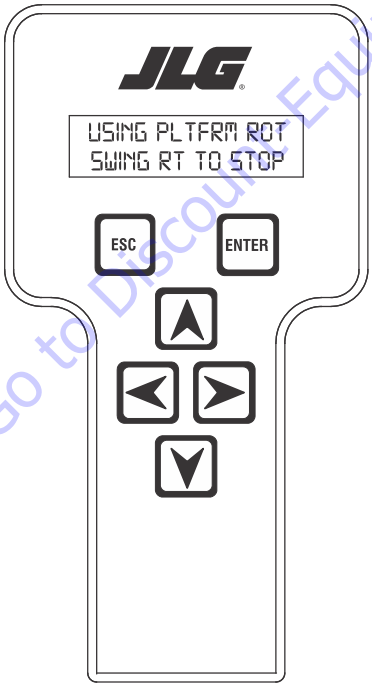
25. Hitting the escape key (ESC) will take the system back to the initial jib lift calibration display.

NOTE: *At this point the left or right arrow key may be used to skip to any of the other jib sensor calibrations.*

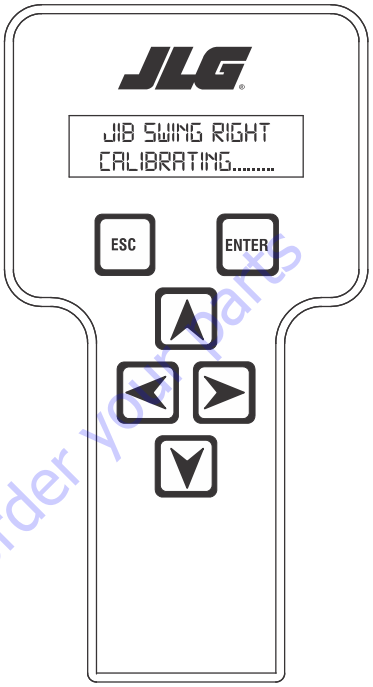
26. Hitting the ENTER key at this point will take the operator to the next jib sensor calibration. The screen will show:



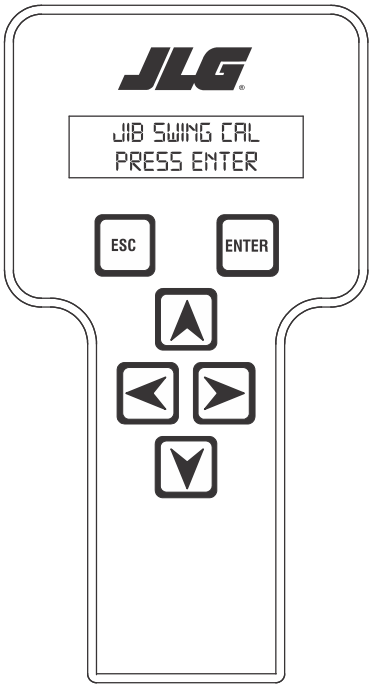
27. Press Enter. The screen shown below will be displayed. At this point, use the platform rotate right function switch to swing the jib right.



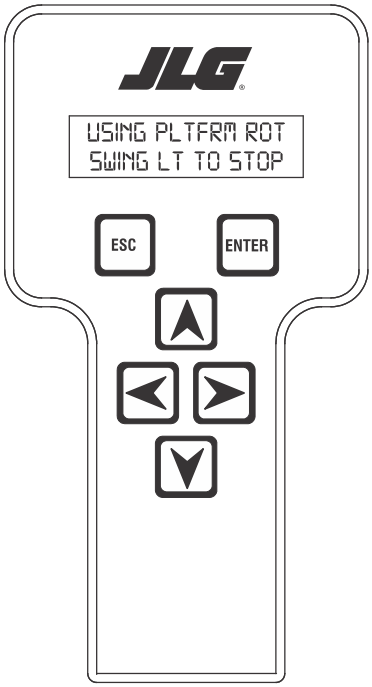
28. When the jib reaches the mechanical stop, press ENTER. The screen will show:



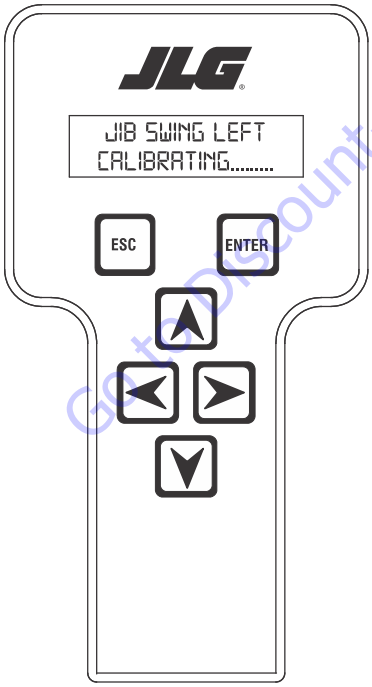
29. When the system is complete with this step, the screen below will be displayed.



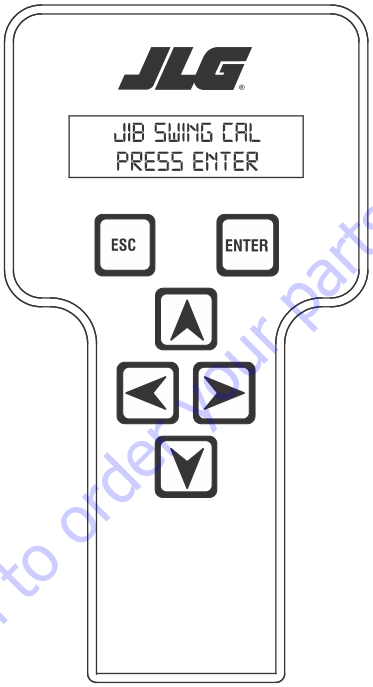
30. Press Enter. The screen shown below will be displayed. At this point, use the platform rotate left function switch to swing the jib left.



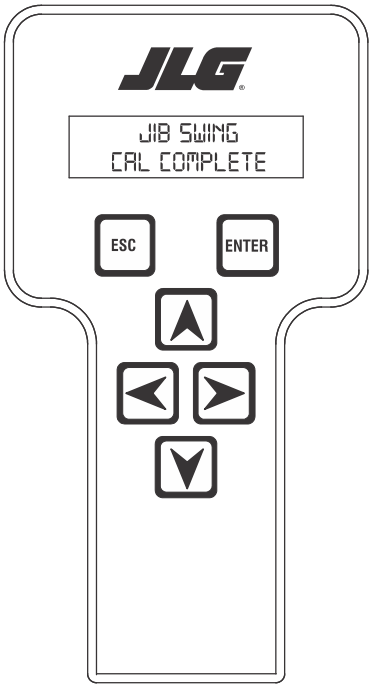
31. When the jib is at the mechanical stop, press ENTER. The screen will show:



32. At the finish of the jib swing lift calibration the jib lock pin will be locked by the control system. The screen will read:



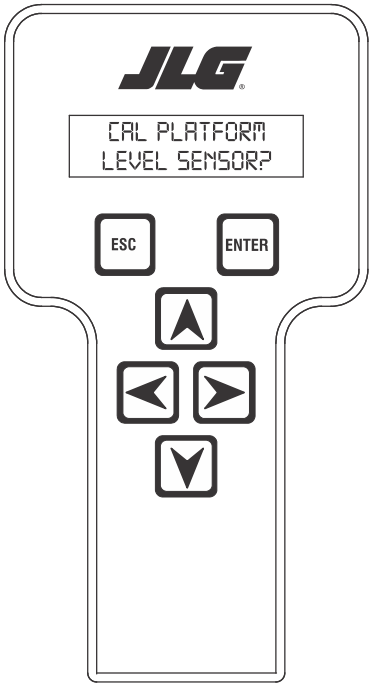
33. Press ENTER. The screen will show:



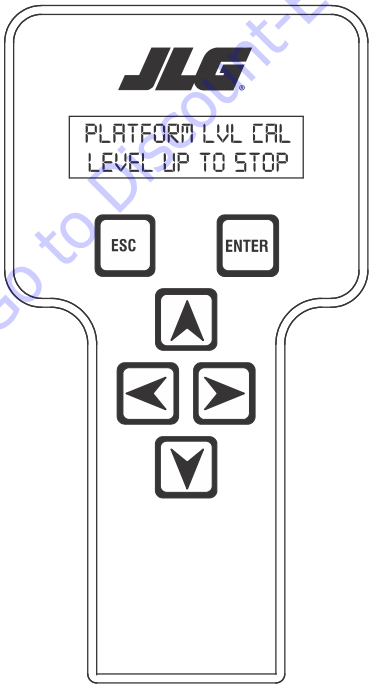
34. Hitting the escape key (ESC) will take the system back to the initial jib lift calibration display.

NOTE: *At this point the left or right arrow key may be used to skip to any of the other jib sensor calibrations.*

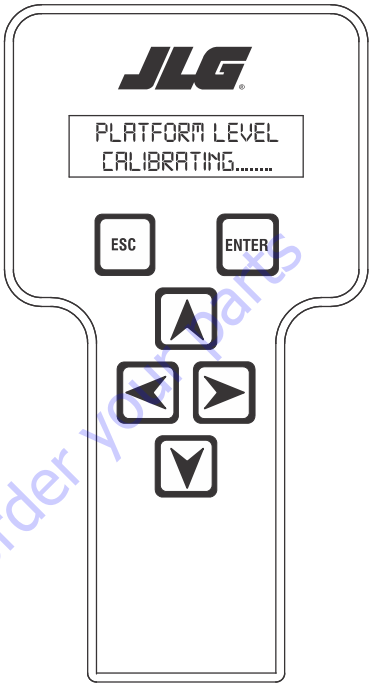
35. Hitting the ENTER key at this point will continue the calibration sequence. The screen will show:



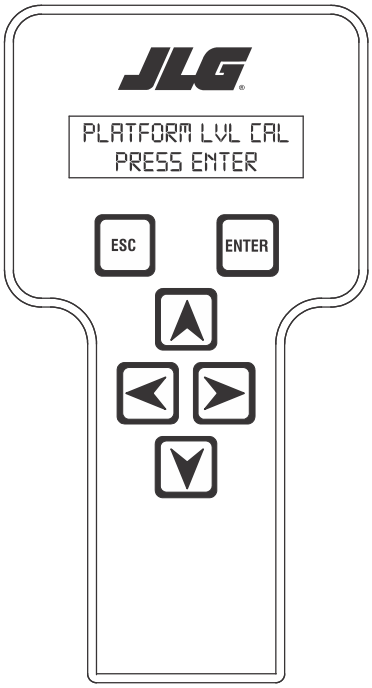
36. Press Enter. The screen shown below will be displayed. At this point, use the platform level up function switch to level up.



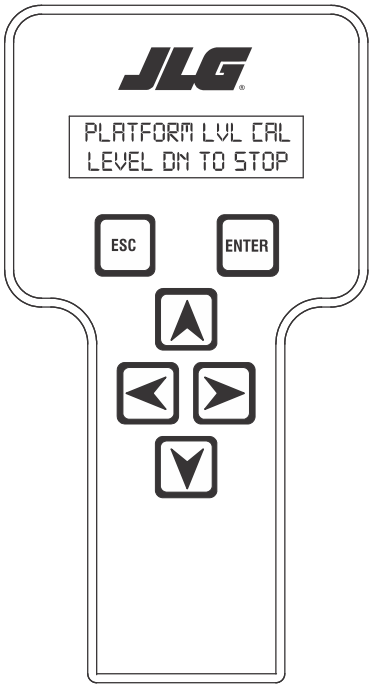
37. When the platform level up is at mechanical stop, Press ENTER. The screen will show:



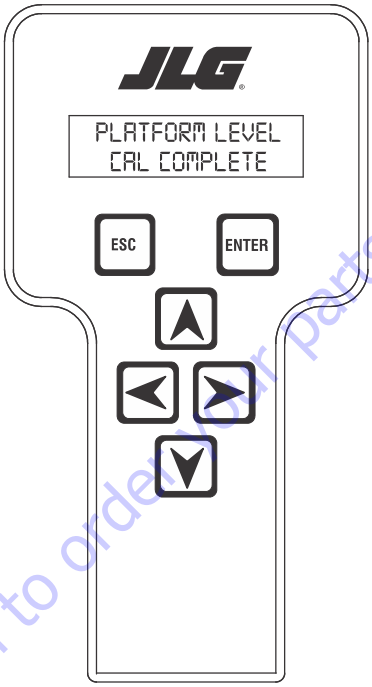
38. When the system is complete with this step, the screen below will be displayed.



39. Press ENTER. The display will then show:



40. The control system will stop the platform level and the screen will show:



41. Pressing ENTER will take you back to the beginning and escape (ESC) will take you to the initial screen.

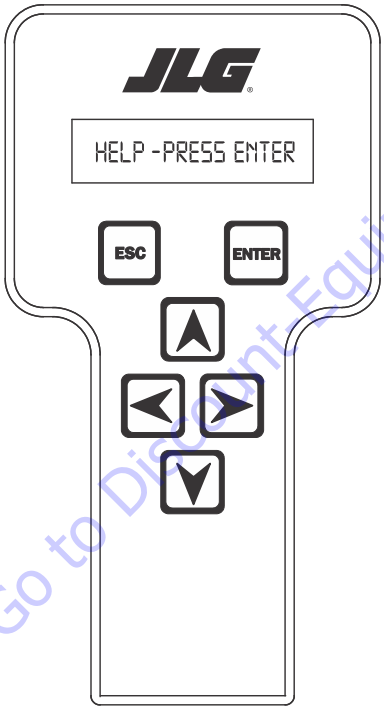
Calibrating the Jib Level Up and Down Valve Crackpoints

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 OPERATOR ACCESS. Hit Enter.
6. Enter the Access Code, 33271.
7. Go to the CALIBRATIONS menu and hit ENTER.
8. Go to the JIB LVL UP 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 jib level movement.
12. Hit ENTER again. CAL. COMPLETE message should appear
13. Engine should again return to idle.
14. Hit ESC should return to JIB LVL UP CRKPT screen.
15. Hit RIGHT ARROW to get to the JIB LVL DN 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 jib level 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.

6.10 BOOM UNLOCK PROCEDURE

If the fault "LIFT CYLINDER OVER PRESSURE" or "WRONG TELE RESPONSE" is active, then the boom will be trapped in transport.

To clear these faults, the Boom Unlock Procedure must be followed.

Initial Conditions

Before performing the Boom Unlock Procedure, the following conditions must be met:

- Booms Sensors, Jib Sensors, Axle Sensor and tilt sensor calibrations must be successfully completed
- The Boom is operating in the BCS Normal Mode
- The parking brake is not reporting a short to battery from the UGM or the UCM
- The main boom sensor is reading less than 600"
- The jib is fully retracted
- The main boom sensor is reading less than 7 degrees
- The axles are completely extended
- The machine control system indicates that it is not tilted
- The turntable is centered between the rear tires
- Ground Mode is selected

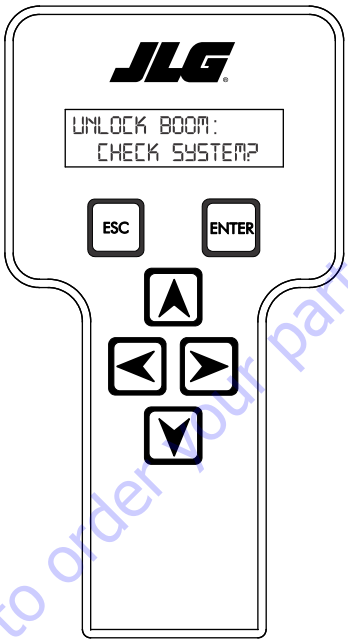
Procedure

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

NOTE: *The envelope, moment and appropriate faults will continuously be monitored after the initial conditions are satisfied. If at any time during the test these conditions change to an unsafe state (communications lost, envelope violation, moment violation etc.) the Calibration will abort and the analyzer will display "ENVLP VIOLATION".*

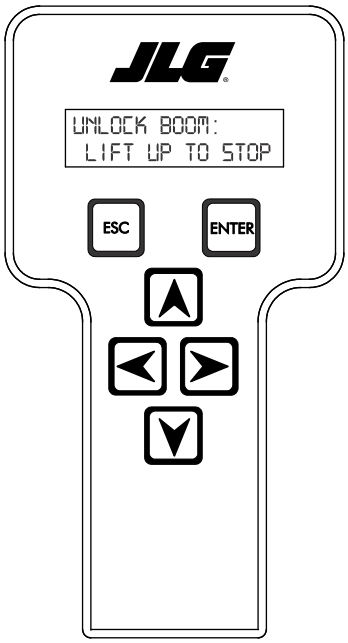
1. Using the analyzer, enter access level 1. Unlock Boom can be found under the Calibrations menu.

2. Once the operator selects the UNLOCK BOOM option, the screen will read:



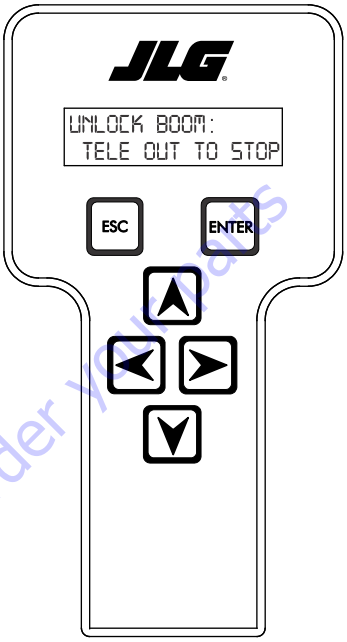
Pressing ENTER will cause the boom to check the initial conditions listed above. If any of the calibrations have not been completed "CAL. BOOM" will be displayed. If there is a problem with the envelope, moment or any of the supporting sensors (including loss of communications) "CHECK FAULTS" will be displayed. If the parking brake is shorted anywhere in the system "PARK BRAKE FAULT" will be displayed. If the jib is not fully retracted "JIB TELE IN" will be displayed. If the telescope is reading more than 600", "MAIN TELE IN" will be displayed. If the main boom angle sensors are reading more than 7 degrees, "MAIN LIFT DOWN" will be displayed, if the axles are not extended "EXTEND AXLES" will be displayed. If the DOS switch is not indicating in line and the angles are not within 10° of inline "ALIGN TURNTABLE" will be displayed. If the chassis tilt is tilted "LEVEL MACHINE" will be displayed. If the machine is in platform mode. "SELECT GRND MODE" will be displayed. If none of the above faults are present, the test will move on to the next step. As each fault is cleared, the system will make sure no other faults are active. During this time the latched faults from If the fault "LIFT CYLINDER OVER PRESSURE" or "WRONG TELE RESPONSE" is active, then the boom will be trapped in transport. These faults will be latched through key-cycle.

3. If all of the initial conditions are passed, the analyzer will display:



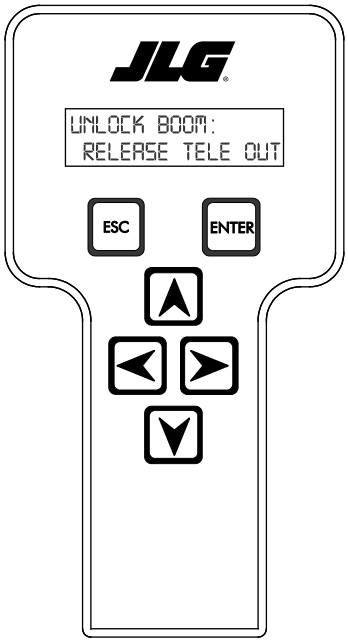
The control system will suppress the latched faults ("LIFT CYLINDER OVER PRESSURE" or "WRONG TELE RESPONSE") to allow the boom out of transport position until the boom is unlocked or the test is cancelled. Engage main lift until the control system cuts it out. The system will cut out at 7°. Only lift up and lift down will be available while on this menu, all other functions will be cut out. After the machine reaches the stop point, the menu will automatically advance.

4. After the machine has reached the set point in step 3, Lift up and down functionality will be cut out and Telescope in and out functionality will be restored. The analyzer menu will display:



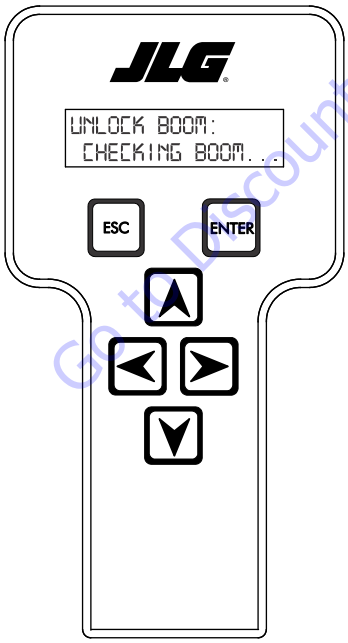
Engage Tele Out until the control system cuts it out. The system will cut out at 60.0". After the machine reaches the set point, the menu will automatically advance and Telescope in and out will be cut out. During this test, the telescope response will be tested. Telescope out will have to be commanded for at least 3 seconds, and meet the requirements for movement and for the correct direction. If the machine reaches the telescope set point without 3 seconds of continuous operation, it will be assumed that the telescope response was correct and the menu will advance. If the machine does not move, or moves in the wrong direction, the menu "CHECK FAILED WRONG TELE DIR." will be displayed and the test will end. The WRONG TELE RESPONSE fault will still be active, and the boom unlock procedure will have to be attempted again.

5. As soon as the machine had reached the set point in step 4, Telescope in and out functionality will be cut out. The analyzer menu will display:



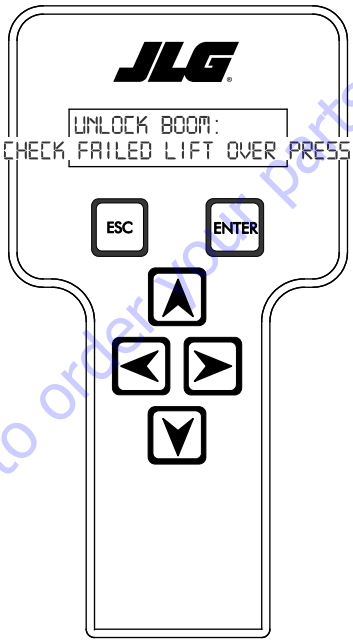
The menu will not change until the telescope controls have returned to neutral and the machine had been disabled.

6. After Step 5, the system will check the boom. The analyzer will display:



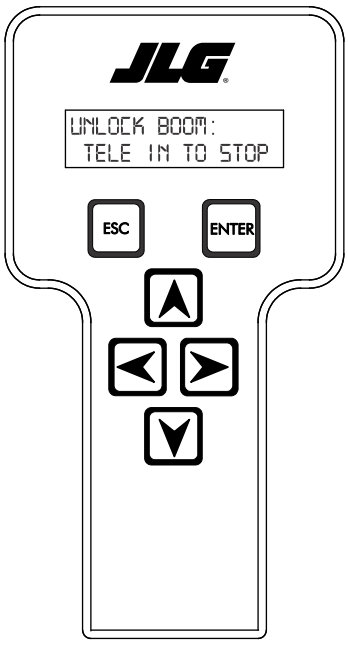
This screen will remain until the boom check has completed, the check fails, or the routine is interrupted by an attempted command. If the check is interrupted the analyzer will display "CHECK FAILED PRESS ENTER". If the check passes the analyzer will display "CHECK PASSED PRESS ENTER".

7. The next test to be performed will be the Lift Pressure over pressure check. The system will monitor the lift pressure input. If the reported PSI is above the over pressure limit then the analyzer will display:



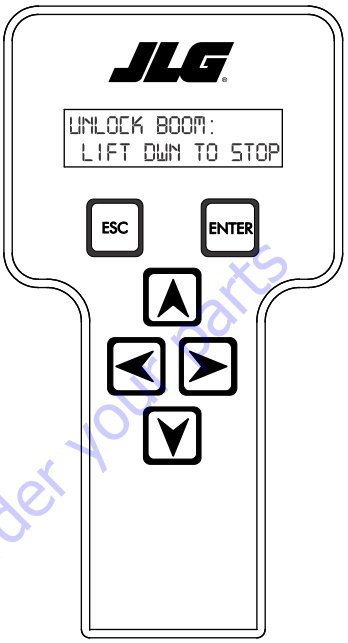
If the lift pressure is under the pressure limit, then the fault will clear at the end of the test.

8. Regardless if the check passed or failed in Step 7, after the status of the test has been reported, press ENTER the menu will advance to:



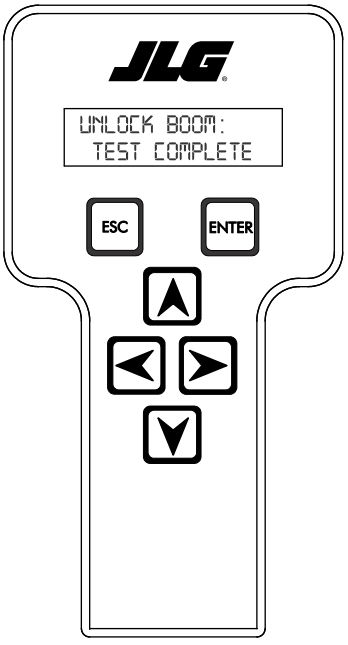
The first part of this step will be the second part of the machine response test. Telescope in and out will be the only hydraulics available. Telescope in will have to be commanded for at least 3 seconds, and meet the requirements in for movement and for the correct direction. If the machine reaches the retracted point without 3 seconds of continuous operation, it will be assumed that the telescope response was correct and the menu will advance. If the machine does not move, or moves in the wrong direction, the menu "CHECK FAILED WRONG TELE DIR." will be displayed and the test will end. The WRONG TELE RESPONSE fault will still be active, and the boom unlock procedure will have to be attempted again. If the test passes, all hydraulics will be enabled, but if the boom was not fully unlocked then the cutouts from the faults will be applied. The operator will have to tele in until the boom is retracted to advance to the next menu.

9. After the boom is retracted, the analyzer menu will advance to:



The operator will have to bring the boom down to below elevation before the menu will advance, all hydraulics are enabled, but the fault cutout rules will still apply.

10. Once the boom is in transport position again the analyzer will display:



6.11 SETTING CRACKPOINTS

Crackpoints, the point at which a valve is opened enough to induce movement, must be set for a variety of reasons: whenever related valves or cartridges are changed, software is updated, the UGM is changed, or the boom envelope control does not seem to be functioning properly.

The crackpoints covered in this section are:

- Platform Level Up and Down,
- Jib Level Up and Down,
- Main Lift Up and Down,
- Main Telescope Out and In.

⚠ DANGER

THE JLG ANALYZER WILL PROMPT USERS FOR A CODE UPON REACHING MENU: OPERATOR ACCESS. THIS FIVE-DIGIT CODE (33271) WILL DISABLE THE BOOM ENVELOPE CONTROL. WHEN THE BOOM ENVELOPE CONTROL IS DISABLED, THE MACHINE MAY TIP IF USED INCORRECTLY.

NOTICE

DO NOT ATTACH THE ANALYZER TO THE CONNECTION PORT IN THE PLATFORM. DO NOT CONDUCT ANY CRACKPOINT SETTINGS FROM THE PLATFORM.

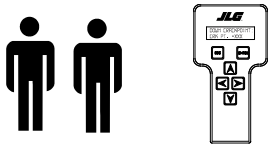
NOTE: *Cycle the boom functions (8 to 10 times, 5 seconds in each direction) prior to setting the crackpoints to ensure the hydraulic oil is at operating temperature.*

NOTE: *If ESC is pressed while calibration readings are being taken, the calibration will abort, and CAL FAILED will appear on the analyzer. The previous calibration values will be used instead. Only press ESC when instructed to do so.*

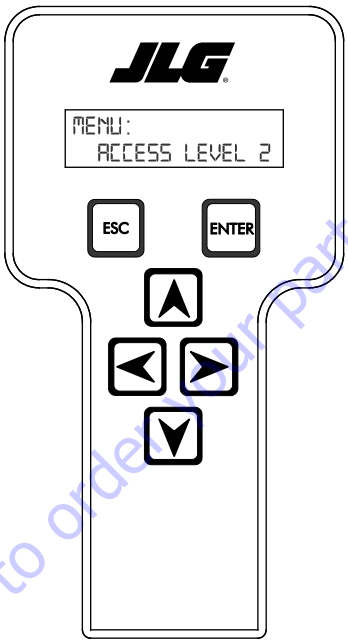
During all Control System lag times, the analyzer will display CALIBRATING...

Platform Level Up and Down Crackpoints

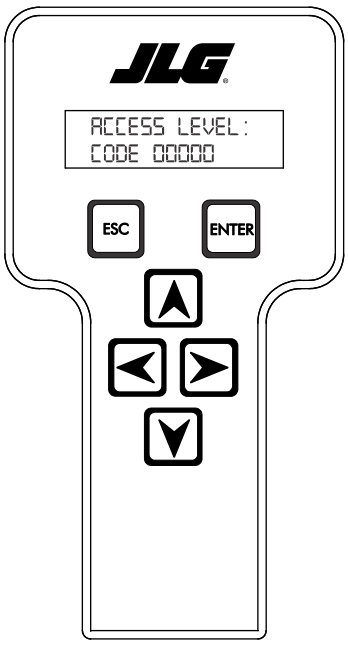
NOTE: *To set crackpoints for Platform Level Up and Down, a JLG analyzer is needed. Have an assistant on hand to help verify that movement occurs.*



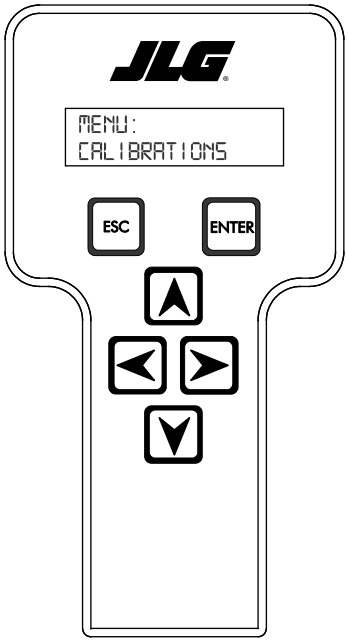
1. Connect the JLG analyzer to the machine at the Ground Controls. Start the engine.
2. Scroll to MENU: OPERATOR ACCESS and press ENTER.



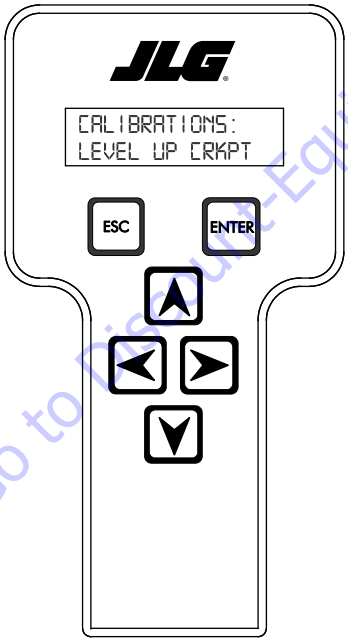
3. Enter code 33271 and press ENTER.



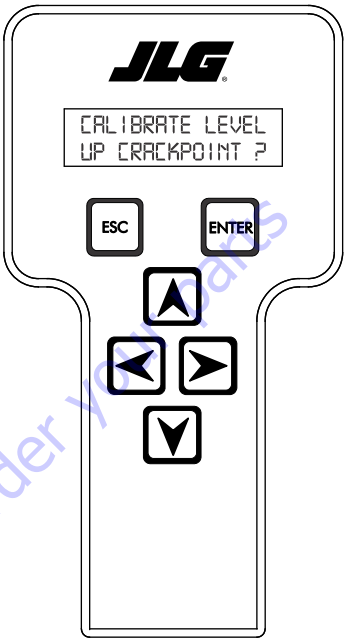
4. Scroll to MENU: CALIBRATIONS and press ENTER (ENTER).



5. Scroll to LEVEL UP CRKPT and press ENTER (ENTER).

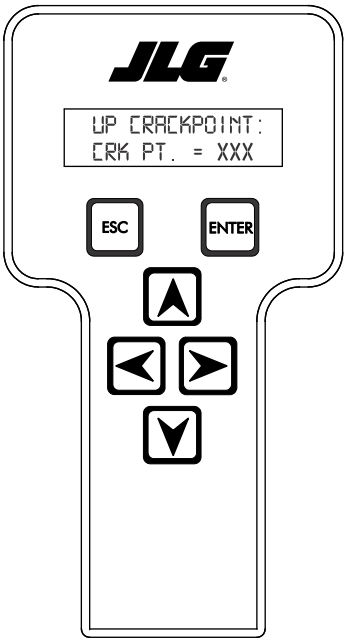


6. Press ENTER (ENTER) to calibrate Platform Level Up crackpoint.

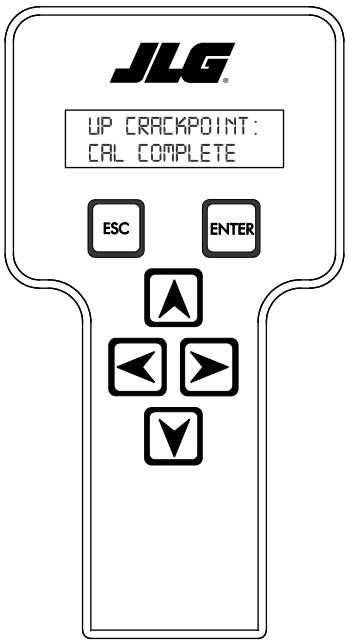


NOTE: *Have an assistant help verify that movement occurs.*

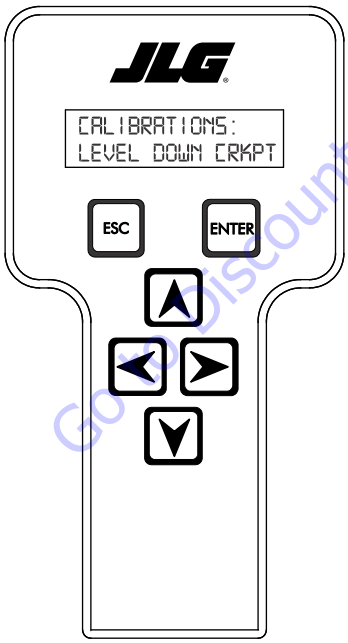
7. Using the analyzer, press and hold the Up Arrow until the function starts moving, then press ENTER (ENTER). Release the Up Arrow..



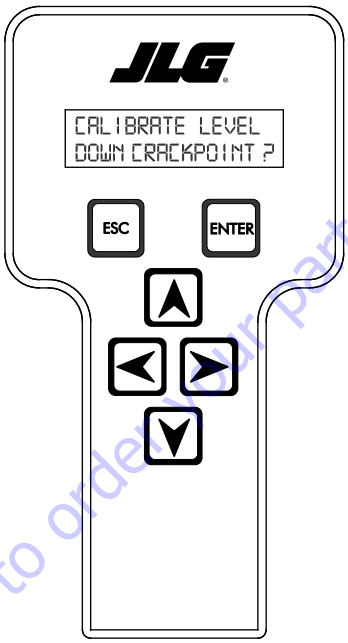
8. This completes the Platform Level Up crackpoint procedure. Press ESC (ESC) to return to the calibrations menu.



9. Scroll to LEVEL DOWN CRKPT and press ENTER (ENTER).

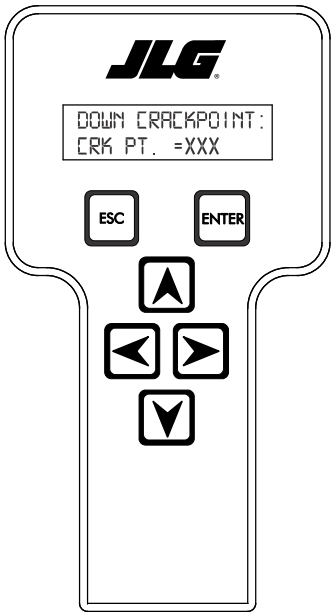


10. Press ENTER (ENTER) to calibrate Platform Level Down crackpoint.

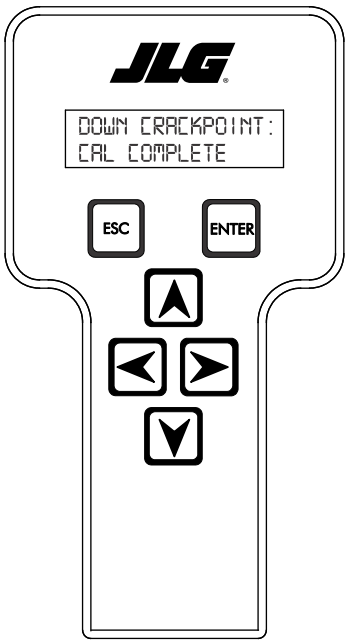


NOTE: *Have an assistant help verify that movement occurs.*

11. Using the analyzer, press and hold the Up Arrow until the function starts moving, then press ENTER (ENTER). Release the Up Arrow.

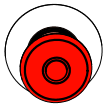


12. This completes the Platform Level Down crackpoint procedure. Press ESC [ESC] to return to the calibrations menu.



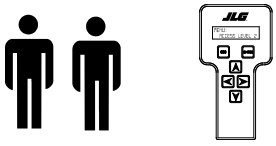
13. The crackpoint setting procedure for Platform Level Up and Down is complete. Press ESC [ESC] to exit calibrations.

14. Push in Power/Emergency stop switch to save the calibration changes.



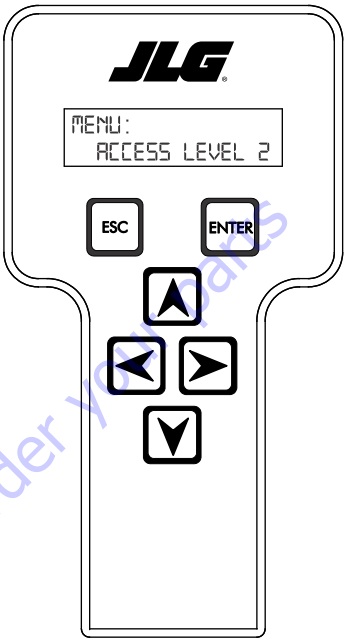
Jib Level Up and Down Crackpoints

NOTE: *To set crackpoints for the Jib Level Up and Down, a JLG analyzer is needed. Have an assistant on hand to help verify that movement occurs.*

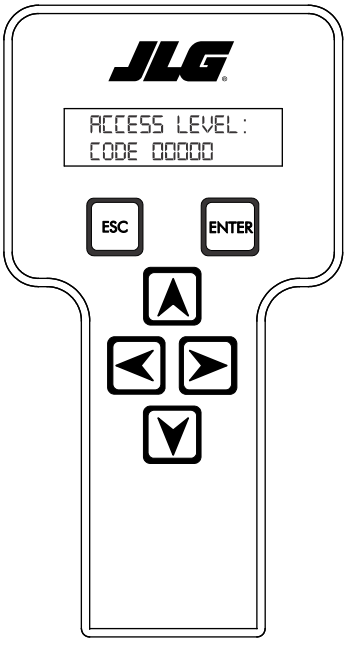


1. Connect the JLG analyzer to the machine at the Ground Controls. Start the engine.

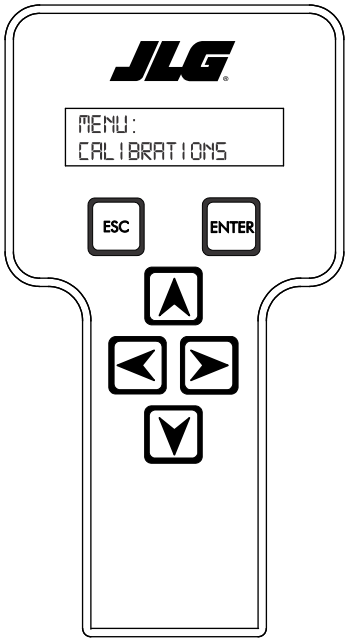
2. Scroll to MENU: OPERATOR ACCESS and press ENTER [ENTER].



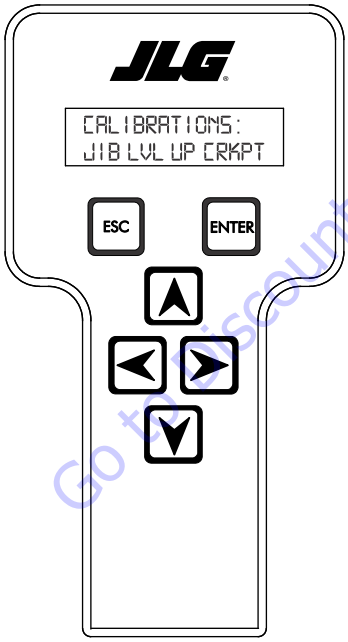
3. Enter code 33271 and press ENTER [ENTER].



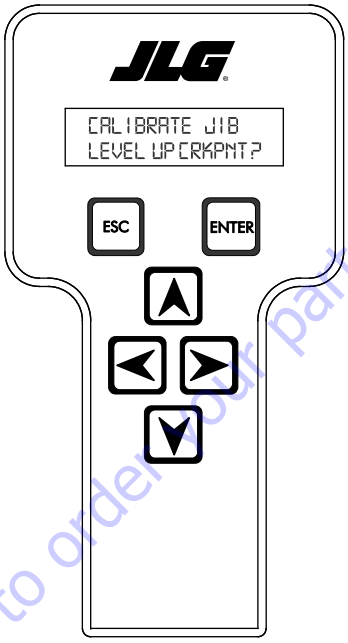
4. Scroll to MENU: CALIBRATIONS and press ENTER (ENTER).



5. Scroll to JIB LVL UP CRKPT and press ENTER (ENTER).

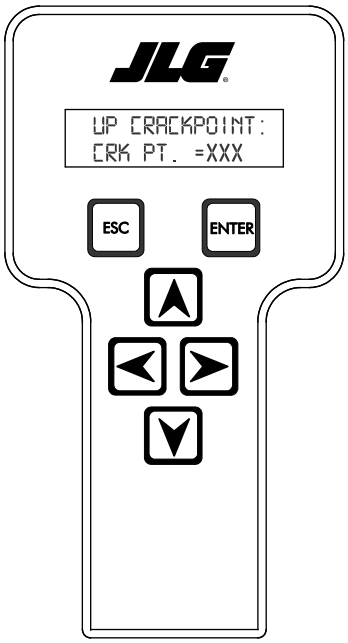


6. Press ENTER (ENTER) to calibrate Jib Level Up crackpoint.

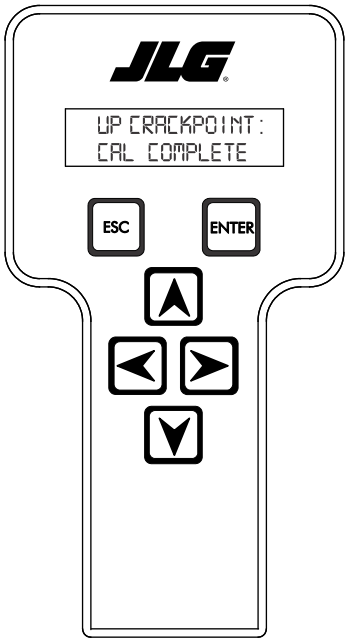


NOTE: *Have an assistant help verify that movement occurs.*

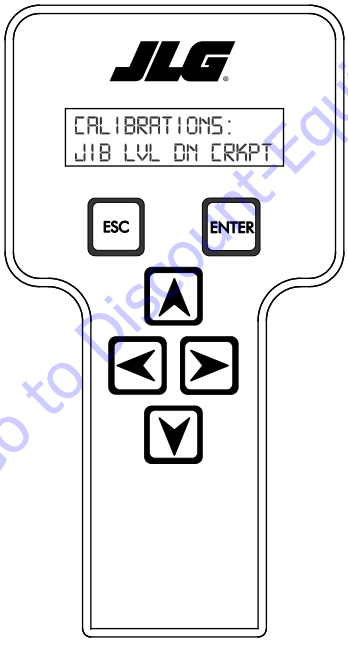
7. Using the analyzer, press and hold the Up Arrow until the function starts moving, then press ENTER (ENTER). Release the Up Arrow.



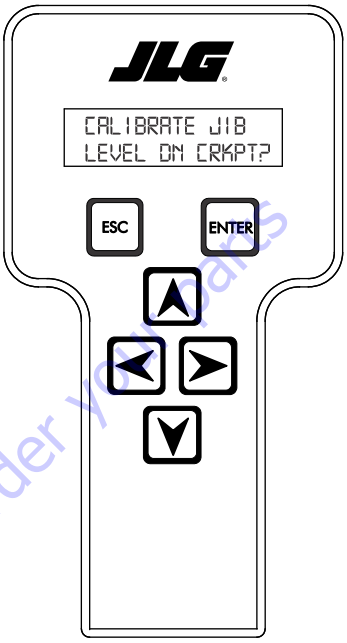
8. This completes the Jib Level Up crackpoint procedure. Press ESC [ESC] to return to the calibrations menu.



9. Scroll to JIB LVL DN CRKPT and press ENTER [ENTER].

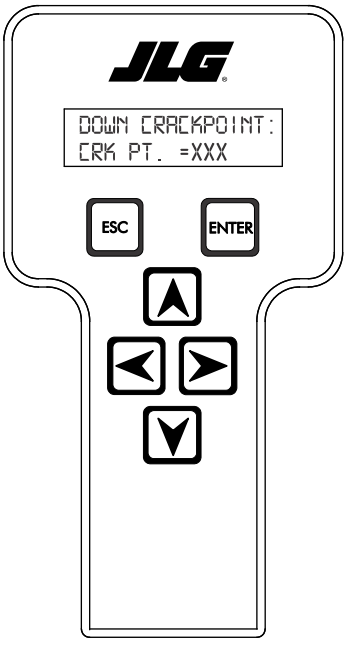


10. Press ENTER [ENTER] to calibrate Jib Level Down crackpoint.

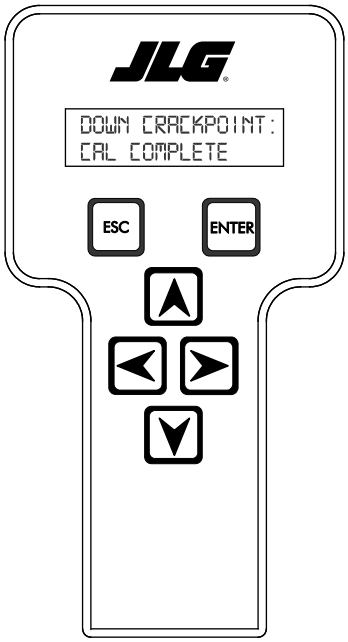


NOTE: *Have an assistant help verify that movement occurs.*

11. Using the analyzer, press and hold the Up Arrow [▲] until the function starts moving, then press ENTER [ENTER]. Release the Up Arrow [▲].

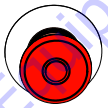


12. This completes the Jib Level Down crackpoint procedure. Press ESC [ESC] to return to the calibrations menu.



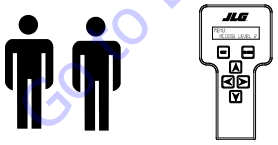
13. The crackpoint setting procedure for Jib Level Up and Down is complete. Press ESC [ESC] to exit calibrations.

14. Push in Power/Emergency Stop switch to save the calibration changes.



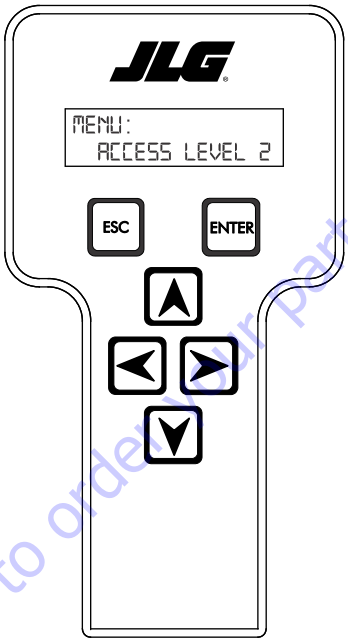
Main Lift Up and Down Crackpoints

NOTE: *To set crackpoints for the Main Lift Up and Down, a JLG analyzer is needed. Have an assistant on hand to help verify that movement occurs.*

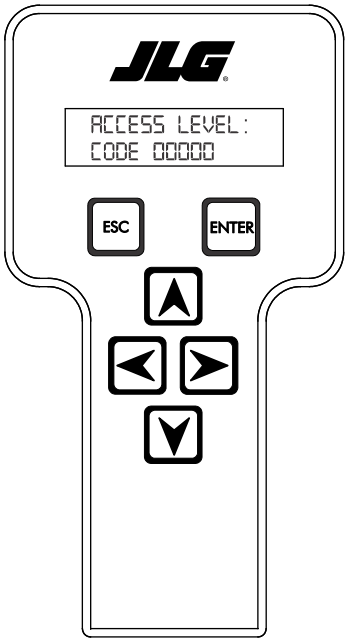


1. Connect the JLG analyzer to the machine at the Ground Controls. Start the engine.

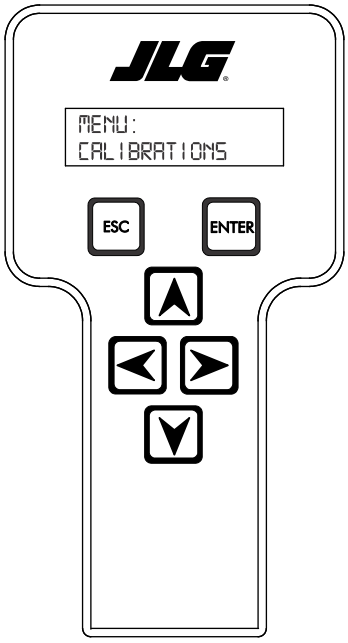
2. Scroll to MENU: OPERATOR ACCESS and press ENTER [ENTER].



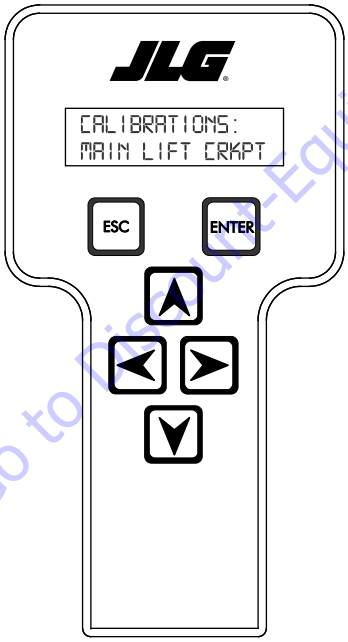
3. Enter code 33271 and press ENTER [ENTER].



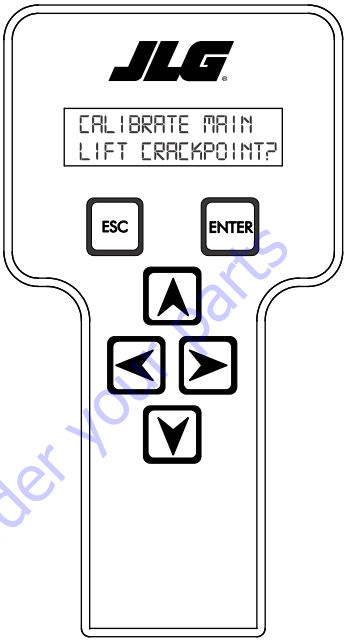
4. Scroll to MENU: CALIBRATIONS and press ENTER (ENTER).



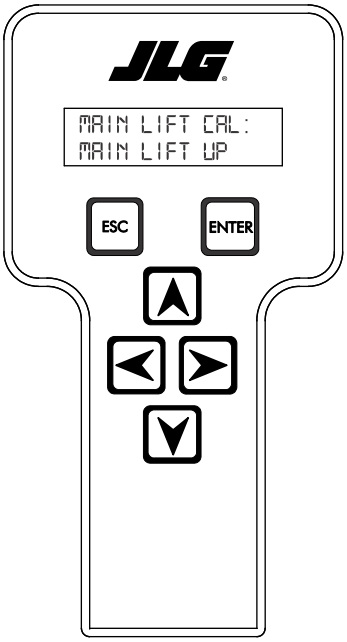
5. Scroll to MAIN LIFT CRKPT and press ENTER (ENTER).



6. Press ENTER (ENTER).

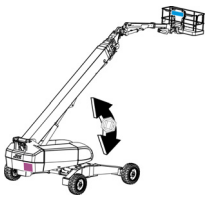


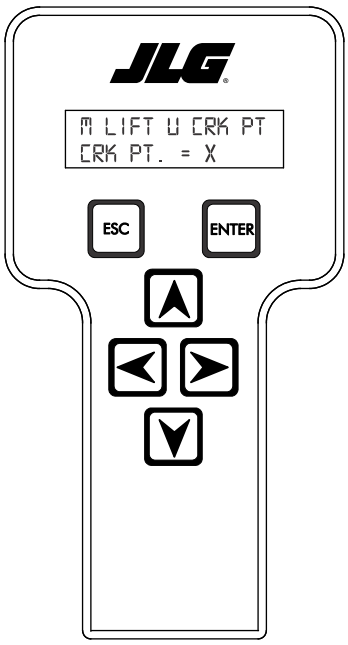
7. Press ENTER (ENTER) to calibrate Main Lift Up crackpoint.



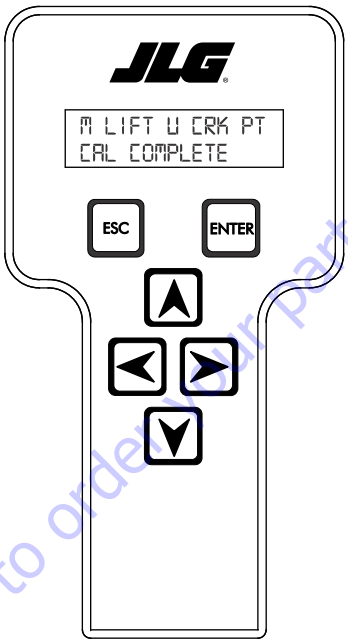
NOTE: *Have an assistant help verify that movement occurs.*

8. At the Ground Controls, press and hold the Lift Up toggle switch until the function starts moving, then press ENTER (ENTER). Release the Lift Up toggle switch.

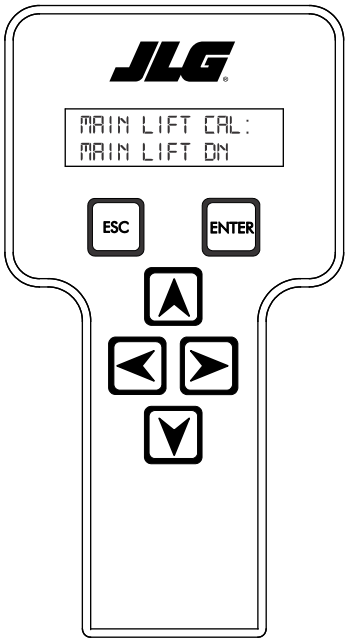




9. This completes the Main Lift Up crackpoint procedure. Press ENTER (ENTER).

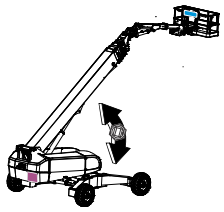


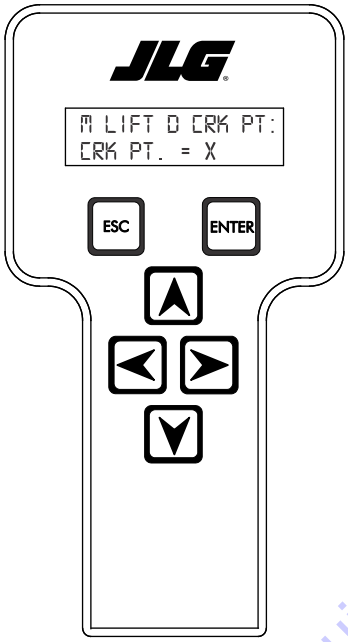
10. Press ENTER (ENTER) to calibrate Main Lift Down crackpoint.



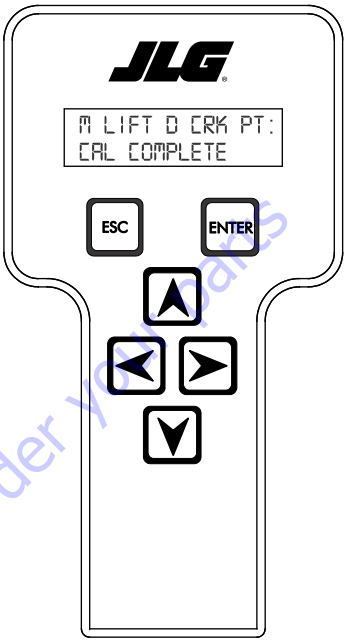
NOTE: *Have an assistant help verify that movement occurs.*

11. At the Ground Controls, press and hold the Lift Down toggle switch until the function starts moving, then press ENTER (ENTER). Release the Lift Down toggle switch.

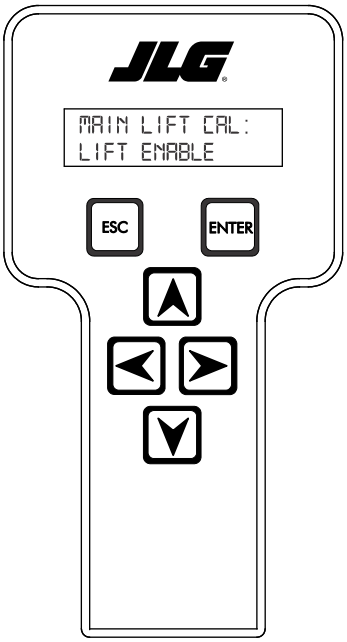




12. This completes the Main Lift Down crackpoint procedure. Press ENTER (ENTER).



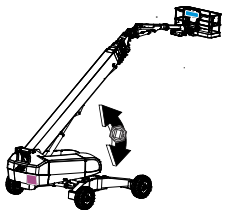
13. Press ENTER (ENTER) to calibrate Main Lift Enable crackpoint.

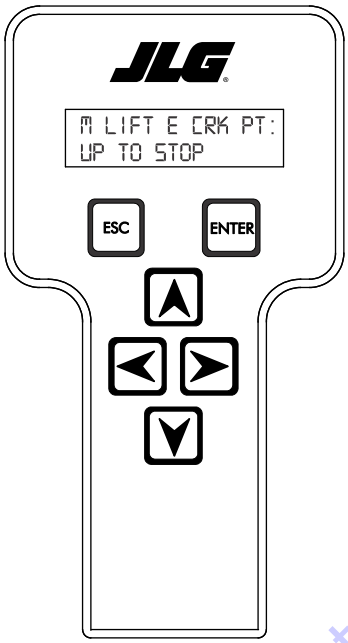


NOTICE

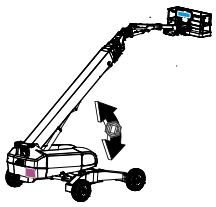
FOR THE FOLLOWING STEP, ELEVATE THE BOOM UNTIL IT STOPS IN ORDER TO CORRECTLY CALIBRATE THE MAIN LIFT ENABLE CRACKPOINT.

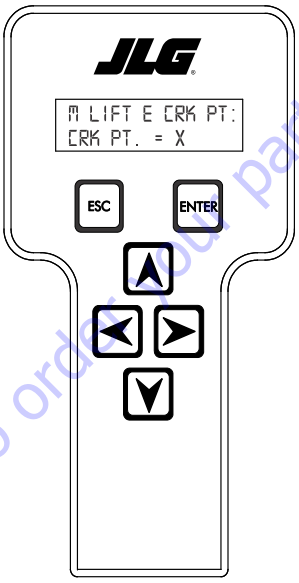
14. At the Ground Controls, press and hold the Lift Up toggle switch until the engine goes to idle speed (lift should not be moving), then press ENTER [ENTER]. Release the Lift Up toggle switch.



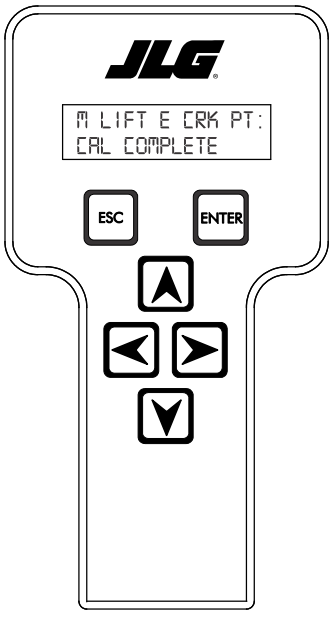


15. At the Ground Controls, press and hold the Lift Down toggle switch until the function starts moving, then press ENTER [ENTER]. Release the Lift Down toggle switch.



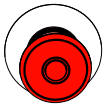


16. This completes the Main Lift Enable crackpoint procedure. Press ESC [ESC] to return to the calibrations menu.



17. The crackpoint setting procedure for Main Lift Up and Down is complete. Press ESC [ESC] to exit calibrations.

18. Push in Power/Emergency Stop button to save the calibration changes.

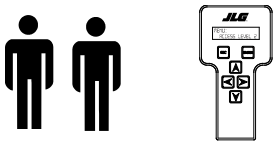


Main Telescope Out and In Crackpoints

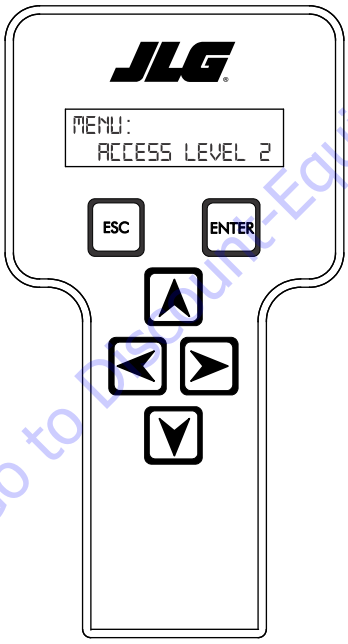
NOTICE

THE BOOM MUST BE FULLY RETRACTED AND HORIZONTAL BEFORE STARTING THE MAIN TELESCOPE OUT AND IN CRACKPOINT PROCEDURE.

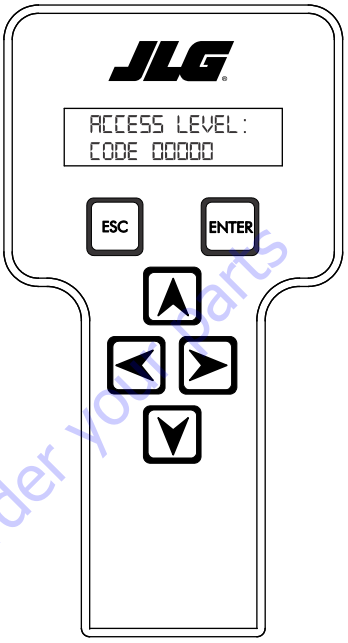
NOTE: *To set crackpoints for the Main Telescope Out and In, a JLG analyzer is needed. Have an assistant on hand to help verify that movement occurs.*



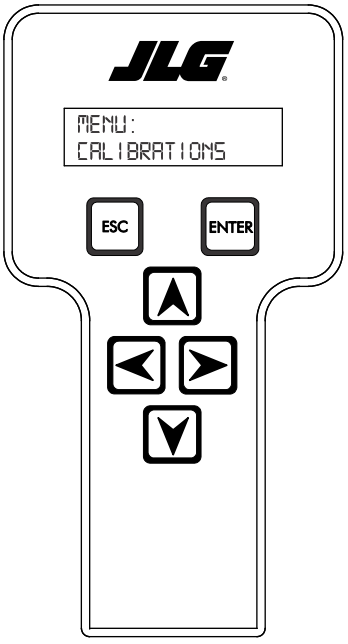
1. Connect the JLG analyzer to the machine at the Ground Controls. Start the engine.
2. Scroll to MENU: OPERATOR ACCESS and press ENTER (ENTER).



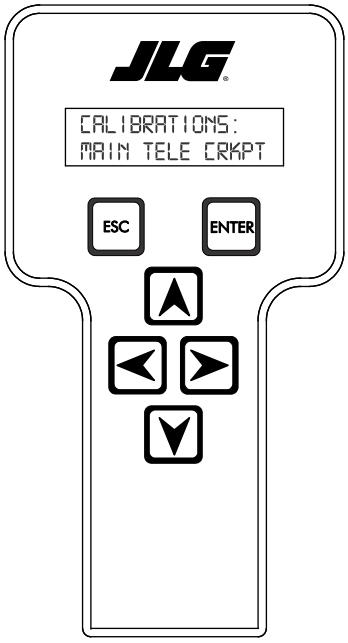
3. Enter code 33271 and press ENTER (ENTER).



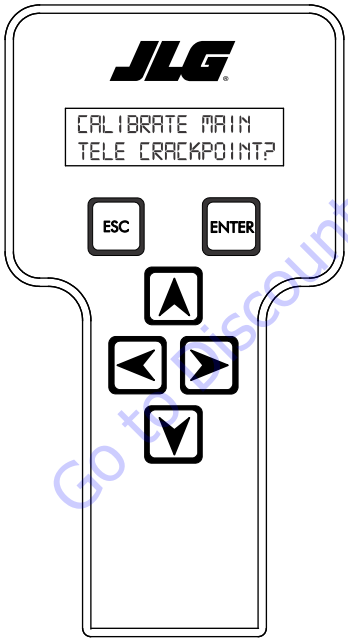
4. Scroll to MENU: CALIBRATIONS and press ENTER (ENTER).



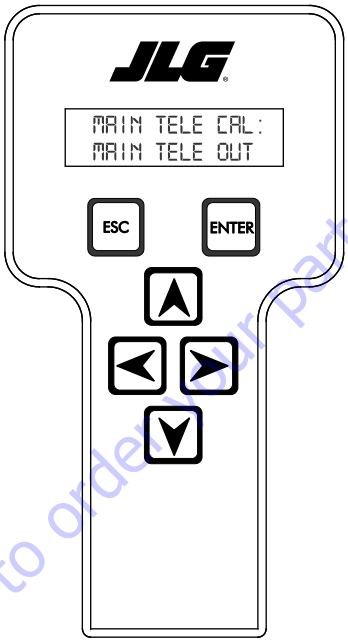
5. Scroll to MAIN TELE CRKPT and press ENTER (ENTER).



6. Press ENTER (ENTER).

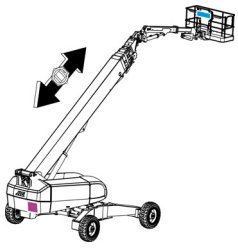


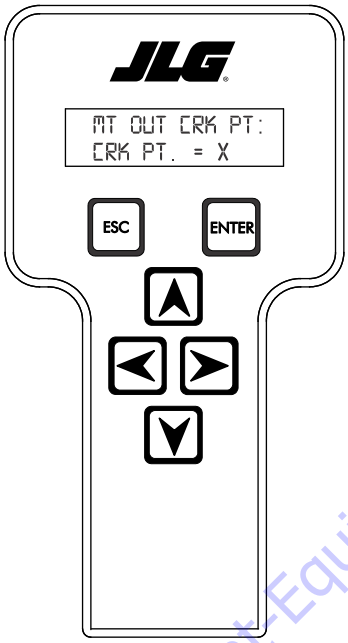
7. Press ENTER (ENTER) to calibrate Main Telescope Out crackpoint.



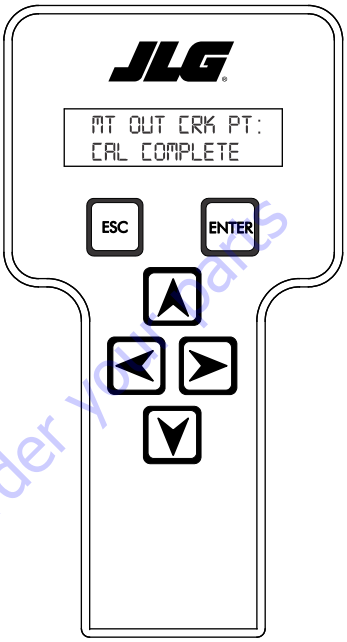
NOTE: *Have an assistant help verify that movement occurs.*

8. At the Ground Controls, press and hold the Telescope Out toggle switch until the function starts moving, then press ENTER. Release the Telescope Out toggle switch.

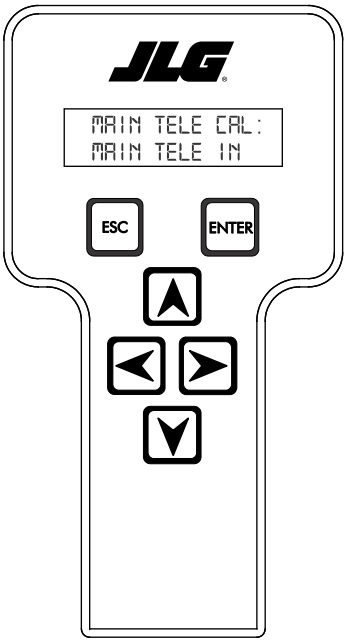




9. This completes the Main Telescope Out crackpoint procedure. Press ENTER.

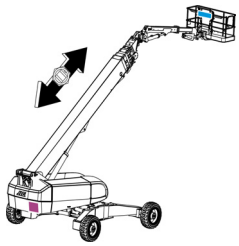


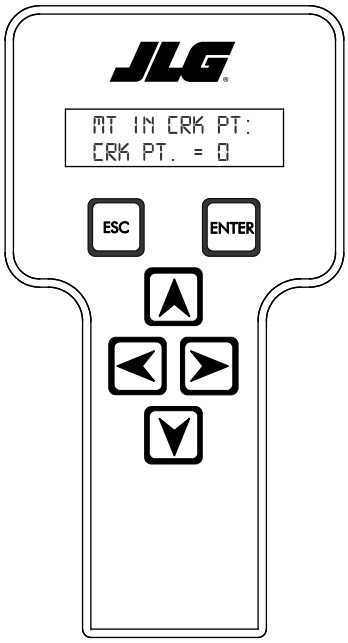
10. Press ENTER to calibrate Main Telescope In crackpoint.



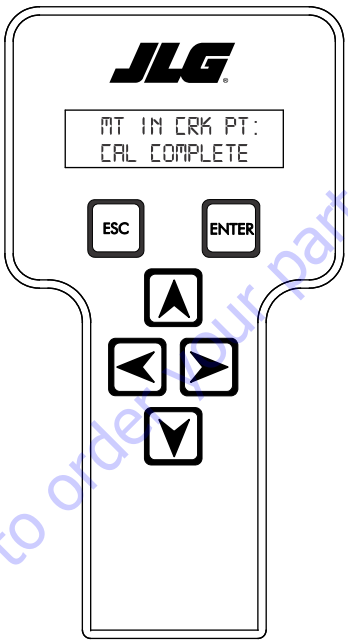
NOTE: *Have an assistant help verify that movement occurs.*

11. At the Ground Controls, press and hold the Telescope In toggle switch until the function starts moving, then press ENTER (ENTER). Release the Telescope In toggle switch.

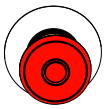




12. The crackpoint setting procedure for Main Telescope Out and In is complete. Press ESC (ESC) to exit calibrations.



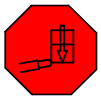
13. Push in Power/Emergency Stop switch to save the calibration changes.



6.12 LSS SYSTEM

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

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



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

NOTICE

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

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

NOTICE

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

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

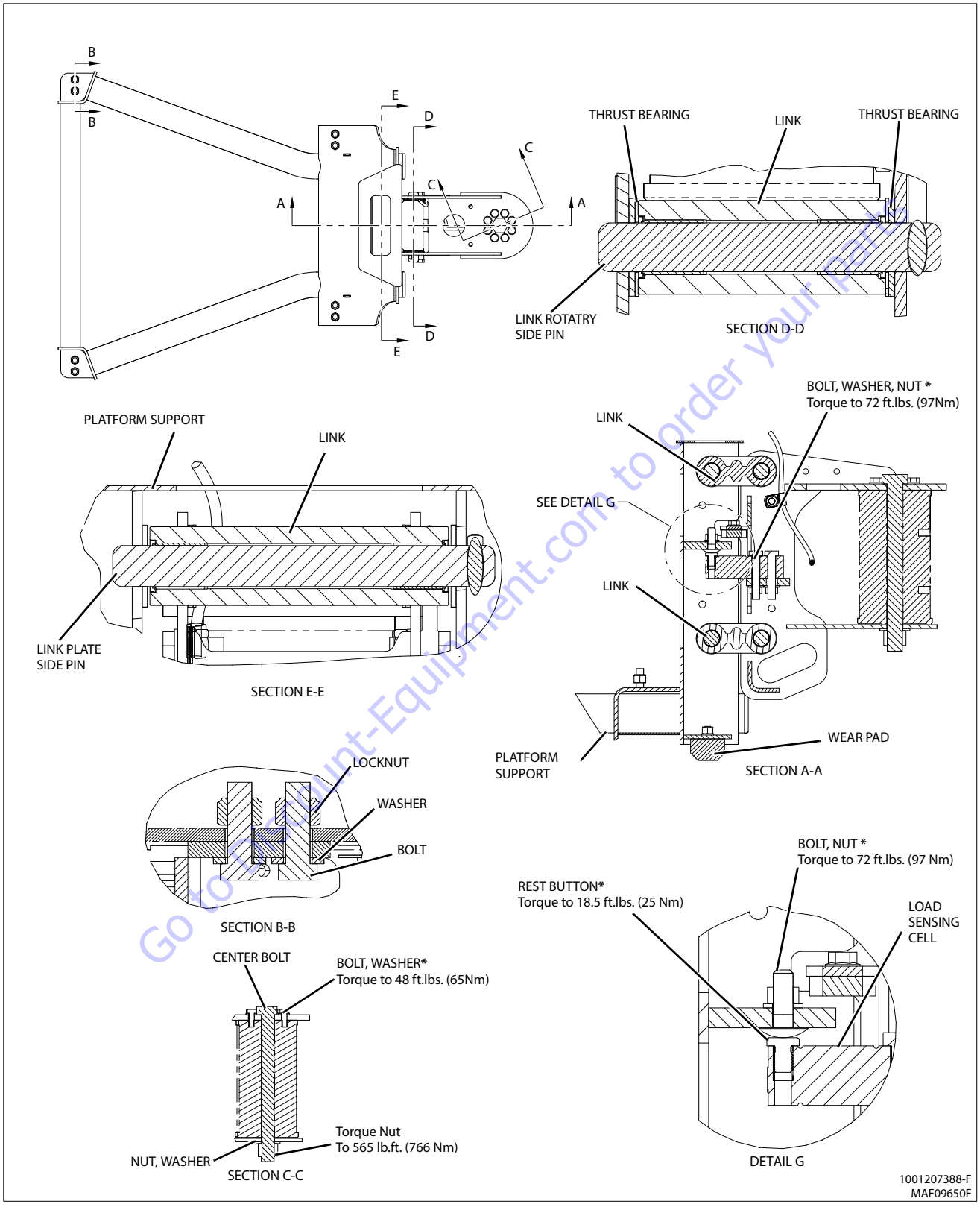


Figure 6-32. LSS Installation - Sheet 1 of 4

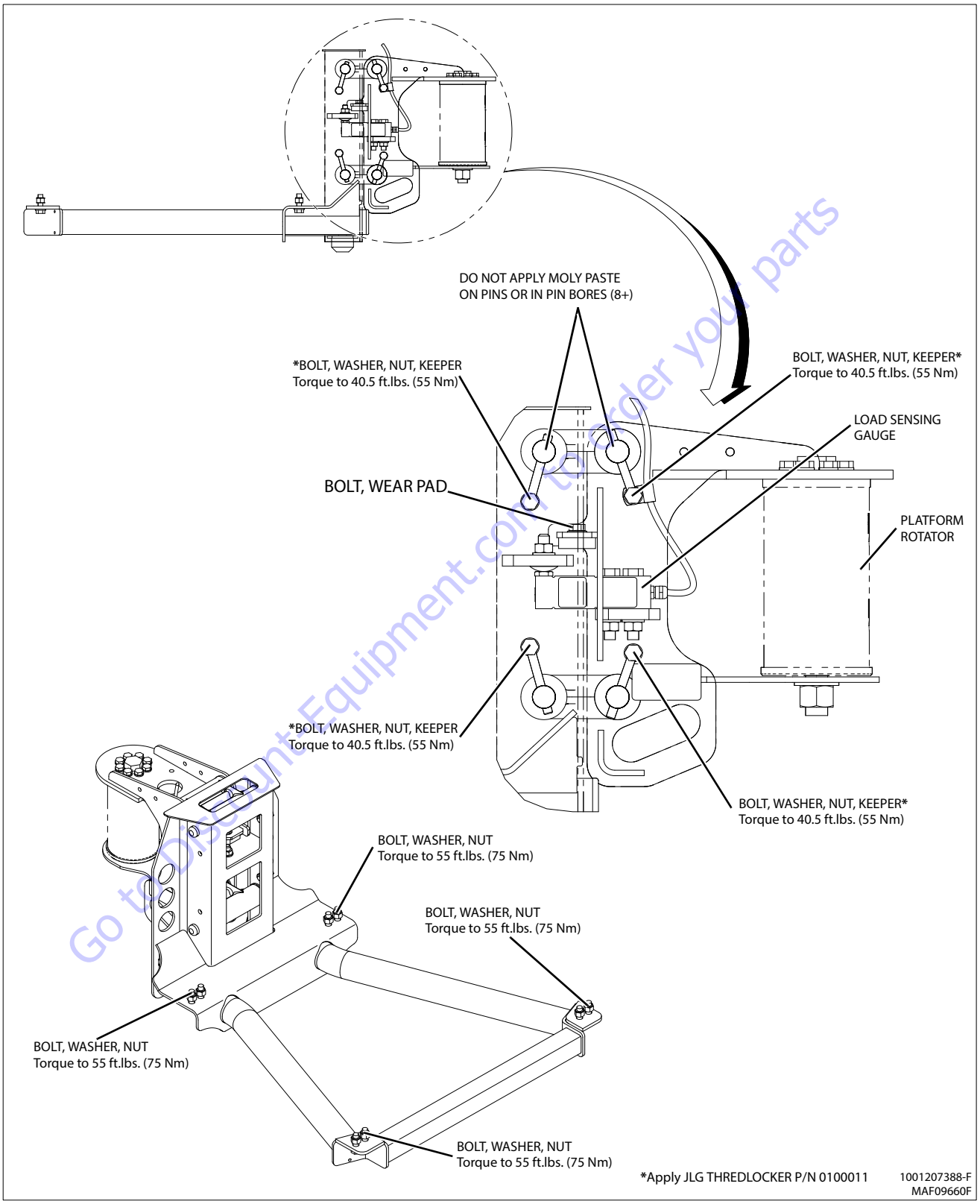


Figure 6-33. LSS Installation - Sheet 2 of 4

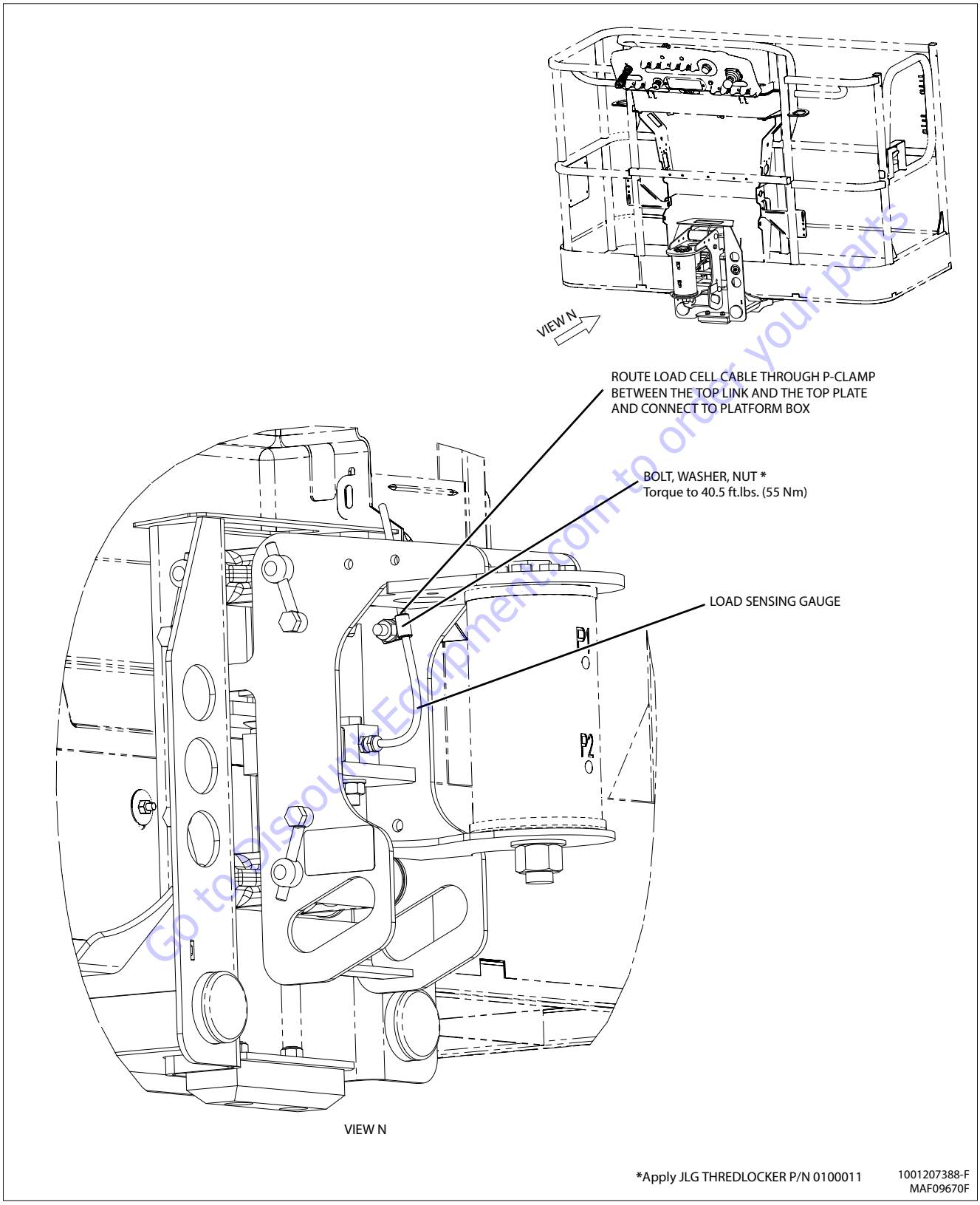


Figure 6-34. LSS Installation - Sheet 3 of 4

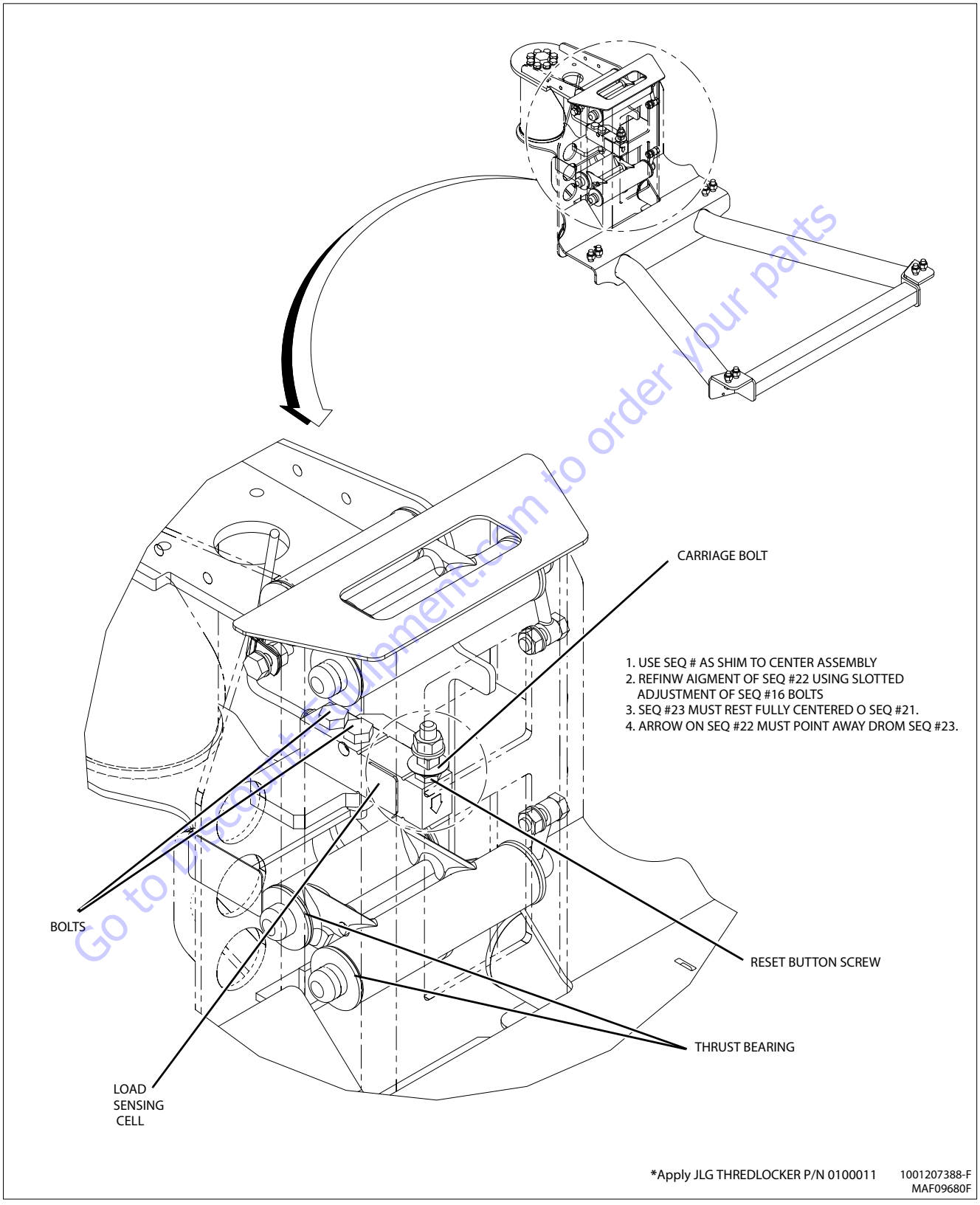


Figure 6-35. LSS Installation - Sheet 4 of 4

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.

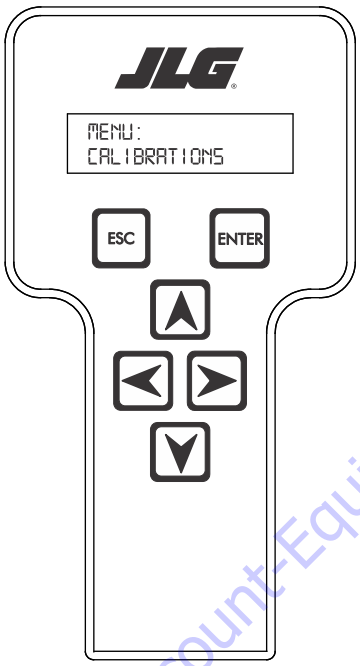
Table 6-7, Diagnostic Menu Descriptions details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

Table 6-7. 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			

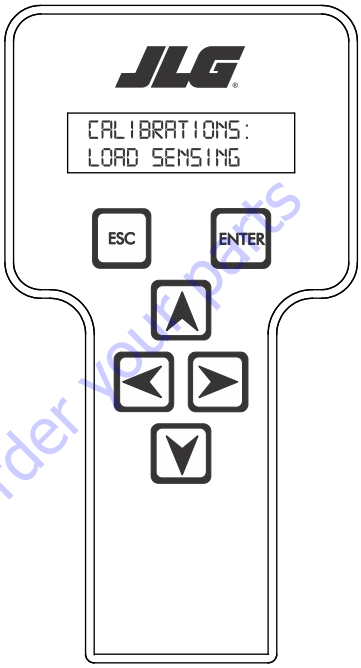
Calibration Procedure

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:

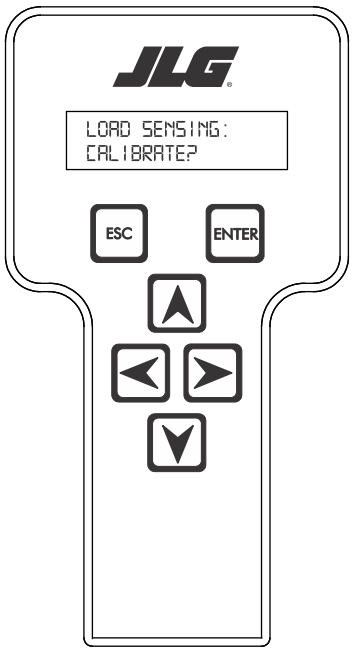


NOTE: *The Calibration Menu is not available in OPERATOR ACCESS.*

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:



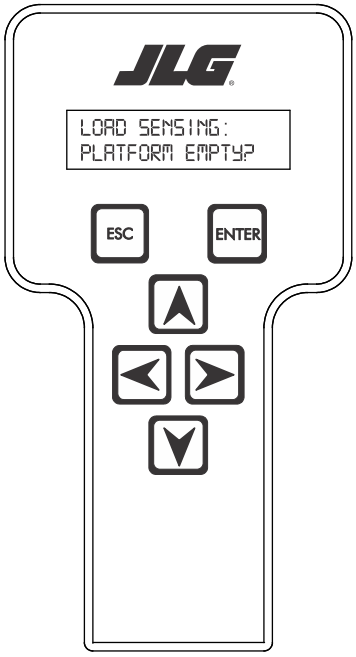
6. Press Enter (ENTER). The Screen will read:



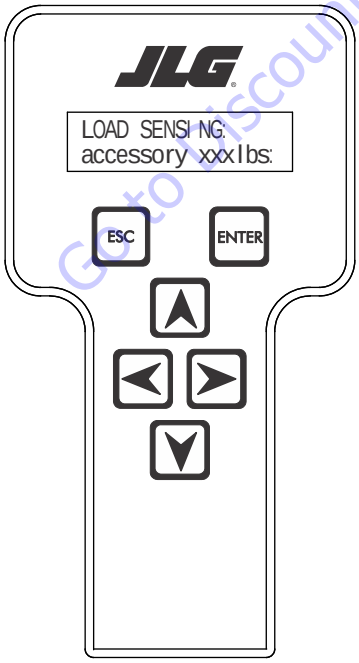
NOTE: *Calibration will auto fail if LSS DTC's are active (443, 444, 4479, 4480, 663, 821, 822, 823, 824, 8218, 8222 -> 8238, 991, 992, 993, 994 or 99285).*

Pressing the ESC key ENTER *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 6-8, 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:

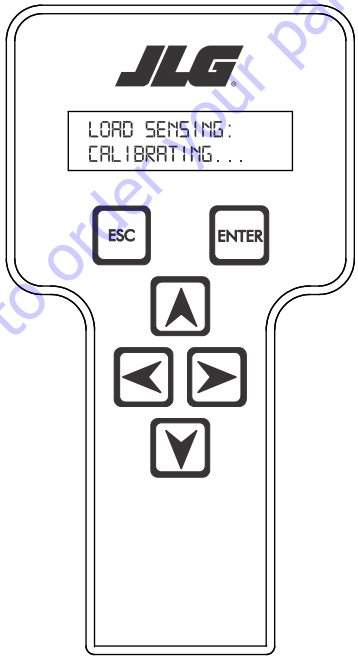


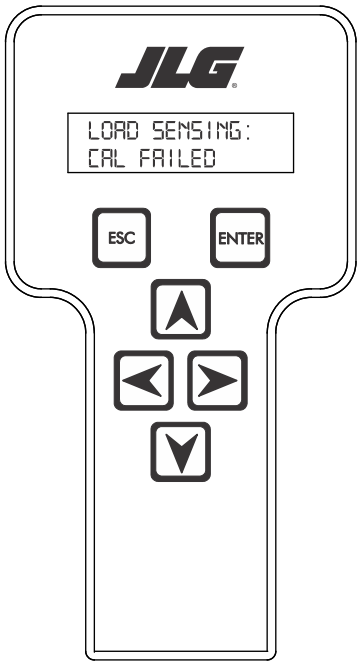
Table 6-8. Accessory Weights

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)

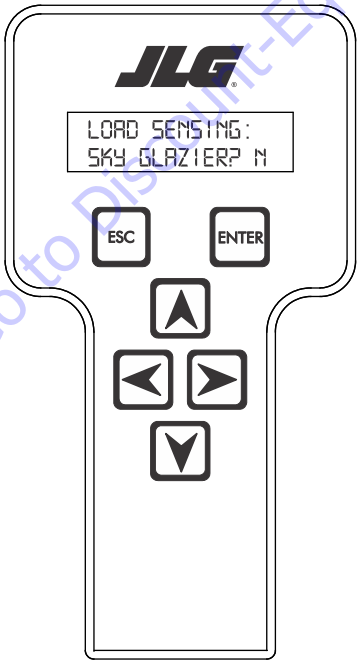
NOTE: *Not all Accessories are available on every JLG model. Some Accessory combinations are prohibited due to excessive weight and/or load restriction. If any installed JLG Accessories are labeled with weight decals but are not listed in the table above, include their weight when entering the ACC WEIGHT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

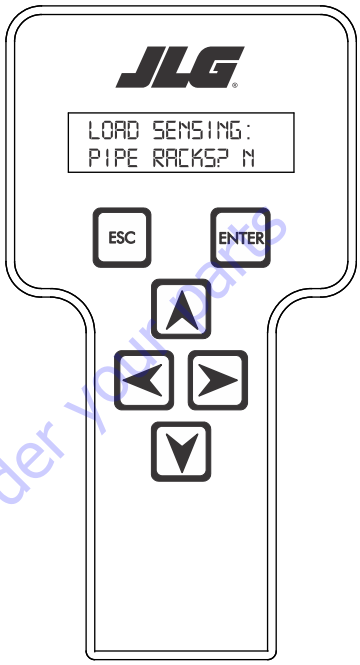
If the platform weight is not within the allowed range, the calibration attempt will be unsuccessful and the Analyzer will show the following:



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 6-9, SkyGlazier Capacity Reductions and Table 6-10, Pipe Rack Capacity Reductions.

The screen will read:

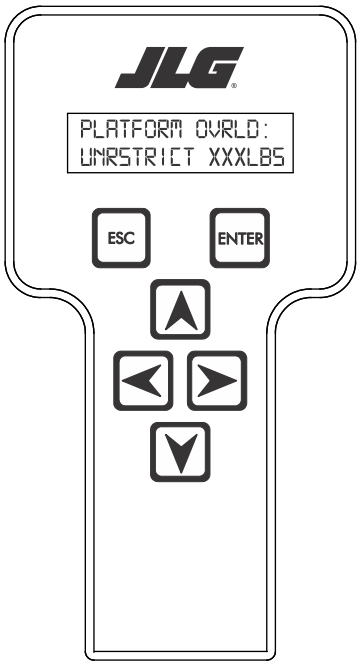


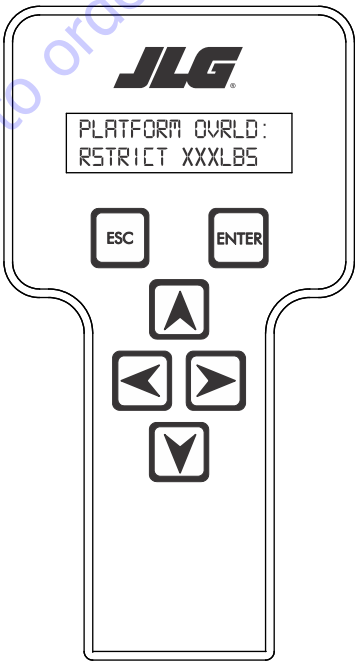
Table 6-9. SkyGlazier Capacity Reductions

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.		

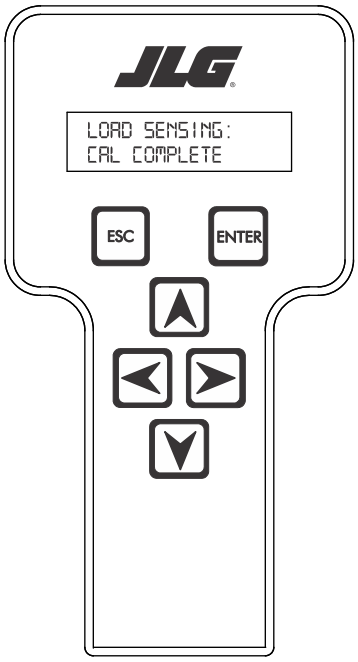
Table 6-10. Pipe Rack Capacity Reductions

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 6-9, SkyGlazier Capacity Reductions and Table 6-10, 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 6-11. LSS Troubleshooting Chart

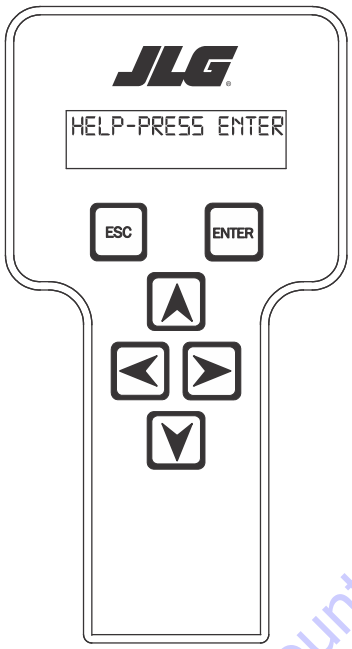
Difficulty	Possible Resolution
Empty Platform Weight (DIAGNOSTICS, PLATFORM LOAD) is not within ±15lbs (±7kg) of zero. or Platform Load readings (DIAGNOTICS, PLTLOAD) are unstable by more than ±2lbs (±1kg) (without the influence of vibration or wind). or There are large variations in Platform Load (DIAGNOSTICS,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

6.13 RESETTING THE MSSO SYSTEM

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

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

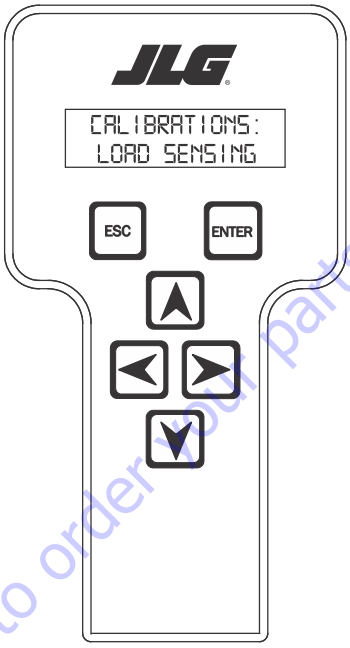
4. Pull out the Emergency Stop switch.
5. The analyzer screen should read:



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

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

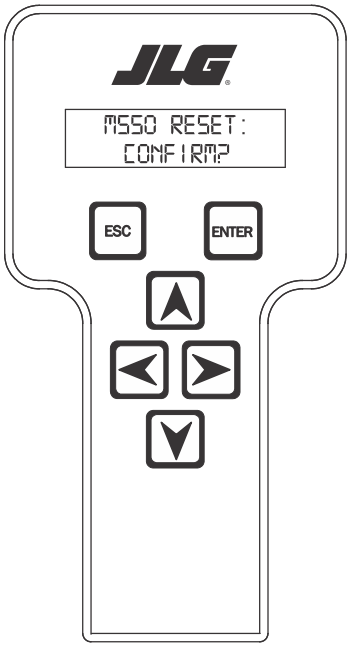
.
9. Use the arrow keys to reach the LOAD SENSING menu. The screen should read:



10. Press ENTER 

.
11. Use the 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.

6.14 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 ± 5.5º 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 ± 5.5º 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.

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
EVERYTHING OK	0	0	1	✓	✓	✓	✓	✓
RUNNING AT CUTBACK - OUT OF TRANSPORT POSITION	0	0	10	✓	✓	✓	✓	✓
FSW OPEN	0	0	11	✓	✓	✓	✓	✓
RUNNING AT CREEP - CREEP SWITCH OPEN	0	0	12	✓	✓	✓	✓	✓
RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	0	0	13	✓	✓	✓	✓	✓
CHASSIS TILT SENSOR OUT OF RANGE	0	0	14	✓	✓	✓	✓	✓
LOAD SENSOR READING UNDER WEIGHT	0	0	15	✓	✓	✓	✓	✓
ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	0	0	16	✓	✓	✓	✓	✓
OVER MOMENT - HYDRAULICS SUSPENDED	0	0	17	✓	✓	✓	✓	✓
UNDER MOMENT - HYDRAULICS SUSPENDED	0	0	18	✓	✓	✓	✓	✓
MAIN ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	0	0	19	✓	✓	✓	✓	✓
TOWER ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	0	0	20	--	--	✓	--	--
ADS1213 REINITIALIZED	0	0	21	✓	✓	✓	✓	✓
RUNNING AT CREEP - PLATFORM STOWED	0	0	30	✓	✓	✓	✓	✓
FUEL LEVEL LOW - ENGINE SHUTDOWN	0	0	31	✓	✓	✓	✓	✓
APU ACTIVE	0	0	35	✓	✓	✓	✓	✓
JIB UNLOCKED OUT OF TRANSPORT - HYDRAULICS SUSPENDED	0	0	37	--	--	--	✓	✓
SWING ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	0	0	38	--	--	--	✓	✓
SKYGUARD ACTIVE - FUNCTIONS CUTOUT	0	0	39	✓	✓	✓	✓	✓
KEYSWITCH FAULTY	2	1	212	✓	✓	✓	✓	✓
FSW FAULTY	2	1	213	✓	✓	✓	✓	✓
STEER SWITCHES FAULTY	2	2	227	✓	✓	✓	✓	✓
FSW INTERLOCK TRIPPED	2	2	2211	✓	✓	✓	✓	✓
DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2	2	2212	✓	✓	✓	✓	✓
STEER LOCKED - SELECTED BEFORE FOOTSWITCH	2	2	2213	✓	✓	✓	✓	✓
D/S JOY. OUT OF RANGE LOW	2	2	2215	✓	✓	✓	✓	✓
D/S JOY. OUT OF RANGE HIGH	2	2	2216	✓	✓	✓	✓	✓
D/S JOY. CENTER TAP BAD	2	2	2217	✓	✓	✓	✓	✓
L/S JOY. OUT OF RANGE LOW	2	2	2218	✓	✓	✓	✓	✓
L/S JOY. OUT OF RANGE HIGH	2	2	2219	✓	✓	✓	✓	✓
L/S JOY. CENTER TAP BAD	2	2	2220	✓	✓	✓	✓	✓
LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2	2	2221	✓	✓	✓	✓	✓
WAITING FOR FSW TO BE OPEN	2	2	2222	✓	✓	✓	✓	✓
FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	2	2	2223	✓	✓	✓	✓	✓
FOOTSWITCH SELECTED BEFORE START	2	2	2224	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	2	3	234	✓	✓	✓	✓	✓
FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	2	3	235	✓	✓	✓	✓	✓
FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	2	3	236	✓	✓	✓	✓	✓
START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	2	3	237	✓	✓	✓	✓	✓
TOWER LIFT PRESSURE SENSOR - OUT OF RANGE HIGH	2	3	23100	--	--	✓	--	--
TOWER LIFT PRESSURE SENSOR - OUT OF RANGE LOW	2	3	23101	--	--	✓	--	--
TOWER LIFT PRESSURE SENSOR - NOT DETECTING CHANGE	2	3	23102	--	--	✓	--	--
TOWER LIFT CYLINDER - OVER PRESSURE	2	3	23103	--	--	✓	--	--
LIFT PRESSURE SENSOR - OUT OF RANGE LOW	2	3	23124	--	--	--	--	✓
LIFT PRESSURE SENSOR - OUT OF RANGE HIGH	2	3	23125	--	--	--	--	✓
LIFT PRESSURE SENSOR - NOT DETECTING CHANGE	2	3	23126	--	--	--	--	✓
LIFT CYLINDER - OVER PRESSURE	2	3	23127	--	--	--	--	✓
REDUCTION CHECK PRESSURE SENSOR - OUT OF RANGE LOW	2	3	23128	--	--	--	--	✓
REDUCTION CHECK PRESSURE SENSOR - OUT OF RANGE HIGH	2	3	23129	--	--	--	--	✓
REDUCTION CHECK PRESSURE SENSOR - HIGH	2	3	23130	--	--	--	--	✓
REDUCTION CHECK PRESSURE SENSOR - LOW	2	3	23131	--	--	--	--	✓
MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS	2	5	259	✓	✓	✓	✓	✓
GENERATOR MOTION CUTOUT ACTIVE	2	5	2513	✓	✓	✓	✓	✓
BOOM PREVENTED - DRIVE SELECTED	2	5	2514	✓	✓	✓	✓	✓
DRIVE PREVENTED - BOOM SELECTED	2	5	2515	✓	✓	✓	✓	✓
DRIVE PREVENTED - ABOVE ELEVATION	2	5	2516	✓	✓	✓	✓	✓
DRIVE PREVENTED - TILTED & ABOVE ELEVATION	2	5	2517	✓	✓	✓	✓	✓
JIB SWING PREVENTED - IN 1000# MODE	2	5	2521	✓	✓	✓	✓	✓
CAN DONGLE ATTACHED - HYDRAULICS NOT RESTRICTED	2	5	2522	✓	✓	✓	✓	✓
BACKUP BLAM COMMUNICATIONS ACTIVE	2	5	2523	--	--	✓	--	--
DISCONNECT ANALYZER AND CYCLE EMS TO PERFORM BOOM RETRIEVAL	2	5	2524	--	--	✓	--	--
MACHINE SETUP FAULT - JIB SWING	2	5	2546	✓	✓	✓	✓	✓
MACHINE SETUP FAULT - MODEL	2	5	2547	✓	✓	✓	✓	✓
SYSTEM TEST MODE ACTIVE	2	5	2548	✓	✓	✓	✓	✓
SKYGUARD SW - DISAGREEMENT	2	5	2563	✓	✓	✓	✓	✓
FRONT LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	2	6	261	--	--	--	--	✓
FRONT LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	2	6	262	--	--	--	--	✓
FRONT RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	2	6	263	--	--	--	--	✓
FRONT RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	2	6	264	--	--	--	--	✓
REAR LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	2	6	265	--	--	--	--	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
REAR LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	2	6	266	--	--	--	--	✓
REAR RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	2	6	267	--	--	--	--	✓
REAR RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	2	6	268	--	--	--	--	✓
FRONT LEFT AXLE SENSOR - NOT RESPONDING	2	6	2611	--	--	--	--	✓
FRONT RIGHT AXLE SENSOR - NOT RESPONDING	2	6	2612	--	--	--	--	✓
REAR LEFT AXLE SENSOR - NOT RESPONDING	2	6	2613	--	--	--	--	✓
REAR RIGHT AXLE SENSOR - NOT RESPONDING	2	6	2614	--	--	--	--	✓
AXLE RETRACT POSITION - NOT CALIBRATED	2	6	2615	--	--	--	--	✓
AXLE DEPLOY POSITION - NOT CALIBRATED	2	6	2616	--	--	--	--	✓
BRAKE - SHORT TO BATTERY	3	3	331	✓	✓	✓	✓	✓
BRAKE - OPEN CIRCUIT	3	3	332	✓	✓	✓	✓	✓
GROUND ALARM - SHORT TO BATTERY	3	3	3311	✓	✓	✓	✓	✓
RIGHT FORWARD DRIVE PUMP - SHORT TO GROUND	3	3	3316	✓	✓	✓	✓	✓
RIGHT FORWARD DRIVE PUMP - OPEN CIRCUIT	3	3	3317	✓	✓	✓	✓	✓
RIGHT FORWARD DRIVE PUMP - SHORT TO BATTERY	3	3	3318	✓	✓	✓	✓	✓
RIGHT REVERSE DRIVE PUMP - SHORT TO GROUND	3	3	3320	✓	✓	✓	✓	✓
RIGHT REVERSE DRIVE PUMP - OPEN CIRCUIT	3	3	3321	✓	✓	✓	✓	✓
RIGHT REVERSE DRIVE PUMP - SHORT TO BATTERY	3	3	3322	✓	✓	✓	✓	✓
LEFT FORWARD DRIVE PUMP - SHORT TO GROUND	3	3	3324	✓	✓	✓	✓	✓
LEFT FORWARD DRIVE PUMP - OPEN CIRCUIT	3	3	3325	✓	✓	✓	✓	✓
LEFT FORWARD DRIVE PUMP - SHORT TO BATTERY	3	3	3326	✓	✓	✓	✓	✓
LEFT REVERSE DRIVE PUMP - SHORT TO GROUND	3	3	3328	✓	✓	✓	✓	✓
LEFT REVERSE DRIVE PUMP - OPEN CIRCUIT	3	3	3329	✓	✓	✓	✓	✓
LEFT REVERSE DRIVE PUMP - SHORT TO BATTERY	3	3	3330	✓	✓	✓	✓	✓
ALTERNATOR/ECM POWER - SHORT TO GROUND	3	3	3336	✓	✓	✓	✓	✓
ALTERNATOR POWER - OPEN CIRCUIT	3	3	3338	✓	✓	✓	✓	✓
ALTERNATOR POWER - SHORT TO BATTERY	3	3	3339	✓	✓	✓	✓	✓
AUX POWER - SHORT TO GROUND	3	3	3340	✓	✓	✓	✓	✓
AUX POWER - OPEN CIRCUIT	3	3	3341	✓	✓	✓	✓	✓
AUX POWER - SHORT TO BATTERY	3	3	3342	✓	✓	✓	✓	✓
COLD START ADVANCE SOLENOID - SHORT TO GROUND	3	3	3343	✓	✓	✓	✓	✓
COLD START ADVANCE SOLENOID - OPEN CIRCUIT	3	3	3344	✓	✓	✓	✓	✓
COLD START ADVANCE SOLENOID - SHORT TO BATTERY	3	3	3345	✓	✓	✓	✓	✓
ELECTRIC PUMP - SHORT TO GROUND	3	3	3349	✓	✓	✓	✓	✓
ELECTRIC PUMP - OPEN CIRCUIT	3	3	3350	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
ELECTRIC PUMP - SHORT TO BATTERY	3	3	3351	✓	✓	✓	✓	✓
MAIN DUMP VALVE - SHORT TO GROUND	3	3	3358	✓	✓	✓	✓	✓
MAIN DUMP VALVE - OPEN CIRCUIT	3	3	3359	✓	✓	✓	✓	✓
MAIN DUMP VALVE - SHORT TO BATTERY	3	3	3360	✓	✓	✓	✓	✓
BRAKE - SHORT TO GROUND	3	3	3361	✓	✓	✓	✓	✓
START SOLENOID - SHORT TO GROUND	3	3	3362	✓	✓	✓	✓	✓
START SOLENOID - OPEN CIRCUIT	3	3	3363	✓	✓	✓	✓	✓
START SOLENOID - SHORT TO BATTERY	3	3	3364	✓	✓	✓	✓	✓
TWO SPEED VALVE - SHORT TO GROUND	3	3	3368	✓	✓	✓	✓	✓
TWO SPEED VALVE - OPEN CIRCUIT	3	3	3369	✓	✓	✓	✓	✓
TWO SPEED VALVE - SHORT TO BATTERY	3	3	3370	✓	✓	✓	✓	✓
GROUND ALARM - SHORT TO GROUND	3	3	3371	✓	✓	✓	✓	✓
GROUND ALARM - OPEN CIRCUIT	3	3	3372	✓	✓	✓	✓	✓
GEN SET/WELDER - SHORT TO GROUND	3	3	3373	✓	✓	✓	✓	✓
GEN SET/WELDER - OPEN CIRCUIT	3	3	3374	✓	✓	✓	✓	✓
GEN SET/WELDER - SHORT TO BATTERY	3	3	3375	✓	✓	✓	✓	✓
HEAD TAIL LIGHT - SHORT TO GROUND	3	3	3376	✓	✓	✓	✓	✓
HEAD TAIL LIGHT - OPEN CIRCUIT	3	3	3377	✓	✓	✓	✓	✓
HEAD TAIL LIGHT - SHORT TO BATTERY	3	3	3378	✓	✓	✓	✓	✓
HOUR METER - SHORT TO GROUND	3	3	3379	✓	✓	✓	✓	✓
HOUR METER - OPEN CIRCUIT	3	3	3380	✓	✓	✓	✓	✓
HOUR METER - SHORT TO BATTERY	3	3	3381	✓	✓	✓	✓	✓
PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO GROUND	3	3	3385	✓	✓	✓	✓	✓
PLATFORM LEVEL UP OVERRIDE VALVE - OPEN CIRCUIT	3	3	3386	✓	✓	✓	✓	✓
PLATFORM LEVEL UP OVERRIDE VALVE - SHORT TO BATTERY	3	3	3387	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO GROUND	3	3	3391	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN OVERRIDE VALVE - OPEN CIRCUIT	3	3	3392	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN OVERRIDE VALVE - SHORT TO BATTERY	3	3	3393	✓	✓	✓	✓	✓
PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	3	3	3394	✓	✓	✓	✓	✓
PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	3	3	3395	✓	✓	✓	✓	✓
PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	3	3	3396	✓	✓	✓	✓	✓
PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	3	3	3397	✓	✓	✓	✓	✓
PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	3	3	3398	✓	✓	✓	✓	✓
PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	3	3	3399	✓	✓	✓	✓	✓
JIB LIFT UP VALVE - SHORT TO GROUND	3	3	33100	✓	✓	✓	--	--

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
JIB LIFT UP VALVE - OPEN CIRCUIT	3	3	33101	✓	✓	✓	--	--
JIB LIFT UP VALVE - SHORT TO BATTERY	3	3	33102	✓	✓	✓	--	--
JIB LIFT DOWN VALVE - SHORT TO GROUND	3	3	33103	✓	✓	✓	--	--
JIB LIFT DOWN VALVE - OPEN CIRCUIT	3	3	33104	✓	✓	✓	--	--
JIB LIFT DOWN VALVE - SHORT TO BATTERY	3	3	33105	✓	✓	✓	--	--
SWING RIGHT VALVE - SHORT TO GROUND	3	3	33118	✓	✓	✓	✓	✓
SWING RIGHT VALVE - OPEN CIRCUIT	3	3	33119	✓	✓	✓	✓	✓
MAIN TELESCOPE IN VALVE - SHORT TO BATTERY	3	3	33120	✓	✓	✓	✓	✓
SWING RIGHT VALVE - SHORT TO BATTERY	3	3	33121	✓	✓	✓	✓	✓
SWING LEFT VALVE - SHORT TO GROUND	3	3	33122	✓	✓	✓	✓	✓
MAIN TELESCOPE OUT VALVE - SHORT TO BATTERY	3	3	33123	✓	✓	✓	✓	✓
THROTTLE ACTUATOR - SHORT TO GROUND	3	3	33130	✓	✓	✓	✓	✓
THROTTLE ACTUATOR - OPEN CIRCUIT	3	3	33131	✓	✓	✓	✓	✓
THROTTLE ACTUATOR - SHORT TO BATTERY	3	3	33132	✓	✓	✓	✓	✓
PLATFORM CONTROL VALVE - SHORT TO GROUND	3	3	33133	✓	✓	✓	✓	✓
PLATFORM CONTROL VALVE - OPEN CIRCUIT	3	3	33134	✓	✓	✓	✓	✓
PLATFORM CONTROL VALVE - SHORT TO BATTERY	3	3	33135	✓	✓	✓	✓	✓
MAIN LIFT APU VALVE - SHORT TO GROUND	3	3	33136	--	--	✓	--	--
MAIN LIFT APU VALVE - OPEN CIRCUIT	3	3	33137	--	--	✓	--	--
MAIN LIFT APU VALVE - SHORT TO BATTERY	3	3	33138	--	--	✓	--	--
MAIN LIFT PILOT - PRESSURE FAILURE	3	3	33139	--	--	✓	--	--
MAIN LIFT PILOT - NO PRESSURE	3	3	33140	--	--	✓	--	--
MAIN LIFT PILOT - PRESSURE SWITCH FAILURE	3	3	33141	--	--	✓	--	--
TOWER LIFT APU VALVE - STUCK OPEN	3	3	33142	--	--	✓	--	--
TOWER LIFT ENABLE VALVE - STUCK OPEN	3	3	33143	--	--	✓	--	--
TOWER LIFT ENABLE VALVE - SHORT TO GROUND	3	3	33144	--	--	✓	--	--
TOWER LIFT ENABLE VALVE - OPEN CIRCUIT	3	3	33145	--	--	✓	--	--
TOWER LIFT ENABLE VALVE - SHORT TO BATTERY	3	3	33146	--	--	✓	--	--
TOWER TELESCOPE APU VALVE - SHORT TO GROUND	3	3	33147	--	--	✓	--	--
TOWER TELESCOPE APU VALVE - OPEN CIRCUIT	3	3	33148	--	--	✓	--	--
TOWER TELESCOPE APU VALVE - SHORT TO BATTERY	3	3	33149	--	--	✓	--	--
LIFT PILOT VALVE - SHORT TO GROUND	3	3	33150	✓	✓	--	✓	✓
LIFT PILOT VALVE - OPEN CIRCUIT	3	3	33151	✓	✓	--	✓	✓
LIFT PILOT VALVE - SHORT TO BATTERY	3	3	33152	✓	✓	--	✓	✓
LIFT DOWN AUX VALVE - SHORT TO GROUND	3	3	33153	✓	✓	--	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
LIFT DOWN AUX VALVE - OPEN CIRCUIT	3	3	33154	✓	✓	--	✓	✓
LIFT DOWN AUX VALVE - SHORT TO BATTERY	3	3	33155	✓	✓	--	✓	✓
TOWER LIFT APU VALVE - SHORT TO GROUND	3	3	33156	--	--	✓	--	--
TOWER LIFT APU VALVE - OPEN CIRCUIT	3	3	33157	--	--	✓	--	--
TOWER LIFT APU VALVE - SHORT TO BATTERY	3	3	33158	--	--	✓	--	--
MAIN LIFT ENABLE VALVE - SHORT TO GROUND	3	3	33159	--	--	✓	--	✓
MAIN LIFT ENABLE VALVE - OPEN CIRCUIT	3	3	33160	--	--	✓	--	✓
MAIN LIFT ENABLE VALVE - SHORT TO BATTERY	3	3	33161	--	--	✓	--	✓
TOWER TELESCOPE APU VALVE - STUCK OPEN	3	3	33162	--	--	✓	--	--
TOWER TELESCOPE ENABLE VALVE - STUCK OPEN	3	3	33163	--	--	✓	--	--
TOWER TELESCOPE ENABLE VALVE - SHORT TO GROUND	3	3	33164	--	--	✓	--	--
TOWER TELESCOPE ENABLE VALVE - OPEN CIRCUIT	3	3	33165	--	--	✓	--	--
TOWER TELESCOPE ENABLE VALVE - SHORT TO BATTERY	3	3	33166	--	--	✓	--	--
PVG ENABLE VALVE - SHORT TO GROUND	3	3	33167	--	--	✓	--	--
PVG ENABLE VALVE - OPEN CIRCUIT	3	3	33168	--	--	✓	--	--
PVG ENABLE VALVE - SHORT TO BATTERY	3	3	33169	--	--	✓	--	--
RESTRICTED TO TRANSPORT - AXLE LOCKOUT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	3	33173	✓	✓	✓	✓	✓
RESTRICTED TO TRANSPORT - BRAKE - SHORT TO BATTERY OR OPEN CIRCUIT	3	3	33174	✓	✓	✓	✓	✓
JIB ROTATE LEFT VALVE - OPEN CIRCUIT	3	3	33175	✓	✓	✓	--	--
JIB ROTATE LEFT VALVE - SHORT TO BATTERY	3	3	33176	✓	✓	✓	--	--
JIB ROTATE LEFT VALVE - SHORT TO GROUND	3	3	33177	✓	✓	✓	--	--
JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	3	3	33178	✓	✓	✓	--	--
JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	3	3	33179	✓	✓	✓	--	--
JIB ROTATE RIGHT VALVE - SHORT TO GROUND	3	3	33180	✓	✓	✓	--	--
MAIN LIFT UP VALVE - OPEN CIRCUIT	3	3	33181	✓	✓	--	✓	✓
MAIN LIFT UP VALVE - SHORT TO BATTERY	3	3	33329	✓	✓	--	✓	✓
MAIN LIFT UP VALVE - SHORT TO GROUND	3	3	33183	✓	✓	--	✓	✓
MAIN LIFT DOWN VALVE - OPEN CIRCUIT	3	3	33184	✓	✓	--	✓	✓
MAIN LIFT DOWN VALVE - SHORT TO GROUND	3	3	33185	✓	✓	--	✓	✓
MAIN TELESCOPE OUT VALVE - OPEN CIRCUIT	3	3	33186	✓	✓	✓	✓	✓
MAIN TELESCOPE OUT VALVE - SHORT TO GROUND	3	3	33188	✓	✓	✓	✓	✓
MAIN TELESCOPE IN VALVE - OPEN CIRCUIT	3	3	33189	✓	✓	✓	✓	✓
MAIN TELESCOPE IN VALVE - SHORT TO GROUND	3	3	33190	✓	✓	✓	✓	✓
HORN - OPEN CIRCUIT	3	3	33207	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
HORN - SHORT TO BATTERY	3	3	33208	✓	✓	✓	✓	✓
HORN - SHORT TO GROUND	3	3	33209	✓	✓	✓	✓	✓
GLOWPLUG - OPEN CIRCUIT	3	3	33279	✓	✓	✓	✓	✓
GLOWPLUG - SHORT TO BATTERY	3	3	33280	✓	✓	✓	✓	✓
GLOWPLUG - SHORT TO GROUND	3	3	33281	✓	✓	✓	✓	✓
ALTERNATOR EXCITATION LINE - SHORT TO BATTERY	3	3	33285	✓	✓	✓	✓	✓
SWING LEFT VALVE - OPEN CIRCUIT	3	3	33295	✓	✓	✓	✓	✓
SWING LEFT VALVE - SHORT TO BATTERY	3	3	33306	✓	✓	✓	✓	✓
MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO GROUND	3	3	33307	✓	✓	✓	✓	✓
MAIN TELESCOPE FLOW CONTROL VALVE - OPEN CIRCUIT	3	3	33308	✓	✓	✓	✓	✓
MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO BATTERY	3	3	33309	✓	✓	✓	✓	✓
MAIN LIFT DOWN VALVE - SHORT TO BATTERY	3	3	33310	✓	✓	--	✓	✓
MAIN LIFT FLOW CONTROL VALVE - SHORT TO GROUND	3	3	33311	✓	✓	--	✓	✓
MAIN LIFT FLOW CONTROL VALVE - OPEN CIRCUIT	3	3	33312	✓	✓	--	✓	✓
MAIN LIFT FLOW CONTROL VALVE - SHORT TO BATTERY	3	3	33313	✓	✓	--	✓	✓
LIFT UP VALVE - SHORT TO BATTERY	3	3	33329	--	--	--	--	✓
SWING - CURRENT FEEDBACK READING TOO LOW	3	3	33414	--	--	--	--	✓
SWING - CURRENT FEEDBACK READING LOST	3	3	33418	--	--	--	--	✓
JIB LIFT UP OVERRIDE VALVE - SHORT TO GROUND	3	3	33429	--	--	--	✓	✓
JIB LIFT UP OVERRIDE VALVE - OPEN CIRCUIT	3	3	33430	--	--	--	✓	✓
JIB LIFT UP OVERRIDE VALVE - SHORT TO BATTERY	3	3	33431	--	--	--	✓	✓
JIB LIFT DOWN OVERRIDE VALVE - SHORT TO GROUND	3	3	33432	--	--	--	✓	✓
JIB LIFT DOWN OVERRIDE VALVE - OPEN CIRCUIT	3	3	33433	--	--	--	✓	✓
JIB LIFT DOWN OVERRIDE VALVE - SHORT TO BATTERY	3	3	33434	--	--	--	✓	✓
JIB CONTROL VALVE - SHORT TO GROUND	3	3	33435	--	--	--	✓	✓
JIB CONTROL VALVE - OPEN CIRCUIT	3	3	33436	--	--	--	✓	✓
JIB CONTROL VALVE - SHORT TO BATTERY	3	3	33437	--	--	--	✓	✓
MAIN LIFT FLOW CONTROL VALVE - CURRENT FEEDBACK READING LOST	3	3	33456	--	--	--	--	✓
MAIN LIFT FLOW CONTROL VALVE - CURRENT FEEDBACK READING TOO LOW	3	3	33457	--	--	--	--	✓
TELESCOPE FLOW CONTROL VALVE - CURRENT FEEDBACK READING LOST	3	3	33460	--	--	--	--	✓
TELESCOPE FLOW CONTROL VALVE - CURRENT FEEDBACK READING TOO LOW	3	3	33461	--	--	--	--	✓
WARM UP VALVE - SHORT TO BATTERY	3	3	33462	--	--	--	--	✓
WARM UP VALVE - OPEN CIRCUIT	3	3	33463	--	--	--	--	✓
WARM UP VALVE - SHORT TO GROUND	3	3	33464	--	--	--	--	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
CHASSIS ENABLE VALVE - SHORT TO BATTERY	3	3	33465	--	--	--	--	✓
CHASSIS ENABLE VALVE - OPEN CIRCUIT	3	3	33466	--	--	--	--	✓
CHASSIS ENABLE VALVE - SHORT TO GROUND	3	3	33467	--	--	--	--	✓
TWO SPEED OR BRAKE VALVE - STUCK OPEN	3	3	33487	--	--	--	--	✓
SWING FLOW CONTROL VALVE - SHORT TO GROUND	3	3	33488	--	--	--	--	✓
SWING FLOW CONTROL VALVE - OPEN CIRCUIT	3	3	33489	--	--	--	--	✓
SWING FLOW CONTROL VALVE - SHORT TO BATTERY	3	3	33490	--	--	--	--	✓
LIFT ENABLE VALVE - STUCK OPEN	3	3	33563	--	--	--	--	✓
COUNTER BALANCE VALVE - STUCK OPEN	3	3	33564	--	--	--	--	✓
LIFT ENABLE - CURRENT FEEDBACK READING LOST	3	3	33565	--	--	--	--	✓
LIFT ENABLE - CURRENT FEEDBACK READING TOO LOW	3	3	33566	--	--	--	--	✓
JIB LOCK VALVE - OPEN CIRCUIT	3	4	3427	--	--	--	✓	✓
JIB LOCK VALVE - SHORT TO BATTERY	3	4	3428	--	--	--	✓	✓
JIB LOCK VALVE - SHORT TO GROUND	3	4	3429	--	--	--	✓	✓
JIB UNLOCK VALVE - OPEN CIRCUIT	3	4	3430	--	--	--	✓	✓
JIB UNLOCK VALVE - SHORT TO BATTERY	3	4	3431	--	--	--	✓	✓
JIB UNLOCK VALVE - SHORT TO GROUND	3	4	3432	--	--	--	✓	✓
PLATFORM LEVEL UP VALVE - SHORT TO GROUND	3	4	343	✓	✓	✓	✓	✓
PLATFORM LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	4	344	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	3	4	347	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	4	348	✓	✓	✓	✓	✓
JIB LEVEL UP VALVE - SHORT TO GROUND	3	5	351	--	--	--	✓	✓
JIB LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	352	--	--	--	✓	✓
JIB LEVEL DOWN VALVE - SHORT TO GROUND	3	5	353	--	--	--	✓	✓
JIB LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	354	--	--	--	✓	✓
JIB LIFT UP VALVE - SHORT TO GROUND	3	5	355	--	--	--	✓	✓
JIB LIFT UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	356	--	--	--	✓	✓
JIB LIFT DOWN VALVE - SHORT TO GROUND	3	5	357	--	--	--	✓	✓
JIB LIFT DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	358	--	--	--	✓	✓
JIB ROTATE LEFT VALVE - SHORT TO GROUND	3	5	359	--	--	--	✓	✓
JIB ROTATE LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	3510	--	--	--	✓	✓
JIB ROTATE RIGHT VALVE - SHORT TO GROUND	3	5	3511	--	--	--	✓	✓
JIB ROTATE RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	3512	--	--	--	✓	✓
JIB TELESCOPE IN VALVE - SHORT TO GROUND	3	5	3513	--	--	--	✓	✓
JIB TELESCOPE IN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	3514	--	--	--	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
JIB TELESCOPE OUT VALVE - SHORT TO GROUND	3	5	3515	--	--	--	✓	✓
JIB TELESCOPE OUT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	3	5	3516	--	--	--	✓	✓
FRONT AXLE EXTEND VALVE - SHORT TO BATTERY	3	6	361	--	--	--	--	✓
FRONT AXLE EXTEND VALVE - SHORT TO GROUND	3	6	362	--	--	--	--	✓
FRONT AXLE RETRACT VALVE - SHORT TO BATTERY	3	6	363	--	--	--	--	✓
FRONT AXLE RETRACT VALVE - SHORT TO GROUND	3	6	364	--	--	--	--	✓
REAR AXLE EXTEND VALVE - SHORT TO BATTERY	3	6	365	--	--	--	--	✓
REAR AXLE EXTEND VALVE - SHORT TO GROUND	3	6	366	--	--	--	--	✓
REAR AXLE RETRACT VALVE - SHORT TO BATTERY	3	6	367	--	--	--	--	✓
REAR AXLE RETRACT VALVE - SHORT TO GROUND	3	6	368	--	--	--	--	✓
FRONT AXLE EXTEND VALVE - OPEN CIRCUIT	3	6	369	--	--	--	--	✓
FRONT AXLE VALVE - CURRENT FEEDBACK READING LOST	3	6	3610	--	--	--	--	✓
FRONT AXLE RETRACT VALVE - OPEN CIRCUIT	3	6	3611	--	--	--	--	✓
REAR AXLE VALVE - CURRENT FEEDBACK READING LOST	3	6	3612	--	--	--	--	✓
REAR AXLE EXTEND VALVE - OPEN CIRCUIT	3	6	3613	--	--	--	--	✓
FRONT AXLE VALVE - CURRENT FEEDBACK READING TOO LOW	3	6	3514	--	--	--	--	✓
REAR AXLE RETRACT VALVE - OPEN CIRCUIT	3	6	3615	--	--	--	--	✓
REAR AXLE VALVE - CURRENT FEEDBACK READING TOO LOW	3	6	3616	--	--	--	--	✓
CHASSIS BRAKE - OPEN CIRCUIT	3	6	3617	--	--	--	--	✓
CHASSIS BRAKE - SHORT TO BATTERY	3	6	3618	--	--	--	--	✓
CHASSIS BRAKE - SHORT TO GROUND	3	6	3619	--	--	--	--	✓
FRONT AXLE VALVE - SHORT TO BATTERY	3	6	3620	--	--	--	--	✓
REAR AXLE VAVE - SHORT TO BATTERY	3	6	3621	--	--	--	--	✓
FUEL SENSOR SHORT TO BATTERY	4	3	431	✓	✓	✓	✓	✓
FUEL SENSOR SHORT TO GROUND	4	3	432	✓	✓	✓	✓	✓
OIL PRESSURE SHORT TO BATTERY	4	3	433	✓	✓	✓	✓	✓
OIL PRESSURE SHORT TO GROUND	4	3	434	✓	✓	✓	✓	✓
COOLANT TEMPERATURE SHORT TO GROUND	4	3	435	✓	✓	✓	✓	✓
ENGINE TROUBLE CODE	4	3	437	✓	✓	✓	✓	✓
HIGH ENGINE TEMP	4	3	438	✓	✓	✓	✓	✓
AIR FILTER BYPASSED	4	3	439	✓	✓	✓	✓	✓
NO ALTERNATOR OUTPUT	4	3	4310	✓	✓	✓	✓	✓
LOW OIL PRESSURE	4	3	4311	✓	✓	✓	✓	✓
THROTTLE ACTUATOR FAILURE	4	3	4313	✓	✓	✓	✓	✓
WRONG ENGINE SELECTED - ECM DETECTED	4	3	4314	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
LOSS OF ENGINE SPEED SENSOR	4	3	4322	✓	✓	✓	✓	✓
SPEED SENSOR READING INVALID SPEED	4	3	4323	✓	✓	✓	✓	✓
SOOT LOAD WARNING - LOW	4	3	4331	✓	✓	✓	✓	✓
SOOT LOAD WARNING - HIGH	4	3	4332	✓	✓	✓	✓	✓
SOOT LOAD WARNING - SEVERE	4	3	4333	✓	✓	✓	✓	✓
ENGINE COOLANT - LOW LEVEL	4	3	4334	✓	✓	✓	✓	✓
BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN	4	4	441	✓	✓	✓	✓	✓
BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN	4	4	442	✓	✓	✓	✓	✓
LSS BATTERY VOLTAGE TOO HIGH	4	4	443	✓	✓	✓	✓	✓
LSS BATTERY VOLTAGE TOO LOW	4	4	444	✓	✓	✓	✓	✓
BATTERY VOLTAGE LOW	4	4	445	✓	✓	✓	✓	✓
MAIN LIFT PVG VALVE - INTERNAL FAULT	4	5	451	--	--	✓	--	--
TOWER LIFT PVG VALVE - INTERNAL FAULT	4	5	452	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - INTERNAL FAULT	4	5	453	--	--	✓	--	--
MAIN LIFT PVG VALVE - HIGH VOLTAGE	4	5	454	--	--	✓	--	--
TOWER LIFT PVG VALVE - HIGH VOLTAGE	4	5	455	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - HIGH VOLTAGE	4	5	456	--	--	✓	--	--
MAIN LIFT PVG VALVE - LOW VOLTAGE	4	5	457	--	--	✓	--	--
TOWER LIFT PVG VALVE - LOW VOLTAGE	4	5	458	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - LOW VOLTAGE	4	5	459	--	--	✓	--	--
MAIN LIFT PVG VALVE - STUCK NEUTRAL	4	5	4510	--	--	✓	--	--
TOWER LIFT PVG VALVE - STUCK NEUTRAL	4	5	4511	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - STUCK NEUTRAL	4	5	4512	--	--	✓	--	--
MAIN LIFT PVG VALVE - STUCK EXTENDED	4	5	4513	--	--	✓	--	--
TOWER LIFT PVG VALVE - STUCK EXTENDED	4	5	4514	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - STUCK EXTENDED	4	5	4515	--	--	✓	--	--
MAIN LIFT PVG VALVE - STUCK RETRACTED	4	5	4516	--	--	✓	--	--
TOWER LIFT PVG VALVE - STUCK RETRACTED	4	5	4517	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - STUCK RETRACTED	4	5	4518	--	--	✓	--	--
MAIN LIFT PVG VALVE - OBSTRUCTED	4	5	4519	--	--	✓	--	--
TOWER LIFT PVG VALVE - OBSTRUCTED	4	5	4520	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - OBSTRUCTED	4	5	4521	--	--	✓	--	--
MAIN LIFT PVG VALVE - COMMAND IMPROPER	4	5	4522	--	--	✓	--	--

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
TOWER LIFT PVG VALVE - COMMAND IMPROPER	4	5	4523	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - COMMAND IMPROPER	4	5	4524	--	--	✓	--	--
MAIN LIFT PVG VALVE - TIMEOUT	4	5	4525	--	--	✓	--	--
TOWER LIFT PVG VALVE - TIMEOUT	4	5	4526	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - TIMEOUT	4	5	4527	--	--	✓	--	--
MAIN LIFT PVG VALVE - SETUP FAULT	4	5	4528	--	--	✓	--	--
TOWER LIFT PVG VALVE - SETUP FAULT	4	5	4529	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - SETUP FAULT	4	5	4530	--	--	✓	--	--
MAIN LIFT PVG VALVE - SENT UNRECOGNIZED FAULT	4	5	4531	--	--	✓	--	--
TOWER LIFT PVG VALVE - SENT UNRECOGNIZED FAULT	4	5	4532	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - SENT UNRECOGNIZED FAULT	4	5	4533	--	--	✓	--	--
MAIN LIFT PVG VALVE - PARAMETERS INCORRECT	4	5	4534	--	--	✓	--	--
TOWER LIFT PVG VALVE - PARAMETERS INCORRECT	4	5	4535	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - PARAMETERS INCORRECT	4	5	4536	--	--	✓	--	--
MAIN LIFT PVG VALVE - LOCATION IMPROPER	4	5	4537	--	--	✓	--	--
TOWER LIFT PVG VALVE - LOCATION IMPROPER	4	5	4538	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - LOCATION IMPROPER	4	5	4539	--	--	✓	--	--
MAIN LIFT PVG VALVE - WIRING INCORRECT	4	5	4540	--	--	✓	--	--
TOWER LIFT PVG VALVE - WIRING INCORRECT	4	5	4541	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - WIRING INCORRECT	4	5	4542	--	--	✓	--	--
MAIN LIFT PVG VALVE - SPOOL CANNOT REACH NEUTRAL	4	5	4543	--	--	✓	--	--
TOWER LIFT PVG VALVE - SPOOL CANNOT REACH NEUTRAL	4	5	4544	--	--	✓	--	--
TOWER TELESCOPE PVG VALVE - SPOOL CANNOT REACH NEUTRAL	4	5	4545	--	--	✓	--	--
CANBUS FAILURE - PLATFORM MODULE	6	6	662	✓	✓	✓	✓	✓
CANBUS FAILURE - LOAD SENSING SYSTEM MODULE	6	6	663	✓	✓	✓	✓	✓
CANBUS FAILURE - ENGINE CONTROLLER	6	6	666	✓	✓	✓	✓	✓
CANBUS FAILURE - MAIN LIFT PVG	6	6	667	--	--	✓	--	--
CANBUS FAILURE - TOWER LIFT PVG	6	6	668	--	--	✓	--	--
CANBUS FAILURE - TOWER TELESCOPE PVG	6	6	669	--	--	✓	--	--

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
CANBUS FAILURE - BLAM	6	6	6610	✓	✓	✓	✓	✓
CANBUS FAILURE - CHASSIS MODULE	6	6	6611	✓	✓	✓	✓	✓
CANBUS FAILURE - CYLINDER LOAD PIN	6	6	6612	✓	✓	✓	✓	✓
CANBUS FAILURE - EXCESSIVE CANBUS ERRORS	6	6	6613	✓	✓	✓	✓	✓
CANBUS FAILURE - MAIN ANGLE SENSOR #1	6	6	6614	--	--	✓	--	--
CANBUS FAILURE - MAIN ANGLE SENSOR #2	6	6	6615	--	--	✓	--	--
CANBUS FAILURE - TCU MODULE	6	6	6622	✓	✓	✓	✓	✓
CANBUS FAILURE - TELEMATICS CANBUS LOADING TOO HIGH	6	6	6629	✓	✓	✓	✓	✓
CANBUS FAILURE - GATEWAY MODULE	6	6	6623	✓	✓	✓	✓	✓
CANBUS FAILURE - JIB CONTROL MODULE	6	6	6639	--	--	--	✓	✓
CANBUS FAILURE - JIB LIFT ANGLE SENSOR	6	6	6640	--	--	--	✓	✓
CANBUS FAILURE - PLATFORM LEVEL ANGLE SENSOR	6	6	6641	--	--	--	✓	✓
REMOTE CONTRACT MANAGEMENT OVERRIDE - ALL FUNCTIONS IN CREEP	6	8	681	✓	✓	✓	✓	✓
CHASSIS TILT SENSOR NOT CALIBRATED	8	1	813	✓	✓	✓	✓	✓
CHASSIS TILT SENSOR OUT OF RANGE	8	1	814	--	--	--	--	✓
CHASSIS TILT SENSOR DISAGREEMENT	8	1	815	✓	✓	✓	✓	✓
CHASSIS TILT READING DISAGREEMENT	8	1	8111	--	--	--	--	✓
LSS CELL #1 ERROR	8	2	821	✓	✓	✓	✓	✓
LSS CELL #2 ERROR	8	2	822	✓	✓	✓	✓	✓
LSS CELL #3 ERROR	8	2	823	✓	✓	✓	✓	✓
LSS CELL #4 ERROR	8	2	824	✓	✓	✓	✓	✓
LSS HAS NOT BEEN CALIBRATED	8	2	825	✓	✓	✓	✓	✓
RUNNING AT CREEP - PLATFORM OVERLOADED	8	2	826	✓	✓	✓	✓	✓
DRIVE & BOOM PREVENTED - PLATFORM OVERLOADED	8	2	827	✓	✓	✓	✓	✓
LIFT UP & TELE OUT PREVENTED - PLATFORM OVERLOADED	8	2	828	✓	✓	✓	✓	✓
PLATFORM LEVELING OVERRIDE ON	8	3	831	✓	✓	✓	✓	✓
PLATFORM LEVELING OVERRIDE OFF	8	3	832	✓	✓	✓	✓	✓
PLATFORM LEVEL UP CRACKPOINT - NOT CALIBRATED	8	3	833	✓	✓	✓	✓	✓
PLATFORM LEVEL DOWN CRACKPOINT - NOT CALIBRATED	8	3	834	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #2 - SHORT TO BATTERY	8	3	8311	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #2 - SHORT TO GROUND OR OPEN CIRCUIT	8	3	8312	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #1 - REFERENCE VOLTAGE OUT OF RANGE	8	3	8313	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #2 - REFERENCE VOLTAGE OUT OF RANGE	8	3	8314	✓	✓	✓	✓	✓
PLATFORM LEVELING SENSOR - DISAGREEMENT	8	3	8315	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
PLATFORM LEVEL SENSOR #1 - COMMUNICATIONS LOST	8	3	8316	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #2 - COMMUNICATIONS LOST	8	3	8317	✓	✓	✓	✓	✓
PLATFORM LEVELING SYSTEM TIMEOUT	8	3	8318	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #1 - SHORT TO BATTERY	8	3	837	✓	✓	✓	✓	✓
PLATFORM LEVEL SENSOR #1 - SHORT TO GROUND OR OPEN CIRCUIT	8	3	838	✓	✓	✓	✓	✓
JIB LEVEL SENSOR #1 - OUT OF RANGE LOW	8	3	8319	--	--	--	✓	✓
JIB LEVEL SENSOR #1 - OUT OF RANGE HIGH	8	3	8320	--	--	--	✓	✓
JIB LEVEL SENSOR #2 - OUT OF RANGE LOW	8	3	8321	--	--	--	✓	✓
JIB LEVEL SENSOR #2 - OUT OF RANGE HIGH	8	3	8322	--	--	--	✓	✓
JIB LEVEL SENSORS - NOT CALIBRATED	8	3	8323	--	--	--	✓	✓
JIB LEVEL SENSORS - DISAGREEMENT	8	3	8324	--	--	--	✓	✓
JIB SWING SENSOR #1 - OUT OF RANGE LOW	8	3	8325	--	--	--	✓	✓
JIB SWING SENSOR #1 - OUT OF RANGE HIGH	8	3	8326	--	--	--	✓	✓
JIB SWING SENSOR #2 - OUT OF RANGE LOW	8	3	8327	--	--	--	✓	✓
JIB SWING SENSOR #2 - OUT OF RANGE HIGH	8	3	8328	--	--	--	✓	✓
JIB SWING SENSORS - NOT CALIBRATED	8	3	8329	--	--	--	✓	✓
JIB SWING SENSORS - DISAGREEMENT	8	3	8330	--	--	--	✓	✓
JIB LOCK PIN SENSOR - DISAGREEMENT	8	3	8331	--	--	--	✓	✓
JIB TRANSPORT SENSOR #1 - DISAGREEMENT	8	3	8332	--	--	--	✓	✓
JIB TRANSPORT SENSOR #2 - DISAGREEMENT	8	3	8333	--	--	--	✓	✓
JIB LIFT ANGLE SENSOR - NOT CALIBRATED	8	3	8334	--	--	--	✓	✓
JIB LEVEL UP CRACKPOINT - NOT CALIBRATED	8	3	8335	--	--	--	✓	✓
JIB LEVEL DOWN CRACKPOINT - NOT CALIBRATED	8	3	8336	--	--	--	✓	✓
JIB LEVELING SYSTEM TIMEOUT	8	3	8337	--	--	--	✓	✓
WRONG JIB LOCK PIN RESPONSE	8	3	8338	--	--	--	✓	✓
PLATFORM LEVEL ANGLE SENSOR - NOT CALIBRATED	8	3	8339	--	--	--	✓	✓
BOOM ANGLE SENSOR DISAGREEMENT	8	4	841	✓	✓	--	✓	✓
BOOM LENGTH SWITCH FAILED	8	4	842	✓	✓	--	✓	✓
BOOM LENGTH SWITCH/SENSOR DISAGREEMENT	8	4	843	✓	✓	--	✓	✓
BOOM LENGTH SENSOR NOT DETECTING LENGTH CHANGE	8	4	844	✓	✓	--	✓	✓
BOOM LENGTH SENSOR - OUT OF RANGE HIGH	8	4	845	✓	✓	--	✓	✓
BOOM LENGTH SENSOR - OUT OF RANGE LOW	8	4	846	✓	✓	--	✓	✓
BOOM LENGTH SENSOR - VALUE OUT OF RANGE HIGH	8	4	847	✓	✓	--	✓	✓
BOOM LENGTH SENSOR - VALUE OUT OF RANGE LOW	8	4	848	✓	✓	--	✓	✓
BOOM ANGLE SENSOR #1 - COMMUNICATIONS FAULT	8	4	849	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
BOOM ANGLE SENSOR #2 - COMMUNICATIONS FAULT	8	4	8410	✓	✓	✓	✓	✓
BOOM ANGLE SENSOR #1 - INVALID ANGLE	8	4	8411	✓	✓	--	✓	✓
BOOM ANGLE SENSOR #2 - INVALID ANGLE	8	4	8412	✓	✓	--	✓	✓
WRONG TELESCOPE RESPONSE	8	4	8413	✓	✓	--	✓	✓
WRONG LIFT RESPONSE	8	4	8414	✓	✓	--	✓	✓
TOWER ANGLE SENSOR DISAGREEMENT	8	4	8415	--	--	✓	--	--
TOWER LENGTH SENSOR DISAGREEMENT	8	4	8416	--	--	✓	--	--
MAIN ANGLE SENSOR DISAGREEMENT	8	4	8417	--	--	✓	--	--
TOWER LENGTH SENSOR #1 - OUT OF RANGE HIGH	8	4	8418	--	--	✓	--	--
TOWER LENGTH SENSOR #1 - OUT OF RANGE LOW	8	4	8419	--	--	✓	--	--
TOWER LENGTH SENSOR #2 - OUT OF RANGE HIGH	8	4	8420	--	--	✓	--	--
TOWER LENGTH SENSOR #2 - OUT OF RANGE LOW	8	4	8421	--	--	✓	--	--
TOWER LENGTH SENSOR - NOT DETECTING LENGTH CHANGE	8	4	8422	--	--	✓	--	--
TOWER LENGTH MOVEMENT WITHOUT COMMAND	8	4	8423	--	--	✓	--	--
TOWER LENGTH SENSOR #1 - OUT OF RANGE HIGH	8	4	8424	--	--	✓	--	--
TOWER LENGTH SENSOR #1 - OUT OF RANGE LOW	8	4	8425	--	--	✓	--	--
TOWER LENGTH SENSOR #2 - OUT OF RANGE HIGH	8	4	8426	--	--	✓	--	--
TOWER LENGTH SENSOR #2 - OUT OF RANGE LOW	8	4	8427	--	--	✓	--	--
TOWER ANGLE SENSOR #1 - INVALID ANGLE	8	4	8428	--	--	✓	--	--
TOWER ANGLE SENSOR #2 - INVALID ANGLE	8	4	8429	--	--	✓	--	--
TOWER ANGLE SENSOR #1 - INVALID MODEL	8	4	8430	--	--	✓	--	--
TOWER ANGLE SENSOR #2 - INVALID MODEL	8	4	8431	--	--	✓	--	--
MAIN ANGLE SENSOR #1 - INVALID ANGLE	8	4	8432	--	--	✓	--	--
MAIN ANGLE SENSOR #2 - INVALID ANGLE	8	4	8433	--	--	✓	--	--
MAIN ANGLE SENSOR - NOT DETECTING ANGLE CHANGE	8	4	8434	--	--	✓	--	--
MAIN ANGLE MOVEMENT WITHOUT CMD	8	4	8435	--	--	✓	--	--
WRONG TOWER TELESCOPE RESPONSE	8	4	8436	--	--	✓	--	--
WRONG TOWER LIFT RESPONSE	8	4	8437	--	--	✓	--	--
TOWER CYLINDER ANGLE SENSOR - OUT OF RANGE HIGH	8	4	8438	--	--	✓	--	--
TOWER CYLINDER ANGLE SENSOR - OUT OF RANGE LOW	8	4	8439	--	--	✓	--	--
TOWER CYLINDER ANGLE SENSOR - NOT DETECTING CHANGE	8	4	8440	--	--	✓	--	--
TOWER CYLINDER ANGLE MOVEMENT WITHOUT COMMAND	8	4	8441	--	--	✓	--	--
MAIN TRANSPORT ANGLE SWITCH FAILED	8	4	8442	--	--	✓	--	--
TWR TRANSPORT SWITCH DISAGREEMENT	8	4	8443	--	--	✓	--	--
TRANSPORT DUAL CAPACITY SWITCHES BAD	8	4	8444	--	--	✓	--	--

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
TRANSPORT DUAL CAPACITY BAD TRANSITION	8	4	8445	--	--	✓	--	--
MAIN TRANSPORT LENGTH SWITCH DISAGREEMENT	8	4	8446	--	--	✓	--	--
MAIN DUAL CAPACITY LENGTH SWITCH DISAGREEMENT	8	4	8447	--	--	✓	--	--
MAIN TRANSPORT ANGLE SWITCH/SENSOR DISAGREEMENT	8	4	8448	--	--	✓	--	--
TOWER CYLINDER ANGLE SWITCH/SENSOR DISAGREEMENT	8	4	8449	--	--	✓	--	--
NEW MAIN ANGLE SENSOR #1 DETECTED	8	4	8450	--	--	✓	--	--
NEW MAIN ANGLE SENSOR #2 DETECTED	8	4	8451	--	--	✓	--	--
TOWER LENGTH SWITCH/SENSOR DISAGREEMENT	8	4	8452	--	--	✓	--	--
WRONG MAIN TELE RESPONSE	8	4	8453	--	--	✓	--	--
WRONG MAIN LIFT RESPONSE	8	4	8454	--	--	✓	--	--
MAIN CYLINDER ANGLE SENSOR #1 - OUT OF RANGE LOW	8	4	8479	--	--	--	✓	✓
MAIN CYLINDER ANGLE SENSOR #1 - OUT OF RANGE HIGH	8	4	8480	--	--	--	✓	✓
TOWER ENVELOPE MASSIVELY ENCROACHED	8	4	8482	--	--	✓	--	--
TOWER ENVELOPE MULTIPLE ENCROACHMENTS	8	4	8483	--	--	✓	--	--
BCS VIOLATION - BOOM LOCKED	8	4	8484	--	--	✓	--	--
BCS - HYDRAULIC RETRIEVAL ACTIVE	8	4	8485	--	--	✓	--	--
BCS - ELECTRICAL RETRIEVAL ACTIVE	8	4	8486	--	--	✓	--	--
BCS - MULTIPLE FAILURES ACTIVE	8	4	8487	--	--	✓	--	--
MAIN CYLINDER ANGLE SENSOR #2 - OUT OF RANGE LOW	8	4	8492	--	--	--	✓	✓
MAIN CYLINDER ANGLE SENSOR #2 - OUT OF RANGE HIGH	8	4	8493	--	--	--	✓	✓
MAIN CYLINDER ANGLE SENSORS - DISAGREEMENT	8	4	8494	--	--	--	✓	✓
TURN TABLE SENSOR #1 - FREQUENCY OUT OF RANGE LOW	8	4	8495	--	--	--	✓	✓
TURN TABLE SENSOR #1 - FREQUENCY OUT OF RANGE HIGH	8	4	8496	--	--	--	✓	✓
TURN TABLE SENSOR #2 - FREQUENCY OUT OF RANGE LOW	8	4	8497	--	--	--	✓	✓
TURN TABLE SENSOR #2 - FREQUENCY OUT OF RANGE HIGH	8	4	8498	--	--	--	✓	✓
CHASSIS TURN TABLE SENSORS - DISAGREEMENT	8	4	8499	--	--	--	✓	✓
CHASSIS TURN TABLE SENSORS AND DRIVE ORIENTATION SWITCH - DISAGREEMENT	8	4	84100	--	--	--	✓	✓
CHASSIS TURN TABLE SENSORS - NOT CALIBRATED	8	4	84101	--	--	--	✓	✓
MAIN CYLINDER ANGLE SENSOR - NOT DETECTING CHANGE	8	4	84102	--	--	--	✓	✓
JIB LEVEL ANGLE SENSOR - NOT DETECTING CHANGE	8	4	84103	--	--	--	✓	✓
JIB LIFT ANGLE SENSOR - NOT DETECTING CHANGE	8	4	84104	--	--	--	✓	✓
PLATFORM LEVEL ANGLE SENSOR - NOT DETECTING CHANGE	8	4	84105	--	--	--	✓	✓
JIB LEVEL MOVEMENT WITHOUT COMMAND	8	4	84106	--	--	--	✓	✓
JIB LIFT MOVEMENT WITHOUT COMMAND	8	4	84107	--	--	--	✓	✓
PLATFORM LEVEL MOVEMENT WITHOUT COMMAND	8	4	84108	--	--	--	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
WRONG SWING RESPONSE	8	4	84109	--	--	--	--	✓
MOMENT PIN - HORIZONTAL FORCE OUT OF RANGE	8	5	851	✓	✓	--	✓	✓
MOMENT PIN - VERTICAL FORCE OUT OF RANGE	8	5	852	✓	✓	--	✓	✓
LOAD PIN - HORIZONTAL FORCE OUT OF RANGE	8	5	853	--	--	✓	--	--
LOAD PIN - VERTICAL FORCE OUT OF RANGE	8	5	854	--	--	✓	--	--
MOMENT PIN - SENSOR FAULT	8	5	855	✓	✓	--	✓	✓
LOAD PIN - SENSOR FAULT	8	5	856	--	--	✓	--	--
NEW MOMENT PIN DETECTED	8	5	857	✓	✓	--	✓	✓
NEW LOAD PIN DETECTED	8	5	858	--	--	✓	--	--
LOAD PIN/TOWER LIFT CYLINDER ANGLE DISAGREEMENT	8	5	859	--	--	✓	--	--
LOAD PIN - FORCE VALUES NOT CHANGING	8	5	8510	--	--	✓	--	--
LOAD PIN - FORCE TOO LOW OVER TOWER ANGLE CHANGE	8	5	8511	--	--	✓	--	--
LOAD PIN - FORCE TOO LOW OVER MAIN ANGLE CHANGE	8	5	8512	--	--	✓	--	--
LOAD PIN - FORCE TOO LOW OVER MAIN LENGTH TRANSITION	8	5	8513	--	--	✓	--	--
RESTRICTED TO TRANSPORT - OSCILLATING AXLE PRESSURE SWITCH DISAGREEMENT	8	6	861	✓	✓	✓	✓	✓
AXLE EXTEND VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	862	✓	✓	✓	✓	--
AXLE EXTEND VALVE - SHORT TO GROUND	8	6	863	✓	✓	✓	✓	--
AXLE RETRACT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	864	✓	✓	✓	✓	--
AXLE RETRACT VALVE - SHORT TO GROUND	8	6	865	✓	✓	✓	✓	--
RIGHT FRONT STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	866	✓	✓	✓	✓	--
RIGHT FRONT STEER RIGHT VALVE - SHORT TO GROUND	8	6	867	✓	✓	✓	✓	✓
RIGHT FRONT STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	868	✓	✓	✓	✓	--
RIGHT FRONT STEER LEFT VALVE - SHORT TO GROUND	8	6	869	✓	✓	✓	✓	✓
LEFT FRONT STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8610	✓	✓	✓	✓	--
LEFT FRONT STEER RIGHT VALVE - SHORT TO GROUND	8	6	8611	✓	✓	✓	✓	✓
LEFT FRONT STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8612	✓	✓	✓	✓	--
LEFT FRONT STEER LEFT VALVE - SHORT TO GROUND	8	6	8613	✓	✓	✓	✓	✓
RIGHT REAR STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8614	✓	✓	✓	✓	--
RIGHT REAR STEER RIGHT VALVE - SHORT TO GROUND	8	6	8615	✓	✓	✓	✓	✓
RIGHT REAR STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8616	✓	✓	✓	✓	--
RIGHT REAR STEER LEFT VALVE - SHORT TO GROUND	8	6	8617	✓	✓	✓	✓	✓
LEFT REAR STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8618	✓	✓	✓	✓	--
LEFT REAR STEER RIGHT VALVE - SHORT TO GROUND	8	6	8619	✓	✓	✓	✓	✓
LEFT REAR STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	8	6	8620	✓	✓	✓	✓	--
LEFT REAR STEER LEFT VALVE - SHORT TO GROUND	8	6	8621	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
FRONT RIGHT STEER SENSOR - DECOUPLED	8	6	8622	✓	✓	✓	✓	✓
FRONT LEFT STEER SENSOR - DECOUPLED	8	6	8623	✓	✓	✓	✓	✓
REAR RIGHT STEER SENSOR - DECOUPLED	8	6	8624	✓	✓	✓	✓	✓
REAR LEFT STEER SENSOR - DECOUPLED	8	6	8625	✓	✓	✓	✓	✓
FRONT LEFT STEER SENSOR - NOT RESPONDING	8	6	8626	✓	✓	✓	✓	✓
FRONT RIGHT STEER SENSOR - NOT RESPONDING	8	6	8627	✓	✓	✓	✓	✓
REAR LEFT STEER SENSOR - NOT RESPONDING	8	6	8628	✓	✓	✓	✓	✓
REAR RIGHT STEER SENSOR - NOT RESPONDING	8	6	8629	✓	✓	✓	✓	✓
FRONT RIGHT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	8	6	8630	✓	✓	✓	✓	✓
FRONT RIGHT STEER SENSOR - SHORT TO BATTERY	8	6	8631	✓	✓	✓	✓	✓
FRONT LEFT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	8	6	8632	✓	✓	✓	✓	✓
FRONT LEFT STEER SENSOR - SHORT TO BATTERY	8	6	8633	✓	✓	✓	✓	✓
REAR RIGHT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	8	6	8634	✓	✓	✓	✓	✓
REAR RIGHT STEER SENSOR - SHORT TO BATTERY	8	6	8635	✓	✓	✓	✓	✓
REAR LEFT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	8	6	8636	✓	✓	✓	✓	✓
REAR LEFT STEER SENSOR - SHORT TO BATTERY	8	6	8637	✓	✓	✓	✓	✓
ENGINE SHUTDOWN - AXLE LOCKOUT VALVE FAULT	8	6	8651	✓	✓	✓	✓	✓
RIGHT FRONT STEER RIGHT VALVE - OPEN CIRCUIT	8	6	8670	--	--	--	--	✓
RIGHT FRONT STEER RIGHT VALVE - SHORT TO BATTERY	8	6	8671	--	--	--	--	✓
RIGHT FRONT STEER LEFT VALVE - OPEN CIRCUIT	8	6	8672	--	--	--	--	✓
RIGHT FRONT STEER LEFT VALVE - SHORT TO BATTERY	8	6	8673	--	--	--	--	✓
LEFT FRONT STEER RIGHT VALVE - OPEN CIRCUIT	8	6	8674	--	--	--	--	✓
LEFT FRONT STEER RIGHT VALVE - SHORT TO BATTERY	8	6	8675	--	--	--	--	✓
LEFT FRONT STEER LEFT VALVE - OPEN CIRCUIT	8	6	8676	--	--	--	--	✓
LEFT FRONT STEER LEFT VALVE - SHORT TO BATTERY	8	6	8677	--	--	--	--	✓
RIGHT REAR STEER RIGHT VALVE - OPEN CIRCUIT	8	6	8678	--	--	--	--	✓
RIGHT REAR STEER RIGHT VALVE - SHORT TO BATTERY	8	6	8679	--	--	--	--	✓
RIGHT REAR STEER LEFT VALVE - OPEN CIRCUIT	8	6	8680	--	--	--	--	✓
RIGHT REAR STEER LEFT VALVE - SHORT TO BATTERY	8	6	8681	--	--	--	--	✓
LEFT REAR STEER RIGHT VALVE - OPEN CIRCUIT	8	6	8682	--	--	--	--	✓
LEFT REAR STEER RIGHT VALVE - SHORT TO BATTERY	8	6	8683	--	--	--	--	✓
LEFT REAR STEER LEFT VALVE - OPEN CIRCUIT	8	6	8684	--	--	--	--	✓
LEFT REAR STEER LEFT VALVE - SHORT TO BATTERY	8	6	8685	--	--	--	--	✓
FRONT LEFT AXLE - MOVEMENT WITHOUT COMMAND	8	6	8686	--	--	--	--	✓
FRONT RIGHT AXLE - MOVEMENT WITHOUT COMMAND	8	6	8687	--	--	--	--	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
REAR RIGHT AXLE - MOVEMENT WITHOUT COMMAND	8	6	8688	--	--	--	--	✓
REAR LEFT AXLE - MOVEMENT WITHOUT COMMAND	8	6	8689	--	--	--	--	✓
MACHINE SAFTEY SYSTEM OVERRIDE OCCURRED	8	7	873	--	--	--	--	✓
LSS WATCHDOG RESET	9	9	991	✓	✓	✓	✓	✓
LSS EEPROM ERROR	9	9	992	✓	✓	✓	✓	✓
LSS INTERNAL ERROR - PIN EXCITATION	9	9	993	✓	✓	✓	✓	✓
LSS INTERNAL ERROR - DRDY MISSING FROM A/D	9	9	994	✓	✓	✓	✓	✓
EEPROM FAILURE - CHECK ALL SETTINGS	9	9	998	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - LSS MODULE SOFTWARE VERSION IMPROPER	9	9	9911	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER	9	9	9910	✓	✓	✓	✓	✓
PLATFORM MODULE SOFTWARE UPDATE REQUIRED	9	9	9914	✓	✓	✓	✓	✓
CHASSIS TILT SENSOR NOT GAIN CALIBRATED	9	9	9915	✓	✓	✓	✓	✓
CHASSIS TILT SENSOR GAIN OUT OF RANGE	9	9	9916	✓	✓	✓	✓	✓
HIGH RESOLUTION A2D FAILURE - INTERRUPT LOST	9	9	9917	✓	✓	✓	✓	✓
HIGH RESOLUTION A2D FAILURE - REINIT LIMIT	9	9	9918	✓	✓	✓	✓	✓
GROUND SENSOR REF VOLTAGE OUT OF RANGE	9	9	9919	✓	✓	✓	✓	✓
PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	9	9	9920	✓	✓	✓	✓	✓
GROUND MODULE FAILURE - HIGH SIDE DRIVER CUTOUT FAULTY	9	9	9921	✓	✓	✓	✓	✓
PLATFORM MODULE FAILURE - HWFS CODE 1	9	9	9922	✓	✓	✓	✓	✓
GROUND MODULE FAILURE - HWFS CODE 1	9	9	9923	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - MACHINE NOT CONFIGURED	9	9	9924	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - CHASSIS MODULE SOFTWARE VERSION IMPROPER	9	9	9925	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - BLAM MODULE SOFTWARE VERSION IMPROPER	9	9	9926	✓	✓	✓	✓	✓
GROUND MODULE CONSTANT DATA UPDATE REQUIRED	9	9	9927	✓	✓	✓	✓	✓
ENVELOPE CONTROL DISABLED	9	9	9928	✓	✓	✓	✓	✓
MOMENT CONTROL DISABLED	9	9	9929	✓	✓	✓	✓	✓
STEER SENSORS NOT CALIBRATED	9	9	9930	✓	✓	✓	✓	✓
BOOM SENSORS NOT CALIBRATED	9	9	9931	✓	✓	✓	✓	✓
LIFT CRACKPOINTS NOT CALIBRATED	9	9	9932	✓	✓	--	✓	✓
TELESCOPE CRACKPOINTS NOT CALIBRATED	9	9	9933	✓	✓	--	✓	✓
DRIVE CRACKPOINTS NOT CALIBRATED	9	9	9934	✓	✓	✓	✓	✓
BLAM SENSOR SUPPLY OUT OF RANGE HIGH	9	9	9935	✓	✓	✓	✓	✓
BLAM SENSOR SUPPLY OUT OF RANGE LOW	9	9	9936	✓	✓	✓	✓	✓
LENGTH SENSOR REF VOLTAGE HIGH	9	9	9937	✓	✓	✓	✓	✓

Table 6-12. Diagnostic Fault Code Chart

Fault Text	Flash 1	Flash 2	DTC	1350	1200	1250	1500	1850
LENGTH SENSOR REF VOLTAGE LOW	9	9	9938	✓	✓	✓	✓	✓
BLAM HIGH RES A/D FAILURE	9	9	9939	✓	✓	✓	✓	✓
CHASSIS SENSOR SUPPLY OUT OF RANGE HIGH	9	9	9940	✓	✓	✓	✓	✓
CHASSIS SENSOR SUPPLY OUT OF RANGE LOW	9	9	9941	✓	✓	✓	✓	✓
BLAM BACKUP COMMUNICATIONS LINK FAULTY	9	9	9942	--	--	✓	--	--
BLAM BACKUP COMMUNICATIONS LOST - HYDRAULICS SUSPENDED	9	9	9943	--	--	✓	--	--
CURRENT FEEDBACK GAINS OUT OF RANGE	9	9	9944	✓	✓	✓	✓	✓
CURRENT FEEDBACK CALIBRATION CHECKSUM INCORRECT	9	9	9945	✓	✓	✓	✓	✓
LOAD PIN NOT CALIBRATED	9	9	9975	--	--	✓	--	--
LSS CORRUPT EEPROM	9	9	9977	✓	✓	✓	✓	✓
FUNCTIONS LOCKED OUT - GROUND MODULE SOFTWARE VERSION IMPROPER	9	9	9979	✓	✓	✓	✓	✓
JIB CONTROL MODULE - HIGH RESOLUTION A2D FAILURE	9	9	99155	--	--	--	✓	✓
JIB CONTROL MODULE - HIGH RESOLUTION A2D REFERENCE LOW	9	9	99156	--	--	--	✓	✓
JIB CONTROL MODULE - HIGH RESOLUTION A2D REFERENCE HIGH	9	9	99157	--	--	--	✓	✓
PLATFORM LEVEL ANGLE SENSOR - INTERNAL ERROR	9	9	99158	--	--	--	✓	✓
JIB LIFT ANGLE SENSOR - INTERNAL ERROR	9	9	99159	--	--	--	✓	✓
FUNCTIONS LOCKED OUT - JIB CONTROL MODULE SOFTWARE VERSION IMPROPER	9	9	99160	--	--	--	✓	✓

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
1	0	1	EVERYTHING OK	The normal help message in Platform Mode.	
2	0	2	GROUND MODE OK	The normal help message in Ground Mode.	
10	0	10	RUNNING AT CUTBACK - OUT OF TRANSPORT POSITION	Drive speed is limited to "ELEVATED MAX" while the vehicle is out of transport position.	
49	0	0	SCR CLEANING REQUIRED	SCR Cleaning for regular maintenance (engine controlled)	
50	0	0	BOOM UNLOCK REQUIRED	Triggers if machine is 1850SJ and DTC 23127 and DTC 8413 become active	
0	**0**	**0**	**<<< HELP COMMENT >>>**		
11	0	11	FSW OPEN	A drive / boom function was selected with the Footswitch open.	
12	0	12	RUNNING AT CREEP - CREEP SWITCH OPEN	All functions at creep while the Creep Switch is open.	
13	0	13	RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	All functions at creep while the Platform is elevated and the Chassis is tilted.	
14	0	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.
16	0	16	ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED	There is an envelope violation.	- Envelope control system equipped vehicle only.
17	0	17	OVER MOMENT - HYDRAULICS SUSPENDED	There is an over moment violation.	- Envelope control system equipped vehicle only.
18	0	18	UNDER MOMENT - HYDRAULICS SUSPENDED	There is an under moment violation.	- Envelope control system equipped vehicle only.
21	0	21	ADS 1213 REINITIALIZED		
30	0	30	RUNNING AT CREEP - PLATFORM STOWED		
31	0	31	FUEL LEVEL LOW - ENGINE SHUTDOWN		
35	0	35	APU ACTIVE		
37	0	37	JIB UNLOCKED OUT OF TRANSPORT - HYDRAULICS SUSPENDED		
38	0	38	SWING ENVELOPE ENCROACHED - HYDRAULICS SUSPENDED		
0039	0	0	SKYGUARD ACTIVE - FUNCTIONS CUTOUT	The SkyGuard sensors have been activated. Fault cleared when controls returned to neutral and SkyGuard is no longer active.	
210	**2'**	**1**	**<<< POWER-UP >>>**		

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
211	2	1	POWER CYCLE	The normal help message is issued at each power cycle.	
212	2	1	KEYSWITCH FAULTY	Both Platform and Ground modes are selected simultaneously.	
213	2	1	FSW FAULTY	Both Footswitches are closed for more then one second.	
220	**22**	**0**	**<<< PLATFORM CONTROLS >>>**		
227	2	2	STEER SWITCHES FAULTY	Both Steer Left and Steer Right inputs are closed simultaneously.	
2211	2	2	FSW INTERLOCK TRIPPED	The Footswitch was closed for more then seven seconds.	- Can be reported during power-up.
2212	2	2	DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A drive function was selected with Footswitch open.	- Can be reported during power-up.
2213	2	2	STEER LOCKED - SELECTED BEFORE FOOTSWITCH	A steer function was selected with Footswitch open.	
2215	2	2	D/S JOY. OUT OF RANGE LOW	The D/S Joystick reference voltage is low.	- Resistive joysticks, these faults do not occur.
2216	2	2	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	2	2	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	2	2	L/S JOY. OUT OF RANGE LOW	The L/S Joystick reference voltage is low.	- Resistive joysticks, these faults do not occur.
2219	2	2	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	2	2	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	2	2	LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A lift / swing function was selected with Footswitch open.	
2222	2	2	WAITING FOR FSW TO BE OPEN	The Footswitch was closed during Platform selection.	- Can be reported during power-up.
2223	2	2	FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	A boom function was selected with Footswitch open.	
2224	2	2	FOOTSWITCH SELECTED BEFORE START	The Footswitch was closed during engine start.	
2286	2	2	FUNCTION PROBLEM - SOFT TOUCH/SKYGUARD OVERRIDE PERMANENTLY SELECTED	The Soft Touch/SkyGuard Override swtich is engaged during system power up and Soft Touch or SkyGuard is turned on in Machine Setup. Fault cleared when switch is no longer enageged	Check wiring and switch
230	**2**	**0**	**<<< Ground Inputs >>>**		
23124	2	3	LIFT PRESSURE SENSOR - OUT OF RANGE LOW	Pressure transducer sensor voltage output < 0.4V for 240ms	Check sensor hardware and wiring

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
23125	2	3	LIFT PRESSURE SENSOR - OUT OF RANGE HIGH	Pressure transducer sensor voltage output > 4.5V for 240ms	Check sensor hardware and wiring
23126	2	3	LIFT PRESSURE SENSOR - NOT DETECTING CHANGE	Lift down is commanded and pressure does not change by 20psi within 10seconds. This is only evaluated when rod-side pressure starts out below a threshold value	Check sensor hardware and wiring
23127	2	3	LIFT CYLINDER - OVER PRESSURE	At the end of a lift up event if pressure is greater than 2200 psi for 3seconds	Check lift cylinder seal across piston, fault detects a hardware failure
23128	2	3	REDUCTION CHECK PRESSURE SENSOR - OUT OF RANGE LOW	Pressure sensor voltage output < 0.4V for 240ms	Check sensor hardware and wiring
23129	2	3	REDUCTION CHECK PRESSURE SENSOR - OUT OF RANGE HIGH	Pressure sensor voltage output > 4.5V for 240ms	Check sensor hardware and wiring
23130	2	3	REDUCTION CHECK PRESSURE SENSOR - HIGH	Pressure transducer reads > 3250 psi for 2 seconds while main dump valve energized and engine is running	Check sensor hardware and wiring and check relief setttings
23131	2	3	REDUCTION CHECK PRESSURE SENSOR - LOW	Pressure transducer reads < 1500 psi for 2 seconds while main dump valve energized and engine is running	Check sensor hardware and wiring and check relief setttings
23253	2	3	MACHINE SETUP WIRING - ERROR	An issue with the machine setup wiring has been detected. Fault cleared once issue resolved.	Check wiring on UGM J3-11 and BLAM J2-7 against Electrical Schematic applicable to machine manufacturing date. Analyzer also provides status of the inputs under DIAGNOSTICS --> SYSTEM --> SETUP CONFIG 1 and DIAGNOSTICS --> SYSTEM --> SETUP CONFIG 2 (LOW = Open Circuit, HIGH = Closed Circuit)
240	**24**	**0**	**<<< OTHER CONTROLS >>>**		
250	**25**	**0**	**<<< FUNCTION PREVENTED >>>**		
259	2	5	MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS	The model selection has been changed.	
2513	2	5	GENERATOR MOTION CUTOUT ACTIVE	Driving is not possible while the vehicle generator is running AND is configured to prevent drive.	
2514	2	5	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	2	5	DRIVE PREVENTED - BOOM SELECTED	Driving is not possible while the vehicle above elevation AND is configured to prevent drive while above elevation.	
2516	2	5	DRIVE PREVENTED - ABOVE ELEVATION	Driving is not possible while Boom functions are selected AND is configured to not allow simultaneous drive & boom operation.	
2517	2	5	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	2	5	JIB SWING PREVENTED - IN 1000# MODE	JIB Swing is not possible while the vehicle is in 1000 LB Mode.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
2522	2	5	CAN DONGLE ATTACHED - HYDRAULICS NOT RESTRICTED	CAN Dongle attached. Very limited restrictions for all hydraulics systems.	
2546	2	5	MACHINE SETUP FAULT - JIB SWING		
2547	2	5	MACHINE SETUP FAULT - MODEL		
2563	2	5	SKYGUARD SWITCH - DISAGREEMENT	The UGM detects that Skyguard Input 1 and Skyguard Input 2 states do not match for more than 160ms. Fault is cleared when Skyguard input 1 and Skyguard Input 2 must match and controls are returned to neutral.	Check wiring, verify wiring to relays and relays are working correctly.
2549	2	5	DRIVE & BOOM PREVENTED - SOFT TOUCH ACTIVE	The Soft Touch sensor has been activated. Fault cleared once controls are returned to neutral and Soft Touch is not active.	
2587	2	5	RUNNING AT CREEP - PLATFORM LEVELED UNDER	The UGM has detected the platform is in the leveled under position. Fault cleared when platform is returned to level.	Level platform
260	**26**	**0**	**<<<Chassis Inputs>>>**		
261	2	6	FRONT LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	Sensor output < 0.1V	Check sensor hardware and wiring
262	2	6	FRONT LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	Sensor output >4.9V	Check sensor hardware and wiring
263	2	6	FRONT RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	Sensor output < 0.1V	Check sensor hardware and wiring
264	2	6	FRONT RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	Sensor output >4.9V	Check sensor hardware and wiring
265	2	6	REAR LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	Sensor output < 0.1V	Check sensor hardware and wiring
266	2	6	REAR LEFT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	Sensor output >4.9V	Check sensor hardware and wiring
267	2	6	REAR RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE LOW	Sensor output < 0.1V	Check sensor hardware and wiring
268	2	6	REAR RIGHT AXLE SWING SENSOR - VOLTAGE OUT OF RANGE HIGH	Sensor output >4.9V	Check sensor hardware and wiring
269	2	6	REAR LEFT AXLE RETRACT SWITCH - DISAGREEMENT		Check sensor hardware and wiring
2610	2	6	REAR RIGHT AXLE RETRACT SWITCH - DISAGREEMENT		Check sensor hardware and wiring
2611	2	6	FRONT LEFT AXLE SENSOR - NOT RESPONDING	< 0.4deg travel detected for 5 seconds with a deploy or retract command	Check sensor hardware and wiring
2612	2	6	FRONT RIGHT AXLE SENSOR - NOT RESPONDING		Check sensor hardware and wiring
2613	2	6	REAR LEFT AXLE SENSOR - NOT RESPONDING		Check sensor hardware and wiring
2614	2	6	REAR RIGHT AXLE SENSOR - NOT RESPONDING		Check sensor hardware and wiring
2615	2	6	AXLE RETRACT POSITION - NOT CALIBRATED	Axles are not calibrated	Calibrate axles
2616	2	6	AXLE DEPLOY POSITION - NOT CALIBRATED	Axles are not calibrated	Calibrate axles
330	**3**	**3**	**<<< GROUND OUTPUT DRIVER >>>**		

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
331	3	3	BRAKE - SHORT TO BATTERY	There is a Short to Battery to the Brake Valve.	
332	3	3	BRAKE - OPEN CIRCUIT	There is an Open Circuit to the Brake Valve.	
3311	3	3	GROUND ALARM - SHORT TO BATTERY	There is a Short to Battery to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3316	3	3	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	3	3	RIGHT FORWARD DRIVE PUMP - OPEN CIR-CUIT	There is an Open Circuit to the Right Forward Drive Valve.	- Chassis Module equipped vehicles only.
3318	3	3	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	3	3	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	3	3	RIGHT REVERSE DRIVE PUMP - OPEN CIR-CUIT	There is an Open Circuit to the Right Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3322	3	3	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	3	3	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	3	3	LEFT FORWARD DRIVE PUMP - OPEN CIR-CUIT	There is an Open Circuit to the Left Forward Drive Valve.	- Chassis Module equipped vehicles only.
3326	3	3	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	3	3	LEFT REVERSE DRIVE PUMP - SHORT TO GROUND	There is a Short to Ground to the Left Reverse Drive Valve.	- Chassis Module equipped vehicles only.
3329	3	3	LEFT REVERSE DRIVE PUMP - OPEN CIRCUIT	There is an Open Circuit to the Left Reverse Drive Valve.	- Chassis Module equipped vehi- cles only.
3330	3	3	LEFT REVERSE DRIVE PUMP - SHORT TO BAT-TERY	There is a Short to Battery to the Left Reverse Drive Valve.	- Chassis Module equipped vehi- cles only.
3336	3	3	ALTERNATOR/ECM POWER - SHORT TO GROUND	There is a Short to Ground to the Alternator/ECM.	
3338	3	3	ALTERNATOR POWER - OPEN CIRCUIT	There is an Open Circuit to the Alternator.	
3339	3	3	ALTERNATOR POWER - SHORT TO BATTERY	There is a Short to Battery to the Alternator	
3340	3	3	AUX POWER - SHORT TO GROUND	There is a Short to Ground to the Auxiliary Power Pump Relay.	
3341	3	3	AUX POWER - OPEN CIRCUIT	There is an Open Circuit to the Auxiliary Power Pump Relay.	
3342	3	3	AUX POWER - SHORT TO BATTERY	There is a Short to Battery to the Auxiliary Power Pump Relay.	
3343	3	3	COLD START ADVANCE SOLENOID - SHORT TO GROUND	There is a Short to Ground to the Cold Start Advance Solenoid.	- CAT engines only.
3344	3	3	COLD START ADVANCE SOLENOID - OPEN CIRCUIT	There is an Open Circuit to the Cold Start Advance Solenoid.	- CAT engines only.
3345	3	3	COLD START ADVANCE SOLENOID - SHORT TO BATTERY	There is a Short to Battery to the Cold Start Advance Solenoid.	- CAT engines only.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3349	3	3	ELECTRIC PUMP - SHORT TO GROUND	There is a Short to Ground to the Pump Relay.	- CAT engines only.
3350	3	3	ELECTRIC PUMP - OPEN CIRCUIT	There is an Open Circuit to the Pump Relay.	- CAT engines only.
3351	3	3	ELECTRIC PUMP - SHORT TO BATTERY	There is a Short to Battery to the Pump Relay.	- CAT engines only.
3358	3	3	MAIN DUMP VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Dump Valve.	
3359	3	3	MAIN DUMP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Dump Valve.	
3360	3	3	MAIN DUMP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Dump Valve.	
3361	3	3	BRAKE - SHORT TO GROUND	There is a Short to Ground to the Brake Valve.	
3362	3	3	START SOLENOID - SHORT TO GROUND	There is a Short to Ground to the Start Relay.	- Diesel engines only.
3363	3	3	START SOLENOID - OPEN CIRCUIT	There is an Open Circuit to the Start Relay.	- Diesel engines only.
3364	3	3	START SOLENOID - SHORT TO BATTERY	There is a Short to Battery to the Start Relay.	- Diesel engines only.
3368	3	3	TWO SPEED VALVE - SHORT TO GROUND	There is a Short to Ground to the Two Speed Valve.	
3369	3	3	TWO SPEED VALVE - OPEN CIRCUIT	There is an Open Circuit to the Two Speed Valve.	
3370	3	3	TWO SPEED VALVE - SHORT TO BATTERY	There is a Short to Battery to the Two Speed Valve.	
3371	3	3	GROUND ALARM - SHORT TO GROUND	There is a Short to Ground to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3372	3	3	GROUND ALARM - OPEN CIRCUIT	There is an Open Circuit to the Ground Alarm.	- Ground Alarm equipped vehicles only.
3373	3	3	GEN SET/WELDER - SHORT TO GROUND	There is a Short to Ground to the Generator Relay.	- Generator / Welder equipped vehicles only.
3374	3	3	GEN SET/WELDER - OPEN CIRCUIT	There is an Open Circuit to the Generator Relay.	- Generator / Welder equipped vehicles only.
3375	3	3	GEN SET/WELDER - SHORT TO BATTERY	There is a Short to Battery to the Generator Relay.	- Generator / Welder equipped vehicles only.
3376	3	3	HEAD TAIL LIGHT - SHORT TO GROUND	There is a Short to Ground to the Head Light Relay.	- Head Light equipped vehicles only.
3377	3	3	HEAD TAIL LIGHT - OPEN CIRCUIT	There is an Open Circuit to the Head Light Relay.	- Head Light equipped vehicles only.
3378	3	3	HEAD TAIL LIGHT - SHORT TO BATTERY	There is a Short to Battery to the Head Light Relay.	- Head Light equipped vehicles only.
3379	3	3	HOUR METER - SHORT TO GROUND	There is a Short to Ground to the Hour Meter.	
3380	3	3	HOUR METER - OPEN CIRCUIT	There is an Open Circuit to the Hour Meter.	- Can be reported during power- up.
3381	3	3	HOUR METER - SHORT TO BATTERY	There is a Short to Battery to the Hour Meter.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3385	3	3	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	3	3	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	3	3	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	3	3	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	3	3	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	3	3	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.
3394	3	3	PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Left Valve.	
3395	3	3	PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Left Valve.	
3396	3	3	PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Left Valve.	
3397	3	3	PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Right Valve.	
3398	3	3	PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Right Valve.	
3399	3	3	PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Right Valve.	
33120	3	3	MAIN TELESCOPE IN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope In Valve.	
33123	3	3	MAIN TELESCOPE OUT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope Out Valve.	
33130	3	3	THROTTLE ACTUATOR - SHORT TO GROUND	There is a Short to Ground to the Throttle Actuator.	
33131	3	3	THROTTLE ACTUATOR - OPEN CIRCUIT	There is an Open Circuit to the Throttle Actuator.	
33132	3	3	THROTTLE ACTUATOR - SHORT TO BATTERY	There is a Short to Battery to the Throttle Actuator.	
33133	3	3	PLATFORM CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.
33134	3	3	PLATFORM CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.
33135	3	3	PLATFORM CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Control Valve.	- Electronic leveling system equipped vehicles only.
33150	3	3	LIFT PILOT VALVE - SHORT TO GROUND	There is a Short to Ground to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.
33151	3	3	LIFT PILOT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.
33152	3	3	LIFT PILOT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Lift Pilot Valve.	- Gravity Lift Down equipped vehicles only.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33153	3	3	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.
33154	3	3	LIFT DOWN AUX VALVE - OPEN CIRCUIT	There is an Open Circuit to the Lift Down Auxiliary Valve.	- Gravity Lift Down equipped vehicles only.
33155	3	3	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.
33159	3	3	MAIN LIFT ENABLE VALVE - SHORT TO GROUND	Short to Ground detected	Check wiring
33160	3	3	MAIN LIFT ENABLE VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
33173	3	3	RESTRICTED TO TRANSPORT - AXLE LOCK-OUT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Axle Lockout Valve.	
33174	3	3	RESTRICTED TO TRANSPORT - BRAKE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Brake.	
33182	3	3	LIFT VALVES - SHORT TO BATTERY		
33186	3	3	MAIN TELESCOPE OUT VALVE - OPEN CIRUIT	There is an Open Circuit to the Main Tele-scope Out Valve.	
33188	3	3	MAIN TELESCOPE OUT VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Tele-scope Out Valve.	
33189	3	3	MAIN TELESCOPE IN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Tele-scope In Valve.	
33190	3	3	MAIN TELESCOPE IN VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope In Valve.	
33207	3	3	HORN - OPEN CIRCUIT	There is an Open Circuit to the Horn.	
33208	3	3	HORN - SHORT TO BATTERY	There is a Short to Battery to the Horn.	
33209	3	3	HORN - SHORT TO GROUND	There is a Short to Ground to the Horn.	
33279	3	3	GLOWPLUG - OPEN CIRCUIT	There is an Open Circuit to the Glow Plugs.	- Glowplugs equipped vehicles only.
33280	3	3	GLOWPLUG - SHORT TO BATTERY	There is a Short to Battery to the Glow Plugs.	- Glowplugs equipped vehicles only.
33281	3	3	GLOWPLUG - SHORT TO GROUND	There is a Short to Ground to the Glow Plugs.	- Glowplugs equipped vehicles only.
33285	3	3	ALTERNATOR EXCITATION LINE - SHORT TO BATTERY		
33307	3	3	MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Tele-scope Flow Control Valve.	
33308	3	3	MAIN TELESCOPE FLOW CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Tele-scope Flow Control Valve.	
33309	3	3	MAIN TELESCOPE FLOW CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Tele-scope Flow Control Valve.	
33311	3	3	MAIN LIFT FLOW CONTROL VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Lift Flow Control Valve.	
33312	3	3	MAIN LIFT FLOW CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Lift Flow Control Valve.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33313	3	3	MAIN LIFT FLOW CONTROL VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Lift Flow Control Valve.	
33414	3	3	SWING - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	Check wiring and coil
33418	3	3	SWING - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	Check wiring and coil
33429	3	3	JIB LIFT UP OVERRIDE VALVE - SHORT TO GROUND		
33430	3	3	JIB LIFT UP OVERRIDE VALVE - OPEN CIRCUIT		
33431	3	3	JIB LIFT UP OVERRIDE VALVE - SHORT TO BATTERY		
33432	3	3	JIB LIFT DOWN OVERRIDE VALVE - SHORT TO GROUND		
33433	3	3	JIB LIFT DOWN OVERRRIDE VALVE - OPEN CIRCUIT		
33434	3	3	JIB LIFT DOWN OVERRIDE VALVE - SHORT TO BATTERY		
33435	3	3	JIB CONTROL VALVE - SHORT TO GROUND		
33436	3	3	JIB CONTROL VALVE - OPEN CIRCUIT		
33437	3	3	JIB CONTROL VALVE - SHORT TO BATTERY		
33456	3	3	MAIN LIFT FLOW CONTROL VALVE - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	Check wiring and coil
33457	3	3	MAIN LIFT FLOW CONTROL VALVE - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	
33460	3	3	TELESCOPE FLOW CONTROL VALVE - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	
33461	3	3	TELESCOPE FLOW CONTROL VALVE - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	
33462	3	3	WARM UP VALVE - SHORT TO BATTERY	Short to Battery detected	Check wiring
33463	3	3	WARM UP VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
33464	3	3	WARM UP VALVE - SHORT TO GROUND	Short to Ground detected	Check wiring
33465	3	3	CHASSIS ENABLE VALVE - SHORT TO BATTERY	Short to Battery detected	Check wiring
33466	3	3	CHASSIS ENABLE VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
33467	3	3	CHASSIS ENABLE VALVE - SHORT TO GROUND	Short to Ground detected	Check wiring
33487	3	3	TWO SPEED OR BRAKE VALVE - STUCK OPEN		
33488	3	3	SWING FLOW CONTROL VALVE - SHORT TO GROUND	Short to Ground detected	Check wiring
33489	3	3	SWING FLOW CONTROL VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
33490	3	3	SWING FLOW CONTROL VALVE - SHORT TO BATTERY	Short to Battery detected	Check wiring

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33563	3	3	LIFT ENABLE VALVE - STUCK OPEN	Lift pilot valve is energized (during auxiliary or gravity sequence) and 1deg of motion is detected prior to the enable valve being energized	Check enable valve hardware
33564	3	3	COUNTER BALANCE VALVE - STUCK OPEN	Counterbalance valve test completed at the end of a lift down command. If Lift Cylinder angle sensor detects 2-deg motion, fault is activated	Check counterbalance valve hardware
33565	3	3	LIFT ENABLE - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	Check wiring and coil
33566	3	3	LIFT ENABLE - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	Check wiring and coil
340	**3**	**4**	**<<< PLATFORM OUTPUT DRIVER >>>**		
343	3	4	PLATFORM LEVEL UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Up Valve.	
344	3	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	3	4	PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Down Valve.	
348	3	4	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.
3427	3	4	JIB LOCK VALVE - OPEN CIRCUIT		
3428	3	4	JIB LOCK VALVE - SHORT TO BATTERY		
3429	3	4	JIB LOCK VALVE - SHORT TO GROUND		
3430	3	4	JIB UNLOCK VALVE - OPEN CIRCUIT		
3431	3	4	JIB UNLOCK VALVE - SHORT TO BATTERY		
3432	3	4	JIB UNLOCK VALVE - SHORT TO GROUND		
350	**3**	**5**	**<<< OTHER OUTPUT DRIVERS >>>**		
351	3	5	JIB LEVEL UP VALVE - SHORT TO GROUND		
352	3	5	JIB LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
353	3	5	JIB LEVEL DOWN VALVE - SHORT TO GROUND		
354	3	5	JIB LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
355	3	5	JIB LIFT UP VALVE - SHORT TO GROUND		
356	3	5	JIB LIFT UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
357	3	5	JIB LIFT DOWN VALVE - SHORT TO GROUND		
358	3	5	JIB LIFT DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
359	3	5	JIB ROTATE LEFT VALVE - SHORT TO GROUND		
3510	3	5	JIB ROTATE LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
3511	3	5	JIB ROTATE RIGHT VALVE - SHORT TO GROUND		

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3512	3	5	JIB ROTATE RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
3513	3	5	JIB TELESCOPE IN VALVE - SHORT TO GROUND		
3514	3	5	JIB TELESCOPE IN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
3515	3	5	JIB TELESCOPE OUT VALVE - SHORT TO GROUND		
3516	3	5	JIB TELESCOPE OUT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT		
360	**3**	**6**	**<<<Chassis Output Driver >>>**		
361	3	6	FRONT AXLE EXTEND VALVE - SHORT TO BATTERY	Short to Battery detected	Check wiring
362	3	6	FRONT AXLE EXTEND VALVE - SHORT TO GROUND	Short to Ground detected	
363	3	6	FRONT AXLE RETRACT VALVE - SHORT TO BATTERY	Short to Battery detected	
364	3	6	FRONT AXLE RETRACT VALVE - SHORT TO GROUND	Short to Ground detected	
365	3	6	REAR AXLE EXTEND VALVE - SHORT TO BATTERY	Short to Battery detected	
366	3	6	REAR AXLE EXTEND VALVE - SHORT TO GROUND	Short to Ground detected	
367	3	6	REAR AXLE RETRACT VALVE - SHORT TO BATTERY	Short to Battery detected	
368	3	6	REAR AXLE RETRACT VALVE - SHORT TO GROUND	Short to Ground detected	
369	3	6	FRONT AXLE EXTEND VALVE - OPEN CIRCUIT	Open Circuit detected	
3610	3	6	FRONT AXLE VALVE - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	Check wiring and coil
3611	3	6	FRONT AXLE RETRACT VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
3612	3	6	REAR AXLE VALVE - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected	Check wiring and coil
3613	3	6	REAR AXLE EXTEND VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
3514	3	6	FRONT AXLE VALVE - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	Check wiring and coil
3615	3	6	REAR AXLE RETRACT VALVE - OPEN CIRCUIT	Open Circuit detected	Check wiring
3616	3	6	REAR AXLE VALVE - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value	Check wiring and coil
3617	3	6	CHASSIS BRAKE - OPEN CIRCUIT	Open Circuit detected	Check wiring
3618	3	6	CHASSIS BRAKE - SHORT TO BATTERY	Short to Battery detected	Check wiring
3619	3	6	CHASSIS BRAKE - SHORT TO GROUND	Short to Ground detected	Check wiring
3620	3	6	FRONT AXLE VALVE - SHORT TO BATTERY	Short to Battery detected	Check wiring
3621	3	6	REAR AXLE VAVE - SHORT TO BATTERY	Short to Battery detected	Check wiring
430	**4**	**3**	**<<< ENGINE >>>**		

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
431	4	3	FUEL SENSOR SHORT TO BATTERY	The Fuel Sensor reading is > 4.3V.	
432	4	3	FUEL SENSOR SHORT TO GROUND	The Fuel Sensor reading is < 0.2V.	
433	4	3	OIL PRESSURE SHORT TO BATTERY	The Oil Pressure Sensor reading is > 6.6V.	- Deutz engine only.
434	4	3	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	4	3	COOLANT TEMPERATURE SHORT TO GROUND	The Coolant Temperature Sensor reading is < 0.1V.	- Deutz engine only.
437	4	3	ENGINE TROUBLE CODE	Displays engine SPN FMI code.	
438	4	3	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.
439	4	3	AIR FILTER BYPASSED	The Air Filter is clogged.	
4310	4	3	NO ALTERNATOR OUTPUT	Battery voltage is < 11.5 volts for more then 15 seconds after engine start.	
4311	4	3	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	4	3	THROTTLE ACTUATOR FAILURE	The engine RPM is > XXX for more then XX seconds.	
4314	4	3	WRONG ENGINE SELECTED - ECM DETECTED	A ECM was detected with a non- ECM type engine selected.	
4322	4	3	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	4	3	SPEED SENSOR READING INVALID SPEED	The engine RPM sensor indicates > 4000 RPM.	- Diesel engine only.
4364	4	3	SCR CLEANING NOT INITIATED	SCR Cleaning was requested bu not initiated.	
4365	4	3	RUNNING AT CREEP - ENGINE POWER REDUCTION	Triggered by 524190:14 (engine controlled)	
4366	4	3	SCR CLEANING REQUIRED - SOOT DETECTED	SCR Crystallization has been detected (engine controlled)	
4368	4	3	ALL FUNCTIONS PREVENTED - ENGINE POWER REDUCTION SEVERE	Triggered by 524191:14 (engine controlled) You	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
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	The engine oil is not warm enough to run the machine. Fault cleared once engine oil temperature has reached temperature.	Let machine run until fault is cleared
440	**4**	**4**	**<<< BATTERY SUPPLY >>>**		
441	4	4	BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN	Battery voltage is < 9V.	
442	4	4	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.
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	4	4	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.
660	**6**	**6**	**<<< COMMUNICATION >>>**		
662	6	6	CANBUS FAILURE - PLATFORM MODULE	Platform Module CAN communication lost.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
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.
666	6	6	CANBUS FAILURE - ENGINE CONTROLLER	Engine Control Module CAN communication lost.	- ECM equipped engine only.
6610	6	6	CANBUS FAILURE - BLAM	BLAM CAN communication lost.	- BLAM equipped vehicles only.
6611	6	6	CANBUS FAILURE - CHASSIS MODULE	Engine Control Module CAN communication lost.	- ECM equipped engine only.
6612	6	6	CANBUS FAILURE - CYLINDER LOAD PIN	Cylinder Load Pin CAN communication lost.	- Cylinder Load Pin equipped engine only.
6613	6	6	CANBUS FAILURE - EXCESSIVE CANBUS ERRORS	There has been > 500 Bus Off errors or >500 Bus Passive Errors.	
6622	6	6	CANBUS FAILURE - TCU MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6623	6	6	CANBUS FAILURE - GATEWAY MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6629	6	6	CANBUS FAILURE - TELEMATICS CANBUS LOADING TOO HIGH	X	-Telematics only
6639	6	6	CANBUS FAILURE - JIB CONTROL MODULE		
6640	6	6	CANBUS FAILURE - JIB LIFT ANGLE SENSOR		
6641	6	6	CANBUS FAILURE - PLATFORM LEVEL ANGLE SENSOR		
6654	6	6	CANBUS FAILURE - GROUND DISPLAY	CANbus communications has been lost between the UGM and the Ground Display (only applicable to 1850SJ with a T4f engine). Fault cleared once communications has been restored.	Verify CANbus wiring per electrical schematic, verify CANbus resistance.
6667	6	6	CANBUS FAILURE - PLATFORM DISPLAY	CANbus communications has been lost between the UGM and the Platform Display (only applicable to 1850SJ with a T4f engine). Fault cleared once communications has been restored.	Verify CANbus wiring per electrical schematic, verify CANbus resistance.
6682	6	6	CANBUS FAILURE - GROUND LIGHT PANEL	CANbus communications has been lost between the UGM and the Ground Light Panel. Fault cleared once communications has been restored.	Verify CANbus wiring per electrical schematic, verify CANbus resistance.
6683	6	6	CANBUS FAILURE - PLATFORM LIGHT PANEL	CANbus communications has been lost between the UGM and the Ground Light Panel Fault cleared once communications has been restored.	Verify CANbus wiring per electrical schematic, verify CANbus resistance.
680	**6**	**8**	**<<< TELEMATICS >>>**		
681	6	8	REMOTE CONTRACT MANAGEMENT OVER-RIDE - ALL FUNCTIONS IN CREEP	X	-Telematics only

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
810	**8**	**1**	**<<< TILT SENSOR >>>**		
813	8	1	CHASSIS TILT SENSOR NOT CALIBRATED	The Chassis Tilt Sensor has not been calibrated.	
814	8	1	CHASSIS TILT SENSOR OUT OF RANGE	Tilt sensor out of range	Check sensor hardware and wiring
815	8	1	CHASSIS TILT SENSOR DISAGREEMENT	X	
8111	8	1	CHASSIS TILT READING DISAGREEMENT	Disagreement between internal (UGM) and external chassis tilt sensors	Check external/internal sensor hardware and installation on machine
820	**8**	**2**	**<<< PLATFORM LOAD SENSE >>>**		
821	8	2	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	8	2	LSS CELL #2 ERROR822822		