

## 5.10 DRIVE PUMP

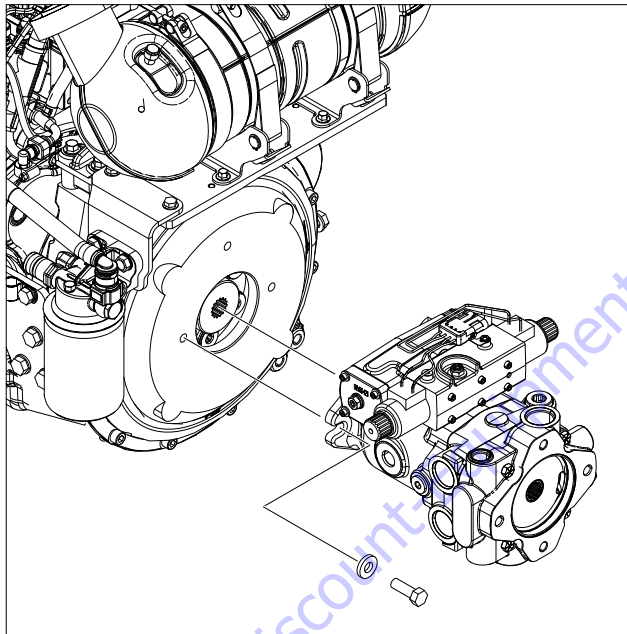
### Removal

**NOTE:** Remove the function pump from the machine first, refer Section 5.9, Function Pump.

1. Tag and disconnect the hydraulic lines and fittings from the drive pump. Use a suitable container to retain any residual hydraulic fluid. Immediately cap lines and ports.

**NOTE:** The drive pump weighs approximately 62 lbs. (28 kg).

2. Use a suitable device to support the drive pump.
3. Remove two bolts and washers attaching the drive pump to the engine assembly. Remove drive pump from the machine as shown.



4. Remove and discard o-ring from the drive pump groove.
5. Place drive pump in the clean work area.

### Installation

**NOTE:** The drive pump weighs approximately 62 lbs. (28 kg).

1. Use a suitable device to support the drive pump.
2. Install the new o-ring in to the drive pump groove.
3. Align and install the drive pump to the engine assembly.

**NOTE:** Make sure that the pump shaft is properly aligned.

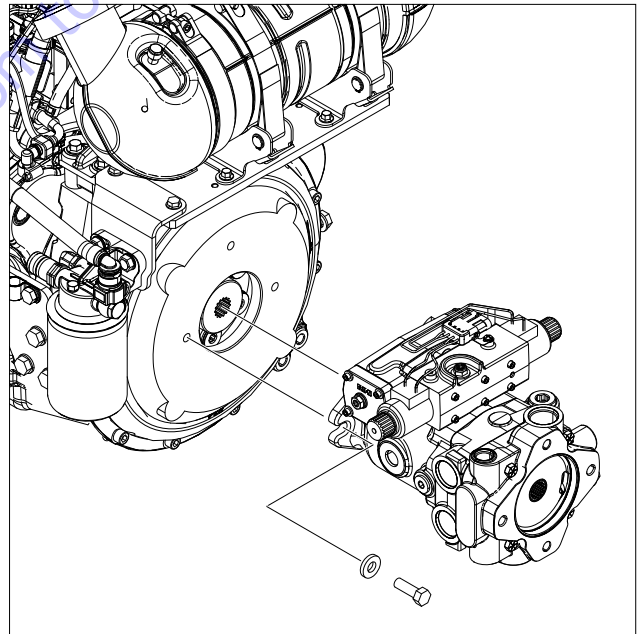
### CAUTION

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

4. Secure drive pump with two bolts and washers as shown.

**NOTE:** Apply JLG Threadlocker P/N 0100011 to the bolts before installation.

5. Torque bolt to 50 ft. lbs. (68Nm).



6. Remove tag and reconnect the hydraulic lines and fittings to the drive pump.

## Servo Controlled Piston Pump

### DISASSEMBLY

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

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

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

5. Remove the inner gerotor ring and key from drive shaft or inner gerotor ring and coupler assembly from shaft.
6. Lift endcover straight up off shaft and housing. Remove valve plate from endcover or from rotating kit assembly, still in housing.
7. From endcover, remove bypass valve or plug, and relief valve assemblies. Note: Mark the relief valve in relationship to the cavity it was removed, for reassembly purposes.

### Endcover Inspection

- Check the bearing (press fit) in endcover. If needles remain in cage, move freely, and setting is at the dimension shown in Figure 5-201. removal not required.
- Check roll pin in endcover. If tight and set to the dimension shown in Figure 5-201. removal not required.

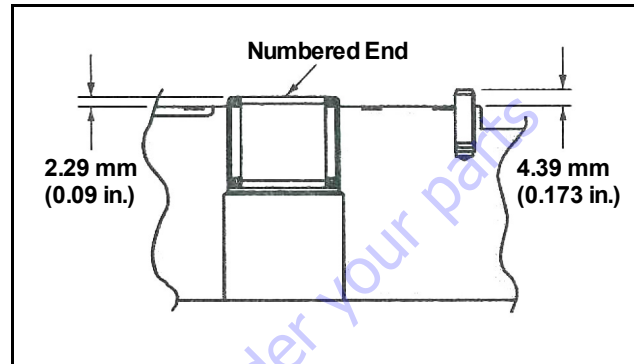


Figure 5-201. Endcover Inspection

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

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

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

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

**Swashplate Inspection**

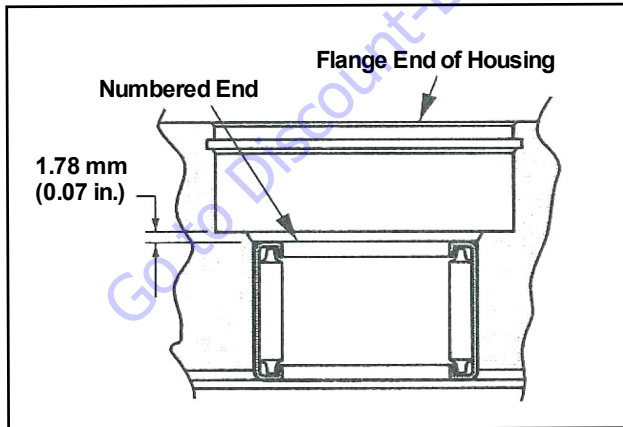
- The finish on the piston shoe surfaces of the swash plate should show no signs of scoring.
  - Inspect swashplate bushing surface for wear and surface for coating transfer from bushing.
1. To remove servo piston assembly from housing, start with the four each cap screws and washers retaining each cover plate.
  2. In removing the cover plate from the servo piston bolt, remove jam nut, washer, and seal washer. Hold the servo piston bolt with hex key and unscrew cover plate off of bolt.
  3. Remove servo piston assembly and seal sub-assemblies (two sets) from housing.

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

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

**Housing Inspection**

- Check the bearing (press fit) in housing. If needles remain in cage, move freely, and setting at the dimension shown in Figure 5-202., removal not required.



**Figure 5-202. Housing Inspection**

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

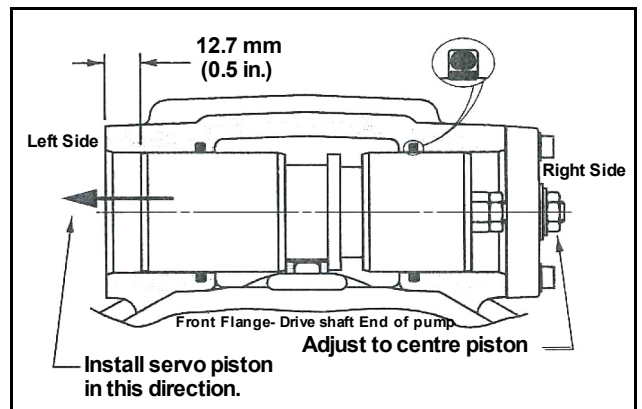
**Bushing Inspection**

- Inspect bushing for contamination embedment within coating of bushing surface coming in contact with swash-plate.
1. Remove all plugs from housing.
  2. Discard the shaft seal, gaskets, and o-rings from all assemblies. Replace with new seals upon reassembly.

**ASSEMBLY**

1. All parts should be cleaned and critical moving parts lubricated before reassembly.
2. If necessary, press new bearing in housing to dimension shown in Figure 5-202. with the numbered end of bearing outward.
3. Install the two new seal sub-assemblies into the servo piston cavity of housing.
4. Screw the cover plate onto the servo piston assembly. Install new cover plate gasket in place on housing. Install servo piston assembly and cover plate into servo piston bore in right side of housing (as shown in Figure 5-203. Retain cover plate with four each washers and cap screws. Torque cap screws 40 to 48 in.lbs (4.5 to 5.4 Nm). To obtain neutral, centering the servo piston assembly is required. Measure in from the left side and set servo piston 0.5 in. (12.7 mm) from surface of housing servo bore as shown in Figure 5-203..

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



**Figure 5-203. Servo Piston Installation**

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

## SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

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6. To assemble cradle sub-assembly, install bushing onto cradle retaining with button head cap screws. Torque button head cap screw 14 to 16 in.lbs (1.6 to 1.8 Nm).
7. Place cradle sub-assembly into housing making sure cradle is completely seated into housing. Retain cradle sub-assembly with two cap screws. Torque cap screws 20 to 24 ft.lbs (27 to 33 Nm).
8. To install shaft, place exterior retaining ring, thrust race, thrust bearing, second thrust race, and second retaining ring onto shaft. Position washer and shaft seal or spacer onto shaft.
9. Install shaft assembly into front of housing for units with spacer, retain with interior retaining ring and go on to step 10. For units with shaft seal. seat seal into position with seal driver and retain with interior retaining ring.
10. Install servo piston follower onto swashplate dowel pin. Install swashplate carefully onto bushing (coat bushing surface with hydraulic oil), aligning servo piston follower with slot in servo piston assembly.

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

11. To install rotating kit assembly, leave housing and shaft in the horizontal position. Holding swashplate into position with screw driver thru controller linkage passage-way at the top of housing. place rotating kit assembly over shaft and into housing until pistons are in against swashplate. Make sure all parts are in housing completely and properly positioned. Return the pump to the vise with open end of housing up. clamping housing on the outer portion of the flange.
12. Install gasket on to housing.
13. If necessary, press new bearing and roll pin in endcover to dimension shown in figure 1-3. Bearing installed with the numbered end outward. Roll pin installed with split oriented away from bearing.
14. Install new o-ring on relief valves. Install relief valve in its original cavity in endcover that it was removed. Torque 100 to 110 ft.lbs (136 to 149 Nm).
15. Install new o-ring on bypass valve or plug. Install bypass valve or plug into endcover. Note: Make sure paddle of bypass valve is perpendicular to relief valve axis prior to installing or damage could result.
16. Apply a small amount of petroleum jelly to the steel side of valve plate to hold in place for installation. Aligning the index pin, place the valve plate in position onto the endcover, with steel side against endcover.
17. Install endcover assembly onto housing assembly. Make sure ports are positioned correctly, valve plate and gasket stay in place.

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

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

19. Install o-ring and outer ring gerotor onto adapter plate. Lubricate both a-ring and outer ring to hold in position during assembly of adapter plate. Install adapter plate onto endcover. Make sure o-ring and gerotor ring stay in place.
20. Retain endcover and adapter plate (when used) with four cap screws, Torque 27 to 31 ft.lbs (37 to 42 Nm).

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

21. Install control housing gasket onto housing. Install orifices into control assembly and retain in position with petroleum jelly. Position the feedback link at 90 degrees from control housing. Install manual servo control assembly onto housing making sure feedback link entered small groove in servo piston assembly.
22. Retain control assembly with six cap screws, torque 40 to 48 in.lbs (4.5 to 5.4 Nm).
23. Install control arm onto control assembly input arm. Retain with lock washer and nut, torque 4 to 6 ft.lbs (5 to 8 Nm).
24. Install new o-rings on all plugs. Install plugs into housing. Torque 3/4 in. plug 21 to 24 ft.lbs (28 to 32 Nm). Torque 1-1/4 in. plug 40 to 45 ft.lbs (54 to 61 Nm).
25. Refer to "Start-up Procedure".



## Charge Pump Adapter Assembly

### DISASSEMBLY

1. Remove plug, shims, spring, and poppet from adapter assembly as shown in Figure 5-205.

### Inspection

- Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that seat is smooth and free of burrs or other defects.
- Inspect the charge pump relief valve spring.
- Inspect the bearing or bushing inside the charge pump adapter. The bearing needles must remain in the bearing cage and bearing at dimension shown in Figure 5-204. The bushing must have no excessive scoring.
- Inspect the gerotor pocket inside the charge pump adapter assembly. It should not be scored excessively.

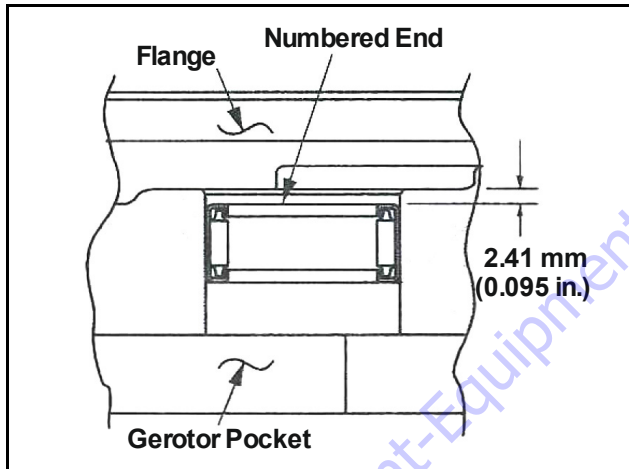
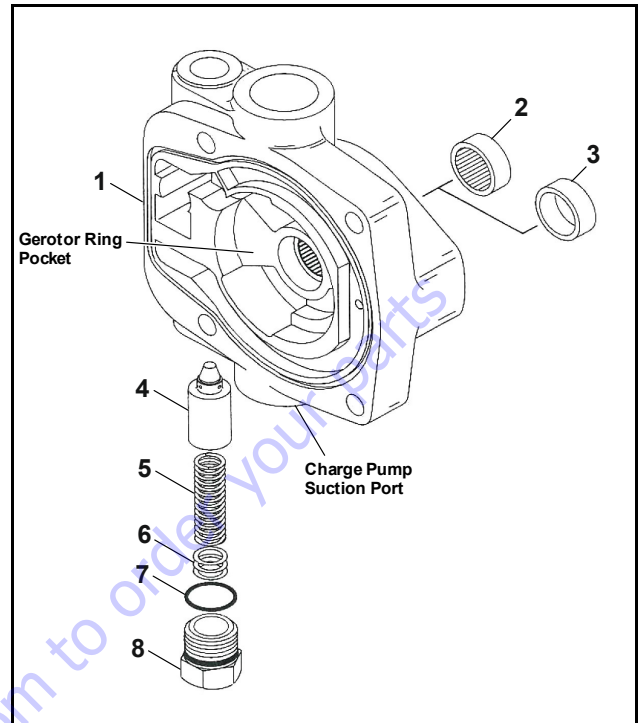


Figure 5-204. bearing or bushing inspection

### ASSEMBLY

1. If necessary, press new bearing or bushing in adapter assembly. The bearing to dimension shown in Figure 5-204. with the numbered end of bearing outward and closest to mounting flange. The bushing is to be pressed flush to 0.254 mm [0.010 in.] recessed.
2. Install poppet, spring, shims, new o-ring on plug, and plug into adapter assembly. Torque plug 30 to 27 ft.lbs. (40.7 to 36.6 Nm).



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

Figure 5-205. Charge Pump Adapter Assembly

## Manual Servo Control Basic Assembly

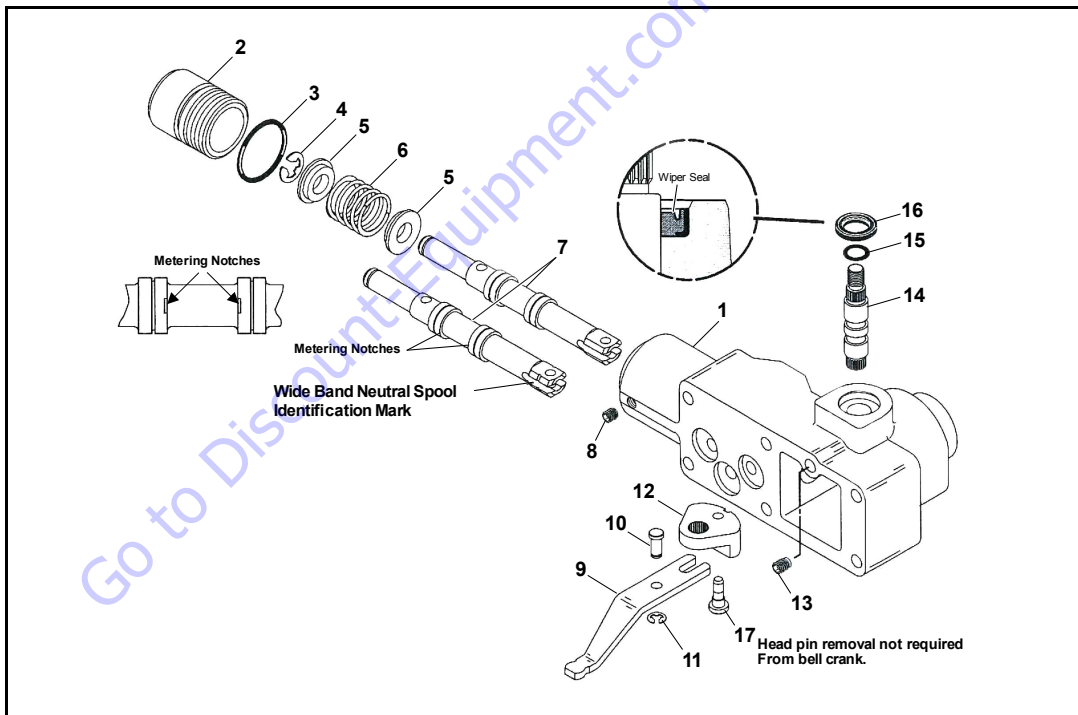
### DISASSEMBLY

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

### ASSEMBLY

1. Install spring retainer, spring, and second spring retainer onto spool. Compress spring with retainer and retain with E-ring onto valve spool.

2. Install valve spool into control housing making sure that metering notches on valve spool can be seen in the metering ports. Notches shown in Figure 5-206.
3. Position bell crank in housing. Slide feedback link into position between clevis on valve spool, aligning holes, and install dowel pin retaining with E-ring.
4. Install new o-ring onto input shaft. Hold bell crank in position with feedback link slot and align splined hole of bell crank with input shaft cavity. Install input shaft into control housing and bell crank.
5. JLG Threadlocker P/N 0100011 or equivalent to set screw and install, retaining input shaft. Adjust set screw until it bottoms out on input shaft and back out one-quarter turn.
6. Install wiper seal on input shaft as shown in Figure 5-206. Install new o-ring onto plug, retaining valve spool, and install plug. Adjust plug until there is no play in the valve spool with input shaft held stationary. Lock in place with set screw. Torque set screw 17 to 25 in.lbs (2 to 3 Nm).



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

Figure 5-206. Manual Servo Control Basic Assembly

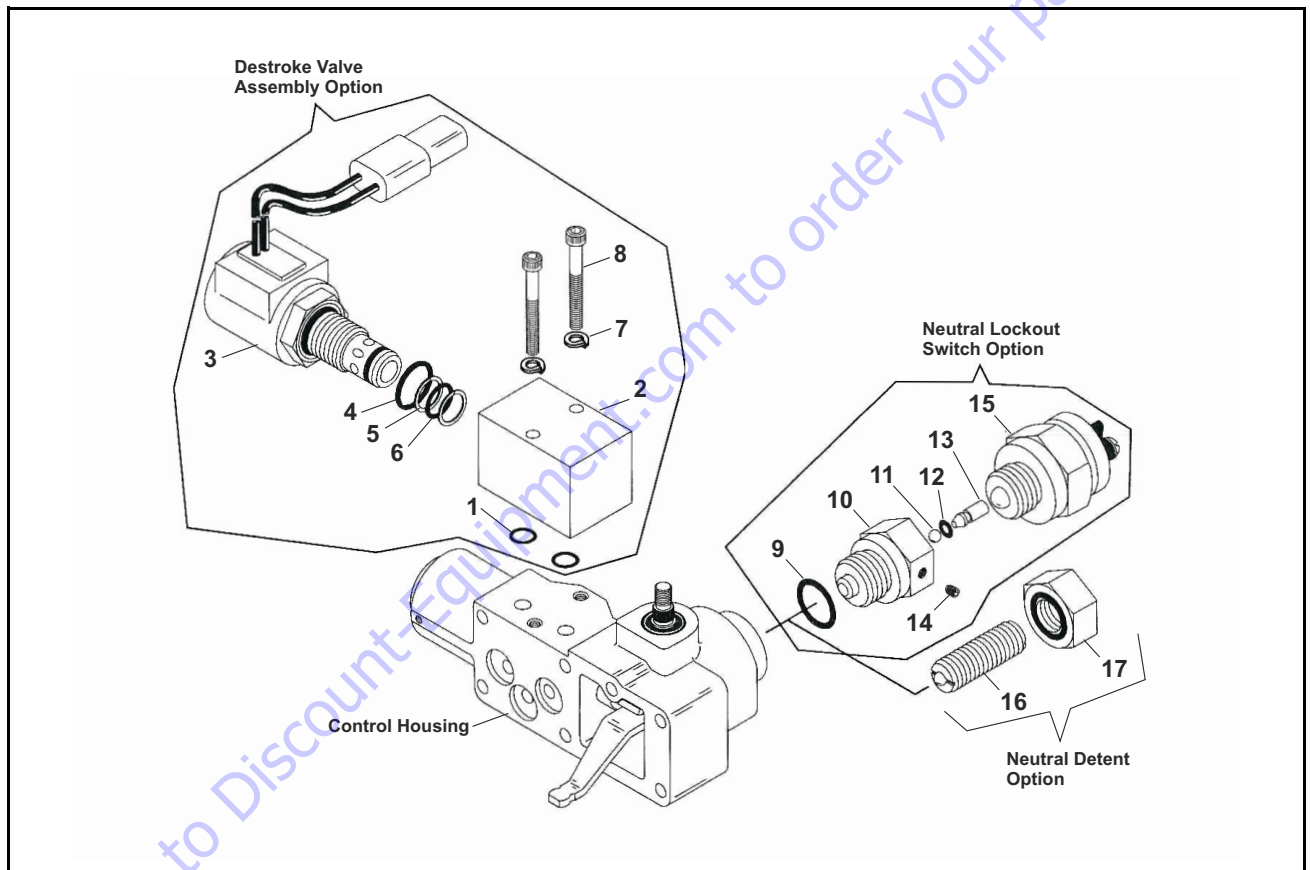
## Manual Servo Control Assembly Options

### DISASSEMBLY - DESTROKE VALVE ASSEMBLY OPTION

1. Remove the two cap screws and lock washers from manifold. Removing destroke valve assembly and two a-rings.
2. Remove destroke valve from manifold in order to remove o-rings and back-up washers. Note: in order to remove destroke valve the solenoid may need to be removed from core first (not shown).

### ASSEMBLY - DESTROKE VALVE ASSEMBLY OPTION

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



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

Figure 5-207. Manual Servo Control Basic Assembly Option

**DISASSEMBLY - NEUTRAL LOCKOUT SWITCH ASSEMBLY OPTION**

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

**ASSEMBLY - NEUTRAL LOCKOUT SWITCH ASSEMBLY OPTION**

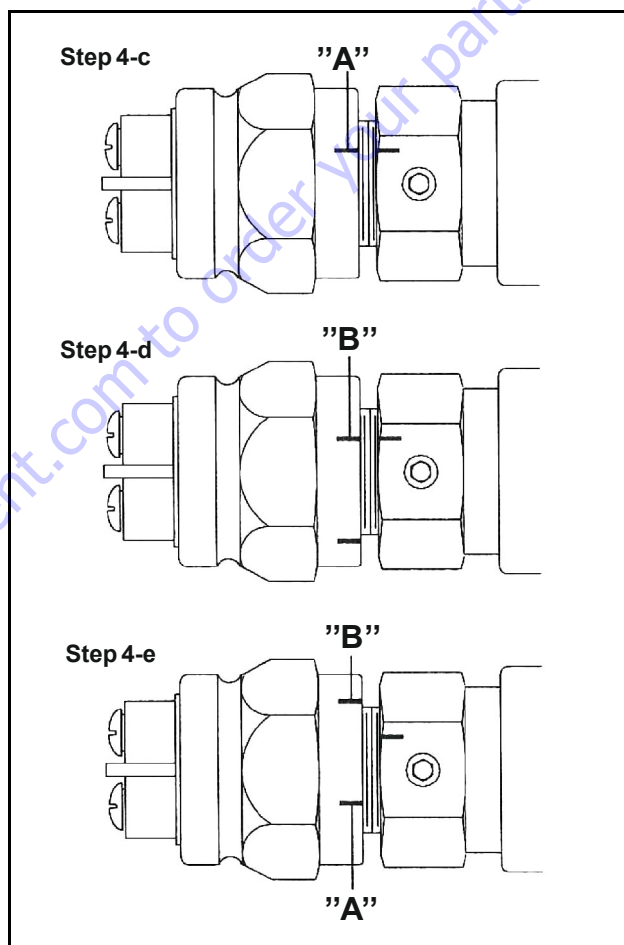
1. Install new a-ring onto adapter and new o-ring onto pin.
2. Install ball and pin into adapter. Lubricate with petroleum jelly to hold in place during installation.
3. Install adapter into control assembly. Torque 44 to 53 ft.lbs. (60 to 70 Nm).
4. Apply Loctite #222 or equivalent to threads of switch and install neutral lockout switch into adapter. The adjustment procedures for the switch are as follows.
  - a. Install switch, while moving control arm back and forth, until "detent" action is detected. Back out the switch until the "detent" action is very slight.
  - b. Obtain a test light or use a multimeter. Attach the leads from the test light to the switch or the wiring connector.
  - c. Move the control arm out of the detent position. The test light will go on. Screw in the switch until the light goes off. Mark this as position "A". See Figure 5-208. Move the control arm to the detent position and the test light should come back on.
  - d. Leaving the control arm in the detent position, the light will remain on. Screw in the switch until the light goes off. Mark this position "B".
  - e. Unscrew the switch one third of the distance between "B" and "A". Install and tighten the hex socket head set screw in one of the main quadrants of the hex of the switch adapter. See Figure 5-208. Torque set screw 2.3 to 2.8 in.lbs (3.2 to 3.8 Nm).
5. Test the switch by moving the control arm to the detent position, the light should be on. Move the control arm out of detent, the light should go off.
6. Remove test light and put servo control assembly into operation.

**DISASSEMBLY - NEUTRAL DETENT OPTION**

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

**ASSEMBLY- NEUTRAL DETENT OPTION**

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



**Figure 5-208. Neutral Lockout Switch Assembly**

## Rotating Kit Assembly

### DISASSEMBLY

Disassembly of rotating assembly is required for inspection only.

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

### Inspection

- Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the swashplate. **Do not lap piston shoes.**
  - Examine the shoe retainer for wear in the pivot area.
  - Examine the pivot to insure smoothness and no signs of wear.
  - Inspect the cylinder barrel surface that makes contact with valve plate. This surface should be smooth and free of deep scratches. Do not lap piston block.
  - The pistons should move freely in the cylinder barrel bore. If they are sticky in the bore, examine the bore for scoring or contamination.
2. To inspect pins and spring caution should be taken in removing spring. The spring is highly compressed and the retaining ring should not be removed without compressing the spring safely.

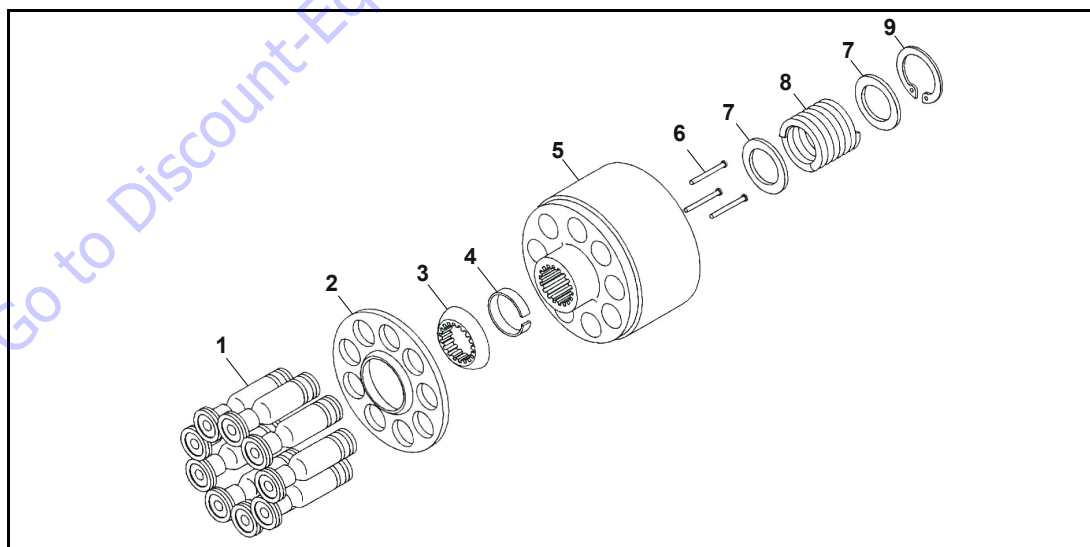
The following parts are required to disassemble the cylinder barrel:

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

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

### ASSEMBLY

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



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

Figure 5-209. Rotating Kit Assembly

### Fault-logic Trouble Shooting

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

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

### RECOMMENDED GAUGE LOCATIONS

#### Gauges Recommended

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

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

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

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

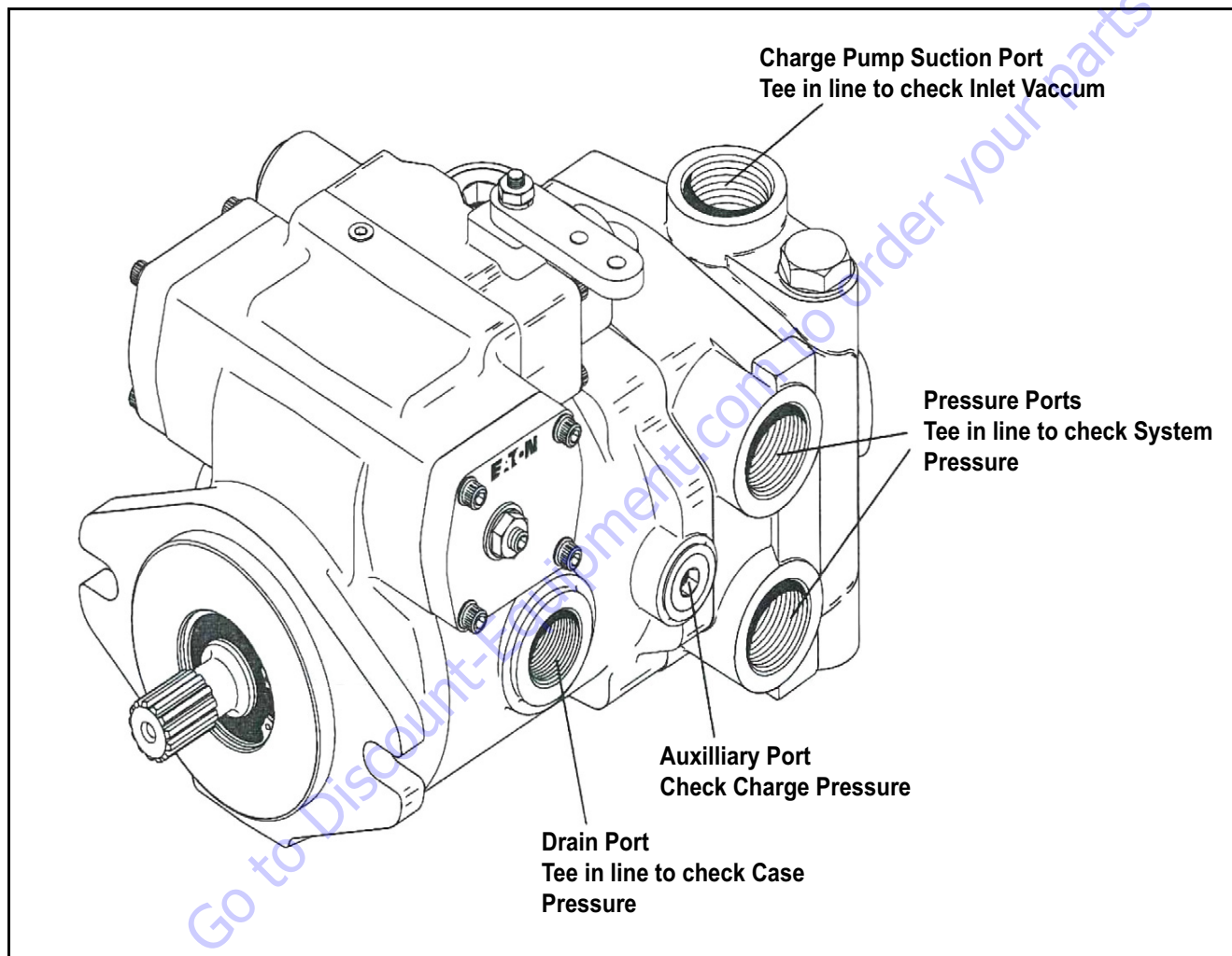


Figure 5-210. Gauge Locations



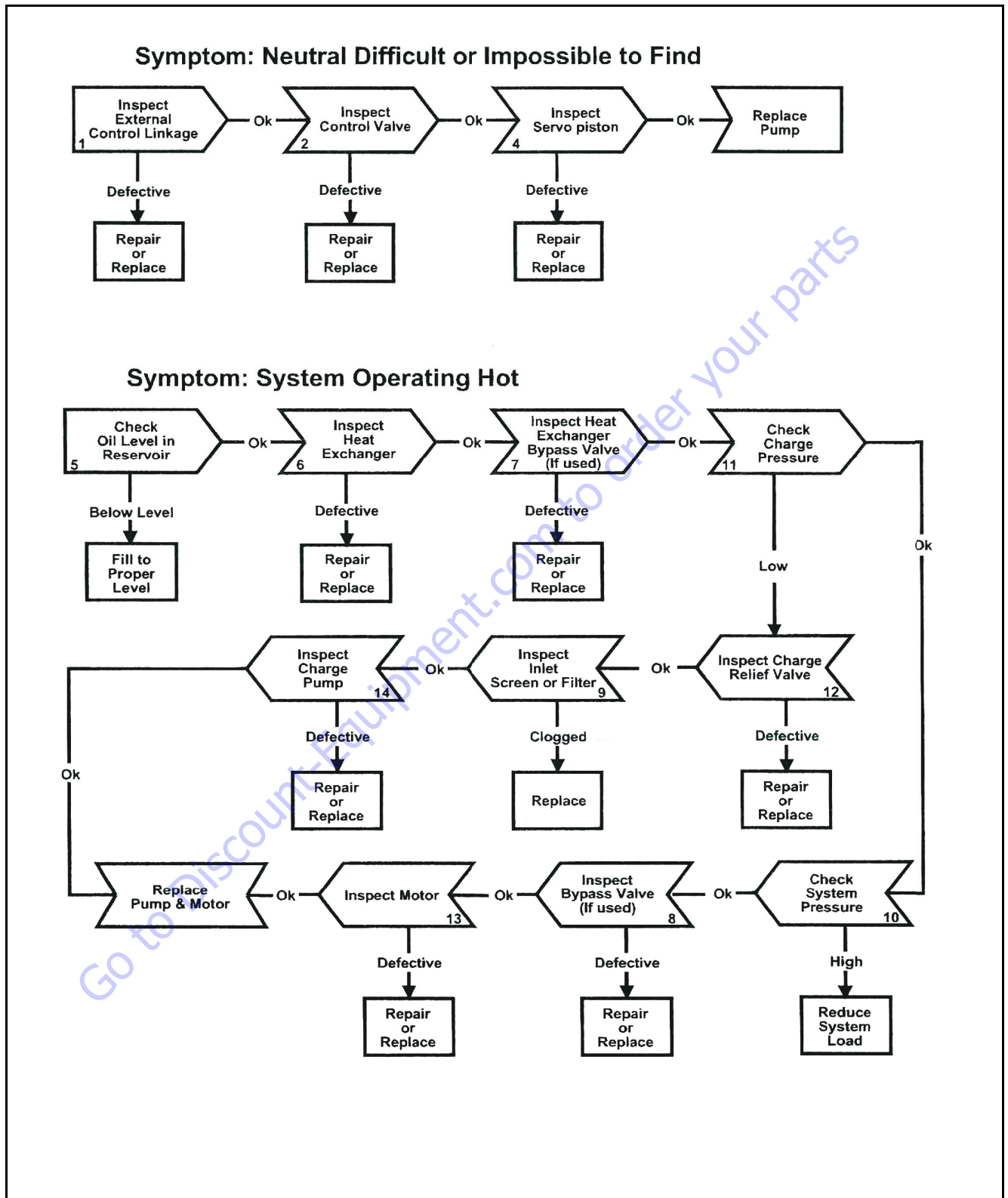


Figure 5-211. Fault-logic Troubleshooting

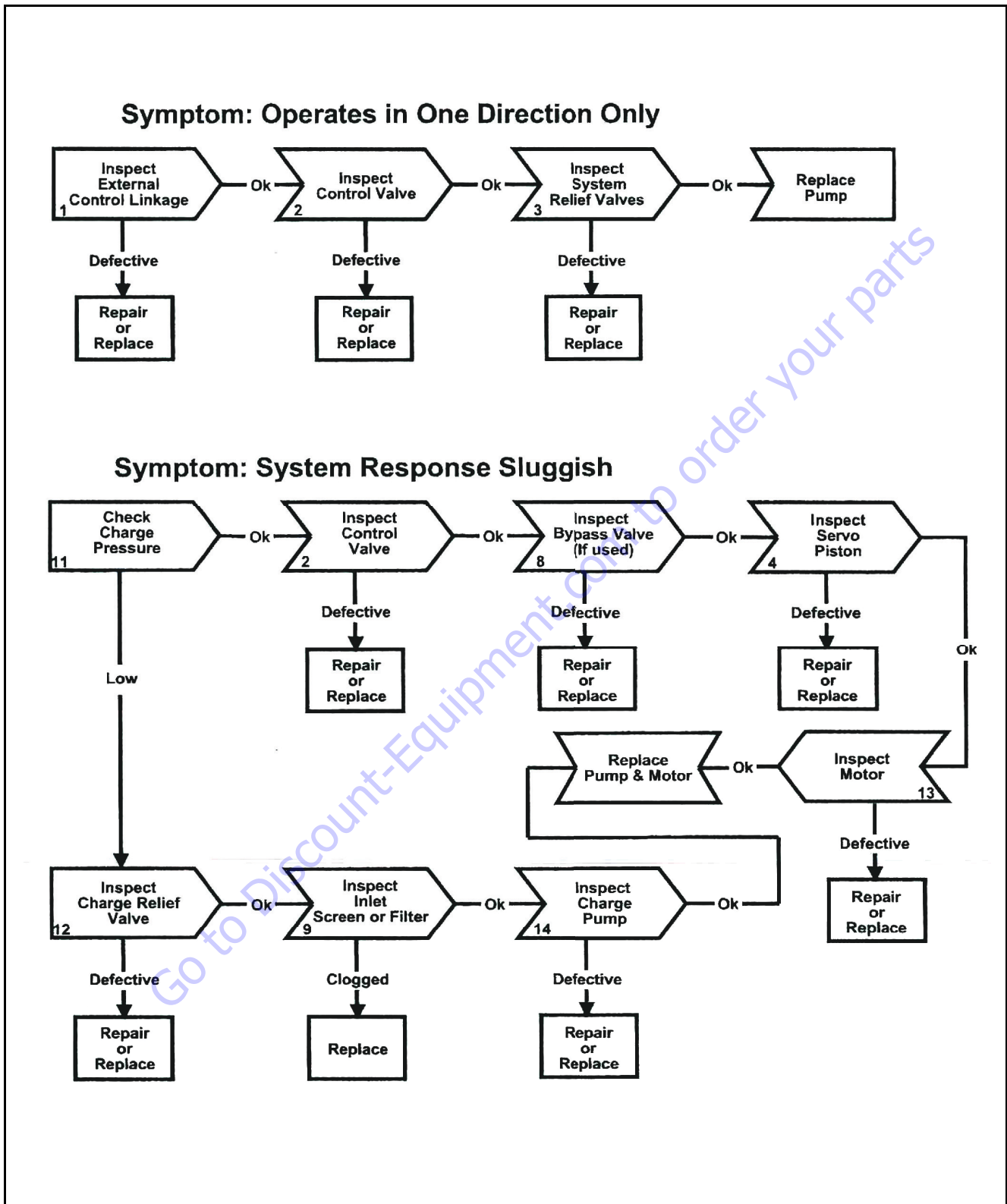


Figure 5-212. Fault-logic Troubleshooting

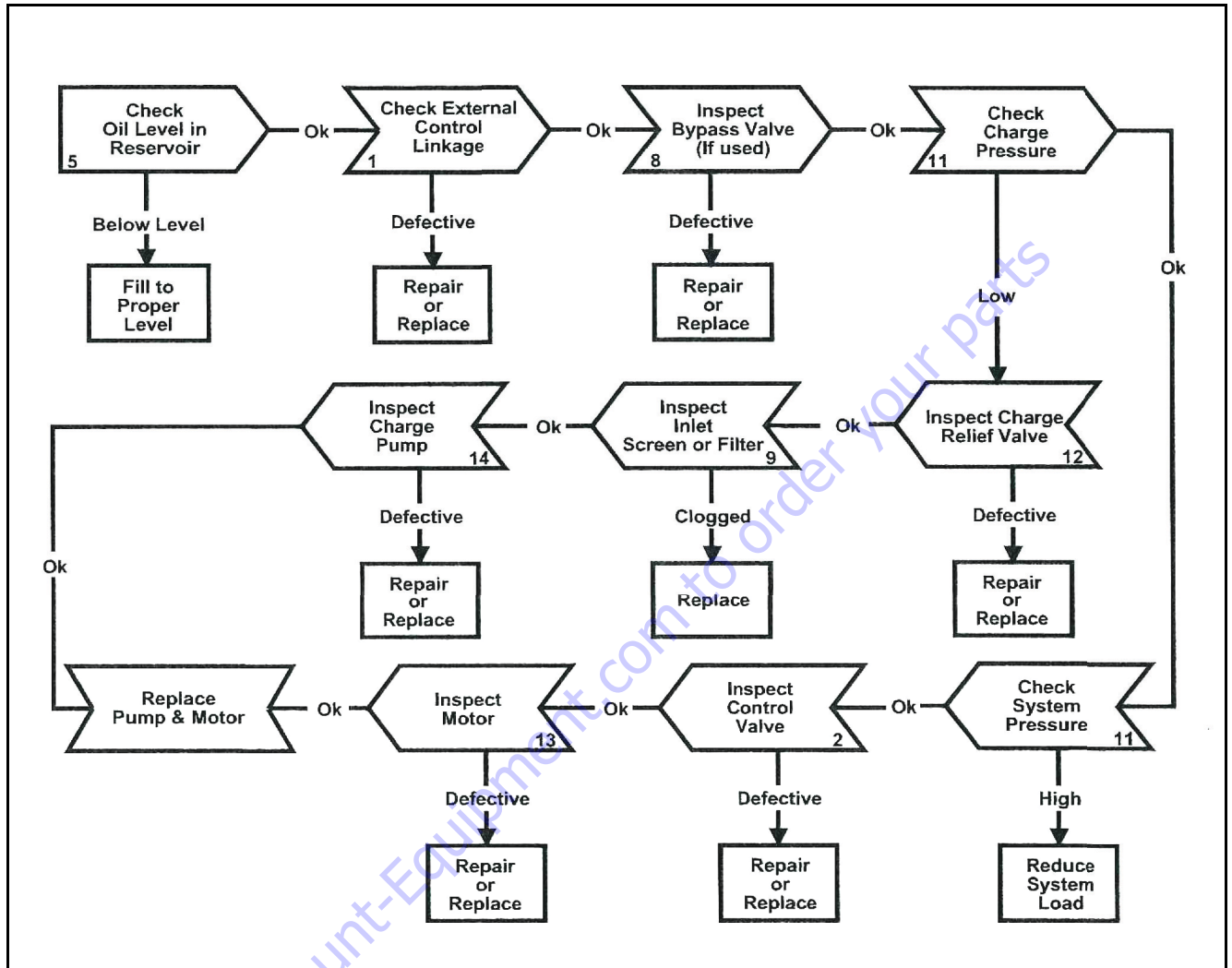


Figure 5-213. Fault-logic Troubleshooting

**DIAGRAM ACTION STEP COMMENTS**

- 1. Inspect External Control Linkage for:**
  - a. Misadjusted or disconnected
  - b. Binding, bent or broken
- 2. Inspect Control Valve for:**
  - a. Plugged control orifice(s)
  - b. Damaged mounting gasket
  - c. Misadjusted, damaged or broken neutral return spring
  - d. Broken control connector pin
  - e. Faulty destroke valve (if used)
  - f. Galled or stuck control spool
  - g. Neutral detent or lockout switch misadjusted (if used)
- 3. Inspect System Relief Valves for:**
  - a. Improper pressure relief setting
  - b. Damaged or broken spring
  - c. Valve held off seat
  - d. Damaged valve seat
- 4. Inspect Servo Piston for:**
  - a. Misadjusted, damaged or broken neutral return spring assembly
  - b. Galled or stuck servo piston
  - c. Damaged or missing o-ring and/or back-up ring
- 5. Check Oil Level in Reservoir:**
  - a. Consult owner/operators manual for the proper type fluid and level
- 6. Inspect Heat Exchanger for:**
  - a. Obstructed air flow (air cooled)
  - b. Obstructed water flow (water cooled)
  - c. Improper plumbing (inlet to outlet)
  - d. Obstructed fluid flow
- 7. Inspect Heat Exchanger Bypass Valve for:**
  - a. Improper pressure adjustment
  - b. Stuck or broken valve
- 8. Inspect Bypass Valve for: (if used)**
  - a. Held in a partial or full open position
- 9. Inspect Inlet Screen or Filter for:**
  - a. Plugged or clogged screen or filter element
  - b. Obstructed inlet or outlet
  - c. Open inlet to charge pump

- 10. Check System Pressure:**
  - a. See Figure 5-206. for location of pressure gauge installation
  - b. Consult owner/operators manual for maximum system relief valve settings
- 11. Check Charge Pressure:**
  - a. See Figure 5-206. for location of charge pressure gauge installation
  - b. Consult owner/operators manual for maximum charge relief valve settings
- 12. Inspect Charge Relief Valve for:**
  - a. Improper charge relief pressure setting
  - b. Damaged or broken spring
  - c. Poppet valve held off seat
- 13. Inspect Motor for:**
  - a. Consult owner/operator manual for motor operation and trouble shooting
- 14. Inspect Charge Pump for:**
  - a. Broken or missing drive key
  - b. Damaged or missing o-ring
  - c. Excessive gerotor clearance
  - d. Galled or broken gerotor set

**System/Charge Relief Valve Pressure Settings**

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

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

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

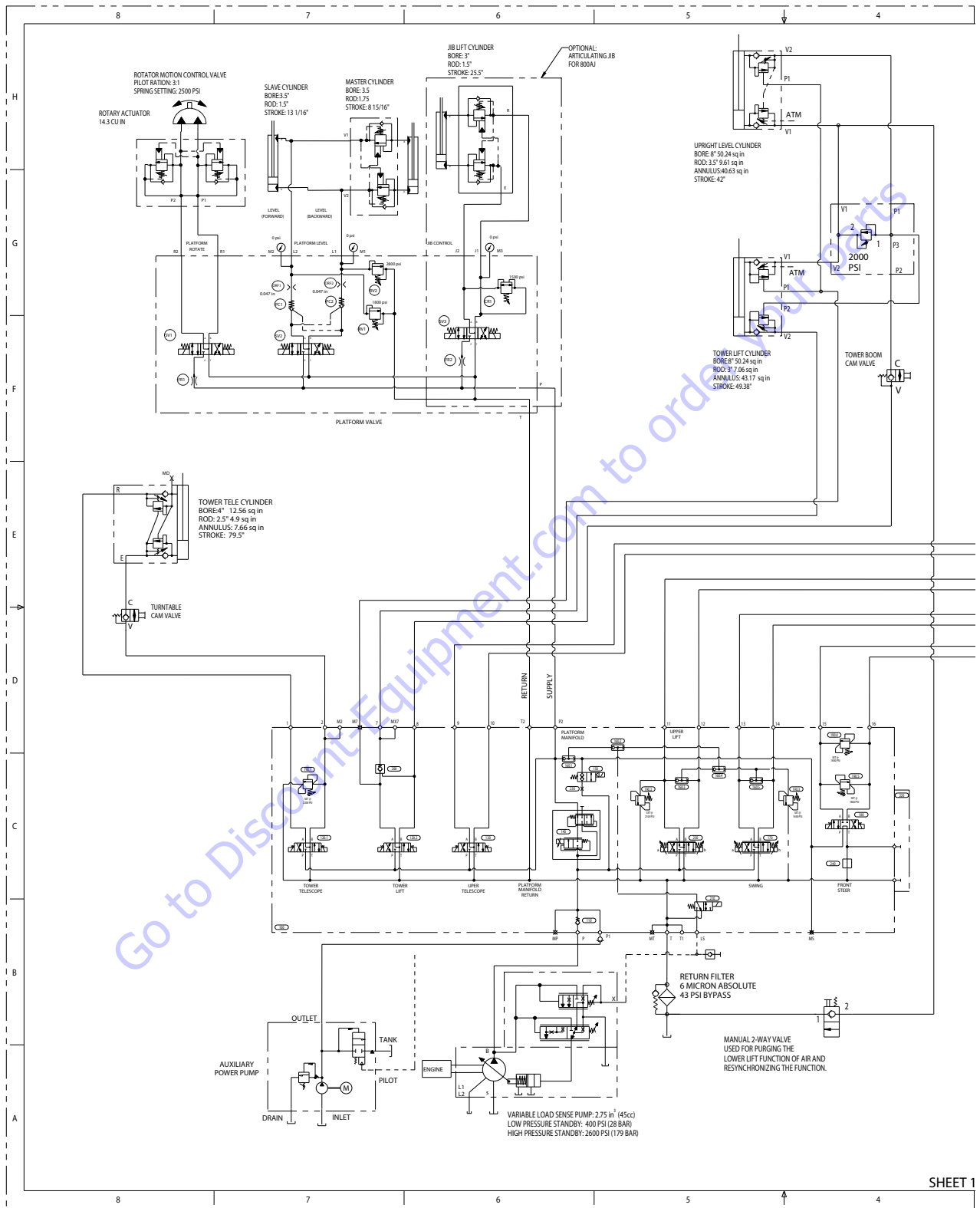
Example: 10 x 500 = 5000 PSI (345 bar)

### **Start-up Procedure**

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

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

**SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS**



**Figure 5-214. Hydraulic Schematic - Sheet 1 of 6**



SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

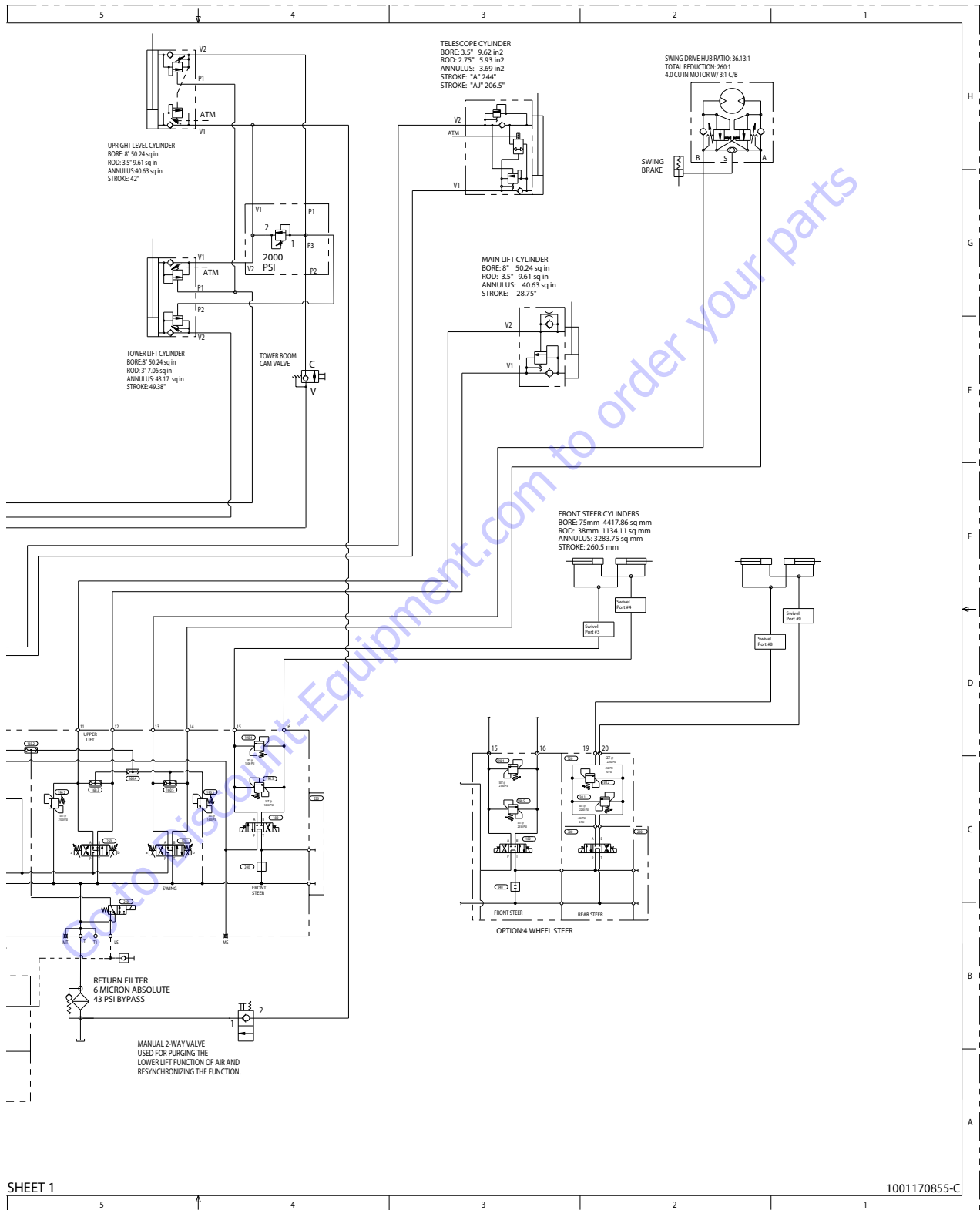
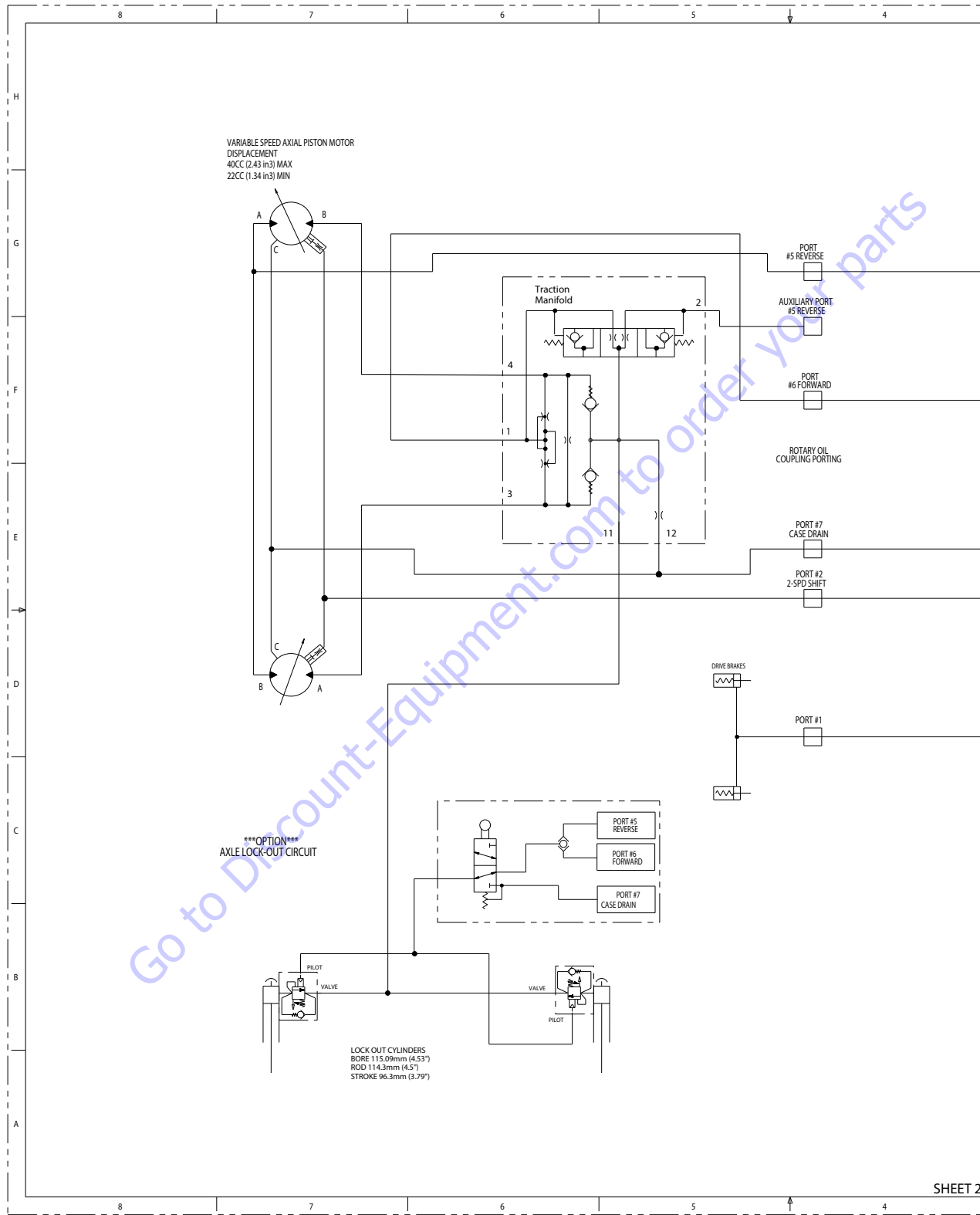


Figure 5-215. Hydraulic Schematic - Sheet 2 of 6

**SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS**



**Figure 5-216. Hydraulic Schematic - Sheet 3 of 6**

SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

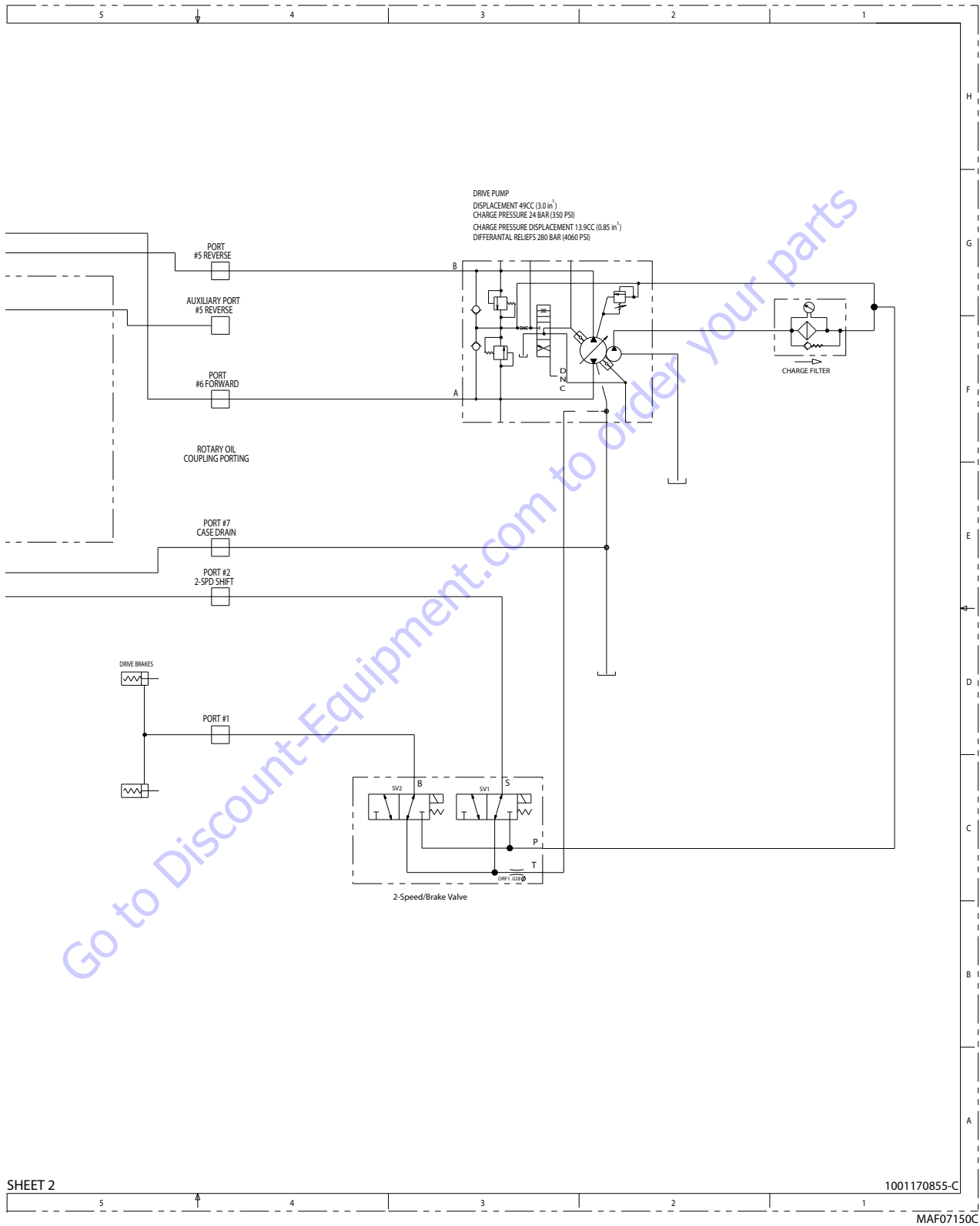
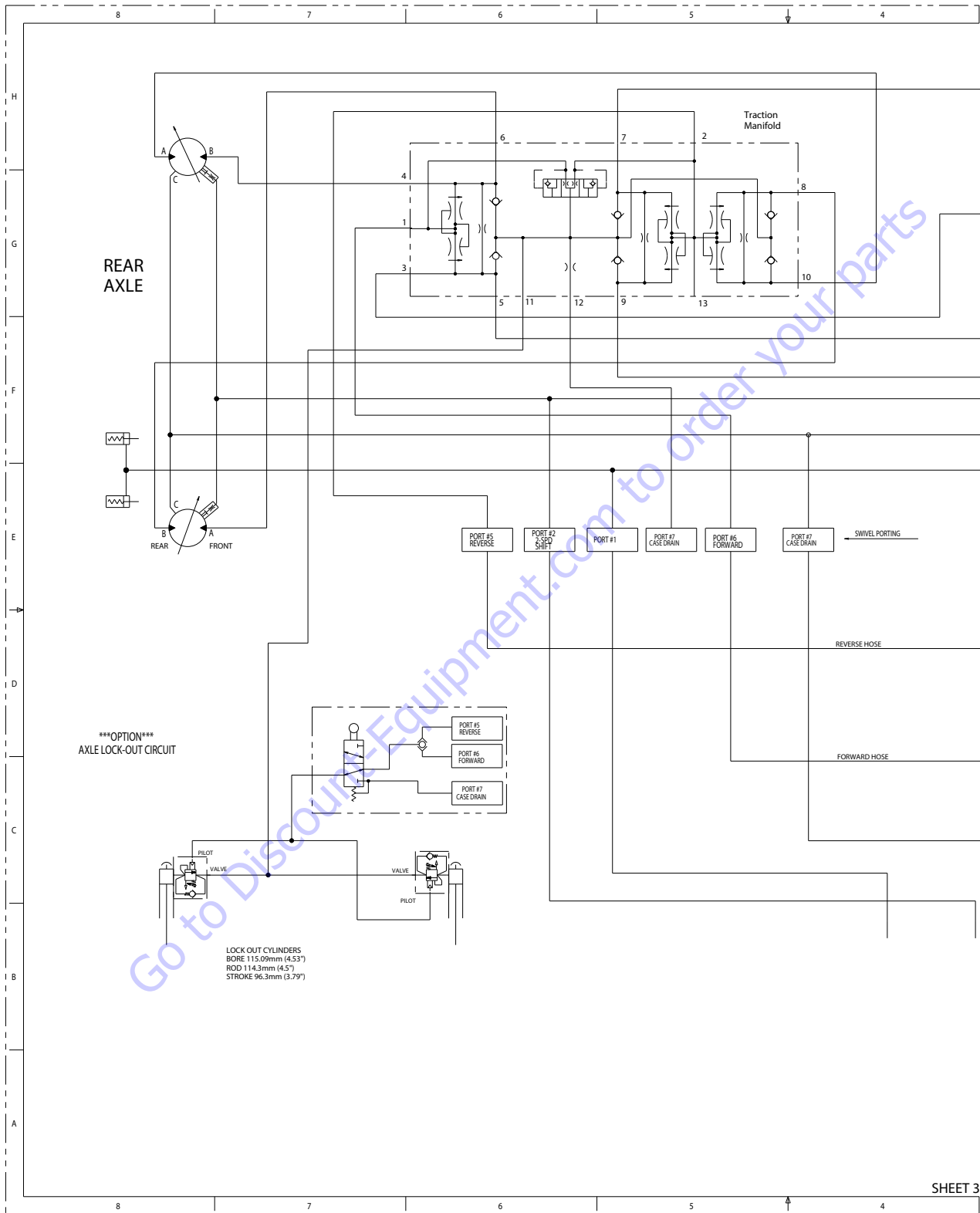


Figure 5-217. Hydraulic Schematic - Sheet 4 of 6

**SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS**



**Figure 5-218. Hydraulic Schematic - Sheet 5 of 6**

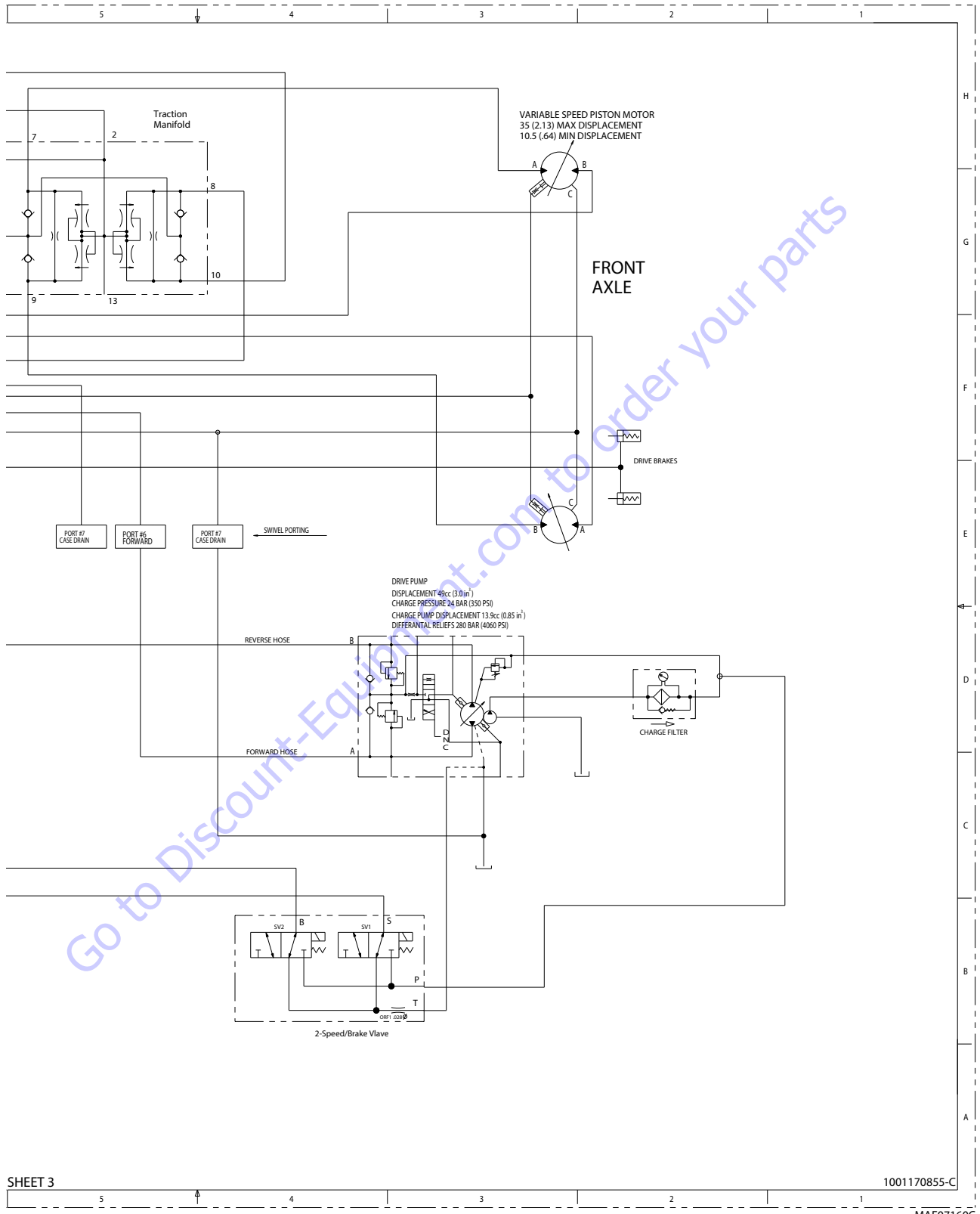


Figure 5-219. Hydraulic Schematic - Sheet 6 of 6

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## 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.

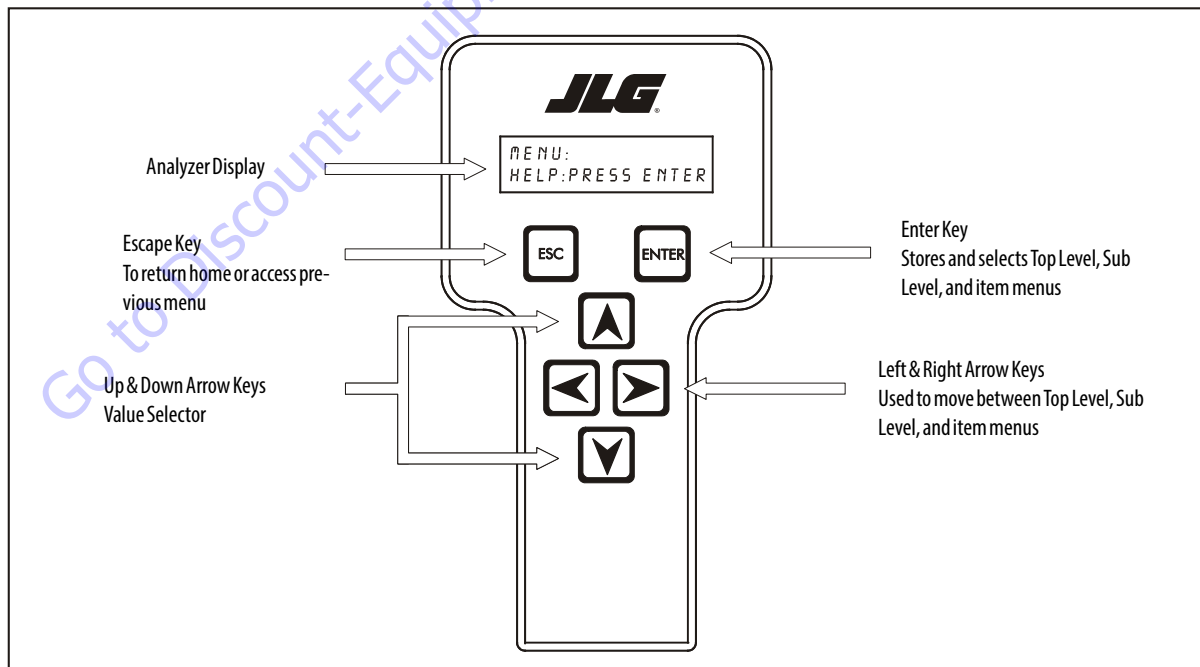


Figure 6-1. Hand Held Analyzer

### To Connect the JLG Control System Analyzer

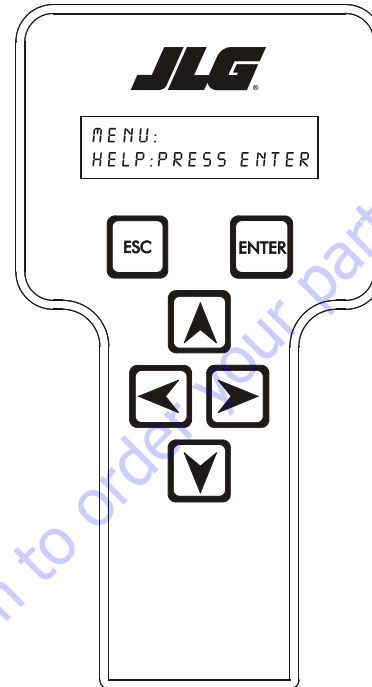
1. Connect the four pin end of the cable supplied with the analyzer, to the controller module located in the platform box or at the controller module in the ground control box and connect the remaining end of the cable to the analyzer.

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





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

### Using the Analyzer

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





**HELP:  
PRESS ENTER**

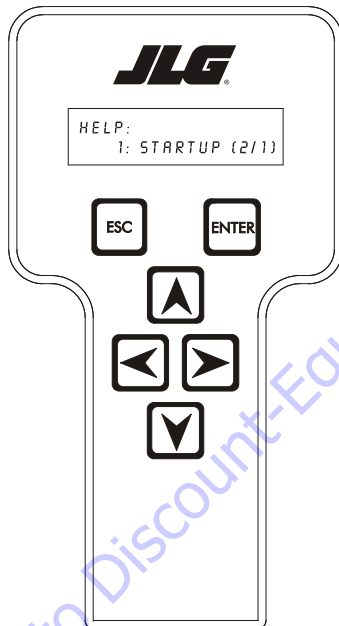
At this point, using the RIGHT  and LEFT  arrow keys, you can move between the top level menu items. To select a displayed menu item, press ENTER . To cancel a selected menu item, press Escape ; then you will be able to scroll using the right and left arrow keys to select a different menu item.

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

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




**LOGGED HELP**  
**1: STARTUP (2/1)**

At this point, the analyzer will display the last fault the system has seen, if any are present. You may scroll through the fault logs to view what the last 25 faults were. Use the right and left arrow keys to scroll through the fault logs. To return to the

beginning, press **ESCAPE**  two times. **STARTUP (2/1)** indicates a power up.

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

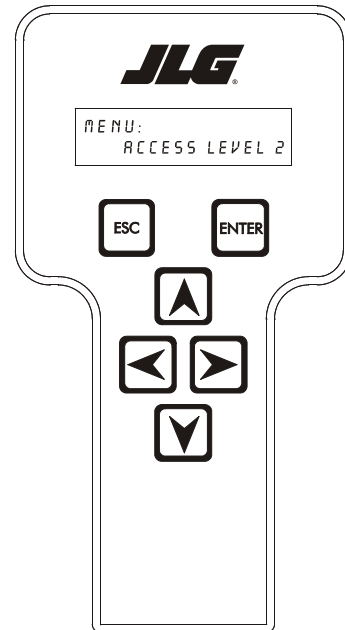
- DRIVE
- BOOM
- SYSTEM
- DATALOG
- VERSIONS

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


menu item by pressing the **ESCAPE**  key.

### Changing the Access Level of the Hand Held Analyzer

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




**ACCESS LEVEL:**  
**CODE 00000**

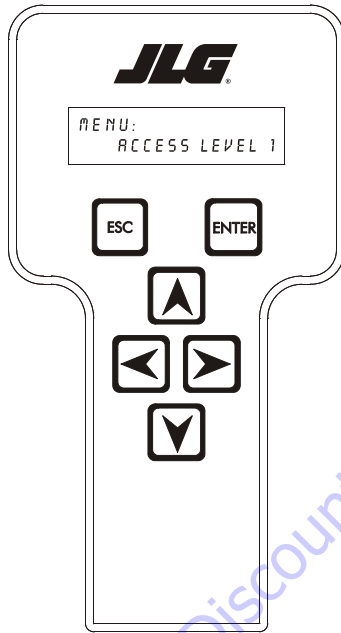
Press **ENTER**  to select the **ACCESS LEVEL** menu.

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:



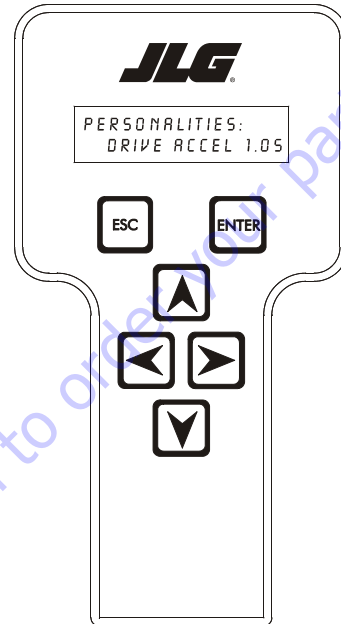
**MENU:  
ACCESS LEVEL 1**

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:





**PERSONALITIES:  
DRIVE ACCEL 1.5s**

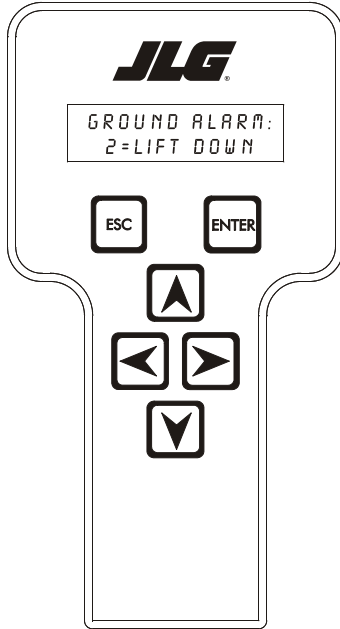
There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP**

 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 = LIFT DOWN**

The effect of the machine digit value is displayed along with its value. The above display would be selected if the machine was equipped with a ground alarm and you wanted it to sound when 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**

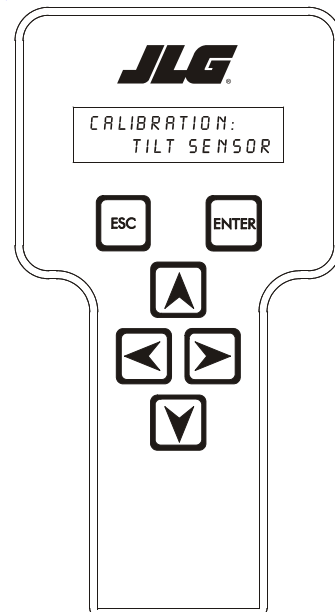
IT IS A GOOD PRACTICE TO AVOID PRESSURE-WASHING ELECTRICAL/ELECTRONIC COMPONENTS. SHOULD PRESSURE-WASHING BE UTILIZED TO WASH AREAS CONTAINING ELECTRICAL/ELECTRONIC COMPONENTS, JLG INDUSTRIES INC. RECOMMENDS A MAXIMUM PRESSURE OF 750 PSI (52 BAR) AT A MINIMUM DISTANCE OF 12 INCHES (30.5CM) AWAY FROM 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

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

### **WARNING**

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



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

To level machine chose:

**CALIBRATION:  
TILT SENSOR**

Press **ENTER** .

When prompted, swing machine 180°

Press **ENTER** .

## SECTION 6 - JLG CONTROL SYSTEM

**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	main or UP
V	VOLT
VER	VERSION
VLV	VALVE
WIT	WITNESS
YEL	YELLOW

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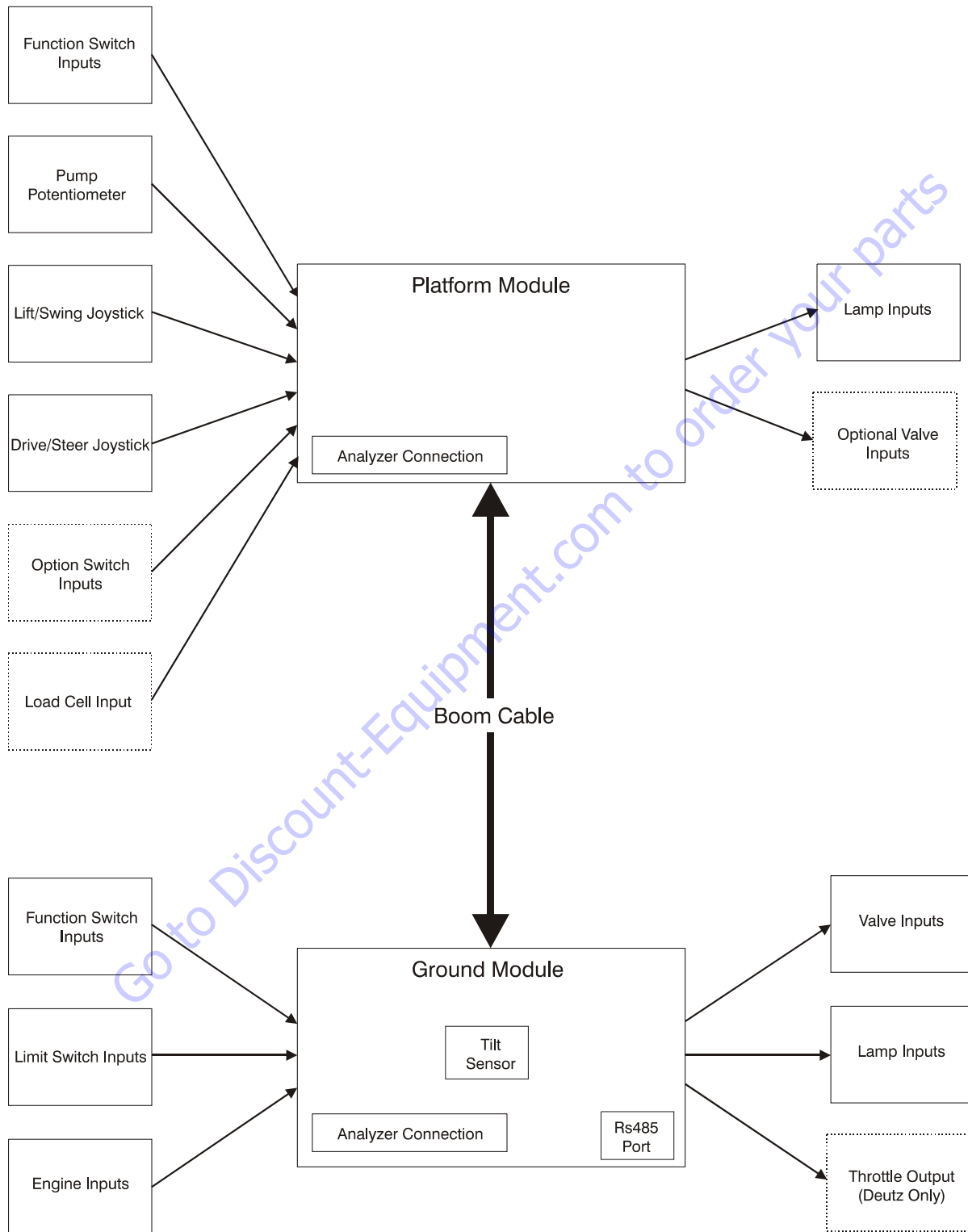


Figure 6-2. ADE Block Diagram

Table 6-2. Machine Configuration Programming Information (Software Version P6.22)

Configuration Digit	Number	Description	Default Number
<p><b>NOTE:</b> For version <b>P6.22 software</b>, some screens may not be available depending upon machine configuration and software versions.</p> <p><b>NOTE:</b> 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.</p>			
MODEL NUMBER: 1	1	400S	1
	2	450A	
	3	510A	
	4	600S	
	5	600A	
	6	600SC	
	7	601S	
	8	740A	
	9	800A	
	10	800S	
MARKET: 2	0	ANSI USA	0
	1	ANSI EXPORT	
	2	CSA	
	3	CE	
	4	AUSTRALIA	
	5	JAPAN	
	6	GB	

**SECTION 6 - JLG CONTROL SYSTEM**

**Table 6-2. Machine Configuration Programming Information (Software Version P6.22)**

Configuration Digit	Number	Description	Default Number
ENGINE: 3* * Engine selections vary depending on model selection.	1	FORD EFI GAS: Ford LRG425 EFI Gas (Tier 1)	<b>14</b>
	2	FORD EFI D/F: Ford LRG425 EFI dual fuel (Tier 1)	
	3	DEUTZ F4 TIER1: Deutz F4M1011F Diesel (Tier 1)	
	4	DEUTZ F3 TIER1: Deutz F3M1011F Diesel (Tier 1)	
	5	CAT. 3024C: CAT 3024C Diesel (Tier 2)	
	6	CAT. 3044C: CAT 3044C Diesel (Tier 2)	
	7	PERKINS 404C (Tier 2)	
	8	DEUTZ F4 TIER2: Deutz F4M2011 Diesel (Tier 2)	
	9	DEUTZ F3 TIER2: Deutz F3M2011 Diesel (Tier 2)	
	10	FORD GASTIER2: Ford LRG425 EFI Gas (Tier 2)	
	11	FORD D/F TIER2: Ford LRG425 EFI Dual Fuel (Tier 2)	
	12	DEUTZ ECM: Engine Control Module - ECM (Tier 2 and Tier 3)	
	13	DUAL FUEL ECM: GM/PSI 3.0L Dual Fuel (Tier 2)	
	<b>14</b>	<b>PERKINSECM</b>	
	15	CAT ECM	
	16	DEUTZ ECM T4F: Deutz Engine Control Module (Tier 4 Final)	
	17	FORD DUAL FUEL	
FLYWHEEL TEETH: 4* *This menu item is only visible if Deutz engine selections 3 or 4 are selected.	0	133 TEETH: 133 flywheel teeth.	<b>1</b>
	<b>1</b>	<b>110 TEETH: 110 flywheel teeth.</b>	

Table 6-2. Machine Configuration Programming Information (Software Version P6.22)

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

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-2. Machine Configuration Programming Information (Software Version P6.22)**

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

Table 6-2. Machine Configuration Programming Information (Software Version P6.22)

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

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-2. Machine Configuration Programming Information (Software Version P6.22)**

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



Table 6-2. Machine Configuration Programming Information (Software Version P6.22)

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

## SECTION 6 - JLG CONTROL SYSTEM

Table 6-2. Machine Configuration Programming Information (Software Version P6.22)

Configuration Digit	Number	Description	Default Number
CRIBBING OPTION: 29	0	<b>NO: Cribbing Option is disabled.</b>	0
	1	YES: Cribbing Option is enabled.	
FUEL TANK SIZE: 30	0	<b>31 Gallon Tank</b>	0
	1	52 Gallon Tank	
ALARM / HORN: 31	0	<b>SEPERATE: Separate alarm and horn.</b>	0
	1	COMBINED: Combination alarm / horn.	
ALERT / BEACON: 32	0	<b>OFF FOR CREEP: Alert beacon will not flash while in Creep</b>	0
	1	20FPS FOR CREEP: Alert beacon will flash at 20FPS while in Creep.	
TEMP CUTOUT: 33	0	<b>NO: Temp Cutout is Disabled</b>	0
	1	YES: Temp Cutout is Enabled	
PLAT LVL OVR CUT: 34	0	<b>NO: Platform Level Override will always be functional</b>	0
	1	YES: Platform Level Override will only be functional when In Transport.	
WATER IN FUEL SENSOR: 35* *This menu item is only visible if Deutz EMR 4 engine is selected. *Only visible under certain model selections.	0	<b>NO: Water in Fuel Sensor Disabled</b>	0
	1	YES: Water in Fuel Sensor Enabled	
DUAL CAPACITY 36	0	<b>NO: Dual Capacity is Disabled.</b>	0
	1	YES: Dual Capacity is enabled.	

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**Table 6-3. 800A Machine Configuration Programming Settings (Software Version P6.22)**

800 A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	9	9	9	9	9	9
Market	0	1	2	3	4	5
Engine	12	12	12	12	12	12
Flywheel Teeth	0	0	0	0	0	0
	1	1	1	1	1	1
Glow Plugs	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Starter Lockout	0	0	0	0	0	0
	1	1	1	1	1	1
Fuel Cutout	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Engine Shutdown	0	0	0	0	0	0
	1	1	1	1	1	1
Tilt	1	1	1	X	X	1
	2	2	2	X	2	2
	3	3	3	X	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	6	6	6	X	X	6
	7	7	7	X	X	7
	8	8	8	8	8	5
	9	9	9	9	9	9
Jib	0	0	0	0	0	0
4 Wheel Steer	0	0	0	0	0	0
Soft Touch/Skyguard	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
Gen Set / Welder	0	0	0	0	0	0
	1	1	1	1	1	1
Gen Set Cutout	0	0	0	0	0	0
	1	1	1	1	1	1
Head & Taillights	0	0	0	0	0	0
	1	1	1	1	1	1
Cable Breaks Switch	0	0	0	0	0	0
	1	1	1	1	1	1

**Table 6-3. 800A Machine Configuration Programming Settings (Software Version P6.22)**

800 A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Load System	0	0	0	0	0	0
	X	1	X	X	X	1
	X	2	X	2	2	2
	X	3	X	3	X	3
	X	4	X	X	X	4
Load Sensor	X	0	X	0	0	0
	1	1	1	1	1	1
	X	2	X	2	2	2
Function Cutout	0	0	0	0	0	0
	X	1	1	1	1	1
	2	2	2	X	2	2
	X	3	3	X	3	3
Ground Alarm	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
Drive Type	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Display Units	0	0	0	0	0	0
	1	1	1	1	1	1
Leveling Mode	0	0	0	0	0	0
	1	1	1	1	1	1
Drive Control	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Drive Pump	0	0	0	0	0	0
	1	1	1	1	1	1
	X	X	X	X	X	X
	X	X	X	X	X	X
Boom Control	0	0	0	0	0	0
	1	1	1	1	1	1
Function Speed Knob	0	0	0	0	0	0
	1	1	1	1	1	1
Clearsky	0	0	0	0	0	0
	1	1	1	1	1	1
Cribbing Option	0	0	0	0	0	0
	1	1	1	1	1	1

**SECTION 6 - JLG CONTROL SYSTEM**

**Table 6-3. 800A Machine Configuration Programming Settings (Software Version P6.22)**

800 A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Fuel Tank Size	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Alarm / Horn	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Alert Beacon	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Temp Cutout	X	<b>0</b>	X	<b>0</b>	X	X
	X	1	X	1	X	X
Plat Lvl Ovr Cut	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Water in Fuel Sensor	X	<b>0</b>	X	X	X	X
	X	1	X	X	X	X
Dual Capacity	0	0	0	<b>0</b>	<b>0</b>	0
	<b>1</b>	<b>1</b>	<b>1</b>	1	1	<b>1</b>

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

**Table 6-4. 800AJ Machine Configuration Programming Settings (Software Version P6.22)**

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

**Table 6-4. 800AJ Machine Configuration Programming Settings (Software Version P6.22)**

800 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Load System	<b>0</b>	<b>0</b>	<b>0</b>	0	0	0
	X	<b>1</b>	X	X	X	<b>1</b>
	X	2	X	2	<b>2</b>	2
	X	3	X	<b>3</b>	X	3
	X	4	X	X	X	4
Load Sensor	X	0	X	0	0	0
	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Function Cutout	X	2	X	2	2	2
	<b>0</b>	<b>0</b>	<b>0</b>	0	<b>0</b>	<b>0</b>
	X	1	1	<b>1</b>	1	1
	2	2	2	X	2	2
Ground Alarm	X	3	3	X	3	3
	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Drive Type	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
	0	0	0	0	0	0
	1	1	1	1	1	1
	2	2	2	2	2	2
Display Units	<b>0</b>	<b>0</b>	0	0	0	0
	1	1	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Leveling Mode	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Drive Control	0	0	0	0	0	0
	1	1	1	1	1	1
	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
Drive Pump	0	0	0	0	0	0
	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
	X	X	X	X	X	X
Boom Control	X	X	X	X	X	X
	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Function Speed Knob	1	1	1	1	1	1
	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Clearsky	1	1	1	1	1	1
	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Table 6-4. 800AJ Machine Configuration Programming Settings (Software Version P6.22)**

800 AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Cribbing Option	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Fuel Tank Size	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Alarm / Horn	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Alert Beacon	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Temp Cutout	X	<b>0</b>	X	<b>0</b>	X	X
	X	1	X	1	X	X
Plat Lvl Ovr Cut	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1	1	1	1	1	1
Water in Fuel Sensor	X	<b>0</b>	X	X	X	X
	X	1	X	X	X	X
Dual Capacity	0	0	0	<b>0</b>	<b>0</b>	0
	<b>1</b>	<b>1</b>	<b>1</b>	1	1	<b>1</b>

**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 6-5. Machine Personality Settings**

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
DRIVE:	ACCEleration	0.0 to 5.0s	2.0	2.0
	DECEleration	0.0 to 3.0s	2.0	2.0
	FORward MINimum speed	1 to 35%	4	15
	FORward MAXimum speed	1 to 100%	30	55
	REVerse MINimum speed	1 to 35%	4	15
	REVerse MAXimum speed	1 to 100%	34	55
	ELEVATED MAXimum speed	1 to 100%	15	28
	CREEP MAXimum speed	1 to 90%	15	32
STEER:	MAXimum speed	1 to 100%	100	100
MAIN LIFT:	ACCEleration	0.0 to 5.0s	2.9	2.9
	DECEleration	0.0 to 3.0s	1.0	1.0
	MINimum LEFT speed	1 to 60%	26	26
	MAXimum LEFT speed	1 to 100%	88	88
	CREEP maximum LEFT speed	1 to 65%	62	62
	MINimum RIGHT speed	1 to 60%	25	25
	MAXimum RIGHT speed	1 to 100%	95	95
	CREEP maximum RIGHT speed	1 to 75%	69	69
TOWER LIFT:	ACCEleration	0.0 to 5.0s	2.8	2.8
	DECEleration	0.0 to 3.0s	0.8	0.8
	MINimum UP speed	1 to 60%	53	53
	MAXimum UP speed	1 to 100%	90	90
	MINimum DOWN speed	1 to 60%	53	53
	MAXimum DOWN speed	1 to 100%	90	90
	Medium Speed	0.01 to 1.00	0.30	0.30
SWING	ACCEleration	0.0 to 5.0s	2.8	2.8
	DECEleration	0.0 to 3.0s	2.5	2.5
	MINimum LEFT speed	1 to 50%	25	25
	MAXimum LEFT speed	1 to 100%	70	70
	CREEP maximum LEFT speed	1 to 65%	62	62
	MINimum RIGHT speed	1 to 50%	25	25
	MAXimum RIGHT speed	1 to 100%	73	73
	CREEP maximum RIGHT speed	1 to 65%	62	62

Table 6-5. Machine Personality Settings

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
MAIN TELESCOPE:	ACCEleration	0.0 to 5.0s	3.5	3.5
	DECEleration	0.0 to 3.0s	0.8	0.8
	MINimum IN speed	1 to 65%	40	40
	MAXimum IN speed	1 to 100%	75	75
	MINimum OUT speed	1 to 65%	40	40
	MAXimum OUT speed	1 to 100%	70	70
	Medium Speed	0.01 to 1.00	0.50	0.50
TELESCOPE TOWER:	ACCEleration	0.0 to 5.0s	1.0	1.0
	DECEleration	0.0 to 3.0s	0.5	0.5
	MINimum IN speed	1 to 65%	45	45
	MAXimum IN speed	1 to 100%	90	90
	MINimum OUT speed	1 to 65%	55	55
	MAXimum OUT speed	1 to 100%	90	90
	Medium Speed	0.01 to 1.00	0.40	0.40
PLATFORM LEVEL:	ACCEleration	0.0 to 5.0s	2.5	2.5
	DECEleration	0.0 to 3.0s	1.0	1.0
	MINimum UP speed	1 to 65%	45	45
	MAXimum UP speed	1 to 100%	55	55
	MINimum DOWN speed	1 to 65%	45	45
	MAXimum DOWN speed	1 to 100%	55	55
	Medium Speed	0.01 to 1.00	0.60	0.60
PLATFORM ROTATE:	ACCEleration	0.0 to 5.0s	1.8	1.8
	DECEleration	0.0 to 3.0s	0.5	0.5
	MINimum LEFT speed	1 to 100%	25	25
	MAXimum LEFT speed	1 to 100%	60	60
	MINimum RIGHT speed	1 to 100%	25	25
	MAXimum RIGHT speed	1 to 100%	60	60
	Medium Speed	0.01 to 1.00	0.35	0.35
JIB LIFT	Lift ACCEleration	0.0 to 5.0s	2.5	2.5
	Lift DECEleration	0.0 to 3.0s	1.0	1.0
	MINimum UP speed	1 to 65%	27	27
	MAXimum UP speed	1 to 100%	50	50
	MINimum down	1 to 65%	26	26
	Max Down	1 to 100%	45	45
	Medium Speed	0.01 to 1.00	0.35	0.35

**Table 6-5. Machine Personality Settings**

SUBMENU (DISPLAYED ON ANALYZER 1ST LINE)	PERSONALITY	RANGE	DEFAULTS (800A Sauer Danfoss)	DEFAULTS (800A Eaton)
GROUND MODE	Tower LIFT UP speed	1 to 100%	89	89
	Tower LIFT DOWN speed	1 to 100%	89	89
	Main LIFT UP speed	1 to 100%	87	87
	Main LIFT DOWN speed	1 to 100%	94	94
	SWING speed	1 to 100%	65	65
	Main TELEscope speed	1 to 100%	69	69
	Tower TELEscope speed	1 to 100%	89	89
	PLATFORM ROTATE speed	1 to 100%	59	59
	PLATFORM LEVEL speed	1 to 100%	54	54
	JIB LIFT speed	1 to 100%	44	44
<i>Note: Ground Mode speed are automatically limited to being lower than platform speed for a given function.</i>				
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### 6.3 MACHINE ORIENTATION WHEN SETTING FUNCTION SPEEDS

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

**Tower Telescope:** Tower Lift Fully Elevated, main Boom Horizontal, Telescoped In. Tower Tele Out, Record Time. Tower Tele In, Record Time.

**Lift:** Tower Lift Fully Elevated, Tower Telescope Fully Extended, Main Telescope Fully Retracted.

**Swing:** Boom at Full Elevation. Telescope Retracted. Swing the Turntable off center and stop. Swing the opposite direction and start the test when the turntable is centered up. This eliminates ramp up and down on the controller affecting times.

**Telescope:** Boom at Full Elevation; Telescope Retracted; Telescope Out, Record Time. Telescope In, Record Time.

**Drive (Forward/Reverse):** Test should be done on a smooth level surface. Drive Select Switch should be set to high speed. Start approximately 25 ft. (7.62 m) from the starting point so that the unit is at maximum speed when starting the test. Results should be recorded for a 200 ft. (60.96 m) course. Drive Forward, Record Time. Drive Reverse, Record Time.

**Drive (Above Horizontal):** Test should be done on a smooth, level surface. Drive Select Switch should be set to Low Engine, Low Drive. The Platform Speed Control Knob should be positioned to Creep Speed. This simulates machine speed when the boom is above horizontal. Results should be recorded for a 50 ft. (15.2 m) course. Drive Forward, Record Time. Drive Reverse, Record Time.

**Platform Rotate:** Platform level and completely rotated one direction. Rotate the opposite direction, Record Time. Rotate the other direction, Record Time.

**Articulating Jib:** Platform level and centered with the boom. Start with the Jib down. Jib Up, Record Time. Jib Down, Record Time.

### Test Notes

1. Stop watch should be started with the function, not with the controller or switch.
2. Drive test results reflect 15x19.5 or 18x19.5 tires, pneumatic or foam filled.
3. All speed tests are run from the platform. These speeds do not reflect the ground control operation.
4. The platform speed knob control must be at full speed (turned clockwise completely).
5. Function speeds may vary due to cold, thick hydraulic oil. Test should be run with the oil temperature above 100° F (38° C).
6. Some flow control functions may not work with the speed knob clicked into the creep position.

**Table 6-6. Function Speeds**

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

4150241-H

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

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

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

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

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

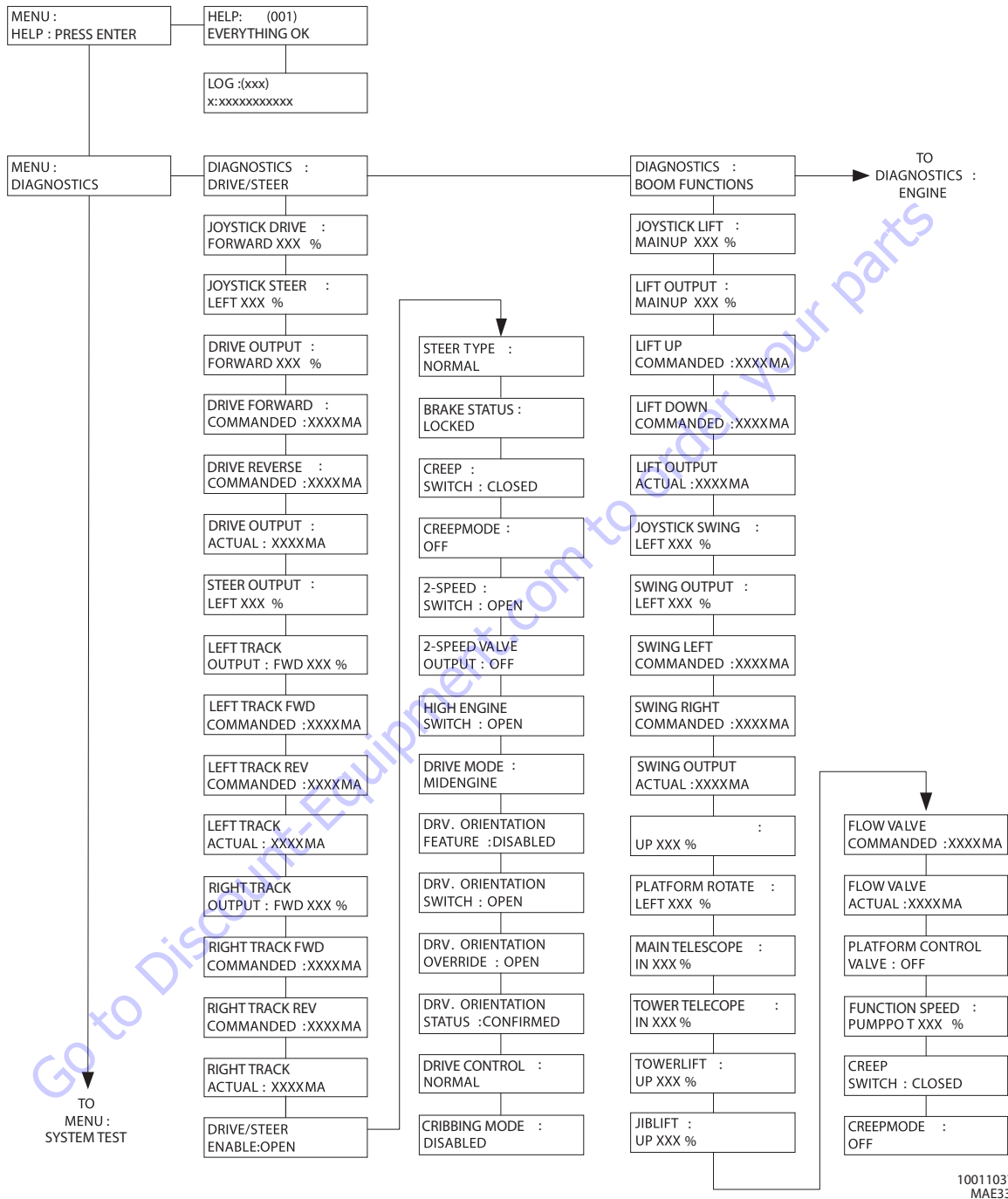
**Interlocks:** Any device that sends an electrical input. (For an example a limit switch, proximity switch, etc;)

**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 and sends desired drive direction, steering mode and axle extend/retract commands. The PLATFORM MODULE reports the steering switch position to the GROUND MODULE.

**Drive:** The GROUND MODULE stores crack points, sends commands for each drive pump. (Command is computed from drive joystick input, interlocks, wheel angle, etc).

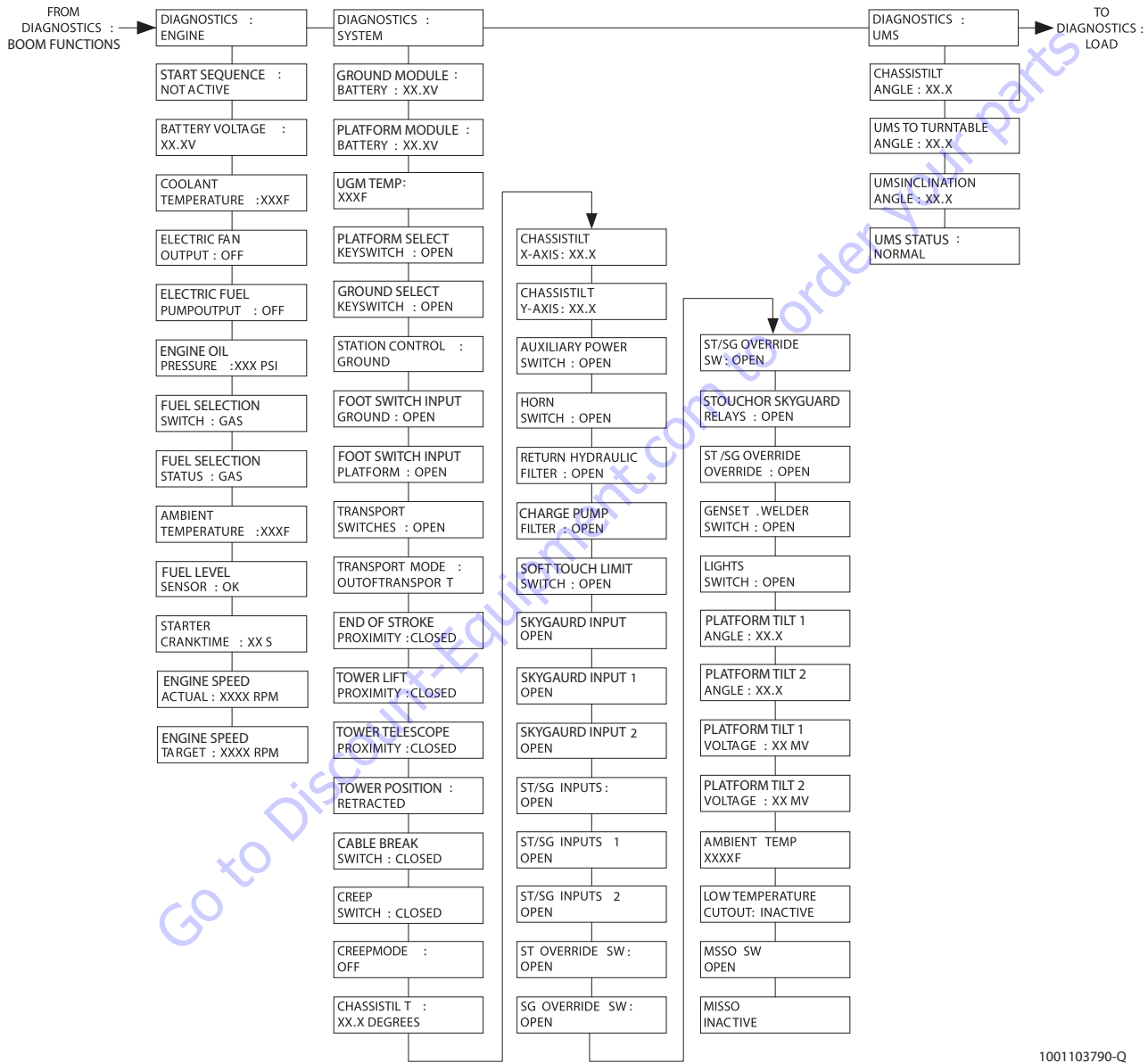
**Lift, Tele, & Swing:** The GROUND MODULE stores default values and handles interlocks and calibration information. Lift, Telescope and Swing commands are dependent upon interlocks through out the machine. Boom angle, length and swing are controlled by the GROUND MODULE.



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

Figure 6-3. Analyzer Flow Chart (Software Version P6.22) -Sheet 1 of 9

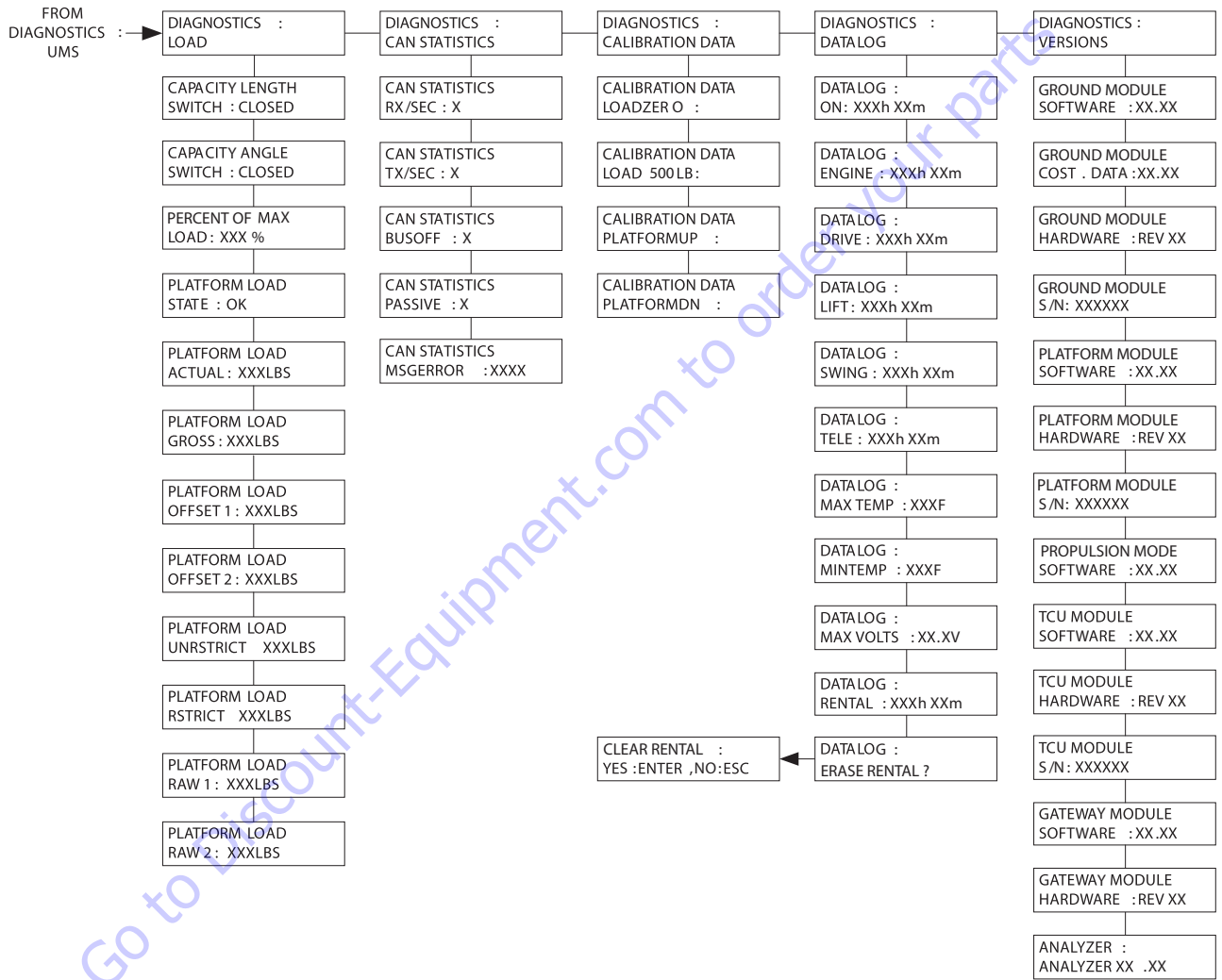
**SECTION 6 - JLG CONTROL SYSTEM**



1001103790-Q  
MAE33190Q

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

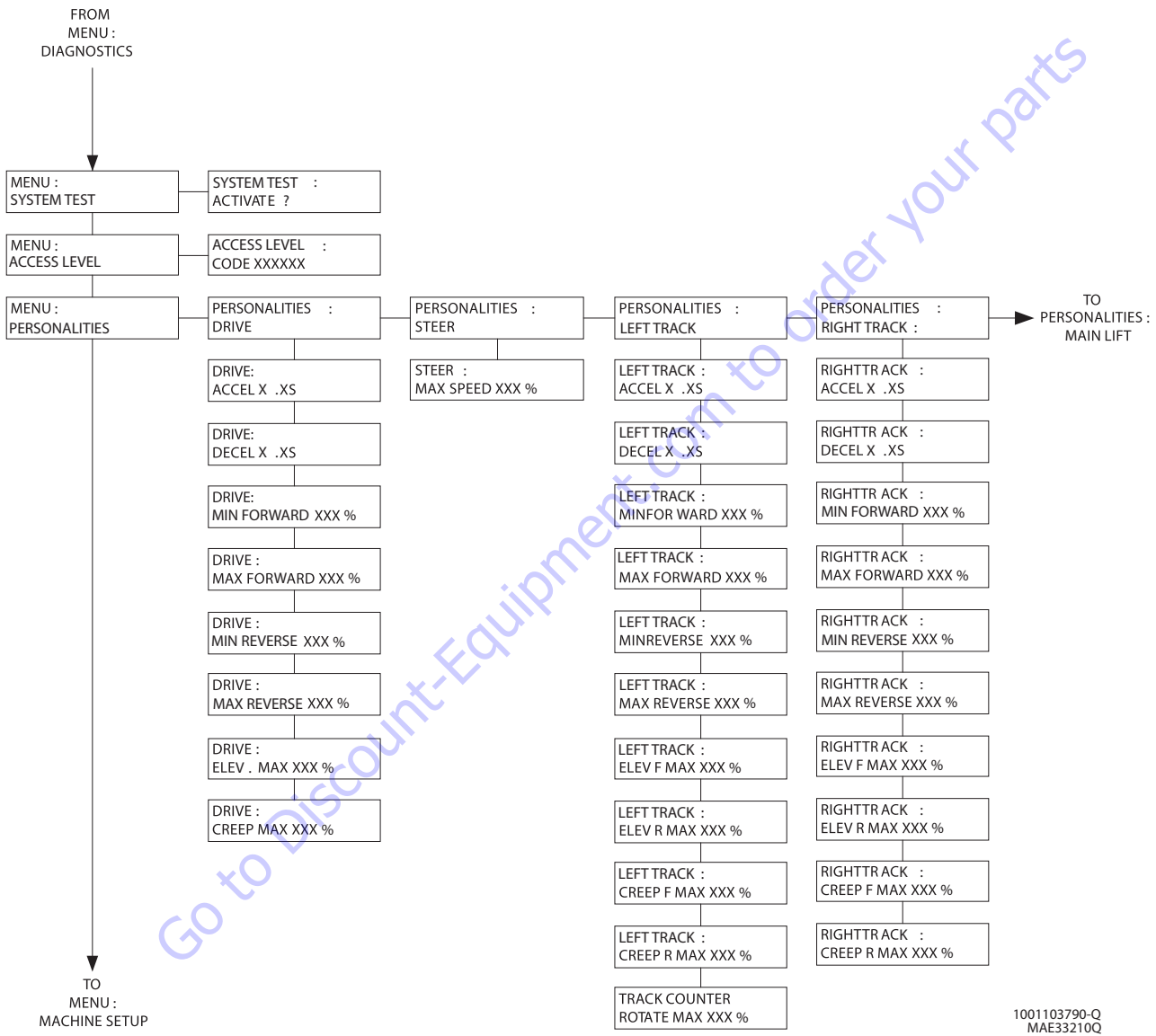
**Figure 6-4. Analyzer Flow Chart (Software Version P6.22) -Sheet 2 of 9**



1001103790-Q  
MAE33200Q

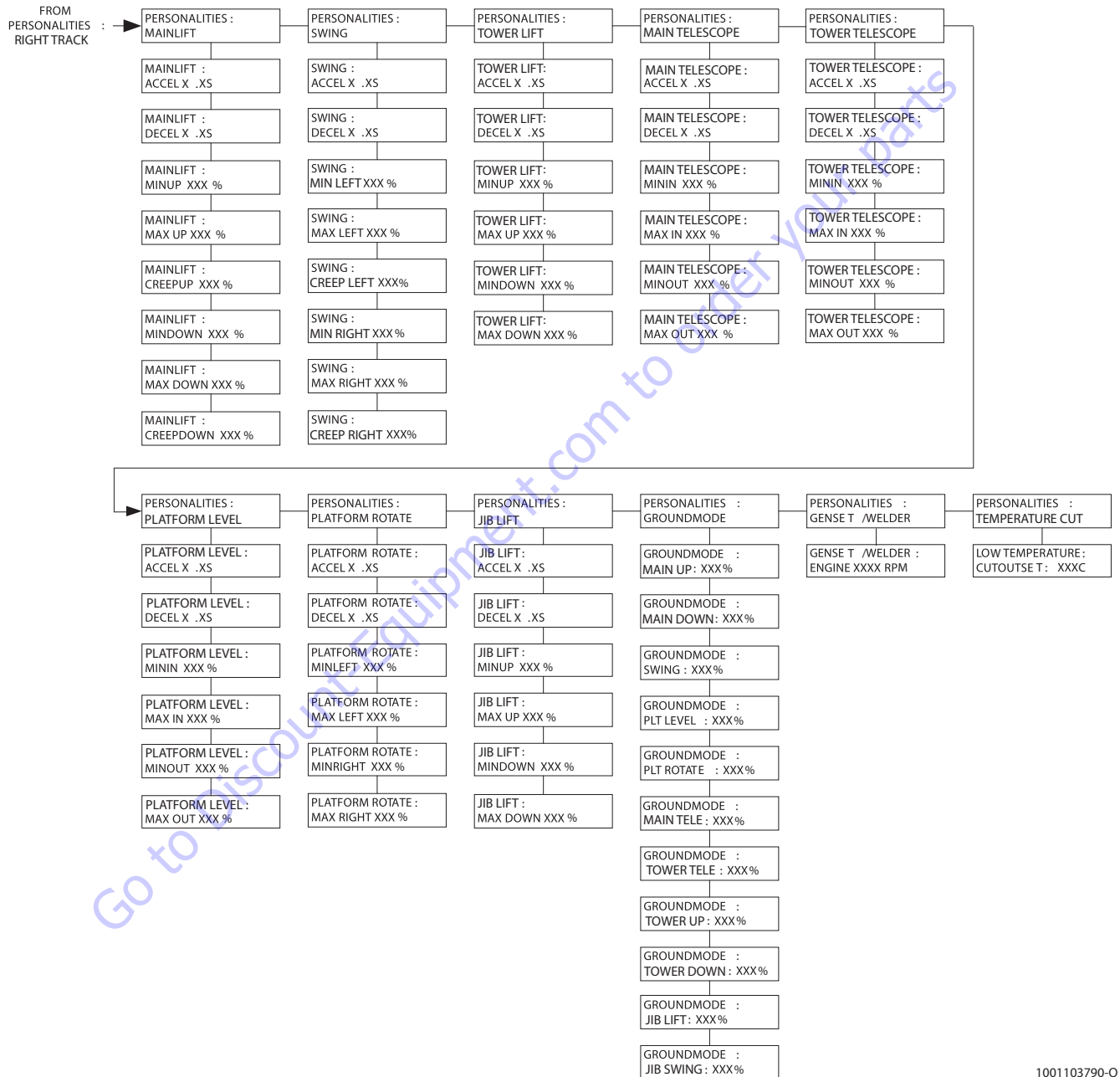
**NOTE:** The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration and software versions.

Figure 6-5. Analyzer Flow Chart (Software Version P6.22) -Sheet 3 of 9



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

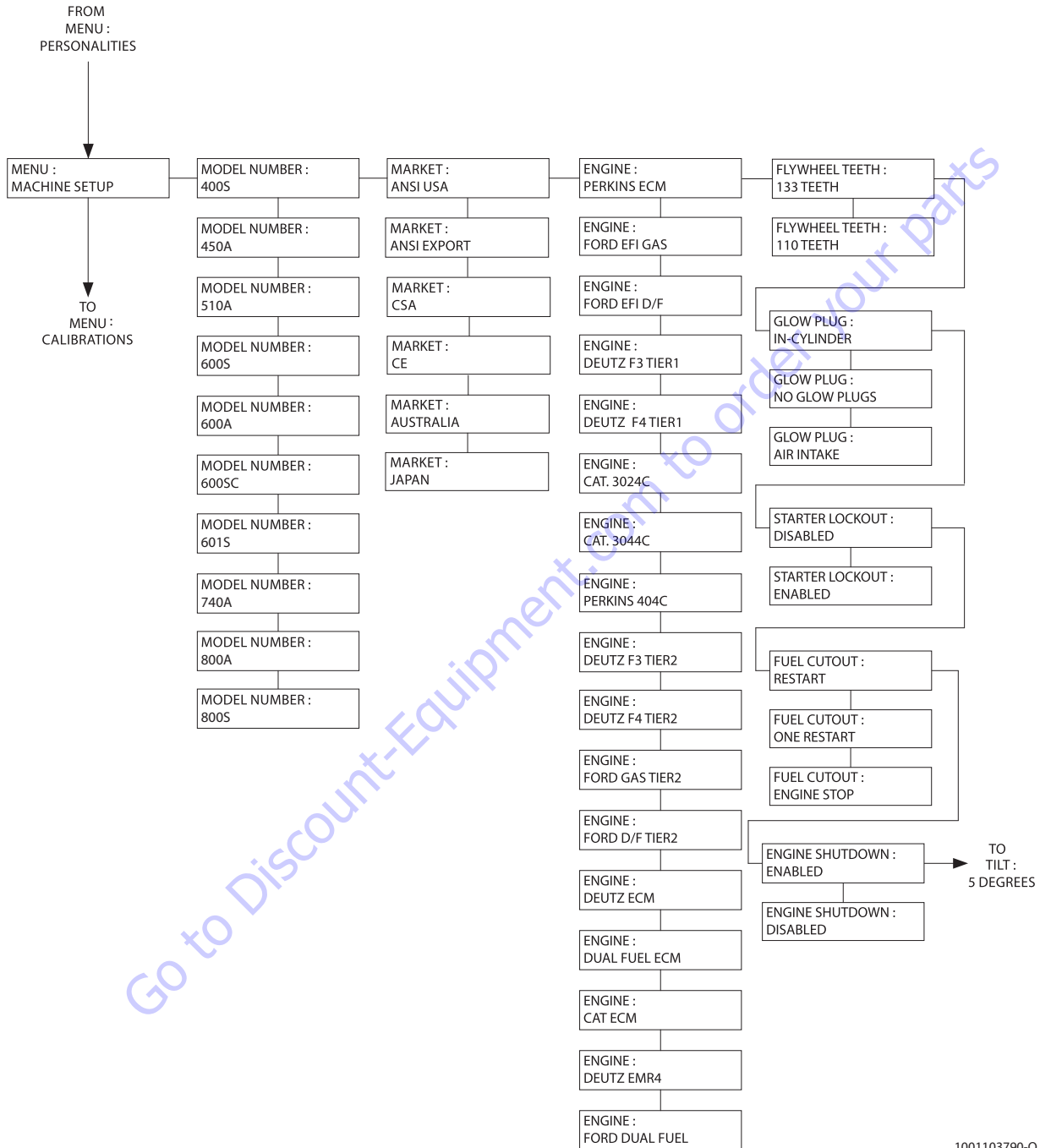
Figure 6-6. Analyzer Flow Chart (Software Version P6.22) -Sheet 4 of 9



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

Figure 6-7. Analyzer Flow Chart (Software Version P6.22) -Sheet 5 of 9

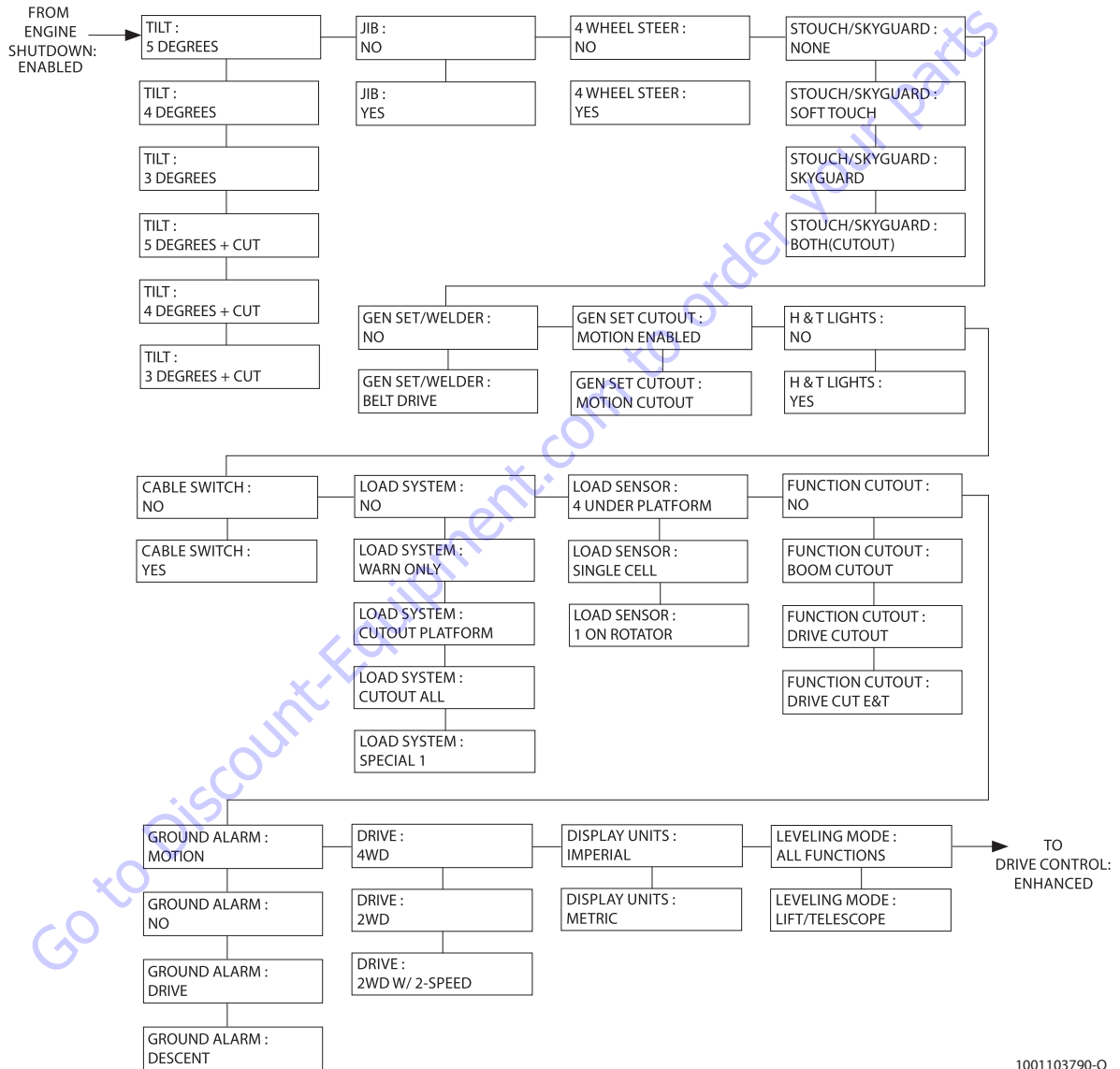
## SECTION 6 - JLG CONTROL SYSTEM



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

**Figure 6-8. Analyzer Flow Chart (Software Version P6.22) -Sheet 6 of 9**

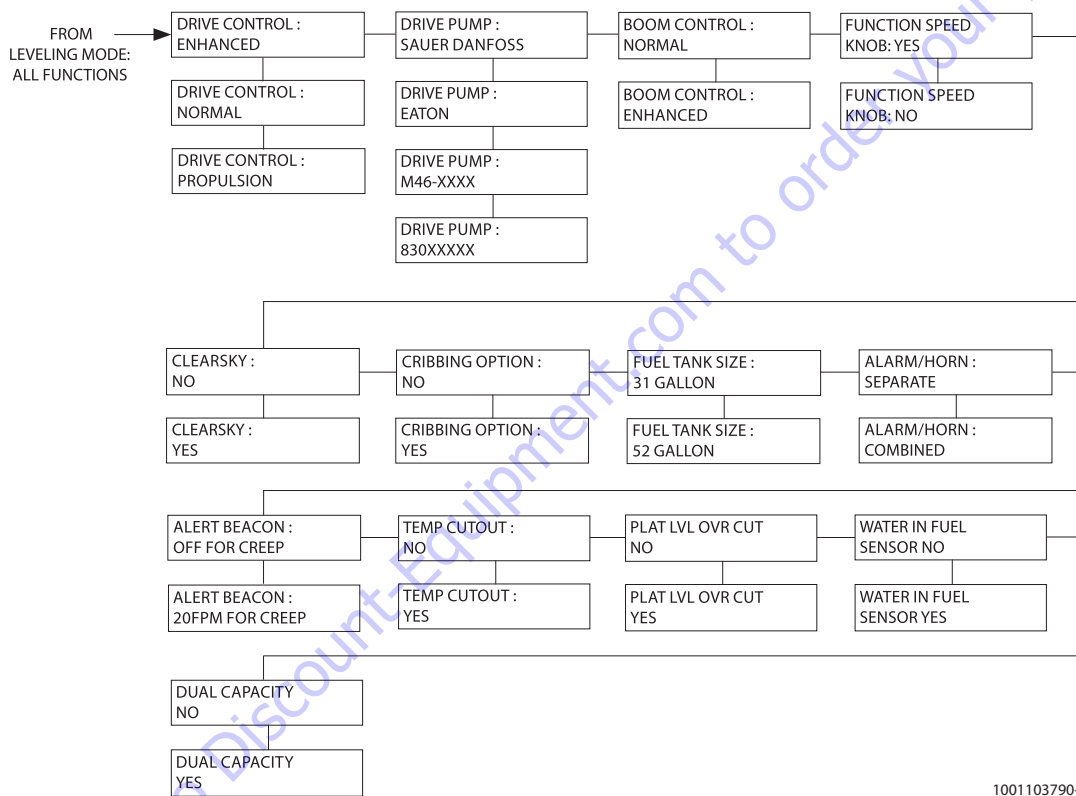




1001103790-Q  
MAE33240Q

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

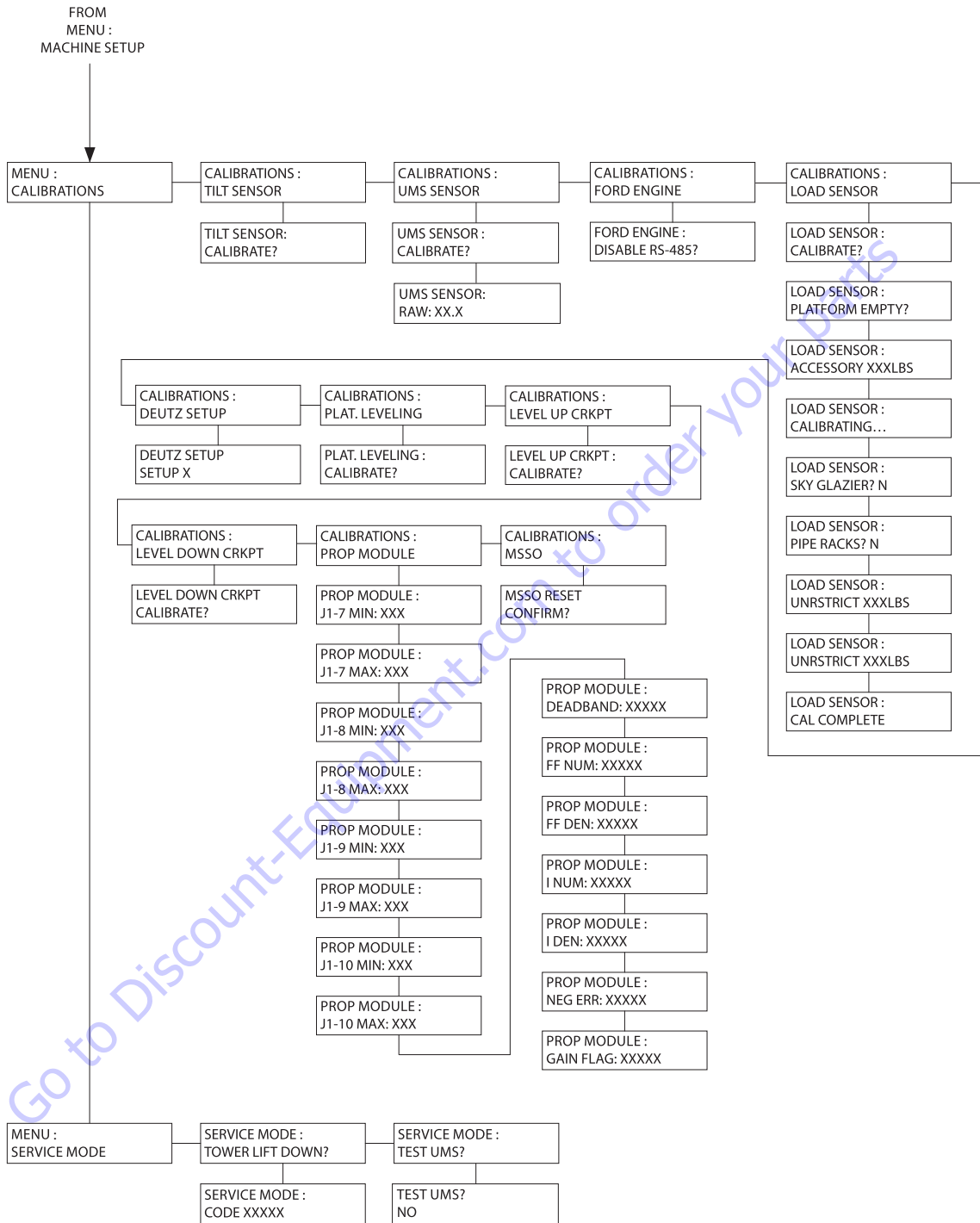
**Figure 6-9. Analyzer Flow Chart (Software Version P6.22) -Sheet 7 of 9**



1001103790-Q  
MAE33250Q

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

Figure 6-10. Analyzer Flow Chart (Software Version P6.22) -Sheet 8 of 9



1001103790-Q  
MAE33260Q

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

Figure 6-11. Analyzer Flow Chart (Software Version P6.22) -Sheet 9 of 9

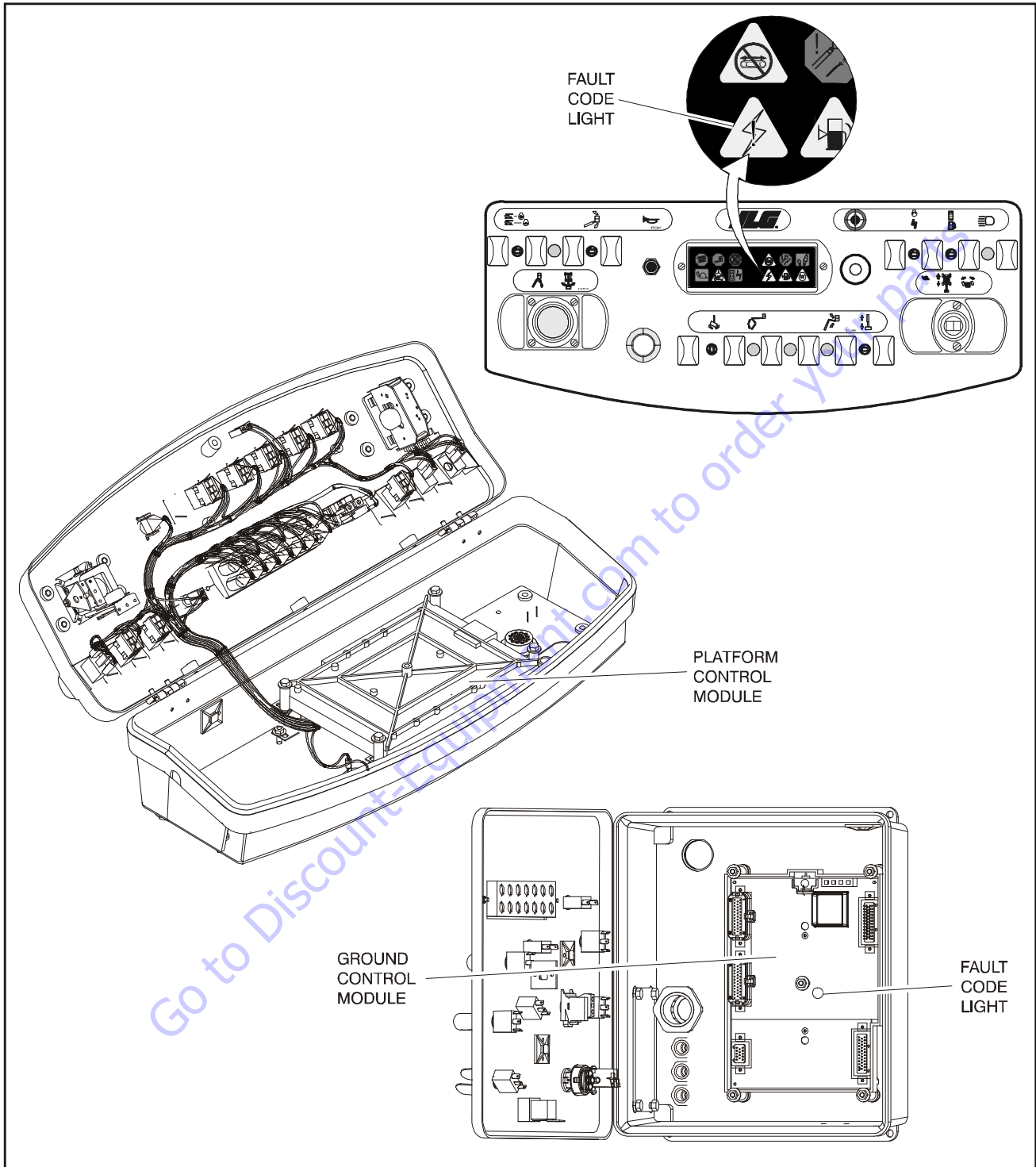
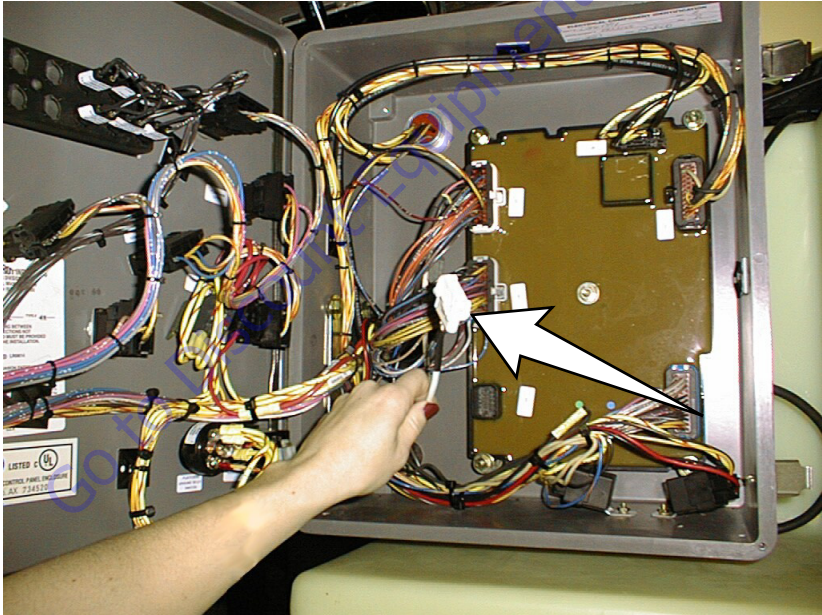


Figure 6-12. Fault Code Light Location



PLATFORM CONNECTION



GROUND CONTROL CONNECTION

Figure 6-13. Analyzer Connecting Points

# SECTION 6 - JLG CONTROL SYSTEM

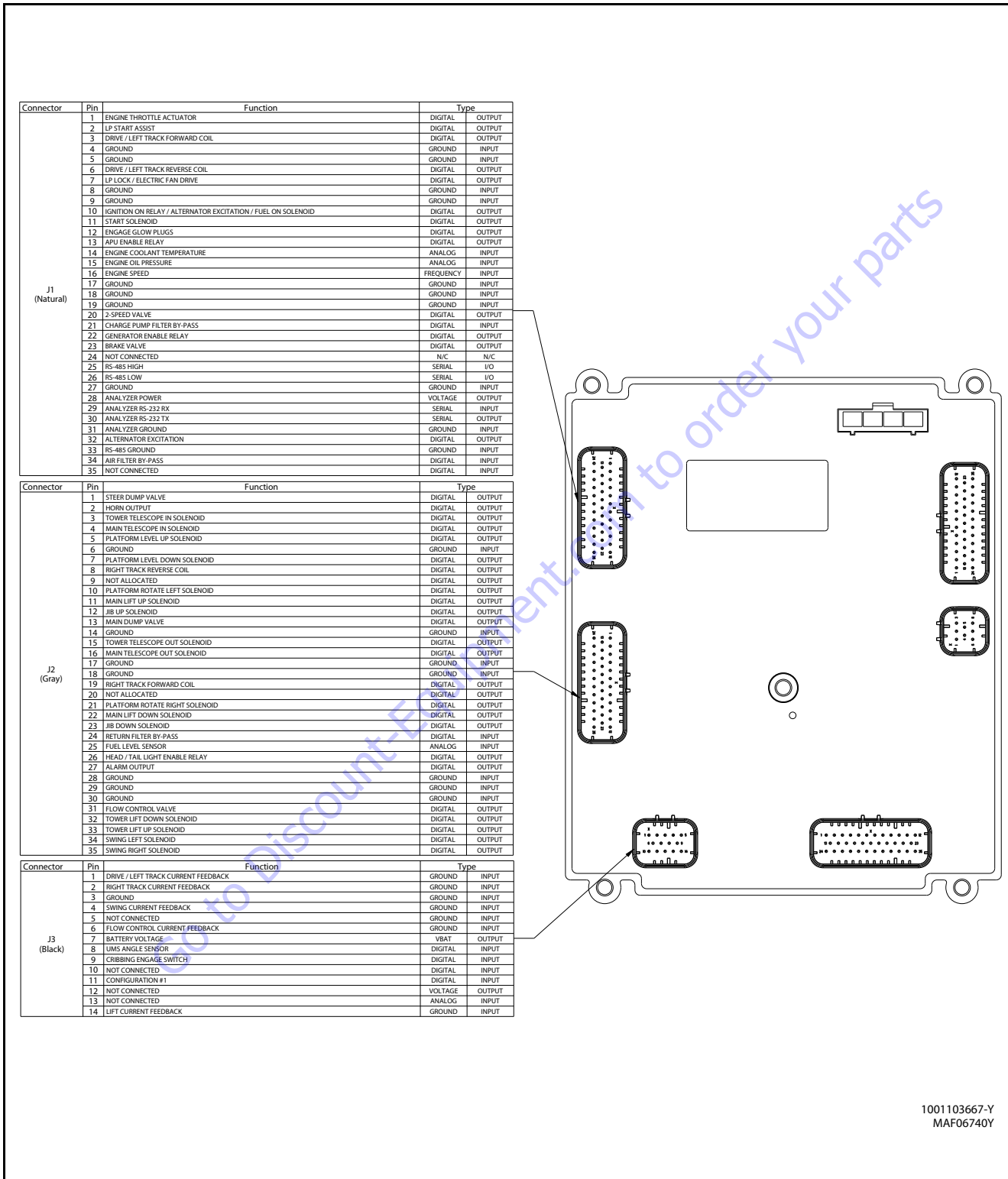
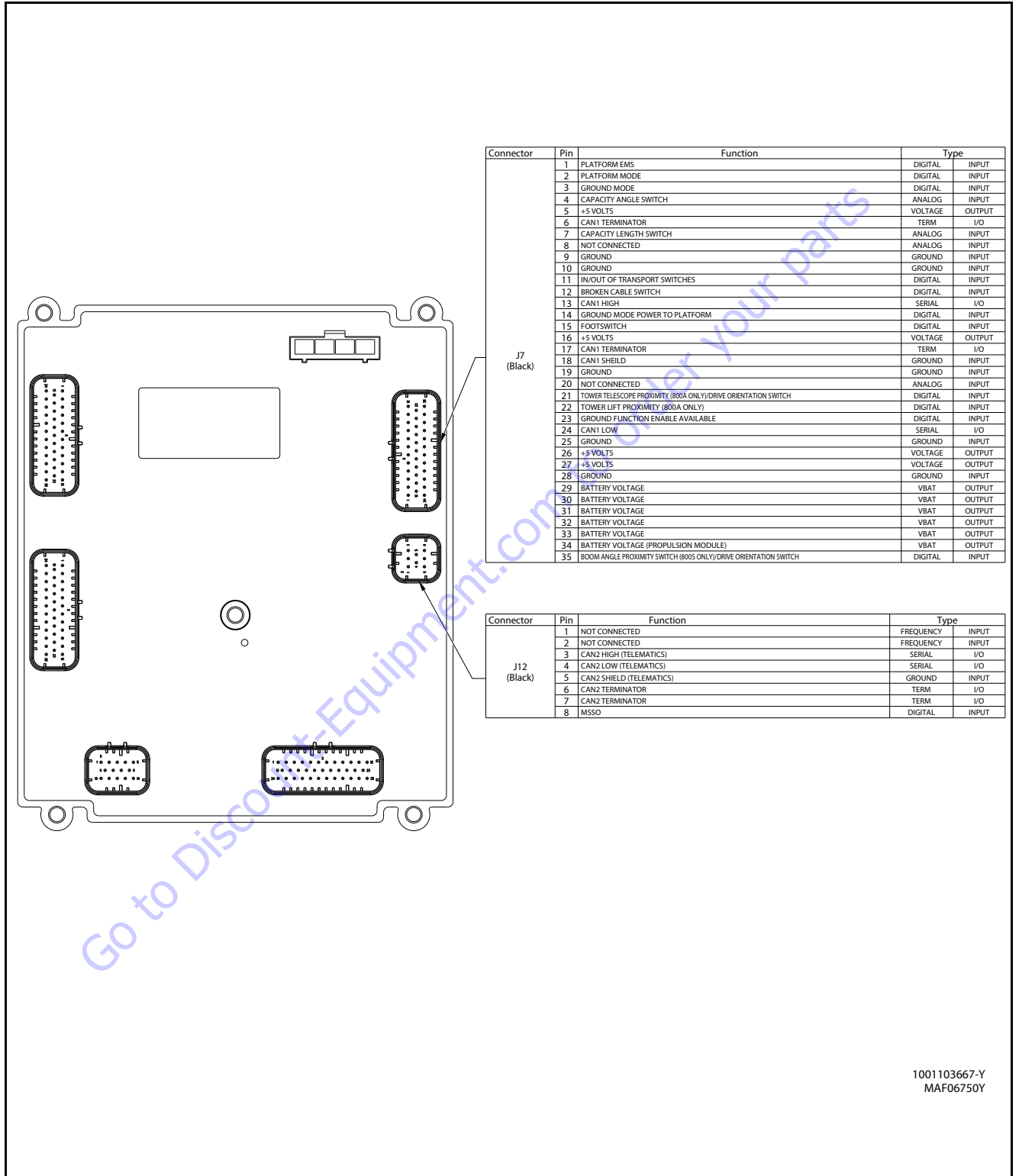


Figure 6-14. Ground Control Module - Sheet 1 of 3

1001103667-Y  
MAF06740Y

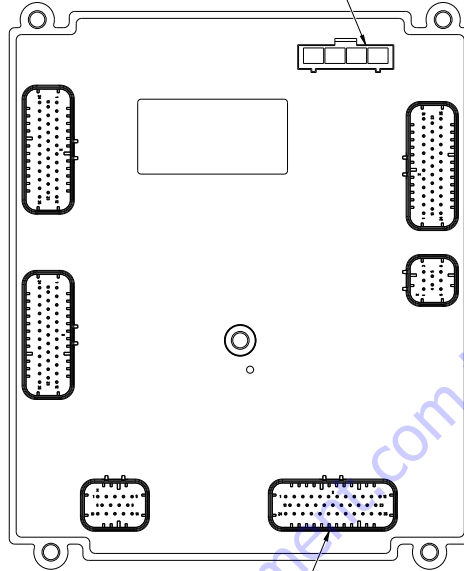


1001103667-Y  
MAF06750Y

Figure 6-15. Ground Control Module - Sheet 2 of 3

## SECTION 6 - JLG CONTROL SYSTEM

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



Connector	Pin	Function	Type	
J4 (Blue)	1	CRIBBING ENGAGED INDICATOR	DIGITAL	OUTPUT
	2	500 LB CAPACITY LAMP	DIGITAL	OUTPUT
	3	GLOWPLUG INDICATOR	DIGITAL	OUTPUT
	4	ENGINE START	DIGITAL	INPUT
	5	PLATFORM LEVEL DOWN	DIGITAL	INPUT
	6	PLATFORM ROTATE LEFT	DIGITAL	INPUT
	7	MAIN TELESCOPE IN	DIGITAL	INPUT
	8	JIB DOWN	DIGITAL	INPUT
	9	JIB LEFT	DIGITAL	INPUT
	10	TOWER LIFT UP	DIGITAL	INPUT
	11	TOWER TELESCOPE IN	DIGITAL	INPUT
	12	HOURLY METER	DIGITAL	OUTPUT
	13	RETURN FILTER BY-PASS LAMP	DIGITAL	OUTPUT
	14	PLATFORM OVERLOADED INDICATOR	DIGITAL	OUTPUT
	15	BOOM MALFUNCTION INDICATOR	DIGITAL	OUTPUT
	16	AUXILIARY POWER / FUNCTION ENABLE	DIGITAL	INPUT
	17	PLATFORM LEVEL UP	DIGITAL	INPUT
	18	PLATFORM ROTATE RIGHT	DIGITAL	INPUT
	19	JIB UP	DIGITAL	INPUT
	20	JIB RIGHT	DIGITAL	INPUT
	21	TOWER LIFT DOWN	DIGITAL	INPUT
	22	TOWER TELESCOPE OUT	DIGITAL	INPUT
	23	MAIN LIFT UP	DIGITAL	INPUT
	24	BATTERY VOLTAGE	VBAT	OUTPUT
	25	BATTERY VOLTAGE - (GROUND ENABLE PRESENT)	VBAT	OUTPUT
	26	BATTERY LOW / NOT CHARGING INDICATOR	DIGITAL	OUTPUT
	27	CHARGE PUMP FILTER BY-PASS LAMP	DIGITAL	OUTPUT
	28	ENGINE HIGH COOLANT TEMPERATURE INDICATOR	DIGITAL	OUTPUT
	29	ENGINE LOW OIL PRESSURE INDICATOR	DIGITAL	OUTPUT
	30	MAIN TELESCOPE OUT	DIGITAL	INPUT
	31	GROUND	GROUND	INPUT
	32	GROUND	GROUND	INPUT
	33	MAIN LIFT DOWN	DIGITAL	INPUT
	34	SWING LEFT	DIGITAL	INPUT
	35	SWING RIGHT	DIGITAL	INPUT

1001103667-Y  
MAF06760Y

Figure 6-16. Ground Control Module - Sheet 3 of 3



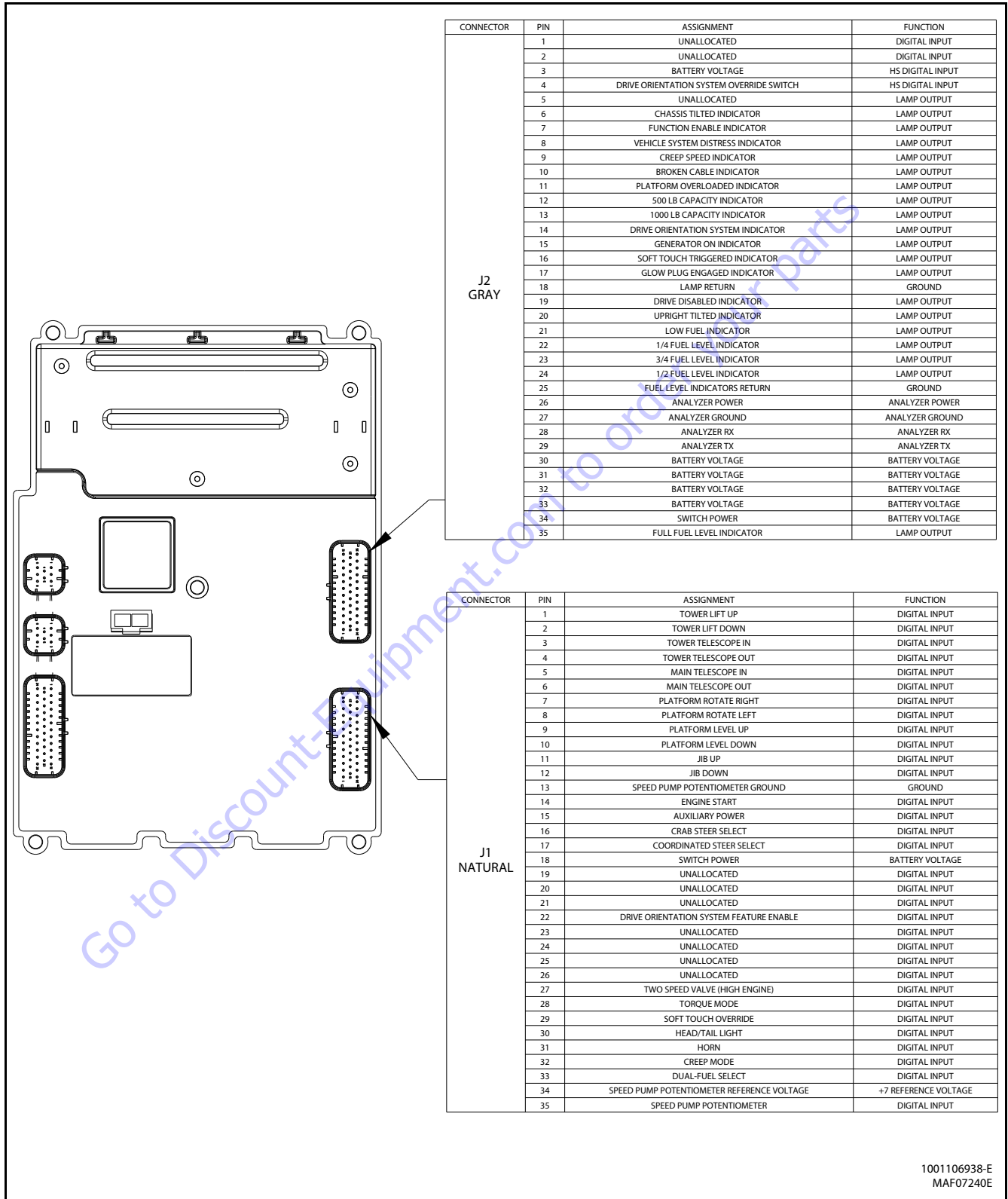
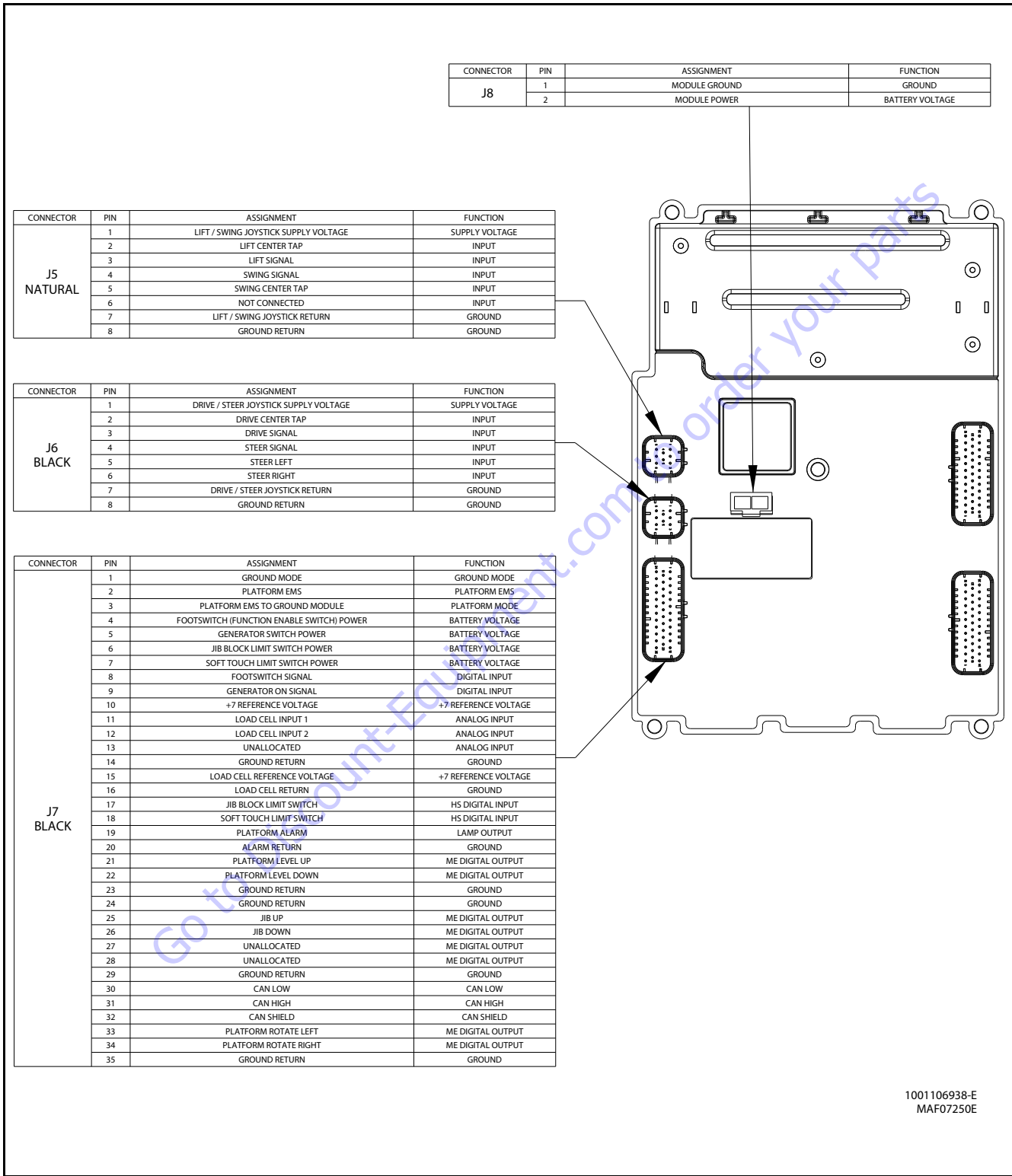


Figure 6-17. Platform Control Module - Sheet 1 of 2

# SECTION 6 - JLG CONTROL SYSTEM



1001106938-E  
MAF07250E

Figure 6-18. Platform Control Module - Sheet 2 of 2

### Analyzer Diagnostics Menu Structure

In the following structure descriptions, an intended item is selected by pressing ENTER; pressing ESC steps back to the next outer level. The LEFT /RIGHT arrow keys

move between items in the same level. The UP or DOWN arrow keys alter a value if allowed

**Table 6-7. Adjustments - Personality Descriptions**

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

**Table 6-7. Adjustments - Personality Descriptions**


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

Table 6-7. Adjustments - Personality Descriptions

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

### 6.5 LSS SYSTEM

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

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

#### NOTICE

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

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



#### NOTICE

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

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

## Diagnostic Menu

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

To access the Diagnostic Menu, use the LEFT  and RIGHT  Arrow keys to select DIAGNOSTICS from the Top Level

Menu. Press the ENTER key  to view the menu.

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


menu). To exit a sub-menu, press the ESC key .

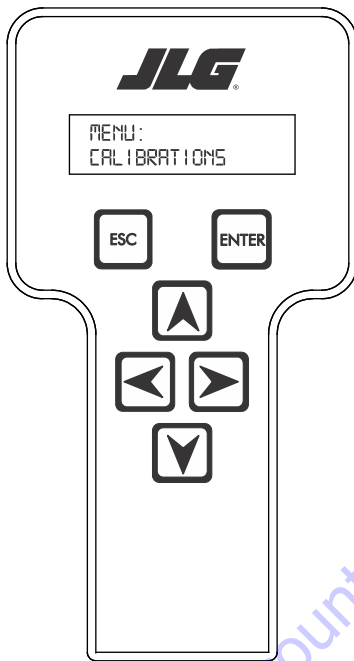
Table 6-8, Diagnostic Menu Descriptions details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

**Table 6-8. Diagnostic Menu Descriptions**


Diagnosics Menu (Displayed on Analyzer 1 <sup>st</sup> Line)	Parameter (Displayed on Analyzer 2 <sup>nd</sup> Line)	Parameter Value (Displayed on Analyzer 2 <sup>nd</sup> 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			

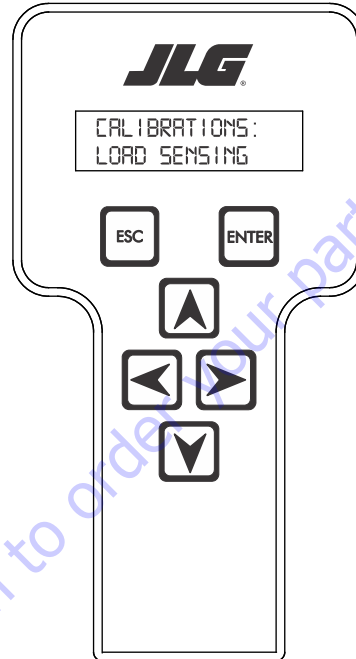
**Calibration Procedure**

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:

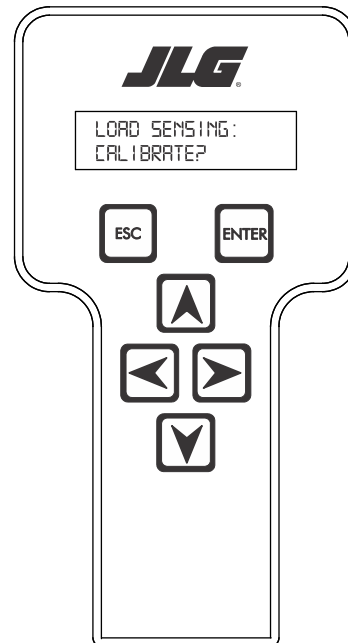


**NOTE:** The Calibration Menu is not available in OPERATOR ACCESS.

5. Press the ENTER key  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 . The Screen will read:

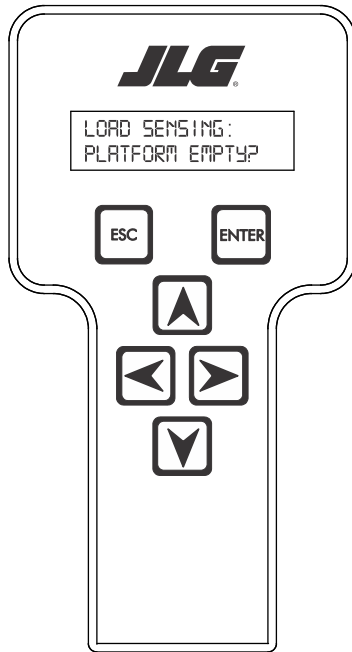



**NOTE:** Calibration will auto fail if LSS DTC's are active (443, 444, 4479, 4480, 663, 821, 822, 823, 824, 8218, 8222 -> 8238, 991, 992, 993, 994 or 99285).

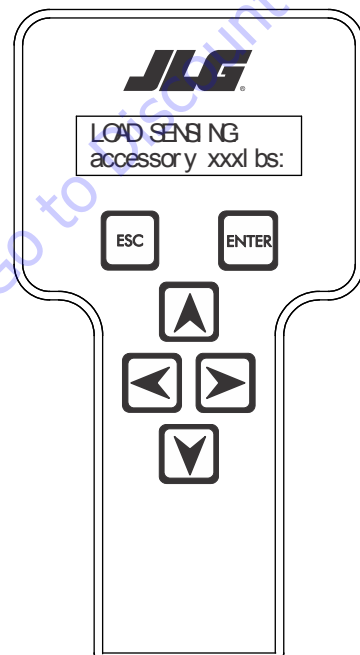


Pressing the ESC key  after starting calibration and before calibration is complete will display the CAL FAILED message. This will not disturb the prior calibration information.

7. Press ENTER . The analyzer screen will read:




8. If the platform is empty, press 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 6-9, 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 . The screen will read:

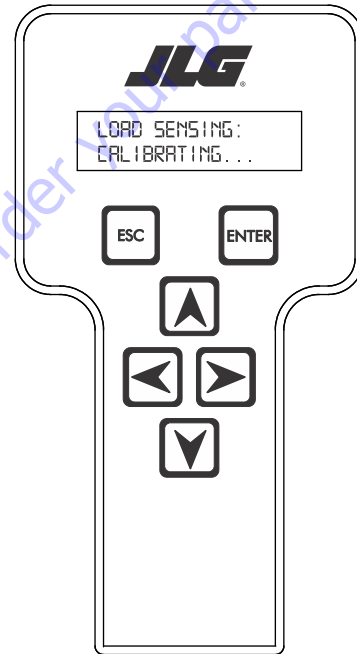


Table 6-9. Accessory Weights

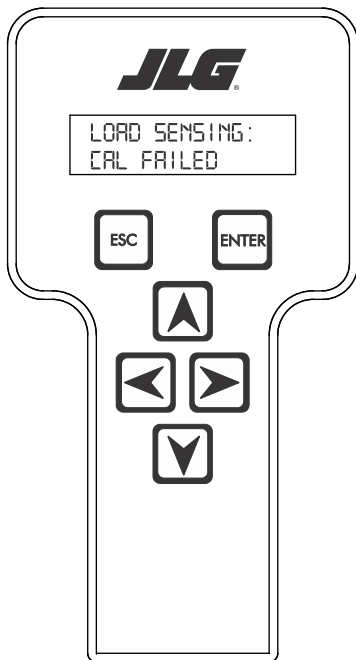
Accessory	Weight
SkyWelder (stick welder)	70 lb (32 kg)
SkyWelder Prep	Prep only = 15 lb (7 kg) Full install = 70 lb (32 kg)
SkyCutter (plasma cutter)	70 lb (32 kg)
SkCutter / SkyWelder Combo	140 lb (64 kg)
Fire Extinguisher	45 lb (20 kg)
Overhead SoftTouch	80 lb (36 kg)
Work Surface	20 lb (9 kg)

**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.


## SECTION 6 - JLG CONTROL SYSTEM

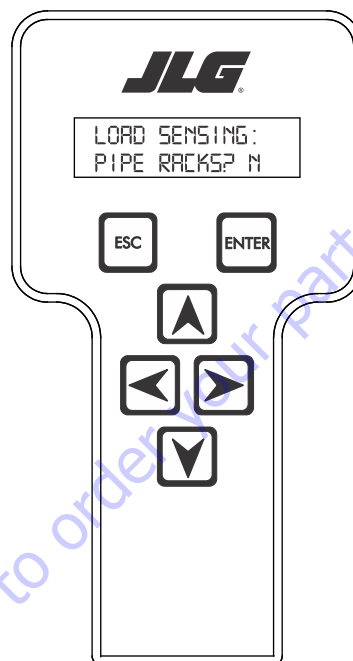
9. The control system will calculate the load cell readings and ensure it is greater than 130 lbs. (59 kg), but less than 575 lbs.(261 kg).


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

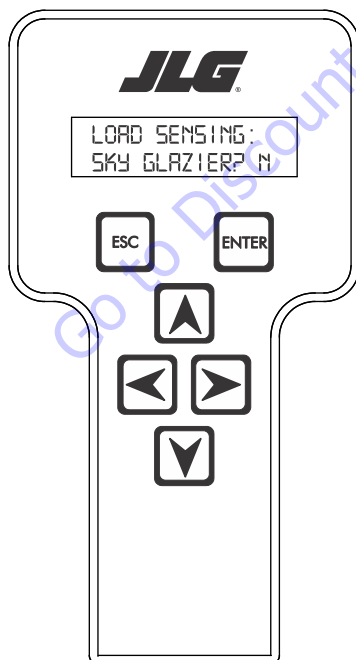


11. Use the analyzer keys to select N for no or Y for yes. Press


ENTER . The screen will read:



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



12. Use the analyzer keys to select N for no or Y for yes. Press

ENTER . The control system will default to an estimate of unrestricted capacity, which can be adjusted if necessary. Refer to Table 6-10, SkyGlazier Capacity Reductions and Table 6-11, Pipe Rack Capacity Reductions.

The screen will read:

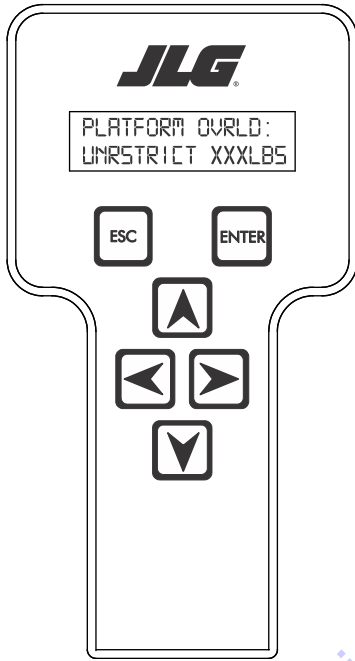


Table 6-10. SkyGlazier Capacity Reductions


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)

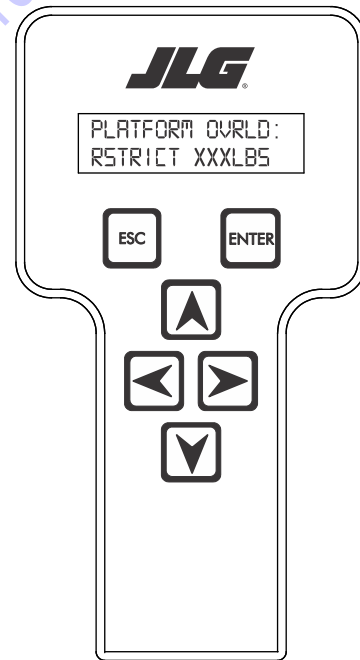
Note: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.


Table 6-11. Pipe Rack Capacity Reductions

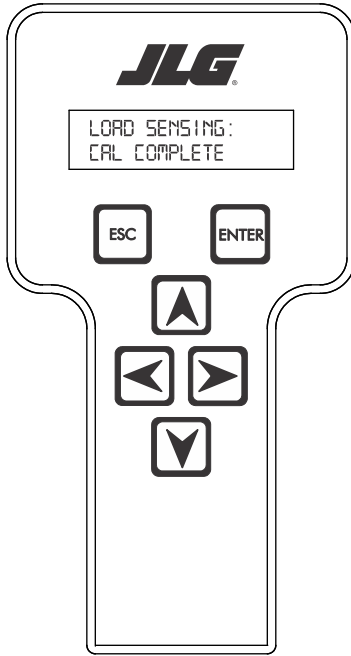
Capacity	PLATFORM OVRLD	PLATFORM OVRLD RESTRICT
500 lb (227 kg)	400 lb (181 kg)	n/a
550 lb (250 kg)	450 lb (204 kg)	n/a
600 lb (272 kg)	500 lb (227 kg)	n/a
750 lb (340 kg)	n/a	650 lb (295 kg)
1000 lb (454 kg)	n/a	900 lb (408 kg)

Note: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.

13. Press ENTER . The following screen will be displayed for restricted capacity, which can be adjusted if necessary. Refer to Table 6-10, SkyGlazier Capacity Reductions and Table 6-11, Pipe Rack Capacity Reductions.



14. Press ENTER . If calibration is successful, the screen will read:



Go to [Discount-Equipment.com](http://Discount-Equipment.com) to order your parts

## 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  $\pm 5$  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  $\pm 15$ lbs ( $\pm 7$ kg). Further, the reading should be stable and should not vary by more than  $\pm 2$ lbs ( $\pm 1$ kg) (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  $\pm 5\%$  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 6-12. LSS Troubleshooting Chart**

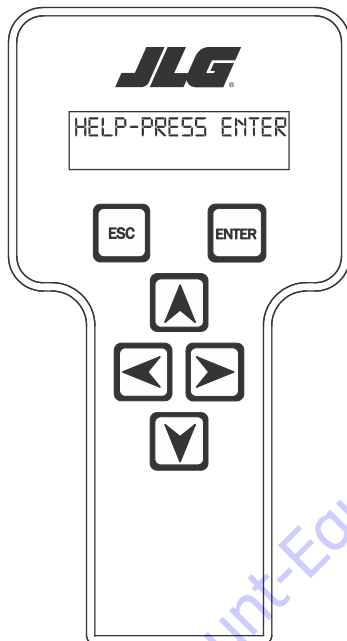
Difficulty	Possible Resolution
<p>Empty Platform Weight (DIAGNOSTICS, PLATFORM LOAD) is not within <math>\pm 15\text{lbs}</math> (<math>\pm 7\text{kg}</math>) of zero.</p> <p>or</p> <p>Platform Load readings (DIAGNOSTICS, PLTLOAD) are unstable by more than <math>\pm 2\text{lbs}</math> (<math>\pm 1\text{kg}</math>) (without the influence of vibration or wind).</p> <p>or</p> <p>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 <math>\pm 5\%</math> of Rated Load when using calibrated weights.</p>	<p>The LSS System is unable to properly measure the platform weight.</p> <ol style="list-style-type: none"> <li>1. The Load Cell is not properly plugged into the LSS Harness. It is possible poor electrical contact is made.</li> <li>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.</li> <li>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).</li> <li>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 <math>\pm 2\text{lbs}</math> (<math>\pm 1\text{kg}</math>) (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.</li> <li>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 (<math>&gt;6000\text{lbs}</math> [<math>&gt;2722\text{kg}</math>]).</li> </ol>
<p>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.</p>	<p>The Control System is failing to regard the overload signal from the LSS System, or the signal is shorted.</p> <ol style="list-style-type: none"> <li>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).</li> </ol>
<p>The Ground Audible Warning fails to sound, but the Platform Audible Warning sounds properly.</p>	<p>The Ground Alarm is missing or improperly installed. Verify that the device is mounted. Verify wiring from the Main Terminal Box and Ground Module.</p>
<p>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.</p>	<p>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.</p> <p>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.</p>



## 6.6 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.

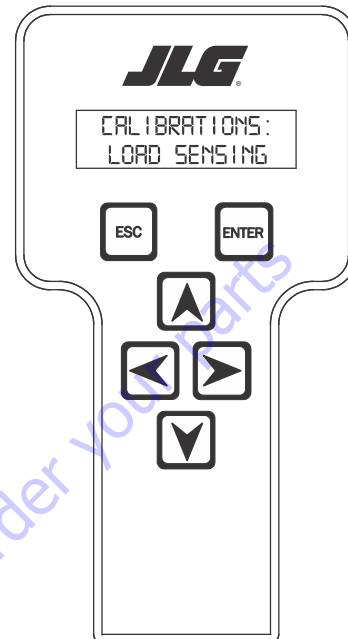
**NOTE:** If performing the procedure from the platform console, the Emergency Stop switch on the ground console must also be pulled out.



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



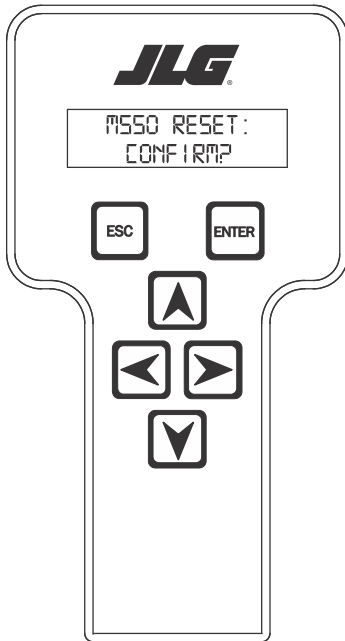
6. Use the arrow button to reach OPERATOR ACCESS. Press  Enter.
7. Enter the Access Code, 33271.
8. Use the right Arrow key to reach MENU: CALIBRATIONS. Press Enter .



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 . The screen will read:



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

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Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
001	00	1	EVERYTHING OK	The normal help message in Platform Mode.	No response required for this DTC.
002	00	2	GROUND MODE OK	The normal help message in Platform Mode.	No response required for this DTC.
0010	00	10	RUNNING AT CUTBACK - OUT OF TRANSPORT POSITION	Drive speed is limited to "ELEVATED MAX" while the vehicle is out of transport position. The normal help message in Ground Mode.	Response described in Drive Modes section.
<b>000</b>	<b>00</b>	<b>0</b>	<b>&lt;&lt;&lt; HELP COMMENT &gt;&gt;&gt;</b>		
0011	00	11	FSW OPEN (Foot switch open)	A drive / boom function was selected with the Footswitch open.	The UGM shall not Enable the Machine.
0012	00	12	RUNNING AT CREEP - CREEP SWITCH OPEN	All functions at creep while the Creep Switch is open.	The UGM shall limit the machine to Creep speed.
0013	00	13	RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	All functions at creep while the Platform is elevated and the Chassis is tilted.	
0014	00	14	CHASSIS TILT SENSOR OUT OF RANGE	The Chassis is tilted > 19 degrees for more than 4 seconds.	Not reported during power-up.
0015	00	15	LOAD SENSOR READING UNDER WEIGHT	The Load Sensing System indicates > 20% under calibrated zero point.	
0031	00	31	FUEL LEVEL LOW - ENGINE SHUTDOWN	Engine Shutdown has occurred due to Fuel Level = EMPTY condition.	Response described in Fuel Shutdown section.
0035	00	35	APU ACTIVE	Auxiliary Power/Emergency Descent Mode is active.	Response described in Auxiliary Power/Emergency Descent Mode section.
0039	00	39	SKYGUARD ACTIVE - FUNCTIONS CUTOFF	Response described in Auxiliary Power/Emergency Descent Mode section.	Response described in Sky-Guard section.
0040	00	40	RUNNING AT CREEP - CREEP SWITCH CLOSED	All Function speeds are limited to creep because the creep switch is closed.	
<b>210</b>	<b>21</b>	<b>0</b>	<b>&lt;&lt;&lt; POWER-UP &gt;&gt;&gt;</b>		
211	21	1	POWER CYCLE	The normal help message is issued at each power cycle.	
212	21	2	KEYSWITCH FAULTY	Both Platform and Ground modes are selected simultaneously.	The UGM shall assume a station selection of Ground.
213	21	3	FSW FAULTY	Both Footswitches are closed for more than one second.	The UGM shall not Enable the Machine.
<b>220</b>	<b>22</b>	<b>0</b>	<b>&lt;&lt;&lt; PLATFORM CONTROLS &gt;&gt;&gt;</b>		
227	22	7	STEER SWITCHES FAULTY	Both Steer Left and Steer Right inputs are closed simultaneously.	The UGM shall prohibit Steer; The UGM shall limit Drive to Creep The Steer Left switch input = Low; The Steer Right switch input = Low; Steer and full Drive speed permitted after controls are initialized
2211	22	11	FSW INTERLOCK TRIPPED	The Footswitch was closed for more than seven seconds.	Can be reported during power-up.

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
2212	22	12	DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A drive function was selected with Footswitch open.	Can be reported during power-up.
2213	22	13	STEER LOCKED - SELECTED BEFORE FOOTSWITCH	A steer function was selected with Footswitch open.	The UGM shall not Enable the Machine.
2214	22	14	DRIVE/STEER LOCKED - JOYSTICK MOVED BEFORE ENABLE	Drive/Steer was selected before Enable switch activated.	
2216	22	16	D/S JOY. OUT OF RANGE HIGH	The D/S Joystick reference voltage is > 8.1V.	Resistive joysticks. If the reference voltage is > 7.7V then the reference voltage is out of tolerance of a short to battery has occurred.
2217	22	17	D/S JOY. CENTER TAP BAD	The D/S Joystick center tap voltage is < 3.08V or > 3.83V.	Resistive joysticks. - There is a +/- .1V range around these values due to resistor tolerances.
2219	22	19	L/S JOY. OUT OF RANGE HIGH	The L/S Joystick reference voltage is > 8.1V.	Resistive joysticks. - If the reference voltage is > 7.7V then the reference voltage is out of tolerance of a short to battery has occurred.
2220	22	20	L/S JOY. CENTER TAP BAD	The L/S Joystick center tap voltage is < 3.08V or > 3.83V.	Resistive joysticks. - There is a +/- .1V range around these values due to resistor tolerances.
2221	22	21	LIFT/SWING LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	A lift / swing function was selected with Footswitch open.	If triggered by the Lift and/or Swing joystick not being in the neutral position at Startup, the UGM shall prohibit Lift and Swing. If triggered by Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active, the UGM shall not Enable the Machine.
2222	22	22	WAITING FOR FSW TO BE OPEN	The Footswitch was closed during Platform selection.	Can be reported during power-up.
2223	22	23	FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	A boom function was selected with Footswitch open.	The UGM shall not Enable the Machine.
2224	22	24	FOOTSWITCH SELECTED BEFORE START	The Footswitch was closed during engine start.	The UGM shall prohibit Engine Start.
2269	22	69	FUNCTION PROBLEM - HIGH SPEED & CREEP ACTIVE TOGETHER		

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
234	23	4	FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	A boom function has both directions selected together.	Disable whichever boom functions whose boom control inputs are triggering the fault. If Engine Start/Aux at fault, disable Engine Start but permit Auxiliary Power/ Emergency Descent.
235	23	5	FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	A boom function was selected before aux power.	
236	23	6	FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	A boom function was selected before engine start.	
237	23	7	START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	The Start Switch was closed during power-up.	The UGM shall prohibit Engine Start.
23163	23	163	FUNCTION PROBLEM - MSSO PERMANENTLY SELECTED	The MSSO switch input = Low at Startup.	No response required for this DTC Power Cycled.
<b>240</b>	<b>24</b>	<b>0</b>	<b>&lt;&lt;&lt; OTHER CONTROLS &gt;&gt;&gt;</b>		
241	24	1	AMBIENT TEMPERATURE SENSOR - OUT OF RANGE LOW	MACHINE SETUP > TEMP CUTOUT = YES; Ambient Temperature sensor reading - 50C.	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; If the Machine is in Ground Mode; No response required for this DTC.
242	24	2	AMBIENT TEMPERATURE SENSOR - OUT OF RANGE HIGH	Ambient Temperature sensor reading $\geq$ 85C.	Check Ambient Temperature sensor reading < 85C.
<b>250</b>	<b>25</b>	<b>0</b>	<b>&lt;&lt;&lt; FUNCTION PREVENTED &gt;&gt;&gt;</b>		
259	25	9	MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS	The model selection has been changed.	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start).
2513	25	13	GENERATOR MOTION CUTOUT ACTIVE	Driving is not possible while the vehicle generator is running AND is configured to prevent drive.	The UGM shall not Enable the Machine.
2514	25	14	BOOM PREVENTED - DRIVE SELECTED	Boom functions are not possible while the vehicle is being driven AND is configured to not allow simultaneous drive & boom operation.	The UGM shall prohibit all boom functions.
2516	25	16	DRIVE PREVENTED - ABOVE ELEVATION	Driving is not possible while Boom functions are selected AND is configured to not allow simultaneous drive & boom operation.	The UGM shall prohibit Drive and Steer.
2517	25	17	DRIVE PREVENTED - TILTED & ABOVE ELEVATION	Driving is not possible while the vehicle is tilted and above elevation AND is configured to prevent drive while tilted and above elevation.	The UGM shall prohibit Drive and Steer.

**SECTION 6 - JLG CONTROL SYSTEM**

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
2518	25	18	DRIVE PREVENTED - BOOM SELECTED	MACHINE SETUP > FUNCTION CUTOUT = BOOM CUTOUT The boom is Above Elevation Any boom function is already active The operator attempts to activate Drive or Steer.	The UGM shall prohibit Drive and Steer.
2519	25	19	DRIVE PREVENTED - TILTED & EXTENDED OR HIGH ANGLE	Drive Selected while tilted and extended and tilt is configured to cutout drive.	
2520	25	20	FUNCTIONS LOCKED OUT - CONSTANT DATA VERSION IMPROPER		
2530	25	30	UMS SENSOR FORWARD LIMIT REACHED	The Upright angle relative to the turntable is less than -4.0 degree.	
2531	25	31	UMS SENSOR OUT OF USABLE RANGE	Both the turntable tilt sensor and the UMS sensor read greater then +/-10 degree in the same direction.	
2532	25	32	UMS SENSOR BACKWARD LIMIT REACHED	The Upright angle relative to the turntable is greater than +2.5 degree.	
2563	25	63	SKYGUARD SWITCH - DISAGREEMENT	MACHINE SETUP > SKYGUARD = YES; Machine is in Platform Mode; [(SkyGuard input #1 Platform Module J7-18) ≠ (SkyGuard input #2 Platform Module J1-23)] > 160ms	Response detailed in Sky-Guard section.
2568	25	68	TEMPERATURE CUTOUT ACTIVE - AMBIENT TEMPERATURE TOO LOW	Low Temperature Cutout = Active	If the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation.
2576	25	76	PLATFORM LEVEL PREVENTED - ABOVE ELEVATION	Platform Level Override Cutout = Enabled; The Platform Level Up or Down switch input = High; Footswitch is active.	The UGM shall suspend Platform Level Up and Down commands; The UGM shall prohibit Platform Level Up and Down
2577	25	77	DRIVE PREVENTED - START BATTERY CONNECTED	Start battery is connected	Check the battery.
<b>330</b>	<b>33</b>	<b>0</b>	<b>&lt;&lt;&lt; GROUND OUTPUT DRIVER &gt;&gt;&gt;</b>		
331	33	1	BRAKE - SHORT TO BATTERY	There is a Short to Battery to the Brake Valve.	Check Harness for damage.
332	33	2	BRAKE - OPEN CIRCUIT	There is an Open Circuit to the Brake Valve.	Check Harness for damage.
3311	33	11	GROUND ALARM - SHORT TO BATTERY	There is a Short to Battery to the Ground Alarm.	Ground Alarm equipped vehicles only.
3336	33	36	ALTERNATOR POWER - SHORT TO GROUND	There is a Short to Ground to the Alternator/ECM.	Check Harness for damage.
3340	33	40	AUX POWER - SHORT TO GROUND	There is a Short to Ground to the Auxiliary Power Pump Relay.	Check Harness for damage.
3341	33	41	AUX POWER - OPEN CIRCUIT	There is an Open Circuit to the Auxiliary Power Pump Relay.	Check Harness for damage.
3342	33	42	AUX POWER - SHORT TO BATTERY	There is a Short to Battery to the Auxiliary Power Pump Relay.	Check Harness for damage.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3346	33	46	ELECTRIC FAN - SHORT TO GROUND	There is a short to ground to the Electric Fan.	Check Harness for damage.
3347	33	47	ELECTRIC FAN - OPEN CIRCUIT	There is an Open Circuit to the Electric Fan.	Check Harness for damage.
3348	33	48	ELECTRIC FAN - SHORT TO BATTERY	There is a Short to Battery to the Electric Pump.	Check Harness for damage.
3349	33	49	ELECTRIC PUMP - SHORT TO GROUND	There is a Short to Ground to the Pump Relay.	Check Harness for damage.
3350	33	50	ELECTRIC PUMP - OPEN CIRCUIT	There is an Open Circuit to the Pump Relay.	Check Harness for damage.
3351	33	51	ELECTRIC PUMP - SHORT TO BATTERY	There is a Short to Battery to the Pump Relay.	Check Harness for damage.
3352	33	52	LP LOCK - SHORT TO GROUND	There is an Open Circuit to the LP Lock.	Check Harness for damage.
3353	33	53	LP LOCK - OPEN CIRCUIT	There is an Open Circuit to the LP Lock.	Check Harness for damage.
3354	33	54	LP LOCK - SHORT TO BATTERY	There is a short to Battery to the LP Lock.	Check Harness for damage.
3355	33	55	LP START ASSIST - SHORT TO GROUND	There is a short to ground to the LP Start Assist.	Check Harness for damage.
3356	33	56	LP START ASSIST - OPEN CIRCUIT	There is an Open Circuit to the LP Start Assist.	Check Harness for damage.
3357	33	57	LP START ASSIST - SHORT TO BATTERY	There is a short to battery to the LP Start Assist.	Check Harness for damage.
3358	33	58	MAIN DUMP VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Dump Valve.	Check Harness for damage.
3359	33	59	MAIN DUMP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Dump Valve.	Check Harness for damage.
3360	33	60	MAIN DUMP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Dump Valve.	Check Harness for damage.
3361	33	61	BRAKE - SHORT TO GROUND	There is a Short to Ground to the Brake Valve.	Check Harness for damage.
3362	33	62	START SOLENOID - SHORT TO GROUND	There is a Short to Ground to the Start Relay.	Check Harness for damage.
3363	33	63	START SOLENOID - OPEN CIRCUIT	There is an Open Circuit to the Start Relay.	Check Harness for damage.
3364	33	64	START SOLENOID - SHORT TO BATTERY	There is a Short to Battery to the Start Relay.	Check Harness for damage.
3365	33	65	STEER DUMP VALVE - SHORT TO GROUND	There is a Short to Ground to the Steer Dump Valve.	Check Harness for damage.
3366	33	66	STEER DUMP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Steer Dump Valve.	Check Harness for damage.
3367	33	67	STEER DUMP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Steer Dump Valve.	Check Harness for damage.
3368	33	68	TWO SPEED VALVE - SHORT TO GROUND	There is a Short to Ground to the Two Speed Valve.	Check Harness for damage.
3369	33	69	TWO SPEED VALVE - OPEN CIRCUIT	There is an Open Circuit to the Two Speed Valve.	Check Harness for damage.
3370	33	70	TWO SPEED VALVE - SHORT TO BATTERY	There is a Short to Battery to the Two Speed Valve.	Check Harness for damage.

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3371	33	71	GROUND ALARM - SHORT TO GROUND	There is a Short to Ground to the Ground Alarm.	Check Harness for damage.
3372	33	72	GROUND ALARM - OPEN CIRCUIT	There is an Open Circuit to the Ground Alarm.	Check Harness for damage.
3373	33	73	GEN SET/WELDER - SHORT TO GROUND	There is a Short to Ground to the Generator Relay.	Check Harness for damage.
3374	33	74	GEN SET/WELDER - OPEN CIRCUIT	There is an Open Circuit to the Generator Relay.	Check Harness for damage.
3375	33	75	GEN SET/WELDER - SHORT TO BATTERY	There is a Short to Battery to the Generator Relay.	Check Harness for damage.
3376	33	76	HEAD TAIL LIGHT - SHORT TO GROUND	There is a Short to Ground to the Head Light Relay.	Check Harness for damage.
3377	33	77	HEAD TAIL LIGHT - OPEN CIRCUIT	There is an Open Circuit to the Head Light Relay.	Check Harness for damage.
3378	33	78	HEAD TAIL LIGHT - SHORT TO BATTERY	There is a Short to Battery to the Head Light Relay.	Check Harness for damage.
3379	33	79	HOUR METER - SHORT TO GROUND	There is a Short to Ground to the Hour Meter.	Check Harness for damage.
3382	33	82	PLATFORM LEVEL UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Up Valve	Check Harness for damage.
3383	33	83	PLATFORM LEVEL UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Up Valve.	Check Harness for damage.
3384	33	84	PLATFORM LEVEL UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Up Valve	Check Harness for damage.
3388	33	88	PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Down Valve	Check Harness for damage.
3389	33	89	PLATFORM LEVEL DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Down Valve.	Check Harness for damage.
3390	33	90	PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Down Valve	Check Harness for damage.
3394	33	94	PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Left Valve.	Check Harness for damage.
3395	33	95	PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Left Valve.	Check Harness for damage.
3396	33	96	PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Left Valve.	Check Harness for damage.
3397	33	97	PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Rotate Right Valve.	Check Harness for damage.
3398	33	98	PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Right Valve.	Check Harness for damage.
3399	33	99	PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Rotate Right Valve.	Check Harness for damage.
33100	33	100	JIB LIFT UP VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Lift Up Valve.	Check Harness for damage.
33101	33	101	JIB LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Up Valve.	Check Harness for damage.
33102	33	102	JIB LIFT UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Up Valve.	Check Harness for damage.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33103	33	103	JIB LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Lift Down Valve.	Check Harness for damage.
33104	33	104	JIB LIFT DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Down Valve.	Check Harness for damage.
33105	33	105	JIB LIFT DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Down Valve.	Check Harness for damage.
33106	33	106	TOWER LIFT UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Lift Up Valve.	Check Harness for damage.
33107	33	107	TOWER LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Lift Up Valve.	Check Harness for damage.
33108	33	108	TOWER LIFT UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Lift Up Valve.	Check Harness for damage.
33109	33	109	TOWER LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Lift Down Valve.	Check Harness for damage.
33110	33	110	TOWER LIFT DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Lift Down Valve.	Check Harness for damage.
33111	33	111	TOWER LIFT DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Lift Down Valve.	Check Harness for damage.
33112	33	112	TOWER TELESCOPE IN VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Telescope In Valve.	Check Harness for damage.
33113	33	113	TOWER TELESCOPE IN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Telescope In Valve.	Check Harness for damage.
33114	33	114	TOWER TELESCOPE IN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Telescope In Valve.	Check Harness for damage.
33115	33	115	TOWER TELESCOPE OUT VALVE - SHORT TO GROUND	There is a Short to Ground to the Tower Telescope Out Valve.	Check Harness for damage.
33116	33	116	TOWER TELESCOPE OUT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Tower Telescope Out Valve.	Check Harness for damage.
33117	33	117	TOWER TELESCOPE OUT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Tower Telescope Out Valve.	Check Harness for damage.
33118	33	118	SWING RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Swing Right Valve.	Check Harness for damage.
33119	33	119	SWING RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Swing Right Valve.	Check Harness for damage.
33120	33	120	TELESCOPE IN VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope In Valve.	Check Harness for damage.
33121	33	121	SWING RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Swing Right Valve.	Check Harness for damage.
33122	33	122	SWING LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Swing Left Valve.	Check Harness for damage.
33123	33	123	TELESCOPE OUT VALVE - SHORT TO BATTERY	There is a Short to Battery to the Main Telescope Out Valve.	Check Harness for damage.
33130	33	130	THROTTLE ACTUATOR - SHORT TO GROUND	There is a Short to Ground to the Throttle Actuator.	Check Harness for damage.
33131	33	131	THROTTLE ACTUATOR - OPEN CIRCUIT	There is an Open Circuit to the Throttle Actuator.	Check Harness for damage.
33132	33	132	THROTTLE ACTUATOR - SHORT TO BATTERY	There is a Short to Battery to the Throttle Actuator.	Check Harness for damage.

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33170	33	170	LIFT DOWN VALVE - OPEN CIRCUIT	There is a Short to Ground to the Lift Down Valve.	Check Harness for damage.
33171	33	171	LIFT DOWN VALVE - SHORT TO BATTERY	There is an Open Circuit to the Lift Down Valve.	Check Harness for damage.
33172	33	172	LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Battery to the Lift Down Valve.	Check Harness for damage.
33175	33	175	JIB ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Left Valve.	Check Harness for damage.
33176	33	176	JIB ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Left Valve.	Check Harness for damage.
33177	33	177	JIB ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Left Valve.	Check Harness for damage.
33178	33	178	JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Right Valve.	Check Harness for damage.
33179	33	179	JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Right Valve.	Check Harness for damage.
33180	33	180	JIB ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Right Valve.	Check Harness for damage.
33182	33	182	LIFT VALVES - SHORT TO BATTERY	There is a Short to Battery to the Lift Valves.	Check Harness for damage.
33186	33	186	TELESCOPE OUT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Telescope Out Valve.	Check Harness for damage.
33188	33	188	TELESCOPE OUT VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope Out Valve.	Check Harness for damage.
33189	33	189	TELESCOPE IN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Main Telescope In Valve.	Check Harness for damage.
33190	33	190	TELESCOPE IN VALVE - SHORT TO GROUND	There is a Short to Ground to the Main Telescope In Valve.	Check Harness for damage.
33207	33	207	HORN - OPEN CIRCUIT	There is an Open Circuit to the Horn.	Check Harness for damage.
33208	33	208	HORN - SHORT TO BATTERY	There is a Short to Battery to the Horn.	Check Harness for damage.
33209	33	209	HORN - SHORT TO GROUND	There is a Short to Ground to the Horn.	Check Harness for damage.
33279	33	279	GLOWPLUG - OPEN CIRCUIT	There is an Open Circuit to the Glow Plugs.	Check Harness for damage.
33280	33	280	GLOWPLUG - SHORT TO BATTERY	There is a Short to Battery to the Glow Plugs.	Check Harness for damage.
33281	33	281	GLOWPLUG - SHORT TO GROUND	There is a Short to Ground to the Glow Plugs.	Check Harness for damage.
33287	33	287	LIFT - CURRENT FEEDBACK READING TOO LOW	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized
33295	33	295	SWING LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Swing Left Valve.	Check Harness for damage.



Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33306	33	306	SWING LEFT VALVE - SHORT TO BATTERY	There is short to Battery to the Swing Left Valve.	Check Harness for damage.
33314	33	314	FLOW CONTROL VALVE - OPEN CIRCUIT	There is an Open Circuit to the Flow Control Valve.	Check Harness for damage.
33315	33	315	FLOW CONTROL VALVE - SHORT TO BATTERY	There is short to Battery to the Flow Control Valve	Check Harness for damage.
33316	33	316	FLOW CONTROL VALVE - SHORT TO GROUND	There is short to Ground to the Flow Control Valve	Check Harness for damage.
33317	33	317	DRIVE FORWARD VALVE - OPEN CIRCUIT	There is an Open Circuit to the Drive Forward Valve.	Check Harness for damage.
33318	33	318	DRIVE FORWARD VALVE - SHORT TO BATTERY	There is short to Battery to the Drive Forward Valve.	Check Harness for damage.
33319	33	319	DRIVE FORWARD VALVE - SHORT TO GROUND	There is short to Ground to the Drive Forward Valve.	Check Harness for damage.
33320	33	320	DRIVE REVERSE VALVE - OPEN CIRCUIT	There is an Open Circuit to the Drive Reverse Valve.	Check Harness for damage.
33321	33	321	DRIVE REVERSE VALVE - SHORT TO BATTERY	There is a short to Battery to the Drive Reverse Valve.	Check Harness for damage.
33322	33	322	DRIVE REVERSE VALVE - SHORT TO GROUND	There is a short to Ground to the Drive Reverse Valve.	Check Harness for damage.
33323	33	323	LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Lift Up Valve.	Check Harness for damage.
33324	33	324	LIFT UP VALVE - SHORT TO BATTERY	There is a short to Battery to the Lift Up Valve.	Check Harness for damage.
33325	33	325	LIFT UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Lift Up Valve.	Check Harness for damage.
33331	33	331	DRIVE - CURRENT FEEDBACK READING TOO LOW	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized
33410	33	410	DRIVE - CURRENT FEEDBACK READING LOST	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Drive Forward and Reverse command and revert to Open Current loop control for Drive; The UGM shall limit Drive Forward and Reverse to Creep speed after controls initialized
33412	33	412	SWING VALVES - SHORT TO BATTERY	There is a short to Battery to the Swing Valves.	Check Harness for damage.
33414	33	414	SWING - CURRENT FEEDBACK READING TOO LOW	Current feedback into controller is below threshold value.	Check wiring and coil.

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
33415	33	415	FLOW CONTROL VALVE - CURRENT FEEDBACK READING TOO LOW	The Engine State = ENGINE RUNNING; The UGM commanded current > 250mA; The difference between the commanded current and the measured feedback current > [the larger of (125mA) or (15% of the commanded function Max)] for longer than 1 second.	The UGM shall suspend Flow Control and revert to Open Current loop control for Flow Control.
33417	33	417	LIFT - CURRENT FEEDBACK READING LOST	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized.
33418	33	418	SWING - CURRENT FEEDBACK READING LOST	Current feedback into controller not detected.	Check wiring and coil.
33419	33	419	FLOW CONTROL VALVE - CURRENT FEEDBACK READING LOST	Measured feedback current < 225mA while PWM output > 40% for a period of 100ms.	The UGM shall suspend Flow Control and revert to Open Current loop control for Flow Control.
33488	33	488	SWING FLOW CONTROL VALVE - SHORT TO GROUND	There is a short to the Ground to the Swing Flow Control Valve.	Check Harness for damage.
33575	33	575	ECM PULL DOWN RESISTOR - OPEN CIRCUIT	There is an Open Circuit to the ECM Pull Down Resistor.	Check Harness for damage.
<b>340</b>	<b>34</b>	<b>0</b>	<b>&lt;&lt;&lt; PLATFORM OUTPUT DRIVER &gt;&gt;&gt;</b>		
341	34	1	PLATFORM LEVEL UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Up Valve.	Check Harness for damage.
342	34	2	PLATFORM LEVEL UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Up Valve.	Check Harness for damage.
343	34	3	PLATFORM LEVEL UP VALVE - SHORT TO GROUND	There is a Short to Ground to the Platform Level Up Valve.	Check Harness for damage.
344	34	4	PLATFORM LEVEL UP VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Platform Level Up Valve.	Check Harness for damage.
345	34	5	PLATFORM LEVEL DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Level Down Valve.	Check Harness for damage.
346	34	6	PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY	There is a short to Battery to the Platform Level Down Valve.	Check Harness for damage.
347	34	7	PLATFORM LEVEL DOWN VALVE - SHORT TO GROUND	There is a short to the Ground to the Platform Level Down Valve.	Check Harness for damage.
348	34	8	PLATFORM LEVEL DOWN VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Platform Level Down Valve.	Check Harness for damage.
349	34	9	PLATFORM ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Left Valve.	Check Harness for damage.
3410	34	10	PLATFORM ROTATE LEFT VALVE - SHORT TO BATTERY	There is a short to Battery to the Platform Rotate Left Valve.	Check Harness for damage.
3411	34	11	PLATFORM ROTATE LEFT VALVE - SHORT TO GROUND	There is a short to Ground to the Platform Rotate Left Valve.	Check Harness for damage.
3412	34	12	PLATFORM ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the Platform Rotate Right Valve.	Check Harness for damage.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
3413	34	13	PLATFORM ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a short to Battery to the Platform Rotate Right Valve.	Check Harness for damage.
3414	34	14	PLATFORM ROTATE RIGHT VALVE - SHORT TO GROUND	There is a short to Ground to the Platform Rotate Right Valve.	Check Harness for damage.
3415	34	15	JIB LIFT UP VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Up Valve.	Check Harness for damage.
3416	34	16	JIB LIFT UP VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Up Valve.	Check Harness for damage.
3417	34	17	JIB LIFT UP VALVE - SHORT TO GROUND	There is a short to Ground to the JIB Lift Up Valve.	Check Harness for damage.
3418	34	18	JIB LIFT DOWN VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Lift Down Valve.	Check Harness for damage.
3419	34	19	JIB LIFT DOWN VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Lift Down Valve.	Check Harness for damage.
3420	34	20	JIB LIFT DOWN VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Lift Down Valve.	Check Harness for damage.
3421	34	21	JIB ROTATE LEFT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Left Valve.	Check Harness for damage.
3422	34	22	JIB ROTATE LEFT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Left Valve.	Check Harness for damage.
3423	34	23	JIB ROTATE LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Left Valve.	Check Harness for damage.
3424	34	24	JIB ROTATE RIGHT VALVE - OPEN CIRCUIT	There is an Open Circuit to the JIB Rotate Right Valve.	Check Harness for damage.
3425	34	25	JIB ROTATE RIGHT VALVE - SHORT TO BATTERY	There is a Short to Battery to the JIB Rotate Right Valve.	Check Harness for damage.
3426	34	26	JIB ROTATE RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the JIB Rotate Right Valve.	Check Harness for damage.
<b>430</b>	<b>43</b>	<b>0</b>	<b>&lt;&lt;&lt; ENGINE &gt;&gt;&gt;</b>		
431	43	1	FUEL SENSOR - SHORT TO BATTERY OR OPEN CIRCUIT	The Fuel Sensor reading is > 4.3V.	Energize fuel sensor per System Indicators
432	43	2	FUEL SENSOR - SHORT TO GROUND	The Fuel Sensor reading is < 0.2V.	Energize fuel sensor per System Indicators
433	43	3	OIL PRESSURE - SHORT TO BATTERY	The Oil Pressure Sensor reading is > 6.6V.	Deutz engine only.
434	43	4	OIL PRESSURE - SHORT TO GROUND	The Oil Pressure Sensor reading is < 0.1V for more then 5 seconds.	Deutz engine only. - Not reported during engine start.
435	43	5	COOLANT TEMPERATURE - SHORT TO GROUND	The Coolant Temperature Sensor reading is < 0.1V.	Deutz engine only.
436	43	6	FORD FAULT CODE ##	All ford fault codes except 63 are simply passed through from the Ford ECM. They only occur if a Ford Engine is selected in the machine configuration digits. Can be reported during power-up sequence.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
437	43	7	ENGINE TROUBLE CODE	Displays engine SPN/FMI code.	Report and log in Help If [(MACHINE SETUP > DEUTZ EMR2) or (MACHINE SETUP > DEUTZ EMR4) and SPN:FMI = 535:7], prohibit engine cranking.
438	43	8	HIGH ENGINE TEMP	(Ford engine only) The engine temperature is > 117 C. (Deutz engine only) The engine temperature is > 130 C.	Ford / Deutz engine only.
439	43	9	AIR FILTER BYPASSED	The Air Filter is clogged.	Check Airfilter for clogging
4310	43	10	NO ALTERNATOR OUTPUT	Battery voltage is < 11.5 volts for more than 15 seconds after engine start.	Activate the No Charge indicator J4-26 per System Indicators.
4311	43	11	LOW OIL PRESSURE	(Ford engine only) The ECM has reported a low oil pressure fault. (Deutz engine only) Oil pressure is < 8 PSI for more than 10 seconds after engine start.	Ford / Deutz engine only.
4312	43	12	485 COMMUNICATIONS LOST	This fault only occurs with a Ford Engine. It occurs when no response are received from the ECM for 2.5 seconds. Can be reported during power-up sequence.	
4313	43	13	THROTTLE ACTUATOR FAILURE	The engine RPM is > XXX for more than XX seconds.	
4314	43	14	WRONG ENGINE SELECTED - ECM DETECTED	A ECM was detected with a non- ECM type engine selected.	
4322	43	22	LOSS OF ENGINE SPEED SENSOR	The engine RPM sensor indicates 0 RPM AND the Oil Pressure Sensor indicates > 8 PSI for three seconds.	Diesel engine only.
4323	43	23	SPEED SENSOR READING INVALID SPEED	The engine RPM sensor indicates > 4000 RPM.	Diesel engine only.
4331	43	31	SOOT LOAD WARNING - LOW	SPN/FMI 3719 / 16 3703 / 31	Check Engine.
4332	43	32	SOOT LOAD WARNING - HIGH	SPN/FMI 3719 / 0 3714 / 31	Check Engine.
4333	43	33	SOOT LOAD WARNING - SEVERE	SPN/FMI 3715 / 31	Check Engine.
4334	43	34	ENGINE COOLANT - LOW LEVEL	MACHINE SETUP > ENGINE = DEUTZ EMR4; ECM transmits a J1939 DM1 message for an engine coolant low level fault (SPN:FMI 111:1) on CAN2 or uses the J1939 Transport Protocol every one second to send this information if multiple engine faults exist.	MACHINE SETUP > ENGINE SHUTDOWN = ENABLED then shutdown the engine; Activate High Engine Temperature indicator J4-28.
<b>440</b>	<b>44</b>	<b>0</b>	<b>&lt;&lt;&lt; BATTERY SUPPLY &gt;&gt;&gt;</b>		
441	44	1	BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN	Battery voltage is < 9V.	
442	44	2	BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN	Battery voltage is > 16V.	
445	44	5	BATTERY VOLTAGE LOW	Battery voltage is < 11V for more than 5 seconds.	

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
<b>660</b>	<b>66</b>	<b>0</b>	<b>&lt;&lt;&lt;COMMUNICATION&gt;&gt;&gt;</b>		
662	66	2	CANBUS FAILURE - PLATFORM MODULE	Platform Module CAN communication lost.	
664	66	4	CANBUS FAILURE - ACCESSORY MODULE	The accessory module is not receiving CAN messages. This is probably due to wiring problem.	Check the Wiring.
666	66	6	CANBUS FAILURE - ENGINE CONTROLLER	Engine Control Module CAN	ECM equipped engine only.
6620	66	20	CANBUS FAILURE - UMS SENSOR	communication lost.	
6622	66	22	CANBUS FAILURE - TCU MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6623	66	23	CANBUS FAILURE - GATEWAY MODULE	Machine Setup/ Telematics=YES, No device heartbeat for 30 sec	
6629	66	29	CANBUS FAILURE - TELEMATICS CANBUS LOADING TOO HIGH		
6657	66	57	CANBUS FAILURE - TEMPERATURE SENSOR	MACHINE SETUP > TEMP CUTOUT = YES; UGM does not receive any CAN messages from the Ambient Temperature sensor in 250ms	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation.
671	67	1	ACCESSORY FAULT		
<b>680</b>	<b>68</b>	<b>0</b>	<b>&lt;&lt;&lt;TELEMATICS&gt;&gt;&gt;</b>		
681	68	1	REMOTE CONTRACT MANAGEMENT OVERRIDE - ALL FUNCTIONS IN CREEP		
<b>810</b>	<b>81</b>	<b>0</b>	<b>&lt;&lt;&lt;TILT SENSOR&gt;&gt;&gt;</b>		
813	81	3	CHASSIS TILT SENSOR NOT CALIBRATED	The Chassis Tilt Sensor has not been calibrated.	
815	81	5	CHASSIS TILT SENSOR DISAGREEMENT		
816	81	6	UMS SENSOR NOT CALIBRATED	The Control System detects a sensor out of range condition or a not calibrated fault with UMS angle sensor	
817	81	7	UMS SENSOR FAULT	The system detects that the UMS sensor frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% Range	
<b>820</b>	<b>82</b>	<b>0</b>	<b>&lt;&lt;&lt;PLATFORM LOAD SENSE&gt;&gt;&gt;</b>		
825	82	5	LSS HAS NOT BEEN CALIBRATED	The Load Sensing System Module has not been calibrated.	UGM to set Platform Load State = Overloaded

## SECTION 6 - JLG CONTROL SYSTEM

**Table 6-13. Diagnostic Trouble Code Chart**

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
826	82	6	RUNNING AT CREEP - PLATFORM OVERLOADED	All functions at creep, the Load Sensing System indicates the Platform is overloaded AND is configured to warn only while the Platform is overloaded.	
827	82	7	DRIVE & BOOM PREVENTED - PLATFORM OVERLOADED	Driving and boom functions are not possible while the Load Sensing System indicates the Platform is overloaded AND is configured to prevent drive and boom functions while the Platform is overloaded.	
828	82	8	LIFT UP & TELE OUT PREVENTED - PLATFORM OVERLOADED	Lift up and telescope out are not possible while the Load Sensing System indicates the Platform is overloaded AND is configured to prevent Lift up and telescope out while the Platform is overloaded.	
8639	86	39	FRONT LEFT STEER VALVE - OPEN CIRCUIT	There is an open circuit to the Front Left Steer Valve	Check Harness for damage.
8640	86	40	FRONT LEFT STEER VALVE - SHORT TO BATTERY	There is a short to Battery to the Front Left Steer Valve	Check Harness for damage.
8641	86	41	FRONT LEFT STEER VALVE - SHORT TO GROUND	There is a short to Ground to the Front Left Steer Valve	Check Harness for damage.
8642	86	42	FRONT RIGHT STEER VALVE - OPEN CIRCUIT	There is an open circuit to the Front Right Steer Valve	Check Harness for damage.
8643	86	43	FRONT RIGHT STEER VALVE - SHORT TO BATTERY	There is a short to Battery to the Front Right Steer Valve	Check Harness for damage.
8644	86	44	FRONT RIGHT STEER VALVE - SHORT TO GROUND	There is a short to Ground to the Front Right Steer Valve	Check Harness for damage.
8645	86	45	REAR LEFT STEER VALVE - OPEN CIRCUIT	There is an open circuit to the Rear Left Steer Valve	Check Harness for damage.
8646	86	46	REAR LEFT STEER VALVE - SHORT TO BATTERY	There is a short to Battery to the Rear Left Steer Valve	Check Harness for damage.
8647	86	47	REAR LEFT STEER VALVE - SHORT TO GROUND	There is a short to Ground to the Rear Left Steer Valve	Check Harness for damage.
8648	86	48	REAR RIGHT STEER VALVE - OPEN CIRCUIT	There is an open circuit to the Rear Right Steer Valve	Check Harness for damage.
8649	86	49	REAR RIGHT STEER VALVE - SHORT TO BATTERY	There is a short to Battery to the Rear Right Steer Valve	Check Harness for damage.
8650	86	50	REAR RIGHT STEER VALVE - SHORT TO GROUND	There is a short to Ground to the Rear Right Steer Valve	Check Harness for damage.
871	87	1	RETURN FILTER BYPASSED	Hydraulic Return Filter Clogged	Check Hydraulic Return Filter.
872	87	2	CHARGE PUMP FILTER BYPASSED	Charge Pump Filter Clogged	Check Charge Pump Filter.
873	87	3	MACHINE SAFETY SYSTEM OVERRIDE OCCURRED	MSSO = Active	Response described in MSSO Influence on Machine Operation section.

Table 6-13. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
998	99	8	EEPROM FAILURE - CHECK ALL SETTINGS	The Ground Module has reported an EEPROM failure.	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start); reset the section of EEPROM where the failure occurred to defaults.
9910	99	10	FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER	The Platform Module software version is not compatible with the rest of the system.	Activate the platform alarm continuously Creep mode is active If Platform Mode is active, disable all Drive, Steer, and Boom functions and do not permit Machine Enable.
9914	99	14	PLATFORM MODULE SOFTWARE UPDATE REQUIRED	The Platform Module software requires an update.	
9915	99	15	CHASSIS TILT SENSOR NOT GAIN CALIBRATED	The Chassis Tilt Sensor gain calibration has been lost.	
9916	99	16	CHASSIS TILT SENSOR GAIN OUT OF RANGE	The Chassis Tilt Sensor gain calibration has become corrupted.	
9919	99	19	GROUND SENSOR REF VOLTAGE OUT OF RANGE	The Ground Module has reported that its sensor reference voltage is outside acceptable range.	Not reported during power-up.
9920	99	20	PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	The Platform Module has reported that its sensor reference voltage is outside acceptable range.	Not reported during power-up.
9921	99	21	GROUND MODULE FAILURE - HIGH SIDE DRIVER CUTOUT FAULTY	The Ground Module has reported that its high side driver cutout failed.	
9922	99	22	PLATFORM MODULE FAILURE - HWFS CODE 1	The Platform Module has reported that the V(Low) FET has failed.	
9923	99	23	GROUND MODULE FAILURE - HWFS CODE 1	The Ground Module has reported that the V(Low) FET has failed.	
9924	99	24	FUNCTIONS LOCKED OUT - MACHINE NOT CONFIGURED	The machine is powered up and no model has been selected yet in the MACHINE SETUP menu	Display ??? or NO MODEL at Analyzer MACHINE SETUP menu MACHINE SETUP->MODEL NUMBER Do not report any other faults Disable all machine and engine functions (i.e., command engine shutdown and do not permit start).
9944	99	44	CURRENT FEEDBACK GAINS OUT OF RANGE	The factory set current feedback gains are out of range.	A gain of 1 is used for the factory gain(s) that was out of range; all functions shall be placed in Creep mode.

**Table 6-13. Diagnostic Trouble Code Chart**

<b>DTC</b>	<b>Flash Code</b>	<b>Sequence</b>	<b>Fault Message</b>	<b>Fault Description</b>	<b>Check</b>
9945	99	45	CURRENT FEEDBACK CALIBRATION CHECKSUM INCORRECT	The factory set current feedback checksum is not correct.	
9979	99	79	FUNCTIONS LOCKED OUT - GROUND MODULE SOFTWARE VERSION IMPROPER	Temporary fault for the telematics project. The model needs to be a 600S or 1350S if not this fault will be generated and Platform controls will be prevented. This fault was to ensure that the software will only work for these two models.	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start).

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## SECTION 7. BASIC ELECTRICAL INFORMATION & SCHEMATICS

### 7.1 GENERAL

This section contains basic electrical information and schematics to be used for locating and correcting most of the operating problems which may develop.

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

### 7.2 MULTIMETER BASICS

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

#### Grounding

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

#### Backprobing

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

#### Min/Max

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

#### Polarity

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

#### Scale

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

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

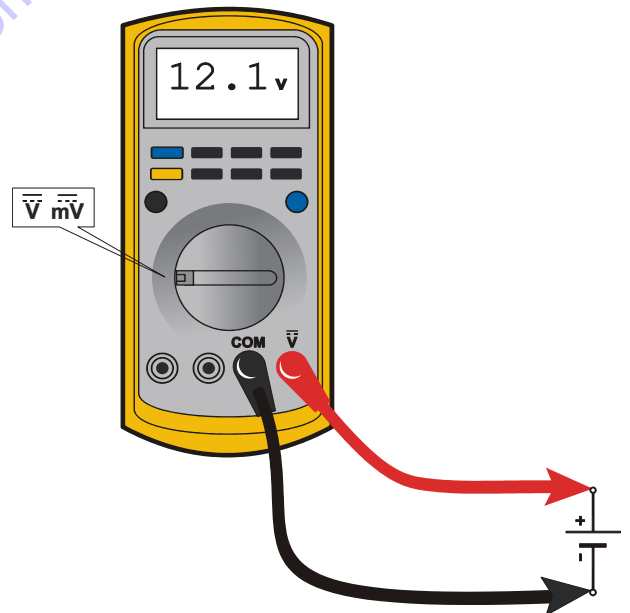
m = milli = (Displayed Number) / 1,000

$\mu$  = micro = (Displayed Number) / 1,000,000

Example: 1.2 kW = 1200 W

Example: 50 mA = 0.05 A

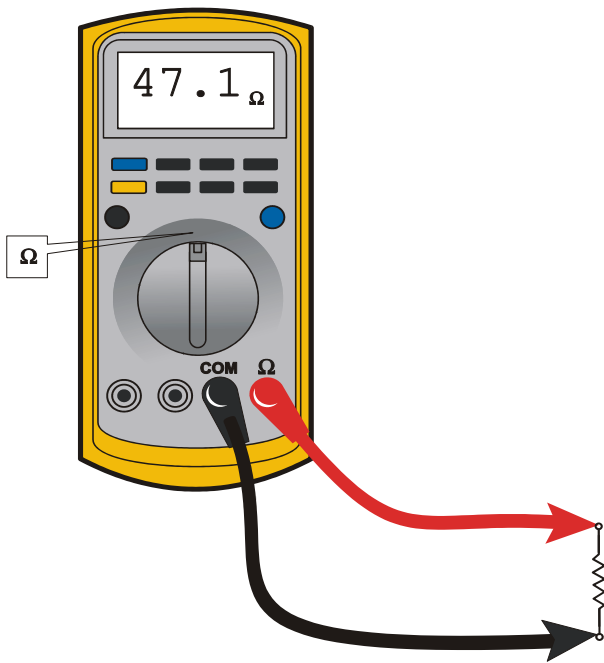
#### Voltage Measurement



**Figure 7-1. Voltage Measurement (DC)**

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

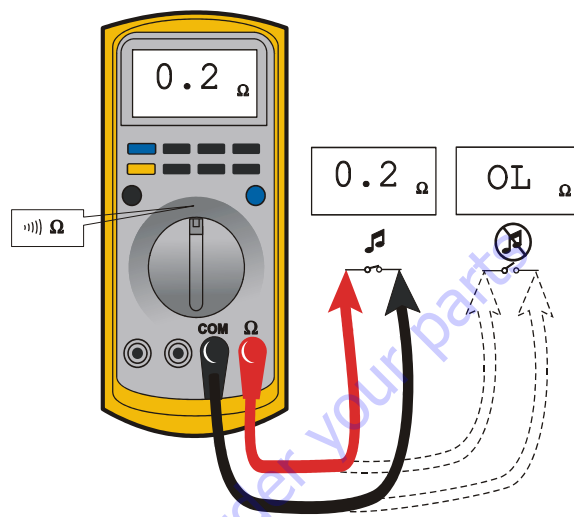
### Resistance Measurement



**Figure 7-2. Resistance Measurement**

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

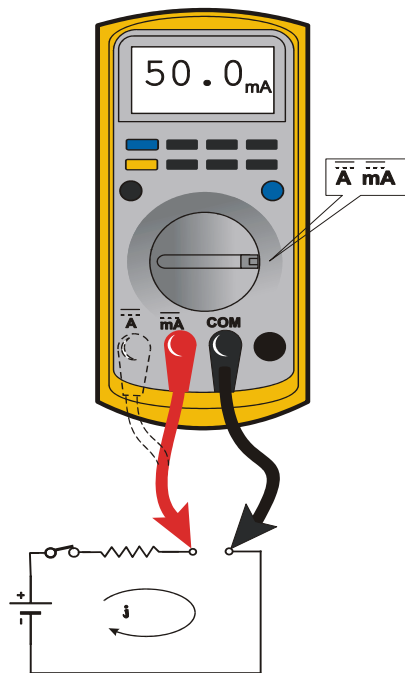
### Continuity Measurement



**Figure 7-3. Continuity Measurement**

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

## Current Measurement



**Figure 7-4. Current Measurement (DC)**

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

## 7.3 APPLYING SILICONE DIELECTRIC COMPOUND TO ELECTRICAL CONNECTIONS

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

### NOTICE

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

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

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

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

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

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

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

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

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

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

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

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

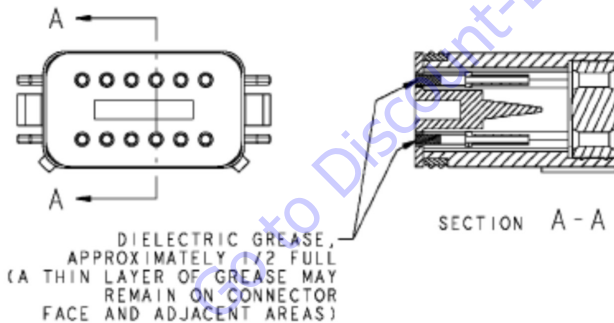
When applied to electrical connections, dielectric grease helps to prevent corrosion of electrical contacts and improper conductivity between contacts from moisture intrusion. Open and sealed connectors benefit from the application of dielectric grease.

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

**Installation of Dielectric Grease**

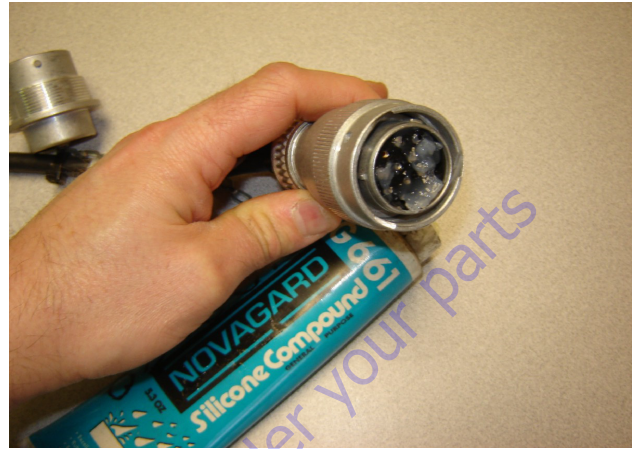
Before following these instructions, refer to excluded connector types (See Exclusions below).

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



**Deutsch HD, DT, DTM, DRC Series**

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



**AMP Seal**

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

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

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



**Figure 7-5. Application to Male Contacts**



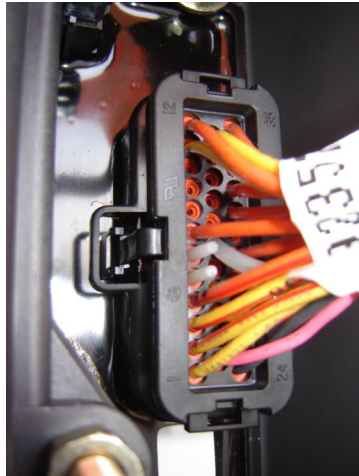


Figure 7-6. Use of Seal Plugs

### DIN Connectors

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



### AMP Mate-N-Lok

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



**Exclusions**

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

**BRAD HARRISON / PHOENIX CONTACT M12**

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



Figure 7-7. Brad-Harrison M12



Figure 7-8. Phoenix Contact M12

**AMP JUNIOR TIMER**

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



**SEALED ENCLOSURES**

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



**MIL-C-5015 SPEC CONNECTOR'S**

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



**MOLEX CMC SERIES CONNECTORS**

The CMC connector family is a sealed, high-density connection system using matte-seal technology for CP 0.635 and 1.50 mm terminals. To guarantee IP6K7 and IP6K9 sealing, a seal plug option is used. However, the low-force contacts cannot displace dielectric grease and create electrical contact. It is possible to use solvents (i.e. contact cleaner or mineral spirits) for the removal of improperly applied dielectric grease. The flexbox control modules from JDES employ this connector system (for example).



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## 7.4 AMP CONNECTOR

### Applying Silicone Dielectric Compound to AMP Connectors

Silicone Dielectric Compound must be used on the AMP connections for the following reasons:

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

Use the following procedure to apply Silicone Dielectric Compound to the electrical connectors.

1. To prevent oxidation and low level conductivity, silicone dielectric grease must be packed completely around male and female pins on the inside of the connector after the mating of the housing to the header. This is easily achieved by using a syringe to fill the header with silicone dielectric compound, to a point just above the top of the male pins inside the header. When assembling the housing to the header, it is possible that the housing will become air locked, thus preventing the housing latch from engaging.
2. Pierce one of the unused wire seals to allow the trapped air inside the housing to escape.
3. Install a hole plug into this and/or any unused wire seal that has silicone dielectric compound escaping from it.

### Assembly

Check to be sure the wedge lock is in the open, or as-shipped, position (See Figure 7-9.). Proceed as follows:

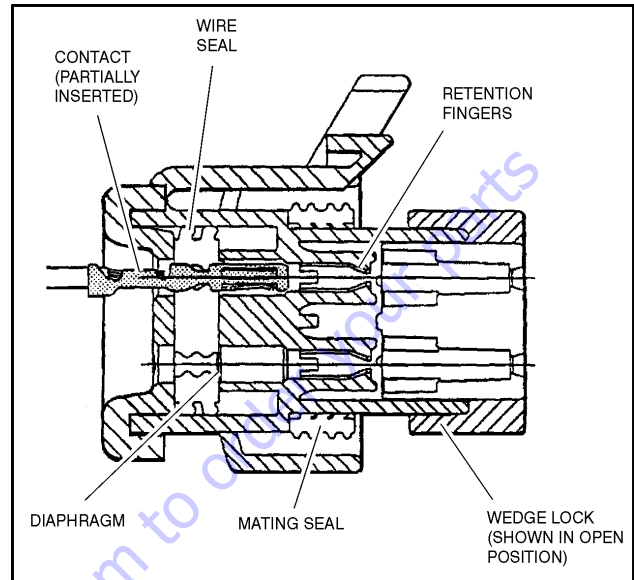


Figure 7-9. Connector Assembly Figure 1

1. To insert a contact, push it straight into the appropriate circuit cavity as far as it will go (See Figure 7-11.).
2. Pull back on the contact wire with a force of 1 or 2 lbs. to be sure the retention fingers are holding the contact (See Figure 7-11.).

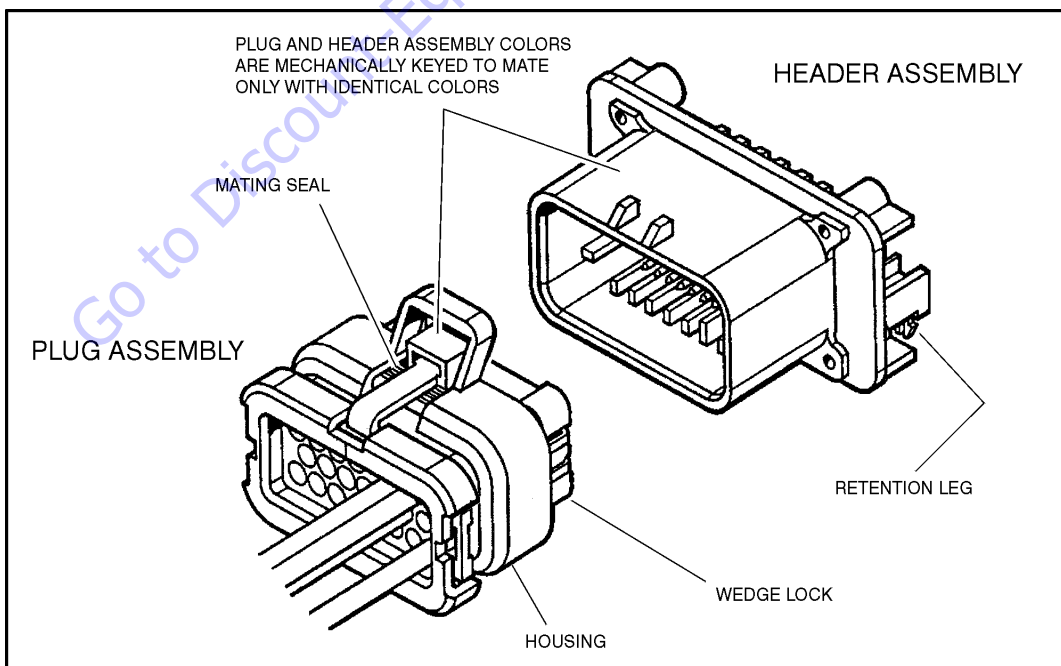


Figure 7-10. AMP Connector

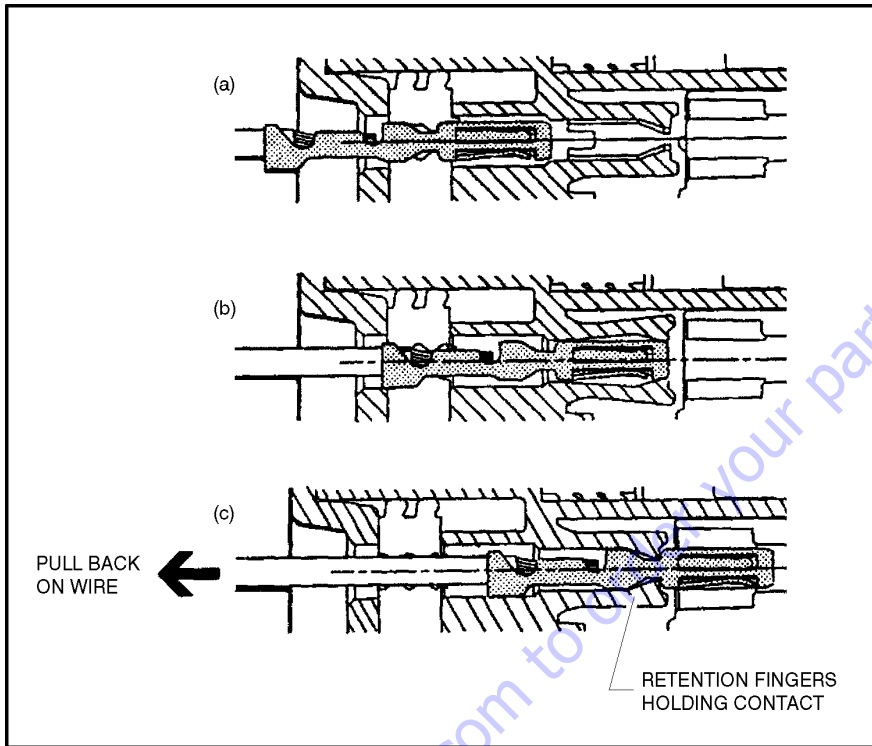


Figure 7-11. Connector Assembly Figure 2

3. After all required contacts have been inserted, the wedge lock must be closed to its locked position. Release the locking latches by squeezing them inward (See Figure 7-12.).

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

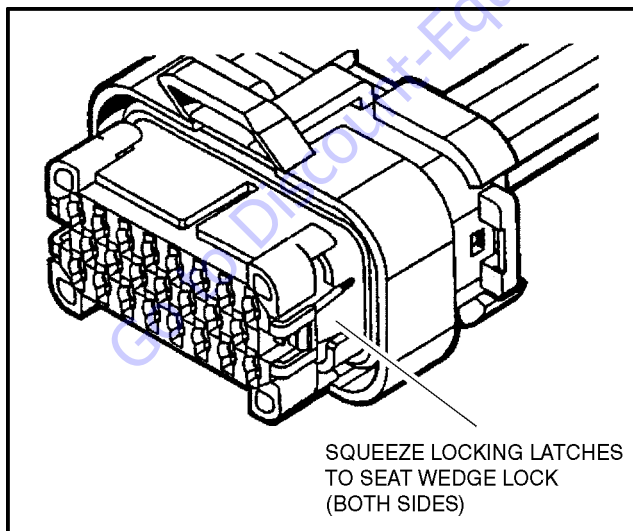


Figure 7-12. Connector Assembly Figure 3

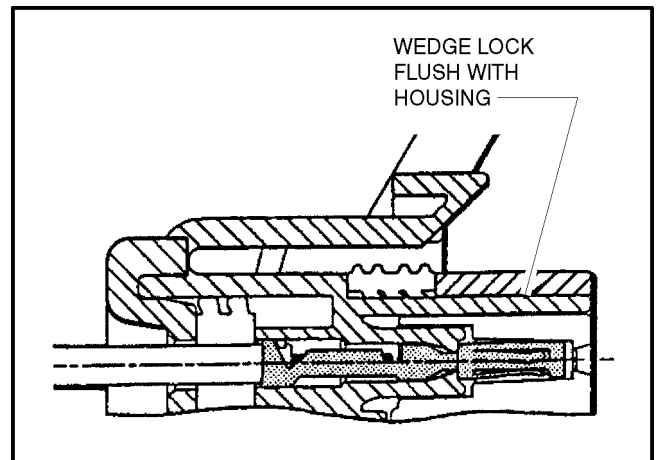


Figure 7-13. Connector Assembly Figure 4

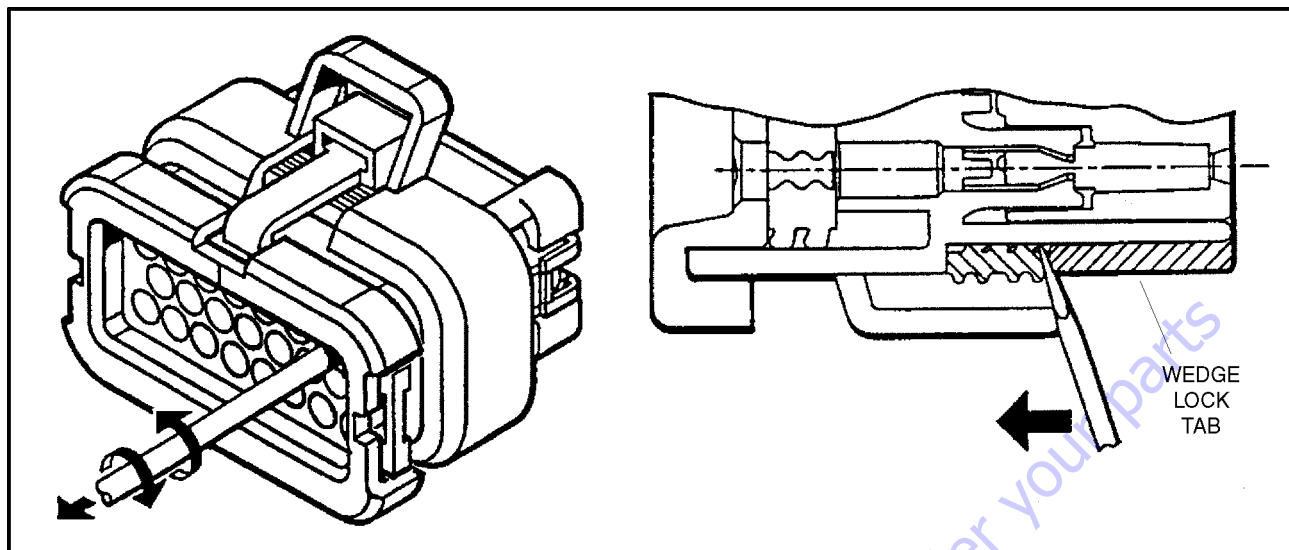


Figure 7-14. Connector Disassembly

### Disassembly

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

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

### Wedge Lock

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

### Service - Voltage Reading

#### **NOTICE**

**DO NOT PIERCE WIRE INSULATION TO TAKE VOLTAGE READINGS.**

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

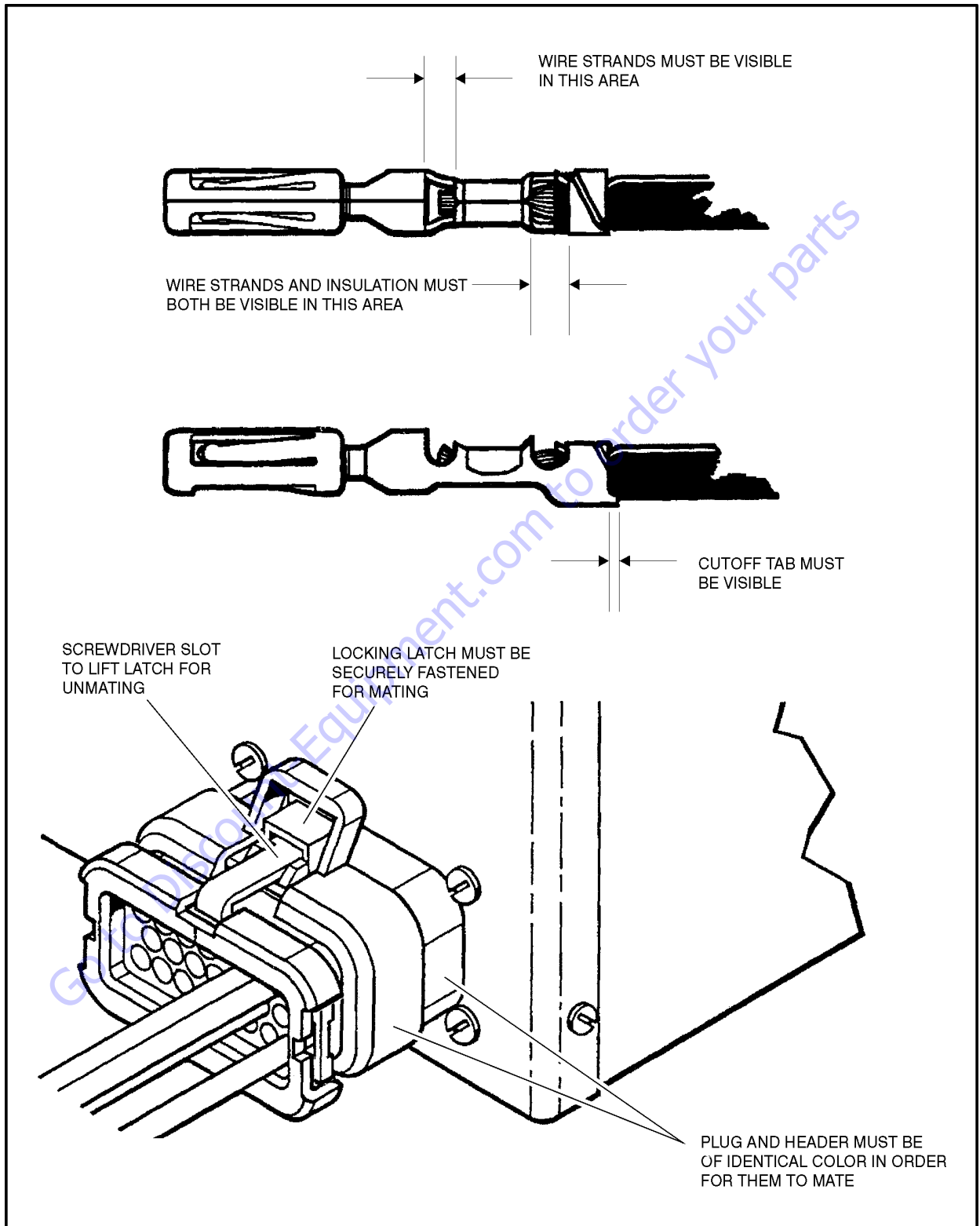


Figure 7-15. Connector Installation

## 7.5 DEUTSCH CONNECTORS

### DT/DTP Series Assembly

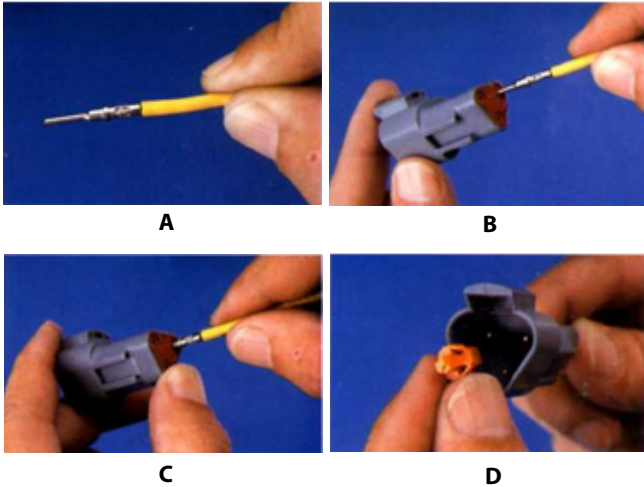


Figure 7-16. DT/DTP Contact Installation

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

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

### DT/DTP Series Disassembly

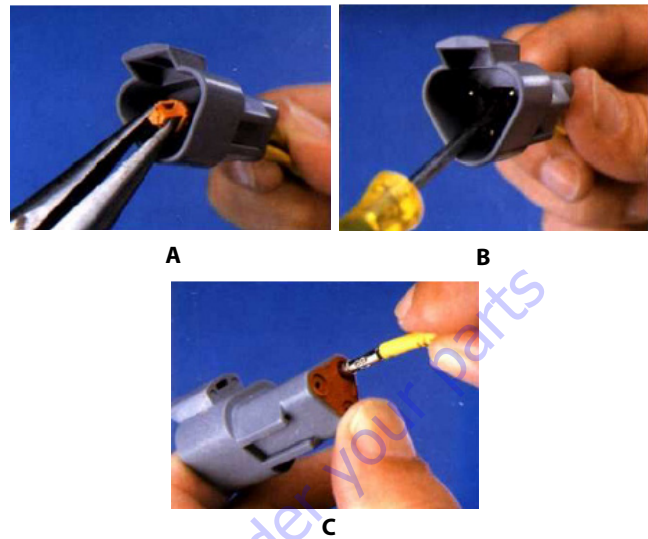
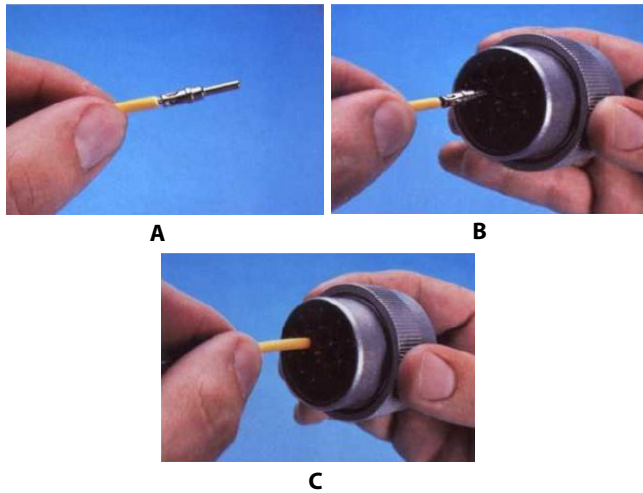


Figure 7-17. DT/DTP Contact Removal

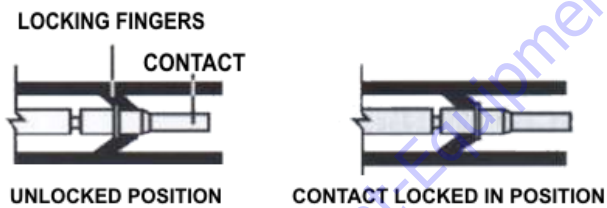
5. Remove wedgelock using needle nose pliers or a hook shaped wire to pull wedge straight out.
6. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.
7. Hold the rear seal in place, as removing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

**HD30/HDP20 Series Assembly**



**Figure 7-18. HD/HDP Contact Installation**

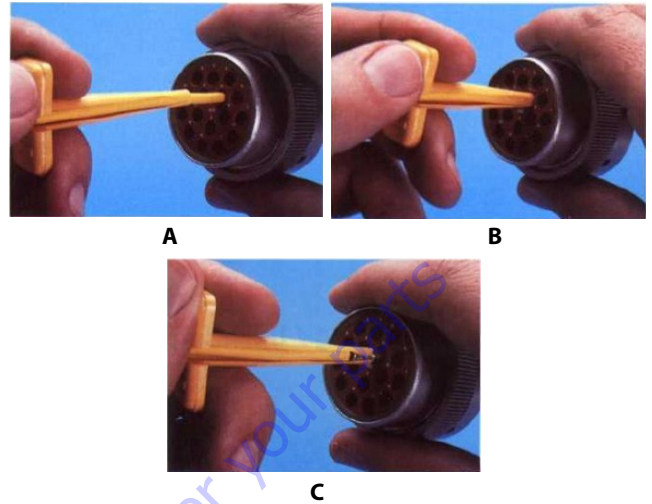
8. Grasp contact about 25mm behind the contact crimp barrel.
9. Hold connector with rear grommet facing you.
10. Push contact straight into connector grommet until a positive stop is felt. A slight tug will confirm that it is properly locked in place.



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

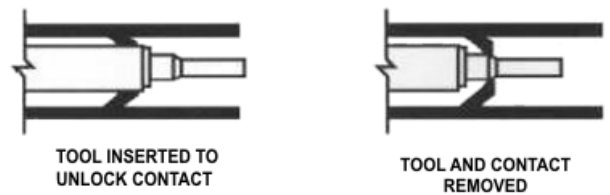
**NOTE:** For unused wire cavities, insert sealing plugs for full environmental sealing.

**HD30/HDP20 Series Disassembly**



**Figure 7-20. HD/HDP Contact Removal**

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



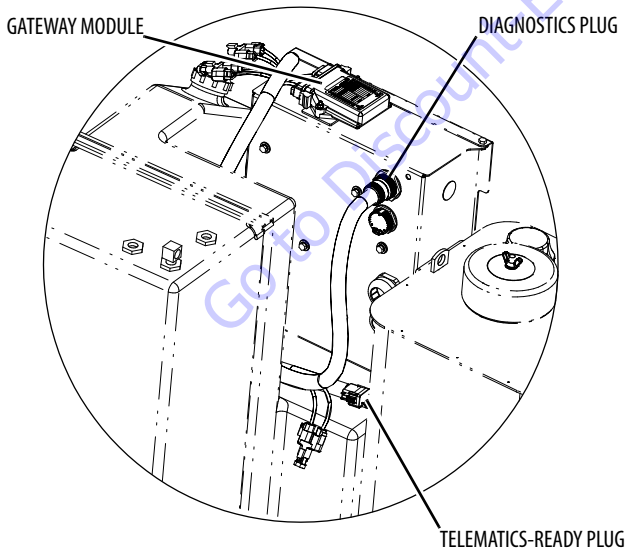
**Figure 7-21. HD/HDP Unlocking Contacts**

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

**7.6 TELEMATICS GATEWAY**

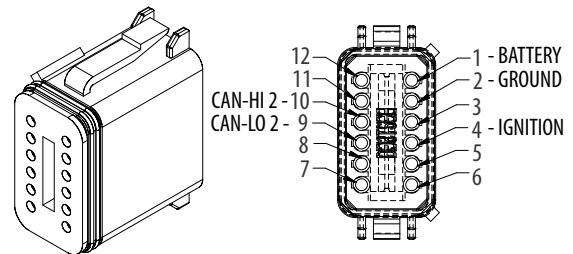
Personnel using machines equipped with an optional telematics gateway will be able to view the following data through their telematics device:

JLG LABEL	DESCRIPTION	UNIT
Engine Speed	Actual engine speed.	RPM
DEF Tank Level (If Equipped)	Indicates the level of DEF (diesel exhaust fluid) within the DEF tank if the machine is equipped with DEF tank. <ul style="list-style-type: none"> <li>• 0% = Empty</li> <li>• 100% = Full</li> </ul>	Percentage (%)
JLG Machine Faults: Active / Not-Active	<ul style="list-style-type: none"> <li>• 00 - No Machine Faults</li> <li>• 01 - Active Machine Fault</li> <li>• 10 - Error</li> <li>• 11 - Not available</li> </ul>	Bit
Total Idle Fuel Used	Total amount of fuel used during vehicle operation during idle conditions.	Liters
Total Idle Hours	Total time of engine operation during idle conditions.	Seconds
Total Engine Hours	Total time of engine operation.	Seconds
Total Fuel Used	Total amount of fuel used during vehicle operation.	Liters
Fuel Rate	Amount of fuel consumed by engine per unit of time.	Liters/Hour
Fuel Level	Ratio of fuel volume to the total volume of the fuel storage container. When a low fuel limit switch is present, the fuel level will indicate "full" until the switch opens, which will then indicate 10% fuel remaining.  When Fuel Level 2 (SPN 38) is not used, Fuel Level 1 represents the total fuel in all fuel storage containers. When Fuel Level 2 is used, Fuel Level 1 represents the fuel level in the primary or left side fuel storage container.	Percentage (%)
DM1 Engine Faults	Shows actual engine fault codes.	N/A



**Telematics-Ready (TCU) Plug**

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





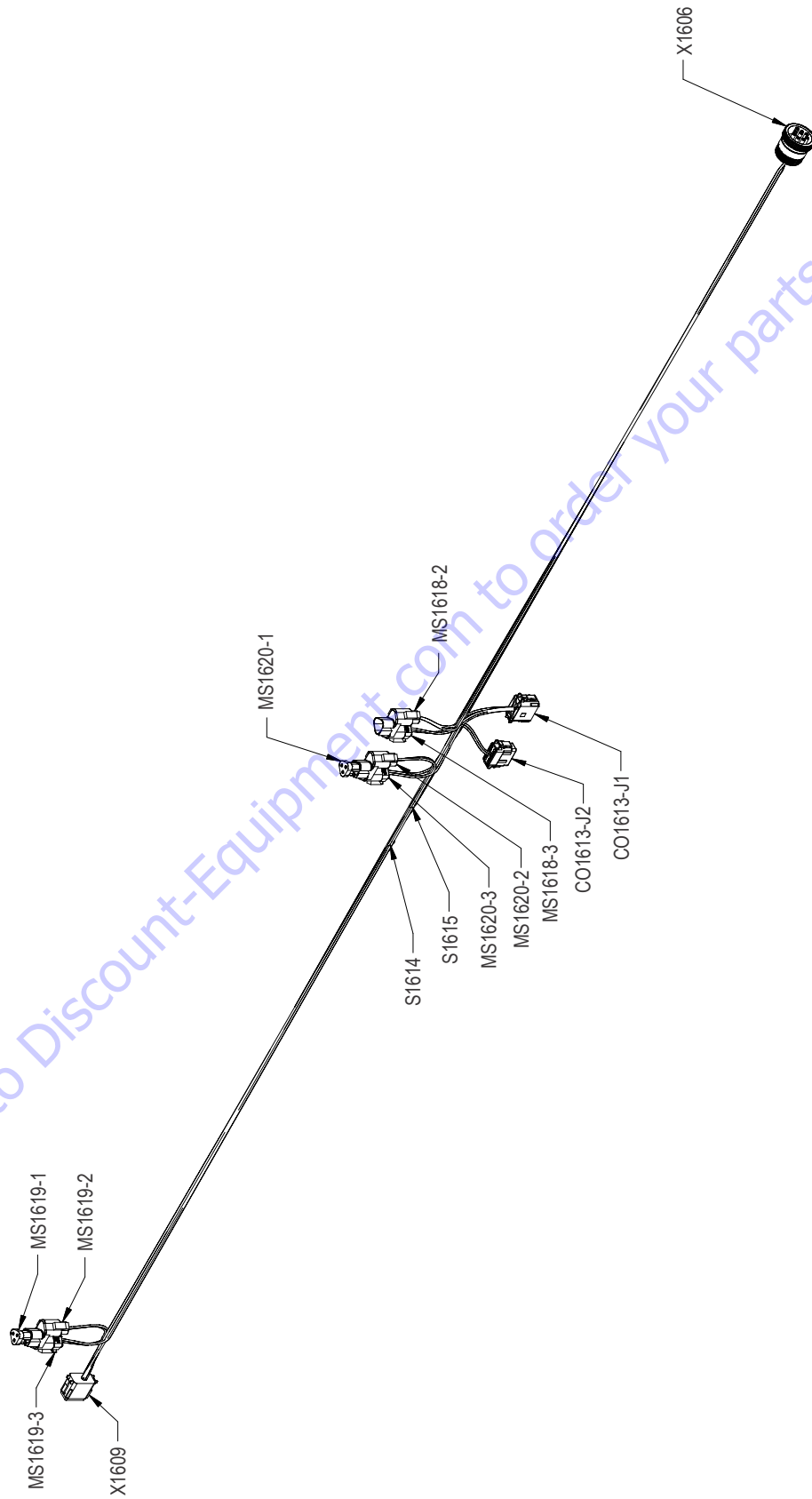


Figure 7-22. Telematics Gateway Harness - Sheet 1 of 3



**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**

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

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

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

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

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

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

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

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

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

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

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

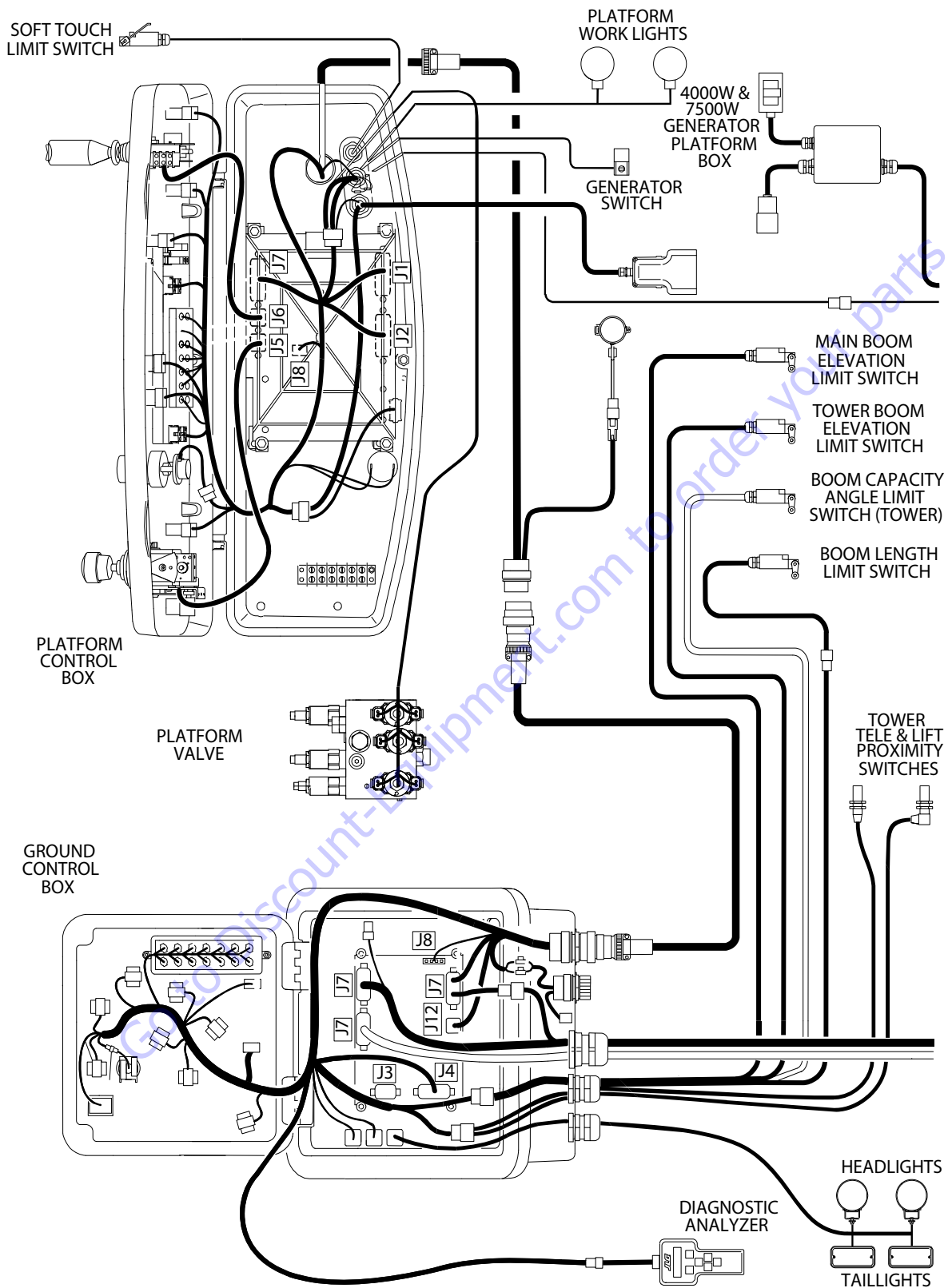
X1606 (DIAG)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	BLK	0-1 GND	16 AWG	GXL	S1615 (2)
B	RED	1-0 BAT	16 AWG	GXL	X1609 (1)
C	YEL	CANH1	18 AWG	GXL	MS1618-3 (A)
D	GRN	CANL1	18 AWG	GXL	MS1618-3 (B)
H	ORN	2-1 IGN	16 AWG	GXL	S1614 (2)

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

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

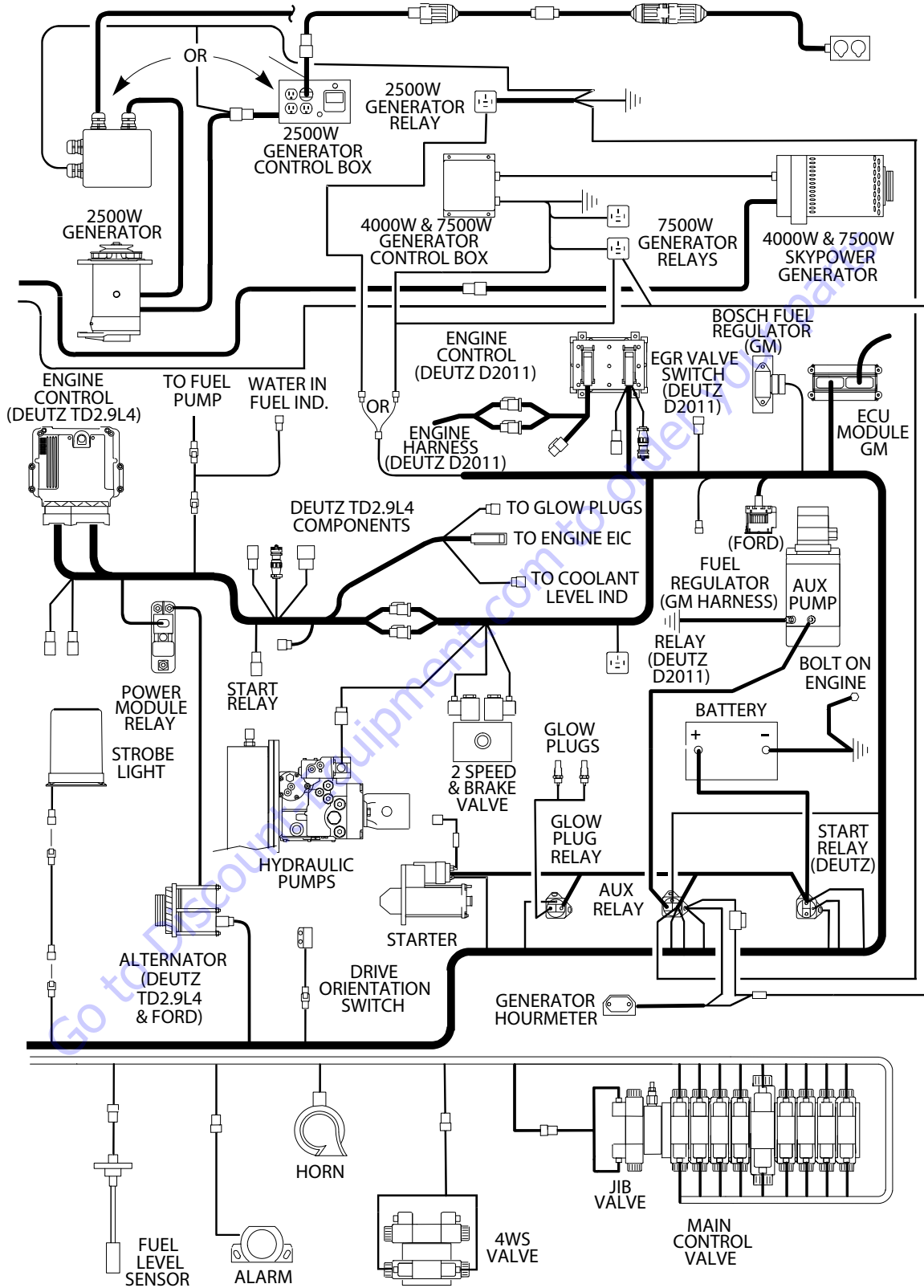
Figure 7-24. Telematics Gateway Harness - Sheet 3 of 3

**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**



MAE19440

**Figure 7-25. Electrical Components Installation - Sheet 1 of 2**



MAE19450

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

7.7 ELECTRICAL SCHEMATIC

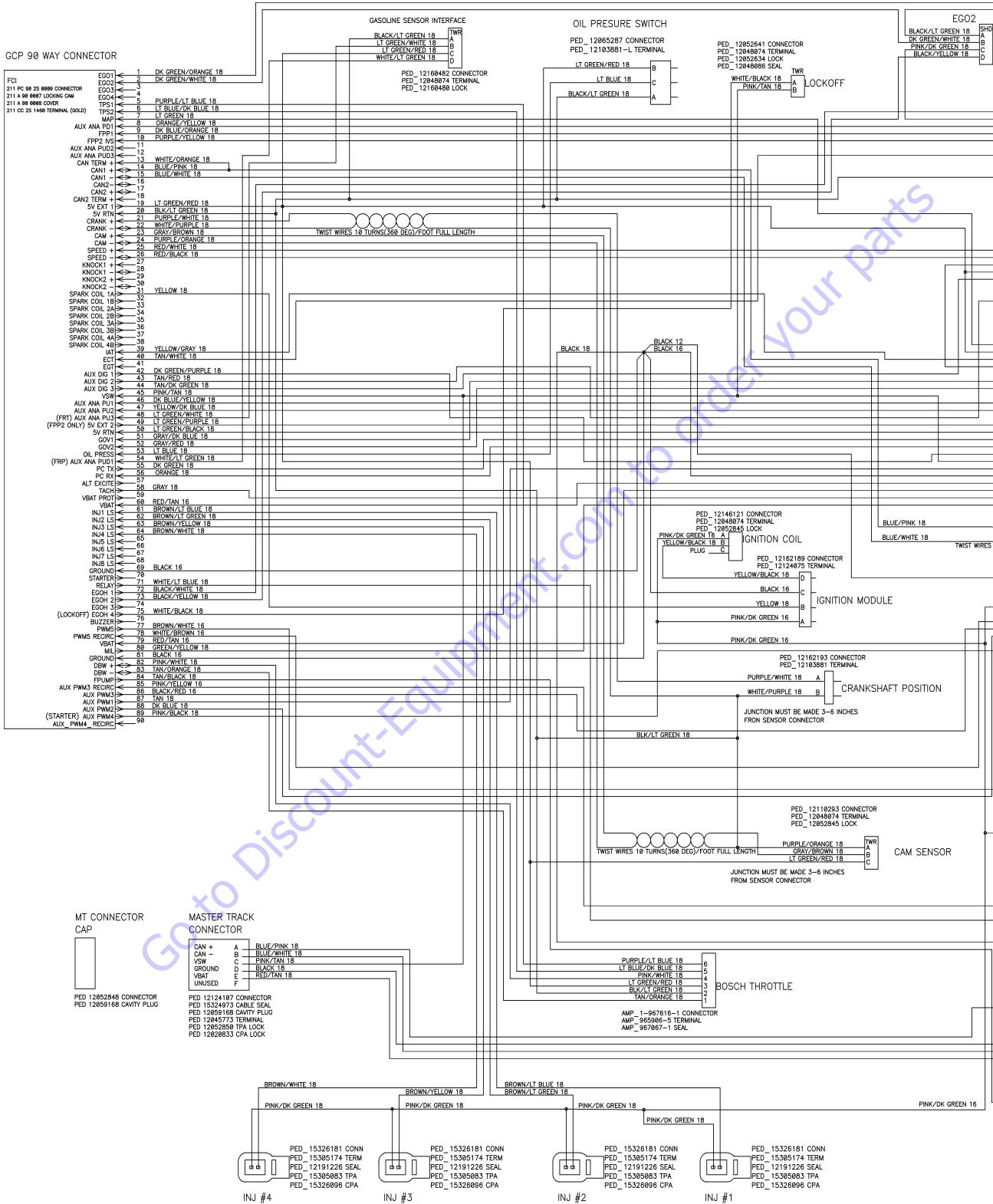


Figure 7-27. Electrical Schematic GM - Sheet 1 of 2

SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

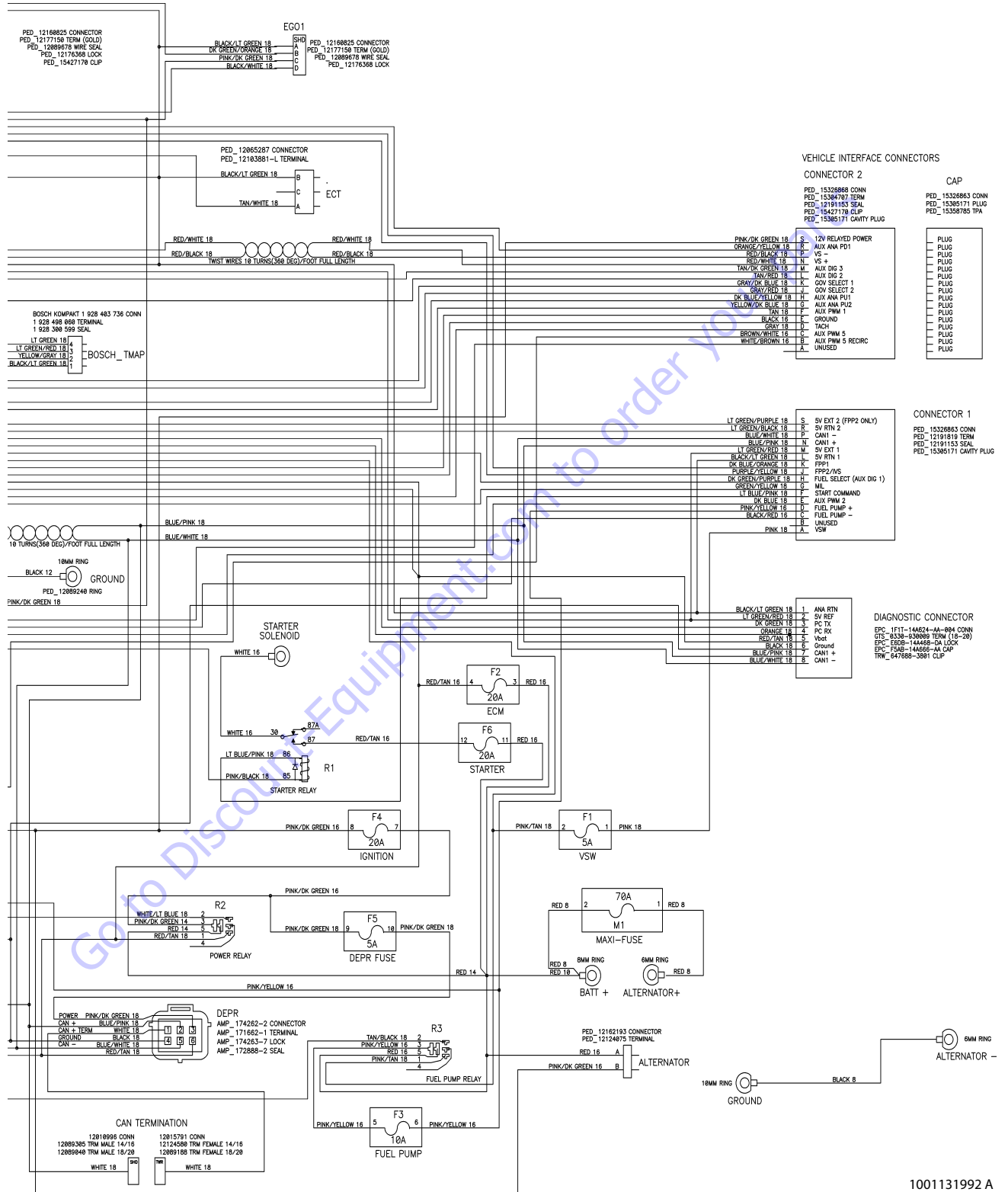
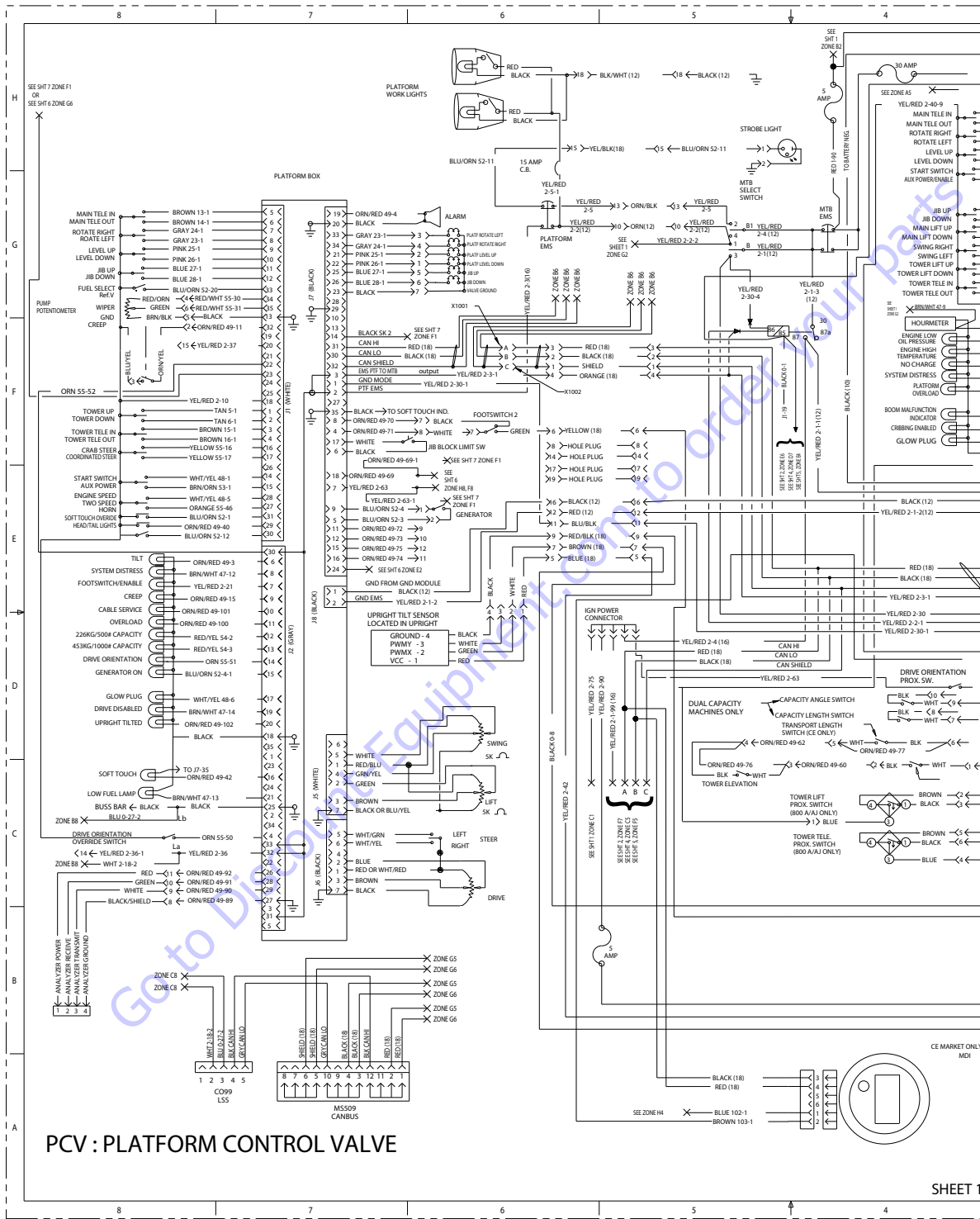


Figure 7-28. Electrical Schematic GM - Sheet 2 of 2

**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**



**Figure 7-29. Electrical Schematic - Sheet 1 of 13**

SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

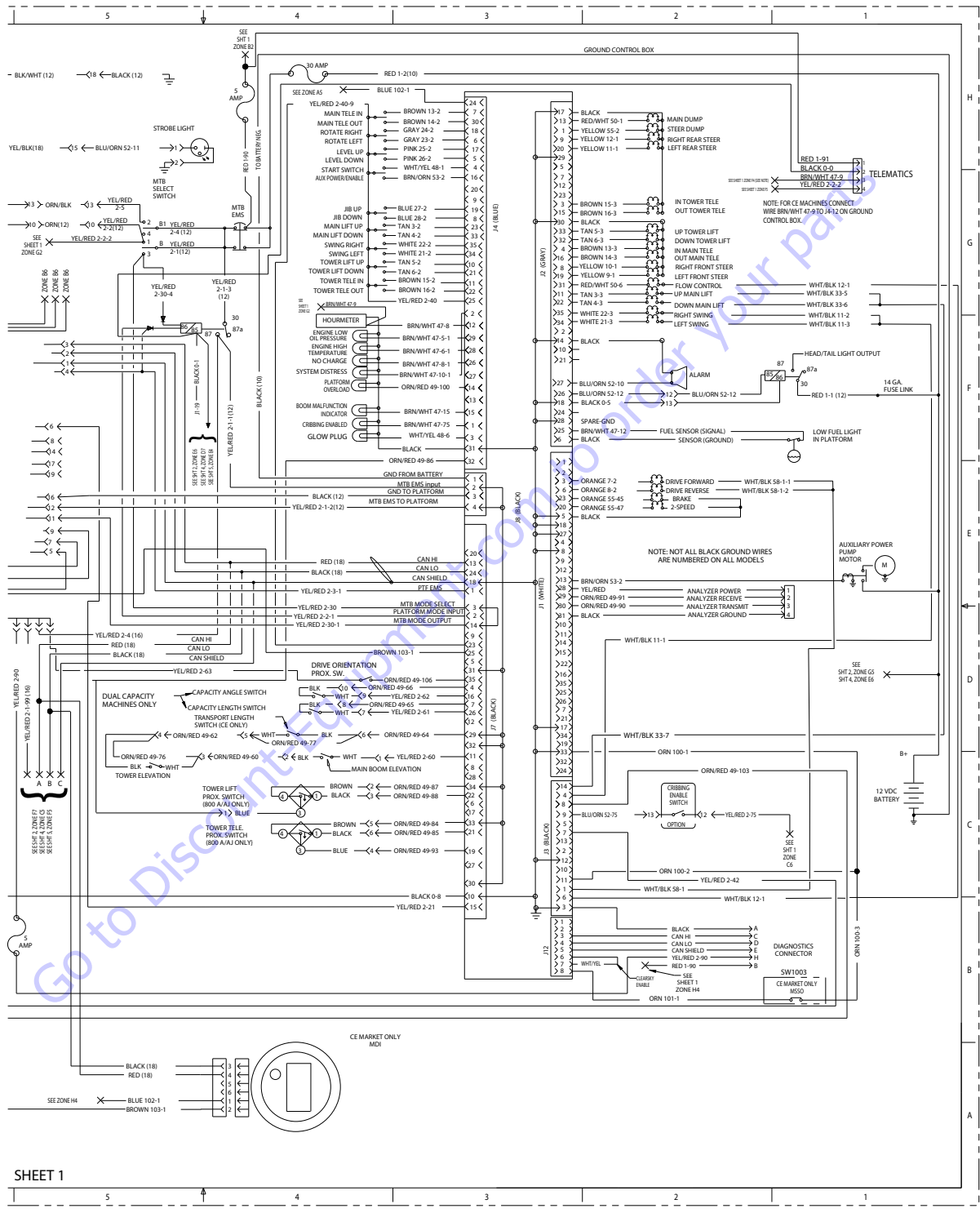
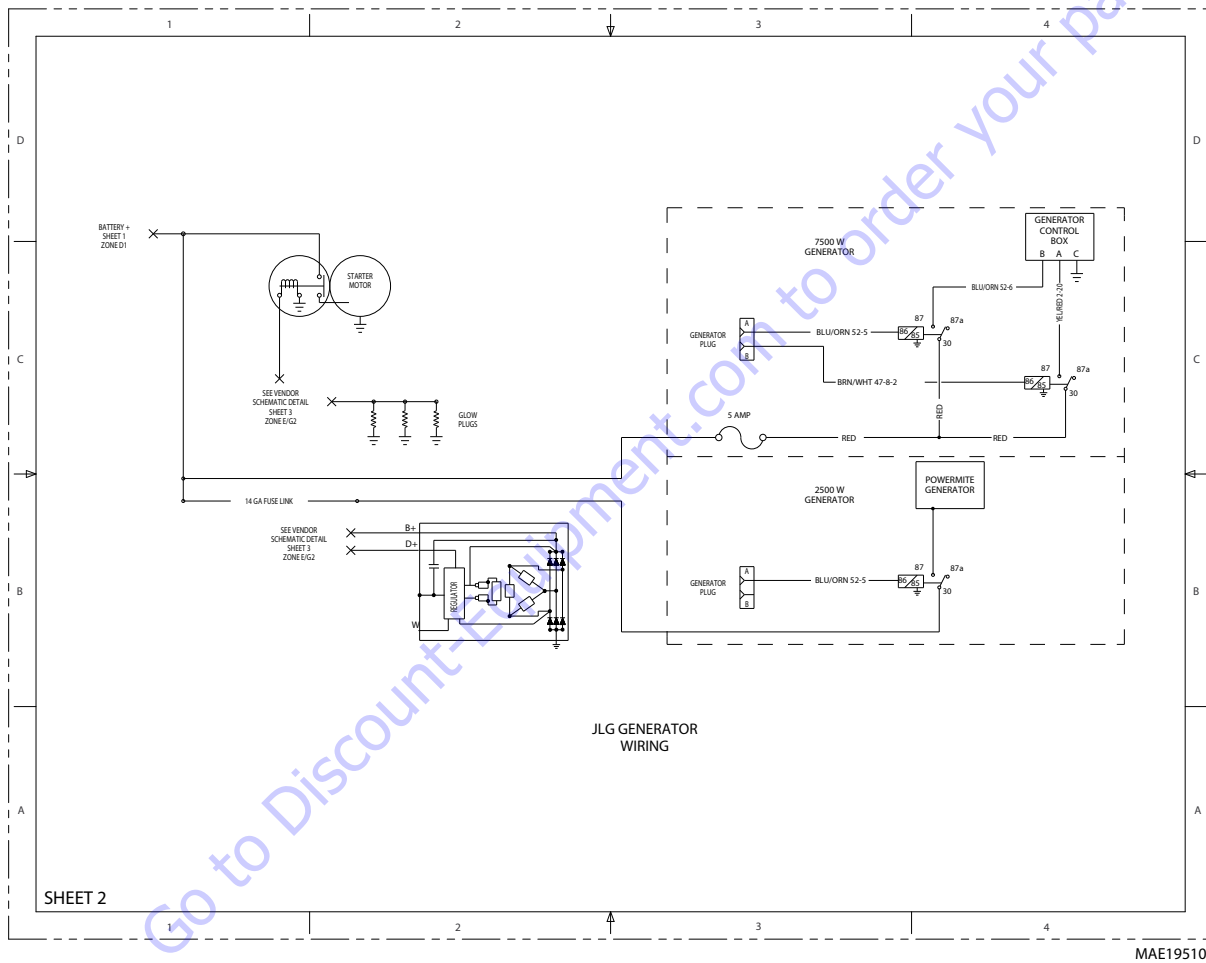


Figure 7-30. Electrical Schematic - Sheet 2 of 13



**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**



**Figure 7-31. Electrical Schematic - Sheet 3 of 13**

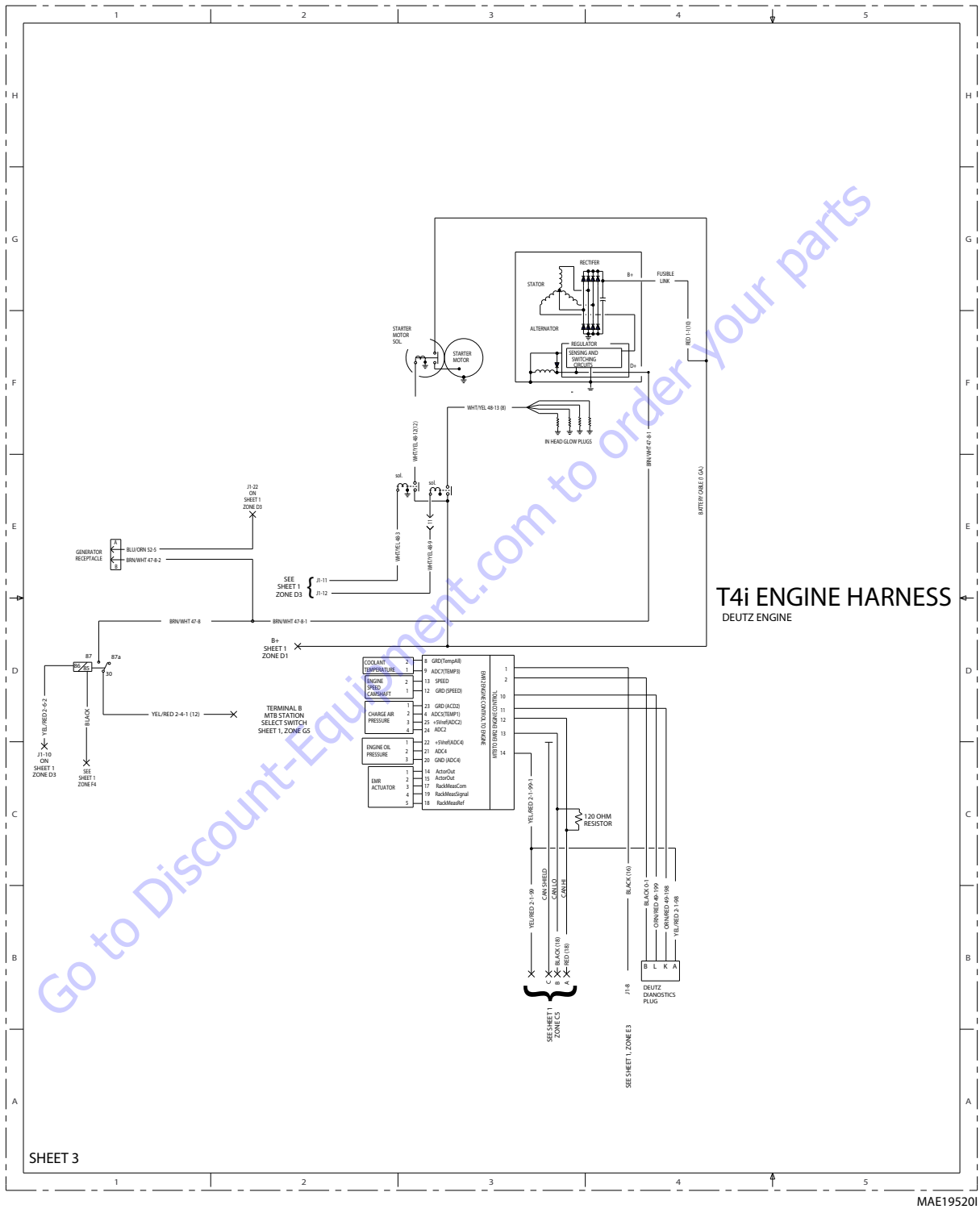
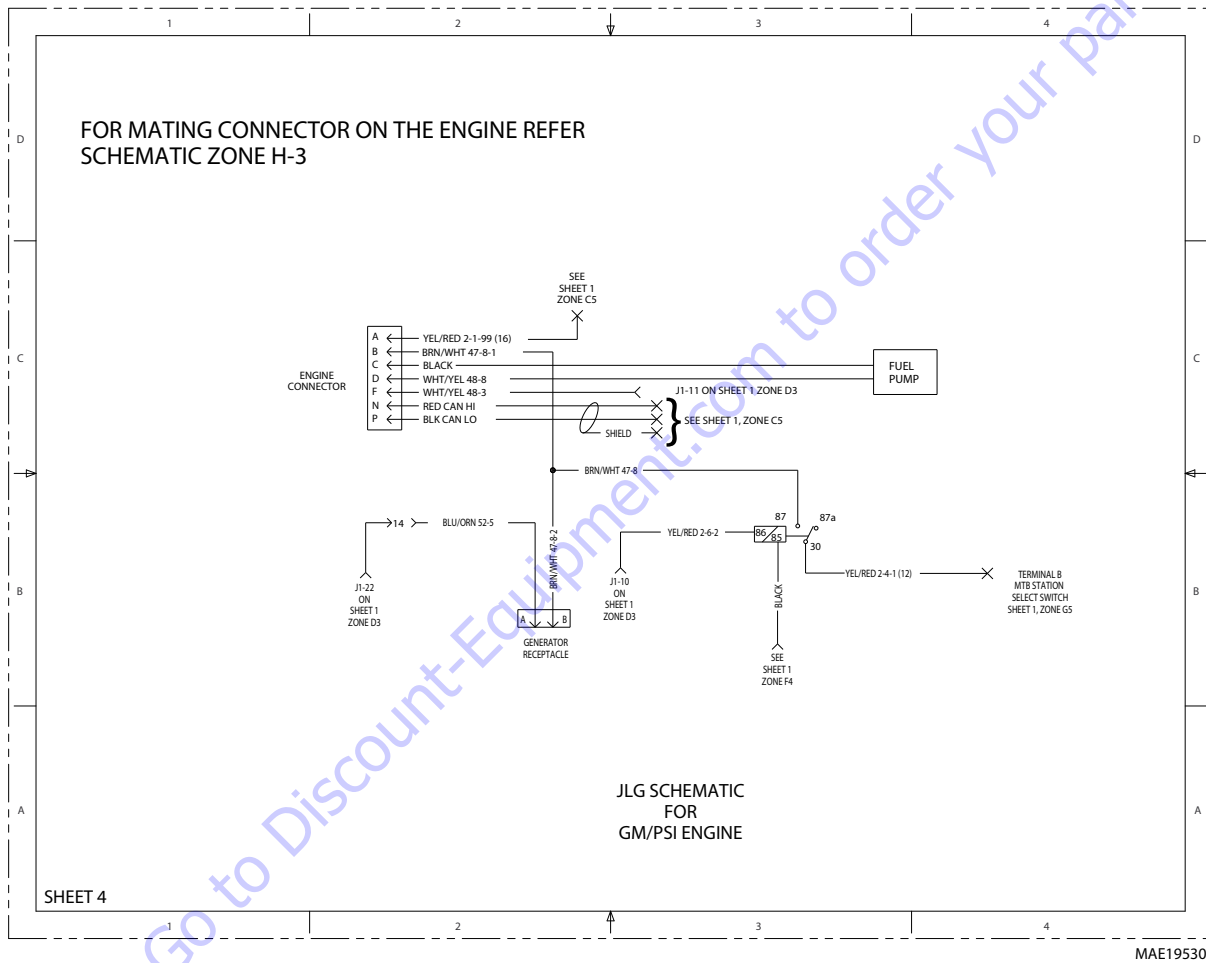


Figure 7-32. Electrical Schematic - Sheet 4 of 13

**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**



**Figure 7-33. Electrical Schematic - Sheet 5 of 13**



SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

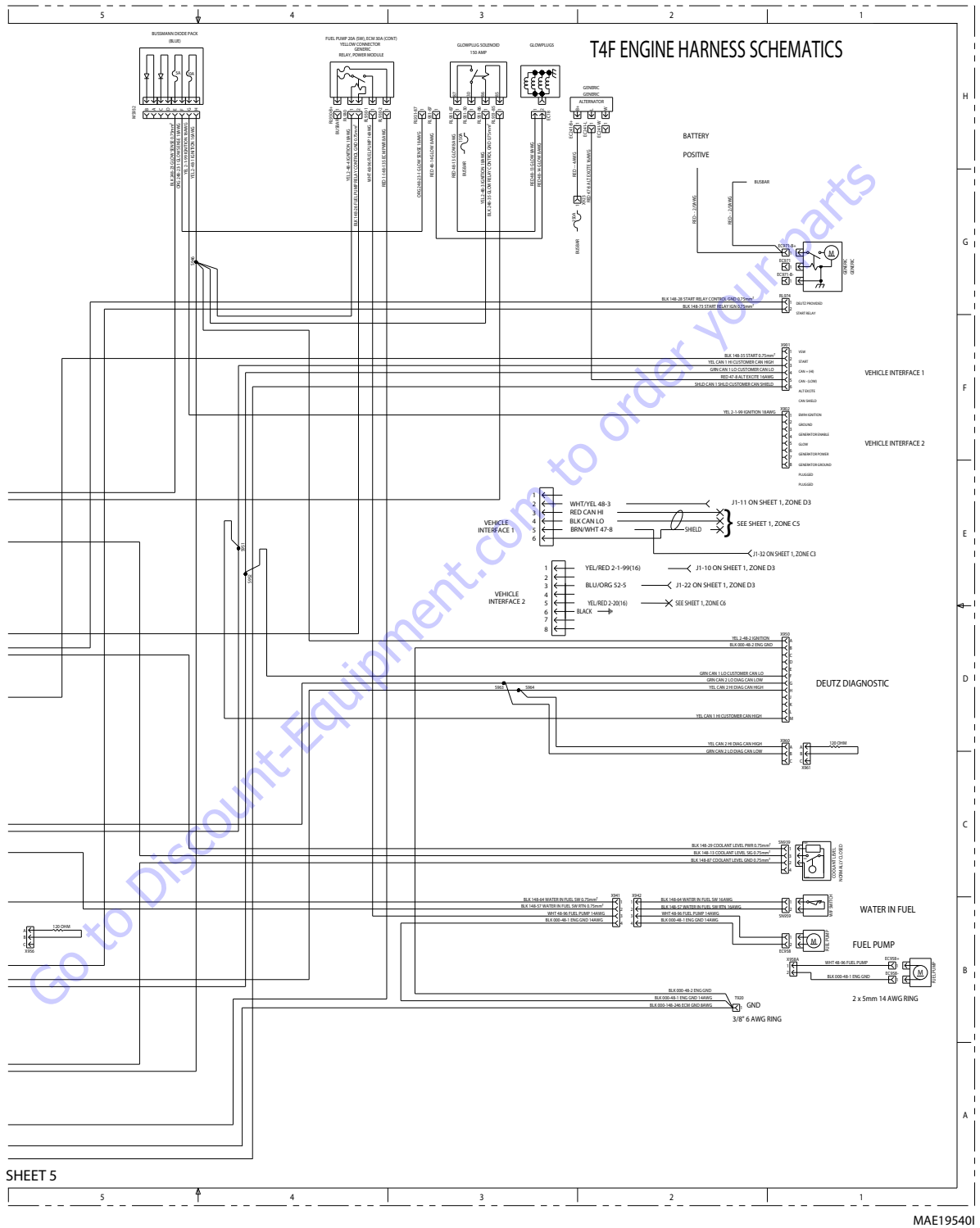
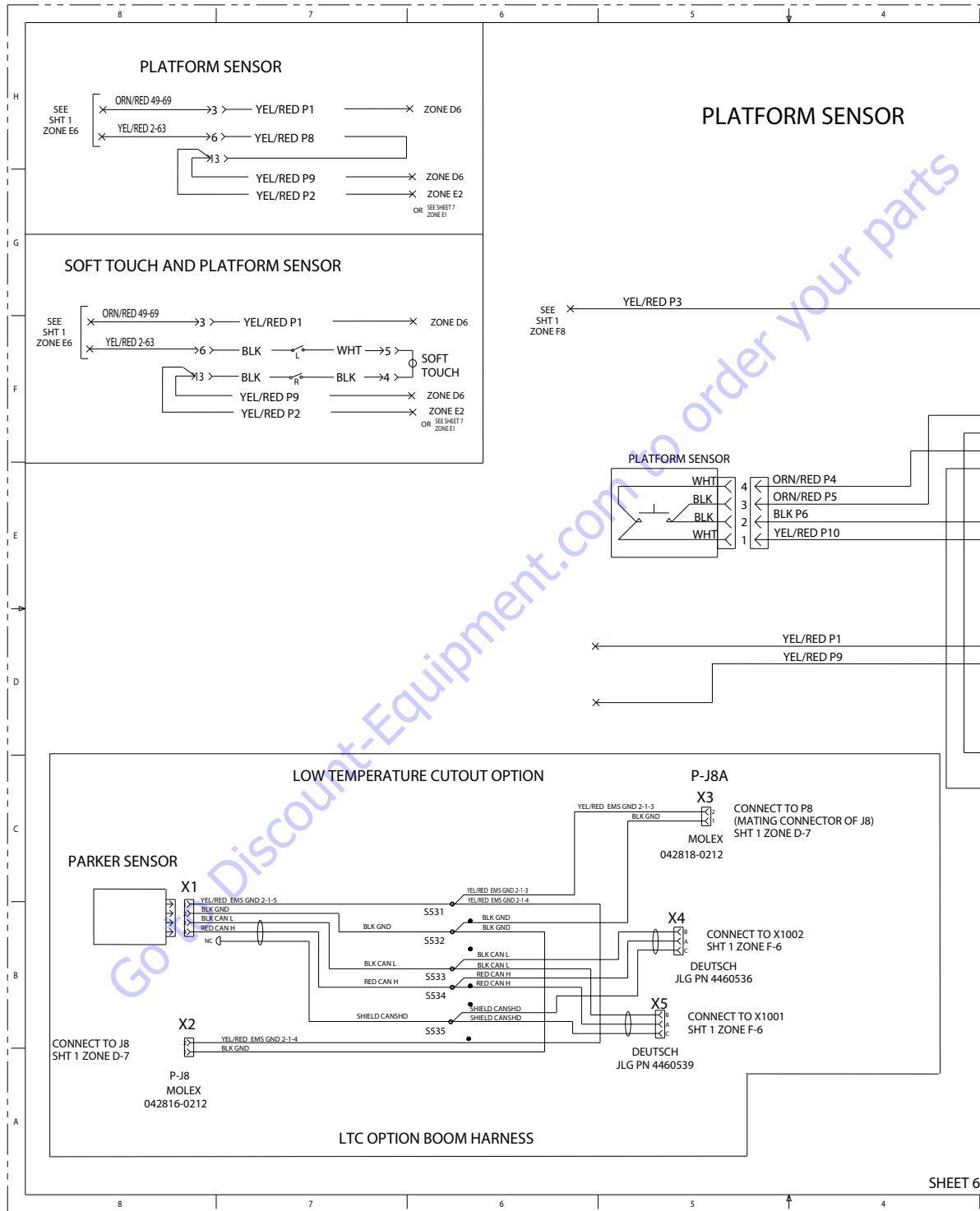


Figure 7-35. Electrical Schematic - Sheet 7 of 13

**SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS**



**Figure 7-36. Electrical Schematic - Sheet 8 of 13**

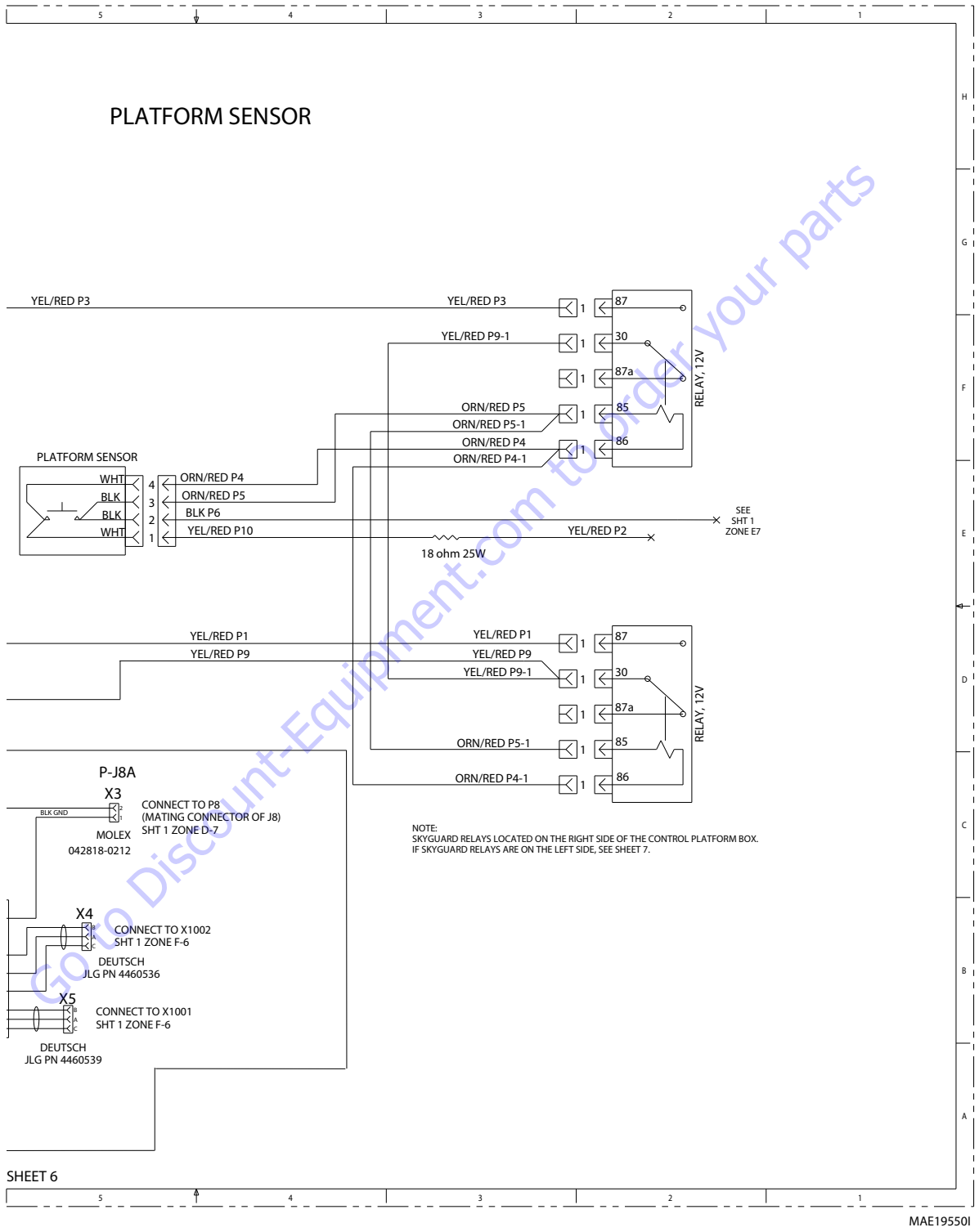


Figure 7-37. Electrical Schematic - Sheet 9 of 13

SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

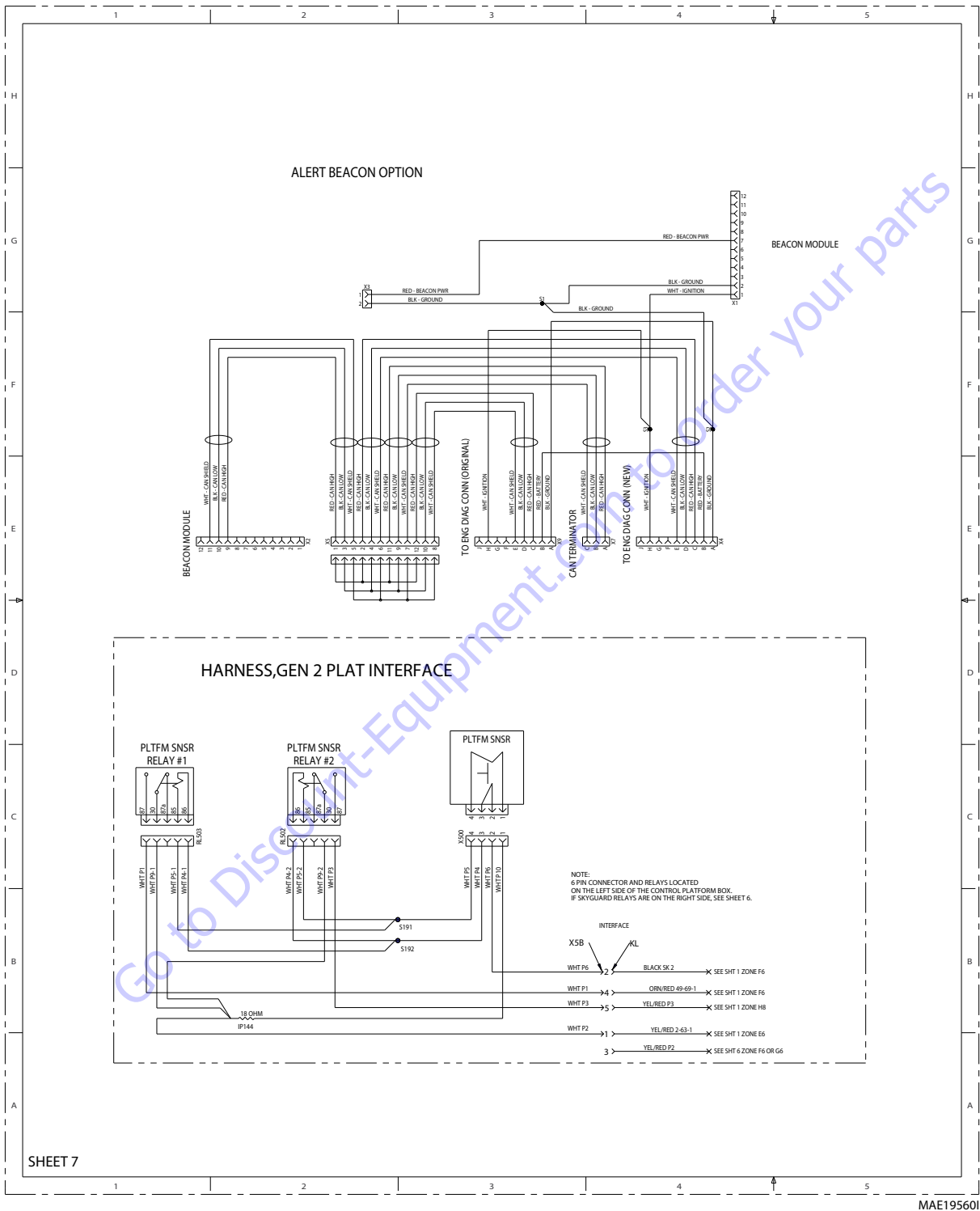


Figure 7-38. Electrical Schematic - Sheet 10 of 13



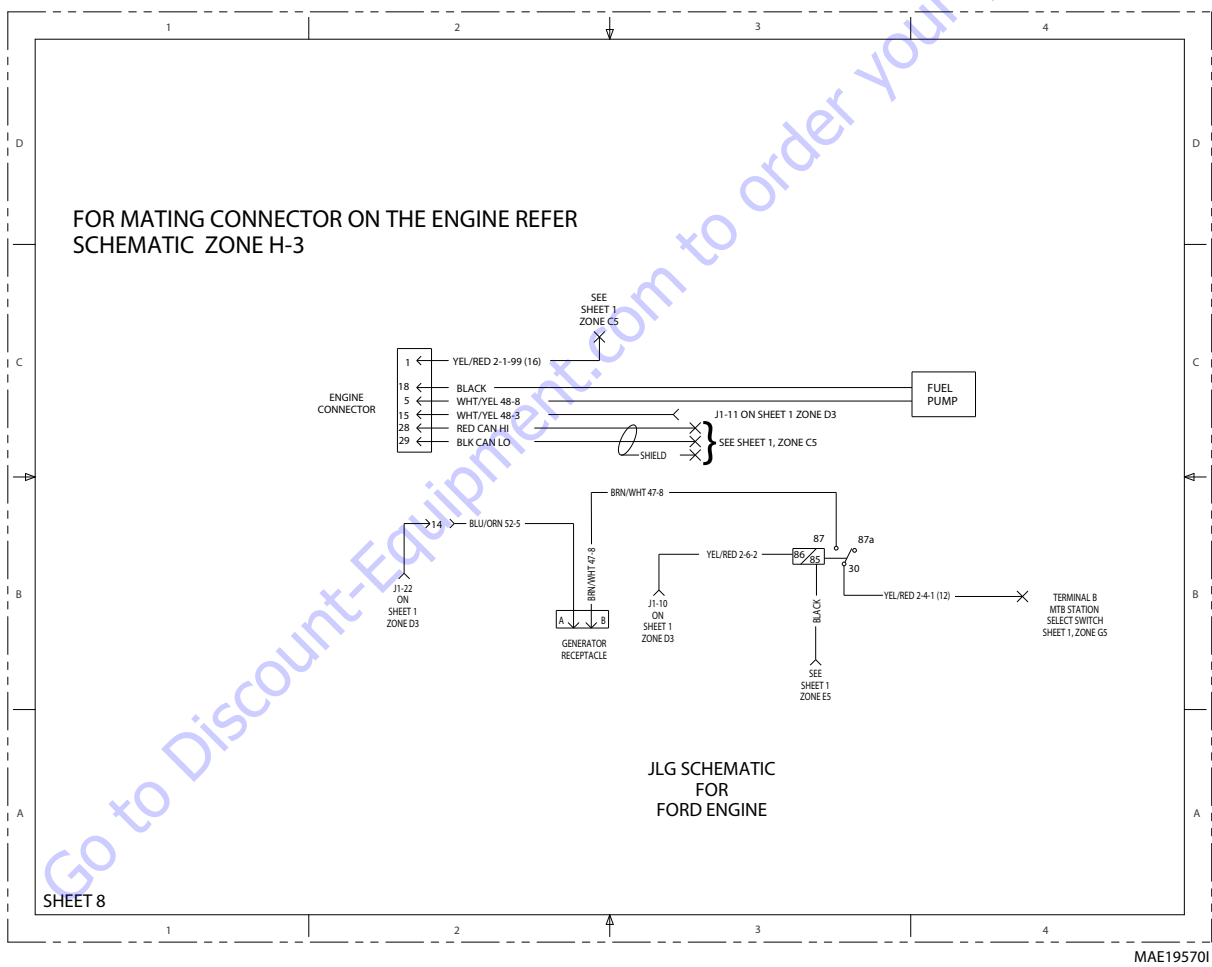


Figure 7-39. Electrical Schematic - Sheet 11 of 13

# SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

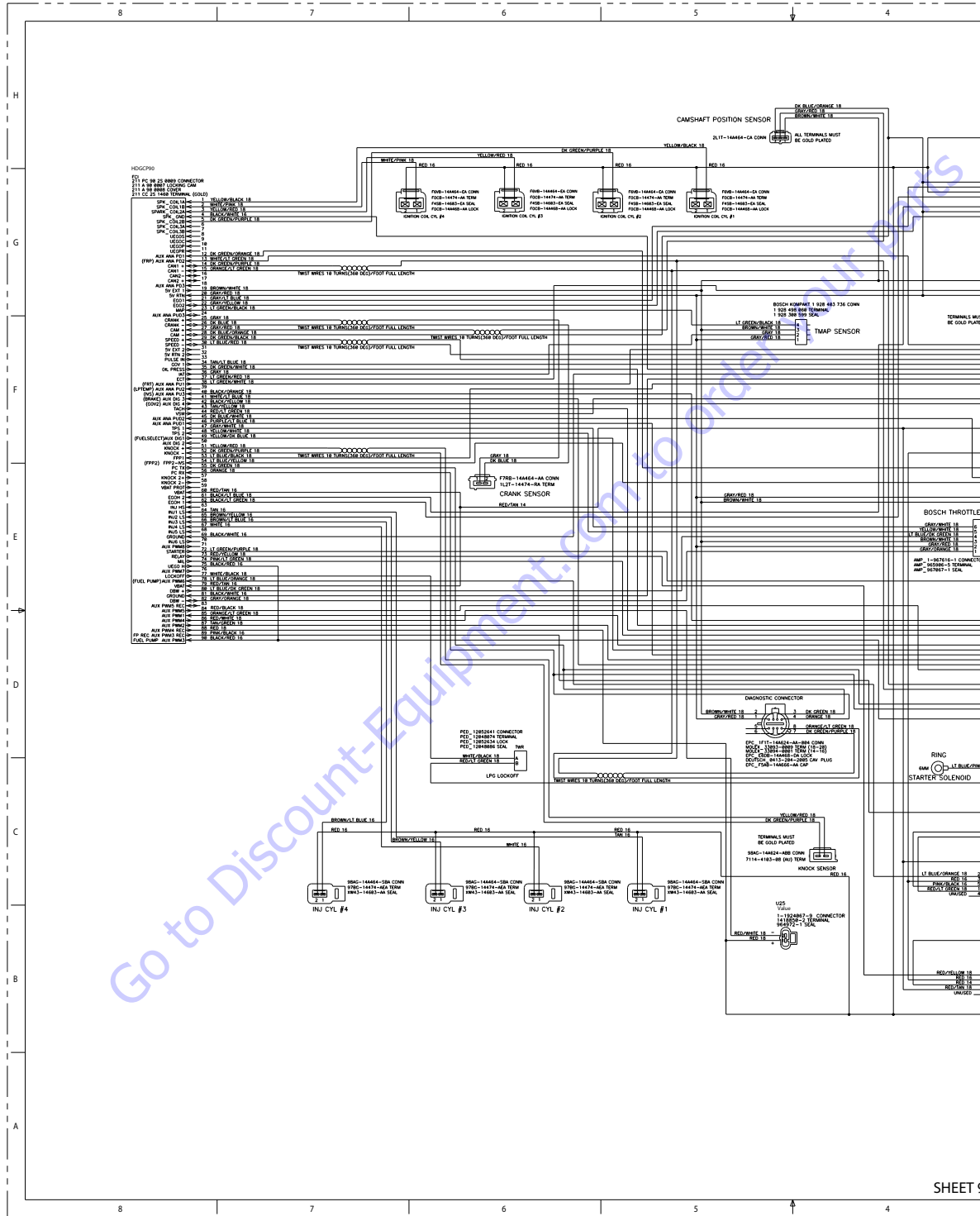


Figure 7-40. Electrical Schematic - Sheet 12 of 13

SECTION 7 - BASIC ELECTRICAL INFORMATION & SCHEMATICS

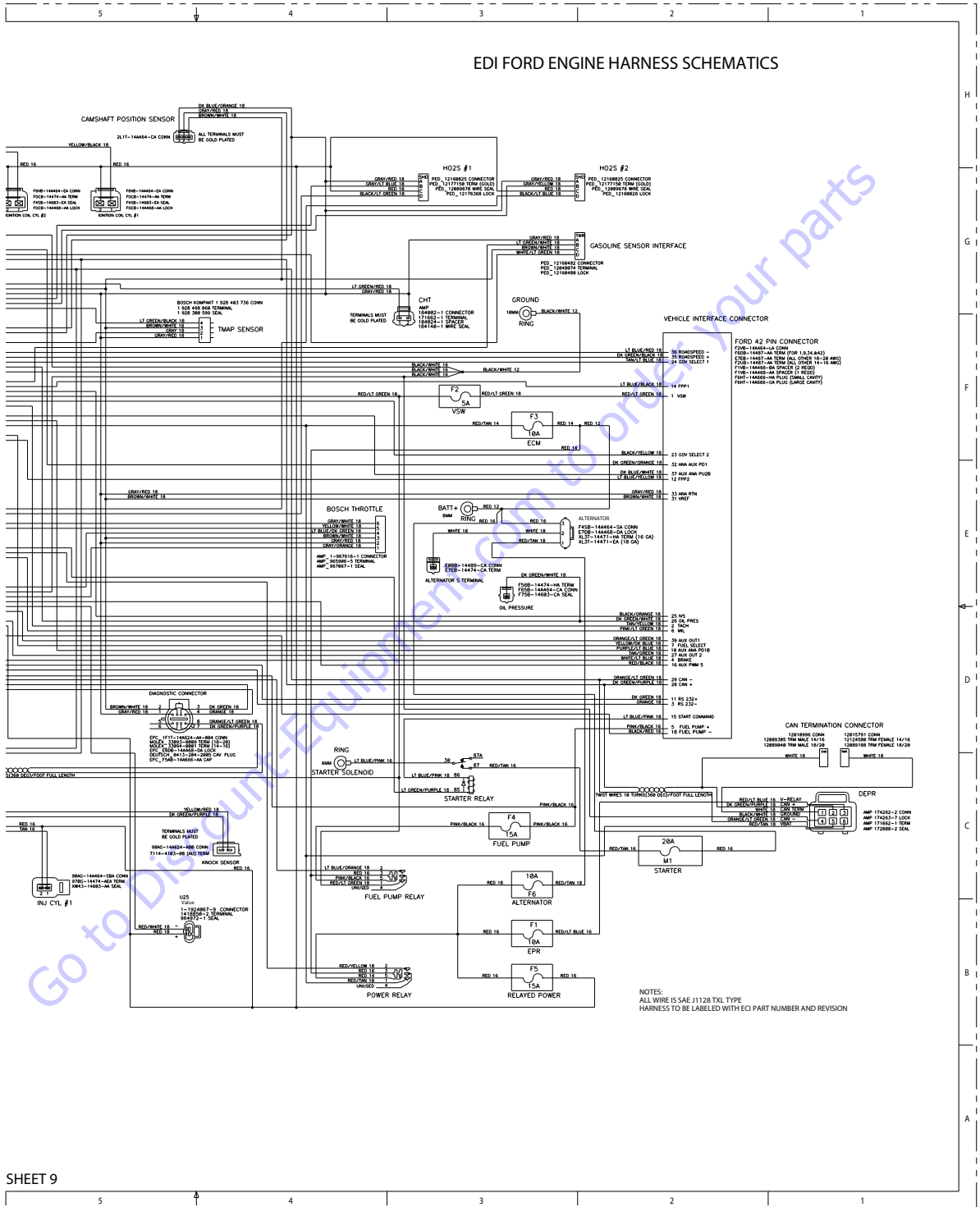


Figure 7-41. Electrical Schematic - Sheet 13 of 13



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