

SECTION 3 - CHASSIS & TURNTABLE

20. While lifting the boom into position, begin to route the hoses into position so they can be inserted into the powertrack.



21. Line up the boom pivot fittings and install the boom pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt threads and secure the pin in place with the keeper pin and bolt. Torque the bolt to 285 ft.lbs. (388 Nm).



22. Raise the boom enough to gain access to the lift cylinder rod pivot fitting.



23. Attach a lifting device to the lift cylinder barrel. Lift the lift cylinder up to align the lift cylinder rod pivot fittings.



24. Install the lift cylinder rod pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt and secure the pivot pin in place with the keeper pin and bolt. Torque the bolt to 285 ft.lbs. (388 Nm).



- 25.** Connect the hoses to the main valve and pressure filter as tagged during removal.



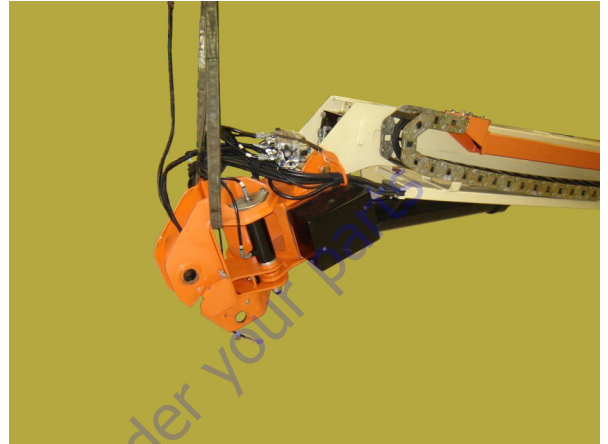
- 26.** Reconnect the negative battery terminal.



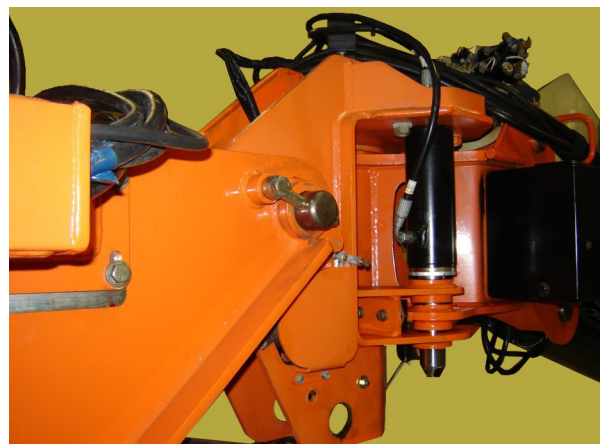
- 27.** Using auxiliary power, lower the boom to horizontal.
- 28.** Attach an adequate lifting device to the jib and position it in front of the boom.



- 29.** Place something under the front of the jib that will allow it to slide or move along the ground easily. Attach a lifting device to the rear of the jib, allowing the front to pivot on the ground.



- 30.** Lift the jib into position on the boom fly section and install the jib pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt and secure the pivot pin in place with the keeper pin and bolt. Torque the bolt to 165 ft.lbs. (224 Nm).



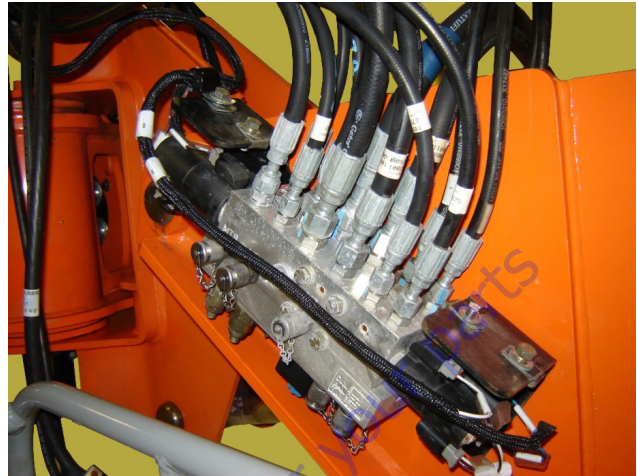
SECTION 3 - CHASSIS & TURNTABLE

- 31.** Attach a lifting device to the front of the jib and align the jib level cylinder attachment fittings. Install the pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt and secure the pivot pin in place with the keeper pin and bolt. Torque the bolt to 165 ft.lbs. (224 Nm).



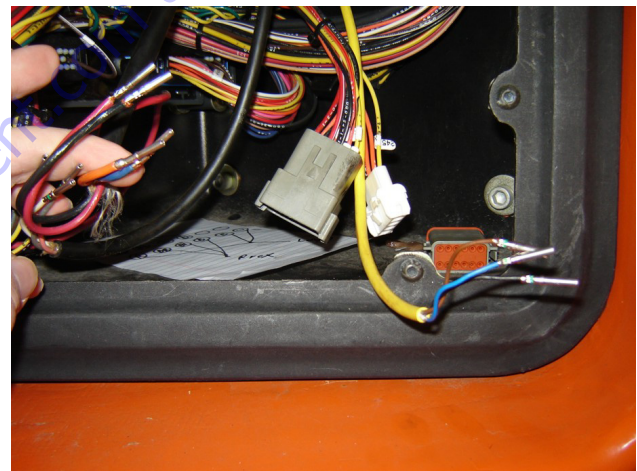
- 32.** Place the mounting bracket on the jib valve and bolt the jib valve to the fly boom section.

- 33.** Install the wiring harnesses and hydraulic hoses on the jib valve as tagged during removal.



- 34.** Install the jib valve protection plate.

- 35.** Connect all electrical harnesses as tagged during removal. Reinstall the wiring into the connector plug in the ground control box as tagged during removal.



36. Position the hoods in place on the turntable and secure in place with the mounting hardware.



37. Cycle test the machine and check for leakage and proper operation.
38. Perform a boom calibration as described in Section 6 under Calibrating the Boom Sensors.

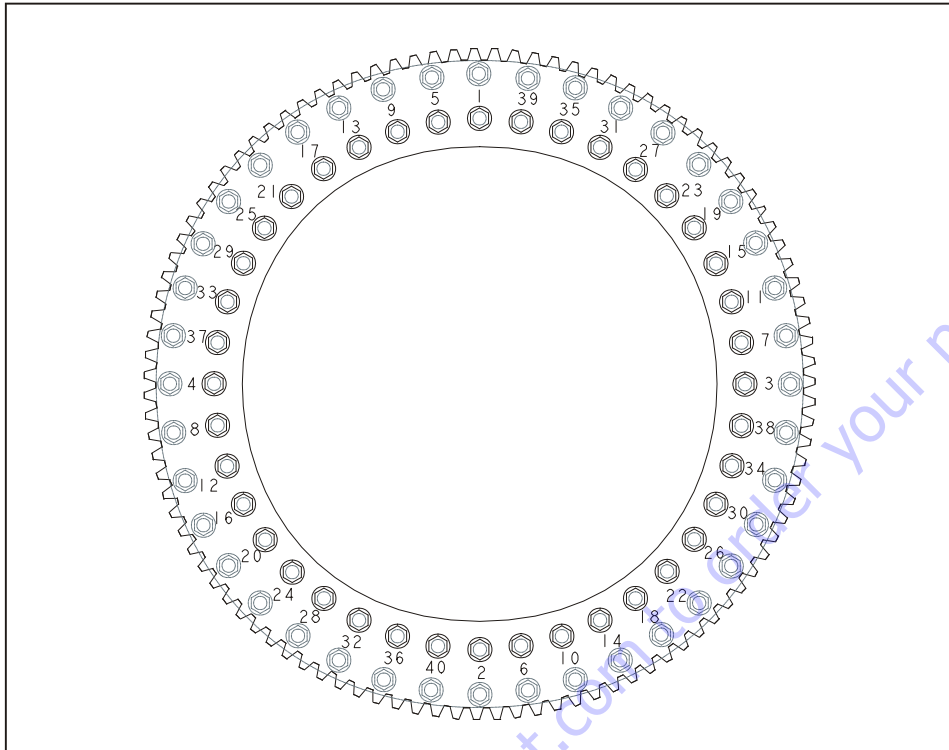
Swing Bearing Torque Values

1. Outer Race - 190 ft. lbs. (258 Nm) w/Loctite.
2. Inner Race - 190 ft. lbs. (258 Nm) w/Loctite.
3. See Swing Bearing Torquing Sequence.

⚠ WARNING

CHECK THE INNER AND OUTER SWING BEARING BOLTS FOR MISSING OR LOOSENESS AFTER FIRST 50 HOURS OF OPERATION, AND EVERY 600 HOURS THEREAFTER.

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NOTE: Swing Bearing Torque Sequence is typical for both inner and outer races.

Figure 3-63. Swing Bearing Torque Sequence

3.21 SWING SPEED PROPORTIONING

Swing Speed Proportioning uses the boom length and angle sensors to improve the comfort, speed and control of the turntable swing function. Turntable swing speed is increased as the distance of the platform to the center of rotation is decreased. This results in approximately constant platform speeds regardless of boom position. Swing speed proportioning is disabled with any envelope sensors failure. Disabling of swing speed proportioning will default to the slowest swing speed setting.

NOTE: For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.

3.22 CHASSIS TILT INDICATOR SYSTEM

The Chassis Tilt Indicator System measures the turntable angle with respect to level ground. The tilt sensor (which is an integral part of the ground module) has three settings; 3.0° side tilt, 5.0° omni directional tilt and an 8.0° omni directional tilt. The tilt angle is dependent on market, Refer Table 6-2, Machine Configuration Programming Information (Software

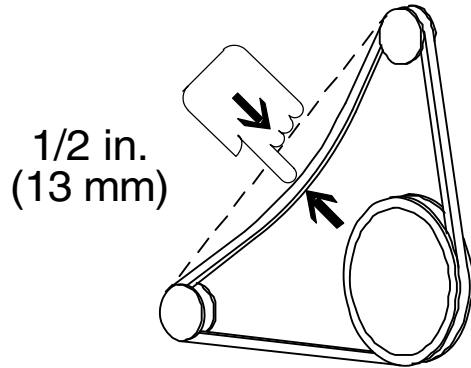
Version P7.29) The 5.0° omni directional angle is used for the purpose of warning the operator by means of the chassis tilt light in the platform display panel. Additionally when used in conjunction with the Beyond Transport - Drive Speed Cutback System, the tilt sensor will cause an alarm to sound, and automatically put all functions in the creep speed mode. With the exception of the speed cutback, this is a warning system only indicating to the operator the machine has reached the out of level limit. The machine will continue to function. The operator is responsible to prevent the machine from attaining an unstable position. The 3.0° side tilt setting is used in conjunction with the main boom length and when exceeded, imposes the same functionality as the 5.0° omni directional setting. The side tilt setting is ignored when the main boom length is less than its 65° maximum length regardless of boom angle (1367.0 inches in the 500 lb mode or 1245.0 inches in the 1000 lb mode). The 8.0 degree angle is used exclusively for the purpose of automatically shifting the drive motors to the maximum displacement position (slow speed). The control system responds to indicated angle readings 0.5° smaller than the required angles to account for calibration and sensor variation.

NOTE: For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.

3.23 GENERATOR

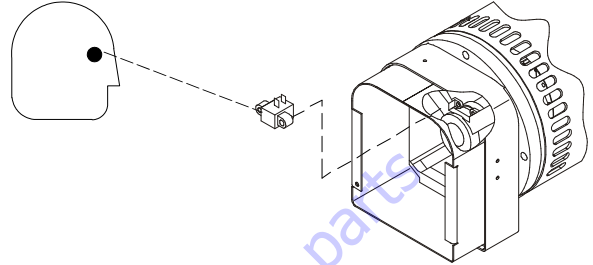
Every 250 hours

Every 250 hours of operation, check the drive belt for proper tension.

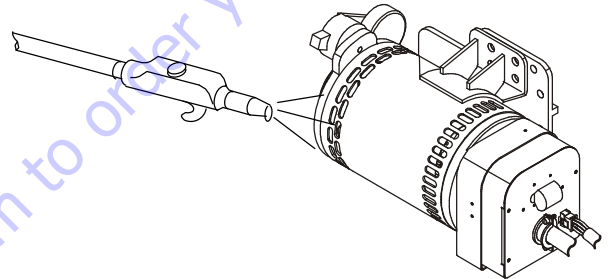


Every 500 hours

Every 500 hours of operation, service the generator brushes and slip rings. Hostile environments may require more frequent service.



Every 500 hours of service, blow out the inside of the generator. If operating in a hostile environment, clean monthly.



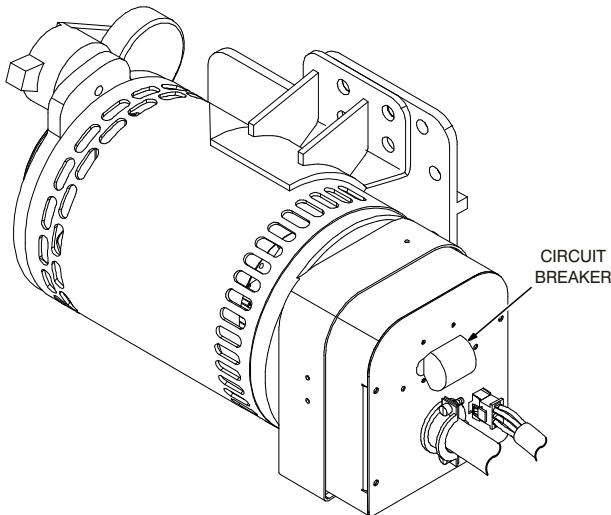
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Overload Protection

⚠ CAUTION

STOP THE ENGINE WHENEVER CHECKING OR INSPECTING THE CIRCUIT BREAKER.

The circuit breaker protects the generator windings from overload. If the circuit breaker opens, generator output stops. If the circuit breaker continues to open, check for faulty equipment connected to the platform receptacles.



Inspecting Brushes, Replacing Brushes, and Cleaning Slip Rings

Refer to Figure 3-64., Inspecting Generator Brushes, Replacing Brushes, and Cleaning Slip Rings.

INSPECTING BRUSH POSITION

Inspect brush alignment with slip rings. View alignment through the air vents in the stator barrel. The brushes must ride completely on the slip rings.

INSPECTING BRUSHES

Remove the end panel. Inspect the wires. Remove the brush holder assembly. Pull the brushes from the holders.

Replace the brushes if damaged, or if the brush is at or near minimum length.

CLEANING SLIP RINGS

Visually inspect the slip rings. Under normal use, the rings turn dark brown.

If the slip rings are corroded or their surface is uneven, remove the belt to turn the shaft by hand for cleaning.

Clean the rings with 220 grit emery paper. Remove as little material as possible. If the rings are deeply pitted and do not clean up, consult generator factory service.

Reinstall the belt, brush holder assembly, and end panel.

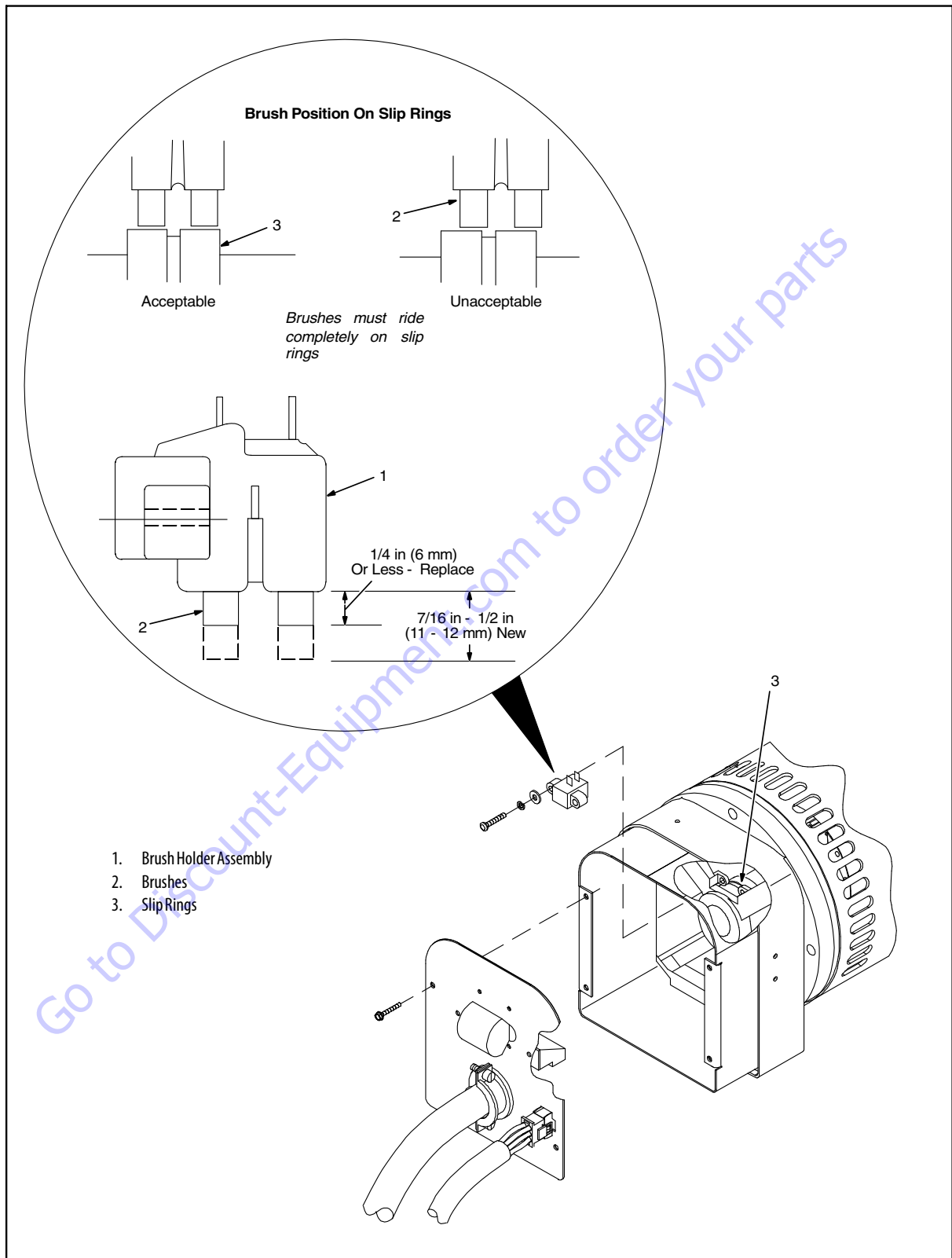
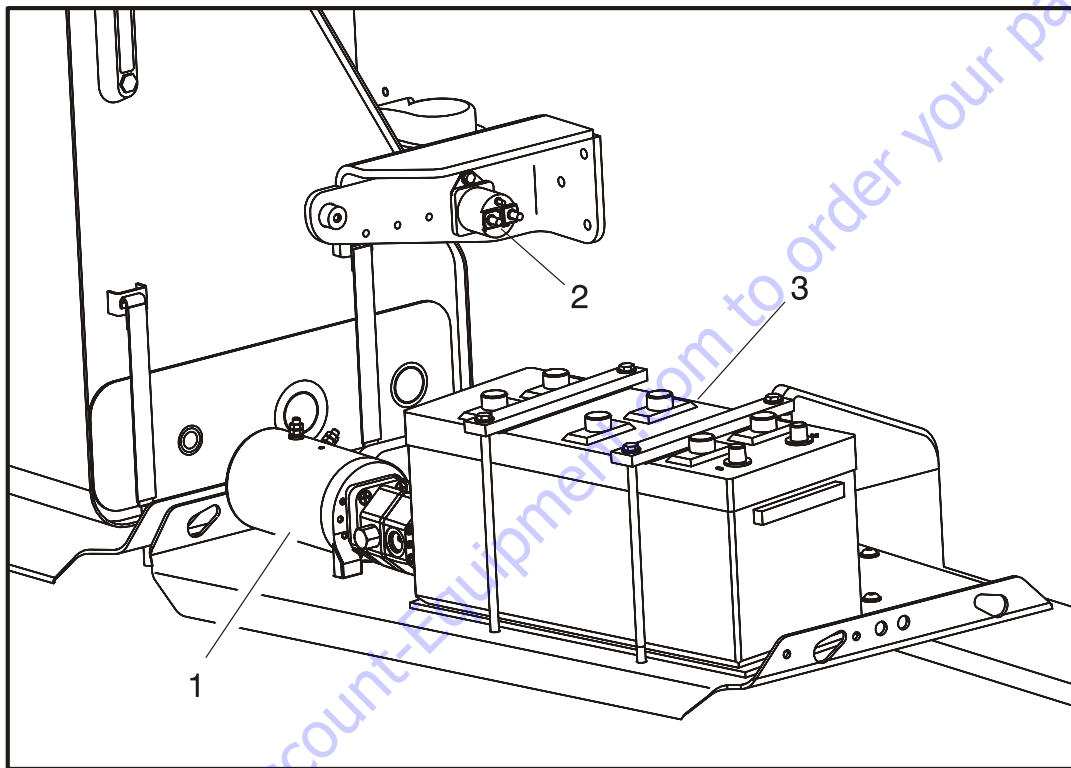


Figure 3-64. Inspecting Generator Brushes, Replacing Brushes, and Cleaning Slip Rings

3.24 AUXILIARY POWER SYSTEM

The auxiliary power system is intended as a secondary means of moving the boom in the event of primary power loss. This system uses an electric motor/pump unit powered by a 12V battery capable of operating all functions except drive, controlled arc, controlled boom angle, and envelope tracking. During lift up or down functions, no other functions are permitted and during lift up functions, automatic platform leveling is not active. To reduce the demand on the battery and therefore extend the run time of the system, the auxiliary power functionality differs from the primary power functional-

ity. The auxiliary power lift down function supplies pilot pressure to the lift cylinder allowing gravity to lower the boom. The system redirects discharge oil from the lift cylinder to retract the telescope cylinder. When the boom is retracted to the transport length, the telescope in valve is dropped out and lift down is operated alone allowing the platform to reach the ground. This not only greatly reduces the power required for these functions but also lowers the boom within the envelope regardless of starting position. Envelope control and moment control remain active during the auxiliary power function.



- 1. Auxiliary Pump
- 2. Power Relay
- 3. Battery

Figure 3-65. Auxiliary Pump Installation

3.25 ENGINE (DEUTZ 2011)

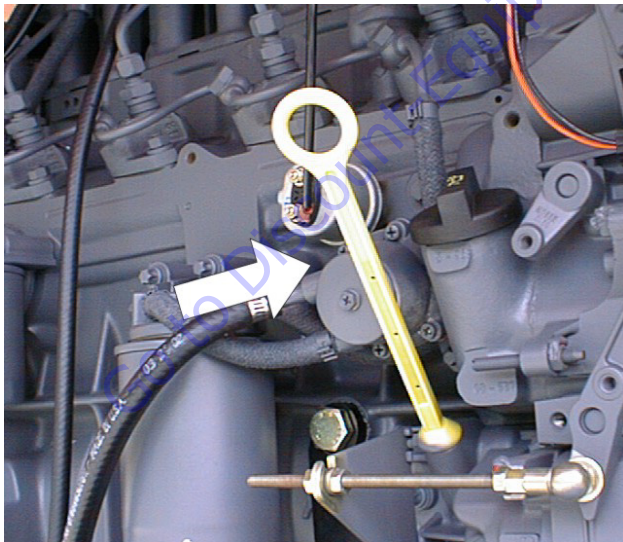
NOTE: Refer to the engine manufacturer's manual for detailed operating and maintenance instructions.

Glow Plugs

If the glow plug option is enabled in the JLG Control System, the glow plug and indicator lamp will be energized when the Power/Emergency Stop switch is pulled on if the ambient air temperature is less than 50° F (10° C) and the engine coolant temperature is less than 140° F (60° C). This determination will occur one second after the Power/Emergency Stop switch has been pulled on. The lamp and glow plugs will remain energized for the period of time specified by the setting in the JLG Control System. Engine start shall be disabled during this period. On Deutz engines, the glow plugs will continue (post glow) after the engine has started for three times the machine digit setting.

Checking Oil Level

1. Switch the engine off before checking oil level.
2. Make sure the machine and engine are level.
3. Remove the oil dipstick.
4. Wipe the dipstick with non-fibrous, clean cloth.
5. Insert the dipstick to the stop and remove again.



Check the oil level, and if necessary, top the oil level up to the MAX mark with an approved grade and type of oil as outlined in the engine manufacturer's operator's manual. Refer to Figure 3-66., Deutz Engine Dipstick.

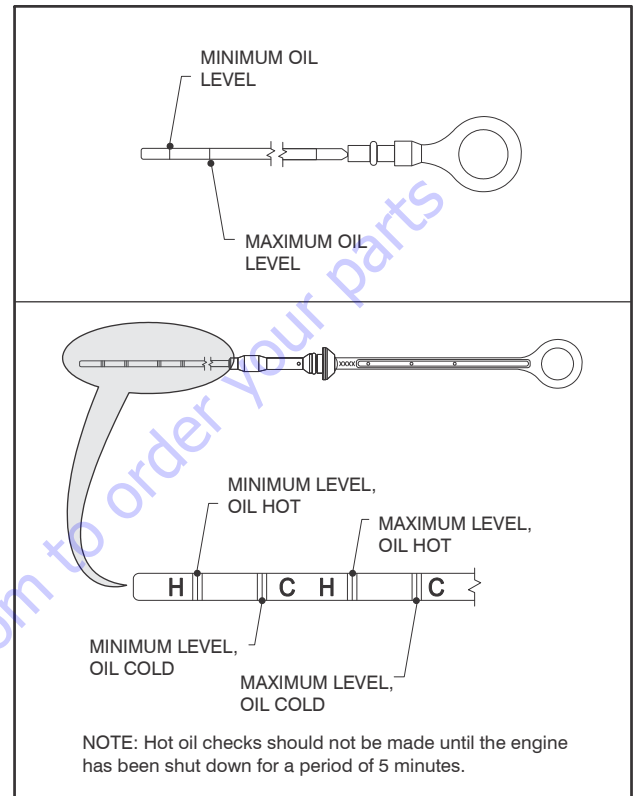
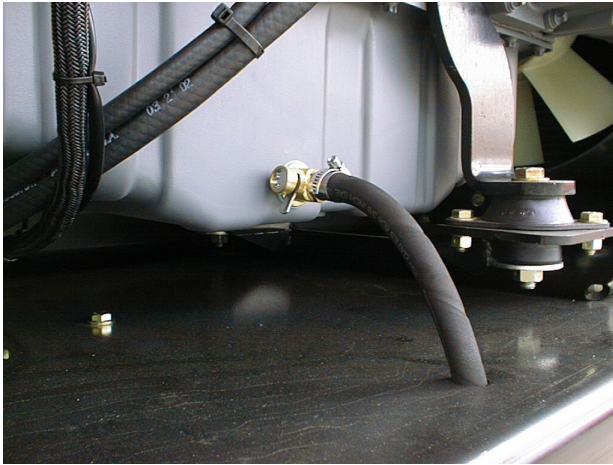


Figure 3-66. Deutz Engine Dipstick

6. Replace the dipstick making sure that it is fully seated in the dipstick tube to seal off the crankcase.

Changing Engine Oil

1. Allow the engine to warm up. The engine oil should reach approximately 176° F (80° C).
2. Make sure the machine and engine are level.
3. Switch off the engine.
4. Place an oil tray under the engine.
5. Open the oil drain valve.



8. Pour in new engine oil. Refer to Section 1 for capacity and refer to Figure 3-67., Engine Oil Viscosity for the proper grade.

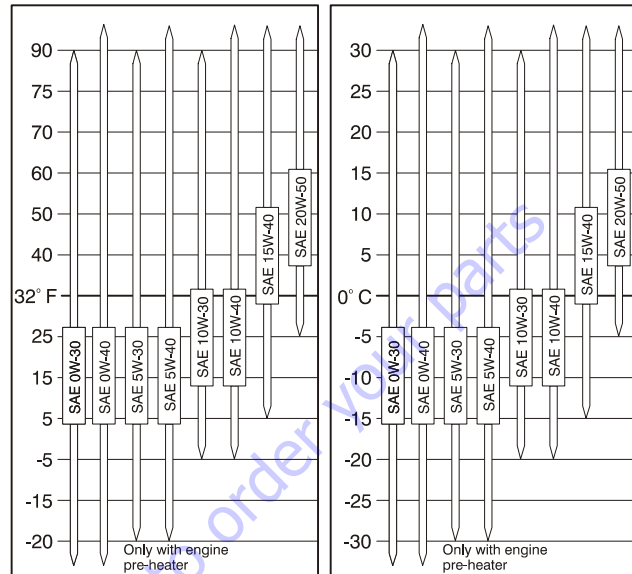


Figure 3-67. Engine Oil Viscosity

⚠ WARNING

WHEN DRAINING HOT ENGINE OIL THERE IS A RISK OF SCALDING.

NOTICE

DO NOT LET USED OIL RUN INTO THE SOIL; COLLECT THE USED OIL IN A CONTAINER SUITABLE FOR DISPOSAL OR RECYCLING. DISPOSE OF THE USED ENGINE OIL IN ACCORDANCE WITH ENVIRONMENTAL REGULATIONS.

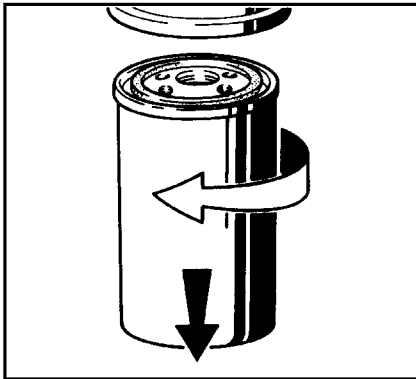
6. Drain the oil.
7. Close the oil drain valve.

Changing the Oil Filter

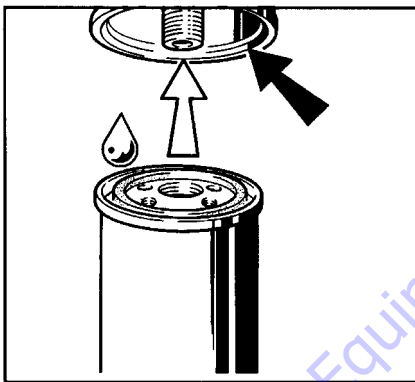


1. Wipe the area around the filter to clean any dirt from the area.

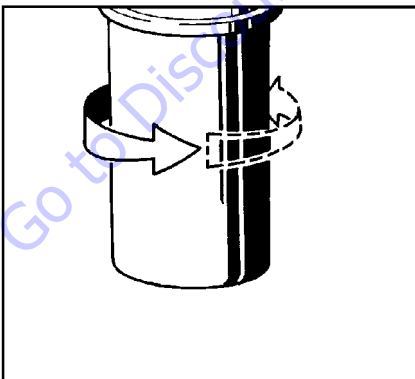
- Using a suitable oil filter removal tool, loosen the lube oil filter cartridge and spin off.



- Catch any escaping oil.
- Clean any dirt from the filter carrier sealing surface.
- Lightly oil the rubber gasket on the new oil filter.



- Manually screw in the new filter until the gasket is flush.



- Tighten the filter another half-turn.
- Check the oil level.
- Check the oil pressure.
- Check the oil filter cartridge and make sure there are no leaks.

Replacing the Fuel Filter

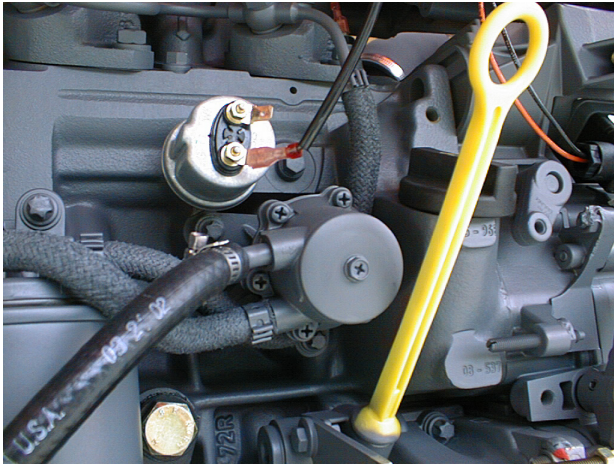


⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

- Wipe the area around the filter to clean any dirt from the area.
- Undo the fuel filter cartridge and spin off.
- Catch any escaping fuel.
- Clean any dirt from the filter carrier sealing surface.
- Apply a light film of oil or diesel fuel to the rubber gasket of the new filter cartridge.
- Manually screw in the new filter until the gasket is flush.
- Tighten the fuel filter cartridge with a final half-turn.
- Open the fuel shut-off valve.
- Check for leaks.

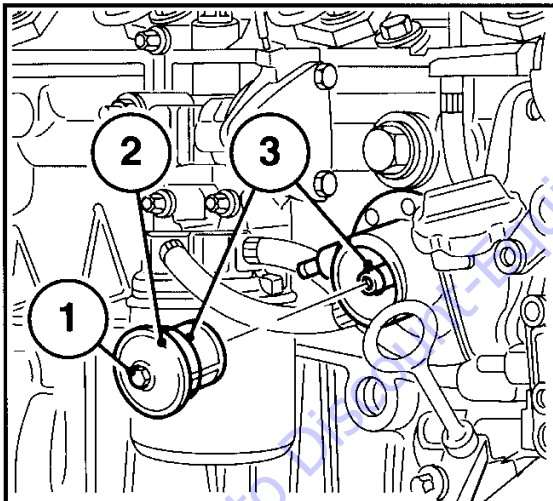
Cleaning the Fuel Strainer



⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

1. Unscrew the hexagonal nut (1).



2. Remove the fuel strainer cover (2).
3. Clean the fuel strainer with diesel fuel, replace if necessary.
4. Place the seal (3) in position.
5. Install the fuel strainer cover (2) in position and tighten the hexagonal screw (1).
6. Check for leaks.

3.26 DEUTZ ENGINE - TD2.9L4

NOTE: Refer to engine manufacturer's manual for detailed operating and maintenance instructions. Limited engine maintenance items are presented here for convenience but detailed engine maintenance items and schedule are included in the engine manufacturer's manual.

Glow Plugs

If the glow plug option is enabled in the JLG Control System, the glow plug and indicator lamp will be energized when the Power/Emergency Stop switch is pulled on if the ambient air temperature is less than 50° F (10° C) and the engine coolant temperature is less than 140° F (60° C). This determination will occur one second after the Power/Emergency Stop switch has been pulled on. The lamp and glow plugs will remain energized for the period of time specified by the setting in the JLG Control System. Engine start shall be disabled during this period. On Deutz engines, the glow plugs will continue (post glow) after the engine has started for three times the machine digit setting.

Check Oil Level

1. Make sure machine and engine are level and switch engine OFF before checking oil level.
2. Remove oil dipstick and wipe with clean cloth.
3. Insert dipstick to the stop and remove again.
4. Check oil level. Top oil level as shown in figure below with an approved grade and type of oil outlined in engine manufacturer's operator's manual.

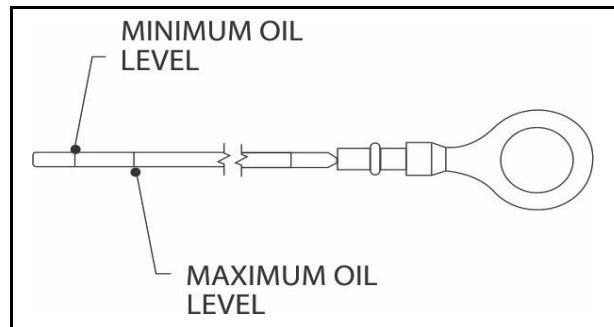


Figure 3-68. Deutz Engine Dipstick

5. Replace dipstick until fully seated.

Replacing Engine Oil

1. Allow engine to warm up. Engine oil should reach approximately 176° F (80° C).
2. Make sure machine and engine are level.
3. Switch off engine.
4. Place oil tray under engine.

CAUTION

HOT ENGINE OIL CAN CAUSE BURNS. AVOID CONTACT WITH HOT OIL WHEN DRAINING.

NOTICE

COLLECT USED OIL IN A CONTAINER SUITABLE FOR DISPOSAL OR RECYCLING. DISPOSE OF USED ENGINE OIL IN ACCORDANCE WITH ENVIRONMENTAL REGULATIONS.

5. Open oil drain valve and drain oil.
6. Close oil drain valve.
7. Pour in new engine oil. Refer to Section 1 for capacity and Figure 3-75., Engine Oil Viscosity.

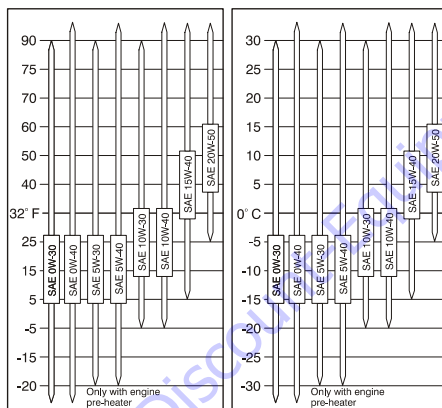


Figure 3-69. Engine Oil Viscosity

Replacing the Oil Filter

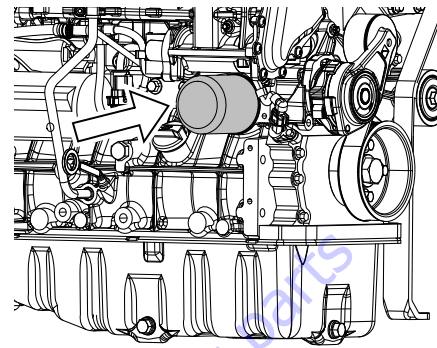
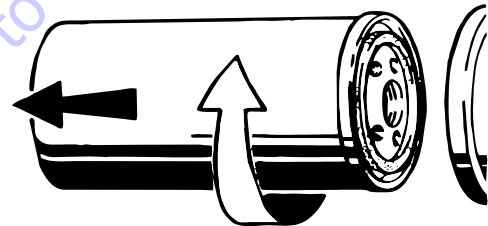
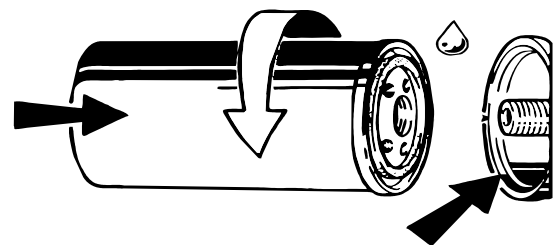


Figure 3-70. Location of the oil filter

1. Wipe area around filter to clean any dirt from area.
2. Using a suitable oil filter removal tool, loosen lube oil filter element and spin off.



3. Catch any escaping oil.
4. Clean any dirt from filter carrier sealing surface.
5. Lightly coat new oil filter rubber gasket with clean oil.
6. Screw in new filter by hand until gasket is flush.
7. Hand-tighten filter another half-turn.



8. Check oil level.
9. Check oil pressure.
10. Check oil filter cartridge for leaks.

Replacing the Primary Fuel Filters

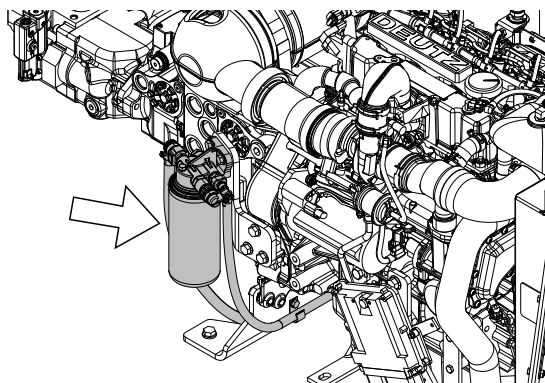
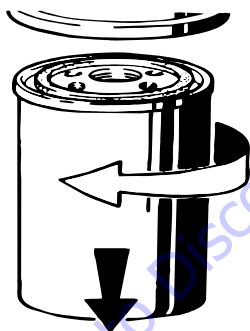


Figure 3-71. Location of the Primary Fuel Filter

⚠ WARNING

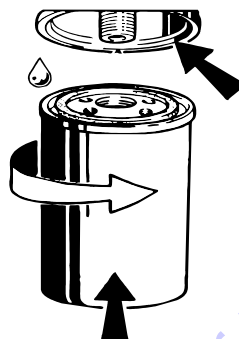
FUEL IS FLAMMABLE AND CAN CAUSE DEATH OR SERIOUS INJURY. MAKE SURE NO OPEN FLAMES OR SPARKS ARE IN THE AREA WHEN WORKING ON FUEL SYSTEM. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEMS.

1. Wipe area around filter to clean any dirt from area.
2. Fuel supply from the fuel tank may need to be blocked to prevent flow from the fuel tank.
3. Remove fuel filter cartridge.
4. Catch any escaping fuel.



5. Clean dirt from filter carrier sealing surface.
6. Apply light film of oil or diesel fuel to rubber gasket of new filter cartridge.

7. Screw in new filter by hand until gasket is flush. Hand-tighten filter another 3/4 turn.



8. Check for leaks.

Replacing the Fuel Pre-Filter

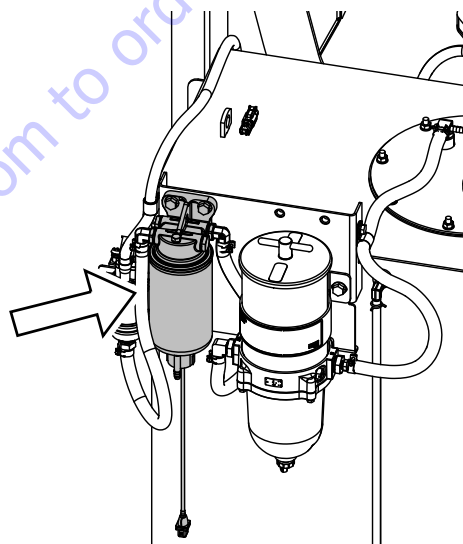
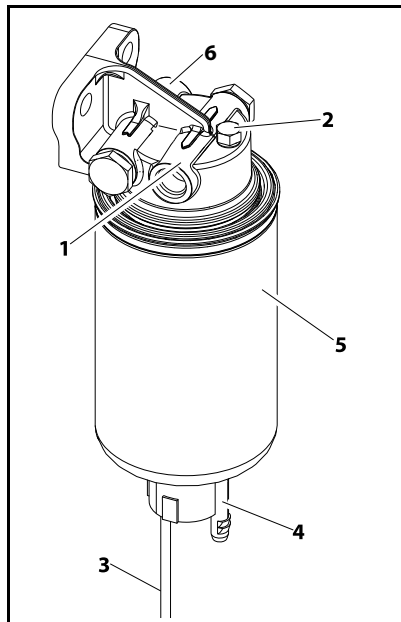


Figure 3-72. Location of Fuel Pre-Filter

NOTE: Refer Figure 3-74., Components of Fuel Pre-Filter.



- | | |
|---|----------------------------------|
| 1. Fuel Supply Flow to the Pump | 4. Drain Plug |
| 2. Venting Screw | 5. Filter Element |
| 3. Electrical Connection for Water Level Sensor | 6. Fuel Inlet from the Fuel Tank |

Figure 3-73. Components of Fuel Pre-Filter

⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

1. Switch off the engine.
2. Fuel supply from the fuel tank may need to be blocked to prevent fuel flow from the tank.
3. Place suitable collecting container under drain plug.
4. Disconnect electrical connections from water sensor.
5. Loosen drain plug and drain liquid.
6. Remove filter element.
7. Catch any escaping fuel.
8. Clean any dirt of the sealing surfaces of the new filter element and opposite side of filter head.
9. Wet the sealing surfaces of new filter element slightly with fuel.
10. Install new filter onto the filter head in clockwise direction. Torque to 12.5-13.3 ft. lbs. (17-18 Nm).
11. Install the drain plug and tighten to torque 1-1.4 ft. lbs. (1.3-1.9 Nm).
12. Connect electrical connection to water sensor.
13. Check for leaks after starting engine.

Water in Fuel Sensing System (Optional)

The Water in Fuel Sensing System detects when there is an excessive amount of water in the fuel and sets a DTC code in the JLG Control System to alert the operator and/or service technician.

When Water in Fuel condition occurs, the machine will respond in the following way:

- The engine will shut down automatically.
- The JLG Control System will set DTC 4375 - Water in Fuel.
- An alarm will sound from the active control station (ground or platform).
- If in platform mode, the Low Fuel Indicator will flash.
- Engine Restart will be permitted after the machine senses the Water in Fuel condition, but will only run for 2 minutes and the engine will shut down again. This restart process will continue until the Water in Fuel condition is corrected.

Draining Water

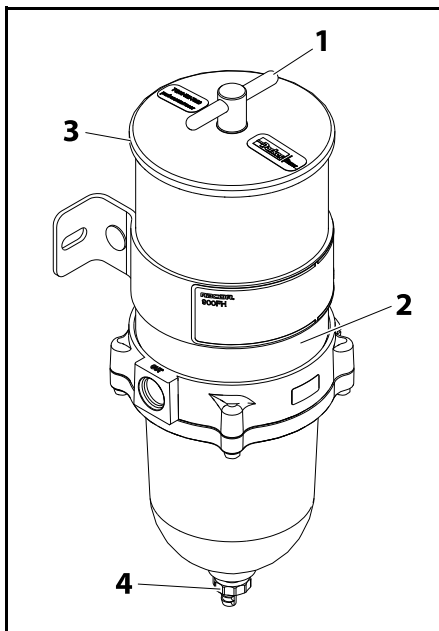
Frequency of water draining is determined by the contamination level of the fuel. Inspect or drain the collection bowl of water daily or as necessary. The collection bowl must be drained before contaminants reach the top of the turbine or when the Water Detection Module (optional) indicates it's time to drain water.

Pressure Applications / Installations:

1. Open the drain plug on the bottom of the bowl to evacuate water and contaminants with a suitable collection container in place.
2. Close the drain after all the water and contaminants have been evacuated.

NOTE: Do not leave the drain open too long as it may completely drain the entire filter assembly of water and fuel.

Auxiliary Fuel Filter



- | | |
|-------------------|---------------|
| 1. T-handle | 3. Lid |
| 2. Filter Element | 4. Drain Plug |

Figure 3-74. Components of Auxiliary Fuel Filter

⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

ELEMENT REPLACEMENT

Frequency of element replacement is determined by the contamination level of the fuel. Replace the elements every 500 hours, if power loss is noticed or annually, whichever comes first.

1. Switch off the engine.
2. Fuel supply from the fuel tank may need to be blocked to prevent fuel flow from the tank.
3. Wipe the area around the filter to clean any dirt from the area.
4. Remove the T-handle and lid.
5. Remove the element by holding the bail handles and slowly pulling upward with a twisting motion. Dispose of properly.
6. Replace old lid gasket and T-handle O-ring with new seals (supplied with new element). Lubricate both seals with motor oil or diesel fuel before installation.
7. Refer to Priming of auxiliary fuel filter or fill the unit with clean fuel, then replace the lid and T-handle then tighten snugly by hand only.

NOTE: Do not use any tool for removal and installation of T-handle.

PRIMING OF AUXILIARY FUEL FILTER

1. Remove the T-handle and lid from the top of the filter assembly.
2. Fill the filter assembly with clean fuel.
3. Lubricate lid gasket and T-handle O-ring with clean fuel or motor oil.
4. Replace the lid and T-handle and tighten snugly by hand only.

NOTE: Do not use any tool for removal and installation of T-handle.

5. Start engine and check for fuel system leaks.
6. Correct as necessary with engine off and pressure relieved from filter assembly.

DRAINING WATER

Frequency of water draining is determined by the contamination level of the fuel. Inspect or drain the collection bowl of water daily or as necessary. The collection bowl must be drained before contaminants reach the top of the turbine or when the Water Detection Module (optional) indicates it's time to drain water.

Pressure Applications / Installations:

1. Open the self-venting drain plug on the bottom of the bowl to evacuate water and contaminants with a suitable collection container in place. Head pressure will push any water and contaminants out of the drain while keeping the filter primed.
2. Close the drain after all the water and contaminants have been evacuated.
3. If necessary, follow priming of auxiliary fuel filter.

NOTE: Do not leave the drain open too long as it may completely drain the entire filter assembly of water and fuel.

3.27 DEUTZ 2.9 L4 (GUO III) ENGINE

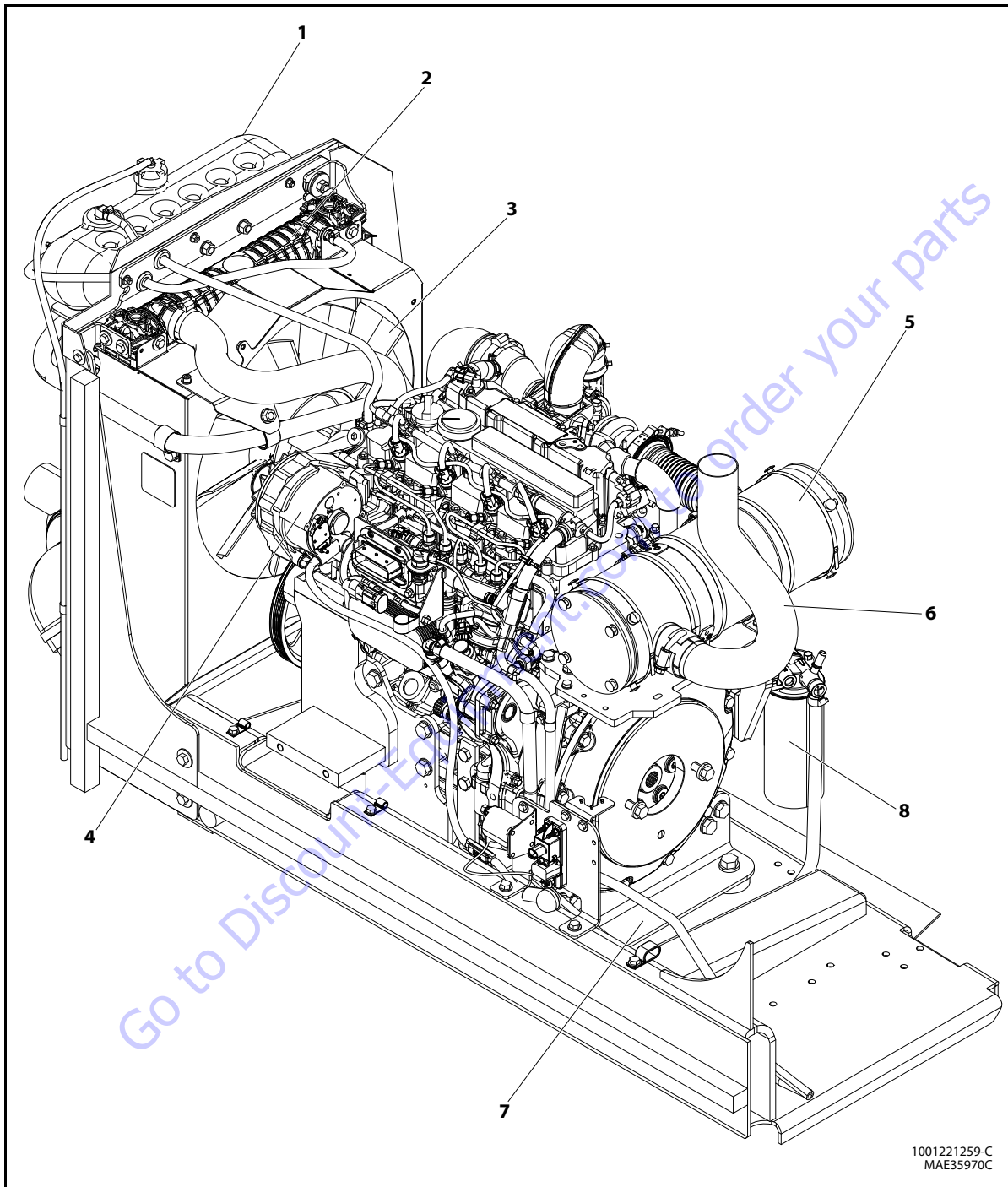
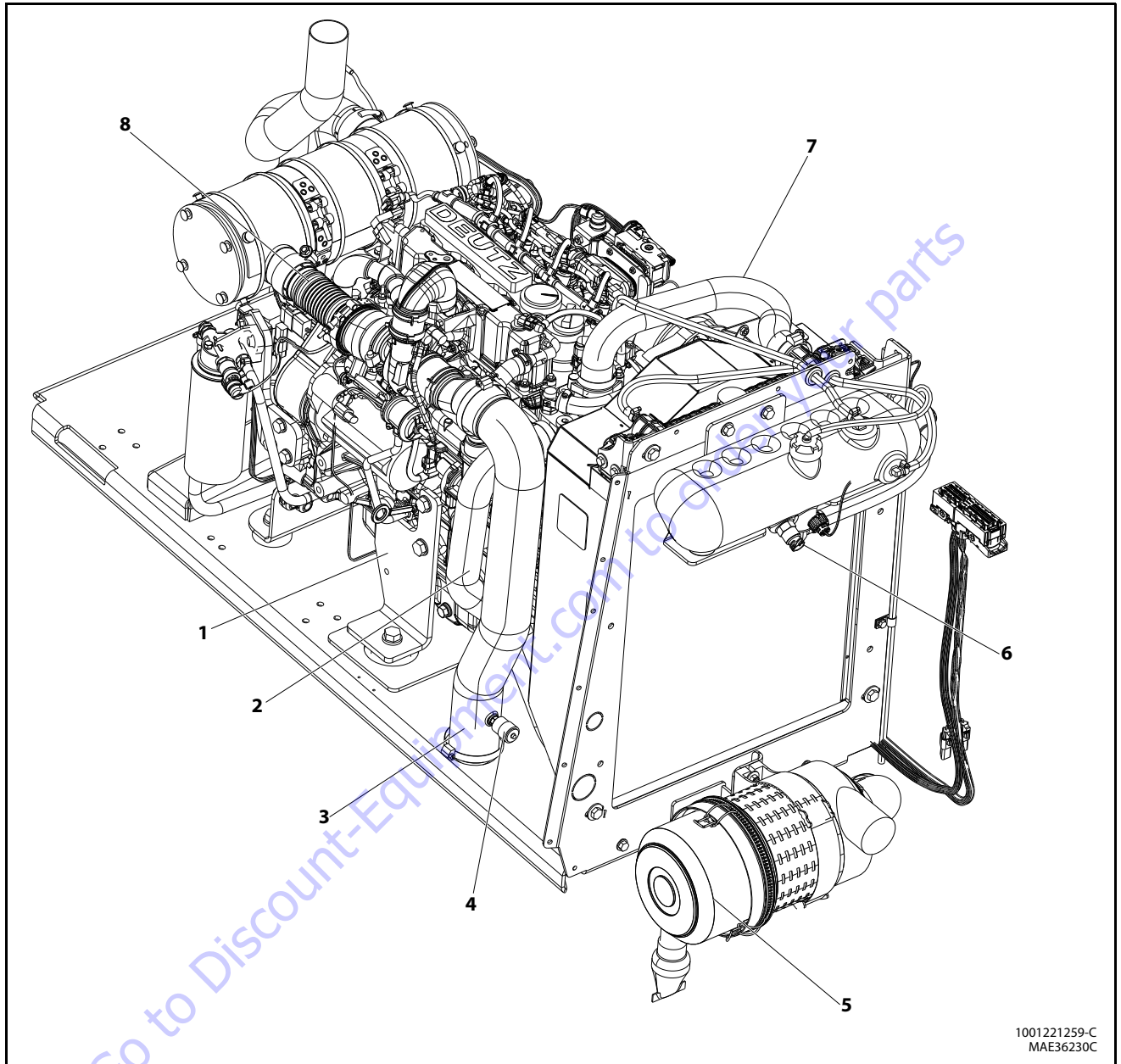


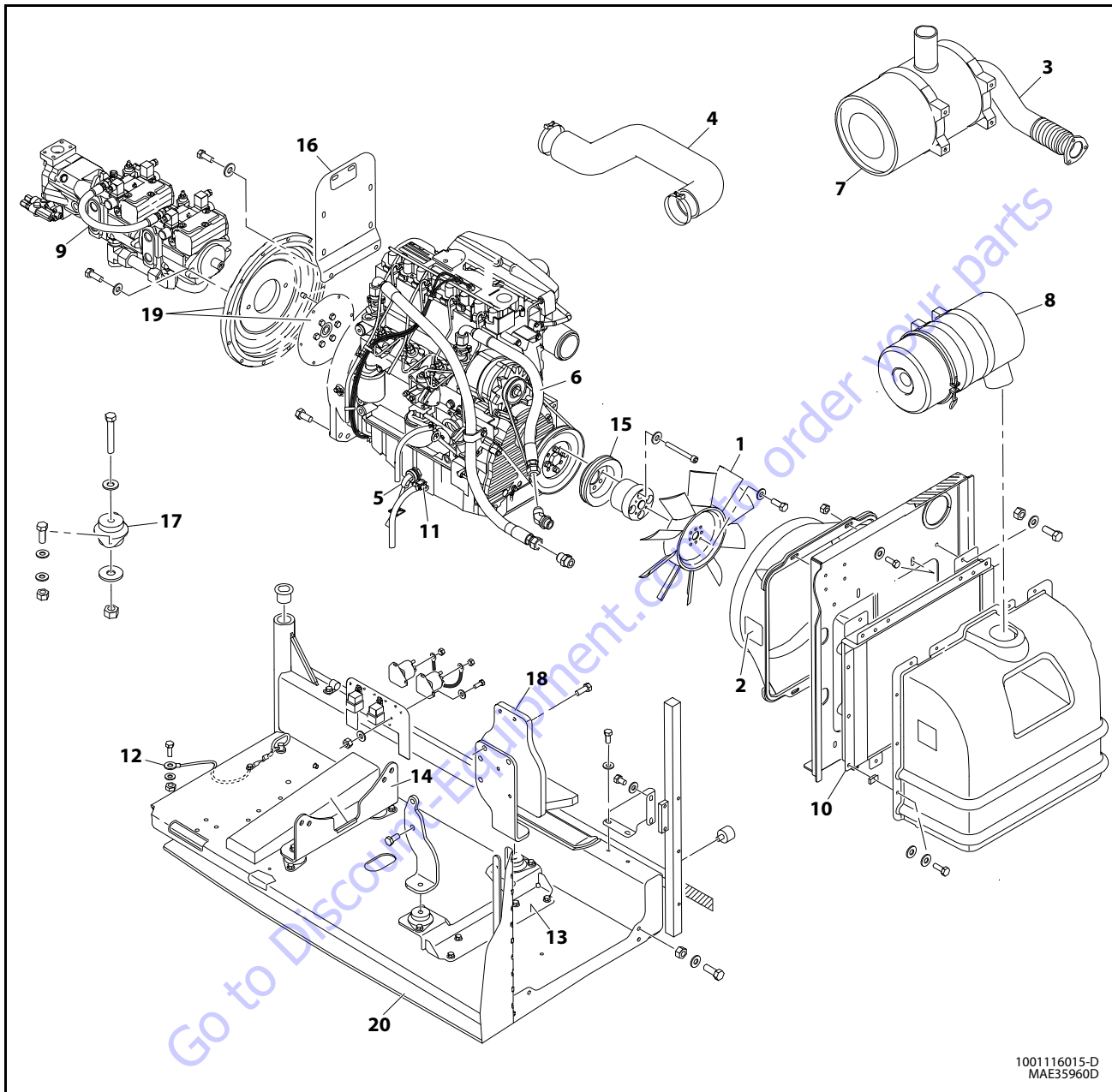
Figure 3-75. Deutz 2.9 L4 (GUO III) Engine Installation - Sheet 1 of 2



- | | |
|-------------------------|-------------------------|
| 1. Generator Mount | 5. Air Filter |
| 2. Lower Radiator Hose | 6. Coolant Level Sensor |
| 3. Air Intake Hose | 7. Upper Radiator Hose |
| 4. Air Filter Indicator | 8. Pipe Flex Assembly |

Figure 3-76. Detuz 2.9 L4 (GUO III) Engine Installation - Sheet 2 of 2

3.28 DEUTZ TD2011 ENGINE

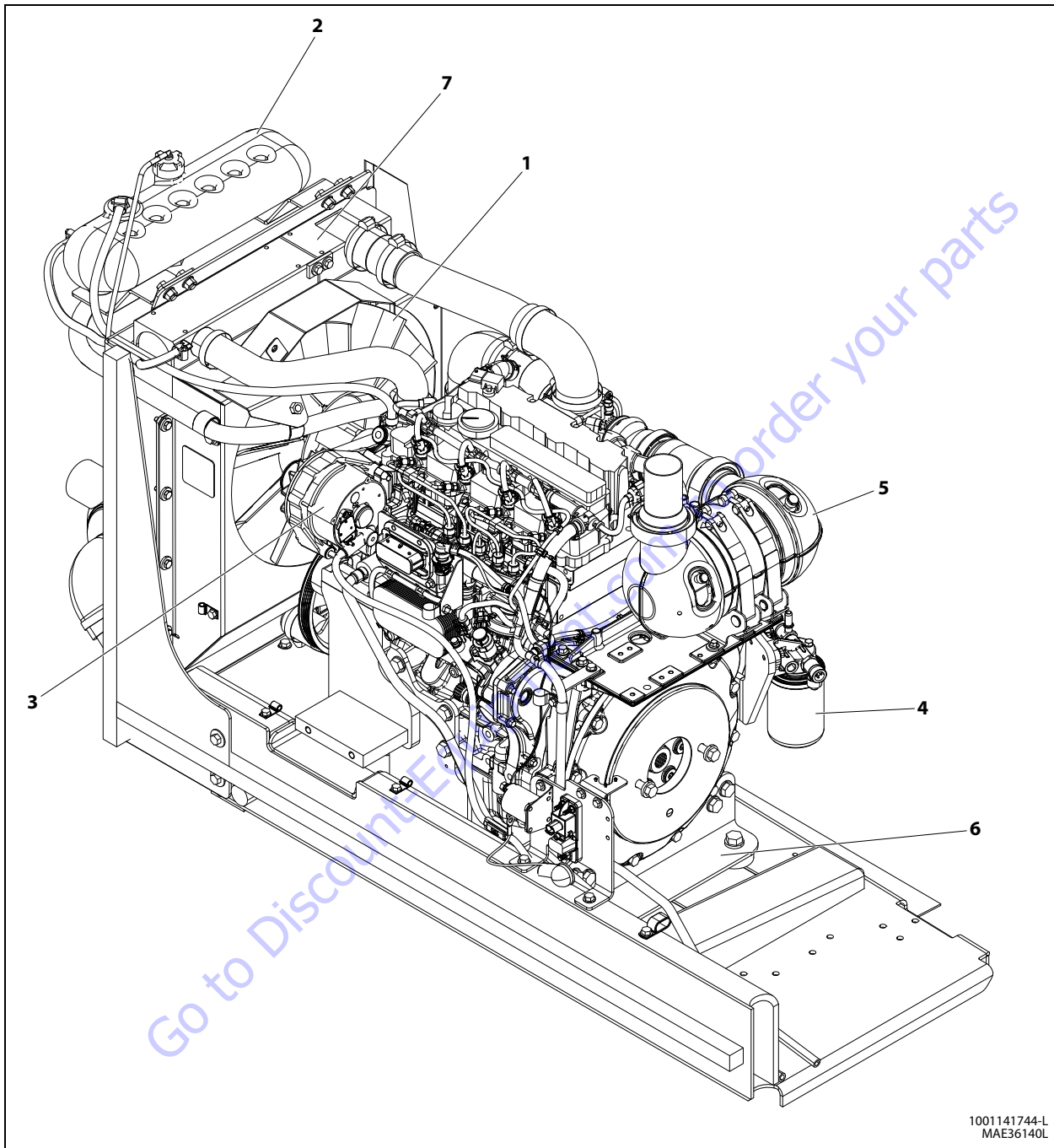


1001116015-D
MAE35960D

- | | | | |
|---------------|-------------------------|---------------------------------|-----------------------|
| 1. Fan | 6. Oil Cooler | 11. Oil Drain | 16. Muffer Bracket |
| 2. Rod | 7. Muffer | 12. Lanyard | 17. Motor Mount |
| 3. Exhaust | 8. Air Cleaner Assembly | 13. Front Engine Mounting Plate | 18. Generator Mount |
| 4. Air Intake | 9. Pump Assembly | 14. Rear Engine Mounting Plate | 19. Pump Coupling Kit |
| 5. Heater | 10. Cooler | 15. Pulley | 20. Engine Tray |

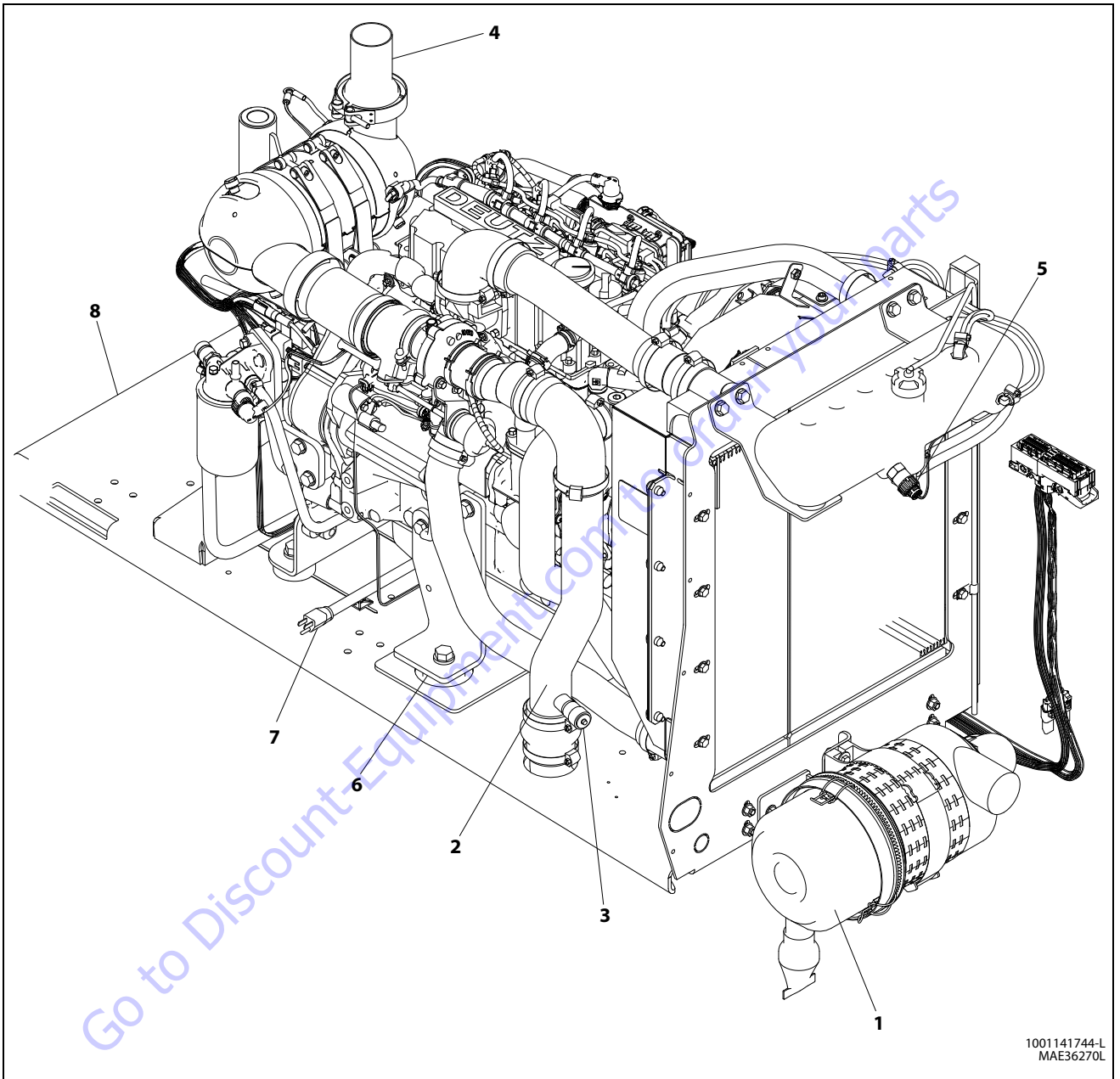
Figure 3-77. Detuz TD2011 L040 Engine Installation

3.29 DEUTZ 2.9L4 ENGINE



- | | |
|--------------------|-----------------|
| 1. Fan | 5. Muffler |
| 2. Fuel Tank | 6. Engine Mount |
| 3. Alternator | 7. Radiator |
| 4. Air Fuel Filter | |

Figure 3-78. Detuz TCD2.9L4 Engine Installation - Sheet 1 of 2



1001141744-L
MAE36270L

- | | |
|----------------------------------|-------------------------|
| 1. Air Filter | 5. Sensor Coolant Level |
| 2. Air Intake | 6. Generator Mount |
| 3. Fuel Filter Service Indicator | 7. Heater Engine Block |
| 4. Pipe Exhaust | 8. Engine Tray |

Figure 3-79. Detuz TCD2.9L4 Engine Installation - Sheet 2 of 2

3.30 DEUTZ EMR 2

The EMR2 consists of the sensors, the control unit and the actuator. Engine-side controls as well as the JLG Control System are connected by means of separate cable harnesses to the EMR control unit.

The sensors attached to the engine provide the electronics in the control unit with all the relevant physical parameters. In accordance with the information of the current condition of the engine and the preconditions (throttle position etc.), the EMR2 controls an actuator that operates the control rod of the injection pump and thus doses the fuel quantity in accordance with the performance requirements.

The exact position of the regulating rod is reported back and, if necessary, is corrected, by means of the control rod travel sensor, situated together with the rotation magnets in a housing of the actuator.

The EMR2 is equipped with safety devices and measures in the hardware and software in order to ensure emergency running (Limp home) functions.

In order to switch the engine off, the EMR2 is switched in a de-energized fashion over the ignition switch. A strong spring in the actuator presses the control rod in the de-energized condition into the zero position. As a redundancy measure, an additional solenoid serves for switching off and this, independently of the actuator, also moves the control rod in the de-energized condition into the zero position.

After the programming, that is carried out over the ISO9141 interface, the EMR2 possesses a motor-specific data set and this is then fixedly assigned to the engine. Included in this are the various application cases as well as the customer's wishes regarding a particular scope of function.

Each EMR2 module is matched by serial number to the engine. Modules cannot be swapped between engines.

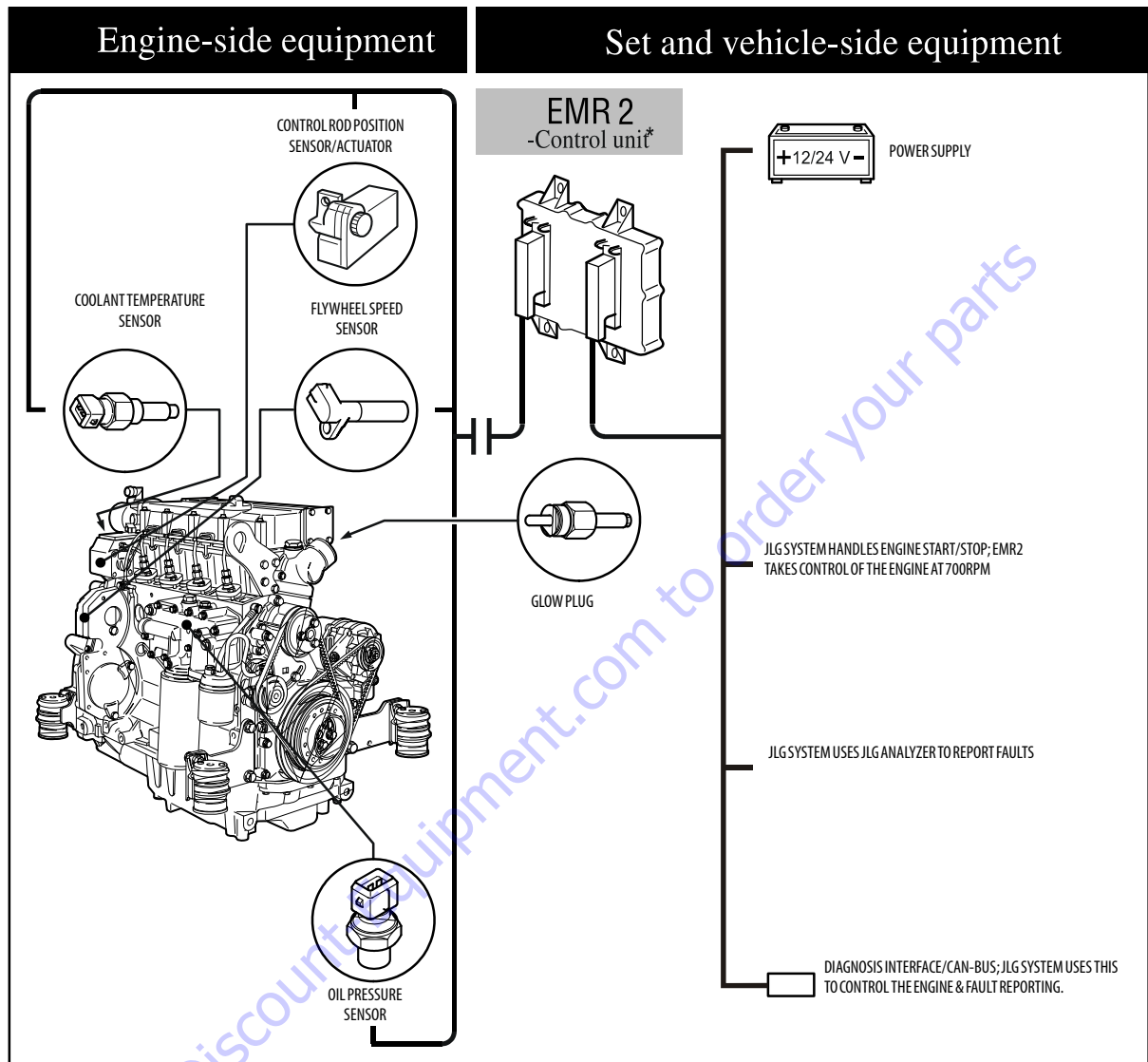


Figure 3-80. EMR 2 Engine Side Equipment

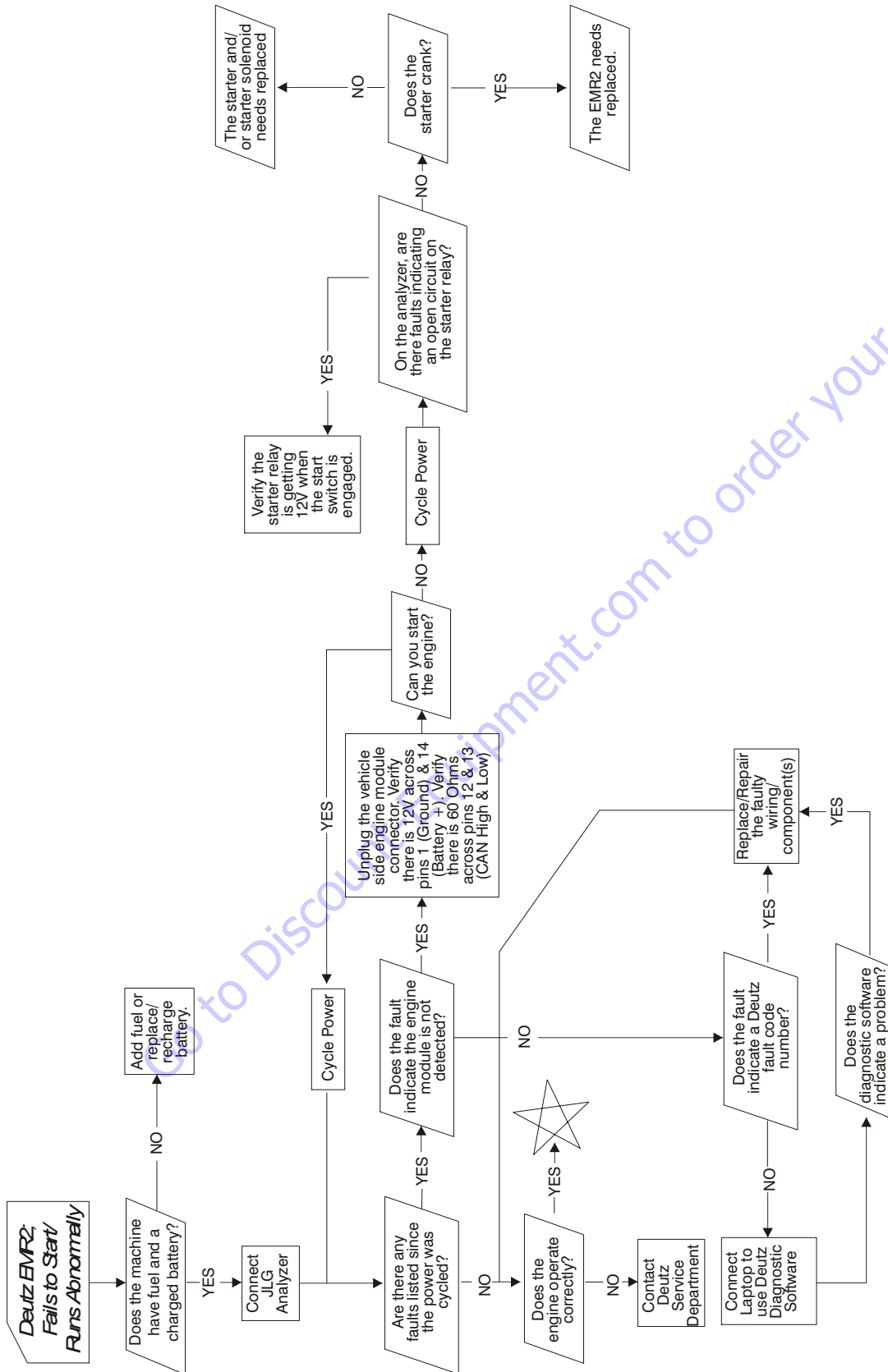
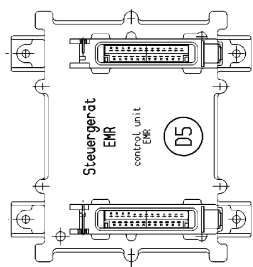


Figure 3-81. Deutz EMR 2 Troubleshooting Flow Chart

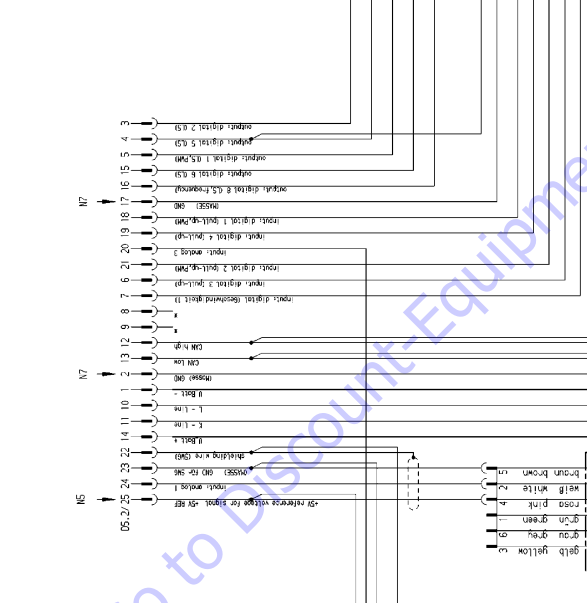
Gerät
Kodierung 2
equipment / code 2



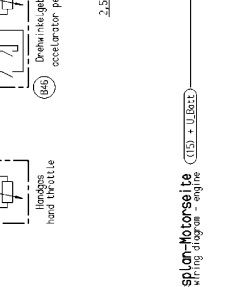
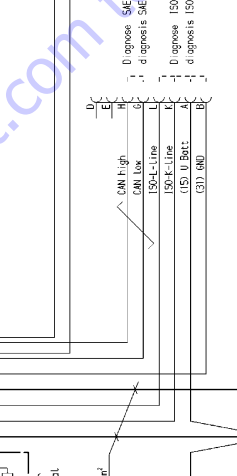
D5.2

- Hinweise: (N ...)
1. Gerätebezeichnung nach H22900 Teil 1, z.B. (X22)
 2. Busabschlusswerte für CAN-Interface SAE J 1939 extern beachten, siehe Anhang C13.97 / 10
 3. nicht mechanische Untergrenzen über 1,5 mm
 4. Steuergeräte EHR → Batterie, 5,5 m
Steuergeräte EM → Steuergerät, 7 m
Steuergeräte EHR → Batterie, 5,5 m
Steuergeräte EM → Steuergerät, 7 m
Gerätekabel → Betrieb- und Anzeigerleuchte 5 m
 5. Max. zulässige Stromstärke: 30 mA
 6. Kein DHDZ-Lieferanzell
 7. DHDZ nicht mit Motormaße verbinden
 8. Nach Sicherung
 9. Anschlusspunkte nahe an Steuergerät montieren

1. equipment designation according (X22)
2. bus terminal resistance for CAN-interfaces SAE J 1939 to H22900, part 1, e.g.
3. do not connect external devices, see page C13.97 / 10
4. cross-section of individual wires: 1,5 mm
5. max. permissible current: 30 mA
6. not supplied by DHDZ
7. don't connect DHDZ-signal to chassis
8. don't connect additional power-consumers behind fuse F75
9. place connection points near ECU

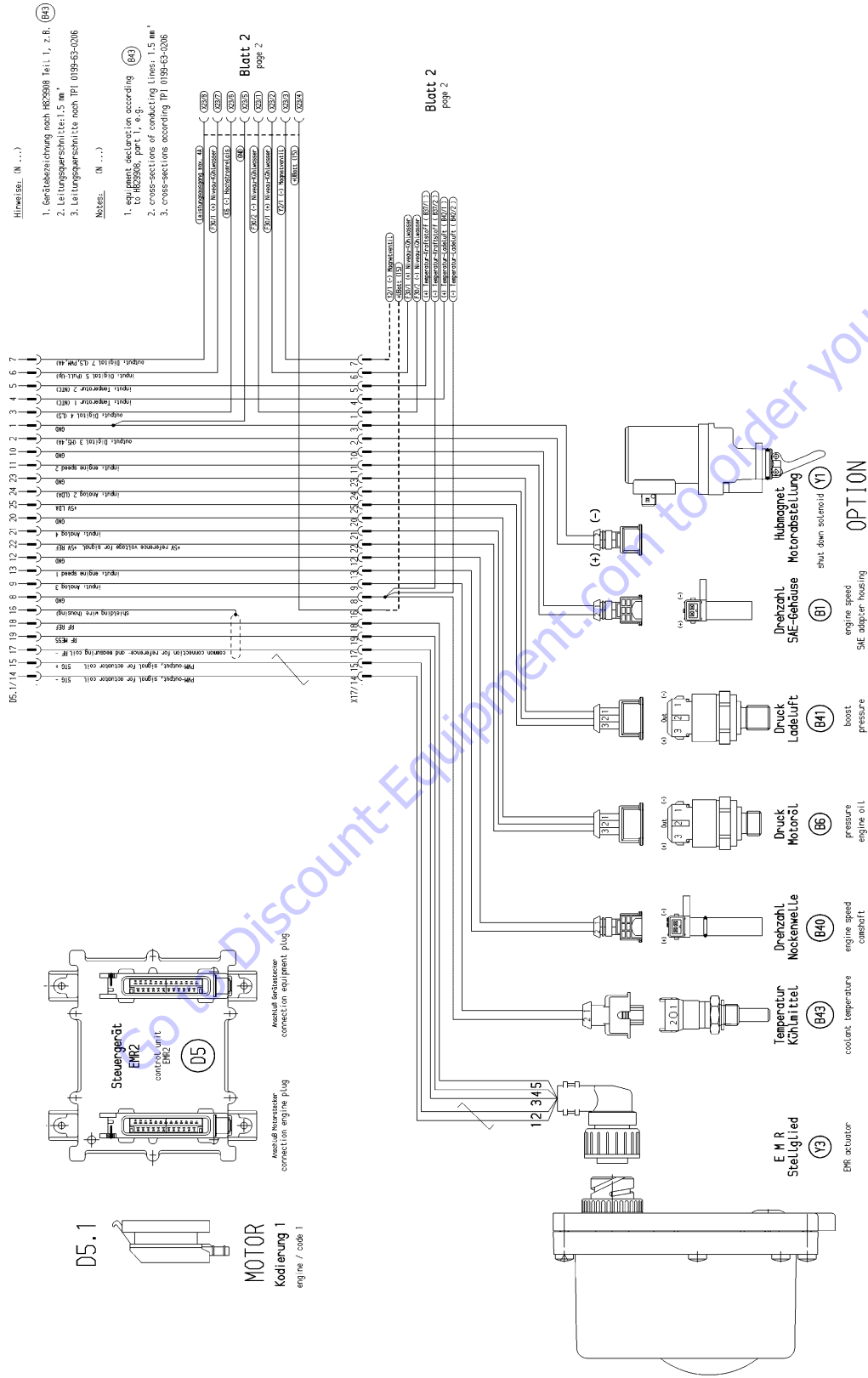


- warning signal, temperature
- fault indicator lamp
- torque
- warning signal oil pressure / relay, engine brake
- engine speed
- diagnosis button
- speed switch
- limiting torque curve switch / Dig-Up Senset
- speed drop switch
- engine brake / spur switch
- speed signal / Dig-Down Senset



Go to Discount-Equipment.com to order your parts

Figure 3-82. Deutz EMR 2 Vehicle Side Connection Diagram



HINWEISE: (N ...)

1. Gerätezeichnung nach R62988 Teil 1, z.B. (B4)
2. Leitungsschnitte: 1,5 mm²
3. Leitungsschnitte nach IP1 0199-63-0206

MAßSTAB: (N ...)

1. equipment designation according to R62988, part 1, e.g.
2. cross-sections of conducting lines: 1.5 mm²
3. cross-sections according IP1 0199-63-0206

Blatt 2
page 2

Blatt 2
page 2

Figure 3-83. Deutz EMR 2 Engine Side Connection Diagram - Sheet 1 of 2

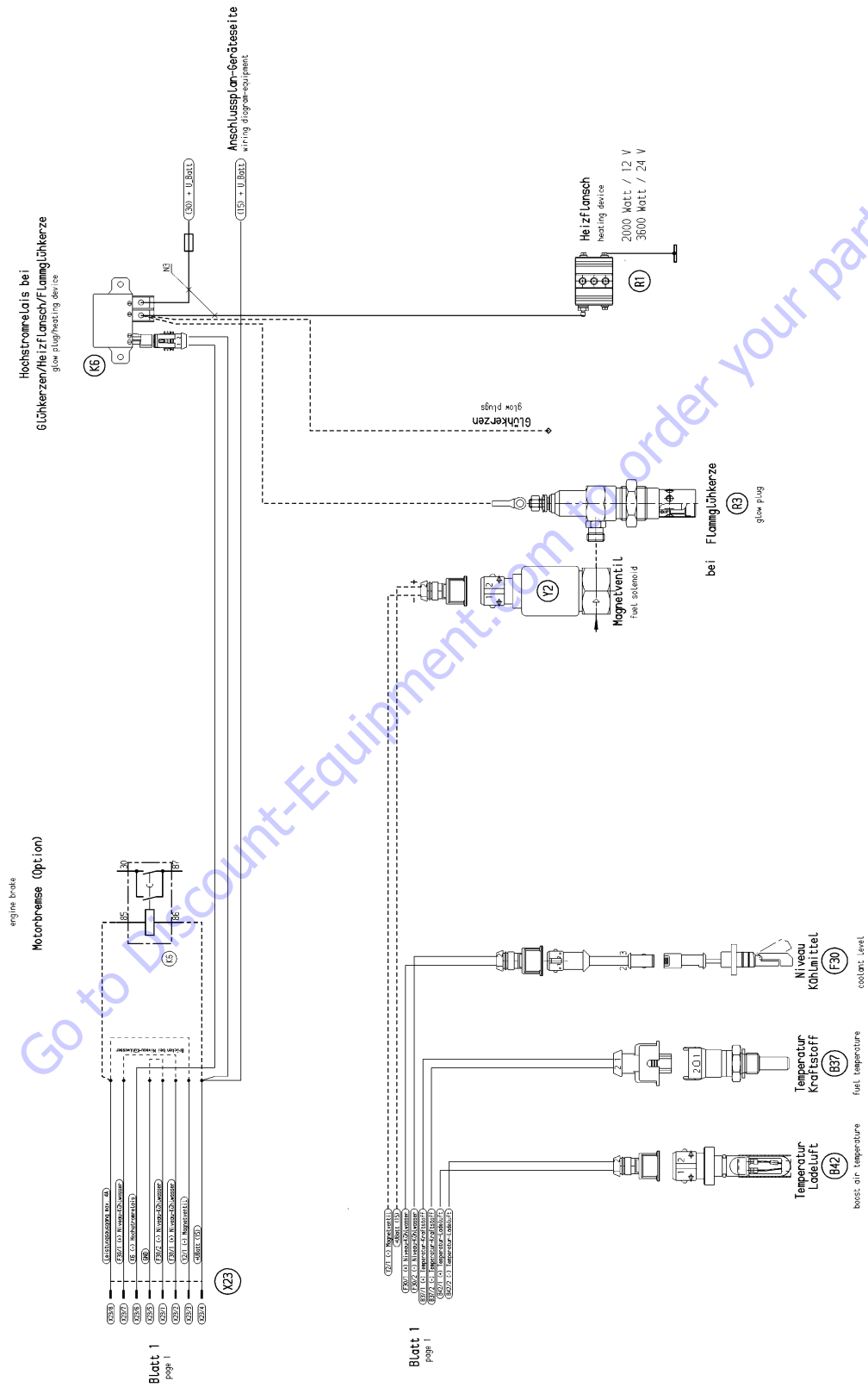
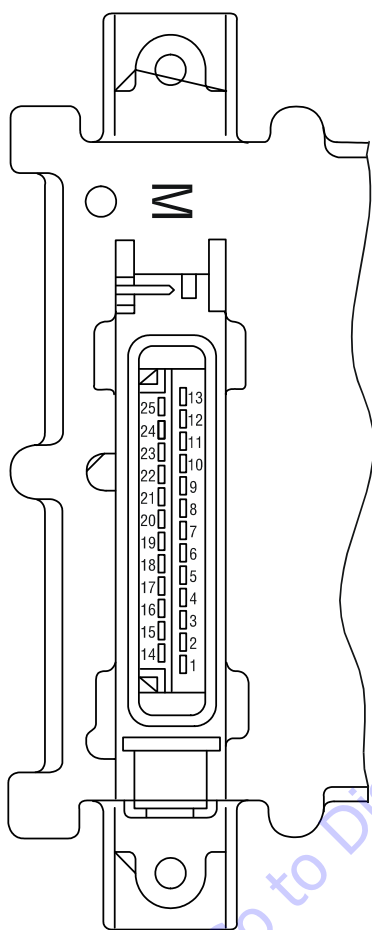


Figure 3-84. Deutz EMR 2 Engine Side Connection Diagram - Sheet 2 of 2

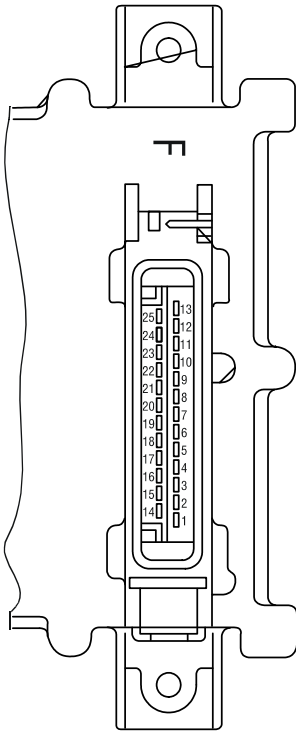


Pin No.	Designation	Description
1	Reserve	Reserve
2	Output: digital 3	Digital output for solenoid ¹⁾
3	Output: digital 4	For heating flange (optional)/ glow plug (optional)
4	Input (optional) Temp 1	Fuel temperature ²⁾
5	Input (optional) Temp 2	Charge air temperature
6	Input (optional) DigIn 5	Coolant level / oil level
7	Output: PWM2/digital 6	
8	GND	Reference potential for analog signal at pin 9
9	Input: analog 7	Analog input for Coolant temperature sensor (NTC)
10	GND	Reference potential for analog signal at pin 11
11	Multi-function input: speed 2/DigIn 2	Digital input second engine speed (crankshaft) (optional) and speed signal (optional)
12	GND	Reference potential for analog signal at pin 13
13	Input: speed 1	Digital input first engine speed (camshaft)
14	STG -	PWM output, signal for actuator coil
15	STG +	PWM output, signal for actuator coil
16	Screen	Screening regulating rod travel sensor (for lines 17, 18, 19)
17	RF -	General connection for reference and measuring coil
18	RF REF	Analog input, reference signal of the reference coil
19	RF MESS	Analog input, measuring signal of the measuring coil
20	GND	Reference potential for signal at pin 21
21	Input: analog 4/digital 9	Analog input 4 (sensor signal oil pressure sensor) or digital input 9
22	+5 V REF	+5 V Reference voltage for signal at pin 21 (max. 15 mA)
23	GND	Reference potential for signal at pin 24
24	Input: analog 2/digital 7	Analog input 2 (sensor signal charge air) or digital input 7
25	+5 V LDA	+5 V Reference potential for signal at pin 24 (max. 15 mA)

1) For continuous power: < 4 A

2) Corresponds to special function "fuel temperature compensation at the EMR (0211 2571)

Figure 3-85. EMR 2 Engine Plug Pin Identification



Pin-No.	Designation	Description
1	U Batt -	Negative pole at battery (clamp 31)
2	GND	Reference potential for signal
3	Output: digital 2	PWM or digital output, various functions
4	Input / output: DigInOut	Fault lamp and diagnostic button
5	Output: PWM 1/Dig 1	PWM or digital output, various functions
6	Multi-function input: DigIn 3	Genset applications/gear shift/motor brake
7	Input: digital 10/velocity	Speed signal (tacho input)
8	NC	Not occupied
9	NC	Not occupied
10	L-line	Serial ISO 9141 interface
11	K-line	Serial ISO 9141 interface
12	CAN high	Interface for CAN-Bus
13	CAN low	Interface for CAN-Bus
14	U Batt +	Positive pole for battery (clamp 15)
15	Output: digital 5	Digital output, various functions
16	Output: digital 7/Frequency	Frequency, PWM or digital output, various functions
17	Ground	Reference potential for signal at pins 18, 19 and 21
18	Input: digital 1 / PWM 1	PWM 1 or digital input 1, various functions
19	Multi-function input: DigIn 4	Performance curve switching/genset applications
20	Multi-function input: digital 8 / analog 3	Hand hand throttle/genset applications, Digital (8) or analog input (3)
21	Input: digital 2 / PWM 2	PWM 2 or digital input 2, various functions
22	Screen	Screening (e.g. for lines hand throttle or PWG)
23	GND	Reference potential for signal at pin 24
24	Input: analog 1 / digital 6	Analog input 1 (pedal value sensor, PWG) or digital input 6
25	+5 V REF	+5 V Reference voltage for signal at pin 24

Figure 3-86. EMR 2 Vehicle Plug Pin Identification

SECTION 3 - CHASSIS & TURNTABLE

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	SPN	FMI	Cause	Remarks	Help
Zero error display	-	No faults	524287	31	No active faults present		
Revolutions / speed acquisition	01	Speed sensor 1	190	8	Sensor failure. Distance from gear too far. Additional fault impulses. Cable joint interrupted.	Governor in emergency operation (if sensor 2 available). Emergency switch-off (if sensor 2 not available or failed). Governor in emergency operation (with sensor 1) Emergency switch-off (if sensor 1 not available or failed).	Check distance. Check cable connection. Check sensor and replace if required.
	03	Speed sensor	84	8	Tacho failed. Additional fault impulses. Cable connection interrupted.	Governor in emergency operation.	Check cable connection and Tacho. Replace if required.
	04	Excess speed switch-off	190	0	Speed was/is in excess of limit.e. Check PID setting. Check rods. Check actuator and replace if required. Check cable to actuator (impulse on incorrect speed). Check No. of teeth. For vehicles check for possible thrust mode.	Engine stop.	Check parameter (21). Check speed settings.
Sensors	07	Charge air pressure	102	2			
	08	Oil pressure	100	2			
	09	Coolant temperature	110	2	Fault at corresponding sensor entry (e.g. short circuit or cable break).	With failure of the sensor, the associated monitoring function is de-activated.	Check sensor cable. Check sensor and replace if required. Check fault limits for sensor.
	10	Charge air temperature	105	2			
	11	Fuel temperature	174	2			

NOTE: SID is equal to 512. To get SPN #, add 512 + number. For example, SID 254 would be 512+254 or an SPN of 766.

Figure 3-87. EMR2 Fault Codes - Sheet 1 of 5

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	SPN	FMI	Cause	Remarks	Help
Functional fault warning	30	Oil pressure warning	100	1	Oil pressure below speed-dependent warning line characteristic	Fault message (disappears when oil pressure is again above recovery limit). After a delay time - fill limitation.	Check engine (oil level, oil pump). Check oil pressure sensor and cable. Check oil pressure warning line characteristic.
	31	Coolant temperature warning	110	0	Coolant temperature has exceeded warning level.	Fault message (disappears when coolant temperature again drops below recovery level). After a delay time - fill limitation.	Check coolant. Check coolant temperature sensor and cable.
	32	Charge air temperature warning	105	0	Charge air temperature has exceeded warning level.	Fault message (disappears when charge air temperature gain drops below recovery level). After a delay time - fill limitation.	Check charge air. Check charge air-temperature sensor and cable.
	34	Coolant level warning	111	1	Switch input "Low coolant level" is active.	Fault message.	Check coolant level. Check coolant level sensor and cable.
	35	Speed warning (with thrust mode operation).	SID 190	14	revolutions was/is above (top) revolution speed limit. "Thrust mode" function is active.		Check parameters. Check speed settings.
	36	Fuel temperature warning	174	0	Fuel-temperature has exceeded warning level.	Fault message (disappears when fuel temperature again drops below recovery level).	Check fuel. Check fuel temperature sensor and cable.

NOTE: SID is equal to 512. To get SPN #, add 512 + number. For example, SID 254 would be 512+254 or an SPN of 766.

Figure 3-88. EMR2 Fault Codes - Sheet 2 of 5

SECTION 3 - CHASSIS & TURNTABLE

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	SPN	FMI	Cause	Remarks	Help
Functional fault, switch-off	42	Charge air temperature switch-off	105	0	Charge air temperature has exceeded switch-off limit.	Emergency stop	Check charge air. Check charge air-temperature sensor and cable. Check switch-off limit.
	44	Coolant level switch-off	111	1	Switch input "Low coolant level" is active.	Emergency stop. Start lock.	Check coolant level. Check coolant level sensor and cable.
Actuator	50	Feedback	SID 24	12	Actuator not connected. Fault in actuator confirmation.	Emergency switch-off. Actuator cannot be operated.	Check actuator, replace if required. Check cable, check fault limits for "Confirmation".
	52	Reference feedback	SID 24	13			Check actuator, replace if required. Check cable, check fault limits for "Rifeness confirmation".
	53	Control travel difference	SID 23	7	Injection pump/actuator jammed or not connected. Difference between nominal/actual control travel is > 10 % of the overall control path.	Fault message (disappears when difference is < 10 %).	Check actuator/actuator rods / injection pump, replace if required. Check actuator cable.
	59	Auto calibration BOSCH-EDC pumps faulty operation	SID 23	13	No automatic actuator equalization possible. Incorrect input of the actuator reference values.	Engine stop / start lock. Governor cannot be taken into use. EDC actuator calibration required.	Check actuator and replaced if required. Check feedback cable. Check fault limits and reference values of the feedback. Program the fault limits for feedback, save the fault limits for feedback, save values. Switch ignition off and on again. Check again. If faulty, inform DEUTZ-Service and carry out automatic equalization again. Set fault limits again.

NOTE: SID is equal to 512. To get SPN #, add 512 + number. For example, SID 254 would be 512+254 or an SPN of 766.

Figure 3-89. EMR2 Fault Codes - Sheet 3 of 5

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	SPN	FMI	Cause	Remarks	Help
Hardware inputs/outputs	60	Digital output 3 (Switch-off solenoid, pin M 2)	SID 51	2	Fault (short circuit / cable break) at digital output.	Driver level is switched off.	Check cable of digital output (cable break or short circuit).
	62	Digital output 6, pin M 7	SID 60	2		Fault message.	
	63	Excess voltage switch-off solenoid	SID 51	6			
	67	Error Hand Setp1	91	11			
	68	Error CAN Setp1	898	2			
	Communication	70	CAN-Bus controller	SID 231	12	CAN-controller for CAN-bus is faulty. Fault removal despite re-initialising continuously not possible	Application-dependent.
71		CAN interface SAE J 1939	SID 231	9	Overflow in input buffer or a transmission cannot be placed on the bus.		Check CAN connection, cable connection. Check sensor and replace if required.
74		Cable break, short circuit or bus-error	SID 231	14			Switch ignition off and on again. Check again. If faulty inform DEUTZ Service
Memory	76	Parameter programming (write EEPROM)	SID 253	12	Fault in parameter programming in the governor fixed value memory.		
	77	Cyclic program test	SID 240	12	Constant monitoring of program memory shows error (so-called "Flash-test").	Emergency switch-off, engine cannot be started.	
	78	Cyclic RAM test	SID 254	2	Constant monitoring of working memory shows error.		Note values of parameters (3895 and 3896). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.

NOTE: SID is equal to 512. To get SPN #, add 512 + number. For example, SID 254 would be 512+254 or an SPN of 766.

Figure 3-90. EMR2 Fault Codes - Sheet 4 of 5

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	SPN	FMI	Cause	Remarks	Help
Control unit hardware	80	Power supply (Actuator)	SID 254	2	Power supply for actuator not in the permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	83	Reference voltage 1	SID 254	2	Reference voltage for actuator not in the permissible range.	Fault message (disappears when power again in the normal range). Auxiliary value 5 V	Check voltage supply. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	84	Reference voltage 2	SID 254	2			
	85	Reference voltage 4	SID 254	2			
	86	Internal temperature	171	12	Internal temperature for control unit not in permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
87	Atmospheric pressure	108	12	Atmospheric pressure not in permissible range.	Fault message (disappears when power again in normal range). Atmospheric pressure monitoring function de-activated.	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.	
Program logic	90	Parameter fault (EEPROM retrieval or checksum faulty).	SID 253	2	No data found or checksum of data is faulty (note: fault only occurs during setting of parameter / saving or reset).	Engine cannot be started.	Check data for correct settings. Save parameters. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	93	Stack overflow	SID 240	2	Internal calculation fault (so-called "Stack overflow" fault).	Emergency switch-off. Engine cannot be started.	Note parameters (3897 and 3898). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	94	Internal fault	SID 254	2			

NOTE: SID is equal to 512. To get SPN #, add 512 + number. For example, SID 254 would be 512+254 or an SPN of 766.

Figure 3-91. EMR2 Fault Codes - Sheet 5 of 5

3.31 BIO FUEL IN DEUTZ ENGINES

General

Use of bio fuels is permitted for the compact engines made by DEUTZ.

Distillate fuels with residue oil percentages or mixed fuels may not be used in DEUTZ compact engines.

The DEUTZ vehicle engines are designed for diesel fuels in accordance with EN 590 with a cetane number of at least 51. DEUTZ engines for mobile machinery are designed for a cetane number of at least 45. When using fuels of a low cetane number, disturbing white smoke and ignition misfires are to be expected under some circumstances.

A cetane number of at least 40 is permissible for the US market, therefore special engine models have been developed to avoid starting difficulties, extreme white smoke or increased hydrocarbon emissions (EPA specification - US EPA REGULATIONS FOR LARGE NONROAD COMPRESSION-IGNITION ENGINES).

If the white smoke behavior is unacceptable when using a very low cetane number, the use of ignition improvers is to be recommended as a later remedial measure.

The certification measurements for compliance with the legal emission limits are carried out with the test fuels prescribed by law. These correspond to the diesel fuels in accordance with EN 590 and ASTM D 975. No emission values are guaranteed with the other fuels described. It is the obligation of the owner to check the permission for use of the fuels in accordance with regional regulations.

Bio Fuel

PERMITTED BIO-DIESEL FUELS

Originally only rape seed oil methylester (RME) was sold as a bio-diesel fuel in Europe but fatty acid methylester (FAME) based on other oils have come onto the market increasingly in recent years. However, with the latter there is a risk that the limit values of EN 14214 are not kept in the field. Anyone who uses bio-diesel fuel in DEUTZ engines must therefore choose his supplier very carefully and have him guarantee compliance with the EN 14214 limit values. Since experience has shown that rape seed oil methylester (RME) exceeds the limit values less often than other esters, it is expressly recommended to use only rape seed oil methylester. DEUTZ customers in Germany can additionally ensure the quality by buying bio-diesel fuel with an AGQM certificate (Arbeitsgemeinschaft Qualitäts-Management Biodiesel e.V.).

The use of US bio-diesel based on soy oil methylester is only permissible in mixtures with diesel fuel with a bio-diesel part of a max. 20 weight-%. The US bio-diesel used for the mixture must comply with the ASTM D6751-07a (B100) standard.

APPROVED ENGINES

The 912, 913, 914, 1011, 2011, 1012, 2012, 1013, 2013, 413 and 513 series are approved for bio-diesel from year of manufacture 1993 under compliance with the basic conditions specified below.

BASIC CONDITIONS TO BE OBSERVED

- A power loss of 5-9 % in relation to diesel fuel in accordance with EN 590 is possible due to the lower heating value. Blocking of the fuel injector is not allowed.
- The lubricating oil quality must correspond to TR 0199-99-3002. The lubricating oil change interval must be halved in relation to operation with diesel fuel in accordance with EN 590.
- Standstills of longer than 4 to 6 weeks must be avoided with bio-diesel. Otherwise the engine must be started and stopped with diesel fuel.
- Bio-diesels can be mixed with normal diesel fuel but the basic conditions described in this subsection apply for mixtures. Mixtures with up to 5 % (m/m) bio-diesel (B5) which have recently been on sale at European fuel stations are excepted. These fuels must be treated like normal diesel fuels because EN 590 expressly permits adding up to 5 % (m/m) bio-diesel in accordance with EN 14214.
- Approx. 30-50 hours after changing over from diesel fuel to bio-diesel, the fuel filter should be changed as a preventive measure to avoid a drop in performance due to clogged fuel filters. Deposited fuel ageing products are dissolved by bio-diesel and transported into the fuel filter. They should not be changed immediately but after approx. 30 to 50 hours because the dissolving of dirt takes a certain amount of time.

PLANT OIL

NOTICE

PURE PLANT OILS (E.G. RAPE SEED OIL, SOY OIL, PALM OIL) ARE NOT CLASSIFIED AS BIO-DIESEL AND EXHIBIT PROBLEMATIC PROPERTIES FOR DIESEL ENGINE OPERATION (STRONG TENDENCY TO COKE, RISK OF PISTON SEIZURE, EXTREMELY HIGH VISCOSITY, POOR EVAPORATION BEHAVIOR).

The conversion of DEUTZ engines to rape seed oil fuel operation with conversion kits and modified tanks systems of various manufacturers is not allowed and leads to loss of warranty rights.

Biological Contamination In Fuels

SYMPTOMS

The following symptoms may indicate that a fuel tank is contaminated by micro-organisms:

- Internal tank corrosion,
- Filter blockage and the associated loss of power due to gel-like deposits on the fuel filter (especially after long stand-stills)

CAUSE

Micro-organisms (bacteria, yeasts, funguses) can form bio-sludge under unfavorable conditions (favoured particularly by heat and water).

Penetration by water is usually caused by condensation of the water in the air. Water does not dissolve in fuel so that the penetrating water collects at the bottom of the tank. The bacteria and funguses grow in the watery phase, at the phase boundary to the fuel phase, from which they draw their nutrition. There is an increased risk especially with bio-diesel (FAME).

PREVENTIVE MEASURES

- Keep the storage tank clean, regular cleaning of the tank by specialist companies
- Installation of fuel pre-filters with water traps, especially in countries with frequently fluctuating fuel qualities and high percentage of water.

If the fuel system and storage tank have already been attacked by micro-organisms. The biocide must be dosed according to the manufacturer's specifications.

- Avoid direct exposure of the storage tank to sunlight
- Use smaller storage tanks with corresponding low dwell times of the stored fuel

FUEL ADDITIVES

The use of fuel additives is not permitted. The flow improvers mentioned above are an exception. Use of unsuitable additives will result in loss of warranty.

3.32 DEUTZ ENGINE FAULT CODES

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
29	2	978	1-2-6	Diagnostic fault check of synchronism of hand throttle and Low idle switch (LIS).	Plausibility error between sensor and idle switch	Threshold for error detection is an internal ECU threshold. The accelerator pedal must have detected full load and idle plausibility at least once.
29	3	932	1-2-6	Diagnostic fault check of short circuit to supply voltage (signal range check high) of acceleration pedal signal.	The signal exceeds the applicable threshold; signal range violation	If the signal is below the applicable threshold APP_uRawSRCHiHTLIS_C, the signal range violation is reset after the healing debouncing. In case when the CCP is active (CCP_stActive = 1) and the reading from the EEPROM memory is successful, the signal is below the threshold APP_uHTLISCCPHi[1], a signal range violation is reset after debouncing.
29	4	937	1-2-6	Diagnostic fault check of short circuit to ground (signal range check low) of acceleration pedal signal	The signal is below the applicable threshold; signal range violation	If the signal exceeds the applicable threshold APP_uRawSRCLoHTLIS_C, the signal range violation is reset after the healing debouncing. In case when the CCP is active (CCP_stActive = 1) and the reading from the EEPROM memory is successful, the signal exceeds the threshold APP_uHTLISCCPLo[1], a signal range violation is reset after debouncing.
91	3	935	2-2-6	Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal	Sensor defect. Short cut to battery or open loop.	Check cabling, check accelerator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it. If the signal is below the applicable threshold APP_uRaw1SRCHigh_C, the signal range violation is reset after the healing debouncing.
91	4	940	2-2-6	Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal	Short circuit to ground.	Check cabling, check accelerator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it If the signal exceeds the applicable threshold APP_uRaw1SRCLow_C, the signal range violation is reset after the healing

SECTION 3 - CHASSIS & TURNTABLE

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
91	11	976	2-2-6	Diagnostic fault check of synchronism of single potentiometer and Low idle switch(LIS).	Measured voltage of accelerator pedal 1 is out of plausible range.	Threshold for error detection is an internal ECU threshold. Check cabling, check accelerator pedal and pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it. When the PWM period APP_tIPWMPer is in between APP_tISRCLoPWMPer_C and APP_tISRCHiPWMPer_C.
94	1	474	216	Low fuel pressure: the low fuel pressure calculated by ECU is underneath the target range; the ECU activates a system reaction	Fuel pressure below warning threshold	Check low fuel pressure system (fuel feed pump, relay, fuse, wiring, sensor) and if necessary repair or replace it.
94	3	472	216	Low fuel pressure sensor: the voltage of sensor measured by ECU is out of the target range	cable break or short circuit, sensor defective, connection cable damaged Short cut to battery or open loop	Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
94	4	473	216	Low fuel pressure sensor: the voltage of sensor measured by ECU is out of the target range	cable break or short circuit, sensor defective, connection cable damaged short cut to ground	Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
97	3	464	228	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range	Sensor not connected or sensor defect.	Check of wiring and water in fuel sensor. Check cabling, if charge Water in Fuel sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
97	4	465	228	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range.	cable break or short circuit, sensor defective, connection cable damaged. Short cut to ground.	Check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
97	12	1157	228	Fuel filter water level sensor: the maximum level is exceeded	Water level in fuel pre-filter reservoir over limit (bad fuel quality)	Measure Voltage at Water in Fuel Sensor and renew harness if needed.
100	1	736	231	Oil pressure is below the target range (warning threshold)	Oil pressure too low (pressure below warning threshold)	Threshold for error detection is an internal ECU threshold. Check oil level, check engine for oil leakage, measure oil pressure external to evaluate sensor value
100	1	737	231	Oil pressure is below the target range (shut off threshold)	Oil pressure too low (pressure below shut off threshold).	Threshold for error detection is an internal ECU threshold. Check oil level, check engine for oil leakage, measure oil pressure external to evaluate sensor value.
100	3	732	224	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range	short circuit to battery or cable break	check battery and wiring Check cabling. If sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
100	4	733	224	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range	Short circuit to ground	The sensed raw voltage value Oil_uRawPSwmp is above Oil_SRCPSwmp.uMin_C Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it No detail informationen!
102	1	774	223	charge air pressure below lower limit	measured charge air pressure below the threshold.	Check complete air system of engine for massive leakage, especially from compressor to intake air manifold. Check air filter. Exchange charge air pressure sensor.
102	2	88	223	Charge air pressure measured by sensor is above the shut off threshold.	Charged air cooler pressure below threshold.	Check waste gate system if necessary replace TC, check CAC if all channels are clean, check charge air piping if necessary.
102	2	89	223	Charge air pressure measured by sensor is above the warning threshold	Charge air pressure above shut off threshold	Check waste gate system if necessary replace TC, check CAC if all channels are clean, check charge air piping if necessary.
102	2	772	223	Deviation between sensed intake manifold pressure is not plausible compared to environment pressure. Which sensor is not okay can not be said.	deviation between ambient pressure sensor and charge air pressure sensor at not running engine to high	1) Exchange boost pressure sensor 2) Exchange ECU
102	3	776	223	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range	The Sensor Voltage is above the Threshold.	Check cabling, if charge air pressure/temperature sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
102	4	777	223	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range	The Sensor Voltage is below the Threshold.	Check cabling, if charge air pressure/temperature sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
105	0	996	233	Charge air temperature downstream calculated by ECU is above the target range. The ECU activates a system reaction.	Charge air temperature (downstream) over warning threshold.	Check CAC system and clean it. Check fan functionality. Check cooling performance with temperature measurement.
105	0	997	233	Charge air temperature downstream calculated by ECU is under the shut down threshold. The ECU activates a system reaction.	Charge air temperature (downstream) over the low threshold.	Check CAC system and clean it. Check fan functionality. Check cooling performance with temperature measurement.
105	1	992	128	Charged Air cooler down stream temperature. Temperature below lower physical threshold.	Sensed temperature within intake air manifold < threshold.	actual temperature below -40°C? exchange sensor
105	3	994	128	Charge air temperature sensor: the voltage of sensor measured by ECU is out of the target range.	Short circuit to battery. sensor voltage > limit	The sensor raw signal Air_uRawTCACDs (voltage) > Air_SRCACDs.uMin_C. Check CAC-sensor and if necessary replace it, check connection cable and if necessary repair or replace it.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
105	4	995	128	Charge air temperature sensor: the voltage of sensor measured by ECU is out of the target range.	Short circuit to ground or open load. sensor voltage < limit.	The sensor raw signal Air_uRawTCACDs (voltage) is below Air_SRCTCACDs.uMin_C. Check CAC-sensor and if necessary replace it, check connection cable and if necessary repair or replace it
107	0	752	136	Air filter differential pressure: the pressure difference of the intake air between the filter inlet and outlet calculated by ECU is above the target range and the ECU activates a system reaction	Pressure loss above target range with system reaction, air filter clogged or defective, sensor not working, connection cable damaged Pressure value above warning threshold	Check air filter and if necessary clean or renew it, check cabling, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
110	0	98	232	Coolant temperature: the coolant temperature calculated by ECU is above the target range; the ECU activates a system reaction	Cooling temperature too high. Coolant temperature above warning threshold	Clean radiator, check fan drive, check coolant level, check cooling system in general, check thermostat function, check water pump
110	0	99	232	Coolant temperature: the coolant temperature calculated by ECU is above the target range. The ECU activates a system reaction	Coolant temperature above shut off threshold.	Clean radiator, check fan drive, check coolant level, check cooling system in general, check thermostat function, check water pump
110	1	93	225	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range.	Suspected components: wiring harness, coolant temperature sensor.	Check wiring harness and connected Coolant Temp Sens.
110	3	96	225	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range	Short cut to battery or open load.	Check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
110	4	97	225	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range	Voltage Surveillance has found shortcut to Ground at Coolant Temperature Sensor.	Check sensor and if necessary replace it, check connection cable and if necessary repair or replace it Measure Voltage at Coolant Temperature Sensor and renew harness if needed.
111	1	101	235	Coolant level: the coolant level calculated by ECU is underneath the allowed minimum.	Coolant level too low, leakage in cooling system, sensor defective, wiring damaged.	Check coolant level, inspect cooling system for leakage and if necessary repair it, check sensor and wiring
157	3	877	147	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range.	Short cut to battery. Damaged rail pressure sensor.	Check cabling, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
157	4	878	147	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range.	Check cabling, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.	Check cabling, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
164	2	1381	839	Rail pressure safety function is not executed correctly	Rail pressure is still above threshold.	Threshold for error detection is an internal ECU threshold. Reset the fault and at reappearance check ECU and injection system
168	0	1180	318	Battery voltage: the voltage measured by ECU is out of the target range	Battery voltage over limit	Check alternator, regulator of alternator and if necessary replace it, check wiring and voltage of alternator
168	1	1181	318	Battery voltage: the voltage measured by ECU is out of the target range	Battery voltage below limit	Check alternator, cabling, contact resistance, safety fuses, too high load in energy system, check battery and if necessary replace it

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
168	2	47	318	Battery voltage: the voltage measured by ECU is out of the target range, system reaction is initiated	If Battery voltage (Ubatt_U) > 17V or 31V for more than =0.5sec a warning is generated Battery voltage above warning threshold	Check wiring harness and connected alternator.
168	3	45	318	Battery voltage: the voltage measured by ECU is out of the target range, system reaction is initiated	Battery voltage above warning threshold (~38,9Volt), Short cut to battery possible.	Check wiring harness and connected alternator.
168	4	46	318	Battery voltage: the voltage measured by ECU is out of the target range, system reaction is initiated	Battery voltage below warning threshold, Short cut to ground	Check wiring harness and connected alternator.
171	3	417	312	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check high	open loop to sensor	Check cabling, if environment temperature sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
171	4	418	312	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check low	short circuit to Ground	Check cabling, if environment temperature sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
172	0	1425	226	sensed intake air temperature at air filter > physical high limit	sensed intake air temperature at air filter > physical high limit	Check outside conditions: Temperature > Threshold within the intake air system of the engine? E.G: engine sucks in air from hot asphalt out of paver bucket Sensor positioned within black air filter housing above engine lid at hot environmental conditions and idling or similar? => if yes check with application team to adapt limits if not check sensor and wiring harness exchange sensor
172	1	1183	226	sensed air temperature within air intake path of engine below physical low limit	sensed air temperature within air intake path of engine below physical low limit	Cold start and ambient temperature < threshold Check wiring harness to AFST-sensor Exchange AFST-sensor
190	0	389	214	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Overspeed monitoring during 1 level of FOC (Failure overrun condition) if engine speed was over Limit.	check powertrain settings regarding overspeed
190	2	421	213	ECU measures a deviation between camshaft and crankshaft angle to target.	Offset error between crankshaft and camshaft.	Threshold for error detection is an internal ECU threshold, occurs by offset between crankshaft and camshaft. Check increment wheel position, clean and adjust if necessary, check sensor position. Check Camshaft and Crankshaft sensor or wiring.
190	8	419	212	Camshaft speed sensor: the ECU receives no signal and uses the signal from crankshaft speed sensor as alternative to calculate the engine speed	When disturbed camshaft signal detected. Error in sensor or wiring.	Threshold for error detection is an internal ECU threshold, occurs by disturbed camshaft signal. Check increment wheel position, clean and adjust if necessary, check sensor position. Check Camshaft Sensor or wiring.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
190	8	422	212	Sensor crankshaft speed; disturbed signal	Error in sensor or wiring. Crankshaft sensor defect.	Threshold for error detection is an internal ECU threshold, occurs by disturbed crankshaft signal. Check increment wheel position, clean and adjust if necessary, check sensor position. Check Crankshaft Sensor or wiring.
190	11	390	214	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Overspeed monitoring during 2 level of FOC (Failure overrun condition) if engine speed was over limit.	check powertrain settings regarding overspeed
190	12	420	212	Camshaft speed sensor: the ECU receives no signal and uses the signal from camshaft speed sensor as alternative to calculate the engine speed Threshold:	Error in sensor or wiring.	Threshold for error detection is an internal ECU threshold, occurs by disturbed or no camshaft signal. Check increment wheel position, clean and adjust if necessary, check sensor position. Check Camshaft Sensor or wiring.
190	12	423	212	Crankshaft speed sensor: the ECU receives no signal and uses the signal from camshaft speed sensor as alternative to calculate the engine speed.	Error in sensor or wiring.	Threshold for error detection is an internal ECU threshold, occurs by disturbed or no Crankshaft signal. Check increment wheel position, clean and adjust if necessary, check Crankshaft sensor position or wiring.
190	14	391	214	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Overspeed monitoring during ORC (Override conditions) if engine speed was over 2900rpm	check powertrain settings regarding overspeed
190	14	1222	2-1-2	Camshaft- and Crankshaft speed sensor signal not available on CAN or defect.	Sensors for engine speed are defect.	Threshold for error detection is an internal ECU threshold. Check wiring, check cables and repair or replace if necessary.
411	0	791	693	delta pressure across venturi in EGR line above physical high limit	sensed value of venturi difference pressure > high limit	Threshold for error detection is an internal ECU threshold. EGR-Valve blocked open EGR-Valve actuator defect EGR-cooler defect (check for coolant water) Reed Valve defect Intake throttle blocked in closed position => Check intake throttle Exhaust pressure too high => Check Exhaust pressure Check Nox-sensor upstream SCR catalyst dp venturi sensor defect
411	1	792	693	delta pressure across venturi in EGR line below physical low limit	sensed value of venturi difference pressure < low limit	Threshold for error detection is an internal ECU threshold. Check correct mounting of difference pressure sensor at venturi tube Exchange difference pressure sensor broken
411	3	795	693	The sensed raw voltage Air_uRawPEGRDeltaP is above the maximum threshold.	EGR Delta pressure Sensor defect	Check cabling, if charge EGR Delta pressure sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
411	4	381	693	Range check cannot be done or interrupted.	EGR or wiring defect	Check wiring harness and connected EGR.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
411	4	796	693	The sensed raw voltage value Air_uRawPEGRDeltaP is above the minimum threshold.	EGR Delta pressure Sensor defect	Check cabling. If charge EGR Delta pressure sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
411	11	793	693	DFC is stored in EEPROM and status kept until check is allowed to be carried out again DFC can be reset by service routine 216	deviation between desired O2 concentration in intake air manifold and the real O2-concentration within intake air manifold > limit	Threshold for error detection is an internal ECU threshold. EGR-Valve mechanically blocked open or closed EGR-pipe blocked with metall plate instead sealing downstream EGR-Valve EGR-Valve actuator defect EGR-cooler defect (check for coolant water) Reed Valve defect Intake throttle blocked in closed position => Check intake throttle Exhaust pressure too high => Check Exhaust pressure Check Nox-sensor upstream SCR catalyst dp venturi sensor defect
412	3	1007	682	EGR downstream temperature sensor: the voltage of sensor measured by ECU is out of the target range.	Short circuit to battery. sensor voltage > limit	Check wiring harness to TEGR-sensor. Exchange TEGR-sensor.
412	4	1008	682	EGR downstream temperature sensor: the voltage of sensor measured by ECU is out of the target range.	Short circuit to ground or open load. sensor voltage < limit	Check wiring harness to TEGR-sensor. Exchange TEGR-sensor.
630	12	376	281	Internal hardware monitoring: the ECU finds an error during the access to its EEPROM memory or works with an alternative value	Section could not be erased	Threshold for error detection is an internal ECU threshold. There is no healing possible for the error. In the every new initialization phase, the debounce level is set to zero. If not programmed, EEPROM is defect --> ECU is defect, reprogramm ECU and if necessary replace it.
630	12	377	281	Internal hardware monitoring: the ECU finds an error during the access to its EEPROM memory or works with an alternative value	Minimum 3 blocks could not be readed, EEPROM has Checksum Error	There is no healing possible for the error. In the every new initialization phase, the debounce level is set to zero. If not programmed, EEPROM is defect --> ECU is defect, reprogramm ECU and if necessary replace it
630	12	378	281	Internal hardware monitoring: the ECU finds an error during the access to its EEPROM memory or works with an alternative value	Block could not be written for minimum 3 times	Threshold for error detection is an internal ECU threshold. If not programmed, EEPROM is defect --> ECU is defect, reprogramm ECU and if necessary replace it.
639	14	84	271	CAN bus 0: the ECU is not allowed to send messages, because the status "BusOff" is detected.	CAN BusOff error; CAN 0 (Customer CAN)	Threshold for error detection is an internal ECU threshold. BusOff bit for CAN A node is set. Check wiring of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it, check resistance in CAN lines (120 Ohm)

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
651	3	580	154	Injector cyl. 1: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 1 wiring harness, cable break or short circuit, sensor defective, connection cable damaged	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.
651	5	568	154	Injector cyl. 1: interruption of electrical connection	Interruption of electronic connection Injector cyl. 1	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
652	3	581	155	Injector cyl. 2: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 2 wiring harness, cable break or short circuit, sensor defective, connection cable damaged	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.
652	5	569	155	Injector cyl. 2: interruption of electrical connection	Interruption of electronic connection Injector cyl. 2	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
653	3	582	156	Injector cyl. 3: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 3 wiring harness, cable break or short circuit, sensor defective, connection cable damaged	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.
653	5	570	156	Injector cyl. 3: interruption of electrical connection	Interruption of electronic connection Injector cyl. 3	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
654	3	583	161	Injector cyl. 4: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 4 wiring harness, cable break or short circuit, sensor defective, connection cable	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.
654	5	571	161	Injector cyl. 4: interruption of electrical connection	Interruption of electronic connection Injector cyl. 4	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
655	3	584	162	Injector cyl. 5: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 5 wiring harness, cable break or short circuit, sensor defective, connection cable	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.
655	5	572	162	Injector cyl. 5: interruption of electrical connection	Interruption of electronic connection Injector cyl. 5	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
656	3	585	163	Injector cyl. 6: the current drop measured by ECU is above the target range	Suspected Components: injector cylinder 6 wiring harness, cable break or short circuit, sensor defective, connection cable	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it. Use SerDia Injector test for diagnosis.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
656	5	573	163	Injector cyl. 6: interruption of electrical connection	Interruption of electronic connection Injector cyl. 6	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
676	11	543	263	Cold start aid relay error.	Relay defect or wire harness problem	Threshold for error detection is an internal ECU threshold. check wire harness, replace relay
676	11	544	263	Cold start aid relay open load	Relay or wire harness	Threshold for error detection is an internal threshold. check wire harness, replace relay
677	3	956	512	Start relay (high side power stage): the current drop measured by ECU is above the target range.	Short cut HighSide-output to battery.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	3	960	512	Start relay (low side power stage): the current drain measured by ECU is above the target range.	Shortcut LowSide-Output to battery.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	4	957	512	Start relay (high side power stage): the current drain measured by ECU is above the target range.	Shortcut HighSide-output to ground.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	4	961	512	Start relay (low side power stage): the current drop measured by ECU is above the target range.	Shortcut LowSide-Output to ground.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable of terminal 50 and if necessary repair or replace it.
677	5	958	512	Start relay (low side power stage): the current drop measured by ECU is above the target range	Open circuit/disconnection LowSide-Output.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	12	959	512	Start relay (low side power stage): the current drop measured by ECU is above the target range.	Temperature over limit.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
691	8	928	928	Supply module heater: PWM time periode out of valid range.	PWM signal for temperature readout from supply module to the control unit is out of range. Supply modul defect, fault in the wiring.	The Time period of the received PWM signal SCR_ttiSMPerPwm is within the specified range of 150ms to 250ms Supply module check and replace if necessary. Check the wiring.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
729	3	549	263	wiring to the intake air heater device is faulty.	Intake Air Heater Device: overload, short-circuit	Threshold for error detection is an internal ECU threshold. Electrical error, Check wiring to the intake air heater device.
729	4	551	263	wiring to the air intake heater is faulty	Relay (for cold start aid) cable break or short to ground:	Threshold for error detection is an internal ECU threshold. Electrical error, check wiring to the air intake heater.
729	5	545	263	The cold start aid relay is according to wiring faulty.	Relay defect or wire harness problem	Threshold for error detection is an internal ECU threshold. Electrical error, check wires
729	12	547	263	The cold start aid relay is overheated, which causes this error	High temperature around the cold start relay.	Check the functionality of relay and replace it if needed. Check the temperature around the cold start relay during worst case operation.
898	9	305	118	TimeoutError of CAN-Receive-Frame TSC1TE - active	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
1079	13	946	282	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 1.	Suspected components EDC17cv52 Pin A19: DEF press / Exh.PressBeforeTurb (P3) / Air Pump Press / BrnFuelPressAfterDV2 Pin K19: Fan Speed Sensor Pin A21: LDF6T / OilPress / LowFuelPress Pin A17: Rail Pressure Sensor Suspected components EDC17cv54 Pin A21: CAM speed Pin K44: Delta Press Venturi / Poti EGR or Inlet Throttle Pin A24: LDF6T / OilPress / LowFuelPress Pin K43: Reserve 5V Sensor Supply Pin A09: second footpedal Suspected components EDC17cv56 Pin A21: Cam speed Pin K44: DEF press / Air FilterDiffPress Pin A24: LDF6T / OilPress / LowFuelPress Pin K43: second footpedal Pin A09: Delta Press Venturi	Check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it, if error is not removable, change ECU.
1080	13	947	282	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 2.	Suspected components EDC17cv52 Pin K16: second footpedal Pin A20: Exh.PressAfterTurb/DPFDiffPress/ BrnDV1Press/HCI PressDV1DV2 Suspected components EDC17cv54 Pin K45: DPF Diff Press / Exh. Press After Turb / Fan Speed Sensor Pin A46: first footpedal Suspected components EDC17cv56 Pin A22: Fan Speed Sensor Pin K45: Position EGR or Intake throttle flap Pin K46: First footpedal	Check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it, if error is not removable, change ECU.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
1109	2	121	341	Request of engine shut off: the operator ignores the engine shut off request within an allowed period.	Engine Shut Off demand has been ignored by the user	Depending on error requested a shut off.
1136	0	1398	681	ECU internal temperature; temperature measured by ECU is out of the target range	Short-Circuit in ECU, ECU heated by hot air	Close warm air circuits, replace ECU
1231	14	85	271	CAN bus 1: the ECU is not allowed to send messages, because the status "BusOff" is detected Warning, no diagnostic with SERDIA2010 possible	CAN BusOff error; CAN 1 (Diagnostic CAN)	Threshold for error detection is an internal ECU threshold. BusOff bit for CAN B node is set. Check wiring of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it, check resistance in CAN lines (120 Ohm)
1235	14	86	271	CAN bus 2: the ECU is not allowed to send messages, because the status "BusOff" is detected. Warning, depends on engine, EAT.	CAN BusOff error; CAN 2 (Engine CAN)	Threshold for error detection is an internal ECU threshold. BusOff bit for CAN C node is set. Check wiring of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it, check resistance in CAN lines (120 Ohm)
1237	2	747	145	Override switch switch: the ECU receives a permanent signal.	Switch is blocked, taster locked, connection cable damaged plausibility error "override switch > 250ms pressed".	If the Block Button is pressed shorter than the Maximum Plausible pressing Time. Check cabling, if sensor is not working, check switch and if necessary replace it, check connection cable and if necessary repair or replace it.
1761	0	1593	129	The urea tank level sensor detects a value higher than the maximum allowed threshold	Suspected components: Urea Quality Sensor defect mechanical defect at the float gauge	Check level sensor and float gauge
1761	1	1594	129	The DEF tank level sensor detects a value lower than the minimum allowed threshold	Suspected components: Urea Quality Sensor defect mechanical defect at the float gauge	Check level sensor and float gauge
1761	14	1655	138	The urea tank volume ratio is below the threshold of <5%	actual urea tank level SCRUTnk_rVol_mp [%] is below applicable threshold 5%	Check urea level => if empty, then fill in urea Check DEF level sensor. If there is urea in the tank, then move the floater of the level sensor. The floater must be free. If you lift the sensor body, then SCRUTnk_rVol_mp must change. Exchange DEF level sensor, if no change of value or it's implausible.
1761	14	1656	138	The urea tank volume ratio is below the threshold of <2.5%	actual urea tank level SCRUTnk_rVol_mp [%] is below 2.5%	Check urea level => if empty, then fill in urea Check DEF level sensor. If there is urea in the tank, then move the floater of the level sensor. The floater must be free. If you lift the sensor body, then SCRUTnk_rVol_mp must change. Exchange DEF level sensor, if no change of value or it's implausible.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
1761	14	1880	138	The DEF tank level is below the threshold.	actual DEF tank level SCRUTnk_rVol_mp [%] is below the threshold	Check DEF level => if empty, refill Check DEF level sensor. If there is urea in the tank loose the sensor and move it. The floater must be free and move if you lift the sensor body. SCRUTnk_rVol_mp must change. Compare SCRUTnk_rVol_mp to: 1 = SCR_rawUTnkLvl 2 = SCR_rAdapUtnkLvl 3 = SCRUTnk_rActTnkVol *SCRUTnk_facVolPer_mp In case of malfunction, exchange DEF level sensor.
2791	0	1763	415	Internal actuator temperature is above threshold.	Overheating of EGR actuator during operation.	Let EGR actuator cool down and check heat accumulation during worst case operation.
2791	2	1753	415	corrupted CAN communication with actuator.	CAN bus error or faulty EGR actuator.	Threshold for error detection is an internal ECU threshold. Check other CAN bus components. If no message is sent, fix the wiring. If o.k. exchange EGR actuator.
2791	3	1758	415	Overvoltage at EGR actuator.	High voltage from the battery	Check battery voltage.
2791	4	1759	415	Undervoltage at EGR actuator.	Low voltage from the battery.	Check battery voltage.
2791	6	1757	415	Overcurrent to EGR actuator.	High voltage from battery. EGR actuator is blocked or moving very hard.	Check battery voltage. Check if EGR is blocked or not running smoothly. If everything is o.k. change EGR actuator.
2791	7	1752	415	EGR actuator is mechanically blocked.	EGR actuator faulty or blocked.	Threshold for error detection is an internal ECU threshold. Check the EGR actuator and EGR valve to mechanical blockage / clean. Check for free movement of the valve. If it's blocked, then exchange the EGR valve.
2791	7	1761	415	EGR actuator spring broken.	mechanical damage of spring due to overstress.	Threshold for error detection is an internal ECU threshold. Exchange EGR actuator.
2791	12	1755	415	Internal electrical fault of EGR actuator.	Internal damage of EGR actuator due to high temperature or electrical wiring issue.	Threshold for error detection is an internal ECU threshold. Exchange EGR actuator.
2791	13	1754	415	EGR actuator can not learn stop positions. Possibly only second failure if other EGRTV failures occur.	Error detection during the learning process.	Threshold for error detection is an internal ECU threshold. Start Serdia Usecase to reset EGR actuator. Check EGR valve and mounting situation. If o.k. change EGR actuator.
2791	13	1756	415	EGR actuator can not learn stop positions because procedure was interrupted.	Interruption of learning process due to mechanical damage.	Threshold for error detection is an internal ECU threshold. Start Serdia Usecase to reset EGR actuator.
2791	13	1760	415	Stop positions of EGR valve not o.k.	Mechanical damage of EGR actuator. EGR valve is blocked or moving very hard.	Threshold for error detection is an internal ECU threshold. Start Serdia Usecase to reset EGR actuator.
2791	16	1762	415	Internal actuator temperature above threshold.	overheating of EGR actuator	Let EGR actuator cool down, check heat accumulation during worst case operation.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
2797	4	1337	565	Injector diagnosis: Timeout of Injetor detection cylinder bank 0	Short-Circuit to ground on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Note: affected injector has to be evaluated according to firing order
2797	4	1339	565	Injector test: Short cut to ground on cylinder bank 0	Short-Circuit to ground on component wiring	Check wiring, component, ECU Note: affected injector has to be evaluated according to firing order
2798	4	1338	566	Injector diagnosis: Timeout of Injetor detection cylinder bank 1	Short-Circuit to ground on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Note: affected injector has to be evaluated according to firing order
2798	4	1340	566	Injector test: Short cut to ground on cylinder bank 1	Short-Circuit to ground on component wiring	Check wiring, component, ECU Note: affected injector has to be evaluated according to firing order
3031	0	1135	669	The urea tank temperature sensor detects a value above the maximum allowed threshold	Sensed urea tank temperature > physical range high limit	Case "CANBUS sensor": Check urea tank temperature: really hot? Check CANBus-message of DEF sensor urea tank temperature Com_dRxSCR2Byt2 Compare it to Com_dRxSCR1Byt1 (urea temperature at quality sensor) identical? Tank heater permantly on? Check wiring of DEF-quality sensor Case "analog DEFT & Level sensor": Check urea tank temperature: really hot? Check urea tank temperature SCR_tSensUTnkT Compare urea tank temperature to EnvT_t or to SCR_tSMT (the urea temperature inside the supply module) identical? Tank heater permantly on? Check wiring of analog DEFT & Level sensor
3031	1	1136	669	The urea tank temperature sensor detects a value lower than the minimum allowed threshold.	sensed urea tank temperature < physical range low limit	Case "CANBUS sensor": Check ambient temperature EnvT_t=> About -40 °C? If yes Error could be plausible Check CANBus-message of DEF sensor urea tank temperature Com_dRxSCR2Byt2 Compare it to Com_dRxSCR1Byt1 (urea temperature at quality sensor) identical? Check wiring of DEF-quality sensor Check quality sensor Case "analog DEFT & Level sensor": Check urea tank temperature: really that cold? Check ambient temperature EnvT_t=> About -40 °C? If yes Error could be plausible Check urea tank temperature SCR_tSensUTnkT Check wiring of analog DEFT & Level sensor Check analog DEFT & Level sensor
3224	2	129	596	DLC Error of CAN-Receive-Frame AT1IG1Vol NOX Sensor (SCR-system upstream cat; DPF-system downstream cat); length of frame incorrect	Not Used	Threshold for error detection is an internal ECU threshold. Check Nox-Sensor and the wiring from CAN-BUS.

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Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3224	9	130	597	Timeout Error of CAN-Receive-Frame AT11G1Vol; NOX sensor (SCR-system upstream cat; DPF-system downstream cat)	Failure of the CAN Bus message	NOX sensor and sensor connection check
3234	2	138	114	DLC Error of CAN-Receive-Frame AT101Vol NOX Sensor (SCR-system downstream cat; DPF-system downstream cat); length of frame incorrect	Failure of the CAN Bus message	NOX downstream sensor and sensor connection check
3234	9	139	117	Timeout Error of CAN-Receive-Frame AT10G1Vol; NOX sensor (SCR-system downstream cat; DPF-system downstream cat)	Failure of the CAN Bus message	NOX downstream sensor and sensor connection check
3361	3	1077	677	Urea dosing valve (low side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Threshold for error detection is an internal ECU threshold See substitute function Check the wiring
3361	3	1078	677	Urea dosing valve (high side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Threshold for error detection is an internal ECU threshold Check the wiring
3361	4	1079	677	Urea dosing valve (low side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Check the wiring
3361	4	1080	677	Urea dosing valve (high side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Threshold for error detection is an internal ECU threshold Check the wiring
3361	6	1075	677	Urea dosing valve: the current measured value by ECU at the end of the injection is too high	Fault in the wiring Defect urea dosing injection valve	Check wiring Check the urea dosing injection valve
3519	3	1898	277	The integrated diagnostic of the temperature sensor of the Urea Quality Sensor recognized a short circuit to battery. The UQS Sensor is a combined sensor of tank temperature, filling grade and DEF quality and it is also an CAN sensor --> no PIN	Wrong diagnostic of the short circuits logic inside the temperature sensor of the UQS CAN Communication corrupted	Check the wiring to the suction unit in the DEF tank. Check the CAN bus communication of the suction unit. In case the communication is corrupt, exchange the suction unit.
3519	4	1899	277	The integrated diagnostic of the temperature sensor of the Urea Quality Sensor recognized a short circuit to ground	DEF quality sensor in the suction unit of the DEF tank is defect CAN Communication corrupted	Check the wiring to the suction unit of the DEF tank. Check the CAN bus communication from the suction unit. In case the signal is corrupt, exchange the suction unit in the DEF tank.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3519	12	1895	277	The integrated temperature sensor of the Urea Quality Sensor measures higher temperature than threshold	Temperature sensor inside the UQS defect. CAN Communication corrupted. Overheating of the DEF tank due to malfunction of the heating valve. Flow direction of coolant is wrong due to mixed up the hoses routed to the heating valve. Overheating of the DEF tank due to heat transfer from neighbor parts.	Check the temperature sensor signal for plausibility. In case of improper signal, exchange the suction unit in the tank. Check CAN bus communication for proper signal. In case of improper signal, exchange the suction unit in the tank. Check the function of heating valve and routing of the hoses. The coolant flow through the heating valve must be observed according to the shown arrow. In case all actions above are OK, check the real temperature in the DEF tank during worst case condition and improve the installation of the DEF tank.
3519	13	1908	277	Temperature at UQS out of range the specified thresholds; invalid quality of the temperature	Suspected Components Tank heater DEF sensor	Check temperature system and/or DEF quality sensor
3520	2	1904	2-7-8	Measured DEF Quality from UQS is too low. Quality value received from UQS is < 22% for a certain time and a certain number or for measuring conditions not observed for a certain time.	Suspected components: Urea quality sensor defect Wrong installation (measuring air) Urea level sensor defect Non urea filled in tank CANBUS problems Evaluation conditions for new quality check not fulfilled after one previous mal detection	Check that there is liquid urea of known quality in the tank first Check urea tank level. Add urea until level is at least 10 cm above sensor. Ensure that urea is not frozen / sufficient urea is liquid Check Sensor: Are urea tank temperature and level displayed? Changes the level if you refill urea? Check electrical connection Check CANBus New quality detection is carried out if urea refill is detected or if a quality evaluation was triggered and was not finished successfully: To provoke a quality measurement: refill urea, at least 10 % of tank volume Wait until quality evaluation was carried out, can take up to 30 minutes => check value. It should be about 33 % Exchange quality sensor
3520	3	1896	278	The integrated diagnostic of the Urea Quality Sensor recognized a short circuit to battery	wiring harness of UQS corrupted CAN Communication corrupted	Threshold for error detection is an internal ECU threshold. Check the wiring harness from the ECU to the suction unit of the DEF tank Check the CAN bus communication. If the signal is corrupt, then exchange the suction unit.
3520	4	1897	278	The integrated diagnostic of the Urea Quality Sensor recognized a short circuit to ground.	wiring harness to the suction unit in the DEF tank is corrupted CAN Communication corrupted	Threshold for error detection is an internal ECU threshold. Check the wiring to the suction unit in the DEF tank. Check the CAN bus communication. In case the communication is corrupt, exchange the suction unit in the DEF tank.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3520	13	1907	278	Urea quality at UQS out of range the specified thresholds; invalid quality of the urea quality	Suspected components DEF quality sensor DEF	Check DEF quality and/or DEF quality sensor
3532	3	1911	127	The urea quality value from the sensor is greater than the maximum physical range threshold Comment: tank temperature is measured by the UQS sensor	Suspected Components: UQS defect	Check DEF quality and/or sensor.
3532	4	1912	127	The urea quality value from the sensor is lower than the minimum physical range threshold.	Suspected Components: UQS defect	Check DEF quality and/or Sensor.
3711	12	1455	711	Temperature Phy_tPFWgh, the weighted DPF temperature < Threshold 1 Temperature Phy_tPFWgh, the weighted DPF temperature > Threshold 2 towards the end of the stand-still main phase.	temperature Phy_tPFWgh, the weighted DPF temperature, is below or above the target temperature towards the end of the stand-still main phase.	Check temperature upstream DOC Exh_tSensOxiCatUs within Stand-still: > 450 °C? If not: => Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function Check temperature difference across DOC by Exh_tSensOxiCatDs - Exh_tSensOxiCatUs within Stand-still: < 100°C? If not: Check exhaust pipe downstream turbo charger for oil? check injectors: is an injector got stuck? Too many hydrocarbons in exhaust? White smoke (at hot EAT system, not at cold start)? Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function Check exhaust gas temperature sensors within EAT-system: T upstream DOCC, T downstream DOC & T upstream SCR catalyst all three of them can influence Phy_tPFWgh
3936	14	1917	2-8-6	Standstill escalation by time. In case the standstill request will not be released within 50 h by the driver this fault code will be set.	Stand-still request ignored by the operator. Display / stand-still request lamp broken.	Perform Stand-still. If soot load level of DPF has increased too high already call service to perform stand-still. In case the DPF soot load level remove DPF => Exchange DPF.
4334	0	1122	665	The absolute pressure value of the urea pump is greater than an applicable maximal filtered pressure threshold	Suspected Components: Urea pump defect Supply module pressure sensor defect Pump contains dirty parts	Check the urea pump Check the supply module pressur sensor Clean the urea pump (filter)
4334	1	1123	665	Urea supply module pressure sensor: The absolute pressure value of the urea pump is less than an applicable minimal filtered pressure threshold	Check the urea pump Check the supply module pressur sensor Clean the urea pump (filter)	Check the urea pump Check the supply module pressur sensor Clean the urea pump (filter)

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4334	2	1866	665	absolute difference of sensed urea pump pressure (SCR_pAbsSensUPmpP) and ambient pressure (EnvP_p) > limit abs(UPmpP_pDiffPmpEnv_mp) > UPmpP_pDiffPmpEnv_C (250 hPa)	absolute difference of sensed urea pump pressure (SCR_pAbsSensUPmpP) and ambient pressure (EnvP_p) > limit abs(UPmpP_pDiffPmpEnv_mp) > UPmpP_pDiffPmpEnv_C	Check environment pressure sensor (EnvP_p) => plausible value? Engine shut-off and immediately re-started? => Shut-off again. Wait until after run of ECU has finished, re-Start engine Back-flow line free? Does the urea pump pressure show values < 1000 hPa in SCR state emptying (64)? Check revision valve => Does the urea pump pressure show values < 1000 hPa in SCR state emptying (64)? => exchange supply module Supply module pressure sensor defect => exchange supply module
4341	3	1104	675	Urea heater supply line: the current drain measured by ECU is above the target range	electrical error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
4341	4	1105	675	Urea heater supply line: the current drain measured by ECU is above the target range	electrical error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
4341	5	1102	675	Urea heater supply line: the current drain measured by ECU is above the target range	electrical error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
4343	3	1096	673	Urea pressure line heater: the current drain measured by ECU is above the target range	shortcut to battery If this error detected during the heating phase is a result error: KWP 1089 broken heating element in pressure line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4343	4	1097	673	Urea pressure line heater: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase is a result error: KWP 1089 Short cut to ground or broken wiring, broken heating element in pressure line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4343	5	1094	673	Urea pressure line heater: the current drain measured by ECU is above the target range	Open load If this error detected during the heating phase is a result error: KWP 1089 Broken wiring, broken heating element in pressure line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4345	3	1092	674	Urea backflow line heater: the current drain measured by ECU is above the target range	Shortcut to battery If this error detected during the heating phase is a result error: KWP 1089 Short cut to battery or broken wiring, broken heating element in backflow line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4345	4	1093	674	Urea backflow line heater: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase is a result error: KWP 1089 Short cut to ground or broken wiring, broken heating element in backflow line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4345	5	1090	674	Urea backflow line heater: the current drain measured by ECU is above the target range	Open load If this error detected during the heating phase is a result error: KWP 1089 Broken wiring, broken heating element in back-flow line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4360	0	1069	668	The filtered urea cat upstream temperature is greater than an applicable maximum temperature threshold	Sensed temperature upstream SCR > physical high limit	Check temperature difference across DOC (Exh_tOxiCatDs-Exh_TOxiCatUs) at higher engine load => high difference > 100 K? If yes, the engine emits too many Hydrocarbons => check injectors: is an injector got stuck? => Check EGR Valve If difference normal the exhaust out of the engine itself is too hot: => Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function If that error was set while stand-still operation the error source could be exothermal soot burn off in DPF (which should not happen) => Dismount DPF and check it visually exchange temperature sensor upstream SCR
4360	1	1070	668	The filtered temperature before urea cat is less than an applicable minimum temperature threshold	Sensed temperature upstream SCR catalyst < than physical low limit	Cold start and ambient temperature < Threshold? Missdetection? Check wiring harness to UCatUsT-sensor Exchange UCatUsT-sensor
4360	2	1865	668	Error at static plausibility check: absolute temperature difference of sensed temperature upstream SCR catalyst and ambient temperature > as static plausibility limit at engine cold start (engine was off for at least 8 h), temperature upstream of SCR catalyst is expected to be identical to ambient temperature => see enable conditions for details. Error at dynamic plausibility check: temperature difference of sensed temperature upstream SCR catalyst and ambient temperature < as dynamic plausibility limit dynamic check is blocked if static plausibility check is already faulty => Temperature upstream SCR catalyst must be by 40°C higher than ambient temperature if engine runs and a certain delay time has expired.	Error at static plausibility check: absolute temperature difference of sensed temperature upstream SCR catalyst and ambient temperature > as static plausibility limit at engine cold start (engine was off for at least 8 h), temperature upstream of SCR catalyst is expected to be identical to ambient temperature => see enable conditions for details. Error at dynamic plausibility check: temperature difference of sensed temperature upstream SCR catalyst and ambient temperature < as dynamic plausibility limit dynamic check is blocked if static plausibility check is already faulty => Temperature upstream SCR catalyst must be by 40°C higher than ambient temperature if engine runs and a certain delay time has expired.	Check whether temperature sensor upstream of SCR catalyst is physically mounted within exhaust pipe If cold start condition can be made sure (engine was off for at least 8 h) compare values of EnvT_t, EngDa_tEng, Exh_TOxiCatUs, Exh_tOxiCatDs and SCR_tSensUCatUsT at ignition on, without starting the engine. All identical? Compare values of Exh_TOxiCatUs, Exh_tOxiCatDs and SCR_tSensUCatUsT after 15 min in constant operation point: show all similar values (30 K tolerance width). Are ambient temperature and (EnvT_t), cooling water temperature (EngDa_tEng) plausible? Sensor coated with urea crystals? Dismount urea injector and inspect temperature sensor upstream SCR catalyst visually Check wiring of sensor Replace sensor
4361	3	1072	668	Urea catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	Voltage of temperature sensor upstream SCR catalyst > maximum limit Short circuit to battery	Check sensor Check wiring Replace UCatUsT-sensor
4361	4	1073	668	Urea catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	Voltage of temperature sensor upstream SCR catalyst < minimum limit Short circuit to ground	Check sensor Check wiring Replace UCatUsT-sensor

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4365	2	1137	6-6-9	Signal error in case of Urea tank temperature transmitted via CAN-signal Com_tUTnkt.	CAN message is not send properly.	Check sensor connector Check CANbus
4365	3	1138	6-6-9	Urea tank temperature sensor: he current drain measured by ECU is above the target range.	Shortcut or open load.	Threshold for error detection is an internal ECU threshold. The Sensed raw voltage value SCR_uRawUTnkt is below SCR_SRCUTnkt.uMax_C. Check wiring.
4365	3	1914	669	Internal error of DEF qualitysensor.	Suspected componetes: DEF qualitysensor Wiring harness	Check wiring harness and DEF qualitysensor
4365	4	1139	6-6-9	Urea tank temperature sensor: he current drain measured by ECU is above the target range.	Shortcut or open load.	Threshold for error detection is an internal ECU threshold. The sensed raw voltage value SCR_uRawUTnkt is above SCR_SRCUTnkt.uMin_C. Check wiring.
4365	4	1915	6-6-9	Internal error of DEF qualitysensor.	Suspected componetes: DEF qualitysensor Wiring harness	Check wiring harness and DEF qualitysensor
4366	3	1112	671	Urea tank heating valve: the current drain measured by ECU is above the target range	Shortcut to battery If this error detected during the heating phase is a result error: KWP 1089 Broken wiring Urea tank heating valve defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea tank heating valve
4366	4	1113	671	Urea tank heating valve: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase is a result error: KWP 1089 Broken wiring Urea tank heating valve defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea tank heating valve
4366	5	1110	671	Urea tank heating valve: the current drain measured by ECU is above the target range	Open load If this error detected during the heating phase is a result error: KWP 1089 Broken wiring Urea tank heating valve defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea tank heating valve
4375	3	1120	666	Urea supply module pump: the current drain measured by ECU is above the target range	Shortcut to battery If this error detected during the heating phase is a result error: KWP 1089 Broken wiring Pump in urea supply module defect	Threshold for error detection is an internal ECU threshold The hardware detects absence of any short circuit to battery on the PWM output power stage for the urea pump module actuator Check wiring Check pump in the urea supply module
4375	4	1121	666	Urea supply module pump: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase is a result error: KWP 1089 Broken wiring Pump in urea supply module defect	Threshold for error detection is an internal ECU threshold The hardware detects a short circuit to ground error on the PWM output power stage for the UreaPump Module Motor Actuator. The error is updated by setting bit 1 of measuring point UPmp-Mot_stPrev1stRslt_mp Check wiring Check pump in the urea supply module

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Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4375	5	1118	666	Urea supply module pump: the ECU can not measure any reaction during pump control	Open load Broken wiring Pump in urea supply module defect	Threshold for error detection is an internal ECU threshold The hardware detects the presence of load on the PWM output power stage for the urea pump module actuator. Check wiring Check pump in the urea supply module
4376	3	1131	667	Urea supply module reversal valve: the current drain measured by ECU is above the target range	Shortcut to battery Fault in the wiring Reversal valve in the urea supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea supply modul
4376	4	1132	667	Urea supply module reversal valve: the current drain measured by ECU is above the target range	Shortcut to ground Fault in the wiring Reversal valve in the urea supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea supply modul
4376	5	1129	667	Urea supply module reversal valve: the current drain measured by ECU is above the target range	Open load Fault in the wiring Reversal valve in the urea supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea supply modul
4765	0	1039	683	The exhaust temperature value from the sensor before DOC is above an applicable upper shutoff threshold TOxiCatUs_tShOffThresHiAds_C = Threshold 1 in Normal and Heatmodes (TOxiCatUs_tShOffThresHiRgn_C = Threshold 2 in stand-still)	sensed temperature upstream DOC > shut-off limit	Check air path of engine: EGR-Valve, Intake-Throttle, Check Turbocharger and Piping each for leakage and correct function Check injectors: is an injector got stuck? Exchange temperature sensor upstream DOC
4765	0	1040	683	The exhaust temperature value from the sensor before DOC is above an applicable upper warning threshold TOxiCatUs_tWarnThresHi_C = Threshold	Sensed temperature upstream DOC > warning limit	Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function Check injectors: is an injector got stuck? Exchange temperature sensor upstream DOC

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4768	2	1036	683	<p>Static plausibility check: The exhaust temperature value from the sensor before DOC, the exhaust temperature value from the sensor after DOC, the temperature value from the sensor before SCR-Cat, the environment temperature and the coolant engine temperature their ratios to each other exceed their related thresholds.</p> <p>Dynamic plausibility check with environment temperature sensor value: The exhaust temperature value from the sensor before DOC is lower than an applicable environment temperature threshold</p>	<p>Static plausibility check: The exhaust temperature value from the sensor before DOC, the exhaust temperature value from the sensor after DOC, the temperature value from the sensor before SCR-Cat, the environment temperature and the coolant engine temperature their ratios to each other exceed their related thresholds. (difference between temperature after DOC and temperature before DOC > Threshold 1 difference between temperature before DOC and before SCR > Threshold 2 difference between temperature after DOC and before SCR < Threshold 3 difference between temperature after DOC and ambient temperature < Threshold 4 difference between temperature ambient temperature and engine temperature < Threshold 5)</p> <p>Dynamic plausibility check with environment temperature sensor value: The exhaust temperature value from the sensor before DOC is lower than an applicable environment temperature threshold (< environmental temperature + Threshold 6)</p>	<p>Check ambient temperature => value plausible? upstream DOC sensor mounted within exhaust line? T upstream DOC sensor physically mounted in correct position upstream DOC? (not upstream SCR or downstream DOC?) Check T upstream DOC sensor Check other T-sensors within EAT-system (Exh_tOxiCatDs & UCatUsT_tFlt_mp show plausible values? No errors on them?</p>
4768	2	1881	683	<p>At engine cold start conditions the sensed exhaust gas temperature downstream DOC (Exh_tSensTOxiCatDs) has exceeded the sum of ambient temperature (EnvT_t) + offset (40°C) earlier than the sensed exhaust gas temperature upstream of DOC (Exh_tSensTOxiCatUs).</p> <p>The check is only performed once each ignition cycle and only if the start is judged a cold start.</p> <p>Error status is frozen for that ignition cycle. No healing possible.</p>	<p>Difference temperature of exhaust gas temperature downstream DOC and fixed ambient temperature at ignition on exceeds a certain limit earlier than the difference temperature of exhaust gas temperature upstream DOC and fixed ambient temperature at ignition on.</p>	<p>Check whether all exhaust gas temperature sensors within the EAT system are mounted properly: Within the exhaust line and at correct positions. Check the position of the sensor upstream SCR which might be physically mounted in the wrong position. If cold start condition can be made sure (engine was off for at least 8 h) compare values of EnvT_t, EngDa_tEng, Exh_tOxiCatUs, Exh_tOxiCatDs and SCR_tSensUCatUsT at ignition on, without starting the engine. All identical? Then the sensors itself are okay. Check exhaust piping for leakage. Check wiring of sensors Replace sensors Check DOC => physically intact?</p>
4768	3	1044	683	<p>Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range</p>	<p>The sensed raw voltage value Exh_uRawTOxiCatUs is above Exh_SRCTOxiCatUs.uMax_C Shortcut to battery</p>	<p>Check wiring harness to temperature sensor upstream DOC Exchange temperature sensor upstream DOC</p>
4768	4	1045	683	<p>Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range</p>	<p>The sensed raw voltage value Exh_uRawTOxiCatUs is below Exh_SRCTOxiCatUs.uMin_C Shortcut to ground</p>	<p>Check wiring harness to temperature sensor upstream DOC Exchange temperature sensor upstream DOC</p>

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Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
5763	3	1024	594	Actuator of the external EGR valve: the ECU detects a short circuit to battery or open load.	Short cut to battery or open loop.	Check cabling, actuator defect, check actuator and if necessary replace it, check connection cable and if necessary repair or replace it.
5763	3	1226	594	Actuator EGR-valve: short cut to battery is detected	Short-Circuit to battery on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case
5763	3	1227	594	Actuator EGR-valve: short cut to battery on ECU pin is detected	Short-Circuit to battery on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case
5763	4	1025	594	Actuator of the external EGR valve: the ECU detects a short circuit to ground.	Short cut to ground	Check cabling, actuator defect, check actuator and if necessary replace it, check connection cable and if necessary repair or replace it.
5763	4	1228	594	Actuator EGR-valve: short cut to ground on ECU pin is detected	Short-Circuit to ground on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case
5763	4	1229	594	Actuator EGR-valve: short cut to battery on ECU pin is detected	Short-Circuit to ground on component	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case
5763	4	1232	5-9-4	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Voltage below threshold 3.6) Drosselklappe (4.1;6.1;7.8); Voltage below threshold;	Monitoring for CY146 Under Voltage.	Threshold for error detection is an internal ECU threshold. Check wiring, component
5763	5	1023	5-9-4	Actuator error EGR-Valve; signal range check low, measured current is below target	Short circuit to ground.	Check wiring, check cables and repair or replace if necessary, check actuator with SERDIA 2010 test for EGR and if necessary replace it.
5763	6	1014	594	Actuator error EGR-Valve. Signal range check high.	Short cut to batterie.	Check wiring and repair or replace if necessary, check actuator with SERDIA test for EGR and if necessary replace it.
5763	6	1022	5-9-4	Actuator error EGR-Valve; signal range check high, measured current by ECU is over target	Short circuit to battery or open circuit.	Check cabling, actuator defect, check actuator and if necessary replace it, check connection cable and if necessary repair or replace it.
5763	6	1223	594	Actuator EGR-Valve: Open load on ECU output is detected	Open circuit on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case
5763	6	1224	594	Actuator EGR-valve: too high current is going into the actuator. Output is switched off	Overload on component wiring	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU Check repair with SerDia 2010 use case

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SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
5763	6	1230	5-9-4	Actuator error EGR-valve; Overload by short-circuit	Short Circuit over Load	Threshold for error detection is an internal ECU threshold. Check wiring, component
5763	7	1016	594	Actuator position for EGR valve is not plausible, internal error, angular misalignment of the flap.	Position error of throttle flap (deviation > 7%).	Threshold for error detection is an internal ECU threshold. Threshold for error detection, deviation from setpoint > 7%. Troubleshooting with SERDIA 2010 Use Case "EGR Diagnostic".
5763	11	1231	5-9-4	Power stage overtemperature due to high current.	Temperature dependent Over Current	Threshold for error detection is an internal ECU threshold. Check wiring, component
520521	5	1015	594	Actuator error EGR-Valve. Signal range check low.	Short cut to ground.	Check wiring and repair or replace if necessary, check actuator with SERDIA test for EGR and if necessary replace it.
523009	9	825	253	The pressure relief valve (PRV) has reached the number of allowed activations.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Replace pressure relief valve (PRV) and reset fault with Serdia.
523009	10	833	2-5-3	The pressure relief valve (PRV) has reached the allowed opening time.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Replace pressure relief valve (PRV) and reset fault with Serdia.
523212	9	171	3-3-3	Timeout Error of CAN-Receive-Frame ComEngPrt; Engine Protection	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer devices
523240	9	179	527	Timeout CAN-message FunModCtl; Function Mode Control	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
523350	4	565	151	Injector cylinder bank 1: the current drop measured by ECU is above the target range	Short circuit injection bank 1 (all injectors of this bank can be affected)	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
523352	4	566	152	Injector cylinder bank 2: the current drop measured by ECU is above the target range	Short circuit injection bank 2 (all injectors of this bank can be affected)	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
523354	12	567	153	Internal hardware monitoring: the ECU detects an error of its injector high current output. Chip of CY33x defect power stage components	Defective powerstage in ECU	Threshold for error detection is an internal ECU threshold. If error is not removable, change ECU.
523450	4	839	1-4-3	Diagnostic fault check for min error of COM message.	The sensed raw value is less than the threshold.	Check cabling, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
523470	2	826	146	The pressure relief valve (PRV) has been opened due to excessive pressure.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Threshold for error detection is an internal ECU threshold. Reset the fault and at reappearance check injection system.
523470	2	827	146	The pressure relief valve (PRV) has been opened due to excessive pressure.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Threshold for error detection is an internal ECU threshold. Reset the fault and at reappearance check injection system.

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Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523470	7	876	146	Rail pressure is out of the expected average range.	Rail pressure is out of the expected average range. PRV can not be opened.	(A) Check rail pressure relief valve and replace if necessary. (B) Check high pressure pumps, pressure relief valve and metering unit. (C) Change components if necessary
523470	11	831	146	Rail pressure relief valve can not be opened due to the rail pressure.	Rail pressure out of tolerance range (PRV can not be opened by a pressure peak in this operating point)	Threshold for error detection is an internal ECU threshold. Check rail pressure, check rail pressure sensor for plausibility, check FCU.
523470	11	832	146	Rail pressure is out of the expected average range. The PRV can not be opened at this operating point with a pressure shock.	Averaged rail pressure is outside the expected tolerance range.	Threshold for error detection is an internal ECU threshold. Check PRV and replace if necessary.
523470	12	828	146	Rail pressure relief valve: is open. Shutoff conditions.	Shut Off after PRV Open	Threshold for error detection is an internal ECU threshold. Check PRV opening counter and if necessary replace PRV, check rail-pressure sensor for plausibility and if necessary replace it, check FCU and if necessary replace it.
523470	12	829	146	Rail pressure relief valve is open. Warning conditions.	Warning PRV open	Threshold for error detection is an internal ECU threshold. Check PRV opening counter and if necessary replace PRV, check rail-pressure sensor for plausibility and if necessary replace it, check FCU and if necessary replace it.
523470	14	830	146	Rail pressure relief valve is open. (PRV)	Open PRV	Threshold for error detection is an internal ECU threshold. Only after ECU reset. Check PRV opening counter and if necessary replace it, check rail-pressure sensor for plausibility and if necessary replace it, check FCU and if necessary replace it.
523550	12	980	515	Terminal 50 was operated for more than 2 minutes. This may happen due to short to battery or wrong usage of Terminal 50. Starter control is disabled until this error is healed.	Start information to Starter (T50-switch) erratic/defect.	Threshold for error detection is an internal ECU threshold. Check cabling, if sensor not working, check start switch and if necessary replace it, check connection cable and if necessary repair or replace it.
523601	13	948	282	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 3.	Suspected components EDC17cv52 Pin A18: DeltaPressVenturi / Position intake throttle flap Pin K20: First footpedal Pin K21: Air FilterDiffPress Suspected components EDC17cv54 and cv56 Pin A07: Rail pressure	Check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it, if error is not removable, change ECU.
523612	3	644	555	supply voltage too high	not used	Threshold for error detection is an internal ECU threshold.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523612	4	646	555	supply voltage too low	not used	Threshold for error detection is an internal ECU threshold.
523612	12	387	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Injector shut off demand for the ICO coordinator System responses: not	Threshold for error detection is an internal ECU threshold. Caution! Sequence error, check error memory for other errors.
523612	12	612	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory.	Plausibility check failed (MoCADC_uNTP_mp is higher than MoCADC_uNTPMax_C).	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	613	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Analysis of test voltage (Value is out of the target -> ECU internal error)	Threshold for error detection is an internal ECU threshold. Check wiring, check connected sensors actuators. If error is still present, exchange ECU.
523612	12	614	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Analysis of the ratiometric correction (Value is out of the target -> ECU internal error)	Threshold for error detection is an internal ECU threshold. Check wiring, check connected sensors actuators. If error is still present, exchange ECU.
523612	12	615	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error report due to an error in the plausibility of Function Coordination (FC) and Monitoring Modul (MM) (ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	616	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error report due to an interrupted SPI communication (ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	617	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	multiple error in complete ROM-test during postdrive detected (ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	618	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Too less bytes received by monitoring memory from CPU as response (ECU internal error). Loss of synchronization sending bytes to the monitoring memory from CPU	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	619	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Suspected components: Injector ECU wiring harness/connector	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	620	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error trying to set MM Response time (ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	621	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error detected in the internal ECU communication, Too many SPI errors during MoCSOP execution	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.

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SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523612	12	623	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in the check of the shut-off path test of the under voltage detection (ECU internal error). Diagnostic fault check to report the error in undervoltage monitoring	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	624	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in the check of the shut-off path of the monitoring module (ECU internal error).	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	625	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Time out error trying to set or cancelling the alarm task (ECU internal error). Failure setting the alarm task period	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	627	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in time monitoring of the shut-off path test (ECU internal error). Diagnostic fault check to report the timeout in the shut off path test	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	628	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in the check of the shut-off path test of the over voltage detection (ECU internal error). Diagnostic fault check to report the error in overvoltage monitoring	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	629	555	The two voltage values (ADC_VAL1, ADC_VAL2), detected by the accelerator pedal, are not plausible to each other.	Defect pedal or wiring	Threshold for error detection is an internal ECU threshold. Check Pedal, repair or exchange the Pedal. Check wiring. If error is still present, exchange ECU.
523612	12	630	555	Impermissible offset between the engine speed of level 2 and level 1	Calculated engine speed in level 1/2 implausible (-> ECU internal error).	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	631	555	Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information	Implausible injection energizing time for either Pilx or MI1 or Polx.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	632	555	Error in the plausibility of the start of energising angles	Implausible start of energising of either Pilx or MI1 or Polx.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	633	555	Error in the plausibility of the energising times of the zero fuel quantity calibration	The energising times of the zero fuel quantity calibration ZFC is out of the target. (-> ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	634	555	Error in the plausibility of Pol2 efficiency.	Error in the plausibility of Pol2 efficiency.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	635	555	Error in the Pol2 shut-off.	Error in the Pol2 shut-off.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	636	555	Error in the plausibility of Pol3 efficiency.	Error in the plausibility of Pol3 efficiency.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.

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SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523612	12	637	555	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Error in the plausibility of current energising time with maximum permitted energising time. Diagnostic fault check to report the error due to Over Run	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	638	555	Error in the plausibility of the wave correction parts	Error in the plausibility of the wave correction parts	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	639	555	Plausibility error of the Rail pressure sensor	In case the gradient of rail pressure is larger than the max threshold or lesser than the min threshold. Rail metering unit defect. Leakage in the Rail System.	Threshold for error detection is an internal ECU threshold. Check metering unit or cable. Check Rail pressure. Check the Rail System of leakage.
523612	12	640	555	Error in the torque comparison between permissible engine torque and current actual torque	Error in the torque comparison between the permissible inner engine torque and the current plausible actual torque.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	641	555	Diagnosis of curr path limitation forced by ECU monitoring level 2	The torque comparison is not plausible with the torque monitoring.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	642	555	Diagnosis of lead path limitation forced by ECU monitoring level 2	The setpoint path of the air system is limited by the limitation torque of the functional control unit monitoring.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	643	555	Diagnosis of set path limitation forced by ECU monitoring level 2.	If the quantity setpoint is exceeds the limit of the torque function.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	714	555	Error report "WDA wire is active" due to a defect query/response communication	Error detection by monitoring module	Threshold for error detection is an internal ECU threshold. Software reset.
523612	12	715	555	Error report "ABE wire is active" due to undervoltage detection	The reason is that a slow dropping of the vehicle electrical system voltage (defective autobattery) should not lead the ECU OCWDA's diagnose to enter an error in the fault memory due to an undervoltage recognition.	Threshold for error detection is an internal ECU threshold. Software reset.
523612	12	716	555	Error report "ABE/WDA wire is active" due to overvoltage detection	If the ABE/WDA powerstage shut-off is active due to an overvoltage detection.	Threshold for error detection is an internal ECU threshold. software reset.
523612	12	717	555	Error report "ABE/WDA active" due to an unknown reason	The reason is that a slow dropping of the vehicle electrical system voltage (defective autobattery) should not lead the ECU OCWDA's diagnose to enter an error in the fault memory due to an undervoltage recognition.	Threshold for error detection is an internal ECU threshold. Software reset.
523612	12	1170	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error during positive test (ECU internal error). Diagnostic fault check to report that the positive test failed	Threshold for error detection is an internal ECU threshold. Reflash ECU. If error is still activ replace ECU.

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SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523612	12	1857	555	Fault in the monitoring during the engine start. Start requested in level 1, but not released in level 2 which leads to no fuel injection.	wiring is not according DEUTZ requirements engine start conditions are not observed low battery voltage during start malfunction of starter	Threshold for error detection is an internal ECU threshold. check other active errors and fix them. check all needed engine start conditions, e.g. neutral switch. check the engine speed during starting of the engine. If it's too low, then check the battery voltage and then check the starter for malfunction.
523612	14	973	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory.	Visibility of Software resets in DSM	Threshold for error detection is an internal ECU threshold.
523612	14	974	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory.	Visibility of Software resets in DSM	Threshold for error detection is an internal ECU threshold.
523612	14	975	555	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Visibility of Software Resets in DSM	Threshold for error detection is an internal ECU threshold. If possible the software update has to be done. Replace the ECU.
523613	0	856	134	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	Pressure governor deviation exceeds the limiting value based on the engine speed.	Threshold for error detection is an internal ECU threshold. (A) Check for leakage (B) Check fuel-primary pressure (C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it
523613	0	857	134	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	maximum positive deviation of rail pressure exceeded concerning set flow of fuel.	Threshold for error detection is an internal ECU threshold. (A) Check for leakage (B) Check fuel-primary pressure (C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it
523613	0	858	134	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed.	leakage is detected based on fuel quantity balance.	Threshold for error detection is an internal ECU threshold. (A) Check backflow pressure (B) Check Injector function with SerDia (C) Change components (metering unit, injector) if necessary
523613	0	859	134	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed.	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded.	Threshold for error detection is an internal ECU threshold. (A) Check backflow pressure (B) Check Injector function with SerDia (C) Change components (metering unit, injector) if necessary
523613	0	862	134	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range.	Rail pressure exceeds the limiting value.	(A) Check backflow pressure (B) Check pressure relief valve and metering unit. (C) Change components if necessary

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SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523613	1	861	134	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	Rail pressure falls below the limiting value based on the engine speed.	Threshold for error detection is an internal ECU threshold. (A) Check backflow pressure (B) Check Injector function with SerDia (C) Change components (metering unit, injector) if necessary
523613	2	864	134	Rail pressure metering unit, Setpoint of metering unit in overrun mode not plausible.	Pressure pump delivery quantity in overrun exceeds the threshold based on the pressure.	Threshold for detection is an internal ECU threshold. (A) Check backflow pressure (B) Check pressure relief valve and metering unit. (C) Change components if necessary
523615	3	594	135	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to battery high side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	3	596	135	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to battery low side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	4	595	135	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to ground high side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	4	597	135	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to ground low side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	5	592	135	Detecting an open load fault in the metering unit	wiring harness defective, cable break	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	12	593	135	powerstage of metering unit is overheated	over temperature	Threshold for error detection is an internal ECU threshold. Check functionality of metering unit and replace it if needed. Check temperature of metering unit and improve the installation in case of overheating.
523632	3	1127	665	Urea supply module pressure sensor: the current drain measured by ECU is above the target range	Shortcut to battery Broken wiring Pressure sensor in urea supply module defect	Check wiring Check pressure sensor in urea supply module
523632	4	1128	665	Urea supply module pressure sensor: the current drain measured by ECU is above the target range The sensed raw voltage value SCR_uRawUPmpP is above SCR_SRCUPmpP.uMin_C	Shortcut to ground Broken wiring Pressure sensor in urea supply module defect	Check wiring Check pressure sensor in urea supply module
523632	11	1117	666	Urea supply module pump: the current drain measured by ECU is above the target range	When the pump motor does not switch to pump actuation mode after temperature measurement has been carried out.	Threshold for error is an internal ECU threshold

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Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523698	11	122	591	Shut off request from supervisory monitoring function	Engine Shut Off due to supervisory function	Threshold for error detection is an internal ECU threshold. Check error memory for additional errorcode to find root cause. Depending on additional error follow the documented "Take action for repair".
523718	3	1100	676	Urea heater relay: the current drain measured by ECU is above the target range	Shortcut to battery If this error detected during the heating phase it is a result error: KWP 1089 Broken wiring, broken relay	Threshold for error detection is an internal ECU threshold Check wiring Check SCR main relay
523718	4	1101	676	Urea heater relay: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase it is a result error: KWP 1089 Broken wiring, broken relay	Threshold for error detection is an internal ECU threshold Check wiring Check SCR main relay
523718	5	1098	676	Urea heater relay: the current drain measured by ECU is above the target range	Open load If this error detected during the heating phase it is a result error: KWP 1089 Broken wiring broken relay	Threshold for error detection is an internal ECU threshold Test SCR main relay Check cabling, if necessary replace relay.
523719	4	1109	672	Urea supply module heater: the current drain measured by ECU is above the target range	Shortcut to ground If this error detected during the heating phase it is a result error: KWP 1089 Broken wiring Heating element in supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check cabling, if necessary replace supply module
523719	5	1106	672	Urea supply module heater: the current drain measured by ECU is above the target range	Open load If this error detected during the heating phase it is a result error: KWP 1089 Broken wiring Heating element in supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check cabling, if necessary replace supply module
523720	8	925	148	Supply module heater: Duration of switch on is too long.	uty cycle for temperature readout from supply module heater to the control unit is out of range; Supply modul defect, fault in the wiring.	When the received supply module heater temperature duty cycle SCR_rSMT is out of the failurerange (SCR_rSMFailMax_C < SCR_rSMHtrT < SCR_rSMFailMin_C) Supply module check and replace if necessary. Check the wiring.
523720	8	926	148	Supply module heater: Dutycycle timing over error threshold.	Duty cycle for temperature readout from supply module heater to the control unit is not valid. Supply modul defect, fault in the wiring.	When the received supply module heater duty cycle SCR_rSMHtrT is in the valid range (SCR_r- Supply module check and replace if necessary. Check the wiring.
523721	8	930	689	Supply module heater: Dutycycle timing over error threshold.	Duty cycle for temperature readout from supply module to the control unit is out of range. Supply modul defect, fault in the wiring.	Supply module check and replace if necessary. Check the wiring.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523721	8	931	689	Supply module heater: Duty cycle timing out of valid range.	Duty cycle for temperature readout from supply module to the control unit is not valid. Supply modul defect, fault in the wiring.	When the received supply module duty cycle SCR_rSMT is in the valid range (SCR_rSMTVld-Min_C <= SCR_rSMT <= SCR_rSMTVldMax_C), OR in the failure range (SCR_rSMFailMin_C <= SCR_rSMT <= SCR_rSMFailMax_C) Supply module check and replace if necessary. Check wiring.
523721	11	927	689	Supply module heater: temperature measurement not available.	Duty cycle for temperature readout from supply module heater to the control unit is not available. Supply modul defect, fault in the wiring.	Threshold for detection is an internal ECU threshold. No erasing in the current driving cycle. Supply module check and replace if necessary. Check the wiring.
523722	8	929	691	Supply module heater: Faulty PWM signal from supply module.	PWM Signal for temperature readout from supply module to the control unit is not valid. Supply modul defect, fault in the wiring.	Threshold for error detection is an internal ECU threshold. When valid Sync followed by temperature information signal is received AND valid sync and temperature signal for both information is received one after the other. Supply module check and replace if necessary. Check the wiring.
523776	9	291	119	Timeout Error of CAN-Receive-Frame TSC1TE-active	Timeout Error (Missing CAN Bus message)	Threshold for error detection is an internal ECU threshold. Check CAN Bus cabling (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
523777	9	292	119	Message TSC1-TE has been missing (passive)	Passive timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range, check actuator
523895	13	559	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 1 (in firing order).	Missing or wrong injector adjustment value for cyl. 1.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA). Use SERDIA UseCase to check it.
523896	13	560	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 2 (in firing order).	Missing or wrong injector adjustment value for cyl. 2	Threshold for error detection is an internal ECU threshold. check dataset and flash correct injector adjustment value (IMA). Use SERDIA UseCase to check it.
523897	13	561	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 3 (in firing order).	Missing or wrong parametrisation of injector adjustment cyl. 3.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA).
523898	13	562	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 4 (in firing order).	Missing or wrong injector adjustment value for cyl. 4.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA).
523899	13	563	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 5 (in firing order).	Missing or wrong injector adjustment value for cyl. 5.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA).

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523900	13	564	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 6 (in firing order).	Missing or wrong injector adjustment value for cyl. 6.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA).
523912	4	73	7-2-2	@ engines < 4l: Throttle valve error, Open Load or Short cut to Battery, blocked valve or wrong control signal for valve. @ engines with Burner T4i: Pressure Sensor error after valve (DV2), lower limit reached	The sensed raw voltage value is below the minimum threshold.	The sensed raw voltage value DPM_uRawBrnDVDsP is above the minimum threshold DPM_SRCBrnDVDsPuMin_C @ CRT < 4l: check throttle valve @ engines with Burner T4i: check back-pressure valve
523924	4	42	167	Overload at Pins O_V_RH2x: A01, K74, K91. Components on A01, K74, K91 cannot be activated. Internal ECU power stage switched off.	Suspected components: 1- Pin K91: Clutch switch, Brake switch, Engine brake demand, Regeneration activation, Parking brake, Gearbox N, Fan control 1 2- Pin K74: Boost air cooler bypass or electrical fuel pump relay, Fan control 2/fuel valve for flame star	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pins A01, K74, K91 and/or reflash ECU. If error is still present, exchange ECU.
523925	3	38	731	Short circuit to battery error of actuator relay 2. Components on Pin A88, K57 cannot be activated. Internal ECU power stage switched off.	Suspected Components: 1- Lamps K57: Warn Ash Charge, Diagnostic, Warn Coolant Temp/Level, Warn Oil, Warn Boost Air, Warn Air Filter, Warn Water in Fuel, SCR, Regeneration, Engine Running. 2- Relay Preheat A88 3- Exhaust Flap A88	Check wiring harness and connected loads on pins A88, K57.
523925	4	43	731	Short circuit to ground actuator relais 3 Overload at Pins O_V_RH3x: A88, K57	Suspected components: 1- Pin A88: Preheat relay, Exhaust flap 2- Pin K 57: - control lamps: - OBD, preheat lamp, warning temp., warning oil, maintenance lamp, regeneration indicator, alternator management, engine running, diagnostic	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pins A88, K57. If error is still present, exchange ECU.
523926	4	44	732	Short circuit to ground aktuator relais 4. Overload at Pins O_V_PCV: A90	Suspected components: Fan, Wiring harness	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pin A90. If error is still present, exchange ECU.
523927	3	40	733	Short circuit to battery error of actuator relay 2. Components on Pin A04, A05 cannot be activated. Internal ECU power stage switched off.	Suspected Components: 1- Urea Pump A04 2- SCR Heater A05	Check wiring harness and connected loads on pins A04, A05.
523935	12	168	763	Timeout Error of CAN-Transmit-Frame EEC3VOL1; Engine send messages	Fault is detected if a TimeOut of the EEC3VOL1 frame has occurred.	Check wiring harness and customer nodes
523936	12	169	764	Timeout Error of CAN-Transmit-Frame EEC3VOL2; Engine send messages	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer nodes

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523938	9	133	766	Timeout Error (BAM to packet) for CAN-Receive-Frame AT11GCVol1 information; factors & Sensorcalibration for NOX Sensor (SCR-system upstream cat; DPF-system downstream cat)	Failure of the CAN Bus message	NOX sensor and sensor connection check
523939	9	134	766	Broadcast Announce Message of the calibration message of the upstream catalytic NOx sensor has failed. Timeout Error (BAM to BAM) for CAN-Receive-Frame AT11GCVol1 information. factors & Sensorcalibration for NOX Sensor (SCR-system upstream cat, DPF-system downstream cat).	Defective Nox sensor, faulty parameterization	NOX sensor and sensor connection check
523940	9	135	766	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT11GCVol1 information; factors & Sensorcalibration for NOX Sensor (SCR-system upstream cat; DPF-system downstream cat)	Failure of the CAN Bus message	NOX sensor and sensor connection check
523941	9	140	767	Timeout Error (BAM to packet) for CAN-Receive-Frame AT10GCVol2 information; factors & Sensorcalibration for NOX Sensor (SCR-system downstream cat; DPF-system downstream cat)	Timeout Error (Missing CAN Bus message)	NOX downstream sensor and sensor connection check
523942	9	141	767	Timeout Error (BAM to BAM) for CAN-Receive-Frame AT10GCVol2 information, Calibration message 1 of the after catalyst NOx sensor has failed. Factors & Sensorcalibration for NOX Sensor (SCR-system downstream cat, DPF-system downstream cat)	Defective Nox sensor, faulty parameterization.	NOX downstream sensor and sensor connection check.
523943	9	142	767	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT10GCVol2 information; factors & Sensorcalibration for NOX Sensor (SCR-system downstream cat; DPF-system downstream cat)	The fault is detected when a timeout error in packet 2 of NOxSenVol2Rx frame occurs.	NOX downstream sensor and sensor connection check
523960	0	1011	771	Physical range check high for EGR cooler downstream temperature.	Sensed temperature downstream EGR-cooler > limit.	EGR-Valve blocked open EGR-Valve actuator defect EGR-cooler defect (check for coolant water) Reed Valve defect Intake throttle blocked in closed position Exhaust pressure too high Check Nox-sensor upstream SCR catalyst dp venturi sensor defect
523960	1	1012	771	Physical range check low for EGR cooler downstream temperature.	sensor voltage > lower limit	EGR-Valve blocked open EGR-Valve actuator defect EGR-cooler defect (check for coolant water) Reed Valve defect Intake throttle blocked in closed position Exhaust pressure too high Check Nox-sensor upstream SCR catalyst dp venturi sensor defect

SECTION 3 - CHASSIS & TURNTABLE

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523982	0	360	737	Powerstage diagnosis disabled; Indicating that battery voltage is not high.	Powerstage diagnostic can be deactivated due to too high battery voltage.	Check wiring, check alternator, check cables and repair or replace if necessary.
523982	1	361	737	Powerstage diagnosis disabled; Indicating that battery voltage is not low.	Powerstage diagnostic can be deactivated due to too low battery voltage.	Check wiring, check alternator, check cables and repair or replace if necessary.
523984	3	1239	788	Actuator relay 5: the voltage measured by ECU is out of the target range	Short-Circuit to battery to component	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU
523986	4	1241	176	Actuator relay 4: the voltage measured by ECU is out of the target range	Short-Circuit to ground to component	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU
523987	4	1242	791	Actuator relay 5: the voltage measured by ECU is out of the target range	Short-Circuit to ground to component	Threshold for error detection is an internal ECU threshold. Check wiring, component, ECU
524050	11	1434	8-3-6	CAN; not used	not used	not used
524051	11	1435	8-3-7	CAN; not used	not used	not used
524057	2	1505	8-4-3	Low fuel pressure: the low fuel pressure calculated by ECU is underneath the target range; the ECU activates a system reaction	Fuel pressure below warning threshold	Threshold for error detection is an internal ECU threshold. Check low fuel pressure system (fuel feed pump, relay, fuse, wiring, sensor) and if necessary repair or replace it.
524063	3	1558	869	SCR heater main relay; short circuit to battery Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Short-Circuit to battery on wiring to component	Check wiring, component
524063	4	1559	869	Connection between heating valve (Y31) on the control unit Pin A:92 and Load side SCR heater main relay (K31) is a short cut to ground. Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Faulty wiring, faulty heater relay (K27-K31), defective heating valve (Y31), broken element in heating.	Disconnect plug from heating valve (Y31) and reset fault. If fault is still present you have to look in the wiring of Y31 to the control unit Pin A:92. If error is no longer present, you have to check the wiring of Y31 via relay K31 and possibly the heating cables and relay (K27-K30).
524063	5	1555	869	Urea backflow line heater: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open Load on wiring to component	Check wiring, component
524063	5	1556	869	Urea main relay: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	relay defect relay not connected wiring harness broken problems with supply voltage	Check wiring, component
524063	5	1557	869	Urea pressure line heater: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open load on wiring to component	Check wiring, component
524063	5	1560	869	SCR relay for suction line not connected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	relay defect relay not connected wiring harness broken problems with supply voltage	Check wiring, component

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524063	5	1561	869	Open load on wiring to component Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open load on wiring to component	Check wiring, component
524063	5	1562	869	SCR heater tank; open load	Open load on wiring to component	Check wiring, component
524063	12	1646	869	SCR supply module temperature is not reaching a threshold before a calibratable time is exceeded. Corresponding to the environmental Temperature a specific defrosting time is given. After starting the defrosting a clock counter is starting. Does the counter reach the given defrosting time limit, an error will be detected. Is the temperature reached in time the clock counter will be reset Example: by using the calibrated temperature/time curve --> environmental temperature 0°C --> defrosting time limit 6000s --> if the clock counter reaches 6000s the error will be detected	Suspected components: Environment temperature sensor defect SCR supply module temperature sensor defect SCR supply module electrical heater defect	Check Environment temperature sensor SCR supply module temperature sensor SCR supply module electrical heater
524065	0	1565	892	The relativ pressure value of the exhaust gas from the urea cat upstream sensor is greater than an applicable maximum pressure threshold	sensed presure upstream SCR catalyst > physical high range limit f(exhaust volume flow) UCatUsP_pRelFlt_mp > UCatUsP_pMax_mp	Check for crystallisation in exhaust line upstream SCR and dwnstream of urea injector Check correct connection from exhaust line to pressure sensor upstream SCR catalyst: syphons?, water in tube?, water in sensor? Check that exhaust pipe outlet is free (downstream SCR catalyst) Check wiring of pressure sensor upstream SCR catalyst Check pressure sensor upstream SCR catalyst: sensor has no connection to vehicle body? => Ensure that sensor is free Does sensor oscillate heavily at engine low idle /high idle? => try to supress the oscillating Exchange pressure sensor upstream SCR catalyst Check calculated exhaust volume flow of engine within EDC: SCR_dvolSCRUs pausable? If not: Check T sensor upstream SCR catalyst, check complete engine air path: EGR-Valve, Intake throttle, turbocharger, piping for leakage and function Check SCR catalyst: Broken? Exchange SCR-Catalyst

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524065	1	1566	892	The relativ pressure value of the exhaust gas from the urea cat upstream sensor is less than an applicable minimum pressure threshold	sensed presure upstream SCR catalyst > physical high range limit f(exhaust volume flow) UCatUsP_pRelFlt_mp < UCatUsP_pMin_mp	Check correct connection from exhaust line to pressure sensor upstream SCR catalyst: leakage? Check electric connector: 4h pin open / new connector type used? pressure exchange from inside electrical connector with the environemt possible Check exhaust line: any leakages upstream of SCR catalyst? Check wiring of pressure sensor upstream SCR catalyst Exchange pressure sensor upstream SCR catalyst Check calculated exhaust volume flow of engine within EDC: SCR_dvolSCRUs pausable? If not: Check T sensor upstream SCR catalyst, check complete engine air path: EGR-Valve, Intake throttle, turbocharger, piping for leakage and function Check SCR catalyst: Broken? Exchange SCR-Catalyst
524065	2	1598	892	Comparison of urea cat upstream exhaust gas- and environment pressure, the difference should not exceed a certain limit abs(UCatUsP_pDiffEnvCat_mp) > Threshold	absolut value of difference between sensed pressure upstream SCR catalyst and environmental pressure > limit abs(UCatUsP_pDiffEnvCat_mp) > Threshold	Check electric connector: 4h pin open / new connector type used? pressure exchange from inside electrical connector with the environemt possible? water in sensor? sensor frozen? Check wiring of pressure sensor upstream SCR catalyst Exchange pressure sensor upstream SCR catalyst Check intake manifold pressure sensor (Air_pCACDs) Check ambient pressure sensor (EnvP_p)
524065	3	1569	892	voltage of pressure sensor upstream SCR > voltage high limit	voltage of pressure sensor upstream SCR > voltage high limit	Check wiring of pressure sensor upstream SCR catalyst Check pressure sensor upstream SCR catalyst Exchange pressure sensor upstream SCR catalyst
524065	4	1570	892	voltage of pressure sensor upstream SCR < voltage low limit	voltage of pressure sensor upstream SCR < voltage low limit	Check wiring of pressure sensor upstream SCR catalyst. Check pressure sensor upstream SCR catalyst. Exchange pressure sensor upstream SCR catalyst

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524067	0	1581	894	Filtered urea supply module heater temperature value is above an applicable maximum heater temperature threshold of the supply module The temperature is read out via the PWM signal of the urea pump. That is only possible in status init of the SCR-system short after ignition was switched on. When that state is left the sensed temperature value is frozen.	sensed temperature of supply module heater > physical high range limit	Compare SCR_tSMT with SCR_tSMHtrT. Both show the same value? Check urea tank temperature (SCR_tAdapUTnkT). Very hot (> 70°C), urea tank heater permanent on? Does the pump never stop working? Check wiring to supply module Compare SCR_tSMT with SCR_tSMHtrT. Both show different values or urea tank temperature (SCR_tAdapUTnkT) is cold: exchange urea pump unit Supply module heater temperature sensor defect Supply module heater defect Supply module defect
524067	0	1585	894	Filtered urea supply module temperature value (SCR_tSMT) is above an applicable maximum temperature threshold of the supply module The temperature is read out via the PWM signal of the urea pump. That is only possible in status init of the SCR-system short after ignition was switched on. When that state is left the sensed temperature value is frozen.	sensed temperature of urea within supply module > physical high range limit	Compare SCR_tSMT with SCR_tSMHtrT. Both show the same value? Check urea tank temperature (SCR_tAdapUTnkT). Very hot (> 70°C), urea tank heater permanent on? Does the pump never stop working? Check wiring to supply module Compare SCR_tSMT with SCR_tSMHtrT. Both show different values or urea tank temperature (SCR_tAdapUTnkT) is cold: exchange urea pump unit Supply module temperature sensor defect Supply module heater defect Supply module defect
524067	1	1582	894	Filtered urea supply module heater temperature value is below an applicable minimum heater temperature threshold of the supply module The temperature is read out via the PWM signal of the urea pump. That is only possible in status init of the SCR-system short after ignition was switched on. When that state is left the sensed temperature value is frozen.	sensed temperature of supply module heater < threshold	Check ambient temperature EnvT_t < Threshold? Compare SCR_tSMT with SCR_tSMHtrT Check wiring with regard to supply module heater exchange urea pump unit Supply module heater temperature sensor defect Supply module defect
524067	1	1586	894	Filtered urea supply module temperature (SCR_tSMT) value is below an applicable minimum temperature threshold of the supply module The temperature is read out via the PWM signal of the urea pump. That is only possible in status init of the SCR-system short after ignition was switched on. When that state is left the sensed temperature value is frozen.	sensed temperature of urea within supply module < physical low range limit	Check ambient temperature EnvT_t < threshold? Compare SCR_tSMT with SCR_tSMHtrT Check wiring with regard to supply module heater exchange urea pump unit Supply module temperature sensor defect Supply module defect

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524067	2	1867	894	absolute difference of sensed temperature of supply module heater temperature and ambient temperature UPmpT_tDiffPmpHtrAmb_mp > threshold	absolute difference of sensed temperature of supply module heater temperature and ambient temperature UPmpT_tDiffPmpHtrAmb_mp > threshold	Compare SCR_tSMT with SCR_tSMHtrT, EnvT_t and CEngTds_t and SCR_tAdapUTnkT => All identical? If not: Has the machine been brought from cold environment into a warm one or vice versa without engine running, e.g. at workshop? Environment temperature sensor defect Coolant temperature sensor defect Supply module temperature sensor defect Problem at Supply module unit (broken?) => exchange supply module
524067	2	1868	894	absolute difference of sensed temperature of supply module temperature and ambient temperature > threshold	absolute difference of sensed temperature of supply module temperature and ambient temperature UPmpT_tDiffPmpAmb_mp > threshold	Compare SCR_tSMT with SCR_tSMHtrT, EnvT_t and CEngTds_t and SCR_tAdapUTnkT => All identical? If not: Has the machine been brought from cold environment into a warm one or vice versa without engine running, e.g. at workshop? Environment temperature sensor defect Coolant temperature sensor defect Supply module temperature sensor defect Problem at Supply module unit (broken?) => exchange supply module
524074	9	1533	246	Open load sensor internally at NOx-sensor downstream SCR	Open load sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor downstream SCR catalyst: water inside? Shake out sensor after dismantling. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
524075	11	1534	247	Short circuit sensor internally at NOx-sensor downstream SCR	Short circuit sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor downstream SCR catalyst: water inside? Shake out sensor after dismantling. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration? Rearrange if critical and possible Check wiring harness Exchange sensor

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524076	9	1535	248	Open line sensor internally at NOx-sensor downstream SCR NOx Sensors are CAN Sensors --> no HW Pin on the ECU	Open line sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor upstream SCR catalyst: water inside? Shake out sensor after dismounting. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
524077	11	1536	249	Short circuit sensor internally at NOx-sensor downstream SCR NOx Sensors are CAN Sensors --> no HW Pin on the ECU	Short circuit sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor upstream SCR catalyst: water inside? Shake out sensor after dismounting. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
524078	9	1537	255	Lambda value of NOx-Sensor downstream SCR is out of range. When the filtered Lambda concentration value at the sensor (ComRxSCR_rFltLamDs_mp) is greater than the physical range check max. lambda threshold	sensed lambda value of Nox-sensor downstream SCR catalyst is > physical high limit ComRxSCR_rCanLamDs_mp > threshold	Check whether NOx-sensor downstream SCR catalyst is physically mounted within the exhaust line Check Lambda values of NOx-sensor downstream SCR catalyst at idle conditions, ComRxSCR_rCanLamDs_mp > threshold? Compare to ComRxSCR_rCanLamUs_mp. Values must be almost identical Check CANBus of NOx-sensor downstream SCR catalyst Check NOx-sensor downstream SCR catalyst wiring Check NOx-sensor downstream SCR catalyst itself Replace NOx-sensor downstream SCR catalyst

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524079	9	1538	256	sensed lambda value of NOx-sensor downstream SCR catalyst is < physical low limit ComRxSCR_rCanLamDs_mp < threshold	sensed lambda value of NOx-sensor downstream SCR catalyst is < physical low limit ComRxSCR_rCanLamDs_mp < threshold	Compare to ComRxSCR_rCanLamUs_mp. ComRxSCR_rCanLamDs_mp must be almost identical! If almost identical, Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function Check injection system of engine. Injector stuck? if sensed lambda upstream SCR higher (ComRxSCR_rCanLamUs_mp): Diesel in Urea-tank? Check CANBus of NOx-sensor downstream SCR catalyst Check NOx-sensor downstream SCR catalyst wiring Check NOx-sensor downstream SCR catalyst itself Replace NOx-sensor downstream SCR catalyst
524080	9	1539	257	sensed lambda value of Nox-sensor upstream SCR catalyst is > physical high limit ComRxSCR_rCanLamUs_mp > Threshold	sensed lambda value of Nox-sensor upstream SCR catalyst is > physical high limit ComRxSCR_rCanLamUs_mp > Threshold	Check whether NOx-sensor upstream SCR catalyst is physically mounted within the exhaust line Check Lambda values of NOx-sensor upstream SCR catalyst at idle conditions, ComRxSCR_rCanLamUs_mp < Threshold? Compare to ComRxSCR_rCanLamDs_mp. Must be almost identical Check CANBus of NOx-sensor upstream SCR catalyst Check NOx-sensor upstream SCR catalyst wiring Check NOx-sensor upstream SCR catalyst itself Replace NOx-sensor upstream SCR catalyst
524081	9	1540	258	sensed lambda value of Nox-sensor upstream SCR catalyst is < physical low limit ComRxSCR_rCanLamUs_mp < Threshold	sensed lambda value of Nox-sensor upstream SCR catalyst is < physical low limit ComRxSCR_rCanLamUs_mp < Threshold	Check air path of engine: EGR-Valve, Intake-Throttle, Turbocharger and Piping each for leakage and correct function Check injection system of engine. Injector stuck? Check CANBus of NOx-sensor upstream SCR catalyst Check NOx-sensor upstream SCR catalyst wiring Check NOx-sensor upstream SCR catalyst itself Replace NOx-sensor upstream SCR catalyst
524083	9	1542	261	sensed NOx-value of NOx-sensor downstream SCR catalyst < Threshold	sensed Nox-value of Nox-sensor downstream SCR catalyst < physical low limit	Check CANBus of NOx-sensor downstream SCR catalyst Check NOx-sensor downstream SCR catalyst wiring Check NOx-sensor downstream SCR catalyst itself Replace NOx-sensor downstream SCR catalyst

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524085	9	1544	912	sensed Nox-value of Nox-sensor upstream SCR catalyst < Threshold	sensed Nox-value of Nox-sensor upstream SCR catalyst < physical low limit	Check CANBus of NOx-sensor upstream SCR catalyst Check NOx-sensor upstream SCR catalyst wiring Check NOx-sensor upstream SCR catalyst itself Replace NOx-sensor upstream SCR catalyst
524100	9	1666	924	Timeout error of CAN-Transmit-Frame Com-DPFHisDat.	Open load on CANBUS wiring.	Check wiring, component.
524104	9	1676	928	Timeout error of CAN-Receive-Frame Com-RxDPFctl. CM1 Module Customer Recieve Message.	Time out of Check CANBUS EAT Control Receive Message, PGN65348. The message is not received.	Threshold for error detection is an internal ECU threshold. Check CANBUS EAT Control Receive Message, PGN65348. CM1 Module Customer Recieve Message.
524118	9	1672	9-4-2	Timeout error of CAN-Receive-Frame ComRxCM1	If the frame CM1 message is not transmitted successfully	Check CAN Bus cabling (Bus shedding, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
524121	9	1683	9-4-5	Timeout error of CAN-Receive-Frame Com-RxTrbChActr	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus shedding, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
524125	9	1687	9-4-9	Timeout error of CAN-Receive-Frame Com-TxTrbChActr	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus shedding, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
524141	7	1827	192	DEF dosing valve is blocked with crystalized urea or other deposits.	While SCR system is starting up and fter urea pressure reaches 10000 hPa, the DEF dosing module is tested. Expectation is that urea pressure drops below 1500 hPa if injector works properly. The test is repeated up to 3 times before an error is set. SCRsysPresMon_stPresDropDet_mp=0 while SCRCo_stStatus_mp=16. Suspected component: wiring harness DEF dosing valve The error is stored into the EEPROM of the ECU and status at ECU shut down is regained at ignition on.	Check electrical connection of urea injector: - wiring harness - connector Conduct SERDIA use-case "injection test". If it is faulty: - remove urea injector from exhaust line: - check for crystallisation direct on injector nozzle / plate - rinse it thoroughly in water - remount urea injector and conduct SERDIA use-case "injection test" If the error is still active, then exchange urea injector.
524141	7	1858	192	DEF dosing valve is blocked with crystalized urea or other deposits.	While SCR system is starting up and fter urea pressure reaches 10000 hPa, the DEF dosing module is tested. Expectation is that urea pressure drops below 1500 hPa if injector works properly. The test is repeated up to 3 times before an error is set. SCRsysPresMon_stPresDropDet_mp=0 while SCRCo_stStatus_mp=16. Suspected component: wiring harness DEF dosing valve The error is stored into the EEPROM of the ECU and status at ECU shut down is regained at ignition on.	Check electrical connection of urea injector: - wiring harness - connector Conduct SERDIA use-case "injection test". If it is faulty: - remove urea injector from exhaust line: - check for crystallisation direct on injector nozzle / plate - rinse it thoroughly in water - remount urea injector and conduct SERDIA use-case "injection test" If the error is still active, then exchange urea injector.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524147	13	1639	966	No proper urea pressure level could be build up within the SCR system state "Fill Lines" => SCRCO_stStatus_mp = 1 within some minutes	This error shows up, if no proper urea pressure level could be build up within the SCR system state "Fill Lines" => SCRCO_stStatus_mp = 1 within some minutes Once the urea pump pressure has exceeded the threshold the error is declared as okay. Suspected components: Suction line blocked PWM Powerstage has a defect and a default value which leads not to a rising pressure Pump Pressure sensor defect pump filter contains dirty parts reverting valve continuously open	Make sure that frozen lines, pump or tank can be excluded! Check whether there is urea in the urea tank Check urea lines: All lines connected? The right lines connected to the correct places? Suction line blocked? No leakage? Not also urea to the outside but also air into the lines, especially in the suction line! Perform service routine "pressure test": Does the urea pump work? => check wiring harness & PWM signal for pump Does the urea pressure rise? DFC already healed? If all unsuccessful so far: Check urea pressure sensor: At ignition on and SCR system state = 0 ("Init check"), SCR_pAbsAdapUPmpP shall be identical to EnvP_p. Fulfilled: Sensor okay! Check reverting valve => see DFC_SCRCoRevVlvBlk Check pump filter: dirt inside? Suspected components: Urea pump broken Reverting valve continuously open Urea suction line, backflow line broken or connection swapped PWM Powerstage has a defect Pump Pressure sensor broken
524152	2	1874	971	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	Check electrical connection of urea quality sensor Check engine CAN bus Check urea quality sensor itself Exchange urea quality sensor
524153	2	1875	997	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	Check electrical connection of suction unit sensor (combined sensor with tank level and tank temperature) Check engine CAN bus Check level sensor itself Exchange suction unit
524156	9	1705	972	Timeout error of CAN-Receive-Frame ComRxEBC2 from wheel speed sensor.	Timeout Error (Missing CAN Bus message) Defect on wheel speed sensor.	Check CAN Bus cabling (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range. Replace the wheel speed sensor.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524177	7	1863	995	The error shows up, if no proper urea pressure could be build up within the SCR system state "Fill Lines" => SCRCo_stStatus_mp = 1.	This error shows up, if no proper urea pressure could be build up within the SCR system state "Fill Lines" => SCRCo_stStatus_mp = 1. 3 cases can lead to the error: Case A: increasing pressure is detected within 15s the check has passed => no error Case B: The pressure threshold was not reached within the 60s but case A was not positiv. Case C: The minimum pressure of 3000 hPa was not reached within the 60s.	Make sure that DEF lines, pump and tank are not frozen. Check for DEF level in the tank. Check DEF lines: Are all DEF lines connected? Is the suction line blocked? Is there any leakage? Not only urea to the outside but also air into the lines, especially in the suction line! Perform SERDIA usecase "pressure test": Does the DEF pump work? => check wiring harness & PWM signal for pump. Does the urea pressure increase? All errors are already healed? If still unsuccessful so far: Check urea pressure sensor: At ignition on and SCR system state = 0 ("Init check"), SCR_pAbsAdapUPmpP shall be identical to EnvP_p. Fulfilled: Sensor okay! Check DEF pump filter: Is any dirt inside? Suspected components: Suction line PWM Powerstage has a defect and a default value which leads not to a rising pressure DEF pump pressure sensor defect DEF pump filter contains dirty parts

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524178	7	1864	996	The urea pump is not able to control the urea pressure between 9bar and 11 bar.	The urea pump controller is not able to control the urea pressure between 9bar and 11 bar due to malfunction in the SCR system. Suspected components: - DEF pump broken - Reverting valve continuously open - Urea suction line, backflow line broken or connection swapped - PWM Powerstage has a defect - Pump Pressure sensor broken	Make sure that DEF lines, pump and tank are not frozen. Check for DEF level in the tank Check DEF lines: All lines connected? The right lines connected to the correct places? Suction line blocked? Is there any leakage? Not also urea to the outside but also air into the lines, especially in the suction line! Perform SERDIA usecase "pressure test": Does the DEF pump work properly? => check wiring harness & PWM signal for pump Does the DEF pressure rise? Is the error healed? If still unsuccessful so far: - Check DEF pressure sensor: At ignition on and SCR system state = 0 ("Init check"), SCR_pAbsAdapUPmpP shall be identical to EnvP_p. Fulfilled: Sensor okay! - Check reverting valve - Check DEF pump filter: dirt inside? Suspected components: DEF pump broken Reverting valve continuously open DEF suction line, backflow line broken or connection swapped PWM Powerstage has a defect DEF pump pressure sensor broken
524190	14	1891	272	Not enough urea in tank or low urea quality or hardware tampering failure is detected or hardware failure is detected	Low DEF tank level Low DEF quality Hardware Tampering is active Hardware Failure is active	Check DEF level in tank. If there is no DEF, refill up to volume above the warning threshold. Check the DEF quality in the tank. If wrong fluid is filled, refill with proper DEF. Check other errors based on hardware malfunctions.
524191	14	1892	273	A low DEF tank level or a low DEF quality is detected or hardware tampering (system components are pinched off) or hardware failures as shortcut to battery, shortcut to ground etc. are detected.	Low DEF tank level Low DEF quality Hardware Tampering is active Hardware Failure is active	Threshold for error detection is an internal ECU threshold. Check the DEF level in tank. If there is no DEF, refill up above the warning level. Check DEF quality filled in the tank. Check other errors based on hardware tampering or failure.

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524193	8	1893	275	The total time in standstill-regeneration mode exceeds the long-limit threshold within last 500h total engine run time. The error is activated if the engine runs to many times in Standstill regeneration.	Stand-still mode is very often aborted by the operator. Stand-still mode does not reach required temperature level and regeneration level is therefore reached after a short time again	Read out stand-still statistics => see service manual: Stand-still operation finished or often interrupted by driver / engine shut-off? => Run stand-still and instruct operator Stand-still operation required often by soot load => Check dp DPF pressure sensor Stand-still mode does not reach required temperature level: Check engine air path: Intake Trottle, EGR-Valve and turbocharger okay? Any leakage in engine air intake system or exhaust gas system? Check temperature sensors within exhaust system: upstream DOC, downstream DOC If soot load level of DPF allow it: Perform Stand-still and check reached temperature level upstream and downstream DOC: T upstream DOC in the range of 480-550°C? Downstream DOC after 25 min stand-still main phase 590°C are reached? Temperature traces are steady and even? Temperature downstream DOC higher than upstream DOC but difference does not exceed 100 K? Very small difference (< 10 K after 25 min stand-still main phase, 590 °C downstream DOC are not reached) => exchange DOC Very big difference (> 100 K after 25 min stand-still main phase, 590 °C downstream DOC exceeded) => check injection system of engine & engine air path

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524194	8	1894	276	<p>The total time in standstill-regeneration mode exceeds the long-limit threshold: 2,5h stand-still operation within 50h total motor run time.</p> <p>The error is activated if the engine runs to much time in short Standstill regeneartion.</p>	<p>Stand-still mode is aborted / interrupted too often by the operator</p> <p>Stand-still is required too often due to miscalculation in the soot model</p> <p>Stand-still mode does not reache temperature level and regeneration level is therefore reached after a short time again.</p>	<p>Read out stand-still statistics => see service manual:</p> <p>Stand-still operation finished or often interrupted by driver / engine shut-off? => Run stand-still and instruct operator</p> <p>Stand-still operation required often by soot load => Check dp DPF pressure sensor</p> <p>Stand-still mode does not reach required temperature level:</p> <p>Check engine air path: Intake Trottle, EGR-Valve and turbocharger okay?</p> <p>Any leakage in engine air intake sytem or exhaust gas system?</p> <p>Check temperature sensors within exhaust system: upstream DOC, downstream DOC</p> <p>If soot load level of DPF allows it:</p> <p>Perform Stand-still and check reached temperature level upstream and downstream DOC: T upstream DOC in the range of 480-550°C? Downstream DOC after 25 min stand-still main phase 590°C are reached?</p> <p>Temerature traces are steady and even?</p> <p>Temperature downstream DOC higher than upstream DOC but difference does not exceed 100 K?</p> <p>Very small difference (< 10 K after 25 min stand-still main phase, 590 °C downstream DOC are not reached) => exchange DOC</p> <p>Very big difference (> 100 K after 25 min stand-still main phase, 590 °C downstream DOC exceeded) => check injection system of engine & engine air path</p>

Table 3-7. Engine Fault Codes TCD2.9L4

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524195	14	1900	279	<p>The standstill request of detected crystallization is ignored for more than 5h(>300min)</p> <p>This will be activated if there is a standstill request activated by Crystallisation Monitoring.</p>	<p>Back pressure upstream SCR catalyst has reached a level which indicates crystallisation inside of exhaust line.</p> <p>The error detection depends on the sensed pressure upstream of the SCR catalyst and the calculated exhaust volume flow through the mixer pipe.</p> <p>In case of error is set, but no crystallisation can be found in the mixing pipe, a possible reason can be the defect sensors:</p> <ul style="list-style-type: none"> - exhaust pressure & temperature upstream of the SCR catalyst, - the ambient pressure - the exhaust mass flow => Check air path system at the engine. 	<p>Dismount urea injector from exhaust line and inspect visually the injector and the exhaust line for urea crystallisation upstream of SCR catalyst:</p> <p>If crystallisation can be clearly seen, then standstill must be processed.</p> <p>Has the engine been operated in low load for longer time? If yes, then it could be the reason for crystallisation.</p> <p>Does the NOx-Sensors work properly? Compare ComRxSCR_rNOxUs to ComRxSCR_rNOxDs, when ComRxSCR_stNOxRdyUs = 1 & ComRxSCR_stNOxRdyDs = 1 (Warm engine and EAT-system, SCRT_tCatAvgExhGs_mp > 250°C, SCR_stStatus = "Dosing" = 8): sensed NOx upstream of SCR catalyst must be higher than downstream of SCR catalyst.</p> <p>Go to idle and wait until SCR system enters status "stand-by" (no dosing), SCRT_tCatAvgExhGs_mp < 225°C: ComRxSCR_rNOxUs = ComRxSCR_rNOxDs</p> <p>Clean urea injector: rinse it thoroughly under water</p> <p>Check EGR-Path: difference pressure sensor at venturi tube, EGR cooler, EGR-Valve, Reed-Valve, Intake throttle regarding function and leakage. Does the EGR-cooler leak water in the exhaust?</p> <p>Check air path for leakage</p> <p>Check turbocharger</p> <p>No crystallisation can be seen in the mixing pipe:</p> <p>Check exhaust pressure sensor upstream of SCR catalyst (SCR_pSensUCatUsP): tube, water in sensor?</p> <p>Check environmental pressure sensor (EnvP_p): plausible?</p> <p>Check exhaust temperature sensor upstream of SCR-catalyst (SCR_tSensUCatUsT): plausible compared to Exh_tOxiCatUs & Exh_tOxiCatDs e.g. when engine has idled for 20 minutes?</p> <p>=> Run stand-still to remove crystallisation and to reset the DFC</p>
5232719	3	1108	672	<p>Urea supply module heater: the current drain measured by ECU is above the target range</p>	<p>Short circuit to battery</p> <p>If this error detected during the heating phase it is a result error:KWP 1089</p> <p>Broken wiring</p> <p>Heating element in supply module defect</p>	<p>Threshold for error detection is an internal ECU threshold</p> <p>Check wiring</p> <p>Check cabling, if necessary replace supply module</p>

3.33 COUNTERWEIGHT

If the counterweight has been removed, ensure the retaining bolts are torqued to the proper value as shown in Figure 3-92., Counterweight Bolt Torque.

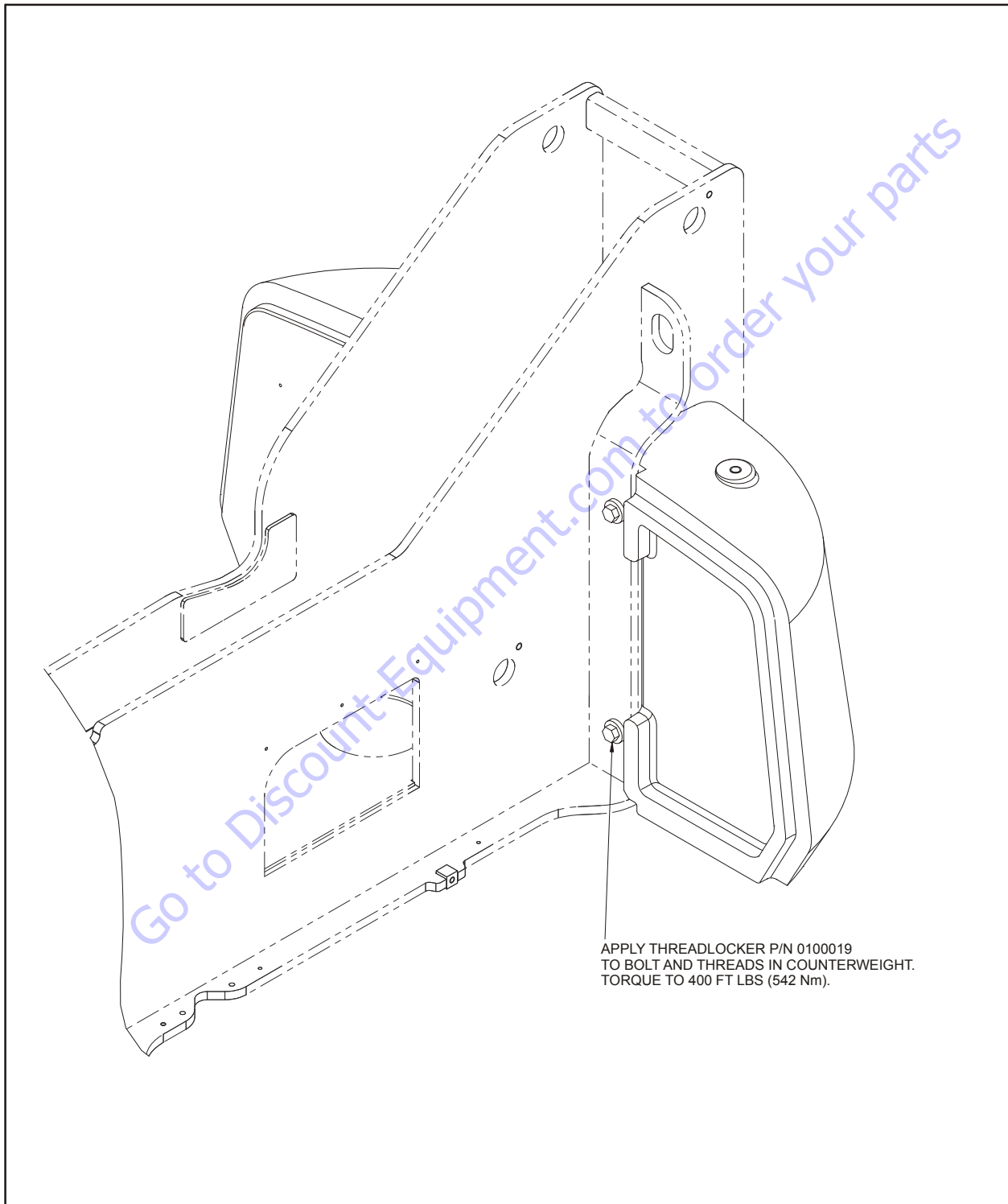


Figure 3-92. Counterweight Bolt Torque

PARTS FINDER

**Search Website
by Part Number**



**Search Manual
Library For Parts
Manual & Lookup Part
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or Request Quote**

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

SECTION 4. BOOM & PLATFORM

4.1 BOOM SYSTEMS

NOTE: For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.

Broken Cable Indicator System

The boom on this model is a 4 section proportionally driven telescopic boom. The inner mid boom is driven directly by the telescope cylinder. The outer mid and fly booms are each driven by separate wire rope systems. Each rope system contains redundant ropes that are capable of allowing the operator to unknowingly continue use of the machine with a single rope failure. These kinds of failures with the extend ropes are self revealing to the operator so proper action can be taken. Failures within the fly extend ropes are self revealing as they are exposed on the exterior of the boom where a broken rope would be obvious. Failures within the outer mid ropes require the addition of the Broken Cable Indicator System in order to be self-revealing to the operator. This system uses a proximity sensor to detect excessive movement of the sensed rope as would be expected with a rope failure. A broken rope detection results in illuminating the Cable Break indicator on the platform control panel. No restrictions are made to the functionality of the control system. It is the responsibility of the operator to take the appropriate action.

Platform Control Enable System

The platform controls make use of a time dependent enable circuit to limit the time availability of "live" or enabled controls. To operate any directional function, the foot-switch must be depressed before activation of the function. When the foot-switch is depressed, the controls are enabled and the operator has 7 seconds to operate any function. The controls will remain enabled as long as the operator continues to use any function and will remain enabled 7 seconds after the last function has been used. While the controls are "live", the enabled light will be illuminated in the platform display panel. When the time limit has been reached, the enabled light will turn off and the controls will be "dead" or disabled. To continue use of the machine the controls must be re-enabled to start the timer system over again. This is done by releasing all functions, then releasing and re-depressing the foot-switch.

Transport Position Sensing System

The transport position sensing system uses the main boom angle sensors, the main boom length sensor mounted in the pivot end of the main base boom in addition to the boom length switch mounted on the platform end of the main base boom and transport proximity switches mounted to the jib fly boom to sense when the main boom and jib boom are in the position associated with high speed travel. Above transport angle is recognized when the main boom cylinder angle sensor reads more than 6° with respect to the turntable and resets to within transport position when both main boom angle sensors read less than 4° with respect to the turntable. Transport length is recognized when the main boom length switch and main boom length sensor read less than 1 ft extension for the main boom. Transport position is also determined when the jib boom length switches indicate the jib is fully retracted with the jib and below 5 degrees with respect to the main boom. During failures of either the main boom length switch or the main boom length sensor the main boom transport length will be determined by the remaining sensor or switch. In addition for a failure either jib boom length switch, jib length will be determined by the remaining switch.

This system is used to control the following systems:

- Beyond Transport - Drive Speed Cutback System
- Drive/Steer - Boom Function Interlock System (CE Only)
- Jib Stow System
- Axle Extension System
- Oscillating Axle System

Beyond Transport - Drive Speed Cutback System

When boom is positioned beyond the Transport Position, the drive motors are automatically restricted to their maximum displacement position (slow speed).

SECTION 4 - BOOM & PLATFORM

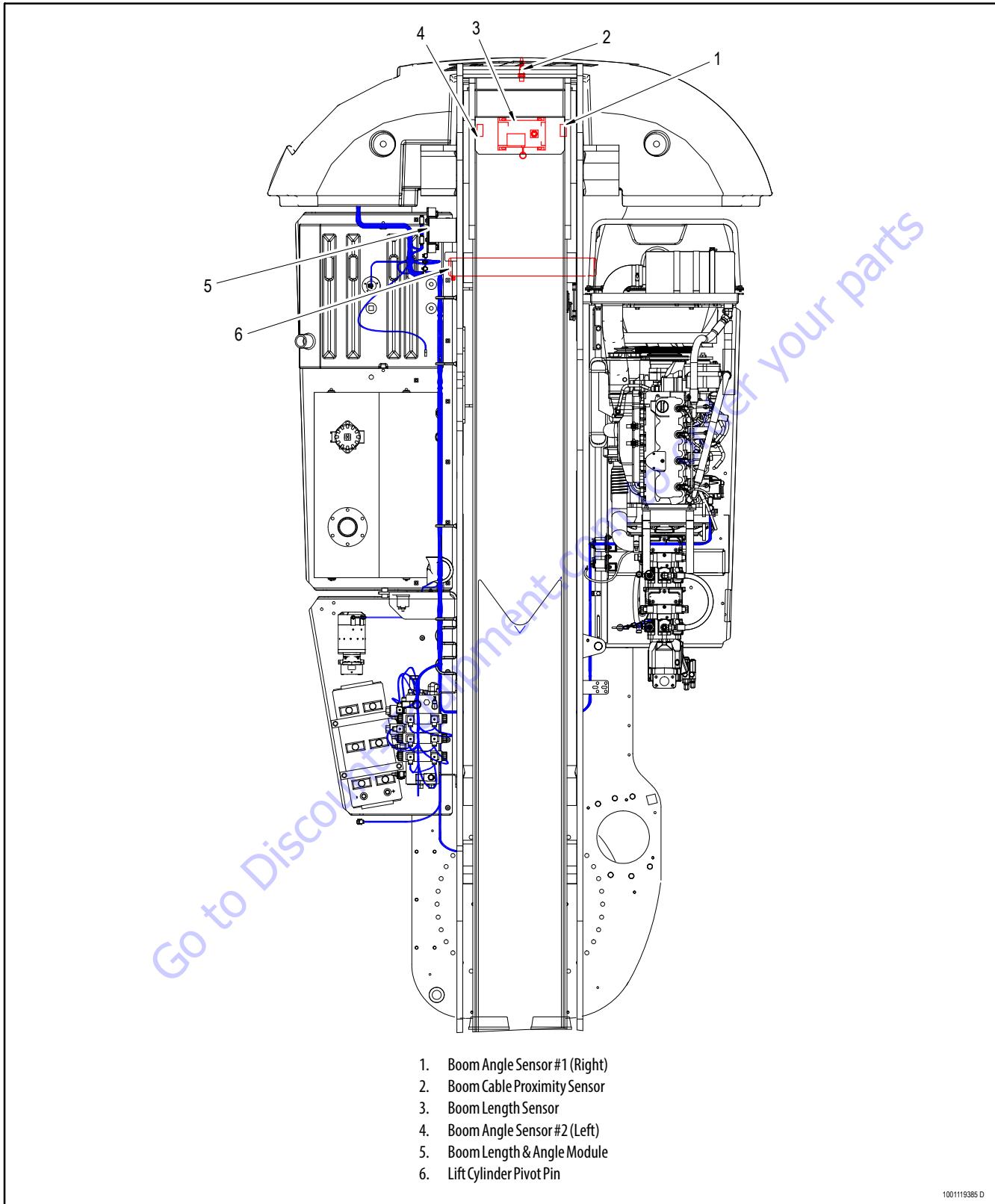


Figure 4-1. Boom Component Location - Sheet 1 of 2

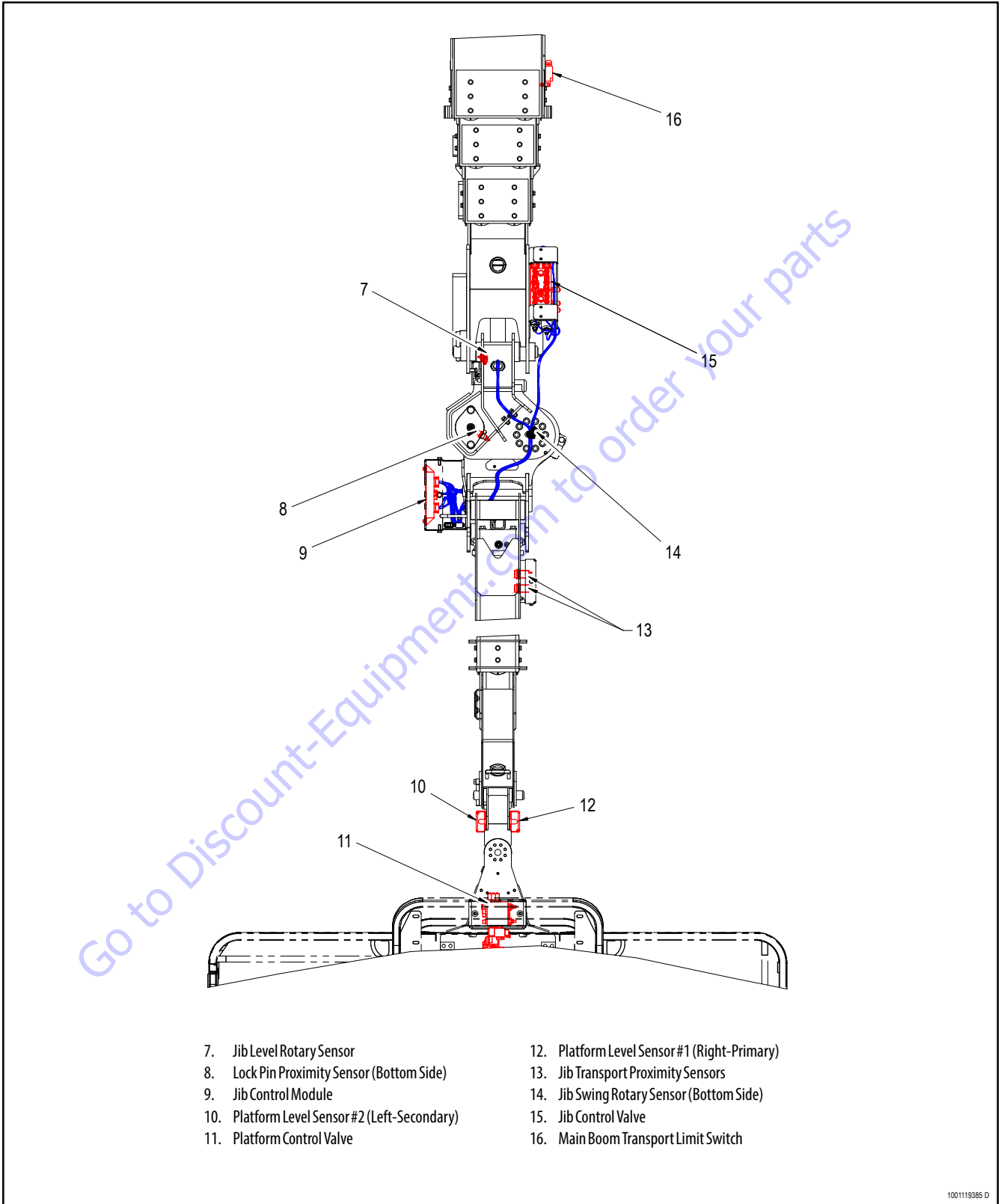


Figure 4-2. Boom Component Location - Sheet 2 of 2

Drive/Steer – Boom Function Interlock System (CE ONLY)

The Drive/Steer – Boom Function Interlock System uses the Transport Position Sensing System to sense when the boom and jib are out of the transport position. All controls are simultaneously functional when the booms are within the transport position as on the standard machine. When the boom/jib are beyond the transport position, the control functions are interlocked to prevent simultaneous operation of any boom function with drive/steer. The first function set to be operated in this mode, becomes the master function set. In other words, while operating drive/steer functions the boom functions are inoperable. Likewise, while operating boom functions drive/steer functions are inoperable.

Jib Stow System

The machines stowed length can be reduced to facilitate transportation on standard trailers by swinging the jib to the right using the hydraulic power of the jib stow rotator. The control system will prevent swinging the jib unless the axles are retracted, the boom and jib are in the transport position. If the transport criteria are met and the operator commands jib swing right via the jib swing function switch. The control system will retract the jib lock pin and begin to swing the jib into the stowed position. When the jib is stowed, automatic platform leveling is disabled, the boom is restricted to the transport position, and axle extension is disabled. This system is functional only in the 500# mode of the Dual Capacity System. Jib telescope function will resume when the jib is fully stowed along side the main boom. Conversely, the jib must be retracted into the transport position before the jib is allowed to swing left into the locked position. Once the jib reaches the in-line position, and the operator is maintaining the jib swing left function switch the control system will attempt to lock the jib lock pin. If successful, the jib lock pin lamp will illuminate continuously after the operator releases jib swing function switch.

Envelope Tracking System

The Envelope Tracking System uses the envelope control sensors to enhance the control of the boom within the working envelope. Due to the shape of the working envelope, the maximum boom angle varies with telescope length. To maintain unrestricted operation of the boom, the lift down function is automatically introduced while telescoping in only when the boom is on the rearward edge of the envelope. This only occurs when telescoping in along the rearward edge and is not used elsewhere within the envelope or when telescoping out. Envelope tracking is disabled with any envelope or moment violations or failures. The envelope tracking functionality and be turned off using the manual position of the boom control select switch.

Moment Control System

The Moment Control System is the secondary means of controlling the stability of the machine. This system uses a load cell pin to attach the lift cylinder of the main boom to the turntable. This pin is instrumented with gauges allowing the forces in the pin to be monitored. These forces are used to compare the actual boom moment (force at a distance) to a predetermined allowable boom moment. In controlling the boom moment, the position and load of the boom is controlled. The moment control system will detect moments larger than expected as well as those smaller than expected. This effectively controls the forward and rearward positions of the boom. The moment control system varies the maximum allowable moment based on ground slope. On level ground and with rated load in the platform, the allowable moments establish a working envelope slightly larger than the Envelope Control System's envelope to minimize interaction of the systems. With increasing ground slopes and rated load in the platform, the allowable moments may establish a working envelope smaller than the Envelope Control System's envelope and may result in moment violations at the extreme platform positions. Violations of the moment control systems allowable moment will result in reduced function speeds, BCS warning light illumination, and restriction of functions. The platform alarm will sound and the BCS light will flash with attempts to operate restricted functions. The restricted functions due to moment system violations related to forward reach are disallowing jib functions, lift down, telescope out, swing, drive and steer. The restricted functions due to moment system violations related to backward reach are disallowing jib functions, lift up, telescope in, swing, drive and steer. Recognized failures within this system will result in control by the Envelope Control System, reduced function speeds, BCS warning light illumination. The boom will be restricted from leaving the transport position until the failure is resolved.

Boom Control System (BCS) Functional Check (Push to Test) System

The machine is equipped with a system for the operator to daily verify the proper functioning of the Boom Control System (Envelope Control System and the Moment Control System). The operator is instructed to position the boom in the position described by the instruction decal and to then verify the control system cut out the main telescope movement at the correct length. When the operator pushes the push button mounted on the ground control panel, the control system compares the current moment reading in the moment system to the moment expected for this position. If the current moment is within allowable tolerance for the test position, the green BCS indicator will illuminate indicating the system is working properly. If the current moment is not within the allowable tolerance for the test position, the red BCS indicator will illuminate indicating the machine requires service by JLG authorized service personnel before the system is used. Failure of this test will not restrict the functionality of the machine and will not cause a system fault. It is the operators responsibility to take proper action. The machine can be in either capacity mode of the dual capacity system for this system check.

4.2 BOOM/JIB SYSTEM FUNCTIONALITY

Main Lift/Jib Velocity Control

To improve the control of the main boom, platform leveling, and main lift/jib functions' end of stroke dampening, the following angle sensors are utilized:



- Jib lift cylinder angle - CAN based in-cylinder length sensor.
- Platform level cylinder angle - CAN based in-cylinder length sensor.
- Jib level angle - Dual output analog angle sensor whose signal is processed by the Jib Control Module.
- Jib rotate angle - Dual output analog angle sensor whose signal is processed by the Jib Control Module.
- Main boom cylinder angle - Dual output analog angle sensor (to be processed by the BLAM)

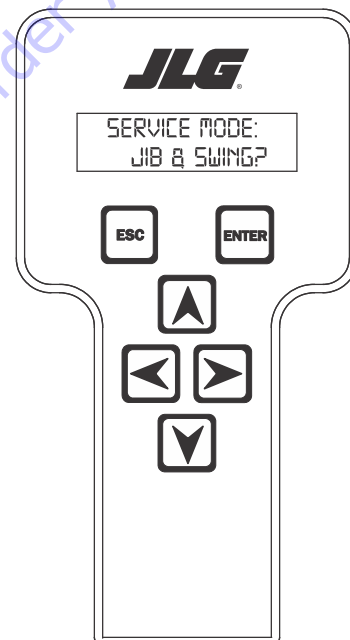
Jib Leveling During Automatic/Manual Envelope Control

There are no function switches in the platform or ground controls to manually adjust the jib level function. During automatic or manual main lift control, jib level maintains its angle in relation to the main boom position.

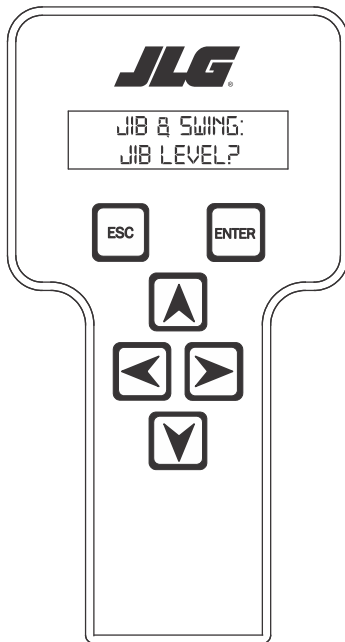
Jib Level Up/Down can be manually overridden using the analyzer. The control system only allows this under certain conditions and it should only be performed by an authorized JLG service technician. When accessed, jib level can be adjusted using the Jib Lift Up/Down function switch.

Jib Level override is accessible in Access Level 1. Using the Left

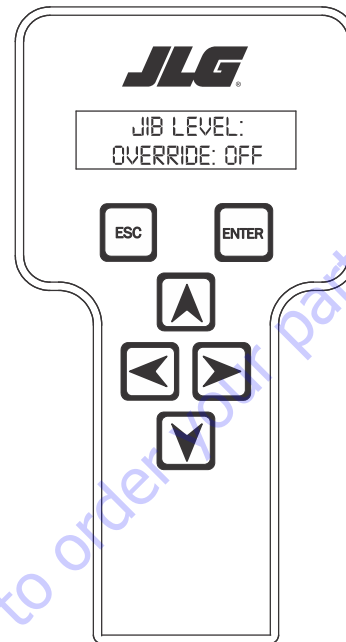
 and Right  arrow keys until the screen shown below is reached.



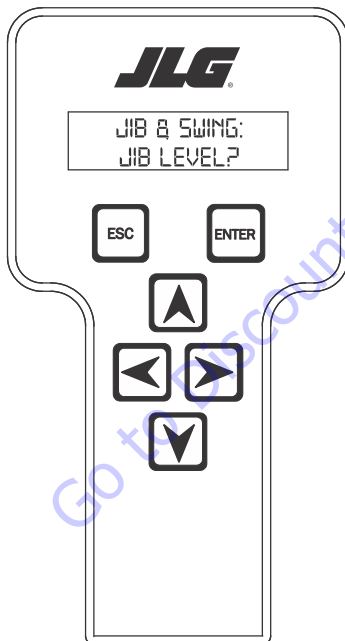
Press ENTER , the screen should read:





Press ENTER , the screen should read:



To enable the level override mode 58237 must be entered as the code. When the code is entered, the screen will show:




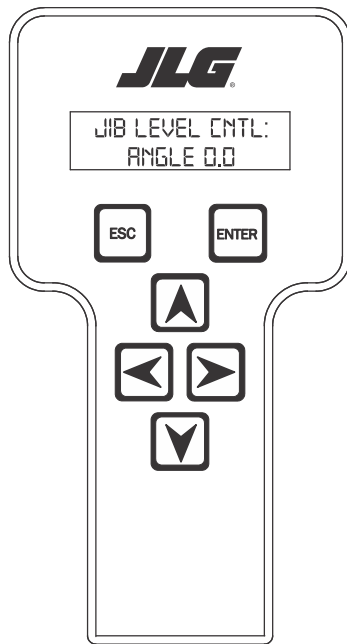
Using the UP  and DOWN  arrow keys will toggle the override from off to on. Once turned on, operating the jib lift function will cause jib level to be activated.

NOTE: Using this override may set the JIB LEVELING SYSTEM FAULT depending on how far out of level the jib is moved. (See Jib Leveling section)

Escaping out of this override will not turn it off, reset is achieved by cycling power to the machine or re-entering the override code and manually turning it off.

Attempts to lift the main boom while this override is on will result in a JIB LEVELING SYSTEM FAULT because during the override automatic jib leveling is disabled. To adjust the jib back to level go into override mode for the jib leveling. Turn it on, escape out of the Service Modes menu, and go to DIAG-

NOSTICS/BOOM SENSORS menu. Use the RIGHT  arrow key go until you get to the following screen.



Adjust the jib level using the jib lift up and down function switch until the jib level control angle reads zero. Cycle power and operate the main boom to verify that jib level is working.

Jib Lift Functionality

The ground module controls the jib control valve using an output on the ground. Simultaneous main lift and jib lift function is not possible. The first function activated will have priority over the other. Manual override of the platform leveling function will be allowed during all functions. If there is a failure in which the jib functions cannot be controlled from the Jib Control Module, the ground module will control the jib control valve and also override the jib lift up and down valve with outputs out of the ground module.

Jib Telescope Functionality

Jib Telescope out will only be allowed if the axles are extended, and the capacity control is in the 500# mode and the jib is locked inline with the main boom, or if the machine is in the stowed state.

Jib Swing Functionality

The jib swing function is only used to stow the jib for transport, and taking the jib out of the stowed position for use. This function is only permitted when the main boom is in the transport state.

Jib Swing Stow Sequence (Jib Pin Unlock)

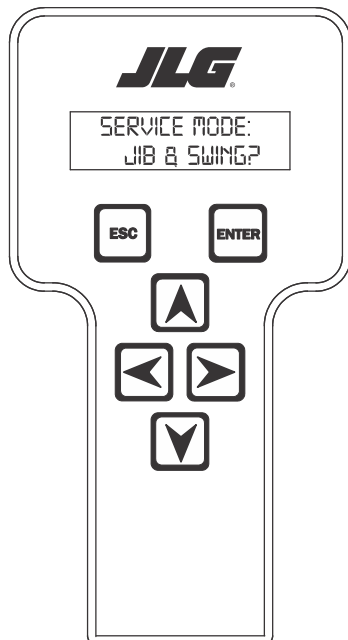
If the machine is in the transport mode and the operator attempts jib swing right, the control system attempts to unlock the jib lock pin. If successful, (determined by the jib lock pin proximity sensor) the control system continues to command the jib lock pin unlock output on and control the jib swing right function until the operator releases the jib swing function, or the jib reaches the jib stowed position. Once the operator releases the jib swing function the control system shall command the jib lock pin unlock output to off. If the jib lock pin does not unlock, the control system continues to try to unlock the jib pin when the operator commands a jib swing right function. The control system allows jib swing left to jog the jib in the instance the pin is pinched by the jib structure.

Jib Lock Pin control can be manually overridden using the analyzer. The control system only allows this under certain conditions and it should only be performed by an authorized JLG service technician. When accessed, the jib lock pin can be manually extended or retracted. To use this service mode the technician must be in platform and in platform mode because the footswitch is required to activate the jib lock pin.

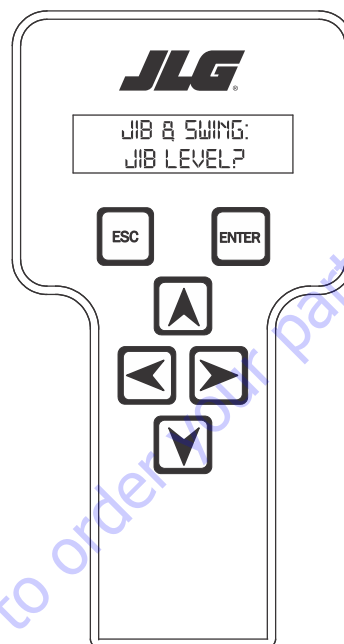
SECTION 4 - BOOM & PLATFORM

Jib Lock Pin override is accessible in Access Level 1. Using the

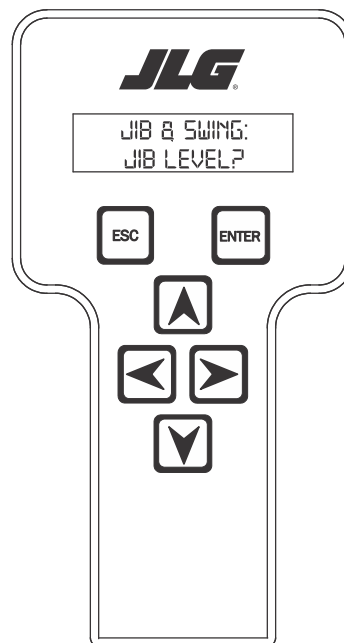
Left  and Right  arrow keys until the screen shown below is reached.



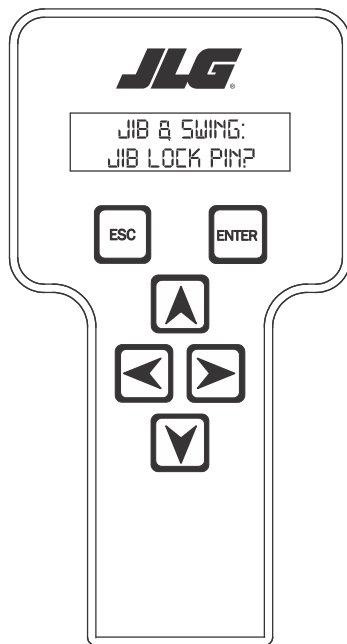
Press ENTER , the screen should read:



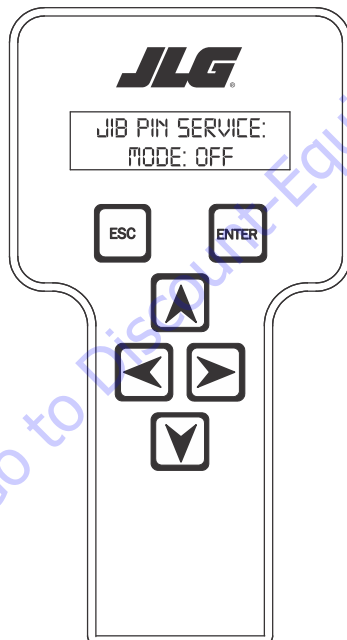
To enable the override mode 58237 must be entered as the code. When the code is entered, the screen will show:



Use the Left  or Right  arrow key until you see:



Press ENTER , the screen should read:



Using the Up  and Down  arrow keys will allow the following modes:

- OFF
- EXTEND
- RETRACT

Once the desired mode is selected, stepping into the foot-switch with the machine running will perform extension or retraction of the jib lock pin. Reset or turning it off is achieved by escaping out of the service mode, by cycling power to the machine, or re-entering the service mode and manually turning it off. When the service mode is used to retract the jib lock pin for servicing, attempts to lift or telescope out of transport will result in a JIB UNLOCKED OUT OF TRANSPORT – HYDRAULICS SUSPENDED fault and the boom will be trapped into transport.

Jib Swing Deploy Sequence (Jib Pin Lock)

If the machine is in the stowed state and the operator attempts to swing the jib left, the control system will first check the position of the jib telescope. If the jib is in the transport position, the control system will unlock the jib lock pin and jib swing left until the jib is in line with the main boom (determined by the jib swing angle sensor). If the jib is in line the control system will attempt to lock the jib lock pin. If the attempt fails, the control system will allow the operator to jib swing right or left.

Jib Lock Pin Lamp Operation

On machine power-up the control system will energize the lamp based on the current state of the jib lock pin as determined by the jib lock proximity sensor. While attempting to stow or deploy the jib, the control system shall flash the jib lock pin lamp while the operator is activating the jib swing function switch. If the jib lock pin is in the locked position the lamp will be energized. If the jib lock pin is in the unlocked position the lamp will be de-energized. If the jib lock pin is in a fault state (i.e. the jib is deployed and the jib lock pin is unlocked) or the jib is in the stowed state and the jib lock pin is in the locked state, attempts of disallowed functions results in the jib lock pin lamp being flashed.

NOTE: Attempts to move the boom out of transport when the pin is unlocked will be disallowed and a fault code will be registered.

Swing/Axle Extend Retract Restrictions

In addition to the Direction Of Steer proximity switch in the chassis, a 360 degree dual rotary sensor is also used to calculate the turntable rotation angle. These sensors are used together to restrict swing when the machine is in the transport state. If the machine is in the transport state and the operator is attempting to swing the boom, the control system shall allow swing until the angle is at approx. +/- 40 Degrees from the transport position or the DOS proximity switch is tripped. At this point the control system will use the turntable rotary angle sensor to determine which swing function is allowed to return the boom between the rear wheels. Attempts to continue swinging in the wrong direction causes the DOS indicator light to flash. If the machine is in the transport state with the exception of the axles being extended and the operator has the boom outside of the rear wheels, the control system disallows axle retract until the boom is again within the rear wheels. Faults within this system override DOS functionality.

Dual Capacity

The position of the jib telescope is integrated into the dual capacity logic and the logic relating to the jib swing control and dual capacity will be removed since the jib is restricted from swinging in all cases except when the machine is in the transport state. In order to switch from the 500# capacity mode to 1000# capacity mode the jib will have to be fully retracted, (determined by the two proximity switches mounted on the side of the jib) and the operating envelope will have to be in the 1000# envelope in order to switch capacity modes. The jib transport/dual capacity proximity sensors are mounted in line so one should switch before the other. The control system monitors the proximity sensors changing state in relation to jib telescope in versus jib telescope out.

Jib Control During Over/Under Moment

During an overmoment condition the control system limits the jib functions to jib telescope in only. During an undermoment condition the control system disables all jib functions.

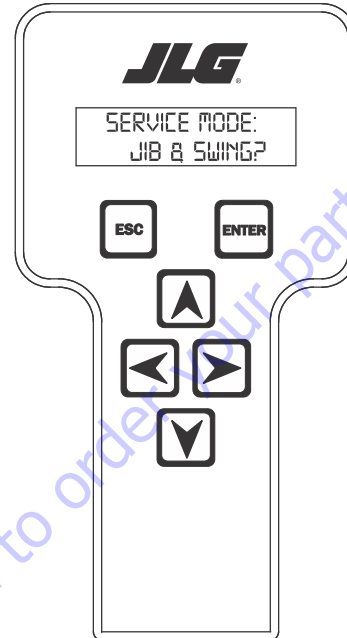
Boom Recovery Mode


Boom Recovery Mode allows the boom to be lifted down and telescoped in, in the event CAN bus communication is lost to both the Jib Control Module and the Platform Module.

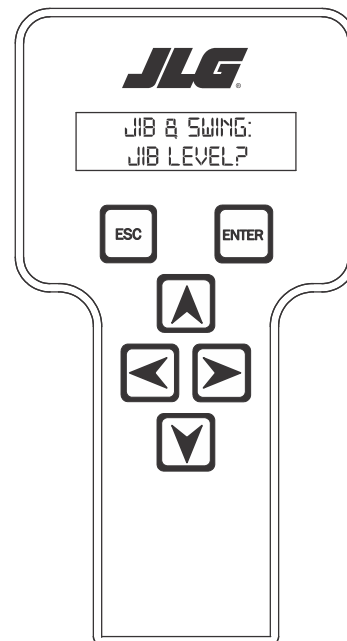
Boom Recovery Override is only available in the event the ground module loses CAN communication with both the Jib Control Module and the Platform module, in the case of a severed boom cable for example. This mode allows the boom to be lifted down and telescoped in.

Boom Recovery override is accessible in Access Level 1. Using

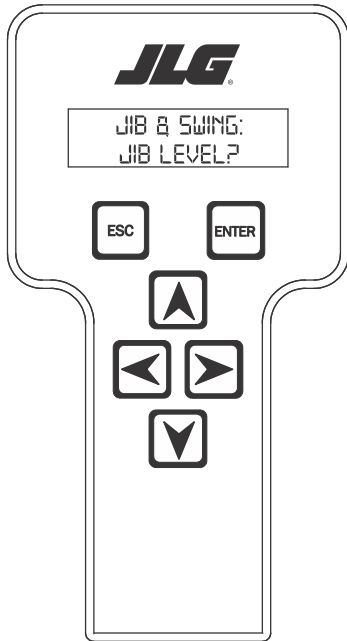
the Left  and Right  arrow keys until the screen shown below is reached.







Press ENTER , the screen should read:

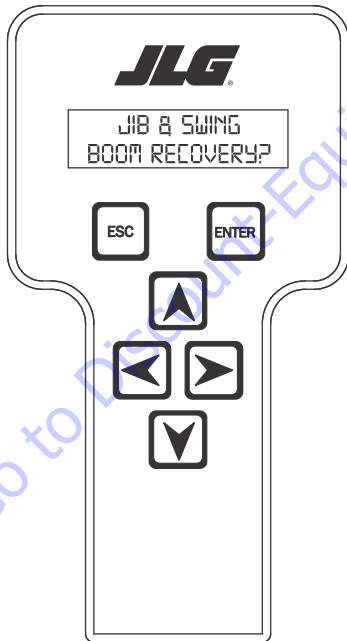


To enable the override mode 58237 must be entered as the code. When the code is entered, the screen will show:



Press Enter . Once Enter  is pressed using the Up  or Down  arrow key will turn the boom recovery on or off. Once turned on, main boom lift down will be enabled and main telescope in will be enabled to recover the boom. After the boom is brought down it will be trapped into transport. Reset or turning it off is achieved by escaping out of the service mode, by cycling power to the machine, or re-entering the service mode and manually turning it off.

Use the Left  or Right  arrow key until you see:



4.3 PLATFORM

Platform/Support Removal

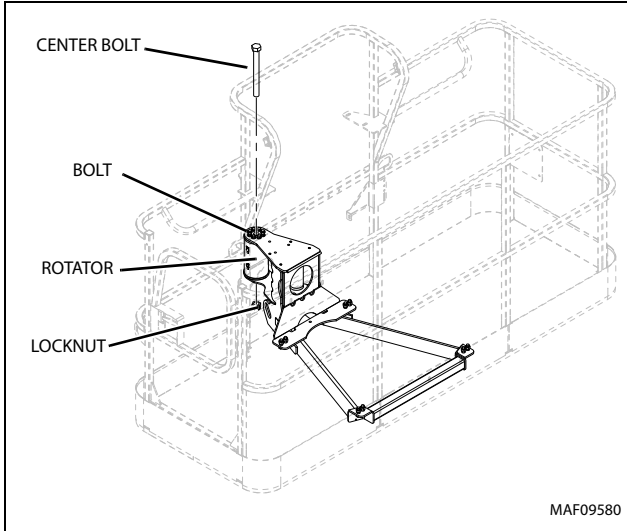
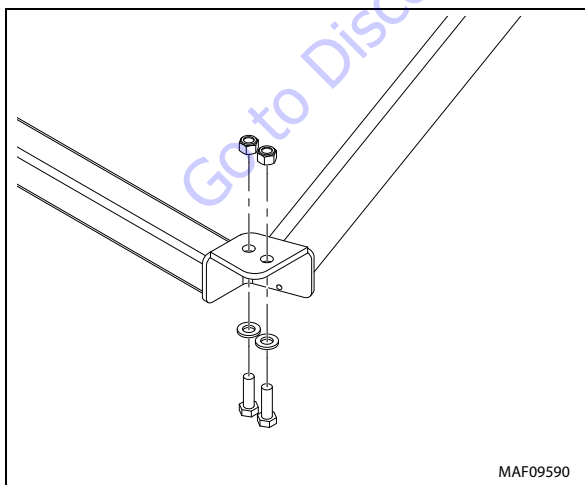
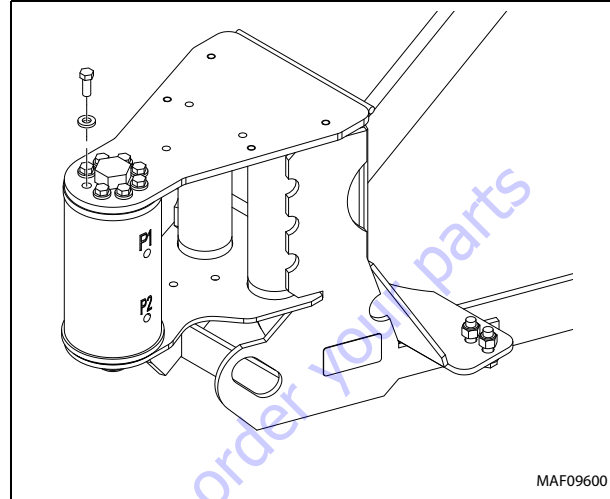


Figure 4-3. Location of Components

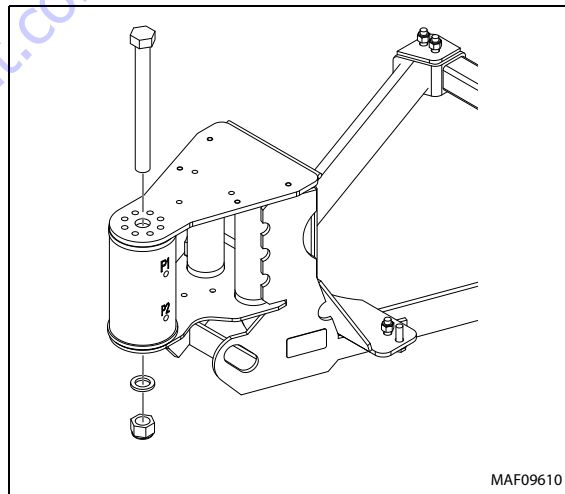
1. Disconnect electrical cable from platform control console.
2. Tag and disconnect the hydraulic lines from the rotator. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.
3. Remove the bolts securing the platform to the platform support, then remove the platform.
4. Remove the bolts securing the platform to the platform support, then remove the platform.



5. Using a suitable device, support the platform support.
6. Remove the bolts and locknuts securing the support to the rotator.



7. Using a suitable brass drift and hammer, remove the center bolt and locknut.



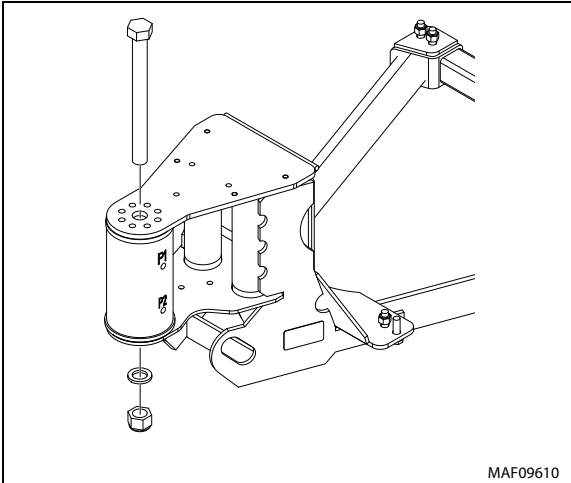
NOTE: The platform support weighs approximately 125 lbs. (56.8 kg).

Platform/Support Installation

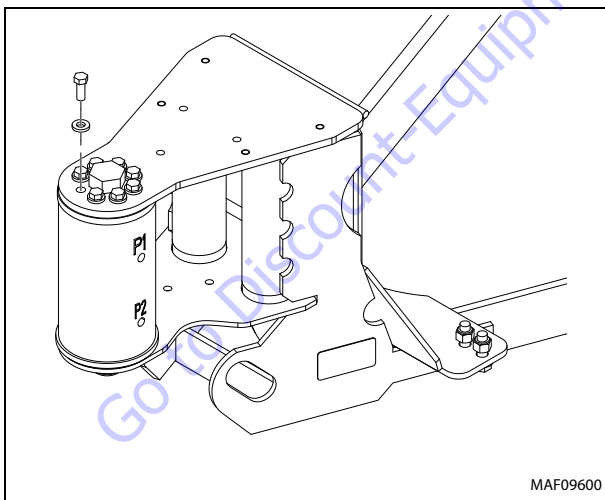
1. Using a suitable lifting device, support the platform support and position it on the rotator.

NOTE: The platform support weighs approximately 125 lbs. (56.8 kg).

2. Install the rotator center bolt and locknut.

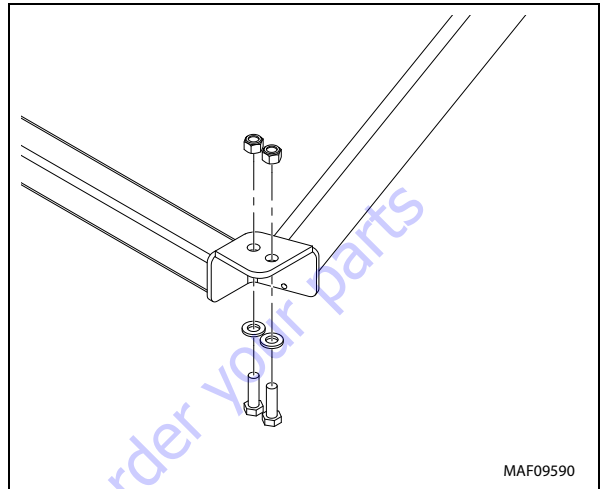


3. Apply JLG Threadlocker PN 0100011 to the eight bolts securing the support to the rotator and install the bolts.



4. Torque the nut on the rotator center bolt and the retaining bolts. See Figure 4-2. and Figure 4-3.

5. Position the platform on the platform support and install the bolts securing the platform to the platform support. See Figure 4-2. and Figure 4-3.



6. Connect the electrical cable to the platform control console.
7. Remove tag and uncap the hydraulic lines and ports.
8. Connect the hydraulic lines to the rotator.

4.4 ROTATOR

Removal

1. Remove the Platform and Platform Support. Refer to Section 4.3 - Platform.
2. Tag and disconnect hydraulic lines from rotator. Use suitable container to retain any residual hydraulic fluid. Cap or plug all openings of hydraulic lines and ports.

NOTE: The rotator approximately weighs 230 lbs. (104 kg).

3. Supporting the rotator and jib lift cylinder, remove hardware from pin (1). Using a suitable brass drift and hammer remove pin (1).
4. Remove the hardware from pin (2). Using a suitable brass drift and hammer, remove pin (2) and remove the rotator.

Installation

NOTE: The rotator approximately weighs 230 lbs. (104 kg).

1. Supporting the rotator and jib lift cylinder, align rotator with jib lift cylinder and jib. Using a suitable brass drift and hammer install pin (1) to the jib assembly. Install hardware securing pin (1).
2. Using a soft head mallet install pin (2) to jib assembly and install the rotator. Install hardware securing pin (2).
3. Install the platform and platform support. Refer to Section 4.3 - Platform.
4. Remove cap or plugs from openings of hydraulic lines and ports and connect hydraulic lines to the rotator as tagged during removal.

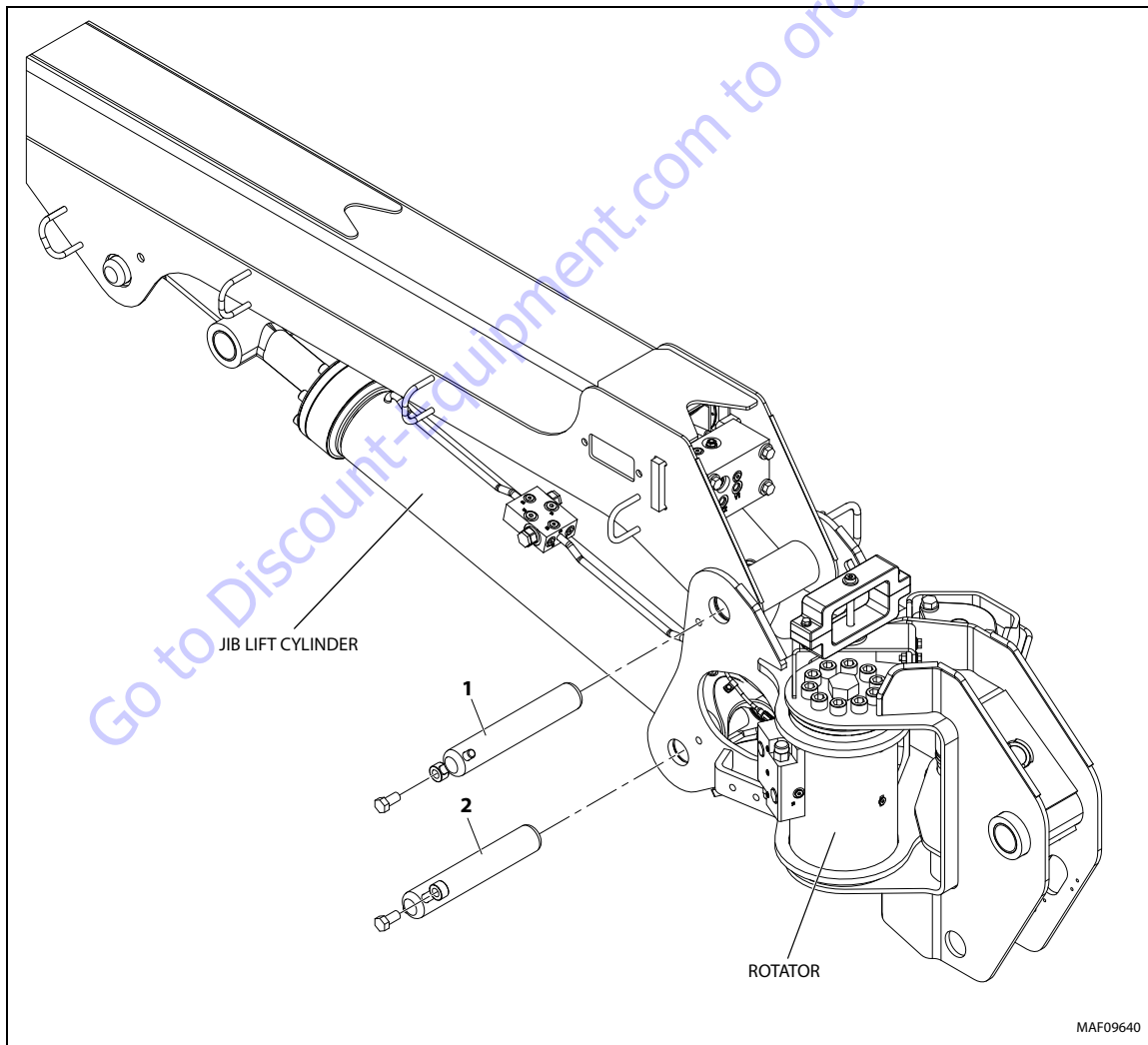
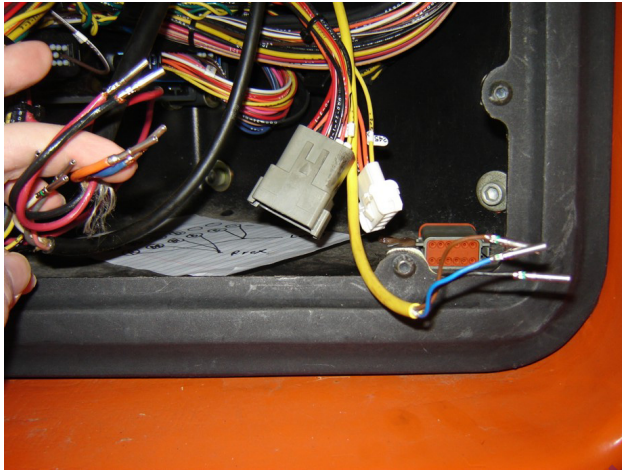


Figure 4-4. Rotator Removal/Installation

4.5 BOOM REMOVAL AND INSTALLATION

Removal

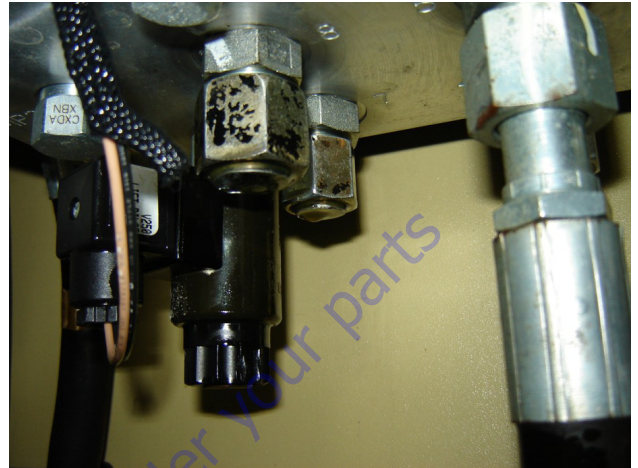
1. Remove the Jib Assembly. Refer to Section 4.8 - Jib.
2. At the rear of the turntable, tag and disconnect all wiring harnesses that run from the powertrack to the ground control station. The connector inside the ground control box will have to be removed from the wires to allow the harness to be pulled out of the control box.



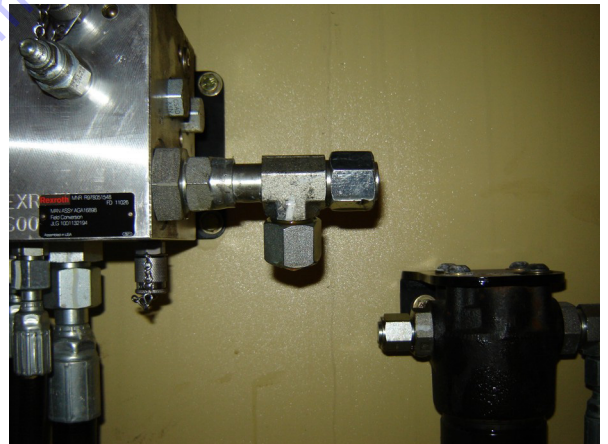
3. Have a container or absorption material ready to catch residual hydraulic fluid. Disconnect the pressure line going into the platform filter, taking care to slowly bleed off hydraulic pressure. Cap or plug all openings.



4. Disconnect the telescope hoses from the bottom of the hydraulic control valve. Pull the hoses out so that can be lifted away from the machine with the boom.



5. Have a container or absorption material ready to catch residual hydraulic fluid. Disconnect the pressure hose from the end of the main control valve. Cap or plug all openings.



SECTION 4 - BOOM & PLATFORM

6. Remove the cover from the rear of the boom and disconnect the wiring harnesses and hoses running from the turntable to the boom.



7. Disassemble the end of the turntable to boom powertrack from the turntable. Use a lifting device to pull the powertrack up so the hydraulic hoses and wiring harnesses can be pulled out from the turntable.



8. Using the Main Lift Crackpoint option under the Calibrations menu, lift the boom enough to access the boom lift cylinder rod pivot pin.



NOTE: The boom assembly weighs approximately 10,800 lbs. (4,900 kg.).

9. Using an adequate lifting device, support the weight of the boom.



10. Attach a lifting device to support the weight of the boom lift cylinder.



NOTE: To assist in determining when the lift cylinder is properly supported, use the JLG Analyzer and select Diagnostics > Moment > Actual Moment and get a reading as close to zero as possible.

11. Remove the bolt and keeper pin securing the boom lift cylinder rod pivot pin and drive out the pivot pin.



12. Lower the lift cylinder until it rests on the turntable.
13. Attach an adequate lifting device to support the rear of the boom.



14. Remove the bolt and keeper pin securing the boom pivot pin and remove the pivot pin. Remove the boom from the machine and place it on adequate supports.

Installation

1. Lift the boom from its supports.



SECTION 4 - BOOM & PLATFORM

2. While lifting the boom into position, begin to route the hoses into position so they can be inserted into the powertrack.



3. Line up the boom pivot fittings and install the boom pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt threads and secure the pin in place with the keeper pin and bolt. Torque the bolt to 285 ft.lbs. (388 Nm).



4. Raise the boom enough to gain access to the lift cylinder rod pivot fitting.



5. Attach a lifting device to the lift cylinder barrel. Lift the lift cylinder up to align the lift cylinder rod pivot fittings.



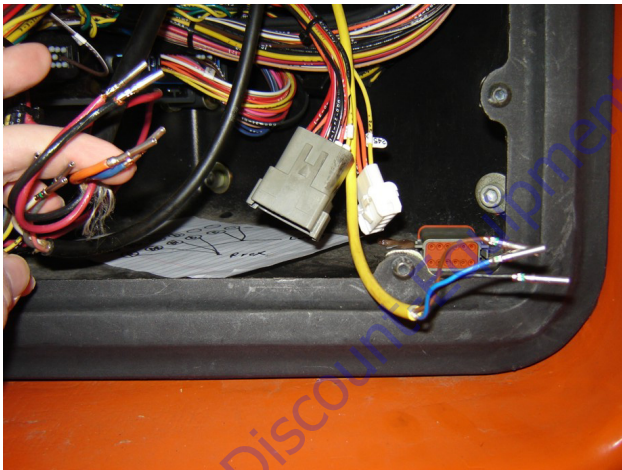
6. Install the lift cylinder rod pivot pin and secure it in place with the keeper pin and bolt.



7. Connect the hoses to the main valve and pressure filter as tagged during removal.



8. Reconnect the negative battery terminal.
9. Using auxiliary power, lower the boom to horizontal.
10. Connect all electrical harnesses as tagged during removal. Reinstall the wiring into the connector plug in the ground control box as tagged during removal.



11. Position the hoods in place on the turntable and secure in place with the mounting hardware.



12. Cycle test the machine and check for leakage and proper operation.
13. Perform a boom calibration as described in Section 6 under Calibrating the Boom Sensors.

4.6 BOOM DISASSEMBLY/ASSEMBLY & CABLE REPLACEMENT

It is not necessary to completely remove the entire boom assembly from the machine to replace the cables. In the following procedure, the base boom section will remain on the machine.

Disassembly

⚠ WARNING

NEVER HANDLE WIRE ROPE WITH BARE HANDS.

1. Position the boom so that it is horizontal. If the boom is below horizontal, ensure that the boom is not on the boom rest.
2. Use an appropriate lifting device to support the weight of the jib and platform assembly.
3. Tag and disconnect the hoses and electrical harnesses that run to the platform. Cap or plug all openings.
4. Pull the hoses and harnesses through the jib and lay them off to the side of the boom.
5. Remove the bolt and keeper pin securing the platform level pivot pin and remove the pin.



6. Remove the bolt and keeper pin securing the jib pivot pin and remove the pin.



7. Remove the jib and platform assembly from the boom.



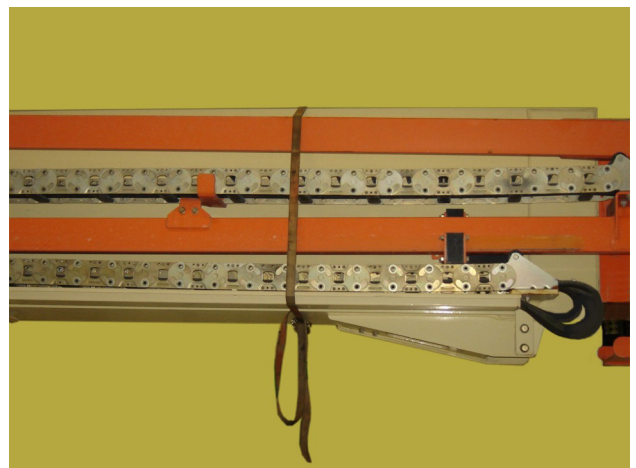
8. Attach a lifting device to the powertrack for support and remove the upper powertrack tube from the fly boom. Pull the disconnected tube back to allow boom to disconnect the lower tube.

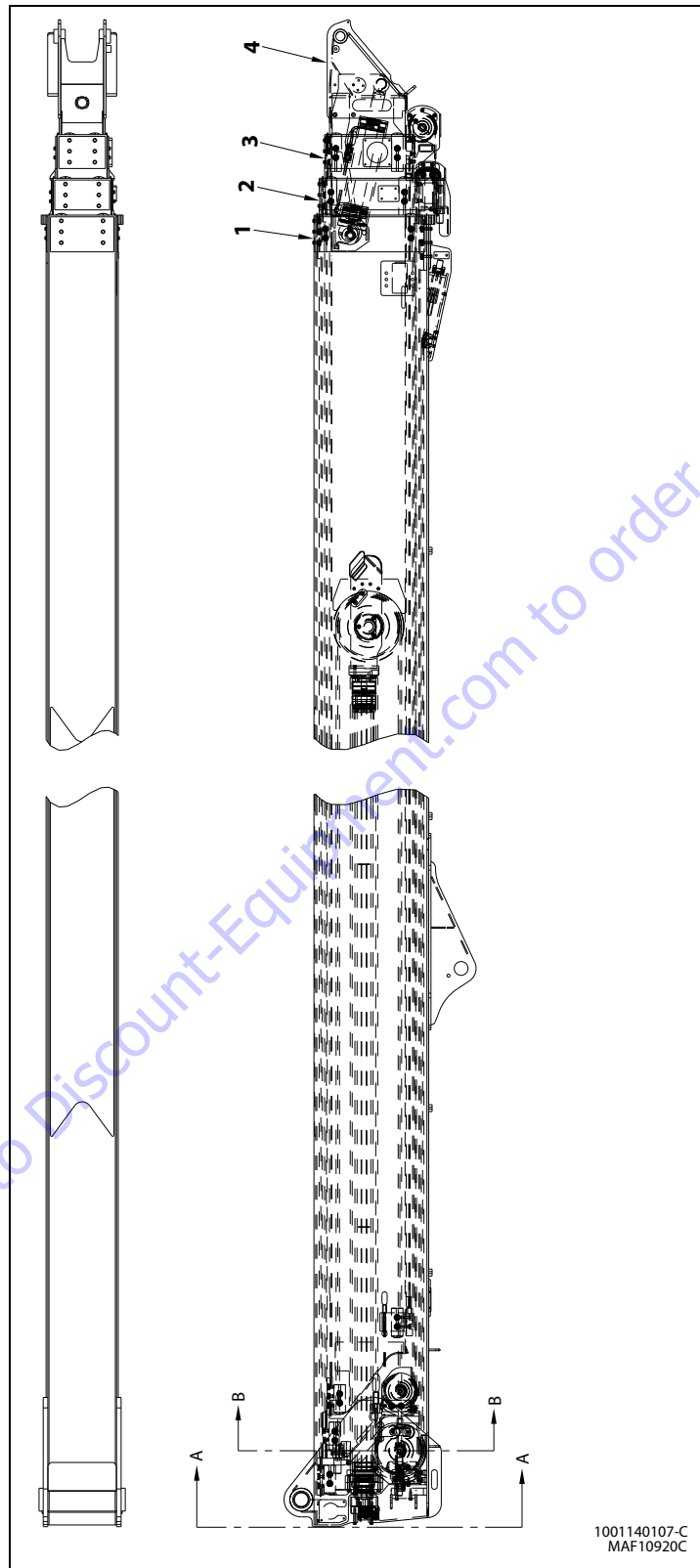


9. Remove the lower powertrack tube from the outer mid boom section and the mounting bracket from the inner mid boom section.



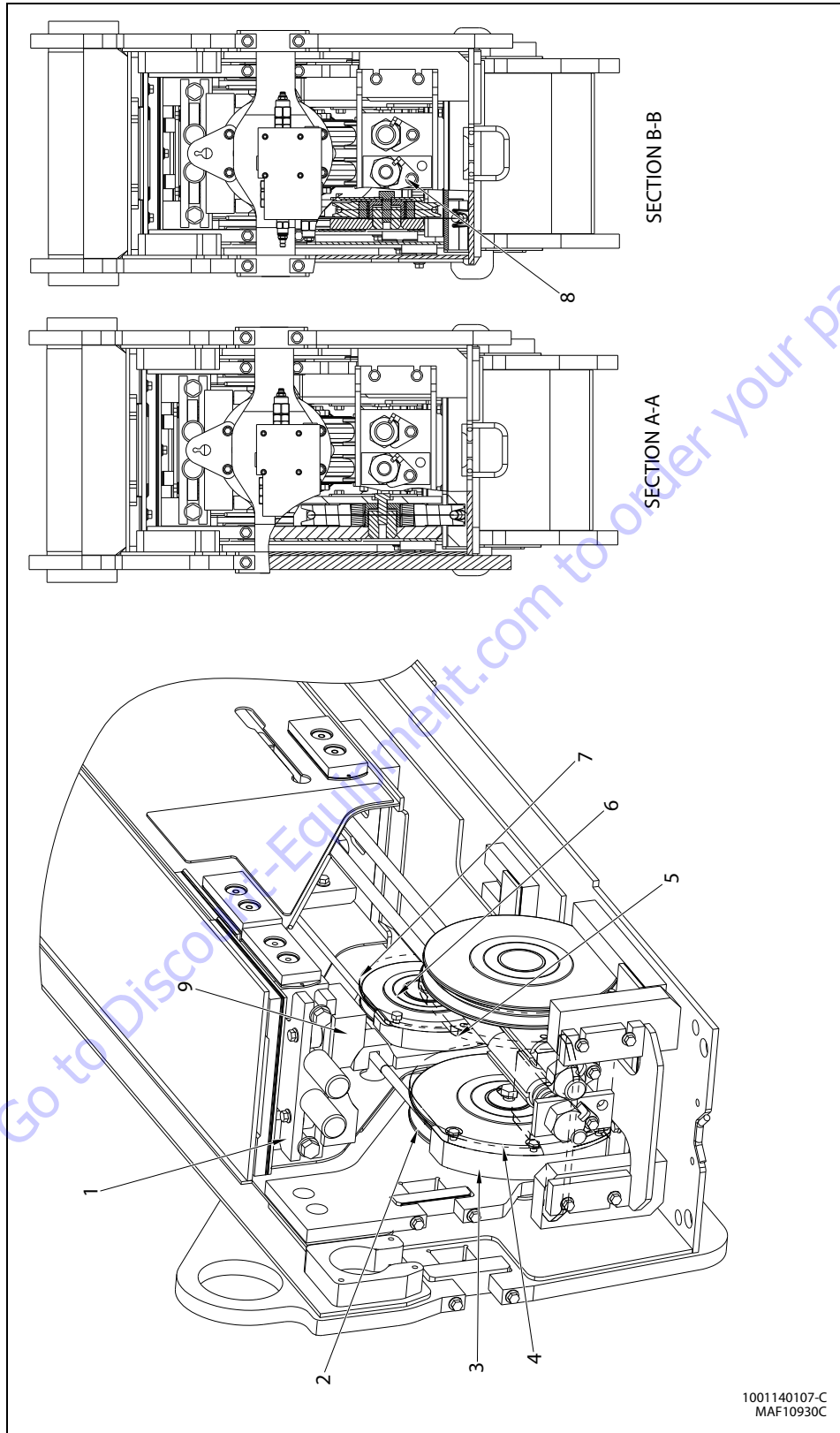
10. Attach a strap or other similar device around the powertrack and boom to keep the powertrack secure throughout the cable replacement procedure.





- 1. Boom Base
- 2. Boom Inner Mid
- 3. Boom Outer Mid
- 4. Boom Fly

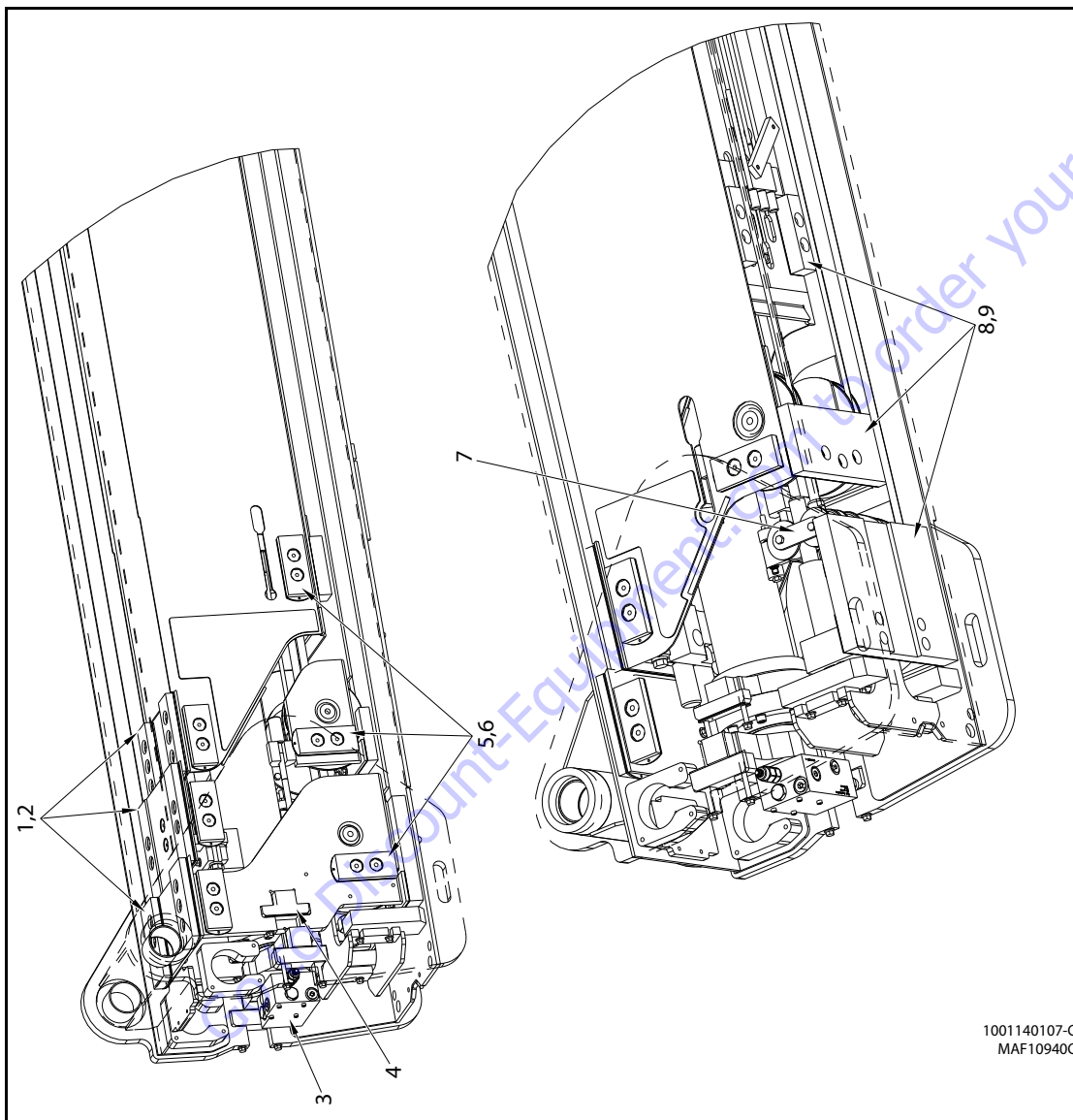
Figure 4-5. Boom Assembly - Sheet 1 of 7



- 1. Outer/Mid/Extend Block
- 2. Outer/Mid/Retract Sheave
- 3. Rope Retainer Block
- 4. Retract Rope Retainer Plate
- 5. Rope Retainer Block
- 6. Fly/Retract Sheave
- 7. Retract Rope Retainer Plate
- 8. Lock Plate
- 9. Tele Cylinder Wear Pads

Figure 4-6. Boom Assembly - Sheet 2 of 7

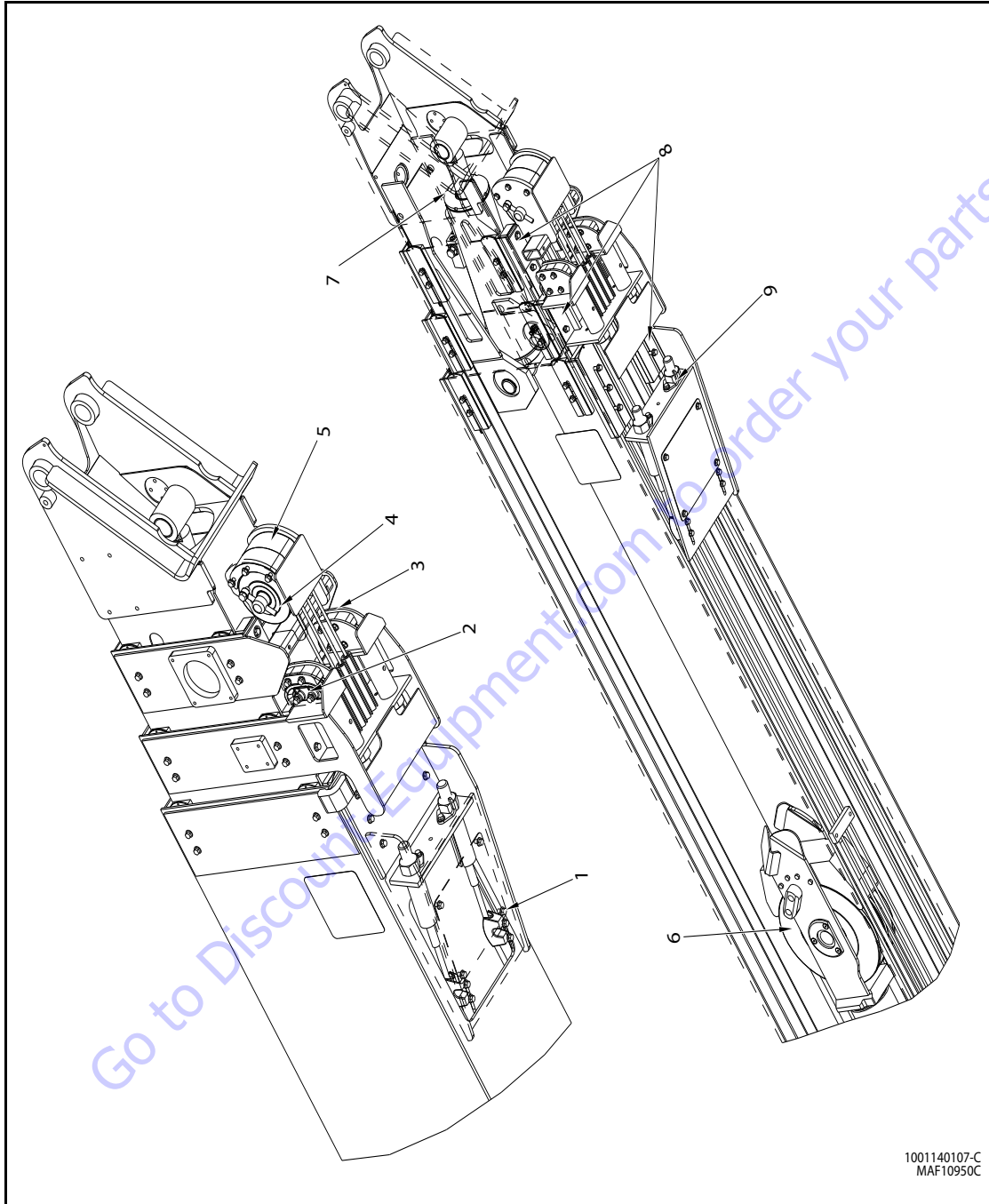
1001140107-C
MAF10930C



1001140107-C
MAF10940C

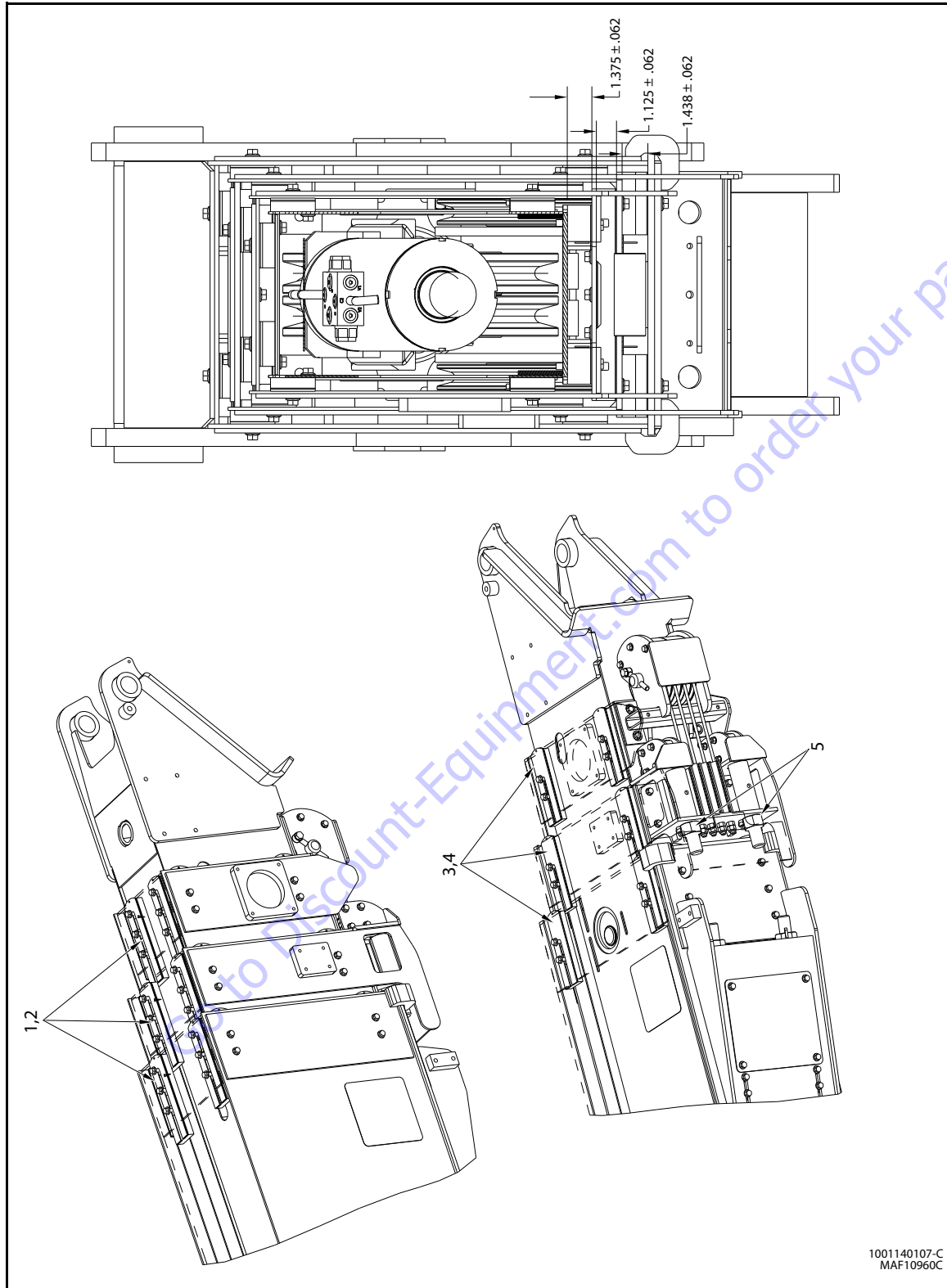
- | | | | |
|----|----------------------|----|-------------------------------|
| 1. | Upper Rear Wear Pad | 6. | Shim |
| 2. | Shim | 7. | Tele Cylinder Pulley Assembly |
| 3. | Telescope Cylinder | 8. | Bottom Rear Wear Pad |
| 4. | Trunion Keeper Block | 9. | Shim |
| 5. | Lower Rear Wear Pad | | |

Figure 4-7. Boom Assembly - Sheet 3 of 7



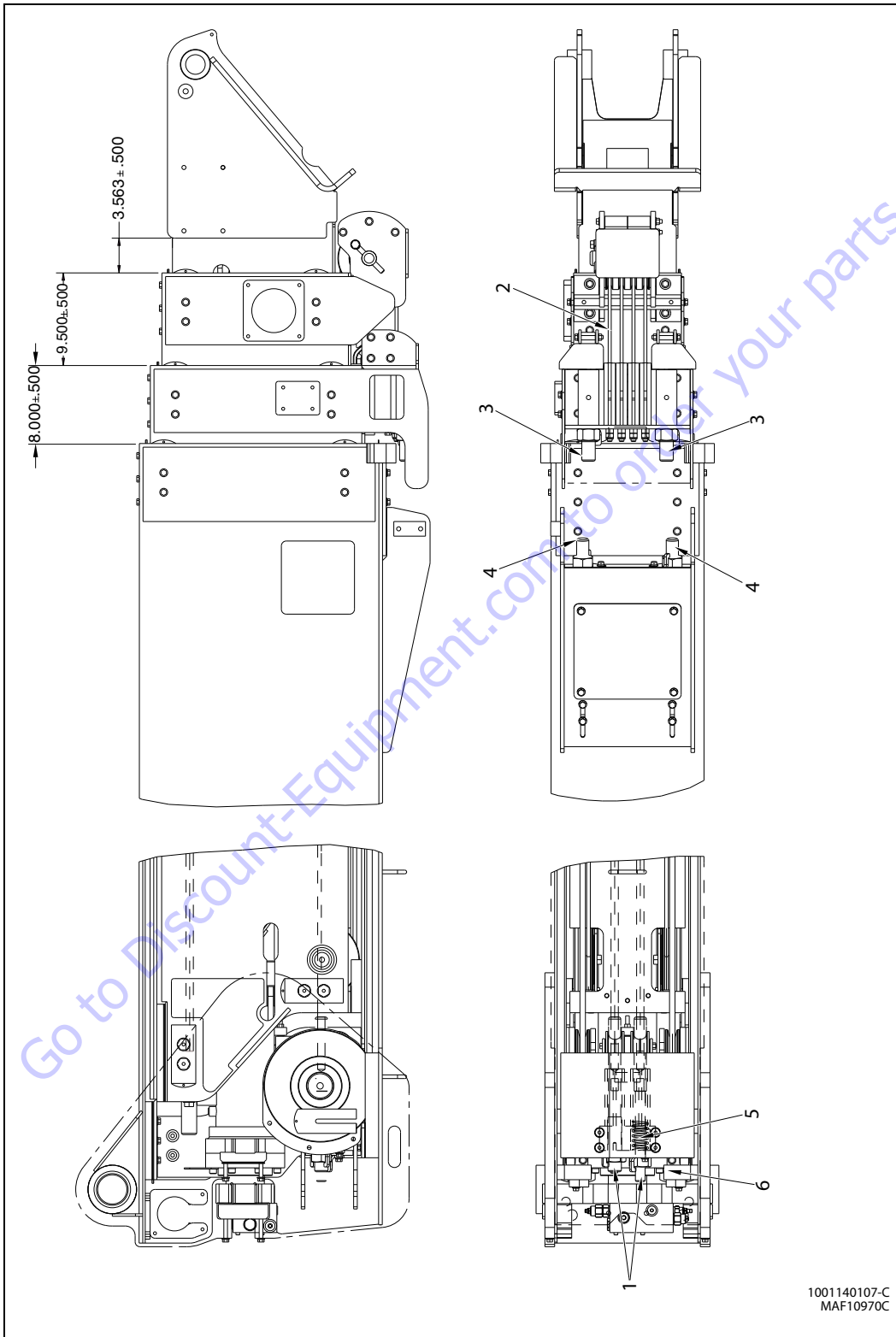
- | | |
|-------------------------|-------------------------|
| 1. Sheave Deflector | 6. Rope Retainer Block |
| 2. Sheave Deflector | 7. Level Cylinder |
| 3. Rope Retainer Block | 8. Front Lower Wear Pad |
| 4. Fly Extension Sheave | 9. Lock Plate |
| 5. Rope Retainer Block | |

Figure 4-8. Boom Assembly - Sheet 4 of 7



- 1. Front Upper Wear Pad
- 2. Shim
- 3. Front Side Wear Pad
- 4. Shim
- 5. Lock Plate

Figure 4-9. Boom Assembly - Sheet 5 of 7



1001140107-C
MAF10970C

- | | |
|--------------------------|----------------------------|
| 1. Outer/Mid Extend Rope | 4. Outer Mid Retract Rope |
| 2. Fly Extend Rope | 5. Proximity Switch Spring |
| 3. Fly Retract Rope | 6. Switch Adjustment Block |

Figure 4-10. Boom Assembly - Sheet 6 of 7

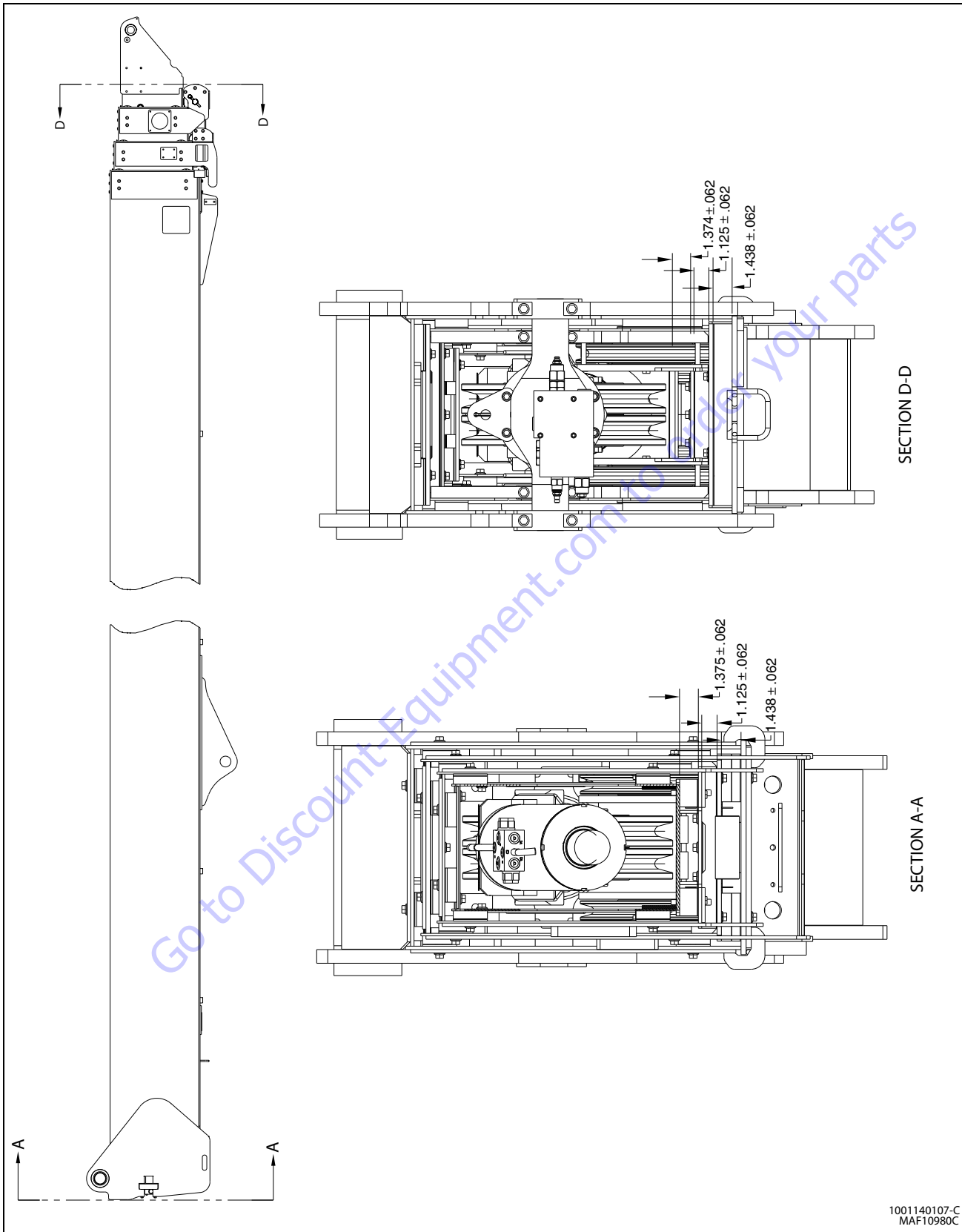


Figure 4-11. Boom Assembly - Sheet 7 of 7

- 11.** Remove the bolts securing the side wear pads to the front of the base boom and remove the pads and shims.



- 12.** Remove the boom length plate.



- 13.** Remove the cover over the boom length limit switch at the front of the boom base section. Remove the switch.



- 14.** Remove the rear boom cover.



SECTION 4 - BOOM & PLATFORM

15. Tag and disconnect the wiring harness running to the boom length sensor. Remove all the bolts and washers securing the sensor, including those that secure the measuring cable to the telescope cylinder, and remove the length sensor.



16. Tag and disconnect the hydraulic hoses from the telescope cylinder. Cap or plug all openings.



17. Remove the front side, top, and lower wear pads from the boom base section.

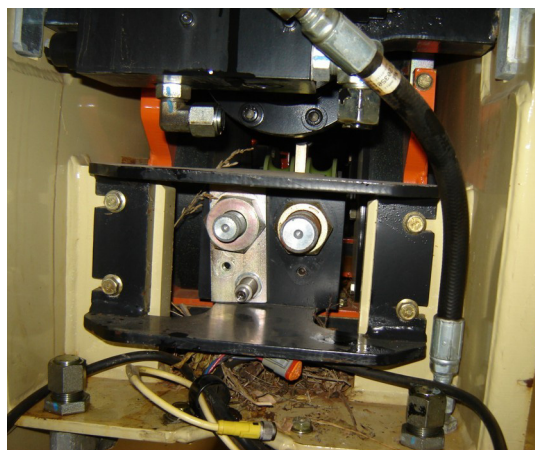
18. Remove the keepers for the outer mid retract cable adjustment nuts at the front of the boom base section.



19. Loosen and remove the outer mid retract cable adjustment nuts.



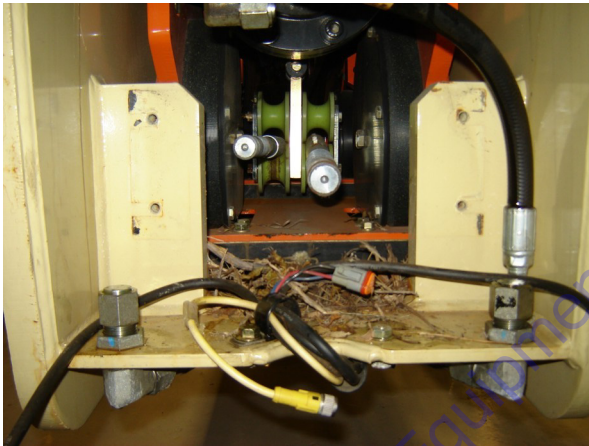
20. Remove the adjustment bolt keepers for the outer mid extend cable adjustment nuts at the rear of the boom.



- 21.** Remove the adjustment nuts for the for the outer mid extend cables along with the Broken Cable proximity switch, spring, and adjustment plate.



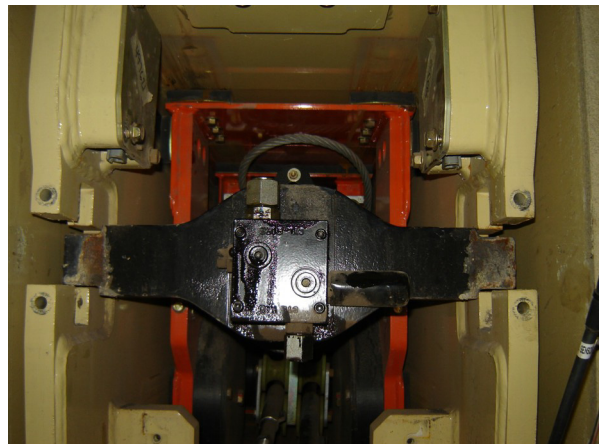
- 22.** Remove the cable mounting plate.



- 23.** Remove the cover plate from the bottom of the boom and remove the sheave blocks.



- 24.** Remove the trunnion blocks that secure the telescope cylinder rod to the boom base section.



SECTION 4 - BOOM & PLATFORM

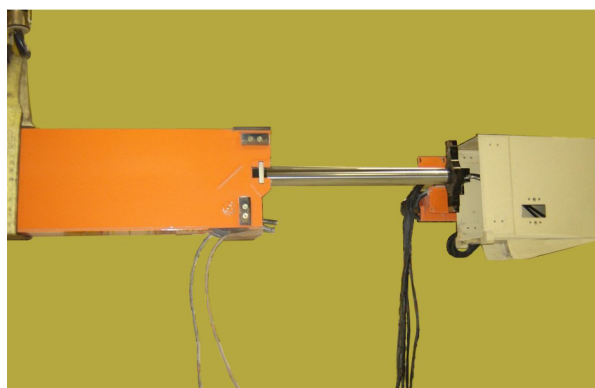
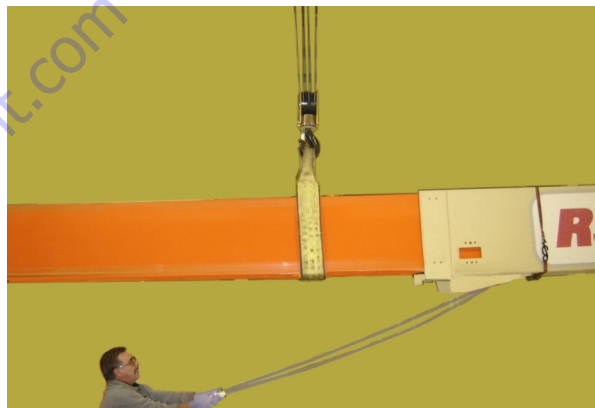
25. Remove the outer mid retract cables from the attachment fixtures at the front of the boom base section.



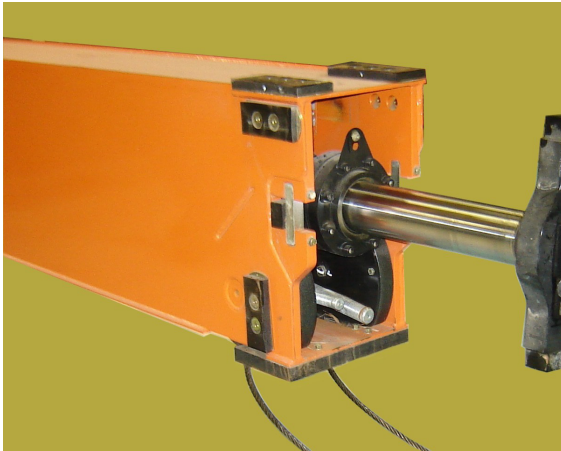
26. Attach an auxiliary hydraulic power source to the telescope cylinder and extend the cylinder rod enough to turn the trunnion in a vertical position.



27. Pull the inner mid, outer mid, and fly boom sections out of the base boom section. Use additional lifting devices and reposition any lifting straps as necessary as the sections are withdrawn. It will be helpful during this step to pull the outer mid retract cable out from the front of the base section as the other sections are being pulled out. This will prevent the cables from tangling as the sections are withdrawn.



28. Remove the trunnion blocks that secure the telescope cylinder barrel to the inner mid boom section.



29. Attach a lifting device to the telescope cylinder and pull the cylinder, along with the outer mid extend cables out of the inner mid boom section. Reposition the lifting device as necessary to balance the cylinder.



30. Remove the hardware attaching the outer mid extend block and remove the block and outer mid extend cables.



31. Remove the cable retainer plate, cable retainer block, bushing, and sheave.



SECTION 4 - BOOM & PLATFORM

32. Remove the rear bottom wear pad.



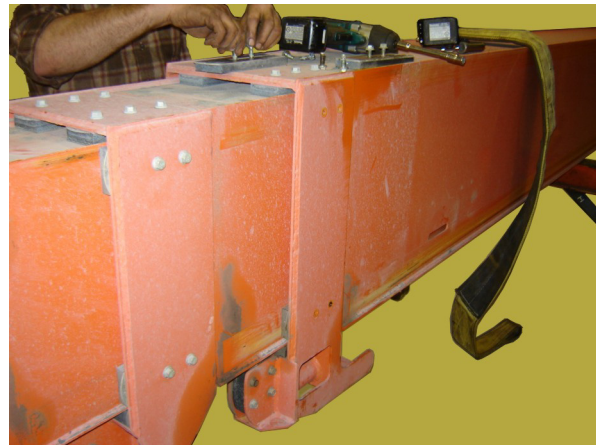
33. Remove the lock plates from the fly boom retract cable adjustment nuts and remove the adjustment nuts from the fly boom retract cables and from the fly boom extend cables at the front of the inner mid boom section.



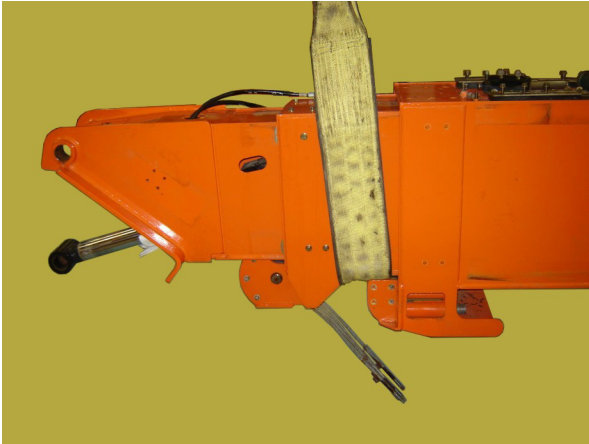
34. Pull the fly boom extend cables from their mounting receptacles.



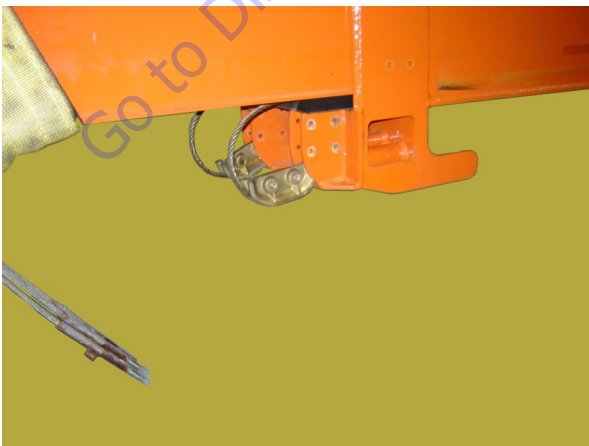
35. Remove the top, side, and bottom wear pads from the front of the inner mid boom sections.



- 36.** Attach a strap to pull the outer mid and fly boom sections out of the inner mid boom section. Secure the rear of the inner mid boom section so it doesn't move as the other sections are withdrawn.



- 37.** Pull the sections out enough to allow easy removal of the cable retainer blocks and sheave blocks for the fly boom retract cables at the front of the inner mid boom section.



NOTE: When pulling the outer mid and fly boom sections out of the inner mid boom section, make sure the outer mid retract cables do not catch at the rear of the boom section.

- 38.** Pull the sections the rest of the way out of the inner mid boom section, pulling the fly boom retract cables out at the same time.



- 39.** Remove the outer mid retract cables from the rear of the inner mid boom section.



SECTION 4 - BOOM & PLATFORM

40. Remove the cable retract retainer plates, cable retainer blocks, sheaves, and bushings from the rear of the outer mid boom section.



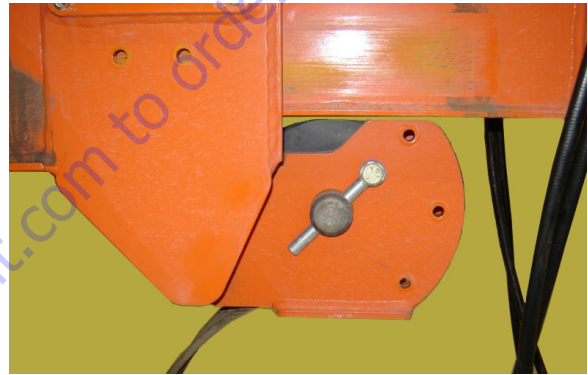
41. Remove the front wear pads from the outer mid boom section.



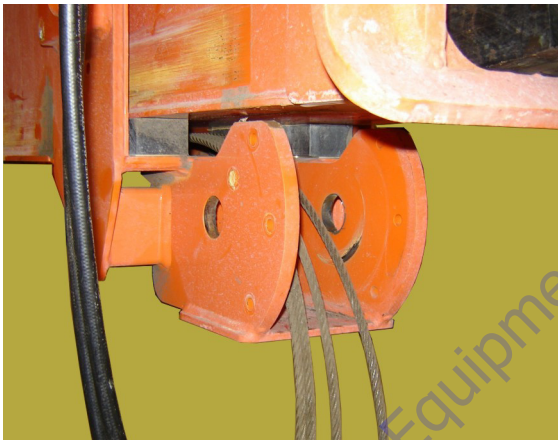
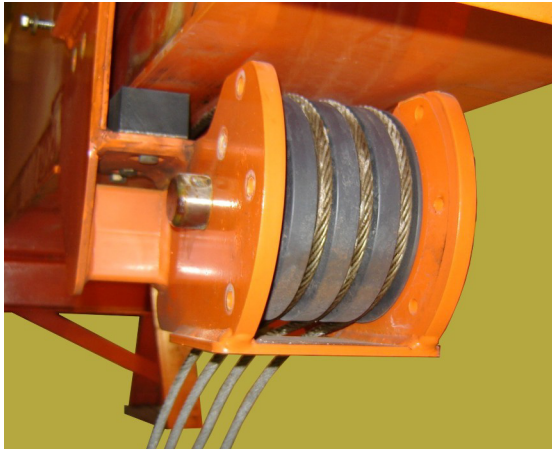
42. Remove the upper rear wear pads from the fly boom section.



43. Remove the cable retainer blocks and shims.



- 44.** Pull the fly boom extend cables out enough to have clearance to remove the sheave, and remove the retaining bolt, keeper pin, pin, bushings, and sheave from the front of the outer mid boom section.



NOTE: When pulling the fly boom section out of the outer mid boom section, make sure the fly boom retract cables do not catch at the rear of the boom section.

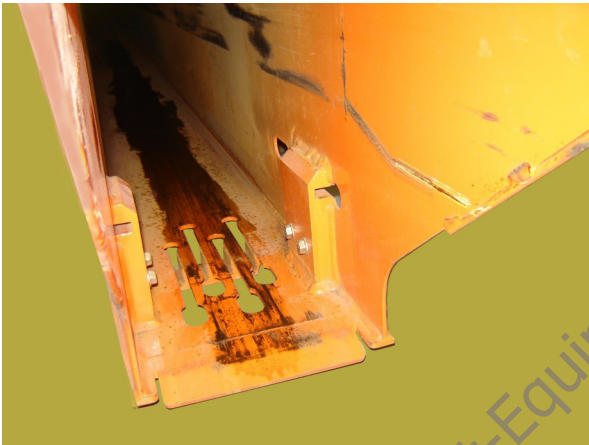
- 45.** Attach a lifting device to the fly boom section and pull the section and fly boom extend cables from the outer mid boom section. Secure the rear of the outer mid boom section so it doesn't move when the fly boom section is withdrawn.



46. Remove the tape from the fly boom section and remove the fly boom retract cables.



47. Remove the fly boom extend cables from the bottom of the fly boom section.



48. Thoroughly clean the boom sections.

Assembly

⚠ WARNING

NEVER HANDLE WIRE ROPE WITH BARE HANDS.

NOTE: Moderately apply Super Lube JLG Part No. 3020042 to all four inner surfaces of both ends of each boom section to a minimum depth of 3 to 4 feet (1 to 1.25 m). The fly boom section only needs Super Lube applied to the insertion end.

Super Lube is also to be moderately applied to all outer surfaces of interior wear pads after they are installed to the insertion end of boom sections. Care should be taken to avoid application on exposed painted surfaces of the fully extended boom. Refer to Section 4.9 - Boom Lubrication Application.

NOTICE

WIRE ROPE NUTS ARE CLOSE IN SIZE AND CAN BE SWITCHED. REFER TO THE JLG PARTS MANUAL. OUTER MID RETRACT NUTS, LOCATED ON BOTTOM OF BASE BOOM, WILL BE BLACK IN COLOR.

NOTICE

TAKE EXTRA CARE NOT TO CROSS ANY WIRE ROPES DURING THE ASSEMBLY PROCEDURE.

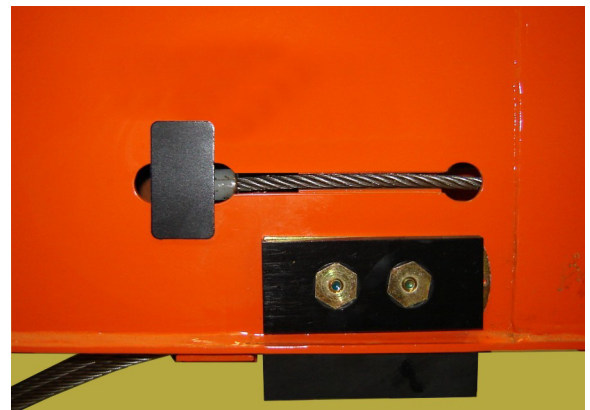
1. Install the fly extend wire rope button ends into the slots on the bottom of the fly boom section. Place tape over the wire ends to keep them in place during assembly.



2. Fabricate a special fixture as shown below to keep four extend wire ropes from crossing over each other.



3. Install the fly retract wire rope button ends into the slots in the side of the fly boom, coil the remaining lengths of wire rope and place them into the fly boom, tape the slots to keep the rope from jumping out.



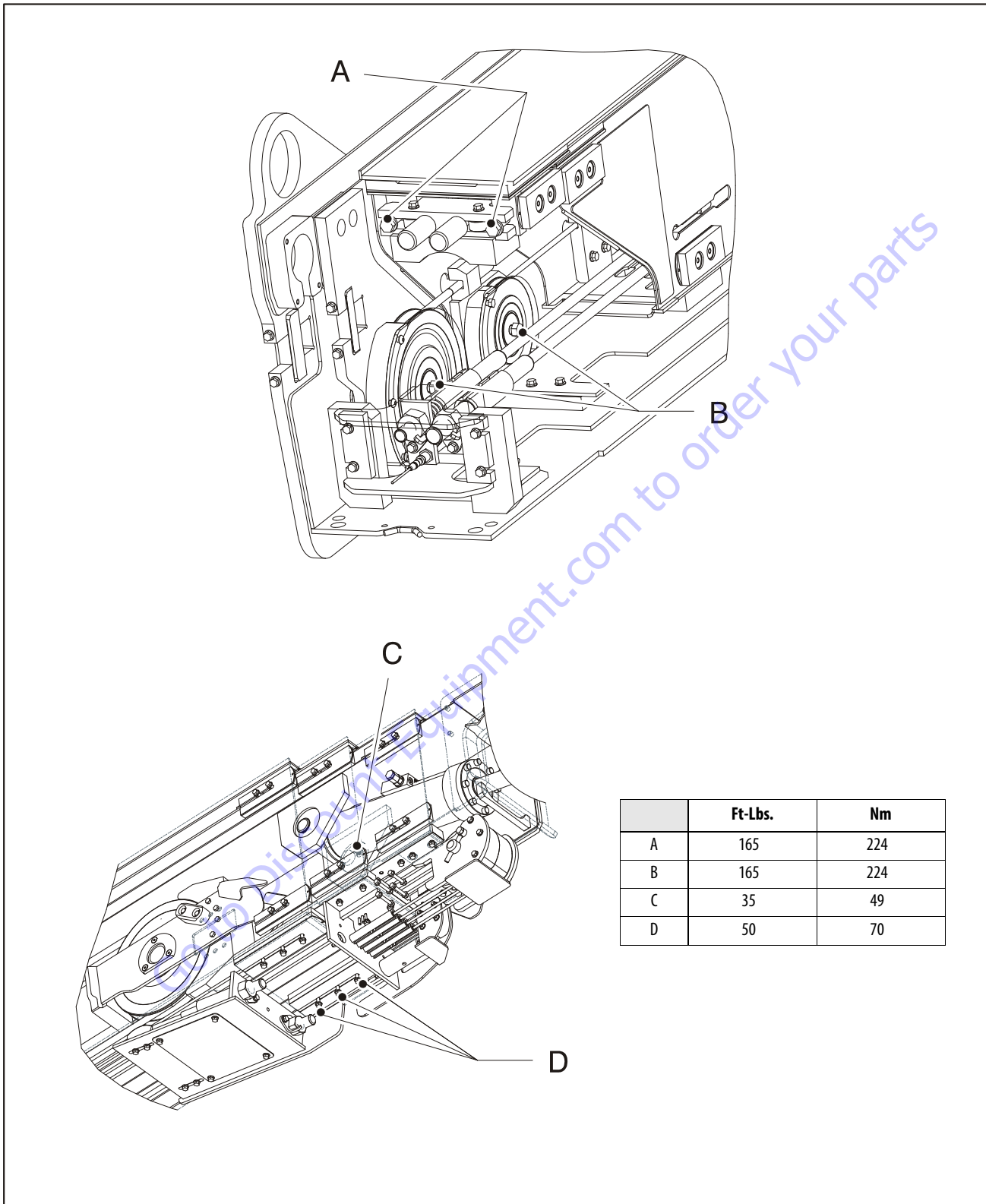


Figure 4-12. Boom Assembly Torque Values

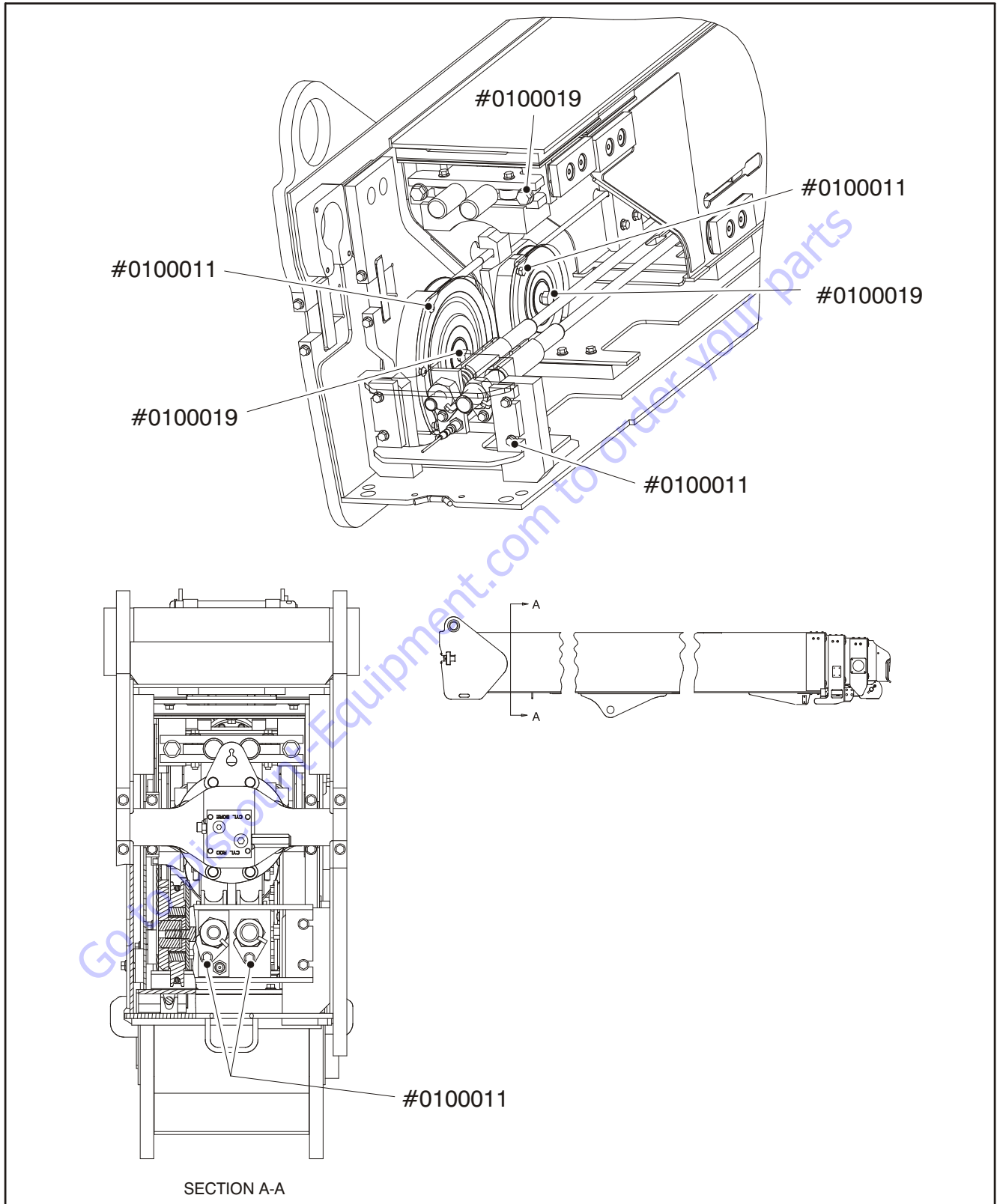


Figure 4-13. Locations for Threadlocker Application - Sheet 1 of 4

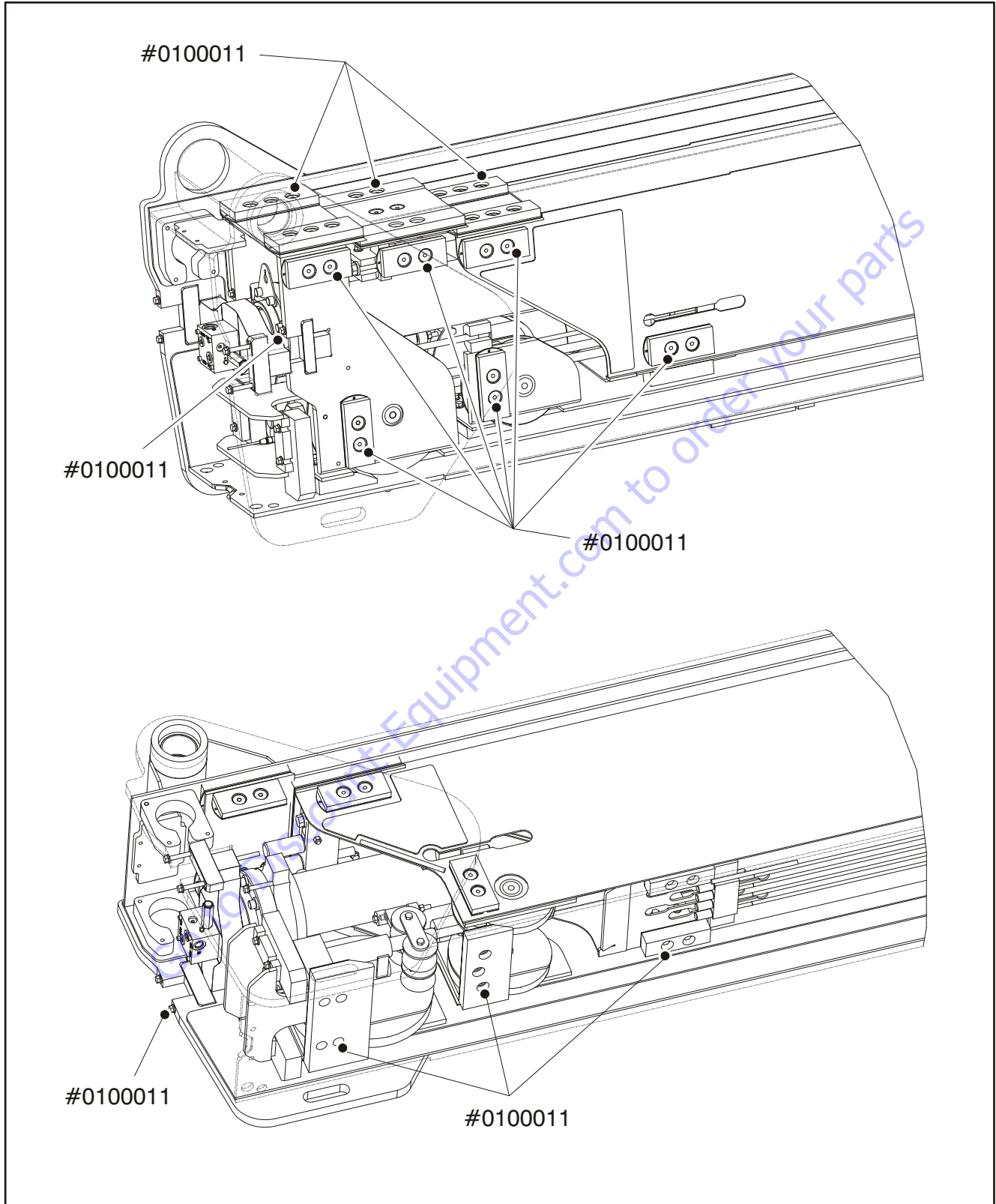


Figure 4-14. Locations for Threadlocker Application - Sheet 2 of 4

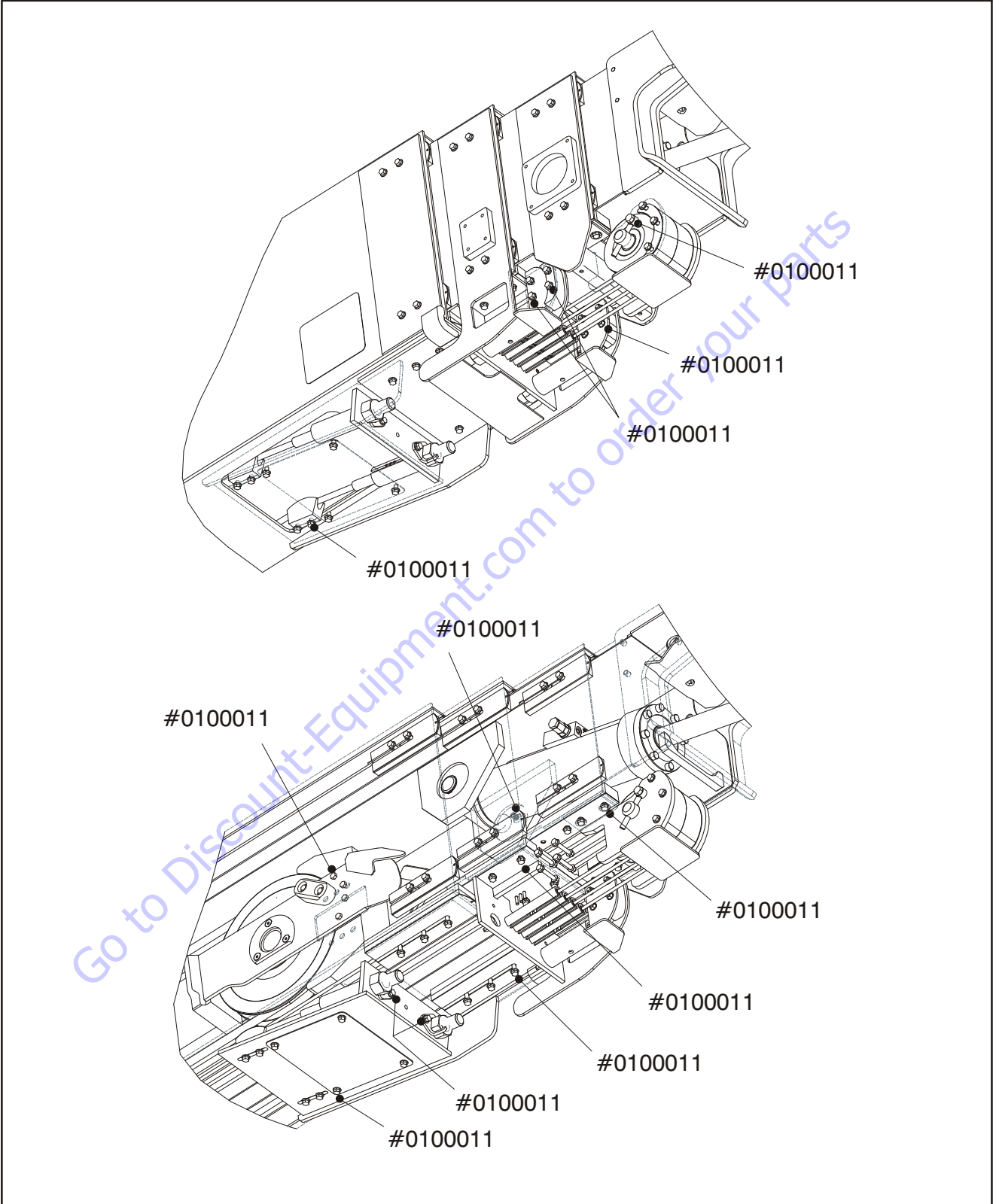


Figure 4-15. Locations for Threadlocker Application - Sheet 3 of 4

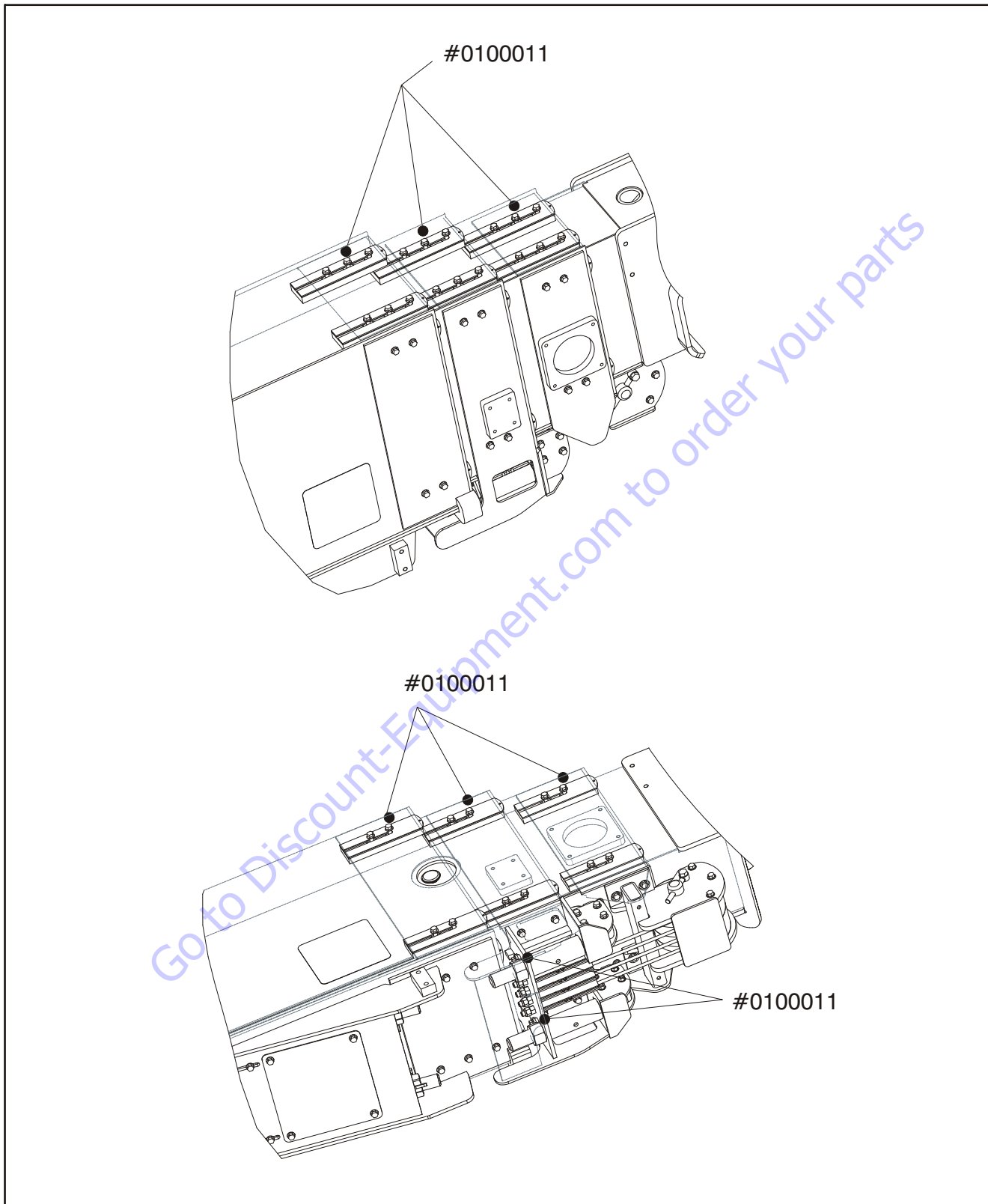
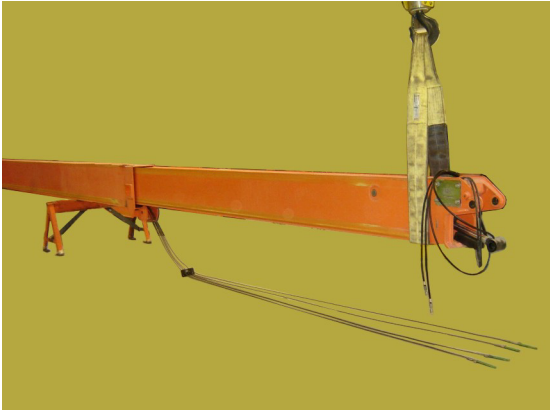


Figure 4-16. Locations for Threadlocker Application - Sheet 4 of 4

4. Install the fly boom section partially into the outer mid boom section.



NOTICE

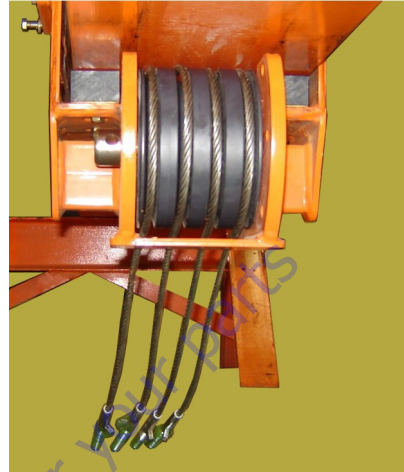
DO NOT ALLOW THE FLY BOOM TO REST ON THE FOUR EXTEND WIRE ROPES WHILE INSERTING IT INTO THE OUTER MID BOOM.

5. Apply JLG Threadlocker PN 0100011 to the bolts and install the front lower wear pads and shims to the outer mid boom as marked during disassembly. Torque the bolts to 50 ft.lbs. (68 Nm).



6. Install the fly boom section most of the way into the outer mid boom section, leaving enough of the fly out so there is adequate slack in the fly boom extend cables to allow for installation of the front sheave.

7. Install the sheave, bushings, pin, keeper pin, and retaining bolt to the front of the outer mid boom section.



8. Install the cable retainer blocks and shims.



9. Apply JLG Threadlocker PN 0100011 to the bolts and install the front upper, and side wear pads on the outer mid boom section as marked during disassembly. Torque the bolts to 50 ft.lbs. (68 Nm).



SECTION 4 - BOOM & PLATFORM

10. Apply JLG Threadlocker PN 0100011 to the bolts and install the rear upper and side wear pads on the outer mid boom section as marked during disassembly. Torque the bolts to 50 ft.lbs. (68 Nm).



11. Uncoil the fly retract wire ropes from the fly boom. Route the threaded ends of the wire ropes through the holes in the outer mid boom plates at the retract sheave locations.



12. Apply a thin coat of moly paste lubricant to the inside diameter of the sheave composite bearings. Install the fly retract sheaves and bushings while guiding the wire ropes into the sheave grooves. Apply moly paste lubricant on the inside diameter of the sheave bushing cup. Ensure the sheaves move freely. Apply JLG Threadlocker PN 0100019 to the sheave retaining bolts and torque to 165 ft.lbs. (224 Nm). Install the cable retract retainer plates and cable retainer blocks.



13. Apply JLG Threadlocker PN 0100011 to the bolts and install the lower rear wear pad onto the outer mid boom section. Torque the bolts to 50 ft.lbs. (68 Nm).



14. Apply JLG Threadlocker PN 0100011 to the bolts and install the side and upper wear pads on the rear of the inner mid boom section. Torque the bolts to 50 ft.lbs. (68 Nm).
15. Lubricate the wear surfaces on the inside of the inner mid boom section with Super Lube.

- 16.** Feed the fly boom retract cable into the inner mid boom section from the front.



- 18.** Attach the fly boom retract cables in the inner mid boom section to the receptacles at the rear of the outer mid boom section.



- 19.** Put tape over the holes to keep the cable ends from jumping out.



- 17.** Using an adequate lifting device, align the outer mid boom section with the inner mid boom section.

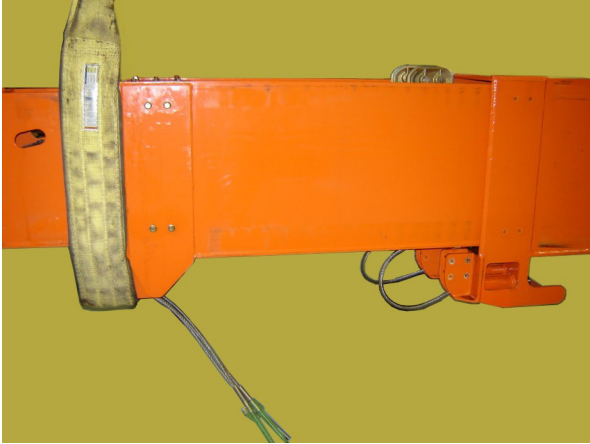


- 20.** Push the outer mid assembly part way into the inner mid boom section. Apply JLG Threadlocker PN 0100011 to the bolts and install the front bottom wear pad into the inner mid boom section. Torque the bolts to 50 ft.lbs. (68 Nm).

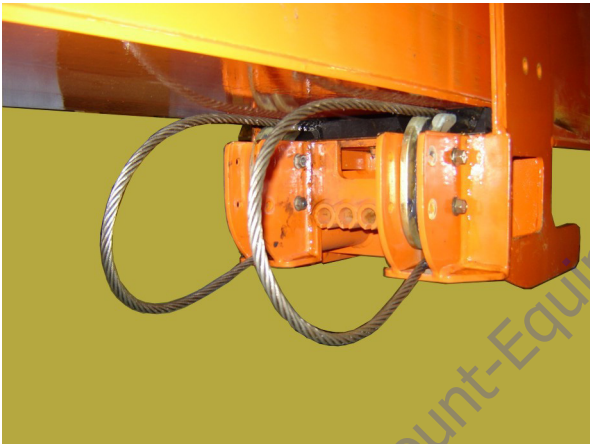


SECTION 4 - BOOM & PLATFORM

21. Push the outer mid assembly into the inner mid while pulling the boom cables out the back fo the inner mid section at the same time. Leave 3 to 4 feet of the outer mid section sticking out of the inner mid section.



22. Push the retract cable ends into the mounting receptacles and install the cable sheaves and adjustment nuts.



23. Push the outer mid assembly almost completely into the inner mid boom section.



24. Install the cable retainer blocks over the fly boom retract cables and insert the fly boom extend cable into the mounting receptacles.



- 25.** Apply JLG Threadlocker PN 0100011 to the bolts and install the side and top wear pads into the inner mid boom section. Torque the bolts to 50 ft.lbs. (68 Nm).



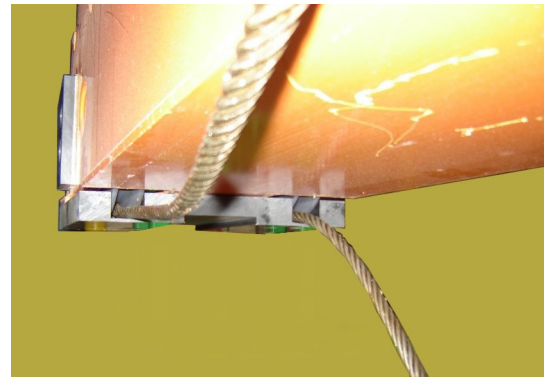
- 26.** Put moly paste on the sheave mounts at the rear of the inner mid boom section and install the sheaves.



- 27.** Apply a thin coat of moly paste lubricant to the inside diameter of the sheave composite bearings. Install the retract sheaves and bushings while guiding the wire ropes into the sheave grooves. Apply moly paste lubricant on the inside diameter of the sheave bushing cup. Ensure the sheaves move freely. Apply JLG Threadlocker PN 0100019 to the sheave retaining bolts and torque to 165 ft.lbs. (224 Nm). Install the cable retainer blocks and cable retainer plates.

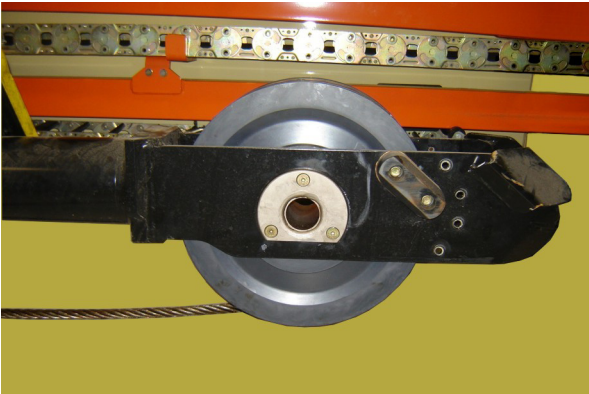


- 28.** Apply JLG Threadlocker PN 0100011 to the bolts and install the rear bottom wear pad on the rear of the inner mid boom section. Torque the bolts to 50 ft.lbs. (68 Nm).

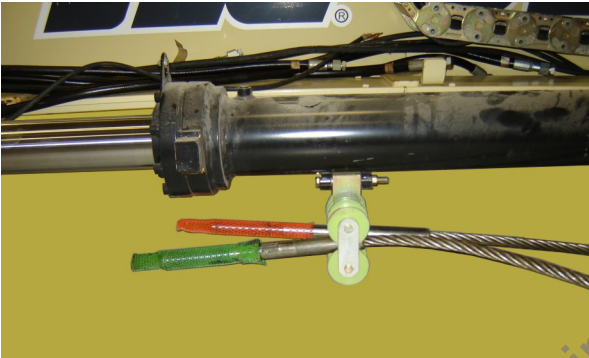


SECTION 4 - BOOM & PLATFORM

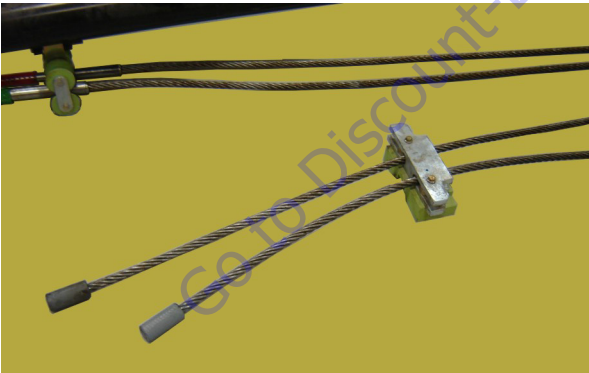
29. Install a new sheave on the telescope cylinder.



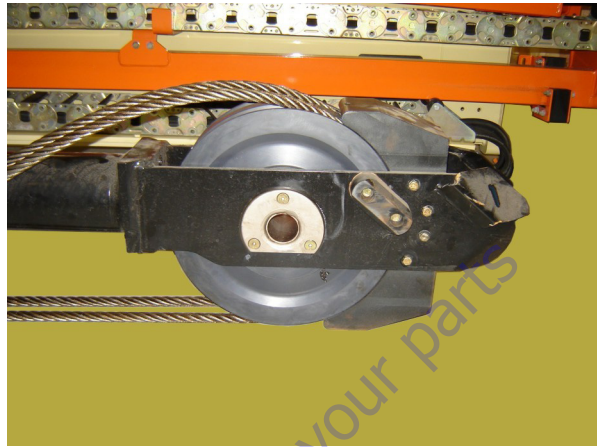
30. Install the outer mid extend cables into the cable pulley at the rod end of the telescope cylinder.



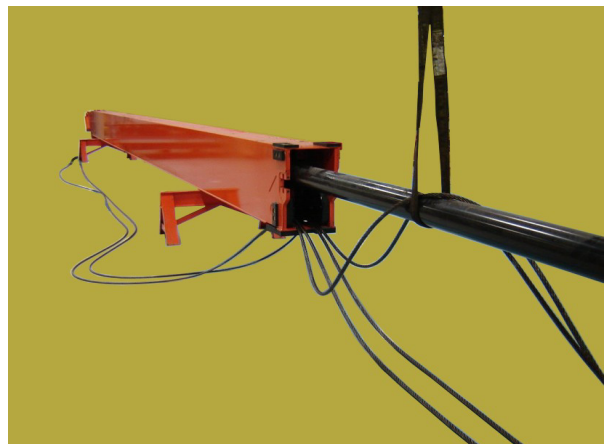
31. Install the other end of the outer mid extend cables into the cable guide block.



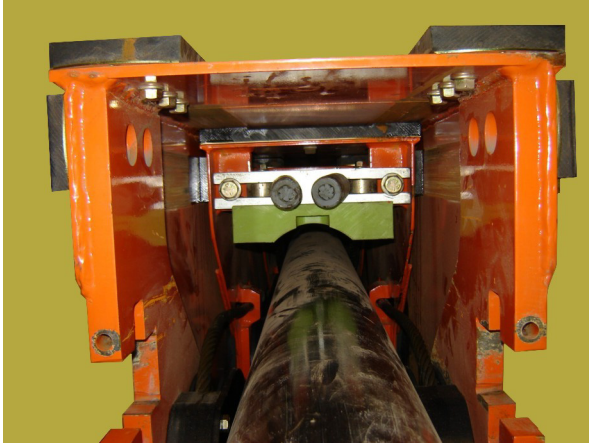
32. Route the cables around the sheave on the cylinder and install the cable retainer block.



33. Using an adequate lifting device, insert the cylinder and cables part way into the inner mid boom.



- 34.** Apply JLG Threadlocker PN 0100019 to the bolts and attach the cable guide to the inner mid boom section with the mounting hardware. Torque the bolts to 165 ft.lbs. (224 Nm).



- 35.** Push the cylinder the rest of the way into the inner mid boom assembly.

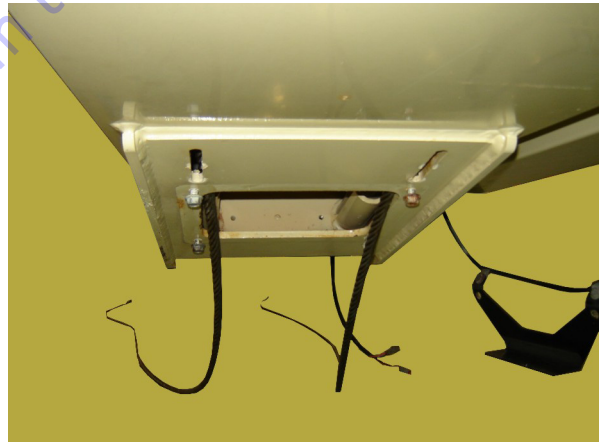
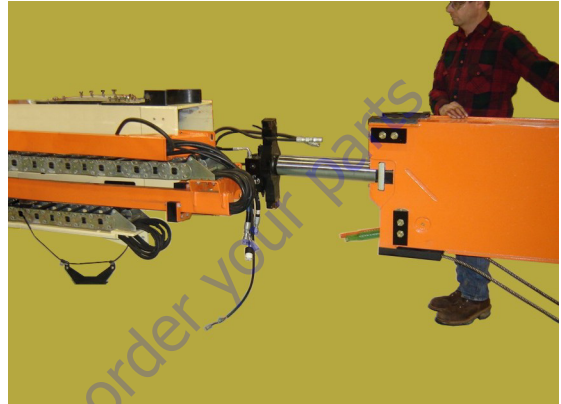


- 36.** Install the cylinder trunnion blocks and shims.

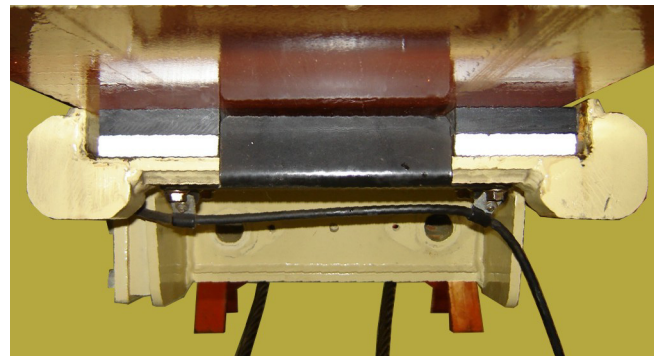


- 37.** Using Super Lube®, lubricate all wear surfaces on the inside of the boom base section and the outside of the inner mid boom section.

- 38.** Insert the inner mid boom section part way into the boom base section enough to be able to pull the outer mid retract cables out through the hole at the bottom front of the boom base section.

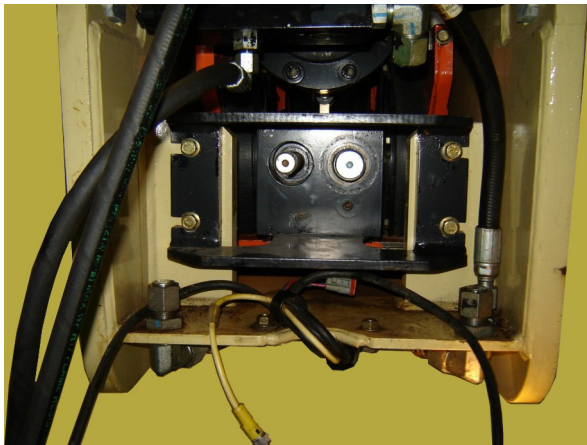


- 39.** Apply JLG Threadlocker PN 0100011 to the bolts and install the front lower wear pads into the boom base section. Torque the bolts to 50 ft.lbs. (68 Nm).

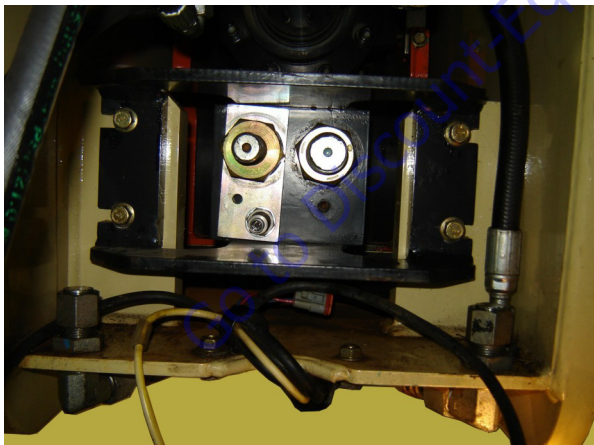


SECTION 4 - BOOM & PLATFORM

40. Push the inner mid boom assembly the rest of the way into the boom base section, adjusting the lifting device as necessary to keep the weight balanced.
41. Apply JLG Threadlocker PN 0100011 to the bolts and install the side and upper wear pads into the boom base section. Torque the bolts to 50 ft.lbs. (68 Nm).
42. Install the boom transport length sensor on the side of the boom base section.
43. Attach the powertrack tubes.
44. If necessary, attach a source of auxiliary hydraulic power and retract the boom enough to allow installation of the cable adjustment plate at the rear of the base boom section and install the plate.



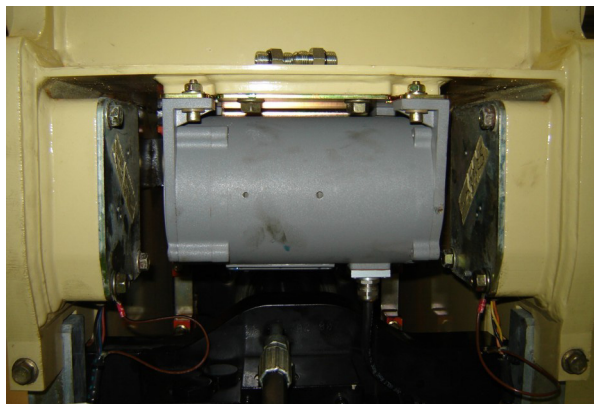
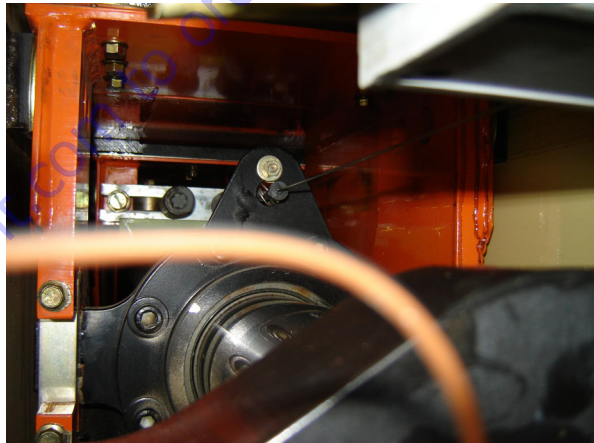
45. Install the broken cable sensor and the outer mid extend cable adjustment nuts.



46. Install the outer mid retract cable adjustment nuts at the front of the boom base section.



47. Install the boom length sensors and angle sensors as tagged during removal.



48. Connect the hydraulic hoses to the telescope cylinder as tagged during removal.
49. Adjust the boom cables. Refer to Section 4.18 - Wire Rope Tensioning Adjustment.
50. Perform a boom calibration as described in Section 6 under Calibrating the Boom Sensors.

4.7 LOAD SENSING PIN REMOVAL AND INSTALLATION

1. Place the machine on a firm, level surface.

NOTE: Replacing the load sensing pin requires the boom sensors be re-calibrated. Make sure the machine is in an area where this can be accomplished after installation of the new pin.

2. Swing the engine tray out to gain access to the sensing pin and retaining pin.

NOTE: The lift cylinder weighs 787 lbs. (357 kg.)

3. Run a nylon strap capable of supporting the weight of the lift cylinder around the bottom of the cylinder. Lift up on the strap to relieve the weight of the lift cylinder on the load sensing pin.



4. Loosen and remove the bolt that secures the retaining pin and remove the retaining pin.



5. Disconnect the wiring harness from the strain relief connector at the opposite side of the load sensing pin.

6. Use the Load Pin Removal Tool (JLG PN 4846765) to prevent the pin from being damaged, and use a hammer to remove the pin. To make the tool refer to Figure 4-17., Load Pin Removal Tool, JLG PN 4846765. If the Load Pin Removal Tool is not available, use an arbor of the proper size (as shown below). If excessive force is necessary to move the pin, it may be necessary to carefully activate lift using the auxiliary power switch to relieve lift cylinder weight from the load sensing pin.



7. When installing a new pin, make sure all of the holes in the turntable and lift cylinder are aligned. If the new load sensing pin does not push 1/2 to 3/4 of the way in by hand, remove the pin and align the holes better. Also make sure the pin is installed with the strain relief connector opposing the pin orientation bar as shown. Refer to Pivot Pin Installation.



8. Using an oak block, carefully tap the pin until it is fully installed. Secure the pin in place with the retaining pin and retaining pin bolt.

NOTICE

DO NOT TAP ON THE CENTER OF THE PIVOT PIN.

9. Connect the wiring harness to the strain relief connector and re-calibrate the boom sensors.

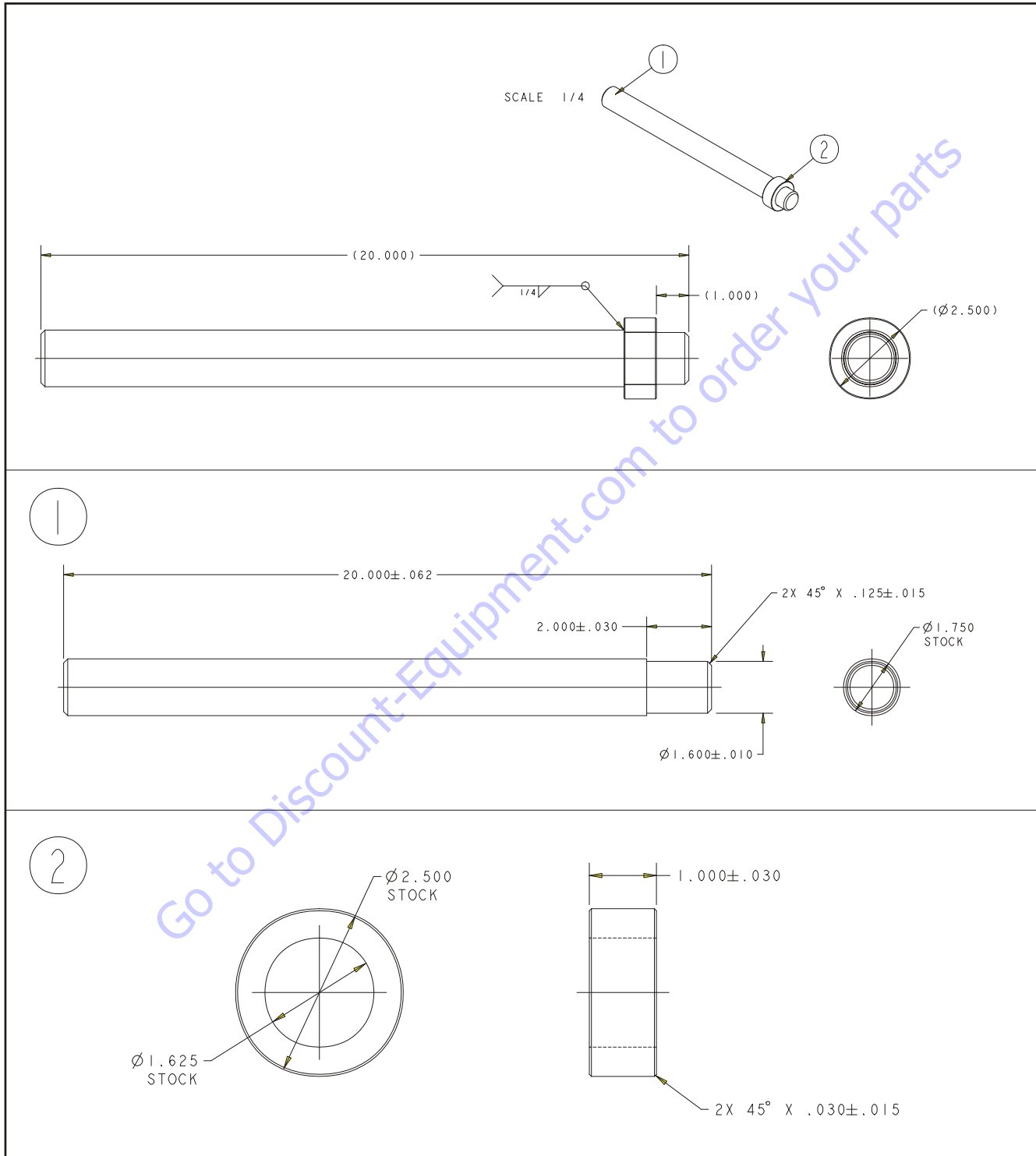


Figure 4-17. Load Pin Removal Tool, JLG PN 4846765

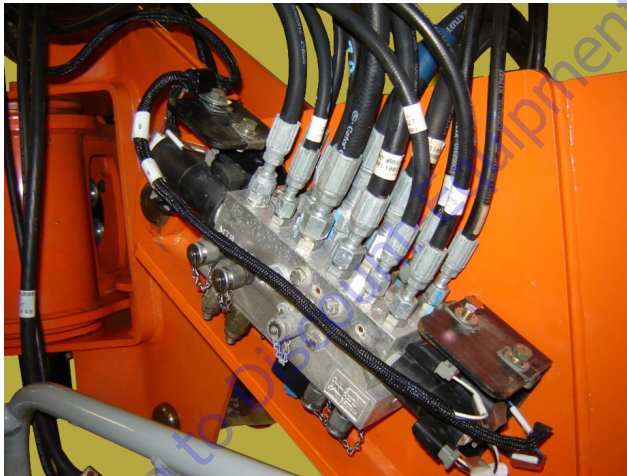
4.8 JIB

Removal

1. Lower the platform to the ground or onto blocking to support the weight of the jib.
2. Tag and disconnect the electrical harnesses that run to the jib. If necessary, loosen the guide block to allow the harnesses and hoses to move more freely.



3. Remove the jib valve protection plate.



4. Have a container or absorption material ready to catch residual hydraulic fluid. Tag and disconnect the hydraulic hoses that run from the boom to the jib control valve.

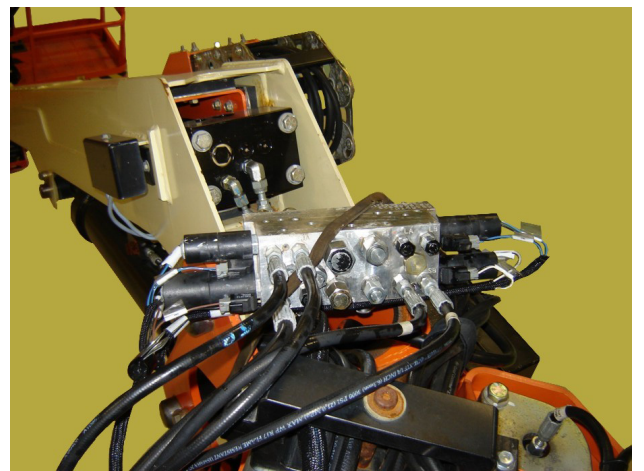
It may be necessary to disconnect additional lines to gain access to certain fittings. Cap or plug all openings.



5. Remove the valve from the boom.



6. Lay the jib control valve aside on the jib. Secure it in place so it does not fall.

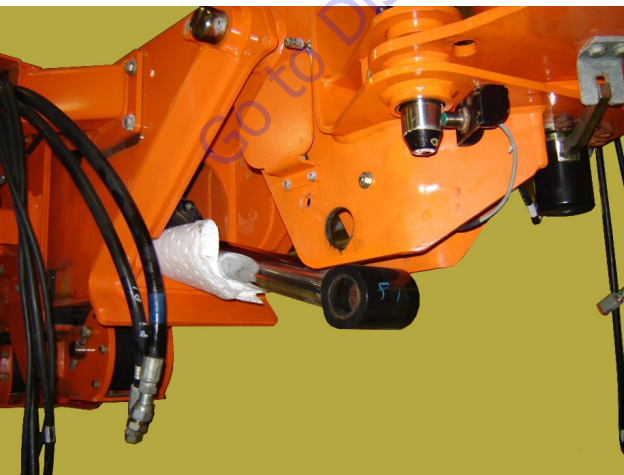


SECTION 4 - BOOM & PLATFORM

7. Disconnect the jib protractor sensor linkage from the boom.

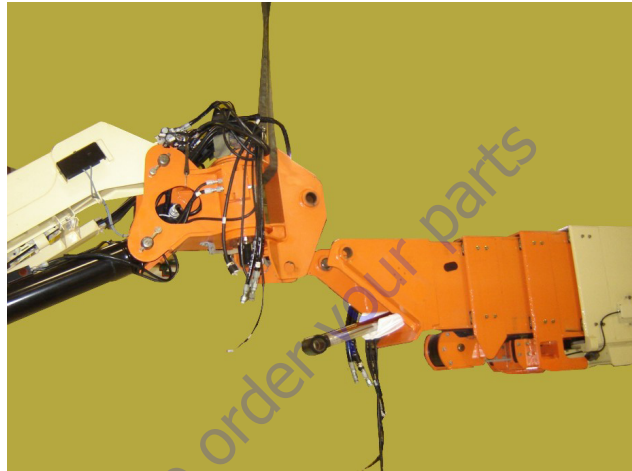


8. Remove the bolt and keeper pin securing the jib level pivot pin and remove the pin. Place blocking under the cylinder rod or a soft material under the cylinder rod to protect the rod from being scratched.



NOTE: The jib and platform assembly weighs approximately 2100 lbs. (953 kg.).

9. Attach an adequate supporting device to the jib to support its weight. Remove the bolt and keeper pin securing the jib pivot pin and remove the pin.



10. Remove the jib and platform assembly from the boom.



Installation

1. Attach an adequate lifting device to the jib and position it in front of the boom.



2. Place something under the front of the jib that will allow it to slide or move along the ground easily. Attach a lifting device to the rear of the jib, allowing the front to pivot on the ground.



3. Lift the jib into position on the boom fly section and install the jib pivot pin. Secure the pin in place with the keeper pin and bolt.

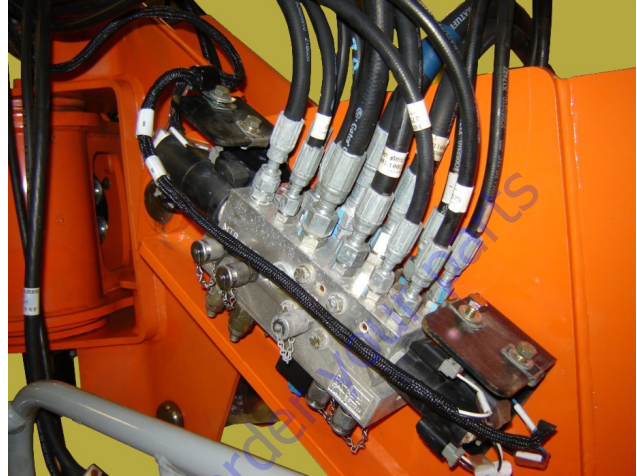


SECTION 4 - BOOM & PLATFORM

4. Attach a lifting device to the front of the jib and align the jib level cylinder attachment fittings. Install the pivot pin. Apply JLG Threadlocker PN 0100019 to the bolt threads and secure the pin in place with the keeper pin and bolt. Torque the bolt to 165 ft.lbs. (224 Nm).



5. Place the mounting bracket on the jib valve and bolt the jib valve to the fly boom section.
6. Install the wiring harnesses and hydraulic hoses on the jib valve as tagged during removal.



7. Install the jib valve protection plate.
8. Perform a boom calibration as described in Section 6 under Calibrating the Boom Sensors.

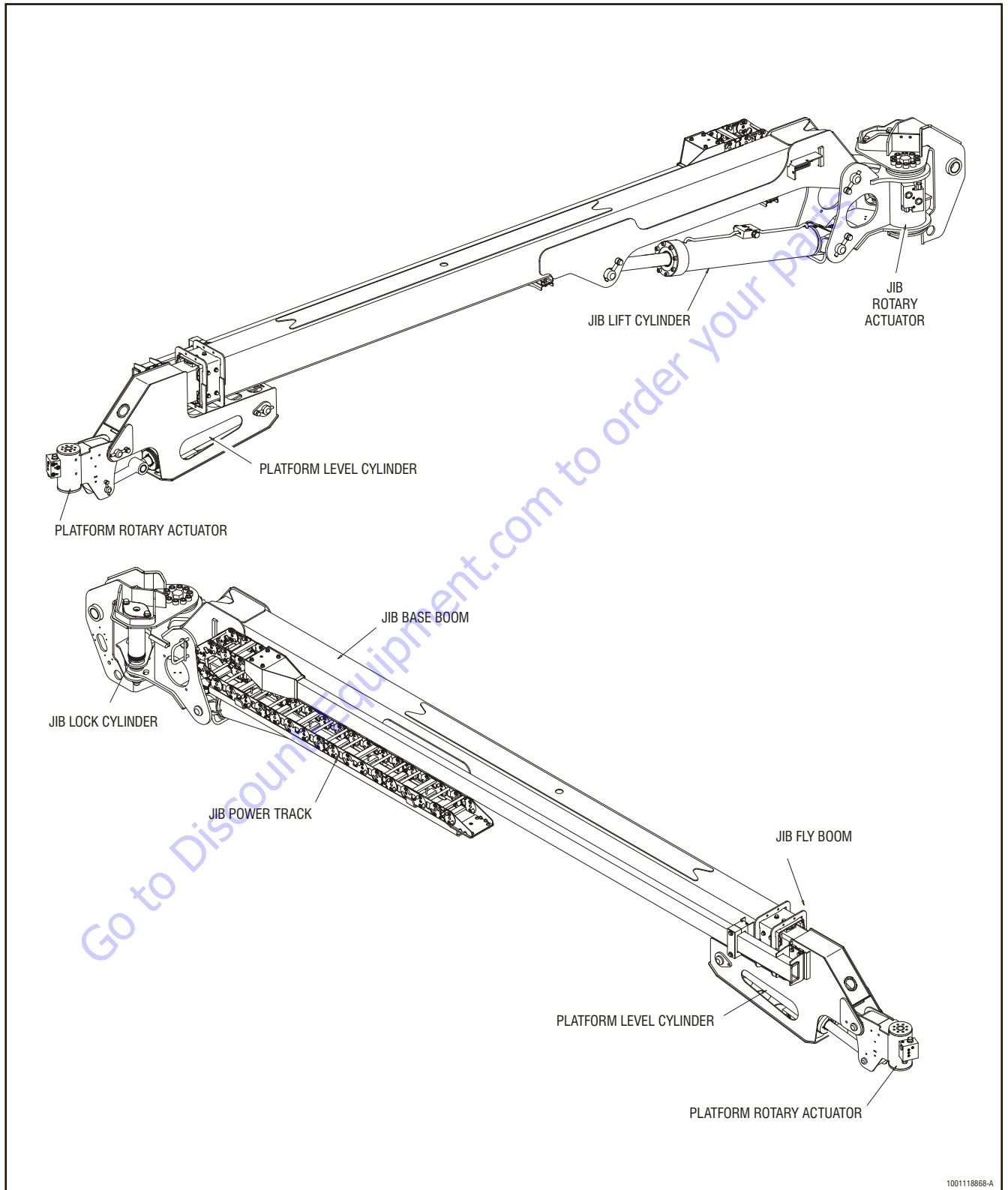


Figure 4-18. Jib Assembly - Sheet 1 of 3

SECTION 4 - BOOM & PLATFORM

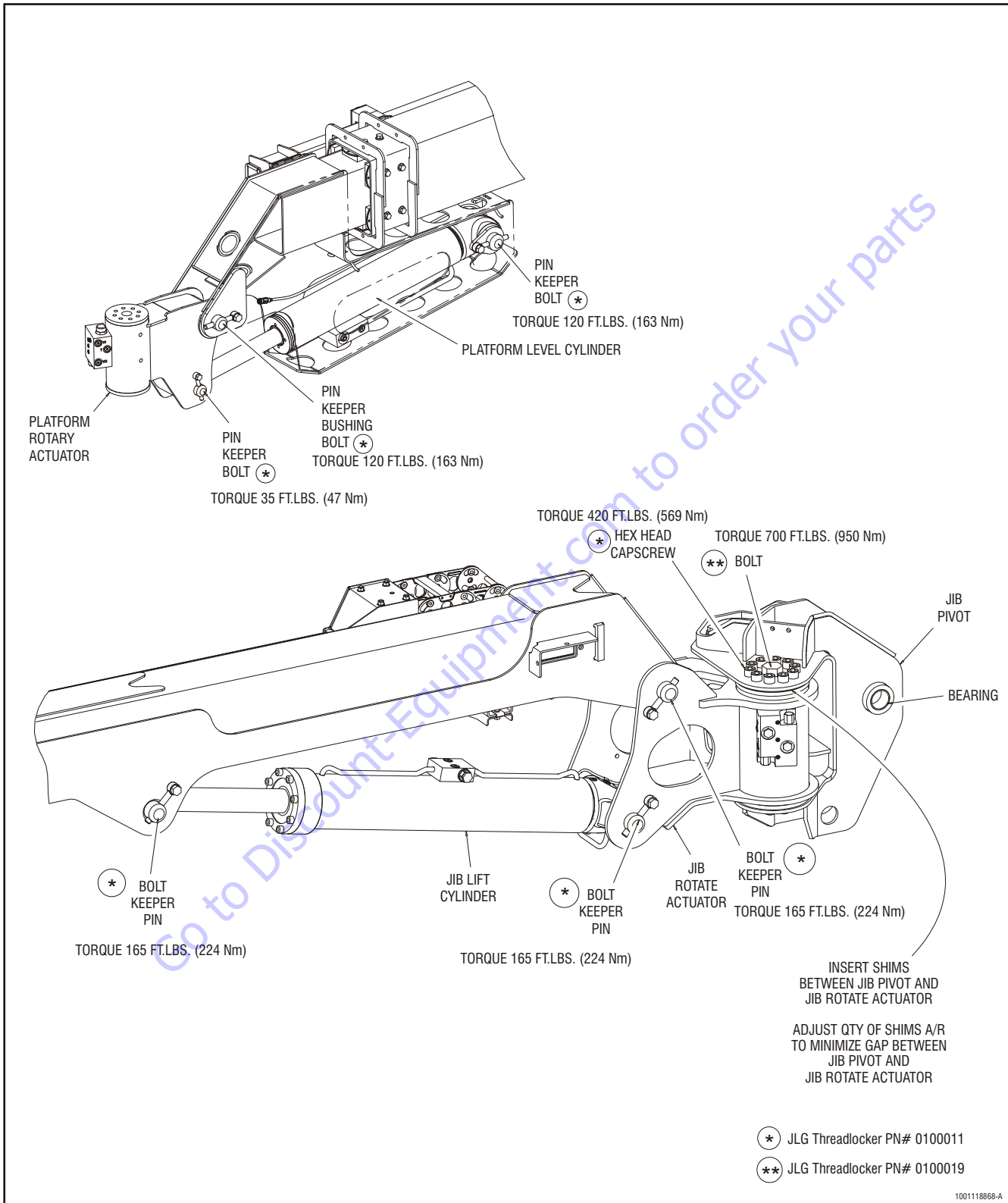


Figure 4-19. Jib Assembly - Sheet 2 of 3

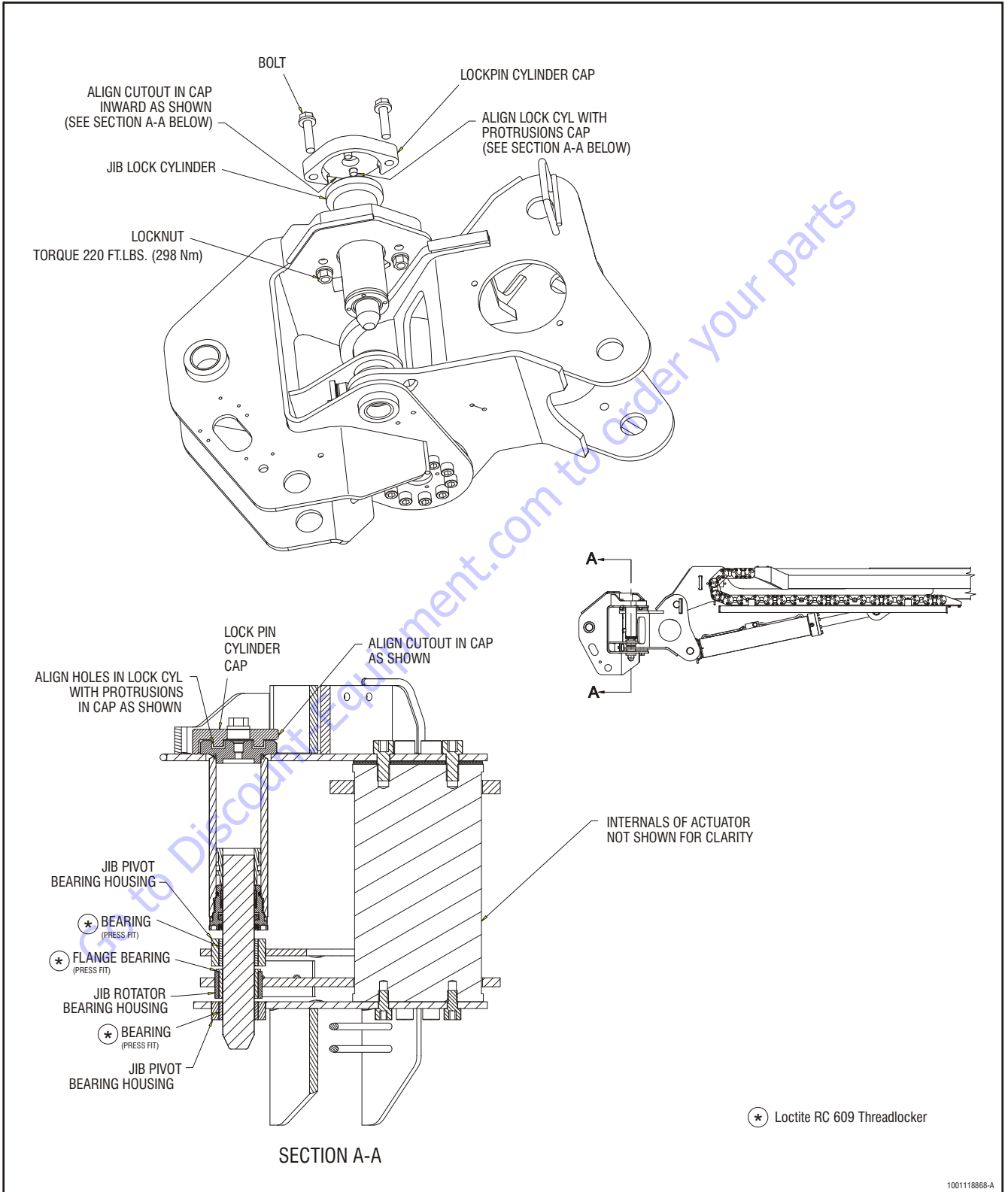


Figure 4-20. Jib Assembly - Sheet 3 of 3

4.9 BOOM LUBRICATION APPLICATION

This procedure applies to booms after assembly or during annual application using Super Lube® Lubricant (JLG PN 3020042).

1. Position the boom on the boom rest using the 500lb capacity setting.
2. Telescope main boom section as far as it will extend at this position, approximately 3 ft. (0.9 m).
3. From the front of the machine (boom pivot end), moderately apply lubricant to the interior surfaces of the base boom, inner mid boom, and outer mid boom. To prevent misdiagnosis of hydraulic leaks, take care to prevent excessive application of lubrication.
4. At the rear of the machine, apply lubricant to the side, top and bottom surfaces of the fly boom, outer mid, and inner mid specifically to wear pad contact paths. To prevent misdiagnosis of hydraulic leaks, take care to prevent excessive application of lubrication.
5. After application of the lubricant is complete, cycle the boom through its full range of travel 2 times.

4.10 PLATFORM LEVELING CYLINDER

Removal

1. Ensure the platform is supported by blocking or an adequate lifting device.
2. Remove the bolt and keeper pin securing the retaining pin that secures the cylinder rod to the platform assembly and remove the pin.



3. Tag and disconnect the hydraulic hoses from the platform level cylinder. Cap or plug all openings. Tag and disconnect the electrical harness running to the cylinder.



4. Lift the platform to allow enough room for removal of the cylinder.



NOTE: The platform level cylinder weighs approximately 79 lbs. (36 kg.).

5. Ensure the cylinder is supported so it will not move when the rear retaining pin is removed. Remove the bolt and keeper pin securing the retaining pin at the rear of the cylinder and remove the pin.



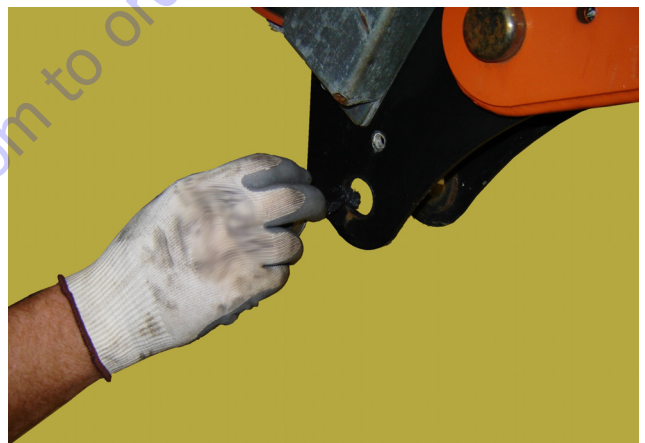
6. Carefully lift the cylinder from the machine.

Installation

1. Attach a lifting or jacking device to the platform and position the platform to provide adequate room to install the platform leveling cylinder.



2. Coat the retaining pin holes with an anti-seize compound to lubricate the holes and prevent rust.



3. Lift the cylinder into place.
4. Line up the rear pivot hole and insert the pivot pin.

5. Secure the pivot pin in place with the keeper pin. Loosely install the bolt, but do not tighten it at this time.

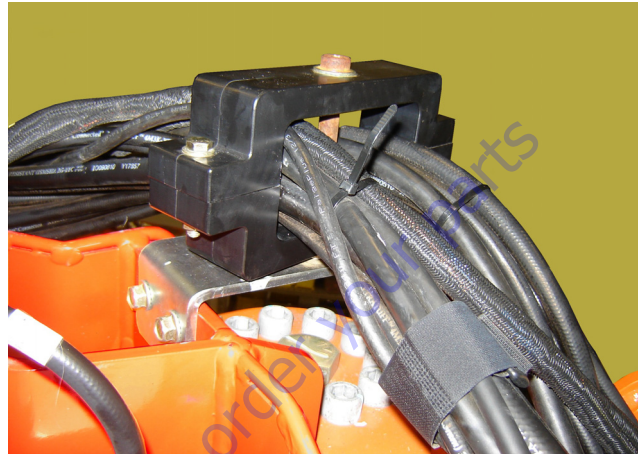


6. Thread the length sensor harness around the cylinder and up to the platform box. Connect the harness to the connector under the platform box.
7. Route the hydraulic hoses around the cylinder. Connect the hoses to the cylinder as tagged during removal.
8. Extend the cylinder to align the front pivot pin hole. It may be necessary to lower the platform to help align the components.
9. Install the retaining pin and keeper pin.
10. Apply JLG Threadlocker PN 0100011 to the bolts and install the bolts to secure the keeper pins. Torque the bolt at the rod end of the cylinder to 40 ft. bs. (55 Nm) and the bolt at the barrel end cylinder to 95 ft.lbs. (130 Nm).
11. Function check the cylinder to ensure it operates properly and there is no leakage.

4.11 JIB TELESCOPE CYLINDER

Removal

1. Remove the guide pad at the rear of the jib to provide more room for cylinder removal.



2. Extend the jib enough to gain access to the pins that secure the jib telescope rod to the jib fly boom section.



3. Lower the boom so the platform base is on the ground or supported by blocking.

4. Remove the retaining rings securing the retaining pins on the powertrack side of the jib and remove the pins.



5. Attach a strap or similar device between the jib base boom and the jib fly boom to ensure the jib fly boom will not extend inadvertently when the jib is raised.



6. Raise the jib to horizontal.



7. Retract the jib telescope cylinder.

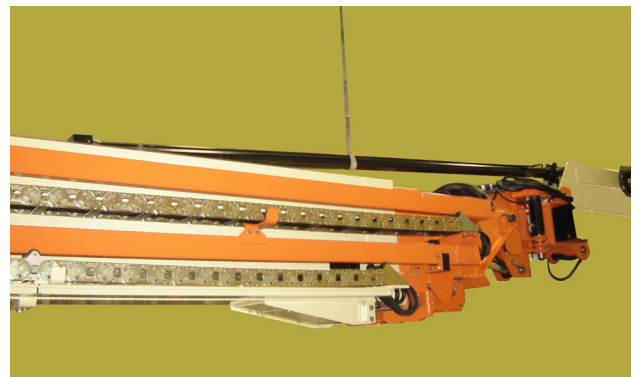
8. Tag and disconnect the hoses going to the jib telescope cylinder.



9. Place blocking underneath the cylinder to prevent it from falling when the retaining bolts are removed. Remove the retaining bolts securing the jib telescope cylinder to the jib base boom.

NOTE: The platform level cylinder weighs approximately 130 lbs. (59 kg.).

10. Attach an adequate lifting device to the cylinder and lift the cylinder from the jib. Adjust the device as necessary as the cylinder is withdrawn to balance the weight of the cylinder.





Installation

1. If installing a new cylinder, test fit the retaining pins that secure the jib telescope rod to the jib fly boom to ensure they fit properly. Apply an anti-seize compound to the attachment holes in the cylinder rod.
2. Lift the cylinder into place, adjusting the lifting device as necessary to maintain balance.



3. Fasten the cylinder barrel to the jib base boom with the attaching bolts. Do not tighten the bolts at this time.

4. Connect the hydraulic hoses to the cylinder as tagged during removal.



5. Lower the jib enough to enable easier access to the attachment holes in the jib fly boom.
6. Extend the cylinder enough to align the attachment holes in the jib fly boom with those in the end of the cylinder rod.
7. Install the retaining pins and secure them in place with the retaining rings.

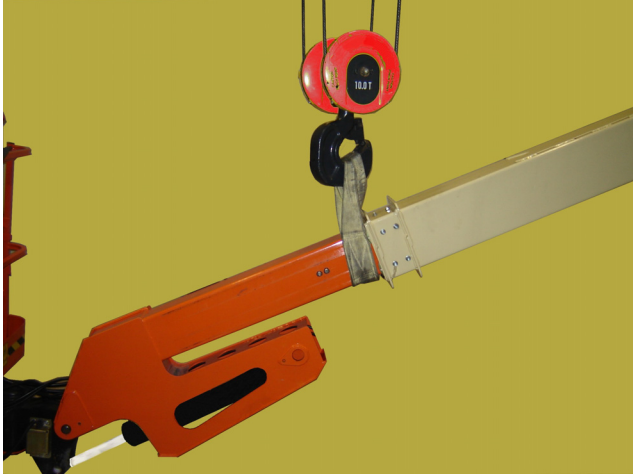


8. Apply JLG Threadlocker PN 0100011 to the bolts securing the cylinder barrel to the jib base boom and torque the bolts to 95 ft.lbs. (130 Nm).
9. Function check the cylinder to ensure it operates properly and there is no leakage.

4.12 JIB LIFT CYLINDER

Removal

1. Ensure the weight of the jib is fully supported.



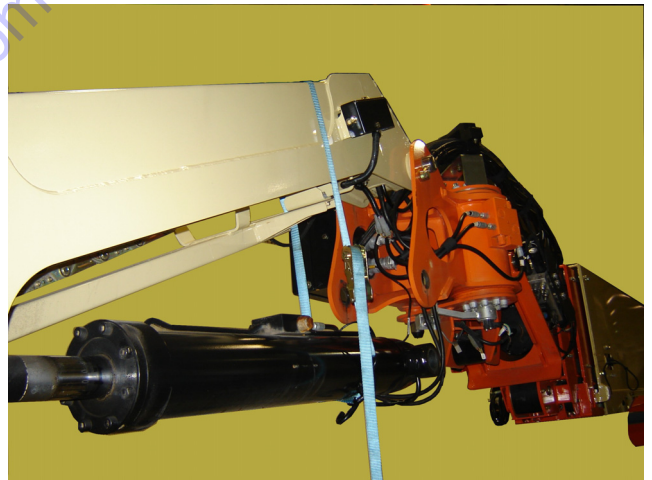
2. Place a strap or similar device in place to support the weight of the cylinder.



3. Remove the bolt and keeper pin that secure the jib lift cylinder barrel pivot pin. Remove the jib lift cylinder barrel pin.



4. Lower the cylinder enough to tag and disconnect the cylinder length sensor harness. Readjust the lifting device as necessary to balance the weight of the cylinder.



5. Remove the bolt and keeper pin that secure the jib lift cylinder rod pivot pin. Remove the jib lift cylinder rod pivot pin.



6. Lower the cylinder from the machine, readjusting the lifting device as necessary to balance the weight of the cylinder.

Installation

1. If installing a new cylinder, test fit the pivot pins in the cylinder to ensure they fit properly. Apply an anti-seize compound to the attachment holes in the cylinder rod and barrel.
1. Lift the cylinder into position to install the jib lift rod pivot pin. Install the pivot pin.
2. Secure the pin in place with the keeper pin. Apply JLG Threadlocker PN 0100011 to the retaining bolt. Install the retaining bolt to secure the keeper pin and torque to 165 ft.lbs. (224 Nm).



3. Reposition the lifting device as necessary to keep the cylinder balanced. Raise the cylinder enough to allow the length sensor harness to be connected and connect the harness as tagged during disassembly.



4. Raise the cylinder into position to allow the jib lift barrel pivot pin to be installed and install the pin.
5. Secure the pin in place with the keeper pin. Apply JLG Threadlocker PN 0100011 to the retaining bolt. Install the retaining bolt to secure the keeper pin and torque to 165 ft.lbs. (224 Nm).

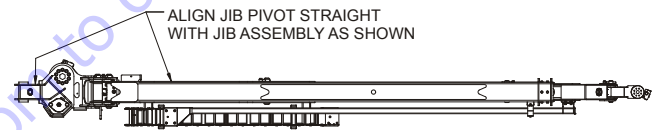


6. Remove the lifting device supporting the cylinder and the lifting device supporting the jib.
7. Function check the cylinder to ensure it operates properly and there is no leakage.

4.13 JIB STRAIGHT SHIMMING PROCEDURE

See Figure 4-21., Jib Straight Shimming.

1. Install the jib lock cylinder and fully extend the rod through the bearing housings in the jib rotator and jib pivot.
2. Align the jib pivot straight with the jib assembly.
3. Insert shims (16 gauge and 20 gauge) between the wear pad and pivot pad mount.
4. Add shims as required to align bearings.
5. Bearing alignment must be checked by rotating against shimmed stop with hydraulic pressure from power unit.
6. Check alignment by installing locking cylinder.
7. Remove hydraulic pressure by rotating with hydraulic power unit.
8. When shimmed properly, the jib pivot and jib assembly should line up straight as shown below.



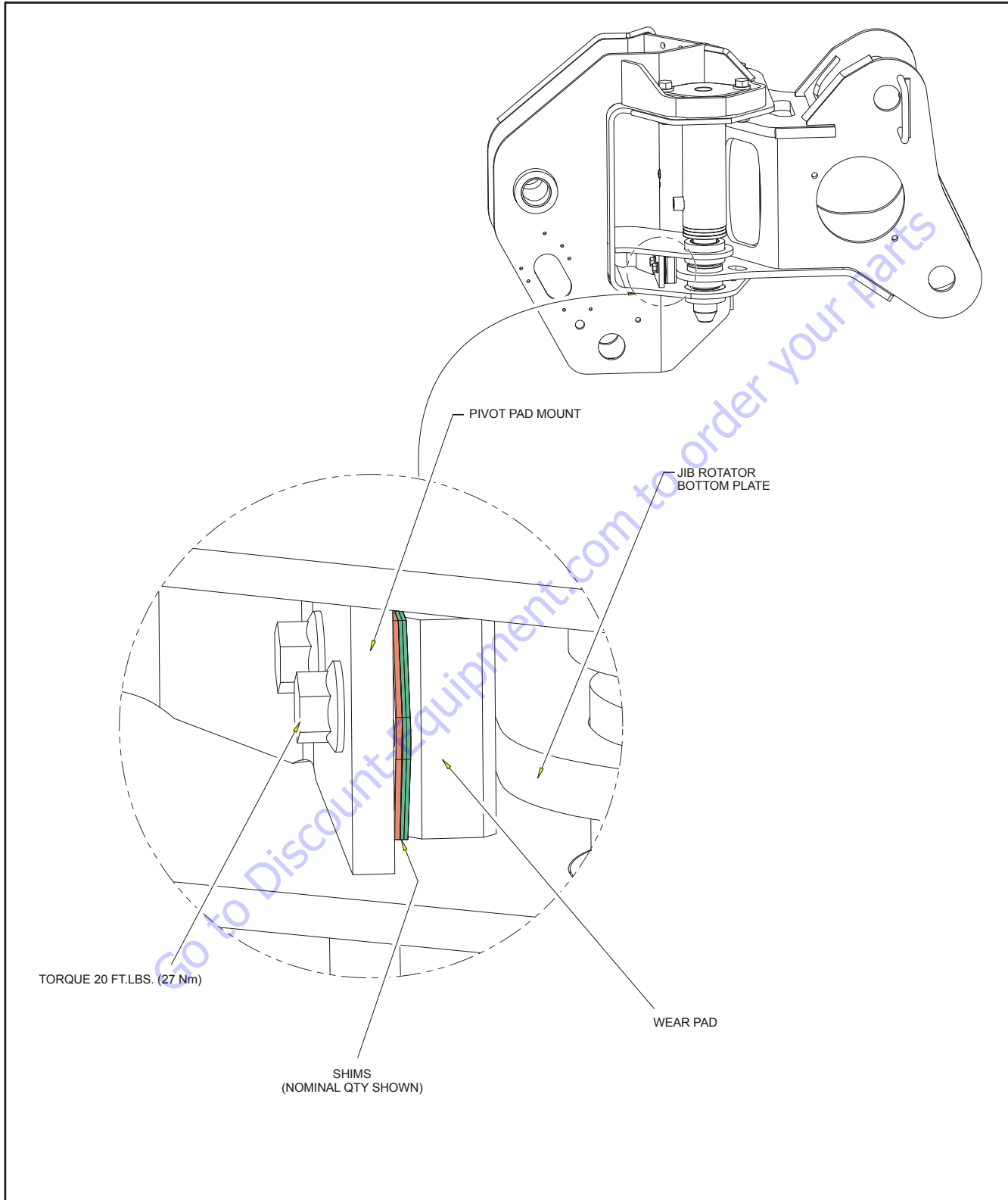


Figure 4-21. Jib Straight Shimming

4.14 BOOM CLEANLINESS GUIDELINES

The following are guidelines for internal boom cleanliness for machines that are used in excessively dirty environments.

1. JLG recommends the use of the JLG Hostile Environment Package if available to keep the internal portions of a boom cleaner and to help prevent dirt and debris from entering the boom. This package reduces the amount of contamination which can enter the boom but does not eliminate the need for more frequent inspections and maintenance when used in these types of environments.
2. JLG recommends that you follow all guidelines for servicing your equipment in accordance with the instructions outlined in the JLG Service & Maintenance Manual for your machine. Periodic maintenance and inspection is vital to the proper operation of the machine. The frequency of service and maintenance must be increased as environment, severity and frequency of usage requires.
3. Debris and foreign matter inside of the boom can cause premature failure of components and should be removed. Methods to remove debris should always be done using all applicable safety precautions outlined in the JLG Service & Maintenance Manuals.

4. The first attempt to remove debris from inside the boom must be to utilize pressurized air to blow the debris toward the nearest exiting point from the boom. Make sure that all debris is removed before operating the machine.
5. If pressurized air cannot dislodge the debris, then water with mild solvents applied via a pressure washer can be used. Again the method is to wash the debris toward the nearest exiting point from the boom. Make sure that all debris is removed, that no "puddling" of water has occurred, and that the boom internal components are dry prior to operating the machine. Make sure you comply with all federal and local laws for disposing of the wash water and debris.
6. If neither pressurized air nor washing of the boom dislodges and removes the debris, then disassemble the boom in accordance to the instructions outlined in the JLG Service & Maintenance Manual to remove the debris.

4.15 HOSE ROUTING

For proper hose routing, refer to Figure 4-22., Figure 4-23., and Figure 4-24. It is important to periodically inspect hoses, wraps and clamps for proper slack adjustments and clamping integrity (pull check). Any changes as a result of inspection should be verified by performing full strokes of boom functions especially lift, telescope, jib, and platform rotate.

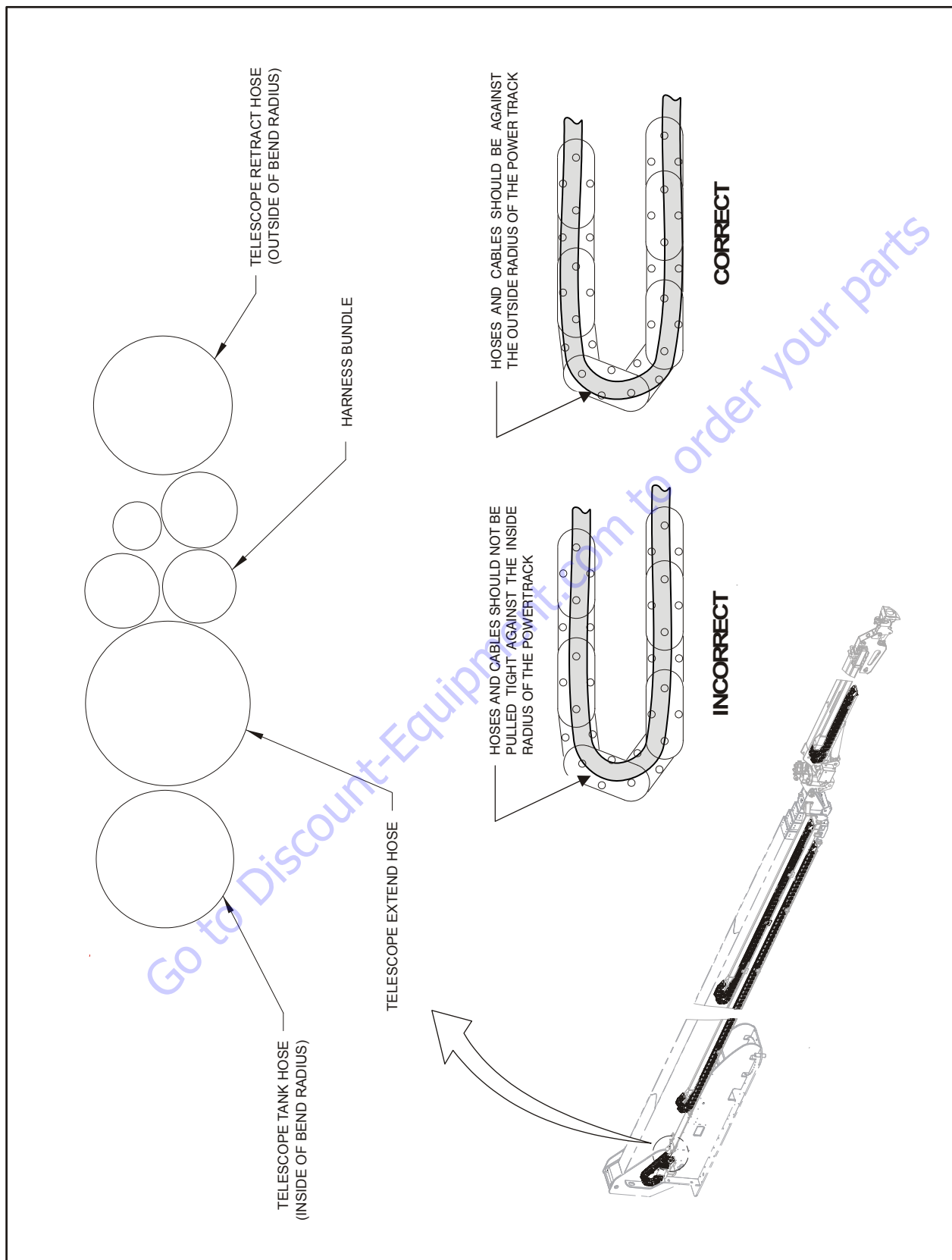


Figure 4-22. Powertrack Hosing - Sheet 1 of 3

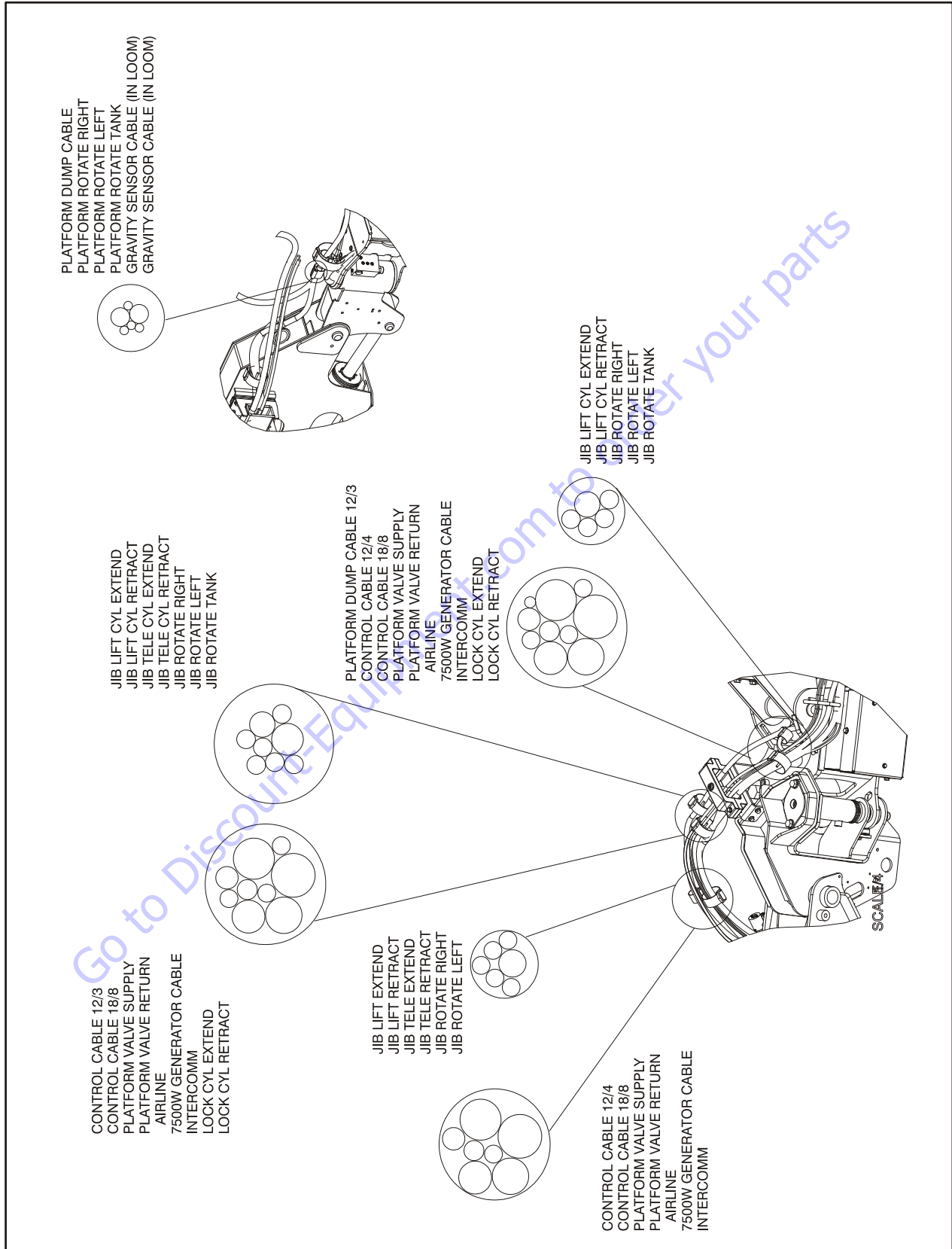


Figure 4-23. Powertrack Hosing - Sheet 2 of 3

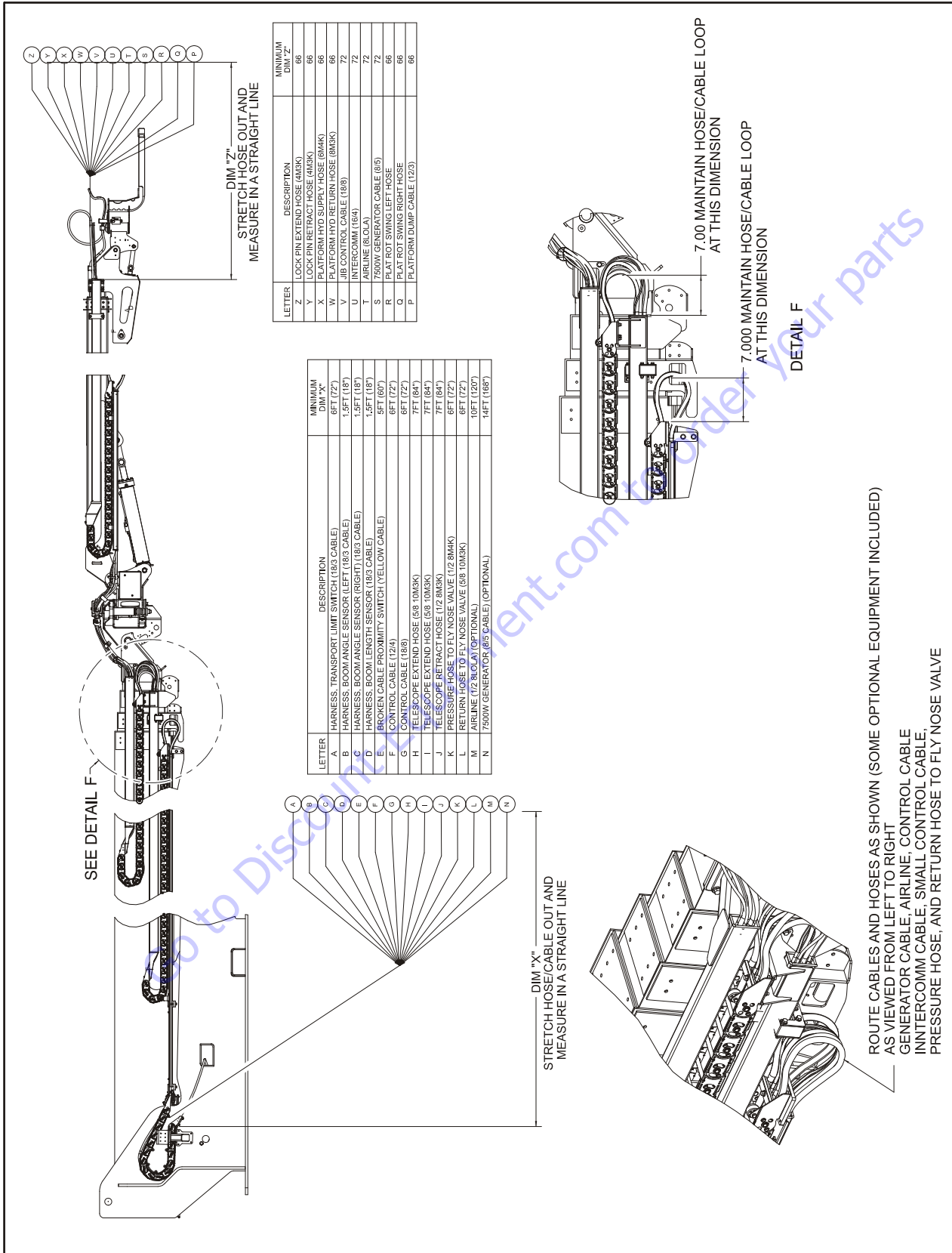
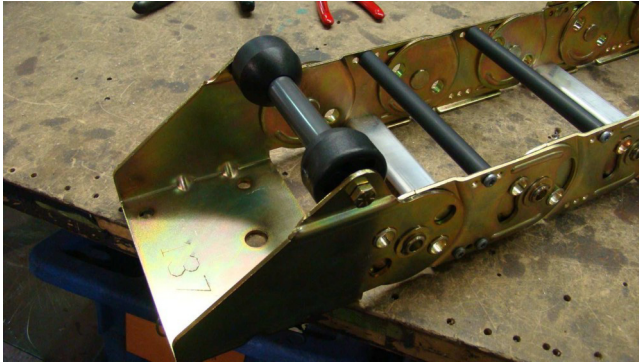


Figure 4-24. Powertrack Hosing - Sheet 3 of 3

4.16 POWERTRACK MAINTENANCE

One Piece Bracket Maintenance

1. Place the powertrack on a workbench.



2. Remove the screws from the bars on one side of the powertrack on the first link.



3. Remove the screws from the flat bar on the other side of the powertrack.



4. Pull up on the loose side of the round bar to allow the poly roller to slide off.

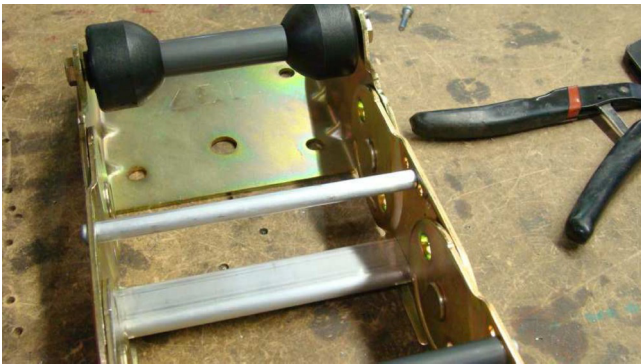
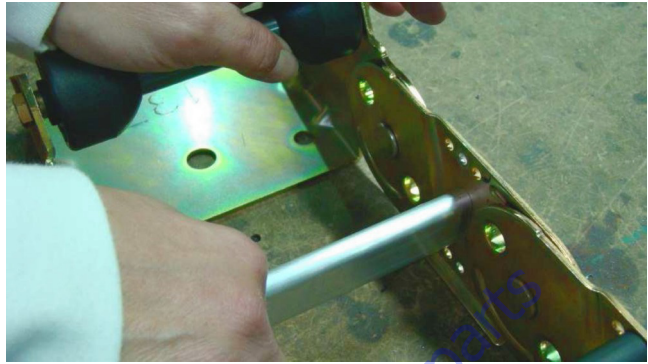


SECTION 4 - BOOM & PLATFORM

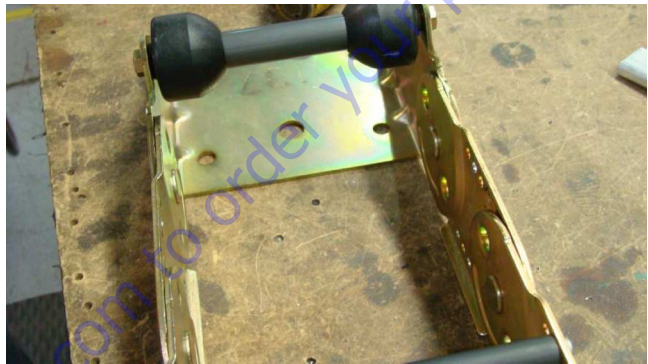
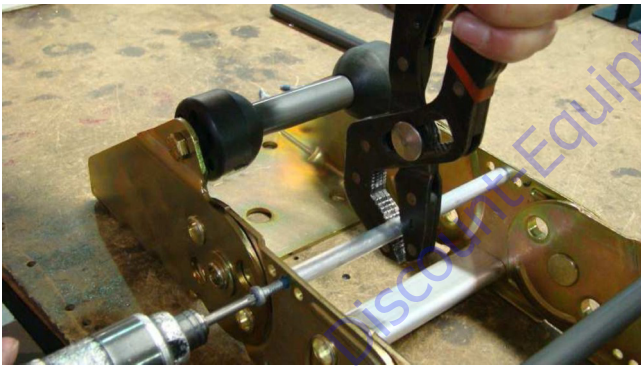
5. Slide the poly roller off of the round bar.



7. Slide the flat bar out.



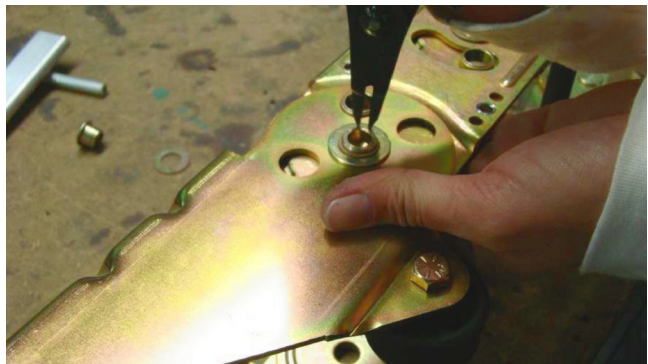
6. Hold the round bar to remove the other screw.



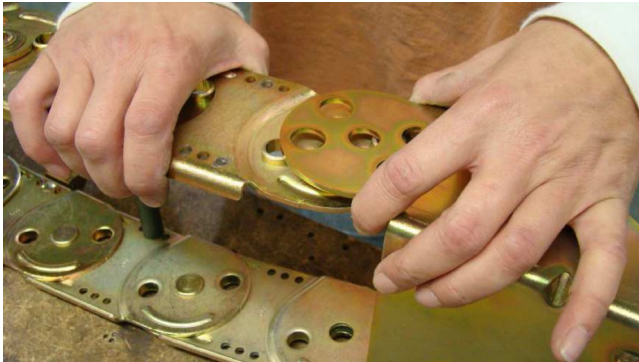
8. Remove the snap ring from one side of the bracket.



9. Remove the snap ring from the other side of the bracket.



10. Push down with slight pressure on the link and slide the bracket side up and over the extrusion on the link.



11. Repeat the previous step on the other side.

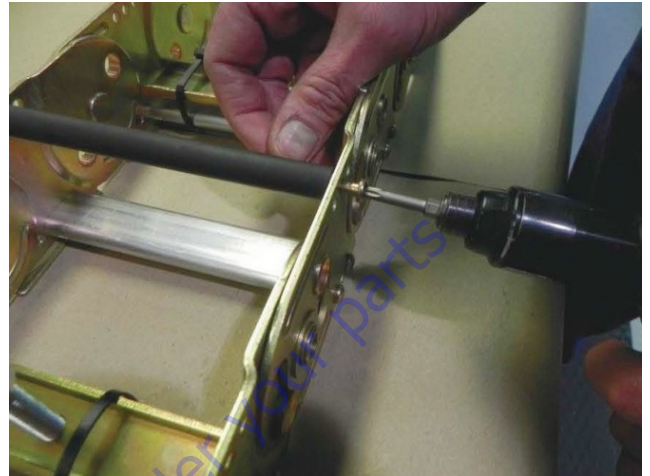


12. Slide the bracket off of the powertrack.



Two Piece Bracket Maintenance

1. Loosen the screw.



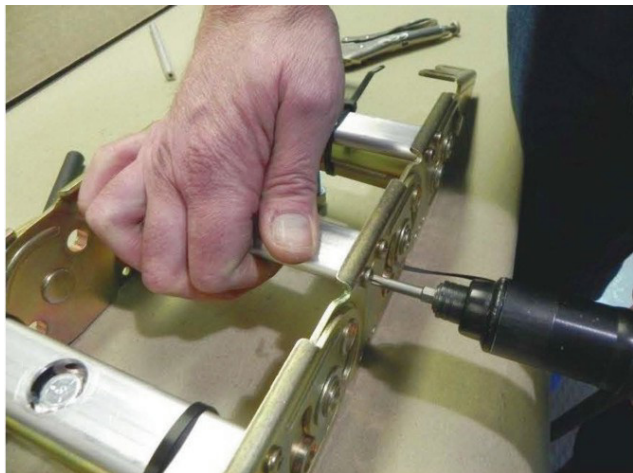
2. Slide the roller off the bar.



3. Hold the bar tightly and remove the other screw.



4. Hold the flat bar and remove the screws.



7. Slide the link out.



5. Remove the snap rings and pins.



6. Remove the screws from the bar. Remove the snap ring and pin.

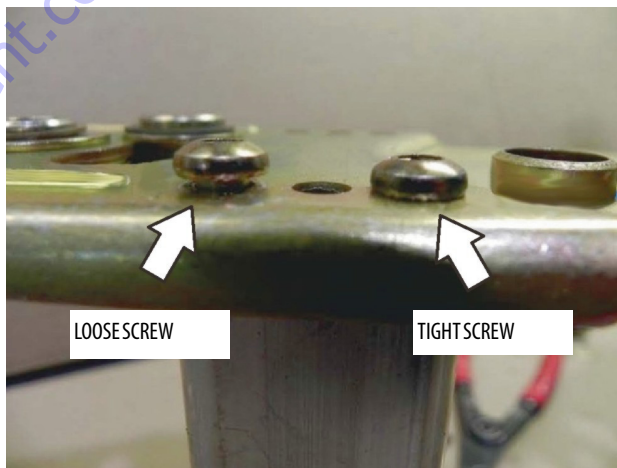


Snap Rings and Screws

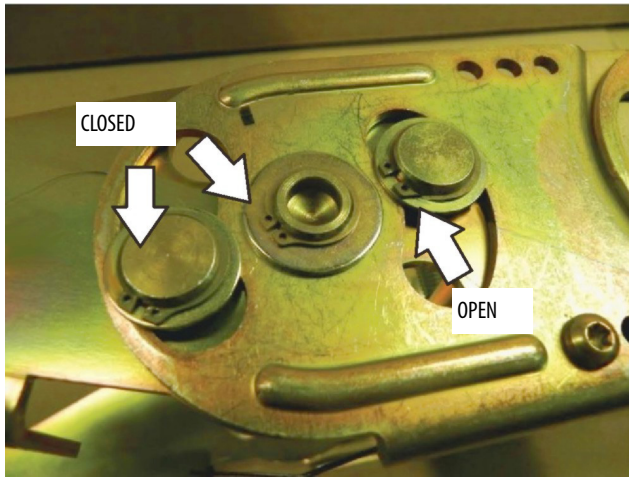
NOTICE

WHEN PERFORMING MAINTENANCE ON THE POWERTRACK, MAKE SURE TO DISCARD AND REPLACE ALL OLD SCREWS.

Make sure screws are tight and installed properly.



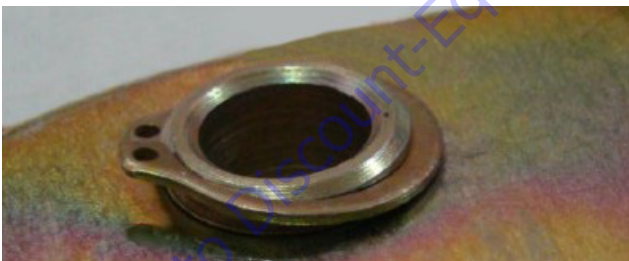
Make sure that all snap rings are closed and seated.



An open snap ring is shown below.



A snap ring that is not seated is shown below.



A seated and closed snap ring is shown below.



10-24 x 0.812 button torx socket head with blue locking patch:

- Tighten to 45-50 in.lbs. (5-5.6 Nm).
- Use T-25 torx bit.
- Do not reuse this screw. After removing replace with a new one.

4.17 WIRE ROPE

⚠ CAUTION

WIRE ROPE CAN HAVE SHARP EDGES AND CAUSE SERIOUS INJURY. NEVER HANDLE WIRE ROPE WITH BARE HANDS.

Each day before using the machine:

1. Raise the main boom to approximately horizontal.
2. Extend and retract the boom sections.
3. Check for delayed movement of the fly section, which indicates loose wire ropes.

⚠ WARNING

IF DELAYED MOVEMENT IS DETECTED IN WIRE ROPE OPERATION, LOWER PLATFORM TO STOWED POSITION, SHUT DOWN MACHINE, AND HAVE WIRE ROPES INSPECTED/SERVICED BY A QUALIFIED JLG MECHANIC. LOOSE OR MIS-ADJUSTED WIRE ROPES COULD RESULT IN SERIOUS INJURY OR DEATH.

Inspection

NOTE: The pictures in this paragraph are just samples to show the replacement criteria of the rope.

1. Inspect ropes for broken wires, particularly valley wire breaks and breaks at end terminations.

NOTE: Flexing a wire rope can often expose broken wires hidden in valleys between strands.

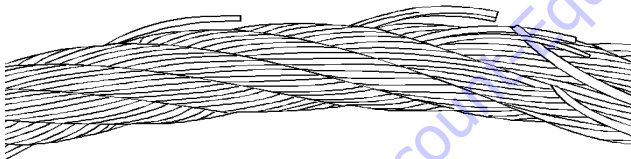


Figure 4-25. Wire Rope Wire Breaks

2. Inspect ropes for corrosion.
3. Inspect ropes for kinks or abuse

NOTE: A kink is caused by pulling down a loop in a slack line during improper handling, installation, or operation..

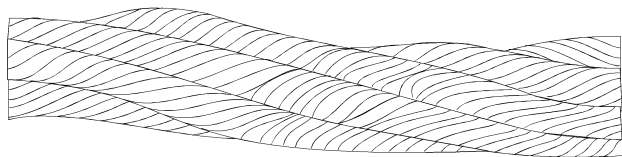


Figure 4-26. Wire Rope Kink

4. Inspect sheaves for condition of bearings/pins. (See Dimension Of Sheaves for proper dimension.)

5. Inspect sheaves for condition of flanges. (See Dimension Of Sheaves for proper dimension.)
6. Inspect sheaves with a groove wearout gauge for excessive wear.

NOTE: Check groove so that it may be clearly seen if gauge contour matches sheave groove contour.

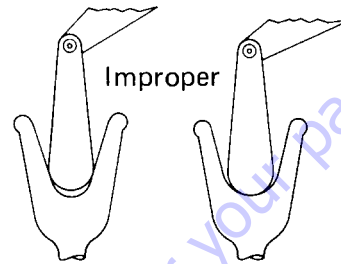


Figure 4-27. Sheave Groove Wear

7. Ropes passing inspection should be lubricated with wire rope lubricant before reassembly.

Three Month Inspection

1. Remove boom covers and visually (with flashlight) inspect the ropes for rust, broken wires, frays, abuse, or any signs of abnormalities.
2. Check rope tension by deflecting the ropes by hand properly tensioned ropes should have little or no movement.

Additional Inspection Required If:

- a. Machine is exposed to hostile environment or conditions.
- b. Erratic boom operation or unusual noise exists.
- c. Machine is idle for an extended period.
- d. Boom is overloaded or sustained a shock load.
- e. Boom exposed to electrical arc. Wires may be fused internally.

12 Year or 7000 Hour Replacement

1. Mandatory wire rope and sheave replacement.

Additional Replacement Criteria

1. Rusted or corroded wire ropes.
2. Kinked, "bird caged", or crushed ropes.
3. Ropes at end of adjustment range.
4. Sheaves failing wearout gage inspection.
5. Ropes with 6 total broken wires in one rope lay, 3 in one strand in one rope lay, 1 valley break, or 1 break at any end termination.

4.18 WIRE ROPE TENSIONING ADJUSTMENT

NOTICE

ANY TIME THE WIRE ROPE TENSIONING HAS BEEN ADJUSTED, BOOM CALIBRATION SHOULD BE PERFORMED IMMEDIATELY AFTERWARD.

Before adjusting wire rope tension, the boom sections must be in the proper position as shown in Figure 4-29., Wire Rope Tensioning. This is so the wire ropes are equalized on both sides of the sheaves and are seated properly in the sheave grooves. This is necessary for proper tensioning of the wire ropes.

This section covers the two major operations in tensioning the wire ropes which are as follows:

- Positioning the boom sections (so that proper tensioning can be achieved).
- Tensioning the wire rope.

Boom Section Re-Positioning

NOTE: Because the Outer Mid Boom is used to control the movement of the Fly Boom, any repositioning of the Outer Mid Boom section will also affect the position of the Fly Boom section. Correctly position the Outer Mid Boom before repositioning the Fly Boom.

NOTE: Use the Telescope function of the machine to position the boom sections. Do not use the wire rope adjustment nuts to position the booms. This may cause damage to the wire rope adjustment threads.

1. Ensure the machine is placed on firm, level ground.
2. Before making any adjustments, position the boom assembly in the fully retracted position.
3. Take preliminary measurements of the position of each boom section and compare them to Figure 4-29., Wire Rope Tensioning. If the measurements fall within the tolerances in the figure, proceed to Wire Rope Tensioning in this section.

NOTICE

PROPER BOOM POSITIONS DO NOT MEAN THAT THE WIRE ROPE TENSIONS ARE CORRECT.

If the measurements do not fall within the tolerances in Figure 4-29., Wire Rope Tensioning, adjust the booms using the re-positioning procedures that follow.

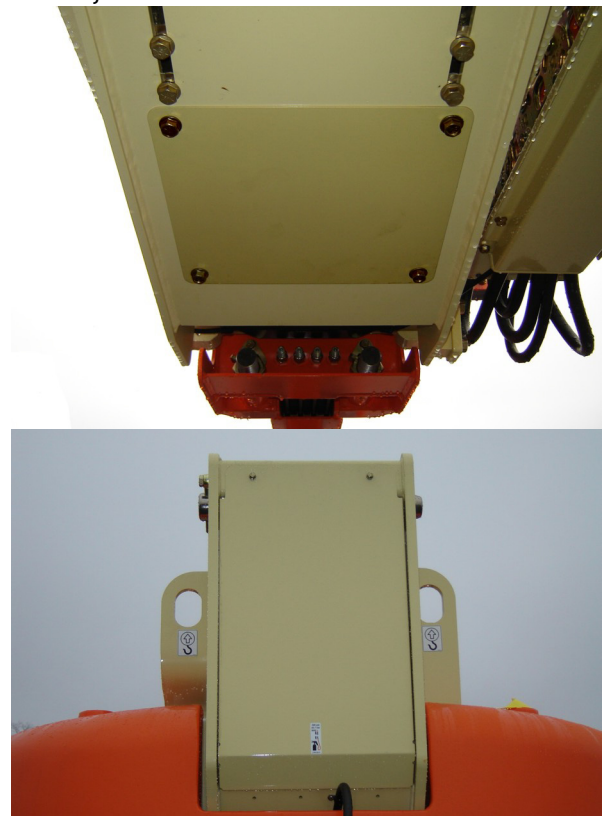
INNER MID BOOM SECTION REPOSITIONING

The inner mid section of the boom is positioned by the hydraulic cylinder. No adjustments can be made to this section. The wire ropes within the assembly only control the movement of the Outer Mid Boom and Fly Boom sections.

OUTER MID BOOM SECTION REPOSITIONING

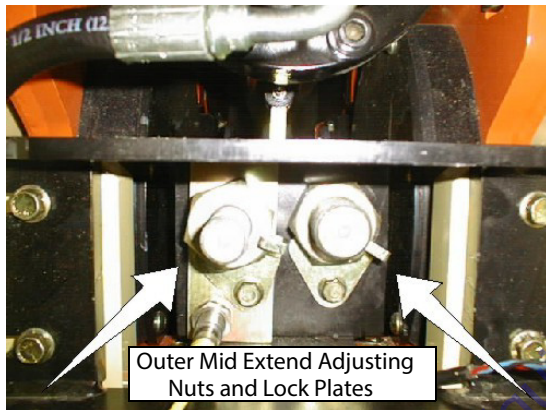
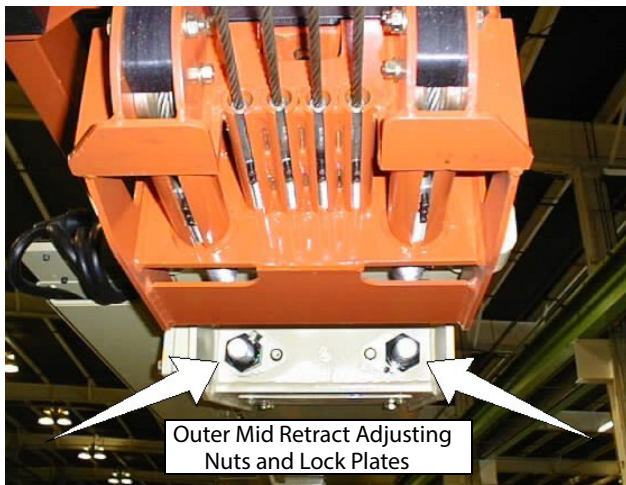
If the Outer Mid Boom falls within the dimension and tolerance of Figure 4-29., Wire Rope Tensioning, proceed to the Fly Boom Section Positioning procedure in this section. If the Outer Mid Boom section is outside of the tolerance as shown, perform the following procedure.

1. Extend the boom assembly so the platform moves 5 to 6 feet (1.5 to 1.8 m) from the fully retracted position.
2. Remove any covers necessary to access the wire rope adjustment nuts.



SECTION 4 - BOOM & PLATFORM

3. Remove the lock plates and nylon collar locknuts from the wire rope adjustment nuts.



4. If the Outer Mid Boom needs to be retracted:
 - a. Loosen the Outer Mid Boom Extend Adjustment Nuts by an amount equal to twice the distance the boom needs to move to be in tolerance.
 - b. Fully retract the boom.
 - c. To remove the slack caused by the previous step, tighten the Outer Mid Boom Extend Adjustment Nuts until they just contact the plate.
5. If the Outer Mid Boom needs to be extended out:
 - a. Loosen the Outer Mid Boom Retract Adjustment Nuts by an amount equal to twice the distance the boom needs to move to be in tolerance
 - b. Extend the boom 3-4 feet (1-1.5m).
 - c. To remove the slack caused by the previous step, tighten the Outer Mid Boom Retract Adjustment Nuts until they just contact the plate.
6. Fully retract the boom sections.

7. Verify that the exposed boom section dimensions meet the dimensions and tolerances of Figure 4-29., Wire Rope Tensioning.
 - a. If the Outer Mid Boom still does not fall within the dimension and tolerance of Figure 4-29., repeat the Outer Mid Boom positioning procedure.
 - b. If the Outer Mid Boom falls within the dimension and tolerance of Figure 4-29., proceed to the Fly Boom Section Positioning procedure in this section.

NOTE: Because the Outer Mid Boom is used to control the movement of the Fly Boom, any repositioning of the Outer Mid Boom Section will also affect the position of the Fly Boom section. After repositioning the Outer Mid Boom, always check the Fly Boom position per Figure 4-29.

FLY BOOM SECTION POSITIONING

If the Fly Boom section location and the Outer Mid Boom section location are both within the dimensions and tolerances in Figure 4-29., proceed to the Wire Rope Tensioning Procedure in this section.

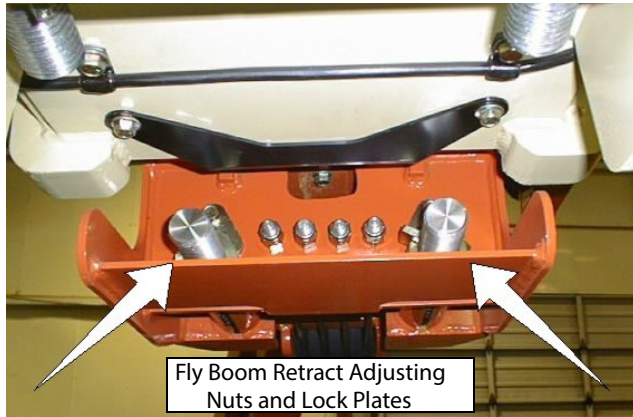
If the Fly Boom section is outside of the tolerance as shown in Figure 4-29. while the boom assembly is fully retracted, perform the following procedure:

1. Extend the boom assembly such that the platform moves 4 feet (1.3 m) from the fully retracted position.
2. Remove the lock plates and nylon collar locknuts from the wire rope adjustment nuts.
3. If the Fly Boom needs to be retracted farther in:
 - a. Loosen the Fly Boom Extend Adjustment Nuts by an amount equal to twice the distance the boom needs to move to be in tolerance.



- b. Fully retract the boom.
- c. To remove the slack caused by the previous step, tighten the Fly Boom Extend Adjustment Nuts until they just contact the plate.

4. If the Fly Boom needs extended:
 - a. Loosen the Fly Boom Retract Adjustment Nuts by an amount equal to twice the distance the boom needs to move to be in tolerance.



- b. Extend the boom 3-4 feet (1-1.5m).
 - c. To remove the slack caused by the previous step, tighten the Fly Boom Retract Adjustment Nuts until they just contact the plate.
 - d. Fully retract the boom sections.
5. Verify that the exposed boom section dimensions meet the dimensions and tolerances of Figure 4-29., Wire Rope Tensioning.
 - a. If the Fly Boom still does not fall within the dimension and tolerance of Figure 4-29., repeat the Fly Boom Section Repositioning procedure.
 - b. If the Fly Boom falls within the dimension and tolerance of Figure 4-29., proceed to the Wire Rope Tensioning Procedure.

Wire Rope Tensioning Procedure

NOTE: Verification of the rope tension should be determined by proper function of the boom assembly and by the dimensions and tolerances of Figure 4-29., Wire Rope Tensioning.

NOTICE

REPEAT WIRE ROPE TENSIONING PROCEDURE ONLY AS NECESSARY TO ACHIEVE PROPER TENSION.

NOTICE

IF THE BOOMS HAVE BEEN PROPERLY POSITIONED AND THERE IS NOT ENOUGH ADJUSTMENT REMAINING ON THE WIRE ROPES TO ACHIEVE TORQUE, THE SERVICE LIFE OF THE WIRE ROPES HAS BEEN CONSUMED. DO NOT PROCEED WITH THE REMAINDER OF THIS PROCEDURE. REPLACE THE WIRE ROPES AND SHEAVES.

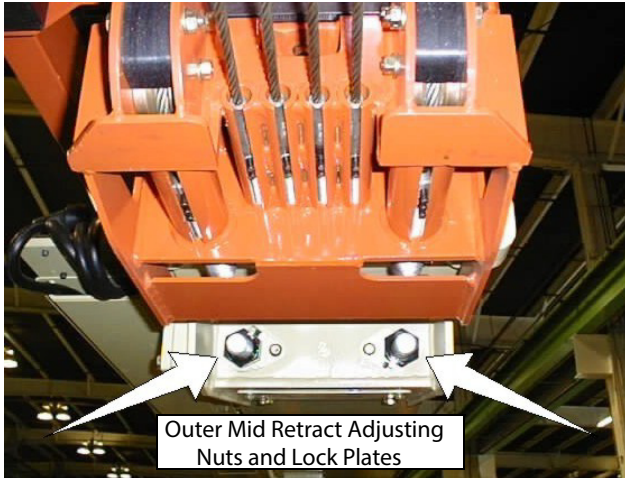
1. Remove any covers necessary to access the wire rope adjustment nuts.



2. If not already done, remove the lock plates and nylon collar locknuts from the wire rope adjustment nuts.
3. Position the boom so that it is horizontal within $\pm 5^\circ$. If the boom is below horizontal, ensure that the boom is not on the boom rest.
4. Extend the boom so the platform moves 4 feet (1.3 m) from the fully retracted position. This is done to position the boom so the ropes to be tensioned are not under load.
5. When extending the boom in the previous step, if the boom reaches the end of travel and then automatically retracts a small amount, the ropes may still be under load. If so, perform the following steps:
 - a. Note where the boom hits the end of stroke.
 - b. Retract 3-4 feet (1-1.3 m).
 - c. Extend the boom and stop just before the boom hits the end of stroke.

SECTION 4 - BOOM & PLATFORM

- Using tool JLG PN 4120043, torque the Outer Mid Boom Retract Adjustment Nuts to 80 ft-lb (108 Nm), alternating between the two ropes until both maintain the required torque.

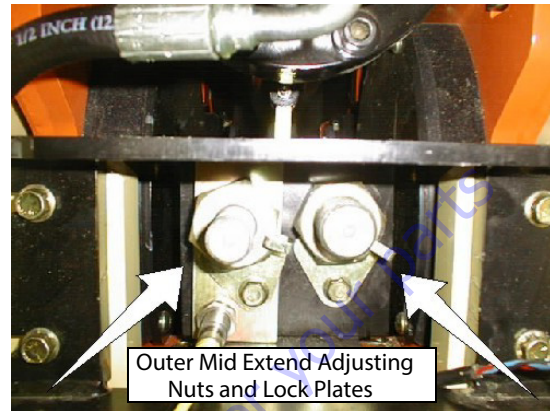


- Using tool JLG PN 4120043, torque the Fly Boom Retract Adjuster Nuts to 80 ft-lb (108 Nm), alternating between the two ropes until both maintain the required torque.



- Retract the boom 2-3 feet (0.6-1.0 m). Do not fully retract or bottom out the booms.

- Using tool JLG PN 4120043, torque the Outer Mid Boom Extend Adjustment Nuts to 80 ft-lb (108 Newton meters), alternating between the two ropes until both maintain the required torque.



- Using tool JLG PN 4120040, torque the Fly Extend Adjustment Nuts to 10 ft-lb (13.5 Nm), starting with the inside ropes and doing the outside ropes last. Refer to Figure 4-28., Torque Sequence for Fly Extend Rope. Alternate between the four ropes until all maintain the required torque.

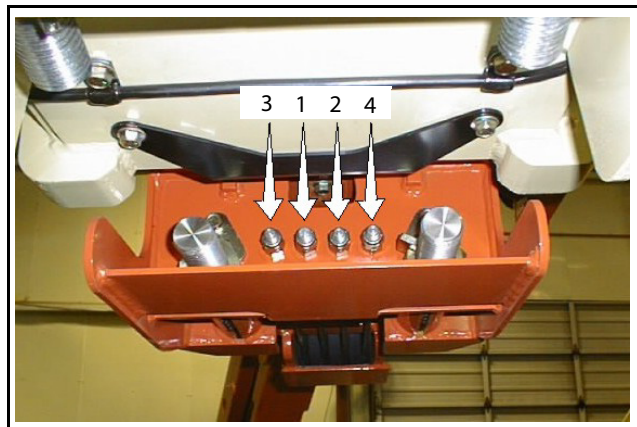


Figure 4-28. Torque Sequence for Fly Extend Rope

11. Repeat the following boom movement steps three times. This is to ensure that the wire rope tension has equalized on both sides of the sheaves and the ropes are seated properly in the sheave grooves.
 - a. Fully retract the boom.
 - b. Extend the boom such that the platform moves 4 feet (1.3 m) from fully retracted position.
12. Verify the Fly Boom and Outer Mid Boom Retract wire rope torques.
 - a. If the torque values are not correct, repeat the Wire Rope Tensioning procedure.
 - b. If the torque values are correct, proceed to the next step.
13. Retract the boom 2-3 feet (0.5-1 m). Do not fully retract or bottom out the boom.
14. Verify the Fly Boom and Outer Mid Boom Extend wire rope torques.
 - a. If the torque values are not correct, repeat the Wire Rope Tensioning procedure.
 - b. If the torque values are correct, proceed to the next step.
15. Check for proper function of the boom assembly. When properly torqued and positioned, all three moving boom sections will move simultaneously.
16. Install new nylon collar locknuts to the Fly Boom Extend wire rope fittings. Do not re-use the old nylon collar lock nuts. Torque the locknuts to 10 ft-lb (13.5 Nm)
17. Reinstall the lock plates to the remaining adjuster nuts.

18. Install all covers.



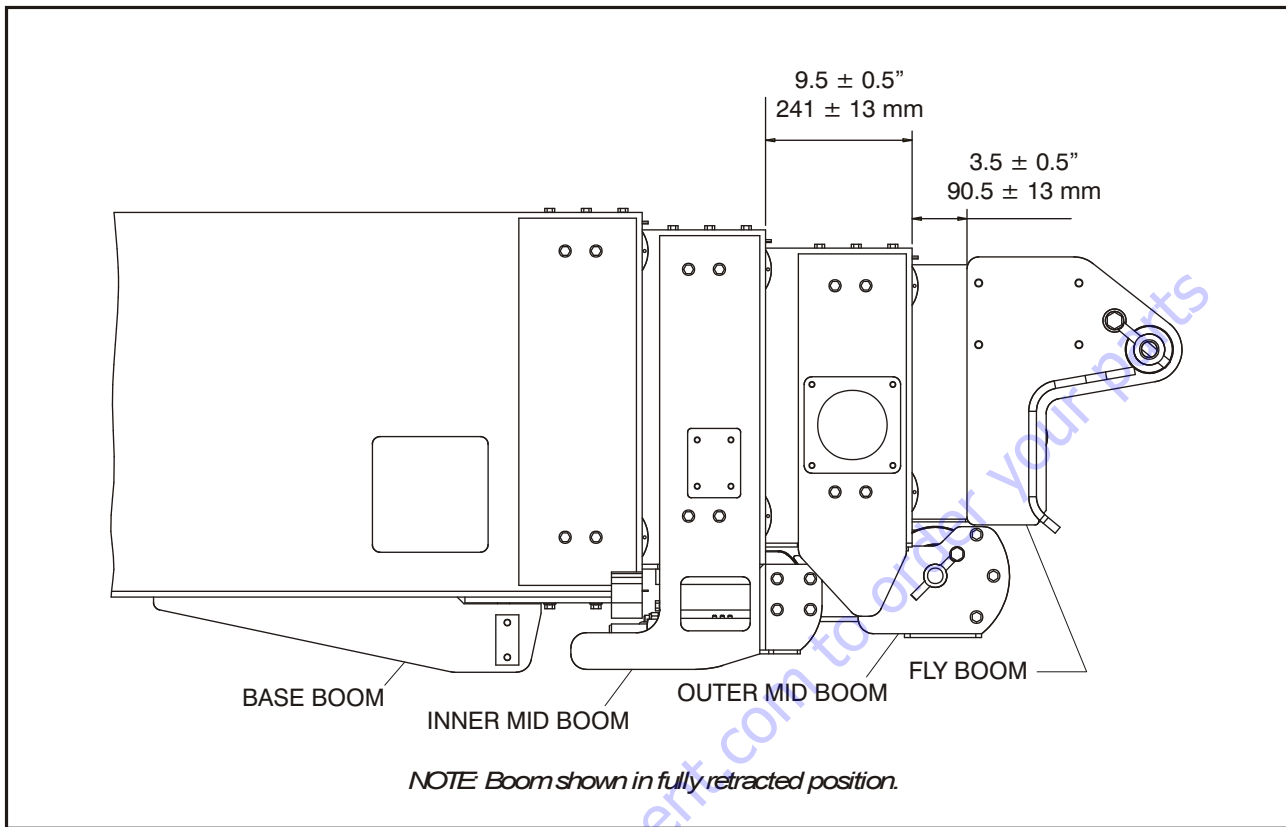


Figure 4-29. Wire Rope Tensioning

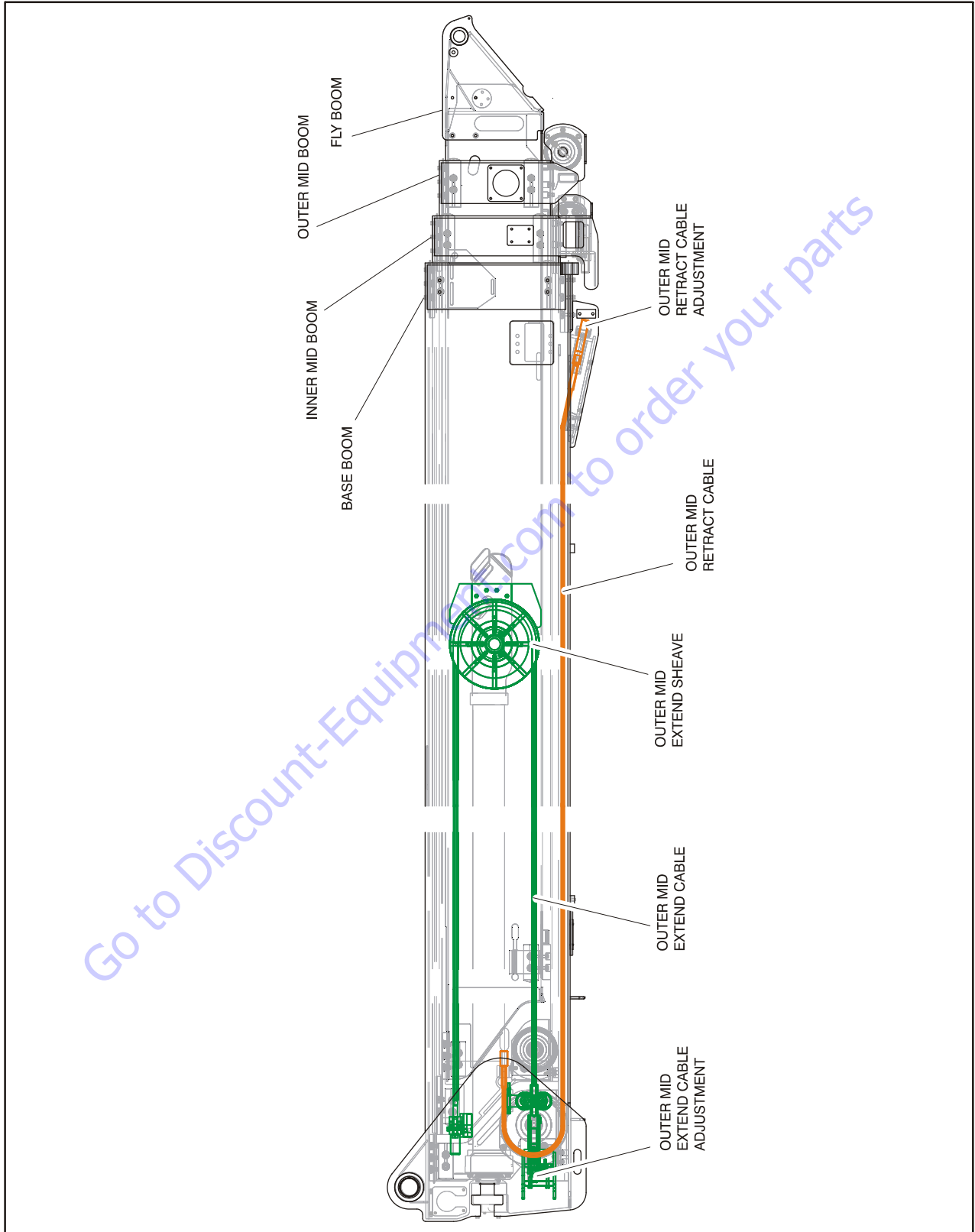


Figure 4-30. Outer Mid Boom Extend/Retract Cables