PRESSURE REGULATOR SECTION REMOVAL

1. Remove the EPR refer to EPR Removal Procedure.
2. Remove the six (6) regulator to voice coil screws using the special tool and separate the regulator from the actuator.

NOTICE

DO NOT REMOVE THE SECONDARY DIAPHRAGM RETAINING PLATE AND DIAPHRAGM THIS WILL VOID THE WARRANTY OF THE ACTUATOR SECTION.

PRESSURE REGULATOR SECTION INSTALLATION

1. Install the regulator to the actuator section using the six (6) retaining screws and tighten 70 in. lbs. (8 Nm).
2. Install the EPR refer to EPR Installation.

Temperature Manifold Absolute Pressure (TMAP) Sensor

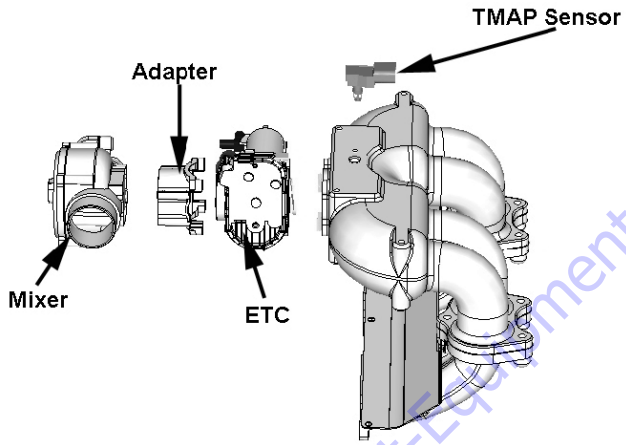


Figure 3-98. (TMAP) Sensor & Electronic Throttle Control (ETC)

REMOVAL

1. Disconnect the TMAP electrical connector.
2. Remove the two retaining bolts.
3. Remove the TMAP.

INSTALLATION

NOTE: *Apply a small amount of O-ring lubricant before installation.*

1. Install in the TMAP.
2. Tighten retaining bolts to 62 in. lbs. (7 Nm).

Start the vehicle and check for proper operation.

Electronic Throttle Control Replacement

See Figure 3-98.

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the air intake duct.
3. Release the hose clamp on the vapor fuel line and remove the vapor hose.
4. Disconnect the TMAP electrical connector.
5. Disconnect the electronic throttle control connector.
6. Remove the manifold to throttle body adapter bolts and remove the throttle body mixer assembly.
7. Pull the throttle body assembly from the adapter.
8. Remove electronic throttle control device.
9. Remove the o-rings gasket and discard.

INSTALLATION

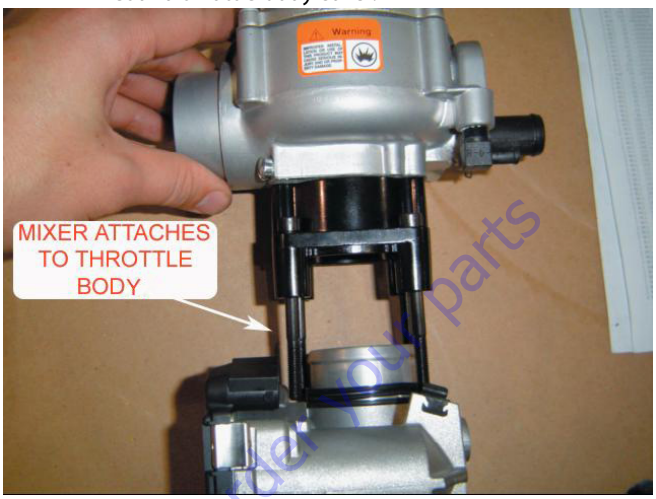
NOTICE

LIGHTLY LUBRICATE BOTH THROTTLE CONTROL DEVICE TO ADAPTER O-RINGS.

1. Install the o-ring on throttle body. Press it down to the bottom of the surface.

2. Install the two quad seals. Install one seal at a time to insure the seal does not roll. The seal must sit flat on the throttle body.

3. Attach mixer and throttle body together. The two parts do not bolt together; they will be secured when you mount it on the intake. Notice the orientation of the air inlet and throttle body cover.



4. Place gasket on intake manifold and attach mixer/throttle assembly to manifold.

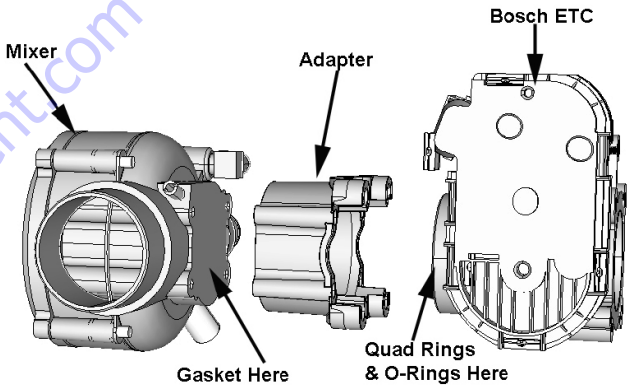


Figure 3-99. Mixer Assembly

Mixer Replacement

See Figure 3-99.

REMOVAL

1. Remove the throttle control device Refer to Electronic Throttle Body Replacement.
2. Remove the four (4) bolts to the throttle control device to mixer adapter bolts.
3. Remove and discard the mixer to adapter gasket.

INSTALLATION

NOTICE

COVER THROTTLE BODY ADAPTER OPENING TO PREVENT DEBRIS FROM ENTERING ENGINE UNTIL REASSEMBLY.

1. Install mixer to adapter gasket onto the mixer.
2. Install the mixer to the throttle control device to mixer adapter and secure with the 4 retaining screws. Tighten 80 in. lbs. (9 Nm).
3. Install throttle body. Refer to “Electronic Throttle Control Replacement”.
4. Start the engine and leak check all fittings and connections.

Coolant Hose Replacement

REMOVAL

1. Drain the coolant.
2. Using hose clamp pliers, disconnect both hose clamps on each hose.
3. Remove the hose from each of the fittings.

INSTALLATION

NOTE: *Use hose material and lengths specified by JLG.*

1. Install the hose clamps to each hose and set the clamp back on each hose to make installation easier.
2. Fit the hose to the fittings.
3. Secure by positioning each of the clamps.

Vapor Hose Replacement

REMOVAL

1. Using hose clamp pliers disconnect both hose clamps.
2. Remove the vapor hose from each fitting.

INSTALLATION

NOTICE

THE VAPOR SUPPLY HOSE IS SPECIFICALLY DESIGNED, DO NOT USE HOSE MATERIAL OR LENGTH OTHER THAN JLG SPECIFIED PARTS.

1. Install hose clamps and set back on each hose.
2. Reinstall the vapor hose to each fitting.
3. Reset clamps.
4. Start engine and check for leaks.

Engine Control Module Replacement

REMOVAL

1. Disconnect negative battery cable.
2. Remove controller from mounting bracket.
3. Push connector lock back to unlock connector.
4. Unplug controller and remove.

INSTALLATION

NOTICE

THE CONTROLLER IS CALIBRATED FOR EACH ENGINE VERIFY YOU HAVE THE CORRECT CONTROLLER

1. Plug connector into controller.
2. Push lock into place.
3. Mount controller into mounting bracket.
4. Reconnect the battery cable.
5. Start engine.
6. Check for any DTC codes and clear.
7. Verify engine is in closed loop and no warning lights are illuminated.

Heated Exhaust Gas Oxygen Sensor Replacement

REMOVAL

1. Disconnect negative battery cable.
2. Disconnect the O2 sensor electrical connector.
3. Using an O2 sensor socket, remove the O2 sensor and discard.

INSTALLATION

NOTICE

BEFORE INSTALL THE O2 SENSOR LUBRICATE THREADS WITH ANTI-SEIZE COMPOUND GM P/N 5613695 OR EQUIVALENT. AVOID GETTING COMPOUND ON THE SENSOR TIP.

1. Install O2 sensor. Tighten to 30 ft. lbs. (41 Nm).
2. Start engine.
3. Check for any DTC codes and clear.
4. Verify engine is in closed loop and no warning lights are illuminated.

3.26 GM ENGINE LPG FUEL SYSTEM DIAGNOSIS

Fuel System Description

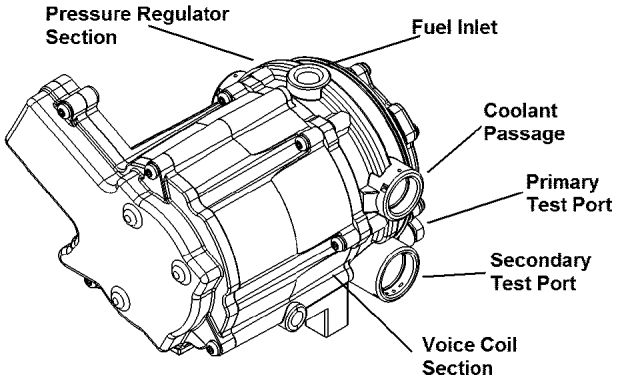


Figure 3-100. EPR Assembly

To maintain fuel and emission control on the LPG fuel system the Engine Control Units (ECM) relies on numerous engine sensor and output data from the Electronic Pressure Regulator (EPR). The ECM will then determine the target fuel calibration and command the EPR to reposition the voice coil to the proper position which, subsequently reposition the secondary lever in the pressure regulator to maintain proper control. The EPR and ECM will continue to communicate back and forth during normal operation.

In the event that the EPR fails to communicate or the Communications Area Network (CAN) cable fails to transmit data the regulator will operate in an open loop configuration. As the air valve vacuum in the mixer venturi is communicated to the secondary chamber of the regulator the secondary diaphragm will be drawn in a downwards motion. This downward motion will cause the secondary lever to open thus allowing more fuel to enter the mixer.

In the (LPR) the fuel is vaporized and the pressure reduced in two stages. The first stage reduces the pressure to approximately 1.0 to 3.0 psi (6.8 to 20.6 kPa). The second stage reduces the pressure to approximately negative 1.5 in. of water column.

The fuel is then drawn from the secondary chamber of the LPR by the vacuum generated by air flowing through the mixer. This vacuum signal is also used to generate lift for the mixer air valve. This vacuum signal is most commonly referred to as air valve vacuum. In the mixer, the fuel mixes with the air entering the engine. This air/ fuel mixture is then drawn into the engine for combustion.

Diagnostic Aids

This procedure is intended to diagnose a vehicle operating on LPG. If the vehicle will not continue to run on LPG, refer to Hard Start for preliminary checks. Before proceeding with this procedure, verify that the vehicle has a sufficient quantity of fuel and that liquid fuel is being delivered to the LPR. Also, ensure that the manual shut off valve on the LPG tank is fully opened and that the excess flow valve has not been activated.

Tools Required:

- 7/16 Open end wrench (for test port plugs).
- DVOM (GM J 39200, Fluke 88 or equivalent).
- 12 volt test light.

Diagnostic Scan Tool

- Diagnostic Display tool.

Pressure Gauges

- IMPCO ITK-2 Test kit.
- Water Column Gauge / Manometer (GM 7333-6 or equivalent).
- 0-10 PSI Gauge.

Test Description

The numbers below refer to step numbers on the diagnostic table.

5. This step determines if the LPR requires replacement.

6. This step determines if the problems are in the mechanical side of the Pressure Regulator or the Electronic Voice Coil.

10. This step determines if the Mixer requires replacement.

14. This step determines if the Lock Off requires replacement.

17. This step determines if the Fuel Filter requires replacement.

Table 3-11. LPG Fuel System Diagnosis

STEP	ACTION	VALUE(S)	YES	NO
1	Were you referred to this procedure by a DTC diagnostic chart?	--	Go to Step 3	Go to Step 2
2	Perform the On Board Diagnostic (OBD) System Check. Are any DTCs present in the ECM?	--	Go to the applicable DTC Table	Go to Step 3
3	Verify that the LPG fuel tank has a minimum of 1/4 tank of fuel, that the manual valve is open and the tank quick connect is fully engaged Does the vehicle have fuel?	--	Go to Step 4	--
4	1. Connect a water column gauge or a manometer to the secondary test port of the low pressure regulator (LPR). 2. Start the engine and allow it to reach operating temperature. Does the engine start and run?	--	Go to Step 5	Go to Step 8
5	With the engine idling, observe the pressure reading for the LPR secondary pressure. Does the fuel pressure fluctuate rhythmically OUTSIDE the specified range?	-1.0" to -2.0" w.c	Go to Step 25	Go to Step 6
6	1. Disconnect the EPR electrical connectors. NOTE: This action will cause a DTC to be set by the ECM 2. With the engine idling observe the pressure reading on the secondary test port. Is the fuel pressure WITHIN the specified range?	-1.0" to -2.0" w.c	Go to Fuel Control System Diagnosis	Go to Step 7
7	1. Inspect the air intake stream between the mixer assembly and the throttle body for leaks. 2. Inspect the fuel hose connection between the LPR and mixer assembly for damage or leakage. 3. Inspect any vacuum hoses for leaks Was a problem found and corrected?	--	Go to Step 26	Go to Step 22
8	1. Connect a water column gauge or a manometer to the secondary test port of the low pressure regulator (LPR). 2. Crank the engine and observe the pressure reading for the LPR secondary pressure. Does the fuel pressure indicate a vacuum is present?	--	Go to Step 12	Go to Step 9
9	1. Remove Air induction hose to the mixer 2. Observe the air valve for movement while the engine is cranking. Note: Movement of the air valve will be minimal at cranking speeds. Does the air valve move when the engine is cranked?	--	Go to Step 11	Go to Step 10
10	1. Inspect the air intake stream to the mixer assembly and the throttle body for vacuum leaks. 2. Inspect the vacuum hoses from the mixer for proper connection and condition. Was a problem found and repaired?	--	Go to Step 26	Go to Step 24
11	Inspect the fuel hose connection between the LPR and the mixer assembly for damage or leakage. Was a problem found and repaired?	--	Go to Step 26	Go to Step 12
12	1. Connect a 0-10 psi gauge to the primary test port of the low pressure regulator (LPR). 2. Crank the engine and observe the pressure reading for the LPR primary pressure. Is the fuel pressure ABOVE the specified value?	1-3 PSI	Go to Step 22	Go to Step 13
13	1. Turn OFF the ignition. 2. Disconnect the LPL connector. 3. Install a test light between the pins of the LPL connector. 4. Crank the engine. The test light should illuminate. Does the test light illuminate?	--	Go to Step 14	Go to Step 16
14	Using a DVOM, check the resistance of the low pressure lock-off (LPL). Is the resistance within the specified range?	12W - 16W	Go to Step 15	Go to Step 23

Table 3-11. LPG Fuel System Diagnosis

STEP	ACTION	VALUE(S)	YES	NO
15	1. Turn the ignition OFF. 2. Close the manual shut-off valve on the LPG tank. CAUTION: When disconnecting LPG fuel lines, liquid LPG may be present. Perform this step in a well ventilated area. 3. Loosen the fuel inlet hose fitting at the inlet of the LPL. Was fuel present when the fitting was loosened?	--	Go to Step 23	Go to Step 17
16	1. Turn OFF the ignition. 2. Connect the test light to chassis ground and probe pin A of the LPL connector. 3. Crank the engine. The test light should illuminate. Does the test light illuminate?	--	Go to Step 20	Go to Step 21
17	1. Remove the LPG fuel filter / LPL. 2. Remove the filter from the LPL. 3. Empty the contents of the inlet side of the LPG fuel filter onto a clean surface. 4. Inspect the contents of the LPG fuel filter for an excessive amount of foreign material or water. If necessary, locate and repair the source of contamination. 5. Verify the LPG fuel filter is not restricted or plugged. Was a problem found?	--	Go to Step 19	Go to Step 18
18	The fuel supply system or hoses are plugged or restricted, locate and repair the problem. Is the action complete?	--	Go to Step 26	--
19	Replace the fuel filter. Refer to Fuel Filter Replacement. Is the action complete?	--	Go to Step 26	--
20	Repair the open in the lock-off ground circuit. Is the action complete?	--	Go to Step 26	--
21	Repair the open in the lock-off power circuit. Is the action complete?	--	Go to Step 26	--
22	Replace the low pressure regulator (LPR). Refer to Low Pressure Regulator Replacement. Is the action complete?	--	Go to Step 26	--
23	Replace the lock-off. Refer to Lock-off Replacement. Is the action complete?	--	Go to Step 26	--
24	Replace the mixer assembly. Refer to Fuel Mixer Replacement. Is the action complete?	--	Go to Step 26	--
25	The fuel supply system is operating normally, if a failure of the control solenoids is suspected. Refer to Fuel Control System Diagnosis. 1. Install the test plug in the LPR secondary chamber. 2. If you were sent to this routine by another diagnostic chart, return to the previous diagnostic procedure. Is the action complete?	--	System OK	--
26	1. Disconnect all test equipment 2. Install the primary and secondary test port plugs. 3. Start the engine. 4. Using SNOOP or equivalent, leak check the test port plugs. Is the action complete?	--	System OK	--

Table 3-12. Symptom Diagnosis

Checks	Action
Important Preliminary Checks	
Before Using This Section	Before using this section, you should have performed On Board Diagnostic Check and determined that: 1. The Control Module and MIL (Malfunction Indicator Lamp) are operating correctly. 2. There are no Diagnostic Trouble Codes (DTCs) stored, or a DTC exists but without a MIL. Several of the following symptom procedures call for a careful visual and physical check. The visual and physical checks are very important. The checks can lead to correcting a problem without further checks that may save valuable time.
LPG Fuel System Check	1. Verify the customer complaint. 2. Locate the correct symptom table. 3. Check the items indicated under that symptom. 4. Operate the vehicle under the conditions the symptom occurs. Verify HEGO switching between lean and rich. **IMPORTANT! Normal HEGO switching indicates the LPG fuel system is in closed loop and operating correctly at that time.**
Visual and Physical Checks	[2] Check all ECM system fuses and circuit breakers. [2] Check the ECM ground for being clean, tight and in its proper location. [2] Check the vacuum hoses for splits, kinks and proper connections. [2] Check thoroughly for any type of leak or restriction. [2] Check for air leaks at all the mounting areas of the intake manifold sealing surfaces. [2] Check for proper installation of the mixer module assembly. [2] Check for air leaks at the mixer assembly. [2] Check the ignition wires for the following conditions: - Cracking - Hardness - Proper routing - Carbon tracking [2] Check the wiring for the following items: - Proper connections, pin. or cuts. [2] The following symptom tables contain groups of possible causes for each symptom. The order of these procedures is not important. If the scan tool readings do not indicate the problems, then proceed in a logical order, easiest to check or most likely to cause first.
Intermittent	
DEFINITION: The problem may or may not turn ON the Malfunction Indicator Lamp (MIL) or store a Diagnostic Trouble Code (DTC).	
Preliminary Checks	[2] Refer to Important Preliminary Checks. [2] Do not use the DTC tables. If a fault is an intermittent, the use of the DTC tables may result in the replacement of good parts.
Faulty Electrical Connections or Wiring	[2] Faulty electrical connections or wiring can cause most intermittent problems. [2] Check the suspected circuit for the following conditions: - Faulty fuse or circuit breaker - Connectors poorly mated - Terminals not fully seated in the connector (backed out) - Terminals not properly formed or damaged - Terminal to wires poorly connected - Terminal tension insufficient. [2] Carefully remove all the connector terminals in the problem circuit in order to ensure the proper contact tension. If necessary, replace all the connector terminals in the problem circuit in order to ensure the proper contact tension. [2] Checking for poor terminal to wire connections requires removing the terminal from the connector body.
Operational Test	If a visual and physical check does not locate the cause of the problem, drive the vehicle with a scan tool. When the problem occurs, an abnormal voltage or scan reading indicates the problem may be in that circuit.

Table 3-12. Symptom Diagnosis

Checks	Action
Intermittent Malfunction Indicator Lamp (MIL)	The following components can cause intermittent MIL and no DTC(s): [2] A defective relay, Control Module driven solenoid, or a switch that can cause electrical system interference. Normally, the problem will occur when the faulty component is operating. [2] The improper installation of electrical devices, such as lights, 2-way radios, electric motors, etc. [2] The ignition secondary voltage shorted to a ground. [2] The Malfunction Indicator Lamp (MIL) circuit or the Diagnostic Test Terminal intermittently shorted to ground. [2] The Control Module grounds.
Loss of DTC Memory	To check for the loss of the DTC Memory: 1. Disconnect the TMAP sensor. 2. Idle the engine until the Malfunction Indicator Lamp illuminates. The ECM should store a TMAP DTC. The TMAP DTC should remain in the memory when the ignition is turned OFF. If the TMAP DTC does not store and remain, the ECM is faulty
Additional Checks	
No Start	
DEFINITION: The engine cranks OK, but does not start.	
Preliminary Checks	Refer to Important Preliminary Checks.
Control Module Checks	If a scan tool is available: [2] Check for proper communication with both the ECM [2] Check the fuse in the ECM battery power circuit. Refer to Engine Controls Schematics. [2] Check battery power, ignition power and ground circuits to the ECM. Refer to Engine Control Schematics. Verify voltage and/or continuity for each circuit.
Sensor Checks	[2] Check the TMAP sensor. [2] Check the Magnetic pickup sensor (RPM).
Fuel System Checks	**Important:** A closed LPG manual fuel shut off valve will create a no start condition. [2] Check for air intake system leakage between the mixer and the throttle body. [2] Verify proper operation of the low pressure lock-off solenoids. [2] Check the fuel system pressures. Refer to the LPG Fuel System Diagnosis. [2] Check for proper mixer air valve operation.
Ignition System Checks	Note: LPG being a gaseous fuel requires higher secondary ignition system voltages for the equivalent gasoline operating conditions. [2] Check for the proper ignition voltage output with J 26792 or the equivalent. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check the spark plugs for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits [2] Check for bare or shorted ignition wires. [2] Check for loose ignition coil connections at the coil.
Engine Mechanical Checks	**Important:** The LPG Fuel system works on a fumigation principle of fuel introduction and is more sensitive to intake manifold leakage than the gasoline fuel supply system. [2] Check for the following: - Vacuum leaks - Improper valve timing - Low compression - Bent pushrods - Worn rocker arms - Broken or weak valve springs - Worn camshaft lobes.

Table 3-12. Symptom Diagnosis

Checks	Action
Exhaust System Checks	[2] Check the exhaust system for a possible restriction: - Inspect the exhaust system for damaged or collapsed pipes - Inspect the muffler for signs of heat distress or for possible internal failure. [2] Check for possible plugged catalytic converter. Refer to Restricted Exhaust System Diagnosis
Hard Start	
DEFINITION: The engine cranks OK, but does not start for a long time. The engine does eventually run, or may start but immediately dies.	
Preliminary Checks	[2] Refer to Important Preliminary Checks. [2] Make sure the vehicle's operator is using the correct starting procedure.
Sensor Checks	[2] Check the Engine Coolant Temperature sensor with the scan tool. Compare the engine coolant temperature with the ambient air temperature on a cold engine. IF the coolant temperature reading is more than 5 degrees greater or less than the ambient air temperature on a cold engine, check for high resistance in the coolant sensor circuit. Refer to DTC 111 [2] Check the Crankshaft Position (CKP) sensor. [2] Check the Throttle position (TPS) sensor.
Fuel System Checks	Important: A closed LPG manual fuel shut off valve will create an extended crank OR no start condition. [2] Verify the excess flow valve in the LPG manual shut-off valve is not tripped. [2] Check mixer module assembly for proper installation and leakage. [2] Verify proper operation of the low pressure lock-off solenoids. [2] Verify proper operation of the EPR [2] Check for air intake system leakage between the mixer and the throttle body. [2] Check the fuel system pressures. Refer to the Fuel System Diagnosis.
Ignition System Checks	Note: LPG being a gaseous fuel requires higher secondary ignition system voltages for the equivalent gasoline operating conditions. [2] Check for the proper ignition voltage output with J 26792 or the equivalent. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check the spark plugs for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits [2] Check for bare or shorted ignition wires. [2] Check for moisture in the distributor cap if applicable. [2] Check for loose ignition coil connections. **Important:** 1. If the engine starts but then immediately stalls, Check the Crankshaft Position (CKP). 2. Check for improper gap, debris or faulty connections.
Engine Mechanical Checks	Important: The LPG Fuel system works on a fumigation principle of fuel introduction and is more sensitive to intake manifold leakage than the gasoline fuel supply system. [2] Check for the following: - Vacuum leaks - Improper valve timing - Low compression - Bent pushrods - Worn rocker arms - Broken or weak valve springs - Worn camshaft lobes. [2] Check the intake and exhaust manifolds for casting flash.
Exhaust System Checks	[2] Check the exhaust system for a possible restriction: - Inspect the exhaust system for damaged or collapsed pipes - Inspect the muffler for signs of heat distress or for possible internal failure. [2] Check for possible plugged catalytic converter. Refer to Restricted Exhaust System Diagnosis or Exhaust System in the GM Base Engine Service Manual

Table 3-12. Symptom Diagnosis

Checks	Action
Additional Checks	
Cuts Out, Misses	
DEFINITION: A surging or jerking that follows engine speed, usually more pronounced as the engine load increases which is not normally felt above 1500 RPM. The exhaust has a steady spitting sound at idle, low speed, or hard acceleration for the fuel starvation that can cause the engine to cut-out.	
Preliminary Checks	[2] Refer to Important Preliminary Checks.
Ignition System Checks	[2] Start the engine. [2] Wet down the secondary ignition system with water from a spray bottle, and look/listen for arcing or misfiring as you apply water. [2] Check for proper ignition output voltage with spark tester J 26792. [2] Check for a cylinder misfire. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Remove the spark plugs in these cylinders and check for the following conditions: [2] Insulation cracks [2] Wear [2] Improper gap [2] Burned electrodes [2] Heavy deposits [2] Visually/Physically inspect the secondary ignition for the following: [2] Ignition wires for arcing, cross-firing and proper routing [2] Ignition coils for cracks or carbon tracking
Engine Mechanical Checks	[2] Perform a cylinder compression check. [2] Check the engine for the following: - Improper valve timing - Bent pushrods - Worn rocker arms - Worn camshaft lobes. - Broken or weak valve springs. [2] Check the intake and exhaust manifold passages for casting flash.
Fuel System Checks	[2] Check the fuel system - plugged fuel filter, low fuel pressure, etc. Refer to LPG Fuel System Diagnosis. [2] Check the condition of the wiring to the low pressure lock-off solenoid.
Additional Check	Check for Electromagnetic Interference (EMI). [2] EMI on the reference circuit can cause a missing condition. [2] Monitoring the engine RPM with a scan tool can detect an EMI. [2] A sudden increase in the RPM with little change in the actual engine RPM, indicates EMI is present. [2] If the problem exists, check the routing of the secondary wires and the ground circuit.
Hesitation, Sag, Stumble	
DEFINITION: The vehicle has a momentary lack of response when depressing the accelerator. The condition can occur at any vehicle speed. The condition may cause the engine to stall if it's severe enough.	
Preliminary Checks	Refer to Important Preliminary Checks.
Fuel System Checks	[2] Check the fuel pressure. Refer to LPG Fuel System Diagnosis. [2] Check for low fuel pressure during a moderate or full throttle acceleration. If the fuel pressure drops below specification, there is possibly a faulty low pressure regulator or a restriction in the fuel system. [2] Check the Manifold Absolute Pressure (MAP) sensor response and accuracy. [2] Check LPL electrical connection [2] Check the mixer air valve for sticking or binding. [2] Check the mixer module assembly for proper installation and leakage. [2] Check the EPR electrical connections.

Table 3-12. Symptom Diagnosis

Checks	Action
Ignition System Checks	Note: LPG being a gaseous fuel requires higher secondary ignition system voltages for the equivalent gasoline operating conditions. If a problem is reported on LPG and not gasoline, do not discount the possibility of a LPG only ignition system failure and test the system accordingly. [2] Check for the proper ignition voltage output with J 26792 or the equivalent. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check for faulty spark plug wires [2] Check for fouled spark plugs.
Additional Check	[2] Check for manifold vacuum or air induction system leaks [2] Check the generator output voltage.
Backfire	
DEFINITION: The fuel ignites in the intake manifold, or in the exhaust system, making a loud popping noise.	
Preliminary Check	[2] Refer to Important Preliminary Checks.
Ignition System Checks	**Important! LPG, being a gaseous fuel, requires higher secondary ignition system voltages for the equivalent gasoline operating conditions. The ignition system must be maintained in peak condition to prevent backfire.** [2] Check for the proper ignition coil output voltage using the spark tester J26792 or the equivalent. [2] Check the spark plug wires by connecting an ohmmeter to the ends of each wire in question. If the meter reads over 30,000 ohms, replace the wires. [2] Check the connection at each ignition coil. [2] Check for deteriorated spark plug wire insulation. [2] Check the spark plugs. The correct spark plugs for LPG are (R42LTS) [2] Remove the plugs and inspect them for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits
Engine Mechanical Check	Important! The LPG Fuel system works on a fumigation principle of fuel introduction and is more sensitive to intake manifold leakage than a gasoline fuel supply system. [2] Check the engine for the following: - Improper valve timing - Engine compression - Manifold vacuum leaks - Intake manifold gaskets - Sticking or leaking valves - Exhaust system leakage [2] Check the intake and exhaust system for casting flash or other restrictions.
Fuel System Checks	[2] Perform a fuel system diagnosis. Refer to LPG Fuel System Diagnosis.
Lack of Power, Sluggishness, or Sponginess	
DEFINITION: The engine delivers less than expected power. There is little or no increase in speed when partially applying the accelerator pedal.	
Preliminary Checks	[2] Refer to Important Preliminary Checks. [2] Refer to the LPG Fuel system OBD System Check [2] Compare the customer's vehicle with a similar unit. Make sure the customer has an actual problem. Do not compare the power output of the vehicle operating on LPG to a vehicle operating on gasoline as the fuels do have different drive feel characteristics [2] Remove the air filter and check for dirt or restriction. [2] Check the vehicle transmission Refer to the OEM transmission diagnostics.

Table 3-12. Symptom Diagnosis

Checks	Action
Fuel System Checks	[2] Check for a restricted fuel filter, contaminated fuel, or improper fuel pressure. Refer to LPG Fuel System Diagnosis. [2] Check for the proper ignition output voltage with the spark tester J 26792 or the equivalent. [2] Check for proper installation of the mixer module assembly. [2] Check all air inlet ducts for condition and proper installation. [2] Check for fuel leaks between the LPR and the mixer. [2] Verify that the LPG tank manual shut-off valve is fully open. [2] Verify that liquid fuel (not vapor) is being delivered to the LPR.
Sensor Checks	[2] Check the Heated Exhaust Gas Oxygen Sensor (HEGO) for contamination and performance. Check for proper operation of the MAP sensor. [2] Check for proper operation of the TPS sensor.
Exhaust System Checks	[2] Check the exhaust system for a possible restriction: - Inspect the exhaust system for damaged or collapsed pipes - Inspect the muffler for signs of heat distress or for possible internal failure. - Check for possible plugged catalytic converter.
Engine Mechanical Check	Check the engine for the following: [2] Engine compression [2] Valve timing [2] Improper or worn camshaft. Refer to Engine Mechanical in the Service Manual.
Additional Check	[2] Check the ECM grounds for being clean, tight, and in their proper locations. [2] Check the generator output voltage. [2] If all procedures have been completed and no malfunction has been found, review and inspect the following items: [2] Visually and physically, inspect all electrical connections within the suspected circuit and/or systems. [2] Check the scan tool data.
Poor Fuel Economy	
DEFINITION: Fuel economy, as measured by refueling records, is noticeably lower than expected. Also, the economy is noticeably lower than it was on this vehicle at one time, as previously shown by an by refueling records.	
Preliminary Checks	[2] Refer to Important Preliminary Checks. [2] Check the air cleaner element (filter) for dirt or being plugged. [2] Visually (Physically) check the vacuum hoses for splits, kinks, and proper connections. [2] Check the operators driving habits for the following items: - Is there excessive idling or stop and go driving? - Are the tires at the correct air pressure? - Are excessively heavy loads being carried? - Is their often rapid acceleration? [2] Suggest to the owner to fill the fuel tank and to recheck the fuel economy. [2] Suggest that a different operator use the equipment and record the results.
Fuel System Checks	[2] Check the LPR fuel pressure. Refer to LPG Fuel System Diagnosis. [2] Check the fuel system for leakage.
Sensor Checks	[2] Check the Temperature Manifold Absolute Pressure (TMAP) sensor.
Ignition System Checks	[2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check the spark plugs. Remove the plugs and inspect them for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits [2] Check the ignition wires for the following items: - Cracking - Hardness - Proper connections
Cooling System Checks	[2] Check the engine thermostat for always being open or for the wrong heat range

Table 3-12. Symptom Diagnosis

Checks	Action
Additional Check	[2] Check the transmission shift pattern. Refer to the OEM Transmission Controls section the Service Manual. [2] Check for dragging brakes.
Rough, Unstable, or Incorrect Idle, Stalling	
DEFINITION: The engine runs unevenly at idle. If severe enough, the engine or vehicle may shake. The engine idle speed may vary in RPM. Either condition may be severe enough to stall the engine.	
Preliminary Check	Refer to Important Preliminary Checks.
Sensor Checks	[2] Check for silicon contamination from fuel or improperly used sealant. The sensor will have a white powdery coating. The sensor will result in a high but false signal voltage (rich exhaust indication). The ECM will reduce the amount of fuel delivered to the engine causing a severe drive-ability problem. [2] Check the Heated Exhaust Gas Oxygen Sensor (HEGO) performance: [2] Check the Temperature Manifold Absolute Pressure (TMAP) sensor response and accuracy.
Fuel System Checks	[2] Check for rich or lean symptom that causes the condition. Drive the vehicle at the speed of the complaint. Monitoring the oxygen sensors will help identify the problem. [2] Check for a sticking mixer air valve. [2] Verify proper operation of the EPR. [2] Perform a cylinder compression test. Refer to Engine Mechanical in the Service Manual. [2] Check the LPR fuel pressure. Refer to the LPG Fuel System Diagnosis. [2] Check mixer module assembly for proper installation and connection.
Ignition System Checks	[2] Check for the proper ignition output voltage using the spark tester J26792 or the equivalent. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check the spark plugs. Remove the plugs and inspect them for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Blistered insulators - Heavy deposits [2] Check the spark plug wires by connecting an ohmmeter to the ends of each wire in question. If the meter reads over 30,000 ohms, replace the wires.
Additional Checks	**Important:** The LPG Fuel system works on a fumigation principle of fuel introduction and is more sensitive to intake manifold leakage than the gasoline fuel supply system. [2] Check for vacuum leaks. Vacuum leaks can cause a higher than normal idle and low throttle angle control command. [2] Check the ECM grounds for being clean, tight, and in their proper locations. [2] Check the battery cables and ground straps. They should be clean and secure. Erratic voltage may cause all sensor readings to be skewed resulting in poor idle quality.
Engine Mechanical Check	[2] Check the engine for the following: - Broken motor mounts - Improper valve timing - Low compression - Bent pushrods - Worn rocker arms - Broken or weak valve springs - Worn camshaft lobes
Surges/Chuggles	
DEFINITION: The engine has a power variation under a steady throttle or cruise. The vehicle feels as if it speeds up and slows down with no change in the accelerator pedal.	
Preliminary Checks	Refer to Important Preliminary Checks.
Sensor Checks	[2] Check Heated Exhaust Gas Oxygen Sensor (HEGO) performance.

Table 3-12. Symptom Diagnosis

Checks	Action
Fuel System Checks	[2] Check for Rich or Lean symptom that causes the condition. Drive the vehicle at the speed of the complaint. Monitoring the oxygen sensors will help identify the problem. [2] Check the fuel pressure while the condition exists. Refer to LPG Fuel System Diagnosis. [2] Verify proper fuel control solenoid operation. [2] Verify that the LPG manual shut-off valve is fully open. [2] Check the in-line fuel filter for restrictions.
Ignition System Checks	[2] Check for the proper ignition output voltage using the spark tester J26792 or the equivalent. [2] Verify that the spark plugs are correct for use with LPG (R42LTS) [2] Check the spark plugs. Remove the plugs and inspect them for the following conditions: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits - Check the Crankshaft Position (CKP) sensor.
Additional Check	[2] Check the ECM grounds for being clean, tight, and in their proper locations. [2] Check the generator output voltage. [2] Check the vacuum hoses for kinks or leaks. [2] Check Transmission

Table 3-13. DTC to SPN/FMI Cross Reference Chart

DTC	Description	SPN Code	FMI Code
16	Crank Never Synced at Start	636	8
91	Fuel Pump Low Voltage	5294	4
92	Fuel Pump High Voltage	94	3
107	MAP Low Voltage	106	4
108	MAP High Pressure	106	16
111	IAT Higher Than Expected 1	105	15
112	IAT Low Voltage	105	4
113	IAT High Voltage	105	3
116	ECT Higher Than Expected 1	110	15
117	ECT Low Voltage	110	4
118	ECT High Voltage	110	3
121	TPS 1 Lower Than TPS 2	51	1
122	TPS 1 Signal Voltage Low	51	4
123	TPS 1 Signal Voltage High	51	3
127	IAT Higher Than Expected 2	105	0
129	BP Low Pressure	108	1
134	EGO 1 Open/Inactive	724	10
154	EGO 2 Open/Inactive	520208	10
171	Adaptive Learn High Gasoline	520200	0
172	Adaptive Learn Low Gasoline	520200	1
182	Fuel Temp Gasoline Low Voltage	174	4
183	Fuel Temp Gasoline High Voltage	174	3
187	Fuel Temp LPG Low Voltage	520240	4
188	Fuel Temp LPG High Voltage	520240	3
217	ECT Higher Than Expected 2	110	0
219	Max Govern Speed Override	515	15
221	TPS 2 Signal Voltage Low	51	0
222	TPS 2 Signal Low Voltage	520251	4
223	TPS 2 Signal High Voltage	520251	3
261	Injector Driver 1 Open	651	5
262	Injector Driver 1 Shorted	651	6
264	Injector Driver 2 Open	652	5
265	Injector Driver 2 Shorted	652	6
267	Injector Driver 3 Open	653	5
268	Injector Driver 3 Shorted	653	6
270	Injector Driver 4 Open	654	5
271	Injector Driver 4 Shorted	654	6
336	Crank Sync Noise	636	2
337	Crank Loss	636	4
341	Cam Sync Noise	723	2
342	Cam Sensor Loss	723	4
420	Gasoline Cat Monitor	520211	10
524	Oil Pressure Low	100	1

Table 3-13. DTC to SPN/FMI Cross Reference Chart

DTC	Description	SPN Code	FMI Code
562	System Voltage Low	168	17
563	System Voltage High	168	15
601	Flash Checksum Invalid	628	13
604	RAM Failure	630	12
606	COP Failure	629	31
642	External 5V Reference Low	1079	4
643	External 5V Reference High	1079	3
685	Power Relay Open	1485	5
686	Power Relay Shorted	1485	4
687	Power Relay Short to Power	1485	3
1111	Fuel Rev Limit	515	16
1112	Spark Rev Limit	515	0
1151	Closed Loop Multiplier High LPG	520206	0
1152	Closed Loop Multiplier Low LPG	520206	1
1155	Closed Loop Multiplier High Gasoline	520204	0
1156	Closed Loop Multiplier Low Gasoline	520204	1
1161	Adaptive Learn High LPG	520202	0
1162	Adaptive Learn Low LPG	520202	1
1165	LPG Cat Monitor	520213	10
1171	LPG Pressure Higher Than Expected	520260	0
1172	LPG Pressure Lower Than Expected	520260	1
1173	EPR Comm Lost	520260	31
1174	EPR Voltage Supply High	520260	3
1175	EPR Voltage Supply Low	520260	4
1176	EPR Internal Actuator Fault	520260	12
1177	EPR Internal Circuitry Fault	520260	12
1178	EPR Internal Comm Fault	520260	12
1612	RTI 1 loss	629	31
1613	RTI 2 Loss	629	31
1614	RTI 3 Loss	629	31
1615	A/D Loss	629	31
1616	Invalid Interrupt	629	31
1625	Shutdown Request	1384	31
1626	CAN Tx Failure	639	12
1627	CAN Rx Failure	639	12
1628	CAN Address Conflict Failure	639	13
1629	Loss of TSC 1	639	31
2111	Unable to Reach Lower TPS	51	7
2112	Unable to Reach Higher TPS	51	
2135	TPS 1/2 Simultaneous Voltages	51	31
2229	BP Pressure High	108	0

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
38	731	523925	3	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.
40	733	523927	3	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.
42	167	523924	4	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.
43	731	523925	4	Short circuit to ground actuator release 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 pinsA88, K57. If error is still present, exchange ECU.
44	732	523926	4	Short circuit to ground actuator release 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.
45	318	168	3	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.
46	318	168	4	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.
47	318	168	2	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 mor than =0.5sec a warning is generated Battery voltage above warning threshold	Check wiring harness and connected alternator.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
73	7-2-2	523912	4	@ 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_SRCBrnDVDsP.uMin_C @ CRT < 4l: check throttle valve @ engines with Burner T4i: check back-pressure valve
84	271	639	14	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).
85	271	1231	14	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).
86	271	1235	14	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).
88	223	102	2	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.
89	223	102	2	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.
93	225	110	1	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.
96	225	110	3	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.
97	225	110	4	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.
98	232	110	0	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
99	232	110	0	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.
101	235	111	1	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
121	341	1109	2	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.
122	591	523698	11	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 error code to find root cause. Depending on additional error follow the documented "Take action for repair".
129	596	3224	2	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.
130	597	3224	9	Timeout Error of CAN-Receive-Frame AT1IG1Vol; NOX sensor (SCR-system upstream cat; DPF-system downstream cat).	Failure of the CAN Bus message	NOX sensor and sensor connection check
133	766	523938	9	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1IGCVol1 information; factors & Sensor calibration for NOX Sensor (SCR-system upstream cat; DPF-system downstream cat).	Failure of the CAN Bus message	NOX sensor and sensor connection check
134	766	523939	9	Broadcast Announce Message of the calibration message of the upstream catalytic NOx sensor has failed. Timeout Error (BAM to BAM) for CAN-Receive-Frame AT1IGCVol1 information. factors & Sensor calibration for NOX Sensor (SCR-system upstream cat, DPF-system downstream cat).	Defective Nox sensor, faulty parameterization	NOX sensor and sensor connection check
135	766	523940	9	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1IGCVol1 information; factors & Sensor calibration for NOX Sensor (SCR-system upstream cat; DPF-system downstream cat).	Failure of the CAN Bus message	NOX sensor and sensor connection check
138	114	3234	2	DLC Error of CAN-Receive-Frame AT1O1Vol 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
139	117	3234	9	Timeout Error of CAN-Receive-Frame AT1OG1Vol; NOX sensor (SCR-system downstream cat; DPF-system downstream cat).	Failure of the CAN Bus message	NOX downstream sensor and sensor connection check

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
140	767	523941	9	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1OGCVol2 information; factors & Sensor calibration for NOX Sensor (SCR-system downstream cat; DPF-system downstream cat)	Timeout Error (Missing CAN Bus message)	NOX downstream sensor and sensor connection check
141	767	523942	9	Timeout Error (BAM to BAM) for CAN-Receive-Frame AT1OGCVol2 information, Calibration message 1 of the after catalyst NO sensor has failed. Factors & Sensor calibration for NOX Sensor (SCR-system downstream cat, DPF-system downstream cat)	Defective Nox sensor, faulty parameterization.	NOX downstream sensor and sensor connection check.
142	767	523943	9	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1OGCVol2 information; factors & Sensor calibration 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
168	763	523935	12	Timeout Error of CAN-Transmit-Frame EEC3VOL1; Engine send messages	Fault is detected if a TimeOut of the EEC3VOL1 frame has occured.	Check wiring harness and customer nodes
169	764	523936	12	Timeout Error of CAN-Transmit-Frame EEC3VOL2; Engine send messages	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer nodes
171	3-3-3	523212	9	Timeout Error of CAN-Receive-Frame Com Eng Prt; Engine Protection	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer devices
179	527	523240	9	Timeout CAN-message FunModCtl; Function Mode Control	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
291	119	523776	9	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.
292	119	523777	9	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
305	118	898	9	Timeout Error 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.
360	737	523982	0	Power stage diagnosis disabled; Indicating that battery voltage is not high.	Power stage diagnostic can be deactivated due to too high battery voltage.	Check wiring, check alternator, check cables and repair or replace if necessary.
361	737	523982	1	Power stage diagnosis disabled; Indicating that battery voltage is not low.	Power stage diagnostic can be deactivated due to too low battery voltage.	Check wiring, check alternator, check cables and repair or replace if necessary.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
376	281	630	12	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, reprogram ECU and if necessary replace it.
377	281	630	12	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, reprogram ECU and if necessary replace it
378	281	630	12	Internal hardware monitoring: the ECU finds an error during the access to it's 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, reprogram ECU and if necessary replace it.
381	693	411	4	Range check cannot be done or interrupted.	EGR or wiring defect	Check wiring harness and connected EGR.
387	555	523612	12	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.
389	214	190	0	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
390	214	190	11	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
391	214	190	14	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
417	312	171	3	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.
418	312	171	4	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
419	212	190	8	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 postition. Check Camshaft Sensor or wiring.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
420	212	190	12	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 postition. Check Camshaft Sensor or wiring.
421	213	190	2	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 senor or wiring.
422	212	190	8	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 postition. Check Crankshaft Sensor or wiring.
423	212	190	12	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.
464	228	97	3	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.
465	228	97	4	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.
472	216	94	3	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
473	216	94	4	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
474	216	94	1	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.
543	263	676	11	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
544	263	676	11	Cold start aid relay open load	Relay or wire harness	Threshold for error detection is an internal threshold. check wire harness, replace relay

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
545	263	729	5	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
547	263	729	12	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.
549	263	729	3	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.
551	263	729	4	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.
559	1-5-8	523895	13	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.
560	1-5-8	523896	13	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 adjuste-ment value (IMA). Use SERDIA UseCase to check it.
561	1-5-8	523897	13	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).
562	1-5-8	523898	13	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).
563	1-5-8	523899	13	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).
564	1-5-8	523900	13	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).
565	151	523350	4	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.
566	152	523352	4	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.
567	153	523354	12	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
568	154	651	5	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.
569	155	652	5	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.
570	156	653	5	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.
571	161	654	5	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.
572	162	655	5	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.
573	163	656	5	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.
580	154	651	3	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.
581	155	652	3	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.
582	156	653	3	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.
583	161	654	3	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.
584	162	655	3	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
585	163	656	3	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.
592	135	523615	5	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.
593	135	523615	12	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.
594	135	523615	3	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.
595	135	523615	4	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.
596	135	523615	3	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.
597	135	523615	4	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.
612	555	523612	12	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.
613	555	523612	12	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.
614	555	523612	12	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.
615	555	523612	12	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 plausbility 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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
616	555	523612	12	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.
617	555	523612	12	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.
618	555	523612	12	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.
619	555	523612	12	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.
620	555	523612	12	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.
621	555	523612	12	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.
623	555	523612	12	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.
624	555	523612	12	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.
625	555	523612	12	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.
627	555	523612	12	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.
628	555	523612	12	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.
629	555	523612	12	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
630	555	523612	12	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.
631	555	523612	12	Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information	Implausible injection energizing time for either PiIx or MI1 or PoIx.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
632	555	523612	12	Error in the plausibility of the start of energising angles	Implausible start of energising of either PiIx or MI1 or PoIx.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
633	555	523612	12	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.
634	555	523612	12	Error in the plausibility of PoI2 efficiency.	Error in the plausibility of PoI2 efficiency.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
635	555	523612	12	Error in the PoI2 shut-off.	Error in the PoI2 shut-off.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
636	555	523612	12	Error in the plausibility of PoI3 efficiency.	Error in the plausibility of PoI3 efficiency.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
637	555	523612	12	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.
638	555	523612	12	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.
639	555	523612	12	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. Leakge 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.
640	555	523612	12	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.
641	555	523612	12	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.
642	555	523612	12	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.
643	555	523612	12	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.
644	555	523612	3	supply voltage too high	not used	Threshold for error detection is an internal ECU threshold.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
646	555	523612	4	supply voltage too low	not used	Threshold for error detection is an internal ECU threshold.
714	555	523612	12	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.
715	555	523612	12	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.
716	555	523612	12	Error report "ABE wire is active" due to over-voltage 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.
717	555	523612	12	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.
732	224	100	3	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.
733	224	100	4	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!
736	231	100	1	Oil pressure is below the target range (warning threshold)	Oilpressure too low (pressure below warning threshold)	Threshold for error detection is an internal ECU threshold. Check oil level, check engine for oil leckage, measure oil pressure external to evaluate sensor value
737	231	100	1	Oil pressure is below the target range (shut off threshold)	Oilpressure too low (pressure below shut off threshold).	Threshold for error detection is an internal ECU threshold. Check oil level, check engine for oil leckage, measure oil pressure external to evaluate sensor value.
747	145	1237	2	Override switch switch: the ECU receives a permanent signal.	Switch is blocked, taster locked, connection cable damaged plausbility 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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
752	136	107	0	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 airfilter 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
772	223	102	2	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
774	223	102	1	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 presure sensor.
776	223	102	3	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.
777	223	102	4	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
791	693	411	0	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
792	693	411	1	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
793	693	411	11	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
795	693	411	3	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.
796	693	411	4	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.
825	253	523009	9	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.
826	146	523470	2	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.
827	146	523470	2	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.
828	146	523470	12	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.
829	146	523470	12	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
830	146	523470	14	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.
831	146	523470	11	Rail pressure relief valve can not be opened due to the railpressure.	Railpressure 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 railpressure, check rail pressure sensor for plausibility, check FCU.
832	146	523470	11	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.
833	2-5-3	523009	10	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.
839	1-4-3	523450	4	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.
856	134	523613	0	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
857	134	523613	0	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
858	134	523613	0	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
859	134	523613	0	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
861	134	523613	1	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
862	134	523613	0	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
864	134	523613	2	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
876	146	523470	7	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 railpressure relief valve and replace if necessary. (B) Check high pressure pumps, pressure relief valve and metering unit. (C) Change components if necessary
877	147	157	3	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.
878	147	157	4	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.
925	148	523720	8	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.
926	148	523720	8	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.
927	689	523721	11	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.
928	928	691	8	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_tiSMPerPwm is within the specified range of 150ms to 250ms Supply module check and replace if necessary. Check the wiring.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
929	691	523722	8	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 temperaturesignal for both information is received one after the other. Supply module check and replace if necessary. Check the wiring.
930	689	523721	8	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.
931	689	523721	8	Supply module heater: Dutycycle 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.
932	1-2-6	29	3	Diagnostic fault check of short circuit to supply voltage (signal range check high) of acceleration pedal signal.	The signal exceeds the applicatable threshold; signal range violation	If the signal is below the applicatable 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.
935	2-2-6	91	3	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 applicatable threshold APP_uRaw1SRCHigh_C, the signal range violation is reset after the healing debouncing.
937	1-2-6	29	4	Diagnostic fault check of short circuit to ground (signal range check low) of acceleration pedal signal	The signal is below the applicatable threshold; signal range violation	If the signal exceeds the applicatable 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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
940	2-2-6	91	4	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 applicatable threshold APP_uRaw1SRCLow_C, the signal range violation is reset after the healing
946	282	1079	13	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 / LowFuelPressPin 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.
947	282	1080	13	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/HClPressDV1DV2 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.
948	282	523601	13	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.
956	512	677	3	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
957	512	677	4	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.
958	512	677	5	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.
959	512	677	12	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.
960	512	677	3	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.
961	512	677	4	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.
973	555	523612	14	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 Softwareresets in DSM	Threshold for error detection is an internal ECU threshold.
974	555	523612	14	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 Softwareresets in DSM	Threshold for error detection is an internal ECU threshold.
975	555	523612	14	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 SoftwareResets in DSM	Threshold for error detection is an internal ECU threshold. If possible the software update has to be done. Replace the ECU.
976	2-2-6	91	11	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
978	1-2-6	29	2	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.
980	515	523550	12	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.	Startinformation 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.
992	128	105	1	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
994	128	105	3	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_SRCTCACDs.uMin_C. Check CAC-sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
995	128	105	4	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
996	233	105	0	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 perfomance with temperature measurement.
997	233	105	0	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 perfomance with temperature measurement.
1007	682	412	3	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.
1008	682	412	4	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.
1011	771	523960	0	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1012	771	523960	1	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
1014	594	5763	6	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.
1015	594	520521	5	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.
1016	594	5763	7	Actuator position for EGR valve is not plausible, internal error, angular misalignement 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".
1022	5-9-4	5763	6	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.
1023	5-9-4	5763	5	Actuator error EGR-Valve; signal range check low, measured current is below target	Short circuit to ground.	Check wiring, check cabels and repair or replace if necessary, check actuator with SERDIA 2010 test for EGR and if necessary replace it.
1024	594	5763	3	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.
1025	594	5763	4	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1036	683	4768	2	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. 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	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 befor DOC and before SCR > Threshold 2 difference between temperature after DOC and before SCR < Threshold 3 difference between temperature after DOC and ambinet temperature < Threshold 4 differnece between temperatur ambient temperature and engine temperature < Threshold 5) 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)	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?
1039	683	4765	0	The exhaust temperature value from the sensor befor 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
1040	683	4765	0	The exhaust temperature value from the sensor befor 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
1044	683	4768	3	Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	The sensed raw voltage value Exh_uRawTOxiCatUs is above Exh_SRCTOxiCatUs.uMax_C Shortcut to battery	Check wiring harness to temperature sensor upstream DOC Exchange temperature sensor upstream DOC
1045	683	4768	4	Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	The sensed raw voltage value Exh_uRawTOxiCatUs is below Exh_SRCTOxiCatUs.uMin_C Shortcut to ground	Check wiring harness to temperature sensor upstream DOC Exchange temperature sensor upstream DOC

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1069	668	4360	0	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 emitts too many Hydrocarbons => check injectors: is an injector got stuck? => Check EGR Valve If difference normal the exhaust out of the engie 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
1070	668	4360	1	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
1072	668	4361	3	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
1073	668	4361	4	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
1075	677	3361	6	Urea dosing valve: the current measured value by ECU at the end of the injection is too high	Fault in the wiriing Defect urea dosing injection valve	Check wiring Check the urea dosing injection valve
1077	677	3361	3	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
1078	677	3361	3	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
1079	677	3361	4	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
1080	677	3361	4	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
1090	674	4345	5	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 backflow line	Threshold for error detection is an internal ECU threshold Check wiring Check heating element

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1092	674	4345	3	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
1093	674	4345	4	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
1094	673	4343	5	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
1096	673	4343	3	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
1097	673	4343	4	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
1098	676	523718	5	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.
1100	676	523718	3	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
1101	676	523718	4	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
1102	675	4341	5	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
1104	675	4341	3	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
1105	675	4341	4	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1106	672	523719	5	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 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
1108	672	5232719	3	Urea supply module heater: the current drain measured by ECU is above the target range	Short circuit to battery 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
1109	672	523719	4	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
1110	671	4366	5	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
1112	671	4366	3	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
1113	671	4366	4	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
1117	666	523632	11	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
1118	666	4375	5	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
1120	666	4375	3	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1121	666	4375	4	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_stPrevTstRslt_mp Check wiring Check pump in the urea supply module
1122	665	4334	0	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)
1123	665	4334	1	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)
1127	665	523632	3	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
1128	665	523632	4	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
1129	667	4376	5	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
1131	667	4376	3	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
1132	667	4376	4	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1135	669	3031	0	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 DEF T & 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 DEF T & Level sensor
1136	669	3031	1	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 DEF T & 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 DEF T & Level sensor Check analog DEF T & Level sensor
1137	6-6-9	4365	2	Signal error in case of Urea tank temperature trnasmitted via CAN-signal Com_tUTnkT.	CAN message is not send properly.	Check sensor connector Check CANbus
1138	6-6-9	4365	3	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.
1139	6-6-9	4365	4	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.
1157	228	97	12	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.
1170	555	523612	12	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1180	318	168	0	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
1181	318	168	1	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
1183	226	172	1	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
1222	2-1-2	190	14	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 cabels and repair or replace if necessary.
1223	594	5763	6	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
1224	594	5763	6	Actuator EGR-valve: too high curent 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
1226	594	5763	3	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
1227	594	5763	3	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
1228	594	5763	4	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
1229	594	5763	4	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
1230	5-9-4	5763	6	Actuator error EGR-valve; Overload by short-circuit	Short Circuit over Load	Threshold for error detection is an internal ECU threshold. Check wiring, component
1231	5-9-4	5763	11	Power stage overtemperature due to high current.	Temperature dependent Over Current	Threshold for error detection is an internal ECU threshold. Check wiring, component
1232	5-9-4	5763	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1239	788	523984	3	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
1241	176	523986	4	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
1242	791	523987	4	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
1337	565	2797	4	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
1338	566	2798	4	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
1339	565	2797	4	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
1340	566	2798	4	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
1381	839	164	2	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
1398	681	1136	0	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
1425	226	172	0	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
1434	8-3-6	524050	11	CAN; not used	not used	not used
1435	8-3-7	524051	11	CAN; not used	not used	not used

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1455	711	3711	12	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
1505	8-4-3	524057	2	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.
1533	246	524074	9	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 dismounting. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
1534	247	524075	11	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 dismounting. => 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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1535	248	524076	9	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
1536	249	524077	11	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
1537	255	524078	9	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 catalystat 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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1538	256	524079	9	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
1539	257	524080	9	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 catalystat 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
1540	258	524081	9	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
1542	261	524083	9	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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1544	912	524085	9	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
1555	869	524063	5	Urea backflow line heater: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open Load on wiring to component	Check wiring, component
1556	869	524063	5	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
1557	869	524063	5	Urea pressure line heater: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open load on wiring to component	Check wiring, component
1558	869	524063	3	SCR heater mainrelay; short circuit to battery Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Short-Circuit to battery on wiring to component	Check wiring, component
1559	869	524063	4	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).
1560	869	524063	5	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
1561	869	524063	5	Open load on wiring to component Threshold 1 < SCRHtr_rUHtrMeasRatio_mp < Threshold 2	Open load on wiring to component	Check wiring, component
1562	869	524063	5	SCR heater tank; open load	Open load on wiring to component	Check wiring, component

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1565	892	524065	0	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 heavely 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 pausible? 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
1566	892	524065	1	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 pausible? 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
1569	892	524065	3	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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1570	892	524065	4	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
1581	894	524067	0	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 permanet 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
1582	894	524067	1	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 modul heater exchange urea pump unit Supply module heater temperature sensor defect Supply module defect
1585	894	524067	0	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), ure tank heater permanet 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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1586	894	524067	1	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 modul heater exchange urea pump unit Supply module temperature sensor defect Supply module defect
1593	129	1761	0	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
1594	129	1761	1	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
1598	892	524065	2	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)

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1639	966	524147	13	No proper urea pressure level could be build up within the SCR system state "Fill Lines" => SCRCo_stStatus_mp = 1 within some miuntes	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 continously 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 continously open Urea suction line, backflow line broken or connection swapped PWM Powerstage has a defect Pump Pressure sensor broken
1646	869	524063	12	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: Enviroment 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

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1655	138	1761	14	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.
1656	138	1761	14	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.
1666	924	524100	9	Timeout error of CAN-Transmit-Frame Com-DPFHisDat.	Open load on CANBUS wiring.	Check wiring, component.
1672	9-4-2	524118	9	Timeout error of CAN-Receive-Frame ComRxCM1	If the frame CM1 message is not transmitted successfully	Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
1676	928	524104	9	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.
1683	9-4-5	524121	9	Timeout error of CAN-Receive-Frame Com-RxTrbChActr	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
1687	9-4-9	524125	9	Timeout error of CAN-Receive-Frame Com-TxTrbChActr	Timeout Error (Missing CAN Bus message)	Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
1705	972	524156	9	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 sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range. Replace the wheel speed sensor.
1752	415	2791	7	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.
1753	415	2791	2	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 actuaror.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1754	415	2791	13	EGR actuator can not learn stop positions. Possibly only second failure if other EGRTV failures occure.	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.
1755	415	2791	12	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.
1756	415	2791	13	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.
1757	415	2791	6	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.
1758	415	2791	3	Overvoltage at EGR actuator.	High voltage from the battery	Check battery voltage.
1759	415	2791	4	Undervoltage at EGR actuator.	Low voltage from the battery.	Check battery voltage.
1760	415	2791	13	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.
1761	415	2791	7	EGR actuator spring broken.	mechanical damage of spring due to overstress.	Threshold for error detection is an internal ECU threshold. Exchange EGR actuator.
1762	415	2791	16	Internal actuator temperature above threshold.	overheating of EGR actuator	Let EGR actuator cool down, check heat accumulation during worst case operation.
1763	415	2791	0	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.
1827	192	524141	7	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.
1857	555	523612	12	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1858	192	524141	7	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.
1863	995	524177	7	The error shows up, if no proper urea presure could be build up within the SCR system state "Fill Lines" => SCRCo_stStatus_mp = 1.	This error shows up, if no proper urea presure 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 ther 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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1864	996	524178	7	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 continously 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 continously open DEF suction line, backflow line broken or connection swapped PWM Powerstage has a defect DEF pump pressure sensor broken
1865	668	4360	2	Error at static plausibility check: absolut 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: absolut 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 crystalls? Dismount urea injector and inspect temperature sensor upstream SCR catalyst visually Check wiring of sensor Replace sensor

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1866	665	4334	2	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 afterun 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
1867	894	524067	2	absolute diference of sensed temperature of supply module heater temperature and ambient temperature UPmpT_tDiffPmpHtrAmb_mp > threshold	absolute diference 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
1868	894	524067	2	absolute diference of sensed temperature of supply module temperature and ambient temperature > threshold	absolute diference 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
1874	971	524152	2	CAN message is not received fora 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 eletrical connection oif urea quality sensor Check engine CAN bus Check urea quality sensor itself Exchange urea quality sensor
1875	997	524153	2	CAN message is not reseived for a definite time => error is set. As soon as the message is received the error heals.	CAN message is not reseived for a definite time => error is set. As soon as the message is received the error heals.	Check eletrical connection of suction unit sensor (combined sensor with tank level and tank temperature) Check engine CAN bus Check level sensor itself Exchange suction unit

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1880	138	1761	14	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.
1881	683	4768	2	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). The check is only performed once each ignition cycle and only if the start is judged a cold start. Error status is frozen for that ignition cycle. No healing possible.	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.	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 => physicallly intact?
1891	272	524190	14	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.
1892	273	524191	14	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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1893	275	524193	8	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 regeneartion.	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 sytem 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? Temerature 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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1894	276	524194	8	The total time in standstill-regeneration mode exceeds the long-limit threshold: 2,5h stand-still operation within 50h total motor run time. The error is activated if the engine runs to much time in short Standstill regeneartion.	Stand-still mode is aborted / interrupted too often by the operator Stand-still is required too often due to miscalculation in the soot model Stand-still mode does not reache 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 sytem or exhaust gas system? Check temperature sensors within exhaust system: upstream DOC, downstream DOC If soot load level of DPF allows 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? Temerature 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
1895	277	3519	12	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 is 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.
1896	278	3520	3	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.

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1897	278	3520	4	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.
1898	277	3519	3	The integrated diagnostic of the temperature sensor of the Urea Quality Sensor recognized a short circuit to battery. The UQS Sensor is an 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.
1899	277	3519	4	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 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1900	279	524195	14	The standstill request of detected crystallization is ignored for more than 5h(>300min) This will be activated if there is a standstill request activated by Crystalisation Monitoring.	Back pressure upstream SCR catalyst has reached a level which indicates crystallisation inside of exhaust line. The error detection depends on the sensed pressure upstream of the SCR catalyst and the calculated exhaust volume flow through the mixer pipe. In case of error is set, but no crystallisation can be found in the mixing pipe, a possible reason can be the defect sensors: - exhaust pressure & temperature upstream of the SCR catalyst, - the ambient pressure - the exhaust mass flow => Check air path system at the engine.	Dismount urea injector from exhaust line and inspect visually the injector and the exhaust line for urea crystallisation upstream of SCR catalyst: If crystallisation can be clearly seen, then standstill must be processed. Has the engine been operated in low load for longer time? If yes, then it could be the reaoson for crystallisation. 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_tCatAvrgExhGs_mp > 250°C, SCR_stStatus = "Dosing" = 8): sensed NOx upstream of SCR catalyst must be higher than downstream of SCR catalyst. Go to idle and wait until SCR system enters status "stand-by" (no dosing), SCRT_tCatAvrgExhGs_mp < 225°C: ComRxSCR_rNOxUs = ComRxSCR_rNOxDs Clean urea injector: rinse it thourougly under water 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? Check air path for leakage Check turbocharger No crystallisation can be seen in the mixing pipe: Check exhaust pressure sensor upstream of SCR catalyst (SCR_pSensUCatUsP): tube, water in sensor? Check environmental pressure sensor (EnvP_p): plausible? 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? => Run stand-still to remove crystallisation and to reset the DFC

Table 3-14. Engine Fault Codes

Deutz Code	Blink Code	SPN	FMI	Description	Possible Cause	Action
1904	2-7-8	3520	2	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 an 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
1907	278	3520	13	Urea quality at UQS out of range the specified thresholds; invalid quality of the urea qualiy	Suspected components DEF quality sensor DEF	Check DEF quality and/or DEF quality sensor
1908	277	3519	13	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
1911	127	3532	3	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.
1912	127	3532	4	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.
1914	669	4365	3	Internal error of DEF quality sensor.	Suspected componentes: DEF quality sensor Wiring harness	Check wiring harness and DEF qualitysensor
1915	6-6-9	4365	4	Internal error of DEF quality sensor.	Suspected componentes: DEF quality sensor Wiring harness	Check wiring harness and DEF qualitysensor
1917	2-8-6	3936	14	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.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1	110	11	226	Air flow sensor load correction factor exceeding the maximum drift limit; plausibility error.
8	132	1	226	The air mass flow AFS_dm is greater than or equal to AFS_PhysRng.Min_C. Physical Range Check low for air mass flow sensor No detail informationen!
9	172	2	226	Air inlet filter temperature, plausibility error.
26	523891	14	263	When AirHt_ctDefSRCLoOn_mp is less than AirHt_ctMaxDef_C. DFC to SRC Low error when heater is On No detail informationen!
28	523953	2	728	Healing takes place if the condition for error detection is not present. Air temprature monitoring plausibility check array No detail informationen!
30	523955	2	728	Healing takes place if the condition for error detection is not present. Air temprature monitoring plausibility check array No detail informationen!
36	523923	3	729	UB1; Short circuit to battery error of actuator relay 1.
37	523924	3	167	UB2; Short circuit to battery error of actuator relay 2.
38	523925	3	731	UB3: Short circuit to battery error of actuator relay 3.
40	523927	3	733	UB5; Short circuit to battery error of actuator relay 5, SCR-Heater/Rev.Valve.
41	523923	4	729	Short circuit to ground error No detail informationen!
42	523924	4	167	UB2; Short circuit to ground actuator relais 2.
43	523925	4	731	UB3; Short circuit to ground actuator relais 3.
44	523926	4	732	UB4; Short circuit to ground aktuator relais 4.
45	168	3	318	Sensor error battery voltage; signal range check high.
46	168	4	318	Sensor error battery voltage; signal range check low.
47	168	2	318	High battery voltage; warning threshold exceeded.
48	168	2	318	High battery voltage; shot off threshold exceeded.
55	523910	14	695	Air pump doesn´t achieve air mass flow setpoint. Burner Control - burner air pump.
56	524013	7	856	Burner Control; burner Flame;Burner does not start after x trials (burner flame lost detection). Burner flame unintentional deleted.
57	524020	14	863	Burner Control: power reduction due to low lambda. Engine power; Not enough oxygen for regeneration.
58	523911	0	723	Burner dosing valve (DV2); overcurrent at the end of the injection phase.
59	523911	12	723	Burner dosing valve (DV2); powerstage over temperature.
60	523911	3	723	Burner dosing valve (DV2); short circuit to battery.
62	523911	4	723	Burner dosing valve (DV2); short circuit to ground.
63	523911	11	723	Burner dosing valve (DV2); short circuit high side powerstage.
64	523912	2	722	Burner dosing valve (DV2) downstream pressure sensor; plausibility error.
66	523912	0	722	Physical range check high for burner dosing valve (DV2) downstream pressure; shut off regeneration.
69	523912	1	722	Physical range check low for burner dosing valve (DV2) downstream pressure; shut off regeneration. When burner injector is actuated, the measured pressure does not rise above ca. 1250mbar abs (expected: ca. 2400mbar).
72	523912	3	722	Sensor error burner dosing valve (DV2) downstream pressure sensor; signal range check high.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
73	523912	4	722	@ 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.
74	523913	3	721	Sensor error glow plug control diagnostic line voltage; signal range check high.
75	523913	4	721	Sensor error glow plug control diagnostic line voltage; signal range check low.
76	523914	5	721	Glow plug control; open load water pump control (PWM).
77	523914	12	721	Glow plug control; powerstage over temperature.
78	523914	3	721	Glow plug control; short circuit to battery water pump control (PWM).
79	523914	4	721	Glow plug control; short circuit to ground.
82	1235	14	271	CAN-Bus 2 = CAN_C reports Bus-error (for engines <8L and CV52 it is the engine-CAN@250kbaud) CAN Bus error passive; warning CAN C - engine CAN.
83	16	0	271	No detail informationen!
84	639	14	271	CAN-Bus 0 "BusOff-Status"
85	1231	14	271	CAN-Bus 1 "BusOff-Status"
86	1235	14	271	CAN-Bus 2 = engine bus "BusOff-Status"
87	16	0	271	BusOff error CAN No detail informationen!
88	102	2	223	Charged air pressure above warning threshold.
89	102	2	223	Charged air pressure above shut off threshold.
90	110	2	225	defect fault check for Absolute plausibility test No detail informationen!
92	110	0	225	Physical Range Check high for Coolant temperature.
93	110	1	225	Physical Range Check low for Coolant temperature.
96	110	3	225	Sensor error coolant temperature; signal range check high.
97	110	4	225	Sensor error coolant temperature; signal range check low.
98	110	0	232	High coolant temperature; warning threshold exceeded.
99	110	0	232	Coolant temperature; system reaction initiated.
101	111	1	235	Coolant level too low.
106	598	2	325	Plausibility check for Clutch No detail informationen!
121	1109	2	341	Engine shut off demand ignored.
122	523698	11	591	Shut off request from supervisory monitoring function.
124	523969	11	774	Fault entry for override control mode. No detail informationen!
125	523717	12	595	Timeout Error of CAN-Transmit-Frame AmbCon; Weather environments.
126	523603	9	338	Timeout Error of CAN-Receive-Frame AMB; Ambient Temperature Sensor.
127	3224	2	596	DLC Error of CAN-Receive-Frame AT1IG1 NOX Sensor (SCR-system upstream cat; DPF-system downstream cat); length of frame incorrect.
128	3224	9	597	Timeout Error of CAN-Receive-Frame AT1IG1; NOX sensor upstream.
129	3224	2	596	DLC Error of CAN-Receive-Frame AT1IG1Vol NOX sensor.
130	3224	9	597	Timeout Error of CAN-Receive-Frame AT1IG1Vol; NOX sensor.
133	523938	9	766	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1IGCVol1.
134	523939	9	766	Broadcast Announce Message of the calibration message of the upstream catalytic NOx sensor has failed.
135	523940	9	766	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1IGCVol1
136	3234	2	114	DLC Error of CAN-Receive-Frame AT1O1 No detail informationen!

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
137	3234	9	117	Timeout Error of CAN-Receive-Frame AT1OG1; NOX sensor (SCR-system down-stream cat; DPF-system downstream cat).
138	3234	2	114	DLC Error of CAN-Receive-Frame AT1O1Vol NOX.
139	3234	9	117	Timeout Error of CAN-Receive-Frame AT1OG1Vol.
140	523941	9	767	Timeout Error (BAM to packet) for CAN-Receive-Frame AT1OGCVol2.
141	523942	9	767	Calibration message 1 of the after catalyst NOx sensor has failed.
142	523943	9	767	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1OGCVol2.
153	523992	9	793	
155	0	0	-	
164	523211	9	331	Timeout Error of CAN-Receive-Frame EBC1.
167	523704	12	615	Timeout Error of CAN-Transmit-Frame EEC3.
168	523935	12	763	Timeout Error of CAN-Transmit-Frame EEC3VOL1; Engine send messages.
169	523936	12	764	Timeout Error of CAN-Transmit-Frame EEC3VOL2; Engine send messages.
171	523212	9	333	Timeout Error of CAN-Receive-Frame ComEngPrt; Engine Protection.
172	523741	14	618	Engine shut off request through CAN No detail informationen!
174	523213	12	334	Timeout Error of CAN-Transmit-Frame ERC1 No detail informationen!
178	523706	12	623	Timeout Error of CAN-Transmit-Frame FIEco No detail informationen!
179	523240	9	527	Timeout CAN-message FunModCtl; Function Mode Control.
193	523937	9	765	Timeout DFC for NOxSensGlbReqTx. No detail informationen!
196	3227	2	638	DFC SAE J1939 error No detail informationen!
198	523216	9	337	Timeout Error of CAN-Receive-Frame PrHtEnCmd; pre-heat command, engine command.
202	523793	9	678	Timeout Error of CAN-Receive-Frame UAA10; AGS sensor service message.
203	523794	9	678	Timeout Error of CAN-Receive-Frame UAA11; AGS sensor data.
212	523803	9	678	Timeout error of CAN Receive Message RxEngPres; Status Burner Air Pump.
273	3219	2	649	DFC SAE J1939 error No detail informationen!
281	523766	9	118	Timeout Error of CAN-Receive-Frame Active TSC1AE.
282	523767	9	118	Timeout Error of CAN-Receive-Frame Passive TSC1AE.
283	523768	9	119	Timeout Error of CAN-Receive-Frame Active TSC1AR.
284	523769	9	119	Timeout Error of CAN-Receive-Frame Passive TSC1AR.
291	523776	9	119	Timeout Error of CAN-Receive-Frame TSC1TE - active.
292	523777	9	119	Passive Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint.
293	523778	9	118	Timeout Error of CAN-Receive-Frame TSC1TR.
294	523779	9	118	Passive Timeout Error of CAN-Receive-Frame TSC1TR.
299	523788	12	655	Timeout Error of CAN-Transmit-Frame TrbCH; Status Wastegate.
300	523605	9	118	Timeout Error of CAN-Receive-Frame TSC1AE; Traction Control.
301	523606	9	119	Timeout Error of CAN-Receive-Frame TSC1AR; Retarder.
305	898	9	118	Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint.
306	520	9	119	Timeout Error of CAN-Receive-Frame TSC1TR; control signal.
313	523858	12	679	Timeout Error of CAN-Transmit-Frame UAA11.
322	523867	12	679	Ansteuerung Brenner Luftpumpe;_Timeout Error of CAN-Transmit-Frame UAA1 on CAN A.
360	523982	0	737	Powerstage diagnosis disabled; high battery voltage.
361	523982	1	737	Powerstage diagnosis disabled; low battery voltage.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
362	523090	2	329	Engine Brake Pre-Selection switch; Plausibility Error.
376	630	12	281	Access error EEPROM memory (delete).
377	630	12	281	Access error EEPROM memory (read).
378	630	12	281	Access error EEPROM memory (write).
381	411	4	693	Physical range check low for EGR differential pressure.
384	2791	12	415	Actuator EGR Valve; powerstage over temperature.
387	523612	12	555	Internal software error ECU; injection cut off.
388	190	0	214	Engine speed above warning threshold. Overspeed detection in component engine protection.
389	190	0	214	Engine speed above warning threshold (FOC-Level 1).
390	190	11	214	Engine speed above warning threshold (FOC-Level 2).
391	190	14	214	Engine speed above warning threshold (Overrun Mode).
411	108	11	292	DFC for CAN message.
412	108	3	292	Sensor error ambient air pressure; signal range check high.
413	108	4	292	Sensor error ambient air pressure; signal range check low.
415	171	0	312	Environment temperature sensor, temperature above upper physical threshold.
416	171	1	312	Environment Temperature Physical Range Check low.
417	171	3	312	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check high.
418	171	4	312	Sensor error SCR-System environment temperature; DPF-System air inlet temperature; signal range check low.
419	190	8	212	Sensor camshaft speed; disturbed signal.
420	190	12	212	Sensor camshaft detection; out of range, signal disrupted; no signal.
421	190	2	213	Offset angle between crank- and camshaft sensor is too large.
422	190	8	212	Sensor crankshaft detection; out of range, signal disrupted; disturbed signal.
423	190	12	212	Speed detection; out of range, signal disrupted Sensor crankshaft speed; no signal.
455	975	5	238	PWM-Signal Fan, Open load or short-circuit ground.
457	975	3	238	PWM-Signal Fan, short-circuit to plus.
458	975	4	238	PWM-Signal Fan, open load or short circuit to ground.
459	1639	12	238	Fan speed sensor; electrical error or signal disturbed or very low fan speed.
460	1639	0	238	Sensor error fan speed; signal range check high or engine speed resp. fan speed too big.
461	1639	1	238	Sensor error fan speed; signal range check low or fan speed too low.
462	523602	0	238	High fan speed; warning threshold exceeded.
463	523602	0	238	High fan speed; shut off threshold exceeded.
464	97	3	228	Sensor error water in fuel; signal range check high.
465	97	4	228	Sensor error water in fuel; signal range check low.
472	94	3	216	Sensor error low fuel pressure; signal range check high.
473	94	4	216	Sensor error low fuel pressure; signal range check low.
474	94	1	216	Low fuel pressure; warning threshold exceeded.
475	94	1	216	Low fuel pressure; shut off threshold exceeded.
483	174	11	227	DFC for fuel temperature plausibility check function No detail informationen!
486	523618	3	133	Gearbox oil temperature; Short circuit to battery or broken harness.
487	523618	4	133	Gearbox oil temperature; Short circuit to ground.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
488	523619	2	133	Physical range check high for exhaust gas temperature upstrem (SCR-CAT).
500	523915	0	165	HCl dosing valve (DV1); overcurrent at the end of the injection phase.
501	523915	12	166	HCl dosing valve (DV1); powerstage overtemperature.
502	523915	3	159	HCl dosing valve (DV1); short circuit to battery.
503	523915	3	164	HCl dosing valve (DV1); short circuit to battery high side.
504	523915	4	159	HCl dosing valve (DV1); short circuit to ground.
505	523915	11	164	HCl dosing valve (DV1); short circuit high side powerstage.
506	523916	2	719	Sensor HCl dosing valve (DV1) downstream pressure; plausibility error.
508	523916	0	719	Physical range check high for HCl dosing valve (DV1) downstream pressure; shut off regeneration.
511	523916	1	719	Physical range check low for HCl dosing valve (DV1) downstream pressure; shut off regeneration.
514	523916	3	719	Sensor error HCl dosing valve (DV1) downstream pressure; signal range check high.
515	523916	4	719	Sensor error HCl dosing valve (DV1) downstream pressure; signal range check low.
524	523917	3	718	Sensor error DV1 & DV2 upstream pressure; signal range check high.
525	523917	4	718	Sensor error DV1 & DV2 upstream pressure; signal range check low.
534	523918	3	717	Sensor error DV1 & DV2 upstream temperature; signal range check high.
535	523918	4	717	Sensor error DV1 & DV2 upstream temperature; signal range check low.
542	1638	2	314	Hydraulic oil temperature check for Shut off condition No detail informationen!
543	676	11	263	Cold start device relay error.
544	676	11	263	Cold start aid relay open load.
545	729	5	263	Cold start aid relay open load.
547	729	12	263	Cold start aid relay; over temperature error.
549	729	3	263	Intake Air Heater Device; Short circuit to battery.
551	729	4	263	Air intake heater; Short circuit to ground error for powerstage on CJ945.
559	523895	13	158	Check of missing injector adjustment value programming (IMA) injector 1 (in firing order).
560	523896	13	158	check of missing injector adjustment value programming (IMA) injector 2 (in firing order).
561	523897	13	158	check of missing injector adjustment value programming (IMA) injector 3 (in firing order).
562	523898	13	158	check of missing injector adjustment value programming (IMA) injector 4 (in firing order).
563	523899	13	158	check of missing injector adjustment value programming (IMA) injector 5 (in firing order).
564	523900	13	158	check of missing injector adjustment value programming (IMA) injector 6 (in firing order).
565	523350	4	151	Injector cylinder-bank 1; short circuit.
566	523352	4	152	Injector cylinder-bank 2; short circuit.
567	523354	12	153	Injector powerstage output defect.
568	651	5	154	Injector 1 (in firing order); interruption of electric connection.
569	652	5	155	Injector 2 (in firing order); interruption of electric connection.
570	653	5	156	Injector 3 (in firing order); interruption of electric connection.
571	654	5	161	Injector 4 (in firing order); interruption of electric connection.
572	655	5	162	Injector 5 (in firing order); interruption of electric connection.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
573	656	5	163	Injector 6 (in firing order); interruption of electric connection.
575	523756	14	155	special pattern for special cases No detail informationen!
576	523757	14	156	special pattern for special cases No detail informationen!
577	523758	14	161	special pattern for special cases No detail informationen!
578	523759	14	162	special pattern for special cases No detail informationen!
579	523760	14	163	special pattern for special cases No detail informationen!
580	651	3	154	Injector 1 (in firing order); short circuit.
581	652	3	155	Injector 2 (in firing order); short circuit.
582	653	3	156	Injector 3 (in firing order); short circuit.
583	654	3	161	Injector 4 (in firing order); short circuit.
584	655	3	162	Injector 5 (in firing order); short circuit.
585	656	3	163	Injector 6 (in firing order); short circuit.
590	655	4	162	High side to low side short circuit in the injector 5 (in firing order).
591	656	4	163	High side to low side short circuit in the injector 6 (in firing order).
592	523615	5	135	Metering unit (Fuel-System); open load.
593	523615	12	135	Metering unit (Fuel-System); powerstage over temperature.
594	523615	3	135	Metering unit (Fuel-System); short circuit to battery highside.
595	523615	4	135	Metering unit (Fuel-System); short circuit to ground high side.
596	523615	3	135	Metering unit (Fuel-System); short circuit to battery low side.
597	523615	4	135	Metering Unit (Fuel-System); short circuit to ground low side.
598	523615	3	135	Metering unit, short circuit to battery.
599	523615	4	135	Metering unit, short circuit to ground.
604	1323	12	241	Too many recognized misfires in cylinder 1 (in firing order).
611	1346	0	241	Misfire detection monitoring No detail informationen!
612	523612	12	555	Internal ECU monitoring detection reported error.
613	523612	12	555	ECU reported internal software error. Internal ECU monitoring detection reported error.
614	523612	12	555	ECU reported internal software error.
615	523612	12	555	ECU reported internal software error.
616	523612	12	555	ECU reported internal software error.
617	523612	12	555	ECU reported internal software error.
618	523612	12	555	ECU reported internal software error.
619	523612	12	555	Injection system, electrical error injectors.
620	523612	12	555	ECU reported internal software error.
621	523612	12	555	ECU reported internal software error.
623	523612	12	555	ECU reported internal software error.
624	523612	12	555	ECU reported internal software error.
625	523612	12	555	ECU reported internal software error.
627	523612	12	555	ECU reported internal software error.
628	523612	12	555	ECU reported internal software error.
629	523612	12	555	Diagnostic fault check to report the accelerator pedal position error.
630	523612	12	555	Diagnostic fault check to report the engine speed error.
631	523612	12	555	Error in the plausibility of the injection energizing time.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
632	523612	12	555	Error in the plausibility of the start of energising angles.
633	523612	12	555	Diagnostic fault check to report the error due to non plausibility in ZFC.
634	523612	12	555	Diagnosis fault check to report the demand for normal mode due to an error in the PoI2 quantity.
635	523612	12	555	Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off.
636	523612	12	555	Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI3 efficiency factor.
637	523612	12	555	Internal ECU monitoring detection reported error.
638	523612	12	555	Monitoring of Fuel Quantity Correction.
639	523612	12	555	Diagnostic fault check to report the plausibility error in rail pressure monitoring.
640	523612	12	555	Diagnostic fault check to report the error due to torque comparison.
641	523612	12	555	Diagnosis of curr path limitation forced by ECU monitoring level 2.
642	523612	12	555	Diagnosis of lead path limitation forced by ECU monitoring level 2.
643	523612	12	555	Diagnosis of set path limitation forced by ECU monitoring level 2.
644	523612	3	555	Reported Over Voltage of Supply.
646	523612	4	555	Reported UnderVoltage of Supply.
648	523008	1	424	Manipulation control was triggered.
649	523008	2	424	Timeout error in Manipulation control.
654	2634	12	757	Early opening defect of main relay No detail informationen!
656	2634	12	757	DFC for stuck main relay error No detail informationen!
659	3226	2	813	Nox feed back fault detection No detail informationen!
692	523752	0	758	Plausibiliti error during Rich to Lean switch over No detail informationen!
693	523752	0	758	Monitoring of Nox signal readyness No detail informationen!
714	523612	12	555	Diagnostic fault check to report WDA active due to errors in query-/response communication.
715	523612	12	555	Diagnostic fault check to report ABE active due to undervoltage detection.
716	523612	12	555	Diagnostic fault check to report ABE active due to overvoltage detection.
717	523612	12	555	Diagnostic fault check to report WDA/ABE active due to unknown reason.
720	98	2	211	Plausibility Check. No detail informationen!
732	100	3	224	Sensor error oil pressure; signal range check high.
733	100	4	224	Sensor error oil pressure sensor; signal range check low.
734	100	0	231	High oil pressure; warning threshold exceeded.
735	100	0	231	High oil pressure; shut off threshold exceeded.
736	100	1	231	Low oil pressure; warning threshold exceeded.
737	100	1	231	Low oil pressure; shut off threshold exceeded.
743	175	3	144	Sensor error oil temperature; signal range check high.
744	175	4	144	Sensor error oil temperature; signal range check low.
745	175	0	144	High oil temperature; warning threshold exceeded.
746	175	0	144	High oil temperature; shut off threshold exceeded.
747	1237	2	145	Override switch; plausibility error.
750	107	3	136	Sensor error airfilter differential pressure; short circuit to battery.
751	107	0	136	Sensor error airfilter differential pressure; short circuit to ground.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
752	107	0	136	Air filter differential pressure; short circuit to ground.
753	523919	2	694	DPF burner air pump pressure sensor, plausibility error.
755	523919	0	694	DPF burner air pump pressure sensor, pressure above upper shutoff threshold.
758	523919	1	694	DPF burner air pump pressure sensor, pressure below lower shutoff threshold.
761	523919	3	694	DPF burner air pump pressure sensor, short circuit to battery or open load.
762	523919	4	694	DPF burner air pump pressure sensor, short circuit to ground.
763	523920	2	716	Exhaustgaspressure upstream burner, plausibility error.
765	523920	0	716	Exhaustgaspressure upstream burner, pressure above upper shutoff threshold.
770	523920	3	716	Exhaustgaspressure upstream burner, short circuit to battery or open load.
771	523920	4	716	Exhaustgaspressure upstream burner, short circuit to ground.
772	102	2	223	Pressure downstream charge air cooler, plausibility error.
774	102	1	223	Pressure downstream charge air cooler, pressure below lower physical threshold.
776	102	3	223	Pressure downstream charge air cooler, short circuit to battery or open load.
777	102	4	223	Pressure downstream charge air cooler, short circuit to ground.
780	523699	3	113	Boost pressure control; negative governor deviation below limit.
781	523699	4	113	learning valu too high No detail informationen!
785	523889	3	113	over teperature of device driver of pressure control valve No detail informationen!
791	411	0	693	delta pressure across venturi in EGR line above physical high limit.
793	411	11	693	Plausibility Check fault for deviation of desired and actual EGR-mass flow, where the latter is calculated out of EGR Delta Pressure Sensor.
795	411	3	693	Sensor error differential pressure Venturiunit (EGR), signal range check low.
796	411	4	693	Sensor error differential pressure Venturiunit (EGR), signal range check high.
805	524025	14	845	Particulate filter regeneration. Regeneration after time X is not successful (The error occurs when the regeneration times (3x) over the max. has been aborted allowed recovery time).
806	524058	2	844	Particulate filter; regeneration not successful.
807	3253	2	692	Differential pressure DPF, plausibility error.
809	3251	0	692	Differential pressure DPF maximum value is exceeded.
810	3251	0	692	Differential pressure sensor across DPF exceeds warning high limit.
812	3251	1	692	Differential pressure DPF, pressure below lower shutoff threshold.
813	3251	1	692	Differential pressure DPF, pressure below lower warning threshold.
814	3253	3	692	Electrical error differential pressure B58 (DPF). (signal range check high).
815	3253	4	692	Electrical error differential pressure (DPF). signal range check low.
825	523009	9	253	The pressure relief valve (PRV) has reached the number of allowed activations.
826	523470	2	146	Pressure relief valve is forced to open, perform pressure increase.
827	523470	2	146	Pressure Relief Valve (PRV) forced to open. Performed by pressure increase.
828	523470	12	146	Pressure Relief Valve (PRV) forced to open. Shutoff conditions.
829	523470	12	146	Pressure Relief Valve (PRV) forced to open. Warning conditions.
830	523470	14	146	Open Pressure Relief Valve (PRV).
831	523470	11	146	Pressure Relief Valve (PRV) error; Rail pressure out of tolerance range.
832	523470	11	146	Rail pressure out of tolerance range. The PRV can not be opened at this operating point with a pressure shock.
833	523009	10	253	Open time of Pressure Relief Valve (PRV) for wear out monitoring had exceeded.
834	523906	5	761	Electrical fuel pre - supply pump; open load.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
835	523906	12	761	Electrical fuel pre - supply pump. ECU powerstage over temperature.
836	523906	3	761	Electrical fuel pre - supply pump; short circuit to battery.
837	523906	4	761	Electrical fuel pre - supply pump. Short circuit to ground.
847	1176	0	139	Pressure sensor upstream turbine, Physical Range Check high.
848	1176	1	139	Pressure sensor upstream turbine, Physical Range Check low.
849	1176	3	141	Pressure sensor upstream turbine, signal range check (SRC) high.
850	1176	4	141	Pressure sensor upstream turbine, signal range check (SRC) low.
856	523613	0	134	Rail pressure metering unit, Positive governor deviation.
857	523613	0	134	Rail pressure metering unit, Rail pressure disrupted. Maximum positive deviation of rail pressure exceeded.
858	523613	0	134	Rail pressure metering unit, Rail pressure disrupted. Maximum positive deviation of rail pressure in metering unit exceeded (RailMeUn1).
859	523613	0	134	Rail pressure metering unit, Rail pressure below the target range. (RailMeUn2) Railsystem leakage detected. (RailMeUn10).
861	523613	1	134	Rail pressure metering unit, Minimum rail pressure exceeded (RailMeUn3). Negative deviation of rail pressure second stage (RailMeUn22).
862	523613	0	134	Rail pressure metering unit, Maximum rail pressure exceeded.
864	523613	2	134	Rail pressure metering unit, Setpoint of metering unit in overrun mode not plausible.
865	523613	0	134	Setpoint of metering unit in overrun mode not plausible.
874	157	0	147	Rail pressure raw value is intermittent No detail informationen!
875	157	1	147	rail pressure raw value is above maximum offset No detail informationen!
876	523470	7	146	Maximum rail pressure exceeded (PRV).
877	157	3	147	Sensor error rail pressure. Sensor voltage above upper limit.
878	157	4	147	Sensor error rail pressure. Sensor voltage below lower limit.
881	523633	11	149	Lonterm adaption factor below threshold.
882	523633	11	149	Nox conversion rate insufficient (SCR-Cat defect, bad DEF quality).
883	523633	11	149	Nox conversion rate insufficient (SCR-Cat defect, bad DEF quality); temperature range 1.
887	3234	11	184	DFC for plausibility error Min for NOx sensor downstream of SCR Cat.
889	3224	1	185	DFC for plausibility error Max for NOx sensor upstream of SCR Cat.
892	4345	11	236	Sensor backflow line pressure (SCR); plausibility error.
893	4343	11	871	SCR Monitoring; Pressure stabilisation error, general pressure check error (SCR).
894	4374	13	872	Pressure stabilisation error dosing valve (SCR).
897	523632	16	875	Pump pressure SCR metering unit too high.
898	523632	18	876	Pump pressure SCR metering unit too low.
899	523632	0	877	Pressure overload of SCR-System.
900	523632	1	878	Pressure build-up error SCR-System.
903	4365	0	881	DEF tank temperature too high.
905	3241	0	883	Sensor SCR catalyst upstream temperature too high; plausibility error.
908	3361	7	886	DEF dosing valve blocked (SCR).
914	523720	2	148	DEF supply module heater temperature; plausibility error (normal condition).
915	523720	2	148	Sensor DEF supply module heater temperature; plausibility error (cold start condition).

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
916	523721	2	689	Sensor DEF supply module temperature; plausibility error (normal condition).
917	523721	2	689	Sensor DEF supply module temperature; plausibility error (cold start condition).
918	523981	11	243	SCR plausibility, OBD and diagnosis; Stuck in range check of DEF tank temperature sensor. DEF-tank without heating function (heating phase).
919	523330	14	131	Immobilizer status; fuel blocked.
920	523330	14	131	DFC to block the fuel by Sia No detail informationen!
921	523330	14	131	DFC to indicate that TEN-code or UC-code received if ECU is learned. No detail informationen!
922	523330	14	131	DFC to indicate that no code is received via CAN. No detail informationen!
923	523330	14	131	DFC to indicate that wrong code is received. No detail informationen!
925	523720	8	148	DEF supply module heater temperature; duty cycle in failure range.
926	523720	8	148	DEF supply module heater temperature; duty cycle in invalid range.
927	523721	11	689	Urea supply module temperature measurement not available.
928	523722	8	691	DEF supply module PWM signal; period outside valid range.
929	523722	8	691	Detect faulty PWM signal from Supply Modul.
930	523721	8	689	DEF supply module temperature; duty cycle in failure range.
931	523721	8	689	Urea supply module temperature; duty cycle in invalid range.
932	29	3	126	Handthrottle idle validation switch; short circuit to battery.
935	91	3	226	Sensor error accelerator pedal. signal range check high.
937	29	4	126	Handthrottle; short circuit to ground.
940	91	4	226	Sensor error accelerator pedal. Signal is below the range.
942	523921	3	714	Sensor error burner temperature; signal range check high.
943	3532	3	127	Sensor error DEF tank level; signal range check high.
944	523921	4	714	Sensor error burner temperature; signal range check low.
945	3532	4	127	Sensor error DEF tank level; signal range check low.
946	1079	13	282	Failure of sensor supply voltage 1.
947	1080	13	282	Failure of sensor supply voltage 2.
948	523601	13	282	Failure of sensor supply voltage 3.
952	523580	2	555	Data set variant with the desired number not found Invalid variant dataset Identifier error. No detail informationen!
953	523580	11	555	An error has occurred in the switch over to the desired data set variant in the code word. Variant dataset switching error No detail informationen!
954	523580	11	555	The code word could not be read correctly from the EEPROM Variant dataset switching error. No detail informationen!
956	677	3	512	Starter relay high side. Short circuit to battery.
957	677	4	512	Starter relay high side short circuit to ground.
958	677	5	512	Starter relay low side no load error.
959	677	12	512	Starter relay powerstage over temperature.
960	677	3	512	Starter relay low side short circuit to battery.
961	677	4	512	Starter relay low side short circuit to ground.
965	523922	3	715	Burner shut of valve; short circuit to battery.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
969	624	5	513	SVS lamp; open load.
970	624	12	513	SVS lamp: powerstage over temperature.
971	624	3	513	SVS lamp; short circuit to battery.
972	624	4	513	SVS lamp; short circuit to ground.
973	523612	14	555	Softwarereset CPU SWReset_0.
974	523612	14	555	Softwarereset CPU SWReset_1.
975	523612	14	555	Softwarereset CPU SWReset_2.
976	91	11	226	Plausibility error between APP1 and APP2 or APP1 and idle switch.
978	29	2	126	Plausibility error between sensor and idle switch, Acceleratio Pedal Detection. In case of Hand Throttle with Low Idle Switch, it is the plausibility check between hand throttle and idle switch.
980	523550	12	515	Terminal 50 was operated too long.
981	172	3	226	Air flow temperature sensor; short circuit to battery or open load.
982	172	4	226	Air flow temperature sensor; short circuit to ground.
986	523921	0	714	Burner temperature, temperature above upper shutoff threshold.
989	523921	1	714	Burner temperature, temperature below lower shutoff threshold.
992	105	1	128	Charged Air cooler down stream temperature. Temperature below lower physical threshold.
994	105	3	128	Electrical error charged air temperature. Signal range check high.(SRC).
995	105	4	128	Electrical error charged air temperature. Signal range check low.
996	105	0	233	Charged air cooler temperature. System reaction initiated. High charged air cooler temperature. Warning threshold exceeded.
997	105	0	233	Low charged air cooler temperature. Shut off threshold exceeded.
998	105	11	128	Diagnostic fault check for charged air cooler downstream temperature sensor. No detail informationen!
1007	412	3	682	Electrical error EGR cooler downstream temperature. Signal range check high.
1008	412	4	682	electrical error EGR cooler downstream temperature. Signal range check low.
1011	523960	0	771	Physical range check high for EGR cooler downstream temperature.
1012	523960	1	771	Physical range check low for EGR cooler downstream temperature.
1014	5763	6	594	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check high.
1015	520521	5	594	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); signal range check low.
1016	5763	7	594	Actuator position for EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8) not plausible.
1022	5763	6	594	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); signal range check high.
1023	5763	5	594	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); signal range check low.
1024	5763	3	594	Position sensor error of actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check high.
1025	5763	4	594	Position sensor error actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8). Signal range check low.
1026	4769	2	684	Temperature downstream DOC, plausibility error.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1029	4766	0	684	Temperature downstream DOC, temperature above upper shutoff threshold.
1030	4766	0	684	Temperature downstream DOC, temperature above upper warning threshold.
1034	4769	3	684	Sensor error exhaust gas temperature downstream (DOC); signal range check high.
1035	4769	4	684	Sensor error exhaust gas temperature downstream (DOC); signal range check low.
1036	4768	2	683	Temperature upstream DOC, plausibility error.
1039	4765	0	683	Temperature upstream DOC, temperature above upper shutoff threshold.
1040	4765	0	683	Temperature upstream DOC, temperature above upper warning threshold.
1044	4768	3	683	Electrical error exhaust gas temperature upstream (DOC); signal range check high.
1045	4768	4	683	Electrical error exhaust gas temperature upstream (DOC); signal range check low.
1047	3248	4	685	Sensor error particle filter downstream temperature; signal range check low.
1067	1180	3	556	Sensor error exhaust gas temperature upstream turbine; signal range check high.
1068	1180	4	556	Sensor error exhaust gas temperature upstream turbine; signal range check low.
1069	4360	0	668	Exhaust temperature upstream SCR-Cat, temperature above upper physical threshold.
1070	4360	1	668	Sensed exhaust temperature before SCR-Cat is < physical low limit.
1071	4361	2	668	Signal error for CAN message . No detail informationen!
1072	4361	3	668	Sensor error DEF catalyst exhaust gas temperature upstream; signal range check high.
1073	4361	4	668	Sensor error DEF catalyst exhaust gas temperature upstream; signal range check low.
1074	1761	14	127	DEF tank level; warning threshold exceeded.
1075	3361	6	677	DEF dosing valve; power at the end of injection too high.
1077	3361	3	677	DEF dosing valve; short circuit to battery on low side.
1078	3361	3	677	DEF dosing valve; short circuit to battery or open load on high side.
1079	3361	4	677	Urea dosing valve; short circuit to ground or open load on low side.
1080	3361	4	677	DEF dosing valve; short circuit on high side.
1081	4345	5	674	SCR heater relay DEF returnline sekondary side; open load.
1082	4366	5	762	SCR main relay (secondary side): open load.
1083	4343	5	673	SCR heater relay DEF pressureline secondary side; open load.
1084	4366	5	762	SCR main relay (secondary side); Shortcut to battery.
1085	4366	5	762	SCR main relay (secondary side), heat relay (secondary side), heating elements or heating valve short to ground.
1086	4341	5	675	SCR heater relay DEF supplyline secondary side; open load.
1087	523719	5	672	SCR heater relay DEF supply modul secondary side; open load.
1088	4366	5	671	SCR Tank heating valve secundary side: open load.
1089	4243	11	783	SCR heater; Pressure line heater error and temperature condition to perform an afterrun (Group error diagnosis heater). SCR system heater diagnostic reports error; shut off SCR-system.
1090	4345	5	674	SCR heater relay DEF returnline primary side; open load.
1091	4345	12	674	Over Temperature error . No detail informationen!
1092	4345	3	674	SCR heater DEF returnline; short circuit to battery.
1093	4345	4	674	SCR heater DEF returnline; short circuit to ground.
1094	4343	5	673	SCR heater relay DEF pressureline primary side; open load.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1095	4343	12	673	Over Temperature error No detail informationen!
1096	4343	3	673	SCR heater DEF pressureline; short circuit to battery.
1097	4343	4	673	SCR heater DEF pressureline; short circuit to ground.
1098	523718	5	676	SCR main relay (primary side); open load.
1099	523718	12	676	SCR main relay (primary side); powerstage over temperature.
1100	523718	3	676	SCR main relay (primary side); short circuit to battery.
1101	523718	4	676	SCR main relay (primary side); short circuit to ground.
1102	4341	5	675	SCR heater relay DEF supply line primary side; open load.
1104	4341	3	675	SCR-heater DEF supplyline; short circuit to battery.
1105	4341	4	675	SCR-heater DEF supply line; short circuit to ground.
1106	523719	5	672	SCR heater relay DEF supplymodule primary side; open load.
1107	523719	12	672	Over Temperature error . No detail informationen!
1108	523719	3	672	SCR heater DEF supplymodule; short circuit to battery.
1109	523719	4	672	SCR heater DEF supplymodule; short circuit to ground.
1110	4366	5	671	SCR tank heating valve primary side; open load.
1111	4366	12	671	SCR-heater relay urea tank powerstage output; over temperature.
1112	4366	3	671	SCR Tank heating valve; short circuit to battery.
1113	4366	4	671	SCR Tank heating valve; short circuit to ground.
1117	523632	11	666	Pump motor not available for actuation.
1118	4375	5	666	Urea pump motor; open load.
1120	4375	3	666	Urea pump motor; short circuit to battery.
1121	4375	4	666	Urea pump motor; short circuit to ground.
1122	4334	0	665	Supply module DEF, DEF pressure above upper physical threshold.
1123	4334	1	665	Urea supply module pressure sensor; physical range check low (defect pressure sensor).
1124	4334	0	665	Urea pump pressure sensor; high signal not plausible.
1125	4334	1	665	Urea pump pressure sensor; low signal not plausible.
1126	523632	2	665	Signal error for CAN message. No detail informationen!
1127	523632	3	665	Sensor error urea pump pressure; signal range check high.
1128	523632	4	665	Sensor error urea pump pressure; signal range check low.
1129	4376	5	667	SCR reversal valve; open load.
1130	4376	12	667	SCR reversing valve; over temperature.
1131	4376	3	667	SCR reversal valve; short circuit to battery.
1132	4376	4	667	SCR reversing valve; short circuit to ground.
1135	3031	0	669	DEF tank, DEF temperature in DEF tank is to high.
1136	3031	1	669	DEF tank, DEF temperature below lower physical threshold.
1137	4365	2	669	Tank temperature signal error for CAN message.
1138	4365	3	669	Sensor error urea tank temperature: short circuit to battery.
1139	4365	4	669	Sensor error urea tank temperature; short circuit to ground.
1157	97	12	228	Water in fuel level prefilter; maximum value exceeded.
1158	523946	0	772	Zero fuel calibration injector 1 (in firing order); maximum value exceeded.
1159	523947	0	772	Zero fuel calibration injector 2 (in firing order); maximum value exceeded.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1160	523948	0	772	Zero fuel calibration injector 3 (in firing order); maximum value exceeded.
1161	523949	0	772	Zero fuel calibration injector 4 (in firing order); maximum value exceeded.
1162	523950	0	772	Zero fuel calibration injector 5 (in firing order); maximum value exceeded.
1163	523951	0	772	Zero fuel calibration injector 6 (in firing order); maximum value exceeded.
1164	523946	1	772	Zero fuel calibration injector 1 (in firing order); minimum value exceeded.
1165	523947	1	772	Zero fuel calibration injector 2 (in firing order); minimum value exceeded.
1166	523948	1	772	Zero fuel calibration injector 3 (in firing order); minimum value exceeded.
1167	523949	1	772	Zero fuel calibration injector 4 (in firing order); minimum value exceeded.
1168	523950	1	772	Zero fuel calibration injector 5 (in firing order); minimum value exceeded.
1170	523612	12	555	Internal software error ECU.
1171	175	2	144	Customer oil temperature: signal unplausible.
1173	523973	14	779	SCR Tamper detection; derating timer below limit 1.
1174	523974	14	779	SCR Tamper detection; derating timer below limit 2.
1175	523975	14	175	Urea quality; derating timer below limit 1.
1176	523976	14	175	Urea qulaity; derating timer below limit 2.
1177	523977	14	781	Urea tank level; derating timer below limit 1.
1178	523978	14	781	Urea tank level; derating timer below limit 2.
1180	168	0	318	Physical range check high for battery voltage.
1181	168	1	318	Physical range check low for battery voltage.
1183	172	1	226	Air inlet filter sensor out of physical range check.
1193	1180	0	556	Physical range check high for exhaust gas temperature upstream turbine.
1194	1180	1	556	Physical range check low for exhaust gas temperature upstream turbine.
1219	524018	14	786	HMI engine derate service state. DPF wasn´t regenerated, power reduction phase 1 (manuell regeneration request).
1220	524022	14	786	HMI engine derate stop state. DPF wasn´t regenerated, power reduction phase 2 (manuell regeneration request).
1222	190	14	212	Camshaft- and Crankshaft speed sensor signal not available on CAN.
1223	5763	5	594	Actuator EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); open load.
1224	5763	6	594	Actuator EGR-Valve (2.9;3.6) or Throttle-Valve (6.1,7.8); over current.
1226	5763	3	594	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to battery.
1227	5763	3	594	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to battery.
1228	5763	4	594	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground.
1229	5763	4	594	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground.
1230	5763	6	594	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Overload by short-circuit.
1231	5763	11	594	Power stage over temperature due to high current.
1232	5763	4	594	actuator AGR valve (2.9;3.6) throttle valve (4.1;6.1;7.8); Voltage below threshold.
1239	523984	3	788	UB7; Short circuit to battery error of actuator relay 6.
1241	523986	4	176	Relais SCR-Heater, Short Circuit to Ground (High side Control side).
1242	523987	4	791	UB6; Short circuit to ground actuator relay 6.
1247	524019	11	862	Burner Control; Air Line - Blocked. Air Pump; air lines blocked.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1248	523910	9	695	Burner Control; Air Pump - CAN Lost. Air Pump; CAN communication lost.
1249	523910	7	695	Air pump; CAN communication interrupted no purge function available.
1250	523910	12	695	Air Pump; internal error.
1252	523910	0	695	Air Pump; operating voltage error.
1254	524014	1	858	Air inlet EPV - pressure too low. Air pressure glow plug flush line; below limit.
1255	524013	7	857	Burner Control; Flame lost max. Burner operation is interrupted too often.
1257	523915	7	853	HCl dosing valve (DV1); blocked open.
1258	524016	11	859	Burner Control; HFM - Electrical Fault. HFM sensor; electrical fault.
1259	524016	2	859	Burner Control; HFM - Plausibilitätsfehler 1. Amount of air is not plausible to pump speed.
1261	523910	6	695	Burner Control Air Pump; over current. Air pump electrically overloaded.
1262	523922	7	854	Burner Control; Shut-off Valve - Blocked closed. Burner Shut Off Valve; blocked closed.
1263	524021	11	864	Burner Control; Fuel line ShutOff downstream - broken. Burner fuel line pipe leak behind Shut Off Valve.
1264	523922	7	855	Burner Shut Off Valve; blocked open.
1282	523993	9	794	
1285	524038	9	824	Timeout error of CAN-Receive-Frame ComMS_Sys1TO (error memory Slave); Master-Slave internal CAN message.
1286	524039	9	825	Timeout error of CAN-Receive-Frame ComMS_Sys2TO (error memory Slave); Master-Slave internal CAN message.
1287	524040	9	826	Timeout error of CAN-Receive-Frame ComMS_Sys3TO (error memory Slave); Master-Slave internal CAN message.
1288	524041	9	827	Timeout error of CAN-Receive-Frame ComMS_Sys4TO (error memory Slave); Master-Slave internal CAN message.
1289	524042	9	828	Timeout error of CAN-Receive-Frame ComMS_Sys5TO (error memory Slave); Master-Slave internal CAN message.
1290	524043	9	829	Timeout error of CAN-Receive-Frame ComMS_Sys6TO (error memory Slave); Master-Slave internal CAN message.
1291	524045	9	831	Master Slave, Error of message counter CAN receive message ComMSMoFOvR; ComMSMoFOvR1CNT.
1292	524046	9	832	Master-Slave CAN; Error Checksum of CAN-Receive Message.
1293	524047	9	833	Master-Slave CAN; Error of message length of CAN receive message ComMSMoFOvR;_ComMSMoFOvR1DLC.
1294	524048	9	834	Timeout error CAN message ComMSMoFOvR1TO error memory Slave.
1299	523788	0	655	Wastegate plauisibility error off CAN transmit message.
1300	523788	0	655	Timeout Error of CAN-Receive-Frame ComTrbChActr; Wastegate.
1302	524024	11	866	Deviation of the exhaust gas temperature setpoint to actual value downstream (DOC) too high.
1324	523995	13	795	Check of missing injector adjustment value programming (IMA) injector 7 (in firing order).

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1325	523996	13	796	check of missing injector adjustment value programming (IMA) injector 8 (in firing order).
1326	523997	4	797	Injector cylinder bank 1 slave; short circuit.
1327	523998	4	798	Injector cylinder bank 2 slave; short circuit.
1328	523999	12	799	Injector powerstage output Slave defect.
1329	524000	5	177	Injector 7 (in firing order); interruption of electric connection.
1330	524001	5	178	Injector 8 (in firing order); interruption of electric connection.
1333	524000	3	177	Injector 7 (in firing order); short circuit.
1334	524001	3	178	Injector 8 (in firing order); short circuit.
1337	2797	4	565	Timeout of Short-Circuit Ground Diagnosis Cyl. Bank 0; _IVDiaShCirGndToutBnk_0.
1338	2798	4	566	Timeout of Short-Circuit Ground Diagnosis Cyl. Bank 1; _IVDiaShCirGndToutBnk_1.
1339	2797	4	565	Injector diagnostic; Short circuit to ground cylinder bank 0.
1340	2798	4	566	Injector diagnostic; Short circuit to ground cylinder bank 1.
1341	524035	12	555	Injector diagnostics; time out error in the SPI communication.
1342	524036	12	555	Injector diagnostics Slave; time out error in the SPI communication.
1345	524069	9	896	Timeout Error of CAN-Receive-Frame MSMon_FidFCCTO; Master-Slave CAN communication faulty.
1357	524052	11	836	Error memory Slave reports FID MSMonFC2 (collective error).
1368	524052	11	836	Error memory Slave reports FID MSMonFC3 (collective error).
1378	523919	2	694	Sensor air pump airpressure; plausibility error.
1379	523920	2	716	Sensor exhaust gas back pressure burner; plausibility error.
1380	3253	2	692	Sensor differential pressure (DPF); plausibility error.
1381	164	2	839	Rail pressure safety function is not executed correctly ().
1389	523922	5	715	Burner Shut Off Valve; open load.
1390	523922	12	715	Burner Shut Off Valve; powerstage over temperature.
1392	523922	4	715	Burner Shut Off Valve; short circuit to ground.
1395	523921	2	714	Burner temperature sensor; Plausibility Check for burner temperature sensor. Sensor burner temperature; plausibility error.
1398	1136	0	681	Physical range check high for ECU temperature.
1402	4769	2	684	Sensor exhaust gas temperature OxiCat downstream (normal operation); plausibility error.
1403	4769	2	684	Sensor exhaust gas temperature OxiCat downstream (regeneration); plausibility error.
1411	1188	11	814	Wastegate actuator; internal error.
1412	1188	11	814	Wastegate actuator; EOL calibration not performed correctly.
1413	1188	13	814	Wastegate actuator calibration deviation too large, recalibration required.
1414	1188	2	814	Wastegate; status message from ECU missing.
1415	1188	7	814	Wastegate actuator; blocked.
1417	1188	11	814	Wastegate actuator; over temperature (> 135°C).
1418	1188	11	814	Wastegate actuator; operating voltage error.
1423	5763	0	594	Warning threshold for an internal actuator error exceeded, < 4L EGR.actuator und >4L Air Intake Flap.
1424	5763	1	594	Shut off threshold for an internal actuator error exceeded, < 4L EGR.actuator und >4L Air Intake Flap.
1425	172	0	226	air temperature within air filter box above maximum physical value.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1431	524028	2	815	CAN message PROEGRActr; plausibility error.
1432	524029	2	815	Timeout Error of CAN-Receive-Frame ComEGRActr - exhaust gas recirculation positioner.
1436	524034	5	816	Disc Separator; open load.
1437	524034	12	816	Disc Separator; powerstage over temperature.
1438	524034	3	816	Disc separator; short circuit to battery.
1439	524034	4	816	Disc separator; short circuit to ground.
1440	524030	7	815	EGR actuator; internal error.
1441	524031	13	815	EGR actuator, calibration error.
1442	524032	2	815	EGR actuator; status message "EGRCust" is missing.
1443	524033	7	815	EGR actuator; due to overload in Save Mode.
1455	3711	12	711	Temperature during stand-still main phase too low or too high.
1458	523960	0	771	High exhaust gas temperature EGR cooler downstream; warning threshold exceeded.
1464	0	0	-	
1466	0	0	-	
1467	0	0	-	
1469	0	0	-	
1470	0	0	-	
1471	0	0	-	
1472	0	0	-	
1481	524025	5	845	DPF system; operating voltage error.
1482	524044	9	188	CAN message ComMS_Sys7 not received from slave.
1484	524068	2	895	Master ECU and Slave ECU have been identified as the same types.
1485	524052	11	836	Master ECU and Slave ECU data sets or software are not identical.
1486	523718	5	676	SCR mainrelay; open load (only CV56B).
1488	523718	3	676	SCR mainrelay; short circuit to battery (only CV56B).
1489	523718	4	676	SCR mainrelay; short circuit to ground (only CV56B).
1490	4376	5	667	SCR reverting valve; open load.
1491	4376	12	667	SCR reverting valve; over temperature.
1493	4376	4	667	SCR reverting valve; short circuit to ground.
1505	524057	2	843	Fuel low pressure pump; error pressure build up.
1523	2659	2	822	Exhaust Gas Recirculation AGS Sensor; signal not plausible.
1524	2659	0	822	Exhaust Gas Recirculation AGS Sensor; Sensed exhaust mass value above maximum physical value.
1525	2659	1	822	Exhaust Gas Recirculation AGS Sensor; Sensed exhaust mass value below minimum physical value.
1526	2659	12	822	Exhaust Gas Recirculation AGS Sensor; plausibility error, AGS sensor has not passed the burn off process.
1527	2659	2	822	Exhaust Gas Recirculation AGS Sensor; Temperature of EGR mass not plausible.
1529	524070	2	897	(Upstream NOx-Sensor) Diagnostic Fault Check for invalid upstream NOx value (Sensor self diagnostic DFC set by Deutz-SW). NOx-Sensor before SCR-Cat: Invalid upstream NOx value.
1530	524071	2	898	(Downstream NOx-Sensor) Diagnostic Fault Check for invalid downstream lambda value (Sensor self diagnostic DFC set by Deutz-SW).

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1531	524072	2	899	(Upstream NOx-Sensor) Diagnostic Fault Check for invalid upstream lambda value (Sensor self diagnostic DFC set by Deutz-SW).
1532	524073	2	245	(Downstream NOx-Sensor) Diagnostic Fault Check for invalid downstream NOx value (Sensor self diagnostic DFC set by Deutz-SW).
1533	524074	9	246	NOx sensor downstream SCR-CAT, sensor internally open load.
1534	524075	11	247	NOx sensor downstream SCR-CAT, sensor internally short circuit.
1535	524076	9	248	NOx sensor upstream SCR-CAT, sensor internally open line.
1536	524077	11	249	NOx sensor upstream SCR-CAT, sensor internally short circuit.
1537	524078	9	255	NOx sensor downstream SCR-CAT, lambda value above upper physical threshold.
1538	524079	9	256	NOx sensor downstream SCR-CAT, lambda value below lower physical threshold.
1539	524080	9	257	NOx sensor upstream SCR-CAT, lambda value above upper physical threshold.
1540	524081	9	258	NOx sensor upstream SCR-CAT, lambda value below lower physical threshold.
1541	524082	9	259	(Downstream NOx-Sensor) Diagnostic Fault Check for downstream NOx value over maximum limit (DFC set by Deutz-SW).
1542	524083	9	261	NOx-Sensor downstream SCR-CAT, NOx value below minimum value.
1543	524084	9	911	NOx-Sensor upstream SCR-CAT, NOx value above maximum value.
1544	524085	9	912	NOx sensor upstream SCR-CAT, NOx value below lower physical threshold.
1545	524149	2	968	Plausibility error between pressure downstream turbine (PTrbnDs) and ambient air pressure (EnvP).
1555	524063	5	869	SCR heater return line; open load.
1556	524063	5	869	SCR main relay not connected.
1557	524063	5	869	SCR heater pressure line; open load.
1558	524063	3	869	SCR heater main relay; short circuit to battery.
1559	524063	4	869	SCR heater main relay load side (K31) on heating valve (Y31), Short cut to ground.
1560	524063	5	869	SCR relay for suction line not connected.
1561	524063	5	869	SCR heater supply module; open load.
1562	524063	5	869	SCR heater tank; open load.
1565	524065	0	892	Pressure sensor upstream SCR-CAT, pressure above upper physical threshold.
1566	524065	1	892	Pressure sensor upstream SCR-CAT, pressure below lower physical threshold.
1569	524065	3	892	Pressure sensor upstream SCR-CAT; short circuit battery or open load.
1570	524065	4	892	Pressure sensor upstream SCR-CAT; short circuit ground.
1579	524066	3	893	SCR measurement heater output stage; short circuit battery or open load.
1581	524067	0	894	DEF supply module, heater temperature above upper physical threshold.
1582	524067	1	894	DEF supply module, heater temperature below lower physical threshold.
1585	524067	0	894	DEF supply module, temperature above upper physical threshold.
1586	524067	1	894	DEF supply module, temperature below lower physical threshold.
1593	1761	0	129	DEF tank, DEF level above upper physical threshold.
1594	1761	1	129	DEF tank, DEF level below lower physical threshold.
1597	524149	2	968	Pressure downstream turbine, plausibility error.
1598	524065	2	892	Pressure sensor upstream SCR-CAT, plausibility error.
1616	3699	2	818	Passive regeneration of DPF; plausibility error. DPF differential pressure sensor and a further sensor or actuator CRT system defective.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1617	3699	2	818	Passive regeneration of DPF; DOC error. Temperature sensor us. and ds. DOC simultaneously defect.
1619	524087	5	884	Urea Error Lamp; open load.
1620	524087	12	884	Urea Error Lamp; temperatur over limit.
1621	524087	3	884	Urea Error Lamp; short circuit battery.
1622	524087	4	884	Urea Error Lamp; short circuit ground.
1630	524132	2	955	Fuel low pressure upstream fuel low pressure pump not plausible.
1631	524132	0	955	Fuel low pressure upstream fuel low pressure pump, pressure above maximum warning threshold.
1632	524132	0	955	Fuel low pressure upstream fuel low pressure pump, pressure above maximum shut off threshold.
1633	524132	1	955	Fuel low pressure upstream fuel low pressure pump, pressure below minimum shut off threshold.
1634	524132	1	955	Fuel low pressure upstream fuel low pressure pump, pressure below minimum warning threshold.
1635	3699	0	818	Maximum standstill time reached; oil exchange request ignored.
1639	524147	13	966	SCR System, pressure build up not possible.
1646	524063	12	869	DEF supply modul, time for defrosting too long.
1647	524063	12	869	DEF tank, time for defrosting too long.
1654	1761	14	138	Urea Tank Signal to HMI for indicating the Urea Tank-Level (Urea tank volume ratio low threshold 1).
1655	1761	14	138	DEF tank, DEF level below first warning threshold.
1656	1761	14	138	DEF tank, DEF level below second warning threshold.
1658	524096	14	196	Control of the SCR system; If the start stop counter (EPA-Counter) exceeds the threshold. SCRCtl_ctEngStrtStopThresh_C. This counter will increment only once in each driving cycle in case of an SCR error. If the counter reaches the threshold, the DFC will be set to inhibit the engine start. Engine will not be started, because of EPA-Counter.
1659	524114	9	938	Timeout error of CAN-Transmit-Frame A1DOC.
1660	524115	9	939	Timeout error of CAN-Transmit-Frame AT1S.
1661	524116	9	194	Timeout error of CAN-Transmit-Frame SCR2.
1662	524117	9	941	Timeout error of CAN-Transmit-Frame SCR3.
1663	524097	9	921	Timeout error of CAN-Transmit-Frame DPFBrnAirPmpCtl.
1664	524098	9	922	Timeout error of CAN-Transmit-Frame ComDPFBrnPT.
1665	524099	9	923	Timeout error of CAN-Transmit-Frame ComDPFC1.
1666	524100	9	924	Timeout error of CAN-Transmit-Frame ComDPFHisDat.
1667	524101	9	925	Timeout error of CAN-Transmit-Frame ComDPFTstMon.
1668	524105	9	929	Timeout error of CAN-Transmit-Frame ComEGRMsFlw.
1669	524108	9	932	Timeout error of CAN-Transmit-Frame ComEGRTVActr.
1670	524110	9	934	Timeout error of CAN-Transmit-Frame ComETVActrTO.
1671	524112	9	936	Timeout ComIntake Throttle Valve Actr.
1672	524118	9	942	Timeout error of CAN-Receive-Frame ComRxCM1.
1673	524119	9	943	Timeout error of CAN-Receive-Frame ComRxCustSCR3.
1674	524102	9	926	Timeout error of CAN-Receive-Frame ComRxDPFBrnAirPmpCtl.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1675	524103	9	927	Timeout error of CAN-Receive-Frame ComRxDPFBrnAirPmp.
1676	524104	9	928	Timeout error of CAN-Receive-Frame ComRxDPFCtl.
1677	524106	9	195	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw1.
1678	524107	9	931	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw2.
1679	524109	9	933	Timeout error of CAN-Receive-Frame ComRxEGRTVActr.
1680	524111	9	935	Timeout error of CAN-Receive-Frame ComRxETVActr.
1681	524113	9	937	Timeout error of CAN-Receive-Frame ComRxITVActr.
1682	524120	9	944	Timeout error of CAN-Receive-Frame ComRxSCRHtDiag.
1683	524121	9	945	Timeout error of CAN-Receive-Frame ComRxTrbChActr.
1684	524122	9	946	Timeout error of CAN-Receive-Frame ComRxUQSens.
1685	524123	9	947	Timeout error of CAN-Receive-Frame ComSCRHtCtl.
1686	524124	9	948	Timeout error of CAN-Receive-Frame ComTxAT1IMG.
1687	524125	9	949	Timeout error of CAN-Receive-Frame ComTxTrbChActr
1698	524133	2	956	HMI system; set if restore button blocked.
1699	524134	0	957	DPF, ash load exceeds the shutoff threshold.
1700	524134	0	957	DPF, ash load exceeds the warning threshold.
1701	524135	0	958	DPF, soot load exceeds the shutoff threshold.
1702	524135	14	958	DPF, soot load exceeds the service request threshold.
1703	524135	0	958	DPF, soot load exceeds the warning threshold.
1705	524156	9	972	Timeout error of CAN-Receive-Frame ComRxEBC2.
1752	2791	7	415	EGR actuator, actuator blocked.
1753	2791	2	415	EGR actuator, CAN error.
1754	2791	13	415	EGR actuator, EOL calibration error.
1755	2791	12	415	EGR Actuator, internal electrical fault.
1756	2791	13	415	EGR actuator, learning process aborted.
1757	2791	6	415	EGR actuator current is above maximum threshold.
1758	2791	3	415	EGR actuator supply voltage is above the maximum threshold.
1759	2791	4	415	EGR actuator supply voltage is below minimum threshold.
1760	2791	13	415	EGR actuator, learning process out of range.
1761	2791	7	415	EGR actuator, broken spring detected.
1762	2791	16	415	EGR actuator, temperature high.
1763	2791	0	415	EGR actuator, temperature critical high.
1788	1188	7	814	Turbocharger wastegate, mechanical blocking detected.
1789	1188	2	814	Turbocharger wastegate, CAN Error.
1790	1188	13	814	Turbocharger wastegate, EOL calibration error.
1791	1188	12	814	Turbocharger wastegate, internal electrical error.
1792	1188	13	814	Turbocharger wastegate, learning process aborted.
1793	1188	6	814	Turbocharger wastegate, current above maximum threshold.
1794	1188	3	814	Turbocharger wastegate, supply voltage above maximum threshold.
1795	1188	4	814	Turbocharger wastegate, supply voltage below minimum threshold.
1796	1188	13	814	Turbocharger wastegate, learning process out of range.
1797	1188	7	814	Turbocharger wastegate, broken spring detected.
1799	1188	0	814	Turbocharger wastegate, temperature critical high.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1827	524141	7	192	DEF dosing valve, dosing valve blocked.
1857	523612	12	555	Engine starter, plausibility error of starter release condition.
1858	524147	7	966	SCR-System, reverting valve blocked
1859	524175	0	993	SCR-CAT, Nox emissions above maximum threshold.
1860	524074	2	246	NOx-Sensor after SCR-Cat: Nox-Sensor dew point problem or plausibility problem.
1861	524076	2	248	NOx-Sensor before SCR-Cat: Nox-Sensor dew point problem or plausibility problem.
1863	524177	7	995	SCR System, DEF suction line blocked.
1864	524178	7	996	SCR System, DEF pressure out of range.
1865	4360	2	668	Exhaust temperature sensor upstream SCR, plausibility error.
1866	4334	2	665	DEF supply module pressure, plausibility error.
1867	524067	2	894	Supply module heater temperature, plausibility error.
1868	524067	2	894	Supply module temperature, plausibility error.
1869	1761	2	129	DEF tank level, plausibility error.
1870	3031	2	669	Urea tank temperature outside of plausible thresholds.
1874	524152	2	971	Urea Quality Sensor; Timeout CAN message.
1875	524153	2	997	Urea tank level & urea tank temperature via CAN bus, timeout of CAN message.
1880	1761	14	138	DEF tank, DEF level below third warning threshold.
1881	4768	2	683	exhaust gas temperature sensors up- and downstream DOC are physically swapped
1882	524025	14	845	The standstill-regeneration mode time exceeds the long-limit. Vehicle was too long or too often in standstill mode. Make oil change and reset counter.
1883	524025	14	845	The standstill-regeneration mode time exceeds the short-limit. Vehicle was too long or too often within a short time in standstill mode. Make oil change and reset counter.
1889	524189	9	269	Master / Slave Can disturbed.
1891	524190	14	272	Inducement level 1 activ.
1892	524191	14	273	Inducement level 2 activ.
1893	524193	8	275	The standstill-regeneration mode time exceeds the long limit threshold. Vehicle was too long or too often in standstill mode. Change oil and reset counter.
1894	524194	8	276	The standstill-regeneration mode time exceeds the short-limit. Vehicle was too long or too often within a short time in standstill mode. Change oil and reset counter.
1895	3519	12	277	DEF tank temperature, temperature too high
1896	3520	3	278	DEF quality sensor, short circuit to battery or open load
1897	3520	4	278	DEF quality sensor, short circuit to ground
1898	3519	3	277	DEF quality sensor, internal temperature sensor short circuit to battery or open load
1899	3519	4	277	DEF quality sensor, internal temperature sensor short circuit to ground.
1900	524195	14	279	Standstill request due to crystalisation ignored too long.
1901	524196	13	283	Variant handling, address error.
1902	524196	2	283	Variant handling, Synchronisation error.
1904	3520	2	278	DEF quality seonsor, bad DEF quality detected or no DEF measuring possible.
1907	3520	13	278	Urea quality at UQS invalid.
1908	3519	13	277	Temperature at UQS invalid.

Table 3-15. Deutz Trouble Codes - EMR4 (TD2.9 Engine)

KWP-Code	SPN	FMI	Blink code	Error Identification
1911	3532	3	127	The DEF Level at UQS out of max. physical range.
1912	3532	4	127	Quality at UQS out of min. physical range.
1914	4365	3	669	DEF qualitysensor, tank temperatur; Short circuit to battery or open load.
1915	4365	4	669	DEF qualitysensor, tank temperatur; Short circuit to ground.
1917	3936	14	286	Standstill request ignored too long.
1918	3936	14	286	Standstill time based escalation requests Inducement step 2.
1921	51	5	594	Intake Throttle Flap, H-Bridge, wiring harness broken at connected actuator.
1922	51	6	594	Intake Throttle Flap, H-Bridge, current above maximum threshold.
1924	51	3	594	Intake Throttle Flap, H-Bridge, short circuit to battery (A02).
1925	51	3	594	Intake Throttle Flap, H-Bridge, short circuit to battery (A67).
1926	51	4	594	Intake Throttle Flap, H-Bridge, short circuit to ground (A02).
1927	51	4	594	Intake Throttle Flap, H-Bridge, short circuit to ground (A67).
1931	51	7	594	Intake Throttle Flap, H-Bridge, position of actuator not plausible (deviation from setpoint more than 7%).
1935	51	3	594	Intake Throttle Flap, H-Bridge, short circuit to battery oder broken wiring harness.
1936	51	4	594	Intake Throttle Flap, H-Bridge, short circuit to ground.
1943	524202	11	313	SCR error code in master ECU active.
1944	524203	11	313	DEF tank level failure is in master ECU active.
1945	524204	11	313	SCR afterrun failure is in master ECU active.
1946	524205	11	313	SCR Co2Off failure is in master ECU active.
1947	524206	11	313	SCR disable DEF dosing failure is in master ECU active.
1971	524230	11	315	Inducement HW Failure Slave.
1972	524231	11	315	Inducement SCR Tamp. Slave.
1973	524232	11	315	Inducement DEF Qualitity in Slave ECU.
1980	524239	11	315	SCR regeneration failure is in slave ECU active.
1989	524248	11	315	NOX sensor downstream error in slave ECU.
1990	524249	11	315	DEF dosing valve error in slave ECU.
1992	524251	11	315	DEF pressure problems in slave ECU.
1993	524252	11	315	Reverting valve error in slave ECU.
1994	524253	11	315	DEF back flow line heater error on slave ECU.
1995	524254	11	315	Error NOx-Tailpipe emissions exceeded on Slave ECU.
1996	524255	11	315	DEF suction line heater error on slave ECU.
1997	524256	11	315	DEF supply module heater error on slave ECU.
1998	524257	11	315	Error Exhaust pressure upstream SCR on Slave ECU.
1999	524258	11	315	Error Exhaust temperature upstream SCR on Slave ECU.
2000	524259	11	315	DEF pressure line heater error on slave ECU.
2001	524260	11	315	Error Urea pump temperature on Slave ECU.
2002	524261	11	315	Error DEF heater relais on Slave ECU.
2007	524266	14	287	Announcement triggers the Inducement Level 2.
2008	524267	14	845	Max. launch time for stand still exceeded (60min).
2011	4171	2	668	Dynamic temperatur check of temp before SCR.
2013	524147	13	996	Set together with DFC_SCRCoBldUpLoPres. DFC_SCRCoBldUpLoPresRst is only used for inducement purposes. It ensures that legal inducement is working correctly.

3.27 AIR COMPRESSOR

Description

The compressor consists of a heavy duty rotary screw air compressor with integral inlet valve assembly, oil separation system, minimum pressure/discharge check valve and oil filter housing. The complete system incorporates compressor oil cooling system, hydraulic drive and valving.

Oil Injection

Lubricant is injected into the compressor air end unit and mixes directly with the air in the compression chamber, internal porting also injects oil into the bearings and seal area. The lubricant has three primary functions:

- Controls the rise of air temperature normally associated with the heat of compression.
- Seals the leakage paths between the rotors and the stator, and also between the rotors themselves.
- Acts as a lubricating film between the rotors allowing one rotor to directly drive the other which is an idler. It also lubricates the bearings and seal.

The screw compressor assembly is mounted inside the main casting and consists of a male and female rotor supported with anti-friction bearings suitably sized for long life.

Inlet Valve and Control Valving

The inlet valve and control solenoid valve assembly are mounted directly on top of the compressor module. On initial start-up the solenoid is energized and the inlet valve opens from pilot air being passed through the solenoid actuated valve. When final pressure is reached a pressure switch de-activates the solenoid and the inlet valve closes**.** At the same time the compressor pressure will relieve down to a low pressure (typically about 40 psig (2.75 bar)). Only the compressed air within the compressor module will reduce down to this lower pressure due to the operation of the discharge minimum pressure/check valve. This reduction in internal air pressure reduces the power requirement considerably during this unloaded state. The pressure switch located in the downstream air line senses air demand and upon reducing pressure in discharge line (ie. air being used) will re-activate the inlet valve and the compressor again starts to load and produce air.

The discharge air pressure switch will typically be set with a 30 psi (2.0 bar) differential pressure.

Air Filter Unit

The air filter is dry type replaceable element and is mounted directly on top of the inlet valve assembly. The element is easily replaced for service changeout - Refer to Maintenance Section.

Oil Reservoir and Primary Oil Separation

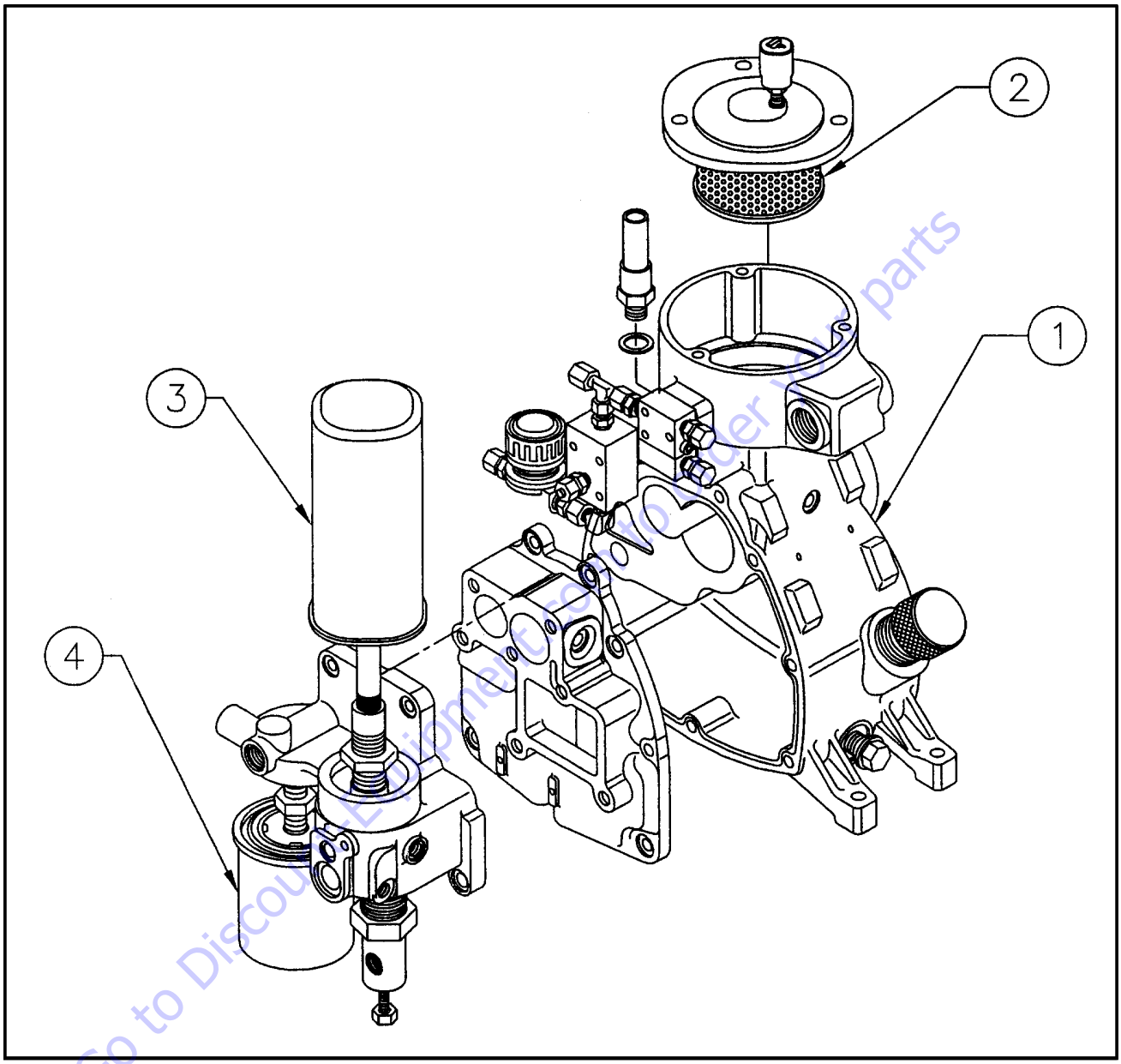
The main casting which contains the screw compressor is also the oil reservoir and primary oil separation unit. The initial (primary) oil separation is caused by both changes in velocity and direction. The main casting also contains the oil level/fill plug and oil drain connection. A separate oil reservoir is not required.

Secondary Spin-On Oil Coalescer/Separator

This spin-on element screws directly onto the filter support housing at the rear of the compressor module. The separator element (coalescer) recovers the finer particles of residual oil after pre-separation oil, which is collected in this element is scavenged back into the compressor unit. The oil return line passes through the Oil Sight Glass which indicates the amount of oil being deposited (scavenged) in the element. At start-up the sight glass most likely will be full for a short period which is due to drainage from the element when it is not in use, this should diminish fairly quickly and a lesser amount should be observed which indicates that the element is separating out oil deposited within the spin-on element.

Spin-On Oil Filter

Located on the filter support housing at the rear of the compressor. The filter incorporates a by-pass valve which will open to by-pass the filter during cold start-up when the oil is very viscous. It will also open if the filter element is plugged. Filter element rating is 10 Micron.



1. Compressor Assembly
2. Air Filter Element
3. Coalescer Spin-On Element
4. Oil Filter Element

Figure 3-101. Air Compressor

Minimum Pressure Valve/Check Valve Assembly

This combined valve located in the filter support housing has two functions.

The Minimum Pressure Valve - will maintain a pressure of approximately 65 psig (4.5 bar) in the compressor unit to ensure oil injection during load conditions and also to maintain effective oil separation. Once this internal pressure is exceeded it will allow air to discharge downstream to the service outlet.

The Discharge Check Valve - prevents air in service lines or downstream receiver from venting down through the compressor during unload (when the compressor automatically will unload to approximately 40 psig [2.75 bar] internally) and also during shutdown.

Hydraulic Drive System

Scope of supply may vary depending upon customer specifications.

Hydraulic pump, oil reservoir, return line oil filter and hoses to and from the completed packaged compressor are not furnished with the compressor. This is customer responsibility.

The packaged compressor unit will normally contain the hydraulic motor, hydraulic pressure relief valve, and on/off solenoid valve.

Input hydraulic oil pressure feed is connected to the bulkhead provided on the compressor package. Within the package the high pressure oil feeds to a manifold containing the pressure relief valve and directional solenoid valve. If a malfunction in the hydraulic motor/compressor assembly causes the hydraulic pressure to rise it will bypass to the return line to safeguard damage or potential injury.

The directional solenoid valve is normally activated by the on/off selector switch mounted in the instrument cluster on the package, this valve is also connected through the compressor safety circuits for over-temperature and over-pressure, if either condition occurs it will shut the unit down, by diverting oil back to tank. It is possible to add remote on/off switch in parallel with the instrument cluster to permit on/off operation from another location on the vehicle.

Hydraulic oil from the manifold is hosed directly to the hydraulic motor and the outlet from the motor passes to the return line connection on the package. Customer to provide both hydraulic feed and return lines.

The hydraulic motor powers the compressor through a belt drive system.

Compressor Cooling System

The package contains a cooler assembly powered by a 12 volt D.C. electric fan. Oil from the compressor sump passes through this cooler before being filtered for re-injection into the compressor. A thermostatic fan temperature switch activates the fan to come on/off to maintain the correct operating temperature for the compressor oil. This switch will activate the fan to come on at approximately 185°F (85°C) and will switch off again at approximately 165°F (74°C). The purpose of maintaining an elevated temperature during operation is to keep intake air moisture in suspension as it passes through the compressor. Thermal switch activation is affected by ambient conditions, load/unload cycles (or low oil level).

Initial Startup

The following procedure should be used to make the initial start-up of your compressor:

1. Position the compressor on a level surface so that the proper amounts of oil can be added if required.
2. Unit should be bolted down, do not rely on hoses to hold the module in position.
3. Check all hose connections are tight and wiring connections correct and tight.
4. Check compressor oil level, top up if necessary.
5. Switch instrument panel to OFF.
6. Ensure hydraulic oil to pump inlet. (Prime if necessary)
7. Engage hydraulic system and allow hydraulic oil to circulate back to tank. Check for leaks.
8. Service valve on compressor closed.
9. Switch the instrument panel switch to ON, this should very quickly pass oil to the hydraulic motor on the compressor and start producing air.
10. Check pressure and temperature gauges. Pressure switch may need adjustment to achieve desired operating pressure.
11. Partly open service valve to load compressor and allow to warm up. Monitor temperature gauge, the ideal operating temperature should be between 165°F and 190°F (74°C and 88°C) although it may be higher in high ambient conditions.
12. Cycle compressor on/off with service valve to ensure operation is OK
13. Close service valve then switch instrument switch to OFF.
14. Disengage hydraulic system.

15. Allow all air to vent to atmosphere, then check compressor oil level - top up if necessary. Check and correct any leaks, tighten any loose fittings, check drive belt tension.

Normal Startup Procedure

1. Check compressor oil level - top up if necessary.
2. Air service valve (beside the compressor) closed.
3. Start the engine.
4. Compressor switch (in the platform) ON - compressor should activate.
5. Allow the compressor to warm up for several minute before operating.

Normal Shutdown Procedure

1. Close service valve and allow compressor to unload and cool down (approx. 5 min.).
2. Position the compressor switch in the platform to OFF.
3. Shut down the engine.

Daily Operation

Before Starting:

1. Check compressor oil level.
2. Check for any leaks or loose bolts.
3. Check drive belt is tight.

After Starting:

1. Check pressure gauge for correct operating pressure.
2. Check for leaks.

General Maintenance

A good maintenance program is the key to long compressor life. Below is a program that when adhered to, should keep the compressor in top operating condition. However, it should be understood that these intervals are for normal operation in a good clean environment. More frequent inspections, oil changes and general maintenance should be carried out in dusty environments, high ambient temperatures or extended light load conditions.

⚠ WARNING

DO NOT REMOVE CAPS, PLUGS OR ANY COMPONENTS WHEN THE COMPRESSOR IS RUNNING OR PRESSURIZED. STOP THE COMPRESSOR AND RELIEVE ALL INTERNAL PRESSURE BEFORE DOING SO.

AFTER INITIAL 50 HOURS

1. Change oil filter (Since initial oil filter will have collected any foreign materials which have collected in manufacture).
2. Check belt tension and alignment (majority of belt stretch will occur during early operation hours, also be sure to check alignment).
3. Check compressor oil for water or emulsion.

EVERY 500 HOURS (OR 6 MONTHS)

1. Change compressor oil and filter.
2. Change air filter (shorter intervals may be required if dirty environment).
3. Check belt tension and alignment.
4. Blow out compressor cooler core.
5. Check all fittings and fastenings.
6. Test shutdown system.

EVERY 1000 HOURS (OR 1 YEAR)

1. Check safety circuit switches.
2. Check sump safety valve.
3. Replace spin-on coalescer (sooner if required).

Lubrication Guide

⚠ WARNING

IT IS IMPORTANT THAT THE COMPRESSOR OIL BE OF A RECOMMENDED TYPE AND THAT IT IS INSPECTED AND REPLACED TOGETHER WITH THE OIL AND AIR FILTERS, IN ACCORDANCE WITH THIS MANUAL.

The result of poorly maintained lubricant and/or filters may produce hazardous conditions resulting in ignition, which could cause a fire in the sump. Damage to equipment and serious bodily harm may result.

It is not possible to establish limits on all physical and chemical properties of lubricants which can affect their performance over a broad range of operating and environmental influences. The responsibility for recommending a suitable lubricant must rest with the user's lubricant supplier and their knowledge of the suitability of their lubricants in screw compressors, operating in the particular environment involved.

Table 3-16. Prime Lubricant Characteristics

Viscosity	160 - 210 SUS at 100°F (38°C) 47 SUS or greater at 210°F (99°C)
Flashpoint	400°F (204°C) minimum
Pour point	Must be at least 20°F (-7°C) lower than the lowest expected ambient operating temperature
Contain	Rust and Oxidation Inhibitors
Contain	Foam Suppressors

TYPES OF LUBRICANT TO BE CONSIDERED:

NOTE: *Factory Fill - A.T.F. – Dexron® III or equivalent.*

NOTICE

DO NOT MIX OILS OF DIFFERENT TYPES.

1. **Automatic Transmission Fluids (i.e., Dexron® III):** Are suitable for the majority of applications. They are commonly applied in heavy duty, high temperature conditions and also where temperatures are consistently below freezing (32°F [0°C]), down to approximately 0°F (-18°C).

   In light load and/or high humidity operating conditions A.T.F. can absorb moisture and may result in emulsification of the lubricant. If this occurs change lubricant immediately since the lubricating properties are breaking down. If this condition persists, consider changing to a different type of lubricant (consult supplier).

2. **Industrial Type Oils:** Should be of premium quality non-detergent mineral oil, viscosity grade SAE20 ISO 68). Industrial oils may be better for high humidity and/or low load factor, where condensed moisture and emulsification may occur. Water will separate and must be drained from the oil sump (daily if necessary In addition to the primary oil characteristics, good water separation is required.

   These lubricants should be applied where conditions above 32°F (0°C) prevail.

3. **Synthetic Lubricants:** In so far as know, all the elastomeric components and metals used in the compressor are fully compatible with Synthetic Hydrocarbon (SHC) and Diester Lubricants. However, the synthetic lubricant should not employ Viscosity Index Additives since, they could precipitate out and cause plugging. Viscosity ranges selected should be based on those outlined in Prime Characteristics and in close liaison with the lubricant supplier.

NOTICE

VARIOUS FACTORS CAN AFFECT "EXTENDED LIFE" LUBRICANTS, SUCH AS REACTIVE GASES OR VAPORS WHICH COULD BE INGESTED INTO THE COMPRESSOR AND MAY ADVERSELY AFFECT THESE LUBRICANTS. IT IS RECOMMENDED WITH THESE LUBRICANTS TO MAINTAIN OIL FILTER CHANGES AT RECOMMENDED INTERVALS AND PARTICIPATE IN AN OIL SAMPLING PROGRAM WITH THE LUBRICANT SUPPLIER.

Oil Filter Replacement

The compressor oil filter is a spin on, throw away type. Before attempting to remove the oil filter, ensure all air is relieved from the system.

NOTICE

USE ONLY ORIGINAL EQUIPMENT FILTERS, OTHER FILTERS MAY NOT HAVE CORRECT PRESSURE RATING OR EVEN DIFFERENT THREAD.

REMOVAL:

1. Remove old filter (use strap wrench if required) by turning Anti-Clockwise and discard as appropriate and in accordance with any pertinent regulations
2. Clean filter head with lint free wiper or cloth.

REPLACEMENT:

1. Apply a light film of oil to the seal surface on the new element.
2. Screw new element on, clockwise by hand until seal contacts filter head, then turn an additional 3/4 turn (by hand).
3. Run compressor and test for leaks.

Coalescer (Air/Oil Separator) Replacement

This is a spin-on, throw away type unit. Before attempting to change ensure all pressure is relieved from the system. Change in accordance with Maintenance Guidelines. If oil carryover into the service line occurs and the oil scavenge return line scavenge shows little or no oil return, then change the element. Verify receiver is not over full.

NOTICE

USE ONLY ORIGINAL EQUIPMENT COALESCER ELEMENT TO ENSURE PRESSURE RATING AND PERFORMANCE IS SATISFACTORY.

REMOVAL:

1. Remove old element (use strap wrench if required) by turning anti-clockwise and discard as appropriate and in accordance with any pertinent regulations.

REPLACEMENT:

1. Apply a light film of oil to the seal surface on the new element.
2. Screw element on clockwise until it seats on the head, rotate an additional 3/4 turn (by hand). Take care not to damage element.
3. Start up and check for leaks.

Air Filter Replacement

DO NOT replace with compressor in operation. If environment is dirty or dusty an earlier change out may be required. To ensure correct filtration use only original equipment filters.

REMOVAL:

1. Unscrew the wing nut on top of the air filter and remove filter cover.
2. Discard filter as appropriate and in accordance with any pertinent regulations.

REPLACEMENT:

1. Clean cover and any dirt inside filter housing taking extreme care that no dust/dirt particles reach the air intake of the compressor.
2. Fit new element inside housing.
3. Replace lid and tighten wing nut on top of air filter assembly.
4. Test run and functional test.

Belts - Tightening and Replacement

Correct tensioning and alignment is important for belt life, bearing life and power transmission.

Correct tensioning and alignment was provided at time of shipment from the factory. However, since maximum belt elongation will occur within the first 50 hours of operation (Of new belts), their tension should be checked several times during this period and corrected as required. The belts should thereafter be checked periodically in order to obtain maximum life and performance.

NOTE: *To avoid possible belt damage, never force belts over the sheaves. Oil spilled or splashed onto the belts in any quantity will cause slippage and severely reduce belt life - take care when filling compressor oil.*

REPLACING/TIGHTENING V-BELTS:

1. Loosen slightly the bolt at the base of the hydraulic motor mounting bracket. This will allow the hydraulic motor to be moved in or out to tighten or loosen the belts.
2. Back off adjusting bolt lock nut. Screw the adjusting bolt clockwise to tighten belt or anti clockwise to loosen belts.
3. After adjustments have been made, tighten base bolt to insure no further movement.

TENSION DATA

Deflection at center of belt span 0.25 in. (6.35 mm), with a force of 4 pounds (1.8 kg).

Pulley alignment is set at factory and shouldn't need to be adjusted, if it is found necessary to adjust the pulley alignment, this is done by loosening the four bolts that hold down the base plate to the frame and adjust per following instructions.

Ensure pulleys are aligned by using a long straight edge which will span both pulleys. Position the straight edge on the sides of the pulleys, if they are in-line there should be no gaps between the straight edge and the pulleys (for the full contact distance across each pulley side), adjust as necessary to get correct alignment and tension.

It may be necessary to repeat and check several times before both tension and alignment are satisfied.

Cooler Core Cleaning (Exterior)

Remove leaves, papers, etc. from outside face. Use compressed air and carefully blow through the core from the inside of the canopy (through fan assembly or remove fan assembly).

DO NOT use high pressure air or pressure washer.

NOTE: *Oil cooler core is aluminum, if this does at some point require internal cleaning, this is best done by a suitable equipped radiator shop. Internal cleaning is NOT a normal maintenance item if the oil is maintained in good condition.*

Adding/Changing Compressor Oil

Ensure all pressure is relieved from the system. Check oil level with unit level, otherwise a false oil level indication will occur.

1. Remove oil fill plug located on main compressor base casting.

NOTE: *This can be done without lifting canopy.)*

2. Carefully add lubricant and monitor oil level, allow time for oil to level out. A complete refill is approximately 5 1/4 quarts (5 liters). Correct oil level is minimum to bottom threads on oil fill port up until oil runs out of port. Overfill can only occur if unit is out of level.

3. Refit oil fill cap tightly by hand.

4. Run unit and recheck oil level after shutdown, allowing time for oil to settle.

Oil drain is provided with short drain hose. This can be routed to a more convenient location if required, dependent upon installation. Use only Schedule 80 pipe or suitably rated hose.

NOTE: *Fill cap has a vent release hole as a safety feature and to act as a "tell-tale". If air escapes while unscrewing the fill cap, then the system still has pressure. Re-tighten the cap and wait until all pressure is relieved.*

Pressure Adjustments

Before adjusting the pressure control system it is necessary to determine the rated full load pressure setting. These can be found in the Specification Section.

PRESSURE SWITCH LOCATION:

The pressure switch is located directly behind the cooling fan inside a black plastic box. Removing the one single screw from the bottom of the plastic cover allows the cover to be removed exposing the two adjustment screws at the top and also exposes the electrical terminations.

⚠ DANGER

ADJUSTMENTS SHOULD BE MADE WITH COMPRESSOR SWITCHED OFF SINCE ELECTRICAL TERMINALS INSIDE PRESSURE SWITCH WILL BE EXPOSED AND OPENING THE CANOPY EXPOSES BELT DRIVE SYSTEM.

PROCEDURE FOR SETTING:

1. Start compressor and allow to warm up. NOTE - Pressure reading on gauge with service valve closed. Switch off compressor.

2. Adjustment screws on pressure switch. Steel slotted screw (L.H. side upper) will adjust both cut-out and cut-in pressures together. Screw in clockwise to increase screw out counter clockwise to decrease. Plastic head slotted screw (R.H. side upper) will permit changes to cut-out pressure (higher pressure) without affecting cut-in pressure. (ie. changes differential pressure range) screw in clockwise to increase and counterclockwise to decrease upper pressure setting.

   Nominal differential setting 25 to 30 psi (1.7 to 2.0 Bar). This is to reduce load/unload cycle in cases where minimal air usage or leaks in hoses/connections may occur. The recovery period from unload to load is rapid with the screw compressor and this initial setting will suit most applications.

   It is suggest to make adjustments in**%** turn increments then close canopy, restart and check pressure. Re-adjust as necessary.

   When desired pressure is set, replace switch cover and close canopy for operation.

NOTICE

INCREASING AIR PRESSURE WILL INCREASE THE REQUIRED COMPRESSOR H.P. BE SURE THE HYDRAULIC POWER SUPPLY IS CAPABLE (HYDRAULIC PRESSURE) OTHERWISE THE COMPRESSOR MAY STALL OUT DURING OPERATION DUE TO INCREASED POWER REQUIREMENT.

Intake Control

The intake control consists of two main sub-assemblies:

1. **Inlet Valve Assembly:** The inlet valve opening/closing (load/unload) is controlled by admitting/exhausting pilot air pressure through the solenoid valve to the piston which is part of the inlet valve assembly. The inlet valve is not a routine maintenance item. Maintenance kits are available which include replacement seals, etc.

2. **Solenoid Valve:** Attaches directly to the inlet valve and responds to signals from the pressure switch to admit/vent pilot air pressure to the inlet valve to control load/unload. In the unlikely event of failure this item is to be replaced as a complete item.

Minimum Pressure Valve

Normally factory set to 65 psig (4.5 Bar). Provides two main functions:

1. **Maintains Minimum Pressure:** Prevents downstream air to pass until compressor system is up to minimum pressure valve setting which aids in maintaining good oil supply to the compressor and also is a requirement for good oil separation.

2. **Back Pressure Check Valve:** Allows for compressor to be unloaded to lower pressure than supply air line system and permits compressor air pressure to be totally relieved when stopped.

   This valve is not a routine maintenance item. Seals and replacement parts are available.

Compressor Thermal Valve

Controls compressor oil temperature and permits for rapid compressor oil warm up. Commences to pass oil through cooler at 160°F (71°C) and is fully open at 185°F (85°C).

Safety Shutdown Systems

Protection for over-pressure and/or over-temperature is provided. If either condition should occur the diverter valve should activate to divert hydraulic fluid back to tank and the compressor will stop, the reset on instrument panel will pop out and stay out until reset. Reason for shutdown should be investigated before pressing reset.

Periodically (every 6 months or every 500 hours) the shutdown system should be tested as follows: Compressor operating, close service valve and allow compressor to unload (2 minutes or more) then touch across button on gauge face to Bezel surrounding the respective gauge with coin or screwdriver. Reset button should pop out and compressor stop. Switch off compressor and press reset button to reactive shutdown system.

Troubleshooting

The information contained in the Troubleshooting Chart has been compiled from information gathered. It contains symptoms and usual causes for the most common types or problem. All available data concerning the trouble should be systematically analyzed before undertaking any repairs or component replacement.

A visual inspection is worth performing for almost all problems and may avoid unnecessary additional damage to the machine. The procedures which can be performed in the least amount of time and with the least amount of removal or disassembly of parts should be performed first.

⚠ WARNING

BEFORE WORKING ON ANY MACHINE, ENSURE IT IS SHUT DOWN AND ISOLATED, AIR PRESSURE RELIEVED, AND UNIT HAS COOLED DOWN.

Table 3-17. Air Compressor Troubleshooting

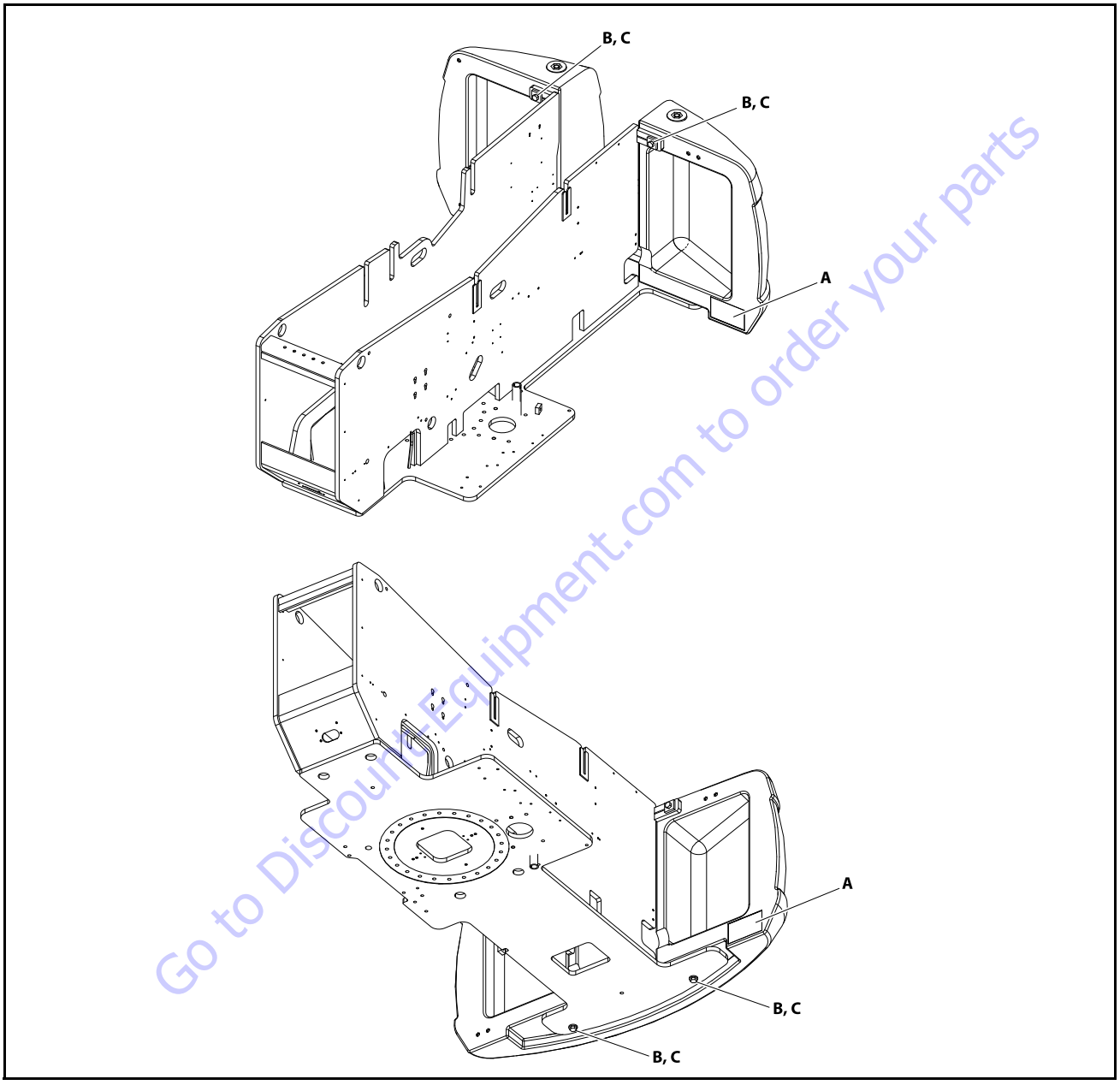
SYMPTOM	PROBABLE CAUSE	SOLUTION
1. Compressor shuts down with air demand	a. Compressor temperature; switch opening.	a. Low oil level-top up. Restricted cooling air intake- clean-reposition machine. Fan not operating-check ground-check fan switch.
	b. Plugged oil filter	b. Replace
	c. Dirty cooler core	c. Clean
	d. Contaminated cooler core	d. Remove and clean
	e. Hydraulic pressure & Flow incorrect	e. Adjust and reset
2. Compressor will not build up pressure	a. Air demand too great	a. Check for leaks and correct Too much air demand
	b. Air filter plugged	b. Check and replace
	c. Press. switch out of adjustment	c. Reset
	d. Defective pressure switch	d. Replace
	e. Motor does not speed up	e. Pressure switch Check hydraulic flow & pressure
	f. Belts slipping	f. Readjust/tighten
	g. Service valve wide open	g. Close
	h. Sol. valve stuck	h. Replace
	i. Leak in air pilot line	i. Check for leaks & correct
3. Compressor over pressures	a. Press. Regul. out of adjustment	a. Reset
	b. Defective press. switch	b. Replace
	c. Leak in air control line	c. Check and correct
	d. Inlet valve stuck	d. Free or replace
	e. Restriction in control line	e. Dirt or ice, clean/free up
	f. Sol. valve not energized/faulty	f. Check for power/replace
	g. Faulty gauge	g. Check with shop air/replace
	h. Defective safety valve	h. Replace
	i. Plugged coalescer	i. Replace
4. Insufficient air delivery	a. Plugged air filter	a. Replace
	b. Plugged coalescer	b. Replace
	c. Motor speed too low	c. Check hydraulic flow & pressure
	d. Inlet valve stuck	d. Free or replace
	f. Belts slipping	f. Readjust

Table 3-17. Air Compressor Troubleshooting

SYMPTOM	PROBABLE CAUSE	SOLUTION
5. Oil carryover	a. Oil level overfull	a. Drain to correct level
	b. Plugged oil scavenge line	b. Remove and clean
	c. Discharge pressure too low	c. Check minimum pressure valve
	d. Defective coalescer	d. Replace
6. Compressor overheating	a. Insufficient oil	a. Check level and top up
	b. Restricted cooling air flow	b. Reposition machine
	c. Fan not operating	c. Check ground connection; Check fan switch; Check air pressure switch; Check circuit breaker; Check for shorted wires; Check fan motor
	d. Plugged oil filter	d. Replace
	e. Cooler core plugged	e. Clean
	f. Pressure set too high	f. Readjust
	g. Contaminated cooler core	g. Remove and clean
	h. Running too fast	h. Check hydraulic flow & pressure
	i. Thermal Valve – element faulty	i. Replace
7. System retains pressure after shutdown	a. Solenoid valve stuck	a. Should be no power to solenoid valve Valve stuck. Replace Pressure switch faulty/replace
	b. Leak back from airline	b. Check minimum pressure valve for leak
8. Compressor stalls	a. Belts slipping	a. Readjust/tighten
	b. Insufficient hydraulic system pressure/flow. This can occur if another hydraulically activated component is used off same pump system. Activating the secondary component may drop hydraulic supply system pressure/flow and leave insufficient for compressor. NOTE - even a momentary drop in supply hydraulic supply pressure/ flow may initiate compressor blowdown to commence.	b. Check setting on supply pressure system relief valve. Check to ensure adequate pressure/ flow. Check if other systems activated off same supply.
	c. Pressure relief valve set too low	c. Check & reset
	d. Leak in seals on pressure relief valve	d. Remove & check seals or fit new valve cartridge
	e. Air pressure set too high for hydraulic system	e. Adjust pressure switch to reduce air pressure.
	f. Leak in solenoid valve cartridge (directional flow control valve) on manifold	f. Remove & check seals or fit new valve cartridge.
	g. Check over-pressure or over-temperature	

3.28 COUNTERWEIGHT

If the counterweight has been removed, ensure the retaining bolts are torqued to the proper value as shown in Figure 3-102., Counterweight.



A. Actual Weight Stamping.

B. Apply JLG Threadlocker P/N 0100019 to Bolt Threads and to Threads in Counterweight.

C. Torque to 285 ft. lbs. (388 Nm). Typical Four Places.

Figure 3-102. Counterweight

PARTS FINDER

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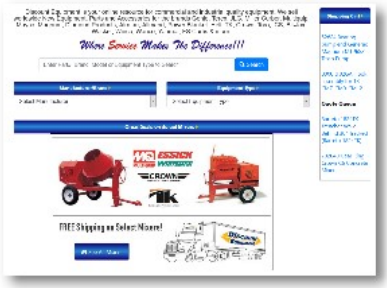

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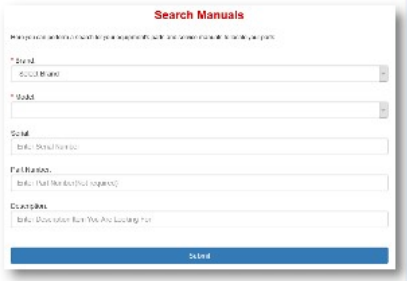

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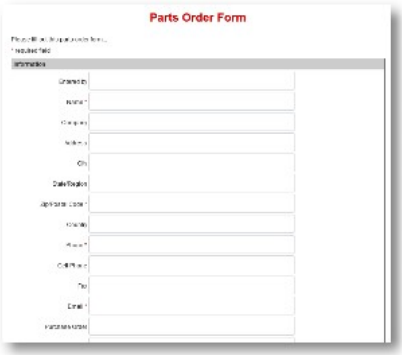

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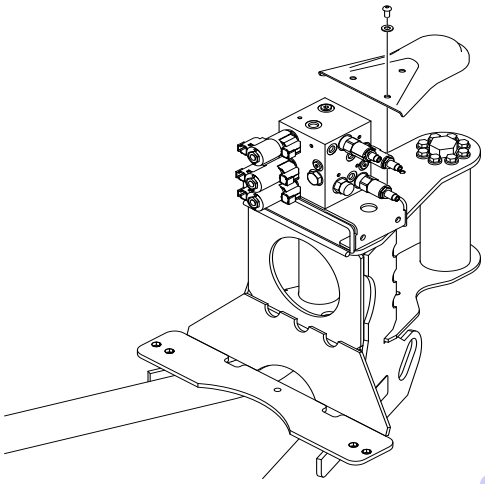
SECTION 4. BOOM & PLATFORM

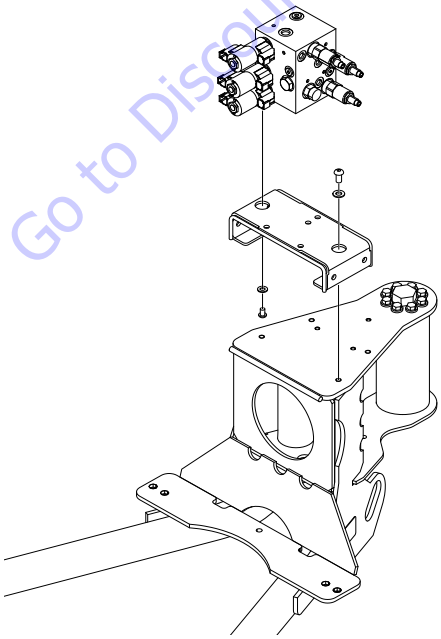
4.1 PLATFORM

Platform Valve Removal

1. Tag and disconnect the hydraulic lines from the platform control valve. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.
2. Remove hardware securing cover from the platform support. Remove cover.

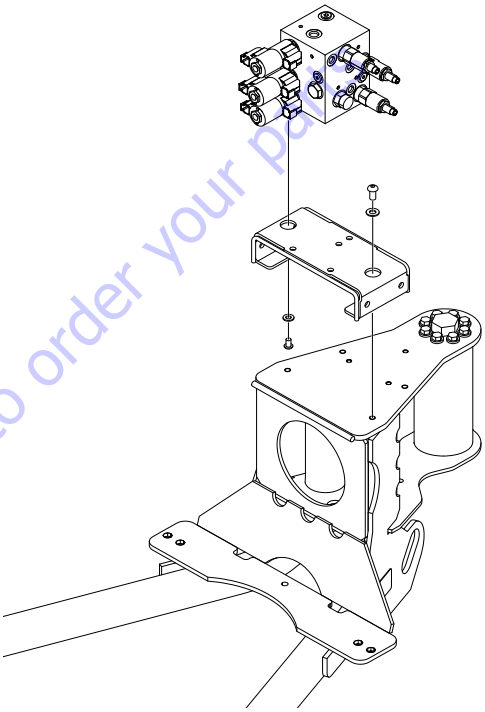


3. Remove hardware securing the mounting bracket to the platform support. Remove the mounting bracket along with platform control valve.
4. Remove hardware securing the platform control valve to the mounting bracket. Remove platform control valve.

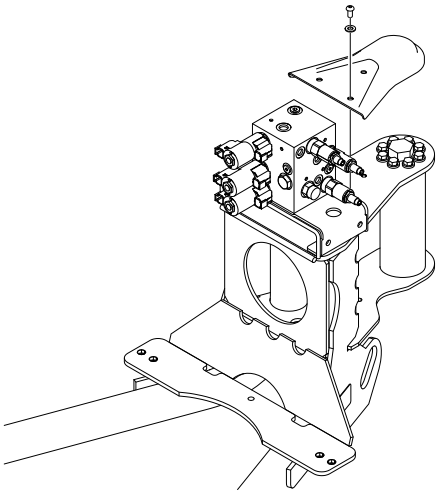


Platform Valve Installation

1. Install platform control valve onto the mounting bracket and secure using hardware.
2. Install the mounting bracket onto the platform support and secure using hardware.



3. Install cover onto the platform support securing the hardware.



4. Remove tag and reconnect the hydraulic lines to the platform control valve.

Support Removal

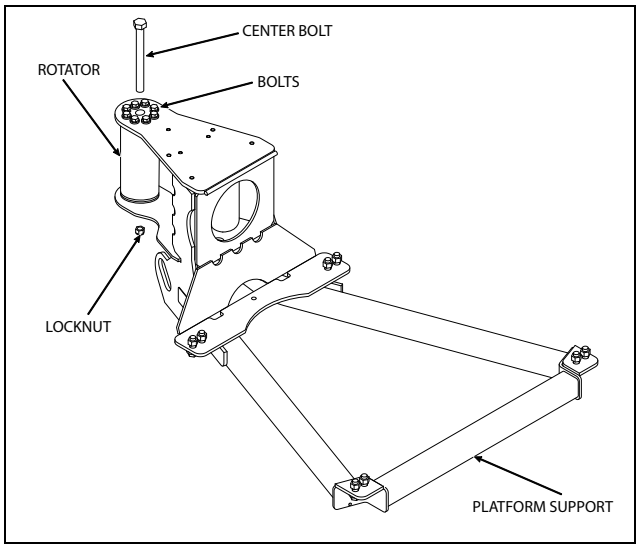
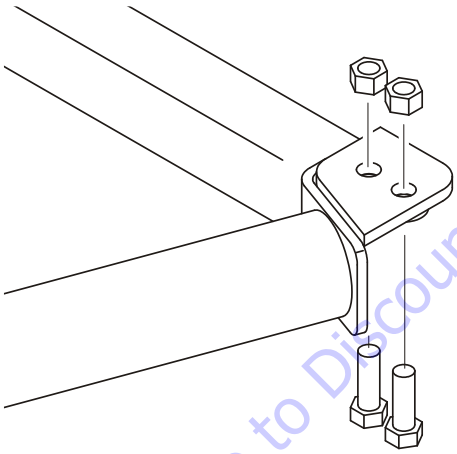


Figure 4-1. Location of Components Platform Support

1. Disconnect electrical cables from control console.
2. Remove the bolts securing the platform to the platform support, then remove the platform.

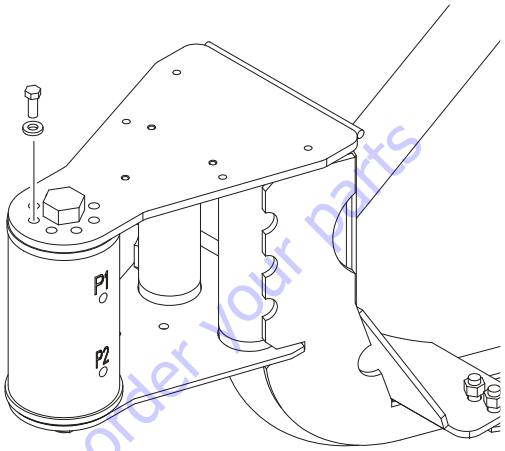
NOTE: *The platform weighs approximately 220 lbs. (100 kg).*



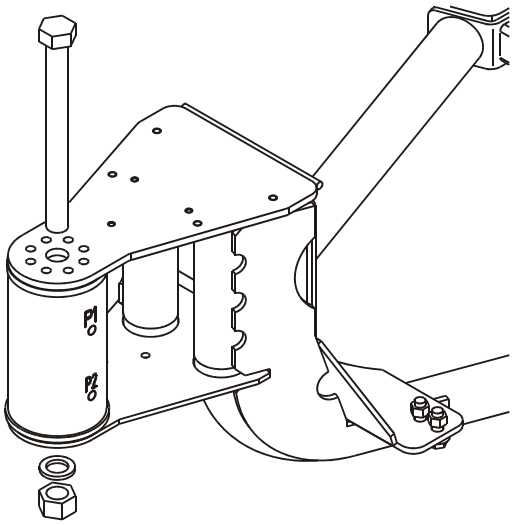
3. Using a suitable device, support the platform support.

NOTE: *The platform support weighs approximately 77 lbs. (35 kg).*

4. Remove the bolts and locknuts securing the support to the rotator.



5. Using a suitable brass drift and hammer, remove the rotator center bolt, then remove the support from the rotator.

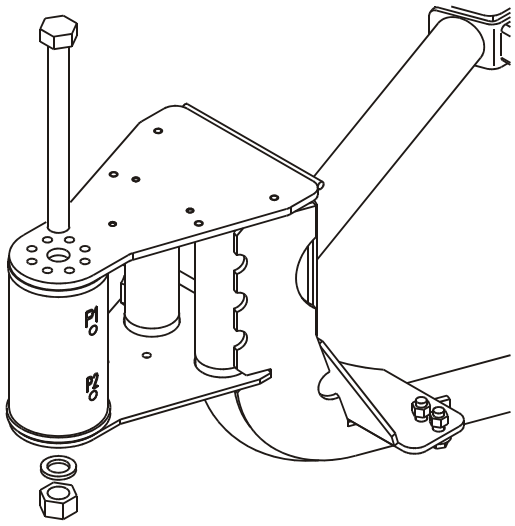


Support Installation

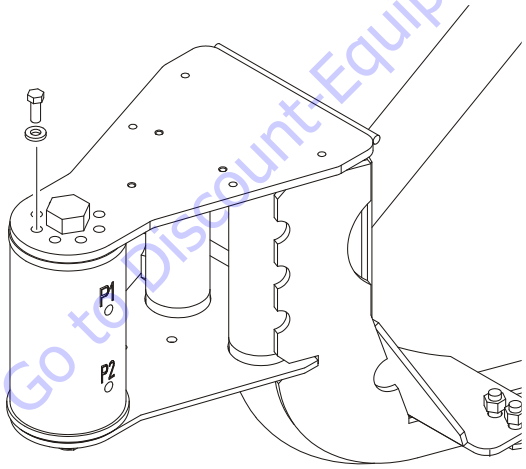
1. Using a suitable device, support the platform support and position it on the rotator.

NOTE: *The platform support weighs approximately 77 lbs. (35 kg).*

2. Install the rotator center bolt.

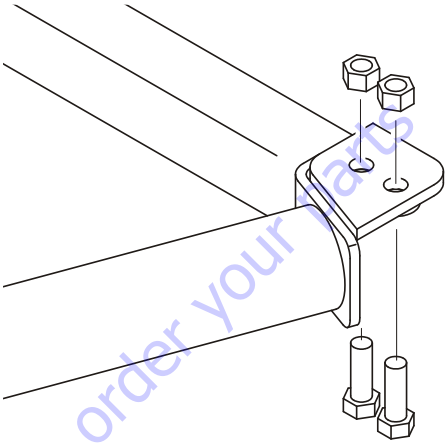


3. Apply JLG Threadlocker P/N 0100011 to the eight bolts and locknuts securing the support to the rotator and install the bolts and locknuts.

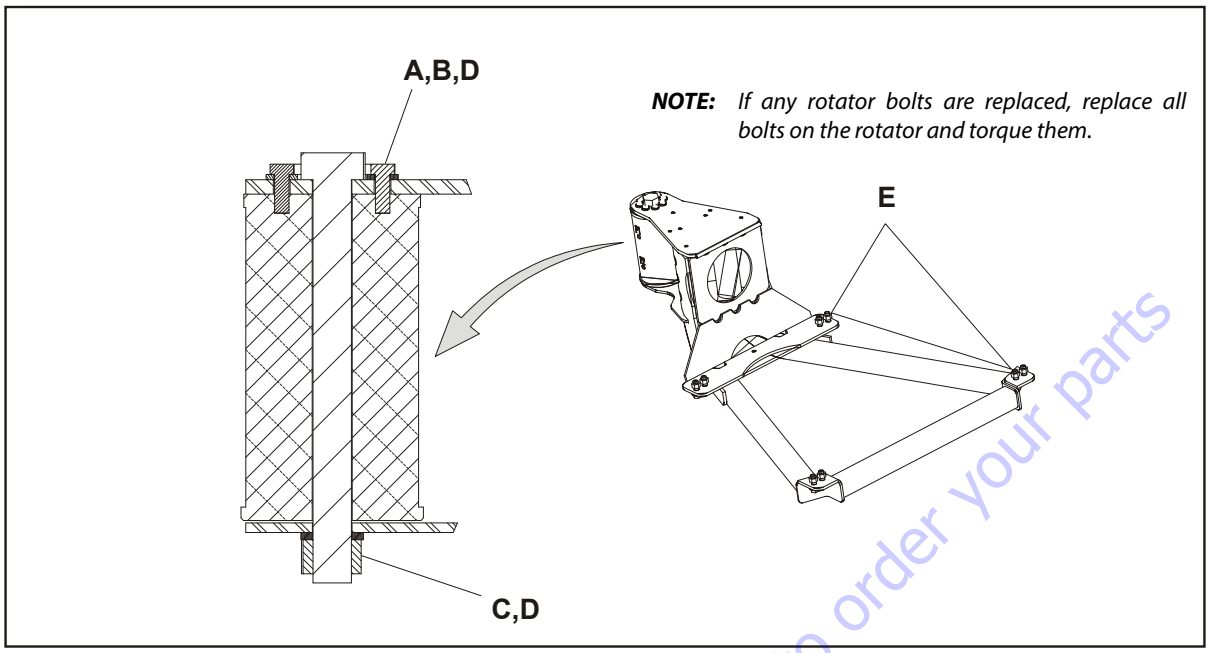


4. Torque the nut on the rotator center bolt to 586 ft. lbs. (795 Nm). Torque the retaining bolts to 40 ft. lbs. (55 Nm).

5. Position the platform on the platform support and install the bolts securing the platform to the platform support. Torque the bolts to 75 ft. lbs. (102 Nm).



6. Connect the electrical cables to the platform control console.



A Torque to 40 ft.lbs. (55 Nm)
B JLG Thread locker (#0100011)
C Torque to 586 ft. lbs. (795 Nm)
D Check torque every 150 hours of operation
E Torque to 75 ft. lbs. (102 Nm)

Figure 4-2. Platform Support Torque Values

4.2 ROTATOR AND SLAVE CYLINDER

Removal

1. Tag and disconnect hydraulic lines from the rotator. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.
2. Supporting the rotator, remove hardware from pin #1. Using a suitable brass drift and hammer remove pin #1 from the jib assembly.

NOTE: *The rotator and slave cylinder assembly weighs approximately 141 lbs. (64 kg).*

3. Remove the hardware from pin #2. Using a suitable brass drift and hammer, remove pin #2 from the jib assembly and remove the rotator.
4. Telescope the fly section out to gain access to the slave cylinder.
5. Remove the hardware from pin #3. Using a suitable brass drift and hammer remove pin #3 from the jib assembly.
6. Supporting the slave cylinder, remove the hardware from pin #4. Using a suitable brass drift and hammer remove pin #4 from the fly boom.
7. Tag and disconnect hydraulic lines from the slave leveling cylinder. Use a suitable container to collect any residual hydraulic fluid. Cap hydraulic lines and ports. Remove the slave cylinder.

Installation

1. Keep the fly section out to gain access to the slave cylinder mounting holes.
2. Support the slave cylinder. Using a suitable brass drift and hammer, install pin #4 to the fly boom. Install hardware securing pin #4.
3. Using a suitable brass drift and hammer, install pin #3 to the jib assembly. Install hardware securing pin #3.
4. Support the rotator. Using a suitable brass drift and hammer, install pin #2 to the fly boom and install the rotator. Install hardware securing pin #2.
5. Using a suitable brass drift and hammer, install pin #1 to the rotator and jib assembly. Install hardware securing pin #1.
6. Remove tag and reconnect the hydraulic lines to the rotator and the slave cylinder.

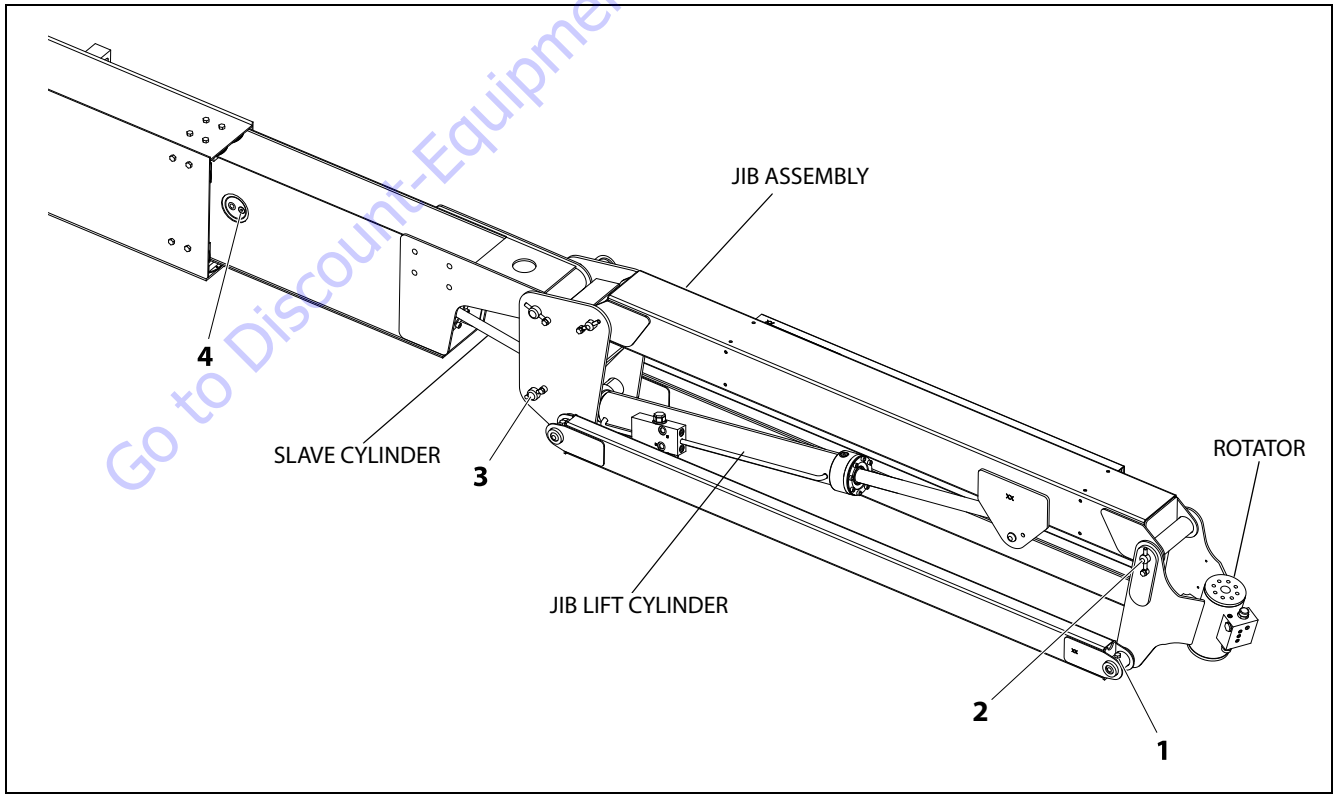


Figure 4-3. Location of Components-Rotator and Slave Cylinder

4.3 BOOM SYSTEM

Switch Systems

The Capacity Indicator, Transport Position Interlock, and Above Elevation Systems use normally closed electrical switches with "positive opening" contacts.

Above Elevation (Above Horizontal) Cutout System

The above elevation cutout system uses a main boom angle switch and a tower boom angle switch to sense when the boom is raised substantially above horizontal. The articulated jib may be in any position. When "above elevation", the engine RPM will attain high engine speed and the drive motors are automatically restricted to their maximum displacement position (slow speed). Additionally when used in conjunction with the "tilt indicator system", the elevation switches will cause an alarm to sound and automatically put the machine in the creep speed mode. With the exception of the speed cutback, this is a warning system only. The machine will continue to function. The operator is responsible to prevent the machine from attaining an unstable position. As described in the Positive Opening Switch System, the "safe" condition of the machine is when high engine and high speed is allowed (at low boom angles).

Transport Position Interlock System (CE only)

The transport position interlock system uses the “above elevation cutout system” switches with the addition of a main boom telescope switch to sense when the boom is out of the transport (nearly stowed) position. The articulated jib may be in any position All controls are simultaneously functional when the booms are within the transport position as on the standard machine. When the booms are outside of 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. In addition to being an interlock, this system also disallows high speed operation while the booms are beyond the transport position. While in this position, the machine will respond in the same way as described in the Above Elevation Cutout System. As described in the Positive Opening Switch System, the “safe” condition of the machine is when the use of multiple function operation is allowed (at low boom angles and short boom lengths).

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. When the footswitch is depressed, the controls are enabled and the operator has 7 seconds to operate any control. 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 be cycling the footswitch by releasing and redepressed the footswitch.

Function Speed Control System

The platform controls for the rotate, tower lift, tower telescope, jib lift, and main telescope functions are controlled through a common infinitely variable speed control knob. This knob feeds a common valve driver control circuit allowing a smooth ramp up and controlled maximum output speed. No ramp down is provided. These functions are controlled through common settings in which compromises must be made from function to function due to differences in flow and pressure. Not all functions will respond the same to the changes in the function speed knob position.

Platform

The standard platform utilizes a hinged swing gate for ease of entry and 3/4 in. expanded metal floor mesh. The optional drop bar gate platform utilizes 1/2 in. expanded metal floor mesh.

Main Lift End Stroke Dampening System

The main boom lift cylinder is constructed in a way that causes the lift cylinder oil flow to be restricted by an orifice while raising the boom within 5 degrees of maximum elevation. This restriction slows the boom lift speed while raising the boom. The oil flow is not restricted while lowering the boom and therefor the speed is not altered.

QuikStick Lift System

The main boom lift cylinder is pinned between the main boom and the nose of the tower fly boom. This causes an interdependency between the tower and main boom. The main boom changes angle when the tower is raised or lowered. In addition, the maximum angle achieved by the main boom is dependent on the position of the tower boom. When the tower boom is stowed, the main boom's maximum angle is 25 degrees. When the tower boom is fully raised, the main boom's maximum angle is 70 degrees. The main boom can be also be raised or lowered independent of the tower boom within the limits of the boom rests and main boom lift cylinder stroke to a minimum angle of -35 degrees. This allows the platform to reach the ground at any position of the tower boom.

Tower Boom Sequence Valve System

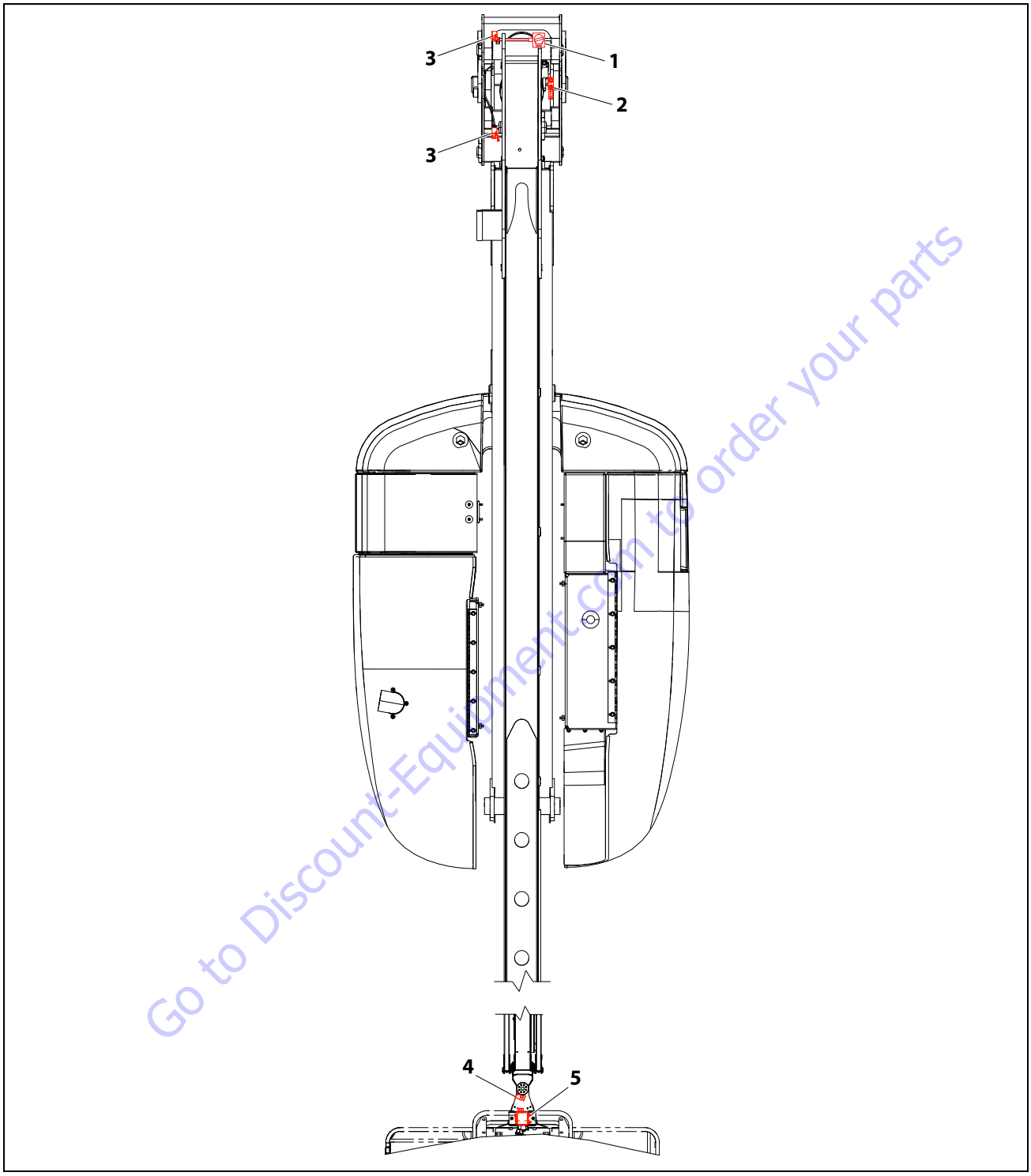
The two section tower boom uses two hydraulic lockout valves to prevent the boom from being telescoped until the boom is fully raised and to prevent the tower boom from being lowered until it is fully retracted. Until the valve mounted in the turntable is actuated by the cam on the tower lift cylinder barrel (at max tower angle), the tower telescope oil flow is blocked preventing the tower from telescoping out. Similarly, until the valve mounted on the tower fly boom is actuated by the tower base boom, the tower lift cylinder oil flow is blocked preventing the tower from lifting down. This is an automatic system. This is an automatic system, however, if either of these lockout valves are defeated, the machine may be positioned in an unstable position.

Upright Level Override System

As the tower boom is raised the upright is leveled by a master-slave cylinder arrangement between the tower lift cylinder and the upright level cylinder. The upright can become out of level in two directions, towards the platform or away from the platform. If the upright is out of level towards the platform, it will automatically correct itself when the tower is lowered by dumping oil from the upright level cylinder over a relief valve mounted in the upright until the tower lift cylinder reaches the end of its stroke. If the upright is out of level away from the platform, the tower lift cylinder is fully retracted with stroke remaining in the upright level cylinder. To correct this condition a re-leveling valve (with a red pull knob) allows the tower to be raised (from ground control) without extending the upright level cylinder. The upright will then correct itself when the tower is lowered to the stowed position.

Ground Control Keyswitch System

The ground control keyswitch is used for selecting the active control of the machine between the platform or ground control stations and as another shut off switch for machine power. On the standard keyswitch, the key is removable only in the off position. This allows the ground control station to have ultimate priority over the platform control.



1. UMS Sensor
2. Relief Valve
3. Limit Switch
4. Rotator Valve
5. Platform Control Valve

Figure 4-4. Boom Components Location

4.4 MAIN BOOM POWERTRACK

Removal

1. Disconnect wiring harness connectors located in tower upright.

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO SYSTEM.

2. Tag and disconnect hydraulic lines from connectors at boom assembly. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.
3. Remove hydraulic lines and electrical cables from Powertrack.

NOTE: *The powertrack weighs approximately 27 lbs. (12.3 kg).*

4. Using suitable lifting device, adequately support Powertrack weight along entire length.
5. Remove bolt #1 securing the push tube on the fly boom section.
6. Remove bolt #2 securing the push tube on the mid boom section.
7. With powertrack supported and using all applicable safety precautions, remove bolts #3 and #4 securing rail to the base boom section. Remove powertrack from boom section.

Installation

1. Using suitable lifting device, adequately support the powertrack weight along entire length.

NOTE: *The powertrack weighs approximately 27 lbs. (12.3 kg).*

2. With powertrack supported and using all applicable safety precautions, install bolts #3 securing rail to the base boom.
3. Install bolts #2 securing the push tube on the base boom section.
4. Install bolts #1 securing the push tube on the fly boom section.
5. Install bolts #4 securing rail to push tube.
6. Remove tag and reconnect all hydraulic lines and electrical cable from powertrack.
7. Reconnect dual capacity indicator limit switch from side of boom section.
8. Remove tag and reconnect hydraulic lines from connectors at boom assembly.

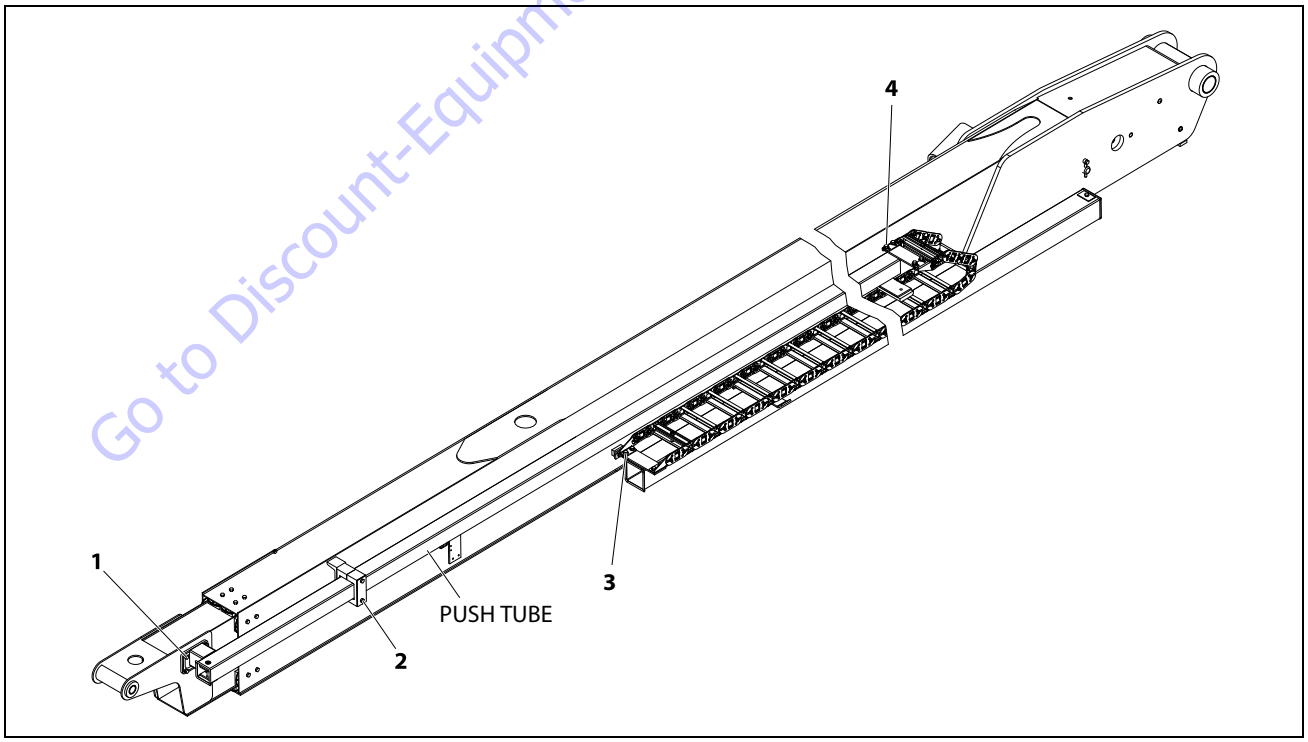


Figure 4-5. Location of Components - Powertrack

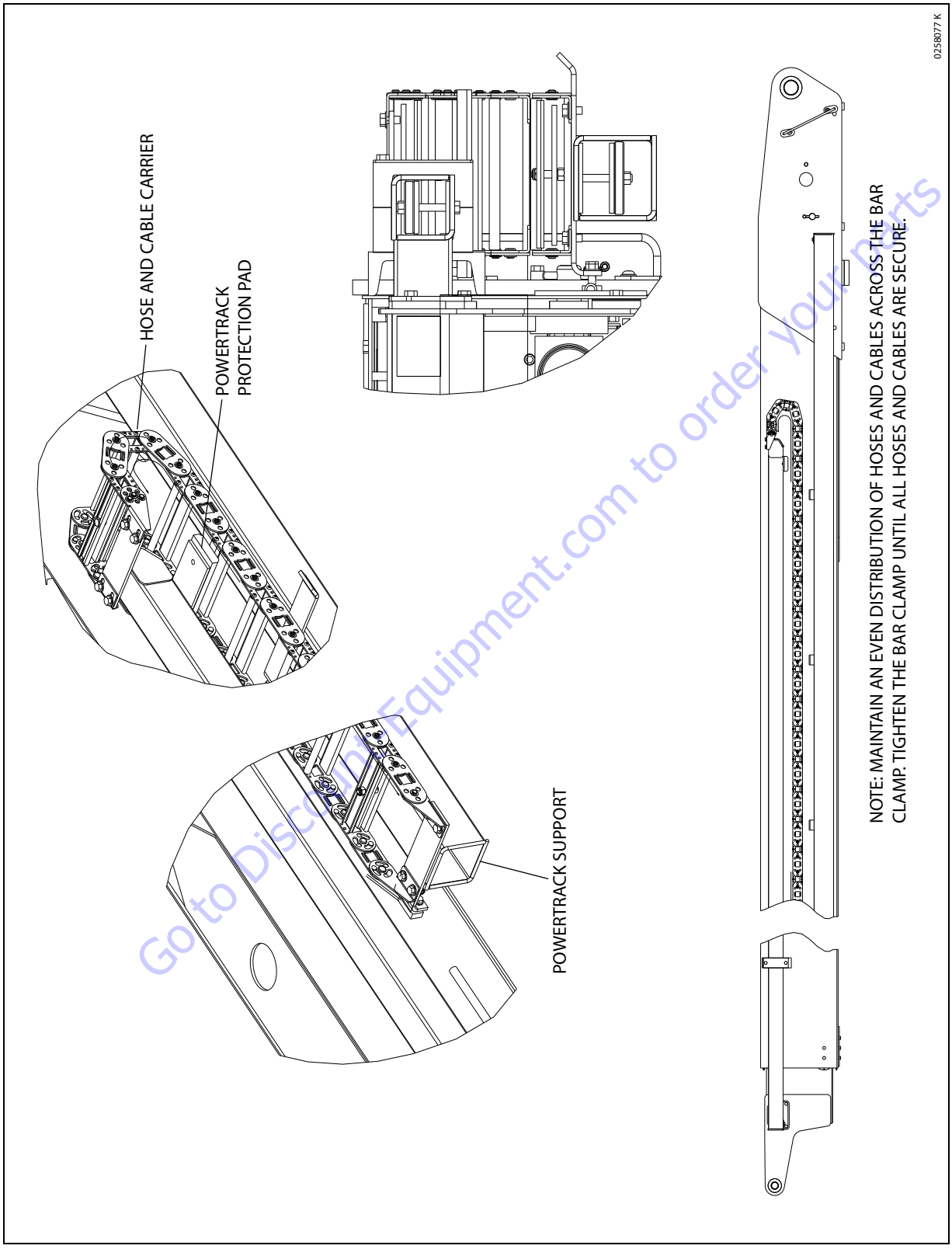


Figure 4-6. Powertrack Installation Main Boom (Sheet 1 of 2)

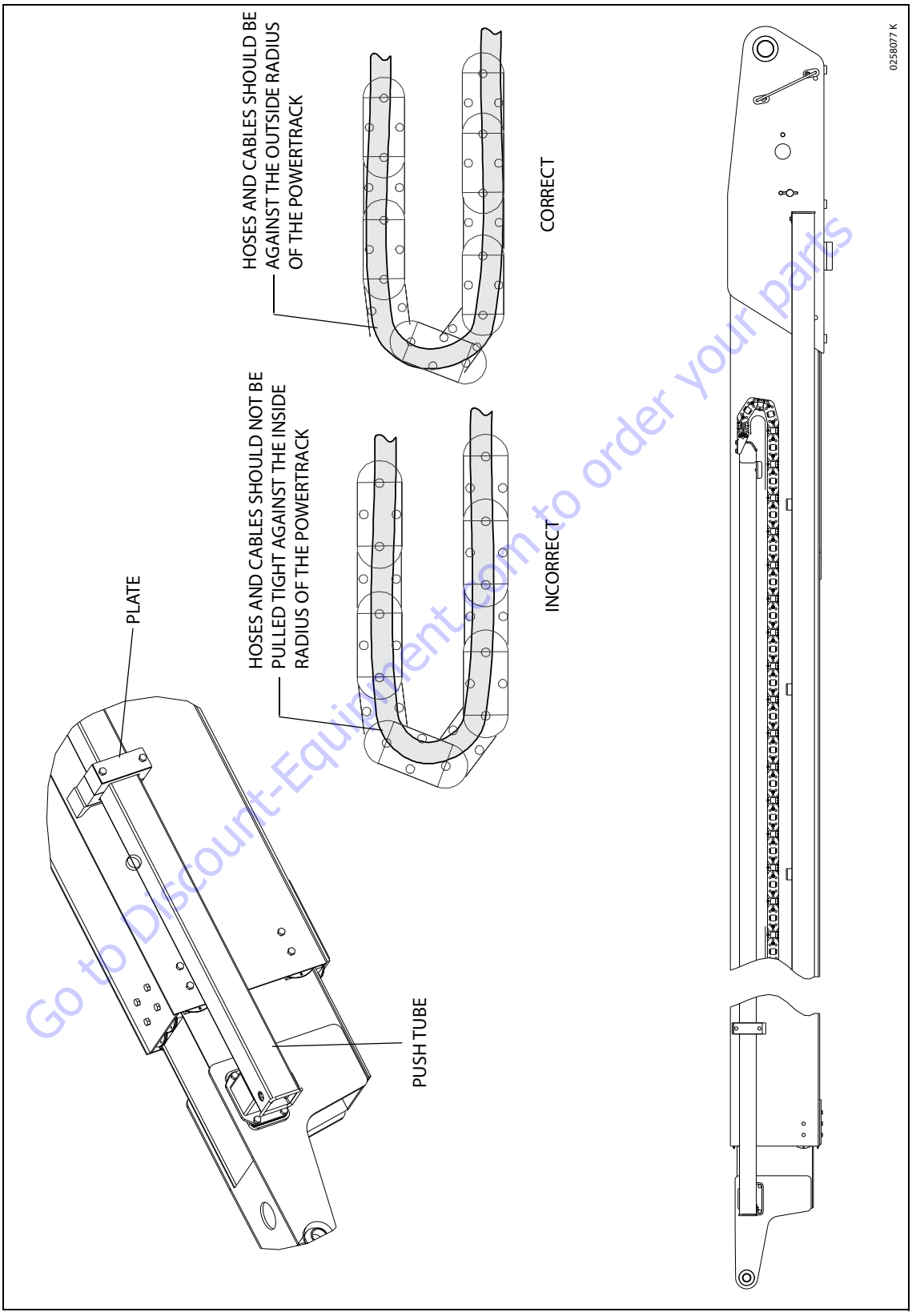


Figure 4-7. Powertrack Installation Main Boom (Sheet 2 of 2)

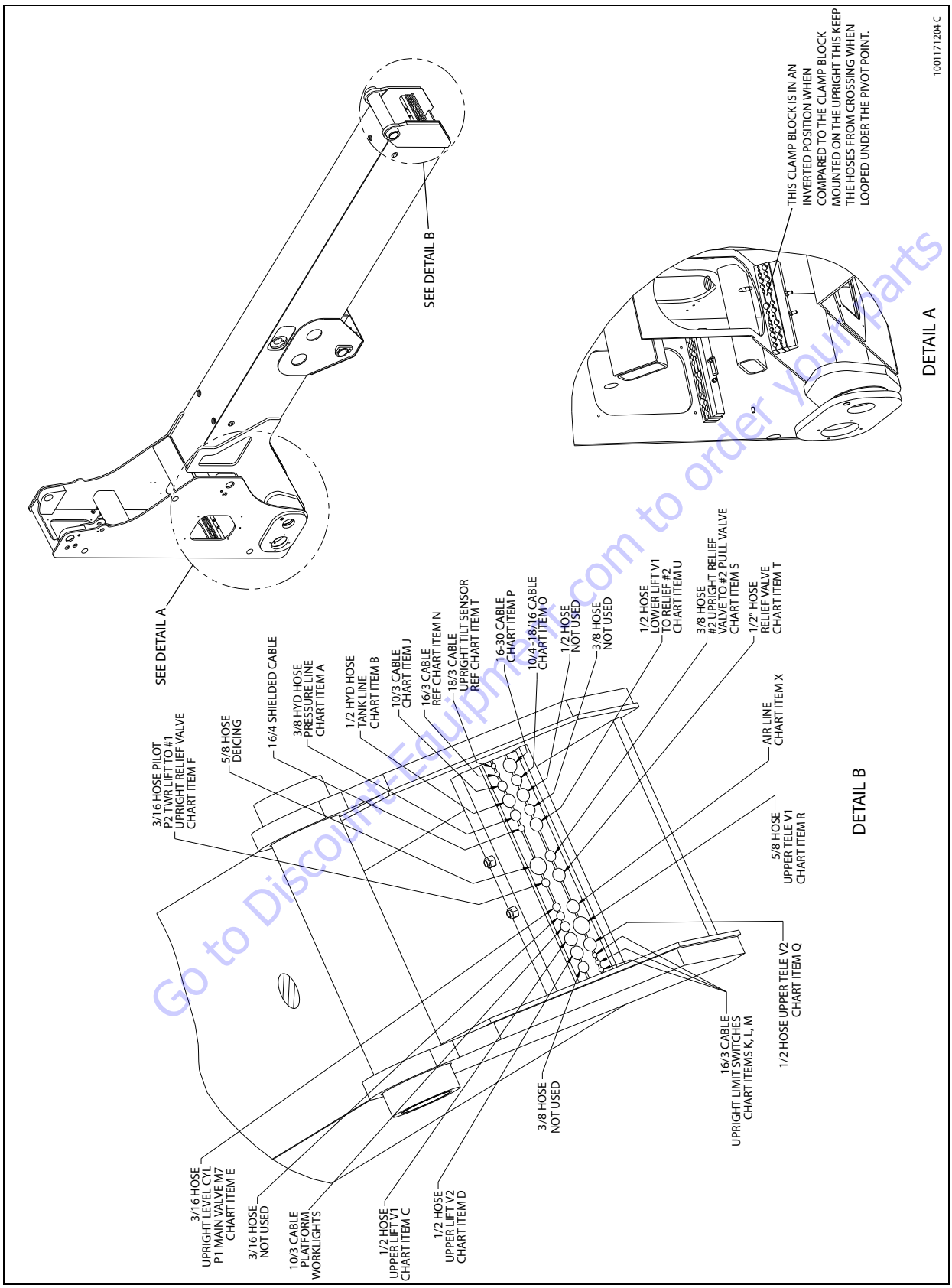
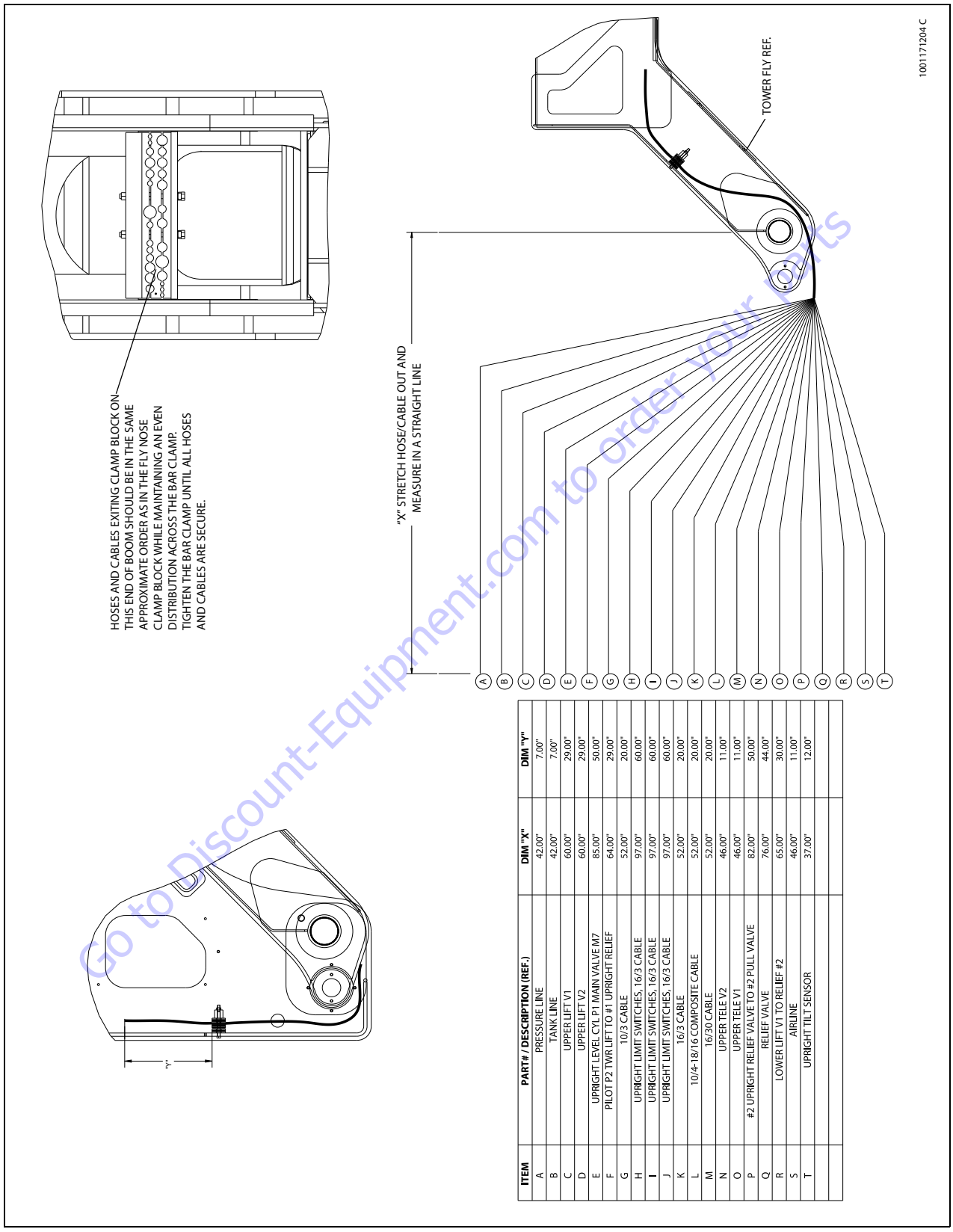


Figure 4-8. Hose and Cables Installation Tower Boom (Sheet 1 of 2)



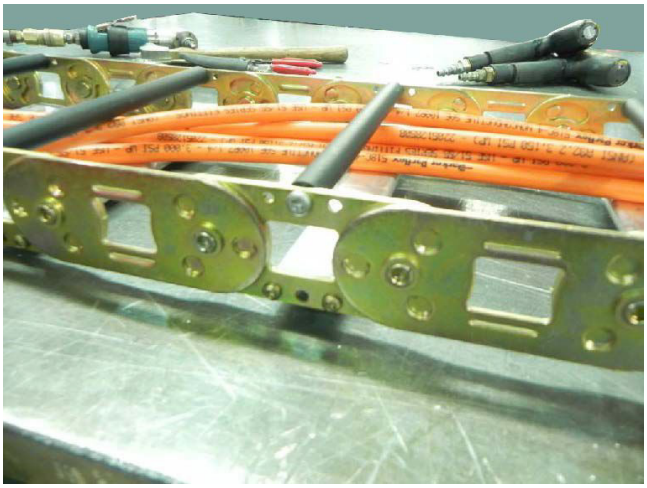
ITEM	PART# / DESCRIPTION (REF.)	DIM "X"	DIM "Y"
A	PRESSURE LINE	42.00"	7.00"
B	TANK LINE	42.00"	7.00"
C	UPPER LIFT V1	60.00"	29.00"
D	UPPER LIFT V2	60.00"	29.00"
E	UPRIGHT LEVEL CYL P1 MAIN VALVE M7	85.00"	50.00"
F	PILOT P2 TWR LIFT TO #1 UPRIGHT RELIEF	64.00"	29.00"
G	10/3 CABLE	52.00"	20.00"
H	UPRIGHT LIMIT SWITCHES, 16/3 CABLE	97.00"	60.00"
I	UPRIGHT LIMIT SWITCHES, 16/3 CABLE	97.00"	60.00"
J	UPRIGHT LIMIT SWITCHES, 16/3 CABLE	97.00"	60.00"
K	16/3 CABLE	52.00"	20.00"
L	10/4-18/16 COMPOSITE CABLE	52.00"	20.00"
M	16/30 CABLE	52.00"	20.00"
N	UPPER TELE V2	46.00"	11.00"
O	UPPER TELE V1	46.00"	11.00"
P	#2 UPRIGHT RELIEF VALVE TO #2 PULL VALVE	82.00"	50.00"
Q	RELIEF VALVE	76.00"	44.00"
R	LOWER LIFT V1 TO RELIEF #2	65.00"	30.00"
S	AIRLINE	46.00"	11.00"
T	UPRIGHT TILT SENSOR	37.00"	12.00"

Figure 4-9. Hose and Cables Installation Tower Boom (Sheet 2 of 2)

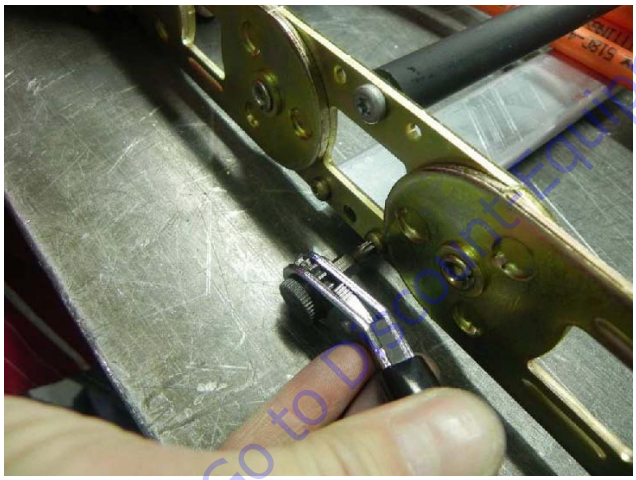
4.5 POWERTRACK MAINTENANCE

Flat Bar Removal

NOTE: *Hoses shown in the powertrack are for example only. Actual hose and cable arrangements will be different.*

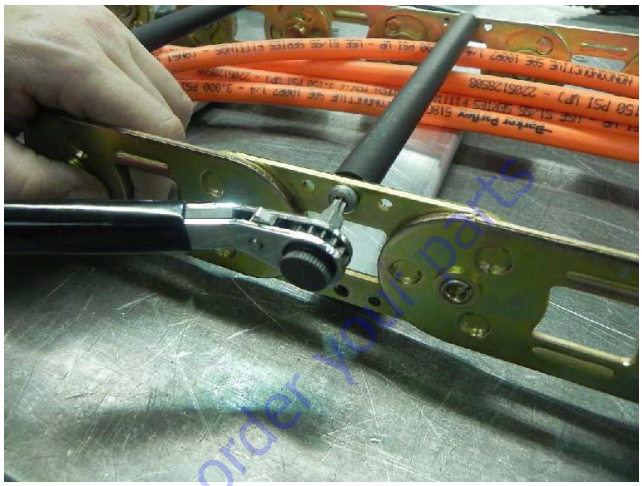


1. Use a small 1/4 in. ratchet and a T-20 Torx bit. Remove the 8-32 x 0.500 screws from both sides. (If the track also has a flat bar on the inside of the track instead of round bar/poly, perform the same step to remove it.)

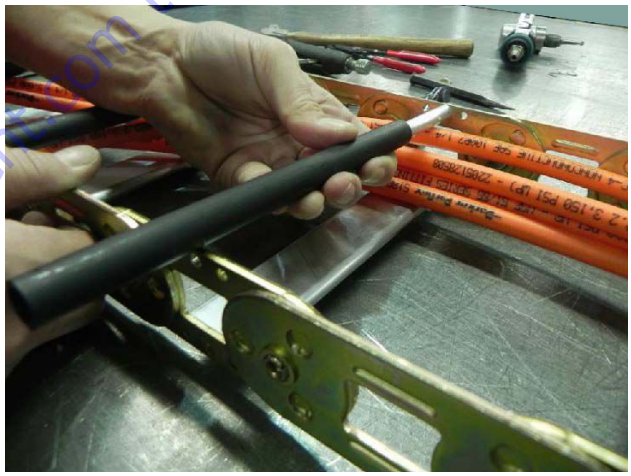


Round Bar/Poly Bar Removal

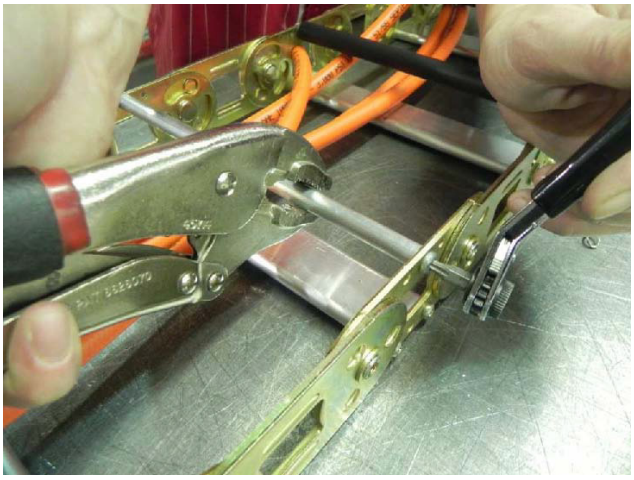
1. Use a small 1/4 in. ratchet with a T-25 Torx bit. Remove the 10-24 x 0.812 screw. (If the bar spins then grip the bar and poly tightly with a vise-grip).

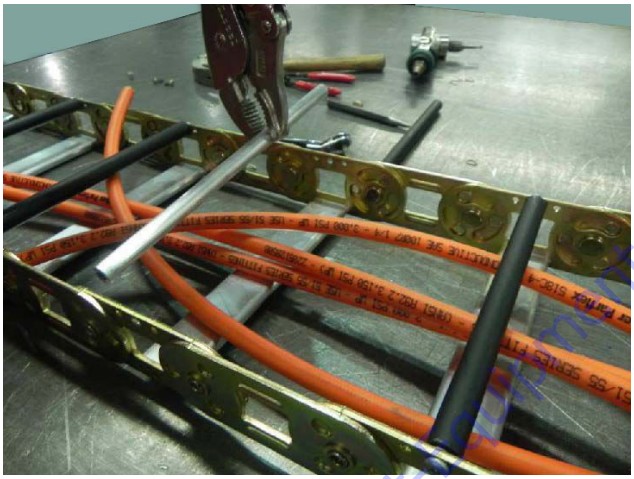


2. Lift up one end of the bar and slide the poly roller off.



3. While gripping the bar tightly, remove the other 10-24 x 0.812 screw.

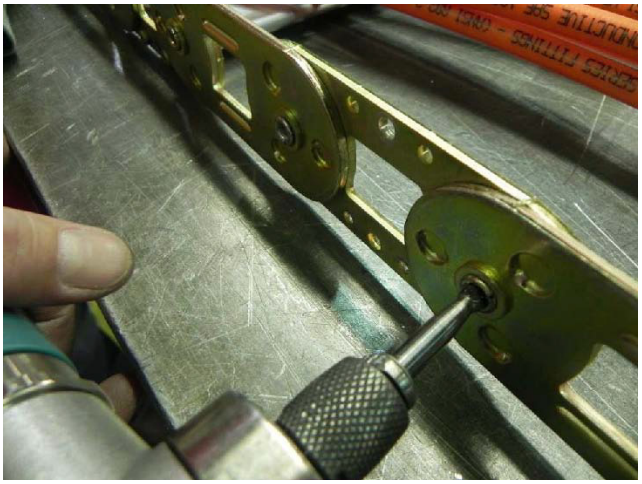




Removing and Installing Links

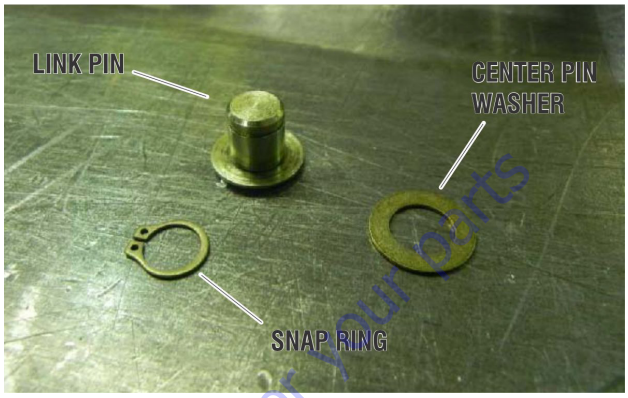
1. To remove the links, the rivets holding the links together must be removed. The following will show one way this can be done. Use a right angle die grinder with a ¼" ball double cut bur.

2. Insert the tool into the rolled over end of the rivet as shown. Grind out the middle of the rivet until the rolled over part of the rivet falls off. Repeat this step for all rivets that must be removed.

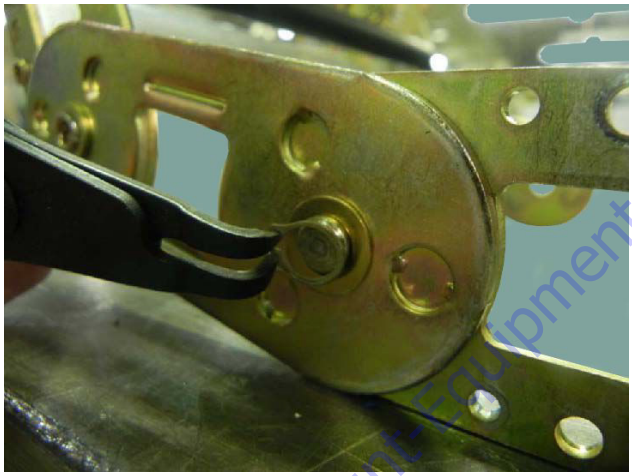


3. After grinding, it is sometimes necessary to use a center punch to punch out the rivet from the link.

4. To install new links, extend the main moving end over the lower part of the track so the new connection point is in the curved part of the track. This will allow the round half-shears to be rotated in a way they will fit into the peanut-shaped cut-outs.

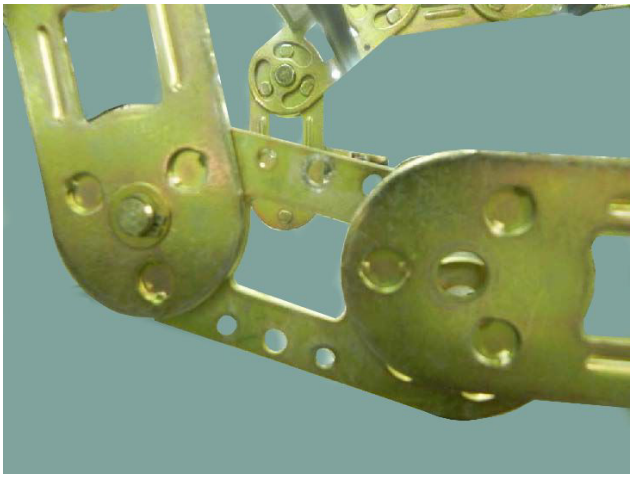


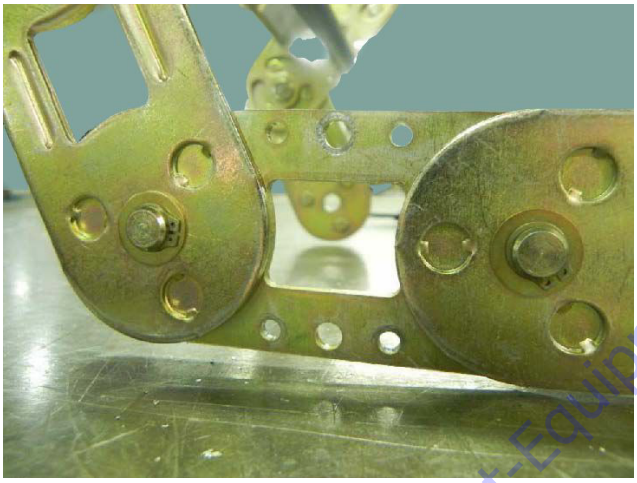
5. Install the pin into the center hole, then slide the washer over the pin. Install the snap ring into the groove in the pin.



NOTE: *When installing snap rings make sure they are seated in the pin groove and closed properly.*

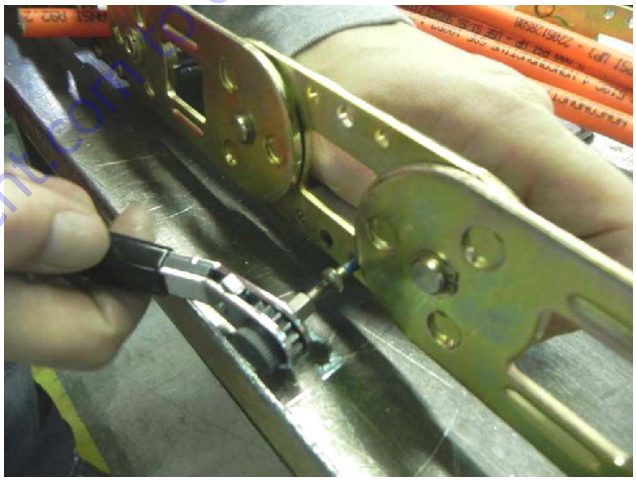
6. Install more pins, washers, and snap rings into all the links where a rivet was removed.





Installing a New Flat Bar

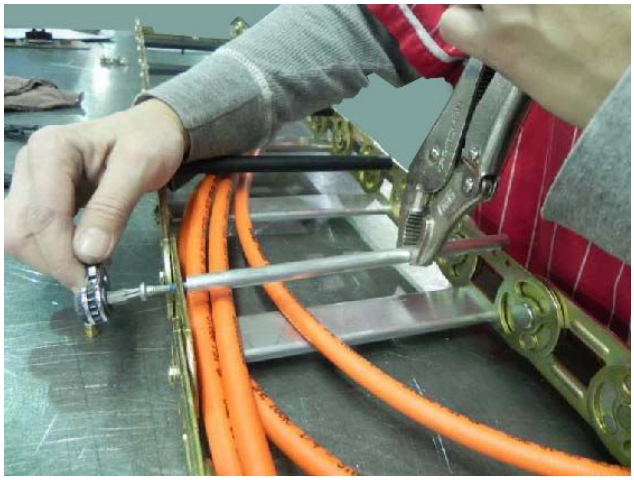
1. While holding the flat bar, install new 8-32 x 0.500 self threading torx screws into both holes on each side of track.



NOTE: *Maximum tightening torque for the 8-32 screw is 18-20 in. lbs. (2-2.2 Nm).*

Installing a New Round Bar/Poly Roller

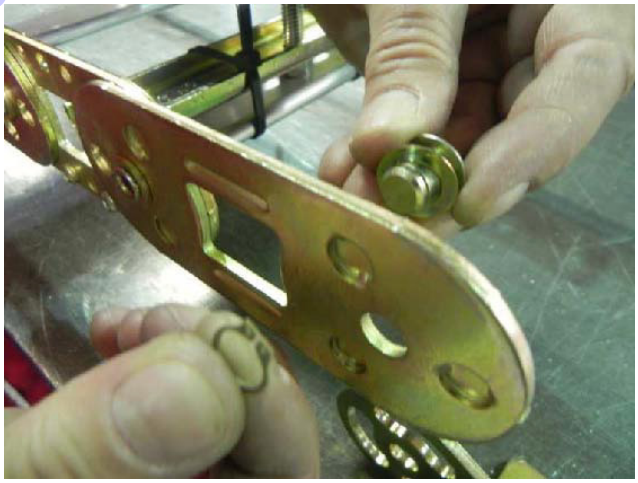
1. While tightly holding the round bar, install the new 10-24 x 0.812 self threading torx screw. Next lift up the other end and slide a new poly roller on. Install another 10-24 x 0.812 screw on the other side.



NOTE: *Maximum tightening torque for the 10-24 screw is 45-50 in. lbs. (5-5.6 Nm).*

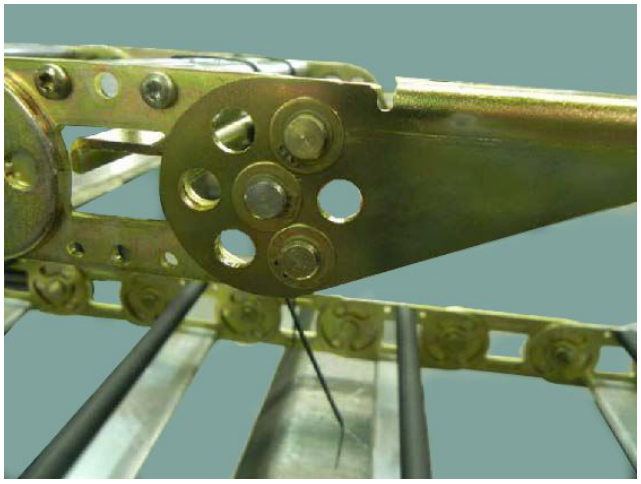
Replacing a Fixed End Bracket

1. Remove the bracket by removing the center pin, washer, and snap ring. Install a new bracket then reinstall the pin, washer, and new snap ring. After installing the new bracket make sure that it rotates correctly.



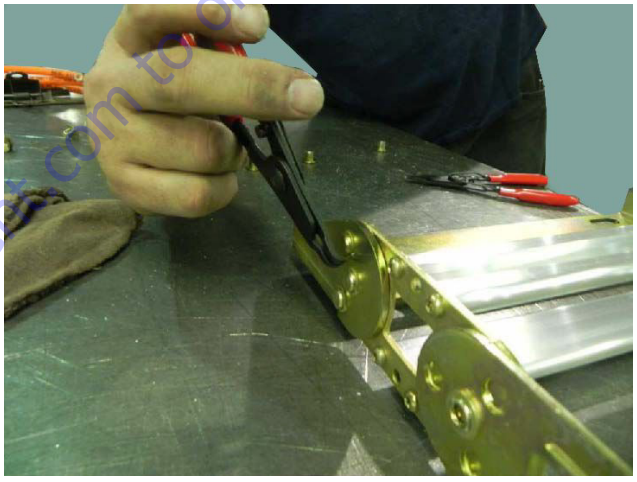
Replacing a Moving End Bracket

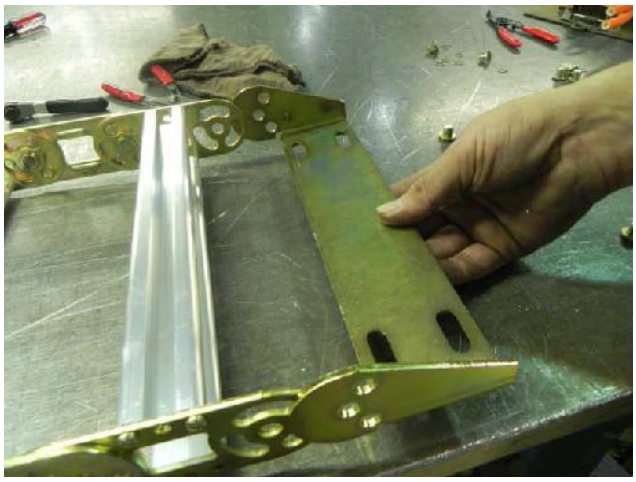
1. Remove bracket by removing all pins, washers, and snap rings. Replace with a new bracket and reinstall the pins, washers, and new snap rings. After installing a new bracket make sure that it rotates correctly.



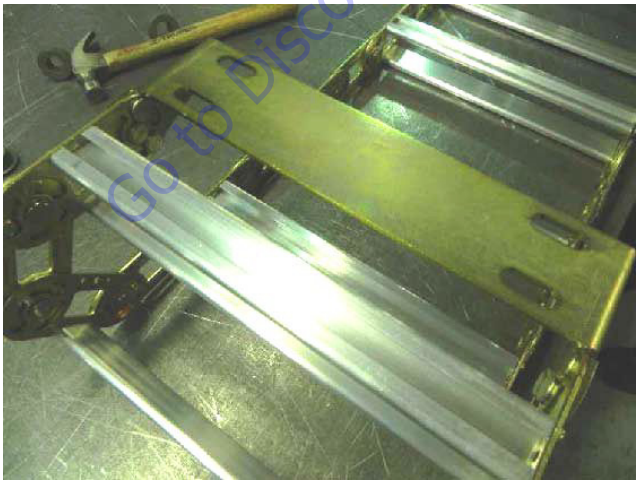
Replacing a One Piece Bracket

1. Remove all pins, washers, and snap rings and slide the bracket off of the links.





2. To install a new bracket, slide the bracket over the links and reinstall the pins, washers, and new snap rings. After installing the new bracket make sure that it rotates correctly.



4.6 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.

4.7 MAIN BOOM ASSEMBLY

Removal

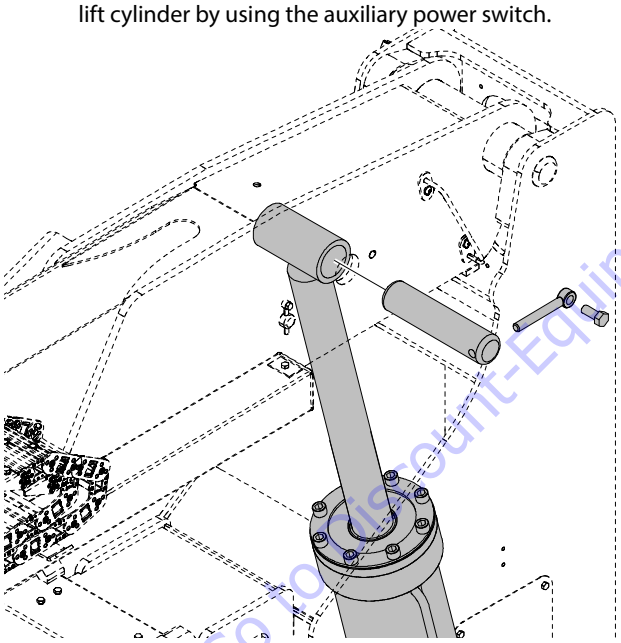
1. Using a suitable lifting equipment, adequately support boom assembly weight along entire length.

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO SYSTEM.

2. Tag and disconnect hydraulic lines from telescope cylinder. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.

3. Using a suitable brass drift and hammer, remove hardware securing the main boom lift cylinder rod end pin to the base boom section. Remove the main boom lift cylinder pin from base boom. Retract the main boom lift cylinder by using the auxiliary power switch.



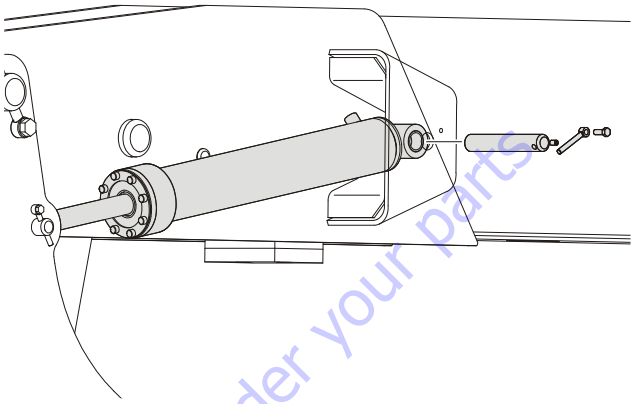
4. Remove the Master Cylinder as follows:

   a. Using an adequate supporting device, support the master cylinder so it doesn't fall when the retaining pins are removed.

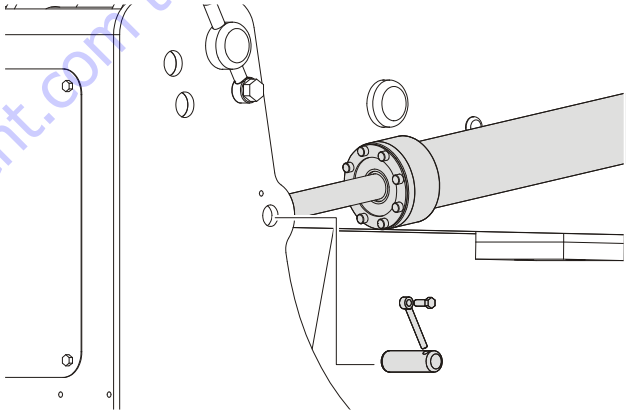
NOTE: *The master cylinder weighs approximately 58.4 lbs. (26.5 kg).*

   b. Tag and disconnect hydraulic lines from master cylinder. Use a suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.

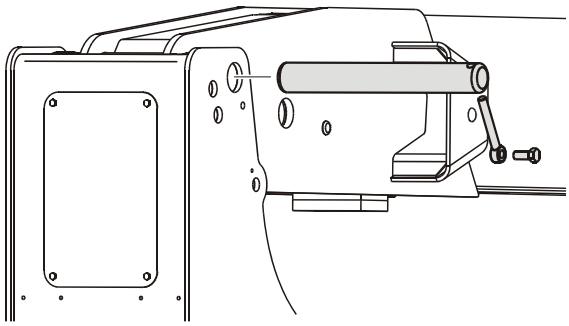
   c. Remove the bolt and keeper pin securing the master cylinder barrel end pin to the base boom section. Next, install a 3/8-16 UNC threaded lifting eye into the threaded hole of the pin and pull pin out.



   d. Remove the bolt and keeper pin securing the master cylinder rod end pin to the upright. Remove the pin.



5. Remove the bolt and keeper pin securing the boom pivot pin to the upright. Using a suitable brass drift and hammer, remove the pivot pin from upright.



6. Using all applicable safety precautions, carefully lift boom assembly clear of upright and lower to ground or suitably supported work surface.

NOTE: *The main boom alone weighs approximately 2226 lbs. (1010 kg). Including the slave cylinder, rotator, and platform support the assembly weighs approximately 3185 lbs. (1445 kg).*

Disassembly

1. Remove hardware securing telescope cylinder to back end of the base boom section.
2. Remove hardware which secures the wear pads to the base boom section; remove the wear pads from the top, sides and bottom of the base boom section.
3. Using overhead crane or suitable lifting device, remove fly boom assembly from base section.
4. Remove hardware from the telescope cylinder pin. Using a suitable brass drift and hammer remove the cylinder pin from fly boom section.
5. Pull the telescope cylinder partially from aft end of the fly boom section; secure the cylinder with a suitable sling and lifting device at approximately the center of gravity.
6. Carefully remove the telescope cylinder and place telescope cylinder on a suitable trestle.

NOTE: *The Main Boom Telescope Cylinder can be removed without disassembling the main boom by disconnecting hydraulic lines, top attaching pin of main boom lift cylinder and telescope cylinders as directed above, and pulling out the telescope cylinder from the rear, through the access plate opening of the upright.*

7. Remove hardware which secures the wear pads to the aft end of fly boom section; remove the wear pads from the top, sides and bottom of the fly boom section.

Inspection

NOTE: *When inspecting pins and bearings, refer to Section 2, Pins and Composite Bearing Repair Guidelines.*

1. Inspect main boom pivot pin for wear, scoring, tapering and ovality, or other damage. Replace pins as necessary.
2. Inspect telescope cylinder attach point for scoring, tapering and ovality. Replace pins as necessary.
3. Inspect main boom lift cylinder attach pin for wear, scoring, tapering and ovality, or other damage. Ensure pin surfaces are protected prior to installation. Replace pins as necessary.
4. Inspect inner diameter of boom pivot bearing for scoring, distortion, wear, or other damage. Replace bearing as necessary.
5. Inspect all wear pads for excessive wear, or other damage.
6. Inspect all threaded components for damage such as stretching, thread deformation, or twisting. Replace as necessary.
7. Inspect structural units of boom assembly for bending, cracking, separation of welds, or other damage. Replace boom sections as necessary.

Assembly

NOTE: *When installing fly section wear pads, install same number and thickness of shims as were removed during disassembly.*

1. Measure inside dimensions of the base section to determine the number of shims required for proper fit.
2. Install side, top and bottom wear pads to the aft end of fly section; shim evenly to the measurements of the inside of base boom section.

NOTICE

WHEN ASSEMBLING BOOM SECTIONS, ENSURE THAT THE BOOM SLIDING TRAJECTORIES HAVE BEEN CLEARED OF CHAINS, TOOLS, AND OTHER OBSTRUCTIONS.

3. Secure the sling and lifting device at the telescope cylinder's approximate center of gravity, and lift the cylinder to the aft end of the fly boom section.
4. Slide telescope cylinder into the aft end of fly boom section. Align attachment holes in fly boom section with hole in rod end of telescope cylinder.
5. Install telescope cylinder pin and secure with mounting hardware.
6. Secure the sling and lifting device at the fly boom assembly approximate center of gravity.

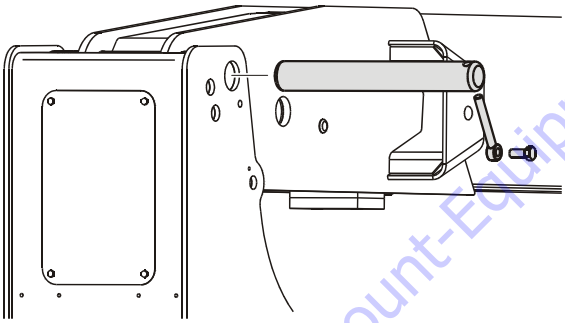
7. Slide fly boom assembly into the base boom section. Shim boom, if necessary, for a total of 1/32 in. (0.08 cm) clearance.
8. Install wear pads into the forward position of the base boom section. Shim boom, if necessary, for a total of 1/32 in. (0.08 cm) clearance.
9. Align the cylinder with the slots at aft end of base boom section, then secure cylinder with mounting hardware.

Installation

1. Using all applicable safety precautions, carefully lift boom assembly to align the pivot holes in the boom with those of the upright.

NOTE: *The main boom alone weighs approximately 2226 lbs. (1010 kg). Including the slave cylinder, rotator, and platform support the assembly weighs approximately 3185 lbs. (1445 kg).*

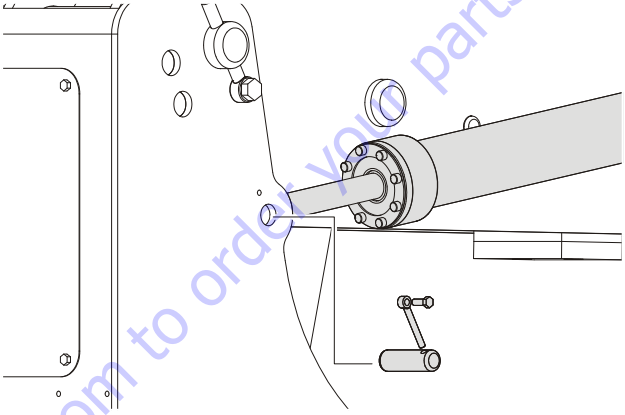
2. Using a suitable brass drift and hammer, install the pivot pin into the upright. Install the bolt and keeper pin securing the boom pivot pin to the upright.



3. Install the Master Cylinder as follows:
   a. Using an adequate supporting device, align the master cylinder with the mounting holes on the boom and upright.

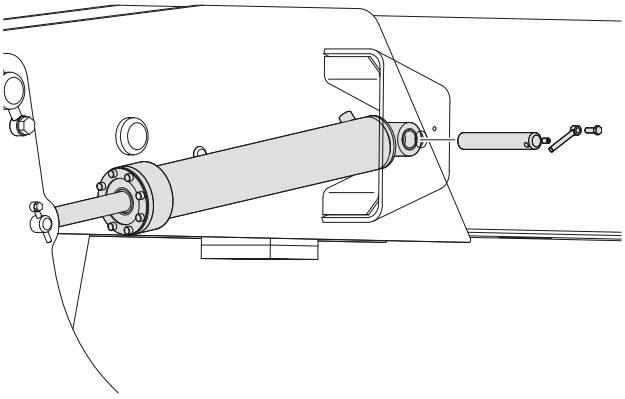
NOTE: *The master cylinder weighs approximately 58.4 lbs. (26.5 kg).*

   b. Install the master cylinder rod end pin. Install the bolt and keeper pin securing the master cylinder rod end pin to the upright.



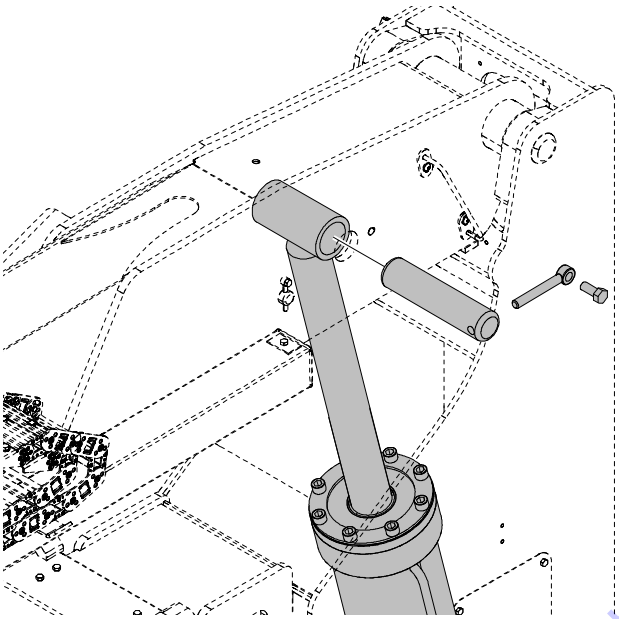
NOTE: *When installing the master cylinder rod end pin, insert the keeper hardware pin to prevent the pin from inserting too far.*

   c. Install the barrel end retaining pin. Install the bolt and keeper pin securing the master cylinder barrel end pin to the base boom section.



   d. Connect hydraulic lines to the master cylinder as tagged during removal.

4. Extend the main boom lift cylinder using auxiliary power switch and align the rod end with the main boom assembly.
5. Carefully insert the main lift cylinder rod end pin through the base boom and install the mounting hardware.



6. Connect the hydraulic lines to the telescope cylinder as tagged during removal.

4.8 UPRIGHT

Removal

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO SYSTEM.

1. Remove the main boom assembly. Refer to Section 4.7, Main Boom Assembly.
2. Tag and disconnect hydraulic lines to the main boom lift cylinder. Use a suitable container to collect any residual hydraulic fluid. Cap hydraulic lines and ports.
3. Remove mounting hardware from main boom lift cylinder barrel end. Using a suitable brass drift and hammer, remove pin #1 from upright and remove main boom lift cylinder.

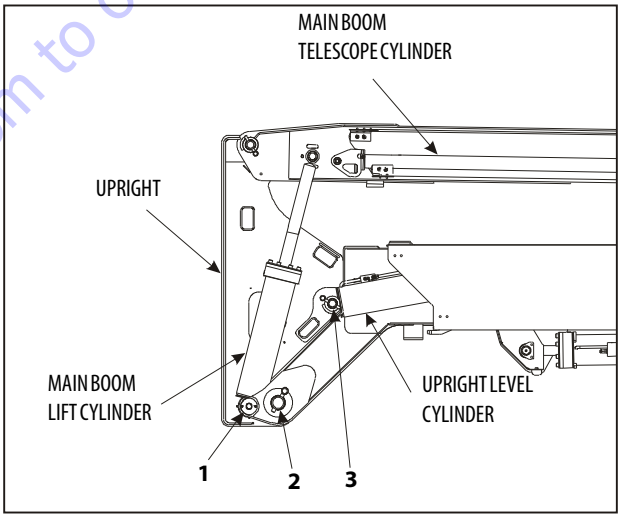


Figure 4-10. Location of Components - Upright

4. Disconnect wiring harness to horizontal limit switch.
5. Disconnect the upright level cylinder as follows:
   a. Using a suitable lifting device, support the upright.
   b. Remove mounting hardware securing hose bracket in upright, and remove the hose bracket.
   c. Remove mounting hardware securing the upright level cylinder to the upright. Using a suitable brass drift and hammer, remove pin #3 from upright and disconnect the upright level cylinder from the upright.
6. Remove mounting hardware from the upright pivot pin using a suitable brass drift and hammer. Remove pin #4 from tower boom assembly and remove the upright from the machine.

NOTE: *Steps 7 through 10 are only necessary if the upright level cylinder is to be removed.*

7. With upright removed, raise the tower boom to gain access to the upright level cylinder rod end attach pin.
8. Tag and disconnect hydraulic lines to the upright lift cylinder. Use a suitable container to collect any residual hydraulic fluid. Cap hydraulic lines and ports.
9. Using an overhead crane or suitable lifting device, support the upright lift cylinder, remove mounting hardware from the barrel end of the upright lift cylinder and remove the pin.
10. Carefully remove the upright lift cylinder and place on a suitable work surface.

Installation

NOTE: *Steps 1 through 4 are only necessary if the upright level cylinder is to be removed.*

1. Using a suitable lifting device, carefully install the upright lift cylinder into place in the tower boom.
2. Install the pin and mounting hardware at the barrel end of the upright lift cylinder.
3. Connect the hydraulic lines to the upright lift cylinder as tagged during removal.
4. Lower the tower boom.
5. Using an adequate lifting device, install the upright into position. Install pin #4 into the tower boom assembly and secure it in place with the mounting hardware.
6. Connect the upright level cylinder as follows:
   a. Align the holes in the cylinder and upright for pin #3, and install the pin into the upright and connect the upright level cylinder to the upright. Install the mounting hardware securing the pin.
   b. Install the hose bracket and secure in place with the mounting hardware.
7. Connect the wiring harness to horizontal limit switch.
8. Align the holes in the main boom lift cylinder and upright for pin #1 and install the pin. Secure the pin in place with the mounting hardware.
9. Connect the hydraulic lines to the main boom lift cylinder as tagged during removal.
10. Install the main boom. Refer to Section 4.7, Main Boom Assembly.

4.9 TOWER BOOM ASSEMBLY

Removal

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO SYSTEM.

1. Remove the main boom assembly. Refer to Section 4.7, Main Boom Assembly.
2. Remove the upright. Refer to Section 4.8, Upright.
3. Using an overhead crane or suitable lifting device, support the entire tower boom assembly and separately support the tower lift cylinder.
4. Remove mounting hardware from tower lift cylinder rod end. Using a suitable brass drift and hammer, remove the tower boom lift cylinder pin #1, disconnecting the tower lift cylinder.
5. Remove mounting hardware from the tower boom pivot pin. Using a suitable brass drift and hammer, remove pin #2 from turntable assembly.
6. Using all applicable safety precautions, carefully lift the tower boom assembly clear of turntable and lower to ground or a suitable supported work surface.
7. Remove mounting hardware from the upright leveling cylinder rod end. Using a suitable brass drift and hammer, remove the upright cylinder pin #3, disconnecting the upright cylinder from the tower boom.
8. Using suitable lifting device, remove tower boom assembly from turntable. keep in clean workspace.

Inspection

NOTE: *Refer to Section 2, Pins and Composite Bearing Repair Guidelines.*

1. Inspect tower boom pivot pin for wear scoring, tapering, and ovality, or other damage. Replace pins as necessary.
2. Inspect tower boom pivot attach points for scoring, tapering, and ovality, or other damage. Replace pins as necessary.
3. Inspect inner diameter of tower boom pivot bearings for scoring, distortion, wear, or other damage.
4. Inspect lift cylinder attach pin for wear, scoring, tapering, and ovality, or other damage. Ensure pin surfaces are protected prior to installation. Replace pins as necessary.
5. Inspect inner diameter of upright attach point bearings for scoring, distortion, wear, or other damage. Replace bearing as necessary.
6. Inspect upright leveling cylinder attach pins for wear, scoring, tapering, and ovality, or other damage. Ensure pin surfaces are protected prior to installation. Replace pins as necessary.
7. Inspect all threaded components for damage such as stretching, thread deformation, or twisting. Replace as necessary.

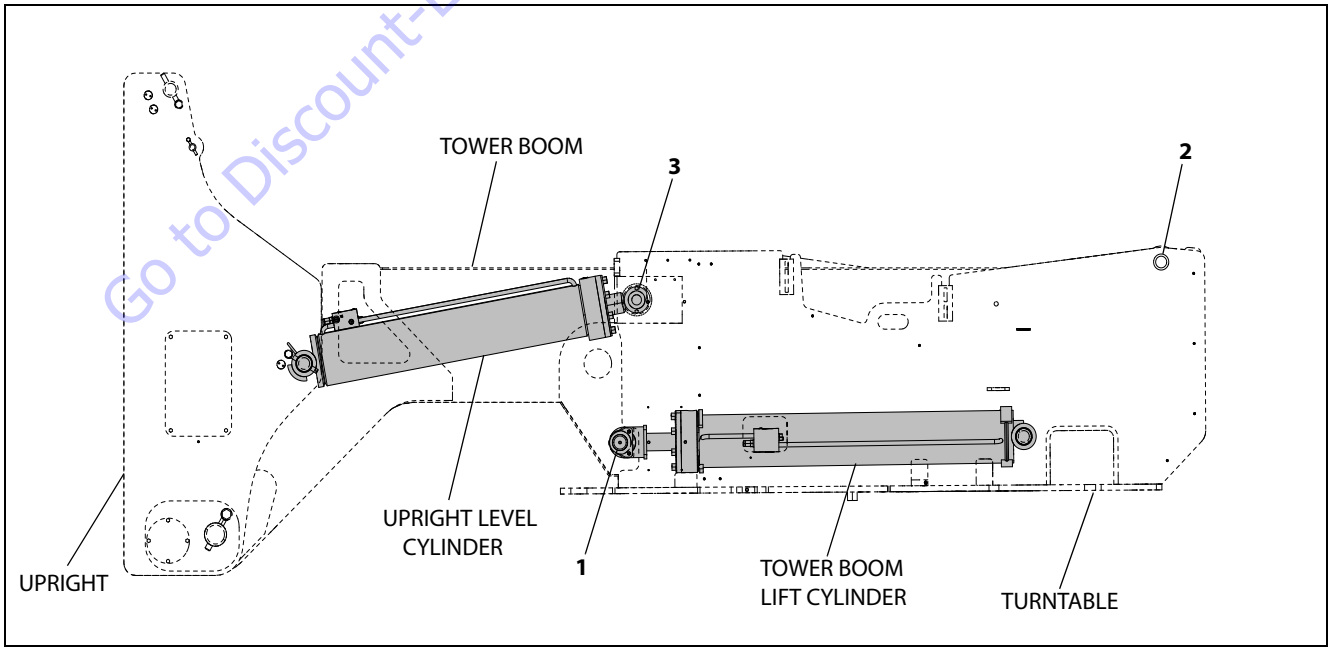


Figure 4-11. Location of Components - Tower Boom

8. Inspect structural units of tower boom assembly for bending, cracking, separation of welds, or other damage. Replace boom sections as necessary.

Installation

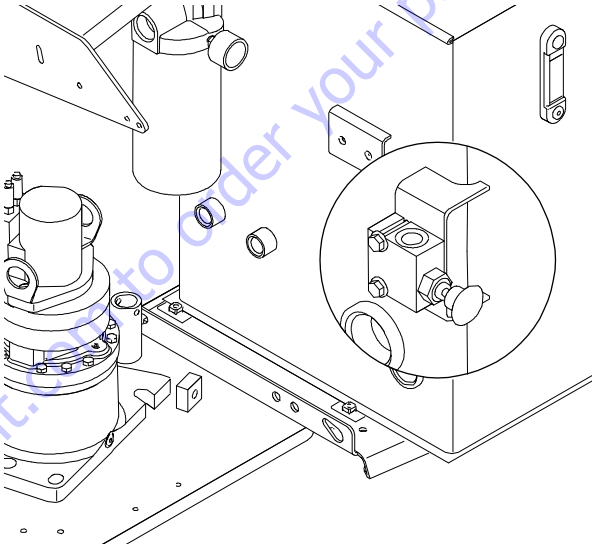
1. Using a suitable lifting device, position the tower boom such as to align upright leveling cylinder with attach holes in tower boom. Using a soft head mallet, install the cylinder pin #3 into tower boom and secure with mounting hardware.
2. Using a suitable lifting device, position boom assembly on turntable so that the pivot holes in both boom and turntable are aligned.
3. Install boom pivot pin #2, ensuring that location of hole in pin is aligned with attach point on turntable.
4. If necessary, gently tap pin into position with soft headed mallet. Secure pin mounting hardware.
5. Connect all wiring connectors to the correct connectors.
6. Connect all hydraulic lines of boom assembly.
7. Using all applicable safety precautions, operate lifting device in order to position tower boom lift cylinder so that holes in the cylinder rod end and boom structure are aligned. Insert the lift cylinder pin #1, ensuring that location of hole in pin is aligned with attach point on boom.
8. Install the upright. Refer to Section 4.8, Upright.
9. Install the main boom assembly. Refer to Section 4.7, Main Boom Assembly.
10. Using all applicable safety precautions, operate from the lower controls and raise boom fully, noting the performance. Lower the boom, noting the performance.

Tower Out of Sync

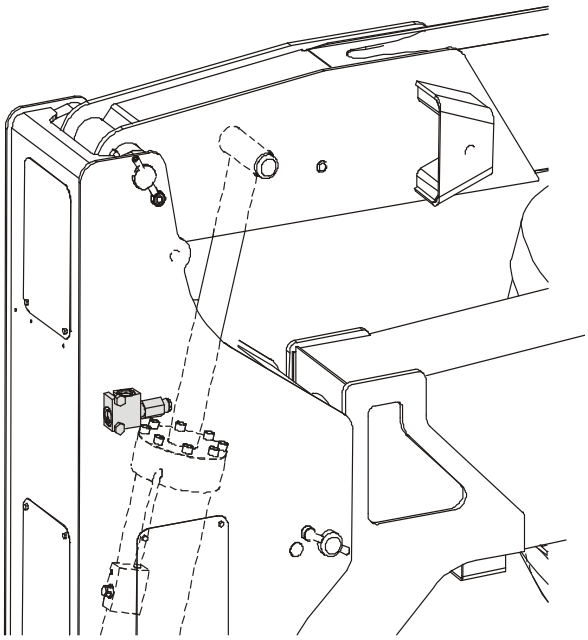
Tower is out of sync backwards, upright leaning toward the platform.

When towering down the upright cylinder bottoms out before the lower lift. Problems that could cause this are:

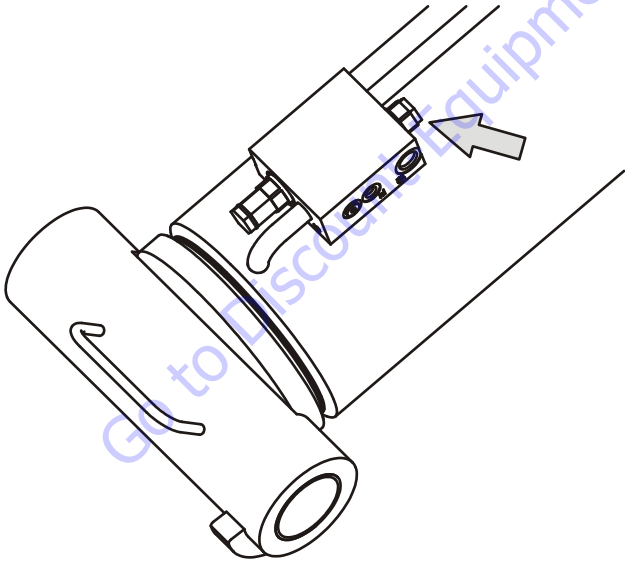
1. The releveling valve (red knob on the oil tank P/N: 4640866), this is a poppet valve that could be leaking fluid out of the closed loop. Manually opening the valve and flushing it can eliminate any contaminate on the seat. The seat could also be damaged, so replacing the cartridge might be necessary.



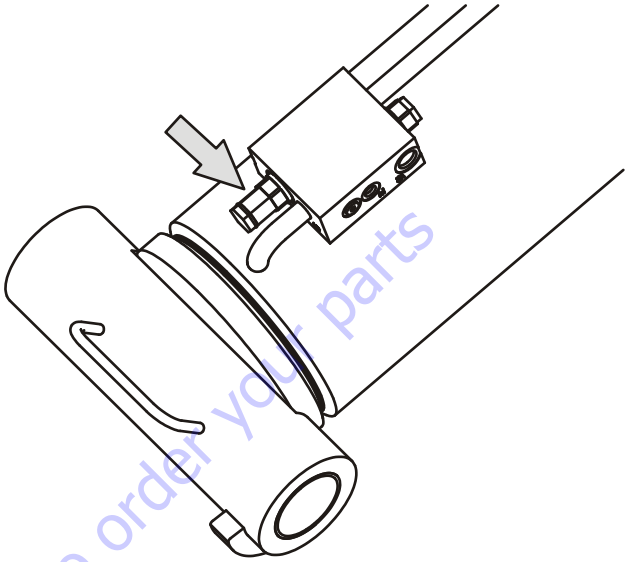
2. A relief valve is located in the upright. This relief valve could be leaking backwards out of the loop. Replace the cartridge. They are pre-set.



3. The counterbalance valve in the piston end of the upright level cylinder. There could be a leak path from the valve port to the pilot port. Replace the counterbalance valve.



4. The counterbalance valve in the rod end of the lower lift cylinder. There could be a leak path from the valve port to the pilot port. Replace the counterbalance valve.

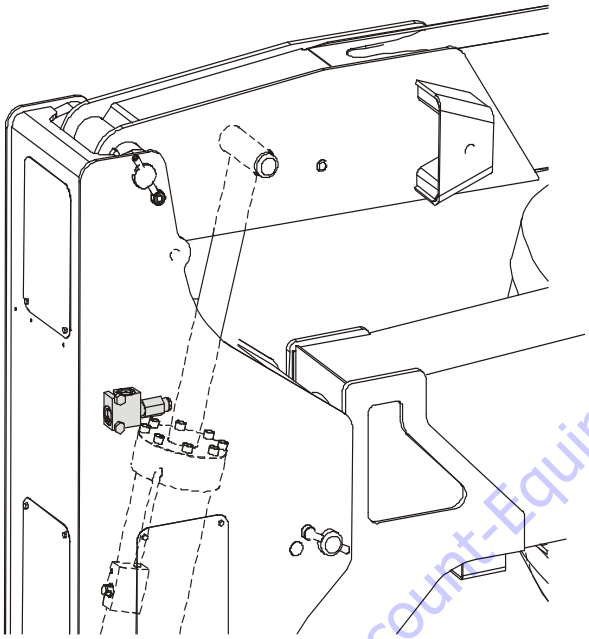


5. The packing on either the upright or lower cylinder can cause this. Do cylinder tests to determine if either cylinder needs new packing.

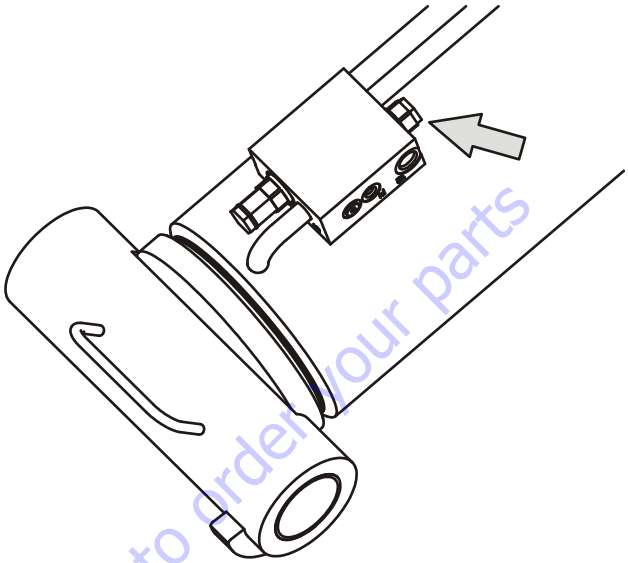
Tower is out of sync forwards, upright leaning toward the steer axle.

When towering down, the lower lift cylinder bottoms out before the upright level cylinder. This is caused by too much oil between the two cylinders. Problems that could cause this are:

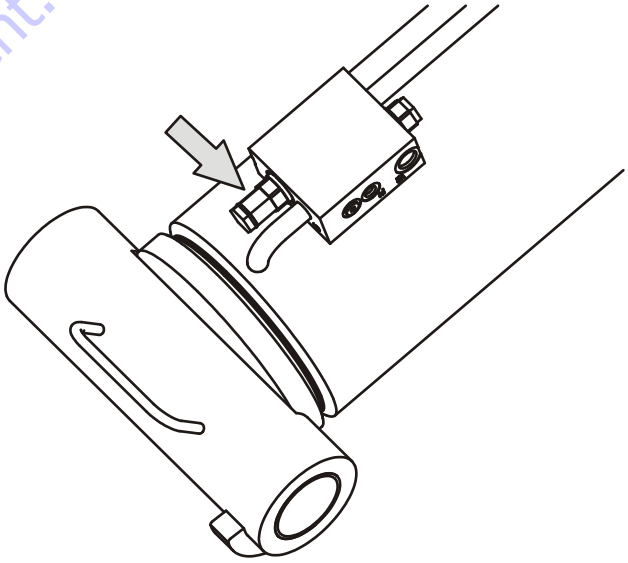
1. The relief valve located in the upright (P/N: 4640929). If this valve is set too low or has contaminate in it causing it to leak prematurely, when lifting down oil can pass through it causing the volume to grow between the cylinders. Flush the valve out and reinstall it, or replace the cartridge. The cartridge pressure is pre-set so no adjustment can be made.



2. The counterbalance valve in the piston end of the upright level cylinder. There could be a leak path from the pilot port to the valve port. Replace the counterbalance valve.



3. The counterbalance valve in the rod end of the lower lift cylinder. There could be a leak path from the pilot port to the valve port. Replace the counterbalance valve.



4. The packing on the lower lift cylinder can cause this. Do a cylinder test to check this out. Refer to Section 2.4, Cylinder Drift Test.

4.10 ARTICULATING JIB

NOTE: *Pin numbers listed in the following procedures are referenced in Figure 4-12., Location of Components - Articulating Jib.*

NOTE: *Using a suitable lifting device, support the jib assembly, jib lift cylinder, slave cylinder, and rotator.*

NOTE: *The approximate weight of slave cylinder is 77.16 lbs. (35 kg), jib lift cylinder is 63 lbs. (28.6 kg), and rotator is 64 lbs. (29 kg).*

Removal

1. For platform/support removal see platform/support removal diagram. See Section 4.1, Platform.
2. Position the articulating jib boom level with the ground.
3. Remove mounting hardware from slave cylinder pin #1. Using a suitable brass drift and hammer, remove the cylinder pin from articulating jib boom.
4. Remove mounting hardware from articulating jib boom pivot pin #2. Using a suitable brass drift and hammer, remove the pivot pin from boom assembly.

Disassembly

1. Remove mounting hardware from articulating jib boom pivot pins #3 and #4. Using a suitable brass drift and hammer, remove the pins from articulating jib boom pivot weldment.
2. Remove mounting hardware from rotator support pins #5 and #6. Using a suitable brass drift and hammer, remove the pins from rotator support.
3. Remove mounting hardware from lift cylinder pin #7. Using a suitable brass drift and hammer, remove the jib lift cylinder pin from articulating jib boom.

Inspection

NOTE: *When inspecting pins and bearings Refer to Section 2.5, Pins and Composite Bearing Repair Guidelines.*

1. Inspect articulating fly boom pivot pin for wear, scoring, tapering and ovality, or other damage. Replace pins as necessary.
2. Inspect articulating fly boom pivot attach points for scoring, tapering and ovality, or other damage. Replace pins as necessary.
3. Inspect inner diameter of articulating fly boom pivot bearings for scoring, distortion, wear, or other damage. Replace bearings as necessary.
4. Inspect lift cylinder attach pin for wear, scoring, tapering and ovality, or other damage. Ensure pin surfaces are protected prior to installation. Replace pins as necessary.

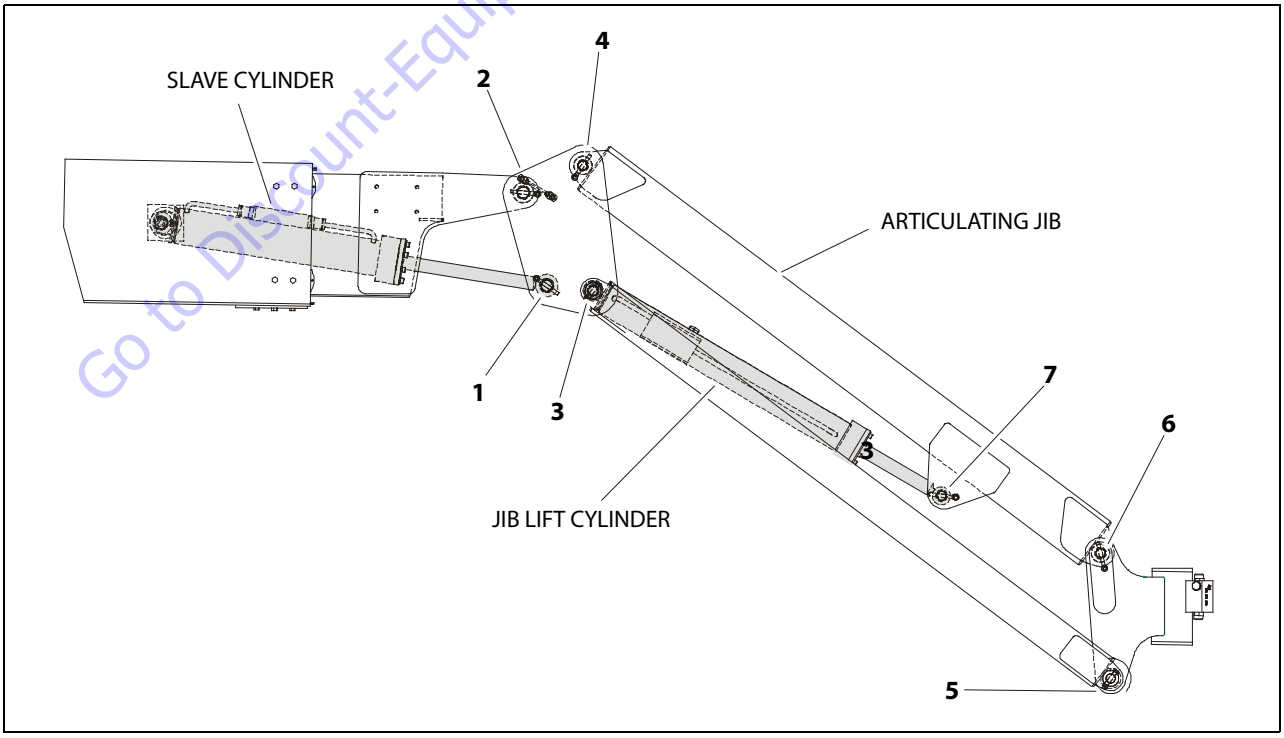


Figure 4-12. Location of Components - Articulating Jib

5. Inspect inner diameter of rotator attach point bearings for scoring, distortion, wear, or other damage.
6. Inspect all threaded components for damage such as stretching, thread deformation, or twisting. Replace as necessary.
7. Inspect structural units of articulating jib boom assembly for bending, cracking, separation of welds, or other damage. Replace boom sections as necessary.

Assembly

1. Align lift cylinder with attach holes in articulating jib boom. Using a soft head mallet, install cylinder pin #7 into articulating jib boom and secure with mounting hardware.
2. Align rotator support with attach hole in articulating jib boom. Using a soft head mallet, install rotator support pin #6 into articulating jib boom and secure with mounting hardware.
3. Align bottom tubes with attach holes in rotator support. Using a soft head mallet, install rotator support pin #5 into articulating jib boom and secure with mounting hardware.
4. Align articulating jib boom with attach hole in articulating jib boom pivot weldment. Using a soft head mallet, install rotator support pin #4 into articulating jib boom and secure with mounting hardware.
5. Align bottom tubes with attach holes in articulating jib boom pivot weldment. Using a soft head mallet, install rotator support pin #3 into articulating jib boom pivot weldment and secure with mounting hardware.

Installation

1. Align articulating jib boom pivot weldment with attach holes in fly boom assembly. Using a soft head mallet, install pivot pin #2 into fly boom assembly and secure with mounting hardware.
2. Align the slave cylinder with attach holes in articulating jib boom pivot weldment. Using a soft head mallet, install slave leveling cylinder pin #1 into articulating jib boom pivot weldment and secure with mounting hardware.

4.11 UPRIGHT MONITORING SYSTEM

The UMS provides a visual and audible warning to the operator when the limits of the upright assembly alignment have been reached. In addition, the UMS will not allow the tower boom to be lowered when the upright assembly is misaligned in a direction oriented away from the work platform.

Re-Synchronizing Upright

A pull type control valve allows the operator to adjust the upright level cylinder if the upright is not 90° (vertical) relative to the chassis. (Refer to Figure 4-13.) This valve is located in the tank compartment area.

Perform the following steps with the aid of an assistant:

1. Turn the key switch to the ground control position.
2. Start the engine.
3. Pull and hold the red relevel knob located next to the main control valve. Refer to Figure 4-13.
4. Raise the tower boom 6 feet (1.8 m).
5. Release the red relevel knob.
6. Lower the tower boom fully and continue to hold down the switch to Tower Down for an additional 20 seconds.
7. Repeat steps 3 through 6 as necessary until the upright is 90° (vertical) relative to the chassis.

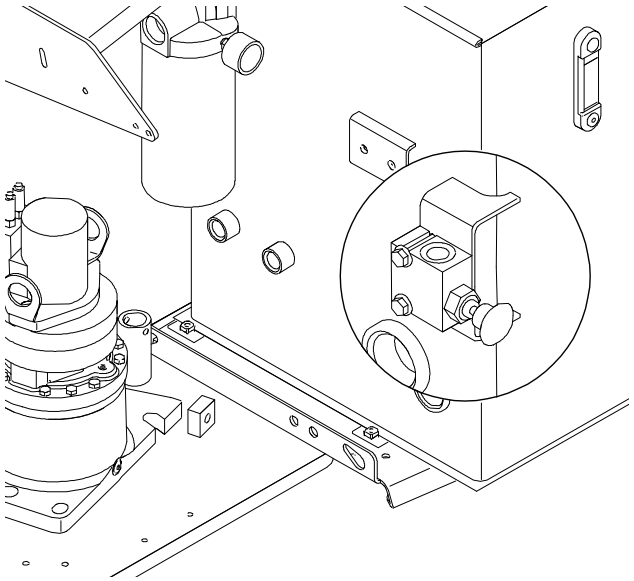


Figure 4-13. Releveling Valve

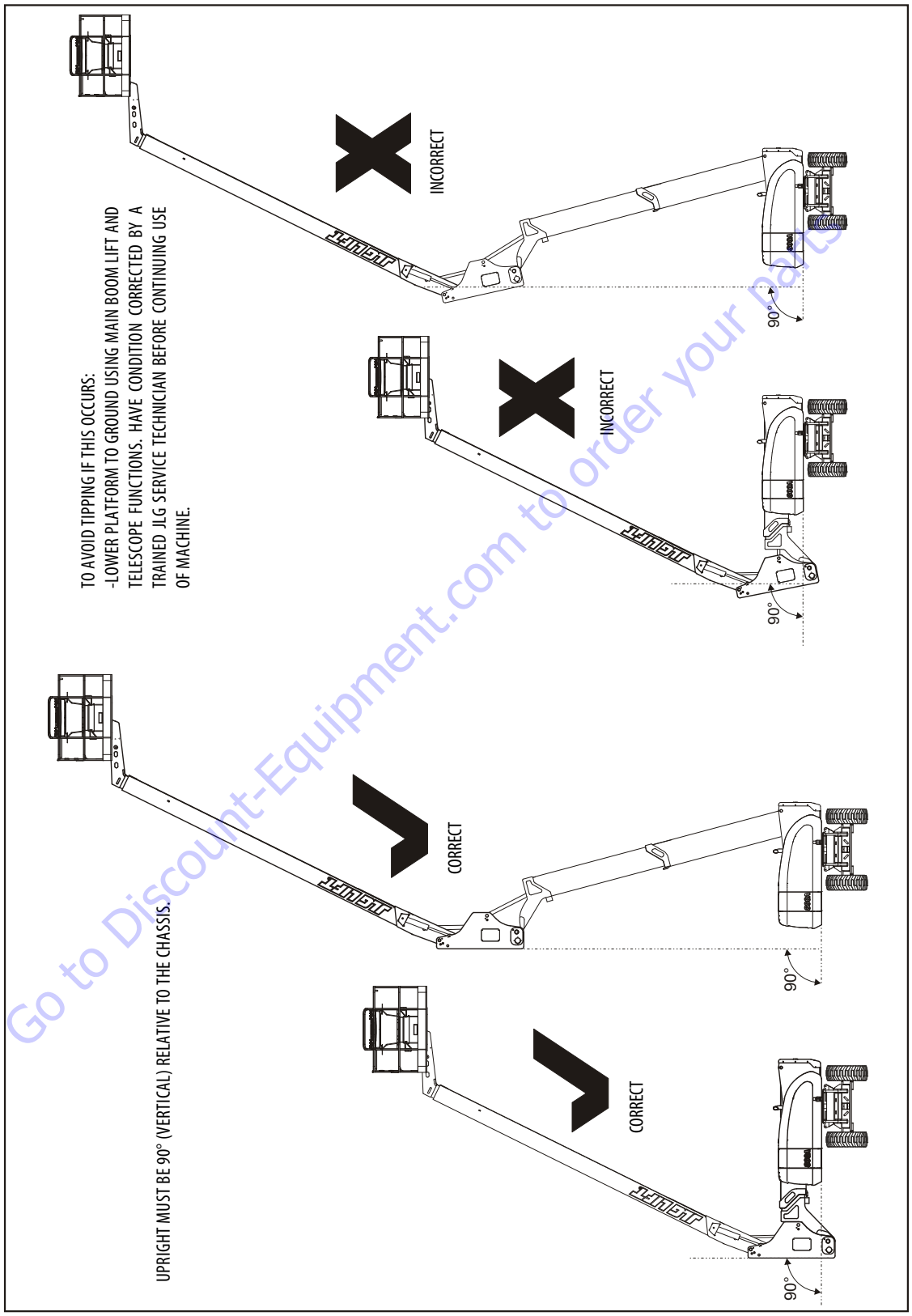


Figure 4-14. Boom Upright Positioning

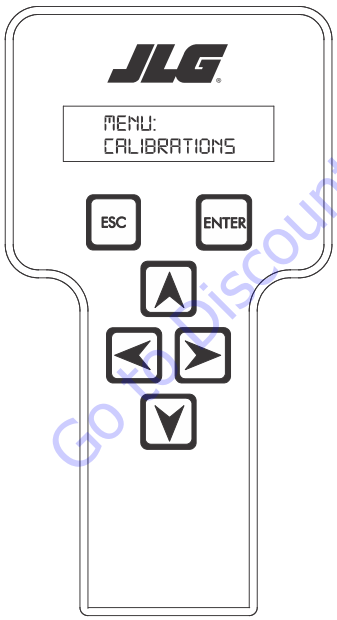
Calibration

1. Connect the JLG Hand-held analyzer to the original analyzer connection in the ground box.

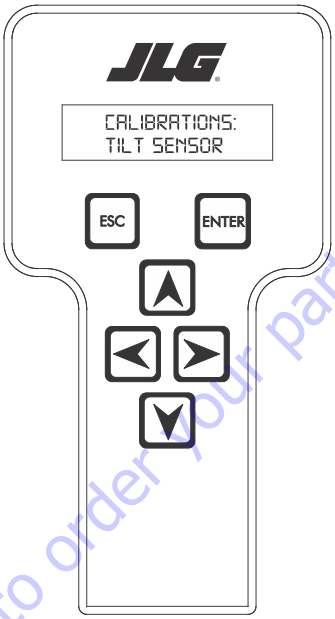
NOTICE

DO NOT CONNECT TO THE ANALYZER CONNECTION PORT INSTALLED WITH THE UPRIGHT MONITORING SYSTEM MODULE.

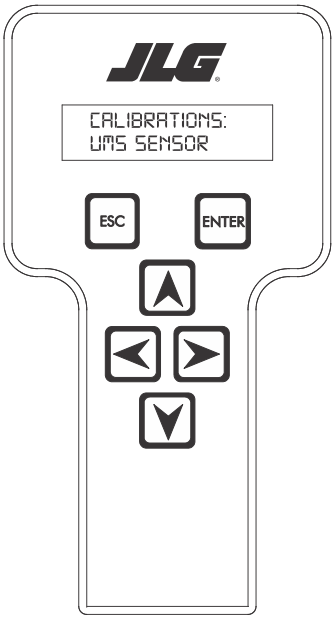
2. Pull out the emergency stop button at the ground control station and start the engine from the ground controls.
3. To calibrate the Upright Monitoring System through the hand-held analyzer, you must be in access level 1. To advance to access level 1, scroll to the ACCESS LEVEL menu and press "ENTER" ENTER. Using the arrows on the keypad, enter the password "33271" and press "ENTER" ENTER.
4. Calibrate the upright monitoring system sensor by the following procedure:
   a. In access level 1, scroll through the menu items until "CALIBRATIONS" is displayed on the second line of the analyzer screen. The screen will display the following:



   b. After pressing 'ENTER" one of the following screens will be displayed:



Or

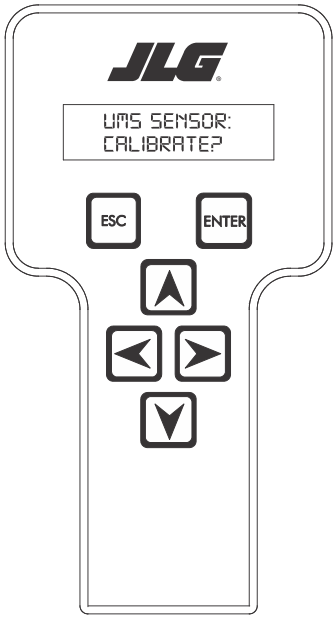


   c. Scroll left to right through the above menu items until "UMS SENSOR" sub menu appears on the bottom line of the analyzer display. Press the "ENTER" ENTER key.

NOTICE

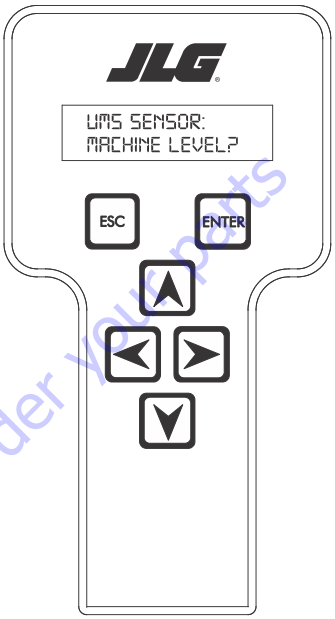
IT IS NOT NECESSARY TO CALIBRATE THE TILT SENSOR IN THE GROUND CONTROL MODULE AT THIS TIME. HOWEVER, WHEN THE TILT SENSOR IN THE GROUND CONTROL MODULE IS RECALIBRATED, THE UPRIGHT MONITORING SYSTEM TILT SENSOR MUST BE RECALIBRATED AS WELL.

d. After selecting "UMS SENSOR", the following screen will appear:



NOTE: *By pressing the left or right arrow keys in this screen, you may view the output of the sensor.*

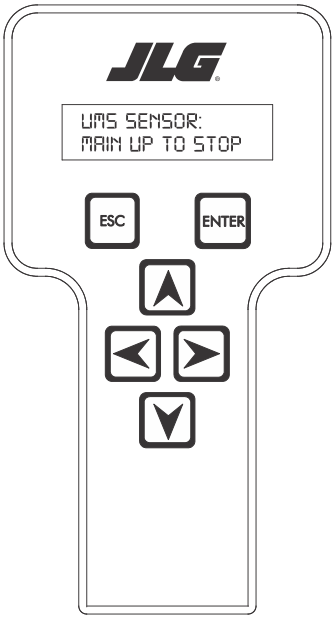
e. Press "ENTER" ENTER and the next screen will display the following, asking if the machine is on a level surface:



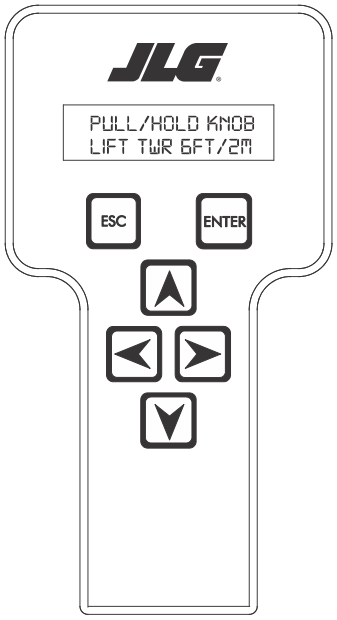
NOTICE

THE MACHINE MUST BE LEVEL FOR PROPER CALIBRATION.

f. Verify the machine is level and press "ENTER" ENTER. The screen will display the following, asking you to fully elevate the main boom:



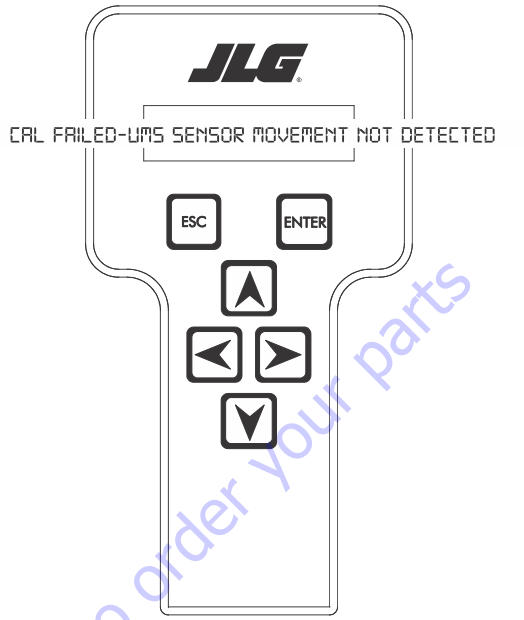
g. After the main boom has been fully elevated, press "ENTER" (ENTER). The analyzer will display the following:



NOTE: *By pressing the left or right arrows in this screen, you may view the output of each sensor.*

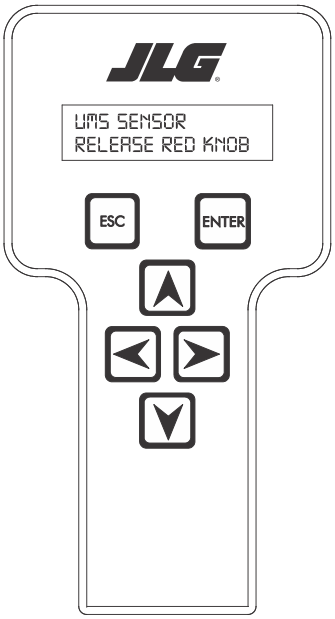
h. With the aid of an assistant, pull and hold the red re-leveling knob on the hydraulic tank while lifting the tower boom. Raise the tower boom six (6) feet or two (2) meters. After elevating the tower the required distance, press "ENTER" (ENTER).

If the upright monitoring system did not detect adequate sensor activity, the screen will display:

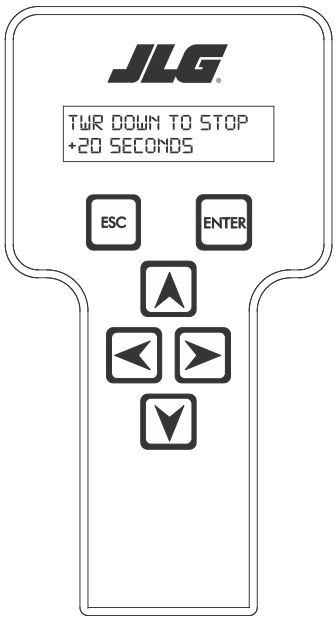


Should you get the above message, verify that the sensor is installed correctly and verify the sensor connection to the sensor harness is secure. Also, ensure the red knob is held fully open for the required time.

If the calibration is executing properly, you shall see the following display:

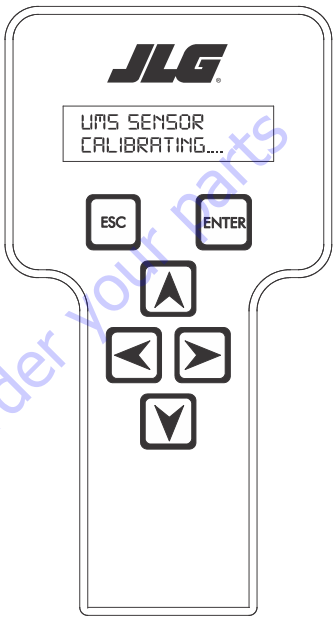


i. When viewing the above display, press "ENTER" (ENTER). The screen will display the following:

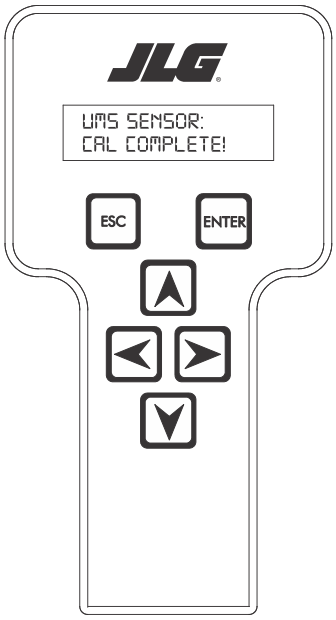


j. Lower the tower boom onto the boom stop. Continue to hold the tower boom down function for at least twenty (20) seconds **WITHOUT RELEASING THE FUNCTION SWITCH**. The calibration must recognize continuous activation of the tower down function switch for the required time.

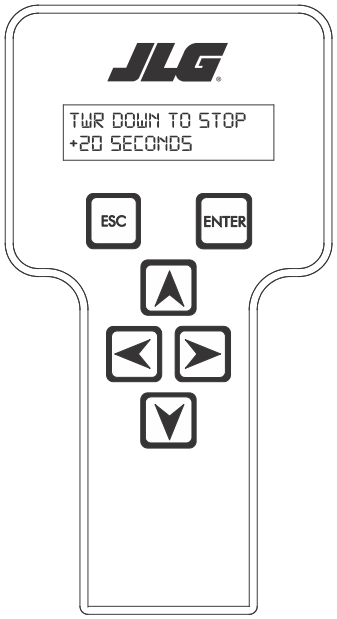
After the required activation time has passed, release the function switch and press "ENTER" (ENTER). The analyzer will display the following message:



If the calibration has been completed successfully, the screen will automatically change to:



If the calibration has not been completed successfully, the display will automatically change to:



Repeat step j until the calibration time requirement has been satisfied.

⚠ WARNING

DO NOT RAISE THE TOWER BOOM AGAIN DURING CALIBRATION.

k. To correctly complete the calibration process, fully retract and fully lower the main boom. Once the machine is in the stowed position, turn off the machine and disconnect the analyzer.

Calibration Faults

CAL Failed-Chassis Not Level

In the event the turntable tilt switch input is logic low indicating that the machine is not level the UMS calibration screens shall display this fault.

CAL Failed-UMS Sensor Raw Output Out Of Range

The control system shall display a fault in the event the raw sensor output is greater then ±5° for the UMS sensor.

CAL Failed-Turntable Sensor Raw Output Out Of Range

The control system shall display a fault in the event the raw sensor output is greater then ±5° for the turntable sensor.

CAL Failed-Calibration Disrupted

If calibration is disrupted, the control system shall display this fault.

CAL Failed- UMS Sensor Movement Not Detected

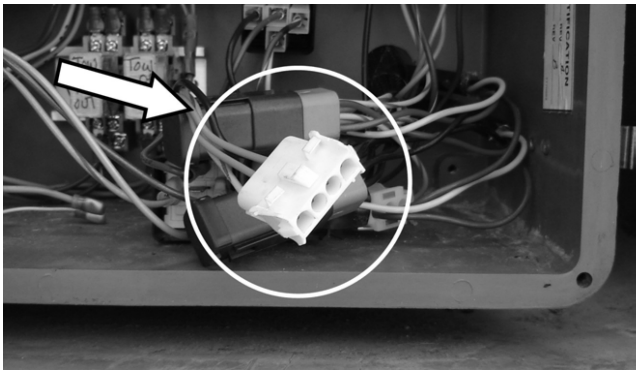
The UMS angle has not detected the required amount of movement during calibration.

Function Check

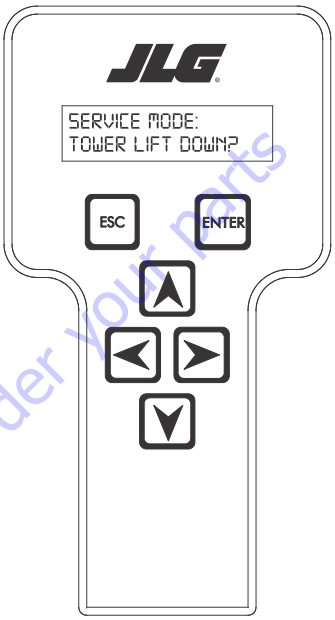
NOTICE

ON ADE EQUIPPED MACHINES, DO NOT CONNECT TO THE ANALYZER CONNECTION PORT INSTALLED WITH THE UPRIGHT MONITORING SYSTEM MODULE.

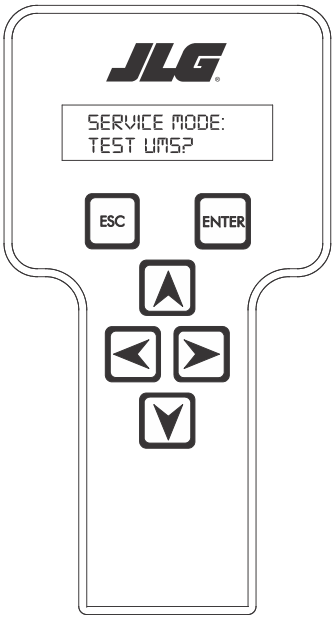
1. Connect the hand-held analyzer at the ground control station using the four-pin connector.



2. Pull out the emergency stop button at the ground control station and turn the key switch to ground controls. Start the engine.
3. Advance to access level 1 by scrolling to the ACCESS LEVEL menu and press "ENTER" (ENTER). Using the arrows on the keypad, enter the password "33271" and press "ENTER" (ENTER).
4. Scroll through the top level menu until SERVICE MODE appears. Press "ENTER" (ENTER) to select this menu item. After pressing "ENTER" one of the following screens will be displayed:

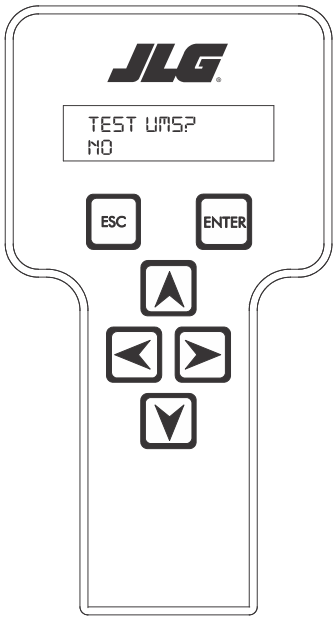


Or

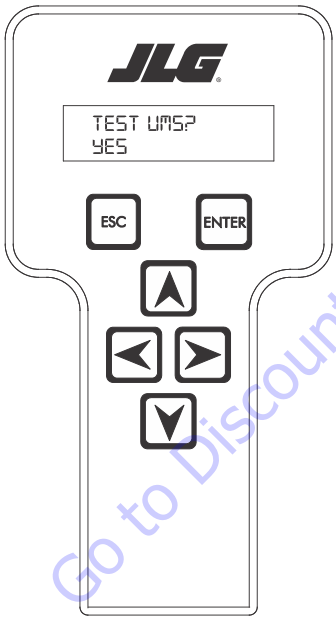


5. Scroll left to right through the above menu items until "TEST UMS?" sub menu appears on the bottom line of the analyzer display. Press the "ENTER" (ENTER) key.

6. The controller will now display the following:



or, by pressing the up and down arrow keys:



7. When the "YES" message is displayed, press the "ENTER" ENTER key to automatically perform a function test. Upon the function test, the system will activate the Upright Monitoring System, warning lights, and alarm. Verify that the alarm sounds, the boom malfunction indicator lights (platform and ground) are illuminated.

8. From the ground controls, raise the tower boom several feet. Verify that the tower boom will not lower.

9. To end the system test, press the Emergency Stop Switch (EMS) at the ground controls. Upon loss of power (pressing the EMS) to the system, the upright monitoring system will reset and all functionality will be restored to the machine.

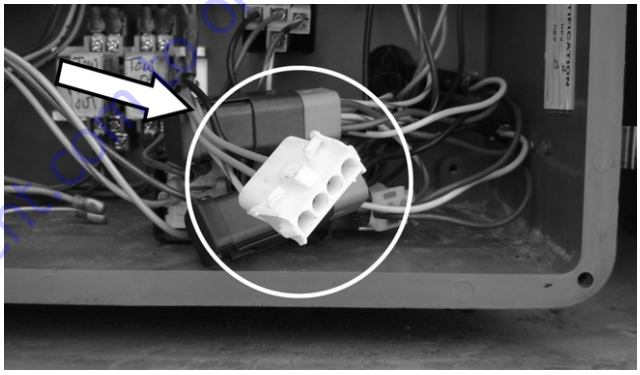
Service Mode/Tower Boom Retrieval

The UMS software incorporates a service mode to temporarily disengage the UMS and allow a tower lift down operation when the UMS has detected a backward stability concern.

NOTICE

ON ADE EQUIPPED MACHINES, DO NOT CONNECT TO THE ANALYZER CONNECTION PORT INSTALLED WITH THE UPRIGHT MONITORING SYSTEM MODULE.

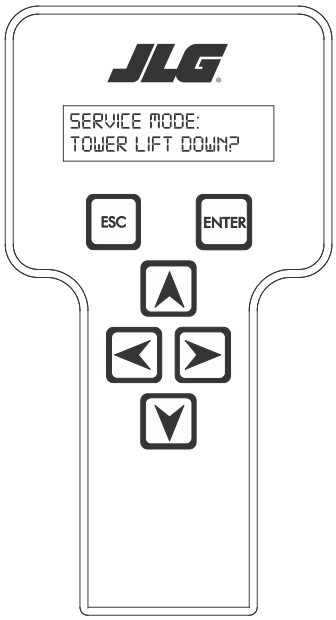
1. Connect the hand-held analyzer at the ground control station using the four-pin connector.



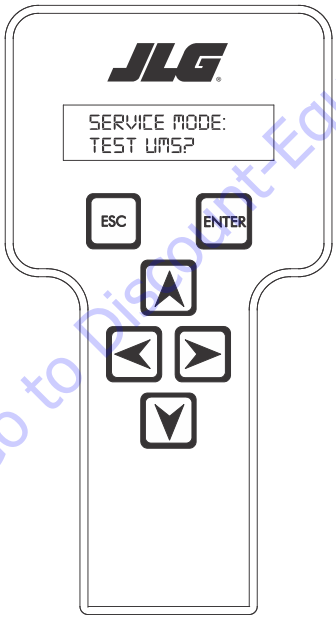
2. Pull out the emergency stop button at the ground control station and turn the key switch to ground controls. Start the engine.

3. Advance to access level 1 by scrolling to the ACCESS LEVEL menu and press "ENTER" ENTER. Using the arrows on the keypad, enter the password "33271" and press "ENTER" ENTER.

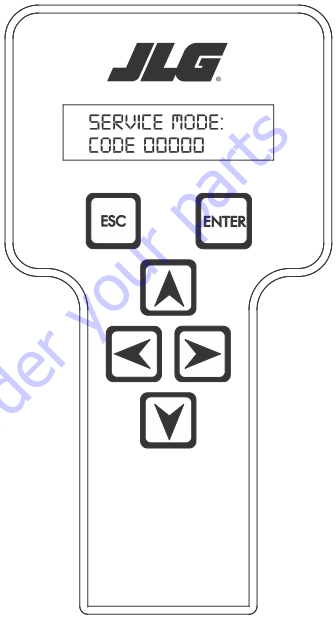
4. Scroll through the top level menu until SERVICE MODE appears. Press "ENTER" (ENTER) to select this menu item. After pressing "ENTER" one of the following screens will be displayed:



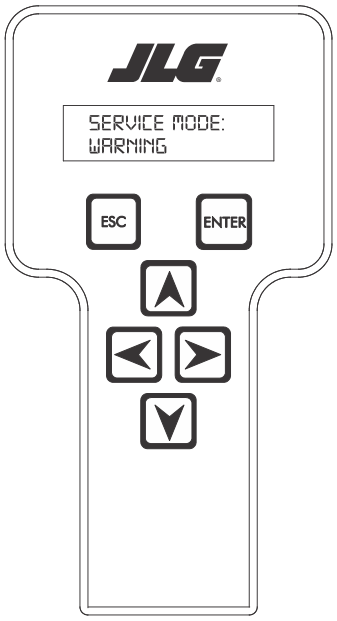
Or



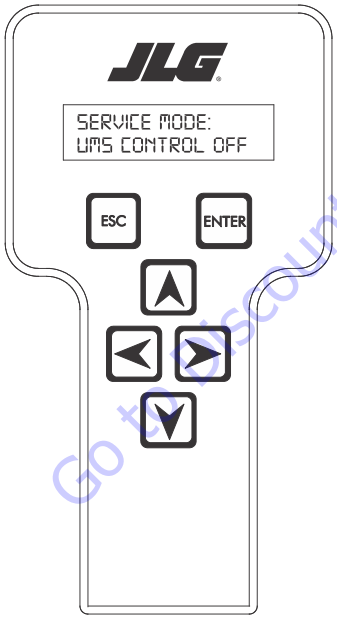
5. Scroll left to right through the above menu items until "TOWER LIFT DOWN?" sub menu appears on the bottom line of the analyzer display. Press the "ENTER" (ENTER) key.
6. The controller will now display the following:



7. Enter the service code "**81075**" and press the "ENTER" ENTER key. The controller display will now display the following,

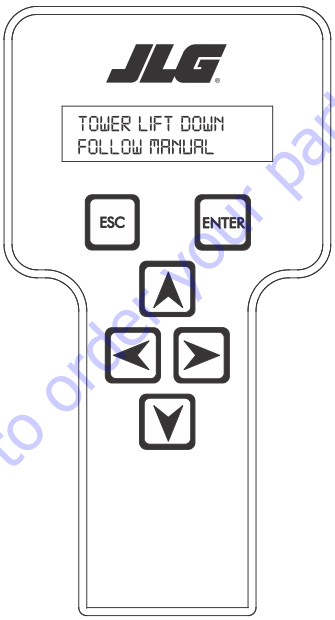


followed by:



The flashing and scrolling messages will repeat until the "ENTER" ENTER key is pressed.

8. When the "ENTER" ENTER key is pressed, the UMS will be disabled and the display will read:



9. Before using tower lift down adhere to the following:

- Make sure the main boom is fully retracted.
- Make sure the tower boom is fully retracted.
- Slowly lower the tower boom.

10. When the platform has been safely lowered to the ground, exit the service mode by pressing the Emergency Stop Switch (EMS) at the ground controls. Upon loss of power (pressing the EMS) to the system, the upright monitoring system will reset and all functionality will be restored to the machine.

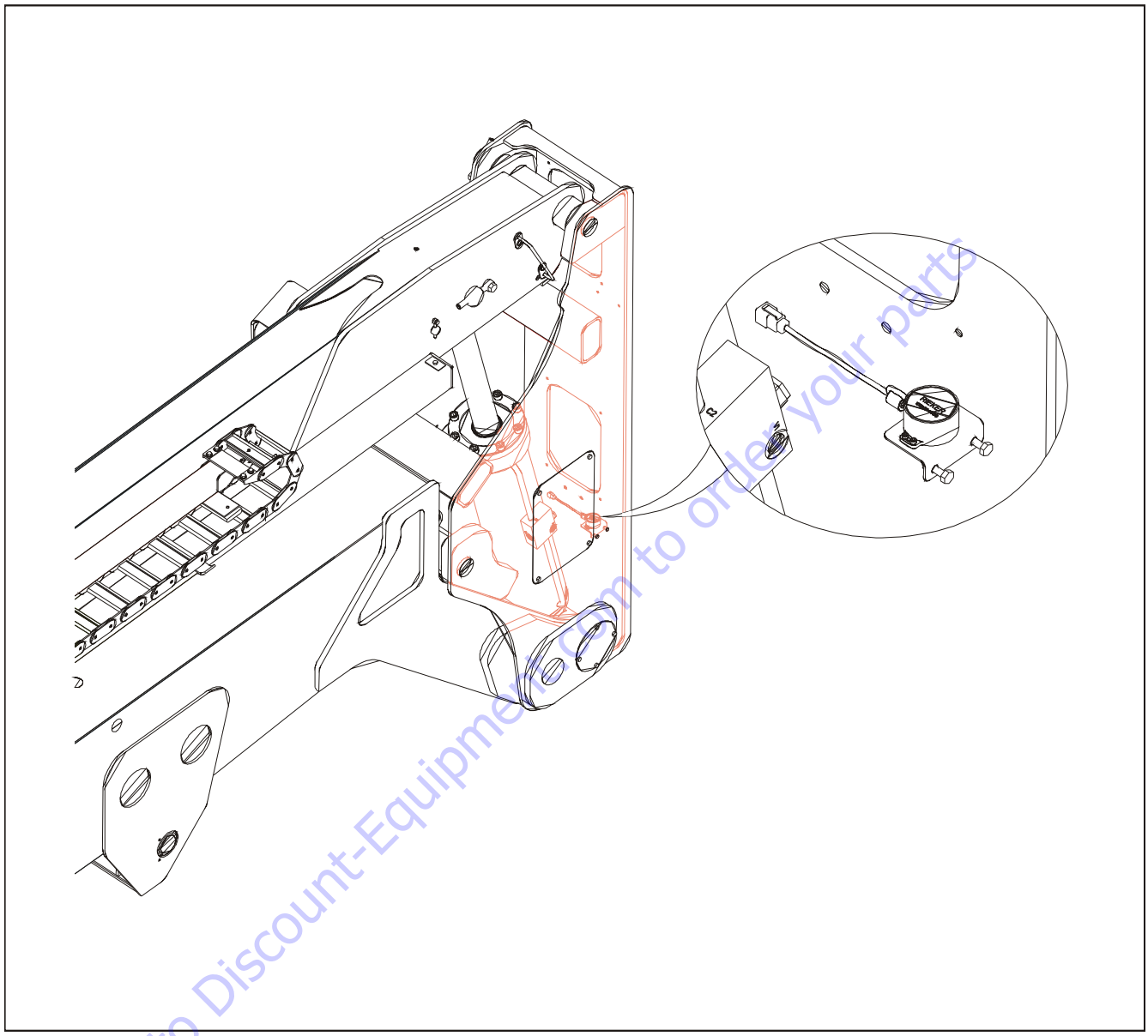


Figure 4-15. UMS Sensor Location

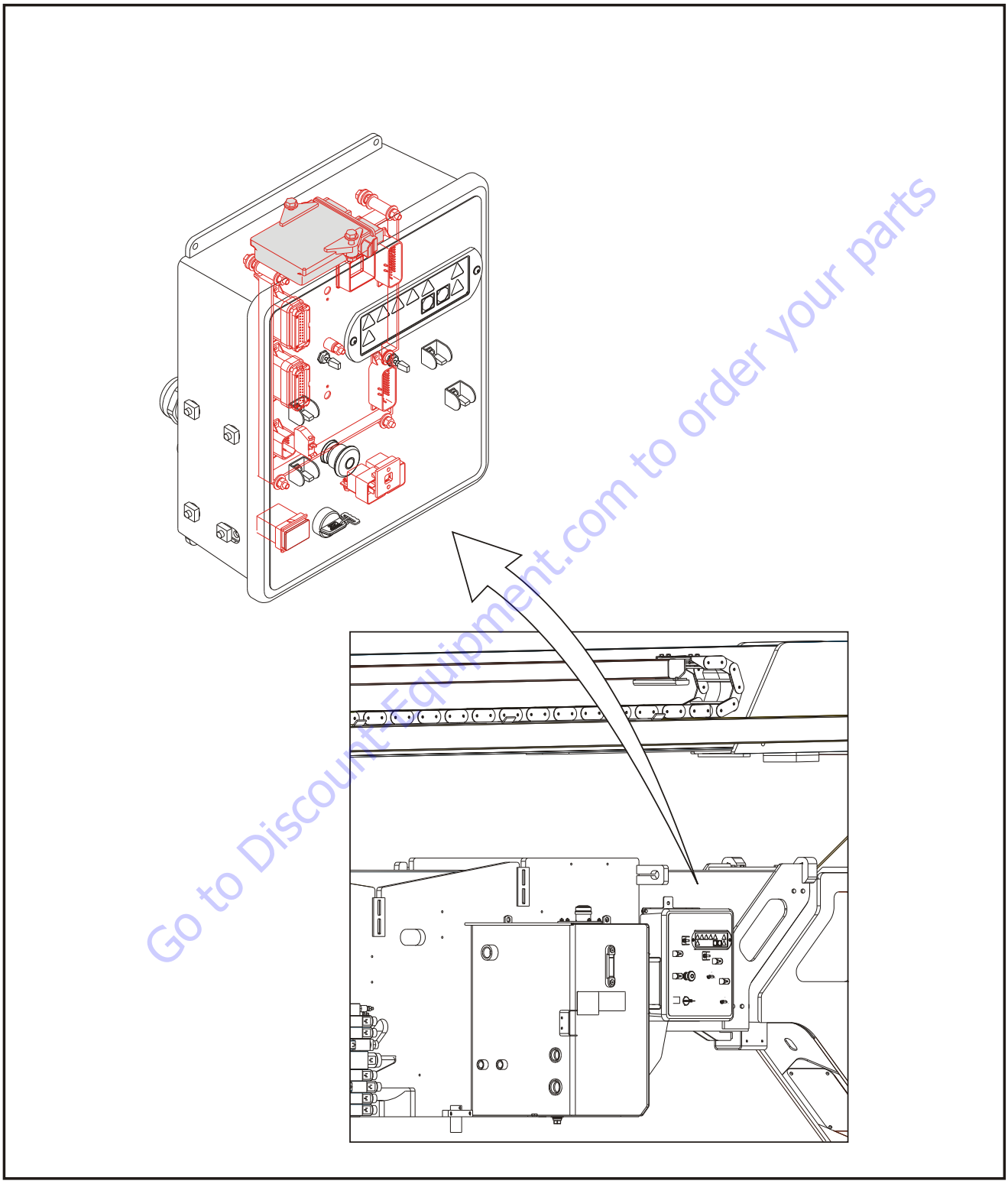


Figure 4-16. UMS Module Location

J1		J2	
1	IGN POWER (7-33V)	1	+5V ANALOG EXCITATION
2	GROUND	2	ANALOG INPUT 0
3	DIGITAL INPUT 0	3	ANALOG GROUND
4	DIGITAL INPUT 1	4	+5V ANALOG EXCITATION
5	DIGITAL INPUT 2	5	ANALOG INPUT 1
6	DIGITAL INPUT 3	6	ANALOG GROUND
7	DIGITAL OUTPUT 0 (PWM, IF)	7	ANALOG INPUT 2
8	DIGITAL OUTPUT 1 (PWM, IF)	8	ANALOG INPUT 3 (NOT POPULATED)
9	DIGITAL OUTPUT 2 (PWM, IF)	9	CANBUS HIGH
10	DIGITAL OUTPUT 3 (PWM, IF)	10	CANBUS LOW
11	DIGITAL OUTPUT 4 (PWM)	11	ANALYZER TRANSMIT
12	DIGITAL OUTPUT 5 (PWM)	12	ANALYZER RECEIVE

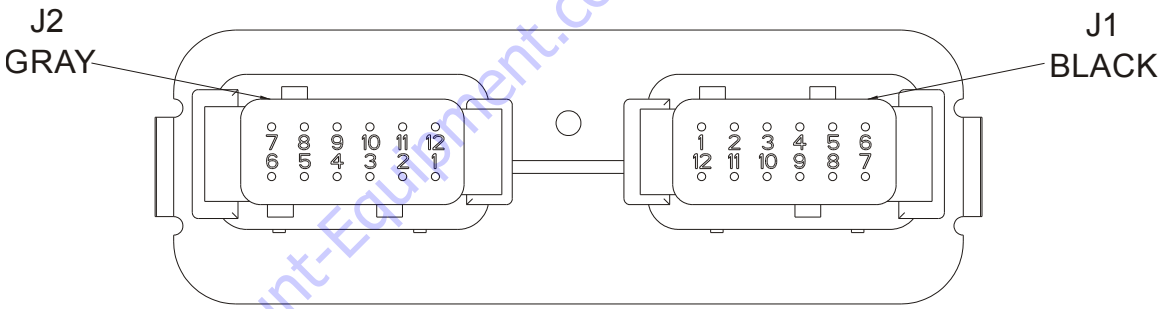


Figure 4-17. UMS Module Pin Identification

4.12 UMS TROUBLESHOOTING AND FAULT MESSAGES

Backward Stability Concern Message

2/5 UMS SENSOR BACKWARD LIMIT REACHED

When the upright angle relative to the turntable is higher than +2.5° (away from the work platform), tower lift down will be disallowed immediately. Tower Lift Down will be re-allowed when the upright angle relative to the turntable is less than 2.0°. If Tower Lift Down is disabled for more than 1.5 seconds, the ground boom malfunction indicator lamp, upright tilted lamp and platform alarm will light/sound continually and a fault shall be raised. These conditions will be latched along with Tower Lift Down until the upright angle is less than 2.0° for 2 seconds and the Tower Lift Down command is returned to neutral.

Solution:

- Inspect sensor mounting.
- Verify sensor calibration on level pad.
- Follow the corrective action listed on decal 1702265 located near the red knob of the machine.
- Inspect machine hydraulics. Refer to Holding Valve Checks in Section 5 - Hydraulics.

Forward Stability Concern Message

2/5 UMS SENSOR FORWARD LIMIT REACHED

When the upright angle relative to the turntable is less than –4.0° for longer than 1.5 seconds, the ground control boom malfunction indicator lamp, the platform malfunction indicator lamp, and platform alarm will light/sound continually and a fault will be raised. The light/alarm signal will stop only when the upright angle reaches values greater than –3.0° for 2 seconds.

Solution:

- Inspect sensor mounting.
- Verify sensor calibration on level pad.
- Tower lift down.
- Inspect machine hydraulics. Refer to Holding Valve Checks in Section 5 - Hydraulics.

Auto Detection Input Low Message

2/5 AUTO DETECTION INPUT LOW

If the UMS detects a valid ground module software version but digital input 2 is not tied high the UMS module shall report a fault.

Solution:

- Inspect wire harness, there should be 12 volts going into pin J1-5 (black connector) of UMS module.

UMS Sensor Communications Lost

6/6 UMS SENSOR COMMUNICATIONS LOST

If the UMS detects a valid ground module software version but digital input 2 is not tied high the UMS module shall report a fault.

Solution:

- Inspect wire harness; CANbus communications are on pins J2-9 & J2-10 (gray connector) of the UMS module.
- Using access level 1 of the UMS module, under “DIAGNOSTICS” CAN, EX/SEC and TX/SEC should be values greater than 0. Also “BUS OFF:” and “BUS ERR:” should be 0 and “PASSIVE:” should be a low value.

Out of Usable Range Message

8/1 UMS SENSOR OUT OF USABLE RANGE

When both the Chassis tilt sensor and the UMS sensor read greater than 10° in the same direction the UMS will be disengaged until the condition no longer exists and a fault shall be raised.

Solution:

- Verify the message clears when operating the machine on grade less than 10°.
- Inspect sensor mounting.
- Verify sensor calibration on level pad.

UMS Sensor Not Calibrated Message

8/1 UMS SENSOR NOT CALIBRATED

If the control system detects a sensor out of range condition or a not calibrated fault with the UMS angle sensor, the control system shall report a fault and disable Tower Lift Down and activate the ground boom malfunction indicator lamp, upright tilted lamp and platform alarm continually

If the control system detects that the UMS angle sensor has not been calibrated, the ground boom malfunction lamp will flash at a 3 Hz rate until the system is calibrated or disabled.

Solution:

- Calibrate sensor.

UMS Sensor Faulted Message

8/1 UMS SENSOR FAULTED

If the system detects that the UMS sensor frequency outside the 100Hz +/- 5Hz range or the duty cycle is outside 50% +/- 21% range the control system shall report a fault.

Solution:

- Inspect wire harness going to the sensor and UMS module.
- Inspect sensor mounting.
- Replace sensor.

Incompatible Software Detected Message

9/9 INCOMPATIBLE SOFTWARE DETECTED

If the control system detects that the ground module software is incompatible with the UMS module, the UMS module shall report a fault and disable the footswitch signal to the ground module.

Solution:

- Update ground module software.

Calibration Faults

CAL FAILED-CHASSIS NOT LEVEL

The control system shall display a fault in the event the raw sensor output is greater than ±5° for the chassis sensor.

CAL FAILED-UMS SENSOR RAW OUTPUT OUT OF RANGE

The control system shall display a fault in the event the raw sensor output is greater then ±5° for the UMS sensor.

CAL FAILED-CALIBRATION DISRUPTED

If calibration is disrupted, the control system shall display this fault.

CAL FAILED- UMS SENSOR MOVEMENT NOT DETECTED

The UMS angle has not detected the required amount of movement during calibration.

4.13 SEQUENCE FOR HOSE REPLACEMENT IN THE TOWER BOOM

1. Remove the tower boom front cover bolts, exposing the Powertrack.
2. Remove bolts to disconnect the top bar of the Powertrack
3. Pull the Powertrack out of base boom. (as far as hoses will allow)
4. At left side rear of upright, remove access cover plate (4) bolts. (others if necessary)
5. Remove access cover plate, (4) bolts, from bottom front of fly boom.
6. Cut cable ties that attach hose to be replaced.
7. Disconnect hose that is to be replaced, and cap the male fitting.
8. Attach the new hose to the end of the hose to be replaced.
9. Pull these lines thru the upright and out the bottom, then feed back into the fly boom.
10. At the Powertrack, in front of the tower boom, open the Powertrack links to expose the hose to be replaced.
11. Pull hose to be replaced, attached to the new hose, thru the fly boom and thru the Powertrack links.
12. Disconnect new hose from the replaced hose and connect to fitting where the damaged hose was connected.
13. Roll Powertrack back into base, and attach the top bar of the Powertrack (2) bolts to the inside top of the fly boom section.
14. Check for leaks and hardware tightened securely.
15. Replace access cover plates and front cover.

4.14 LIMIT SWITCHES ADJUSTMENT

Main Boom Horizontal Limit Switch

1. Place machine on level surface.
2. Raise main boom 5 to 10 degrees above horizontal. Limit switch should activate before this point.
3. Lower main boom until limit switch resets. This should be 1 degree above to 4 degrees below horizontal. See Figure 4-18. for adjustments.

NOTE: *Angle indicator should be placed approx. 2 ft. from the main boom pivot pin and the attach point on the main boom. Tower angle switch must be reset before main boom angle switch can be activated.*

Tower Boom Horizontal Limit Switch

1. Place machine on level surface.
2. Raise tower boom 8 to 13 degrees above horizontal. The tower angle limit switch should activate at this point.
3. Lower the tower boom until the limit switch resets. This should be 2 to 7 degrees below where the switch was activated. See Figure 4-18. and Figure 4-19. for adjustments.

4.15 BOOM VALVE ADJUSTMENT

1. Adjust the screws so the plunger on the valves has 0.250 in. (6.35 mm) travel remaining when the lower boom is fully raised and retracted.
2. After the valves are adjusted, adjust the proximity switches to within 0.20 in. (5 mm) of their target. The LED's on the proximity switches will light when the power is on and the switch is within 0.20 in. (5 mm) of the target. There is a proximity switch to back up both valves.

NOTE: *The cam valve under the boom requires the tower boom to be completely lowered and the cam valve mounted on T/T requires the tower boom to be fully elevated prior to adjustment.*

Main Boom

1. Shim up wear pads to within 1/32 in. (0.8 mm) clearance between wear pad and adjacent surface.
2. Adjusting wear pads, removing or adding shims, bolt length must also be changed.
   a. When adding shims, longer bolts must be used to ensure proper thread engagement in insert.
   b. When shims are removed, shorter bolts must be used so bolt does not protrude from insert and Sheaves and wire rope must be replaced as sets.

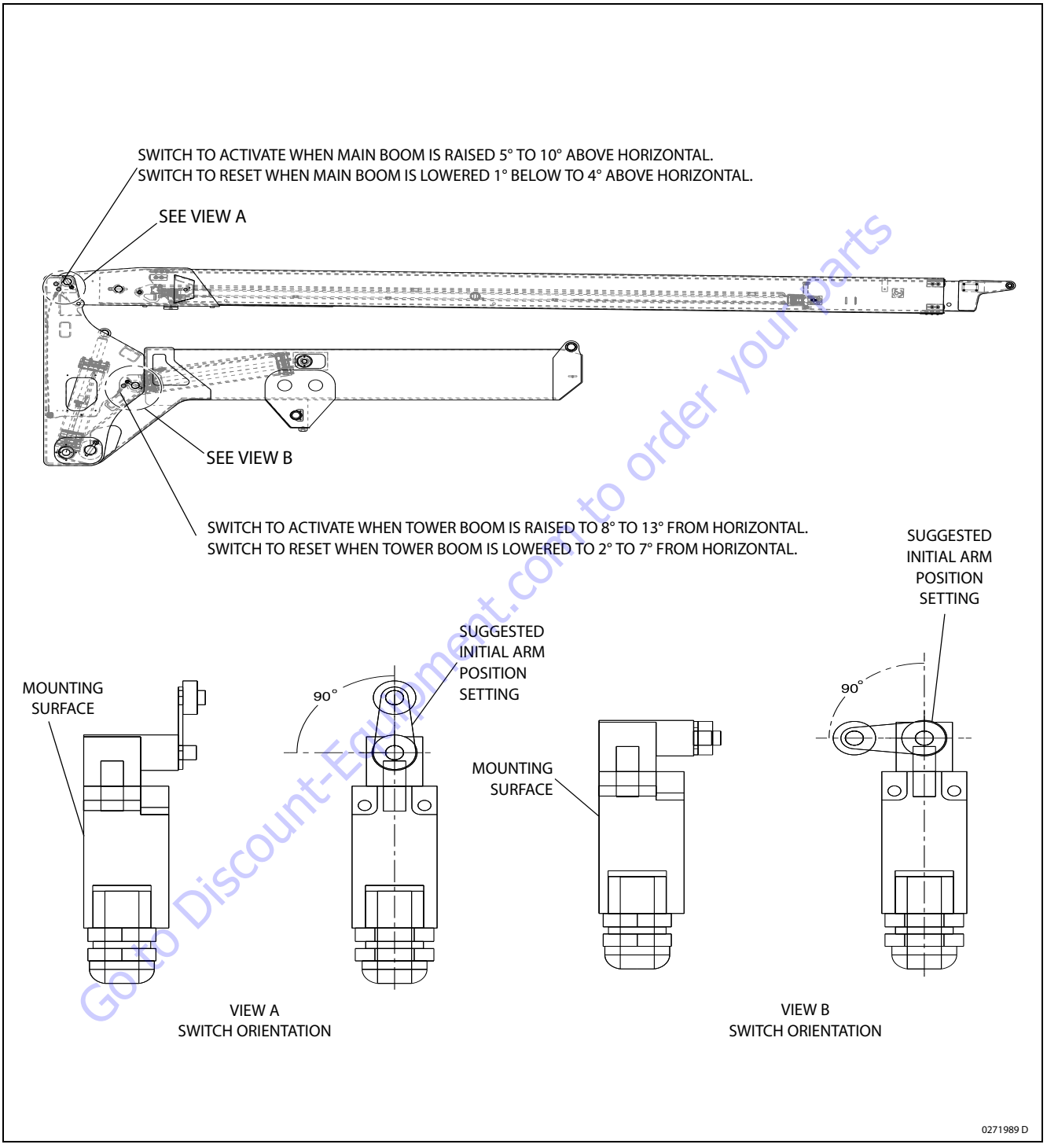


Figure 4-18. Boom Valve and Limit Switches Location (Sheet 1 of 2)

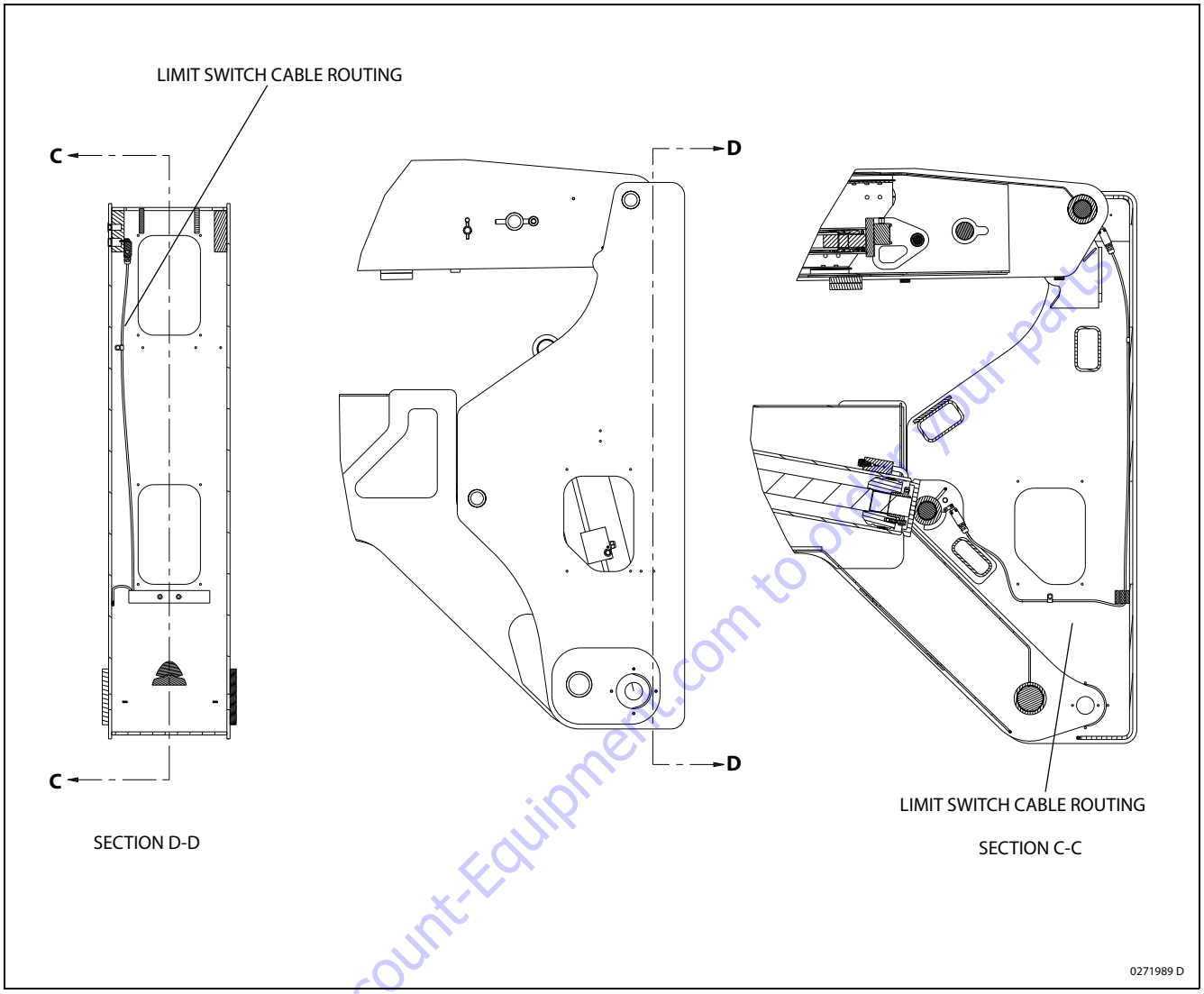


Figure 4-19. Boom Valve and Limit Switches Location (Sheet 2 of 2)

4.16 ROTATOR ASSEMBLY

Theory of Operation

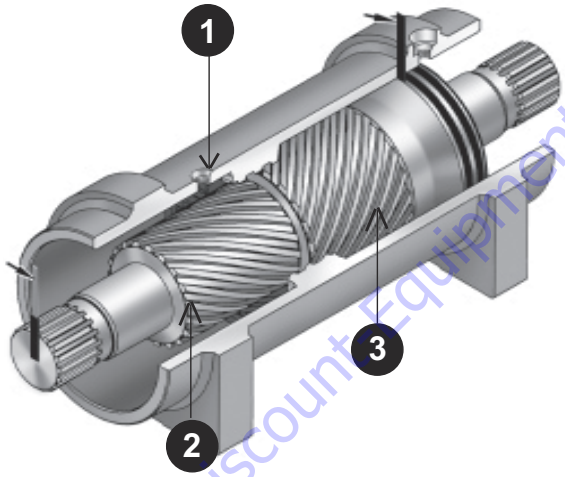
The rotary actuator is a simple mechanism that uses the sliding spline operating concept to convert axial piston motion into powerful shaft rotation. Each actuator is composed of a housing with integrated gear ring (1) and only two moving parts: the central shaft with integrated bearing tube and mounting flange (2), and the annular piston sleeve (3). Helical spline teeth machined on the shaft engage matching splines on the inside diameter of the piston. The outside diameter of the piston carries a second set of splines, of opposite hand, which engage with matching splines in the housing. As hydraulic pressure is applied, the piston is displaced axially within the housing similar to the operation of a hydraulic cylinder while the splines cause the shaft to rotate. When the control valve is closed, oil is trapped inside the housing, preventing piston movement and locking the shaft in position.

The shaft is supported radially by the large main radial bearing and the lower radial bearing. Axially, the shaft is separated from the housing by the main and lower thrust washers. The end cap is adjusted for axial clearance and locked in position by set screws or pins.

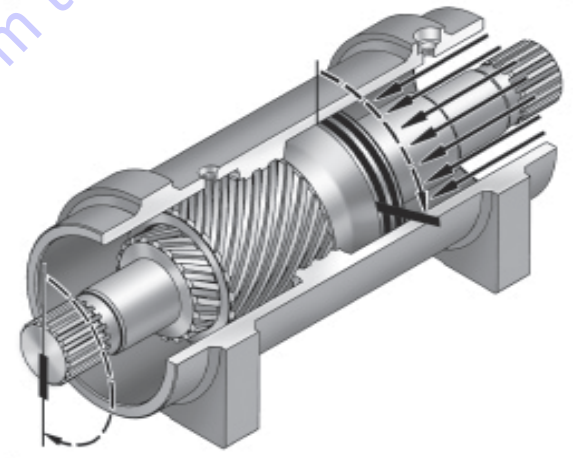
The actuators are equipped with factory installed counterbalance valves, which performs four major functions.

- Protects the actuator in the event of overload.
- Enables the actuator to hold position without drifting when external loads are applied.
- Reduces hydraulic backlash by pressuring the hydraulic fluid.

Provides a constant controlled rate of rotation in over-center load conditions.



Bars indicate starting positions of piston and shaft. Arrows indicate direction they will rotate. The housing with integral ring gear remains stationary.



Applying fluid pressure will displace the piston axially while the helical gearing causes the piston and shaft to rotate simultaneously.

The double helix design compounds rotation: shaft rotation is about twice that of the piston. Applying pressure to the opposite port will return the piston and shaft

Required Tools

Upon assembly and disassembly of the actuator there are basic tools required. The tools and their intended functions are as follows:

1. PIPE VISE
2. HEX WRENCH - Removal and replacement of port plugs and setscrews.
3. ASSORTED SCREWS
4. SAFETY GLASSES
5. END CAP REMOVAL TOOLS (provided with Helac seal kit).
6. DRILL
7. FLASHLIGHT - Helps to locate and examine timing marks, component failure and overall condition.
8. RUBBER MALLET - Removal and installation of shaft and piston sleeve assembly.
9. PLASTIC MANDREL
10. PRY BAR - Removal of end cap and manual rotation of shaft.
11. FELT MARKER - Highlights the timing marks and outline troubled areas.
12. T-HANDLE SCREW EXTRACTOR
13. HEX WRENCH SET - Removal and replacement of port plugs and setscrews (106 &110).
14. SEAL TOOLS - Removal and installation of seals and wear guides. Directions to make a seal tool are provided below making a Seal Tool.
15. PUNCH
16. DOWEL PINS - Removal and installation of end cap.

Making a Seal Tool

The seal tool is merely a customized standard flat head screwdriver.

⚠ CAUTION

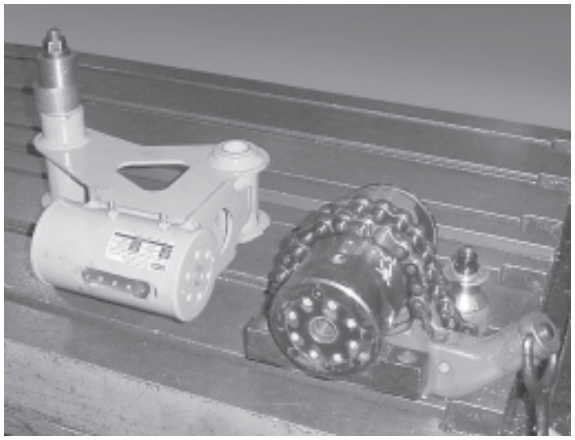
TO AVOID INJURY BE CAREFUL WHILE HANDLING THE HOT SCREWDRIVER.

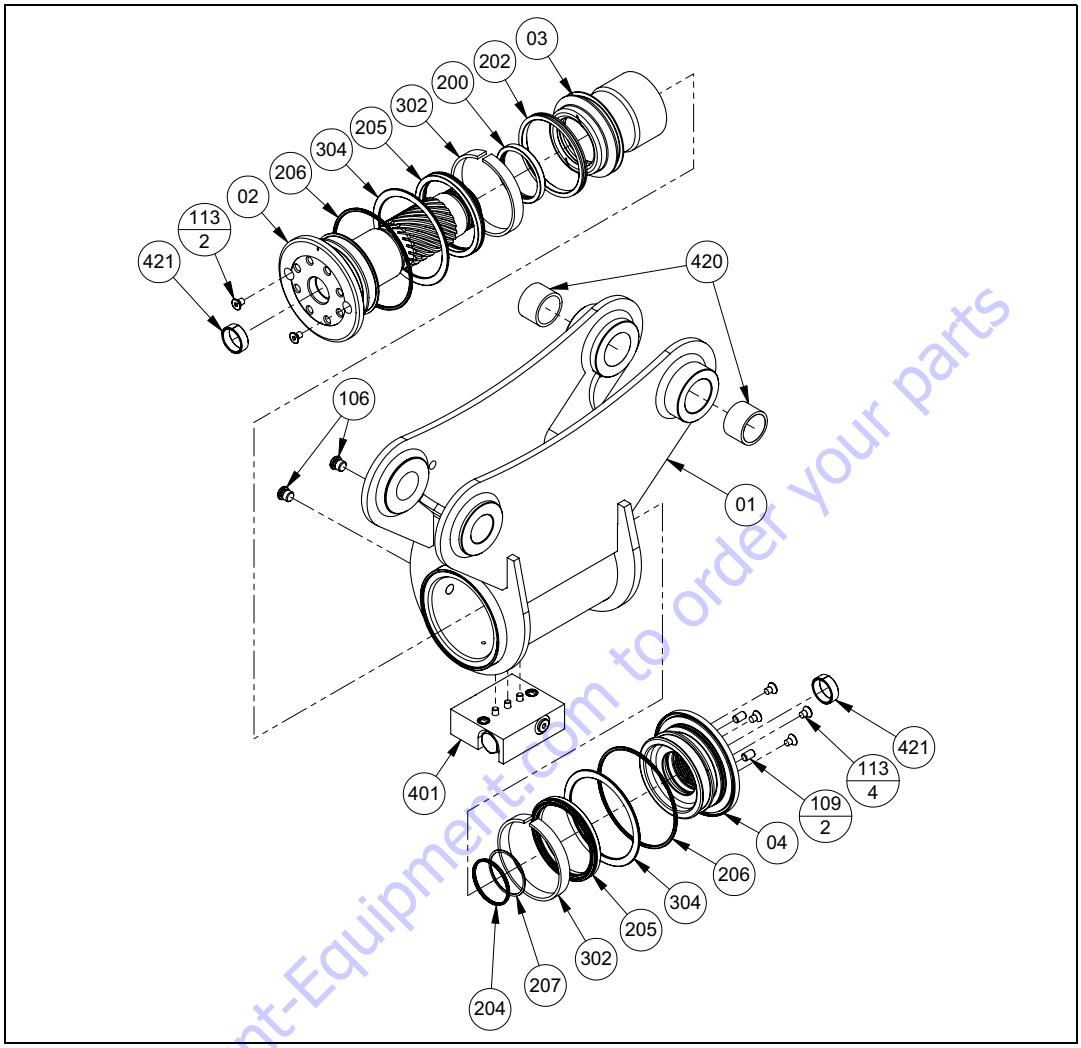
1. Heat the flat end with a torch until it glows.
2. Secure the heated end of the screwdriver in a vise and bend the heated end to a slight radius.
3. Round off all sharp edges of the heated to a polished finish. The tool may be modified slightly to your own personal preference. To avoid injury be careful while handling the hot screwdriver.

Before Disassembly

Inspect the actuator for corrosion prior to disassembly. Severe corrosion can make it difficult to remove the lock pins (109) and unthread the end cap (04). If corrosion is evident, soak the lock pins and end cap with penetrating oil for several hours before disassembly.

Disassembly is considerably easier if the actuator is firmly secured to the work bench. A pipe vise or mounting fixture work well.





PARTS
1. Housing
2. Shaft
3. Piston Sleeve
4. End Cap

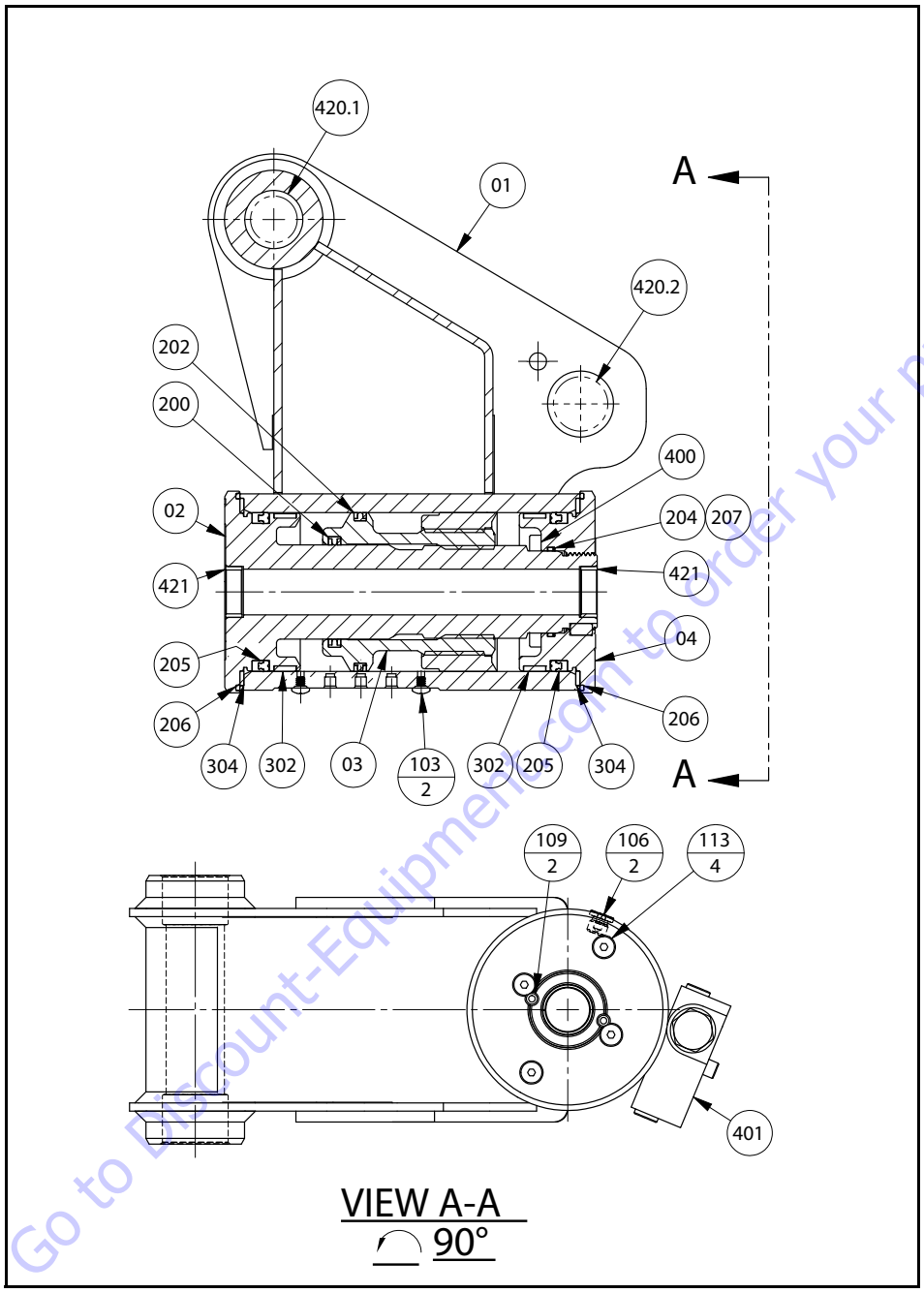
HARDWARE
103. Screw
106. Port Plug
109. Lock Pin
113. Capscrew

SEALS
200. T-Seal
202. T-Seal
204. O-ring
205. Cup Seal
206. Exclusion Seal
207. Backup Ring

BEARINGS
302. Wear Guide
304. Thrust Washer

ACCESSORIES
400. Stop Tube
401. Counterbalance Valve
403. Motion Control Valve
420. Bushing
421 Bushing

Figure 4-20. Rotator - Exploded View



PARTS
1. Housing
2. Shaft
3. Piston Sleeve
4. End Cap

HARDWARE
103. Screw
106. Port Plug
109. Lock Pin
113. Capscrew

SEALS
200. T-Seal
202. T-Seal
204. O-ring
205. Cup Seal
206. Exclusion Seal
207. Backup Ring

BEARINGS
302. Wear Guide
304. Thrust Washer

ACCESSORIES
400. Stop Tube
401. Counterbalance Valve
403. Motion Control Valve
420.1 Bushing
420.2 Bushing
421 Bushing

Figure 4-21. Rotator - Assembly Drawing

Disassembly

⚠ CAUTION

SECURE PRODUCT TO SLOTTED TABLE OR VISE.

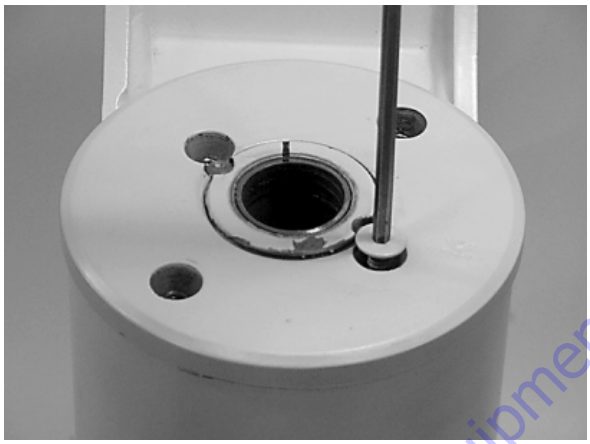
⚠ CAUTION

CONTENTS UNDER PRESSURE. WEAR APPROVED EYE PROTECTION. USE CAUTION WHEN REMOVING PORT PLUGS AND FITTINGS.

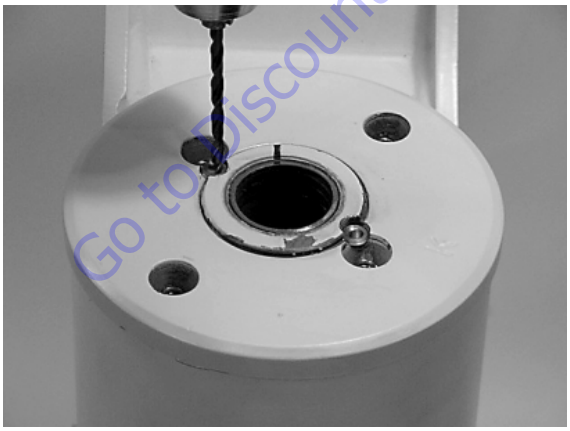
NOTICE

MAKE SURE WORK AREA IS CLEAN.

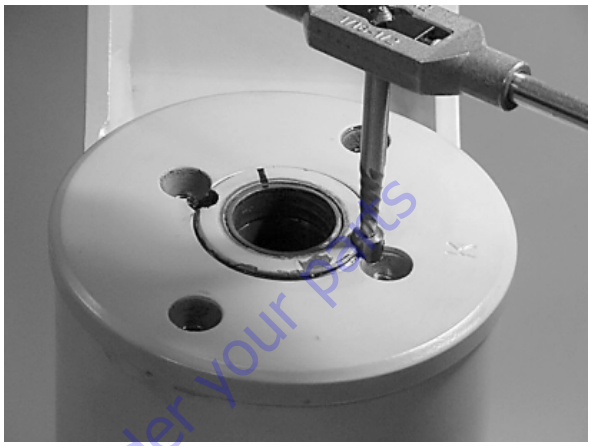
1. Remove the cap screws (113) over end cap lock pins (109).



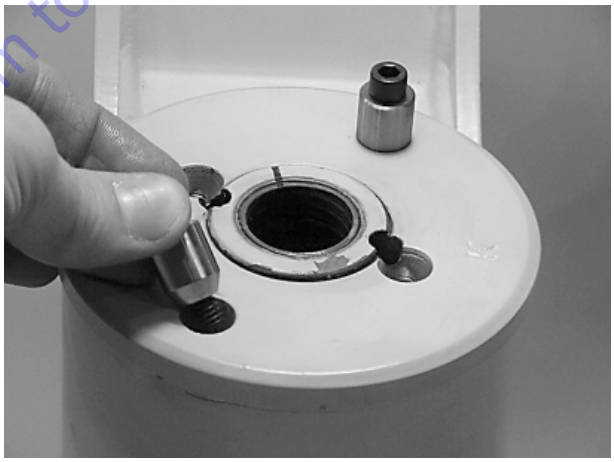
2. Using a 1/8 in. (3.18 mm) drill bit, drill a hole in the center of each lock pin to a depth of approximately 3/16 in. (4.76 mm).



3. Remove the lock pins using an "Easy Out" (a size #2 is shown). If the pin will not come out with the "Easy Out", use 5/16 in. drill bit to a depth of 1/2 in. (12.7 mm) to drill out the entire pin.



4. Install the end cap (4) removal tools provided with the Helac seal kit.

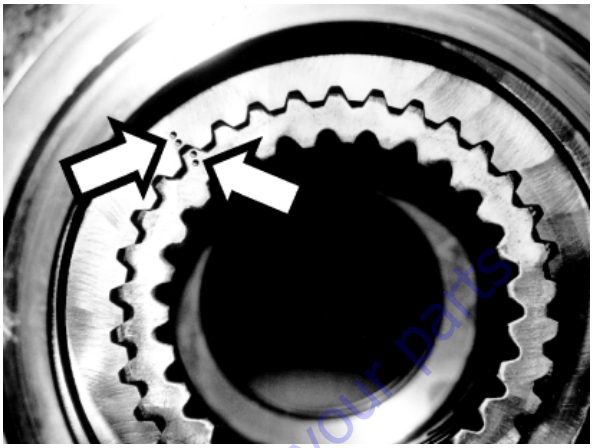


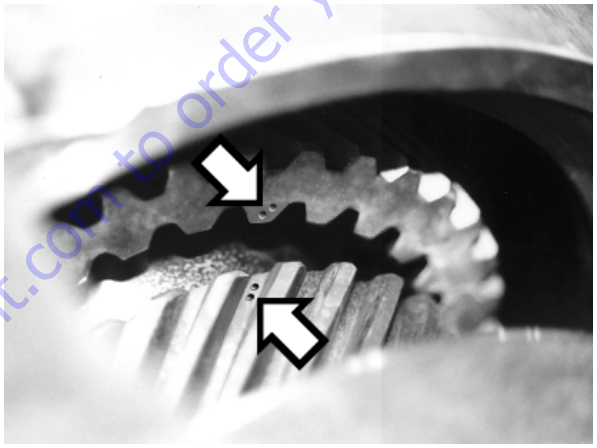
5. Using a metal bar, or similar tool, unscrew the end cap (4) by turning it counter clockwise.

6. Remove the end cap (4) and set aside for later inspection.

7. Remove the stop tube if equipped. The stop tube is an available option to limit the rotation of the actuator.

8. Every actuator has timing marks for proper engagement.



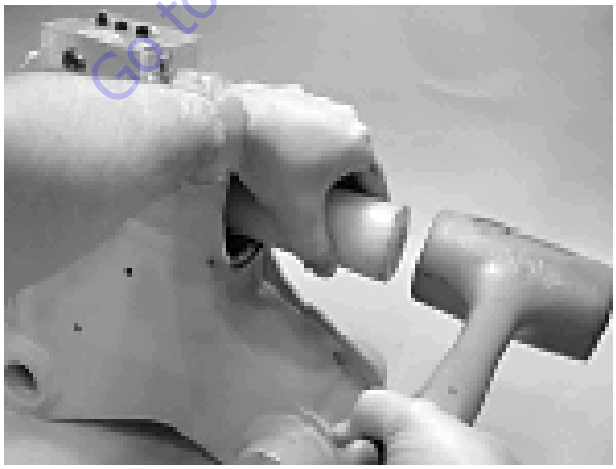


9. Prior to removing the shaft, (2), use a felt marker to clearly indicate the timing marks between shaft and piston. This will greatly simplify timing during assembly.

10. Remove the shaft (2). It may be necessary to strike the threaded end of the shaft with a rubber mallet.

11. Before removing the piston (3), mark the housing (1) ring gear in relation to the piston O.D. gear. There should now be timing marks on the housing (1) ring gear, the piston (3) and the shaft (2).

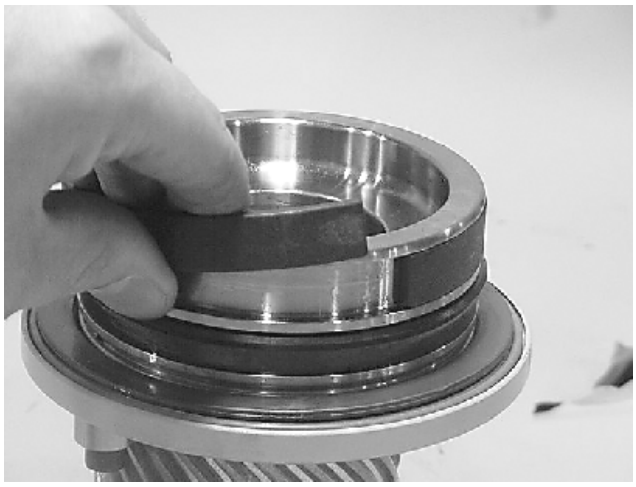
12. To remove the piston (3) use a rubber mallet and a plastic mandrel so the piston is not damaged.



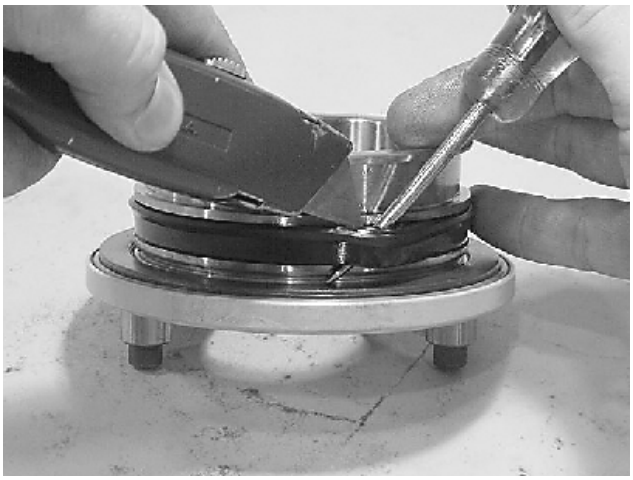
13. At the point when the piston gear teeth come out of engagement with the housing gear teeth, mark the piston and housing with a marker as shown.

14. Remove the o-ring (204) and backup ring (207) from end cap (4) and set aside for inspection.

15. Remove the wear guides (302) from the end cap (4) and shaft (2).



16. To remove the main pressure seals (205), it is easiest to cut them using a sharp razor blade being careful not to damage the seal groove.



17. Remove the thrust washers (304), from the end cap (4) and shaft (2).

18. Remove the wiper seal (304.1) from its groove in the end cap (4) and shaft (2).

19. Remove the piston O.D. seal (202) from the piston.

20. Remove the piston I.D. seal (200). You may now proceed to the inspection process.

Inspection

NOTICE

SMALL OR MINOR SURFACE SCRATCHES CAN BE CAREFULLY POLISHED.

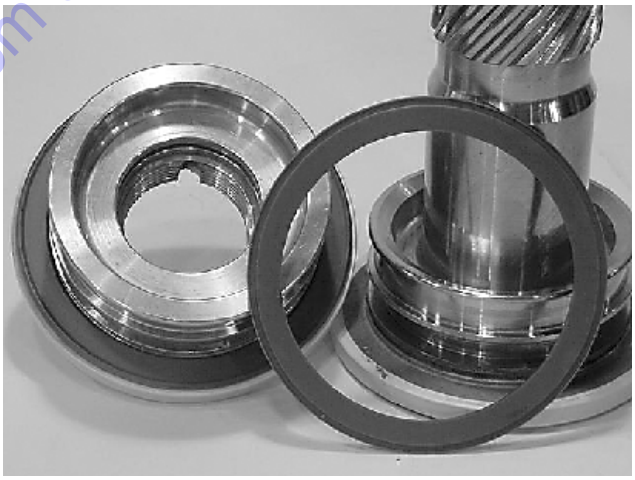
1. Clean all parts in a solvent tank and dry with compressed air prior to inspecting. Carefully inspect all critical areas for any surface finish abnormalities: Seal grooves, bearing grooves, thrust surfaces, rod surface, housing bore and gear teeth.

2. Inspect the thrust washers (304) for rough or worn edges and surfaces. Measure it's thickness to make sure it is within specifications (Not less than 0.092 in. or 2.34 mm).

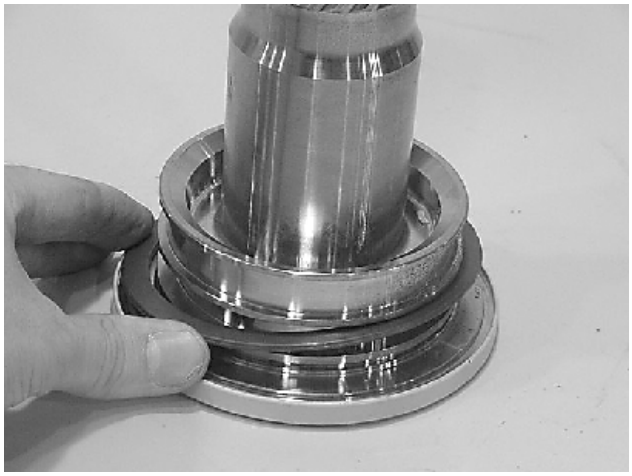
3. Inspect the wear guide condition and measure thickness (not less than 0.123 in. or 3.12 mm).

Assembly

1. Gather all the components and tools into one location prior to re-assembly. Use the cut away drawing to reference the seal orientations.

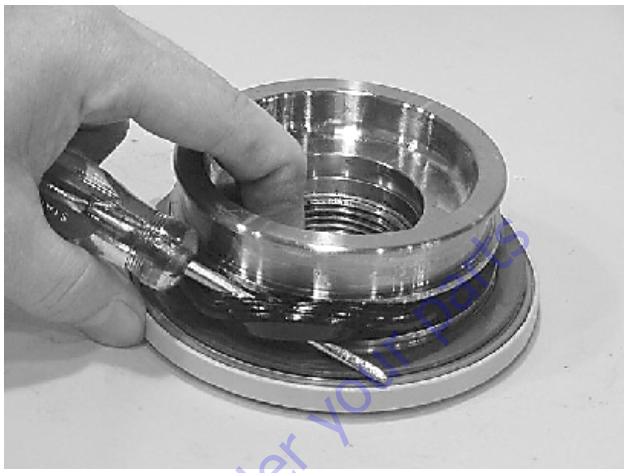


2. Install the thrust washer (304) onto shaft (2) and end cap (4).



3. Install the wiper seal (304.1/green o-ring) into the groove on the shaft (2) and end cap (4) around the outside edge of the thrust washer (304).

4. Using a seal tool install the main pressure seal (205) onto shaft (2) and end cap (4). Use the seal tool in a circular motion.



5. Install the wear guide (302) on the end cap (4) and shaft (2).

6. Install the O-ring (204) and back-up ring (207) into the inner seal groove on the end cap (4).

7. Install the inner T-seal (200) into the piston (3) using a circular motion.

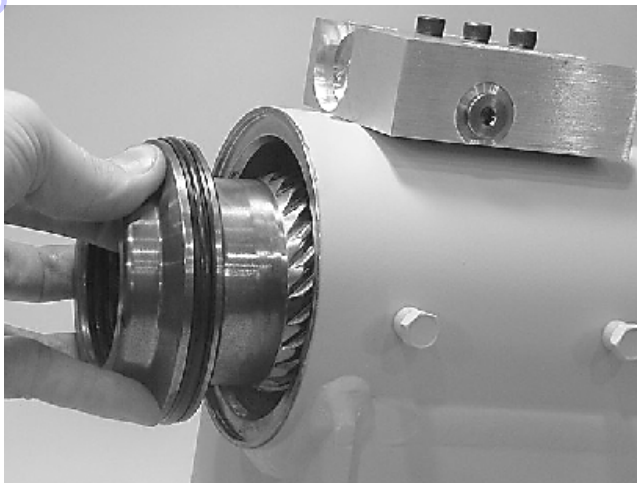
   Install the outer T-seal (202) by stretching it around the groove in a circular motion.

   Each T-seal has 2 back-up rings (see drawing for orientation).

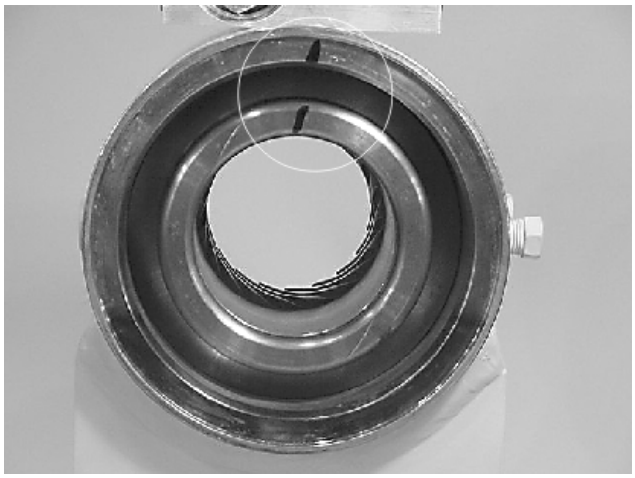
Beginning with the inner seal (200) insert one end of b/u ring in the lower groove and feed the rest in using a circular motion. Make sure the wedged ends overlap correctly.

Repeat this step for the outer seal (202).

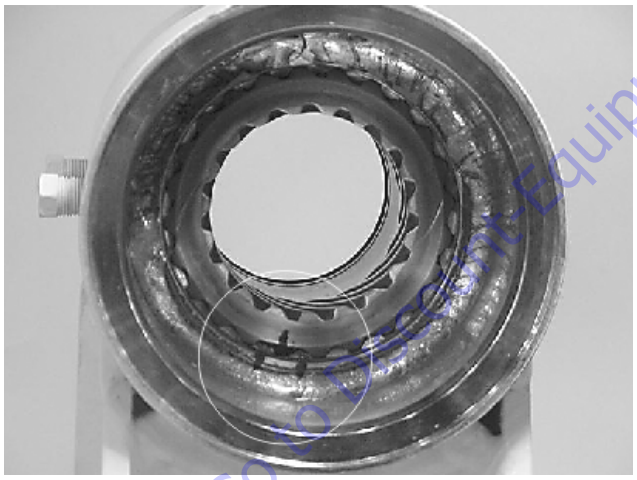
8. Insert the piston (3) into the housing (1) as shown, until the outer piston seal (202) is touching inside the housing bore.



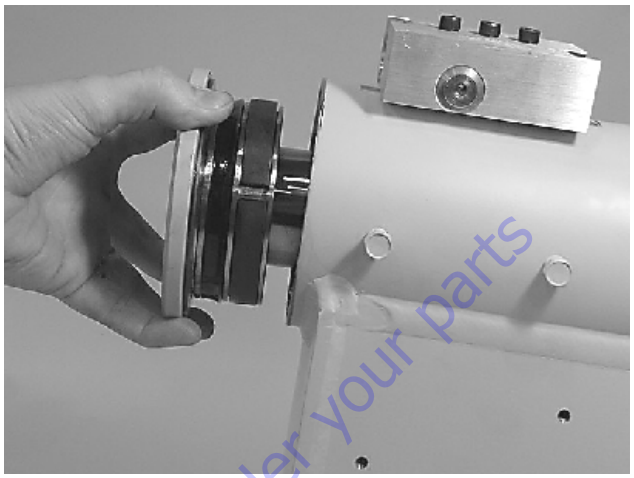
9. Looking from the angle shown, rotate the piston (3) until the marks you put on the piston and the housing (1) during disassembly line up as shown. Using a rubber mallet, tap the piston into the housing up to the point where the gear teeth meet.



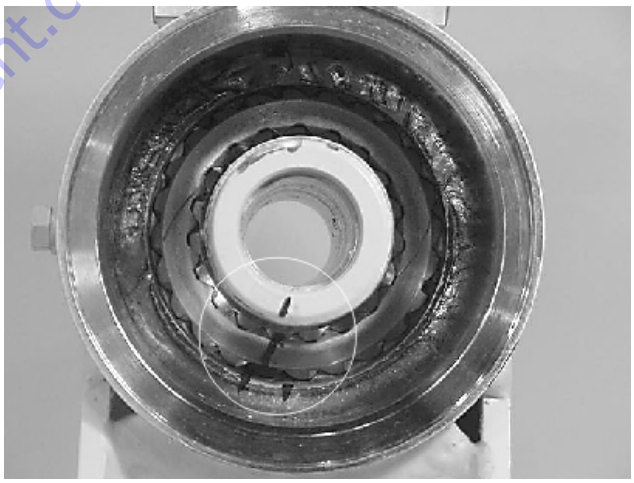
10. Looking from the opposite end of the housing (1) you can see if your timing marks are lining up. When they do, tap the piston (3) in until the gear teeth mesh together. Tap the piston into the housing the rest of the way until it bottoms out.



11. Install the shaft (2) into the piston (3). Be careful not to damage the seals. Do not engage the piston gear teeth yet.



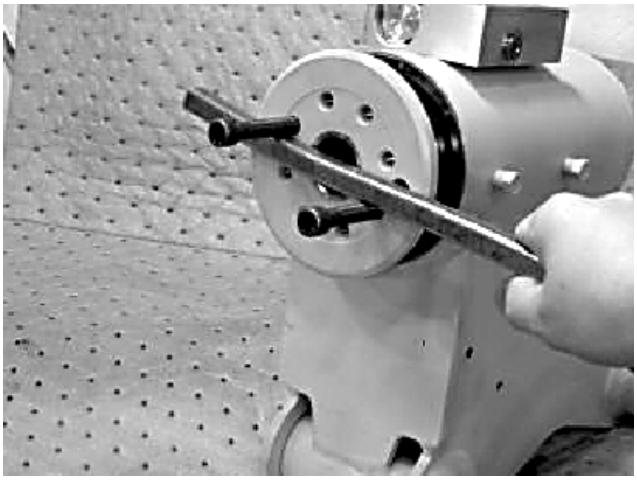
12. Looking from the view shown, use the existing timing marks to line up the gear teeth on the shaft (2) with the gear teeth on the inside of the piston (3). Now tap the flange end of the shaft with a rubber mallet until the gear teeth engage.



13. Install 2 bolts in the threaded holes in the flange. Using a bar, rotate the shaft in a clockwise direction until the wear guides are seated inside the housing bore.

NOTICE

AS THE SHAFT IS ROTATED, BE CAREFUL NOT TO DISENGAGE THE PISTON AND HOUSE GEARING.

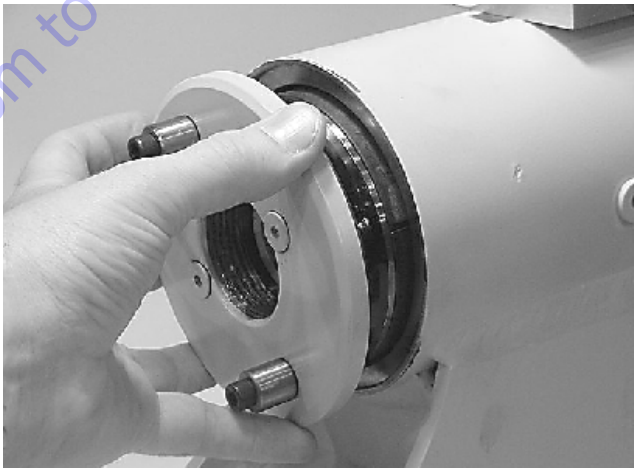


14. Install the stop tube onto the shaft end, if equipped. Stop tube is an available option to limit the rotation of an actuator.

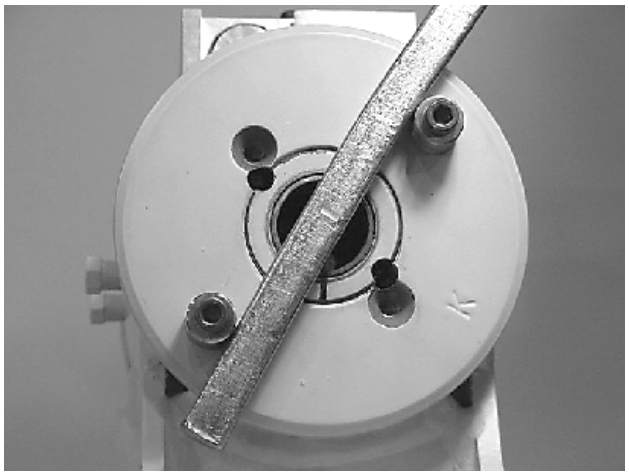
15. Coat the threads on the end of the shaft with anti-seize grease to prevent galling.

16. Install the 0-ring (204) and back-up ring (207) into the inner seal groove on the end cap (4).

17. Thread the end cap (4) onto the shaft (2) end. Make sure the wear guide remains in place on the end cap as it is threaded into the housing (1).

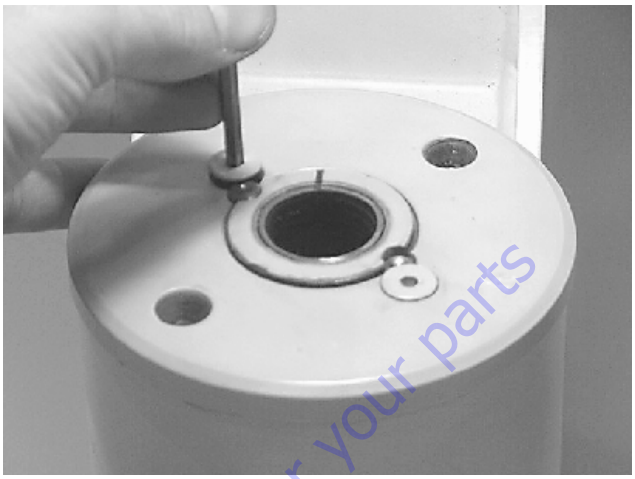


18. Tighten the end cap (4). In most cases the original holes for the lock pins will line up.



19. Place the lock pins (109) provided in the Helac seal kit in the holes with the dimple side up. Then, using a punch, tap the lock pins to the bottom of the hole.

20. Insert the set screws (113) over the lock pins. Tighten them to 25 in. lbs. (2.825 Nm).



Installing Counterbalance Valve

Refer to Figure 4-22., Rotator Counterbalance Valve.

1. Make sure the surface of the actuator is clean, free of any contamination and foreign debris including old JLG Threadlocker P/N 0100011.
2. Make sure the new valve has the o-rings in the counter-bores of the valve to seal it to the actuator housing.
3. The bolts that come with the valve are grade 8 bolts. New bolts should be installed with a new valve. JLG Threadlocker P/N 0100011 should be applied to the shank of the three bolts at the time of installation.
4. Torque the 1/4 in. bolts 110 to 120 in. lbs. (12.4 to 13.5 Nm). Do not torque over 125 in. lbs. (14.1 Nm). Torque the 5/16 in. bolts 140 in. lbs. (15.8 Nm). Do not torque over 145 in. lbs. (16.3 Nm).
5. Make sure the valve is seated against the housing valve flat. If it is raised up on any side or corner, remove the valve to determine what the obstruction is. If possible, test this using a hydraulic hand pump or electric test.

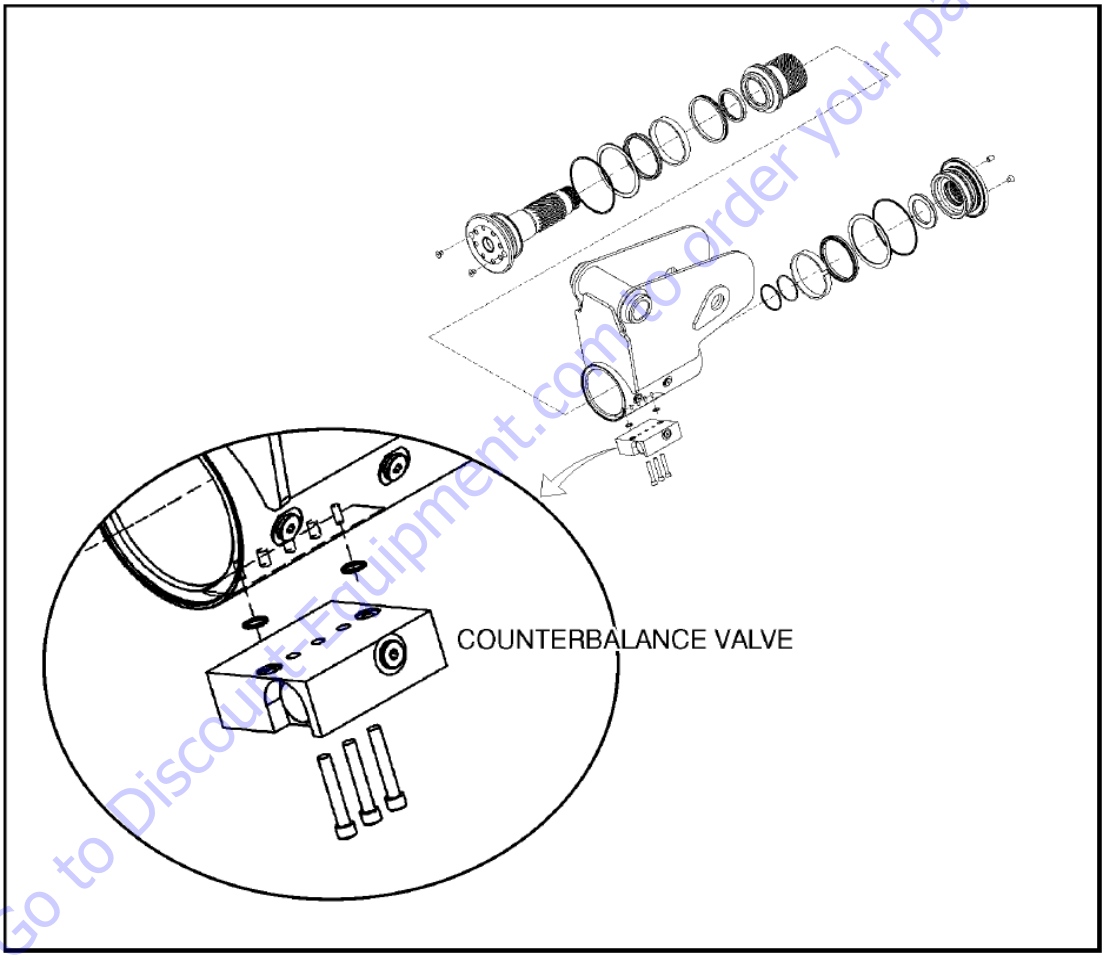


Figure 4-22. Rotator Counterbalance Valve

Greasing Thrust Washers

1. After the actuator is assembled but before it is put into service, the thrust washer area must be packed with Lithium grease.

2. There are two grease ports located on both the shaft flange and the end cap. They are plugged with cap screws (113) or set screws. Remove the grease port screws from the shaft flange and end cap. (See exploded view)

NOTICE

IF A HYDRAULIC TEST BENCH IS NOT AVAILABLE, THE ACTUATOR CAN BE ROTATED BY HAND, OPEN THE PRESSURE PORTS AND USE A PRY BAR WITH CAP SCREWS INSERTED INTO THE SHAFT FLANGE TO TURN THE SHAFT IN THE DESIRED DIRECTION.

3. Insert the tip of a grease gun into one port and apply grease to the shaft flange. Continue applying until grease flows from the opposite port. Cycle the actuator five times and apply grease again. Repeat this process on the end cap. Insert the cap screws into the grease ports and tighten to 25 in. lbs. (2.8 Nm).

Testing the Actuator

If the equipment is available, the actuator should be tested on a hydraulic test bench. The breakaway pressure — the pressure at which the shaft begins to rotate — should be approximately 400 psi (28 bar). Cycle the actuator at least 25 times at 3000 psi (210 bar) pressure. After the 25 rotations, increase the pressure to 4500 psi (315 bar) to check for leaks and cracks. Perform the test again at the end of the rotation in the opposite direction.

TESTING THE ACTUATOR FOR INTERNAL LEAKAGE

If the actuator is equipped with a counterbalance valve, plug the valve ports. Connect the hydraulic lines to the housing ports. Bleed all air from the actuator (see Installation and Bleeding) Rotate the shaft to the end of rotation at 3000 psi (210 bar) and maintain pressure. Remove the hydraulic line from the non-pressurized side.

Continuous oil flow from the open housing port indicates internal leakage across the piston. Replace the line and rotate the shaft to the end of rotation in the opposite direction. Repeat the test procedure outlined above for the other port. If there is an internal leak, disassemble, inspect and repair.

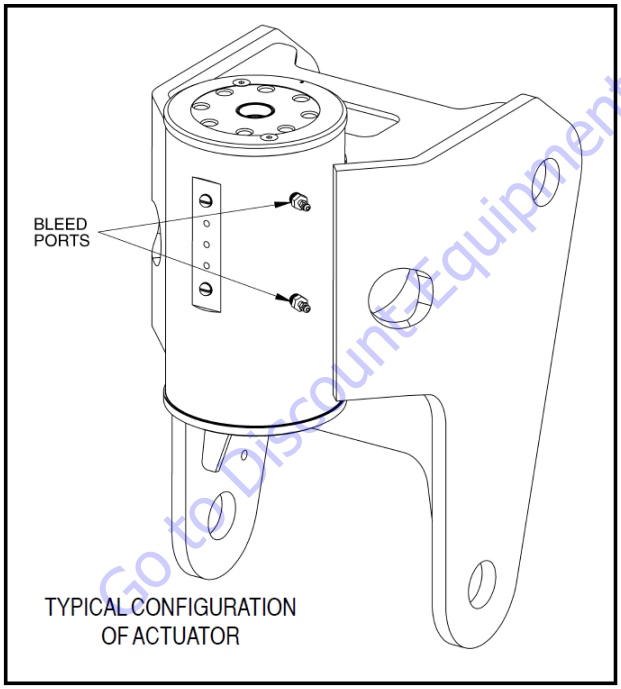
Installation and Bleeding

After installation of the actuator on the equipment, it is important that all safety devices such as tie rods or safety cables are properly reattached.

To purge air from the hydraulic lines, connect them together to create a closed loop and pump hydraulic fluid through them. Review the hydraulic schematic to determine which hydraulic lines to connect. The linear feet and inside diameter of the hydraulic supply lines together with pump capacity will determine the amount of pumping time required to fully purge the hydraulic system.

Bleeding may be necessary if excessive backlash is exhibited after the actuator is connected to the hydraulic system. The following steps are recommended when a minimum of two gallons (8 liters) is purged.

1. Connect a 3/16 in. inside diameter x 5/16 in. outside diameter x 5 foot clear, vinyl drain tube to each of the two bleed nipples. Secure them with hose clamps. Place the vinyl tubes in a clean 5-gallon container to collect the purged oil. The oil can be returned to the reservoir after this procedure is completed.



TYPICAL CONFIGURATION
OF ACTUATOR

2. With an operator in the platform, open both bleed nipples 1/4 turn. Hydraulically rotate the platform to the end of rotation (either clockwise or counterclockwise), and maintain hydraulic pressure. Oil with small air bubbles will be seen flowing through the tubes. Allow a 1/2 gallon of fluid to be purged from the actuator.
3. Keep the fittings open and rotate the platform in the opposite direction to the end position. Maintain hydraulic pressure until an additional 1/4 gallon of fluid is pumped into the container.
4. Repeat steps 2 & 3. After the last 1/2 gallon is purged, close both bleed nipples before rotating away from the end position.

4.17 FOOT SWITCH ADJUSTMENT

Adjust so that functions will operate when pedal is at center of travel. If switch operates within last 1/4 in. (6.35 mm) of travel, top or bottom, it should be adjusted.

Troubleshooting

Table 4-1. Troubleshooting

Problem	Cause	Solution
1. Shaft rotates slowly or not at all	a. Insufficient torque output	a. Verify correct operating pressure. Do not exceed OEM's pressure specifications. Load may be above maximum capacity of the actuator.
	b. Low rate of fluid flow	b. Inspect ports for obstructions and hydraulic lines for restrictions and leaks.
	c. Control or counterbalance valve has internal leak	c. Disconnect hydraulic lines and bypass valve. Leave valve ports open and operate the actuator through housing ports (do not exceed OEM's operating pressure). The valve must be replaced if a steady flow of fluid is seen coming from the valve ports.
	d. Piston and/or shaft seal leak	d. Remove the plug and the housing's valve ports. Operate the actuator through the housing ports. Conduct the internal leakage test.
	e. Corrosion build-up on the thrust surfaces	e. Re-build the actuator. Remove all rust then polish. Replacement parts may be needed.
	f. Swollen seals and composite bearings caused by incompatible hydraulic fluid	f. Re-build the actuator. Use fluid that is compatible with seals and bearings.
2. Operation is erratic or not responsive	a. Air in actuator	a. Purge air from actuator. See bleeding procedures.
3. Shaft will not fully rotate	a. Twisted or chipped gear teeth	a. Check for gear binding. Actuator may not be able to be re-built and may need to be replaced. Damage could be a result of overload or shock.
	b. Port fittings are obstructing the piston	b. Check thread length of port fittings. Fittings should during stroke not reach inside the housing bore.
4. Selected position cannot be maintained	a. Control or counterbalance valve has internal leak	a. Disconnect hydraulic lines and bypass valve. Leave valve ports open and operate the actuator through housing ports (do not exceed OEM's operating pressure). The valve must be replaced if a steady flow of fluid is seen coming from the valve ports.
	b. Piston and/or shaft seal leak	b. Remove the plug and the housing's valve ports. Operate the actuator through the housing ports. Conduct the internal leakage test.
	c. Air in actuator	c. Purge air from actuator. See bleeding procedures.

4.18 BOLT-ON EXTERNAL FALL ARREST SYSTEM

The Bolt-On External Fall Arrest system is designed to provide a lanyard attach point while allowing the operator to access areas outside the platform. Exit/Enter the platform through the gate area only. The system is designed for use by one person.

The Operator must use fall protection at all times. A full body harness with lanyard not to exceed 6 ft. (1.8 m) in length, that limits the maximum arrest force to 900 lbs. (408 kg) for the transfastener type and 1350 lbs. (612 kg) for the shuttle type Bolt-On External Fall Arrest system.

The Bolt-On External Fall Arrest System capacity is 310 lb (140 kg) / one (1) person maximum.

Do not move the platform during use of the Bolt-On External Fall Arrest system.

⚠ WARNING

DO NOT OPERATE ANY MACHINE FUNCTIONS WHILE OUTSIDE OF THE PLATFORM. BE CAREFUL WHEN ENTERING/EXITING THE PLATFORM AT ELEVATION.

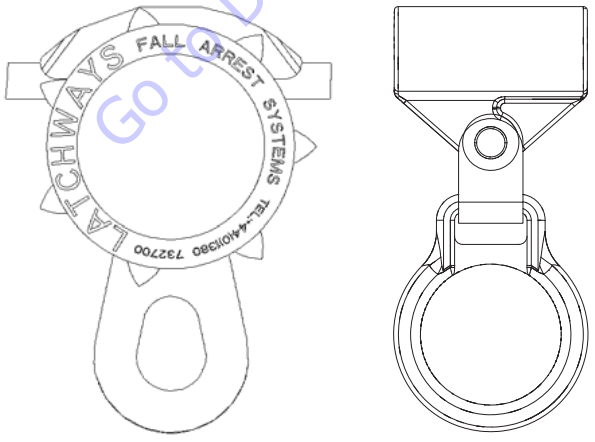
NOTICE

IF THE BOLT-ON EXTERNAL FALL ARREST SYSTEM IS USED TO ARREST A FALL OR IS OTHERWISE DAMAGED, THE ENTIRE SYSTEM MUST BE REPLACED AND PLATFORM FULLY INSPECTED BEFORE RETURNING TO SERVICE.

Bolt-On External Fall Arrest System Types

NOTE: *There are two types of Bolt-On External Fall Arrest Systems - Transfastener Type and Shuttle Type. Both operate identically with minor component differences.*

Refer to the figure below and Figure 4-27., Bolt-On External Fall Arrest System Components - Transfastener Type and Figure 4-28., Bolt-On External Fall Arrest System Components - Shuttle Type.



Transfastener Type Shuttle Type

Figure 4-23. Bolt-On External Fall Arrest System Types

Inspection Before Use

The Bolt-On External Fall Arrest system must be inspected before each use of the aerial work platform. Replace components if there are any signs of wear or damage.

Before each use, perform a visual inspection of the following components:

- Cable: Inspect cable for proper tension, broken strands, or any signs of corrosion.
- Fittings & Brackets: Ensure all fittings are tight and there are no signs of fractures. Inspect brackets for any damage.
- Transfastener or Shuttle: Inspect for signs of damage. Ensure transfastener or shuttle is free and slides properly through all intermediate supports.
- Attaching Hardware: Inspect all attaching hardware to ensure there are no missing components and hardware is properly tightened. Transfastener type only - Ensure star wheels rotate freely.

Inspecting Line Tenser

Cable tension is adjusted using the Line Tenser. The Line Tenser is the disc at the end of the cable (shown below). When proper tension is achieved, the disc will spin by hand. When less than proper tension is present the disc will not turn by hand. The cable will stretch normally over time. To tension the cable, rotate the turnbuckle until proper tension is achieved.

NOTE: *Rotate open or closed body turnbuckles using an appropriately sized Phillips screwdriver or rod as a lever.*

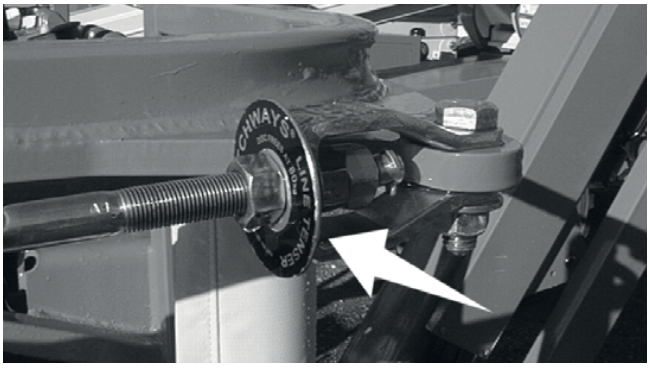


Figure 4-24. Line Tenser - Transfastener Type

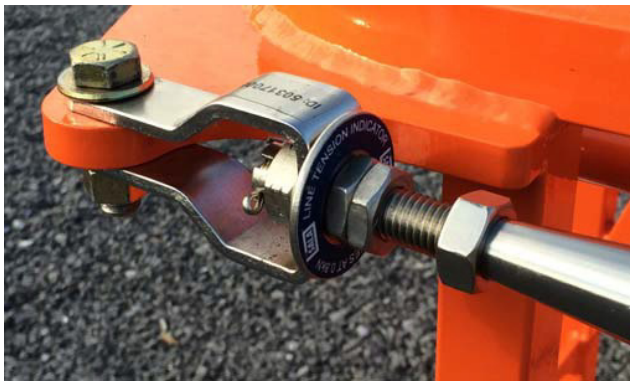


Figure 4-25. Line Tenser - Shuttle Type

Inspecting Slip Indicator

The slip indicator is the short tube crimped beside the end connection of the cable.

NOTICE

IF THE CABLE SLIPS FROM THE END CONNECTION A GAP WILL BE PRESENT BETWEEN THE SLIP INDICATOR AND THE END CONNECTION. NO GAP IS ACCEPTABLE. A CABLE THAT IS SLIPPED SHOULD BE TAKEN OUT OF SERVICE AND THE SYSTEM REPLACED.

Shown below is the slip indicator as it should appear.

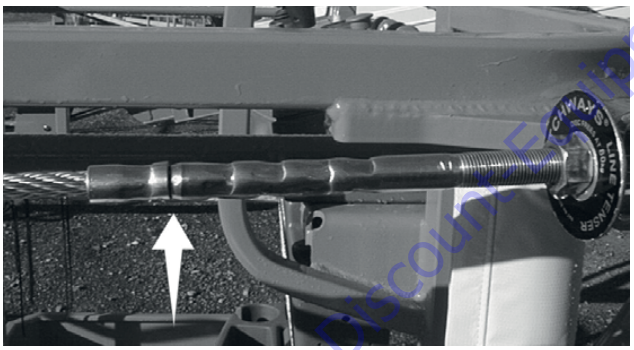
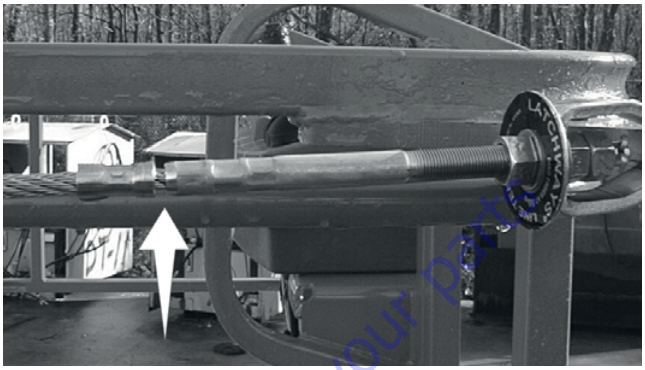


Figure 4-26. Slip Indicator - System OK

Shown below is the slip indicator with a gap, signifying that the Bolt-On External Fall Arrest system should be replaced immediately.



Annual Inspection and Certification

NOTICE

THE BOLT-ON EXTERNAL FALL ARREST SYSTEM REQUIRES AN ANNUAL INSPECTION AND CERTIFICATION. THE ANNUAL INSPECTION AND CERTIFICATION MUST BE PERFORMED BY A COMPETENT PERSON.

If inspection services are required, contact:

Flexible Lifeline Systems
14325 West Hardy Rd.
Houston, TX 77060
Phone: 281-448-8821

Installation

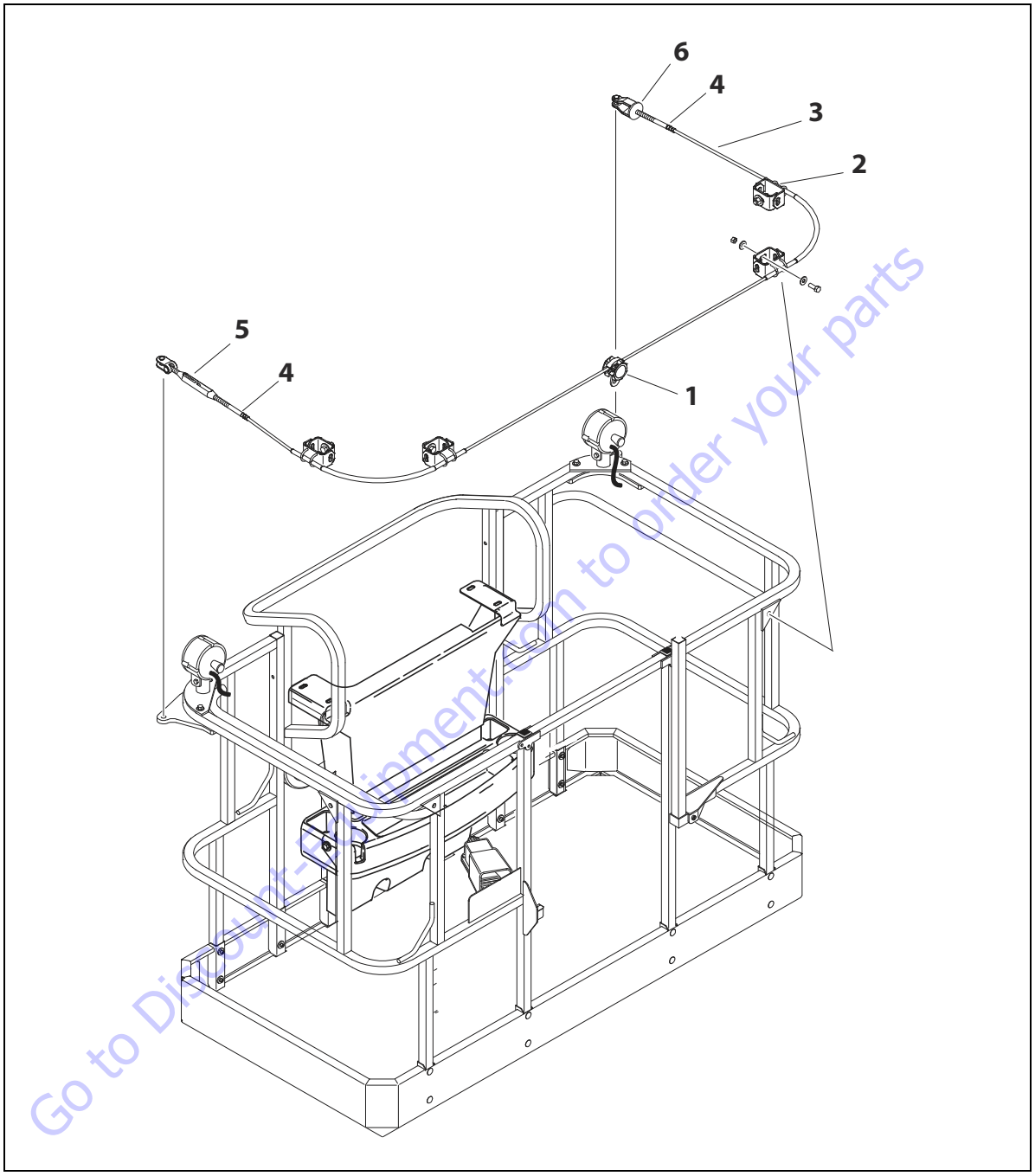
Installation requires bolting the ends of the cable to the platform with the supplied drilled bolt, castle nut, and split pin. The drilled bolts only need to be tightened enough to fully engage all of the threads of the castle nut and then further just enough to install the split pin.

Intermediate supports are bolted to the platform using 1/2"- 13NC Grade 8 bolts, flat washers, and locknuts.

- Intermediate supports used with the transfastener type system are adjusted to an angle slightly below horizontal to improve movement of the transfastener.
- Intermediate supports used with the shuttle type system are not adjustable.

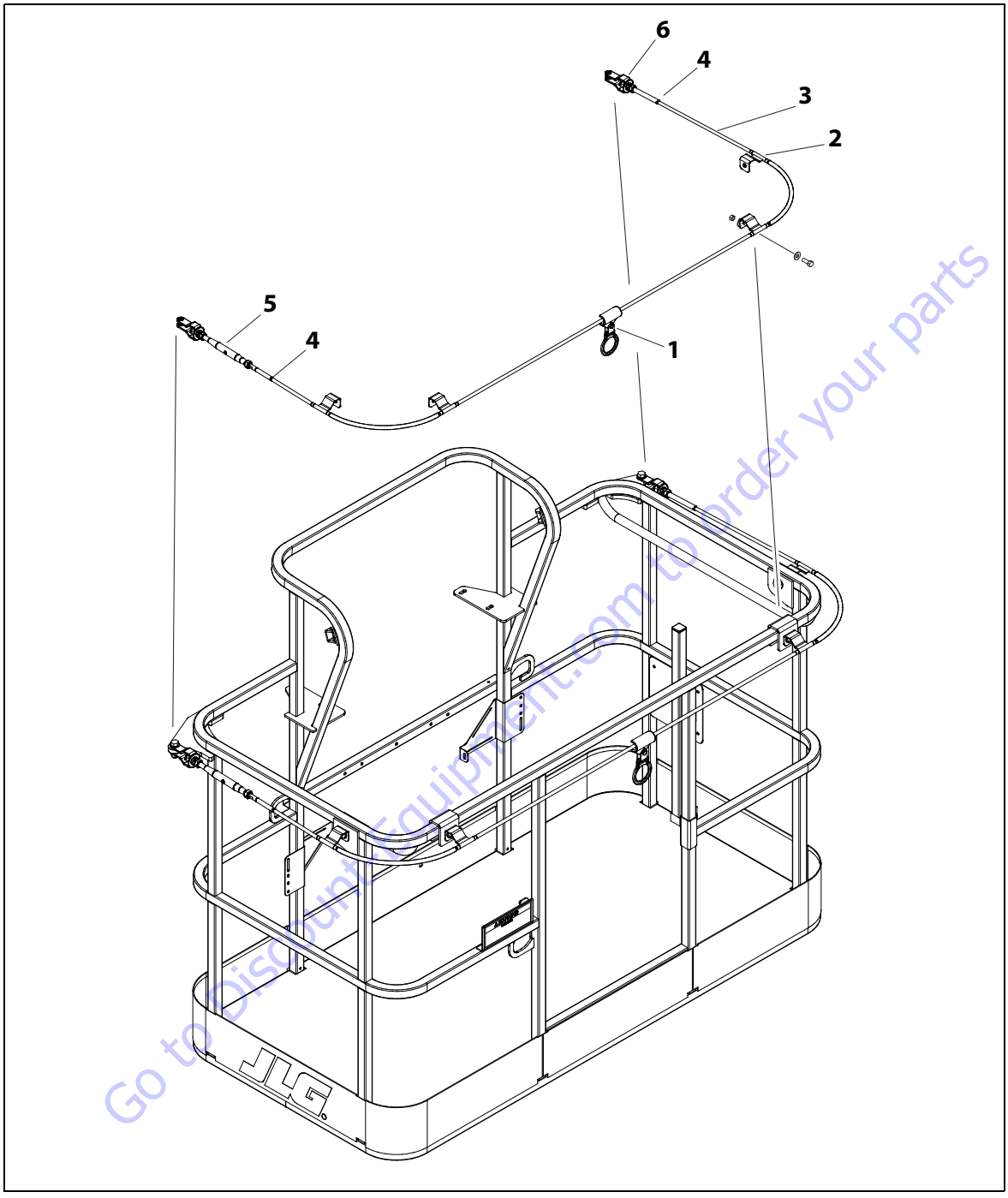
Ensure all bolts and locknuts are tightened properly. Tension the cable with the turnbuckle until the line tenser spins. Tighten jam nuts against the turnbuckle to hold it in place.

NOTE: *Rotate open or closed body turnbuckles using an appropriately sized Phillips screwdriver or rod as a lever.*



1. Transfastener
2. Bracket
3. Cable
4. Swage/Slip Indicator
5. Turnbuckle
6. Line Tenser

Figure 4-27. Bolt-On External Fall Arrest System Components - Transfastener



1. Shuttle
2. Bracket
3. Cable
4. Swage/Slip Indicator
5. Turnbuckle
6. Line Tenser

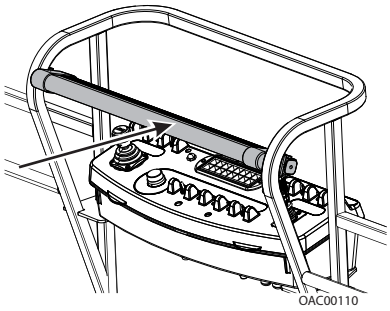
Figure 4-28. Bolt-On External Fall Arrest System Components - Shuttle Type

4.19 SKYGUARD

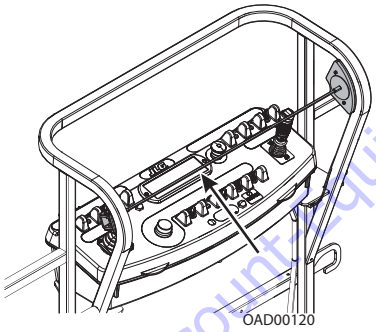
Operation

SkyGuard provides enhanced control panel protection. When the SkyGuard sensor is activated, functions in use at the time of actuation will reverse or cutout. The SkyGuard Function Table provides more details on these functions.

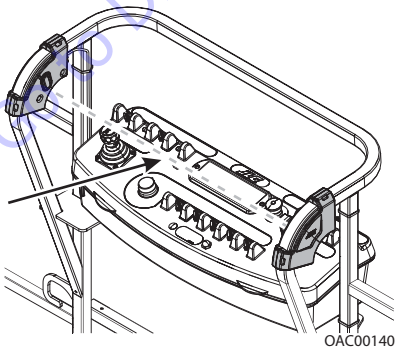
Consult the following illustrations to determine which type of SkyGuard the machine is equipped with. Regardless of the type, SkyGuard function according to the SkyGuard Function Table does not change.



SkyGuard



SkyGuard SkyLine™



SkyGuard SkyEye™

⚠ WARNING

THE MACHINE OPERATOR IS REQUIRED TO PERFORM A DAILY FUNCTION TEST TO ENSURE PROPER OPERATION OF THE SKYGUARD SYSTEM.

Function Test

SKYGUARD ONLY

Perform this function test if **SkyGuard only** is selected in machine setup (refer to Table 6-2).

From the Platform Control Console in an area free from obstructions:

1. Operate the telescope out function, then activate SkyGuard sensor.
2. Once sensor has been activated, ensure telescope out function stops then telescope in function operates for a short duration. Additionally, verify Soft Touch/SkyGuard indicator light flashes and horn sounds. If machine is equipped with SkyGuard beacon, ensure it flashes when sensor activates.
3. With SkyGuard sensor still engaged, press and hold yellow Soft Touch/SkyGuard override button. Operate a function to verify operation can be resumed.
4. Disengage SkyGuard sensor, release controls, and recycle footswitch. Ensure normal operation available.

In Ground Mode:

1. Operation is allowed regardless of SkyGuard activation.

BOTH SKYGUARD AND SOFT TOUCH

*Perform this procedure if **both SkyGuard and Soft Touch** are selected in machine setup* (refer to Table 6-2).

From the Platform Control Console in an area free from obstructions:

1. Operate the telescope out function, then activate SkyGuard sensor.
2. Once sensor has been activated, ensure telescope out function stops. Additionally, verify Soft Touch/SkyGuard indicator light flashes and horn sounds. If machine is equipped with SkyGuard beacon, ensure it flashes when sensor activates.
3. With SkyGuard sensor still engaged, press and hold yellow Soft Touch/SkyGuard override button. Operate a function to verify operation can be resumed.
4. Disengage SkyGuard sensor, release controls, and recycle footswitch. Ensure sure normal operation is available.

In Ground Mode:

1. Operation is allowed regardless of SkyGuard activation.