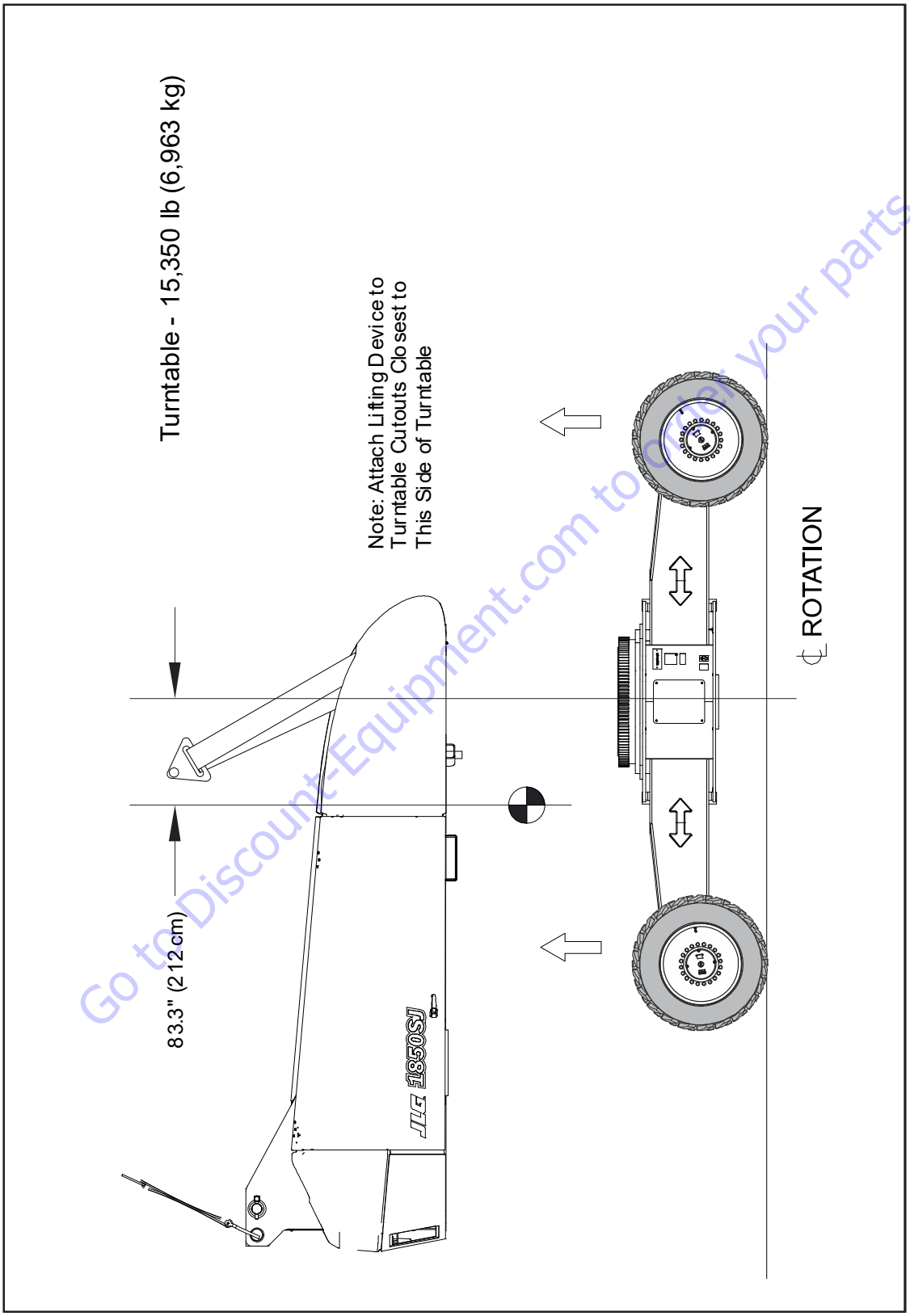
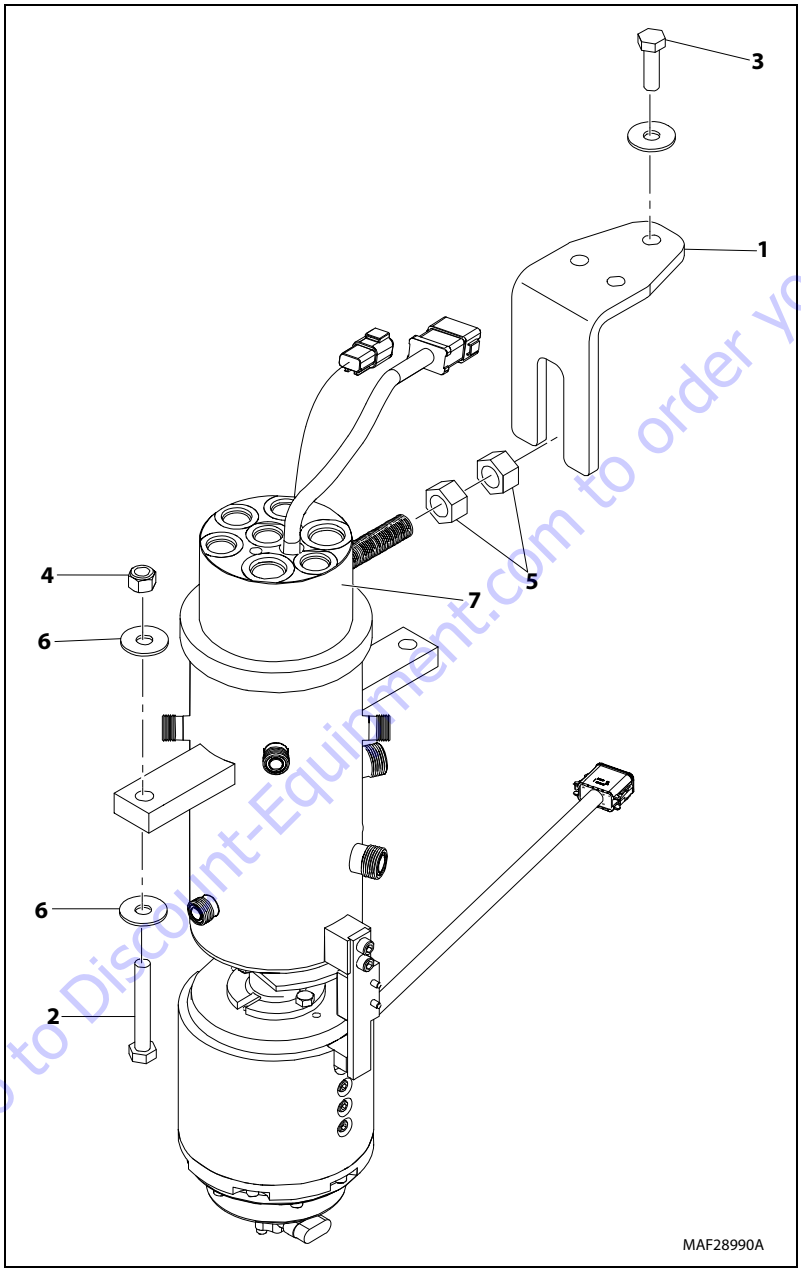


Figure 3-26. Swing Bearing Removal - Sheet 4 of 4

3.22 ROTARY COUPLING

Assembly/Disassembly

For detail assembly/disassembly instructions and seal replacement of rotary coupling, contact JLG dealer.



1. Bracket
2. Capscrew
3. Capscrew
4. Lock Nut
5. Nut
6. Washer
7. Oil Coupling

Figure 3-27. Rotary Coupling Installation

3.23 SWING CONTROL SYSTEM

The swing control system uses the turntable swing angle sensor in addition to the DOS proximity switch to prevent turntable swing while the axles are retracted. Swing will be allowed to +/- 35 degrees (before the DOS proximity switch trips) to facilitate positioning the turntable for transport of the machine. Attempts to swing past this position will be disallowed by the control system and the operator will be prompted via the LCD display to swing in the opposite direction to return the boom behind the rear wheels. Once the axles are extended the boom has 360 degree continuous turntable swing. If the turntable is swung past +/- 35° when the boom is lowered into the transport position, the operator will have to swing the turntable back within the rear wheels before attempting to retract the axles. The DOS will work as described below when the axles are extended.

3.24 CHASSIS TILT INDICATOR SYSTEM

The Chassis Tilt Indicator System measures the turntable angle with respect to level ground. The tilt sensor (mounted to a bracket on the side of the turntable near the boom pivot pin) has three settings; 3.0° side tilt, 5.0 degree omni directional tilt, and an 8.0° omni directional tilt.

The 5.0° omni directional angle setting is used for the purpose of warning the operator by means of the chassis tilt light in the platform display panel. Additionally when used in conjunction with the Beyond Transport - Drive Speed Cutback System, the tilt sensor will cause an alarm to sound and drive functions will be disabled.

The 3.0° side tilt setting is used in conjunction with the main boom length and when exceeded, imposes the same functionality as the 5.0° omni directional setting plus prevents boom telescope out. The side tilt setting is ignored when the main boom length is less than 1477.7 inches in the 500 lb mode or 1442.8 inches in the 1000 lb mode.

The 8.0° angle is used exclusively for the purpose of automatically shifting the drive motors to the maximum displacement position (slow speed).

The control system responds to indicated angle readings 0.3° smaller than the required angles to account for calibration and sensor variation.

3.25 AUXILIARY POWER SYSTEM

The auxiliary power system is intended as a secondary means of moving the boom in the event of primary power loss. This system uses an electric motor/pump unit powered by two12V batteries capable of operating all functions except drive, controlled arc, controlled boom angle, and envelope tracking.

During main lift up or down functions, no other functions are permitted and during main lift up functions, automatic platform leveling is not active but jib leveling is active. To reduce the demand on the battery and therefore extend the run time of the system, the auxiliary power functionality differs from the primary power functionality. The auxiliary power main lift down function supplies pilot pressure to the main lift cylinder. This allows gravity to lower the boom. The system redirects discharge oil from the main lift cylinder to retract the main telescope cylinder. At high main boom angles the envelope may be encroached during lift down requiring the operator to use main telescope in.

When the main boom is retracted to the transport length, the main telescope in valve is dropped out and lift down is operated alone allowing the platform to reach the ground. This not only greatly reduces the power required for these functions but also lowers the boom within the envelope regardless of starting position. Jib lift down function may then be operated allowing the platform to reach ground level. Envelope control and moment control remain active during the auxiliary power function.

3.26 WATER IN FUEL SENSING SYSTEM (OPTIONAL)

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

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

- The engine will shut down automatically.
- The JLG Control System will set DTC 4375 - Water in Fuel
- An alarm will sound from the active control station (ground or platform)
- If in platform mode, the Low Fuel Indicator will flash

Engine Restart will be permitted after the machine senses the Water in Fuel condition, but will only run for 2 minutes and the engine will shut down again. This restart process will continue until the Water in Fuel condition is corrected.

3.27 DEUTZ TURBOCHARGER OPERATION

Good engine operating procedures are essential to prolong turbocharger life.

Particular attention to oil system and air system will eliminate the two main causes of turbocharger failure. To prevent this Operators/Owners must ensure that:-

1. Air and oil filters are checked regularly to the manufacturer's specifications.
2. Engine maintenance intervals are adhered to.
3. Engine and equipment are operated in such a way that is not harmful to the life of the turbocharger.

Operating Practices

Operators and owners can get maximum service life from their turbochargers if a few good practices are followed:

START UP

When starting the engine use minimum throttle and run in idle mode for approximately one minute. Full working oil pressure builds up within seconds but it is useful to allow the turbocharger moving parts to warm up under good lubricating conditions. Revving the engine within the first few seconds of start up causes the turbocharger to rotate at high speeds with marginal lubrication which can lead to early failure of the turbocharger.

AFTER SERVICING

After servicing the engine or turbocharger, ensure the turbocharger is pre-lubed by adding clean engine oil into the turbocharger oil inlet until full. After pre-lubing, crank the engine without firing (engine/fuel pump stop out) to allow oil to circulate through the full system under pressure. On starting the engine, run at idle for a few minutes to ensure the oil and bearing systems are operating satisfactorily.

LOW AIR TEMPERATURES & INACTIVE OPERATION

If the engine has been inactive for some time or the air temperature is very low, crank the engine first and then run at idle. This allows the oil to circulate throughout the full system before high loads and speeds are applied to engine and turbocharger.

SHUT DOWN

Before shutting the engine down, let the turbocharger cool down. When an engine runs at maximum power/high torque, the turbocharger is operating at very high temperatures and speeds. Hot shut down can cause reduced service life which is avoidable by a minute or two of idling. Most mobile equipment applications include an adequate cooling period during parking or mooring procedures.

Allow the engine to idle for 1-5 minutes to allow the high temperatures and speed to reduce and thus prolong the life of the turbocharger.

ENGINE IDLE

Avoid running the engine for long periods in idle mode (greater than 20-30 minutes). Under idling conditions low pressures are generated in the turbocharger which can cause oil mist to leak past seals into the two end housings. Although no real harm is done to the turbocharger, as load is applied temperatures increase and the oil will start to burn off and cause blue smoke emission problems.

In the picture above you can see discoloration on the shaft caused only by heat. If the engine is allowed to Idle for a period of time, lube oil will continue to flow cooling the turbine shaft.

You can also see spots on the turbo where grooves have been “worn” in to the turbine shaft at the point where the radial bearing sits. Dirty oil/contaminates in the oil can become trapped in between the radial bearing and the surface of the shaft becoming abrasive and ultimately grinding away the material.

3.28 DIESEL EXHAUST FLUID (DEF) TANK

Refer to Figure 3-28. and Figure 3-29.

Diesel exhaust fluid (DEF) is a urea solution consisting of 32.5% urea and 67.5% deionized water. DEF is used in selective catalytic reduction (SCR) to lower nitrogen oxide (NOx) concentration in exhaust emissions.

DEF is temperature sensitive in storage. If stored between 75°F (24°C) and 12°F (-10°C), it can be stored for 2 years. In the machine's DEF tank, the storage life is 4 months. After 4 months, the DEF must be drained from the tank, properly disposed of, and the tank cleaned and flushed. If the machine has been idle in an extreme cold environment (-40° to 32°F [-40° to 0°C]), the interval is reduced to 2 months.

NOTE: *DEF freezes at 12°F (-11°C).*

Cleaning and Flushing the Tank

If contaminated fluid or foreign material is found in the tank, the tank must be cleaned. Use the following procedure for cleaning.

1. Remove the DEF tank drain plug, and drain any fluid into a suitable container. Dispose of fluid properly.
2. Clean the header with a mixture of warm water and a light petroleum based soap.
3. Clean DEF tank with a high pressure washer, or flush tank with hot water for five minutes and drain water.
4. If DEF fluid lines are contaminated, tag and remove the lines from the DEF pump module and flush with a mixture of warm water and a light petroleum based soap.
5. Refill DEF tank with water until it overflows. Completely flush tank with water.
6. Empty DEF tank, and dispose of contaminated water properly.
7. Rinse the tank and all soap residue with deionized or distilled water and allow to air dry.

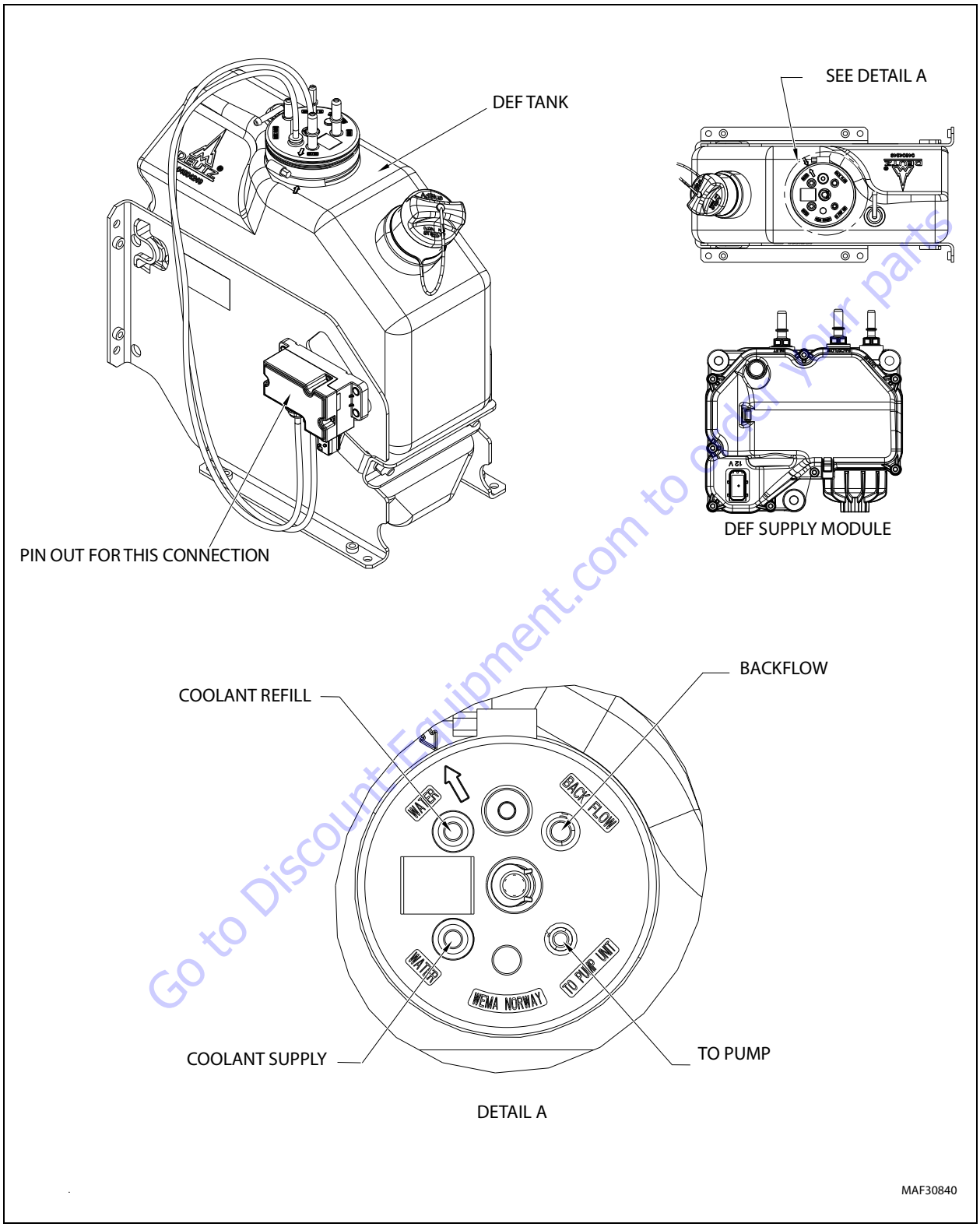


Figure 3-28. Diesel Exhaust Fluid (DEF) Tank - Sheet 1 of 2

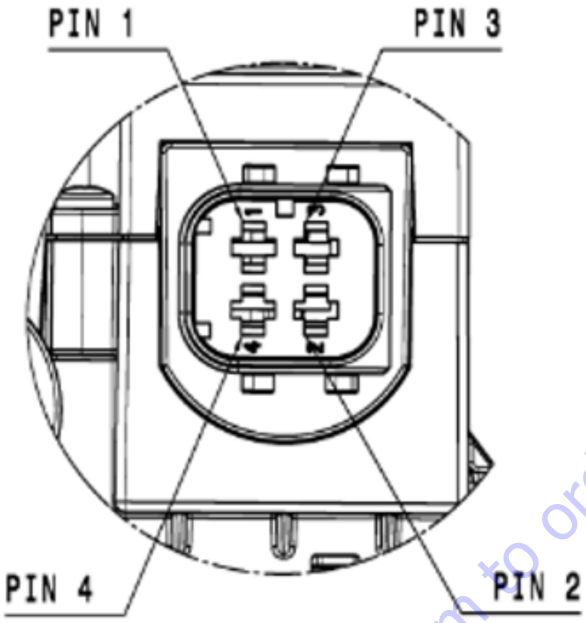


Table 3-5. Connector TYCO HDSCS 4POL

PIN 1	12 - 24 VDC
PIN 2	CAN Low
PIN 3	CAN High
PIN 4	GND

MAF23340

Figure 3-29. Diesel Exhaust Fluid (DEF) Tank - Sheet 2 of 2

3.29 GENERATOR

Every 250 hours

Check drive belt tension every 250 hours of operation,.

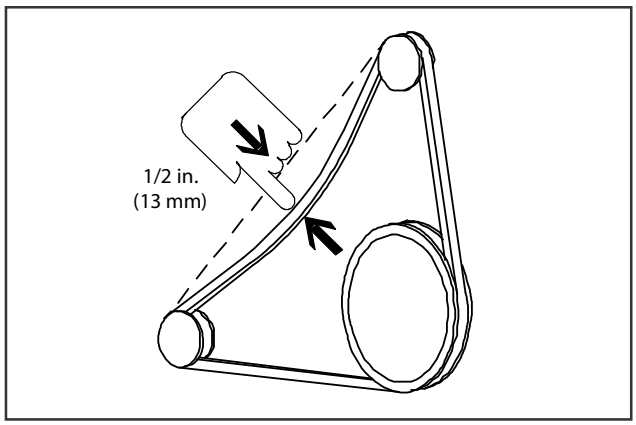


Figure 3-30. Generator Belt Tension

Every 500 hours

Service generator brushes and slip rings every 500 hours of operation. Hostile environments may require more frequent service.

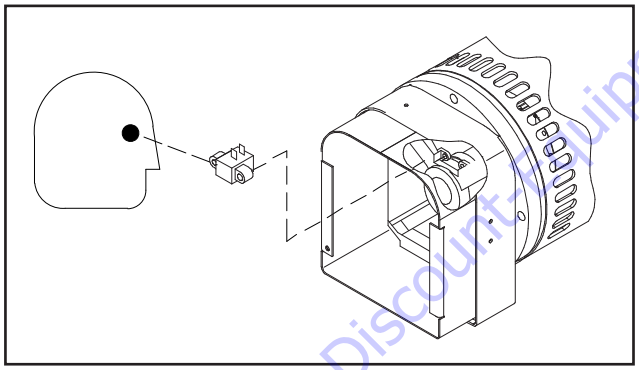


Figure 3-31. Generator Brushes and Slip Rings

Blow out inside of generator every 500 hours of service. If operating in a hostile environment, clean monthly.

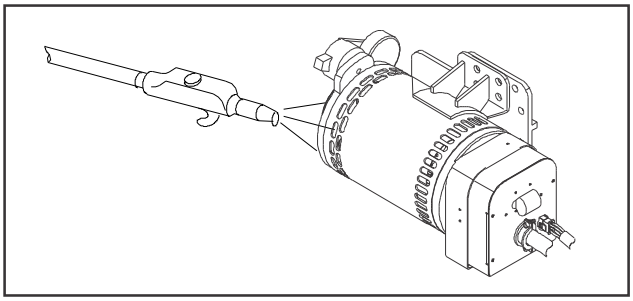


Figure 3-32. Generator Cleaning

Overload Protection

⚠ CAUTION

STOP ENGINE WHENEVER CHECKING OR INSPECTING CIRCUIT BREAKER.

The circuit breaker protects generator windings from overload. Generator output stops if circuit breaker opens.

If circuit breaker continues to open, check for faulty equipment connected to platform receptacles.

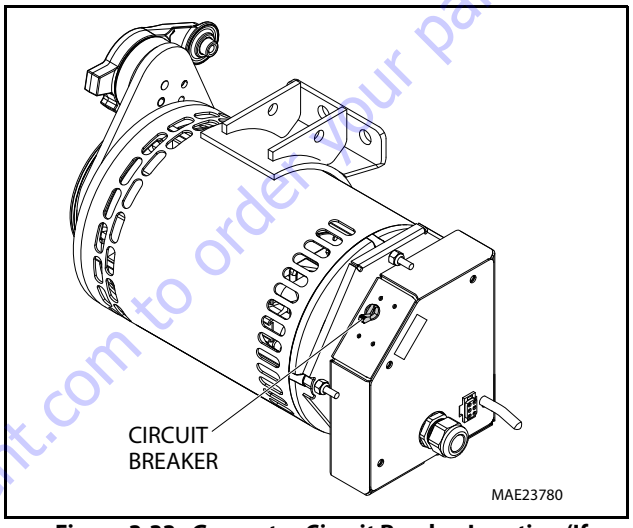


Figure 3-33. Generator Circuit Breaker Location (If Equipped with 4000W)

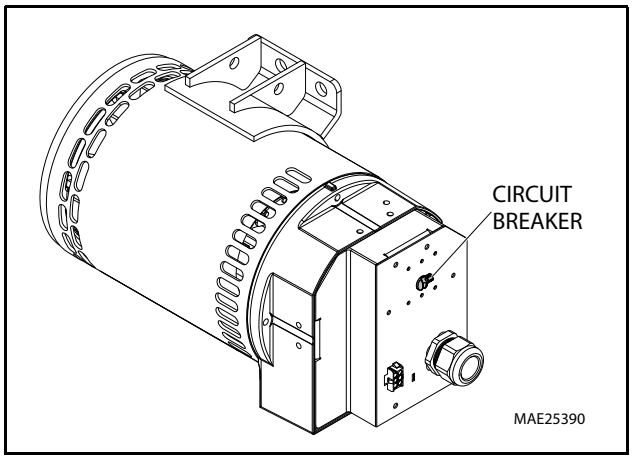


Figure 3-34. Generator Circuit Breaker Location (If Equipped with 7500W)

Inspecting Brushes, Replacing Brushes, and Cleaning Slip Rings

INSPECTING BRUSH POSITION

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

INSPECTING BRUSHES

1. Remove end panel. Inspect wires.
2. Remove brush holder assembly. Pull brushes from holders.
3. Replace brushes if damaged, or if brush is at or near minimum length.

CLEANING SLIP RINGS

1. Visually inspect the slip rings. Under normal use, the rings turn dark brown.
2. If slip rings are corroded or their surface is uneven, remove belt to turn shaft by hand for cleaning.
3. Clean rings with 220 grit emery paper. Remove as little material as possible. If rings are deeply pitted and do not clean up, consult generator factory service.
4. Reinstall belt, brush holder assembly, and end panel.

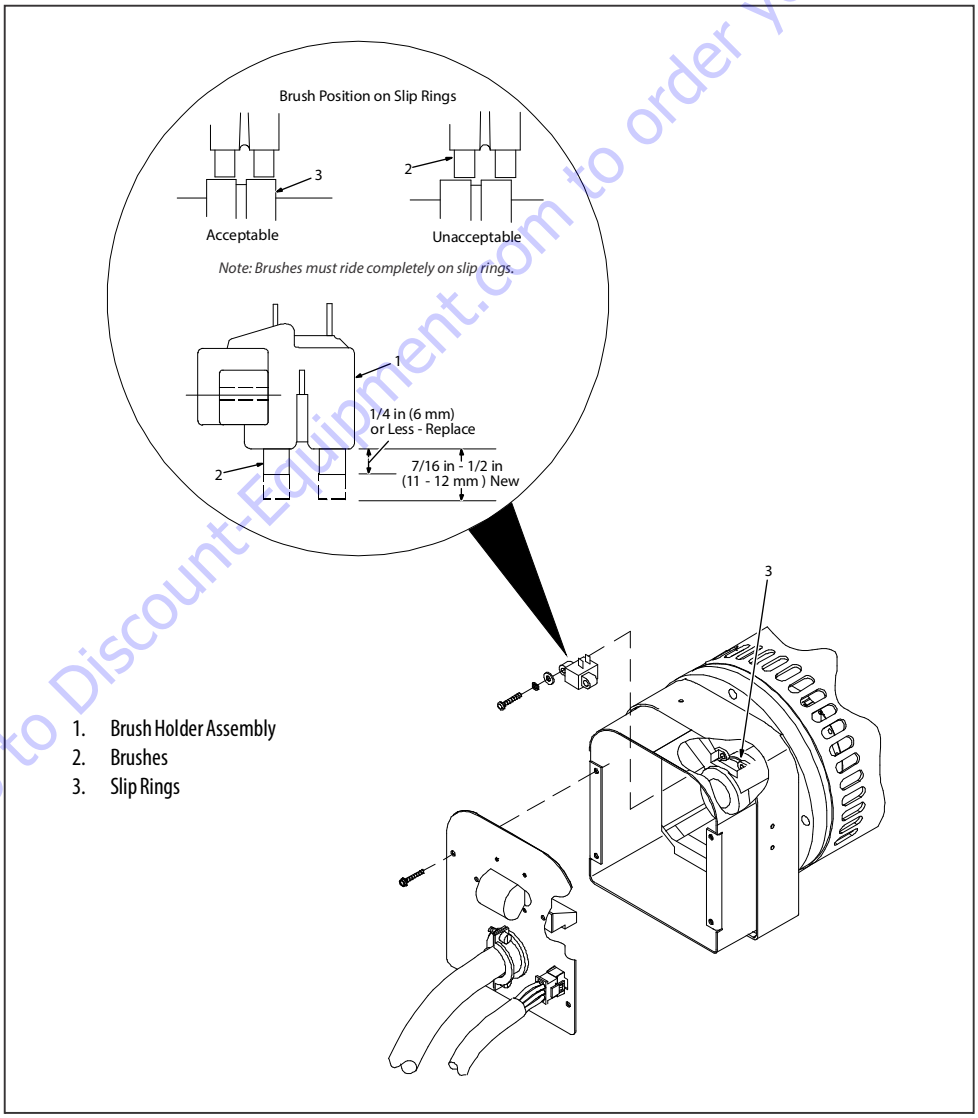


Figure 3-35. Inspecting Generator Brushes, Replacing Brushes, and Cleaning Slip Rings

Troubleshooting

Table 3-6. Troubleshooting

Trouble	Remedy
No generator output at platform AC receptacles.	Be sure generator control switch is turned on at platform.
	Check and secure electrical connections at platform, generator, and control box.
	Be sure all equipment is turned off when starting unit.
	Reset circuit breaker CB1.
	Check plug PLG3 connection and/or connections at receptacles RC3 and RC5.
	Be sure + 12 volts DC input voltage is being supplied to control box.
	Check slip rings, wiring to brushes, and brush position on slip rings. Install new brushes if necessary.
	Disconnect leads 12 and 13 from brushes, and check continuity across slip rings (nominal reading is 26 ohms). Replace generator if rotor is open.
	Disconnect stator weld leads 1, 2, and 3 from circuit breaker CB1 , and check continuity between leads. Replace generator if necessary.
	Disconnect plug PLG4 and check continuity between exciter leads 5 and 6. Replace generator if necessary.
	Check power board PC1 and connections, and replace if necessary.
	Check control board PC2 and connections, and replace if necessary.
Low generator output at platform AC receptacles.	Verify generator is running at 3600 rpm (60 Hz) or 3000 rpm (50 Hz).
	Check slip rings, wiring to brushes, and brush position on slip rings. Install new brushes if necessary.
	Disconnect leads 12 and 13 from brushes, and check continuity across slip rings nominal reading is 26 ohms). Replace generator if rotor is open.
	Disconnect stator weld leads 1, 2, and 3 from circuit breaker CB1, and check continuity between leads. Replace generator if necessary.
	Disconnect plug PLG4 and check continuity between exciter leads 5 and 6. Replace generator if necessary.
	Check power board PC1 and connections, and replace if necessary.
	Check control board PC2 and connections, and replace if necessary.
High generator output at platform AC receptacles.	Verify generator is running at 3600 rpm (60 Hz) or 3000 rpm (50 Hz).
	Check slip rings, wiring to brushes, and brush position on slip rings. Install new brushes if necessary.
	Check power board PC1 and connections, and replace if necessary.
	Check control board PC2 and connections, and replace if necessary.
Erratic generator output at platform AC receptacles.	Check and secure electrical connections at platform, generator, and control box.
	Verify generator is running at 3600 rpm (60 Hz) or 3000 rpm (50 Hz).
	Check slip rings, wiring to brushes, and brush position on slip rings. Install new brushes n necessary.
	Disconnect leads 12 and 13 from brushes, and check continuity across slip rings nominal reading is 26 ohms). Replace generator if rotor is open.
	Check power board PC1 and connections, and replace if necessary
	Check control board PC2 and connections, and replace if necessary

Generator Disassembly and Assembly

Refer to Figure 3-60. and Figure 3-61. to determine if trouble is in stator, rotor, control box, or combination of these components.

1. Rotor
2. Stator Assembly

⚠ CAUTION

DO NOT DAMAGE ROTOR OR STATOR WINDINGS DURING DISASSEMBLY AND ASSEMBLY PROCEDURE.

DISASSEMBLY

1. Mark and disconnect all electrical leads, secure using cable ties.
2. Remove brush holder assembly.
3. Disassemble generator parts shown in Figure 3-59.
4. Clean all parts with approved solvent and dry with compressed air, If applicable.

ASSEMBLY

1. Assemble generator parts using torque values in table.
2. Reconnect all leads. Use cable ties to secure leads away from moving or hot parts.

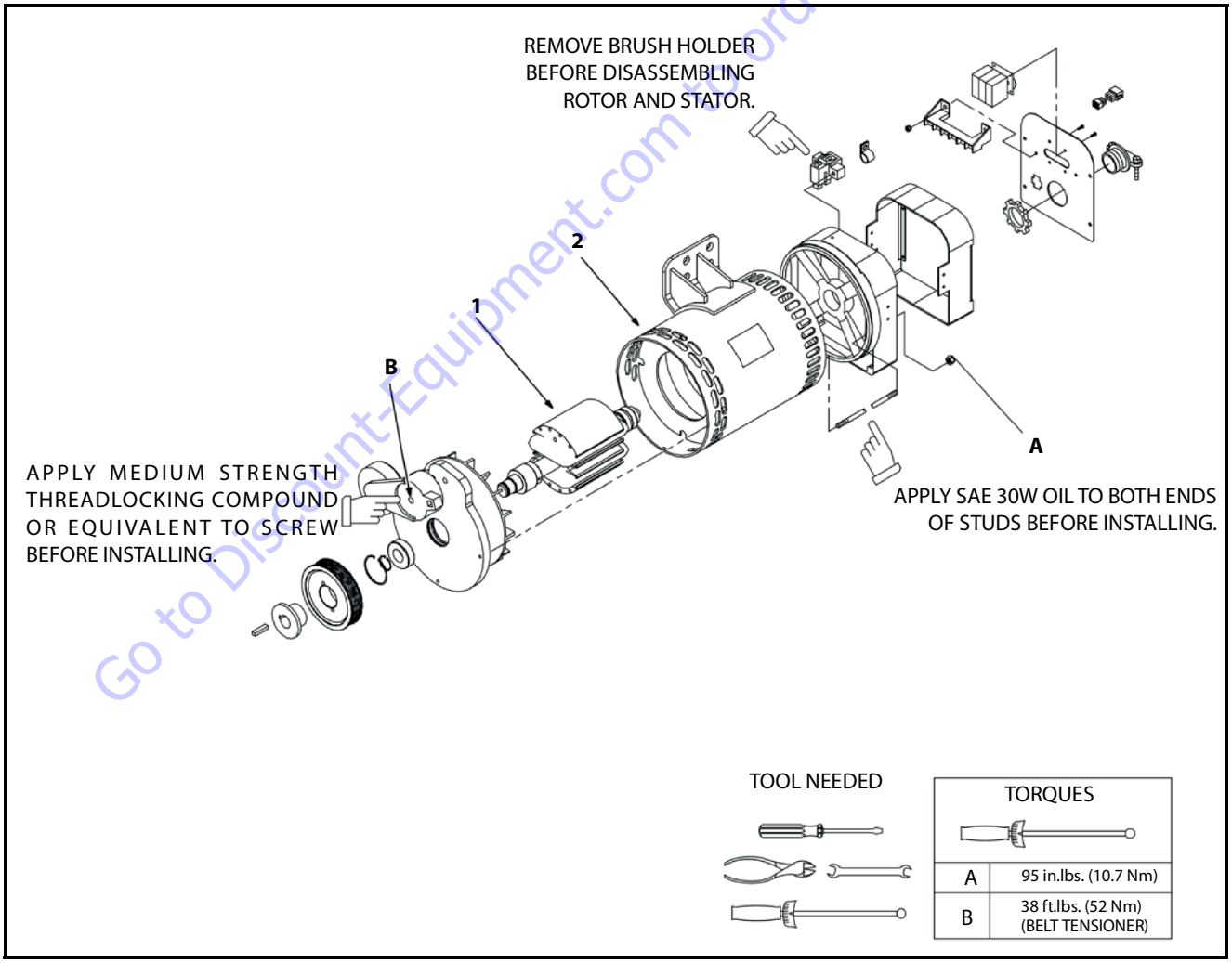


Figure 3-36. Generator Disassembly and Assembly

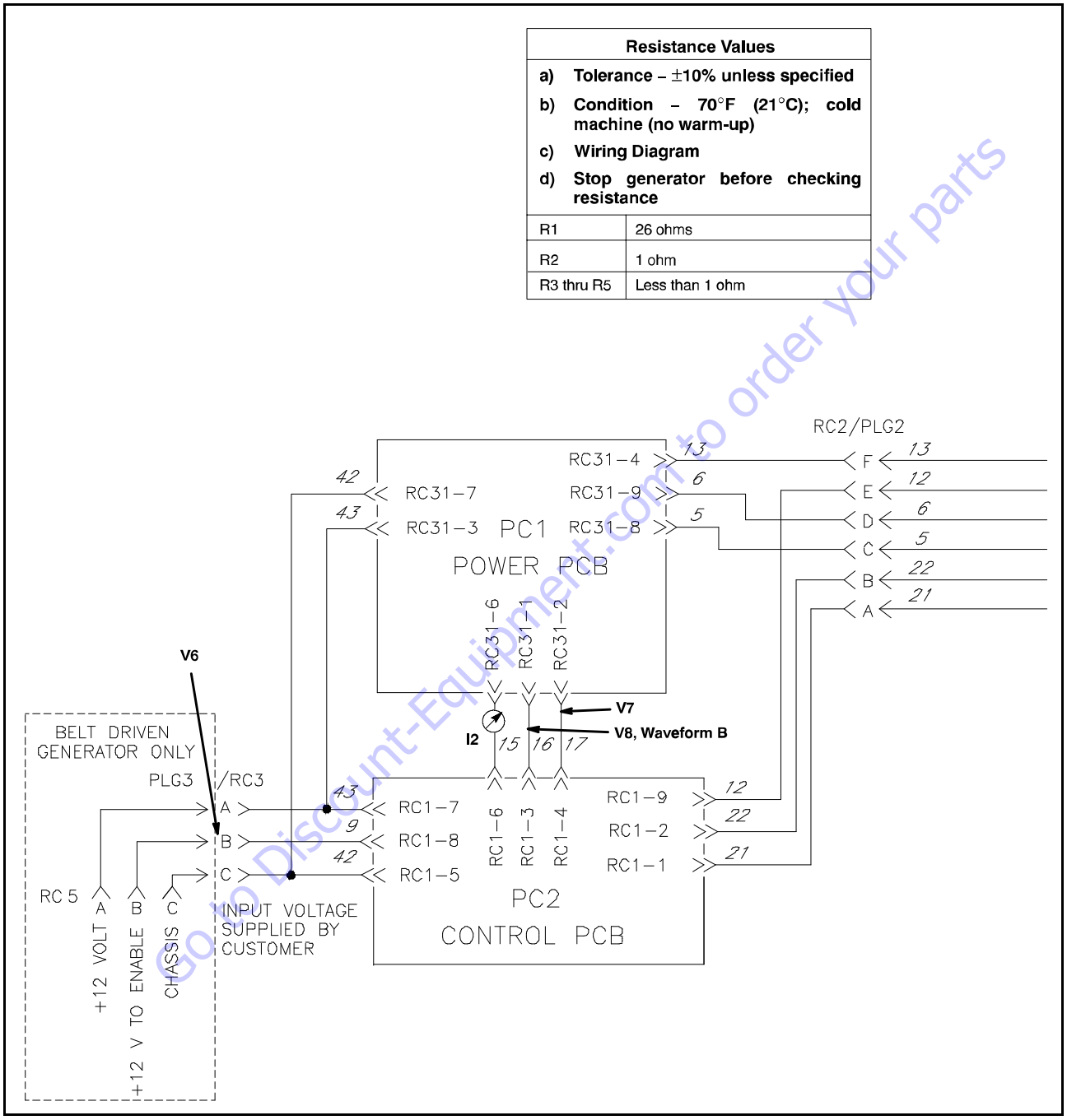


Figure 3-37. Generator Troubleshooting Circuit Diagram (Sheet 1 of 2)

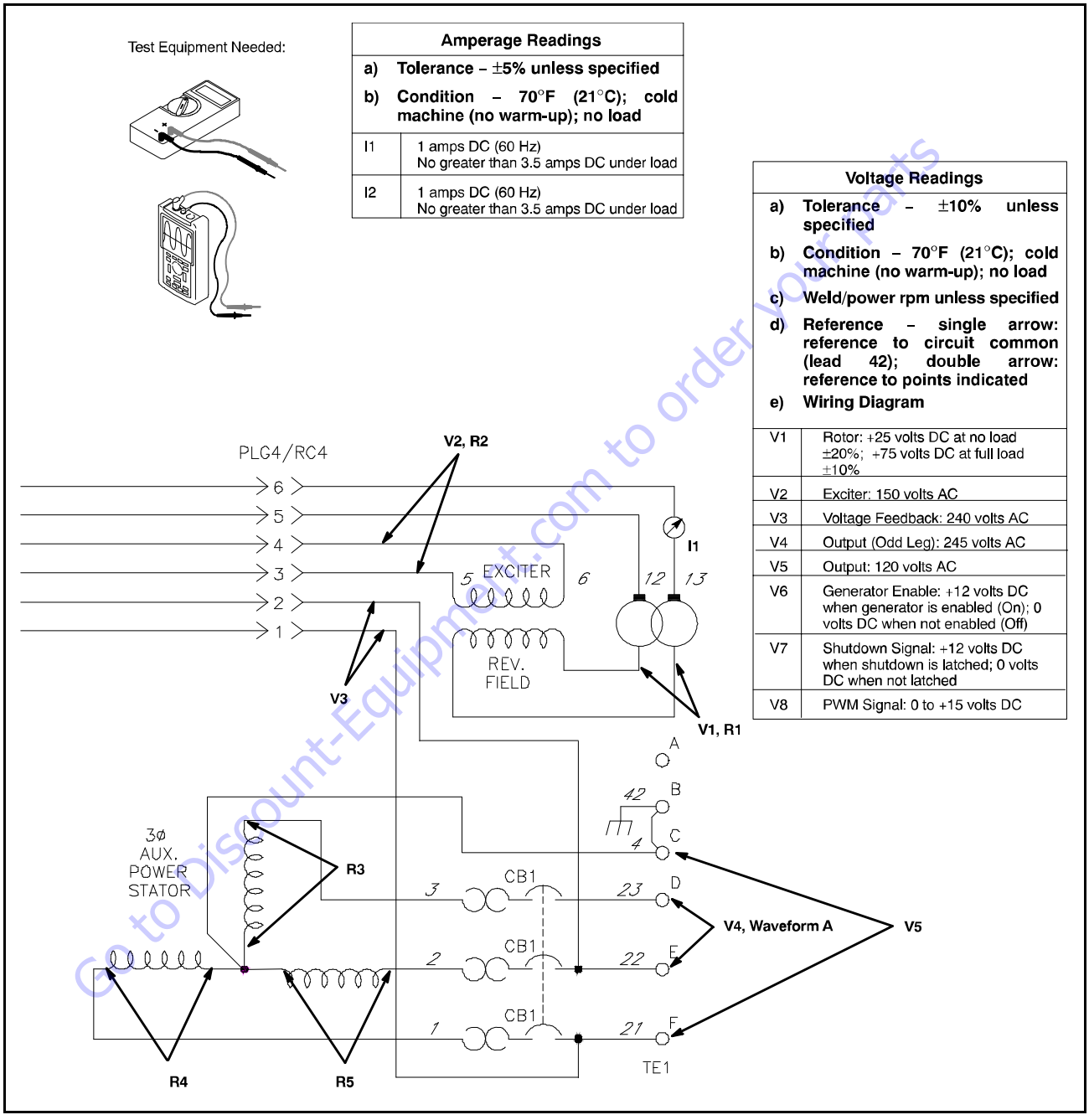


Figure 3-38. Generator Troubleshooting Circuit Diagram (Sheet 2 of 2)

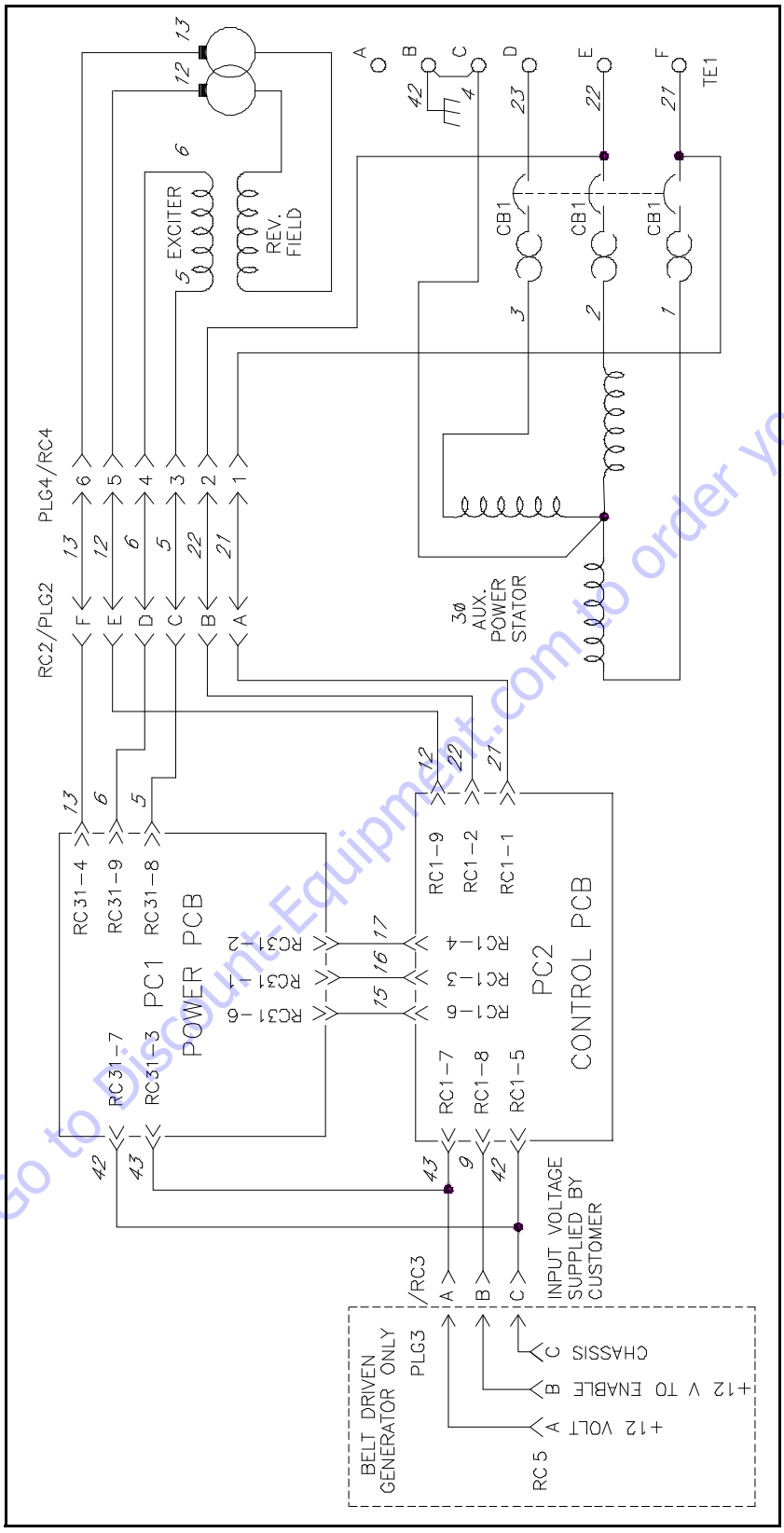


Figure 3-39. Generator Electrical Circuit Diagram

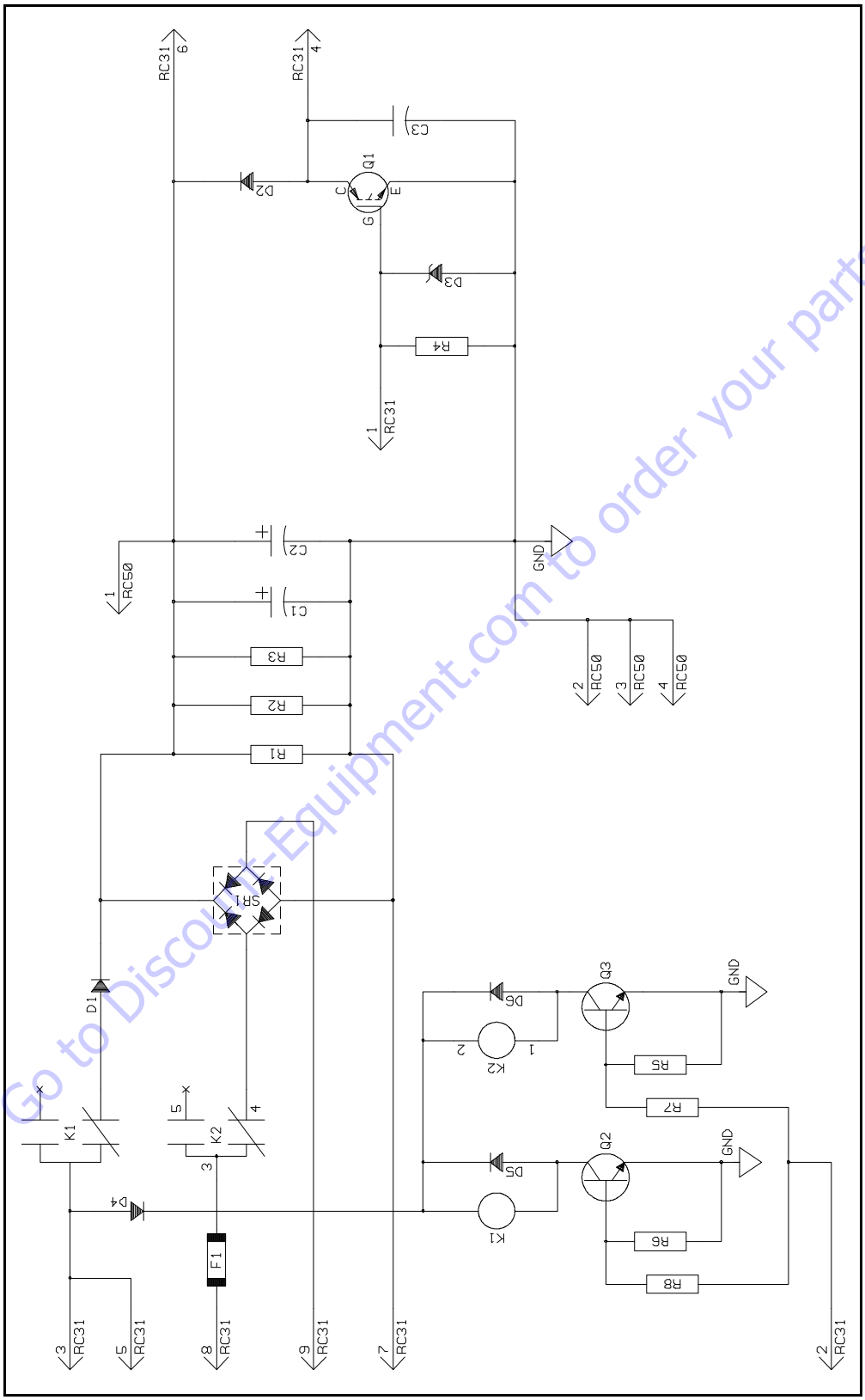


Figure 3-40. Power Board PC1 Electrical Circuit Diagram

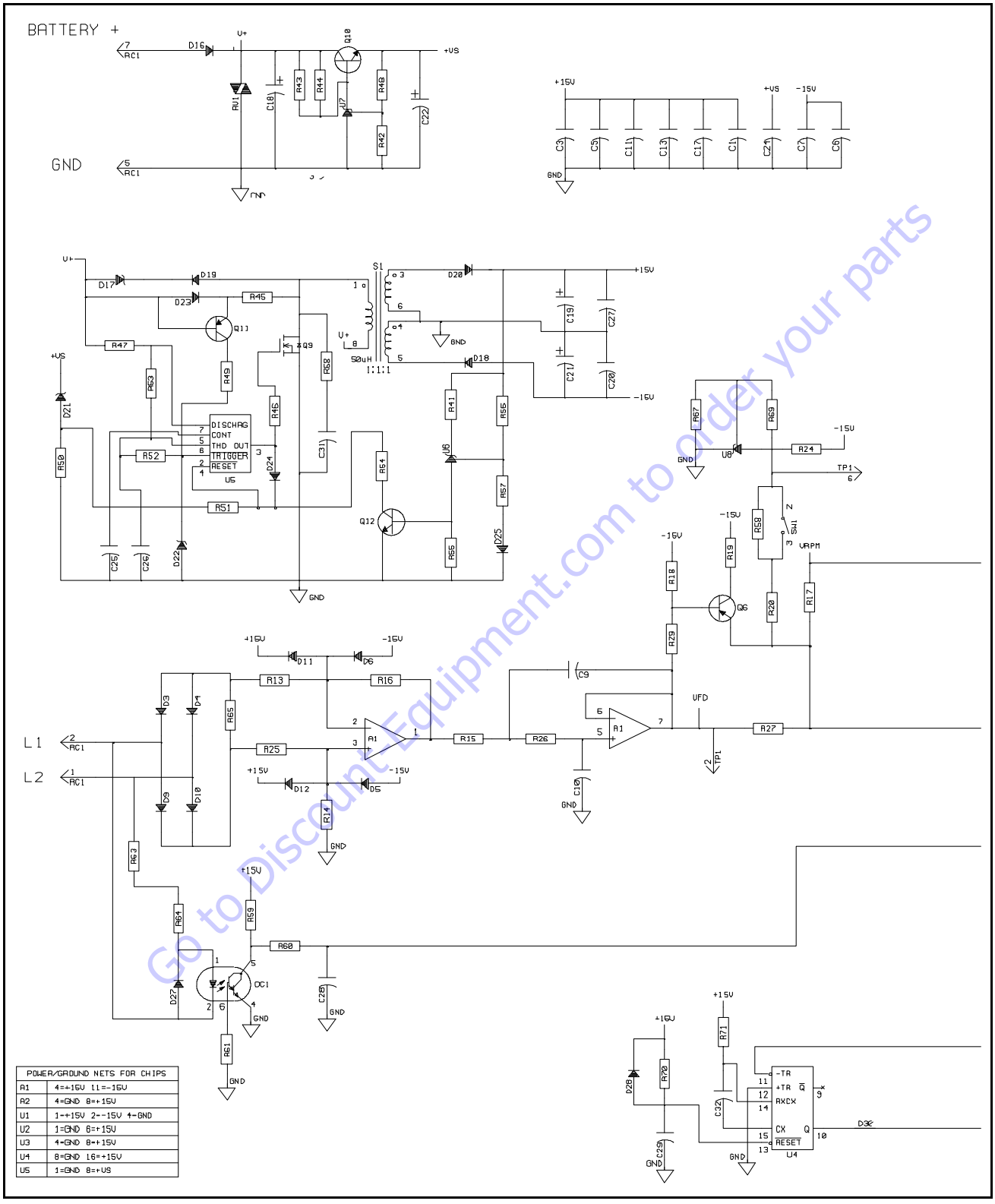


Figure 3-41. Power Board PC2 Electrical Circuit Diagram (Sheet 1 of 2)

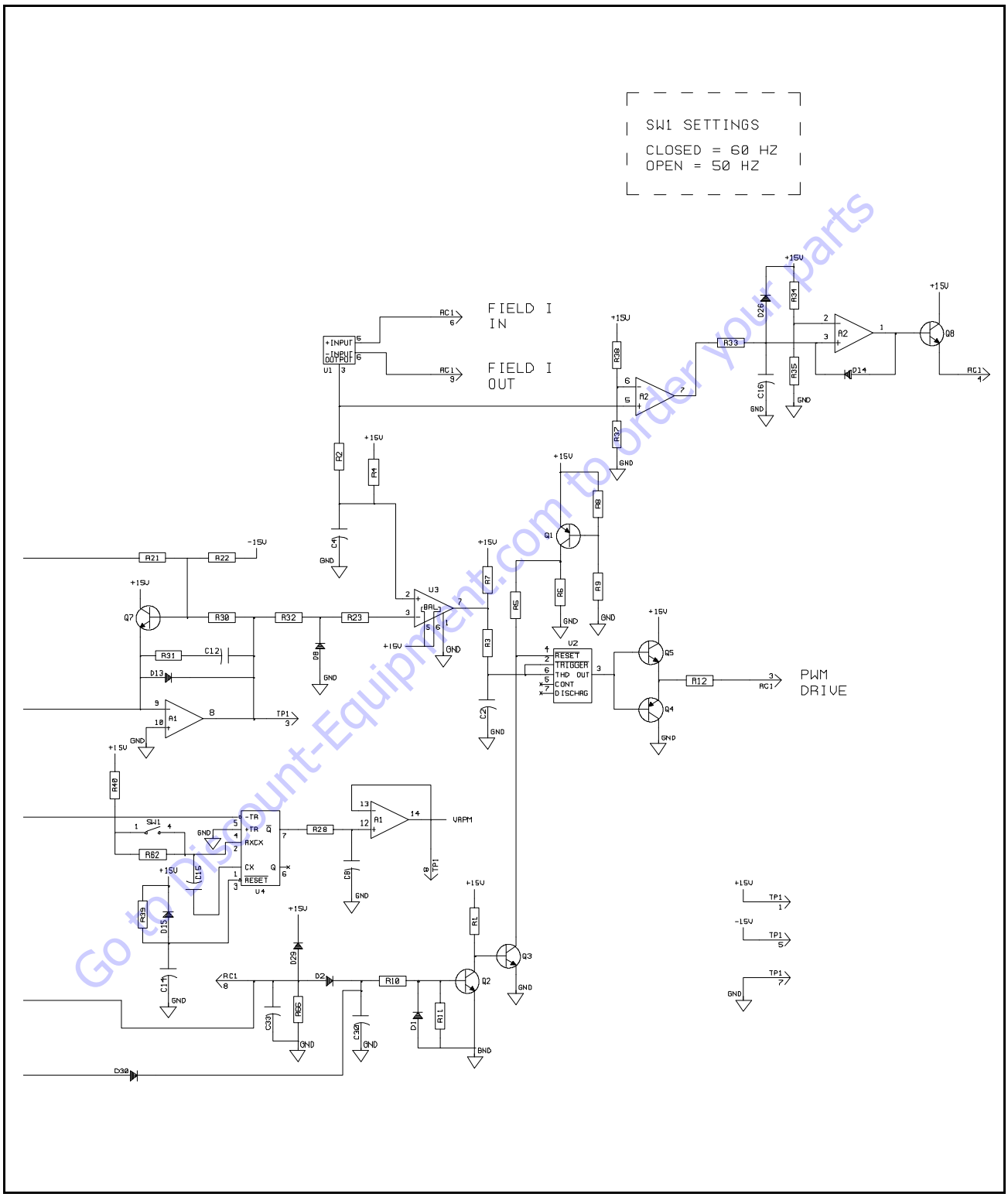


Figure 3-42. Power Board PC2 Electrical Circuit Diagram (Sheet 2 of 2)

Lead Connection List for Generator

NOTE: *Table shows physical lead connections and should be used with circuit diagram (table replaces wiring diagram).*

NOTE: *Apply small amount of dielectric grade, non conductive electric grease to connectors where factory-applied grease had been present.*

Table 3-7. Lead Connection List for Generator

Leads	Connections
1A	STATOR TO CB1
2A	STATOR TO CB1
3A	STATOR TO CB1
4A	STATOR TO TE1 (C)
5A	STATOR TO RC4 (3)
5B	PLG2 (C) TO PLG4 (3)
5C	RC2 (C) PLG31 (8)
6A	STATOR TO RC4 (4)
6B	PLG2 (D) TO PLG4 (4)
6C	RC2 (D) PLG31 (9)
9A	RC5 (B) TO PLG3 (B) (Customer Supplied)
9B	RC3 (B) PLG1 (8)
12A	PLG2 (E) TO PLG4 (5)
12B	RC2 (E) PLG1 (9)
12C	RC4 (5) TO BRUSH
13A	PLG2 (F) TO PLG4 (6)
13B	RC2 (F) PLG31 (4)
13C	RC4 (6) TO BRUSH
15A	PLG1 (6) TO PLG31 (6)
16A	PLG1 (3) TO PLG31 (1)
17A	PLG1 (4) TO PLG31 (2)
21A	CB1 TO TE1 (F)
21B	PLG2 (A) TO PLG4 (1)
21C	PLG1 (1) TO RC2 (A)
21D	RC4 (1) TO CB1
22A	CB1 TO TE1 (E)
22B	PLG2 (B) TO PLG4 (2)
22C	PLG1 (2) TO RC2 (B)
22D	RC4 (2) TO CB1
23A	CB1 TO TE1 (D)
42A	RC5 (C) TO PLG3 (C) (Customer Supplied)
42B	RC3 (C) TO CONNECTION POINT 1
42C	PLG31 (7) TO CONNECTION POINT 1
42D	PLG1 (5) TO CONNECTION POINT 1
42F	END BELL SHROUD TO ENGINE MOUNT
42G	CHASSIS TO TE1 (B)
43A	RC5 (A) TO PLG3 (A) (Customer Supplied)
43B	RC3 (A) TO CONNECTION POINT 2
43C	PLG31 (3) TO CONNECTION POINT 2
43D	PLG1 (7) TO CONNECTION POINT 2

3.30 GENERATOR PULLEY

Removal

1. Remove the hardware securing the pulley belt tensioner assembly (1) to the generator (4) and remove pulley belt tensioner.
2. Remove hardware attaching tapered bushing (2) to the pulley (3) and remove tapered bushing and pulley from the generator shaft.

NOTE: *The Generator approximately weighs 106.9 lb (48.5 kg).*

3. Using suitable lifting equipment, adequately support engine assembly weight along entire length.
4. Remove the hardware securing generator (4) to the engine and remove generator from engine assembly.

Installation

1. Install generator (4) to the engine and secure with hardware.
2. Install generator pulley (3) and tapered bushing (2) on the generator shaft and secure with hardware. Torque hardwares to 8.8 ft. lbs. (12 Nm).

NOTE: *Ensure that generator pulley is aligned with engine pulley.*

3. Install pulley belt tensioner assembly (1) to generator and secure with hardware.

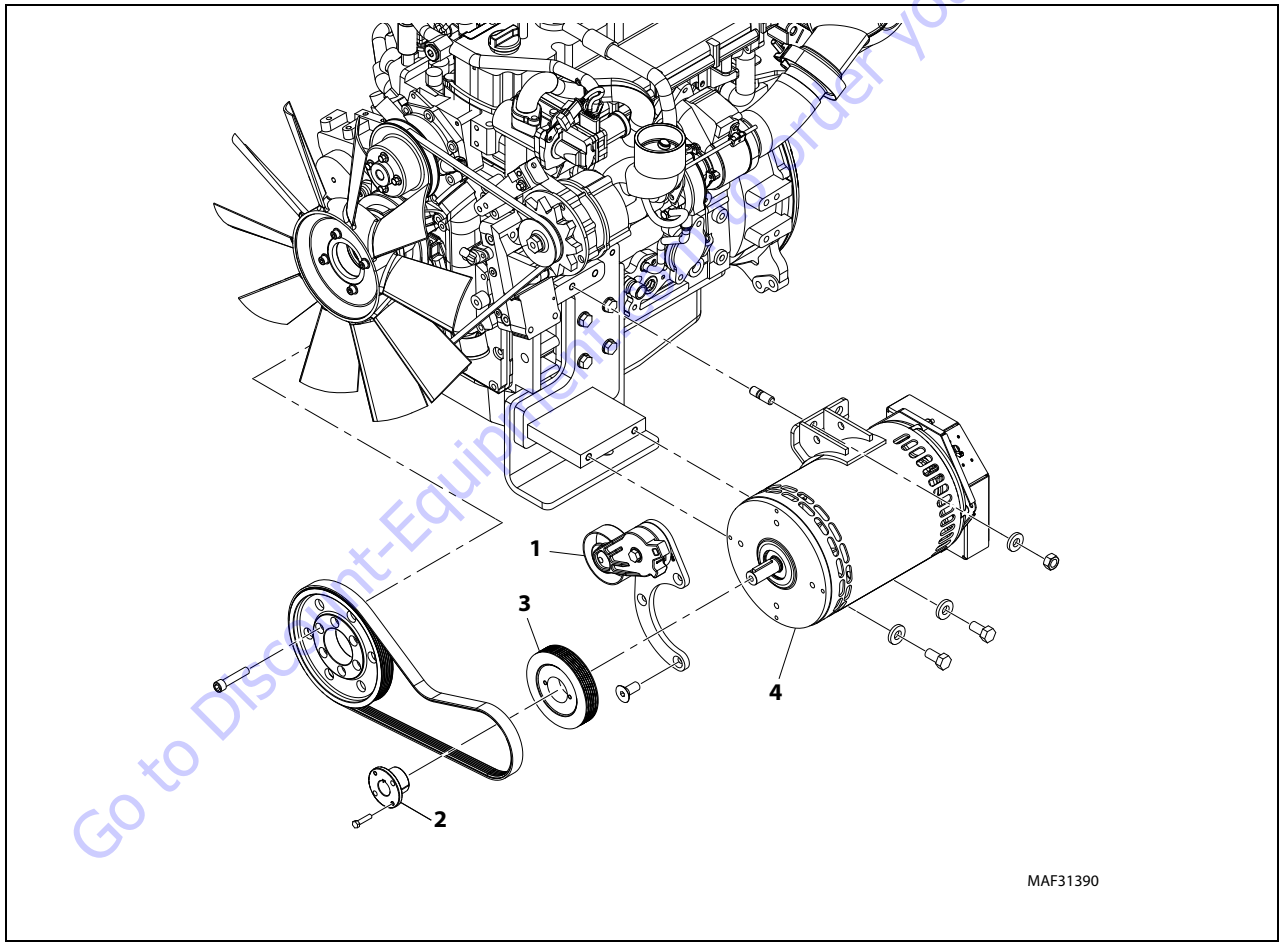


Figure 3-43. Generator Pulley

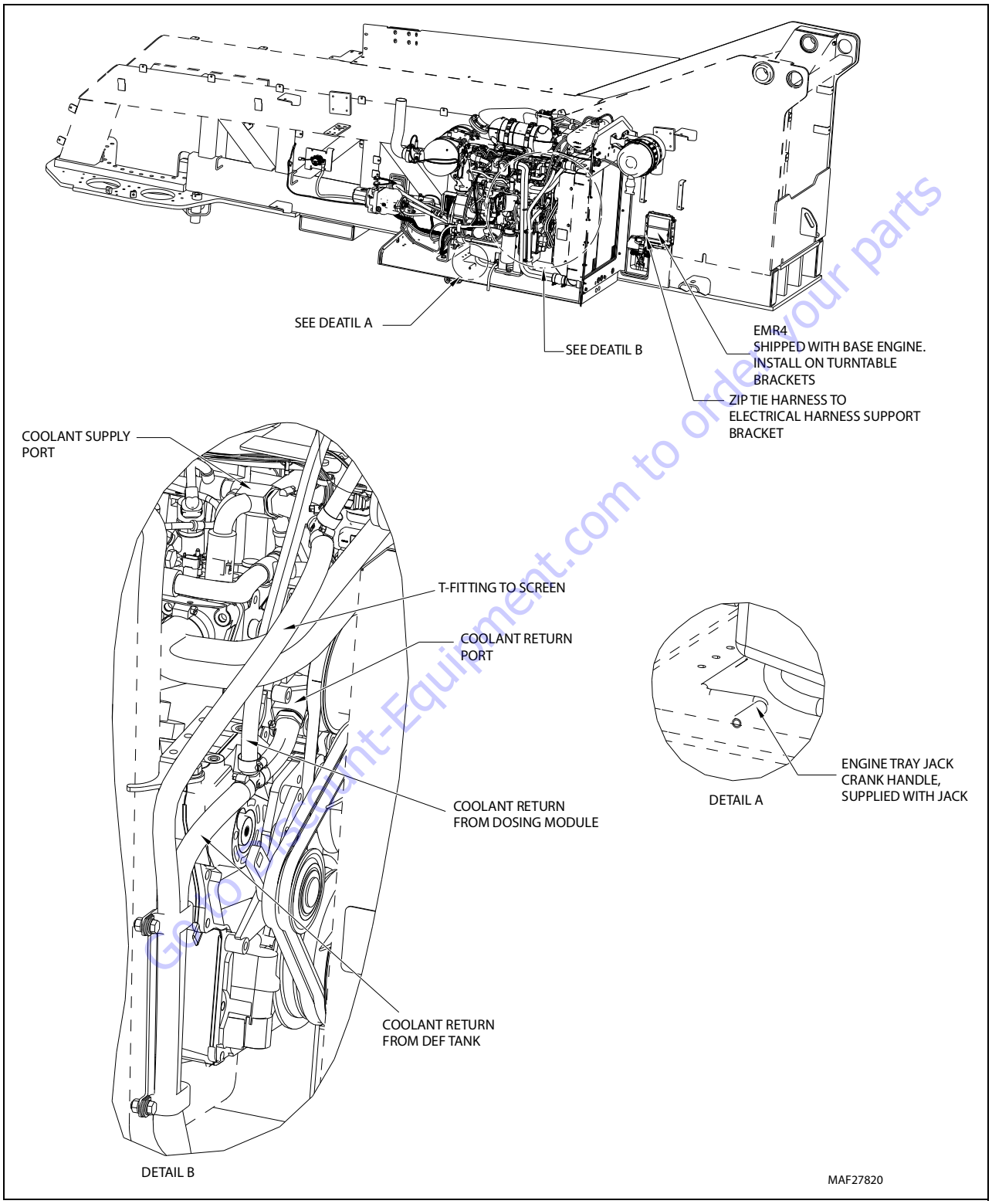


Figure 3-44. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 1 of 6

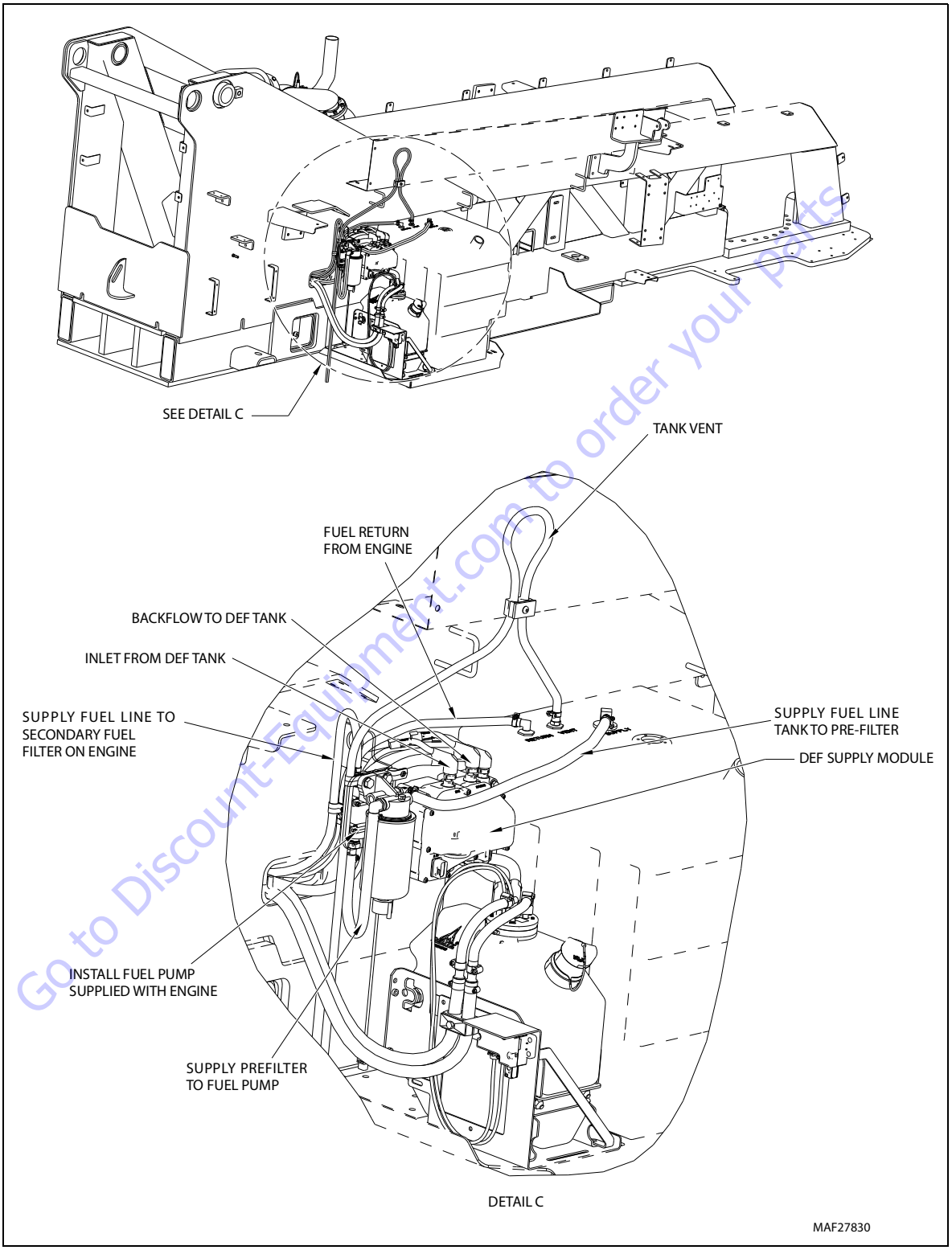


Figure 3-45. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 2 of 6

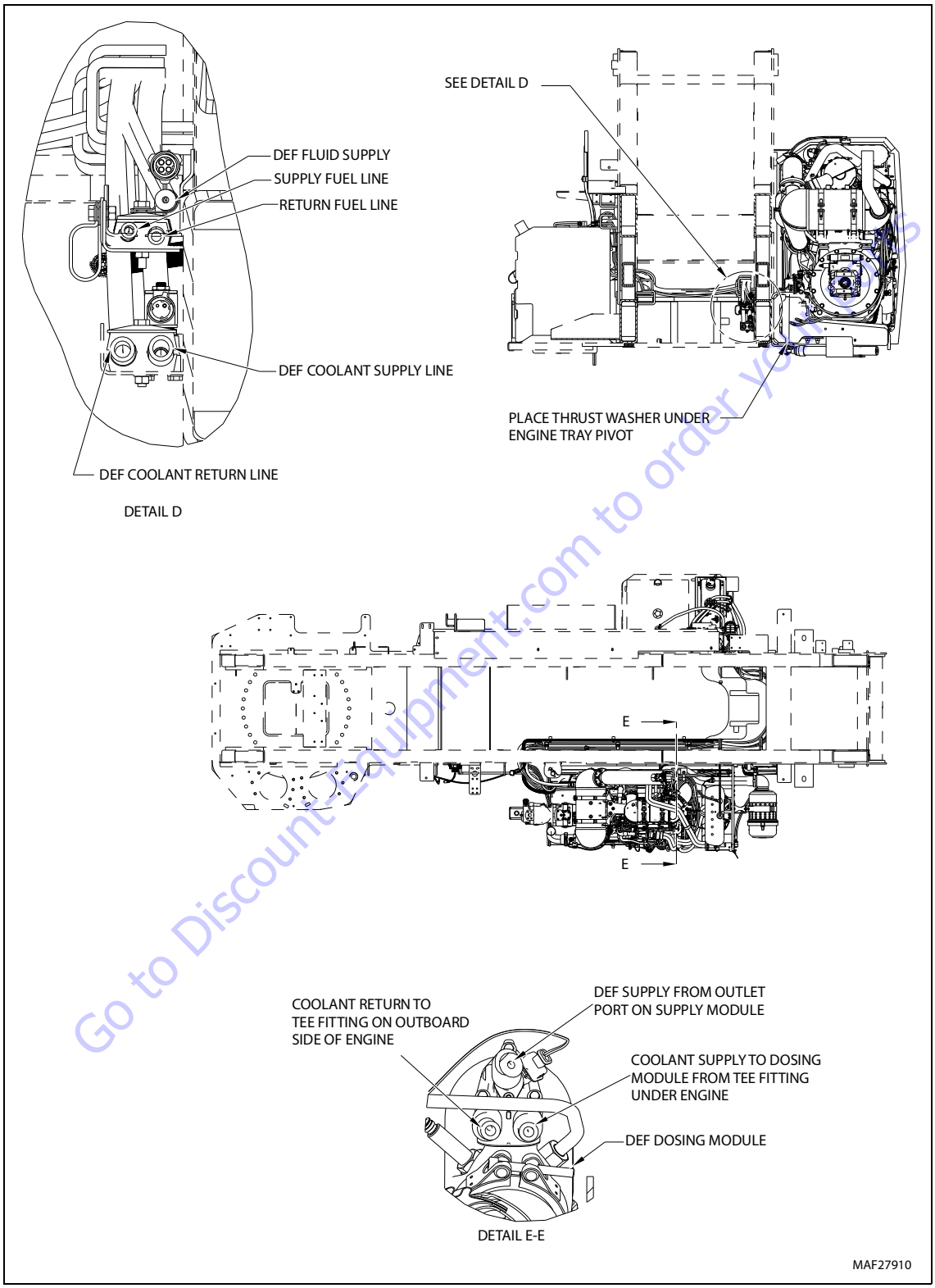


Figure 3-46. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 3 of 6

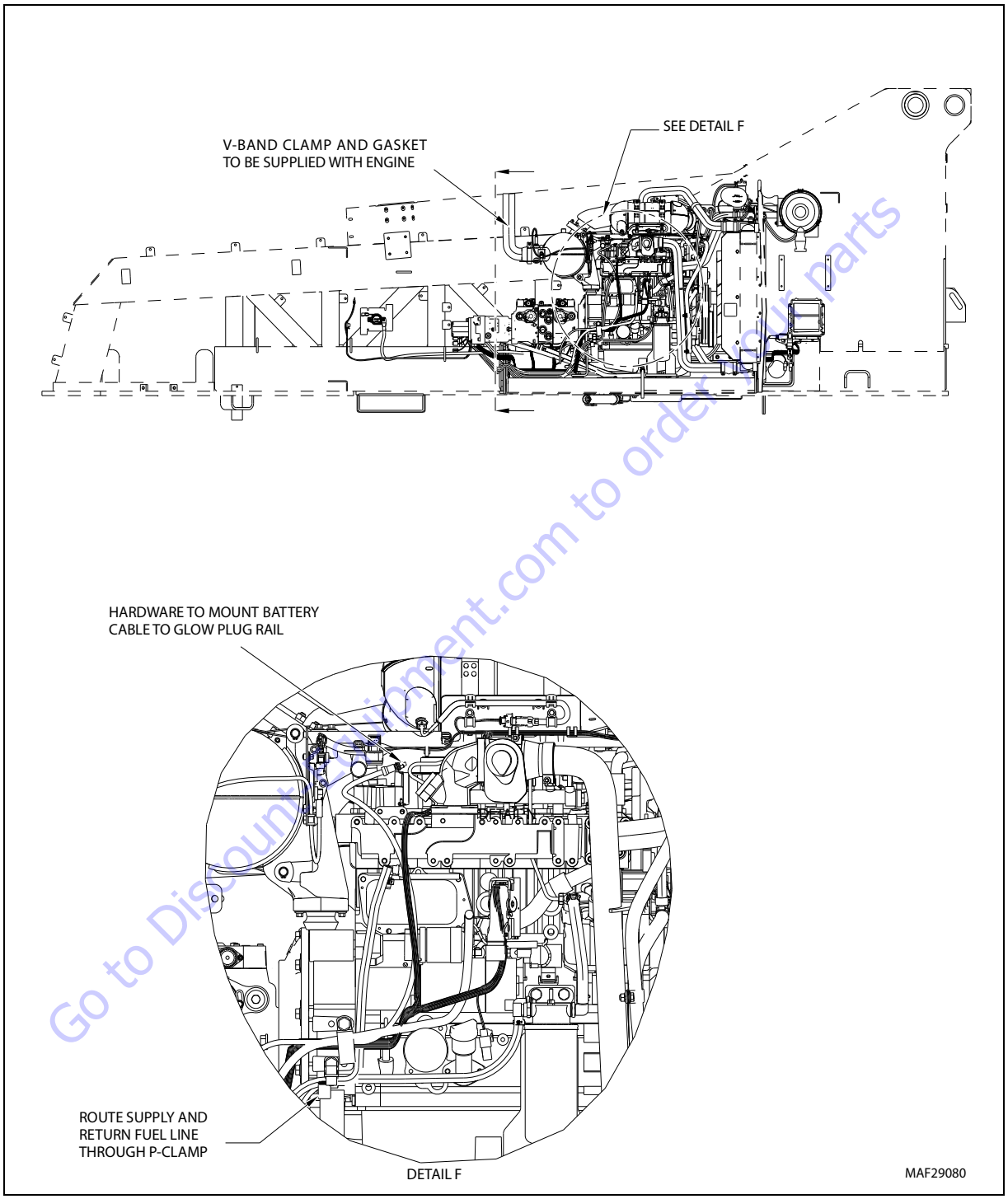


Figure 3-47. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 4 of 6

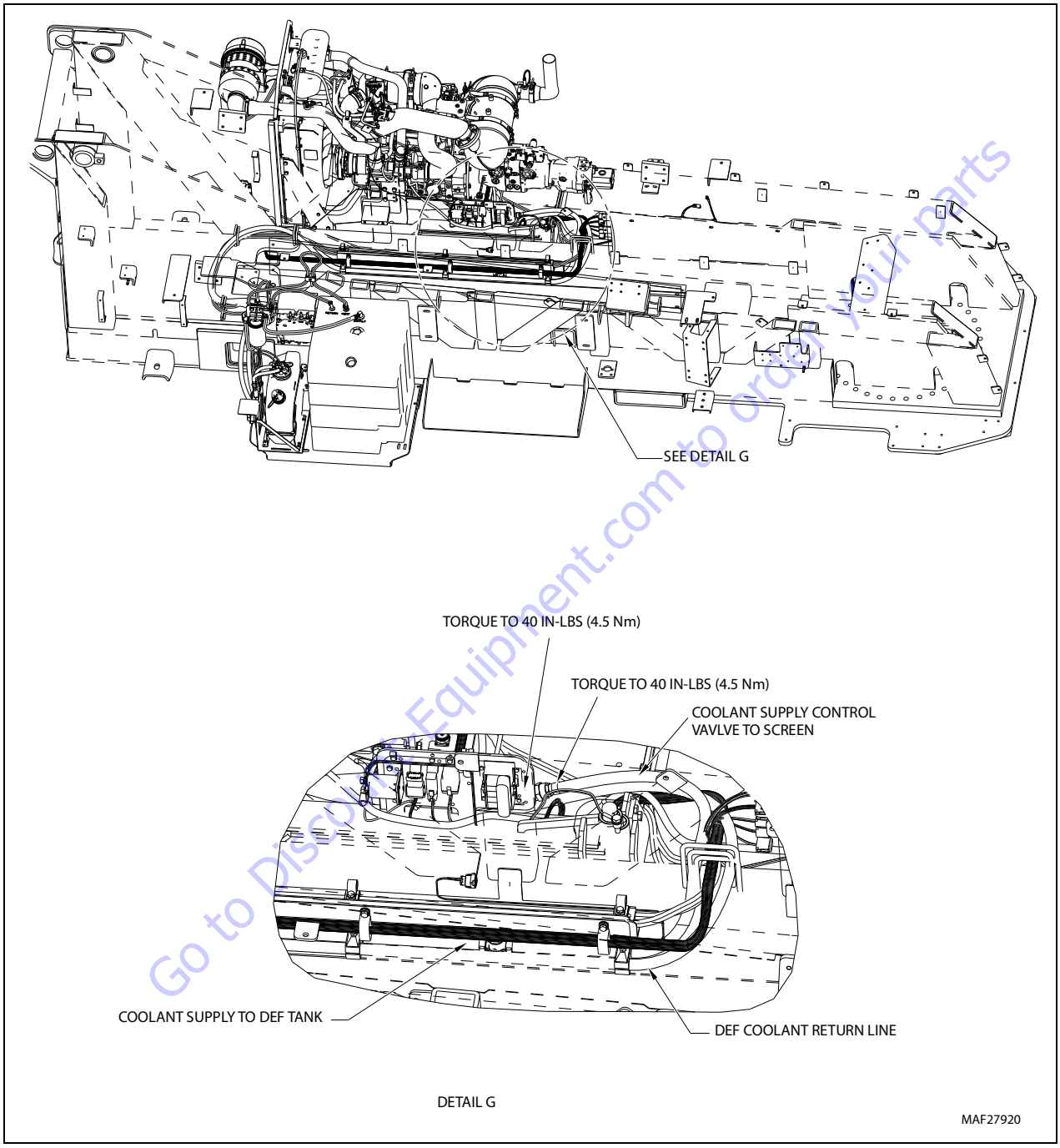


Figure 3-48. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 5 of 6

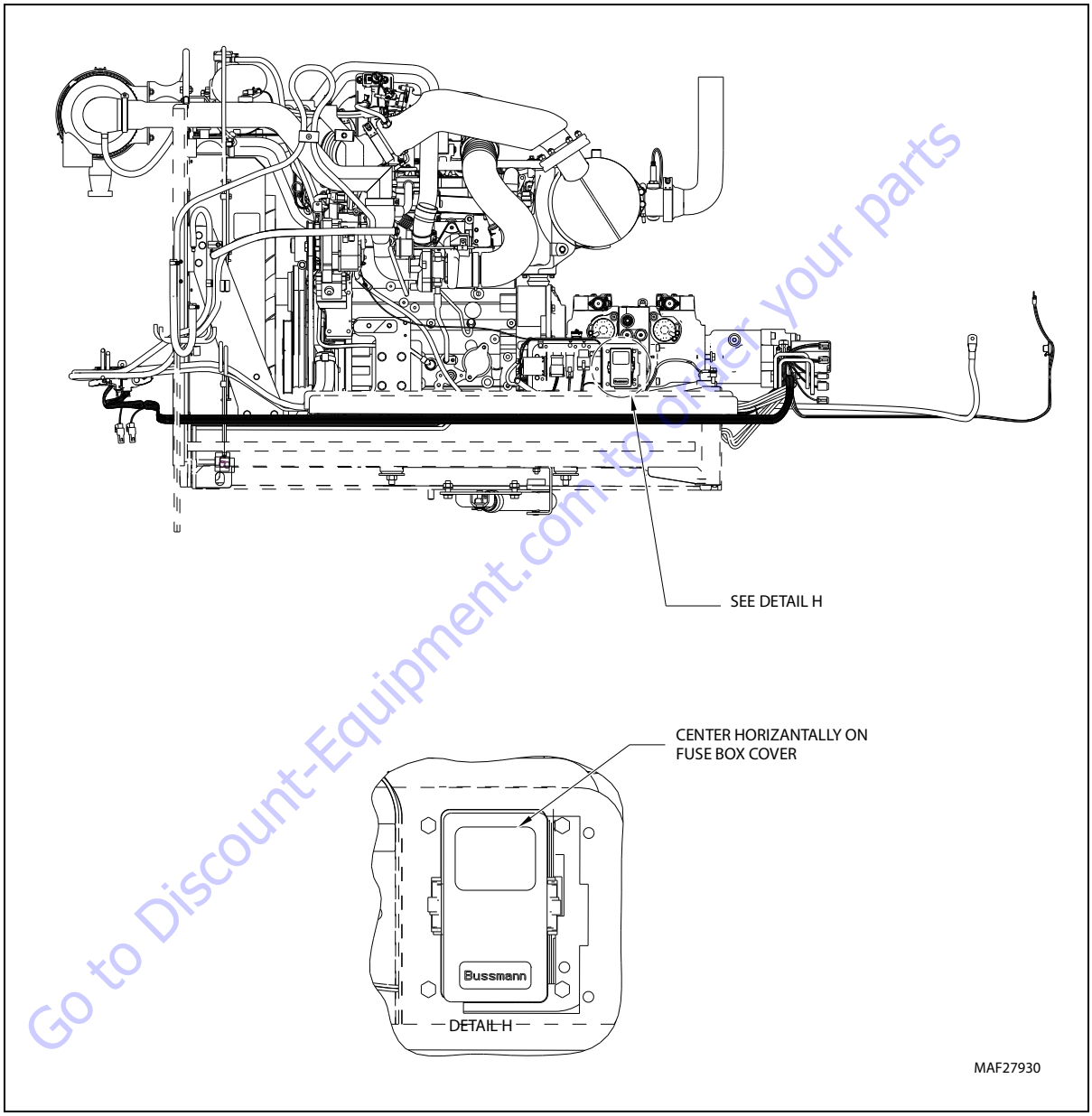


Figure 3-49. Engine Installation and Diesel Exhaust Fluid (DEF) System (T4F & Stage IV) - Sheet 6 of 6

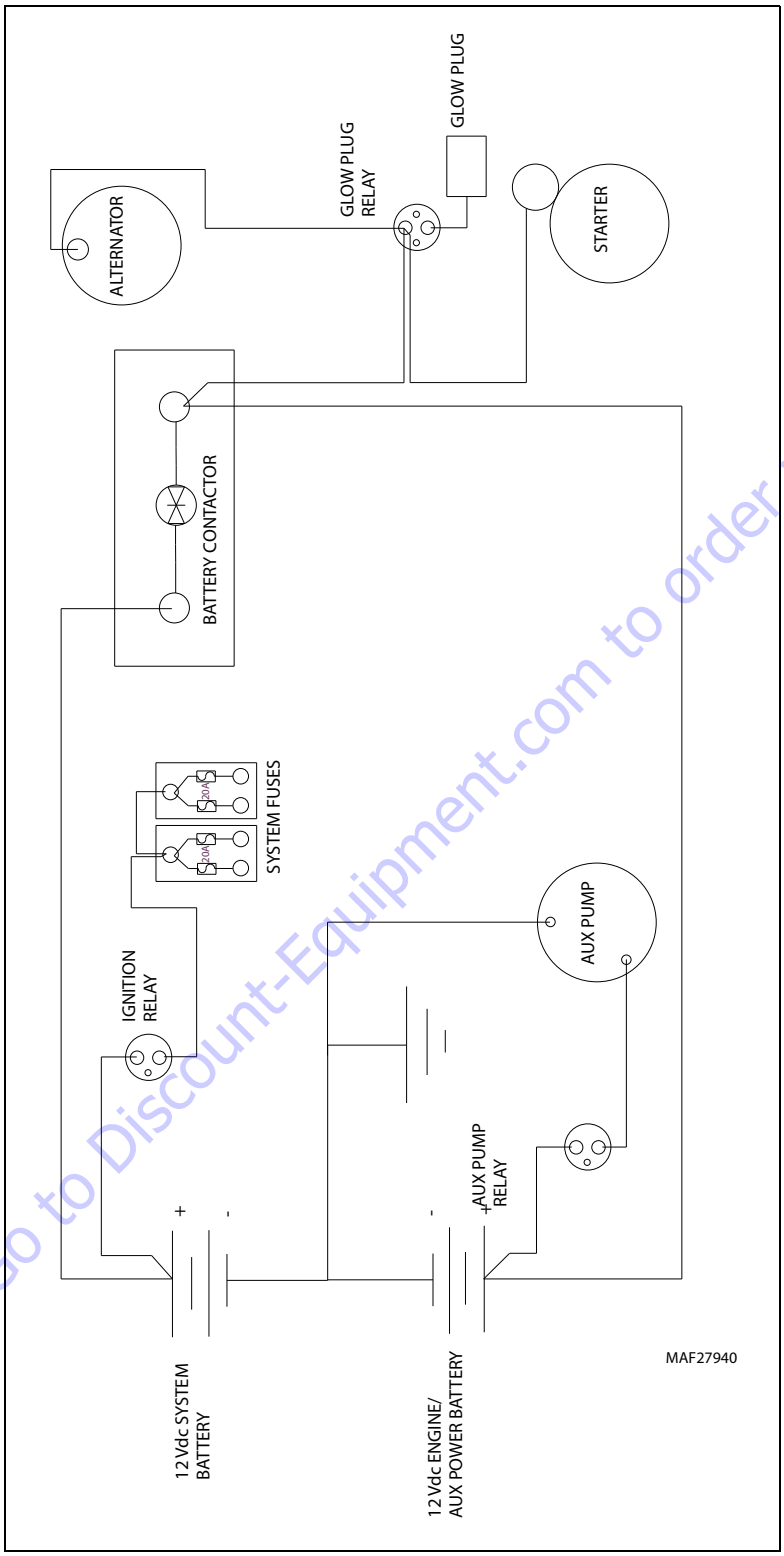


Figure 3-50. Engine Electrical Circuit

3.31 DEUTZ ENGINE WITH DIESEL EXHAUST FLUID (DEF)

Engine Oil

Engines equipped with Exhaust After Treatment (EAT) systems require the use of low-ash engine lubricating oils.

Lubricating oil that is not "low-ash" rated can contain sulphate and oxide ashes from metal-organic additives which will significantly shorten the life span of diesel particle filters. Phosphor from wear-protection additives as well as sulphur and sulphur compounds negatively influence the catalyst activity in exhaust gas post-treatment systems.

NOTICE

LOW-ASH ENGINE LUBRICATING OILS ARE RECOMMENDED FOR SCR EXHAUST AFTER TREATMENT SYSTEMS.

NOTICE

USE OF NON-APPROVED LUBRICATING OIL WILL RESULT IN VOIDED WARRANTY COVERAGE.

Diesel Fuel

Engines equipped with an SCR system (Selective Catalytic Reduction) may only be operated with sulphur-free diesel fuels (EN 590, ASTM D975 Grade 2-D S15, ASTM D975 Grade 1-D S15 or heating oil in EN 590 quality). Otherwise compliance with the emission requirements and durability is not guaranteed.

In a warranty case the customer must prove by a certificate from the fuel supplier that a released fuel was used.

HIGH SULPHUR CONTENT IN THE FUEL

Fuels with a sulphur content > 0.5% (m/m) (5,000 mg/kg) demand a shorter lubricating oil change interval. Fuels with a high sulphur content may not be used in engines with exhaust gas after-treatment. Fuels with a sulphur content > 1.0% (m/m) are not permissible due to high corrosion and considerable shortening of the engine life. Low-ash / low SAPS engine lubricating oils (sulphate ash max. 1.0% (m/m)) may only be used in engines without exhaust after-treatment systems if the sulphur content in the fuel does not exceed 50 mg/kg. However, low-ash lubricating oils may be used in engines without exhaust gas after-treatment systems up to sulphur contents of 500 mg/kg if the base number (TBN) is at least 9 mg KOH/g.

WINTER OPERATION WITH DIESEL FUEL

Special demands are placed on the cold behavior (temperature limit value of the filtrability) for winter operation. Suitable fuels are available in winter.

Mixing with petrol is not permissible for safety and technical reasons (cavitation in the injection system).

Diesel fuels up to -44 °C are available for an Arctic climate. The addition of flow improvers to the diesel fuel is only allowed in exceptional cases. The choice of a suitable additive and the necessary dosing and mixing procedure must be discussed with the fuel supplier. If only summer diesel fuel is available, petroleum or kerosene can be added to the diesel fuel up to 30% (V/V) at low temperatures as shown in the diagram below.

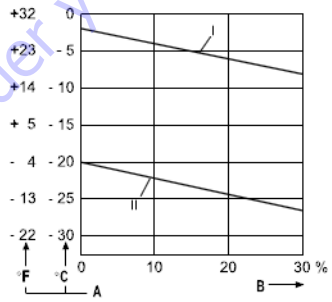


Figure 3-51. Mixing Petroleum With Summer Diesel Fuel

The mixing should take place in the engine tank. First pour in the necessary amount of petroleum or kerosene, and then add the diesel fuel.

3.32 SELECTIVE CATALYTIC REDUCTION (SCR) - MACHINES USING DIESEL EXHAUST FLUID (DEF)

Selective Catalytic Reduction (SCR) is an emissions control used in diesel engines and requires operator interaction to ensure proper operation of the system.

The system injects liquid through a special catalyst into the exhaust stream of a diesel engine. The liquid is automotive-grade urea, otherwise known as Diesel Exhaust Fluid (DEF). The DEF sets off a chemical reaction that converts nitrogen oxides into nitrogen, water and carbon dioxide (CO2), which is then expelled through the engine exhaust pipe.

For peak operation, the SCR system must be cleaned using one of two methods, Standstill Cleaning and Maintenance Standstill Cleaning. Standstill Cleaning is any cleaning requested by the engine outside of the regular maintenance window (for example, if the system detects crystallization in the DEF solution). Maintenance Standstill Cleaning is cleaning requested by the engine on the regular maintenance interval.

SCR technology is designed to permit nitrogen oxide (NOx) reduction reactions to take place in an oxidizing atmosphere. It is called “selective” because it reduces levels of NOx using ammonia as a reductant within a catalyst system. The chemical reaction is known as “reduction” where the DEF is the reducing agent that reacts with NOx to convert the pollutants into nitrogen, water and tiny amounts of CO2. The DEF can be rapidly broken down to produce the oxidizing ammonia in the exhaust stream. SCR technology alone can achieve NOx reductions up to 90 percent.

NOTE: *The system will reset the maintenance interval back to 0 hours after Standstill or Maintenance Standstill cleaning events are performed.*

Standstill Cleaning

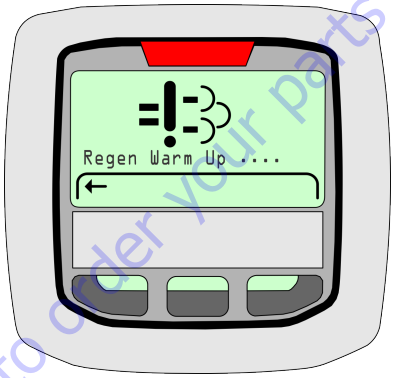
The following conditions must be met to perform Standstill Cleaning.

- Machine must be stationary
- Boom in the stowed position
- No personnel in platform
- Engine must be idling
- Coolant temperature must be above 167° F (75° C)
- Diesel Exhaust Fluid (DEF) tank must not be frozen
- Machine in Ground Station mode

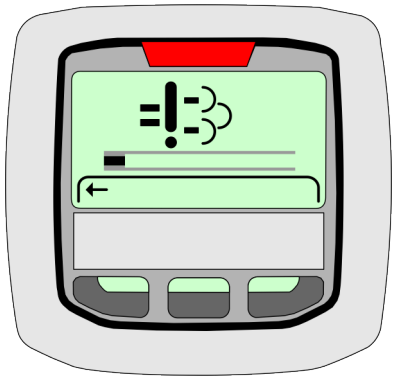
NOTE: *Every standstill regenration slightly dilutes the engine oil with fuel.The number of standstill regenration is therefore monitored.*

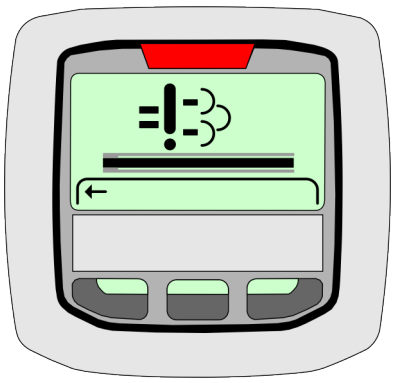
1. The Selective Catalytic Reduction Indicator will flash when standstill cleaning is required.

2. Move the machine to an suitable area free of flammables and personnel that could be exposed to hot exhaust. Launch the cleaning process by pressing the SCR button on the Ground Console for 3 seconds. The Indicator Gauge will display the following screen.



3. The Main Cleaning process will begin and last for approximately 30 to 60 minutes. The following screen will show that the process has begun and includes a status bar that indicates the progress of the cleaning process.





4. After the cleaning process is complete, the engine will run for approximately 5 minutes to allow the Engine and Exhaust After Treatment (EAT) to cool down. The Indicator Gauge will display the “Regen Complete" screen as shown and the HEST indicator will no longer be illuminated.

Maintenance Standstill Cleaning Initiation Methods

Maintenance Standstill Cleaning can be started by one of two methods, by using the Analyzer or SCR button on the Ground Console. All the same conditions as outlined under Standstill Cleaning must be met.

Cancelling Maintenance Standstill

Maintenance Standstill Cleaning will be stopped immediately if:

- The Platform/Ground Select switch is switched from Ground to Platform mode
- Function switch is enabled to perform a boom function
- The Engine is powered down

If Maintenance Standstill Cleaning is interrupted, it must be re-initiated.

If Maintenance Standstill Cleaning is interrupted, it must be re-initiated and the Indicator Gauge will display the "Regen Failed” screen as shown.

Unsuccessful Cleaning Event

If there is an unsuccessful cleaning event, The SCR icon will show on the display gauge. Possible causes of an Unsuccessful Cleaning Event are:

- Engine is not warmed up
- DEF tank is frozen
- Machine functions operated during cleaning event in progress
- Other engine faults are active

The Indicator Gauge will display the “Regen Failed” screen as shown. If the cleaning event has failed, it must be run again.

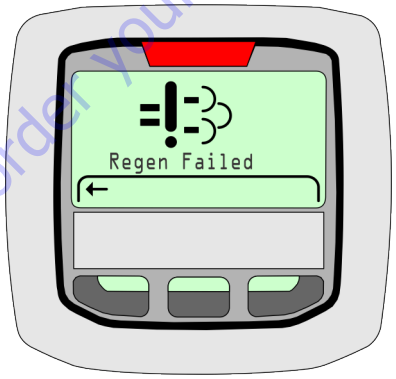


Table 3-8. Maintenance Standstill Cleaning

Standstill Cleaning Levels		Machine Hours Since Last Cleaning	System Distress Light	SCR Cleaning Light	Derate	Comments
0	Normal Operation	0-500 500-1000	--	--	None	Between 500 and 1000 hours, cleaning cycle can be initiated with JLG analyzer.
1	Standstill Required	1000-1100	--	 0.5 Hz	None	Engine coolant temperature must be >40°C and DEF should be thawed before cleaning can be initiated.
2	Warning Level	1100-1125	 Continuous	 0.5 Hz	Machine placed in Creep and DTC active	
3	Shut Off Level	>1125	 Blinking	 3 Hz	Idle Lock. Boom Functions Locked Out and Trapped in Transport.	Contact Deutz Dealer.

Table 3-9. Cleaning When Crystallization is Detected During SCR

Crystallization Levels	Machine Hours after Crystallization	Cleaning Initiation Methods	System Distress Light	SCR Cleaning Light	Derate
Normal Operation	No Crystallization Detected	--	--	--	None
Crystallization Detected Standstill Required	0-5	SCR Switch or Analyzer	--	 0.5 Hz	None
Crystallization Detected Warning Level 1	5-600	SCR Switch or Analyzer	 Continuous	 0.5 Hz	Machine placed in Creep and DTC active
Crystallization Detected Shut Off Level	>600	Contact Deutz Dealer.	 Blinking	 3 Hz	Idle Lock. Boom Functions Locked Out and Trapped in Transport.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523927	3	40	7-3-3	UB5; Short circuit to battery error of actuator relay 5. Short circuit to battery error of actuator relay 5. Components on Pin A04, A05 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A04, A05 Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram.	Check wiring harness and connected loads on pins A04, A05.
523924	4	42	1-6-7	UB2; Short circuit to ground actuator relay 2. Components on Pin A01, K74 and K91 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A01, K74 and K91. Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram.	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pins A04, A05. If error is still present, exchange ECU.
523925	4	43	7-3-1	Short circuit to ground actuator relay 3 Components on Pin A88 and K57 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A88 and K57. Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram .	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.
523926	4	44	7-3-2	UB4; Short circuit to ground actuator relay 4. Components on Pin A90 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A90 Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram.	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.
168	3	45	3-1-8	Battery voltage: the voltage measured by ECU is out of the target range, system reaction is initiated.	Battery voltage above warning threshold (~38,9Volt), Short cut to battery possible.	Check wiring harness and connected alternator.
168	4	46	3-1-8	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.
168	2	47	3-1-8	Battery voltage: the voltage measured by ECU is out of the target range, system reaction is initiated.	If Batteryvoltage (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.
523912	4	73	7-2-2	@engines < 4l: Throttle valve error, Open Load or Short cut to Battery, blocked valve or wrong control signal for valve. @ engines with Burner T4i: Pressure Sensor error after valve (DV2), lower limit reached.	The sensed raw voltage value is below the minimum threshold.	The sensed raw voltage value DPM_uRawBrnDVDsP is above the minimum threshold DPM_SRCBrnDVDsP.uMin_C @CRT < 4l: check throttle valve @engines with Burner T4i: check back-pressure valve.
639	14	84	2-7-1	CAN bus 0: the ECU is not allowed to send messages, because the status "BusOff" is detected.	CAN Bus Off error; CAN 0 (Customer CAN).	Threshold for error detection is an internal ECU threshold. Bus Off 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).
1231	14	85	2-7-1	CAN bus 1: the ECU is not allowed to send messages, because the status "BusOff" is detected Warning, no diagnostic with SERDIA2010 possible.	CAN Bus Off error; CAN 1 (Diagnostic CAN)	Threshold for error detection is an internal ECU threshold. Bus Off bit for CAN B node is set. Check wiring of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it, check resistance in CAN lines (120 Ohm).
1235	14	86	2-7-1	CAN bus 2: the ECU is not allowed to send messages, because the status "BusOff" is detected. Warning, depends on engine, EAT.	CAN Bus Off 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).

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
102	2	89	2-2-3	Charge air pressure messured by sensor is above the shut off 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 necessery.!! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
110	1	93	2-2-5	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range.	Suspected components: wiring harness, coolant temperature sensor.	Check wiring harness and connected Coolant Temp Sens.
110	3	96	2-2-5	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range (signal range check high)	Short cut to power supply or open load.	Check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
110	4	97	2-2-5	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range (signal range check low)	Voltage Surveillance has found shortcut to Ground at Coolant Temperatur 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.
110	0	98	2-3-2	Coolant temperature: the coolant temperature calculated by ECU is above the target range; the ECU activates a system reaction	Cooling temperature too high. Coolant temperature above warning threshold	Clean radiator, check fan drive, check coolant level, check cooling system in general, check thermostat function, check water pump
110	0	99	2-3-2	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
111	1	101	2-3-5	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
3224	9	130	5-9-7	Timeout Error of CAN-Receive-Frame AT1IG-1Vol; NOX sensor (SCR-system upstream cat; DPF-system downstream cat)	Failure of the CAN Bus message	NOX sensor and sensor connection check
3234	2	138	1-1-4	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
3234	9	139	1-1-7	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
523942	9	141	7-6-7	Timeout Error (BAM to BAM) for CAN-Receive-Frame AT1OGCVol2 information, Calibration message 1 of the after catalyst NOx sensor has failed. Factors & Sensorcalibration for NOX Sensor (SCR-system downstream cat, DPF-system downstream cat)	Defective Nox sensor, faulty parameterization.	NOX downstream sensor and sensor connection check.
523943	9	142	7-6-7	Timeout Error (PCK2PCK) for CAN-Receive-Frame AT1OGCVol2 information; factors & Sensorcalibration for NOX Sensor (SCR-system downstream cat; DPF-system downstream cat)	The fault is detected when a timeout error in packet 2 of NOxSenVol2Rx frame occurs.	NOX downstream sensor and sensor connection check
523211	9	164	3-3-1	Timeout Error of CAN-Receive-Frame EBC1	not used	not used
523704	12	167	6-1-5	Timeout Error of CAN-Transmit-Frame EEC3	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer nodes

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523935	12	168	7-6-3	Timeout Error of CAN-Transmit-Frame EEC3V0L1; Engine send messages	Fault is detected if a TimeOut of the EEC3V0L1 frame has occured.	Check wiring harness and customer nodes
523936	12	169	7-6-4	Timeout Error of CAN-Transmit-Frame EEC3V0L2; Engine send messages	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer nodes
523240	9	179	5-2-7	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.
523216	9	198	3-3-7	Timeout Error of CAN-Receive-Frame PrHtEnCmd; pre-heat command, engine command	Timeout Error (Missing CAN Bus message)	Check wiring harness and customer devices
523766	9	281	1-1-8	Timeout Error of CAN-Receive-Frame Active TSC1AE	not used	not used
523769	9	284	1-1-9		not used	No detail informationen!
523776	9	291	1-1-9	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 sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range.
523777	9	292	1-1-9	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
523778	9	293	1-1-8	Timeout Error of CAN-Receive-Frame TSC1TR; control signal	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
523779	9	294	1-1-8	Message TSC1-TR 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
523605	9	300	1-1-8		No detail informationen!	No detail informationen!
523982	1	361	7-3-7	Powerstage diagnosis disabled; Indicating that battery voltage is to low.	Powerstage diagnostic can be deactivated due to too low battery voltage.	Check wiring, check alternator, check cables and repair or replace if necessary.
630	12	376	2-8-1	Internal hardware monitoring: the ECU finds an error during the access to its EEPROM memory or works with an alternative value	Section could not be erased	Threshold for error detection is an internal ECU threshold. There is no healing possible for the error. In the every new initialization phase, the debounce level is set to zero. If not programmed, EEPROM is defect --> ECU is defect, reprogramm ECU and if necessary replace it.
630	12	377	2-8-1	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	Threshold for error detection is an internal ECU threshold. There is no healing possible for the error. In the every new initialization phase, the debounce level is set to zero. If not programmed, EEPROM is defect --> ECU is defect, reprogramm ECU and if necessary replace it
630	12	378	2-8-1	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, reprogramm ECU and if necessary replace it.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
411	4	381	6-9-3	Range check cannot be done or interrupted.	Defect EGR differential Pressure sensor or defect wiring	Check wiring harness and connected EGR. !!If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
523612	12	387	5-5-5	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	Threshold for error detection is an internal ECU threshold. Caution ! Sequence error, check error memory for other errors.
190	0	389	2-1-4	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Overspeed monitoring during 1 level of FOC (Failure overrun condition) if engine speed was over Limit.	Check powertrain settings regarding overspeed
190	11	390	2-1-4	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Overspeed monitoring during 2 level of FOC (Failure overrun condition) if engine speed was over limit.	Check powertrain settings regarding overspeed
190	14	391	2-1-4	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 limit	Check powertrain settings regarding overspeed
171	3	417	3-1-2	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.
190	8	419	2-1-2	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.
190	2	421	2-1-3	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 postition. Check Camshaft and Crankshaft senor or wiring.
190	8	422	2-1-2	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.
190	12	423	2-1-2	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 postition or wiring.
97	3	464	2-2-8	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
97	4	465	2-2-8	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range.	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range.	Check wiring, sensor, ECU
94	3	472	2-1-6	Low fuel pressure sensor: the voltage of sensor measured by ECU is out of the target range	cable break or short circuit, sensor defective, connection cable damaged Short cut to battery or open loop	Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
94	4	473	2-1-6	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
94	1	474	2-1-6	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.
676	11	543	2-6-3	Cold start device relay error	Relay defect or wire harness problem	Threshold for error detection is an internal ECU threshold. check wire harness, replace relay
676	11	544	2-6-3	Cold start aid relay open load	Relay or wire harness	Threshold for error detection is an internal threshold. check wire harness, replace relay
729	5	545	2-6-3	The cold start aid relay is according to wiring faulty.	Relay defect or wire harness problem	Threshold for error detection is an internal ECU threshold. Electrical error, check wires
729	3	549	2-6-3	Intake Air Heater Device; Short circuit to battery	wiring to the intake air heater device is faulty.	Threshold for error detection is an internal ECU threshold. Electrical error, Check wiring to the intake air heater device.
729	4	551	2-6-3	Air intake heater; Short circuit to ground error for powerstage on CJ945.	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.
523895	13	559	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 1 (in firing order).	Missing or wrong injector adjustment value for cyl. 1.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA). Use SERDIA UseCase to check it.
523896	13	560	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 2 (in firing order).	Missing or wrong injector adjustment value for cyl. 2	Threshold for error detection is an internal ECU threshold. check dataset and flash correct injector adjustement value (IMA). Use SERDIA UseCase to check it.
523897	13	561	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 3 (in firing order).	Missing or wrong parametrisation of injector adjustment cyl. 3.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA). Use SERDIA UseCase to check it.
523900	13	564	1-5-8	Missing or wrong injector adjustment value programming (IMA) injector 6 (in firing order).	Missing or wrong injector adjustment value for cyl. 6.	Threshold for error detection is an internal ECU threshold. Check correct injector adjustment value (IMA). Use SERDIA UseCase to check it.
523350	4	565	1-5-1	Injector cylinder bank 1: the current drop measured by ECU is above the target range	Short circuit injection bank 1 (all injectors of this bank can be affected)	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
523352	4	566	1-5-2	Injector cylinder bank 2: the current drop measured by ECU is above the target range	Short circuit injection bank 2 (all injectors of this bank can be affected)	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
523354	12	567	1-5-3	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 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
651	5	568	1-5-4	Injector cyl. 1: interruption of electrical connection	Interruption of electronic connection Injector cyl. 1	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
652	5	569	1-5-5	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.
653	5	570	1-5-6	Injector cyl. 3: interruption of electrical connection	Interruption of electronic connection Injector cyl. 3	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
654	5	571	1-6-1	Injector cyl. 4: interruption of electrical connection	Interruption of electronic connection Injector cyl. 4	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
655	5	572	1-6-2	Injector cyl. 5: interruption of electrical connection	Interruption of electronic connection Injector cyl. 5	Threshold for error detection is an internal ECU threshold. Check wiring harness, injectors and if necessary repair/replace it.
656	5	573	1-6-3	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.
651	3	580	1-5-4	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.
652	3	581	1-5-5	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.
653	3	582	1-5-6	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.
654	3	583	1-6-1	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 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.
655	3	584	1-6-2	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 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.
656	3	585	1-6-3	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 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.
523615	5	592	1-3-5	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.
523615	3	594	1-3-5	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523615	4	595	1-3-5	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to ground high side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	3	596	1-3-5	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to battery low side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	4	597	1-3-5	Fuel metering unit: the current drain measured by ECU is above the target range	short circuit to ground low side	Threshold for error detection is an internal ECU threshold. Check wiring harness and metering unit if necessary repair/replace it.
523615	4	599	1-3-5	Metering unit, short circuit to ground	not used	not used
523612	12	612	5-5-5	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_mpis higher than MoCADC_uNTPMax_C).	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	613	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Analysis of test voltage (Value is out of the target -> ECU internal error)	Threshold for error detection is an internal ECU threshold. Check wiring, check connected sensors actuators. If error is still present, exchange ECU.
523612	12	614	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Analysis of the ratiometric correction (Value is out of the target -> ECU internal error)	Threshold for error detection is an internal ECU threshold. Check wiring, check connected sensors actuators. If error is still present, exchange ECU.
523612	12	618	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Too less bytes received by monitoring memory from CPU as response(ECU internal error). Loss of synchronization sending bytes to the monitoring memory from CPU	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	619	5-5-5	Injection system,electrical error injectors	Suspected components: Injector ECU wiring harness/connector	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	620	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error trying to set MM Response time(ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	621	5-5-5	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.
523612	12	623	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in the check of the shut-off path test of the under voltage detection(ECU internal error). Diagnostic fault check to report the error in undervoltage monitoring	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	624	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Error in the check of the shut-off path of the monitoring module(ECU internal error).	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	625	5-5-5	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory	Time out error trying to set or cancelling the alarm task(ECU internal error). Failure setting the alarm task period	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	630	5-5-5	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523612	12	631	5-5-5	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.
523612	12	632	5-5-5	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.
523612	12	633	5-5-5	Error in the plausibility of the energising times of the zero fuel quantity calibration	The energising times of the zero fuel quantity calibration ZFC is out of the target. (-> ECU internal error)	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	634	5-5-5	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.
523612	12	635	5-5-5	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.
523612	12	636	5-5-5	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.
523612	12	637	5-5-5	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction	Error in the plausibility of current energising time with maximum permitted energising time. Diagnostic fault check to report the error due to Over Run	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	638	5-5-5	Error in the plausibility of the wave correction parts	Error in the plausibility of the wave correction parts	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	639	5-5-5	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.
523612	12	640	5-5-5	Error in the torque comparison between permissible engine torque and current actual torque	Error in the torque comparison between the permissible inner engine torque and the current plausible actual torque.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	12	641	5-5-5	Diagnosis of curr path limitation forced by ECU monitoring level 2	The torque comparison is not plausible with the torque monitoring.	Threshold for error detection is an internal ECU threshold. If error is still present, exchange ECU.
523612	3	644	5-5-5	supply voltage to high	not used	Threshold for error detection is an internal ECU threshold.
523612	4	646	5-5-5	supply voltage to low	not used	Threshold for error detection is an internal ECU threshold.
523612	12	714	5-5-5	Error report "WDA wire is active" due to a defect query/response communication	Error detection by monitoring module	Threshold for error detection is an internal ECU threshold. Software reset.
523612	12	715	5-5-5	Error report "ABE wire is active" due to undervoltage detection	The reason is that a slow dropping of the vehicle electrical system voltage (defective autobattery) should not lead the ECU OCWDA's diagnose to enter an error in the fault memory due to an undervoltage recognition.	Threshold for error detection is an internal ECU threshold. Software reset.
523612	12	716	5-5-5	Error report "ABE wire is active" due to overvoltage detection	If the ABE/WDA powerstage shut-off is active due to an overvoltage detection.	Threshold for error detection is an internal ECU threshold. software reset.
523612	12	717	5-5-5	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
100	3	732	2-2-4	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.
100	4	733	2-2-4	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
100	0	735	2-3-1	High oil pressure; shut off threshold exceeded	not used	not used
100	1	736	2-3-1	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
100	1	737	2-3-1	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.
107	3	750	1-3-6	short circuit to battery or cable break	No detail informationen!	If the signal PAirFltD_uRaw is below the applicatable threshold PAirFltD_uSRCMax_C, a signal range violation is reset after the healing debouncing. No detail informationen!
107	0	751	1-3-6	short circuit to ground	No detail informationen!	If the signal PAirFltD_uRaw is above the applicatable threshold PAirFltD_uSRCMin_C, a signal range violation is reset after the healing debouncing No detail informationen!
107	0	752	1-3-6	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, 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
102	2	772	2-2-3	Deviation between sensed intake manifold pressure is not plausible compared to environment pressure. Which sensor is not okay can not be said.	deviation between ambient pressure sensor and charge air pressure sensor at not running engine to high	1) Exchange boost pressure sensor 2) Exchange ECU
102	1	774	2-2-3	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.
102	3	776	2-2-3	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.
102	4	777	2-2-3	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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
411	3	795	6-9-3	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.
411	4	796	6-9-3	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.
3253	2	807	6-9-2	The difference pressure sensor value exceeds an applicable not plausible threshold.	sensed differential pressure across DPF > limit	Check tubes from exhaust line to sensor => course strictly rising Could sensor be frozen? Cold enough? => Warm-up engine and check whether failure heals (needs ignition cycle) Water in sensor or lines to sensor? => dry & Re-Check system Exchange differental pressure sensor. Trigger Conditions: If the differential pressure sensor over the DOC + DPF system detects a pressure difference higher than 18hPa AND ignition is off for more than 2s AND engine is not in cranking this diagnostic will detect an error.
3251	0	809	6-9-2	The difference pressure sensor value exceeds an applicable upper shutoff limit	sensensed differential pressure across DPF > high limit f(exhaust volume flow)	Check soot load level. DPF Check DPF condition. Check DPF differential sensor . If still allowed run stand-still If failure healed after stand-still check engine regarding too high soot emissions at engine out: Check complete air path of engine => Turbocharger, throttle, EGR-Valve, EGR-Cooler, all pipes. If stand-still is not allowed to run check engine regarding too high soot emissions at engine out Replace DPF! ! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
3251	0	810	6-9-2	The difference pressure sensor value exceeds an applicable upper warning threshold.	sensed differential pressure across DPF > warning high limit f(exhaust volume flow)	Check soot load level. Check DPF condition. Check DPF differential sensor. If still allowed run stand-still If failure healed after stand-still check engine regarding too high soot emissions at engine out: Check complete air path of engine => Turbocharger, throttle, EGR-Valve, EGR-Cooler, all pipes If stand-still is not allowed to run check engine regarding too high soot emissions at engine out Replace DPF !! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3251	1	812	6-9-2	The difference pressure sensor value exceeds an applicable lower shutoff threshold.	sensed differential pressure across DPF < shut-off low limit f(exhaust volume flow)	Check tubes from exhaust line to DPF differential sensor Check flange between DOC & DPF for leakage Check Exhaust pipe upstream DPF for leakage Check engine exhaust mass flow / exhaust volume flow Visual inspection of dismounted DPF exchange DPF differential sensor exchange DPF
3251	1	813	6-9-2	The difference pressure sensor value drops below an applicable warning threshold.	sensed differential pressure across DPF < warning low limit f(exhaust volume flow)	Check tubes from exhaust line to DPF differential sensor Check flange between DOC & DPF for leakage Check Exhaust pipe upstream DPF for leakage Check engine exhaust mass flow / exhaust volume flow Visual inspection of dismounted DPF exchange DPF differential sensor exchange DPF
3253	3	814	6-9-2	Electrical error differential pressure B58 (DPF) The measured voltage is above the preset upper limit value.	sensor voltage > high limit	Check wiring (terminal diagram engine side). Exchange differential sensor DPF.
3253	4	815	6-9-2	Electrical error differential pressure (DPF) The measured voltage is below the set lower limit value. Short circuit to ground	sensor voltage < low limit	Check wiring Exchange differential sensor DPF
523009	9	825	2-5-3	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.
523470	2	826	1-4-6	The pressure relief valve (PRV) has been opened due to excessive pressure.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Threshold for error detection is an internal ECU threshold. Reset the fault and at reappearance check injection system.
523470	2	827	1-4-6	The pressure relief valve (PRV) has been opened due to excessive pressure.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Threshold for error detection is an internal ECU threshold. Reset the fault and at reappearance check injection system.
523470	12	828	1-4-6	Rail pressure relief valve: is open. Shutoff conditions.	Shut Off after PRV Open	Threshold for error detection is an internal ECU threshold. Check PRV opening counter and if necessary replace PRV, check rail-pressure sensor for plausibility and if necessary replace it, check FCU and if necessary replace it.
523470	12	829	1-4-6	Rail pressure relief valve is open. Warning conditions.	Warning PRV open	Threshold for error detection is an internal ECU threshold. Check PRV opening counter and if necessary replace PRV, check rail-pressure sensor for plausibility and if necessary replace it, check FCU and if necessary replace it.
523470	14	830	1-4-6	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.
523470	11	831	1-4-6	Rail pressure relief valve can not be opened due to the rail pressure.	Rail pressure out of tolerance range (PRV can not be opened by a pressure peak in this operating point)	Threshold for error detection is an internal ECU threshold. Check rail pressure, check rail pressure sensor for plausibility, check FCU.
523470	11	832	1-4-6	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523009	10	833	2-5-3	The pressure relief valve (PRV) has reached the allowed opening time.	Rail pressure has exceeded the trigger threshold of the pressure limiting valve.	Replace pressure relief valve (PRV) and reset fault with Serdia.
1176	0	847	1-3-9	Pressure above upper limit. Pressure sensor upstream turbine, Physical Range Check high. The physical value is above the set threshold.	sensed pressure upstream turbine > limit	Check function of waste gate => tube connected / actuator okay Check exhaust pipe blockage Check for crystallisation downstream of DEF injector Check EGR-Valve functionality Check rail pressure & injectors: injector stuck? Check free rotation of turbocharger
1176	3	849	1-4-1	Signal range check (SRC) with the pressure sensor has exceeded the upper limit of the voltage signal.	Short cut to battery. Damaged Turbine upstream sensor.	Check cabling, check turbine upstream pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
1176	4	850	1-4-1	In signal range check (SRC) has the voltage signal of the pressure sensor the lower limit below.	Short cut to ground. Damagedturbine upstream pressure sensor.	Check cabling, check turbine upstream pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
523613	0	856	1-3-4	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	Pressure governor deviation exceeds the limiting value based on the engine speed.	Threshold for error detection is an internal ECU threshold. (A) Check for leakage (B) Check fuel-primary pressure (C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it
523613	0	857	1-3-4	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	maximum positive deviation of rail pressure exceeded concerning set flow of fuel.	Threshold for error detection is an internal ECU threshold. (A) Check for leakage (B) Check fuel-primary pressure (C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it
523613	0	858	1-3-4	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed.	leakage is detected based on fuel quantity balance.	Threshold for error detection is an internal ECU threshold. (A) Check backflow pressure (B) Check Injector function with SerDia (C) Change components (metering unit, injector) if necessary
523613	0	859	1-3-4	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded.	Threshold for error detection is an internal ECU threshold. (A) Check backflow pressure (B) Check Injector function with SerDia (C) Change components (metering unit, injector) if necessary
523613	1	861	1-3-4	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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523613	0	862	1-3-4	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
523613	2	864	1-3-4	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
523470	7	876	1-4-6	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
157	3	877	1-4-7	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range.	Short cut to battery. Damaged rail pressure sensor.	Check cabling, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
157	4	878	1-4-7	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range.	Short cut to ground. 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.
523720	8	925	1-4-8	Supply module heater: Duration of switch on is too long.	Duty cycle for temperature readout from supply module heater to the control unit is out of range; Supply modul defect, fault in the wiring.	When the received supply module heater temperature duty cycle SCR_rSMT is out of the failurerange (SCR_rSMFailMax_C < SCR_rSMHtrT < SCR_rSMFailMin_C) Supply module check and replace if necessary. Check the wiring.
523720	8	926	1-4-8	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.
523721	11	927	6-8-9	Supply module heater: temperature measurement not available.	Duty cycle for temperature readout from supply module heater to the control unit is not available. Supply modul defect, fault in the wiring.	Threshold for detection is an internal ECU threshold. No erasing in the current driving cycle. Supply module check and replace if necessary. Check the wiring.
523722	8	928	6-9-1	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 of150ms to 250ms Supply module check and replace if necessary. Check the wiring.
523722	8	929	6-9-1	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.
523721	8	930	6-8-9	Supply module heater: Dutycycle timing over error threshold.	Duty cycle for temperature readout from supply module to the control unit is out of range. Supply modul defect, fault in the wiring.	Supply module check and replace if necessary. Check the wiring.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523721	8	931	6-8-9	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_rSMTVld-Max_C), OR in the failure range (SCR_rSM-FailMin_C <= SCR_rSMT <= SCR_rSMFailMax_C) Supply module check and replace if necessary. Check wiring.
29	3	932	1-2-6	Analog accelerator pedal 2 (hand pedal): the voltage measured by ECU is out of the target range.	"Sensor defect. Short cut to battery or open loop."	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.
91	3	935	2-2-6	Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal	Sensor defect. Short cut to battery or open loop.	Check cabling, check accelerator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it. If the signal is below the applicatable threshold APP_uRaw1SRCHigh_C, the signal range violation is reset after the healing debouncing.
29	4	937	1-2-6	Analog accelerator pedal 2 (hand pedal): the voltage measured by ECU is out of the target range.	Sensor defect. Short circuit to Ground.	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.
91	4	940	2-2-6	Analog accelerator pedal 1: the voltage measured by ECU is out of the target range.	Sensor defect. 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
3532	3	943	1-2-7	DEF tank level sensor: the voltage measured by ECU is out of the target range.	Short circuit to battery, broken wiring	DEF tank level sensor check, wiring check The sensed raw voltage value SCR_uRawUTnkLvl is below SCR_SRCUTnkLvl.uMax_C
3532	4	945	1-2-7	DEF tank level sensor: the voltage measured by ECU is out of the target range.	Short circuit to ground	The sensed raw voltage value SCR_uRawUTnkLvl is above SCR_SR-CUTnkLvl.uMin_C DEF tank level sensor check, wiring check

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
1079	13	946	2-8-2	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/BrnFuelPressAfterDV2Pin K19: Fan Speed Sensor Pin A21: LDF6T / OilPress / LowFuelPressPin A17: Rail Pressure Sensor Suspected components EDC17cv54 Pin A21: CAM speedPin 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 speedPin K44: DEF press / Air FilterDiffPress Pin A24: LDF6T / OilPress / LowFuelPressPin K43: second footpedal Pin A09: Delta Press Venturi	Check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it, if error is not removable, change ECU.
1080	13	947	2-8-2	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 K18: Pressure DS DPF 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.
523601	13	948	2-8-2	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.
677	3	956	5-1-2	Start relay (high side power stage): the current drop measured by ECU is above the target range.	Short cut HighSide-output to battery.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	4	957	5-1-2	Start relay (high side power stage): the current drain measured by ECU is above the target range.	Shortcut HighSide-output to ground.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	5	958	5-1-2	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
677	3	960	5-1-2	Start relay (low side power stage): the current drain measured by ECU is above the target range.	Shortcut LowSide-Output to battery.	Threshold for error detection is an internal ECU threshold. Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it.
677	4	961	5-1-2	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.
523612	14	973	5-5-5	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.
523612	14	974	5-5-5	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.
523612	14	975	5-5-5	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.
91	11	976	2-2-6	Diagnostic fault check of synchronism of single potentiometer and Low idle switch(LIS.	Measured voltage of accelerator pedal 1 is out of plausible range.	Threshold for error detection is an internal ECU threshold. Check cabling, check accelerator pedal and pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it. When the PWM period APP_tiPWMPer is in between APP_tiSRCLoPWMPer_C and APP_tiSRCHiPWMPer_C.
29	2	978	1-2-6	Diagnostic fault check of synchronism of hand throttle and Low idle switch (LIS).	Plausibility error between sensor and idle switch	Threshold for error detection is an internal ECU threshold. The accelerator pedal must have detected full load and idle plausibility at least once.
523550	12	980	5-1-5	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.
105	3	994	1-2-8	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.
105	4	995	1-2-8	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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
105	0	996	2-3-3	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. !! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
105	0	997	2-3-3	Charge air temperature downstream calculated by ECU is over the shut off threshold. The ECU activates a system reaction.	Charge air temperature (downstream) over the shut off threshold.	Check CAC system and clean it. Check fan functionality. Check cooling perfomance with temperature measurement. !! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
412	3	1007	6-8-2	EGR downstream temperature sensor: the voltage of sensor measured by ECU is out of the target range.	Short circuit to battery. sensor voltage > limit	Check wiring harness to TEGR-sensor. Exchange TEGR-sensor.
412	4	1008	6-8-2	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.
523960	0	1011	7-7-1	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 !! If an error occurs, always check the delta P sensor and the Venturi tube for damage or contamination because problems at this point can lead to this result error.!!
5763	6	1014	5-9-4	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.
520521	5	1015	5-9-4	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.
5763	7	1016	5-9-4	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".
5763	6	1022	5-9-4	Actuator error EGR-Valve; signal range check high, measured current by ECU is over target	Short circuit to battery or open circuit.	Check cabling, actuator defect, check actuator and if necessary replace it, check connection cable and if necessary repair or replace it.
5763	5	1023	5-9-4	Actuator error EGR-Valve; signal range check low, measured current is below target	Short circuit to ground.	Check wiring, check cabels and repair or replace if necessary, check actuator with SERDIA 2010 test for EGR and if necessary replace it.
5763	3	1024	5-9-4	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.

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
5763	4	1025	5-9-4	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.
4769	2	1026	6-8-4	Static plausibility check: The exhaust temperature value from the sensor after DOC, the exhaust temperature value from the sensor before DOC, the temperature value from the sensor before SCR-Cat-Cat, the environment temperature and the coolant engine temperature their ratios to each other exceed their related thresholds. (difference temprature between sensor befor DOC and sensor after DOC > threshold 1 difference temperature between sensor after DOC and sensor before SCR >threshold 2 difference temperature between sensor befor DOC and sensor befor SCR < threshold 3 difference temperature between sensor befor DOC and sensor environment < threshold 4 difference temperature betweenengine temperature and environment < threshold 5) Dynamic plausibility check with exhaust temperature sensor value before DOC: The difference between the exhaust temperature sensor befor- and after DOC is large	static plausibility check: sensed temperature downstream DOC differ too much from sensed temperature upstream DOC or sensed temperature upstream SCR catalyst=> check is done if difference temperature of EngDa_tEng- Air_-tAFS < limit & Exh_tOxiCatUs - SCR_tAdapUCatUsT < Limit& Exh_tOxiCatUs-Air_tAFS < Limit & SCR_stWrmUpLstDrvCyc = 1 & TOxiCatDs_stStatChkEna_mp = 1 in words: engine cold start and EAT-system had reached SCR-dosing-state at least once in the last driving cycle before that start or dynamic plausibility check against environmental temperature: engine running and sensed temperature downstream DOC > ambient temperature + offset TOxiCatDs_tDsEnvOffsThres_C or dynamic plausibility check of temperature difference across DOC: Exh_tSensTOxiCatDs-Exh_tOxiCatUs > limit, separate limits for nomal mode, heatmode or Stand-still. Engine must be in operation. Which conditions sets the D	Check ambient temaperature => value plausible? T downstream DOC sensor mounted within exhaust line? T downstream DOC sensor physically mounted in correct position downstream DOC? (not upstream SCR or upstream DOC?) Other T-sensors show plausible values? No errors on them? Check temperatur difference across DOC by Exh_tSensOxiCatDs-Exh_tSensOxiCatUs: < 100 K? Check exhaust pipe downstream turbo charger for oil? 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, Piping for leakage and correct function check injectors: is an injector got stuck?
4766	0	1029	6-8-4	The exhaust temperature value from the sensor after DOC is above an applicable upper shutoff threshold	Sensed temperature downstream DOC > threshold	Check temperature difference across DOC by Exh_tSensOxiCatDs-Exh_tSensOxiCatUs: < 100 K? Check exhaust pipe downstream turbo charger for oil? 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 injectors: is an injector got stuck? Exchange temperature sensor downstream DOC
4766	0	1030	6-8-4	The exhaust temperature value from the sensor after DOC is above an applicable upper warning threshold	Suspected Components: Sensor after DOC defect Problems in the exhaust path before DOC DOC is defect	Check temperature sensor after DOC Check the exhaust path before DOC Check the DOC
4769	3	1034	6-8-4	Sensor error exhaust gas temperature downstream (DOC); signal range check high	The sensed raw voltage value Exh_uRawTOxiCatDs > Exh_SRCTOxiCatDs.uMax_C Shortcut to battery	Check wiring harness to temperature sensor downstream DOC Exchangetemperature sensor downstream DOC
4769	4	1035	6-8-4	Sensor error exhaust gas temperature downstream (DOC); signal range check low	The sensed raw voltage value Exh_uRawTOxiCatDs < Exh_SRCTOxiCatDs.uMin_C Shortcut to ground	Check wiring harness to temperature sensor downstream DOC Exchangetemperature sensor downstream DOC

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4768	2	1036	6-8-3	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 tempe	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?
4765	0	1039	6-8-3	The exhaust temperature value from the sensor befor DOC is above an applicable upper shutoff threshold TOxiCatUs_tShOff-ThresHiAds_C = Threshold 1 in Normal and Heatmodes (TOxiCatUs_tShOff-ThresHiRgn_C = Threshold 2 in stand-still)	sensed temperature upstream DOC > shut-off limit	Check air path of engine: EGR-Valve, Intake-Throttle, Check Turbocharger and Piping each for leakage and correct function Check injectors: is an injector got stuck? Exchange temperature sensor upstream DOC
4765	0	1040	6-8-3	The exhaust temperature value from the sensor befor DOC is above an applicable upper warning threshold TOxiCatUs_tWarn-ThresHi_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
4768	3	1044	6-8-3	Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	The sensed raw voltage value Exh_uRawTOxi-CatUs is above Exh_SRCTOxiCatUs.uMax_C Shortcut to battery	Check wiring harness to temperature sensor upstream DOC Exchangetemperature sensor upstream DOC
4768	4	1045	6-8-3	Oxidation catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	The sensed raw voltage value Exh_uRawTOxi-CatUs is below Exh_SRCTOxiCatUs.uMin_C Shortcut to ground	Check wiring harness to temperature sensor upstream DOC Exchangetemperature sensor upstream DOC

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4360	0	1069	6-6-8	The filtered DEF 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
4361	3	1072	6-6-8	DEF catalyst upstream temperature sensor: the voltage of sensor measured by ECU is out of the target range	Voltage of temperature sensor upstream SCR catalyst > maximum limit Short circuit to battery	Check sensor Check wiring Replace UCatUsT-sensor
4361	4	1073	6-6-8	DEF 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
3361	6	1075	6-7-7	DEF dosing valve: the currentmeasured value by ECU at the end of the injection is too high	Fault in the wiriing Defect DEF dosing injection valve	Check wiring Check the DEF dosing injection valve
3361	3	1077	6-7-7	DEF dosing valve (low side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Threshold for error detection is an internal ECU threshold See substitute function Check the wiring
3361	3	1078	6-7-7	DEF dosing valve (high side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Threshold for error detection is an internal ECU threshold Check the wiring
3361	4	1079	6-7-7	Urea dosing valve (low side power stage): the current drain measured by ECU is above the target range	Fault in the wiring	Check the wiring
3361	4	1080	6-7-7	DEF 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
4345	5	1090	6-7-4	DEF backflow line heater: the current drain measured by ECU is above the target range	Open load Broken wiring, broken heating element in backflow line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4345	3	1092	6-7-4	DEF backflow line heater: the current drain measured by ECU is above the target range	Shortcut to battery Short cut to battery or broken wiring, broken heating element in backflow line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4345	4	1093	6-7-4	DEF backflow line heater: the current drain measured by ECU is above the target range	Shortcut to ground Short cut to ground or broken wiring, broken heating element in backflow line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
4343	5	1094	6-7-3	DEF pressure line heater: the current drain measured by ECU is above the target range	Open load Broken wiring, broken heating element in pressure line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4343	3	1096	6-7-3	DEF pressure line heater: the current drain measured by ECU is above the target range	shortcut to battery broken heating element in pressure line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
4343	4	1097	6-7-3	DEF pressure line heater:the current drain measured by ECU is above the target range	Shortcut to ground Short cut to ground or broken wiring, broken heating element in pressure line If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check heating element
523718	5	1098	6-7-6	tank heating valve: the current drain measured by ECU is above the target range	Open load Broken wiring, broken Valve If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Test tank heating valve Check cabling, if necessary replace relay.
523718	3	1100	6-7-6	DEF heater relay: the current drain measured by ECU is above the target range	Shortcut to battery Broken wiring, broken relay If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check SCR main relay
523718	4	1101	6-7-6	DEF heater relay: the current drain measured by ECU is above the target range	Shortcut to ground Broken wiring, broken relay If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check SCR main relay
4341	5	1102	6-7-5	DEF heater supply line: the current drain measured by ECU is above the target range	Open load Broken wiring If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
4341	3	1104	6-7-5	DEF heater supply line: the current drain measured by ECU is above the target range	Shortcut to battery Broken wiring If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
4341	4	1105	6-7-5	DEF heater supply line: the current drain measured by ECU is above the target range	short cut to ground Broken wiring If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wire harness Check supply line
523719	5	1106	6-7-2	DEF supply module heater: the current drain measured by ECU is above the target range	Open load Broken wiring Heating element in supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check cabling, if necessary replace supply module
523719	3	1108	6-7-2	DEF supply module heater: the current drain measured by ECU is above the target range	Short circuit to battery Broken wiring Heating element in supply module defect If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check cabling, if necessary replace supply module

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
523719	4	1109	6-7-2	DEF supply module heater: the current drain measured by ECU is above the target range	Shortcut to ground Broken wiring Heating element in supply module defect If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check cabling, if necessary replace supply module
4366	5	1110	6-7-1	DEF tank heating valve: the current drain measured by ECU is above the target range	Open load Broken wiring Urea tank heating valve defect If this error detected during the heating phase KWP 1089 can be a result error	Threshold for error detection is an internal ECU threshold Check wiring Check urea tank heating valve
523632	11	1117	6-6-6	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
4375	5	1118	6-6-6	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
4375	3	1120	6-6-6	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
523632	3	1127	6-6-5	Urea supply module pressure sensor: the current drain measured by ECU is above the target range	Shortcut to battery Broken wiring Pressure sensor in DEF supply module defect	Check wiring Check pressure sensor in urea supply module
523632	4	1128	6-6-5	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 DEF supply module
4376	5	1129	6-6-7	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 DEF supply module defect	Threshold for error detection is an internal ECU threshold Check wiring Check urea supply modul

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3031	0	1135	6-6-9	DEF temperature in DEF tank is to high.The DEF 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-messageof 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
3031	1	1136	6-6-9	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_dRx-SCR1Byt1 (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
4365	3	1138	6-6-9	Urea tank temperature sensor: he current drain measured by ECU is above the target range.	Shortcut or open load.	Threshold for error detection is an internal ECU threshold. The Sensed raw voltage value SCR_uRawUTnkT is below SCR_SR-CUTnkT.uMax_C. Check wiring.
4365	4	1139	6-6-9	Urea tank temperature sensor: he current drain measured by ECU is above the target range.	Shortcut or open load.	Threshold for error detection is an internal ECU threshold. The sensed raw voltage value SCR_uRawUTnkT is above SCR_SR-CUTnkT.uMin_C. Check wiring.
523612	12	1170	5-5-5	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.
168	1	1181	3-1-8	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, check battery pole and if necessary c

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
5763	4	1229	5-9-4	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
5763	6	1230	5-9-4	Actuator error EGR-valve; Overload by short-circuit	Short Circuit over Load	Threshold for error detection is an internal ECU threshold. Check wiring, component
5763	11	1231	5-9-4	Actuator error EGR valve (2.9;3.6) or throttle valve (4.1;6.1;7.8); Power stage overtemperature due to high current 3.6) throttle valve (4.1;6.1;7.8); Power stage overtemperature due to high current;	Temperature dependent Over Current	Threshold for error detection is an internal ECU threshold. Check wiring, component
5763	4	1232	5-9-4	_Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Voltage below threshold 3.6) Drosselklappe (4.1;6.1;7.8); Voltage below threshold;	Monitoring for CY146 Under Voltage.	Threshold for error detection is an internal ECU threshold. Check wiring, component
523984	3	1239	7-8-8	UB7; Short circuit to battery error of actuator relay 7 Components on Pin A03 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A03 Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pin A03. If error is still present, exchange ECU.
523986	4	1241	1-7-6	UB6; Short circuit to ground actuator relais 6 Components on Pin A04 and A05 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A04 and A05 Because the assignment of PINs is different between the engine series, check the conected loads in the motor circuit diagram	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pin A04 and A05. If error is still present, exchange ECU.
523987	4	1242	7-9-1	UB7; Short circuit to ground actuator relay 7 Components on Pin A03 cannot be activated. Internal ECU power stage switched off.	Suspected Components: ECU PIN A03 Because the assignment of PINs is different between the engine series, check the connected loads in the motor circuit diagram	Threshold for error detection is an internal ECU threshold. Check wiring harness and connected loads on pin A03. If error is still present, exchange ECU.
2797	4	1337	5-6-5	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
2798	4	1338	5-6-6	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
2797	4	1339	5-6-5	Injector test: Short cut to ground on cylinder bank 0	Short-Circuit to ground on component wiring	Check wiring, component, ECU Note: affected injector has to be evaluated according to firing order
2798	4	1340	5-6-6	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
164	2	1381	8-3-9	Rail pressure control: error during afterrun (appears only at 2000 bar system)	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
1136	0	1398	6-8-1	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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3711	12	1455	7-1-1	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
524057	2	1505	8-4-3	Low fuel pressure: the low fuel pressure calculated by ECU is underneath the target range; the ECU activates a system reaction	Fuel pressure below warning threshold	Threshold for error detection is an internal ECU threshold. Check low fuel pressure system (fuel feed pump, relay, fuse, wiring, sensor) and if necessary repair or replace it.
524074	9	1533	2-4-6	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
524075	11	1534	2-4-7	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 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524076	9	1535	2-4-8	Open line sensor internally at NOx-sensor downstream SCR NOx Sensors are CAN Sensors --> no HW Pin on the ECU	Open line sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor upstream SCR catalyst: water inside? Shake out sensor after dismounting. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
524077	11	1536	2-4-9	Short circuit sensor internally at NOx-sensor downstream SCR NOx Sensors are CAN Sensors --> no HW Pin on the ECU	Short circuit sensor internally at NOx-sensor downstream SCR	Threshold for error detection is an internal ECU threshold. Check NOx-Sensor upstream SCR catalyst: water inside? Shake out sensor after dismounting. => If water inside, replace sensor. Check mounting position of sensor and judge it regarding condense water formation / agglomeration. Check wiring harness Exchange sensor
524078	9	1537	2-5-5	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
524079	9	1538	2-5-6	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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524080	9	1539	2-5-7	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 ComRx-SCR_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_r-CanLamUs_mp < Threshold? Compare to Com-RxSCR_rCanLamDs_mp. Must be almost identical Check CANBus of NOx-sensor upstream SCR catalyst Check NOx-sensor upstream SCR catalyst wiring Check NOx-sensor upstream SCR catalyst itself Replace NOx-sensor upstream SCR catalyst
524081	9	1540	2-5-8	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 ComRx-SCR_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
524063	5	1557	8-6-9	Urea pressure line heater: broken wiring detected Threshold 1 < SCRHtr_rUHtrMeas-Ratio_mp < Threshold 2	Open load on wiring to component	Check wiring, component
524063	3	1558	8-6-9	SCR heater mainrelay; short circuit to battery Threshold 1 < SCRHtr_rUHtrMeasRa-tio_mp < Threshold 2	Short-Circuit to battery on wiring to component	Check wiring, component
524063	4	1559	8-6-9	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_rUHtrMeas-Ratio_mp < Threshold 2	Faulty wiring, faulty heater relay (K27-K31), defective heating valve (Y31), broken element in heating.	Disconnect plug from heating valve (Y31) and reset fault. If fault is still present you have to look in the wiring of Y31 to the control unit Pin A:92. If error is no longer present, you have to check the wiring of Y31 via relay K31 and possibly the heating cables and relay (K27-K30).
524063	5	1560	8-6-9	SCR relay for suction line not connected Threshold 1 < SCRHtr_rUHtrMeasRa-tio_mp < Threshold 2	relay defect relay not connected wiring harness broken problems with supply voltage	Check wiring, component
524065	4	1570	8-9-2	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
524065	2	1598	8-9-2	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_p-CACDs) Check ambient pressure sensor (EnvP_p)

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
1761	14	1655	1-3-8	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.
2791	7	1752	4-1-5	EGR actuator is mechanically blocked.	EGR actuator faulty or blocked.	Threshold for error detection is an internal ECU threshold. Check the EGR actuator and EGR valve to mechanical blockage / clean. Check for free movement of the valve. If it'S blocked, then exchange the EGR valve.
2791	2	1753	4-1-5	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.
2791	13	1754	4-1-5	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.
2791	12	1755	4-1-5	Internal electrical fault of EGR actuator.	Internal damage of EGR actuator due to high temperature or electrical wiring issue.	Threshold for error detection is an internal ECU threshold. Exchange EGR actuator.
2791	13	1756	4-1-5	EGR actuator can not learn stop positions because procedure was interrupted.	Interruption of learning process due to mechanical damage.	Threshold for error detection is an internal ECU threshold. Start Serdia Usecase to reset EGR actuator.
2791	6	1757	4-1-5	Overcurrent to EGR actuator.	High voltage from battery. EGR actuator is blocked or moving very hard.	Check battery voltage. Check if EGR is blocked or not running smoothly. If everything is o.k. change EGR actuator.
2791	3	1758	4-1-5	Overvoltage at EGR actuator.	High voltage from the battery	Check battery voltage.
2791	4	1759	4-1-5	Undervoltage at EGR actuator.	Low voltage from the battery.	Check battery voltage.
2791	13	1760	4-1-5	Stop positions of EGR valve not o.k.	Mechanical damage of EGR actuator. EGR valve is blocked or moving very hard.	Threshold for error detection is an internal ECU threshold. Start Serdia Usecase to reset EGR actuator.
2791	7	1761	4-1-5	EGR actuator spring broken.	mechanical damage of spring due to overstress.	Threshold for error detection is an internal ECU threshold. Exchange EGR actuator.
2791	16	1762	4-1-5	Internal actuator temperature above threshold.	overheating of EGR actuator	Let EGR actuator cool down, check heat accumulation during worst case operation.
2791	0	1763	4-1-5	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.
523612	12	1857	5-5-5	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 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524147	7	1858	9-6-6	During Afterrun and draining of DEF lines, the reverting valve in the DEF supply module is opened but the urea pump pressure increases instead of decrease, which means that the reverting valve is not working.	Urea pressure sensor is defect. Reverting valve is blocked. Urea injector is blocked.	Run SERDIA use-case "injection test" to ensure the urea injector works properly. Run SERDIA use-case "pressure test" to ensure the lines are filled with urea and supply module is working Run SERDIA use-case "empty service". The urea pump ressure, SCR_pAbsAdapUPmpP,must decrease below the urea pump pressure before the reverting valve was opened. Observe SCR_pAbsAdapUPmpP & SCR_stURevVlv (0 = closed, 1 = open) & SCR_rDycUdosVlv The error heals each time after SCR system status "emptying" (64) is successfully ended => debounce time 30 s. If the error is still active, then exchange supply module.
524175	0	1859	9-9-3	Tailpipe Nox-emissions are higher than NTE-Limit (2 g/kWh) and/or NRTC-Limit (0.9 g/kWh)	- no DEF injection ijection of DEF with low quality (normal quality = 32.5%) - injection of non-DEF fluid	- Check DEF level in tank which should be higner than 12%. - Check DEF quality ComRxSCR_rAdBlu which shall be above 32.5%. If it's below 24, then it's diluted urea in tank or even water => Exchange the fluid in the tank with right DEF quality. -Check DEF supply module: perform pressure test => Replace supply module -Check DEF dosing valve => perform injector test => Clean injector with water => Repeat injector test => Replace injector -Check NOx sensor downstream SCR catayst: check wiring and sensor itself. At warm engine and warm EAT-system (SCRT_tCatAvrgExhGs > 250°C) in steady state, check sensed Nox-values: at ComRxSCR_stNOxRdyUs &ComRxSCR_stNOxRdyDs, ComRxSCR_rNOxUs must be > ComRxSCR_rNOxDs. ComRxSCR_rNOxDs shall be< 100 ppm in steady state operation. => Exchange NOx-Sensor downstream of SCR catalyst -Check engine air path: dp venturi sensor, EGR cooler, EGR-Valve, Intake

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524178	7	1864	9-9-6	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
4360	2	1865	6-6-8	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
524067	2	1867	8-9-4	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_tand 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

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524067	2	1868	8-9-4	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_tand 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
1761	2	1869	1-2-9	In the case the system is calucalating an DEF injection demand and the filling level of the tankdoesn´t change, the diagnostic function will detect an implausible behavior.	Suspected components: - suction unit sensor defect - mechanical defect at the float gauge	Check the suction unit sensor for communicated values on CAN bus. Check the level sensor for plausible values. Check mechanical damage on the floater of the level gauge.
524152	2	1874	9-7-1	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	CAN message is not received for a definite time => error is set. As soon as the message is received the error heals.	Check eletrical connection oif urea quality sensor Check engine CAN bus Check urea quality sensor itself Exchange urea quality sensor
524153	2	1875	9-9-7	CAN message is not recieved for a definite time => error is set. As soon as the message is received again the error is healed.	CAN message is not received for a defined time => error is set. As soon as the message is received again the error is healed.	Check electrical connection of suction unit sensor (combined sensor with tank level and tank temperature) Check engine CAN bus Check level sensor itself Exchange suction unit
4768	2	1881	6-8-3	At engine cold start conditions the sense-dexhaust 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?
524190	14	1891	2-7-2	Inducement level 1 activ Not enough urea in tank or low urea quality or hardware tampering failure is detected or hardware failure is detected	Low DEF tank level Low DEF quality Hardware Tampering is active Hardware Failure is active	Check DEF level in tank. If there is no DEF, refill up to volume above the warning threshold. Check the DEF quality in the tank. If wrong fluid is filled, refill with proper DEF. Check other errors based on hardware malfunctions.
524191	14	1892	2-7-3	Inducement level 2 activ. 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 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524193	8	1893	2-7-5	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. Change oil and reset counter.	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 DOCin 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?
524194	8	1894	2-7-6	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. Change oil and reset counter.	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 DOCin 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?

Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
3519	12	1895	2-7-7	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.
3520	3	1896	2-7-8	The integrated diagnostic of the DEF quality Sensor recognized a short circuit to battery	wiring harness of UQS corrupted CAN Communication corrupted	Threshold for error detection is an internal ECU threshold. Check the wiring harness from the ECU to the suction unit of the DEF tank Check the CAN bus communication. If the signal is corrupt, then exchange the suction unit.
3520	4	1897	2-7-8	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.
3519	3	1898	2-7-7	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.
3519	4	1899	2-7-7	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 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524195	14	1900	2-7-9	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 stand-still 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 tub
3520	13	1907	2-7-8	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
3519	13	1908	2-7-7	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
3532	3	1911	1-2-7	The DEF level value from the sensor is higher than the maximum physical range threshold Comment: tank level, temperature and quality are measured by the UQS sensor	Suspected Components: UQS defect	Check DEF quality and/or sensor.
3532	4	1912	1-2-7	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.
4365	3	1914	6-6-9	Internal error of DEF qualitysensor.	Suspected componentes: DEF qualitysensor Wiring harness	Check wiring harness and DEF qualitysensor
4365	4	1915	6-6-9	Internal error of DEF qualitysensor.	Suspected componentes: DEF qualitysensor Wiring harness	Check wiring harness and DEF qualitysensor
3936	14	1917	2-8-6	Standstill escalation by time.In case the standstill request will not be released within 50 h by the driver this fault code will be set.	Stand-still request ignored by the operator. Display / stand-still request lamp broken.	Perform Stand-still. If soot load level of DPF has increased too high already call service to perform stand-still. In case the DPF soot load level remove DPF => Exchange DPF.
3936	14	1918	2-8-6	Standstill escalation by time.In case the standstill request will not be released within 75h by the driver this fault code will be set and the next step for power reduction (50% power reduction) will be activated. Debounce Time: 0ms		
524267	14	2007	2-8-7	Announcement triggers the Inducement Level 2	not used	not used

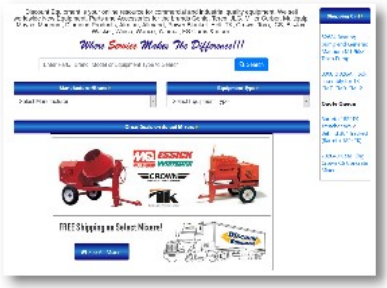
Table 3-10. Engine Fault Codes (Deutz Engine)

SPN	FMI	Deutz Code	Blink Code	Description	Possible Cause	Action
524025	8	2008	8-4-5	Max. launch time for stand still exceeded (60min).	not used	not used
4171	2	2011	6-6-8	Dynamic temperatur check of temp before SCR	not used	not used
524147	13	2013	9-9-6	Set together with DFC_SCRCoBldUpLoPres. DFC_SCRCoBldUpLoPresRst is only used for inducement purposes. It ensures that legal inducement is working correctly.	Look at KWP 1639 (DFC_SCRCoBldUpLoPres)	See KWP 1639 (DFC_SCRCoBldUpLoPres) In addition for See DFC_SCRCoBldUpLoPresRst: Fix supply module. DFC_SCRCoBldUpLoPres & See DFC_SCRCoBldUpLoPresRst heal by themselfs if proper urea pressure was build up once If that is not possible for some reason run service routine number 216 to reset all DFC2Restore-blocks

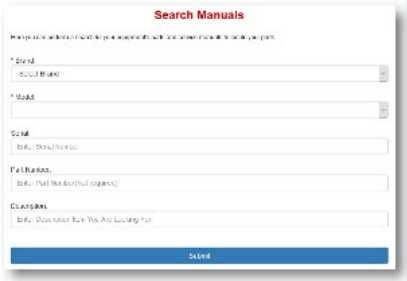
PARTS FINDER

Search Website by Part Number

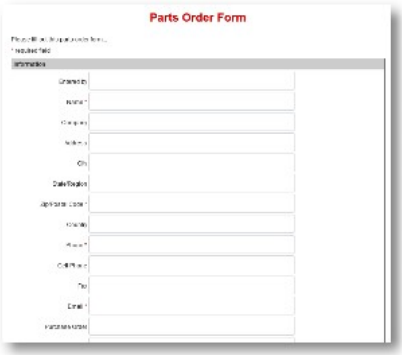
Discount Equipment



Search Manual Library For Parts Manual & Lookup Part Numbers – Purchase or Request Quote



Can't Find Part or Manual? Request Help by Manufacturer, Model & Description



Discount-Equipment.com is your online resource for quality parts & equipment.

Florida: 561-964-4949 Outside Florida TOLL FREE: 877-690-3101

Need parts?

Click on this link: http://www.discount-equipment.com/category/5443-parts/ and choose one of the options to help get the right parts and equipment you are looking for. Please have the machine model and serial number available in order to help us get you the correct parts. If you don't find the part on the website or on once of the online manuals, please fill out the request form and one of our experienced staff members will get back to you with a quote for the right part that your machine needs.

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

SECTION 4. BOOM & PLATFORM

4.1 BOOM SYSTEMS

Broken Cable Indicator System

The boom on this model is a 5 section proportionally driven telescopic boom. Section #2 is driven directly by the telescope cylinder. Section #3, #4, and #5 (fly boom) are each driven by separate wire rope systems. Each rope system contains redundant ropes that are capable of allowing the operator to unknowingly continue use of the machine with a single rope failure. These kinds of failures with the extend ropes are self revealing to the operator so proper action can be taken. Failures within section #4 and section #5 extend ropes are self revealing as they are exposed on the exterior of the boom where a broken rope would be obvious. Failures within section #3 ropes require the addition of the Broken Cable Indicator System in order to be self-revealing to the operator. This system uses a proximity sensor to detect excessive movement of the sensed rope as would be expected with a rope failure.
A broken rope detection results in illuminating the Cable Break indicator on the platform control panel. No restrictions are made to the functionality of the control system. It is the responsibility of the operator to take the appropriate action.

Transport Position Sensing System

The transport position sensing system uses the main boom angle sensors, the main boom length sensor mounted in the pivot end of the main section #1boom in addition to the boom length switch mounted on the platform end of the main base boom and transport proximity switches mounted to the jib fly boom to sense when the main boom and jib boom are in the position associated with high speed travel. Above transport angle is recognized when the main boom (using the cylinder angle sensors) is more than 5° with respect to the turntable and resets to within transport position when both main boom angle sensors read less than 3° with respect to the turntable. Transport length is recognized when the main boom length switch and main boom length sensor read less than 17" extension for the main boom. Transport position is also determined when the jib boom length switches indicate the jib is fully retracted. During failures of either the main boom length transport switch or the main boom length sensor the main boom transport length will be determined by the remaining sensor or switch. In addition, for a failure of either jib transport length switch, jib length will be determined by the remaining switch.

This system is used to control the following systems:

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

Beyond Transport - Drive Speed Cutback System

When boom is positioned beyond the Transport Position as described in The transport position sensing system, the drive motors are automatically restricted to their maximum displacement position (slow speed). See the Tilt Indicator System for interaction with the tilt sensor.

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

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

Jib Stow System

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

Envelope Control System

The Envelope Control System is the primary means of controlling the stability of the machine by restricting the working envelope of the main boom. The envelope shape, is such that, positions of stability and structural integrity can be controlled including the restriction of forward and rearward reach of the platform. This system uses the two main boom angle sensors, the main boom length sensor, and the main boom transport length switch to continuously measure the position of the main boom and control its position within the predetermined envelope. The two main boom angle sensors measure the angle of the main boom relative to gravity and are continuously monitored for mutual agreement. The main boom length sensor measures the length of the main boom and is monitored for response to main telescope command and for agreement with the fixed position length switch (Main boom length transport switch). Violations of the main boom position to allowable envelope positions will result in reduced function speeds, BCS warning light illumination, and restriction of functions. The platform alarm will sound and the BCS light will flash with attempts to operate restricted functions. The restricted functions due to envelope violations related to forward reach are disallowing main lift down, main telescope out, swing, drive and steer. The restricted functions due to envelope violations related to backward reach are disallowing main lift up, main telescope in, swing, drive, and steer. Recognized failures within this system will result in control by the Moment Control System, reduced function speeds, and BCS warning light illumination. The unit will be restricted from leaving the transport position until the failure is resolved.

Moment Control System

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

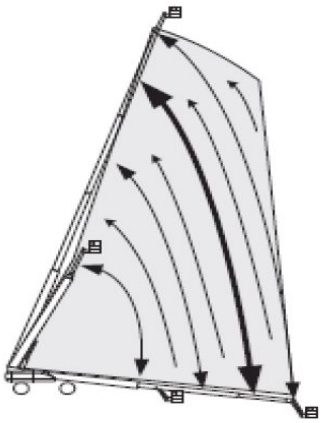
Boom Control System (BCS) Functional Check (Push to Test) System

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

Controlled Arc System

The Controlled Arc System uses the envelope control sensors to enhance the control of the main boom within the working envelope. The purpose of the controlled arc system is to minimize the interaction of lift functions with envelope edges and to increase user efficiency. This minimizes the effect of a long boom working in a comparatively narrow envelope. Because the boom is permitted to extend to longer lengths at high angles than at it is low angles, lift commands would normally cause the boom to violate the permitted envelope while lifting down or conversely require the operator to frequently command telescope out while lifting to high heights. The controlled arc system optimizes the envelope shape by automatically introducing telescope in or out during “lift only” commands. Telescope flow is regulated during lift commands to maintain a constant percentage of available boom length (0% is always fully retracted, 100% is variable as the permitted length changes when the boom is raised). The target percentage will be maintained throughout the lift command whether it is maintaining 0%, 100%, or any percentage in between. The target percentage is established at the start of lift command or

end of manual telescope commands when using multiple functions with lift. The telescope command can be used independently or in combination with other functions. Manual introduction of telescope will override the controlled arc system and result in conventional control. Controlled arc will be disabled with any sensor failure, any moment violation, any envelope violation, or with auxiliary power functions. The controlled arc functionality can be turned off using the manual position of the boom control select switch.When selected, this system active at all boom angles and lengths.



Controlled Arc Boom Movements

Controlled Boom Angle System

The Controlled Boom Angle System uses the envelope control sensors to enhance the control of the boom by minimizing the interaction of swing and drive functions with the envelope edges. This interaction is due to two factors. First, the envelope is controlled relative to gravity regardless of ground slope and second, the turntable/boom mounting is effected by swing and drive functions when the ground slope varies. This can cause the boom position to vary within the envelope or even violate the envelope edges when swinging or driving without intentionally moving the boom. The controlled boom angle system minimizes this effect by automatically introducing lift up or down during swing and drive commands to maintain a constant boom angle relative to gravity for all boom angles greater than 8 degrees. Controlled boom angle is disabled with any envelope or moment violations or failures. The controlled boom angle functionality can be turned off using the manual position of the boom control select switch.

Envelope Tracking

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

Slow Down System

When the main boom approaches the edges of the working envelope, all functions (except jib and platform functions, telescope in or out on the rearward edge and telescope in on the forward edge) are automatically slowed down by the control system to reduce the machine dynamics and improve operator control. The slow down starts within 4 feet of all edges and is at the fully reduced speeds 2 feet from all edges. The control system indicates to the operator this automatic introduction of slow down by flashing the creep light on the platform display panel. This feature applies to both platform and ground controls, however, no indication is made on the ground control panel. This is not adjustable using the analyzer.

Dual Capacity System

The Dual Capacity System on this machine is a multiple envelope control system as opposed to an indication system. The control system changes the working envelope and moment limits to match the capacity select mode to either the 500# mode or the 1000# mode. It then displays the capacity mode on the platform and ground display panel and controls the positions of the boom within the allowable envelope for that mode. This mode is selectable by the operator with the dual capacity select switch on the platform control panel. The 500# mode has the largest envelope. The 1000# mode has a smaller envelope and requires the jib to be retracted fully. To select the 1000# mode the boom must already be in the smaller 1000# envelope. When the operator selects the 1000# mode and this condition is met, the capacity light changes from 500# to 1000# and the envelope and permitted moment values are changed accordingly. When the operator selects the 1000# mode and this condition is not met, both capacity lights will flash, the platform alarm will sound, and all functions will be disabled until the capacity select switch is put back into the 500# position.

Swing Speed Proportioning

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

Platform Load Sensing System

The Platform Load Sensing System (LSS) consists of 1 load cell and 2 linkages mounted to the platform rotator and replaces the platform support on machines that get this optional installation. The load cell includes a sealed circuit and is connected directly to a CAN-based platform control panel within the platform box. This system compares the capacity mode (500# or 1000#) recognized by the dual capacity system to the measured weight in the platform. When the capacity is exceeded, or when there is a fault in the system, the platform overload indicator will flash, the platform alarm will sound at the rate of 5 sec on, 2 sec off and all platform controls (except auxiliary power) will be disabled. For CE Market, the ground controls are also affected.

Electronic Platform Leveling

The electronic platform leveling system uses two tilt sensors (mounted on either side of the platform rotator), a control valve (mounted to the platform support), a level cylinder, and the platform control module (mounted in the platform control box) to automatically measure and control the incline of the platform with respect to gravity. While in the automatic position of the boom control select platform leveling is active while operating drive, telescope, main lift, jib lift or swing and is not active while operating any other function (e.g. rotate, jib, or steer). While in the manual position of the boom control select platform leveling is active while operating main lift and jib lift only. The system controls the platform angle relative to gravity using a set point established during power-up (cycling of the EMS) or at the conclusion of a manual platform level override by the operator using the platform level override switch from either the platform or the ground control. In other words the operator can choose a platform incline other than level with gravity and the system will maintain that incline automatically. If a fault occurs in the platform leveling system the following will occur:

- Automatic platform leveling will stop (except when there is a fault in only one sensor)
- The platform level fault indicator will flash
- The platform alarm will sound
- All functions will default to creep speed if in platform mode and the boom is out of the transport position

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

Boom Control Select

The boom control select switch is mounted on the platform control panel and allows the operator the ability to select between two different modes of boom control functionality: automatic and manual. While in either mode, the envelope control system and moment control system remains active.

When the boom control is selected to the automatic boom control position, lift and telescope movements are coordinated by the control system as described in the controlled arc, controlled boom angle, and envelope tracking descriptions. These systems will remain active to automatically assist the operator in keeping the boom within the envelope boundaries. When operating in the automatic mode, the following functionality characteristics should be noted.

- While operating Lift Up, the boom may also telescope out (controlled arc)
- While operating Lift Down, the boom may also telescope in (controlled arc)
- While operating Swing or Drive, the boom may lift up or lift down (controlled boom angle)
- While operating Telescope In, the boom may lift down when at high boom angles and the creep light is flashing (envelope tracking)

In addition, when the boom control is selected to the automatic position, the automatic platform leveling feature is active during lift, telescope, swing, and drive movements as described in the electronic platform leveling system description.

When the boom control is selected to the manual position, lift and telescope movements are controlled separately by the operator effectively turning off the controlled arc, controlled boom angle, and envelope tracking systems. Without these systems being active, the control system will stop the movements of the boom when the envelope boundaries are reached and the functions that could violate the envelope will be restricted. The platform alarm will sound and the BCS light will flash with attempts to operate a restricted function. In addition, when the boom control is selected to the manual position, the automatic platform leveling feature is active only during lift movements.

Platform Control Enable System

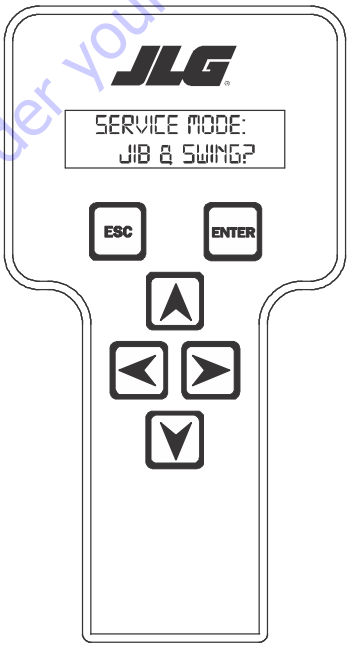
The platform controls make use of a time dependent enable circuit to limit the time availability of "live" or enabled controls. To operate any directional function, the footswitch must be depressed before activation of the function. When the footswitch is depressed, the controls are enabled and the operator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

Boom Recovery Mode

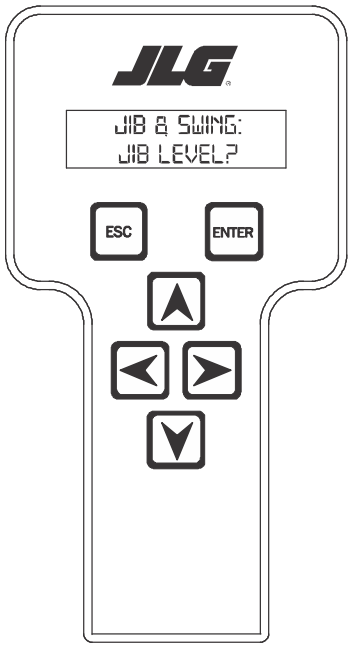
Boom Recovery Mode allows the boom to be lifted down and telescoped in, in the event CAN bus communication is lost to both the Jib Control Module and the Platform Module.

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

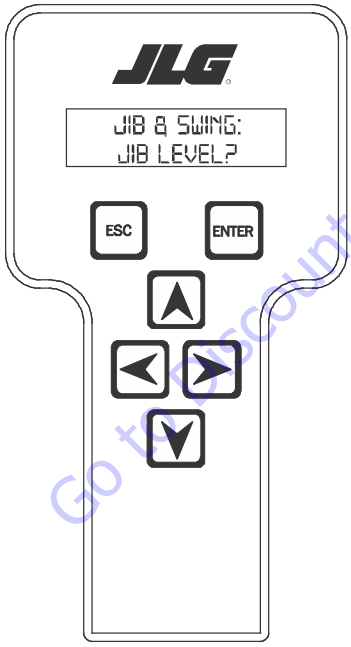
Boom Recovery override is accessible in Access Level 1. Using the Left and Right arrow keys until the screen shown below is reached.



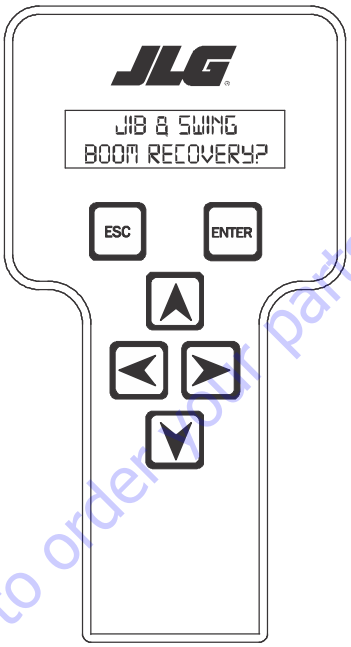
Press ENTER, the screen should read:



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



Use the Left or Right arrow key until you see:



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

4.2 PLATFORM

Platform/Support Removal

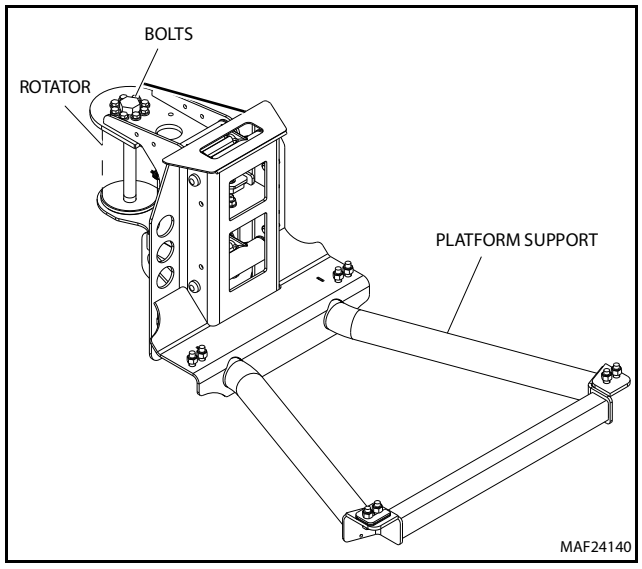
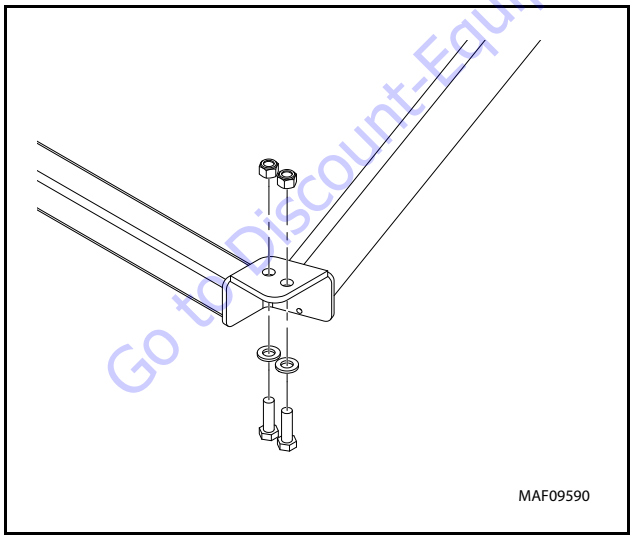


Figure 4-1. Location of Components

1. Disconnect electrical cable from control console.

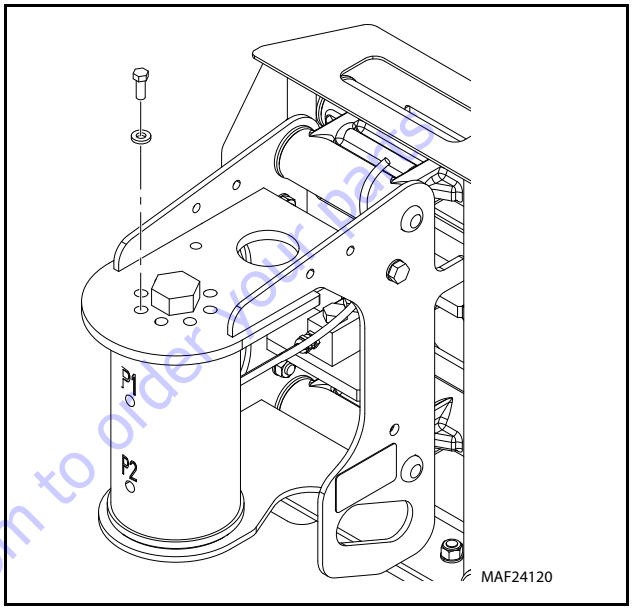
NOTE: *The platform weighs approximately 121 lb (100 kg).*

2. Remove the bolts securing the platform to the platform support, then remove the platform.

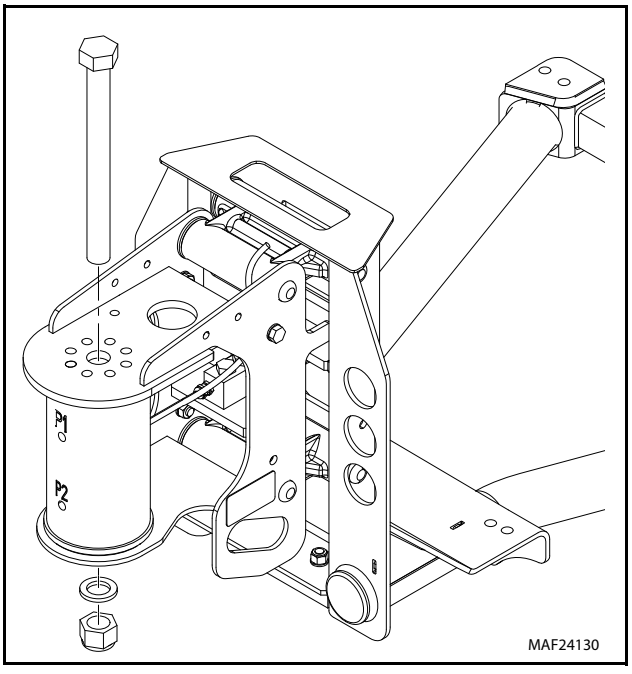


NOTE: *The platform support weighs approximately 125 lb (56.8 kg).*

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



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

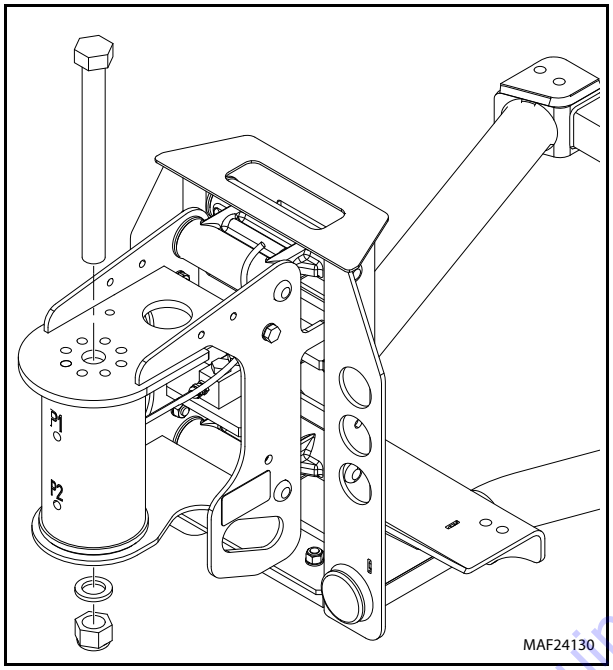


6. Remove the platform support from rotator.

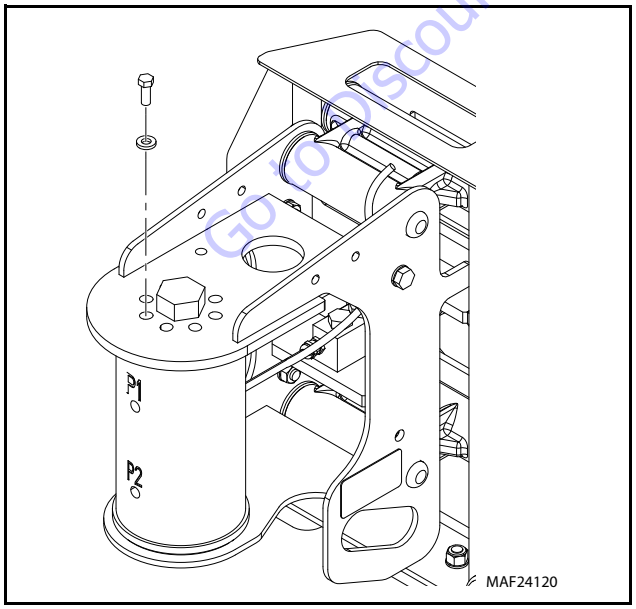
Platform/Support Installation

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

1. Using a suitable device, support the platform support and position it on the rotator.
2. Install the rotator center bolt and locknut.



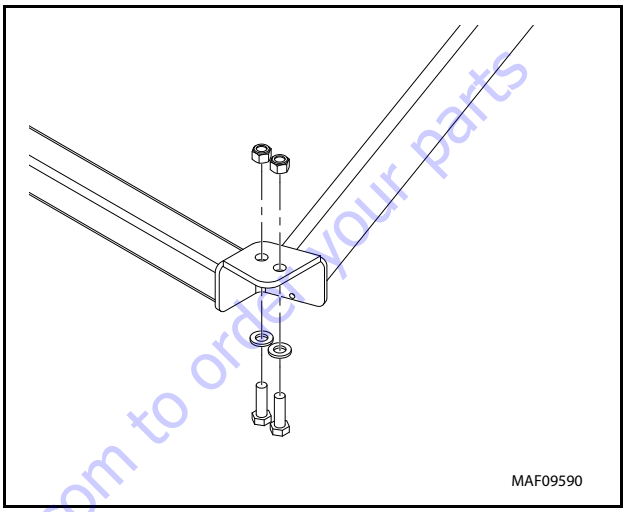
3. Apply Medium Strength Threadlocking Compound to the eight bolts securing the support to the rotator and install the bolts.



4. Torque the nut on the rotator center bolt to 586 ft. lbs. (795 Nm) and the retaining bolts 35 ft. lbs. (50 Nm).

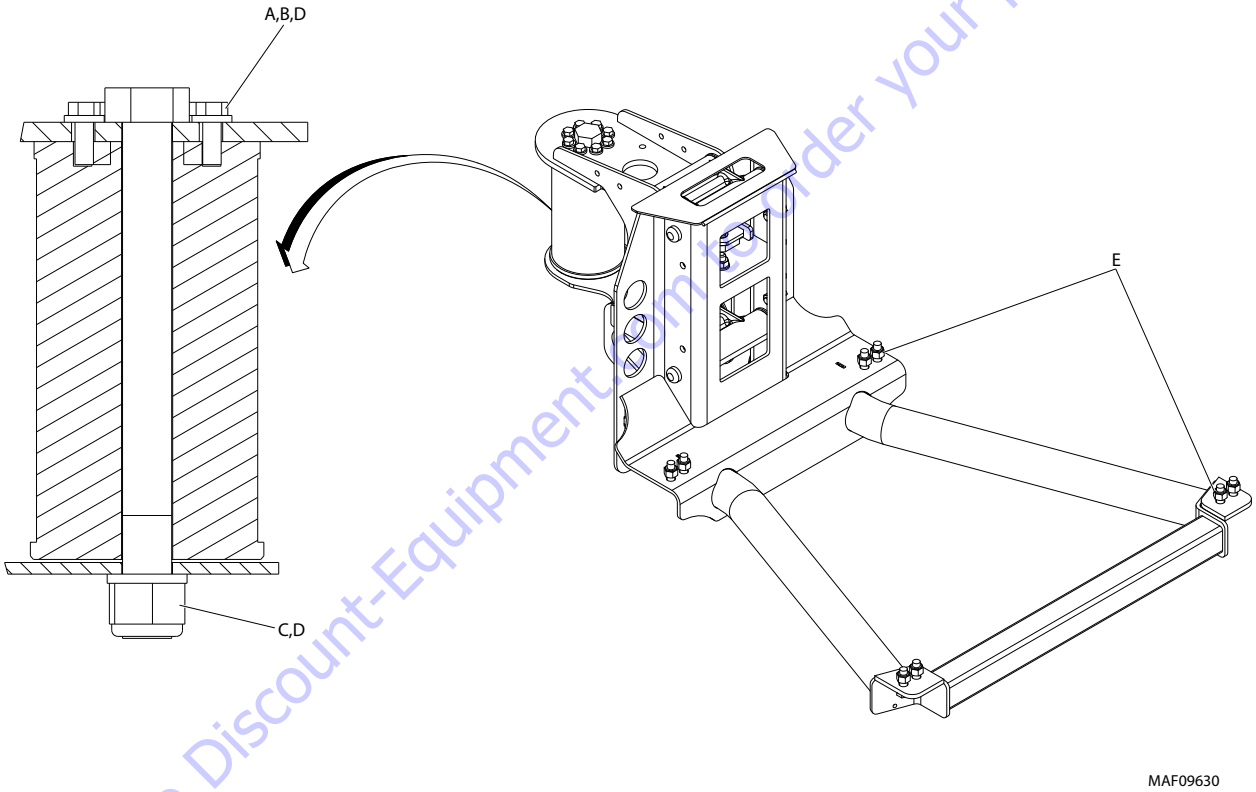
NOTE: *The platform weighs approximately 221 lb (100 kg).*

5. Using a suitable lifting device., position the platform on the platform support and install the bolts securing the platform to the platform support. Torque the bolts to 55 ft.lbs. (75 Nm).



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

NOTE: *If any rotator bolts are replaced, all bolts on the rotator should be retorqued.*



A Torque to 35 ft. lbs. (50 Nm)
B Medium Strength Threadlocking Compound
C Torque to 586 ft. lbs. (795 Nm)
D Check torque every 150 hours of operation
E Torque to 55 ft. lbs. (74 Nm)

Figure 4-2. Platform Support Torque Values

4.3 ROTATOR

Removal

1. Remove the Platform and Platform Support. Refer to Section 4.2, Platform.
2. Tag and disconnect hydraulic lines to rotator. Use suitable container to retain any residual hydraulic fluid. Cap or plug all openings of hydraulic lines and ports.

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

NOTE: *The jib lift cylinder approximately weighs 194.7 lb (87.6 kg).*

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

Installation

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

NOTE: *The jib lift cylinder approximately weighs 194.7 lb (87.6 kg).*

1. Supporting the rotator and jib lift cylinder, align rotator with jib lift cylinder and jib. Using a soft head mallet, install pin #1 to the jib assembly. Install hardware securing pin #1.
2. Using a soft head mallet install pin #2 to jib assembly and install the rotator. Install hardware securing pin #2.
3. Install the platform and platform support. Refer Section 4.2, Platform.
4. Remove cap or plugs from openings of hydraulic lines and ports and connect hydraulic lines to the rotator as tagged during removal.

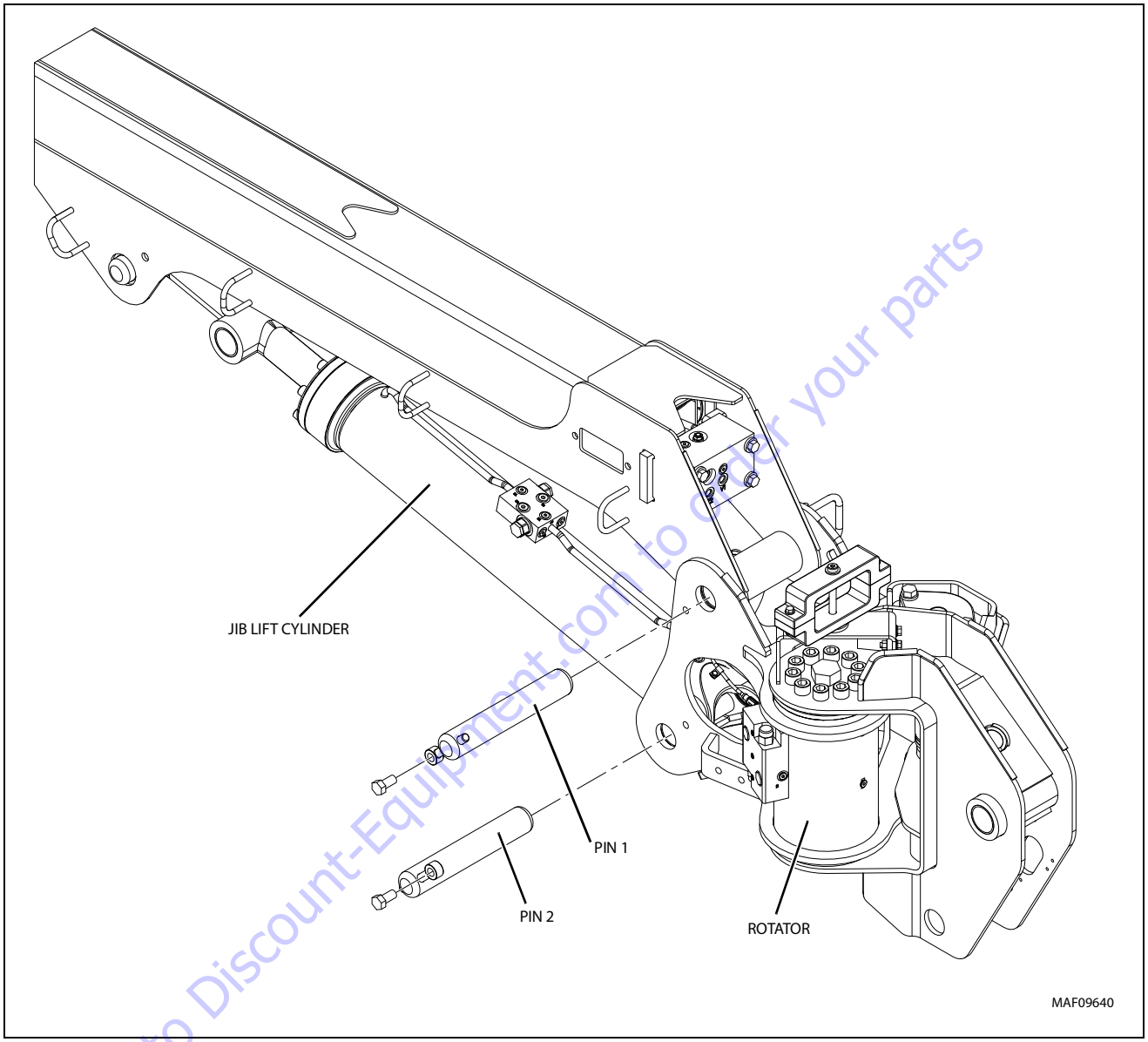
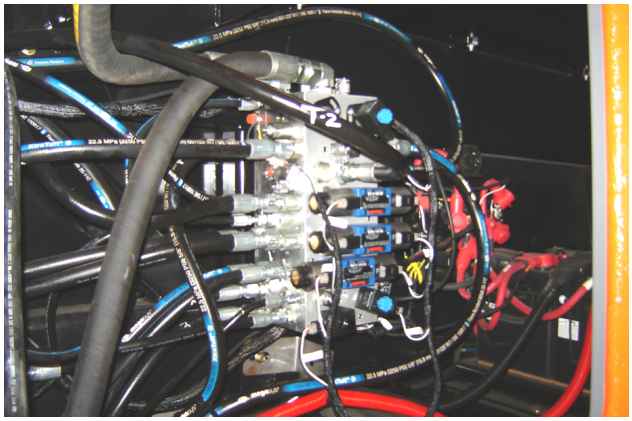


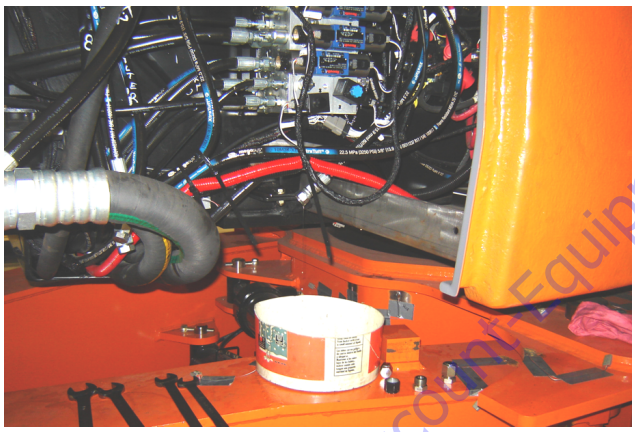
Figure 4-3. Rotator Removal/Installation

4.4 BOOM REMOVAL AND INSTALLATION

Removal

1. If necessary, remove the platform.
2. If necessary, remove the jib.
3. Tag and disconnect hoses T2 T3, 7, 8, and Pressure Filter lines from the main valve. Cap or plug all openings.





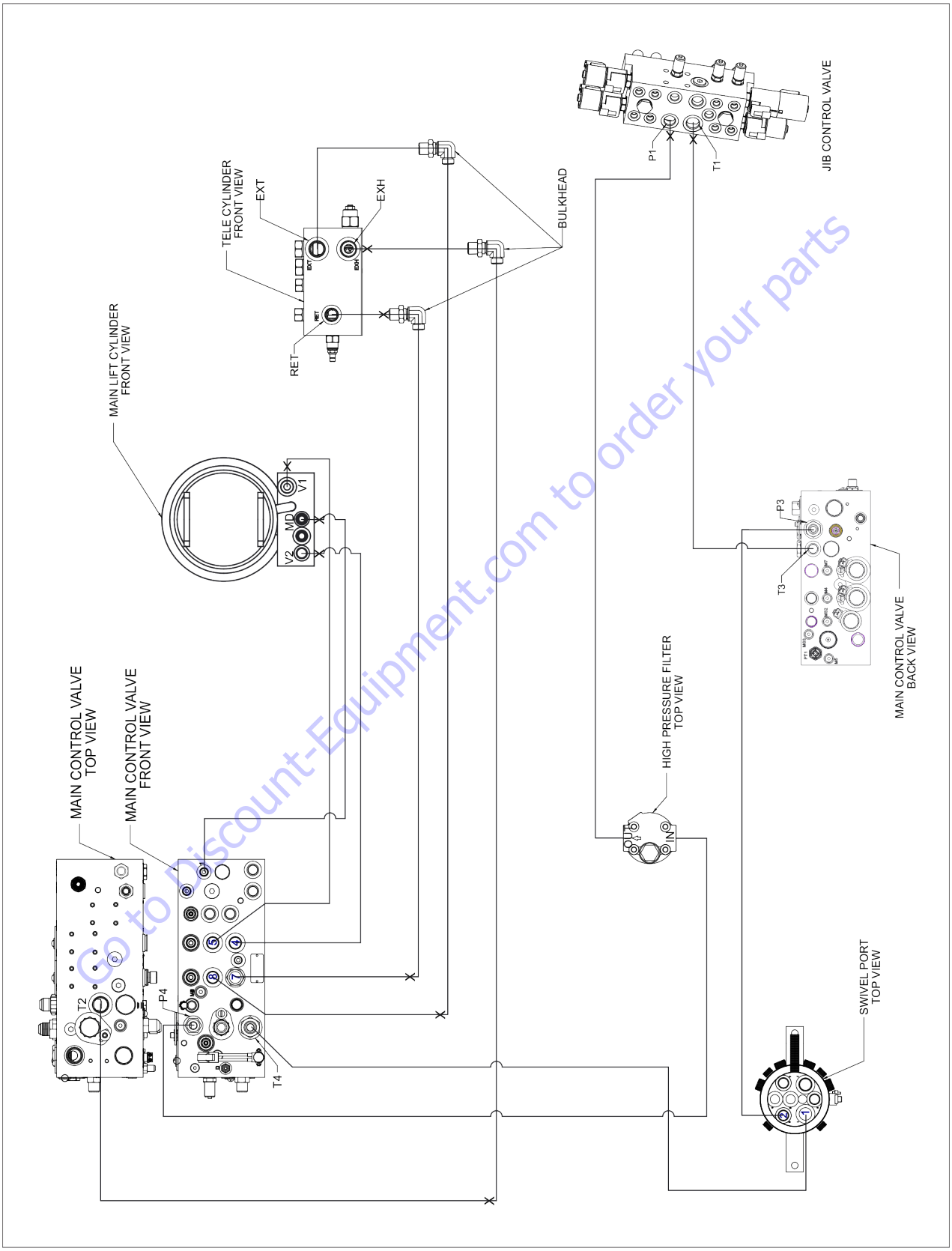
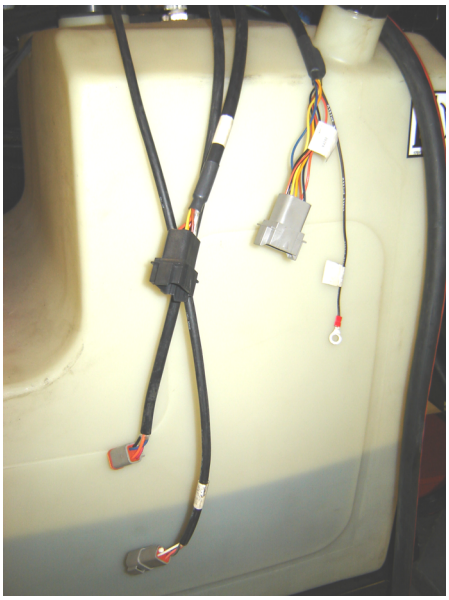


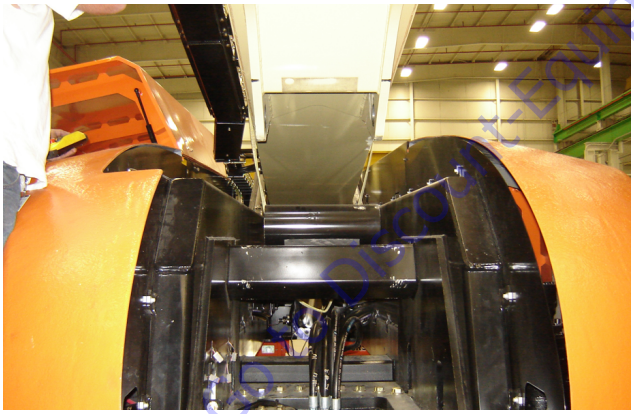
Figure 4-4. Boom Hydraulic System

4. Tag and disconnect all electrical lines from the limit switches and generator that go to from the turntable to the powertrack.



5. Elevate the boom enough to remove the upper lift cylinder pin. Use an overhead crane or similar lifting device to support the weight of the boom.

6. Using an adequate lifting device, support the weight of the lift cylinder and remove the lift cylinder pin. Lower the lift cylinder down until it rests on the boom rest.



7. Use an overhead crane or similar lifting device to support the rear of the boom.

8. Remove the boom pivot pin.

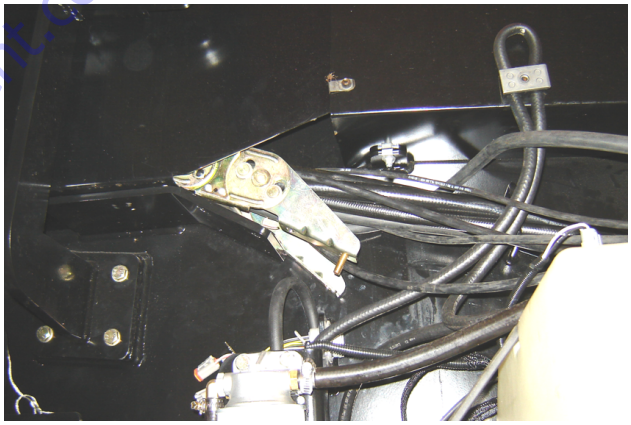
9. Carefully lift the boom from the machine, taking care to feed the hydraulic and electrical lines up alongside the boom as it is raised.

Installation

1. Lift the boom almost into position.

2. Feed the hydraulic hoses and electrical lines down alongside the hood.

3. Loosely connect the powertrack end. Remember to tighten the bolts the rest of the way when installation is complete.



4. Lower the boom into position and install the boom pivot pin.

5. Raise the front of the boom enough to allow connection of the lift cylinder.

6. Attach a lifting strap to the lift cylinder. Raise the lift cylinder into place and install the lift cylinder pin.

7. Connect the hydraulic lines as tagged during removal.
8. Connect the electrical lines as tagged during removal.
9. If removed, install the jib.
10. If removed install the platform.

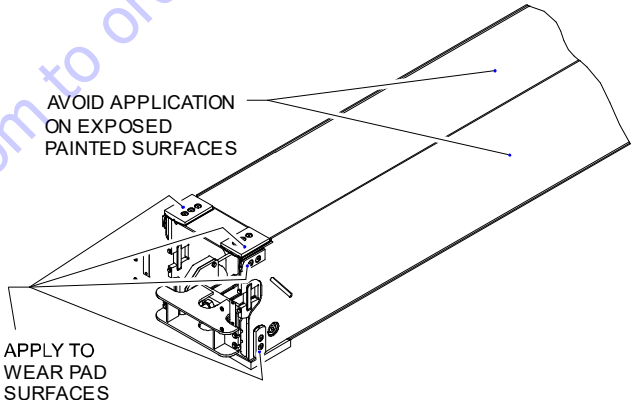
4.5 BOOM ASSEMBLY

Assembly

NOTE: *Throughout this procedure, boom sections are identified numerically, 1-5. Boom Section 1 is at the base, Boom Section 5 is the fly.*

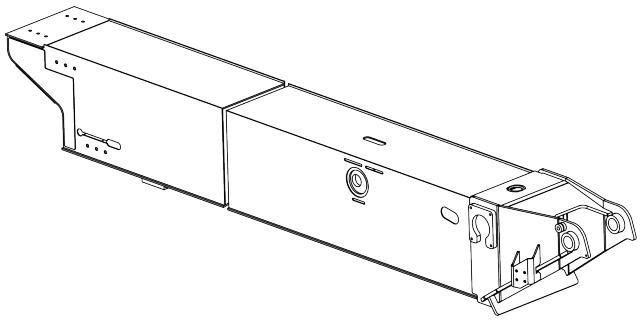
NOTE: *During Assembly, Super Lube® lubricant (JLG PN 3020042) is to be moderately applied to all four inner surfaces of both ends of each boom section to a minimum depth of three to four feet and also to the end of section 5 that is inserted into section 4.*

NOTE: *During Assembly, Super Lube® lubricant (JLG PN 3020042) is to be moderately applied to all outer surfaces of interior wear pads after they are assembled to the insertion end of boom sections. Care should be taken to avoid application on exposed painted surfaces of the fully extended boom.*



NOTE: *Boom section 5 weighs approximately 1682 lb (763 kg).*

1. Place boom section 5 on a proper supporting device.

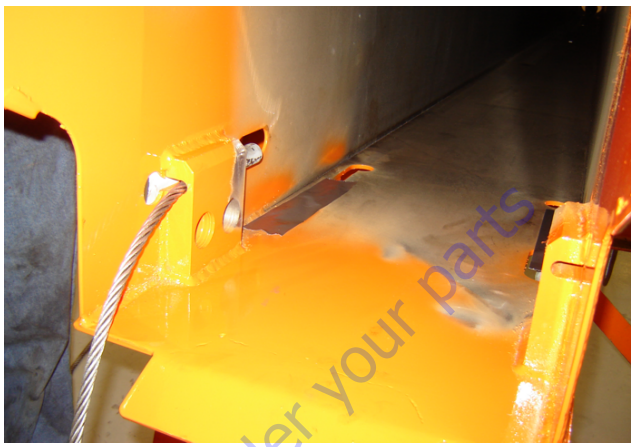


2. Install the side rear wear pads and shims. Coat the retaining bolts with Medium Strength Threadlocking Compound and secure the wear pads with the bolts and washers. Torque the bolts to 40.5 ft.lbs. (55 Nm).

3. Install the top and bottom rear wear pads and shims. Coat the retaining bolts with Medium Strength Threadlocking Compound and secure the wear pads with the bolts and washers. Torque the bolts to 40.5 ft.lbs. (55 Nm).

4. Install the section 5 retract ropes to into the holes in the side of section 5. Place tape over the holes to keep the cables in place during assembly as shown.

5. Install the section 5 extend ropes into the mounting holes in the bottom of section 5. Place tape over the holes to keep the cables in place during assembly as shown.



NOTE: *Boom section 4 weighs approximately 1898 lb (861 kg).*

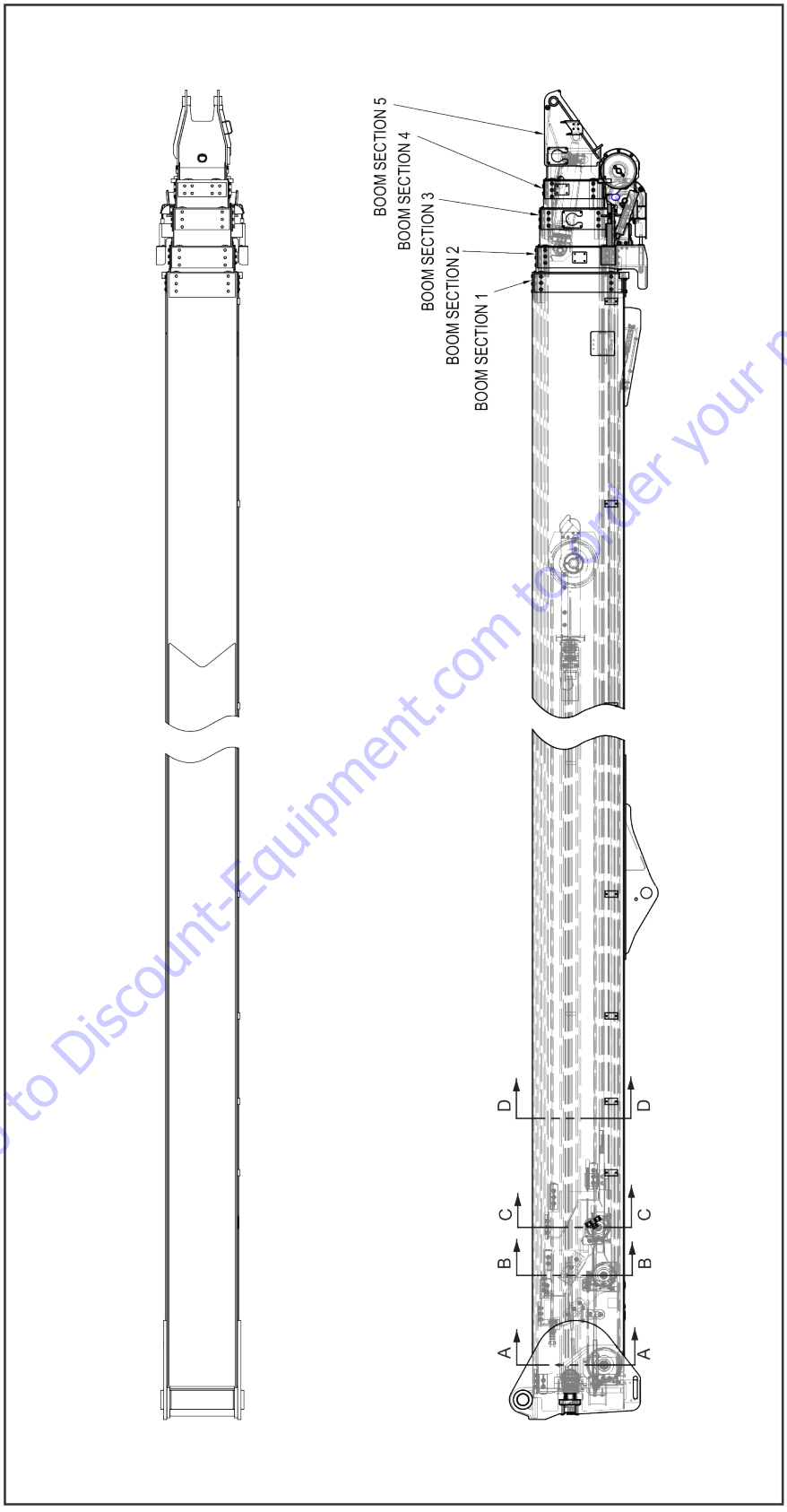
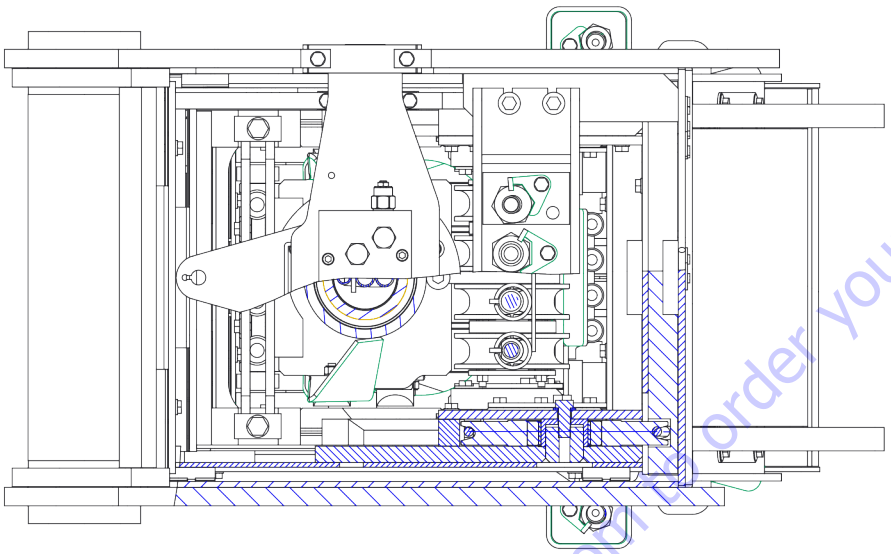


Figure 4-5. Boom Assembly - Sheet 1 of 9



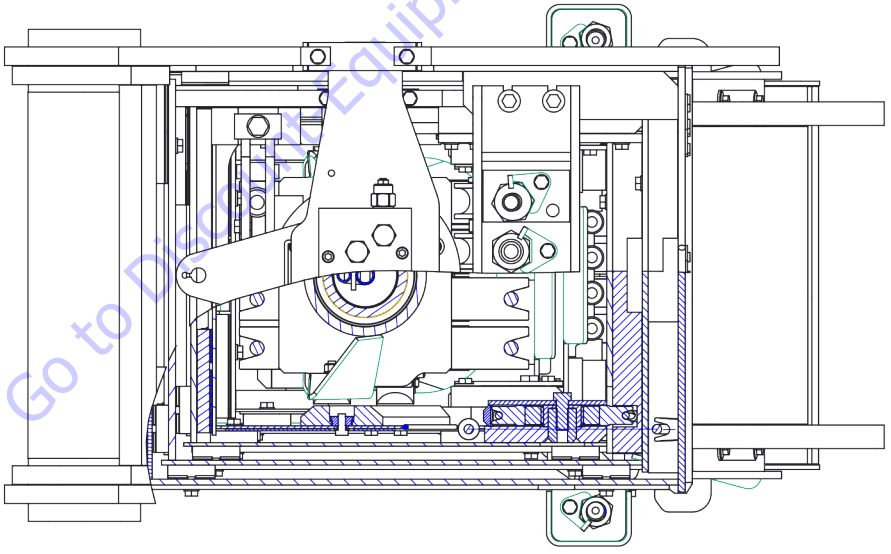


Figure 4-6. Boom Assembly - Sheet 2 of 9

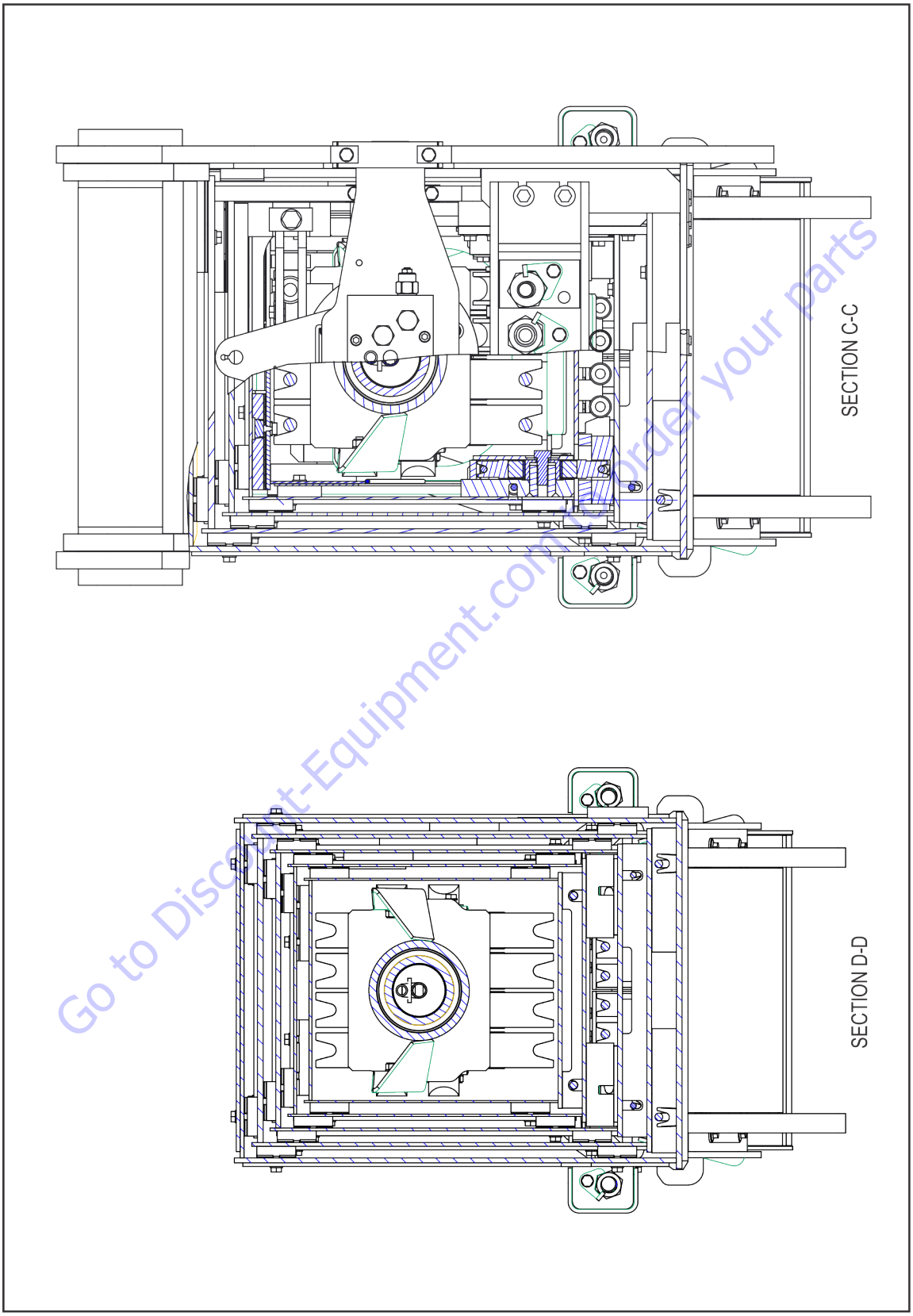


Figure 4-7. Boom Assembly - Sheet 3 of 9

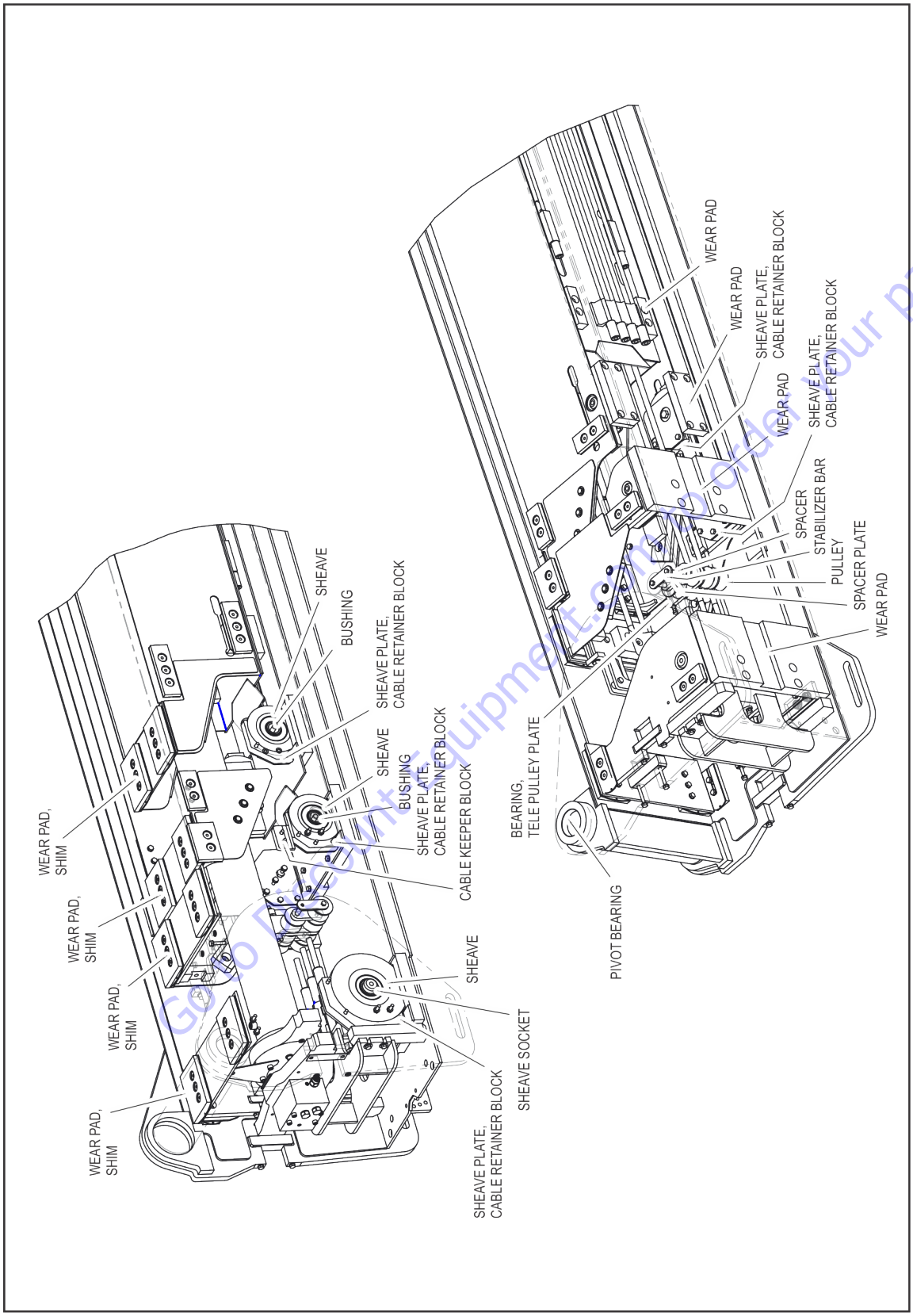


Figure 4-8. Boom Assembly - Sheet 4 of 9

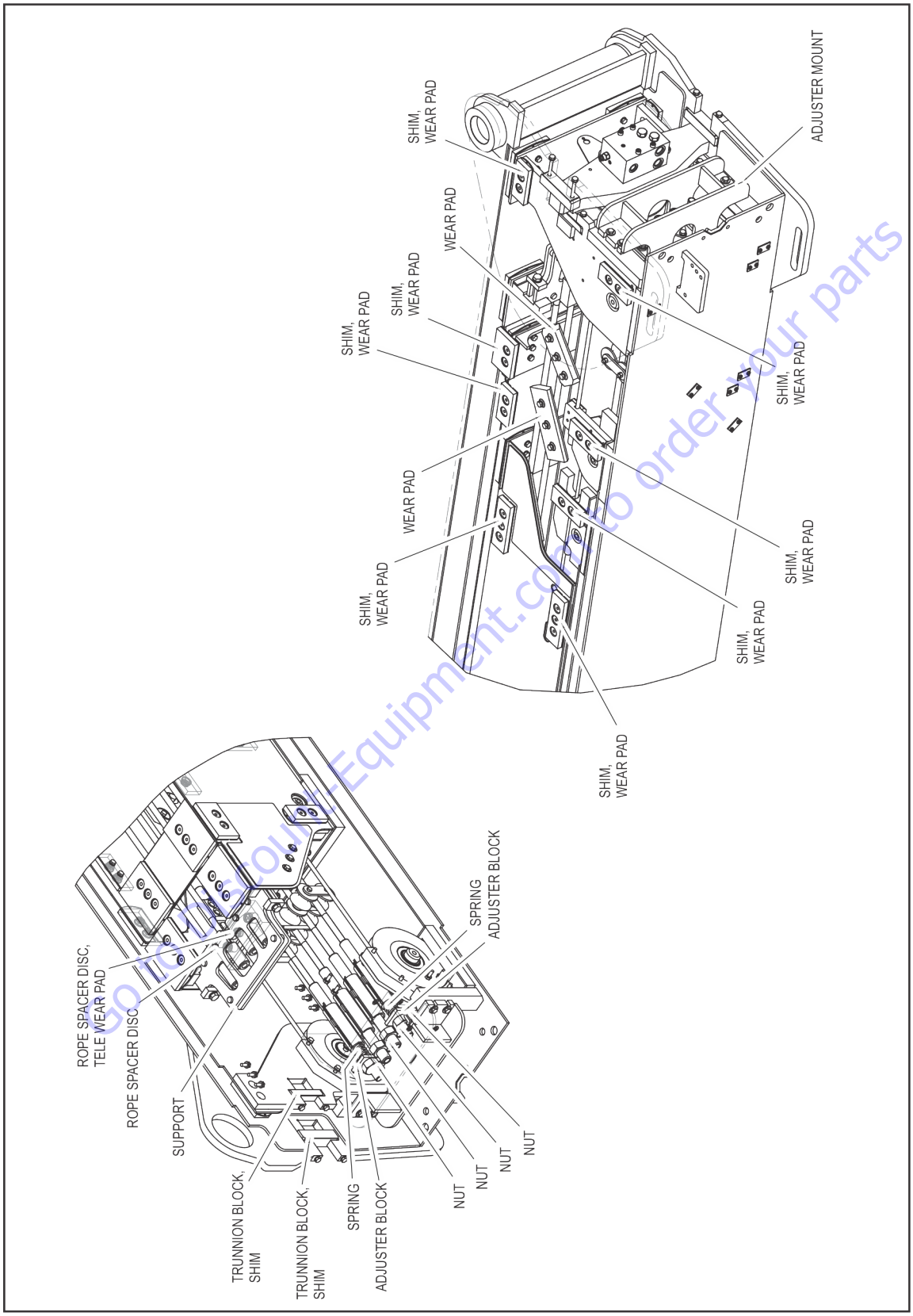


Figure 4-9. Boom Assembly - Sheet 5 of 9

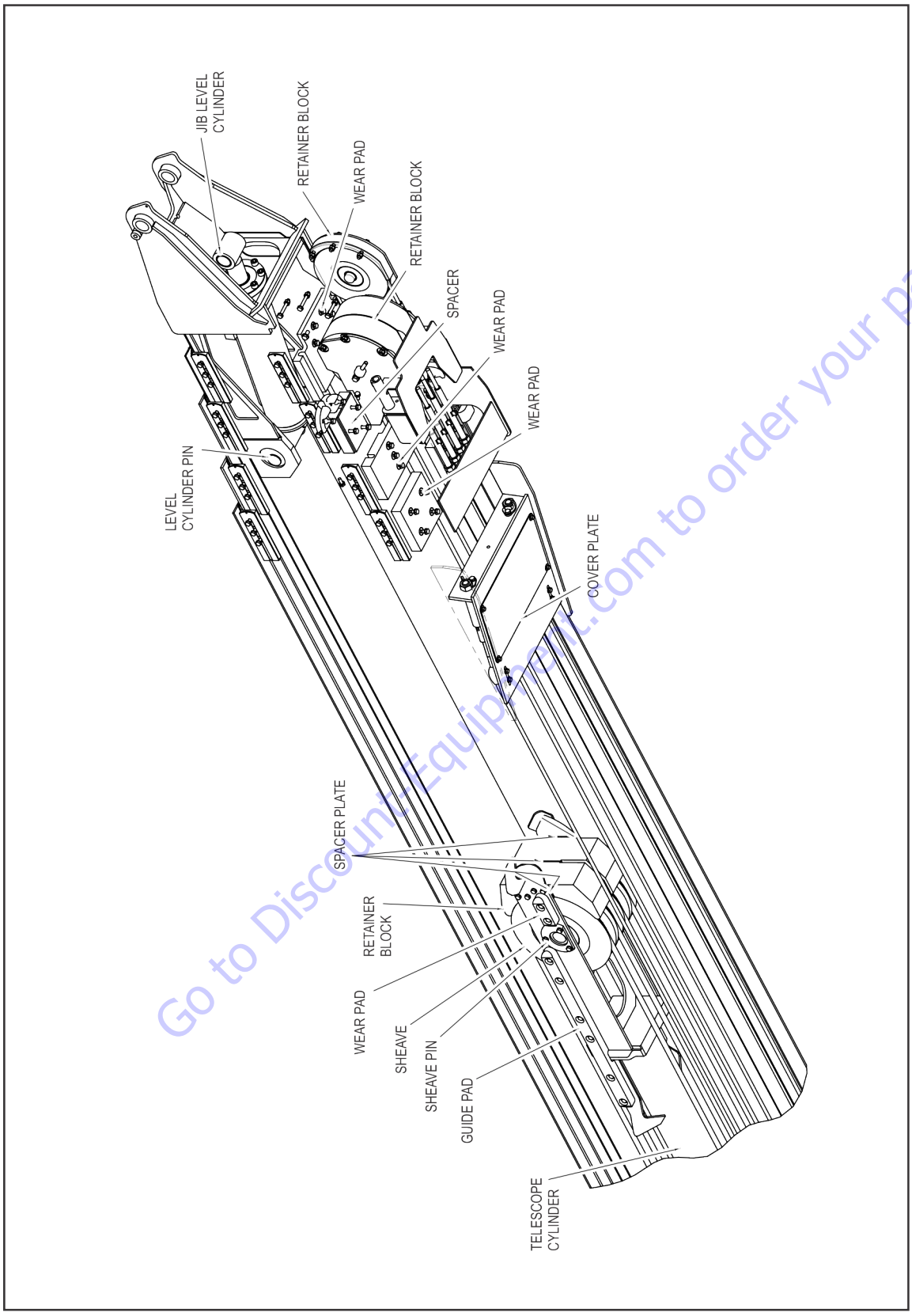


Figure 4-10. Boom Assembly - Sheet 6 of 9

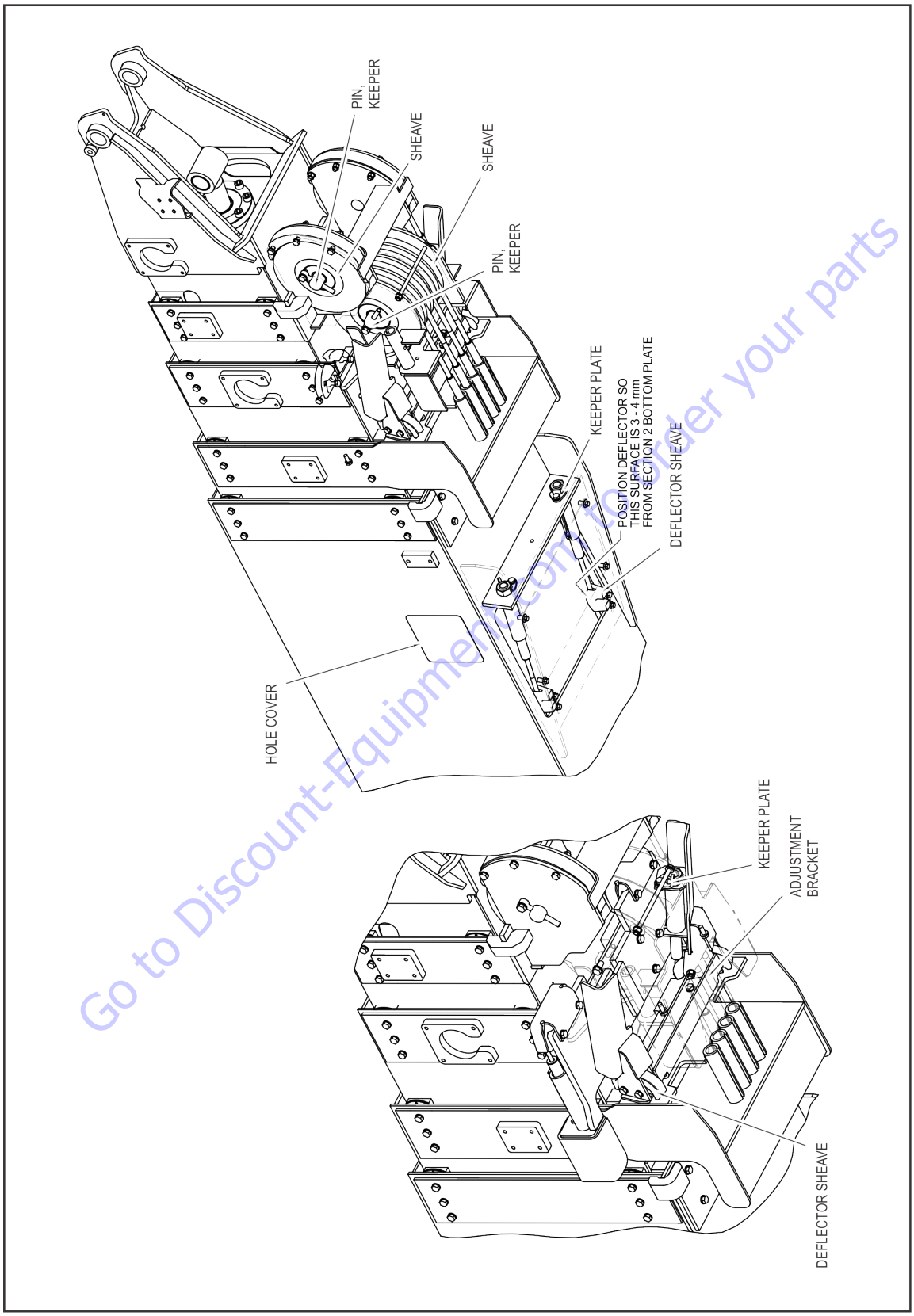


Figure 4-11. Boom Assembly - Sheet 7 of 9

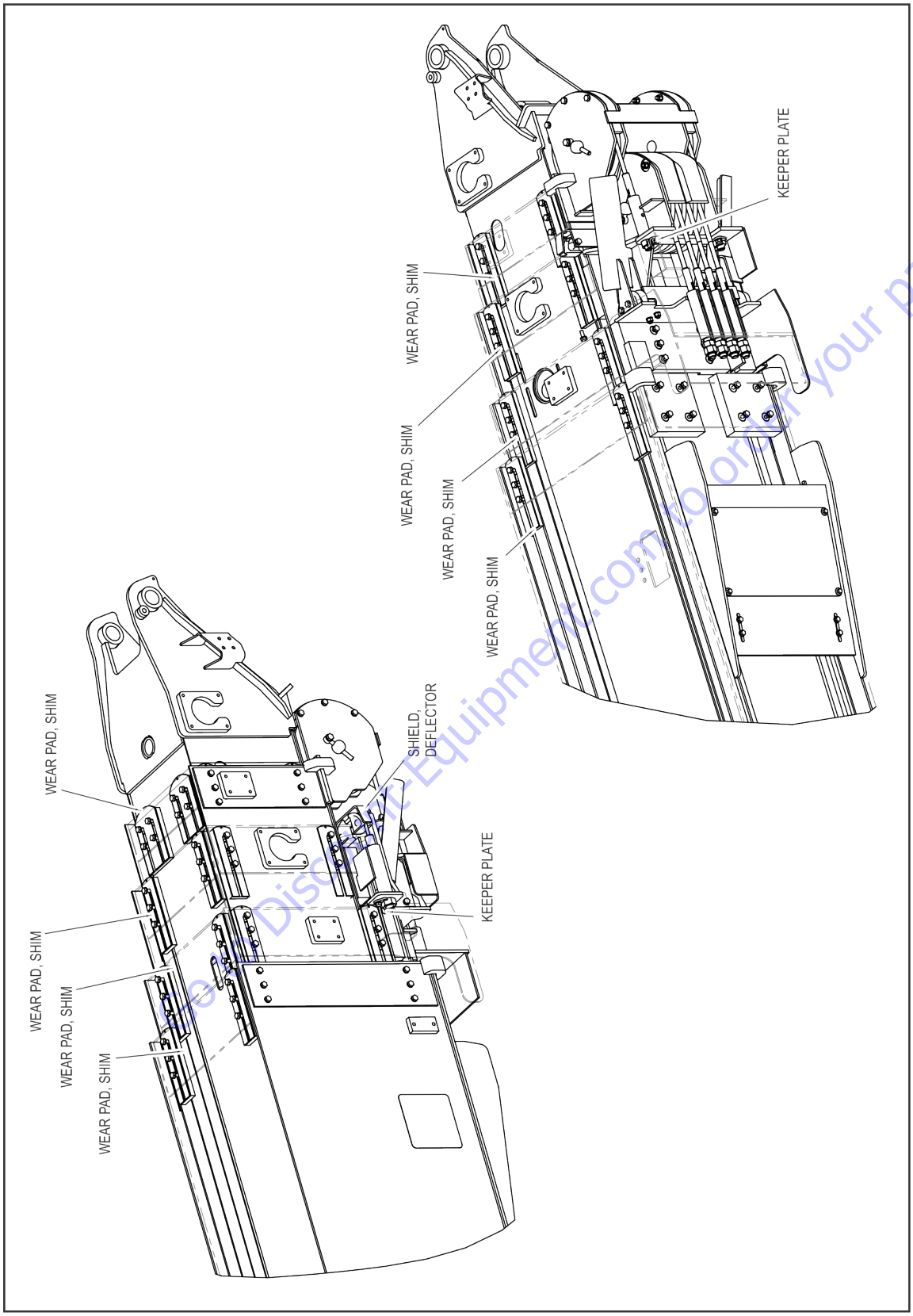


Figure 4-12. Boom Assembly - Sheet 8 of 9

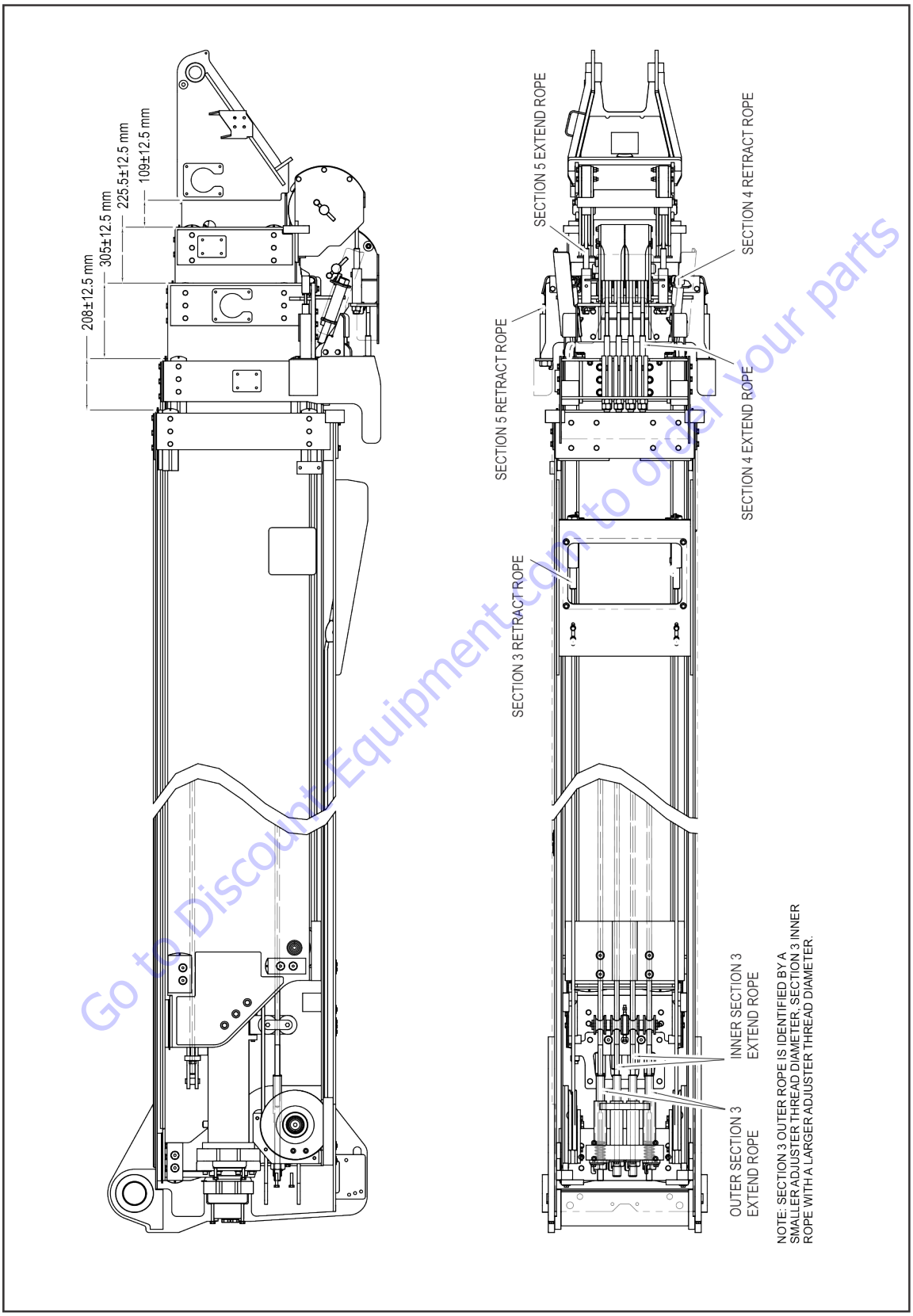


Figure 4-13. Boom Assembly - Sheet 9 of 9

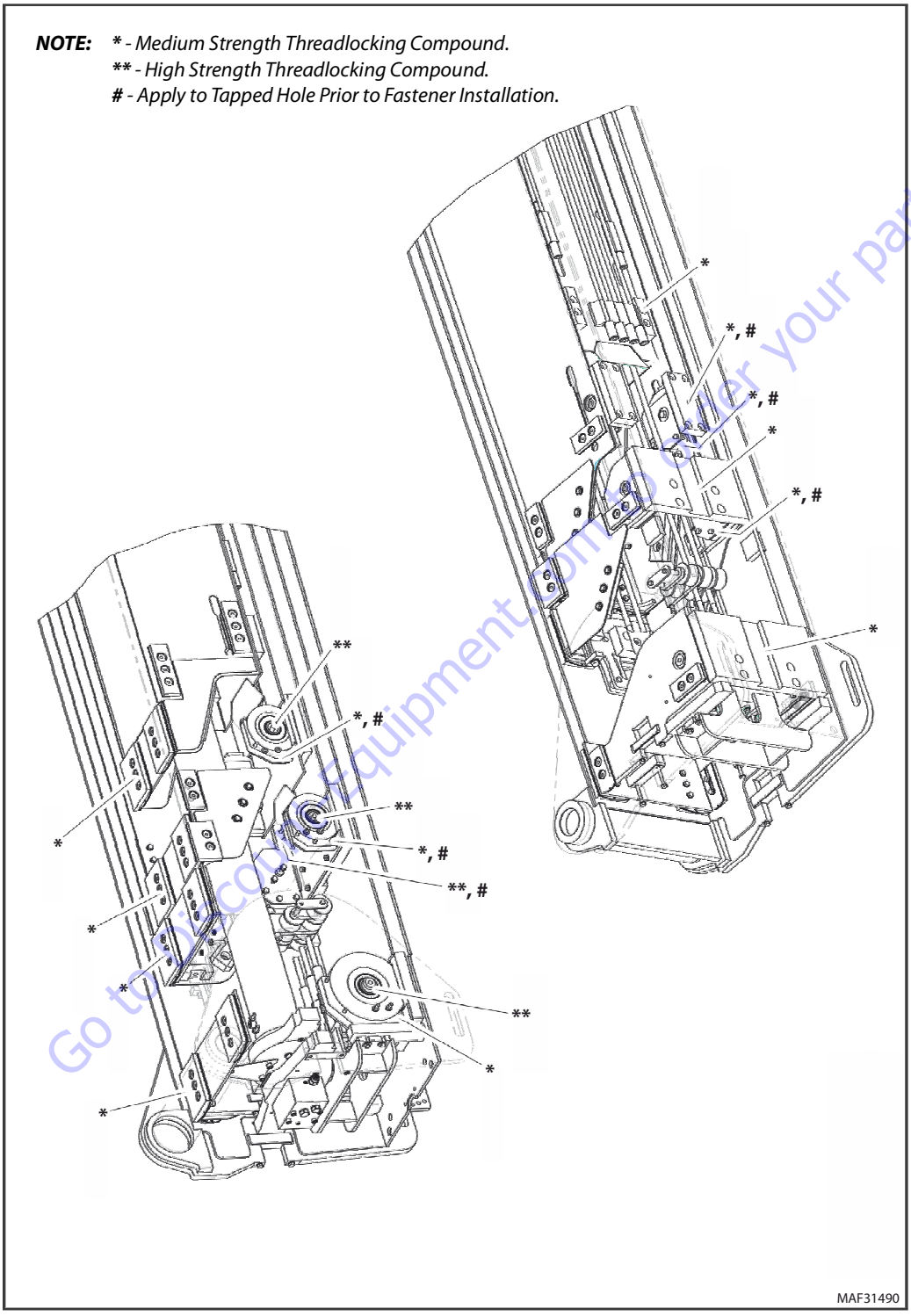


Figure 4-14. Locations for Threadlocker Application - Sheet 1 of 5

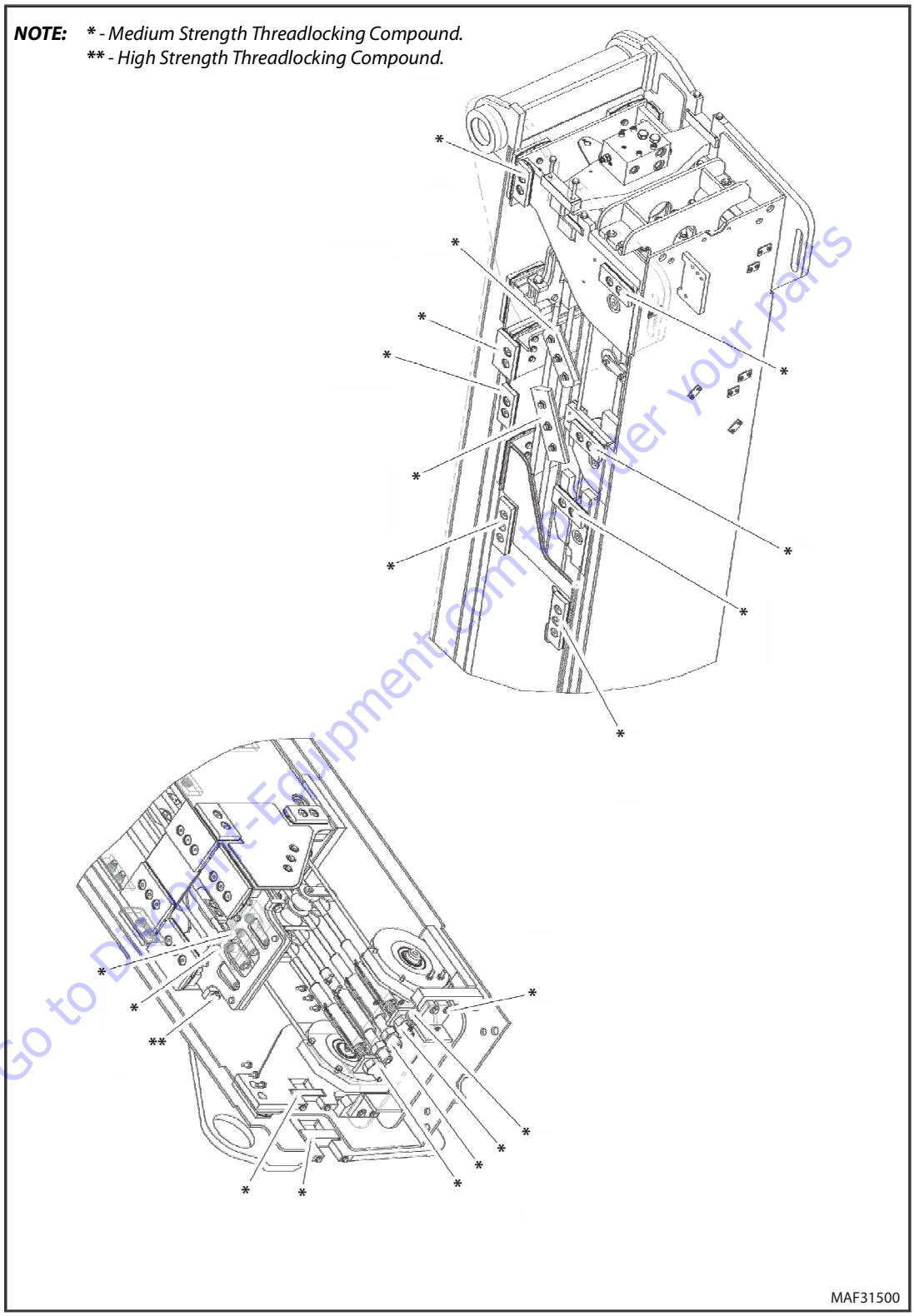


Figure 4-15. Locations for Threadlocker Application - Sheet 2 of 5