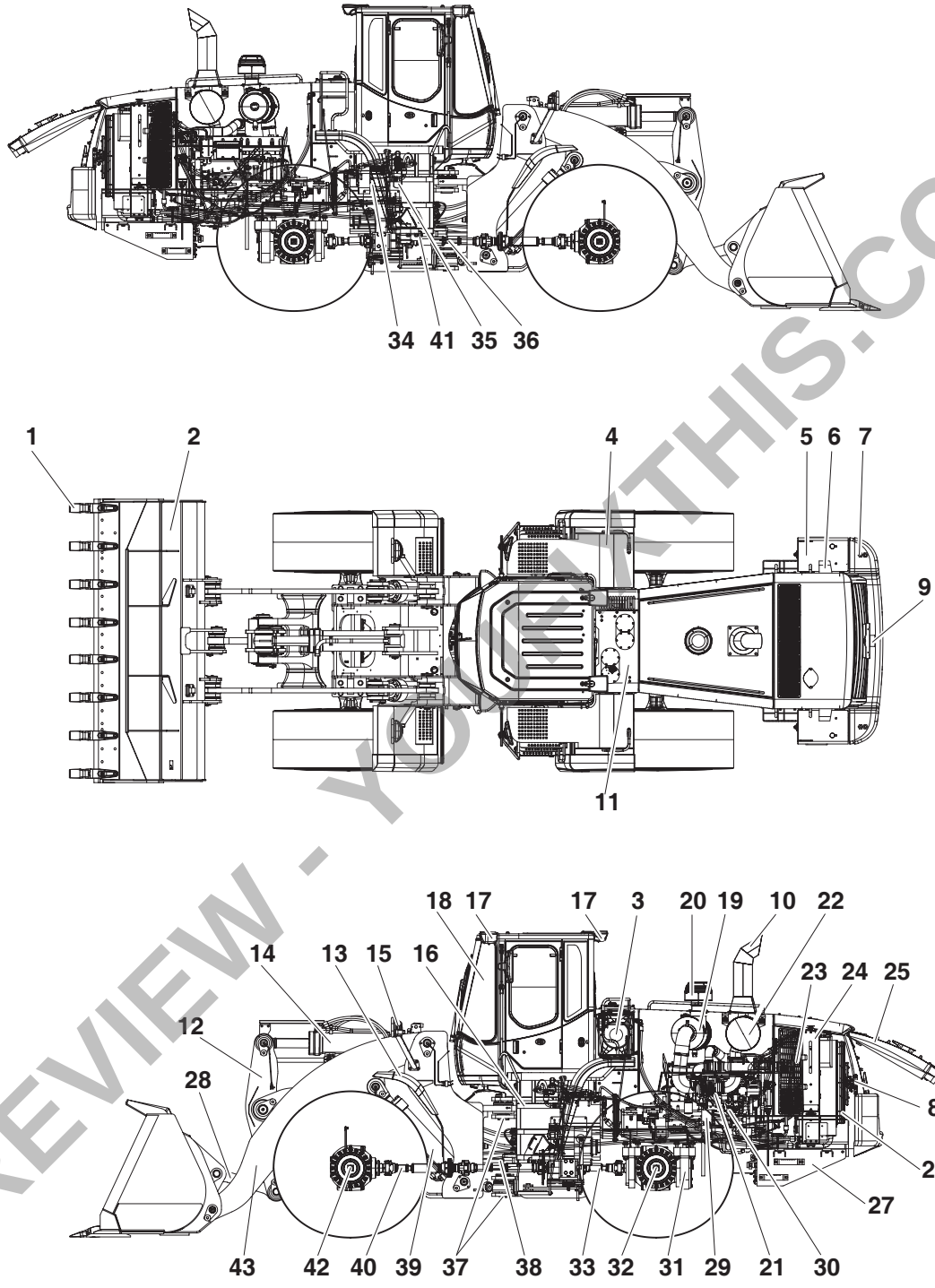
COMPONENT LOCATIONS



FG013747

Figure 1

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SAFETY PRECAUTIONS

⚠ CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

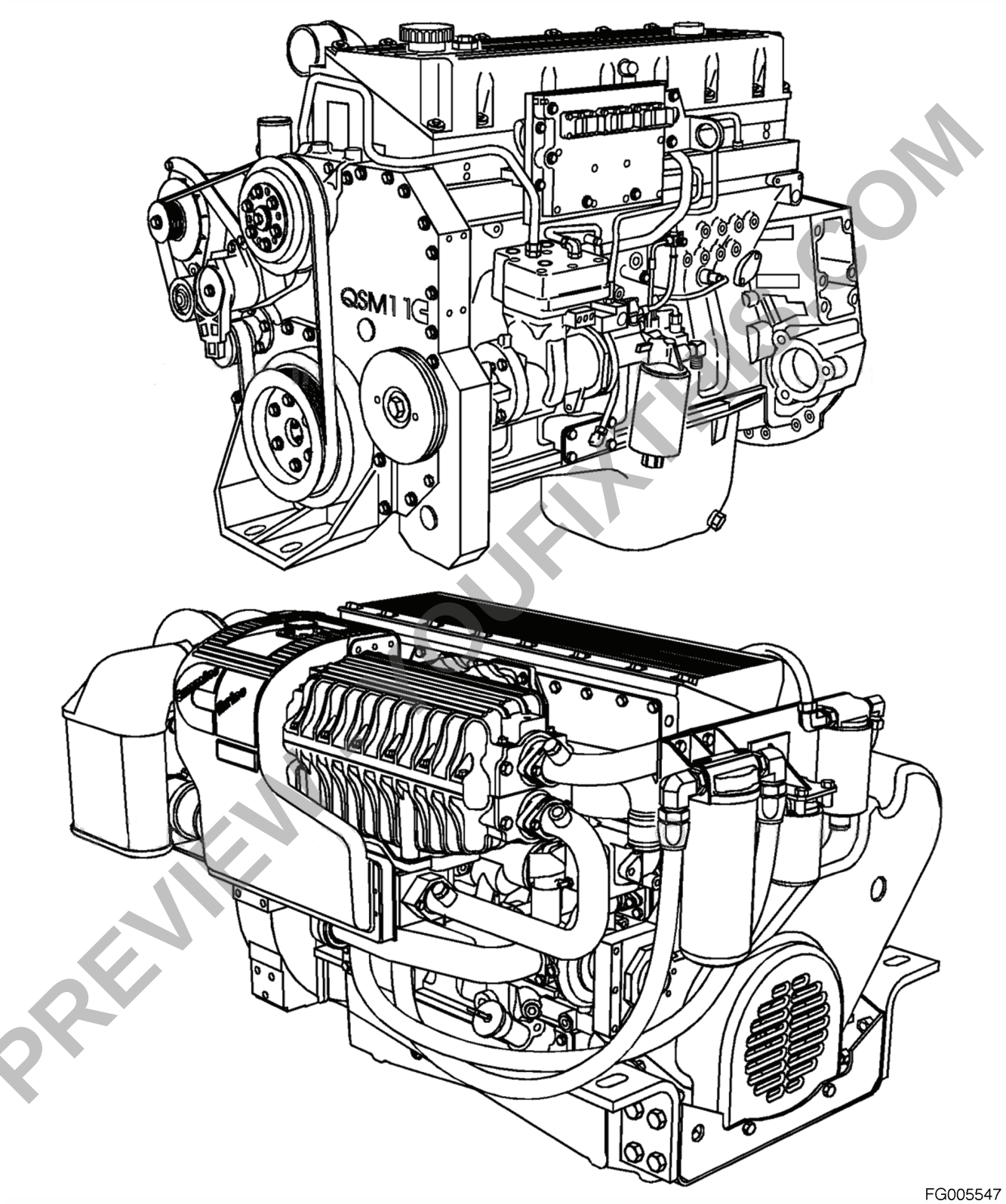
The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
ALL MODELS	ALL RANGES

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QSM11 ENGINE



FG005547

Figure 1

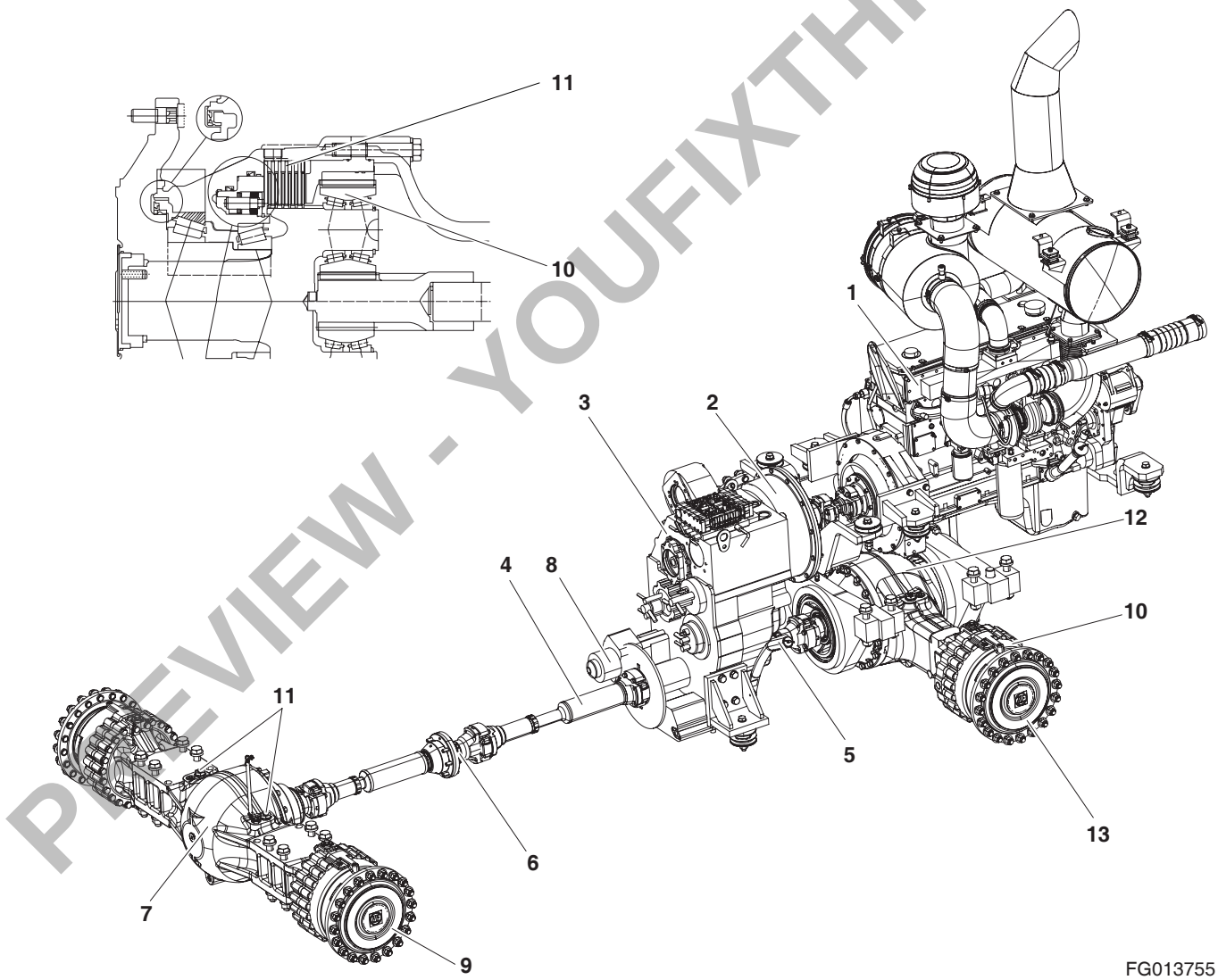
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GENERAL

Figure 1, shows layout of drive train assemblies. The engine (1, Figure 1) drives a torque converter (2), which drives a power shift transmission (3). Two output shafts extend out of the transmission. Each output shaft has a drive shaft attached to it. Front drive shaft (4) drives a final drive shaft (6) that drives the front differential (7).

A parking brake (8, Figure 1) is mounted on the front differential input or transmission output shaft. The front differential is enclosed in the front axle housing (9). Each end of the front axle housing contains reduction gearing (10). Each end of the front axle housing also contains a service brake (11). Rear drive shaft (5) drives the rear differential (12). The rear differential is enclosed in the rear axle housing (13). Each end of the rear axle housing contains reduction gearing (10). Each end of the rear axle housing also contains a service brake (11).



FG013755

Figure 1

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DISPLAY

If a fault is detected, the display shows a spanner symbol (g) for a fault. The display shows the fault code, if the gear selector is in neutral position.

If more than one fault is detected, each fault code is shown for about 1 second.

Reference Letter	Description
a, f	Automatic Range (Upshifting and Downshifting)
b, c, d, e	Preselected Gear
g	EST-37 has detected an error and is flashing.
h	This character will not be used at the EST-37.

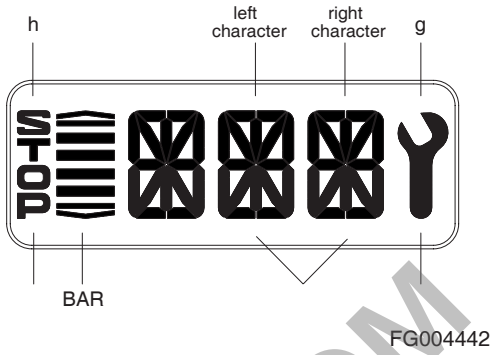


Figure 1

Description of Fault Codes

The first number of the error code is the category that it is grouped into. They are as follows for the first number.

First Number	Meaning of Number
1 Hex	Digital Input Signal
2 Hex	Analog Input Signal
3 Hex	Speed Signal
4 Hex	CAN Signal Error
5 Hex	CAN Signal Error
6 Hex	CAN Signal Error
7 Hex	Analog Current Output Signal
8 Hex	Analog Current Output Signal
9 Hex	Digital Output Signal
A Hex	Digital Output Signal
B Hex	Transmission Fault, Clutch Error
C Hex	Logical Fault
D Hex	Power Supply
E Hex	High Speed Signal
F Hex	General Fault

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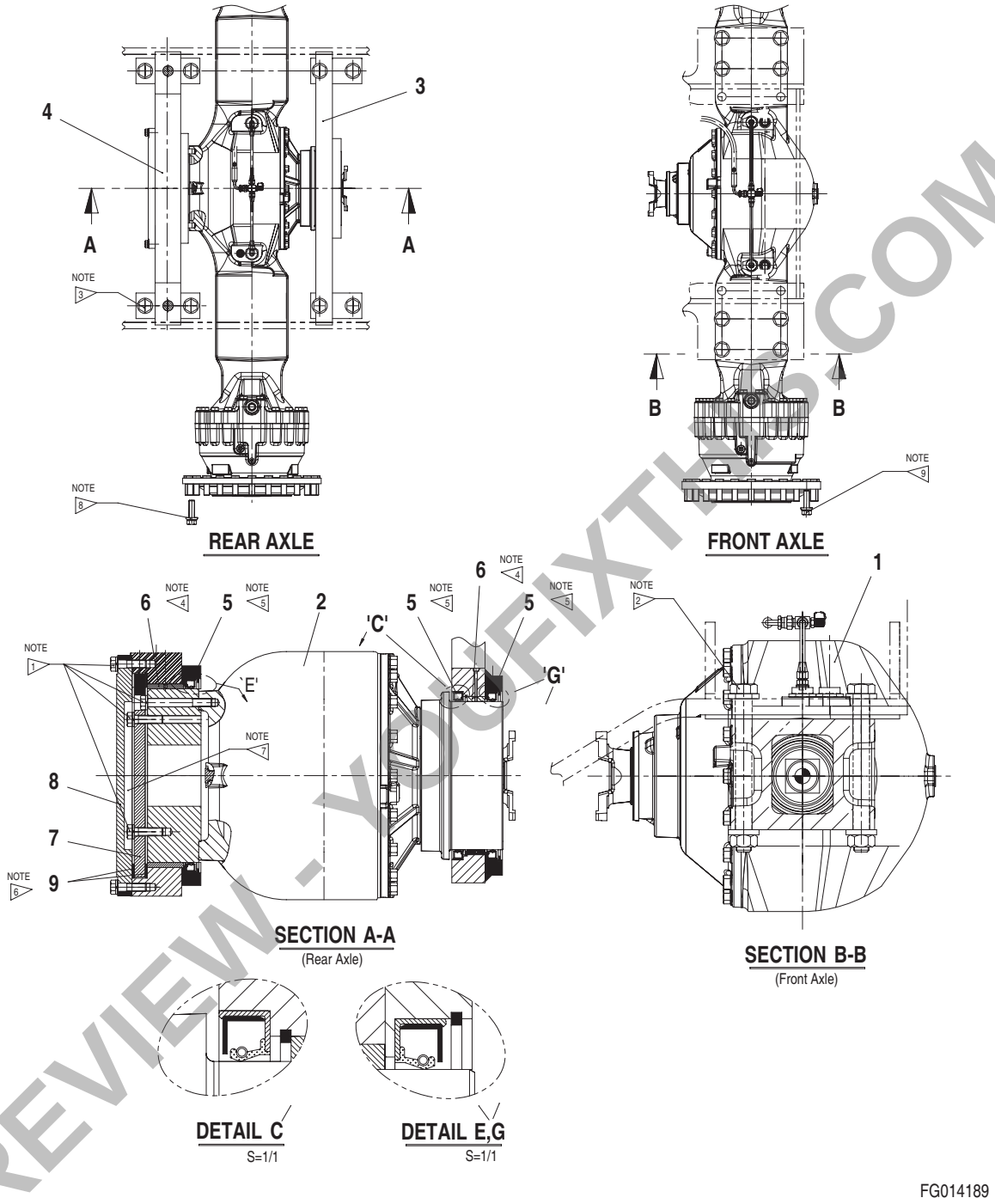


Figure 1 DRIVE AXLE ASSEMBLY

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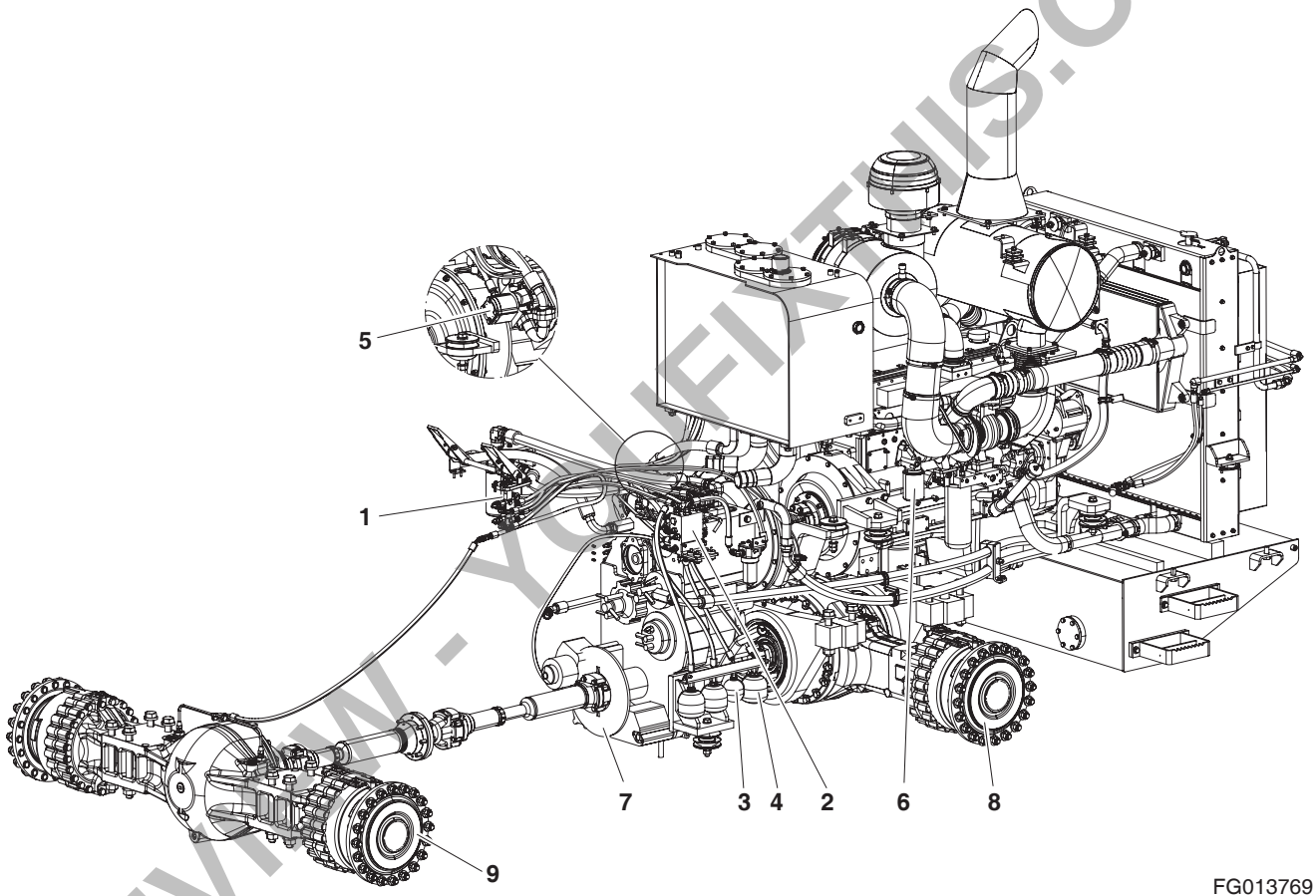
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GENERAL DESCRIPTION

This machine is equipped with a fully hydraulic operated brake system and have independent circuit for the front axle and rear axle.

The brake system is composed of brake pedal valve, brake supply valve and accumulators and provided with oil through brake supply valve from pump.

A system pressure drop below 65 bar (943 psi) will be indicated on the display panel in the cab, warning light will flash and also alarm will sound.



FG013769

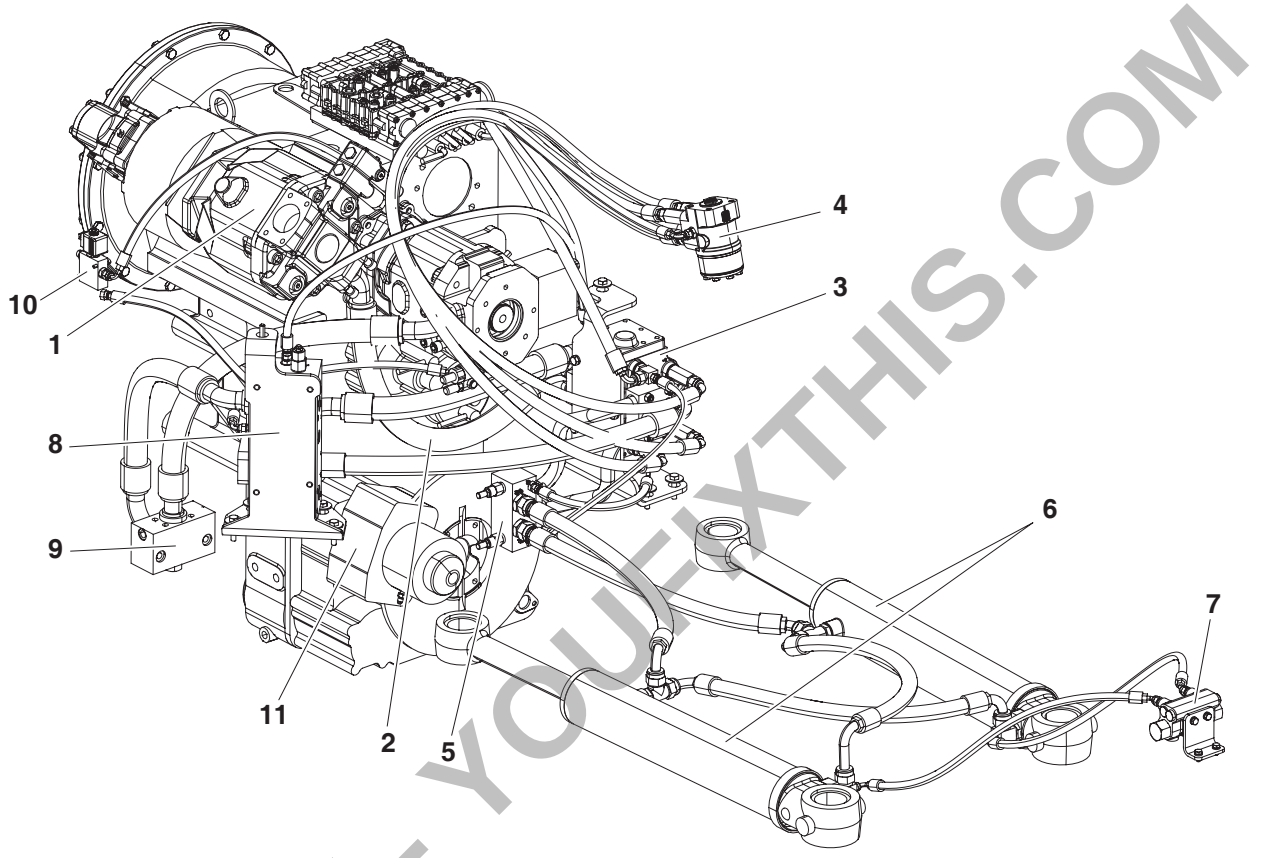
Figure 1

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GENERAL DESCRIPTION

Power Steering System



FG013750

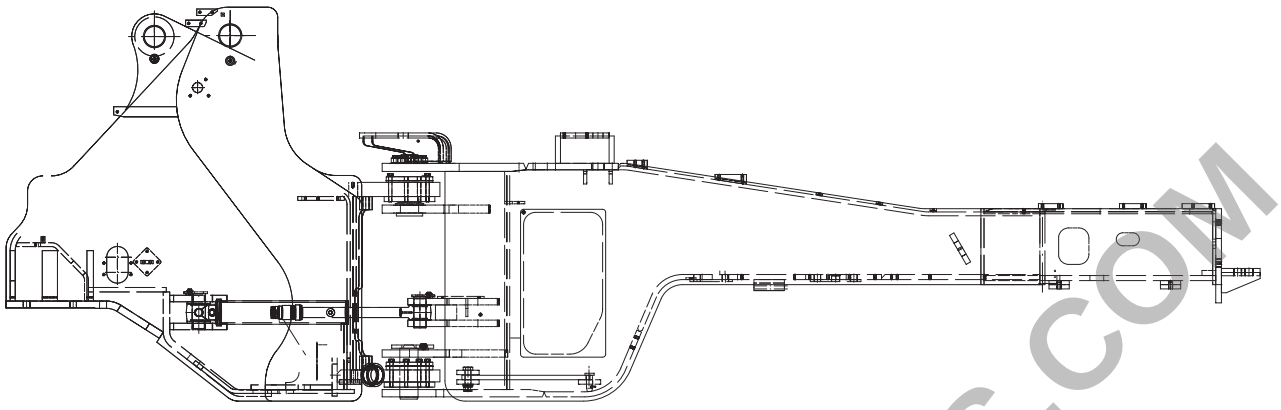
Figure 1

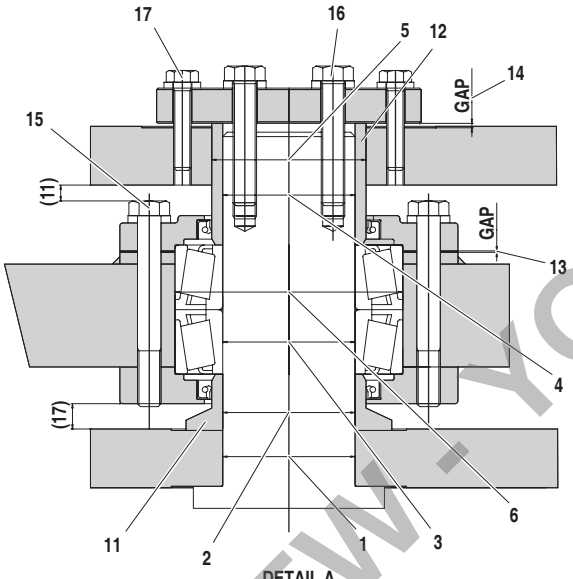
Reference Number	Description
1	Steering Pump
2	Supply Line to Control Valve
3	Flow Amplifier
4	Steering Unit
5	Jerk Softner
6	Steering Cylinder

Reference Number	Description
7	Cusion Valve
8	Main LS Valve
9	Check Valve
10	Unloading Valve
11	Transmission

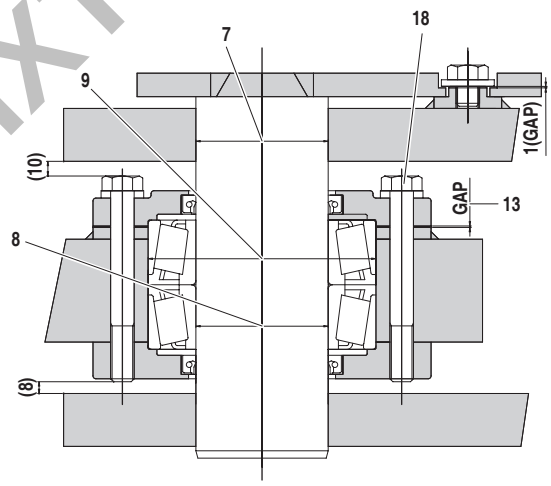
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DETAIL A
G450 UPPER BEARING DETAIL



DETAIL B
G450 LOWER BEARING DETAIL

FG013753

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PARTS LIST

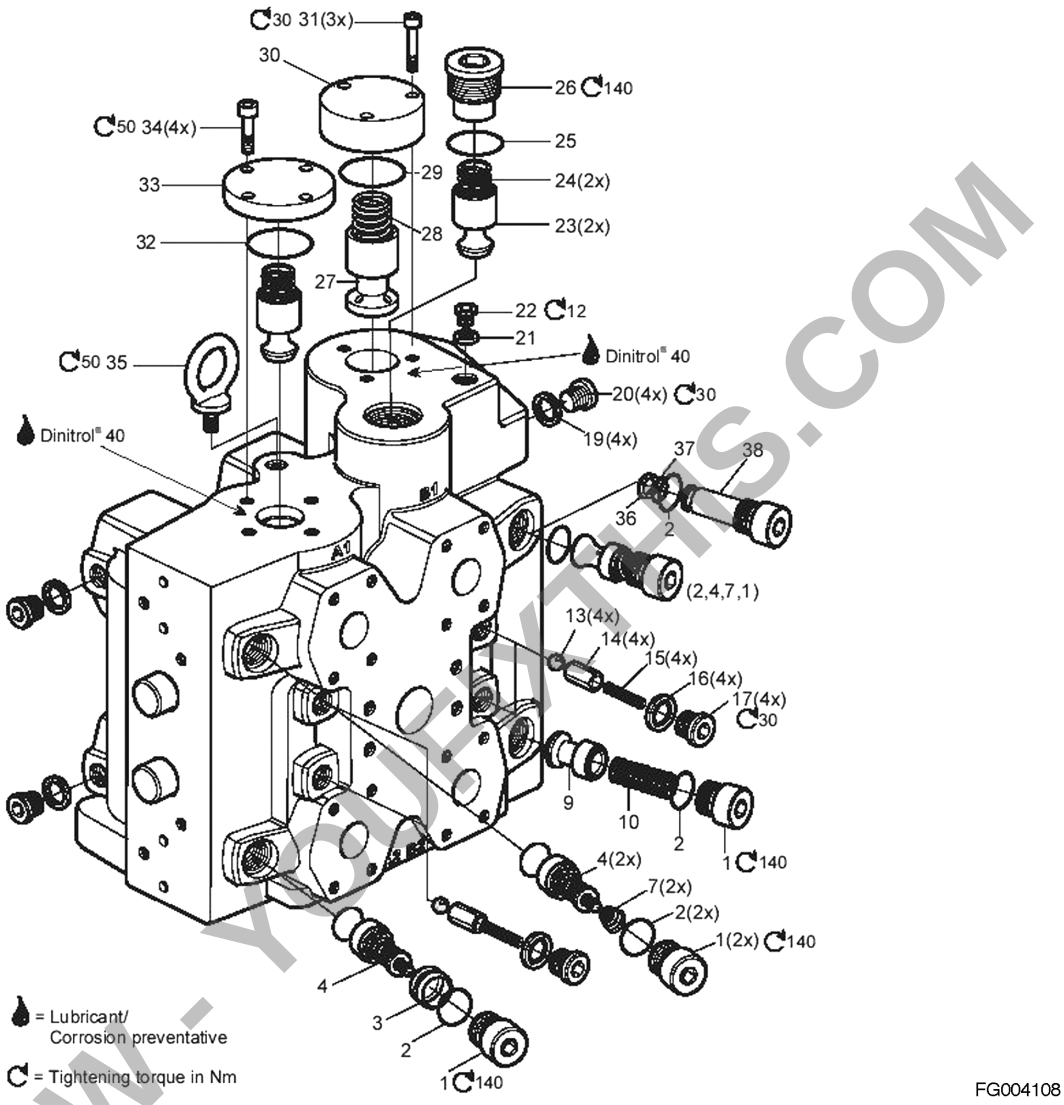


Figure 1

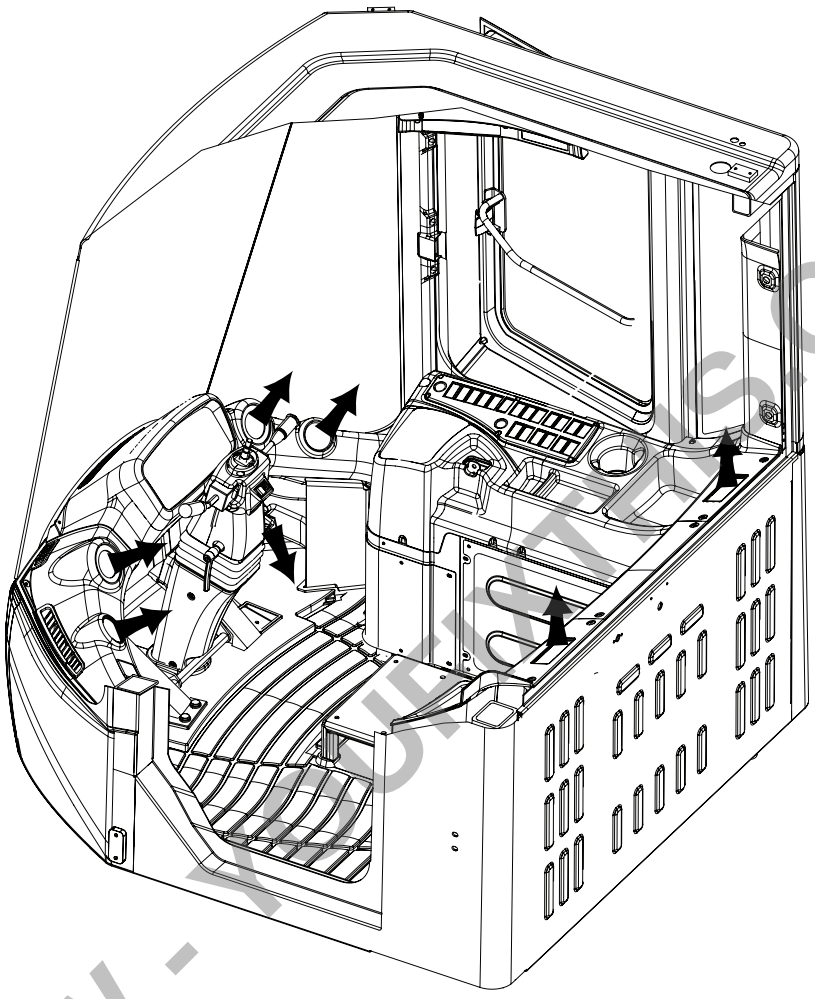
Reference Number	Description
1, 2	Plug
3	Distance Ring
(2, 4, 7, 1)	Shock Valve
9, 10	Check Valve
13 - 17	LS Check Valve
19	Sealing Ring
20	Plug
21	Sealing Ring

Reference Number	Description
22	Plug
23, 24	Supply Check Valve
25, 26	Plug
27, 28	Counter Pressure Valve
29, 30, 31	Cover
32, 33, 34	Cover
35	Lifting Eye

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GENERAL DESCRIPTION



FG004488

Figure 1

The heater and air conditioner are combined into one blower unit in the right control stand of operator's seat. If necessary, the operator can control inner temperature using the operation panel installed in the top of the right side door.

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Asbestos Dust Hazard Prevention

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work site. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage. To prevent lung damage from asbestos fiber, observe following precautions;

- Use a respirator that is approved for use in an asbestos-laden atmosphere.
- Never use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Work on the machine or component with the wind at your back whenever possible.
- Always observe any rules and regulations related to the work site and working environment.



ARO1770L

Figure 2

Mounting and Dismounting

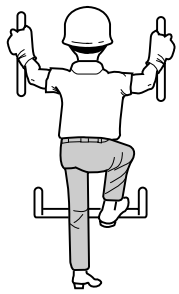
Before getting on or off the machine, if there is any oil, grease, or mud on the handrails, steps, or track shoes, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.

Never get on or off a moving machine. In particular, never get on or off a moving machine. These actions may lead to serious injury.

When getting on or off the machine, always face the machine, and maintain a three-point contact (both feet and one hand or one foot and both hands) with the handholds and steps to ensure that you support yourself securely.

Never hold any control levers when getting on or off the machine.

Never get up from operator's seat or leave operator's station and dismount machine if engine is running.



HA3O1003

Figure 3

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Table of Contents

Safety

Wheel Loader Safety SP001667

Specifications

Specification for DL450 ..... SP001668

General Maintenance

General Maintenance Procedures SP000097

Standard Torques SP000813

Engine

QSM11 Engine SP001669

Drive Train

Transmission and Torque Converter (ZF 4WG-260-4) SP001670

Transmission Error Codes (ZF) SP000100

Axle (ZF-MT-L 3105) SP001672

Drive Shaft SP001673

Brake

Service Brake SP001674

Brake Supply Valve SP000121

Parking Brake SP000122

Brake Pedal Valve SP000123

Accumulator SP001675

Steering

Steering Unit SP001676

Flow Amplifier SP000126

Cushion Valve SP000127

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MAINTENANCE SERVICE AND REPAIR PROCEDURE

General Precautions

Fluid level and condition should always be checked whenever any other type of maintenance service or repair is being performed.

NOTE: *If the unit is being used in an extreme temperature environment (in subfreezing climates or in high temperature, high humidity tropical conditions), frequent purging of moisture condensation from the hydraulic reservoir drain tap should be a regular and frequent part of the operating routine. In more moderate, temperate climates, draining reservoir sediment and moisture may not be required more than once or twice every few months.*

Inspect drained oil and used filters for signs of abnormal coloring or visible fluid contamination at every oil change. Abrasive grit or dust particles will cause discoloration and darkening of the fluid. Visible accumulations of dirt or grit could be an indication that filter elements are overloaded (and will require more frequent replacement) or that disintegrating bearings or other component failures in the hydraulic circuit may be imminent or have already occurred. Open the drain plugs on the main pump casings and check and compare drain oil in the pumps. Look for evidence of grit or metallic particles.

Vibration or unusual noise during operation could be an indication of air leaking into the circuit (Refer to the appropriate Troubleshooting section for component or unit for procedures.), or it may be evidence of a defective pump. The gear type pilot pump could be defective, causing low pilot pressure, or a main pump broken shoe or piston could be responsible.

NOTE: *If equipped, indicated operating pressure, as shown on the multidisplay digital gauge on the Instrument Panel ("F-Pump" and "R-Pump") will be reduced as a result of a mechanical problem inside the pump. However, pressure loss could also be due to cavitation or air leakage, or other faults in the hydraulic system.*

Check the exterior case drain oil in the main pumps. If no metallic particles are found, make sure there is no air in the system. Unbolt and remove the tank return drain line from the top part of the swing motor, both travel motors and each main pump. If there is air in any one of the drain lines, carefully prefill the assembly before bolting together the drain line piping connections. Run the system at low rpm.

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⚠ CAUTION!

Select the correct oil change interval for your application. Cummins Engine Company, does not recommend exceeding these published intervals and is not responsible for damage sustained due to overextended drain intervals.

The maintenance monitor automatic mode is easily adjusted to accommodate severe-, normal-, or light-duty applications and Valvoline® Premium Blue 2000™, engine oil. This is done by using a Compulink™, or Echek™, service tool to enter an interval factor that corresponds to the appropriate duty cycle and type of product used.

When selecting the correct interval factor for your application, refer to 102-002 (Maintenance Schedule) in Section 2, to determine which oil drain interval duty cycle fits your application: Severe duty, normal duty, or light duty. Once the duty cycle is chosen, use an interval factor of 1.00 for severe duty, 1.50 for normal duty, and 2.00 for light duty.

NOTE: *These interval factors must be adjusted accordingly if Valvolive® Premium Blue® 2000 oil is used to extend the oil drain interval. See the Valvolive® Premium Blue® 2000 product literature to determine how much your drain interval can be extended.*

The time mode allows the customer to enter a desired time interval. The maintenance monitor will then monitor the time the engine has been operating and alert the operator when the interval has been consumed.

Alerting the operator: The maintenance monitor will alert the operator of the need to change oil by flashing the engine maintenance for approximately 12 seconds after key-on. The flashing sequence will be three quick flashes, followed by a pause. This flash sequence will go through five cycles in the 12-second period. This sequence will occur at every key-on until the maintenance monitor has been reset.

NOTE: *The diagnostic switch must be in the OFF position for the flashing sequence to occur.*

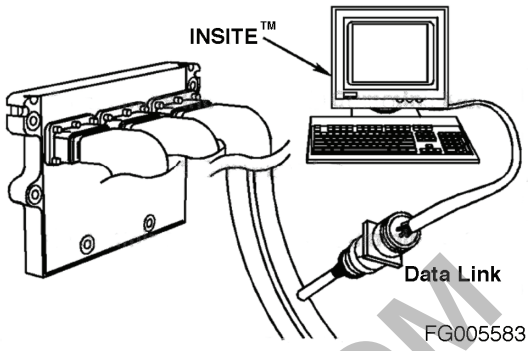


Figure 55

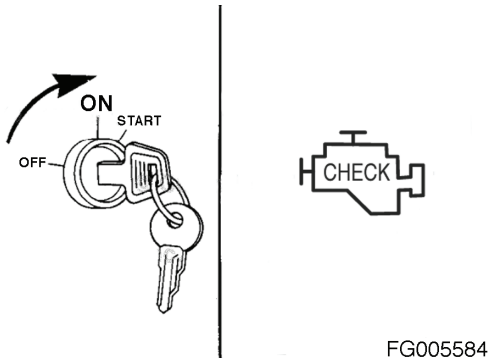
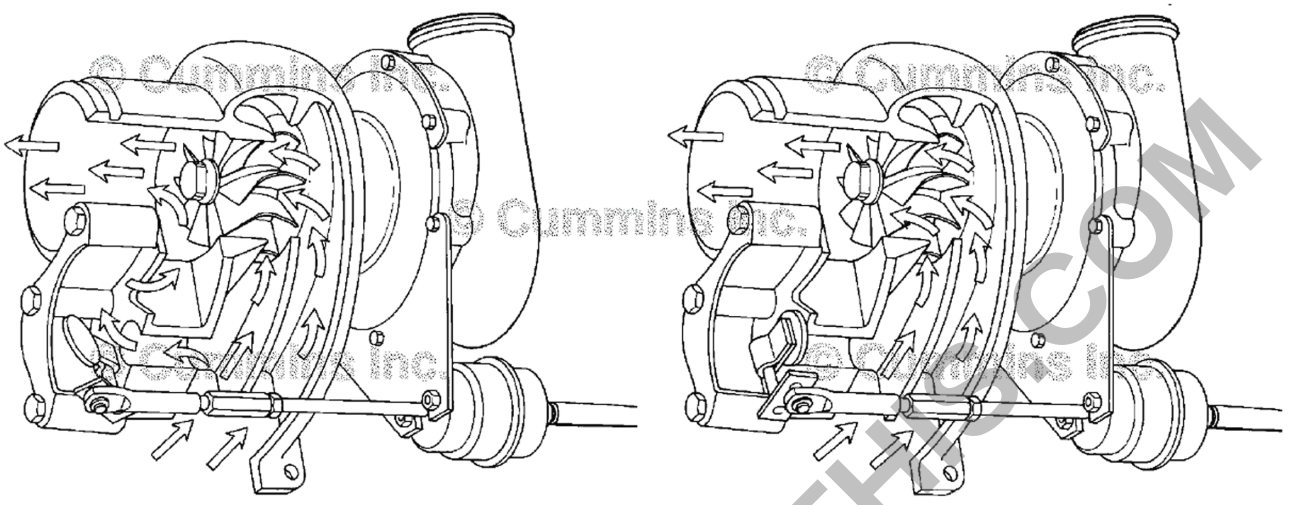


Figure 56

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FG005727

Figure 254 Wastegate Actuation OPEN and CLOSED

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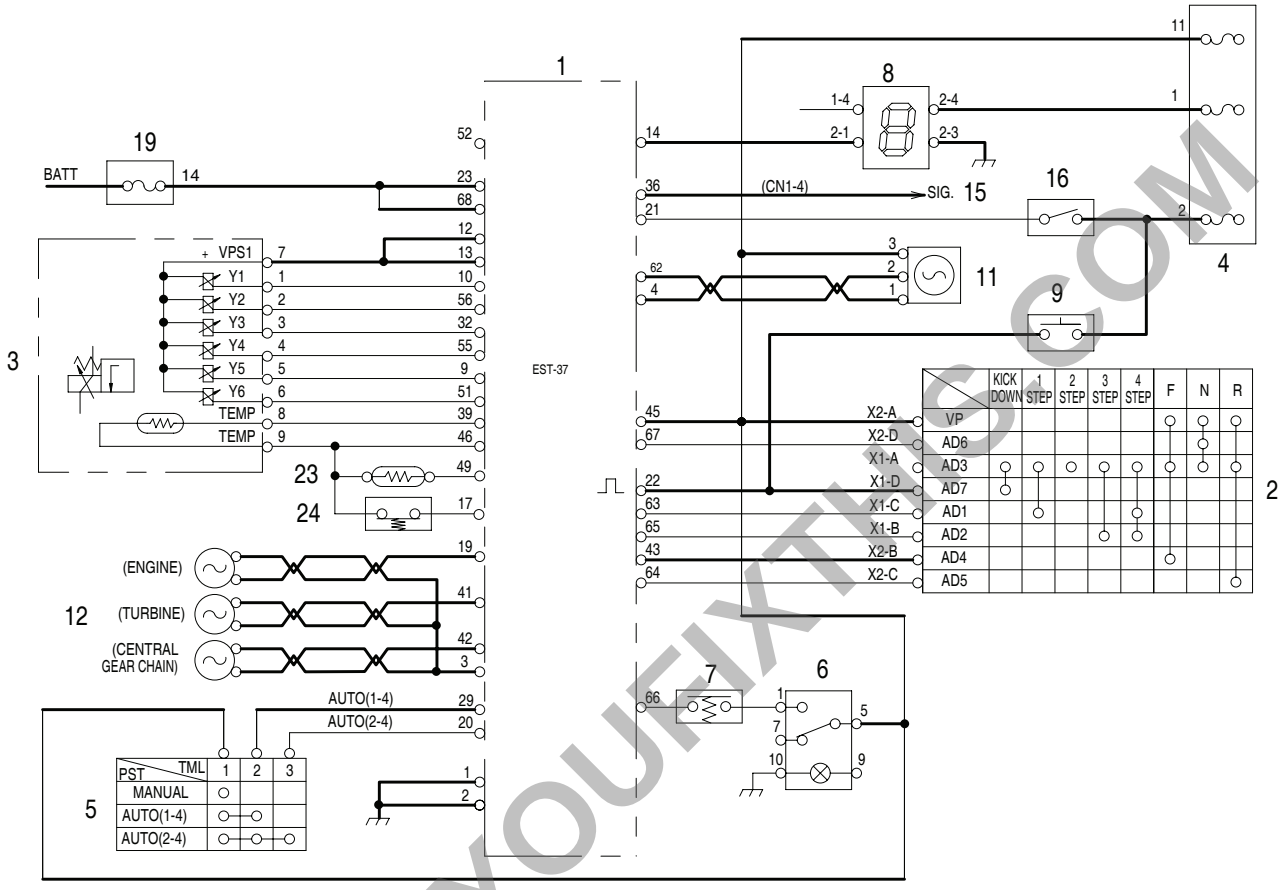
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Engine Vibration Excessive

Cause	Correction
STEP 1 Electronic fault codes are active	For instructions on how to read active fault codes, refer to Procedure 101-007 (Electronic Controlled Fuel System) in Section 1 for diagnostic fault codes. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK Go To Next Step	
STEP 2 Engine is misfiring	Refer to the Engine Runs Rough or Misfires symptom tree.
OK Go To Next Step	
STEP 3 Engine idle speed is set too low (electronically controlled fuel systems)	Verify the correct idle speed setting. Increase the idle speed with the idle increment switch or an electronic service tool. Refer to a Cummins Authorized Repair Location.
OK Go To Next Step	
STEP 4 Fan is loose, damaged, or not corret	Check the fan. Refer to Procedure 008-040 (Fan, Cooling) in Section 3.
OK Go To Next Step	
STEP 5 Belt-driven accessories are malfunctioning	Check the fan hub, alternator, refrigerant compressor, and hydraulic pump for interference. Isolate belt-driven accessories and check for vibration. Refer to Procedure 008-036 (Fan Hub, Belt Driven) in Section A.
OK Go To Next Step	
STEP 6 Engine mounts are worn, damaged, or not correct	Check the engine mounts. Refer to the OEM service manual.
OK Go To Next Step	
STEP 7 Vibration damper is damaged	Inspect the vibration damper. Refer to Procedure 001-052 (Vibration Damper, Viscous) in Section 7.
OK Go To Next Step	
STEP 8 Contact a Cummins Authorized Repair Facility	

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FG004386

Figure 38

When the auto selector switch (Figure 38) is in the "Auto (1-4)" position, the "29" terminal of transmission controller is energized. This allows the transmission to automatically upshift and downshift gears depending on the load and on the engine speed.

If either downshift switch (Figure 35) is activated, a pulse signal is sent to the "22" terminal of transmission controller. This signal shifts the transmission to the next lowest gear.

Automatic Gear Selection	Downshift Switch "Activated"
Fourth Gear	Downshift to Third Gear
Third Gear	Downshift to Second Gear
Second Gear	Downshift to First Gear
First Gear	Remains in First Gear

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15. Insert second oil baffle and fasten both plates using hex. head screws (mount plain washer).

    NOTE: *Torque limit (M8/8.8) 2.35 kg•m (17 ft lb).*

    NOTE: *Secure hex. head screws with Loctite #262.*

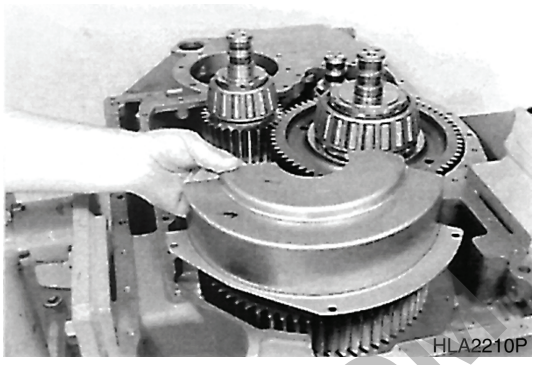


Figure 268

16. Cool down output shaft and install it until seated.

    NOTE: *Pay attention to installation position, see Figure 269.*

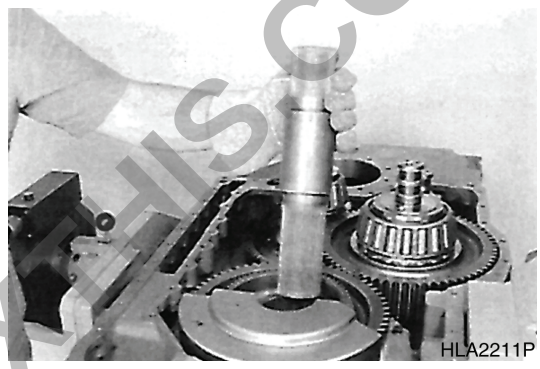


Figure 269

17. Wet mounting face with sealing compound (Loctite #574).
18. Install two adjusting screws and position housing cover using lifting device on gearbox housing until seated.

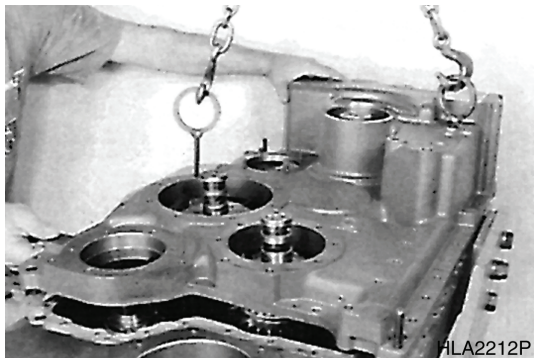


Figure 270

19. Install both cylindrical pins (1 and 2, Figure 271) and roll pin (3).

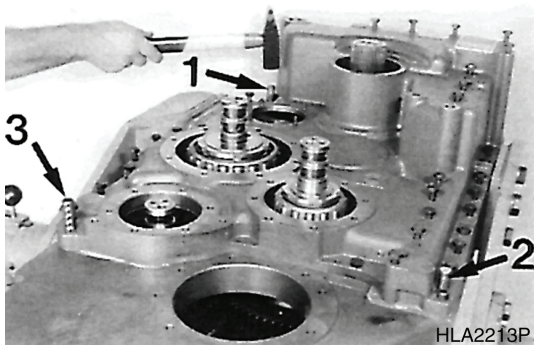


Figure 271

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Fault Code (hex)	Meaning of the Fault Code (Possible reason for fault detection.)	Reaction of the TCU	Possible Steps to Repair	Remarks
F5	Clutch failure. AEB was not able to adjust clutch filling parameters. • One of the AEB-Values is out of limit.	Transmission stay neutral. Op-Mode: TCU shut down.	Check clutch.	TCU shows also the affected clutch on the Display.
F6	Clutch adjustment data lost or inch pedal calibration data lost. TCU was not able to read correct clutch adjustment parameters. • Interference during saving data on nonvolatile memory. • TCU is brand new.	Default values = 0 for AEB offsets used. Op-Mode: normal. No Inch mode available.	Execute AEB.	----------

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Reassembly of Differential Carrier

NOTE: *If crown wheel or drive pinion are damaged, both parts have to be replaced together. For new installation of a complete bevel gear set, pay attention to same pair number of drive pinion and crown wheel.*

Determine Shim Thickness for Perfect Tooth Contact Pattern

NOTE: *Make following measurements with accuracy. Inexact measurements result in a faulty tooth contact pattern and require a repeated disassembly and reassembly of drive pinion and of differential.*

1. Install adapter pieces (1) and preliminarily fasten bearing bracket using hex screws.

   Then install stop washer (4) and measuring pin (3) and assemble measuring shaft (2), see Figure 173.

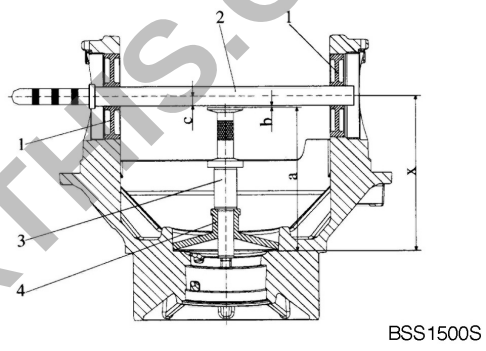
   (S) Adapter piece 5870 500 046

   (S) Adapter piece 5870 500 030

   (S) Measuring shaft 5870 500 001

   (S) Measuring pin 5870 351 016

   (S) Stop washer 5870 351 019



BSS1500S

Figure 173

2. Determine gap (Dimension b) between measuring shaft and measuring pin by means of a feeler gauge.

   Dimension b, e.g. 5.60 mm (0.2205 in)

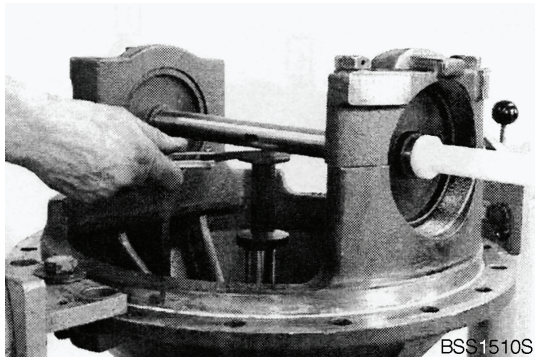

BSS1510S

Figure 174

EXAMPLE "A"

Dimension a (= Measuring pin + stop washer)	225.00 mm (8.8582 in)
Dimension b	+ 5.60 mm (0.2205 in)
Dimension c	+ 15.00 mm (0.5906 in)
Dimension X	= 245.60 mm (8.6693 in)

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Power Steering Unit.

The machine contains a fully hydraulic steering unit. Rotating the steering wheel controls hydraulic flow through the steering valve. The steering valve meters the volume of pump flow that is supplied to the steering cylinders

The steering unit contains a gerotor. This allows the operator to steer the machine when the engine is not running or when the steering pump has failed. The gerotor functions as a manual hydraulic pump that is powered by the rotation of the steering wheel. Rotating the steering wheel will cause the gerotor to draw oil from the hydraulic tank and send this oil to the steering cylinders.

The shaft that is rotated by the steering wheel is attached to the spool (2, Figure 3) by the engagement of a spline. The spool is surrounded by a sleeve (2). The spool and sleeve are connected by the centering spring (12). At the steering wheel neutral position, the center pin does not contact the spool. A drive shaft (11) extends through the spool. The upper end of the drive shaft engages the center pin (9). The lower end of the drive shaft engages the spline in the gerotor (5).

Specifications

General	
Type	Open Load Sensing Non Reaction
Rated Displacement	250 cc/rev (15.2 in^3/rev)
Max. Pressure ON P - Port	185 bar (2,683 psi)
Max. Pressure ON T - Port	15 bar (218 psi)
Max. Pressure ON L, R - Port	240 bar (3,481 psi)
Rated Oil Flow	25 *l*/min (4.2 U.S. gpm) (@steering speed 100 rev/min)
Operating Condition	
Max. Pump Discharge Flow	240 *l*/min (58 U.S. gpm)
Max. Pump Pressure	185 bar (2,683 psi)
Hydraulic Oil	ISO VG 46 WR or SIMILAR
Hydraulic Oil Temperature	-20 - +90 °C
Atmospheric Temperature	-30 - +45 °C

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SAFETY PRECAUTIONS

⚠ CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DL450	5001 and Up

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SAFETY PRECAUTIONS

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MODEL	SERIAL NUMBER RANGE
DL400	5001 and Up
DL450	5001 and Up

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Table of Contents

Electrical System

Safety Precautions 5
Applicable Models 5
Overview 6
Electric Supply System 7
Engine Starting Circuit 9
- Operation During Start Process 9
- Operation After Start Process 11

Engine Preheating System 14
Engine Stop System 16
Charging System 17
Monitoring System 19
- Instrument Panel 20
- Function Check 21
- Monitoring System Schematic 22
- Operation 24

Windshield Wiper 30
- Front windshield wiper 30
- Rear Windshield wiper 32

Lighting System 34
- Light Circuit 34

ECU System 39
- ECU Electric Circuit 40
- ECU System Component 42

Engine Fault Code 46
Cooling Fan Control System 59
- Outline 59
- Diagram 60
- Electrical Diagram 61
- Parts of Cooling Fan Control System 62
- Operation of Cooling Fan Control System 64

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