WENBM00320

Shop Manual

BACKHOE LOADER **WB93S-8E0**

SERIAL NUMBERS WB93S-8E0 F25001 and up

KOMATSU

SAFETY NOTICE FOR OPERATION

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manuals describe the effective and safe servicing and repair methods recommended by Komatsu. Some of the servicing and repair methods require the use of special tools designed by Komatsu for special purposes.
- The symbol mark ⚠ is indicated for such matters that require special precautions. The work indicated with this warning mark ⚠ should be performed according to the instructions with special attention. Should a hazardous situation occurs or be anticipated during such work, be sure to keep safe first and take every necessary measures.

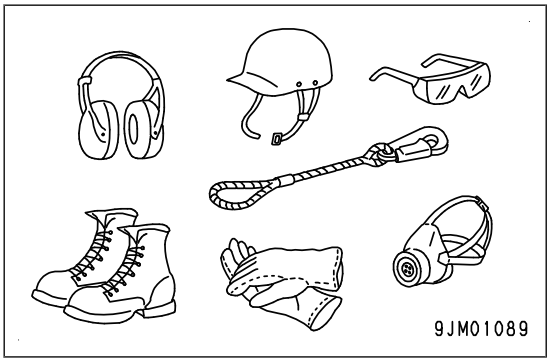
Safety matters

- Well organized work place
- Correct work clothes
- Observance of work standard
- Enforcement of hand signals
- Prohibition against unlicensed persons operating and handling the machine
- Safety check before starting work
- Wear of dust glasses (for cleaning or grinding work)
- Wear of welding goggles and protectors (for welding work)
- Being in good physical condition, and good preparation
- Always be alert and careful.

General precautions

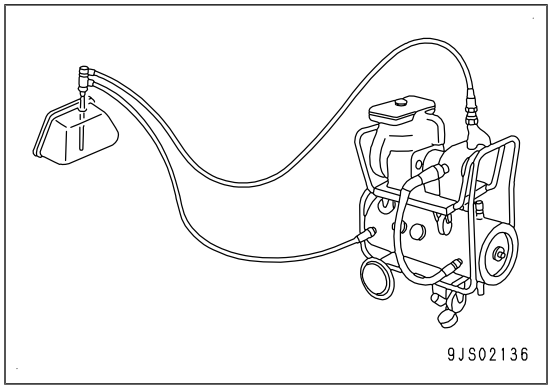
⚠ **If the machine is handled incorrectly, it is dangerous. Read and understand what is described in the operation and maintenance manual before operation. Read and understand what is described in this manual before operation.**

- Read and understand the meaning of all the safety labels stuck to the machine before performing any greasing or repairs. For the locations of the safety labels and detailed explanation of precautions, see Operation and Maintenance Manual.
- Tools and removed parts in the workshop should be well organized. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dust, dirt, oil, or water on the floor. Smoke only in the designated areas. Never smoke while working.
- Keep all tools in good condition, learn the correct way to use them, and use the proper ones. Check the tools, machine, forklift truck, service car, etc. thoroughly before starting the work.
- Always wear safety shoes and helmet when performing any operation. Do not wear loose clothes, or clothes with buttons missing.



REMARK

The oil cleaning equipment can remove the ultra fine (approximately 3 μm) particles that the filter built in the hydraulic equipment cannot remove. So, it is very effective device.



PRECAUTIONS FOR DISCONNECTION AND CONNECTION OF CONNECTORS

Disconnecting connectors

1. Hold the connectors when disconnecting.

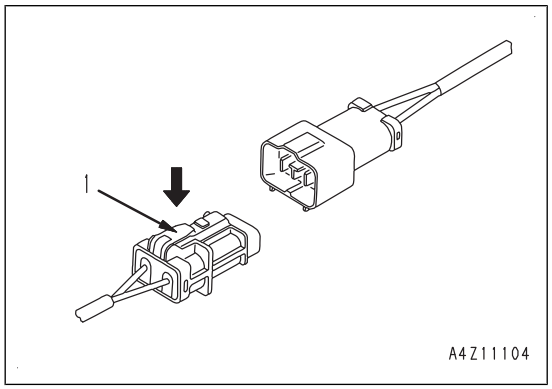
   When disconnecting the connectors, always hold the connecting portion. If the connector is fixed with screw, loosen the screw of the connector completely, hold the both of male and female connectors, and pull them out in parallel.

   NOTICE

   Do not pull the connectors with one hand.

   REMARK

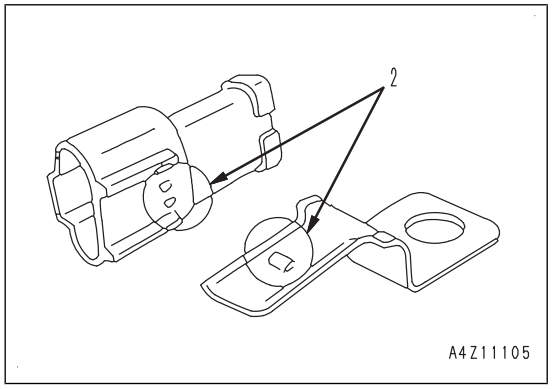
   If it is a lock stopper type connector, pull it out as pushing the stopper (1) with your thumb.

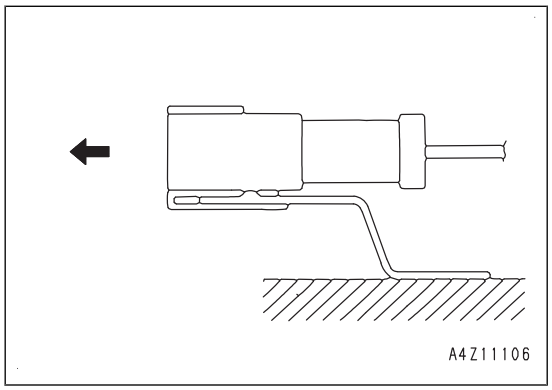


2. When removing a connector from a clip
   - Both of the connector and clip have stoppers (2), which are engaged with each other when the connector is connected.
   - When removing a connector from a clip, pull the connector in parallel with the clip as removing stoppers.

     NOTICE

     If the connector is pried up and down or to the right or left, it may break the housing.



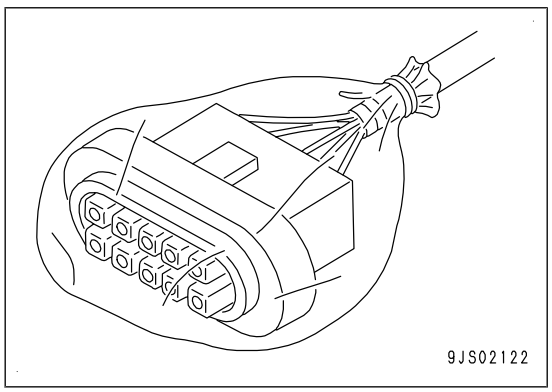


3. Action to be taken after removing connectors

   After removing the connector, cover it with plastic bags to prevent entry of dust, dirt, oil, or water in the contact portion.

   NOTICE

   Be sure to cover the connector with plastic bags when leaving the machine disassembled for a long time, otherwise defective contact may occur.



Connecting connectors

1. Check the connector visually.

- The parts whose interferences are out of the allowable interference must be replaced or repaired.

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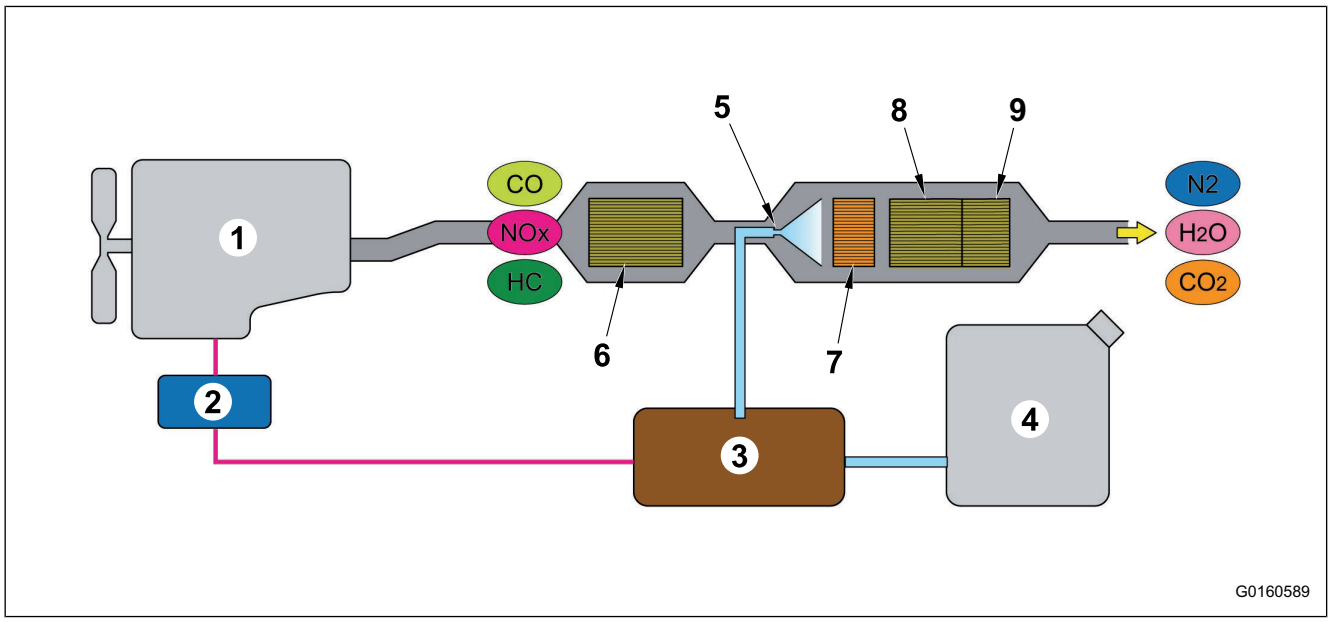
FUNCTION OF UREA SCR SYSTEM

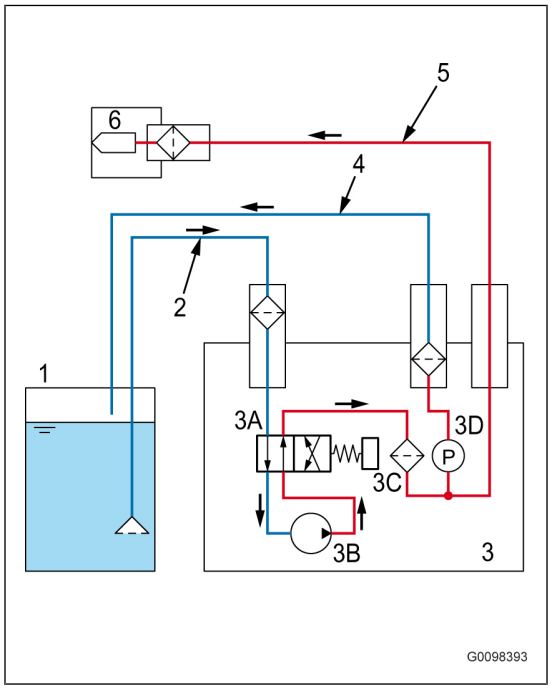


1: Engine
2: Engine controller
3: DEF pump
4: DEF tank
5: DEF injector
6: DOC
7: Diesel Particulate filter (DPF)
8: Selective catalyst reduction (SCR)
9: Clean-up catalyst (CUC)

- Urea SCR system is a device which converts toxic nitrogen oxides (NOx) in the exhaust gas into harmless nitrogen and water.
- By spraying DEF into the exhaust gas, it decomposes and hydrolyzes to form ammonia (NH_3) and the ammonia selectively reacts with nitrogen oxides for the conversion to nitrogen and water.

FUNCTION OF DEF SYSTEM

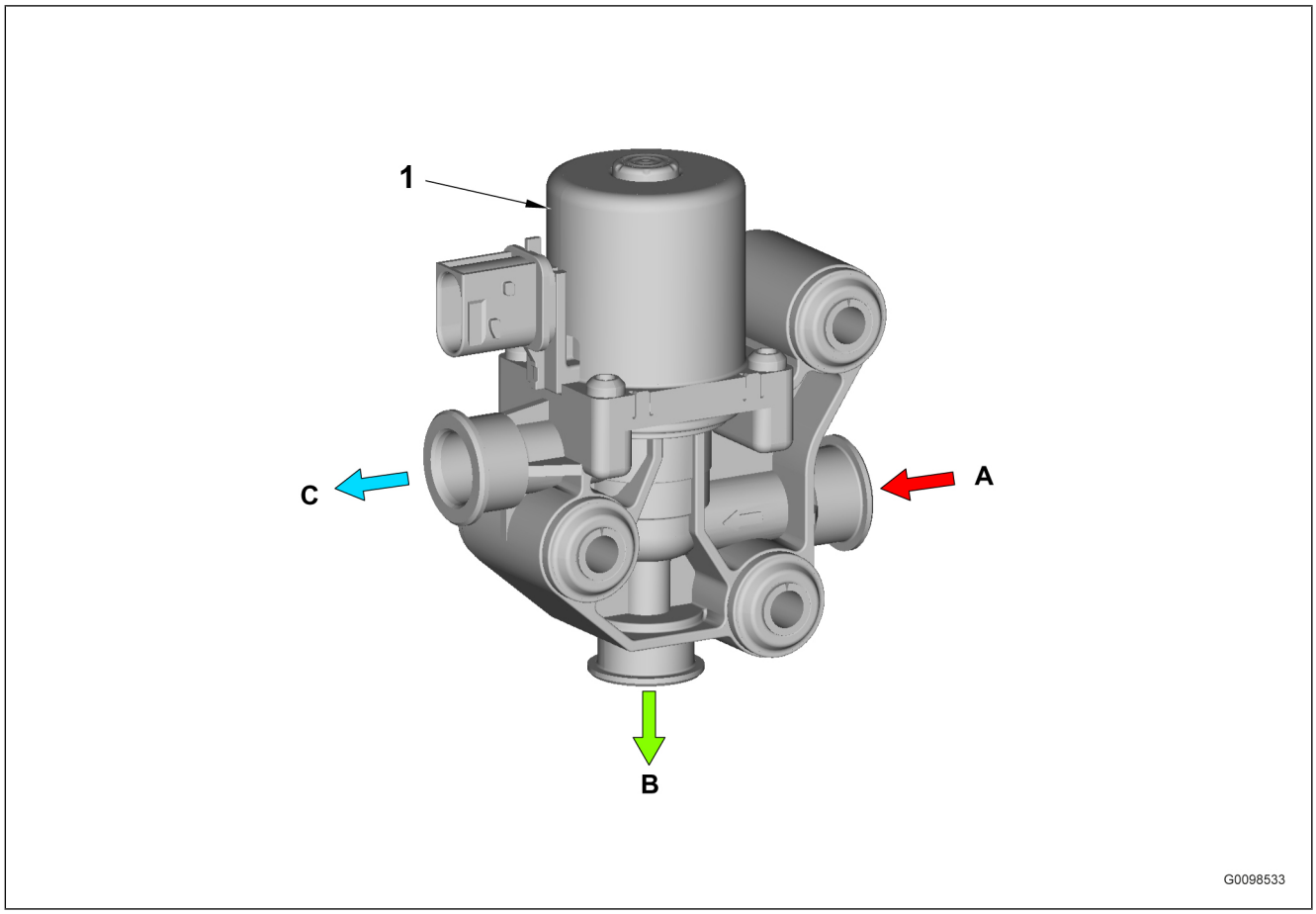
1: DEF tank
2: DEF suction hose
3: DEF pump
3A: Flow control valve
3B: Pump
3C: DEF filter
3D: Pressure sensor
4: DEF return hose
5: DEF pressure hose
6: DEF injector



- DEF system consists of DEF tank (1), DEF hoses (2), (4), (5), DEF pump (3), and DEF injector (6).
- The DEF system is a part of the Komatsu Urea SCR system and its function is to provide DEF into the SCR Catalyst Assembly.
- However, the comprising devices, such as the DEF pump, may not start functioning till certain conditions are fulfilled.
- The DEF system has heating systems to thaw and prevent DEF from freezing because DEF freezes at -11 °C.

DEF TANK HEATING VALVE

STRUCTURE OF DEF TANK HEATING VALVE



A: Engine coolant inlet

C: Engine coolant outlet (to DEF tank)

B: Engine coolant outlet (to DEF injector)

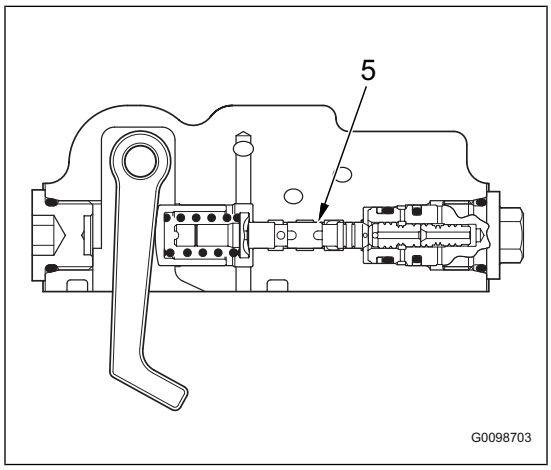
1: Solenoid

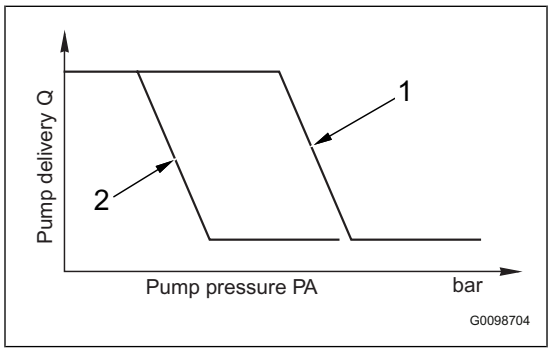
FUNCTION OF DEF TANK HEATING VALVE

- DEF tank heating valve is a 3-way valve, switching the engine coolant DEF injector or to DEF tank when DEF tank needs to be thaw DEF tank.
- Switching of the valve is done by solenoid (1).
- The opening position of valve is fixed and the control is only for selecting outlet B or C.
- When the solenoid (1) is de-energized, the valve select outlet B.
- When the solenoid (1) is energized, the valve select outlet C.

Function of PC valve

- The PC valve limits the oil flow to a certain level (according to the discharge pressure) even if the stroke of the control valve is increased extremely so that the horsepower absorbed by the pump does not exceed the engine horsepower, as long as pump discharge pressure (PA) is high.
- In other words, the PC valve decreases the pump delivery when the load is increased and the pump dis- charge pressure rises, and increases it when the pump discharge pressure lowers.
- If pressure PC is increased, the relationship between the pump pressure (PA) and pump delivery (Q) is translated in proportion to the pressing force of pressure PC.
- In other words, since the pressing force pressure PC is added to the pressing force on the left side caused by the pump pressure applied to spool (5), the relationship between pump pressure (PA) and (Q) is translated from [1] to [2].





OPERATION OF MAIN PUMP SERVO VALVE

Operation of spring

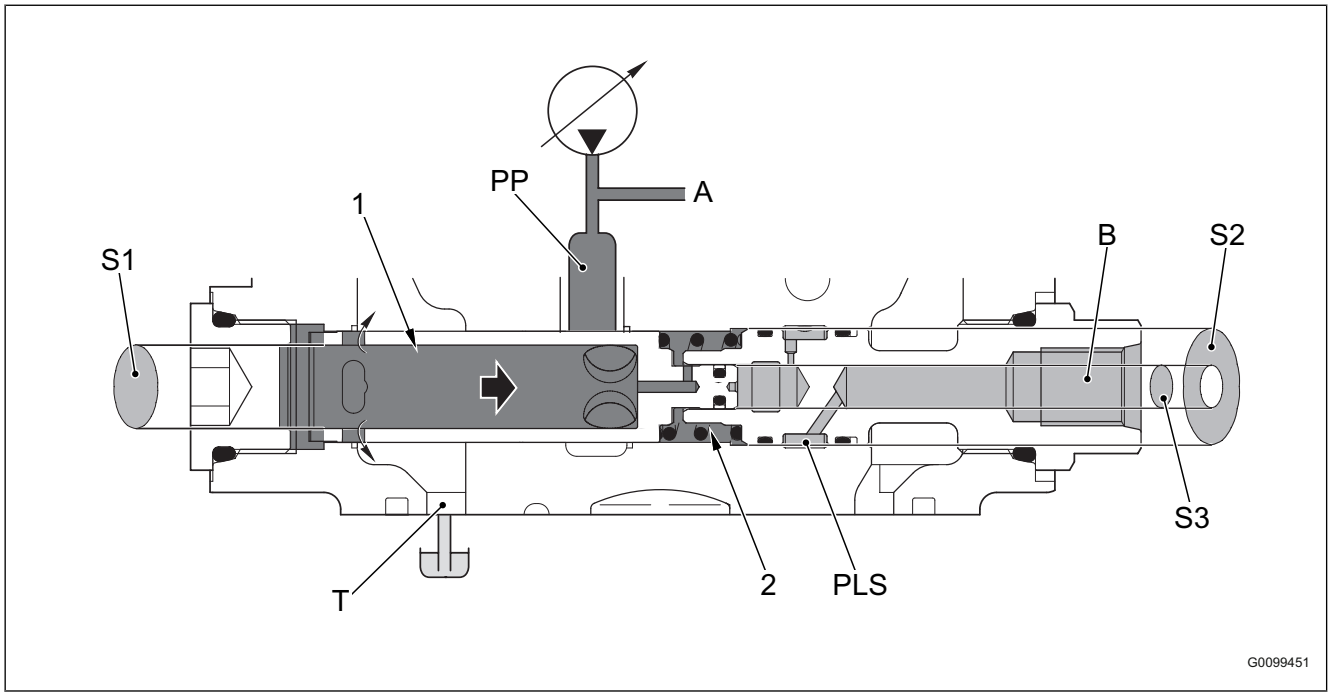
- The spring load of spring (1) at the PC valve is decided by the position of the swash plate.
- If servo piston (2) moves to the right, spring (1) is compressed through lever (3) and its spring load changes.

9: Backhoe boom swing spool
10: Backhoe arm spool
11: Service spool
12: Unloading valve:
Set pressure: LS pressure + 2.75 MPa {28.0 kgf/cm^2}
13: LS relief valve
Set pressure: 21.5 MPa {219 kgf/cm^2}
14: Safety valve
Set pressure: 27.0 MPa {275 kgf/cm^2}
15: Suction valve
16: Safety valve
Set pressure: 21.5 MPa {219 kgf/cm^2}
17: Safety valve
Set pressure: 22.0 MPa {224 kgf/cm^2}
18: Safety valve
Set pressure: 34.4 MPa {350 kgf/cm^2}
19: Pressure compensation valve
20: Priority valve
21: Servocontrol reducing valve
22: Backhoe sliding plate lock solenoid valve

STRUCTURE OF CONTROL VALVE (HYDRAULIC CONTROLS SPECIFICATION)

This topic explains structure of 11-spool loader and backhoe valves.

WHEN CONTROL VALVE IS IN FINE CONTROL



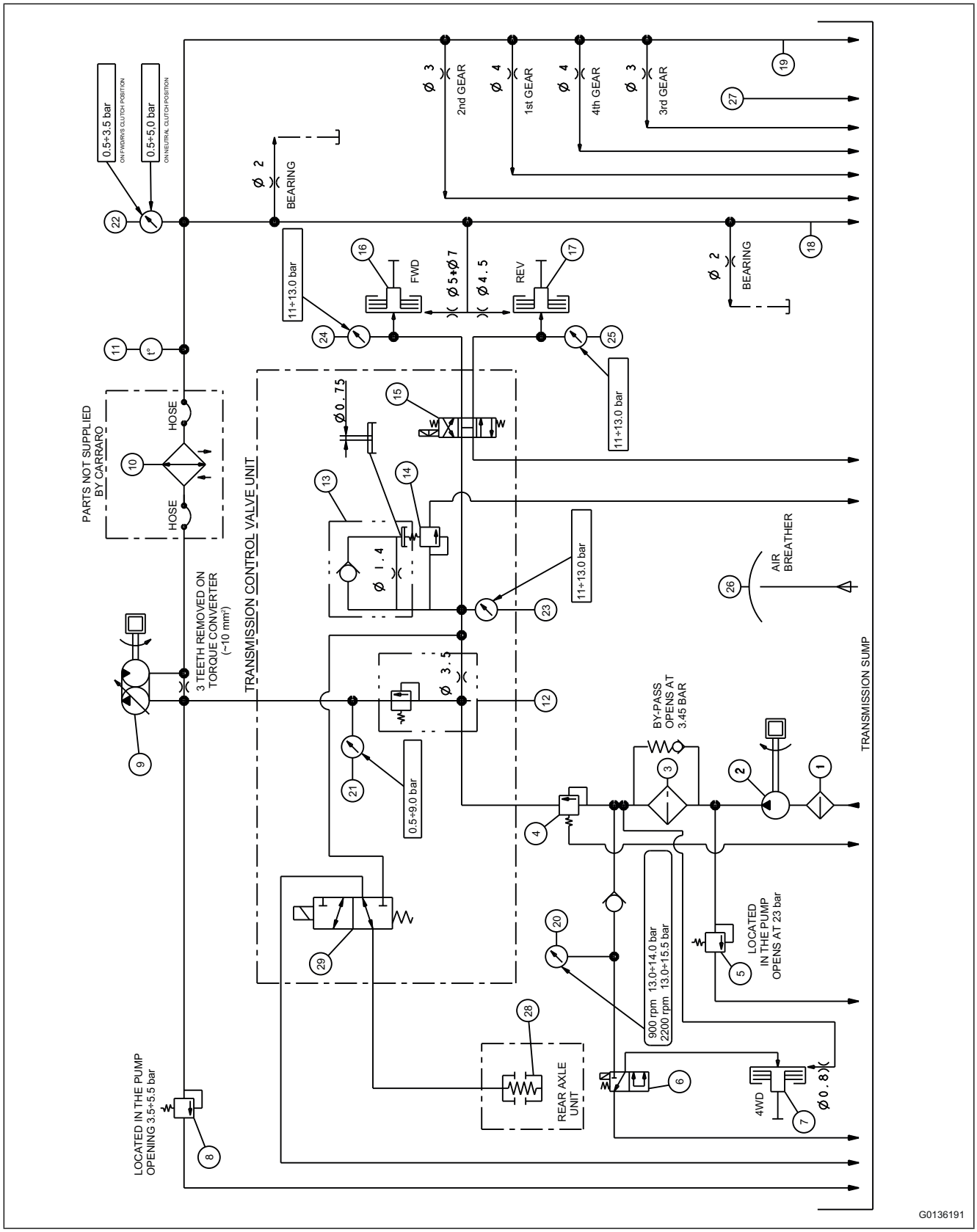
Function

- When the control valve is in the fine control mode, if the demand flow for actuator is less then the value corresponding to the minimum swash plate angle of the pump, pump pressure PP is set LS pressure PLS + 2.75 MPa {28 kgf/cm^2}.
- If the difference pressure between pump pressure PP and LS pressure PLS becomes equal to the load of spring (2) (2.75 MPa {28 kgf/cm^2}), the unload valve opens.
- Accordingly, LS differential pressure ΔPLS is (2.75 MPa {28 kgf/cm^2}) at this time.

Operation

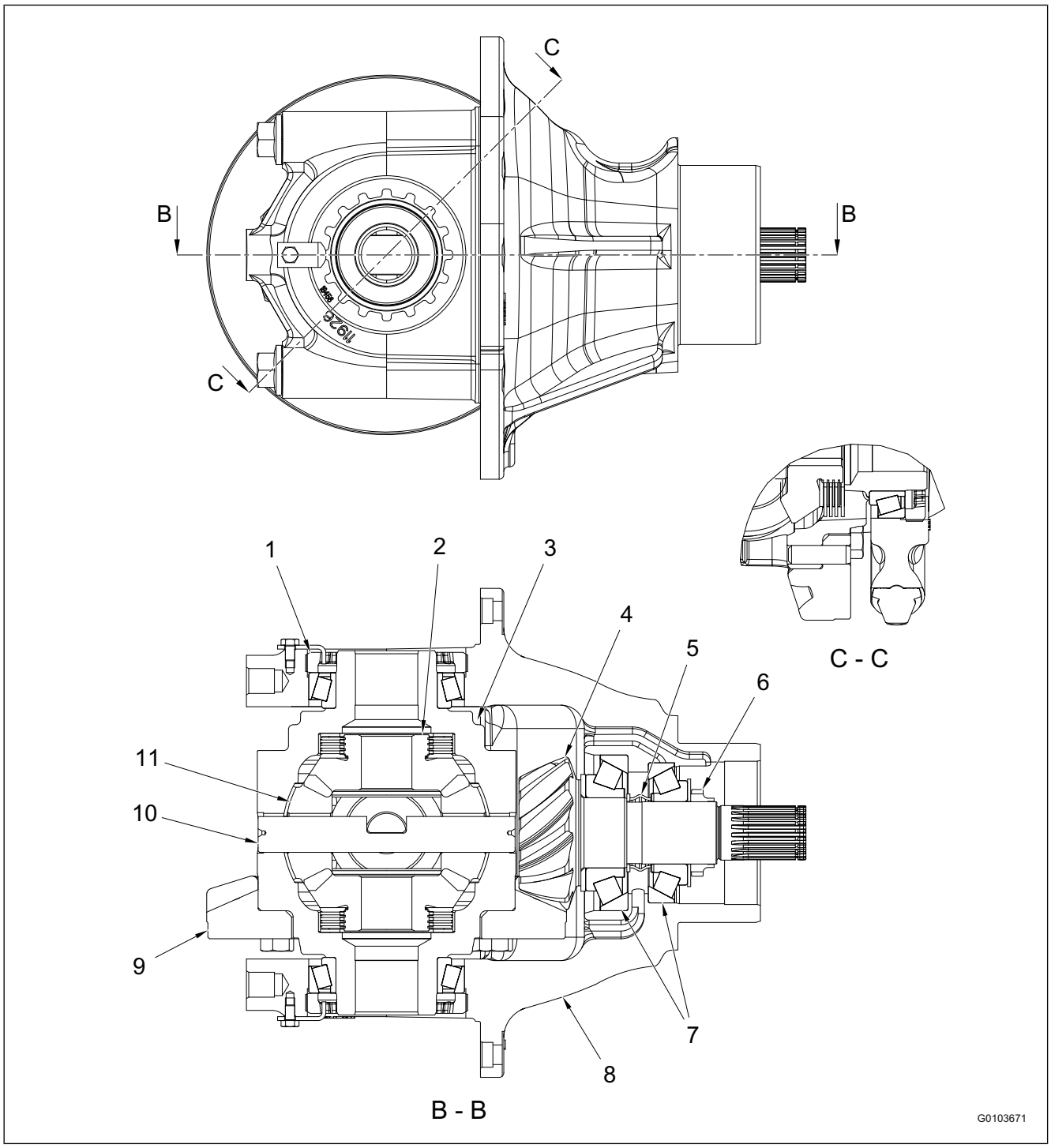
- When the control valve is operated finely, LS pressure PLS is generated and applied to area S3 at the right end of spool (1). At this time difference between LS pressure PLS and pump discharge pressure PP is large, since the opening area of the control valve spool is narrow.
- When the difference between pump discharge pressure PP and LS pressure PLS reaches the load of spring (2), spool (1) moves to the right and pump circuit PP and tank circuit T are connected to each other.
- In other words, pump discharge pressure PP is set to a pressure equal to force of spring (2) (2.75 MPa {28 kgf/cm^2}) + LS pressure PLS, and differential pressure ΔPLS becomes (2.75 MPa {28 kgf/cm^2}) .

HYDRAULIC CIRCUIT DIAGRAM



1: Suction filter (250 µm)
2: Transmission pump
3: Spin-on filter (10 µm)
4: Pressure regulator
5: Oil relief valve
6: 4WD disengagement solenoid valve

PINION AND DIFFERENTIAL

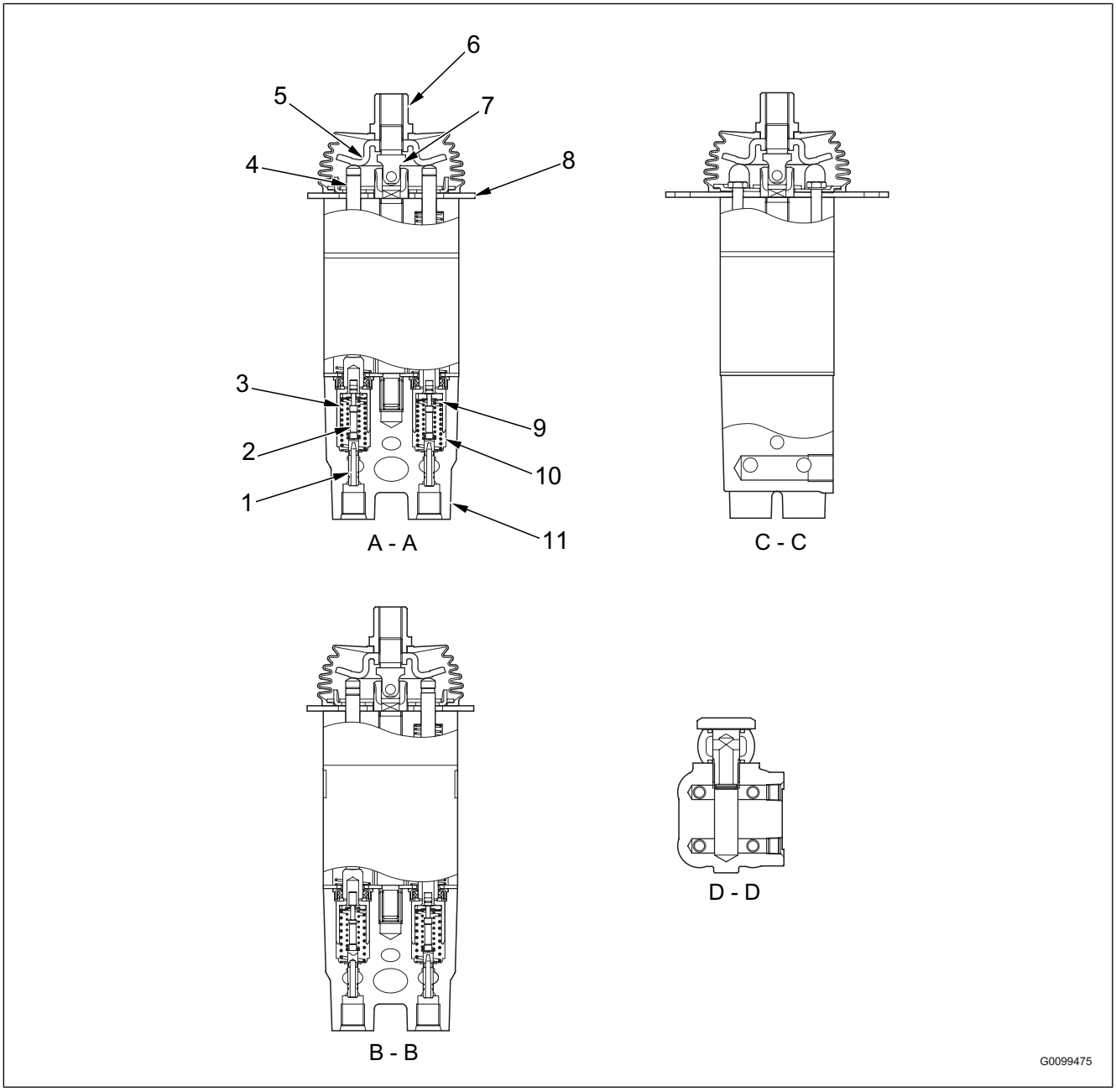


1: Ring nut
2: Sun gear
3: Differential housing
4: Pinion
5: Spacer
6: Ring nut
7: Bearing
8: Differential support
9: Crown wheel
10: Pin
11: Planetary gear

Specification

Axle oil quantity: 10.5 ℓ

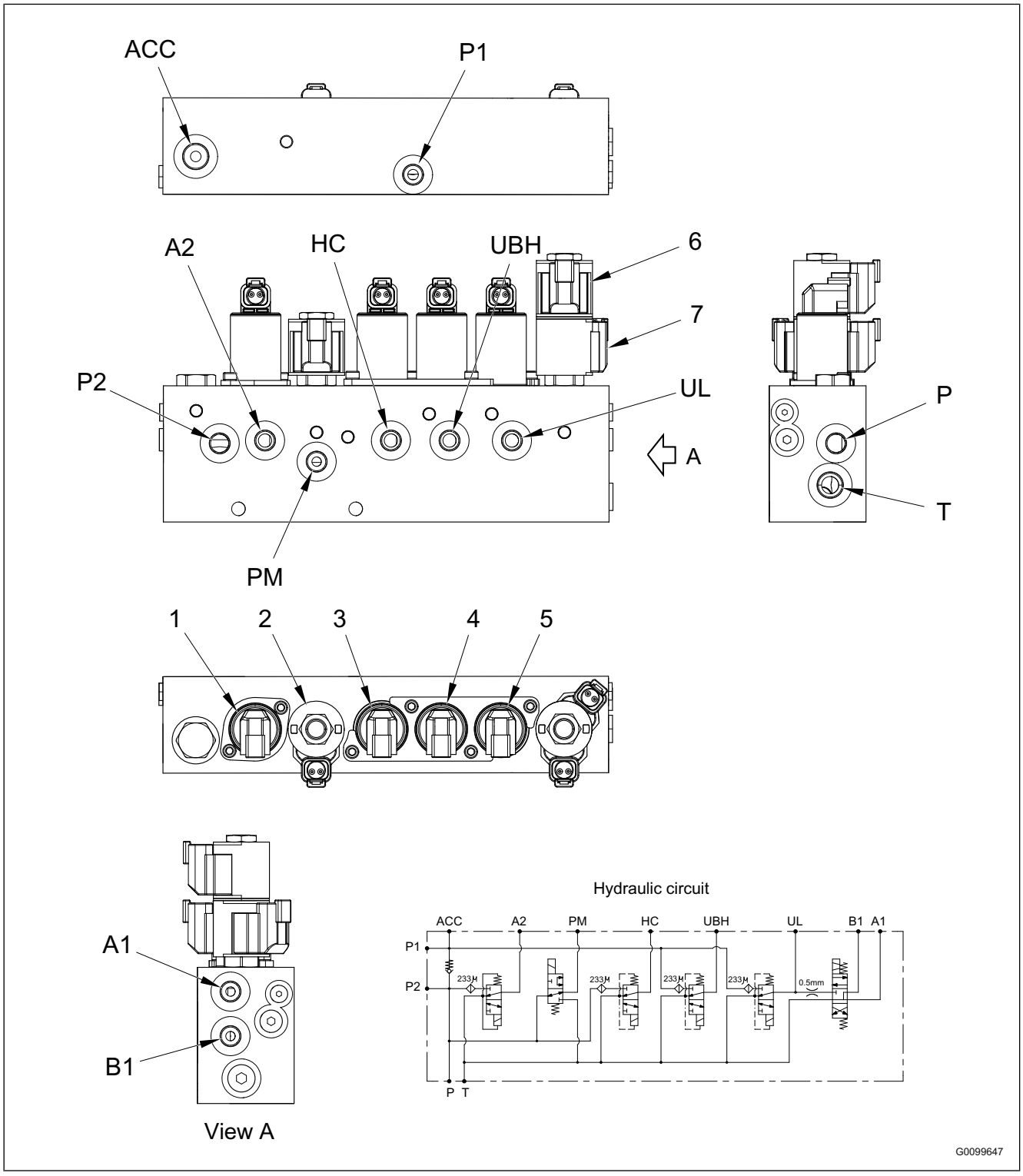
Sectional view



1: Spool
2: Centering spring
3: Metering spring
4: Piston
5: Disk
6: Disk
7: Joint
8: Cover
9: Retainer
10: Piston
11: Valve body

SOLENOID VALVES

SOLENOID VALVE GROUP (HYDRAULIC CONTROLS SPECIFICATION) STRUCTURE



1: Boom unlock solenoid valve (F03)
2: Power mode solenoid valve (F08)
3: Backhoe hammer solenoid valve (F05)
4: Backhoe PPC solenoid valve (F02)
5: PPC solenoid valve (F01)
6: Loader bucket 4 in 1 solenoid valve (OPEN) (F10)
7: Loader bucket 4 in 1 solenoid valve (CLOSE) (F11)

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STANDARD VALUE TABLE FOR MACHINE: WB93S-8E0 20-6
MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE 20-26

Item	Test condition	Unit	Standard value for new machine	Repair limit
Backhoe arm cylinder retraction amount	• For details about measurement position, see fig. 7 of “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE (20-26)”." • Hydraulic oil temperature: 45 to 55 °C • With standard arm: add 410 to bucket • With telescopic arm: fully extend arm and do not add weight to bucket • Bucket weight: 155 kg • Engine: stopped [*1] • Measure immediately after setting • Measure hydraulic drift every 5 minutes and judge after 15 minutes [ ]: value for machine equipped with cold climate device	mm	Max. 10 [Max. 14]	Max. 20 [Max. 28]
Backhoe bucket cylinder retraction amount	• For details about measurement position, see fig. 7 of “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE (20-26)”." • Hydraulic oil temperature: 45 to 55 °C • With standard arm: add 410 to bucket • With telescopic arm: fully extend arm and do not add weight to bucket • Bucket weight: 155 kg • Engine: stopped [*1] • Measure immediately after setting • Measure hydraulic drift every 5 minutes and judge after 15 minutes [ ]: value for machine equipped with cold climate device	mm	Max. 8 [Max. 10]	Max. 15 [Max. 19]

SET USAGE LIMITATION AND CHANGE PASSWORD 30-108
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- Offboard tool Diagnosis tester

1. Read out coolant temperature value with diagnostic tester.
2. Read out coolant temperature sensor value.
   - Coolant temperature sensor value equal environment temperature
   - If coolant temperature sensor is damaged, the possible root cause is Offset error coolant temperature sensor.

REMARK

After fixing the error cause, please clear up fault memory and read again to verify.

VISUALLY CHECK COOLING SYSTEM

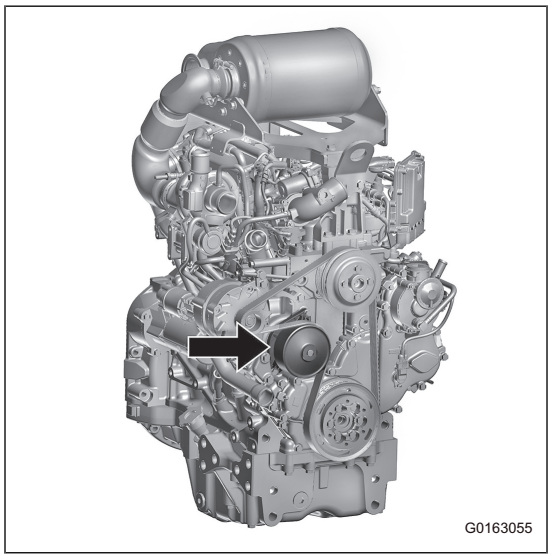
1. Check fan
   - Start the engine and check if the fan is working correctly
   - Check the fan for damage and pollution
2. Visually check cooling system
   - Drive belt not damaged, if present
   - No leaks from actuating hydraulic circuit, if present
   - If cooling system is damaged, go to the possible root cause
     - Drive belt could be damaged
     - Actuating hydraulic circuit (if present) could be damaged

REMARK

After fixing the error cause, please clear up fault memory and read again to verify.

MECHANICALLY CHECK WATER PUMP

Location of water pump



Check water pump

1) Set ignition OFF
2) Check water pump for tightness
3) Ignition switch set to ON position and start engine
4) Check the water pump mechanical sounds
5) Water pump not damaged or leak

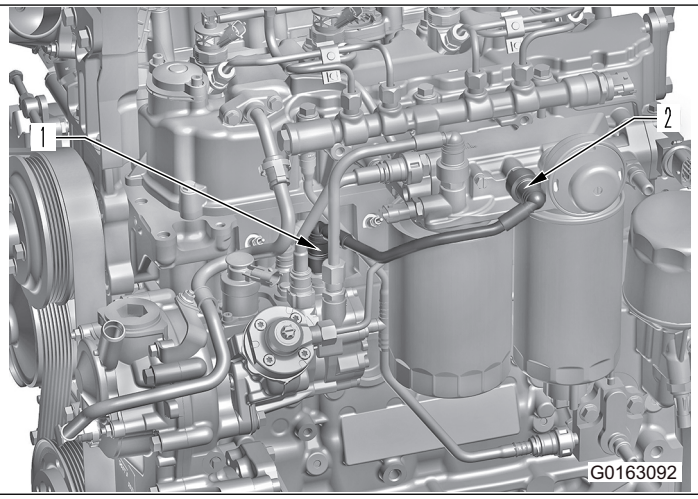
REMARK

After fixing the error cause, please clear up fault memory and read again to verify.

PRESSURE TEST CHECK SUCTION PRESSURE AFTER PRE-FILTER

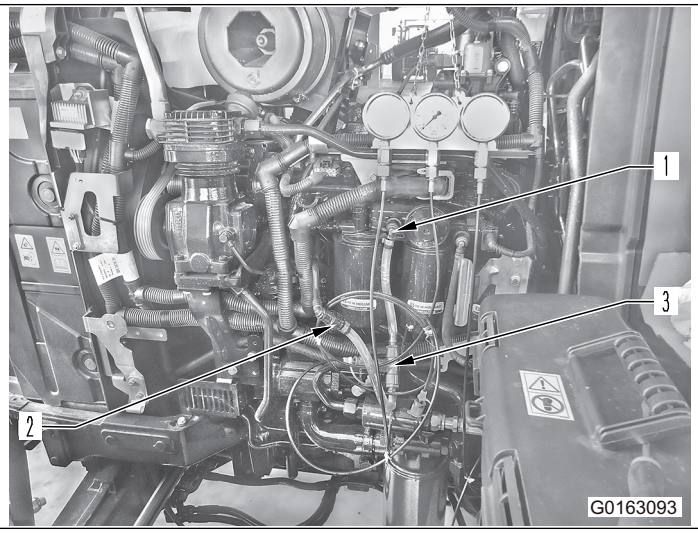
Preparation

- Visually check all related components for any signs of leakage
- Install the low pressure gauge at the pre-filter outlet
- See figure below for preparation:



(1) Inlet fitting (low pressure pump)

(2) Pre-filter outlet fitting



(1) Pre-filter outlet

(2) Connecting hose to low pressure pump inlet

(3) T-connector to manometer

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

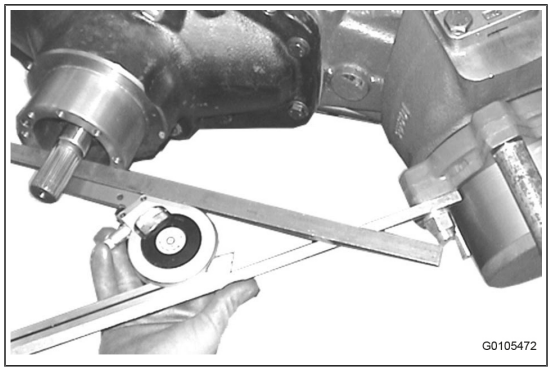
1. Start the engine (can be delayed) and let run for several minutes
2. Observe suction pressure in several engine conditions. Check for leaks.
3. See table below for a list of expected results

2. For the steering angle adjustment, set a protractor to the following calculated angle C.

   C= 90 °- S

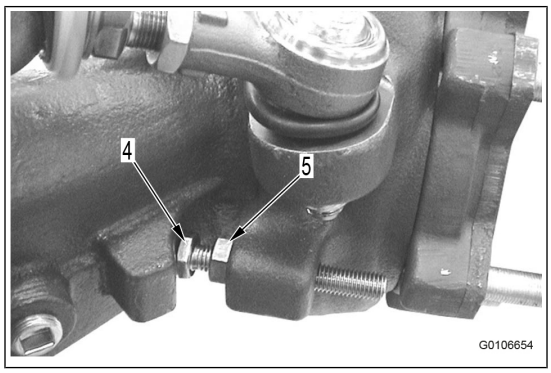
   Where S is the prescribed adjustment steering angle.

   Position the protractor on the long bar. Move a wheel side till the two bars form the calculated angle C.

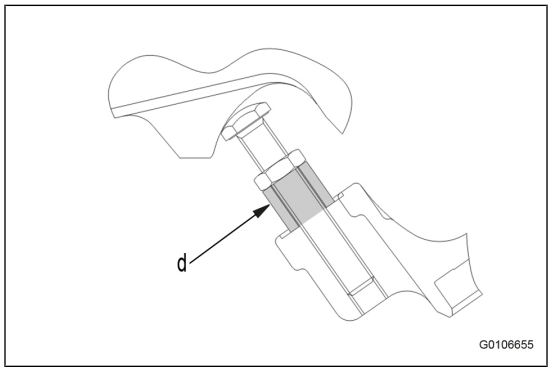


3. Unscrew the nut (5) to unlock the stop steering to be adjusted. Adjust the mechanical steering stop, screwing in or out the stop bolts (4), locking them with the nuts (5) to the requested tightening torque.

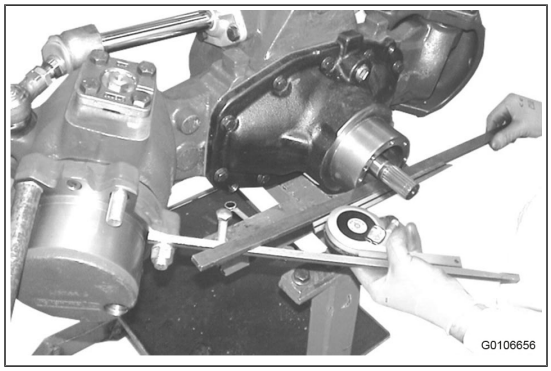
   Nuts: 150 Nm



4. In some axles may also be present 1 or 2 spacer bushings (d) under the locknut (5); do not remove the spacers if present.



5. Steer completely towards the other side and repeat the same operations described above.

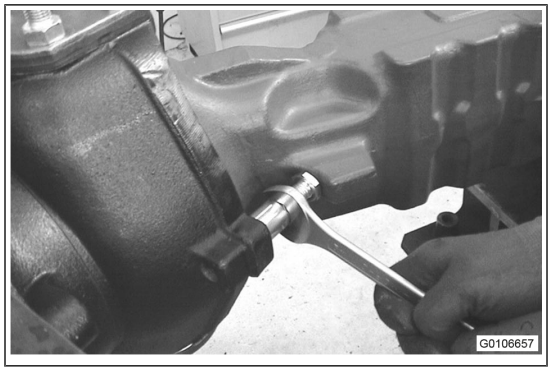


6. Lock the stop screw (4) by tightening the locknut (5) to the prescribed torque.

   Locknut: 150 Nm

   NOTICE

   It's recommended to check the maximum steering angle. For details see "STEERING ANGLE CHECK (30-57)".



TEST AND ADJUST PARKING BRAKE SYSTEM

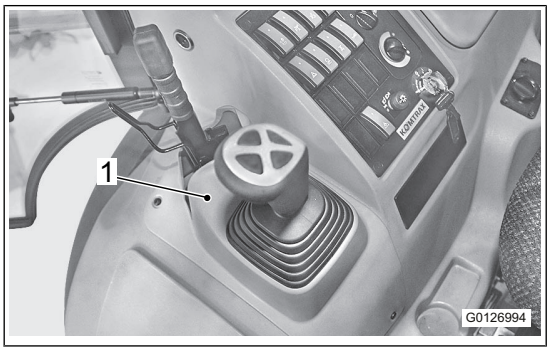
⚠ **Place the machine on a level ground, fully raise the front work equipment and secure them with the safety lock, so that it is stable, and then stop the engine.**

Check this item under the following conditions.

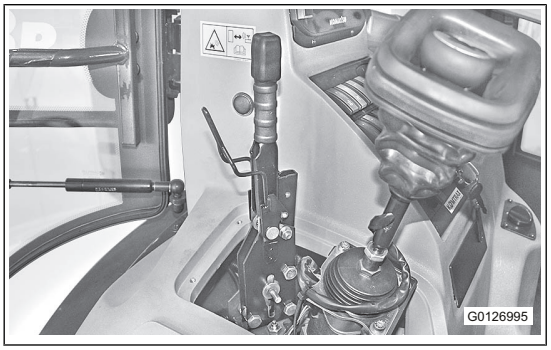
- Engine coolant temperature: 75 to 94 °C
- Hydraulic oil temperature: 45 to 55 °C
- Rear axle oil temperature: 75 to 85 °C

TEST PARKING BRAKE

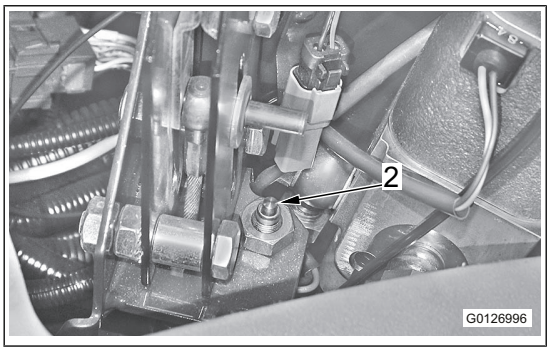
1. Remove cover (1).



2. Engage the parking brake.
3. Start the engine at low idle.



4. With the parking brake lever engaged, press the parking brake switch (2) and select the 2nd forward speed.
5. While raising the engine speed up to 1400 rpm, verify when the machine attempts to move immediately release the parking brake switch (2) to stop the machine from travelling.
   - If the machine attempts to move before 1250 rpm adjust the parking brake.
   - If the machine attempts to move at 1250 rpm or above, there is no need to adjust the parking brake.



   - If after two adjustment of the parking brake the machine still attempts to move before 1250 rpm, there might be a problem with the parking brake cable, the parking brake caliper or the parking brake lining.

TEST SOLENOID VALVE OUTLET PRESSURE

Tools to test solenoid valve pressure

Symbol		Part No.	Part name	Q'ty	Remarks
Q	1	799-101-5002	Hydraulic tester	1	-
		790-261-1204	Digital hydraulic tester	1	-
	2	799-401-3100	Adapter	1	Size: 02
	3	799-101-5160	Nipple	1	PT 1/8"

⚠ Park the machine on a level ground, lower the work equipment to the ground, stop the engine.

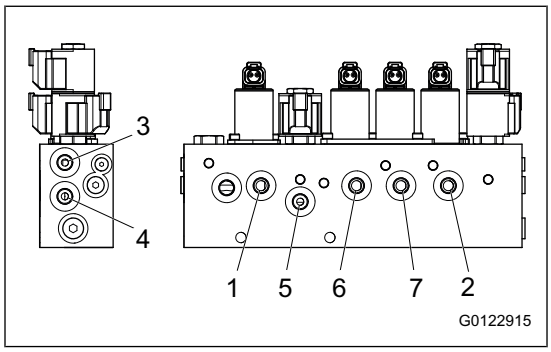
⚠ Loosen the hydraulic tank cap to release the pressure inside the hydraulic tank.

⚠ Release the residual pressure in the hydraulic circuit. For details, see "TEST AND ADJUST HYDRAULIC CIRCUIT PRESSURE (30-75)".

Check this item under the following conditions.

- Hydraulic oil temperature: 45 to 55 °C

1. Disconnect outlet hoses (1) to (7) of the solenoid valves to be tested.

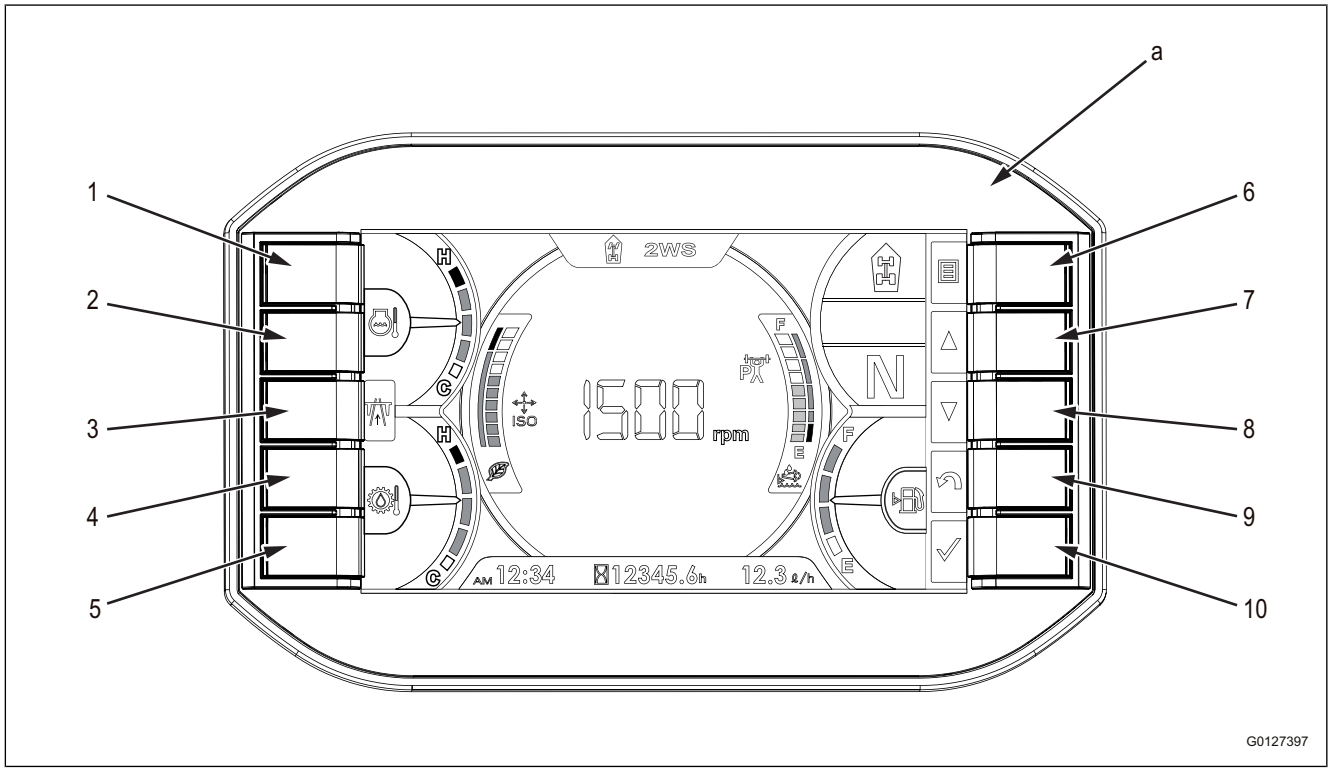


No.	Solenoid valve to be tested	Port
1	Boom unlock solenoid valve	A2
2	PPC solenoid valve	UL
3	4 in 1 bucket curl solenoid valve	A1
4	4 in 1 bucket dump solenoid valve	B1
5	Eco/Power solenoid valve	PM
6	Backhoe 1-attachment solenoid valve (Hammer)	HC
7	Backhoe PPC valve and backhoe telescopic arm solenoid valve	UBH

2. Install adapter Q2 and connect the disconnected hose again.
3. Install nipple Q3 of hydraulic tester Q1, and connect them to oil pressure gauge.
   - Use the oil pressure gauge of 5.9 MPa {60 kgf/cm^2}
4. Start the engine.
5. Run the engine at high idle, operate each control lever and switch, turn the solenoid valve ON or OFF, and measure the output pressure.
   - The conditions for turning the solenoid valve ON/OFF, see the operation table of each solenoid valve.
   - You can check the operating condition of the solenoid valve with the monitoring function of the machine monitor.
   - Monitoring code available:
     - 02431: Boom retain unlock switch
     - 02426: PPC Lock Switch
     - 02421: OUT PPC Lock Switch
     - 02420: Out Eco-Power Solenoid
     - 02447: Eco-Power Rocker Switch
     - 02448: EcoPower Joystick Switch
   - For standard values, see STANDARD VALUE TABLE FOR MACHINE (20-6)".
6. After finishing the test, remove the testing tools, and restore the machine.

ELECTRICAL SYSTEM

SET AND OPERATE MACHINE MONITOR



Machine monitor

(a): Multi-information display

REMARK

When starting the engine, the battery voltage may suddenly drop depending on the temperature and the battery condition. If this happens, the display on the machine monitor may momentarily go out, but this does not indicate any abnormality

Command selector

1: No Function (except for special operations)

2: No Function (except for special operations)

3: Street mode switch

4: No Function (except for special operations)

5: No Function (except for special operations)

6: Menu switch

7: UP switch

8: DOWN switch

9: RETURN switch

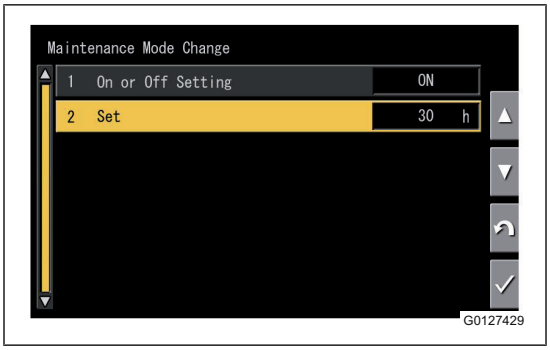
10: ENTER switch

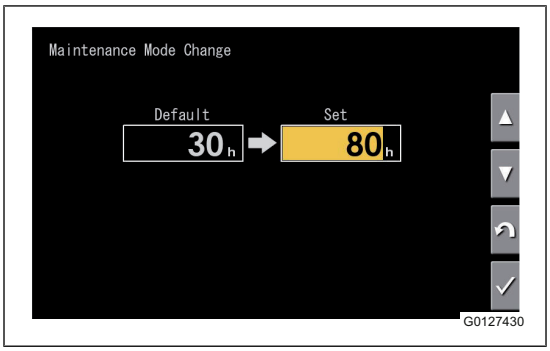
REMARK

The function of each function switch is indicated by the icon which is displayed on the left side of the function switch on the screen of the multi-information display panel (a). If the icon for a function switch is not displayed, that function switch is not working..

5. Select “Set”. Select an item to be changed with the switches.
   - “Default”: Maintenance notice time being set on the machine monitor (Recommended by the manufacturer and not changeable).
   - “Set”: Maintenance notice time that can be freely set in the range from 10 to 200 hours. Maintenance reminder function works according to this set time in operator mode (the time can be increased or decreased in multiples of 10 hours).
   - UP switch (7): Increases the set value.
   - DOWN switch (8): Decreases the set value.
   - RETURN switch (9): Cancels the setting and returns the display to the “Maintenance Mode Change” screen.
   - ENTER switch (10): Enters the setting and returns the display to the “Maintenance Mode Change” screen.

   REMARK
   - Enter the selected item with ENTER switch (10). The setting is validated after the display returns to “Set” screen with the RETURN switch (9).
   - If the value of an item which is set to “ON” is changed after one operating hour or more from the setup, the change is recognized as a reset operation.

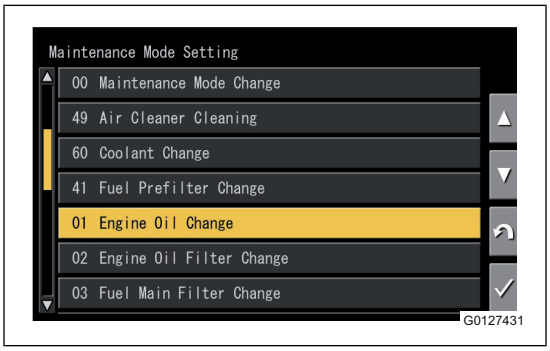




6. When the screen of selected maintenance item is displayed, select “ON/OFF” and change the setting with switches on the switch panel.
   - UP switch (7): Moves the selected item up by one item.
   - DOWN switch (8): Moves the selected item down by one item.
   - RETURN switch (9): Cancels the selection and returns the display to the “Maintenance Mode Setting” screen.
   - ENTER switch (10): Enter the selected item and switches to display to the individual setting screen.

   REMARK

   The image will be displayed when “Engine Oil Change” is selected.



INSPECTION PROCEDURE BEFORE TROUBLESHOOTING

WALK-AROUND CHECK

Before starting the engine, look around and under the machine to check for any loose nuts or bolts, leakages of oil, fuel, or coolant, and check the condition of the work equipment and hydraulic system.

Check the connectors for looseness, wiring harnesses for play, and accumulation of dust in places that reach high temperatures.

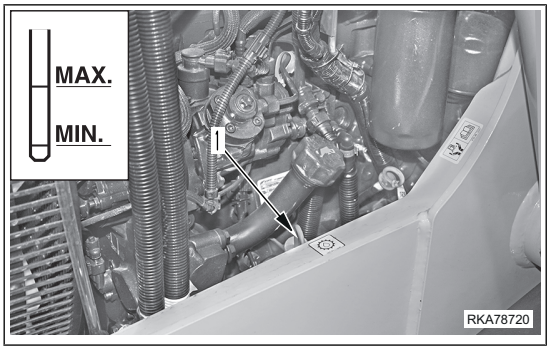
⚠ **Any combustible materials accumulated around the exhaust pipe, aftertreatment devices, turbocharger, or other high temperature engine parts or the battery, and leakage of fuel or oil will cause the machine to catch fire.**

⚠ **Check carefully, and if any abnormality is found, repair it or contact your Komatsu distributor.**

- Check for unusual noise and smell
  If the machine is operated under the unusual sounds or smells, the cause of it may damage the machine, so stop the operation immediately once you recognize it.
- Check around engine and removal of dirt
  Check and remove any accumulated dirt around the engine and any combustibles (dead leaves, twigs, etc.) on hot engine parts such as the exhaust pipes, aftertreatment devices, turbocharger, etc.
- Check of engine for water leakage
  Check for coolant leakage from cooling system. If any abnormality is found, repair it.
- Check of engine for oil leakage
  Check for oil leakage from engine. If any abnormality is found, repair it.
- Check of fuel line for leakage
  Check for fuel leakage, check hoses and pipes for damage. If any abnormality is found, repair it.
- Check of radiator and removal of dirt
  Check if there is any accumulated dirt and any combustibles (dead leaves, twigs, etc.) around the radiator. If any, remove them.
  For removal of dirt from the radiator, see Operation and Maintenance Manual, “CHECK AND CLEAN FINS”.
- Check of DEF line for leakage
  Check for oil leakage from DEF tank, pump, injector, hose or connecting parts. If any abnormality is found, repair it.
- Check around the aftertreatment devices and remove dirt
  Check if there is any accumulated dirt and any combustibles (dead leaves, twigs, etc.) around the aftertreatment devices. If any, remove them.
- Check around the aftertreatment device for exhaust gas leakage
  Check the pipe between the turbocharger and DOC, and also the aftertreatment devices connection for leakage of exhaust gas (or sticking of soot, etc.). If any abnormality is found, repair it.
- Check of work equipment, cylinders, linkage and hoses for breakage, wear and clearance
  Check the work equipment, cylinders, linkage, and hoses for breakage, wear, and clearance. If any abnormality is found, repair it.
- Check of hydraulic equipment, hydraulic tank, hoses, and joints for oil leakage
  Check for oil leaks. If any abnormality is found, repair it.
- Check around batteries and dirt removal
  Check for any accumulated dirt and combustibles (dead leaves, twigs, etc.) around the batteries. If any, remove them.
- Check of wheels (tires, rims) for abnormality, wear, loose bolts, and oil leakage
  If any abnormality is found, repair it and tighten any loose bolts.
- Check of handrails and steps for abnormality and looseness of bolts
  If any abnormality is found, repair it and tighten any loose bolts.
- Check and clean rearview mirrors
  Check rearview mirror for abnormality. If any, repair it.

2. Pull out the oil level gauge (1) and wipe the oil off with a cloth.
3. Fully insert the oil level gauge (1) into the dipstick pipe, then pull it out.

   The oil level gauge must be inserted into the pipe in the dipstick pipe.
4. If the oil level is between MIN. and MAX of oil level gauge (1), it is correct. If the oil level is below MIN. mark, add oil through the oil filler port (1).
5. If the oil level is correct, insert the dipstick (1) into dipstick pipe, and tighten the cap.



CHECK FRONT AXLE OIL LEVEL

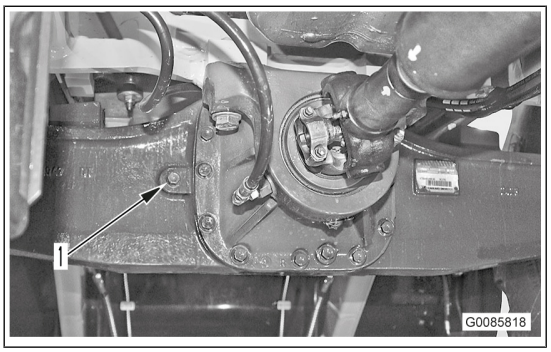
⚠ **Immediately after the engine is stopped, its parts and oil remain very hot and can cause burn injury. Wait for the temperature to go down, and then start the work.**

Position the machine on the level ground and place the equipment on the ground.

CHECK DIFFERENTIAL OIL LEVEL

1. Check visually that the lubricant reaches the hole (1).
2. If necessary, restore the level through the hole (1).

   Use a 17 mm wrench

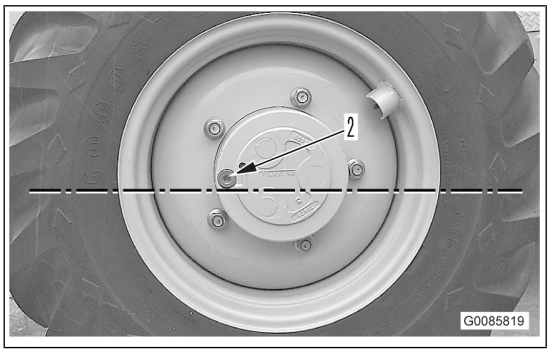


CHECK FINAL REDUCTION GEARS OIL LEVEL

1. Place the reduction gear with the plug (2) on the horizontal axis.

   If necessary, move the machine slightly until reaching the specified position, which is indispensable for an accurate check.
2. Check visually that the lubricant reaches the hole (2).
3. If necessary, restore the level through the hole (2).

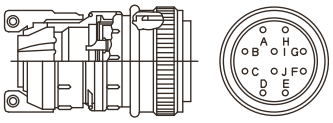
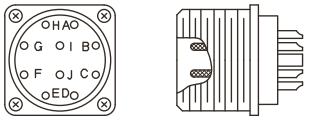
   Use a ½" square wrench

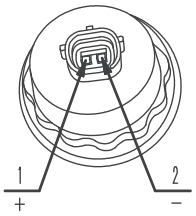


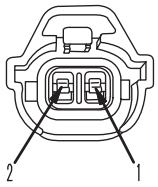
CHECK REAR AXLE OIL LEVEL

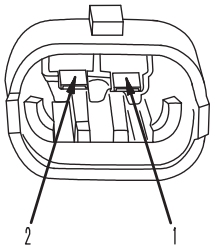
⚠ **Immediately after the engine is stopped, its parts and oil remain very hot and can cause burn injury. Wait for the temperature to go down, and then start the work.**

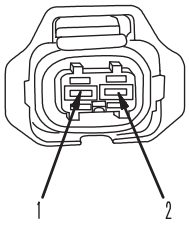
Position the machine on the level ground and place the equipment on the ground.

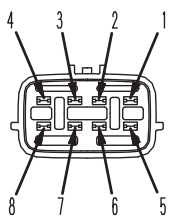
Total number of pins	Bendix (MS) type connector		Special tool number for connection checks
	Male (concave engaging portion)	Female (convex engaging portion)	
10	 G0042471	 G0042472	799-601-3460 (T-branch)
	-	-	

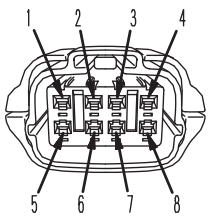
<table>
<tr><td colspan="4">SUMITOMO connector (for engine)</td></tr>
<tr><td rowspan="2">Total number of pins</td><td colspan="2">PCV (125, 140 engines)</td><td rowspan="2">Special tool number for connection checks</td></tr>
<tr><td>Valve side (plug)</td><td>Harness side (receptacle)</td></tr>
<tr><td rowspan="2">2</td><td> 

G0042585</td><td> 

G0042586</td><td rowspan="2">799-601-9430 (socket)
(Kit: 799-601-4101)
(Kit: 799-601-4201)</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Total number of pins</td><td colspan="2">Fuel supply pump (95 engine)</td><td rowspan="4">-</td></tr>
<tr><td>Valve side (plug)</td><td>Harness side (receptacle)</td></tr>
<tr><td rowspan="2">2</td><td> 

G0042587</td><td> 

G0042588</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Total number of pins</td><td colspan="2">Variable flow turbocharger, EGR valve (95 engine)</td><td rowspan="4">-</td></tr>
<tr><td>Sensor (motor) side (plug)</td><td>Harness side (receptacle)</td></tr>
<tr><td rowspan="2">8</td><td> 

G0042589</td><td> 

G0042590</td></tr>
<tr><td>-</td><td>-</td></tr>
</table>

Part No.	Part name	Number of pins	Identification code	T-branch adapter kit													Non-kit part
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-9410 (*1)	Socket for engine (CRI-T2)	2	G															●
799-601-9420	Adapter for engine (CRI-T2) Adapter for engine (CRI-T3) PFUEL Oil pressure sensor	3	A3													●	●	
799-601-9430 (*1)	Socket for engine (CRI-T2) Socket for engine (CRI-T3) PCV	2	P													●	●	
799-601-9440 (*1)	Socket for engine (CRI-T2)	3	1, 2, 3															●
795-799-5520 (*1)	Socket for engine (HPI-T2)	2	S															●
795-799-5530 (*1)	Socket for engine (HPI-T2) Socket for engine (CRI-T3) Temperature sensor	2	C													●	●	
795-799-5540 (*1)	Socket for engine (HPI-T2) Socket for engine (CRI-T3) TIM	2	A													●	●	
795-799-5460	Cable for engine (HPI-T2)	3																●
795-799-5470	Cable for engine (HPI-T2)	3																●
795-799-5480	Cable for engine (HPI-T2)	3																●
799-601-4110	Adapter for engine (140-T3) PIM	4	ITT3N													●	●	
799-601-4130	Adapter for engine (CRI-T3) NE, CAM	3	FCIN													●	●	
799-601-4140	Adapter for engine (CRI-T3) Ambient pressure	3	FCIG													●	●	
799-601-4150	Adapter for engine (CRI-T3) POIL	3	FCIB													●	●	
799-601-4160	Adapter for engine (CRI-T3) Oil pressure switch	2	4160													●	●	
799-601-4180	Adapter for engine (CRI-T3) PEVA	3	4180													●	●	
799-601-4190 (*1)	Socket for engine (CRI-T3) Common rail pressure	3	1, 2, 3L													●	●	
799-601-4230 (*1)	Socket for engine (CRI-T3) Intake pressure/temperature	4	1, 2, 3, 4C													●	●	
799-601-4240 (*1)	Socket for engine (CRI-T3) PAMB	3	1, 2, 3A													●	●	

Failure Code [#T0037]

REMARK

Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.

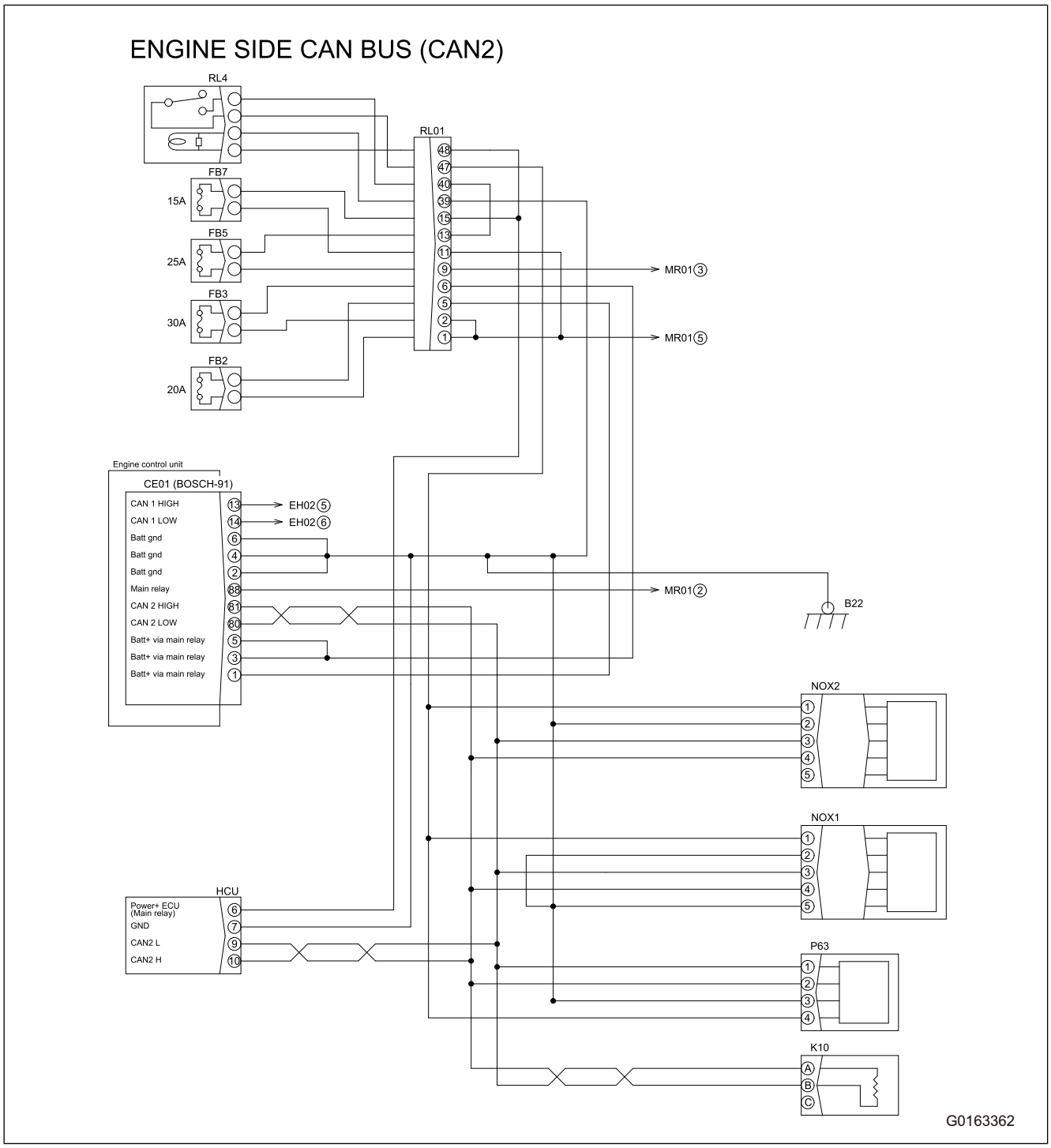
REMARK

Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Action level	Failure code	DTMC	Failure	NOx sensor downstream - Internal error: Open circuit error of the heater for the NOx downstream sensor
L03	#T0037	A00C-05		
Detail of failure	The NOx detection sensor downstream of SCR (NOX2) has reported an interruption in the heater control circuit to the ECU A-F02 through the CAN (Controller Area Network).			
Related information	The NOx detection sensor downstream of SCR (NOX2) is provided with an internal monitoring system to detect any open wires or short circuits and to send an error state should a fault be detected. This fault is the result of an open circuit in the heater circuit of the sensor. 1. Faulty NOx detection sensor downstream of SCR (NOX2), hardware or firmware. 2. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the operator display or the diagnostic tool to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.
2	Check that the NOx detection sensor downstream of SCR (NOX2) is operating correctly.	• The module is working correctly, contact the Komatsu Distributor. • The module is not working correctly, go to step 3.
3	Replace the NOx detection sensor downstream of SCR (NOX2).	Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service. Then carry out the SCR fault verification if necessary. Then check to see that this fault is resolved. • If this fault is resolved, return the machine to service. • If fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If no damage is detected, only normal readings will appear on the screen delete the fault code.

Circuit diagram



Failure Code [#T0046]

REMARK

Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.

REMARK

Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Action level	Failure code	DTMC	Failure	NOx sensor downstream - Internal error: short circuit error for the downstream NOx and oxygen level
L03	#T0046	980C-06		
Detail of failure	The NOx detection sensor upstream of SCR (NOX1) has indicated to the Engine ECU, through the CAN (Controller Area Network), the presence of a short circuit in the circuit of the NOx sensor and/or of the oxygen level.			
Related information	The NOx detection sensor upstream of SCR (NOX1) has internal monitoring for open wire or short circuit and sends an error status in case of a detected fault. This fault is the result of a short circuit in the circuit of the NOx sensor and/or of the oxygen level. 1. Faulty NOx detection sensor upstream of SCR (NOX1), hardware or firmware. 2. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Check if the fault is present and active.	Use the operator display or the diagnostic tool to check the status of this fault. • If the fault is present and active, continue to step 2 • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. continue to step 6
2	Check the integrityof the control of the NOx detection sensor upstream of SCR (NOX1). Check for a short circuit to battery.	Disconnect the connector NOX1 at the NOx detection sensor upstream of SCR (NOX1). Use a multimeter to check the continuity:

From	To	Value
NOX1 (male) pin 2	NOX1 (male) pin 1	There should be no continuity
NOX1 (male) pin 3	NOX1 (male) pin 1	There should be no continuity
NOX1 (male) pin 4	NOX1 (male) pin 1	There should be no continuity

• If continuity is detected,repair or replace as required.
• If there is no continuity, continue to step 3

Failure Code [#T0061]

REMARK

Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.

REMARK

Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Action level	Failure code	DTMC	Failure	Downstream NOx sensor lambda signal deviation - NOx sensor possible removal detected
L03	#T0061	A20C-02		
Detail of failure	The ENGINE ECU has determined that the NOx detection sensor downstream of SCR (NOX2) is not measuring the correct Lambda values.			
Related information	The NOx detection sensor downstream of SCR (NOX2) is provided with an internal monitoring system for the operational conditions and reports the status together with the measured data. If the Lambda sensor data value is outside the values set by the minimum/maximum curves specified in the Engine ECU according to the Lambda value, this fault occurs. 1. Fault in the NOx detection sensor downstream of SCR (NOX2), hardware or firmware. 2. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Determine proper installation of the NOx detection sensor downstream of SCR (NOX2).	Remove and re-install, if necessary, the NOx detection sensor downstream of SCR (NOX2) to make sure that it is properly aligned and securely fitted. Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service. Then carry out the SCR fault repair verification if necessary. Then check to see that this fault is resolved. • If this fault is resolved, return the machine to service. • If fault has not been resolved, go to step 2.
2	Check that the NOx detection sensor downstream of SCR (NOX2)is operating correctly.	• If the sensor is okay, contact the Komatsu Distributor. • If the sensor is not working correctly, go to step 3.
3	Replace the NOx detection sensor downstream of SCR (NOX2).	Then use the diagnostic instrument to perform the "Replacement of NOx Downstream Sensor - Reset ECU Data" configuration. Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service. Then carry out the SCR fault repair verification if necessary. Then check to see that this fault is resolved. • If this fault is resolved, return the machine to service. • If fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.

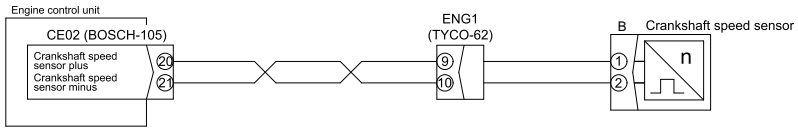
Failure Code [#T0080]

Action level	Failure code	DTMC	Failure	EGR Valve: position sensor voltage above the maximum threshold
L03	#T0080	E70A-00		
Detail of failure	The ENGINE ECU detects a short circuit to battery in the wiring or a malfunction on the position sensor of the EGR actuator (EGR).			
Related information	The Engine ECU monitors the electric signal of the EGR valve position sensor (EGR). If a fault is detected, the value read is taken as a replacement value. The signal detected is higher than a predetermined threshold.			

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>1</td><td>Check if the fault is present and active.</td><td>Use the diagnostic tool to check the status of this fault.
• If the fault is present and active, go to step 2.
• If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.</td></tr>
<tr><td>2</td><td>Check for a short circuit to battery in the circuit of the EGR actuator (EGR).</td><td>Disconnect the EGR actuator (EGR) at the connector EGR.
Disconnect the engine wiring from the ENGINE ECU at connector CE02.
With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring: Then use the multimeter to perform the following tests on the engine wiring:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>EGR(female) pin 2</td><td>Battery positive</td><td>There should be no continuity</td></tr>
<tr><td>EGR(female) pin 4</td><td>Battery positive</td><td>There should be no continuity</td></tr>
<tr><td>EGR(female) pin 5</td><td>Battery positive</td><td>There should be no continuity</td></tr>
</table>
• If there is continuity, there is a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.
• If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to step 3.</td></tr>
<tr><td>3</td><td>Check the correct operation of the EGR actuator (EGR).</td><td>Connect the diagnostic instrument to the Engine ECU, delete the error and check if the fault code returns active.
• If code returns in an active status, replace the EGR actuator (EGR).
• If code remains inactive, return the machine to service.</td></tr>
<tr><td>4</td><td>Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires.
Check that the connectors are fully inserted.</td><td>Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.
Operate the machine while monitoring the display.
• If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
• If no damage is detected, only normal readings will appear on the screen delete the fault code.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>3</td><td>Check the signal circuit of the crankshaft sensor (B) for an intermittent short circuit towards a voltage source.</td><td>With the ignition switch B05,B06 (OCCHIO #3) in the ON position, use a multimeter to carry out the following voltage checks by moving the wiring. In this way it is easier to locate any intermittent connections:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE02 (female) pin 20</td><td>Ground</td><td>There should be no voltage.</td></tr>
<tr><td>CE02 (female) pin 21</td><td>Ground</td><td>There should be no voltage.</td></tr>
</table>
• If there is voltage during one or both checks, there is a short circuit towards a voltage source in the signal circuit of the crankshaft sensor (B). Locate and repair the shorted conductors.
• If there is no voltage during both checks, go to step 4.</td></tr>
<tr><td>4</td><td>Check the integrity of the camshaft sensor (C).</td><td>Make sure that the sensor installed of the crankshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.
• In case of assembly or alignment problems, repair or replace as required.
• If no issues are found, go to step 5.</td></tr>
<tr><td>5</td><td>Replace the crankshaft sensor (B).</td><td>Use the operator display or the diagnostic instrument to check the status of this fault.
• If the fault has been resolved, return the machine to service.</td></tr>
<tr><td>6</td><td>Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires.
Check that the connectors are fully inserted.</td><td>Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display.
• If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
• If no damage is detected, only normal readings will appear on the screen delete the fault code.</td></tr>
</table>

Circuit diagram



G0163359

Failure Code [#T0113]

Action level	Failure code	DTMC	Failure	Short circuit or voltage above the threshold on the glow plug of cylinder 1
L03	#T0113	CC14-04		
Detail of failure	The ENGINE ECU has detected a short circuit to battery in the wiring or an overcurrent in the pre-heating glow plug (G1).			
Related information	The Engine ECUmonitors the correct operation of the glow plug control unit (GCU). If there is a relay between the Engine ECU and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the pre-heating glow plug (G1)is reported.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.
2	Checkfor a short circuit to battery in the circuit of the preheating glow plug control unit (GCU).	Disconnect the preheating glow plug control unit (GCU) at the connector GCU. Disconnect the engine wiring of the pre-heating glow plug (G1). With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring: From: GCU(female) pin 2 — To: GP pin 4 — Value: There should be no continuity • If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams. • If the result does match that expected in the wiring test listed above, the wiring is operating correctly. Leave the connectors disconnected and go to step 3.
3	Check the correct operation of the pre-heating glow plug (G1).	Connect the diagnostic instrument to the Engine ECU, delete the error and check if the fault code returns active. • If code returns in an active status, replace pre-heating glow plug (G1). If code remains inactive, return the machine to service.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If you do not find damage and the display indicates only normal readings, delete the fault code.

Failure Code [#T0148]

Action level	Failure code	DTMC	Failure	Fuel metering unit has an over-temperature error
L03	#T0148	A205-06		
Detail of failure	• high voltage in the battery; • high internal temperature in the ENGINE ECU; • open circuit or wiring problems.			
Related information	The Engine ECU monitors the voltage and the correct operation of the fuel metering unit (X). If the fuel metering unit (X)is not operating, the fuel pressure will reach the maximum value. 1. Fault in the battery, voltage too high; 2. Fuel metering unit (X) solenoid coil, defective. 3. Faulty fuel metering unit (X) control circuit, broken wiring. 4. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 5.
2	Check for faults in the battery.	Check the condition of the battery charge. Check that the battery voltage is correct. • If no problems have been detected,go to step 3. • If problems have been detected,replace the battery.
3	Check condition of fuel metering unit (X)solenoid coil.	Disconnect the engine wiring harness from the fuel metering unit (X) at connector X. Use a multimeter to measure the resistance of the fuel metering unit (X) solenoid coil: From: X (female) pin 1 — To: X (female) pin 2 — Value: The resistance should be 2.8 – 3.2 Ω. • If there is between 2.8 – 3.2 Ω leave the connector Xdisconnected and go to step 4. • If the result is infinite resistance, the fuel metering unit (X) solenoid coil is faulty, replace the fuel metering unit (X).
4	Verify the condition of the fuel metering unit (X) control circuit.	Disconnect the engine wiring harness from the ENGINE ECU at the connector CE02. Use a multimeter to check for continuity in the engine wiring harness: From: X (female) pin 1 — To: CE02 (female) pin 7 — Value: There should be continuity. From: X (female) pin 2 — To: CE02 (female) pin 6 — Value: There should be continuity. • If there is continuity in both checks, check the ENGINE ECU for the appropriate software and update if necessary. • If no continuity is detected on the high side or low side control circuit, this indicates an interruption. Locate and repair the broken conductor.

Failure Code [#T0196]

Action level	Failure code	DTMC	Failure	Fuel pressure relief valve reached maximum allowed opening count
L03	#T0196	C315-0F		
Detail of failure	The PRV opening counter inside the ENGINE ECU, has exceeded the maximum limit.			
Related information	A mechanical pressure relief valve (PRV), integrated in the fuel supply rail, opens if excessive pressure is present in the rail. The Engine ECUdetects and counts the sudden pressure drops in the rail due to the opening of the PRV valve. If more openings than the maximum limit are detected, this fault occurs. 1. Faulty PRV, check tightness and opening pressure. 2. Faulty fuel metering unit (X), wiring. 3. Faulty fuel metering unit (X), internal failure.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Check the status of the following related faults: #T0205 #T0208 #T0204 #T0206	• If either of the faults are active, diagnose them first and then return to this fault. • If neither of the listed faults is active, go to step 2.
2	Replace the PRV.	Use the diagnostic tool to verify the status of the alarm #T201. • If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service. If the fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.

Failure Code [#T0215]

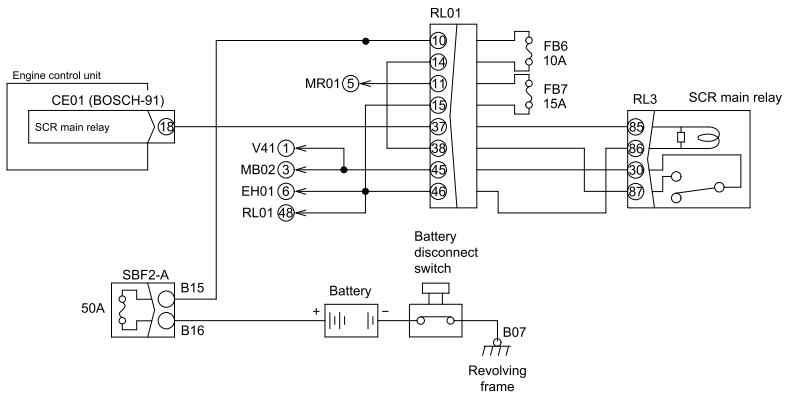
REMARK

Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Action level	Failure code	DTMC	Failure	DEF level too low warning is active - Stage 1
L00	#T0215	E106-11		
Detail of failure	The signal of the DEF tank quality - level - temperature sensor (P63)transmitted to the ENGINE ECU is too low in relation to 100% full.			
Related information	The Engine ECU monitors the level and temperature of the Diesel Exhaust Fluid (DEF) fluid. If the fluid level falls below the minimum level, this fault occurs. 1. Fluid level in the DEF tanktoo low. 2. Fault in the DEF tank quality - level - temperature sensor (P63), internal fault. 3. Fault in the ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Top up the DEF tank to the appropriate level.	Then check to see that this fault is resolved. • If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service. • If the fault has not been resolved, go to step 2.
2	Check the conditions of the DEF tank quality - level - temperature sensor (P63).	Disconnect the wiring of the urea tank (UT) from the DEF tank quality - level - temperature sensor (P63) at connector P63. Use a multimeter to measure the resistance of the DEF tank quality - level - temperature sensor (P63): From: P63 (male) pin 1 — To: P63 (male) pin 2 — Value: There should be a value greater than 12,000Ω. • If the measured resistance is greater than 12,000Ω, check the ENGINE ECU for the appropriate software and update if necessary. • If the measured resistance is less than 12,000 Ω, the DEF tank quality - level - temperature sensor (P63) has failed internally. go to step 3
3	Check the correct operation of the DEF tank DEF tank quality - level - temperature sensor (P63).	**REMARK** After having removed the DEF tank quality - level - temperature sensor (P63) inspect the equipment to determine if the magnet of the filler inlet discharge pipe has come out of its seat and became lodged there by causing a false reading. • The sensor is operating correctly go to step 4 • The sensor is not operating correctly, replace the DEF tank DEF tank quality - level - temperature sensor (P63) and go to step 4
4	Carry out the Diesel Exhaust Fluid (DEF) system test.	Use the diagnostic instrument to carry out the Urea Dosing System test. Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service. Carry out the SCR fault verification. Then check to see that this fault is resolved. • If the fault is resolved, return the machine to service. • If the fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.

Circuit diagram



G0163857

Failure Code [#T0254]

Action level	Failure code	DTMC	Failure	Over temperature in the starter motor relay high side power stage
L03	#T0254	2905-06		
Detail of failure	The error could occur due to the following causes: • power supply voltage too high; • high temperature inside the ECU; • fault or presence of open circuit in the wiring of the Starter control relay (RL2).			
Related information	The Engine ECU monitors the correct operation of the Starter control relay (RL2). When the ENGINE ECU detects an “over temperature” error, this fault occurs. 1. Battery damaged; 2. Fault in the wiring; 3. Fault in the Starter control relay (RL2). 4. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify that the fault is present and active.	Use the operator display or the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 9.
2	Check the temperature of the Starter control relay (RL2).	• If the relativetemperature is high, continue with step 3. • If the relativetemperature is not high, continue with 8
3	Check that the battery voltage is correct.	Use a multimeter to check the correct voltage: From: Battery terminal (+) — To: Battery terminal (+) — Value: There should be 12 V voltage. • If the measured voltage is not approximately 12V, recharge the battery and repeat the battery test. Then go to step 4 • If the measured voltage is approximately 12 V, continue with 5.
4	Check again that the battery voltage is correct.	Use a multimeter to check the correct voltage: From: Battery terminal (+) — To: Battery terminal (+) — Value: There should be 12 V voltage. • If the measured voltage is approximately 12 V, go to step 5. • If the measured voltage is not approximately 12 V, replace the battery.

Failure Code [#T0268]

REMARK

Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.

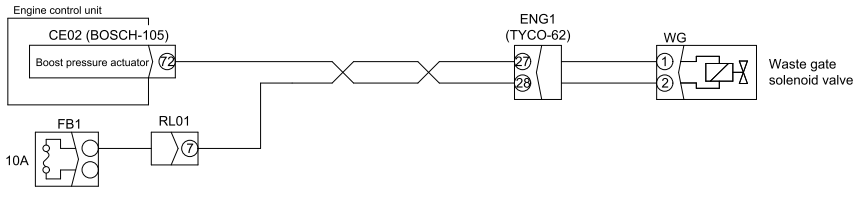
Action level	Failure code	DTMC	Failure	SCR inducement: level 3 (creep mode), triggered by tampering fault
L04	#T0268	7E14-00		
Detail of failure	-			
Related information	This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the Diesel Exhaust Fluid (DEF)tampering detection faults of the selective catalytic reduction system (SCR) that remain active for too long will cause this fault.			

Failure Code [#T0292]

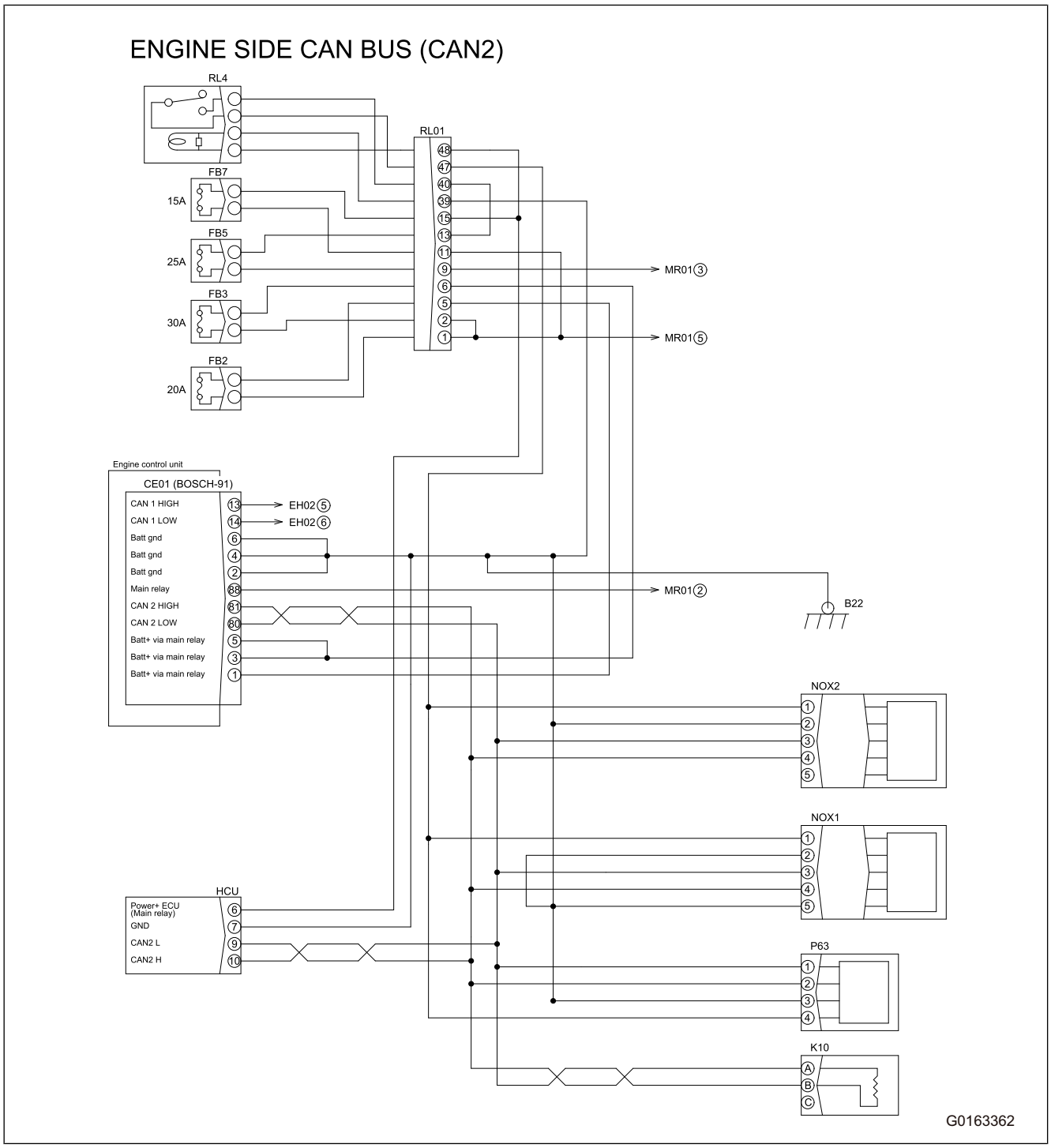
Action level	Failure code	DTMC	Failure	VGT turbocharger actuator: open circuit
L04	#T0292	8102-05		
Detail of failure	The ENGINE ECU has detected an open load in the wastegate pressure modulating valve (WG) circuit.			
Related information	The Engine ECU monitors the circuit of the wastegate pressure modulating valve (WG). If the ENGINE ECU determines the presence of an open load condition in the circuit of the wastegate pressure modulating valve (WG), this fault occurs. 1. Faulty wastegate pressure modulating valve (WG) wiring, open circuit. 2. Faulty wastegate pressure modulating valve (WG), internal failure. 3. Faulty ENGINE ECU, software.			

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>1</td><td>Verify fault is present and active.</td><td>Use the diagnostic instrument to check the status of this fault.
• If the fault is present and active, go to step 2.
• If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.</td></tr>
<tr><td>2</td><td>Check the internal voltage of the wastegate pressure modulating valve (WG).</td><td>Disconnect the wiring of the wastegate pressure modulating valve (WG) connector WG.
Use a multimeter to carry out the following voltage checks on the pins of the wastegate pressure modulating valve (WG):
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>WG (male) pin 1</td><td>Positive</td><td>This should be 12.0V</td></tr>
</table>
• If the reading is approximately 12.0V, leave the wiring disconnected of the wastegate pressure modulating valve connector WG and go to step 3.
• If a value of approximately 12.0V is not detected, this indicates a fault inside the wastegate pressure modulating valve (WG). Replace the wastegate pressure modulating valve (WG).</td></tr>
<tr><td>3</td><td>Check the wastegate pressure modulating valve (WG) vehicle wiring harness (VE) wiring for an open circuit.</td><td>Disconnect the wiring of the wastegate pressure modulating valve (WG) connector WG.
With the key set to OFF, use a multimeter to carry out the following continuity check:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>WG (female) pin 2</td><td>CE02 pin 72</td><td>There should be continuity.</td></tr>
</table>
• If there is no continuity, there is an open circuit in the wiring of the wastegate pressure modulating valve. Use the appropriate workshop manual if necessary, to locate and repair the broken conductor.
• If continuity is detected, check the ENGINE ECU for the appropriate software and re-flash if necessary.</td></tr>
</table>

Circuit diagram



Circuit diagram



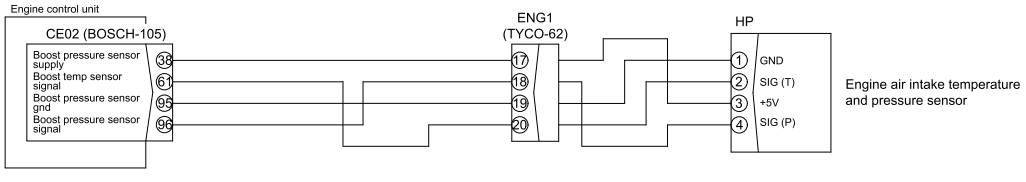
Failure Code [#T0403]

Action level	Failure code	DTMC	Failure	Coolant temperature sensor : low engine temperature
L03	#T0403	EC0F-04		
Detail of failure	The ENGINE ECU has detected a too low voltage in the temperature signal circuit of the coolant temperature sensor (F).			
Related information	The Engine ECU monitors the signal circuit of the coolant temperature sensor (F). If the ENGINE ECUdetermines that the voltage in the temperature signal circuit is lower than expected, a replacement value is used, calculated according to a curve based on the difference between the oil temperature and the ambient temperature; then this fault occurs. 1. Faulty coolant temperature sensor (F), internal fault. 2. Faulty temperature signal circuit in the coolant temperature sensor (F) short circuit towards a low voltage source or short circuit. 3. Faulty ENGINE ECU, software.			

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>1</td><td>Verify fault is present and active.</td><td>Use the operator display or the diagnostic instrument to check the status of this fault.
• If the fault is present and active, go to step 2.
• If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 6.</td></tr>
<tr><td>2</td><td>Check the conditions of the coolant temperature sensor (F).</td><td>Disconnect the engine wiring from the coolant temperature sensor (F) at connector F. Use a multimeter to measure the resistance of the coolant temperature sensor (F):
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>Coolant temperature sensor F pin 1</td><td>Coolant temperature sensor F pin 2</td><td>There must be a measurable quantityof resistance according to the effective coolant temperature, between 100 – 50000 Ω.</td></tr>
</table>
• If there is a measurable amount of resistance, leave the connector disconnected and go to step 3.
• If there is no resistance, the coolant temperature sensor (F) has failed internally. Replace sensor.</td></tr>
<tr><td>3</td><td>Check the signal circuit of the coolant temperature sensor (F) for a short circuit.</td><td>Disconnect the engine wiring from the ENGINE ECU at connector CE02.
With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE02 (female) pin 99</td><td>CE02 (female) pin 100</td><td>There should be no continuity.</td></tr>
</table>
• If there is no continuity, leave the connectors disconnected and go to step 4.
• If there is continuity, there is a short circuit in the engine wiring between the coolant temperature sensor (F) and the ENGINE ECU. Locate and repair the shorted conductors.</td></tr>
</table>

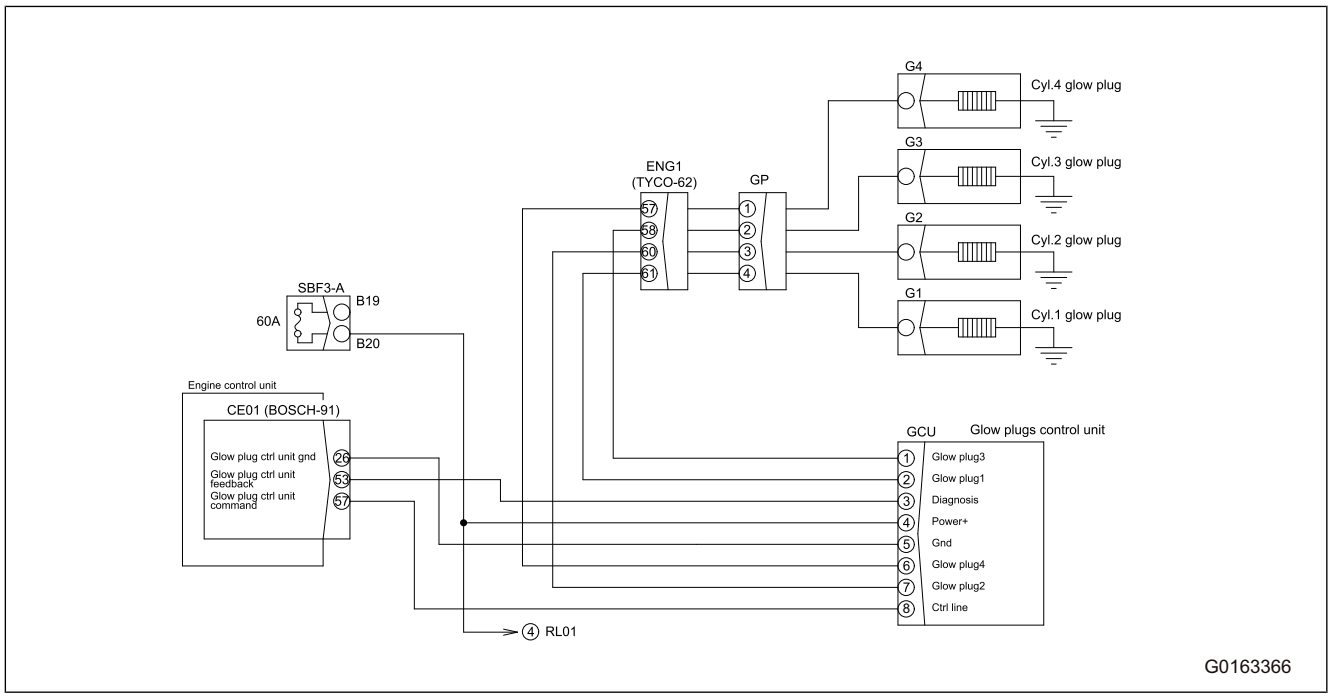
<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>3</td><td>Check the pressure signal circuit of the boost air temperature and pressure sensor (HP) to check for a short circuit to another circuit.</td><td>With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:<table><tr><th>From</th><th>To</th><th>Value</th></tr><tr><td>CE02 pin 96</td><td>All other pins in connector CE02_6</td><td>There should be no continuity.</td></tr></table>• If there is continuity, there is a short circuit to another circuit in the pressure signal circuit of the boost air temperature and pressure sensor (HP). Locate and repair the shorted conductor.
• If no continuity is detected, leave the connectors disconnected and go to step 4.</td></tr>
<tr><td>4</td><td>Check the pressure signal circuit of the boost air temperature and pressure sensor (HP) to check for a short circuit to voltage.</td><td>With the ignition switch set to ON, use a multimeter to perform the following voltage check:<table><tr><th>From</th><th>To</th><th>Value</th></tr><tr><td>CE02 pin 96</td><td>Ground</td><td>There should be no voltage.</td></tr></table>• If there is voltage, there is a short circuit to a voltage source in the pressure signal circuit of the boost air temperature and pressure sensor (HP). Locate and repair the shorted conductors.
• In the absence of voltage, go to step 5.</td></tr>
<tr><td>5</td><td>Replace the boost air temperature and pressure sensor (HP).</td><td>Use the operator display or the diagnostic instrument to check that this fault has been resolved.
• If this fault has been resolved, return the machine to service.
• If this fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.</td></tr>
<tr><td>6</td><td>Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires.
Check that the connectors are fully inserted.</td><td>Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display.
• If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
• If no damage is detected, only normal readings will appear on the screen delete the fault code.</td></tr>
</table>

Circuit diagram



G0163367

Circuit diagram



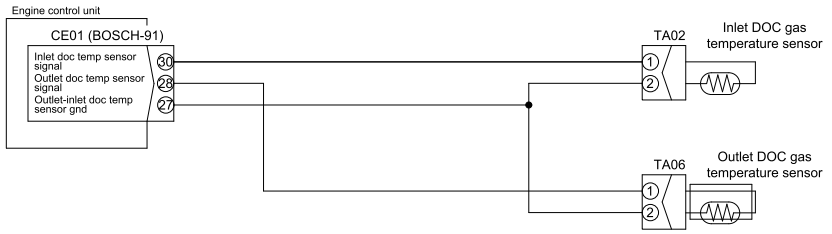
Failure Code [#T0430]

Action level	Failure code	DTMC	Failure	Throttle valve (TVA): position sensor voltage above the maximum threshold
L03	#T0430	2B15-03		
Detail of failure	The ENGINE ECU has detected a short circuit to external source or throttle valve solenoid valve (TVA) faulty.			
Related information	The Engine ECU monitors the correct operation of the throttle valve solenoid valve (TVA). If the position sensor inside the TVA sends the ECU a throttle valve solenoid valve (TVA)position which differs from the one required, this fault occurs. 1. Fault in the wiring, short circuit to external source. 2. Fault in the throttle valve solenoid valve (TVA). 3. The ENGINE ECU has failed.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.
2	Check for a short circuit to ground working on the wiring of the throttle valve solenoid valve (TVA).	With the wiring of the throttle valve solenoid valve (TVA), connector TVA, connected and in a Key-Off condition, use a multimeter to carry out the following continuity check: From / To / Value TVA pin 1 / Battery + / There should be no continuity TVA pin 5 / Battery + / There should be no continuity TVA pin 6 / Battery + / There should be no continuity • If there is no continuity, go to step 3. • If there is continuity, a short circuit to ground is present. Locate and repair the shorted conductor.
3	Check the correct operation of the throttle valve solenoid valve (TVA)	• If it is not working correctly, replace it and return the machine to service. If it is working correctly, check the ENGINE ECU for the appropriate software and re-flash if necessary.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. If you do not find damage and the display indicates only normal readings, delete the fault code.

No.	Cause or Action	Procedure, measuring location, criteria and remarks
5	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If no damage is detected, only normal readings will appear on the screen delete the fault code.

Circuit diagram

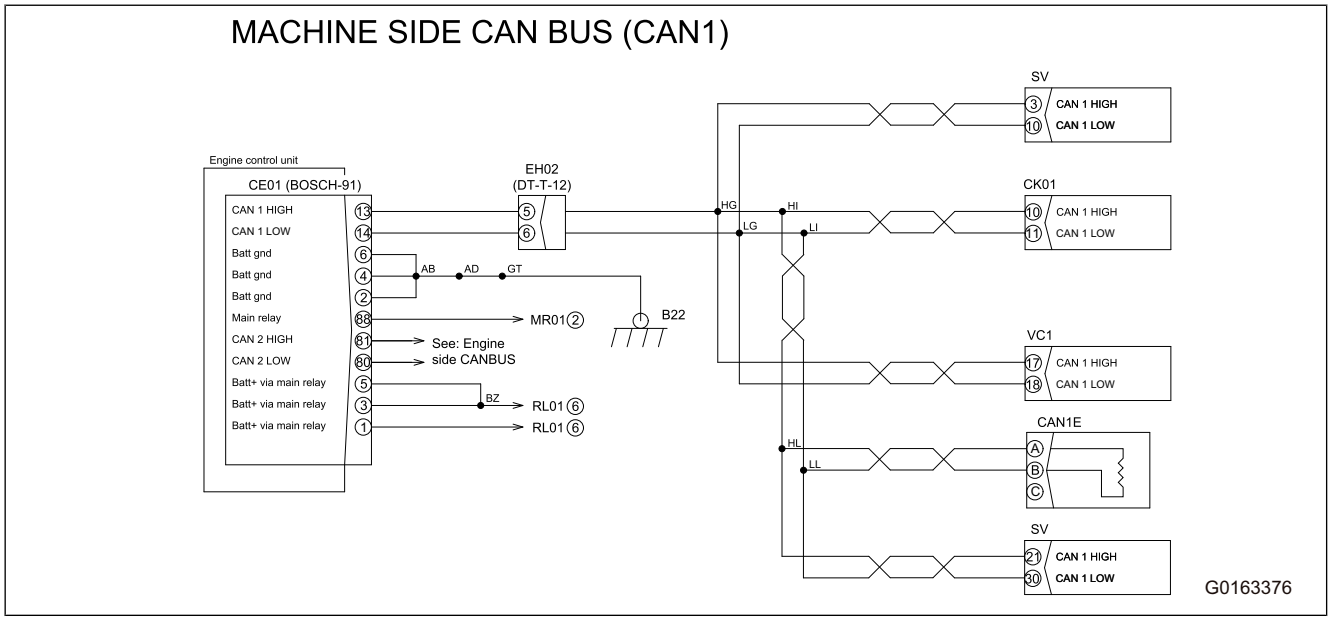


Failure Code [#T0450]

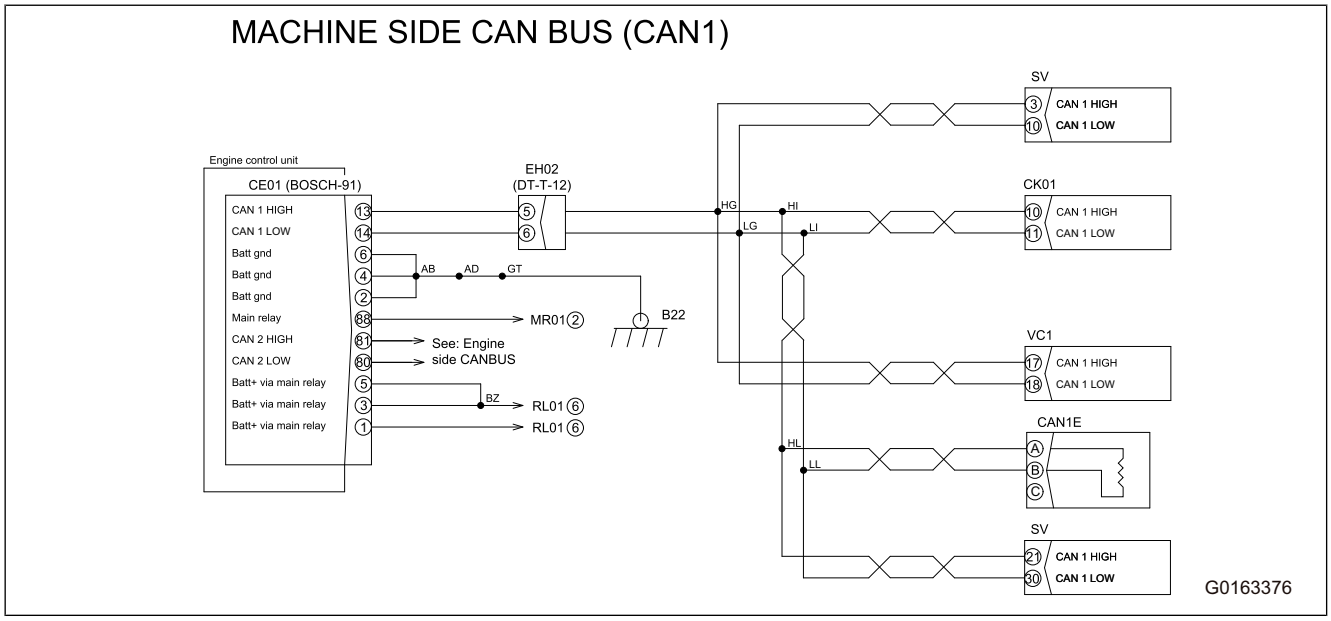
Action level	Failure code	DTMC	Failure	The working cycle of the DEF internal pump is below the minimum limit
L03	#T0450	C31B-12		
Detail of failure				
Related information	The Engine ECU monitors the correct operation of the DEF pump module (MB02) that contains the DEF pump motor, the DEF return valve, and the DEF pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the DEF to be injected. 1. Fault in the DEF pump module (MB02). 2. Faulty ENGINE ECU, software.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Check if the fault is present and active.	Use the operator display or the diagnostic tool to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 4.
2	Check the correct operation of the DEF pump module (MB02).	• If the module is working correctly, go to step 3. • If the module is not working correctly, replace the DEF pump module (MB02), go to step 3
3	Carry out the Diesel Exhaust Fluid (DEF) system test.	Use the diagnostic instrument to carry out the Urea Dosing System test. Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service. Carry out the SCR fault verification. Then check to see that this fault is resolved. • If the fault is resolved, return the machine to service. • If the fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If no damage is detected, only normal readings will appear on the screen delete the fault code.

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>4</td><td>Check the wiring of the DEF pump module (MB02) to check for a short circuit to ground.</td><td>The key must be in the OFF position.
Use amultimeter to carry out the following continuity check:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>MB02 pin 2</td><td>MB02 pin 4</td><td>There should be no continuity.</td></tr>
<tr><td>MB02 pin 3</td><td>MB02 pin 4</td><td>There should be no continuity.</td></tr>
</table>
• If there is continuity, this indicates a short circuit to ground in the DEF pump module (MB02) wiring, locate and repair the damaged conductor.
• If there is no continuity, go to step 5.</td></tr>
<tr><td>5</td><td>Check the connector for a short circuit to ground condition.</td><td>The key must be in the OFF position.
Disconnect the connectors CE02, CE01 and RL3
Use amultimeter to carry out the following continuity check:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE02 (female) pin 10</td><td>CE01 (female) pin 2</td><td>There should be no continuity.</td></tr>
<tr><td>RL3 pin 87</td><td>CE01 (female) pin 2</td><td>There should be no continuity.</td></tr>
<tr><td>CE02 (female) pin 10</td><td>CE01 (female) pin 4</td><td>There should be no continuity.</td></tr>
<tr><td>RL3 pin 87</td><td>CE01 (female) pin 4</td><td>There should be no continuity.</td></tr>
<tr><td>CE02 (female) pin 10</td><td>CE01 (female) pin 6</td><td>There should be no continuity.</td></tr>
<tr><td>RL3 pin 87</td><td>CE01 (female) pin 6</td><td>There should be no continuity.</td></tr>
</table>
• If there is continuity, this indicates a short circuit to ground in the DEF pump module (MB02) control circuit, locate and repair the damaged conductor.
• If there is no continuity, pass on to point 6.</td></tr>
<tr><td>6</td><td>Check the wiring of the DEF pump module (MB02) to check for a short circuit to ground.</td><td>The key must be in the OFF position.
Use amultimeter to carry out the following continuity check:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>MB02 pin 2</td><td>MB02 pin 3</td><td>There should be no continuity.</td></tr>
<tr><td>MB02 pin 4</td><td>MB02 pin 3</td><td>There should be no continuity.</td></tr>
</table>
• If there is continuity, this indicates a short circuit to battery in the DEF pump module (MB02) wiring, locate and repair the damaged conductor.
• If there is no continuity, pass on to point 7.</td></tr>
</table>


MACHINE SIDE CAN BUS (CAN1)
Engine control unit
CE01 (BOSCH-91)
CAN 1 HIGH
CAN 1 LOW
Batt gnd
Batt gnd
Batt gnd
Main relay
CAN 2 HIGH
CAN 2 LOW
Batt+ via main relay
Batt+ via main relay
Batt+ via main relay
13
14
6
4
2
88
81
80
5
3
1
EH02
(DT-T-12)
AB
AD
GT
MR01 2
B22
See: Engine
side CANBUS
BZ
RL01 6
RL01 6
HG
LG
HI
LI
HL
LL
SV
CAN 1 HIGH
CAN 1 LOW
CK01
CAN 1 HIGH
CAN 1 LOW
VC1
CAN 1 HIGH
CAN 1 LOW
CAN1E
SV
CAN 1 HIGH
CAN 1 LOW
G0163376

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>4</td><td>Check the CAN circuit of the ENGINE ECU for a short circuit towards a high voltage source.</td><td>Disconnect the engine wiring from the ENGINE ECU at the connector CE01.
With the ignition switch in the ON position, use a multimeter to check the voltage on the engine wiring side:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE01 (female) pin 13</td><td>Ground</td><td>There should be a voltage of 0 V.</td></tr>
<tr><td>CE01 (female) pin 14</td><td>Ground</td><td>There should be a voltage of 0 V.</td></tr>
</table>
• If the value is greater than 0V, there is a short circuit towards a high voltage source in the CAN circuit of the ENGINE ECU. Locate and repair the shorted conductor.
• In the absence of voltage, go to step 5.</td></tr>
<tr><td>5</td><td>Check the CAN circuit of the ENGINE ECU to check for a short circuit.</td><td>Disconnect the engine wiring from the ENGINE ECU at the connector CE01.
With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE01 (female) pin 13</td><td>Ground</td><td>There should be no continuity.</td></tr>
<tr><td>CE01 (female) pin 14</td><td>Ground</td><td>There should be no continuity.</td></tr>
<tr><td>CE01 (female) pin 13</td><td>CE01 all other pins</td><td>There should be no continuity.</td></tr>
<tr><td>CE01 (female) pin 14</td><td>CE01 all other pins</td><td>There should be no continuity.</td></tr>
</table>
• If there is continuity, there is a short circuit condition in the CAN circuit of the ENGINE ECU. Locate and repair the shorted conductor.
• If no continuity is detected, check the ENGINE ECU for the appropriate software and update if necessary.</td></tr>
<tr><td>6</td><td>Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires.
Check that the connectors are fully inserted.</td><td>Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display.
• If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
• If no damage is detected, only normal readings will appear on the screen delete the fault code.</td></tr>
</table>


MACHINE SIDE CAN BUS (CAN1)
Engine control unit
CE01 (BOSCH-91)
CAN 1 HIGH
CAN 1 LOW
Batt gnd
Batt gnd
Batt gnd
Main relay
CAN 2 HIGH
CAN 2 LOW
Batt+ via main relay
Batt+ via main relay
Batt+ via main relay
13
14
6
4
2
88
81
80
5
3
1
AB
AD
GT
BZ
MR01 2
See: Engine side CANBUS
RL01 6
RL01 6
EH02
(DT-T-12)
5
6
B22
1
HG
LG
HI
LI
HL
LL
SV
3
10
CAN 1 HIGH
CAN 1 LOW
CK01
10
11
CAN 1 HIGH
CAN 1 LOW
VC1
17
18
CAN 1 HIGH
CAN 1 LOW
CAN1E
A
B
C
SV
21
30
CAN 1 HIGH
CAN 1 LOW
G0163376

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>3</td><td>Determine the presence of a short circuit in the CAN circuit between the DEF tank quality - level - temperature sensor (P63) level/temperature sensorand the ENGINE ECU.</td><td>Disconnect the wiring from the ENGINE ECU, connector CE02 (male). With the switch set to ON use a multimeter to measure the continuity:
<table>
<tr><th>From</th><th>To</th><th>Value</th></tr>
<tr><td>CE01 (male) pin 80</td><td>Ground</td><td>There should be no continuity</td></tr>
<tr><td>CE01 (male) pin 81</td><td>Ground</td><td>There should be no continuity</td></tr>
</table>
• If there is continuity, there is a short circuit. Locate and repair the damaged conductor.
• If there is no continuity, go to step 4.</td></tr>
<tr><td>4</td><td>Check the correct operation of the DEF tank quality - level - temperature sensor (P63) level/ temperature sensor.</td><td>• If the sensor is okay, contact the Komatsu Distributor.
• If the sensor is not working correctly, continue with step 5.</td></tr>
<tr><td>5</td><td>Replace the DEF tank quality - level - temperature sensor (P63) level/ temperature sensor.</td><td>Use the diagnostic instrument to replace the DEF tank quality - level - temperature sensor (P63) level/temperature sensorand restore the ECU data configuration.
Then check to see that this fault is resolved
• If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.
• If fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.</td></tr>
<tr><td>6</td><td>Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires.
Check that the connectors are fully inserted.</td><td>Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display.
• If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
• If no damage is detected, only normal readings will appear on the screen delete the fault code.</td></tr>
</table>

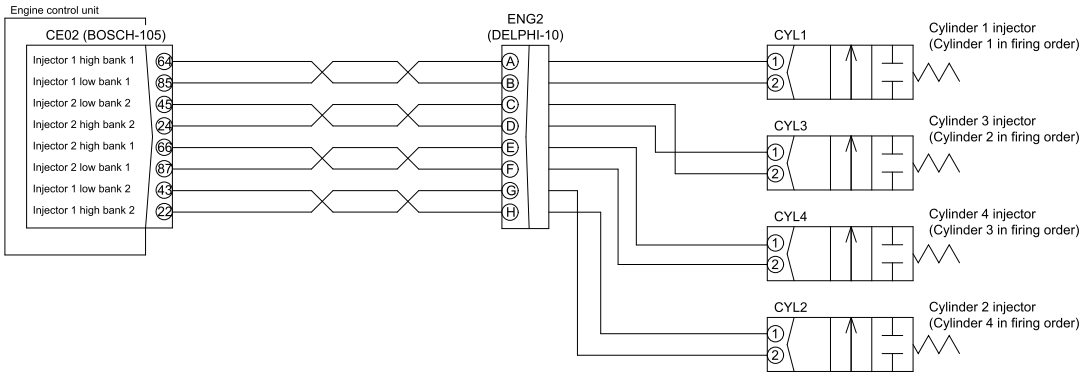
<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>4</td><td>Check the ENGINE ECU grounding.</td><td>Disconnect the engine wiring harness from the ENGINE ECU at the connector CE01.
With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:
<table>
<tr><td>From</td><td>To</td><td>Value</td></tr>
<tr><td>CE01 (female) pin 2</td><td>Ground</td><td>There should be continuity.</td></tr>
<tr><td>CE01 (female) pin 4</td><td>Ground</td><td>There should be continuity.</td></tr>
<tr><td>CE01 (female) pin 6</td><td>Ground</td><td>There should be continuity.</td></tr>
</table>
• If no continuity is detected in one or more checks, identify and restore the ground circuit to the ENGINE ECU.
• If continuity is detected on all of the checks, go to step 5.</td></tr>
<tr><td>5</td><td>Check the terminating resistor inside the ENGINE ECU.</td><td>Disconnect the engine wiring harness from the ENGINE ECU at the connector CE01.
With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on thecomponent side:
<table>
<tr><td>From</td><td>To</td><td>Value</td></tr>
<tr><td>CE01 (female) pin 13</td><td>CE01 (female) pin 14</td><td>There should be 120 Ω.</td></tr>
</table>
• If the measured resistance is incorrect, there is a fault inside the ENGINE ECU.Check the ENGINE ECU for the appropriate software and update if necessary.
• If the measured resistance is correct, go to step 6.</td></tr>
<tr><td>6</td><td>Check the CAN circuit of the ENGINE ECU for a short circuit towards a high voltage source.</td><td>Disconnect the engine wiring harness from the ENGINE ECU at the connector CE01.
With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:
<table>
<tr><td>From</td><td>To</td><td>Value</td></tr>
<tr><td>CE01 (female) pin 13</td><td>Ground</td><td>There should be a voltage of 0 V.</td></tr>
<tr><td>CE01 (female) pin 14</td><td>Ground</td><td>There should be a voltage of 0 V.</td></tr>
</table>
• If the value is greater than 0V, there is a short circuit towards a high voltage source in the CAN circuit of the ENGINE ECU. Locate and repair the shorted conductor.
• In the absence of voltage, go to step 7.</td></tr>
</table>

Failure Code [#T0543]

Action level	Failure code	DTMC	Failure	EGR Valve: stuck on open position
L00	#T0543	21EC-E7		
Detail of failure	The EGR actuator (EGR) does not closed within the set time. The EGR actuator (EGR)is mechanically blocked or stuck. The sensor is not aligned.			
Related information	The EGR actuator (EGR) with a position sensor provides feedback to the Engine ECU. If there is a deviation between the position requested and the position detected, a deviation error (min or max) is triggered. The system then tries to “release” the closing or opening of the fast actuator. If it is not possible to “release” the actuator, the fault “Valve jammed” is triggered. The valve stuck in the open state is detected if the deviation is permanent, the valve release attempts have failed or the EGR actuator prosecution is above a predetermined threshold.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 3.
2	Check monitoring of the EGR actuator (EGR).	Connect the diagnostic instrument to the Engine ECU, delete the error and check if the fault code returns active. • If code returns in an active status, correctly mount the EGR actuator (EGR)or replace it if necessary. • If code remains inactive, return the machine to service.
3	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If you do not find damage and the display indicates only normal readings, delete the fault code.

Circuit diagram



Failure Code [#T0581]

Action level	Failure code	DTMC	Failure	Diagnostic fault check to report the plausibility error in PoI3 efficiency factor
L04	#T0581	07E8-FF		
Related information	The engine performance is supported by the addition of pilot injections, main injections, and post-injections. The Engine ECUmonitors these injections and compares their values against a model. If the post- injection 3 efficiency is not within the relative range of plausible values, this fault occurs. Replace the ENGINE ECU if necessary.			

Failure Code [#T0598]

Action level	Failure code	DTMC	Failure	ECU internal failure - Safety management unit alarm group 1 Failure 1 issued
L01	#T0598	9DF0-FF		
Detail of failure				
Related information	The Engine ECU internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ENGINE ECU must be replaced.			

Failure Code [#T0615]

Action level	Failure code	DTMC	Failure	ECU internal failure - Safety management unit alarm group 2 Failure 8 issued
L01	#T0615	A5F0-FF		
Detail of failure				
Related information	The Engine ECU internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ENGINE ECU must be replaced.			

Failure Code [#T0633]

Action level	Failure code	DTMC	Failure	ECU internal failure - Safety management unit alarm group 3 Failure 7 issued
L01	#T0633	AEF0-FF		
Detail of failure				
Related information	The Engine ECU internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ENGINE ECU must be replaced.			

Failure Code [#T0650]

Action level	Failure code	DTMC	Failure	ECU internal failure - Safety management unit alarm group 6 Failure 4 issued
L01	#T0650	B6F0-EB		
Detail of failure	The ENGINE ECU has an internal problem.			
Related information	The Engine ECU internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ENGINE ECU must be replaced.			

Failure Code [#T0664]

Action level	Failure code	DTMC	Failure	DPF system: particulate filter damaged
L03	#T0664	F80B-07		
Detail of failure	The particulate filter has failed or is disassembled			
Related information	The Engine ECU monitors the integrity of the particulate filter. In order to determine the integrity of the particulate filter, the pressure drop measured on the empty filter (low soot) in stationary conditions is compared with the reference values determined on a new undamaged DPF. An error is detected if the maximum differential pressure value saved at stationary state is lower than a threshold that depends on the flow of the volume. 1. Faulty particulate filter, failed or disassembled 2. Faulty ENGINE ECU, software.			

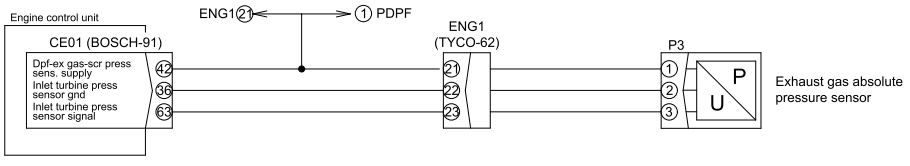
No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify that the fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is presentand active, continue with step 2. • If the fault is no longer present or active, the fault may be intermittent and not currently active, go to step 4.
2	Check for black smoke at the exhaust pipe.	• If there is black smoke, the particulate filter could be disassembled. Install it correctly. If the fault occurs again go to step 3. • If there is no black smoke, contact the Komatsu Distributor.
3	Check that the particulate filter is operating correctly.	• If a fault is present,replace the filter. • If a fault is not present,check the ENGINE ECU for the appropriate software and re-flash if necessary.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If no damage is detected, only normal readings will appear on the screen delete the fault code.

Failure Code [#T0676]

Action level	Failure code	DTMC	Failure	Low pressure upstream of turbine
L03	#T0676	B904-07		
Detail of failure	The ENGINE ECU detects a pressure loss due to possible leakage in the exhaust gas circuit or detects a malfunction in the Exhaust gas pressure sensor (P3)			
Related information	The Engine ECU monitors the pressure upstream of the turbine which is acquired via the connected Exhaust gas pressure sensor (P3). The control unit detects A-F02 a pressure lower than a predetermined threshold and creates this error.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Verify fault is present and active.	Use the diagnostic instrument to check the status of this fault. • If the fault is present and active, go to step 2. • If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step 4.
2	Check for leaks in the exhaust gas circuit.	• If there are leaks in the exhaust gas circuit, eliminate the leaks restoring the correct circuit. • If there are noleaks in the exhaust gas circuit, go to step 3.
3	Check the correct operation of the Exhaust gas pressure sensor (P3).	• If the sensor is not working correctly, replace the Exhaust gas pressure sensor (P3). • If the sensor is working correctly, return the machine to service.
4	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. If you do not find damage and the display indicates only normal readings, delete the fault code.

Circuit diagram



G0163369

Failure Code [#T0691]

Action level	Failure code	DTMC	Failure	Control unit internal error: erratic shutdown detected
L01	#T0691	39E8-FF		
Detail of failure	The ENGINE ECU has been switched off while the engine is running due to: • a loss of power supply; • a software reset A-F02.			
Related information	The system of the Engine ECU supplies the execution command as the calculation of the "ECU deactivation time". The "incorrect activation counter" is a function of a control counter whose task is to check if the ENGINE ECU has always been operating from when the ENGINE ECU has been activated to when it has been deactivated. If the ENGINE ECU has been incorrectly switched off before completing the shut down procedure (due to power failure, power supply reset, or software reset with the key switch signal set to OFF), the counter is not reset. This causes the subsequent initialization (switching on activation) after reading the counter in order to detect the missed reset and the signalisation of this error.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
1	Check that the error is not sporadic or intermittent.	• If the fault is not constant, it is possible that the operator might have disconnected the power supply before theafterrun has completed or immediately after the key off. Adjust the duration of the ECU afterrun accordingly A-F02. • If the fault is always present, continue with 2.
2	Check for related faults.	Use the diagnostic instrument to determine the presence of faults in the battery power supply. • If other faults are present in the battery supply, resolve the corresponding fault. Then determine if the fault has been resolved. • If other faults are not detected on the battery supply, continue with step 3.
3	End the operations underway and restart the machine.	Check the ENGINE ECU for the appropriate software and re-flash if necessary. • If the faulthas been resolved, return the machine to service. • If the fault has not been resolved, send a request to the Technical Help Desk.

Failure Code [#T0701]

REMARK

Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Action level	Failure code	DTMC	Failure	ECU internal: short circuit in the power supply of sensor 1
L01	#T0701	B50D-05		
Detail of failure	The ECU sensor supply referencevoltage 1 is below the set range.			
Related information	The Engine ECU supplies six separate 5.0 V voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 1 is below the set range, this fault occurs. 1. Internal fault or faulty wiring of the Differential pressure sensor on DPF (PDPF). 2. Internal fault or fault in the wiring of the intake air Intake air temperature sensor (TA01). 3. Faulty DEF pump module (MB02), internal fault or faulty wiring. 4. Faulty ENGINE ECU, software.			

<table>
<tr><th>No.</th><th>Cause or Action</th><th>Procedure, measuring location, criteria and remarks</th></tr>
<tr><td>1</td><td>Verify fault is present and active.</td><td>Use the diagnostic tool to check the status of this fault.
• If the fault is present and active, go to step 2
• If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step 12.</td></tr>
<tr><td>2</td><td>Disconnect the wiring from the Differential pressure sensor on DPF (PDPF) at connector PDPF.</td><td>Use the diagnostic tool to monitor the status of the alarm.
• Ifthis fault is eliminated after disconnecting a connector, the sensor has an internal fault. Replace sensor.
• If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to step.</td></tr>
<tr><td>3</td><td>Check the supply circuit 1 for an interruption.
Set the ignition switch to ON.</td><td>Use a multimeter to carry out the following voltage check:<table><tr><th>From</th><th>To</th><th>Value</th></tr><tr><td>PDPF (male) pin 1</td><td>Ground</td><td>There should be between 4.5 – 5.5V.</td></tr></table>• If there is no voltage or if the voltage is too low, go to step 4
• If the voltage reading is correct, go to step 5</td></tr>
<tr><td>4</td><td>Check the supply circuit 1 for an interruption.
Set the ignition switch to ON.</td><td>Use a multimeter to carry out the following voltage check:<table><tr><th>From</th><th>To</th><th>Value</th></tr><tr><td>CE01 pin 42</td><td>Ground</td><td>There should be between 4.5 – 5.5V.</td></tr></table>• If there is no voltage or if the voltage is too low, check the ENGINE ECU for the appropriate software and update if necessary.
• If the voltage reading is correct, this indicates faulty wiring. Locate and repair the shorted conductor.</td></tr>
</table>

Failure Code [#T0710]

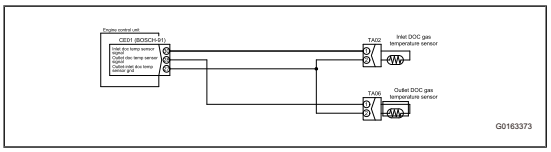
REMARK

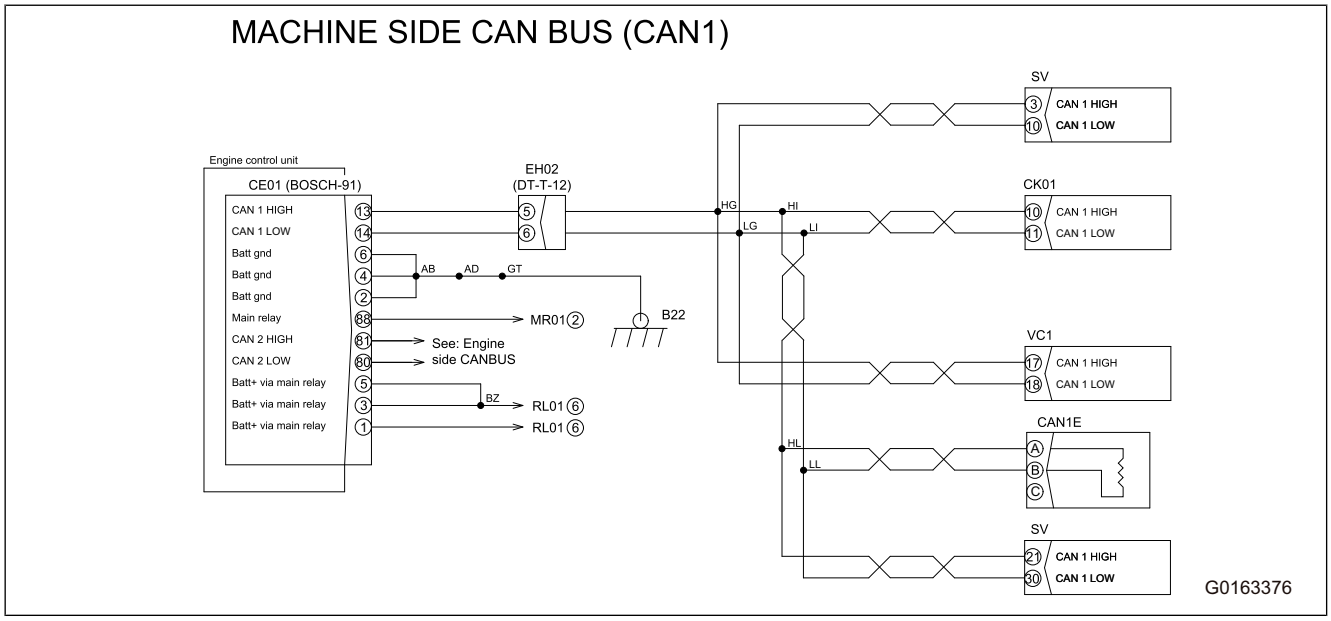
Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.

Action level	Failure code	DTMC	Failure	SCR inducement:error warning triggered by customer(errors that affect NOx efficiency)
L02	#T0710	E0ED-EF		
Detail of failure	This fault is for informational purposes only and requires no action other than the resolution of the active fault causing this fault to occur.			
Related information	Any of the various faults that could occur in the engine causes the generation of this fault.			

No.	Cause or Action	Procedure, measuring location, criteria and remarks
4	Replace the exhaust temperature sensor downstream of the DOC (TA06).	Use the operator display or the diagnostic instrument to check that this fault has been resolved. • If this faulthas been resolved, return the machine to service. • If this fault has not been resolved, check the ENGINE ECU for the appropriate software and update if necessary.
5	Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.	Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires. Operate the machine while monitoring the display. • If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved. • If no damage is detected, only normal readings will appear on the screen delete the fault code.

Circuit diagram




MACHINE SIDE CAN BUS (CAN1)
Engine control unit
CE01 (BOSCH-91)
CAN 1 HIGH
CAN 1 LOW
Batt gnd
Batt gnd
Batt gnd
Main relay
CAN 2 HIGH
CAN 2 LOW
Batt+ via main relay
Batt+ via main relay
Batt+ via main relay
13
14
6
4
2
88
81
80
5
3
1
AB
AD
GT
BZ
MR01 2
See: Engine side CANBUS
RL01 6
RL01 6
EH02
(DT-T-12)
5
6
B22
1
HG
LG
HI
LI
HL
LL
SV
3
10
CAN 1 HIGH
CAN 1 LOW
CK01
10
11
CAN 1 HIGH
CAN 1 LOW
VC1
17
18
CAN 1 HIGH
CAN 1 LOW
CAN1E
A
B
C
SV
21
30
CAN 1 HIGH
CAN 1 LOW
G0163376

REMOVE AND INSTALL OF FAN CLUTCH ASSEMBLY

⚠ Place the machine on a level ground, fully raise the front work equipment and lock them in position with safety bar.

⚠ Set the work equipment lock lever to LOCK position.

⚠ Turn the starting switch to OFF position to stop the engine.

⚠ Turn the battery disconnect switch to OFF position, and remove the key.

REMARK

- Check the connector numbers and installed positions before disconnecting wirings and hoses, and record them.
- Fit a plug or flange in the place where a hydraulic hose is disconnected to prevent oil from flowing out.

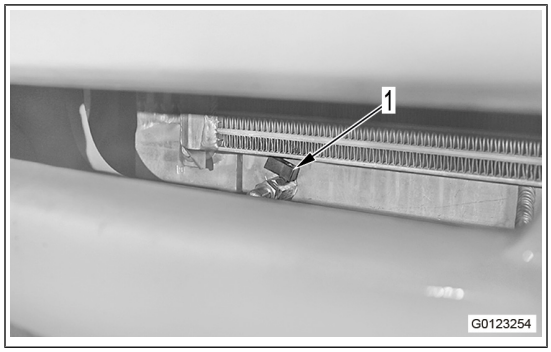
REMOVE FAN CLUTCH ASSEMBLY

1. Drain oil from the hydraulic tank. [*1]

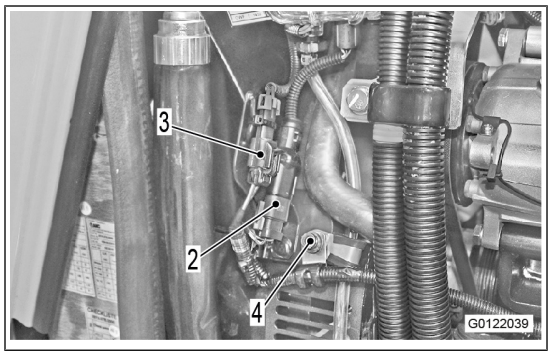
   Radiator: 12 ℓ

2. Remove engine hood (For details, see “REMOVE AND INSTALL ENGINE HOOD (50-68)”).

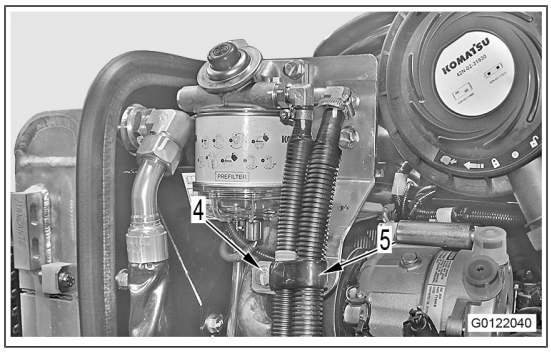
3. Loosen the drain valve (1) of the radiator, and drain coolant.



4. Disconnect the connector FFH (2) and WIF (3) of fuel prefilter. [*2]



5. Remove bolt (4) disconnect clamp (5).



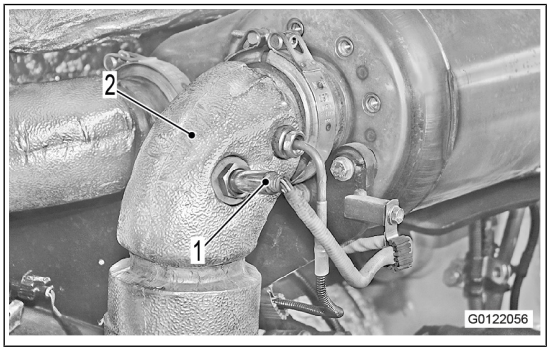
REMOVE AND INSTALL NOx DETECTION SENSOR UPSTREAM OF THE DOC

⚠ **Place the machine on a level ground, fully raise the front work equipment and lock them in position with safety bar.**

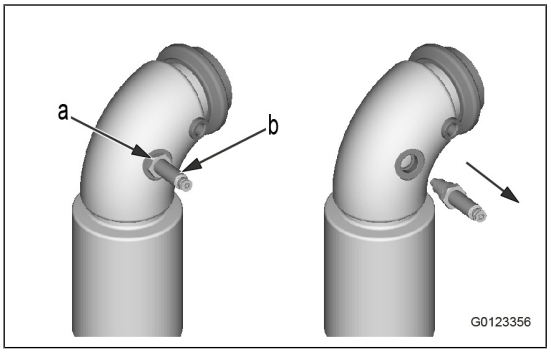
⚠ **Turn the battery disconnect switch to OFF position, and remove the key.**

REMOVE NOx DETECTION SENSOR UPSTREAM OF THE DOC

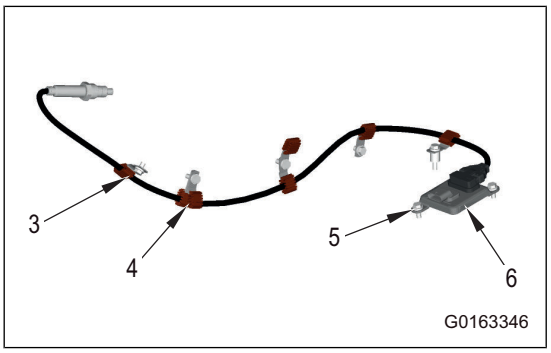
1. Remove air cleaner assembly (For details, see “REMOVE AND INSTALL AIR CLEANER ASSEMBLY (50-61)”.
2. Disconnect turbocharger outlet NOx sensor (1) from bellows (2). [*1]



3. Loosen the nut (a), hold the metal part (b), and then pull out the sensor (1) vertically in the direction of the arrow.



4. Remove all bolts (3) fixing clamps (4).
5. Remove bolts (5) and remove the NOx detection sensor upstream of the DOC controller (6).



INSTALL NOx DETECTION SENSOR UPSTREAM OF THE DOC

Perform installation in the reverse order to removal.

INSTALL DEF TANK SENSOR FLANGE ASSEMBLY

Perform installation in the reverse order to removal.

[*1]

- **Refill DEF tank with DEF to the specified level through the filler port.**

  DEF tank: 21.1 ℓ

- **If necessary, refill the radiator with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant. Then check the coolant level again.**

1. Wear the vinyl gloves (A) to install O-ring (20) to DEF tank (19).

   REMARK

   - Be sure to wear the vinyl gloves (A) when handling DEF.
   - Use a new O-ring (20).

2. Install the O-ring (20) to the tip of DEF tank sensor flange assembly (18).

   REMARK

   - Be sure to wear the vinyl gloves (A) when handling DEF.
   - Use a new O-ring (21).

3. Apply distilled water to O-rings (20) and (21) as lubricant.

   REMARK

   Do not use grease, lubricating oil, or any lubricating substance. Otherwise, it may cause failures if it is mixed into the DEF tank.

   O-rings (20), (21): Distilled water

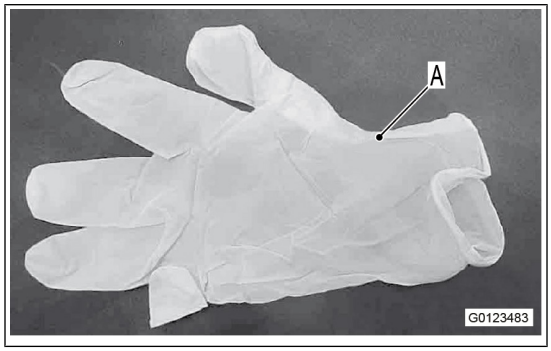
4. Press the top of DEF tank sensor flange assembly (18) by hands with careful attention not to get O-rings (20) and (21) caught, so that the mounting face is seated on the flange.

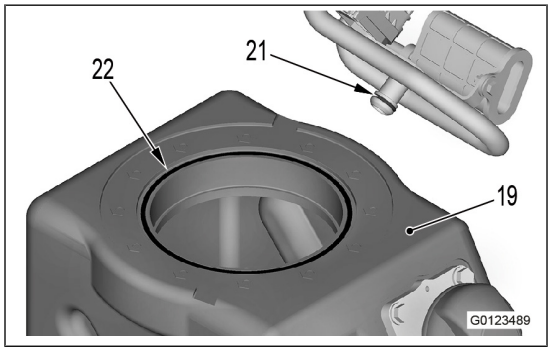
5. Install the DEF tank sensor flange assembly (18) with the bolts (17) (12 pieces).

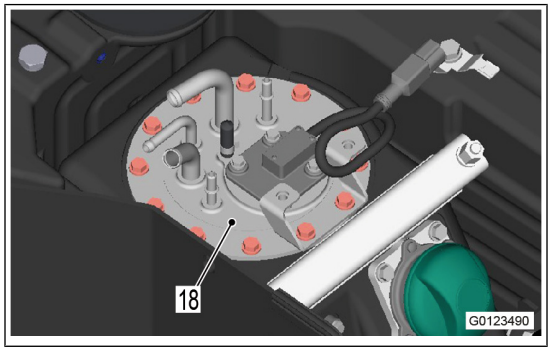
   Mounting bolt (17): 9.5 to 10.5 Nm {0.97 to 1.07 kgfm}

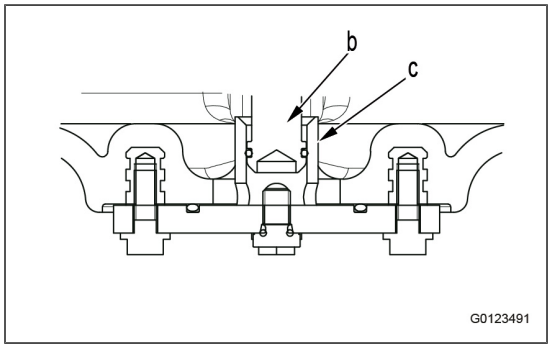
   REMARK

   - Install the DEF tank sensor flange assembly (18) straight without rotating when the flange is seated on the installing face. (To prevent O-rings (20) and (21) from falling off, and twisting.)
   - Check that the tip (b) of DEF tank sensor flange assembly (18) is securely inserted into the installing groove (c) of the bottom flange.









UNDERCARRIAGE AND FRAME

REMOVE AND INSTALL ENGINE HOOD

⚠ **Place the machine on a level ground, fully raise the front work equipment and lock them in position with safety bar.**

⚠ **Set the work equipment lock lever to LOCK position.**

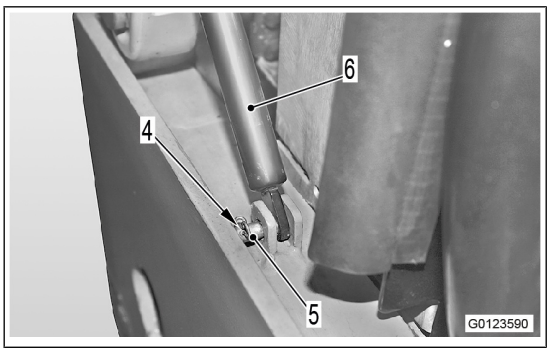
⚠ **Turn the starting switch to OFF position to stop the engine.**

⚠ **Turn the battery disconnect switch to OFF position, and remove the key.**

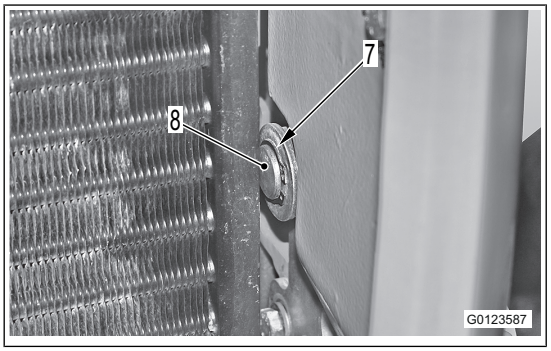
REMOVE ENGINE HOOD

1. Remove the bolts (1), and remove front mask (2)
2. Open engine hood (3).

3. Remove safety pins (4).
4. Remove pins (5) and disconnect gas accumulator (6).



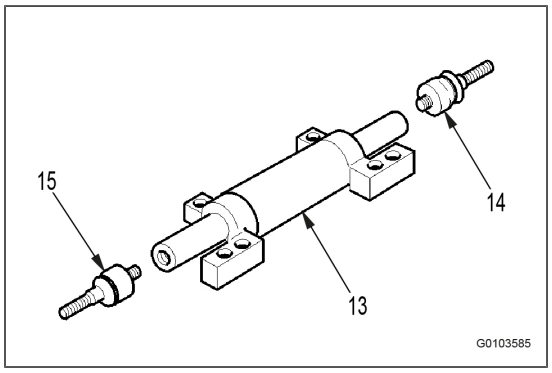
5. Remove snap ring (7) and washer (8) from both side.



INSTALL STEERING CYLINDER GROUP

1. Assemble the ball joints (5) and (12) to the ends of the cylinder rod (21) and tighten using torque wrench to the prescribed torque.

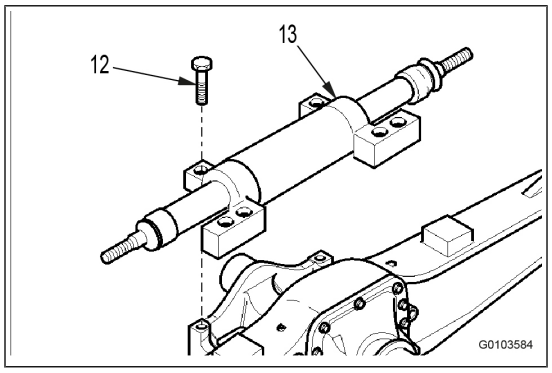
   Ball joints: 300 Nm



2. Before matching surfaces, make sure that they are perfectly clean, degrease and clean them with appropriate detergents. Spread a film of adhesive on the contact surface between the axle beam and the steering cylinder (13). Assemble and tighten the fastening screws (12) of the steering cylinder (13) to the prescribed torque.

   Fastening screws: Loctite 638

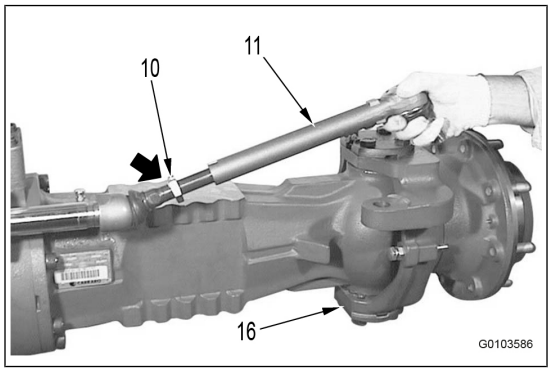
   Fastening screws: 460 Nm



3. Align the swivel housing (16) with the axle. Screw the tie rod (11) so that its ball joint can be inserted into the swivel housing (16) arm.

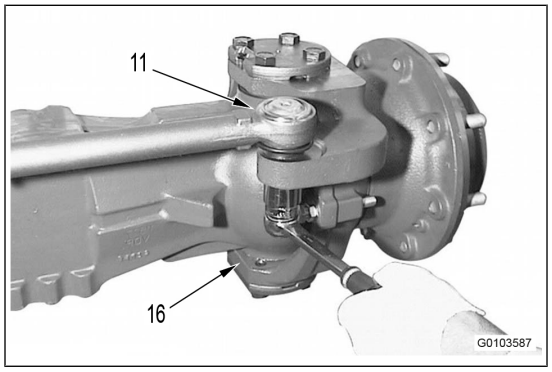
   REMARK

   If necessary unscrew the lock nut (10). Repeat the whole sequence of the mentioned operations on the opposite side.



4. Insert the ball joint of the tie rod (11) into its housing on the swivel housing (16). Assemble and tighten the lock nut (7) with a dynamometric wrench to the requested torque. Repeat the whole sequence of the mentioned operations on the opposite side.

   Bolt: 280 Nm

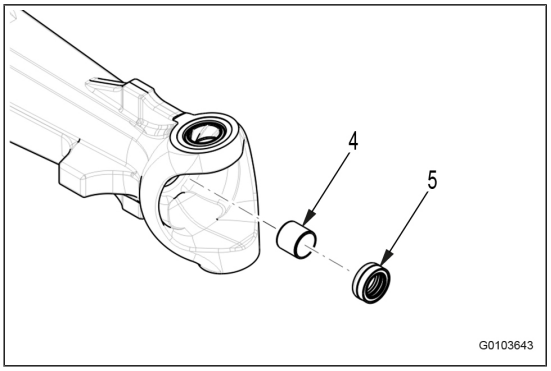


2. Remove the seal ring (5) from the axle beam (1). Remove the bush (4) from the axle beam (1) only if the wear conditions require this.

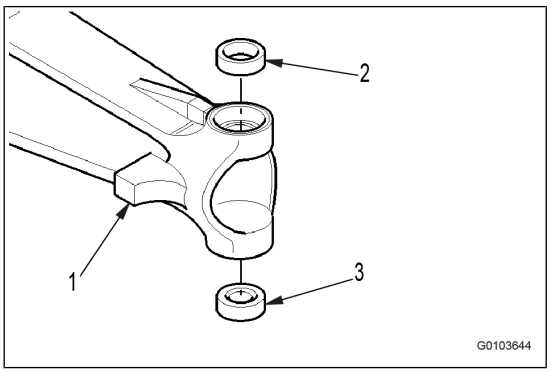
   REMARK

   Destructive operation for the seal ring; the seal ring must be replaced.

   ⚠ **Be careful not to damage the bush seat.**



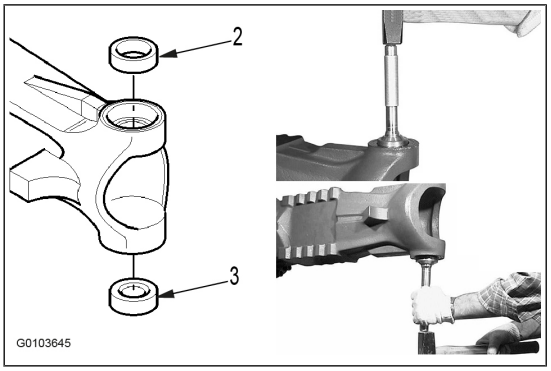
3. Remove the upper king pin bush (2) and the ball bearing cup (3) from the king pin seats using a suitable extractor only if the wear conditions require this.



ASSEMBLE AXLE BEAM GROUP

1. Cool the upper king pin bush (2) and the ball bearing cup (3) at a temperature lower than -100 °C with liquid nitrogen. Assemble the upper bush (2) on the upper king pin seat with the special tool (A) and a hammer. Assemble the ball bearing cup (3) on the lower king pin seat with the special tool (A) and a hammer.

   ⚠ **Wear safety gloves.**

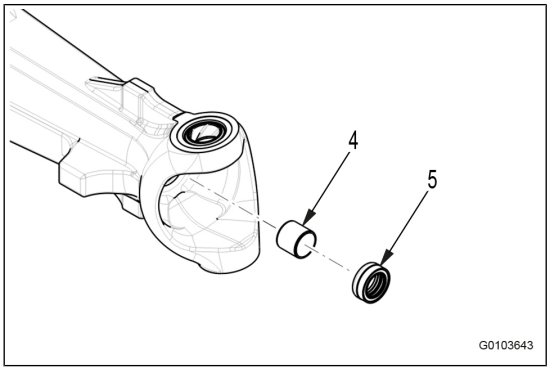


2. Assemble the bush (4) on the axle beam (1) with the special tool (B) and a hammer. Assemble the seal ring (5) on the axle beam with the special tool (C) and a hammer. See: next point.

   REMARK

   Lubricate carefully the seal ring with prescribed grease

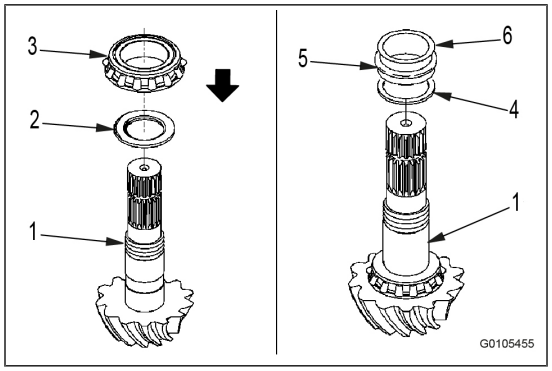
   Polymer 400



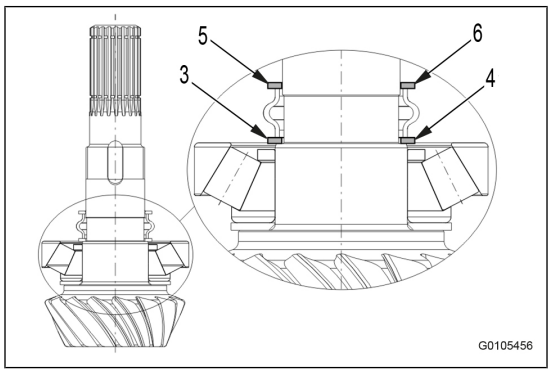
9. Force the bearing (3) into the pinion shaft (1) with the special tool (F) under a press, making sure that it is well set. Insert the shims (4) and (6) and the new collapsible spacer (5).

   REMARK

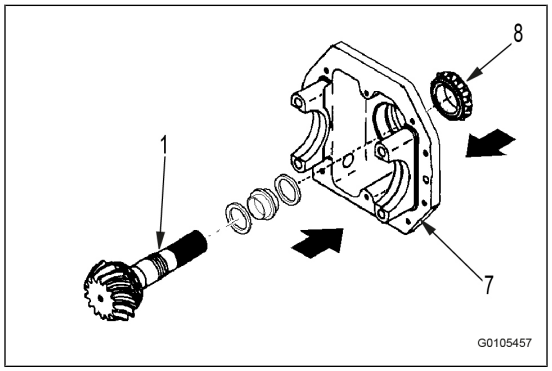
   Use always a new collapsible spacer (5).



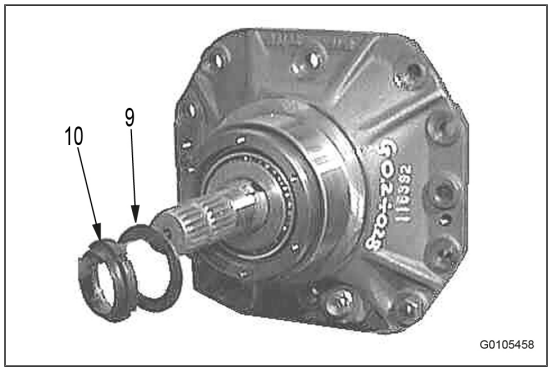
10. Check the right assembly sequence.



11. Insert the bevel pinion (1) unit into the differential support housing (7) and the bearing cone (8) into the pinion end, as shown in figure. Use the special tool (F) and a hammer to drive the bearing (8).



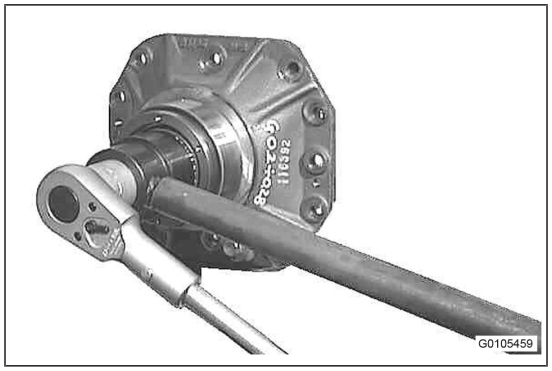
12. Insert the ring nut washer (9) and screw a new lock ring nut (10) on the pinion end.



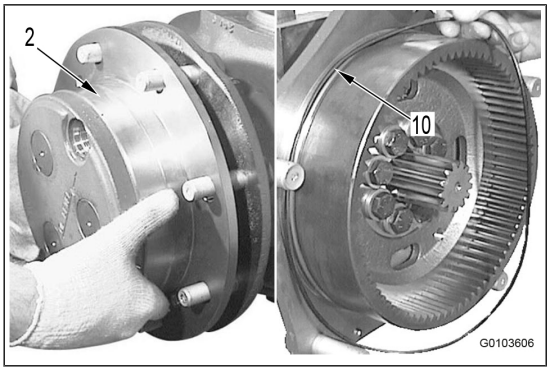
13. Screw the ring nut (10), using the special wrench for ring nut (B) while lock the pinion with retainer (A). The torque setting is given by the preloading measurement on bearings (3) and (8): tighten the ring nut (9) gradually 15° to 20° every step then measure the resulting preloading.

   NOTICE

   If the tightening is excessive, the elastic spacer (5) must be replaced and the procedure repeated.

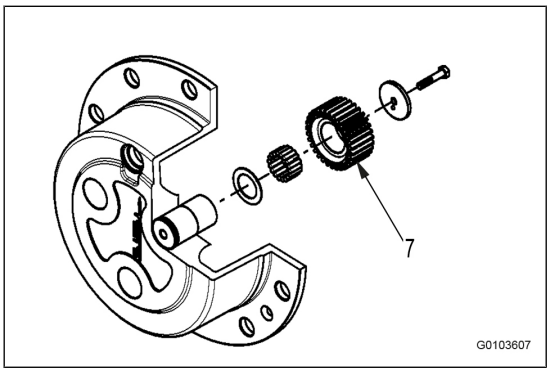


3. Remove the planetary carrier (2) from the wheel hub (11) and remove the relative O-Ring (10). Position the planetary carrier (2) on a workbench and check its wear conditions.



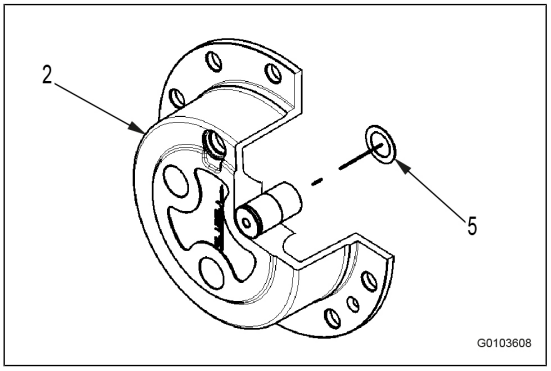
To replace the planetary gears (7).

4. Remove the fastening bolts (9) on every pin (4), remove the washer (8), remove the planetary gears (7) from the pins, collect the needle bearing (6), and collect the thrust washer (5).



ASSEMBLE EPICYCLIC REDUCTION GEAR GROUP

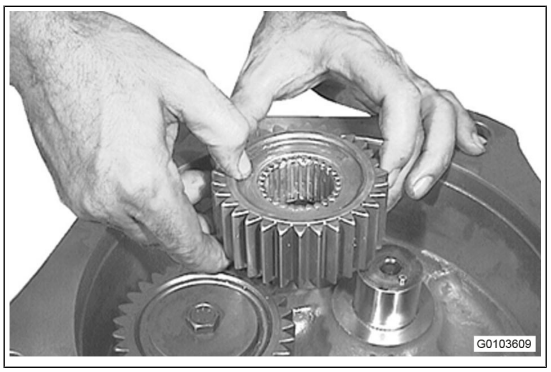
1. Position the planetary carrier (2) on a workbench. Insert the thrust washer (5) on every pin.



2. Insert the needles (6) into the planetary gears (7). Insert the gears (7) with assembled needles on the pins (4).

   REMARK

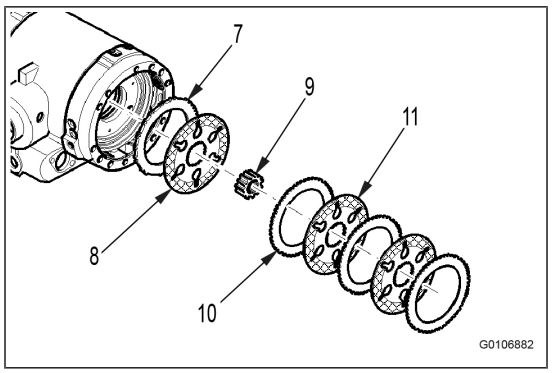
   Grease well the needle bearings (6).



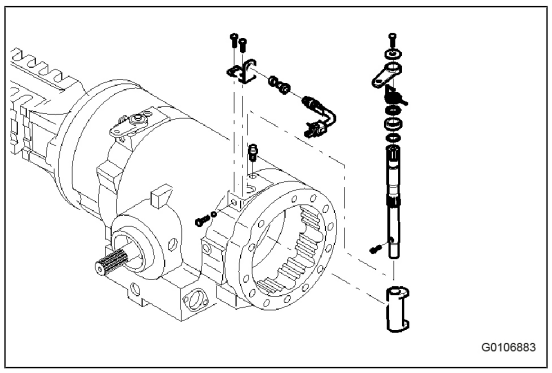
2. Remove the components from the brake flange (7): brake counterplate (7) and brake plates (8), brake disk carrier gear (9), brake counterplates (10) and plates (11).

   REMARK

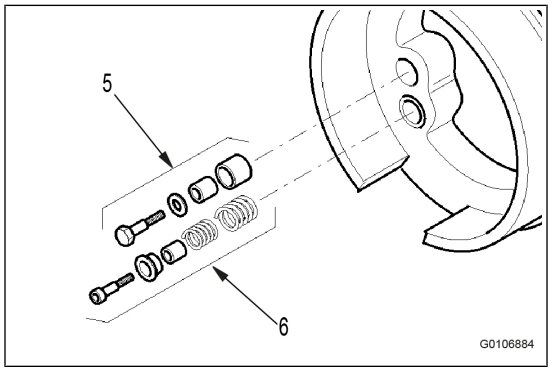
   The position of the brake disk carrier, it must be reassembled in the same position.



3. Remove the brake control group. For detail see: related section



4. Unscrew the fastening screws and remove all the parts of the self- adjust kit (5) and brake mechanism return kit (6).

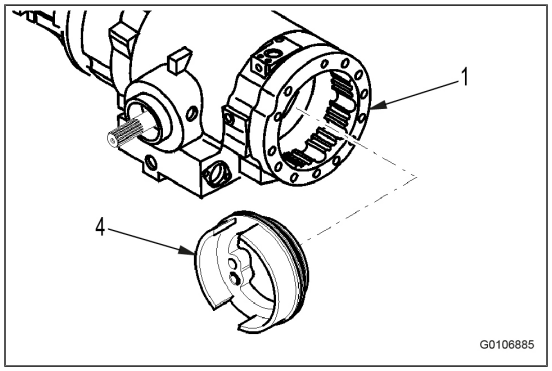


5. Remove the brake piston (4).

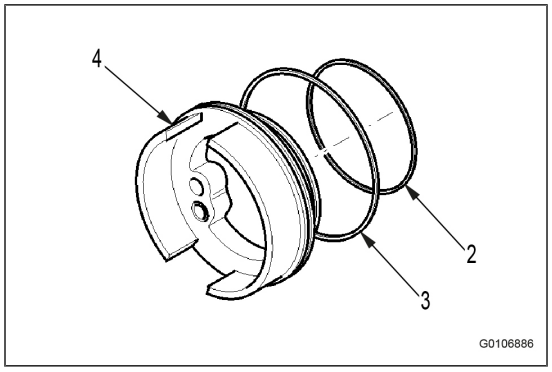
   REMARK

   If necessary, blow in air through the brake oil input hole to eject the piston, using the minimum pressure.

   ⚠ **Possible swift ejection of the piston.**



6. Remove the O-Rings (2) and (3) from the brake piston (4).

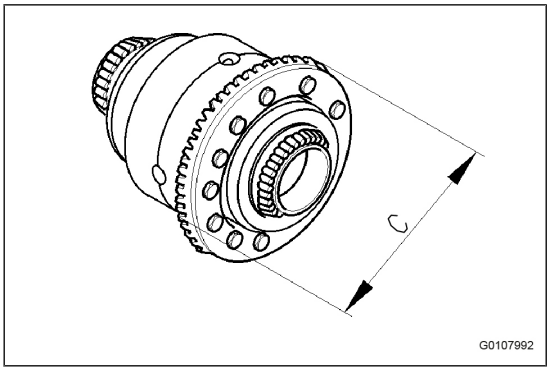


5. Measure the external diameter C of the bevel crown gear assembled to differential housing. Calculate the value:

   R= C/ 2 mm

   REMARK

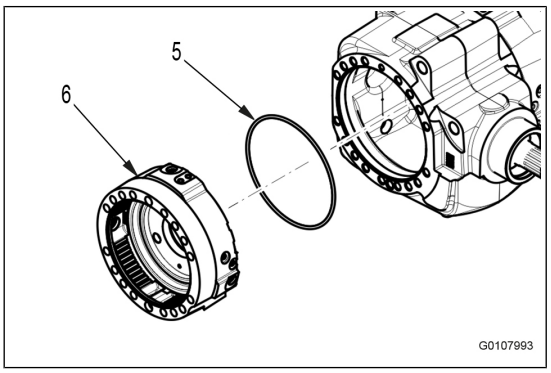
   This value is necessary to measure the backlash between pinion and crown.



6. Assemble a new well lubricated O-Ring (5) on the brake cylinder (6) housing. First assemble the brake cylinder on the opposite side to the differential crown gear.

   REMARK

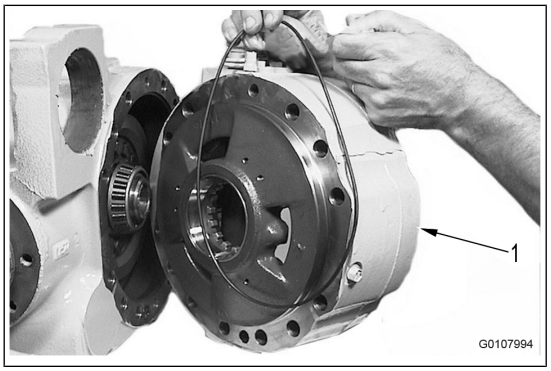
   Check that the reference marks made during the disassembly between the brake cylinder and the central body coincide.



7. Insert the differential group into the central body (1) coupling the crown gear to the pinion gear. Assemble the brake cylinder (with relative O-Ring) on the crown gear side.

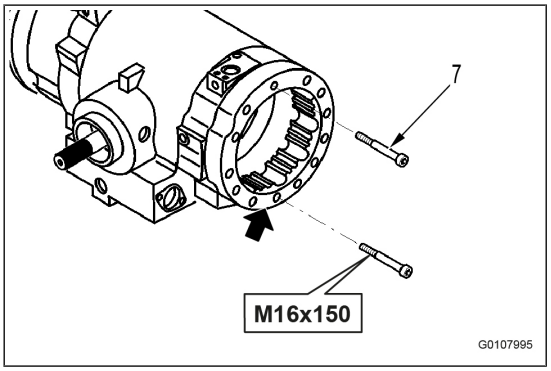
   REMARK

   Check that the reference marks made during the disassembly between the brake cylinder and the central body coincide.



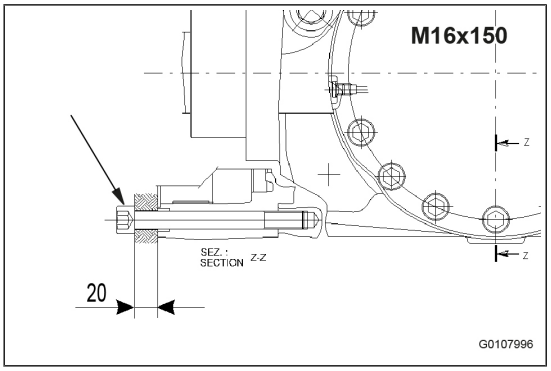
8. Assemble the fastening screws (7). Tighten the fastening screws to the requested torque. Assemble in the shown position a fastening screws M16 x 150 mm to torque of 80 Nm on both sides

   Bolts: 266 Nm

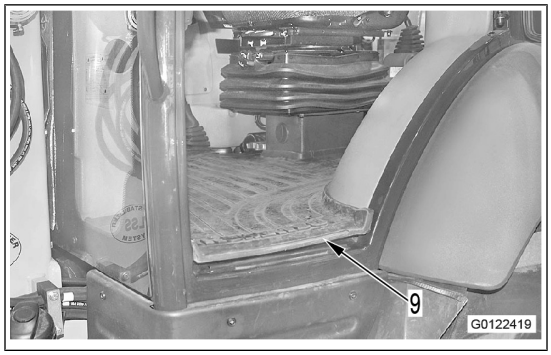


9. Assemble the fastening screws (7). Tighten the fastening screws to the requested torque. Assemble in the shown position a fastening screws M16 x 150 mm to torque of 80 Nm on both sides

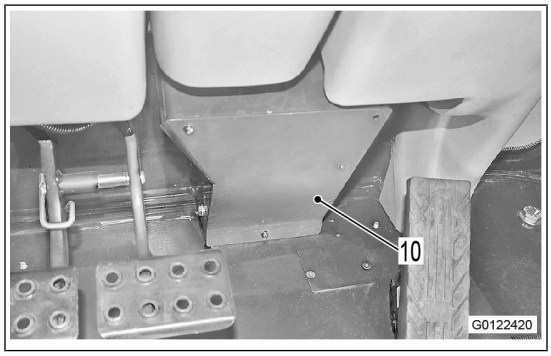
   Bolts: 266 Nm



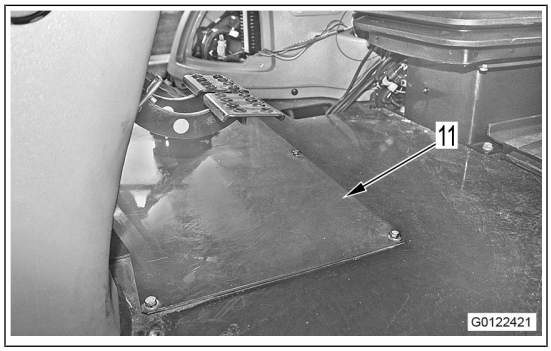
14. Remove front floor mat (9).

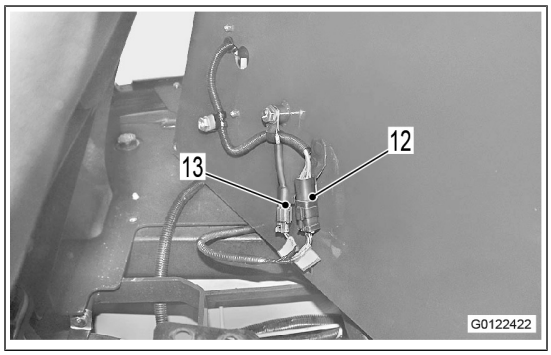


15. Remove protection (10).



16. Remove front floor cover (11) and disconnect connector PD1 (12) and K14 (13) of accelerator pedal.
17. Disconnect connector SLD (16).

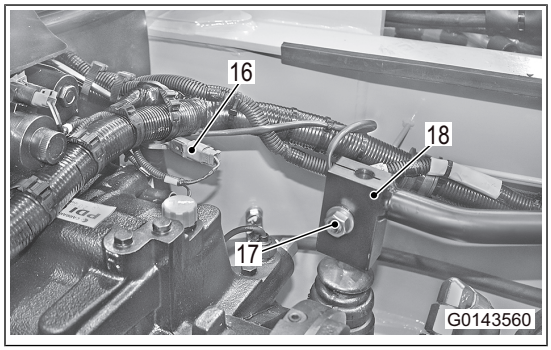




18. Loosen bolt (17) and remove lever assembly (18).
19. Disconnect hydraulic differential lock hose (19).

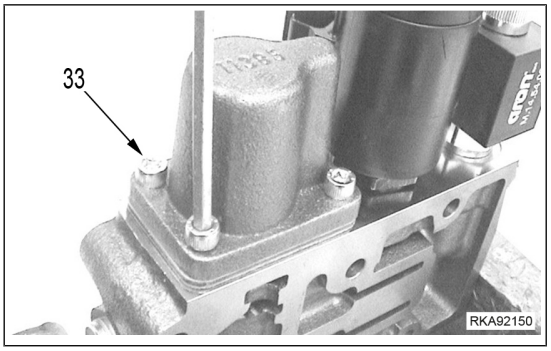
REMARK

Plug all hoses to prevent entry of any impurities.

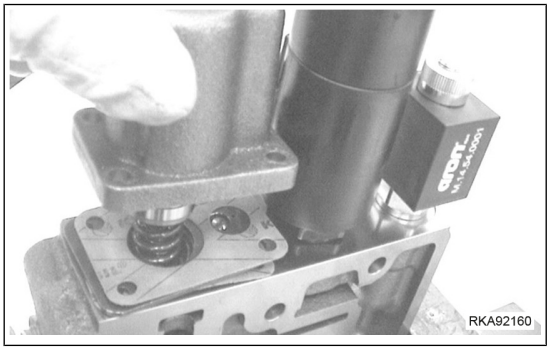


20. Disconnect connectors:
    - FWD solenoid connector TFW (20)

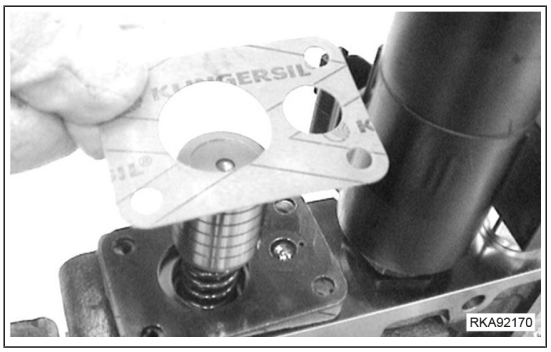
17. Turn the control valve (47).
18. Remove the screws (33).



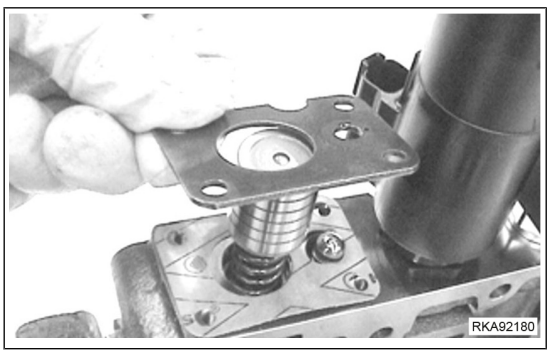
19. Remove the valve cover (34).



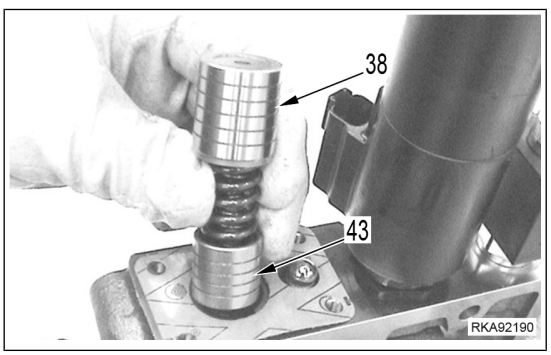
20. Remove the plate gasket (35).



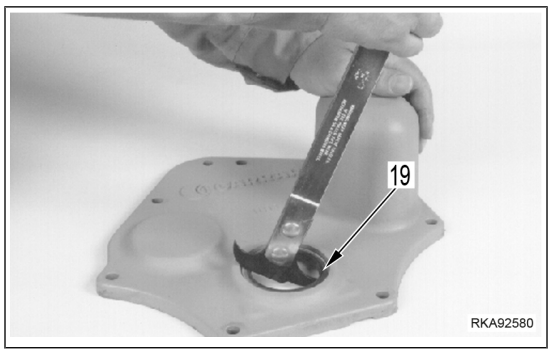
21. Remove the plate (36).



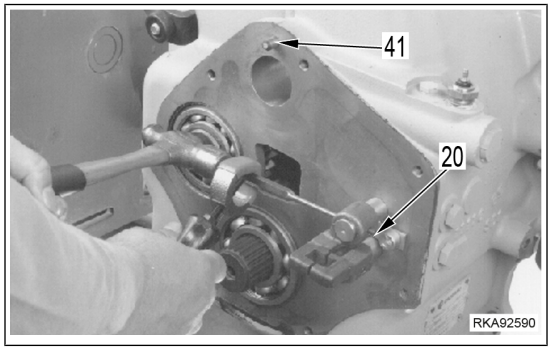
22. Remove the outward piston (38), the springs (39),(40), (41), the pin (42) and the inward piston (43).



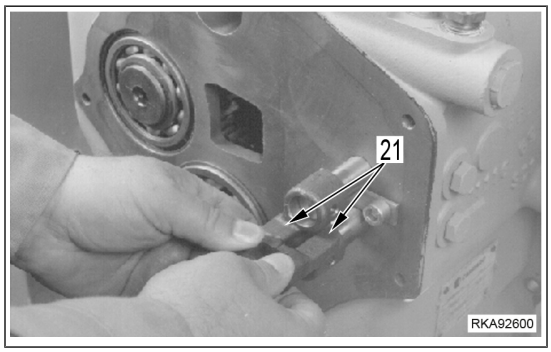
20. Remove the seal (19) from the rear cover.



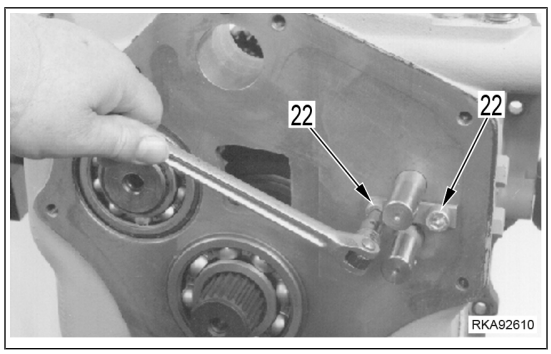
21. Use a punch to remove the pins (20) which fasten the shift collars to the shift rods and centering pins (41).



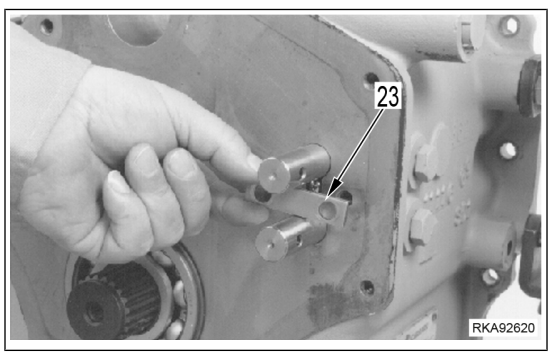
22. Remove the shift collars (21).



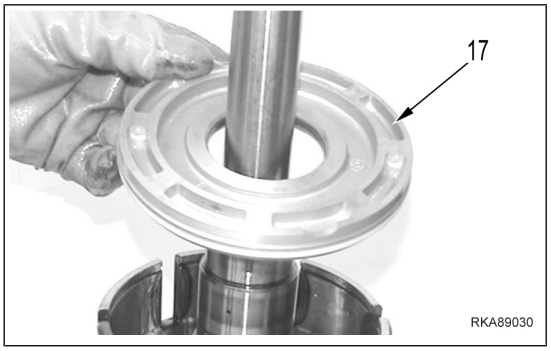
23. Remove the two screws (22) which hold the plate between the two shift rods.



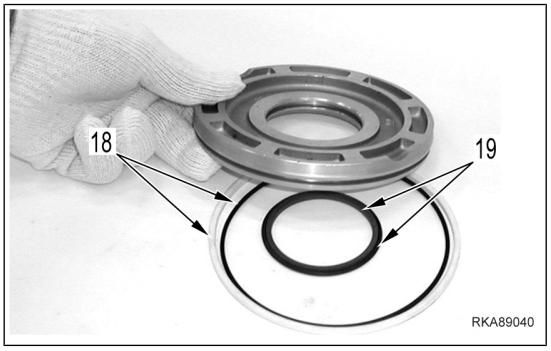
24. Remove the plate (23).



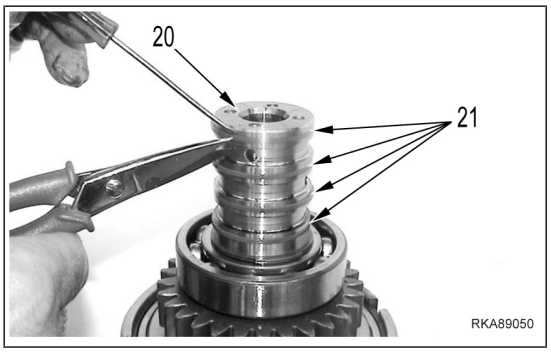
22. Remove clutch piston (17) by blowing in compressed air through the delivery hole.



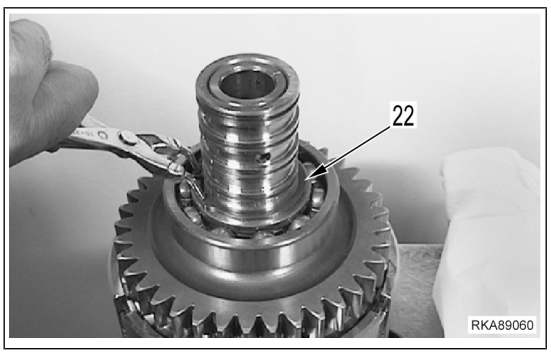
23. If to be replaced, remove teflon seal ring (18) and relevant inner O- ring from outer seat of piston and teflon seal rings (19) and relevant inner O-ring from inner of piston. To remove the rings it is necessary to cut them.



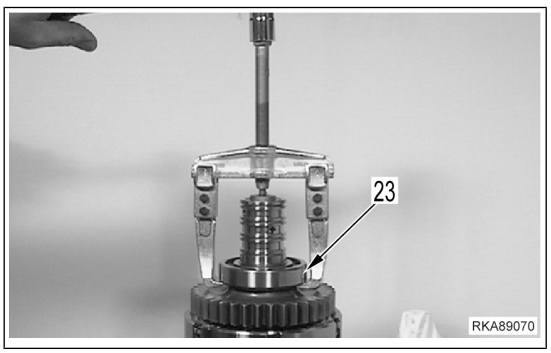
24. Turn the shaft (20).
25. If to be replaced, remove teflon seal rings (21) by cutting them.



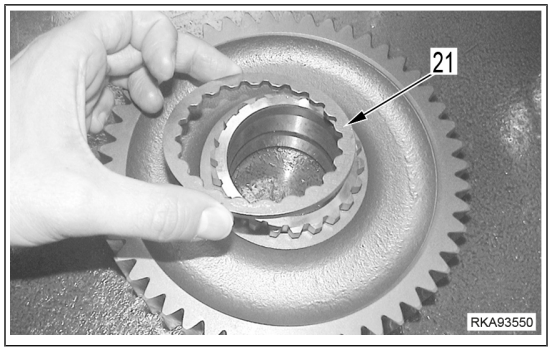
26. Remove snap ring (22).



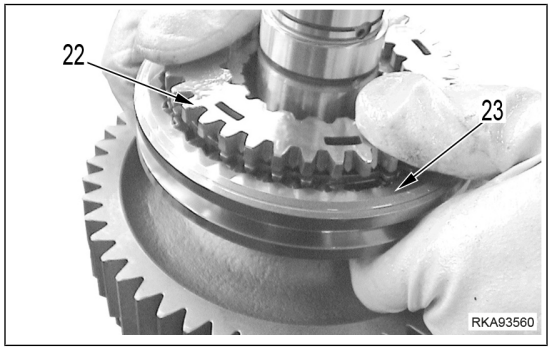
27. Remove bearing (23) by means of an extractor.



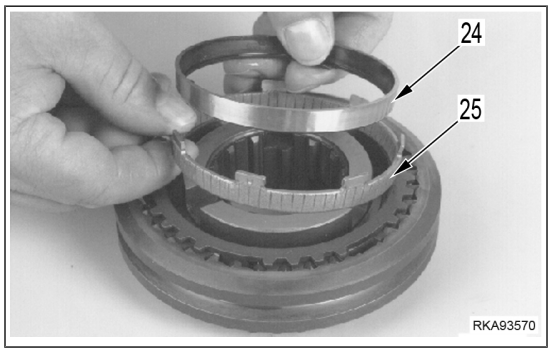
18. Remove the spacer (21).



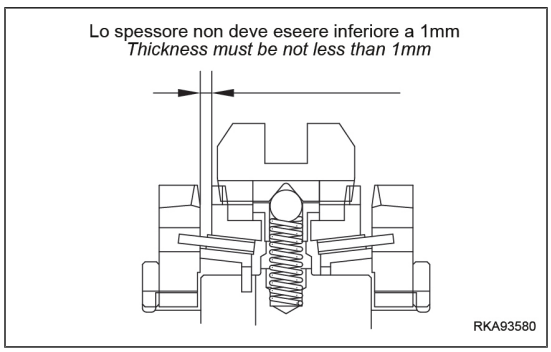
19. Remove the first/second speed synchronizer assembly (23).
20. Remove synchronizer ring (22).



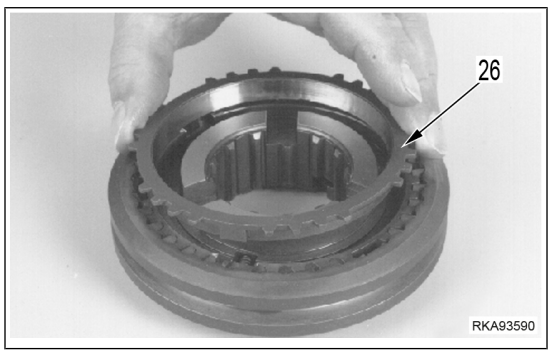
21. Remove the steel ring (24) and the sintered ring (25) together. Install the synchronizer ring on top of the synchronizer assembly. Use a feeler gauge to measure the clearance between the bottom of the teeth on the synchronizer ring and the edge of the sleeve on the outside of the synchroniz-er assembly.



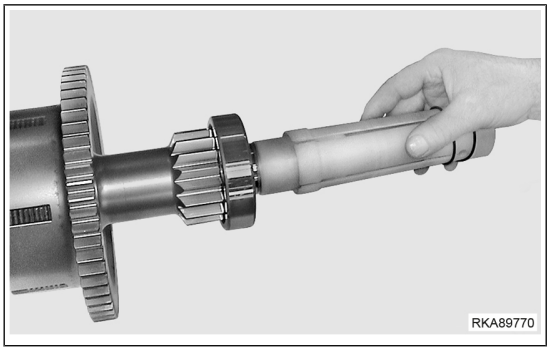
22. This clearance should be approximately 1.0 mm with used parts in good condition. If the clearance is 0.5 mm or less, use a new synchronizer assembly. Repeat the measurement for the opposite side of the synchronizer assembly before disassembly.



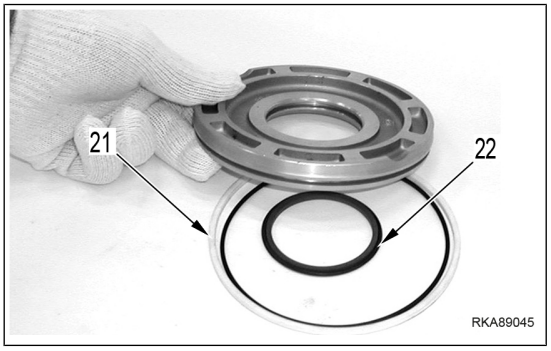
23. Remove the tapered friction ring (26).



2. Assemble new teflon seal ring (23). For the introduction of the teflon ring, follow the operations from step 30 to step 35 (see “ASSEMBLE SHAFT A (50-241)”) using special tools (C), (D) e (E).



3. Assemble new teflon ring (21) and relevant inner O-ring, new teflon ring (22) and relevant inner O-rings respectively into the piston outer and inner seats.



4. Apply a thin film of grease on the seal rings just inserted.

5. Insert clutch piston (20) with tool (a) (F) as protection of seal rings (22).

6. Assemble the sleeve (19).

REMOVE AND INSTALL BACKHOE WORK EQUIPMENT ASSEMBLY

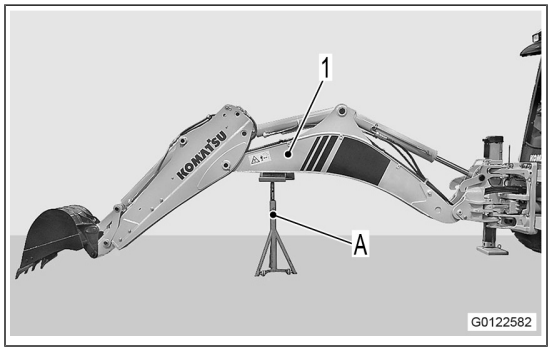
⚠ Place the machine on a level ground, lower the outrigger fully extend backhoe work equipment.

⚠ The bucket is needed to be installed to carry out this procedure safely.

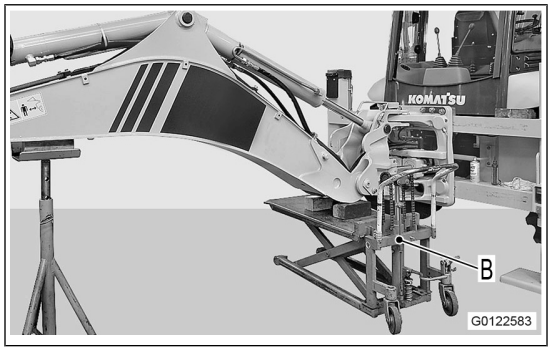
⚠ Turn the starting switch to OFF position to stop the engine.

REMOVE BACKHOE WORK EQUIPMENT ASSEMBLY

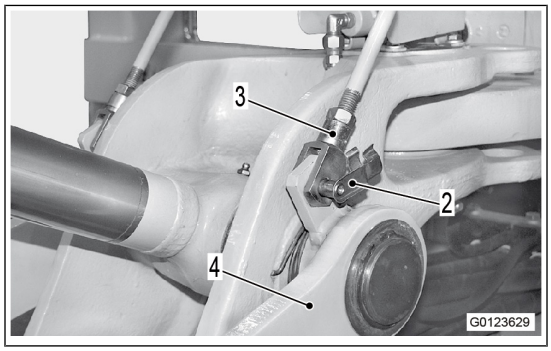
1. Place a stand “A” under boom (1).



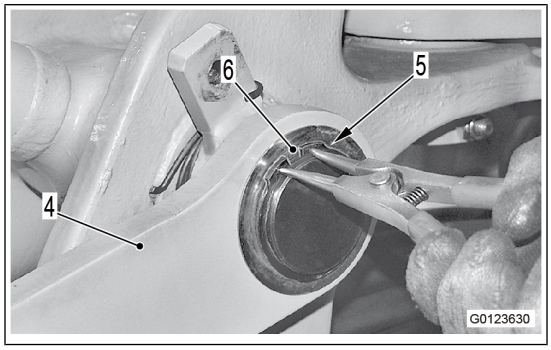
2. Position a lifter “B” under boom fulcrum pin.



3. Remove pins (2) and disconnect tie-rod (3) from levers (4).



4. Remove snap ring (5), shims (6) and lever (4) of both side.



⚠ **When aligning the positions between hole and pin, run the engine at minimum idling. Do not insert fingers in the holes to check the alignment.**

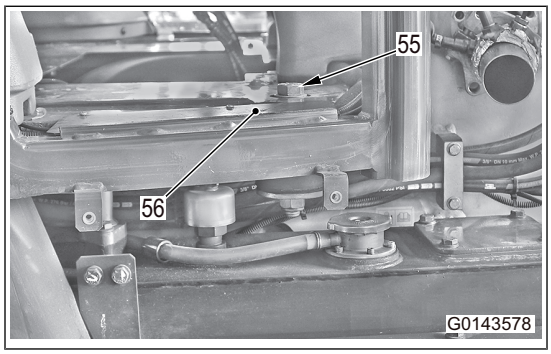
[*2]

Inside bushings: Hyper white grease (G2-T)

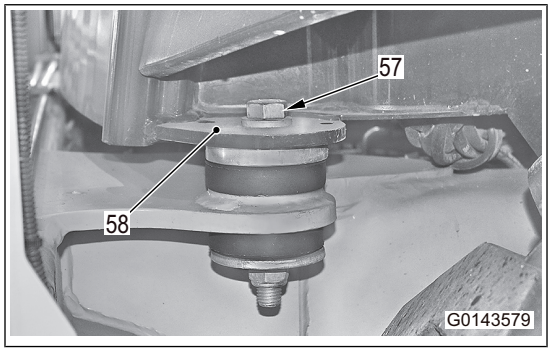
- Adjust the shim so that clearance between boom (1) and boom swing support (6) will be 1.0 mm or less. Shim thickness: t = 1.0 mm
- Refilling with hydraulic oil.
- Bleed air from hydraulic circuit.
- Run the engine to circulate the oil through the system. Then, check the oil level again.

35. Remove L.H. and R.H. covers (54).

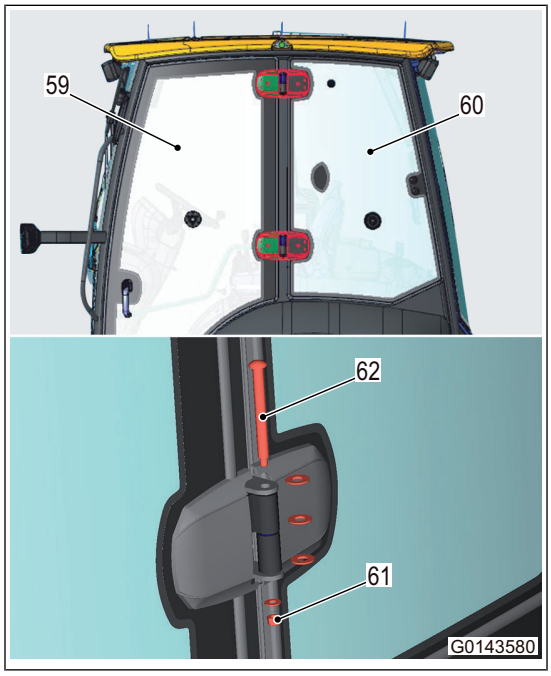
36. Remove mounting bolts (55) on the front side of the operator's cab (56). [*5]



37. Remove mounting bolts (57) at the rear side of the operator's cab (58). [*5]



38. Open the left front door (59), disconnect the gas spring from the door frame and sling the door assembly.
39. Open the left rear window (60) and sling it.
40. Remove nut (61) from upper and lower hinge.
41. Remove upper and lower hinge pin (62).
42. Sling the door (59) and the window (60).
43. Repeat the procedure on the other side of the cab.



REMOVE AND INSTALL TRANSMISSION CONTROLLER ASSEMBLY

⚠ **Place the machine on a level ground, and lower the work equipment to the ground in a stable posture.**

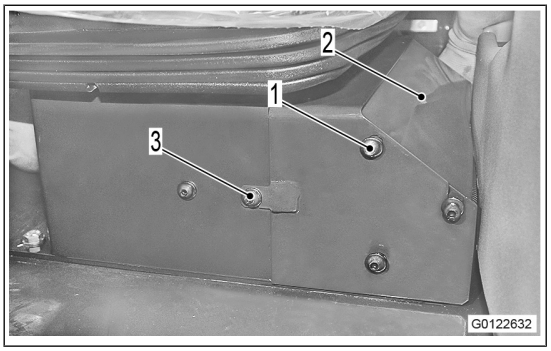
⚠ **Set the work equipment lock lever to LOCK position.**

⚠ **Turn the starting switch to OFF position to stop the engine.**

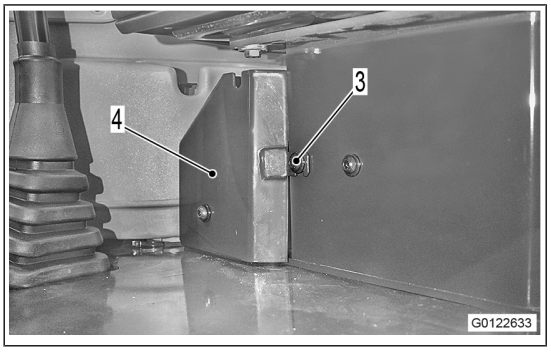
⚠ **Turn the battery disconnect switch to OFF position, and remove the key.**

REMOVE TRANSMISSION CONTROLLER ASSEMBLY

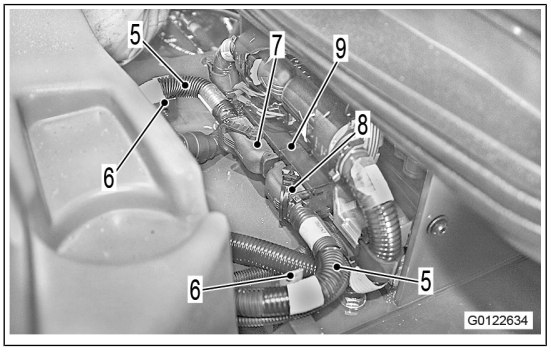
1. Loosen bolts (1) (3 pieces) and remove cover (2).



2. Loosen bolts (3) (4 pieces) and remove cover (4).

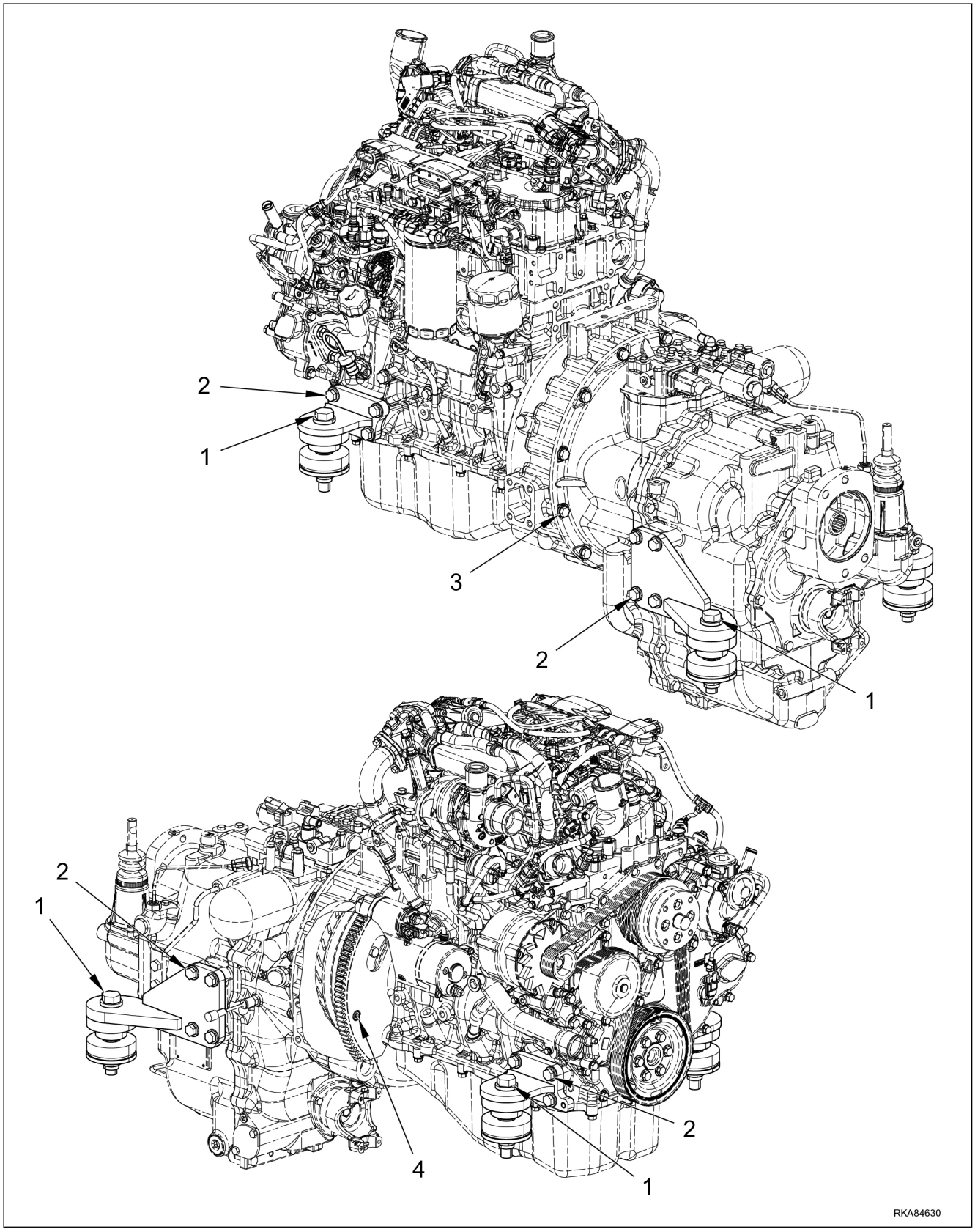


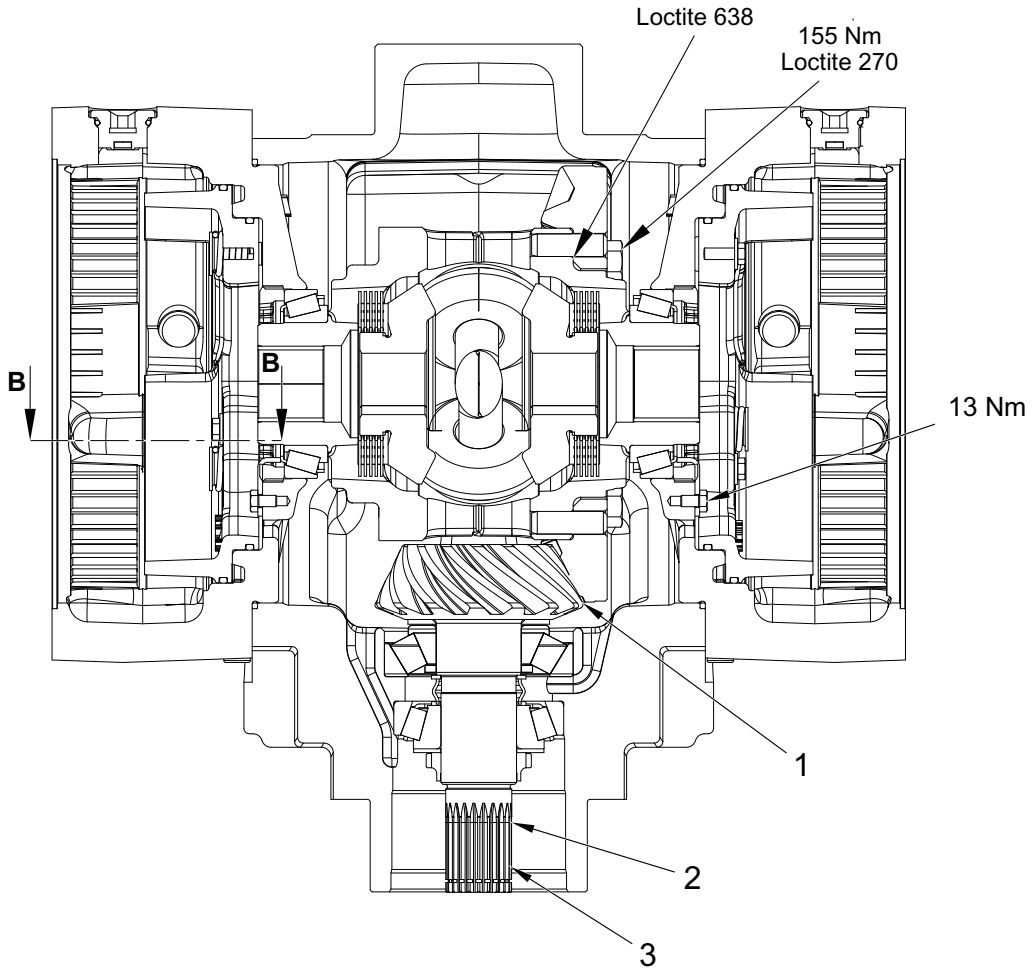
3. Disconnect cables (5) opening clips (6) (2 pieces).
4. Disconnect the connectors CT01 (7) and CT02 (8) from transmission controller (9).

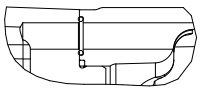


ENGINE AND COOLING SYSTEM

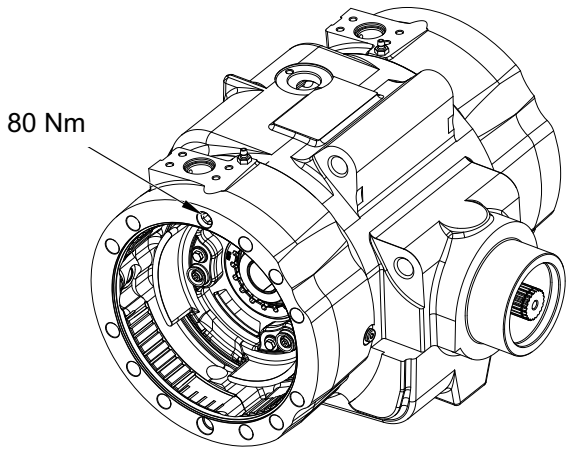
MAINTENANCE STANDARD OF ENGINE MOUNT







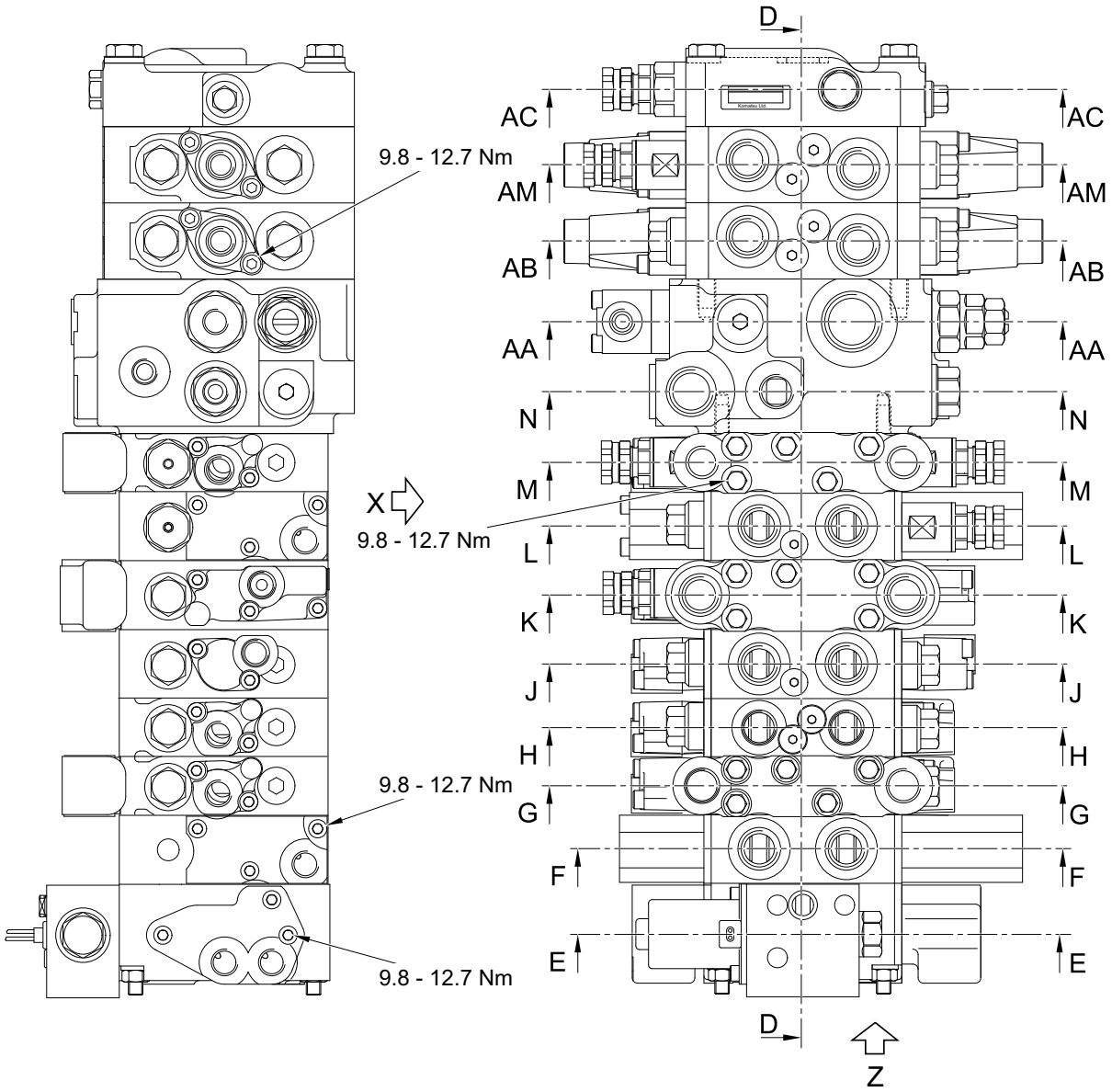
B - B

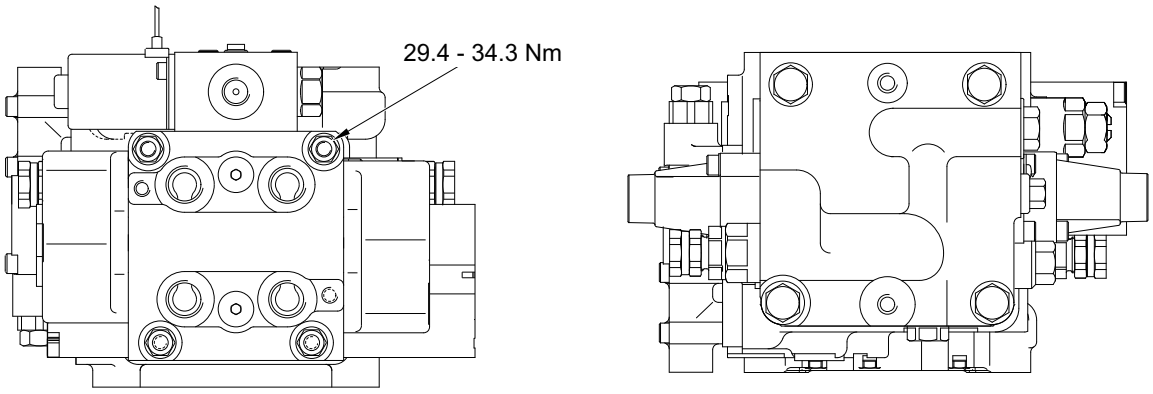


G0103819

MAINTENANCE STANDARD OF CONTROL VALVE (HYDRAULIC CONTROLS SPECIFICATION)

Since the valve are single add-on type, they can be added and removed one by one any time.





View Z

G0102420

Unit: mm

No.	Item	Judgment criteria					Remedy
1	Clearance between boom swing cylinder bushing and bushing on bracket	Standard dimensions	Tolerance		Standard clearance	Allowable clearance	
			Shaft	Hole			
		60	-0.010 -0.085	+0.034 +0.071	0.044 to 0.156	1.000	Replace bushing and pin
2	Clearance between mounting pin and bushing of swing bracket (lower) and sliding plate	65	-0.060 -0.106	+0.228 +0.147	0.207 to 0.334	1.000	
3	Clearance between mounting pin and bushing of sliding plate (upper) and boom swing bracket	65	-0.060 -0.106	+0.228 +0.150	0.210 to 0.334	1.000	
4	Clearance between mounting pin swing cylinder head and bushing on swing bracket	55	-0.030 -0.076	+0.097 +0.038	0.068 to 0.173	1.000	
5	Upper shim thickness	Standard dimensions			Repair limit		
		2.50 (0 / 0.1)			-		
6	Central shim thickness	4.75 (0 / 0.1)			-		
7	Lower shim thickness	4.75 (0 / 0.1)			-		

Electrical wire number			8	15	20	30	40	50	60	85	100
Conductor		Number of element wires	50	84	41	70	85	108	127	169	217
		Element wire diameter (mm)	0.45	0.45	0.80	0.80	0.80	0.80	0.80	0.80	0.80
		Cross-sectional area (mm^2)	7.95	13.36	20.61	35.19	42.73	54.29	63.84	84.96	109.1
		d (approximately) (mm)	3.7	4.8	6.0	8.0	8.6	9.8	10.4	12.0	13.6
Coating D	AVS	Criteria (mm)	—	—	—	—	—	—	—	—	—
	AV	Criteria (mm)	5.5	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6
	AEX	Criteria (mm)	5.3	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6

Electrical wire number			0.5f	0.5	0.75f	0.85	1.25f	1.25
Conductor		Number of element wires	—	7	—	11	—	16
		Element wire diameter	—	- (circular compressed)	—	- (circular compressed)	—	- (circular compressed)
		Cross-sectional area (mm^2)	—	0.56	—	0.88	—	1.29
		d (approximately) (mm)	—	0.9	—	1.1	—	1.4
Coating D	CAVS	Criteria (mm)	—	1.6	—	1.8	—	2.1

REMARK

"F" for the electrical wire number shows flexible.

Color code table

(Table 3)

Color code	Electric wire color	Color code	Electric wire color
B	Black	LgW	Lightgreen and white
Br	Brown	LgY	Lightgreen and yellow
BrB	Brown and black	LR	Blue and red
BrR	Brown and red	LW	Blue and white