3740 DL/3740 HP/3740 RB/ 3740 TL

Excavator

SERVICE MANUAL

WLSM2507TL-03LX

Aug. 2018

A. LOWER

t	Pilot pressure	v	Motor load pressure	x	Oil path A
u	Pressure in motor	w	Pilot oil pressure chamber	y	Motor load pressure chamber

4. Parking brake function

Diagram 14 shows a structural diagram of the parking brake section.

The parking brake is made up of the disks (1) coupled with the cylinder block (z), the friction plate (2) mounted between the disks, the brake piston (3), and the spring (4) that applies force to the brake piston.

[1] Releasing the parking brake (Diagram 14)

When the pressure oil is fed from Port P1 and attempts to start driving the piston motor, when the "High-pressure selection shuttle valve function" explained in Item E of "[1] Double counter balance valve" leads the pressure oil to parking brake cylinder chamber E (ac) via oil path D, the hydraulic pressure force (aa) operates on the brake piston (3) and moves it to the left against the spring (4).

As a result, the force pressing the disks (1) disappears, the disks (1) enter the free state, and the parking brake is released.

[2] Operating the parking brake (Diagram 15)

When the control valve is returned to the neutral position, the pressure oil fed to Port P1 is cut off, and an attempt is made to stop the piston motor, because the "High-pressure selection shuttle valve function" explained in Item E of "[1] Double counter balance valve" oil path D is connected to motor case drain oil path F, the pressure oil in parking brake cylinder chamber E (ac) is led to the motor case drain and the pressure drops.

Therefore, the brake piston (3) is moved to the right side by the spring (4), the disks (1) are tightened with the force (ad) of the spring (4) by the brake piston (3) and motor case (ab), so the piston motor shaft is locked and the parking brake operates.

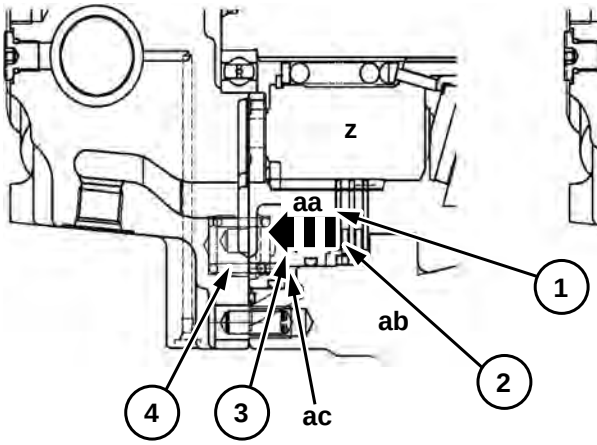

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Diagram 14 Parking brake released state

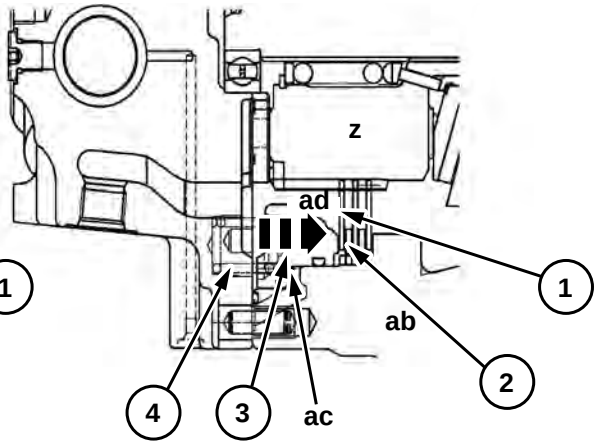


Diagram 15 Parking brake engaged state

5. Piston motor

A swash plate-type piston motor is used as the piston motor.

Diagram 16 shows a structural diagram of the piston motor.

9 pistons (4-2) are incorporated in the cylinder block (4-1) and the end of the cylinder block (4-1) touches a valve plate (22) that has 2 sausage-shaped ports, B and C.

The pressure oil discharged from the hydraulic pump flow in from Port P1 or Port P2 and while the piston motor rotates, flows out from Port P2 or Port P1.

Also, the drain oil in the case that has leaked from the sliding sections and the gap returns to the hydraulic tank from Port T1 or T2 of the base plate (2-1).

[1] The high-pressure oil from Port P1 enters sausage-shaped Port B of the valve plate (22), the piston (4-2) is pressurized, and the top of the swash plate (5) rotates and moves from top dead center to bottom dead center.

[2] Port P2 becomes the low-pressure side and while the piston (4-2) rotates and moves from bottom dead center to top dead center, the oil is discharged to Port P2 via sausage-shaped Port C of the valve plate (22).

Removal and Installation of Roller

Removal and Installation of Upper Roller

Job code	**AJJR01**

Warning

- Be sure to adjust the shoe tension appropriately.
  Inappropriate tension is very dangerous because the shoe separates from the roller when it enters a bad road.
- Make sure that the check valve is loosened little by little. When grease comes out, stop loosening it.
  Since the pressure inside the cylinder is very high, loosening that too much may make grease spout or the plug jump out.
  Do not perform adjustment of the check valve in front of the check valve.
- When jacking up the main unit, do not get under it.
  Be sure to place crossties to prevent falling.

Caution

- Be sure to stop the engine before starting work.
- Before assembling the shoes, be sure to remove earth and sand, gravel, etc. stuck in the travel unit.

Items to prepare

- Box wrench [19 mm (0.748 in.), 36 mm (1.417 in.)]
- Jack (that fulfills lifting weight)
- Rag
- Cleaning fluid
- Wood planks etc.

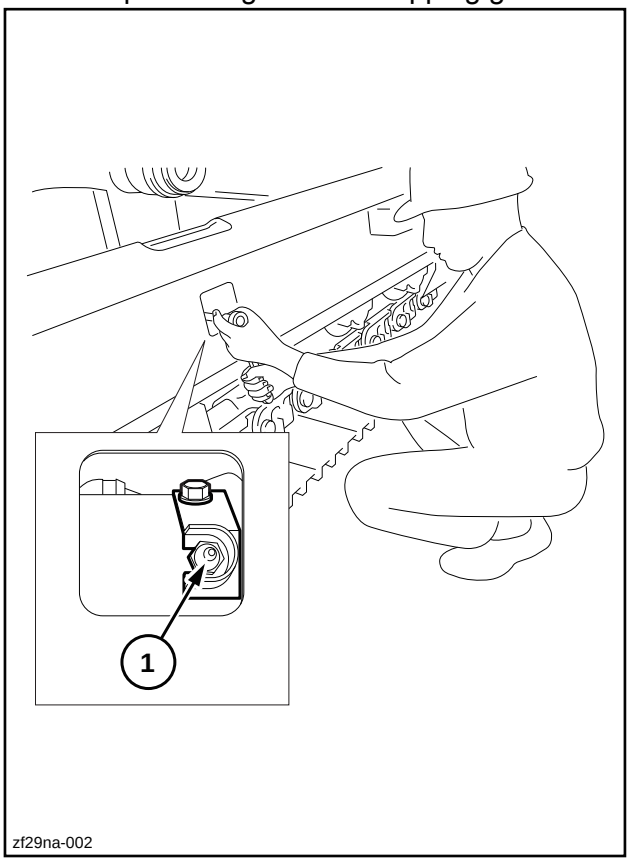
Removal of Upper Roller

1. Loosen the check valve (1) with a box wrench [19 mm (0.748 in.)] to drain grease and loosen tension of the track shoe.

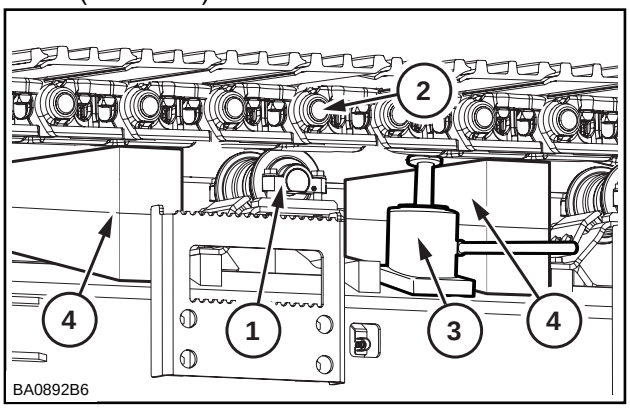
Warning

- The check valve (1) may jump out if it is loosened too much.
- Be careful to avoid being in front of that.

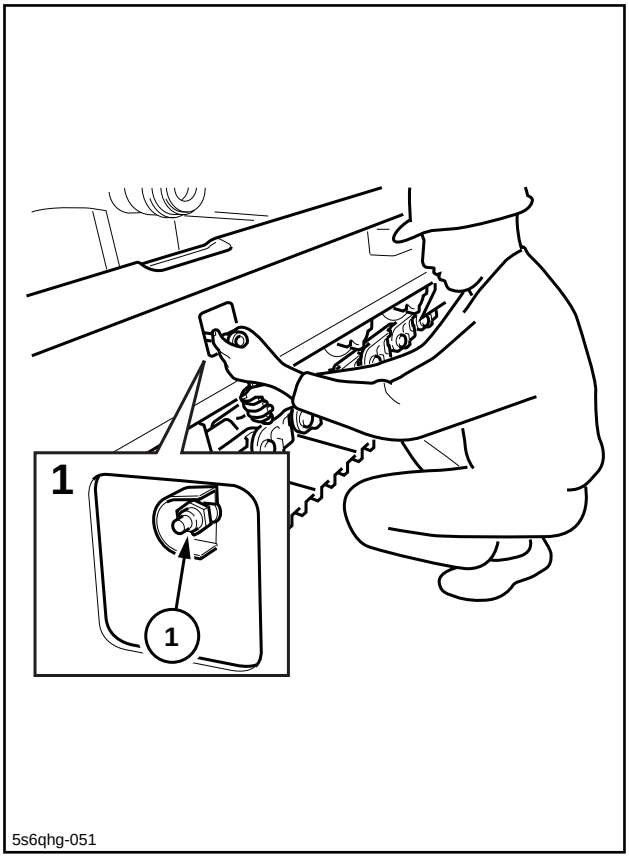
Do not loosen the check valve at a stretch.
It should be loosened gradually in consideration of draining grease and looseness of the shoe.
Prepare a rag to catch dripping grease.



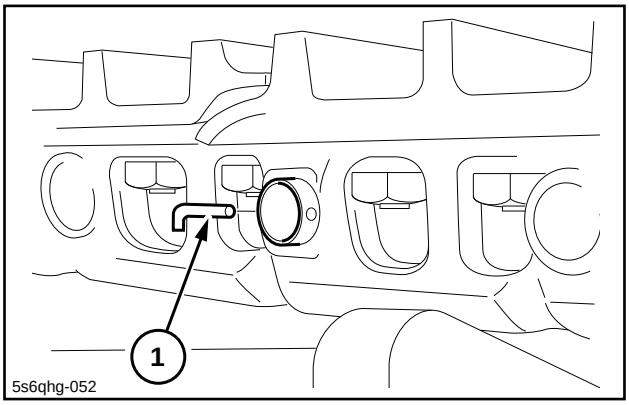
2. Use a jack (3) to raise the upper part of the shoe, and insert wood planks (4) to separate the shoe (2) and the upper roller (1) from each other by about 10 mm (0.394 in.).



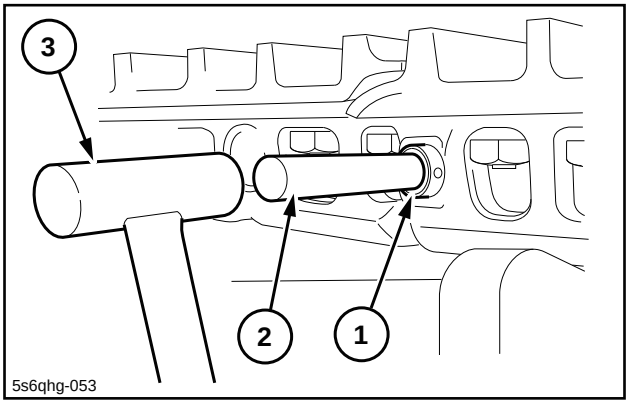
Be careful to avoid being in front of the check valve.



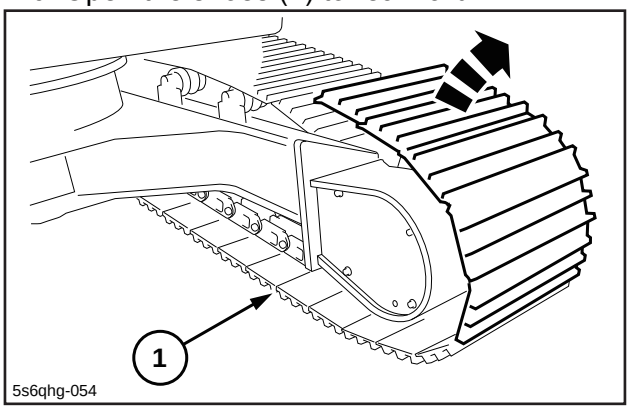
4. Pull out the S-pin (1) at the back of the joint section.



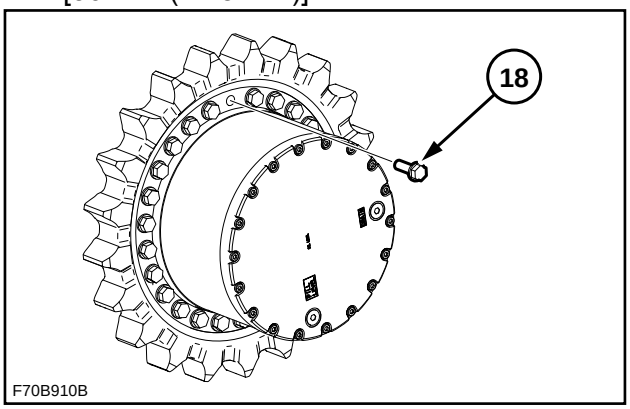
5. Put a striking rod (2) on the master pin (1), and hit it with a hammer (3) to push out the master pin.



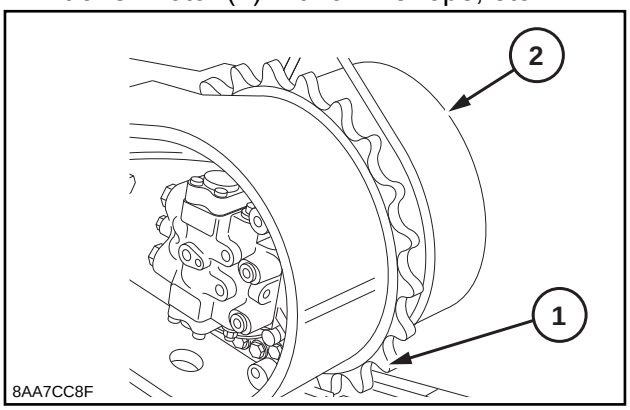
6. Open the shoes (1) to rearward.



7. Remove the 26 bolts (18) with a wrench [30 mm (1.181 in.)].



8. Remove the drive sprocket (1) from the travel motor (2) with a wire rope, etc.

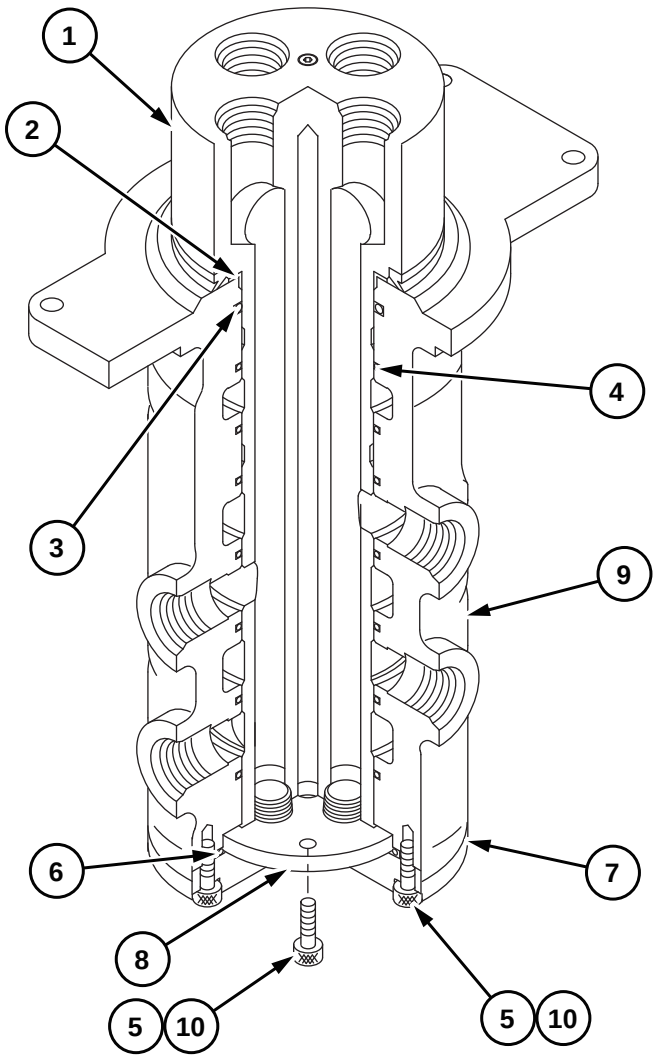


Installation of Drive Sprocket

To install, perform the reverse of the removal procedure.

- Tightening torque M20: 521 - 608 N·m (384.34 - 448.51 lbf·ft.)
  Apply Loctite #262 to the bolts.

Configuration Diagram



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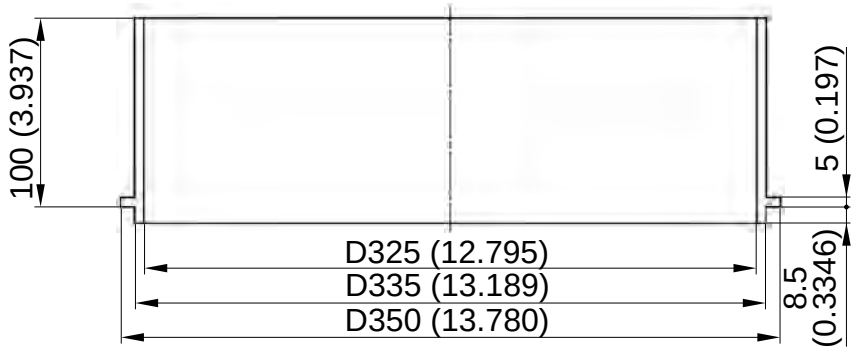
Code	Part name	Code	Part name	Code	Part name
1	Axle	5	Hexagon socket head bolt	9	Rotor
2	V-ring	6	O-ring	10	Loctite
3	O-ring	7	Cover		
4	Packing ring	8	Thrust plate		

・ No. S-9-3
Floating seal press-fit jig
Part used with: 210, 213

mm (in.)



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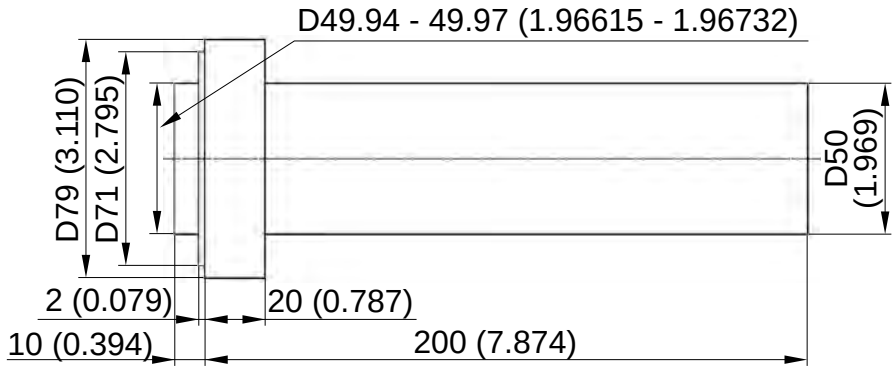
・ No. S-10
Oil seal press-fit jig
Part used with: 112

mm (in.)



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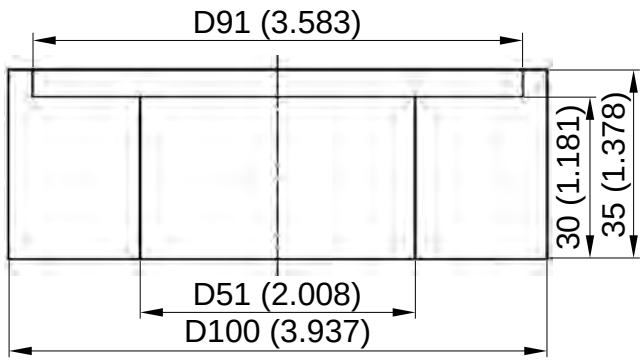
・ No. S-11
Bearing press-fit jig
Part used with: 108

mm (in.)



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Applicable part	Inspection and measurement locations	Permissible limit value	Repair and solution procedures
Case (101)	piston assembly outer diameter	Gap 0.040 mm (0.001575 in.)	Replace using the case kit.
	2-speed piston hole inner diameter	1.2 a degree of roughness Or the surface is rough or there is scratching at least 0.02 mm (0.00079 in.) deep.	
Thrust plate (223)	Thickness	Plate thickness 1.0 mm (0.0394 in.), Plate thickness 1.6 mm (0.0630 in.), Plate thickness 2.3 mm (0.0906 in.), Plate thickness 2.8 mm (0.1102 in.), Plate thickness 3.2 mm (0.1260 in.) Or there is deep scratching on the sliding surface.	Replace the thrust plate.
Angular bearing (212)	Ball rotation surfaces	Flaking occurs.	Replace the angular bearing.
	Operation	Abnormal noise or unsmooth rotation occurs with rotation.	
Floating seal (211)	Sliding surface	There is deep scratching that may cause oil leaking.	Replace the floating seal. (During reassembly, oil leaking may occur due to the seal ring sliding track not matching.))
	O-ring	Cracking occurs on the surface.	
Each O-ring		During disassembly	Replace the O-rings.

Installation position	Code	Screw size	Tightening torque (N·m)
a	102-19 102-22	M5 x 0.8: Bolt width 2.5 mm	1.96 - 2.94 (1.4459 - 2.1688)
b	102-8	Metal plug M5	8.8 - 10.8 (6.492 - 7.967)
c	102-11 102-14	PF1/2: Bolt width 10 mm	112.0 - 124.0 (82.622 - 91.473)
d	102-20	PF1/4: Bolt width 6 mm	34.3 - 39.3 (25.303 - 28.991)
e	111	M14 x 35L: Bolt width 2.5 mm	195 - 215 (143.85 - 158.60)
	300	M14 x 110L: Bolt width 2.5 mm	
f	102-2-4	M24 x 1.5: Bolt width 14 mm	127 - 147 (93.69 - 108.44)
g	102-6-4	M12 x 40L: Bolt width 10 mm	98 - 118 (72.30 - 87.04)
h	102-6-7	PF1/8: Bolt width 14 mm	19.6 - 21.6 (14.459 - 15.934)
i	102-7-15	Bolt width 6 mm	-
j	102-7-16	M12 x 1.75: Bolt width 10 mm	34.3 - 44.1 (25.303 - 32.532)
k	102-7-6	1-5/16 12UNF: Bolt width 27 mm	353 - 393 (260.41 - 289.91)

Contents

Assembly and Disassembly of Swing Motor

Job code	**CMMO03**

⚠ Caution

1.Read and understand the contents of this maintenance manual before performing disassembly, reassembly, inspection, repair, or other such work of this product.

2.Handle this product according to the separate "Usage Precautions".

3.When removing this product from the equipment it is mounted on, stop that equipment system and wait for the surface temperature of this product to fall to about 40°C (104.0°F) or below before removing it. Working on this product while it is still hot can cause burns.
Additionally, always bleed out the pressure before removing any line from this product. Removing a pressurized line can result in oil spraying out and causing injury or oil leak.

4.Use the specialty tools and measurement instruments for disassembly, reassembly, inspection, and repair, etc. of this product. Using an inappropriate tool may result in injury or product damage.

5.Be careful of parts falling when performing disassembly, reassembly, inspection or repair, etc. of this product.
This may result in injury or parts damage.

6.Do not directly touch with bare hands the machined edges or threaded sections of parts during disassembly, reassembly, inspection, or repair etc. of this product.
Doing so may result in injury.

7.Check performance after reassembly. Do not resume use unless performance is fully recovered.
Using this product at a sub-par performance level may result in product damage.

8.The cautions (mark !) listed in this maintenance manual do not cover all possible dangers.
Always think of safety first during disassembly, inspection, reassembly, repair, or other such work.

Drain Volume Measurement Procedures

Preparations

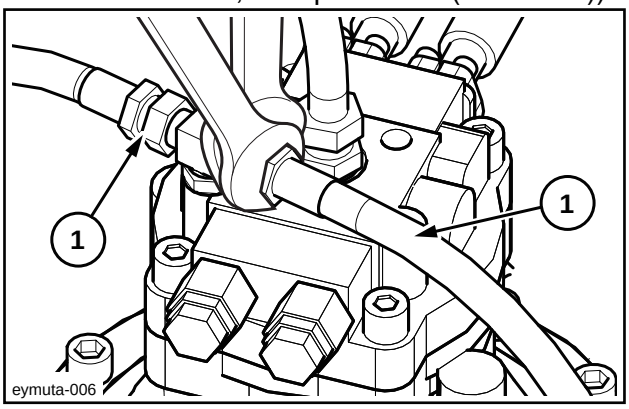
Measuring conditions

Engine speed	2000 min^{-1} (2000 rpm)
Mode	SP mode
Oil temperature	About 50 °C

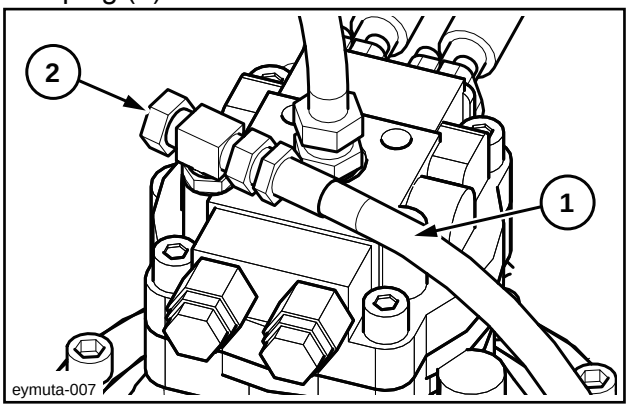
* Be aware that the drain volume varies greatly depending on the oil temperature.

Swing Motor Drain Volume Measurement

1. Remove the 2 drain hoses (1) and put plugs in the hose side of each. (wrench size: 1.417 in, clamp 1.417 in (hose side))

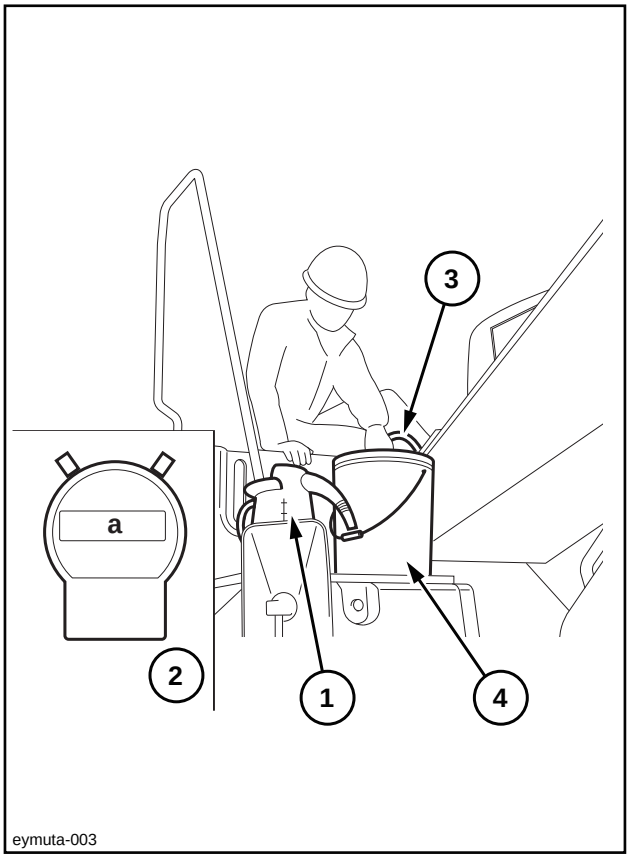


2. Install the extension hose (1) for measuring the drain volume on one side of the T nipple.
   Install the hose facing in a direction that makes measurement easy and install a plug (2) on the other side.



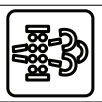
3. Prepare a waste oil receiver and measuring container (1) and set them as in the diagram on the right.
   For details on the method for locking the swing motor, see "Swing Relief Pressure Adjustment".
4. In SP mode, relieve the swing operation and move the extension hose to the measuring container (1) at the same time the motor starts. (At starting, start measurement with a stop watch (2).)
5. After 60 sec., move the extension hose (3) to the waste oil can (4).
6. Measure the volume of oil in the measuring container (1) as the drain volume for 60 sec.
   Measure at least 3 times each for left and right.

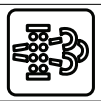
Right	Left



a	60 sec.

4. When SCR auto RE-GEN or manual RE-GEN is performed

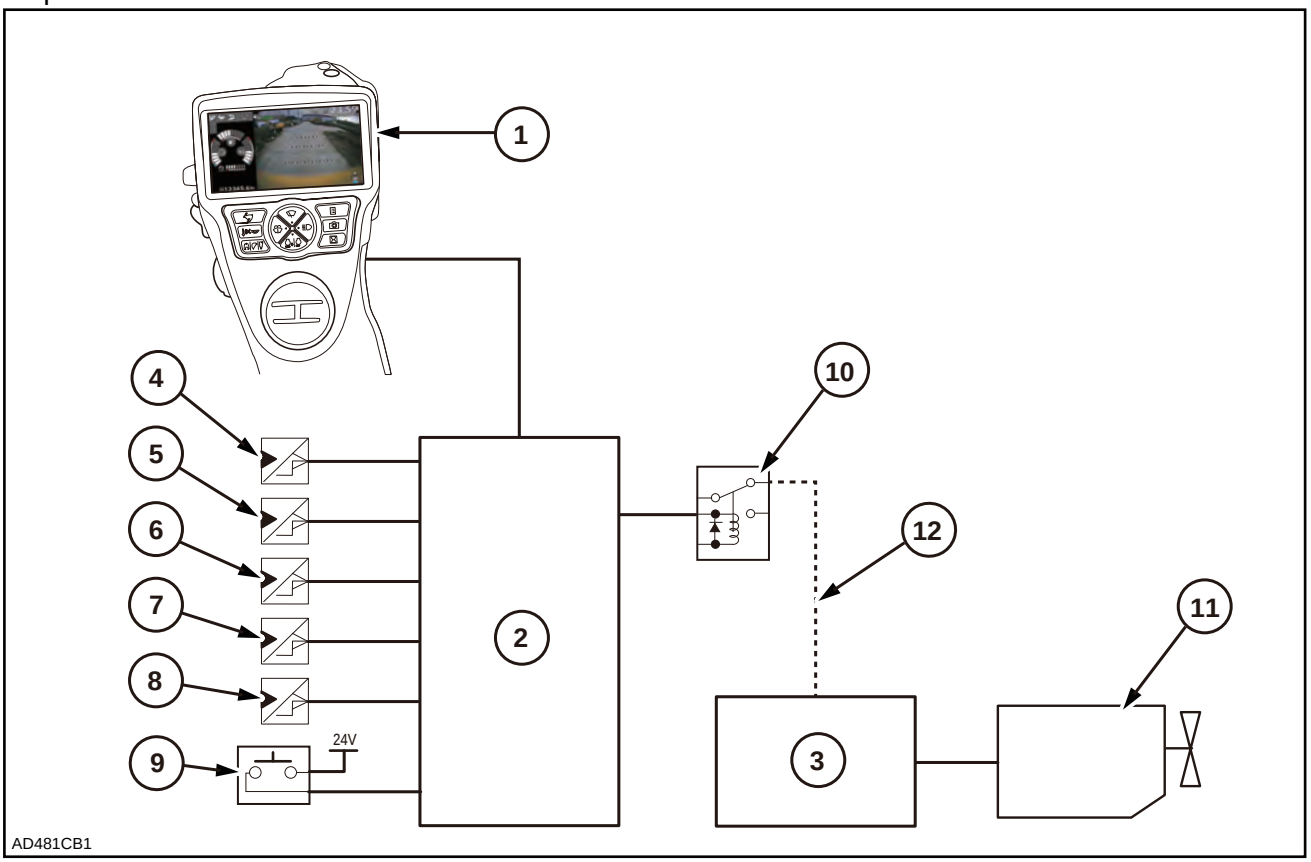
	Auto SCR RE-GEN	Manual SCR RE-GEN requested
Indicator color	Green	Orange
Warning buzzer	2 sec.	2 sec.
Purge icon 	Displayed	Blinking
Text message	AUTO SCR RE-GEN	PUSH SCR SWITCH TO ACTIVATE

	Manual SCR RE-GEN started	Manual SCR RE-GEN stopped	Manual SCR RE-GEN disabled
Indicator color	Orange	Orange	Red
Warning buzzer	2 sec.	None	2 sec.
Purge icon 	Displayed	Blinking	Displayed
Text message	MANUAL SCR RE-GEN DO NOT OPERATE	PUSH SCR SWITCH TO ACTIVATE	CHECK ENGINE

Idle Shutdown

〈Purpose/Overview〉

The machine stops the engine automatically when idling condition continues for a certain time period.



1	Monitor	5	Pressure sensor (swing)	9	Gate lock limit switch
2	Main controller	6	Pressure sensor (travel)	10	Battery relay
3	ECM	7	Pressure sensor (option 1)	11	Engine
4	Pressure sensor (upper)	8	Pressure sensor (option 2)	12	M line

〈Control〉

Operation:

[1] The machine starts time count when the idle mode switch is pressed and idle shutdown mode is selected.

[2] It displays "Stopping Engine" on the monitor and sounds alarm intermittently when the time count reaches idle shutdown time.

[3] In further 10 seconds, it activates idle shutdown control and sounds the alarm continuously at the same time.

[4] If the idle shutdown control is activated, the controller turns ON (energizes) the key ON relay to cut the M line of the key switch.

[5] The ECM judges as the Key OFF to stop the engine when the M line is cut.

・ Phase 2 clogging: Engine speed is kept reduced until negative pressure at the filter outlet increases to -30 kPa.

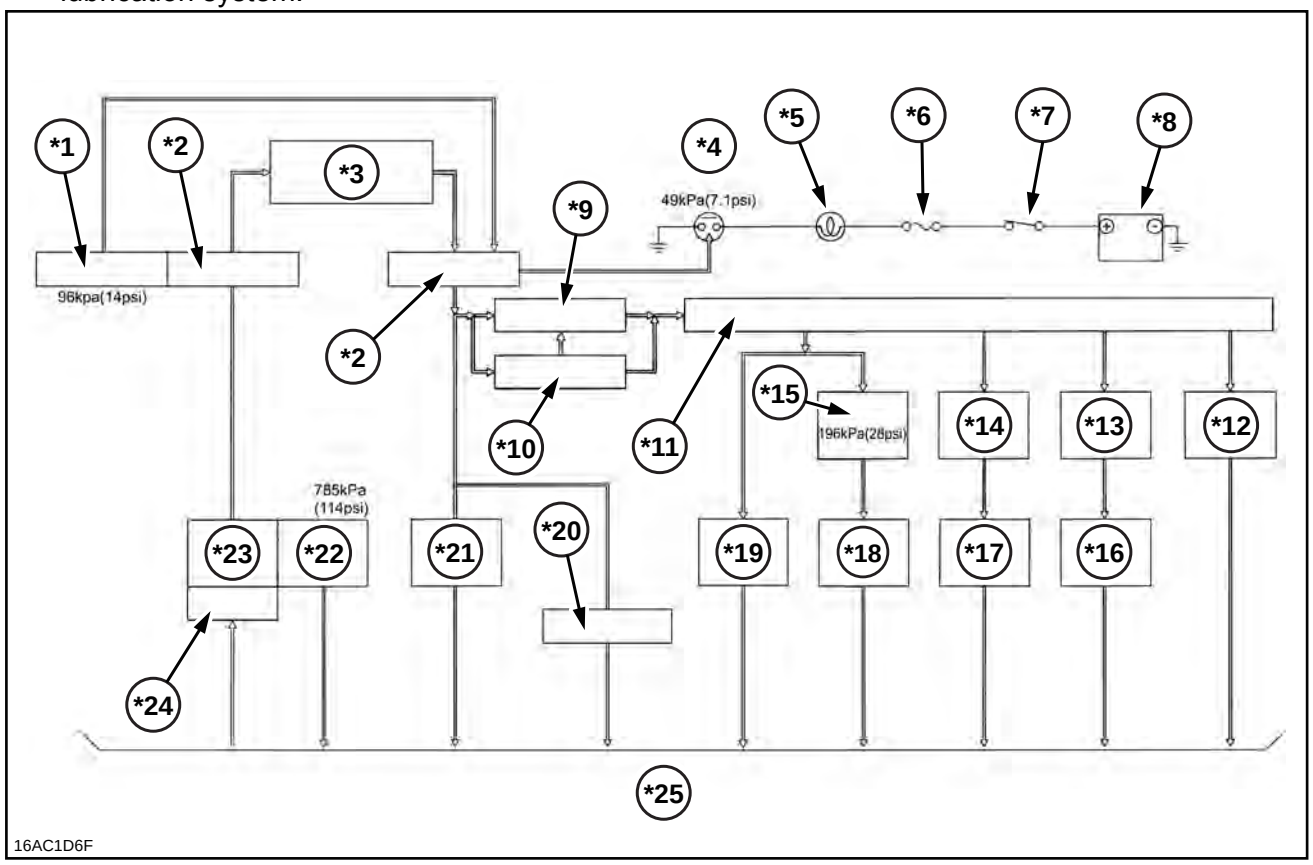
* Engine speed lower limit value: Rated speed -300min^{-1}
- The monitor continues to display message "FUEL FILTER" and sounds alarm for 5 seconds.

Stop condition:

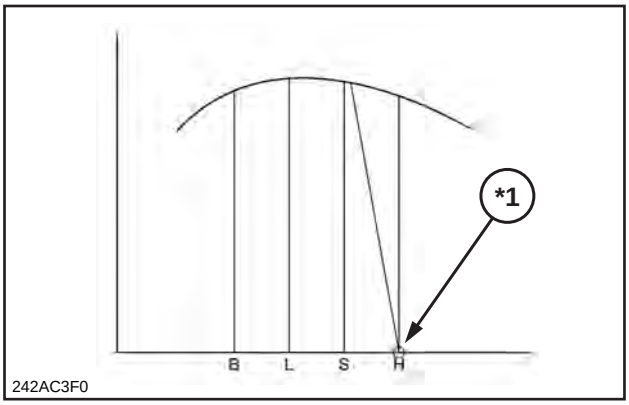
[1] If the state that negative pressure at the filter outlet is -5 kPa or more continues for 5 seconds or more, the system judges as "No clogging" to stop control of the warning.

[5] Lubrication system

A full-flow bypass integrated filter element, water cooling oil cooler, and piston coolant oil jet are adopted for the lubrication system.



*1	Delivery valve	*10	Thermo valve	*19	Idle gear A
*2	Oil port	*11	Oil gallery	*20	Turbocharger
*3	Full-flow oil filter	*12	Relief valve	*21	Flywheel PTO
*4	Oil pressure switch	*13	Crankshaft bearing	*22	Relief valve
*5	Oil pressure indicator lamp	*14	Valve mechanism	*23	Oil pump
*6	Fuse	*15	Check valve	*24	Strainer
*7	Starter switch	*16	Conn-rod bearing	*25	Engine oil pan
*8	Battery	*17	Gear train		
*9	Oil cooler	*18	Oiling jet		



1	Directed speed

Idling control
By operating the idling control change switch during the warm-up operation, the minimum idling speed can be adjusted. In addition, by operating the idling control change switch, the minimum idling speed can be automatically set to the optimum value in accordance with the engine coolant temperature.

Note

・The specifications vary depending on the machine, so availability of functions alsodiffers.

Idling control change switch
By operating the idling control change switch, the idling control functions can be switched.

Idling control switch
By operating the idling control switch, the idling speed can be adjusted.

Note

For the installation positions of the idling control change switch and the idling controlswitch, refer to the manual of the machine.The engine speed upper limit varies depending on the engine type, the machine specifications,and the engine warm-up condition.

Up
While the Up side of the switch is pressed, the engine speed is increased and the idling speed can be raised.

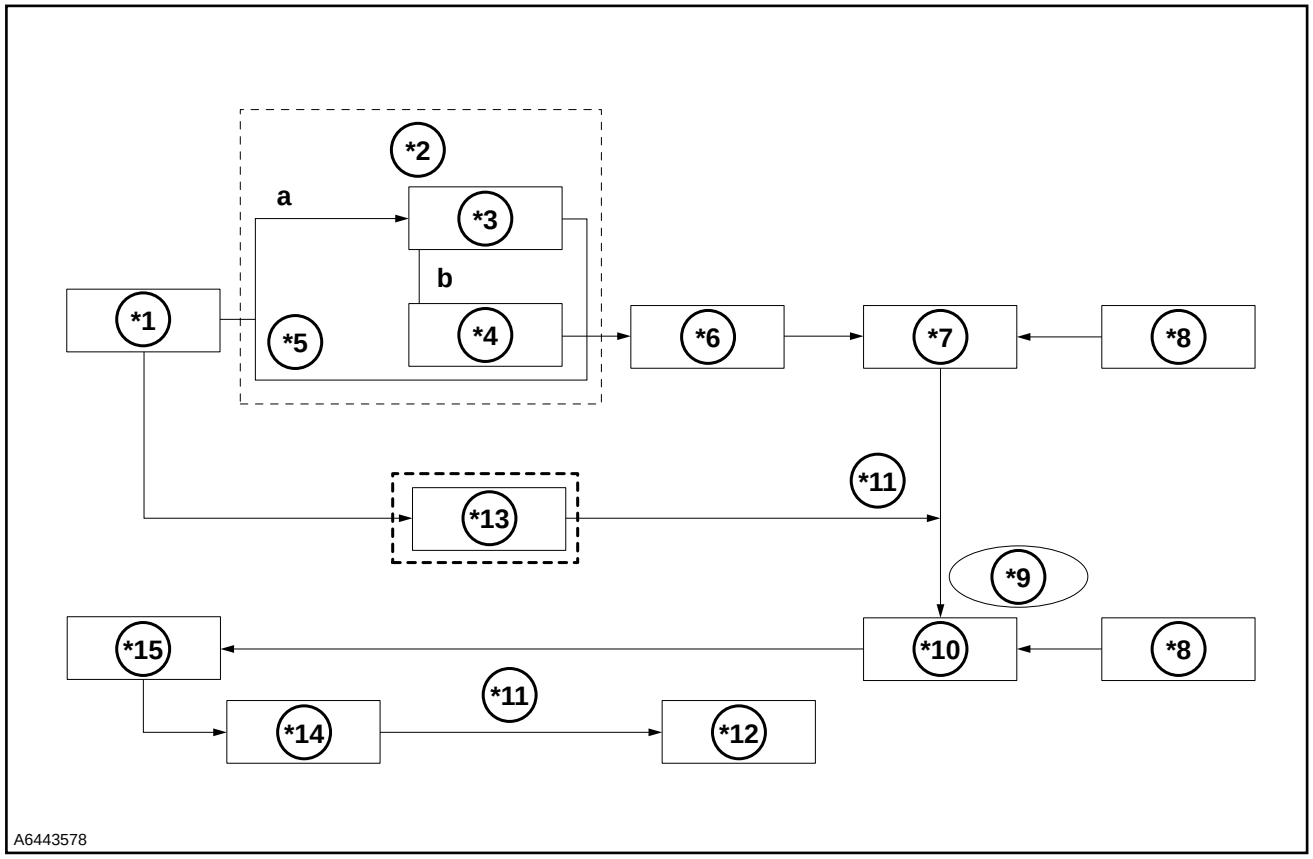
Down
While the Down side of the switch is pressed, the engine speed is decreased and the idling speed can be lowered.However, the engine speed cannot be lowered to below the minimum idling speed.

Control during ignition switch OFF state
There are 2 types of controls provided when the ignition switch is turned OFF after the idling control switch is operated, and either one of them is performed dependingon the specification.The engine speed adjusted by the idling control switch is recorded in the ECM, and the next time the vehicle is operated, the engine speed is set to the speed it was atwhen the ignition switch was turned OFF.The engine speed adjusted by the idling control switch is not recorded in the ECM, and the next time the vehicle is operated, the engine speed is set to the default speed.For verification and questions regarding the specifications, contact an Isuzu service representative.

Pin No.	Terminal name	Connection
88	-	-
89	OM-IDM2	Intake throttle motor drive Low
90	OM-IDM1	Intake throttle motor drive High
91	OM-EBM3	EGR valve DC servo motor drive W
92	OM-EBM2	EGR valve DC servo motor drive V
93	OM-EBM1	EGR valve DC servo motor drive U
94	OS-IADBL	Abnormal urea fluid quality warning light
95	-	-
96	-	-
97	-	-
98	-	-
99	IF-CAM	CMP sensor signal
100	-	-
101	-	-
102	-	-
103	-	-
104	-	-
105	OP-SCVHI	SCV-HI drive

91 pin (B connector)

Pin No.	Terminal name	Connection
1	PS-+B	Battery power supply
2	PG-POWER	ECM power supply GND
3	PS-+B	Battery power supply
4	PG-POWER	ECM power supply GND
5	PS-+B	Battery power supply
6	PG-POWER	ECM power supply GND
7	CC-KW2000	Data link connector
8	-	-
9	SG-5VRT1	Accelerator position sensor GND
10	-	-
11	SG-5VRT3	IAT sensor, charge air cooler temperature sensor 1, EGT sensor 1 GND
12	-	-
13	-	-
14	-	-
15	SP-5V1	Accelerator position sensor power supply
16	SP-5V5	Fuel filter pressure sensor power supply
17	IA-FIPRESS	Fuel filter pressure sensor signal
18	IA-THCSFI	EGT sensor 1 signal
19	IA-THDOCI	EGT sensor 2 signal
20	-	-
21	IA-THCAI	Charge air cooler temperature sensor 1 signal
22	-	-
23	OF-TACHO	Tachometer



a	When the DEF (Urea fluid) is frozen
b	When the outside air temperature is low

*1	Ignition switch is ON	*6	Startup control	*11	Control completion
*2	Heater control	*7	Dosing control through calculation	*12	Urea SCR System Shut-Off
*3	Defrosting control	*8	NH3 storage control	*13	NOx sensor control
*4	Thermal control	*9	NOx sensor operation	*14	After-run control
*5	At room temperature	*10	Dosing control based on NOx sensor information	*15	Ignition switch is OFF

About dosing control

The DCU calculates the optimal urea fluid injection quantity, and instructs the dosing module. Depending on the condition of the machine, either of two methods for calculating the urea fluid injection quantity can be used: one is based on calculation of the ECM information, and the other is based on values measured by NOx sensors.

Engine abnormality caused by seizing, compression pressure deficiency and other mechanical troubles
ACG failure
Troubles related to the hydraulic pump and other device on the machine
Effect of electrical components installed after purchasing (wireless devices, lamps, etc.)
ECM trouble
Inspect for connector connection problems, abnormalities involving friction or breaking in harnesses, any wires inside harnesses separated and touching another circuit and causing a short. Also, perform functional diagnosis inspection, check operations and control in each area, and repair any abnormalities.

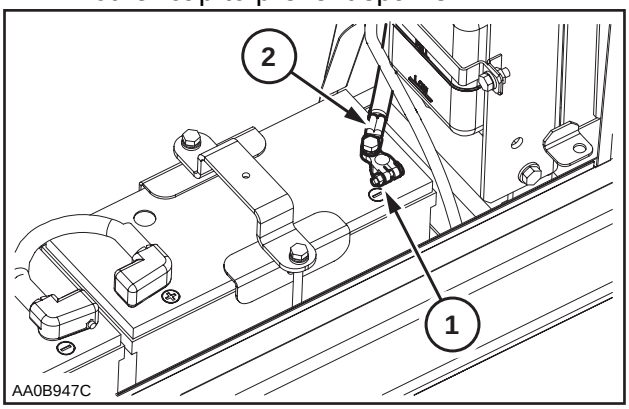
Engine Stalling

1. Engine stalling - symptoms
   The engine cranks but does not start for a long time. The engine starts after a while or it starts but stops immediately.
2. Engine stalling - diagnosis
   - Preliminary inspection
     Before performing this diagnosis, check all of the following items by performing functional inspections and OBD system check.
     Check for an excessive load on the machine side.
     The ECM and monitor are operating correctly.
     CKP sensor abnormalities are not diagnosed unless the crank rotates at least 14 times. Crank the engine for 14 sec. or more at 60 r/min.
     Check DTCs.
     CKP sensor diagnostic trouble codes may not be detected for CKP sensor problems during low speed of the engine.
     For intermittent trouble, increase the engine speed to the maximum with no load and check whether a CKP sensor related diagnostic trouble code is detected.
     Values indicated in MACHINE STATUS on the service support screen are within the normal operation range. See "Service Support - MACHINE STATUS".
     Check the condition of the machine and find applicable symptoms. Confirm with the customer that the stipulated engine oil and fuel are being used.
     Check whether fuel is filled.
   - Visual inspection
     Some symptoms detection procedures require careful visual inspection. This allows for problems to be repaired without performing further inspection, which saves valuable time.
     The following items are included in this inspection.
     Check the connector for connection problems. Especially the CKP and CMP sensors.
     Check whether the wires are connected and tightened correctly, or power supply for commercially-available accessories is being diverged from the ECM power supply.
     Check whether the ECM ground is dirty and check that it is securely installed in the correct location.
     Check that pipes and hoses for fuel, air, and oil are not broken or twisted and that they are correctly connected. Thoroughly check for any leaking or clogging.
     Check for fuel leaks and damage and denting on pipes in the fuel system.
     Check whether the layout of the fuel filter, pre-filter and charge fuel pump makes it easy for air pockets to form. Due to the Isuzu genuine pre-filter not having an air-bleed plug, check that parts are arranged in such a way that air pockets will not occur.
     Also, check whether the intake and discharge ports of the charge fuel pump are positioned correctly. Correct the layout if the intake port of the charge fuel pump is positioned on the upper side or the discharge port is facing the direction of the machine movement.
     Intake air system components abnormality
     Exhaust system components abnormality

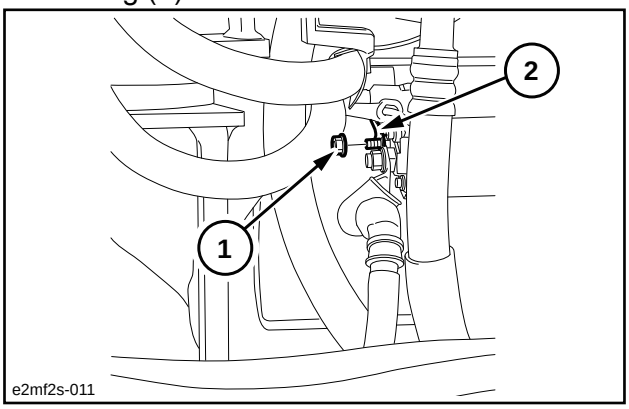
11. Remove the nut (1) with a wrench [13 mm (0.512 in.)] to remove the battery cable (2) for minus side.

> **Caution**
>
> ・While the indicator (LED) of the battery disconnect switch is lit, do not turn OFF the battery disconnect switch or disconnect its negative cable from the battery. (After key OFF, lit for a maximum duration of 3 minutes)

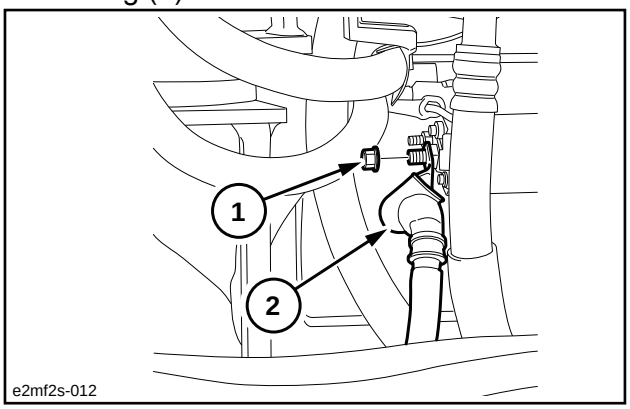
・ Secure the terminal and harness in order to prevent them from touching the frame or other parts when they have been removed.
Or protect them with a rubber cap or other cap to prevent sparks.



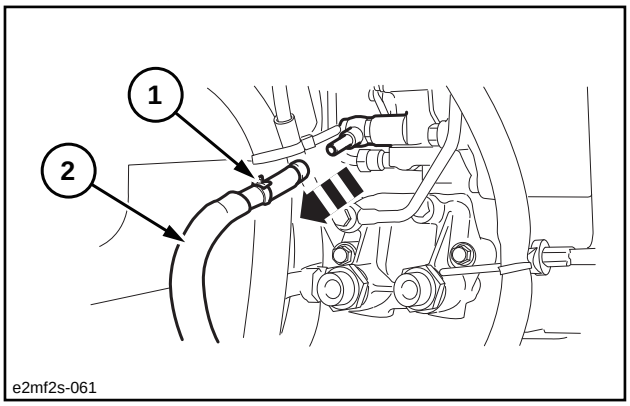
12. Remove the nut (1) with a wrench [8 mm (0.315 in.)] to disconnect the starter motor wiring (2).



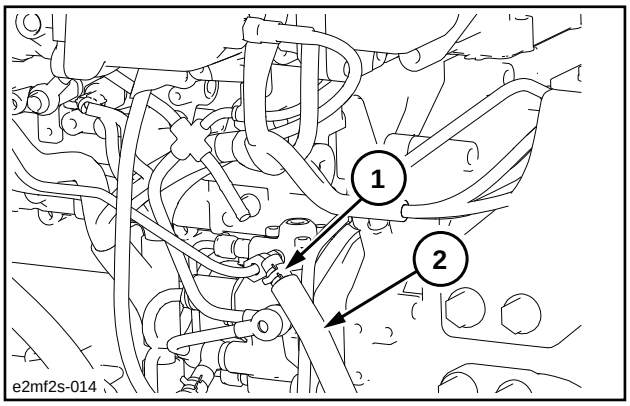
13. Remove the nut (1) with a wrench [14 mm (0.551 in.)] to disconnect the starter motor wiring (2).



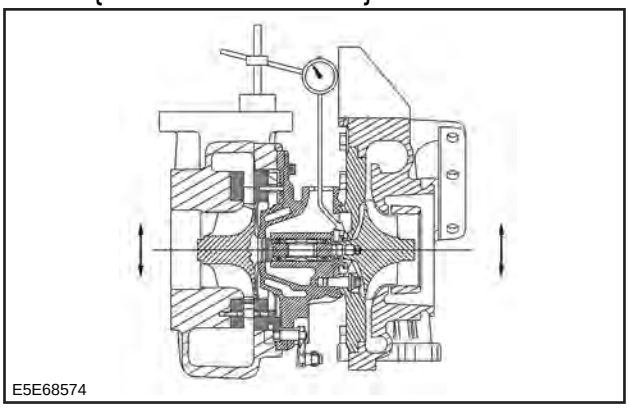
14. Remove the hose band (1) to remove the fuel hose (2).
・ Attach caps and plugs at the engine and the hoses so as to prevent invasion of water, dust and dirt.



15. Remove the hose band (1) to remove the fuel hose (2).
・ Attach caps and plugs at the engine and the hoses so as to prevent invasion of water, dust and dirt.



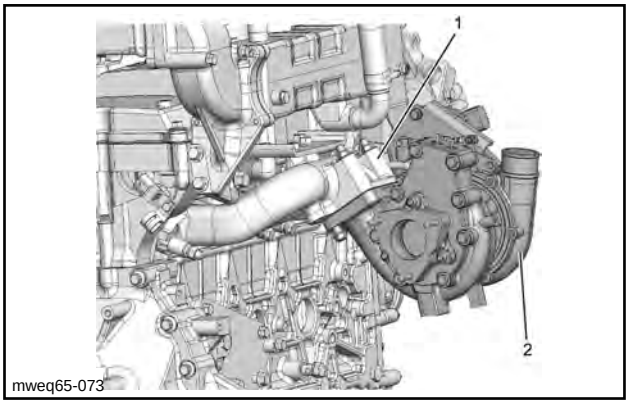
specified value： 0.086 - 0.140 mm
{ 0.0034 - 0.0055 in. }



Caution

・Replace the turbocharger assembly if the measured value of the turbine shaft is not within the range of the specified value.

[14] Remove the turbocharger assembly from the exhaust manifold.

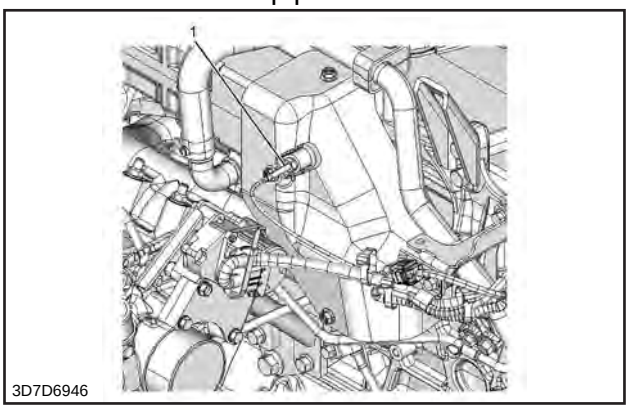


1	Exhaust manifold
2	Turbocharger assembly

5. EGR gas temperature sensor 1 removal

[1] Disconnect the harness connector from EGR gas temperature sensor 1.

[2] Remove EGR gas temperature sensor 1 from EGR pipe A.



1	EGR gas temperature sensor 1

6. EGR gas temperature sensor 2 removal

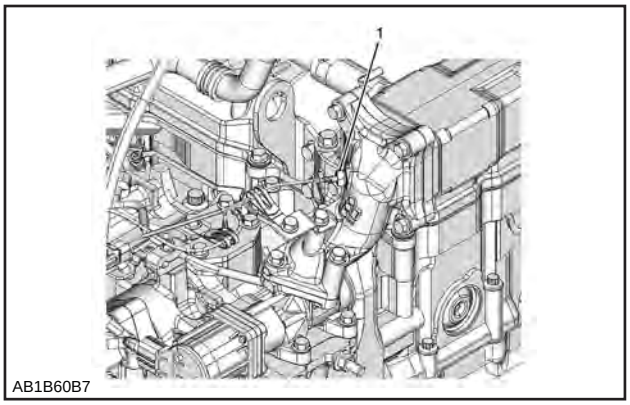
[1] Disconnect the harness connector from EGR gas temperature sensor 2.

[2] Remove EGR gas temperature sensor 2 from EGR pipe C.

[3] Remove the harness bracket from EGR pipe C.

Note

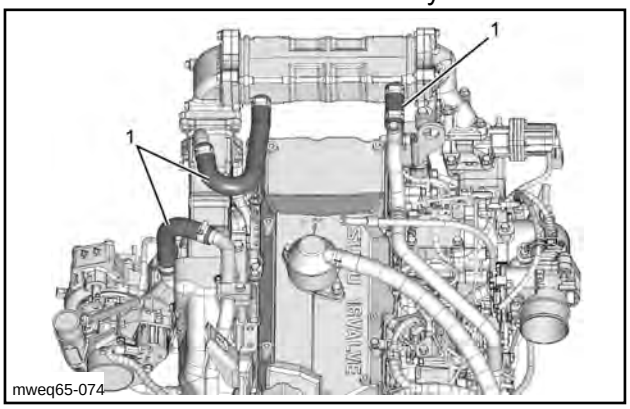
・Remove together with the clip.



1	EGR gas temperature sensor 2

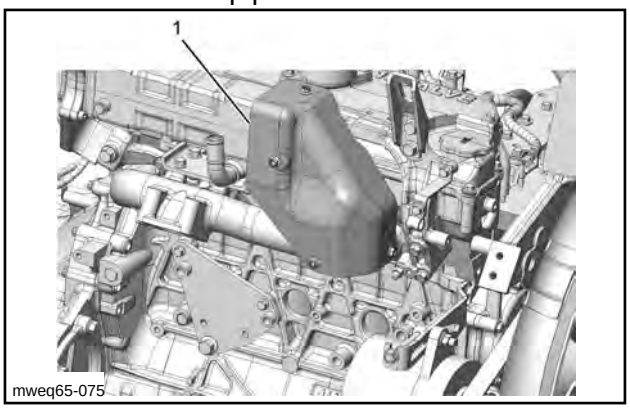
7. EGR cooler assembly removal

[1] Disconnect the water rubber hose from the EGR cooler assembly.



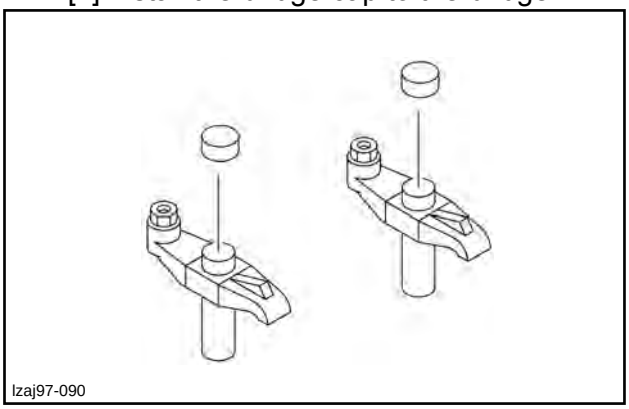
1	Water rubber hose

[2] Remove the EGR heat protector from the EGR pipe A.



1	EGR heat protector

[3] Apply the engine oil to the bridge cap.
[4] Install the bridge cap to the bridge.

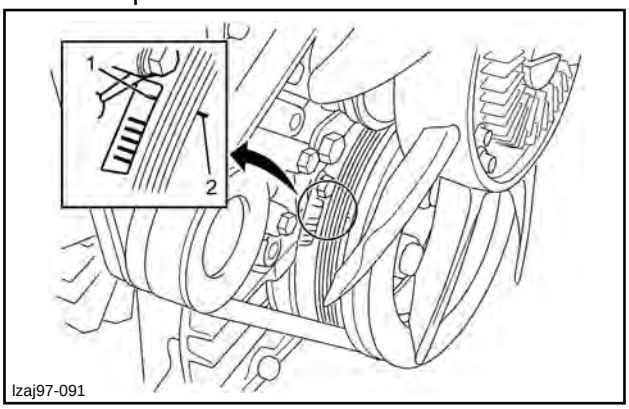


Caution

・Be careful not to drop the bridge cap into the engine.

3. Camshaft installation

[1] Align No.1 cylinder to the compression top dead center.



1	Front cover marking
2	0 degree marking on the crankshaft damper

[2] Apply the engine oil to the camshaft bearing.

Note

・Apply engine oil to the sliding surface of the bearing.

Caution

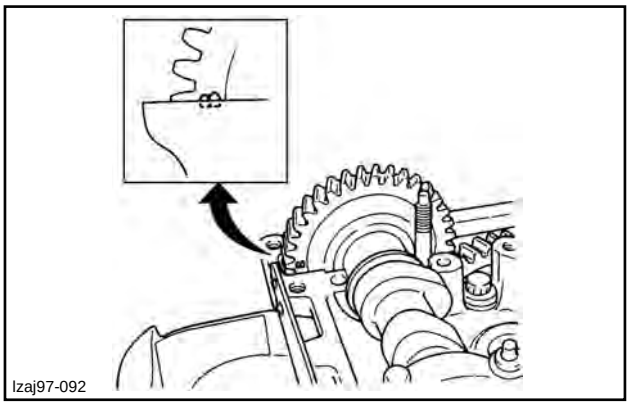
・Apply engine oil after cleaning the bearing installation sections of the camshaft bearing and cylinder head.

[3] Install the camshaft bearing to the cylinder head assembly.

[4] Install the camshaft to the cylinder head assembly.

Note

・Mesh together the idle gear C and the camshaft gear so that the alignment mark on the camshaft gear matches the top surface of the cylinder head, and gently install the camshaft.



[5] Check alignment mark of the camshaft gear.

Caution

・Confirm that the alignment mark is not misaligned before installing the camshaft bearing cap.
・If the alignment mark is not at the correct position, reinstall the camshaft.

[6] Apply the engine oil to the camshaft bearing.

Note

・Apply engine oil to the sliding surface of the bearing.

Caution

・Apply engine oil after cleaning the bearing installation sections of the camshaft bearing and camshaft bearing cap.

[7] Install the camshaft bearing to the camshaft bearing cap.
[8] Install the camshaft bearing cap to the cylinder head assembly.

Note

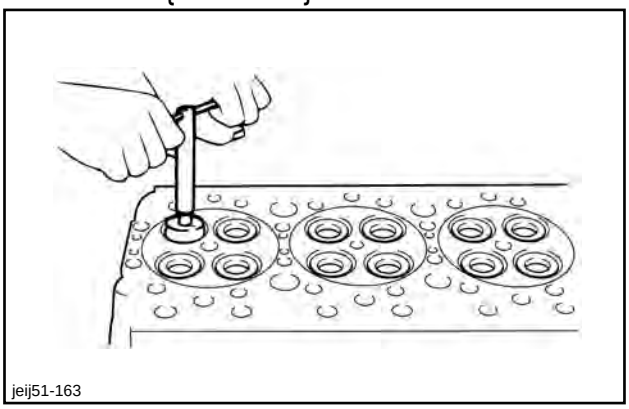
・Turn the camshaft bearing cap so that the arrow mark on the top surface faces the engine front side, and assemble in numerical order.

[6] Adjust the valve seat.

Caution

・Use a seat cutter suitable for the valve seat angle and valve stem diameter.

Valve seat angle: 45 °
External diameter of the valve stem: 8.0 mm {0.3150 in.} Diameter


jeij51-163

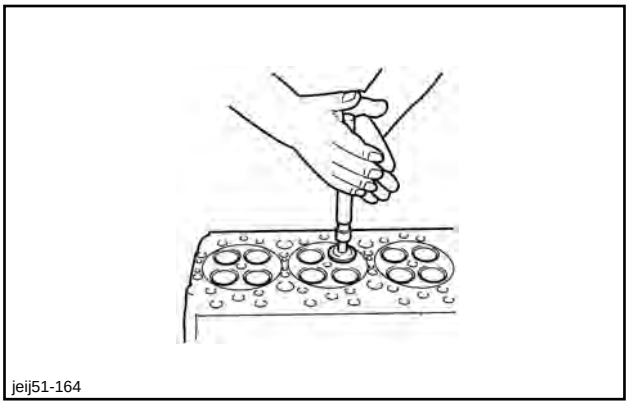
[7] Apply the compound to the valve seat.

[8] Install the exhaust valve to the valve guide.

[9] Adjust contact surface to standard value using the valve lapper.

Note

・Tap the exhaust valve on the valve seat while turning it.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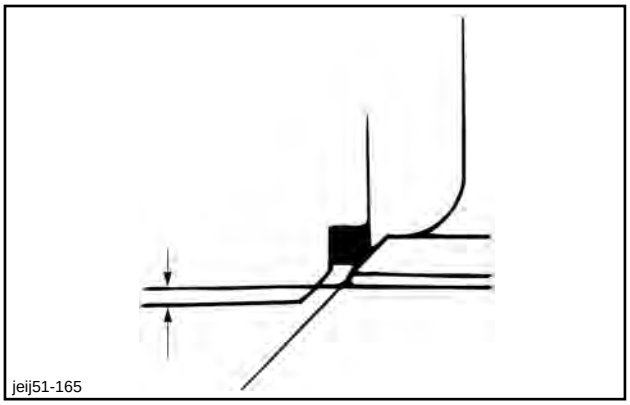
Caution

・After fixing the valve, remove all compounds.

[10] Check the sinking amount of the exhaust valve.
Specified value: 1.24 - 1.47 mm {0.0488 - 0.0579 in.}
Limit: 2.8 mm {0.1102 in.}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6. Cylinder head assembly Inspection

Caution

・Clean the each part of the cylinder head assembly before inspecting.
・Be careful not to damage the cylinder head while cleaning the cylinder head assembly.

[1] Inspect the cylinder head assembly.

Note

・Installation surface of the cylinder head gasket
・Combustion chamber
・Exhaust port
・Valve seat
・Glow plug hole

Caution

・Replace the cylinder head if damage such as a crack has been found in the inspection.

Note

・Fix it if it is possible.

[2] Perform dye penetrant check.

Note

・Check if there is a problem which cannot be detected by visual inspection.

[3] Align the simple straight ruler to the cylinder head assembly.

[4] Measure the clearance using the feeler gauge.

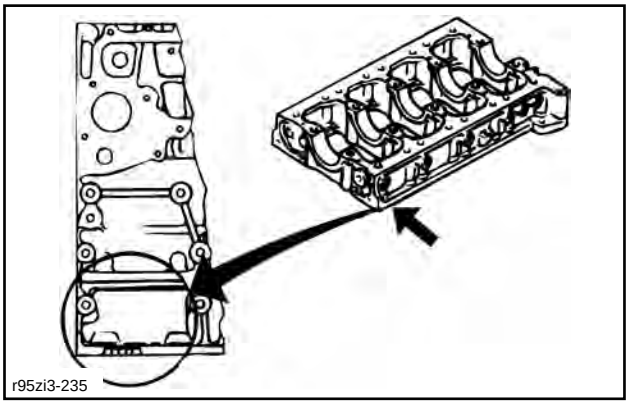
Note

・Flatness of the bottom of the cylinder head

[1] Check marking of the crankcase.

Note

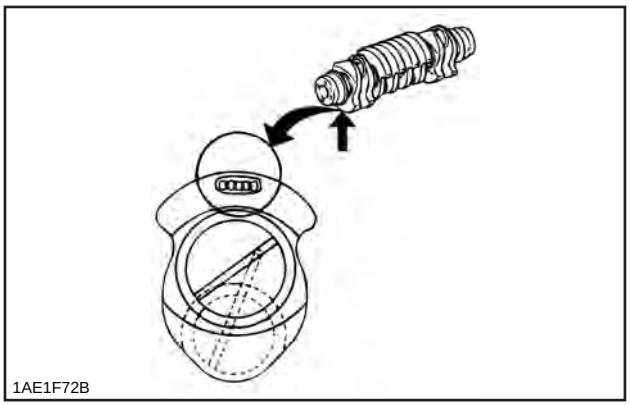
- The marking on the crankcase indicates the inner diameter grade of the cylinder block journal section.
- Grade indications are lined up as No.1, 2, 3, 4, 5 from the left when looking at the marking section from the front side.



[2] Check the marking on the crankshaft.

Note

- The marking on the crankshaft indicates the outer diameter grade of the journal section.
- Grade indications are lined up as No.1, 2, 3, 4, 5 from the left when looking at the marking section from the front side.



[3] Select the crankshaft bearing.

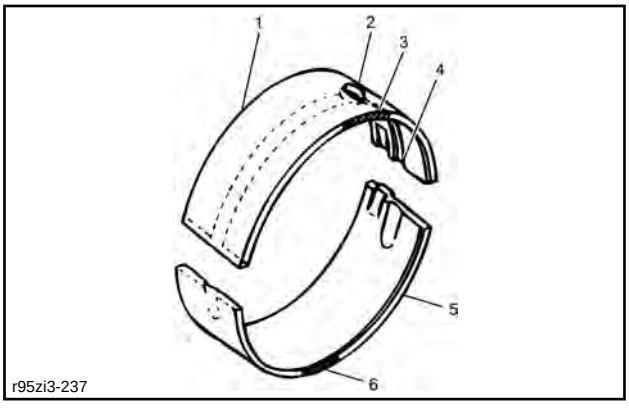
Note

- Refer to the bearing selection table.

Bearing selection table			
Grade combination		Oil clearance	
Cylinder block grade	Crank journal grade	1, 2, 4, 5	3
1	1	: 0.041 - 0.068 mm { 0.0016 - 0.0027 in. }	: 0.055 - 0.082 mm { 0.0022 - 0.0032 in. }
1	2	: 0.039 - 0.065 mm { 0.0015 - 0.0026 in. }	: 0.053 - 0.079 mm { 0.0021 - 0.0031 in. }
2	1	: 0.043 - 0.070 mm { 0.0017 - 0.0028 in. }	: 0.057 - 0.084 mm { 0.0022 - 0.0033 in. }
2	2	: 0.041 - 0.067 mm { 0.0016 - 0.0026 in. }	: 0.055 - 0.081 mm { 0.0022 - 0.0032 in. }

Caution

- Be careful not to mistake the bearing shape when installing the crankshaft bearing.



1	Upper bearing
2	Oil hole
3	Grade identification color
4	Oil groove
5	Lower bearing
6	Grade identification color

5. Crankshaft installation

[1] Install the crankshaft bearing to the cylinder block.

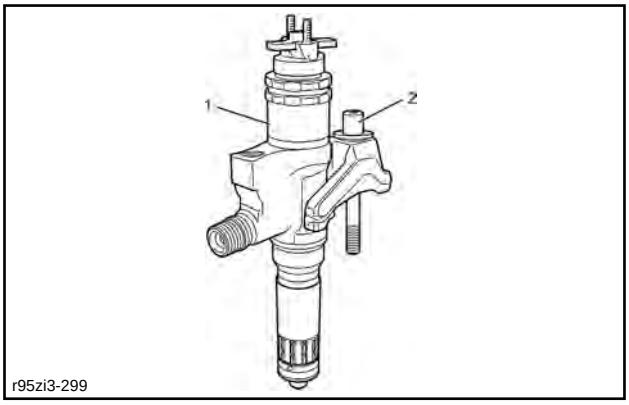
Note

- Install a bearing with an oil hole on the cylinder block.

[2] Temporarily tighten the injector to the cylinder head assembly.

Caution

・Be extremely careful not to damage the injector nozzle.



1	Injector
2	Installation bolt

[3] Temporarily tighten the injection pipe to the injector.

Caution

・Use new injection pipes.

[4] Temporarily tighten the injection pipe to the common rail assembly.

[5] Securely tighten the injector to the cylinder head assembly.
tightening torque： 30 N・m { 3.1 kgf・m / 22 lb・ft. }

[6] Install the injector leak-off pipe to the injector.

Caution

・Use new gaskets.

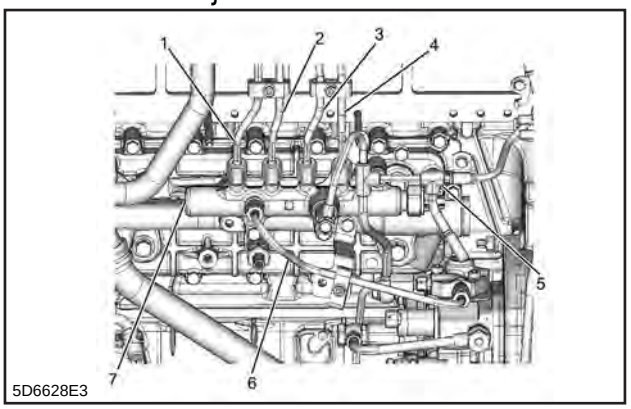
tightening torque： 14 N・m { 1.4 kgf・m / 10 lbf・ft. }

31. Injection pipe installation

[1] Securely tighten the injection pipe to the injector.
tightening torque： 30 N・m { 3.0 kgf・m / 22 lb・ft. }

[2] Securely tighten the injection pipe to the common rail assembly.
tightening torque： 25 N・m { 2.5 kgf・m / 18 lb・ft. }

[3] Install the clip to the bracket.
tightening torque： 6 N・m { 0.6 kgf・m / 4 lbf・ft. }



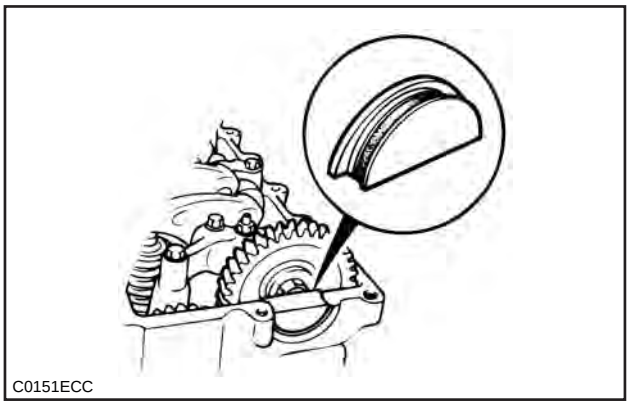
1	No.1 injection pipe
2	No.2 injection pipe
3	No.3 injection pipe
4	No.4 injection pipe
5	Fuel leak-off pipe
6	Fuel pipe
7	Common rail assembly

32. Lower cover installation

[1] Apply the liquid gasket to the rubber plug.

Note

・Apply ThreeBond 1207B.



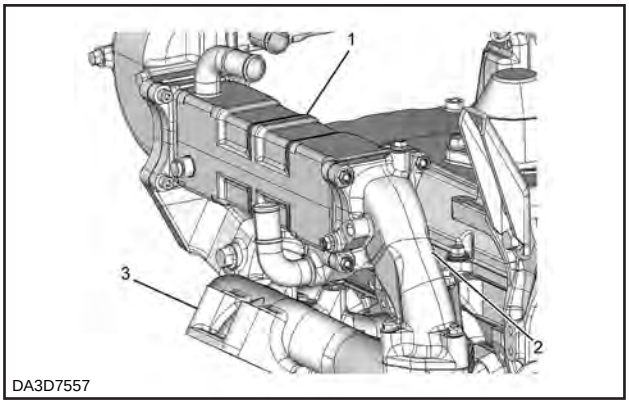
[2] Install the rubber plug to the cylinder head.

[3] Apply liquid gasket to the rubber plug.

Note

・Apply ThreeBond 1207B to the rubber plug and cylinder head mating surfaces.

[3] Remove EGR pipe A from EGR cooler A and the exhaust manifold.



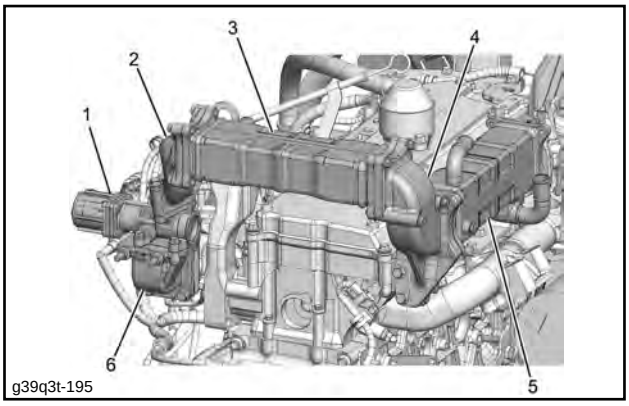
1	EGR cooler A
2	EGR pipe A
3	Exhaust manifold

[4] Remove EGR cooler A from EGR pipe B.

[5] Remove EGR pipe B from EGR cooler B.

[6] Remove EGR cooler B from EGR pipe C.

[7] Remove EGR pipe C from the EGR valve.

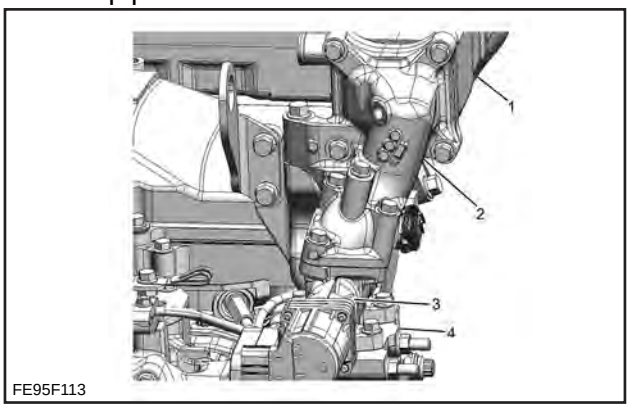


1	EGR valve
2	EGR pipe C
3	EGR cooler B
4	EGR pipe B
5	EGR cooler A
6	EGR pipe D

9. EGR valve removal

[1] Disconnect the harness connector from the EGR valve.

[2] Remove the EGR valve from the EGR pipe D.

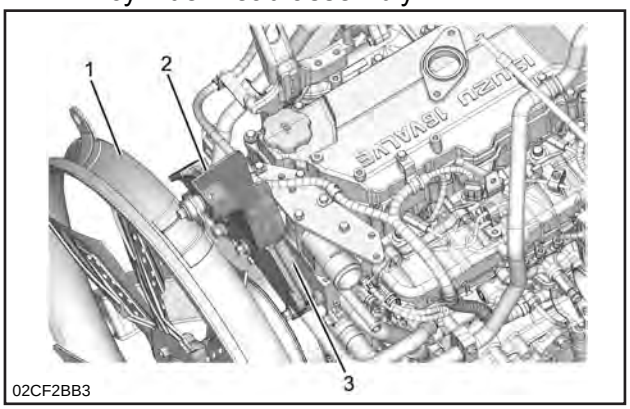


1	EGR cooler C
2	EGR pipe C
3	EGR valve
4	EGR pipe D

10. EGR cooler water pipe removal

[1] Remove the fan guide stay from the fan guide and the fan guide bracket.

[2] Remove the fan guide bracket from the cylinder head assembly.

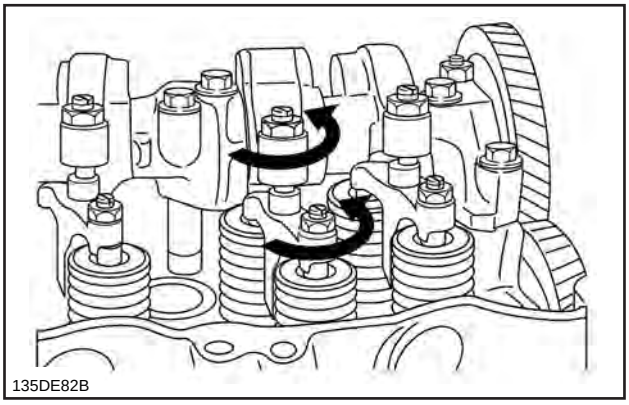


1	Fan guide
2	Fan guide stay
3	Fan guide bracket

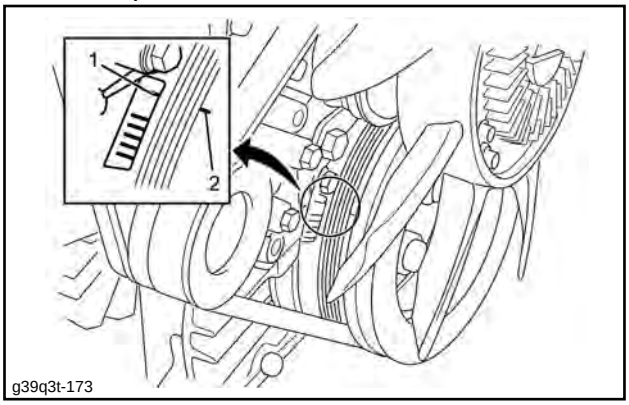
[3] Disconnect the radiator upper hose from the water outlet pipe.

Caution

・Adjust the valve clearance while cool.
・Loosen all adjust screws before adjustment.



[1] Align No.1 cylinder to the compression top dead center.



1	Front cover marking
2	0 degree marking on the crankshaft damper

[2] Prepare the feeler gauge.
thickness： 0.4 mm { 0.0157 in. }

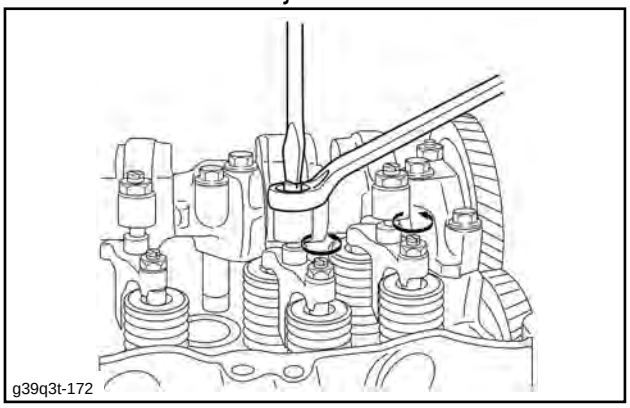
Note

・Insert the thickness gauge between the rocker arm and bridge cap.

[3] Turn the adjust screw.

Note

・When the movement of the thickness gauge becomes stiff, secure the adjust screw nut of the rocker arm.
tightening torque： 22 N・m { 2.2 kgf・m / 16 lb・ft. }



[4] Turn the adjust screw.

Note

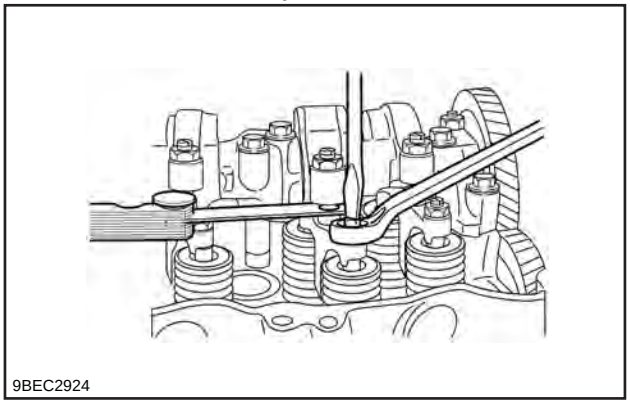
・With the thickness gauge inserted, lightly tighten the adjust screw of the bridge.
・Confirm that the leading end of the adjust screw and valve shaft end have made contact and the movement of the thickness gauge has become stiff.
・Check if the valve shaft end on the opposite side is floating or touching at an angle.
・If it is floating or touching at an angle, slightly loosen the bridge adjust screw and adjust the valve shaft ends on both sides to touch properly.

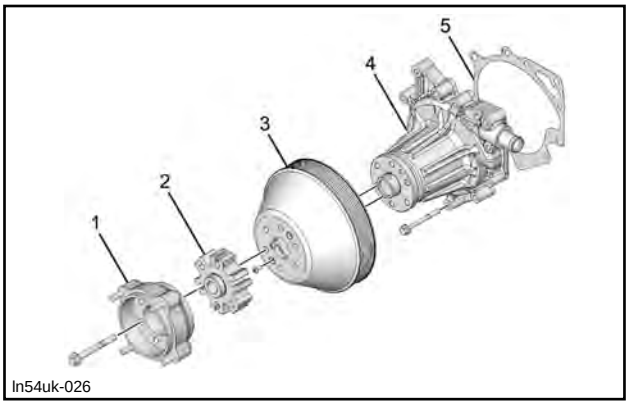
clearance： less than 0.1 mm { less than 0.0039 in. }
Between valve and bridge

Note

・To prevent turning, fix the bridge adjust screw with a flathead screwdriver, and tighten the adjust screw nut.

tightening torque： 22 N・m { 2.2 kgf・m / 16 lb・ft. }





1	Adapter
2	Spacer
3	Fan pulley
4	Water pump assembly
5	Gasket

2. Cooling fan belt installation

[1] Install the cooling fan belt to the engine assembly.

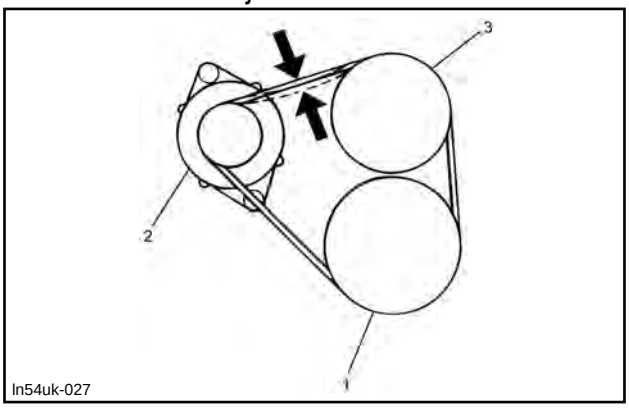
3. Cooling fan belt adjustment

[1] Press the cooling fan belt.

Note

・Measure the amount of cooling fan belt flex by pressing on the point indicated by the arrow in the diagram with the specified pressure.

standard: 98 N { 10.0 kg / 22 lb }
specified value: 6.0 - 8.0 mm { 0.2362 - 0.3150 in. } Amount of flex



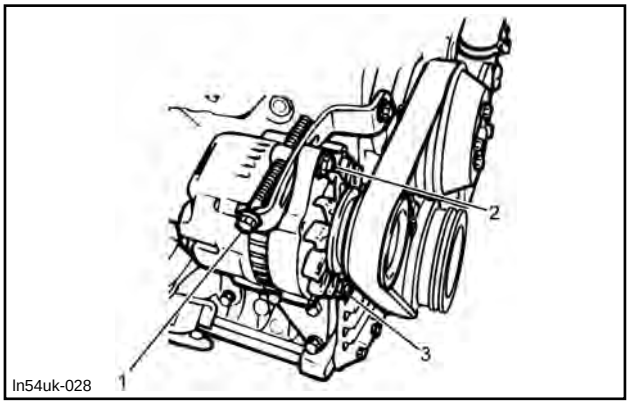
1	Crankshaft pulley
2	Generator
3	Fan pulley

[2] Adjust the cooling fan belt to specified value using the adjust bolt.

Note

・Loosen adjust-plate-side nut 2 and bracketside bolt 3, shown in the diagram, and lightly tighten to the position for seating.

・Adjust the belt deflection amount to the specified value using adjust bolt 1.



1	Adjust bolt
2	Adjust plate side nut
3	Bracket side bolt

Note

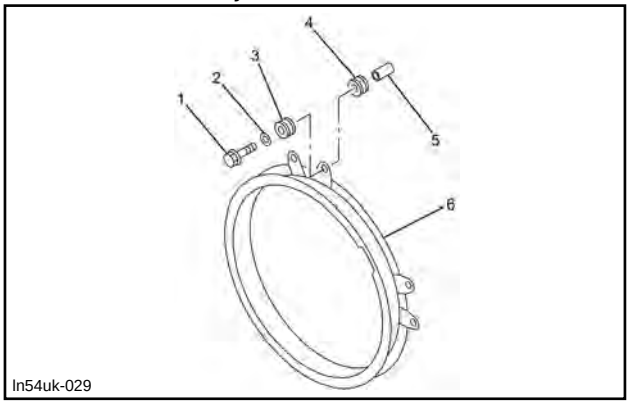
・After adjustment, tighten the adjust-plate-side nut and bracket-side bolt to the specified torque.

tightening torque: 76 N・m { 7.7 kgf・m / 56 lb・ft. } Nut of the adjust plate
tightening torque: 127 N・m { 12.9 kgf・m / 93 lb・ft. } Bolt of the bracket side

4. Fan guide installation

[1] Install the fan guide bracket to the engine assembly.
tightening torque: 40 N・m { 4.1 kgf・m / 30 lb・ft. }

[2] Install the fan guide to the fan guide bracket.
tightening torque: 30 N・m { 3.1 kgf・m / 22 lb・ft. }



[2] Replenish the radiator with coolant.

Caution

・Add slowly to prevent air from entering the system.

[3] Tighten the air bleeding plug using a wrench.

Note

・Check that the coolant has overflowed.
・With the pressurized reserve tank specification, it is not necessary to bleed the air.

Caution

・Do not reuse the gasket.

tightening torque: 27 N・m { 2.8 kgf・m / 20 lb・ft. }

[4] Replenish the radiator with coolant.

Note

・While manually pressing the upper hose several times to bleed air in the hose, add an amount of coolant equal to the difference between the remaining coolant level and the radiator cap mouth.
・Repeat until the coolant level no longer decreases.

[5] Install the radiator cap to the radiator.

Caution

・Securely attach the radiator cap.

[6] Add coolant to the radiator reserve tank.

Note

・Add up to the MAX line of the radiator reserve tank.
・Perform the urea SCR dosing module coolant piping air bleeding process while referring to the owner's manual from the machinery manufacturer.

Caution

・Wipe off any excess coolant.

[7] Start the engine.

a. Start the engine.

b. In order to bleed the urea SCR dosing module coolant piping of air, choose the CCV (coolant control valve) operation test in the device test from the service support screen.

Note

・Repeat the operation test several times.
・Idle the engine for 5 minutes.

[8] Stop the engine.

[9] Remove the radiator cap from the radiator.

Caution

・Do not loosen the radiator cap or sub-tank cap when the coolant temperature is high.
・Because steam and boiling water can burst out from the radiator and possibly cause burns, check that the engine has cooled.

[10] Replenish the radiator with coolant.

Note

・Add an amount of coolant equal to the difference between the remaining coolant level and the radiator cap mouth.

Caution

・If the coolant amount is excessively low, inspect for coolant leakage.

[11] Install the radiator cap to the radiator.

Caution

・Securely attach the radiator cap.

[12] Start the engine.

a. Start the engine.

b. In order to bleed the urea SCR dosing module coolant piping of air, choose the CCV (coolant control valve) operation test in the device test from the service support screen.

Note

・Repeat the operation test several times.
・For models with heaters, the set temperature and blower speed are set to the maximum, and warm up the engine at approximately 1500 - 2000 r/min.
・Touch the radiator upper hose, and confirm that it has become warm.

Removal and Installation of Fuel Tank

Warning

・Keep fire away.

Caution

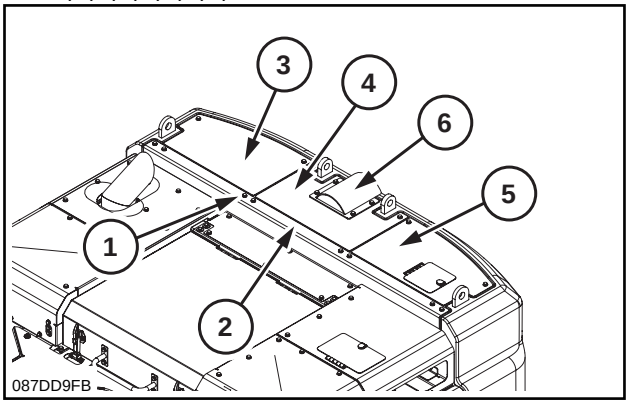
・Make sure to stop the engine before starting work.
・Make sure to check slinging apparatus such as a wire rope before starting work.
・Before work, remove the pressure inside the fuel tank.
・Never allow any person to enter underneath a slung load.

Items to prepare

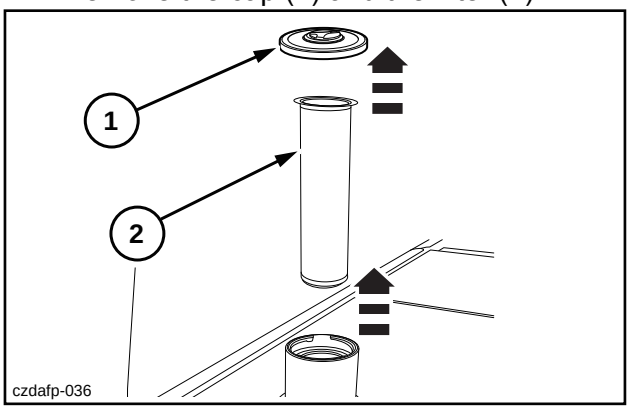
・Wrench [13 mm (0.512 in.), 19 mm (0.748 in.), 30 mm (1.181 in.)]
・Eyebolt (M12 x 4)
・Shackle (that fulfills slinging capacity x 4)
・Wire rope (that fulfills breaking load)
・Liftcrane (that fulfills slinging capacity)
・Cap
・Plug
・Drum (for draining fuel)
・Rag
・Cleaning fluid
・Wood plank

Removal of Fuel Tank

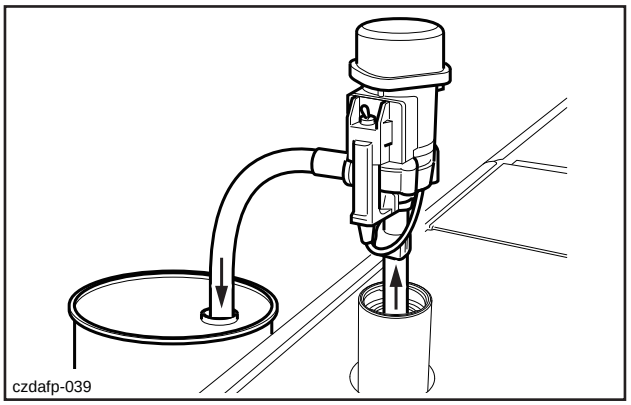
1. Remove the 18 bolts (1) with a wrench [19 mm (0.748 in.)] to remove the covers (2) (3) (4) (5) (6).



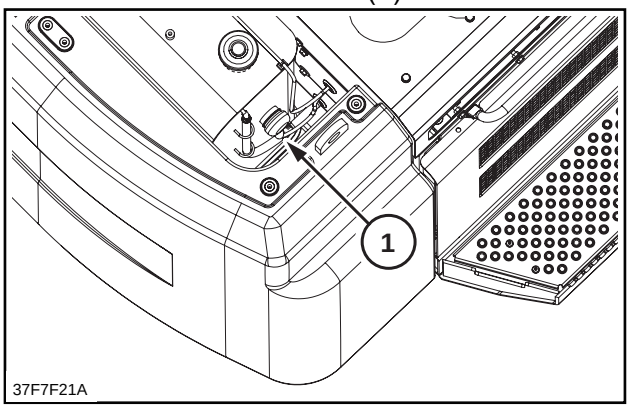
2. Remove the cap (1) and the filter (2).



3. Drain all fuel inside the fuel tank to a drum or other container.



4. Remove the connector (1).



5. Loosen the hose band to disconnect the fuel hoses (1) (2).
   ・Apply marking to each location of the fuel tank and hoses so as to match connections at assembling.
   ・Attach caps and plugs to each location of the fuel tank and hoses to prevent the entry of water, dust, and dirt.

8. Lower cover removal

[1] Remove the connector from the lower cover.

Caution

- Do not pull the wire, or pry the connector with a screwdriver.

[2] Disconnect the injector harness from the injector.

Caution

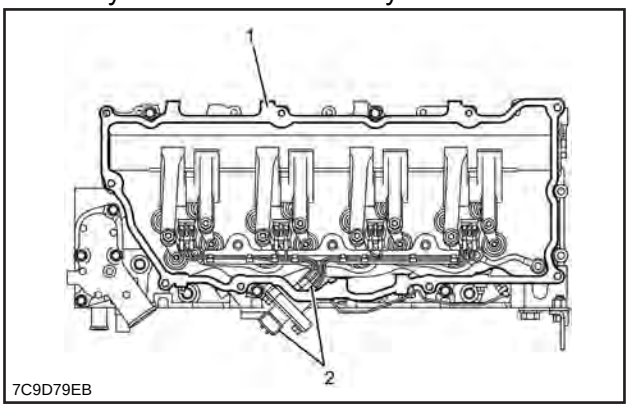
- Be careful not to damage the injector side stud bolts.

[3] Remove the injector harness from the cylinder head assembly.

Note

- Remove the bracket tightening bolts and then remove the injector harness together with the bracket.

[4] Remove the lower cover from the cylinder head assembly.



1	Lower cover
2	Connector

[5] Remove the gasket from the lower cover.

[6] Remove the rubber plug from the cylinder head assembly.

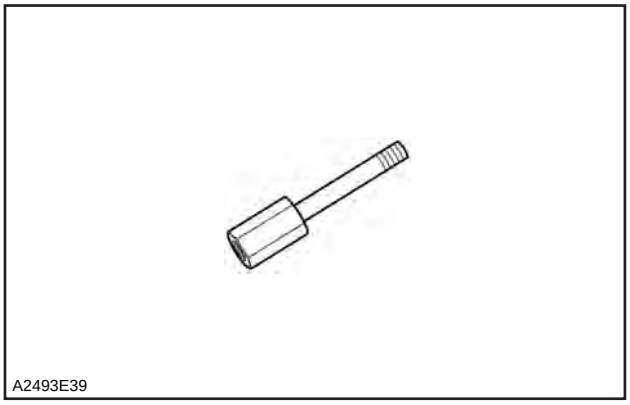
9. Injector removal

[1] Remove the injector leak-off pipe from the injector.

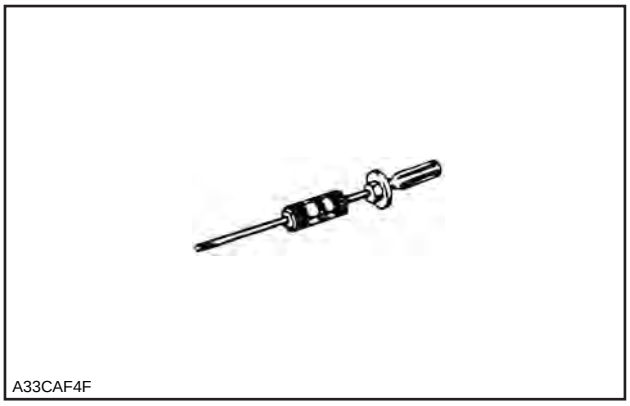
[2] Remove the injector from the cylinder head assembly.

Note

- When it is difficult to remove the injector, use a special tool.



SST: 5-8840-2826-0 - injector remover



SST: 5-8840-0019-0 - sliding hammer

1	Idle gear B
2	Thrust collar
3	Bolt

Caution

・Confirm that the idle gear B turns smoothly after installing.

2. Idle gear A installation

[1] Align No.1 cylinder to the compression top dead center.

[2] Apply the engine oil to the idle gear A.

[3] Install the idle gear A shaft to the idle gear A.

[4] Align the idle gear A to alignment mark.

Note

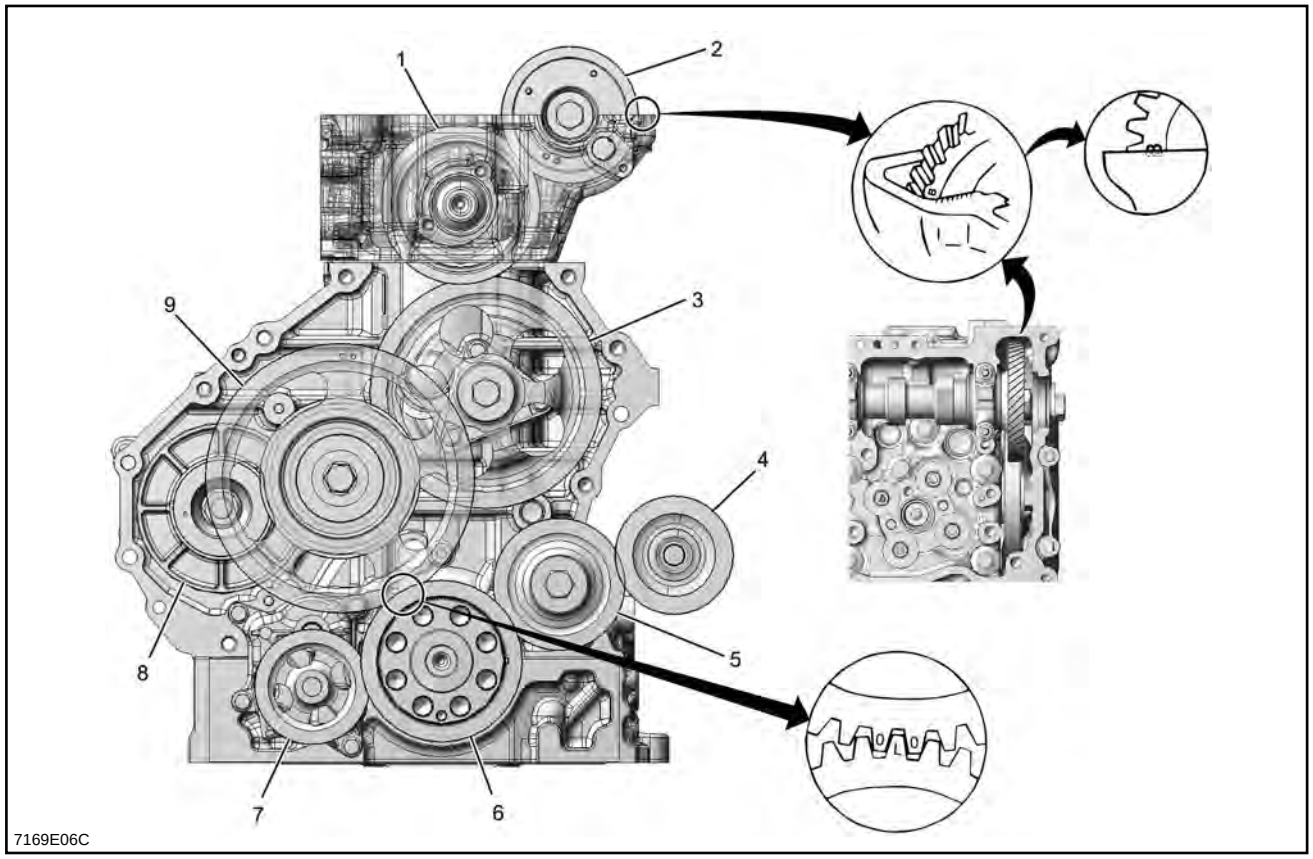
・Align the L mark on the crank gear with the O mark on the idle gear A.

[5] Apply the engine oil to the bolt.

Note

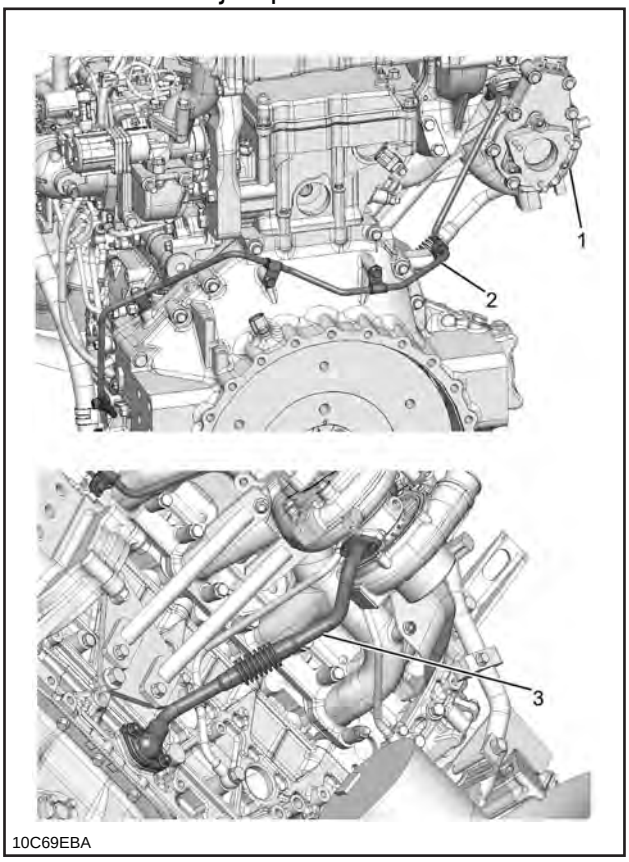
・Apply engine oil to the threaded portion and seat surface on the idle gear A installation bolt.

[6] Install the idle gear A to the cylinder block.
tightening torque: 133 N・m { 13.6 kgf・m / 98 lb・ft }



1	Idle gear C	4	PTO gear	7	Oil pump drive gear
2	Camshaft gear	5	PTO idle gear	8	Supply pump gear
3	Idle gear B	6	Crankshaft gear	9	Idle gear A

tightening torque: 29 N・m { 3.0 kgf・m / 21 lb・ft. } Eyebolt
tightening torque: 24 N・m { 2.4 kgf・m / 17 lb・ft. } Clip



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1	Turbocharger assembly
2	Oil feed pipe
3	Oil return pipe

[14] Install the exhaust pipe to the turbocharger assembly.
[15] Install the air intake hose to the turbocharger assembly and the intercooler.
[16] Install the air cleaner duct to the air cleaner assembly and the turbocharger assembly.
[17] Connect the harness connector to the turbocharger assembly.

32. Engine harness connect
[1] Connect the engine harness to the engine assembly.

Note
・Connect each connector.

33. Engine oil filling
[1] Replenish the engine oil with the engine assembly.

Note
・Add engine oil up to the MAX position of the oil level gauge.

Caution
・Confirm the tightening of the oil pan drain before adding engine oil.

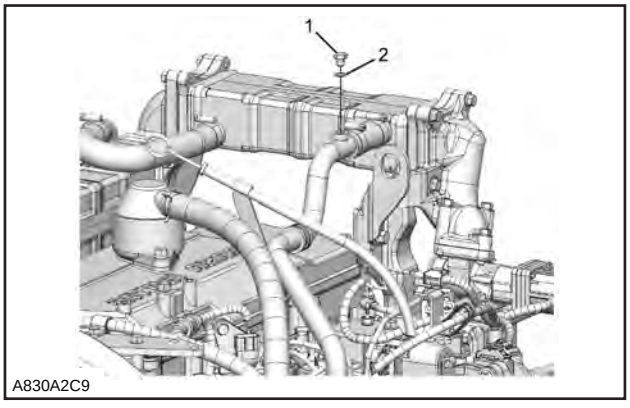
34. Battery ground cable connect
[1] 1. Connect the battery ground cable to the battery.

35. Coolant filling

Caution
・Work while taking care to prevent excess coolant from splashing onto the exhaust system parts.
・Wipe off any excess coolant.

[1] Loosen the air bleeding plug using a wrench.

Note
・If the EGR cooler has an air bleeding plug, loosen the plug.
・With the pressurized reserve tank specification, it is not necessary to bleed the air.



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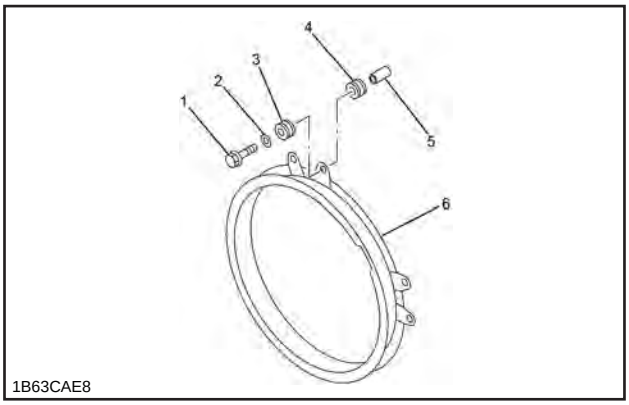
1	Air bleeding plug
2	Gasket

[2] Replenish the radiator with coolant.

Caution
・Add slowly to prevent air from entering the system.

6. Fan guide removal

[1] Remove the fan guide from the fan guide bracket.

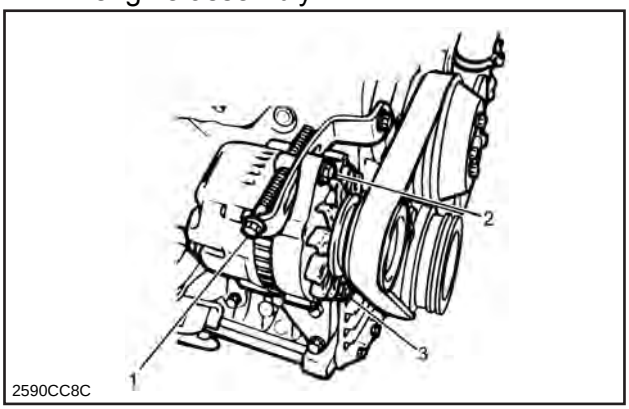


1	Bolt
2	Washer
3	Rubber mount
4	Rubber mount
5	Guide tube
6	Fan guide

[2] Remove the fan guide bracket from the engine assembly.

7. Cooling fan belt removal

[1] Remove the cooling fan belt from the engine assembly.



1	Adjust bolt
2	Fixing bolt
3	Fixing bolt

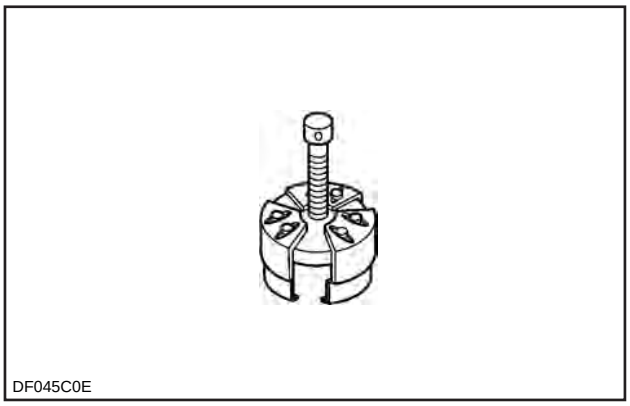
8. Crankshaft pulley removal

[1] Remove the crankshaft pulley from the crankshaft.

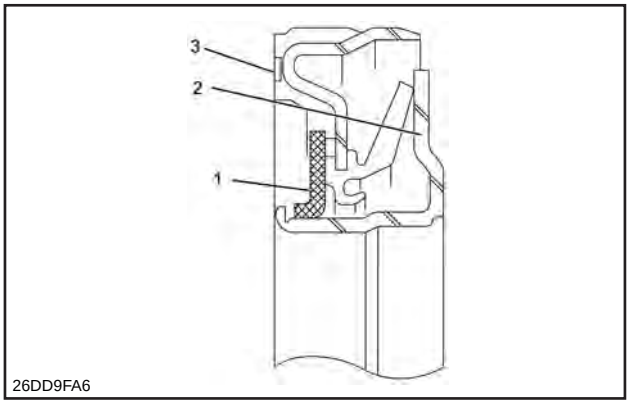
[2] Remove the crankshaft damper from the crankshaft pulley.

9. Crankshaft front oil seal removal

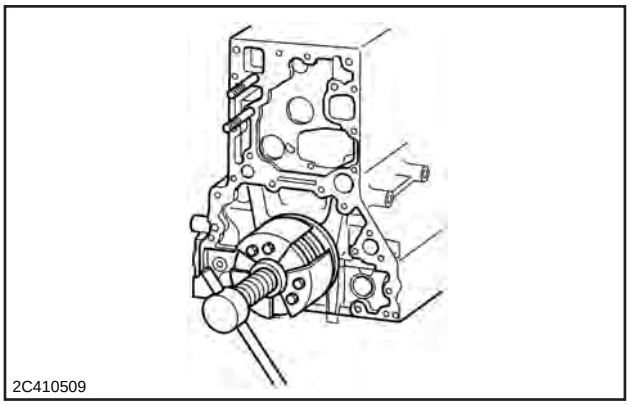
[1] Remove the crankshaft front oil seal from the crankshaft using the special tool.



SST: 5-8840-2360-0 - rear oil seal remover



1	Felt
2	Slinger
3	Crankshaft front oil seal



⚠ Caution

・Be careful not to damage the oil seal pressfitting surface.

[4] Align the idle gear A to alignment mark.

Note

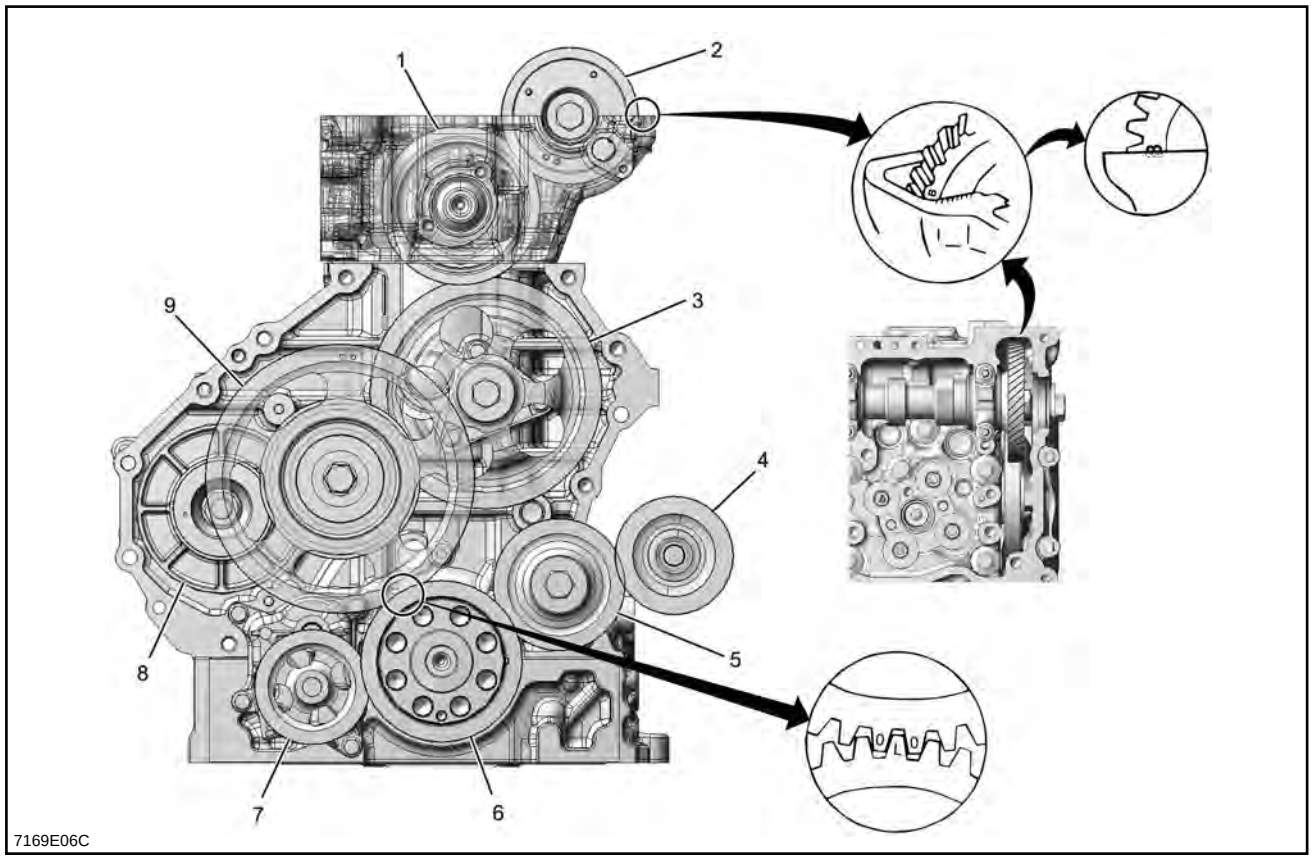
・Align the L mark on the crank gear with the O mark on the idle gear A.

[5] Apply the engine oil to the bolt.

Note

・Apply engine oil to the threaded portion and seat surface on the idle gear A installation bolt.

[6] Install the idle gear A to the cylinder block.
tightening torque: 133 N・m { 13.6 kgf・m / 98 lb・ft. }



1	Idle gear C	4	PTO gear	7	Oil pump drive gear
2	Camshaft gear	5	PTO idle gear	8	Supply pump gear
3	Idle gear B	6	Crankshaft gear	9	Idle gear A

7. Flywheel housing installation

[1] Clean the cylinder block using the scraper.

Note

・Remove dust and oil from the flywheel housing installation area.

[2] Apply the liquid gasket to the flywheel housing.

Note

・Refer to the diagram and apply the ThreeBond 1207B to the flywheel housing.

[8] Final tighten EGR pipe B to the bracket.
tightening torque: 48 N・m { 4.9 kgf・m / 35 lb・ft. } Diagram No. 3

[9] Final tighten EGR cooler B to EGR pipe C.
tightening torque: 24 N・m { 2.4 kgf・m / 18 lb・ft. } Diagram No. 4

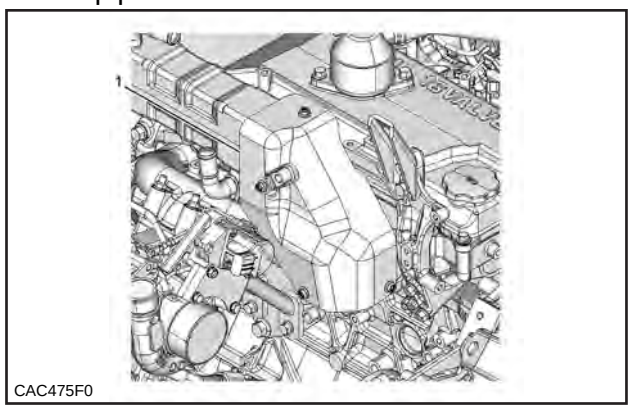
[10] Final tighten EGR pipe B to EGR cooler B.
tightening torque: 24 N・m { 2.4 kgf・m / 18 lb・ft. } Diagram No. 5

[11] Final tighten EGR cooler A to EGR pipe B.
tightening torque: 24 N・m { 2.4 kgf・m / 18 lb・ft. } Diagram No. 6

[12] Final tighten EGR pipe A to the exhaust manifold.
tightening torque: 28 N・m { 2.9 kgf・m / 21 lb・ft. } Diagram No. 7

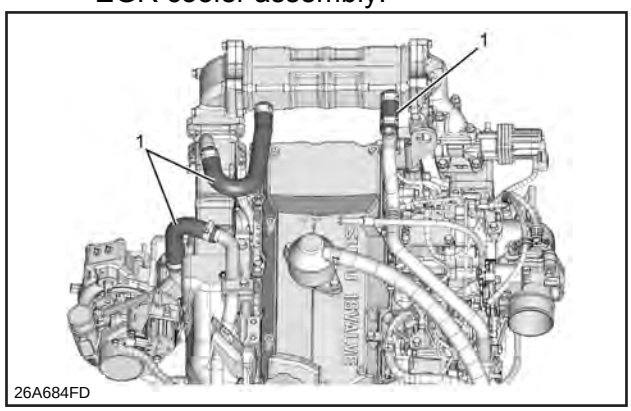
[13] Final tighten EGR pipe A to EGR cooler A.
tightening torque: 28 N・m { 2.9 kgf・m / 21 lb・ft. } Diagram No. 8

[14] Install the EGR heat protector to EGR pipe A.



1	EGR heat protector

[15] Connect the water rubber hose to the EGR cooler assembly.



1	Water rubber hose

38. EGR gas temperature sensor 2 installation

Caution

・Check the EGR gas temperature sensor 2 connector color, and take care not to assemble incorrectly.
・Because the connector color cannot be identified using the outer surface if the exterior is painted, remove the connector and identify it using the connector interior color.
・If it is difficult to determine the color, remove the connectors of EGR gas temperature sensor 2 and the IMT sensor, and determine the color using the connector interior color.

Sensor name	Connector color
EGR gas temperature sensor 2	Light gray
IMT sensor	Gray

Caution

・Do not subject the tip of the sensor to impact when installing the EGR gas temperature sensor.
・Do not reuse an EGR gas temperature sensor that has been subjected to impact due to being dropped, etc.

[1] Apply anti-seize lubricant to EGR gas temperature sensor 2.

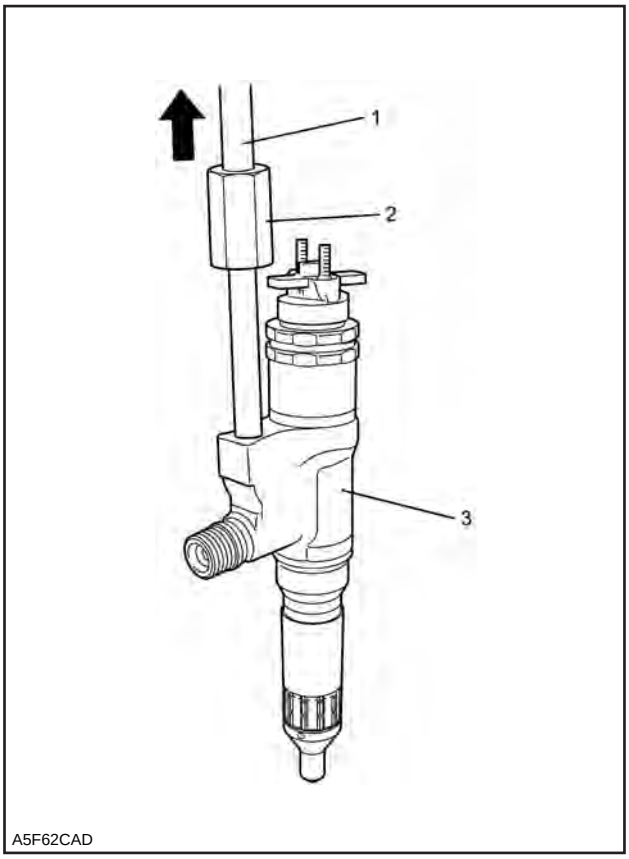
Note

・Apply High Temperature Stainless Never-Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of EGR gas temperature sensor 2.

[2] Install EGR gas temperature sensor 2 to EGR pipe C.
tightening torque: 19.6 N・m { 2.0 kgf・m / 14 lb・ft. }

[3] Install the harness bracket to EGR pipe C.
tightening torque: 23.5 N・m { 2.4 kgf・m / 17 lb・ft. }

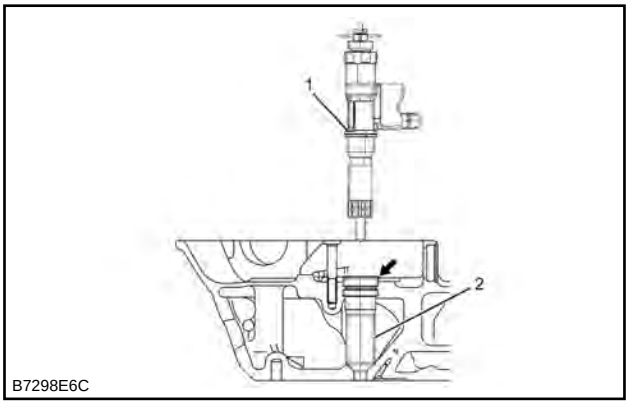
[4] Connect the harness connector to EGR gas temperature sensor 2.



1	Sliding hammer
2	Fuel injector remover
3	Injector

Caution

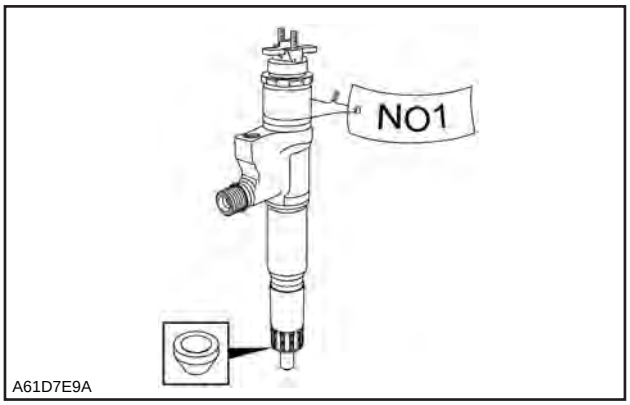
- When removing the injector using the special tool, check that the injector sleeve has not been removed as well.



1	Injector
2	Injector sleeve

Caution

- Confirm that the sleeve is not pulled out together when pulling out the injector using a special tool.
- Store each ID code plate on the injector head with the cylinder number tag attached to avoid a mix-up.
- Be extremely careful not to damage the injector nozzle.

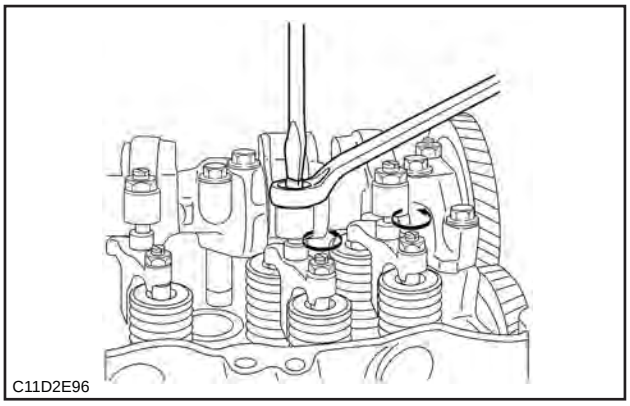


24. Rocker arm shaft removal

[1] Loosen the adjust screw using the wrench.

Note

- Loosen all valve clearance adjustment screws.



[2] Remove the rocker arm shaft from the cylinder head assembly.

Note

- Evenly loosen the rocker arm shaft bracket and the rocker arm assembly bracket tightening bolts from both ends and remove them.

[6] Add coolant to the radiator reserve tank.

Note

- Add up to the MAX line of the radiator reserve tank.
- Perform the urea SCR dosing module coolant piping air bleeding process while referring to the owner's manual from the machinery manufacturer.

Caution

- Wipe off any excess coolant.

[7] Start the engine.

Note

- Idle the engine for 5 minutes.

[8] Stop the engine.

[9] Remove the radiator cap from the radiator.

Caution

- Do not loosen the radiator cap or sub-tank cap when the coolant temperature is high.
- Because steam and boiling water can burst out from the radiator and possibly cause burns, check that the engine has cooled.

[10] Replenish the radiator with coolant.

Note

- Add an amount of coolant equal to the difference between the remaining coolant level and the radiator cap mouth.

Caution

- If the coolant amount is excessively low, inspect for coolant leakage.

[11] Install the radiator cap to the radiator.

Caution

- Securely attach the radiator cap.

[12] Start the engine.

Note

- For models with heaters, the set temperature and blower speed are set to the maximum, and warm up the engine at approximately 1500 - 2000 r/min.
- Touch the radiator upper hose, and confirm that it has become warm.

Caution

- If the upper hose is not warm, perform step 12 again.

Note

- Idle the engine for 5 minutes.

[13] Stop the engine.

[14] Remove the radiator cap from the radiator.

Caution

- Confirm that the engine has cooled.

[15] Replenish the radiator with coolant.

Note

- Add an amount of coolant equal to the difference between the remaining coolant level and the radiator cap mouth.

Caution

- If the coolant amount is excessively low, inspect for coolant leakage.

[16] Install the radiator cap to the radiator.

Caution

- Securely attach the radiator cap.

[17] Add coolant to the radiator reserve tank.

Note

- Add up to the MAX line of the radiator reserve tank.

Caution

- If the level of the radiator reserve tank has fallen the next morning, add coolant up to the MAX line.

Installation of Flywheel

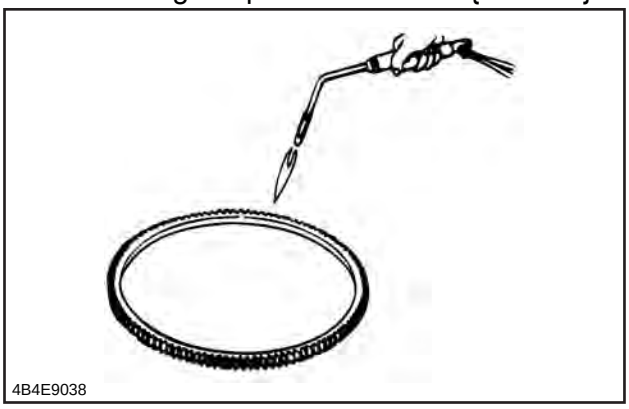
1. Ring gear installation

[1] Heat the ring gear with the gas burner.

Note

・Evenly heat the inside of the ring gear.

heating temperature: 200 °C { 392 °F }



[2] Install the ring gear to the flywheel.

Caution

・Turn the ring gear so that the chamfered surface faces the flywheel and install.

・After shrink-fitting, check that the ring gear is airtight against the flywheel.

2. Flywheel installation

[1] Apply the disulfide molybdenum grease to the bolt.

Note

・Apply to the seat surface and threaded portion on the flywheel installation bolts.

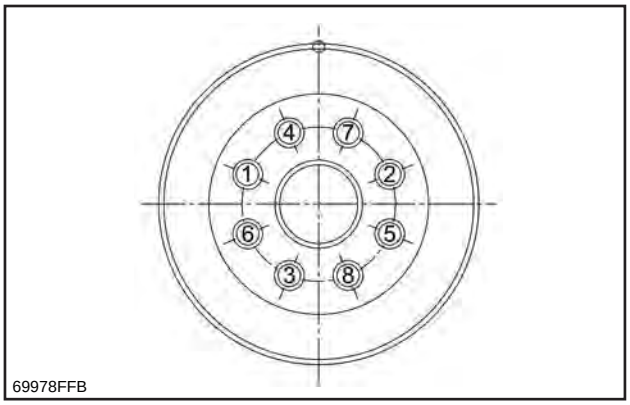
[2] Install the flywheel to the crankshaft.

Caution

・Pay attention to the knock pin position of the crankshaft.

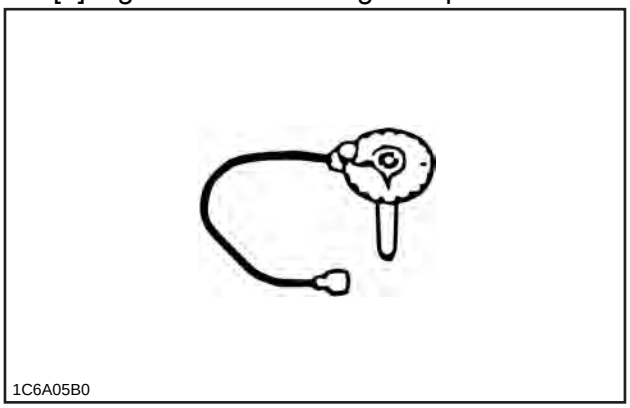
Note

・Tightening order



[3] Tighten the bolt using the torque wrench.
tightening torque: 78 N・m { 8.0 kgf・m / 58 lb・ft. }

[4] Tighten the bolt using the special tool.



SST: 5-8840-0266-0 - angle gauge

tightening angle: 120 °

3. CKP sensor installation

[1] Install the CKP sensor to the flywheel housing.

Caution

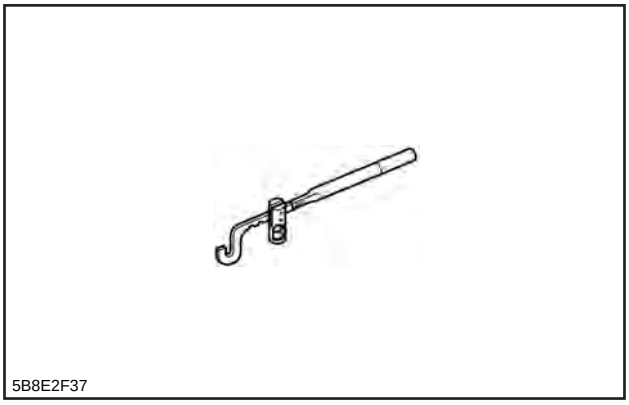
・Be careful not to subject the sensor to shock.

Note

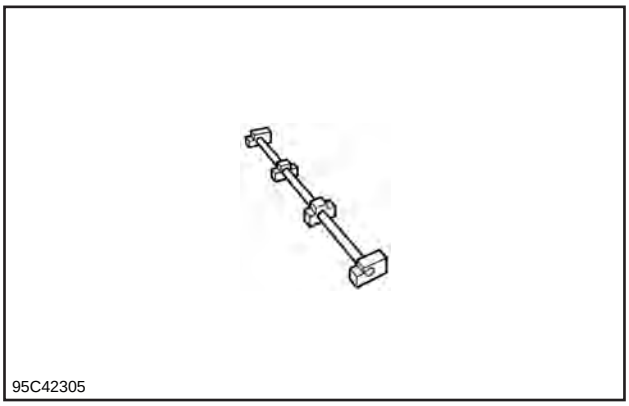
・Tighten together with the clip.

tightening torque: 6 N・m { 0.6 kgf・m / 4 lbf・ft. }

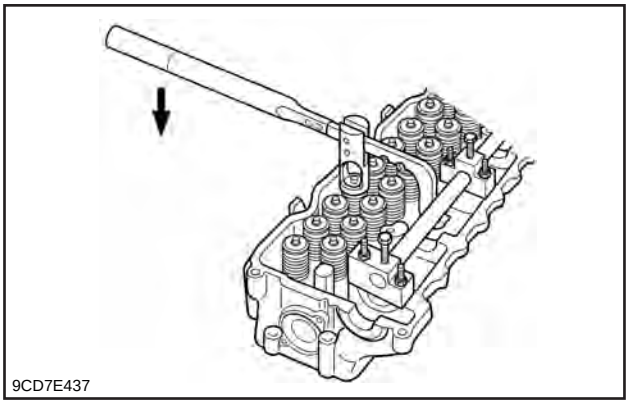
[2] Press the valve spring using the special tool.



SST: 5-8840-2621-0 - valve spring replacer



SST: 8-9439-6862-0 - pivot ASM



[3] Remove the split collar from the spring seat.

[4] Remove the special tool from the cylinder head assembly.

[5] Remove the valve spring seat from the valve spring.

[6] Remove the valve spring from the cylinder head assembly.

Note

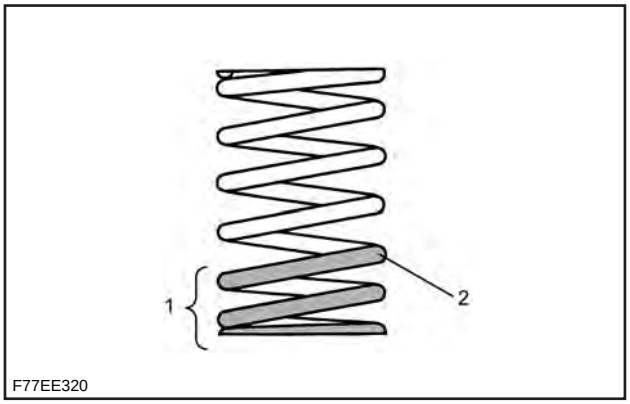
・Store the removed valve springs according to the cylinders.

Installation of Valve Spring

1. Valve spring installation

[1] Check the identification paint of the valve spring.

Valve spring identification paint	
Inlet	Light blue
Exhaust	White



1	Spring pitch (small)
2	Identification paint

[2] Install the valve spring to the cylinder head assembly.

Note

・Turn the valve spring to face the identification paint application area towards the cylinder head assembly.

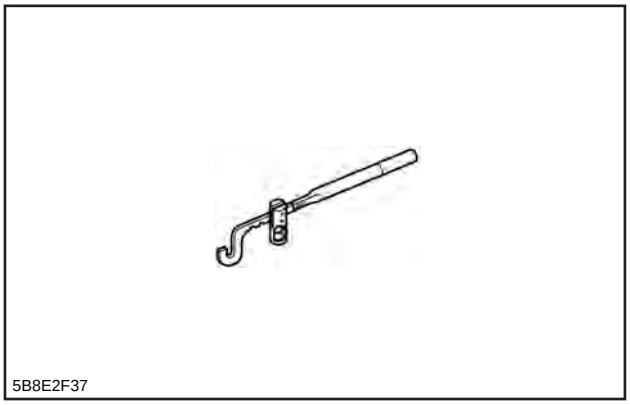
[3] Install the spring seat to the valve spring.

[4] Secure the valve using air.

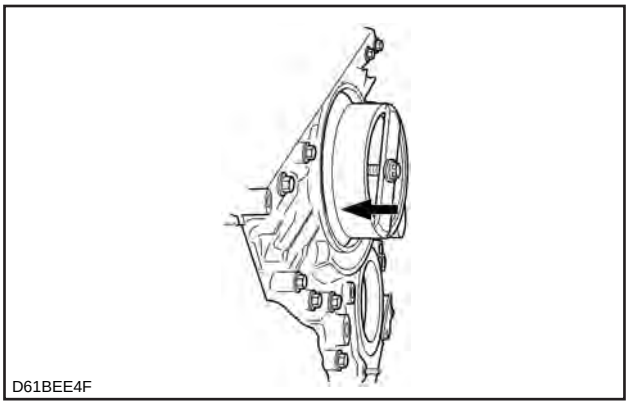
Note

・Secure the valve on the closed position by blowing the compressed air into the cylinder from the glow plug hole.

[5] Press the valve spring using the special tool.



SST: 5-8840-2621-0 - valve spring replacer

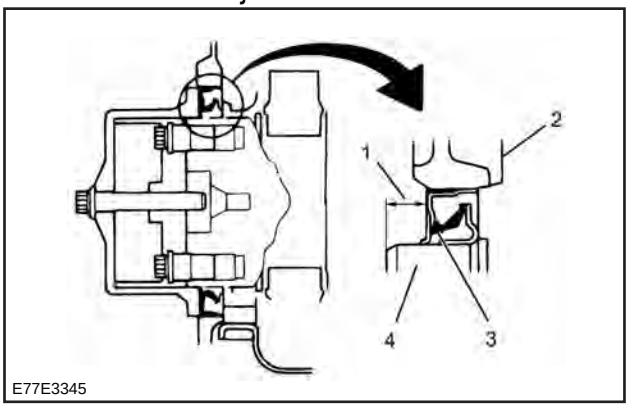


[9] Inspect the crankshaft front oil seal.

Note

・Measure the distance between the crankshaft head and the crankshaft front oil seal.

specified value: 30.7 - 31.3 mm { 1.2087 - 1.2323 in }



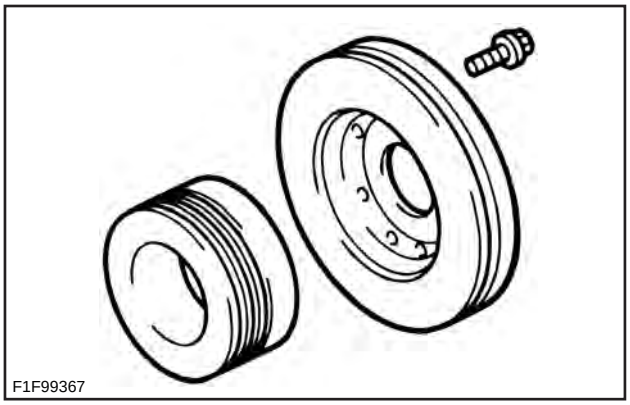
1	Oil seal press-fitting measurement
2	Front cover
3	Crankshaft front oil seal
4	Crankshaft

4. Crankshaft pulley installation

[1] Install the crankshaft damper to the crankshaft pulley.
tightening torque: 48 N・m { 4.9 kgf・m / 35 lb・ft. }

Note

・Tighten the bolts in a diagonal line order.



[2] Install the crankshaft pulley to the crankshaft.

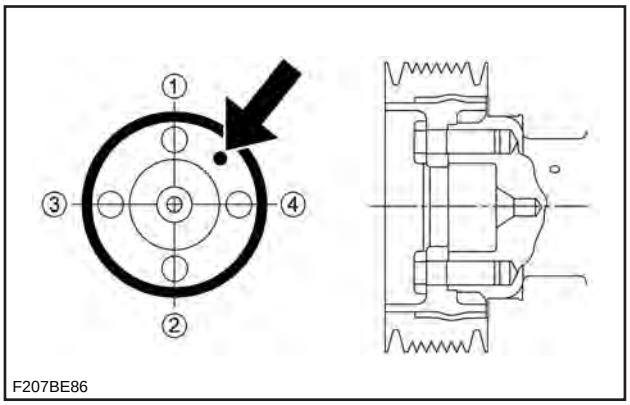
Caution

・Pay attention to the knock pin position of the crankshaft.

tightening torque: 200 N・m { 20.4 kgf・m / 148 lb・ft } Apply engine oil on the threaded area of bolt

Note

・Tightening order



5. Cooling fan belt installation

[1] Install the cooling fan belt to the engine assembly.

6. Cooling fan belt adjustment

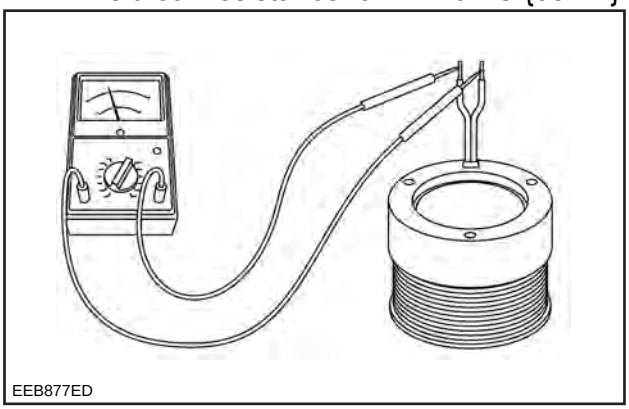
[1] Press the cooling fan belt.

Note

・Measure the amount of cooling fan belt flex by pressing on the point indicated by the arrow in the diagram with the specified pressure.

standard: 98 N { 10.0 kg / 22 lb }
specified value: 6.0 - 8.0 mm { 0.2362 - 0.3150 in. } Amount of flex

field coil resistance: 6.7 Ω 20 ˚ C {68 ˚ F}



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Caution

・Replace the field coil if the measured value is not within the range of the specified value.

8. Bearing inspection

[1] Inspect the bearing.

Note

・Inspect the grease leakage.

・Rotate the bearings with your hands, and inspect for abnormalities such as noise or looseness.

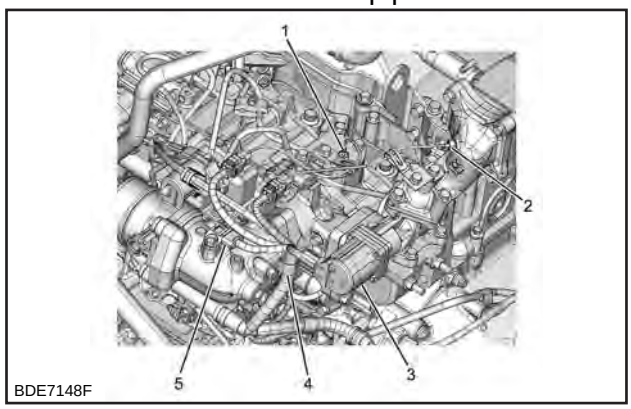
Removal and installation of Pressure Sensor/Boost Temperature Sensor

Removal of Pressure Sensor/Boost Temperature Sensor

1. Battery ground cable disconnect
   [1] Disconnect the battery ground cable from the battery.

> ⚠ Caution
>
> ・While the indicator (LED) of the battery disconnect switch is lit, do not turn OFF the battery disconnect switch or disconnect its negative cable from the battery. (After key OFF, lit for a maximum duration of 3 minutes)

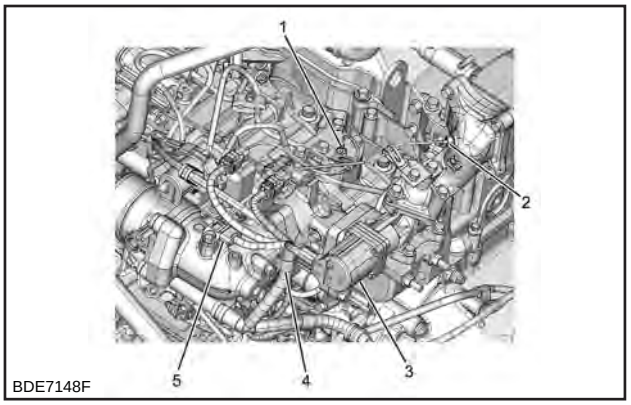
2. Pressure sensor/boost temperature sensor removal
   [1] Disconnect the harness connector from the boost pressure sensor/boost temperature sensor.
   [2] Remove the boost pressure sensor/ boost temperature sensor from the inlet pipe.



1	IMT sensor
2	EGR gas temperature sensor 2
3	EGR valve
4	Harness clip
5	Boost pressure sensor/boost temperature sensor

Installation of Pressure Sensor/Boost Temperature Sensor

1. Pressure sensor/boost temperature sensor installation
   [1] Install the boost pressure sensor/boost temperature sensor to the inlet pipe. tightening torque: 5 N・m { 0.5 kgf・m / 4 lbf・ft. }
   [2] Connect the harness connector to the boost pressure sensor/boost temperature sensor.



1	IMT sensor
2	EGR gas temperature sensor 2
3	EGR valve
4	Harness clip
5	Boost pressure sensor/boost temperature sensor

2. Battery ground cable connect
   [1] Connect the battery ground cable to the battery.

Inspection of Pressure Sensor/Boost Temperature Sensor

1. Pressure sensor/boost temperature sensor inspection
   [1] Inspect the boost pressure sensor/boost temperature sensor.

> Note
>
> ・Body fouling
> ・Body damage
> ・Terminal malfunction

> ⚠ Caution
>
> ・The sensor body must not be cleaned because doing so may damage the sensor internally.

Diagnostic trouble code	Diagnostic trouble mode	130X4 160X4	210X4 245X4 250X4 250X4-TL	300X4 350X4 290X4-TL 380X4-MH	490X4
P2457	Diagnostic trouble code_P2457: EGR cooler performance deterioration	○	○	○	○
P2458	Diagnostic trouble code_P2458: Excessive PURGE time-outs	○	○	○	○
P2BA7	Diagnostic trouble code_P2BA7: Urea solution shortage	-	○	○	○
P2BAA	Diagnostic trouble code_P2BAA: SCR SYSTEM abnormality (with inducement, purge prohibited)	○	○	○	○
P3093	Diagnostic trouble code_P3093: Fuel rail pressure low pressure abnormality	○	○	○	○
U0001	Diagnostic trouble code_U0001: ISO-CAN Bus abnormality	○	○	○	○
U0073	Diagnostic trouble code_U0073: CAN Bus abnormality	○	○	○	○
U0101	Diagnostic trouble code_U0101: CAN time-out abnormality	○	○	○	○
U010E	Diagnostic trouble code_U010E: DCU communication abnormality	○	○	○	○
U0110	Diagnostic trouble code_U0110: CAN VNT time-out abnormality	-	○	○	○
U2106	Diagnostic trouble code_U2106: Wheel Loader CAN time-out abnormality	-	-	○	○
U0411	Diagnostic trouble code_U0411: VNT communication abnormality	-	○	-	○

<DCU diagnostic trouble code>

Diagnostic trouble code	Diagnostic trouble mode	130X4 160X4	210X4 245X4 250X4 250X4-TL	300X4 350X4 290X4-TL 380X4-MH	490X4
P0607	Diagnostic trouble code_P0607: Control module characteristic abnormality	○	○	○	○
P060B	Diagnostic trouble code_P060B: Control module A/D conversion processing device abnormality	○	○	○	○
P062F	Diagnostic trouble code_P062F: Control module EEPROM abnormality	○	○	○	○
P0641	Diagnostic trouble code_P0641: Sensor reference voltage abnormality	○	○	○	○
P0658	Diagnostic trouble code_P0658: Actuator supply power feed system abnormality	○	○	○	○
P0659	Diagnostic trouble code_P0659: Actuator supply power feed system abnormality	○	○	○	○
P1462	Diagnostic trouble code_P1462: Urea solution quality sensor time-out abnormality	○	○	○	○
P1464	Diagnostic trouble code_P1464: Main relay abnormality (Early OPEN error/sticking error of main relay)	○	○	○	○

[16] If the reading is less than or equal to the specified value, inspect the GND circuit between the ECM and the IAT sensor for an open circuit or high resistance.

Note

・The IAT sensor shares the GND circuit with other sensors.
・DTCs on sensors that share this circuit may be set.

[17] If a problem is found, repair the GND circuit.
[18] Inspect the signal circuit between the ECM and the IAT sensor for an open circuit or high resistance.
[19] If a problem is found, repair the signal circuit.
[20] Inspect for poor connections at the ECM harness connector.
[21] If a problem is found, repair the harness connector.
[22] If the harness connector is normal, replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".
[23] Set the Injector ID Code and engine No. on the ECM.
[24] Use the device test on the service monitor to perform SCR purging.
See "Service Monitor - Device Test - SCR RE-GEN".

3. DTC P0113 confirm resolution
[1] Execute DCU MEMORY CLEAR and ECM MEMORY CLEAR sequentially during the device test of the service monitor to reset the diagnostic trouble code.
Refer to "Service Monitor - Device Test - ECM/DCU Memory Clear".
・ Note that all the generated diagnostic trouble codes will be cleared.
[2] Turn OFF the starter switch for 1 minute or more.
[3] Start the engine.
[4] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting the DTCs such as engine run time or coolant temperature, etc., vary depending on the DTCs.

[5] Display FAULT HISTORY on the service support screen on the monitor and check that no DTC has been detected.
See "Service Support - FAULT HISTORY".

DTC P0335 Crankshaft Position Sensor Circuit

1. DTC P0335 priority DTC
   DTC P0340
   DTC P06A6
2. DTC P0335 diagnostics
   [1] Turn OFF the starter switch.
   [2] Disconnect the harness connector from the CKP sensor.
   [3] Turn ON the starter switch.
   [4] Measure the voltage between the 5 V power supply circuit and normal GND of the CKP sensor harness connector.
   voltage: 4.5 V
   [5] If the reading is less than or equal to the specified value, inspect to see if there is an open circuit or high resistance with the 5 V power supply circuit between the ECM and the CKP sensor.

Note

- The CKP sensor shares the 5 V power supply circuit with other sensors.
- The DTC set on a sensor which shares this circuit may be detected.

   [6] If a problem is found, repair the 5 V power supply circuit.
   [7] Measure the voltage between the signal circuit and normal GND of the CKP sensor harness connector.
   voltage: 5.5 V
   [8] If the reading is more than or equal to the specified value, inspect to see if there is a short circuit to the battery or ignition power supply with the signal circuit between the ECM and the CKP sensor.
   [9] If a problem is found, repair the signal circuit.
   [10] Measure the voltage between the signal circuit of the CKP sensor harness connector and a normal GND again.
   voltage: 4.5 V
   [11] If the reading is less than or equal to the specified value, inspect the signal circuit between the ECM and the CKP sensor.

Note

- There should be no open circuit or high resistance.
- There should be no short to GND.

   [12] If a problem is found, repair the signal circuit.
   [13] Connect the test light between the signal circuit and normal GND of the CKP sensor harness connector.
   [14] Measure the voltage between the probe of the test light and a normal GND.
   voltage: 4.5 V
   [15] If the reading is more than or equal to the specified value, inspect to see if there is a short circuit to the 5 V power supply circuit with the signal circuit between the ECM and the CKP sensor.
   [16] If a problem is found, repair the signal circuit.
   [17] Measure the voltage between the 5 V power supply circuit and GND circuit of the CKP sensor harness connector.
   voltage: 4.5 V
   [18] If the reading is more than or equal to the specified value, inspect to see if there is a poor connection with the CKP sensor harness connector.
   [19] If a problem is found, repair the harness connector.
   [20] If the harness connector is normal, inspect the CKP sensor.
   Refer to "CKP sensor inspection".
   [21] If a problem is found, replace the CKP sensor.
   Refer to "CKP sensor removal".
   Refer to "CKP sensor installation".
   [22] Inspect the GND circuit between the ECM and the CKP sensor for an open circuit and high resistance.

Note

- The CKP sensor shares the GND circuit with other sensors.
- The DTC set on a sensor which shares this circuit may be detected.

   [23] If a problem is found, repair the GND circuit.

voltage: 0.1 V

[16] If the reading is less than or equal to the specified value, inspect the EGR gas temperature sensor 1 GND circuit for an open circuit or high resistance.

Note

・EGR gas temperature sensor 1 shares the GND circuit with other sensors.
・DTCs on sensors that share this circuit may be set.

[17] If a problem is found, repair the GND circuit.

[18] Inspect the EGR gas temperature sensor 1 signal circuit for an open circuit or high resistance.

[19] If a problem is found, repair the signal circuit.

[20] Inspect for poor connections at the ECM harness connector.

[21] If a problem is found, repair the harness connector.

[22] If the harness connector is normal, replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".

[23] Set the Injector ID Code and engine No. on the ECM.

[24] Use the device test on the service monitor to perform SCR purging.
See "Service Monitor - Device Test - SCR RE-GEN".

3. DTC P0546 confirm resolution

[1] Execute DCU MEMORY CLEAR and ECM MEMORY CLEAR sequentially during the device test of the service monitor to reset the diagnostic trouble code.
Refer to "Service Monitor - Device Test - ECM/DCU Memory Clear".
・ Note that all the generated diagnostic trouble codes will be cleared.

[2] Turn OFF the starter switch for 1 minute or more.

[3] Start the engine.

[4] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting the DTCs such as engine run time or coolant temperature, etc., vary depending on the DTCs.

[5] Display FAULT HISTORY on the service support screen on the monitor and check that no DTC has been detected.
See "Service Support - FAULT HISTORY".

[33] Check to see if there is any foreign matter in the fuel tank or any foreign matter which can cause fuel clogging.

[34] If a problem is found, repair it.

[35] Replace the fuel filter element.
Refer to "Fuel filter element removal".
Refer to "Fuel filter element installation".

[36] If the negative pressure is less than or equal to the specified value, pinch the fuel hose at a position as close as possible to the fuel tank, so that the fuel does not flow.

Note

・The fuel pipe can be disconnected and clogged with a plug.

[37] Start the engine and increase the engine speed up to the maximum engine speed.

[38] Check the pressure gauge.
values: (-27.0) kPa { 8 inHg / (-4) psi }

Note

・If the pressure gauge is likely to indicate a value exceeding the specified value during inspection, release the fuel being blocked.

・Air mixture is checked with the negative pressure amount while the fuel flow is being blocked.

[39] If the specified negative pressure cannot be generated, inspect to see if there is a cut or crack with the fuel hose.

[40] If a problem is found, replace the fuel hose.

[41] Inspect to see if appropriate clamp is used.

[42] If a problem is found, replace the clamp with an appropriate one.

[43] Turn OFF the starter switch.

[44] Inspect the suction control valve harness connector for a poor connection.

[45] If a problem is found, repair the harness connector.

[46] Inspect the ECM harness connector for a poor connection.

[47] If a problem is found, repair the harness connector.

[48] Inspect each circuit for high resistance.

[49] If a problem is found, repair the circuit.

[50] If the suction control valve harness connector and the ECM harness connector are normal and there is no high resistance in each circuit, replace the fuel supply pump and the fuel filter element.
Refer to "Fuel supply pump removal".
Refer to "Fuel supply pump installation".
Refer to "Fuel filter element removal".
Refer to "Fuel filter element installation".

Note

・When replacing the fuel supply pump, it is required to also replace the fuel filter element at the same time.

[51] If the negative pressure is normal, turn OFF the starter switch.

[52] Restore the fuel system.

[53] Start the engine.

[54] Use the device test on the service monitor to perform an injector balance test.
See "Service Monitor - Device Test - Injector Balance Test".

[55] Check to see if any injector does not change the engine speed when OFF is instructed.

[56] If any injector does not change the engine speed when OFF is instructed, replace the relevant injector.
Refer to "Injector removal".
Refer to "Injector installation".

[57] When the injector has been replaced, set the injector ID Code on the ECM.

[58] If the engine speed changes when OFF is instructed to all injectors, replace the pressure limiter valve.
Refer to "Common rail assembly removal".
Refer to "Common rail assembly installation".

Note

・The pressure limiter valve may be fixed open, or the operation pressure may decrease.

・Do not replace the pressure limiter valve separately. If a problem is found, replace the common rail assembly.

[14] Disconnect the harness connector from the ECM.
[15] Inspect the ECM harness connector for a poor connection.
[16] If a problem is found, repair the harness connector.
[17] Inspect to see if there is an open circuit or high resistance with the charge voltage circuit between the ECM and the injector harness intermediate connector.
[18] If a problem is found, repair the charge voltage circuit.
[19] Remove the cylinder head cover.
Refer to "Cylinder head cover removal".
[20] Inspect the injector harness tightening nut for looseness.
[21] If the injector harness tightening nut is loose, tighten it.
[22] Inspect to see if any foreign matter is attached to the injector terminal.
[23] If any foreign matter is attached to the injector terminal, remove it.
[24] Inspect the injector harness intermediate harness connector for a poor connection.
[25] If a problem is found, repair the intermediate harness connector.
[26] Check if the insulation resistance of the No.2 cylinder injector and No.3 cylinder injector is more than or equal to the specified value.
resistance: 1.0 MΩ
[27] If the reading is less than or equal to the specified value, replace the relevant injector.
Refer to "Injector removal".
Refer to "Injector installation".
[28] Set the injector ID Code on the ECM.
[29] If the reading is more than or equal to the specified value, repair or replace the injector harness.

2. DTC P2149 confirm resolution
[1] Display RESET on the service support screen on the monitor and reset FAULTY HISTORY.
See "Service Support - RESET Screen List".
・ Note that all the generated DTCs will be cleared.
[2] Turn OFF the starter switch for 1 minute or more.
[3] Start the engine.
[4] Perform a test-run under the conditions for running the DTC.

Note
・ Conditions for setting the DTCs such as engine run time or coolant temperature, etc., depending on the DTCs.

[5] Display ENGINE STATUS on the service support screen on the monitor and check that no DTC has been detected.
See "Service Support - ENGINE STATUS".

Diagnostic trouble code_P0659: Actuator Supply Power Feed System Abnormality

1. Diagnostic trouble code: P0659 - Diagnostic trouble code to be addressed with higher priority
   Diagnostic trouble code: P208D
   Diagnostic trouble code: P20A3
   Diagnostic trouble code: P20B4
2. Diagnostic trouble code P0659 diagnostics
   [1] Turn OFF the starter switch.
   [2] Disconnect the coolant control valve harness connector.
   [3] Inspect the coolant control valve harness connector.

Note

- There must not be any intermittent problems, poor contact or corrosion.
- Invasion by water or foreign matter should not be there.

   [4] Repair the connector if problems are found.
   [5] Turn ON the starter switch without starting the engine.
   [6] Check whether the diagnostic trouble code is detected on the monitor screen.
   Refer to "Function explanation - Diagnostic trouble code indicator"
   [7] If the diagnostic trouble code P20B1 is detected, and P0659 is not detected, replace the coolant control valve.
   Refer to "Removal of Coolant Control Valve".
   Refer to "Installation of Coolant Control Valve".
   [8] Turn OFF the starter switch.
   [9] Disconnect the urea solution supply module harness connector.

Note

- Urea solution pump, reverting valve, and urea solution pressure sensor are built in.

   [10] Inspect the urea solution supply module harness connector.

Note

- Invasion by water or foreign matter should not be there.
- There must not be any intermittent problems, poor contact or corrosion.

   [11] Repair the connector if problems are found.
   [12] Turn ON the starter switch without starting the engine.
   [13] Check whether the diagnostic trouble code is detected on the monitor screen.
   Refer to "Function explanation - Diagnostic trouble code indicator"
   [14] If the diagnostic trouble codes P20A0 and P20B1 are detected, and P0659 is not detected, replace the urea solution supply module.
   Refer to "Removal of Urea Solution Supply Module".
   Refer to "Installation of Urea Solution Supply Module".
   [15] If diagnostic trouble code P0659 is detected, inspect whether there is no short circuit to battery or ignition power supply in the battery voltage supply circuit between DCU and coolant control valve.
   [16] If any fault is found, repair the battery voltage supply circuit.
   [17] Inspect whether there is no short circuit to battery or ignition power supply in the battery voltage supply circuit between DCU and urea solution supply module.
   [18] If any fault is found, repair the battery voltage supply circuit.
   [19] Turn OFF the starter switch.
   [20] Disconnect the DCU harness connector.
   [21] Inspect the DCU harness connector.

Note

- There must not be any intermittent problems, poor contact or corrosion.
- Invasion by water or foreign matter should not be there.

   [22] Repair the connector if problems are found.
   [23] Replace the DCU.
   Refer to "Removal of DCU".
   Refer to "Installation of DCU".

Diagnostic trouble code_P205B: Urea Solution Tank Temperature Sensor Characteristic Abnormality

1. Diagnostic trouble code: P205B - Diagnostic trouble code to be addressed with higher priority
   All diagnostic trouble codes detected at the same time
2. Diagnostic trouble code: P205B diagnostics
   [1] At the same time, if there are detected diagnostic trouble codes, first, take an action.
   [2] Check that the components of body that cause abnormal high temperature are not installed around the urea solution tank.
   [3] Take action against abnormal high temperature if problems are found.
   [4] Check with the operator whether there was an external factor that caused abnormal high temperature near urea solution tank in the past.
   [5] If there is a possibility that abnormal high temperature has occurred in the past, inspect the corresponding locations.
   [6] Turn OFF the starter switch.
   [7] Disconnect the harness connector from the urea sensor.
   [8] Inspect the urea sensor harness connector.

Note

- There must not be any intermittent problems, poor contact or corrosion.
- Invasion by water or foreign matter should not be there.

   [9] Repair the connector if problems are found.
   [10] Replace the urea sensor.
   Refer to "Removal of Urea Sensor".
   Refer to "Installation of Urea Sensor".
3. Checking diagnostic trouble code P205B symptom resolution
   [1] Execute DCU MEMORY CLEAR in the device test of the service monitor to reset the diagnostic trouble code.
   Refer to "Service Monitor - Device Test ECM/DCU Memory Clear".
   - Note that all the generated diagnostic trouble codes will be cleared.

Note

- Check if the diagnostic trouble code P20C9 is detected at the ECM side when DCU diagnostic trouble codes are deleted.
- Delete if the diagnostic trouble code P20C9 is detected.

   [2] Turn OFF the starter switch.
   [3] Check that the difference between engine coolant temperature, intake air temperature and fuel temperature are below the standard value and then start the engine.
   5 ℃ {9 °F} or less (temperature difference)

Note

- If the difference of temperature is not within the condition of standard value, soak until the temperature is within the condition.

   [4] Enable the FAULT HISTORY and ensure that diagnostic trouble code is not detected on the service support screen of monitor.
   Refer to "Service Support - FAULT HISTORY".

Diagnostic trouble code_P20B3: Urea Solution Tank Heater Coolant Control Valve System Low Voltage Potential

1. Diagnostic trouble code: P20B3 diagnostics

[1] Turn OFF the starter switch.

[2] Disconnect the coolant control valve harness connector.

[3] Inspect the coolant control valve harness connector.

Note

- There must not be any intermittent problems, poor contact or corrosion on all terminals.
- Make sure that there are no open-circuit, high resistance point, and short circuit to all circuits.
- Invasion by water or foreign matter should not be there.

[4] Repair the connector if problems are found.

[5] Disconnect the DCU harness connector.

[6] Inspect the DCU harness connector.

Note

- There must not be any intermittent problems, poor contact or corrosion.
- Invasion by water or foreign matter should not be there.

[7] Repair the connector if problems are found.

[8] Inspect whether there is no open-circuit or high resistance point in the power supply circuit between DCU and coolant control valve.

[9] If any fault is found, repair power supply circuit.

[10] Inspect control circuit between DCU and coolant control valve.

Note

- Make sure that there is no short circuit to ground circuit.
- Make sure that there is no short circuit to metal components such as frame.

[11] If any fault is found, repair the control circuit.

[12] Turn ON the starter switch without starting the engine.

[13] Check the diagnostic trouble code on the monitor screen.
Refer to "Function explanation - Diagnostic trouble code indicator"

[14] If the diagnostic trouble code P20B1 is detected, and P20B3 is not detected, replace the coolant control valve.
Refer to "Removal of Coolant Control Valve".
Refer to "Installation of Coolant Control Valve".

[15] Turn OFF the starter switch.

[16] Replace the DCU.
Refer to "Removal of DCU".
Refer to "Installation of DCU".

2. Checking diagnostic trouble code P20B3 symptom resolution

[1] Execute DCU MEMORY CLEAR in the device test of the service monitor to reset the diagnostic trouble code.
Refer to "Service Monitor - Device Test ECM/DCU Memory Clear".

- Note that all the generated diagnostic trouble codes will be cleared.

Note

- Check if the diagnostic trouble code P20C9 is detected at the ECM side when DCU diagnostic trouble codes are deleted.
- Delete if the diagnostic trouble code P20C9 is detected.

[2] Turn OFF the starter switch.

[3] Turn ON the starter switch without starting the engine.

[4] Enable the FAULT HISTORY and ensure that diagnostic trouble code is not detected on the service support screen of monitor.
Refer to "Service Support - FAULT HISTORY".

3. Checking diagnostic trouble code U029E symptom resolution

[1] Execute DCU MEMORY CLEAR in the device test of the service monitor to reset the diagnostic trouble code.
Refer to "Service Monitor - Device Test ECM/DCU Memory Clear".

・ Note that all the generated diagnostic trouble codes will be cleared.

Note

・Check if the diagnostic trouble code P20C9 is detected at the ECM side when DCU diagnostic trouble codes are deleted.

・Delete if the diagnostic trouble code P20C9 is detected.

[2] Turn OFF the starter switch.

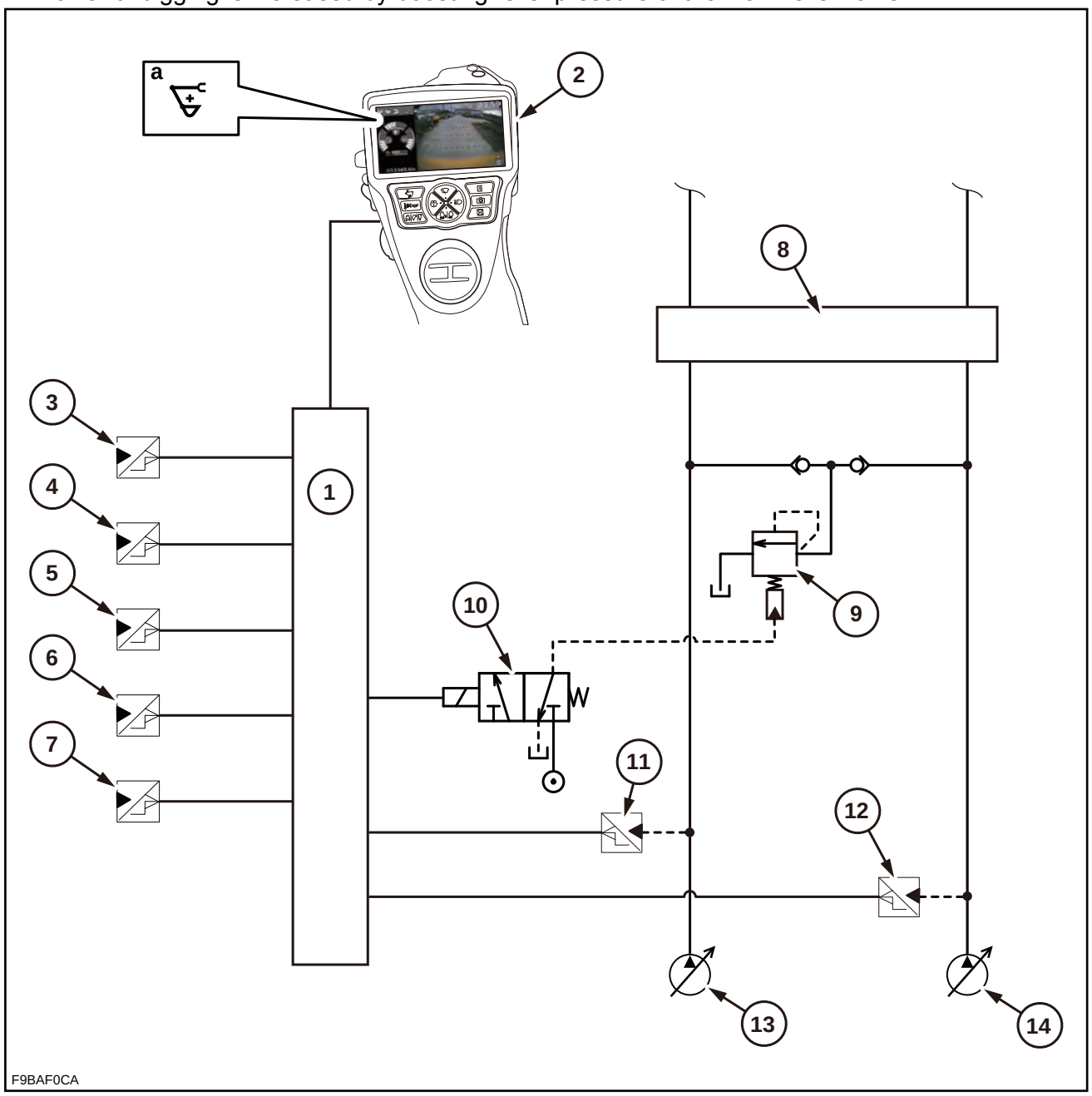
[3] Start the engine.

[4] Enable the FAULT HISTORY and ensure that diagnostic trouble code is not detected on the service support screen of monitor.
Refer to "Service Support - FAULT HISTORY".

Pressure Boost Control

<Purpose/Overview>

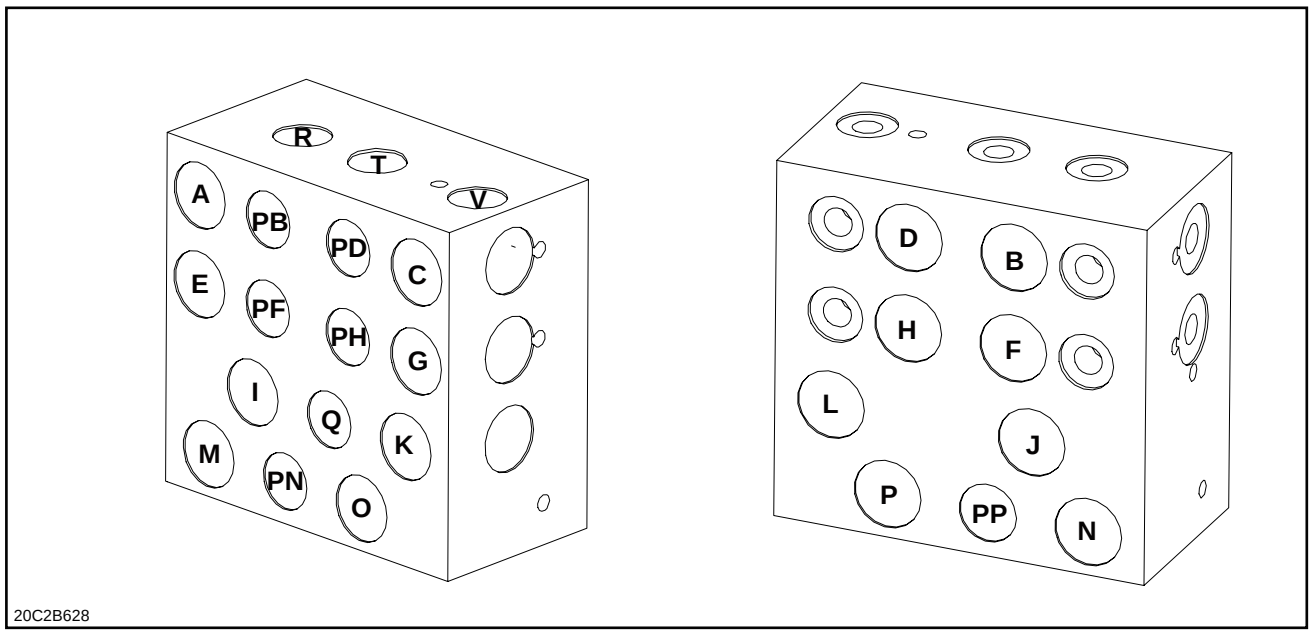
Power of digging is increased by boosting relief pressure of the main relief valve.



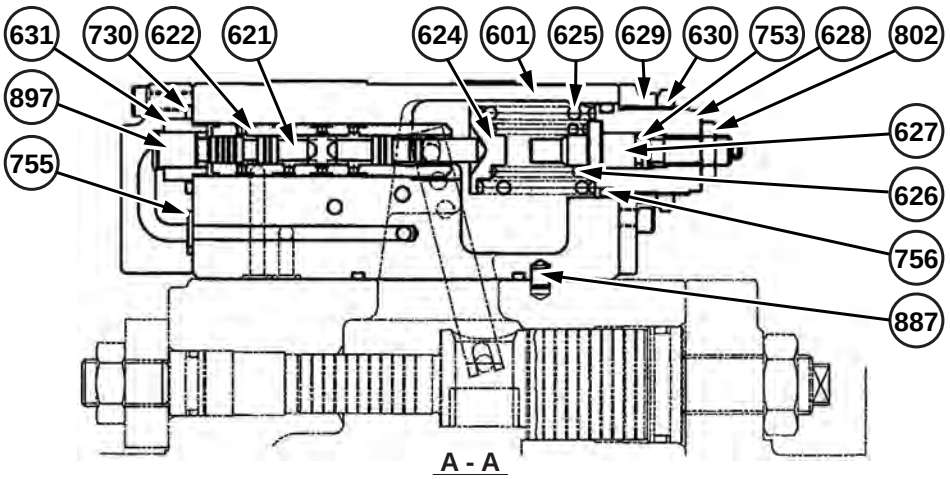
a	Auto pressure boost icon

1	Main controller	6	Pressure sensor (option 1)	11	P1 pressure sensor
2	Monitor	7	Pressure sensor (option 2)	12	P2 pressure sensor
3	Pressure sensor (upper)	8	Control valve	13	P2 pump
4	Pressure sensor (travel)	9	Main relief valve	14	P1 pump
5	Pressure sensor (swing)	10	Pressure boost solenoid		

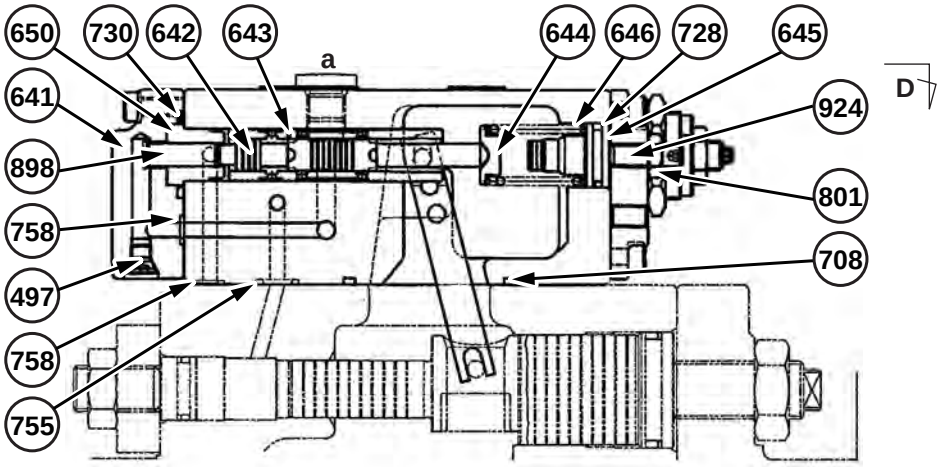
Cushion Valve



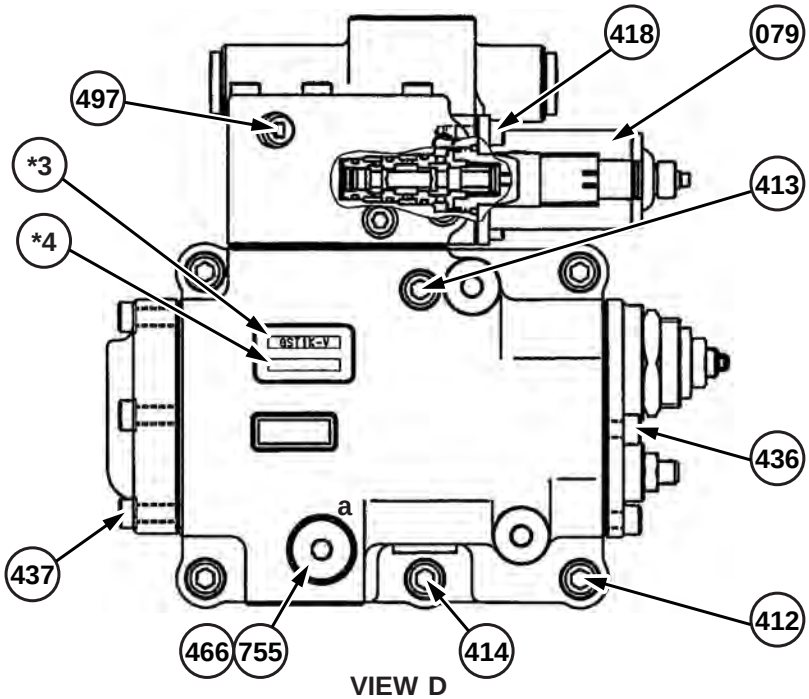
Port	Port name	Port size	Port	Port name	Port size
E, F	boom up	G3/8	V	–	G1/4
G, H	boom down	G3/8	T	Return (drain line)	G1/4
O, P	Bucket open	G3/8	R	Heat Circuit	G1/4
M, N	Bucket Close	G3/8	PD	Arm (out) pressure sensor signal	G1/4
C, D	arm out	G3/8	PB	Arm (in) pressure sensor signal	G1/4
A, B	arm in	G3/8	PF	Boom (up) pressure sensor signal	G1/4
K, L	Swing left	G3/8	PN	Bucket (close) pressure sensor signal	G1/4
I, J	Swing right	G3/8	PH	Boom (down) pressure sensor signal	G1/4
Q	Swing pressure sensor signal	G1/4	PP	Bucket (open) pressure sensor signal	G1/4



A - A

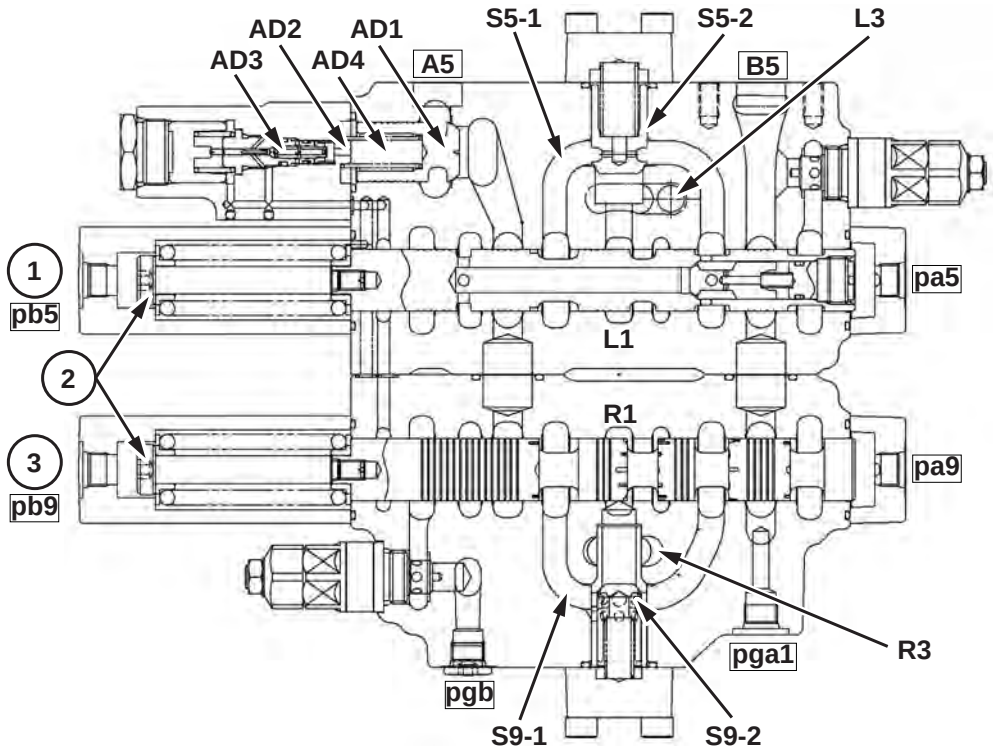


B - B



VIEW D

E5A9A5E6



[Fig.12]

1	Arm 1 (section 5)
2	Neutral state
3	Arm 2 (section 9)

b. Arm in (2 pumps flow) [Fig. 13]
Oil fed from the P1 port flows to the B5 port via the load check valve (S5-2), the path (S5-1) and neck of the spool from the neutral path (L1) when the arm 1 spool is switched by pressurizing it from the pilot port Pb5 of the arm 1 (section 5). Oil fed from the P2 port merges in the B5 port via the load check valve (S9-2) and the path (S9-1) from the neutral path (R1) when the arm 2 spool is switched by pressurizing it from the pilot port Pb9 of the arm 2 (section 9) as well.
The poppet (AD1) opens by reducing pressure of the spring chamber (AD4) when pilot pressure applied to the pb5 switches the spool at the same time it moves the spool (AD3) of the antidrift valve via a path built in the housing. This movement releases cut-off of the A5 port prior to switching the spool.
Then, returning oil from the A5 port is divided into a flow regenerating to the B5 port via the regeneration check inside the spool and a flow returning to the tank path (Ta) via the regeneration control valve.
(Refer to the arm in (regeneration release) in the next paragraph "c." for the detail of the regeneration function.)

3. When the handle is held (See Diagram 4.)
   When the handle is tilted and the pressure of the ports (2, 4) rises to a pressure equivalent to the set spring force (241), the hydraulic pressure and the spring force are in balance. When the ports (2, 4) pressure becomes higher than the set pressure, the ports (2, 4) and the P port close and the ports (2, 4) and the T port open. When the ports (2, 4) pressure becomes lower than the set pressure, the ports (2, 4) and the P port open and the ports (2, 4) and the T port close, so the secondary pressure is held constant.

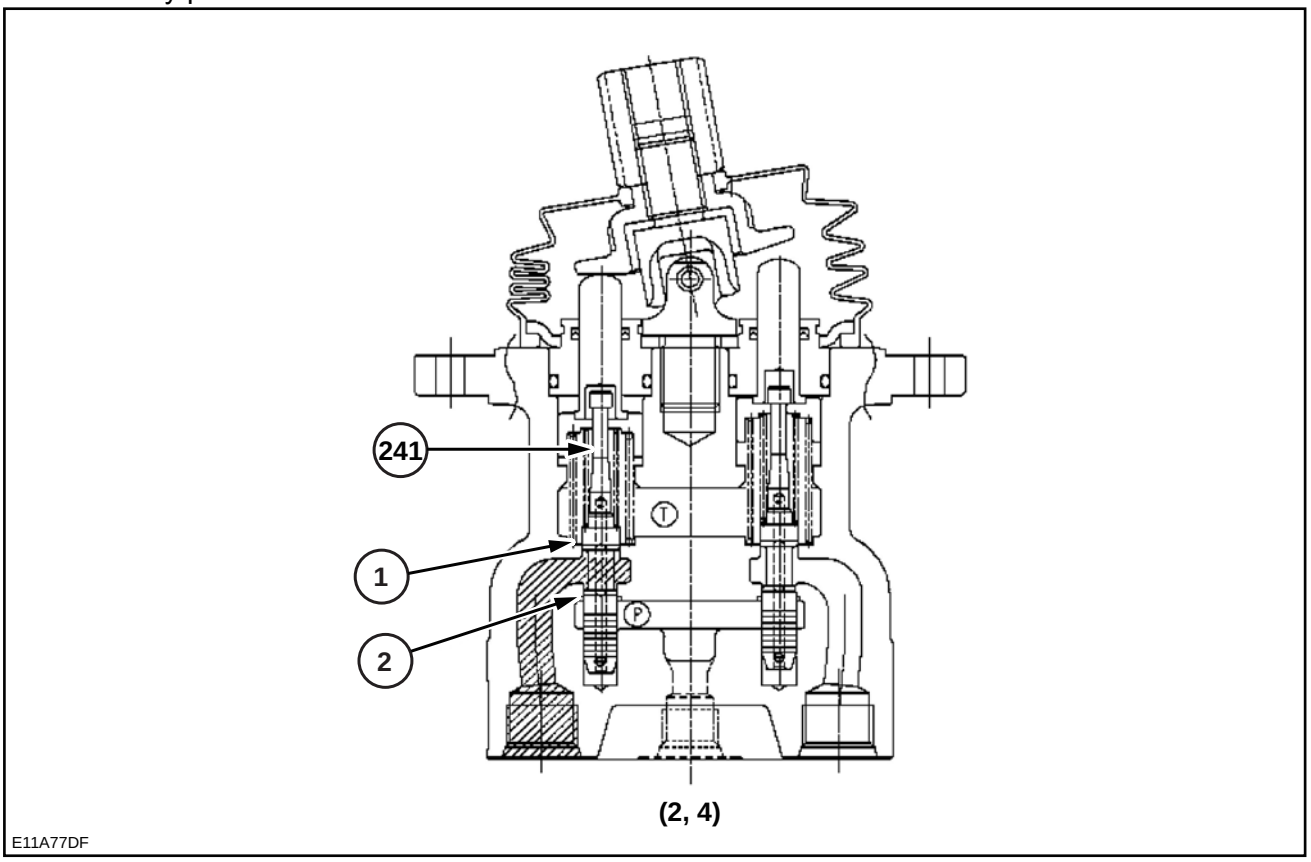
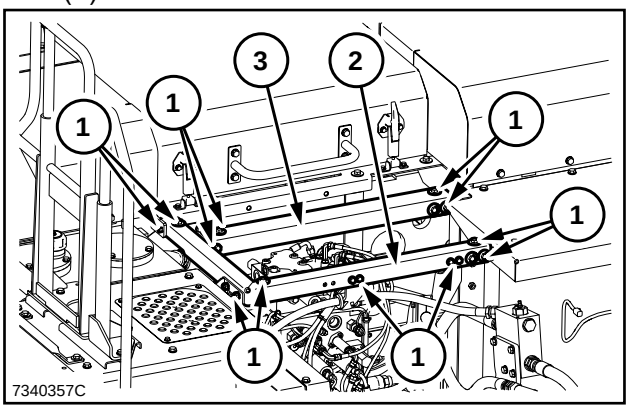


Diagram 4 When handle held (secondary pressure at or above set pressure)

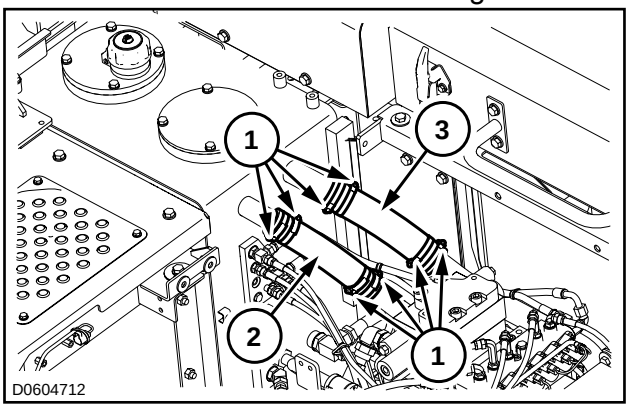
1	T port
2	P port

4. Operation in area in which the handle tilt is large (depends on the model)
   For certain models, when the handle is flipped down beyond a certain angle, the spool top end section touches the push rod bore bottom section and the output pressure goes into the state of still being connected with the P port pressure.
   Furthermore, with the structure in which the spring seating and spring are installed inside the push rod, when the handle is flipped down beyond a certain angle, the push rod bore bottom section and the spring touch. That spring force changes the 2nd pressure gradient and after that the push rod bore bottom section and the spring seating top end section touch, and the output pressure remains connected to the P port.

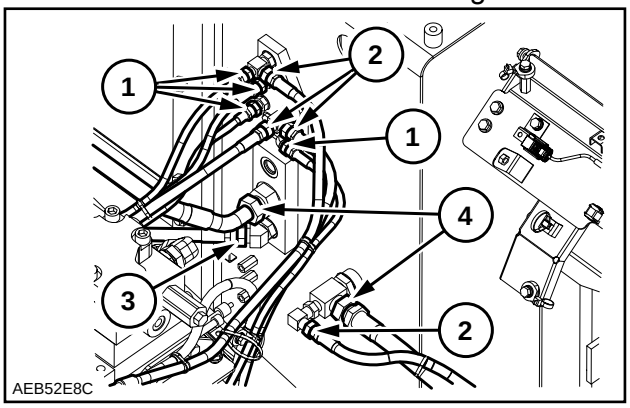
7. Remove the 17 bolts (1) with a wrench [19 mm (0.748 in.)] to remove the frames (2) (3).



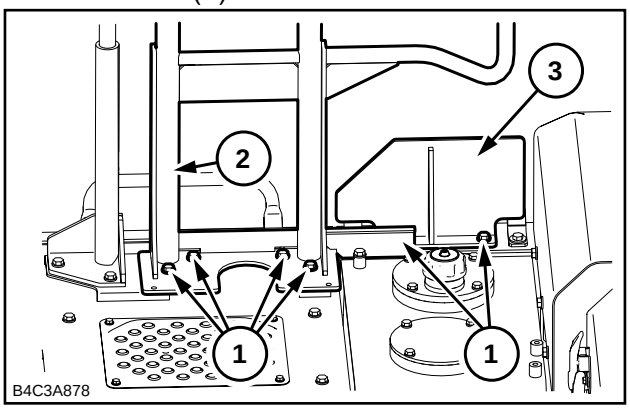
8. Loosen the 4 hose bands (1) with a wrench [7 mm (0.276 in.)] to remove the hydraulic hoses (2) (3).
   - Apply marking at each location of the hydraulic reservoir and the hose so as to match connections at assembling.
   - Attach caps and plugs at each location of the hydraulic reservoir and hose so as to prevent invasion of water, dust and dirt.
   - Wash each location of the hydraulic reservoir and the hoses by blowing parts cleaner so as to prevent adhering dirt at connections and not to damage them.



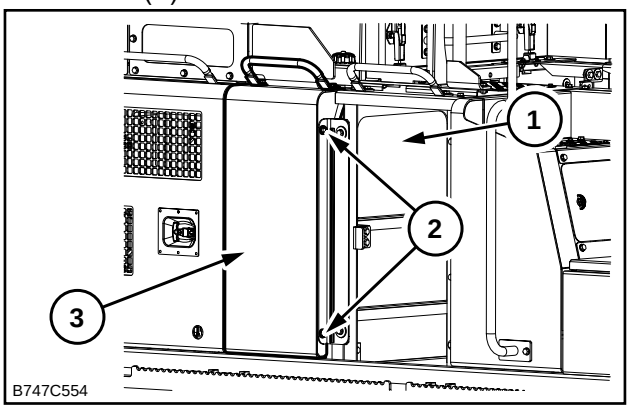
9. Remove the 4 hydraulic hoses (1) from hydraulic tank with a wrench [19 mm (0.748 in.)]. Remove the 4 hydraulic hoses (2) with a wrench [22 mm (0.866 in.)]. Remove the hydraulic hose (3) with a wrench [27 mm (1.063 in.)]. Remove the 2 hydraulic hoses (4) with a wrench [36 mm (1.417 in.)].
   - Apply marking at each location of the hydraulic reservoir and the hose so as to match connections at assembling.
   - Attach caps and plugs at each location of the hydraulic reservoir and hose so as to prevent invasion of water, dust and dirt.
   - Wash each location of the hydraulic reservoir and the hoses by blowing parts cleaner so as to prevent adhering dirt at connections and not to damage them.



10. Remove the 6 bolts (1) with a wrench [19 mm (0.748 in.)] to remove the stay (2) and the cover (3).

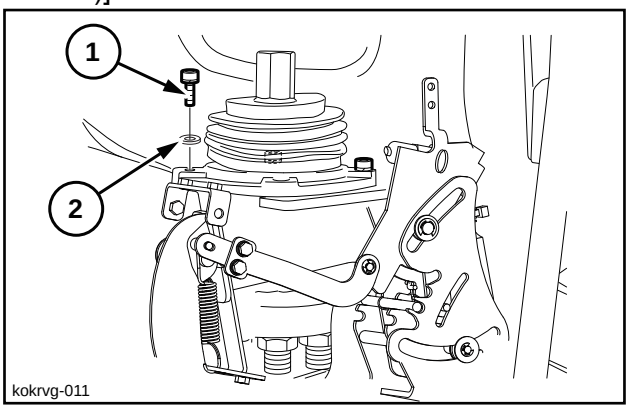


11. After opening the right-front cover (1), remove the 2 bolts (2) with a wrench [19 mm (0.748 in.)] to remove the right-center cover (3).

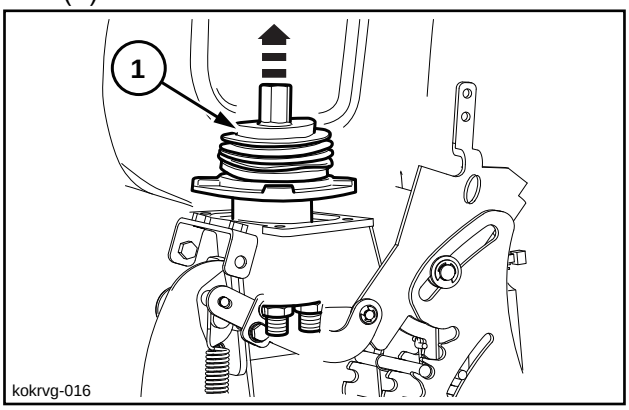


12. Remove the 4 bolts (1) and the 4 spacers (2) at bottom of the hydraulic tank with a wrench [24 mm (0.945 in.)].
   - Do not lose a shim for height adjustment, which may be inserted between the tank and the frame depending on machine.
   - Also, note inserted section and quantity.

11. Remove the 3 bolts (1) and the 3 washers (2) with a hexagon wrench [5 mm (0.197 in.)].

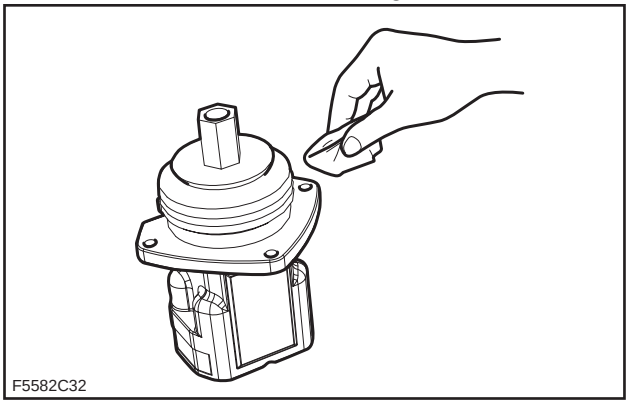


12. Remove the joystick remote control valve (1).

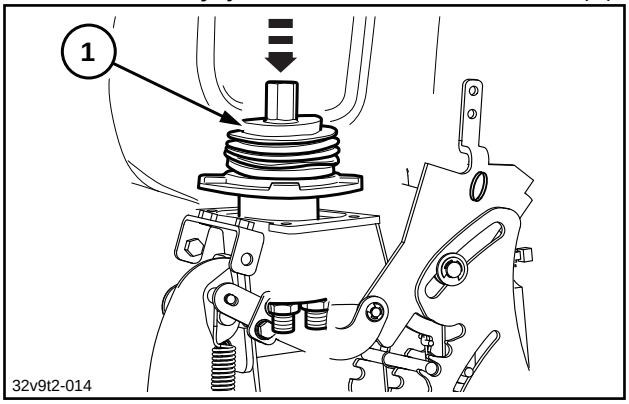


Installation of Operation Remote Control Valve (Left)

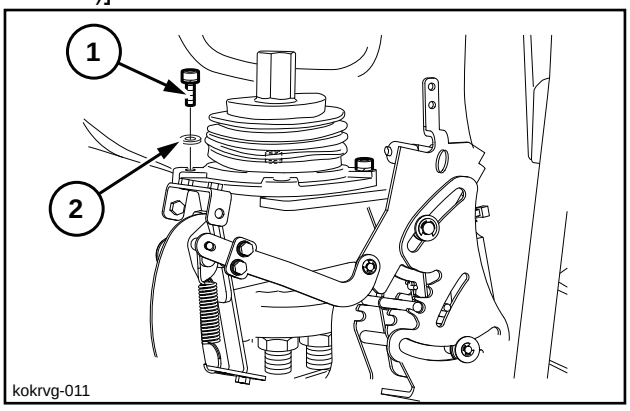
1. Clean each part with a rag etc.



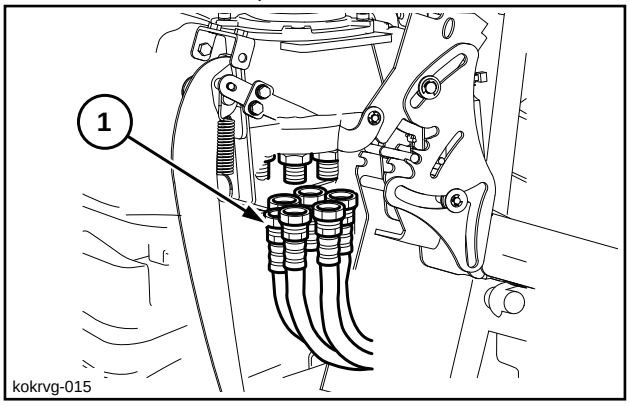
2. Attach the joystick remote control valve (1).



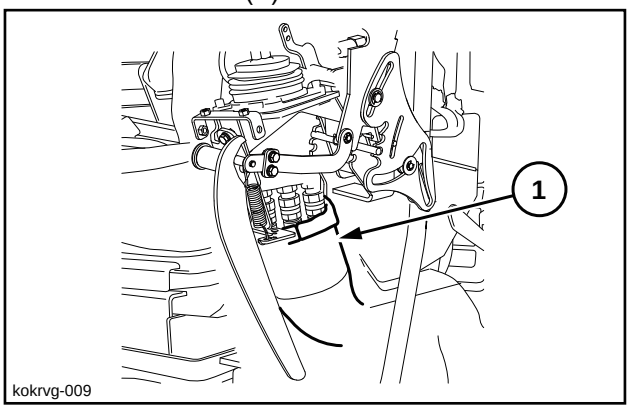
3. Tighten the 3 bolts (1) and the 3 washers (2) with a hexagon wrench [5 mm (0.197 in.)].



4. Attach the 6 hoses (1) with a wrench [22 mm (0.866 in.)].
   - P port
     Hose adapter tightening torque: 25.4 - 31.4 N•m (18.738 - 23.163 lbf•ft.)
     Hydraulic hose tightening torque: 44 - 54 N•m (32.459 - 39.835 lbf•ft.)
   - T port, 1 to 4 port
     Hose adapter and hydraulic hose tightening torque: 44 - 54 N•m (32.459 - 39.835 lbf•ft.)



5. Put the cover (1) on the hoses.

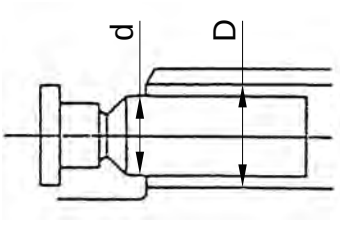


Pump Main Unit Maintenance Standards

Replacement Standard of Wear Component

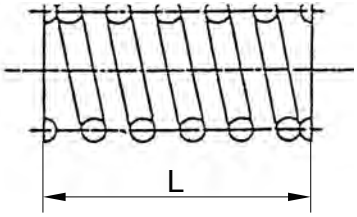
Replace or re-adjust a component when the component is worn out to a level exceeding the following standard values.
However, always replace the component when there is a severe damage on the exterior.

Item name and test item	Standard dimension	Recommended value for replacement	Action
Clearance between the piston and the cylinder bore (D -d)	0.029 mm (0.001142 in.)	0.057 mm (0.002244 in.)	Replacement of the piston or the cylinder
Backlash at the piston and the shoe swage section (δ)	0 - 0.1 mm (0.0001 - 0.0039 in.)	0.3 mm (0.0118 in.)	Replacement of the piston and the shoe assembly
Shoe thickness (t)	5.0 mm (0.1969 in.)	4.8 mm (0.1890 in.)	Replacement of the piston and the shoe assembly
Free height (L) of the cylinder spring	41.8 mm (1.6457 in.)	41.0 mm (1.6142 in.)	Replacement of the cylinder spring
Height of the combination of the holder plate and the spherical bushing (H - h)	25.0 mm (0.9843 in.)	24.0 mm (0.9449 in.)	Replacement of the holder plate or the spherical bushing

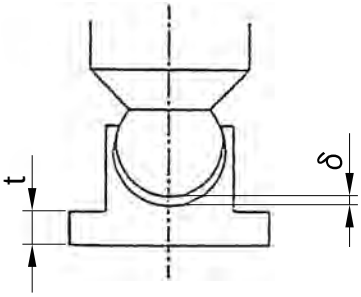


gluymj-001

Clearance between the piston and the cylinder bore: D-d

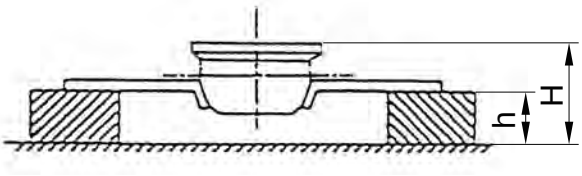


Free height of the cylinder spring: L



gluymj-002

Backlash at the piston and the shoe swage section. δ
Shoe thickness: t

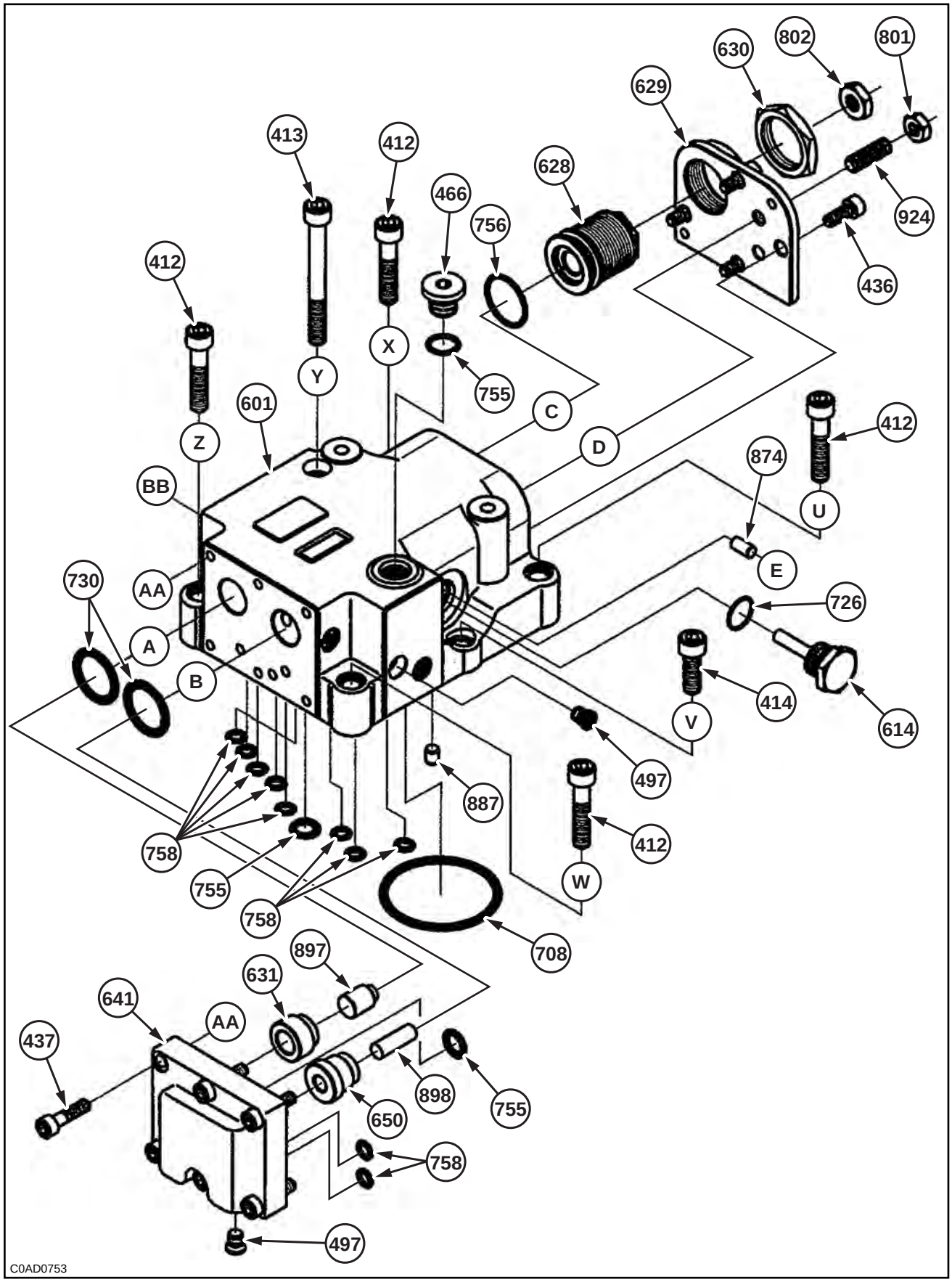


Height of the combination of the holder plate and the spherical bushing: H-h

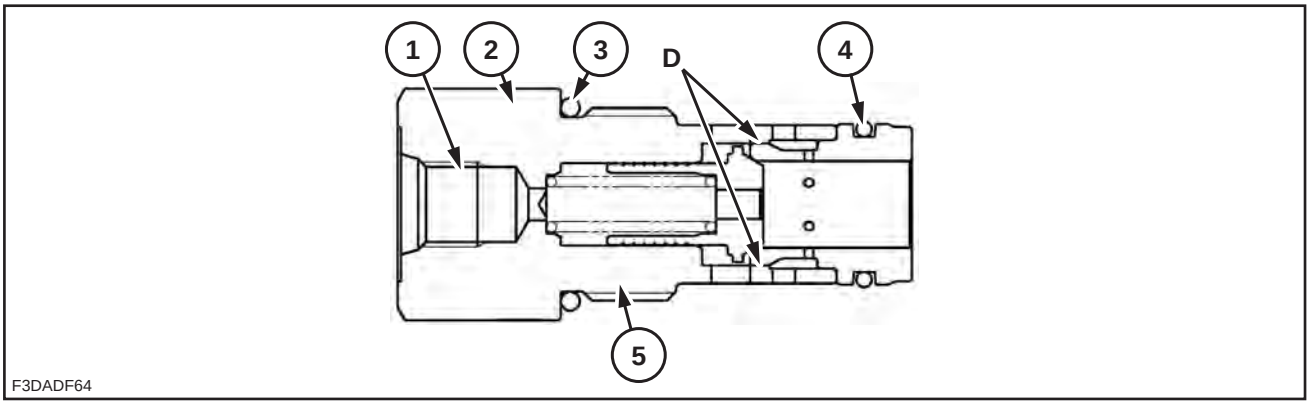
Correction Standard of Cylinder, Valve Plate, and Sash Plate (Shoe Plate)

Valve plate (sliding section) Swash plate (shoe plate section) Cylinder Surface roughness	Surface roughness that requires correction	3-Z
	Standard surface roughness (correction value)	0.4Z or lower (wrapping)

Development Diagram of Regulator



Assembly and Disassembly Procedure of Low-Pressure Relief Valve



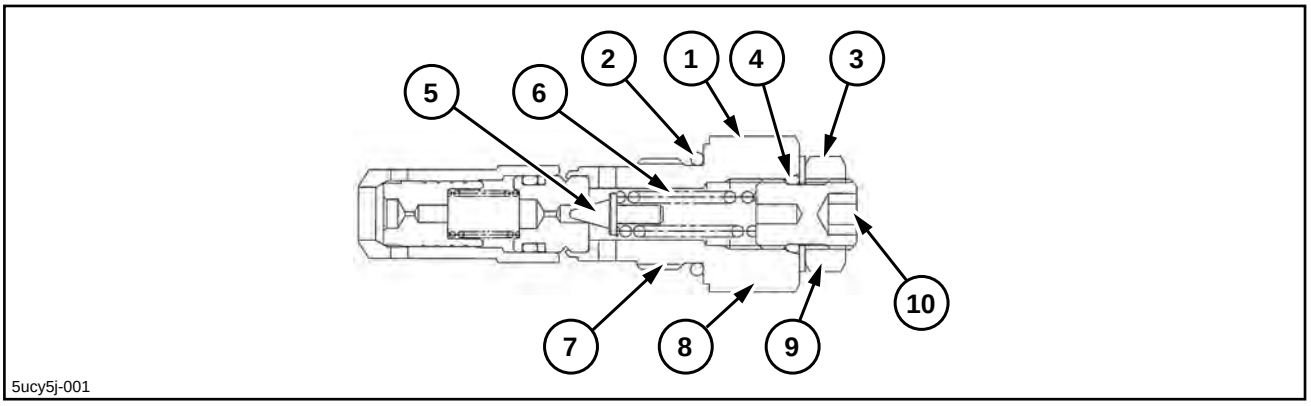
1	PF1/4-A	4	O-ring
2	Plug	5	1 3/16-12UN-2A
3	O-ring		

1. Disassembly
   This unit needs to be replaced as an assembly without disassemble since it is pressed-fit at "D" section.
2. Assembly
   Check thoroughly for any dirt or paint debris around the thread section of the plug (1) (hexagon diameter 32 mm (1.260 in.)), and then assemble the new O-ring (5).
   Assemble the new O-ring (6) to the sleeve.
   Thoroughly clean the relief installation section of the valve housing, and then tighten the plug (hexagon diameter 32 mm (1.260 in.)) of the relief assembly.
   Tightening torque: 103 - 113 N•m (75.99 - 83.35 lbf•ft.)

⚠ Caution

Specified values of the tightening torque are all in a wet condition (hydraulic fluid applied state).

Assembly and Disassembly Procedure of Main Relief Valve for Add-On



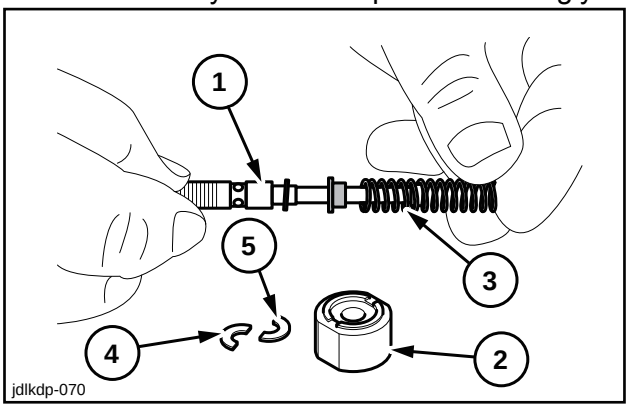
1	Plug (hexagon diameter 32 mm (1.260 in.))	5	Poppet	9	Lock nut (hexagon diameter 17 mm (0.669 in.))
2	O-ring	6	Spring	10	Adjuster (hexagon diameter 6 mm (0.236 in.))
3	Adjuster kit section	7	1-5/16-12UN-2A		
4	O-ring	8	Plug (hexagon diameter 24 mm (0.945 in.))		

1. Disassembly
   This unit needs to be replaced as an assembly.
   For replacement, loosen the plug (1) (hexagon diameter 32 mm (1.260 in.)) with a wrench to remove the O-ring (2).

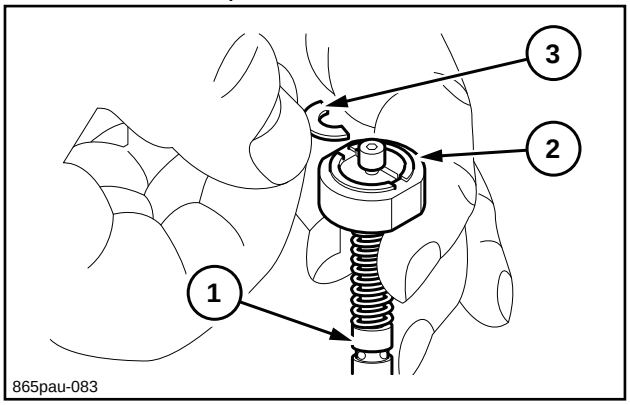
- If the white kerosene is dirty, this will encourage damage to parts and result in reduced performance after reassembly. Thoroughly manage the level of cleanliness of the white kerosene.
- Clean each part by placing it in a finish cleaning container filled with white kerosene, and thoroughly clean each part, including the interior, while slowly rotating it. (finish cleaning)
  Use a clean rag to thoroughly remove any white kerosene stuck to parts.
- Do not dry parts with compressed air, as this will damage parts and cause rust to form due to debris and moisture being dispersed into the atmosphere.
- Preventing rust on parts
  Apply an anti-rust agent to each part.
  Rust will form on parts if they are left as is after cleaning, and this will cause reduced performance of functions after reassembly.

Assembly Procedures

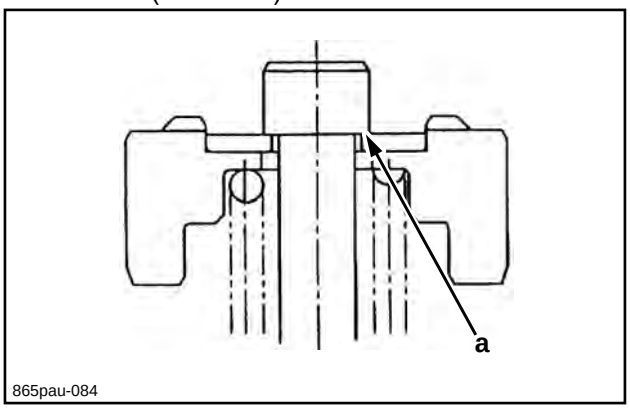
1. Install the washer 3 (5), washer 2 (4), secondary pressure spring (3), and the spring seating (2) onto each of the spools (1) in that order.
   Washers 2 are used for pre-set adjustment of the secondary pressure springs, so thickness is different for each spool assembly.
   Additionally, these are sometimes not used.
   Check the status recorded during disassembly and install parts accordingly.



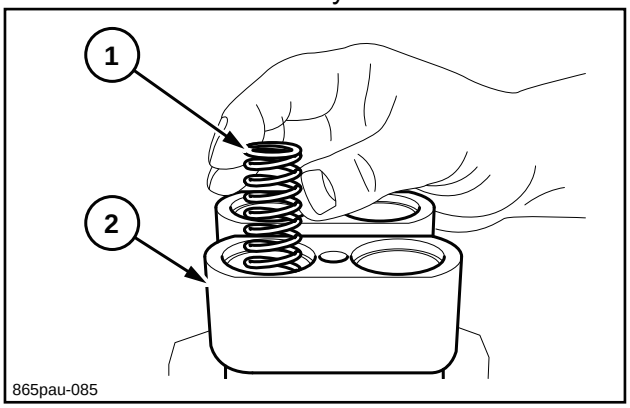
2. Place the bottom end of the spool (1) perpendicular on a level work platform, push the spring seating (2) down, and install the 2 half-circle washers 1 (3) onto the spring seating in such a way that they are not on top of each other.



- Install the washer 1 so that the sharp edge side (a) faces up and the washer catches the head of the spool.
  Do not press in the spring seating by 4 mm (0.157 in.) or more.



3. Install the return springs (1) in the casing (2).
   - Install them in the positions they were in before disassembly.



4. Install the pressure reducing valve subassemblies (1) assembled in steps 1) and 2) above into the casing (2).
   - Install them in the positions they were in before disassembly.

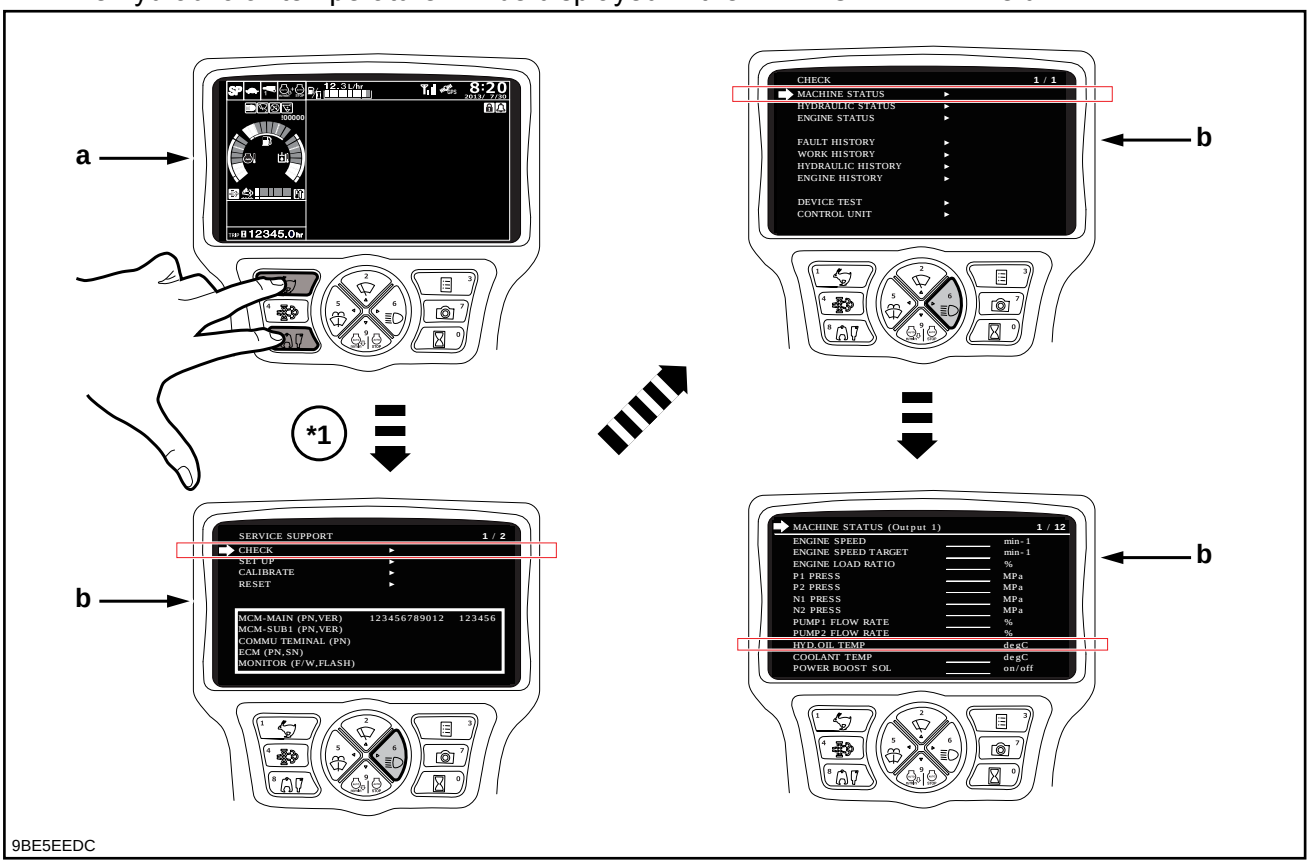
PROCEDURES FOR MEASURING HYDRAULIC OIL TEMPERATURE FROM THE MONITOR DISPLAY

Hydraulic Oil Temperature Measurement Method

The hydraulic oil temperature can be measured from the monitor display.

Operating Method

1. Hold down the travel speed select switch and attachment select switch on the monitor for 3 seconds at the same time to transit to the service support screen.
2. Select CHECK on the service support screen.
3. Select MACHINE STATUS on the service support screen.
4. The hydraulic oil temperature will be displayed in the "HYD.OIL TEMP" field.



9BE5EEDC

a	Normal screen
b	Service support screen

*1	Hold down for 3 sec.

Air Bleed Procedure

⚠ Caution

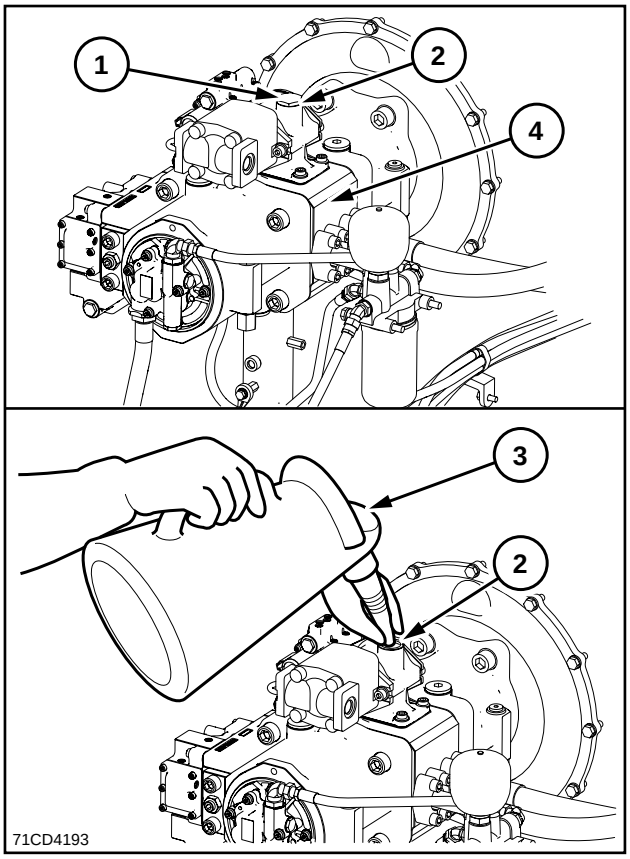
Always bleed off any air in the hydraulic circuits after replacing the hydraulic oil, repairing or replacing hydraulic equipment, or removing hydraulic pipes.

	Air bleed procedure mode (when bleeding, follow the procedure below.)				
	Hydraulic pump air bleeding	Cylinder air bleeding	Swing motor air bleeding	Travel motor air bleeding	Check
Hydraulic oil or hydraulic pump replacement	◯ →	◯ →	◯ →	→	◯
Cylinder replacement		◯ →	→	→	◯
Swing motor replacement			◯ →	→	◯
Travel motor replacement				◯ →	◯

* Failure to completely bleed off all the air can reduce the service life of hydraulic equipment and lead to damage.

Hydraulic Pump

1. Loosen the air bleed plug (1) and check that oil oozes from the air bleed port (2). If oil does not ooze out, remove the air bleed plug (1), and fill hydraulic oil (3) from the air bleed port (2) into the pump (4) case.
   Temporarily tighten the air bleed plug (1). Run the engine at low idle, slightly loosen the air bleed plug (1), and run until oil oozes from the air bleed port (2) section. Completely tighten the air bleed plug (1).



	Pressure line		Pilot tank line
	Tank line		Electric line
	Pilot pressure line		

1	Swing motor	8	Control valve	15	P1 flow control proportional valve
2	Swing spool	9	Main computer	16	Hydraulic pump
3	Cushion valve	10	Lever lock	17	Check valve
4	Right swing	11	Swing brake	18	Oil cooler
5	Left swing	12	5 stack solenoid valve	19	Swing motor relief valve
6	Swing pilot pressure sensor	13	Console lever lock switch		
7	Remote control valve (arm, swing)	14	P1 pressure sensor		

When an independent sharp swing operation is carried out, the starting pressure is boosted and the excess oil is ejected from the swing motor relief valve (19) to the tank line.
This control provides an energy-saving effect by controlling the pump in such a way as to minimize the excess oil.
As an example, this section explains the right swing operation.
When a right swing operation starts, the main computer (9) receives an electrical signal input from the swing pilot pressure sensor (6) and P1 pressure sensor (14) and outputs an electrical signal to the P1 flow control proportional valve (15).
The electrical signal output from the main computer (9) controls the P1 flow control proportional valve (15) and the discharge flow on the hydraulic pump (16) A1 side is reduced.
Also, the pilot pressure is controlled by an electrical signal input from the P1 pressure sensor (14) and the discharge flow on the hydraulic pump (16) A1 side increases gradually.
The control is canceled when a compound operation is performed.

	Pressure line		Pilot tank line
	Tank line		Electric line
	Pilot pressure line		

1	Boom load holding valve check valve	9	5 stack solenoid valve	17	Monitor display
2	Load holding valve spool	10	Control valve	18	Main computer
3	Cushion valve	11	Check valve	19	P1 pressure sensor
4	Boom (up)	12	Oil cooler	20	P2 pressure sensor
5	Boom (down)	13	Boom cylinder	21	Hydraulic pump
6	Remote control valve (boom, heel)	14	Boom [1] spool	22	Regeneration orifice
7	Lever lock	15	Boom-down pilot pressure sensor	23	Bleed-off
8	Pressure boost relief	16	Console lever lock switch		

When the remote control valve (6) boom operation lever is in neutral, the pressure oil at the boom cylinder (13) bottom side is sealed by the boom load holding valve check valve (1), reducing internal leakage from the boom [1] spool (14) to reduce the hydraulic drift of the boom.
When the remote control valve (6) is operated to the boom-down side, the pilot pressure oil is fed to the control valve (10) pb8 port via the cushion valve (3) and switches the boom [1] spool (14) to the down side.
The pilot pressure oil separated in the control valve (10) internal path moves the load holding valve spool (2) to the left.
In this way, the pressure oil in the spring chamber of the boom load holding valve check valve (1) goes to the tank line through the load holding valve spool (2), the pressure in the spring chamber drops, and the boom load holding valve check valve (1) is opened.
The discharge oil from the hydraulic pump (21) A2 enters the control valve (10) P2 port and is fed to the boom [1] spool (14) via the parallel oil path.
Switching the boom [1] spool (14) lets the pressure oil flow into the boom cylinder (13) rod side, and the boom-down operation is carried out.
The boom cylinder (13) bottom side pressure oil returns to the hydraulic tank through the boom load holding valve check valve (1) and the boom [1] spool (14).

	Pressure line		Pilot tank line
	Tank line		Electric line
	Pilot pressure line		

1	P1 negative control relief valve	7	5 stack solenoid valve	13	P2 flow control proportional valve
2	P2 negative control relief valve	8	P1 pressure sensor	14	Hydraulic pump
3	Control valve	9	P2 pressure sensor	15	Check valve
4	Main computer	10	N1 negative control pressure sensor	16	Oil cooler
5	Console lever lock switch	11	N2 negative control pressure sensor		
6	Lever lock	12	P1 flow control proportional valve		

When the remote control valve operation lever is set to neutral, the discharge oil from the hydraulic pump (14) A1 and A2 goes from the control valve (3) P1 and P2 ports through the center bypass oil path, the downmost stream P1 negative control relief valve (1) and P2 negative control relief valve (2), and returns to the hydraulic tank.
The negative control pressure oil separated from the center bypass oil path is fed to the N1 negative control pressure sensor (10) via the control valve (3) Ps1 port and to the N2 negative control pressure sensor (11) via the Ps2 port.
Then, the P1 flow control proportional valve (12) and P2 flow control proportional valve (13) on the hydraulic pump (14) operate and the pressure oil is fed to the regulator and moves the hydraulic pump (14) tilting to the low flow side to reduce the pump discharge flow.

	Pressure line		Pilot tank line
	Tank line		Electric line
	Pilot pressure line		

1	Control valve	6	Hydraulic rotation grapple	11	4th pump
2	2nd option solenoid valve	7	Console lever lock switch	12	Check valve
3	2nd option lever switch	8	Lever lock	13	Oil cooler
4	Main computer	9	5 stack solenoid valve	14	2nd option spool
5	Monitor display	10	Hydraulic pump		

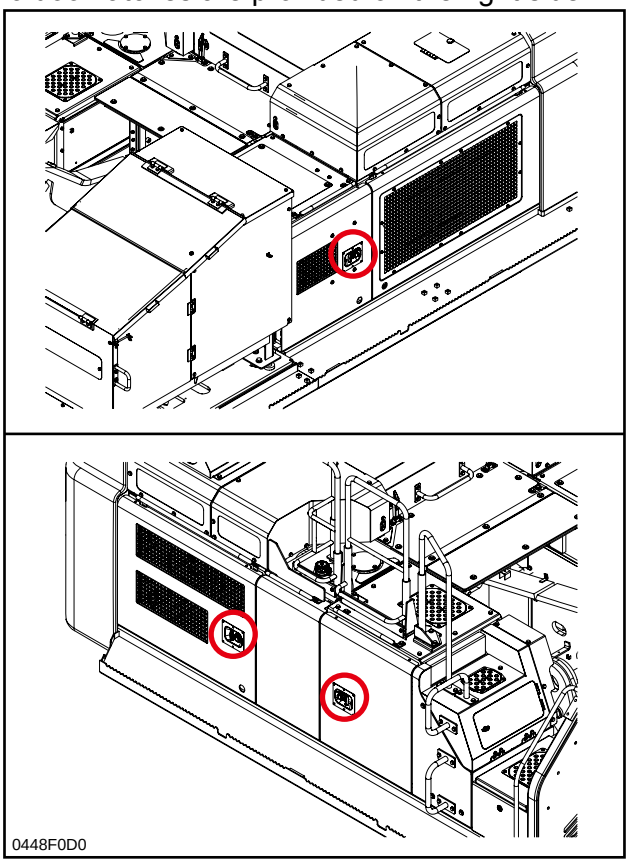
As an example, this section explains the right swing operation of the hydraulic rotation grapple.
When the 2nd option lever switch (3) is operated to the right swing side, the 2nd option solenoid valve (2) is switched by the electrical signal output from the main computer (4) and the pilot pressure oil enters the control valve (1) par1 port and switches the 2nd option spool (14).
The discharge oil from the 4th pump (11) A4 enters the 2nd option control valve (1) Pr port, goes through the 2nd option spool (14) and right swing the hydraulic rotation grapple (6).
The return oil from the hydraulic rotation grapple (6) returns to the hydraulic tank through the 2nd option spool (14).
The oil from the 2nd option drain line returns to the hydraulic tank without going through the control valve (1).

Door Latch Adjustment Procedure

Items to prepare

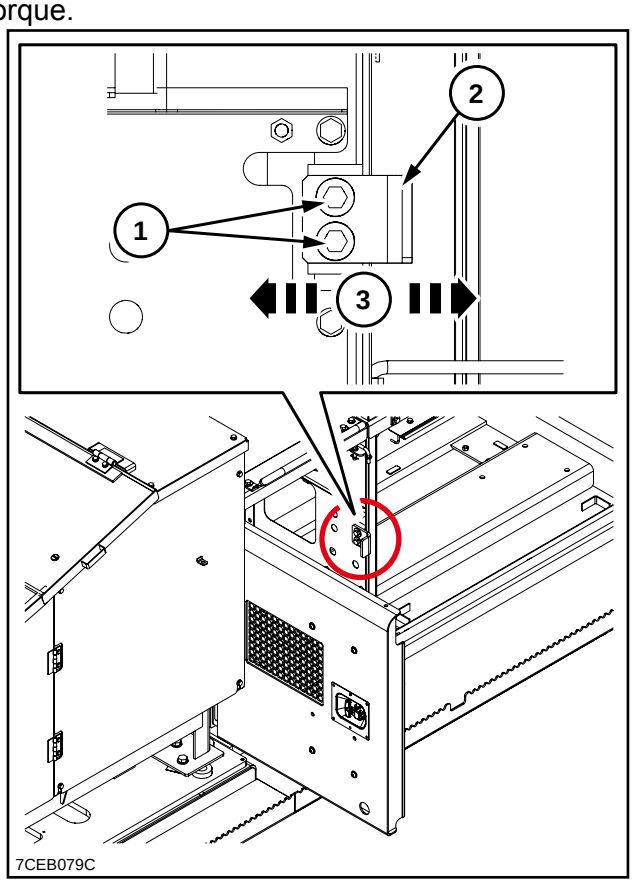
- Wrench [10 mm (0.394 in.), 14 mm (0.551 in.)]

One door latch is provided on the left side, and two door latches are provided on the right side.



Use the bracket (2) mounted on the house frame to adjust the door latches.Loosen the 2 bolts (1) securing the bracket (2), and slide (3) the bracket (2) to adjust the door latches.After the adjustment, tighten the bolts (1).

Close the door, and check that the door latch is firmly locked.If the door latch is not locked or if there is a gap, perform the adjustment again. Each bolt has to be tightened in the specified torque.



〈Operation explanation〉

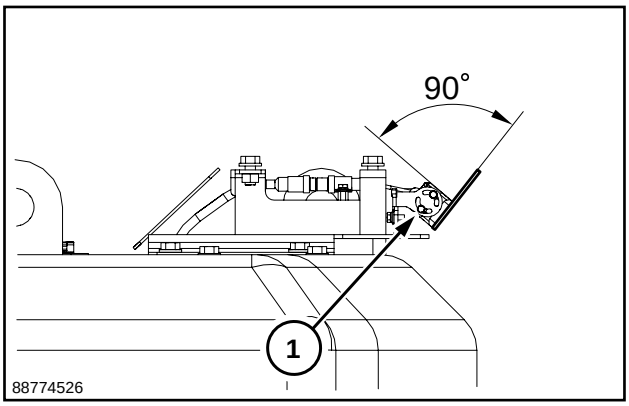
[1] When the key is set in the ON position, you can view the camera screen by pressing the camera screen switch.

- Pressing the camera screen switch will toggle between the work screen and the camera screen.
- The camera screen is selectable between that with gauge and that without gauge.

[2] When a lost image is detected due to a failure (disconnection etc.) in the camera, the monitor will display the message "CHECK CAMERA CONNECTION."

* When the work screen is displayed, pressing the camera select switch will serve as the trip meter select switch.

■Precautions for Camera Installation



1. The camera mounting angle should be adjusted by loosening the camera mounting bolts (1) while keeping the lens side parallel to the cover side.
2. Wipe the lens clean if it is dirty.

Display	Explanation	Unit	Judgment condition	Judgment start condition
SWING PC.PRESS	Swing pilot pressure	MPa (psi)	0	5 (725.1)
TRAVEL LEFT PC.PRESS	Travel left pilot pressure	MPa (psi)	0	5 (725.1)
TRAVEL RIGHT PC.PRESS	Travel right pilot pressure	MPa (psi)	0	5 (725.1)
TRAVEL ONE-PEDAL PC.PRESS	Travel 1 pedal pilot pressure	MPa (psi)	0	5 (725.1)

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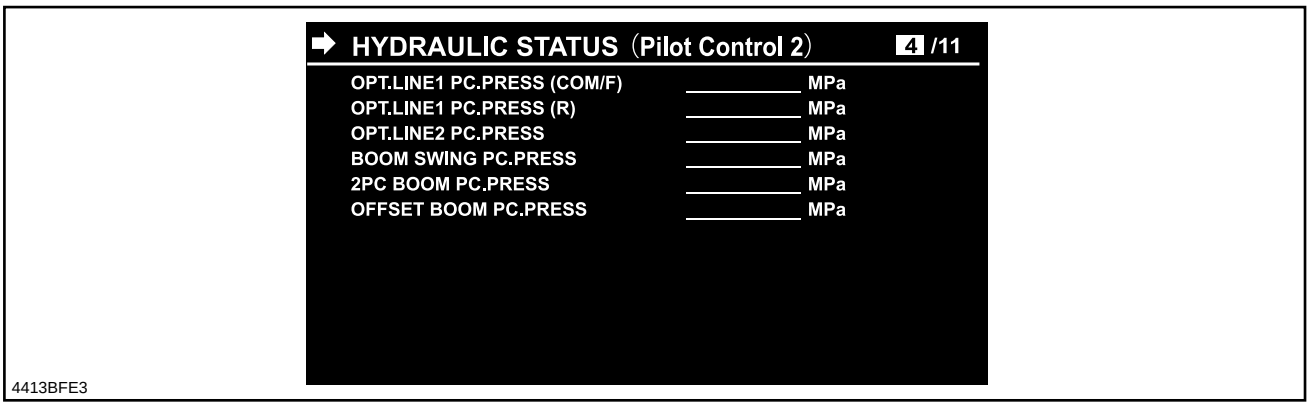

Display	Explanation	Unit	Judgment condition	Judgment start condition
OPT.LINE1 PC.PRESS (COM/F)	1st option pilot pressure (common/front)	MPa (psi)	0	5 (725.1)
OPT.LINE1 PC.PRESS (R)	1st option pilot pressure (rear)	MPa (psi)	0	5 (725.1)
OPT.LINE2 PC.PRESS	2nd option / blade pilot pressure	on/off	----	++++
BOOM SWING PC.PRESS	Boom swing pilot pressure	on/off	----	++++
2PC BOOM PC.PRESS	2-piece boom pilot pressure	on/off	----	++++
OFFSET BOOM PC.PRESS.	Offset boom pilot pressure	on/off	----	++++

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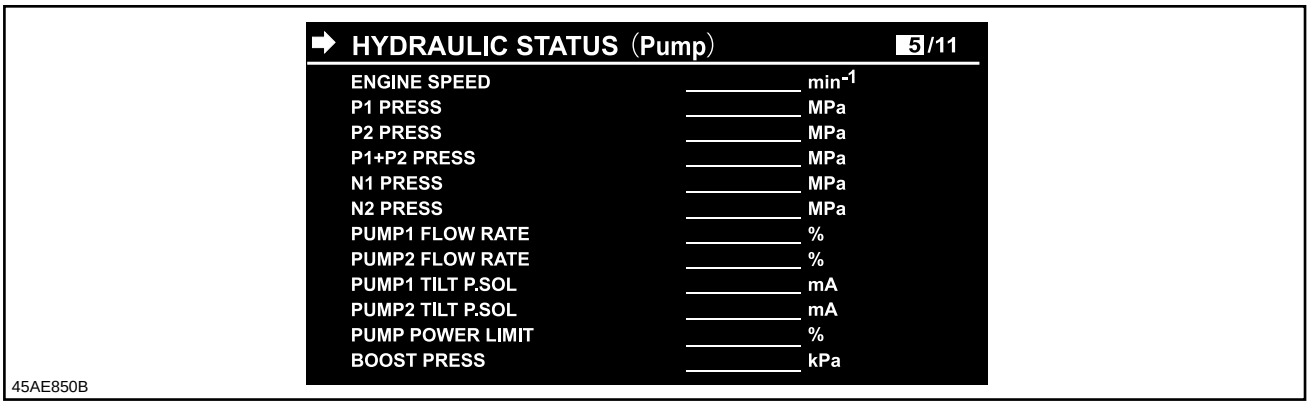

Display	Explanation	Unit	Judgment condition	Judgment start condition
ENGINE SPEED	Actual engine speed	min^{-1} (rpm)	0	2500
P1 PRESS	P1 pressure	MPa (psi)	0	50 (7251)
P2 PRESS	P2 pressure	MPa (psi)	0	50 (7251)
P1+P2 PRESS	P1+P2 pressure	MPa (psi)	0	100 (14503)
N1 PRESS	N1 pressure	MPa (psi)	0	5 (725.1)

Display	Explanation	Unit	Judgment condition	Judgment start condition
P2 PRESS RANGE 4	P2 pressure; time distribution 4	hour	Less than 25 MPa	Engine in operation
P2 PRESS RANGE 5	P2 pressure; time distribution 5	hour	Less than 30 MPa	Engine in operation
P2 PRESS RANGE 6	P2 pressure; time distribution 6	hour	Less than 35 MPa	Engine in operation
P2 PRESS RANGE 7	P2 pressure; time distribution 7	hour	35 MPa or more	Engine in operation
P2 PRESS MAX	Maximum P2 pressure	MPa (psi)	-	Engine in operation

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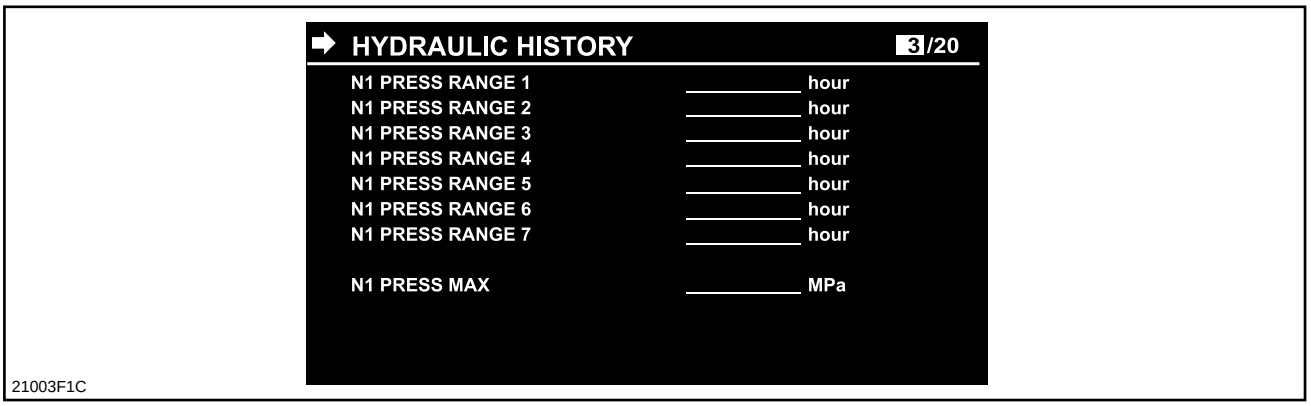

Display	Explanation	Unit	Judgment condition	Judgment start condition
N1 PRESS RANGE 1	N1 pressure; time distribution 1	hour	1.0 MPa	Engine in operation
N1 PRESS RANGE 2	N1 pressure; time distribution 2	hour	Less than 1.5 MPa	Engine in operation
N1 PRESS RANGE 3	N1 pressure; time distribution 3	hour	Less than 2.0 MPa	Engine in operation
N1 PRESS RANGE 4	N1 pressure; time distribution 4	hour	Less than 2.5 MPa	Engine in operation
N1 PRESS RANGE 5	N1 pressure; time distribution 5	hour	Less than 3.0 MPa	Engine in operation
N1 PRESS RANGE 6	N1 pressure; time distribution 6	hour	Less than 3.5 MPa	Engine in operation
N1 PRESS RANGE 7	N1 pressure; time distribution 7	hour	3.5 MPa or more	Engine in operation
N1 PRESS MAX	Maximum N1 pressure	MPa (psi)	-	Engine in operation

Display	Explanation	Unit	Judgment condition	Judgment start condition
LOAD RATIO H RANGE 1	Load ratio (H); time distribution	hour	Less than 30%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 2	Load ratio (H); time distribution	hour	Less than 40%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 3	Load ratio (H); time distribution	hour	Less than 50%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 4	Load ratio (H); time distribution	hour	Less than 60%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 5	Load ratio (H); time distribution	hour	Less than 70%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 6	Load ratio (H); time distribution	hour	Less than 80%	In 10 sec. after the engine starts
LOAD RATIO H RANGE 7	Load ratio (H); time distribution	hour	80% or more	In 10 sec. after the engine starts

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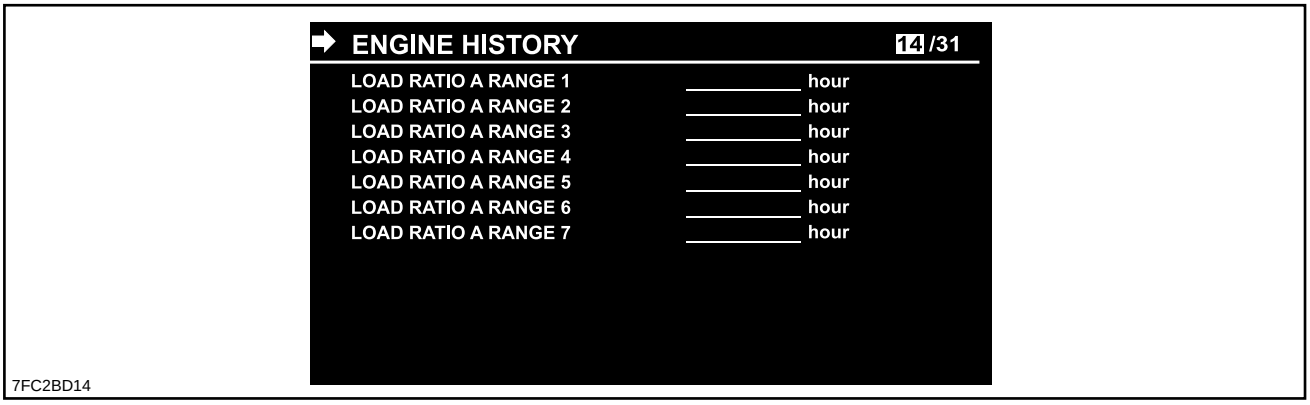
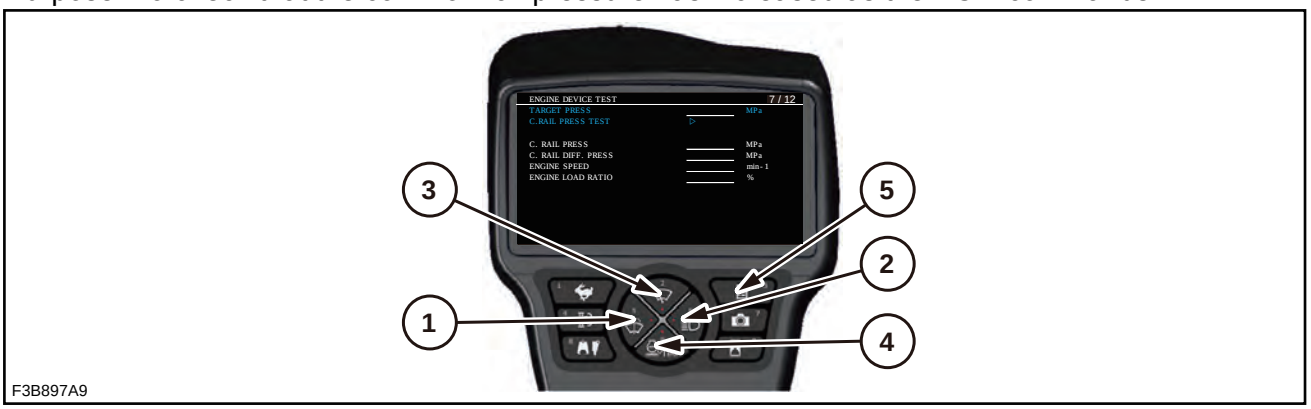


Display	Explanation	Unit	Judgment condition	Judgment start condition
LOAD RATIO A RANGE 1	Load ratio (A); time distribution	hour	Less than 30%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 2	Load ratio (A); time distribution	hour	Less than 40%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 3	Load ratio (A); time distribution	hour	Less than 50%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 4	Load ratio (A); time distribution	hour	Less than 60%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 5	Load ratio (A); time distribution	hour	Less than 70%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 6	Load ratio (A); time distribution	hour	Less than 80%	In 10 sec. after the engine starts
LOAD RATIO A RANGE 7	Load ratio (A); time distribution	hour	80% or more	In 10 sec. after the engine starts

■Common Rail Pressure Test

Purpose: To check that the common rail pressure has increased as the ECM commands.



Display	Explanation	Unit	Remarks
TARGET PRESS	Target common rail pressure	MPa (psi)	Items selectable. The common rail pressure can be set. Initial value: 50
C.RAIL PRESS TEST	Common rail pressure test	-	The common rail pressure test is conducted (for 10 seconds).
C. RAIL PRESS	Common rail pressure	MPa (psi)	
C. RAIL DIFF. PRESS	Common rail differential pressure	MPa (psi)	
ENGINE SPEED	Actual engine speed	min^{-1} (rpm)	
ENGINE LOAD RATIO	Engine torque (load ratio)	%	

Procedure

-Condition for the test-

The engine is running [550 min^{-1} (550 rpm) to 3000 min^{-1} (3000 rpm)].

[1] Set the target common rail pressure.
Select "TARGET PRESS" (target common rail pressure) using SW (3) and (4).
Press SW (1) and (2) to set the target test pressure.
Available set range: 30 to 80 MPa (4351.62 to 11604.29 psi)
After the setting is completed, press SW (5).

[2] Test execution
Select "C.RAIL PRESS TEST" (common rail pressure test) using SW (3) and (4).
Hold down SW (2) for 3 seconds, then "▷" changes to "▶" and the test starts.
The test will be continued for 10 seconds.

[3] Test finish
After 10 seconds, the engine automatically returns to the normal state.

DIMENSIONS

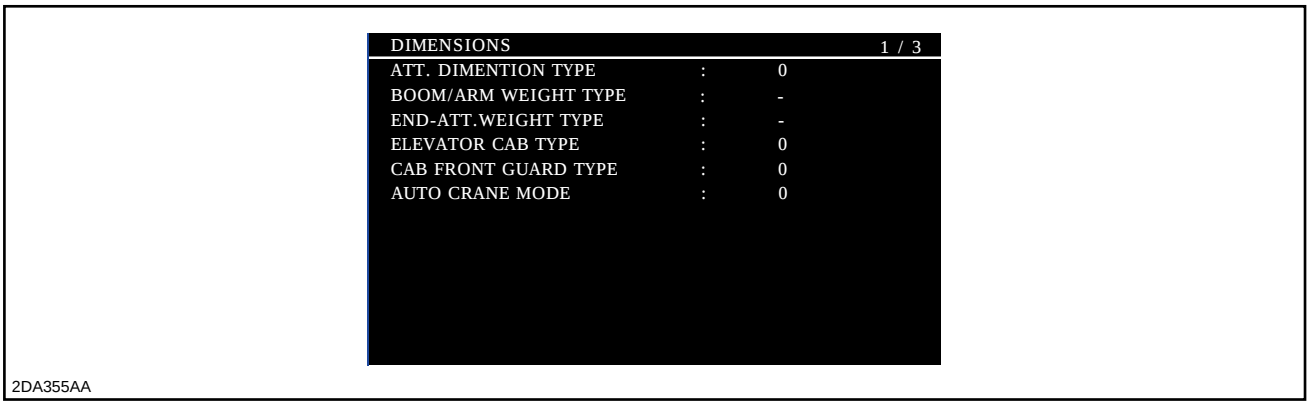
- Transition to this screen is enabled only with the following settings in the model selection screen.

OVERLORD-WARNING	2: Yes (Japan Type)
ANTI-INTFERENCE	1: Yes

- Items that can be specified vary with the following combination.

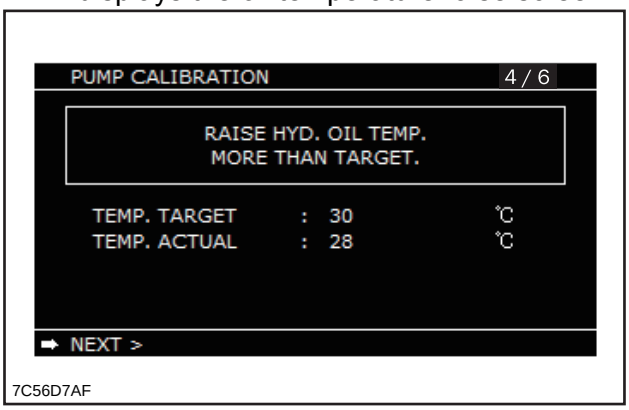
OVERLOAD-WARNING	2: Yes (Japan Type)
ANTI-INTFERENCE	1: Yes
ELEVATOR CAB	0: None, 1: Yes
LIFTING MAGNET	0: None, 1: SPS, 2: XXX
BUCKET CYLINDER SENSOR	0: None, 1: Angle sensor

1/3

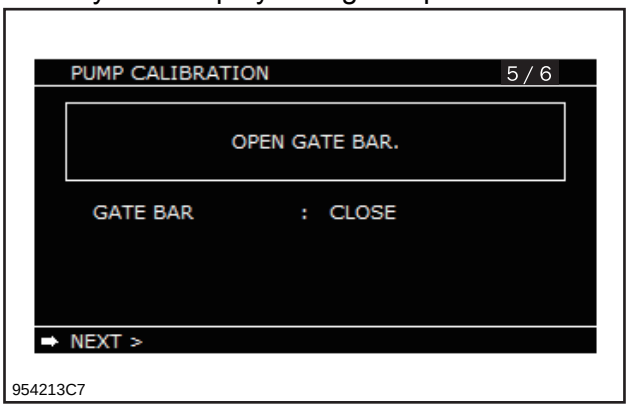


Item	Selection	Display
ATT DIMENTION TYPE	· 0: STD	"?" appears in white initially. Fixed at SUPER_LONG, for LR machine.
	· 1: LONG	
	· 2: SHORT	
	· 3: SUPER_LONG	
	· 4: SUPER_SHORT	
	· 5: STD_HL	
	· 6: AMLONG_HL	
	· 7: SHORT_HL	
	· 8: MF_STD	
	· 9: MF_AMLONG	
	· 10: MF_SHORT	
	· 11: MF_STD_HL	
	· 12: MF_AMLONG_HL	
	· 13: MF_SHORT_HL	
	· 14: MH_1	
	· 15: MH_2	
	· 16: SL_1	
	· 17: SL_2	
BOOM/ARM WEIGHT TYPE	· 0: STD	"?" appears in white initially.
	· 1: HEAVY	

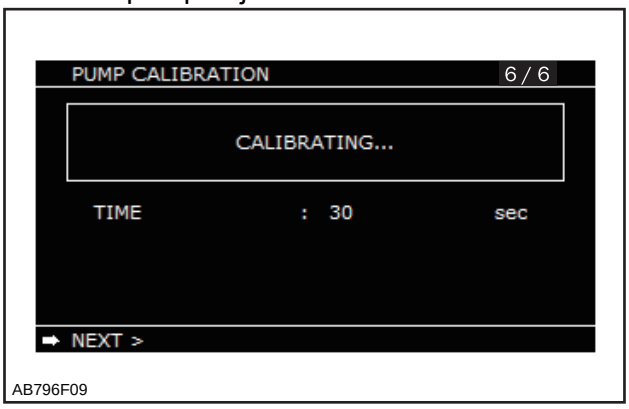
4. When the work mode is turned to the SP mode and  is pressed, the system displays the oil temperature raise screen.



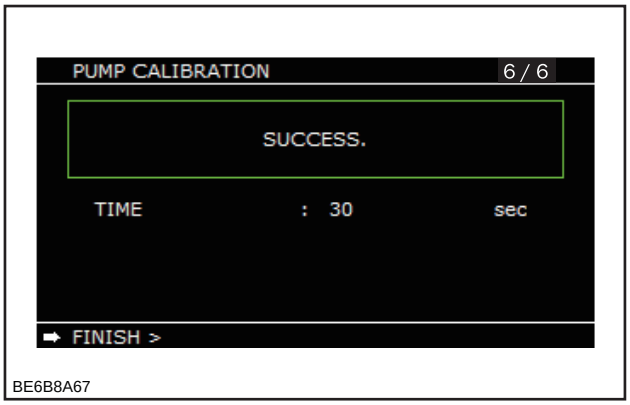
5. When the oil temperature reaches the target value and  is pressed, the system displays the gate open screen.



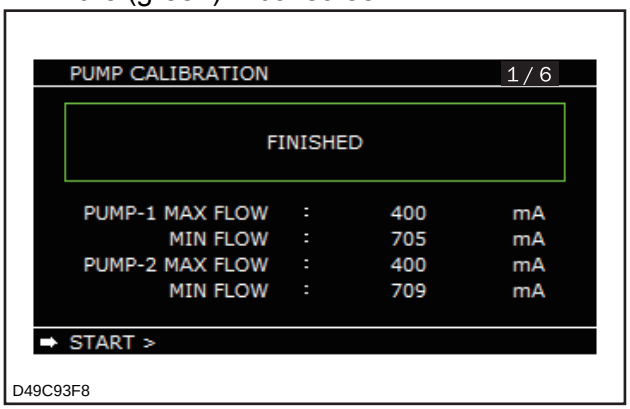
6. When the gate is opened and  is pressed, the system displays a screen indicating an adjustment in progress and the pump adjustment starts.



7. When the pump adjustment is finished, the system displays the (green) result screen.



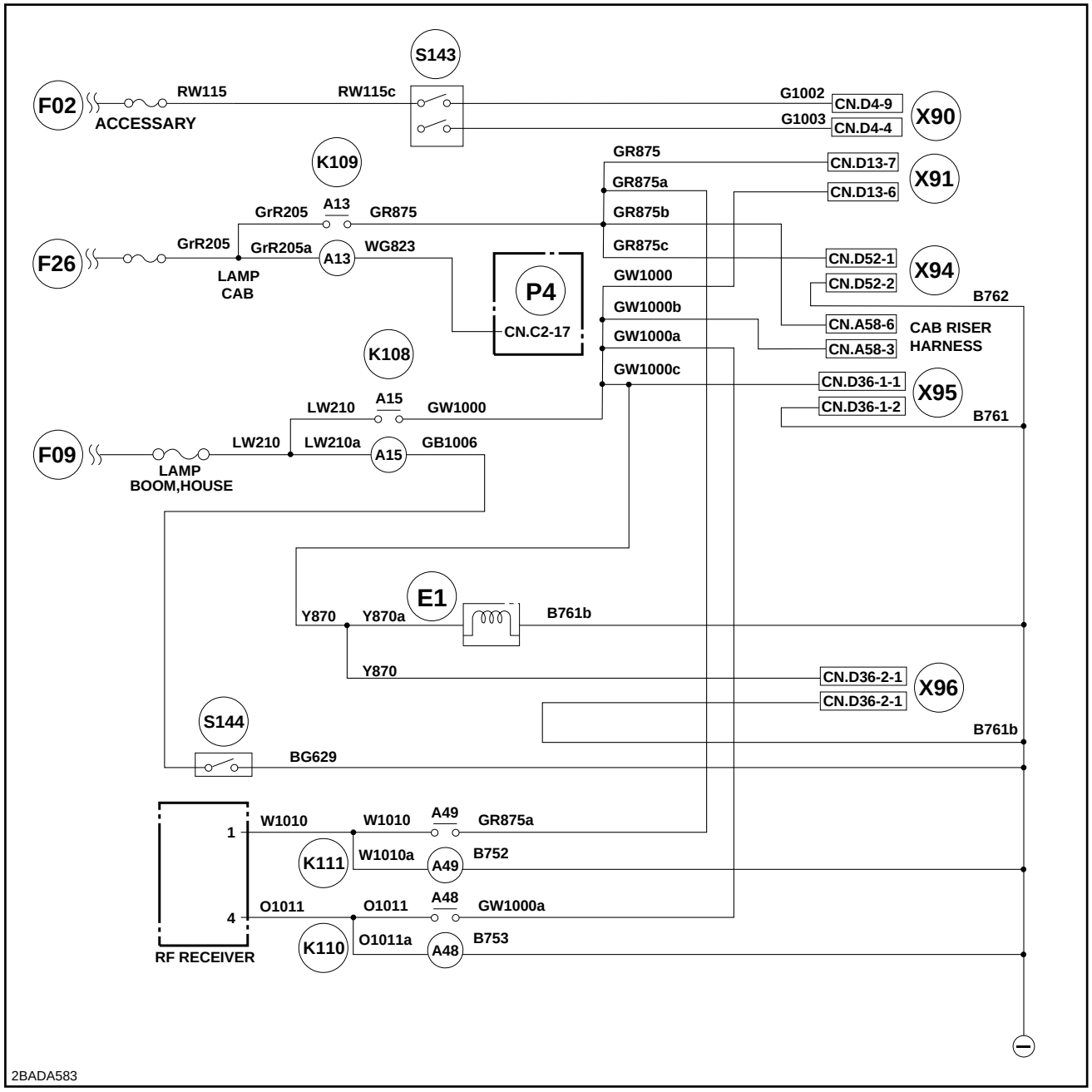
8.  Press this, and the system will display the (green) initial screen.

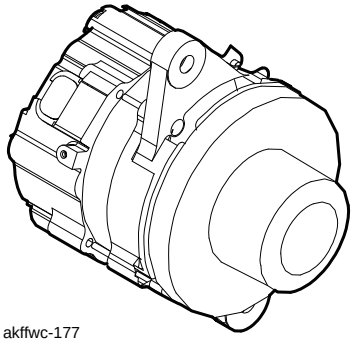
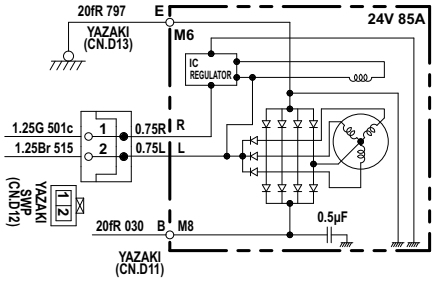
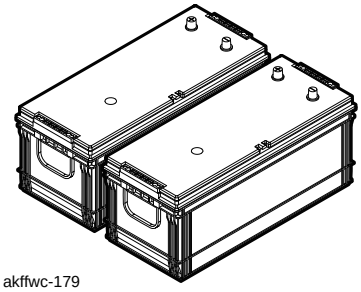
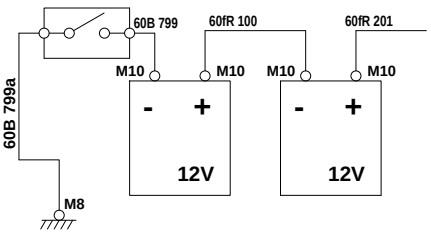
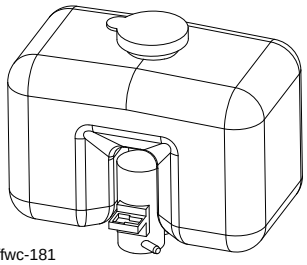
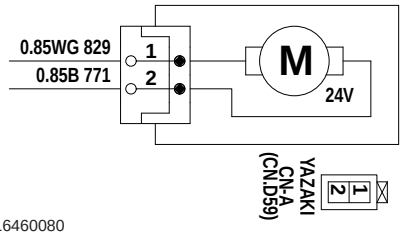
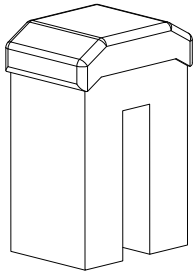
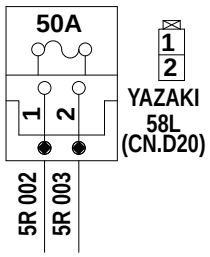


- If the calibration fails or you press the menu SW in the middle of the process, the system will be interrupted and display the (red) result screen "FAILURE" with an error code.

Code	Contents	Detail
001	Precondition not satisfied	One-touch idle ON Attachment mode not bucket Stop the engine. Throttle changed Oil temperature dropped Gate CLOSE FAN REVERSING
002	Timeout	If the CALIBRATING... screen displays for 90 seconds or more
003	Device abnormal	P1 P2 N1 N2 Tilting proportional valve 1 Tilting proportional valve 2

Working Light



Name	Shape	Circuit	Remarks
Alternator	 akffwc-177	**ALTERNATOR**  0DE9C661	Model: 85 A-24 V
Battery	 akffwc-179	**BATTERY**  10E7A0F3	Model: 130E41R Sumitomo Part No.: KHR3944
Washer motor	 akffwc-181	**WASHER MOTOR**  16460080	Sumitomo Part No.: KHR2261 (tank + motor)
Fusible link (safety relay 1)	 akffwc-185	**FUSIBLE LINK SAFTY RL (NO TAPE)**  1865AE6F	Rated current: 50 A Sumitomo Part No.: KHR3850

Removal and Installation of Wiper Motor

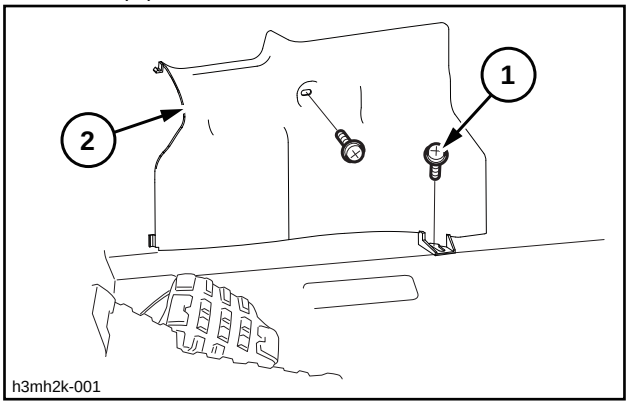
Job code	**RZWP01**

Items to prepare

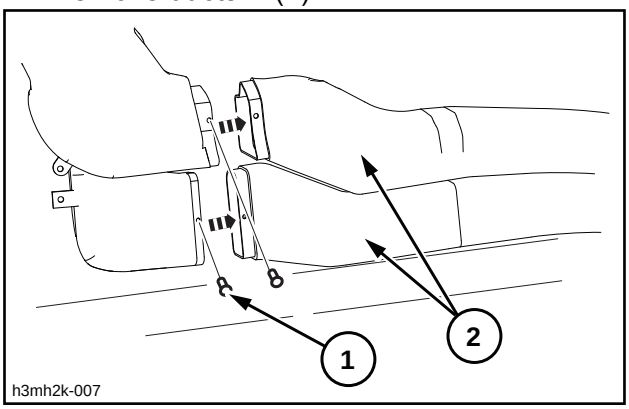
- Hexagon wrench [5 mm (0.197 in.)]
- Wrenches [10 mm (0.394 in.), 17 mm (0.669 in.)]
- Box wrench [10 mm (0.394 in.)]
- Flathead screwdriver (longnose pliers)
- Phillips screwdriver

Removal of Wiper Motor

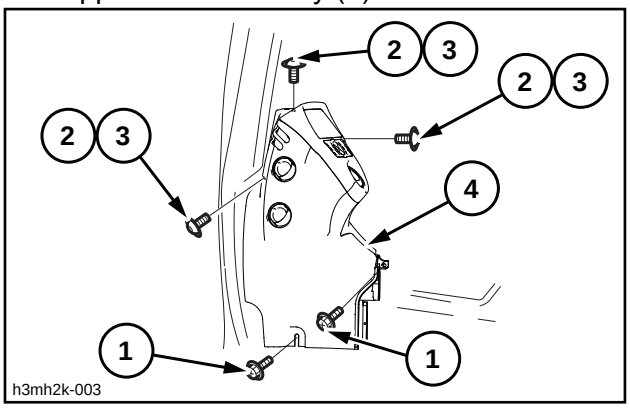
1. Use a Phillips screwdriver or box wrench [10 mm (0.394 in.)] to remove the 2 bolts (1), and then remove the side front lower trim (2).



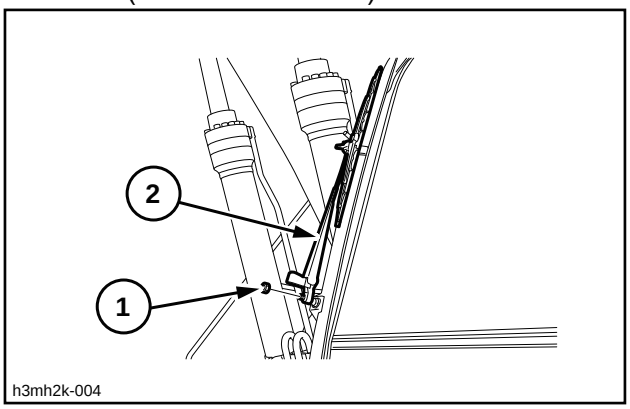
2. Use a flathead screwdriver or longnose pliers to remove the clip pins (1), and then remove ducts B (2).



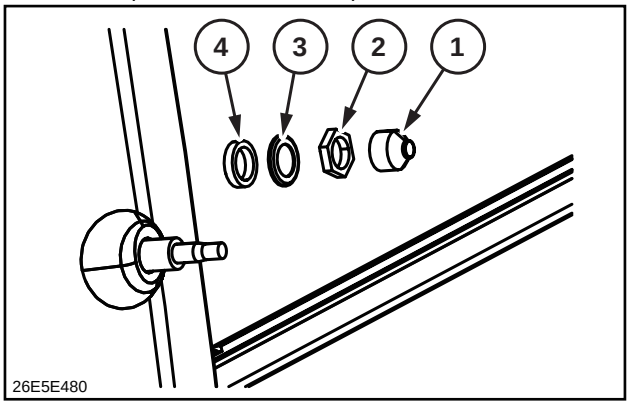
3. Use a Phillips screwdriver or box wrench [10 mm (0.394 in.)] to remove the 2 bolts (1), use a hexagon wrench [5 mm (0.197 in.)] to remove the 3 bolts (2) and 3 washers (3), and then remove the front upper trim assembly (4).



4. Use a wrench [17 mm (0.669 in.)] to remove the 1 nut (1), and then remove the wiper arm (2).
   Tightening torque for installation: 12 - 16 N·m (8.85 - 11.80 lbf·ft.)



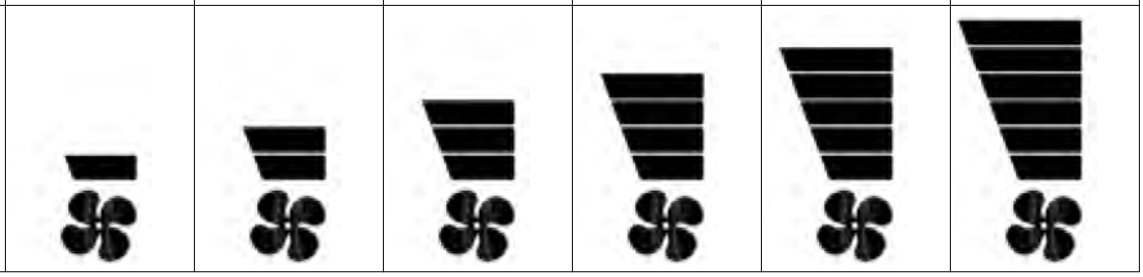
5. Remove the cover (1), and then use a wrench [27 mm (1.063 in.)] to remove the 1 nut (2).
   Remove the 1 washer (4) and 1 packing (3).
   Tightening torque for installation: 11 - 13 N·m (8.12 - 9.58 lbf·ft.)



Refresh/recirculate mode and refresh/ recirculate display		
Refresh/ recirculate mode	Recirculate	Outside air
Panel display		

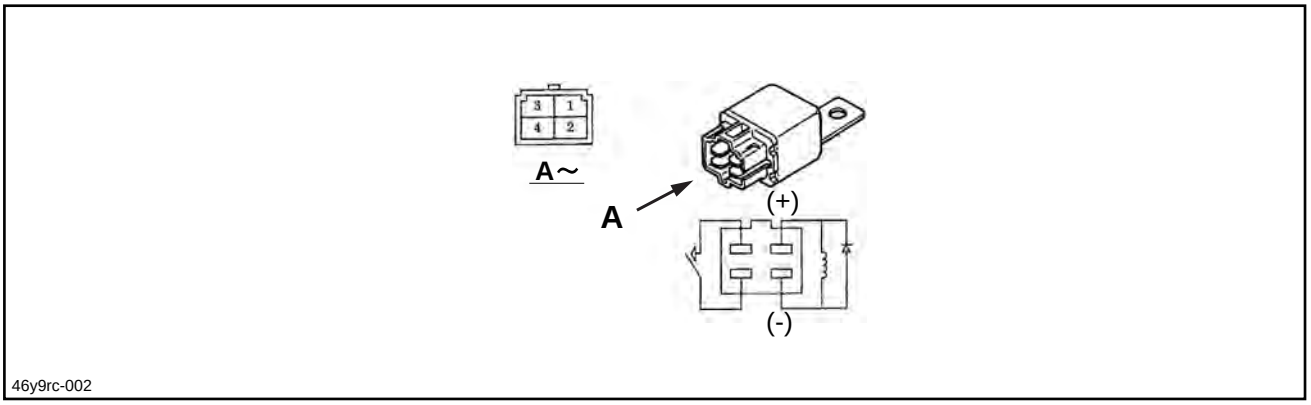
■Blower Amp Control

1. Summary explanation
   The air flow is controlled by outputting to the blower amp connected in series with the blower motor.
   The air flow is switched by varying the analog voltage output by changing the PWM output duty ratio and increasing or decreasing the blower motor speed.
   There are 2 types of air flow control: auto air flow control and manual air flow control.
   Also, in auto air flow control, the air flow is restricted by the cold blast prevention control etc.
2. Manual air flow control
   Each time it is recognized that the air flow UP switch has been closed, the air flow is fixed to the next higher level of air flow from Lo → M1 → M2 → M3 → M4 → Hi.
   When Hi is already displayed, the air flow is not changed.
   In the same way, each time it is recognized that the air flow DOWN switch has been closed, the air flow is fixed to the next lower level of air flow from Hi → M4 → M3 → M2 → M1 → Lo.
   When Lo is already displayed, the air flow is not changed.
   The same is true when air flow control is switched from auto to manual. For example, when AUTO M1 is displayed, if it is recognized that the air flow DOWN switch has been closed, the display becomes Lo and AUTO is no longer displayed.
   Also, the change speed for air flow output switchover is the same as discussed for auto below.

Relationship between air flow and display during manual operation						
Air flow	Lo (minimum air flow)	M1	M2	M3	M4	Hi (maximum air flow)
Blower air flow %	40 %	46 %	54 %	64 %	80 %	100 %
Display						

3. Auto air flow control
   When it is recognized that the AUTO switch has been closed, the air flow is controlled automatically and AUTO is displayed.
   [1] During auto air flow control, the air flow is set according to the target blowing temperature as shown in the diagram below.
   [2] Auto air flow control continues until closing of either the air flow UP or air flow DOWN switch is recognized.
   [3] The auto air flow amount calculation results are continuous, not divided into levels.
   [4] When it is recognized that the AUTO switch has been closed, the display becomes as in the table below according to the results of the auto air flow amount calculation.
   [5] The normal auto air flow output change is roughly 5 V/sec.

Relay



4-pole relays are used for the blower OFF relay and compressor relay.

Blower OFF relay

This relay receives the signal from the control amp and switches the blower OFF relay ON.
When the blower OFF relay is switched ON, the power supply voltage is fed to the blower motor via the blower amp and the blower motor is started.

Compressor relay

The compressor relay is switched ON/OFF by the control amp compressor control.

Relay inspection contents

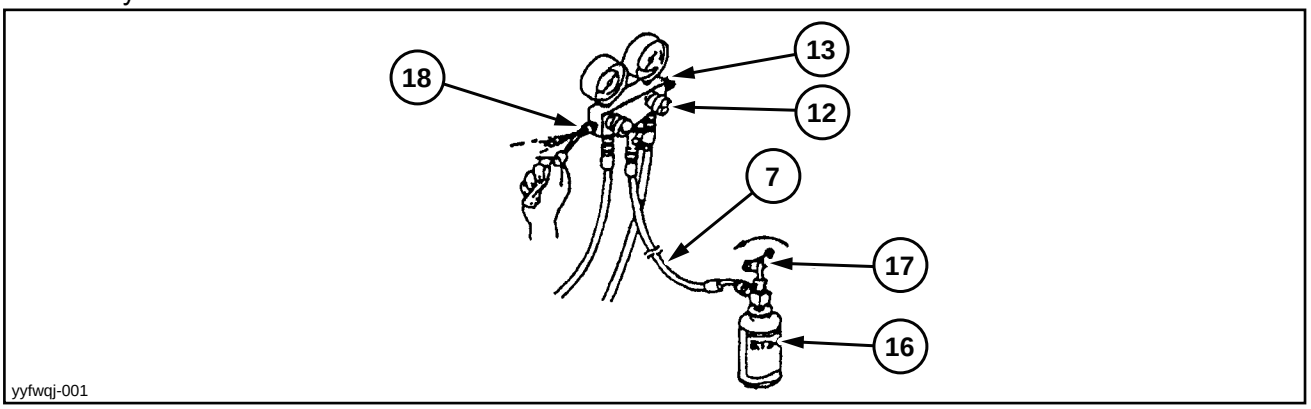
1. Relay
2. Coil resistor: 320 Ω
3. Specification voltage: DC 20 - 30 V
4. Be careful. The coil side of this relay must be installed with the poles facing correctly.
5. Inspection: Inspect for continuity between 3 and 4 under the conditions below.

20 - 30 V applied between term8inals 1 and 2	: Continuity
No voltage applied between terminals 1 and 2	: No continuity

Gas Filling Operation, High-pressure Side

First, prepare the regulation amount of refrigerant, and then start the filling operation from the high-pressure side.

1. After repeating vacuuming, switch the charging hose (yellow) (7) of the gauge manifold (13) from the vacuum pump to the service can (16).
2. Air purging
   Open the valve for the service can (17). (However, keep the gauge manifold high-pressure and low-pressure valves closed.)
   Next, press the air purge valve (18) of the side service port on the gauge manifold low-pressure side with a screwdriver to discharge the air inside the charging hose using the refrigerant pressure. (Complete after the swooshing sound stops.)
3. Open the high-pressure valve (12) of the gauge manifold (13), and fill with coolant. [Fill with refrigerant gas up to a gauge pressure of 0.098 MPa (14.21525 psi).]
   After filling, close the gauge manifold high-pressure valve and valve for the service can (17).
   Never operate the compressor. (This is very dangerous, as the refrigerant will flow in the opposite direction and may cause a service can or hose explosion.)
4. Gas leak check
   Check for gas leaks in the cycle using the gas leak tester.
   If there are leaks, eliminate them through tightening.
   Always use the tester for R134a.



Note

1.Install the joint connectors on connectors CN.A33F, A34F, CN.A35F, A36F, A37F, and A38F.
2.For connectors marked with *, install the suitable housing.

a	The connectors (CN.A47M, A47F) must be fastened with red tape.	e	Fasten the connector (CN.A27F) with red tape.	i	Fasten the connector (CN.A25F) with red tape.
b	Fasten the connectors (CN.A30F, A31F) with red tape.	f	Fasten the connectors (CN.A33F, A34F) with red tape.	j	Fasten the connectors (CN.A24F, A24M) with red tape.
c	After connecting connectors (CN.A28M, A28F), these must be fastened with red tape.	g	Fasten the connector (CN.A26F) with red tape.		
d	Fasten the connectors (CN.A35F, A36F) with red tape.	h	Fasten the connector (CN.A21F) with red tape.		

*1	White adhesive tape	*3	Blue adhesive tape	*5	Fuse box: 1
*2	Red adhesive tape	*4	Plate	*6	Fuse box: 2

CN.A1F	Computer connector: 1	CN.A31F	Diode 2
CN.A2F	Computer connector: 2	CN.A32F	Cab harness: C
CN.A3F	Computer connector: 3	CN.A33F	Joint connector: CONT 1
CN.A4F	Computer connector: 4	CN.A34F	Joint connector: CONT 2
CN.A5F	Computer connector: 5	CN.A35F	Joint connector: A
CN.A6F	ECM relay	CN.A36F	Joint connector: B
CN.A7F	Starter cut relay	CN.A37F	Joint connector: GND 1
CN.A8F	Neutral start relay	CN.A38F	Joint connector: GND 2
CN.A9F	ACC relay 1	CN.A39	Cab ground
CN.A10F	ACC relay 2	CN.A40F	Cab harness: A
CN.A11F	Key ON relay	CN.A41F	Cab harness: B
CN.A12F	Room lamp relay	CN.A42M	Console harness: A
CN.A13F	Cab lamp relay: R	CN.A43M	Console harness: B
CN.A14F	Beacon relay	CN.A44M	Console harness: C
CN.A15F	Cab lamp relay: F	CN.A45M	Console harness: D
CN.A16F	Speaker relay: LR	CN.A46F	Receiver RF
CN.A17F	Speaker relay: RR	CN.A47F	Immobilizer
CN.A18F	Horn relay: R	CN.A47M	Immobilizer: GND
*CN.A19F	EST-B connector (F)	CN.A48F	Cab lamp relay: F (backup)
CN.A20F	Diagnostic connector	CN.A49F	Cab lamp relay: R (backup)
CN.A21F	EST-A harness	CN.A50M	Frame main harness: A
CN.A24F	Buzzer: +	CN.A51M	Frame main harness: B
CN.A24M-1	Buzzer: -	CN.A52M	Frame main harness: C
CN.A24M-2	Console harness: E	CN.A53M	Frame main harness: D
*CN.A25F	Option harness	CN.A54M	Frame main harness: E
CN.A26F	CONT-T harness	CN.A55M	Frame main harness: F
CN.A27F	CONT-C harness	CN.A56M	Frame main harness: G
CN.A28F	Hour meter: +	CN.A58M	Cab harness: A
CN.A28M	Hour meter: -	CN.A59F	Speaker relay: LF
CN.A29F	DC converter	CN.A60F	Speaker relay: RF
CN.A30F	Diode 1		

Note

1.When installing the ground terminals marked with *, check that the frame seating surface is not coated. If the surface is coated, remove the coating before installation.

2.Adjust the clamp positions of the electrical wiring that comes out from connectors so that the wiring does not form sharp rounded shapes. [R = 10 mm (0.394 in.) or more]

3.While the indicator (LED) of the battery disconnect switch is lit, do not turn OFF the battery disconnect switch or disconnect the battery ground cable from the battery.

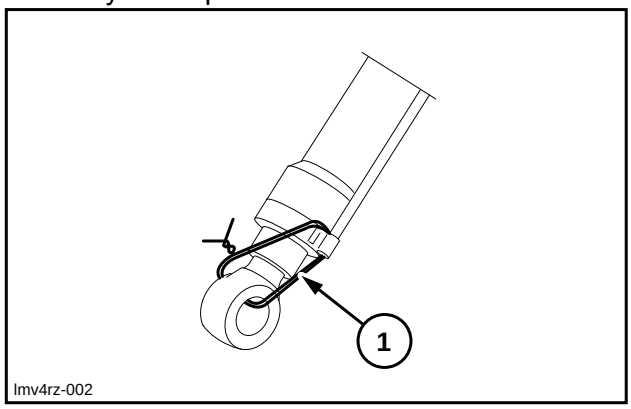
a	Fasten together with the starter cable.	c	Align white tape of harness marking position.	e	Battery disconnect switch OFF
b	Install the battery in such a way that the indicator is completely visible.	d	Battery disconnect switch ON		

*1	Battery relay box details	*3	Engine accessory; Starter relay	*5	Starter motor B terminal
*2	Engine accessory; Glow relay	*4	KBR14070 Frame main wire harness		

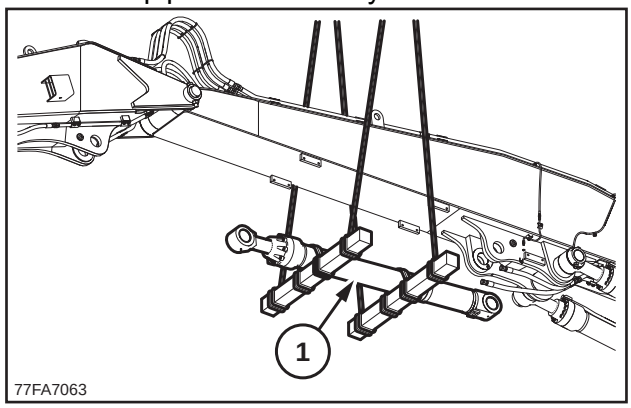
Code	Part name	Q'ty	Code	Part name	Q'ty
1	Battery 180G51	2	8	Fuse (fusible link) 50 A	2
2	Battery cable switch	1	9	Fuse (fusible link) 50 A	1
3	Battery cable bridge	1	10	PEC fuse holder	3
4	Battery cable starter relay	1	11	Battery relay	1
5	Battery cable GND	1	12	PEC fuse 60 A	1
6	Battery cable (battery switch)	1	13	PEC fuse 100 A	1
7	Battery disconnect switch	1	14	Indicator (LED)	1

CN.D10	Starter motor: S	CN.D25	Battery relay: B2 (ID: Red tape)
CN.D15	Fuse 100 A; 1 (ID: Blue tape)	CN.D26	Battery relay: IGN
CN.D16	Fuse 100 A; 2 (ID: Yellow tape)	CN.D27	Battery relay: Coil 1
CN.D17	Fuse 60 A; 1 (ID: Red tape)	CN.D28	Battery relay: Coil 2
CN.D18	Fuse 60 A: 2	CN.D29F	Battery relay: GND
CN.D19M	Fuse 50 A; +B (2-pin) (ID: Red tape)	CN.D30F	Starter relay; B/C (2-pin)
CN.D20M	Fuse 50 A; ST (2-pin) (ID: Blue tape)	CN.D31F	Starter relay; S/E (2-pin)
CN.D21F	Fuse; 4-pin (ID: Red tape)	CN.D33F	Glow relay coil; 2-pin
CN.D22F	Fuse; 4-pin (ID: Yellow tape)	CN.D34F	Relay coil 1
CN.D23F	Fuse; 4-pin	CN.D35F	Relay coil 2
CN.D24	Battery relay: B1 (ID: Red tape)	CN.D84F	LLC tank switch; 2-pin

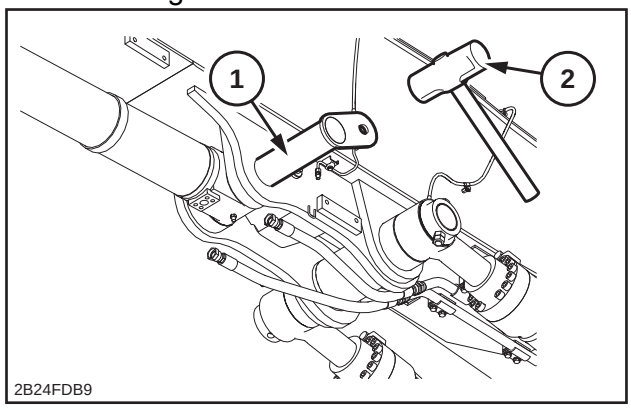
2. Tie the cylinder rod with a wire (1) so that it may not slip out.



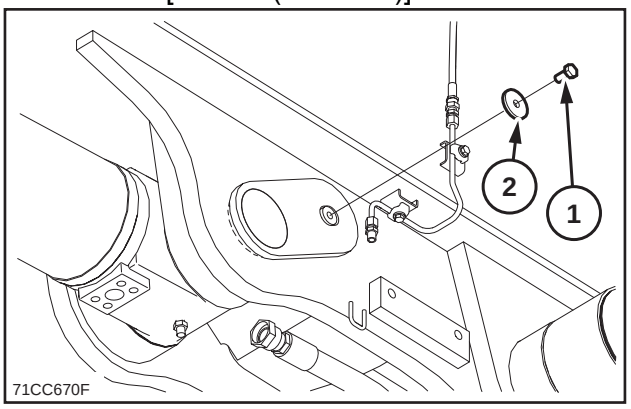
3. Lift the arm cylinder (1) with a liftcrane and a nylon sling (2).
   - Wind a nylon sling around inner side of the pipe so that it may not be crushed.



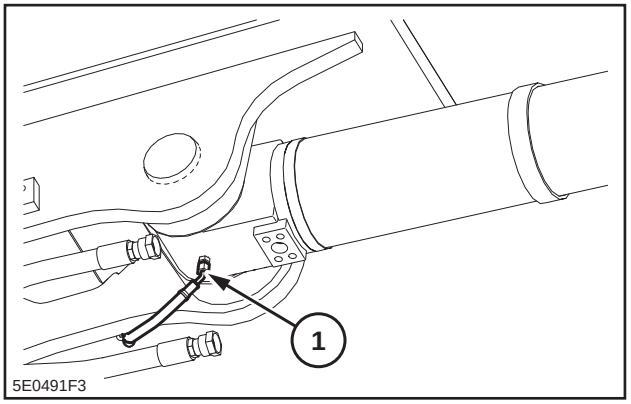
4. Align the arm cylinder with the boom, and push in the pin (1) with a hammer (2).
   - If it is hard to put in the pin, load is applied to the pin.
   - When inserting the pin, be careful not to damage the attached dust seal.



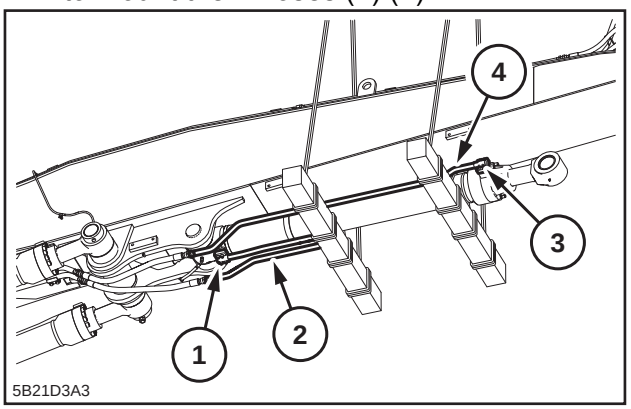
5. Tighten the bolt (1) and washer (2) with a wrench [19 mm (0.748 in.)].



6. Attach the grease hose (1) with a wrench [19 mm (0.748 in.)].



7. Tighten the 4 bolts (1) and the 4 bolts (3) with a hexagon wrench [10 mm (0.394 in.)] to mount the 2 hoses (2) (4).



Storage Standards

When a hydraulic cylinder is shipped from the plant, every measure is taken, but in order to prevent trouble during storage and to extend the product service life, pay attention to the following items.

Storing Parts Individually (In principle, store indoors.)

- Store parts off the floor and do not store in any location with high temperature and humidity, corrosive gas or liquids.
- Before shipment, we operate the cylinder with hydraulic oil to which a fixed quantity of vaporizing anti-rust agent has been added (in order to prevent rust within the cylinder), carry out the pre-shipping inspection, retract the piston rod with ultra-dry air (condensation point -35°C (-31.0°F) or lower) (in order to prevent condensation due to temperature difference), and then put caps on the ports and line joints before shipping the cylinder.
- Any product that has been in storage in our product warehouse longer than the standard storage period is disassembled and inspected before being shipped. Therefore, do not store or leave a cylinder unused with a cap removed or with the remaining oil in the cylinder drained.

	Storage for 1 month or longer	Storage for 6 month or longer (3 months for cylinder alone)	Storage for 1 year or longer
①	Clean any dust from the cylinder, and then apply anti-rust oil to the pin bushings, flange sections, piston rod, and other sections that rust easily.	Operate the cylinder back and forth with clear hydraulic oil, and then pour anti-rust oil into the cylinder and store in compliance with the items on the left for storage of 1 month.	Since there is a danger of packings deterioration, disassemble, inspect, and replace packings. Also, check for rust inside the cylinder.
②	-	If the cylinder cannot be operated, seal in anti-rust oil.	If a cylinder that has been stored for a long time is used as is, oil may leak due to temporary running-in defects of seals.
③	When storing, be extremely careful not to let parts drop, let them collide with anything, or let anything strike them.		

When Mounted on Vehicle Body

① Operate the cylinder at least once per month.

② Retract the cylinder so that as much as possible outside air does not touch the piston rod and apply anti-rust oil at least once per month to the exposed part of the piston rod.

③ Handle carefully to absolutely avoid scratching the piston rod.

④ When putting the cylinder into an environment where rust occurs particularly easily, for example due to exposure to sea breezes during export, always apply anti-rust oil to the piston rod and as much as possible protect with polyethylene sheets or VCI paper (vaporizing anti-rust paper).

⑤ Anti-rust oil and other solvents can have negative impacts on seals, so select anti-rust oil carefully and as much as possible keep it off dust seals etc. (For details on anti-rust oil to select, see "6.3) Recommended Anti-rust Oil".)

*1	After tightening, crimp two locations around the perimeter by punching.	*5	To the bottom pin center	*9	Female screw effective depth 18 mm (0.708 in.) at two locations
*2	Hexagon bolt width 100 mm (3.937 in.)	*6	Pay attention to orientation of semi-circle during assembly.	*10	TYPE-B PT1/8
*3	Outer periphery knurling processing	*7	Serial No. stamping position	*11	TYPE-C PT1/8
*4	Cushion stroke	*8	97 mm (3.819 in.) or more		

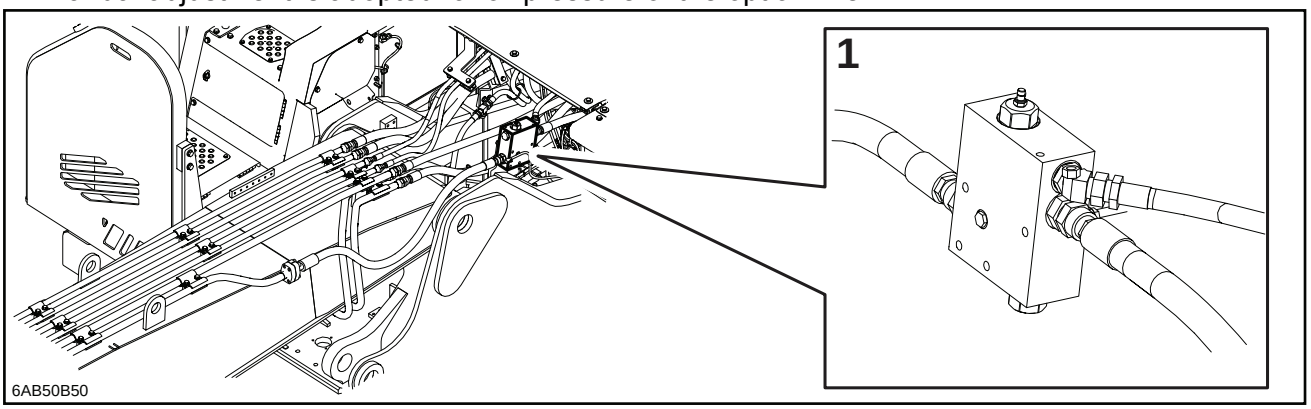
L1	Maximum retracted length 1665 mm (65.551 in.)
L2	Stroke 1073 mm (42.244 in.)

Code	mm	in.	Code	mm	in.
a	157	6.181	k	D105 H8	4.134
b	D154	D6.063	l	D95 H8	3.740
c	D135	D5.135	m	100	3.937
d	D90	D3.543	n	115	4.528
e	60	2.632	o	D90	D3.543
f	131	5.157	p	R83	R3.268
g	170	6.693	q	D197	D7.756
h	105	4.133	r	D80	D3.149
i	7.5	0.295	s	R75	R2.953
j	90	3.543			

Code	Part name	Quantity	Code	Part name	Quantity
1	Tube subassembly	1	21	Retaining screw	1
2	Rod subassembly	1	22	Steel ball	1
3	Cylinder head	1	23	Pin bushing	1
4	Bushing	1	24	Wiper ring	2
5	Snap ring	1	25	Pin bushing	1
6	Buffer ring	1	26	Wiper ring	2
7	U-ring	1	27	Joint subassembly	1
8	Backup ring	1	28	Pipe subassembly	1
9	Wiper ring	1	29	O-ring	2
10	O-ring	1	30	Hexagon socket head bolt	8
11	Backup ring	1	31	Band subassembly	1
12	Hexagon socket head bolt	12	32	Band	1
13	Cushion ring	1	33	Bolt	2
14	Piston	1	34	Washer	2
15	Seal ring assembly	1	35	Pipe holder	1
16	Backup ring	2	36	Bolt	1
17	Slide ring	2	37	Spring washer	1
18	Slide ring	2	38	Grease nipple	1
19	Shim	1	39	Grease nipple	1
20	Nut	1			

Hydraulic-related Data

・ Manual adjustment is adopted for oil pressure of the option line.



Oil Pressure Control

The control valve is exclusively configured on the basis of that for the standard model's 2nd option.
Configuration of the electromagnetic proportional valve control for the arm 1 variable parallel spool is changed.

・ Pressure loss during independent arm operation is reduced.
・ Swing pressure during arm swing is secured.
・ Responsiveness during arm/boom up is improved.

Configuration of the electromagnetic proportional valve control for the arm 2 variable parallel spool is changed.

・ Pressure loss during independent arm operation is reduced.
・ Responsiveness during arm/boom up is improved.

Configuration of the boom regenerative control is changed.

・ Energy is saved by arm/boom regeneration.

Arm regeneration (close) control is eliminated.

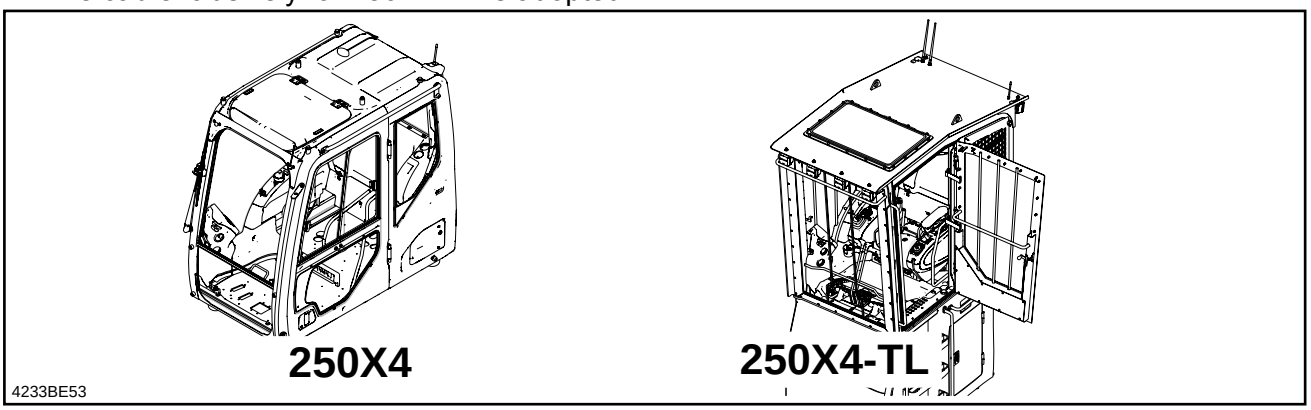
・ Return pressure loss during heavy excavation is reduced.
・ Energy is saved by regeneration under light load.

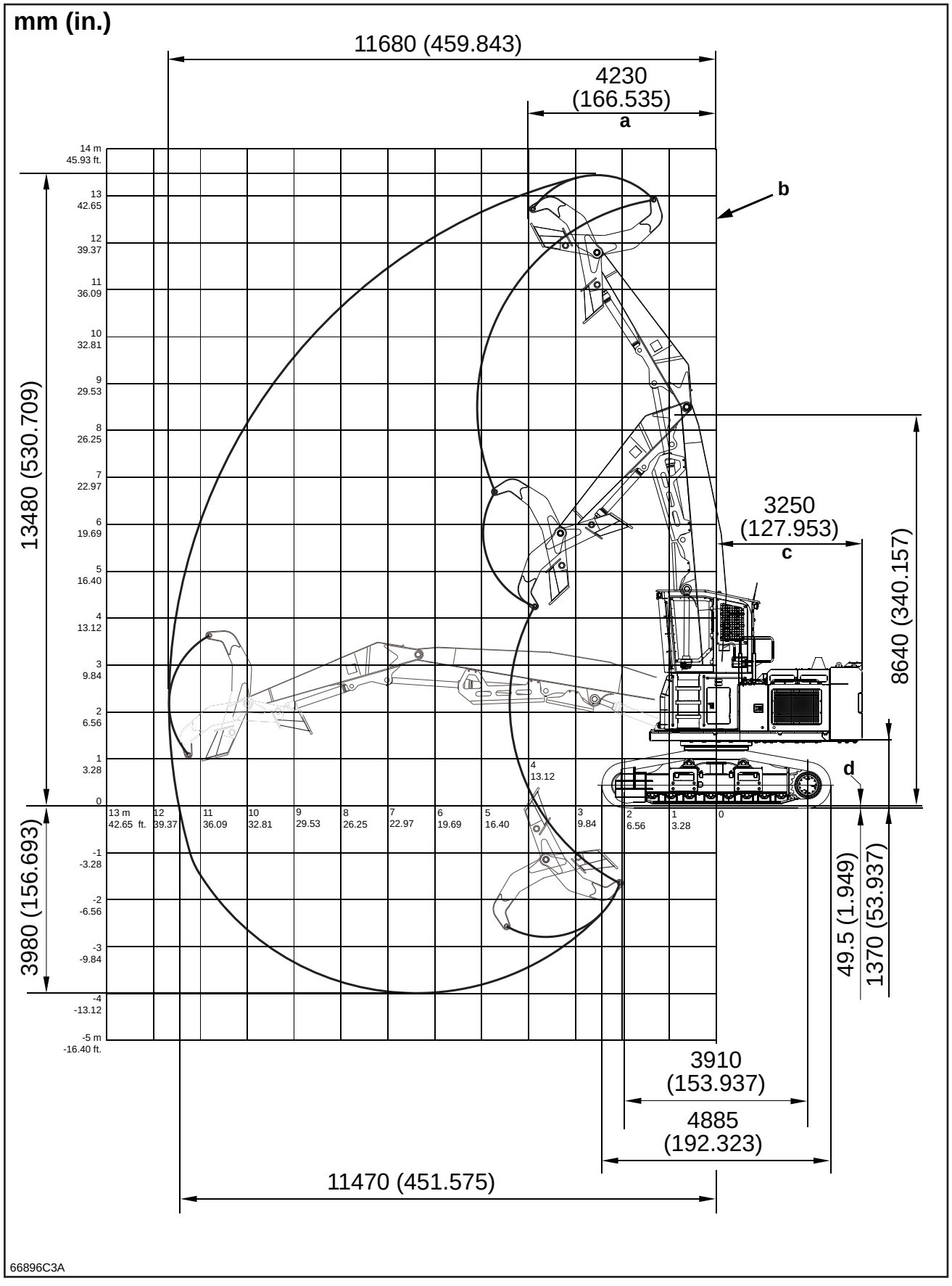
Stroke control of the bucket spool is eliminated.

・ Pressure loss during heavy excavation is reduced.
・ Energy is saved by regeneration under light load.

Cab, Housing

・ The cab exclusively for 250X4-TL is adopted.





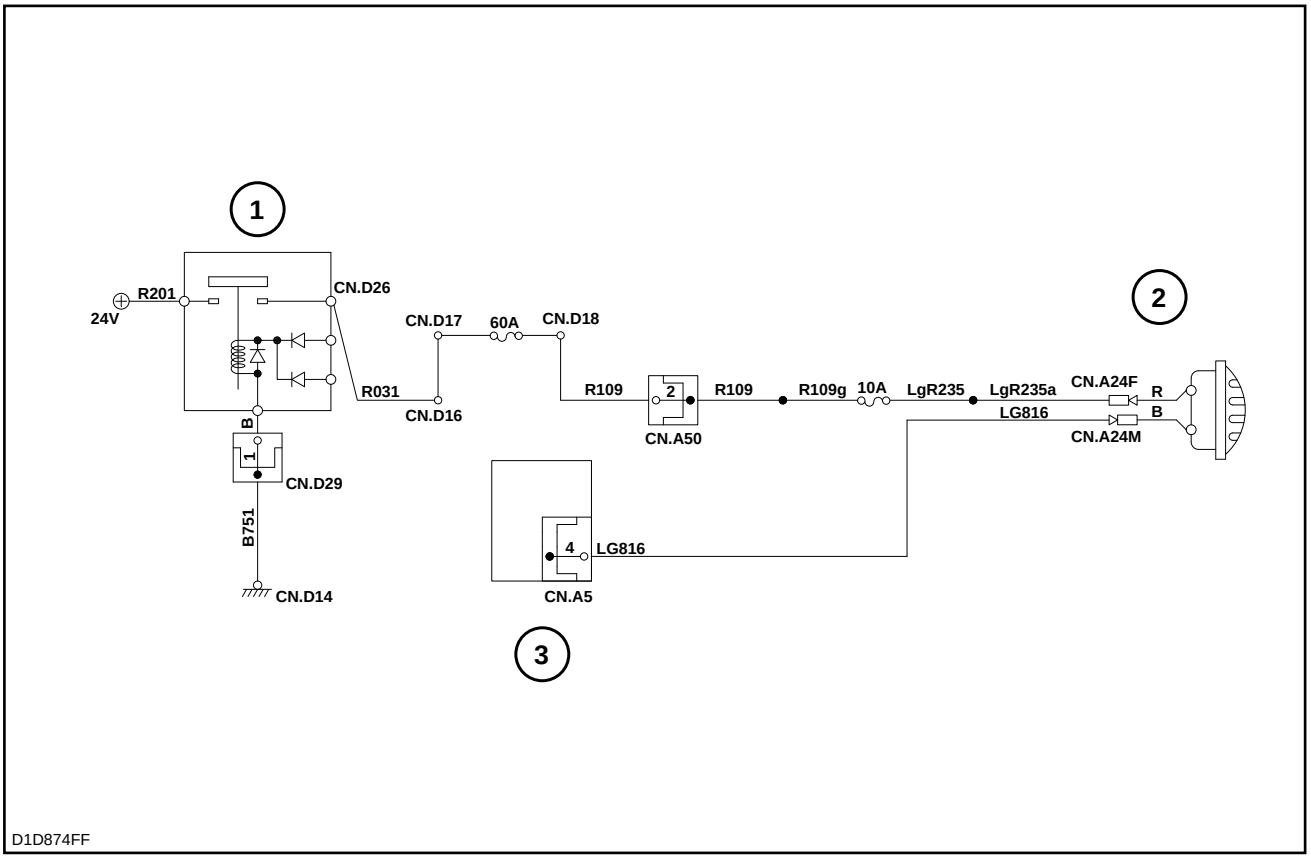
a	Minimum swing radius	c	Swing radius (rear end)
b	Swing center	d	Grouser shoe lug height

Diagnostic Trouble Code: 7002 Pressure Sensor N1 Abnormality

Step	Action	Standard value	Yes	No
1	1. Turn the key switch ON. 2. Check whether diagnostic trouble code: 7002 is displayed. Is diagnostic trouble code: 7002 displayed?		Go to Step 2	
2	1. Inspect the connection status of each connector. 2. Check whether diagnostic trouble code: 7002 is displayed. Is diagnostic trouble code: 7002 displayed?		Go to Step 3	
3	1. Check the voltage of N1 pressure sensor at the service support screen. Is the measured voltage 4.75 V or more?	Voltage is 4.75 V or more	Go to Step 4	If the measured voltage 0.25 V or less, go to Step 7
4	Inspect for short circuit. 1. Turn the key switch OFF and disconnect CN.D65-1. 2. Turn the key switch ON. 3. Measure the voltage between the ground and terminal 1 of the CN.D65-1 harness side. Is the measured voltage about 5 V?	Voltage is about 5 V	Go to Step 5	W430b and W430 harnesses defect (short). Replace.
5	1. Measure the voltage between the ground and terminal 2 of the CN.D65-1 harness side. Is the measured voltage 4.75 V or less?	Voltage is 4.75 V or less	Go to Step 6	R419 harness defect (short). Replace.
6	1. Measure the voltage between the ground and terminal 3 of the CN.D65-1 harness side. Is the measured voltage 0.25 V or less?	Voltage is 0.25 V or less	Replace the main controller because it is faulty.	BL440b and BL440 harnesses defect (short). Replace.
7	1. Inspect for N1 pressure sensor. 2. Turn the key switch OFF. 3. Disconnect CN.D65-1. 4. Measure the resistance between terminals 1 and 3 of the CN.D65-1 N1 pressure sensor side. Is the measured resistance about 10 kΩ?	Resistance is about 10 kΩ	Go to Step 8	N1 pressure sensor defect, replace.
8	Inspect for ground short circuit and disconnection. 1. Inspect for continuity between the ground and terminal 1 of the CN.D65-1 harness side. 2. Inspect for continuity between the ground and terminal 2 of the CN.D65-1 harness side. Is there continuity?		W430b, W430, and R419 harnesses defect (short). Replace.	Go to Step 9
9	1. Inspect for continuity between the ground and terminal 3 of the CN.D65-1 harness side. Is there continuity?		Go to Step 10	BL440b and BL440 harnesses defect (disconnection). Repair or replace.
10	1. Turn the key switch ON	Voltage is about 5 V	Go to Step 11	W430b and W430 harnesses defect

Diagnostic Trouble Code: 7069 Pressure Sensor Arm-out Pilot Abnormality

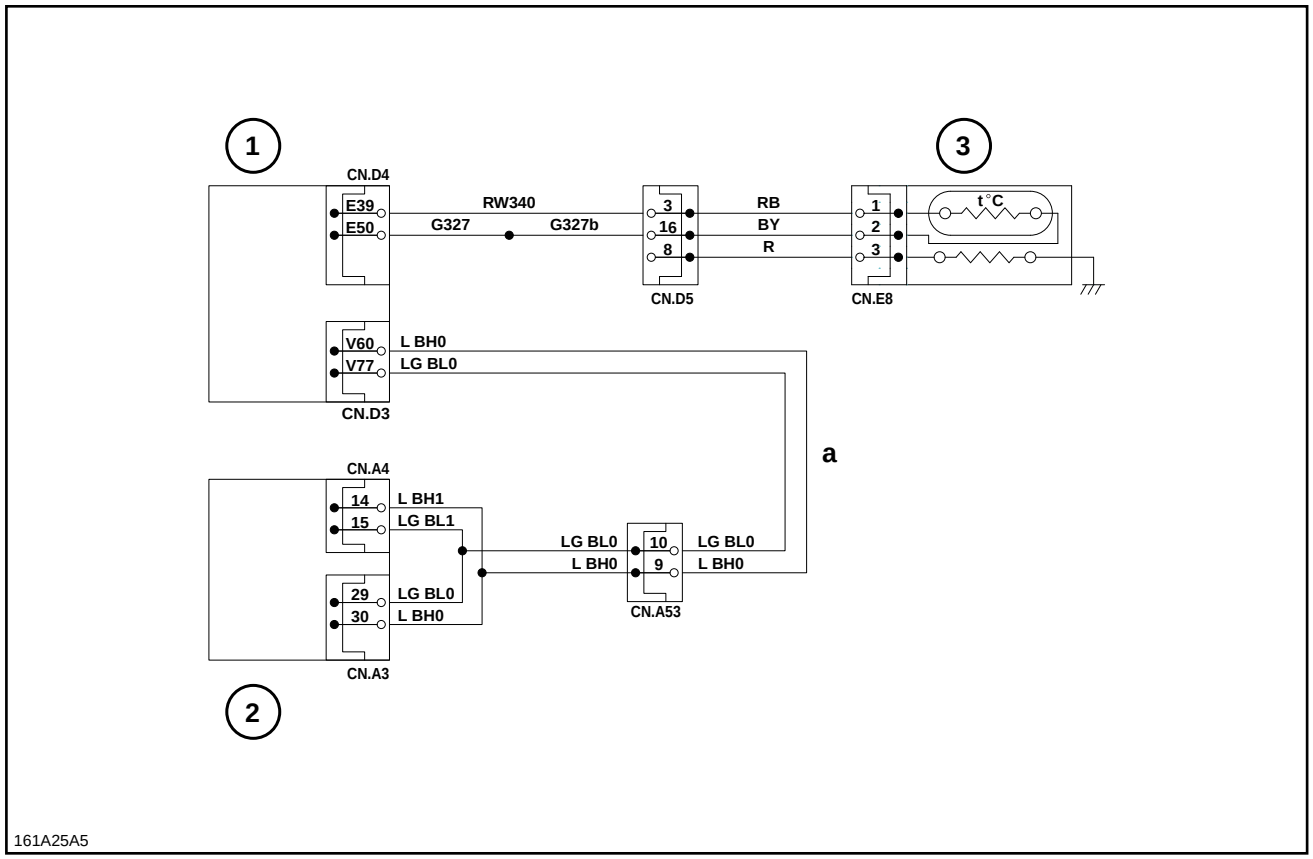
Step	Action	Standard value	Yes	No
1	1. Turn the key switch ON. 2. Check whether diagnostic trouble code: 7069 is displayed.		Go to Step 2	
2	1. Turn the key switch OFF. 2. Inspect the connection status of each connector and check whether it is sufficiently inserted or if any wiring terminal has come out. 3. Disconnect the connection of each connector to check whether there is abnormality in wiring terminal. Connect the connector again if thee there is no abnormality. 4. Turn the key switch ON to check whether diagnostic trouble code: 7069 is displayed.		Go to Step 3	
3	1. Is the voltage of pressure sensor 4.75 V or more at the service support screen?Check.	Voltage is 4.75 V or more	Go to Step 4	If the measured voltage 0.25 V or less, go to Step 8
4	Inspect for short circuit. 1. Turn the key switch OFF and disconnect CN.D72. 2. Turn the key switch ON. 3. Is the voltage between the ground and terminal 1 of the CN.D72 harness side 5 V or more?Measure.	Voltage is about 5 V	Go to Step 5	WL435e, WL435, and WB435 harnesses defect (short). Replace.
5	1. Is the voltage between the ground and terminal 2 of the CN.D72 harness side 4.75 V or less?Measure.	Voltage is 4.75 V or less	Go to Step 6	YR407 harnesses defect (short). Replace.
6	1. Is the voltage between the ground and terminal 3 of the CN.D72 harness side 0.25 V or less?Measure.	Voltage is 0.25 V or less	Go to Step 7	BW445e and BW445 harnesses defect (short). Replace or go to Step 8
7	Main controller defect			Replace main controller.
8	1. Inspect for arm-out Pi pressure sensor. 2. Turn the key switch OFF. 3. Disconnect CN.D72. 4. Is the resistance between the terminals 1 and 3 of CN.D72 pressure sensor side about 10 Ω?Measure.	Resistance is about 10 Ω	Go to Step 9	Arm-out Pi pressure sensor defect, replace.
9	Inspect for ground short circuit and disconnection. 1. Is there continuity between the ground and terminal 1 of the CN.D72 harness side?Inspect. 2. Is there continuity between the ground and terminal 2 of the CN.D72 harness side?Inspect.		WL435e, WL435, WB435, and YR407 harnesses defect (short). Replace.	Go to Step 9



1	Battery relay
2	Quick coupler buzzer
3	Main controller

Diagnostic Trouble Code: 7401 Coolant Temperature Overheating 2

Step	Action	Standard value	Yes	No
1	1. Start the engine and warm-up until the engine completely gets warm. 2. Check whether diagnostic trouble code: 7401 is displayed at the service support screen. Is diagnostic trouble code: 7401 displayed?		Go to Step 2	
2	Inspect the engine			



1	Engine controller
2	Main controller
3	Coolant temperature sensor

a	CAN communication

Diagnostic Trouble Code: 7606 EEPROM Abnormality

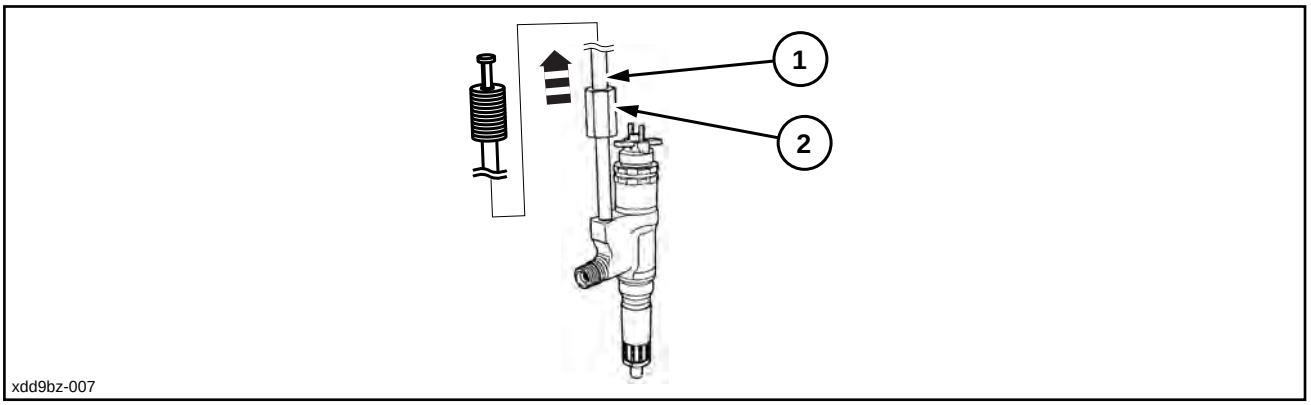
step	Action	Standard value	Yes	No
1	1. Turn ON the key switch. 2. Check whether the diagnostic trouble code: 7606 is displayed at the service support screen. Is the diagnostic trouble code: 7606 displayed?		Go to step 2.	
2	1. Check whether the main controller had been rewritten before the diagnostic trouble code was displayed? Had the main controller been rewritten before the diagnostic trouble code was displayed?		The EEPROM area was changed because the main controller had been rewritten. Turn OFF the key switch, and turn ON the key switch again.	Replace the main controller because it is faulty.

Kilopascals → Weight kilograms/square centimeter

kpa	0	100	200	300	400	500	600	700	800	900	kpa
	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	
----		1.020	2.039	3.059	4.079	5.099	6.118	7.138	8.158	9.177	----
1000	10.197	11.217	12.237	13.256	14.276	15.296	16.315	17.335	18.355	19.375	1000
2000	20.394	21.414	22.434	23.453	24.473	25.493	26.513	27.532	28.552	29.572	2000
3000	30.591	31.611	32.631	33.651	34.670	35.690	36.710	37.729	38.749	39.769	3000
4000	40.789	41.808	42.828	43.848	44.868	45.887	46.907	47.927	48.946	49.966	4000
5000	50.986	52.006	53.025	54.045	55.065	56.084	57.104	58.124	59.144	60.163	5000
6000	61.183	62.203	63.222	64.242	65.262	66.282	67.301	68.321	69.341	70.360	6000
7000	71.380	72.400	73.420	74.439	75.459	76.479	77.498	78.518	79.538	80.558	7000
8000	81.577	82.597	83.617	84.636	85.656	86.676	87.696	88.715	89.735	90.755	8000
9000	91.774	92.794	93.814	94.834	95.853	96.873	97.893	98.912	99.932	100.952	9000
10000	101.972	102.991	104.011	105.031	106.050	107.070	108.090	109.110	110.129	111.149	10000

Injector Special Tool

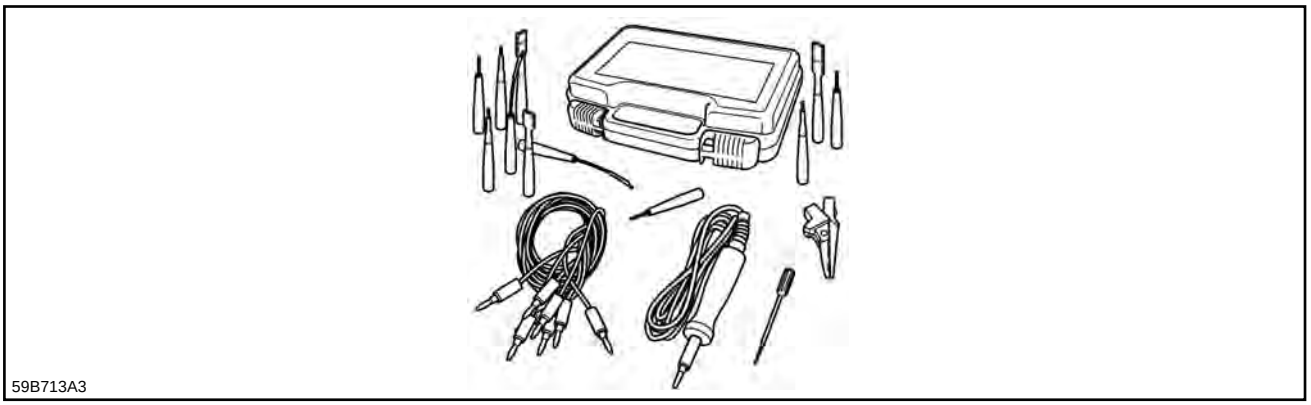
■250X4 / 210X4 / 250X4-TL / 210X4-TL



Code	Order No.	Jig name	Remarks
1		Sliding hammer (Isuzu part No.: 5-8840-0019-0)	
2		Injector remover (Isuzu part No.: 5-8840-2826)	

Circuit Test Special Tool

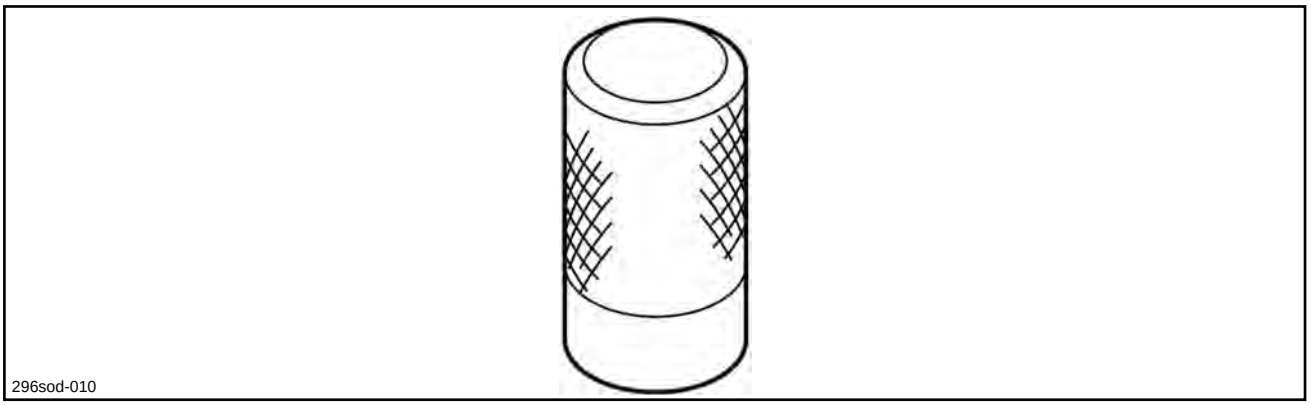
■250X4 / 210X4 / 250X4-TL / 210X4-TL



Part number	Jig name	Remarks
5-8840-2835-0	Connector test adapter kit	

Valve Guide Special Tool

■250X4 / 210X4 / 250X4-TL / 210X4-TL



Part number	Jig name	Remarks
5-8840-2625-0	Valve stem seal setting tool	