250X4/
250X4 LF

Excavator

SERVICE MANUAL

WLSM2507-05LX

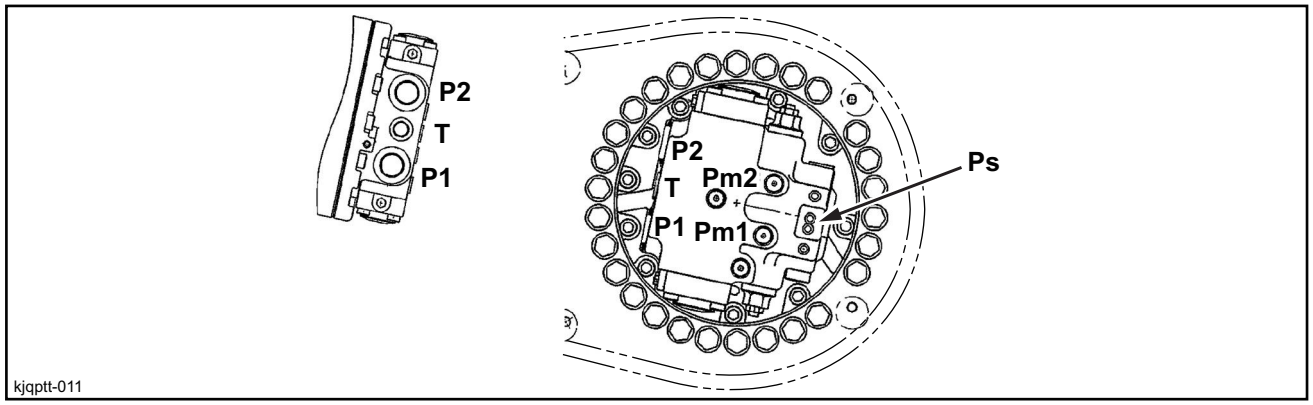
LBX®

Total Customer Support

Dec. 2014

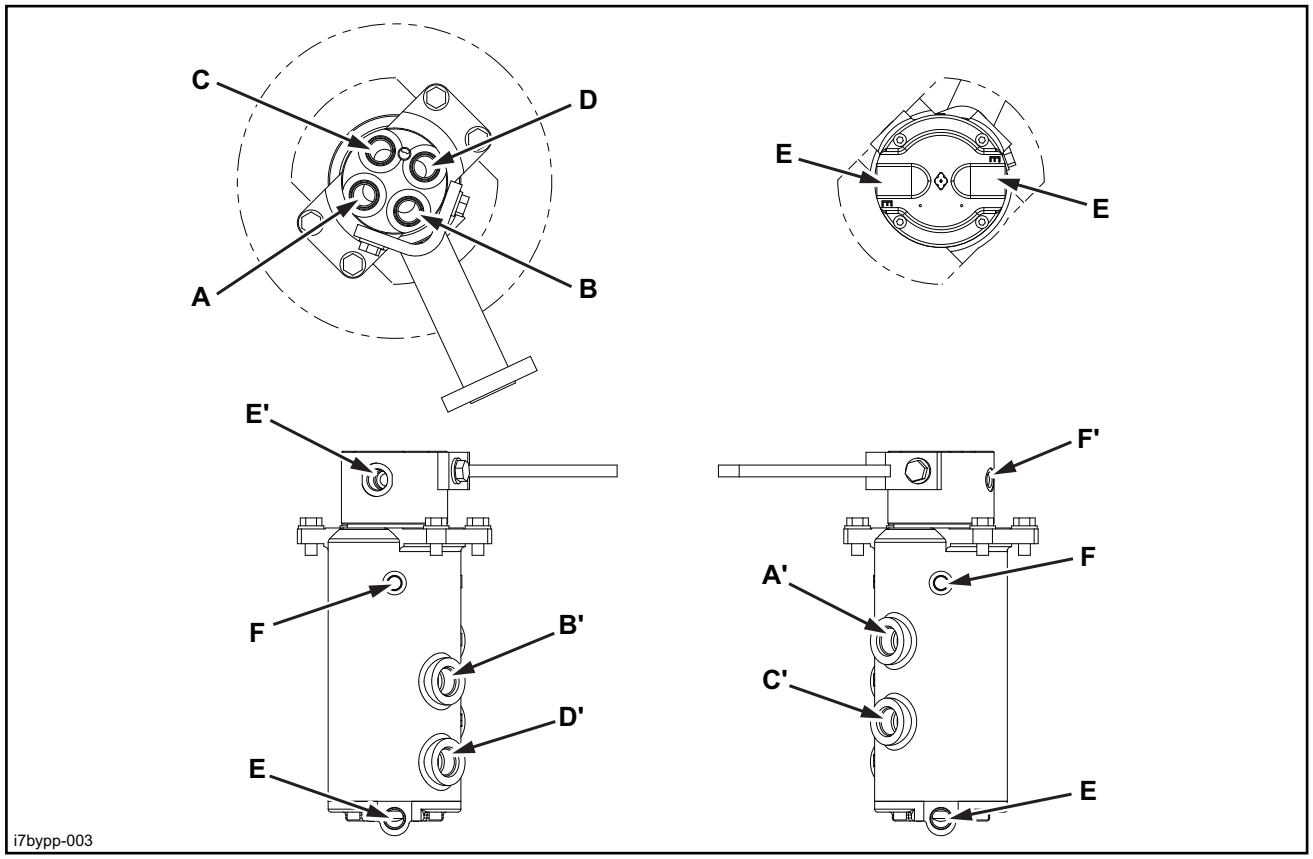
Port Diagram

Travel Motor



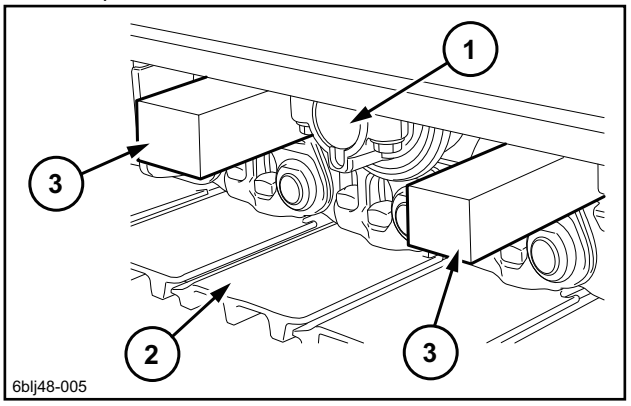
Port	Port name	Port size
P1, P2	Main port	G1
T	Drain port	G1/2
Ps	Pilot port	G1/4
Pm1, Pm2	Pressure detection port	G1/4

Center Joint

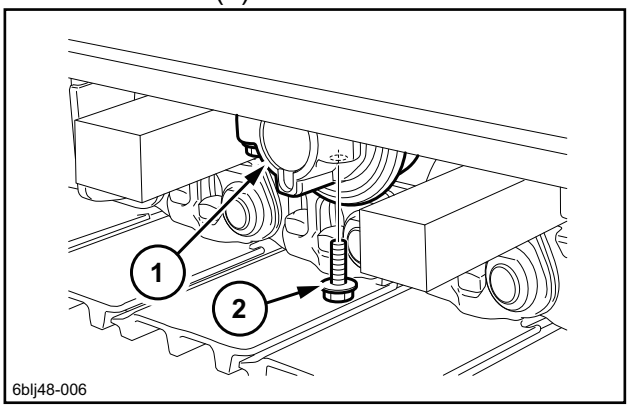


Port	Port name	Port size
A, A'	Main port (forward right)	G3/4
B, B'	Main port (forward left)	G3/4
C, C'	Main port (backward right)	G3/4
D, D'	Main port (backward left)	G3/4
E, E'	Drain port *E (2 locations), E' (1 location)	G1/2
F, F'	Pilot port *F (2 locations), F' (1 location)	G1/4

3. If it is impossible to insert wood planks (3) under the lower frame, insert wood planks (3) between the side frame and the link shoe (2) to separate the link shoe and lower roller (1) by about 15 mm (0.591 in.).

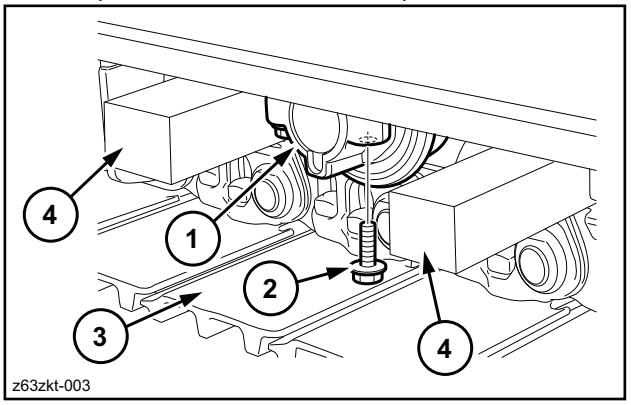


4. Use a box wrench [27 mm (1.063 in.)] to remove the 4 bolts (2), then remove the lower roller (1).

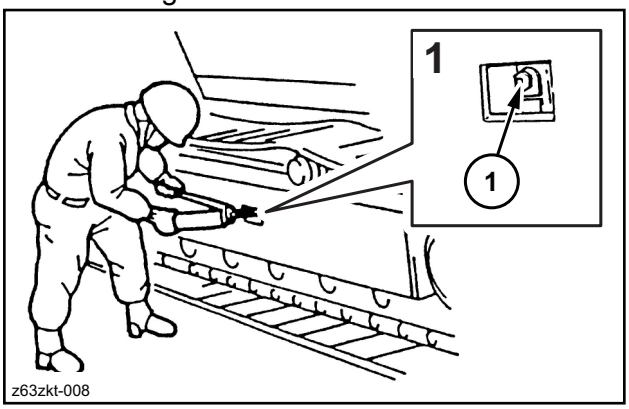


Installation of Lower Roller

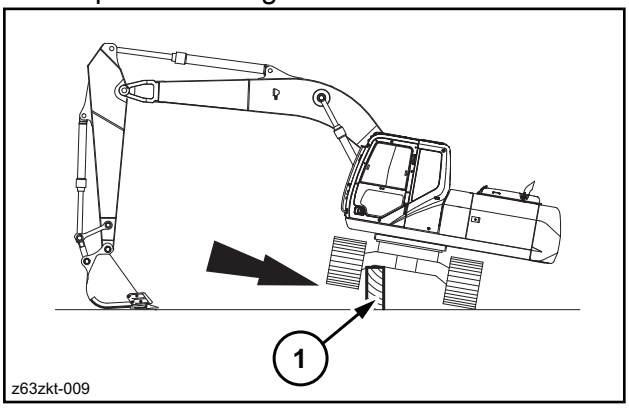
1. Insert wood planks (4) between the side frame and the link shoe (3), and tighten the 4 bolts (2) with a box wrench [27 mm (1.063 in.)] to install the lower roller (1).
   - Bolt (2) tightening torque: 371 - 432 N·m (273.69 - 318.68 lbf·ft.)



2. Tighten the check valve (1).
   Fill grease to the grease cylinder while checking tension of the track shoe.



3. Raise the lower side frame while adjusting tension of the track shoe as shown in the figure.
   Put wood planks (1) under the lower frame to prevent falling.



Removal and Installation of Grease Cylinder

Warning

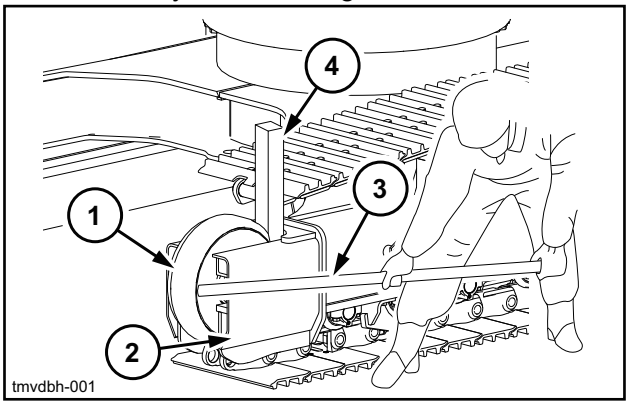
- When loosening the grease cylinder check valve, loosen it a little at a time.
- The pressure inside the cylinder is very high, so there is a danger of grease being expelled and the plug flying off.
  The check valve adjustment procedure should not be done in front of the check valve.
- Do not get under the machine when the main unit is jacked up.
- Make sure to place the main unit on wood planks or the like to prevent falling.
- Align the shoe assembly feed location and stop the engine except when working.

Items to prepare

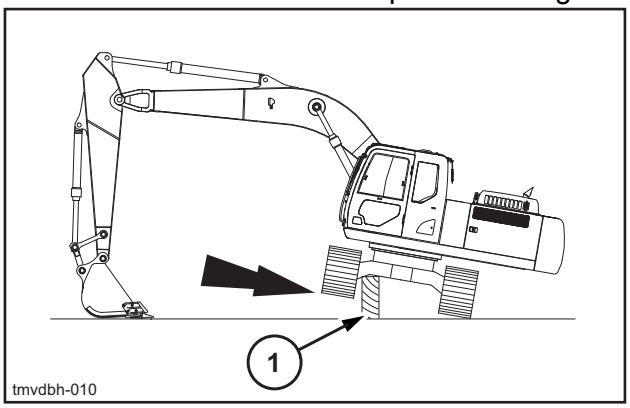
- Wrench [24 mm (0.945 in.), 27 mm (1.063 in.)]
- Hammer
- Lifting equipment
- Loctite #262
- Striking jig
- Striking jig
- Crowbar
- Wood planks, etc.
- Rag

Removal of grease cylinder

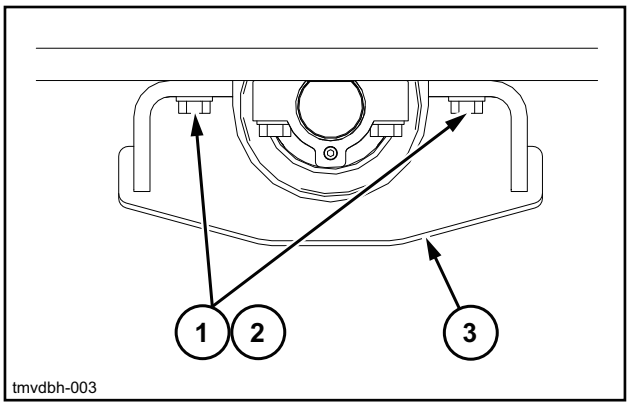
1. Remove the shoe assembly.
   See the "Removal and Installation of Shoe Assembly" procedure.
2. Use a crowbar (3) to pull off the take-up roller (1) and recoil spring assembly about 100 mm (3.937 in.) from the side frame (2).
   When removing the grease cylinder, use a wood plank or the like (4) to prevent the take-up roller (1) and recoil spring assembly from coming out.



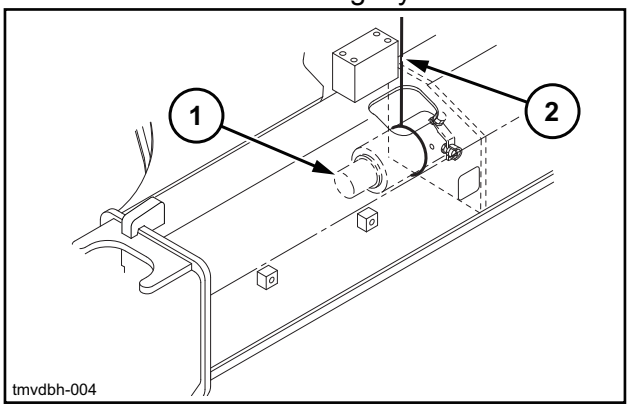
3. Jack up the side frame on the side where the grease cylinder is being removed as shown in the diagram.
   Jack up so that the shoe is floating about 5 cm (1.969 in.), and insert wood plank (1) under the lower frame to prevent falling.



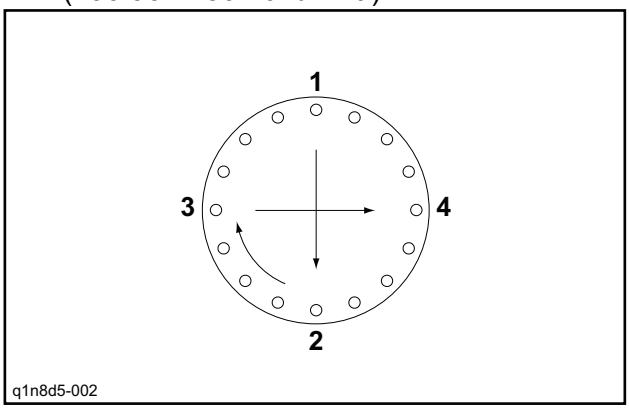
4. Use a wrench [27 mm (1.063 in.)] to remove the bolts (1) and washers (2), and then remove the track guard (3).

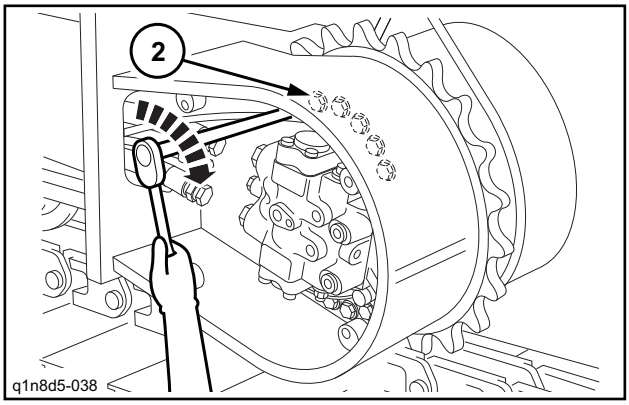


5. Install the wire (2) on the grease cylinder assembly (1), and then lift it with the liftcrane so that it is slightly tensed.

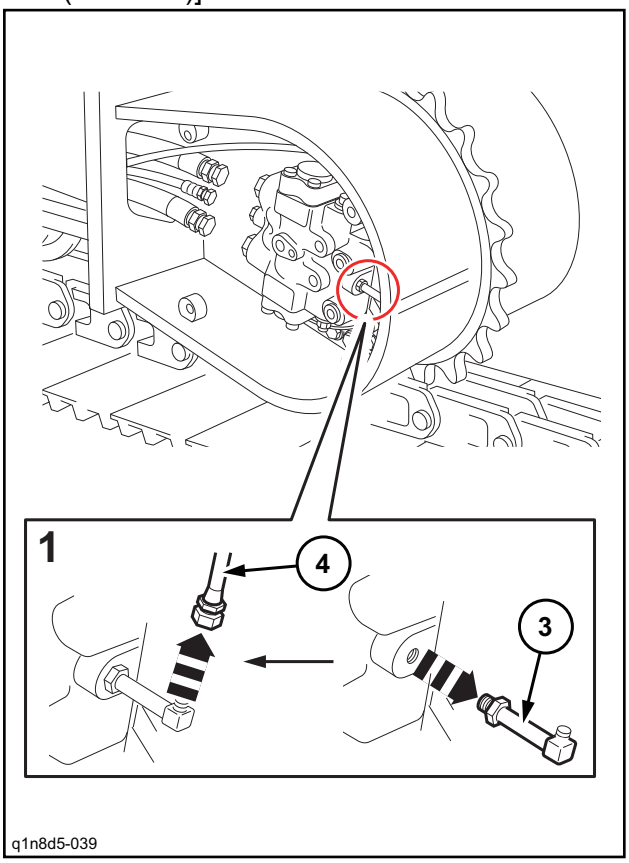


2. Apply Loctite #262 to the thread area of all the 28 mounting bolts (2).
   Tighten them top to bottom alternately so as to apply even diagonal tightening force with specified torque with a wrench [24 mm (0.945 in.)].
   Tightening torque M16: 267 - 312 N・m (196.96 - 230.16 lbf・ft.)

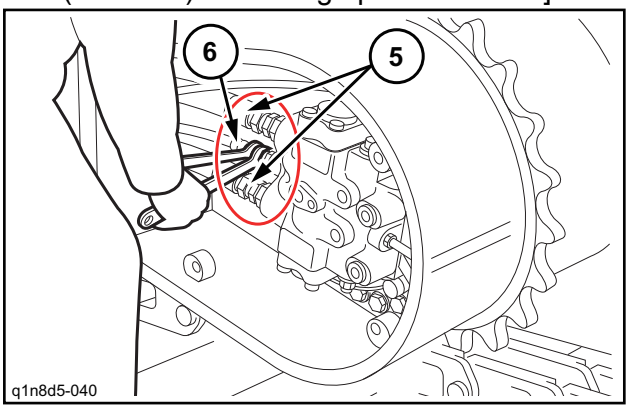




3. Mount the elbow (3) and the pilot hose (4) shown in the figure with a wrench [19 mm (0.748 in.)].



4. Mount the drain hose (6) and the high pressure hoses (5) with a wrench [27 mm (1.063 in.) for the drain hose, 41 mm (1.614 in.) for the high pressure hose].



Applicable part	Inspection and measurement location	Permissible limit value	Repair, solution procedure
Relief housing (1-2-7-1)	1. Sliding section against the free piston (outer diameter)	There is scratching at least 0.02 mm (0.00079 in.) deep. Or the surface is rough.	Replace using the relief valve assembly.
Spring (1-4-7)	1. Exterior dimensions	Free length 61.0 mm (2.4016 in.)	
	2. Exterior	There is deformation and scratching on the coil surface.	
Spring (1-18)	1. Exterior dimensions	Free length 39.0 mm (1.5354 in.)	
	2. Exterior	There is deformation and scratching on the coil surface.	
Spring (1-20)	1. Exterior dimensions	Free length 41.5 mm (1.6339 in.)	
	2. Exterior	There is deformation and scratching on the coil surface.	
Spring (1-2-4)	1. Exterior dimensions	Free length 48.5 mm (1.9094 in.)	
	2. Exterior	There is deformation and scratching on the coil surface.	
Spring (1-2-10)	1. Exterior dimensions	Free length 28.3 mm (1.1142 in.)	
	2. Exterior	There is deformation and scratching on the coil surface.	
Each O-ring and oil seal		During disassembly	Replace each O-ring and oil seal.

Reduction Gear Parts Maintenance Standards

Table 7 indicates maintenance standards for reduction gear parts.
Check each part according to the reduction gear parts maintenance standards in Table 7. When a permissible limit has been exceeded or is near being exceeded, perform part repair or replacement according to repair and solution procedures.

Table 7. Reduction gear maintenance standards

Applicable part	Inspection and measurement location	Permissible limit value	Repair, solution procedure
Planetary gear B (21)	Tooth thickness	Across 6 teeth 66.649 mm (2.623976 in.)	Replace planetary gear B.
	Tooth surface	There is pitching on 10 % or more of the tooth surface or breaking damage is occurring.	
	Inner diameter	Flaking is occurring on the inner diameter surface.	Replace the planetary gear, needle bearing and inner race.
Needle bearing (20)	Roller rotation surfaces	Flaking is occurring on the surface.	
Inner race (19)	Outer diameter surface	Flaking is occurring on the surface.	
Drive gear (25)	Tooth thickness	Across 3 teeth 29.908 mm (1.177480 in.)	Replace the drive gear.
	Tooth surface	There is pitching on 10 % or more of the tooth surface or breaking damage is occurring.	

Troubleshooting

See the troubleshooting section below to perform checking, countermeasures and to solve problems when any kind of problem occurs in the motor during operation.

1. Piston motor troubleshooting

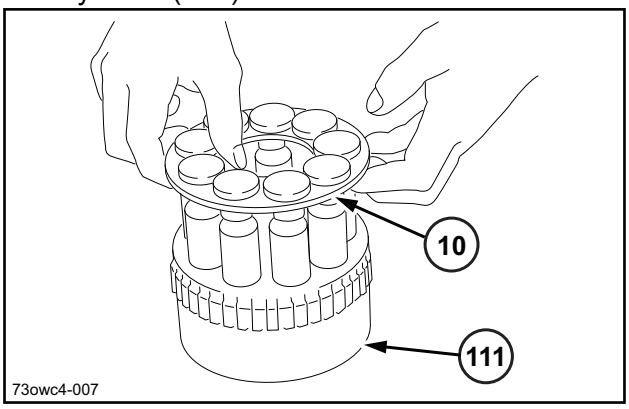
Trouble phenomenon	Suggested cause	Countermeasure and solution
The motor does not rotate	There is an operation problem in a piece of equipment other than the piston motor or reduction gear.	After investigating whether pressure is reaching the motor inlet side, investigate the causes of problems and countermeasures for each piece of equipment and perform inspection and repair.
	If the cause is in the motor itself, there is dirt clogging an operation section or there is an operation problem.	Perform disassembly and clean and remove dirt from parts before reassembling the motor. If parts are damaged due to dirt, replace the parts.
	Motor inlet side pressure is low.	Operate the main relief valve of the circuit and raise the set pressure.
	There is abnormal wear on the sliding sections of the piston motor and pressure oil is escaping.	Perform disassembly and replace abnormally worn parts. After completely removing surface scratching, burrs, etc. and cleaning, perform reassembly.
	Damage is occurring with the main parts of the piston motor. In this instance, abnormal noise is coming from the piston motor.	Perform disassembly and replace damaged parts. Perform reassembly after cleaning parts.
	The load on the piston motor is too large and the relief valve is operating.	Investigate the load conditions and adjust the load to an amount appropriate to the set pressure of the relief valve.
Motor rotation speed is insufficient	The cause resides in the hydraulic pump, pressure control valve, flow control valve, etc. Required oil flow is not being supplied to the piston motor and rotation is insufficient.	After investigating whether the required flow is being supplied to the piston motor inlet side, investigate the causes of problems and countermeasures for each piece of equipment and perform inspection and repair.
	Pressure oil is moving from the high-pressure side to the low-pressure side due to wear on the sliding sections of the piston motor (volume efficiency reduction) and speed is insufficient.	Perform disassembly, investigate the status of wear on the sliding sections of the piston motor, and perform repair or replacement according to the maintenance standards.
	There is looseness in the piston motor base plate fastening bolts. Internal leaking is increased and speed is insufficient.	Retighten the base plate fastening bolts to the specified torque.
Motor rotation variation is high	There is wear on the sliding sections of the piston motor and high-pressure oil is leaking and flowing out from the drain port, which is causing speed to greatly decrease and causing rotation variation.	Perform disassembly, check the status of wear on the sliding sections, and perform repair or replacement according to the maintenance standards.
	When going down an incline, the double counter balance valve is causing hunting and rotation variation.	Perform disassembly, check the status of wear on the double counter balance valve, and perform repair or replacement according to the maintenance standards.
Noise is high	The shaft is touching driven parts due to problems with shaft core alignment, and this is producing noise.	Make the shaft core alignment accurate.

Part name	Code	Measurement dimension [mm (in.)]	Standard value [mm (in.)]	Usage limit [mm (in.)]	Judgment	Solution
Shoe plate	a		34.5 (1.3583)	28.5 (1.1220)	Acceptable/ Unacceptable	Replace.
Link	b		106 (4.173)	101 (3.976)	Acceptable/ Unacceptable	Clad by welding or replace.
Master bushing	c	D	D58.72 (2.31181)	D57.5 (2.2638)	Acceptable/ Unacceptable	Replace.
	d	D	D37.3 (1.4685)	D38.3 (1.5079)	Acceptable/ Unacceptable	
Master pin	e	D	D36.3 (1.4291)	D35.2 (1.3858)	Acceptable/ Unacceptable	Replace.
Link pitch	f		190 (7.480)	193.7 (7.6260)	Acceptable/ Unacceptable	Replace.
Link pitch (4-link portion)	f'		760 (29.921)	774.9 (30.5079)	Acceptable/ Unacceptable	
Track bushing	c'	D	D58.72 (2.31181)	D57.5 (2.2638)	Acceptable/ Unacceptable	Replace.
	d'	D	D37.3 (1.4685)	D38.3 (1.5079)	Acceptable/ Unacceptable	
Track pin	e'	D	D36.65 (1.44291)	D35.5 (1.3976)	Acceptable/ Unacceptable	Replace.

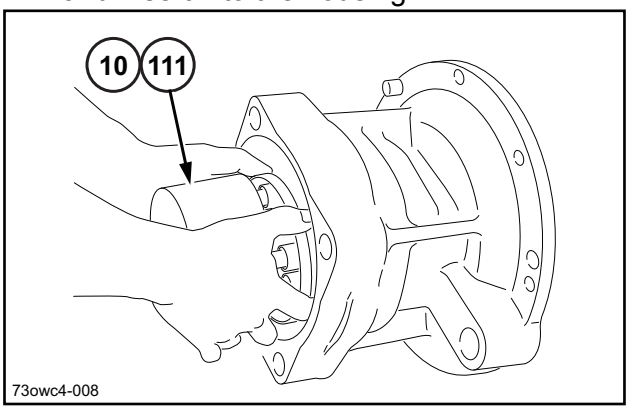
Code	Part name	Q'ty	Code	Part name	Q'ty
052	Reverse prevention valve subassembly	1 set	163	O-ring	2
100	Casing	1	171	Hexagon socket head bolt	4
151	ROH plug	2	400	Reverse prevention valve	2 sets
161	O-ring	2	400-1	O-ring	2
162	O-ring	2	400-2	Backup ring	2

Code	Part name	Q'ty	Code	Part name	Q'ty
051	Relief valve	2 sets	401	Hexagon socket head bolt	4
051-1	O-ring	2	443	Cylinder roller bearing	1
10	Piston; Subassembly	1 set	444	Cylinder roller bearing	1
101	Drive shaft	1	451	Pin	2
111	Cylinder	1	469	ROMH plug	2
114	Plate spring	1	472	O-ring	1
121	Piston	9	488	O-ring	2
122	Shoe	9	491	Oil seal	1
123	Holder plate	1	702	Brake piston	1
124	Shoe plate	1	706	O-ring	1
131	Valve plate B	1	707	O-ring	1
20	Valve casing H2 subassembly	1 set	712	Brake spring	14
301	Casing K1	1	742	Friction plate	3
303	Valve casing H2	1	743	Separator plate	4
351	Plunger H2	2	983	Masking plug	2 sets
355	Spring H2	2	984	Masking plug	1 set
390	Plate	1	985	Masking plug	1 set
391	Driving tack	2	986	Masking plug	1 set

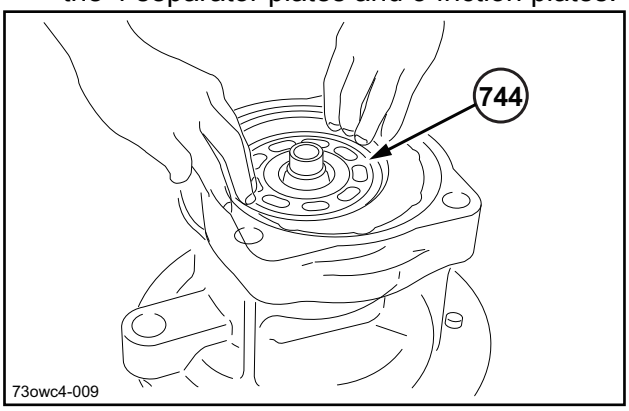
8. Install the piston subassembly (10) on the cylinder (111).

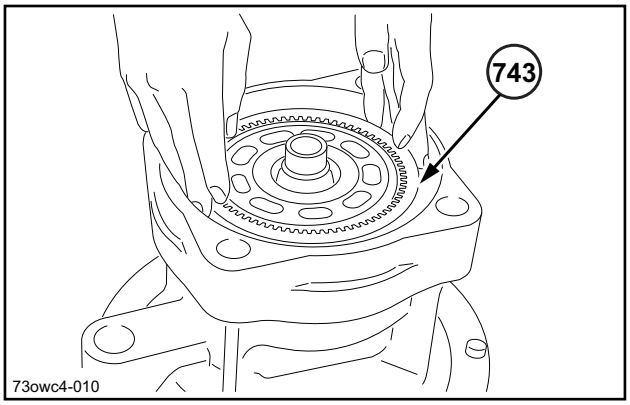


9. Align the piston subassembly (10) and cylinder (111) with the drive shaft spline and insert into the housing.

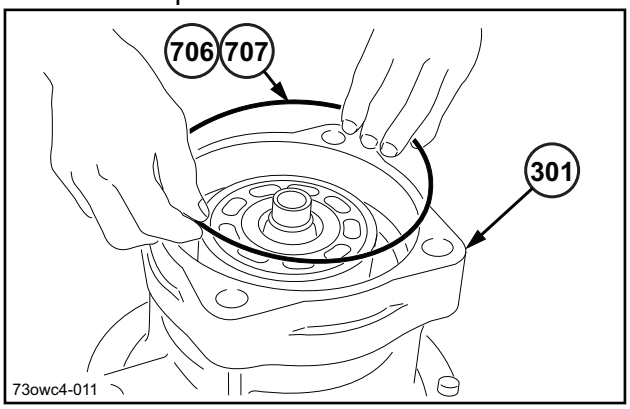


10. Set the housing down with the oil seal side facing downwards, and alternately install separator plates (743) and friction plates (744) in that order to the housing. Install the 4 separator plates and 3 friction plates.

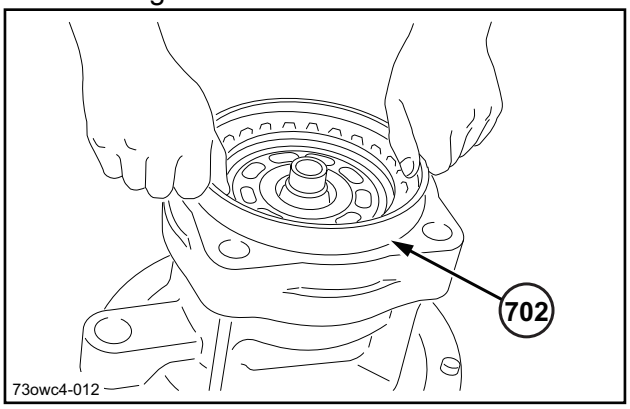




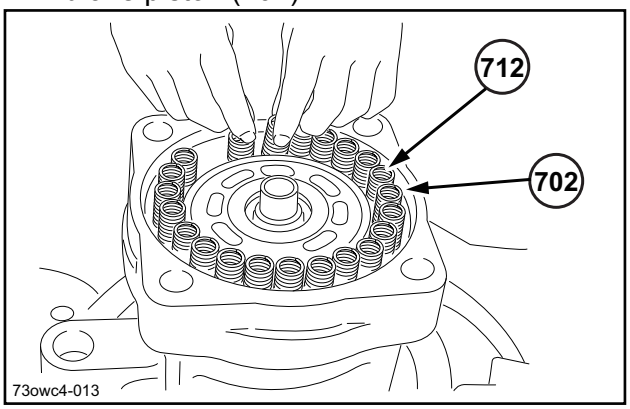
11. Mount the O-rings (706) (707) on casing JA1 (301).
    - If grease is applied to the O-ring, it will not break easily when inserting the brake piston.



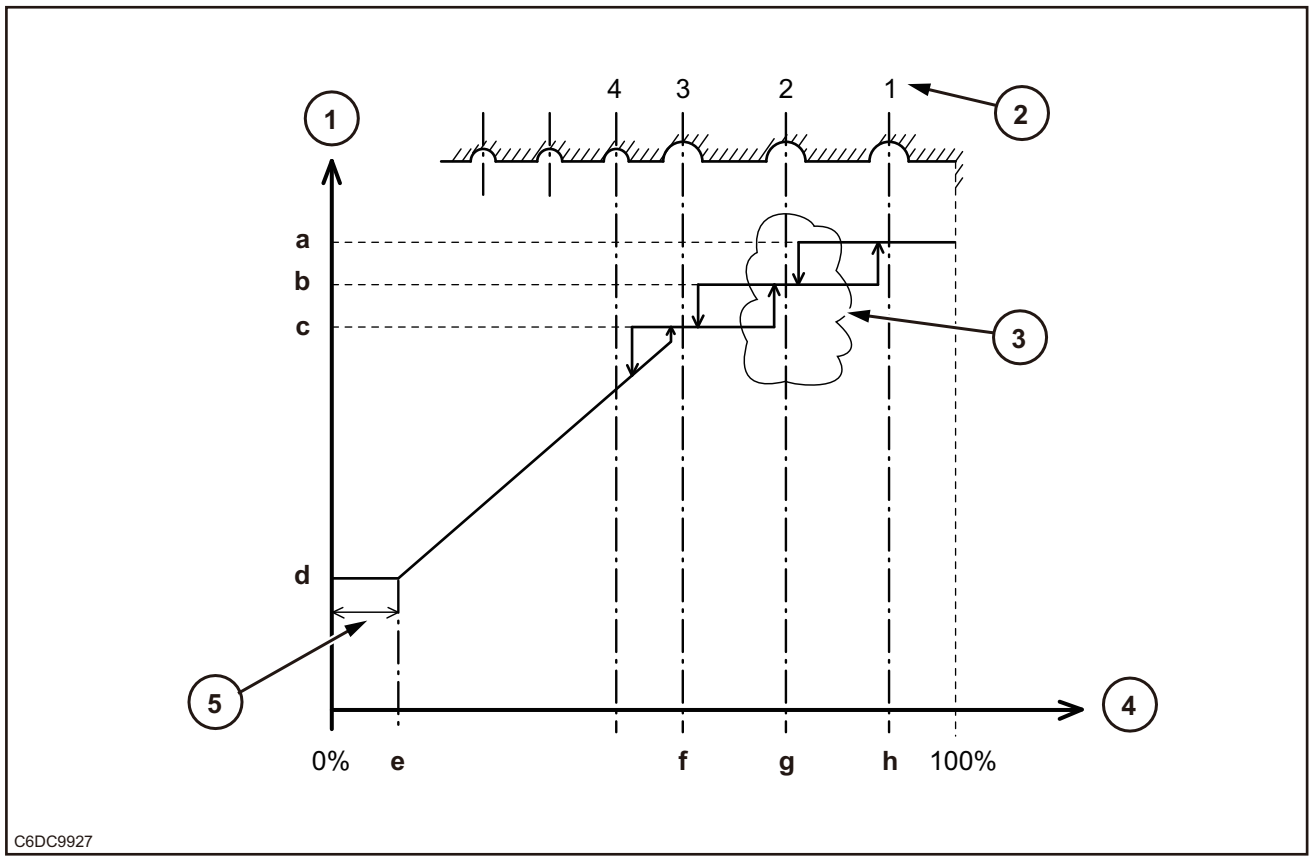
12. Install the brake piston (702) into the housing.



13. Install the brake springs (712) into the brake piston (702).



The target engine speed is calculated from the degree of opening (position) of the throttle volume.



1	Engine speed [min-1]	3	Hysteresis	5	h play
2	Detent number	4	Throttle volume position [%] (position)		

a	rpm-SP	d	rpm-Lo	g	Position H
b	rpm-H	e	Position Lo (fixed at 10%)	h	Position SP
c	rpm-A	f	Position A		

<Control>

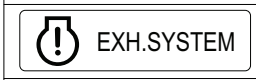
Calculation of target speed:

[1] Required throttle speed

Detent number	Degree of opening of volume	Required throttle speed (engine speed)	Variable name in Fig.
1	-	SP mode speed	rpm-SP
2	-	H mode speed	rpm-H
3	-	A mode speed	rpm-A
4 or above	10% or more	Calculated from degree of opening of volume (e-f in Fig.) and linear expression in Fig.	-
4 or above	Less than 10%	Low idle speed	rpm-Lo

[2] Target engine speed

- Offset of speed:
  Although the offset speed is usually zero, it dynamically varies with AES, BES, etc. Therefore, the output speed (target engine speed) should be obtained by subtracting the offset speed from the throttle speed.
- Lower limit of speed:
  If the speed after offset is lower than the lower-limit speed, the output speed should be obtained by increasing it up to the lower-limit speed so that it may not fall below the lower-limit speed.

Status		Normal	Warning	Early Inducement	Final Inducement
Low output icon		None	None	Displayed	Displayed
Message icon		None	None	None	Displayed
Warning buzzer		None	One long beep (5 sec.)	Three short beeps (1 sec. x 3 times)	Continuous beeps (continues at intervals of 1 sec.)
Inducement due to remaining urea level	DEF/AdBlue® tank level	10% or more	Less than 10%	Less than 5%	0
	(Indicator bar and icon)	2 or more	1	1 (blinking)	0
	(Indicator color)	White	Orange	Orange (blinking)	Red
	REFILL DEF icon 	None	Lit	Blinking	Blinking quickly
	Text message	None			
Inducement due to urea solution quality / urea injection stop / SCR system failure / NCD-target component failure / EGR system failure	DEF/AdBlue® icon 	None	Lit	Blinking	Blinking quickly
	Low output icon 	None	None	Displayed	Displayed
	EXH.SYSTEM icon 	None	Displayed	Displayed	Displayed
	Text message	None			
Output reduction cancel		-	-	Allowed more than once	Allowed once

〈Control〉

[1] Overview of control

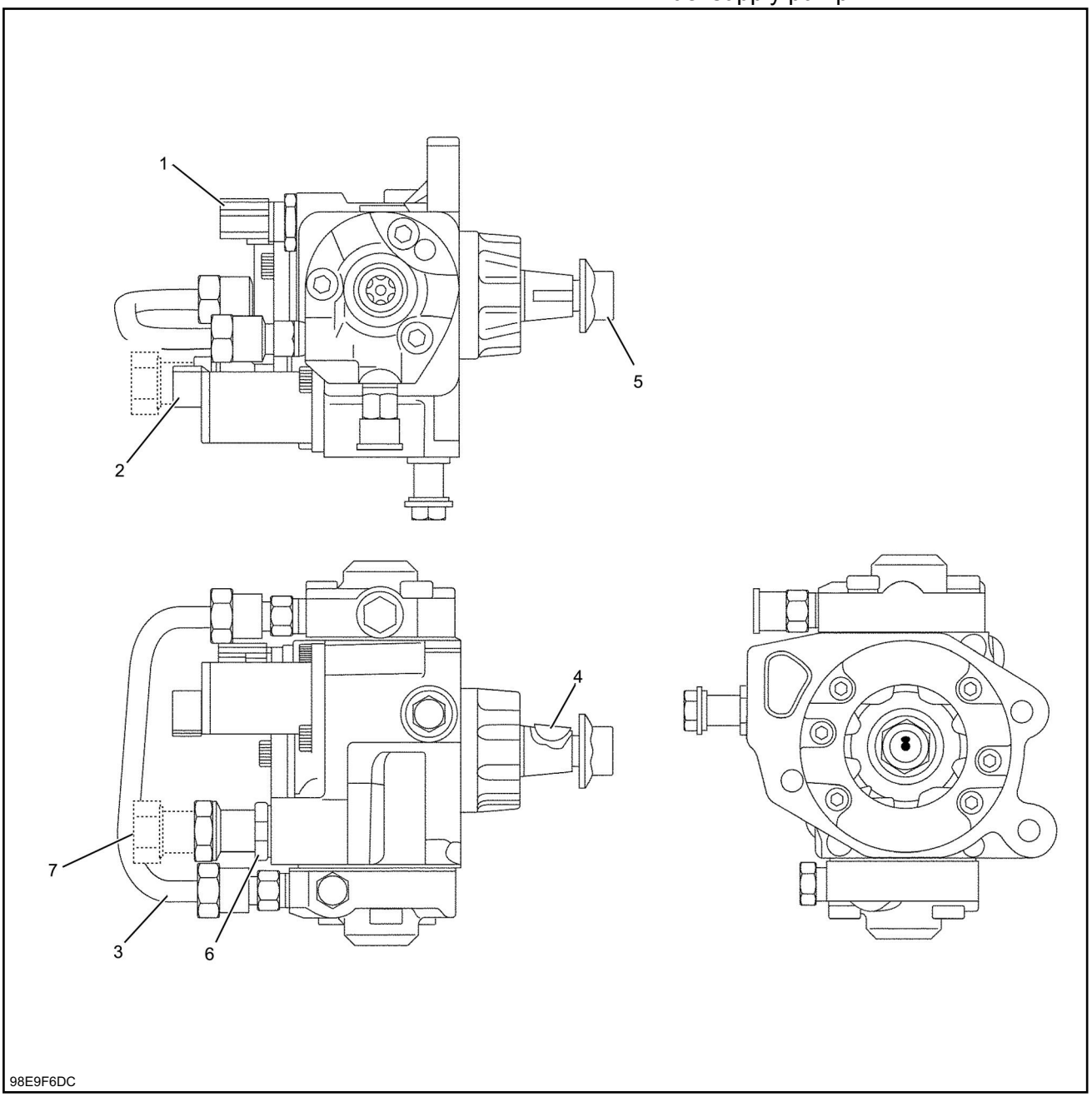
Inducement control logic consists of the three blocks: (1) Inducement operation start condition, (2) Inducement judgment, and (3) Communication with excavator / Engine output limit.

[2] Control details

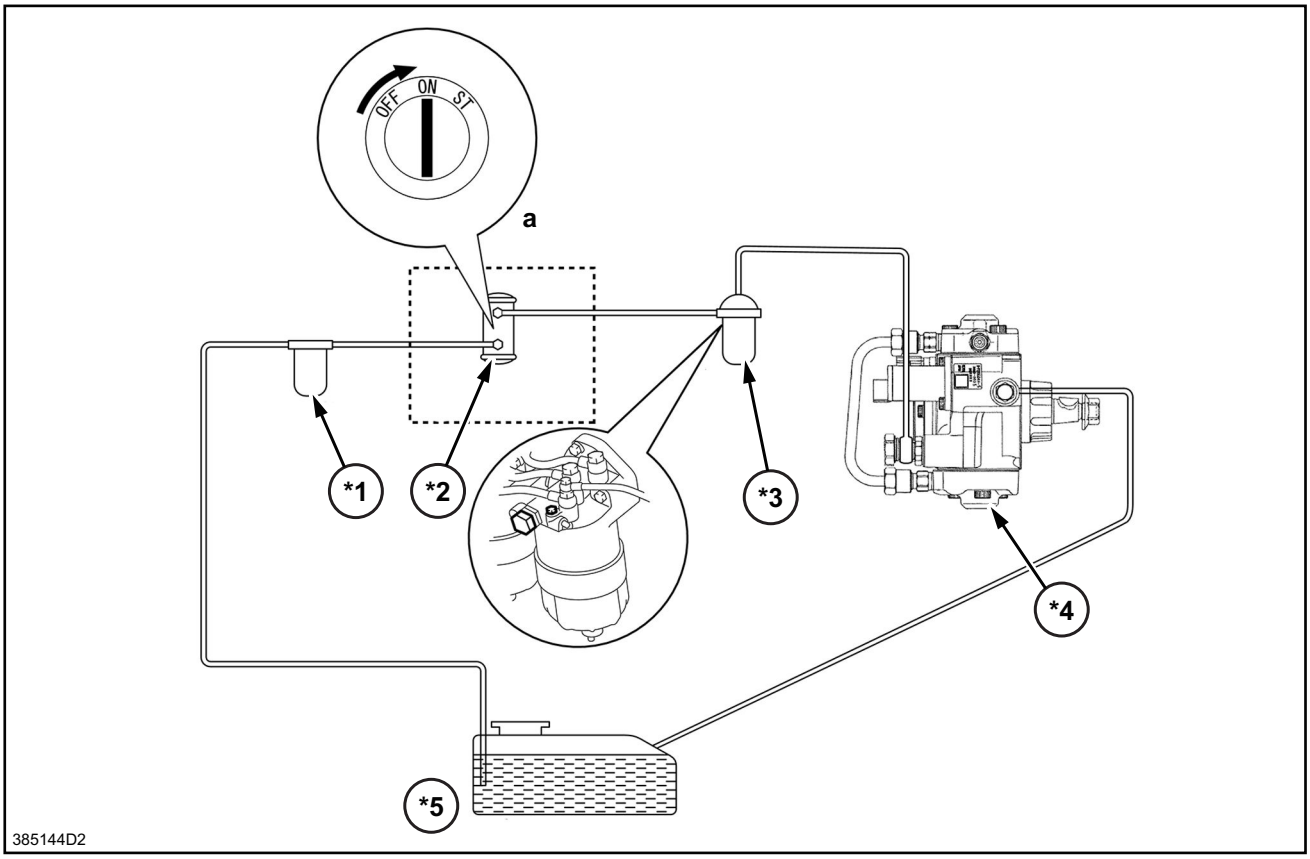
a. Inducement operation start condition

			Inducement start time			
			First time		Repeated	
Operation condition	Trouble diagnosis name	DTC	Early	Final	Early	Final
Remaining urea level	Inducement (Urea level low)	7428 7429 7430	Instantly	Instantly	Instantly	Instantly
Urea solution quality	Urea quality abnormality	P207F	3 hours	3.5 hours	Instantly	30 minutes
Urea injection stop / SCR system failure	SCR system abnormality (with inducement)	P20C9				
	(Dosing valve disconnected or shorted)	P2048 P2049				
NCD-target component failure	Suction air temperature sensor abnormally high voltage	P0113				

Fuel supply pump



1	Fuel temperature sensor	4	Camshaft key	7	Joint bolt
2	Suction control valve	5	Camshaft nut		
3	High pressure pipe	6	Union		



a	On the machine with electromagnetic pump

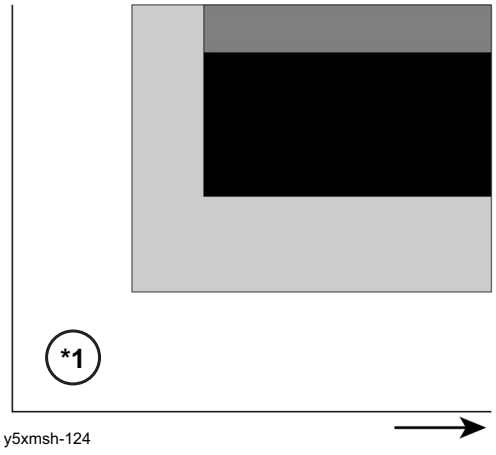
1	Pre fuel filter	4	Supply pump
2	Electromagnetic pump	5	Fuel tank
3	Fuel filter		

EGR

The EGR system recirculates part of the exhaust gas to the intake manifold, and by mixing in inert gas with the intake air, combustion temperature is lowered and the generation of nitrogen oxide is suppressed. The EGR amount is controlled by opening and closing the EGR valve installed between the exhaust manifold and intake manifold. The EGR amount is determined from the engine speed and engine load ratio, and the EGR valve is operated to control the EGR amount. By providing the EGR cooler on the path of the EGR gas, high-temperature EGR gas is cooled by the EGR cooler and then mixed with air to further lower the combustion temperature in order to reduce the NOx amount. Further, the EGR system is also equipped with a check valve to prevent the EGR from flowing in the opposite direction to increase the EGR amount.

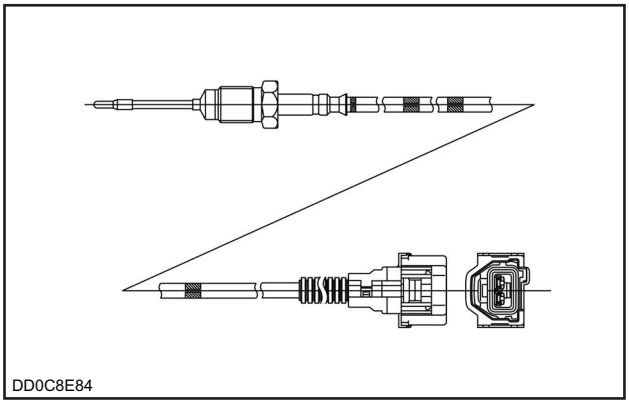
EGR control

The ECM controls the EGR valve lift amount by operating the motor according to the engine status, determined by the engine speed and engine load, etc. The valve lift amount is detected by the EGR position sensor. The darker portions of the diagram represent large valve lift amounts, and the darkest portion represents a lift amount of nearly 100%.

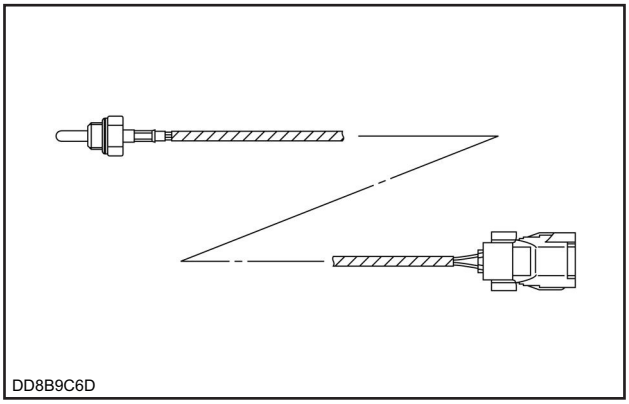


*1	No idle EGR

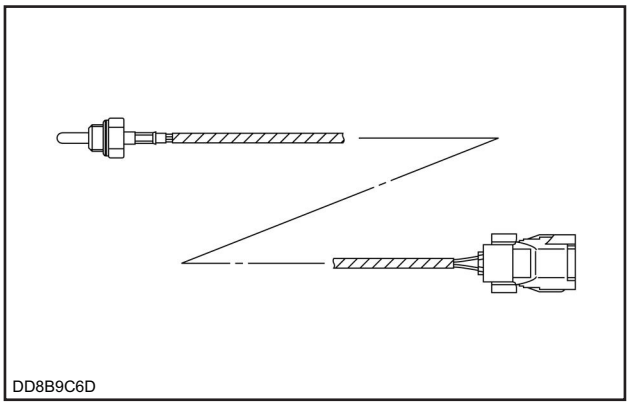
EGT sensor
The EGT sensors are variable resistors installed in front of oxidation catalyst 1 and oxidation catalyst 2. EGT sensor 1 measures the temperature of the exhaust gas in front of oxidation catalyst 2, while EGT sensor 2 measures the temperature of the exhaust gas in front of oxidation catalyst 1. When the EGT sensor is cold, the sensor resistance is high. As the exhaust temperaturerises, the sensor resistance decreases. The ECM detects a high voltage in the signal circuit when the sensor resistance is high. Also, the ECM detects a low voltage in the signal circuit when the sensor resistance is low.


DD0C8E84

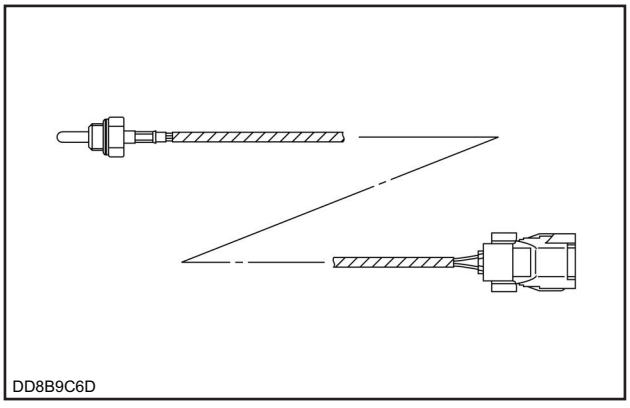
IMT sensor
The IMT sensor is a variable resistor that is installed to the intake manifold and measures the intake air temperature of the intake manifold. Sensor resistance is high when the sensor is cool and lowers as the intake air temperature increases. The ECM detects a low voltage in the signal circuit when the sensor resistance is low.

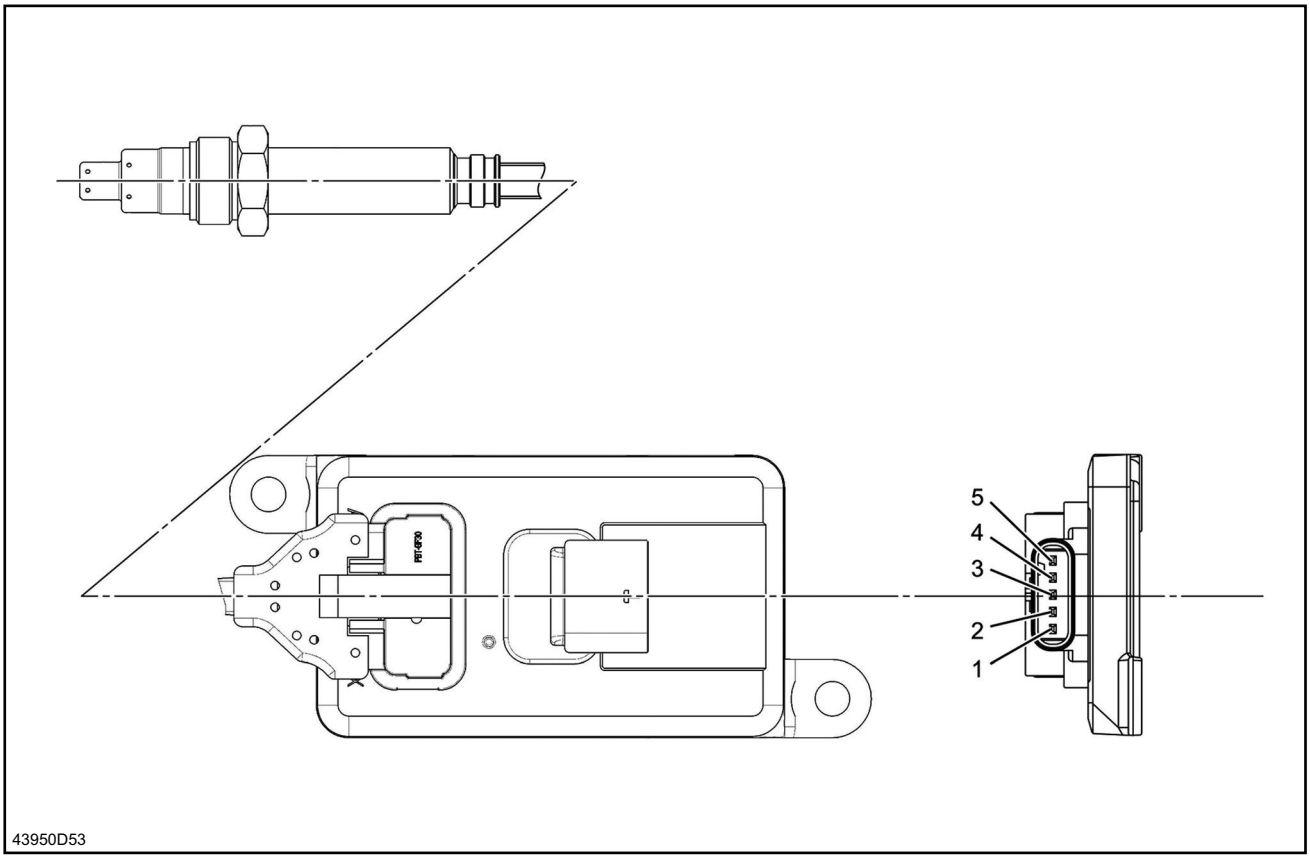

DD8B9C6D

Charge air cooler temperature sensor 1
Charge air cooler temperature sensor 1 is installed to the upstream side of the intercooler. Charge air cooler temperature sensor 1 is a variable resistor. Charge air cooler temperature sensor 1 measures the temperature of the air flowing into the intercooler.When the intercooler temperature sensor is cold, the sensor resistance is high. As the air temperature increases, the sensor resistance decreases. The ECM detects a high voltage in the signal circuit when the sensor resistance is high. The ECM detects a low voltage in the signal circuit when the sensor resistance is low.


DD8B9C6D

EGR gas temperature sensor 1
EGR gas temperature sensor 1 is installed to the EGR cooler duct. EGR gas temperature sensor 1 is a variable resistor and measures the temperature of the exhaust gas at the EGR cooler inlet. The EGR gas temperature sensor 1 resistance is high at low temperatures. As the exhaust gas temperature rises, the sensor resistance decreases.The ECM detects a high voltage in the signal circuit when the sensor resistance is high. The ECM detects a low voltage in the signal circuit when the sensor resistance is low.


DD8B9C6D



1	NOx sensor power supply	3	CAN Low	5	-
2	NOx sensor GND	4	CAN High		

EGT sensor 3

EGT sensor 3 is a resistance temperature detector, and is installed at the inlet of the SCR catalyst. It measures the temperature of exhaust gas in front of the SCR catalyst, and sends the temperature signal to the DCU. Based on the signal from the exhaust temperature sensor, the DCU controls the urea SCR.

SCR Control System Inspection

1. Diagnostic system check-urea selective catalytic reduction system description of function
   The urea SCR control system inspection is a systematic method for checking problems caused by malfunctions in the urea SCR control system. It is the starting point for diagnosis related to drivability complaints. Move from the system inspection to the next logical step to diagnose problems. Understanding and correctly using the diagnostic chart reduces diagnostic time and prevents the replacement of good parts.

Note

・If there are no complaints on drivability, do not perform these diagnostic steps unless otherwise instructed in other sections.

   If there are no complaints on drivability, do not perform these diagnostic steps unless otherwise instructed in other sections.
   Do not clear the DTC unless instructed to do so in a diagnostic step.
   The battery should be fully charged.
   The battery cable should be normal and securely connected.
   The GND of the DCU should be securely connected to the correct position.
   Verify that the DCU harness connector has no excessive fouling and is correctly connected.
   Verify that the DCU terminals have no excessive fouling and are correctly connected.
   The machine must be completely maintained.
   Programming of the DCU must be performed correctly.
   If a urea SCR system DTC is set, first diagnose the sensor DTCs, solenoid DTCs, and actuator DTCs.

2. Diagnostic system check-urea selective catalytic reduction system inspection

[1] Turn ON the ignition switch without starting the engine.

[2] Observe the DCU and ECM DTC information with a scan tool.

[3] Check if a DTC beginning with U or a DTC related to another ECU is set.

Note

・If a DTC beginning with U or a DTC related to another ECU is set, inspect the applicable DTC.

・When a DTC beginning with U is set, it indicates that there is no communication with other ECUs.

[4] Observe whether DCU DTC 0607, 060B, 062F, or 1464 is set.

Note

・Inspect the applicable DTC if a DTC is set.

[5] Observe whether DCU DTC 0641, 0658, or 0659 is set.

Note

・Inspect the applicable DTC if a DTC is set.

[6] Check all of the ECUs for DTC codes that have not yet been diagnosed.

Note

・Inspect the applicable DTC if a DTC is set.

[7] Check whether the customer's concern is related to the engine.

Note

・If there is a concern relating to the engine, inspect the engine control system.

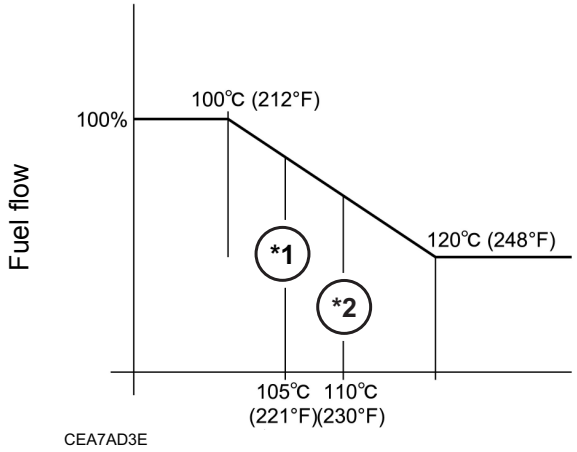
[8] Check for excessive urea fluid consumption.

[9] Check for a significant ammonia odor.

[10] Check for the adherence of white crystal powder.

Output reduction due to fuel flow restriction resulting from high altitude operation

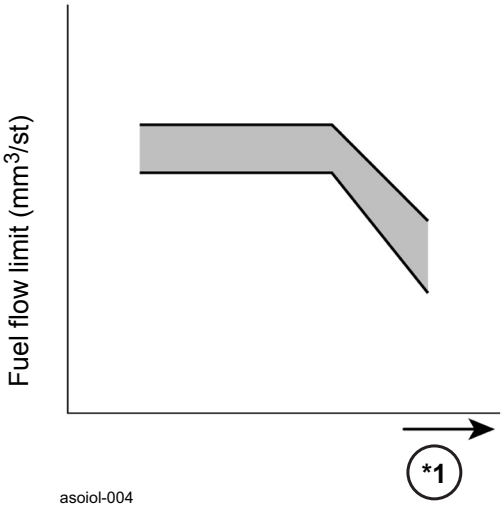
- Control for overheating
  In order to protect the engine, the ECM starts controlling the fuel flow if the engine coolant temperature exceeds 100°C (212°F).
  If the engine coolant temperature rises further, the fuel flow is further restricted. Near 120°C (248°F), the fuel flow is restricted to a constant level. Varies depending on the manufacturer of the actual machine.
  The system emits a warning through the machine from 105°C (221°F). By lowering the load applied to the actual machine in addition to the warning, it is possible to avoid an operation condition in which the fuel flow is restricted.



Engine coolant temperature

*1	Warning display
*2	DTC set

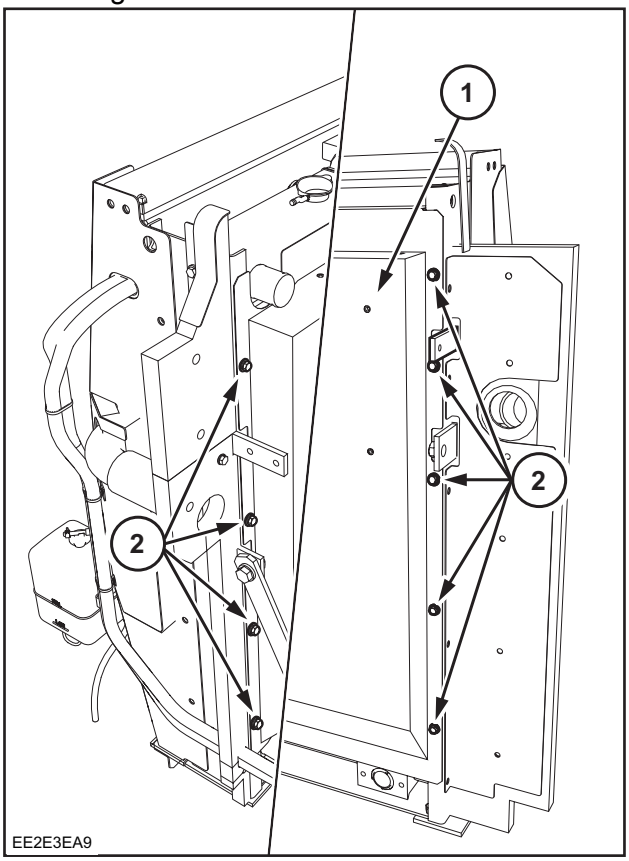
- High altitude correction
  The ECM calculates the current altitude from the barometric pressure sensor signals.
  The SCV opening and closing interval and the injector electrified time are controlled according to the high altitude conditions at this time, and correction is made to achieve the optimum fuel flow.



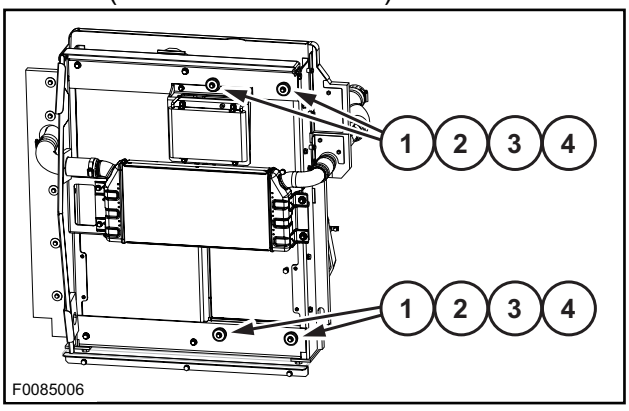
Barometric pressure kPa (psi)

*1	High altitude

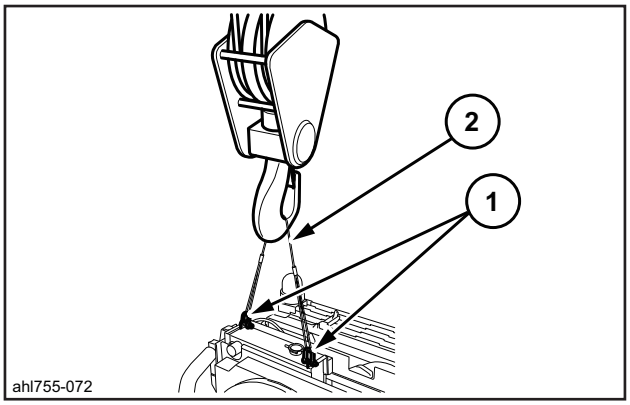
14. Remove the 9 bolts (2) of the fan shroud (1) with a box wrench [13 mm (0.512 in.)] to shift the fan shroud (1) toward the engine side.



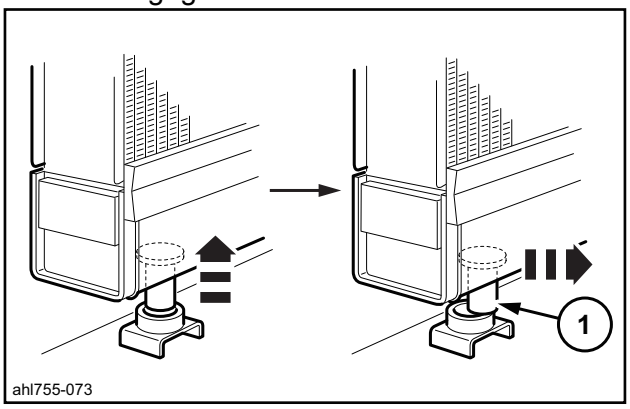
15. Remove the 4 bolts (1), the 4 washers (2), the 4 cushion rubbers (3) and 4 collars (4) with a wrench [17 mm (0.669 in.)].
    - Bolt (1) tightening torque: 29 - 44 N・m (21.39 - 32.46 lbf・ft.)



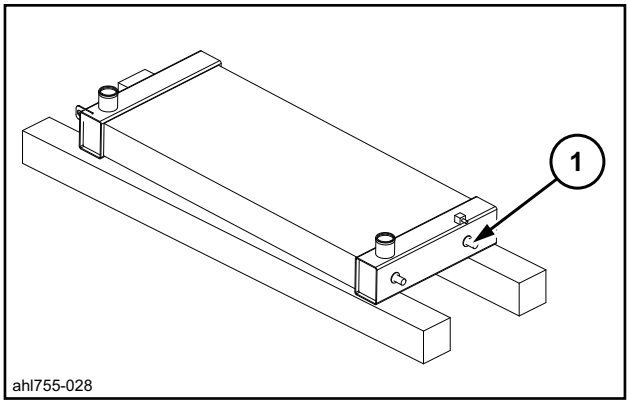
16. Attach the 2 shackles (1) on top of the radiator and then lift it with a wire rope (2) and a liftcrane.



17. Lift the radiator until the secure bracket (1) at bottom of the radiator is disengaged.



18. Make sure that you have a safe site, and then settle the radiator on a wood plank. Make sure not to bend or crash the secure bracket (1) at bottom when it is laid down.



Installation of Radiator

Mount the radiator in the reversed order of the procedure for removal.
Each bolt has to be tightened in the specified torque.
Refer to the "Standard Torque Data for Cap Screws and Nuts" for those without specified torque.
Coolant capacity is 31.4 L (8.30 gal.).

Removal and Installation of Engine Hood

Caution

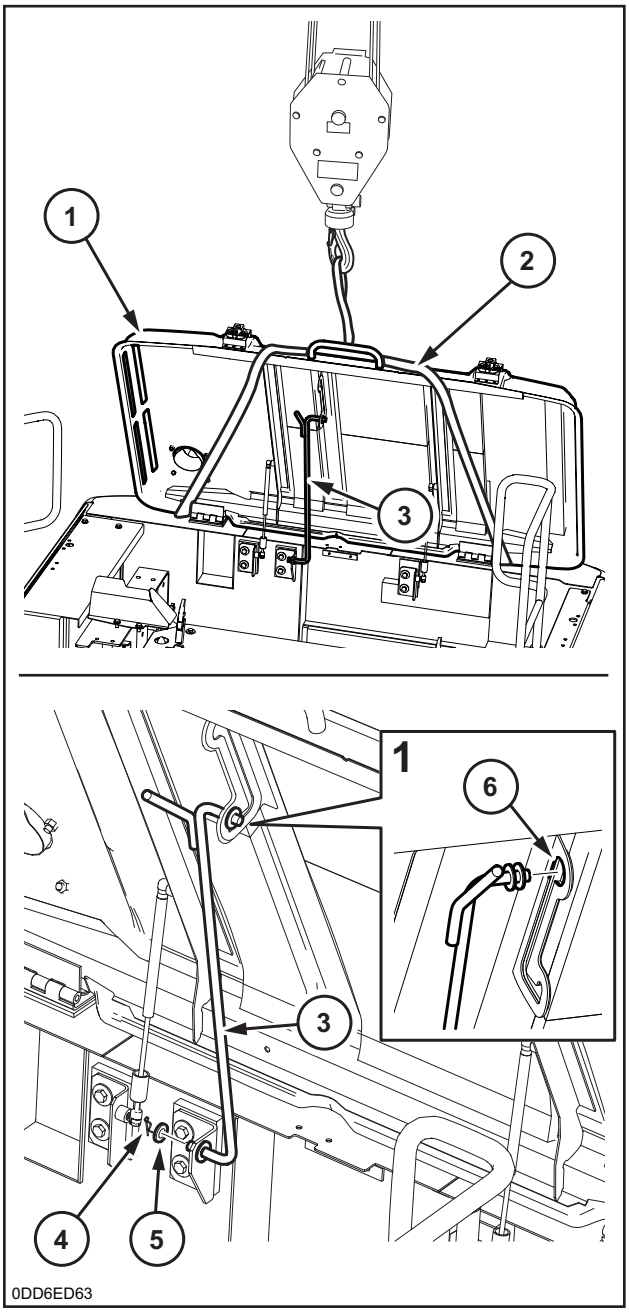
- Make sure to stop the engine before starting work.
- Do not work in strong wind.
- Make sure to check slinging apparatus such as a nylon sling before starting work.
- Never allow any person to enter underneath a slung load.
- Make sure to work with the lock is engaged since the hood may be lowered due to reduced holding force for the hood when removing the gas damper.
- Pay attention not to pinch fingers or hands when the hood drops.
- There is a hazard that the rod of the damper blast out suddenly.
  It must be fully extended when removing it.
- Liftcrane should be operated gently and calmly.

Items to prepare

- Wrench [13 mm (0.512 in.), 19 mm (0.748 in.)]
- Nylon sling (that fulfills breaking load)
- Liftcrane (that fulfills slinging capacity)

Removal of Engine Hood

1. Open the engine hood (1) by hand until the lock is engaged.
   Lift up the engine hood (1) slowly until a force on the open lock stay (3) is relieved by winding a nylon sling (2) around the engine hood.
   Remove the pin (4) and the washer (5) at fixation portion between the open lock stay (3) and the engine hood (1) to pull out the open lock stay (3) from the guide hole (6).



14. Valve seat insert Removal

[1] Heat the valve seat insert with the gas burner.
Heating temperature： 700.0 - 800.0 °C {1292 - 1472 °F}
： 2 section(s) Inner surface of the insert

Note

・Cool the valve seat insert naturally after heating.

Specified time： 5 min Natural cool

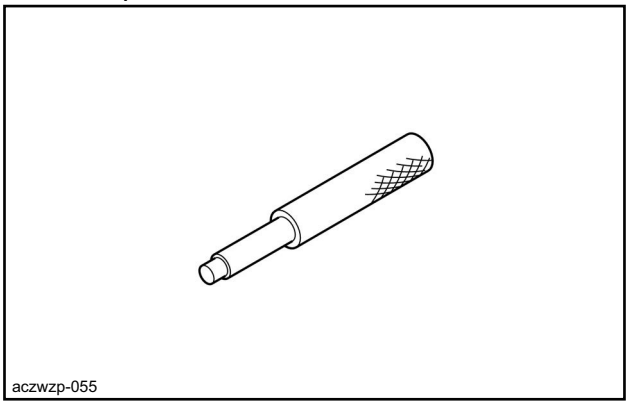
[2] Remove the valve seat insert from the cylinder head assembly using the driver.

Caution

・Be careful not to damage the cylinder head.

15. Injector sleeve Removal

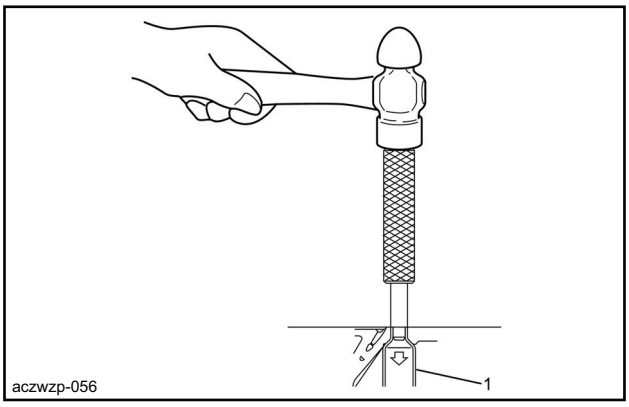
[1] Remove the injector sleeve from the cylinder head assembly using the special tool.



SST: 5-8840-2623-0 - nozzle sleeve remover

Note

・Tap the injector sleeve out from the bottom surface of the cylinder head.



1	Injector sleeve

Caution

・Be careful not to damage the bottom surface of the cylinder head.
・Do not reuse the removed injector sleeve.

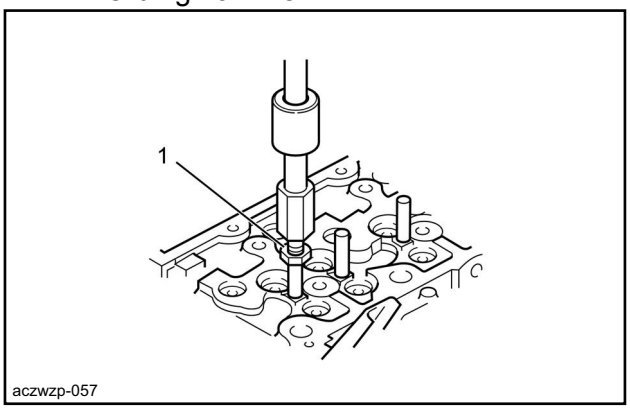
16. Bridge guide Removal

[1] Install the nut to the bridge guide.

Note

・Electrically weld the nut to the top of the bridge guide.

[2] Remove the bridge guide from the cylinder head assembly using the sliding hammer.



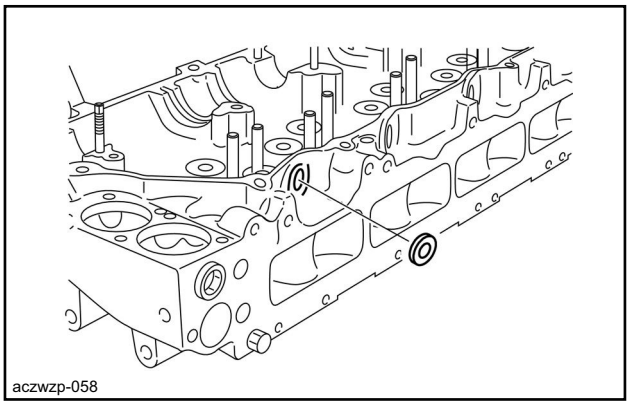
1	Nut

17. Oil seal Removal

[1] Remove the oil seal from the cylinder head assembly.

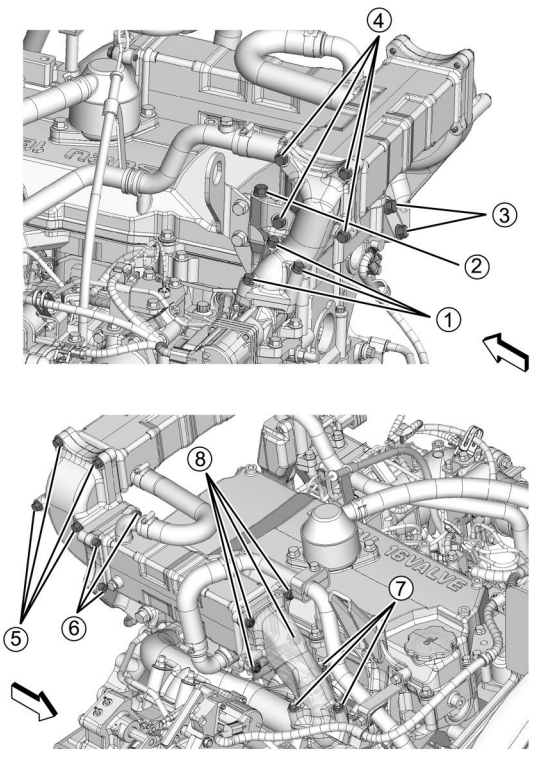
Note

・Attach a rod from the inner surface of the cylinder head, and tap it to remove it to the outer side.



Note

・After temporarily tightening all the components, final tighten in the numerical order shown in the diagram.



lzaj97-119

[6] Final tighten EGR pipe C to the EGR valve.
tightening torque： 24 N・m { 2.4 kgf・m / 18 lb・ft. } Diagram No. 1

[7] Final tighten EGR pipe C to the engine hanger bracket.
tightening torque： 48 N・m { 4.9 kgf・m / 35 lb・ft. } Diagram No. 2

[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

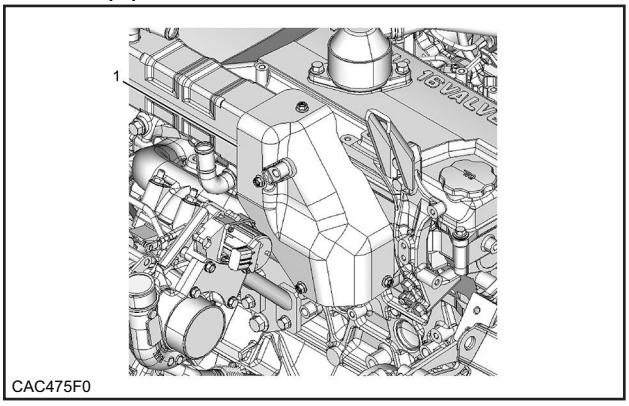
[10] Final tighten EGR pipe B to EGR cooler B.
tightening torque： 24 N・m { 2.4 kgf・m / 18 lb・ft. } Diagram No. 5

[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

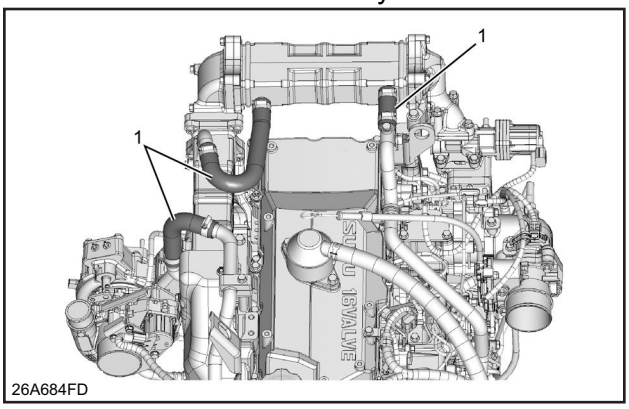
[14] Install the EGR heat protector to EGR pipe A.



CAC475F0

1	EGR heat protector

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

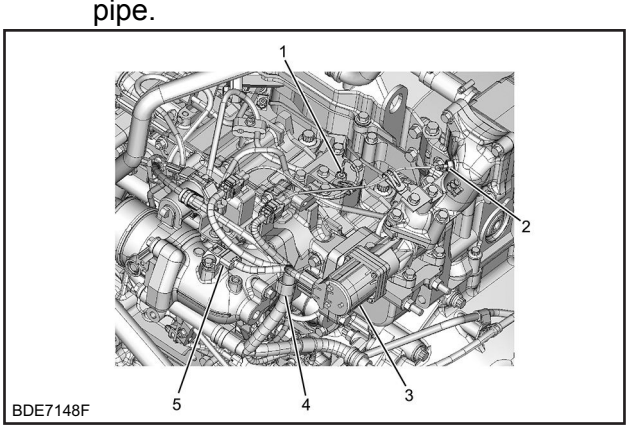


26A684FD

1	Water rubber hose

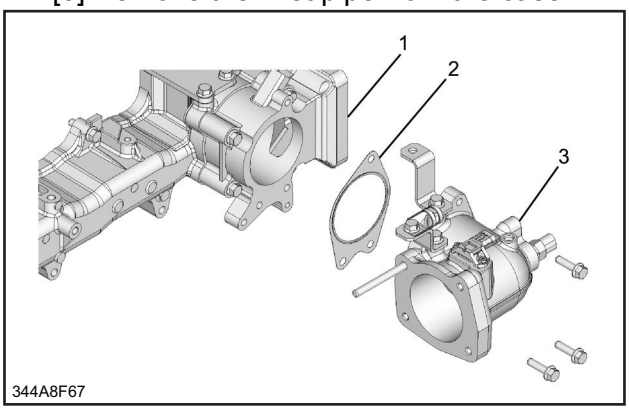
20. EGR gas temperature sensor 2 installation
Caution：
・Check the EGR gas temperature sensor 2
connector color, and take care not to assemble incorrectly.
・Because the connector color cannot be identified using the outer surface if the exterior is painted, remove the connector and identify it using the connector interior color.

[4] Remove the harness clip 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

[5] Remove the inlet pipe from the case.



1	Case
2	Gasket
3	Inlet pipe

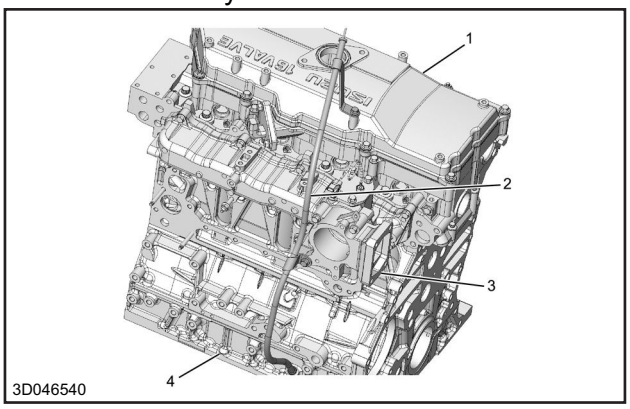
20. Oil level gauge guide tube removal

[1] Remove the oil level gauge from the oil level gauge guide tube.

[2] Disconnect the oil level gauge guide tube from the cylinder head cover.

[3] Disconnect the oil level gauge guide tube from the case.

[4] Remove the oil level gauge guide tube from the cylinder block.

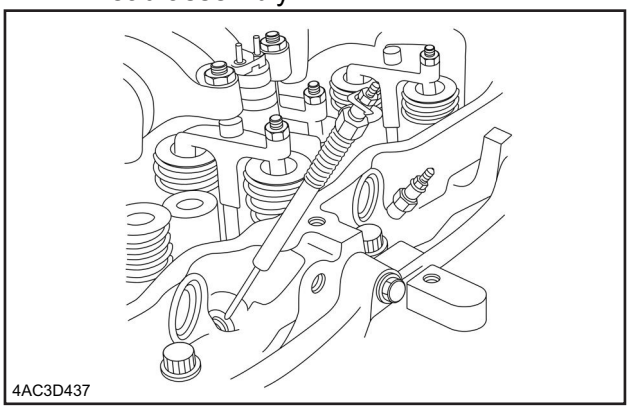


1	Cylinder head cover
2	Oil level gauge guide tube
3	Case
4	Cylinder block

21. Glow plug removal

[1] Remove the glow plug connector from the glow plug.

[2] Remove the glow plug from the cylinder head assembly.

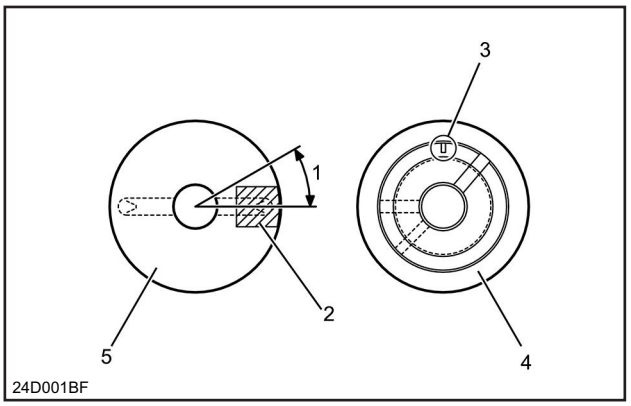


22. Injection pipe removal

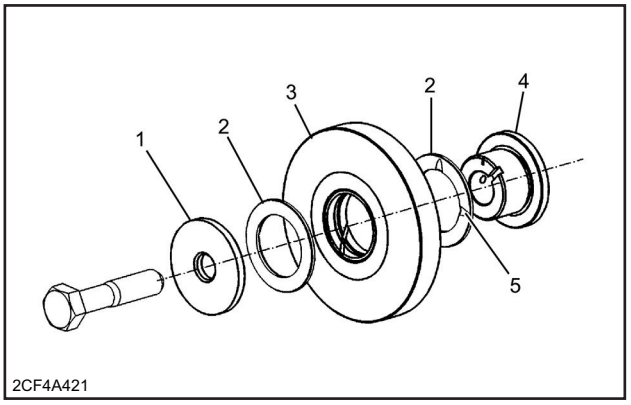
[1] 1. Remove the clip from the bracket.

Caution

- Install it with the oil groove of the thrust collar facing toward the gear side.
- Orient the notch of the shaft facing upward for oil lubrication and make sure to install the thrust collar so that the paint portion is within the area indicated by the diagram.



1	30°
2	Paint portion
3	Notch
4	PTO idle gear shaft
5	Thrust collar



1	Thrust collar
2	Washer
3	PTO idle gear
4	PTO idle gear shaft
5	Oil groove

[11] Install the O-ring to the cover.

[12] Install the cover to the flywheel housing.
tightening torque : 19 N・m { 1.9 kgf・m / 14 lb・ft. }

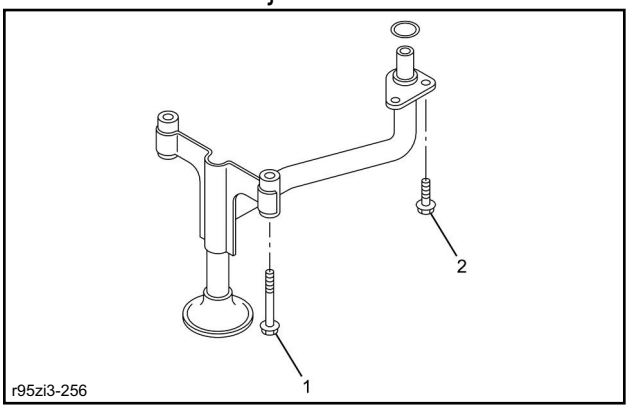
11. Oil strainer installation

[1] Install the O-ring to the oil strainer.

Caution

- Use new O-rings.

[2] Install the oil strainer to the crankcase.
tightening torque : 31 N・m { 3.2 kgf・m / 23 lb・ft. }



1	M10 bolt
2	M8 bolt

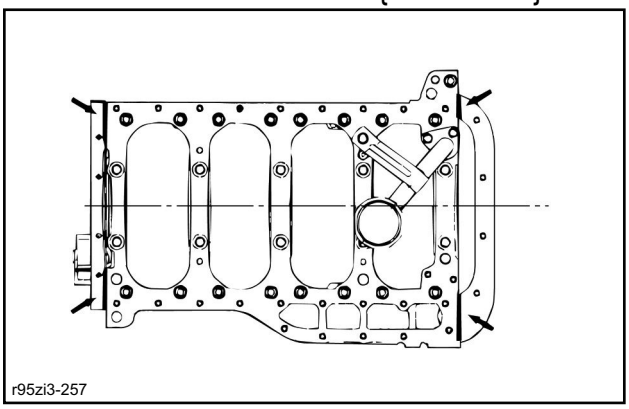
12. Oil pan installation

[1] Apply the liquid gasket to the crankcase.

Note

- Apply ThreeBond 1207B to each joint of the crankcase, flywheel housing and gear case.

bead width : 3.0 mm { 0.1181 in. }



Caution

- After applying the liquid gasket, install the oil pan within 5 minutes.

[2] Install the gasket to the oil pan.

41. 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.

42. EGR gas temperature sensor 1 installation

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 1.

Note

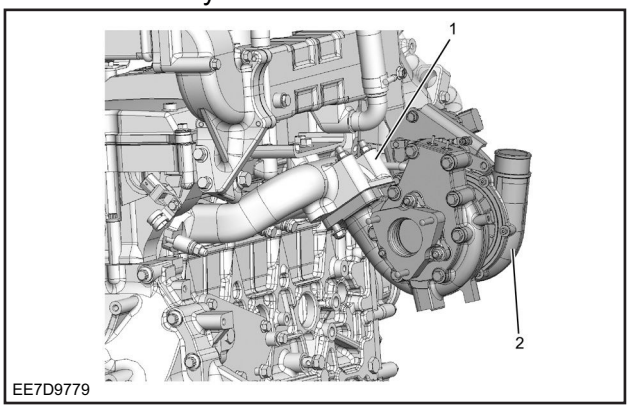
- Apply High Temperature Stainless Never-Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of EGR gas temperature sensor 1.

[2] Install EGR gas temperature sensor 1 to EGR pipe A.
tightening torque： 44 N・m { 4.5 kgf・m / 32 lb・ft. }

[3] Connect the harness connector to EGR gas temperature sensor 1.

43. Turbocharger assembly installation

[1] Temporarily tighten the turbocharger assembly to the exhaust manifold.

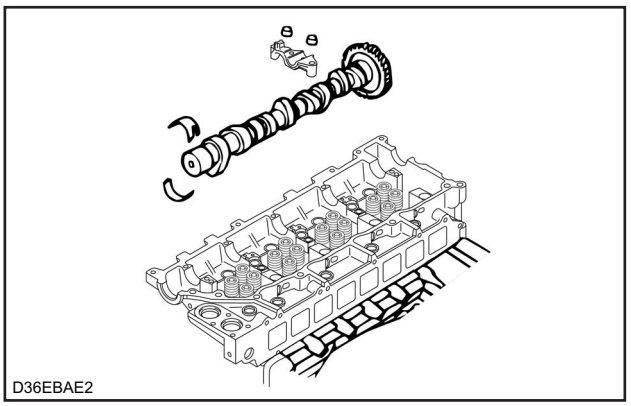


1	Exhaust manifold
2	Turbocharger assembly

[4] Remove the camshaft bearing from the cylinder head assembly.

Note

・Temporarily assemble the removed caps and bearings in the original position to avoid a mixup after the bearings have been inspected.



24. Bridge removal

[1] Remove the bridge cap from the bridge.

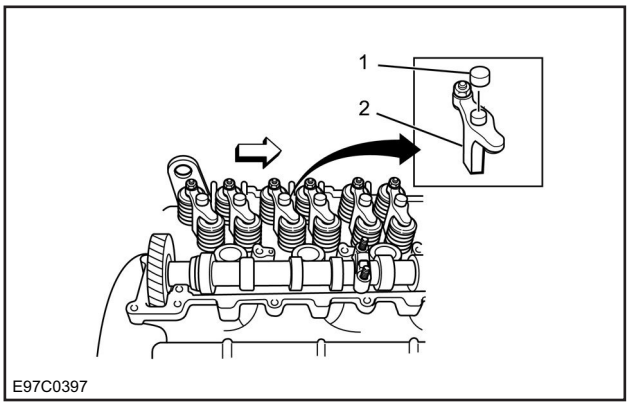
Caution

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

[2] Remove the bridge from the bridge guide.

Note

・After removing, organize to avoid a mix-up with other installation locations.



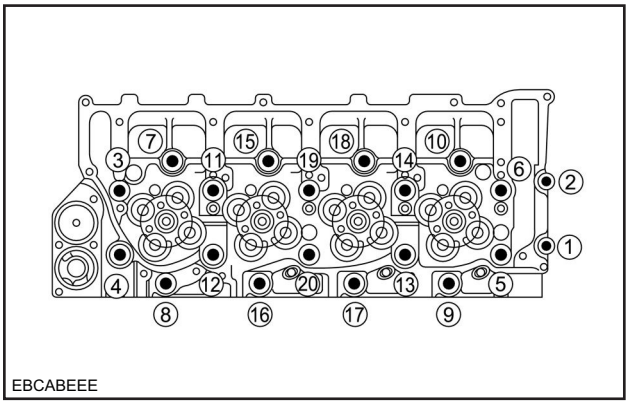
1	Bridge cap
2	Bridge

25. Cylinder head assembly removal

[1] Remove the cylinder head assembly from the cylinder block.

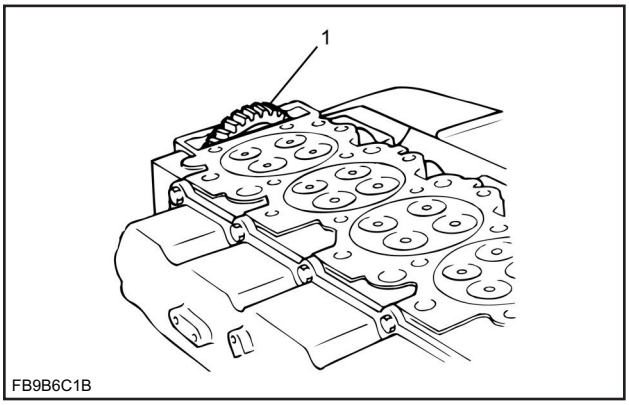
Note

・Loosening order of the head bolts



Caution

・Since the idle gear C protrudes from the bottom surface of the cylinder head, be careful not to damage the gear.



1	Idle gear C

[2] Remove the cylinder head gasket from the cylinder block.

Caution

・Do not reuse the cylinder head gasket.

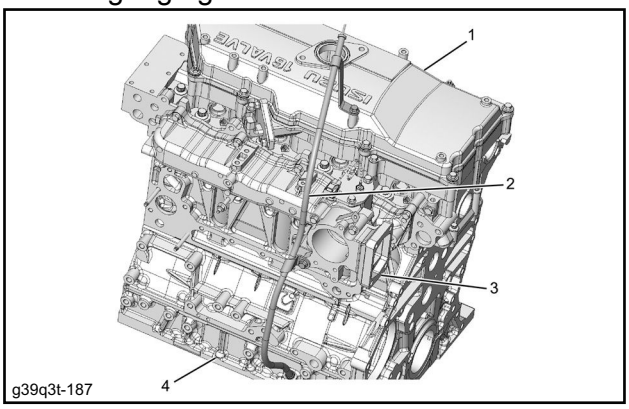
26. Fuel supply pump removal

[1] Disconnect the harness connector from the fuel supply pump.

tightening torque : 19 N・m { 1.9 kgf・m / 14 lb・ft. }

[3] Connect the oil level gauge guide tube to the cylinder head cover.
tightening torque : 19 N・m { 1.9 kgf・m / 14 lb・ft. }

[4] Install the oil level gauge to the oil level gauge guide



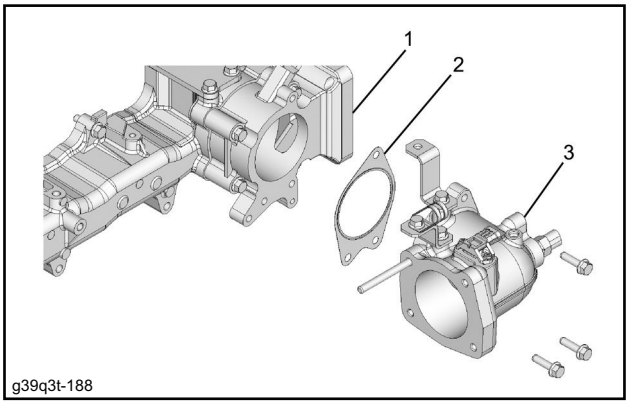
1	Cylinder head cover
2	Oil level gauge guide tube
3	Case
4	Cylinder block

24. Inlet pipe installation

[1] Install the inlet pipe to the case.
tightening torque : 24 N・m { 2.4 kgf・m / 17 lb・ft. }

Caution

・Use new gaskets.



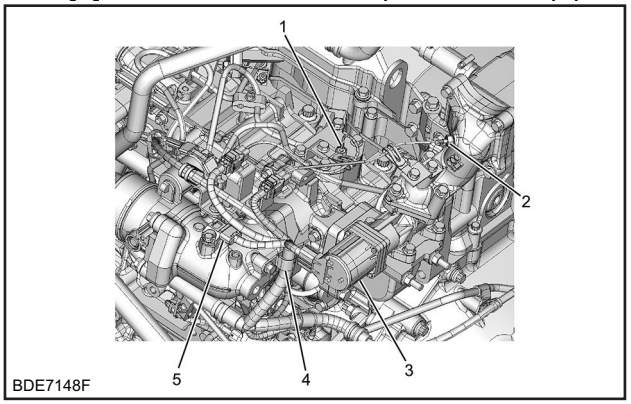
1	Case
2	Gasket
3	Inlet pipe

[2] Connect the harness connector to the IMT sensor.

[3] Connect the harness connector to the EGR valve.

[4] Connect the harness connector to the boost pressure sensor/boost temperature sensor.

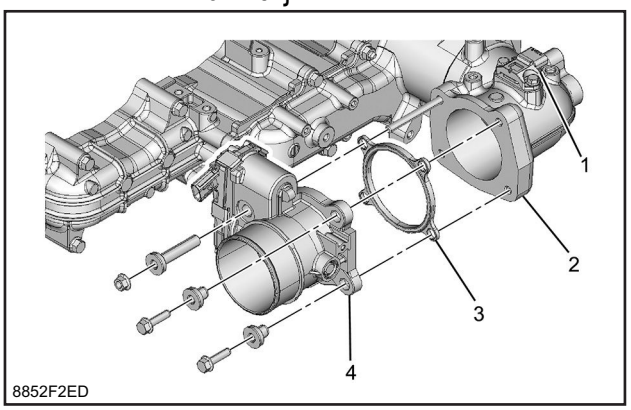
[5] Install the harness clip to the inlet pipe.



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

25. Intake throttle valve installation

[1] Install the intake throttle valve to the inlet pipe.
tightening torque : 24 N・m { 2.4 kgf・m / 17 lb・ft. }



1	Boost pressure sensor/boost temperature sensor
2	Inlet pipe
3	Gasket
4	Intake throttle valve

[2] Install the air duct to the intake throttle valve.

Installation of Thermostat

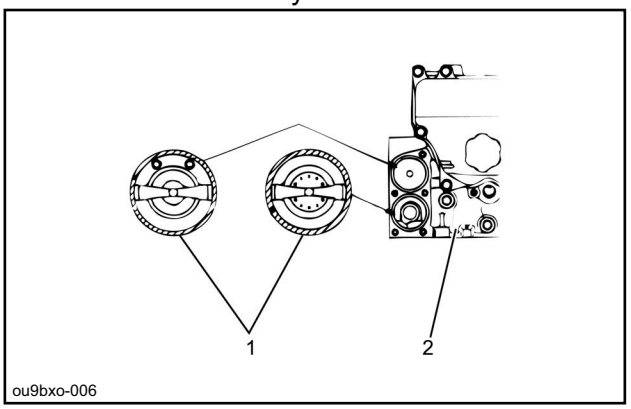
1. Thermostat installation

[1] Install the gasket to the thermostat.

Caution

- Use new gaskets.

[2] Install the thermostat to the cylinder head assembly.



1	Thermostat
2	Cylinder head

Caution

- Be careful not to mistake the assembly position and direction.

[3] Install the water outlet pipe to the cylinder head assembly.
tightening torque: 25 N・m { 2.5 kgf・m / 18 lb・ft. }

[4] Connect the radiator upper hose to the water outlet pipe.

2. Coolant filling

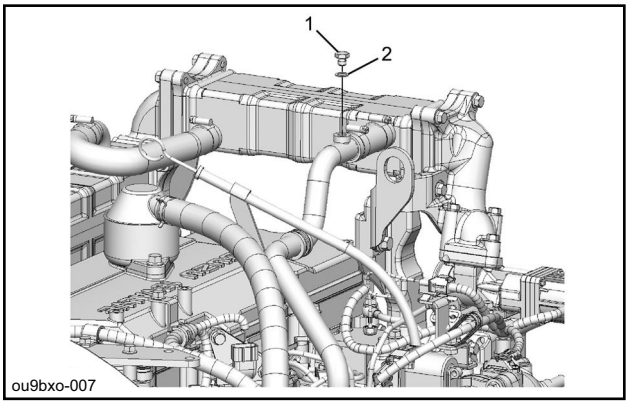
Caution

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

[1] Remove the air bleeding plug from the EGR cooler.

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.



1	Air bleeding plug
2	Gasket

[2] Replenish the radiator with coolant.

Caution

- Add slowly to prevent air from entering the system.

[3] Install the air bleeding plug to the EGR cooler.

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.

[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]

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]

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.

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.

Removal and Installation of Urea Pump

Caution

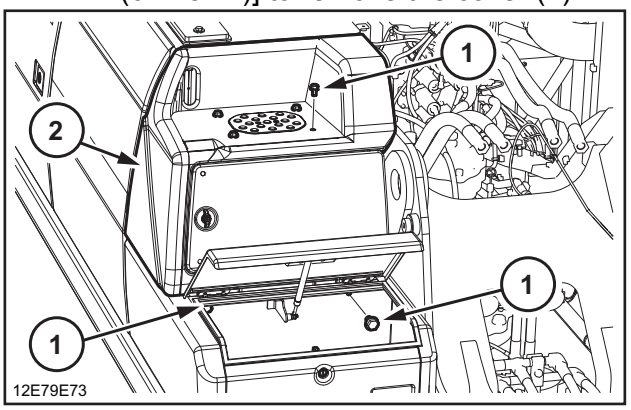
- Make sure to release pressure before starting work.
- Make sure to stop the engine before starting work.

Items to prepare

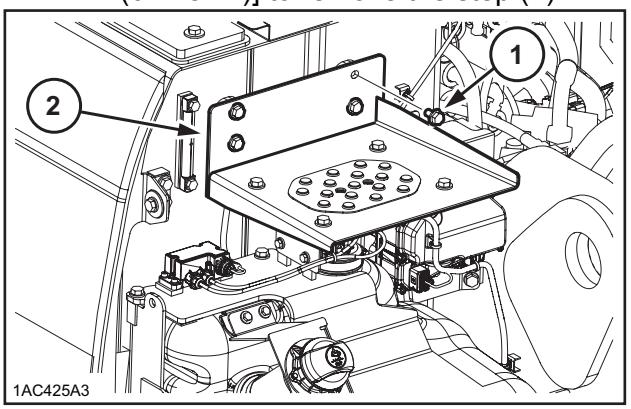
- Wrench [13 mm (0.512 in.), 19 mm (0.748 in.)]
- Marking pen
- Cap
- Plug
- Waste oil can
- Rag

Removal of Urea Pump

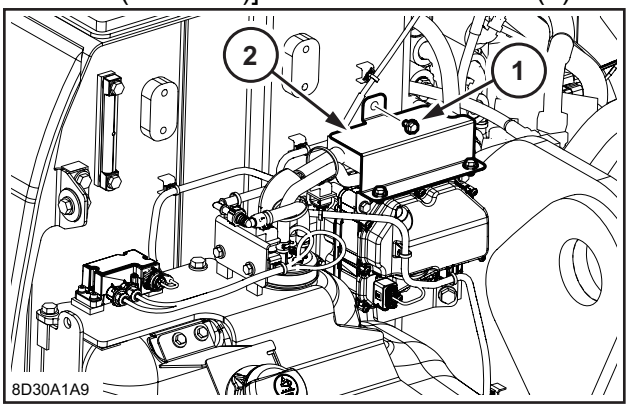
1. Remove the 6 bolts (1) with a wrench [19 mm (0.748 in.)] to remove the cover (2).



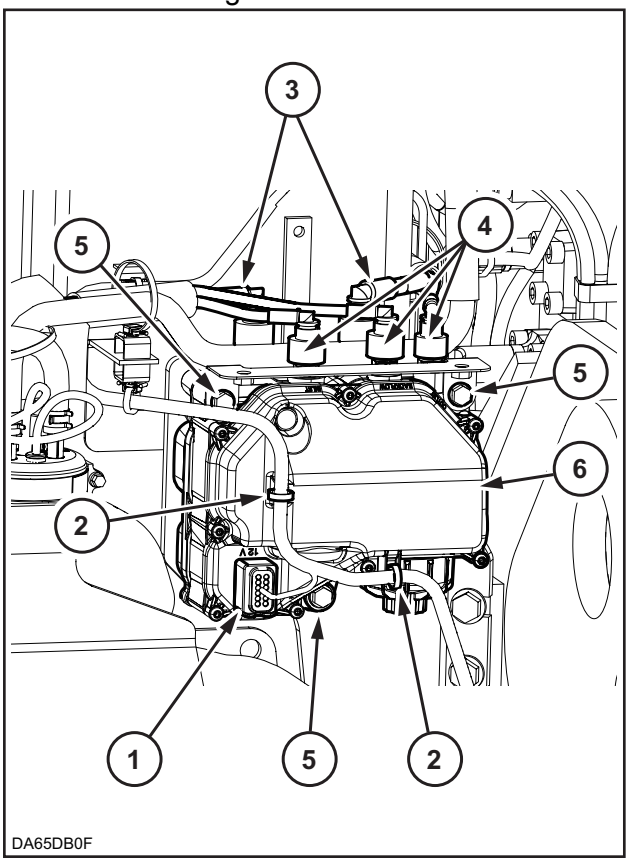
2. Remove the 4 bolts (1) with a wrench [19 mm (0.748 in.)] to remove the step (2).



3. Remove the 3 bolts (1) with a wrench [13 mm (0.512 in.)] to remove the cover (2).



4. Remove the connector (1) to remove the 2 clamps (2).
   Remove the 3 coolant hoses (2).
   Remove the 4 urea hoses (3).
   Remove the 3 bolts (5) with a wrench [13 mm (0.512 in.)] to remove the urea pump (6).
   - Attach caps and plugs at the hoses so as to prevent invasion of water, dust and dirt.
   - Apply marking at each location of the hoses so as to match connections at assembling.



Installation of Injector

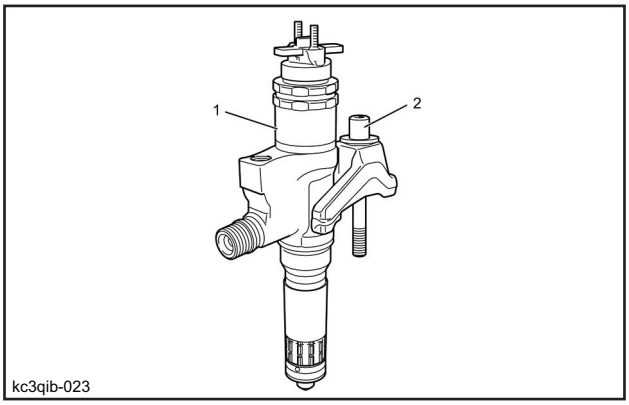
1. Injector installation

> ⚠ Caution
>
> ・When reusing an injector, do not change the installation position.

[1] Apply the engine oil to the bolt.

[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.

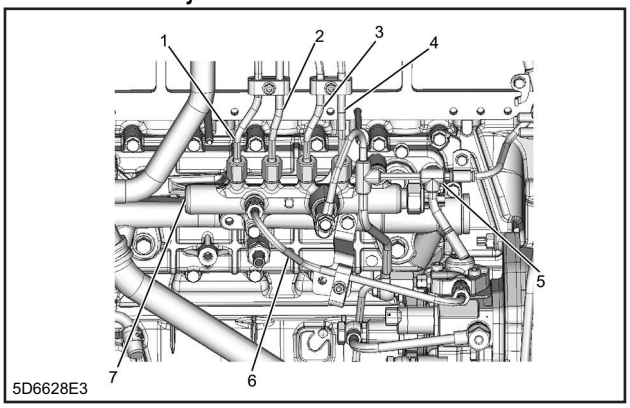
tightening torque: 14 N・m { 1.4 kgf・m / 10 lbf・ft. }

2. 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. }

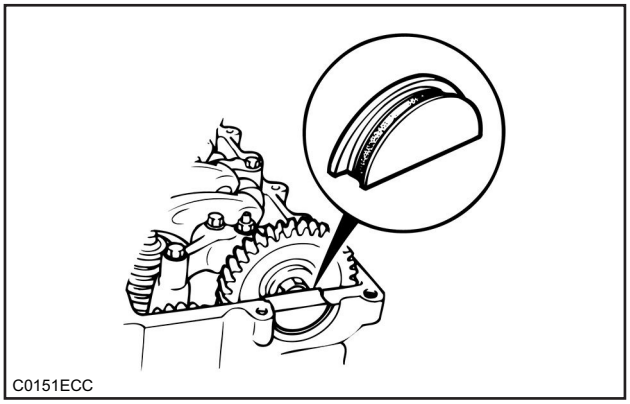


1	No.1 injection pipe
2	No.2 injection pipe
3	No.3 injection pipe
4	No.4 injection pipe
5	Fuel leak-off pipe
6	Fuel pipe
7	Common rail assembly

3. 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.

Caution

・After applying the liquid gasket, install the flywheel housing within 5 minutes.

[3] Install the flywheel housing to the cylinder block.

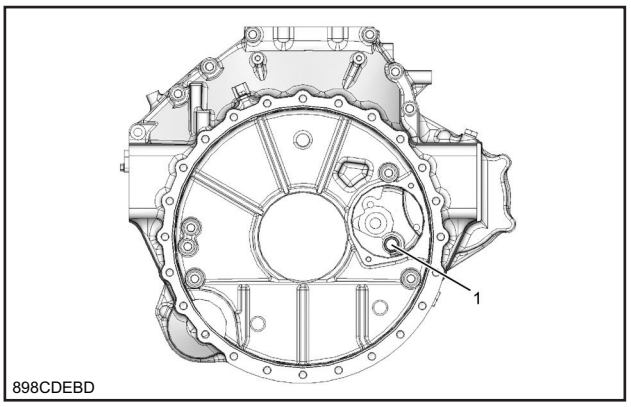
Tightening torque	
Flywheel housing side	: 96 N・m { 9.8 kgf・m / 71 lb・ft. }
Cylinder block side	: 38 N・m { 3.9 kgf・m / 28 lb・ft. }
Supply pump bracket side	: 76 N・m { 7.7 kgf・m / 56 lb・ft. }

Note

・Install the flywheel housing after aligning with the knock pin position of the cylinder block.

Caution

・Be careful not to forget to tighten the bolt indicated in the diagram.



1	Bolt

[4] Apply engine oil to the PTO idle gear shaft.

Note

・Apply it to the sliding surface.

[5] Install the washer to the PTO idle gear shaft.

Caution

・Install it with the oil groove of the washer facing toward the gear side.

[6] Apply engine oil to the washer.

Note

・Apply it to the oil groove side of the washer.

[7] Install the PTO idle gear to the PTO idle gear shaft.

Caution

・Install it with the convex section of the gear facing the front side.

[8] Apply engine oil to the PTO idle gear.

[9] Install the washer to the PTO idle gear shaft.

Caution

・Install it with the oil groove of the washer facing toward the gear side.

Note

・Turn the gear shaft and adjust the oil.

[10] Install the PTO idle gear to the flywheel housing.
tightening torque: 134 N・m { 13.7 kgf・m / 99 lb・ft }

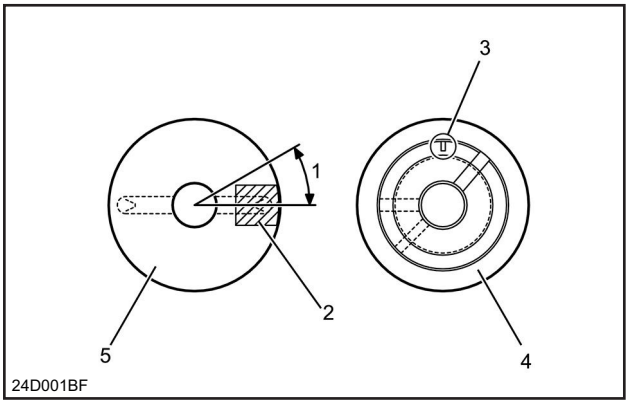
Note

・Assemble the thrust collar to the mounting bolt and install it after applying engine oil.

Caution

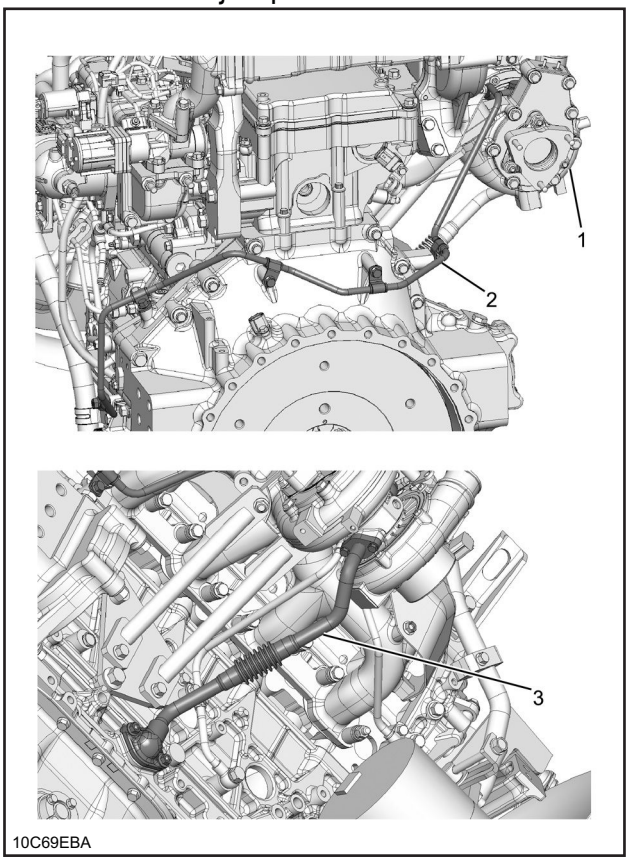
・Install it with the oil groove of the thrust collar facing toward the gear side.

・Orient the notch of the shaft facing upward for oil lubrication and make sure to install the thrust collar so that the paint portion is within the area indicated by the diagram.



1	30 °
2	Paint portion
3	Notch
4	PTO idle gear shaft
5	Thrust collar

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



10C69EBA

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.

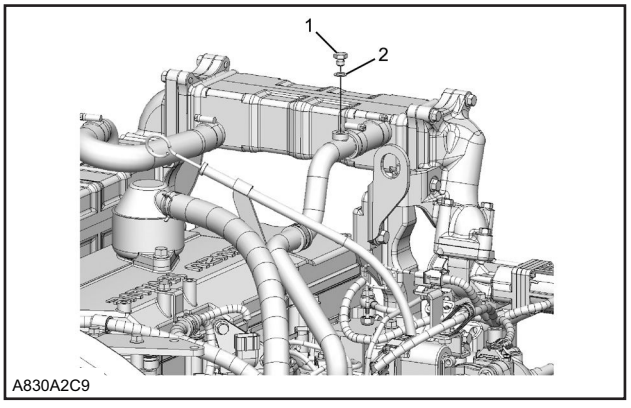
34. Battery ground cable connect
[1] 1. Connect the battery ground cable to the battery.

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] Remove the air bleeding plug from the EGR cooler.

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.



A830A2C9

1	Air bleeding plug
2	Gasket

[2] Replenish the radiator with coolant.

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

Removal and installation of Crankshaft

Removal of Crankshaft

1. Battery ground cable disconnect
   [1] Disconnect the battery ground cable from the battery.
2. Coolant drain
   [1] Remove the radiator cap from the radiator.

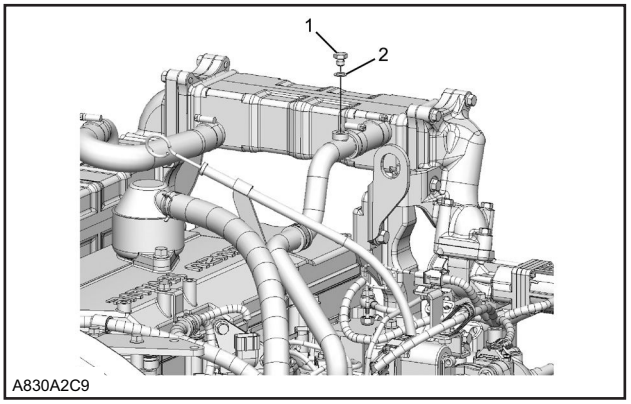
Caution

- 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.

   [2] Remove the drain plug from the radiator.
   [3] Drain coolant from the radiator.

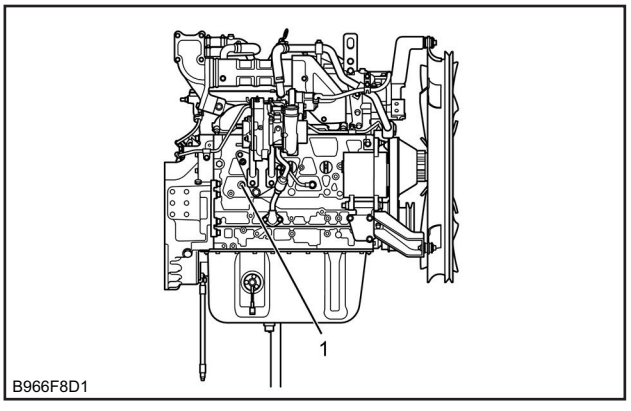
Note

- 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.



1	Air bleeding plug
2	Gasket

   [4] Remove the drain plug from the cylinder block.



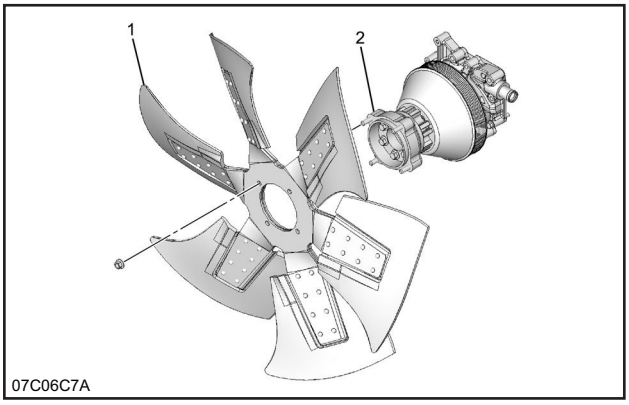
1	Drain plug

   [5] Discharge coolant from the engine.
   [6] Install the drain plug to the cylinder block.
   [7] Install the drain plug to the radiator.
3. Engine oil drain
   [1] Remove the drain plug from the oil pan.
   [2] Drain the engine oil from the oil pan.
   [3] Install the drain plug to the oil pan. tightening torque: 70 N・m { 7.1 kgf・m / 52 lb・ft. }
4. Engine harness disconnect
   [1] Disconnect the engine harness from the engine assembly.

Note

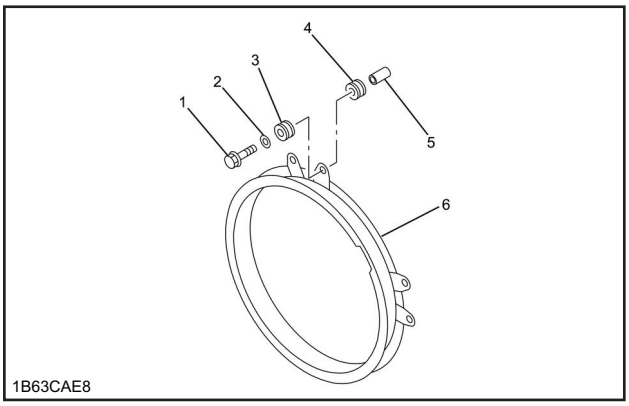
- Disconnect each connector.

5. Cooling fan removal
   [1] Remove the cooling fan from the adapter.



1	Cooling fan
2	Adapter

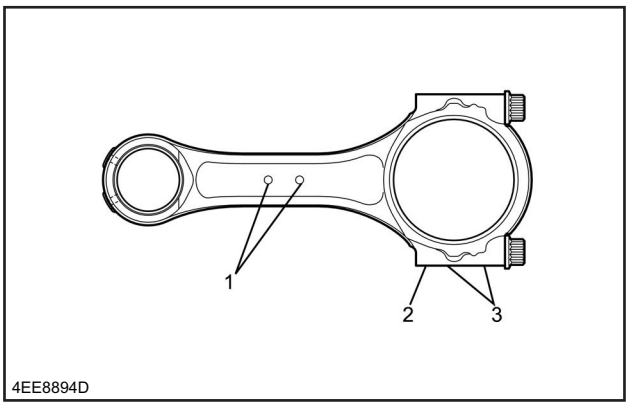
6. Fan guide removal
   [1] Remove the fan guide from the fan guide bracket.



[12] Align the connecting rod bearing cap to the connecting rod.

Note

・Confirm that the numbers on the connecting rod bearing cap and the connecting rod are the same.



1	Front and back side discrimination boss
2	Grade mark of the large end hole diameter
3	Cylinder number

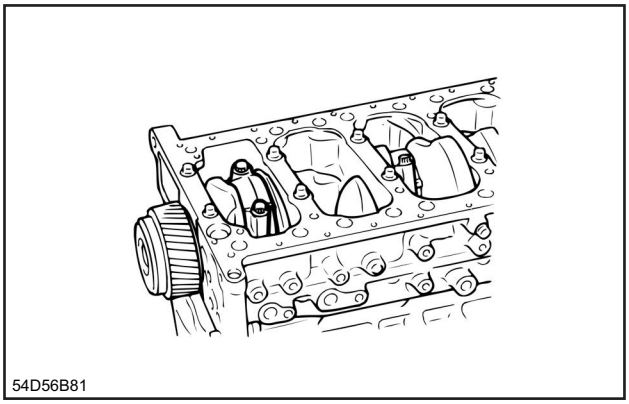
[13] Install the connecting rod bearing cap to the connecting rod.

Note

・Precautions when tightening the connecting rod bolt

Caution

・Set each cylinder to the bottom dead center while working.



Caution

・Do not allow tightening tools to touch the oi jet.

・Confirm that the crankshaft turns smoothly after tightening the connecting rod bolt.

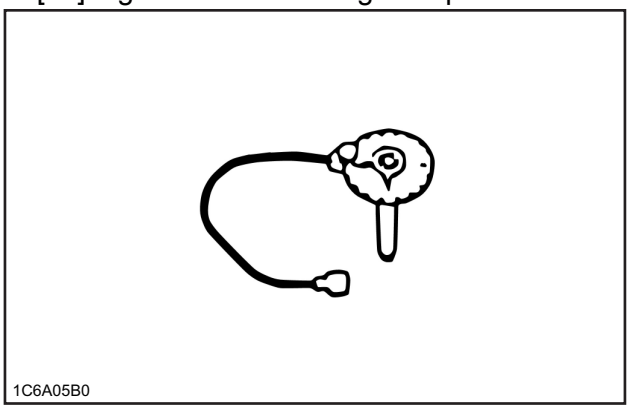
[14] Apply the disulfide molybdenum grease to the bolt.

Note

・Apply to the threaded portion and seat surface of the bolts for the connecting rod installation.

[15] Tighten the bolt using the torque wrench.
tightening torque: 39 N・m { 4.0 kgf・m / 29 lb・ft. }

[16] Tighten the bolt using the special tool.

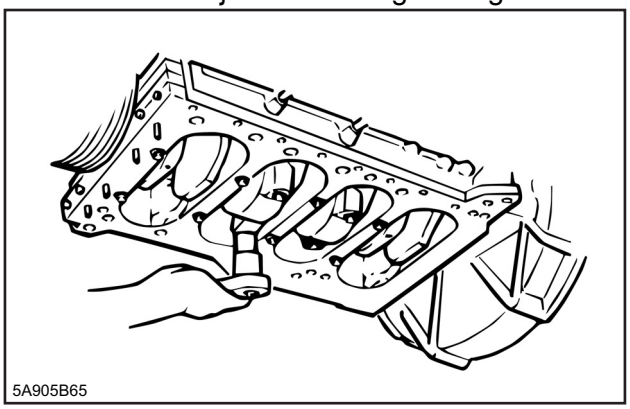


SST: 5-8840-0266-0 - angle gauge

tightening angle: 60 °

[17] Tighten the bolt using the special tool.
tightening angle: 30 °

[18] Tighten the bolt using the torque wrench.
tightening torque: 98 N・m { 10.0 kgf・m / 72 lb・ft. } Check the tightening

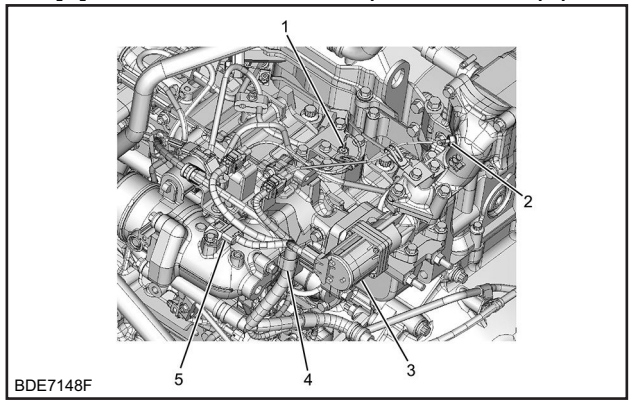


4. Idle gear B installation

[1] Install the idle gear B shaft to the cylinder block.
tightening torque: 31 N・m { 3.2 kgf・m / 23 lb・ft. }

sensor/boost temperature sensor.

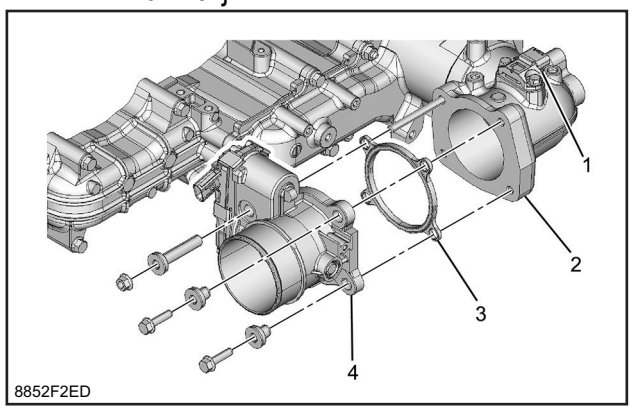
[5] Install the harness clip to the inlet pipe.



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

34. Intake throttle valve installation

[1] Install the intake throttle valve to the inlet pipe.
tightening torque: 24 N・m { 2.4 kgf・m / 17 lb・ft. }



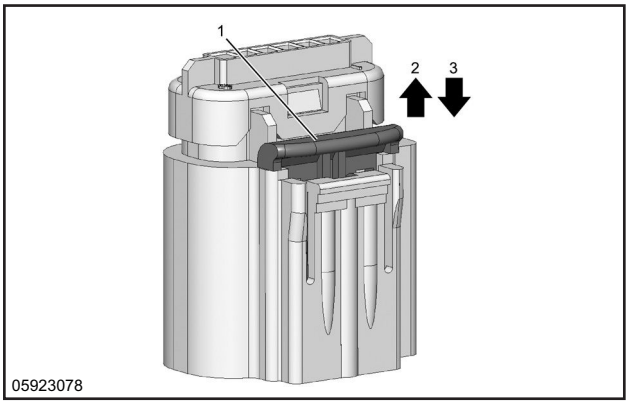
1	Boost pressure sensor/boost temperature sensor
2	Inlet pipe
3	Gasket
4	Intake throttle valve

[2] Install the air duct to the intake throttle valve.

[3] Connect the harness connector to the intake throttle valve.

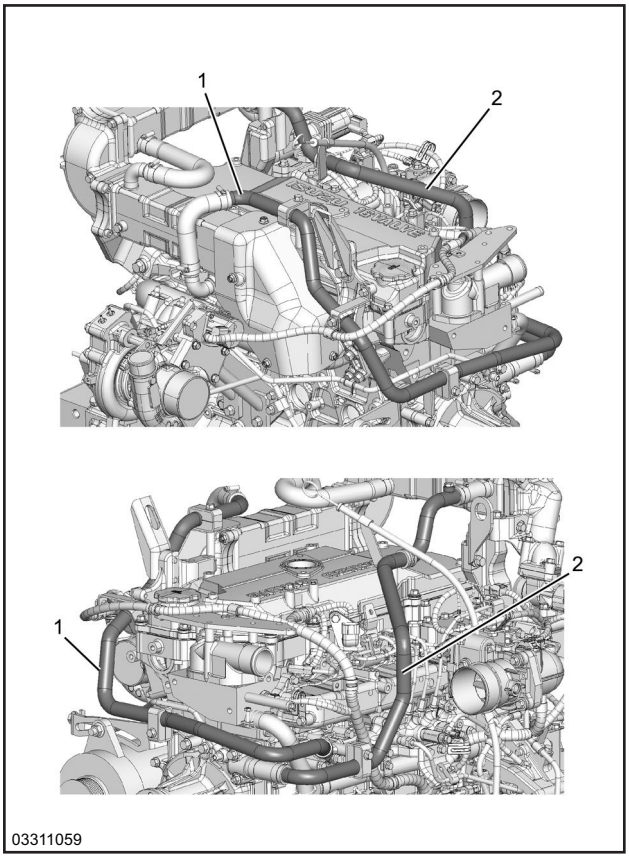
Note

・After connecting the harness connector, press in the lock operation portion to lock.



1	Lock operation section
2	Lock release
3	Lock

35. EGR cooler water pipe installation

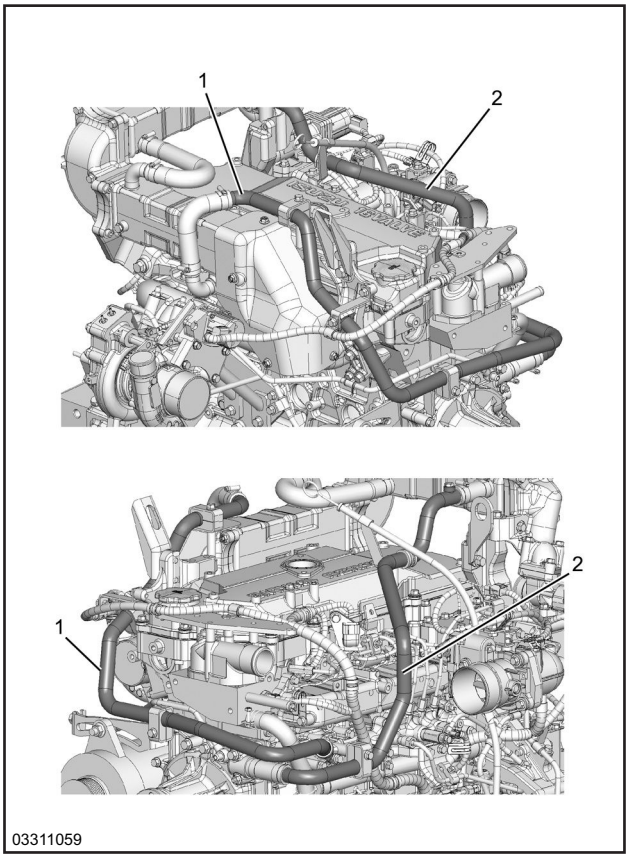


1	EGR cooler water feed pipe
2	EGR cooler water return pipe

[4] Remove the EGR cooler water pipe from the engine assembly.

Note

・Remove the EGR cooler water feed pipe and EGR cooler water return pipe.



1	EGR cooler water feed pipe
2	EGR cooler water return pipe

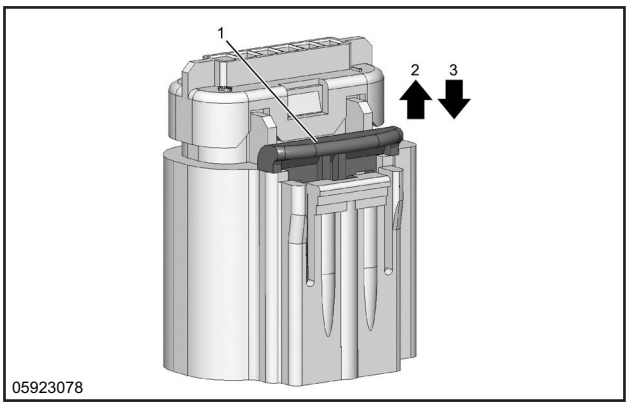
13. Intake throttle valve removal

[1] Remove the air duct from the intake throttle valve.

[2] Disconnect the harness connector from the intake throttle valve.

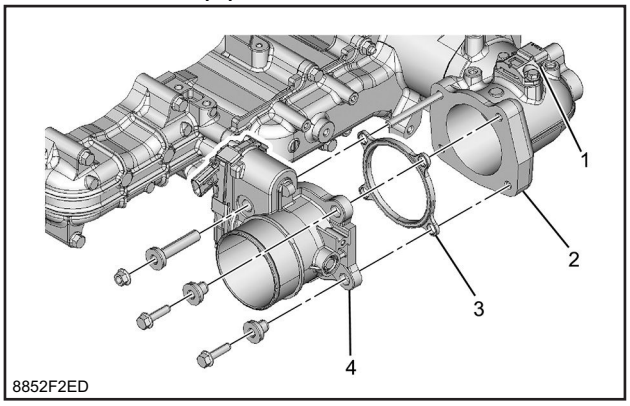
Note

・Pull the lock operation portion to release the lock.



1	Lock operation section
2	Lock release
3	Lock

[3] Remove the intake throttle valve from the inlet pipe.



1	Boost pressure sensor/boost temperature sensor
2	Inlet pipe
3	Gasket
4	Intake throttle valve

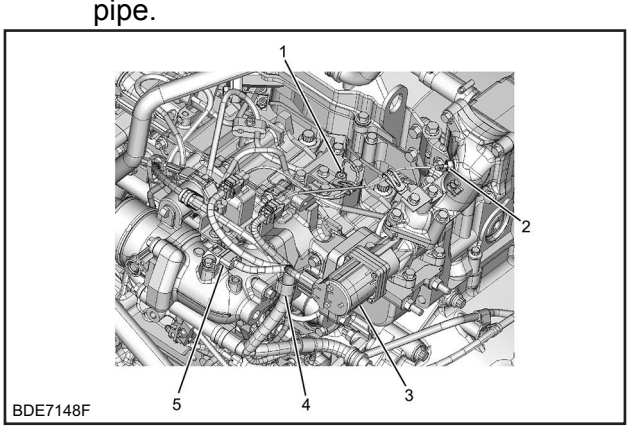
14. Inlet pipe removal

[1] Disconnect the harness connector from the boost pressure sensor/boost temperature sensor.

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

[3] Disconnect the harness connector from the IMT sensor.

[4] Remove the harness clip 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

21. 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.

22. EGR gas temperature sensor 1 installation

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 1.

Note

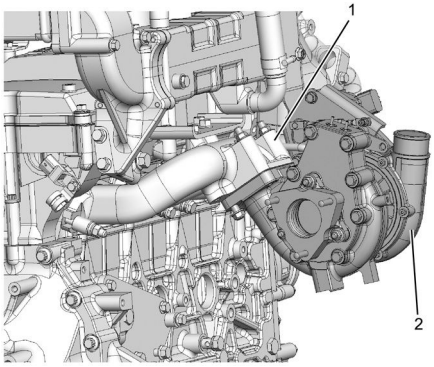
- Apply High Temperature Stainless Never Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of EGR gas temperature sensor 1.

[2] Install EGR gas temperature sensor 1 to EGR pipe A.
tightening torque: 44 N・m { 4.5 kgf・m / 32 lb・ft. }

[3] Connect the harness connector to EGR gas temperature sensor 1.

23. Turbocharger assembly installation

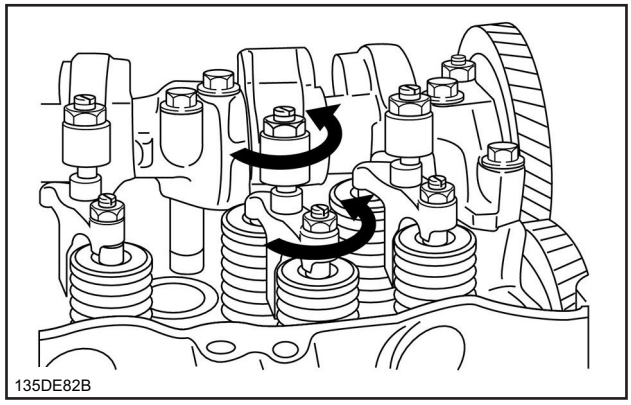
[1] Temporarily tighten the turbocharger assembly to the exhaust manifold.



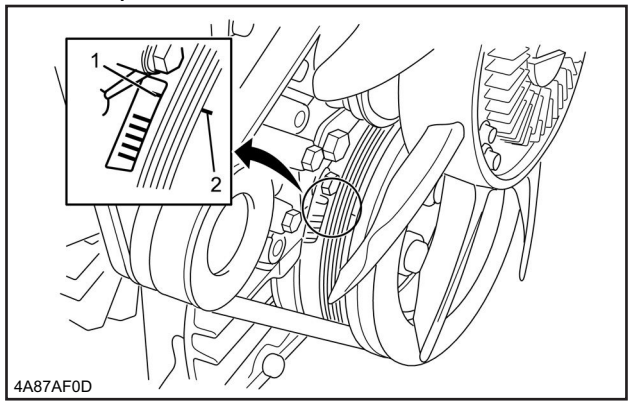
1	Exhaust manifold
2	Turbocharger assembly

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

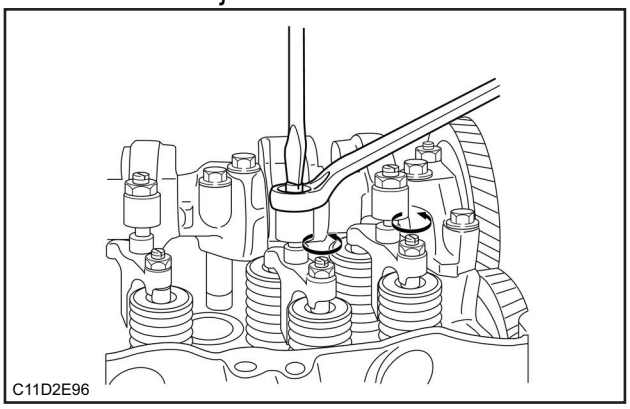
・Insert the thickness gauge between the rocker arm and bridge cap.

[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

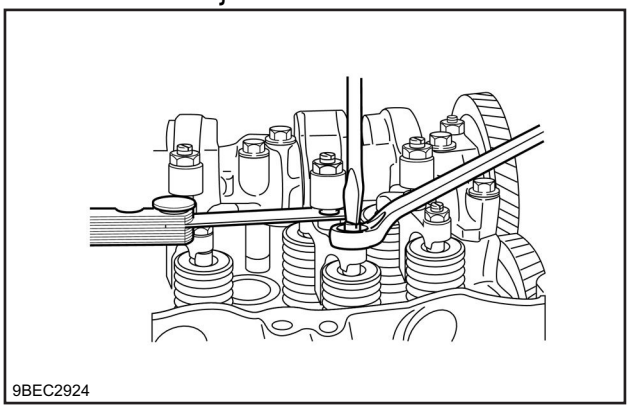
・With the thickness gauge inserted, lightly tighten the adjust screw of the bridge.
・Confirm that the leading end of the adjust screw and valve shaft end have made contact and the movement of the thickness gauge has become stiff.
・Check if the valve shaft end on the opposite side is floating or touching 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. }



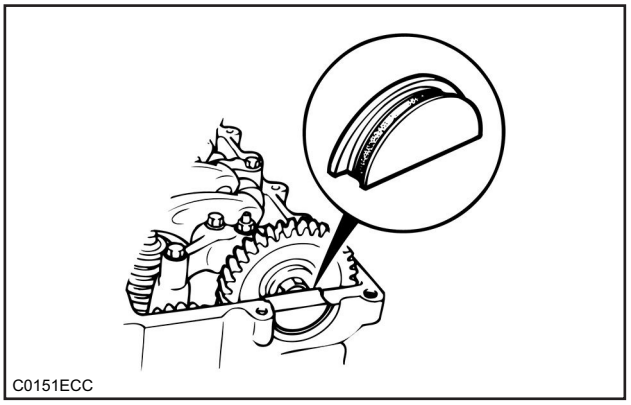
Adjustment table				
Cylinder No.	1	2	3	4

3. 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.

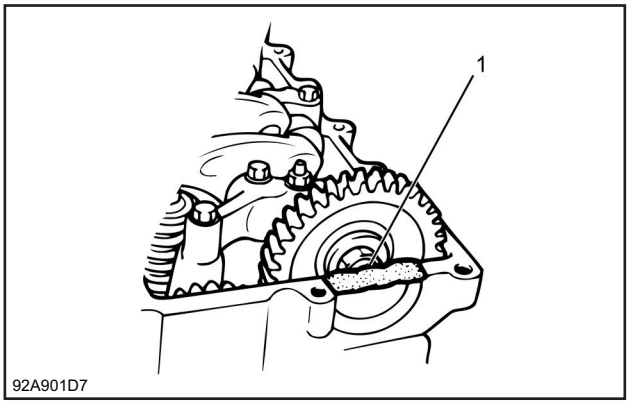
[3] Apply liquid gasket to the rubber plug.

Note

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

Caution

・After applying the liquid gasket, install the lower cover within 5 minutes.



1	Application area

[4] Install the gasket to the lower cover.

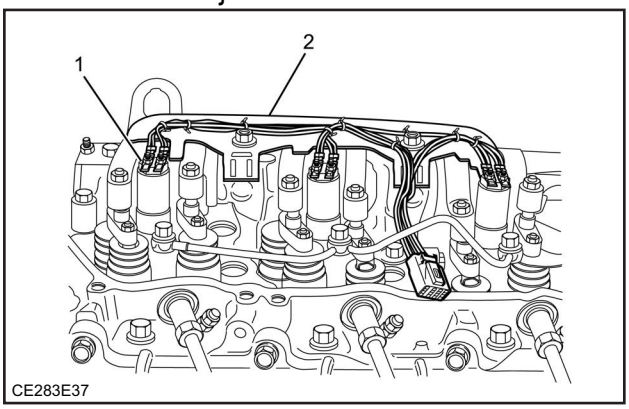
[5] Install the lower cover to the cylinder head assembly.
tightening torque: 18 N・m { 1.8 kgf・m / 13 lb・ft. }

[6] Install the injector harness to the cylinder head assembly.

Note

・Tighten the bolts on the bracket and install the injector harness together with the bracket.

tightening torque: 48 N・m { 4.9 kgf・m / 35 lb・ft. }

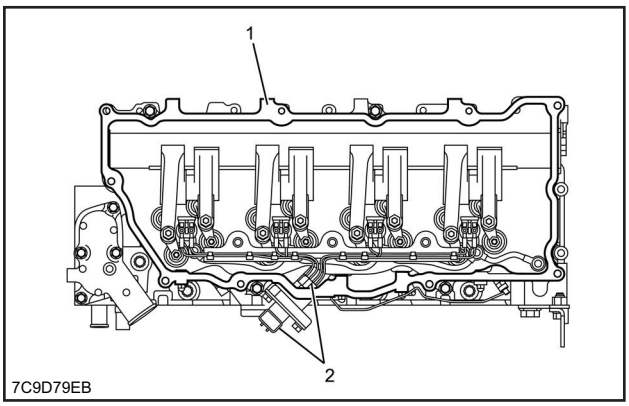


1	Injector harness terminal
2	Injector harness bracket

[7] Connect the injector harness to the injector.
tightening torque: 2 N・m { 0.2 kgf・m / 1 lbf・ft. }

Caution

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



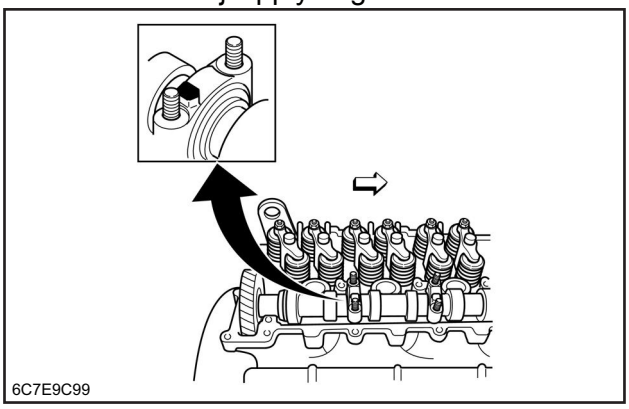
1	Lower cover
2	Connector

[8] Install the connector to the lower cover.
tightening torque: 2 N・m { 0.2 kgf・m / 1 lbf・ft. }

4. Cylinder head cover installation

[1] Align the head cover gasket to the cylinder head cover.

tightening torque: 28 N・m { 2.8 kgf・m / 20 lb・ft. } Apply engine oil



5. Rocker arm shaft installation

[1] Apply the engine oil to the bracket.

Note

・Apply to each sliding surface.

[2] Apply the engine oil to the rocker arm.

Note

・Confirm that the adjust screw is fully loosened.

[3] Temporarily tighten the bolt to the cylinder head assembly.

Note

・Apply engine oil to the threaded portion of the bolts.

[4] Temporarily tighten the nut to the cylinder head assembly.

Note

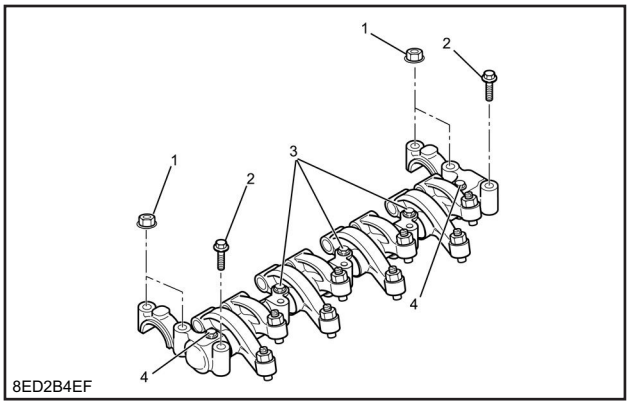
・Apply engine oil to the threaded portion of the nuts.

[5] Securely tighten the rocker arm shaft to the cylinder head assembly.

Note

・Hold the entire rocker arm shaft horizontally and gradually tighten it.

Rocker arm shaft tightening torque		
Parts		Tightening torque
No.1	Nut	: 21 N・m { 2.1 kgf・m / 15 lb・ft. }
No.2	Bolt	: 27 N・m { 2.8 kgf・m / 20 lb・ft. }
No.3	Bolt	: 56 N・m { 5.7 kgf・m / 41 lb・ft. }
No.4	Bolt	: 27 N・m { 2.8 kgf・m / 20 lb・ft. }



1	Nut
2	Bolt
3	Bolt
4	Bolt

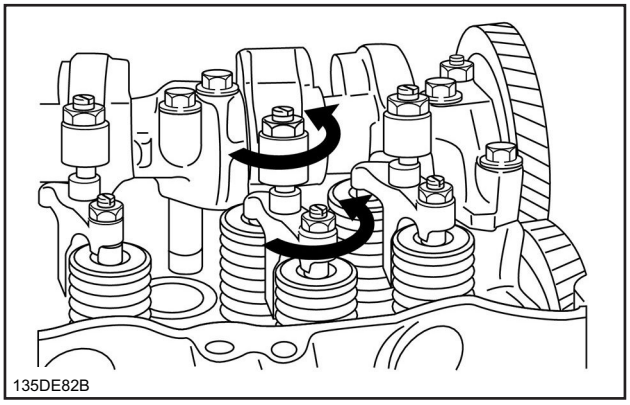
6. Rocker arm shaft adjustment

Note

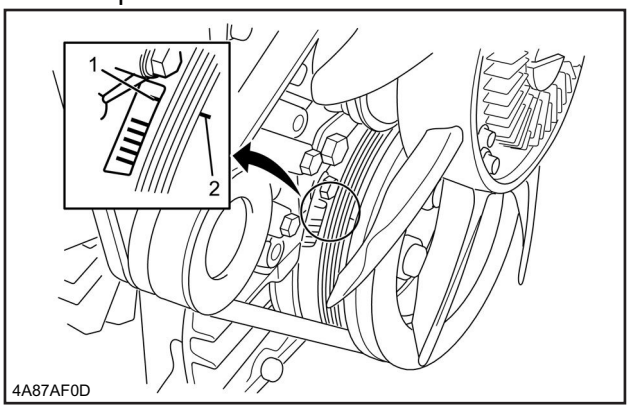
・Valve clearance adjustment

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

3. Brush holder inspection

[1] Measure the brush using the vernier caliper.
Specified value: 17.0 - 18.0 mm { 0.6693 - 0.7087 in }
limit: 10.0 mm { 0.3937 in. }

Caution

- Replace the brush holder if the measured value exceeds the limit value.

4. Overrunning clutch inspection

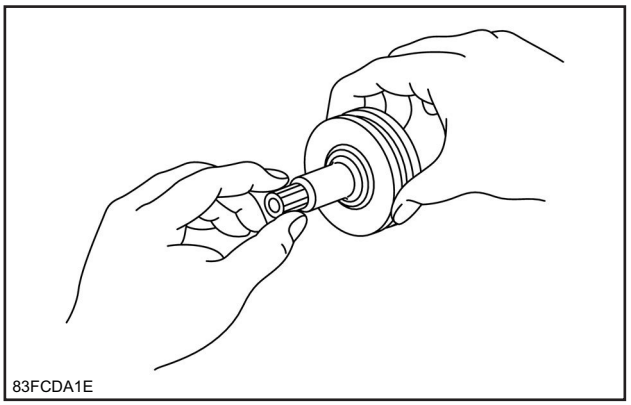
[1] Inspect the overrunning clutch.

Note

- Hold the housing section of the overrunning clutch and turn the pinion over using your hands to confirm that the pinion moves smoothly in one direction with a certain degree of resistance while not moving to the other direction.

Caution

- Do not use a cleaning agent when cleaning the overrunning clutch.
- Use a cloth to clean the overrunning clutch.



[2] Inspect the pinion.

Note

- Replace the pinion if abnormal worn or damage has been found.

5. Front bracket inspection

[1] Inspect the bearing.

Caution

- Replace the front bracket if worn or damage has been found.

6. Internal gear inspection

[1] Inspect the internal gear.

Caution

- Replace the internal gear if abnormal worn or damage has been found.

7. Planetary gear inspection

[1] Inspect the planetary gear.

Caution

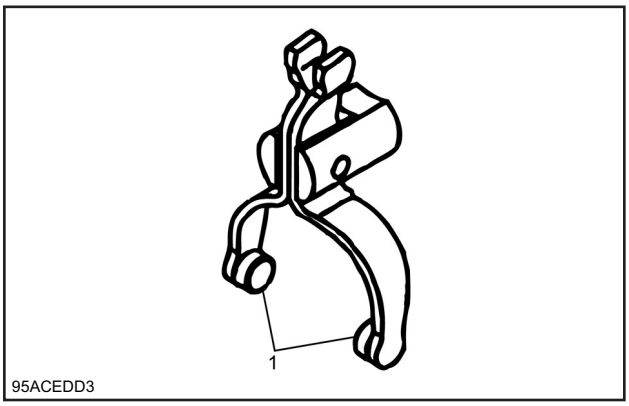
- Replace the planetary gear if abnormal worn or damage has been found.

8. Lever inspection

[1] Inspect the lever.

Note

- Inspect the lever and overrunning clutch sliding sections for worn.



1	Inspection locations

9. Magnetic switch inspection

[1] Inspect the magnetic switch using the circuit tester.

Note

- Inspect the continuity between the M terminal and body.

Removal and installation of Fuel Filter Element

Removal of Fuel Filter Element

1. Fuel filter element removal

Caution

・Be careful not to allow foreign matter to get inside the filter during work.

Note

・The following applies to the element replaceable specification.

[1] Loosen the plug using the wrench.

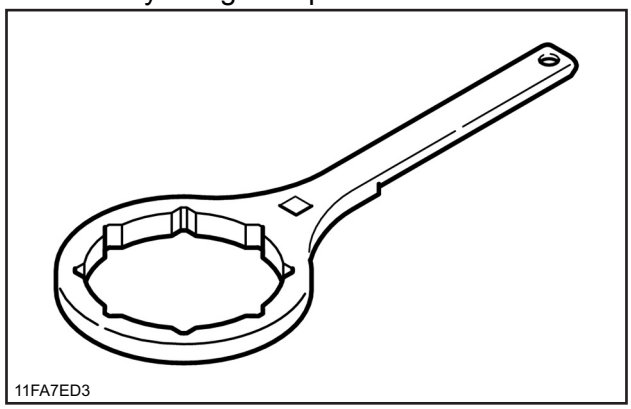
[2] Prepare the pan.

[3] Loosen the drain plug using the wrench.

[4] Drain the fuel from the case.

[5] Tighten the drain plug using the wrench. tightening torque: 3 N・m { 0.3 kgf・m / 2 lbf・ft. }

[6] Remove the case from the fuel filter body using the special tool.



SST: 8-9801-3170-0 - filter wrench

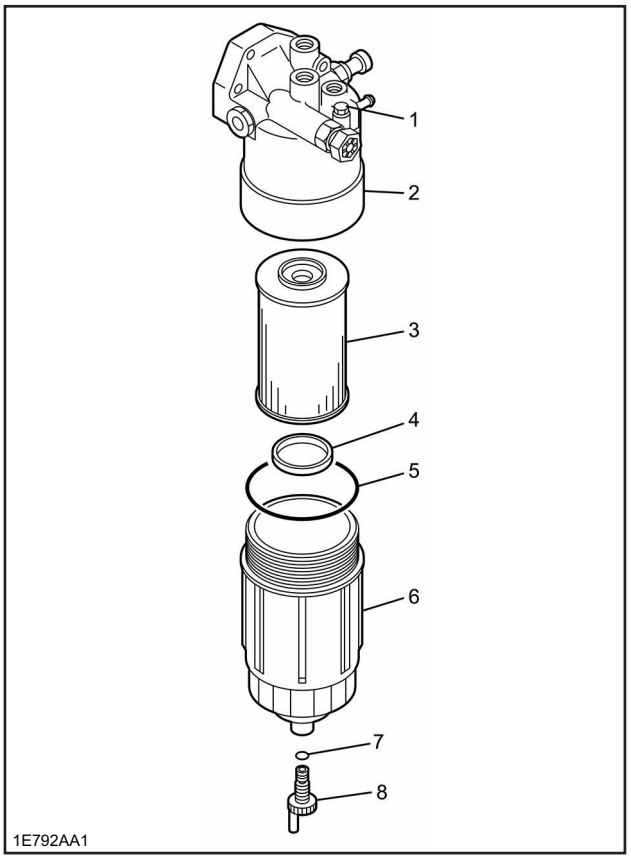
[7] Remove the fuel filter element from the fuel filter body.

[8] Remove the O-ring from the case.

[9] Inspect the case.

Note

・Clean if the inside of the case is dirty.



1	Plug
2	Fuel filter body
3	Fuel filter element
4	Float
5	O-ring
6	Case
7	Gasket
8	Drain plug

Note

・The following applies to the cartridge-type specification.

[10] Prepare a pan.

Removal and installation of EGR Gas Temperature Sensor 3

Removal of EGR Gas Temperature Sensor 3

1. Battery ground cable disconnect
   [1] Disconnect the battery ground cable from the battery.
2. Exhaust gas temperature sensor 3 removal
   [1] Remove the harness connector from EGT sensor 3.
   [2] Remove EGT sensor 3 from the front chamber.

Installation of EGR Gas Temperature Sensor 3

1. Exhaust gas temperature sensor 3 installation Caution:
   - Clean the old anti-seize lubricant on the sleeve nut, and apply new anti-seize lubricant to the threaded portion of the sleeve nut.
   - When assembling the tip of the sensor, do not hit the mating boss.
   - Do not use a sensor that has scratches or dents caused by being dropped or hit.
   - Do not hit the protruding section after assembling the sensor.
   - After starting the engine, check for gas leaks, and verify that it is securely sealed.
   - If the temperature sensor connector is removed from the bracket, replace the connector fixing clip with a new one.

   [1] Apply anti-seize lubricant to EGT sensor 3.

Note

- Apply High Temperature Stainless Never-Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of EGT sensor 3.

   [2] Install EGT sensor 3 to the front chamber.
   tightening torque: 30 N・m { 22 lb・ft. / 3 kgf・m }

Caution

- Apply Never-Seez High Temperature Stainless Grade 5-87411-039-0 by Bostik of USA as the anti-seize lubricant.

   [3] Connect the harness connector to EGT sensor 3.
2. Battery ground cable connect
   [1] Connect the battery ground cable to the battery.
3. Exhaust gas temperature sensor 3 setting
   Caution:
   - If EGT sensor 3 is replaced, reset the data with the trouble diagnosis scan tool.

   [1] Connect the trouble diagnosis scan tool to the DLC.
   [2] Turn ON the ignition switch.
   [3] Select Search.

Note

- Input the engine No. and select Search.

   [4] Select Diagnosis.
   [5] Select the Engine.
   [6] Select Urea SCR.
   [7] Select Data Reset.
   [8] Select EGT Sensor 3 Data Reset.

Note

- Reset the data by following the on-screen instructions.

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

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[7] Check the DTC.
[8] If a DTC has been detected, replace the control unit of the machine.
[9] Connect all harnesses.
[10] Clear the DTC using the trouble diagnosis scan tool.
[11] Turn OFF the ignition switch for at least 30 seconds.
[12] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[13] Check the DTC.
[14] If a DTC has been detected, replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".
[15] Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.

2. DTC U0101 confirm resolution
[1] Clear the DTC using the trouble diagnosis scan tool.
[2] Turn OFF the ignition switch for at least 30 seconds.
[3] Start the engine.
[4] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

DTC P0102 Mass Air Flow Sensor Circuit Low Input

1. DTC P0102 priority DTC
DTC P0560
2. DTC P0102 diagnostics
[1] Turn OFF the ignition switch.
[2] Disconnect the harness connector from the MAF sensor.
[3] Inspect to see if there is an open circuit or high resistance in the 12 V power supply circuit between the ECM and the MAF sensor.
[4] If a problem is found, repair the 12 V power supply circuit.
[5] Connect the test cable with fuse between the 12 V power supply circuit and the signal circuit of the MAF sensor harness connector.
[6] Check the MAF sensor display with the trouble diagnosis scan tool.
voltage: 4.9 V
[7] If the reading is more than or equal to the specified value, inspect to see if there is a poor connection with the MAF sensor harness connector.
[8] If a problem is found, repair the harness connector.
[9] If the harness connector is normal, replace the MAF sensor.
[10] Inspect the signal circuit between the ECM and the MAF sensor.
・ There should be no open circuit or high resistance.
・ There should be no short to GND.
[11] If a problem is found, repair the signal circuit.
[12] Inspect the ECM harness connector for a poor connection.
[13] If a problem is found, repair the harness connector.
[14] If the harness connector is normal, replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".
[15] Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.
3. DTC P0102 confirm resolution
[1] Clear the DTC using the trouble diagnosis scan tool.

[5] Inspect the ECM harness connector for a poor connection.
[6] If a problem is found, repair the harness connector.
[7] Disconnect the harness connector from the CKP sensor.
[8] Inspect the CKP sensor harness connector for a poor connection.
[9] If a problem is found, repair the harness connector.
[10] Inspect the CKP sensor.
Refer to "CKP sensor inspection".
[11] If a problem is found, replace the CKP sensor.
Refer to "CKP sensor removal".
Refer to "CKP sensor installation".

3. DTC P0336 confirm resolution
[1] Clear the DTC using the trouble diagnosis scan tool.
[2] Turn OFF the ignition switch for at least 30 seconds.
[3] Start the engine.
[4] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

DTC P0340 Camshaft Position Sensor Circuit

1. DTC P0340 priority DTC
DTC P0601
DTC P06A7

2. DTC P0340 diagnostics
[1] Turn OFF the ignition switch.
[2] Disconnect the harness connector from the CMP sensor.
[3] Turn ON the ignition switch.
[4] Measure the voltage between the 5 V power supply circuit and normal GND of the CMP 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 CMP sensor.
[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 CMP 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 CMP sensor.
[9] If a problem is found, repair the signal circuit.
[10] Measure the voltage between the signal circuit of the CMP 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 CMP sensor.
・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 CMP 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 CMP 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 CMP sensor harness connector.
voltage: 4.5 V

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

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Observe the DTC information with the trouble diagnosis scan tool. A DTC should not be set.

DTC P06A7 Sensor Reference Voltage 2 Circuit

1. DTC P06A7 diagnostics

[1] Turn OFF the ignition switch.
[2] Disconnect the harness connector from the CMP sensor.
[3] Turn ON the ignition switch.
[4] Measure the voltage between the CMP sensor 5 V power supply circuit of the CMP sensor harness connector and the GND.
voltage: 5.5 V
[5] If the reading is more than or equal to the specified value, inspect the CMP sensor 5 V power supply circuit between the ECM and the CMP sensor for a short to the battery or a short to the ignition power supply.
[6] If a problem is found, repair the CMP sensor 5 V power supply circuit.
[7] Inspect the FRP sensor 5 V power supply circuit between the ECM and the FRP sensor for a short to the battery or a short to the ignition power supply.
[8] If a problem is found, repair the FRP sensor 5 V power supply circuit.
[9] If the reading is less than or equal to the specified value, measure the voltage between the CMP sensor 5 V power supply circuit of the CMP sensor harness connector and the GND.
voltage: 4.5 V
[10] If the reading is more than or equal to the specified value, replace the CMP sensor.
Refer to "CMP sensor removal".
Refer to "CMP sensor installation".
[11] If the reading is less than or equal to the specified value, turn OFF the ignition switch.
[12] Disconnect the harness connector from the fuel pressure sensor.
[13] Turn ON the ignition switch.
[14] Measure the voltage between the CMP sensor 5 V power supply circuit of the CMP sensor harness connector and the GND.
voltage: 4.5 V
[15] If the reading is more than or equal to the specified value, replace the FRP sensor.
Refer to "Common rail assembly removal".
Refer to "Common rail assembly installation".
[16] If the reading is less than or equal to the specified value, inspect the CMP sensor 5 V power supply circuit between the ECM and the CMP sensor for a short to GND.
[17] If a problem is found, repair the CMP sensor 5 V power supply circuit.
[18] Inspect the FRP sensor 5 V power supply circuit between the ECM and the FRP sensor for a short to GND.
[19] If a problem is found, repair the FRP sensor 5 V power supply circuit.
[20] Replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".
[21] Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.

2. DTC P06A7 confirm resolution

[1] Clear the DTC with the trouble diagnosis scan tool.
[2] Turn OFF the ignition switch for 30 seconds or more.
[3] Start the engine.
[4] Perform a test-run under the conditions for running the DTC.

Note

・Conditions for setting engine run time or coolant temperature vary depending on the DTCs.
・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Observe the DTC information with the trouble diagnosis scan tool. A DTC should not be set.

[9] If the charge voltage circuit between the ECM and the injector harness intermediate connector is normal, replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".

[10] Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.

[11] Inspect the injector harness intermediate connector for a poor connection.

[12] If a problem is found, repair the injector harness intermediate connector.

[13] Disconnect the harness connector from the ECM.

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

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

[16] 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.

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

[18] Remove the cylinder head cover.
Refer to "Cylinder head cover removal".

[19] Inspect the injector harness tightening nut for looseness.

[20] If the injector harness tightening nut is loose, tighten it.

[21] Inspect to see if any foreign matter is attached to the injector terminal.

[22] If any foreign matter is attached to the injector terminal, remove it.

[23] Inspect the injector harness intermediate harness connector for a poor connection.

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

[25] 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

[26] If the reading is less than or equal to the specified value, replace the relevant injector.
Refer to "Injector removal".
Refer to "Injector installation".

[27] Set the injector ID Code on the ECM.

[28] If the reading is more than or equal to the specified value, repair or replace the injector harness.

2. DTC P2149 confirm resolution

[1] Clear the DTC using the trouble diagnosis scan tool.

[2] Turn OFF the ignition switch for at least 30 seconds.

[3] Start the engine.

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

Note

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

・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

DTC P2228 Barometric Pressure Sensor Circuit Low

1. DTC P2228 diagnostics

[1] Replace the ECM.
Refer to "ECM removal".
Refer to "ECM installation".

[2] Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.

2. DTC P2228 confirm resolution

[1] Clear the DTC using the trouble diagnosis scan tool.

[2] Turn OFF the ignition switch for at least 30 seconds.

[3] Start the engine.

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

Note

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

・For the conditions for setting the DTC, refer to the applicable code listed in 15E DTC information.

[5] Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

[7] Inspect the urea fluid sensor in the urea fluid tank for engine coolant leakage.
a. Drain the urea fluid from the drain plug of the urea fluid tank.
b. Check the color of the drained urea fluid, and inspect for an intrusion of engine coolant.
c. If an intrusion of engine coolant is found, remove the urea fluid sensor and visually inspect for engine coolant leakage from the engine coolant pipe and pipe installation section.

[8] If a problem is found, replace the urea fluid sensor.

[9] Inspect the urea fluid temperature sensor for characteristic malfunctions.
a. Connect the urea fluid sensor harness connector to the removed urea fluid sensor.
b. Put the urea fluid sensor in a container with water or warm water at 60 °C {140 °F} or less.

Note
- The temperature sensing element on the bottom end of the urea fluid sensor should be submerged in the water.
- Do not use warm water at 70 °C {158 °F} or more. This may cause the DTC to be set.

c. Measure the temperature of the water or warm water in the container using an engine coolant temperature gauge.
d. Turn ON the ignition switch.
e. Compare the urea fluid tank temperature display on the trouble diagnosis scan tool with the value of the engine coolant temperature gauge, and check whether the difference is less than or equal to the specified value.

Note
- It takes time for the temperature display on the trouble diagnosis scan tool to stabilize. Determine after the temperature display is stable.

Specified value: 5 °C {9 °F} or less (Temperature difference)

f. Measure 2 - 3 times at different temperatures and check whether the temperature difference is less than or equal to the specified value.

[10] If the temperature difference is more than or equal to the specified value, replace the urea fluid sensor.

2. DTC 149D confirm resolution

[1] Clear the DTC with the trouble diagnosis scan tool.

Note
- After clearing the DCU DTC, observe whether ECM DTC P20C9 is set.
- If DTC P20C9 is set, clear it.

[2] Turn OFF the ignition switch until communication with the trouble diagnosis scan tool is discontinued.

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

[4] Observe the DTC information with the trouble diagnosis scan tool. A DTC should not be set.

DTC 203B Urea Fluid Tank Level Sensor Stuck

1. DTC 203B priority DTC
DTC 203C
DTC 203D

2. DTC 203B diagnostics

Note
- Check the frequency with which urea fluid is added, because this DTC may be set if urea fluid is repeatedly added with a high amount of urea fluid remaining in the urea fluid tank.

[1] Remove the urea fluid tank level sensor.

[2] Inspect the urea fluid tank level sensor.

Note
- There should be no bending of the level sensor tube.
- The float should not be stuck and there should be no foreign material that restricts the movement of the float.
- There should be no leaning or delayed response of the level sensor.
- The urea fluid tank should not be deformed or broken.

[3] If a problem is found, repair or replace the urea fluid tank level sensor.

[4] Turn ON the ignition switch.

[8] Inspect the urea fluid pump power supply circuit between the DCU and the urea fluid supply module for an open circuit or high resistance.

[9] If a problem is found, repair the pump power supply circuit.

[10] Inspect the GND circuit between the DCU and the urea fluid supply module harness connector for an open circuit or high resistance.

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

[12] Inspect the urea fluid pump control circuit between the DCU and the urea fluid supply module for abnormal harness appearances.

Note

・There should be no damage, deformation, etc.

[13] If a problem is found, repair the urea fluid pump control circuit.

[14] If the control circuit is normal, replace the urea fluid supply module.
Refer to "DEF supply module removal".
Refer to "DEF supply module installation".

[15] Clear the DTC with the trouble diagnosis scan tool.

[16] Turn OFF the ignition switch until communication with the trouble diagnosis scan tool is discontinued.

[17] Turn ON the ignition switch without starting the engine.

[18] Observe the DTC information with a trouble diagnosis scan tool.

[19] If the DTC is set, turn OFF the ignition switch.

[20] Replace the DCU.
Refer to "DCU removal".
Refer to "DCU installation".

3. DTC 20AC confirm resolution

[1] Clear the DTC with the trouble diagnosis scan tool.

Note

・After clearing the DCU DTC, observe whether ECM DTC P20C9 is set.

・If DTC P20C9 is set, clear it.

[2] Turn OFF the ignition switch until communication with the trouble diagnosis scan tool is discontinued.

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

[4] Observe the DTC information with the trouble diagnosis scan tool. A DTC should not be set.

DTC 20AD Urea Fluid Pump Module Temperature Sensor Performance

1. DTC 20AD priority DTC
All the DTCs that were set at the same time

2. DTC 20AD diagnostics

[1] If there are DTCs that were set at the same time, treat those first.

[2] Turn OFF the ignition switch.

[3] Disconnect the harness connector from the urea fluid sensor.

[4] Inspect the urea fluid sensor harness connector.

Note

・There should be no intermittent conditions, poor connections, or corrosion.

・There should be no water intrusion or adhering foreign material.

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

[6] Turn ON the ignition switch.

[7] Connect a test lamp between the urea fluid sensor power supply circuit and the DCU harness GND connection.

[8] If the test lamp does not illuminate, repair the open circuit or high resistance in the urea fluid sensor power supply circuit.

[9] Connect a test lamp between the power supply circuit and the GND circuit.

[10] If the test lamp does not illuminate, repair the open circuit or high resistance in the urea fluid sensor GND circuit.

[11] Check whether any equipment which could cause abnormally high temperature is installed in the area around the urea fluid tank.

[12] If a problem is found, take countermeasures to prevent abnormally high temperature.

[13] Ask the operator whether or not there were any external factors in the past which could have caused abnormally high temperature close to the urea fluid tank.

[2] Selecting the crasher mode enables using the crasher.

* The maximum flow and the maximum pressure are set in the flow setting screen at first.
* 2 pumps flow is set if a flow set in setting requires it.

[3] Turning OFF the key once and then turning ON the key next time holds the attachment mode previously selected.

Operation condition:

[1] Flow restriction

- The pump is controlled in accordance with set flow rate when the crasher is operated in independent operation.
- The pump is controlled in the maximum flow rate (100%) when the crasher and other operation are operated simultaneously. (Travel/crasher priority)

[2] Pressure restriction

- The pump is controlled in accordance with pressure setting when selecting option mode.

[3] Condition of 2 pumps flow

- 2nd speed flow rate setting + option 1 pressure 2 MPa or more

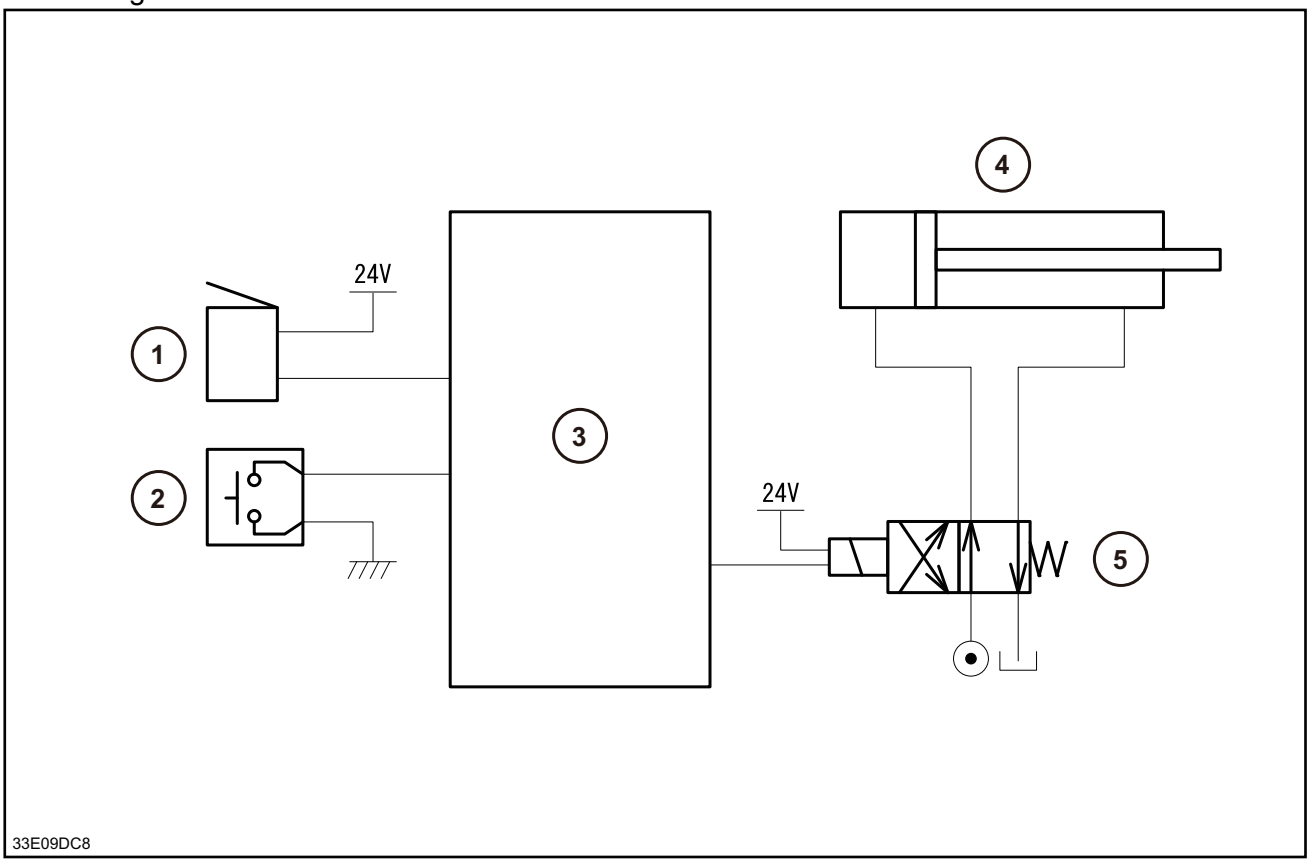
Quick coupler

<Purpose/Overview>

This is a device for one-touch replacement of the end attachment.

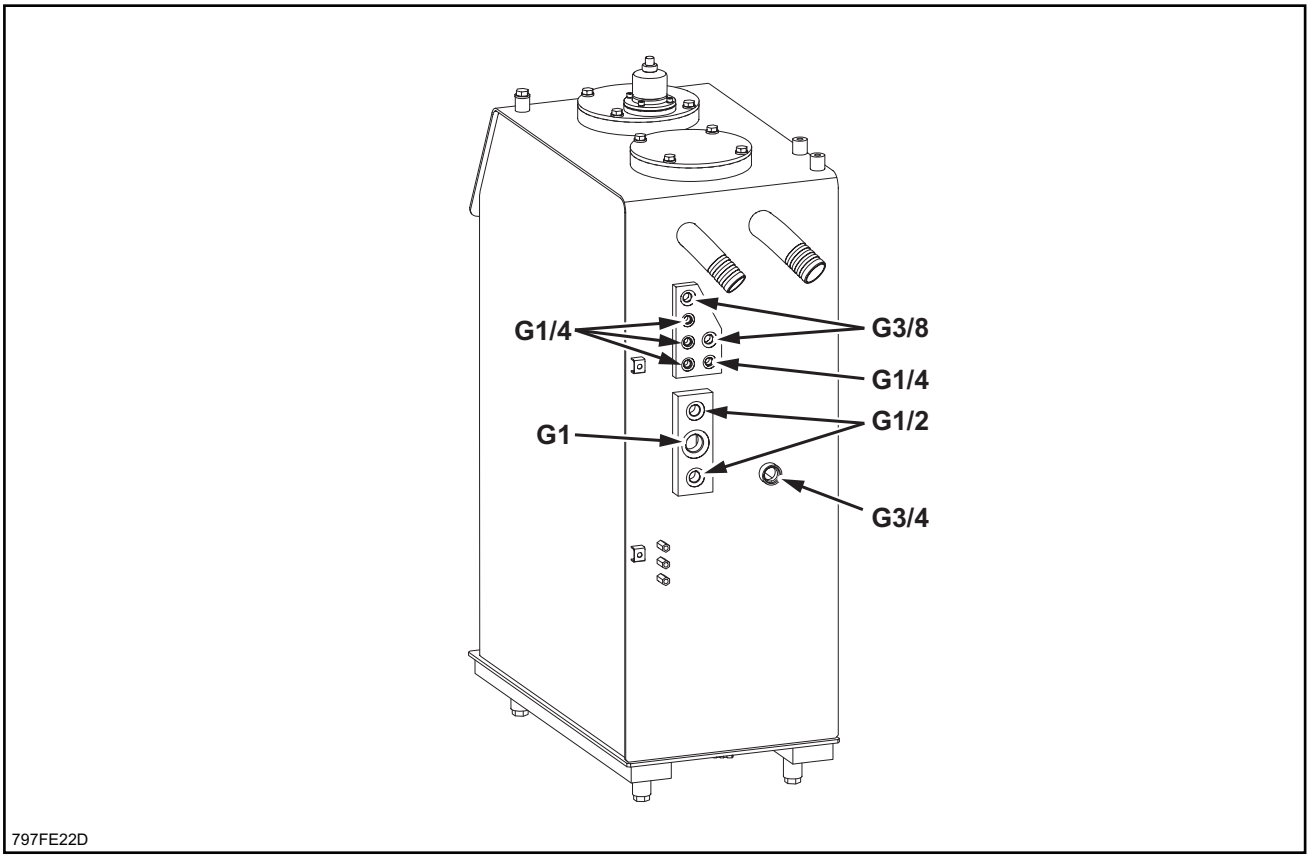
While the switch is pressed, a buzzer sounds and the coupler is unlocked. When the coupler switch is released, the coupler will be locked automatically.

<Configuration>



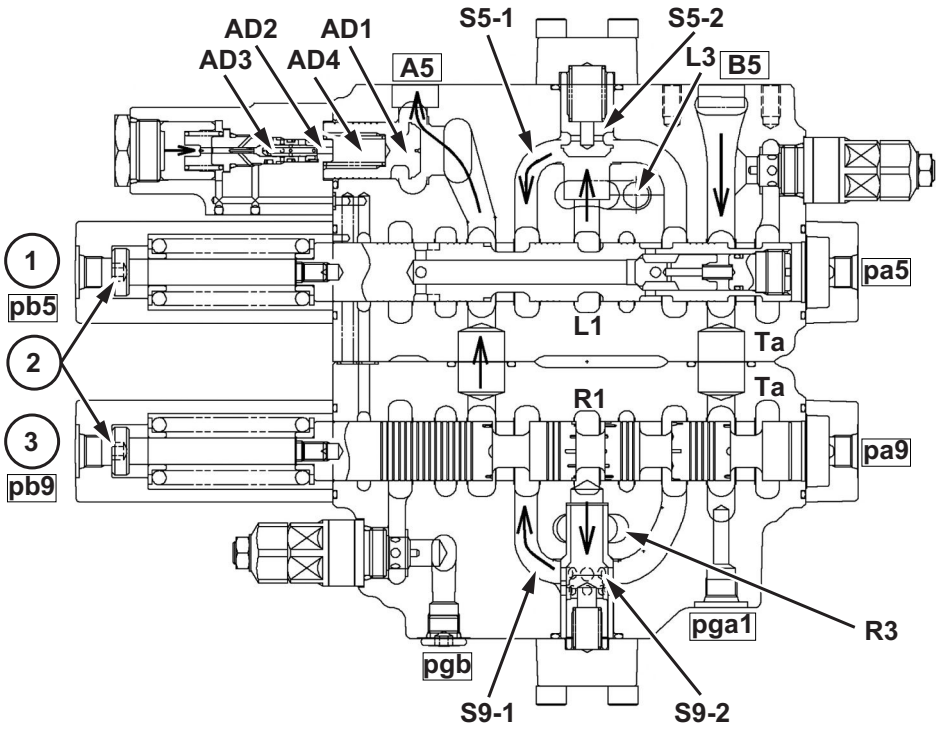
1	Quick coupler buzzer
2	Quick coupler switch
3	Main controller
4	Coupler cylinder
5	Coupler solenoid valve

Hydraulic Oil Tank



Code	Part name	Quanti ty	Code	Part name	Quanti ty
-	Regulator subassembly	1	643	Pilot sleeve	1
412	Hexagon socket head bolt	4	644	Spring seat Q	1
413	Hexagon socket head bolt	1	645	Regulating ring Q	1
414	Hexagon socket head bolt	1	646	Pilot spring	1
418	Hexagon socket head bolt	2	650	Pi sleeve	1
436	Hexagon socket head bolt	4	660	Valve casing N2	1
437	Hexagon socket head bolt	6	665	spool	1
438	Hexagon socket head bolt	6	666	spring	1
466	ROH plug	3	708	O-ring	1
497	MH plug	16	726	O-ring	1
601	Casing N8	1	728	O-ring	2
611	Feedback lever	1	730	O-ring	2
614	Adjusting plug	1	753	O-ring	1
621	Compensation spool	1	755	O-ring	5
622	Compensation sleeve	1	756	O-ring	1
624	Spring seat C	1	758	Square ring	17
625	Outer spring	1	801	Hexagon nut	1
626	Inner spring	1	802	Hexagon nut	1
627	Regulating ring C	1	874	Fulcrum pin	1
628	Adjusting screw C	1	876	Pin	1
629	Cover C	1	887	Pin	1
630	lock nut	1	897	Pf piston	1
631	Pf sleeve	1	898	Pi piston	1
641	Pilot cover N	1	924	Hexagon socket head retaining screw	1
642	Pilot spool	1			

d. Arm out (2 pumps flow) [Fig .15]
Oil fed from the P1 port flows to the A5 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 Pa5 of the arm 1 (section 5).
Oil fed from the P2 port merges in the arm 1 section to flow to the A5 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 pa9 of the arm 2 (section 9) as well.
Returning oil from the B5 port returns to the tank path (Ta) via neck of the spool.



[Fig.15]

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

[7] Parallel orifice for arm [Fig. 16]
Orifices utilizing the spool are installed at the parallel path for arm 1 and arm 2 of this valve to control the amount of feeding oil to the arm section for combined operation.
Oil fed from the parallel path (L3) of the arm 1 (section 5) pushes and opens the poppet (S5-3), and then it passes through the orifice (Lc8) of the adjustable orifice spool and is connected to the path (L5).

When the operation section is tilted to increase the pressure of the port 1 up to that equivalent to the set spring force for secondary pressure setting, the hydraulic pressure on the spool and that spring force will be balanced with each other to keep the output pressure of the port 1 constant. The spool on the port 2 side remains in a neutral state, and the oil from the control valve is drained through the port T.
When the operation section is tilted at almost the maximum angle, the push rod will come in contact with the spool top directly to push the spool in forcibly, and the port P and the output port will conduct to each other to achieve the same pressure.

Damping Mechanism in Operation Section

1. In a neutral state
   The push rod is pushed up by the damping spring (336, 337) through the piston (224), and located in the position shown in the assembly cross-section diagram.
2. When the operation section is tilted from a neutral state (refer to Damping operation explanation diagram (1).)
   When, in the assembly cross-section diagram, the cam is turned clockwise, the push rod on the port 1 side will be pushed down, and the piston will move downward (3).
   At this time, the oil in the damping piston chamber is drained from the orifice in the piston, and the resulting pressure produces damping force (2).
   On the other hand, the push rod on the port 2 side is moved up by the damping spring through the piston.
   At this time, the oil in the tank chamber is sucked into the damping piston chamber through the ball check section (3 locations) that consists of steel ball (225).
   The oil outside the piston chamber drains out of the passage leading from the casing top end to the port T.
3. When the operation section is tilted in the opposite direction from a fully tilted state (refer to Damping operation explanation diagram (2).)
   When, in the assembly cross-section diagram, the cam is fully tilted clockwise and then turned counter-clockwise, the push rod on the port 2 side will be pushed down, and the piston will move downward.
   At this time, as above, the oil in the damping piston chamber is drained from the orifice in the piston, and the resulting pressure produces damping force (3-1).
   On the other hand, the push rod on the port 1 side is moved up by the return spring (335) and the damping spring (3-2).
   At the same time, the oil in the tank chamber is sucked into the damping piston chamber through the ball check section (3 locations) that consists of steel ball (3-3).
   The oil outside the piston chamber drains out of the passage leading from the casing top end to the tank port (3-4).
   In other words, damping force will act for either operation: tilting from the neutral position to the fully tilted position or tilting from the fully tilted position to the neutral position.

100	Casing	301	Plunger	801	Proportional solenoid
101	Body	302	O-ring	802	Cap
102	O-ring	303	Backup ring	811	O-ring
201	Plug	304	Spring	812	Plug
202	O-ring	305	Spring	821	Plunger
203	O-ring	401	Poppet	822	Spring
204	Backup ring	402	Spring	823	O-ring
205	Filter	403	Spring	824	Plug
206	Filter stopper	501	Seat	901	Plate
207	C-ring	601	Piston	902	Parker rivet
208	Seat	700	Cartridge type electromagnetic proportional relief valve		

Operation Explanation

Operation of Check Valve

1. High pressure is selected at the A or B port and the C port by the operation of check valve A1 and check valve C1, and the pressure from the high pressure side is led upstream from the electromagnetic relief valve.
2. When negative pressure is generated at the A or B port, the operation of check valve A2 feeds the hydraulic oil from the T port to the A or B port.
3. When negative pressure is generated at the C port, the operation of check valve C2 feeds the hydraulic oil from the T port to the C port.

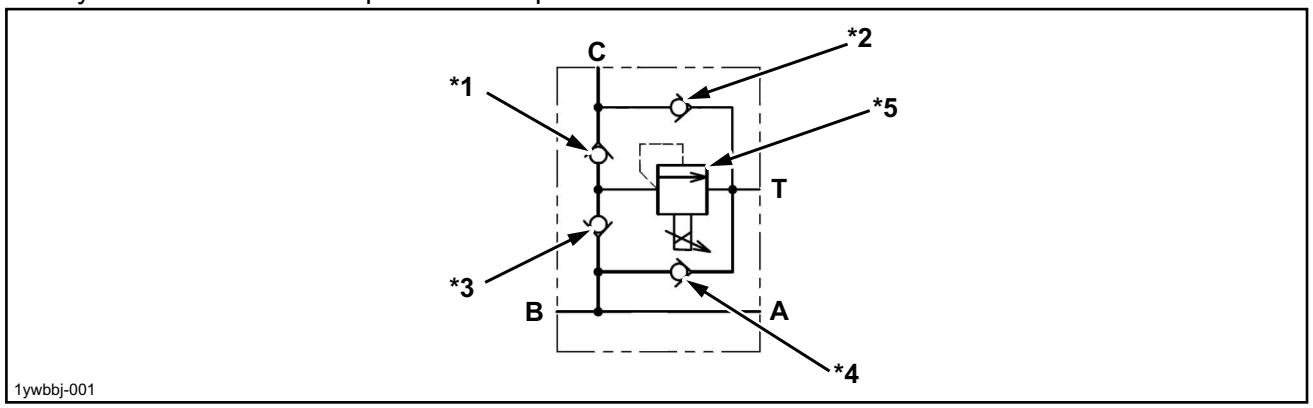
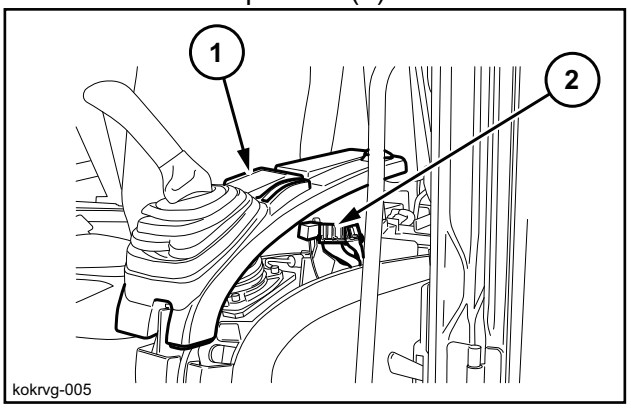


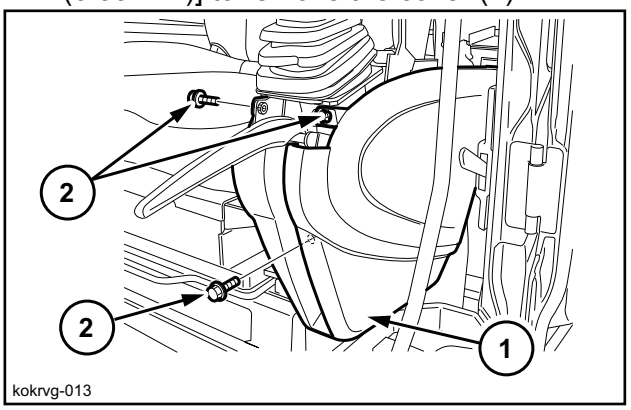
Diagram 6-1

*1	Check valve C1	*3	Check valve A1	*5	Electromagnetic relief valve
*2	Check valve C2	*4	Check valve A2		

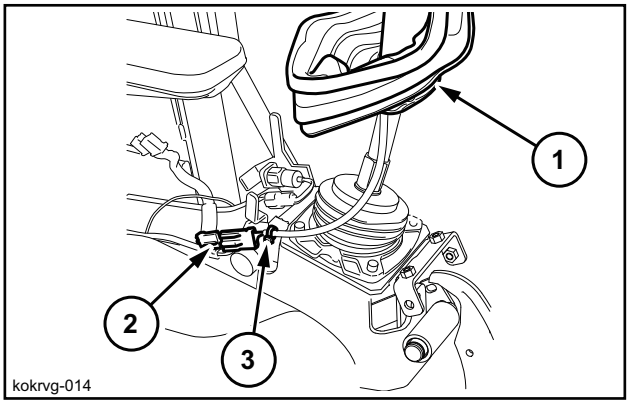
5. Disconnect the 3 connectors (2) to remove the console top cover (1).



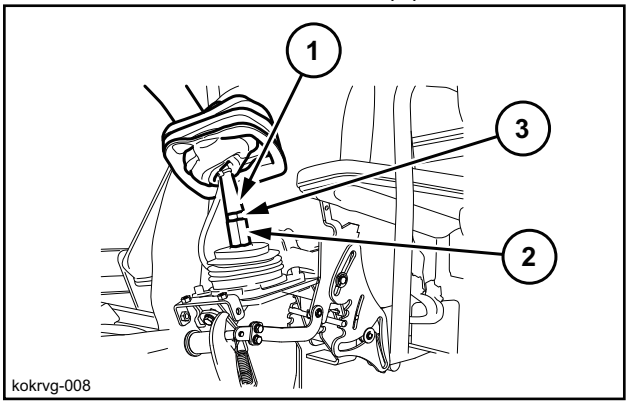
6. Remove the 5 bolts (2) with a Phillips screwdriver or a box wrench [10 mm (0.394 in.)] to remove the cover (1).



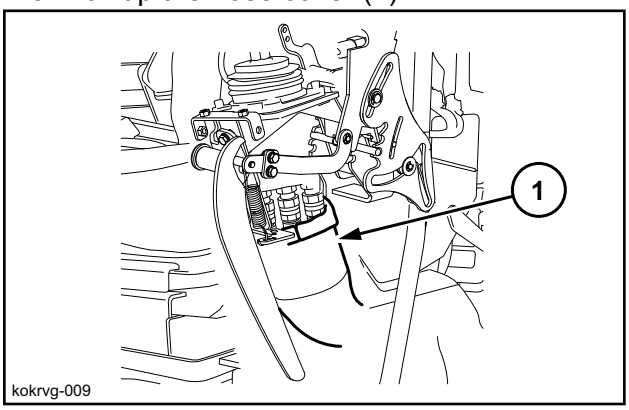
7. Roll up the boot (1) of the control lever, disconnect the horn switch connector (2), and cut the wire band (3).



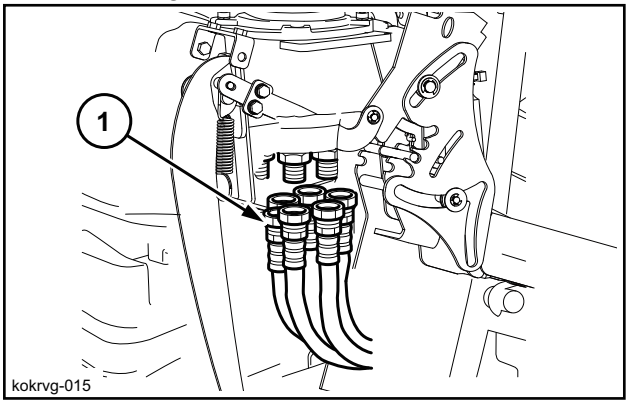
8. While securing the nut (2) with a wrench [22 mm (0.866 in.)], remove the lock nut (3) with a wrench [19 mm (0.748 in.)] to remove the control lever (1).

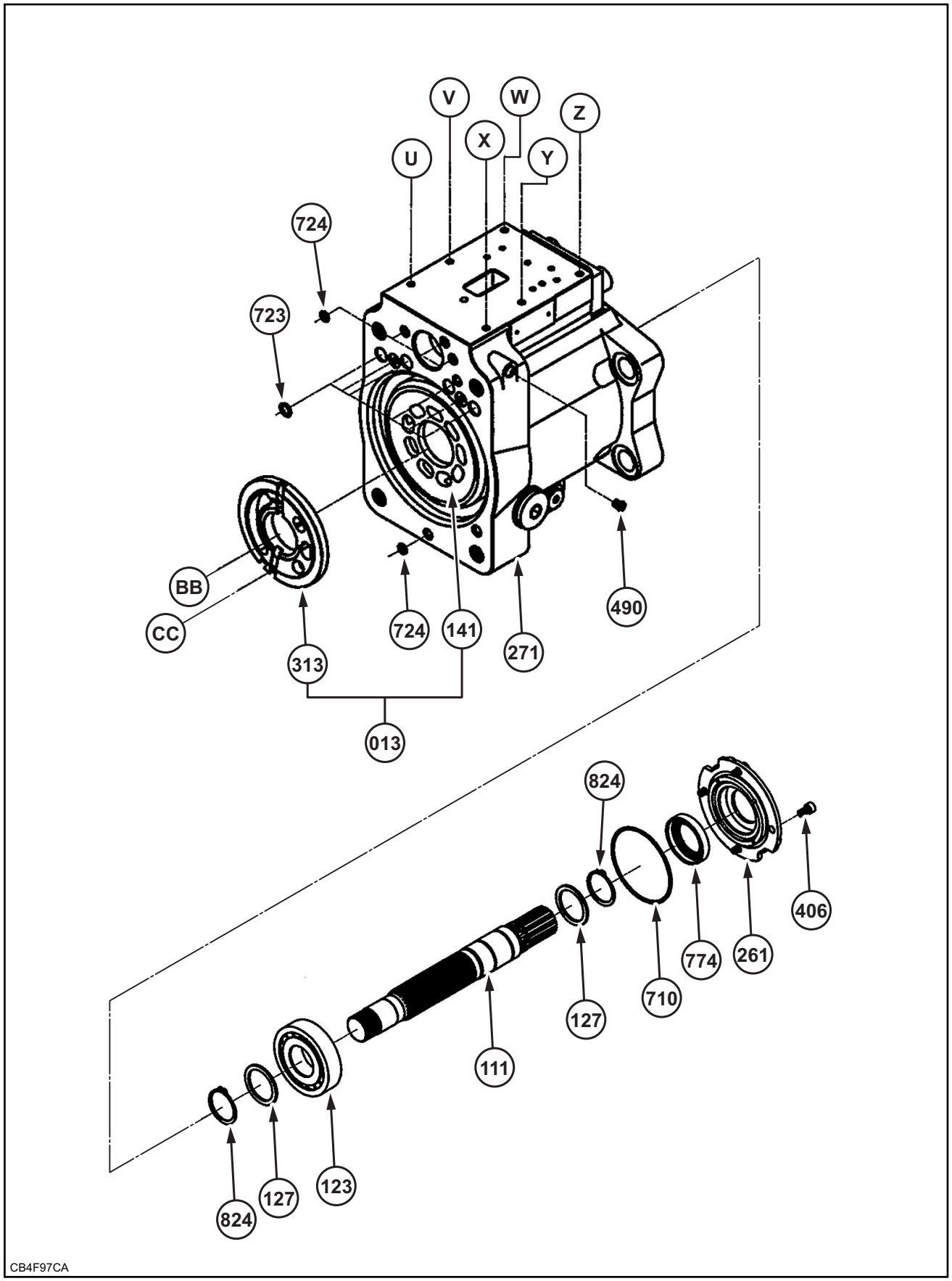


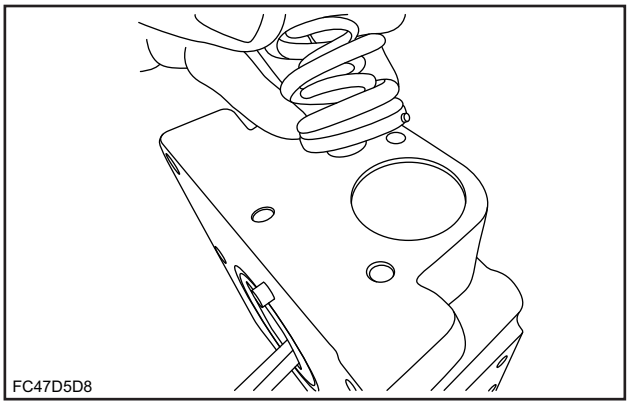
9. Roll up the hose cover (1).



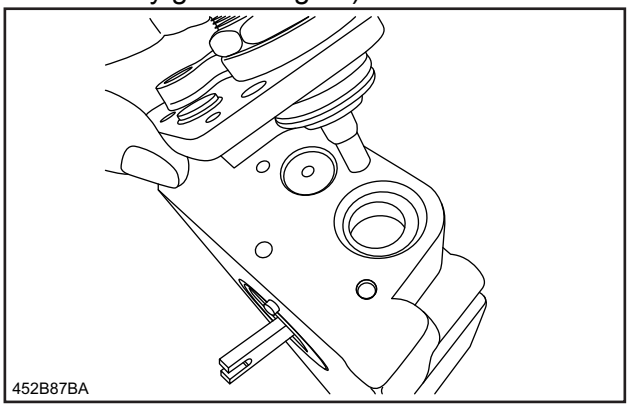
10. Remove the 6 hoses (1) with a wrench [19 mm (0.748 in.)].
    - Apply marking to the joystick remote control valve and the hoses so as to match connections at assembling.
    - Attach caps and plugs to the joystick remote control valve and the hoses to prevent the entry of water, dust, and dirt.
    - Wash each location of the joystick remote control valve and hoses by blowing parts cleaner so as to prevent adhering dirt at connections and not to damage them.

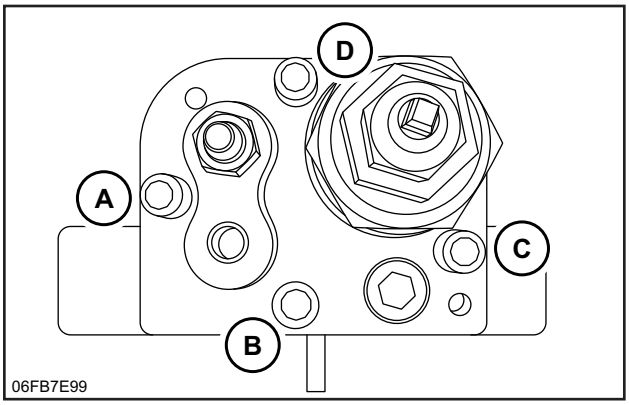



V
W
Z
X
Y
U
724
723
BB
CC
313
724
141
271
490
013
824
406
774
261
710
127
111
824
127
123
CB4F97CA

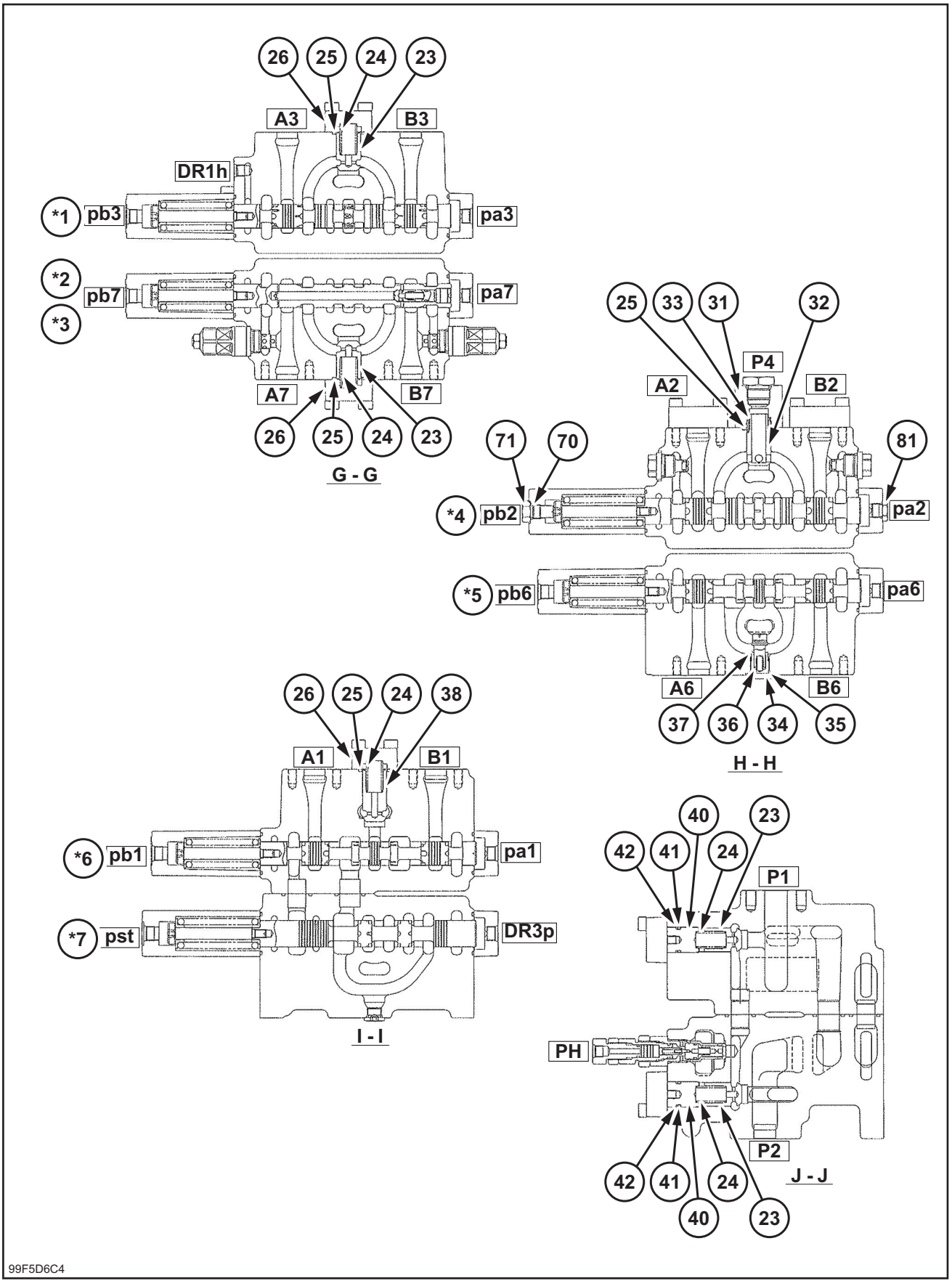


8. Insert the adjusting ring (Q) (645) and attach the cover (C)(629), of which the adjusting screw (C) (628), the adjusting ring (C) (627), the lock nut (630), the hexagonal nuts (801, 802), and the hexagon socket head retaining screw (924) are set.
   - When tightening the mounting bolt (436) of the cover (C) (629), tighten the C and D bolts alternately little by little first.
     After fully tightening the C and D bolts, tighten the A and B mounting bolts. (* The reaction force of the outer spring (625) is strong. Therefore, the cover (C) (629) may fall over, and the casing (601) and the adjusting screw (C) (628) may get damaged.)





9. Insert the spring (666) and the spool (665) to the valve casing (660). Then tighten the ROH plug (466).
   - The spool (665) has the specific insertion direction. Pay attention not to incorrectly insert the spool.
10. Attach the electromagnetic proportional pressure reducing valve (079) to the valve casing (660). Then, attach the valve casing (660) to the casing (601).
    Now, the regulator assembly completes.



*1	Swing	*4	Option	*7	Straight travel
*2	Open/close	*5	Travel		
*3	Bucket	*6	Travel		

Procedures for Assembly and Disassembly of Travel Remote Control Valve

Job code	**JCVC04**

⚠ Caution

- To ensure safe operations, wear protective devices before beginning work and follow all precautions.
- When removing devices or positioning devices at the time of installation, use a removal jig and a hammer or steel rod.
- Follow the precautions below when suspending the load.
- The liftcrane must be operated by a qualified operator.
- Do not stand or pass under the suspended load.
- Check the weight of the load to determine whether it can be carried by hand or whether a liftcrane must be used.
- Be sure to repair any parts damaged during disassembly, and prepare replacement parts in advance.
- If any parts are significantly rusted or dirty, clean them before disassembling.
- Any foreign matter entering the equipment during assembly can create a malfunction. Therefore, after thoroughly cleaning the equipment with cleaning oil, air blow the equipment, and assemble in a clean location.
- When assembling sliding parts, be sure to coat them with new hydraulic oil.
- As a rule, replace all O-rings and other seal parts with new parts.

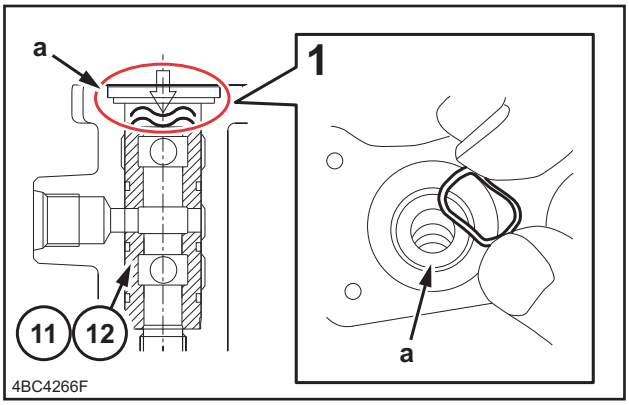
General cautions

- Be careful not to drop precision parts or let bump them with other parts during work.
- Do not forcefully open or hit parts in an effort to speed up operations. Pay careful attention and proceed slowly so as not to damage any parts, create any oil leaks, or compromise the efficiency of the equipment, etc.
- Disassembled parts can easily rust or collect dust. Therefore, immediately after disassembling parts, take precautions to prevent the parts from rusting or collecting dust.

Items to prepare

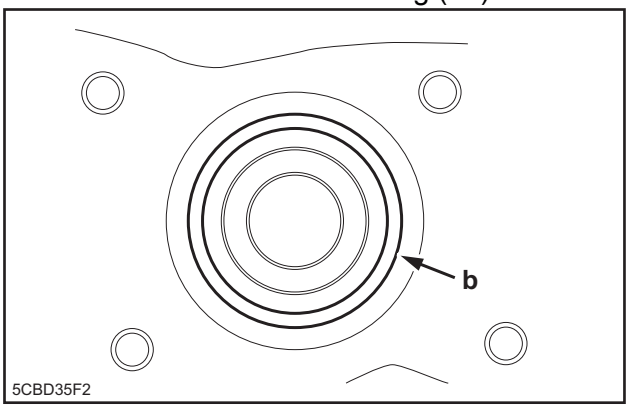
- Wrench
- Screwdriver
- Specialty jigs
- Vise
- Loctite 262
- Special fiber cloth (Kimwipe)
- White kerosene

Maintenance Procedures



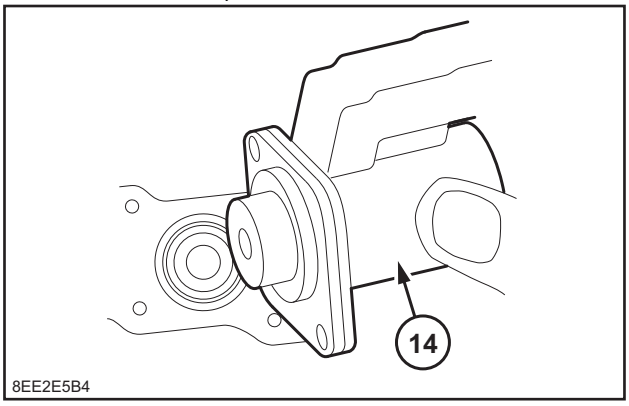
a	Assemble the wave washer to the inside of the groove.

2. Assemble the O-ring (30) to the groove of the body (1).
   - Do not reuse the O-ring (30).



b	Assemble the O-ring to the groove of the body (1).

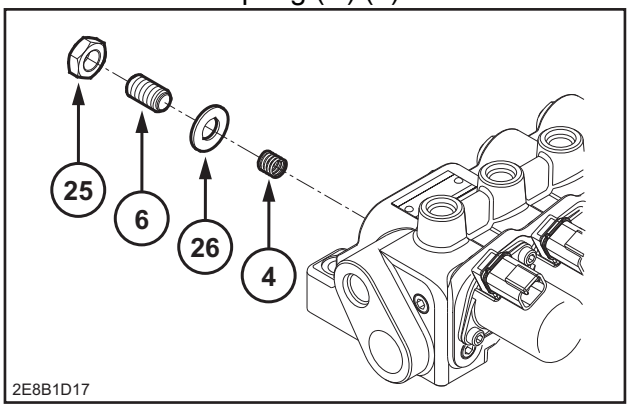
3. Assemble the proportional solenoid (14) to the body (1).
   Tighten the hexagon socket head bolts (15).
   Tightening torque: 5.0 - 6.2 N•m (3.69 - 4.57 lbf•ft.)

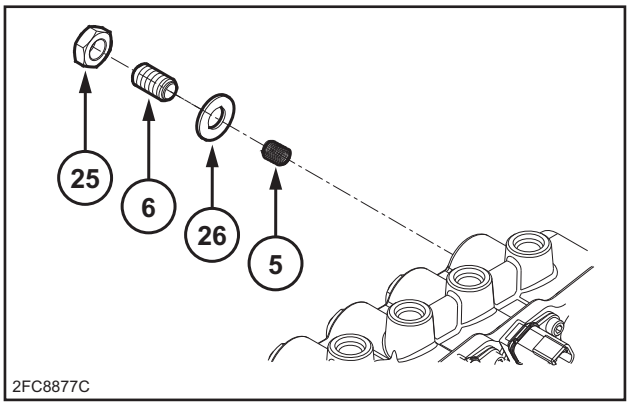


Replacement of Sleeve and Spool

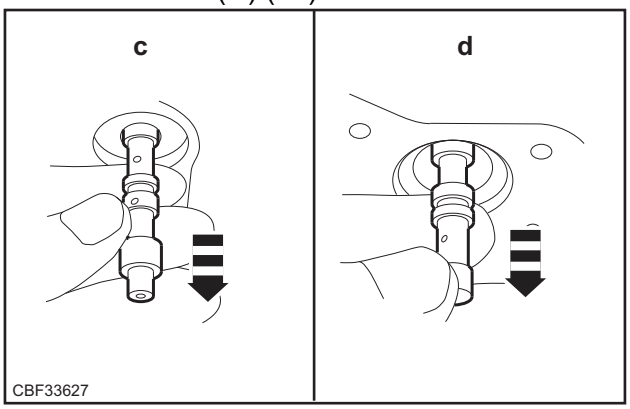
■Disassembly

1. Loosen the hexagon nut (25) to remove the adjusting screw (6) and the Daithread (26).
   Remove the spring.
   S1: Spring (O) (4)
   S2 to S6: Spring (C) (5)





2. Remove the spool.
   - For normally open (S1)
     Pull out the spool (O) (2) from a hole for the adjusting screw of the body (1).
   - For normally closed (S2 to S6)
     Pull out the spool (C) (3) from the sleeve (C) (12).



c	Normally open (S1)
d	Normally closed (S2 to S6)

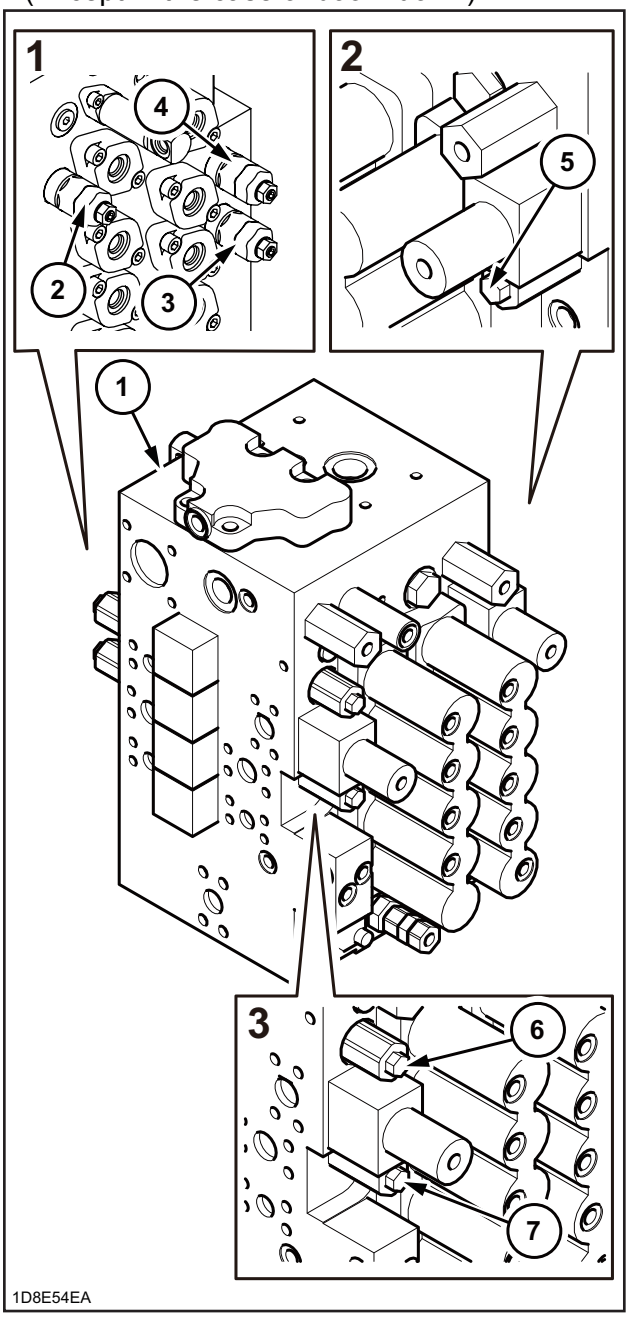
3. Remove the sleeve.
   Pull out the sleeve from the body (1) using a jig for removing sleeve.
   - Remove the sleeve (O), (C) in the same manner.
   - Pay attention not to damage the body during removing the sleeve.

4	Control valve
5	Wrench [19 mm (0.748 in.)]

■Overload Relief Pressure Adjustment

Engine speed	2000 min^{-1} (1900 rpm)
Work mode	SP mode
Oil temperature	45 (113.0) - 55 °C (131.0 °F)
Measuring port	P1/P2 port
Measurement pressure	Boom down: 29.4 MPa (4264.578 psi)
	Others: 39.2 MPa (5686.104 psi)
Measurement pressure (LF)	arm in: 21.1 MPa (3060.632 psi)
	boom down, Bucket close, Bucket open: 29.4 MPa (4264.578 psi)
	Others: 39.2 MPa (5686.104 psi)
Pressure per revolution of adjusting screw	21.2 MPa (3075.138 psi)/revolution

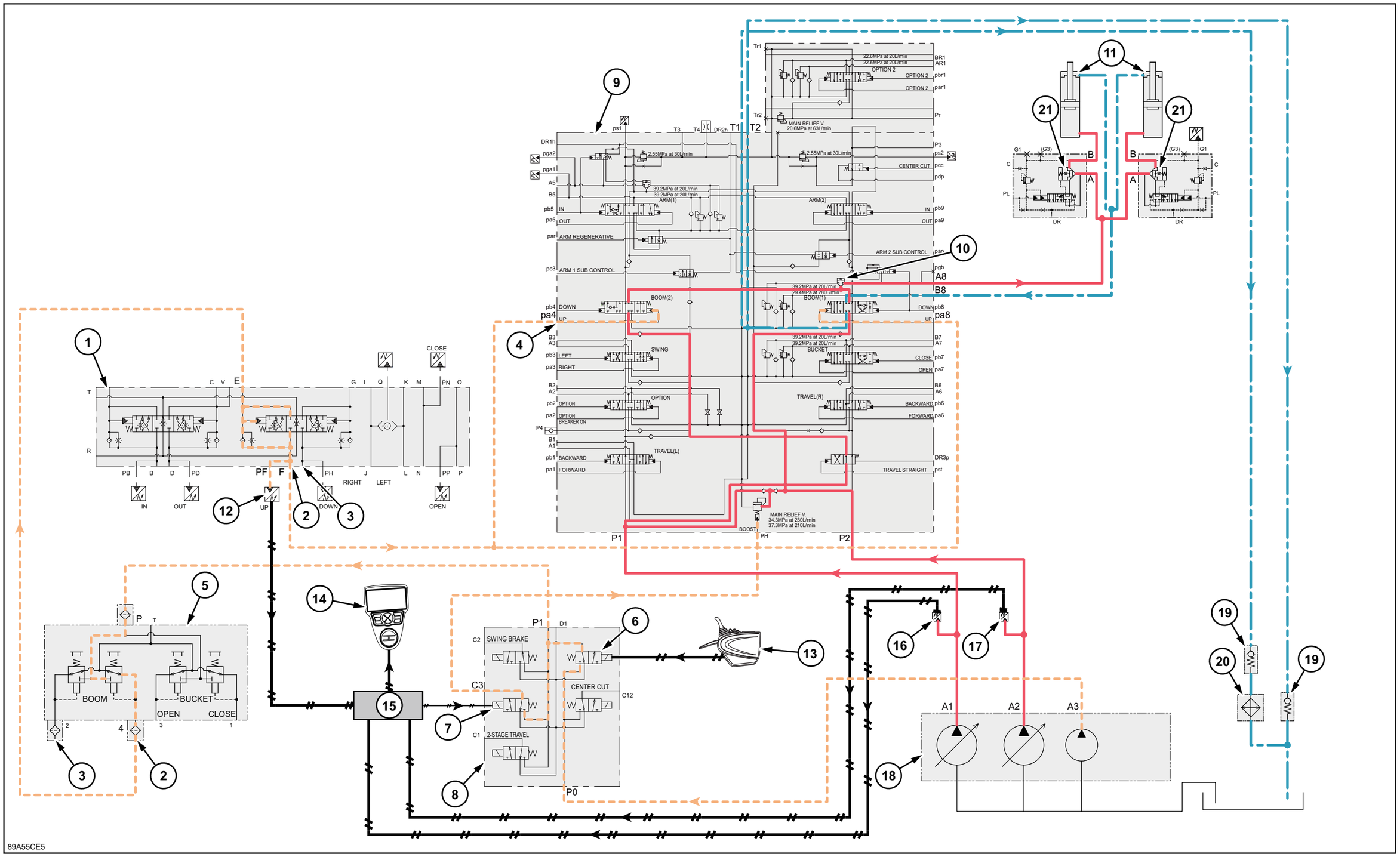
Since the overload relief pressure is set higher than the main relief pressure, the main relief pressure needs to tentatively be set highly than the overload relief pressure. (Except in the case of boom down)



1	Control valve
2	arm in
3	Bucket close
4	boom down
5	arm out
6	boom up
7	Bucket open

Boom Circuit

Boom-up Circuit (independent operation) (with HBCV)



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

1	Load holding valve spool	10	5 stack solenoid valve	19	P1 pressure sensor
2	Load holding valve check valve	11	Control valve	20	P2 pressure sensor
3	Oil cooler	12	Arm cylinder	21	Hydraulic pump
4	Arm (in)	13	Arm (1)	22	Check valve
5	Arm (out)	14	Arm (2)	23	Arm HBCV check valve
6	Cushion valve	15	Arm-in pilot pressure sensor	24	Arm HBCV
7	Remote control valve (arm, swing)	16	Console lever lock switch	25	6 stack proportional pressure reducing valve
8	Lever lock	17	Monitor display	26	Arm regeneration proportional valve
9	Boost pressure relief	18	Main computer		

When the remote control valve arm operation lever is in neutral, the oil at the arm cylinder rod side is sealed by the load holding valve check valve, reducing internal leakage from the main spool and reducing the natural drop of the arm.
By moving the remote control valve to the arm-in side, the pilot pressure oil is fed via the cushion valve to the control valve pb5 port and pb9 port and switches the arm (1) and (2) spools to the in side.
The discharge oil from hydraulic pump A1 enters the control valve P1 port and is fed from the center bypass oil path to the arm (1) spool. The discharge oil from hydraulic pump A2 enters the control valve P2 port and is fed from the center bypass oil path to the arm (2) spool.
The oil flows from the arm (2) spool through the arm oil merging path and merges downstream of the arm (1) spool.
Switching the arm spool lets the oil flow into the arm cylinder bottom side and the arm-in operation is carried out.
The pilot pressure oil from the Pb5 port separated in the internal path flows into the HBCV PL port and switches the spool. This opens the HBCV check valve.
The pilot pressure oil from the Pb5 port separated in the internal path is fed to the load holding valve spool and moves the spool to the right. In this way, the load holding valve check valve spring chamber oil is connected to the tank line through the load holding valve spool, the spring chamber pressure drops, and the load holding valve check valve is opened.
The arm cylinder rod side pressure oil goes through the HBCV check valve, load holding valve check valve, and the arm (1) spool and returns to the hydraulic tank.

Removal and Installation of Cab Assembly

Job code	**NRZZ02**

Caution

- Be sure to stop the engine before beginning work.
- Be sure to inspect the wire rope and other lifting equipment before beginning work.
- Do not let anyone go under a suspended load.

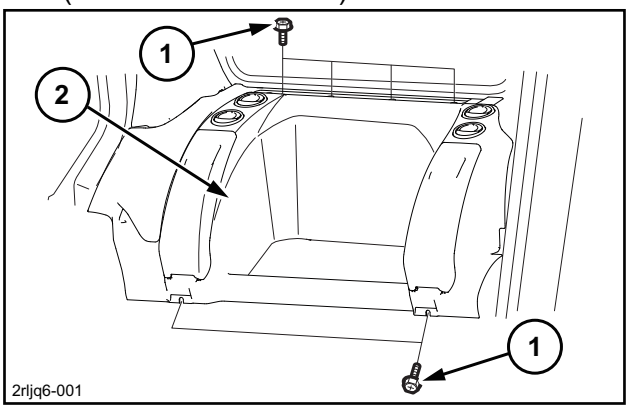
Items to prepare

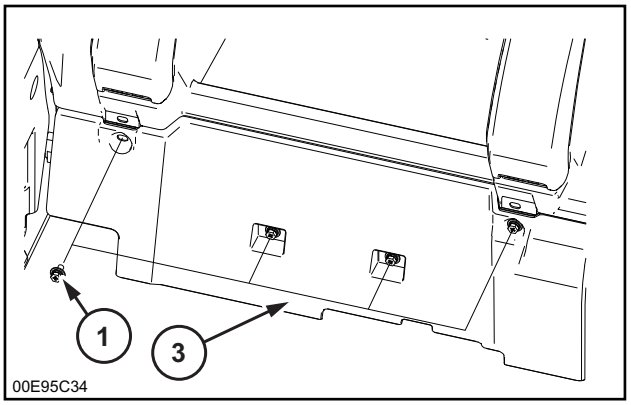
- Wrenches [10 mm (0.394 in.), 12 mm (0.472 in.), 13 mm (0.512 in.), 19 mm (0.748 in.), 24 mm (0.945 in.), (41 mm (1.614 in.)]
- Box wrenches [10 mm (0.394 in.), 13 mm (0.512 in.), 19 mm (0.748 in.)]
- Longnose pliers
- Flathead screwdriver
- Phillips screwdriver
- Eyebolts (M24 × 4)
- Chains (wire ropes) (with the required breaking load)
- Liftcrane (with the required lifting capacity)
- Lubricating oil
- Rag
- Cleaning fluid
- Wood planks, etc.

Removal of Cab Assembly

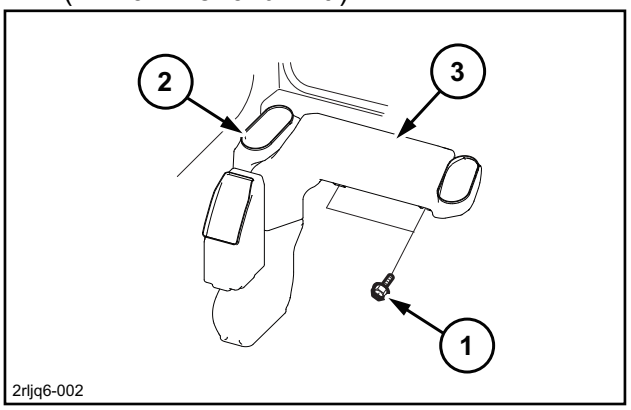
- Remove the operator's seat. (Refer to the "Removal and Installation of Operator's Seat" for detail.)

1. Remove the 10 bolts (1) with a box wrench [13 mm (0.512 in.)] to remove the trim rear assembly (2) and the rear lower trim (3).
   Bolt (1) tightening torque: 5.9 - 7.8 N・m (4.353 - 5.753 lbf・ft.)

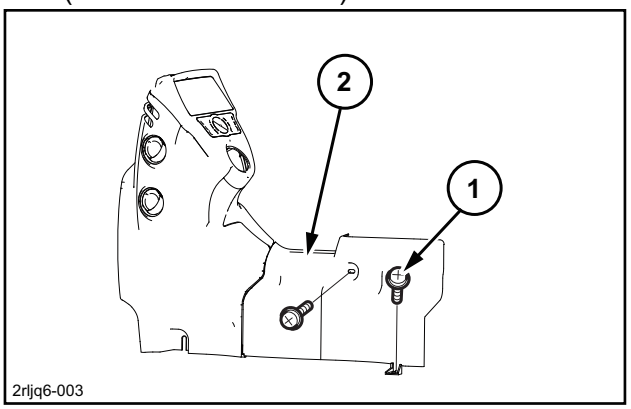




2. Remove the 3 bolts (1) with a box wrench [10 mm (0.394 in.)] to remove the air conditioner ducts (2) (3) in left and right.
   Bolt (1) tightening torque: 2.9 - 3.9 N・m (2.140 - 2.876 lbf・ft.)



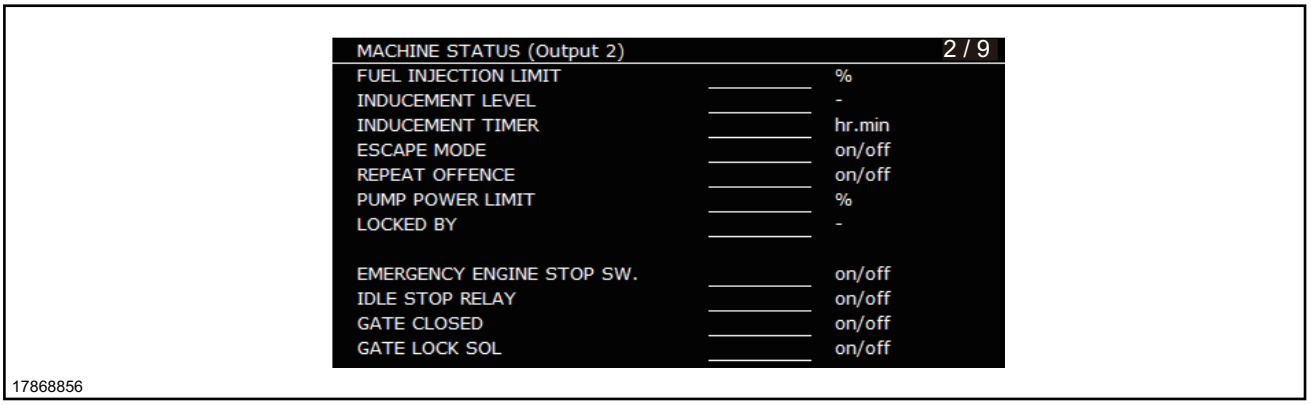
3. Remove the 2 bolts (1) with a Phillips screwdriver or a box wrench [10 mm (0.394 in.)] to remove the side front lower trim (2).
   Bolt (1) tightening torque: 5.9 - 7.8 N・m (4.353 - 5.753 lbf・ft.)



* Override (forced drive) that commands the devices directly from the monitor by taking control authority from the controller is not activated during battery save.

Display	Explanation	Unit	Minimum	Maximum
HYD.OIL TEMP	Temperature sensor; hydraulic oil	°C (°F)	-40	210 (410)
COOLANT TEMP	Coolant temperature	°C (°F)	-40	210 (410)
POWER BOOST SOL	Pressure boost solenoid	on/off	----	++++

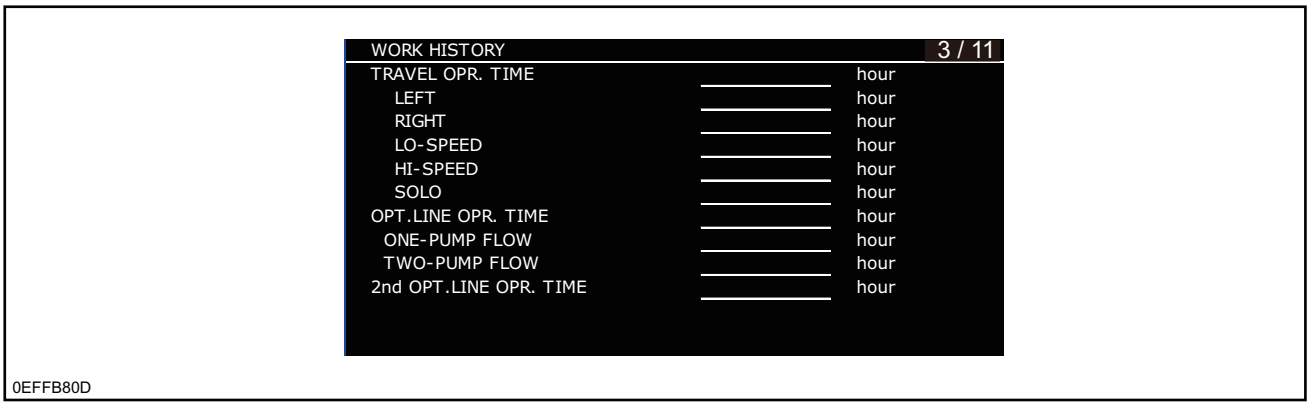
2/9



Display	Explanation	Unit	Minimum	Maximum
FUEL INJECTION LIMIT	Fuel injection quantity restriction level	%	0	100
INDUCEMENT LEVEL	Inducement level 0: Normal 1: Warning 2: Early Inducement 3: Severve Inducement 4: Final Inducement	-	0	4
INDUCEMENT TIMER	Inducement timer	hr.min	0	250.59
ESCAPE MODE	Escape mode "++++": ON "----": OFF	on/off	----	++++
REPEAT OFFENCE	Repeat offense "++++": ON "----": OFF	on/off	----	++++
PUMP POWER LIMIT	Pump output limit	%	0	100
LOCKED BY	-	-	-	-
EMERGENCY ENGINE STOP SWITCH	Engine emergency stop SW	on/off	----	++++
IDLE STOP RELAY	Idling stop REL	on/off	----	++++
GATE CLOSED	Gate open/close SW	on/off	----	++++
GATE LOCK SOL	Gate Lock SOL	on/off	----	++++

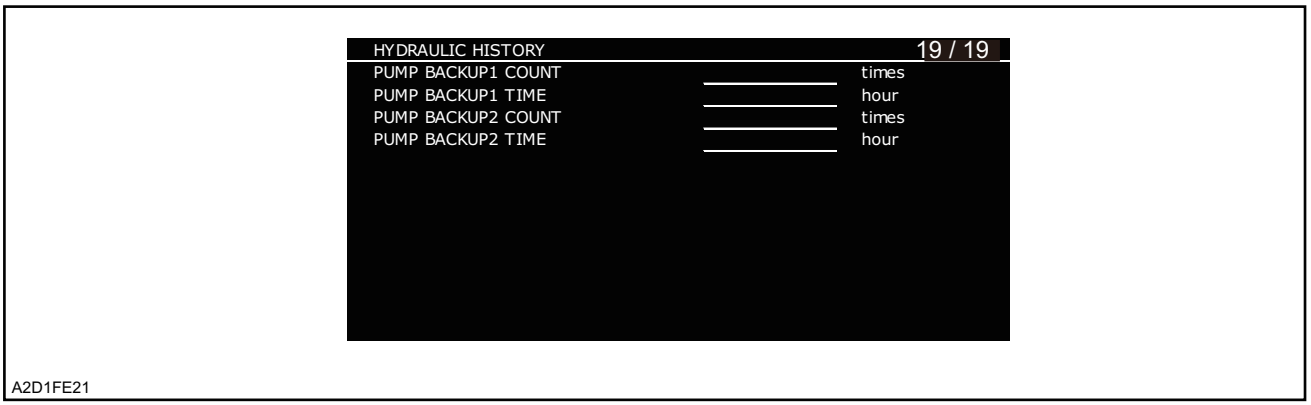
Display	Explanation	Unit	Judgment condition	Judgment start condition
CLOSE	Bucket-close operation time	hour	Bucket-close operation judgment = ON	Engine in operation
UPPER OPR. TIME	Upper operation time	hour	Upper operation judgment = ON	Engine in operation
SWING OPR. TIME	Swing operation time	hour	Swing operation judgment = ON	Engine in operation

3/11



Display	Explanation	Unit	Judgment condition	Judgment start condition
TRAVEL OPR. TIME	Travel operation time (both right and left)	hour	Travel operation judgment = ON	Engine in operation
LEFT	Left travel operation time	hour	Left travel operation judgment = ON	Engine in operation
RIGHT	Right travel operation time	hour	Right travel operation judgment = ON	Engine in operation
LO-SPEED	1st speed travel time	hour	(Travel operation judgment = ON) + (2nd speed travel SOL = OFF)	Engine in operation
HI-SPEED	2nd speed travel time	hour	(Travel operation judgment = ON) + (2nd speed travel SOL = ON)	Engine in operation
SOLO	Independent travel time	hour	(Travel judgment = ON) + (Upper judgment = OFF)	Engine in operation
OPT.LINE OPR. TIME	1st (both with and without 2 pumps flow) option operation time	hour	1st option operation judgment = ON	Engine in operation
ONE-PUMP FLOW	1st option operation (without 2 pumps flow) time	hour	(1st option operation judgment = ON) + (2 pumps flow SOL = OFF)	Engine in operation
TWO-PUMP FLOW	1st option operation (with 2 pumps flow) time	hour	(1st option operation judgment = ON) + (2 pumps flow SOL = ON)	Engine in operation
2nd OPT.LINE OPR. TIME	2nd option operation time	hour	2nd option operation judgment = ON	Engine in operation

19/19



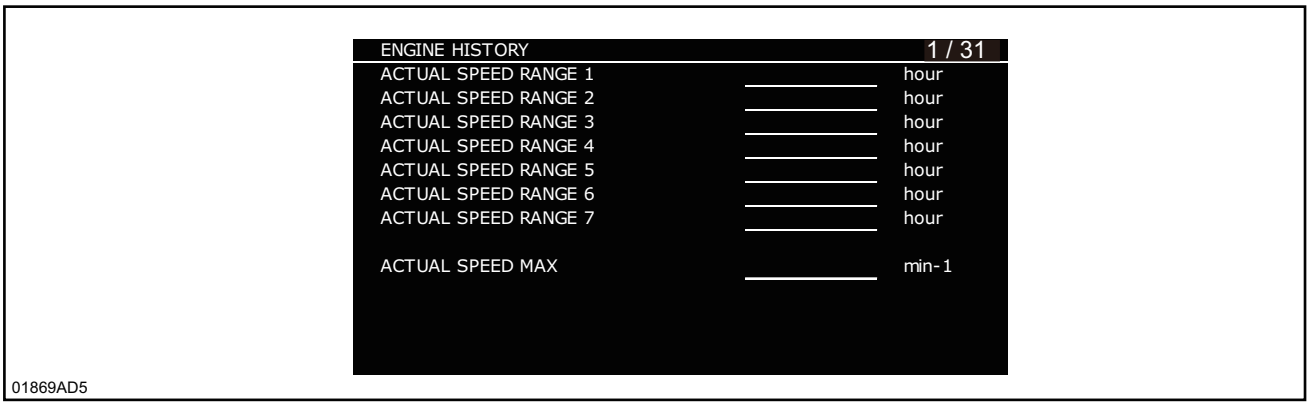
Display	Explanation	Unit	Judgment condition	Judgment start condition
PUMP BACKUP1 COUNT	Pump backup 1; occurrence count	times	Pump backup 1 OFF → ON	Engine in operation
PUMP BACKUP1 TIME	Pump backup 1; occurrence time	hour	Pump backup 1 = ON	Engine in operation
PUMP BACKUP2 COUNT	Pump backup 2; occurrence count	times	Pump backup 2 OFF → ON	Engine in operation
PUMP BACKUP2 TIME	Pump backup 2; occurrence time	hour	Pump backup 2 = ON	Engine in operation

To switch to a page from 1 to 19, press the light switch while the HYDRAULIC HISTORY screen is displayed, and select the desired page.

ENGINE HISTORY

The engine speed, coolant temperature, fuel temperature, intake air temperature distribution, etc. can be displayed.

1/31



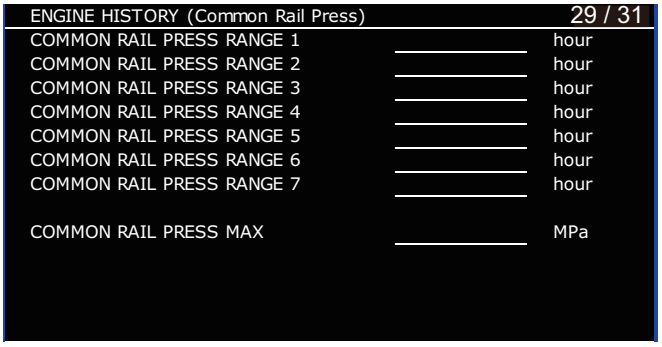
Display	Explanation	Unit	Judgment condition	Judgment start condition
ACTUAL SPEED RANGE 1	Actual speed; time distribution	hour	Less than 1025 rpm	Engine in operation
ACTUAL SPEED RANGE 2	Actual speed; time distribution	hour	Less than 1225 rpm	Engine in operation
ACTUAL SPEED RANGE 3	Actual speed; time distribution	hour	Less than 1425 rpm	Engine in operation
ACTUAL SPEED RANGE 4	Actual speed; time distribution	hour	Less than 1625 rpm	Engine in operation
ACTUAL SPEED RANGE 5	Actual speed; time distribution	hour	Less than 1825 rpm	Engine in operation

28/31

E4B88724

Display	Explanation	Unit	Judgment condition	Judgment start condition
DEF/AdBLUE PRESS RANGE 1	Urea solution pressure; time distribution	hour	Less than 200 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 2	Urea solution pressure; time distribution	hour	Less than 400 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 3	Urea solution pressure; time distribution	hour	Less than 600 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 4	Urea solution pressure; time distribution	hour	Less than 800 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 5	Urea solution pressure; time distribution	hour	Less than 1000 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 6	Urea solution pressure; time distribution	hour	Less than 1200 kPa	In 10 sec. after the engine starts
DEF/AdBLUE PRESS RANGE 7	Urea solution pressure; time distribution	hour	1200 kPa or more	In 10 sec. after the engine starts
DEF/AdBLUE PRESS MAX	Maximum value of urea solution pressure	kPa (psi)	-	In 10 sec. after the engine starts
DEF/AdBLUE PRESS MIN	Minimum value of urea solution pressure	kPa (psi)	-	In 10 sec. after the engine starts

29/31

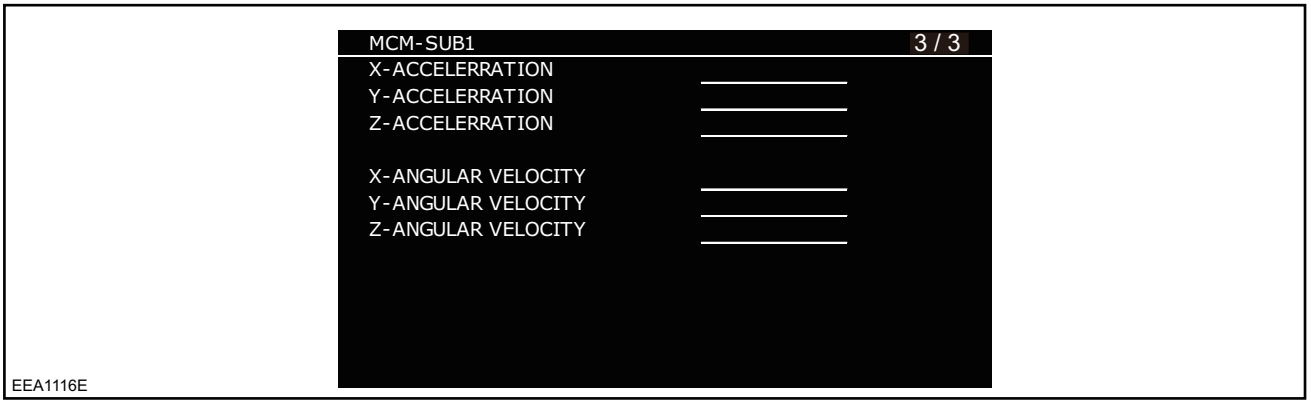


EDE56814

Display	Explanation	Unit	Judgment condition	Judgment start condition
COMMON RAIL PRESS RANGE 1	Common rail pressure; time distribution	hour	Less than 40 MPa	In 10 sec. after the engine starts
COMMON RAIL PRESS RANGE 2	Common rail pressure; time distribution	hour	Less than 80 MPa	In 10 sec. after the engine starts

Display	Explanation	Unit
PWM OUT 2 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 3 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 4 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 5 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 6 TARGET	PWM target current	mA
ACTUAL	Actual current	mA

3/3

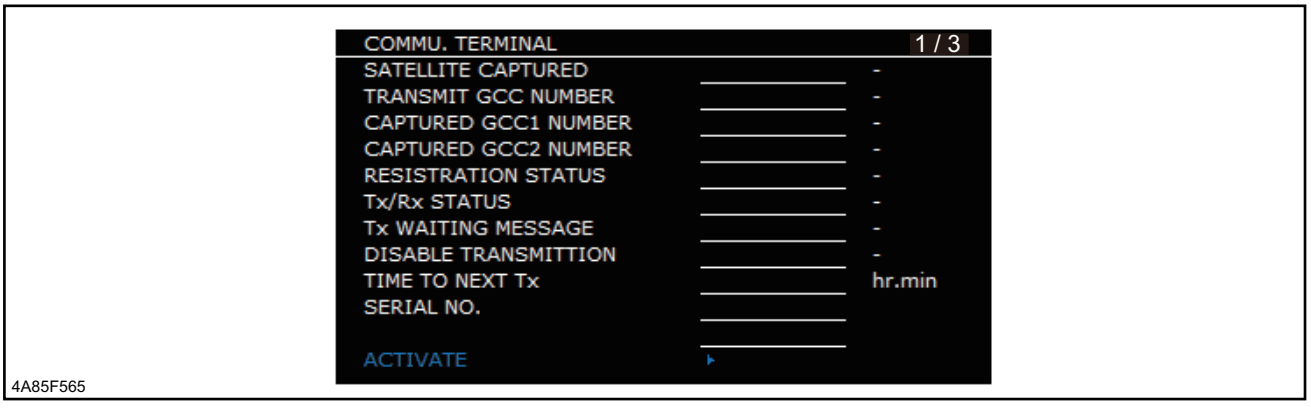


Display	Explanation	Unit
X-ACCELERRATION	Acceleration	
Y-ACCELERRATION	Acceleration	
Z-ACCELERRATION	Acceleration	
X-ANGULAR VELOCITY	Angular acceleration	
Y-ANGULAR VELOCITY	Angular acceleration	
Z-ANGULAR VELOCITY	Angular acceleration	

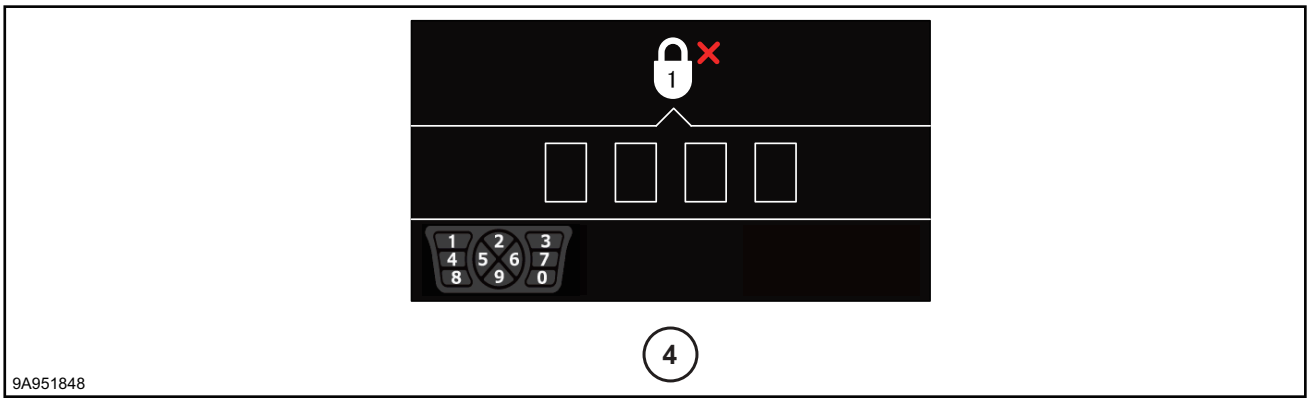
To switch to a page from 1 to 3, press the light switch  while the MCM-SUB screen is displayed, and select the desired page.

■COMMU. TERMINAL

1/3



・ To delete it

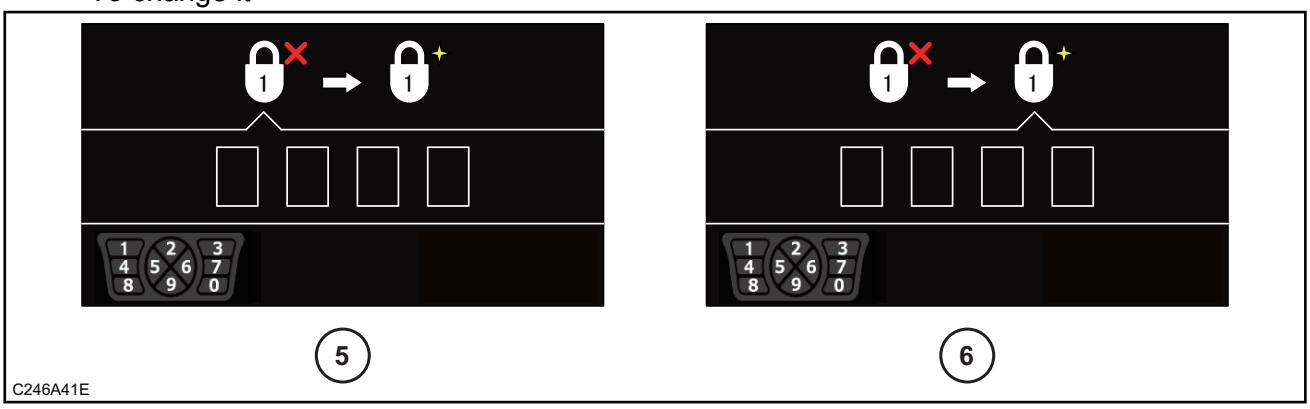


9A951848

4	Deletion screen

a. Enter the password management screen (1).
b. Choose the desired item for password setup.
c. Choose "TURN PASSWORD OFF."
d. Enter the registered password. (Enter it on the deletion screen (4).)
e. On completion of the process, the password management screen (1) will be redisplayed.
・ When a wrong password is entered, the previous screen will be redisplayed without deleting the password.

・ To change it

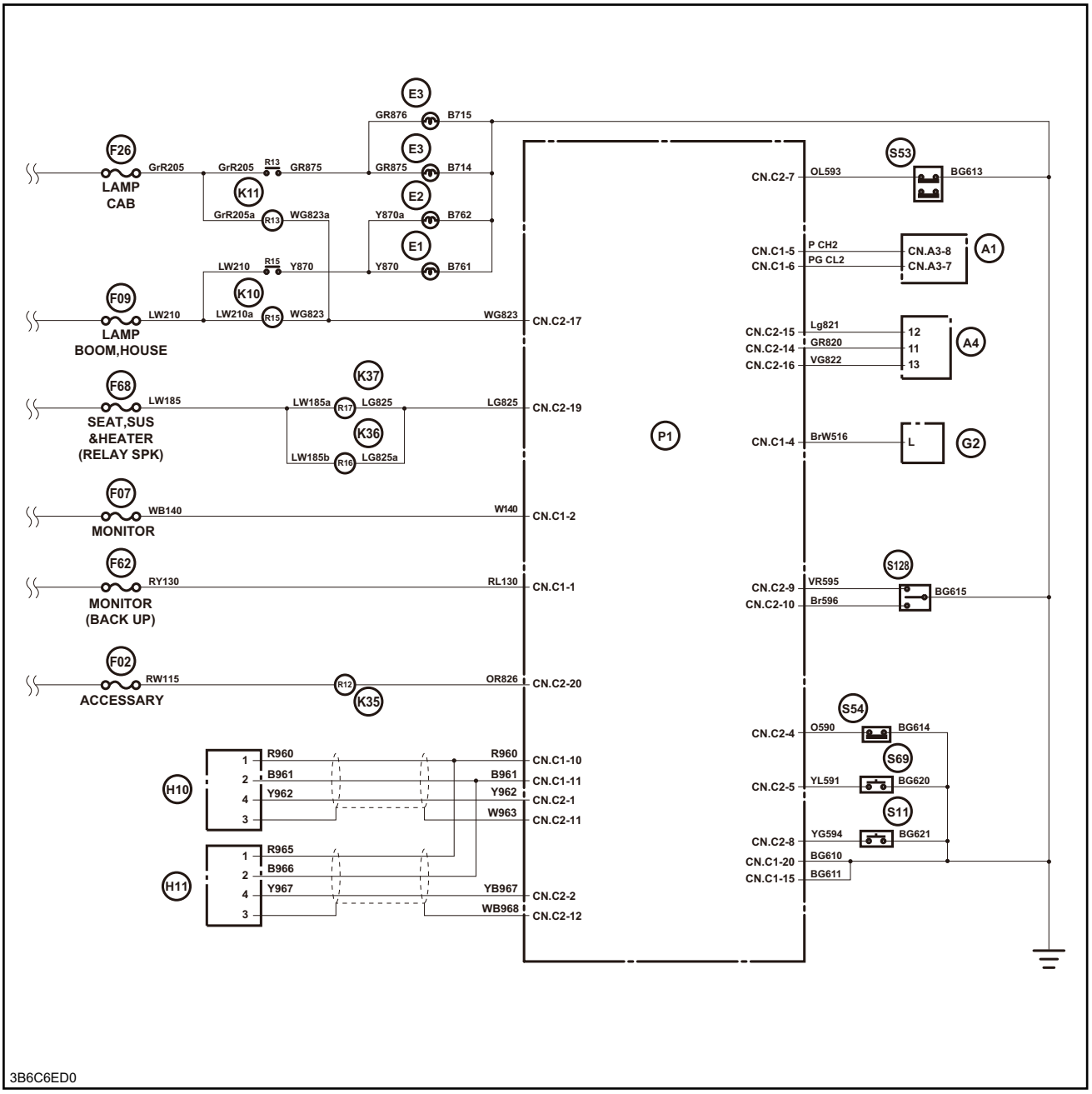


C246A41E

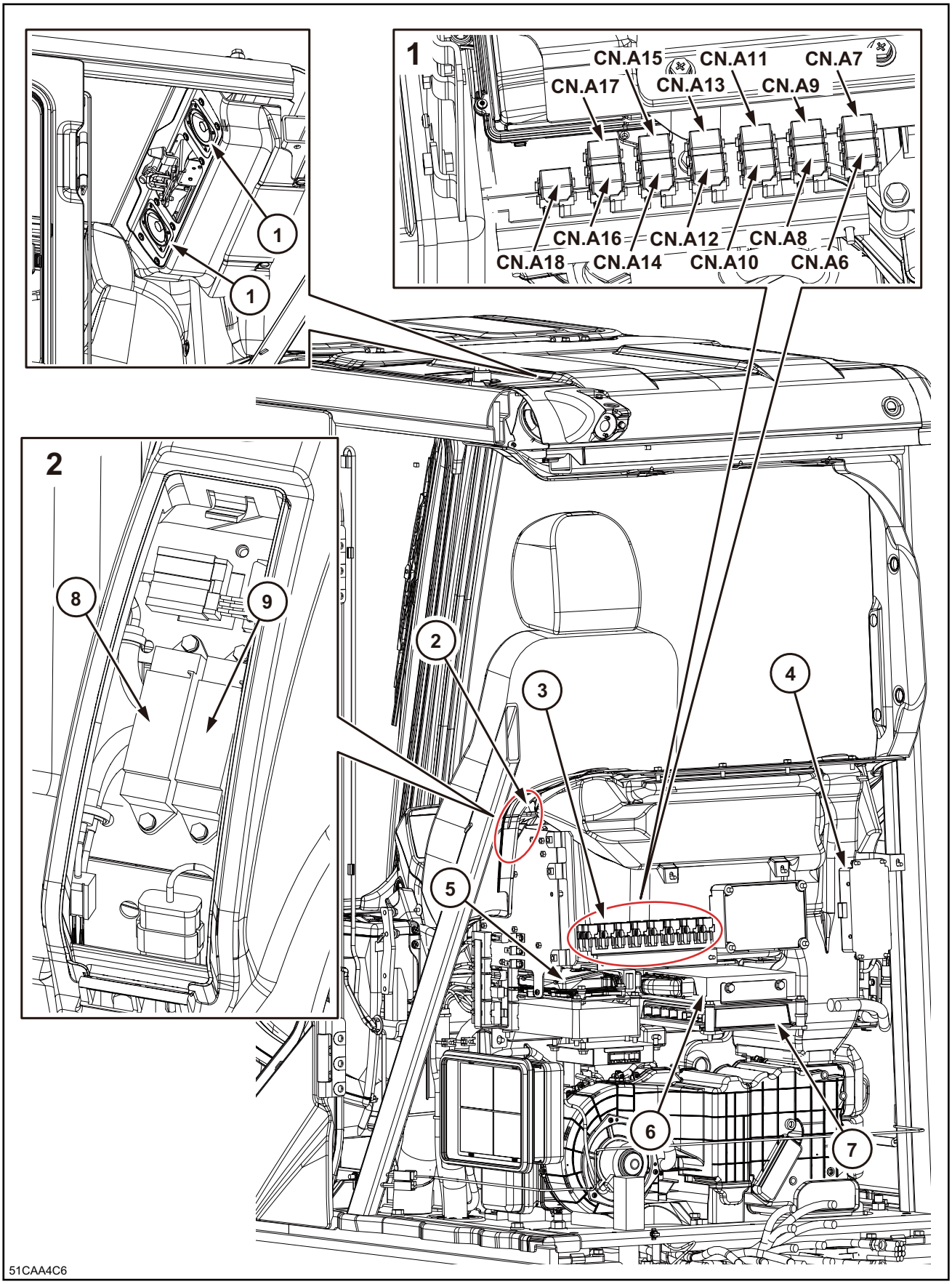
5	Change screen (from old to new)
6	Change screen (new)

a. Enter the password management screen (1).
b. Choose the desired item for password setup.
c. Choose "CHANGE PASSWORD."
d. Enter the registered password. (Enter it on the change screen (5).)
e. Enter the new password to register. (Enter it on the change screen (6).)
f. On completion of the process, the password management screen (1) will be redisplayed.

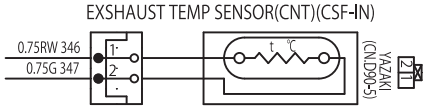
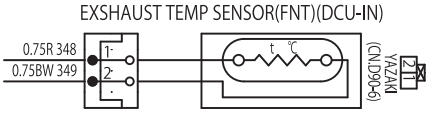
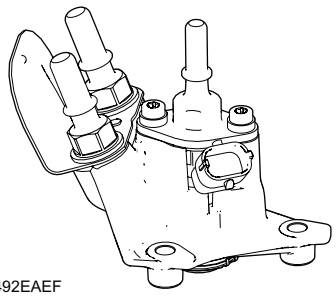
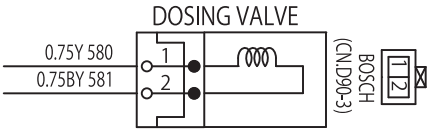
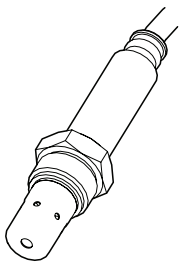
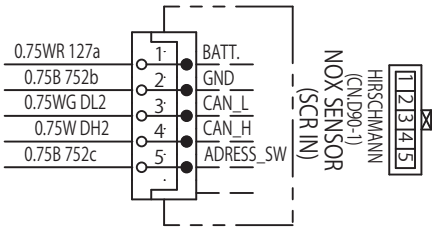
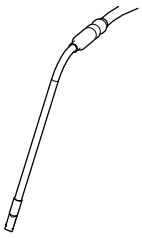
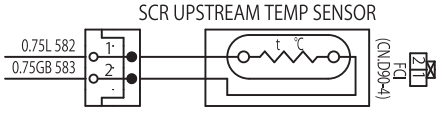
Monitor


E3
GR876
B715
F26
GrR205
GrR205
R13
GR875
GR875
B714
LAMP
CAB
K11
E2
GrR205a
R13
WG823a
Y870a
B762
E1
LW210
R15
Y870
Y870
B761
K10
F09
LW210
LW210a
R15
WG823
WG823
CN.C2-17
LAMP
BOOM,HOUSE
K37
F68
LW185
LW185a
R17
LG825
LG825
CN.C2-19
SEAT,SUS
&HEATER
(RELAY SPK)
K36
LW185b
R16
LG825a
F07
WB140
W140
CN.C1-2
MONITOR
F62
RY130
RL130
CN.C1-1
MONITOR
(BACK UP)
F02
RW115
R12
OR826
CN.C2-20
ACCESSARY
K35
H10
1
2
4
3
R960
B961
Y962
R960
B961
Y962
W963
CN.C1-10
CN.C1-11
CN.C2-1
CN.C2-11
H11
1
2
4
3
R965
B966
Y967
YB967
WB968
CN.C2-2
CN.C2-12
P1
CN.C2-7
OL593
S53
BG613
CN.C1-5
CN.C1-6
P CH2
PG CL2
CN.A3-8
CN.A3-7
A1
CN.C2-15
CN.C2-14
CN.C2-16
Lg821
GR820
VG822
12
11
13
A4
CN.C1-4
BrW516
L
G2
CN.C2-9
CN.C2-10
VR595
Br596
S128
BG615
CN.C2-4
O590
S54
BG614
CN.C2-5
YL591
S69
BG620
CN.C2-8
YG594
S11
BG621
CN.C1-20
CN.C1-15
BG610
BG611
3B6C6ED0

Cab Layout Diagram 2



51CAA4C6

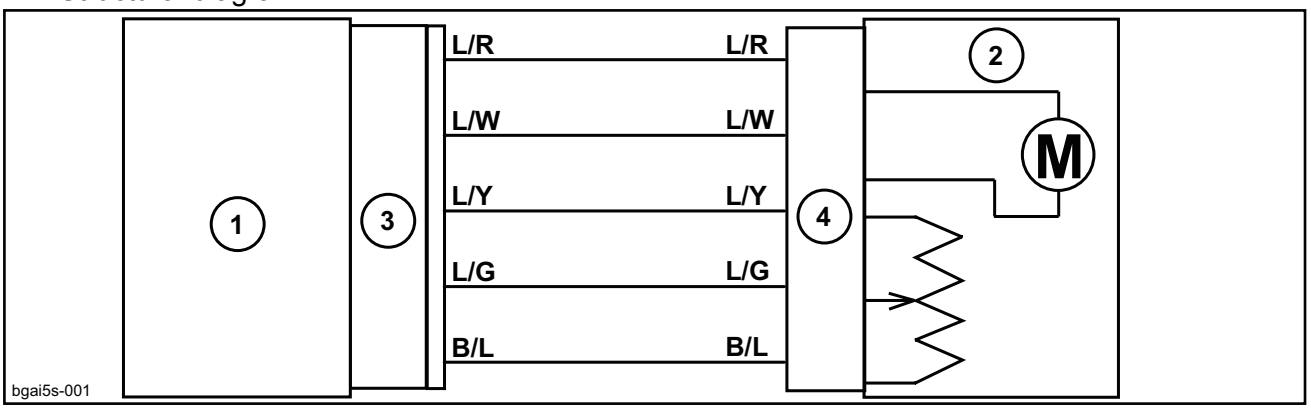
Name	Shape	Circuit	Remarks
DOC temperature sensor (Isuzu) (center)	 akffwc-162	 B4C94495	Isuzu Part No.: 898186-7621 Sumitomo Part No.: KHH15090
DOC temperature sensor (Isuzu) (front)	 akffwc-162	 BA40E3AA	Isuzu Part No.: 898178-3581 Sumitomo Part No.: KHH15080
Dosing module	 3492EAEF	 C2E24242	Sumitomo Part No.: KHH15351
Nox sensor (in, out)	 3A607C70	 C7666ADE	Sumitomo Part No.: KHH17610
SCR temperature sensor	 3CBDAC18	 CAF945E1	Sumitomo Part No.: KHH15320

Code	Part name	Q'ty	Code	Part name	Q'ty	Code	Part name	Q'ty
1	Solar radiation sensor	1	8	Duct; H and C box	1	15	Duct; Intake-B (Fresh)	1
2	Duct; Face-A	1	9	Bracket; Box	1	16	Unit; Air conditioner	1
3	Duct; Def-A	1	10	Box; Hot and cool	1	17	Duct; Foot	1
4	Grille; Air vent	7	11	Duct; Vent (Left)	1	18	Duct; Def-B	
5	Duct; Face-B	1	12	Duct; Vent (Right)	1	19	Control panel (AC)	1
6	Duct; Def-C	1	13	Air filter (Fresh)	1	20	Drain hose	2
7	Duct; Face-C	1	14	Duct; Intake-A (Fresh)	1	21	Flange plate	1

a	Monitor display	e	Heater hose (Eng.Out)	i	Should be connected with the console harness.
b	Trim side; Front (Right)	f	Cooler hose (Suction)	j	Wire harness (Console)
c	Trim side; Front (Left)	g	Cooler hose (Liquid)	k	Floor
d	Heater hose (Eng.Return)	h	Cover; Top (Console left)		

Refresh/Recirculate Switch Motor Actuator Inspection

· Structural diagram



Inside/outside air mix damper operation defect
↓
See the chart.
↓
Specifying the trouble location

1	Control panel	3	Connector 1
2	Refresh/recirculate motor actuator	4	Connector 11

· Chart

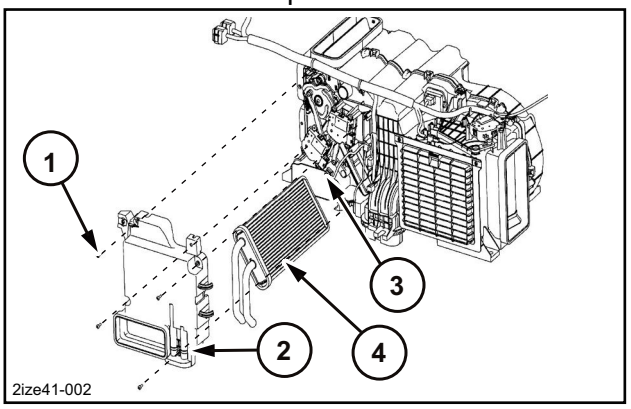
Step	Action	Standard value	Yes	No
1	Press the refresh/recirculate switch. Does the actuator operate at all?		Go to Step 2	Go to Step 3
2	Is an error displayed?		Go to Step 5	Damper lock or link defect
3	Is an error displayed?		Go to Step 4	Control panel defect
4	Is there continuity in harness between the actuator and control panel?		Actuator defect or damper lock or link defect	Harness defect
5	Remove the actuator connector (11). Is the resistance between L/Y and B/L of the actuator about 4.7 KΩ?	About 4.7 KΩ	Go to Step 6	Actuator defect
6	Is there continuity between the L/G and L/Y and between L/G and B/L of the actuator?		Control panel defect	Actuator defect

Removal of Heater Core

Caution

Remove while being careful not to apply excessive force to the pipe.

1. Drain the coolant.
   - Remove the 4 Phillips screws (1) and remove the link cover (2).
     Screw size
   - Remove the mode actuator connector (3), and remove the heater core (4).
   - The installation procedure is the reverse of the removal procedure.

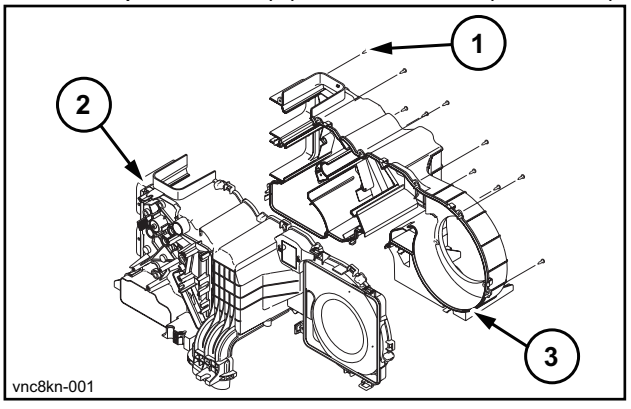


Removal of Heat Case Right/Left

Caution

At this time, perform work with the heater core removed from the heater case.
The evaporator sensor cord is sandwiched in the groove of the HVAC unit, so carefully check it and remove it while making sure not to damage it.

1. Remove the 10 Phillips screws (1) and remove the right heater case (2) and left heater case (3).
   Screw size
   Phillips screws (1): M4 x 16 mm (0.630 in.)

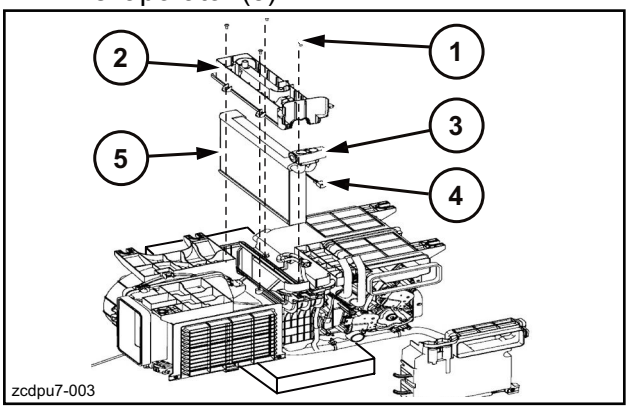


Replacement of Evaporator and Expansion Valve

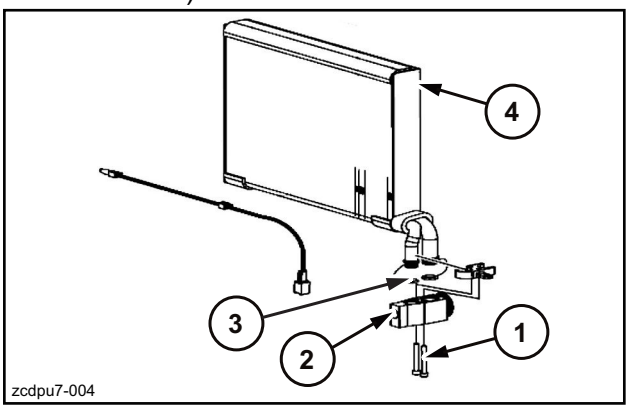
Caution

Be careful of the O-rings getting caught, etc. when installing the expansion valve.
The evaporator sensor cord is sandwiched in the groove of the HVAC unit, so carefully check it and remove it while making sure not to damage it.

1. Turn the HVAC unit upside down and place it on a stand.
   - Remove the 4 Phillips screws (1) and remove the drain case (2).
   - Remove the 1 Phillips screw (1) and remove the evaporator pipe stay (3).
   - Remove the evaporator sensor connector (4), and remove the evaporator (5).



2. Use a hexagon wrench [4 mm (0.157 in.)] to remove the 2 hexagon socket head bolts (1), and then remove the expansion valve (2).
   - Install O-rings (3) on the new evaporator (4) (1 NF O-ring 5/8 and 1 NF O-ring 1/2).
     Bolt (1) tightening torque: 6.9 N・m (5.09 lbf・ft.)



Note

1.Install the fuse box and blade fuse on CN. D21F, D22F, and D23F.

2.Install the fuse holder, 60 A fuse (KHR39840) and 100 A fuse (KHR39850) on CN. D15 - D18, 50 A fuse (KHR3850) on CN. D19 and D20.

3.For connectors marked with * (CN. D49F, D50F, D51F, D61F, D62F, D65F, D76F, D77F, D91F, D92F), install the suitable housing, waterproof plug, and rear holder assembly.

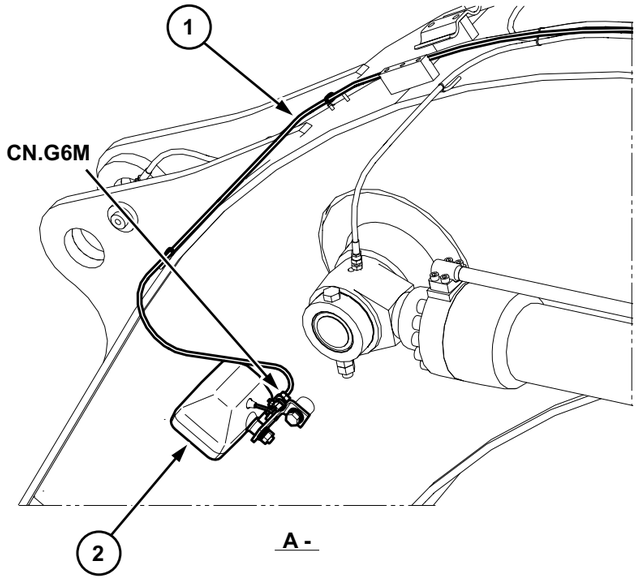
4.For connectors marked with # (CN. D10, D27, D28), install the suitable rubber cap.

5.Install the joint connector on CN. D93 (CN JOINT GND).

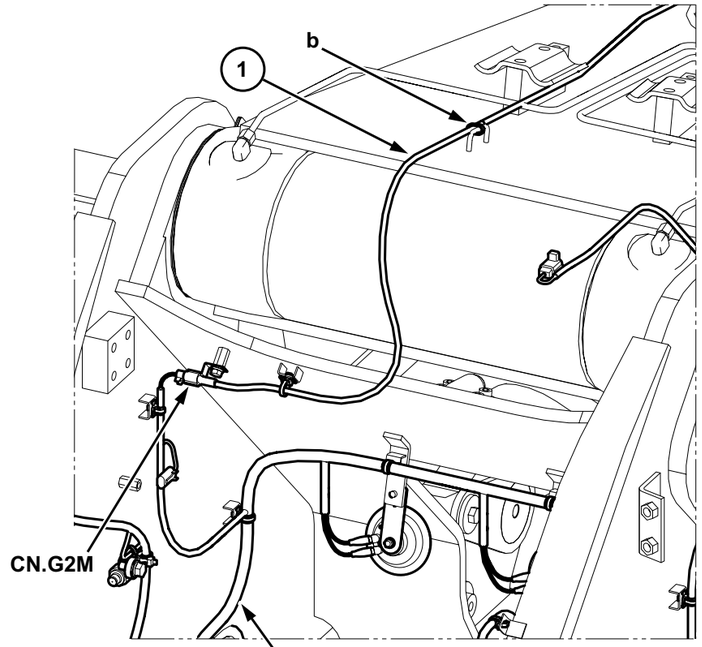
a	The connector (CN. D61F) must be fastened with red tape.	f	The connector (CN. D50F) must be fastened with blue tape.	k	The connector (CN. D37F) must be fastened with red tape.
b	The connector (CN. D60F) must be fastened with red tape.	g	The connector (CN. D49F) must be fastened with red tape.	l	The connector (CN. D51F) must be fastened with red tape.
c	The connector (CN. D54F) must be fastened with red tape.	h	The connector (CN. D76F) must be fastened with white tape.	m	The connector (CN. D32F) must be fastened with red tape.
d	The connector (CN. D77F) must be fastened with red tape.	i	The connector (CN. D92F) must be fastened with red tape.	n	The connector (CN. D62F) must be fastened with red tape.
e	The connector (CN. D65F) must be fastened with red tape.	j	The connector (CN. D93) must be fastened with red tape.		

*1	White adhesive tape	*4	Yellow adhesive tape	*7	Black adhesive tape
*2	Blue adhesive tape	*5	Green adhesive tape	*8	Computer unit (ECM) details
*3	Red adhesive tape	*6	Plate	*9	Computer unit (DCU) details

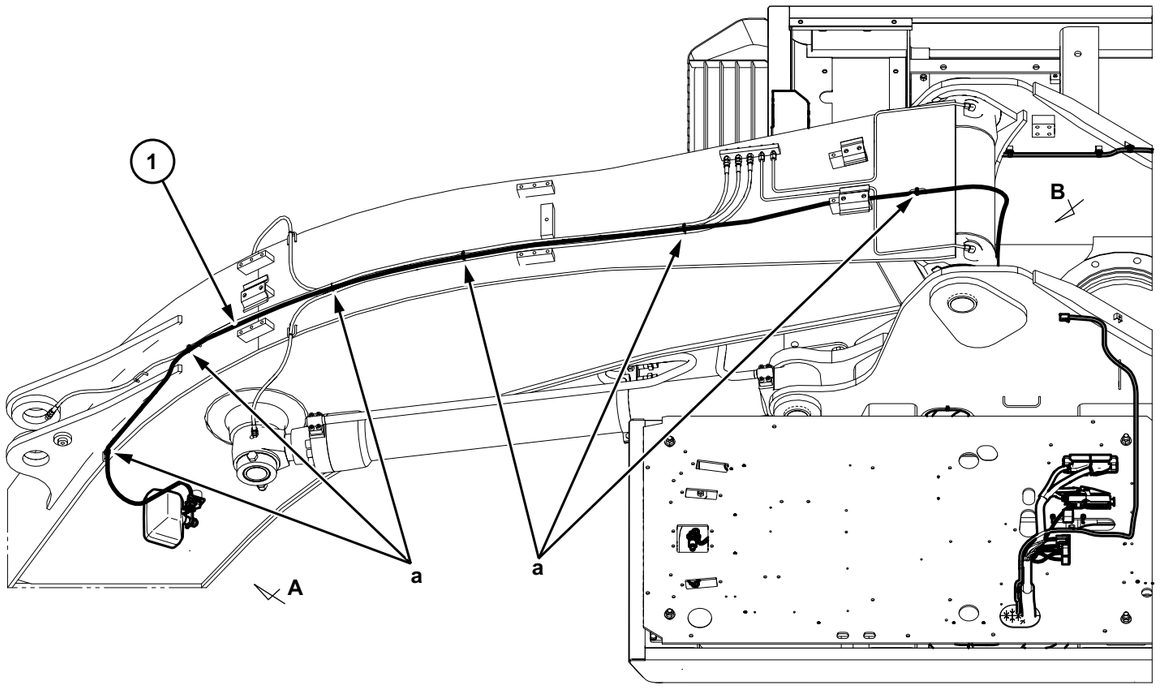
CN.A50F	Cab main harness: A	CN.D45F	Lever lock solenoid valve
CN.A51F	Cab main harness: B	CN.D46F	Swing brake solenoid valve
CN.A52F	Cab main harness: C	CN.D47F	Travel high-speed solenoid valve
CN.A53F	Cab main harness: D	CN.D48F	Pressure boost relief solenoid valve
CN.A54F	Cab main harness: E	CN.D49F-1	Free swing solenoid valve
CN.A55F	Cab main harness: F	CN.D49F-2	Hydraulic load solenoid valve
CN.A56F	Cab main harness: G	CN.D50F	Quick coupler solenoid valve
CN.D1F	DCU: 1	CN.D51F	Travel alarm
CN.D2F	DCU: 2	CN.D52F	Boom lamp harness
CN.D3F	ECM: 1	CN.D53F	Housing lamp
CN.D4F	ECM: 2	CN.D54F	Refueling pump harness
CN.D5F	Engine harness: A	CN.D55F	Horn: L+
CN.D6M	Engine harness: B	CN.D56F	Horn: L-
CN.D7M	Engine harness: C	CN.D57F	Horn: H+
CN.D8M	Engine harness: D	CN.D58F	Horn: H-
CN.D9M	Engine harness: H	CN.D59F	Washer motor
CN.D10	Starter motor: S	CN.D60F	Washer motor diode
CN.D11	Alternator: B	CN.D61F	Beacon harness
CN.D12F	Alternator: L/R	CN.D62F	CCD harness
CN.D13	Alternator: E	CN.D63F	P1 flow proportional solenoid valve
CN.D14	Alternator: GND	CN.D64F	P2 flow proportional solenoid valve
CN.D15	Fuse 100 A: 1	CN.D65F	Option harness proportional solenoid valve
CN.D16	Fuse 100 A: 2	CN.D66M	Control valve PWM
CN.D17	Fuse 60 A: 1	CN.D67F	P1 pressure sensor
CN.D18	Fuse 60 A: 2	CN.D68F	P2 pressure sensor
CN.D19M	Fuse 50 A: +B	CN.D69F	Swing pressure sensor
CN.D20M	Fuse 50 A: ST	CN.D70F	Boom-up pressure sensor
CN.D21F	Fuse: 1	CN.D71F	Boom-down pressure sensor
CN.D22F	Fuse: 2	CN.D72F	Arm-out pressure sensor
CN.D23F	Fuse: 3	CN.D73F	Arm-in pressure sensor
CN.D24	Battery relay: B1	CN.D74F	Bucket-open pressure sensor
CN.D25	Battery relay: B2	CN.D75F	Bucket-close pressure sensor
CN.D26	Battery relay: IGN	CN.D76F	Return room sensor
CN.D27	Battery relay: Coil 1	CN.D77F	HBCV harness
CN.D28	Battery relay: Coil 2	CN.D78F	Oil temperature sensor
CN.D29M	Battery relay: GND	CN.D80F	Fuel level sensor
CN.D30F	Starter relay: B/C	CN.D81M	Control valve sensor
CN.D31F	Starter relay: S/E	CN.D82F	Floor harness: 1
CN.D32F	Starter: Diode	CN.D83F	Floor harness: 2
CN.D33F	Glow relay coil	CN.D84F	Coolant tank switch
CN.D34F	Glow relay: 1	CN.D85M	Air cleaner switch
CN.D35F	Glow relay: 2	CN.D86F	Receiver dryer
CN.D36F	Fuel pump	CN.D87F	Air conditioner compressor
CN.D37F	Pump: Diode	CN.D88M	Signal lamp harness
CN.D38F	Supply module	CN.D89F	Cab harness: Rear camera
CN.D39F	Urea sensor	CN.D90F	SCR harness
CN.D40F	Coolant control valve	CN.D91F	Option power supply
CN.D41F	MAF sensor	CN.D92F	Urea pump
CN.D42F	Fuel filter sensor	CN.D93	Ground joint connector
CN.D43F	Intercooler suction air temperature	CN.D94	G1 GND
CN.D44F	Turbo computer	CN.D95	G2 GND



A -



B -

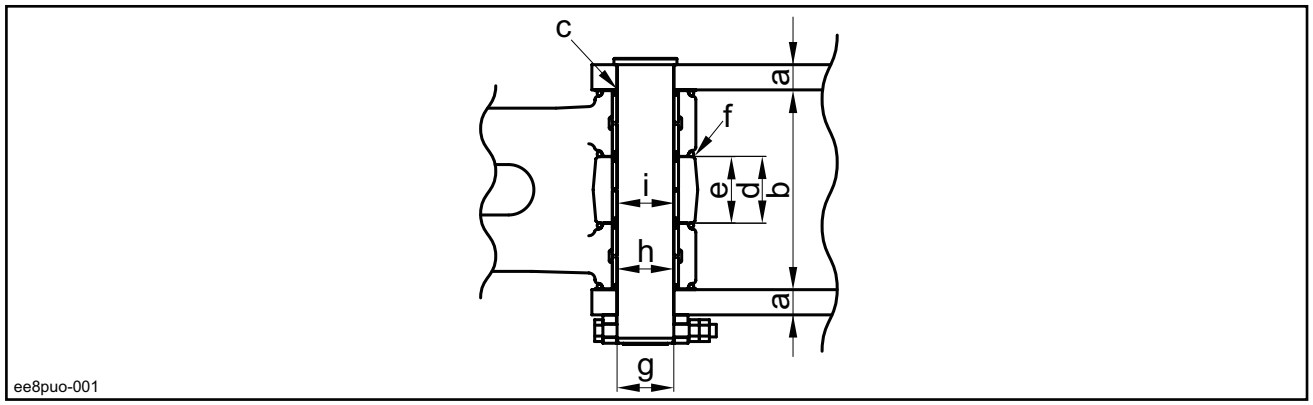


KRR22110-AZ00

5E613421

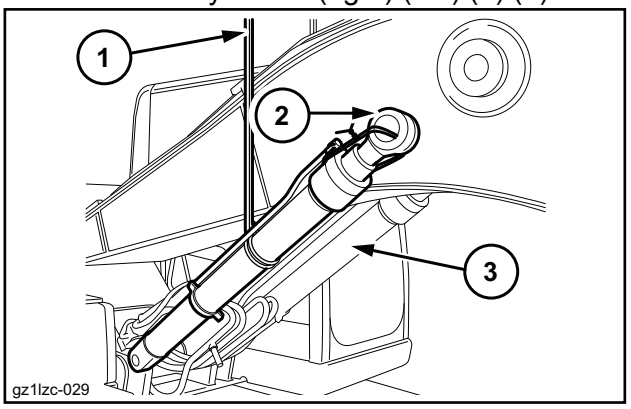
Part name	Code	Measurement dimension [mm (in.)]	Standard value [mm (in.)]	Usage limit [mm (in.)]	Judgment	Solution
Bucket link	b		325 (12.795)	323 (12.717)	Acceptable/ Unacceptable	Replacement
Clearance	c		1.0 - 3.5 (0.0394 - 0.1378)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims
Pin	d	D	D90 (3.543)	D89 (3.504)	Acceptable/ Unacceptable	Replacement
Bushing (bucket link)	e	D	D90 (3.543)	D91.5 (3.6024)	Acceptable/ Unacceptable	Replacement

10. Bucket Link and Bucket Cylinder Installation Section

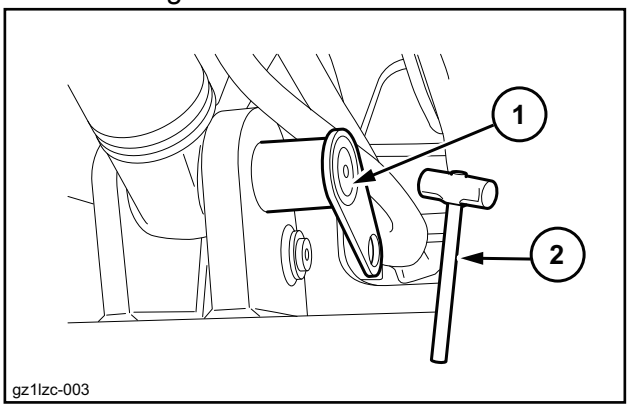


Part name	Code	Measurement dimension [mm (in.)]	Standard value [mm (in.)]	Usage limit [mm (in.)]	Judgment	Solution
Arm link	a		40 (1.575)	38 (1.496)	Acceptable/ Unacceptable	Replacement
Bucket link	b		316 (12.441)	314 (12.362)	Acceptable/ Unacceptable	Replacement
Clearance	c		1.0 - 1.5 (0.0394 - 0.0591)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims
Bucket link	d		106 (4.173)	108 (4.252)	Acceptable/ Unacceptable	Replacement
Bucket cylinder (top section)	e		105 (4.134)	103 (4.055)	Acceptable/ Unacceptable	Replacement
Clearance	f		1.0 - 2.0 (0.0394 - 0.0787)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims

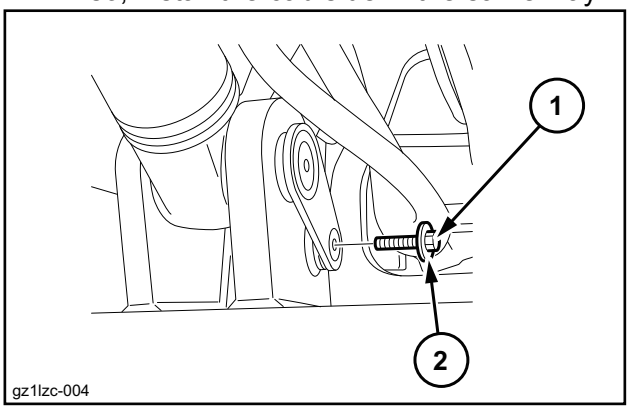
3. Use a liftcrane and a nylon sling (1) to lift the boom cylinders (right) (left) (2) (3).



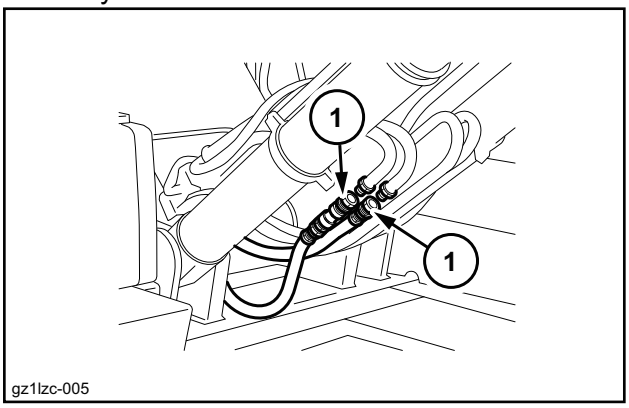
4. Align the boom cylinders (right) (left) with the swing frame pin holes and use a hammer (2) to push in the pin (1).
   - When inserting the pin, be careful not to damage the installed dust seals.



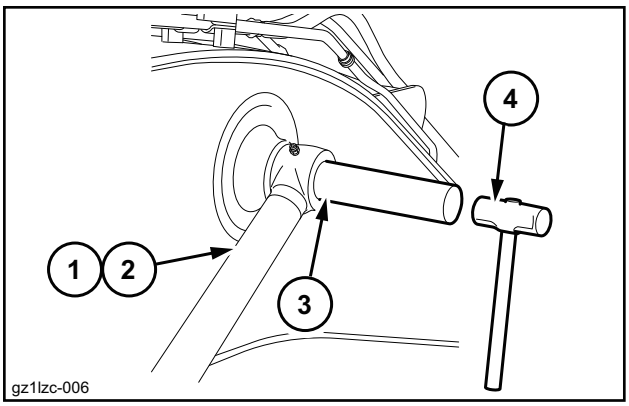
5. Use a wrench [19 mm (0.748 in.)] to tighten the bolt (1) and washer (2).
   Also, install the cab side in the same way.



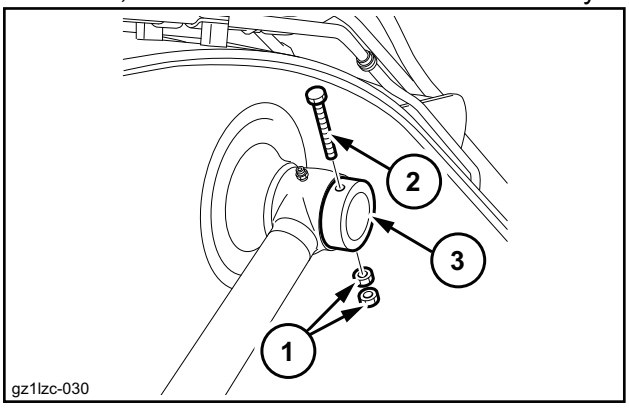
6. Use a wrench [36 mm (1.417 in.)] to install the hose (1).
   Also, install the cab side hose in the same way.



7. Start the engine, raise the boom at idle, and extend the boom cylinder (right) (left) (1) (2) rods.
   Align the boom cylinders (right) (left) (1) (2) with the boom pin holes and use a hammer (4) to push in the pin (3).
   - If the insertion of a shim is possible according to the tolerance, adjust the shim.



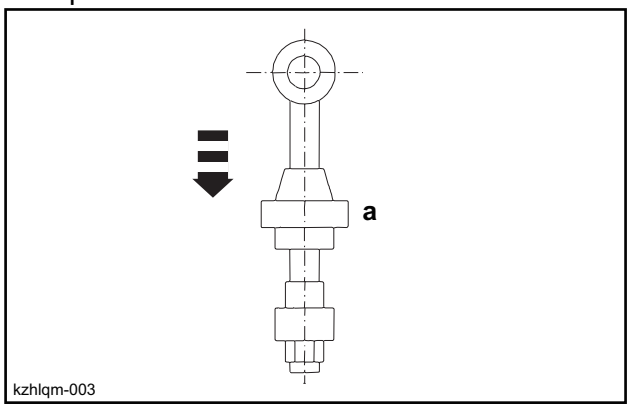
8. Use 2 wrenches [30 mm (1.181 in.)] to install the 2 double nuts (1) and bolt (2), and install the fastening ring (3).
   Also, install the cab side in the same way.



4. Pull out the piston rod.
   [1] Check that the line caps are removed.
   [2] Put the oil pan at the retraction side (cylinder head side) port.
   [3] With the piston rod pulled out all the way, slowly pull out the cylinder head and remove it.
   [4] Pull out the piston rod together with the cylinder head and place them on crossties.

Caution

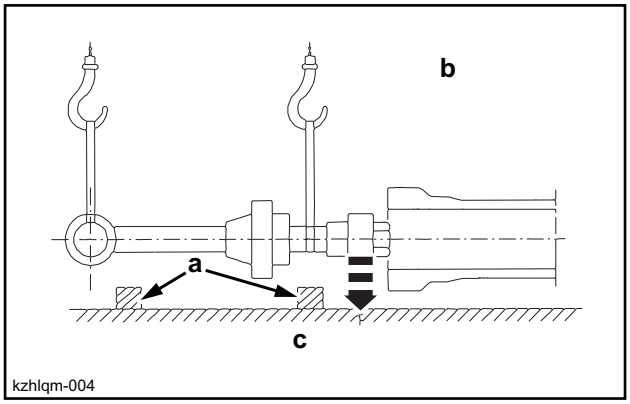
・When assembling and disassembling with the cylinder secured vertically, work paying particular attention to the following points.
In the work of removing the piston rod, the cylinder head may come out of the cylinder tube ahead of the piston due to friction with the packing, creating a condition in which there is space between the cylinder head and the piston.
If the work is done in that state, the cylinder head may suddenly slip out and injure the operator.
Always work with the cylinder head touching the piston.



a	Beware of falling

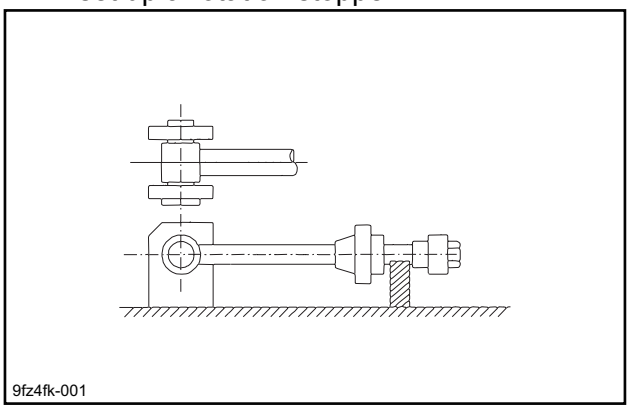
Caution

・When assembling and disassembling with the cylinder secured horizontally, work paying particular attention to the following points.
In the work of removing the piston rod, there is a danger of the piston rod falling and damaging parts right after it is removed.
Work carefully while holding the rod horizontal and in contact with the crossties.



a	Crosstie
b	Working in the horizontal state
c	Beware of falling

5. Secure the piston rod.
   Use the rod head bolt width or pin hole to set up a rotation stopper.



6. Remove the piston nut.
   [1] Remove the locking screw (3).
   Locking screw is caulked in with a punch at 2 locations on the outer circumference.
   Cut away the caulked sections with a hand drill (1), and then loosen the locking screw.

HBCV

structure

This valve is a holding control valve which is developed for the hydraulic excavator, and which prevents a free fall of the cylinder in the non-operation state and a sudden drop of the cylinder due to a hose burst.

Function

Poppet (311)

- This stops a leak between M.C.V.-cylinder.
- It has a load check function.

Spool (511)

- This is given strokes by the cylinder operation pilot pressure to control the flow from the cylinder to the M.C.V.
- It will control the poppet state (open/close) when the pilot pressure becomes higher.

Relief valve (601)

- This restricts the maximum pressure of the cylinder port.

Piston (1), (631)

- This receives the pilot pressure to give the spool strokes.

Piston (2), (632)

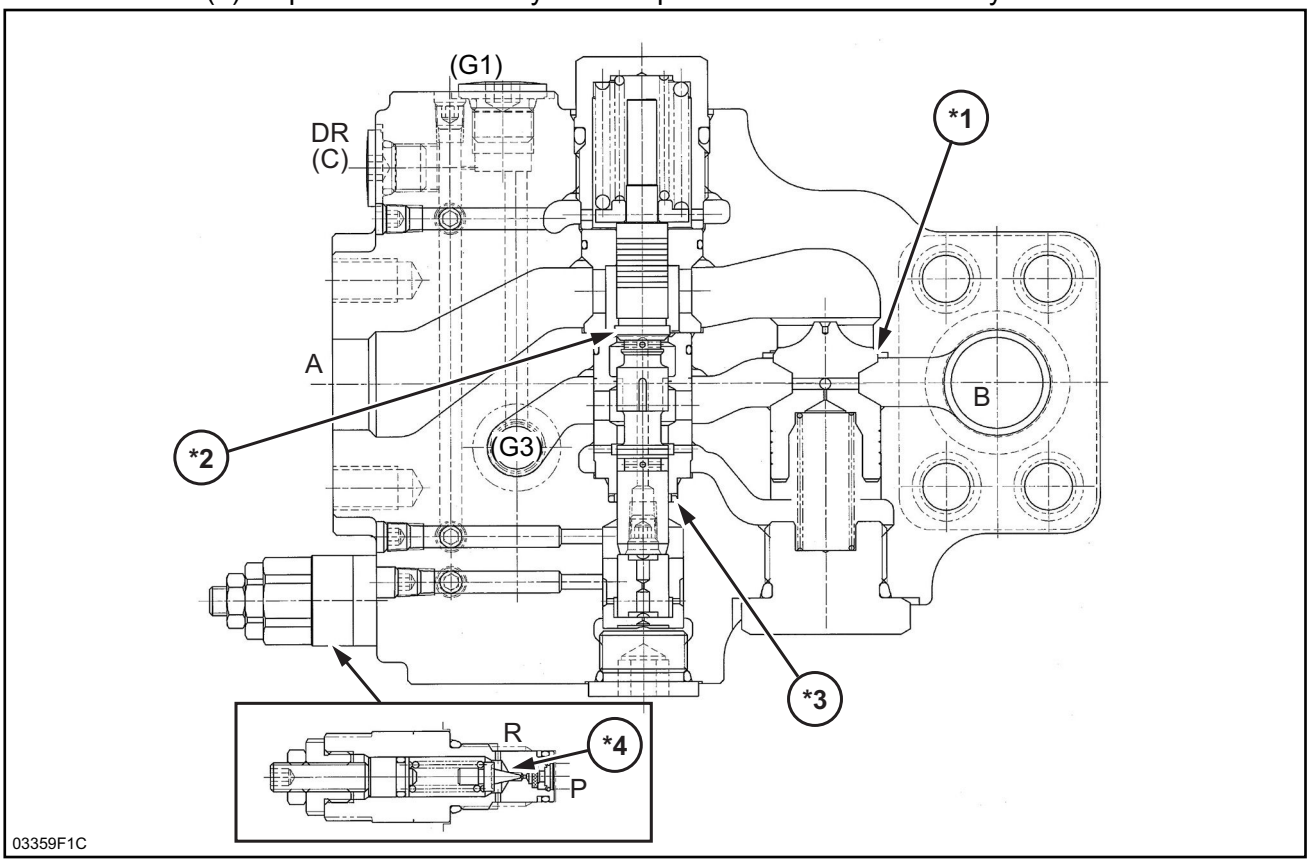
- When relieved, the piston (1) gives the spool strokes.

operation explanation

For HBCV arm

In a neutral state of spool

a. In a neutral state of spool (where no pilot pressure is added), the poppet seat section (a), the spool seat section (b), the spool sliding section seal (c), and the relief valve poppet seat section (d) stop a leak from the cylinder to prevent a free fall of the cylinder.



*1	Seat section (a)	*3	Seal (c)
*2	Seat section (b)	*4	Seat section (d)

Removal and Installation of Arm HBCV

Caution

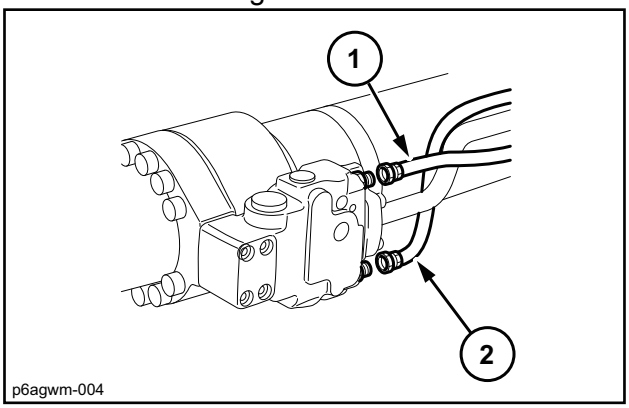
- Stop the machine in the temporary decommissioning posture on a level location with good footing.
- Be sure to stop the engine before beginning work.
- When working together with others, always be sure to exchange signals and pay adequate attention to safety.
- Be sure to release hydraulic pressure before beginning work.

Items to prepare

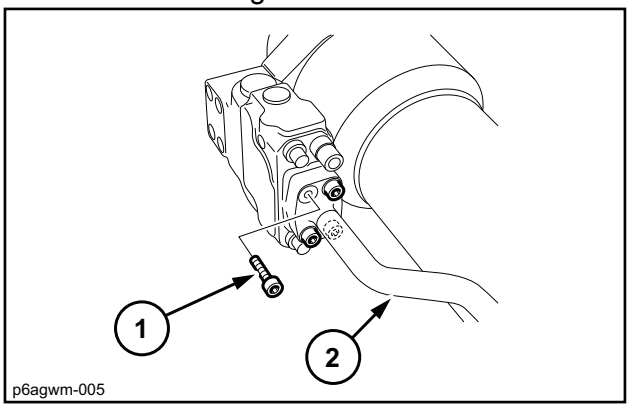
- Wrenches [19 mm (0.748 in.), 22 mm (0.866 in.)]
- Hexagon wrench [10 mm (0.394 in.)]
- Marking pen
- Cap
- Plug
- Rag
- Cleaning fluid

Removal of Arm HBCV

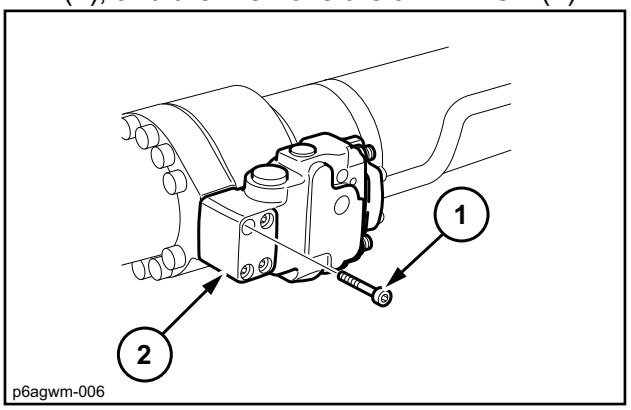
1. Use wrenches [19 mm (0.748 in.), 22 mm (0.866 in.)] to remove the hoses (1) (2).
   - Mark the HBCV and hoses so that the connectors match at the time of installation.
   - Use caps or plugs to cover the hoses and HBCV to prevent any entry of water, dust or dirt.
   - Clean the hoses and HBCV by spraying them with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.



2. Use a hexagon wrench [10 mm (0.394 in.)] to remove the 4 hexagon socket head bolts (1), and then remove the line (2).
   - Use caps or plugs to cover the HBCV and line to prevent any entry of water, dust or dirt.
   - Clean the HBCV and line by spraying them with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.



3. Use a hexagon wrench [10 mm (0.394 in.)] to remove the 4 hexagon socket head bolts (1), and then remove the arm HBCV (2).



Installation of arm HBCV

To install, perform the reverse of the removal procedure.
The tightening torque for line installation and HBCV installation is 74.9 - 109.9 N•m (55.253 - 81.071 lbf・ft.).

UNDERCARRIAGE

Travel motor		Variable displacement axial piston motor
Brake		Mechanical disc brake
Hydraulic service brake		Brake valve
Final drive		Planetary gear reduction
Travel speeds	High	5.5 km/h (3.4 mph)(Automatic travel speed shifting)
	Low	3.5 km/h (2.2 mph)
Drawbar pull		200 KN (45,000 lbf)
Number of carrier rollers (each side)		2
Number of track rollers (each side)		9
Number of shoes (each side)		51
Type of shoe		Triple grouser shoe
Link pitch		190 mm (7.480 in)
Width of shoe		800 mm (31.496 in) (S.T.D)
Grade-ability		70 % (35°)

MASS

Operating mass	28,800 kg（63,600 lb）
with 8.00 m (26.25 ft) Arm, 0.37 m^3 Sumitomo Bucket, 800 mm (31.496 in) grouser shoe, operator, lubricant, coolant and full fuel tank	
Shipping mass	28,100 kg (62,000 lb)
Operating mass - (operator mass [75kg (165.35 lb)]) + 90 % of fuel mass + bucket mass [340kg (749.576 lb)])	
Counter weight mass	7,350 kg (16,200 lb)
Ground pressure	0.043 MPa (5.512 psi)
with 8.00 m (26.25 ft) Arm, 0.37 m^3 Sumitomo Bucket, 800 mm (31.496 in) grouser shoe	

DIGGING FORCE (with 0.37 m^3 Sumitomo Bucket) (ISO 6015)

	[8.00 m (26.25 ft)] Arm
Arm digging force	40 kN (9,060 lbf)
Bucket digging force	77 kN (17,300 lbf)

DIMENSIONS

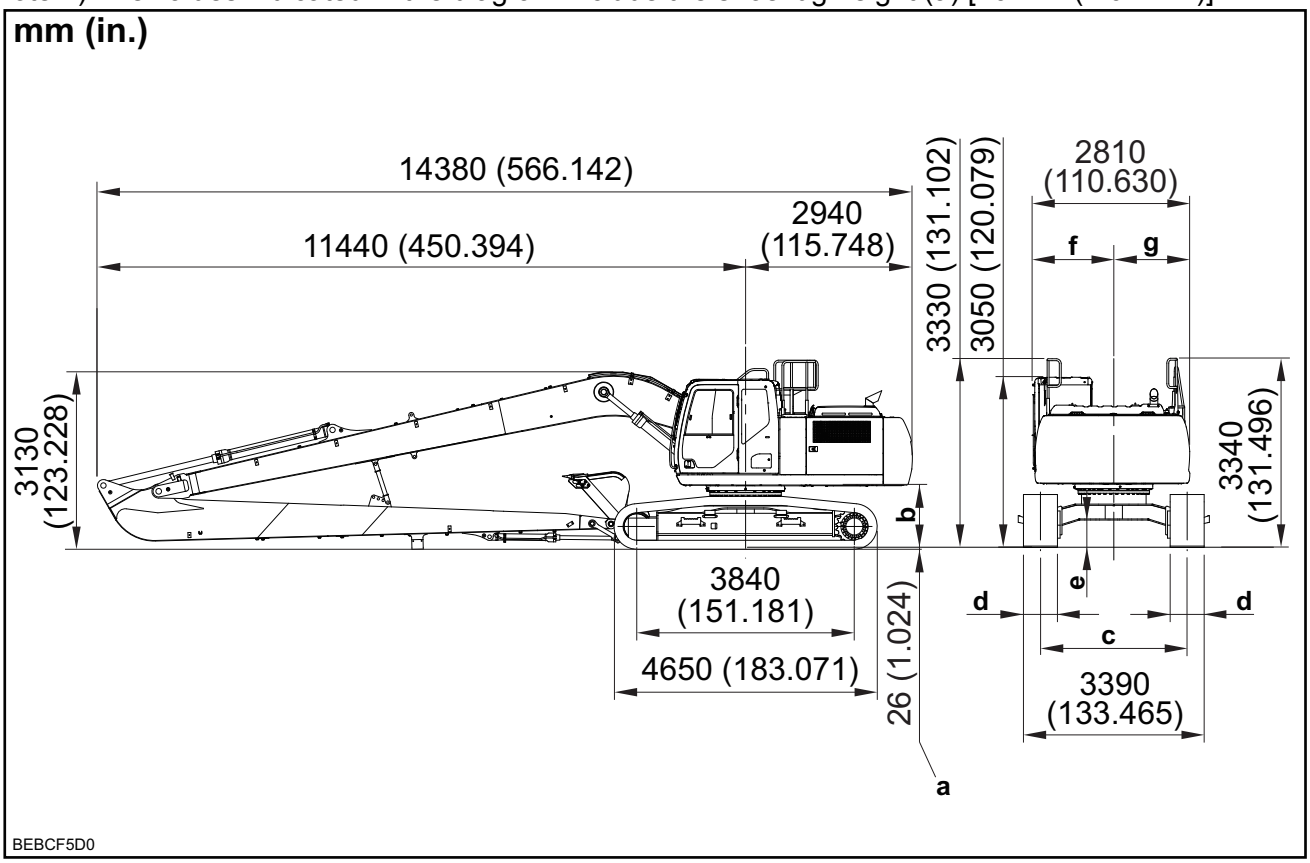
	[8.00 m (26.25 ft)] Arm
Overall length (without attachment)	5270 mm (207.480 in)
Overall length (with attachment)	14380 mm (566.142 in)
Overall height (to top of boom)	3130 mm (123.228 in)
Overall height (to top of Cab)	3050 mm (120.079 in)
Overall height (to top of guardrail)	3340 mm (131.496 in)
Upper structure overall width	2810 mm (110.630 in)
Swing (rear end) radius	2950 mm (116.141 in)
Clearance height under upper structure	1100 mm (43.307 in)
Minimum ground clearance	440 mm (17.323 in)
Wheel base (Center to center of wheels)	3840 mm (151.181 in)
Crawler overall length	4650 mm (183.070 in)
Track gauge	2590 mm (101.968 in)

250X4 LF

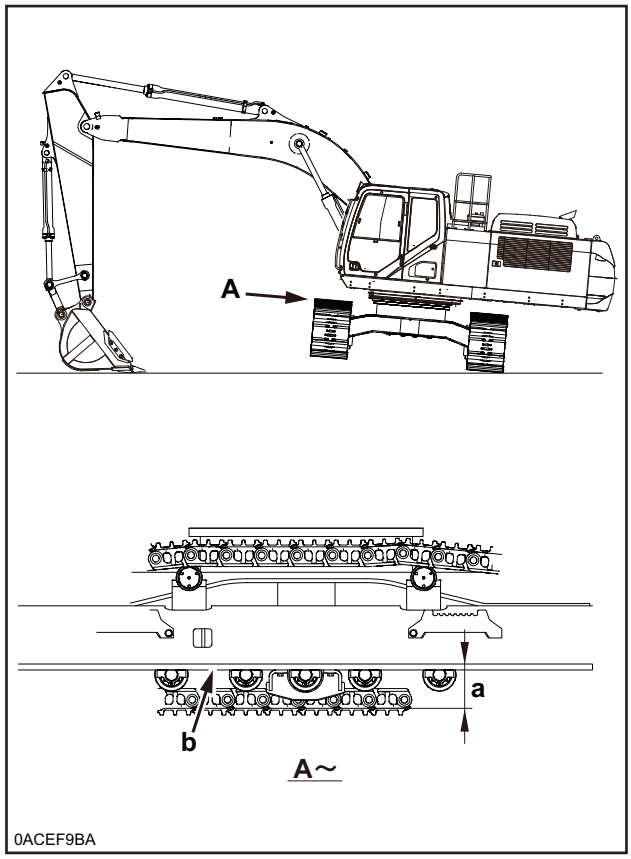
Ultra-long Arm [8.0 m (26.247 ft.)]

Note 1) The values used in this document are subject to change without notice due to a design change or other reasons.

Note 2) The values indicated in the diagram include the shoe lug height (a) [26 mm (1.024 in.)].



b	1100（43.307）	d	800 (31.496)	f	1470 (57.874)
c	2590（101.969）	e	440 (17.323)	g	1340 (52.756)



a	Topside of shoe plate
b	Underside of lower side frame

Swing Ball Race Bearing Movement Amount and Bucket Tip Movement Amount

Measurement method

[1] **Measurement in a vertical direction**

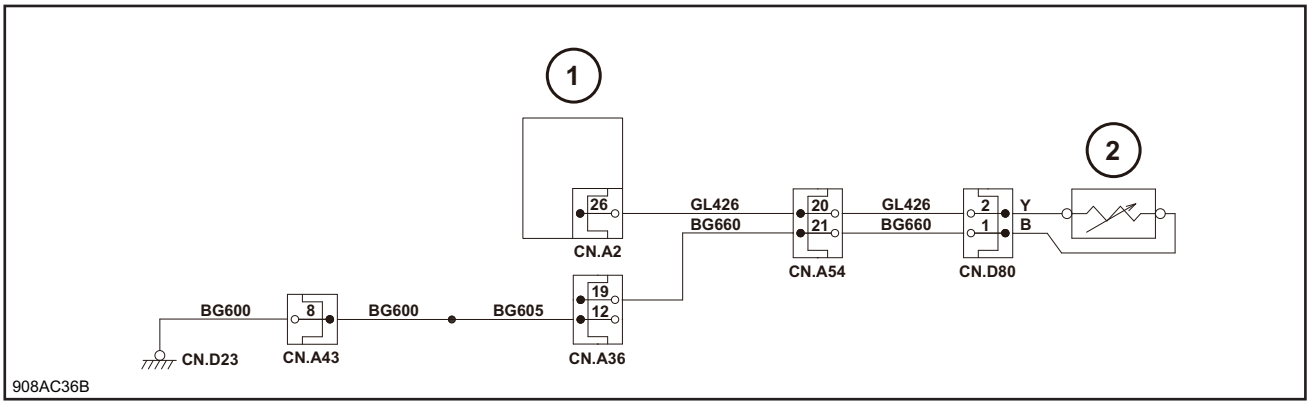
a. Measure the vertical movement amount at the front and back of the ball race (two locations).

b. With the arm cylinder out and the bucket cylinder closed, raise the bucket bottom 30 cm off the ground and perform 0-point adjustment with the dial gauge attached at the lowering part as shown in the following figure.

c. Jack up the main unit and measure the movement amount on the dial gauge.

* Jack up the main unit until oscillation of the dial gauge becomes stable.

Step	Action	Standard value	Yes	No
7	Is there continuity?		GL426 harness defect (short). Replace.	Go to Step 8.
8	1. Turn the key switch ON. 2. Measure the voltage between the ground and terminal 1 of the CN.D80 harness side. Is it 0 V?	0 V	Main controller defect. Replace.	BG660, BG600, or BG605 harness defect (short). Replace.



1	Main controller
2	Fuel level sensor

Float position and resistance

Flow and position	FULL	HALF	EMPTY
Resistance (Ω)	10 (Tolerance 0 - 4)	38	80 (Tolerance 0 - 10)

* Temperature conditions: 5 - 35°C

Diagnostic Trouble Code: 7041 Temperature Sensor Hydraulic Fluid Abnormality

Step	Action	Standard value	Yes	No
1	1. Turn the key switch ON. 2. Check whether diagnostic trouble code: 7041 is displayed. Is diagnostic trouble code: 7041 displayed?		Go to Step 2.	
2	1. Inspect the connection status of each connector. 2. Check whether diagnostic trouble code: 7040 is displayed. Is diagnostic trouble code: 7040 displayed?		Go to Step 3.	
3	1. Check the oil temperature sensor resistance (or voltage) on the service support screen. Is it 67200 Ω (4.93 V) or higher?	67200Ω (4.93 V) min.	Go to Step 4.	When 111 Ω (0.5 V) or lower, go to Step 7
4	Inspect for disconnection. 1. Turn the key switch OFF and disconnect CN.D78.		Go to Step 5.	Oil temperature sensor defect. Replace.

Step	Action	Standard value	Yes	No
4	2. Turn ON the key switch. 3. Measure whether the voltage between CN.G11 harness side terminal No. 1-GND is 5 V or more.	About 5 V	Go to Step 5	they are faulty (short-circuited).
5	1. Measure whether the voltage between CN.G11 harness side terminal No. 2-GND is 4.75 V or less.	4.75 V or less	Go to Step 6	Replace the YG401 harness because it is faulty (short-circuited).
6	1. Measure whether the voltage between CN.G11 harness side terminal No. 3-GND is 0.25 V or less.	0.25 V or less	Go to Step 7	Replace the BW445n and BW445 harnesses because they are faulty (short-circuited), or go to step 8.
7	Faulty main controller			Replace the main controller.
8	1. Inspect the 1st option (rear pedal) Pi pressure sensor. 2. Turn OFF the key switch. 3. Remove the CN.G11. 4. Measure whether the resistance between CN.G11 1st option (rear pedal) Pi pressure sensor side terminal No. 1-3 is about 10 Ω.	About 10 Ω	Go to Step 9	Replace the 1st option (rear pedal) Pi pressure sensor because it is faulty.
9	Inspect for a short circuit or a disconnection in the GND. 1. Inspect whether there is continuity between CN.G11 harness side terminal No. 1-GND. 2. Inspect whether there is continuity between CN.G11 harness side terminal No. 2-GND.		Replace the WL435n, WL435, WB435, and YG401 harnesses because they are faulty (short-circuited).	Go to Step 9
10	1. Inspect whether there is continuity between CN.G11 harness side terminal No. 3-GND.		Go to Step 11	Repair or replace the BW445n and BW445 harnesses because they are faulty (disconnected).
11	1. Turn ON the key switch. 2. Measure whether the voltage between CN.G11 harness side terminal No. 1-GND is about 5 V.	About 5 V	Go to Step 12	Repair or replace the WL435n, WL435, and WB435 harnesses because they are faulty (disconnected).
12	1. Measure whether the voltage between CN.G11 harness side terminal No. 2-GND is 0.25 V or more.	0.25 V or higher	Replace the main controller because it is faulty.	Repair or replace the YG401 harness because it is faulty (disconnected).

1	Main controller
2	Proportional valve (tilting 1)

Diagnostic Trouble Code: 7271 Tilting 2 Proportional Valve Abnormality

step	Action	Standard value	Yes	No
1	1. Turn ON the key switch. 2. Check whether the diagnostic trouble code: 7271 is displayed.		Go to step 2.	
2	1. Turn OFF the key switch. 2. Inspect the connectivity of each connector for poor insertion and wiring terminal disconnection. 3. Disconnect each connector, and check for any wiring terminal abnormality. If there is no abnormality, reconnect the connectors. 4. Turn ON the key switch, and check whether the diagnostic trouble code: 7271 is displayed.		Go to step 3.	
3	1. Reset the diagnostic trouble code at the service support screen. 2. Check whether the diagnostic trouble code: 7271 is displayed.		Go to step 4.	Go to step 5.
4	Inspect for a short circuit. 1. Turn OFF the key switch and remove the CN.D64. 2. Inspect whether there is continuity between CN.D64 harness side terminal No. 1-GND.		Replace or repair the L912a harness because it is faulty (short-circuited).	Replace the main controller because it is faulty.
5	Inspect the proportional valve. 1. Turn OFF the key switch. 2. Remove the CN.D64. 3. Inspect whether there is continuity between CN.D64 proportional valve side terminal No. 1-2.		Go to step 6.	Replace the proportional valve because it is faulty.
6	Inspect for a disconnection. 1. Remove the CN.A1. 2. Inspect whether there is continuity between CN.A1 harness side terminal No. 3-CN.D64 harness side terminal No. 1.		Go to step 7.	Repair or replace the L912a harness because it is faulty (disconnected).
7	Inspect whether there is continuity between CN.A1 harness side terminal No. 1-CN.D64 harness side terminal No. 2.		Replace the main controller because it is faulty.	Repair or replace the BL912b and LY912b harnesses because they are faulty (disconnected).

Step	Action	Standard value	Yes	No
2	1. Inspect the connection status of each connector. 2. Check whether diagnostic trouble code: 7608 is displayed. Is diagnostic trouble code: 7608 displayed?		Go to Step 3.	
3	Inspect for disconnection. 1. Turn the key switch OFF and disconnect CN.C1, CN.C2, CN.C20, CN.C21, and CN.C22. 2. Inspect for continuity between terminal 10 of the CN.C1 harness side and terminal 1 of the CN.C20 harness side, terminal 1 of the CN.C21 harness side, or terminal 1 of the CN.C22 harness side. Is there continuity?		Go to Step 4.	R960, R965, or R970 harness defect (disconnection). Repair or replace.
4	Inspect for continuity between terminal 11 of the CN.C1 harness side and terminal 2 of the CN.C20 harness side, terminal 2 of the CN.C21 harness side, or terminal 2 of the CN.C22 harness side. Is there continuity?		Go to Step 5.	B961, B966, or B971 harness defect (disconnection). Repair or replace.
5	Inspect for continuity between terminal 1 of the CN.C2 harness side and terminal 3 of the CN.C20 harness side. Is there continuity?		Go to Step 6.	Y962 harness defect (disconnection). Repair or replace.
6	Inspect for continuity between terminal 11 of the CN.C2 harness side and terminal 4 of the CN.C20 harness side. Is there continuity?		Go to Step 7.	W963 harness defect (disconnection). Repair or replace.
7	Inspect for continuity between terminal 2 of the CN.C2 harness side and terminal 3 of the CN.C21 harness side. Is there continuity?		Go to Step 8.	YB967 harness defect (disconnection). Repair or replace.
8	Inspect for continuity between terminal 12 of the CN.C2 harness side and terminal 4 of the CN.C21 harness side. Is there continuity?		Go to Step 9.	WB968 harness defect (disconnection). Repair or replace.
9	Inspect for continuity between terminal 3 of the CN.C2 harness side and terminal 3 of the CN.C22 harness side. Is there continuity?		Go to Step 10.	YR972 harness defect (disconnection). Repair or replace.
10	Inspect for continuity between terminal 13 of the CN.C2 harness side and terminal 4 of the CN.C22 harness side. Is there continuity?		Go to Step 11.	WR973 harness defect (disconnection). Repair or replace.
11	1. Turn the key switch ON. 2. Check whether diagnostic trouble code: 7608 is displayed. Is diagnostic trouble code: 7608 displayed?		Monitor defect. Replace	

Code	Order No.	Jig name	Remarks
1		Pulley puller	
2		Bearing press-fit jig 1	
3		Bearing press-fit jig 2	
4		Floating seal installation jig	
5		Rod 1	
6		Angular bearing press-fit jig	
7		Shim thickness adjustment jig	
8		Rod 2	

a	Puller	e	Guide A (flange and housing : material DURACON)	i	(M8 thread depth)
b	Guide shaft	f	Guide B (flange)	j	Surface knurling processing
c	Hammer	g	Guide C (housing)	k	Including the assembly diagram
d	Stopper nuts (M8 x 1.25)	h	Press-fit auxiliary jig (flange)		

L1	C0.039	L5	D13.0788 - D13.0866	L9	D13.5630 - D13.5669
L2	D12.9489 - D12.9566	L6	D13.6024 - D13.6102	L10	R0.0197
L3	D13.0512 - D13.0590	L7	0.9803 - 0.9881	L11	R0.0040 - R0.0078
L4	D13.0434 - D13.0472	L8	D13.0788 - D13.0866		