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E13C-VV (90/92Z7) SHOP MANUAL
General Information
Engine Diagnosis

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SHOP MANUAL

HINO DIESEL ENGINE

E13C-VV

General Information
Engine Diagnosis

(For Kawasaki Wheel Loaders 90Z7 and 92Z7)

Serial No. 90H1-5001 and up
92H1-5001 and up

7. Definition of terms

Terms in this manual are defined as follows:

(1) Direction

a. Individual unit

Front/back direction

The power input side is front and the output side is back.

Rotating direction

When viewed from the rear, the clockwise direction is right rotation and the counterclockwise direction is left rotation.

Vertical direction

With a unit mounted on the vehicle (chassis), the upward direction is upper and the downward direction is lower.

Left/right direction

When viewed from the rear, the left direction is left and the right direction is right.

(2) Standard value ·····Basic dimension excluding tolerance and clearance generated by tolerances when two parts are joined

(3) Repair limit···It is the value requiring repair. Symbol of + or - with the value means increase or decrease to the standard value.

(4) Operation limit···It is the value requiring replacement. Symbol of + or - with the value means increase or decrease to the standard value.

(5) Warning·····It is an item that may result in risk of human life or serious injury by incorrect handling.

(6) Caution·····It is an item that should not be performed including inhibited work or an item that require attention in working procedures.

(7) Reference·····It is supplementary explanation in work.

Assembly of joints and gaskets for piping

JP30ZLE010102006

1. Tightening torque of joints

Unit : N·m{kgf·cm, lbf·ft}

Screw size	Sealing method		
	Gasket sealing method (Aluminum + Rubber or Copper)	Metal sealing method (Flare pipe type, nipple connector type)	
		Type A	Type B
M8	13 {130, 9}		
M10	20 {200, 14}		11 {110, 8}
M12	25 {250, 18}	20 {200, 14}	
M14	25 {250, 18}	31 {320, 23}	
M16	29 {300, 22}	39 {400, 29}	
M18	39 {400, 29}	59 {600, 43}	
M20	*39 {400, 29}	64 {650, 47}	20 {200, 14}
M24	69 {700, 51}		
M28	*127 {1300, 94}		

2. Joint assembly procedure and subsequent inspection

(1) Before assembly, make sure that there is no dirt or burr on the seating surface (mating part, pipe joint, gasket, etc.).

(2) Since pipes have some degrees of freedom for assembly, the seating surface tends to incline. Tighten pipes finally after temporary tightening to prevent leak.

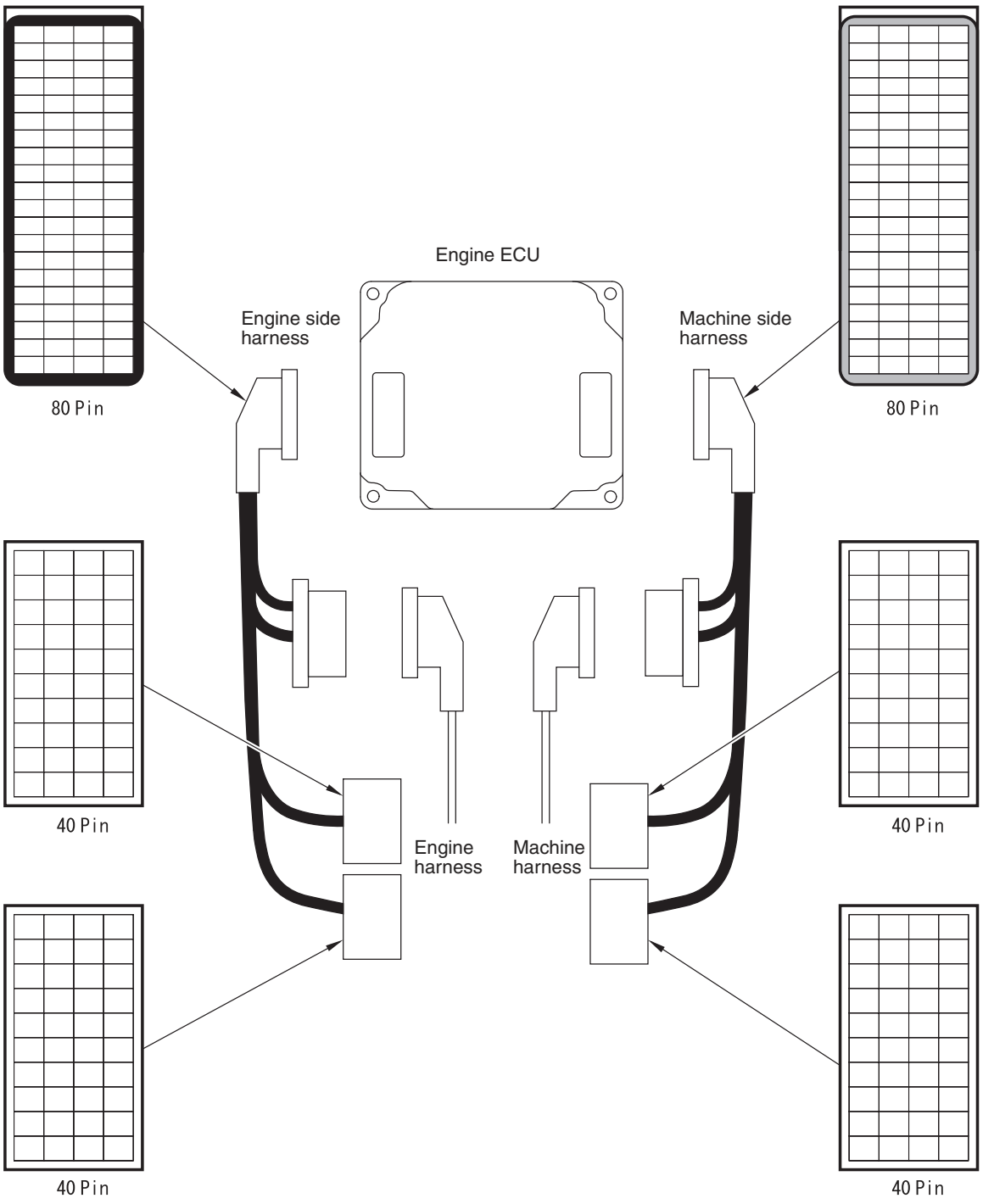
(3) After tightening, apply the specified pressure to each pipe joint to ensure that there is no leak.

(4) Observe the values above for each tightening torque.
*When assembled soft washer #4840FR-N (aluminum and rubber carbon pressure bonding) is loosened or removed, be sure to replace it with a new part. This is not necessary for normal retightening.

(2) Terminal No.

For the signal check harness connector, the ECU terminal number in the text is treated as follows:

Signal check harness(for engine control system)



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Inspection item			Standard value	Repair limit	Operation limit	Action
Connecting rod	Small end bushing inner diameter		55 {2.1654}	—	—	Replace
	Small end bushing oil clearance		0.030-0.048 {0.0012-0.0019}	—	0.10 {0.0039}	
	End play		0.15-0.32 {0.0060-0.0125}	—	0.6 {0.0236}	Replace connecting rod or crankshaft.
Crankshaft	Journal outer diameter		108 {4.252}	—	107.8 {4.2441}	Replace bearing or crankshaft.
	Journal oil clearance		0.054-0.110 {0.0022-0.0043}	—	0.3 {0.0118}	
	Center journal width		48-48.3 {1.8898-1.9016}	—	—	
	Pin outer diameter		90 {3.543}	—	89.8 {3.5354}	
	Crankshaft-pin connecting rod oil clearance		0.049-0.100 {0.0020-0.0039}	—	0.30 {0.0118}	
	Crankshaft end play		0.110-0.274 {0.0044-0.0107}	—	0.5 {0.0197}	Replace thrust bearing.
	Run out		—	0.05 {0.0020}	—	
Camshaft	Journal outer diameter		54.0{2.1260}	—	—	
	Bearing oil clearance		0.025-0.072 {0.0010-0.0028}	—	0.3 {0.0118}	Replace camshaft or bearing.
	End play		0.10-0.31 {0.0040-0.0122}	—	0.5 {0.0197}	Replace camshaft.
	Cam height	IN	68.1 {2.6811}	—	67.3 {2.6496}	
		EX	71.5 {2.8150}	—	70.7 {2.7834}	
	Cam lift	IN	8.1 {0.3189}	—	—	
		EX	11.5 {0.4528}	—	—	
	Run out		0.04 {0.0016}	—	0.05 {0.0020}	

Standard value (Alternator 60A)

JP30ZLE020701017

Unit:mm{in.}

Inspection item		Standard value	Operation limit	Action
Resistance between stator coil terminals (for 2 phases)		0.15-0.17Ω	—	Replace
Resistance between stator coil core - Coil		1MΩ or more	—	Replace
Resistance of field coil		6.2-6.8Ω	—	Replace
Resistance between field coil core - Coil		1MΩ or more	—	Replace
Shaft outer diameter of rotor assembly	Front	25.0mm {0.9843in.}	24.98mm {0.9835in.}	Replace
	Rear	17.0mm {0.6693in.}	16.98mm {0.6685in.}	
Resistance between diode - Rectifier holder	Forward resistance value	Approx. 10 Ω	—	Replace
	Reverse resistance value	Infinite	—	
Resistance between regulator terminals F -E	Forward resistance value	Approx. 10 Ω	—	Replace
	Reverse resistance value	Infinite	—	
Resistance between terminals B - E and P - E	B - E	Approx. 20Ω	—	Replace
	E - B	Infinite	—	
	P - E	Approx. 7Ω	—	
	E - P	Infinite	—	

Lubrication

Instruments

JP30ZLE030901007

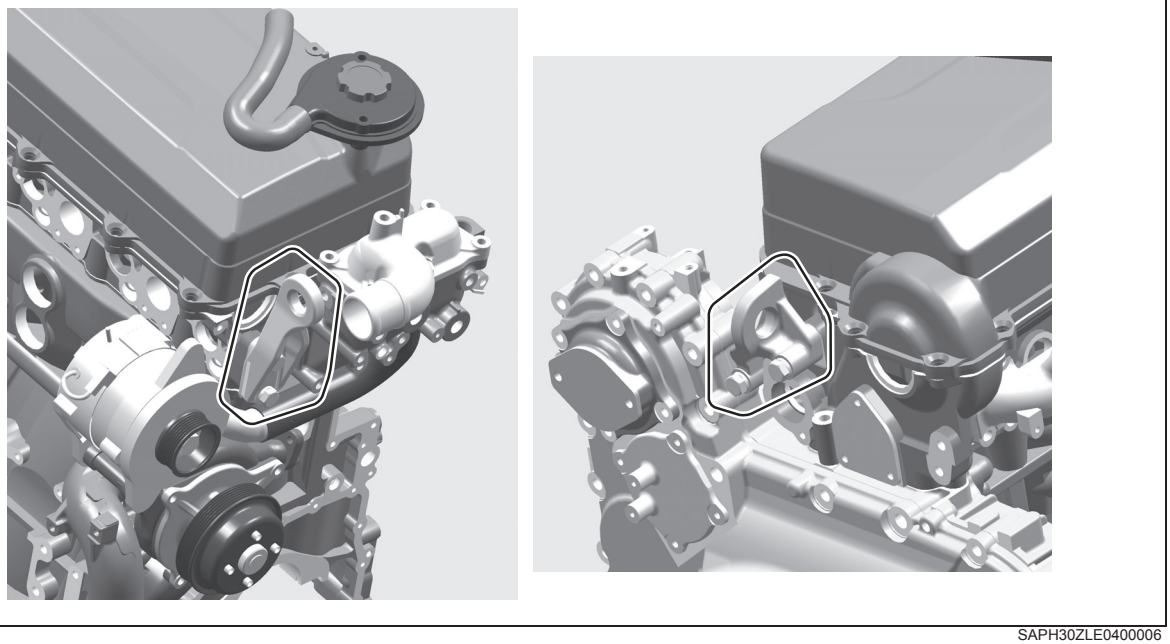
Name	Remark
Micrometer	For measurement of part outer diameter
Cylinder gauge	For measurement of part inner diameter
Thickness gauge	For measurement of each clearance

Lubricant, etc.

Name	Remark
Liquid gasket (ThreeBond TB1207 : Brown)	For sealing of parts

6. Engine lifting

(1) Place a hook in the hole of the engine hangers located on the front and rear of the engine.



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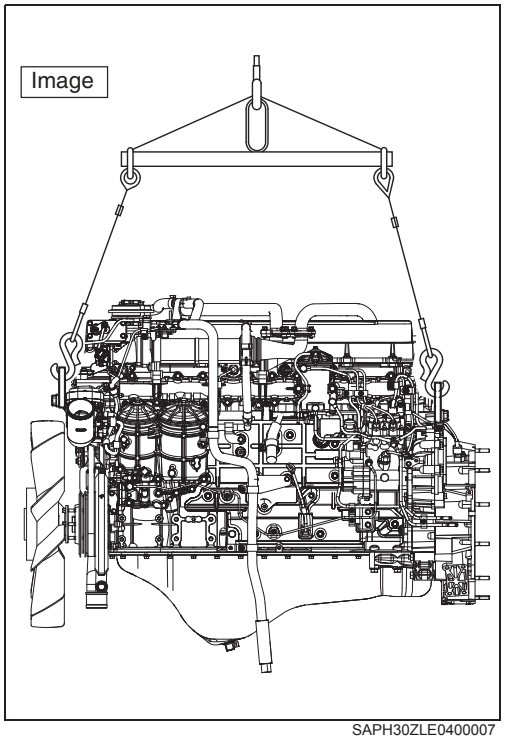

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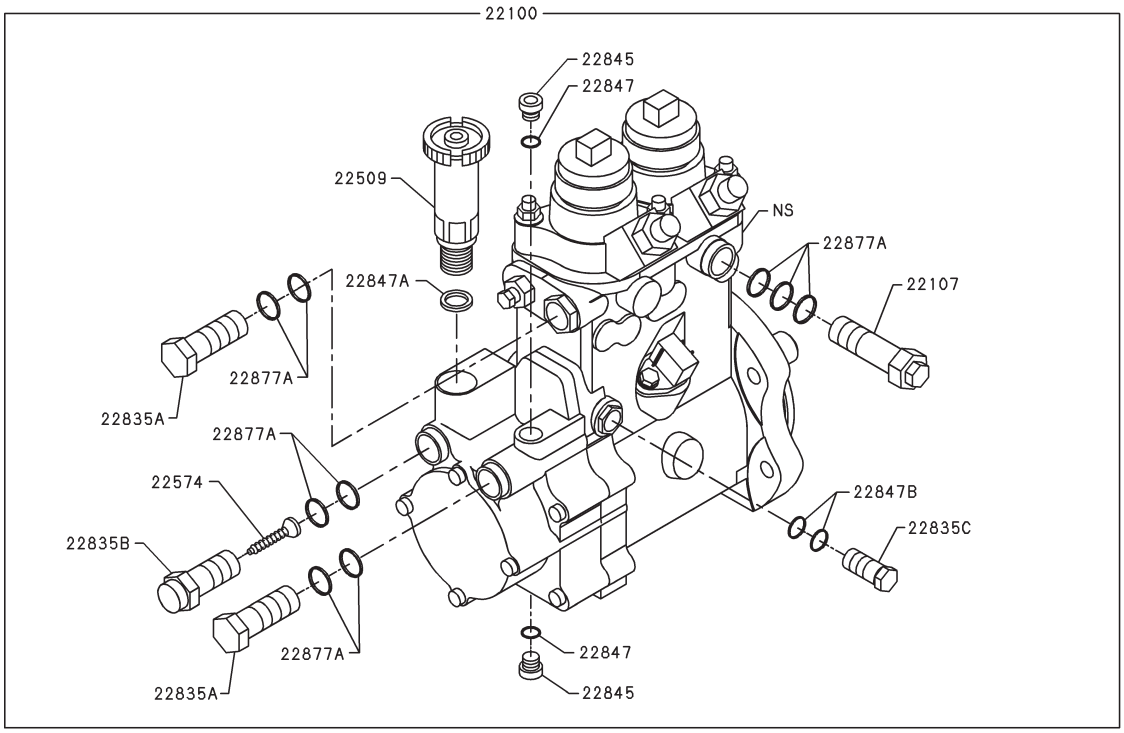
(2) Keep a little slack of the wire rope.

(3) When the wire is completely tense, make sure that the wire is firmly engaged with the engine hanger. Then, lift the engine slowly.

⚠ **CAUTION**

- **Work carefully so that the engine may not come in contact with the frame or other components.**



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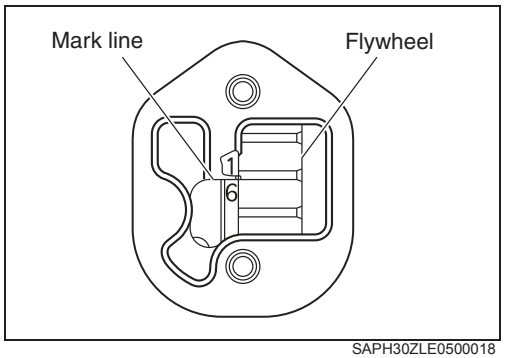
22100	Supply pump	22509	Priming pump



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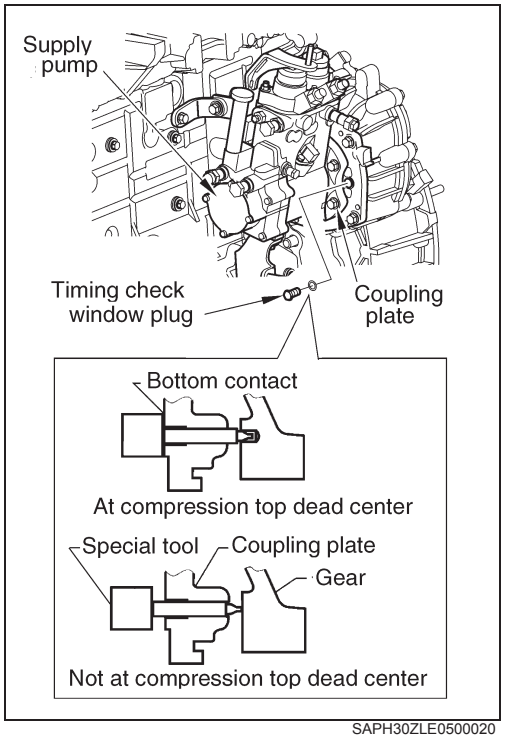

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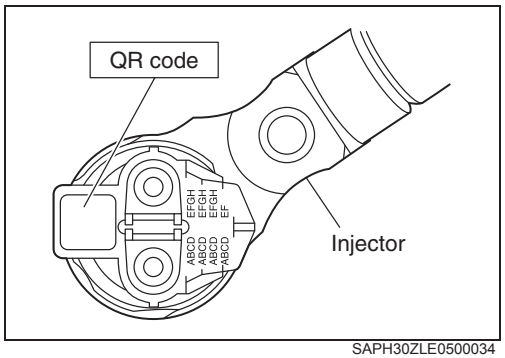
2. Compression top dead center setting for cylinder No. 1 (when the supply pump is installed)

(1) Turn the crankshaft in engine rotation direction (counterclockwise as seen from the flywheel side) and match the "1/6" mark line on the outer circumference of the crankshaft damper and the outer circumference of the flywheel with the pointer.

(2) Remove the timing check window plug and insert the special tool into the coupling plate for supply pump mounting. Cylinder No. 1 is at compression top dead center when the tool makes bottom contact.
If it does not make bottom contact, cylinder No. 6 is at compression top dead center. Rotate the crankshaft once more and confirm again with the special too

Special tool : S0951-22530 (09512-2530)
Injection Pump Tool



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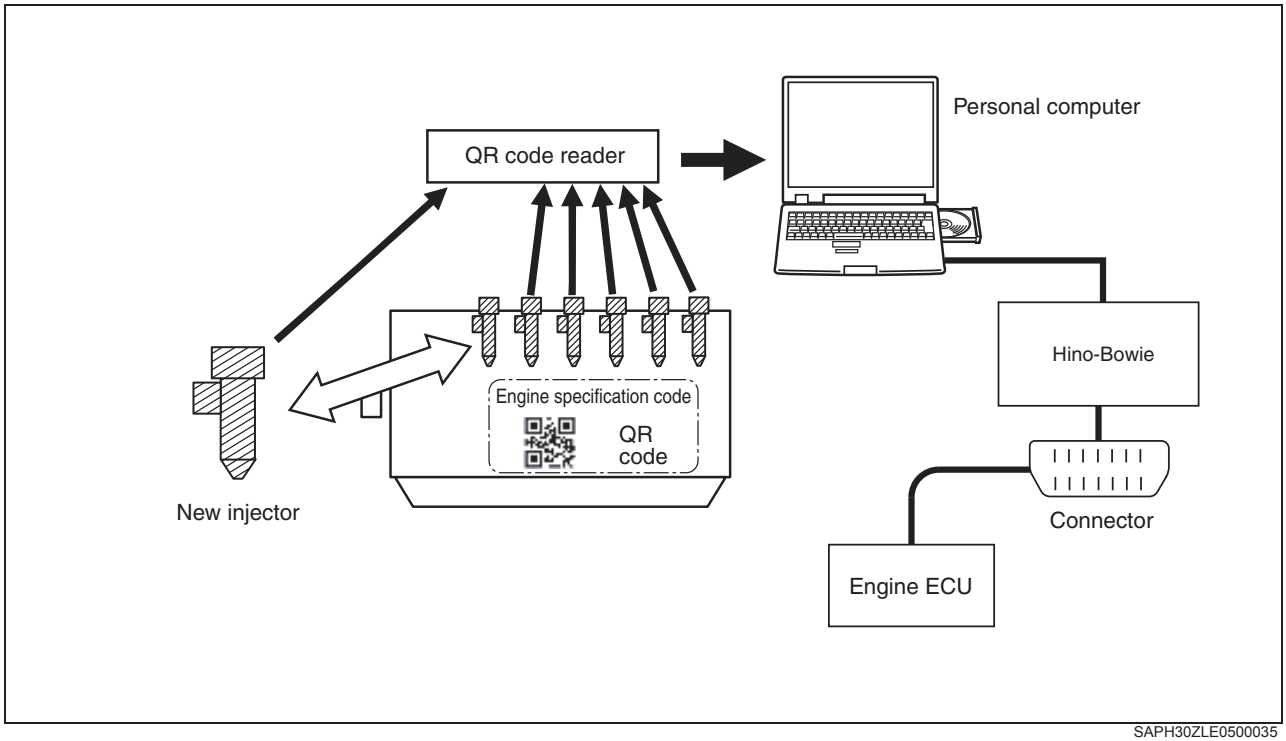
6. Writing of the injector compensation value to the engine ECU (writing by reprogramming)

⚠ CAUTION
- **When an injector has been replaced, the injector compensation value (QR code) listed for the injector must be written to the engine ECU. If the compensation value is not written correctly, this can cause engine trouble.**

NOTICE
- **PC tools and QR code reader can be used together for writing the injector compensation value.**
- **The work flow is described in the following, but refer to the HinoDX Instruction Manual for the detailed procedure.**

(1) Read the QR code of the injector with the scanner of the QR code reader and create a compensation data file.

(2) The injector compensation value is written from the personal computer to the engine ECU.



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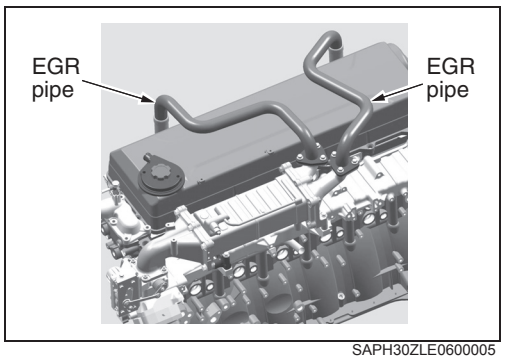

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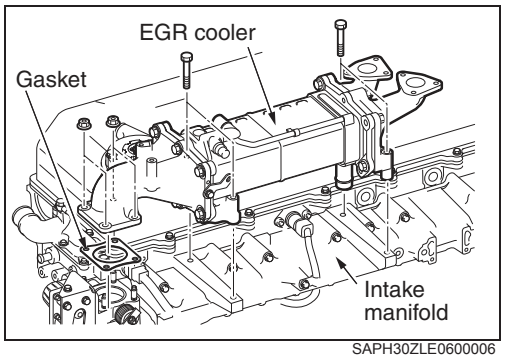
(4) Remove the bolts and the nuts and remove the gasket and the EGR pipes.



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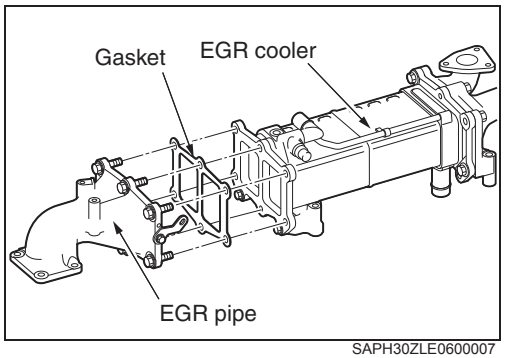
(5) Remove the bolts (4 pcs.) and nuts (4 pcs.), remove the gasket and EGR cooler from the intake manifold.



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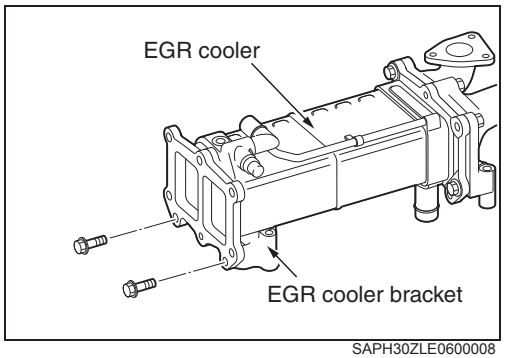
(6) Remove the bolts (6 pcs.), remove the EGR pipe and gasket from the EGR cooler.



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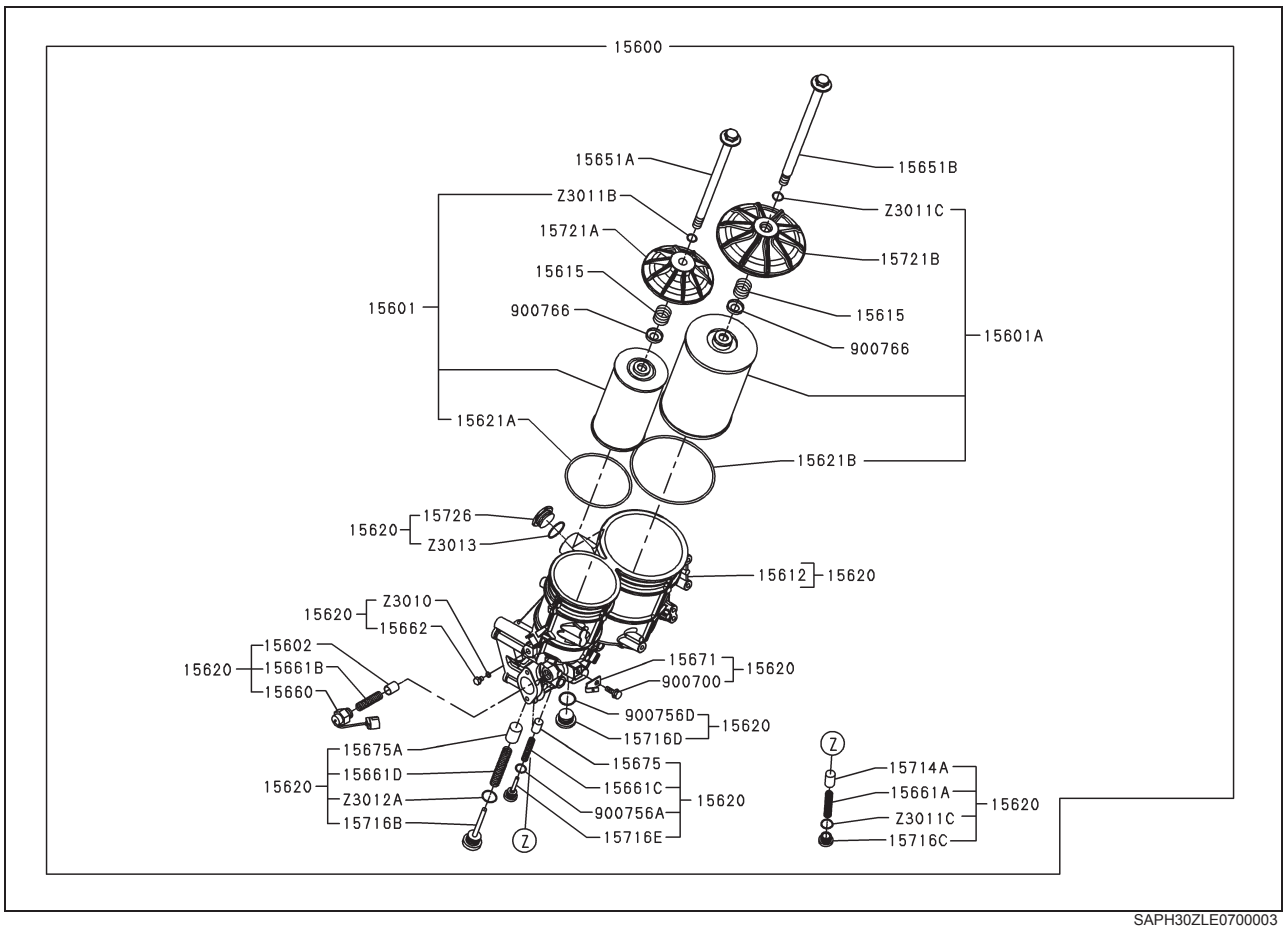
(7) Remove the bolts (2 pcs.), remove the EGR cooler bracket from the EGR cooler.



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15660	Oil filter warning switch	

*Parts not to be reused.

Tightening torque

15660	29.4±4.9N·m {300±50kgf·cm, 22±4 lbf·ft}	

Replacement of the alternator

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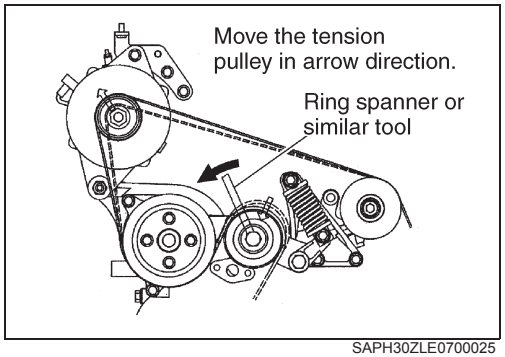

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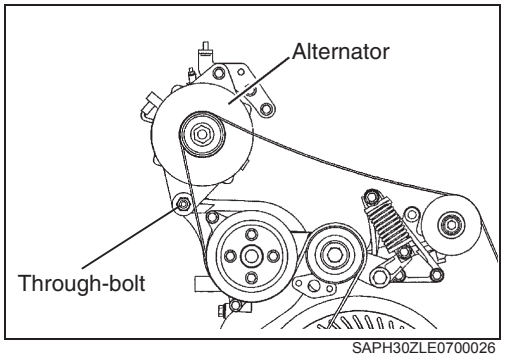
1. Removal of the V-ribbed belt

(1) Remove the negative battery terminal cable.

(2) Use a ring spanner to move the tension pulley slowly in arrow direction and remove the V-ribbed belt.

⚠ **CAUTION** • **Move the pulley slowly because the auto-tensioner has a built-in hydraulic damper.**



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2. Replacement of the alternator

(1) Remove the two bolts at the top and the bottom and take off the alternator.

(2) Install the upper part of the replacement alternator to the bracket and the lower side with through-bolts to the water pump.

Tightening torque
: 132N·m {1,350kgf·cm, 97 lbf·ft} (Through bolt)
: 55N·m {560kgf·cm, 40 lbf·ft} (Upper part)

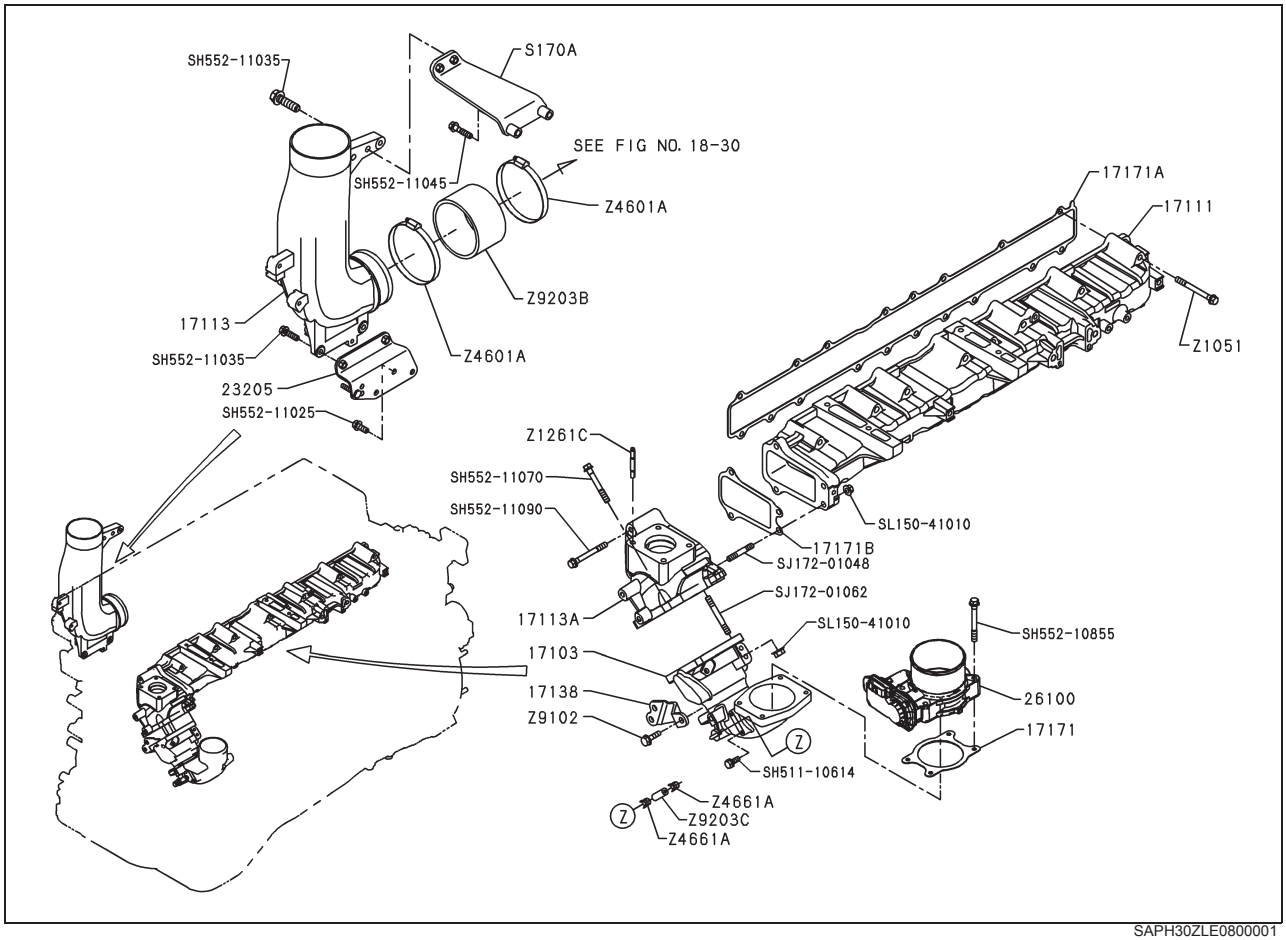
(3) Perform the following work and inspections after installation of the alternator.

- Check that the harness does not interfere with angled parts.
- Connect all connectors securely.
- Connect the negative battery cable securely to the negative terminal of the battery.
- Check the alternator rotation condition and the charging status.

Intake Manifold

Part layout

JP30ZLE080402001



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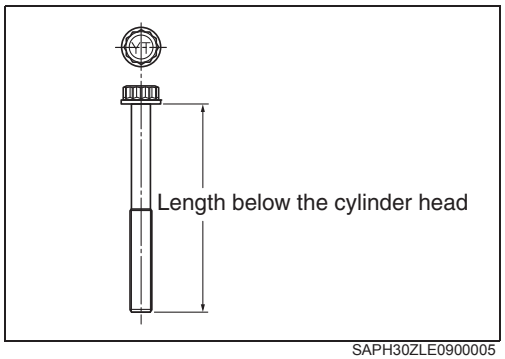
17103	Intake pipe	17171	Gasket*
17111	Intake manifold	17171A	Gasket*
17113A	Intake pipe	17171B	Gasket*
17138	Stay	26100	Intake throttle plate

*Parts not to be reused.

Tightening torque

SH552-11090	55N·m {560kgf·cm, 40 lbf·ft}	Z1051	55N·m {560kgf·cm, 40 lbf·ft}
SL150-41010	55N·m {560kgf·cm, 40 lbf·ft}	Z9102	28.5N·m {290kgf·cm, 21 lbf·ft}



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8. Cylinder head bolt length inspection

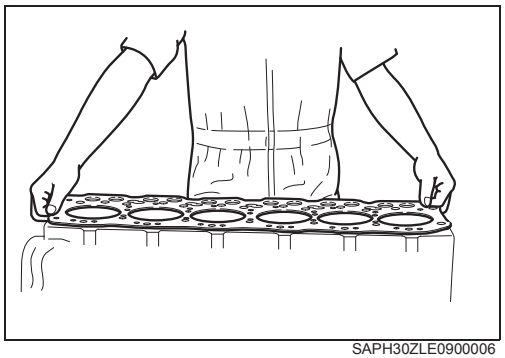
(1) Use vernier calipers to measure the length below the head of the cylinder head bolt, and replace the bolt by a new one if the operation limit is exceeded.

Standard value (mm{in.})	Operation limit (mm{in.})
158 {6.2205}	160 {6.2992}

9. Setting of compression top dead center for cylinder No. 1

(1) Set cylinder No. 1 to compression top dead center. **Refer to the "5 Fuel system, Fuel system, Replacement of the supply pump".**

10. Cylinder head installation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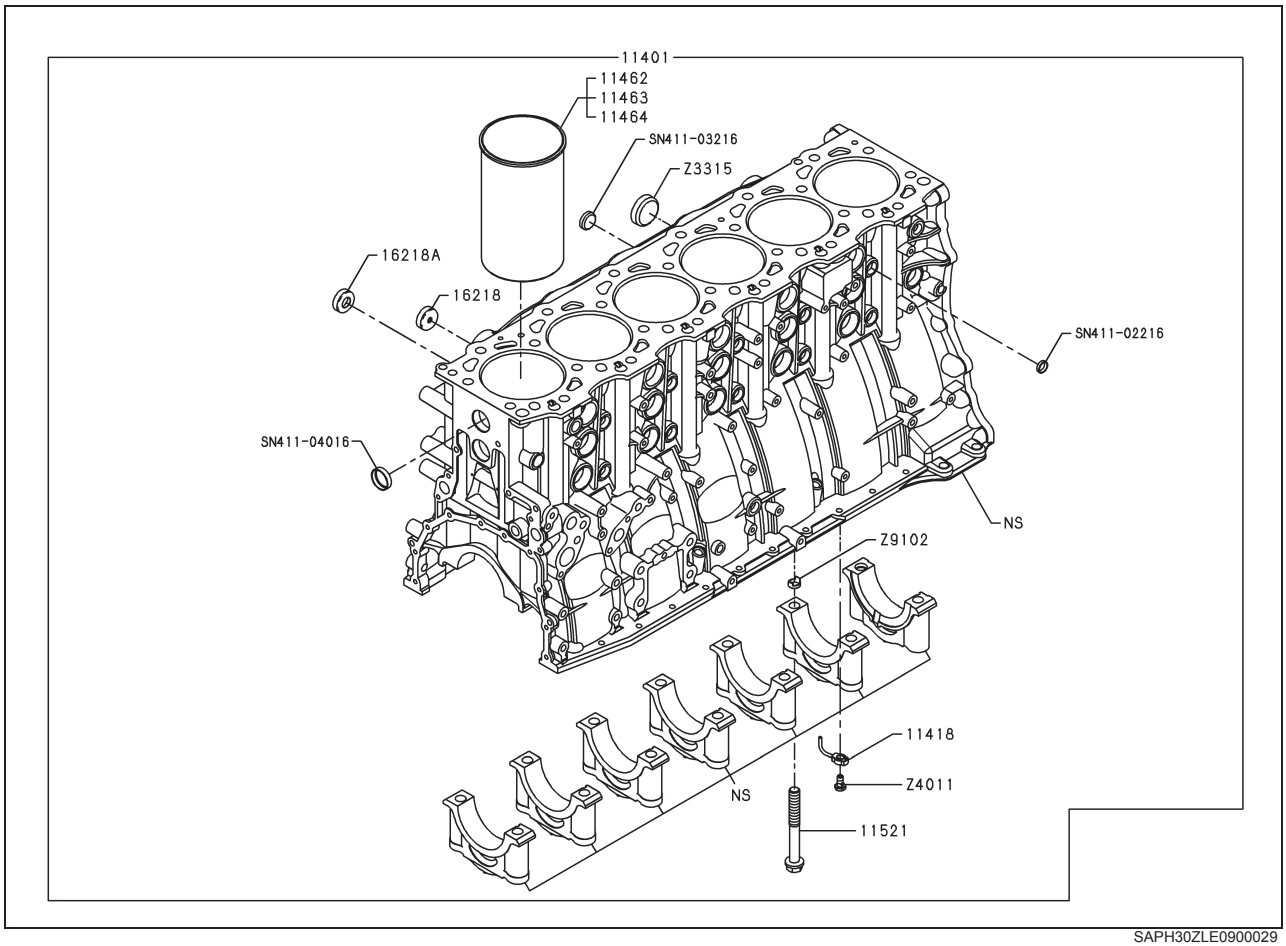
(1) Place a new head gasket onto the upper surface of the cylinder block.

⚠ **CAUTION**
- **Perform the work after removing any dirt, water, and oil from the mounting surfaces of cylinder head and cylinder block.**
- **Never reuse a gasket, as this may lead to engine destruction.**
- **Before installation of the cylinder head gasket, check that the seal ring has not dropped off and that there is no damage.**
- **Do not apply liquid gasket to each seal part.**

Cylinder Block

Part layout

JP30ZLE090402002



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11401	Cylinder block assembly	11463	Cylinder liner
11418	Cooling jet	11464	Cylinder liner
11462	Cylinder liner		

Tightening torque

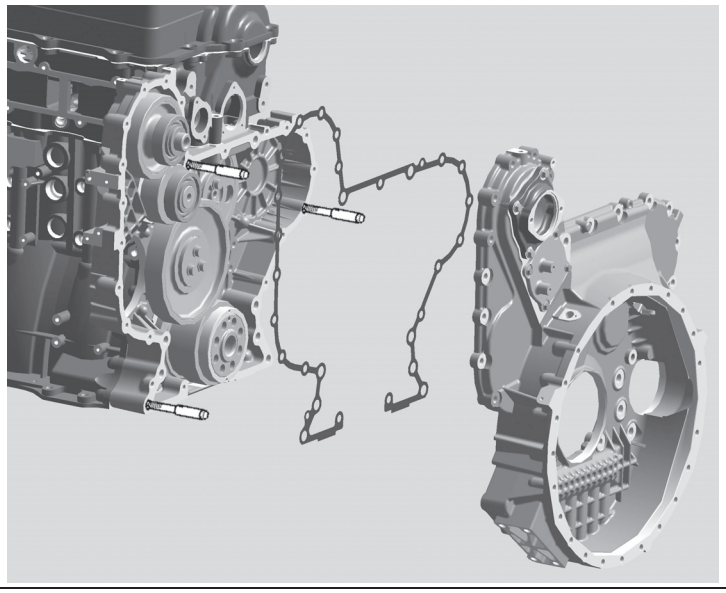
11521	127N·m {1,300kgf·cm, 94 lbf·ft}+90°+45°	Z4011	23N·m {235kgf·cm, 17 lbf·ft}

6. Flywheel housing installation

(1) Install some guide bolts to the timing gear case.

(2) Replace the gasket with a new one and install the flywheel housing straight through the guide bolts.

⚠ **CAUTION** • **Confirm that the connection surfaces and tap holes of the timing gear case and flywheel housing are free of burr, dirt, etc.**



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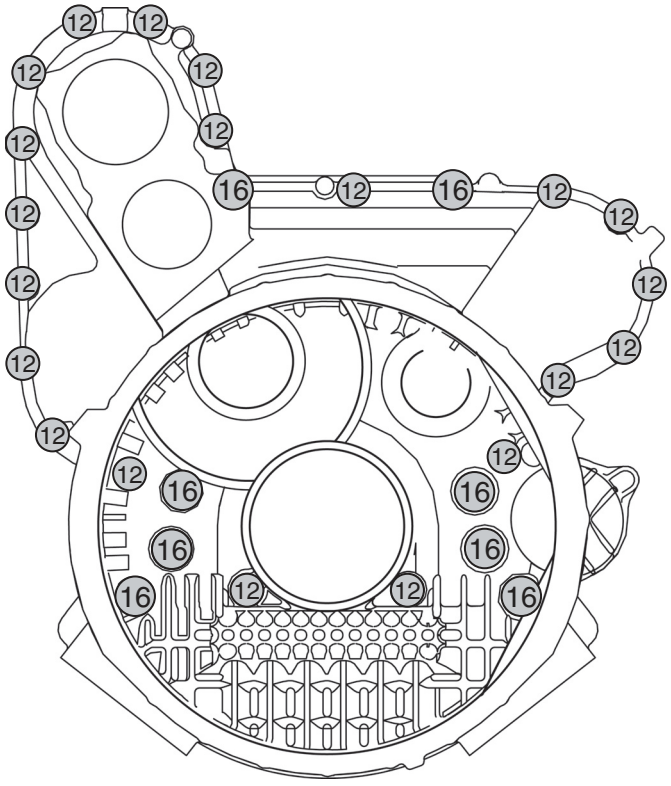
(3) Tighten the flywheel housing mounting bolts with a specified torque.

Tightening torque :

125N·m {1,270kgf·cm, 92 lbf·ft} (M12 Bolt)

225N·m {2,300kgf·cm, 166 lbf·ft} (M16 Bolt)



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Timing gear case replacement

1. Flywheel housing removal

(1) Remove the flywheel housing.
Refer to the "9 Engine mechanical, Timing gear cover and flywheel housing, Flywheel housing replacement".

2. Crankshaft rear oil seal removal

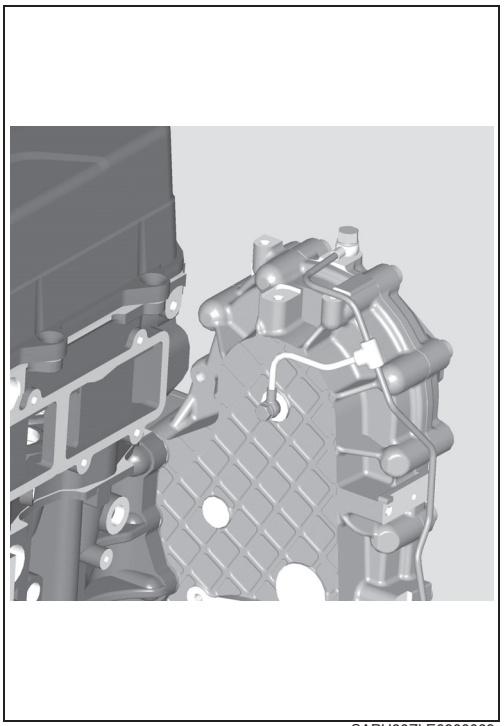
(1) Remove the crankshaft rear oil seal.
Refer to the "9 Engine mechanical, Timing gear cover and flywheel housing, Crankshaft rear oil seal replacement".

3. Timing gear removal

(1) Remove the timing gear.
Refer to the "9 Engine mechanical, Camshaft and idle gear, timing gear removal".

4. Timing gear case removal

(1) Remove the union bolts and take off the oil pipes and gasket from the timing gear case.



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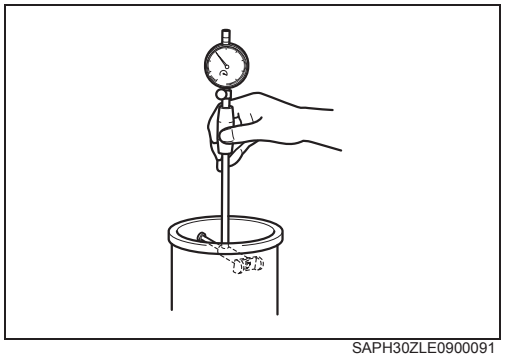
Inspection of piston and connecting rod

1. Piston clearance inspection

(1) Use a cylinder bore gauge and measure the inner diameter of the cylinder liner.



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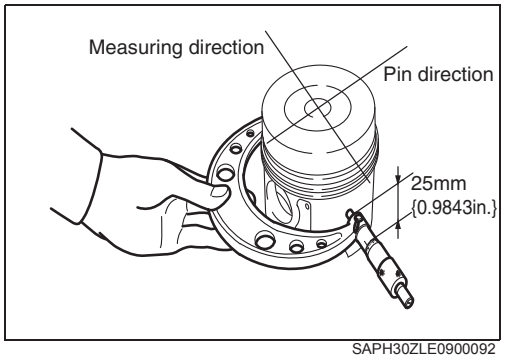
Standard value (mm{in.})	137 {5.3937}

(2) Use a micrometer and measure the outer diameter of the piston.



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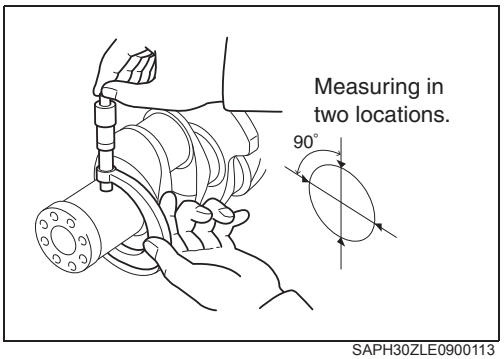
⚠ **CAUTION** • **The measuring position is 25 mm {0.9843in.} up from the bottom of the piston and at a right angle from the pin hole at the top.**

Standard value (mm{in.})	136.92 {5.3906}

(3) Calculate the difference between the inner diameter of the cylinder liner and the outer diameter of the piston, and replace the cylinder liner and the piston if the operation limit is exceeded.

Standard value (mm{in.})	Operation limit (mm{in.})
0.068-0.092 {0.0027-0.0036}	0.116 {0.0046}



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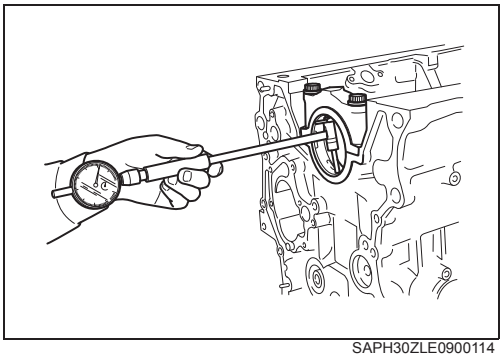
4. Crankshaft oil clearance inspection

(1) Use a micrometer and measure the outer diameter of the journal part of the crankshaft.

Standard value (mm{in.})	Operation limit (mm{in.})
108 {4.252}	107.8 {4.2441}

(2) Without installing the crankshaft, install the crankshaft bearings and the main bearing caps with the normal torque to the cylinder block.

(3) Use a cylinder bore and measure the inner diameter of the crankshaft bearing.

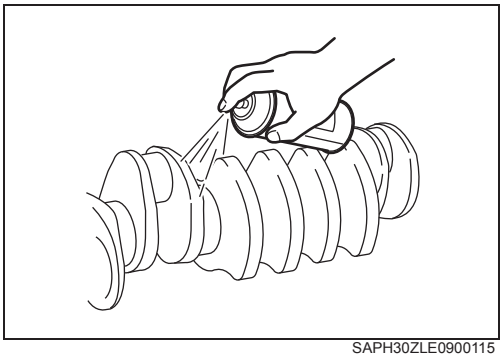

SAPH30ZLE0900114

(4) Calculate the difference between the outer diameter of the journal part of the crankshaft and the inner diameter of the crankshaft bearing. Replace the crankshaft bearing or the crankshaft if the operation limit is exceeded.

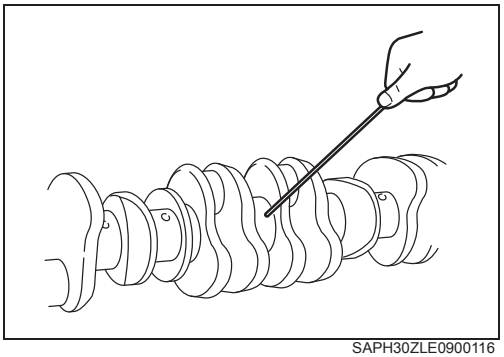
Standard value (mm{in.})	Operation limit (mm{in.})
0.054-0.110 {0.0021-0.0043}	0.3 {0.0118}

5. Crankshaft inspection for cracks and damage, oil hole inspection

(1) Use dye penetrant to inspect the crankshaft for cracks and damage. Replace the crankshaft in case of defects.


SAPH30ZLE0900115

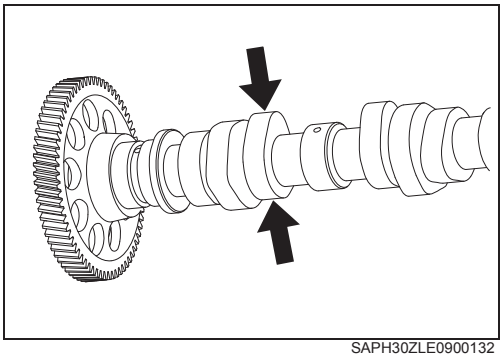
(2) Inspect the crankshaft oil hole for clogging. Replace the crankshaft in case of defects.


SAPH30ZLE0900116

Inspection of camshaft and camshaft bearing

1. Camshaft cam height inspection

(1) Use a micrometer to measure the cam height. Replace the camshaft if the operation limit is exceeded.

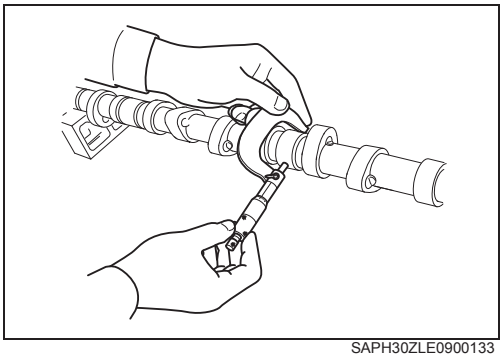


SAPH30ZLE0900132

Measurement item		Standard value (mm{in.})	Operation limit (mm{in.})
Cam height	IN	68.1 {2.6811}	67.3 {2.6496}
	EX	71.5 {2.8150}	70.7 {2.7834}
Cam lift	IN	8.1 {0.3189}	—
	EX	11.5 {0.4528}	—

2. Camshaft bearing oil clearance inspection

(1) Use a micrometer to measure the outer diameter of the camshaft journal part.

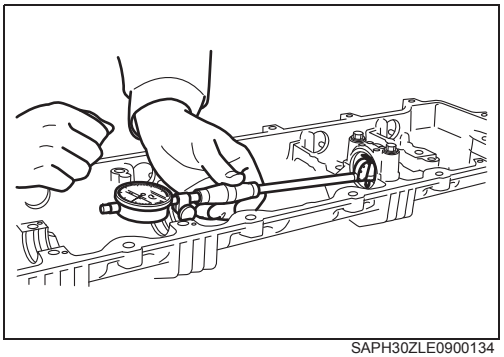


SAPH30ZLE0900133

Standard value (mm{in})	54.0 {2.1260}

(2) Install the cam cap with bearing to the cylinder head and tighten with the specified torque.
Tightening torque : 39N·m {400kgf·cm, 29 lbf·ft}

(3) Use a cylinder bore gauge and measure the inner diameter of the camshaft bearing.

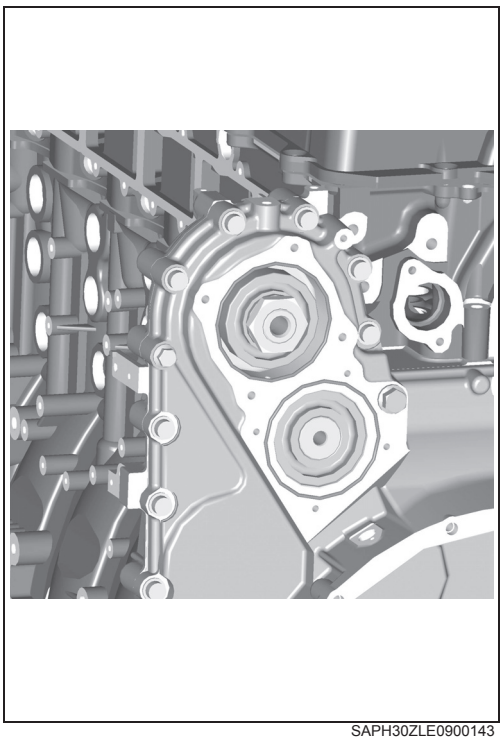


SAPH30ZLE0900134

Standard value (mm{in.})	54.0 {2.1260}

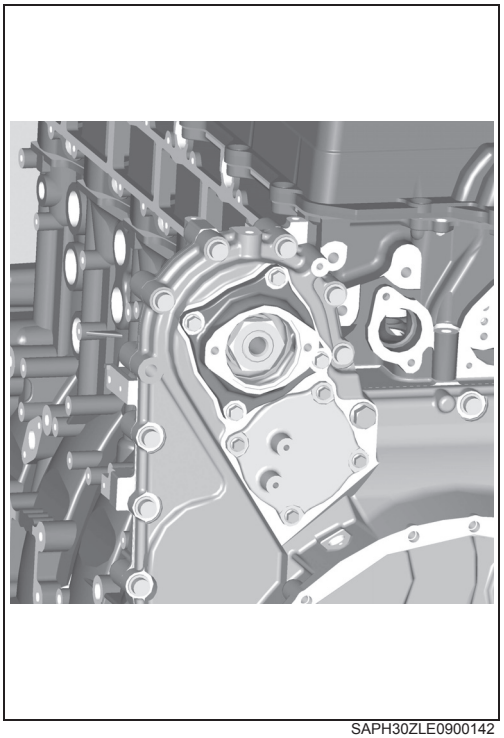
(4) Calculate the difference between the outer diameter of the camshaft journal and the inner diameter of the camshaft bearing. Replace the camshaft bearing if the operation limit is exceeded. If the operation limit is still exceeded, replace the camshaft.

Standard value (mm{in.})	Operation limit (mm{in.})
0.025-0.072 {0.0010-0.0028}	0.3 {0.0118}



SAPH30ZLE0900143

(5) Install new O-rings to the flywheel housing.



SAPH30ZLE0900142

(6) Install the flywheel PTO cover to the flywheel housing with bolts (4 pcs.).

Tightening torque : 55N·m {560kgf·cm, 40 lbf·ft}

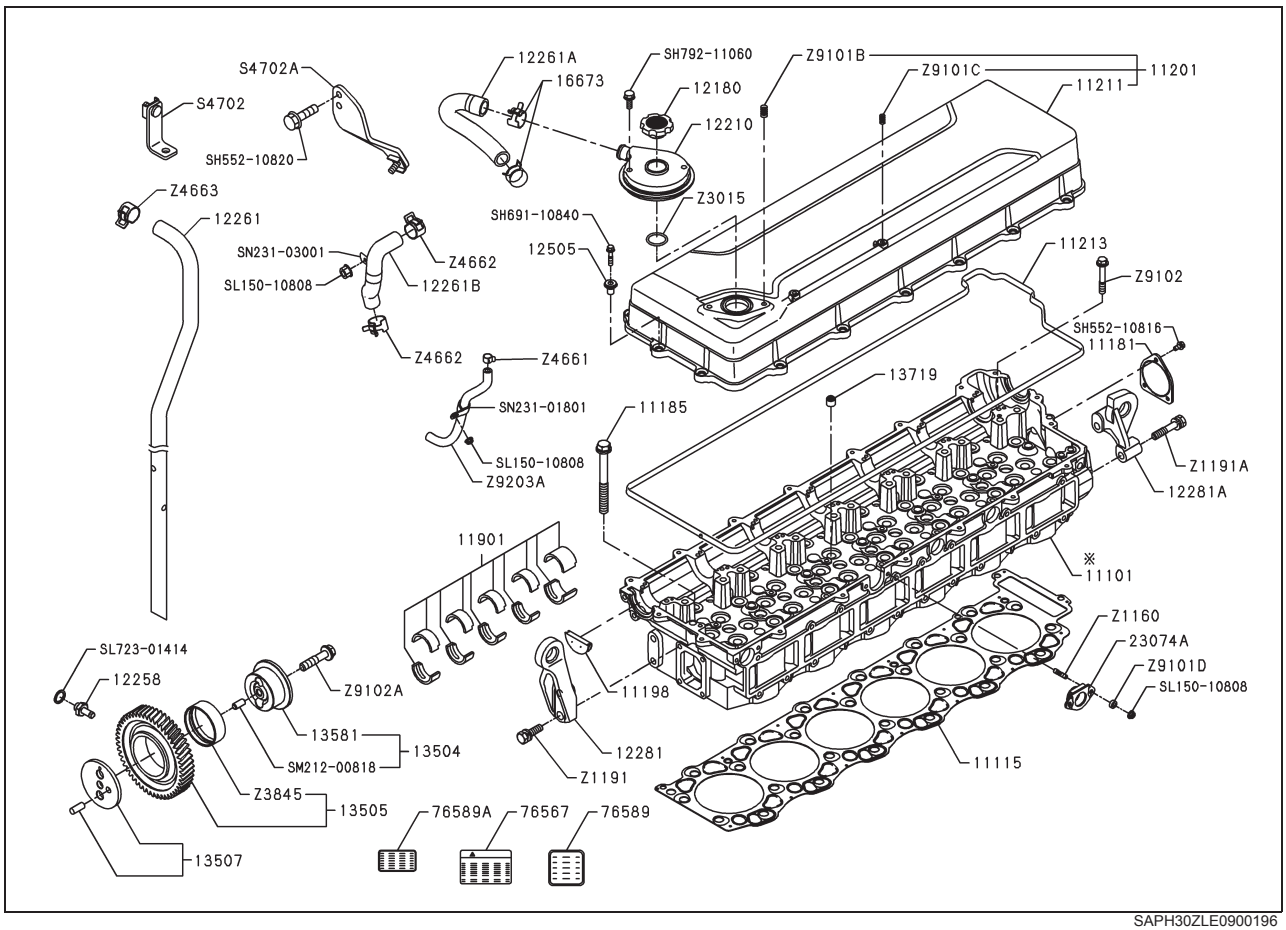
(7) Install the idle gear cover to the flywheel housing with bolts (4 pcs.).

Tightening torque : 28.5N·m {290kgf·cm, 21 lbf·ft}

2. Machine side oil pump installation

(1) Install the machine side oil pump.

Please refer to the workshop manual of your machine.



SAPH30ZLE0900196

13719	Valve stem seal*	

*Parts not to be reused.

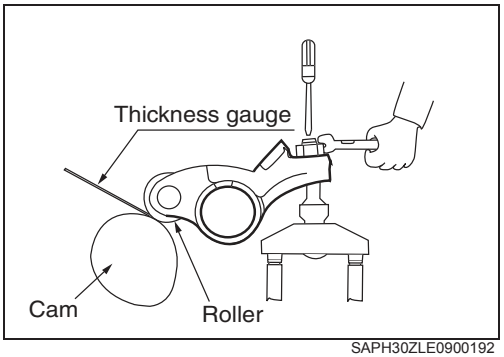
Valve clearance adjustment

JP30ZLE090703007

1. Caution items before adjustment

⚠ **CAUTION**

- **Before adjustment, confirm that head bolts and rocker support bolts have been tightened with the specified torque.**
- **Confirm that there is no dirt etc. on crosshead and valve stem head.**



SAPH30ZLE0900192

2. Valve clearance adjustment

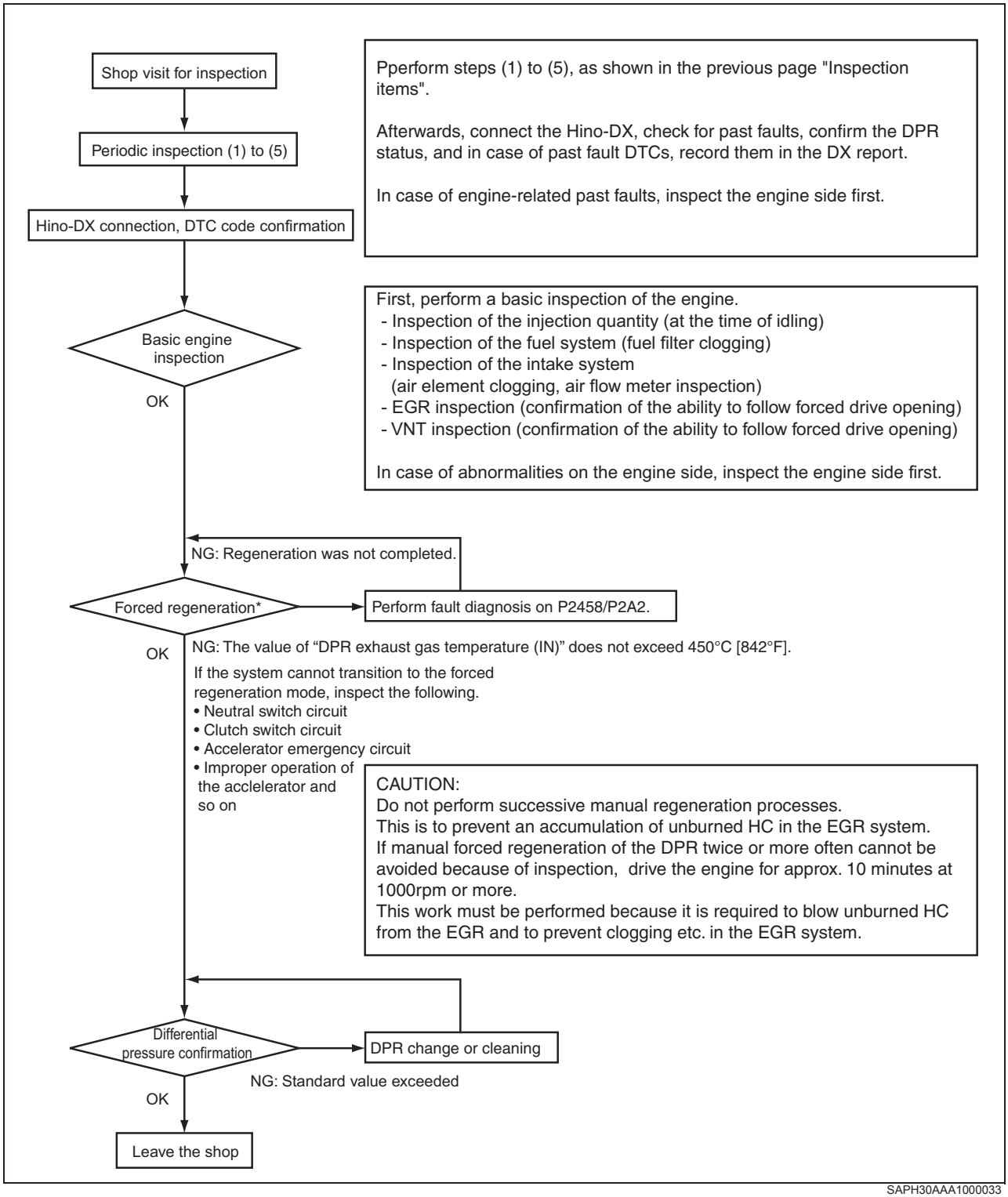
(1) Perform cranking until cylinder No. 1 or cylinder No. 6 is at compression top dead center.

(2) Insert a thickness gauge between rocker arm roller and cam, adjust the valve clearance according to the table, and tighten the lock nut.

Tightening torque : 69N·m {700kgf·cm, 51 lbf·ft}

Measurement item	Standard value (when cold)
Intake	0.28mm {0.0110in.}
Exhaust	0.49mm {0.0193in.}

DPR flow inspection regular situation



SAPH30AAA1000033

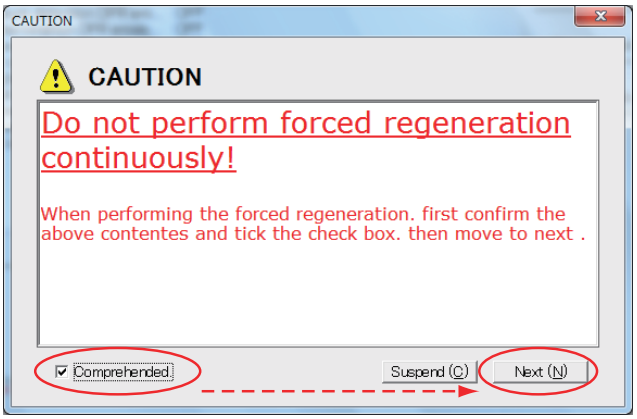
⚠ CAUTION

- *** "Forced regeneration" here aims to check the regeneration function of the DPR system. Inspect the temperature surrounding the DPR cleaner using the Hino-DX.**

NOTICE

- **DPR:Diesel Particulate active Reduction system**

(5) Verify the contents of the displayed caution note, set a check mark for "Comprehended", and then click the "Next (N)" button.



SAPH30AAA1000019

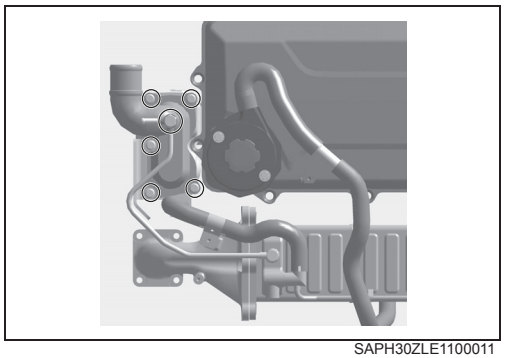
⚠ **CAUTION** • **If you continuously perform manual forced regeneration, perform a 10-minute scavenging drive before the next regeneration cycle.**

Inspection of thermostat

JP30ZLE110703004

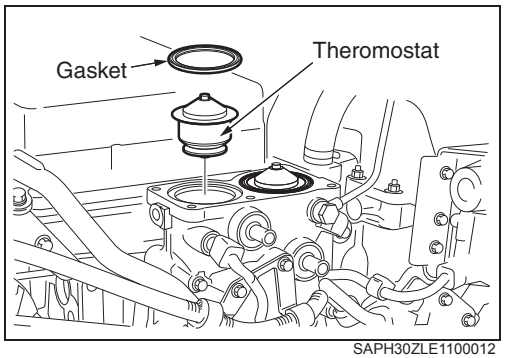
1. Thermostat removal

(1) Remove the air escape pipe and bolts (5 pcs.) at the EGR cooler, and remove the thermostat case cover from the thermostat housing.



SAPH30ZLE1100011

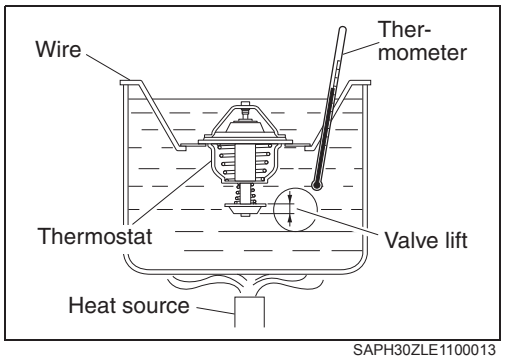
(2) Remove the thermostat housing from the thermostat and gasket.



SAPH30ZLE1100012

2. Individual inspection of thermostat

(1) Put the thermostat in water as shown in the figure and heat it.



SAPH30ZLE1100013

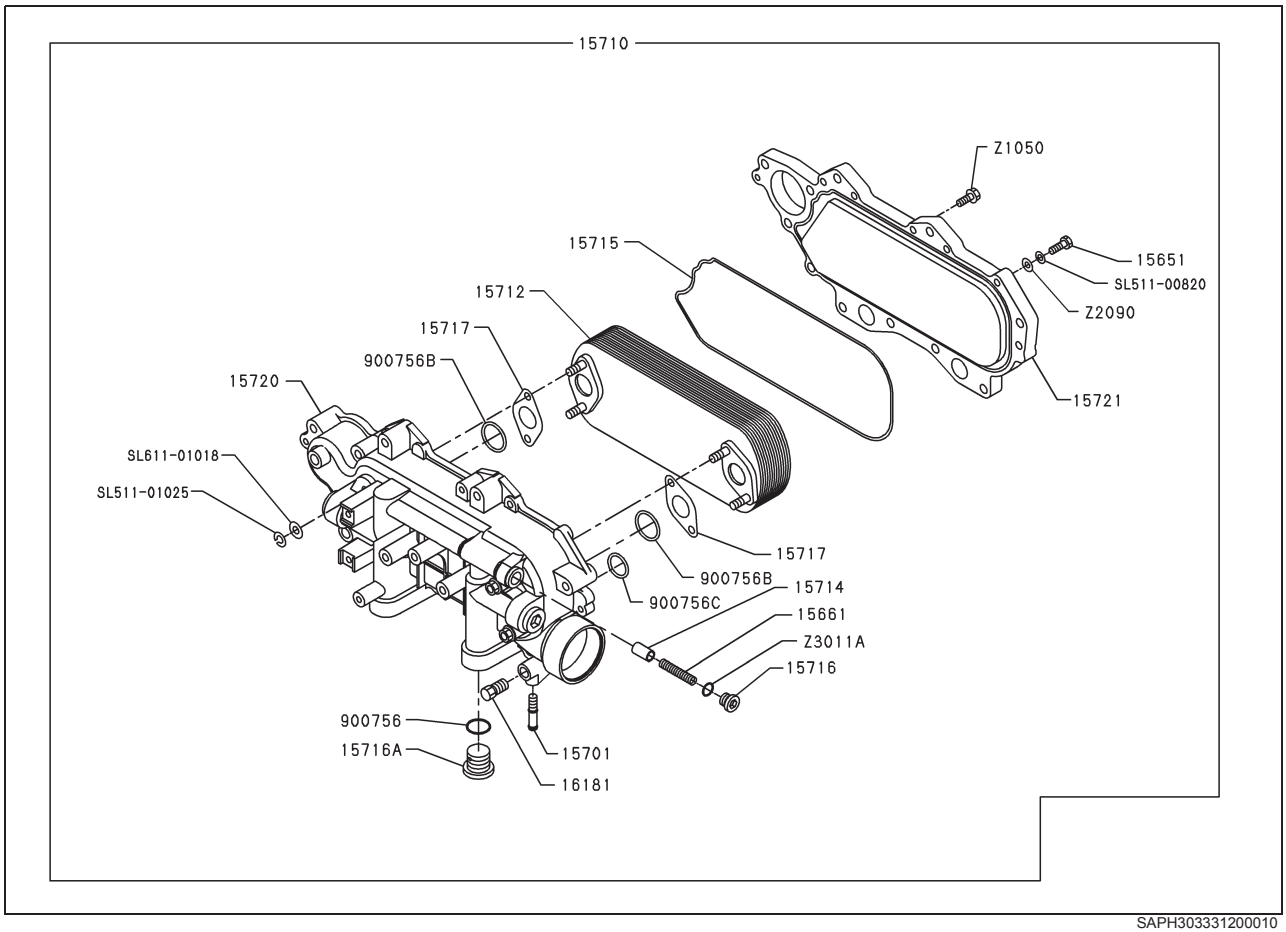
⚠ **CAUTION**

- **Support the thermostat in the center to prevent with the heat source.**
- **Stir the water well so that water temperature in the container is uniform.**

Oil Cooler

Part layout

JP30ZLE120402002



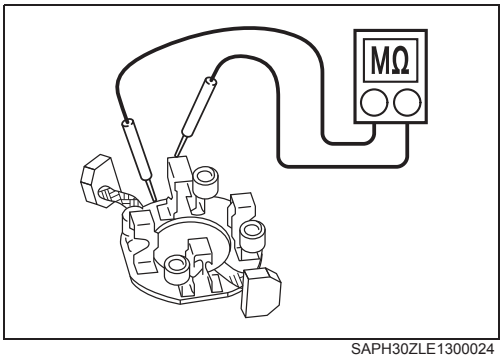
SAPH303331200010

15661	Spring	15720	Oil cooler case assembly
15710	Oil cooler assembly	15721	Oil cooler cover
15712	Oil cooler element	16181	Drain plug
15714	Safety valve	900756	O-ring*
15715	O-ring*	900756B	O-ring*
15716	Plug	900756C	O-ring*
15716A	Plug	Z3011A	O-ring*
15717	Gasket*		

*Parts not to be reused.

Tightening torque

15651	17.2±2.5N·m {175±25kgf·cm, 13±2 lbf·ft}	Z1050	17.2±2.5N·m {175±25kgf·cm, 13±2 lbf·ft}
15716	29.4±4.9N·m {300±50kgf·cm, 22±4 lbf·ft}		



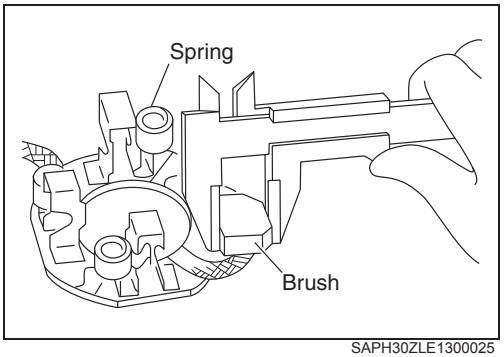
SAPH30ZLE1300024

3. Inspection of the holder assembly

(1) Measure the resistance between the holder and the plate using a megger tester and check insulation.

⚠ **CAUTION** • **After cleaning and drying, take measurements.**

Standard value (MΩ)	Operation limit (MΩ)
1 or above	0.5 or less



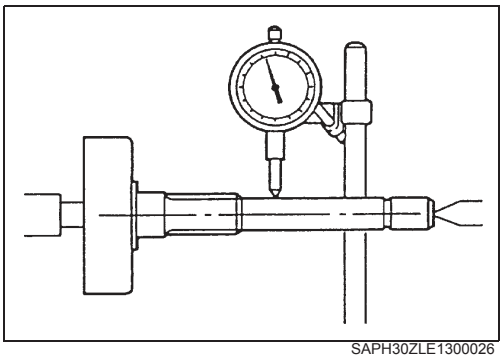
SAPH30ZLE1300025

(2) Measure the brush length using vernier calipers.

Standard value (mm{in.})	Operation limit (mm{in.})
22{0.866}	15{0.591}

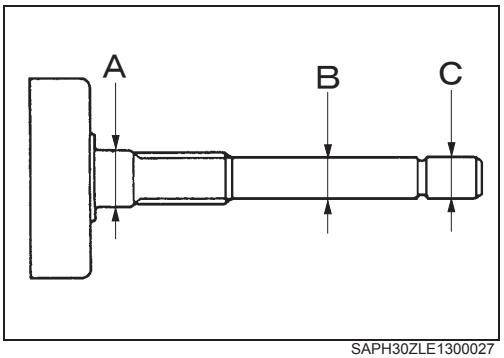
(3) Make sure that the spring has pressure.

4. Inspection of the shaft assembly


SAPH30ZLE1300026

(1) Rotate the shaft and inspect the shaft deflection at the center using a dial gauge and magnetic stand. If it is beyond the operation limit, replace the shaft.

Standard value (mm{in.})	Operation limit (mm{in.})
0.02{0.0008}	0.1{0.0004}



SAPH30ZLE1300027

(2) Measure the outer diameter of the shaft in the figure A, B, C using a micrometer.
When the value is beyond the operation limit, replace it.

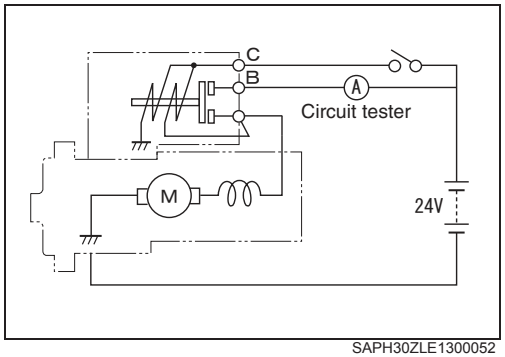
Measuring point	Standard value (mm{in.})	Operation limit (mm{in.})
Part A	28{1.1024}	27.90{1.0984}
Part B, C	19{0.7480}	18.92{0.7449} or less

Inspection after assembly

JP30333130703005

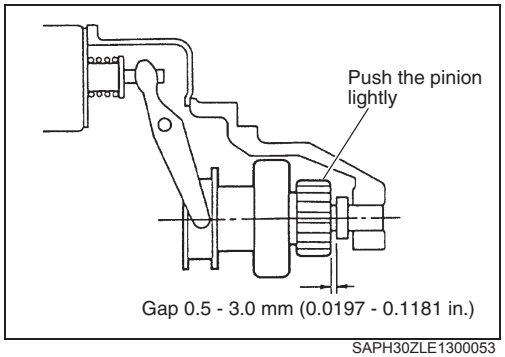
1. Inspection of the timing gear gap

NOTICE • **"The timing gap" means the pinion axial play at the shaft sub assembly were projected.**



SAPH30ZLE1300052

(1) Connect the batteries and switch S1, S2 as shown in figure.



SAPH30ZLE1300053

(2) Close the switch S1 and close switch S2.

(3) After the pinion was come out, open the switch S2 at once.

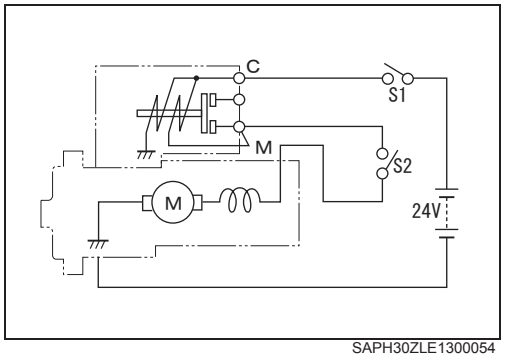
(4) After the rotation of the pinion stops complete, push the pinion lightly.

(5) Measure the distance between the position that returned from the position in which the pinion went out.

Standard value (mm {in.})	0.5 - 3.0 {0.0197 - 0.1181}

⚠ **CAUTION** • **Do the inspection in a short time (15 minutes).**

2. No-load test



SAPH30ZLE1300054

(1) Connect the circuit including a tester as shown in figure.

(2) Make sure that the pinion rotate powerfully at 120A ampere.

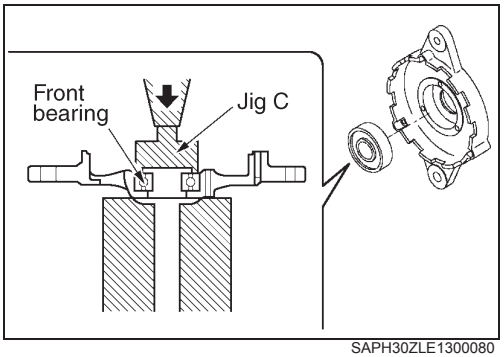
Assembly (60A)

JP30333130702002

1. Assembly of the drive end frame

⚠ **CAUTION**
- **Place a rubber mat and perform work on the mat.**

(1) Press fit a new front bearing into the drive end frame using a press and jig C.

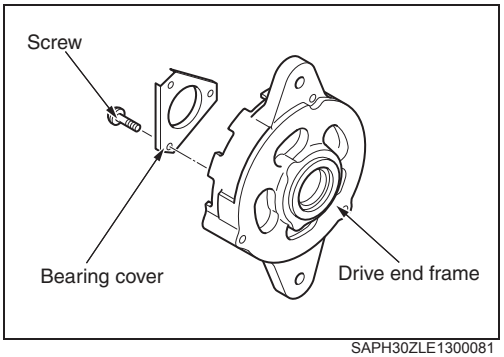


SAPH30ZLE1300080

⚠ **CAUTION**
- **Place jig C at the outer race of the front bearing.**

(2) Install the bearing cover to the drive end frame by screws (3pcs.).

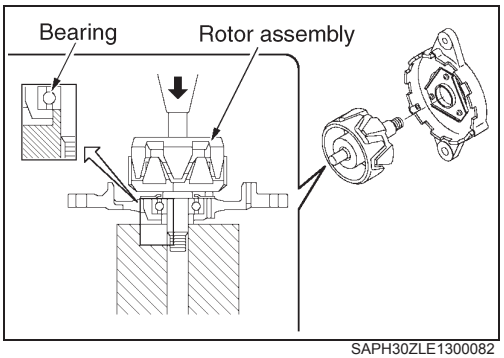
Tightening torque :
1.9 - 2.5 N·m {20 - 25 kgf·cm, 1.4 - 1.8 lbf·ft}



SAPH30ZLE1300081

(3) Press fit the rotor assembly to the drive end frame using a press.

⚠ **CAUTION**
- **Always fit the inner race part of the bearing when press-fitting.**
- **Do not damage the shaft.**



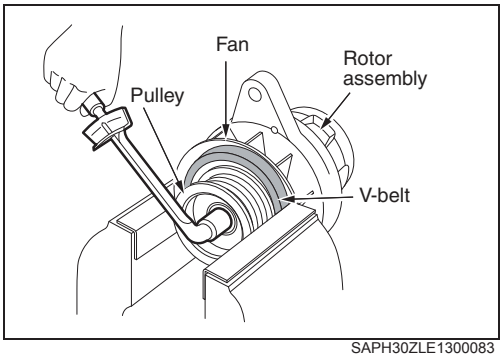
SAPH30ZLE1300082

(4) Tie around a general V-belt in the pulley groove and fix the pulley with a vice.

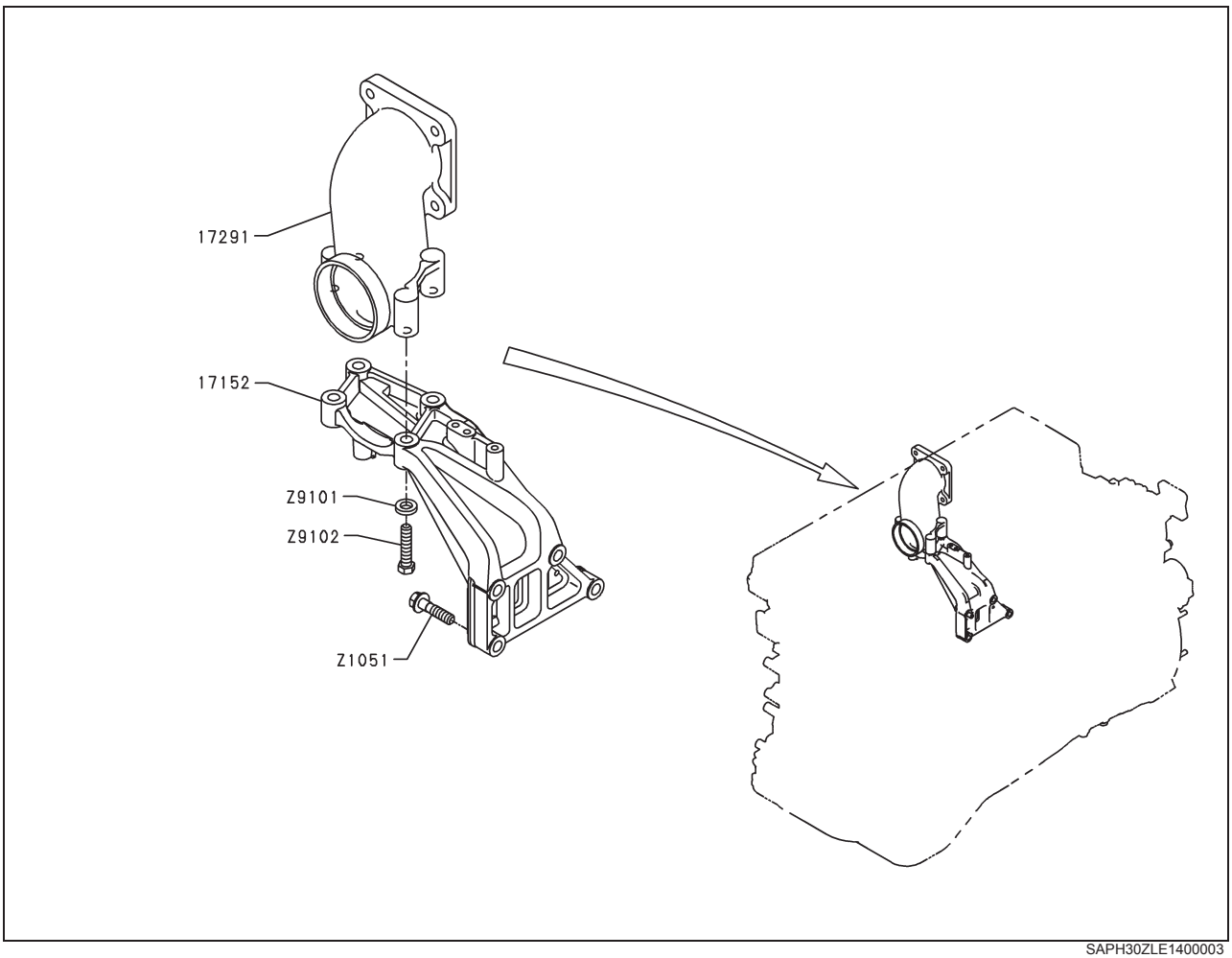
(5) Install the collar, fan and pulley on the shaft of the rotor assembly.

⚠ **CAUTION**
- **Do not reuse if outer frame of the pulley was damaged.**

Tightening torque :
127 - 157 N·m {1,300 - 1,600 kgf·cm, 94 - 116 lbf·ft}



SAPH30ZLE1300083



SAPH30ZLE1400003

17152	Exhaust connector bracket	17291	Exhaust connector

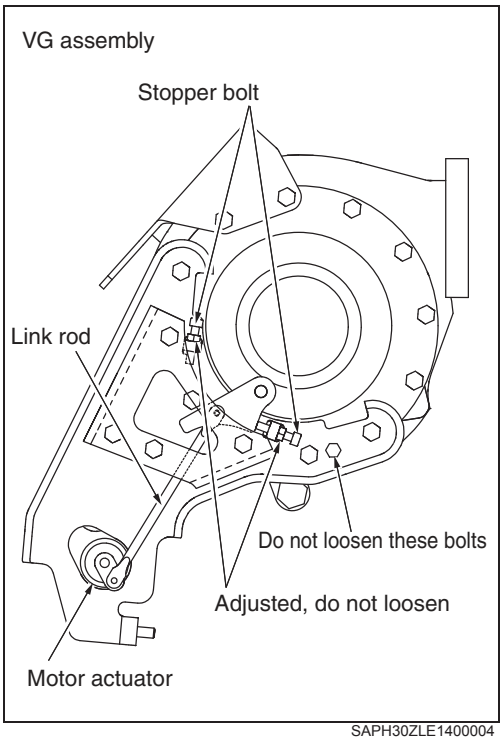
Tightening torque

Z1051	125N·m {1,275kgf·cm, 92 lbf·ft}	Z9102	125N·m {1,275kgf·cm, 92 lbf·ft}

5. Removal of turbocharger

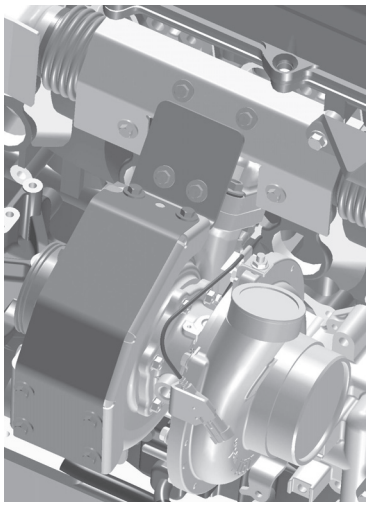
⚠ CAUTION

- **Remove the VG assembly together with the turbocharger body. Perform the work without touching the link rod and the stopper bolts.**
- **Do not remove the link rod of the motor actuator as it has been adjusted. If it is removed, the turbocharger function may be impaired.**
- **Do not remove the VG open/close stopper bolts as it has been set by the factory.**



SAPH30ZLE1400004

(1) Remove the insulator.



SAPH30ZLE1400024

DPR filter

JP31ZLE160601005

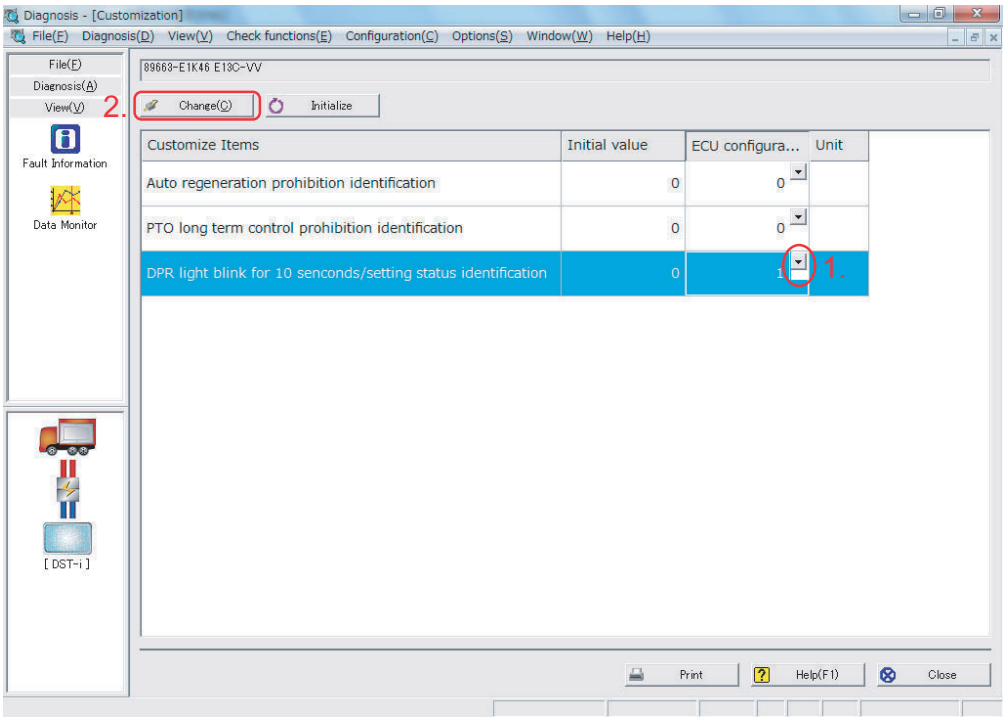
Status	Cause	Action
DPR damaged or melted	DPR filter was cracked	Replace DPR filter
	DPR filter was melted	Replace DPR filter

(1) Connect the Hino-DX to the machine and set the starter key to [ON].
(2) Start Hino-DX and confirm using "Configuration (C)" → "Customize (C)" that the value in the Initial value/ ECU configuration of "DPR light blinks for 10 seconds/setting status identification" is "1".

NOTICE

- **If the value is "0", use the following procedure to change the value to "1".**

1. **Click the "ECU configuration" field and change the value from 0 to 1.**
2. **After the change, click the "Change (C)" button.**
   - **When the "Change (C)" button is clicked, confirm that the value [1] of the set value turns blue.**
3. **Close Hino-DX once and set the starter key to "LOCK".**
4. **After 30 seconds, set the starter key to "ON" and connect the Hino-DX.**



SAPH31E051700250

Table of failure code

JP31E05170601001

NOTICE

- **The P0000 of "P0000 [00]" in this table indicates a SAE code, and [00] indicates a 2-digit code of TCCS.**
- **"Fuel rail" in this table indicates "common rail".**

SAE CODE	TCCS 2-DIGIT CODE	TROUBLE (Estimated failure cause)
P0045	35	Nozzle position sensor failure DC motor open circuit DC motor short circuit Nozzle stuck Nozzle operating range failure Initialization failure
P0049	34	Turbocharger overrun
P0087	76	Fuel system pressure control - low
P0088	76	Fuel system pressure control - high
P0088	69	Excessive common rail pressure
P0102	17	Air flow sensor fault (Low input)
P0103	17	Air flow sensor fault (High input)
P0108	25	Boost pressure sensor - out of range (Out of range high)
P0112	17	Intake air temperature sensor (built-in air flow sensor) - out of range (Out of range low)
P0113	17	Intake air temperature sensor (built-in air flow sensor) - out of range (Out of range high)
P0117	11	Engine coolant temperature sensor - out of range (Out of range low)
P0118	11	Engine coolant temperature sensor - out of range (Out of range high)
P0122	32	Intake throttle valve-opening sensor 1 out of range (Out of range low)
P0123	32	Intake throttle valve position sensor 1 out of range (Out of range high)
P0188	14	Fuel temperature sensor circuit low input
P0192	74	Fuel rail pressure sensor (main) - out of range (Out of range low)
P0193	74	Fuel rail pressure sensor (main) - out of range (Out of range high)
P0200	71	Fuel injector driver charge circuit - circuit (circuit high)
P0201	61	Fuel injector - open circuit (#1cyl)
P0202	62	Fuel injector - open circuit (#2cyl)
P0203	63	Fuel injector - open circuit (#3cyl)
P0204	64	Fuel injector - open circuit (#4cyl)

E

Intake throttle valve motor (+)		–		–		–		–		–		PCV 1		PCV 2		–		–	
E1	MOT+	E2	-	E3	-	E4	-	E5	-	E6	-	E7	SP1S	E8	SP2S	E9	-	E10	-

–		Air flow sensor (Power)		Sensor power supply 1		No.1, No.2, No.3 Fuel injector power supply (Main)		No.1 Fuel injector drive signal (Main)		No.2 Fuel injector drive signal (Main)		No.3 Fuel injector drive signal (Main)		No.4, No.5, No.6 Fuel injector power supply (Main)		No.4 Fuel injector drive signal (Main)		No.6 Fuel injector drive signal (Main)	
E11	-	E12	AFVB	E13	AVC1	E14	IJ1+	E15	INJ1	E16	INJ3	E17	INJ5	E18	IJ2+	E19	INJ2	E20	INJ4

Intake throttle valve motor (-)		–		–		–		–		–		PCV 1		PCV 2		–		–	
E21	MOT-	E22	-	E23	-	E24	-	E25	-	E26	-	E27	SPV1	E28	SPV2	E29	-	E30	-

–		–		Sensor power supply 2		No.1, No.2, No.3 Fuel injector power supply (Sub)		No.1 Fuel injector drive signal (Sub)		No.2 Fuel injector drive signal (Sub)		No.3 Fuel injector drive signal (Sub)		No.4, No.5, No.6 Fuel injector power supply (Sub)		No.4 Fuel injector drive signal (Sub)		No.6 Fuel injector drive signal (Sub)	
E31	-	E32	-	E33	AVC2	E34	I1+S	E35	IJ01	E36	IJ03	E37	IJ05	E38	I2+S	E39	IJ02	E40	IJ04

SAPH31E051700030

5	CHECK THE FUEL TANK FOR CLOGGING OF THE AIR HOLE AND THE REMAINING AMOUNT

1. Check the air hole for clogging.
2. Check if fuel is sufficiently supplied.

NG → • Clogging of the air hole
• Insufficient fuel supply

OK

6	CHECK THE SUPPLY PUMP FOR FUEL LEAKAGE

1. Check the supply pump for fuel oozing and leakage.

NG → Faulty supply pump

OK

7	MEASURING THE RESISTANCE BETWEEN TERMINALS

1. Set the starter switch to "LOCK".
2. Connect the signal check harness on the engine side.
3. Disconnect the connector on the engine ECU side.
4. Measure the resistance between the terminals.

Terminals to measure the resistance
SPV1 (E27) ↔ SP2S (E8)
SPV1 (E27) ↔ SPV2 (E28)
SP1S (E7) ↔ SP2S (E8)
SP1S (E7) ↔ SPV2 (E28)

Standard value : 7.65 - 8.15 Ω (20°C {68°F})

NG → Faulty supply pump

OK

7	CHECK A MALFUNCTION CODE

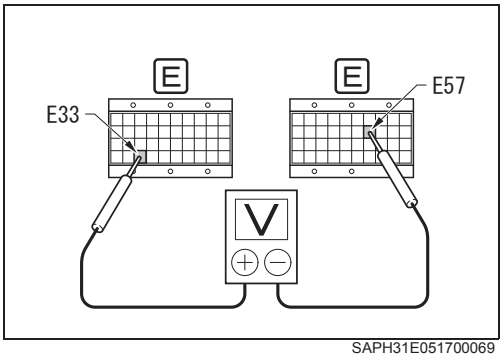
1. Connect the connector on the engine ECU side.
2. Set the starter switch to "ON".
3. Make sure that the malfunction code P0237 is displayed.

NG → Fault in engine ECU

OK

Clear and recheck the DTC

5	MEASURING THE VOLTAGE BETWEEN TERMINALS



SAPH31E051700069

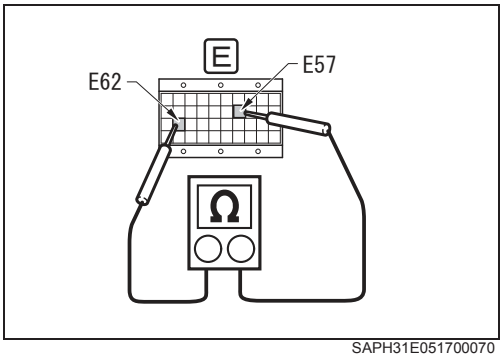
1. Connect the connectors on the engine ECU side.
2. Disconnect the connector on the engine sub harness side.
3. Set the starter switch to "ON".
4. Measure the voltage between the terminals AVC2 (E33) and AGD3 (E57).

Standard value: 4.5-5.5 V

NG
- Fault in engine ECU
- Faulty ECU connector

OK

6	MEASURING THE RESISTANCE BETWEEN TERMINALS



SAPH31E051700070

1. Measure the resistance between the terminals DTS1 (E62) and AGD3 (E57).

Standard value: Approx. 25-35 kΩ

NG
- Fault in engine ECU
- Faulty ECU connector

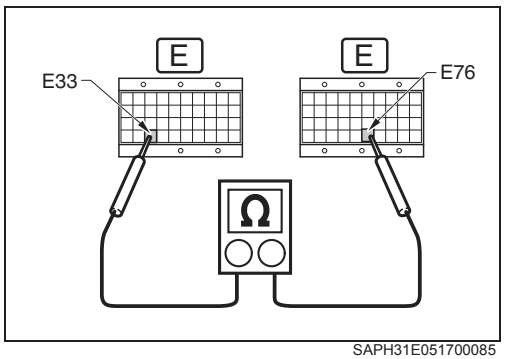
OK

Bad connectors contact

4	MEASURING THE RESISTANCE BETWEEN TERMINALS

1. Connect the signal check wiring harness on the engine side.
2. Disconnect the connector on the engine ECU side.
3. Measure the resistance between the terminals AVC2 (E33) and AGD2 (E76).

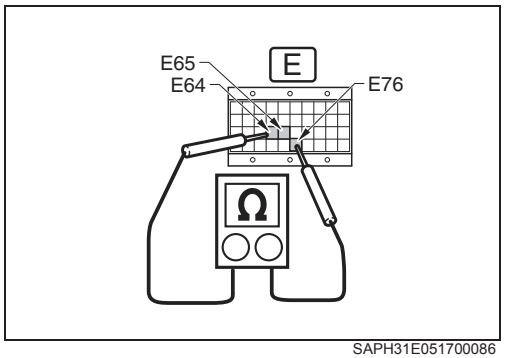
Standard value: 2 Ω or more



SAPH31E051700085

4. Measure the resistance between the terminals PCR3 (E64), PCR4 (E65) and AGD2 (E76).

Standard value: 2 Ω or more

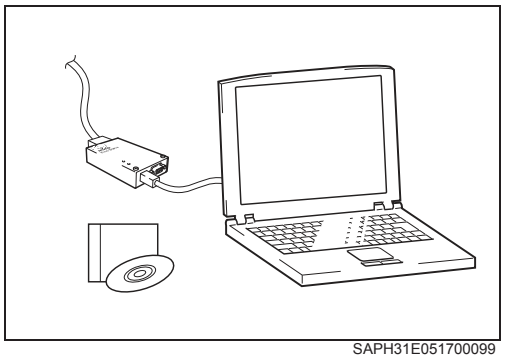


SAPH31E051700086

NG → Faulty fuel rail pressure sensor

OK

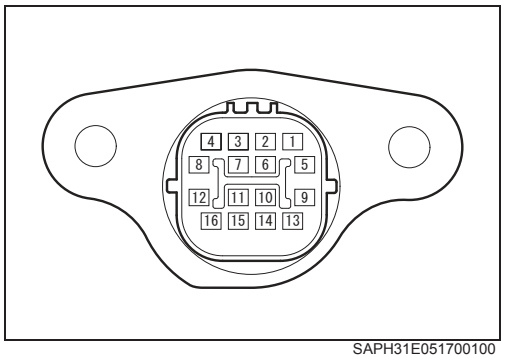
2	CHECK OF DIAGNOSIS CODE



SAPH31E051700099

1. Connect the ECU side connector of the signal check harness. Start the engine.
2. Erase the DTC memory with HinoDX, and recheck the DTC code.
3. If the same DTC is displayed, replace the engine ECU. If no DTC is displayed, a temporary failure may be occurred.

3	MEASURING THE RESISTANCE BETWEEN MAIN INJECTOR CONNECTOR TERMINAL



SAPH31E051700100

1. Disconnect the main injector connector that is located on the cylinder head.
2. Measure the resistance between the terminals of the main injector connector at cylinder head side (male) as shown below.

DTC code		Terminal to measure resistance
SAE code	TCCS 2-DIGIT code	
P0201	51	1↔2
P0202	52	9↔10
P0203	53	6↔8
P0204	54	5↔7
P0205	55	11↔12
P0206	56	3↔4

Standard value: 2kΩ or below

NG → Proceed to 4

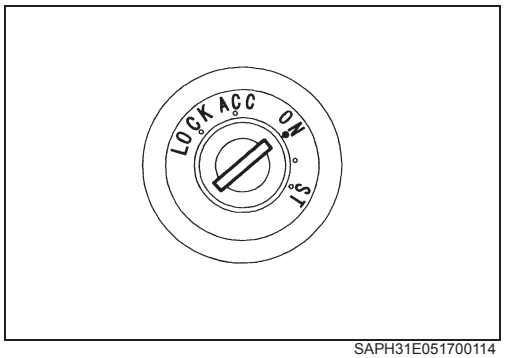
OK

Breakdown of the engine sub wiring harness (check the wiring harness between ECU and the main injector connector)

DTC code P0263 [61]
/Injection quantity and timing (#1cyl)
DTC code P0266 [62]
/Injection quantity and timing (#2cyl)
DTC code P0269 [63]
/Injection quantity and timing (#3cyl)
DTC code P0272 [64]
/Injection quantity and timing (#4cyl)
DTC code P0275 [65]
/Injection quantity and timing (#5cyl)
DTC code P0278 [66]
/Injection quantity and timing (#6cyl)

JP31E05170601023

1	CHECK THE FLOW DAMPER



SAPH31E051700114

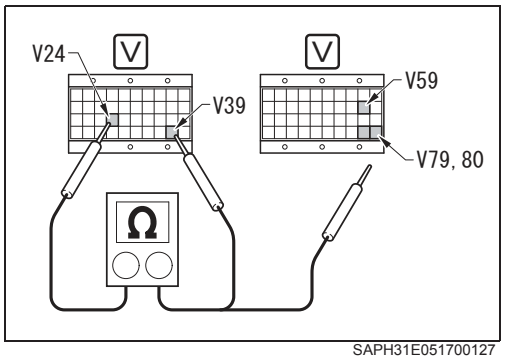
1. Turn the starter switch to "LOCK". Stop the engine.
2. Wait for about 30 seconds and then start the engine.
3. Perform the warm-up until the coolant temperature becomes 60°C {140°F} or higher.
   And then erase the DTC.
4. If the same DTC is displayed again after erasing it, replace the fuel rail.

DTC code P0540 [53]

/Air intake heater circuit malfunction

JP31E05170601028

1	MEASUREING THE RESISTANCE BETWEEN TERMINALS



SAPH31E051700127

1. Set the starter switch to "LOCK" and connect the signal check harness.
2. Disconnect the ECU side connector of the signal check harness and measure the resistance between terminals as shown below.

Terminal to measure the resistance	
+side	**-side**
V24	**V39, V59, V79, V80**

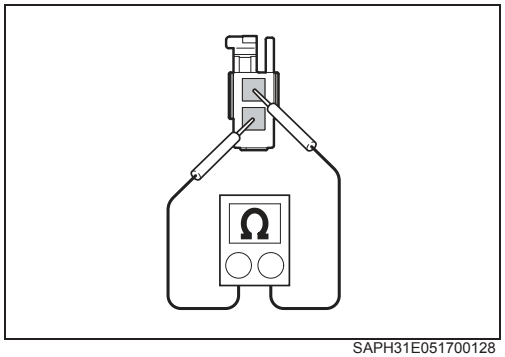
Standard value : 25±2.5 Ω

NG → Proceed to 2

OK →

Engine ECU failure, ECU connector failure

2	MEASUREING THE RELAY RESISTANCE



SAPH31E051700128

1. Remove the heater relay connector.
2. Measure the resistance between terminals 1 and 2 (parts side).

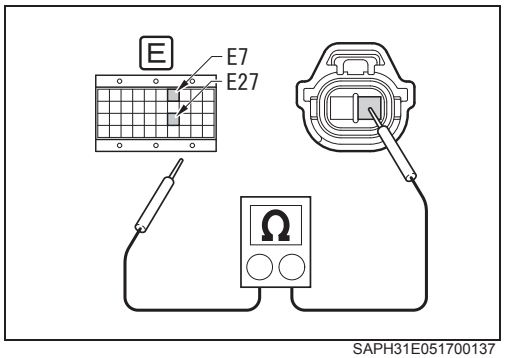
Standard value : 24.8 ± 0.8 Ω

NG → Heater relay failure

OK →

Wiring harness failure, connector failure

5	MEASURING THE RESISTANCE OF THE TERMINALS



SAPH31E051700137

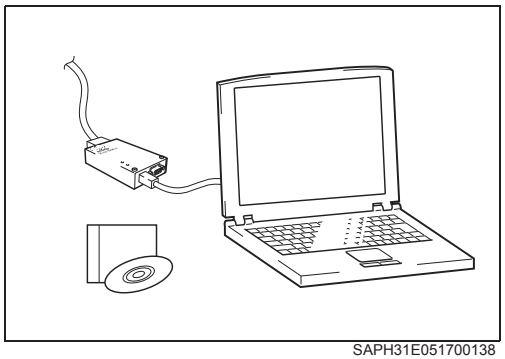
1. Set the starter switch to "LOCK".
2. Measure the resistance between E7, E27 terminals and terminal 2 of the supply pump magnetic valve 1 connector (engine sub harness side).

Standard value : 2Ω or less

NG → Faulty wiring harness between supply pump magnetic valve 1 and ECU

OK

6	CHECK THE DTC CODE

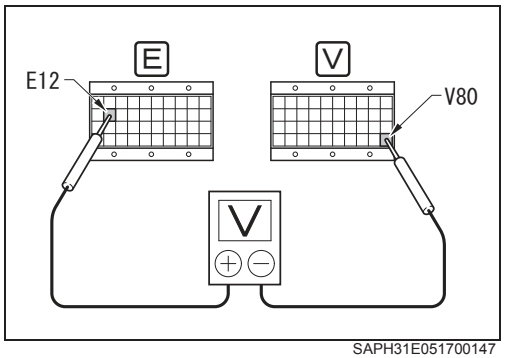

SAPH31E051700138

1. Connect all connectors, erase past DTC previously recorded data with HinoDX, recheck DTC code.

NOTICE

- **In case the connector connection is loose, erase the past DTC previously recorded data and recheck the DTC code again. If the same DTC code is displayed, restart the procedure from the beginning.**
- **Check the resistance for insulation between the supply pump magnetic valve 1 and the engine GND or battery GND terminal, etc.**

3	MEASURING THE VOLTAGE BETWEEN TERMINALS



SAPH31E051700147

1. Set the starter switch to "ON".
2. Measure the voltage between the terminals AFVB (E12) and PGD4 (V80).

Standard value: 11.5-13.5 V

NG → Fault in engine ECU

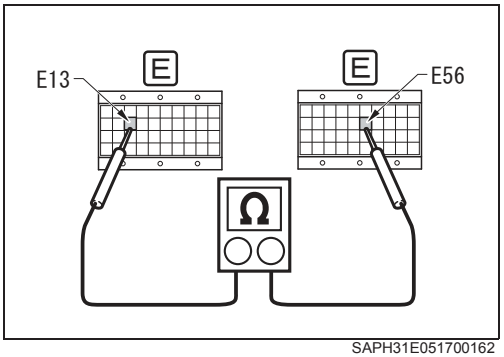
OK

Faulty ECU connector
Fault in wiring harness

4	MEASURING THE RESISTANCE BETWEEN TERMINALS

1. Connect the signal check harness on the engine side.
2. Disconnect the connector on the engine ECU side.
3. Connect the fuel rail pressure sensor connector.
4. Measure the resistance between the terminals AVC1 (E13) and AGD1 (E56).

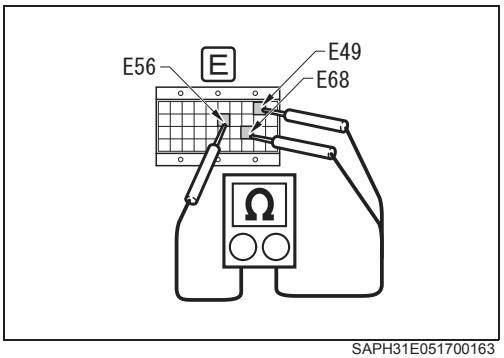
Standard value: 2 Ω or more



SAPH31E051700162

5. Measure the resistance between the terminals PCR1 (E49), PCR2 (E68) and AGD1 (E56).

Standard value: 2 Ω or more

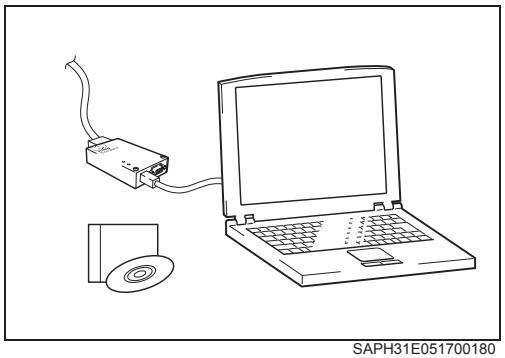


SAPH31E051700163

NG → Fault in fuel rail pressure sensor

OK

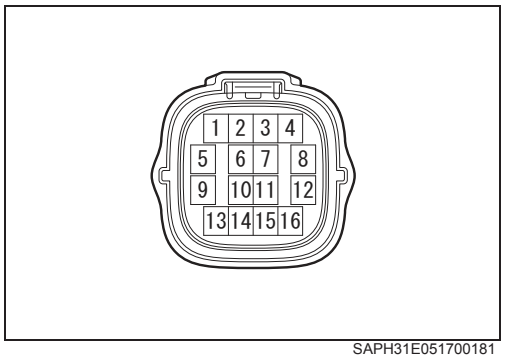
2	CHECK DTC CODE



SAPH31E051700180

1. Connect the signal check harness connector on the ECU side.
2. Start the engine, erase past DTC code with HinoDX.
3. If the same DTC is displayed, replace the engine ECU. If no DTC is displayed, a temporary failure may have occurred.

3	MEASURING THE RESISTANCE BETWEEN INJECTOR TERMINALS



SAPH31E051700181

1. Set the starter to “LOCK“.
2. Disconnect the main injector connector located on the cylinder head.
3. Measure the resistance between the terminals of the main injector connector (engine sub harness side) as shown below.

DTC code		Terminal to measure	
SAE code	**TCCS 2-DIGIT code**	**+side**	**-side**
P1211	**57**	**1, 2, 6, 8, 9, 10**	**ECU case GND**
P1214	**58**	**3, 4, 5, 7, 11, 12**	**ECU case GND**

Standard value : ∞ Ω

NG

Fault in wiring harness
A wiring harness is defective when its resistance value is out of standard.

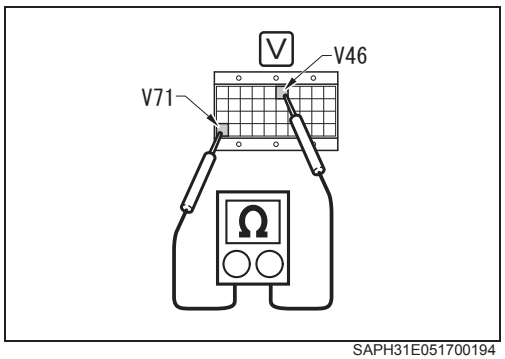
OK

Check the wiring harness in the head cover
(A short-circuit may occur between the wiring harness in the head cover and the GND line)

3	MEASURING THE RESISTANCE BETWEEN TERMINALS

1. Disconnect the connector on the engine ECU side.
2. Disconnect the differential pressure sensor.
3. Measure the resistance between the terminals AVC5 (V71) and ADG9 (V46).

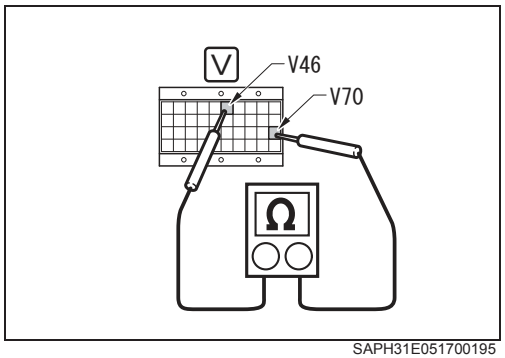
Standard value: ∞ Ω



SAPH31E051700194

4. Measure the resistance between the terminals EXPS (V70) and AGD9 (V46).

Standard value: ∞ Ω



SAPH31E051700195

NG
- Fault in wiring harness
- Irregular contact of connector

OK

DTC code P1601 [2]

/Fuel Injector adjustment data error

JP31E05170601056

1	CHECK THE INJECTOR REPLACED RECORD

1. Check the injector replaced record.
   Standard
   No replace record : Go to OK
   Replaced record was found, or not clear : Go to NG

NG → Proceed to 3

OK

2	INSPECTION OF THE QR CODE

1. Re-input the registration QR code date of the service server.
2. Erase the DTC memory, and recheck the DTC code.
   Verify that DTC code P1601 [2] is not displayed.
   Standard
   Not displayed

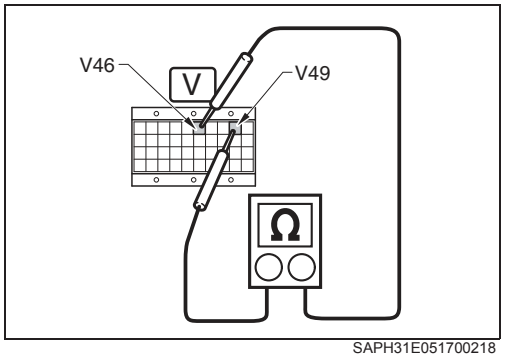
NG → Proceed to 3

OK

Normal

3	MEASURING THE RESISTANCE BETWEEN TERMINALS

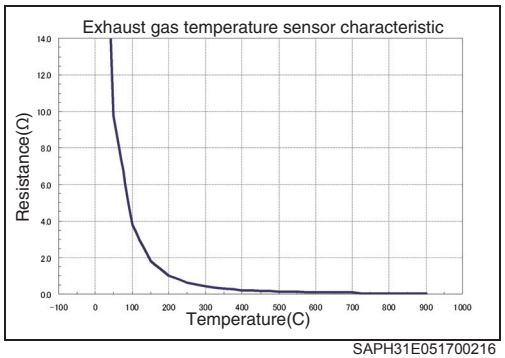
1. Set the starter switch to "LOCK".
2. Connect the signal check harness on the unit side.
3. Disconnect the connector on the engine ECU side.
4. Measure the resistance between the terminals ET2+ (V49) and ADG9 (V46).



SAPH31E051700218

Standard value

Resistance	Temperature (°C{°F})
9.75 kΩ	**50 {122}**
3.77 kΩ	**100 {212}**
1.80 kΩ	**150 {302}**



SAPH31E051700216

NG

- Faulty exhaust gas temperature sensor (DPR outlet)
- Fault wiring harness
- Faulty sensor connector

OK

Fault in engine ECU

DTC code P244A [91]

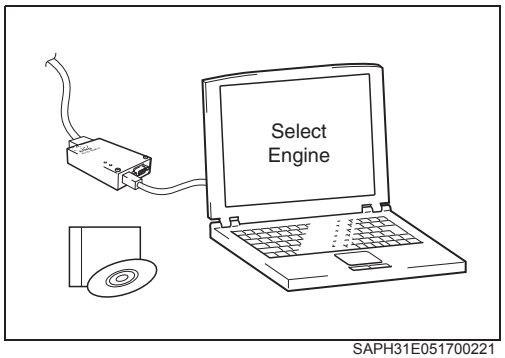
/Filtering performance (missing substrate)

JP31E05170601063

NOTICE

- **DPR: Diesel Particulate active Reduction system, which is known as DPF (Diesel Particulate Filter)**

1	Check the DTC detected (Engine) [Hino-DX]



SAPH31E051700221

1. Set the starter switch to "LOCK" position.
2. Connect the machine to Hino-DX.
3. Set the starter switch to the "ON" position.
4. Select [Engine] and check if DTC code has been detected.
   Standard: Only the DTC code "P244A" is displayed.

NO > Should any other code(s) be displayed, repair the malfunction the relevant code(s) indicate before proceeding to the next step.

YES

2	Inspection of the DPR differential pressure pipe and hose

1. Check the differential pressure pipe and hose for clogging.
   Standard: The absence of clogging

NO > Repair or replace, proceed to the step 3.

YES

6	Inspect the injector [Hino-DX]

Check the injection quantity and the rotational fluctuation.

1. Start the engine.
2. Select [Injection quantity] from the [Data Monitor] menu and measure the injection quantity.
3. Select [Engine speed] from the [Data Monitor] menu and measure the rotational fluctuation.

⚠ **CAUTION** • **Inspect after engine warm-up.**

Standard value (No load)

Engine speed (r/min)	Injection quantity (q)
800	10 to 30

NO → Replace the injector.
After that, proceed to the step 7.

YES

7	Check for black smoke

1. Check the exhaust pipe for black smoke.
   Standard: The absence of black smoke

NO → Make sure that there is very little smoke: if necessary, inspect the engine for leakage of engine oil.
After that, proceed to the step 8.

YES

8	Cleaning or replacing the DPR filter

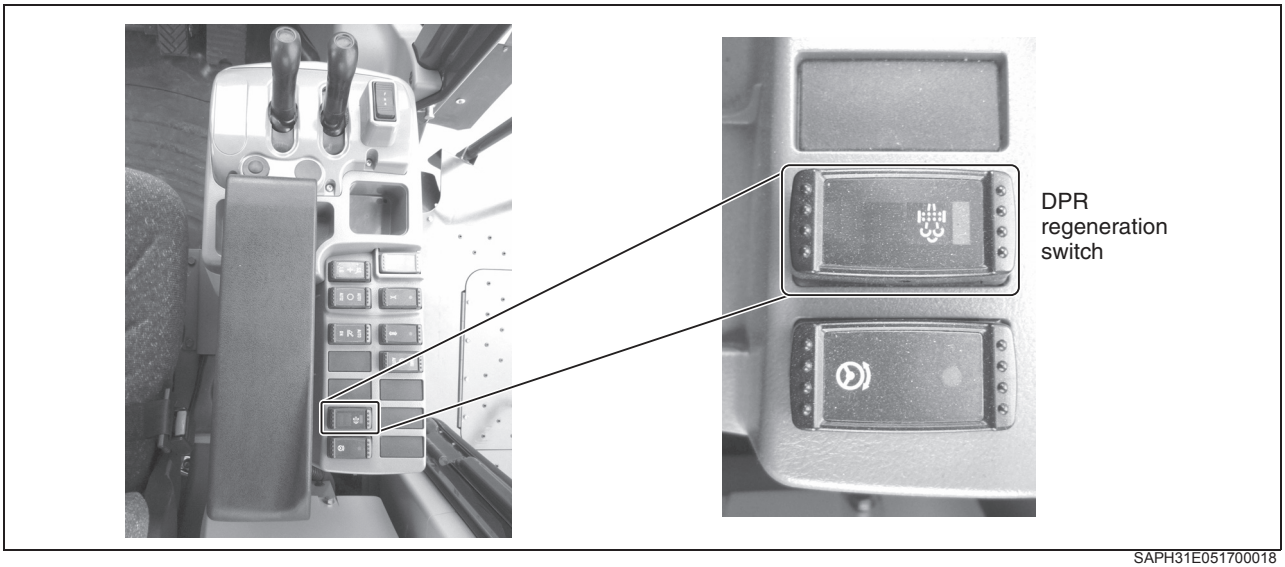
1. Clean or replace the DPR filter.
   Standard: The absence of soot leakage

NO → Clean or replace the DPR, and then go to step 9.
If cleaning, restore to new-part condition.

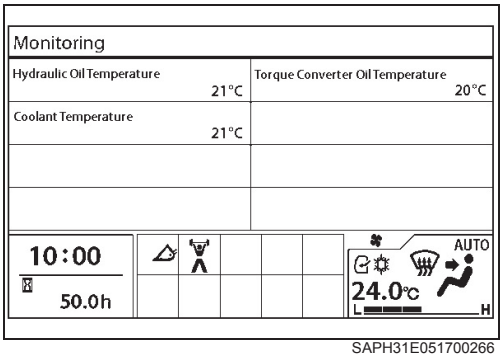
YES

(5) When the regeneration request display out, DPR regeneration switch to ON, regeneration will starts.

⚠ **CAUTION**
- **Do not perform forced regeneration continuously.**
- **If you continuously perform manual forced regeneration, perform a 10-minuite scavenging drive (refer to page 17-16) before the next regeneration cycle.**



SAPH31E051700018



SAPH31E051700266

(6) Check the DPR regeneration.
Select [Information Menu] - [Monitoring] and verify the "Particulate Matter Accumulate Amount" is "0" (no soot level bar appears).
Standard: Regeneration is successfully completed.

NO

Replace the DPR filter and perform manual forced regeneration.

NOTICE
- **You do not have to implement the differential pressure check after performing manual forced regeneration.**

After that, proceed to the step 10.

YES