HINO

WORKSHOP MANUAL

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GENERAL INTRODUCTION (ENGINE)

GENERAL PRECAUTIONS

EN00103010100001

Some recommended and standard maintenance services for your engine are included in this section. When performing maintenance on your engine, be careful not to get injured by using improper work procedures. Improper or incomplete work can cause a malfunction of the engine, which may result in personal injury and/or property damage. If you have any questions about performing maintenance, please consult your Hino dealer.

WARNING

When working on your engine, observe the following general precautions to prevent death, personal injury and/or property damage, in addition to the particular DANGERS, WARNINGS, CAUTIONS and NOTICE in each chapter.

- **Always wear safety glasses or goggles to protect your eyes.**
- **Remove rings, watches, ties, loose hanging jewelery and loose clothing before starting work on the vehicle.**
- **Bind long hair securely behind the head.**
- **When working on the vehicle, apply the parking brake firmly, place the gear shift lever in "Neutral" or "N" and block the wheels.**
- **Always stop the engine and turn off the starter switch, unless the operation requires the engine running. Removing the key from the switch is recommended.**
- **To avoid serious burns, keep yourself away from hot metal parts such as the engine, exhaust manifold, radiator, muffler, exhaust pipe and tail pipe.**
- **Do not smoke while working on the vehicle, since fuel and gas from battery are flammable.**
- **Take utmost care when working on the battery. It contains corrosive sulfuric acid.**
- **Large electric current flows through the battery cable and starter cable. Be careful not to cause a short, which can result in personal injury and/or property damage.**
- **Read carefully and observe the instructions placed on the jack before using it.**
- **Use safety stands to support the vehicle whenever you need to work under it. It is dangerous to work under a vehicle supported only by a jack.**
- **If it is necessary to run the engine after the hood is raised (tilted), make sure that the parking brake is firmly applied, the wheels are blocked, and the gear shift lever is positioned in "Neutral" before staring the engine.**
- **Run the engine only in a well-ventilated area to avoid inhaling of carbon monoxide.**
- **Keep yourself, your clothing and your tools away from moving parts such as the cooling fan and V-belt when the engine is running.**
- **Be careful not to damage lines and hoses by stepping or holding on them.**
- **Be careful not to leave any tool in the engine compartment. Tools may be hit by moving parts, which can cause personal injury.**

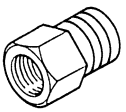
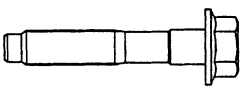
DEFINITION OF SAFETY TERMS

⚠ DANGER	**Indicates an extremly hazardous situation if proper procedures are not followed and could result in death or serious injury.**
⚠ WARNING	**Indicates a potential hazardous situation if proper procedures are not followed and could result in death or serious injury.**
⚠ CAUTION	**Indicates a hazardous situation if proper procedures are not followed and could result in serious injury or damage to parts/equipment.**
NOTICE	**Indicates the need to follow proper procedures and to pay attention to precautions so that efficient service is provided.**
HINT	**Provides additional information to help you to perform the repair efficiently.**

SPECIAL TOOL

EN0110301K100001

Prior to starting an engine overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0955-21110	COMPRESSION GAUGE ADAPTER (A)	For Overhaul criteria
	S0955-21030 S0955-21060	COMPRESSION GAUGE ADAPTER (B)	
	S0940-91190	CRANKING TOOL	
	SZ105-08067	GUIDE BOLT	

OVERHAUL CRITERIA

EN0110301H300002

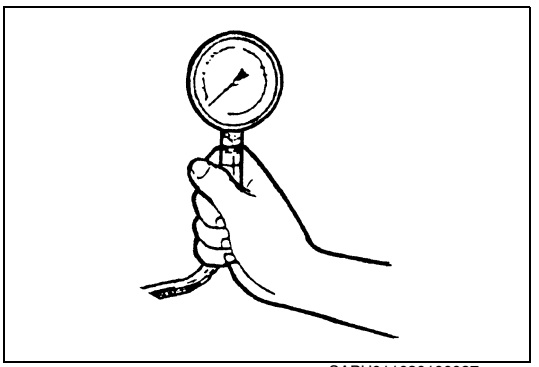
FACTORS TO DETERMINE THE ENGINE OVERHAUL

1. LOW COMPRESSION PRESSURE

(1) Before measurement
   a. Charge the battery completely.
   b. Set the valve clearance to the correct value.
   c. Idle the engine (Coolant temperature at 80°C {176°F}).
   d. Remove the air cleaner.
   e. Remove all injector.

(2) Measurement
   a. Insert the gauge adaptor into the nozzle holder hole.

SST:
Compression gauge adaptor(A) (S0955-21110)
Compression gauge adaptor(B) (S0955-21030)
Compression gauge adaptor(B) (S0955-21060)



SAPH011030100027

   b. Run the engine with the starter and measure the compression pressure.

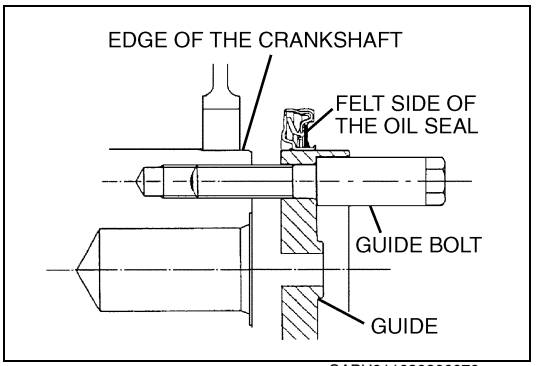
Standard	Limit	Difference between each cylinder
2.9-3.1 MPa {30-32 kgf·cm^2, 425-455 lbf/in^2}	**2.3 MPa {24 kgf·cm^2, 341 lbf/in^2}**	**0.3 MPa {3 kgf·cm^2, 43 lbf/in^2} or less**
Engine revolution 150r/min		

NOTICE
Do not operate the starter for more than 15 seconds.

   c. Measure the compression pressure of each cylinder.

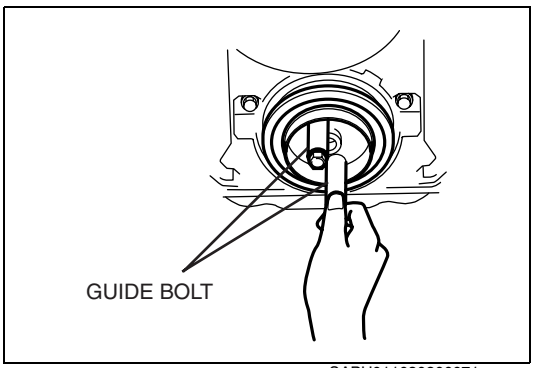
NOTICE
Do not allow gas leakage from the seal face.

(3) Reassemble the removed parts.



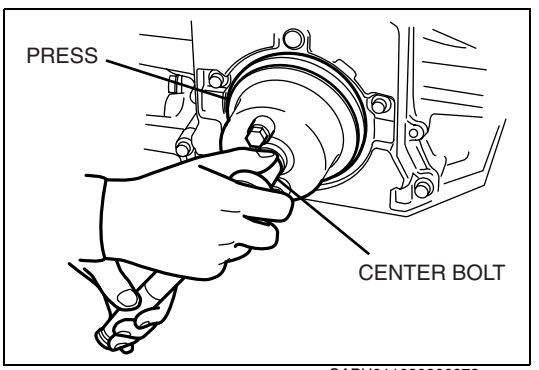
SAPH011030200070

NOTICE
Pay attention to the orientation of the crankshaft oil seal (The felt side should face the outside of the cylinder block).



SAPH011030200071

(3) Apply a little engine oil to the seal portion of the crankshaft oil seal.
(4) Attach the oil seal press guide with the new crankshaft oil seal onto the crankshaft using the attached guide bolt.



SAPH011030200072

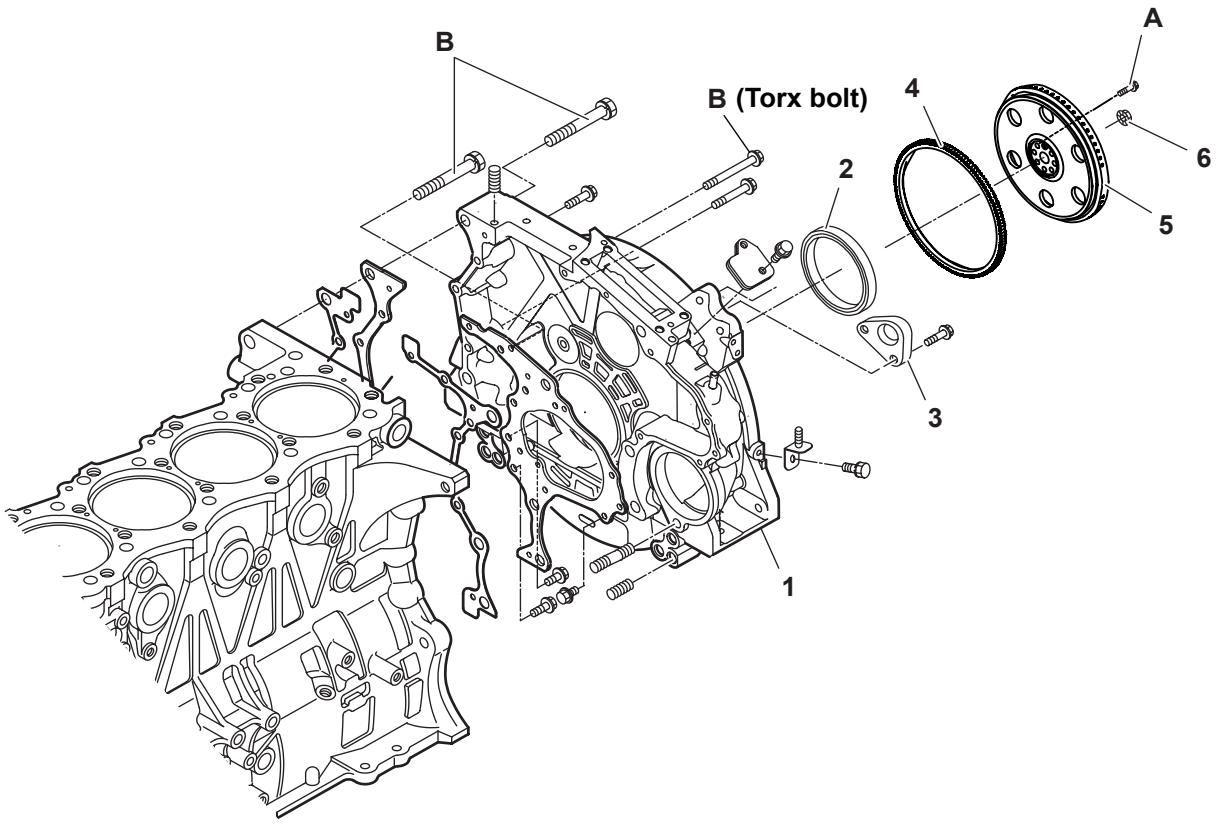
(5) Insert the oil seal press by adjusting the oil seal press hole to the guide bolt.
(6) Press the crankshaft oil seal inside by attaching the accompanying center bolt onto the oil seal press and tightening it until it stops.

FLYWHEEL AND FLYWHEEL HOUSING

COMPONENT LOCATOR

EN0110302D100003

EXAMPLE



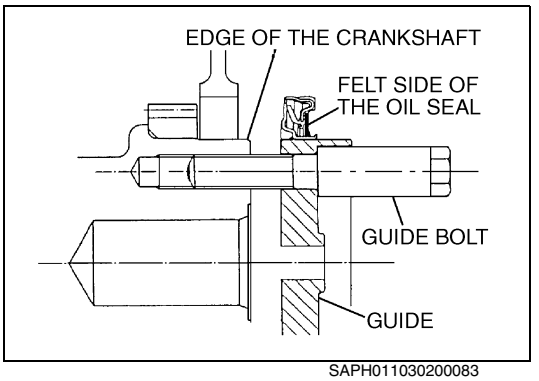
SAPH011030200073

1	Flywheel housing	4	Ring gear
2	Crankshaft oil seal	5	Flywheel
3	Hanger bracket	6	Pilot bearing

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

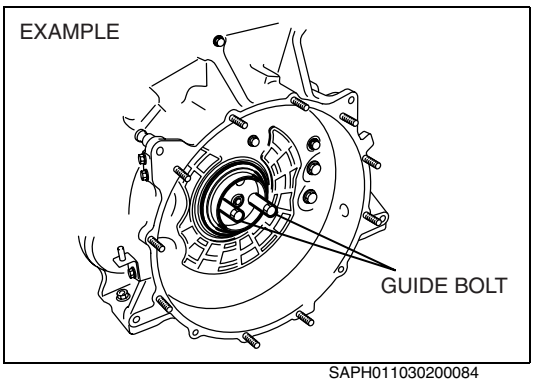
A	186 {1,900, 137}#○	B	M8: 28.5 {290, 21}
		B	M8 Torx bolt: 36 {367, 27}
		B	M10: 55 {560, 40.5}
		B	M16: 176.5 {1,800, 130}

#=Apply oil to the threads and seat surface before tightening.
○=Tighten the bolt to the specified torque, then loosen it. Tighten to the specified torque again.



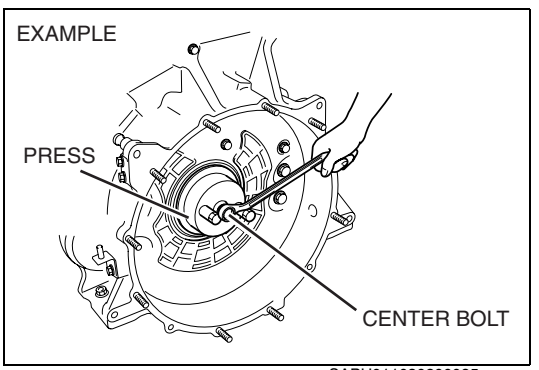
SAPH011030200083

NOTICE
Pay attention to the orientation of the crankshaft oil seal (The felt side should face the outside of the cylinder block).



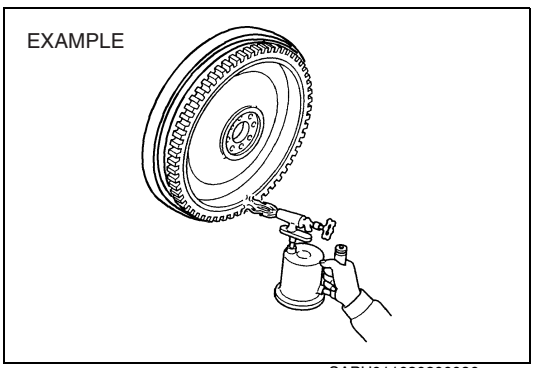
SAPH011030200084

(3) Apply a little engine oil to the seal portion of the crankshaft oil seal.
(4) Attach the oil seal press guide with the new crankshaft oil seal onto the crankshaft using the attached guide bolt.



SAPH011030200085

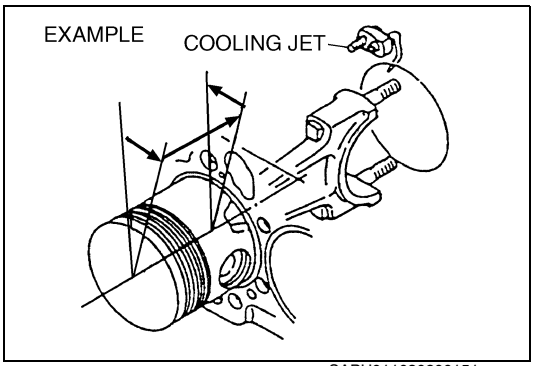
(5) Insert the oil seal press by adjusting the oil seal press hole to the guide bolt.
(6) Press the crankshaft oil seal inside by attaching the accompanying center bolt onto the oil seal press and tightening it until it stops.



SAPH011030200086

3. REPLACE THE FLYWHEEL RING GEAR.
(1) Heat the ring gear evenly to about 200°C {392°F} with a torch. Tap the ring gear periphery lightly using a cushion bar to remove the gear.

⚠ WARNING
Never touch the heated ring gear or flywheel with your bare hand. This can result in personal injury.



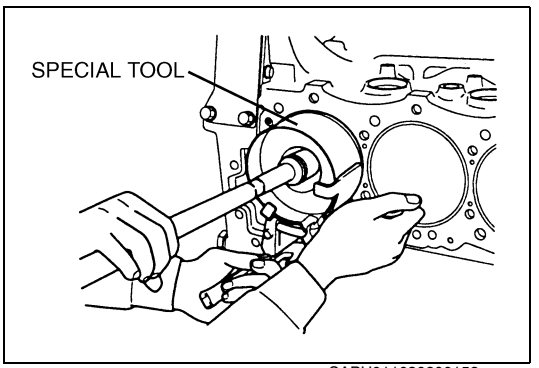
SAPH011030200151

11. INSTALL THE PISTON.

(1) Apply engine oil to the piston, cylinder liner and connecting rod bearing, then compress the piston ring using the special tool.
SST: Piston ring holder (S0944-11370)

NOTICE

- **When installing the piston, be careful that the cooling jet is not struck by the connecting rod.**
- **Make sure that the Follow-mark on the piston is at the exhaust side.**



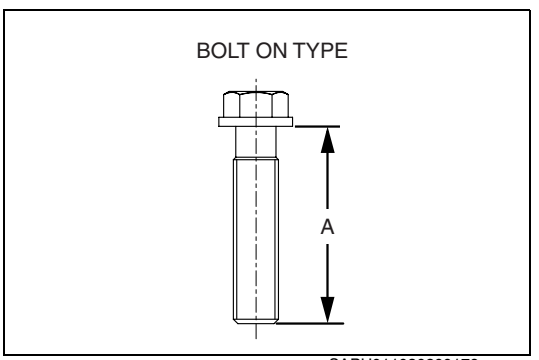
SAPH011030200152

(2) Insert the piston into the cylinder liner.

12. TIGHTEN THE CONNECTING ROD BOLT.

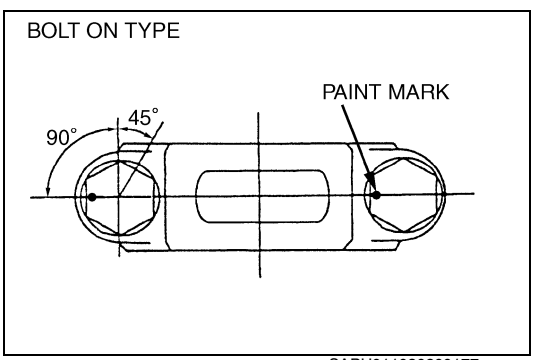
(1) Measure the length of the bolts, if the length is A or more, replace with new bolts.

Dimension A	68.0 mm {2.775 in.}



SAPH011030200179

(2) Apply clean engine oil to the bolt thread and the nut seat surface of the connecting rod cap.



SAPH011030200177

(3) Tighten the connecting rod nut to the specified torque.
Tightening Torque:
69 N·m {700 kgf·cm, 51 lbf·ft}

(4) Mark the nut heads in the same direction with paint.
(5) Tighten the connecting rod nut 90° (1/4 turn).
(6) Tighten the connecting rod nut 45° (1/8 turn).
(7) Make sure that the paint marks face the same direction.

NOTICE

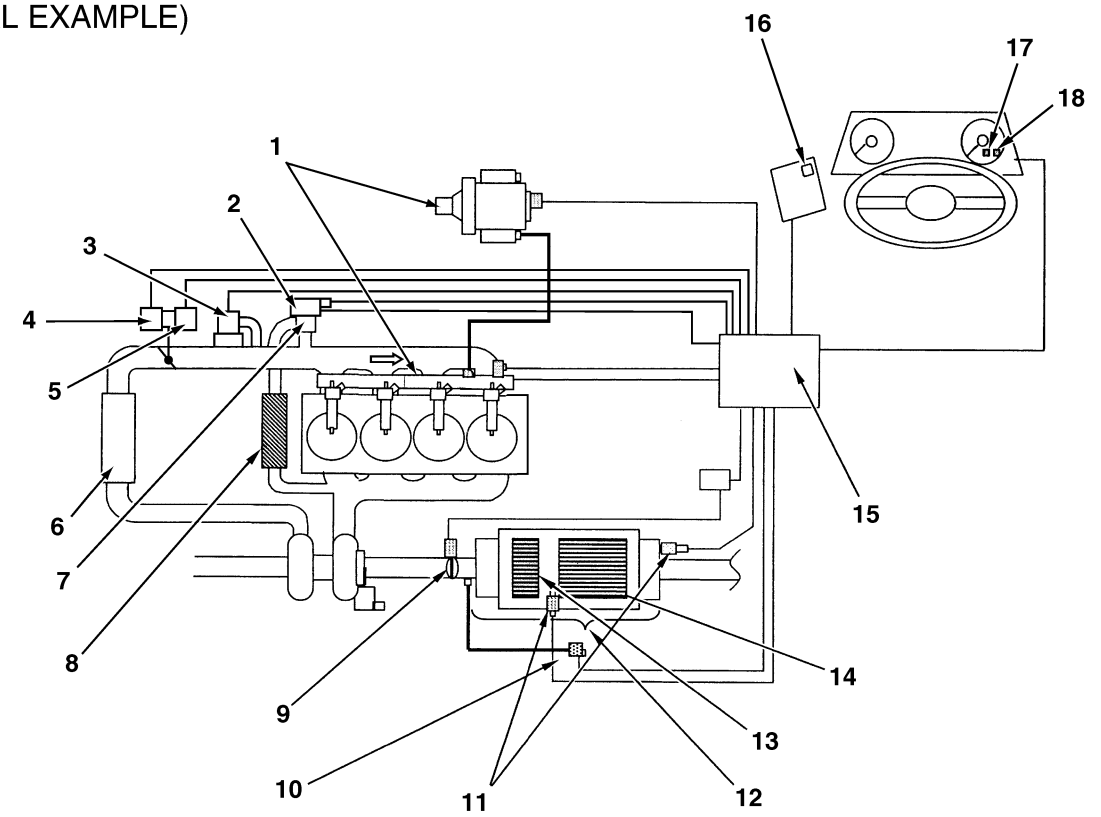
- **When retightening the bolts, never adjust them by turning counterclockwise, even if they have been retightened more than the specified angle above.**
  If the angle of bolts is adjusted to the specified angle by turning counterclockwise, the axial force of the bolts might fall short and it is feared that this could reduce the engine reliability. Also there is a possibility that this could reduce the number of times a bolt can be reused.

DPR(DIESEL PARTICULATE REDUCTION SYSTEM)

SYSTEM CONFIGURATION

EN0110604D100003

(TYPICAL EXAMPLE)

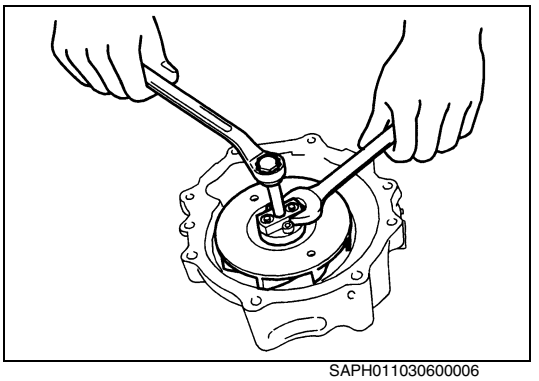


SAPH018010400011

1	Common rail fuel injection system	10	Backpressure sensor
2	EGR valve lift sensor	11	Exhaust temperature sensor
3	Intake air pressure sensor	12	DPR-cleaner
4	Diesel throttle valve	13	Oxidation catalyst
5	Diesel throttle valve aperture sensor	14	Catalyst coated filter
6	Intercooler	15	Engine ECU
7	EGR valve	16	DPR-cleaner switch
8	EGR cooler	17	DPR indicator lamp
9	Exhaust control valve	18	Check engine lamp

OVERHAUL

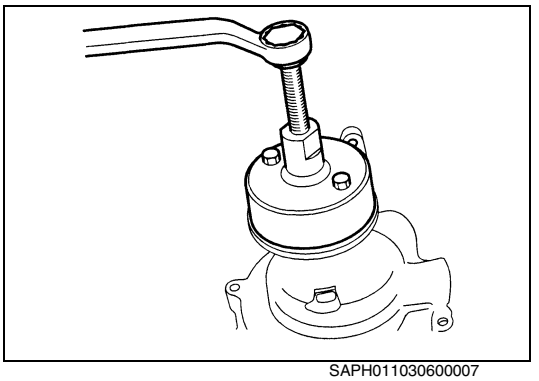
EN0110306H200001


SAPH011030600006

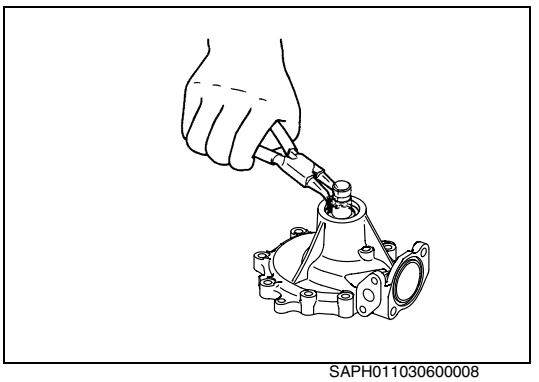
IMPORTANT POINTS - DISASSEMBLY

1. DISASSEMBLE THE COOLANT PUMP.

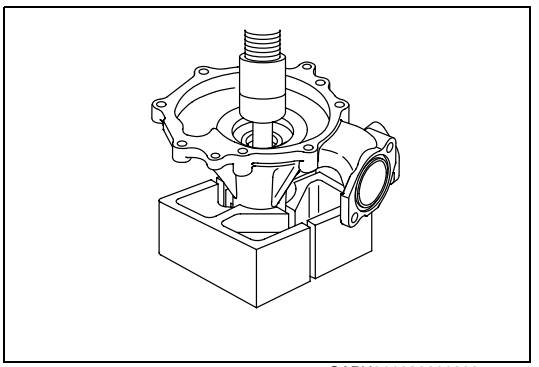
(1) Remove the vane from the shaft using the special tool.
SST: Puller (S0942-01820)


SAPH011030600007

(2) Remove the pulley center from the shaft using the special tool.
SST: Puller (S0942-01810)

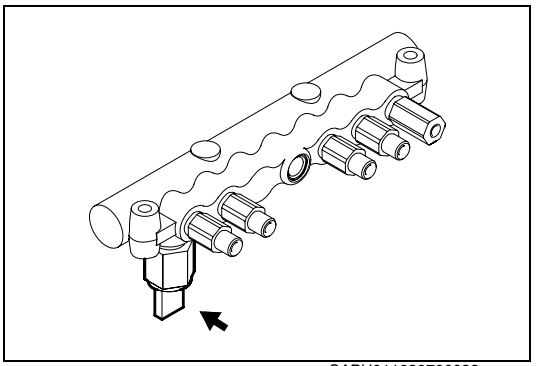

SAPH011030600008

(3) Remove the retainer ring from the pump case using snap ring pliers.


SAPH011030600009

(4) Push the shaft from the vane side using a hydraulic press, and remove the coolant shaft from the pump case.

NOTICE
Before pressing, recheck that the retainer ring is removed completely.


SAPH011030700023

3. REMOVE THE COMMON-RAIL PRESSURE SENSOR.

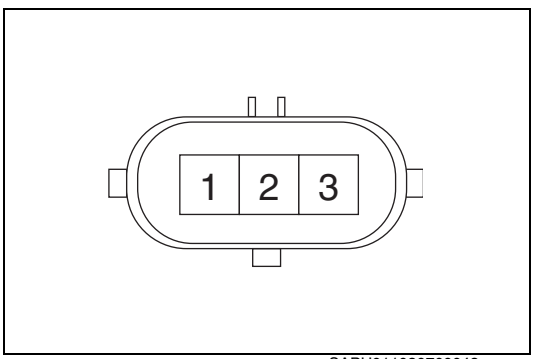
(1) Using a 30 mm {1.181 in} width across flats deep socket wrench, loosen the common-rail sensor by turning in counter-clockwise direction.
(2) Remove the common-rail sensor.

NOTICE
Never reuse a used common-rail pressure sensor.
Because if it is reused, its thread may break.

IMPORTANT POINT - ON - VEHICLE INSPECTION

1. INSPECT THE PRESSURE SENSOR.

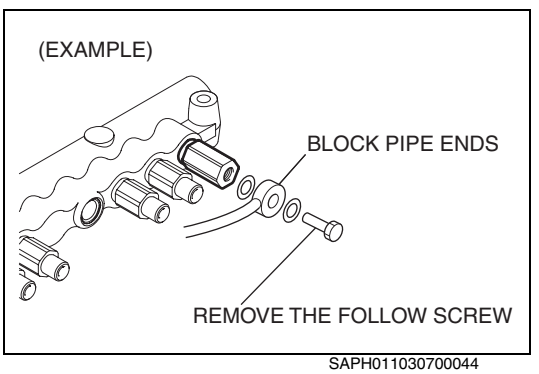
(1) If the diagnosis monitor lamp come on, and the following malfunction is displayed at the diagnosis system, replace the pressure sensor.
   a. Harness disconnection or short-circuit in the pressure sensor circuit
   b. Common rail pressure does not change at a certain time while the engine is running.
(2) Measure the resistance between terminals.
   If not standard value, replace sensor.
   Standard: (Engine stop condition)
   Terminal 2 and 3 6.5 - 18.5 kΩ
   Terminal 1 and 2 0.5 - 3.0 kΩ



SAPH011030700043

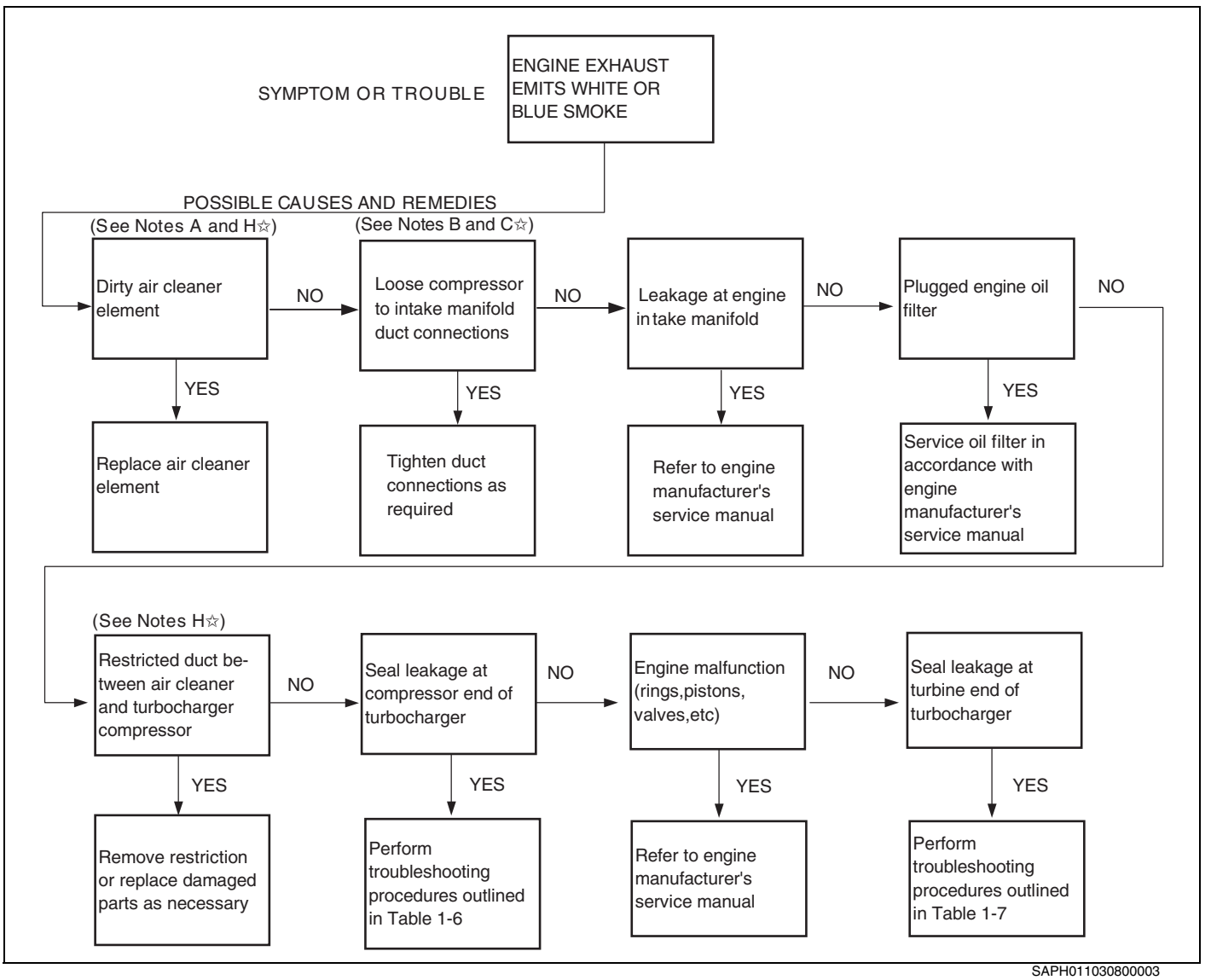
2. INSPECT THE PRESSURE LIMITER.

(1) Remove the follow screw from pressure limiter.
(2) Block pipe ends to prevent fuel leak.



SAPH011030700044

2. Table 1-2 Troubleshooting Engine Exhaust Emits WHITE or BLUE SMOKE

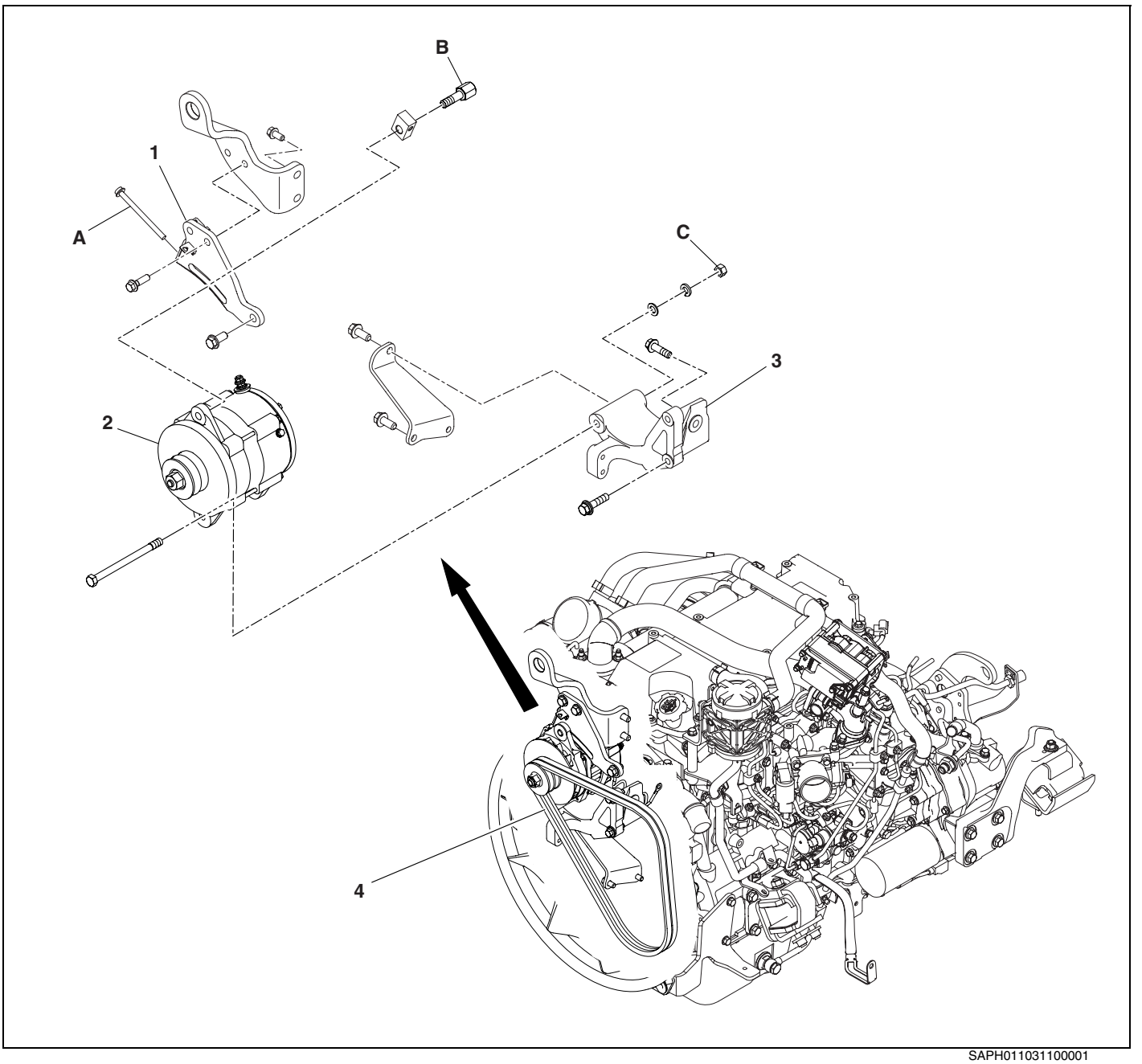


SAPH011030800003

☆ **Shown on Table 1-9**

COMPONENT LOCATOR

EN0110311D100001



SAPH011031100001

1	Brace	3	Bracket
2	Alternator	4	V-belt

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	25 {255, 19}	C	83 {850, 61}
B	81-95 {826-969, 60-70}		

ALTERNATOR

DATA AND SPECIFICATIONS

EN01Z0111I200001

Nominal voltage	**12V**
Nominal output	**12V-105A**
Max. output	**105A at 13.5V, 5,000 r/min**
Initial output starting speed	**1,370 r/min at 13.5V**
Max. rotating	**10,000 r/min**
Rotating direction	**Right (seen from pulley side)**
Regulator	**Mount-on**

TROUBLESHOOTING

EN01Z0111F300001

Symptom	Possible cause	Remedy/Prevention
Charge warning lamp does not light with starter switch ON and engine off	Fuse blown	Determine cause and replace fuse
	Lamp burned out	Replace lamp
	Wiring connection loose	Tighten loose connections
	Charge lamp relay faulty	Check relay
	IC regulator faulty	Replace IC regulator
Charge warning lamp does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt
	Battery cables loose, corroded or worn	Repair or replace cables
	Fuse blown	Determine cause and replace fuse
	Fusible link blown	Replace fusible link
	Charge lamp relay, IC regulator or alternator faulty	Check charging system
	Wiring faulty	Repair wiring

AIR COMPRESSOR

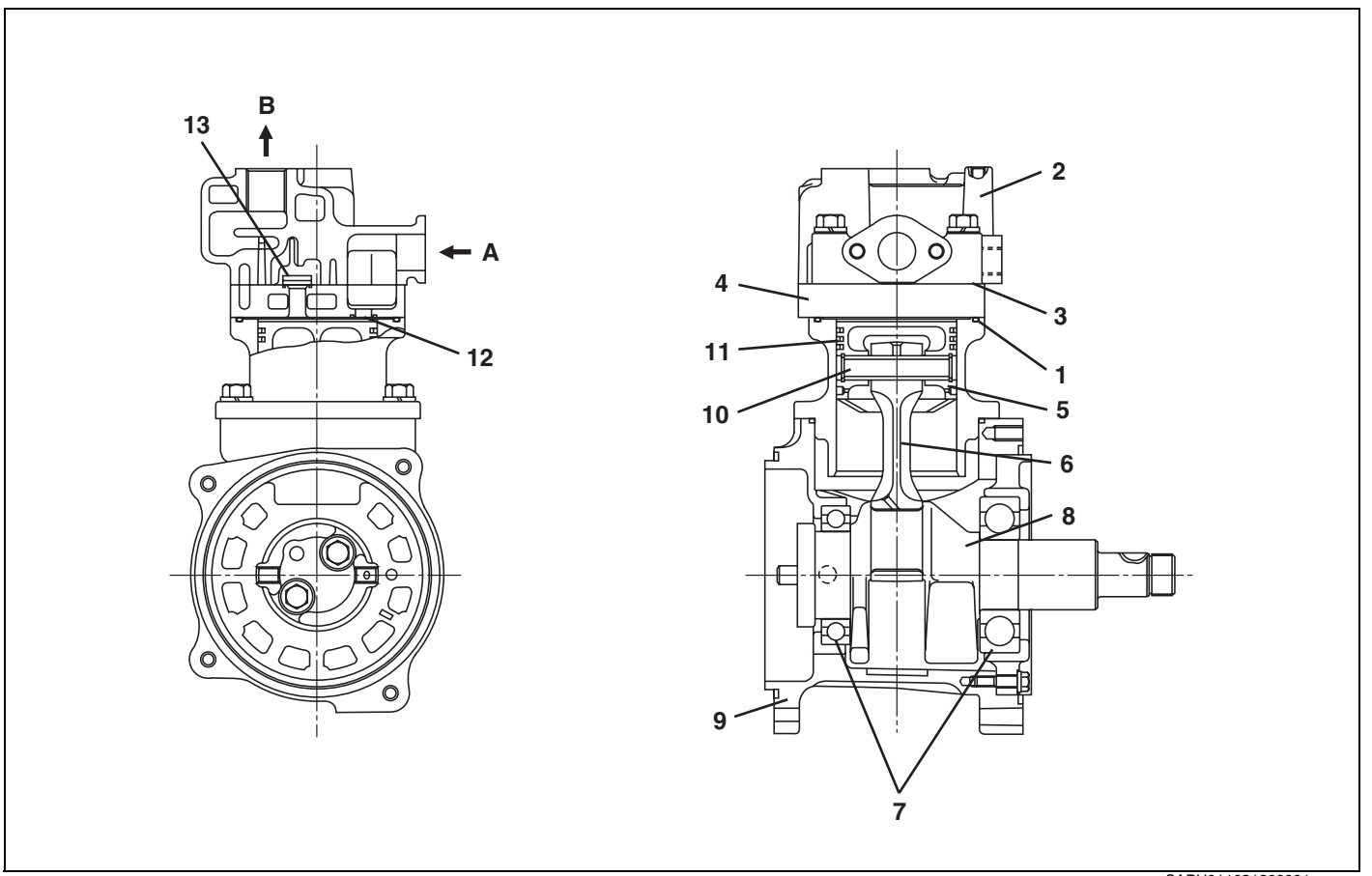
DATA AND SPECIFICATIONS

EN0110313I200001

Type	**Reciprocating, single cylinder**
Discharge amount	**154cm^3 {9.4 cu.in.}**
Bore x stroke	**70 mm x 40 mm {2.76 in. x 1.57 in.}**
Lubrication system	**Forced feed lubrication**
Cooling system	**Forced water-circulated**

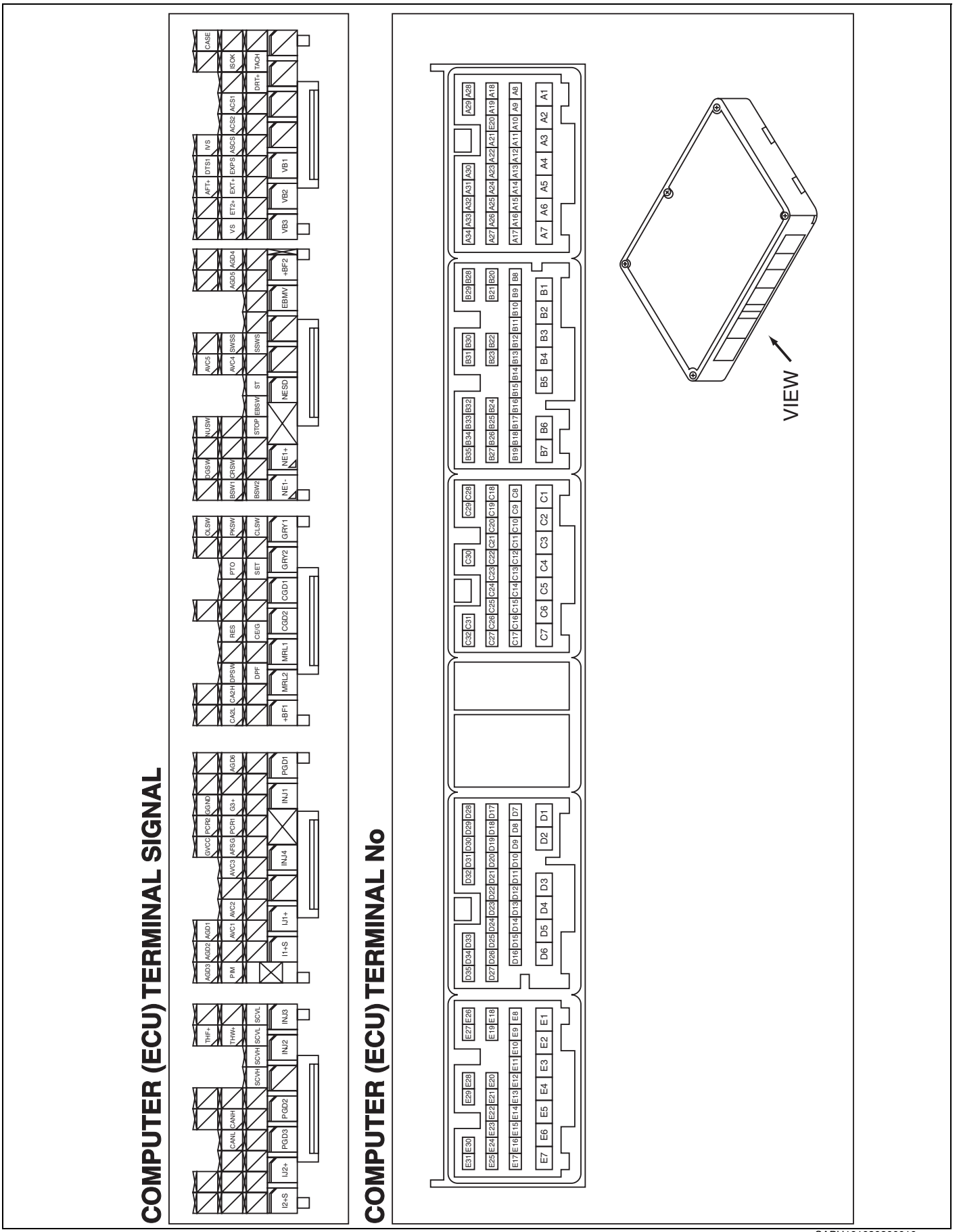
DESCRIPTION

EN0110313C100001



SAPH011031300001

1	**O-ring**	**9**	**Crankcase**
2	**Cylinder head assembly**	**10**	**Piston pin**
3	**Gasket**	**11**	**Piston ring**
4	**Valve seat**	**12**	**Suction valve**
5	**Piston**	**13**	**Delivery valve**
6	**Connecting rod**	**A**	**Suction**
7	**Bearing**	**B**	**Delivery**
8	**Crankshaft**		



SAPH161030200010